IKO

Needle Roller Bearing Series

CAT-5508.2

The IKO Needle Roller Bearing Series has been produced at a quality level in conformance with ISO-14001 and ISO-9001 using a production system that reduces negative impact on the global environment.

This catalog adopts the SI system (system of international units) in conformance with ISO (International Organization for Standardization) Standard 1000.

In the table of dimensions, standard products are referred to using identification numbers marked with ▭. The products are reputed for high quality, reasonable price and quick delivery. The identification numbers marked with ▭ refer to our semi-standard products.
The specifications and dimensions of products in this catalogue are subject to change without prior notice.

The basic dynamic load rating values are based on the equation in JIS B 1518-1992 which takes into consideration the fact that improvements in the quality of bearing materials and manufacturing technologies have extended bearing lives.
In addition, the basic static load rating values have been revised according to ISO 76-1987. The bearing accuracy are based on JIS B 1514-2000.

Index

General Explanation

Description of Each Series & Table of Dimensions

Applications Miscellaneous Tables M 1

Alphabetical Index M47

Presentation of Linear Motion Rolling Guide and Mechatronics Series M51

General Explanation

Nippon Thompson Co., Ltd. is a bearing manufacturer that launched the technical development of needle roller bearings for the first time in Japan and is proud of the high quality level and abundant varieties of its products.

Needle roller bearings are bearings for rotary motion that incorporate needle-shaped thin rollers instead of ordinary bearing balls or rollers. Compared with other rolling bearings, they are small-sized and lightweight but have a large load capacity. They are widely used with high reliability in the fields of automobiles, industrial machinery, OA equipment, etc. as resource-saving type bearings that make the whole machine compact.

Characteristics of Needle Roller Bearings

Bearings can be classified into two main types, namely rolling bearings and sliding bearings. Rolling bearings can be subdivided further into ball bearings and roller bearings according to the rolling elements.
IKO Needle Roller Bearings are high-precision rolling bearings with a low sectional height, incorporating needle rollers as the rolling element. They have the following features.

Merits of Rolling Bearings

Compared with sliding bearings, rolling bearings have the following merits:

❶ Static and kinetic friction is low.

Since the difference between static friction and kinetic friction is small and the frictional coefficient is also small, drive units or machines can be made more compact and lightweight, saving machine costs and power consumption.

❷ Stable accuracy can be maintained for long periods.

Owing to less wear, stable accuracy can be maintained for long periods.

❸ Machine reliability is improved.

Since the bearing life can be estimated based on rolling fatigue, machine reliability is improved.

❹ Lubrication is simplified.

Since grease lubrication is sufficient in most cases, lubrication can be simplified for easy maintenance.

Merits of Needle Roller Bearings

Compared with other rolling bearings, IKO Needle Roller Bearings have the following advantages:

❶ With a low sectional height, they can withstand heavy loads.

Since they have a low sectional height compared with other rolling bearings and yet can withstand heavy loads, machines can be made more compact and lightweight, thus saving costs.

❷ Rotating torque is small, improving mechanical efficiency.

Since the rotating radius is small, the rotating torque is also small under the same frictional conditions, thus improving mechanical efficiency.

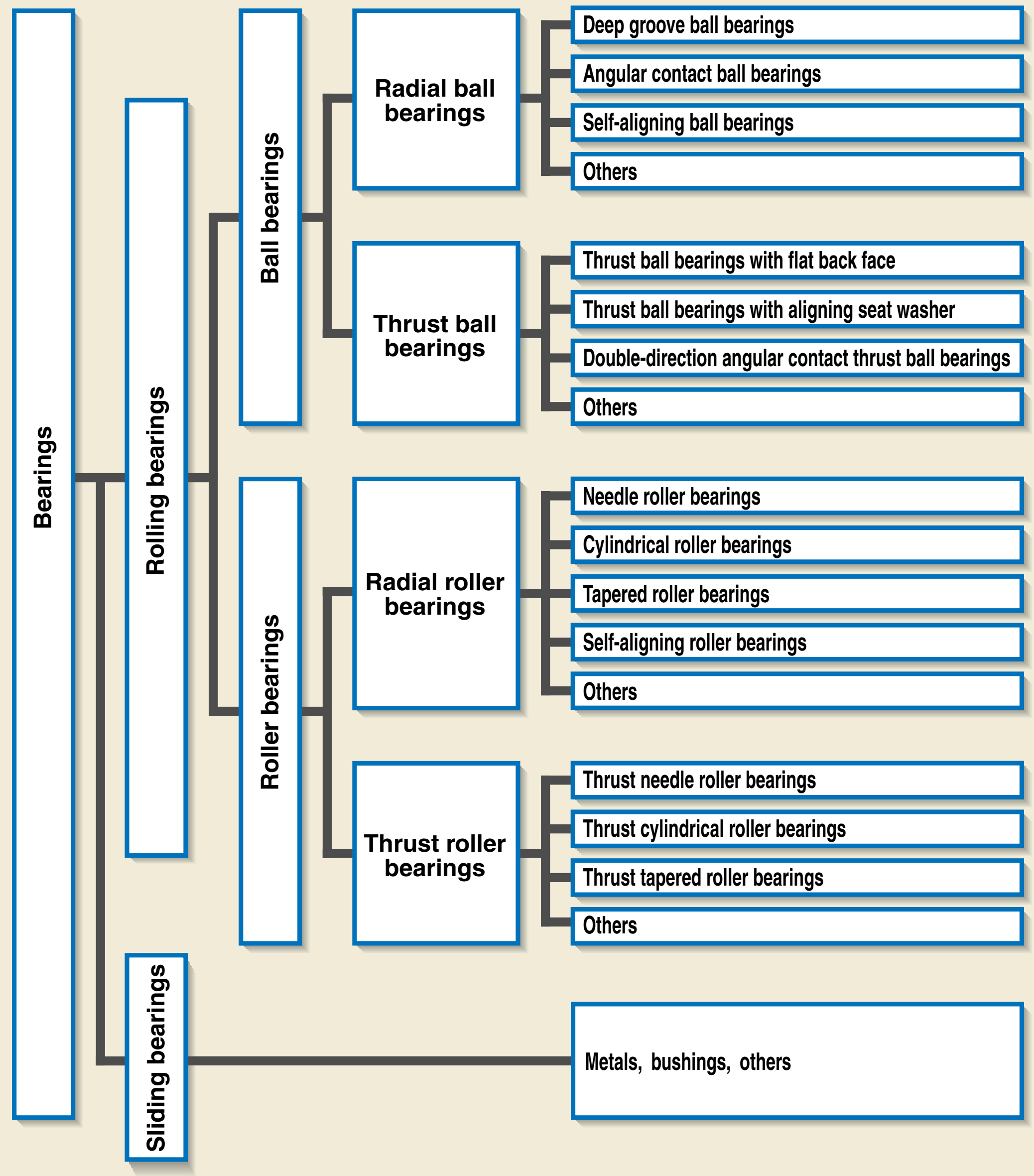
❸ Inertia is minimized.

Since the bearing volume and weight are small, the moment of inertia of the bearing is minimized when it is put in motion.

❹ Most suited to oscillating motions.

Many rolling elements are arranged at a small spacing pitch, and this configuration is most suited to oscillating motions.

Classification of bearings



Types and Features of Bearings

IKO Bearings can be roughly classified into radial bearings and thrust bearings according to applicable load direction. Radial Bearings are grouped into Shell Type Needle Roller Bearings, Machined Type Needle Roller Bearings, and various other types. Thrust Bearings are grouped into Thrust Needle Roller Bearings and Thrust Roller Bearings. Follower Bearings that are used for cam mechanisms and linear motion are grouped into Cam Followers and Roller Followers.

Classification of IKO Bearings

- **Radial Bearings**
  - Shell Type Needle Roller Bearings
    - TA、TAM
    - TLA、TLAM
    - BA、BAM
    - BHA、BHAM
    - YT
    - YTL
    - YB
    - YBH
  - Needle Roller Cages
    - Needle Roller Cages for General Usage
      - KT
      - KTW
    - Needle Roller Cages for Engine Connecting Rods
      - KT…EG
      - KTV…EG
  - Machined Type Needle Roller Bearings
    - C-Lube Machined Type Needle Roller Bearings
      - TAF…/SG
    - NA、RNA
    - TAFI、TAF
    - TRI、TR
    - BRI、BR
    - GTRI、GTR
    - GBRI、GBR
    - Needle Roller Bearings with Separable Cage
      - NAF、RNAF
      - NAFW、RNAFW
  - Roller Bearings
    - NAU
    - NAG
    - TRU
    - Roller Bearings for Sheaves
      - NAS
- **Thrust Bearings**
  - Thrust Needle Roller Bearings
    - NTB
  - Thrust Roller Bearings
    - AZK、AZ
- **Combined Type Bearings**
  - Combined Type Needle Roller Bearings
    - with Thrust Ball Bearing: NAXI、NAX
    - with Thrust Roller Bearing: NBXI、NBX
    - with Angular Contact Ball Bearing: NATA
    - with Three-point Contact Ball Bearing: NATB

Crossed Roller Bearings are special shape bearings that can simultaneously receive loads in all directions with a single bearing.

Bearings other than rolling bearings, such as self-aligning Spherical Bushings that can support radial loads and axial loads and PILLOBALLs and L-Balls that are used for link mechanisms, are also available.

- **Follower Bearings**
  - Cam Followers
    - C-Lube Cam Followers: CF…WB…/SG
    - Standard Type Cam Followers: CF…B
    - Solid Eccentric Stud Type Cam Followers: CFES…B
    - Eccentric Type Cam Followers: CFE…B
    - Thrust Disk Type Cam Followers: CF…WB
    - Centralized Lubrication Type Cam Followers: CF-RU1、CF-FU1
    - Easy Mounting Type Cam Followers: CF-SFU…B
    - Cylindrical Roller Cam Followers: NUCF…B
    - Miniature Type Cam Followers: CFS
    - Thrust Disk Type Miniature Cam Followers: CFS…W
    - Miniature Type Cam Followers Stainless Steel Made: CFS…F
    - Inch Series Cam Followers: CR、CRH
  - Roller Followers
    - Separable Roller Followers: NAST、RNAST
    - Non-separable Roller Followers: NART、CRY
    - Cylindrical Roller Followers: NURT
- **Crossed Roller Bearings**
  - Crossed Roller Bearings
    - Mounting Holed Type High Rigidity Crossed Roller Bearings: CRBF
    - High Rigidity Type Crossed Roller Bearings: CRBH
    - Standard Type Crossed Roller Bearings: CRBC、CRB
    - Slim Type Crossed Roller Bearings: CRBS
    - Super Slim Type Crossed Roller Bearings: CRBT
- **Spherical Sliding Bearings**
  - Spherical Bushings
    - SB
    - GE
    - SBB
  - PILLOBALLs
    - PB
    - PHS
    - POS
    - PHSA
  - L-Balls
    - LHSA
    - LHS

Shell Type Needle Roller Bearings

Shell Type Needle Roller Bearings are lightweight with the lowest sectional height among needle roller bearings with outer ring, because they employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched.
Since these bearings are press-fitted into the housing, no axial positioning fixtures are required. They are ideal for use in mass-produced articles that require economy.

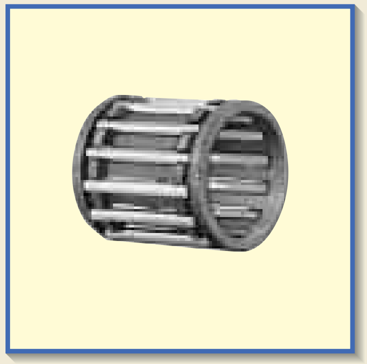
Radial Bearings Page B1

Needle Roller Cages for General Usage

Needle Roller Cages for General Usage are bearings that display excellent rotational performance. Their specially shaped cages with high rigidity and accuracy, precisely guide the needle rollers.
Since needle rollers with extremely small dimensional variations in diameter are incorporated and retained, Needle Roller Cages for General Usage are useful in small spaces when combined with shafts and housing bores that are heat treated and accurately ground as raceway surfaces.

Radial Bearing Page C1

Needle Roller Cages for Engine Connecting Rods



Needle Roller Gages for Engine Connecting Rods are used for motor cycles, small motor vehicles, outboard marines, snow mobiles, general-purpose engines, high-speed compressors, etc. that are operated under extremely severe and complex operating conditions such as heavy shock loads, high speeds, high temperatures, and stringent lubrication.
Needle Roller Cages for Engine Connecting Rods are lightweight and have high load ratings and high rigidity as well as superior wear resistance.

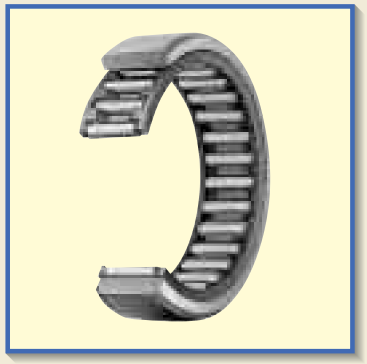
Radial Bearing Page C17

Machined Type Needle Roller Bearings

Machined Type Needle Roller Bearings have an outer ring made by machining, heat treatment, and grinding. The outer ring has stable high rigidity and can be easily used even for light alloy housings.
These bearings are available in various types and optimally selectable for different conditions such as heavy loads, high-speed rotation and low-speed rotation. They are most suitable for general-purpose applications.

Radial Bearing Page D1

Needle Roller Bearings with Separable Cage



In Needle Roller Bearings with Separable Cage, the inner ring, outer ring and Needle Roller Cage are combined, and they can be separated easily. This type has a simple structure with high accuracy. In addition, the radial clearance can be freely selected by choosing an assembly combination.
These bearings have excellent rotational performance, because Needle Roller Cages are used.

Radial Bearing Page D93

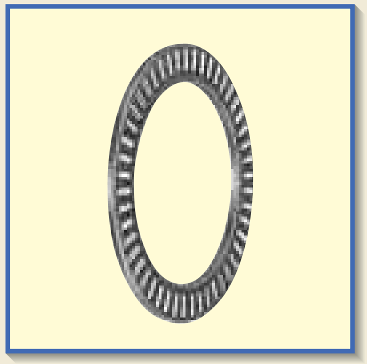
Roller Bearings

Roller Bearings, in which rollers are incorporated in double rows, are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are most suitable for use at the fixing side of a shaft.

Radial Bearing Page E1

A B C D E F G H I J K L M

Thrust Bearings



Thrust Bearings consist of a precisely made cage and rollers, and can receive axial loads. They have high rigidity and high load capacities and can be used in small spaces.
Thrust Needle Roller Bearings use needle rollers, while Thrust Roller Bearings use cylindrical rollers.

Thrust Bearing Page F1

Combined Type Needle Roller Bearings

Combined Type Needle Roller Bearings are combinations of a radial bearing and a thrust bearing. Caged Needle Roller Bearings are used as radial bearings and Thrust Ball Bearings or Thrust Roller Bearings are used as thrust bearings.
They can be subjected to radial loads and axial loads simultaneously.

Combined Type Bearing Page G1

Inner Rings

Inner Rings are heat-treated and finished by grinding to a high degree of accuracy and are used for Needle Roller Bearings.
In the case of Needle Roller Bearings, normally the shafts are heat-treated and finished by grinding and used as raceway surfaces. However, when it is impossible to make shaft surfaces according to the specified surface hardness or surface roughness, Inner Rings are used.

Component part Page H1

Cam Followers

Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring.
They are designed for outer ring rotation, and the outer rings run directly on mating track surfaces.
Various types of Cam Followers are available. They are widely used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I1

Roller Followers

Roller Followers are bearings in which needle rollers are incorporated in a thick walled outer ring.
These bearings are designed for outer ring rotation, and the outer rings run directly on mating track surfaces.
They are used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I71

Crossed Roller Bearings

Crossed Roller Bearings are high-rigidity and compact bearings with their cylindrical rollers alternately crossed at right angles to each other between inner and outer rings. A single Crossed Roller Bearing can take loads from any directions at the same time such as radial, thrust, and moment loads.
These bearings are widely used in the rotating parts of industrial robots, machine tools, medical equipment, etc. which require compactness, high rigidity and high rotational accuracy.

Crossed Roller Bearing Page J1

Spherical Bushings

Spherical Bushings are self-aligning spherical plain bushings, which have inner and outer rings with spherical sliding surfaces. They can take a large radial load and a bi-directional axial load at the same time.
They are divided into steel-on-steel types that are suitable for applications where there are alternate loads or shock loads, and maintenance-free types which require no lubrication.

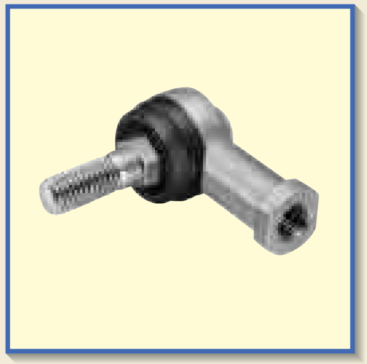
Spherical Sliding Bearing Page K1

PILLOBALLs

PILLOBALLs are compact self-aligning spherical plain bushings which can support a large radial load and a bi-directional axial load at the same time.
PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, so they can be easily assembled onto machines.
PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc.

Spherical Sliding Bearing Page K29

L-Balls



L-Balls are self-aligning rod-ends consisting of a special die-cast zinc alloy body and a studded ball which has its axis at right-angles to the body.
They can perform tilting movement and rotation with low torque, and transmit power smoothly due to the uniform clearance between the sliding surfaces.
They are used in link mechanisms in automobiles, construction machinery, farm and packaging machines, etc.

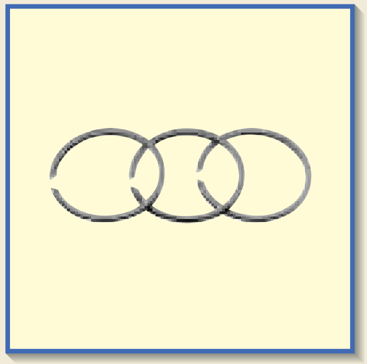
Spherical Sliding Bearing Page K45

Seals for Needle Roller Bearings

Seals for Needle Roller Bearings have a low sectional height and consist of a sheet metal ring and special synthetic rubber.
As these seals are manufactured to the same sectional height as Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings.

Component Part Page L1

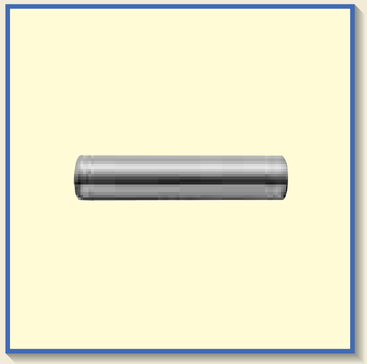
Cir-clips for Needle Roller Bearings



Cir-clips for Needle Roller Bearings have been specially designed for needle roller bearings on which, in many cases, generally available Cir-clips cannot be used. They have a low sectional height and are very rigid.
There are Cir-clips for shafts and for bores, and they are used for positioning to prevent bearing movement in the axial direction.

Component Part Page L17

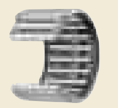
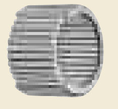
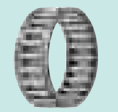
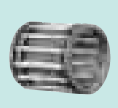
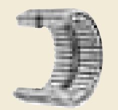
Needle Rollers



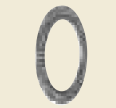
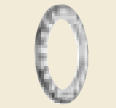
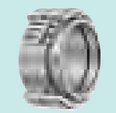
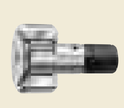
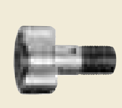
Needle Rollers are used for needle roller bearings and are rigid and highly accurate.
These needle rollers are widely used as rolling elements for bearings, and also as pins and shafts.

Component Part Page L23

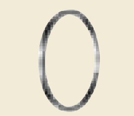
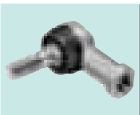
Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Shell Type Needle Roller Bearings	Caged type		Rotation	Radial load, light load	○	○	◎	B1～
	Full complement type		Rotation	Radial load, light load	△	△	◎	
Needle Roller Cages	For general usage		Rotation	Radial load, medium load	◎	◎	◎	C1～
	For engine connecting rods		Rotation	Radial load, medium load	◎	◎	◎	C17～
Machined Type Needle Roller Bearings	Caged type		Rotation	Radial load, medium load	○	◎	○	D1～
	Full complement type		Rotation	Radial load, heavy load	△	△	○	
Needle Roller Bearings with Separable Cage	Caged type		Rotation	Radial load, medium load	◎	◎	○	D93～
Roller Bearings	Caged type		Rotation	Radial load, medium load; axial load, light load	○	○	○	E1～
	Full complement type		Rotation	Radial load, medium load; axial load, light load	△	△	○	
	For sheaves		Rotation	Radial load, heavy load; axial load, light load	△	△	△	

Symbol Rotation / Oscillating motion / Radial load / Axial load / Light load / Medium load / Heavy load / ◎ Especially excellent / ○ Excellent / △ Normal

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Thrust Bearings	Needle roller bearings		Rotation	Axial load, medium load	○	○	◎	F1～
	Roller bearings		Rotation	Axial load, heavy load	○	○	○	
Combined Type Needle Roller Bearings	With thrust ball bearing		Rotation	Radial load, medium load; axial load, medium load	○	○	△	G1～
	With thrust roller bearing		Rotation	Radial load, medium load; axial load, heavy load	○	○	△	
	With angular contact ball bearing		Rotation	Radial load, medium load; axial load, light load	○	○	○	
	With three-point contact ball bearing		Rotation	Radial load, medium load; axial load, light load	○	○	○	
Cam Followers	Caged type		Rotation	Radial load, medium load	○	○	△	I1～
	Full complement type		Rotation	Radial load, heavy load	△	△	△	
Roller Followers	Separable caged type		Rotation	Radial load, medium load	○	○	△	I71～
	Non-separable caged type		Rotation	Radial load, medium load	○	○	△	
	Non-separable full complement type		Rotation	Radial load, heavy load	△	△	△	

Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Crossed Roller Bearings	Caged type, Separator type				△	○	○	J1～
	Full complement type				△	△	○	
	Slim type				△	○	◎	
Spherical Bushings	Steel-on-steel type				△	△	△	K1～
	Maintenance-free type				△	△	△	
PILLOBALLs	Insert type, Lubrication type				△	△	△	K29～
	Die-casting type, Lubrication type				△	△	△	
	Maintenance-free type				△	△	△	
L-Balls	Lubrication type				△	△	△	K45～

Symbol Rotation Oscillating motion Radial load Axial load Light load Medium load Heavy load ◎ Especially excellent ○ Excellent △ Normal

Outline of Bearing Selection

IKO Bearings are available in many types and sizes. To obtain satisfactory bearing performance in machines and equipment, it is essential to select the most suitable bearing by carefully studying the requirements for the application. Although there is no particular procedure or rule for bearing selection, an example of a commonly adopted procedure is shown in the figure below.

An example of procedure for bearing selection

1. ***Confirmation of requirements and operating conditions***
   - Identify the machine and place where the bearing is to be used.
   - Confirm the requirements for bearings such as required bearing performance, and also confirm the operating conditions and special environment conditions.
2. ***Selection of bearing type***
   - Select the bearing type suitable for the operating conditions by considering load direction and magnitude, rigidity, friction, allowable rotational speed, bearing space, etc.
   - See page A5
3. ***Selection of bearing dimensions***
   - Select the bearing dimensions by calculating bearing load, life, static safety factor, etc.
   - See page A17
4. ***Selection of accuracy class, etc.***
   - Select the accuracy as required by the machine or equipment.
   - See page A30
5. ***Selection of radial clearance and fit***
   - Select the radial clearance considering the fit, temperature, rotational speed, inclination of the inner and outer rings, etc.
   - See page A37
6. ***Determination of bearing dimensions, accuracy, radial clearance and fit***
7. ***Selection of lubrication and dust-proof methods***
   - Select oil or grease lubrication.
   - After selection of lubricant, in case of oil lubrication, select the oil application method.
   - Select the sealing method according to the lubricant.
   - See page A49
8. ***Design of surrounding part***
   - Design the surrounding part based on how to mount or dismount and based on mounting dimensions.
   - See page A57
9. ***Determination of final specifications of the bearing and the surrounding part***

Basic Dynamic Load Rating and Life

Life

Rolling bearings will suffer damage due to various causes during service. Damage such as abnormal wear, seizure, and cracks is caused by improper use, including incorrect mounting, lack of oil, dust intrusion and so on, and can be avoided by remedying these causes. However, bearings will eventually be damaged due to fatigue-flaking even if used properly. When a bearing rotates under load, the raceways and the rolling elements are subjected to repeated stresses concentrated on the part close to the surface. Fatigue, therefore, occurs in the surface layer, producing damage in the form of scaling. This is called flaking (spalling). When this occurs, the bearing can no longer be used.

Bearing Life

Bearing life is defined as the total number of revolutions (or total service hours at a constant rotational speed) before a sign of the first flaking appears on the rolling surface of raceway or rolling elements. However, even when bearings of the same size, structure, material and heat treatment are subjected to the same conditions, the bearing lives will show variation (See Fig. 1.). This results from the statistical nature of the fatigue phenomenon.
In selecting a bearing, it is incorrect to take an average life for all bearings as the design standard. It is more practical to consider a bearing life that is reliable for the greater proportion of bearings used. Therefore, the basic rating life defined in the following is used.

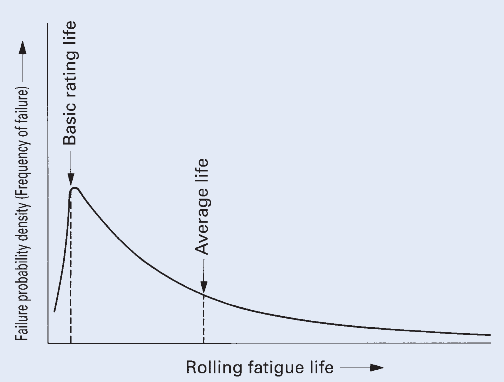


Fig. 1 Variation of rolling fatigue life

Basic rating life

The basic rating life is defined as the total number of revolutions that 90% of a group of identical bearings can be operated individually under the same conditions free from any material damage caused by rolling fatigue.
For rotation at a constant rotational speed, the basic rating life can be represented by the total service hours.

Basic dynamic load rating

The basic dynamic load rating is defined as the constant radial load (in the case of radial bearings) or the constant axial load acting along the bearing central axis (in the case of thrust bearings) that allows a basic rating life of 1,000,000 revolutions.

Calculation of rating life

The relationship among the basic rating life, basic dynamic load rating and dynamic equivalent load (bearing load) of rolling bearings is as follows:

$$L_{10}=\left(\frac{C}{P}\right)^{p} \quad \cdots\cdots(1)$$

where, L_{10} : Basic rating life, 10^6 rev.
C : Basic dynamic load rating, N
P : Dynamic equivalent load, N
p : Exponent, Roller bearing: 10/3
Ball bearing: 3

Accordingly, when the rotational speed per minute is given, the basic rating life is represented as the total service hours according to the following equations:

$$L_h=\frac{10^6 L_{10}}{60n}=500 f_h^{\,p} \quad \cdots\cdots(2)$$

$$f_h=f_n\frac{C}{P} \quad \cdots\cdots(3)$$

$$f_n=\left(\frac{33.3}{n}\right)^{1/p} \quad \cdots\cdots(4)$$

where, L_h : Basic rating life represented by service hours, h
n : Rotation speed, rpm
f_h : Life factor
f_n : Velocity factor

In addition, the rating life can be calculated by obtaining f_h and f_n from the life calculation scales of Fig. 2.

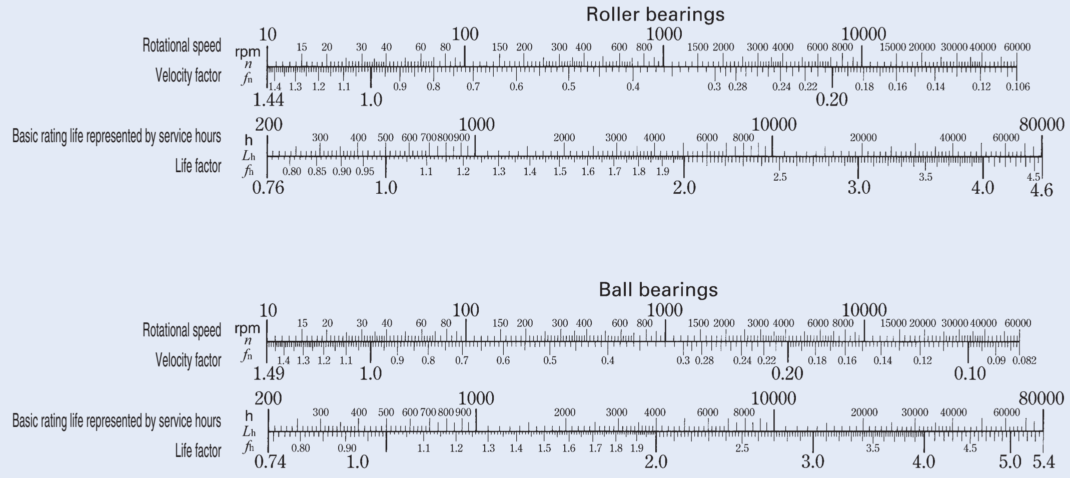


Fig. 2 Scales for rating life calculation

Bearing life factors for various machines

The required life of the bearing must be determined according to the machine in which the bearing is to be used and the operating conditions.
Table 1 shows reference values of life factors for selecting a bearing for each machine.

Table 1 Life factor of bearings f_h for various machines

Operating conditions	Machine and life factor f_h				
	～3	2～4	3～5	4～7	6～
Occasional or short term usage	· Power tools	· Agricultural machines			
Infrequent usage but requiring reliable operation		· Construction machinery	· Conveyors · Elevators		
Intermittent operation but for comparatively long periods	· Roll neck of rolling mills	· Small motors · Deck cranes · General cargo cranes · Passenger cars	· Factory motors · Machine tools · General gear units · Printing machines	· Crane sheaves · Compressors · Important gear units	
Operated in excess of 8 hours per day or continuously for an extended time		· Escalators	· Centrifugal separators · Blowers · Wood working machines · Plastic extruding machines		· Paper making machines
Continuous use for 24 hours and accidental stops not allowed					· Water supply equipment · Power station equipment

A B C D E F G H I J K L M

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

Life of oscillating bearing

The life of an oscillating bearing can be obtained from equation (5).

$$L_{OC} = \frac{90}{\theta}\left(\frac{C}{P}\right)^{p} \cdots\cdots\cdots\cdots (5)$$

where, L_{OC} : Basic rating life of oscillating bearing, 10^6 cycles

2θ : Oscillating angle, deg. (See Fig.3)

P : Dynamic equivalent load, N

Therefore, when the oscillating frequency $n_1$cpm is given, the basic rating life as represented by total oscillating hours can be obtained by substituting n_1 for n in equation (2) on page A17.

When 2θ is small, an oil film cannot be formed easily between the contact surfaces of the raceway and the rolling elements. This may cause fretting corrosion. In this case, please consult IKO.

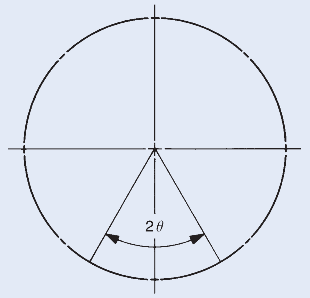


Fig. 3 Oscillating motion

Corrected rating life

When a rolling bearing is used in ordinary applications, the basic rating life can be calculated by equations (1) and (2) mentioned previously.

This basic rating life applies to bearings which require a reliability of 90%, have ordinary bearing properties being made of materials of ordinary quality for rolling bearings, and are used under ordinary operating conditions.

In some applications, however, it is necessary to obtain a rating life that applies to bearings which require high reliability, have special bearing properties or are used under special operating conditions. The corrected rating life for these special cases can be obtained from the following equation by using the bearing life adjustment factors a_1, a_2 and a_3, respectively.

$$L_{na} = a_1 a_2 a_3 L_{10} \cdots\cdots\cdots\cdots (6)$$

where, L_{na} : Corrected rating life, 10^6 rev.

a_1 : Life adjustment factor for reliability

a_2 : Life adjustment factor for special bearing properties

a_3 : Life adjustment factor for operating conditions

Life adjustment factor for reliability a_1

The reliability of rolling bearings is defined as the proportion of bearings having a life equal to or greater than a certain specified value when a group of identical bearings are operated under identical conditions. With respect to individual bearings, it refers to the probability of the life of a bearing being equal to or greater than a certain specified value.

The corrected rating life for a reliability of (100-n)% can be obtained using equation (6). Table 2 shows the values of the life adjustment factor a_1 for various reliabilities.

Table 2 Life adjustment factor for reliability a_1

Reliability %	L_n	a_1
90	L_{10}	1
95	L_5	0.62
96	L_4	0.53
97	L_3	0.44
98	L_2	0.33
99	L_1	0.21

Life adjustment factor for special bearing properties a_2

The bearing life is extended or shortened according to the quality of the material, the manufacturing technology of the bearing and its internal design. For these special bearing life properties, the life is corrected by the life adjustment factor for special bearing properties a_2.

The table of dimensions for IKO Bearings shows the values of the basic dynamic load rating which are determined taking into consideration the fact that bearing life has been extended by improved quality of materials and advances in manufacturing technologies. Therefore, the bearing life is calculated using equation (6) usually assuming $a_2 = 1$.

Life adjustment factor for operating conditions a_3

This factor helps take into account the effects of operating conditions, especially lubrication on the bearing. The bearing life is limited by the phenomenon of fatigue which occurs, in general, beneath surfaces subjected to repeated stresses. Under good lubrication conditions where the rolling element and raceway surfaces are completely separated by an oil film and surface damage can be disregarded, a_3 is set to be 1. However, when conditions of lubrication are not good, namely, when the viscosity of the lubricating oil is low or the peripheral speed of the rolling elements is especially low, and so on, $a_3 < 1$ is used.

On the other hand, when lubrication is especially good, a value of $a_3 > 1$ can be used. When lubrication is not good and $a_3 < 1$ is used, the life adjustment factor a_2 cannot generally exceed 1.

When selecting a bearing according to the basic dynamic load rating, it is recommended that a suitable value for reliability factor a_1 is chosen for each application. The selection should be made using the (C/P) or f_h values determined by machine type and based upon the actual conditions of lubrication, temperature, mounting, etc., which have already been experienced and observed in the same type of machines.

Limiting conditions

These bearing life equations are applicable only when the bearing is mounted and lubricated normally without intrusion of foreign materials and not used under extreme operating conditions.

Unless these conditions are satisfied, the life may be shortened. For example, it is necessary to separately consider the effects of bearing mounting errors, excessive deformation of housing and shaft, centrifugal force acting on rolling elements at high-speed revolution, excessive preload, especially large radial internal clearance of radial bearings, etc.

When the dynamic equivalent load exceeds 1/2 of the basic dynamic load rating, the life equations may not be applicable.

Correction of basic dynamic load rating for temperature and hardness

Temperature factor

The operating temperature for each bearing is determined according to its material and structure. If special heat treatment is performed, bearings can be used at temperatures higher than +150˚C. However, the allowable contact stress decreases gradually as the operating temperature increases. Accordingly, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_t = f_t C \cdots\cdots\cdots\cdots (7)$$

where, C_t : Basic dynamic load rating considering temperature rise, N

f_t : Temperature factor (See Fig. 4.)

C : Basic dynamic load rating, N

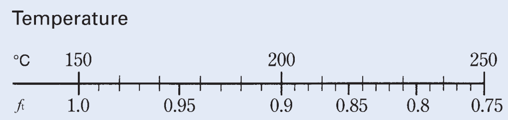


Fig. 4 Temperature factor

Hardness factor

When the shaft or housing is used as the raceway surface instead of the inner or outer ring, the surface hardness of the part used as the raceway surface should be 58～64HRC.

If it is less than 58HRC, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_H = f_H C \cdots\cdots\cdots\cdots (8)$$

where, C_H : Basic dynamic load rating considering hardness, N

f_H : Hardness factor (See Fig. 5.)

C : Basic dynamic load rating N

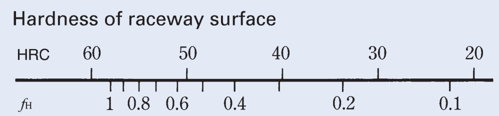


Fig. 5 Hardness factor

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

Basic Static Load Rating and Static Safety Factor

Basic static load rating

When a bearing at rest sustains a heavy load or a bearing rotating at a relatively low speed receives a heavy shock load, the contact stress may exceed a certain limiting value, producing a local permanent deformation in the raceways or the rolling elements, and subsequently causing noise or vibration or lowering the rotating performance. The basic static load rating is, therefore, determined as a guideline for the maximum allowable load for the bearing at rest, under which the permanent deformation will not exceed a certain limit value, and the lowering of the rotating performance will not occur. Its definition is given as follows.
The basic static load rating is the static load that gives the contact stress shown in Table 3 at the center of the contact area of the rolling element and the raceway receiving the maximum load. A radial load constant in direction and magnitude is used in the case of radial bearings, while an axial load constant in magnitude acting along the bearing central axis is used in the case of thrust bearings.

Table 3

Type of bearing	Contact stress MPa
Roller bearings	4 000
Self-aligning ball bearings	4 600
Other ball bearings	4 200

Static safety factor

The basic static load rating gives the theoretical allowable limit of the static equivalent load. Normally, this limit is corrected by considering the operating conditions and the requirements for the bearing. The correction factor, namely, the static safety factor f_s is defined as in the following equation and its general values are shown in Table 4.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots(9)$$

where, C_0 : Basic static load rating, N
P_0 : Static equivalent load, N

Table 4 Static safety factor

Operating conditions of the bearing	f_s
When high rotational accuracy is required	≧3
For ordinary operation conditions	≧1.5
For ordinary operation conditions not requiring very smooth rotation When there is almost no rotation	≧1

In case of Shell Type Needle Roller Bearings of which outer ring is drawn from a thin steel plate and then carburized and quenched, it is necessary to use a static safety factor of 3 or more.

Calculation of Bearing Loads

The loads acting on bearings include the weight of the machine parts supported by the bearings, the weight of the rotating body, loads produced when operating the machine, loads by belts or gears transmitting power, and various other loads.
These loads can be divided into radial loads perpendicular to the central axis of the bearings and axial loads parallel to the central axis, and they act independently or in combination with other loads. In addition, the magnitude of vibration or shocks on the bearings varies depending on the application of the machine. Thus, theoretically calculated loads may not always be accurate and have to be corrected by multiplying various empirical factors to obtain the actual bearing loads.

Load distribution to bearings

Table 5 shows examples of calculations where static loads are acting in radial direction.

Load factor

Although radial loads and axial loads can be obtained by calculation, it is not unusual for the actual bearing loads to exceed the calculated loads, due to vibration and shocks produced when operating the machine. The actual bearing load is obtained from the following equation, by multiplying the calculated load by the load factor:

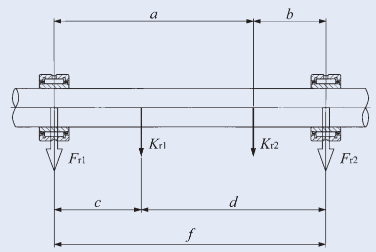
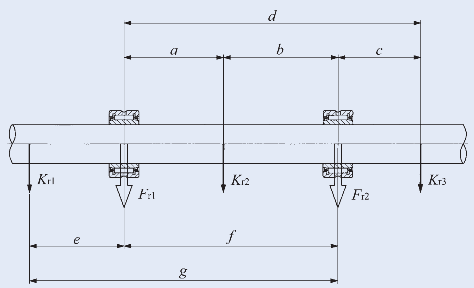
$$F = f_w F_c \quad \cdots\cdots(10)$$

where, F : Bearing load, N
f_w : Load factor (See Table 6.)
F_c : Theoretically calculated load, N

Table 6 Load factor

Operating conditions	Example	f_w
Smooth operation without shocks	Electric motors, Air conditioning equipment, Measuring instruments, Machine tools	1 ～1.2
Ordinary operation	Reduction gearboxes, Vehicles, Textile machinery, Paper making machinery	1.2～1.5
Operation subjected to vibration and shocks	Rolling mills, Rock crushers, Construction machinery	1.5～3

Table 5 Load distribution to bearings

Example	Bearing load
	$F_{r1} = \frac{dK_{r1} + bK_{r2}}{f}$ $F_{r2} = \frac{cK_{r1} + aK_{r2}}{f}$
	$F_{r1} = \frac{gK_{r1} + bK_{r2} - cK_{r3}}{f}$ $F_{r2} = \frac{aK_{r2} + dK_{r3} - eK_{r1}}{f}$

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

Bearing loads in case of belt or chain transmission

When power is transmitted by a belt or chain, the load acting on the pulley or sprocket wheel is obtained from the following equations:

$$T = 9550000\,\frac{H}{n} \quad \cdots\cdots (11)$$

$$K_t = \frac{T}{R} \quad \cdots\cdots (12)$$

where, T : Torque acting on pulley or sprocket wheel, N-mm
K_t : Effective transmitting force of belt or chain, N
H : Transmitting power, kW
n : Rotation speed, rpm
R : Effective radius of pulley or sprocket wheel, mm

For belt transmission, the load K_r acting on the pulley shaft is obtained from the following equation, multiplying the effective transmitting force K_t by the belt factor f_b shown in Table 7.

$$K_r = f_b K_t \quad \cdots\cdots (13)$$

Table 7 Belt factor

Type of belt	f_b
V-belts	2 ～2.5
Timing belts	1.3～2
Plain belts (with tension pulley)	2.5～3
Plain belts	4 ～5

In the case of chain transmission, a value of 1.2 to 1.5 is taken as the chain factor corresponding to f_b. The load acting on the sprocket wheel shaft is obtained from equation (13) in the same manner as the belt transmission.

Bearing loads in case of gear transmission

When power is transmitted by gears, the force acting on the gears varies according to the type of gear. Spur gears produce radial loads only, but helical gears, bevel gears and worm gears produce axial loads in addition to radial loads. Taking the simplest case of spur gears as an example, the bearing load is obtained from the following equations:

$$T = 9550000\,\frac{H}{n} \quad \cdots\cdots (14)$$

$$K_t = \frac{T}{R} \quad \cdots\cdots (15)$$

$$K_s = K_t \tan\theta \quad \cdots\cdots (16)$$

$$K_c = \sqrt{K_t^2 + K_s^2} = K_t \sec\theta \quad \cdots\cdots (17)$$

where, T : Torque applied to gear, N-mm
K_t : Tangential force acting on gear, N
K_s : Radial force acting on gear, N
K_c : Resultant normal force on gear tooth surface, N
H : Transmitting power, kW
n : Rotational speed, rpm
R : Pitch circle radius of drive gear, mm
θ : Pressure angle of gear, deg.

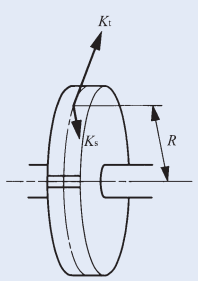


Fig. 6

In this case, the resultant normal force on the tooth surface acts as the radial force to the shaft and the magnitude of vibration or shocks varies depending on the accuracy and surface finish of the gear. Therefore, the radial load K_r applied to the shaft is obtained from the following equation, multiplying the resultant normal force K_c on gear tooth surface by the gear factor f_z shown in Table 8.

$$K_r = f_z\, K_c \quad \cdots\cdots (18)$$

Table 8 Gear factor

Type of gear	f_z
Precision gears (Pitch error and form error: Less than 0.02mm)	1.05～1.1
Ordinary machined gears (Pitch error and form error: 0.02～0.1mm)	1.1 ～1.3

Mean equivalent load corresponding to fluctuating load

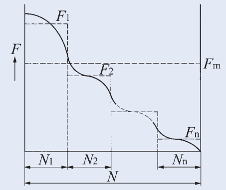
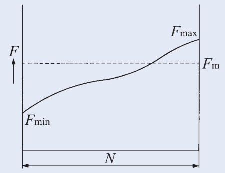
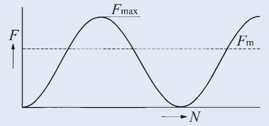
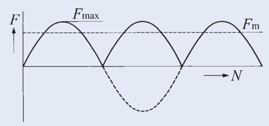
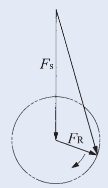
When the load applied to the bearing fluctuates, the bearing life is calculated by using the mean equivalent load F_m, which is a constant load that will give the bearing a life equal to that produced under the fluctuating load. The mean equivalent load is obtained from the following equation:

$$F_m = \sqrt[p]{\frac{1}{N}\int_0^N F_n^{\,p}\, dN} \quad \cdots\cdots (19)$$

where, F_m : Mean equivalent load, N
N : Total number of revolutions, rev.
F_n : Fluctuating load, N
p : Exponent, Roller bearing = 10/3
Ball bearing = 3

Table 9 shows examples of the calculation of mean equivalent loads for various fluctuating loads.

Table 9 Mean equivalent load for the fluctuation load

Type of fluctuating load		Mean equivalent load F_m
Step load		$F_m = \sqrt[p]{\frac{1}{N}(F_1^{\,p} N_1 + F_2^{\,p} N_2 + \cdots + F_n^{\,p} N_n)}$ where, N_1 : Total number of revolutions under load F_1 rev. N_2 : Total number of revolutions under load F_2 rev. N_n : Total number of revolutions under load F_n rev.
Monotonously changing load		$F_m = \frac{1}{3}(2F_{max} + F_{min})$ where, F_{max} : Maximum value of fluctuating load, N F_{min} : Minimum value of fluctuating load, N
Sinusoidally fluctuating load		$F_m \fallingdotseq 0.65 F_{max}$
		$F_m \fallingdotseq 0.75 F_{max}$
Stationary load plus rotating load		$F_m = F_S + F_R - \frac{F_S F_R}{F_S + F_R}$ where, F_S : Stationary load, N F_R : Rotating load, N

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

Equivalent load

The loads applied to the bearing are divided into radial loads that are applied perpendicular to the central axis and axial loads that are applied in parallel to the central axis. These loads act independently or in combination with other loads.

Dynamic equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will give a life equal to that under the radial load and the axial load is defined as a dynamic equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used in the life calculation of the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_r = F_r \quad \cdots\cdots (20)$$

[For thrust bearings]

$$P_a = F_a \quad \cdots\cdots (21)$$

where, P_r : Dynamic equivalent radial load, N
P_a : Dynamic equivalent axial load, N
F_r : Radial load, N
F_a : Axial load, N

Static equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will produce a maximum contact stress on the contact surface between the rolling element and the raceway equal to that given by the radial load and the axial load is defined as a static equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used for the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_{0r} = F_r \quad \cdots\cdots (22)$$

[For thrust bearings]

$$P_{0a} = F_a \quad \cdots\cdots (23)$$

where, P_{0r} : Static equivalent radial load, N
P_{0a} : Static equivalent axial load, N
F_r : Radial load, N
F_a : Axial load, N

Boundary Dimensions and Identification Number

Boundary dimensions

Examples of symbols for quantities indicating the boundary dimensions of IKO Needle Roller Bearings are shown below. For details, see the table of dimensions for each model.

Machined Type Needle Roller Bearing

d : Nominal bearing bore diameter
D : Nominal bearing outside diameter
B : Nominal inner ring width
C : Nominal outer ring width
F_w : Nominal roller set bore diameter
r : Chamfer dimensions of inner and outer rings
$r_{s\,min}$: Smallest permissible single chamfer dimensions of inner and outer rings

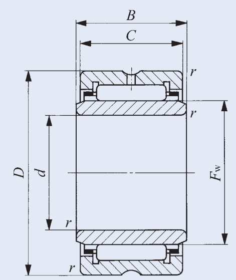


Fig. 7 Machined Type Needle Roller Bearing

Shell Type Needle Roller Bearing

D : Nominal bearing outside diameter
F_w : Nominal roller set bore diameter
C : Nominal outer ring width

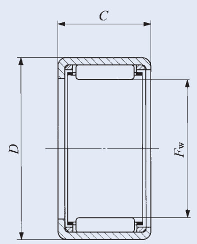


Fig. 8 Shell Type Needle Roller Bearing

Needle Roller Cage

E_w : Nominal roller set outside diameter
F_w : Nominal roller set bore diameter
B_c : Nominal cage width

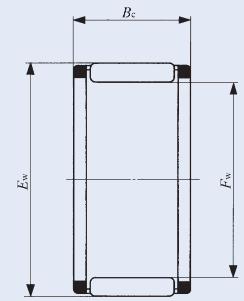


Fig. 9 Needle Roller Cage

Thrust Roller Bearing

D_c : Nominal cage outside diameter
d_c : Nominal cage bore diameter
D_w : Nominal roller diameter

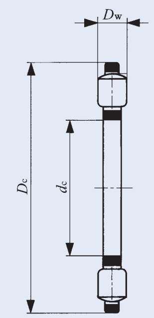


Fig. 10 Thrust Roller Bearing

Identification Number

The identification number of IKO Bearings consists of a model number and supplemental codes. The descriptions of typical codes and their arrangements are shown below. There are many codes other than those described. See the section of identification number of each bearing.

Table 10 Arrangement of identification number of bearing

Model number	Model code	❶
	Boundary dimensions	❷
Supplemental code	Material symbol	❸
	Cage symbol	❹
	Shield symbol Seal symbol,	❺
	Bearing ring shape symbol	❻
	Clearance symbol	❼
	Classification symbol	❽

❶Model code

The model code represents the bearing series. The features of each bearing series are shown on pages A5 to A15.

❷Boundary dimensions

One of the following four kinds of presentation methods is used for showing boundary dimensions in the identification number, which vary depending on the bearing series. Table 11 shows the presentation methods of boundary dimensions for each model code.

(a)Dimension series + Bore diameter number
(b)Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + Width
(c)Bore diameter or roller set bore diameter + Width
(d)Basic diameter

❸Material symbol

Symbol	Type of material
F	Stainless steel for bearing rings and rolling elements

❹Cage symbol

Symbol	Descriptions
N	Made of synthetic resin
V	No cage or full complement

❺Seal or shield symbol

Symbol	Descriptions
Z	With dust cover
ZZ	With shields on both sides
U	With a seal on one side
UU	With seals on both sides
2RS	With seals on both sides

❻Bearing ring shape symbol

Symbol	Descriptions
NR	With stop ring on outer surface of outer ring
OH (1)	With oil hole in bearing ring
J	No oil hole

Note(1) This differs depending on the type of bearing. See the section of each bearing.

❼Clearance symbol

Symbol	Descriptions
C2	C2 clearance
(None)	CN clearance
C3	C3 clearance
C4	C4 clearance
C5	C5 clearance
T1	Special radial clearance (Applicable to Crossed Roller Bearings)
C1	
C2	

❽Classification symbol

Symbol	Descriptions
(None)	JIS Class 0
P6	JIS Class 6
P5	JIS Class 5
P4	JIS Class 4

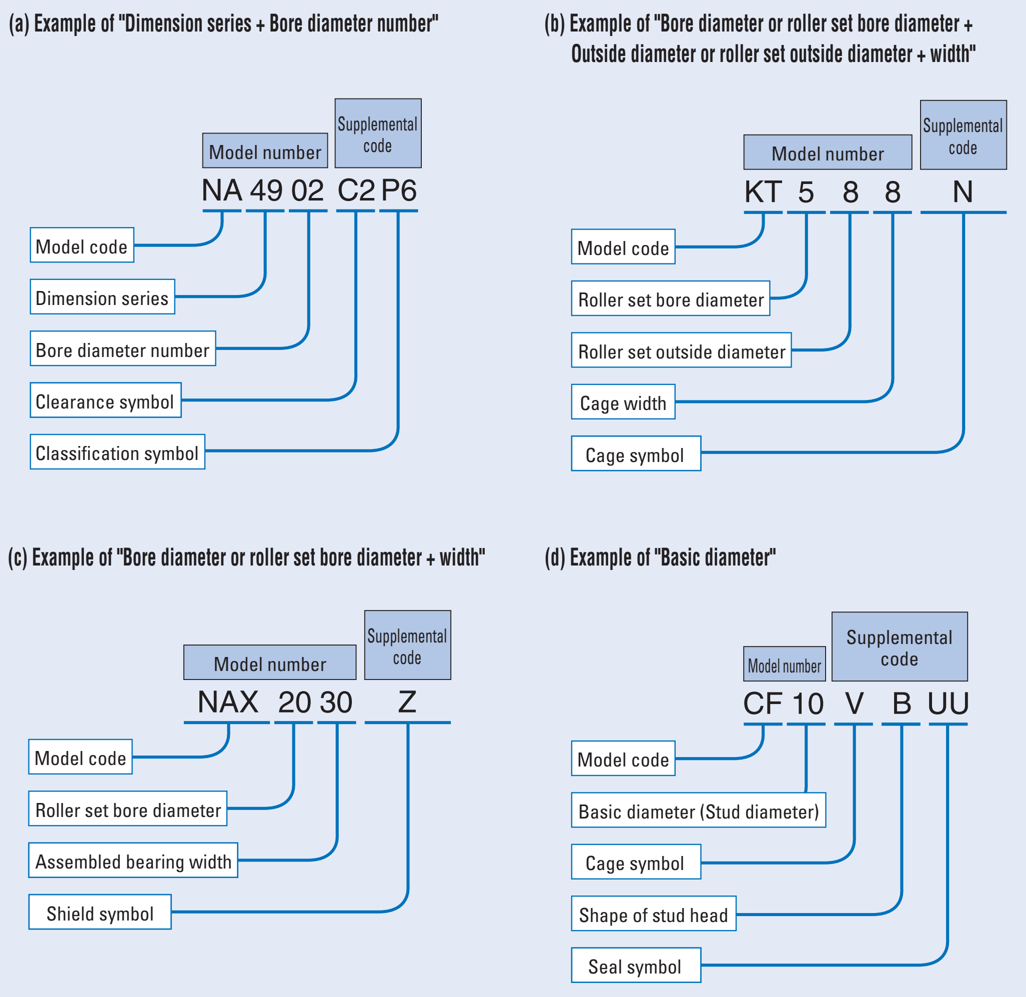
Table 11 Indication of boundary dimensions

Bearing type	Model number	
	Model code	Indication of boundary dimensions
Shell Type Needle Roller Bearings	TA, TLA, YT, YTL	Roller set bore diameter + Outer ring width
	BA, BHA, YB, YBH	Roller set bore diameter + Outer ring width (1)
Needle Roller Cages for General Usage	KT, KTW	Roller set bore diameter + Roller set outside diameter + Cage width
Needle Roller Cages for Engine Connecting Rods	KT⋯EG, KTV⋯EG	Roller set bore diameter + Roller set outside diameter + Cage width
Machined Type Needle Roller Bearings	NA, RNA	Dimension series + Bore diameter number
	TR, TAF, GTR	Roller set bore diameter + Bearing outside diameter + Bearing width
	TRI, TAFI, GTRI	Bearing bore diameter + Bearing outside diameter + Outer ring width
	BR, GBR	Roller set bore diameter + Bearing outside diameter + Bearing width (1)
	BRI, GBRI	Bearing bore diameter + Bearing outside diameter + Outer ring width (1)
Needle Roller Bearings with Separable Cage	RNAF, RNAFW	Roller set bore diameter + Bearing outside diameter + Bearing width
	NAF, NAFW	Bearing bore diameter + Bearing outside diameter + Bearing width
Roller Bearings	NAU, NAG, NAS	Dimension series + Bore diameter number
	TRU	Bearing bore diameter + Bearing outside diameter + Bearing width
Thrust Bearings	NTB, AS, WS, GS	Bearing bore diameter + Bearing outside diameter
	AZ	Bearing bore diameter + Bearing outside diameter + Bearing height
	AZK	Bearing bore diameter + Bearing outside diameter + Roller diameter
Combined Type Needle Roller Bearings	NAX, NBX	Roller set bore diameter + Assembled bearing width
	NAXI, NBXI	Innerring bore diameter + Assembled bearing width
	NATA, NATB	Dimensional series + Bore diameter number
Cam Followers	CF, NUCF, CFS	Stud diameter
	CR, CRH	Bearing outside diameter (1)
Roller Followers	NAST, NART, NURT	Bearing bore diameter
	CRY	Bearing outside diameter (1)
Crossed Roller Bearings	CRBH, CRB, CRBS, CRBT	Bearing bore diameter + Bearing width
Spherical Bushings	SB⋯A, GE	Inner ring bore diameter
	SBB	Inner ring bore diameter (1)
PILLOBALLs	PB,PHS,POS,PHSB,POSB,PHSA	Inner ring bore diameter
L-Balls	LHSA, LHS	Screw size
Seals for Needle Roller Bearings	OS, DS	Shaft diameter + Seal outside diameter + Seal width
Cir-clips for Needle Roller Bearings	WR	Shaft diameter
	AR	Bore diameter

Note(1) The nominal dimensions of inch series bearings are indicated in units of 1/16 inch.

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

Example of identification number



Accuracy

The accuracy of IKO Needle Roller Bearings conforms to JIS B 1514:2000 (Tolerances of Rolling Bearings), and the dimensional accuracy and rotational accuracy are specified. The specified items are shown in Fig. 11.

Needle Roller Bearings are classified into 4 classes of accuracy. These classes are represented by the numbers 0, 6, 5 and 4, written in order of increasing accuracy.

Table 12 shows the accuracy for the inner rings of radial bearings, Table 13 shows the accuracy for the outer rings of radial bearings, Table 14 shows the tolerances for the smallest single roller set bore diameter of radial bearings, and Table 15 shows the permissible limit values of chamfer dimensions of radial bearings. For thrust bearings, see the section on accuracy of Thrust Bearings. Note that the series of Shell Type Needle Roller Bearings, Roller Bearings, Cam Followers, Roller Followers, Combined Type Needle Roller Bearings, and Crossed Roller Bearings have special accuracy. For further details, see the section on accuracy of each bearing series.

Remarks

The meanings of the new symbols for quantities used for accuracy of radial bearings are as follows:

① Δ represents the deviation of a dimension from the specified value.

② V represents the variation of a dimension.

③ Suffixes $_{s}$, $_{m}$, and $_{p}$ represent a single (or actual) measurement, a mean measurement, and a measurement in a single radial plane, respectively.

[Example] V_{dp} means the difference between the largest and the smallest of the bore diameters in a single radial plane (circularity). V_{dmp} means the difference between the largest and the smallest of the single plane mean bore diameters (cylindricity).

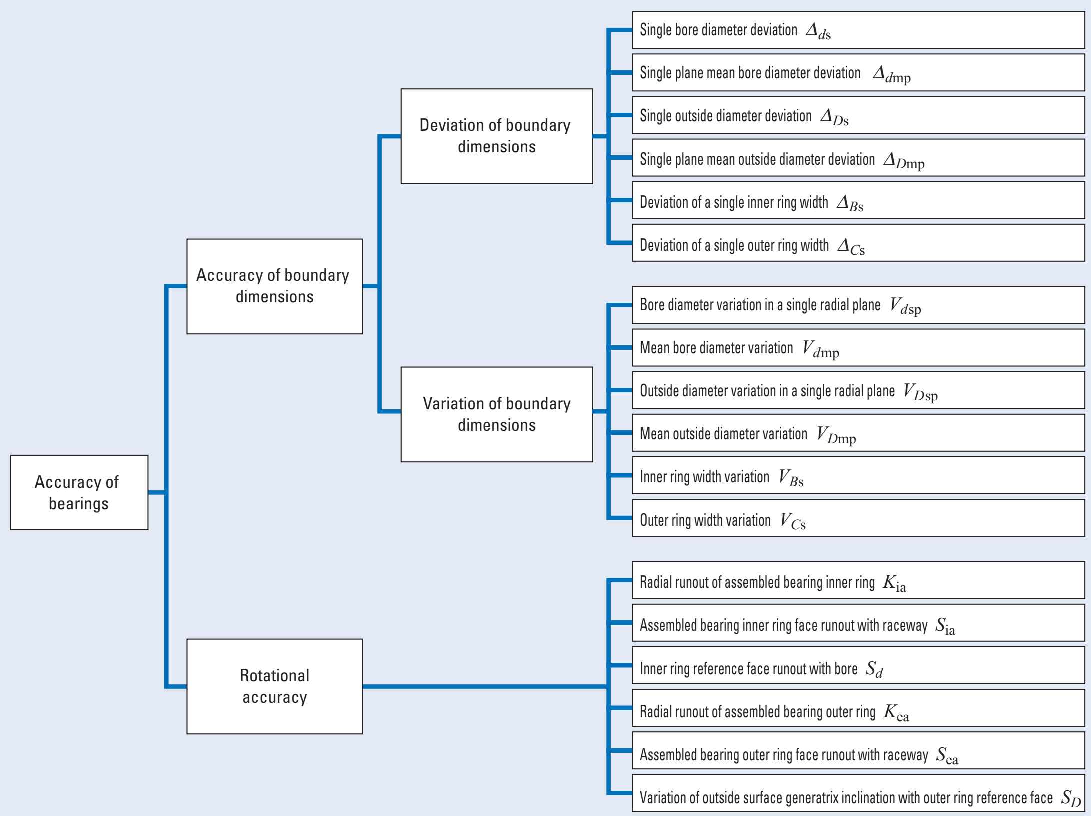


Fig. 11 Accuracy of bearings

Table 12 Tolerances for inner ring

unit: μm

d Nominal bearing bore diameter mm Over	Incl.	Δ_{dmp} Single plane mean bore diameter deviation Class 0 High	Class 0 Low	Class 6 High	Class 6 Low	Class 5 High	Class 5 Low	Class 4 High	Class 4 Low	Δ_{ds} Single bore diameter deviation Class 4 High	Class 4 Low	V_{dsp} Bore diameter variation in a single radial plane, Diameter series 8, 9(1) Class 0 Max.	Class 6	Class 5	Class 4	V_{dsp} Diameter series 0(2) Class 0 Max.	Class 6	Class 5	Class 4	V_{dmp} Mean bore diameter variation Class 0 Max.	Class 6	Class 5	Class 4
2.5	10	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
10	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
18	30	0	- 10	0	- 8	0	- 6	0	- 5	0	- 5	13	10	6	5	10	8	5	4	8	6	3	2.5
30	50	0	- 12	0	- 10	0	- 8	0	- 6	0	- 6	15	13	8	6	12	10	6	5	9	8	4	3
50	80	0	- 15	0	- 12	0	- 9	0	- 7	0	- 7	19	15	9	7	19	15	7	5	11	9	5	3.5
80	120	0	- 20	0	- 15	0	- 10	0	- 8	0	- 8	25	19	10	8	25	19	8	6	15	11	5	4
120	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	19	14	7	5
180	250	0	- 30	0	- 22	0	- 15	0	- 12	0	- 12	38	28	15	12	38	28	12	9	23	17	8	6
250	315	0	- 35	0	- 25	0	- 18					44	31	18		44	31	14		26	19	9	
315	400	0	- 40	0	- 30	0	- 23					50	38	23		50	38	18		30	23	12	
400	500	0	- 45	0	- 35							56	44			56	44			34	26		
500	630	0	- 50	0	- 40							63	50			63	50			38	30		
630	800	0	- 75																				
800	1000	0	- 100																				
1000	1250	0	- 125																				
1250	1600	0	- 160																				
1600	2000	0	- 200																				

K_{ia} Radial runout of assembled bearing inner ring Class 0 Max.	Class 6	Class 5	Class 4	S_d Inner ring reference face runout with bore Class 5 Max.	Class 4	S_{ia}(3) Assembled bearing inner ring face runout with raceway Class 5 Max.	Class 4	Δ_{Bs} Deviation of a single inner ring width Class 0 High	Class 0 Low	Class 6 High	Class 6 Low	Class 5 High	Class 5 Low	Class 4 High	Class 4 Low	V_{Bs} Inner ring width variation Class 0 Max.	Class 6	Class 5	Class 4	d Nominal bearing bore diameter mm Over	Incl.
10	6	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 40	0	- 40	15	15	5	2.5	2.5	10
10	7	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 80	0	- 80	20	20	5	2.5	10	18
13	8	4	3	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	2.5	18	30
15	10	5	4	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	3	30	50
20	10	5	4	8	5	8	5	0	- 150	0	- 150	0	- 150	0	- 150	25	25	6	4	50	80
25	13	6	5	9	5	9	5	0	- 200	0	- 200	0	- 200	0	- 200	25	25	7	4	80	120
30	18	8	6	10	6	10	7	0	- 250	0	- 250	0	- 250	0	- 250	30	30	8	5	120	180
40	20	10	8	11	7	13	8	0	- 300	0	- 300	0	- 300	0	- 300	30	30	10	6	180	250
50	25	13		13		15		0	- 350	0	- 350	0	- 350			35	35	13		250	315
60	30	15		15		20		0	- 400	0	- 400	0	- 400			40	40	15		315	400
65	35							0	- 450	0	- 450					50	45			400	500
70	40							0	- 500	0	- 500					60	50			500	630
80								0	- 750							70				630	800
90								0	- 1000							80				800	1000
100								0	- 1250							100				1000	1250
120								0	- 1600							120				1250	1600
140								0	- 2000							140				1600	2000

Note(1) Applicable to all series except NAS series
(2) Applicable to NAS series
(3) Applicable to NATA and NATB series

Table 13 Tolerances for outer ring

unit: μm

D Nominal bearing outside diameter mm Over	Incl.	Δ_{Dmp} Single plane mean outside diameter deviation Class 0 High	Class 0 Low	Class 6 High	Class 6 Low	Class 5 High	Class 5 Low	Class 4 High	Class 4 Low	Δ_{Ds} Single outside diameter deviation Class 4 High	Class 4 Low	V_{Dsp}(1) Outside diameter variation in a single radial plane, Open bearing, Diameter series 8, 9(2) Class 0 Max.	Class 6	Class 5	Class 4	Open bearing, Diameter series 0(3) Class 0 Max.	Class 6	Class 5	Class 4	Bearing with seal or shield, Diameter series 0(3) Class 6 Max.
2.5	6	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
6	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
18	30	0	- 9	0	- 8	0	- 6	0	- 5	0	- 5	12	10	6	5	9	8	5	4	10
30	50	0	- 11	0	- 9	0	- 7	0	- 6	0	- 6	14	11	7	6	11	9	5	5	13
50	80	0	- 13	0	- 11	0	- 9	0	- 7	0	- 7	16	14	9	7	13	11	7	5	16
80	120	0	- 15	0	- 13	0	- 10	0	- 8	0	- 8	19	16	10	8	19	16	8	6	20
120	150	0	- 18	0	- 15	0	- 11	0	- 9	0	- 9	23	19	11	9	23	19	8	7	25
150	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	30
180	250	0	- 30	0	- 20	0	- 15	0	- 11	0	- 11	38	25	15	11	38	25	11	8	
250	315	0	- 35	0	- 25	0	- 18	0	- 13	0	- 13	44	31	18	13	44	31	14	10	
315	400	0	- 40	0	- 28	0	- 20	0	- 15	0	- 15	50	35	20	15	50	35	15	11	
400	500	0	- 45	0	- 33	0	- 23					56	41	23		56	41	17		
500	630	0	- 50	0	- 38	0	- 28					63	48	28		63	48	21		
630	800	0	- 75	0	- 45	0	- 35					94	56	35		94	56	26		
800	1000	0	- 100	0	- 60							125	75			125	75			
1000	1250	0	- 125																	
1250	1600	0	- 160																	
1600	2000	0	- 200																	
2000	2500	0	- 250																	

V_{Dmp} Mean outside diameter variation Class 0 Max.	Class 6	Class 5	Class 4	K_{ea} Radial runout of assembled bearing outer ring Class 0 Max.	Class 6	Class 5	Class 4	S_D Variation of outside surface generatrix inclination with outer ring reference face Class 5 Max.	Class 4	S_{ea}(4) Assembled bearing outer ring face runout with raceway Class 5 Max.	Class 4	Δ_{Cs} Deviation of a single outer ring width Class 0, 6, 5, 4 High	Low	V_{Cs} Outer ring width variation Class 0 Max.	Class 6	Class 5	Class 4	D Nominal bearing outside diameter mm Over	Incl.
6	5	3	2	15	8	5	3	8	4	8	5	Same as the tolerance values of Δ_{Bs} for d of the same bearing		Same as the tolerance values of V_{Bs} for d of the same bearing		5	2.5	2.5	6
6	5	3	2	15	8	5	3	8	4	8	5					5	2.5	6	18
7	6	3	2.5	15	9	6	4	8	4	8	5					5	2.5	18	30
8	7	4	3	20	10	7	5	8	4	8	5					5	2.5	30	50
10	8	5	3.5	25	13	8	5	8	4	10	5					6	3	50	80
11	10	5	4	35	18	10	6	9	5	11	6					8	4	80	120
14	11	6	5	40	20	11	7	10	5	13	7					8	5	120	150
19	14	7	5	45	23	13	8	10	5	14	8					8	5	150	180
23	15	8	6	50	25	15	10	11	7	15	10					10	7	180	250
26	19	9	7	60	30	18	11	13	8	18	10					11	7	250	315
30	21	10	8	70	35	20	13	13	10	20	13					13	8	315	400
34	25	12		80	40	23		15		23						15		400	500
38	29	14		100	50	25		18		25						18		500	630
55	34	18		120	60	30		20		30						20		630	800
75	45			140	75													800	1000
				160														1000	1250
				190														1250	1600
				220														1600	2000
				250														2000	2500

Note(1) Classes 0 and 6 are applicable to outer rings without stop rings.
(2) Applicable to all series except NAS series
(3) Applicable to NAS series
(4) Applicable to NATA and NATB series

Table 14 Tolerances for smallest single roller set bore diameter $F_{ws\ min}$ (1) unit: μm

F_w Nominal roller set bore diameter mm		$\Delta_{F ws\ min}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
3	6	+ 18	+ 10
6	10	+ 22	+ 13
10	18	+ 27	+ 16
18	30	+ 33	+ 20
30	50	+ 41	+ 25
50	80	+ 49	+ 30
80	120	+ 58	+ 36
120	180	+ 68	+ 43
180	250	+ 79	+ 50
250	315	+ 88	+ 56
315	400	+ 98	+ 62
400	500	+108	+ 68

Note(1) This is the diameter of the cylinder used instead of the inner ring, where the radial clearance becomes 0 at least in one radial direction.

Table 15 Permissible limit values for chamfer dimensions of radial bearings unit: mm

$r_{s\ min}$ Smallest permissible single chamfer dimension	d Nominal bore diameter		$r_{s\ max}$ Largest permissible single chamfer dimension	
	Over	Incl.	Radial direction	Axial direction
0.1	—	—	0.55 (2)	0.55 (2)
0.15	—	—	0.6 (2)	0.6
0.2	—	—	0.7 (2)	0.8
0.3	—	40	0.8 (2)	1
	40	—	0.8	1
0.4 (1)	—	—	0.8	1.2
0.6	—	40	1.1 (2)	2
	40	—	1.3	2
1	—	50	1.5	3
	50	—	1.9	3
1.1	—	120	2	3.5
	120	—	2.5	4
1.5	—	120	2.3	4
	120	—	3	5
2	—	80	3	4.5
	80	220	3.5	5
	220	—	3.8	6
2.1	—	280	4	6.5
	280	—	4.5	7
2.5 (1)	—	100	3.8	6
	100	280	4.5	6
	280	—	5	7
3	—	280	5	8
	280	—	5.5	8
4	—	—	6.5	9
5	—	—	8	10
6	—	—	10	13

Note(1) Not specified in JIS.
(2) The numeric value differs from JIS.
Remark Although the exact shape of the chamfer is not specified, its profile in the axial plane must not extend beyond the imaginary circular arc of radius $r_{s\ min}$ which is tangential to the inner ring side surface and bearing bore surface or to the outer ring side surface and bearing outside surface. (See Fig. 12.)

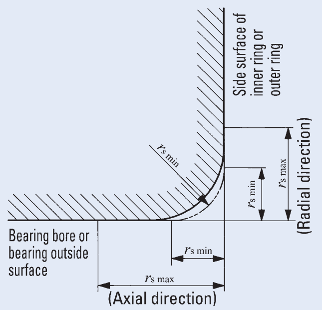
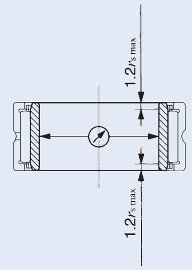
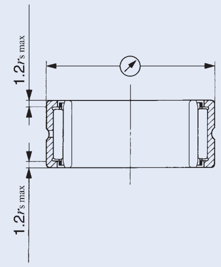


Fig. 12 Permissible values for chamfer dimensions

Methods of Measurement

Measurement of IKO Needle Roller Bearings is based on JIS B 1515:1988 (Methods of Measurement for Roller Bearings). Tables 16 and 17 show some examples of the methods.
Special methods are used to measure Shell Type Needle Roller Bearings. Therefore, refer to the section on accuracy for these bearings on page B3.

Table 16 Measurement methods of accuracy of boundary dimensions

Measurement methods		Accuracy and definitions	
Bore diameter	In principle, measurements of dimensions are carried out using a two-point measuring instrument for various radial planes.  This does not apply to the regions within a range of 1.2 times the largest permissible single chamfer dimension from both side-surfaces of the inner ring.	d_{mp} Single plane mean bore diameter	$d_{mp}=\dfrac{d_{sp\ max}+d_{sp\ min}}{2}$ $d_{sp\ max}$: Maximum value of bore diameter (d_s) obtained for a single radial plane $d_{sp\ min}$: Minimum value of bore diameter (d_s) obtained for a single radial plane
		Δ_{dmp} Single plane mean bore diameter deviation	$\Delta_{dmp}=d_{mp}-d$ d : Nominal bore diameter
		V_{dsp} Bore diameter variation in a single radial plane	$V_{dsp}=d_{sp\ max}-d_{sp\ min}$
		V_{dmp} Mean bore diameter variation	$V_{dmp}=d_{mp\ max}-d_{mp\ min}$ $d_{mp\ max}$: Maximum value of single plane mean bore diameters d_{mp} for various radial planes $d_{mp\ min}$: Minimum value of single plane mean bore diameters d_{mp} for various radial planes
		Δ_{ds} Single bore diameter deviation	$\Delta_{ds}=d_s-d$ d_s : Any measured bore diameter obtained in any radial plane
Outside diameter	In principle, measurements of dimensions are carried out using a two-point measuring instrument for various radial planes.  This does not apply to the regions within a range of 1.2 times the largest permissible single chamfer dimension from both side-surfaces of the outer ring.	D_{mp} Single plane mean outside diameter	$D_{mp}=\dfrac{D_{sp\ max}+D_{sp\ min}}{2}$ $D_{sp\ max}$: Maximum value of outside diameter (D_s) obtained for a single radial plane $D_{sp\ min}$: Minimum value of outside diameter (D_s) obtained for a single radial plane
		Δ_{Dmp} Single plane mean outside diameter deviation	$\Delta_{Dmp}=D_{mp}-D$ D : Nominal outside diameter
		V_{Dsp} Outside diameter variation in a single radial plane	$V_{Dsp}=D_{sp\ max}-D_{sp\ min}$
		V_{Dmp} Mean outside diameter variation	$V_{Dmp}=D_{mp\ max}-D_{mp\ min}$ $D_{mp\ max}$: Maximum value of single plane mean outside diameters D_{mp} for various radial planes $D_{mp\ min}$: Minimum value of single plane mean outside diameters D_{mp} for various radial planes
		Δ_{Ds} Single outside diameter deviation	$\Delta_{Ds}=D_s-D$ D_s : Any measured outside diameter obtained in any radial plane

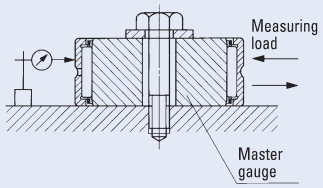
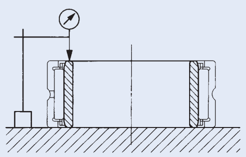
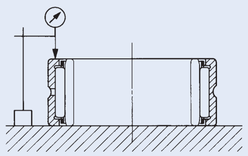
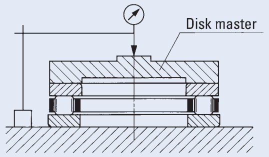
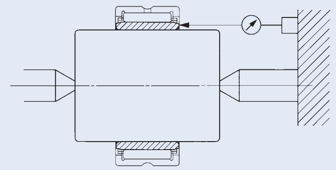
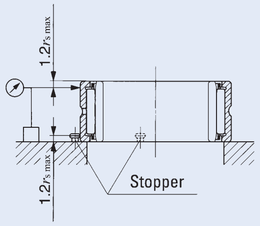
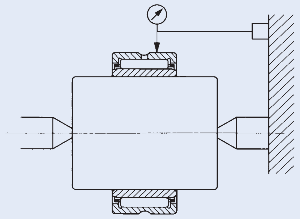
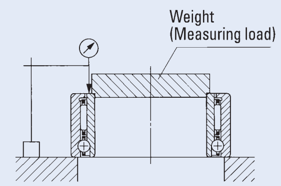
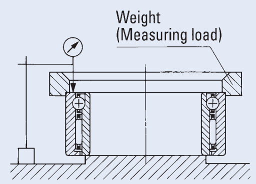
Measurement methods		Accuracy and definitions	
Roller set bore diameter	In principle, this is measured using a master gauge. The master gauge is fixed on the base with its side surface downward, and the outer ring with needle rollers is fitted onto the gauge. An indicator probe is applied radially to the approximate middle of the outside surface of the outer ring, and a measuring load is applied in that direction inward and outward alternately to obtain the amount of outer ring movement. Measurements are taken at various angular positions by turning the outer ring.  	$\Delta_{F\mathrm{ws}}$ Deviation of a single roller set bore diameter	$\Delta_{F\mathrm{ws}}=(d_{\mathrm{G}}+\delta_{1\mathrm{m}})-F_{\mathrm{w}}$ d_{G} : Outside diameter of master gauge $\delta_{1\mathrm{m}}$: Arithmetical mean value of outer ring movement F_{w} : Nominal dimension of roller set bore diameter
		$\Delta_{F\mathrm{ws\,min}}$ Deviation of smallest single roller set bore diameter	$\Delta_{F\mathrm{ws\,min}}=(d_{\mathrm{G}}+\delta_{1\mathrm{min}})-F_{\mathrm{w}}$ $\delta_{1\mathrm{min}}$: Minimum value of outer ring movement
Inner ring width	The inner ring width is measured between the base and the indicator probe perpendicular to the base. 	$\Delta_{B\mathrm{s}}$ Deviation of a single inner ring width	$\Delta_{B\mathrm{s}}=B_{\mathrm{s}}-B$ B_{s} : Single inner ring width B : Nominal inner ring width
		$V_{B\mathrm{s}}$ Inner ring width variation	$V_{B\mathrm{s}}=B_{\mathrm{s\,max}}-B_{\mathrm{s\,min}}$ $B_{\mathrm{s\,max}}$: Maximum value of single inner ring width $B_{\mathrm{s\,min}}$: Minimum value of single inner ring width
Outer ring width	The outer ring width is measured between the base and the indicator probe perpendicular to the base. 	$\Delta_{C\mathrm{s}}$ Deviation of a single outer ring width	$\Delta_{C\mathrm{s}}=C_{\mathrm{s}}-C$ C_{s} : Single outer ring width C : Nominal outer ring width
		$V_{C\mathrm{s}}$ Outer ring width variation	$V_{C\mathrm{s}}=C_{\mathrm{s\,max}}-C_{\mathrm{s\,min}}$ $C_{\mathrm{s\,max}}$: Maximum value of single outer ring width $C_{\mathrm{s\,min}}$: Minimum value of single outer ring width
Bearing height	In principle, the height is measured between the base plane on which the back surface of the outer ring is placed and the disk master placed on the back surface of the inner ring.  	$\Delta_{T\mathrm{s}}$ Deviation of the actual bearing height	$\Delta_{T\mathrm{s}}=T_{\mathrm{s}}-T$ T_{s} : Actual bearing height T : Nominal bearing height

Table 17 Measurement methods for rotational accuracy

Accuracy	Measurement methods	
S_d **Inner ring reference face runout with bore**	The inner ring reference face runout with bore, in principle, is measured using a tapered arbor. The bearing is correctly fitted to the arbor, which is held by both centers so that it can rotate smoothly without play. An indicator probe is applied axially to the approximate middle of the width of the flat part of the inner ring reference side-surface. The tapered arbor together with the bearing is turned fully once to obtain the runout, which is the difference between the maximum and minimum readings of the indicator.	
S_D **Variation of outside surface generatrix inclination with outer ring reference face**	The outer ring reference side-surface is placed on a flat base, and the inner ring is left free. Two stoppers are applied to the outside cylindrical surface of the outer ring at a distance of 1.2 times the maximum permissible chamfer dimension ($r_{\mathrm{s\,max}}$) from the base. Just above one of the stoppers, an indicator probe is applied radially to the outside cylindrical surface of the outer ring at a distance of 1.2 times the maximum permissible chamfer dimension ($r_{\mathrm{s\,max}}$) from the upper side-surface. The outer ring is turned fully once along the stoppers to obtain the Variation which is the difference between the maximum and the minimum readings of the indicator.	
K_{ia} **Radial runout of assembled bearing inner ring**	The radial runout of the inner ring is measured by holding the tapered arbor, to which the bearing is correctly fitted, horizontally by both centers so that it can rotate smoothly without play. An indicator probe is applied radially downward to the approximate middle of the width of the outside-surface of the outer ring. The inner ring, together with the tapered arbor, is turned fully once to obtain the radial runout, which is the difference between the maximum and the minimum readings of the indicator. (The outer ring is not rotated.)	
K_{ea} **Radial runout of assembled bearing outer ring**	The radial runout of the outer ring is measured by holding the tapered arbor, to which the bearing is correctly fitted, horizontally by both centers so that it can rotate smoothly without play. An indicator probe is applied radially downward to the approximate middle of the width of the outside-surface of the outer ring. The outer ring is turned fully once to obtain the radial runout, which is the difference between the maximum and the minimum readings of the indicator. (The inner ring is not rotated.) In the case of needle roller bearings without inner ring, the measurement is carried out by using a cylindrical arbor instead of the inner ring.	
S_{ia} **Assembled bearing inner ring face runout with raceway**	The axial runout of the inner ring is measured by placing the outer ring on a flat base with the center axis of the bearing vertical. An indicator probe is applied axially to the approximate middle of the flat part of the inner ring reference side-surface. The specified measuring weight is applied to the inner ring reference side-surface in the direction of the center axis. The inner ring is turned fully once to obtain the runout, which is the difference between the maximum and the minimum readings of the indicator.	
S_{ea} **Assembled bearing outer ring face runout with raceway**	The axial runout of the outer ring is measured by placing the inner ring on the flat base with the center axis of the bearing vertical. An indicator probe is applied axially to the approximate middle of the flat part of the outer ring reference side-surface. The specified measuring weight is applied to the outer ring reference side-surface in the direction of the center axis. The outer ring is turned fully once to obtain the runout, which is the difference between the maximum and the minimum readings of the indicator.	

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

Clearance

The clearances between the bearing rings and rolling elements are known as bearing clearances. When either the inner or outer ring is fixed and a specified measuring load is applied to the free bearing ring inward and outward alternately in the radial direction, the displacement of the free bearing is referred to as the radial internal clearance. The amount of measuring load in this case is extremely small, and its values are specified in JIS B 1515:1988 (Methods of Measurement for Rolling Bearings).

❶Table 18 shows the radial internal clearances of Needle Roller Bearings with Inner Ring based on JIS B 1520:1995 (Radial internal clearances of rolling bearings). The radial internal clearances are classified into C2, CN, C3, C4, and C5, with clearances increasing in this order. CN is used under normal operating conditions. When a smaller range in radial internal clearance than the values shown in Table 18 is required, please consult IKO.

❷In the case of Shell Type Needle Roller Bearings, the correct dimensional accuracy is achieved only after the bearings are press-fitted into the specified housing bore. Therefore, the clearances shown in Table 18 are not applicable. See page B5.

❸For the radial internal clearances of Cam Followers, Roller Followers and Crossed Roller Bearings, see the relevant section for each bearing.

Table 18 Radial internal clearances of Needle Roller Bearings

unit: μm

d Nominal bore diameter mm		Classification of clearances									
		C2		CN		C3		C4		C5	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
—	10	0	25	20	45	35	60	50	75	—	—
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

Remark For bearings with CN clearance, no symbol is attached to the identification number. In the case of bearings with C2, C3, C4 and C5 clearances, these symbols are attached to the identification number.
Example NA 4905 C2

Selection of clearance

Radial clearances of needle roller bearings change according to bearing fit, temperature difference between bearing rings and rolling elements, loads, etc., and these factors greatly influence bearing life, accuracy, noise, generation of heat, etc. If radial clearances are too large, noise and vibration will increase, and if they are too small, abnormally great forces are exerted on the contact areas between raceways and rolling elements, resulting in abnormally high heat generation and a decrease in bearing life. Therefore, in the ideal case, the clearance provided before mounting should be such that it will become zero or slightly larger when the bearing has reached steady-state operation and the temperature has become constant (saturation temperature). However, it is difficult to achieve this ideal state for all bearings. Under general operating conditions, bearings with CN clearance are most widely used, and are manufactured to provide satisfactory performance when fitted according to Tables 21 and 22.
When radial internal clearances other than CN are used, refer to Table 19.

Table 19 Examples of selecting radial internal clearances other than CN clearance

Operating conditions	Selection of clearance
When heavy loads and shock loads are applied, and amount of interference is great.	C3 or larger clearance
When directionally indeterminate loads are applied, and a tight fit is required for both inner and outer rings.	
When temperature of inner ring is much higher than that of outer ring.	
When shaft deflection and/or mounting error to the housing are great.	
When less noise and vibration are required. When a loose fit is required for both inner and outer rings. When preload is required.	C2 or smaller clearance

Reduction of radial clearances by fit

When the inner or outer rings are interference fitted onto shafts and into housings, respectively, they expand or shrink due to elastic deformation. As the result, the radial clearances are reduced. These reduced radial clearances are called residual (internal) clearances.
The amount of reduction is obtained by the following equation, and it is generally 70 to 90% of the interference amount.

$$\Delta_C = \Delta_F + \Delta_E \quad \cdots\cdots (24)$$

where, Δ_C : Amount of reduction of the radial clearance, mm
Δ_F : Amount of expansion of the outside diameter of inner ring, mm
Δ_E : Amount of shrinkage of the bore diameter of outer ring, mm

❶Amount of expansion of the outside diameter of inner ring

· With solid shaft

$$\Delta_F = \Delta_{de}\frac{d}{F} \quad \cdots\cdots (25)$$

· With hollow shaft

$$\Delta_F = \Delta_{de}\frac{d}{F}\,\frac{1-(d_i/d)^2}{1-(d/F)^2\,(d_i/d)^2} \quad \cdots\cdots (26)$$

where, Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
F : Outside diameter of inner ring, mm
d_i : Bore diameter of hollow shaft, mm

❷Amount of shrinkage of the bore diameter of outer ring

· With steel housing $(D_0 = \infty)$

$$\Delta_E = \Delta_{De}\frac{E}{D} \quad \cdots\cdots (27)$$

· With steel housing $(D_0 \neq \infty)$

$$\Delta_E = \Delta_{De}\frac{E}{D}\,\frac{1-(D/D_0)^2}{1-(E/D)^2\,(D/D_0)^2} \quad \cdots\cdots (28)$$

where, Δ_{De} : Effective interference of outer ring, mm
D : Outside diameter of outer ring, mm
E : Bore diameter of outer ring, mm
D_0 : Outside diameter of housing, mm

Reduction of radial clearances due to temperature differences between inner and outer rings

Frictional heat generated by rotation is dissipated through the shafts and housings as well as through oil and air. Under general operating conditions, heat dissipation is larger on the housing side compared with that on the shaft side, and the temperature of the outer ring is usually lower than that of the inner ring. During operation, the temperature of the rolling elements is the highest, followed by that of the inner ring and that of the outer ring. The amount of thermal expansion, therefore, varies, and the radial clearances are reduced. This reduced radial clearance is called the effective (internal) clearance, and the amount of reduction is obtained by the following equation:

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

$$\Delta\delta = \alpha \Delta_t E \cdots\cdots (29)$$

where,
$\Delta\delta$: Reduction of radial clearance, mm
α : Coefficient of linear expansion for bearing steel $\doteqdot 12.5 \times 10^{-6}$ 1/°C
Δ_t : Temperature difference between the outer ring and the inner ring plus rolling elements considered as one unit, °C
E : Bore diameter of outer ring, mm

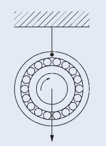
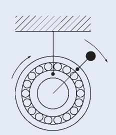
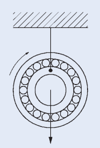
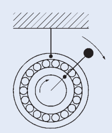
The temperature difference Δ_t is considered to be 5～10°C under normal operating conditions and 15～20°C at high rotational speeds. Therefore, when the temperature difference is great, a correspondingly larger radial internal clearance must be selected.

Fit

Purpose of fit

To achieve the best performance of needle roller bearings, it is important that the bearing rings are correctly fitted onto the shaft and into the housing.
The purpose of fit is to provide the appropriate amount of interference required between the inner ring and the shaft or between the outer ring and the housing, to prevent harmful mutual slippage.
If the interference is insufficient, it will cause a harmful relative displacement, known as creep, between the fitted surfaces in the circumferential direction. This may lead to abnormal wear of fitted surfaces, intrusion of wear particles into the bearing, generation of abnormal heat, vibration, etc. Therefore, a suitable fit must be selected.

Table 20 Nature of radial load and fit

Nature of the load			Fit	
		Rotating conditions	Inner ring	Outer ring
Rotating load on inner ring Stationary load on outer ring		Inner ring : Rotating Outer ring : Stationary Load direction : Fixed	Interference fit	Clearance fit
		Inner ring : Stationary Outer ring : Rotating Load direction : Rotating with outer ring		
Rotating load on outer ring Stationary load on inner ring		Inner ring : Stationary Outer ring : Rotating Load direction : Fixed	Clearance fit	Interference fit
		Inner ring : Rotating Outer ring : Stationary Load direction : Rotating with inner ring		
Directionally indeterminate load	The load direction is not fixed, including cases where the load direction is fluctuating or there is an unbalanced load.	Inner ring : Rotating or stationary Outer ring : Rotating or stationary Load direction : Not fixed	Interference fit	Interference fit

Conditions for determination of fit

When determining a suitable fit for a bearing, it is necessary to consider various conditions such as nature and magnitude of the load, temperature, required rotational accuracy, material/finish grade/thickness of the shaft and housing, ease of mounting and dismounting, etc.

❶ Nature of load and fit
Basically, the appropriate fit depends on whether the load direction is rotational or stationary in relation to the inner and outer rings.
The relationship between the nature of radial loads and the fit is, in general, based on Table 20.

❷ Load amount and interference
The greater the load, the larger the interference must be.
When selecting an interference between the inner ring and the shaft, it is necessary to estimate the reduction of interference due to the radial load. The amount of reduction of interference is obtained by the following equations.

・When $F_r \leqq 0.2C_0$

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}}\, F_r \times 10^{-3} \cdots\cdots (30)$$

・When $F_r > 0.2C_0$

$$\Delta_{dF} = 0.02\,\frac{F_r}{B} \times 10^{-3} \cdots\cdots (31)$$

where,
F_r : Radial load applied to bearing, N
C_0 : Basic static load rating, N
Δ_{dF} : Amount of reduction of inner ring interference, mm
d : Bore diameter of inner ring, mm
B : Width of inner ring, mm

❸ Temperature conditions and change of interference
The interference of fitted surfaces is also influenced by the temperature difference between the bearing and the shaft and housing. For example, when steam is flowing through a hollow shaft, or when the housing is made of light metal, it is necessary to take into consideration the differences in temperature, the coefficient of linear expansion and other such factors.
Usually, the interference of the inner ring decreases as the bearing temperature increases during operation. If the temperature difference between the inside of the bearing and the outside of the housing is taken as Δ_T, the temperature difference between the inner ring and the shaft can be estimated to be (0.1～0.15) Δ_T. Accordingly, the amount of reduction of the inner ring interference is obtained by the following equation.

$$\Delta_{dT} = (0.1\sim0.15)\,\Delta_T \alpha d \doteqdot 0.0015\,\Delta_T d \times 10^{-3} \cdots (32)$$

where,
Δ_{dT} : Reduction amount of inner ring interference due to temperature difference, mm
Δ_T : Temperature difference between the inside of the bearing and the outside of the housing, °C
α : Coefficient of linear expansion for bearing steel $\doteqdot 12.5 \times 10^{-6}$ 1/°C
d : Bore diameter of inner ring, mm

❹ Shaft finish grade and interference
Since peaks of surface roughness of the fitted surface are crushed down when fitting the bearing, the effective interference becomes smaller than the apparent interference obtained by measurements, and it is generally obtained by the following equations.

・For ground shaft

$$\Delta_{de} = \frac{d}{d+2}\,\Delta_{df} \cdots\cdots (33)$$

・For machined shaft

$$\Delta_{de} = \frac{d}{d+3}\,\Delta_{df} \cdots\cdots (34)$$

where,
Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
Δ_{df} : Apparent interference, mm

❺ Minimum interference and maximum interference
When the load direction is rotating in relation to the inner ring, the inner ring is fitted with interference to the shaft.
For solid ground steel shafts, the minimum interference (required apparent interference) Δ_{df} is expressed by the following equation which is deduced from equations (30) or (31), (32) and (33).

$$\Delta_{df} \geqq \frac{d+2}{d}\left(\Delta_{dF} + 0.0015\,\Delta_T d \times 10^{-3}\right) \cdots (35)$$

It is desired that the maximum interference should be less than 1/1000 of the shaft diameter. In the case of the outer ring, the effective interference varies according to the housing material, thickness, shape, etc., so it is determined empirically.

Selection of fit

When selecting a suitable fit, in addition to the various conditions mentioned above, it is necessary to draw on experience and practical results.
Tables 21 and 22 show the most general fit data.
When a thin housing or a hollow shaft is used, the interference is made larger than an ordinary fit.
The fit between needle roller bearings without inner ring and shafts is based on Table 23.
For the fit between Shell Type Needle Roller Bearings and housing bores, see page B5.
For the fit between inner rings for Shell Type Needle Roller Bearings and shafts, see Table 22.

Table 21 Fit between needle roller bearings and housing bores (Not applicable to Shell Type Needle Roller Bearings)

Operating conditions		Tolerance class of housing bore (1)	Application examples (Reference)
Rotating load on outer ring	Heavy load on thin housing, large shock load	P7 (2)	Flywheels
	Heavy load, normal load	N7 (2)	Wheel bosses, transmission gears
	Light load, fluctuating load	M7	Pulleys, tension pulleys
Directionally indeterminate load	Large shock load	M7	Eccentric wheels, pumps
	Heavy load, normal load	K7	Compressors
	Normal load, light load	J7	Crankshafts, compressors
Stationary load on outer ring	Shock load, heavy load	J7	General bearing applications, gear shafts
	Normal load, light load	H7	General bearing applications
	With heat conduction through shaft	G7	Paper dryers
Light load, normal load, requirements of high-precision rotation and high rigidity		K6	Main spindles of machine tools

Notes(1) This table applies to steel or cast iron housings. For lighter metal, a tighter fit should be selected. For split housings, do not use a fit tighter than J7.
(2) Care should be taken so that the radial internal clearance is not too small.
Remark Light load, normal load and heavy load represent $P \leqq 0.06C$, $0.06C < P \leqq 0.12C$, and $0.12C < P$, respectively, where P is the dynamic equivalent radial load and C is the basic dynamic load rating of the bearing to be used.

Table 22 Fit between needle roller bearings with inner ring and shafts

Operating conditions		Shaft dia. mm Over	Shaft dia. mm Incl.	Tolerance class of shaft (1)	Application examples (Reference)
Stationary load on inner ring	Light load, normal load, low or medium rotating speed	All shaft diameters		g6	Wheels on dead axles Control lever gears Rope sheaves Tension pulleys
	Heavy load, medium rotating speed			h6	
	Especially smooth operation and accuracy are required.			h5	
Rotating load on inner ring or Directionally indeterminate load	Light load	— 50 100 200	50 100 200 —	j5 k5 m6 (2) n6 (3)	Electric appliances, Precision machinery Machine tools, Pumps Blowers, Transportation vehicles
	Normal load	— 50 150 200	50 150 200 —	k5 (4) m5, m6 (2) n6 (3) p6 (3)	General bearing applications Pumps, Transmission gearboxes, Wood working machinery, Internal combustion engines
	Heavy load Shock load	— 150	150 —	n6 (3) p6 (3)	Industrial vehicles, Construction machinery Crushers

Notes(1) This table applies to solid steel shafts.
(2) It is necessary to examine the reduction of radial internal clearances caused by the expansion of inner rings after mounting.
(3) It is necessary to use bearings with radial internal clearances greater than CN clearance.
(4) For NATA and NATB, do not use a tighter fit than k5.

Table 23 Tolerance class of shafts assembled with needle roller bearings without inner ring

F_w Nominal roller set bore diameter mm		Radial internal clearance		
		Smaller than CN clearance	CN clearance	Larger than CN clearance
Over	Incl.	Tolerance class of shaft (1)		
—	65	k5	h5	g6
65	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	—	g5	f6	d6

Note(1) When the housing bore fit is tighter than K7, the shaft diameter is made smaller by considering shrinkage of roller set bore diameter after mounting.

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

Table 24 Fit values for radial bearings (JIS Class 0) (Fit with housing bore) unit: μm

D Nominal outside diameter mm		Δ_{Dmp} Single plane mean outside diameter deviation		G7	H7	J7	K6	K7	M7	N7	P7
Over	Incl.	High	Low	Housing / Bearing	Housing / Bearing	Housing / Bearing	Housing / Bearing	Housing / Bearing	Housing / Bearing	Housing / Bearing	Housing / Bearing
3	6	0	- 8	- 24～- 4	- 20～0	-14～ 6	-10～ 6	-11～ 9	- 8～12	- 4～16	0～ 20
6	10	0	- 8	- 28～- 5	- 23～0	-16～ 7	-10～ 7	-13～10	- 8～15	- 4～19	1～ 24
10	18	0	- 8	- 32～- 6	- 26～0	-18～ 8	-10～ 9	-14～12	- 8～18	- 3～23	3～ 29
18	30	0	- 9	- 37～- 7	- 30～0	-21～ 9	-11～11	-15～15	- 9～21	- 2～28	5～ 35
30	50	0	-11	- 45～- 9	- 36～0	-25～11	-14～13	-18～18	-11～25	- 3～33	6～ 42
50	80	0	-13	- 53～-10	- 43～0	-31～12	-17～15	-22～21	-13～30	- 4～39	8～ 51
80	120	0	-15	- 62～-12	- 50～0	-37～13	-19～18	-25～25	-15～35	- 5～45	9～ 59
120	150	0	-18	- 72～-14	- 58～0	-44～14	-22～21	-30～28	-18～40	- 6～52	10～ 68
150	180	0	-25	- 79～-14	- 65～0	-51～14	-29～21	-37～28	-25～40	-13～52	3～ 68
180	250	0	-30	- 91～-15	- 76～0	-60～16	-35～24	-43～33	-30～46	-16～60	3～ 79
250	315	0	-35	-104～-17	- 87～0	-71～16	-40～27	-51～36	-35～52	-21～66	1～ 88
315	400	0	-40	-115～-18	- 97～0	-79～18	-47～29	-57～40	-40～57	-24～73	1～ 98
400	500	0	-45	-128～-20	-108～0	-88～20	-53～32	-63～45	-45～63	-28～80	0～108

Remark The negative value denotes a clearance and the positive value denotes an interference.

Table 25 Fit values for radial bearings (JIS Class 0) (Fit with shaft) unit: μm

d Nominal bore diameter mm		Δ_{dmp} Single plane mean bore diameter deviation		g6	h5	h6	j5	k5	m5	m6	n6	p6
Over	Incl.	High	Low	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft	Bearing / Shaft
3	6	0	- 8	-12～ 4	- 5～ 8	- 8～ 8	- 2～11	1～14	4～17	4～ 20	8～ 24	12～ 28
6	10	0	- 8	-14～ 3	- 6～ 8	- 9～ 8	- 2～12	1～15	6～20	6～ 23	10～ 27	15～ 32
10	18	0	- 8	-17～ 2	- 8～ 8	-11～ 8	- 3～13	1～17	7～23	7～ 26	12～ 31	18～ 37
18	30	0	-10	-20～ 3	- 9～10	-13～10	- 4～15	2～21	8～27	8～ 31	15～ 38	22～ 45
30	50	0	-12	-25～ 3	-11～12	-16～12	- 5～18	2～25	9～32	9～ 37	17～ 45	26～ 54
50	80	0	-15	-29～ 5	-13～15	-19～15	- 7～21	2～30	11～39	11～ 45	20～ 54	32～ 66
80	120	0	-20	-34～ 8	-15～20	-22～20	- 9～26	3～38	13～48	13～ 55	23～ 65	37～ 79
120 140 160	140 160 180	0	-25	-39～11	-18～25	-25～25	-11～32	3～46	15～58	15～ 65	27～ 77	43～ 93
180 200 225	200 225 250	0	-30	-44～15	-20～30	-29～30	-13～37	4～54	17～67	17～ 76	31～ 90	50～109
250 280	280 315	0	-35	-49～18	-23～35	-32～35	-16～42	4～62	20～78	20～ 87	34～101	56～123
315 355	355 400	0	-40	-54～22	-25～40	-36～40	-18～47	4～69	21～86	21～ 97	37～113	62～138
400 450	450 500	0	-45	-60～25	-27～45	-40～45	-20～52	5～77	23～95	23～108	40～125	68～153

Remark The negative value denotes a clearance and the positive value denotes an interference.

Design of Shaft and Housing

Accuracy and roughness of shaft and housing

Accuracy and roughness of fitting surface

Since the bearing rings of needle roller bearings are thin, their performance is easily affected by poor accuracy of shafts or housings. Under general operating conditions, the fitting surfaces of shafts and housings can be finished by lathe turning. However, when the load is great and high accuracy and low noise are required, a grinding finish is required.
Table 26 shows the accuracy and roughness of fitting surfaces for general use.

Accuracy and roughness of raceway surface

In case of needle roller bearings unlike other bearings, mating surfaces such as shaft and housing bore surfaces can be used directly as the raceway surfaces. For such use, accuracy and roughness of the raceway surfaces are important because they will influence bearing life, noise and accuracy.
In general, accuracy and roughness of raceway surfaces are based on Table 26.

Inclination of shaft

Shafts and outer rings may have some inclination between them due to deflection of the shaft, machining accuracy of shafts and housings, errors in mounting, etc.
In this case, the use of two or more bearings in tandem arrangement on a single shaft should be avoided. Instead, a bearing with large load ratings should be used.
It is recommended that inclination of shafts be less than 1/1000.

Table 27 Tolerance class IT values for basic dimensions

Basic dimension mm		Tolerance class		
		IT5	IT6	IT7
Over	Incl.	Tolerance μm		
—	3	4	6	10
3	6	5	8	12
6	10	6	9	15
10	18	8	11	18
18	30	9	13	21
30	50	11	16	25
50	80	13	19	30
80	120	15	22	35
120	180	18	25	40
180	250	20	29	46
250	315	23	32	52
315	400	25	36	57
400	500	27	40	63
500	630	30	44	70

Table 26 Specifications of shafts and housings for radial needle roller bearings

Item	Shaft		Housing bore	
	Fitting surface	Raceway surface	Fitting surface	Raceway surface
Circularity	0.3×IT6 (1) or 0.3×IT5 (1)	0.3×IT6 (1) or 0.3×IT5 (1)	0.3×IT7 (1) or 0.3×IT6 (1)	0.3×IT7 (1) or 0.3×IT6 (1)
Cylindricity	0.5×IT6 (2) or 0.5×IT5 (2)	0.3×IT6 (1) or 0.3×IT5 (1)	0.5×IT7 (2) or 0.5×IT6 (2)	0.3×IT7 (1) or 0.3×IT6 (1)
Surface roughness μmR_a (μmR_y)	0.8 (3.2)	0.2 (3) (0.8)	1.6 (6.3)	0.2 (3) (0.8)
Hardness	—	58～64HRC (4)	—	58～64HRC (4)

Notes(1) 30% or less of the dimensional tolerance for shafts or housing bores is recommended.
(2) 50% or less of the dimensional tolerance for shafts or housing bores is recommended.
(3) When required accuracy is not critical, a surface roughness within 0.8 μmR_a (3.2 μmR_y) is allowable.
(4) An appropriate thickness of the hardened layer is required.

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

Raceway materials and heat treatment

When using shafts and housings as raceways, the following materials are generally used.

High-carbon chromium bearing steel		
	SUJ2	JIS G 4805
Carburizing steel	SCM415～421	JIS G 4105
Carburizing steel	SNCM 220	JIS G 4103
Carburizing steel	SCr 420	JIS G 4104
Carburizing steel	SNC 415、815	JIS G 4102
Carburizing steel	S 15 CK	JIS G 4051

In addition, S50C and S55C (JIS G 4051) can be used after through hardening or induction hardening.
The hardened layer produced by tempering at +160～+180°C after hardening must have a fine uniform martensite microstructure.
When hardening the raceway surface by case hardening or induction hardening, a surface hardness of 58～64HRC and an appropriate thickness of the hardened layer must be ensured. The minimum effective thickness of the hardened layer after heat treatment and grinding is defined as the distance from the surface to the depth where the hardness is 513HV (50HRC), and it is obtained by the following equation.

$$E_{ht} \geqq 0.8D_w(0.1+0.002D_w) \quad \cdots\cdots\cdots\cdots\cdots (36)$$

where, E_{ht} : Minimum effective thickness of the hardened layer, mm
D_w : Roller diameter, mm

Generally, the required effective thickness of the hardened layer is at least 0.3 mm.

Dimensions related to mounting of bearings

The dimensions of shaft and housing related to mounting of the needle roller bearings are shown in the table of dimensions for each bearing. (See Fig. 13.)
The minimum value of the shaft shoulder diameter d_a which receives the inner ring, and the maximum value of the housing shoulder diameter D_a which receives the outer ring, represent the effective shoulder diameters (excluding the chamfered part) which make proper contact with the side faces of the inner and outer rings respectively.
Also, the maximum value of the shaft shoulder (or inner ring retaining piece) diameter d_a is the dimension related to the ease of mounting/dismounting of the shaft and inner ring to/from the housing and outer ring.
The largest permissible single corner radius $r_{as\,max}$ of the shaft and housing must be smaller than the smallest permissible single chamfer dimension $r_{s\,min}$ of the bearing so that the side surface of the bearing can make proper contact with the shoulder. Table 28 shows the related dimensions.
For dimensions of the fillet relief when finishing the shaft or housing by grinding, the values shown in Table 29 are recommended.
For other dimensions related to mounting, see the related section for each bearing as required.
In addition, for ease in dismounting of bearings, it is convenient to make notches in the shoulder of the shaft or housing to allow the insertion of dismounting hooks.

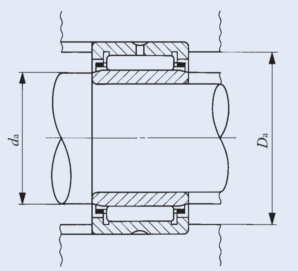


Fig. 13 Dimensions related to mounting

Table 28 Largest permissible single corner radius of shafts and housings $r_{as\,max}$

unit: mm

$r_{s\,min}$ Smallest permissible single chamfer dimension	$r_{as\,max}$ Largest permissible single corner radius of shafts and housings
0.1	0.1
0.15	0.15
0.2	0.2
0.3	0.3
0.4	0.4
0.6	0.6
1	1
1.1	1
1.5	1.5
2	2
2.1	2
2.5	2
3	2.5
4	3
5	4

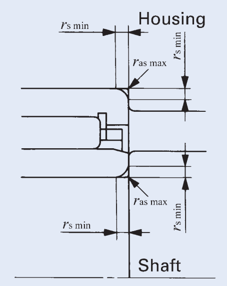
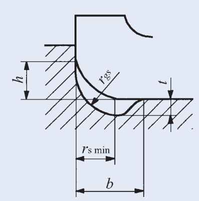


Table 29 Fillet relief dimensions for ground shafts and housings

unit: mm

$r_{s\,min}$ Smallest permissible single chamfer dimension	Fillet relief dimensions		
	t	r_{gs}	b
1	0.2	1.3	2
1.1	0.3	1.5	2.4
1.5	0.4	2	3.2
2	0.5	2.5	4
2.1	0.5	2.5	4
3	0.5	3	4.7
4	0.5	4	5.9
5	0.6	5	7.4
6	0.6	6	8.6
7.5	0.6	7	10



Sealing

To obtain the best performance of rolling bearings, it is necessary to prevent leakage of lubricant and the entry of harmful foreign substances, such as dirt, dust and water. For this reason, sealing devices must always work effectively to seal and prevent against dust penetration under all operating conditions. Also, when selecting a suitable sealing method, it is necessary to consider such factors as the type of lubricant, peripheral speed of the seal, operating temperature, shaft eccentricity, seal friction, etc. as well as ease of assembly and disassembly.
Sealing methods are of the non-contact and contact types, and it is necessary to select the appropriate type depending on the application.

Non-contact type sealing method

There are many methods of non-contact type sealing, including the use of oil grooves, flingers and labyrinths, which utilize the centrifugal force and narrow gaps.
Since they do not make direct contact with the shaft or housing, it is unnecessary to consider friction and wear, and the non-contact sealing method is suitable for high speed rotation and high operating temperatures. However, because of gaps, this method is not always sufficient in preventing oil leakage and dust entry when the machine is not in operation.

❶ Oil groove

Oil grooves are provided on either the shaft or housing bore, or on both for more effective sealing (See Fig. 14.). The clearance between the shaft and the housing bore should be as small as possible, and the values shown in Table 30 are generally used, taking into consideration errors in machining and assembly, shaft deformation, etc. Three or more grooves are made with a width of 3～5 mm and a depth of 4～5 mm. If the grooves are filled with grease, it will be more effective for dust prevention.
As shown in Fig. 15, helical grooves are suitable for horizontal shafts which have a fixed direction of rotation. Right or left handed grooves are used according to the direction of rotation, and they are used for oil lubrication normally in conjunction with a suitable anti-dust device.

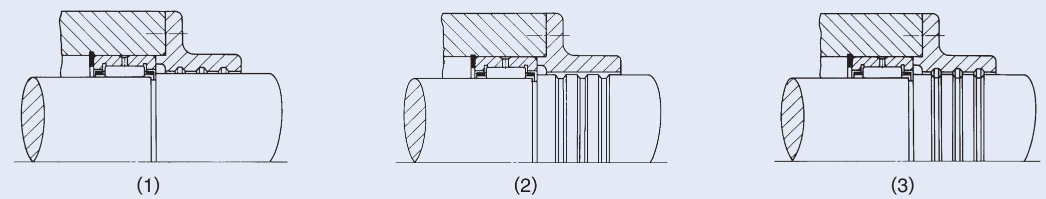


Fig. 14

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

Table 30 Clearance between grooved shaft and housing bore

unit: mm

Shaft dia.	Clearance
Incl. 50 mm	0.25～0.4
Over 50 mm	0.5 ～1

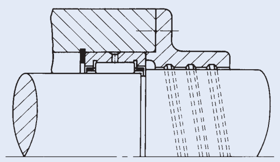


Fig. 15

❷ Flinger

The oil flinger is a disk attached to the shaft which throws off oil due to the centrifugal force of rotation and thus prevents oil leakage and the entry of foreign particles. Fig. 16 (1) shows an example in which the flinger is located inside the housing, mainly to prevent oil leakage. Since it sucks in dust and dirt, it should be used in a dust free environment. Fig. 16 (2) shows an example in which the flinger is located outside the housing, and is used in combination with another sealing device, to prevent entry of foreign particles.

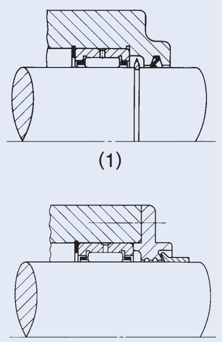


Fig. 16

❸ Labyrinth

Although it is a little difficult to make, the labyrinth is very effective in preventing oil leakage especially at high speeds. At low speeds, filling the labyrinth with grease is effective in preventing the entry of dust. In Fig. 17, it is necessary to split the housing or cover plate into two. In Fig. 18, it is easy to assemble, and if combined with an oil seal, it improves the sealing effect.
Table 31 shows the labyrinth clearances generally used.

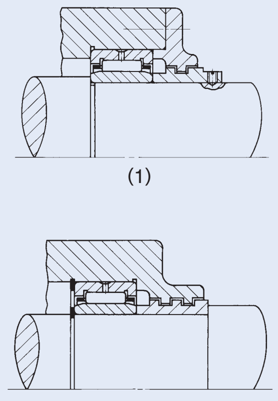


Fig. 17

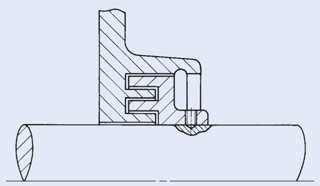


Fig. 18

Table 31 Labyrinth clearance

unit: mm

Shaft dia.	Clearance	
	Radial direction	Axial direction
Incl. 50 mm	0.25～0.4	1～2
Over 50 mm	0.5 ～1	3～5

Contact type sealing method

In this type of sealing, the shaft is sealed by the application of pressure resulting from the elasticity of the seal material to the sealing surface of the shaft, which rotates, reciprocates or oscillates. Synthetic rubber, synthetic resin and felt are generally used as sealing materials.

❶ Oil seal

Synthetic rubber oil seals are the most general type of sealing used. The sealing effect is obtained when the elastic lip comes into contact with the shaft. Some lips are spring-loaded to maintain adequate pressing force.
The sliding surfaces of the lip and the shaft always show frictional behavior such that the boundary lubrication and fluid lubrication are mixed. If there is an insufficient amount of oil between the contact surfaces, it will cause heat generation, wear and seizure. Conversely, if the oil film is too thick, it may cause oil leakage.
General oil seals are specified in JIS B 2402. IKO Oil Seals for Needle Roller Bearings (See page 486.) have a low sectional height to match the Needle Roller Bearings.
Nitrile rubber is generally used as the material for oil seal lips. Table 32 shows the materials and their operating temperature ranges.
The finished surface of the shaft where the seal lip makes contact must have an appropriate surface roughness, as shown in Table 33, according to the peripheral speed. It must also have accurate circularity, and the shaft eccentricity should be less than 0.05 mm.
To increase wear resistance, the hardness of the sliding part of the shaft must be more than 40HRC. This can be achieved by hard-chrome plating or heat treatment.

Table 32 Seal materials and operating temperatures

Seal material		Operating temperature range ℃
Synthetic rubber	Nitrile rubber	－25～＋120
	Acrylic rubber	－15～＋130
	Silicon rubber	－50～＋180
	Fluoro rubber	－10～＋180
Tetrafluoethylene resin		－50～＋220

Table 33 Peripheral speed and surface roughness of shaft

Peripheral speed m／s		Surface roughness $\mu mR_a(\mu mR_y)$
Over	Incl.	
－	5	0.8(3.2)
5	10	0.4(1.6)
10	－	0.2(0.8)

❷ Felt seal

Because of their simple structure, felt seals have long been used to protect grease lubrication from dust. Since felt absorbs some grease during operation, it hardly causes heat generation and seizure, but it cannot be used when the peripheral speed of the shaft is high (more than 4 m/s). Where there is a high concentration of dirt and dust, they may become attached to the contact surface of felt, sometimes scratching the shaft surface. To prevent this, two felt seals are placed apart from each other, or a felt seal is used together with a synthetic rubber seal.

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

Lubrication

Purpose of lubrication

The main purpose of bearing lubrication is to reduce friction and wear and to prevent heat generation and seizure. The lubricant and the lubricating method have a big influence on the operating performance of the bearing, and it is therefore necessary to select them suitably for the operating conditions.
The effects of lubrication are as follows.

❶ Reduction of friction and wear
At the contact surfaces between the race rings, rolling elements and cage of the bearing, lubrication prevents metal-to-metal contact, and reduces friction and wear due to sliding and rolling, in the latter of which micro-slips occur by differential slip, skew, spin, or elastic deformation.

❷ Elimination of frictional heat
The lubricant removes the heat generated by friction or transferred from outside, and prevents overheating of the bearing. Circulating lubrication is generally used for this purpose.

❸ Influence on bearing life
The bearing life is extended if the rolling contact surfaces between the race rings and rolling elements are separated by an oil film of adequate thickness, and is shortened if the oil film is inadequate due to low oil viscosity, etc.

❹ Rust prevention
The lubricant prevents rust formation on the inside and outside surfaces of the bearing.

❺ Dust prevention
Grease lubrication is particularly effective for dust prevention. Oil circulating or jet lubrication is effective in washing foreign particles away from the area around the bearing.

Methods of lubrication

Grease lubrication and oil lubrication are generally used for rolling bearings. In special cases, solid lubricants are also used.
In general, grease lubrication requires the simplest sealing device. It is therefore economical, and widely used. Also, once filled with grease, the bearing can be used for a long period without replenishing the grease. However, compared with oil, its heat removal properties and cooling capacity are inferior, since grease has high flow resistance, which causes high churning heat.
Oil has greater fluidity and superior heat removal properties. It is therefore suitable for high-speed operations. In addition, it is simple to filter out dust and dirt from oil. Thus it can prevent the generation of noise and vibration and increase bearing life.
Another advantage of oil lubrication is that it offers the possibility for selecting the appropriate method for particular operating conditions from among various available lubrication methods. However, measures to prevent oil leakage are required. As a guideline for selection, Table 34 compares grease and oil lubrication.
For the lubricants used for IKO Spherical Bushings, see page K2.

Table 34 Comparison between grease lubrication and oil lubrication

Item	Grease lubrication (1)	Oil lubrication
Sealing, Housing structure	Simple	Slightly complicated
Temperature	High temperature not allowed	High temperature allowed (Cooling effect by circulation)
Rotational speed	Low and medium speeds	High speed allowed
Load	Low and medium loads	High load allowed
Maintenance	Easy	Elaborate (Pay special attention to oil leaks.)
Lubricant replacement	Slightly complicated	Simple
Lubrication performance	Good	Very good
Dust filtration	Difficult	Simple
Entry of dust and dirt	Easy measures for protection	Dust and dirt can be removed by filtering in circulating lubrication.

Note(1) This represents bearing grease for general use.

Grease lubrication

❶ Amount of grease to be filled
The amount of grease to be filled depends on the housing structure, dimensions, type of grease used and atmosphere. Generally, filling about 1/3 to 1/2 of the free space inside of the bearing and the housing is considered to be appropriate. Too much will cause a rise in temperature, and care should be taken especially at high speed rotations.
In Fig. 19, several grease pockets are provided by the grease sectors on one side of the bearing. Even if the filled grease is dispersed by the centrifugal force at high rotational speeds, it is trapped by the grease pockets and diverted back into the bearing again. Old grease accumulates in the space on the opposite side of the bearing, and this can be removed periodically by taking off the cover.

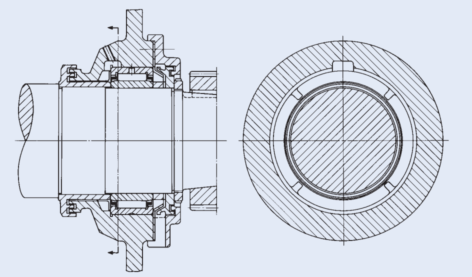
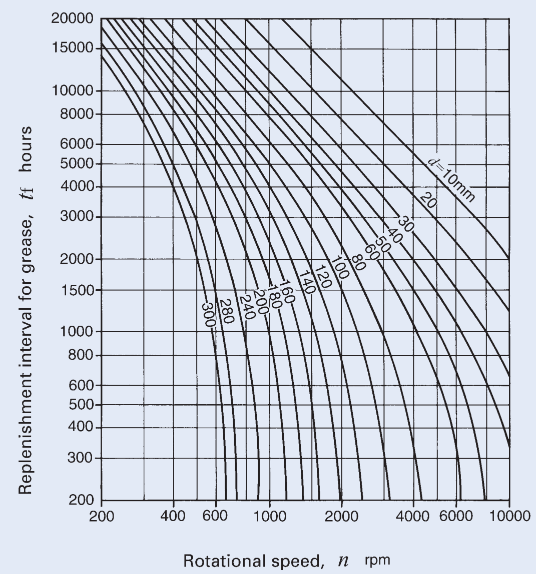


Fig. 19

❷ Replenishment of grease
The life of grease depends on its type and quality, the type and dimensions of the bearing, operating conditions, temperature, amount of wear, penetration of foreign particles and water, etc.
Fig. 20 shows the replenishment intervals for grease, and is used as a general guideline. The values obtained from this diagram apply to cases in which the load condition is normal, the machine body is stationary, and the operating temperature on the outer surface of bearing outer ring is less than +70°C. If the temperature exceeds +70°C, as a general rule, the replenishment interval is halved for every 15°C increase.



Remark
d is the bore diameter of the inner ring. For a bearing without an inner ring, the roller set bore diameter F_w is used for d.

Fig. 20 Interval for replenishment of grease

A
B
C
D
E
F
G
H
I
J
K
L
M

Oil lubrication

❶ Oil bath lubrication

This is the most commonly used oil lubrication method, and is used for medium and low speeds. If the amount of oil is too large, heat will be generated by churning, and if the amount is too small, seizure will occur. Therefore, the correct amount of oil must be maintained. When the machine is stationary, the correct oil level in the case of a bearing mounted on a horizontal shaft, is near the center of the lowest rolling element. In the case of a vertical shaft, about 50% of the surfaces of the rolling elements should be submerged in oil.

It is desirable to provide an oil gauge so that the oil level can be easily checked while the machine is stationary or running.

❷ Oil drip lubrication

Oil drips, which are fed down from a sight-feed oiler or along a fiber string, become an oil spray due to wind pressure generated by the rotating cage, shaft, nut, etc., or they strike the rotating parts and form an oil spray, which fills up the housing and every required part. Because oil spray removes frictional heat, this method has a more effective cooling effect than the oil bath method, and is widely used for high-speed rotation and medium load conditions.

In the case of the sight-feed oiler (Fig. 21), the number of drips can be adjusted. However, this is difficult using the string-feed method. The number of drips depends on the bearing type, rotational speed, etc., but 5 ～ 6 drips per minute is generally used.

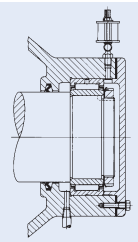


Fig. 21 Oil drip lubrication

❸ Oil splash lubrication

In this method, oil is splashed in all directions by the rotation of the gear or disk. This can be used for considerably high-speed rotations without soaking the bearing directly in oil.

In the gear case where shafts and bearings are lubricated with the same oil, wear particles may be introduced into the bearing as they might get mixed with the oil. In this case, a permanent magnet is provided at the bottom of the gear case to collect metal particles, or a shield plate is installed next to the bearing.

Fig. 22 shows another method in which the splashed oil flows along the grooves in the case and accumulates in the oil pockets, keeping the oil level constant. So the oil is steadily supplied to the bearing.

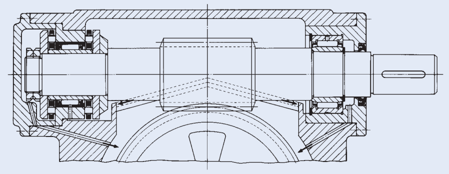


Fig. 22 Oil splash lubrication

❹ Oil circulating lubrication

When automatic lubrication is more economical because lubrication is required at many points, or when cooling is required for high rotational speed, this method is used. The oil is supplied with a pump, which can control the oil pressure, and a filter or cooler, etc. can be set up in the circulation system, making this an ideal method of lubrication. As shown in Fig. 23, the oil supply and discharge ports are located opposite to each other, and the discharge port is made large to prevent the accumulation of oil.

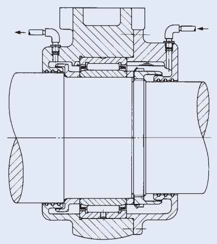


Fig. 23 Oil circulating lubrication

❺ Oil mist lubrication

After dirt and dust are removed by a filter, the oil is turned into a spray by dry compressed air, and this lubricates the bearing. When the air and oil pass through the bearing, the air cools the bearing and the oil lubricates it. In addition, because the air inside the housing is at a higher pressure than the outside air, the entry of water and foreign particles is prevented. There are many other advantages of this method, and it is suitable for high rotational speed applications such as high speed internal grinding spindles.

❻ Oil jet lubrication

This is a highly reliable lubrication method and is used under severe conditions such as ultra-high rotational speeds and high temperatures. The speed of the oil jet should be more than 20% of the peripheral speed of the inner ring raceway surface, since the air around the bearing rotates together with the bearing forming an air wall. As shown in Fig. 24, the jet from the nozzle blows directly into the space between the inner ring and the cage. Due to the large amount of oil being used, it is more effective to make the discharge port larger, and use the forced discharge.

When the $d_m n$ value (mean value of the bearing outside and bore diameters in millimeter x rotational speed in revolutions per minute) is more than 1,000,000, the speed of the jet should be 10～20 m/s, the nozzle diameter should be about 1 mm, oil supply pressure should be 0.1～0.5 MPa, and the oil supply amount should be about 500 cc/min or greater. When the rotational speed is higher, the oil supply pressure and the oil amount should be higher.

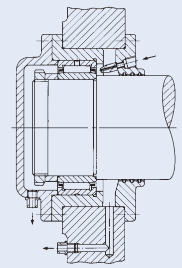


Fig. 24 Oil jet lubrication

Table 35 Properties of various types of grease

Item \ Name (Common name)	Calcium grease (Cup grease)	Sodium grease (Fiber grease)	Aluminum grease (Mobile grease)	Mixed base grease	Barium grease	Lithium grease			Non-soap base grease (Non-soap grease)	
							(Diester grease)	(Silicon grease)	(Bentone grease)	
Base oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Diester oil	Silicon oil	Mineral oil	Synthetic oil
Thickener	Ca soap	Na soap	Al soap	Na + Ca soap, Li + Ca soap	Ba soap	Li soap	Li soap	Li soap	Bentone	Silica gel. Polyurea, etc.
Appearance	Buttery	Fibrous and buttery	Stringy and buttery	Fibrous and buttery	Fibrous and buttery	Buttery	Buttery	Buttery	Buttery	Buttery
Pour point ℃	80～90	150～180	70～90	160～190	150～180	170～190	170～190	200～250	200～	None
Operating temperature range ℃	−10～+70	−20～+120	−10～+80	−10～+100	−10～+135	−20～+120	−50～+120	−50～+180	−10～+150	～+200
Pressure resistance	Strong to weak	Strong to medium	Strong	Strong	Strong to medium	Medium	Medium	Weak	Medium to weak	Medium
Water resistance	Good	Poor	Good	Good, poor for Na+ Ca soap grease	Good	Good	Good	Good	Good	Good
Mechanical stability	Fair	Good	Poor	Good	Poor	Excellent	Excellent	Excellent	Good	Good to poor
Features and application	Contains about 1% water. When the temperature rises to more than +80˚C, the water evaporates and the grease separates into oil and soap. This is used for medium loads.	Long fibrous grease cannot withstand high speeds, but has good pressure resistance properties. Short fibrous grease is comparatively good for high speeds.	It has water and rust resistant properties, and adheres easily to metal surface.	Usable at fairly high speeds.	It has water and heat resistant properties. This is an all-purpose grease.	This is the best all-purpose grease among soap based greases.	Excellent under low temperature conditions and has superior frictional properties. Suitable for small bearings used in measuring instruments.	Mainly used for high temperatures. Not suited to high speeds and heavy loads.	Generally good heat resistance. Grease having a mineral base oil is for general use. Grease having a synthetic base oil is suitable for special use where superior heat and chemical resistance properties are required.	

Lubricants

For rolling bearings, lubricating grease or oil is generally used. For special applications, solid lubricants are used.

Lubricating grease

Grease is a semi-solid lubricant made by mixing base oil (liquid lubricant) and a thickener under heat and adding additives as required.

There are many types of grease according to various combinations of base oil, thickeners and additives. Grease is usually classified by thickeners and base oil. Table 35 shows the general properties of each type of grease.

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

❶ Base oil
Petroleum lubricating oil is usually used as the base oil.
As the lubricating performance of grease depends mainly on that of base oil, the viscosity of the base oil is an important property. In general, low viscosity is suitable for light-load and high-speed rotations, and high viscosity for heavy-load and low-speed rotations. Synthetic lubricants of the diester or silicon series are used instead of lubricants of the petroleum series in consideration of the pour point and high temperature stability.

❷ Thickener
As shown in Table 35, metal soap bases are mostly used as thickeners. In particular, Na-soap is water-soluble and emulsifies easily, and it cannot be used in damp or wet areas. The type of thickener and the pour point of grease have a close relationship. In general, the higher the pour point, the higher the maximum usable temperature of grease. However, even when the grease uses a thickener having a high pour point, its upper operating temperature limit is low if its base oil has low heat resistance.

❸ Consistency
This represents the hardness grade of grease. Grease becomes harder in proportion to the amount of thickener if the same thickener is used.
Immediately after grease has been stirred (usually 60 times), a depression is formed in the grease in a specified time using a specified cone. The consistency (combined consistency) is expressed by the value of depth of depression (mm) multiplied by 10.
This value gives an estimate of the fluidity during operation with a greater value for softer grease.
Table 36 shows the consistency number of grease and the relationship between the consistency and operating conditions.

Table 36 Consistency and operating conditions of grease

NLGI consistency number	Combined consistency	Application
0	385 ～ 355	For centralized lubrication,
1	340 ～ 310	For oscillating motion
2	295 ～ 265	For general use
3	250 ～ 220	For general use, For high temperature
4	205 ～ 175	For sealing with grease

❹ Additives
Additives include various types of substances, which are added to grease in small quantities to improve its characteristics. For example, when a bearing is kept running for long periods of time, its temperature rises. This results in oxidation of the lubricant and formation of oxides, which lead to corrosion of the bearing.
Thus, when a bearing is to be operated for long periods of time without regreasing, antioxidants are added. In addition, grease containing extreme pressure additives is suitable for use in places that are subjected to heavy loads.

❺ Miscibility of different greases
In principle, it is desirable to use grease of the same brand. However, when the mixing of different greases is unavoidable, greases with the same type of thickener and with a similar type of base oil should be used.
It should be noted that if different types of grease are mixed, they may interact with each other and the consistency will become softer than that for the individual greases.

Lubricating oil

For rolling bearings, refined mineral oil or synthetic oil is used. To improve its properties, antioxidant additives, extreme pressure additives and detergent additives are added as required.
When selecting lubricating oil, it is important to select oil which has adequate viscosity under operating temperatures. If the viscosity is too low, the formation of the oil film will be insufficient, causing abnormal wear and seizure. On the other hand, if the viscosity is too high, it will generate excessive heat or increase power loss due to viscous resistance. As a general standard, oil having higher viscosity should be used for heavier loads and oil having lower viscosity should be used for higher rotational speeds.
Under conditions of normal use for various bearings, the values of viscosity shown in Table 37 will be a guideline.
The relationship between viscosity and temperature can be obtained from Fig. 25. Also, Table 38 shows examples of selecting lubricating oil according to the conditions of bearing use.

Table 37 Bearing series and required viscosity of lubricating oil

Bearing series	Kinematic viscosity at operating temperatures
Needle roller bearings Roller bearings	13 mm²/s or more
Crossed roller bearings	20 mm²/s or more
Thrust needle roller bearings Thrust roller bearings	32 mm²/s or more

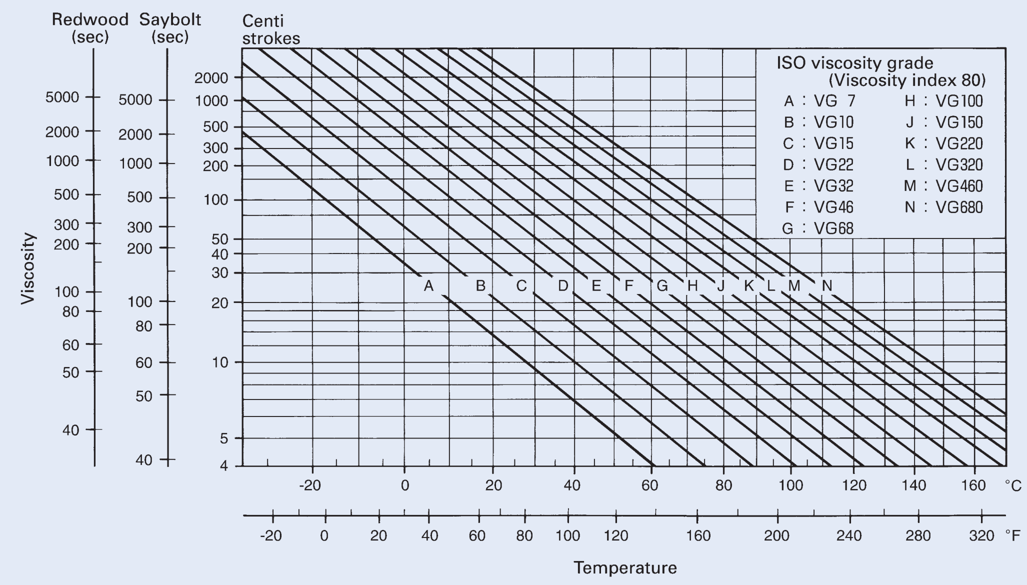


Fig. 25 Relationship between viscosity and temperature of lubricating oil

Table 38 Conditions of bearing use and examples of lubricating oil selection

Conditions		ISO viscosity grade(VG) 10	15	22	32	46	68	100	150	220	320	460	680
Operating temperature	−30～ 0℃		←	Refrigerator oil	→								
	0～ 50℃	←			Bearing oil			→					
					←	Turbine oil	→						
	50～ 80℃				←			Bearing oil		→			
					←	Turbine oil	→						
	80～110℃						←		Bearing oil		→		
							← Turbine oil →						
											←	Gear oil	→
$d_m n$ value		Large ←											→ Small
Load		Small ←											→ Large

Remarks · Lubricating oils are based on JIS K 2211 (Refrigerator Oil), JIS K 2239 (Bearing Oil), JIS K 2213 (Turbine Oil), and JIS K 2219 (Gear Oil).
· The method of lubrication in these cases is mainly oil bath lubrication or circulating lubrication.
· When the temperature is on the high side within the operating temperature range, oils of high viscosity are used.
· $d_m n$ represents the mean value of the bore and outside diameters (mm) of the bearing multiplied by the rotational speed (rpm).

C-Lube Bearing

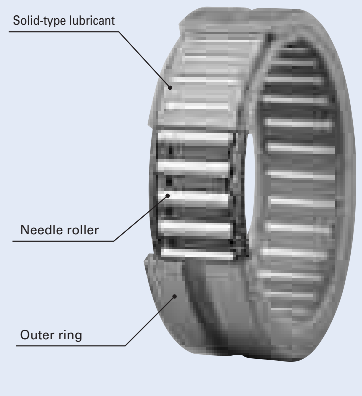
IKO C-Lube Bearing is a bearing that is lubricated with a newly developed thermosetting solid-type lubricant. A large amount of lubricating oil and fine particles of ultra high molecular weight polyolefin resin are solidified by heat treatment to fill the inner space of the bearing. As the bearing rotates, the lubricating oil oozes out onto the raceway in proper quantities, maintaining the lubrication performance for a long period of time.
C-Lube Bearing is available in all Needle Roller Bearing series with an outer diameter not exceeding 80 mm. Also, C-Lube Bearing with food grade oil is available For Food machinery. When required, please consult IKO for further information.

Features of C-Lube Bearing

- Most suitable for preventing grease dry-up in applications where lubrication is difficult.
- Great reduction of maintenance work by extending the lubrication interval.
- Elimination of oil contamination, making this bearing most suitable for applications that would be adversely affected by oil.

Cautions for using C-Lube Bearing

- Never wash C-Lube Bearing with organic solvent and/or white kerosene which have the ability to remove fat, or leave the bearing in contact with these agents.
- The operating temperature range is -15～+80°C. For continuous operation, the recommended operating temperature is +60°C or less.
- To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
- The allowable rotational speed is different from that of the general needle roller bearings. See the values shown in Table 39.



Structure of C-Lube Bearing

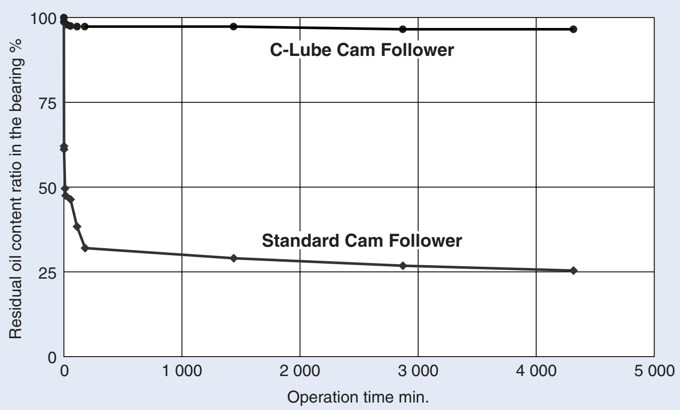
Table 39 Allowable rotational speed of C-Lube Bearing

Type (representative)		Allowable dn values
	Model code (representative)	$d_m n$ (1), $d_1 n$ (2)
Machined type needle roller bearing	NA, TR, TAF, NAF	20 000
Shell type needle roller bearing	TA⋯Z, TLA⋯Z	20 000
Cam follower	CF⋯W	10 000

Notes(1) $d_m n$ = (bore diameter of bearing [mm] + outside diameter of bearing [mm]) /2 × rotational speed [rpm]
(2) $d_1 n$ = stud diameter [mm] × rotational speed [rpm]

Rotational endurance test

Test condition
Test product
IKO C-Lube Cam Follower: CF10/SG
IKO Standard Cam Follower: CF10
Rotational speed : 1,000rpm
Ambient temperature : Room temperature



Friction and Allowable Rotational Speed

Friction

Compared with sliding bearings, the starting (static) friction for rolling bearings is small, and the difference between the starting (static) friction and the kinetic friction is also small. The loss of power and temperature rise in machines are thus reduced, improving the mechanical efficiency.
Frictional torque is influenced by the bearing type, bearing load, rotational speed, lubricant characteristics, etc. It varies according to the lubricant when operated under light-loads and high-speed conditions, and according to the load when operated under heavy-loads and low-speed conditions.
Frictional torque of rolling bearings is complicated because it is influenced by various factors, but for convenience, it can be expressed approximately by the following equations.

- Radial bearings $M = \mu P \dfrac{d}{2}$ ……………………(37)
- Thrust bearings $M = \mu P \dfrac{d_m}{2}$ ……………………(38)

where, M : Frictional torque, N-mm
μ : Coefficient of friction
P : Bearing load, N
d : Bearing bore diameter, mm
d_m : Mean value of bearing bore and outside diameters, mm

The approximate coefficients of friction of IKO Bearings under operating conditions, in which lubrication and mounting are correct and where loads are relatively large and stable, are shown in Table 40.

Table 40 Coefficient of friction

Bearing series	μ
Needle roller bearings with cage	0.0010 ～ 0.0030
Full complement needle roller bearings	0.0030 ～ 0.0050
Thrust needle roller bearings	0.0030 ～ 0.0040
Thrust roller bearings	0.0030 ～ 0.0040

Allowable rotational speed

As the rotational speed of rolling bearings is increased, the bearing temperature also increases due to the heat generated at the contact surfaces between the cage, raceways and rolling elements, until it finally leads to bearing seizure. It is therefore necessary to maintain the rotational speed of a bearing below a certain limit value to ensure safe operation for long periods. This limit value is called the allowable rotational speed.
Since the amount of heat generated is approximately proportional to the sliding speed at the contact area, this sliding speed is an approximate guide indicating the limit of the bearing rotational speed.
The allowable rotational speed of bearings thus varies according to the bearing type, size, bearing load, method of lubrication, radial clearance, and other such factors.
The allowable rotational speeds shown in the table of dimensions are empirical values. They are not absolute values and can be changed according to the bearing use conditions. Depending on the structure and accuracy around the bearing, the lubricant and the lubrication method, it is possible for some bearings to be operated at more than twice the allowable rotational speed given in the table without trouble.

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

Operating Temperature Range

The allowable operating temperature range for needle roller bearings is generally -20～+120°C.
When operating at temperatures outside this range, the operation may be limited by the allowable temperature range of prepacked grease, seal, cage material, etc.
The operating temperature range for some types of bearings is different from the above. See the section for each bearing.

Handling of Bearings

Precautions in handling

Since the bearing is a high-accuracy mechanical element, special attention must be paid to its handling. The following precautions should be noted when handling the bearings.

❶ Bearings and their surrounding parts should be kept clean.
Bearings and their surrounding parts must be kept clean paying special attention to dust and dirt. Tools and the working environment should also be cleaned.

❷ Bearings should be handled carefully.
A shock load during handling may cause scratches, indentations and even cracks or chips on the raceway surfaces and rolling elements.

❸ Bearings should be mounted or dismounted with proper tools.
When mounting and dismounting, tools suitable for the bearing type should be used.

❹ Bearings should be protected against corrosion.
Bearings are treated with anti-corrosive oil. However, when handling them with bare hands, sweat from the hands may result in future rust formation. Gloves should be worn, or hands should be dipped in mineral oil.

Mounting

Preparation

Before mounting the bearing, the dimensions and fillets of the shaft and housing should be checked to ensure that they conform to specifications.
Bearings should be unwrapped just before mounting. In case of grease lubrication, bearings should be filled with grease without cleaning the bearings. Even in the case of oil lubrication, it is normally unnecessary to clean the bearings. However, when high accuracy is required or when using at high speeds, the bearings should be cleaned using cleaning oil to remove thoroughly oily contents. The cleaned bearings should not be left alone without anti-corrosive precautions, because bearings can easily be corroded after anti-corrosive agents are removed.
Lubricating grease is prepacked in some types of bearings. Therefore, refer to the relevant section for each bearing.

Methods of mounting

Mounting methods of bearings are different according to the type of bearing and the fit. In general, mounting of needle roller bearings is comparatively easy. However, non-separable bearings with large interferences should be handled with great care.

❶ Mounting by press fit
Small and medium bearings with small interferences require a small pressing-in force for mounting, and they are mounted using a press at room temperature. The bearing should be pressed in carefully, applying a force evenly to the bearing with a fitting tool as shown in Fig. 26. For separable bearings, the inner and outer rings can be mounted separately, and the mounting work is simple. However, when installing the shaft and inner ring assembly into the outer ring, care should be taken not to damage the raceway surfaces and rolling elements.

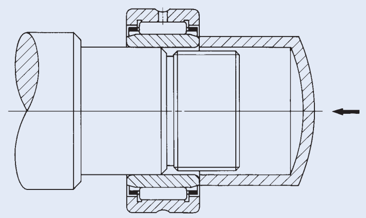


Fig. 26

When mounting non-separable bearings, the inner and outer rings are pressed in simultaneously by applying a cover plate as shown in Fig. 27. It must never happen that the inner ring is press-fitted to the shaft by striking the outer ring, or the outer ring by striking the inner ring, because the raceway surfaces and rolling elements will be scratched or indented.

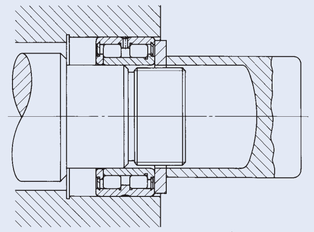


Fig. 27

When press fitting, the friction of the fitting surfaces can be reduced by applying high viscosity oil over the fitting surfaces.
The pressing-in or pulling-out force to be applied to the bearing is given on page A59.

❷ Mounting by shrink fitting
This method is used when the interference is great or when a large bearing is to be fitted. The housing is heated and thermally expanded when fitting the outer ring to the housing and the inner ring is heated and expanded when fitting it to the shaft allowing the bearing to be set easily within a short time. The maximum allowable temperature for the shrink fit is +120°C, and heating should be performed appropriately. Pure non-corrosive mineral oil is recommended as the heating oil for shrink fit, and insulation oil for transformers is considered to be the best. During cooling, the bearing also shrinks in the axial direction. Therefore, to ensure that there is no clearance between the bearing and the shoulder, an axial force must be applied continuously to the bearing until it has cooled.
When the interference between the outer ring and the housing is great, an expansion fit method in which the bearing is cooled using dry ice or other cooling agent before fitting can be used. Immediately after fitting, however, moisture from the air easily condenses on the bearing. Therefore, it is necessary to take preventive measures against corrosion.

A B C D E F G H I J K L M

Pressing force and pulling force

Guidelines for the pressing force when pressing in the inner ring to the shaft and the pulling force when pulling it out are obtained from the following equation.

$$K=f_{k}\frac{d}{d+2}\,\Delta_{df}B\left\{1-\left(\frac{d}{F}\right)^{2}\right\} \quad \cdots\cdots(39)$$

where, K : Pressing or pulling force, N

f_k : Resistance factor determined by the coefficient of friction

When pressing in inner ring to shaft, $f_k=4\times10^4$

When pulling out inner ring from shaft, $f_k=6\times10^4$

d : Bore diameter of inner ring, mm

Δ_{df} : Apparent interference, mm

B : Width of inner ring, mm

F : Outside diameter of inner ring, mm

The actual pressing force or pulling force may be greater than the calculated value due to mounting errors. When designing a puller, it is necessary that the puller has the strength (rigidity) to withstand more than 5 times the calculated value.

Running test

After mounting the bearing, a running test is carried out to check whether the mounting is normal. Usually, it is first checked by manual turning. Then, it is operated by power gradually from no-load and low-speed up to normal operating conditions to check for abnormalities.
Noise can be checked by using a soundscope or similar instrument. In this test, checks are carried out for the following abnormalities.

❶ Manual turning

(a) Uneven torque ················ Improper mounting
(b) Sticking and rattling ··· Scratches or indentations on the raceway surface
(c) Irregular noise ··· Penetration of dust or foreign particles

❷ Power running

(a) Abnormal noise or vibration ··· Indentations on the raceway surface, too great clearance
(b) Abnormal temperature ··· Unsuitable lubricant, improper mounting, too small clearance

Dismounting

Dismounting of the bearings is carried out for the periodic inspection or repairs of machines. By inspecting the bearing, related parts or mechanisms, lubrication, etc., important data is obtained. In the same manner as in mounting, care should be taken to prevent damage to the bearing or other parts.
A suitable dismounting method should be selected according to the type of the bearing, fit, etc. Bearings mounted by interference fit are especially difficult to dismount, and it is necessary to give due consideration to the structure around the bearing during the design stage.

Dismounting of outer ring

Outer rings mounted by interference fit are dismounted as shown in Fig. 28, by screwing in the push-out bolts evenly through several screw holes provided at places corresponding to the side face of the outer ring.

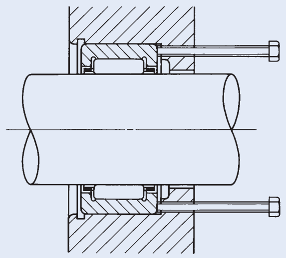


Fig. 28

Dismounting of inner ring

In the case of bearings such as needle roller bearings in which the inner and outer rings are separable, the simplest way to press out the inner ring is by using a press as shown in Fig. 29.
The puller shown in Fig. 30 is also generally used. This is designed according to the bearing size. In addition, there are a 3-hook puller (Fig. 31) and a 2-hook puller for wide-range use.

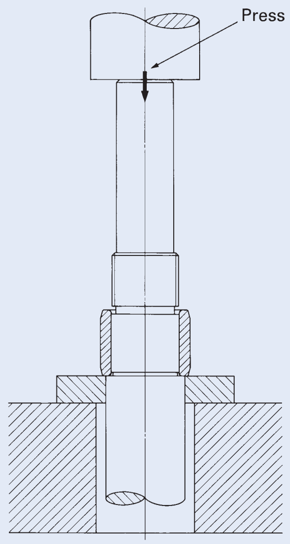


Fig. 29

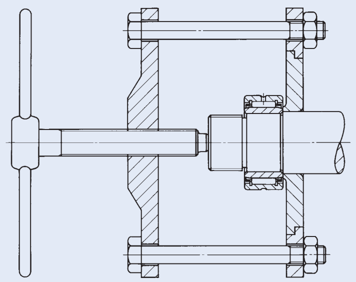


Fig. 30

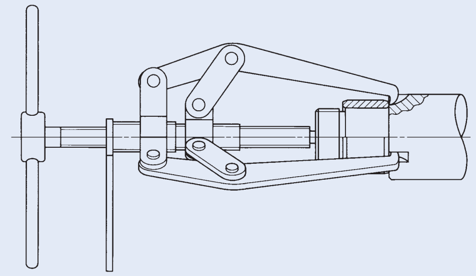


Fig. 31

In addition to these, when it is difficult to remove the inner ring due to high shoulders, several holes for removal pins are made through the shoulder, or several hook grooves are cut in the shoulder as shown in Fig. 32 and Fig. 33.
When a bearing is not to be used again after removal, it may be removed by heating with a torch lamp.

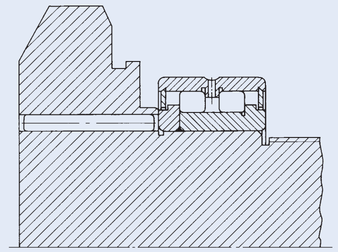


Fig. 32

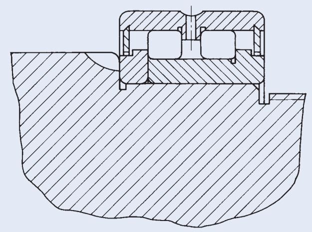


Fig. 33

Inspection of bearing

Cleaning of bearing

When inspecting a bearing after removal, the appearance of the bearing should be recorded first. Then, after the residual amount of lubricant is checked and a sample of lubricant is collected, the bearing should be cleaned.
For cleaning, light oil or kerosene is commonly used. Cleaning is divided into rough cleaning and final cleaning, and wire gauze is set as a raised bottom in a container to prevent the bearing from touching the bottom of the container.
Lubricating grease and adhering substances such as foreign particles are removed with a brush, etc., using oil for rough cleaning. Care should be taken during this process, because if the bearing is turned with foreign particles attached, the raceway surfaces may be scratched.
Final cleaning is carried out by turning the bearing in cleaning oil. It is desirable that the cleaning oil is kept clean by filtering. Immediately after cleaning, the bearing must be protected against corrosion.

Inspection and evaluation of bearing

The judgement as to whether the removed bearing is reusable depends on the inspection after cleaning. Conditions of the raceway surfaces, rolling elements and fitting surfaces, wear condition of the cage, increase of bearing clearance, dimensions, rotational accuracy, etc. should be checked for damage and abnormalities.
The evaluation is performed based on the experience taking into consideration the degree of damage, machine performance, importance of the machine, operating conditions, period until the next inspection, and other such factors.

Maintenance and inspection

Maintenance and inspection

Maintenance and inspection are carried out to maintain good performance of bearings installed in the machine.
Maintenance is performed by checking the machine operating conditions, checking and replenishing or replacing the lubricant, checking the bearing and related parts by periodic disassembly and other such procedures.
Items for inspection of a running bearing in a machine include the bearing temperature, noise, vibration and condition of lubricant.
When any abnormality is found during operation, the cause should be investigated and measures taken by referring to the section on running test on page 62.
When removing a bearing, refer to the section on dismounting on page A59.

Damage, causes and corrective action

Rolling bearings can generally be used fully up to their rolling fatigue life if they are properly selected, mounted, operated and maintained. However, they may actually be damaged earlier than their expected lifetimes creating problems or accidents. Common causes of damage include improper mounting or handling, insufficient lubrication and penetration of foreign particles.
It may be difficult to determine the exact cause of a problem by checking only the damaged bearing. The conditions of the machine before and after the occurrence of the damage, the location and the operating and ambient conditions of the bearing, the structure around the bearing, etc. should also be examined. It then becomes possible to assess the cause of the damage by linking the conditions of the damaged bearing to the probable causes arising from the machine operation, and to prevent the recurrence of similar problems.
Common types of damage, causes and corrective action are listed in Table 41.

Table 41 Damage, causes and corrective action

	Condition of bearing damage	Cause	Corrective action
Flaking	Flakings at opposite circumferential positions on raceway surfaces	Improper roundness of housing bore	Correction of housing bore accuracy
	Flakings in the vicinity of raceway surface edges and roller ends	Improper mounting, Shaft deflection, Poor centering, Poor accuracy of shaft or housing	Careful mounting, Careful centering, Correction of shoulders of shaft and housing for right angles
	Flakings on raceway surfaces with an interval corresponding to roller pitch	Great shock load when mounting, Rusting during machine stoppage	Careful mounting, Protection against rust for long periods of machine stoppage
	Early flaking on raceway surfaces and rolling elements	Too small clearance, Too great load, Poor lubrication, Rusting, etc.	Correct selection of fit and clearance Correct selection of lubricant
Galling	Galling on raceway surfaces and rolling surfaces of rollers	Poor lubrication in early stage Grease consistency too hard High acceleration at start	Selection of softer grease, Avoiding quick acceleration
	Galling between roller end faces and collar guide surfaces	Poor lubrication, Poor mounting, Large axial load	Correct selection of lubricant Correct mounting
Breakage	Cracks in outer or inner ring	Excessive shock load, Too much interference. Poor cylindricity of shaft. Too large fillet radius, Development of thermal cracks, Development of flaking	Reevaluation of load conditions, Correction of fit, Correction of machining accuracy of shaft or sleeve, Making fillet radius smaller than the chamfer dimension of bearing
	Cracked rolling elements, broken collar	Development of flaking Shock to collar when mounting, Dropped by careless handling	Careful handling and mounting
	Broken cage	Abnormal load to cage by poor mounting, Poor lubrication	Minimizing mounting errors, Study of lubricating method and lubricant
Dent	Indentations on raceway surfaces at an interval corresponding to the pitch between rolling elements (brinelling)	Shock load applied when mounting, Excessive load while stopping	Careful handling
	Indentation on raceway surfaces and rolling surfaces of rollers	Biting of foreign substances such as metal chips and sands	Cleaning of housing, Improvement of sealing, Use of clean lubricant
Abnormal wear	False brinelling (Phenomenon like brinelling)	Vibration when the bearing is stationary such as during transportation, Oscillating motion with small amplitude	Fixing of shaft and housing, Use of lubricating oil, Application of preload to reduce vibration
	Fretting Localized wear of fitted surfaces accompanied by red-brown wear particles	Sliding between fitted surfaces	Increase of interference, Application of oil
	Wear on raceway surfaces, collar surfaces, rolling surfaces of rollers, cages, etc.	Penetration of foreign particles, Poor lubrication, Rust	Improvement of sealing, Cleaning of housing Use of clean lubricant
	Creep Wear on fitted surfaces	Sliding between fitted surfaces, Insufficient tightening of sleeve	Increase of interference, Correct tightening of sleeve
Seizure	Discoloration of rolling elements and/or raceway surfaces and/or flange surfaces, Adhesion and welding, Discoloration of cage	Poor lubrication, Too small clearance, Poor mounting	Supply of proper amount of proper lubricant, Rechecking of fit and bearing clearance Rechecking of mounting dimensions and related parts
Electric corrosion	Ripples on raceway surfaces	Melting by sparks due to electric current	Insulation of bearing, Grounding to avoid electric current
Rust, corrosion	Rust or corrosion on bearing inside surfaces or on fitted surfaces	Condensation of vapor in air, Penetration of corrosive substances	Careful storage if under high temperature and high humidity, Protection against rust, Improvement of sealing

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

Description of Each Series & Table of Dimensions

SHELL TYPE NEEDLE ROLLER BEARINGS

● Shell Type Caged Needle Roller Bearings

● Shell Type Grease Retained Full Complement Needle Roller Bearings

Structure and features

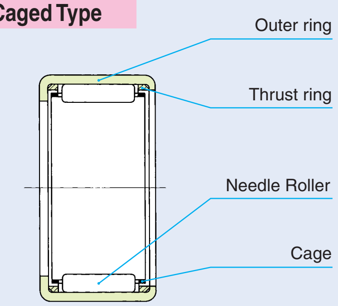
IKO Shell Type Needle Roller Bearings are light-weight bearings with large load ratings. They employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched, thus providing the lowest sectional height among the needle roller bearings.

There are two types of bearings available in this series; the caged type and the full complement type. The appropriate type can be selected according to the operating conditions. The caged type has a structure in which the needle rollers are accurately guided by the cage and thrust rings. It is useful for applications at high-speed rotation. The full complement type needle roller bearing, on the other hand, is suitable for heavy-load applications at low-speed rotation.

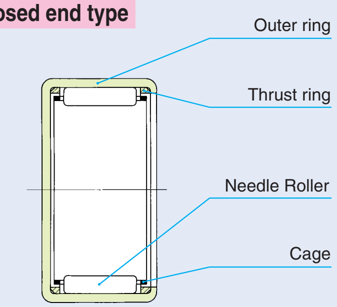
Since these bearings are press-fitted into the housing, no fixtures for axial positioning are needed. They are ideal for use in mass-produced articles that require economy, and have a wide variety of applications.

Structures of Shell Type Needle Roller Bearings

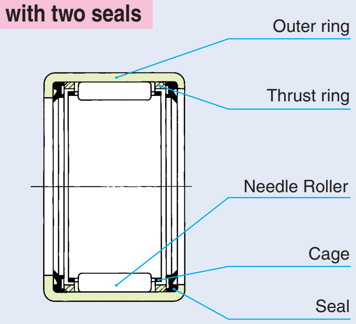
Standard Caged Type



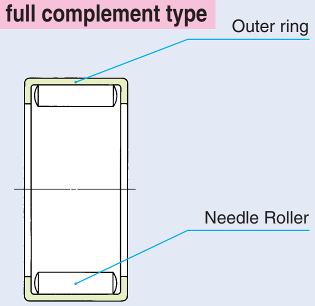
Caged and closed end type



Caged type with two seals



Grease retained full complement type



Types

Numerous varieties of Shell Type Needle Roller Bearings are available as shown in Table 1.

Table 1 Type of bearing

Series \ Type		Caged: Standard	Caged: Closed end	Caged: With seals (1)	Full complement: Grease retained
Metric series	–	TLA ···Z	TLAM	TLA···UU	YTL
	Heavy duty	TA ···Z	TAM	–	YT
Inch series	–	BA ···Z	BAM	–	YB
	Heavy duty	BHA···Z	BHAM	–	YBH

Note(1) When the heavy duty type with seals or the closed end type with one seal is required, please consult IKO.

Remark A "W" is added to the model code to indicate that the rolling elements are of the double-row type.
Example TAW 5045 Z

Shell Type Caged Needle Roller Bearings

Standard type

This type has a narrow gap between the bore of the marked-side flange of the outer ring (brand, bearing number, etc. are marked) and the shaft, which prevents grease leaks and the entry of foreign particles. This type has wide applications.

Closed end type

This type is completely closed on one side of the outer ring, and is ideal for use when perfect closing of shaft ends is desired.

The shape of the closed end surface of the outer ring is divided into two types, and the dimensions t_1 and t_2 in the illustrations shown in the dimension tables apply to the bearings with the roller set bore diameters, $F_w > 22$ and $F_w \leqq 22$, respectively.

Type with seals at both sides

This type has a wider outer ring than the standard type and is installed with seals consisting of a reinforcing ring and special synthetic rubber to prevent grease leaks and the entry of foreign particles.

Shell Type Grease Retained Full Complement Needle Roller Bearings

This type has full complement rollers which extend to the full width of the outer ring raceway. It can, therefore, withstand heavy bearing loads and is most suitable for low and medium rotational speeds as well as rocking motions. As lubricating grease is prepacked with the rollers, the bearing can be operated immediately after being fitted.

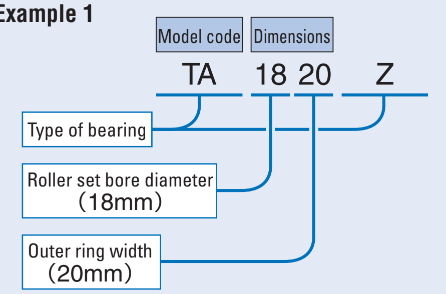
Identification Number

The identification number of Shell Type Needle Roller Bearings consists of a model code and dimensions. Examples of the arrangement are shown below.

When using with inner rings, the assembled inner rings shown in the dimension tables are used. An example in this case is also shown below. Inner rings are delivered separately.

Examples of identification number

Example 1



Example 2 (With inner ring)

Identification number of Shell Type Needle Roller Bearing		Identification number of Inner Ring
TA 1820 Z	+	IRT 1520

Accuracy

The outer rings of Shell Type Needle Roller Bearings are thin and therefore cannot avoid deformation due to heat treatment. It is thus not appropriate to take direct measurements of the bearing. The roller set bore diameter is measured using a plug gauge or tapered gauge after press-fitting the bearing to a suitable ring gauge. The gauge specifications are shown in Tables 2.1 and 2.2.

Tolerances of outer ring width C are shown in Table 3.

Table 2.1 Measuring gauges for metric series bearings unit: mm

F_w Nominal roller set bore diameter	Ring gauge: TA···Z(1)	Ring gauge: TLA···Z(2)	Plug gauge: Go	Plug gauge: No-go
4	–	7.981	4.004	4.016
5	–	8.981	5.004	5.016
6	–	9.981	6.004	6.016
7	–	10.977	7.005	7.020
8	14.992	11.977	8.005	8.020
9	15.992	12.977	9.005	9.020
10	16.992	13.977	10.005	10.020
12	18.991	15.977(3) 17.977(3)	12.006	12.024
13	–	18.972	13.006	13.024
14	21.991	19.972	14.006	14.024
15	21.991	20.972	15.006	15.024
16	23.991	21.972	16.006	16.024
17	23.991	22.972	17.006	17.024
18	24.991	23.972	18.006	18.024
19	26.991	–	19.007	19.028
20	26.991(4) 27.991(4)	25.972	20.007	20.028
21	28.991	–	21.007	21.028
22	28.991(5) 29.991(5)	27.972	22.007	22.028
24	30.989(6) 31.989(6)	–	24.007	24.028
25	32.989	31.967	25.007	25.028
26	33.989	–	26.007	26.028
28	36.989	34.967	28.007	28.028
29	37.989	–	29.007	29.028
30	39.989	36.967	30.007	30.028
32	41.989	–	32.009	32.034
35	44.989	41.967	35.009	35.034
37	46.989	–	37.009	37.034
38	47.989	–	38.009	38.034
40	49.989	46.967	40.009	40.034
45	54.988	51.961	45.009	45.034
50	61.988	57.961	50.009	50.034
55	66.988	62.961	55.010	55.040
60	71.988	–	60.010	60.040
62	73.988	–	62.010	62.040
65	76.988	–	65.010	65.040
70	81.987	–	70.010	70.040

Notes(1) Also applicable to TAM and YT
(2) Also applicable to TLAM, YTL, TLA···UU
(3) The upper value is for TLA 1210Z model, and the lower value is for TLA 1212Z model.
(4) The lower value is for TA 202820Z model, and the upper value is for models other than TA 202820Z model.
(5) The lower value is for TA 223016Z and TA 223020Z models, and the upper value is for models other than those models.
(6) The lower value is for TA 243216Z and TA 243220Z models, and the upper value is for models other than those models.

Table 2.2 Measuring gauges for inch series bearings unit: mm

F_w Nominal roller set bore diameter	Ring gauge: BA···Z(1)	Ring gauge: BHA···Z(2)	Plug gauge: Go	Plug gauge: No-go
3.969	7.155	–	3.990	4.016
4.762	8.730	–	4.783	4.808
6.350	11.125	–	6.388	6.414
7.938	12.713	14.300	7.976	8.001
9.525	14.300	15.888	9.563	9.588
11.112	15.888	17.475	11.151	11.176
12.700	17.475	19.063	12.738	12.764
14.288	19.063	20.650	14.326	14.351
15.875	20.650	22.238	15.913	15.938
17.462	22.238	23.825	17.501	17.526
19.050	25.387	26.975	19.063	19.088
20.638	26.975	28.562	20.650	20.676
22.225	28.562	30.150	22.238	22.263
23.812	30.150	–	23.825	23.851
25.400	31.737	33.325	25.413	25.438
26.988	33.325	–	27.000	27.026
28.575	34.912	38.087	28.588	28.613
30.162	38.087	–	30.175	30.201
31.750	38.087	41.262	31.763	31.788
33.338	41.262	–	33.350	33.378
34.925	41.262	44.437	34.938	34.966
38.100	47.612	–	38.113	38.143
41.275	50.787	–	41.288	41.318
44.450	53.962	57.137	44.463	44.496
47.625	57.137	–	47.638	47.671
50.800	60.312	–	50.815	50.848
52.388	–	64.280	52.413	52.451
53.975	63.487	–	53.990	54.028
57.150	66.662	–	57.165	57.203
66.675	76.187	–	66.700	66.738
69.850	79.362	–	69.875	69.914

Notes(1) Also applicable to BAM and YB
(2) Also applicable to BHAM and YBH

Table 3 Tolerances of outer ring width C unit: mm

Series	Tolerance
Metric	0 ～ −0.20
Inch	0 ～ −0.25

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

Fit

As the outer ring is thin, the correct dimensions and accuracy of Shell Type Needle Roller Bearings are obtained only after they have been press-fitted into the housing bore. Bearing accuracy is directly affected by housing dimensions, shape and rigidity. This should be taken into account when considering fit and accuracy. The radial clearance after fitting the bearing to the shaft and the housing bore varies with their tolerances.

Table 4 shows the recommended fit for Shell Type Needle Roller Bearings.

Table 5 shows a calculation example of radial clearance after fitting. This calculation applies to bearings without inner ring to be fitted into rigid steel or cast iron housings. When the housing is made of light alloy or a thin steel pipe, it is necessary to check dimensions by actual measurement.

Generally, when making the radial clearance smaller, it is recommended that the shaft diameter be increased, without decreasing the housing bore diameter.

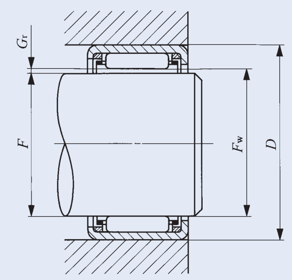
Table 4 Recommended fit

Type of bearing	Housing material	Tolerance class		
		Shaft (1)		Housing bore
		Without inner ring	With inner ring	
TA…Z, BA…Z, BHA…Z, TAM, BAM, BHAM, YT, YB, YBH	Steel Cast iron	h6	k5(j5)	J7
	Light alloy (Thin steel pipe)	h6	k5(j5)	M7(N7)
TLA…Z, TLAM, YTL, TLA…UU	Steel Cast iron	h6	k5(j5)	N7
	Light alloy (Thin steel pipe)	h6	k5(j5)	R7(S7)

Note(1) When housings are made of light alloy or a thin steel pipe, the roller set bore diameter is greatly affected by the housing thickness and shape. Therefore, before mass-production assembly, assembly tests should be carried out to confirm the amount of dimensional change and to determine the tolerance of the shaft which will give normal clearances.

Table 5 Calculation example of radial clearance after fitting

unit: mm



D : Housing bore diameter
F_w : Roller set bore diameter
F : Shaft diameter
G_r : Radial clearance

Calculation procedure	Example of TLA 2020 Z
❶ Dimension of roller set bore diameter of bearing after it has been press-fitted into the ring gauge. Dimension of ring gauge (D_0): See Tables 2.1 and 2.2 on page B4. Max. value of roller set bore dia. ($F_{w\,max}$): No-go dimension of plug gauge Min. value of roller set bore dia. ($F_{w\,min}$): Go dimension of plug gauge	From Table 2.1 on page B4 D_0 = 25.972 $F_{w\,max}$ = 20.028 $F_{w\,min}$ = 20.007
❷ Dimension of housing bore Max. value of housing bore (D_{max}): See the dimension table. Min. value of housing bore (D_{min}): See the dimension table.	From the dimension table on page B14, D_{max} = 25.993 D_{min} = 25.972
❸ Dimension of roller set bore diameter of bearing after it has been press-fitted into the housing bore Max. value of roller set bore dia.$(F_{we\,max})=(D_{max}-D_0)+F_{w\,max}$ Min. value of roller set bore dia.$(F_{we\,min})=(D_{min}-D_0)+F_{w\,min}$	From the equations, $F_{we\,max}$ = 20.049 $F_{we\,min}$ = 20.007
❹ Dimension of shaft Max. value of shaft dia. (F_{max}): See the dimension table. Min. value of shaft dia. (F_{min}): See the dimension table.	From the dimension table on page B14, F_{max} = 20.000 F_{min} = 19.987
❺ Radial clearance after mounting Max. value of radial clearance$(G_{r\,max})=F_{we\,max}-F_{min}$ Min. value of radial clearance$(G_{r\,min})=F_{we\,min}-F_{max}$	From the equations, $G_{r\,max}$ = 0.062 $G_{r\,min}$ = 0.007 The radial clearance after mounting becomes 0.007~0.062 mm.

Lubrication

Bearings with prepacked grease are shown in Table 6. ALVANIA GREASE S2 (SHELL) is prepacked as the lubricating grease.

In the case of bearings without prepacked grease, perform proper lubrication for use. If the bearings are operated without lubrication, the wear of the roller contact surfaces will increase and the bearing life will be shortened.

Table 6 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

Series		Caged			Full complement
	Bearing type	Standard	Closed end	With seals	Grease retained
Metric series	TLA, TLAM, YTL	×	×	○	○
	TA, TAM, YT	×	×	–	○
Inch series	BA, BAM, YB	×	×	–	○
	BHA, BHAM, YBH	×	×	–	○

Oil Hole

For Shell Type Needle Roller Bearings with an oil hole, "OH" is appended to the end of the identification number.

Example TA 2525 Z OH

The symbol "OH" is not marked on the bearing itself, but is shown on its packaging, etc. When bearings with multiple oil holes are required, please consult IKO.

Static Safety Factor

Since Shell Type Needle Roller Bearings employ an outer ring made from a thin steel plate which is drawn, carburized and quenched, excessively large loads must be avoided. The required static safety factor is usually more than 3.

Specifications of shaft and housing

Shell Type Needle Roller Bearings are commonly used without an inner ring. In such cases, the surface hardness of the raceway surface should be 58～64HRC and the surface roughness should not exceed 0.2 μmR_a. However, when the operating condition is not severe, a surface roughness 0.8 μmR_a or less can be used.

If the surface hardness is low, the load rating must be corrected by the hardness factor shown on page A20.

When the shaft cannot be heat treated and finished by grinding, the use of IKO Inner Rings for Shell Type Needle Roller Bearings (See page H1.) is recommended.

Mounting

Shell Type Needle Roller Bearings should be pressed into the housings gently using the appropriate tool as shown in Fig. 1, with their marked end surface up. As the outer ring is thin, it must never be struck directly with a hammer.

Since the outer rings of Shell Type Needle Roller Bearings are firmly fitted to housing bores with interference, it is unnecessary to fix them axially. Fig. 2 shows mounting examples.

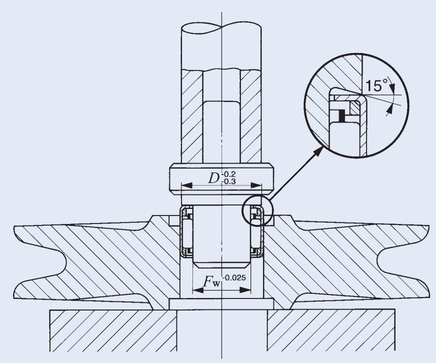


Fig.1 Example of mounting tool

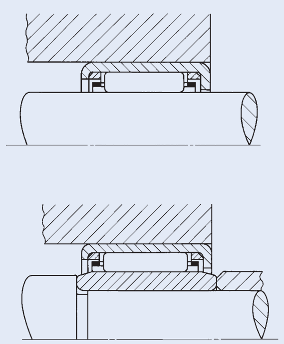
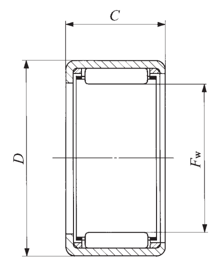
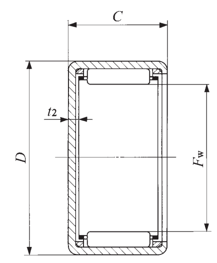


Fig.2 Mounting examples

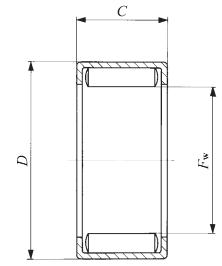
SHELL TYPE NEEDLE ROLLER BEARINGS



TA···Z TLA···Z



TAM TLAM



YT YTL

Shaft dia. 4 ─ 10 mm

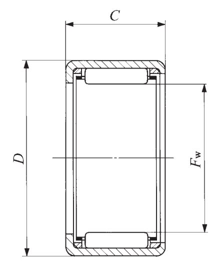
Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
4	—	—	—	—	TLA 48 Z	1.54	TLAM 48	1.67	—	—
	—	—	—	—	—	—	—	—	YTL 48	1.73
5	—	—	—	—	TLA 59 Z	1.9	TLAM 59	2	—	—
	—	—	—	—	—	—	—	—	YTL 59	2.4
6	—	—	—	—	TLA 69 Z	2.2	TLAM 69	2.3	—	—
7	—	—	—	—	TLA 79 Z	2.5	TLAM 79	2.7	—	—
8	—	—	—	—	TLA 810 Z	3.1	TLAM 810	3.3	—	—
	TA 810 Z	6.7	TAM 810	7.1	—	—	—	—	—	—
	TA 815 Z	9.7	TAM 815	10.1	—	—	—	—	—	—
	TA 820 Z	12.9	TAM 820	13.3	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YT 810	7.7
9	—	—	—	—	TLA 910 Z	3.4	TLAM 910	3.6	—	—
	—	—	—	—	TLA 912 Z	4	TLAM 912	4.3	—	—
	TA 912 Z	8.7	TAM 912	9.2	—	—	—	—	—	—
	TA 916 Z	11.4	TAM 916	11.9	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YT 912	10.1
10	—	—	—	—	TLA 1010 Z	3.7	TLAM 1010	4	—	—
	—	—	—	—	TLA 1012 Z	4.4	TLAM 1012	4.8	—	—
	—	—	—	—	TLA 1015 Z	5.5	TLAM 1015	5.9	—	—
	TA 1010 Z	7.9	TAM 1010	8.5	—	—	—	—	—	—
	TA 1012 Z	9.3	TAM 1012	10	—	—	—	—	—	—
	TA 1015 Z	11.5	TAM 1015	12.2	—	—	—	—	—	—
	TA 1020 Z	15.4	TAM 1020	16	—	—	—	—	—	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

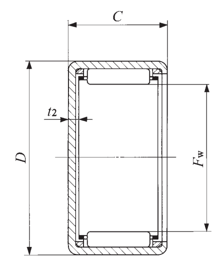
Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		N7		C	C_0		
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	rpm	
4	8	8	1	4.000	3.992	—	—	7.996	7.981	1 350	1 010	75 000	—
4	8	8	—							3 010	2 900	40 000	—
5	9	9	1	5.000	4.992	—	—	8.996	8.981	1 880	1 600	65 000	—
5	9	9	—							4 320	4 750	30 000	—
6	10	9	1	6.000	5.992	—	—	9.996	9.981	2 100	1 900	55 000	—
7	11	9	1	7.000	6.991	—	—	10.995	10.977	2 490	2 450	50 000	—
8	12	10	1	8.000	7.991	—	—	11.995	11.977	3 320	3 670	45 000	—
8	15	10	1.3	8.000	7.991	15.010	14.992	—	—	3 470	2 880	45 000	—
8	15	15	1.3							5 780	5 570	45 000	—
8	15	20	1.3							8 340	8 920	45 000	—
8	15	10	—							7 530	7 950	19 000	—
9	13	10	1	9.000	8.991	—	—	12.995	12.977	3 500	4 040	45 000	—
9	13	12	1							4 460	5 510	45 000	—
9	16	12	1.3	9.000	8.991	16.010	15.992	—	—	5 140	4 880	45 000	—
9	16	16	1.3							6 960	7 210	45 000	—
9	16	12	—							9 690	11 200	17 000	—
10	14	10	1	10.000	9.991	—	—	13.995	13.977	3 870	4 740	40 000	IRT 710
10	14	12	1							4 920	6 460	40 000	IRT 712
10	14	15	1							6 390	9 040	40 000	IRT 715
10	17	10	1.3	10.000	9.991	17.010	16.992	—	—	4 150	3 780	40 000	IRT 710
10	17	12	1.3							5 590	5 540	40 000	IRT 712
10	17	15	1.3							6 920	7 300	40 000	IRT 715
10	17	20	1.3							9 990	11 700	40 000	—

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

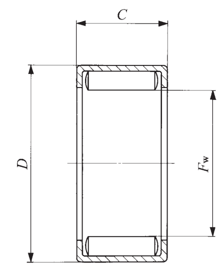
SHELL TYPE NEEDLE ROLLER BEARINGS



TA⋯Z　TLA⋯Z



TAM　TLAM



YT　YTL

Shaft dia. 12 — 15 mm

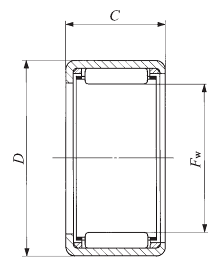
Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	h6 Min.	Housing bore dia. J7 Max.	J7 Min.	N7 Max.	N7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
12	—	—	—	—	TLA 1210 Z	4.3	TLAM 1210	4.7	—	—	12	16	10	1	12.000	11.989	—	—	15.995	15.977	4 350	5 810	35 000	IRT 810
	—	—	—	—	—	—	—	—	YTL 1210	5.1	12	16	10	—							7 470	11 800	13 000	IRT 810
	—	—	—	—	TLA 1212 Z	8.6	TLAM 1212	9.4	—	—	12	18	12	1.3	12.000	11.989	—	—	17.995	17.977	6 420	7 490	35 000	IRT 812
	TA 1212 Z	10.5	TAM 1212	11.5	—	—	—	—	—	—	12	19	12	1.3	12.000	11.989	19.012	18.991	—	—	6 000	6 310	35 000	IRT 812
	TA 1215 Z	13.1	TAM 1215	14	—	—	—	—	—	—	12	19	15	1.3							7 440	8 320	35 000	IRT 815
	TA 1220 Z	17.3	TAM 1220	18.3	—	—	—	—	—	—	12	19	20	1.3							10 700	13 300	35 000	—
	TA 1225 Z	21.5	TAM 1225	22.5	—	—	—	—	—	—	12	19	25	1.3							13 800	18 300	35 000	—
	—	—	—	—	—	—	—	—	YT 1212	12.8	12	19	12	—							11 800	15 200	13 000	IRT 812
13	—	—	—	—	TLA 1312 Z	9.2	TLAM 1312	10.1	—	—	13	19	12	1.3	13.000	12.989	—	—	18.993	18.972	6 760	8 170	30 000	IRT 1012
14	—	—	—	—	TLA 1412 Z	9.8	TLAM 1412	10.8	—	—	14	20	12	1.3	14.000	13.989	—	—	19.993	19.972	7 080	8 840	30 000	IRT 1012-2
	—	—	—	—	TLA 1416 Z	13.2	TLAM 1416	14.3	—	—	14	20	16	1.3							8 950	12 000	30 000	IRT 1016-2
	TA 1416 Z	18.4	TAM 1416	19.6	—	—	—	—	—	—	14	22	16	1.3	14.000	13.989	22.012	21.991	—	—	10 500	12 000	30 000	IRT 1016-2
	TA 1420 Z	23	TAM 1420	24	—	—	—	—	—	—	14	22	20	1.3							13 900	17 200	30 000	IRT 1020-2
15	—	—	—	—	TLA 1512 Z	10.4	TLAM 1512	11.5	—	—	15	21	12	1.3	15.000	14.989	—	—	20.993	20.972	7 380	9 520	25 000	IRT 1212
	—	—	—	—	TLA 1516 Z	14	TLAM 1516	15.2	—	—	15	21	16	1.3							9 330	12 900	25 000	IRT 1216
	—	—	—	—	TLA 1522 Z	19.1	TLAM 1522	20.5	—	—	15	21	22	1.3							13 600	20 900	25 000	IRT 1222
	TA 1510 Z	10.8	TAM 1510	12.3	—	—	—	—	—	—	15	22	10	1.3	15.000	14.989	22.012	21.991	—	—	5 290	5 680	25 000	IRT 1010-1
	TA 1512 Z	12.9	TAM 1512	14.3	—	—	—	—	—	—	15	22	12	1.3							7 120	8 310	25 000	IRT 1012-1
	TA 1515 Z	15.9	TAM 1515	17.3	—	—	—	—	—	—	15	22	15	1.3							8 830	11 000	25 000	IRT 1015-1
	TA 1520 Z	21	TAM 1520	22.5	—	—	—	—	—	—	15	22	20	1.3							12 700	17 600	25 000	IRT 1020-1
	TA 1525 Z	25	TAM 1525	26.5	—	—	—	—	—	—	15	22	25	1.3							16 300	24 200	25 000	IRT 1025-1

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

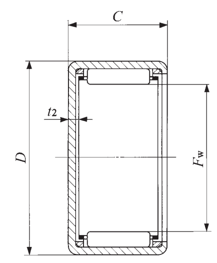
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

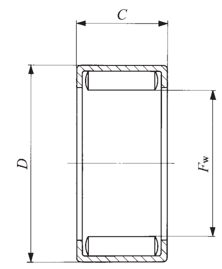
SHELL TYPE NEEDLE ROLLER BEARINGS



TA···Z TLA···Z



TAM TLAM



YT

Shaft dia. 16 — 19mm

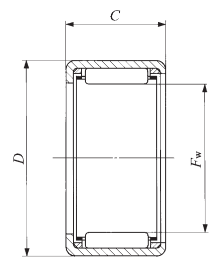
Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
16	—	—	—	—	**TLA 1612 Z**	10.9	**TLAM 1612**	12.2	—	—
	—	—	—	—	**TLA 1616 Z**	14.8	**TLAM 1616**	16.1	—	—
	—	—	—	—	**TLA 1622 Z**	20	**TLAM 1622**	21.5	—	—
	TA 1616 Z	20	**TAM 1616**	22	—	—	—	—	—	—
	TA 1620 Z	25	**TAM 1620**	27	—	—	—	—	—	—
17	—	—	—	—	**TLA 1712 Z**	11.5	**TLAM 1712**	13	—	—
	TA 1715 Z	17.6	**TAM 1715**	19.5	—	—	—	—	—	—
	TA 1720 Z	23.5	**TAM 1720**	25	—	—	—	—	—	—
	TA 1725 Z	29	**TAM 1725**	31	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 1715**	20.5
	—	—	—	—	—	—	—	—	**YT 1725**	35.5
18	—	—	—	—	**TLA 1812 Z**	12	**TLAM 1812**	13.7	—	—
	—	—	—	—	**TLA 1816 Z**	16.2	**TLAM 1816**	17.9	—	—
	TA 1813 Z	16.4	**TAM 1813**	18.5	—	—	—	—	—	—
	TA 1815 Z	18.5	**TAM 1815**	20.5	—	—	—	—	—	—
	TA 1817 Z	21	**TAM 1817**	23	—	—	—	—	—	—
	TA 1819 Z	23.5	**TAM 1819**	25.5	—	—	—	—	—	—
	TA 1820 Z	24.5	**TAM 1820**	26.5	—	—	—	—	—	—
	TA 1825 Z	30.5	**TAM 1825**	32.5	—	—	—	—	—	—
19	**TA 1916 Z**	23	**TAM 1916**	25.5	—	—	—	—	—	—
	TA 1920 Z	29	**TAM 1920**	31	—	—	—	—	—	—

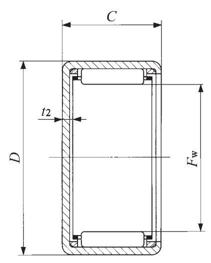
Boundary dimensions mm				Standard mounting dimensions mm: Shaft dia. h6		Housing bore dia. J7		Housing bore dia. N7		Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(1)	Assembled inner ring
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	rpm	
16	22	12	1.3	16.000	15.989	—	—	21.993	21.972	7 670	10 200	25 000	**IRT 1212-1**
16	22	16	1.3							9 700	13 800	25 000	**IRT 1216-1**
16	22	22	1.3							14 200	22 400	25 000	**IRT 1222-1**
16	24	16	1.3	16.000	15.989	24.012	23.991	—	—	11 100	13 300	25 000	**IRT 1216-1**
16	24	20	1.3							14 700	19 100	25 000	**IRT 1220-1**
17	23	12	1.3	17.000	16.989	—	—	22.993	22.972	7 960	10 900	25 000	—
17	24	15	1.3	17.000	16.989	24.012	23.991	—	—	9 660	12 700	25 000	**IRT 1215-2**
17	24	20	1.3							13 900	20 400	25 000	**IRT 1220-2**
17	24	25	1.3							17 900	28 100	25 000	**IRT 1225-2**
17	24	15	—							16 600	26 000	9 000	**IRT 1215-2**
17	24	25	—							27 200	49 000	9 000	**IRT 1225-2**
18	24	12	1.3	18.000	17.989	—	—	23.993	23.972	8 230	11 500	20 000	**IRT 1512**
18	24	16	1.3							10 400	15 600	20 000	**IRT 1516**
18	25	13	1.3	18.000	17.989	25.012	24.991	—	—	9 100	12 000	20 000	**IRT 1513**
18	25	15	1.3							10 100	13 600	20 000	**IRT 1515**
18	25	17	1.3							11 900	16 900	20 000	**IRT 1517**
18	25	19	1.3							13 700	20 200	20 000	**IRT 1519**
18	25	20	1.3							14 500	21 800	20 000	**IRT 1520**
18	25	25	1.3							18 600	30 000	20 000	**IRT 1525**
19	27	16	1.3	19.000	18.987	27.012	26.991	—	—	12 200	15 700	20 000	**IRT 1516-1**
19	27	20	1.3							16 100	22 600	20 000	**IRT 1520-1**

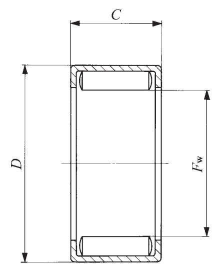
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

SHELL TYPE NEEDLE ROLLER BEARINGS


TA…Z TLA…Z


TAM TLAM


YT

Shaft dia. 20 — 21mm

Shaft dia. mm	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
20	—	—	—	—	**TLA 2012 Z**	13.2	**TLAM 2012**	15.2	—	—
	—	—	—	—	**TLA 2016 Z**	17.8	**TLAM 2016**	19.9	—	—
	—	—	—	—	**TLA 2020 Z**	22	**TLAM 2020**	24	—	—
	—	—	—	—	**TLA 2030 Z**	33	**TLAM 2030**	35	—	—
	TA 2015 Z	20	**TAM 2015**	22.5	—	—	—	—	—	—
	TA 2020 Z	26.5	**TAM 2020**	29	—	—	—	—	—	—
	TA 2025 Z	33	**TAM 2025**	35.5	—	—	—	—	—	—
	TA 2030 Z	39.5	**TAM 2030**	42	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2015**	23.5
	—	—	—	—	—	—	—	—	**YT 2025**	41
	TA 202820 Z	30	**TAM 202820**	32.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 202820**	37.5
21	**TA 2116 Z**	25	**TAM 2116**	28	—	—	—	—	—	—
	TA 2120 Z	31.5	**TAM 2120**	34.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2116**	31
	—	—	—	—	—	—	—	—	**YT 2120**	39

Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		N7					
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	rpm	
20	26	12	1.3	20.000	19.987	—	—	25.993	25.972	8 740	12 900	20 000	—
20	26	16	1.3							11 100	17 500	20 000	**IRT 1716**
20	26	20	1.3							14 500	24 700	20 000	**IRT 1720**
20	26	30	1.3							22 300	42 900	20 000	**IRT 1730**
20	27	15	1.3	20.000	19.987	27.012	26.991	—	—	10 400	14 600	20 000	**IRT 1515-2**
20	27	20	1.3							15 000	23 400	20 000	**IRT 1520-2**
20	27	25	1.3							19 200	32 200	20 000	**IRT 1525-2**
20	27	30	1.3							23 100	41 000	20 000	**IRT 1530-2**
20	27	15	—							18 400	30 900	7 500	**IRT 1515-2**
20	27	25	—							30 000	58 300	7 500	**IRT 1525-2**
20	28	20	1.3	20.000	19.987	28.012	27.991	—	—	16 900	24 300	20 000	**IRT 1520-2**
20	28	20	—							26 800	44 600	7 500	**IRT 1520-2**
21	29	16	1.3	21.000	20.987	29.012	28.991	—	—	13 300	18 100	19 000	**IRT 1716-1**
21	29	20	1.3							17 600	25 900	19 000	**IRT 1720-1**
21	29	16	—							22 100	35 200	7 000	**IRT 1716-1**
21	29	20	—							27 500	46 800	7 000	**IRT 1720-1**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

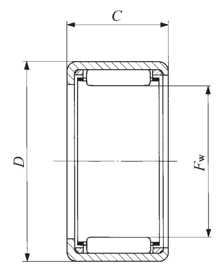
SHELL TYPE NEEDLE ROLLER BEARINGS



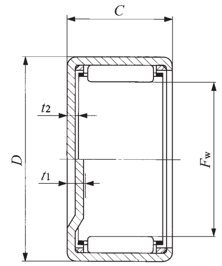
Shaft dia. 22 ─ 24mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
22	—	—	—	—	**TLA 2212 Z**	15.6	**TLAM 2212**	18.1	—	—
	—	—	—	—	**TLA 2216 Z**	21.5	**TLAM 2216**	24	—	—
	—	—	—	—	**TLA 2220 Z**	26.5	**TLAM 2220**	29	—	—
	TA 2210 Z	15	**TAM 2210**	18.1	—	—	—	—	—	—
	TA 2215 Z	21.5	**TAM 2215**	24.5	—	—	—	—	—	—
	TA 2220 Z	29	**TAM 2220**	32	—	—	—	—	—	—
	TA 2225 Z	35.5	**TAM 2225**	38.5	—	—	—	—	—	—
	TA 2230 Z	42.5	**TAM 2230**	45.5	—	—	—	—	—	—
	TA 223016 Z	26	**TAM 223016**	29	—	—	—	—	—	—
	TA 223020 Z	32.5	**TAM 223020**	35.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 223016**	32
	—	—	—	—	—	—	—	—	**YT 223020**	40.5
24	**TA 2420 Z**	31	**TAM 2420**	35	—	—	—	—	—	—
	TA 2428 Z	43.5	**TAM 2428**	47	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2428**	54
	TA 243216 Z	28	**TAM 243216**	32	—	—	—	—	—	—
	TA 243220 Z	35.5	**TAM 243220**	39	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 243216**	34.5
	—	—	—	—	—	—	—	—	**YT 243220**	43.5

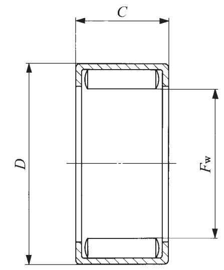
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.



TA···Z TLA···Z



TAM TLAM
t_1 ($F_w \geqq 24$)
t_2 ($F_w \leqq 22$)

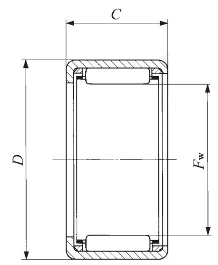


YT

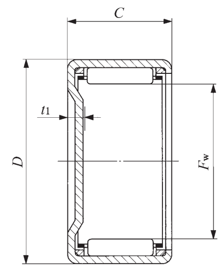
Boundary dimensions mm: F_w	D	C	t_1, t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	h6 Min.	Housing bore dia. J7 Max.	J7 Min.	N7 Max.	N7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
22	28	12	1.3							9 230	14 300	18 000	—
22	28	16	1.3	22.000	21.987	—	—	27.993	27.972	11 700	19 300	18 000	**IRT 1716-2**
22	28	20	1.3							15 300	27 300	18 000	**IRT 1720-2**
22	29	10	1.3							6 650	8 500	18 000	**IRT 1710-2**
22	29	15	1.3							11 100	16 400	18 000	**IRT 1715-2**
22	29	20	1.3	22.000	21.987	29.012	28.991	—	—	16 000	26 300	18 000	**IRT 1720-2**
22	29	25	1.3							19 700	34 300	18 000	**IRT 1725-2**
22	29	30	1.3							23 800	43 700	18 000	**IRT 1730-2**
22	30	16	1.3							13 200	18 200	18 000	**IRT 1716-2**
22	30	20	1.3	22.000	21.987	30.012	29.991	—	—	17 500	26 100	18 000	**IRT 1720-2**
22	30	16	—							22 600	36 800	7 000	**IRT 1716-2**
22	30	20	—							28 200	48 900	7 000	**IRT 1720-2**
24	31	20	3.4							17 000	29 200	16 000	**IRT 2020**
24	31	28	3.4	24.000	23.987	31.014	30.989	—	—	24 500	46 700	16 000	**IRT 2028**
24	31	28	—							36 800	79 900	6 500	**IRT 2028**
24	32	16	3.4							14 200	20 500	16 000	**IRT 2016**
24	32	20	3.4	24.000	23.987	32.014	31.989	—	—	18 800	29 400	16 000	**IRT 2020**
24	32	16	—							23 700	40 100	6 500	**IRT 2016**
24	32	20	—							29 500	53 200	6 500	**IRT 2020**

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

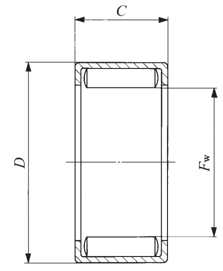
SHELL TYPE NEEDLE ROLLER BEARINGS



TA⋯Z TLA⋯Z



TAM TLAM



YT YTL

Shaft dia. 25 — 28 mm

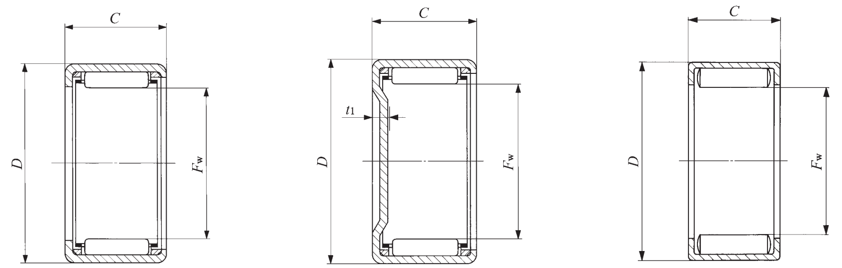
Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
25	—	—	—	—	**TLA 2512 Z**	19.7	**TLAM 2512**	23.5	—	—
	—	—	—	—	**TLA 2516 Z**	26	**TLAM 2516**	29.5	—	—
	—	—	—	—	**TLA 2520 Z**	32	**TLAM 2520**	36	—	—
	—	—	—	—	**TLA 2526 Z**	41.5	**TLAM 2526**	45.5	—	—
	—	—	—	—	**TLAW2538Z**	58.5	**TLAMW2538**	62	—	—
	—	—	—	—	—	—	—	—	**YTL 2526**	51.5
	TA 2510 Z	19.1	**TAM 2510**	23	—	—	—	—	—	—
	TA 2515 Z	28.5	**TAM 2515**	32.5	—	—	—	—	—	—
	TA 2520 Z	36.5	**TAM 2520**	40.5	—	—	—	—	—	—
	TA 2525 Z	45.5	**TAM 2525**	49	—	—	—	—	—	—
	TA 2530 Z	54.5	**TAM 2530**	58.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2510**	22.5
	—	—	—	—	—	—	—	—	**YT 2515**	33
	—	—	—	—	—	—	—	—	**YT 2520**	45
	—	—	—	—	—	—	—	—	**YT 2525**	57
26	**TA 2616 Z**	30.5	**TAM 2616**	34.5	—	—	—	—	—	—
	TA 2620 Z	38	**TAM 2620**	42.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2616**	37
	—	—	—	—	—	—	—	—	**YT 2620**	46.5
28	—	—	—	—	**TLA 2816 Z**	28.5	**TLAM 2816**	33.5	—	—
	—	—	—	—	**TLA 2820 Z**	35.5	**TLAM 2820**	40.5	—	—
	TA 2820 Z	45	**TAM 2820**	50	—	—	—	—	—	—
	TA 2830 Z	67.5	**TAM 2830**	72.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2820**	56.5

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.
2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		Housing bore dia. N7		C	C_0		
F_w	D	C	t_1 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	rpm	
25	32	12	2.8	25.000	24.987	—	—	31.992	31.967	9 440	13 900	15 000	—
25	32	16	2.8							12 800	20 500	15 000	—
25	32	20	2.8							16 900	29 300	15 000	**IRT 2020-1**
25	32	26	2.8							22 600	42 500	15 000	**IRT 2026-1**
25	32	38	2.8							28 900	58 500	15 000	**IRT 2038-1**
25	32	26	—							35 000	75 800	6 000	**IRT 2026-1**
25	33	10	3.4	25.000	24.987	33.014	32.989	—	—	7 990	9 900	15 000	**IRT 2010-1**
25	33	15	3.4							13 400	19 300	15 000	**IRT 2015-1**
25	33	20	3.4							19 500	31 100	15 000	**IRT 2020-1**
25	33	25	3.4							24 100	40 800	15 000	**IRT 2025-1**
25	33	30	3.4							29 100	52 000	15 000	**IRT 2030-1**
25	33	10	—	25.000	24.987	33.014	32.989	—	—	15 500	23 600	6 000	**IRT 2010-1**
25	33	15	—							22 700	38 300	6 000	**IRT 2015-1**
25	33	20	—							30 200	55 400	6 000	**IRT 2020-1**
25	33	25	—							37 200	72 500	6 000	**IRT 2025-1**
26	34	16	3.4	26.000	25.987	34.014	33.989	—	—	15 200	22 900	15 000	**IRT 2216**
26	34	20	3.4							20 100	32 800	15 000	**IRT 2220**
26	34	16	—							24 700	43 300	6 000	**IRT 2216**
26	34	20	—							30 800	57 500	6 000	**IRT 2220**
28	35	16	2.8	28.000	27.987	—	—	34.992	34.967	13 800	23 500	13 000	—
28	35	20	2.8							18 300	33 600	13 000	**IRT 2220-1**
28	37	20	3.4	28.000	27.987	37.014	36.989	—	—	21 200	32 300	13 000	**IRT 2220-1**
28	37	30	3.4							33 000	56 900	13 000	**IRT 2230-1**
28	37	20	—							34 700	61 700	5 500	**IRT 2220-1**

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

SHELL TYPE NEEDLE ROLLER BEARINGS



TA…Z TLA…Z TAM TLAM YT

Shaft dia. 29 — 35mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
	TA 2920 Z	47	**TAM 2920**	52	—	—	—	—	—	—
29	**TA 2930 Z**	70	**TAM 2930**	75.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2920**	58.5
	—	—	—	—	**TLA 3012 Z**	23.5	**TLAM 3012**	29	—	—
	—	—	—	—	**TLA 3016 Z**	30.5	**TLAM 3016**	36	—	—
	—	—	—	—	**TLA 3018 Z**	34.5	**TLAM 3018**	40	—	—
	—	—	—	—	**TLA 3020 Z**	38	**TLAM 3020**	43.5	—	—
	—	—	—	—	**TLA 3026 Z**	49	**TLAM 3026**	54.5	—	—
30	—	—	—	—	**TLAW3038 Z**	69	**TLAMW3038**	74.5	—	—
	TA 3013 Z	36.5	**TAM 3013**	42.5	—	—	—	—	—	—
	TA 3015 Z	42	**TAM 3015**	47.5	—	—	—	—	—	—
	TA 3020 Z	54.5	**TAM 3020**	60	—	—	—	—	—	—
	TA 3025 Z	68	**TAM 3025**	73.5	—	—	—	—	—	—
	TA 3030 Z	80	**TAM 3030**	85.5	—	—	—	—	—	—
	TA 3220 Z	57.5	**TAM 3220**	63.5	—	—	—	—	—	—
32	**TA 3230 Z**	86	**TAM 3230**	97.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 3220**	71.5
	—	—	—	—	**TLA 3512 Z**	27	**TLAM 3512**	34.5	—	—
	—	—	—	—	**TLA 3516 Z**	35	**TLAM 3516**	42.5	—	—
	—	—	—	—	**TLA 3520 Z**	43.5	**TLAM 3520**	51	—	—
35	**TA 3512 Z**	38.5	**TAM 3512**	46	—	—	—	—	—	—
	TA 3515 Z	48	**TAM 3515**	56	—	—	—	—	—	—
	TA 3520 Z	62.5	**TAM 3520**	70	—	—	—	—	—	—
	TA 3525 Z	78	**TAM 3525**	85.5	—	—	—	—	—	—
	TA 3530 Z	97	**TAM 3530**	105	—	—	—	—	—	—

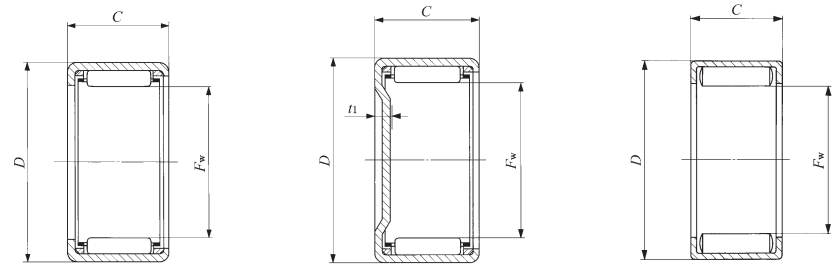
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.
2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	J7 Min.	N7 Max.	N7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
29	38	20	3.4							22 000	34 200	13 000	**IRT 2520**
29	38	30	3.4	29.000	28.987	38.014	37.989	—	—	34 200	60 300	13 000	**IRT 2530**
29	38	20	—							35 500	64 100	5 000	**IRT 2520**
30	37	12	2.8							10 400	16 600	12 000	—
30	37	16	2.8							14 100	24 500	12 000	—
30	37	18	2.8	30.000	29.987	—	—	36.992	36.967	16 400	29 800	12 000	—
30	37	20	2.8							18 600	35 100	12 000	**IRT 2520-1**
30	37	26	2.8							24 800	50 900	12 000	**IRT 2526-1**
30	37	38	2.8							31 900	70 200	12 000	**IRT 2538-1**
30	40	13	3.4							13 500	16 800	12 000	—
30	40	15	3.4							16 800	22 400	12 000	**IRT 2515-1**
30	40	20	3.4	30.000	29.987	40.014	39.989	—	—	24 500	36 300	12 000	**IRT 2520-1**
30	40	25	3.4							31 600	50 300	12 000	**IRT 2525-1**
30	40	30	3.4							36 700	60 700	12 000	**IRT 2530-1**
32	42	20	3.4							25 400	38 600	11 000	**IRT 2820**
32	42	30	3.4	32.000	31.984	42.014	41.989	—	—	39 500	68 400	11 000	**IRT 2830**
32	42	20	—							39 900	70 100	4 500	**IRT 2820**
35	42	12	2.8							11 600	20 000	10 000	**IRT 3012**
35	42	16	2.8	35.000	34.984	—	—	41.992	41.967	15 700	29 600	10 000	—
35	42	20	2.8							20 700	42 300	10 000	**IRT 3020**
35	45	12	3.4							14 800	19 900	10 000	**IRT 3012**
35	45	15	3.4							18 500	26 500	10 000	**IRT 3015**
35	45	20	3.4	35.000	34.984	45.014	44.989	—	—	27 000	43 100	10 000	**IRT 3020**
35	45	25	3.4							34 800	59 700	10 000	**IRT 3025**
35	45	30	3.4							40 600	72 600	10 000	**IRT 3030**

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

SHELL TYPE NEEDLE ROLLER BEARINGS

IKO



TA…Z TLA…Z　　TAM TLAM　　YT

Shaft dia. 37 — 45mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
37	**TA 3720 Z**	64.5	**TAM 3720**	73	—	—	—	—	—	—
	TA 3730 Z	101	**TAM 3730**	110	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 3720**	81
38	**TA 3815 Z**	51	**TAM 3815**	60	—	—	—	—	—	—
	TA 3820 Z	65.5	**TAM 3820**	74.5	—	—	—	—	—	—
	TA 3825 Z	82.5	**TAM 3825**	96	—	—	—	—	—	—
	TA 3830 Z	104	**TAM 3830**	114	—	—	—	—	—	—
	TAW 3845 Z	149	**TAMW 3845**	159	—	—	—	—	—	—
40	—	—	—	—	**TLA 4012 Z**	30	**TLAM 4012**	40	—	—
	—	—	—	—	**TLA 4016 Z**	39	**TLAM 4016**	49	—	—
	—	—	—	—	**TLA 4020 Z**	49	**TLAM 4020**	58.5	—	—
	TA 4015 Z	54	**TAM 4015**	63.5	—	—	—	—	—	—
	TA 4020 Z	69.5	**TAM 4020**	79	—	—	—	—	—	—
	TA 4025 Z	86.5	**TAM 4025**	102	—	—	—	—	—	—
	TA 4030 Z	110	**TAM 4030**	120	—	—	—	—	—	—
	TA 4040 Z	144	**TAM 4040**	154	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 4015**	63.5
	—	—	—	—	—	—	—	—	**YT 4025**	109
45	—	—	—	—	**TLA 4516 Z**	43.5	**TLAM 4516**	56	—	—
	—	—	—	—	**TLA 4520 Z**	54.5	**TLAM 4520**	67	—	—
	TA 4520 Z	77	**TAM 4520**	90	—	—	—	—	—	—
	TA 4525 Z	102	**TAM 4525**	115	—	—	—	—	—	—
	TA 4530 Z	122	**TAM 4530**	135	—	—	—	—	—	—
	TA 4540 Z	161	**TAM 4540**	174	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 4520**	96
	—	—	—	—	—	—	—	—	**YT 4525**	122

Boundary dimensions mm F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	J7 Min.	N7 Max.	N7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
37	47	20	3.4	37.000	36.984	47.014	46.989	—	—	27 800	45 400	9 500	**IRT 3220**
37	47	30	3.4							41 800	76 700	9 500	**IRT 3230**
37	47	20	—							43 300	81 300	4 000	**IRT 3220**
38	48	15	3.4	38.000	37.984	48.014	47.989	—	—	19 000	28 000	9 000	**IRT 3215-1**
38	48	20	3.4							27 700	45 600	9 000	**IRT 3220-1**
38	48	25	3.4							35 600	63 100	9 000	**IRT 3225-1**
38	48	30	3.4							43 100	80 600	9 000	**IRT 3230-1**
38	48	45	3.4							55 700	112 000	9 000	**IRT 3245-1**
40	47	12	2.8	40.000	39.984	—	—	46.992	46.967	12 400	22 800	8 500	—
40	47	16	2.8							16 700	33 700	8 500	—
40	47	20	2.8							22 100	48 200	8 500	**IRT 3520**
40	50	15	3.4	40.000	39.984	50.014	49.989	—	—	19 500	29 400	8 500	**IRT 3515**
40	50	20	3.4							28 400	47 800	8 500	**IRT 3520**
40	50	25	3.4							36 600	66 200	8 500	**IRT 3525**
40	50	30	3.4							44 300	84 600	8 500	**IRT 3530**
40	50	40	3.4							56 700	116 000	8 500	**IRT 3540**
40	50	15	—							33 400	59 800	4 000	**IRT 3515**
40	50	25	—							55 300	114 000	4 000	**IRT 3525**
45	52	16	2.8	45.000	44.984	—	—	51.991	51.961	17 800	37 800	7 500	—
45	52	20	2.8							23 400	54 000	7 500	**IRT 4020**
45	55	20	3.4	45.000	44.984	55.018	54.988	—	—	30 600	54 600	7 500	**IRT 4020**
45	55	25	3.4							39 400	75 600	7 500	**IRT 4025**
45	55	30	3.4							47 700	96 600	7 500	**IRT 4030**
45	55	40	3.4							61 300	133 000	7 500	**IRT 4040**
45	55	20	—							47 800	98 200	3 500	**IRT 4020**
45	55	25	—							59 100	129 000	3 500	**IRT 4025**

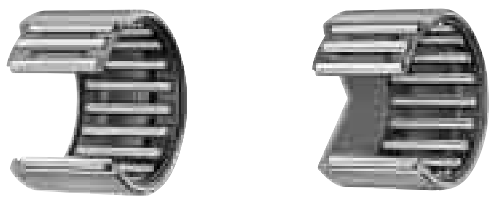
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

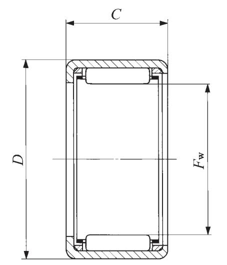
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.

2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

SHELL TYPE NEEDLE ROLLER BEARINGS





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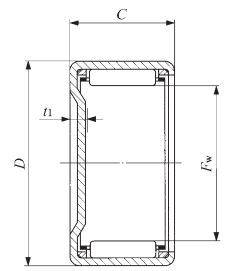


TAM TLAM

Shaft dia. 50 — 62mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
50	—	—	—	—	TLA 5020 Z	69	TLAM 5020	84.5	—	—
	—	—	—	—	TLA 5025 Z	86	TLAM 5025	107	—	—
	TA 5012 Z	62.5	TAM 5012	78	—	—	—	—	—	—
	TA 5015 Z	78	TAM 5015	98.5	—	—	—	—	—	—
	TA 5020 Z	107	TAM 5020	123	—	—	—	—	—	—
	TA 5025 Z	134	TAM 5025	150	—	—	—	—	—	—
	TA 5030 Z	161	TAM 5030	178	—	—	—	—	—	—
	TA 5040 Z	210	TAM 5040	230	—	—	—	—	—	—
	TAW 5045 Z	230	TAMW 5045	245	—	—	—	—	—	—
55	—	—	—	—	TLA 5520 Z	75	TLAM 5520	98.5	—	—
	—	—	—	—	TLA 5525 Z	98.5	TLAM 5525	118	—	—
	TA 5520 Z	116	TAM 5520	136	—	—	—	—	—	—
	TA 5525 Z	145	TAM 5525	165	—	—	—	—	—	—
	TA 5530 Z	175	TAM 5530	195	—	—	—	—	—	—
	TA 5540 Z	230	TAM 5540	250	—	—	—	—	—	—
	TAW 5545 Z	250	TAMW 5545	270	—	—	—	—	—	—
	TAW 5550 Z	280	TAMW 5550	300	—	—	—	—	—	—
60	TA 6025 Z	158	TAM 6025	182	—	—	—	—	—	—
	TA 6030 Z	191	TAM 6030	215	—	—	—	—	—	—
	TA 6040 Z	250	TAM 6040	275	—	—	—	—	—	—
	TAW 6045 Z	270	TAMW 6045	295	—	—	—	—	—	—
	TAW 6050 Z	305	TAMW 6050	330	—	—	—	—	—	—
62	TA 6212 Z	78	TAM 6212	107	—	—	—	—	—	—

Note([1]) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

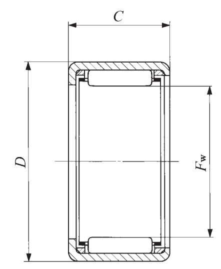
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.

2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm: F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	J7 Min.	N7 Max.	N7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed([1]) rpm	Assembled inner ring
50	58	20	2.8	50.000	49.984	—	—	57.991	57.961	28 800	64 100	6 500	IRT 4520
50	58	25	2.8							36 900	88 400	6 500	IRT 4525
50	62	12	3.4	50.000	49.984	62.018	61.988	—	—	17 700	24 000	6 500	IRT 4512
50	62	15	3.4							25 800	39 000	6 500	IRT 4515
50	62	20	3.4							38 000	64 000	6 500	IRT 4520
50	62	25	3.4							49 100	89 000	6 500	IRT 4525
50	62	30	3.4							59 500	114 000	6 500	IRT 4530
50	62	40	3.4							76 500	157 000	6 500	IRT 4540
50	62	45	3.4							76 700	158 000	6 500	IRT 4545
55	63	20	2.8	55.000	54.981	—	—	62.991	62.961	29 800	69 400	5 500	IRT 5020-1
55	63	25	2.8							38 300	95 700	5 500	IRT 5025-1
55	67	20	3.4	55.000	54.981	67.018	66.988	—	—	39 600	69 700	5 500	IRT 5020-1
55	67	25	3.4							51 200	97 000	5 500	IRT 5025-1
55	67	30	3.4							62 000	124 000	5 500	IRT 5030-1
55	67	40	3.4							80 000	172 000	5 500	IRT 5040-1
55	67	45	3.4							79 900	172 000	5 500	IRT 5045-1
55	67	50	3.4							91 500	205 000	5 500	IRT 5050-1
60	72	25	3.4	60.000	59.981	72.018	71.988	—	—	54 700	108 000	5 000	IRT 5025
60	72	30	3.4							66 300	139 000	5 000	IRT 5030
60	72	40	3.4							85 700	193 000	5 000	IRT 5040
60	72	45	3.4							85 400	193 000	5 000	IRT 5045
60	72	50	3.4							97 800	229 000	5 000	IRT 5050
62	74	12	3.4	62.000	61.981	74.018	73.988	—	—	20 100	30 300	4 500	IRT 5212

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

SHELL TYPE NEEDLE ROLLER BEARINGS



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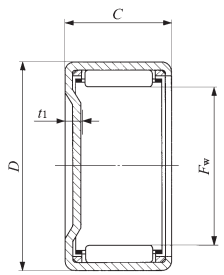


TAM

Shaft dia. 65 — 70mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
65	TA 6525 Z	169	TAM 6525	197	—	—	—	—	—	—
	TA 6530 Z	205	TAM 6530	230	—	—	—	—	—	—
	TAW 6545 Z	290	TAMW 6545	315	—	—	—	—	—	—
	TAW 6550 Z	330	TAMW 6550	355	—	—	—	—	—	—
70	TA 7025 Z	181	TAM 7025	215	—	—	—	—	—	—
	TA 7030 Z	220	TAM 7030	250	—	—	—	—	—	—
	TA 7040 Z	290	TAM 7040	320	—	—	—	—	—	—
	TAW 7050 Z	350	TAMW 7050	380	—	—	—	—	—	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.
2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

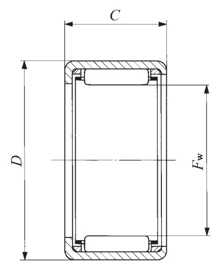
Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		N7		C	C_0		
F_w	D	C	t_1 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	rpm	
65	77	25	3.4	65.000	64.981	77.018	76.988	—	—	56 500	116 000	4 000	IRT 5525
65	77	30	3.4							68 500	149 000	4 000	IRT 5530
65	77	45	3.4							88 300	207 000	4 000	IRT 5545
65	77	50	3.4							101 000	246 000	4 000	IRT 5550
70	82	25	3.4	70.000	69.981	82.022	81.987	—	—	58 500	124 000	3 500	IRT 6025
70	82	30	3.4							70 900	159 000	3 500	IRT 6030
70	82	40	3.4							92 000	222 000	3 500	IRT 6040
70	82	50	3.4							105 000	262 000	3 500	IRT 6050

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series

IKO



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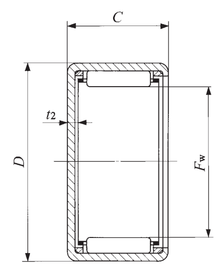
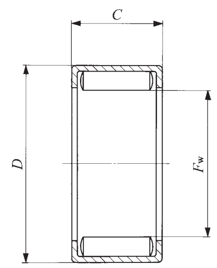


BAM BHAM



YB

Shaft dia. 3.969 — 9.525mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
3.969 (5/32)	—	—	—	—	—	—	—	—	YB 2.5 2.5	0.64
	—	—	—	—	—	—	—	—	YB 2.5 4	0.96
4.762 (3/16)	—	—	—	—	—	—	—	—	YB 34	1.6
6.350 (1/4)	BA 44	2.1	—	—	—	—	—	—	—	—
	BA 45 Z	2.5	BAM 45	2.7	—	—	—	—	—	—
	BA 47 Z	3.5	BAM 47	3.7	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 45	3.2
	—	—	—	—	—	—	—	—	YB 47	4.6
7.938 (5/16)	BA 55 Z	3	BAM 55	3.3	—	—	—	—	—	—
	BA 56 Z	3.6	BAM 56	3.9	—	—	—	—	—	—
	BA 57 Z	4.3	BAM 57	4.6	—	—	—	—	—	—
	BA 59 Z	5.4	BAM 59	5.7	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 55	3.8
	—	—	—	—	BHA 57 Z	6.3	BHAM 57	6.6	—	—
9.525 (3/8)	BA 65 Z	3.5	BAM 65	3.9	—	—	—	—	—	—
	BA 66 Z	4.2	BAM 66	4.6	—	—	—	—	—	—
	BA 68 Z	5.7	BAM 68	6.1	—	—	—	—	—	—
	BA 69 Z	6.3	BAM 69	6.7	—	—	—	—	—	—
	BA 610 Z	7	BAM 610	7.4	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 64	3.4
	—	—	—	—	—	—	—	—	YB 66	5.3
	—	—	—	—	—	—	—	—	YB 68	7.2
	—	—	—	—	—	—	—	—	YB 610	9.1
	—	—	—	—	BHA 68 Z	8.2	BHAM 68	8.6	—	—

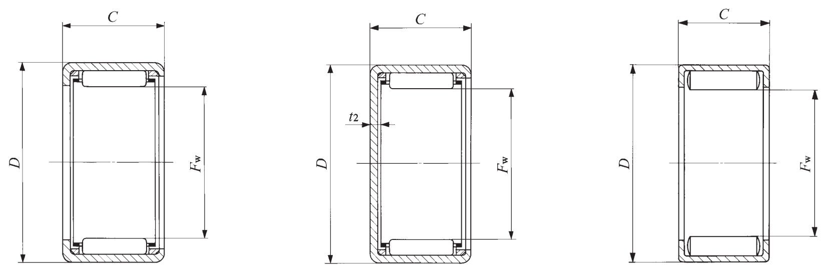
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm(inch) F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
3.969 (5/32)	7.144 (9/32)	3.96(.156)	—	3.969	3.961	7.152	7.137	1 350	1 220	40 000	—
3.969 (5/32)	7.144 (9/32)	6.35(.250)	—					2 320	2 440	40 000	—
4.762 (3/16)	8.731 (11/32)	6.35(.250)	—	4.762	4.754	8.739	8.724	2 770	2 700	30 000	—
6.350 (1/4)	11.112 (7/16)	6.35(.250)	1	6.350	6.341	11.122	11.104	1 770	1 390	55 000	—
6.350 (1/4)	11.112 (7/16)	7.92(.312)	1					1 510	1 120	55 000	—
6.350 (1/4)	11.112 (7/16)	11.13(.438)	1					2 650	2 310	55 000	—
6.350 (1/4)	11.112 (7/16)	7.92(.312)	—					4 450	4 870	25 000	—
6.350 (1/4)	11.112 (7/16)	11.13(.438)	—					6 320	7 650	25 000	—
7.938 (5/16)	12.700 (1/2)	7.92(.312)	1	7.938	7.929	12.710	12.692	1 880	1 560	45 000	—
7.938 (5/16)	12.700 (1/2)	9.52(.375)	1					2 620	2 390	45 000	—
7.938 (5/16)	12.700 (1/2)	11.13(.438)	1					3 310	3 220	45 000	—
7.938 (5/16)	12.700 (1/2)	14.27(.562)	1					4 190	4 360	45 000	—
7.938 (5/16)	12.700 (1/2)	7.92(.312)	—					5 110	6 090	20 000	—
7.938 (5/16)	14.288 (9/16)	11.13(.438)	1.3	7.938	7.929	14.298	14.280	4 150	3 730	45 000	—
9.525 (3/8)	14.288 (9/16)	7.92(.312)	1	9.525	9.516	14.298	14.280	2 220	2 010	40 000	—
9.525 (3/8)	14.288 (9/16)	9.52(.375)	1					3 090	3 080	40 000	—
9.525 (3/8)	14.288 (9/16)	12.70(.500)	1					4 190	4 560	40 000	—
9.525 (3/8)	14.288 (9/16)	14.27(.562)	1					4 940	5 630	40 000	—
9.525 (3/8)	14.288 (9/16)	15.88(.625)	1					5 660	6 700	40 000	—
9.525 (3/8)	14.288 (9/16)	6.35(.250)	—	9.525	9.516	14.298	14.280	4 470	5 360	16 000	—
9.525 (3/8)	14.288 (9/16)	9.52(.375)	—					6 920	9 410	16 000	—
9.525 (3/8)	14.288 (9/16)	12.70(.500)	—					9 210	13 600	16 000	—
9.525 (3/8)	14.288 (9/16)	15.88(.625)	—					11 300	17 800	16 000	—
9.525 (3/8)	15.875 (5/8)	12.70(.500)	1.3	9.525	9.516	15.885	15.867	4 880	4 740	40 000	—

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA…Z BHA…Z BAM BHAM YB YBH

Shaft dia. 11.112 ― 12.700mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	Boundary dimensions mm(inch): F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
11.112 (7/16)	**BA 76 Z**	4.8	**BAM 76**	5.3	—	—	—	—	—	—	11.112 (7/16)	15.875 (5/8)	9.52(.375)	1					3 290	3 470	35 000	—
	BA 77 Z	5.6	**BAM 77**	6.2	—	—	—	—	—	—	11.112 (7/16)	15.875 (5/8)	11.13(.438)	1					4 150	4 680	35 000	—
	BA 78 Z	6.4	**BAM 78**	7	—	—	—	—	—	—	11.112 (7/16)	15.875 (5/8)	12.70(.500)	1	11.112	11.101	15.885	15.867	4 460	5 130	35 000	—
	BA 710 Z	7.9	**BAM 710**	8.5	—	—	—	—	—	—	11.112 (7/16)	15.875 (5/8)	15.88(.625)	1					6 020	7 550	35 000	—
	—	—	—	—	—	—	—	—	**YB 78**	8.2	11.112 (7/16)	15.875 (5/8)	12.70(.500)	—					10 100	15 900	14 000	—
	—	—	—	—	**BHA 78 Z**	9.3	**BHAM 78**	10	—	—	11.112 (7/16)	17.462 (11/16)	12.70(.500)	1.3	11.112	11.101	17.472	17.454	5 680	5 970	35 000	—
	—	—	—	—	—	—	—	—	**YBH 78**	10.5	11.112 (7/16)	17.462 (11/16)	12.70(.500)	—					12 500	15 800	14 000	—
12.700 (1/2)	**BA 85 Z**	4.4	**BAM 85**	5.2	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	7.92(.312)	1					2 490	2 510	30 000	—
	BA 86 Z	5.3	**BAM 86**	6.1	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	9.52(.375)	1					3 470	3 850	30 000	—
	BA 87 Z	6.3	**BAM 87**	7	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	11.13(.438)	1	12.700	12.689	17.472	17.454	4 380	5 190	30 000	—
	BA 88 Z	7.2	**BAM 88**	7.9	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	12.70(.500)	1					4 710	5 700	30 000	**IRB 58**
	BA 810 Z	8.9	**BAM 810**	9.6	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	15.88(.625)	1					6 350	8 380	30 000	—
	BA 812 Z	10.6	**BAM 812**	11.3	—	—	—	—	—	—	12.700 (1/2)	17.462 (11/16)	19.05(.750)	1					7 840	11 000	30 000	—
	—	—	—	—	—	—	—	—	**YB 84**	4.3	12.700 (1/2)	17.462 (11/16)	6.35(.250)	—					5 260	7 150	12 000	—
	—	—	—	—	—	—	—	—	**YB 86**	6.7	12.700 (1/2)	17.462 (11/16)	9.52(.375)	—					8 150	12 600	12 000	—
	—	—	—	—	—	—	—	—	**YB 87**	7.9	12.700 (1/2)	17.462 (11/16)	11.13(.438)	—	12.700	12.689	17.472	17.454	9 530	15 300	12 000	—
	—	—	—	—	—	—	—	—	**YB 88**	9.1	12.700 (1/2)	17.462 (11/16)	12.70(.500)	—					10 800	18 100	12 000	**IRB 58**
	—	—	—	—	—	—	—	—	**YB 810**	11.5	12.700 (1/2)	17.462 (11/16)	15.88(.625)	—					13 400	23 700	12 000	—
	—	—	—	—	—	—	—	—	**YB 812**	13.9	12.700 (1/2)	17.462 (11/16)	19.05(.750)	—					15 800	29 300	12 000	—
	—	—	—	—	**BHA 87 Z**	9.1	**BHAM 87**	9.9	—	—	12.700 (1/2)	19.050 (3/4)	11.13(.438)	1.3					5 670	6 120	30 000	—
	—	—	—	—	**BHA 88 Z**	10.4	**BHAM 88**	11.3	—	—	12.700 (1/2)	19.050 (3/4)	12.70(.500)	1.3					6 040	6 650	30 000	**IRB 58**
	—	—	—	—	**BHA 810 Z**	12.5	**BHAM 810**	13.3	—	—	12.700 (1/2)	19.050 (3/4)	15.88(.625)	1.3	12.700	12.689	19.062	19.041	8 830	10 900	30 000	—
	—	—	—	—	**BHA 812 Z**	15	**BHAM 812**	15.8	—	—	12.700 (1/2)	19.050 (3/4)	19.05(.750)	1.3					11 100	14 500	30 000	—
	—	—	—	—	—	—	—	—	**YBH 810**	16	12.700 (1/2)	19.050 (3/4)	15.88(.625)	—					16 300	23 500	12 000	—

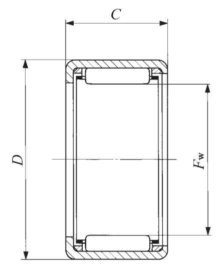
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

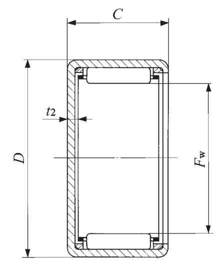
SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series

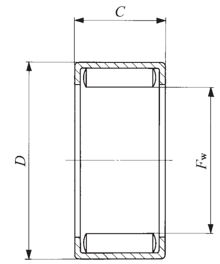




BA…Z BHA…Z



BAM BHAM



YB YBH

Shaft dia. 14.288 — 15.875mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	t_2 Max.	Standard mounting dimensions mm Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed[1] rpm	Assembled inner ring
	BA 95 Z	4.9	BAM 95	5.8	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	7.92(.312)	1.3					2 760	2 970	30 000	—
	BA 96 Z	5.9	BAM 96	6.8	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	9.52(.375)	1.3					3 850	4 560	30 000	—
	BA 97 Z	6.9	BAM 97	7.8	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	11.13(.438)	1.3					4 860	6 140	30 000	—
	BA 98 Z	7.9	BAM 98	8.9	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	12.70(.500)	1.3					5 220	6 740	30 000	IRB 68
	BA 910 Z	9.9	BAM 910	10.8	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	15.88(.625)	1.3	14.288	14.277	19.062	19.041	7 050	9 910	30 000	—
14.288 (9/16)	BA 912 Z	11.7	BAM 912	12.6	—	—	—	—	—	—	14.288(9/16)	19.050(3/4)	19.05(.750)	1.3					8 690	13 000	30 000	IRB 612
	—	—	—	—	—	—	—	—	YB 98	10.1	14.288(9/16)	19.050(3/4)	12.70(.500)	—					11 600	20 400	11 000	IRB 68
	—	—	—	—	—	—	—	—	YB 910	12.7	14.288(9/16)	19.050(3/4)	15.88(.625)	—					14 300	26 700	11 000	—
	—	—	—	—	—	—	—	—	YB 912	15.4	14.288(9/16)	19.050(3/4)	19.05(.750)	—					16 800	33 000	11 000	IRB 612
	—	—	—	—	BHA 98 Z	11.4	BHAM 98	12.5	—	—	14.288(9/16)	20.638(13/16)	12.70(.500)	1.3					6 380	7 330	30 000	IRB 68
	—	—	—	—	BHA 910 Z	13.6	BHAM 910	14.7	—	—	14.288(9/16)	20.638(13/16)	15.88(.625)	1.3	14.288	14.277	20.650	20.629	9 280	11 900	30 000	—
	—	—	—	—	BHA 912 Z	16.3	BHAM 912	17.4	—	—	14.288(9/16)	20.638(13/16)	19.05(.750)	1.3					11 600	15 900	30 000	IRB 612
	BA 105 Z	5.3	BAM 105	6.5	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	7.92(.312)	1.3					2 870	3 220	25 000	—
	BA 107 Z	7.6	BAM 107	8.7	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	11.13(.438)	1.3					5 040	6 660	25 000	—
	BA 108 Z	8.7	BAM 108	9.9	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	12.70(.500)	1.3					5 420	7 310	25 000	IRB 68-1
	BA 1010 Z	10.8	BAM 1010	12	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	15.88(.625)	1.3					7 320	10 700	25 000	—
	BA 1012 Z	12.9	BAM 1012	14	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	19.05(.750)	1.3	15.875	15.864	20.650	20.629	9 020	14 100	25 000	IRB 612-1
	BA 1014 Z	15.1	BAM 1014	16.2	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	22.22(.875)	1.3					10 700	17 500	25 000	IRB 714
	BA 1016 Z	17.3	BAM 1016	18.4	—	—	—	—	—	—	15.875(5/8)	20.638(13/16)	25.40(1.000)	1.3					12 300	20 800	25 000	IRB 716
15.875 (5/8)	—	—	—	—	—	—	—	—	YB 105	6.7	15.875(5/8)	20.638(13/16)	7.92(.312)	—					7 580	12 200	9 500	—
	—	—	—	—	—	—	—	—	YB 108	11	15.875(5/8)	20.638(13/16)	12.70(.500)	—					12 300	22 700	9 500	IRB 68-1
	—	—	—	—	—	—	—	—	YB 1012	16.9	15.875(5/8)	20.638(13/16)	19.05(.750)	—					17 800	36 600	9 500	IRB 612-1
	—	—	—	—	BHA 108 Z	12.6	BHAM 108	13.9	—	—	15.875(5/8)	22.225(7/8)	12.70(.500)	1.3					6 680	8 020	25 000	IRB 68-1
	—	—	—	—	BHA 1010 Z	14.9	BHAM 1010	16.2	—	—	15.875(5/8)	22.225(7/8)	15.88(.625)	1.3					10 200	13 800	25 000	—
	—	—	—	—	BHA 1012 Z	18	BHAM 1012	19.3	—	—	15.875(5/8)	22.225(7/8)	19.05(.750)	1.3	15.875	15.864	22.237	22.216	12 700	18 500	25 000	IRB 612-1
	—	—	—	—	BHA 1016 Z	24	BHAM 1016	25	—	—	15.875(5/8)	22.225(7/8)	25.40(1.000)	1.3					17 400	27 600	25 000	IRB 716
	—	—	—	—	—	—	—	—	YBH 108	15.3	15.875(5/8)	22.225(7/8)	12.70(.500)	—					15 000	22 400	9 500	IRB 68-1

Note[1] Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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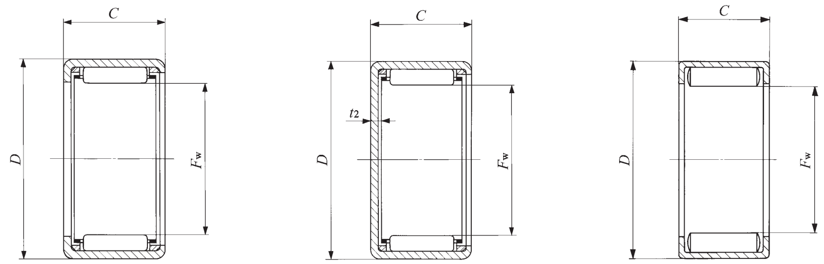
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA…Z BHA…Z   BAM BHAM   YB

Shaft dia. 17.462 — 19.050mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
17.462 (11/16)	BA 116 Z	7	BAM 116	8.4	—	—	—	—	—	—
	BA 118 Z	9.5	BAM 118	10.8	—	—	—	—	—	—
	BA 1110 Z	11.8	BAM 1110	13.2	—	—	—	—	—	—
	BA 1112 Z	14	BAM 1112	15.4	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 1112	18.3
	—	—	—	—	BHA 117 Z	11.9	BHAM 117	13.5	—	—
	—	—	—	—	BHA 118 Z	13.7	BHAM 118	15.3	—	—
	—	—	—	—	BHA 1110 Z	16	BHAM 1110	17.6	—	—
	—	—	—	—	BHA 1112 Z	19.3	BHAM 1112	21	—	—
19.050 (3/4)	BA 126 Z	10	BAM 126	11.7	—	—	—	—	—	—
	BA 128 Z	13.5	BAM 128	15.2	—	—	—	—	—	—
	BA 1210 Z	17	BAM 1210	18.6	—	—	—	—	—	—
	BA 1212 Z	20.5	BAM 1212	22	—	—	—	—	—	—
	BA 1214 Z	23.5	BAM 1214	25	—	—	—	—	—	—
	BA 1216 Z	27	BAM 1216	28.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 124	8.5
	—	—	—	—	—	—	—	—	YB 128	17.8
	—	—	—	—	—	—	—	—	YB 1210	22.5
	—	—	—	—	—	—	—	—	YB 1212	27
	—	—	—	—	BHA 1212 Z	26.5	BHAM 1212	28.5	—	—

Boundary dimensions mm(inch) F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
17.462 (11/16)	22.225 (7/8)	9.52 (.375)	1.3	17.462	17.451	22.237	22.216	4 530	5 980	25 000	IRB 86
17.462 (11/16)	22.225 (7/8)	12.70 (.500)	1.3					6 140	8 850	25 000	IRB 88
17.462 (11/16)	22.225 (7/8)	15.88 (.625)	1.3					8 280	13 000	25 000	—
17.462 (11/16)	22.225 (7/8)	19.05 (.750)	1.3					10 200	17 000	25 000	IRB 812
17.462 (11/16)	22.225 (7/8)	19.05 (.750)	—					18 700	40 300	8 500	IRB 812
17.462 (11/16)	23.812 (15/16)	11.13 (.438)	1.3	17.462	17.451	23.824	23.803	6 860	8 530	25 000	—
17.462 (11/16)	23.812 (15/16)	12.70 (.500)	1.3					7 320	9 270	25 000	IRB 88
17.462 (11/16)	23.812 (15/16)	15.88 (.625)	1.3					10 500	14 900	25 000	—
17.462 (11/16)	23.812 (15/16)	19.05 (.750)	1.3					13 200	19 900	25 000	IRB 812
19.050 (3/4)	25.400 (1)	9.52 (.375)	1.3	19.050	19.037	25.412	25.391	5 040	5 850	20 000	—
19.050 (3/4)	25.400 (1)	12.70 (.500)	1.3					6 910	8 780	20 000	IRB 88-1
19.050 (3/4)	25.400 (1)	15.88 (.625)	1.3					9 500	13 200	20 000	IRB 810-1
19.050 (3/4)	25.400 (1)	19.05 (.750)	1.3					11 900	17 700	20 000	IRB 812-1
19.050 (3/4)	25.400 (1)	22.22 (.875)	1.3					14 200	22 200	20 000	IRB 814-1
19.050 (3/4)	25.400 (1)	25.40 (1.000)	1.3					16 300	26 500	20 000	IRB 816-1
19.050 (3/4)	25.400 (1)	6.35 (.250)	—	19.050	19.037	25.412	25.391	7 820	10 200	8 000	—
19.050 (3/4)	25.400 (1)	12.70 (.500)	—					16 600	26 900	8 000	IRB 88-1
19.050 (3/4)	25.400 (1)	15.88 (.625)	—					20 500	35 300	8 000	IRB 810-1
19.050 (3/4)	25.400 (1)	19.05 (.750)	—					24 100	43 400	8 000	IRB 812-1
19.050 (3/4)	26.988 (1 1/16)	19.05 (.750)	1.3	19.050	19.037	27.000	26.979	16 600	22 600	20 000	IRB 812-1

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
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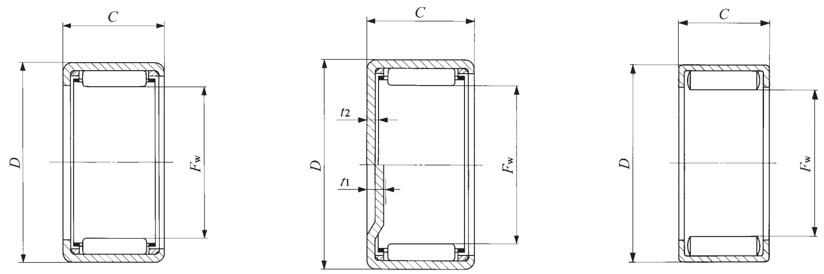
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA⋯Z BHA⋯Z

BAM BHAM
t_1 ($F_w \geqq 22.225$)
t_2 ($F_w \leqq 20.638$)

YB YBH

Shaft dia. 20.638 — 22.225mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
20.638 (13⁄16)	BA 136 Z	10.7	BAM 136	12.6	—	—	—	—	—	—
	BA 138 Z	14.5	BAM 138	16.4	—	—	—	—	—	—
	BA 1310 Z	18.2	BAM 1310	20	—	—	—	—	—	—
	BA 1312 Z	22	BAM 1312	23.5	—	—	—	—	—	—
	BA 1314 Z	25	BAM 1314	27	—	—	—	—	—	—
	BA 1316 Z	28.5	BAM 1316	30.5	—	—	—	—	—	—
	BA 1320 Z	35.5	BAM 1320	37.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 136	14.1
	—	—	—	—	—	—	—	—	YB 138	19.1
	—	—	—	—	BHA 138 Z	20	BHAM 138	22.5	—	—
	—	—	—	—	BHA 1310 Z	23.5	BHAM 1310	25.5	—	—
	—	—	—	—	BHA 1312 Z	28.5	BHAM 1312	30.5	—	—
	—	—	—	—	—	—	—	—	YBH 1310	30.5
	—	—	—	—	—	—	—	—	YBH 1312	37
22.225 (7⁄8)	BA 146 Z	11.5	BAM 146	13.8	—	—	—	—	—	—
	BA 148 Z	15.6	BAM 148	17.8	—	—	—	—	—	—
	BA 1412 Z	23.5	BAM 1412	26	—	—	—	—	—	—
	BA 1414 Z	27	BAM 1414	29.5	—	—	—	—	—	—
	BA 1416 Z	31	BAM 1416	33.5	—	—	—	—	—	—
	BA 1418 Z	34.5	BAM 1418	37	—	—	—	—	—	—
	BA 1422 Z	42.5	BAM 1422	44.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 148	20.5
	—	—	—	—	—	—	—	—	YB 1412	31
	—	—	—	—	—	—	—	—	YB 1416	41.5
	—	—	—	—	BHA 1410 Z	25	BHAM 1410	27.5	—	—
	—	—	—	—	BHA 1412 Z	30	BHAM 1412	32.5	—	—
	—	—	—	—	BHA 1416 Z	39.5	BHAM 1416	42	—	—
	—	—	—	—	—	—	—	—	YBH 1412	39

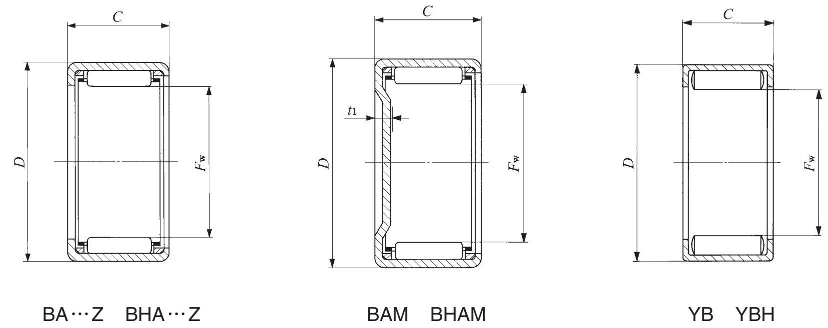
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm(inch) F_w	D	C	t_1 t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
20.638 (13⁄16)	26.988 (1 1⁄16)	9.52(.375)	1.3	20.638	20.625	27.000	26.979	5 230	6 300	19 000	—
20.638 (13⁄16)	26.988 (1 1⁄16)	12.70(.500)	1.3					7 170	9 450	19 000	IRB 98
20.638 (13⁄16)	26.988 (1 1⁄16)	15.88(.625)	1.3					9 870	14 200	19 000	IRB 910
20.638 (13⁄16)	26.988 (1 1⁄16)	19.05(.750)	1.3					12 400	19 000	19 000	IRB 912
20.638 (13⁄16)	26.988 (1 1⁄16)	22.22(.875)	1.3					14 700	23 800	19 000	IRB 914
20.638 (13⁄16)	26.988 (1 1⁄16)	25.40(1.000)	1.3					16 900	28 500	19 000	IRB 916
20.638 (13⁄16)	26.988 (1 1⁄16)	31.75(1.250)	1.3					21 200	38 100	19 000	IRB 920
20.638 (13⁄16)	26.988 (1 1⁄16)	9.52(.375)	—					13 000	20 100	7 500	—
20.638 (13⁄16)	26.988 (1 1⁄16)	12.70(.500)	—					17 400	29 200	7 500	IRB 98
20.638 (13⁄16)	28.575 (1 1⁄8)	12.70(.500)	1.3	20.638	20.625	28.587	28.566	9 500	11 200	19 000	IRB 98
20.638 (13⁄16)	28.575 (1 1⁄8)	15.88(.625)	1.3					13 800	18 200	19 000	IRB 910
20.638 (13⁄16)	28.575 (1 1⁄8)	19.05(.750)	1.3					17 300	24 400	19 000	IRB 912
20.638 (13⁄16)	28.575 (1 1⁄8)	15.88(.625)	—					22 900	36 300	7 500	IRB 910
20.638 (13⁄16)	28.575 (1 1⁄8)	19.05(.750)	—					27 200	45 300	7 500	IRB 912
22.225 (7⁄8)	28.575 (1 1⁄8)	9.52(.375)	2.8	22.225	22.212	28.587	28.566	5 430	6 740	18 000	IRB 106
22.225 (7⁄8)	28.575 (1 1⁄8)	12.70(.500)	2.8					7 440	10 100	18 000	IRB 108
22.225 (7⁄8)	28.575 (1 1⁄8)	19.05(.750)	2.8					12 800	20 400	18 000	IRB 1012
22.225 (7⁄8)	28.575 (1 1⁄8)	22.22(.875)	2.8					15 300	25 500	18 000	IRB 1014
22.225 (7⁄8)	28.575 (1 1⁄8)	25.40(1.000)	2.8					17 600	30 500	18 000	IRB 1016
22.225 (7⁄8)	28.575 (1 1⁄8)	28.58(1.125)	2.8					19 800	35 600	18 000	—
22.225 (7⁄8)	28.575 (1 1⁄8)	34.92(1.375)	2.8					24 100	45 700	18 000	IRB 1022
22.225 (7⁄8)	28.575 (1 1⁄8)	12.70(.500)	—					18 100	31 400	7 000	IRB 108
22.225 (7⁄8)	28.575 (1 1⁄8)	19.05(.750)	—					26 300	50 700	7 000	IRB 1012
22.225 (7⁄8)	28.575 (1 1⁄8)	25.40(1.000)	—					33 800	70 200	7 000	IRB 1016
22.225 (7⁄8)	30.162 (1 3⁄16)	15.88(.625)	3.4	22.225	22.212	30.176	30.151	14 300	19 500	18 000	—
22.225 (7⁄8)	30.162 (1 3⁄16)	19.05(.750)	3.4					18 000	26 100	18 000	IRB 1012
22.225 (7⁄8)	30.162 (1 3⁄16)	25.40(1.000)	3.4					23 600	36 900	18 000	IRB 1016
22.225 (7⁄8)	30.162 (1 3⁄16)	19.05(.750)	—					28 200	49 000	7 000	IRB 1012

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



Shaft dia. 23.812 — 26.988mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
23.812 (15/16)	BA 158 Z	16.5	BAM 158	19	—	—	—	—	—	—
	BA 1510 Z	20.5	BAM 1510	23	—	—	—	—	—	—
	BA 1516 Z	33	BAM 1516	35.5	—	—	—	—	—	—
25.400 (1)	BA 166 Z	13.1	BAM 166	16	—	—	—	—	—	—
	BA 167 Z	15.4	BAM 167	18.3	—	—	—	—	—	—
	BA 168 Z	17.7	BAM 168	20.5	—	—	—	—	—	—
	BA 1610 Z	22	BAM 1610	25	—	—	—	—	—	—
	BA 1612 Z	26.5	BAM 1612	29.5	—	—	—	—	—	—
	BA 1614 Z	31	BAM 1614	33.5	—	—	—	—	—	—
	BA 1616 Z	35.5	BAM 1616	38	—	—	—	—	—	—
	BA 1620 Z	44	BAM 1620	46.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 168	23
	—	—	—	—	—	—	—	—	YB 1612	34.5
	—	—	—	—	—	—	—	—	YB 1616	46.5
	—	—	—	—	BHA 168 Z	24	BHAM 168	27	—	—
	—	—	—	—	BHA 1610 Z	28	BHAM 1610	31	—	—
	—	—	—	—	BHA 1612 Z	33.5	BHAM 1612	37	—	—
	—	—	—	—	BHA 1614 Z	39.5	BHAM 1614	42.5	—	—
	—	—	—	—	BHA 1616 Z	45	BHAM 1616	48	—	—
	—	—	—	—	BHA 1620 Z	56.5	BHAM 1620	59.5	—	—
	—	—	—	—	BHA 1624 Z	67.5	BHAM 1624	71	—	—
	—	—	—	—	—	—	—	—	YBH 168	29
	—	—	—	—	—	—	—	—	YBH 1612	44.5
	—	—	—	—	—	—	—	—	YBH 1616	59.5
26.988 (1 1/16)	BA 1710 Z	23.5	BAM 1710	26.5	—	—	—	—	—	—
	BA 1716 Z	37	BAM 1716	40.5	—	—	—	—	—	—

Boundary dimensions mm(inch): F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
23.812 (15/16)	30.162 (1 3/16)	12.70 (.500)	2.8					8 000	11 400	16 000	—
23.812 (15/16)	30.162 (1 3/16)	15.88 (.625)	2.8	23.812	23.799	30.176	30.151	11 000	17 100	16 000	IRB 1110
23.812 (15/16)	30.162 (1 3/16)	25.40 (1.000)	2.8					18 900	34 300	16 000	IRB 1116
25.400 (1)	31.750 (1 1/4)	9.52 (.375)	2.8					6 010	8 020	15 000	—
25.400 (1)	31.750 (1 1/4)	11.13 (.438)	2.8					7 720	11 100	15 000	—
25.400 (1)	31.750 (1 1/4)	12.70 (.500)	2.8					8 240	12 000	15 000	IRB 128
25.400 (1)	31.750 (1 1/4)	15.88 (.625)	2.8					11 300	18 100	15 000	—
25.400 (1)	31.750 (1 1/4)	19.05 (.750)	2.8					14 200	24 300	15 000	IRB 1212
25.400 (1)	31.750 (1 1/4)	22.22 (.875)	2.8	25.400	25.387	31.764	31.739	16 900	30 400	15 000	IRB 1214
25.400 (1)	31.750 (1 1/4)	25.40 (1.000)	2.8					19 400	36 300	15 000	IRB 1216
25.400 (1)	31.750 (1 1/4)	31.75 (1.250)	2.8					24 400	48 500	15 000	IRB 1220
25.400 (1)	31.750 (1 1/4)	12.70 (.500)	—					19 400	36 000	6 000	IRB 128
25.400 (1)	31.750 (1 1/4)	19.05 (.750)	—					28 200	58 000	6 000	IRB 1212
25.400 (1)	31.750 (1 1/4)	25.40 (1.000)	—					36 300	80 300	6 000	IRB 1216
25.400 (1)	33.338 (1 5/16)	12.70 (.500)	3.4					10 200	13 100	15 000	IRB 128
25.400 (1)	33.338 (1 5/16)	15.88 (.625)	3.4					15 300	22 100	15 000	—
25.400 (1)	33.338 (1 5/16)	19.05 (.750)	3.4					19 300	29 700	15 000	IRB 1212
25.400 (1)	33.338 (1 5/16)	22.22 (.875)	3.4					23 000	37 200	15 000	IRB 1214
25.400 (1)	33.338 (1 5/16)	25.40 (1.000)	3.4	25.400	25.387	33.352	33.327	26 400	44 500	15 000	IRB 1216
25.400 (1)	33.338 (1 5/16)	31.75 (1.250)	3.4					33 200	59 600	15 000	IRB 1220
25.400 (1)	33.338 (1 5/16)	38.10 (1.500)	3.4					39 400	74 400	15 000	—
25.400 (1)	33.338 (1 5/16)	12.70 (.500)	—					20 900	34 100	6 000	IRB 128
25.400 (1)	33.338 (1 5/16)	19.05 (.750)	—					30 700	56 100	6 000	IRB 1212
25.400 (1)	33.338 (1 5/16)	25.40 (1.000)	—					39 900	78 400	6 000	IRB 1216
26.988 (1 1/16)	33.338 (1 5/16)	15.88 (.625)	2.8	26.988	26.975	33.352	33.327	11 600	19 200	14 000	—
26.988 (1 1/16)	33.338 (1 5/16)	25.40 (1.000)	2.8					20 000	38 300	14 000	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

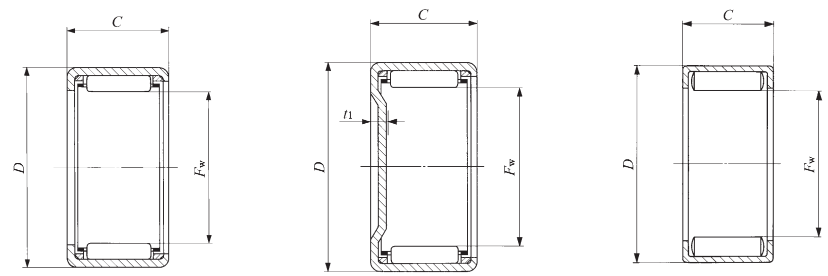
SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series

Shaft dia. 28.575 — 30.162mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
28.575 (1 1/8)	**BA 186 Z**	14.5	**BAM 186**	18.1	—	—	—	—	—	—
	BA 188 Z	19.5	**BAM 188**	23	—	—	—	—	—	—
	BA 1812 Z	29.5	**BAM 1812**	33	—	—	—	—	—	—
	BA 1816 Z	39	**BAM 1816**	42.5	—	—	—	—	—	—
	BA 1820 Z	48.5	**BAM 1820**	52	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 188**	25.5
	—	—	—	—	—	—	—	—	**YB 1812**	38.5
	—	—	—	—	—	—	—	—	**YB 1816**	51.5
	—	—	—	—	**BHA 1812 Z**	45	**BHAM 1812**	49	—	—
	—	—	—	—	**BHA 1816 Z**	60	**BHAM 1816**	64	—	—
	—	—	—	—	**BHA 1818 Z**	67.5	**BHAM 1818**	71.5	—	—
	—	—	—	—	**BHA 1820 Z**	73.5	**BHAM 1820**	78	—	—
30.162 (1 3/16)	**BA 1910 Z**	32.5	**BAM 1910**	37.5	—	—	—	—	—	—
	BA 1916 Z	52	**BAM 1916**	57	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 1910**	42.5

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.



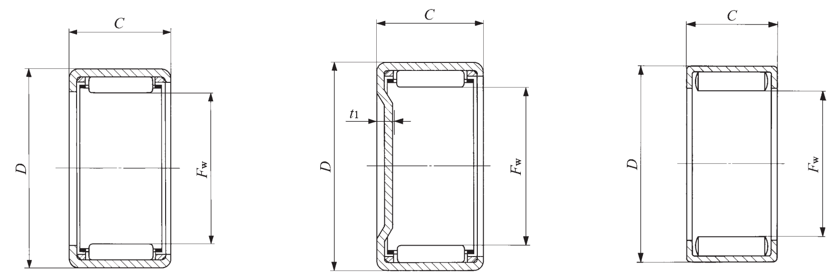
BA…Z BHA…Z BAM BHAM YB

Boundary dimensions mm(inch) F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
28.575 (1 1/8)	34.925 (1 3/8)	9.52(. 375)	2.8	28.575	28.562	34.939	34.914	6 330	8 910	13 000	—
28.575 (1 1/8)	34.925 (1 3/8)	12.70(.500)	2.8					8 680	13 400	13 000	**IRB 148**
28.575 (1 1/8)	34.925 (1 3/8)	19.05(.750)	2.8					15 000	26 900	13 000	**IRB 1412**
28.575 (1 1/8)	34.925 (1 3/8)	25.40(1.000)	2.8					20 500	40 300	13 000	**IRB 1416**
28.575 (1 1/8)	34.925 (1 3/8)	31.75(1.250)	2.8					25 700	53 900	13 000	**IRB 1420**
28.575 (1 1/8)	34.925 (1 3/8)	12.70(.500)	—					20 700	40 500	5 500	**IRB 148**
28.575 (1 1/8)	34.925 (1 3/8)	19.05(.750)	—					30 000	65 300	5 500	**IRB 1412**
28.575 (1 1/8)	34.925 (1 3/8)	25.40(1.000)	—					38 700	90 400	5 500	**IRB 1416**
28.575 (1 1/8)	38.100 (1 1/2)	19.05(.750)	3.4	28.575	28.562	38.114	38.089	22 500	32 200	13 000	**IRB 1412**
28.575 (1 1/8)	38.100 (1 1/2)	25.40(1.000)	3.4					30 900	48 600	13 000	**IRB 1416**
28.575 (1 1/8)	38.100 (1 1/2)	28.58(1.125)	3.4					34 900	56 600	13 000	—
28.575 (1 1/8)	38.100 (1 1/2)	31.75(1.250)	3.4					37 100	61 100	13 000	**IRB 1420**
30.162 (1 3/16)	38.100 (1 1/2)	15.88(.625)	2.8	30.162	30.146	38.114	38.089	15 000	22 500	12 000	—
30.162 (1 3/16)	38.100 (1 1/2)	25.40(1.000)	2.8					25 800	45 300	12 000	—
30.162 (1 3/16)	38.100 (1 1/2)	15.88(.625)	—					28 400	53 600	5 000	—

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA…Z BHA…Z　　BAM BHAM　　YB

Shaft dia. 31.750 — 33.338mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
31.750 (1 1/4)	BA 208 Z	21.5	BAM 208	26	—	—	—	—	—	—
	BA 2010 Z	27	BAM 2010	31.5	—	—	—	—	—	—
	BA 2012 Z	32.5	BAM 2012	37	—	—	—	—	—	—
	BA 2016 Z	43	BAM 2016	47.5	—	—	—	—	—	—
	BA 2020 Z	53.5	BAM 2020	58	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 2010	35
	—	—	—	—	—	—	—	—	YB 2012	42.5
	—	—	—	—	—	—	—	—	YB 2016	57
	—	—	—	—	—	—	—	—	YB 2018	64
	—	—	—	—	—	—	—	—	YB 2020	68
	—	—	—	—	BHA 208 Z	34.5	BHAM 208	40	—	—
	—	—	—	—	BHA 2012 Z	49.5	BHAM 2012	54.5	—	—
	—	—	—	—	BHA 2016 Z	66	BHAM 2016	71	—	—
	—	—	—	—	BHA 2020 Z	81.5	BHAM 2020	86.5	—	—
33.338 (1 5/16)	BA 218 Z	28.5	BAM 218	35	—	—	—	—	—	—
	BA 2110 Z	35.5	BAM 2110	41.5	—	—	—	—	—	—
	BA 2112 Z	43	BAM 2112	49	—	—	—	—	—	—

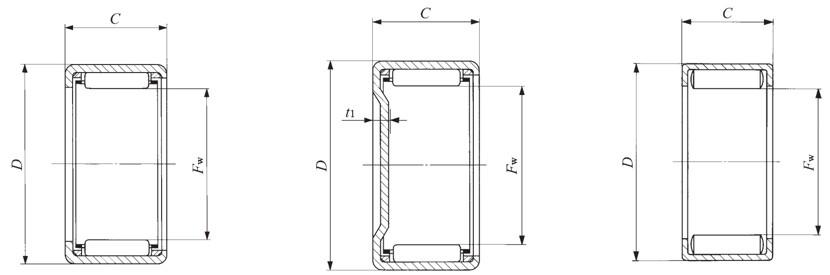
Boundary dimensions mm(inch): F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
31.750(1 1/4)	38.100(1 1/2)	12.70(.500)	2.8					9 100	14 700	12 000	IRB 168
31.750(1 1/4)	38.100(1 1/2)	15.88(.625)	2.8					12 500	22 200	12 000	IRB 1610
31.750(1 1/4)	38.100(1 1/2)	19.05(.750)	2.8	31.750	31.734	38.114	38.089	15 700	29 600	12 000	IRB 1612
31.750(1 1/4)	38.100(1 1/2)	25.40(1.000)	2.8					21 500	44 300	12 000	IRB 1616
31.750(1 1/4)	38.100(1 1/2)	31.75(1.250)	2.8					26 900	59 200	12 000	IRB 1620
31.750(1 1/4)	38.100(1 1/2)	15.88(.625)	—					27 000	59 000	4 500	IRB 1610
31.750(1 1/4)	38.100(1 1/2)	19.05(.750)	—					31 800	72 500	4 500	IRB 1612
31.750(1 1/4)	38.100(1 1/2)	25.40(1.000)	—	31.750	31.734	38.114	38.089	40 900	100 000	4 500	IRB 1616
31.750(1 1/4)	38.100(1 1/2)	28.58(1.125)	—					45 300	114 000	4 500	—
31.750(1 1/4)	38.100(1 1/2)	31.75(1.250)	—					49 400	128 000	4 500	IRB 1620
31.750(1 1/4)	41.275(1 5/8)	12.70(.500)	3.4					13 700	17 600	12 000	IRB 168
31.750(1 1/4)	41.275(1 5/8)	19.05(.750)	3.4	31.750	31.734	41.289	41.264	24 100	36 400	12 000	IRB 1612
31.750(1 1/4)	41.275(1 5/8)	25.40(1.000)	3.4					33 200	55 000	12 000	IRB 1616
31.750(1 1/4)	41.275(1 5/8)	31.75(1.250)	3.4					40 000	69 600	12 000	IRB 1620
33.338(1 5/16)	41.275(1 5/8)	12.70(.500)	2.8					11 100	15 800	11 000	IRB 168-1
33.338(1 5/16)	41.275(1 5/8)	15.88(.625)	2.8	33.338	33.322	41.289	41.264	15 400	23 900	11 000	IRB 1610-1
33.338(1 5/16)	41.275(1 5/8)	19.05(.750)	2.8					19 300	32 100	11 000	IRB 1612-1

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA···Z BHA···Z BAM BHAM YB

Shaft dia. 34.925 ― 38.100mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
34.925 (1 3/8)	BA 228 Z	23.5	BAM 228	29	—	—	—	—	—	—
	BA 2212 Z	35.5	BAM 2212	41	—	—	—	—	—	—
	BA 2216 Z	47.5	BAM 2216	53	—	—	—	—	—	—
	BA 2220 Z	59	BAM 2220	64	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 228	30.5
	—	—	—	—	—	—	—	—	YB 2212	46
	—	—	—	—	—	—	—	—	YB 2220	77.5
	—	—	—	—	BHA 228 Z	37	BHAM 228	43	—	—
	—	—	—	—	BHA 2210 Z	44	BHAM 2210	50	—	—
	—	—	—	—	BHA 2212 Z	53	BHAM 2212	59	—	—
	—	—	—	—	BHA 2216 Z	71	BHAM 2216	77	—	—
	—	—	—	—	BHA 2220 Z	87	BHAM 2220	98.5	—	—
38.100 (1 1/2)	BA 248 Z	38.5	BAM 248	47.5	—	—	—	—	—	—
	BA 2410 Z	48.5	BAM 2410	57.5	—	—	—	—	—	—
	BA 2412 Z	58.5	BAM 2412	67.5	—	—	—	—	—	—
	BA 2414 Z	69	BAM 2414	78	—	—	—	—	—	—
	BA 2416 Z	79	BAM 2416	88	—	—	—	—	—	—
	BA 2420 Z	97.5	BAM 2420	106	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 246	38
	—	—	—	—	—	—	—	—	YB 248	51.5
	—	—	—	—	—	—	—	—	YB 2414	91
	—	—	—	—	—	—	—	—	YB 2416	105
	—	—	—	—	—	—	—	—	YB 2420	131

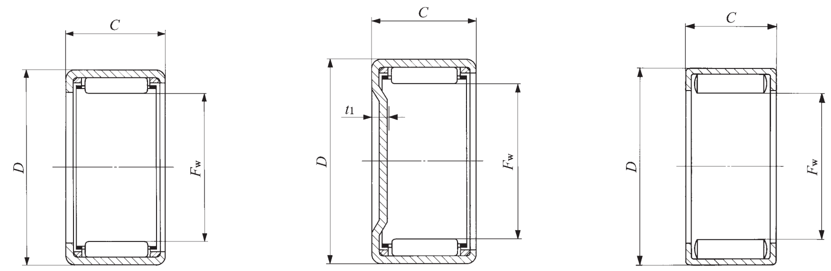
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

Boundary dimensions mm(inch): F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
34.925 (1 3/8)	41.275 (1 5/8)	12.70(.500)	2.8	34.925	34.909	41.289	41.264	9 770	16 600	10 000	IRB 188
34.925 (1 3/8)	41.275 (1 5/8)	19.05(.750)	2.8					16 900	33 500	10 000	IRB 1812
34.925 (1 3/8)	41.275 (1 5/8)	25.40(1.000)	2.8					23 100	50 200	10 000	IRB 1816
34.925 (1 3/8)	41.275 (1 5/8)	31.75(1.250)	2.8					28 900	67 100	10 000	IRB 1820
34.925 (1 3/8)	41.275 (1 5/8)	12.70(.500)	—					23 000	49 500	4 500	IRB 188
34.925 (1 3/8)	41.275 (1 5/8)	19.05(.750)	—					33 400	79 800	4 500	IRB 1812
34.925 (1 3/8)	41.275 (1 5/8)	31.75(1.250)	—					52 000	141 000	4 500	IRB 1820
34.925 (1 3/8)	44.450 (1 3/4)	12.70(.500)	3.4	34.925	34.909	44.464	44.439	14 100	18 800	10 000	IRB 188
34.925 (1 3/8)	44.450 (1 3/4)	15.88(.625)	3.4					19 700	28 800	10 000	—
34.925 (1 3/8)	44.450 (1 3/4)	19.05(.750)	3.4					24 800	38 800	10 000	IRB 1812
34.925 (1 3/8)	44.450 (1 3/4)	25.40(1.000)	3.4					34 100	58 400	10 000	IRB 1816
34.925 (1 3/8)	44.450 (1 3/4)	31.75(1.250)	3.4					41 200	74 200	10 000	IRB 1820
38.100 (1 1/2)	47.625 (1 7/8)	12.70(.500)	2.8	38.100	38.084	47.639	47.614	12 900	17 900	9 000	—
38.100 (1 1/2)	47.625 (1 7/8)	15.88(.625)	2.8					17 800	27 100	9 000	IRB 2010
38.100 (1 1/2)	47.625 (1 7/8)	19.05(.750)	2.8					22 500	36 600	9 000	—
38.100 (1 1/2)	47.625 (1 7/8)	22.22(.875)	2.8					26 700	45 600	9 000	IRB 2014
38.100 (1 1/2)	47.625 (1 7/8)	25.40(1.000)	2.8					31 100	55 400	9 000	IRB 2016
38.100 (1 1/2)	47.625 (1 7/8)	31.75(1.250)	2.8					39 000	74 200	9 000	IRB 2020
38.100 (1 1/2)	47.625 (1 7/8)	9.52(.375)	—	38.100	38.084	47.639	47.614	21 000	34 100	4 000	—
38.100 (1 1/2)	47.625 (1 7/8)	12.70(.500)	—					28 700	50 900	4 000	—
38.100 (1 1/2)	47.625 (1 7/8)	22.22(.875)	—					48 900	101 000	4 000	IRB 2014
38.100 (1 1/2)	47.625 (1 7/8)	25.40(1.000)	—					55 100	118 000	4 000	IRB 2016
38.100 (1 1/2)	47.625 (1 7/8)	31.75(1.250)	—					66 800	151 000	4 000	IRB 2020

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

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA…Z BHA…Z BAM BHAM YB

Shaft dia. 41.275 — 52.388mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
41.275 (1 5/8)	BA 268 Z	41	BAM 268	51.5	—	—	—	—	—	—
	BA 2610 Z	52	BAM 2610	62.5	—	—	—	—	—	—
	BA 2616 Z	85	BAM 2616	95.5	—	—	—	—	—	—
	BA 2620 Z	105	BAM 2620	115	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 2610	69
44.450 (1 3/4)	BA 2812 Z	67.5	BAM 2812	79.5	—	—	—	—	—	—
	BA 2816 Z	91	BAM 2816	103	—	—	—	—	—	—
	BA 2820 Z	112	BAM 2820	125	—	—	—	—	—	—
	BA 2824 Z	136	BAM 2824	148	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 2816	119
	—	—	—	—	BHA 2824 Z	195	BHAM 2824	210	—	—
47.625 (1 7/8)	BA 308 Z	47.5	BAM 308	61	—	—	—	—	—	—
	BA 3010 Z	60	BAM 3010	74	—	—	—	—	—	—
	BA 3012 Z	72.5	BAM 3012	86.5	—	—	—	—	—	—
	BA 3016 Z	97.5	BAM 3016	112	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 3012	95
50.800 (2)	BA 328 Z	50	BAM 328	66	—	—	—	—	—	—
	BA 3216 Z	104	BAM 3216	119	—	—	—	—	—	—
	BA 3220 Z	128	BAM 3220	144	—	—	—	—	—	—
	BA 3224 Z	155	BAM 3224	170	—	—	—	—	—	—
	BAW3228Z	180	BAMW3228	196	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	YB 3216	130
52.388 (2 1/16)	—	—	—	—	BHA 3312 Z	104	BHAM 3312	122	—	—
	—	—	—	—	BHA 3316 Z	139	BHAM 3316	157	—	—
	—	—	—	—	BHA 3324 Z	205	BHAM 3324	225	—	—

Boundary dimensions mm(inch) F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
41.275(1 5/8)	50.800(2)	12.70(.500)	2.8	41.275	41.259	50.818	50.788	13 700	19 800	8 000	—
41.275(1 5/8)	50.800(2)	15.88(.625)	2.8					18 900	30 000	8 000	IRB 2210
41.275(1 5/8)	50.800(2)	25.40(1.000)	2.8					33 000	61 400	8 000	—
41.275(1 5/8)	50.800(2)	31.75(1.250)	2.8					41 400	82 100	8 000	IRB 2220
41.275(1 5/8)	50.800(2)	15.88(.625)	—					37 000	71 700	3 500	IRB 2210
44.450(1 3/4)	53.975(2 1/8)	19.05(.750)	2.8	44.450	44.434	53.993	53.963	25 200	44 500	7 500	IRB 2412
44.450(1 3/4)	53.975(2 1/8)	25.40(1.000)	2.8					34 800	67 400	7 500	IRB 2416
44.450(1 3/4)	53.975(2 1/8)	31.75(1.250)	2.8					43 600	90 200	7 500	—
44.450(1 3/4)	53.975(2 1/8)	38.10(1.500)	2.8					52 000	113 000	7 500	IRB 2424
44.450(1 3/4)	53.975(2 1/8)	25.40(1.000)	—					59 500	136 000	3 500	IRB 2416
44.450(1 3/4)	57.150(2 1/4)	38.10(1.500)	3.4	44.450	44.434	57.168	57.138	72 200	135 000	7 500	IRB 2424
47.625(1 7/8)	57.150(2 1/4)	12.70(.500)	2.8	47.625	47.609	57.168	57.138	14 700	22 800	7 000	IRB 248-1
47.625(1 7/8)	57.150(2 1/4)	15.88(.625)	2.8					20 300	34 500	7 000	IRB 2410-1
47.625(1 7/8)	57.150(2 1/4)	19.05(.750)	2.8					25 700	46 700	7 000	—
47.625(1 7/8)	57.150(2 1/4)	25.40(1.000)	2.8					35 400	70 600	7 000	—
47.625(1 7/8)	57.150(2 1/4)	19.05(.750)	—					47 800	105 000	3 000	—
50.800(2)	60.325(2 3/8)	12.70(.500)	2.8	50.800	50.781	60.343	60.313	15 400	24 700	6 000	—
50.800(2)	60.325(2 3/8)	25.40(1.000)	2.8					37 100	76 500	6 000	IRB 2616
50.800(2)	60.325(2 3/8)	31.75(1.250)	2.8					46 600	102 000	6 000	IRB 2720
50.800(2)	60.325(2 3/8)	38.10(1.500)	2.8					55 500	128 000	6 000	—
50.800(2)	60.325(2 3/8)	44.45(1.750)	2.8					57 900	136 000	6 000	IRB 2628
50.800(2)	60.325(2 3/8)	25.40(1.000)	—					64 100	156 000	2 500	IRB 2616
52.388(2 1/16)	64.294(2 17/32)	19.05(.750)	3.4	52.388	52.369	64.312	64.282	36 400	62 100	6 000	—
52.388(2 1/16)	64.294(2 17/32)	25.40(1.000)	3.4					50 600	94 700	6 000	—
52.388(2 1/16)	64.294(2 17/32)	38.10(1.500)	3.4					73 900	154 000	6 000	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

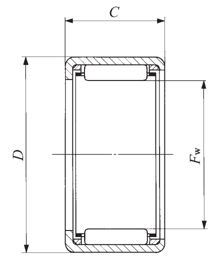
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.

2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

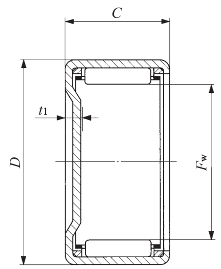
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



BA···Z



BAM

Shaft dia. 53.975 — 69.850mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
53.975 (2 1/8)	**BA 348 Z**	53	**BAM 348**	70.5	—	—	—	—	—	—
	BA 3416 Z	109	**BAM 3416**	127	—	—	—	—	—	—
	BA 3424 Z	162	**BAM 3424**	180	—	—	—	—	—	—
57.150 (2 1/4)	**BA 3612 Z**	85.5	**BAM 3612**	105	—	—	—	—	—	—
	BA 3616 Z	115	**BAM 3616**	135	—	—	—	—	—	—
	BA 3620 Z	143	**BAM 3620**	163	—	—	—	—	—	—
	BA 3624 Z	172	**BAM 3624**	192	—	—	—	—	—	—
66.675 (2 5/8)	**BA 4216 Z**	133	**BAM 4216**	161	—	—	—	—	—	—
69.850 (2 3/4)	**BA 4410 Z**	85.5	**BAM 4410**	115	—	—	—	—	—	—
	BA 4412 Z	103	**BAM 4412**	133	—	—	—	—	—	—
	BA 4416 Z	139	**BAM 4416**	169	—	—	—	—	—	—
	BA 4420 Z	173	**BAM 4420**	205	—	—	—	—	—	—

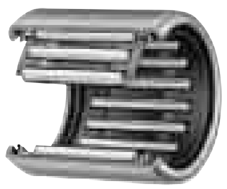
Boundary dimensions mm(inch): F_w	D	C	t_1 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm	Assembled inner ring
53.975 (2 1/8)	63.500 (2 1/2)	12.70(.500)	2.8					16 100	26 600	5 500	—
53.975 (2 1/8)	63.500 (2 1/2)	25.40(1.000)	2.8	53.975	53.956	63.518	63.488	38 700	82 500	5 500	**IRB 3016**
53.975 (2 1/8)	63.500 (2 1/2)	38.10(1.500)	2.8					57 900	138 000	5 500	**IRB 3024**
57.150 (2 1/4)	66.675 (2 5/8)	19.05(.750)	2.8					28 500	56 700	5 000	—
57.150 (2 1/4)	66.675 (2 5/8)	25.40(1.000)	2.8	57.150	57.131	66.693	66.663	39 300	85 700	5 000	—
57.150 (2 1/4)	66.675 (2 5/8)	31.75(1.250)	2.8					49 400	115 000	5 000	—
57.150 (2 1/4)	66.675 (2 5/8)	38.10(1.500)	2.8					58 800	144 000	5 000	—
66.675 (2 5/8)	76.200 (3)	25.40(1.000)	2.8	66.675	66.656	76.218	76.188	42 000	97 900	4 000	**IRB 3616**
69.850 (2 3/4)	79.375 (3 1/8)	15.88(.625)	2.8					25 000	50 800	3 500	—
69.850 (2 3/4)	79.375 (3 1/8)	19.05(.750)	2.8	69.850	69.831	79.393	79.363	31 500	68 700	3 500	—
69.850 (2 3/4)	79.375 (3 1/8)	25.40(1.000)	2.8					43 500	104 000	3 500	**IRB 4016**
69.850 (2 3/4)	79.375 (3 1/8)	31.75(1.250)	2.8					54 600	139 000	3 500	**IRB 4020**

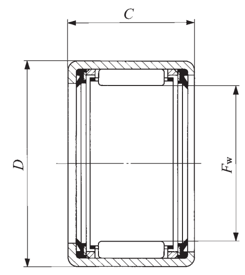
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

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

SHELL TYPE NEEDLE ROLLER BEARINGS

With seals





TLA···UU

Shaft dia. 12 ─ 50mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	Standard mounting dimensions mm Shaft dia. h6 Max.	Min.	Housing bore dia. N7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed[1] rpm
12	**TLA 1216 UU**	11.7	12	18	16	12.000	11.989	17.995	17.977	6 420	7 490	14 000
14	**TLA 1416 UU**	13.3	14	20	16	14.000	13.989	19.993	19.972	7 080	8 840	12 000
15	**TLA 1516 UU**	14	15	21	16	15.000	14.989	20.993	20.972	7 380	9 520	11 000
16	**TLA 1616 UU**	14.8	16	22	16	16.000	15.989	21.993	21.972	7 670	10 200	11 000
18	**TLA 1816 UU**	16.3	18	24	16	18.000	17.989	23.993	23.972	8 230	11 500	9 000
20	**TLA 2016 UU**	17.8	20	26	16	20.000	19.987	25.993	25.972	8 740	12 900	9 000
	TLA 2020 UU	22.5	20	26	20					11 100	17 500	9 000
22	**TLA 2216 UU**	19.4	22	28	16	22.000	21.987	27.993	27.972	9 230	14 300	8 000
	TLA 2220 UU	25	22	28	20					11 700	19 300	8 000
25	**TLA 2516 UU**	26	25	32	16	25.000	24.987	31.992	31.967	9 440	13 900	7 000
	TLA 2520 UU	33	25	32	20					12 800	20 500	7 000
28	**TLA 2820 UU**	36.5	28	35	20	28.000	27.987	34.992	34.967	13 800	23 500	6 000
30	**TLA 3016 UU**	30.5	30	37	16	30.000	29.987	36.992	36.967	10 400	16 600	5 500
	TLA 3020 UU	39	30	37	20					14 100	24 500	5 500
35	**TLA 3516 UU**	35	35	42	16	35.000	34.984	41.992	41.967	11 600	20 000	5 000
	TLA 3520 UU	45	35	42	20					15 700	29 600	5 000
40	**TLA 4016 UU**	39.5	40	47	16	40.000	39.984	46.992	46.967	12 400	22 800	4 500
	TLA 4020 UU	50.5	40	47	20					16 700	33 700	4 500
45	**TLA 4520 UU**	56	45	52	20	45.000	44.984	51.991	51.961	17 800	37 800	4 000
50	**TLA 5026 UU**	89	50	58	26	50.000	49.984	57.991	57.961	28 800	64 100	3 500

Note(1) Allowable rotational speed applies to grease lubrication.
Remark The type with seals is provided with prepacked grease.

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

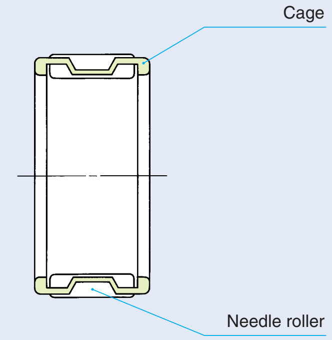
NEEDLE ROLLER CAGES FOR GENERAL USAGE

Structure and Features

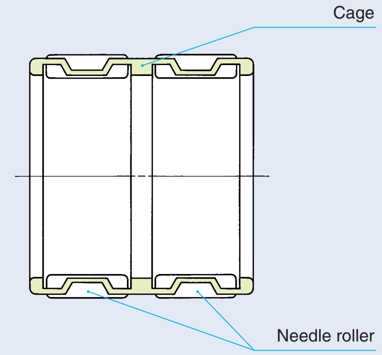
IKO Needle Roller Cages for General Usage are bearings which display excellent rotational performance. Needle rollers with extremely small dimensional variations in diameter are incorporated and retained in their specially shaped cages with high rigidity and accuracy, which precisely guide the needle rollers.
When combined with shafts and housing bores that are heat treated and accurately ground as raceway surfaces, Needle Roller Cages for General Usage are particularly useful in small spaces.
In addition, since they are lightweight and have high rigidity as well as a large lubricant holding capacity, they can withstand severe operating conditions such as high speed rotation and shock loads, and they are used in a wide range of applications.

Structures of Needle Roller Cages for General Usage

KT



KTW



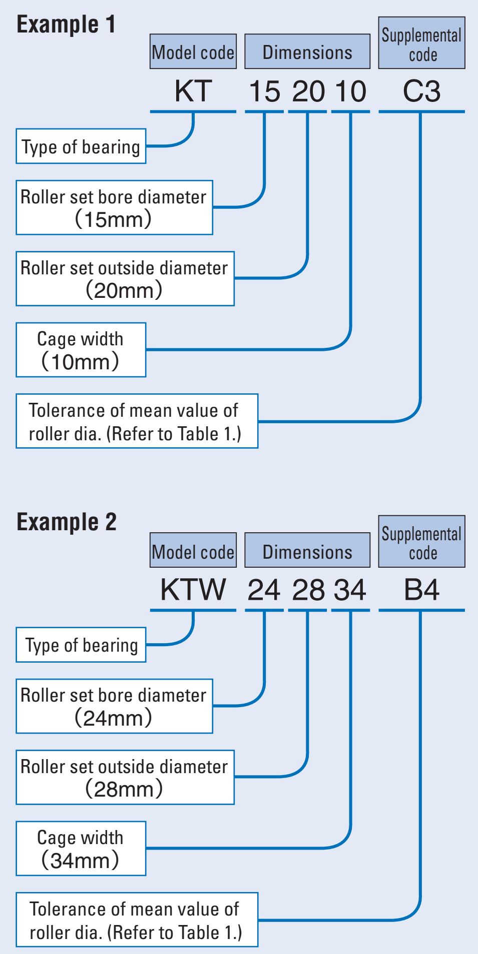
Types

Needle Roller Cages for General Usage are available in two types, with single row needle rollers and double row needle rollers.
For applications such as crank shafts where these bearings are difficult to install, it is also possible to make split type bearings.
If such bearings are required, please contact IKO.
For Needle Roller Cages for Engine Connecting Rods (KT…EG and KTV…EG), see page C17.

Identification Number

The identification number of Needle Roller Cages for General Usage consists of a model code, dimensions and any supplemental codes. The arrangement examples are shown below.

Examples of identification number



Accuracy

The diameter tolerances of needle rollers of Needle Roller Cages for General Usage are classified by classification symbols shown in Table 1. If a classification symbol is not indicated in an identification number, the classification symbol "C3" is applied.
When two or more bearings are used in tandem arrangement on the same shaft, it is necessary to select bearings of the same classification symbol to obtain an even load distribution.
The tolerance of the cage width B_c is -0.20～-0.55 mm.

Table 1 Diameter tolerances of needle rollers unit: μm

Classification symbol	Tolerance of mean value of needle roller diameter
C 3	0～－3
B 2	0～－2
B 4	－2～－4
B 6	－4～－6
B 8	－6～－8
B10	－8～－10

Fit

Radial clearances of Needle Roller Cages for General Usage are determined by the dimensional accuracy of the raceways and needle rollers. Table 2 shows the recommended fits for the operating conditions.

Table 2 Recommended fits of shaft to the housing bore diameter G6

Shaft / Operating conditions	Tolerance class of shaft	
	$F_w \leqq 68$mm	$F_w > 68$mm
When high operating accuracy is required. When shock loads and oscillating motions are applied.	j5	h5
For general use	h5	g5
When the temperature is high, or mounting errors are large.	g6	f6

Remark When setting the required radial clearance according to the operating conditions, the clearance can easily be obtained by selecting and matching the tolerances of needle rollers, shaft and housing bore. When variation of the clearance does not create any problems, h6 and G7 are used for shaft and housing bore, respectively.

Specifications of shaft and housing

For the raceways, a surface hardness of 58～64HRC and a surface roughness 0.2 μmR_a or less are desirable. However, when the operating conditions are not severe, a surface roughness 0.8 μmR_a or less can be used.
When the surface hardness is low, it is necessary to correct the load rating by the hardness factor specified on page A20.

Operating temperature range

For synthetic resin cages, "N" is added at the end of the identification number. The operating temperature range for Needle Roller Cages for General Usage is -20˚C～+120˚C. However, the maximum allowable temperature for synthetic resin cages is +110˚C, and when they are continuously operated, it is +100˚C.

Mounting

The dimensions related to mounting of Needle Roller Cages for General Usage are shown in Figs. 1 and 2.
When mounting Needle Roller Cages for General Usage, they are axially positioned by using, for example, Cir-clips for shaft and housing bore (WR and AR on page L13) as shown in Figs. 3, 4 and 5.
For high rotational speed applications, a heat treated and ground spacer is positioned between the cage and the cir-clip as shown in Fig. 5 so that the cage does not make direct contact with the cir-clip. In this case, the cir-clip is normally mounted on the non-rotating side.
Fig. 3 shows a mounting example in the case of outer ring rotation, and Figs. 4 and 5 show examples in the case of inner ring rotation.

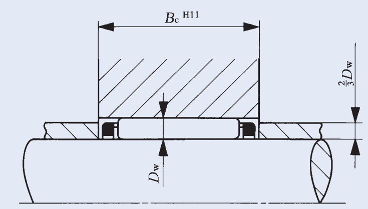


Fig.1

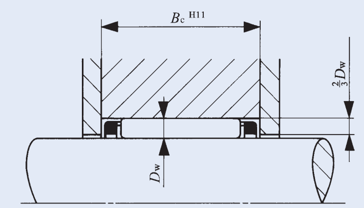


Fig.2

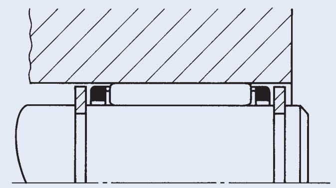


Fig.3

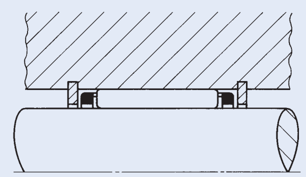


Fig.4

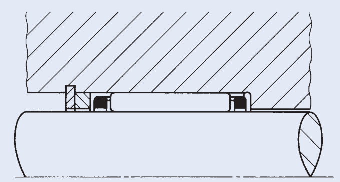
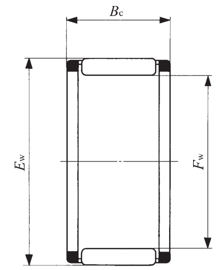


Fig.5

C
KT

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

NEEDLE ROLLER CAGES FOR GENERAL USAGE



KT

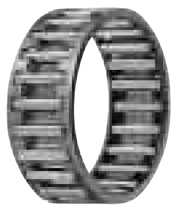
Shaft dia. 3 — 14mm

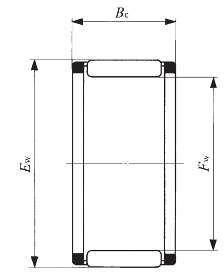
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
3	KT 367N	0.39	3	6	7	1 480	990	140 000
4	KT 477N	0.47	4	7	7	1 800	1 300	100 000
5	KT 587N	0.53	5	8	7	2 070	1 600	85 000
	KT 588N	0.66	5	8	8	2 420	1 950	85 000
6	KT 697N	0.63	6	9	7	2 310	1 900	75 000
	KT 698N	0.75	6	9	8	2 700	2 320	75 000
	KT 6910	1.45	6	9	10	3 010	2 660	75 000
	KT 61013	2.7	6	10	13	4 410	3 720	75 000
7	KT 7108N	0.86	7	10	8	2 960	2 690	65 000
	KT 71010	1.69	7	10	10	3 340	3 130	65 000
8	KT 8118N	0.96	8	11	8	3 190	3 060	60 000
	KT 81110	1.9	8	11	10	3 630	3 600	60 000
	KT 81113	2.5	8	11	13	4 500	4 750	60 000
	KT 8128	2.1	8	12	8	3 630	3 040	60 000
	KT 81211	3	8	12	11	4 630	4 170	60 000
9	KT 91210	2.1	9	12	10	3 900	4 070	55 000
	KT 91213	2.8	9	12	13	4 840	5 370	55 000
10	KT 10138	1.9	10	13	8	3 370	3 470	50 000
	KT 101310	2.3	10	13	10	4 160	4 550	50 000
	KT 101313	3	10	13	13	5 160	6 000	50 000
	KT 101410	3.2	10	14	10	4 900	4 680	50 000
	KT 101412	3.8	10	14	12	5 940	6 000	50 000
	KT 101413	4.2	10	14	13	6 100	6 200	50 000
	KT 101415	4.8	10	14	15	7 080	7 520	50 000
11	KT 111410	2.5	11	14	10	4 400	5 020	45 000

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remark For synthetic resin cages, "N" is added at the end of the identification number.

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
12	KT 12158	2.2	12	15	8	3 750	4 200	40 000
	KT 121510	2.7	12	15	10	4 620	5 490	40 000
	KT 121512	3.2	12	15	12	5 590	7 020	40 000
	KT 121513	3.6	12	15	13	5 730	7 250	40 000
	KT 121514	3.8	12	15	14	6 200	8 010	40 000
	KT 121610	4	12	16	10	5 650	5 890	40 000
	KT 121613	5.2	12	16	13	7 020	7 800	40 000
	KT 121618	7	12	16	18	9 790	11 900	40 000
	KT 121710	5.1	12	17	10	6 170	5 740	40 000
	KT 121812	7.8	12	18	12	9 030	8 460	40 000
	KT 121820	13.2	12	18	20	13 700	14 400	40 000
13	KT 131710	4.3	13	17	10	5 990	6 500	40 000
	KT 131815	8.2	13	18	15	9 660	10 400	40 000
	KT 131816	8.7	13	18	16	10 300	11 400	40 000
14	KT 14188	3.7	14	18	8	5 110	5 410	35 000
	KT 141810	4.6	14	18	10	6 320	7 110	35 000
	KT 141811	5.2	14	18	11	6 520	7 410	35 000
	KT 141813	6	14	18	13	7 860	9 410	35 000
	KT 141816	7.3	14	18	16	9 750	12 400	35 000
	KT 141910	5.9	14	19	10	7 130	7 180	35 000
	KT 141916	9.4	14	19	16	11 100	12 600	35 000
	KT 141918	10.5	14	19	18	12 400	14 700	35 000
	KT 142012	8.7	14	20	12	9 790	9 680	35 000
	KT 142017	12.4	14	20	17	13 300	14 400	35 000

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





KT

Shaft dia. 15 — 18mm

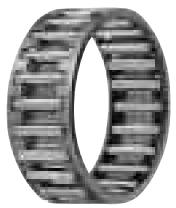
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
15	KT 15199	4.4	15	19	9	6 120	6 950	35 000
	KT 151910	4.9	15	19	10	6 630	7 720	35 000
	KT 151911	5.5	15	19	11	6 850	8 040	35 000
	KT 151913	6.4	15	19	13	8 250	10 200	35 000
	KT 151917	8.2	15	19	17	10 900	14 600	35 000
	KT 151918	8.7	15	19	18	11 500	15 600	35 000
	KT 152010	6.3	15	20	10	7 580	7 920	35 000
	KT 152115	11.9	15	21	15	12 600	13 500	35 000
16	KT 162010	5.2	16	20	10	6 930	8 330	30 000
	KT 162013	6.8	16	20	13	8 620	11 000	30 000
	KT 162016	8.3	16	20	16	10 700	14 600	30 000
	KT 162017	8.7	16	20	17	11 400	15 700	30 000
	KT 162118	12	16	21	18	14 000	17 700	30 000
	KT 162120	13.6	16	21	20	14 700	18 900	30 000
	KT 162125	16.6	16	21	25	18 300	25 100	30 000
	KT 162212	9.7	16	22	12	10 500	10 900	30 000
	KT 162214	11.5	16	22	14	11 600	12 500	30 000
	KT 162217	13.8	16	22	17	14 200	16 100	30 000
	KT 162220	16.5	16	22	20	15 900	18 600	30 000
	KT 162420	23.5	16	24	20	18 500	19 000	30 000
17	KT 172110	5.5	17	21	10	7 220	8 950	30 000
	KT 172113	7.2	17	21	13	8 980	11 800	30 000
	KT 172115	8.2	17	21	15	10 400	14 400	30 000
	KT 172117	9.3	17	21	17	11 800	16 900	30 000
	KT 172220	14	17	22	20	15 500	20 500	30 000
	KT 172311	9.6	17	23	11	10 100	10 500	30 000
	KT 172315	13.1	17	23	15	13 300	15 100	30 000
	KT 172418	18.6	17	24	18	16 500	18 000	30 000

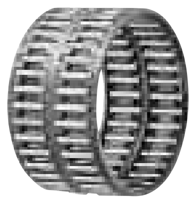
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

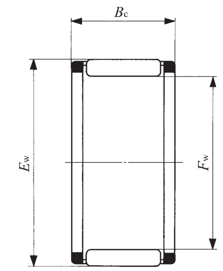
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
18	KT 18228	4.7	18	22	8	6 060	7 270	30 000
	KT 182210	5.8	18	22	10	7 500	9 560	30 000
	KT 182213	7.6	18	22	13	9 330	12 700	30 000
	KT 182216	9.2	18	22	16	11 600	16 700	30 000
	KT 182412	11	18	24	12	11 800	13 100	30 000
	KT 182416	14.8	18	24	16	15 100	17 900	30 000
	KT 182417	15.7	18	24	17	16 000	19 400	30 000
	KT 182420	18.7	18	24	20	17 900	22 400	30 000
	KT 182517	18.8	18	25	17	16 700	18 600	30 000
	KT 182519	21	18	25	19	18 700	21 400	30 000
	KT 182522	24.5	18	25	22	20 600	24 200	30 000
	KT 182614	18.1	18	26	14	14 600	14 400	30 000
	KT 182620	26	18	26	20	20 000	21 600	30 000

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

NEEDLE ROLLER CAGES FOR GENERAL USAGE







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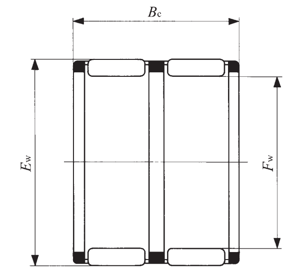


KTW

Shaft dia. 20 — 24mm

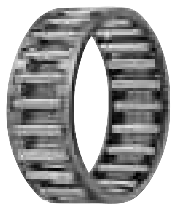
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
20	KT 202410	6.3	20	24	10	7 710	10 200	25 000
	KT 202413	8.3	20	24	13	9 590	13 500	25 000
	KT 202417	10.6	20	24	17	12 600	19 300	25 000
	KTW 202422	14.6	20	24	22	13 700	21 300	25 000
	KT 202525	19.7	20	25	25	19 900	29 800	25 000
	KTW 202531.6	26.5	20	25	31.6	21 700	33 200	25 000
	KTW 202540	32.5	20	25	40	27 500	44 900	25 000
	KT 202611	11.1	20	26	11	11 200	12 500	25 000
	KT 202612	12	20	26	12	12 400	14 300	25 000
	KT 202614	14.2	20	26	14	13 700	16 400	25 000
	KT 202617	17	20	26	17	16 800	21 200	25 000
	KT 202620	20.5	20	26	20	18 700	24 400	25 000
	KT 202624	24	20	26	24	22 500	30 900	25 000
	KT 202627	26.5	20	26	27	26 000	37 300	25 000
	KT 202814	20	20	28	14	15 700	16 100	25 000
	KT 202820	29	20	28	20	21 500	24 200	25 000
	KT 203225	49.5	20	32	25	30 800	30 500	25 000
21	KT 212610	8.5	21	26	10	9 090	11 000	25 000
	KT 212611	9.6	21	26	11	9 390	11 500	25 000

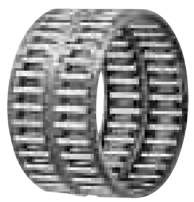
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

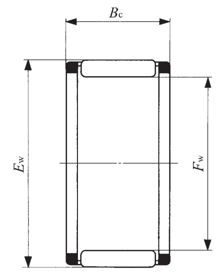
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
22	KT 222610	6.9	22	26	10	8 220	11 500	25 000
	KT 222613	9.1	22	26	13	10 200	15 200	25 000
	KT 222617	11.6	22	26	17	13 500	21 600	25 000
	KTW 222625	17.7	22	26	25	17 100	29 400	25 000
	KT 222720	17.9	22	27	20	17 400	25 700	25 000
	KT 222726	22.5	22	27	26	22 500	35 800	25 000
	KT 222817	18.4	22	28	17	17 500	23 000	25 000
	KT 222912	16.1	22	29	12	12 900	14 000	25 000
	KT 222916	21	22	29	16	17 600	20 900	25 000
	KT 222917	22.5	22	29	17	18 700	22 600	25 000
	KT 222918	23.5	22	29	18	19 800	24 400	25 000
	KT 222920	26.5	22	29	20	20 900	26 100	25 000
	KT 223015	23.5	22	30	15	17 900	19 700	25 000
	KT 223230	52.5	22	32	30	36 400	42 700	25 000
	KT 223232	56	22	32	32	38 800	46 300	25 000
23	KT 232824	22	23	28	24	21 600	34 500	20 000
	KT 232913	15.1	23	29	13	13 800	17 200	20 000
	KT 233015	21	23	30	15	17 300	20 800	20 000
	KT 233016	22	23	30	16	18 600	22 600	20 000
24	KT 242813	9.9	24	28	13	10 800	16 800	20 000
	KT 242816	12	24	28	16	13 400	22 200	20 000
	KTW 242834	27	24	28	34	21 600	40 700	20 000
	KT 242913	12.8	24	29	13	12 700	17 600	20 000
	KT 243020	23.5	24	30	20	20 300	28 500	20 000

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

NEEDLE ROLLER CAGES FOR GENERAL USAGE







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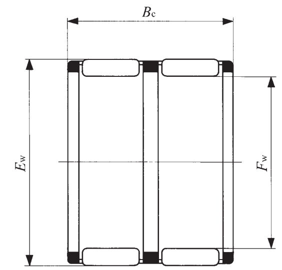


KTW

Shaft dia. 25 — 32mm

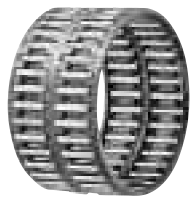
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
25	KT 252910	7.9	25	29	10	8 940	13 300	20 000
	KT 252913	10.3	25	29	13	11 100	17 600	20 000
	KT 253013	13.3	25	30	13	13 100	18 600	20 000
	KT 253016	16.2	25	30	16	16 300	24 600	20 000
	KT 253017	17.1	25	30	17	17 300	26 600	20 000
	KT 253020	20	25	30	20	18 600	29 100	20 000
	KT 253113	16.2	25	31	13	14 300	18 400	20 000
	KT 253116	19.6	25	31	16	17 800	24 400	20 000
	KT 253117	20.5	25	31	17	19 000	26 500	20 000
	KT 253120	25	25	31	20	21 200	30 500	20 000
	KT 253216	23.5	25	32	16	19 400	24 500	20 000
	KT 253224	35	25	32	24	27 700	38 700	20 000
	KT 253515	33	25	35	15	22 600	23 800	20 000
	KT 253525	48	25	35	25	32 500	37 900	20 000
	KT 253530	58	25	35	30	39 100	48 000	20 000
26	KT 263013	10.7	26	30	13	11 400	18 400	19 000
	KT 263832	79.5	26	38	32	47 200	55 300	19 000
28	KT 283313	14.8	28	33	13	13 800	20 700	18 000
	KT 283317	18.9	28	33	17	18 300	29 500	18 000
	KT 283327	29	28	33	27	26 300	47 300	18 000
	KT 283417	23	28	34	17	20 300	29 900	18 000
	KT 283516	26	28	35	16	20 100	26 500	18 000
	KT 283528	44.5	28	35	28	33 200	50 600	18 000
	KT 283620	38.5	28	36	20	26 500	34 700	18 000
	KT 284138	110	28	41	38	58 700	71 100	18 000

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
30	KT 303513	15.6	30	35	13	14 100	21 700	17 000
	KT 303516	18.9	30	35	16	17 500	28 700	17 000
	KT 303517	20	30	35	17	18 700	31 100	17 000
	KT 303524	28.5	30	35	24	24 900	45 100	17 000
	KT 303527	31.5	30	35	27	27 900	52 100	17 000
	KT 303613	19.1	30	36	13	15 800	22 100	17 000
	KT 303620	29.5	30	36	20	23 300	36 500	17 000
	KT 303630	41.5	30	36	30	33 200	57 500	17 000
	KT 303715	26	30	37	15	19 500	26 000	17 000
	KT 303716	27.5	30	37	16	20 800	28 400	17 000
	KT 303720	35	30	37	20	24 700	35 400	17 000
	KT 303723	39.5	30	37	23	28 500	42 500	17 000
	KT 303818	36.5	30	38	18	26 200	34 800	17 000
	KT 303824	48.5	30	38	24	33 200	47 200	17 000
	KT 304232	93	30	42	32	54 000	68 100	17 000
	KTW 304237	117	30	42	37	55 900	71 300	17 000
32	KT 323713	16.7	32	37	13	14 900	23 700	16 000
	KT 323717	21.5	32	37	17	19 600	33 900	16 000
	KT 323723	28.5	32	37	23	24 400	44 800	16 000
	KT 323813	20.5	32	38	13	16 800	24 400	16 000
	KT 323820	31.5	32	38	20	24 800	40 300	16 000
	KT 323916	29	32	39	16	21 600	30 200	16 000
	KT 323920	37	32	39	20	25 600	37 700	16 000
	KT 324519	63.5	32	45	19	33 700	35 900	16 000
	KT 324525	84.5	32	45	25	45 600	53 000	16 000
	KT 324532	109	32	45	32	58 500	73 000	16 000
	KT 324550	162	32	45	50	81 500	111 000	16 000

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

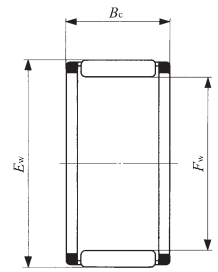
NEEDLE ROLLER CAGES FOR GENERAL USAGE



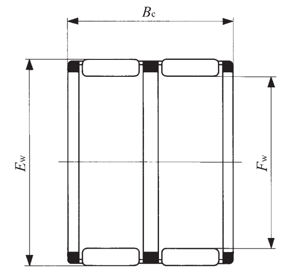
Shaft dia. 35 — 52mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed[1] rpm
35	KT 354013	18.1	35	40	13	15 500	25 800	14 000
	KT 354017	23	35	40	17	20 500	36 900	14 000
	KT 354026	34.5	35	40	26	28 700	56 800	14 000
	KT 354113	22.5	35	41	13	17 700	26 800	14 000
	KT 354216	32	35	42	16	23 100	33 900	14 000
	KT 354218	35.5	35	42	18	26 000	39 500	14 000
	KT 354220	40.5	35	42	20	27 400	42 300	14 000
	KT 354230	59	35	42	30	40 600	70 300	14 000
	KT 354525	68.5	35	45	25	42 100	57 900	14 000
36	KT 364216	27.5	36	42	16	21 900	35 700	14 000
38	KT 384417	30.5	38	44	17	23 800	40 400	13 000
	KT 384620	50	38	46	20	30 500	45 400	13 000
	KT 384632	80	38	46	32	45 400	75 700	13 000
40	KT 404513	20.5	40	45	13	16 800	29 800	12 000
	KT 404517	26.5	40	45	17	22 200	42 700	12 000
	KT 404527	41	40	45	27	32 400	69 200	12 000
	KT 404817	44	40	48	17	28 100	41 600	12 000
	KT 404820	52.5	40	48	20	31 400	48 000	12 000
	KT 404825	64.5	40	48	25	39 300	64 000	12 000
	KT 404834	87.5	40	48	34	51 100	89 600	12 000
	KT 405015	48.5	40	50	15	28 200	35 900	12 000
	KT 405017	56.5	40	50	17	30 200	39 200	12 000
	KT 405020	61	40	50	20	35 700	48 600	12 000
	KTW 405238	158	40	52	38	65 000	93 000	12 000
	KT 405432	144	40	54	32	66 800	87 200	12 000
	KT 405450	215	40	54	50	93 600	134 000	12 000
	KT 405463	270	40	54	63	115 000	175 000	12 000

Note([1]) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.



KT

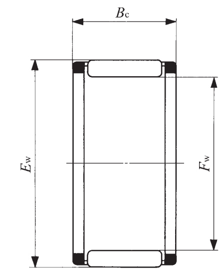


KTW

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed[1] rpm
41	KT 414835	78.5	41	48	35	47 800	90 800	12 000
42	KT 424717	27.5	42	47	17	22 500	44 200	12 000
	KT 424815	30	42	48	15	22 400	38 600	12 000
	KT 424816	32	42	48	16	24 000	42 100	12 000
	KT 425020	55	42	50	20	32 400	50 600	12 000
	KT 425030	80.5	42	50	30	48 200	84 400	12 000
45	KT 455017	29.5	45	50	17	23 300	47 100	11 000
	KT 455027	46	45	50	27	34 800	79 000	11 000
	KT 455320	58	45	53	20	33 200	53 300	11 000
	KT 455325	71.5	45	53	25	41 500	71 100	11 000
	KT 455330	86	45	53	30	47 800	85 300	11 000
	KT 455335	101	45	53	35	53 900	99 500	11 000
	KT 455527	90.5	45	55	27	50 300	78 200	11 000
48	KT 485320	37	48	53	20	26 800	57 600	10 000
	KT 485420	46	48	54	20	30 600	60 400	10 000
50	KT 505520	38.5	50	55	20	27 100	59 300	10 000
	KT 505527	50.5	50	55	27	35 600	84 100	10 000
	KT 505820	65	50	58	20	35 900	61 100	10 000
	KT 505825	80	50	58	25	44 900	81 500	10 000
	KT 505830	96.5	50	58	30	51 700	97 800	10 000
	KT 505835	113	50	58	35	58 300	114 000	10 000
52	KT 525817	41	52	58	17	28 300	56 000	9 500
	KT 526024	80	52	60	24	44 000	80 800	9 500

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

NEEDLE ROLLER CAGES FOR GENERAL USAGE



KT

Shaft dia. 55 — 100mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) rpm
55	KT 556020	42.5	55	60	20	28 600	66 000	9 000
	KT 556027	55.5	55	60	27	37 600	93 900	9 000
	KT 556120	52	55	61	20	32 600	68 500	9 000
	KT 556315	52.5	55	63	15	29 400	48 700	9 000
	KT 556320	71	55	63	20	37 400	66 400	9 000
	KT 556325	87	55	63	25	46 800	88 600	9 000
58	KT 586320	44.5	58	63	20	29 300	69 400	8 500
	KT 586420	54.5	58	64	20	33 600	72 500	8 500
60	KT 606520	45.5	60	65	20	29 700	71 100	8 500
	KT 606820	76.5	60	68	20	38 900	71 700	8 500
	KT 606825	94	60	68	25	48 600	95 600	8 500
	KT 606827	101	60	68	27	52 400	105 000	8 500
	KT 607236	205	60	72	36	86 700	152 000	8 500
63	KT 637120	79.5	63	71	20	39 500	74 400	8 000
65	KT 657320	83.5	65	73	20	41 200	79 600	7 500
	KT 657330	124	65	73	30	59 300	127 000	7 500
68	KT 687620	86.5	68	76	20	41 800	82 200	7 500
70	KT 707820	89	70	78	20	42 500	84 900	7 000
	KT 707830	132	70	78	30	61 200	136 000	7 000
72	KT 728020	91.5	72	80	20	43 200	87 500	7 000
75	KT 758320	94.5	75	83	20	43 800	90 200	6 500
	KT 758325	116	75	83	25	54 800	120 000	6 500
	KT 758330	141	75	83	30	63 100	144 000	6 500
	KT 758335	164	75	83	35	71 200	168 000	6 500
80	KT 808822	110	80	88	22	49 700	108 000	6 000
	KT 808825	123	80	88	25	56 400	127 000	6 000
	KT 808830	149	80	88	30	65 000	153 000	6 000
85	KT 859112	44.5	85	91	12	25 200	56 700	6 000
	KT 859325	130	85	93	25	57 800	134 000	6 000
	KT 859330	157	85	93	30	66 600	161 000	6 000
90	KT 909825	138	90	98	25	60 400	145 000	5 500
	KT 909830	167	90	98	30	69 600	174 000	5 500
95	KT 9510330	175	95	103	30	70 900	182 000	5 500
100	KT 10010830	184	100	108	30	72 500	191 000	4 500

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

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

NEEDLE ROLLER CAGES FOR ENGINE CONNECTING RODS

●Needle Roller Cages for Big End
●Needle Roller Cages for Small End

Structure and Features

IKO Needle Roller Cages for Engine Connecting Rods are bearings for use in engine connecting rods. These bearings have superior performance proven in high performance engines of racing motor cycles, and are widely used in small motor vehicles, motor cycles, outboard marines, snow mobiles, high-speed compressors, etc. and also in general-purpose engines.
Bearings for engine connecting rods are used under extremely severe and complex operating conditions such as heavy shock loads, high speeds, high temperatures and stringent lubrication.
Needle Roller Cages for Engine Connecting Rods are lightweight, and have high load ratings and high rigidity as well as superior wear resistance to withstand these severe conditions.

Types

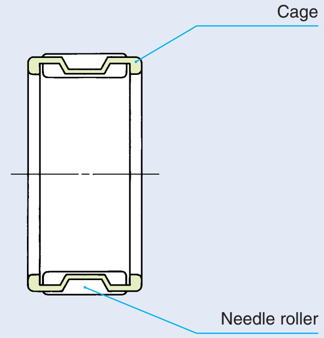
In Needle Roller Cages for Engine Connecting Rods, the types shown in Table 1 are available.

Table 1 Types

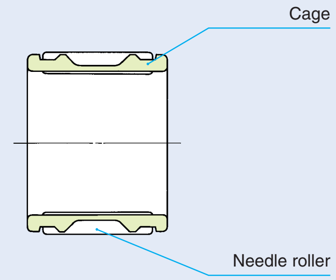
Type	For big end	For small end
Model code	KT···EG	KTV···EG

Structures of Needle Roller Cages for Engine Connecting Rods

KT···EG

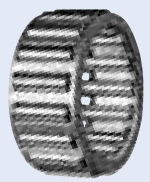


KTV···EG



Needle Roller Cages for Big End KT···EG

These roller cages are subjected to acceleration and deceleration during their rotating and epicyclic motion due to crank shaft rotation. To withstand such conditions, they are made of a special alloy and are lightweight with high rigidity.
They are guided on their outer periphery surface with superior lubricating properties.
For the purpose of using them under severe conditions such as high rotational speed and stringent lubrication, bearings plated with non-ferrous metals are also available on request.
High-load capacity and high-rigidity cages to be used for racing motor cycles (See the photo bellow.), split needle cages for solid (one-piece) type crank-shafts and other special specification cages of various types are also available. Please consult IKO when required.



High-load capacity and high-rigidity cage KTZ···EG

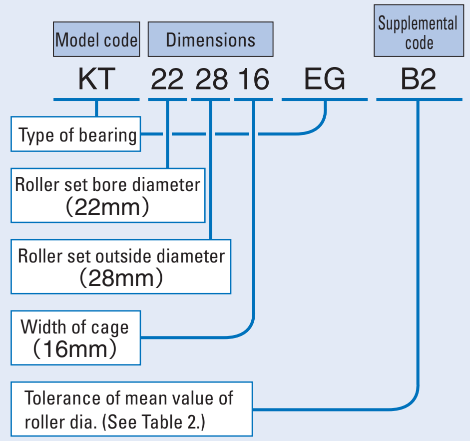
Needle Roller Cages for Small End KTV···EG

These roller cages oscillates at high speeds within a limited loading zone under heavy shock loads. Thus, these cages are designed to be lightweight and have high rigidity with a well-balanced structure. In these cages, a number of needle rollers having a small diameter are incorporated to reduce the rolling contact stress in the loading zone.
Needle Roller Cages for Small End are classified into two types, the outer surface guide type and the inner surface guide type. This classification is shown in the table of dimensions.
In the outer surface guide type, the cage is guided by the sliding contact between the inner surface of the connecting rod and the outer surface of the cage.
In the inner surface guide type, the cage is guided by the sliding contact between the outer surface of the pin and the inner surface of the cage.

Identification Number

The identification number of Needle Roller Cages for Engine Connecting Rods consists of a model code, dimensions and any supplemental codes as shown below.

Examples of identification number



Accuracy

The diameter tolerances of needle rollers of Needle Roller Cages for Engine Connecting Rods are classified as shown in Table 2. When the classification symbol is not indicated in the identification number, the classification symbol "B2" is applied.
The tolerance of the cage width B_c is $-0.2\sim-0.4$ mm. But cages with marks in the B_c column in the dimension tables are manufactured with the following width tolerances.

● : $0\sim-0.2$ mm　　■ : $-0.1\sim-0.3$ mm

Table 2 Tolerances of needle roller diameter unit: μm

Class	Classification symbol(1)	Tolerance of mean value of roller dia. (2)
Standard	B 2	$0\sim-2$
	B 4	$-2\sim-4$
Semi-standard	B 6	$-4\sim-6$
	B 8	$-6\sim-8$
	B10	$-8\sim-10$

Notes(1) The classification symbol is indicated at the end of the identification number.
(2) Tolerances for circularity are based on JIS B 1506-1991 (Rollers for rolling bearings).

Clearance

Radial internal clearances are selected according to the type of engine and the operating conditions (rotational speed, load, lubricating conditions, etc.). If a bearing is used with an inadequate clearance, bearing troubles such as seizure, early flaking and noise increase may occur, leading to an engine failure. Therefore, it is necessary to select the clearance carefully according to test results and experience.

Recommended radial internal clearances are shown in Table 3. When operating at high speeds, it is recommended to select the upper limit of the clearance.

Fit

To obtain the recommended clearance shown in Table 3, it is general practice to match a connecting rod, crank pin or piston pin and needle roller cage of suitable tolerances for assembly.

Precautions for Use

When designing a connecting rod, crank pin and piston pin, the following precautions should be taken, because the raceways are subjected to loads under extremely severe conditions.

❶ Material
It is recommended to use carburizing steel because the raceways are subjected to fluctuating loads with frequent and heavy shock loads. Generally, chromium molybdenum steel is used. Nickel chromium molybdenum steel is also used.

❷ Hardness
The recommended surface hardness of the raceway is 697～800HV (60～64HRC). While the effective hardening depth differs depending on the applications, the general value is 0.6～1.2 mm.

❸ Surface roughness
To minimize initial wear and to extend life, it is recommended that the surface roughness of the crank pin and piston pin be 0.1 μmR_a or less, and the surface roughness of the connecting rod large end and small end bores be 0.2 μmR_a or less.

❹ Accuracy
Circularity and cylindricity of connecting rod, piston pin and crank pin are as shown in Table 4.

❺ Parallelism and torsional accuracy of connecting rod bores
$L\pm0.02$ mm and $E\pm0.02$ mm shown in Fig. 1 indicate the parallelism and torsional accuracy between the big end and small end bores of the connecting rod, respectively. The tolerance range is 0.04 mm or less per 100 mm in case of a general-purpose engine and 0.02 mm or less for a high-speed engine such as a racing motorcycle engine. When these accuracy conditions are not satisfied, the axial forces on the needle roller cage and connecting rod will increase, directly leading to a failure such as seizure. Careful consideration is required.

Table 3 Recommended radial internal clearance unit: μm

Shaft dia. mm Over	Shaft dia. mm Incl.	Big end	Small end
―	18	$(d_p-6)\sim d_p$	3～15
18	30	$(d_p-8)\sim d_p$	
30	40	$(d_p-12)\sim d_p$	

Remark d_p is obtained using the following formula for roller pitch circle diameter in millimeters, and changing the unit from millimeters to micrometers.
Roller pitch circle dia. $=\dfrac{F_w+E_w}{2}$
Example KT 222814 EG for big end
Recommended clearance is; 17～25 μm

Table 4 Accuracy of connecting rod, piston pin and crank pin unit: μm

Range of dia. mm		Crank pin diameter d_1 Piston pin diameter d_2		Big end bore D_1 Small end bore D_2	
Over	Incl.	Circularity MAX.	Cylindricity MAX.	Circularity MAX.	Cylindricity MAX.
―	18	1	2	2	3
18	30	2	3	3	4
30	40	3	4	4	5

Remark Refer to Fig.1 for the dimension symbols.

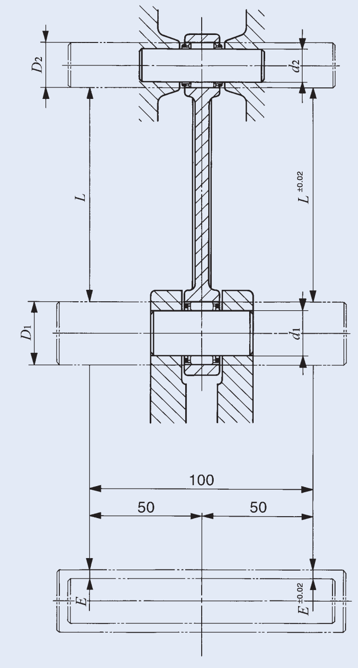


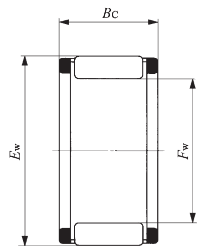
Fig.1

C
KT···EG
KTV···EG

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

NEEDLE ROLLER CAGES FOR ENGINE CONNECTING RODS

Needle Roller Cages for Big End



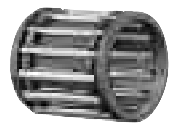
KT···EG

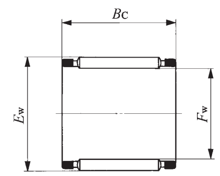
Shaft dia. 8 — 32mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N
8	KT 8128 EG	2.1	8	12	8	3 280	2 660
10	KT 101410 EG	3.2	10	14	10	4 900	4 680
12	KT 121610 EG	3.8	12	16	10	5 650	5 890
	KT 121710 EG	5.3	12	17	10	6 670	6 380
14	KT 14199.7 EG	5.7	14	19	9.7	6 120	5 880
	KT 141910 EG	5.7	14	19	10	6 640	6 530
15	KT 15199 EG	4.2	15	19	9	5 790	6 460
	KT 152010 EG	6.1	15	20	10	7 100	7 260
16	KT 162211.5 EG	9.5	16	22	▪11.5	9 550	9 660
	KT 162212 EG	9.7	16	22	12	10 500	10 900
18	KT 182210 EG	5.7	18	22	10	7 500	9 560
	KT 182411.6 EG	11	18	24	▪11.6	10 600	11 500
	KT 182412 EG	11	18	24	12	11 800	13 100
20	KT 202612 EG	12	20	26	12	12 400	14 300
	KT 202614 EG	13.8	20	26	14	13 000	15 200
	KT 202814 EG	20	20	28	•14	15 700	16 100
22	KT 222814 EG	14.9	22	28	14	13 600	16 600
	KT 222816 EG	17.5	22	28	16	15 700	19 800
	KT 222912 EG	15.2	22	29	12	12 900	14 000
	KT 223215 EG	30	22	32	15	21 300	21 500
23	KT 232913 EG	14.9	23	29	13	12 800	15 600
24	KT 243015 EG	17.9	24	30	15	14 200	18 000
	KT 243016 EG	18.2	24	30	16	16 300	21 500
	KT 243120 EG	28	24	31	20	20 800	26 400
30	KT 303818 EG	35.5	30	38	18	24 900	32 600
32	KT 324220 EG	54	32	42	20	31 900	39 400

IKO

Needle Roller Cages for Small End





KTV···EG

Shaft dia. 9 — 18mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Cage guide type
9	KTV 91211.5 EG	2.8	9	12	•11.5	3 900	4 070	Outer surface guide
	KTV 91214 EG	3.5	9	12	14	4 440	4 810	Inner surface guide
10	KTV 101316 EG	4.5	10	13	16	4 400	4 880	Inner surface guide
	KTV 101410 EG	3.8	10	14	10	4 520	4 220	Inner surface guide
	KTV 101411 EG	4.1	10	14	11	5 060	4 880	Outer surface guide
	KTV 101412.5 EG	4.8	10	14	•12.5	5 590	5 540	Inner surface guide
10.5	KTV 10.51415 EG	5.1	10.5	14	15	5 710	6 270	Outer surface guide
12	KTV 121514.3 EG	4.3	12	15	•14.3	5 840	7 390	Outer surface guide
	KTV 121613 EG	5.6	12	16	13	7 020	7 800	Outer surface guide
	KTV 121615.5 EG	6.8	12	16	•15.5	7 600	8 600	Outer surface guide
14	KTV 141812 EG	6	14	18	12	6 780	7 760	Inner surface guide
	KTV 141816.5 EG	8.2	14	18	16.5	9 180	11 500	Outer surface guide
	KTV 141822 EG	10.8	14	18	•22	9 950	12 600	Inner surface guide
16	KTV 162019 EG	10.6	16	20	19	10 800	14 600	Outer surface guide
	KTV 162022 EG	12.7	16	20	22	11 400	15 700	Inner surface guide
18	KTV 182223.5 EG	14.9	18	22	▪23.5	13 000	19 300	Inner surface guide
	KTV 182321 EG	16.4	18	23	21	14 400	18 900	Inner surface guide

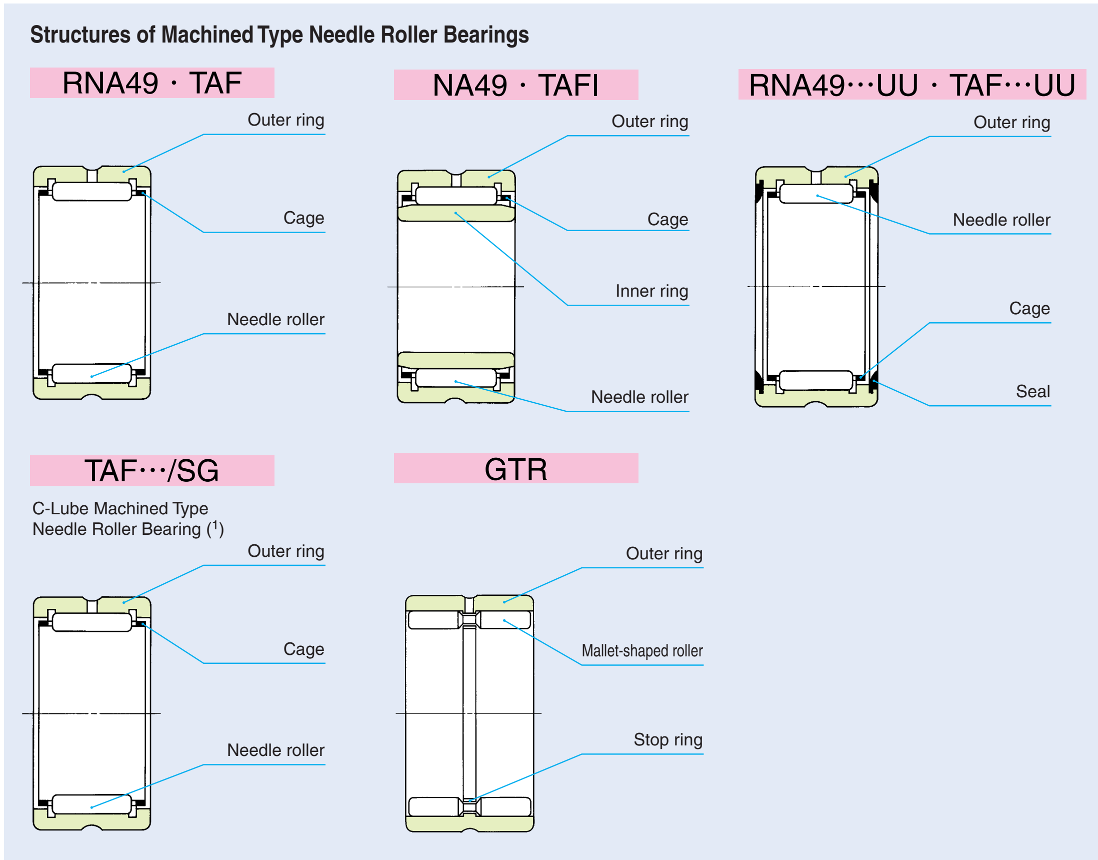
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

- Machined Type Caged Needle Roller Bearings
- Machined Type Guide Needle Roller Bearings
- C-Lube 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.



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 TAF/SG	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.

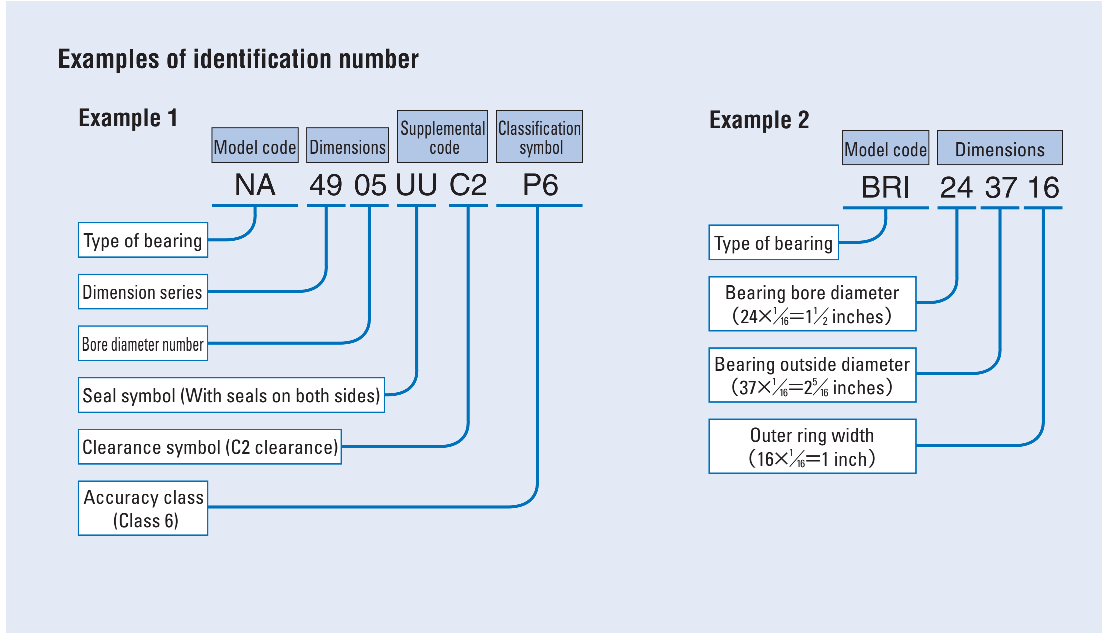
Needle Roller Bearings with Seal
These bearings are sealed types of the NA49, NA69 and BRI series bearings, in which a seal is installed on one side (type with one seal) or both sides (type with two seals) of the bearing. The seal is made of special synthetic rubber and effectively prevents dust penetration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



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.

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.

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, TAF/SG	×	–	–
	Inch series	BR, BRI	×	○	×
Guide Needle Roller Bearings	Metric series	GTR, GTRI	×	–	–
	Inch series	GBR, GBRI	×	○	×

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			Nominal roller set bore diameter F_w mm	Number of oil holes of the outer ring: 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			Nominal bearing bore diameter d mm	Number of oil holes of the inner ring: 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

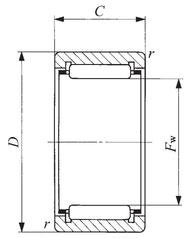
When using two or more Machined Type Needle Roller Bearings adjacent to each other on the same shaft, it is necessary to obtain an even load distribution. On request, a set of bearings is available, in which bearings are matched to obtain an even load distribution.

Mounting

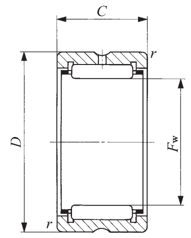
Mounting dimensions for Machined Type Needle Roller Bearings are shown in the table of dimensions.

C-LUBE MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



$F_w \leqq 26$
(Without oil hole and oil groove)



$F_w > 26$
(With oil hole and oil groove)

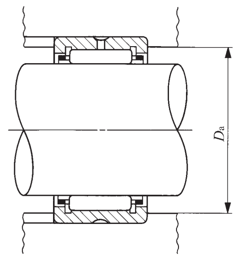
Shaft dia. 10 — 45mm

Shaft dia.	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N
10	TAF 101712/SG	11	10	17	12	0.2	15.4	5 880	5 970
	TAF 101716/SG	14.7	10	17	16	0.2	15.4	8 230	9 190
12	TAF 121912/SG	12.5	12	19	12	0.3	17	6 610	7 260
	TAF 121916/SG	16.8	12	19	16	0.3	17	9 250	11 200
14	TAF 142216/SG	22	14	22	16	0.3	20	11 700	13 700
	TAF 142220/SG	27.5	14	22	20	0.3	20	14 800	18 600
15	TAF 152316/SG	23.5	15	23	16	0.3	21	12 300	14 900
	TAF 152320/SG	29	15	23	20	0.3	21	15 600	20 200
16	TAF 162416/SG	24	16	24	16	0.3	22	12 300	15 100
	TAF 162420/SG	30	16	24	20	0.3	22	15 500	20 400
18	TAF 182616/SG	26.5	18	26	16	0.3	24	13 400	17 500
	TAF 182620/SG	33	18	26	20	0.3	24	17 000	23 600
19	TAF 192716/SG	28	19	27	16	0.3	25	14 000	18 700
	TAF 192720/SG	35.5	19	27	20	0.3	25	17 700	25 300
20	TAF 202816/SG	28.5	20	28	16	0.3	26	13 900	18 800
	TAF 202820/SG	37	20	28	20	0.3	26	17 600	25 400
21	TAF 212916/SG	30	21	29	16	0.3	27	14 400	20 000
	TAF 212920/SG	37.5	21	29	20	0.3	27	18 200	27 100
22	TAF 223016/SG	31	22	30	16	0.3	28	14 900	21 200
	TAF 223020/SG	39	22	30	20	0.3	28	18 900	28 700
24	TAF 243216/SG	33	24	32	16	0.3	30	15 300	22 500
	TAF 243220/SG	42	24	32	20	0.3	30	19 400	30 500
25	TAF 253316/SG	35	25	33	16	0.3	31	15 800	23 700
	TAF 253320/SG	43.5	25	33	20	0.3	31	20 000	32 100
29	TAF 293820/SG	59	29	38	20	0.3	36	21 600	37 200
	TAF 293830/SG	88	29	38	30	0.3	36	30 900	59 100
30	TAF 304020/SG	67	30	40	20	0.3	38	25 100	40 100
	TAF 304030/SG	101	30	40	30	0.3	38	36 000	63 900
35	TAF 354520/SG	76.5	35	45	20	0.3	43	26 900	46 200
	TAF 354530/SG	116.5	35	45	30	0.3	43	38 600	73 600
40	TAF 405020/SG	86	40	50	20	0.3	48	29 400	54 100
	TAF 405030/SG	130	40	50	30	0.3	48	42 300	86 200
45	TAF 455520/SG	95.5	45	55	20	0.3	53	31 000	60 200
	TAF 455530/SG	144	45	55	30	0.3	53	44 600	95 800

Note(1) Minimum allowable value of chamfer dimension r .

Remarks
1. Allowable rotational speed : $d_m n \leqq 20000$ ($d_m n$=(bore diameter of bearing [mm] + outside diameter of bearing [mm])/2 X rotational speed [mm])
2. Please do not wash with organic solvent and/or white kerosene which have the ability to remove fat.
3. To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
4. The operating temperature range is -15～+80℃. Continuous operating temperature is +60℃ or less.
5. Models with a nominal roller set bore diameter Fw of 26mm or less are provided without oil holes. other models are provided with one oil hole and oil groove.
However, this bearing can not be re-lubricated as thermosetting solid-type lubricant fills inner space of the bearing.

IKO

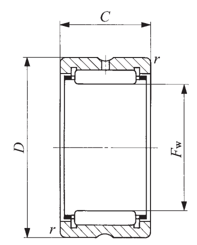


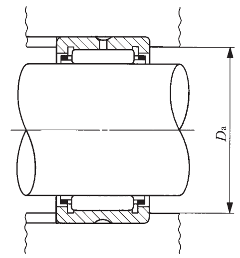
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring

IKO





RNA49 TAF
RNA69 ($F_w \leqq 35$)

Shaft dia. 5 — 15mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
5	—	—	—	TAF 51010	—	—	3.4	5	10	10	0.2	8.4	2 420	1 950	80 000
	—	—	—	TAF 51012	—	—	4.2	5	10	12	0.2	8.4	3 080	2 660	80 000
	RNA 493	—	—	—	—	—	4.6	5	11	10	0.15	9.8	2 420	1 950	80 000
6	RNA 494	—	—	—	—	—	5.3	6	12	10	0.15	10.8	2 700	2 320	70 000
	—	—	—	TAF 61212	—	—	6.4	6	12	12	0.2	10.4	3 440	3 170	70 000
7	RNA 495	—	—	—	—	—	5.9	7	13	10	0.15	11.8	2 960	2 690	60 000
	—	—	—	TAF 71410	—	—	6.9	7	14	10	0.2	12.4	3 600	2 960	60 000
	—	—	—	TAF 71412	—	—	8.3	7	14	12	0.2	12.4	4 610	4 050	60 000
8	RNA 496	—	—	—	—	—	7.4	8	15	10	0.15	13.8	3 960	3 420	50 000
	—	—	—	TAF 81512	—	—	9.1	8	15	12	0.2	13.4	5 060	4 690	50 000
	—	—	—	TAF 81516	—	—	12.9	8	15	16	0.2	13.4	7 080	7 220	50 000
9	—	—	—	TAF 91612	—	—	9.8	9	16	12	0.2	14.4	5 490	5 330	45 000
	—	—	—	TAF 91616	—	—	13.2	9	16	16	0.2	14.4	7 680	8 210	45 000
	RNA 497	—	—	—	—	—	9.3	9	17	10	0.15	15.8	4 530	3 650	45 000
10	—	—	—	TAF 101712	—	—	10.7	10	17	12	0.2	15.4	5 880	5 970	40 000
	—	—	—	TAF 101716	—	—	14.3	10	17	16	0.2	15.4	8 230	9 190	40 000
	RNA 498	—	—	—	—	—	12.6	10	19	11	0.2	17.4	6 180	5 030	40 000
12	—	—	—	TAF 121912	—	—	12.2	12	19	12	0.3	17	6 610	7 260	35 000
	—	—	—	TAF 121916	—	—	16.3	12	19	16	0.3	17	9 250	11 200	35 000
	RNA 499	—	—	—	—	—	13.6	12	20	11	0.3	18	6 600	6 310	35 000
14	RNA 4900	—	—	—	—	—	16.5	14	22	13	0.3	20	9 230	10 100	30 000
	—	—	—	TAF 142216	—	—	21	14	22	16	0.3	20	11 700	13 700	30 000
	—	—	—	TAF 142220	—	—	26.5	14	22	20	0.3	20	14 800	18 600	30 000
15	—	—	—	TAF 152316	—	—	22.5	15	23	16	0.3	21	12 300	14 900	30 000
	—	—	—	TAF 152320	—	—	28	15	23	20	0.3	21	15 600	20 200	30 000

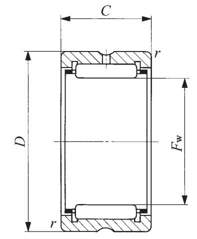
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

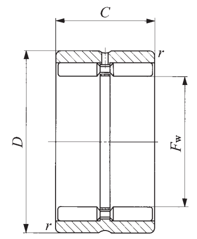
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

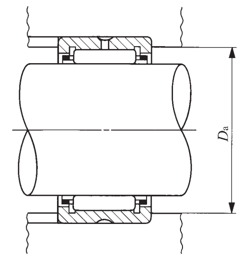
Without Inner Ring



RNA49 TAF TR
RNA69 ($F_w \leqq 35$)



GTR



Shaft dia. 16 — 22mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
16	**RNA 4901**	—	—	—	—	—	18.1	16	24	13	0.3	22	9 660	11 100	25 000
	—	—	—	**TAF 162416**	—	—	23	16	24	16	0.3	22	12 300	15 100	25 000
	—	—	—	**TAF 162420**	—	—	29	16	24	20	0.3	22	15 500	20 400	25 000
	—	**RNA 6901**	—	—	—	—	30	16	24	22	0.3	22	17 100	23 000	25 000
17	—	—	—	**TAF 172516**	—	—	24.5	17	25	16	0.3	23	12 900	16 300	25 000
	—	—	—	**TAF 172520**	—	—	30.5	17	25	20	0.3	23	16 300	22 000	25 000
18	**RNA 49/14**	—	—	—	—	—	19.9	18	26	13	0.3	24	10 600	12 800	20 000
	—	—	—	**TAF 182616**	—	—	25.5	18	26	16	0.3	24	13 400	17 500	20 000
	—	—	—	**TAF 182620**	—	—	32	18	26	20	0.3	24	17 000	23 600	20 000
19	—	—	—	**TAF 192716**	—	—	27	19	27	16	0.3	25	14 000	18 700	20 000
	—	—	—	**TAF 192720**	—	—	34	19	27	20	0.3	25	17 700	25 300	20 000
20	**RNA 4902**	—	—	—	—	—	21.5	20	28	13	0.3	26	10 900	13 800	20 000
	—	—	—	**TAF 202816**	—	—	27.5	20	28	16	0.3	26	13 900	18 800	20 000
	—	—	—	**TAF 202820**	—	—	35.5	20	28	20	0.3	26	17 600	25 400	20 000
	—	**RNA 6902**	—	—	—	—	37	20	28	23	0.3	26	19 300	28 800	20 000
	—	—	—	—	**TR 203320**	—	59.5	20	33	20	0.3	31	24 300	26 500	20 000
	—	—	—	—	—	**GTR 203320**	69	20	33	20	0.3	31	29 200	37 200	7 500
21	—	—	—	**TAF 212916**	—	—	29	21	29	16	0.3	27	14 400	20 000	19 000
	—	—	—	**TAF 212920**	—	—	36	21	29	20	0.3	27	18 200	27 100	19 000
22	**RNA 4903**	—	—	—	—	—	23.5	22	30	13	0.3	28	11 700	15 600	18 000
	—	—	—	**TAF 223016**	—	—	30	22	30	16	0.3	28	14 900	21 200	18 000
	—	—	—	**TAF 223020**	—	—	37.5	22	30	20	0.3	28	18 900	28 700	18 000
	—	**RNA 6903**	—	—	—	—	40.5	22	30	23	0.3	28	20 800	32 500	18 000
	—	—	—	—	**TR 223425**	—	73.5	22	34	25	0.3	32	29 100	36 800	18 000
	—	—	—	—	—	**GTR 223425**	87	22	34	25	0.3	32	37 900	57 800	7 000

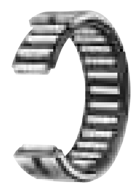
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, 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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



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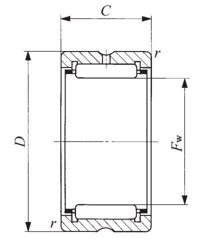
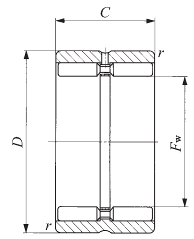
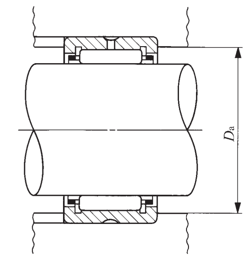


RNA49 TAF TR
RNA69 ($F_w \leqq 35$)



GTR



Shaft dia. 24 – 30mm

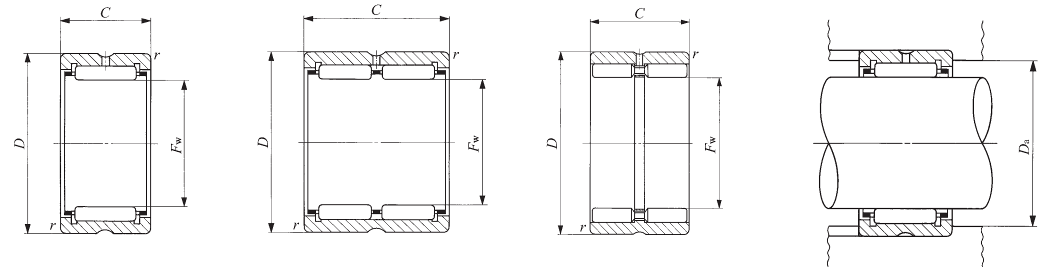
Shaft dia. mm	RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	F_w mm	D mm	C mm	$r_{s\,min}$ (1) mm	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
24	—	—	—	**TAF 243216**	—	—	32	24	32	16	0.3	30	15 300	22 500	17 000
	—	—	—	**TAF 243220**	—	—	40.5	24	32	20	0.3	30	19 400	30 500	17 000
25	—	—	—	**TAF 253316**	—	—	33.5	25	33	16	0.3	31	15 800	23 700	16 000
	—	—	—	**TAF 253320**	—	—	42	25	33	20	0.3	31	20 000	32 100	16 000
	RNA 4904	—	—	—	—	—	55.5	25	37	17	0.3	35	21 000	25 000	16 000
	—	**RNA 6904**	—	—	—	—	95.5	25	37	30	0.3	35	35 400	48 900	16 000
	—	—	—	—	**TR 253820**	—	71	25	38	20	0.3	36	28 900	35 000	16 000
	—	—	—	—	**TR 253825**	—	89	25	38	25	0.3	36	34 800	44 400	16 000
	—	—	—	—	—	**GTR 253820**	81.5	25	38	20	0.3	36	33 300	46 500	6 000
	—	—	—	—	—	**GTR 253825**	104	25	38	25	0.3	36	42 400	63 700	6 000
26	—	—	—	**TAF 263416**	—	—	34.5	26	34	16	0.3	32	16 300	24 900	15 000
	—	—	—	**TAF 263420**	—	—	43.5	26	34	20	0.3	32	20 600	33 800	15 000
28	—	—	—	**TAF 283720**	—	—	51.5	28	37	20	0.3	35	21 700	37 100	14 000
	—	—	—	**TAF 283730**	—	—	83.5	28	37	30	0.3	35	31 100	58 900	14 000
	RNA 49/22	—	—	—	—	—	56.5	28	39	17	0.3	37	21 400	28 900	14 000
	—	**RNA 69/22**	—	—	—	—	97.5	28	39	30	0.3	37	36 300	56 900	14 000
29	—	—	—	**TAF 293820**	—	—	57	29	38	20	0.3	36	21 600	37 200	14 000
	—	—	—	**TAF 293830**	—	—	85	29	38	30	0.3	36	30 900	59 100	14 000
30	—	—	—	**TAF 304020**	—	—	64.5	30	40	20	0.3	38	25 100	40 100	13 000
	—	—	—	**TAF 304030**	—	—	97.5	30	40	30	0.3	38	36 000	63 900	13 000
	RNA 4905	—	—	—	—	—	64	30	42	17	0.3	40	23 700	30 700	13 000
	—	**RNA 6905**	—	—	—	—	111	30	42	30	0.3	40	42 100	64 300	13 000
	—	—	—	—	**TR 304425**	—	115	30	44	25	0.3	42	37 900	52 100	13 000
	—	—	—	—	—	**GTR 304425**	133	30	44	25	0.3	42	47 000	76 500	5 000

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, 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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 TAF TR
RNA69 (F_w ≦ 35)

RNA69

GTR

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Shaft dia. 32 — 40mm

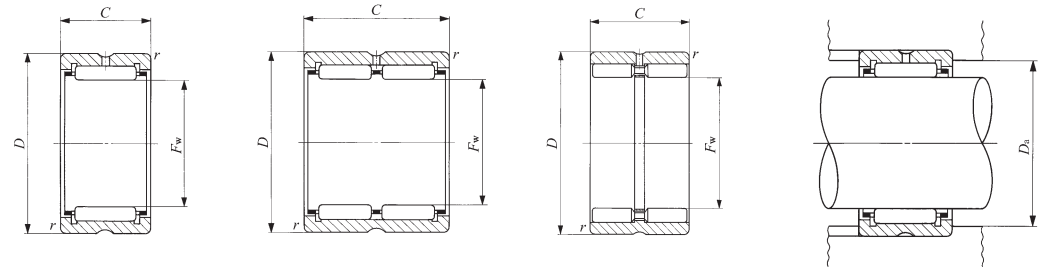
Shaft dia. mm	RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
32	—	—	—	TAF 324220	—	—	68	32	42	20	0.3	40	25 700	42 200	12 000
	—	—	—	TAF 324230	—	—	102	32	42	30	0.3	40	36 800	67 200	12 000
	RNA 49/28	—	—	—	—	—	76.5	32	45	17	0.3	43	24 500	32 700	12 000
	—	RNA 69/28	—	—	—	—	133	32	45	30	0.3	43	41 800	64 800	12 000
	—	—	—	—	—	GTR 324530	152	32	45	30	0.3	43	58 000	101 000	4 500
35	—	—	—	TAF 354520	—	—	73.5	35	45	20	0.3	43	26 900	46 200	11 000
	—	—	—	TAF 354530	—	—	112	35	45	30	0.3	43	38 600	73 600	11 000
	RNA 4906	—	—	—	—	—	72.5	35	47	17	0.3	45	25 200	34 700	11 000
	—	RNA 6906	—	—	—	—	125	35	47	30	0.3	45	43 000	69 000	11 000
	—	—	—	—	TR 354830	—	139	35	48	30	0.3	46	47 400	72 300	11 000
	—	—	—	—	—	GTR 354830	163	35	48	30	0.3	46	61 100	110 000	4 500
37	—	—	—	TAF 374720	—	—	77.5	37	47	20	0.3	45	28 200	50 100	11 000
	—	—	—	TAF 374730	—	—	117	37	47	30	0.3	45	40 500	79 800	11 000
38	—	—	—	TAF 384820	—	—	79	38	48	20	0.3	46	28 100	50 200	11 000
	—	—	—	TAF 384830	—	—	119	38	48	30	0.3	46	40 300	80 000	11 000
	—	—	—	—	TR 385230	—	168	38	52	30	0.6	48	50 800	81 100	11 000
	—	—	—	—	—	GTR 385230	195	38	52	30	0.6	48	64 200	121 000	4 000
40	—	—	—	TAF 405020	—	—	83	40	50	20	0.3	48	29 400	54 100	10 000
	—	—	—	TAF 405030	—	—	125	40	50	30	0.3	48	42 300	86 200	10 000
	RNA 49/32	—	—	—	—	—	96	40	52	20	0.6	48	31 200	47 800	10 000
	—	RNA 69/32	—	—	—	—	172	40	52	36	0.6	48	53 500	95 700	10 000
	—	—	—	—	TR 405520	—	129	40	55	20	0.6	51	37 400	55 700	10 000
	—	—	—	—	—	GTR 405520	144	40	55	20	0.6	51	44 300	73 600	3 500

Notes(1) Minimum allowable value of chamfer dimension r
(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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 TAF TR　　　RNA69　　　GTR

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Shaft dia. 42 — 50mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
42	—	—	—	**TAF 425220**	—	—	86.5
	—	—	—	**TAF 425230**	—	—	130
	RNA 4907	—	—	—	—	—	113
	—	**RNA 6907**	—	—	—	—	200
	—	—	—	—	**TR 425630**	—	183
	—	—	—	—	—	**GTR 425630**	210
43	—	—	—	**TAF 435320**	—	—	88.5
	—	—	—	**TAF 435330**	—	—	133
45	—	—	—	**TAF 455520**	—	—	92
	—	—	—	**TAF 455530**	—	—	138
	RNA 49/38	—	—	—	—	—	120
	—	—	—	—	**TR 455930**	—	193
	—	—	—	—	—	**GTR 455930**	225
47	—	—	—	**TAF 475720**	—	—	95
	—	—	—	**TAF 475730**	—	—	144
48	**RNA 4908**	—	—	—	—	—	152
	—	—	—	—	**TR 486230**	—	205
	—	**RNA 6908**	—	—	—	—	275
	—	—	—	—	—	**GTR 486230**	240
50	—	—	—	**TAF 506225**	—	—	159
	—	—	—	**TAF 506235**	—	—	225
	—	—	—	—	**TR 506430**	—	210
	RNA 49/42	—	—	—	—	—	174
	—	—	—	—	—	**GTR 506430**	245

Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
42	52	20	0.3	50	29 900	56 200	9 500
42	52	30	0.3	50	43 000	89 400	9 500
42	55	20	0.6	51	32 000	50 100	9 500
42	55	36	0.6	51	54 900	100 000	9 500
42	56	30	0.6	52	53 800	90 100	9 500
42	56	30	0.6	52	67 500	133 000	3 500
43	53	20	0.3	51	30 500	58 200	9 500
43	53	30	0.3	51	43 800	92 600	9 500
45	55	20	0.3	53	31 000	60 200	9 000
45	55	30	0.3	53	44 600	95 800	9 000
45	58	20	0.6	54	33 600	54 600	9 000
45	59	30	0.6	55	55 100	94 800	9 000
45	59	30	0.6	55	70 300	142 000	3 500
47	57	20	0.3	55	31 500	62 200	8 500
47	57	30	0.3	55	45 200	99 100	8 500
48	62	22	0.6	58	41 600	67 400	8 500
48	62	30	0.6	58	56 300	99 500	8 500
48	62	40	0.6	58	71 300	135 000	8 500
48	62	30	0.6	58	72 700	154 000	3 000
50	62	25	0.3	60	43 000	85 300	8 000
50	62	35	0.3	60	58 000	125 000	8 000
50	64	30	0.6	60	57 700	104 000	8 000
50	65	22	0.6	61	42 500	70 300	8 000
50	64	30	0.6	60	74 600	158 000	3 000

Notes(1) Minimum allowable value of chamfer dimension r
(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.

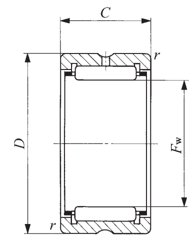
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

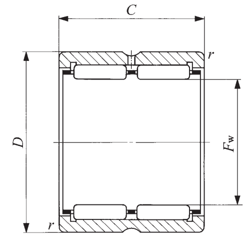
IKO

Without Inner Ring

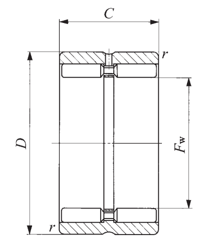




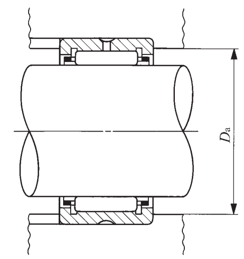
RNA49 TAF TR



RNA69



GTR



Shaft dia. 52 — 68mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
52	RNA 4909	—	—	—	—	—	197	52	68	22	0.6	64	43 500	73 300	7 500
	—	RNA 6909	—	—	—	—	355	52	68	40	0.6	64	74 600	147 000	7 500
55	—	—	—	TAF 556825	—	—	193	55	68	25	0.3	66	45 400	94 000	7 500
	—	—	—	TAF 556835	—	—	255	55	68	35	0.3	66	61 200	138 000	7 500
	RNA 49/48	—	—	—	—	—	188	55	70	22	0.6	66	44 300	76 300	7 500
58	RNA 4910	—	—	—	—	—	179	58	72	22	0.6	68	46 200	82 100	7 000
	—	RNA 6910	—	—	—	—	320	58	72	40	0.6	68	79 200	164 000	7 000
	—	—	—	—	TR 587745	—	515	58	77	45	1	72	104 000	191 000	7 000
	—	—	—	—	—	GTR 587745	590	58	77	45	1	72	135 000	280 000	2 500
60	—	—	—	TAF 607225	—	—	187	60	72	25	0.3	70	47 500	103 000	6 500
	—	—	—	TAF 607235	—	—	260	60	72	35	0.3	70	64 100	151 000	6 500
	RNA 49/52	—	—	—	—	—	205	60	75	22	0.6	71	47 100	85 100	6 500
62	—	—	—	—	TR 628138	—	460	62	81	38	1	76	92 000	166 000	6 500
	—	—	—	—	—	GTR 628138	520	62	81	38	1	76	118 000	241 000	2 500
63	RNA 4911	—	—	—	—	—	265	63	80	25	1	75	57 600	97 200	6 500
	—	RNA 6911	—	—	—	—	475	63	80	45	1	75	98 700	194 000	6 500
65	—	—	—	TAF 657825	—	—	225	65	78	25	0.6	74	49 600	112 000	6 000
	—	—	—	TAF 657835	—	—	315	65	78	35	0.6	74	67 000	164 000	6 000
	RNA 49/58	—	—	—	—	—	275	65	82	25	1	77	58 900	101 000	6 000
68	—	—	—	TAF 688225	—	—	250	68	82	25	0.6	78	54 800	117 000	6 000
	—	—	—	TAF 688235	—	—	350	68	82	35	0.6	78	72 000	166 000	6 000
	RNA 4912	—	—	—	—	—	285	68	85	25	1	80	60 200	105 000	6 000
	—	RNA 6912	—	—	—	—	510	68	85	45	1	80	103 000	211 000	6 000

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

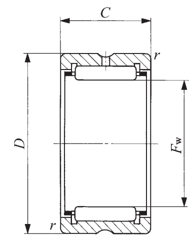
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

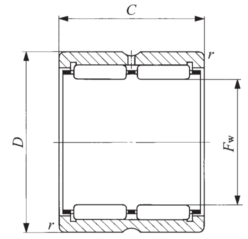
Without Inner Ring



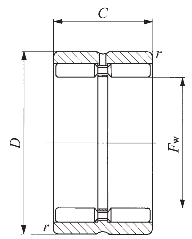
IKO



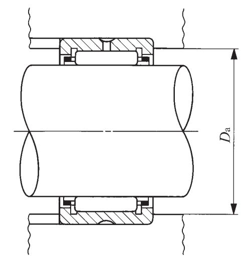
RNA49 TAF TR



RNA69



GTR



Shaft dia. 70 — 85mm

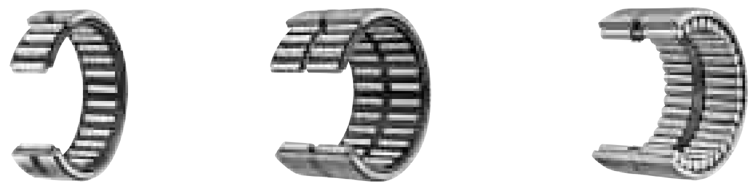
Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
70	—	—	—	TAF 708525	—	—	280	70	85	25	0.6	81	55 500	120 000	5 500
	—	—	—	TAF 708535	—	—	395	70	85	35	0.6	81	73 000	171 000	5 500
	RNA 49/62	—	—	—	—	—	320	70	88	25	1	83	61 500	109 000	5 500
	—	—	—	—	TR 708945	—	605	70	89	45	1	84	114 000	228 000	5 500
	—	—	—	—	—	GTR 708945	690	70	89	45	1	84	147 000	336 000	2 000
72	RNA 4913	—	—		—	—	325	72	90	25	1	85	62 700	113 000	5 500
	—	RNA 6913	—	—	—	—	585	72	90	45	1	85	108 000	227 000	5 500
73	—	—	—	TAF 739025	—	—	335	73	90	25	1	85	61 100	127 000	5 500
	—	—	—	TAF 739035	—	—	475	73	90	35	1	85	80 400	181 000	5 500
75	—	—	—	TAF 759225	—	—	345	75	92	25	1	87	62 100	131 000	5 500
	—	—	—	TAF 759235	—	—	485	75	92	35	1	87	81 700	186 000	5 500
	RNA 49/68	—	—	—	—	—	470	75	95	30	1	90	79 900	147 000	5 500
80	—	—	—	TAF 809525	—	—	315	80	95	25	1	90	59 400	137 000	5 000
	—	—	—	TAF 809535	—	—	445	80	95	35	1	90	78 100	195 000	5 000
	RNA 4914	—	—	—	—	—	495	80	100	30	1	95	83 200	158 000	5 000
	—	RNA 6914	—	—	—	—	910	80	100	54	1	95	134 000	311 000	5 000
83	—	—	—	—	TR 8310845	—	995	83	108	45	1	103	146 000	270 000	5 000
	—	—	—	—	—	GTR 8310845	1 090	83	108	45	1	103	190 000	396 000	1 800
85	—	—	—	TAF 8510525	—	—	435	85	105	25	1	100	76 300	145 000	4 500
	RNA 4915	—	—	—	—	—	525	85	105	30	1	100	86 200	169 000	4 500
	—	—	—	TAF 8510535	—	—	610	85	105	35	1	100	102 000	210 000	4 500
	—	RNA 6915	—	—	—	—	960	85	105	54	1	100	138 000	331 000	4 500

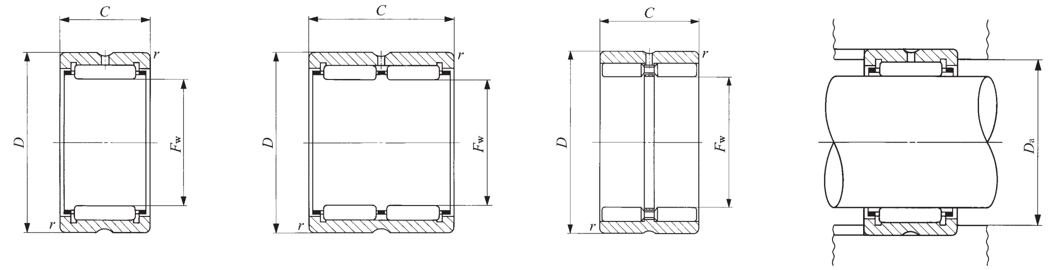
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring





RNA49 TAF TR　　RNA69　　GTR

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Shaft dia. 90 — 105mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
90	—	—	—	**TAF 9011025**	—	—	455	90	110	25	1	105	77 300	150 000	4 500
	RNA 4916	—	—	—	—	—	550	90	110	30	1	105	87 300	175 000	4 500
	—	—	—	**TAF 9011035**	—	—	640	90	110	35	1	105	103 000	217 000	4 500
	—	**RNA 6916**	—	—	—	—	1 010	90	110	54	1	105	143 000	351 000	4 500
93	—	—	—	—	**TR 9311850**	—	1 210	93	118	50	1	113	165 000	329 000	4 500
	—	—	—	—	—	**GTR 9311850**	1 340	93	118	50	1	113	224 000	509 000	1 600
95	—	—	—	**TAF 9511526**	—	—	495	95	115	26	1	110	79 700	159 000	4 000
	RNA 49/82	—	—	—	—	—	575	95	115	30	1	110	90 000	186 000	4 000
	—	—	—	**TAF 9511536**	—	—	690	95	115	36	1	110	106 000	231 000	4 000
	—	—	—	—	**TR 9512045**	—	1 120	95	120	45	1.5	112	155 000	305 000	4 000
	—	—	—	—	—	**GTR 9512045**	1 230	95	120	45	1.5	112	204 000	455 000	1 600
100	—	—	—	**TAF 10012026**	—	—	525	100	120	26	1	115	82 400	168 000	4 000
	RNA 4917	—	—	—	—	—	705	100	120	35	1.1	113.5	110 000	244 000	4 000
	—	—	—	**TAF 10012036**	—	—	725	100	120	36	1	115	110 000	244 000	4 000
	—	**RNA 6917**	—	—	—	—	1 300	100	120	63	1.1	113.5	173 000	467 000	4 000
	—	—	—	—	**TR 10012550**	—	1 290	100	125	50	1.5	117	172 000	355 000	4 000
	—	—	—	—	—	**GTR 10012550**	1 440	100	125	50	1.5	117	234 000	549 000	1 500
105	—	—	—	**TAF 10512526**	—	—	545	105	125	26	1	120	84 700	178 000	4 000
	RNA 4918	—	—	—	—	—	740	105	125	35	1.1	118.5	113 000	258 000	4 000
	—	—	—	**TAF 10512536**	—	—	760	105	125	36	1	120	113 000	258 000	4 000
	—	**RNA 6918**	—	—	—	—	1 360	105	125	63	1.1	118.5	178 000	490 000	4 000

Notes(1) Minimum allowable value of chamfer dimension r
(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.

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring

Shaft dia. 110 ─ 170mm

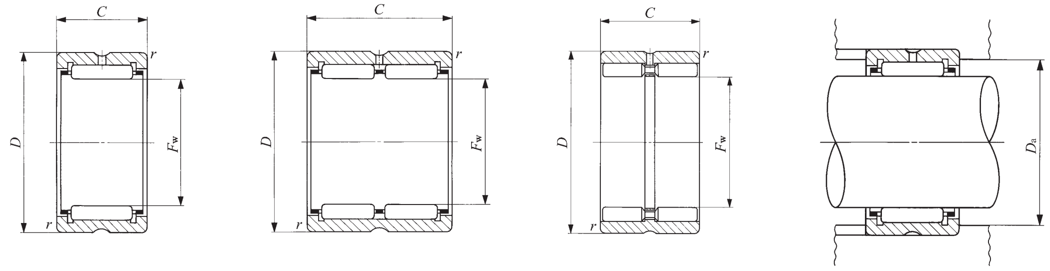
Shaft dia. mm	RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
110	—	—	—	**TAF 11013030**	—	—	660
	RNA 4919	—	—	—	—	—	770
	—	—	—	**TAF 11013040**	—	—	880
	—	**RNA 6919**	—	—	—	—	1 420
	—	—	—	—	**TR 11013550**	—	1 400
	—	—	—	—	—	**GTR 11013550**	1 560
115	**RNA 4920**	—	—	—	—	—	1 190
	—	—	—	—	**TR 11515350**	—	2 350
	—	—	—	—	—	**GTR 11515350**	2 600
120	—	—	**RNA 4822**	—	—	—	790
125	**RNA 4922**	—	—	—	—	—	1 280
130	—	—	**RNA 4824**	—	—	—	850
135	**RNA 4924**	—	—	—	—	—	1 930
140	—	—	—	—	**TR 14017860**	—	3 320
	—	—	—	—	—	**GTR 14017860**	3 730
145	—	—	**RNA 4826**	—	—	—	1 100
150	**RNA 4926**	—	—	—	—	—	2 360
	—	—	—	—	**TR 15018860**	—	3 540
	—	—	—	—	—	**GTR 15018860**	3 970
155	—	—	**RNA 4828**	—	—	—	1 170
160	**RNA 4928**	—	—	—	—	—	2 500
165	—	—	**RNA 4830**	—	—	—	1 750
170	**RNA 4930**	—	—	—	—	—	4 090

Notes(1) Minimum allowable value of chamfer dimension r

(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.

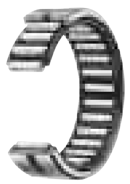


Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
110	130	30	1	125	106 000	240 000	3 500
110	130	35	1.1	123.5	116 000	271 000	3 500
110	130	40	1	125	134 000	324 000	3 500
110	130	63	1.1	123.5	182 000	514 000	3 500
110	135	50	1.5	127	183 000	395 000	3 500
110	135	50	1.5	127	245 000	603 000	1 400
115	140	40	1.1	133.5	145 000	329 000	3 500
115	153	50	1.5	145	233 000	414 000	3 500
115	153	50	1.5	145	315 000	614 000	1 300
120	140	30	1	135	93 200	239 000	3 500
125	150	40	1.1	143.5	152 000	357 000	3 000
130	150	30	1	145	96 900	259 000	3 000
135	165	45	1.1	158.5	187 000	435 000	3 000
140	178	60	1.5	170	307 000	625 000	3 000
140	178	60	1.5	170	409 000	923 000	1 100
145	165	35	1.1	158.5	116 000	340 000	3 000
150	180	50	1.5	172	215 000	540 000	2 500
150	188	60	1.5	180	320 000	675 000	2 500
150	188	60	1.5	180	423 000	989 000	1 000
155	175	35	1.1	168.5	120 000	363 000	2 500
160	190	50	1.5	182	224 000	580 000	2 500
165	190	40	1.1	183.5	168 000	446 000	2 500
170	210	60	2	201	324 000	712 000	2 500

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 RNA48

Shaft dia. 175 – 350mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
175	—	—	**RNA 4832**	—	—	—	1 850
180	**RNA 4932**	—	—	—	—	—	4 310
185	—	—	**RNA 4834**	—	—	—	2 700
190	**RNA 4934**	—	—	—	—	—	4 530
195	—	—	**RNA 4836**	—	—	—	2 840
205	**RNA 4936**	—	—	—	—	—	6 250
210	—	—	**RNA 4838**	—	—	—	3 380
215	**RNA 4938**	—	—	—	—	—	6 500
220	—	—	**RNA 4840**	—	—	—	3 520
225	**RNA 4940**	—	—	—	—	—	10 400
240	—	—	**RNA 4844**	—	—	—	3 820
245	**RNA 4944**	—	—	—	—	—	11 200
265	—	—	**RNA 4848**	—	—	—	5 670
265	**RNA 4948**	—	—	—	—	—	12 000
285	—	—	**RNA 4852**	—	—	—	6 070
290	**RNA 4952**	—	—	—	—	—	21 200
305	—	—	**RNA 4856**	—	—	—	9 750
310	**RNA 4956**	—	—	—	—	—	22 500
330	—	—	**RNA 4860**	—	—	—	13 200
340	**RNA 4960**	—	—	—	—	—	33 400
350	—	—	**RNA 4864**	—	—	—	14 100

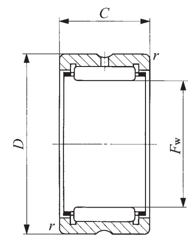
Boundary dimensions mm F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
175	200	40	1.1	193.5	173 000	474 000	2 500
180	220	60	2	211	337 000	761 000	1 900
185	215	45	1.1	208.5	211 000	567 000	1 900
190	230	60	2	221	347 000	810 000	1 900
195	225	45	1.1	218.5	218 000	602 000	1 900
205	250	69	2	241	434 000	989 000	1 900
210	240	50	1.5	232	249 000	726 000	1 800
215	260	69	2	251	440 000	1 020 000	1 700
220	250	50	1.5	242	255 000	766 000	1 600
225	280	80	2.1	269	518 000	1 120 000	1 600
240	270	50	1.5	262	266 000	833 000	1 500
245	300	80	2.1	289	536 000	1 200 000	1 400
265	300	60	2	291	345 000	1 150 000	1 300
265	320	80	2.1	309	565 000	1 320 000	1 300
285	320	60	2	311	354 000	1 220 000	1 100
290	360	100	2.1	349	847 000	1 900 000	1 100
305	350	69	2	341	486 000	1 550 000	950
310	380	100	2.1	369	877 000	2 040 000	950
330	380	80	2.1	369	610 000	1 900 000	900
340	420	118	3	407	1 130 000	2 650 000	850
350	400	80	2.1	389	635 000	2 040 000	750

Notes(1) Minimum allowable value of chamfer dimension r
(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.

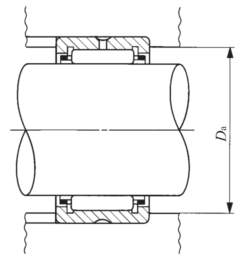
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 RNA48



Shaft dia. 360 — 490mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
360	**RNA 4964**	—	—	—	—	—	35 200
370	—	—	**RNA 4868**	—	—	—	14 800
380	**RNA 4968**	—	—	—	—	—	37 000
390	—	—	**RNA 4872**	—	—	—	15 600
400	**RNA 4972**	—	—	—	—	—	38 700
415	—	—	**RNA 4876**	—	—	—	27 900
430	**RNA 4976**	—	—	—	—	—	56 400
450	**RNA 4980**	—	—	—	—	—	58 800
470	**RNA 4984**	—	—	—	—	—	61 200
490	**RNA 4988**	—	—	—	—	—	86 900

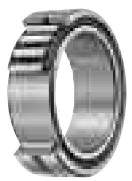
Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
360	440	118	3	427	1 170 000	2 830 000	750
370	420	80	2.1	409	651 000	2 140 000	700
380	460	118	3	447	1 220 000	3 020 000	700
390	440	80	2.1	429	680 000	2 320 000	650
400	480	118	3	467	1 260 000	3 200 000	600
415	480	100	2.1	469	951 000	2 860 000	600
430	520	140	4	504	1 540 000	4 030 000	500
450	540	140	4	524	1 590 000	4 270 000	500
470	560	140	4	544	1 640 000	4 510 000	500
490	600	160	4	584	1 910 000	5 140 000	400

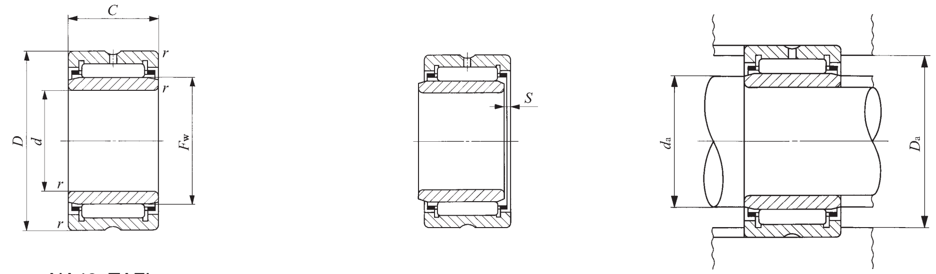
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring





NA49 TAFI
NA69 ($d \leqq 30$)

Shaft dia. 5 – 12mm

Shaft dia. mm	NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	D	C	B	$r_{s\,min}$(1)	F_w	S(2)	d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
5	**NA 495**	—	—	—	—	—	7.3	5	13	10	—	0.15	7	0.5	6.2	6.7	11.8	2 960	2 690	60 000	**LRT 5710**
	—	—	—	**TAFI 51512**	—	—	11.9	5	15	12	—	0.2	8	0.5	6.6	7.7	13.4	5 060	4 690	50 000	**LRT 5812**
	—	—	—	**TAFI 51516**	—	—	16.7	5	15	16	—	0.2	8	0.5	6.6	7.7	13.4	7 080	7 220	50 000	**LRT 5816**
6	**NA 496**	—	—	—	—	—	9.1	6	15	10	—	0.15	8	0.5	7.2	7.7	13.8	3 960	3 420	50 000	**LRT 6810**
	—	—	—	**TAFI 61612**	—	—	13	6	16	12	—	0.2	9	0.5	7.6	8.7	14.4	5 490	5 330	45 000	**LRT 6912**
	—	—	—	**TAFI 61616**	—	—	17.5	6	16	16	—	0.2	9	0.5	7.6	8.7	14.4	7 680	8 210	45 000	**LRT 6916**
7	**NA 497**	—	—	—	—	—	11.2	7	17	10	—	0.15	9	0.5	8.2	8.7	15.8	4 530	3 650	45 000	**LRT 7910**
	—	—	—	**TAFI 71712**	—	—	14.3	7	17	12	—	0.2	10	0.5	8.6	9.7	15.4	5 880	5 970	40 000	**LRT 71012**
	—	—	—	**TAFI 71716**	—	—	19.2	7	17	16	—	0.2	10	0.5	8.6	9.7	15.4	8 230	9 190	40 000	**LRT 71016**
8	**NA 498**	—	—	—	—	—	15	8	19	11	—	0.2	10	0.5	9.6	9.9	17.4	6 180	5 030	40 000	**LRT 81011**
9	—	—	—	**TAFI 91912**	—	—	16.7	9	19	12	—	0.3	12	0.5	11	11.5	17	6 610	7 260	35 000	**LRT 91212**
	—	—	—	**TAFI 91916**	—	—	22.5	9	19	16	—	0.3	12	0.5	11	11.5	17	9 250	11 200	35 000	**LRT 91216**
	NA 499	—	—	—	—	—	16.7	9	20	11	—	0.3	12	0.5	11	11.5	18	6 600	6 310	35 000	**LRT 91211**
10	**NA 4900**	—	—	—	—	—	24	10	22	13	—	0.3	14	0.5	12	13	20	9 230	10 100	30 000	**LRT 101413**
	—	—	—	**TAFI 102216**	—	—	30	10	22	16	—	0.3	14	0.5	12	13	20	11 700	13 700	30 000	**LRT 101416**
	—	—	—	**TAFI 102220**	—	—	38	10	22	20	—	0.3	14	0.5	12	13	20	14 800	18 600	30 000	**LRT 101420**
12	**NA 4901**	—	—	—	—	—	26.5	12	24	13	—	0.3	16	0.5	14	15	22	9 660	11 100	25 000	**LRT 121613**
	—	—	—	**TAFI 122416**	—	—	33.5	12	24	16	—	0.3	16	0.5	14	15	22	12 300	15 100	25 000	**LRT 121616**
	—	—	—	**TAFI 122420**	—	—	42.5	12	24	20	—	0.3	16	0.5	14	15	22	15 500	20 400	25 000	**LRT 121620**
	—	**NA 6901**	—	—	—	—	44.5	12	24	22	—	0.3	16	0.5	14	15	22	17 100	23 000	25 000	**LRT 121622**

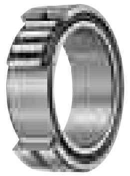
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

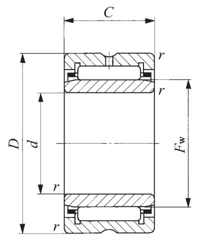
Remarks1. TAFI series with a bore diameter d of 22 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

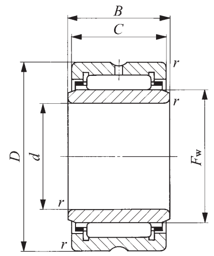
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring

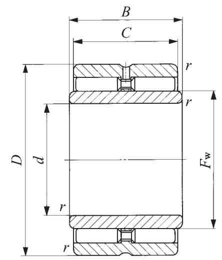




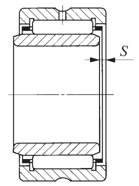
NA49 TAFI
NA69（$d \leqq 30$）

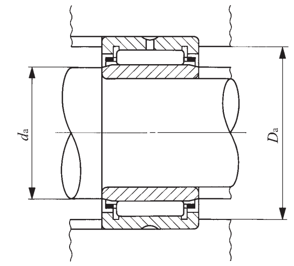


TRI



GTRI





Shaft dia. 15 ─ 22mm

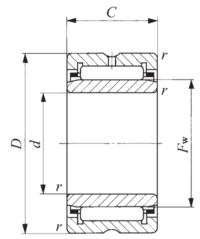
Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
15	—	—	—	TAFI 152716	—	—	39.5	15	27	16	—	0.3	19	0.5	17	18	25	14 000	18 700	20 000	LRT 151916
	—	—	—	TAFI 152720	—	—	50	15	27	20	—	0.3	19	0.5	17	18	25	17 700	25 300	20 000	LRT 151920
	NA 4902	—	—	—	—	—	35	15	28	13	—	0.3	20	0.3	17	19	26	10 900	13 800	20 000	LRT 152013
	—	NA 6902	—	—	—	—	61	15	28	23	—	0.3	20	0.3	17	19	26	19 300	28 800	20 000	LRT 152023
	—	—	—	—	TRI 153320	—	81	15	33	20	20.5	0.3	20	0.3	17	19	31	24 300	26 500	20 000	LRT 152020
	—	—	—	—	—	GTRI 153320	90.5	15	33	20	20.5	0.3	20	—	17	19	31	29 200	37 200	7 500	LRTZ 152020
17	—	—	—	TAFI 172916	—	—	43.5	17	29	16	—	0.3	21	0.5	19	20	27	14 400	20 000	19 000	LRT 172116
	—	—	—	TAFI 172920	—	—	54	17	29	20	—	0.3	21	0.5	19	20	27	18 200	27 100	19 000	LRT 172120
	NA 4903	—	—	—	—	—	39	17	30	13	—	0.3	22	0.3	19	21	28	11 700	15 600	18 000	LRT 172213
	—	NA 6903	—	—	—	—	67	17	30	23	—	0.3	22	0.3	19	21	28	20 800	32 500	18 000	LRT 172223
	—	—	—	—	TRI 173425	—	104	17	34	25	25.5	0.3	22	0.5	19	21	32	29 100	36 800	18 000	LRT 172225
	—	—	—	—	—	GTRI 173425	117	17	34	25	25.5	0.3	22	—	19	21	32	37 900	57 800	7 000	LRTZ 172225
20	—	—	—	TAFI 203216	—	—	48.5	20	32	16	—	0.3	24	0.5	22	23	30	15 300	22 500	17 000	LRT 202416
	—	—	—	TAFI 203220	—	—	61	20	32	20	—	0.3	24	0.5	22	23	30	19 400	30 500	17 000	LRT 202420
	NA 4904	—	—	—	—	—	78.5	20	37	17	—	0.3	25	0.5	22	24	35	21 000	25 000	16 000	LRT 202517
	—	NA 6904	—	—	—	—	136	20	37	30	—	0.3	25	0.5	22	24	35	35 400	48 900	16 000	LRT 202530
	—	—	—	—	TRI 203820	—	99	20	38	20	20.5	0.3	25	0.3	22	24	36	28 900	35 000	16 000	LRT 202520
	—	—	—	—	TRI 203825	—	124	20	38	25	25.5	0.3	25	0.5	22	24	36	34 800	44 400	16 000	LRT 202525
	—	—	—	—	—	GTRI 203820	110	20	38	20	20.5	0.3	25	—	22	24	36	33 300	46 500	6 000	LRTZ 202520
	—	—	—	—	—	GTRI 203825	138	20	38	25	25.5	0.3	25	—	22	24	36	42 400	63 700	6 000	LRTZ 202525
22	—	—	—	TAFI 223416	—	—	52	22	34	16	—	0.3	26	0.5	24	25	32	16 300	24 900	15 000	LRT 222616
	—	—	—	TAFI 223420	—	—	67.5	22	34	20	—	0.3	26	0.5	24	25	32	20 600	33 800	15 000	LRT 222620
	NA 49/22	—	—	—	—	—	87	22	39	17	—	0.3	28	1	24	27	37	21 400	28 900	14 000	LRT 222817
	—	NA 69/22	—	—	—	—	152	22	39	30	—	0.3	28	0.5	24	27	37	36 300	56 900	14 000	LRT 222830

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

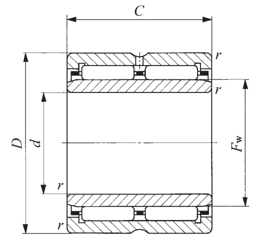
Remarks1. TAFI series with a bore diameter d of 22 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

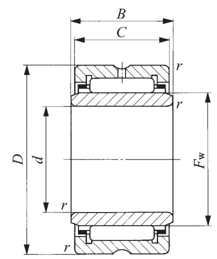
With Inner Ring



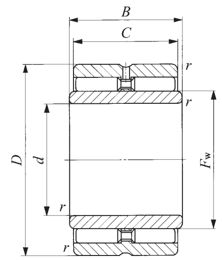
NA49 TAFI
NA69 ($d \leq 30$)



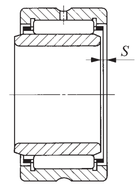
NA69

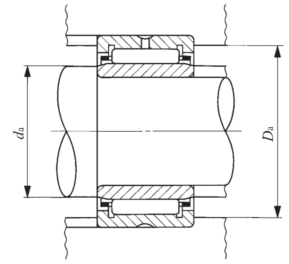


TRI



GTRI





D
NA
TAFI
TRI
BRI

Shaft dia. 25 — 32mm

Shaft dia. mm	NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	D	C	B	$r_{s\,min}$(1)	F_w	S(2)	d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
25	—	—	—	TAFI 253820	—	—	82	25	38	20	—	0.3	29	0.5	27	28	36	21 600	37 200	14 000	LRT 252920
	—	—	—	TAFI 253830	—	—	123	25	38	30	—	0.3	29	1	27	28	36	30 900	59 100	14 000	LRT 252930
	NA 4905	—	—	—	—	—	92.5	25	42	17	—	0.3	30	0.5	27	29	40	23 700	30 700	13 000	LRT 253017
	—	NA 6905	—	—	—	—	160	25	42	30	—	0.3	30	0.5	27	29	40	42 100	64 300	13 000	LRT 253030
	—	—	—	—	TRI 254425	—	157	25	44	25	25.5	0.3	30	0.5	27	29	42	37 900	52 100	13 000	LRT 253025
	—	—	—	—	—	GTRI 254425	175	25	44	25	25.5	0.3	30	—	27	29	42	47 000	76 500	5 000	LRTZ 253025
28	—	—	—	TAFI 284220	—	—	96.5	28	42	20	—	0.3	32	0.5	30	31	40	25 700	42 200	12 000	LRT 283220
	—	—	—	TAFI 284230	—	—	145	28	42	30	—	0.3	32	1	30	31	40	36 800	67 200	12 000	LRT 283230
	NA 49/28	—	—	—	—	—	101	28	45	17	—	0.3	32	1	30	31	43	24 500	32 700	12 000	LRT 283217
	—	NA 69/28	—	—	—	—	176	28	45	30	—	0.3	32	1	30	31	43	41 800	64 800	12 000	LRT 283230
	—	—	—	—	—	GTRI 284530	196	28	45	30	30.5	0.3	32	—	30	31	43	58 000	101 000	4 500	LRTZ 283230
30	—	—	—	TAFI 304520	—	—	112	30	45	20	—	0.3	35	0.3	32	34	43	26 900	46 200	11 000	LRT 303520
	—	—	—	TAFI 304530	—	—	171	30	45	30	—	0.3	35	0.5	32	34	43	38 600	73 600	11 000	LRT 303530
	NA 4906	—	—	—	—	—	106	30	47	17	—	0.3	35	0.5	32	34	45	25 200	34 700	11 000	LRT 303517
	—	NA 6906	—	—	—	—	184	30	47	30	—	0.3	35	0.5	32	34	45	43 000	69 000	11 000	LRT 303530
	—	—	—	—	TRI 304830	—	199	30	48	30	30.5	0.3	35	1	32	34	46	47 400	72 300	11 000	LRT 303530-1
	—	—	—	—	—	GTRI 304830	225	30	48	30	30.5	0.3	35	—	32	34	46	61 100	110 000	4 500	LRTZ 303530
32	—	—	—	TAFI 324720	—	—	121	32	47	20	—	0.3	37	0.3	34	36	45	28 200	50 100	11 000	LRT 323720
	—	—	—	TAFI 324730	—	—	180	32	47	30	—	0.3	37	0.5	34	36	45	40 500	79 800	11 000	LRT 323730
	NA 49/32	—	—	—	—	—	165	32	52	20	—	0.6	40	0.5	36	39	48	31 200	47 800	10 000	LRT 324020
	—	—	—	—	TRI 325230	—	245	32	52	30	30.5	0.6	38	0.5	36	37	48	50 800	81 100	11 000	LRT 323830
	—	NA 69/32	—	—	—	—	295	32	52	36	—	0.6	40	0.3	36	39	48	53 500	95 700	10 000	LRT 324036
	—	—	—	—	—	GTRI 325230	270	32	52	30	30.5	0.6	38	—	36	37	48	64 200	121 000	4 000	LRTZ 323830

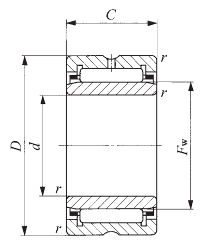
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

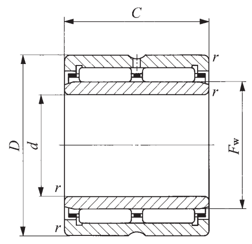
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI



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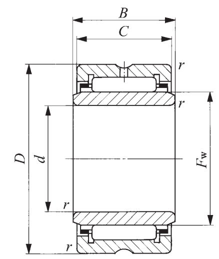

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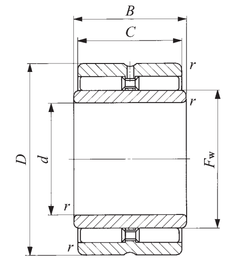

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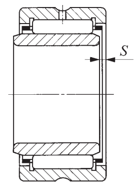
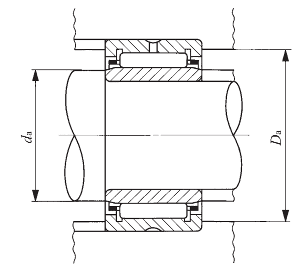




Shaft dia. 35 – 45mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
35	—	—	—	**TAFI 355020**	—	—	129	35	50	20	—	0.3	40	0.3	37	39	48	29 400	54 100	10 000	**LRT 354020**
	—	—	—	**TAFI 355030**	—	—	192	35	50	30	—	0.3	40	0.5	37	39	48	42 300	86 200	10 000	**LRT 354030**
	NA 4907	—	—	—	—	—	178	35	55	20	—	0.6	42	0.5	39	41	51	32 000	50 100	9 500	**LRT 354220**
	—	**NA 6907**	—	—	—	—	320	35	55	36	—	0.6	42	0.3	39	41	51	54 900	100 000	9 500	**LRT 354236**
	—	—	—	—	**TRI 355630**	—	280	35	56	30	30.5	0.6	42	0.5	39	41	52	53 800	90 100	9 500	**LRT 354230**
	—	—	—	—	—	**GTRI 355520**	191	35	55	20	20.5	0.6	40	—	39	39.5	51	44 300	73 600	3 500	**LRTZ 354020**
	—	—	—	—	—	**GTRI 355630**	310	35	56	30	30.5	0.6	42	—	39	41	52	67 500	133 000	3 500	**LRTZ 354230**
38	—	—	—	**TAFI 385320**	—	—	136	38	53	20	—	0.3	43	0.3	40	42	51	30 500	58 200	9 500	**LRT 384320**
	—	—	—	**TAFI 385330**	—	—	205	38	53	30	—	0.3	43	0.5	40	42	51	43 800	92 600	9 500	**LRT 384330**
40	—	—	—	**TAFI 405520**	—	—	143	40	55	20	—	0.3	45	0.3	42	44	53	31 000	60 200	9 000	**LRT 404520**
	—	—	—	**TAFI 405530**	—	—	215	40	55	30	—	0.3	45	0.5	42	44	53	44 600	95 800	9 000	**LRT 404530**
	—	—	—	—	**TRI 405930**	—	270	40	59	30	30.5	0.6	45	1	44	44.5	55	55 100	94 800	9 000	**LRT 404530-1**
	NA 4908	—	—	—	—	—	245	40	62	22	—	0.6	48	0.5	44	47	58	41 600	67 400	8 500	**LRT 404822**
	—	**NA 6908**	—	—	—	—	440	40	62	40	—	0.6	48	0.3	44	47	58	71 300	135 000	8 500	**LRT 404840**
	—	—	—	—	—	**GTRI 405930**	300	40	59	30	30.5	0.6	45	—	44	44.5	55	70 300	142 000	3 500	**LRTZ 404530**
42	—	—	—	**TAFI 425720**	—	—	149	42	57	20	—	0.3	47	0.3	44	46	55	31 500	62 200	8 500	**LRT 424720**
	—	—	—	**TAFI 425730**	—	—	225	42	57	30	—	0.3	47	0.5	44	46	55	45 200	99 100	8 500	**LRT 424730**
	—	—	—	—	**TRI 426230**	—	305	42	62	30	30.5	0.6	48	0.5	46	47	58	56 300	99 500	8 500	**LRT 424830**
	—	—	—	—	—	**GTRI 426230**	340	42	62	30	30.5	0.6	48	—	46	47	58	72 700	154 000	3 000	**LRTZ 424830**
45	—	—	—	**TAFI 456225**	—	—	230	45	62	25	—	0.3	50	0.5	47	49	60	43 000	85 300	8 000	**LRT 455025**
	—	—	—	**TAFI 456235**	—	—	320	45	62	35	—	0.3	50	1	47	49	60	58 000	125 000	8 000	**LRT 455035**
	—	—	—	—	**TRI 456430**	—	300	45	64	30	30.5	0.6	50	1	49	49.5	60	57 700	104 000	8 000	**LRT 455030**
	NA 4909	—	—	—	—	—	285	45	68	22	—	0.6	52	0.5	49	51	64	43 500	73 300	7 500	**LRT 455222**
	—	**NA 6909**	—	—	—	—	520	45	68	40	—	0.6	52	0.3	49	51	64	74 600	147 000	7 500	**LRT 455240**
	—	—	—	—	—	**GTRI 456430**	335	45	64	30	30.5	0.6	50	—	49	49.5	60	74 600	158 000	3 000	**LRTZ 455030**

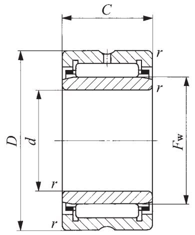
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

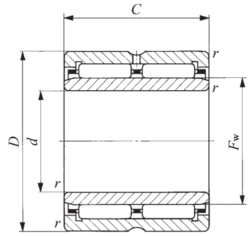
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring

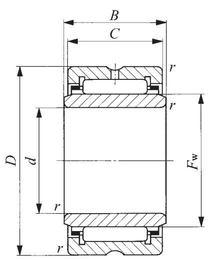


NA49 TAFI



NA69

IKO



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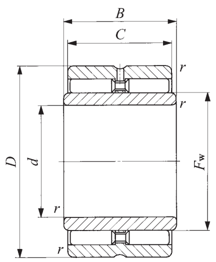

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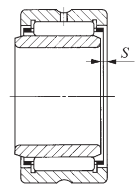
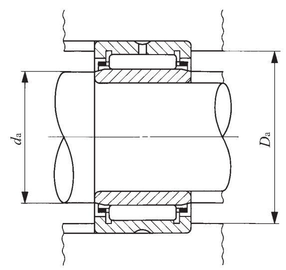




Shaft dia. 50 — 70mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
50	—	—	—	TAFI 506825	—	—	270	50	68	25	—	0.3	55	0.5	52	54	66	45 400	94 000	7 500	LRT 505525
	—	—	—	TAFI 506835	—	—	365	50	68	35	—	0.3	55	1	52	54	66	61 200	138 000	7 500	LRT 505535
	NA 4910	—	—	—	—	—	295	50	72	22	—	0.6	58	0.5	54	57	68	46 200	82 100	7 000	LRT 505822
	—	NA 6910	—	—	—	—	530	50	72	40	—	0.6	58	0.3	54	57	68	79 200	164 000	7 000	LRT 505840
	—	—	—	—	TRI 507745	—	755	50	77	45	45.5	1	58	2	55	57	72	104 000	191 000	7 000	LRT 505845
	—	—	—	—	—	GTRI 507745	825	50	77	45	45.5	1	58	—	55	57	72	135 000	280 000	2 500	LRTZ 505845
55	—	—	—	TAFI 557225	—	—	275	55	72	25	—	0.3	60	0.5	57	59	70	47 500	103 000	6 500	LRT 556025
	—	—	—	TAFI 557235	—	—	380	55	72	35	—	0.3	60	1	57	59	70	64 100	151 000	6 500	LRT 556035
	NA 4911	—	—	—	—	—	410	55	80	25	—	1	63	1	60	61	75	57 600	97 200	6 500	LRT 556325
	—	NA 6911	—	—	—	—	730	55	80	45	—	1	63	0.5	60	61	75	98 700	194 000	6 500	LRT 556345
	—	—	—	—	TRI 558138	—	650	55	81	38	38.5	1	62	1.5	60	60.5	76	92 000	166 000	6 500	LRT 556238
	—	—	—	—	—	GTRI 558138	710	55	81	38	38.5	1	62	—	60	60.5	76	118 000	241 000	2 500	LRTZ 556238
60	—	—	—	TAFI 608225	—	—	395	60	82	25	—	0.6	68	0.3	64	66	78	54 800	117 000	6 000	LRT 606825
	—	—	—	TAFI 608235	—	—	560	60	82	35	—	0.6	68	1	64	66	78	72 000	166 000	6 000	LRT 606835
	NA 4912	—	—	—	—	—	440	60	85	25	—	1	68	1	65	66	80	60 200	105 000	6 000	LRT 606825-1
	—	NA 6912	—	—	—	—	785	60	85	45	—	1	68	0.5	65	66	80	103 000	211 000	6 000	LRT 606845
	—	—	—	—	TRI 608945	—	960	60	89	45	45.5	1	70	2	65	68	84	114 000	228 000	5 500	LRT 607045
	—	—	—	—	—	GTRI 608945	1 050	60	89	45	45.5	1	70	—	65	68	84	147 000	336 000	2 000	LRTZ 607045
65	NA 4913	—	—	—	—	—	470	65	90	25	—	1	72	1	70	70.5	85	62 700	113 000	5 500	LRT 657225
	—	—	—	TAFI 659035	—	—	710	65	90	35	—	1	73	1	70	71	85	80 400	181 000	5 500	LRT 657335
	—	NA 6913	—	—	—	—	840	65	90	45	—	1	72	0.5	70	70.5	85	108 000	227 000	5 500	LRT 657245
70	—	—	—	TAFI 709525	—	—	540	70	95	25	—	1	80	0.3	75	78	90	59 400	137 000	5 000	LRT 708025
	—	—	—	TAFI 709535	—	—	755	70	95	35	—	1	80	1	75	78	90	78 100	195 000	5 000	LRT 708035
	NA 4914	—	—	—	—	—	765	70	100	30	—	1	80	1.5	75	78	95	83 200	158 000	5 000	LRT 708030
	—	NA 6914	—	—	—	—	1 400	70	100	54	—	1	80	1	75	78	95	134 000	311 000	5 000	LRT 708054

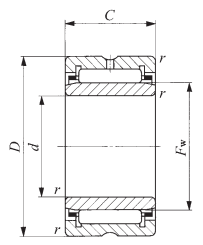
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

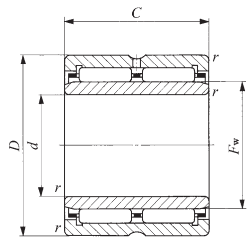
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI



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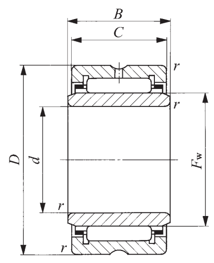

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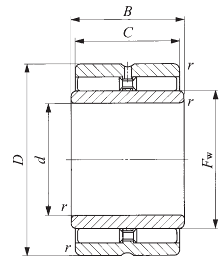

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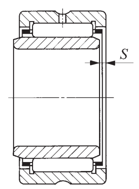
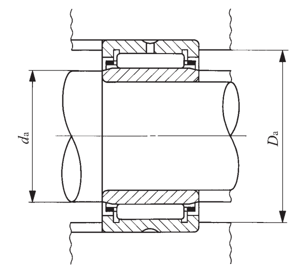




D
NA
TAFI
TRI
BRI

Shaft dia. 75 — 90mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
75	—	—	—	TAFI 7510525	—	—	675	75	105	25	—	1	85	0.5	80	83	100	76 300	145 000	4 500	LRT 758525
	NA 4915	—	—	—	—	—	810	75	105	30	—	1	85	1.5	80	83	100	86 200	169 000	4 500	LRT 758530
	—	—	—	TAFI 7510535	—	—	945	75	105	35	—	1	85	1.5	80	83	100	102 000	210 000	4 500	LRT 758535
	—	NA 6915	—	—	—	—	1 480	75	105	54	—	1	85	1	80	83	100	138 000	331 000	4 500	LRT 758554
	—	—	—	—	TRI 7510845	—	1 340	75	108	45	45.5	1	83	2.5	80	81	103	146 000	270 000	5 000	LRT 758345
	—	—	—	—	—	GTRI 7510845	1 440	75	108	45	45.5	1	83	—	80	81	103	190 000	396 000	1 800	LRTZ 758345
80	—	—	—	TAFI 8011025	—	—	710	80	110	25	—	1	90	0.5	85	88	105	77 300	150 000	4 500	LRT 809025
	NA 4916	—	—	—	—	—	855	80	110	30	—	1	90	1.5	85	88	105	87 300	175 000	4 500	LRT 809030
	—	—	—	TAFI 8011035	—	—	995	80	110	35	—	1	90	1.5	85	88	105	103 000	217 000	4 500	LRT 809035
	—	NA 6916	—	—	—	—	1 560	80	110	54	—	1	90	1	85	88	105	143 000	351 000	4 500	LRT 809054
85	—	—	—	TAFI 8511526	—	—	775	85	115	26	—	1	95	1	90	93	110	79 700	159 000	4 000	LRT 859526
	—	—	—	TAFI 8511536	—	—	1 080	85	115	36	—	1	95	2	90	93	110	106 000	231 000	4 000	LRT 859536
	NA 4917	—	—	—	—	—	1 280	85	120	35	—	1.1	100	1	91.5	98	113.5	110 000	244 000	4 000	LRT 8510035
	—	NA 6917	—	—	—	—	2 340	85	120	63	—	1.1	100	0.5	91.5	98	113.5	173 000	467 000	4 000	LRT 8510063
	—	—	—	—	TRI 8511850	—	1 640	85	118	50	50.5	1	93	3	90	91	113	165 000	329 000	4 500	LRT 859350
	—	—	—	—	TRI 8512045	—	1 610	85	120	45	45.5	1.5	95	2.5	93	93.5	112	155 000	305 000	4 000	LRT 859545
	—	—	—	—	—	GTRI 8511850	1 780	85	118	50	50.5	1	93	—	90	91	113	224 000	509 000	1 600	LRTZ 859350
	—	—	—	—	—	GTRI 8512045	1 720	85	120	45	45.5	1.5	95	—	93	93.5	112	204 000	455 000	1 600	LRTZ 859545
90	—	—	—	TAFI 9012026	—	—	820	90	120	26	—	1	100	1	95	98	115	82 400	168 000	4 000	LRT 9010026
	—	—	—	TAFI 9012036	—	—	1 140	90	120	36	—	1	100	2	95	98	115	110 000	244 000	4 000	LRT 9010036
	NA 4918	—	—	—	—	—	1 350	90	125	35	—	1.1	105	1	96.5	103	118.5	113 000	258 000	4 000	LRT 9010535
	—	—	—	—	TRI 9012550	—	1 870	90	125	50	50.5	1.5	100	3	98	98.5	117	172 000	355 000	4 000	LRT 9010050
	—	NA 6918	—	—	—	—	2 460	90	125	63	—	1.1	105	0.5	96.5	103	118.5	178 000	490 000	4 000	LRT 9010563
	—	—	—	—	—	GTRI 9012550	2 020	90	125	50	50.5	1.5	100	—	98	98.5	117	234 000	549 000	1 500	LRTZ 9010050

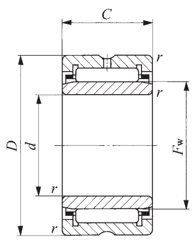
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

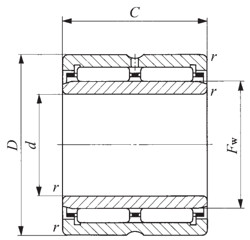
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring

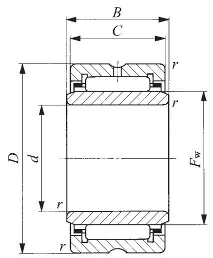


NA49 TAFI
NA48

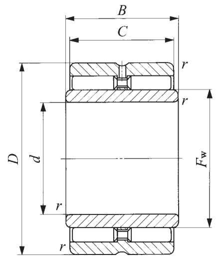


NA69

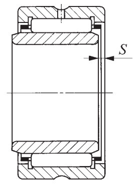
IKO

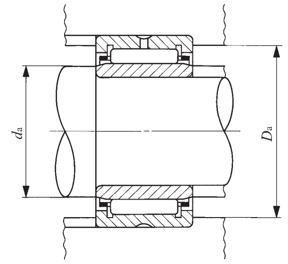


TRI



GTRI





D

NA
TAFI
TRI
BRI

Shaft dia. 95 — 150mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d
95	—	—	—	TAFI 9512526	—	—	860	95
	—	—	—	TAFI 9512536	—	—	1 190	95
	NA 4919	—	—	—	—	—	1 420	95
	—	NA 6919	—	—	—	—	2 580	95
100	—	—	—	TAFI 10013030	—	—	1 040	100
	—	—	—	TAFI 10013040	—	—	1 380	100
	—	—	—	—	TRI 10013550	—	2 040	100
	NA 4920	—	—	—	—	—	1 960	100
	—	—	—	—	—	GTRI 10013550	2 200	100
105	—	—	—	—	TRI 10515350	—	3 020	105
	—	—	—	—	—	GTRI 10515350	3 270	105
110	—	—	NA 4822	—	—	—	1 200	110
	NA 4922	—	—	—	—	—	2 120	110
120	—	—	NA 4824	—	—	—	1 300	120
	NA 4924	—	—	—	—	—	2 960	120
125	—	—	—	—	TRI 12517860	—	4 780	125
	—	—	—	—	—	GTRI 12517860	5 180	125
130	—	—	NA 4826	—	—	—	1 960	130
	NA 4926	—	—	—	—	—	4 030	130
135	—	—	—	—	TRI 13518860	—	5 100	135
	—	—	—	—	—	GTRI 13518860	5 530	135
140	—	—	NA 4828	—	—	—	2 100	140
	NA 4928	—	—	—	—	—	4 290	140
150	—	—	NA 4830	—	—	—	2 880	150
	NA 4930	—	—	—	—	—	6 380	150

Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
125	26	—	1	105	1	100	103	120	84 700	178 000	4 000	LRT 9510526
125	36	—	1	105	2	100	103	120	113 000	258 000	4 000	LRT 9510536
130	35	—	1.1	110	1	101.5	108	123.5	116 000	271 000	3 500	LRT 9511035
130	63	—	1.1	110	0.5	101.5	108	123.5	182 000	514 000	3 500	LRT 9511063
130	30	—	1	110	0.5	105	108	125	106 000	240 000	3 500	LRT 10011030
130	40	—	1	110	1.5	105	108	125	134 000	324 000	3 500	LRT 10011040
135	50	50.5	1.5	110	3	108	108.5	127	183 000	395 000	3 500	LRT 10011050
140	40	—	1.1	115	1	106.5	113	133.5	145 000	329 000	3 500	LRT 10011540
135	50	50.5	1.5	110	—	108	108.5	127	245 000	603 000	1 400	LRTZ 10011050
153	50	50.5	1.5	115	3	113	113.5	145	233 000	414 000	3 500	LRT 10511550
153	50	50.5	1.5	115	—	113	113.5	145	315 000	614 000	1 300	LRTZ 10511550
140	30	—	1	120	1	115	118	135	93 200	239 000	3 500	LRT 11012030
150	40	—	1.1	125	1	116.5	123	143.5	152 000	357 000	3 000	LRT 11012540
150	30	—	1	130	1	125	128	145	96 900	259 000	3 000	LRT 12013030
165	45	—	1.1	135	2	126.5	133	158.5	187 000	435 000	3 000	LRT 12013545
178	60	60.5	1.5	140	2.5	133	138	170	307 000	625 000	3 000	LRT 12514060
178	60	60.5	1.5	140	—	133	138	170	409 000	923 000	1 100	LRTZ 12514060
165	35	—	1.1	145	1	136.5	143	158.5	116 000	340 000	3 000	LRT 13014535
180	50	—	1.5	150	2.5	138	148	172	215 000	540 000	2 500	LRT 13015050
188	60	60.5	1.5	150	2.5	143	148	180	320 000	675 000	2 500	LRT 13515060
188	60	60.5	1.5	150	—	143	148	180	423 000	989 000	1 000	LRTZ 13515060
175	35	—	1.1	155	1	146.5	153	168.5	120 000	363 000	2 500	LRT 14015535
190	50	—	1.5	160	2.5	148	158	182	224 000	580 000	2 500	LRT 14016050
190	40	—	1.1	165	1.5	156.5	163	183.5	168 000	446 000	2 500	LRT 15016540
210	60	—	2	170	3	159	168	201	324 000	712 000	2 500	LRT 15017060

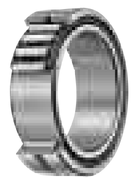
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

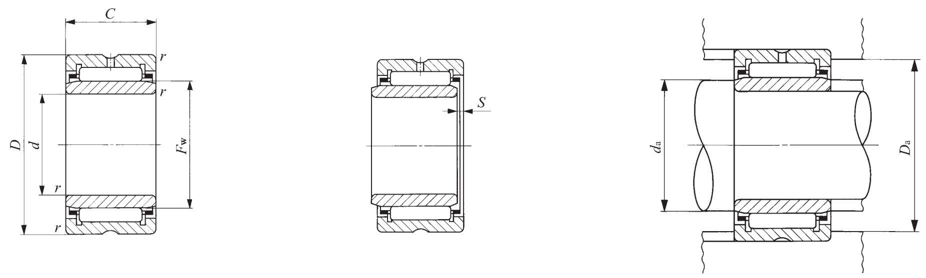
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring





NA49 NA48

Shaft dia. 160 — 340mm

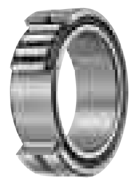
Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d
160	—	—	NA 4832	—	—	—	3 050	160
	NA 4932	—	—	—	—	—	6 750	160
170	—	—	NA 4834	—	—	—	4 120	170
	NA 4934	—	—	—	—	—	7 110	170
180	—	—	NA 4836	—	—	—	4 340	180
	NA 4936	—	—	—	—	—	10 200	180
190	—	—	NA 4838	—	—	—	5 760	190
	NA 4938	—	—	—	—	—	10 700	190
200	—	—	NA 4840	—	—	—	6 040	200
	NA 4940	—	—	—	—	—	15 400	200
220	—	—	NA 4844	—	—	—	6 570	220
	NA 4944	—	—	—	—	—	16 700	220
240	—	—	NA 4848	—	—	—	10 200	240
	NA 4948	—	—	—	—	—	18 000	240
260	—	—	NA 4852	—	—	—	11 000	260
	NA 4952	—	—	—	—	—	31 100	260
280	—	—	NA 4856	—	—	—	15 800	280
	NA 4956	—	—	—	—	—	33 100	280
300	—	—	NA 4860	—	—	—	22 300	300
	NA 4960	—	—	—	—	—	51 400	300
320	—	—	NA 4864	—	—	—	23 700	320
	NA 4964	—	—	—	—	—	54 400	320
340	—	—	NA 4868	—	—	—	25 000	340
	NA 4968	—	—	—	—	—	57 300	340

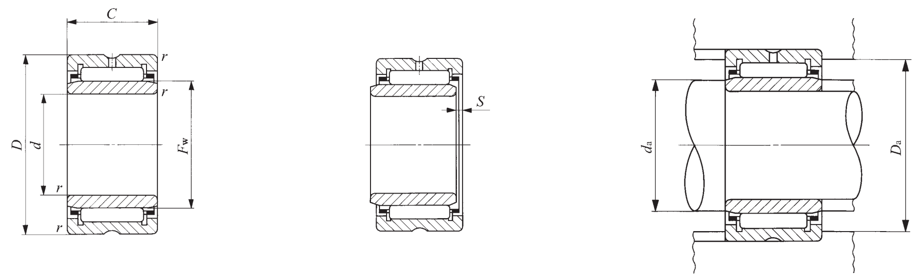
Boundary dimensions mm D	C	B	$r_{s\,min}$(1)	F_w	S(2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
200	40	—	1.1	175	1.5	166.5	173	193.5	173 000	474 000	2 500	LRT 16017540
220	60	—	2	180	3	169	178	211	337 000	761 000	1 900	LRT 16018060
215	45	—	1.1	185	1.5	176.5	183	208.5	211 000	567 000	1 900	LRT 17018545
230	60	—	2	190	3	179	188	221	347 000	810 000	1 900	LRT 17019060
225	45	—	1.1	195	1.5	186.5	193	218.5	218 000	602 000	1 900	LRT 18019545
250	69	—	2	205	3	189	203	241	434 000	989 000	1 900	LRT 18020569
240	50	—	1.5	210	1.5	198	208	232	249 000	726 000	1 800	LRT 19021050
260	69	—	2	215	3	199	213	251	440 000	1 020 000	1 700	LRT 19021569
250	50	—	1.5	220	1.5	208	218	242	255 000	766 000	1 600	LRT 20022050
280	80	—	2.1	225	4	211	223	269	518 000	1 120 000	1 600	LRT 20022580
270	50	—	1.5	240	1.5	228	238	262	266 000	833 000	1 500	LRT 22024050
300	80	—	2.1	245	4	231	243	289	536 000	1 200 000	1 400	LRT 22024580
300	60	—	2	265	2	249	262	291	345 000	1 150 000	1 300	LRT 24026560
320	80	—	2.1	265	4	251	262	309	565 000	1 320 000	1 300	LRT 24026580
320	60	—	2	285	2	269	282	311	354 000	1 220 000	1 100	LRT 26028560
360	100	—	2.1	290	4	271	287	349	847 000	1 900 000	1 100	LRT 260290100
350	69	—	2	305	2.5	289	302	341	486 000	1 550 000	950	LRT 28030569
380	100	—	2.1	310	4	291	307	369	877 000	2 040 000	950	LRT 280310100
380	80	—	2.1	330	2.5	311	327	369	610 000	1 900 000	900	LRT 30033080
420	118	—	3	340	4	313	337	407	1 130 000	2 650 000	850	LRT 300340118
400	80	—	2.1	350	2.5	331	347	389	635 000	2 040 000	750	LRT 32035080
440	118	—	3	360	4	333	357	427	1 170 000	2 830 000	750	LRT 320360118
420	80	—	2.1	370	2.5	351	367	409	651 000	2 140 000	700	LRT 34037080
460	118	—	3	380	4	353	377	447	1 220 000	3 020 000	700	LRT 340380118

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) 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

With Inner Ring





NA49 NA48

D
NA
TAFI
TRI
BRI

Shaft dia. 360 — 440mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d
360	—	—	**NA 4872**	—	—	—	26 400	360
	NA 4972	—	—	—	—	—	60 200	360
380	—	—	**NA 4876**	—	—	—	44 600	380
	NA 4976	—	—	—	—	—	90 300	380
400	**NA 4980**	—	—	—	—	—	94 400	400
420	**NA 4984**	—	—	—	—	—	98 500	420
440	**NA 4988**	—	—	—	—	—	131 000	440

Boundary dimensions mm D	C	B	$r_{s\,min}$(1)	F_w	S(2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
440	80	—	2.1	390	2.5	371	387	429	680 000	2 320 000	650	**LRT 36039080**
480	118	—	3	400	4	373	397	467	1 260 000	3 200 000	600	**LRT 360400118**
480	100	—	2.1	415	3	391	412	469	951 000	2 860 000	600	**LRT 380415100**
520	140	—	4	430	5	396	427	504	1 540 000	4 030 000	500	**LRT 380430140**
540	140	—	4	450	5	416	447	524	1 590 000	4 270 000	500	**LRT 400450140**
560	140	—	4	470	5	436	467	544	1 640 000	4 510 000	500	**LRT 420470140**
600	160	—	4	490	5	456	487	584	1 910 000	5 140 000	400	**LRT 440490160**

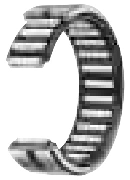
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

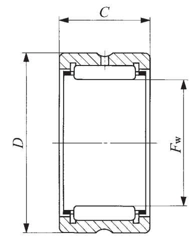
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

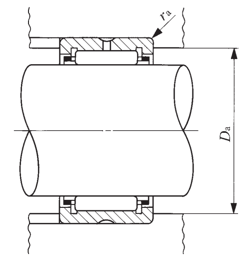
MACHINED TYPE NEEDLE ROLLER BEARINGS

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

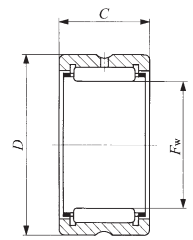
Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

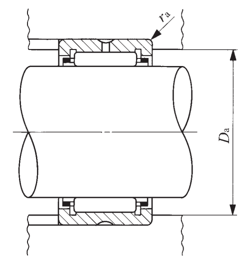
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series



BR



Shaft dia. 50.800 — 101.600mm

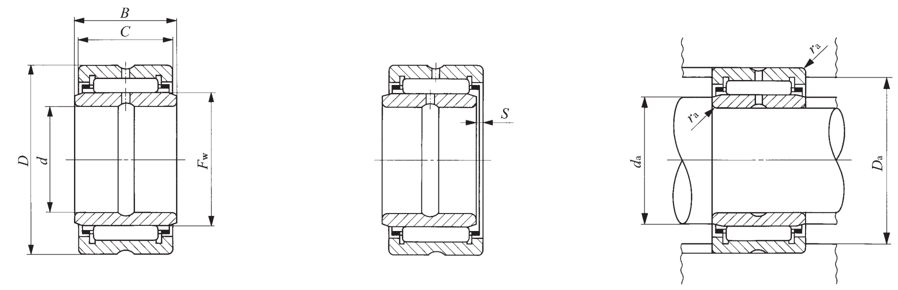
Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\ max}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
50.800 (2)	**BR 324116**	190	50.800 (2)	65.088 (2 9/16)	25.400 (1)	57.8	1.5	51 000	89 400	8 000
	BR 324120	240	50.800 (2)	65.088 (2 9/16)	31.750 (1 1/4)	57.8	1.5	63 200	118 000	8 000
57.150 (2 1/4)	**BR 364824**	435	57.150 (2 1/4)	76.200 (3)	38.100 (1 1/2)	69	1.5	90 300	158 000	7 000
	BR 364828	510	57.150 (2 1/4)	76.200 (3)	44.450 (1 3/4)	69	1.5	105 000	191 000	7 000
63.500 (2 1/2)	**BR 405224**	475	63.500 (2 1/2)	82.550 (3 1/4)	38.100 (1 1/2)	74.3	2	94 600	174 000	6 500
	BR 405228	555	63.500 (2 1/2)	82.550 (3 1/4)	44.450 (1 3/4)	74.3	2	110 000	210 000	6 500
69.850 (2 3/4)	**BR 445624**	510	69.850 (2 3/4)	88.900 (3 1/2)	38.100 (1 1/2)	80.7	2	98 700	189 000	5 500
	BR 445628	600	69.850 (2 3/4)	88.900 (3 1/2)	44.450 (1 3/4)	80.7	2	114 000	228 000	5 500
76.200 (3)	**BR 486024**	555	76.200 (3)	95.250 (3 3/4)	38.100 (1 1/2)	87	2	105 000	211 000	5 500
	BR 486028	650	76.200 (3)	95.250 (3 3/4)	44.450 (1 3/4)	87	2	122 000	255 000	5 500
82.550 (3 1/4)	**BR 526828**	990	82.550 (3 1/4)	107.950 (4 1/4)	44.450 (1 3/4)	99.7	2	141 000	259 000	5 000
	BR 526832	1 140	82.550 (3 1/4)	107.950 (4 1/4)	50.800 (2)	99.7	2	154 000	290 000	5 000
88.900 (3 1/2)	**BR 567232**	1 220	88.900 (3 1/2)	114.300 (4 1/2)	50.800 (2)	106.1	2	162 000	316 000	4 500
95.250 (3 3/4)	**BR 607632**	1 290	95.250 (3 3/4)	120.650 (4 3/4)	50.800 (2)	111.4	2.5	169 000	342 000	4 000
101.600 (4)	**BR 648032**	1 370	101.600 (4)	127.000 (5)	50.800 (2)	117.8	2.5	176 000	368 000	4 000

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. In bearings with a roller set bore diameter F_w of 69.850 mm or less, the outer ring has an oil groove and an oil hole. In others, the outer ring has an oil groove and two oil holes.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



BRI

D
NA
TAFI
TRI
BRI

Shaft dia. 9.525 ─ 41.275mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	S [1]	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	$r_{as\ max}$ [2]	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed[3] rpm	Assembled inner ring
9.525 (3/8)	BRI 61812	67.5	9.525(3/8)	28.575(1 1/8)	19.050(3/4)	19.300	15.875(5/8)	0.3	14	14.5	24.5	0.6	18 900	19 700	25 000	LRB 61012
12.700 (1/2)	BRI 82012	79.5	12.700(1/2)	31.750(1 1/4)	19.050(3/4)	19.300	19.050(3/4)	0.3	17.5	18	26.5	1	21 700	24 400	20 000	LRB 81212
	BRI 82016	106	12.700(1/2)	31.750(1 1/4)	25.400(1)	25.650	19.050(3/4)	0.5	17.5	18	26.5	1	27 600	33 100	20 000	LRB 81216
15.875 (5/8)	BRI 102212	91	15.875(5/8)	34.925(1 3/8)	19.050(3/4)	19.300	22.225(7/8)	0.3	21	21.2	29.7	1	23 000	27 100	18 000	LRB 101412
	BRI 102216	122	15.875(5/8)	34.925(1 3/8)	25.400(1)	25.650	22.225(7/8)	0.5	21	21.2	29.7	1	29 100	36 800	18 000	LRB 101416
19.050 (3/4)	BRI 122412	102	19.050(3/4)	38.100(1 1/2)	19.050(3/4)	19.300	25.400(1)	0.3	24	24.4	32.9	1	25 300	31 900	16 000	LRB 121612
	BRI 122416	136	19.050(3/4)	38.100(1 1/2)	25.400(1)	25.650	25.400(1)	0.5	24	24.4	32.9	1	32 100	43 300	16 000	LRB 121616
22.225 (7/8)	BRI 142616	152	22.225(7/8)	41.275(1 5/8)	25.400(1)	25.650	28.575(1 1/8)	0.5	27	27.5	36	1	34 900	49 900	14 000	LRB 141816
	BRI 142620	190	22.225(7/8)	41.275(1 5/8)	31.750(1 1/4)	32.000	28.575(1 1/8)	0.5	27	27.5	36	1	43 200	65 600	14 000	LRB 141820
25.400 (1)	BRI 162816	166	25.400(1)	44.450(1 3/4)	25.400(1)	25.650	31.750(1 1/4)	0.5	30.5	30.7	39.2	1	36 000	53 500	13 000	LRB 162016
	BRI 162820	210	25.400(1)	44.450(1 3/4)	31.750(1 1/4)	32.000	31.750(1 1/4)	0.5	30.5	30.7	39.2	1	44 600	70 300	13 000	LRB 162020
28.575 (1 1/8)	BRI 183016	182	28.575(1 1/8)	47.625(1 7/8)	25.400(1)	25.650	34.925(1 3/8)	0.5	33.5	33.9	42.4	1	38 500	60 000	11 000	LRB 182216
	BRI 183020	225	28.575(1 1/8)	47.625(1 7/8)	31.750(1 1/4)	32.000	34.925(1 3/8)	0.5	33.5	33.9	42.4	1	47 700	78 900	11 000	LRB 182220
31.750 (1 1/4)	BRI 203316	220	31.750(1 1/4)	52.388(2 1/16)	25.400(1)	25.650	38.100(1 1/2)	0.5	37	37.1	45.1	1.5	43 700	66 900	11 000	LRB 202416
	BRI 203320	275	31.750(1 1/4)	52.388(2 1/16)	31.750(1 1/4)	32.000	38.100(1 1/2)	0.5	37	37.1	45.1	1.5	54 200	88 200	11 000	LRB 202420
34.925 (1 3/8)	BRI 223516	235	34.925(1 3/8)	55.562(2 3/16)	25.400(1)	25.650	41.275(1 5/8)	0.5	40.2	40.2	48.3	1.5	44 800	70 900	9 500	LRB 222616
	BRI 223520	295	34.925(1 3/8)	55.562(2 3/16)	31.750(1 1/4)	32.000	41.275(1 5/8)	0.5	40.2	40.2	48.3	1.5	55 600	93 400	9 500	LRB 222620
38.100 (1 1/2)	BRI 243716	250	38.100(1 1/2)	58.738(2 5/16)	25.400(1)	25.650	44.450(1 3/4)	0.5	43.3	43.4	51.5	1.5	47 500	78 200	9 000	LRB 242816
	BRI 243720	315	38.100(1 1/2)	58.738(2 5/16)	31.750(1 1/4)	32.000	44.450(1 3/4)	0.5	43.3	43.4	51.5	1.5	58 900	103 000	9 000	LRB 242820
	BRI 243820	350	38.100(1 1/2)	60.325(2 3/8)	31.750(1 1/4)	32.000	44.450(1 3/4)	0.5	43.3	43.4	53.1	1.5	58 900	103 000	9 000	LRB 242820
	BRI 243920	380	38.100(1 1/2)	61.912(2 7/16)	31.750(1 1/4)	32.000	47.625(1 7/8)	0.5	43.3	43.4	54.7	1.5	60 100	108 000	8 500	LRB 243020
41.275 (1 5/8)	BRI 264116	325	41.275(1 5/8)	65.088(2 9/16)	25.400(1)	25.650	50.800(2)	0.5	48	49	57.8	1.5	51 000	89 400	8 000	LRB 263216
	BRI 264120	410	41.275(1 5/8)	65.088(2 9/16)	31.750(1 1/4)	32.000	50.800(2)	0.5	48	49	57.8	1.5	63 200	118 000	8 000	LRB 263220

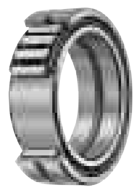
Notes(1) Allowable axial shift amount of inner ring to outer ring
(2) Maximum permissible corner radius of the shaft or housing
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

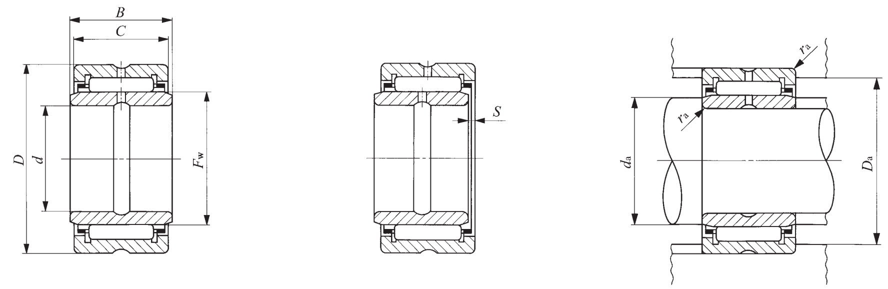
Remarks1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series





BRI

Shaft dia. 44.450 — 88.900mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	S(1)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	$r_{as\,max}$(2)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) rpm	Assembled inner ring
44.450 (1 3/4)	**BRI 284824**	735	44.450(1 3/4)	76.200(3)	38.100(1 1/2)	38.350	57.150(2 1/4)	1	52.5	55	69	1.5	90 300	158 000	7 000	**LRB 283624**
	BRI 284828	855	44.450(1 3/4)	76.200(3)	44.450(1 3/4)	44.700	57.150(2 1/4)	1	52.5	55	69	1.5	105 000	191 000	7 000	**LRB 283628**
50.800 (2)	**BRI 325224**	810	50.800(2)	82.550(3 1/4)	38.100(1 1/2)	38.350	63.500(2 1/2)	1	58	61	74.3	2	94 600	174 000	6 500	**LRB 324024**
	BRI 325228	945	50.800(2)	82.550(3 1/4)	44.450(1 3/4)	44.700	63.500(2 1/2)	1	58	61	74.3	2	110 000	210 000	6 500	**LRB 324028**
57.150 (2 1/4)	**BRI 365624**	885	57.150(2 1/4)	88.900(3 1/2)	38.100(1 1/2)	38.350	69.850(2 3/4)	1	65	67	80.7	2	98 700	189 000	5 500	**LRB 364424**
	BRI 365628	1 040	57.150(2 1/4)	88.900(3 1/2)	44.450(1 3/4)	44.700	69.850(2 3/4)	1	65	67	80.7	2	114 000	228 000	5 500	**LRB 364428**
63.500 (2 1/2)	**BRI 406024**	965	63.500(2 1/2)	95.250(3 3/4)	38.100(1 1/2)	38.350	76.200(3)	1	71	73	87	2	105 000	211 000	5 500	**LRB 404824**
	BRI 406028	1 130	63.500(2 1/2)	95.250(3 3/4)	44.450(1 3/4)	44.700	76.200(3)	1	71	73	87	2	122 000	255 000	5 500	**LRB 404828**
69.850 (2 3/4)	**BRI 446828**	1 520	69.850(2 3/4)	107.950(4 1/4)	44.450(1 3/4)	44.700	82.550(3 1/4)	1.5	77	79	99.7	2	141 000	259 000	5 000	**LRB 445228**
	BRI 446832	1 740	69.850(2 3/4)	107.950(4 1/4)	50.800(2)	51.050	82.550(3 1/4)	3	77	79	99.7	2	154 000	290 000	5 000	**LRB 445232**
76.200 (3)	**BRI 487232**	1 860	76.200(3)	114.300(4 1/2)	50.800(2)	51.050	88.900(3 1/2)	3	83.5	86	106.1	2	162 000	316 000	4 500	**LRB 485632**
82.550 (3 1/4)	**BRI 527632**	1 980	82.550(3 1/4)	120.650(4 3/4)	50.800(2)	51.050	95.250(3 3/4)	3	91	93	111.4	2.5	169 000	342 000	4 000	**LRB 526032**
88.900 (3 1/2)	**BRI 568032**	2 120	88.900(3 1/2)	127.000(5)	50.800(2)	51.050	101.600(4)	3	97	99	117.8	2.5	176 000	368 000	4 000	**LRB 566432**

Notes(1) Allowable axial shift amount of inner ring to outer ring
(2) Maximum permissible corner radius of the shaft or housing
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. In bearings with a bearing bore diameter, d, of 57.150 mm or less, the outer ring has an oil groove and an oil hole. In bearings with a bearing bore diameter, d, of 76.200 mm or less, the inner ring has an oil groove and an oil hole. In others, the inner ring and the outer ring each have an oil groove and two oil holes.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series

GBR

Shaft dia. 15.875 — 50.800mm

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)	GBR 101812	55.5	15.875 (5/8)	28.575 (1 1/8)	19.050 (3/4)	24.5	0.6	23 500	28 500	9 500
19.050 (3/4)	GBR 122012	63	19.050 (3/4)	31.750 (1 1/4)	19.050 (3/4)	27	0.6	26 400	34 500	8 000
22.225 (7/8)	GBR 142212	71	22.225 (7/8)	34.925 (1 3/8)	19.050 (3/4)	30	0.6	28 600	40 100	7 000
	GBR 142216	95.5	22.225 (7/8)	34.925 (1 3/8)	25.400 (1)	30	0.6	38 300	58 300	7 000
25.400 (1)	GBR 162412	79	25.400 (1)	38.100 (1 1/2)	19.050 (3/4)	33.3	0.6	31 000	46 100	6 000
	GBR 162416	106	25.400 (1)	38.100 (1 1/2)	25.400 (1)	33.3	0.6	41 400	67 100	6 000
28.575 (1 1/8)	GBR 182616	117	28.575 (1 1/8)	41.275 (1 5/8)	25.400 (1)	36.3	0.6	43 900	75 300	5 500
31.750 (1 1/4)	GBR 202816	128	31.750 (1 1/4)	44.450 (1 3/4)	25.400 (1)	39.6	0.6	46 600	83 900	4 500
34.925 (1 3/8)	GBR 223016	137	34.925 (1 3/8)	47.625 (1 7/8)	25.400 (1)	42.8	0.6	49 500	91 800	4 500
38.100 (1 1/2)	GBR 243316	168	38.100 (1 1/2)	52.388 (2 1/16)	25.400 (1)	47.3	0.6	54 200	97 700	4 000
	GBR 243320	205	38.100 (1 1/2)	52.388 (2 1/16)	31.750 (1 1/4)	47.3	0.6	64 100	121 000	4 000
41.275 (1 5/8)	GBR 263516	180	41.275 (1 5/8)	55.562 (2 3/16)	25.400 (1)	50.5	0.6	56 600	105 000	3 500
	GBR 263520	220	41.275 (1 5/8)	55.562 (2 3/16)	31.750 (1 1/4)	50.5	0.6	67 000	130 000	3 500
44.450 (1 3/4)	GBR 283720	235	44.450 (1 3/4)	58.738 (2 5/16)	31.750 (1 1/4)	53.7	0.6	69 700	141 000	3 500
	GBR 283820	275	44.450 (1 3/4)	60.325 (2 3/8)	31.750 (1 1/4)	55.3	0.6	69 700	141 000	3 500
47.625 (1 7/8)	GBR 303920	250	47.625 (1 7/8)	61.912 (2 7/16)	31.750 (1 1/4)	56.2	1	72 400	150 000	3 000
50.800 (2)	GBR 324116	215	50.800 (2)	65.088 (2 9/16)	25.400 (1)	59.2	1	63 100	130 000	3 000
	GBR 324120	265	50.800 (2)	65.088 (2 9/16)	31.750 (1 1/4)	59.2	1	74 600	162 000	3 000

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series

GBR

Shaft dia. 57.150 ─ 107.950mm

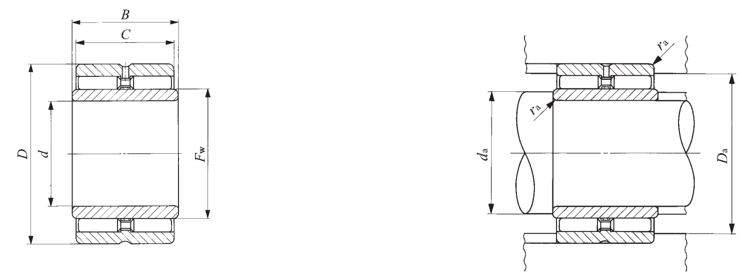
Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\,max}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
57.150 (2 1/4)	GBR 364824	490	57.150 (2 1/4)	76.200 (3)	38.100 (1 1/2)	69.2	1.5	113 000	224 000	2 500
	GBR 364828	580	57.150 (2 1/4)	76.200 (3)	44.450 (1 3/4)	69.2	1.5	133 000	276 000	2 500
63.500 (2 1/2)	GBR 405224	535	63.500 (2 1/2)	82.550 (3 1/4)	38.100 (1 1/2)	75.7	1.5	120 000	248 000	2 500
	GBR 405228	635	63.500 (2 1/2)	82.550 (3 1/4)	44.450 (1 3/4)	75.7	1.5	141 000	306 000	2 500
69.850 (2 3/4)	GBR 445624	585	69.850 (2 3/4)	88.900 (3 1/2)	38.100 (1 1/2)	82	1.5	125 000	273 000	2 000
	GBR 445628	690	69.850 (2 3/4)	88.900 (3 1/2)	44.450 (1 3/4)	82	1.5	147 000	336 000	2 000
76.200 (3)	GBR 486024	630	76.200 (3)	95.250 (3 3/4)	38.100 (1 1/2)	88	1.5	131 000	298 000	2 000
	GBR 486028	745	76.200 (3)	95.250 (3 3/4)	44.450 (1 3/4)	88	1.5	154 000	368 000	2 000
82.550 (3 1/4)	GBR 526828	1 100	82.550 (3 1/4)	107.950 (4 1/4)	44.450 (1 3/4)	99.9	1.5	193 000	396 000	1 800
	GBR 526832	1 240	82.550 (3 1/4)	107.950 (4 1/4)	50.800 (2)	99.9	1.5	214 000	452 000	1 800
88.900 (3 1/2)	GBR 567232	1 330	88.900 (3 1/2)	114.300 (4 1/2)	50.800 (2)	106.3	1.5	221 000	488 000	1 700
95.250 (3 3/4)	GBR 607632	1 420	95.250 (3 3/4)	120.650 (4 3/4)	50.800 (2)	112.6	1.5	228 000	522 000	1 600
101.600 (4)	GBR 648032	1 500	101.600 (4)	127.000 (5)	50.800 (2)	119	1.5	237 000	556 000	1 500
107.950 (4 1/4)	GBR 688432	1 580	107.950 (4 1/4)	133.350 (5 1/4)	50.800 (2)	125.3	1.5	242 000	590 000	1 400

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.
Remarks 1. 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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



GBRI

Shaft dia. 9.525 — 41.275mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	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	Assembled inner ring
9.525 (3/8)	**GBRI 61812**	74	9.525 (3/8)	28.575 (1 1/8)	19.050 (3/4)	19.300	15.875 (5/8)	14	14.5	24.5	0.6	23 500	28 500	9 500	**LRBZ 61012**
12.700 (1/2)	**GBRI 82012**	86.5	12.700 (1/2)	31.750 (1 1/4)	19.050 (3/4)	19.300	19.050 (3/4)	17.5	18	27	0.6	26 400	34 500	8 000	**LRBZ 81212**
15.875 (5/8)	**GBRI 102212**	99	15.875 (5/8)	34.925 (1 3/8)	19.050 (3/4)	19.300	22.225 (7/8)	21	21.2	30	0.6	28 600	40 100	7 000	**LRBZ 101412**
	GBRI 102216	133	15.875 (5/8)	34.925 (1 3/8)	25.400 (1)	25.650	22.225 (7/8)	21	21.2	30	0.6	38 300	58 300	7 000	**LRBZ 101416**
19.050 (3/4)	**GBRI 122412**	112	19.050 (3/4)	38.100 (1 1/2)	19.050 (3/4)	19.300	25.400 (1)	24	24.4	33.3	0.6	31 000	46 100	6 000	**LRBZ 121612**
	GBRI 122416	150	19.050 (3/4)	38.100 (1 1/2)	25.400 (1)	25.650	25.400 (1)	24	24.4	33.3	0.6	41 400	67 100	6 000	**LRBZ 121616**
22.225 (7/8)	**GBRI 142616**	167	22.225 (7/8)	41.275 (1 5/8)	25.400 (1)	25.650	28.575 (1 1/8)	27	27.5	36.3	0.6	43 900	75 300	5 500	**LRBZ 141816**
25.400 (1)	**GBRI 162816**	184	25.400 (1)	44.450 (1 3/4)	25.400 (1)	25.650	31.750 (1 1/4)	30.5	30.7	39.6	0.6	46 600	83 900	4 500	**LRBZ 162016**
28.575 (1 1/8)	**GBRI 183016**	200	28.575 (1 1/8)	47.625 (1 7/8)	25.400 (1)	25.650	34.925 (1 3/8)	33.5	33.9	42.8	0.6	49 500	91 800	4 500	**LRBZ 182216**
31.750 (1 1/4)	**GBRI 203316**	235	31.750 (1 1/4)	52.388 (2 1/16)	25.400 (1)	25.650	38.100 (1 1/2)	37	37.1	47.3	0.6	54 200	97 700	4 000	**LRBZ 202416**
	GBRI 203320	291	31.750 (1 1/4)	52.388 (2 1/16)	31.750 (1 1/4)	32.000	38.100 (1 1/2)	37	37.1	47.3	0.6	64 100	121 000	4 000	**LRBZ 202420**
34.925 (1 3/8)	**GBRI 223516**	255	34.925 (1 3/8)	55.562 (2 3/16)	25.400 (1)	25.650	41.275 (1 5/8)	40.2	40.2	50.5	0.6	56 600	105 000	3 500	**LRBZ 222616**
	GBRI 223520	316	34.925 (1 3/8)	55.562 (2 3/16)	31.750 (1 1/4)	32.000	41.275 (1 5/8)	40.2	40.2	50.5	0.6	67 000	130 000	3 500	**LRBZ 222620**
38.100 (1 1/2)	**GBRI 243720**	335	38.100 (1 1/2)	58.738 (2 5/16)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	43.3	43.4	53.7	0.6	69 700	141 000	3 500	**LRBZ 242820**
	GBRI 243820	375	38.100 (1 1/2)	60.325 (2 3/8)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	43.3	43.4	55.3	0.6	69 700	141 000	3 500	**LRBZ 242820**
	GBRI 243920	410	38.100 (1 1/2)	61.912 (2 7/16)	31.750 (1 1/4)	32.000	47.625 (1 7/8)	43.3	45	56.2	1	72 400	150 000	3 000	**LRBZ 243020**
41.275 (1 5/8)	**GBRI 264116**	350	41.275 (1 5/8)	65.088 (2 9/16)	25.400 (1)	25.650	50.800 (2)	48	49	59.2	1	63 100	130 000	3 000	**LRBZ 263216**
	GBRI 264120	435	41.275 (1 5/8)	65.088 (2 9/16)	31.750 (1 1/4)	32.000	50.800 (2)	48	49	59.2	1	74 600	162 000	3 000	**LRBZ 263220**

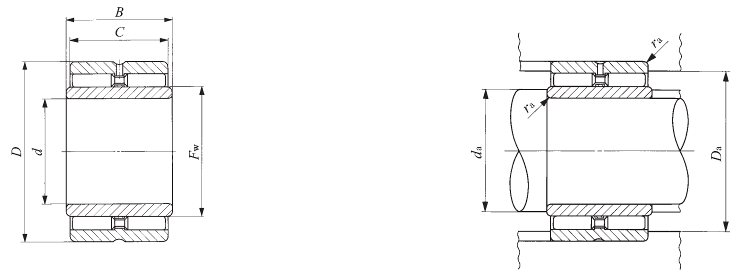
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series

IKO


GBRI

Shaft dia. 44.450 — 95.250mm

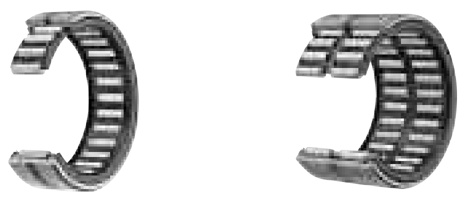
Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	$r_{as\ max}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed (2) rpm	Assembled inner ring
44.450 (1 3/4)	**GBRI 284824**	790	44.450 (1 3/4)	76.200 (3)	38.100 (1 1/2)	38.350	57.150 (2 1/4)	52.5	55	69.2	1.5	113 000	224 000	2 500	**LRBZ 283624**
	GBRI 284828	925	44.450 (1 3/4)	76.200 (3)	44.450 (1 3/4)	44.700	57.150 (2 1/4)	52.5	55	69.2	1.5	133 000	276 000	2 500	**LRBZ 283628**
50.800 (2)	**GBRI 325224**	870	50.800 (2)	82.550 (3 1/4)	38.100 (1 1/2)	38.350	63.500 (2 1/2)	58	61	75.7	1.5	120 000	248 000	2 500	**LRBZ 324024**
	GBRI 325228	1 030	50.800 (2)	82.550 (3 1/4)	44.450 (1 3/4)	44.700	63.500 (2 1/2)	58	61	75.7	1.5	141 000	306 000	2 500	**LRBZ 324028**
57.150 (2 1/4)	**GBRI 365624**	955	57.150 (2 1/4)	88.900 (3 1/2)	38.100 (1 1/2)	38.350	69.850 (2 3/4)	65	67	82	1.5	125 000	273 000	2 000	**LRBZ 364424**
	GBRI 365628	1 130	57.150 (2 1/4)	88.900 (3 1/2)	44.450 (1 3/4)	44.700	69.850 (2 3/4)	65	67	82	1.5	147 000	336 000	2 000	**LRBZ 364428**
63.500 (2 1/2)	**GBRI 406024**	1 040	63.500 (2 1/2)	95.250 (3 3/4)	38.100 (1 1/2)	38.350	76.200 (3)	71	73	88	1.5	131 000	298 000	2 000	**LRBZ 404824**
	GBRI 406028	1 230	63.500 (2 1/2)	95.250 (3 3/4)	44.450 (1 3/4)	44.700	76.200 (3)	71	73	88	1.5	154 000	368 000	2 000	**LRBZ 404828**
69.850 (2 3/4)	**GBRI 446828**	1 630	69.850 (2 3/4)	107.950 (4 1/4)	44.450 (1 3/4)	44.700	82.550 (3 1/4)	77	79	99.9	1.5	193 000	396 000	1 800	**LRBZ 445228**
	GBRI 446832	1 840	69.850 (2 3/4)	107.950 (4 1/4)	50.800 (2)	51.050	82.550 (3 1/4)	77	79	99.9	1.5	214 000	452 000	1 800	**LRBZ 445232**
76.200 (3)	**GBRI 487232**	1 970	76.200 (3)	114.300 (4 1/2)	50.800 (2)	51.050	88.900 (3 1/2)	83.5	86	106.3	1.5	221 000	488 000	1 700	**LRBZ 485632**
82.550 (3 1/4)	**GBRI 527632**	2 110	82.550 (3 1/4)	120.650 (4 3/4)	50.800 (2)	51.050	95.250 (3 3/4)	91	93	112.6	1.5	228 000	522 000	1 600	**LRBZ 526032**
88.900 (3 1/2)	**GBRI 568032**	2 250	88.900 (3 1/2)	127.000 (5)	50.800 (2)	51.050	101.600 (4)	97	99	119	1.5	237 000	556 000	1 500	**LRBZ 566432**
95.250 (3 3/4)	**GBRI 608432**	2 380	95.250 (3 3/4)	133.350 (5 1/4)	50.800 (2)	51.050	107.950 (4 1/4)	103	105	125.3	1.5	242 000	590 000	1 400	**LRBZ 606832**

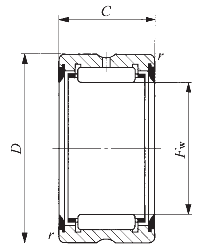
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

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

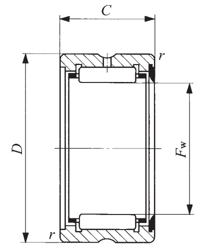
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring

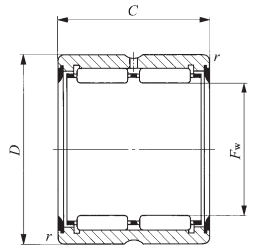




RNA49…UU
RNA69…UU(F_w≦35)



RNA49…U
RNA69…U(F_w≦35)



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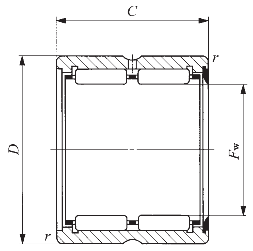
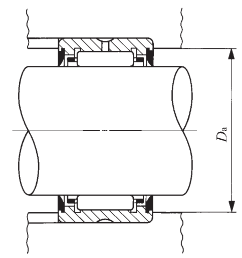


RNA69…U



Shaft dia. 14 — 45mm

Shaft dia. mm	Identification number: With two seals	Identification number: With one seal	Identification number: With two seals	Identification number: With one seal	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
14	**RNA 4900UU**	**RNA 4900U**	—	—	16.3	14	22	13	0.3	20	8 080	8 490	14 000
16	**RNA 4901UU**	**RNA 4901U**	—	—	17.9	16	24	13	0.3	22	8 470	9 320	12 000
	—	—	**RNA 6901UU**	**RNA 6901U**	30	16	24	22	0.3	22	15 500	20 400	12 000
18	**RNA 49/14UU**	**RNA 49/14U**	—	—	19.7	18	26	13	0.3	24	9 260	10 800	11 000
20	**RNA 4902UU**	**RNA 4902U**	—	—	21.5	20	28	13	0.3	26	9 570	11 600	9 500
	—	—	**RNA 6902UU**	**RNA 6902U**	37.5	20	28	23	0.3	26	18 500	27 100	9 500
22	**RNA 4903UU**	**RNA 4903U**	—	—	23	22	30	13	0.3	28	10 300	13 100	8 500
	—	—	**RNA 6903UU**	**RNA 6903U**	40.5	22	30	23	0.3	28	19 800	30 600	8 500
25	**RNA 4904UU**	**RNA 4904U**	—	—	54.5	25	37	17	0.3	35	18 000	20 500	7 500
	—	—	**RNA 6904UU**	**RNA 6904U**	95.5	25	37	30	0.3	35	33 000	44 600	7 500
28	**RNA 49/22UU**	**RNA 49/22U**	—	—	55.5	28	39	17	0.3	37	18 300	23 700	7 000
	—	—	**RNA 69/22UU**	**RNA 69/22U**	97.5	28	39	30	0.3	37	33 800	52 000	7 000
30	**RNA 4905UU**	**RNA 4905U**	—	—	63	30	42	17	0.3	40	20 300	25 100	6 500
	—	—	**RNA 6905UU**	**RNA 6905U**	111	30	42	30	0.3	40	39 200	58 700	6 500
32	**RNA 49/28UU**	**RNA 49/28U**	—	—	75.5	32	45	17	0.3	43	21 000	26 800	6 000
	—	—	**RNA 69/28UU**	**RNA 69/28U**	133	32	45	30	0.3	43	38 900	59 100	6 000
35	**RNA 4906UU**	**RNA 4906U**	—	—	71	35	47	17	0.3	45	21 500	28 400	5 500
	—	—	**RNA 6906UU**	**RNA 6906U**	125	35	47	30	0.3	45	40 100	63 000	5 500
40	**RNA 49/32UU**	**RNA 49/32U**	—	—	94.5	40	52	20	0.6	48	29 400	44 200	5 000
	—	—	**RNA 69/32UU**	**RNA 69/32U**	170	40	52	36	0.6	48	50 300	88 300	5 000
42	**RNA 4907UU**	**RNA 4907U**	—	—	112	42	55	20	0.6	51	30 100	46 300	4 500
	—	—	**RNA 6907UU**	**RNA 6907U**	200	42	55	36	0.6	51	51 600	92 600	4 500
45	**RNA 49/38UU**	**RNA 49/38U**	—	—	119	45	58	20	0.6	54	31 600	50 400	4 000

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.

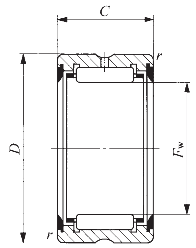
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring





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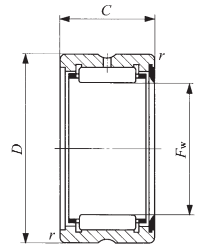
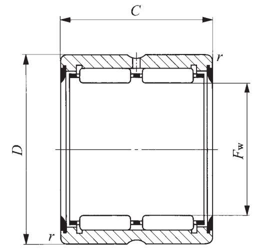
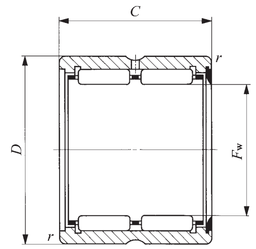


RNA49⋯U



RNA69⋯UU



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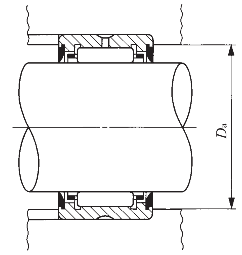


Shaft dia. 48 – 85mm

Shaft dia. mm	Identification number: With two seals	With one seal	With two seals	With one seal	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
48	RNA 4908UU	RNA 4908U	—	—	150	48	62	22	0.6	58	37 200	58 400	4 000
	—	—	RNA 6908UU	RNA 6908U	270	48	62	40	0.6	58	63 700	117 000	4 000
50	RNA 49/42UU	RNA 49/42U	—	—	173	50	65	22	0.6	61	38 000	60 900	4 000
52	RNA 4909UU	RNA 4909U	—	—	197	52	68	22	0.6	64	38 900	63 400	3 500
	—	—	RNA 6909UU	RNA 6909U	355	52	68	40	0.6	64	66 600	127 000	3 500
55	RNA 49/48UU	RNA 49/48U	—	—	187	55	70	22	0.6	66	39 600	66 100	3 500
58	RNA 4910UU	RNA 4910U	—	—	177	58	72	22	0.6	68	41 300	71 100	3 500
	—	—	RNA 6910UU	RNA 6910U	320	58	72	40	0.6	68	70 800	142 000	3 500
60	RNA 49/52UU	RNA 49/52U	—	—	200	60	75	22	0.6	71	42 100	73 600	3 000
63	RNA 4911UU	RNA 4911U	—	—	265	63	80	25	1	75	52 200	85 700	3 000
	—	—	RNA 6911UU	RNA 6911U	470	63	80	45	1	75	89 400	171 000	3 000
65	RNA 49/58UU	RNA 49/58U	—	—	275	65	82	25	1	77	53 400	89 200	3 000
68	RNA 4912UU	RNA 4912U	—	—	285	68	85	25	1	80	54 500	92 800	3 000
	—	—	RNA 6912UU	RNA 6912U	505	68	85	45	1	80	93 400	186 000	3 000
70	RNA 49/62UU	RNA 49/62U	—	—	320	70	88	25	1	83	55 700	96 300	2 500
72	RNA 4913UU	RNA 4913U	—	—	325	72	90	25	1	85	56 800	99 800	2 500
	—	—	RNA 6913UU	RNA 6913U	580	72	90	45	1	85	97 400	200 000	2 500
75	RNA 49/68UU	RNA 49/68U	—	—	465	75	95	30	1	90	73 900	133 000	2 500
80	RNA 4914UU	RNA 4914U	—	—	495	80	100	30	1	95	76 900	143 000	2 500
	—	—	RNA 6914UU	RNA 6914U	910	80	100	54	1	95	124 000	281 000	2 500
85	RNA 4915UU	RNA 4915U	—	—	520	85	105	30	1	100	79 600	153 000	2 000
	—	—	RNA 6915UU	RNA 6915U	960	85	105	54	1	100	128 000	299 000	2 000

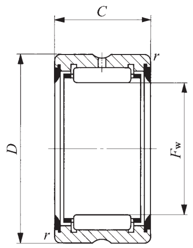
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

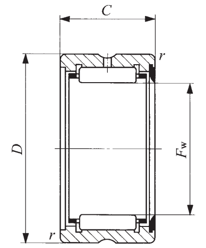
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring



RNA49…UU



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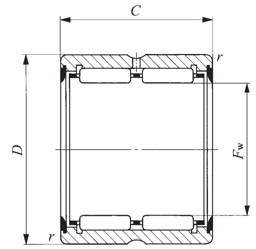
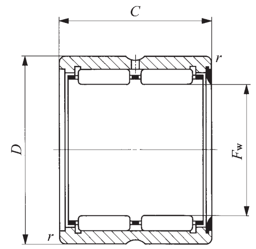


RNA69…UU



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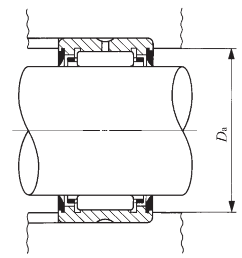


Shaft dia. 90 — 160mm

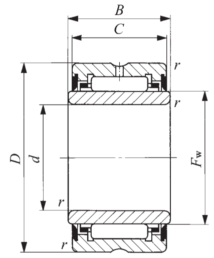
Shaft dia. mm	Identification number: With two seals	With one seal	With two seals	With one seal	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
90	RNA 4916UU	RNA 4916U	—	—	545	90	110	30	1	105	80 700	158 000	2 000
	—	—	RNA 6916UU	RNA 6916U	1 010	90	110	54	1	105	132 000	317 000	2 000
95	RNA 49/82UU	RNA 49/82U	—	—	570	95	115	30	1	110	83 200	168 000	2 000
100	RNA 4917UU	RNA 4917U	—	—	695	100	120	35	1.1	113.5	103 000	225 000	1 900
	—	—	RNA 6917UU	RNA 6917U	1 300	100	120	63	1.1	113.5	168 000	448 000	1 900
105	RNA 4918UU	RNA 4918U	—	—	730	105	125	35	1.1	118.5	106 000	238 000	1 800
	—	—	RNA 6918UU	RNA 6918U	1 360	105	125	63	1.1	118.5	172 000	471 000	1 800
110	RNA 4919UU	RNA 4919U	—	—	760	110	130	35	1.1	123.5	109 000	250 000	1 700
	—	—	RNA 6919UU	RNA 6919U	1 420	110	130	63	1.1	123.5	177 000	493 000	1 700
115	RNA 4920UU	RNA 4920U	—	—	1 200	115	140	40	1.1	133.5	134 000	297 000	1 700
125	RNA 4922UU	RNA 4922U	—	—	1 280	125	150	40	1.1	143.5	140 000	322 000	1 500
135	RNA 4924UU	RNA 4924U	—	—	1 940	135	165	45	1.1	158.5	178 000	410 000	1 400
150	RNA 4926UU	RNA 4926U	—	—	2 360	150	180	50	1.5	172	206 000	511 000	1 300
160	RNA 4928UU	RNA 4928U	—	—	2 510	160	190	50	1.5	182	214 000	549 000	1 200

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

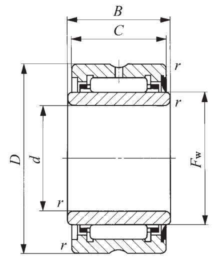
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

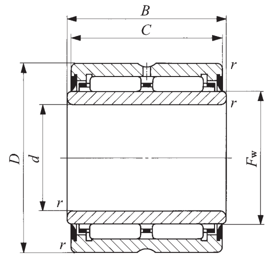
With Seal, With Inner Ring



NA49…UU
NA69…UU(d≦30)



NA49…U
NA69…U(d≦30)



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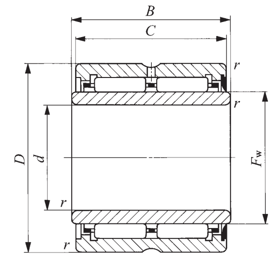

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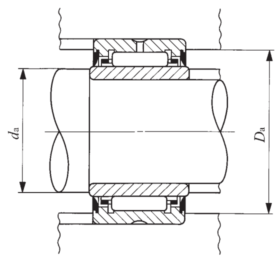


Shaft dia. 10 — 40mm

Shaft dia. mm	Identification number: With two seals	Identification number: With one seal	Identification number: With two seals	Identification number: With one seal	Mass (Ref.) g	Boundary dimensions mm d	D	C	B	$r_{s\,min}$ (1)	F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
10	NA 4900UU	NA 4900U	—	—	24.5	10	22	13	14	0.3	14	12	13	20	8 080	8 490	14 000	LRTZ 101414
12	NA 4901UU	NA 4901U	—	—	27.5	12	24	13	14	0.3	16	14	15	22	8 470	9 320	12 000	LRTZ 121614
	—	—	NA 6901UU	NA 6901U	45.5	12	24	22	23	0.3	16	14	15	22	15 500	20 400	12 000	LRTZ 121623
15	NA 4902UU	NA 4902U	—	—	36	15	28	13	14	0.3	20	17	19	26	9 570	11 600	9 500	LRTZ 152014
	—	—	NA 6902UU	NA 6902U	62.5	15	28	23	24	0.3	20	17	19	26	18 500	27 100	9 500	LRTZ 152024
17	NA 4903UU	NA 4903U	—	—	39.5	17	30	13	14	0.3	22	19	21	28	10 300	13 100	8 500	LRTZ 172214
	—	—	NA 6903UU	NA 6903U	68.5	17	30	23	24	0.3	22	19	21	28	19 800	30 600	8 500	LRTZ 172224
20	NA 4904UU	NA 4904U	—	—	78.5	20	37	17	18	0.3	25	22	24	35	18 000	20 500	7 500	LRTZ 202518
	—	—	NA 6904UU	NA 6904U	137	20	37	30	31	0.3	25	22	24	35	33 000	44 600	7 500	LRTZ 202531
22	NA 49/22UU	NA 49/22U	—	—	87.5	22	39	17	18	0.3	28	24	27	37	18 300	23 700	7 000	LRTZ 222818
	—	—	NA 69/22UU	NA 69/22U	153	22	39	30	31	0.3	28	24	27	37	33 800	52 000	7 000	LRTZ 222831
25	NA 4905UU	NA 4905U	—	—	92.5	25	42	17	18	0.3	30	27	29	40	20 300	25 100	6 500	LRTZ 253018
	—	—	NA 6905UU	NA 6905U	162	25	42	30	31	0.3	30	27	29	40	39 200	58 700	6 500	LRTZ 253031
28	NA 49/28UU	NA 49/28U	—	—	101	28	45	17	18	0.3	32	30	31	43	21 000	26 800	6 000	LRTZ 283218
	—	—	NA 69/28UU	NA 69/28U	177	28	45	30	31	0.3	32	30	31	43	38 900	59 100	6 000	LRTZ 283231
30	NA 4906UU	NA 4906U	—	—	106	30	47	17	18	0.3	35	32	34	45	21 500	28 400	5 500	LRTZ 303518
	—	—	NA 6906UU	NA 6906U	185	30	47	30	31	0.3	35	32	34	45	40 100	63 000	5 500	LRTZ 303531
32	NA 49/32UU	NA 49/32U	—	—	167	32	52	20	21	0.6	40	36	39	48	29 400	44 200	5 000	LRTZ 324021
	—	—	NA 69/32UU	NA 69/32U	300	32	52	36	37	0.6	40	36	39	48	50 300	88 300	5 000	LRTZ 324037
35	NA 4907UU	NA 4907U	—	—	179	35	55	20	21	0.6	42	39	41	51	30 100	46 300	4 500	LRTZ 354221
	—	—	NA 6907UU	NA 6907U	320	35	55	36	37	0.6	42	39	41	51	51 600	92 600	4 500	LRTZ 354237
40	NA 4908UU	NA 4908U	—	—	245	40	62	22	23	0.6	48	44	47	58	37 200	58 400	4 000	LRTZ 404823
	—	—	NA 6908UU	NA 6908U	440	40	62	40	41	0.6	48	44	47	58	63 700	117 000	4 000	LRTZ 404841

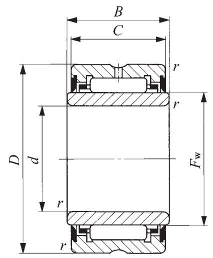
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring



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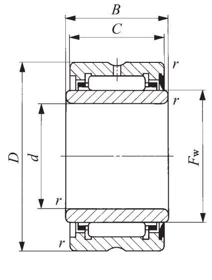

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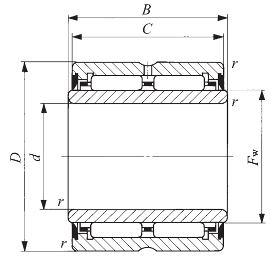

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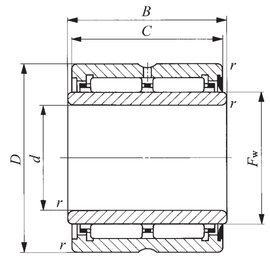

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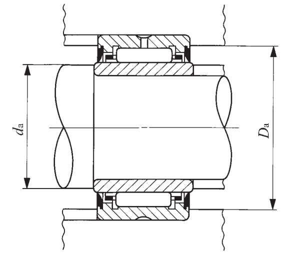


Shaft dia. 45 — 110mm

Shaft dia. mm	Identification number: With two seals	With one seal	With two seals	With one seal	Mass (Ref.) g	Boundary dimensions mm d	D	C	B
45	**NA 4909UU**	**NA 4909U**	—	—	290	45	68	22	23
	—	—	**NA 6909UU**	**NA 6909U**	520	45	68	40	41
50	**NA 4910UU**	**NA 4910U**	—	—	295	50	72	22	23
	—	—	**NA 6910UU**	**NA 6910U**	530	50	72	40	41
55	**NA 4911UU**	**NA 4911U**	—	—	415	55	80	25	26
	—	—	**NA 6911UU**	**NA 6911U**	730	55	80	45	46
60	**NA 4912UU**	**NA 4912U**	—	—	445	60	85	25	26
	—	—	**NA 6912UU**	**NA 6912U**	785	60	85	45	46
65	**NA 4913UU**	**NA 4913U**	—	—	475	65	90	25	26
	—	—	**NA 6913UU**	**NA 6913U**	845	65	90	45	46
70	**NA 4914UU**	**NA 4914U**	—	—	770	70	100	30	31
	—	—	**NA 6914UU**	**NA 6914U**	1 400	70	100	54	55
75	**NA 4915UU**	**NA 4915U**	—	—	815	75	105	30	31
	—	—	**NA 6915UU**	**NA 6915U**	1 480	75	105	54	55
80	**NA 4916UU**	**NA 4916U**	—	—	860	80	110	30	31
	—	—	**NA 6916UU**	**NA 6916U**	1 570	80	110	54	55
85	**NA 4917UU**	**NA 4917U**	—	—	1 300	85	120	35	36
	—	—	**NA 6917UU**	**NA 6917U**	2 360	85	120	63	64
90	**NA 4918UU**	**NA 4918U**	—	—	1 360	90	125	35	36
	—	—	**NA 6918UU**	**NA 6918U**	2 480	90	125	63	64
95	**NA 4919UU**	**NA 4919U**	—	—	1 420	95	130	35	36
	—	—	**NA 6919UU**	**NA 6919U**	2 600	95	130	63	64
100	**NA 4920UU**	**NA 4920U**	—	—	1 980	100	140	40	41
110	**NA 4922UU**	**NA 4922U**	—	—	2 150	110	150	40	41

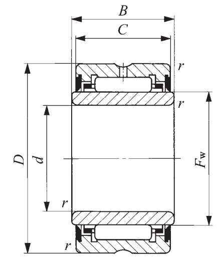
$r_{s\,min}$ (1)	F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
0.6	52	49	51	64	38 900	63 400	3 500	**LRTZ 455223**
0.6	52	49	51	64	66 600	127 000	3 500	**LRTZ 455241**
0.6	58	54	57	68	41 300	71 100	3 500	**LRTZ 505823**
0.6	58	54	57	68	70 800	142 000	3 500	**LRTZ 505841**
1	63	60	61	75	52 200	85 700	3 000	**LRTZ 556326**
1	63	60	61	75	89 400	171 000	3 000	**LRTZ 556346**
1	68	65	66	80	54 500	92 800	3 000	**LRTZ 606826**
1	68	65	66	80	93 400	186 000	3 000	**LRTZ 606846**
1	72	70	70.5	85	56 800	99 800	2 500	**LRTZ 657226**
1	72	70	70.5	85	97 400	200 000	2 500	**LRTZ 657246**
1	80	75	78	95	76 900	143 000	2 500	**LRTZ 708031**
1	80	75	78	95	124 000	281 000	2 500	**LRTZ 708055**
1	85	80	83	100	79 600	153 000	2 000	**LRTZ 758531**
1	85	80	83	100	128 000	299 000	2 000	**LRTZ 758555**
1	90	85	88	105	80 700	158 000	2 000	**LRTZ 809031**
1	90	85	88	105	132 000	317 000	2 000	**LRTZ 809055**
1.1	100	91.5	98	113.5	103 000	225 000	1 900	**LRTZ 8510036**
1.1	100	91.5	98	113.5	168 000	448 000	1 900	**LRTZ 8510064**
1.1	105	96.5	103	118.5	106 000	238 000	1 800	**LRTZ 9010536**
1.1	105	96.5	103	118.5	172 000	471 000	1 800	**LRTZ 9010564**
1.1	110	101.5	108	123.5	109 000	250 000	1 700	**LRTZ 9511036**
1.1	110	101.5	108	123.5	177 000	493 000	1 700	**LRTZ 9511064**
1.1	115	106.5	113	133.5	134 000	297 000	1 700	**LRTZ 10011541**
1.1	125	116.5	123	143.5	140 000	322 000	1 500	**LRTZ 11012541**

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

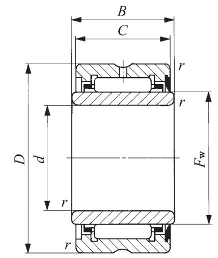
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring



NA49⋯UU



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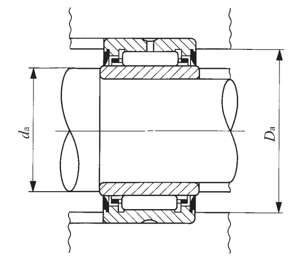


Shaft dia. 120 ─ 140mm

Shaft dia. mm	Identification number: With two seals	With one seal	With two seals	With one seal	Mass (Ref.) g	Boundary dimensions mm: d	D	C	B
120	**NA 4924UU**	**NA 4924U**	—	—	2 990	120	165	45	46
130	**NA 4926UU**	**NA 4926U**	—	—	4 080	130	180	50	51
140	**NA 4928UU**	**NA 4928U**	—	—	4 340	140	190	50	51

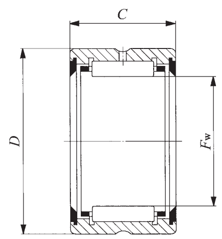
$r_{s\,min}$(1)	F_w	Standard mounting dimensions mm: d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
1.1	135	126.5	133	158.5	178 000	410 000	1 400	**LRTZ 12013546**
1.5	150	138	148	172	206 000	511 000	1 300	**LRTZ 13015051**
1.5	160	148	158	182	214 000	549 000	1 200	**LRTZ 14016051**

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication.
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series



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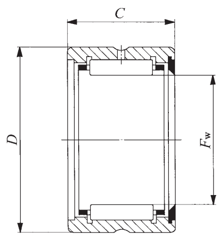
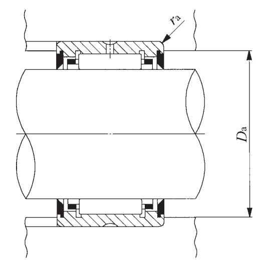


BR···U



Shaft dia. 15.875 – 50.800mm

Shaft dia. mm (inch)	Identification number: With two seals	Identification number: With one seal	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 101816 UU	BR 101816 U	54	15.875 (5/8)	28.575 (1 1/8)	25.400 (1)	24.5	0.6	18 300	20 000	12 000
19.050 (3/4)	BR 122016 UU	BR 122016 U	68	19.050 (3/4)	31.750 (1 1/4)	25.400 (1)	26.5	1.0	20 700	24 400	10 000
22.225 (7/8)	BR 142216 UU	BR 142216 U	76	22.225 (7/8)	34.925 (1 3/8)	25.400 (1)	29.7	1.0	21 600	26 900	9 000
25.400 (1)	BR 162416 UU	BR 162416 U	83	25.400 (1)	38.100 (1 1/2)	25.400 (1)	32.9	1.0	23 600	31 300	8 000
28.575 (1 1/8)	BR 182620 UU	BR 182620 U	115	28.575 (1 1/8)	41.275 (1 5/8)	31.750 (1 1/4)	36.0	1.0	34 900	49 900	7 000
31.750 (1 1/4)	BR 202820 UU	BR 202820 U	124	31.750 (1 1/4)	44.450 (1 3/4)	31.750 (1 1/4)	39.2	1.0	36 000	53 500	6 500
34.925 (1 3/8)	BR 223020 UU	BR 223020 U	134	34.925 (1 3/8)	47.625 (1 7/8)	31.750 (1 1/4)	42.4	1.0	38 500	60 000	5 500
38.100 (1 1/2)	BR 243320 UU	BR 243320 U	168	38.100 (1 1/2)	52.388 (2 1/16)	31.750 (1 1/4)	45.1	1.5	43 700	66 900	5 500
41.275 (1 5/8)	BR 263520 UU	BR 263520 U	179	41.275 (1 5/8)	55.562 (2 3/16)	31.750 (1 1/4)	48.3	1.5	44 800	70 900	4 500
44.450 (1 3/4)	BR 283720 UU	BR 283720 U	193	44.450 (1 3/4)	58.738 (2 5/16)	31.750 (1 1/4)	51.5	1.5	47 500	78 200	4 500
47.625 (1 7/8)	BR 303920 UU	BR 303920 U	202	47.625 (1 7/8)	61.912 (2 7/16)	31.750 (1 1/4)	54.7	1.5	48 500	82 100	4 000
50.800 (2)	BR 324120 UU	BR 324120 U	216	50.800 (2)	65.088 (2 9/16)	31.750 (1 1/4)	57.8	1.5	51 000	89 400	4 000

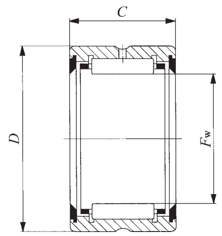
Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series



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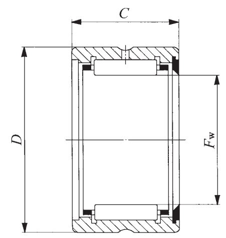
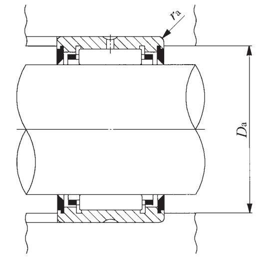




BR···U

Shaft dia. 57.150 ― 95.250mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.)	Boundary dimensions mm(inch)			Standard mounting dimensions mm		Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(2)
	With two seals	With one seal	g	F_w	D	C	D_a Max.	$r_{as\ max}$ (1)	N	N	rpm
57.150 (2 1/4)	**BR 364828 UU**	**BR 364828 U**	459	57.150 (2 1/4)	76.200 (3)	44.450 (1 3/4)	69.0	1.5	90 300	158 000	3 500
63.500 (2 1/2)	**BR 405228 UU**	**BR 405228 U**	499	63.500 (2 1/2)	82.550 (3 1/4)	44.450 (1 3/4)	74.3	2.0	94 600	174 000	3 000
69.850 (2 3/4)	**BR 445628 UU**	**BR 445628 U**	540	69.850 (2 3/4)	88.900 (3 1/2)	44.450 (1 3/4)	80.7	2.0	98 700	189 000	2 500
76.200 (3)	**BR 486028 UU**	**BR 486028 U**	585	76.200 (3)	95.250 (3 3/4)	44.450 (1 3/4)	87.0	2.0	105 000	211 000	2 500
82.550 (3 1/4)	**BR 526828 UU**	**BR 526828 U**	891	82.550 (3 1/4)	107.950 (4 1/4)	44.450 (1 3/4)	99.7	2.0	109 000	227 000	2 500
88.900 (3 1/2)	**BR 567232 UU**	**BR 567232 U**	1 098	88.900 (3 1/2)	114.300 (4 1/2)	50.800 (2)	106.1	2.0	142 000	265 000	2 000
95.250 (3 3/4)	**BR 607632 UU**	**BR 607632 U**	1 161	95.250 (3 3/4)	120.650 (4 3/4)	50.800 (2)	111.4	2.5	148 000	287 000	2 000

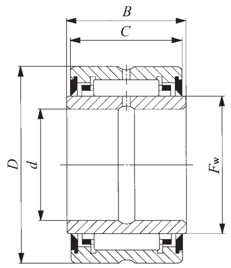
Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



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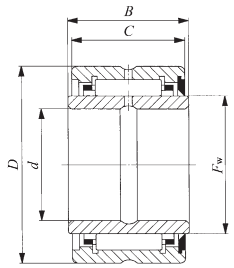
IKO



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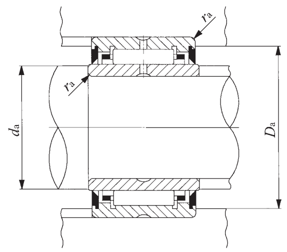


D

NA
TAFI
TRI
BRI

Shaft dia. 9.525 — 44.450mm

Shaft dia. mm (inch)	Identification number: With two seals	Identification number: With one seal	Mass (Ref.) g	Boundary dimensions mm(inch): d	D	C	B	F_w	Standard mounting dimensions mm: d_a Min.	d_a Max.	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	Assembled inner ring
9.525 (3/8)	**BRI 61816 UU**	**BRI 61816 U**	79	9.525 (3/8)	28.575 (1 1/8)	25.400 (1)	25.650	15.875 (5/8)	14	14.5	24.5	0.6	18 300	20 000	12 000	**LRBZ 61016 B**
12.700 (1/2)	**BRI 82016 UU**	**BRI 82016 U**	99	12.700 (1/2)	31.750 (1 1/4)	25.400 (1)	25.650	19.050 (3/4)	17.5	18	26.5	0.6	20 700	24 400	10 000	**LRBZ 81216 B**
15.875 (5/8)	**BRI 102216 UU**	**BRI 102216 U**	113.5	15.875 (5/8)	34.925 (1 3/8)	25.400 (1)	25.650	22.225 (7/8)	21	21.2	29.7	0.6	21 600	26 900	9 000	**LRBZ 101416 B**
19.050 (3/4)	**BRI 122416 UU**	**BRI 122416 U**	127	19.050 (3/4)	38.100 (1 1/2)	25.400 (1)	25.650	25.400 (1)	24	24.4	32.9	0.6	23 600	31 300	8 000	**LRBZ 121616 B**
22.225 (7/8)	**BRI 142620 UU**	**BRI 142620 U**	177	22.225 (7/8)	41.275 (1 5/8)	31.750 (1 1/4)	32.000	28.575 (1 1/8)	27	27.5	36.0	0.6	34 900	49 900	7 000	**LRBZ 141820 B**
25.400 (1)	**BRI 162820 UU**	**BRI 162820 U**	196	25.400 (1)	44.450 (1 3/4)	31.750 (1 1/4)	32.000	31.750 (1 1/4)	30.5	30.7	39.2	0.6	36 000	53 500	6 500	**LRBZ 162020 B**
28.575 (1 1/8)	**BRI 183020 UU**	**BRI 183020 U**	211	28.575 (1 1/8)	47.625 (1 7/8)	31.750 (1 1/4)	32.000	34.925 (1 3/8)	33.5	33.9	42.4	0.6	38 500	60 000	5 500	**LRBZ 182220 B**
31.750 (1 1/4)	**BRI 203320 UU**	**BRI 203320 U**	254	31.750 (1 1/4)	52.388 (2 1/16)	31.750 (1 1/4)	32.000	38.100 (1 1/2)	37	37.1	45.1	0.6	43 700	66 900	5 500	**LRBZ 202420 B**
34.925 (1 3/8)	**BRI 223520 UU**	**BRI 223520 U**	275	34.925 (1 3/8)	55.562 (2 3/16)	31.750 (1 1/4)	32.000	41.275 (1 5/8)	40.2	40.2	48.3	0.6	44 800	70 900	4 500	**LRBZ 222620 B**
38.100 (1 1/2)	**BRI 243720 UU**	**BRI 243720 U**	293	38.100 (1 1/2)	58.738 (2 5/16)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	43.3	43.4	51.5	0.6	47 500	78 200	4 500	**LRBZ 242820 B**
	BRI 243920 UU	**BRI 243920 U**	362	38.100 (1 1/2)	61.912 (2 7/16)	31.750 (1 1/4)	32.000	47.625 (1 7/8)	43.3	45	54.7	1	48 500	82 100	4 000	**LRBZ 243020 B**
41.275 (1 5/8)	**BRI 264120 UU**	**BRI 264120 U**	386	41.275 (1 5/8)	65.088 (2 9/16)	31.750 (1 1/4)	32.000	50.800 (2)	48	49	57.8	1	51 000	89 400	4 000	**LRBZ 263220 B**
44.450 (1 3/4)	**BRI 284828 UU**	**BRI 284828 U**	804	44.450 (1 3/4)	76.200 (3)	44.450 (1 3/4)	44.700	57.150 (2 1/4)	52.5	55	69.0	1.5	90 300	158 000	3 500	**LRBZ 283628 B**

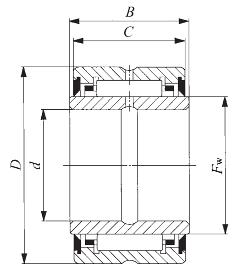
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



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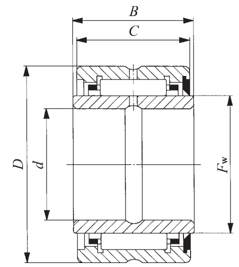

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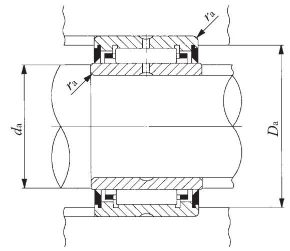


Shaft dia. 50.800 ― 82.550mm

Shaft dia. mm (inch)	Identification number With two seals	Identification number With one seal	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B
50.800 (2)	**BRI 325228 UU**	**BRI 325228 U**	889	50.800 (2)	82.550 (3 1/4)	44.450 (1 3/4)	44.700
57.150 (2 1/4)	**BRI 365628 UU**	**BRI 365628 U**	980	57.150 (2 1/4)	88.900 (3 1/2)	44.450 (1 3/4)	44.700
63.500 (2 1/2)	**BRI 406028 UU**	**BRI 406028 U**	1 065	63.500 (2 1/2)	95.250 (3 3/4)	44.450 (1 3/4)	44.700
69.850 (2 3/4)	**BRI 446828 UU**	**BRI 446828 U**	1 421	69.850 (2 3/4)	107.950 (4 1/4)	44.450 (1 3/4)	44.700
76.200 (3)	**BRI 487232 UU**	**BRI 487232 U**	1 738	76.200 (3)	114.300 (4 1/2)	50.800 (2)	51.050
82.550 (3 1/4)	**BRI 527632 UU**	**BRI 527632 U**	1 851	82.550 (3 1/4)	120.650 (4 3/4)	50.800 (2)	51.050

F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	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	Assembled inner ring
63.500 (2 1/2)	58	61	74.3	1.5	94 600	174 000	3 000	**LRBZ 324028 B**
69.850 (2 3/4)	65	67	80.7	1.5	98 700	189 000	2 500	**LRBZ 364428 B**
76.200 (3)	71	73	87.0	1.5	105 000	211 000	2 500	**LRBZ 404828 B**
82.550 (3 1/4)	77	79	99.7	1.5	109 000	227 000	2 500	**LRBZ 445228 B**
88.900 (3 1/2)	83.5	86	106.1	1.5	142 000	265 000	2 000	**LRBZ 485632 B**
95.250 (3 3/4)	91	93	111.4	1.5	148 000	287 000	2 000	**LRBZ 526032 B**

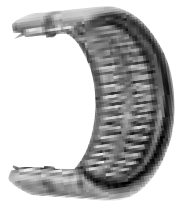
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

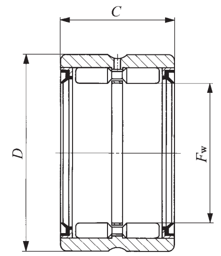
Remarks1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series





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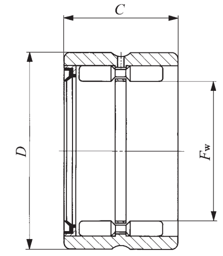

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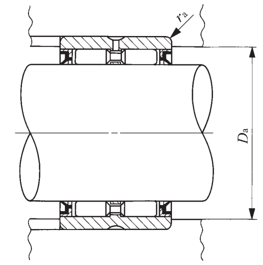


Shaft dia. 15.875 — 50.800mm

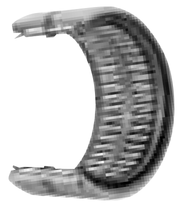
Shaft dia. mm (inch)	Identification number		Mass (Ref.)	Boundary dimensions mm(inch)			Standard mounting dimensions mm		Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(2)
	With two seals	With one seal	g	F_w	D	C	D_a Max.	$r_{as\ max}$(1)	N	N	rpm
15.875 (5/8)	GBR 101816 UU	GBR 101816 U	69.5	15.875(5/8)	28.575(1 1/8)	25.400(1)	24.5	0.6	23 500	28 500	5 000
19.050 (3/4)	GBR 122016 UU	GBR 122016 U	79	19.050(3/4)	31.750(1 1/4)	25.400(1)	27	0.6	26 400	34 500	4 000
22.225 (7/8)	GBR 142216 UU	GBR 142216 U	89.5	22.225(7/8)	34.925(1 3/8)	25.400(1)	30	0.6	28 600	40 100	3 500
25.400 (1)	GBR 162416 UU	GBR 162416 U	99	25.400(1)	38.100(1 1/2)	25.400(1)	33.3	0.6	31 000	46 100	3 000
28.575 (1 1/8)	GBR 182620 UU	GBR 182620 U	139	28.575(1 1/8)	41.275(1 5/8)	31.750(1 1/4)	36.3	0.6	43 900	75 300	3 000
31.750 (1 1/4)	GBR 202820 UU	GBR 202820 U	152	31.750(1 1/4)	44.450(1 3/4)	31.750(1 1/4)	39.6	0.6	46 600	83 900	2 500
34.925 (1 3/8)	GBR 223020 UU	GBR 223020 U	163	34.925(1 3/8)	47.625(1 7/8)	31.750(1 1/4)	42.8	0.6	49 500	91 800	2 500
38.100 (1 1/2)	GBR 243320 UU	GBR 243320 U	200	38.100(1 1/2)	52.388(2 1/16)	31.750(1 1/4)	47.3	0.6	54 200	97 700	2 000
41.275 (1 5/8)	GBR 263520 UU	GBR 263520 U	215	41.275(1 5/8)	55.562(2 3/16)	31.750(1 1/4)	50.5	0.6	56 600	105 000	1 900
44.450 (1 3/4)	GBR 283720 UU	GBR 283720 U	230	44.450(1 3/4)	58.738(2 5/16)	31.750(1 1/4)	53.7	0.6	58 900	114 000	1 800
47.625 (1 7/8)	GBR 303920 UU	GBR 303920 U	240	47.625(1 7/8)	61.912(2 7/16)	31.750(1 1/4)	56.2	1	61 100	121 000	1 700
50.800 (2)	GBR 324120 UU	GBR 324120 U	255	50.800(2)	65.088(2 9/16)	31.750(1 1/4)	59.2	1	63 100	130 000	1 600

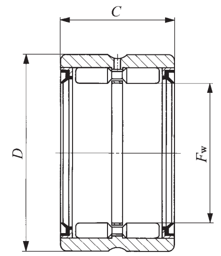
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.
Remarks 1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series





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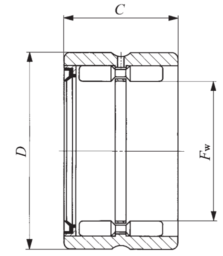

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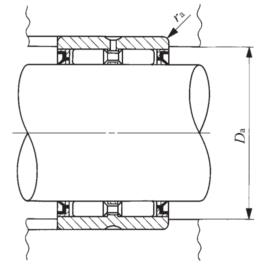


D
NA
TAFI
TRI
BRI

Shaft dia. 57.150 — 107.950mm

Shaft dia. mm (inch)	Identification number: With two seals	Identification number: With one seal	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	Boundary dimensions mm(inch) D	Boundary dimensions mm(inch) C	Standard mounting dimensions mm D_a Max.	Standard mounting dimensions mm $r_{as\,max}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
57.150 (2¼)	**GBR 364828 UU**	**GBR 364828 U**	515	57.150 (2¼)	76.200 (3)	44.450 (1¾)	69.2	1.5	87 500	161 000	1 400
63.500 (2½)	**GBR 405228 UU**	**GBR 405228 U**	560	63.500 (2½)	82.550 (3¼)	44.450 (1¾)	75.7	1.5	93 300	179 000	1 300
69.850 (2¾)	**GBR 445628 UU**	**GBR 445628 U**	610	69.850 (2¾)	88.900 (3½)	44.450 (1¾)	82	1.5	97 200	197 000	1 100
76.200 (3)	**GBR 486028 UU**	**GBR 486028 U**	660	76.200 (3)	95.250 (3¾)	44.450 (1¾)	88	1.5	101 000	215 000	1 100
82.550 (3¼)	**GBR 526828 UU**	**GBR 526828 U**	960	82.550 (3¼)	107.950 (4¼)	44.450 (1¾)	99.9	1.5	127 000	231 000	950
88.900 (3½)	**GBR 567232 UU**	**GBR 567232 U**	1 240	88.900 (3½)	114.300 (4½)	50.800 (2)	106.3	1.5	170 000	347 000	900
95.250 (3¾)	**GBR 607632 UU**	**GBR 607632 U**	1 320	95.250 (3¾)	120.650 (4¾)	50.800 (2)	112.6	1.5	175 000	371 000	850
101.600 (4)	**GBR 648032 UU**	**GBR 648032 U**	1 380	101.600 (4)	127.000 (5)	50.800 (2)	119	1.5	182 000	395 000	800
107.950 (4¼)	**GBR 688432 UU**	**GBR 688432 U**	1 460	107.950 (4¼)	133.350 (5¼)	50.800 (2)	125.3	1.5	186 000	419 000	750

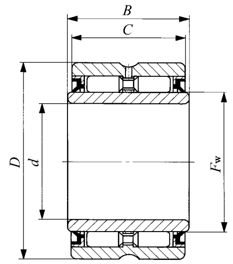
Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



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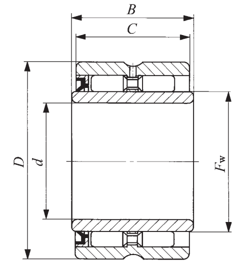

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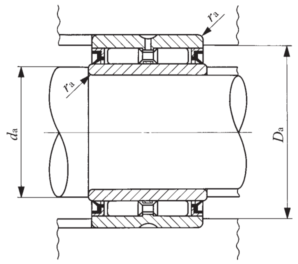


Shaft dia. 9.525 — 44.450mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.)	Boundary dimensions mm(inch)					Standard mounting dimensions mm				Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(2)	Assembled inner ring
	With two seals	With one seal	g	d	D	C	B	F_w	d_a Min.	d_a Max.	D_a Max.	$r_{as\,max}$(1)	N	N	rpm	
9.525 (3/8)	**GBRI 61816 UU**	**GBRI 61816 U**	94.5	9.525 (3/8)	28.575 (1 1/8)	25.400 (1)	25.650	15.875 (5/8)	14	14.5	24.5	0.6	23 500	28 500	5 000	**LRBZ 61016**
12.700 (1/2)	**GBRI 82016 UU**	**GBRI 82016 U**	110	12.700 (1/2)	31.750 (1 1/4)	25.400 (1)	25.650	19.050 (3/4)	17.5	18	27	0.6	26 400	34 500	4 000	**LRBZ 81216**
15.875 (5/8)	**GBRI 102216 UU**	**GBRI 102216 U**	127	15.875 (5/8)	34.925 (1 3/8)	25.400 (1)	25.650	22.225 (7/8)	21	21.2	30	0.6	28 600	40 100	3 500	**LRBZ 101416**
19.050 (3/4)	**GBRI 122416 UU**	**GBRI 122416 U**	143	19.050 (3/4)	38.100 (1 1/2)	25.400 (1)	25.650	25.400 (1)	24	24.4	33.3	0.6	31 000	46 100	3 000	**LRBZ 121616**
22.225 (7/8)	**GBRI 142620 UU**	**GBRI 142620 U**	200	22.225 (7/8)	41.275 (1 5/8)	31.750 (1 1/4)	32.000	28.575 (1 1/8)	27	27.5	36.3	0.6	43 900	75 300	3 000	**LRBZ 141820**
25.400 (1)	**GBRI 162820 UU**	**GBRI 162820 U**	220	25.400 (1)	44.450 (1 3/4)	31.750 (1 1/4)	32.000	31.750 (1 1/4)	30.5	30.7	39.6	0.6	46 600	83 900	2 500	**LRBZ 162020**
28.575 (1 1/8)	**GBRI 183020 UU**	**GBRI 183020 U**	240	28.575 (1 1/8)	47.625 (1 7/8)	31.750 (1 1/4)	32.000	34.925 (1 3/8)	33.5	33.9	42.8	0.6	49 500	91 800	2 500	**LRBZ 182220**
31.750 (1 1/4)	**GBRI 203320 UU**	**GBRI 203320 U**	286	31.750 (1 1/4)	52.388 (2 1/16)	31.750 (1 1/4)	32.000	38.100 (1 1/2)	37	37.1	47.3	0.6	54 200	97 700	2 000	**LRBZ 202420**
34.925 (1 3/8)	**GBRI 223520 UU**	**GBRI 223520 U**	311	34.925 (1 3/8)	55.562 (2 3/16)	31.750 (1 1/4)	32.000	41.275 (1 5/8)	40.2	40.2	50.5	0.6	56 600	105 000	1 900	**LRBZ 222620**
38.100 (1 1/2)	**GBRI 243720 UU**	**GBRI 243720 U**	330	38.100 (1 1/2)	58.738 (2 5/16)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	43.3	43.4	53.7	0.6	58 900	114 000	1 800	**LRBZ 242820**
	GBRI 243920 UU	**GBRI 243920 U**	400	38.100 (1 1/2)	61.912 (2 7/16)	31.750 (1 1/4)	32.000	47.625 (1 7/8)	43.3	45	56.2	1	61 100	121 000	1 700	**LRBZ 243020**
41.275 (1 5/8)	**GBRI 264120 UU**	**GBRI 264120 U**	425	41.275 (1 5/8)	65.088 (2 9/16)	31.750 (1 1/4)	32.000	50.800 (2)	48	49	59.2	1	63 100	130 000	1 600	**LRBZ 263220**
44.450 (1 3/4)	**GBRI 284828 UU**	**GBRI 284828 U**	860	44.450 (1 3/4)	76.200 (3)	44.450 (1 3/4)	44.700	57.150 (2 1/4)	52.5	55	69.2	1.5	87 500	161 000	1 400	**LRBZ 283628**

Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

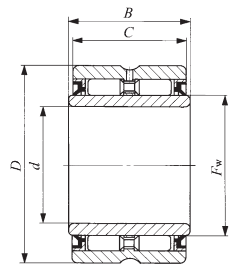
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

MACHINED TYPE NEEDLE ROLLER BEARINGS

IKO

With Seal, With Inner Ring, Inch Series



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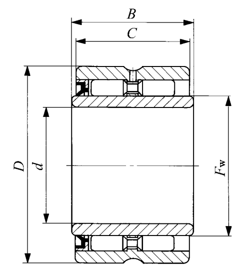

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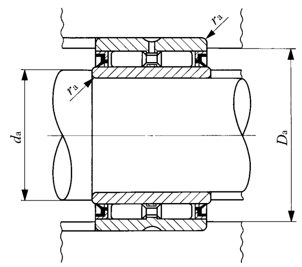


D

NA
TAFI
TRI
BRI

Shaft dia. 50.800 — 95.250mm

Shaft dia. mm (inch)	Identification number With two seals	Identification number With one seal	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	Standard mounting dimensions mm d_a Min.	d_a Max.	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	Assembled inner ring
50.800 (2)	**GBRI 325228 UU**	**GBRI 325228 U**	950	50.800 (2)	82.550 (3¼)	44.450 (1¾)	44.700	63.500 (2½)	58	61	75.7	1.5	93 300	179 000	1 300	**LRBZ 324028**
57.150 (2¼)	**GBRI 365628 UU**	**GBRI 365628 U**	1 050	57.150 (2¼)	88.900 (3½)	44.450 (1¾)	44.700	69.850 (2¾)	65	67	82	1.5	97 200	197 000	1 100	**LRBZ 364428**
63.500 (2½)	**GBRI 406028 UU**	**GBRI 406028 U**	1 140	63.500 (2½)	95.250 (3¾)	44.450 (1¾)	44.700	76.200 (3)	71	73	88	1.5	101 000	215 000	1 100	**LRBZ 404828**
69.850 (2¾)	**GBRI 446828 UU**	**GBRI 446828 U**	1 490	69.850 (2¾)	107.950 (4¼)	44.450 (1¾)	44.700	82.550 (3¼)	77	79	99.9	1.5	127 000	231 000	950	**LRBZ 445228**
76.200 (3)	**GBRI 487232 UU**	**GBRI 487232 U**	1 880	76.200 (3)	114.300 (4½)	50.800 (2)	51.050	88.900 (3½)	83.5	86	106.3	1.5	170 000	347 000	900	**LRBZ 485632**
82.550 (3¼)	**GBRI 527632 UU**	**GBRI 527632 U**	2 010	82.550 (3¼)	120.650 (4¾)	50.800 (2)	51.050	95.250 (3¾)	91	93	112.6	1.5	175 000	371 000	850	**LRBZ 526032**
88.900 (3½)	**GBRI 568032 UU**	**GBRI 568032 U**	2 130	88.900 (3½)	127.000 (5)	50.800 (2)	51.050	101.600 (4)	97	99	119	1.5	182 000	395 000	800	**LRBZ 566432**
95.250 (3¾)	**GBRI 608432 UU**	**GBRI 608432 U**	2 260	95.250 (3¾)	133.350 (5¼)	50.800 (2)	51.050	107.950 (4¼)	103	105	125.3	1.5	186 000	419 000	750	**LRBZ 606832**

Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

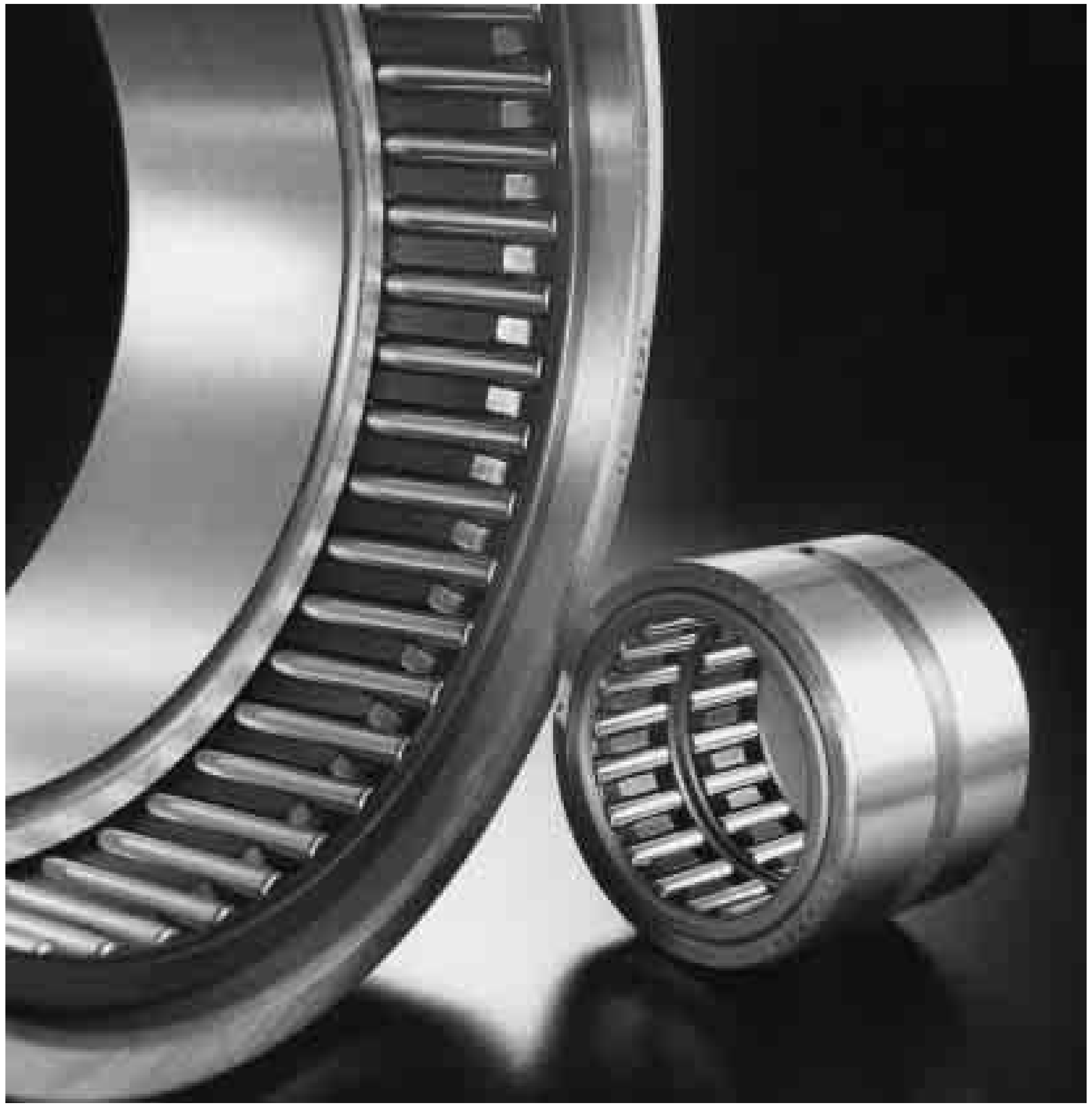
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

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

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

●Needle Roller Bearings with Separable Cage - Without Inner Ring

●Needle Roller Bearings with Separable Cage - With Inner Ring

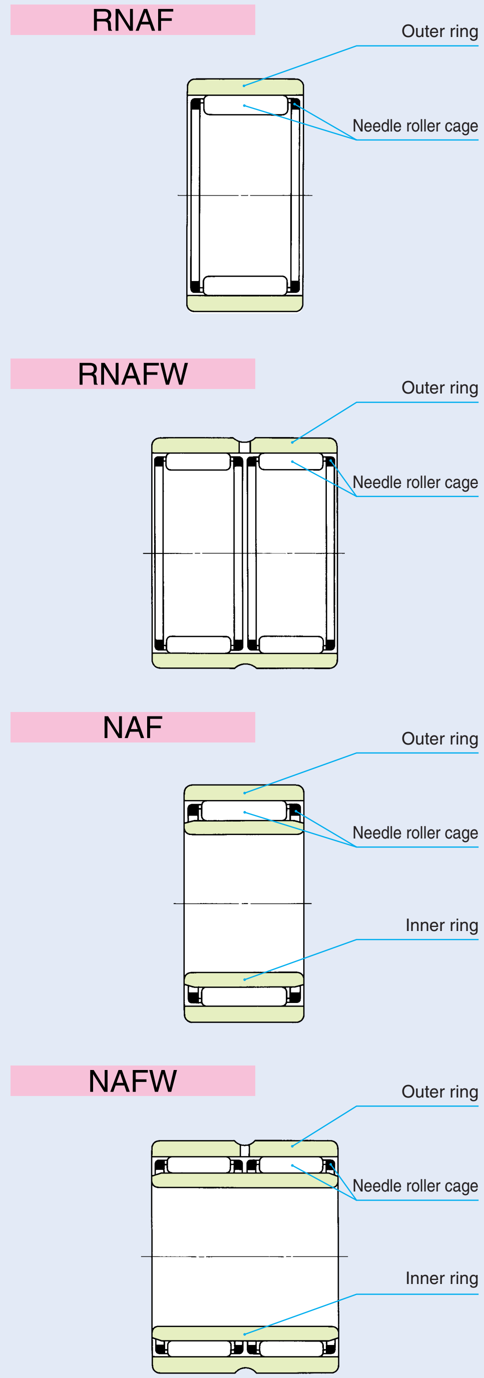


Structure and Features

In IKO Needle Roller Bearings with Separable Cage, the inner ring, outer ring and IKO Needle Roller Cage are combined, and they can be separated easily. This type has a simple structure with high accuracy. In addition, the radial clearance can be freely chosen by selecting and combining these component parts. As Needle Roller Cages are used, these bearings have excellent rotational performance.

These bearings are most suitable for mass-production high accuracy products such as machine tools, textile machinery, and printing machines.

Structures of Needle Roller Bearings with Separable Cage



Types

Needle Roller Bearings with Separable Cage are available in the types shown in Table 1.

Table 1 Type of bearing

Type	Single-row		Double-row	
	Without inner ring	With inner ring	Without inner ring	With inner ring
Model code	RNAF	NAF	RNAFW	NAFW

Needle Roller Bearings with Separable Cage - Without Inner Ring

The single-row as well as the double-row types are available with the same sectional height, and either of them can be selected according to load conditions. As shown in the section, "Design of shaft and housing" on page A44, any desired radial internal clearance can be selected by combining a shaft which is heat-treated and finished by grinding.

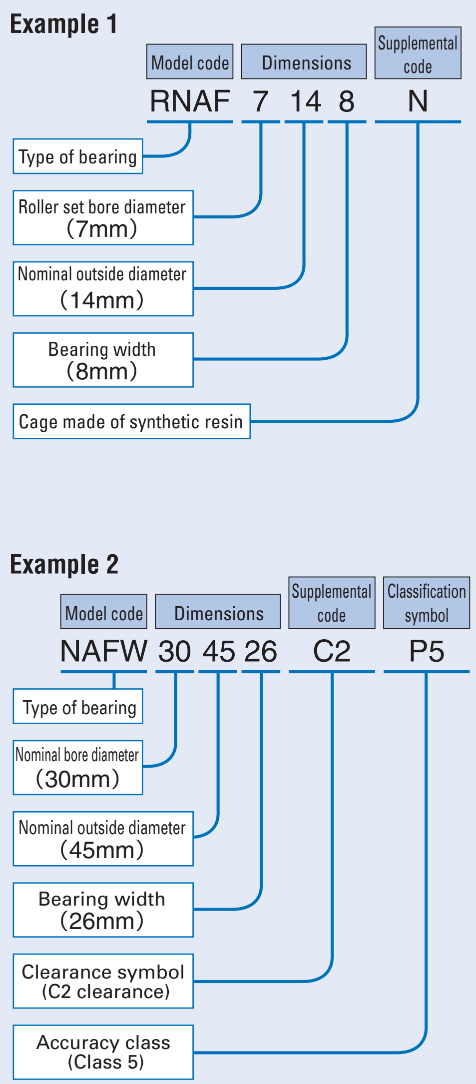
Needle Roller Bearings with Separable Cage - With Inner Ring

These bearings are made to the CN clearance shown in Table 19 on page A37. When especially high accuracy is required, it is possible to supply semi-finished inner rings which have a finishing allowance on their outside diameter so that they can be ground after being press-fitted to shafts.

Identification Number

The identification number of Needle Roller Bearings with Separable Cage consists of a model code, dimensions, any supplemental codes and a classification symbol. The arrangement examples are as follows.

Examples of identification number



Accuracy

Needle Roller Bearings with Separable Cage are manufactured to the accuracy based on JIS (See page A31.). Tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33.

Clearance

Radial internal clearances of Needle Roller Bearings with Separable Cage are made to the CN clearance shown in Table 18 on page A37.

Fit

Recommended fits for Needle Roller Bearings with Separable Cage are shown in Tables 21 to 23 on pages A41 and A42.

Lubrication

Needle Roller Bearings with Separable Cage are not provided with prepacked grease. Perform proper lubrication for use. Using them without lubrication will increase the wear of the rolling contact surfaces and shorten their lives.

Oil Hole

The double-row type outer rings have both an oil hole and an oil groove, but the single-row type outer rings do not. When outer rings with an oil hole are required, attach "-OH" before the clearance symbol in the identification number, and when outer rings with both an oil hole and an oil groove are required, attach "-OG" to the same position.
Example: NAF 203517 - OH C2 P6
When outer rings with multiple oil holes or inner rings with oil hole(s) are required, please contact IKO.

Operating temperature range

For synthetic resin cages, "N" is added at the end of the identification number. The operating temperature range for Needle Roller Bearings with Separable Cage is -20～+120˚C. However, the maximum allowable temperature for synthetic resin cages is +110˚C, and when they are continuously operated, it is +100˚C.

Mounting

Mounting examples of Needle Roller Bearings with Separable Cage are shown in Fig.1.
When mounting Needle Roller Bearings with Separable Cage, it is necessary to locate the needle cage axially. The needle cage is guided by shoulders of the shaft and housing or by side plates, and their guide surfaces must be heat-treated and finished by grinding at right angles to the shaft central axis.
Dimensions related to mounting are shown in the table of dimensions.

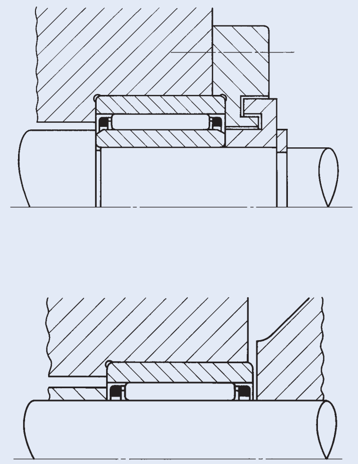
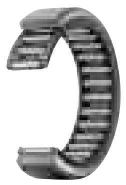


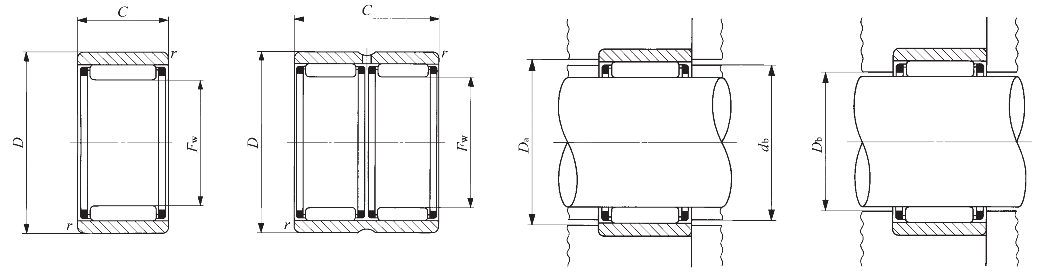
Fig.1 Mounting examples

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

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

Without Inner Ring





RNAF RNAFW

Shaft dia. 5 — 18mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimensions mm d_b	D_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
5	RNAF 5108N	2.8	5	10	8	0.2	6.7	8.4	5.4	2 420	1 950	85 000
6	RNAF 6138N	5.5	6	13	8	0.3	8.4	11	6.4	2 700	2 320	75 000
7	RNAF 7148N	6.1	7	14	8	0.3	9.4	12	7.4	2 960	2 690	65 000
8	RNAF 81510	8.2	8	15	10	0.3	10.4	13	8.4	3 630	3 600	60 000
	RNAFW 81620	20.5	8	16	20	0.3	10.8	14	8.4	6 220	7 200	60 000
10	RNAF 101710	9.6	10	17	10	0.3	12.4	15	10.4	4 160	4 550	50 000
	RNAF 102012	18.7	10	20	12	0.3	13.5	18	10.4	5 940	6 000	50 000
12	RNAF 122212	19.5	12	22	12	0.3	15.5	20	12.4	9 030	8 460	40 000
14	RNAF 142213	18.7	14	22	13	0.3	17.6	20	14.6	7 860	9 410	35 000
	RNAFW 142220	28.5	14	22	20	0.3	17.6	20	14.6	10 800	14 200	35 000
	RNAF 142612	29	14	26	12	0.3	19.4	24	14.6	9 790	9 680	35 000
15	RNAF 152313	19.7	15	23	13	0.3	18.6	21	15.6	8 250	10 200	35 000
	RNAFW 152320	30.5	15	23	20	0.3	18.6	21	15.6	11 400	15 400	35 000
16	RNAF 162413	21	16	24	13	0.3	19.6	22	16.6	8 620	11 000	30 000
	RNAFW 162420	32	16	24	20	0.3	19.6	22	16.6	11 900	16 700	30 000
	RNAF 162812	31.5	16	28	12	0.3	21.4	26	16.6	10 500	10 900	30 000
17	RNAF 172513	22	17	25	13	0.3	20.6	23	17.6	8 980	11 800	30 000
	RNAFW 172520	33.5	17	25	20	0.3	20.6	23	17.6	12 400	17 900	30 000
18	RNAF 182613	23	18	26	13	0.3	21.6	24	18.6	9 330	12 700	30 000
	RNAFW 182620	35	18	26	20	0.3	21.6	24	18.6	12 900	19 100	30 000
	RNAF 183012	34.5	18	30	12	0.3	23.4	28	18.6	11 800	13 100	30 000
	RNAFW 183024	69.5	18	30	24	0.3	23.4	28	18.6	20 200	26 200	30 000

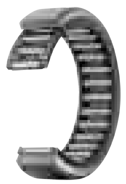
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. The character "N" at the end of the identification number indicates that a synthetic resin cage is incorporated.
2. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
3. No grease is prepacked. Perform proper lubrication.

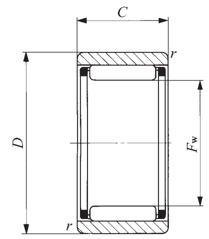
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

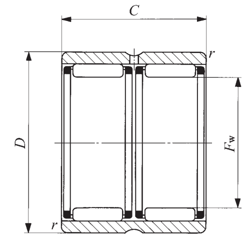
IKO

Without Inner Ring

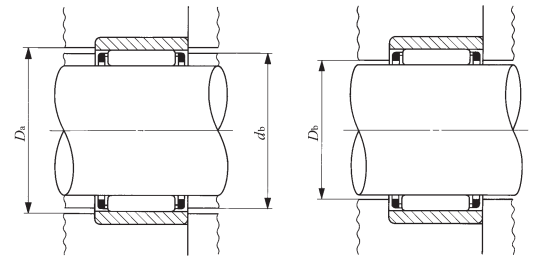




RNAF



RNAFW



D

NAF

Shaft dia. 20 — 40mm

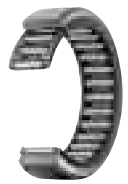
Shaft dia. (mm)	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimensions mm d_b	D_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
20	**RNAF 202813**	25	20	28	13	0.3	23.6	26	20.6	9 590	13 500	25 000
	RNAFW 202826	49.5	20	28	26	0.3	23.6	26	20.6	16 400	27 100	25 000
	RNAF 203212	37.5	20	32	12	0.3	25.4	30	20.6	12 400	14 300	25 000
	RNAFW 203224	75	20	32	24	0.3	25.4	30	20.6	21 200	28 600	25 000
22	**RNAF 223013**	27	22	30	13	0.3	25.6	28	22.6	10 200	15 200	25 000
	RNAFW 223026	53.5	22	30	26	0.3	25.6	28	22.6	17 500	30 300	25 000
	RNAF 223516	58.5	22	35	16	0.3	27.8	33	22.6	17 600	20 900	25 000
	RNAFW 223532	117	22	35	32	0.3	27.8	33	22.6	30 200	41 800	25 000
25	**RNAF 253517**	51	25	35	17	0.3	29.5	33	25.6	17 300	26 600	20 000
	RNAFW 253526	78	25	35	26	0.3	29.5	33	25.6	22 400	37 200	20 000
	RNAF 253716	57	25	37	16	0.3	30.4	35	25.6	19 400	24 500	20 000
	RNAFW 253732	114	25	37	32	0.3	30.4	35	25.6	33 200	49 000	20 000
28	**RNAF 284016**	62.5	28	40	16	0.3	33.4	38	28.6	20 100	26 500	18 000
	RNAFW 284032	125	28	40	32	0.3	33.4	38	28.6	34 400	53 000	18 000
30	**RNAF 304017**	59	30	40	17	0.3	34.5	38	30.6	18 700	31 100	17 000
	RNAFW 304026	90.5	30	40	26	0.3	34.5	38	30.6	24 200	43 400	17 000
	RNAF 304216	66	30	42	16	0.3	35.4	40	30.6	20 800	28 400	17 000
	RNAFW 304232	132	30	42	32	0.3	35.4	40	30.6	35 700	56 800	17 000
35	**RNAF 354517**	67.5	35	45	17	0.3	39.5	43	35.6	20 500	36 900	14 000
	RNAFW 354526	103	35	45	26	0.3	39.5	43	35.6	26 600	51 500	14 000
	RNAF 354716	75.5	35	47	16	0.3	40.4	45	35.6	23 100	33 900	14 000
	RNAFW 354732	151	35	47	32	0.3	40.4	45	35.6	39 500	67 800	14 000
40	**RNAF 405017**	76	40	50	17	0.3	43.5	48	40.8	22 200	42 700	12 000
	RNAFW 405034	152	40	50	34	0.3	43.5	48	40.8	38 000	85 400	12 000
	RNAF 405520	140	40	55	20	0.3	45.2	53	40.8	31 400	48 000	12 000
	RNAFW 405540	280	40	55	40	0.3	45.2	53	40.8	53 900	96 000	12 000

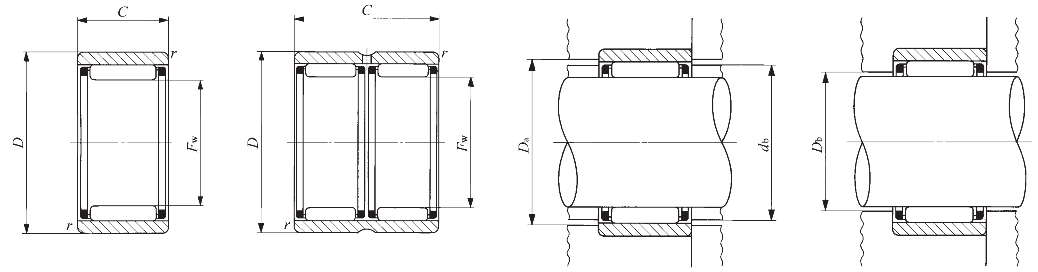
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
2. No grease is prepacked. Perform proper lubrication.

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

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

Without Inner Ring





RNAF RNAFW

Shaft dia. 45 — 100mm

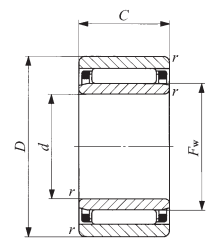
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimensions mm d_b	D_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
45	**RNAF 455517**	83.5	45	55	17	0.3	48.5	53	45.8	23 300	47 100	11 000
	RNAFW 455534	167	45	55	34	0.3	48.5	53	45.8	39 900	94 200	11 000
	RNAF 456220	184	45	62	20	0.3	50.9	60	45.8	33 200	53 300	11 000
	RNAFW 456240	370	45	62	40	0.3	50.9	60	45.8	56 900	107 000	11 000
50	**RNAF 506220**	138	50	62	20	0.3	54.2	60	50.8	27 100	59 300	10 000
	RNAFW 506240	275	50	62	40	0.3	54.2	60	50.8	46 400	119 000	10 000
	RNAF 506520	170	50	65	20	0.3	55.2	63	50.8	35 900	61 100	10 000
	RNAFW 506540	340	50	65	40	0.6	55.2	61	50.8	61 500	122 000	10 000
55	**RNAF 556820**	167	55	68	20	0.3	59.5	66	55.8	28 600	66 000	9 000
	RNAFW 556840	335	55	68	40	0.3	59.5	66	55.8	49 000	132 000	9 000
	RNAF 557220	220	55	72	20	1	60.9	67	55.8	37 400	66 400	9 000
	RNAFW 557240	440	55	72	40	1	60.9	67	55.8	64 100	133 000	9 000
60	**RNAF 607820**	255	60	78	20	1	66.3	73	60.8	38 900	71 700	8 500
	RNAFW 607840	510	60	78	40	1	66.3	73	60.8	66 700	143 000	8 500
65	**RNAF 658530**	470	65	85	30	1.5	72	77	66	59 300	127 000	7 500
	RNAFW 658560	945	65	85	60	1.5	72	77	66	102 000	255 000	7 500
70	**RNAF 709030**	500	70	90	30	1.5	77	82	71	61 200	136 000	7 000
	RNAFW 709060	1 000	70	90	60	1.5	77	82	71	105 000	272 000	7 000
75	**RNAF 759530**	530	75	95	30	1.5	82	87	76	63 100	144 000	6 500
	RNAFW 759560	1 060	75	95	60	1.5	82	87	76	108 000	289 000	6 500
80	**RNAF 8010030**	560	80	100	30	1.5	87	92	81	65 000	153 000	6 000
	RNAFW 8010060	1 120	80	100	60	1.5	87	92	81	111 000	306 000	6 000
85	**RNAF 8510530**	590	85	105	30	1.5	92	97	86	66 600	161 000	6 000
90	**RNAF 9011030**	625	90	110	30	1.5	97	102	91	69 600	174 000	5 500
95	**RNAF 9511530**	655	95	115	30	1.5	102	107	96	70 900	182 000	5 500
100	**RNAF 10012030**	685	100	120	30	1.5	107	112	101	72 500	191 000	4 500

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
2. No grease is prepacked. Perform proper lubrication.

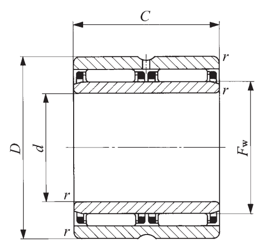
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

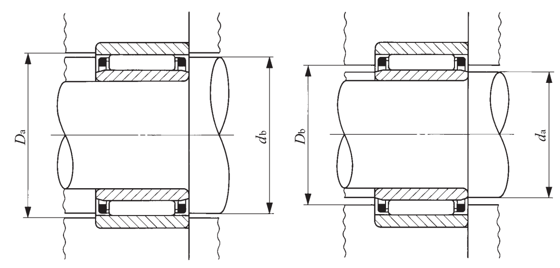
With Inner Ring



NAF



NAFW



D

NAF

Shaft dia. 6 ─ 25mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	$r_{s\,min}$ (1)	F_w	Standard mounting dimensions mm d_b	D_a Max.	d_a Min.	d_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
6	**NAF 61710**	13.5	6	17	10	0.3	10	12.4	15	8	9.7	10.4	4 160	4 550	50 000	**LRT 61010**
7	**NAF 72012**	22.5	7	20	12	0.3	10	13.5	18	9	9.7	10.4	5 940	6 000	50 000	**LRT 71012-1**
9	**NAF 92212**	24	9	22	12	0.3	12	15.5	20	11	11.5	12.4	9 030	8 460	40 000	**LRT 91212**
10	**NAF 102213**	26	10	22	13	0.3	14	17.6	20	12	13	14.6	7 860	9 410	35 000	**LRT 101413**
	NAFW 102220	40	10	22	20	0.3	14	17.6	20	12	13	14.6	10 800	14 200	35 000	**LRT 101420**
	NAF 102612	36	10	26	12	0.3	14	19.4	24	12	13	14.6	9 790	9 680	35 000	**LRT 101412**
12	**NAF 122413**	29.5	12	24	13	0.3	16	19.6	22	14	15	16.6	8 620	11 000	30 000	**LRT 121613**
	NAFW 122420	45.5	12	24	20	0.3	16	19.6	22	14	15	16.6	11 900	16 700	30 000	**LRT 121620**
	NAF 122812	40	12	28	12	0.3	16	21.4	26	14	15	16.6	10 500	10 900	30 000	**LRT 121612**
15	**NAF 152813**	38.5	15	28	13	0.3	20	23.6	26	17	19	20.6	9 590	13 500	25 000	**LRT 152013**
	NAFW 152826	77.5	15	28	26	0.3	20	23.6	26	17	19	20.6	16 400	27 100	25 000	**LRT 152026**
	NAF 153212	50.5	15	32	12	0.3	20	25.4	30	17	19	20.6	12 400	14 300	25 000	**LRT 152012**
17	**NAF 173013**	42.5	17	30	13	0.3	22	25.6	28	19	21	22.6	10 200	15 200	25 000	**LRT 172213**
	NAFW 173026	84.5	17	30	26	0.3	22	25.6	28	19	21	22.6	17 500	30 300	25 000	**LRT 172226**
	NAF 173516	77.5	17	35	16	0.3	22	27.8	33	19	21	22.6	17 600	20 900	25 000	**LRT 172216**
	NAFW 173532	155	17	35	32	0.3	22	27.8	33	19	21	22.6	30 200	41 800	25 000	**LRT 172232**
20	**NAF 203517**	74	20	35	17	0.3	25	29.5	33	22	24	25.6	17 300	26 600	20 000	**LRT 202517**
	NAFW 203526	114	20	35	26	0.3	25	29.5	33	22	24	25.6	22 400	37 200	20 000	**LRT 202526**
	NAF 203716	79	20	37	16	0.3	25	30.4	35	22	24	25.6	19 400	24 500	20 000	**LRT 202516**
	NAFW 203732	158	20	37	32	0.3	25	30.4	35	22	24	25.6	33 200	49 000	20 000	**LRT 202532**
25	**NAF 254017**	87.5	25	40	17	0.3	30	34.5	38	27	29	30.6	18 700	31 100	17 000	**LRT 253017**
	NAFW 254026	135	25	40	26	0.3	30	34.5	38	27	29	30.6	24 200	43 400	17 000	**LRT 253026**
	NAF 254216	94	25	42	16	0.3	30	35.4	40	27	29	30.6	20 800	28 400	17 000	**LRT 253016**
	NAFW 254232	186	25	42	32	0.3	30	35.4	40	27	29	30.6	35 700	56 800	17 000	**LRT 253032**

Notes(1) Minimum allowable value of chamfer dimension r

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

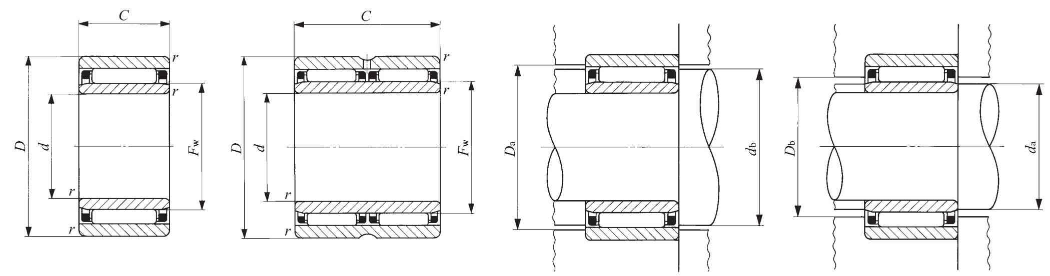
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.

2. No grease is prepacked. Perform proper lubrication.

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

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

With Inner Ring



NAF NAFW

D

NAF

Shaft dia. 30 — 65mm

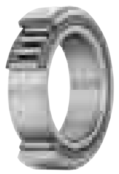
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	$r_{s\,min}$ (1)	F_w	Standard mounting dimensions mm d_b	D_a Max.	d_a Min.	d_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
30	**NAF 304517**	101	30	45	17	0.3	35	39.5	43	32	34	35.6	20 500	36 900	14 000	**LRT 303517**
	NAFW 304526	155	30	45	26	0.3	35	39.5	43	32	34	35.6	26 600	51 500	14 000	**LRT 303526**
	NAF 304716	107	30	47	16	0.3	35	40.4	45	32	34	35.6	23 100	33 900	14 000	**LRT 303516**
	NAFW 304732	215	30	47	32	0.3	35	40.4	45	32	34	35.6	39 500	67 800	14 000	**LRT 303532**
35	**NAF 355017**	115	35	50	17	0.3	40	43.5	48	37	39	40.8	22 200	42 700	12 000	**LRT 354017**
	NAFW 355034	230	35	50	34	0.3	40	43.5	48	37	39	40.8	38 000	85 400	12 000	**LRT 354034**
	NAF 355520	186	35	55	20	0.3	40	45.2	53	37	39	40.8	31 400	48 000	12 000	**LRT 354020**
	NAFW 355540	375	35	55	40	0.3	40	45.2	53	37	39	40.8	53 900	96 000	12 000	**LRT 354040**
40	**NAF 405517**	128	40	55	17	0.3	45	48.5	53	42	44	45.8	23 300	47 100	11 000	**LRT 404517**
	NAFW 405534	255	40	55	34	0.3	45	48.5	53	42	44	45.8	39 900	94 200	11 000	**LRT 404534**
	NAF 406220	235	40	62	20	0.3	45	50.9	60	42	44	45.8	33 200	53 300	11 000	**LRT 404520**
	NAFW 406240	475	40	62	40	0.3	45	50.9	60	42	44	45.8	56 900	107 000	11 000	**LRT 404540**
45	**NAF 456220**	196	45	62	20	0.3	50	54.2	60	47	49	50.8	27 100	59 300	10 000	**LRT 455020**
	NAFW 456240	390	45	62	40	0.3	50	54.2	60	47	49	50.8	46 400	119 000	10 000	**LRT 455040**
	NAF 457220	340	45	72	20	1	55	60.9	67	50	54	55.8	37 400	66 400	9 000	**LRT 455520**
	NAFW 457240	685	45	72	40	1	55	60.9	67	50	54	55.8	64 100	133 000	9 000	**LRT 455540**
50	**NAF 506820**	230	50	68	20	0.3	55	59.5	66	52	54	55.8	28 600	66 000	9 000	**LRT 505520**
	NAFW 506840	465	50	68	40	0.3	55	59.5	66	52	54	55.8	49 000	132 000	9 000	**LRT 505540**
	NAF 507820	390	50	78	20	1	60	66.3	73	55	59	60.8	38 900	71 700	8 500	**LRT 506020**
	NAFW 507840	775	50	78	40	1	60	66.3	73	55	59	60.8	66 700	143 000	8 500	**LRT 506040**
55	**NAF 558530**	690	55	85	30	1.5	65	72	77	63	63.5	66	59 300	127 000	7 500	**LRT 556530**
	NAFW 558560	1 380	55	85	60	1.5	65	72	77	63	63.5	66	102 000	255 000	7 500	**LRT 556560**
60	**NAF 609030**	740	60	90	30	1.5	70	77	82	68	68.5	71	61 200	136 000	7 000	**LRT 607030**
	NAFW 609060	1 480	60	90	60	1.5	70	77	82	68	68.5	71	105 000	272 000	7 000	**LRT 607060**
65	**NAF 659530**	790	65	95	30	1.5	75	82	87	73	73.5	76	63 100	144 000	6 500	**LRT 657530**
	NAFW 659560	1 580	65	95	60	1.5	75	82	87	73	73.5	76	108 000	289 000	6 500	**LRT 657560**

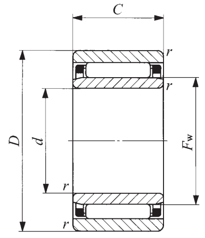
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
2. No grease is prepacked. Perform proper lubrication.

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

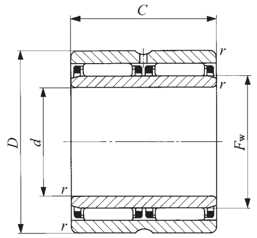
NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

With Inner Ring

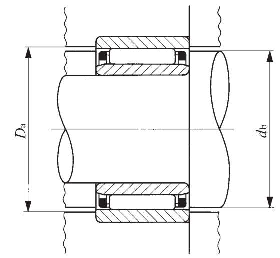


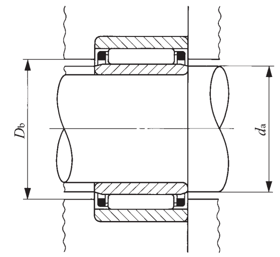


NAF



NAFW





Shaft dia. 70 ― 90mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	$r_{s\,min}$(1)	F_w	Standard mounting dimensions mm d_b	D_a Max.	d_a Min.	d_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm	Assembled inner ring
70	**NAF 7010030**	835	70	100	30	1.5	80	87	92	78	78.5	81	65 000	153 000	6 000	**LRT 708030-1**
	NAFW 7010060	1 680	70	100	60	1.5	80	87	92	78	78.5	81	111 000	306 000	6 000	**LRT 708060**
75	**NAF 7510530**	885	75	105	30	1.5	85	92	97	83	83.5	86	66 600	161 000	6 000	**LRT 758530-1**
80	**NAF 8011030**	935	80	110	30	1.5	90	97	102	88	88.5	91	69 600	174 000	5 500	**LRT 809030-1**
85	**NAF 8511530**	985	85	115	30	1.5	95	102	107	93	93.5	96	70 900	182 000	5 500	**LRT 859530**
90	**NAF 9012030**	1 040	90	120	30	1.5	100	107	112	98	98.5	101	72 500	191 000	4 500	**LRT 9010030**

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
2. No grease is prepacked. Perform proper lubrication.

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

ROLLER BEARINGS

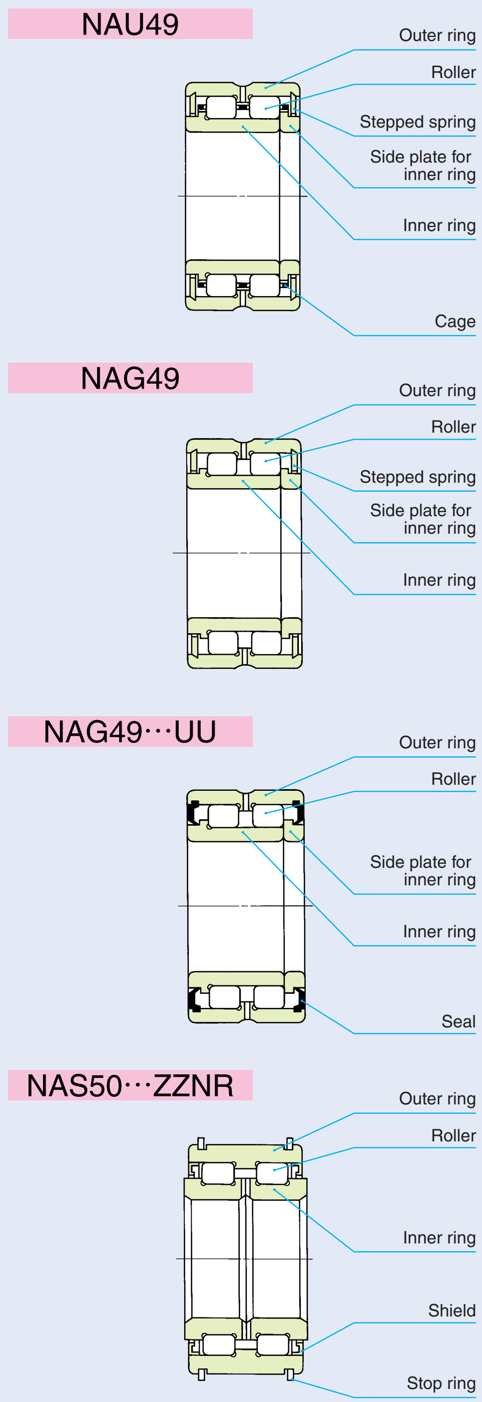
- Caged Roller Bearings
- Full Complement Roller Bearings
- Roller Bearings for Sheaves

Structure and Features

IKO Roller Bearings in which rollers are incorporated in two rows are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are most suitable for use at the fixing side of a shaft. Like needle roller bearings, they are also compact.

Roller bearings include the caged type, full complement type and the type for sheaves, and any bearings suitable for the operating conditions can be selected. In particular, these bearings are used for heavy-duty machines such as construction machinery, and industrial machinery.

Structures of Roller Bearings



E
NAG
NAU
TRU
NAS

Types

The types of Roller Bearings shown in Table 1 are available.

Table 1 Type of bearing

Series \ Type	Caged type	Full complement type	For sheaves
Standard	NAU49 TRU	NAG49	—
With seal	NAU49⋯UU TRU⋯UU	NAG49⋯UU	NAS50⋯UUNR
With shield	—	—	NAS50⋯ZZNR

Caged Roller Bearings

These bearings are suitable for high-speed rotations and fluctuating loads. Also, as the axial distance between the double-row rollers is comparatively large, large moment loads can be supported.
Caged roller bearings with seal incorporate seals on both sides. Synthetic resin rubber seals are excellent in the prevention of dust penetration and grease leakage, providing an excellent sealing effect.

Full Complement Roller Bearings

These bearings are suitable for low-speed rotations or oscillating motions and heavy loads. Similar to the caged type, the structure is advantageous for supporting moment loads.
The bearings with seal incorporate seals on both sides.

Roller Bearings for Sheaves

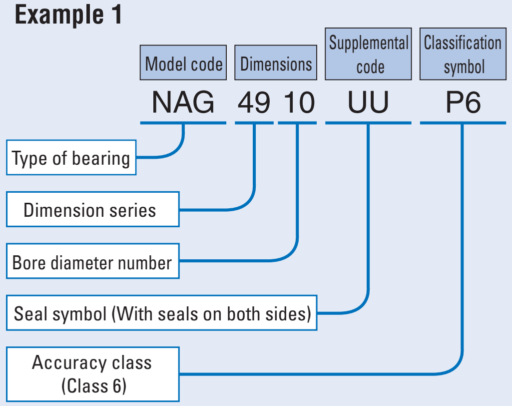
These bearings are the double-row full complement type with a low sectional height designed for use in sheaves. There are two types; the sealed type and the shield type. They can withstand heavy radial loads and shock loads at comparatively low-speed rotations, and can also withstand axial loads.
They can be easily fixed axially to sheaves using the stop rings of the outer ring. As the width of the inner ring is designed to be larger than that of the outer ring, they require no spacer between sheaves. The structure is stable because the double-row rollers can withstand the moment loads caused by rope transition.
The surfaces of these bearings are treated to have high corrosion resistance.

Identification Number

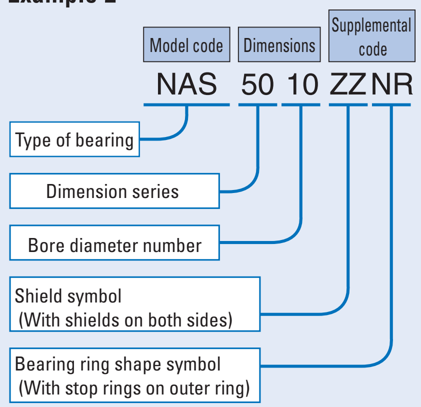
The identification number of Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. The arrangement examples are shown below.

Examples of identification number

Example 1



Example 2



Accuracy

Roller Bearings are manufactured in accordance with JIS (See page A31.). A side plate for inner ring is assembled on one side of caged or full complement roller bearings. The tolerance of bore diameter of the side plate is shown below. Tolerances of Roller Bearings for Sheaves represent the values before surface treatment. The tolerance of internal distance between cir-clips is shown below.
Tolerance of bore diameter of the side plate d: E7
Tolerance of internal distance between cir-clips C_1: 0～+0.4mm

Clearance

Roller Bearings are manufactured to the CN clearance shown in Table 18 on page A37. However, Roller Bearings for Sheaves are manufactured so that proper operating clearances are obtained after being mounted with a specified fit.

Fit

The recommended fits for Roller Bearings are shown in Tables 21 to 22 on pages A41 and A42. The recommended fits for Roller Bearings for Sheaves are shown in Table 2.

Table 2 Recommended fits for Roller Bearings for Sheaves

Tolerance class of shaft	Tolerance class of housing bore
g6	N7

Lubrication

Bearings with prepacked grease are shown in Table 3. For Caged Roller Bearings and Full Complement Roller Bearings, ALVANIA GREASE S2 (SHELL) is prepacked as the lubricating grease. For Roller Bearings for Sheaves, ALVANIA GREASE EP2 (SHELL) is prepacked as the lubricating grease.
In the case of bearings without prepacked grease, perform proper lubrication for use. Operating without lubrication will increase the wear of the rolling contact surfaces and shorten their lirees.

Oil Hole

The number of oil holes of the inner and outer rings is shown in Table 4.

Operating Temperature Range

The operating temperature range for Roller Bearings is −20℃～+120℃. However, the maximum allowable temperature for Roller Bearings for Sheaves is +110℃.

Table 3 Bearings with prepacked grease

○: With prepacked grease ×: Without prepacked grease

Type		Standard	With seals	With shields
Caged type	NAU, TRU	×	○	–
Full complement type	NAG	×	○	–
For sheaves	NAS	–	○	○

Table 4 Number of oil holes of the inner ring and outer ring

Type		Nominal bore diameter d mm	Number of oil holes of the outer ring: Standard	With seals	With shields	Number of oil holes of the inner ring
Caged type	NAU	$d \leqq 17$	0	0	—	0
		$17 < d$	2	2		
	TRU		2	2	—	0
Full complement type	NAG	$d \leqq 17$	0	0	—	0
		$17 < d$	2	2		
For sheaves	NAS		—	0	0	2

Remark The bearings with oil holes are also provided with an oil groove.

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

Axial Load Capacity

Axial load capacity is not determined from the basic dynamic load rating based on rolling fatigue, but is determined by the amount of heat generated by sliding contact between the ends of rollers and guide shoulders of the inner and outer rings. It is therefore limited by the load conditions, sliding speeds, lubrication methods, etc.

The axial load capacity of Roller Bearings is obtained from the following equation.

If the axial load increases in comparison with the radial load, it will start to interfere with the smooth rolling motion. The axial load should therefore be within 20% of the radial load.

$$C_A = f_v \, a \, f_A \cdots\cdots (1)$$

where, C_A : Axial load capacity N

f_v : Speed correction factor

f_v is obtained from Fig.2 by calculating the $d_m n$ value.

$d_m n = d_m \times n$

d_m : Mean value of bearing bore and outside diameters mm

$\left(d_m \doteqdot \dfrac{d+D}{2}\right)$

n : Rotational speed rpm

When $d_m n \leqq 1000$, $f_v = 1$.

a : Value determined by type of bearing (See Table 5.)

f_A : Axial load capacity factor (See Fig.1.)

Table 5 Value by type of bearing

Type of bearing	a
NAS 50	1
NAG 49	0.78
NAU 49, TRU	0.7

Calculation example

When a roller bearing for sheaves NAS 5016 ZZ NR is run at n = 250 rpm under grease lubrication and subjected to an intermittent axial load, the axial load capacity is calculated as follows.

As the bearing bore diameter is 80 mm, f_A = 18000 is obtained from the axial load capacity line of Fig. 1 (ii).

$a = 1$

$$d_m \doteqdot \frac{80+125}{2} = 102.5$$

$d_m n = 102.5 \times 250 \doteqdot 25600$

From Fig. 2, $f_v \doteqdot 0.87$

Therefore, the axial load capacity C_A is obtained.

$C_A = f_v \, a \, f_A = 0.87 \times 1 \times 18000 \doteqdot 15700$ N

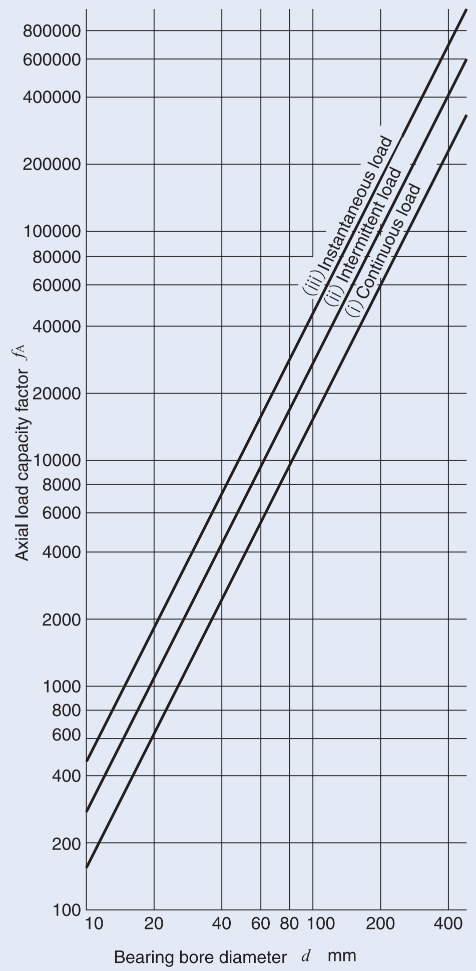


Fig. 1 Axial load capacity factor

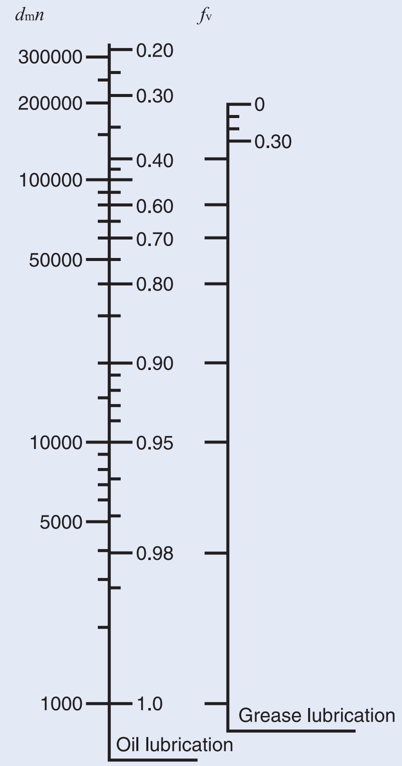


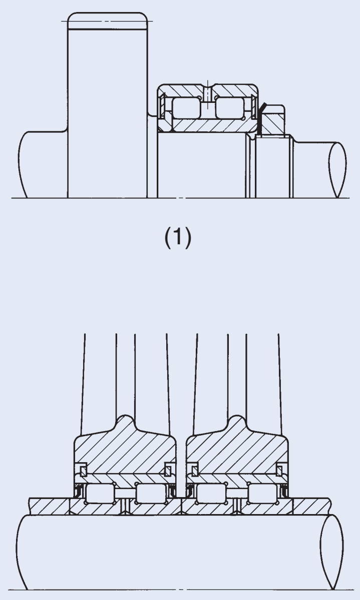
Fig. 2 Speed correction factor

Mounting

Unlike needle roller bearings, Caged and Full Complement Roller Bearings are non-separable.

As shown in Fig. 3 (1), the inner ring should be press-fitted until it makes close contact with the shaft shoulder, and fixed axially with a nut. Dimensions of the shoulders of the shaft and housing should be based on J and E_W shown in the table of dimensions, respectively.

In the case of Roller Bearings for Sheaves, as shown in Fig. 3 (2), the outer ring should be fixed by stop rings after being press-fitted into the sheaves, and the inner ring should be fixed securely in the axial direction.



(1)

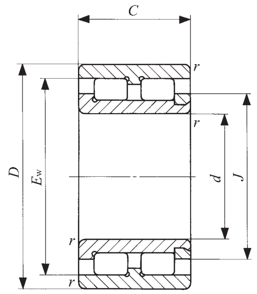
(2)

Fig. 3 Mounting examples

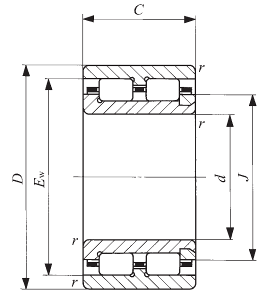
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER BEARINGS

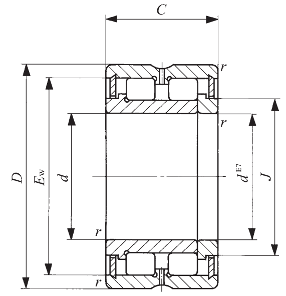
Caged Roller Bearings
Full Complement Roller Bearings



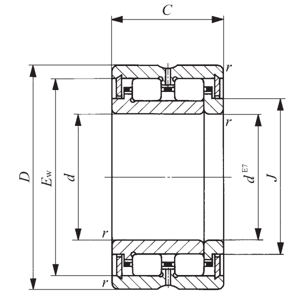
NAG49
($d \leq 17$)



NAU49
($d \leq 17$)



NAG49



NAU49 TRU

Shaft dia. 10 — 35mm

Shaft dia. mm	Identification number: Full complement type	Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
10	NAG 4900	—	—	25.5	10	22	13	0.3	15.5	18.5	9 650	10 800	17 000
	—	NAU 4900	—	24.5	10	22	13	0.3	15.5	18.5	6 580	6 470	30 000
12	NAG 4901	—	—	28.5	12	24	13	0.3	17	20	10 300	12 000	15 000
	—	NAU 4901	—	27.5	12	24	13	0.3	17	20	6 950	7 120	25 000
15	NAG 4902	—	—	38	15	28	13	0.3	21	24	11 800	15 200	12 000
	—	NAU 4902	—	36.5	15	28	13	0.3	21	24	7 950	9 020	20 000
	—	—	TRU 153320	80.5	15	33	20	0.3	19.5	27	10 400	10 400	20 000
17	NAG 4903	—	—	41	17	30	13	0.3	22.5	25.5	12 300	16 500	11 000
	—	NAU 4903	—	39.5	17	30	13	0.3	22.5	25.5	8 240	9 670	19 000
	—	—	TRU 173425	100	17	34	25	0.3	21.5	29.5	18 000	21 600	18 000
20	NAG 4904	—	—	76.5	20	37	17	0.3	24	31.5	15 600	18 900	9 500
	—	NAU 4904	—	76	20	37	17	0.3	24	31.5	10 700	11 300	16 000
	—	—	TRU 203820	96.5	20	38	20	0.3	25	32.5	12 100	13 400	16 000
	—	—	TRU 203825	122	20	38	25	0.3	25	32.5	18 700	23 600	16 000
25	NAG 4905	—	—	89.5	25	42	17	0.3	29.5	37	17 500	23 200	7 500
	—	NAU 4905	—	89	25	42	17	0.3	29.5	37	11 900	13 900	13 000
	—	—	TRU 254425	154	25	44	25	0.3	30.5	38	21 000	28 900	13 000
28	—	—	TRU 284530	173	28	45	30	0.3	31.5	39.5	28 700	43 800	12 000
30	NAG 4906	—	—	103	30	47	17	0.3	34	41.5	19 400	27 600	6 500
	—	NAU 4906	—	102	30	47	17	0.3	34	41.5	13 000	16 200	12 000
	—	—	TRU 304830	197	30	48	30	0.3	35	42.5	29 400	46 600	11 000
32	—	—	TRU 325230	260	32	52	30	0.6	38	46	29 800	44 200	10 000
35	NAG 4907	—	—	172	35	55	20	0.6	40	49	28 700	43 800	5 500
	—	NAU 4907	—	168	35	55	20	0.6	40	49	19 500	26 300	10 000
	—	—	TRU 355630	270	35	56	30	0.6	40	49	32 200	49 800	10 000

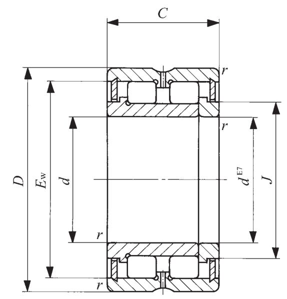
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The NAG and NAU series with a bore diameter d of 17 mm or less have no oil hole. In others, the outer ring has an oil groove and two oil holes.
2. No grease is prepacked. Perform proper lubrication.

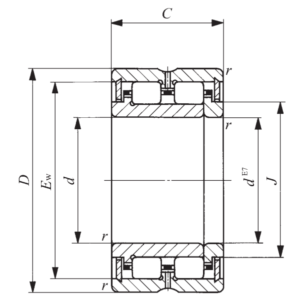
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER BEARINGS

Caged Roller Bearings
Full Complement Roller Bearings



NAG49



NAU49 TRU

Shaft dia. 40 ─ 80mm

Shaft dia. mm	Identification number: Full complement type	Identification number: Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$(1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
40	**NAG 4908**	—	—	225	40	62	22	0.6	46	56	34 600	49 500	5 000
	—	—	**TRU 405930**	265	40	59	30	0.6	45	52.5	34 700	62 500	8 500
	—	**NAU 4908**	—	220	40	62	22	0.6	46	56	23 400	29 400	8 500
42	—	—	**TRU 426230**	290	42	62	30	0.6	48	56.5	34 600	57 800	8 000
45	**NAG 4909**	—	—	265	45	68	22	0.6	51	61	36 400	54 700	4 500
	—	—	**TRU 456430**	295	45	64	30	0.6	50.5	58.5	32 600	59 700	8 000
	—	**NAU 4909**	—	260	45	68	22	0.6	51	61	24 800	32 800	8 000
50	**NAG 4910**	—	—	270	50	72	22	0.6	55.5	65.5	38 200	59 900	4 000
	—	**NAU 4910**	—	265	50	72	22	0.6	55.5	65.5	26 200	36 200	7 000
	—	—	**TRU 507745**	710	50	77	45	1	58	69	75 700	134 000	7 000
55	**NAG 4911**	—	—	395	55	80	25	1	61.5	72.5	48 100	77 700	3 500
	—	**NAU 4911**	—	385	55	80	25	1	61.5	72.5	33 000	47 000	6 500
	—	—	**TRU 558138**	615	55	81	38	1	61.5	72.5	61 400	104 000	6 500
60	**NAG 4912**	—	—	425	60	85	25	1	67	77.5	50 300	84 300	3 500
	—	**NAU 4912**	—	415	60	85	25	1	67	77.5	34 700	51 400	6 000
	—	—	**TRU 608945**	880	60	89	45	1	69.5	81.5	88 100	152 000	6 000
65	**NAG 4913**	—	—	455	65	90	25	1	72	83	53 200	93 000	3 000
	—	**NAU 4913**	—	440	65	90	25	1	72	83	36 900	57 100	5 500
70	**NAG 4914**	—	—	725	70	100	30	1	79	91.5	77 700	139 000	3 000
	—	**NAU 4914**	—	705	70	100	30	1	79	91.5	53 700	84 600	5 000
75	**NAG 4915**	—	—	775	75	105	30	1	83.5	95.5	80 000	146 000	2 500
	—	**NAU 4915**	—	750	75	105	30	1	83.5	95.5	54 800	88 200	5 000
	—	—	**TRU 7510845**	1 240	75	108	45	1	85.5	98.5	103 000	190 000	4 500
80	**NAG 4916**	—	—	815	80	110	30	1	89.5	102	83 000	157 000	2 500
	—	**NAU 4916**	—	790	80	110	30	1	89.5	102	57 200	95 500	4 500

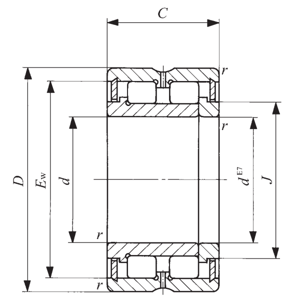
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The outer ring has an oil groove and two oil holes.
2. No grease is prepacked. Perform proper lubrication.

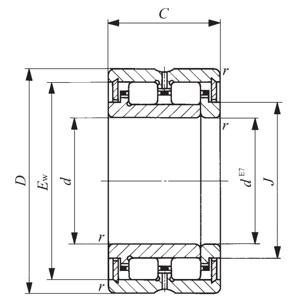
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER BEARINGS

Caged Roller Bearings
Full Complement Roller Bearings



NAG49



NAU49 TRU

E

NAG
NAU
TRU
NAS

Shaft dia. 85 — 140mm

Shaft dia. mm	Identification number: Full complement type	Identification number: Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
85	**NAG 4917**	—	—	1 190	85	120	35	1.5	96	110	111 000	200 000	2 500
	—	—	**TRU 8511850**	1 530	85	118	50	1	94.5	107.5	114 000	222 000	4 000
	—	**NAU 4917**	—	1 150	85	120	35	1.5	96	110	75 400	120 000	4 000
	—	—	**TRU 8512045**	1 500	85	120	45	1.5	96.5	110	110 000	215 000	4 000
90	**NAG 4918**	—	—	1 250	90	125	35	1.5	101	115.5	114 000	211 000	2 500
	—	**NAU 4918**	—	1 210	90	125	35	1.5	101	115.5	79 500	130 000	4 000
	—	—	**TRU 9012550**	1 740	90	125	50	1.5	101	114	119 000	240 000	4 000
95	**NAG 4919**	—	—	1 300	95	130	35	1.5	106	120.5	117 000	222 000	2 000
	—	**NAU 4919**	—	1 270	95	130	35	1.5	106	120.5	81 000	136 000	4 000
100	**NAG 4920**	—	—	1 850	100	140	40	1.5	114.5	129.5	152 000	292 000	2 000
	—	—	**TRU 10013550**	1 900	100	135	50	1.5	112	125.5	124 000	264 000	3 500
	—	**NAU 4920**	—	1 770	100	140	40	1.5	114.5	129.5	106 000	181 000	3 500
105	—	—	**TRU 10515350**	2 890	105	153	50	1.5	120	138	159 000	286 000	3 500
110	**NAG 4922**	—	—	2 010	110	150	40	1.5	123	138.5	161 000	322 000	1 900
	—	**NAU 4922**	—	1 930	110	150	40	1.5	123	138.5	113 000	200 000	3 500
120	**NAG 4924**	—	—	2 780	120	165	45	1.5	136	153.5	208 000	431 000	1 700
	—	**NAU 4924**	—	2 680	120	165	45	1.5	136	153.5	146 000	268 000	3 000
125	—	—	**TRU 12517860**	4 490	125	178	60	1.5	143.5	162	211 000	408 000	3 000
130	**NAG 4926**	—	—	3 750	130	180	50	2	147	165.5	240 000	495 000	1 600
	—	**NAU 4926**	—	3 610	130	180	50	2	147	165.5	166 000	304 000	2 500
135	—	—	**TRU 13518860**	4 790	135	188	60	1.5	154	172.5	220 000	442 000	2 500
140	**NAG 4928**	—	—	3 990	140	190	50	2	157.5	176	249 000	531 000	1 500
	—	**NAU 4928**	—	3 840	140	190	50	2	157.5	176	174 000	327 000	2 500

Notes(1) Minimum allowable value of chamfer dimension r

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

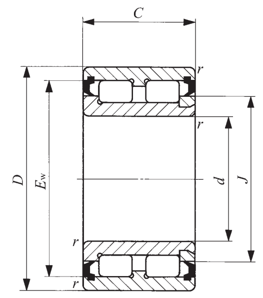
Remarks1. The outer ring has an oil groove and two oil holes.

2. No grease is prepacked. Perform proper lubrication.

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

ROLLER BEARINGS

Caged Roller Bearings With Seal
Full Complement Roller Bearings With Seal



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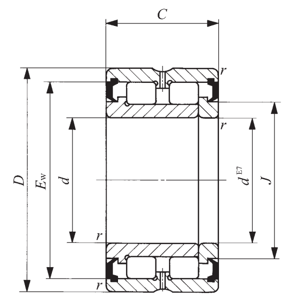
($d \leqq 17$)



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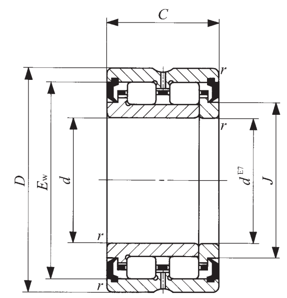


NAU49…UU
TRU…UU

Shaft dia. 10 — 40mm

Shaft dia. mm	Identification number: Full complement type	Identification number: Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
10	NAG 4900UU	—	—	25.5	10	22	13	0.3	15.5	19.5	9 650	10 800	10 000
12	NAG 4901UU	—	—	28.5	12	24	13	0.3	17	21	10 300	12 000	9 000
15	NAG 4902UU	—	—	38	15	28	13	0.3	21	25	11 800	15 200	7 000
	—	—	TRU 153320UU	80.5	15	33	20	0.3	19.5	27	10 400	10 400	9 500
17	NAG 4903UU	—	—	41	17	30	13	0.3	22.5	26.5	12 300	16 500	6 500
	—	—	TRU 173425UU	100	17	34	25	0.3	21.5	29.5	18 000	21 600	8 500
20	NAG 4904UU	—	—	76.5	20	37	17	0.3	24	31.5	15 600	18 900	5 500
	—	NAU 4904UU	—	76	20	37	17	0.3	24	31.5	10 700	11 300	8 000
	—	—	TRU 203820UU	96.5	20	38	20	0.3	25	32.5	12 100	13 400	7 500
	—	—	TRU 203825UU	122	20	38	25	0.3	25	32.5	18 700	23 600	7 500
25	NAG 4905UU	—	—	89.5	25	42	17	0.3	29.5	37	17 500	23 200	4 500
	—	NAU 4905UU	—	89	25	42	17	0.3	29.5	37	11 900	13 900	6 500
	—	—	TRU 254425UU	154	25	44	25	0.3	30.5	38	21 000	28 900	6 000
28	—	—	TRU 284530UU	173	28	45	30	0.3	31.5	39.5	28 700	43 800	6 000
30	NAG 4906UU	—	—	103	30	47	17	0.3	34	41.5	19 400	27 600	4 000
	—	NAU 4906UU	—	102	30	47	17	0.3	34	41.5	13 000	16 200	5 500
	—	—	TRU 304830UU	197	30	48	30	0.3	35	42.5	29 400	46 600	5 500
32	—	—	TRU 325230UU	260	32	52	30	0.6	38	46	29 800	44 200	5 000
35	NAG 4907UU	—	—	172	35	55	20	0.6	40	49	28 700	43 800	3 500
	—	NAU 4907UU	—	168	35	55	20	0.6	40	49	19 500	26 300	4 500
	—	—	TRU 355630UU	270	35	56	30	0.6	40	49	32 200	49 800	4 500
40	NAG 4908UU	—	—	225	40	62	22	0.6	46	56	34 600	49 500	3 000
	—	—	TRU 405930UU	265	40	59	30	0.6	45	52.5	34 700	62 500	4 000
	—	NAU 4908UU	—	220	40	62	22	0.6	46	56	23 400	29 400	4 000

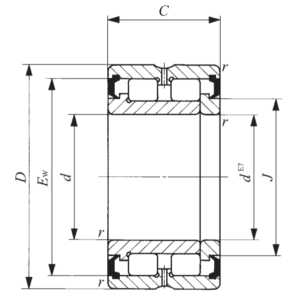
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The NAG and NAU series with a bore diameter, d, of 17 mm or less have no oil hole. In others, the outer ring has an oil groove and two oil holes.
2. The bearings with seals are provided with prepacked grease.

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

ROLLER BEARINGS

Caged Roller Bearings With Seal
Full Complement Roller Bearings With Seal



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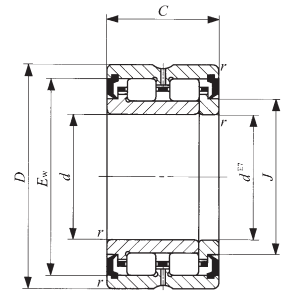


NAU49…UU
TRU…UU

E

NAG
NAU
TRU
NAS

Shaft dia. 42 — 80mm

Shaft dia. mm	Identification number Full complement type	Caged type		Mass (Ref.) g	Boundary dimensions mm d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
42	—	—	TRU 426230UU	290	42	62	30	0.6	48	56.5	34 600	57 800	4 000
45	NAG 4909UU	—	—	265	45	68	22	0.6	51	61	36 400	54 700	2 500
	—	—	TRU 456430UU	295	45	64	30	0.6	50.5	58.5	32 600	59 700	3 500
	—	NAU 4909UU	—	260	45	68	22	0.6	51	61	24 800	32 800	3 500
50	NAG 4910UU	—	—	270	50	72	22	0.6	55.5	65.5	38 200	59 900	2 500
	—	NAU 4910UU	—	265	50	72	22	0.6	55.5	65.5	26 200	36 200	3 500
	—	—	TRU 507745UU	710	50	77	45	1	58	69	75 700	134 000	3 500
55	NAG 4911UU	—	—	395	55	80	25	1	61.5	72.5	48 100	77 700	2 000
	—	NAU 4911UU	—	385	55	80	25	1	61.5	72.5	33 000	47 000	3 000
	—	—	TRU 558138UU	615	55	81	38	1	61.5	72.5	61 400	104 000	3 000
60	NAG 4912UU	—	—	425	60	85	25	1	67	77.5	50 300	84 300	2 000
	—	NAU 4912UU	—	415	60	85	25	1	67	77.5	34 700	51 400	3 000
	—	—	TRU 608945UU	880	60	89	45	1	69.5	81.5	88 100	152 000	3 000
65	NAG 4913UU	—	—	455	65	90	25	1	72	83	53 200	93 000	1 900
	—	NAU 4913UU	—	440	65	90	25	1	72	83	36 900	57 100	2 500
70	NAG 4914UU	—	—	725	70	100	30	1	79	91.5	77 700	139 000	1 800
	—	NAU 4914UU	—	705	70	100	30	1	79	91.5	53 700	84 600	2 500
75	NAG 4915UU	—	—	775	75	105	30	1	83.5	95.5	80 000	146 000	1 700
	—	NAU 4915UU	—	750	75	105	30	1	83.5	95.5	54 800	88 200	2 500
	—	—	TRU 7510845UU	1 240	75	108	45	1	85.5	98.5	103 000	190 000	2 000
80	NAG 4916UU	—	—	815	80	110	30	1	89.5	102	83 000	157 000	1 600
	—	NAU 4916UU	—	790	80	110	30	1	89.5	102	57 200	95 500	2 000

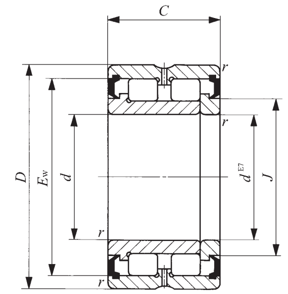
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The outer ring has an oil groove and two oil holes.
2. The bearings with seals are provided with prepacked grease.

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

ROLLER BEARINGS

Caged Roller Bearings With Seal
Full Complement Roller Bearings With Seal

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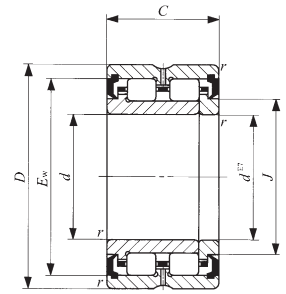


NAU49⋯UU
TRU⋯UU

Shaft dia. 85 — 140mm

Shaft dia. mm	Identification number: Full complement type	Identification number: Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
85	NAG 4917UU	—	—	1 190	85	120	35	1.5	96	110	111 000	200 000	1 500
	—	—	TRU 8511850UU	1 530	85	118	50	1	94.5	107.5	114 000	222 000	2 000
	—	NAU 4917UU	—	1 150	85	120	35	1.5	96	110	75 400	120 000	2 000
	—	—	TRU 8512045UU	1 500	85	120	45	1.5	96.5	110	110 000	215 000	2 000
90	NAG 4918UU	—	—	1 250	90	125	35	1.5	101	115.5	114 000	211 000	1 400
	—	NAU 4918UU	—	1 210	90	125	35	1.5	101	115.5	79 500	130 000	1 900
	—	—	TRU 9012550UU	1 740	90	125	50	1.5	101	114	119 000	240 000	1 900
95	NAG 4919UU	—	—	1 300	95	130	35	1.5	106	120.5	117 000	222 000	1 300
	—	NAU 4919UU	—	1 270	95	130	35	1.5	106	120.5	81 000	136 000	1 800
100	NAG 4920UU	—	—	1 850	100	140	40	1.5	114.5	129.5	152 000	292 000	1 200
	—	—	TRU 10013550UU	1 900	100	135	50	1.5	112	125.5	124 000	264 000	1 700
	—	NAU 4920UU	—	1 770	100	140	40	1.5	114.5	129.5	106 000	181 000	1 700
105	—	—	TRU 10515350UU	2 890	105	153	50	1.5	120	138	159 000	286 000	1 600
110	NAG 4922UU	—	—	2 010	110	150	40	1.5	123	138.5	161 000	322 000	1 100
	—	NAU 4922UU	—	1 930	110	150	40	1.5	123	138.5	113 000	200 000	1 600
120	NAG 4924UU	—	—	2 780	120	165	45	1.5	136	153.5	208 000	431 000	1 000
	—	NAU 4924UU	—	2 680	120	165	45	1.5	136	153.5	146 000	268 000	1 400
125	—	—	TRU 12517860UU	4 490	125	178	60	1.5	143.5	162	211 000	408 000	1 400
130	NAG 4926UU	—	—	3 750	130	180	50	2	147	165.5	240 000	495 000	950
	—	NAU 4926UU	—	3 610	130	180	50	2	147	165.5	166 000	304 000	1 300
135	—	—	TRU 13518860UU	4 790	135	188	60	1.5	154	172.5	220 000	442 000	1 300
140	NAG 4928UU	—	—	3 990	140	190	50	2	157.5	176	249 000	531 000	900
	—	NAU 4928UU	—	3 840	140	190	50	2	157.5	176	174 000	327 000	1 200

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

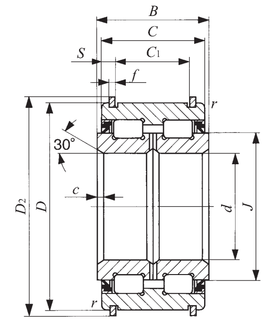
Remarks 1. The outer ring has an oil groove and two oil holes.
2. The bearings with seals are provided with prepacked grease.

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

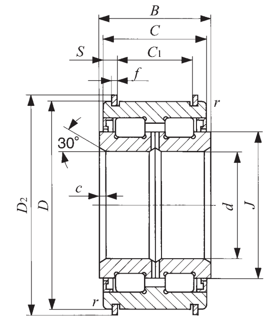
ROLLER BEARINGS

Roller Bearings for Sheaves

IKO



NAS50···UUNR



NAS50···ZZNR

Shaft dia. 40 — 170mm

Shaft dia. mm	Identification number Sealed type	Identification number Shield type	Mass (Ref.) kg	Boundary dimensions mm d	D	D_2	B	C	C_1	S	f	c	$r_{s\ min}$ (1)	J	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
40	NAS 5008UUNR	NAS 5008ZZNR	0.55	40	68	71.8	38	37	28	4.5	2	1.5	0.6	50	79 500	116 000	2 500
45	NAS 5009UUNR	NAS 5009ZZNR	0.70	45	75	78.8	40	39	30	4.5	2	1.5	0.6	56	95 500	144 000	2 000
50	NAS 5010UUNR	NAS 5010ZZNR	0.75	50	80	83.8	40	39	30	4.5	2	1.5	0.6	61	100 000	158 000	2 000
55	NAS 5011UUNR	NAS 5011ZZNR	1.15	55	90	94.8	46	45	34	5.5	2.5	2	0.6	68	118 000	193 000	1 800
60	NAS 5012UUNR	NAS 5012ZZNR	1.20	60	95	99.8	46	45	34	5.5	2.5	2	0.6	73	123 000	208 000	1 700
65	NAS 5013UUNR	NAS 5013ZZNR	1.30	65	100	104.8	46	45	34	5.5	2.5	2	0.6	78	128 000	224 000	1 600
70	NAS 5014UUNR	NAS 5014ZZNR	1.90	70	110	114.5	54	53	42	5.5	2.5	2	0.6	84	171 000	284 000	1 400
75	NAS 5015UUNR	NAS 5015ZZNR	2.00	75	115	119.5	54	53	42	5.5	2.5	2	0.6	91	179 000	308 000	1 300
80	NAS 5016UUNR	NAS 5016ZZNR	2.65	80	125	129.5	60	59	48	5.5	2.5	2	0.6	97	251 000	428 000	1 300
85	NAS 5017UUNR	NAS 5017ZZNR	2.80	85	130	134.5	60	59	48	5.5	2.5	2	0.6	101	257 000	446 000	1 200
90	NAS 5018UUNR	NAS 5018ZZNR	3.70	90	140	145.4	67	66	54	6	2.5	2.5	0.6	110	305 000	540 000	1 100
95	NAS 5019UUNR	NAS 5019ZZNR	3.90	95	145	150.4	67	66	54	6	2.5	2.5	0.6	114	312 000	562 000	1 100
100	NAS 5020UUNR	NAS 5020ZZNR	4.05	100	150	155.4	67	66	54	6	2.5	2.5	0.6	118	318 000	584 000	1 000
110	NAS 5022UUNR	NAS 5022ZZNR	6.50	110	170	175.4	80	79	65	7	2.5	3	1	130	384 000	697 000	900
120	NAS 5024UUNR	NAS 5024ZZNR	6.95	120	180	188.4	80	79	65	7	3	3	1	139.5	400 000	750 000	850
130	NAS 5026UUNR	NAS 5026ZZNR	10.5	130	200	208.4	95	94	77	8.5	3	3	1	156	537 000	1 000 000	750
140	NAS 5028UUNR	NAS 5028ZZNR	11.0	140	210	218.4	95	94	77	8.5	3	3	1	167	543 000	1 070 000	700
150	NAS 5030UUNR	NAS 5030ZZNR	13.5	150	225	233.4	100	99	81	9	3	3.5	1	176.5	623 000	1 210 000	650
160	NAS 5032UUNR	NAS 5032ZZNR	16.5	160	240	248.4	109	108	89	9.5	3	3.5	1.5	188.5	720 000	1 390 000	650
170	NAS 5034UUNR	NAS 5034ZZNR	22.5	170	260	270	122	121	99	11	4	3.5	1.5	204.5	857 000	1 730 000	600

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

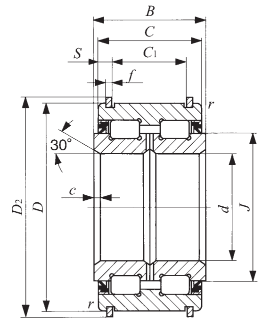
Remarks1. The inner ring has an oil groove and two oil holes.
2. Roller Bearings for Sheaves are provided with prepacked grease.

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

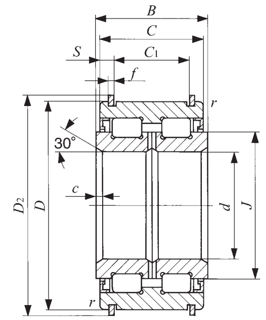
ROLLER BEARINGS

Roller Bearings for Sheaves

IKO



NAS50···UUNR



NAS50···ZZNR

E

NAG
NAU
TRU
NAS

Shaft dia. 180 ─ 440mm

Shaft dia. mm	Identification number: Sealed type	Identification number: Shield type	Mass (Ref.) kg	Boundary dimensions mm: d	D	D_2	B	C	C_1	S	f	c	$r_{s\,min}$(1)	J	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
180	NAS 5036UUNR	NAS 5036ZZNR	30.0	180	280	294	136	135	110	12.5	5	3.5	1.5	217	1 070 000	2 140 000	550
190	NAS 5038UUNR	NAS 5038ZZNR	31.5	190	290	306	136	135	110	12.5	5	3.5	1.5	225	1 120 000	2 230 000	500
200	NAS 5040UUNR	NAS 5040ZZNR	40.5	200	310	326	150	149	120	14.5	5	3.5	1.5	242	1 310 000	2 650 000	500
220	NAS 5044UUNR	NAS 5044ZZNR	52.0	220	340	356	160	159	130	14.5	6	4	1.5	260	1 510 000	3 110 000	450
240	NAS 5048UUNR	NAS 5048ZZNR	55.5	240	360	376	160	159	130	14.5	6	4	1.5	278.5	1 570 000	3 350 000	400
260	NAS 5052UUNR	NAS 5052ZZNR	85.0	260	400	416	190	189	154	17.5	7	5	2	312	2 130 000	4 510 000	350
280	NAS 5056UUNR	NAS 5056ZZNR	90.9	280	420	440	190	189	154	17.5	7	5	2	335	2 210 000	4 860 000	350
300	NAS 5060UU	NAS 5060ZZ	130	300	460	—	218	216	—	—	—	5	2	359	2 670 000	5 870 000	300
320	NAS 5064UU	NAS 5064ZZ	135	320	480	—	218	216	—	—	—	5	2	375	2 700 000	6 140 000	300
340	NAS 5068UU	NAS 5068ZZ	180	340	520	—	243	241	—	—	—	6	2.5	404	3 370 000	7 560 000	300
360	NAS 5072UU	NAS 5072ZZ	190	360	540	—	243	241	—	—	—	6	2.5	423	3 420 000	7 940 000	250
380	NAS 5076UU	NAS 5076ZZ	200	380	560	—	243	241	—	—	—	6	2.5	442	3 580 000	8 300 000	250
400	NAS 5080UU	NAS 5080ZZ	265	400	600	—	272	270	—	—	—	6	2.5	471	4 250 000	10 100 000	250
420	NAS 5084UU	NAS 5084ZZ	275	420	620	—	272	270	—	—	—	6	2.5	490	4 390 000	10 400 000	250
440	NAS 5088UU	NAS 5088ZZ	310	440	650	—	280	278	—	—	—	8	3	516	4 570 000	10 900 000	200

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The bearings with a bore diameter d of 300 mm or more has neither stop rings nor stop ring grooves.
2. The inner ring has an oil groove and two oil holes.
3. Roller Bearings for Sheaves are provided with prepacked grease.

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

THRUST BEARINGS

●Thrust Needle Roller Bearings

●Thrust Roller Bearings

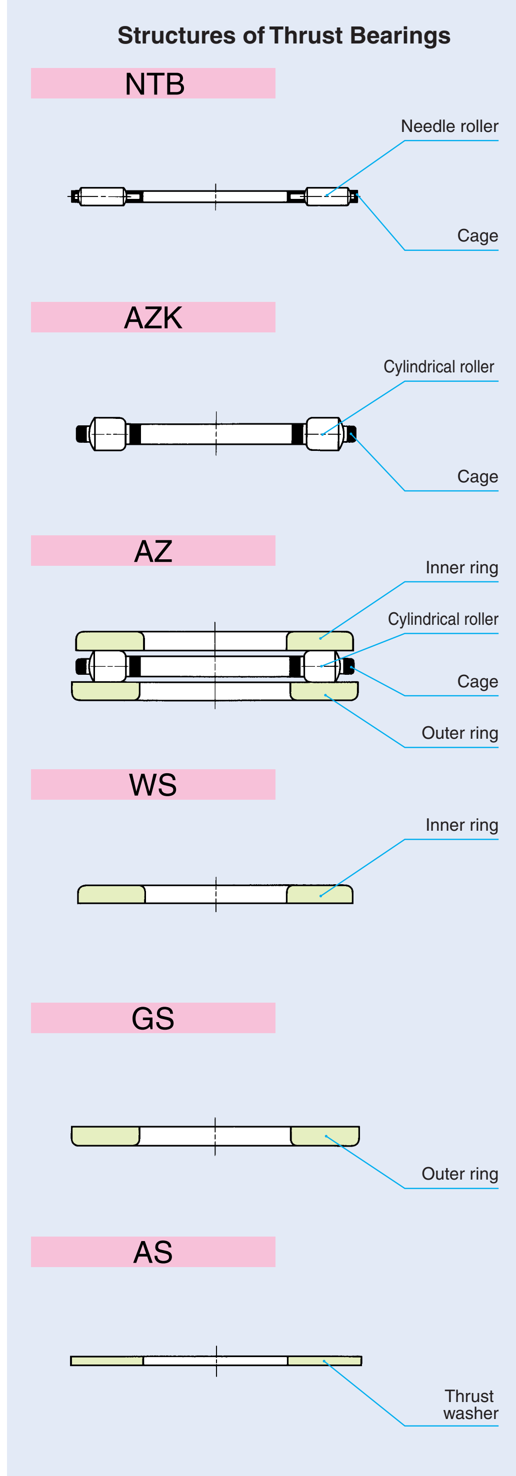
Structure and Features

IKO Thrust Bearings consist of a precisely made cage and rollers. They have high rigidity and high load capacities and can be used in small spaces.

Thrust Needle Roller Bearings incorporate needle rollers, while Thrust Roller Bearings incorporate cylindrical rollers. Various types of raceway rings are available, and suitable bearings can be selected according to the operating conditions.

When the bearing mounting surfaces of a machine are heat-treated and finished by grinding as raceways, Thrust Bearings can be used without raceway rings allowing the machine to be made more compact.

They are most suited to applications where high accuracy is required at high speeds and under fluctuating heavy loads, such as driving mechanisms for automobiles, machine tools, and high-pressure pumps.



Types

In IKO Thrust Bearings, the types shown in Table 1 are available.

Table 1.1 Type of bearing

Type	Thrust needle roller bearings	Thrust roller bearings	
		Without inner and outer rings	With inner and outer rings
Model code	NTB	AZK	AZ

Table 1.2 Type of bearing ring

Type	Inner ring	Outer ring	Thrust washer
Model code	WS	GS	AS

Thrust Needle Roller Bearings

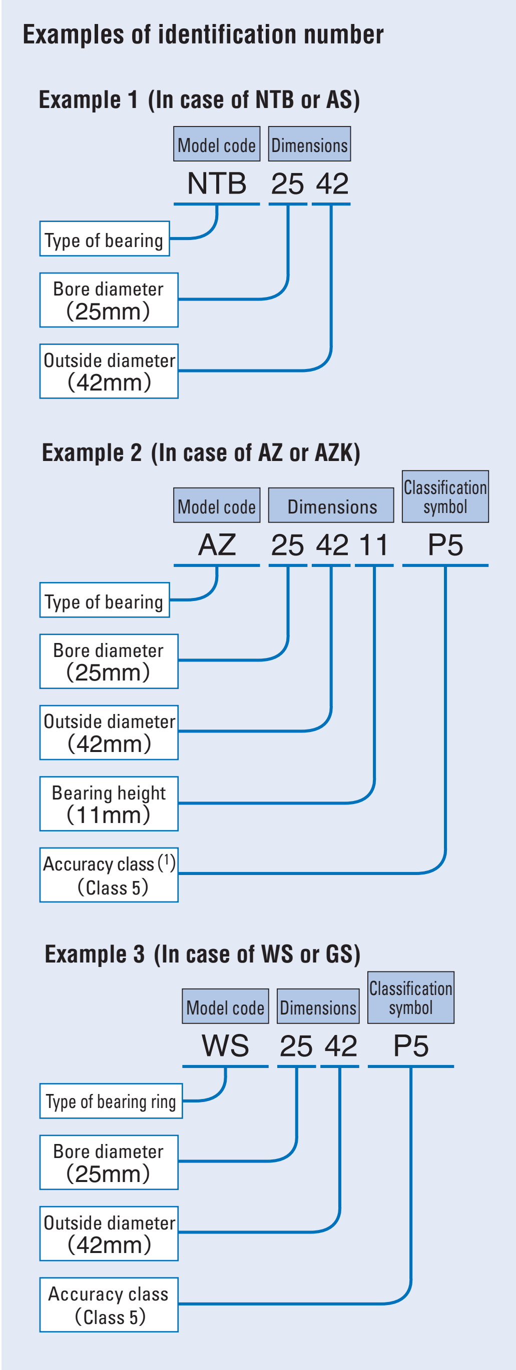
These bearings consist of a cage made from a steel plate, which is precisely press formed and surface-hardened, and needle rollers with a diameter variation within 2 μm. They have a rigid structure and a high lubricant-retaining capacity.
As they have the lowest sectional height compared with other thrust bearings, they can be used instead of conventional thrust washers and can withstand high-speed rotations with a low coefficient of friction.
Specially designed thin inner rings (WS) and outer rings (GS), and especially thin (1 mm thick) thrust washers (AS), are available for use in various applications.
These bearings are generally used by utilizing their inner surface as the guide surface.

Thrust Roller Bearings

In this series, the caged cylindrical rollers AZK and the complete bearings AZ in which AZK are combined with an inner ring (WS) and an outer ring (GS) are available.
The cage has a special precise structure which is highly rigid, and cylindrical rollers are outwardly arranged and guided by the cage with exact precision to enable them to withstand heavy loads even at high rotational speeds.
Owing to the high accuracy of the bearing height T, they are suitable for use in machine tools, ultra-high pressure pumps, etc.
These bearings are generally used by utilizing their inner surface as the guide surface.

Identification Number

The identification number of Thrust Bearings consists of a model code, dimensions and a classification symbol. Some examples are shown below.



Note(1) Not applicable to the model AZK.

Accuracy

The accuracy of Thrust Bearings is based on JIS B 1514:2000 as shown in Table 2.

Table 2.1 Tolerances unit: μm

Type of bearing \ Item		Dimension	Dimension symbol	Tolerance	
Thrust needle roller bearings	NTB	Bore diameter	d	E11	
		Outside diameter	D	c12	
		Width	D_w	Equivalent to JIS B 1506 Class 2	
Thrust roller bearings	AZK	Bore diameter	d_c	As per Table 2.2	
		Outside diameter	D_c		
		Width	D_w	$1 \leqq D_w \leqq 10$	Equivalent to JIS B 1506 Class 2
				$10 < D_w \leqq 30$	Equivalent to JIS B 1506 Class 3
	AZ	Height	T	As per Table 2.3	
Inner rings	WS	Bore diameter	d	As per Table 2.4	
		Outside diameter	D	b12	
		Width	B	h11	
Outer rings	GS	Bore diameter	d	B12	
		Outside diameter	D	As per Table 2.4	
		Width	B	h11	
Thrust washers	AS	Bore diameter	d	E12	
		Outside diameter	D	e12	
		Width	s	±50	

Table 2.2 Tolerances of bore and outside diameters for AZK series unit: μm

Nominal dimension mm		Δ_{dc} Cage bore diameter deviation		Δ_{Dc} Cage outside diameter deviation	
Over	Incl.	High	Low	High	Low
–	50	+100	0	0	− 300
50	100	+200	0	0	− 400
100	200	+300	0	0	− 500
200	300	+500	0	0	− 700
300	400	+700	0	0	−1000
400	500	–	–	0	−1200

Table 2.3 Tolerances of height for AZ series unit: μm

d Nominal bearing bore dia. mm		Δ_{Ts} Deviation of an actual bearing height	
Over	Incl.	High	Low
–	18	0	− 75
18	30	0	− 75
30	50	0	−100
50	80	0	−125
80	120	0	−150
120	180	0	−175
180	250	0	−200
250	315	0	−225
315	400	0	−300
400	500	0	−400

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

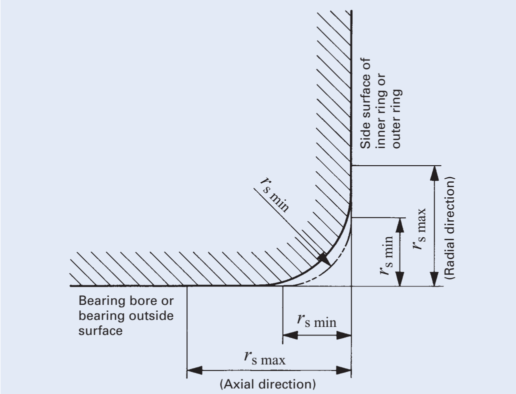
Table 2.4 Tolerances and allowable values for WS and GS

unit: μm

d or D (1) Nominal bearing bore dia. or outside dia. mm		Inner ring			Outer ring			Inner ring or outer ring		
		Δ_{dmp} Single plane mean bore diameter deviation		V_{dsp} Bore diameter variation in a single radial plane	Δ_{Dmp} Single plane mean outside diameter deviation		V_{Dsp} Outside diameter variation in a single radial plane	S_i or S_e (2) Bearing ring thickness variation		
								Class 0	Class 6	Class 5
Over	Incl.	High	Low	Max.	High	Low	Max.	Max.		
–	18	0	− 8	6	0	− 11	8	10	5	3
18	30	0	− 10	8	0	− 13	10	10	5	3
30	50	0	− 12	9	0	− 16	12	10	6	3
50	80	0	− 15	11	0	− 19	14	10	7	4
80	120	0	− 20	15	0	− 22	17	15	8	4
120	180	0	− 25	19	0	− 25	19	15	9	5
180	250	0	− 30	23	0	− 30	23	20	10	5
250	315	0	− 35	26	0	− 35	26	25	13	7
315	400	0	− 40	30	0	− 40	30	30	15	7
400	500	0	− 45	34	0	− 45	34	30	18	9

Notes(1) d for Δ_{dmp} and V_{dp}, and D for Δ_{Dmp} and V_{Dp}, respectively.
d for thickness variations of inner and outer rings .
(2) d_i for thickness variations of rings for NAX(I) and NBX(I) .

Table 2.5 Permissible limit values for chamfer dimension



unit: mm

$r_{s\,min}$	Radial and axial directions $r_{s\,max}$
0.3	0.8
0.6	1.5
1	2.2
1.1	2.7
1.5	3.5
2	4
2.1	4.5
3	5.5
4	6.5
5	8

Fit

The recommended fits for Thrust Bearings are shown in Table 3.

Table 3 Recommended fits

Type of bearing		Tolerance class	
		Shaft	Housing bore
Thrust needle roller bearings	NTB	h8(h10)	——
Thrust roller bearings	AZK	h6(h8)	——
	AZ		H7(H9)
Inner rings	WS	h6(h8)	——
Outer rings	GS	——	H7(H9)
Thrust washers	AS	h8(h10)	——

Mounting

When mounting Thrust Bearings, the following items should be considered.

❶When inner and outer rings are not used, the hardness of the raceway surfaces should be 58～64HRC, the effective hardening depth should be adequate, and the surface roughness should be less than 0.2 μmR_a.

❷When mounting inner and outer rings to shaft and housing bore, dimensions related to mounting should be based on the dimension tables.

Also, the mounting surfaces should be finished at right angles to the center axis and they should be sufficiently rigid.

❸To avoid elastic deformation, the thrust washer AS must be seated uniformly on its mating surface.

A small warp in an AS washer will be corrected automatically when an axial load is applied.

❹Thrust Roller Bearings are combinations of a copper alloy component and cylindrical rollers. When handling the AZK itself, care should be taken to prevent deformations, blemishes, etc.

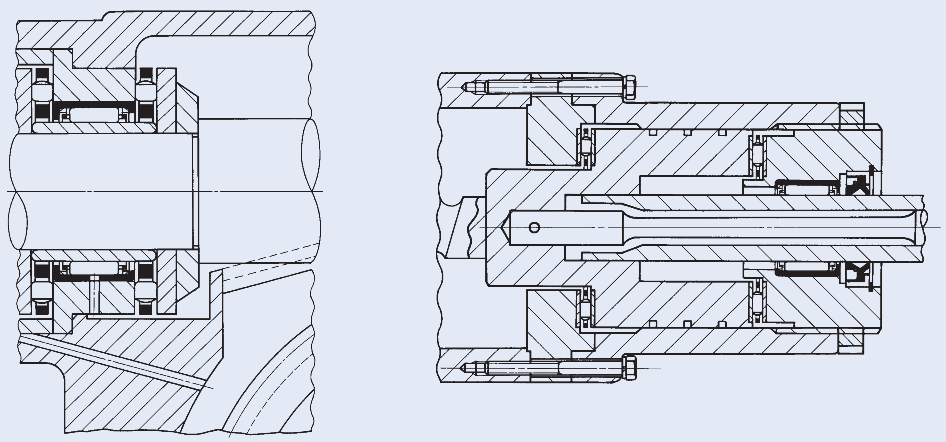
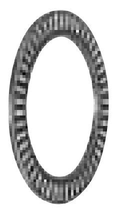


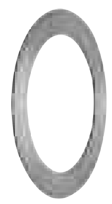
Fig.1 Mounting examples

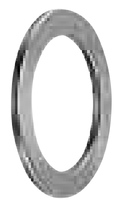
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

THRUST BEARINGS

Thrust Needle Roller Bearings



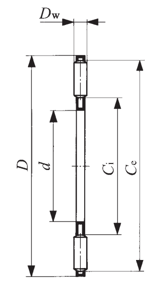


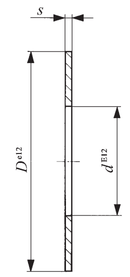


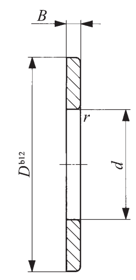
Shaft dia. 10 — 85mm

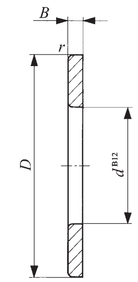
Shaft dia. mm	Identification number							
	Thrust needle roller bearing	Mass (Ref.) g	Thrust washer	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
10	**NTB 1024**	3.3	**AS 1024**	2.9	**WS 1024**	**GS 1024**	8
12	**NTB 1226**	3.8	**AS 1226**	3.2	**WS 1226**	**GS 1226**	8.9
15	**NTB 1528**	4.1	**AS 1528**	3.4	**WS 1528**	**GS 1528**	9.3
16	**NTB 1629**	4.3	**AS 1629**	3.6	**WS 1629**	**GS 1629**	9.8
17	**NTB 1730**	4.5	**AS 1730**	3.7	**WS 1730**	**GS 1730**	10.2
18	**NTB 1831**	4.7	**AS 1831**	3.9	**WS 1831**	**GS 1831**	10.7
20	**NTB 2035**	6.1	**AS 2035**	5	**WS 2035**	**GS 2035**	13.8
25	**NTB 2542**	8.2	**AS 2542**	6.9	**WS 2542**	**GS 2542**	21
30	**NTB 3047**	9.4	**AS 3047**	7.9	**WS 3047**	**GS 3047**	24
35	**NTB 3552**	10.6	**AS 3552**	8.9	**WS 3552**	**GS 3552**	31.5
40	**NTB 40603**	22	**AS 4060**	12.1	**WS 4060**	**GS 4060**	42.5
45	**NTB 4565**	24.5	**AS 4565**	13.3	**WS 4565**	**GS 4565**	53.5
50	**NTB 5070**	26.5	**AS 5070**	14.5	**WS 5070**	**GS 5070**	58.5
55	**NTB 5578**	33.5	**AS 5578**	18.5	**WS 5578**	**GS 5578**	93
60	**NTB 6085**	38.5	**AS 6085**	22	**WS 6085**	**GS 6085**	105
65	**NTB 6590**	41.5	**AS 6590**	23.5	**WS 6590**	**GS 6590**	124
70	**NTB 7095**	61	**AS 7095**	25	**WS 7095**	**GS 7095**	132
75	**NTB 75100**	65	**AS 75100**	26.5	**WS 75100**	**GS 75100**	153
80	**NTB 80105**	68.5	**AS 80105**	28	**WS 80105**	**GS 80105**	162
85	**NTB 85110**	72	**AS 85110**	29.5	**WS 85110**	**GS 85110**	170

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.


NTB


AS


WS

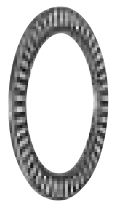

GS

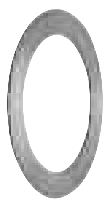
Boundary dimensions mm								Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(2)
d	D	D_w	s	B	$r_{s\,min}$(1)	C_i	C_e	N	N	rpm
10	24	2	1	2.75	0.3	14	22	7 820	23 900	15 000
12	26	2	1	2.75	0.3	16	24	8 340	26 900	13 000
15	28	2	1	2.75	0.3	18	26	8 830	29 900	12 000
16	29	2	1	2.75	0.3	19	27	9 070	31 400	11 000
17	30	2	1	2.75	0.3	20	28	9 320	32 900	11 000
18	31	2	1	2.75	0.3	21	29	9 550	34 400	10 000
20	35	2	1	2.75	0.3	23	33	11 700	46 500	9 000
25	42	2	1	3	0.6	29	40	14 400	64 700	7 500
30	47	2	1	3	0.6	34	45	15 400	73 300	6 500
35	52	2	1	3.5	0.6	39	50	16 300	81 900	5 500
40	60	3	1	3.5	0.6	45	57	24 200	108 000	5 000
45	65	3	1	4	0.6	50	62	25 900	121 000	4 500
50	70	3	1	4	0.6	55	67	27 600	135 000	4 000
55	78	3	1	5	0.6	61	75	32 400	171 000	4 000
60	85	3	1	4.75	1	66	82	38 200	219 000	3 500
65	90	3	1	5.25	1	71	87	40 100	237 000	3 000
70	95	4	1	5.25	1	75	91	47 400	244 000	3 000
75	100	4	1	5.75	1	80	96	48 400	256 000	3 000
80	105	4	1	5.75	1	85	101	49 500	267 000	2 500
85	110	4	1	5.75	1	90	106	50 300	279 000	2 500

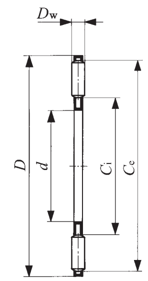
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

THRUST BEARINGS

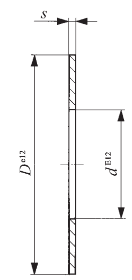
Thrust Needle Roller Bearings



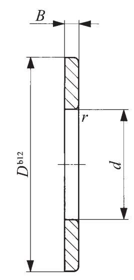




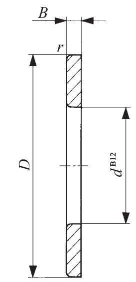
NTB



AS



WS



GS

Shaft dia. 90 — 130mm

Shaft dia. mm	Identification number: Thrust needle roller bearing	Mass (Ref.) g	Thrust washer	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
90	**NTB 90120**	92	**AS 90120**	38	**WS 90120**	**GS 90120**	250
100	**NTB 100135**	119	**AS 100135**	50	**WS 100135**	**GS 100135**	350
110	**NTB 110145**	129	—	—	**WS 110145**	**GS 110145**	380
120	**NTB 120155**	139	—	—	**WS 120155**	**GS 120155**	410
130	**NTB 130170**	225	—	—	**WS 130170**	**GS 130170**	660

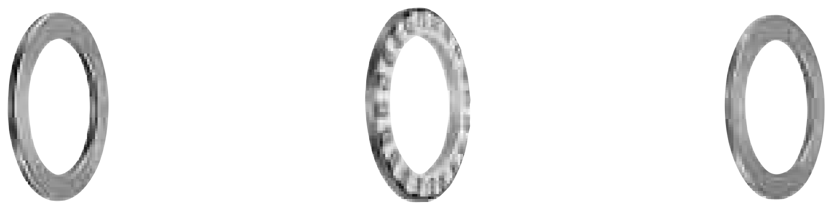
Boundary dimensions mm: d	D	D_w	s	B	$r_{s\,min}$(1)	C_i	C_e	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
90	120	4	1	6.5	1	96	116	64 500	394 000	2 500
100	135	4	1	7	1	107	131	80 300	541 000	2 000
110	145	4	—	7	1	117	141	83 200	578 000	2 000
120	155	4	—	7	1	127	151	87 900	634 000	1 800
130	170	5	—	9	1	137	165	120 000	839 000	1 700

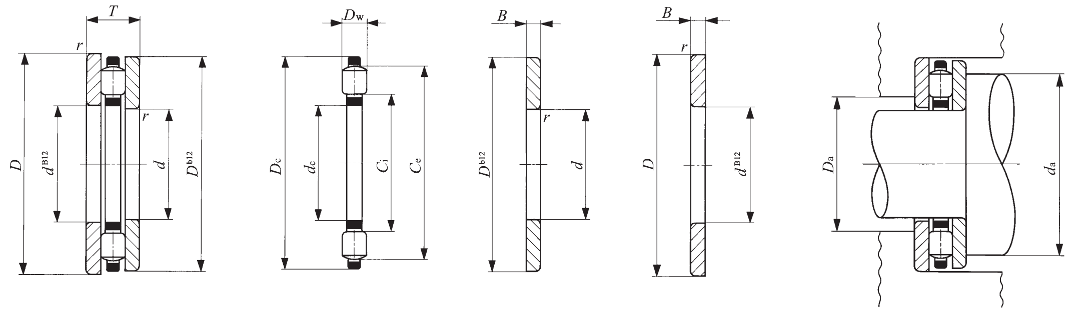
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

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

THRUST BEARINGS

Thrust Roller Bearings





AZ AZK WS GS

Shaft dia. 10 — 65mm

F
NTB
AS
AZK
WS·GS

Shaft dia. mm	Identification number						
	Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
10	**AZ 10249**	24.6	**AZK 10243.5**	8.6	**WS 1024**	**GS 1024**	8
12	**AZ 12269**	26.5	**AZK 12263.5**	8.7	**WS 1226**	**GS 1226**	8.9
15	**AZ 15289**	28	**AZK 15283.5**	9.4	**WS 1528**	**GS 1528**	9.3
17	**AZ 17309**	30.5	**AZK 17303.5**	10.1	**WS 1730**	**GS 1730**	10.2
20	**AZ 203510**	45.5	**AZK 20354.5**	17.9	**WS 2035**	**GS 2035**	13.8
25	**AZ 254211**	70	**AZK 25425**	28	**WS 2542**	**GS 2542**	21
30	**AZ 304711**	79	**AZK 30475**	31	**WS 3047**	**GS 3047**	24
	AZ 305216	160	**AZK 30527.5**	70	**WS 3052**	**GS 3052**	45
35	**AZ 355212**	99	**AZK 35525**	36	**WS 3552**	**GS 3552**	31.5
	AZ 356218	260	**AZK 35627.5**	98	**WS 3562**	**GS 3562**	81
40	**AZ 406013**	139	**AZK 40606**	54	**WS 4060**	**GS 4060**	42.5
	AZ 406819	310	**AZK 40689**	132	**WS 4068**	**GS 4068**	89
45	**AZ 456514**	169	**AZK 45656**	62	**WS 4565**	**GS 4565**	53.5
	AZ 457320	360	**AZK 45739**	144	**WS 4573**	**GS 4573**	108
50	**AZ 507014**	185	**AZK 50706**	68	**WS 5070**	**GS 5070**	58.5
	AZ 507822	430	**AZK 507811**	194	**WS 5078**	**GS 5078**	118
55	**AZ 557816**	275	**AZK 55786**	89	**WS 5578**	**GS 5578**	93
	AZ 559025	725	**AZK 559011**	275	**WS 5590**	**GS 5590**	225
60	**AZ 608517**	345	**AZK 60857.5**	135	**WS 6085**	**GS 6085**	105
	AZ 609526	770	**AZK 609511**	290	**WS 6095**	**GS 6095**	240
	AZ 6013026	2 090	**AZK 6013010**	790	**WS 60130**	**GS 60130**	650
65	**AZ 659018**	380	**AZK 65907.5**	132	**WS 6590**	**GS 6590**	124
	AZ 6510027	860	**AZK 6510011**	310	**WS 65100**	**GS 65100**	275

Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
d	D	T	d_c	D_c	D_w	B	$r_{s\,min}$(1)	C_i	C_e	d_a Min.	D_a Max.			
10	24	9	10.04	23.6	3.5	2.75	0.3	13	21	21	13	8 990	19 100	18 000
12	26	9	12.04	25.6	3.5	2.75	0.3	15	23	23	16	10 400	23 900	16 000
15	28	9	15.04	27.6	3.5	2.75	0.3	17	25	25	18	10 200	23 900	14 000
17	30	9	17.04	29.6	3.5	2.75	0.3	19	27	27	20	11 400	28 600	13 000
20	35	10	20.04	34.6	4.5	2.75	0.3	22	33	33	23	19 000	48 700	11 000
25	42	11	25.05	41.6	5	3	0.6	28	39	39	28	22 700	60 700	9 000
30	47	11	30.05	46.5	5	3	0.6	33	44	44	33	27 400	81 000	8 000
30	52	16	30.05	51.5	7.5	4.25	0.6	35	49	48	36	38 400	95 700	7 500
35	52	12	35.05	51.5	5	3.5	0.6	38	49	49	39	29 100	91 100	7 000
35	62	18	35.05	61.5	7.5	5.25	1	42	58	57	43	47 900	135 000	6 500
40	60	13	40.05	59.5	6	3.5	0.6	44	57	57	44	41 700	133 000	6 000
40	68	19	40.05	67.5	9	5	1	45	64	64	46	68 700	195 000	5 500
45	65	14	45.05	64.5	6	4	0.6	49	62	62	49	40 800	133 000	5 500
45	73	20	45.05	72.5	9	5.5	1	50	69	69	51	75 700	227 000	5 000
50	70	14	50.05	69.5	6	4	0.6	54	67	67	54	43 300	148 000	5 000
50	78	22	50.05	77.5	11	5.5	1	55	74	73	56	84 300	232 000	4 500
55	78	16	55.05	77.5	6	5	0.6	59	75	75	60	51 700	192 000	4 500
55	90	25	55.05	89.5	11	7	1	63	85	84	63	108 000	332 000	4 000
60	85	17	60.05	84.5	7.5	4.75	1	65	81	81	66	64 600	224 000	4 000
60	95	26	60.05	94.5	11	7.5	1	68	90	89	68	106 000	332 000	4 000
60	130	26	60.05	129.5	10	8	1.5	79	119	119	80	158 000	634 000	3 000
65	90	18	65.05	89.5	7.5	5.25	1	70	86	86	71	68 300	247 000	4 000
65	100	27	65.05	99.5	11	8	1	73	95	94	73	116 000	379 000	3 500

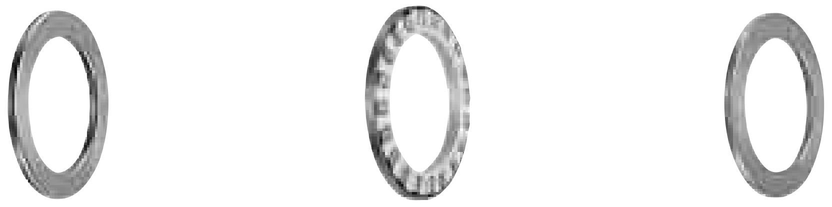
Notes(1) Minimum allowable value of chamfer dimension r

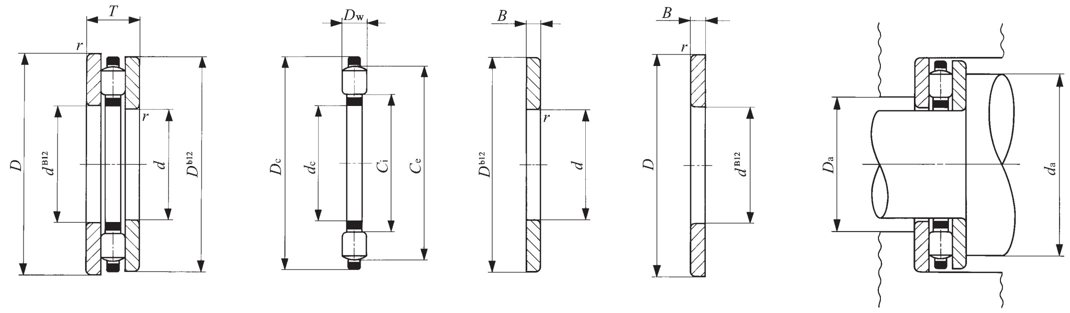
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

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

THRUST BEARINGS

Thrust Roller Bearings





Shaft dia. 70 — 130mm

Shaft dia. mm	Identification number: Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
70	**AZ 709518**	420	**AZK 70957.5**	156	**WS 7095**	**GS 7095**	132
	AZ 7010527	905	**AZK 7010511**	325	**WS 70105**	**GS 70105**	290
	AZ 7014026	2 250	**AZK 7014010**	890	**WS 70140**	**GS 70140**	680
75	**AZ 7510019**	465	**AZK 751007.5**	159	**WS 75100**	**GS 75100**	153
	AZ 7511027	960	**AZK 7511011**	340	**WS 75110**	**GS 75110**	310
80	**AZ 8010519**	495	**AZK 801057.5**	171	**WS 80105**	**GS 80105**	162
	AZ 8011528	1 060	**AZK 8011511**	370	**WS 80115**	**GS 80115**	345
	AZ 8015026	2 500	**AZK 8015010**	920	**WS 80150**	**GS 80150**	790
85	**AZ 8511019**	530	**AZK 851107.5**	190	**WS 85110**	**GS 85110**	170
	AZ 8512531	1 460	**AZK 8512512**	510	**WS 85125**	**GS 85125**	475
90	**AZ 9012022**	790	**AZK 901209**	290	**WS 90120**	**GS 90120**	250
	AZ 9013535	2 040	**AZK 9013514**	750	**WS 90135**	**GS 90135**	645
	AZ 9016026	2 710	**AZK 9016010**	1 000	**WS 90160**	**GS 90160**	855
100	**AZ 10013525**	1 190	**AZK 10013511**	490	**WS 100135**	**GS 100135**	350
	AZ 10015038	2 720	**AZK 10015015**	980	**WS 100150**	**GS 100150**	870
	AZ 10019039	5 960	**AZK 10019015**	2 120	**WS 100190**	**GS 100190**	1 920
110	**AZ 11014525**	1 350	**AZK 11014511**	590	**WS 110145**	**GS 110145**	380
	AZ 11016040	3 220	**AZK 11016017**	1 320	**WS 110160**	**GS 110160**	950
	AZ 11020039	6 400	**AZK 11020015**	2 280	**WS 110200**	**GS 110200**	2 060
120	**AZ 12015525**	1 450	**AZK 12015511**	630	**WS 120155**	**GS 120155**	410
	AZ 12017542	4 020	**AZK 12017518**	1 640	**WS 120175**	**GS 120175**	1 190
	AZ 12022039	7 730	**AZK 12022015**	2 730	**WS 120220**	**GS 120220**	2 500
130	**AZ 13017030**	2 180	**AZK 13017012**	860	**WS 130170**	**GS 130170**	660
	AZ 13018542	4 300	**AZK 13018518**	1 760	**WS 130185**	**GS 130185**	1 270
	AZ 13023039	8 240	**AZK 13023015**	2 940	**WS 130230**	**GS 130230**	2 650

Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
d	D	T	d_c	D_c	D_w	B	$r_{s\,min}$(1)	C_i	C_e	d_a Min.	D_a Max.	C N	C_0 N	rpm
70	95	18	70.05	94.5	7.5	5.25	1	75	91	91	76	72 000	269 000	3 500
70	105	27	70.05	104.5	11	8	1	78	100	99	78	114 000	379 000	3 500
70	140	26	70.05	139.5	10	8	1.1	89	129	129	90	169 000	713 000	3 000
75	100	19	75.05	99.5	7.5	5.75	1	80	96	96	81	71 100	269 000	3 500
75	110	27	75.05	109.5	11	8	1	83	105	104	83	123 000	427 000	3 000
80	105	19	80.05	104.5	7.5	5.75	1	85	101	101	86	74 500	292 000	3 000
80	115	28	80.05	114.5	11	8.5	1	88	110	109	88	122 000	427 000	3 000
80	150	26	80.05	149.5	10	8	1.5	99	139	139	100	180 000	792 000	2 500
85	110	19	85.05	109.5	7.5	5.75	1	90	106	106	91	77 800	314 000	3 000
85	125	31	85.05	124.5	12	9.5	1	95	119	118	95	145 000	513 000	3 000
90	120	22	90.05	119.5	9	6.5	1	97	116	115	97	99 700	390 000	3 000
90	135	35	90.05	134.5	14	10.5	1.1	100	129	128	101	181 000	626 000	2 500
90	160	26	90.05	159.5	10	8	1.5	109	149	149	110	189 000	871 000	2 500
100	135	25	100.05	134.5	11	7	1	108	130	129	108	136 000	522 000	2 500
100	150	38	100.05	149.5	15	11.5	1.1	112	143	142	113	219 000	796 000	2 500
100	190	39	100.1	189.3	15	12	1.5	119	179	177	120	333 000	1 420 000	2 000
110	145	25	110.1	144.5	11	7	1	118	140	139	118	142 000	569 000	2 500
110	160	40	110.1	159.5	17	11.5	1.1	120	154	153	121	282 000	1 030 000	2 000
110	200	39	110.1	199.3	15	12	2	129	188	187	130	388 000	1 770 000	2 000
120	155	25	120.1	154.5	11	7	1	128	150	149	128	149 000	617 000	2 000
120	175	42	120.1	174.5	18	12	1.1	132	168	167	133	313 000	1 160 000	2 000
120	220	39	120.1	219	15	12	2.1	141	207	206	142	415 000	1 980 000	1 800
130	170	30	130.1	169.5	12	9	1	140	164	163	140	176 000	741 000	2 000
130	185	42	130.1	184.5	18	12	1.5	142	178	177	143	333 000	1 290 000	1 900
130	230	39	130.1	229	15	12	2.1	151	217	216	152	440 000	2 180 000	1 700

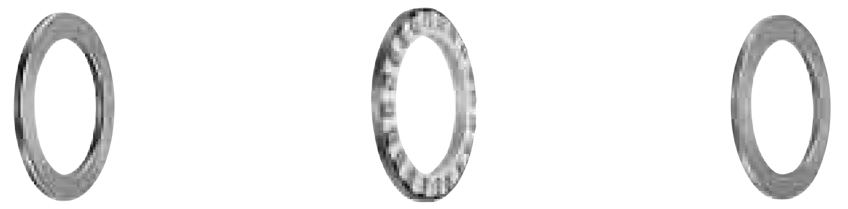
Notes(1) Minimum allowable value of chamfer dimension r

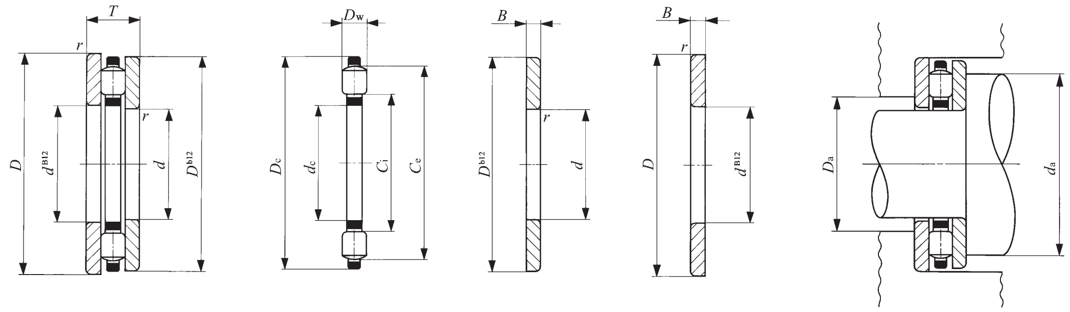
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

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

THRUST BEARINGS

Thrust Roller Bearings





AZ AZK WS GS

Shaft dia. 140 — 280mm

Shaft dia. mm	Identification number						
	Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
140	**AZ 14018031**	2 410	**AZK 14018012**	920	**WS 140180**	**GS 140180**	745
	AZ 14019542	4 560	**AZK 14019518**	1 860	**WS 140195**	**GS 140195**	1 350
	AZ 14024039	8 680	**AZK 14024015**	3 100	**WS 140240**	**GS 140240**	2 790
150	**AZ 15019031**	2 560	**AZK 15019012**	980	**WS 150190**	**GS 150190**	790
	AZ 15020542	4 840	**AZK 15020518**	1 980	**WS 150205**	**GS 150205**	1 430
	AZ 15025039	9 140	**AZK 15025015**	3 260	**WS 150250**	**GS 150250**	2 940
160	**AZ 16020031**	2 710	**AZK 16020012**	1 030	**WS 160200**	**GS 160200**	840
	AZ 16027039	10 800	**AZK 16027015**	3 840	**WS 160270**	**GS 160270**	3 480
170	**AZ 17023045**	6 220	**AZK 17023019**	2 420	**WS 170230**	**GS 170230**	1 900
	AZ 17028039	11 300	**AZK 17028015**	4 020	**WS 170280**	**GS 170280**	3 640
180	**AZ 18024045**	6 540	**AZK 18024019**	2 540	**WS 180240**	**GS 180240**	2 000
	AZ 18031039	14 600	**AZK 18031015**	5 200	**WS 180310**	**GS 180310**	4 700
190	**AZ 19025548**	8 060	**AZK 19025520**	3 100	**WS 190255**	**GS 190255**	2 480
	AZ 19032039	15 000	**AZK 19032015**	5 280	**WS 190320**	**GS 190320**	4 860
200	**AZ 20026548**	8 430	**AZK 20026520**	3 250	**WS 200265**	**GS 200265**	2 590
	AZ 20034039	17 200	**AZK 20034015**	6 120	**WS 200340**	**GS 200340**	5 540
220	**AZ 22029050**	10 400	**AZK 22029022**	4 280	**WS 220290**	**GS 220290**	3 060
	AZ 22036052	24 000	**AZK 22036020**	8 000	**WS 220360**	**GS 220360**	8 000
240	**AZ 24031554**	13 200	**AZK 24031524**	5 520	**WS 240315**	**GS 240315**	3 840
	AZ 24038052	26 500	**AZK 24038020**	9 440	**WS 240380**	**GS 240380**	8 530
260	**AZ 26034055**	15 400	**AZK 26034025**	6 600	**WS 260340**	**GS 260340**	4 400
	AZ 26042080	51 600	**AZK 26042030**	18 200	**WS 260420**	**GS 260420**	16 700
280	**AZ 28044080**	54 600	**AZK 28044030**	19 200	**WS 280440**	**GS 280440**	17 700

Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
d	D	T	d_c	D_c	D_w	B	$r_{s\,min}$(1)	C_i	C_e	d_a Min.	D_a Max.			
140	180	31	140.1	179.5	12	9.5	1	150	174	173	150	184 000	798 000	1 900
140	195	42	140.1	194.5	18	12	1.5	152	188	187	153	353 000	1 420 000	1 800
140	240	39	140.1	239	15	12	2.1	161	227	226	162	435 000	2 180 000	1 600
150	190	31	150.1	189.5	12	9.5	1	160	184	183	160	181 000	798 000	1 800
150	205	42	150.1	204.5	18	12	1.5	162	198	197	163	349 000	1 420 000	1 700
150	250	39	150.1	249	15	12	2.1	171	237	236	172	459 000	2 380 000	1 500
160	200	31	160.1	199.5	12	9.5	1	170	194	193	170	189 000	855 000	1 700
160	270	39	160.1	269	15	12	3	183	256	255	184	519 000	2 850 000	1 400
170	230	45	170.1	229	19	13	1.5	183	221	220	184	406 000	1 730 000	1 500
170	280	39	170.1	279	15	12	3	193	266	265	194	543 000	3 070 000	1 300
180	240	45	180.1	239	19	13	1.5	193	231	230	194	426 000	1 870 000	1 400
180	310	39	180.1	308	15	12	3	204	294	293	205	619 000	3 710 000	1 200
190	255	48	190.1	254	20	14	2	205	245	244	206	470 000	2 080 000	1 300
190	320	39	190.1	318	15	12	4	214	304	303	215	647 000	3 980 000	1 200
200	265	48	200.15	264	20	14	2	215	255	254	216	465 000	2 080 000	1 300
200	340	39	200.15	338	15	12	4	227	323	322	228	710 000	4 580 000	1 100
220	290	50	220.15	289	22	14	2	236	280	278	237	557 000	2 530 000	1 300
220	360	52	220.15	358	20	16	4	246	343	342	247	943 000	5 520 000	1 000
240	315	54	240.15	314	24	15	2	256	304	302	257	695 000	3 250 000	1 100
240	380	52	240.15	378	20	16	4	266	363	362	267	977 000	5 910 000	1 000
260	340	55	260.15	339	25	15	2.1	278	328	326	279	739 000	3 510 000	1 000
260	420	80	260.15	418	30	25	5	289	402	400	291	1 430 000	7 490 000	900
280	440	80	280.15	438	30	25	5	309	422	420	311	1 420 000	7 490 000	800

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

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

COMBINED TYPE NEEDLE ROLLER BEARINGS

- ●Needle Roller Bearings with Thrust Ball Bearing
- ●Needle Roller Bearings with Thrust Roller Bearing
- ●Needle Roller Bearings with Angular Contact Ball Bearing
- ●Needle Roller Bearings with Three-point Contact Ball Bearing

Structure and Features

IKO Combined Type Needle Roller Bearings are combinations of a radial bearing and a thrust bearing. Caged needle roller bearings are used as radial bearings and thrust ball bearings or thrust roller bearings are used as thrust bearings. They are compact and very economical, and can be subjected to radial loads and axial loads simultaneously.
They are widely used for machine tools, textile machinery, and industrial machinery.

Types

In IKO Combined Type Needle Roller Bearings, the types shown in Table 1 are available.

Table 1.1 Type of bearing

Type	Combined with thrust ball bearing		Combined with thrust roller bearing	
	Without inner ring	With inner ring	Without inner ring	With inner ring
——	NAX	NAXI	NBX	NBXI
With dust cover	NAX···Z	NAXI···Z	NBX···Z	NBXI···Z

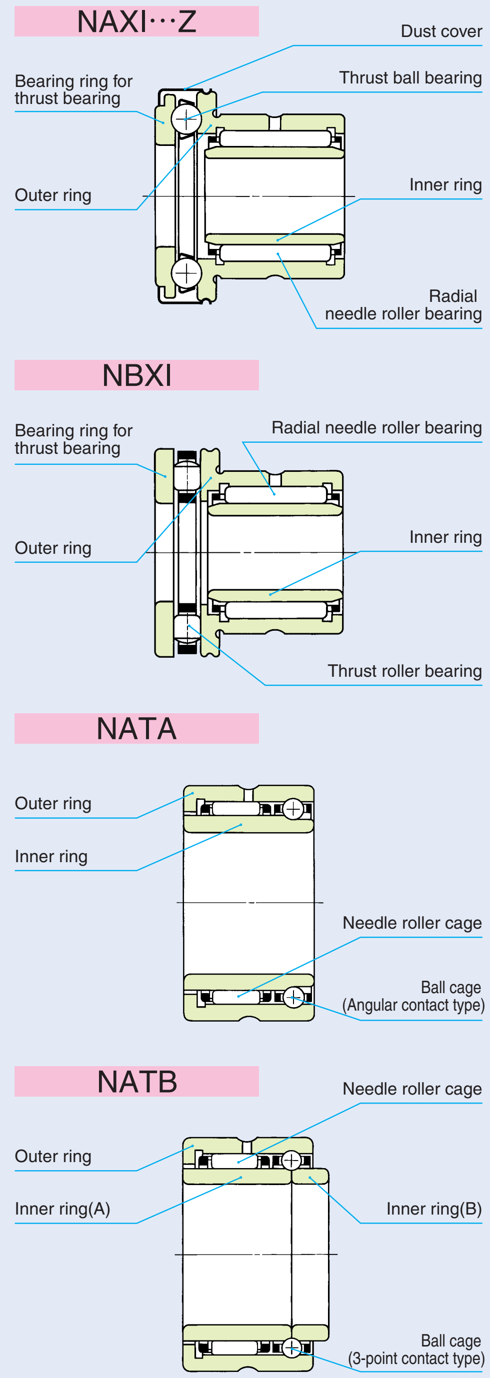
Table 1.2 Type of bearing

Type	Combined with angular contact ball bearing	Combined with three-point contact ball bearing
Model code	NATA	NATB

Needle Roller Bearings with Thrust Ball Bearing

In this series, needle roller bearings are combined with thrust ball bearings to receive thrust loads.
In bearings with a dust cover, the dust cover is formed from a thin steel plate and fixed to a groove cut on the outer cylindrical surface of the outer ring collar. The cover forms a labyrinth with the thrust raceway ring, and is therefore effective in preventing leakage of grease and penetration of dust and dirt.
In the case of bearings without an inner ring, the tolerances of roller set bore diameter F_w are shown in Table 14 on page A33. Therefore, the required radial internal clearances can be selected by combining the bearings with shafts that have been heat-treated and finished by grinding as shown in Table 23 on page A42 and Table 26 on page A44.

Structures of Combined Type Needle Roller Bearings



Needle Roller Bearings with Thrust Roller Bearing

In this series, needle roller bearings are combined with thrust roller bearings to receive thrust loads.
Their axial load ratings are greater than those of bearings that are combined with thrust ball bearings. Also, elastic deformation of the rolling contact surfaces under load is minimal. Furthermore, the thrust bearing section is finished to high accuracy, and therefore high rotational accuracy is obtained in the case of both vertical and horizontal shafts.
Like the needle roller bearings with thrust ball bearing, this series also includes bearings with a dust cover and bearings with an inner ring.

Needle Roller Bearings with Angular Contact Ball Bearing

In this series, caged needle roller bearings are combined with angular contact ball bearings to receive thrust loads. These bearings conform to the international dimension series #59, which is based on the ISO Standard. They can withstand heavy radial loads and unidirectional axial loads simultaneously.
When the axial load exceeds 25% of the radial load, the radial load will be induced in the angular contact ball bearing, and bearing life will be affected. The relationship between the two loads must therefore be taken into careful consideration.

Needle Roller Bearings with Three-point Contact Ball Bearing

These bearings can withstand heavy radial loads and bi-directional axial loads at the same time during high-speed rotation.
Since the non-interchangeable inner rings are separated at the center of the ball raceway surface, they must be firmly tightened against the shaft in the axial direction. The axial clearance of this bearing is 0.1～0.3 mm, and like NATA59, the axial load should not exceed 25% of the radial load.

Identification Number

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

Examples of identification number

Example 1

Model code	Dimensions	Supplemental code	Classification symbol
NAXI	17 30	Z	P6

- NAXI — Type of bearing
- 17 — Bearing bore diameter (17mm)
- 30 — Assembled bearing width (30mm)
- Z — With dust cover
- P6 — Accuracy class (Class 6)

Example 2

Model code	Dimensions
NATA	59 05

- NATA — Type of bearing
- 59 — Dimension series
- 05 — Bore diameter number

Accuracy

Dimensional accuracy and rotational accuracy of Combined Type Needle Roller Bearings are based on Table 2 below and Tables 12 and 13 on page A31. Thickness variations of thrust rings of NAX(I) and NBX(I) are based on Table 2.4 on page F5.
Bore diameter of the small width inner ring of NATB59 is made for a transition fit with k5 tolerance shaft.

Table 2 Tolerances unit: mm

Type of bearing \ Item	Dimension	Dimension symbol	Tolerance
NAX(I)(1) NBX(I)(1)	Bore dia. of bearing ring for thrust bearing	d_i	E7
	Assembled bearing width	L	0 −0.25
	Bearing height of thrust bearing	H	0 −0.20
NATB59	Width of inner ring	B	0 −0.3

Note(1) Also applicable to bearings with dust cover

Clearance

Combined Type Needle Roller Bearings are manufactured to have the radial internal clearance CN shown in Table 18 on page A37.

Fit

The recommended fits for Combined Type Needle Roller Bearings are shown in Table 3.

Table 3 Recommended fits

Type of bearing \ Item	Tolerance class		
	Shaft		Housing bore
	Without inner ring	With inner ring	
NAX(I)(1) NBX(I)(1)	h5, k5	k5	K6, M6
NATA59 NATB59	—	k5(2)	M6(2)

Notes(1) The housing bore for the thrust bearing must be machined to be more than 0.5 mm larger than the outside diameters D_1 and D_2 to ensure that it does not incur radial loads.
(2) If the fit is made tighter than specified in this table, radial loads will act upon the thrust bearing, limiting its function.

Lubrication

Grease is not prepacked in Combined Type Needle Roller Bearings, so perform proper lubrication for use. Operating without lubrication will increase the wear of the rolling contact surfaces and shorten the bearing life.

Oil Hole

The outer ring of Combined Type Needle Roller Bearings has an oil groove and an oil hole. When outer rings with multiple oil holes or inner rings with oil hole(s) are required, please contact IKO.

Rating Life

In Combined Type Needle Roller Bearings, caged needle roller bearings are subjected to radial loads while thrust bearings receive axial loads. Therefore, it is necessary to calculate their lives respectively (page A17).

Mounting

Fig.1 shows mounting examples of Combined Type Needle Roller Bearings. When applying preload to the NAX and NBX models, it is recommended that thrust raceway rings are not tightened directly with nuts, but are tightened using springs as shown in Fig. 2.
Mounting two NATA models symmetrically allows them to be subjected to two-way axial loads. When mounting these models, an axial clearance of 0.2～0.3 mm should be provided in the angular contact ball bearings so that radial loads are not applied to the angular contact ball bearings.
Dimensions related to mounting should be based on the table of dimensions.

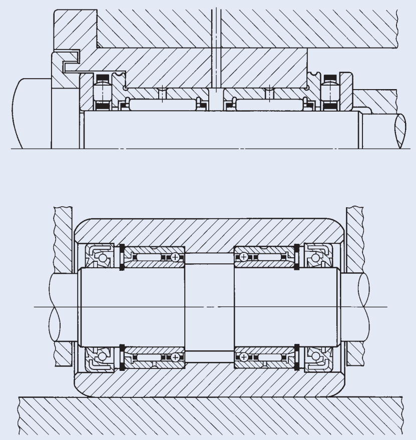


Fig.1 Mounting examples

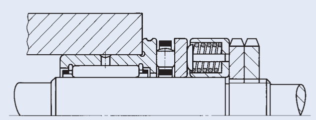
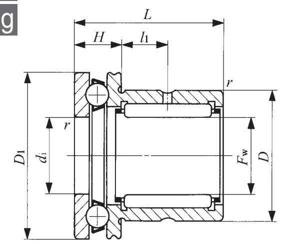


Fig.2 Mounting example when applying preload

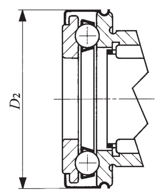
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

COMBINED TYPE NEEDLE ROLLER BEARINGS

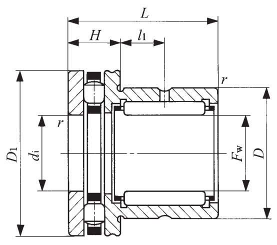
Needle Roller Bearings with Thrust Ball Bearing **Without Inner Ring**
Needle Roller Bearings with Thrust Roller Bearing **Without Inner Ring**



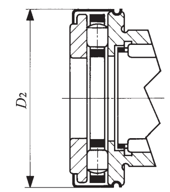
NAX



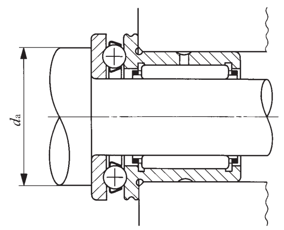
NAX···Z



NBX



NBX···Z



Shaft dia. 10 — 70mm

Shaft dia. mm	Identification number	Mass (Ref.) g	With dust cover	Mass (Ref.) g		Mass (Ref.) g	With dust cover	Mass (Ref.) g
10	NAX 1023	38.5	NAX 1023Z	40	—	—	—	—
12	NAX 1223	43.5	NAX 1223Z	45.5	—	—	—	—
15	NAX 1523	47.5	NAX 1523Z	48.5	—	—	—	—
	—	—	—	—	NBX 1523	54	NBX 1523Z	55
17	NAX 1725	54	NAX 1725Z	56	—	—	—	—
	—	—	—	—	NBX 1725	61	NBX 1725Z	63
20	NAX 2030	85.5	NAX 2030Z	89	—	—	—	—
	—	—	—	—	NBX 2030	94	NBX 2030Z	97.5
25	NAX 2530	131	NAX 2530Z	135	—	—	—	—
	—	—	—	—	NBX 2530	143	NBX 2530Z	147
30	NAX 3030	145	NAX 3030Z	151	—	—	—	—
	—	—	—	—	NBX 3030	160	NBX 3030Z	166
35	NAX 3530	169	NAX 3530Z	176	—	—	—	—
	—	—	—	—	NBX 3530	186	NBX 3530Z	193
40	NAX 4032	219	NAX 4032Z	227	—	—	—	—
	—	—	—	—	NBX 4032	240	NBX 4032Z	248
45	NAX 4532	264	NAX 4532Z	273	—	—	—	—
	—	—	—	—	NBX 4532	293	NBX 4532Z	302
50	NAX 5035	287	NAX 5035Z	297	—	—	—	—
	—	—	—	—	NBX 5035	315	NBX 5035Z	325
60	NAX 6040	417	NAX 6040Z	454	—	—	—	—
	—	—	—	—	NBX 6040	501	NBX 6040Z	538
70	NAX 7040	555	NAX 7040Z	606	—	—		—

Boundary dimensions mm F_w	D	D_1	D_2	L	H	l_1	$r_{s\,min}$(1)	d_i	Standard mounting dimension d_a Min. mm	Basic dynamic load rating C Radial N	Axial N	Basic static load rating C_0 Radial N	Axial N	Allowable rotational speed(2) rpm
10	19	24	25	23	9	6.5	0.3	10	18	8 230	10 000	9 190	11 100	9 500
12	21	26	27	23	9	6.5	0.3	12	20	9 250	9 670	11 200	11 100	9 000
15	24	28	29	23	9	6.5	0.3	15	23	12 300	9 930	14 900	12 200	8 500
15	24	28	29	23	9	6.5	0.3	15	26	12 300	10 200	14 900	23 900	14 000
17	26	30	31	25	9	8	0.3	17	25	12 900	10 800	16 300	14 500	8 500
17	26	30	31	25	9	8	0.3	17	28	12 900	11 400	16 300	28 600	13 000
20	30	35	36	30	10	10.5	0.3	20	29	17 600	14 200	25 400	19 700	7 500
20	30	35	36	30	10	10.5	0.3	20	33	17 600	19 000	25 400	48 700	11 000
25	37	42	43	30	11	9.5	0.6	25	35	20 000	19 600	32 100	29 700	7 000
25	37	42	43	30	11	9.5	0.6	25	40	20 000	22 700	32 100	60 700	9 000
30	42	47	48	30	11	9.5	0.6	30	40	25 100	20 400	40 100	33 600	6 500
30	42	47	48	30	11	9.5	0.6	30	45	25 100	27 400	40 100	81 000	8 000
35	47	52	53	30	12	9	0.6	35	45	26 900	21 200	46 200	37 600	6 000
35	47	52	53	30	12	9	0.6	35	50	26 900	29 100	46 200	91 100	7 000
40	52	60	61	32	13	10	0.6	40	52	29 400	26 900	54 100	50 000	5 500
40	52	60	61	32	13	10	0.6	40	57	29 400	41 700	54 100	133 000	6 000
45	58	65	66.5	32	14	9	0.6	45	57	31 000	27 900	60 200	55 100	5 000
45	58	65	66.5	32	14	9	0.6	45	62	31 000	40 800	60 200	133 000	5 500
50	62	70	71.5	35	14	10	0.6	50	62	42 200	28 800	83 400	60 100	4 500
50	62	70	71.5	35	14	10	0.6	50	67	42 200	43 300	83 400	148 000	5 000
60	72	85	86.5	40	17	12	1	60	75	47 500	41 400	103 000	89 700	4 000
60	72	85	86.5	40	17	12	1	60	82	47 500	64 600	103 000	224 000	4 000
70	85	95	96.5	40	18	11	1	70	85	55 500	43 100	120 000	101 000	3 500

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 70% of this value is allowable in the NAX series, and a maximum of 25% of this value is allowable in the NBX series.

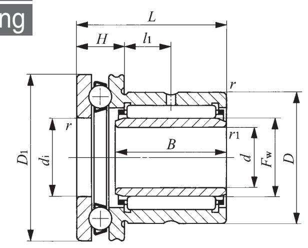
Remarks1. The outer ring has an oil groove and an oil hole.
2. Grease is not prepacked. Perform proper lubrication.

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

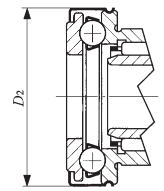
COMBINED TYPE NEEDLE ROLLER BEARINGS

IKO

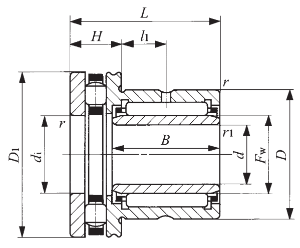
Needle Roller Bearings with Thrust Ball Bearing — With Inner Ring
Needle Roller Bearings with Thrust Roller Bearing — With Inner Ring



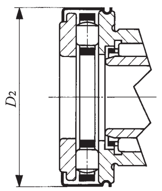
NAXI



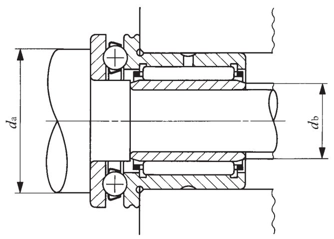
NAXI···Z



NBXI



NBXI···Z



Shaft dia. 7 — 60mm

Shaft dia. mm	Identification number	Mass (Ref.) g	With dust cover	Mass (Ref.) g		Mass (Ref.) g	With dust cover	Mass (Ref.) g	d	D	D_1	D_2	L	B	H	l_1	$r_{s\,min}$ (1)	$r_{1s\,min}$ (1)	F_w	d_i	d_a Min.	d_b	Basic dynamic load rating C Radial N	Basic dynamic load rating C Axial N	Basic static load rating C_0 Radial N	Basic static load rating C_0 Axial N	Allowable rotational speed(2) rpm	Assembled inner ring
7	NAXI 723	43.5	NAXI 723Z	45	—	—	—	—	7	19	24	25	23	16	9	6.5	0.3	0.2	10	10	18	9	8 230	10 000	9 190	11 100	9 500	LRT 71016
9	NAXI 923	49.5	NAXI 923Z	51.5	—	—	—	—	9	21	26	27	23	16	9	6.5	0.3	0.3	12	12	20	11	9 250	9 670	11 200	11 100	9 000	LRT 91216
12	NAXI 1223	55.5	NAXI 1223Z	56.5	—	—	—	—	12	24	28	29	23	16.5	9	6.5	0.3	0.3	15	15	23	14	12 300	9 930	14 900	12 200	8 500	LRT 121516
	—	—	—	—	NBXI 1223	62	NBXI 1223Z	63	12	24	28	29	23	16.5	9	6.5	0.3	0.3	15	15	26	14	12 300	10 200	14 900	23 900	14 000	LRT 121516
14	NAXI 1425	63.5	NAXI 1425Z	65.5	—	—	—	—	14	26	30	31	25	17	9	8	0.3	0.3	17	17	25	16	12 900	10 800	16 300	14 500	8 500	LRT 141717
	—	—	—	—	NBXI 1425	70.5	NBXI 1425Z	72.5	14	26	30	31	25	17	9	8	0.3	0.3	17	17	28	16	12 900	11 400	16 300	28 600	13 000	LRT 141717
17	NAXI 1730	99	NAXI 1730Z	103	—	—	—	—	17	30	35	36	30	20.5	10	10.5	0.3	0.3	20	20	29	19	17 600	14 200	25 400	19 700	7 500	LRT 172020
	—	—	—	—	NBXI 1730	108	NBXI 1730Z	111	17	30	35	36	30	20.5	10	10.5	0.3	0.3	20	20	33	19	17 600	19 000	25 400	48 700	11 000	LRT 172020
20	NAXI 2030	159	NAXI 2030Z	163	—	—	—	—	20	37	42	43	30	20.5	11	9.5	0.6	0.3	25	25	35	24	20 000	19 600	32 100	29 700	7 000	LRT 202520
	—	—	—	—	NBXI 2030	171	NBXI 2030Z	175	20	37	42	43	30	20.5	11	9.5	0.6	0.3	25	25	40	24	20 000	22 700	32 100	60 700	9 000	LRT 202520
25	NAXI 2530	179	NAXI 2530Z	185	—	—	—	—	25	42	47	48	30	20.5	11	9.5	0.6	0.3	30	30	40	29	25 100	20 400	40 100	33 600	6 500	LRT 253020
	—	—	—	—	NBXI 2530	194	NBXI 2530Z	200	25	42	47	48	30	20.5	11	9.5	0.6	0.3	30	30	45	29	25 100	27 400	40 100	81 000	8 000	LRT 253020
30	NAXI 3030	208	NAXI 3030Z	215	—	—	—	—	30	47	52	53	30	20	12	9	0.6	0.3	35	35	45	34	26 900	21 200	46 200	37 600	6 000	LRT 303520
	—	—	—	—	NBXI 3030	225	NBXI 3030Z	232	30	47	52	53	30	20	12	9	0.6	0.3	35	35	50	34	26 900	29 100	46 200	91 100	7 000	LRT 303520
35	NAXI 3532	265	NAXI 3532Z	273	—	—	—	—	35	52	60	61	32	20	13	10	0.6	0.3	40	40	52	39	29 400	26 900	54 100	50 000	5 500	LRT 354020
	—	—	—	—	NBXI 3532	286	NBXI 3532Z	294	35	52	60	61	32	20	13	10	0.6	0.3	40	40	57	39	29 400	41 700	54 100	133 000	6 000	LRT 354020
40	NAXI 4032	315	NAXI 4032Z	324	—	—	—	—	40	58	65	66.5	32	20	14	9	0.6	0.3	45	45	57	44	31 000	27 900	60 200	55 100	5 000	LRT 404520
	—	—	—	—	NBXI 4032	344	NBXI 4032Z	353	40	58	65	66.5	32	20	14	9	0.6	0.3	45	45	62	44	31 000	40 800	60 200	133 000	5 500	LRT 404520
45	NAXI 4535	358	NAXI 4535Z	368	—	—	—	—	45	62	70	71.5	35	25	14	10	0.6	0.3	50	50	62	49	42 200	28 800	83 400	60 100	4 500	LRT 455025
	—	—	—	—	NBXI 4535	386	NBXI 4535Z	396	45	62	70	71.5	35	25	14	10	0.6	0.3	50	50	67	49	42 200	43 300	83 400	148 000	5 000	LRT 455025
50	NAXI 5040	582	NAXI 5040Z	619	—	—	—	—	50	72	85	86.5	40	25.5	17	12	1	1	60	60	75	59	47 500	41 400	103 000	89 700	4 000	LRT 506025
	—	—	—	—	NBXI 5040	666	NBXI 5040Z	703	50	72	85	86.5	40	25.5	17	12	1	1	60	60	82	59	47 500	64 600	103 000	224 000	4 000	LRT 506025
60	NAXI 6040	750	NAXI 6040Z	801	—	—	—	—	60	85	95	96.5	40	25.5	18	11	1	1	70	70	85	68	55 500	43 100	120 000	101 000	3 500	LRT 607025

Notes(1) Minimum allowable value of chamfer dimension r or r_1
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 70% of this value is allowable in the NAXI series, and a maximum of 25% of this value is allowable in the NBXI series.

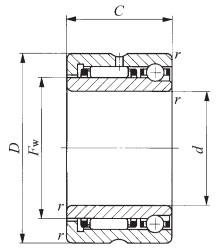
Remarks1. The outer ring has an oil groove and an oil hole.
2. Grease is not prepacked. Perform proper lubrication.

G
NAX
NBX
NATA
NATB

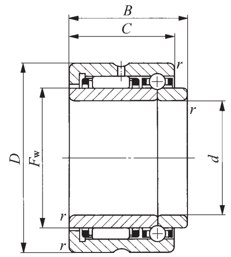
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

COMBINED TYPE NEEDLE ROLLER BEARINGS

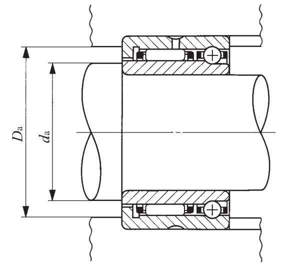
Needle Roller Bearings with Angular Contact Ball Bearing
Needle Roller Bearings with Three-point Contact Ball Bearing

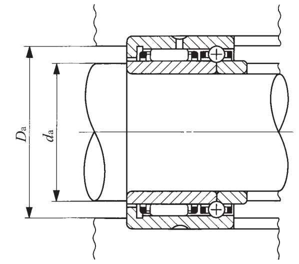


NATA59



NATB59





Shaft dia. 15 ─ 70mm

Shaft dia. mm	Identification number: Angular contact type	Mass (Ref.) g	Three-point contact type	Mass (Ref.) g	Boundary dimensions mm: d	D	C	B	$r_{s\,min}$(1)	F_w
15	**NATA 5902**	50.5	**NATB 5902**	53	15	28	18	20	0.3	20
17	**NATA 5903**	55.5	**NATB 5903**	58.5	17	30	18	20	0.3	22
20	**NATA 5904**	111	**NATB 5904**	115	20	37	23	25	0.3	25
25	**NATA 5905**	131	**NATB 5905**	136	25	42	23	25	0.3	30
30	**NATA 5906**	151	**NATB 5906**	157	30	47	23	25	0.3	35
35	**NATA 5907**	250	**NATB 5907**	260	35	55	27	30	0.6	42
40	**NATA 5908**	355	**NATB 5908**	375	40	62	30	34	0.6	48
45	**NATA 5909**	410	**NATB 5909**	435	45	68	30	34	0.6	55
50	**NATA 5910**	420	**NATB 5910**	445	50	72	30	34	0.6	58
55	**NATA 5911**	585	**NATB 5911**	615	55	80	34	38	1	63
60	**NATA 5912**	625	**NATB 5912**	660	60	85	34	38	1	68
65	**NATA 5913**	665	**NATB 5913**	710	65	90	34	38	1	75
70	**NATA 5914**	1 070	**NATB 5914**	1 130	70	100	40	45	1	80

Shaft dia. mm	Standard mounting dimensions mm: d_a Min.	D_a Max.	Basic dynamic load rating C: Radial N	Axial N	Basic static load rating C_0: Radial N	Axial N	Allowable rotational speed(2) rpm
15	17	26	7 710	1 900	10 200	2 920	20 000
17	19	28	8 220	2 050	11 500	3 340	18 000
20	22	35	14 300	3 810	18 400	6 110	16 000
25	27	40	15 800	4 300	22 100	7 520	13 000
30	32	45	17 700	4 550	26 800	8 460	11 000
35	39	51	24 000	4 890	42 100	9 870	9 500
40	44	58	30 600	5 350	60 400	11 800	8 500
45	49	64	32 600	5 450	68 500	12 700	7 000
50	54	68	33 600	5 660	72 500	13 600	7 000
55	60	75	39 500	10 400	74 400	24 700	6 500
60	65	80	41 800	10 700	82 200	26 700	6 000
65	70	85	43 800	11 000	90 200	28 700	5 500
70	75	95	56 400	13 500	127 000	35 000	5 000

Notes(1) Minimum allowable value of chamfer dimension r
(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. Grease is not prepacked. Perform proper lubrication.

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

INNER RINGS

●Inner Rings for Shell Type Needle Roller Bearings

●Inner Rings for General Usage

Structure and Features

IKO Inner Rings are heat-treated and finished by grinding to a high degree of accuracy. In the case of needle roller bearings, normally, the shafts are heat-treated and finished by grinding, and used as the raceway surfaces. However, when it is impossible to make shaft surfaces according to the specified surface hardness or surface roughness, inner rings are used.

Inner rings include those for Shell Type Needle Roller Bearings and those for general use and are available in a variety of dimensions. When shafts move axially or seals are used adjacent to bearings, wide inner rings can be selected.

Inner rings can also be used economically as bushings without requiring any additional machining.

Types

For Inner Rings, the types shown in Table 1 are available.

Table 1.1 Inner Rings for Shell Type Needle Roller Bearings

Series		Model codes of assembled bearings
Metric series	IRT	TA…Z, TLA…Z TAM, TLAM, YT, YTL
Inch series	IRB	BA…Z, BHA…Z BAM, BHAM, YB, YBH

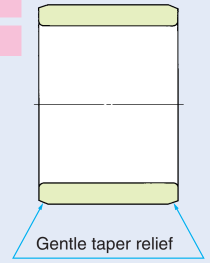
Remark For Inner Rings for Shell Type Needle Roller Bearings with Seal, please consult IKO.

Table 1.2 Inner Rings for General Usage

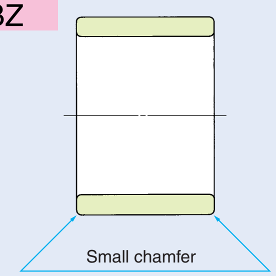
Series		Model codes of assembled bearings
Metric series	LRT	RNA 49, RNA 69 RNA 48, TAF, TR RNAF, NAX, NBX
	LRTZ	RNA 49…UU, RNA 69…UU GTR
Inch series	LRB	BR
	LRBZ…B	BR…UU
	LRBZ	GBR, GBR…UU

Shapes of Inner Rings

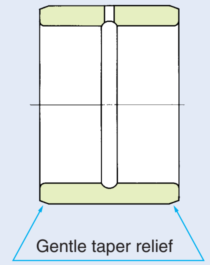
IRT
IRB
LRT



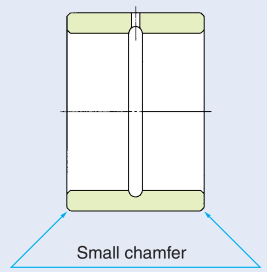
LRTZ
LRBZ



LRB



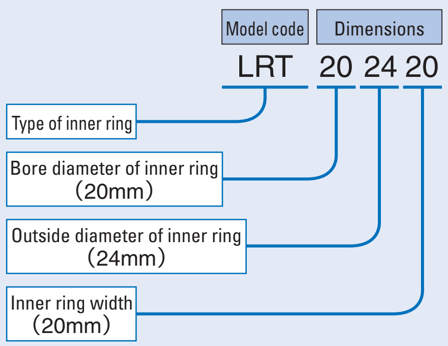
LRBZ…B



Identification number

The identification number of Inner Rings consists of a model code and dimensions. An example is shown below.

Example of identification number



Accuracy

Dimensional accuracy of Inner Rings is based on Table 2.
Inner Rings for Shell Type Needle Roller Bearings are manufactured so that exact radial internal clearances can be obtained when assembled with Shell Type Needle Roller Bearings. Inner Rings for General Usage produce CN clearance when used in the assembled bearings shown in Table 1.2. LRB and LRBZ…B models produce the radial internal clearances shown in Table 4 on page D5.
When clearances other than CN clearance or accuracy other than Class 0 are required, please consult IKO.

Table 2 Tolerances for inner ring

Model code	Tolerance
IRT LRT、LRTZ LRBZ	JIS Class 0 (See the table 12, page A31)
IRB	Based on Table 3
LRB LRBZ…B	Based on Table 4

Remark Tolerances of outside diameter of inner ring are based on Table 5.

Table 3 Tolerances of IRB

d Nominal inside diameter of inner ring mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial runout of assembled bearing inner ring
Over	Incl.	High	Low	High	Low	Max.
2.5	10	0	−13	0	−250	10
10	18	0	−13	0	−250	10
18	30	0	−13	0	−250	13
30	50	0	−13	0	−250	15
50	80	0	−13	0	−250	20

Table 4 Tolerances of LRB,LRBZ…B

d Nominal inside diameter of inner ring mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial runout of assembled bearing inner ring
Over	Incl.	High	Low	High	Low	Max.
−	19.050	0	−10	0	−130	10
19.050	30.162	0	−13	0	−130	13
30.162	50.800	0	−13	0	−130	15
50.800	82.550	0	−15	0	−130	20
82.550	120.650	0	−20	0	−130	25

Table 5 Tolerances of outside diameter of inner ring unit: μm

Model code	Tolerance
IRT	g5
IRB	0～−13
LRT, LRTZ, LRBZ	Based on Table 6
LRB, LRBZ…B	Based on Table 7

Table 7 Tolerances of outside diameters of LRB and LRBZ…B unit: μm

Nominal outside diameter of inner ring mm		Tolerance	
Over	Incl.	High	Low
−	18.034	−13	−23
18.034	25.908	−18	−30
25.908	30.226	−23	−36
30.226	35.052	−23	−38
35.052	50.038	−25	−41
50.038	80.010	−28	−46
80.010	100.076	−32	−56
100.076	102.108	−37	−66

Fit

The recommended fits between Inner Rings and shafts are shown in Table 22 on page A42.

Oil Hole

The number of oil holes is shown in Table 8.
When Inner Rings with an oil hole are especially required for a model without an oil hole, attach an "OH" to the end of the identification number when ordering.
Example: LRT 202420 OH
For Inner Rings with multiple oil holes, please consult IKO.

Table 8 Number of oil holes

Bearing type			Bore diameter of inner ring d mm	Number of oil holes
For Shell Type Needle Roller Bearings	Metric series	IRT		0
	Inch series	IRB		0
For General Usage	Metric series	LRT		0
		LRTZ		0
	Inch series	LRB	d≦76.200	1
			76.200＜d	2
		LRBZ…B		1
		LRBZ		0

Remark Inner rings with an oil hole are provided with an oil groove.

Table 6 Tolerances of outside diameters for LRT, LRTZ and LRBZ (When the clearance is CN clearance) unit: μm

d Bore diameter of inner ring mm		F Outside diameter of inner ring mm 3＜F≦6		6＜F≦10		10＜F≦18		18＜F≦30		30＜F≦50		50＜F≦80		80＜F≦120		120＜F≦180		180＜F≦250		250＜F≦315		315＜F≦400		400＜F≦500		d Bore diameter of inner ring mm	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
−	24	−10	−27	−7	−23	−4	−18	0	−12																	−	24
24	30							0	−12	+5	−4															24	30
30	40									0	−9															30	40
40	50									−5	−19	0	−11													40	50
50	65											−10	−21													50	65
65	80											−10	−26	−4	−17											65	80
80	100													−14	−27											80	100
100	120													−14	−32	−7	−22									100	120
120	140															−17	−37									120	140
140	160															−27	−52									140	160
160	180																	−25	−46							160	180
180	200																	−40	−66							180	200
200	225																	−55	−86							200	225
225	250																			−54	−87					225	250
250	280																			−69	−107					250	280
280	315																					−68	−107			280	315
315	355																					−83	−127			315	355
355	400																					−128	−182	−122	−172	355	400
400	450																							−142	−202	400	450
450	500																							−152	−222	450	500

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

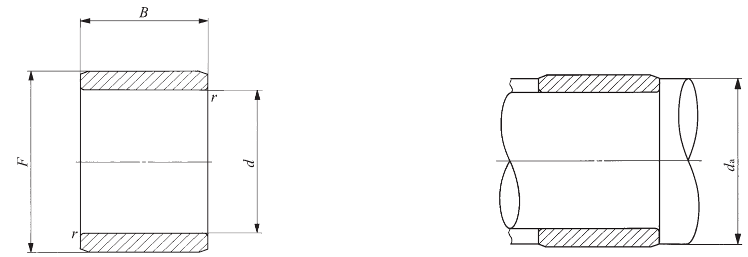
INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings

Shaft dia. 7 — 17mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings TA…Z (TAM)	TLA…Z (TLAM)	YT YTL
7	IRT 710	3.2	7	10	10.5	0.3	9	9.7	TA 1010Z	TLA 1010Z	—
	IRT 712	3.9	7	10	12.5	0.3	9	9.7	TA 1012Z	TLA 1012Z	—
	IRT 715	4.8	7	10	15.5	0.3	9	9.7	TA 1015Z	TLA 1015Z	—
8	IRT 810	5.1	8	12	10.5	0.3	10	11	—	TLA 1210Z	YTL 1210
	IRT 812	6	8	12	12.5	0.3	10	11	TA 1212Z	TLA 1212Z	YT 1212
	IRT 815	7.5	8	12	15.5	0.3	10	11	TA 1215Z	—	—
10	IRT 1012	5.2	10	13	12.5	0.3	12	12.7	—	TLA 1312Z	—
	IRT 1012-2	7.2	10	14	12.5	0.3	12	13	—	TLA 1412Z	—
	IRT 1016-2	9.6	10	14	16.5	0.3	12	13	TA 1416Z	TLA 1416Z	—
	IRT 1020-2	11.9	10	14	20.5	0.3	12	13	TA 1420Z	—	—
	IRT 1010-1	7.9	10	15	10.5	0.3	12	14	TA 1510Z	—	—
	IRT 1012-1	9.4	10	15	12.5	0.3	12	14	TA 1512Z	TLA 1512Z	—
	IRT 1015-1	11.7	10	15	15.5	0.3	12	14	TA 1515Z	—	—
	IRT 1020-1	15.5	10	15	20.5	0.3	12	14	TA 1520Z	—	—
	IRT 1025-1	19.3	10	15	25.5	0.3	12	14	TA 1525Z	—	—
12	IRT 1212	6.1	12	15	12.5	0.3	14	14.5	TA 1512Z	TLA 1512Z	—
	IRT 1216	8.1	12	15	16.5	0.3	14	14.5	—	TLA 1516Z	—
	IRT 1222	11	12	15	22.5	0.3	14	14.5	—	TLA 1522Z	—
	IRT 1212-1	8.5	12	16	12.5	0.3	14	15	—	TLA 1612Z	—
	IRT 1216-1	11.2	12	16	16.5	0.3	14	15	TA 1616Z	TLA 1616Z	—
	IRT 1220-1	13.9	12	16	20.5	0.3	14	15	TA 1620Z	—	—
	IRT 1222-1	15.2	12	16	22.5	0.3	14	15	—	TLA 1622Z	—
	IRT 1215-2	13.6	12	17	15.5	0.3	14	16	TA 1715Z	—	YT 1715
	IRT 1220-2	18	12	17	20.5	0.3	14	16	TA 1720Z	—	—
	IRT 1225-2	22.5	12	17	25.5	0.3	14	16	TA 1725Z	—	YT 1725
15	IRT 1512	7.5	15	18	12.5	0.3	17	17.5	—	TLA 1812Z	—
	IRT 1513	8.1	15	18	13.5	0.3	17	17.5	TA 1813Z	—	—

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.



IRT

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings TA…Z (TAM)	TLA…Z (TLAM)	YT YTL
15	IRT 1515	9.3	15	18	15.5	0.3	17	17.5	TA 1815Z	—	—
	IRT 1516	9.9	15	18	16.5	0.3	17	17.5	—	TLA 1816Z	—
	IRT 1517	10.5	15	18	17.5	0.3	17	17.5	TA 1817Z	—	—
	IRT 1519	11.7	15	18	19.5	0.3	17	17.5	TA 1819Z	—	—
	IRT 1520	12.3	15	18	20.5	0.3	17	17.5	TA 1820Z	—	—
	IRT 1525	15.2	15	18	25.5	0.3	17	17.5	TA 1825Z	—	—
	IRT 1516-1	13.6	15	19	16.5	0.3	17	18	TA 1916Z	—	—
	IRT 1520-1	16.8	15	19	20.5	0.3	17	18	TA 1920Z	—	—
	IRT 1515-2	16.4	15	20	15.5	0.3	17	19	TA 2015Z	—	YT 2015
	IRT 1520-2	21.5	15	20	20.5	0.3	17	19	TA 2020Z TA 202820Z	TLA 2020Z	YT 202820
	IRT 1525-2	27	15	20	25.5	0.3	17	19	TA 2025Z	—	YT 2025
	IRT 1530-2	32	15	20	30.5	0.3	17	19	TA 2030Z	TLA 2030Z	—
17	IRT 1716	11.1	17	20	16.5	0.3	19	19.5	—	TLA 2016Z	—
	IRT 1720	13.7	17	20	20.5	0.3	19	19.5	TA 2020Z TA 202820Z	TLA 2020Z	YT 202820
	IRT 1730	20.5	17	20	30.5	0.3	19	19.5	TA 2030Z	TLA 2030Z	—
	IRT 1716-1	15.1	17	21	16.5	0.3	19	20	TA 2116Z	—	YT 2116
	IRT 1720-1	18.8	17	21	20.5	0.3	19	20	TA 2120Z	—	YT 2120
	IRT 1710-2	12.4	17	22	10.5	0.3	19	21	TA 2210Z	—	—
	IRT 1715-2	18.3	17	22	15.5	0.3	19	21	TA 2215Z	—	—
	IRT 1716-2	19.4	17	22	16.5	0.3	19	21	TA 223016Z	TLA 2216Z	YT 223016
	IRT 1720-2	24	17	22	20.5	0.3	19	21	TA 2220Z TA 223020Z	TLA 2220Z	YT 223020
	IRT 1725-2	30	17	22	25.5	0.3	19	21	TA 2225Z	—	—
	IRT 1730-2	36	17	22	30.5	0.3	19	21	TA 2230Z	—	—

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

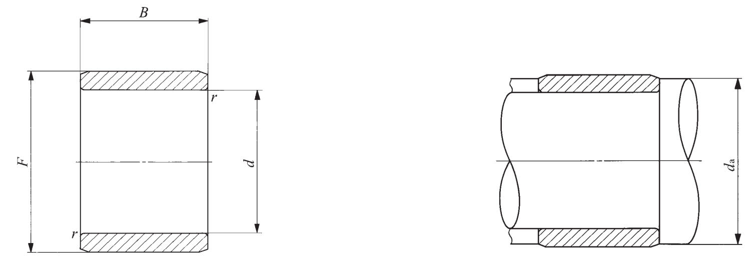
INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings

Shaft dia. 20 — 45mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings TA…Z (TAM)	TLA…Z (TLAM)	YT YTL
20	IRT 2016	17.5	20	24	16.5	0.3	22	23	TA 243216Z	—	YT 243216
	IRT 2020	22	20	24	20.5	0.3	22	23	TA 2420Z TA 243220Z	—	YT 243220
	IRT 2028	30.5	20	24	28.5	0.3	22	23	TA 2428Z	—	YT 2428
	IRT 2010-1	14.3	20	25	10.5	0.3	22	24	TA 2510Z	—	YT 2510
	IRT 2015-1	21	20	25	15.5	0.3	22	24	TA 2515Z	—	YT 2515
	IRT 2020-1	28	20	25	20.5	0.3	22	24	TA 2520Z	TLA 2520Z	YT 2520
	IRT 2025-1	34.5	20	25	25.5	0.3	22	24	TA 2525Z	—	YT 2525
	IRT 2026-1	36	20	25	26.5	0.3	22	24	—	TLA 2526Z	YTL 2526
	IRT 2030-1	41.5	20	25	30.5	0.3	22	24	TA 2530Z	—	—
	IRT 2038-1	52.5	20	25	38.5	0.3	22	24	—	TLAW 2538Z	—
22	IRT 2216	19.1	22	26	16.5	0.3	24	25	TA 2616Z	—	YT 2616
	IRT 2220	24	22	26	20.5	0.3	24	25	TA 2620Z	—	YT 2620
	IRT 2220-1	37	22	28	20.5	0.3	24	27	TA 2820Z	TLA 2820Z	YT 2820
	IRT 2230-1	55.5	22	28	30.5	0.3	24	27	TA 2830Z	—	—
25	IRT 2520	26.5	25	29	20.5	0.3	27	28	TA 2920Z	—	YT 2920
	IRT 2530	40	25	29	30.5	0.3	27	28	TA 2930Z	—	—
	IRT 2515-1	25.5	25	30	15.5	0.3	27	29	TA 3015Z	—	—
	IRT 2520-1	34	25	30	20.5	0.3	27	29	TA 3020Z	TLA 3020Z	—
	IRT 2525-1	42.5	25	30	25.5	0.3	27	29	TA 3025Z	—	—
	IRT 2526-1	44	25	30	26.5	0.3	27	29	—	TLA 3026Z	—
	IRT 2530-1	50.5	25	30	30.5	0.3	27	29	TA 3030Z	—	—
	IRT 2538-1	64	25	30	38.5	0.3	27	29	—	TLAW 3038Z	—
28	IRT 2820	29.5	28	32	20.5	0.3	30	31	TA 3220Z	—	YT 3220
	IRT 2830	44	28	32	30.5	0.3	30	31	TA 3230Z	—	—
30	IRT 3012	24.5	30	35	12.5	0.6	34	34.5	TA 3512Z	TLA 3512Z	—
	IRT 3015	30.5	30	35	15.5	0.6	34	34.5	TA 3515Z	—	—

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.



IRT

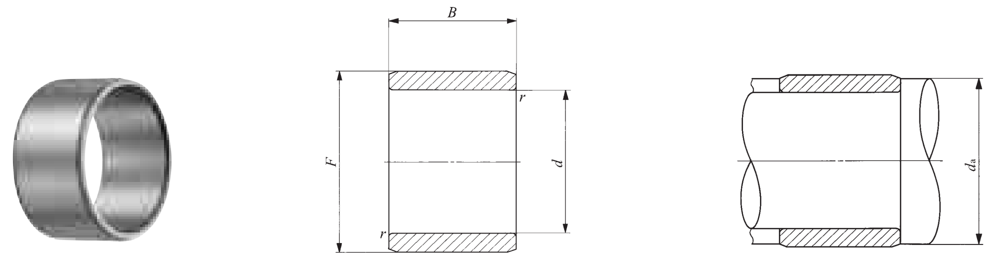
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings TA…Z (TAM)	TLA…Z (TLAM)	YT YTL
30	IRT 3020	40	30	35	20.5	0.6	34	34.5	TA 3520Z	TLA 3520Z	—
	IRT 3025	50	30	35	25.5	0.6	34	34.5	TA 3525Z	—	—
	IRT 3030	60	30	35	30.5	0.6	34	34.5	TA 3530Z	—	—
32	IRT 3220	42.5	32	37	20.5	0.6	36	36.5	TA 3720Z	—	YT 3720
	IRT 3230	63.5	32	37	30.5	0.6	36	36.5	TA 3730Z	—	—
	IRT 3215-1	39.5	32	38	15.5	0.6	36	37	TA 3815Z	—	—
	IRT 3220-1	52	32	38	20.5	0.6	36	37	TA 3820Z	—	—
	IRT 3225-1	64.5	32	38	25.5	0.6	36	37	TA 3825Z	—	—
	IRT 3230-1	77.5	32	38	30.5	0.6	36	37	TA 3830Z	—	—
	IRT 3245-1	115	32	38	45.5	0.6	36	37	TAW 3845Z	—	—
35	IRT 3515	35	35	40	15.5	0.6	39	39.5	TA 4015Z	—	YT 4015
	IRT 3520	46.5	35	40	20.5	0.6	39	39.5	TA 4020Z	TLA 4020Z	—
	IRT 3525	58	35	40	25.5	0.6	39	39.5	TA 4025Z	—	YT 4025
	IRT 3530	69	35	40	30.5	0.6	39	39.5	TA 4030Z	—	—
	IRT 3540	91.5	35	40	40.5	0.6	39	39.5	TA 4040Z	—	—
40	IRT 4020	52.5	40	45	20.5	0.6	44	45.5	TA 4520Z	TLA 4520Z	YT 4520
	IRT 4025	65.5	40	45	25.5	0.6	44	45.5	TA 4525Z	—	YT 4525
	IRT 4030	78.5	40	45	30.5	0.6	44	45.5	TA 4530Z	—	—
	IRT 4040	104	40	45	40.5	0.6	44	45.5	TA 4540Z	—	—
45	IRT 4512	36	45	50	12.5	0.6	49	49.5	TA 5012Z	—	—
	IRT 4515	44.5	45	50	15.5	0.6	49	49.5	TA 5015Z	—	—
	IRT 4520	59	45	50	20.5	0.6	49	49.5	TA 5020Z	TLA 5020Z	—
	IRT 4525	73	45	50	25.5	0.6	49	49.5	TA 5025Z	TLA 5025Z	—
	IRT 4530	87.5	45	50	30.5	0.6	49	49.5	TA 5030Z	—	—
	IRT 4540	116	45	50	40.5	0.6	49	49.5	TA 5040Z	—	—
	IRT 4545	131	45	50	45.5	0.6	49	49.5	TAW 5045Z	—	—

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings



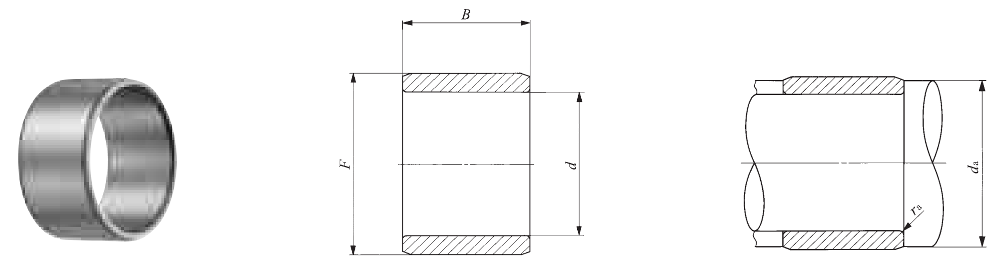
IRT

Shaft dia. 50 — 60mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings TA···Z (TAM)	TLA···Z (TLAM)	YT YTL
50	**IRT 5020-1**	65	50	55	20.5	0.6	54	54.5	**TA 5520Z**	**TLA 5520Z**	—
	IRT 5025-1	81	50	55	25.5	0.6	54	54.5	**TA 5525Z**	**TLA 5525Z**	—
	IRT 5030-1	96.5	50	55	30.5	0.6	54	54.5	**TA 5530Z**	—	—
	IRT 5040-1	128	50	55	40.5	0.6	54	54.5	**TA 5540Z**	—	—
	IRT 5045-1	144	50	55	45.5	0.6	54	54.5	**TAW 5545Z**	—	—
	IRT 5050-1	160	50	55	50.5	0.6	54	54.5	**TAW 5550Z**	—	—
	IRT 5025	169	50	60	25.5	1.5	58	59	**TA 6025Z**	—	—
	IRT 5030	205	50	60	30.5	1.5	58	59	**TA 6030Z**	—	—
	IRT 5040	270	50	60	40.5	1.5	58	59	**TA 6040Z**	—	—
	IRT 5045	300	50	60	45.5	1.5	58	59	**TAW 6045Z**	—	—
	IRT 5050	335	50	60	50.5	1.5	58	59	**TAW 6050Z**	—	—
52	**IRT 5212**	86	52	62	12.5	1.5	60	60.5	**TA 6212Z**	—	—
55	**IRT 5525**	185	55	65	25.5	1.5	63	63.5	**TA 6525Z**	—	—
	IRT 5530	220	55	65	30.5	1.5	63	63.5	**TA 6530Z**	—	—
	IRT 5545	330	55	65	45.5	1.5	63	63.5	**TAW 6545Z**	—	—
	IRT 5550	365	55	65	50.5	1.5	63	63.5	**TAW 6550Z**	—	—
60	**IRT 6025**	200	60	70	25.5	1.5	68	68.5	**TA 7025Z**	—	—
	IRT 6030	240	60	70	30.5	1.5	68	68.5	**TA 7030Z**	—	—
	IRT 6040	320	60	70	40.5	1.5	68	68.5	**TA 7040Z**	—	—
	IRT 6050	395	60	70	50.5	1.5	68	68.5	**TAW 7050Z**	—	—

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

Inner Rings for Shell Type Needle Roller Bearings Inch Series



IRB

Shaft dia. 7.938 — 15.875mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings BA···Z (BAM)	BHA···Z (BHAM)	YB YBH
7.938 (5/16)	**IRB 58**	8	7.938 (5/16)	12.700 (1/2)	13.08	11.3	11.7	0.3	**BA 88Z**	**BHA 88Z**	**YB 88**
9.525 (3/8)	**IRB 68**	8.9	9.525 (3/8)	14.288 (9/16)	13.08	12.8	13.2	0.3	**BA 98Z**	**BHA 98Z**	**YB 98**
	IRB 68-1	12.6	9.525 (3/8)	15.875 (5/8)	13.08	12.8	14	0.3	**BA 108Z**	**BHA 108Z**	**YB 108** **YBH 108**
	IRB 612	13.2	9.525 (3/8)	14.288 (9/16)	19.43	12.8	13.2	0.3	**BA 912Z**	—	**YB 912**
	IRB 612-1	18.8	9.525 (3/8)	15.875 (5/8)	19.43	12.8	14	0.3	**BA 1012Z**	**BHA 1012Z**	**YB 1012**
11.112 (7/16)	**IRB 78**	10.1	11.112 (7/16)	15.875 (5/8)	13.08	14.4	14.8	0.3	**BA 108Z**	**BHA 108Z**	**YB 108** **YBH 108**
	IRB 712	15	11.112 (7/16)	15.875 (5/8)	19.43	14.4	14.8	0.3	**BA 1012Z**	**BHA 1012Z**	**YB 1012**
	IRB 714	17.4	11.112 (7/16)	15.875 (5/8)	22.60	14.4	14.8	0.3	**BA 1014Z**	—	—
	IRB 716	19.9	11.112 (7/16)	15.875 (5/8)	25.78	14.4	14.8	0.3	**BA 1016Z**	**BHA 1016Z**	—
12.700 (1/2)	**IRB 86**	8.5	12.700 (1/2)	17.462 (11/16)	9.90	16.9	16.9	0.3	**BA 116Z**	—	—
	IRB 88	11.2	12.700 (1/2)	17.462 (11/16)	13.08	16.9	16.9	0.3	**BA 118Z**	**BHA 118Z**	—
	IRB 812	16.7	12.700 (1/2)	17.462 (11/16)	19.43	16.9	16.9	0.3	**BA 1112Z**	**BHA 1112Z**	**YB 1112**
	IRB 88-1	15.8	12.700 (1/2)	19.050 (3/4)	13.08	16.9	17.5	0.6	**BA 128Z**	—	**YB 128**
	IRB 810-1	19.6	12.700 (1/2)	19.050 (3/4)	16.25	16.9	17.5	0.6	**BA 1210Z**	—	**YB 1210**
	IRB 812-1	23.5	12.700 (1/2)	19.050 (3/4)	19.43	16.9	17.5	0.6	**BA 1212Z**	**BHA 1212Z**	**YB 1212**
	IRB 814-1	27.5	12.700 (1/2)	19.050 (3/4)	22.60	16.9	17.5	0.6	**BA 1214Z**	—	—
	IRB 816-1	31	12.700 (1/2)	19.050 (3/4)	25.78	16.9	17.5	0.6	**BA 1216Z**	—	—
14.288 (9/16)	**IRB 98**	17.3	14.288 (9/16)	20.638 (13/16)	13.08	19	19.6	0.6	**BA 138Z**	**BHA 138Z**	**YB 138**
	IRB 910	21.5	14.288 (9/16)	20.638 (13/16)	16.25	19	19.6	0.6	**BA 1310Z**	**BHA 1310Z**	**YBH 1310**
	IRB 912	26	14.288 (9/16)	20.638 (13/16)	19.43	19	19.6	0.6	**BA 1312Z**	**BHA 1312Z**	**YBH 1312**
	IRB 914	30	14.288 (9/16)	20.638 (13/16)	22.60	19	19.6	0.6	**BA 1314Z**	—	—
	IRB 916	34.5	14.288 (9/16)	20.638 (13/16)	25.78	19	19.6	0.6	**BA 1316Z**	—	—
	IRB 920	43	14.288 (9/16)	20.638 (13/16)	32.13	19	19.6	0.6	**BA 1320Z**	—	—
15.875 (5/8)	**IRB 106**	14.5	15.875 (5/8)	22.225 (7/8)	9.90	20.7	21.2	0.6	**BA 146Z**	—	—
	IRB 108	18.9	15.875 (5/8)	22.225 (7/8)	13.08	20.7	21.2	0.6	**BA 148Z**	—	**YB 148**
	IRB 1012	28	15.875 (5/8)	22.225 (7/8)	19.43	20.7	21.2	0.6	**BA 1412Z**	**BHA 1412Z**	**YB 1412**

Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.

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

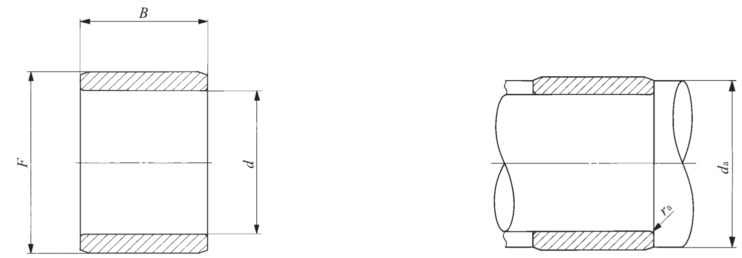
INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings Inch Series

Shaft dia. 15.875 – 63.500mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings BA…Z (BAM)	BHA…Z (BHAM)	YB YBH
15.875 (5/8)	IRB 1014	33	15.875 (5/8)	22.225 (7/8)	22.60	20.7	21.2	0.6	BA 1414Z	—	—
	IRB 1016	37.5	15.875 (5/8)	22.225 (7/8)	25.78	20.7	21.2	0.6	BA 1416Z	BHA 1416Z	YB 1416
	IRB 1022	51.5	15.875 (5/8)	22.225 (7/8)	35.30	20.7	21.2	0.6	BA 1422Z	—	—
17.462 (11/16)	IRB 1110	25.5	17.462 (11/16)	23.812 (15/16)	16.25	22.3	22.8	0.6	BA 1510Z	—	—
	IRB 1116	40.5	17.462 (11/16)	23.812 (15/16)	25.78	22.3	22.8	0.6	BA 1516Z	—	—
19.050 (3/4)	IRB 128	22	19.050 (3/4)	25.400 (1)	13.08	23.9	24.4	0.6	BA 168Z	BHA 168Z	YB 168 YBH 168
	IRB 1212	33	19.050 (3/4)	25.400 (1)	19.43	23.9	24.4	0.6	BA 1612Z	BHA 1612Z	YB 1612 YBH 1612
	IRB 1214	38.5	19.050 (3/4)	25.400 (1)	22.60	23.9	24.4	0.6	BA 1614Z	BHA 1614Z	—
	IRB 1216	43.5	19.050 (3/4)	25.400 (1)	25.78	23.9	24.4	0.6	BA 1616Z	BHA 1616Z	YB 1616 YBH 1616
	IRB 1220	54.5	19.050 (3/4)	25.400 (1)	32.13	23.9	24.4	0.6	BA 1620Z	BHA 1620Z	—
20.638 (13/16)	IRB 1316	34	20.638 (13/16)	25.400 (1)	25.78	24.9	24.9	0.6	BA 1616Z	BHA 1616Z	YB 1616 YBH 1616
22.225 (7/8)	IRB 148	25	22.225 (7/8)	28.575 (1 1/8)	13.08	27	27.5	0.6	BA 188Z	—	YB 188
	IRB 1412	37.5	22.225 (7/8)	28.575 (1 1/8)	19.43	27	27.5	0.6	BA 1812Z	BHA 1812Z	YB 1812
	IRB 1416	50	22.225 (7/8)	28.575 (1 1/8)	25.78	27	27.5	0.6	BA 1816Z	BHA 1816Z	YB 1816
	IRB 1420	62.5	22.225 (7/8)	28.575 (1 1/8)	32.13	27	27.5	0.6	BA 1820Z	BHA 1820Z	—
25.400 (1)	IRB 168	28.5	25.400 (1)	31.750 (1 1/4)	13.08	30	30.7	0.6	BA 208Z	BHA 208Z	—
	IRB 1610	35.5	25.400 (1)	31.750 (1 1/4)	16.25	30	30.7	0.6	BA 2010Z	—	YB 2010
	IRB 1612	42.5	25.400 (1)	31.750 (1 1/4)	19.43	30	30.7	0.6	BA 2012Z	BHA 2012Z	YB 2012
	IRB 1616	56	25.400 (1)	31.750 (1 1/4)	25.78	30	30.7	0.6	BA 2016Z	BHA 2016Z	YB 2016
	IRB 1620	70	25.400 (1)	31.750 (1 1/4)	32.13	30	30.7	0.6	BA 2020Z	BHA 2020Z	—
	IRB 168-1	36.5	25.400 (1)	33.338 (1 5/16)	13.08	30	32.1	0.6	BA 218Z	—	—
	IRB 1610-1	45.5	25.400 (1)	33.338 (1 5/16)	16.25	30	32.1	0.6	BA 2110Z	—	—
	IRB 1612-1	54.5	25.400 (1)	33.338 (1 5/16)	19.43	30	32.1	0.6	BA 2112Z	—	—

Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.



IRB

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings BA…Z (BAM)	BHA…Z (BHAM)	YB YBH
28.575 (1 1/8)	IRB 188	31.5	28.575 (1 1/8)	34.925 (1 3/8)	13.08	33.2	33.9	0.6	BA 228Z	BHA 228Z	YB 228
	IRB 1812	47	28.575 (1 1/8)	34.925 (1 3/8)	19.43	33.2	33.9	0.6	BA 2212Z	BHA 2212Z	YB 2212
	IRB 1816	62.5	28.575 (1 1/8)	34.925 (1 3/8)	25.78	33.2	33.9	0.6	BA 2216Z	BHA 2216Z	—
	IRB 1820	78	28.575 (1 1/8)	34.925 (1 3/8)	32.13	33.2	33.9	0.6	BA 2220Z	BHA 2220Z	YB 2220
31.750 (1 1/4)	IRB 2010	43	31.750 (1 1/4)	38.100 (1 1/2)	16.25	37	37.1	0.6	BA 2410Z	—	—
	IRB 2014	60	31.750 (1 1/4)	38.100 (1 1/2)	22.60	37	37.1	0.6	BA 2414Z	—	YB 2414
	IRB 2016	68.5	31.750 (1 1/4)	38.100 (1 1/2)	25.78	37	37.1	0.6	BA 2416Z	—	YB 2416
	IRB 2020	85.5	31.750 (1 1/4)	38.100 (1 1/2)	32.13	37	37.1	0.6	BA 2420Z	—	YB 2420
34.925 (1 3/8)	IRB 2210	47	34.925 (1 3/8)	41.275 (1 5/8)	16.25	40.2	40.2	0.6	BA 2610Z	—	YB 2610
	IRB 2220	93.5	34.925 (1 3/8)	41.275 (1 5/8)	32.13	40.2	40.2	0.6	BA 2620Z	—	—
36.512 (1 7/16)	IRB 2316	99	36.512 (1 7/16)	44.450 (1 3/4)	25.78	42.5	43.2	0.6	BA 2816Z	—	—
38.100 (1 1/2)	IRB 2412	62	38.100 (1 1/2)	44.450 (1 3/4)	19.43	43.3	43.4	0.6	BA 2812Z	—	—
	IRB 2416	81	38.100 (1 1/2)	44.450 (1 3/4)	25.78	43.3	43.4	0.6	BA 2816Z	—	YB 2816
	IRB 2424	121	38.100 (1 1/2)	44.450 (1 3/4)	38.48	43.3	43.4	0.6	BA 2824Z	BHA 2824Z	—
	IRB 248-1	64	38.100 (1 1/2)	47.625 (1 7/8)	13.08	44.5	45.5	1	BA 308Z	—	—
	IRB 2410-1	79.5	38.100 (1 1/2)	47.625 (1 7/8)	16.25	44.5	45.5	1	BA 3010Z	—	—
41.275 (1 5/8)	IRB 2616	136	41.275 (1 5/8)	50.800 (2)	25.78	47.5	48.5	1	BA 3216Z	—	—
	IRB 2628	235	41.275 (1 5/8)	50.800 (2)	44.83	47.5	48.5	1	BAW 3228Z	—	—
42.862 (1 11/16)	IRB 2720	146	42.862 (1 11/16)	50.800 (2)	32.13	48.5	49.5	0.6	BA 3220Z	—	—
47.625 (1 7/8)	IRB 3016	100	47.625 (1 7/8)	53.975 (2 1/8)	25.78	52.9	52.9	0.6	BA 3416Z	—	—
	IRB 3024	149	47.625 (1 7/8)	53.975 (2 1/8)	38.48	52.9	52.9	0.6	BA 3424Z	—	—
57.150 (2 1/4)	IRB 3616	183	57.150 (2 1/4)	66.675 (2 5/8)	25.78	63.5	64.5	1	BA 4216Z	—	—
63.500 (2 1/2)	IRB 4016	131	63.500 (2 1/2)	69.850 (2 3/4)	25.78	68.7	68.8	0.6	BA 4416Z	—	—
	IRB 4020	164	63.500 (2 1/2)	69.850 (2 3/4)	32.13	68.7	68.8	0.6	BA 4420Z	—	—

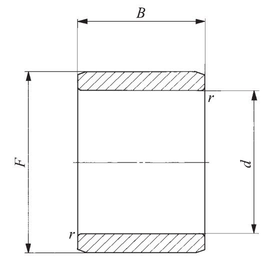
Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.

H
IRT
IRB
LRT
LRB

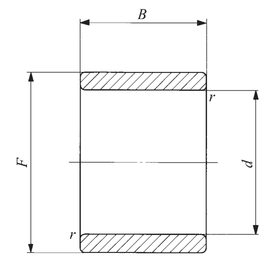
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

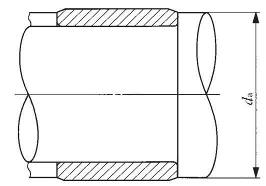
Inner Rings for General Usage



LRT



LRTZ



Shaft dia. 5 — 20mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings	
5	LRT 5710	—	1.4	5	7	10	0.15	6.2	6.7	RNA 495	
	LRT 5812	—	2.8	5	8	12	0.2	6.6	7.7	TAF 81512	
	LRT 5816	—	3.8	5	8	16	0.2	6.6	7.7	TAF 81516	
6	LRT 6810	—	1.7	6	8	10	0.15	7.2	7.7	RNA 496	
	LRT 6912	—	3.2	6	9	12	0.2	7.6	8.7	TAF 91612	
	LRT 6916	—	4.3	6	9	16	0.2	7.6	8.7	TAF 91616	
	LRT 61010	—	3.9	6	10	10	0.3	8	9.7	RNAF 101710	
7	LRT 7910	—	1.9	7	9	10	0.15	8.2	8.7	RNA 497	
	LRT 71012	—	3.6	7	10	12	0.2	8.6	9.7	TAF 101712	
	LRT 71012-1	—	3.6	7	10	12	0.3	9	9.7	RNAF 102012	
	LRT 71016	—	4.9	7	10	16	0.2	8.6	9.7	TAF 101716	NAX 1023
8	LRT 81011	—	2.4	8	10	11	0.2	9.6	9.9	RNA 498	
9	LRT 91211	—	3.1	9	12	11	0.3	11	11.5	RNA 499	
	LRT 91212	—	4.5	9	12	12	0.3	11	11.5	TAF 121912	RNAF 122212
	LRT 91216	—	6	9	12	16	0.3	11	11.5	TAF 121916	NAX 1223
10	LRT 101412	—	7	10	14	12	0.3	12	13	RNAF 142612	
	LRT 101413	—	7.5	10	14	13	0.3	12	13	RNA 4900	RNAF 142213
	—	LRTZ 101414	8.2	10	14	14	0.3	12	13	RNA 4900 UU	
	LRT 101416	—	9	10	14	16	0.3	12	13	TAF 142216	
	LRT 101420	—	11.5	10	14	20	0.3	12	13	TAF 142220	RNAFW142220
12	LRT 121516	—	8	12	15	16.5	0.3	14	14.5	NAX 1523	NBX 1523
	LRT 121612	—	8.5	12	16	12	0.3	14	15	RNAF 162812	
	LRT 121613	—	8.5	12	16	13	0.3	14	15	RNA 4901	RNAF 162413
	—	LRTZ 121614	9.6	12	16	14	0.3	14	15	RNA 4901 UU	
	LRT 121616	—	10.5	12	16	16	0.3	14	15	TAF 162416	
	LRT 121620	—	13.5	12	16	20	0.3	14	15	TAF 162420	RNAFW162420

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings	
12	LRT 121622	—	14.5	12	16	22	0.3	14	15	RNA 6901	
	—	LRTZ 121623	15.5	12	16	23	0.3	14	15	RNA 6901 UU	
14	LRT 141717	—	9.5	14	17	17	0.3	16	16.5	NAX 1725	NBX 1725
15	LRT 151916	—	12.5	15	19	16	0.3	17	18	TAF 192716	
	LRT 151920	—	16	15	19	20	0.3	17	18	TAF 192720	
	LRT 152012	—	12	15	20	12	0.3	17	19	RNAF 203212	
	LRT 152013	—	13.5	15	20	13	0.3	17	19	RNA 4902	RNAF 202813
	—	LRTZ 152014	14.5	15	20	14	0.3	17	19	RNA 4902 UU	
	LRT 152020	—	21.5	15	20	20.5	0.3	17	19	TR 203320	
	—	LRTZ 152020	21.5	15	20	20.5	0.3	17	19	GTR 203320	
	LRT 152023	—	24	15	20	23	0.3	17	19	RNA 6902	
	—	LRTZ 152024	25	15	20	24	0.3	17	19	RNA 6902 UU	
	LRT 152026	—	28	15	20	26	0.3	17	19	RNAFW 202826	
17	LRT 172020	—	13.5	17	20	20.5	0.3	19	19.5	NAX 2030	NBX 2030
	LRT 172116	—	14.5	17	21	16	0.3	19	20	TAF 212916	
	LRT 172120	—	18	17	21	20	0.3	19	20	TAF 212920	
	LRT 172213	—	15.5	17	22	13	0.3	19	21	RNA 4903	RNAF 223013
	—	LRTZ 172214	16.5	17	22	14	0.3	19	21	RNA 4903 UU	
	LRT 172216	—	19	17	22	16	0.3	19	21	RNAF 223516	
	LRT 172223	—	26.5	17	22	23	0.3	19	21	RNA 6903	
	—	LRTZ 172224	28	17	22	24	0.3	19	21	RNA 6903 UU	
	LRT 172225	—	30	17	22	25.5	0.3	19	21	TR 223425	
	—	LRTZ 172225	30	17	22	25.5	0.3	19	21	GTR 223425	
	LRT 172226	—	31	17	22	26	0.3	19	21	RNAFW 223026	
	LRT 172232	—	38	17	22	32	0.3	19	21	RNAFW 223532	
20	LRT 202416	—	16.5	20	24	16	0.3	22	23	TAF 243216	
	LRT 202420	—	20.5	20	24	20	0.3	22	23	TAF 243220	

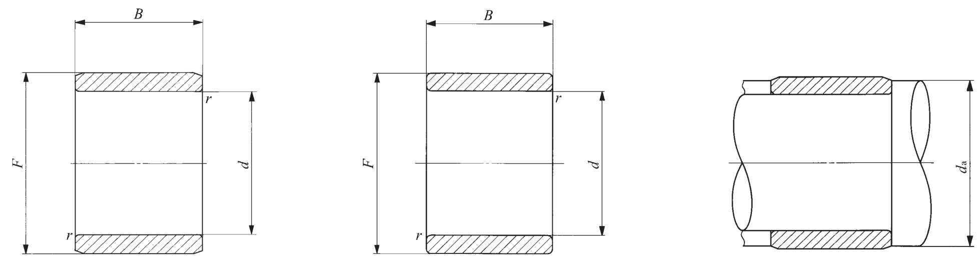
Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

H
IRT
IRB
LRT
LRB

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

INNER RINGS

Inner Rings for General Usage



LRT LRTZ

Shaft dia. 20 — 32mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings	
20	LRT 202516	—	22	20	25	16	0.3	22	24	RNAF 253716	
	LRT 202517	—	23	20	25	17	0.3	22	24	RNA 4904	RNAF 253517
	—	LRTZ 202518	24	20	25	18	0.3	22	24	RNA 4904 UU	
	LRT 202520	—	28	20	25	20.5	0.3	22	24	TR 253820 NBX 2530	NAX 2530
	—	LRTZ 202520	28	20	25	20.5	0.3	22	24	GTR 253820	
	LRT 202525	—	35	20	25	25.5	0.3	22	24	TR 253825	
	—	LRTZ 202525	35	20	25	25.5	0.3	22	24	GTR 253825	
	LRT 202526	—	36	20	25	26	0.3	22	24	RNAFW 253526	
	LRT 202530	—	40.5	20	25	30	0.3	22	24	RNA 6904	
	—	LRTZ 202531	41.5	20	25	31	0.3	22	24	RNA 6904 UU	
	LRT 202532	—	44	20	25	32	0.3	22	24	RNAFW 253732	
22	LRT 222616	—	17.5	22	26	16	0.3	24	25	TAF 263416	
	LRT 222620	—	24	22	26	20	0.3	24	25	TAF 263420	
	LRT 222817	—	30.5	22	28	17	0.3	24	27	RNA 49/22	
	—	LRTZ 222818	32	22	28	18	0.3	24	27	RNA 49/22 UU	
	LRT 222830	—	55	22	28	30	0.3	24	27	RNA 69/22	
	—	LRTZ 222831	55	22	28	31	0.3	24	27	RNA 69/22 UU	
25	LRT 252920	—	25	25	29	20	0.3	27	28	TAF 293820	
	LRT 252930	—	38	25	29	30	0.3	27	28	TAF 293830	
	LRT 253016	—	28	25	30	16	0.3	27	29	RNAF 304216	
	LRT 253017	—	28.5	25	30	17	0.3	27	29	RNA 4905	RNAF 304017
	—	LRTZ 253018	29.5	25	30	18	0.3	27	29	RNA 4905 UU	
	LRT 253020	—	34	25	30	20.5	0.3	27	29	NAX 3030	NBX 3030
	LRT 253025	—	42	25	30	25.5	0.3	27	29	TR 304425	
	—	LRTZ 253025	42	25	30	25.5	0.3	27	29	GTR 304425	
	LRT 253026	—	44.5	25	30	26	0.3	27	29	RNAFW 304026	
	LRT 253030	—	49	25	30	30	0.3	27	29	RNA 6905	

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

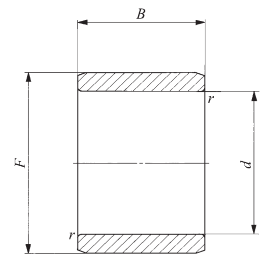
Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings	
25	—	LRTZ 253031	51	25	30	31	0.3	27	29	RNA 6905 UU	
	LRT 253032	—	54	25	30	32	0.3	27	29	RNAFW 304232	
28	LRT 283217	—	24.5	28	32	17	0.3	30	31	RNA 49/28	
	—	LRTZ 283218	25.5	28	32	18	0.3	30	31	RNA 49/28 UU	
	LRT 283220	—	28.5	28	32	20	0.3	30	31	TAF 324220	
	LRT 283230	—	43	28	32	30	0.3	30	31	RNA 69/28	TAF 324230
	—	LRTZ 283230	43	28	32	30.5	0.3	30	31	GTR 324530	
	—	LRTZ 283231	44	28	32	31	0.3	30	31	RNA 69/28 UU	
30	LRT 303516	—	31.5	30	35	16	0.3	32	34	RNAF 354716	
	LRT 303517	—	33.5	30	35	17	0.3	32	34	RNA 4906	RNAF 354517
	—	LRTZ 303518	35	30	35	18	0.3	32	34	RNA 4906 UU	
	LRT 303520	—	38.5	30	35	20	0.3	32	34	TAF 354520 NBX 3530	NAX 3530
	LRT 303526	—	52	30	35	26	0.3	32	34	RNAFW 354526	
	LRT 303530	—	59	30	35	30	0.3	32	34	RNA 6906	TAF 354530
	LRT 303530-1	—	59	30	35	30.5	0.3	32	34	TR 354830	
	—	LRTZ 303530	59	30	35	30.5	0.3	32	34	GTR 354830	
	—	LRTZ 303531	61	30	35	31	0.3	32	34	RNA 6906 UU	
	LRT 303532	—	64	30	35	32	0.3	32	34	RNAFW 354732	
32	LRT 323720	—	43.5	32	37	20	0.3	34	36	TAF 374720	
	LRT 323730	—	63	32	37	30	0.3	34	36	TAF 374730	
	LRT 323830	—	77	32	38	30.5	0.6	36	37	TR 385230	
	—	LRTZ 323830	77	32	38	30.5	0.6	36	37	GTR 385230	
	LRT 324020	—	69	32	40	20	0.6	36	39	RNA 49/32	
	—	LRTZ 324021	72.5	32	40	21	0.6	36	39	RNA 49/32 UU	
	LRT 324036	—	123	32	40	36	0.6	36	39	RNA 69/32	
	—	LRTZ 324037	130	32	40	37	0.6	36	39	RNA 69/32 UU	

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

INNER RINGS

Inner Rings for General Usage



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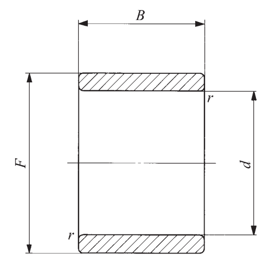

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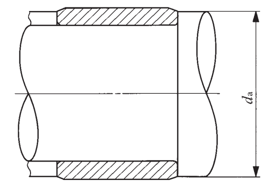


Shaft dia. 35 — 50mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
35	LRT 354017	—	39	35	40	17	0.3	37	39	RNAF 405017
	LRT 354020	—	46	35	40	20	0.3	37	39	TAF 405020 RNAF 405520 NAX 4032 NBX 4032
	—	LRTZ 354020	46	35	40	20.5	0.6	39	39.5	GTR 405520
	LRT 354030	—	67	35	40	30	0.3	37	39	TAF 405030
	LRT 354034	—	78	35	40	34	0.3	37	39	RNAFW 405034
	LRT 354040	—	95	35	40	40	0.3	37	39	RNAFW 405540
	LRT 354220	—	65	35	42	20	0.6	39	41	RNA 4907
	—	LRTZ 354221	67	35	42	21	0.6	39	41	RNA 4907 UU
	LRT 354230	—	97	35	42	30.5	0.6	39	41	TR 425630
	—	LRTZ 354230	100	35	42	30.5	0.6	39	41	GTR 425630
	LRT 354236	—	120	35	42	36	0.6	39	41	RNA 6907
	—	LRTZ 354237	120	35	42	37	0.6	39	41	RNA 6907 UU
38	LRT 384320	—	47.5	38	43	20	0.3	40	42	TAF 435320
	LRT 384330	—	72	38	43	30	0.3	40	42	TAF 435330
40	LRT 404517	—	44.5	40	45	17	0.3	42	44	RNAF 455517
	LRT 404520	—	51	40	45	20	0.3	42	44	TAF 455520 RNAF 456220 NAX 4532 NBX 4532
	LRT 404530	—	77	40	45	30	0.3	42	44	TAF 455530
	LRT 404530-1	—	77	40	45	30.5	0.6	44	44.5	TR 455930
	—	LRTZ 404530	77	40	45	30.5	0.6	44	44.5	GTR 455930
	LRT 404534	—	88	40	45	34	0.3	42	44	RNAFW 455534
	LRT 404540	—	105	40	45	40	0.3	42	44	RNAFW 456240
	LRT 404822	—	93	40	48	22	0.6	44	47	RNA 4908
	—	LRTZ 404823	95	40	48	23	0.6	44	47	RNA 4908 UU
	LRT 404840	—	165	40	48	40	0.6	44	47	RNA 6908
	—	LRTZ 404841	170	40	48	41	0.6	44	47	RNA 6908 UU

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

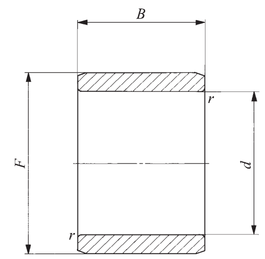
Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
42	LRT 424720	—	54	42	47	20	0.3	44	46	TAF 475720
	LRT 424730	—	81	42	47	30	0.3	44	46	TAF 475730
	LRT 424830	—	100	42	48	30.5	0.6	46	47	TR 486230
	—	LRTZ 424830	100	42	48	30.5	0.6	46	47	GTR 486230
45	LRT 455020	—	58	45	50	20	0.3	47	49	RNAF 506220
	LRT 455025	—	71	45	50	25	0.3	47	49	TAF 506225 NAX 5035 NBX 5035
	LRT 455030	—	90	45	50	30.5	0.6	49	49.5	TR 506430
	—	LRTZ 455030	90	45	50	30.5	0.6	49	49.5	GTR 506430
	LRT 455035	—	95	45	50	35	0.3	47	49	TAF 506235
	LRT 455040	—	115	45	50	40	0.3	47	49	RNAFW 506240
	LRT 455222	—	88	45	52	22	0.6	49	51	RNA 4909
	—	LRTZ 455223	93	45	52	23	0.6	49	51	RNA 4909 UU
	LRT 455240	—	165	45	52	40	0.6	49	51	RNA 6909
	—	LRTZ 455241	170	45	52	41	0.6	49	51	RNA 6909 UU
	LRT 455520	—	120	45	55	20	1	50	54	RNAF 557220
	LRT 455540	—	245	45	55	40	1	50	54	RNAFW 557240
50	LRT 505520	—	63	50	55	20	0.3	52	54	RNAF 556820
	LRT 505525	—	77	50	55	25	0.3	52	54	TAF 556825
	LRT 505535	—	110	50	55	35	0.3	52	54	TAF 556835
	LRT 505540	—	130	50	55	40	0.3	52	54	RNAFW 556840
	LRT 505822	—	116	50	58	22	0.6	54	57	RNA 4910
	—	LRTZ 505823	118	50	58	23	0.6	54	57	RNA 4910 UU
	LRT 505840	—	210	50	58	40	0.6	54	57	RNA 6910
	—	LRTZ 505841	215	50	58	41	0.6	54	57	RNA 6910 UU
	LRT 505845	—	235	50	58	45.5	1	55	57	TR 587745
	—	LRTZ 505845	235	50	58	45.5	1	55	57	GTR 587745
	LRT 506020	—	135	50	60	20	1	55	59	RNAF 607820

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

INNER RINGS

Inner Rings for General Usage



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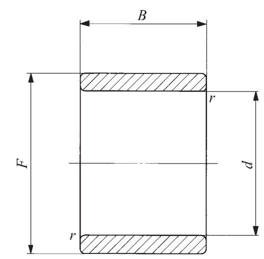

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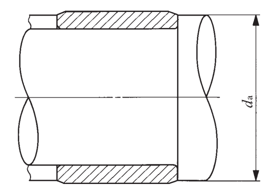


Shaft dia. 50 — 80mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings	
50	LRT 506025	—	165	50	60	25.5	1	55	59	NAX 6040	NBX 6040
	LRT 506040	—	265	50	60	40	1	55	59	RNAFW 607840	
55	LRT 556025	—	88	55	60	25	0.3	57	59	TAF 607225	
	LRT 556035	—	120	55	60	35	0.3	57	59	TAF 607235	
	LRT 556238	—	190	55	62	38.5	1	60	60.5	TR 628138	
	—	LRTZ 556238	190	55	62	38.5	1	60	60.5	GTR 628138	
	LRT 556325	—	145	55	63	25	1	60	61	RNA 4911	
	—	LRTZ 556326	150	55	63	26	1	60	61	RNA 4911 UU	
	LRT 556345	—	255	55	63	45	1	60	61	RNA 6911	
	—	LRTZ 556346	260	55	63	46	1	60	61	RNA 6911 UU	
	LRT 556530	—	220	55	65	30	1.5	63	63.5	RNAF 658530	
	LRT 556560	—	435	55	65	60	1.5	63	63.5	RNAFW 658560	
60	LRT 606825	—	150	60	68	25	0.6	64	66	TAF 688225	
	LRT 606825-1	—	150	60	68	25	1	65	66	RNA 4912	
	—	LRTZ 606826	160	60	68	26	1	65	66	RNA 4912 UU	
	LRT 606835	—	210	60	68	35	0.6	64	66	TAF 688235	
	LRT 606845	—	275	60	68	45	1	65	66	RNA 6912	
	—	LRTZ 606846	280	60	68	46	1	65	66	RNA 6912 UU	
	LRT 607025	—	195	60	70	25.5	1	65	68	NAX 7040	
	LRT 607030	—	240	60	70	30	1.5	68	68.5	RNAF 709030	
	LRT 607045	—	355	60	70	45.5	1	65	68	TR 708945	
	—	LRTZ 607045	360	60	70	45.5	1	65	68	GTR 708945	
	LRT 607060	—	480	60	70	60	1.5	68	68.5	RNAFW 709060	
65	LRT 657225	—	145	65	72	25	1	70	70.5	RNA 4913	
	—	LRTZ 657226	150	65	72	26	1	70	70.5	RNA 4913 UU	
	LRT 657245	—	255	65	72	45	1	70	70.5	RNA 6913	
	—	LRTZ 657246	265	65	72	46	1	70	70.5	RNA 6913 UU	
	LRT 657335	—	235	65	73	35	1	70	71	TAF 739035	
65	LRT 657530	—	260	65	75	30	1.5	73	73.5	RNAF 759530	
	LRT 657560	—	520	65	75	60	1.5	73	73.5	RNAFW 759560	
70	LRT 708025	—	225	70	80	25	1	75	78	TAF 809525	
	LRT 708030	—	275	70	80	30	1	75	78	RNA 4914	
	LRT 708030-1	—	275	70	80	30	1.5	78	78.5	RNAF 8010030	
	—	LRTZ 708031	275	70	80	31	1	75	78	RNA 4914 UU	
	LRT 708035	—	310	70	80	35	1	75	78	TAF 809535	
	LRT 708054	—	490	70	80	54	1	75	78	RNA 6914	
	—	LRTZ 708055	500	70	80	55	1	75	78	RNA 6914 UU	
	LRT 708060	—	560	70	80	60	1.5	78	78.5	RNAFW 8010060	
75	LRT 758345	—	350	75	83	45.5	1	80	81	TR 8310845	
	—	LRTZ 758345	350	75	83	45.5	1	80	81	GTR 8310845	
	LRT 758525	—	240	75	85	25	1	80	83	TAF 8510525	
	LRT 758530	—	290	75	85	30	1	80	83	RNA 4915	
	LRT 758530-1	—	290	75	85	30	1.5	83	83.5	RNAF 8510530	
	—	LRTZ 758531	300	75	85	31	1	80	83	RNA 4915 UU	
	LRT 758535	—	335	75	85	35	1	80	83	TAF 8510535	
	LRT 758554	—	520	75	85	54	1	80	83	RNA 6915	
	—	LRTZ 758555	530	75	85	55	1	80	83	RNA 6915 UU	
80	LRT 809025	—	255	80	90	25	1	85	88	TAF 9011025	
	LRT 809030	—	310	80	90	30	1	85	88	RNA 4916	
	LRT 809030-1	—	310	80	90	30	1.5	88	88.5	RNAF 9011030	
	—	LRTZ 809031	315	80	90	31	1	85	88	RNA 4916 UU	
	LRT 809035	—	355	80	90	35	1	85	88	TAF 9011035	
	LRT 809054	—	550	80	90	54	1	85	88	RNA 6916	
	—	LRTZ 809055	560	80	90	55	1	85	88	RNA 6916 UU	

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

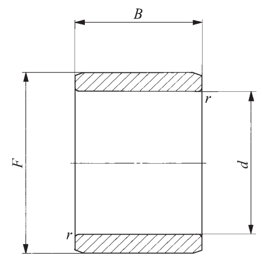
INNER RINGS

Inner Rings for General Usage

Shaft dia. 85 — 140mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ [(1)]	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
85	LRT 859350	—	440	85	93	50.5	1	90	91	TR 9311850
	—	LRTZ 859350	440	85	93	50.5	1	90	91	GTR 9311850
	LRT 859526	—	280	85	95	26	1	90	93	TAF 9511526
	LRT 859530	—	330	85	95	30	1.5	93	93.5	RNAF 9511530
	LRT 859536	—	390	85	95	36	1	90	93	TAF 9511536
	LRT 859545	—	490	85	95	45.5	1.5	93	93.5	TR 9512045
	—	LRTZ 859545	490	85	95	45.5	1.5	93	93.5	GTR 9512045
	LRT 8510035	—	575	85	100	35	1.1	91.5	98	RNA 4917
	—	LRTZ 8510036	605	85	100	36	1.1	91.5	98	RNA 4917 UU
	LRT 8510063	—	1 040	85	100	63	1.1	91.5	98	RNA 6917
	—	LRTZ 8510064	1 060	85	100	64	1.1	91.5	98	RNA 6917 UU
90	LRT 9010026	—	295	90	100	26	1	95	98	TAF 10012026
	LRT 9010030	—	355	90	100	30	1.5	98	98.5	RNAF 10012030
	LRT 9010036	—	415	90	100	36	1	95	98	TAF 10012036
	LRT 9010050	—	580	90	100	50.5	1.5	98	98.5	TR 10012550
	—	LRTZ 9010050	580	90	100	50.5	1.5	98	98.5	GTR 10012550
	LRT 9010535	—	610	90	105	35	1.1	96.5	103	RNA 4918
	—	LRTZ 9010536	630	90	105	36	1.1	96.5	103	RNA 4918 UU
	LRT 9010563	—	1 100	90	105	63	1.1	96.5	103	RNA 6918
	—	LRTZ 9010564	1 120	90	105	64	1.1	96.5	103	RNA 6918 UU
95	LRT 9510526	—	315	95	105	26	1	100	103	TAF 10512526
	LRT 9510536	—	430	95	105	36	1	100	103	TAF 10512536
	LRT 9511035	—	650	95	110	35	1.1	101.5	108	RNA 4919
	—	LRTZ 9511036	660	95	110	36	1.1	101.5	108	RNA 4919 UU
	LRT 9511063	—	1 160	95	110	63	1.1	101.5	108	RNA 6919
	—	LRTZ 9511064	1 180	95	110	64	1.1	101.5	108	RNA 6919 UU

Note[(1)] Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.



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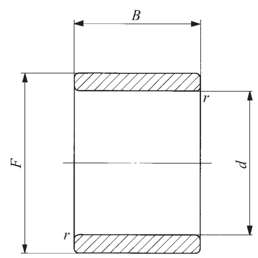

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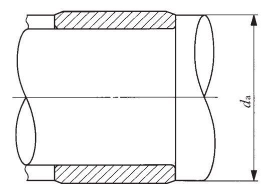


Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ [(1)]	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
100	LRT 10011030	—	380	100	110	30	1	105	108	TAF 11013030
	LRT 10011040	—	500	100	110	40	1	105	108	TAF 11013040
	LRT 10011050	—	640	100	110	50.5	1.5	108	108.5	TR 11013550
	—	LRTZ 10011050	640	100	110	50.5	1.5	108	108.5	GTR 11013550
	LRT 10011540	—	770	100	115	40	1.1	106.5	113	RNA 4920
	—	LRTZ 10011541	780	100	115	41	1.1	106.5	113	RNA 4920 UU
105	LRT 10511550	—	670	105	115	50.5	1.5	113	113.5	TR 11515350
	—	LRTZ 10511550	670	105	115	50.5	1.5	113	113.5	GTR 11515350
110	LRT 11012030	—	410	110	120	30	1	115	118	RNA 4822
	LRT 11012540	—	840	110	125	40	1.1	116.5	123	RNA 4922
	—	LRTZ 11012541	870	110	125	41	1.1	116.5	123	RNA 4922 UU
120	LRT 12013030	—	450	120	130	30	1	125	128	RNA 4824
	LRT 12013545	—	1 030	120	135	45	1.1	126.5	133	RNA 4924
	—	LRTZ 12013546	1 050	120	135	46	1.1	126.5	133	RNA 4924 UU
125	LRT 12514060	—	1 460	125	140	60.5	1.5	133	138	TR 14017860
	—	LRTZ 12514060	1 460	125	140	60.5	1.5	133	138	GTR 14017860
130	LRT 13014535	—	860	130	145	35	1.1	136.5	143	RNA 4826
	LRT 13015050	—	1 670	130	150	50	1.5	138	148	RNA 4926
	—	LRTZ 13015051	1 720	130	150	51	1.5	138	148	RNA 4926 UU
135	LRT 13515060	—	1 560	135	150	60.5	1.5	143	148	TR 15018860
	—	LRTZ 13515060	1 560	135	150	60.5	1.5	143	148	GTR 15018860
140	LRT 14015535	—	930	140	155	35	1.1	146.5	153	RNA 4828
	LRT 14016050	—	1 790	140	160	50	1.5	148	158	RNA 4928
	—	LRTZ 14016051	1 830	140	160	51	1.5	148	158	RNA 4928 UU

Note[(1)] Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

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

INNER RINGS

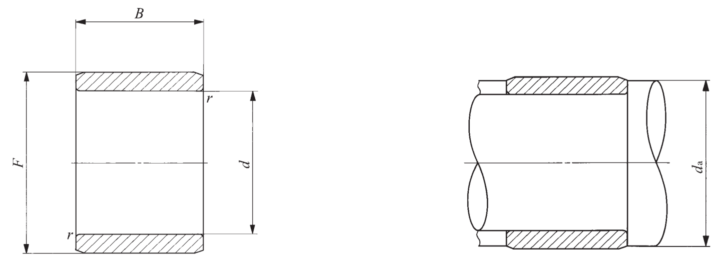
Inner Rings for General Usage

Shaft dia. 150 — 440mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
150	**LRT 15016540**	—	1 130	150	165	40	1.1	156.5	163	**RNA 4830**
	LRT 15017060	—	2 290	150	170	60	2	159	168	**RNA 4930**
160	**LRT 16017540**	—	1 200	160	175	40	1.1	166.5	173	**RNA 4832**
	LRT 16018060	—	2 440	160	180	60	2	169	178	**RNA 4932**
170	**LRT 17018545**	—	1 420	170	185	45	1.1	176.5	183	**RNA 4834**
	LRT 17019060	—	2 580	170	190	60	2	179	188	**RNA 4934**
180	**LRT 18019545**	—	1 500	180	195	45	1.1	186.5	193	**RNA 4836**
	LRT 18020569	—	3 950	180	205	69	2	189	203	**RNA 4936**
190	**LRT 19021050**	—	2 380	190	210	50	1.5	198	208	**RNA 4838**
	LRT 19021569	—	4 200	190	215	69	2	199	213	**RNA 4938**
200	**LRT 20022050**	—	2 520	200	220	50	1.5	208	218	**RNA 4840**
	LRT 20022580	—	5 000	200	225	80	2.1	211	223	**RNA 4940**
220	**LRT 22024050**	—	2 750	220	240	50	1.5	228	238	**RNA 4844**
	LRT 22024580	—	5 500	220	245	80	2.1	231	243	**RNA 4944**
240	**LRT 24026560**	—	4 530	240	265	60	2	249	262	**RNA 4848**
	LRT 24026580	—	6 000	240	265	80	2.1	251	262	**RNA 4948**
260	**LRT 26028560**	—	4 930	260	285	60	2	269	282	**RNA 4852**
	LRT 260290100	—	9 900	260	290	100	2.1	271	287	**RNA 4952**
280	**LRT 28030569**	—	6 050	280	305	69	2	289	302	**RNA 4856**
	LRT 280310100	—	10 600	280	310	100	2.1	291	307	**RNA 4956**
300	**LRT 30033080**	—	9 100	300	330	80	2.1	311	327	**RNA 4860**
	LRT 300340118	—	18 000	300	340	118	3	313	337	**RNA 4960**
320	**LRT 32035080**	—	9 600	320	350	80	2.1	331	347	**RNA 4864**
	LRT 320360118	—	19 200	320	360	118	3	333	357	**RNA 4964**

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

IKO



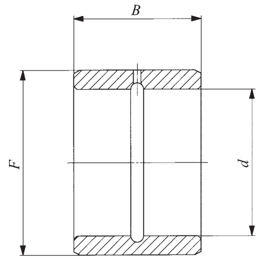
LRT

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
340	**LRT 34037080**	—	10 200	340	370	80	2.1	351	367	**RNA 4868**
	LRT 340380118	—	20 300	340	380	118	3	353	377	**RNA 4968**
360	**LRT 36039080**	—	10 800	360	390	80	2.1	371	387	**RNA 4872**
	LRT 360400118	—	21 500	360	400	118	3	373	397	**RNA 4972**
380	**LRT 380415100**	—	16 700	380	415	100	2.1	391	412	**RNA 4876**
	LRT 380430140	—	33 900	380	430	140	4	396	427	**RNA 4976**
400	**LRT 400450140**	—	35 600	400	450	140	4	416	447	**RNA 4980**
420	**LRT 420470140**	—	37 300	420	470	140	4	436	467	**RNA 4984**
440	**LRT 440490160**	—	44 100	440	490	160	4	456	487	**RNA 4988**

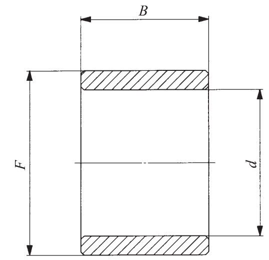
Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

INNER RINGS

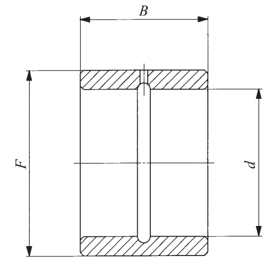
Inner Rings for General Usage Inch Series



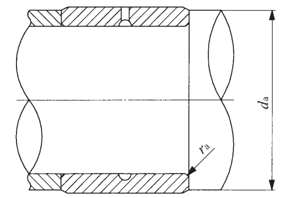
LRB



LRBZ



LRBZ…B



Shaft dia. 9.525 — 22.225mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\ max}$ (1) Max.	Assembled bearings
9.525 (3/8)	LRB 61012	—	18.5	9.525 (3/8)	15.875 (5/8)	19.300	14	14.5	0.6	BR 101812
	—	LRBZ 61012	18.5	9.525 (3/8)	15.875 (5/8)	19.300	14	14.5	0.6	GBR 101812
	—	LRBZ 61016	25	9.525 (3/8)	15.875 (5/8)	25.650	14	14.5	0.6	GBR 101816UU
	—	LRBZ 61016 B	25	9.525 (3/8)	15.875 (5/8)	25.650	14	14.5	0.6	BR 101816UU
12.700 (1/2)	LRB 81212	—	23.5	12.700 (1/2)	19.050 (3/4)	19.300	17.5	18	1	BR 122012
	LRB 81216	—	31	12.700 (1/2)	19.050 (3/4)	25.650	17.5	18	1	BR 122016
	—	LRBZ 81212	23.5	12.700 (1/2)	19.050 (3/4)	19.300	17.5	18	0.6	GBR 122012
	—	LRBZ 81216	31	12.700 (1/2)	19.050 (3/4)	25.650	17.5	18	0.6	GBR 122016UU
	—	LRBZ 81216 B	31	12.700 (1/2)	19.050 (3/4)	25.650	17.5	18	0.6	BR 122016UU
15.875 (5/8)	LRB 101412	—	28	15.875 (5/8)	22.225 (7/8)	19.300	21	21.2	1	BR 142212
	LRB 101416	—	37.5	15.875 (5/8)	22.225 (7/8)	25.650	21	21.2	1	BR 142216
	—	LRBZ 101412	28	15.875 (5/8)	22.225 (7/8)	19.300	21	21.2	0.6	GBR 142212
	—	LRBZ 101416	37.5	15.875 (5/8)	22.225 (7/8)	25.650	21	21.2	0.6	GBR 142216 GBR 142216UU
	—	LRBZ 101416 B	37.5	15.875 (5/8)	22.225 (7/8)	25.650	21	21.2	0.6	BR 142216UU
19.050 (3/4)	LRB 121612	—	33	19.050 (3/4)	25.400 (1)	19.300	24	24.4	1	BR 162412
	LRB 121616	—	44	19.050 (3/4)	25.400 (1)	25.650	24	24.4	1	BR 162416
	—	LRBZ 121612	33	19.050 (3/4)	25.400 (1)	19.300	24	24.4	0.6	GBR 162412
	—	LRBZ 121616	44	19.050 (3/4)	25.400 (1)	25.650	24	24.4	0.6	GBR 162416 GBR 162416UU
	—	LRBZ 121616 B	44	19.050 (3/4)	25.400 (1)	25.650	24	24.4	0.6	BR 162416UU
22.225 (7/8)	LRB 141816	—	50	22.225 (7/8)	28.575 (1 1/8)	25.650	27	27.5	1	BR 182616
	LRB 141820	—	62	22.225 (7/8)	28.575 (1 1/8)	32.000	27	27.5	1	BR 182620
	—	LRBZ 141816	50	22.225 (7/8)	28.575 (1 1/8)	25.650	27	27.5	0.6	GBR 182616
	—	LRBZ 141820	62	22.225 (7/8)	28.575 (1 1/8)	32.000	27	27.5	0.6	GBR 182620UU
	—	LRBZ 141820 B	62	22.225 (7/8)	28.575 (1 1/8)	32.000	27	27.5	0.6	BR 182620UU

Note(1) Maximum allowable fillet corner radius of shaft
Remark LRBZ has no oil hole. LRB and LRBZ…B are provided with an oil groove and an oil hole.

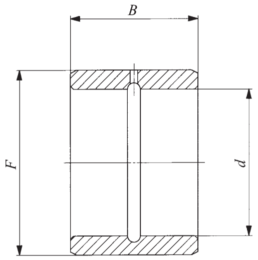
H
IRT
IRB
LRT
LRB

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

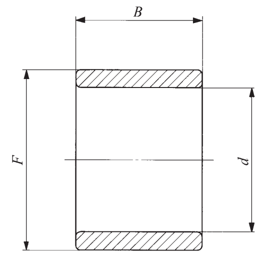
INNER RINGS

Inner Rings for General Usage Inch Series

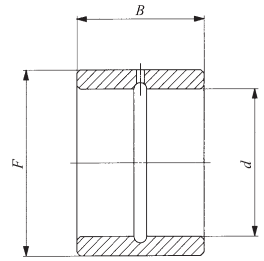
IKO



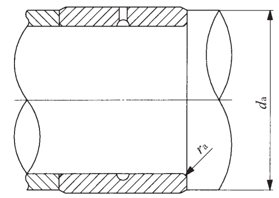
LRB



LRBZ



LRBZ…B



Shaft dia. 25.400 — 38.100mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings		
25.400 (1)	LRB 162016	—	56	25.400 (1)	31.750 (1 1/4)	25.650	30.5	30.7	1	BR 202816		
	LRB 162020	—	72	25.400 (1)	31.750 (1 1/4)	32.000	30.5	30.7	1	BR 202820		
	—	LRBZ 162016	56	25.400 (1)	31.750 (1 1/4)	25.650	30.5	30.7	0.6	GBR 202816		
	—	LRBZ 162020	72	25.400 (1)	31.750 (1 1/4)	32.000	30.5	30.7	0.6	GBR 202820UU		
	—	LRBZ 162020 B	72	25.400 (1)	31.750 (1 1/4)	32.000	30.5	30.7	0.6	BR 202820UU		
28.575 (1 1/8)	LRB 182216	—	63	28.575 (1 1/8)	34.925 (1 3/8)	25.650	33.5	33.9	1	BR 223016		
	LRB 182220	—	77	28.575 (1 1/8)	34.925 (1 3/8)	32.000	33.5	33.9	1	BR 223020		
	—	LRBZ 182216	63	28.575 (1 1/8)	34.925 (1 3/8)	25.650	33.5	33.9	0.6	GBR 223016		
	—	LRBZ 182220	77	28.575 (1 1/8)	34.925 (1 3/8)	32.000	33.5	33.9	0.6	GBR 223020UU		
	—	LRBZ 182220 B	77	28.575 (1 1/8)	34.925 (1 3/8)	32.000	33.5	33.9	0.6	BR 223020UU		
31.750 (1 1/4)	LRB 202416	—	71	31.750 (1 1/4)	38.100 (1 1/2)	25.650	37	37.1	1.5	BR 243316		
	LRB 202420	—	86	31.750 (1 1/4)	38.100 (1 1/2)	32.000	37	37.1	1.5	BR 243320		
	—	LRBZ 202416	71	31.750 (1 1/4)	38.100 (1 1/2)	25.650	37	37.1	0.6	GBR 243316		
	—	LRBZ 202420	86	31.750 (1 1/4)	38.100 (1 1/2)	32.000	37	37.1	0.6	GBR 243320	GBR 243320UU	
	—	LRBZ 202420 B	86	31.750 (1 1/4)	38.100 (1 1/2)	32.000	37	37.1	0.6	BR 243320UU		
34.925 (1 3/8)	LRB 222616	—	77	34.925 (1 3/8)	41.275 (1 5/8)	25.650	40.2	40.2	1.5	BR 263516		
	LRB 222620	—	96	34.925 (1 3/8)	41.275 (1 5/8)	32.000	40.2	40.2	1.5	BR 263520		
	—	LRBZ 222616	77	34.925 (1 3/8)	41.275 (1 5/8)	25.650	40.2	40.2	0.6	GBR 263516		
	—	LRBZ 222620	96	34.925 (1 3/8)	41.275 (1 5/8)	32.000	40.2	40.2	0.6	GBR 263520	GBR 263520UU	
	—	LRBZ 222620 B	96	34.925 (1 3/8)	41.275 (1 5/8)	32.000	40.2	40.2	0.6	BR 263520UU		
38.100 (1 1/2)	LRB 242816	—	80	38.100 (1 1/2)	44.450 (1 3/4)	25.650	43.3	43.4	1.5	BR 283716		
	LRB 242820	—	100	38.100 (1 1/2)	44.450 (1 3/4)	32.000	43.3	43.4	1.5	BR 283720	BR 283820	
	LRB 243020	—	155	38.100 (1 1/2)	47.625 (1 7/8)	32.000	43.3	45	1.5	BR 303920		
	—	LRBZ 242820	100	38.100 (1 1/2)	44.450 (1 3/4)	32.000	43.3	43.4	0.6	GBR 283720	GBR 283820	GBR 283720UU
	—	LRBZ 242820 B	100	38.100 (1 1/2)	44.450 (1 3/4)	32.000	43.3	43.4	0.6	BR 283720UU		
	—	LRBZ 243020	160	38.100 (1 1/2)	47.625 (1 7/8)	32.000	43.3	45	1	GBR 303920	GBR 303920UU	
	—	LRBZ 243020 B	160	38.100 (1 1/2)	47.625 (1 7/8)	32.000	43.3	45	1	BR 303920UU		

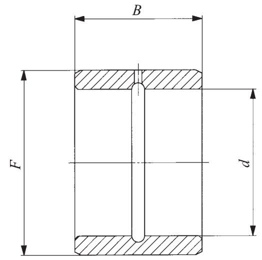
Note(1) Maximum allowable fillet corner radius of shaft
Remark LRBZ has no oil hole. LRB and LRBZ…B are provided with an oil groove and an oil hole.

H
IRT
IRB
LRT
LRB

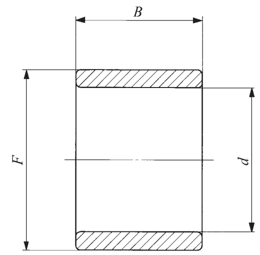
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

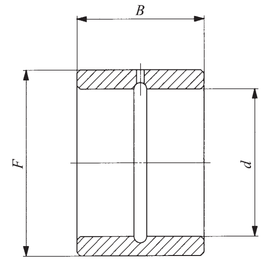
Inner Rings for General Usage Inch Series



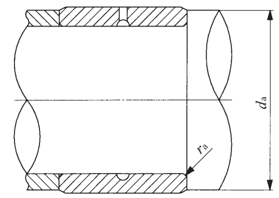
LRB



LRBZ



LRBZ···B



Shaft dia. 41.275 — 63.500mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings	
41.275 (1 5/8)	LRB 263216	—	135	41.275 (1 5/8)	50.800 (2)	25.650	48	49	1.5	BR 324116	
	LRB 263220	—	170	41.275 (1 5/8)	50.800 (2)	32.000	48	49	1.5	BR 324120	
	—	LRBZ 263216	135	41.275 (1 5/8)	50.800 (2)	25.650	48	49	1	GBR 324116	
	—	LRBZ 263220	170	41.275 (1 5/8)	50.800 (2)	32.000	48	49	1	GBR 324120	GBR 324120UU
	—	LRBZ 263220 B	170	41.275 (1 5/8)	50.800 (2)	32.000	48	49	1	BR 324120UU	
44.450 (1 3/4)	LRB 283624	—	300	44.450 (1 3/4)	57.150 (2 1/4)	38.350	52.5	55	1.5	BR 364824	
	LRB 283628	—	345	44.450 (1 3/4)	57.150 (2 1/4)	44.700	52.5	55	1.5	BR 364828	
	—	LRBZ 283624	300	44.450 (1 3/4)	57.150 (2 1/4)	38.350	52.5	55	1.5	GBR 364824	
	—	LRBZ 283628	345	44.450 (1 3/4)	57.150 (2 1/4)	44.700	52.5	55	1.5	GBR 364828	GBR 364828UU
	—	LRBZ 283628 B	345	44.450 (1 3/4)	57.150 (2 1/4)	44.700	52.5	55	1.5	BR 364828UU	
50.800 (2)	LRB 324024	—	335	50.800 (2)	63.500 (2 1/2)	38.350	58	61	2	BR 405224	
	LRB 324028	—	390	50.800 (2)	63.500 (2 1/2)	44.700	58	61	2	BR 405228	
	—	LRBZ 324024	335	50.800 (2)	63.500 (2 1/2)	38.350	58	61	1.5	GBR 405224	
	—	LRBZ 324028	390	50.800 (2)	63.500 (2 1/2)	44.700	58	61	1.5	GBR 405228	GBR 405228UU
	—	LRBZ 324028 B	390	50.800 (2)	63.500 (2 1/2)	44.700	58	61	1.5	BR 405228UU	
57.150 (2 1/4)	LRB 364424	—	375	57.150 (2 1/4)	69.850 (2 3/4)	38.350	65	67	2	BR 445624	
	LRB 364428	—	440	57.150 (2 1/4)	69.850 (2 3/4)	44.700	65	67	2	BR 445628	
	—	LRBZ 364424	375	57.150 (2 1/4)	69.850 (2 3/4)	38.350	65	67	1.5	GBR 445624	
	—	LRBZ 364428	440	57.150 (2 1/4)	69.850 (2 3/4)	44.700	65	67	1.5	GBR 445628	GBR 445628UU
	—	LRBZ 364428 B	440	57.150 (2 1/4)	69.850 (2 3/4)	44.700	65	67	1.5	BR 445628UU	
63.500 (2 1/2)	LRB 404824	—	410	63.500 (2 1/2)	76.200 (3)	38.350	71	73	2	BR 486024	
	LRB 404828	—	480	63.500 (2 1/2)	76.200 (3)	44.700	71	73	2	BR 486028	
	—	LRBZ 404824	410	63.500 (2 1/2)	76.200 (3)	38.350	71	73	1.5	GBR 486024	
	—	LRBZ 404828	480	63.500 (2 1/2)	76.200 (3)	44.700	71	73	1.5	GBR 486028	GBR 486028UU
	—	LRBZ 404828 B	480	63.500 (2 1/2)	76.200 (3)	44.700	71	73	1.5	BR 486028UU	

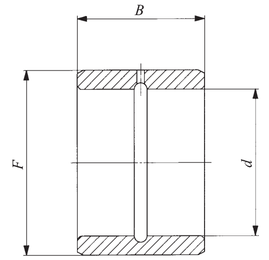
Note(1) Maximum allowable fillet corner radius of shaft
Remark LRBZ has no oil hole. LRB and LRBZ···B are provided with an oil groove and an oil hole.

H
IRT
IRB
LRT
LRB

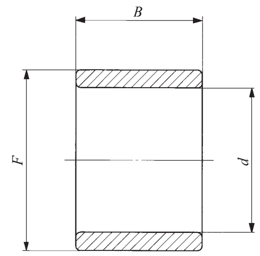
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

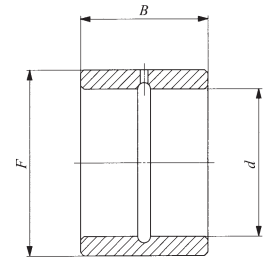
Inner Rings for General Usage Inch Series



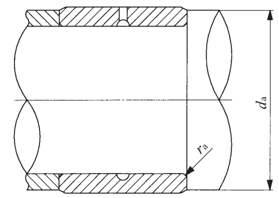
LRB



LRBZ



LRBZ···B



Shaft dia. 69.850 — 95.250mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings	
69.850 (2¾)	LRB 445228	—	530	69.850 (2¾)	82.550 (3¼)	44.700	77	79	2	BR 526828	
	LRB 445232	—	600	69.850 (2¾)	82.550 (3¼)	51.050	77	79	2	BR 526832	
	—	LRBZ 445228	530	69.850 (2¾)	82.550 (3¼)	44.700	77	79	1.5	GBR 526828	GBR 526828UU
	—	LRBZ 445228 B	530	69.850 (2¾)	82.550 (3¼)	44.700	77	79	1.5	BR 526828UU	
	—	LRBZ 445232	600	69.850 (2¾)	82.550 (3¼)	51.050	77	79	1.5	GBR 526832	
76.200 (3)	LRB 485632	—	640	76.200 (3)	88.900 (3½)	51.050	83.5	86	2	BR 567232	
	—	LRBZ 485632	640	76.200 (3)	88.900 (3½)	51.050	83.5	86	1.5	GBR 567232	GBR 567232UU
	—	LRBZ 485632 B	640	76.200 (3)	88.900 (3½)	51.050	83.5	86	1.5	BR 567232UU	
82.550 (3¼)	LRB 526032	—	690	82.550 (3¼)	95.250 (3¾)	51.050	91	93	2.5	BR 607632	
	—	LRBZ 526032	690	82.550 (3¼)	95.250 (3¾)	51.050	91	93	1.5	GBR 607632	GBR 607632UU
	—	LRBZ 526032 B	690	82.550 (3¼)	95.250 (3¾)	51.050	91	93	1.5	BR 607632UU	
88.900 (3½)	LRB 566432	—	750	88.900 (3½)	101.600 (4)	51.050	97	99	2.5	BR 648032	
	—	LRBZ 566432	750	88.900 (3½)	101.600 (4)	51.050	97	99	1.5	GBR 648032	GBR 648032UU
95.250 (3¾)	—	LRBZ 606832	800	95.250 (3¾)	107.950 (4¼)	51.050	103	105	1.5	GBR 688432	GBR 688432UU

Note(1) Maximum allowable fillet corner radius of shaft

Remark LRBZ has no oil hole. LRB with inner ring bore diameter d of 76.200 mm or less and LRBZ···B are provided with an oil groove and an oil hole.
Other models are provided with an oil groove and two oil holes.

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

CAM FOLLOWERS

- Standard Type Cam Followers
- Solid Eccentric Stud Type Cam Followers
- Eccentric Type Cam Followers
- Thrust Disk Type Cam Followers
- C-Lube Cam Followers
- Centralized Lubrication Type Cam Followers
- Easy Mounting Type Cam Followers
- Cylindrical Roller Cam Followers
- Miniature Type Cam Followers
- Thrust Disk Type Miniature Cam Followers

Structure and Features

IKO Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring. These bearings are designed for outer ring rotation, and have superior rotational performance with a small coefficient of friction and high load capacity.

As studs already have threads or steps, they are easy to mount.

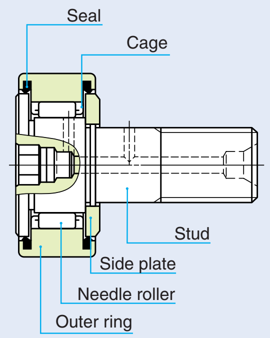
Cam Followers are follower bearings for cam mechanisms and linear motions and have high rigidity and high accuracy. They are, therefore, used widely for machine tools, industrial robots, electronic devices, and OA equipment.

Stainless steel made Cam Followers are superior in corrosion resistance and suitable for applications in environments where oil cannot be used or water splashed, and in clean rooms.

Structure of Cam Followers

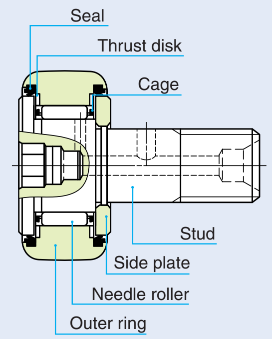
Structure of Standard Type Cam Follower[1]

CF···BUU



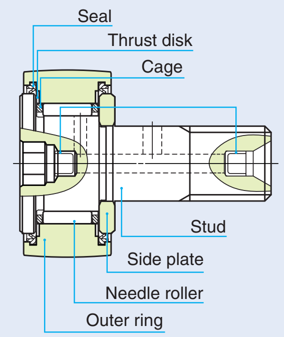
Structure of Thrust Disk Type Cam Follower

CF···WBUUR



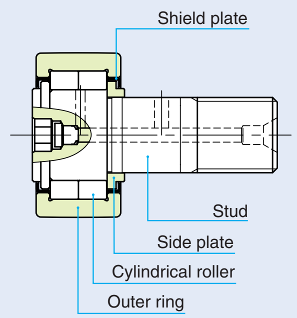
Structure of C-Lube Cam Follower[2]

CF···WBUUR/SG



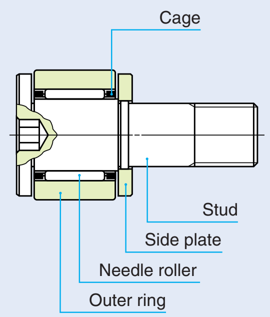
Structure of Cylindrical Roller Cam Follower

NUCF···BR



Structure of Miniature Type Cam Follower

CFS



Note(1) In case of the stud diameter (d_1) 5 to 10mm, a lubrication fitting is provided in the stud head hex hole. The stud diameter (d_1) 12 to 30mm, a grease nipple is provided in the stud head hex hole.
(2) For the detail of C-Lube, please refer page A55.

Types

For Cam Followers, the types shown in Table 1 are available.

Table 1 Type of Cam Followers

Type					With cage: Crowned outer ring	With cage: Cylindrical outer ring	Full complement: Crowned outer ring	Full complement: Cylindrical outer ring
Metric CF series	Standard Type Cam Followers CF…B	High carbon steel made	With hexagon hole	Shield type	CF…B R	CF…B	CF…VB R	CF…VB
				Sealed type	CF…BUUR	CF…BUU	CF…VBUUR	CF…VBUU
		Stainless steel made	With hexagon hole	Shield type	CF…FB R	CF…FB	—	—
				Sealed type	CF…FBUUR	CF…FBUU	—	—
	Solid Eccentric Stud Type Cam Followers CFES…B	High carbon steel made	With hexagon hole	Shield type	CFES…B R	CFES…B	—	—
				Sealed type	CFES…BUUR	CFES…BUU	—	—
	Eccentric Type Cam Followers CFE…B	High carbon steel made	With hexagon hole	Shield type	CFE…B R	CFE…B	CFE…VB R	CFE…VB
				Sealed type	CFE…BUUR	CFE…BUU	CFE…VBUUR	CFE…VBUU
	Thrust Disk Type Cam Followers CF…WB	High carbon steel made	With hexagon hole	Shield type	CF…WB R	—	—	—
				Sealed type	CF…WBUUR	—	—	—
		Stainless steel made	With hexagon hole	Shield type	CF…FWB R	—	—	—
				Sealed type	CF…FWBUUR	—	—	—
	Centralized Lubrication Type Cam Followers CF-RU1, CF-FU1	High carbon steel made	With screwdriver slot	Sealed type	CF-RU1	CF-FU1	—	—
	Easy Mounting Type Cam Followers CF-SFU…B	High carbon steel made	With hexagon hole	Sealed type	—	CF-SFU…B	—	—
C-Lube Cam Followers CF…WB…/SG		High carbon steel made	With hexagon hole	Sealed type	CF…WBUUR/SG	—	—	—
Cylindrical Roller Cam Followers NUCF…B		High carbon steel made	With hexagon hole	Shield type	—	—	NUCF…BR	—
Miniature CFS series	Miniature Type Cam Followers CFS	High carbon steel made	With hexagon hole	Shield type	—	CFS	—	CFS…V
		Stainless steel made		Shield type	—	CFS…F	—	CFS…FV
	Thrust Disk Type Miniature Cam Followers CFS…W	High carbon steel made	With hexagon hole	Shield type	—	CFS…W	—	CFS…WV
		Stainless steel made		Shield type	—	CFS…FW	—	—
Inch series	Inch series Cam Followers CR	High carbon steel made	With hexagon hole	Shield type	CR…B R	CR…B	CR…VB R	CR…VB
				Sealed type	CR…BUUR	CR…BUU	CR…VBUUR	CR…VBUU
			With screwdriver slot	Shield type	CR… R	CR…	CR…V R	CR…V
				Sealed type	CR…UUR	CR…UU	CR…V UUR	CR…V UUR
	Inch series Heavy Duty Cam Followers CRH	High carbon steel made	With hexagon hole	Shield type	—	—	CRH…VB R	CRH…VB
				Sealed type	—	—	CRH…VBUUR	CRH…VBUU
			With screwdriver slot	Shield type	—	—	CRH…V R	CRH…V
				Sealed type	—	—	CRH…V UUR	CRH…V UU

Standard Type Cam Followers

These are the basic type bearings in IKO Cam Follower series. Models with stud diameters ranging from 3 to 30 mm are prepared, and are suitable for a wide range of applications.

Solid Eccentric Stud Type Cam Followers

The stud of these bearings is eccentric to the center axis of the outer ring. Thus, the position of the outer ring in the radial direction in relation to the mating track surface can easily be adjusted by turning the stud, and the load distribution on a number of cam follower outer rings used on the same track surface can be made uniform.

These are eccentric cam followers with a one-piece stud that can be mounted in the same mounting holes as those for Standard Type Cam Followers.

Eccentricity is 0.25 mm～0.6 mm.

Eccentric Type Cam Followers

In these bearings, an eccentric collar is assembled with the Cam Follower stud, enabling the outer ring to be positioned easily in the radial direction against the mating track surface.

Eccentricity is 0.4～1.5 mm.

Thrust Disk Type Cam Followers

These bearings have special resin thrust disk washers superior in wear and heat resistance between the sliding surfaces of outer ring shoulders, stud head and side plate. These disk washers reduce friction and wear due to axial loads caused by misalignment, etc.

Centralized Lubrication Type Cam Followers

These bearings have one or two pipe-threaded holes in the stud. Thus, this series is suitable when centralized lubrication is required.

Easy Mounting Type Cam Followers

These bearings have a stepped tapered portion on the stud. When mounting the Cam Follower, it is easy to fix its location by tightening a set screw to the stepped portion. Thus, this type is suitable when a large number of Cam Followers are used in a machine such as a pallet changer.

C-Lube Cam Followers

These bearings are lubricated with a newly developed thermosetting solid-type lubricant which fills the inner space of the bearing. This lubricant provides long-term maintenance free.

Cylindrical Roller Cam Followers

These bearings are full complement type bearings incorporating double rows of full complement cylindrical rollers in the outer ring, and can withstand large radial loads and some axial loads.

Miniature Type Cam Followers

These are compactly designed bearings, incorporating very thin needle rollers in an outer ring with a small outside diameter. They are used in electronic devices, OA equipment, small index devices, etc.

Inch series Cam Followers

Two types, CR and CRH, are available in the Inch series Cam Followers. Black oxide film treatment is made on CRH models.

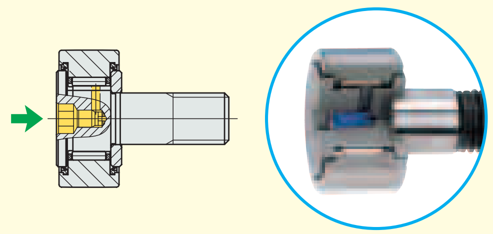
I
CF
NUCF
CFS
CR

Lubrication method of Hex Head Cam Followers

〈Types〉 **Standard Type, Solid Eccentric Stud Type, Eccentric Type, Thrust Disk Type, Easy Mounting Type, Cylindrical Roller Type.**

1 Way

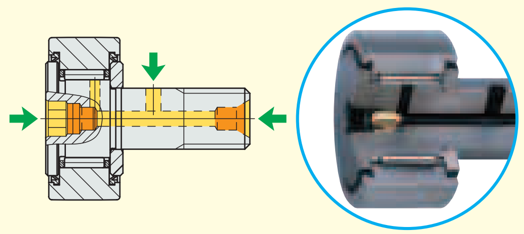
Stud dia. 5～10 mm



Re-greasing fitting is imcorporated in the stud head.

3 Ways

Stud dia. 12～30 mm



Grease nipple is imcorporated in the stud head.

Remark : All of Easy Mounting Type are 1way port.

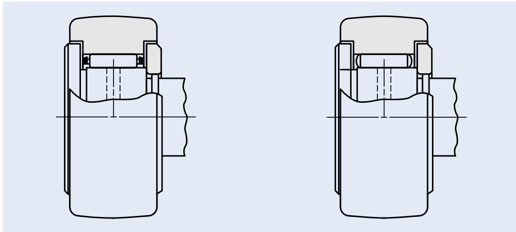
Internal Structures and Shapes

Various types are lined up in Cam Follower series, including the caged type, full complement type, shield type, sealed type, type with crowned outer ring, type with cylindrical outer ring, type with hexagonal hole, etc.

Roller guide method

Cam Followers include the caged type and the full complement type . The caged type has a small coefficient of friction and is suitable for high speed rotations, while the full complement type is suitable for heavy loads at low speed rotations.

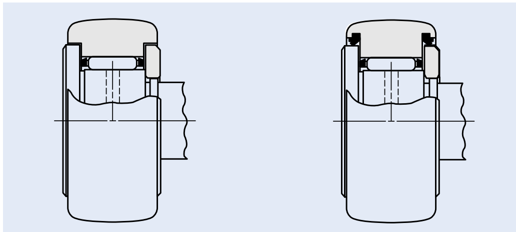
《With cage》 《Full complement》



Seal structure

Cam Followers include the shield type and the sealed type. In the shield type, the narrow clearances between the outer ring and the stud flange and between the outer ring and the side plate form labyrinths .
The sealed type incorporates seals in the narrow clearances to prevent the penetration of foreign particles.

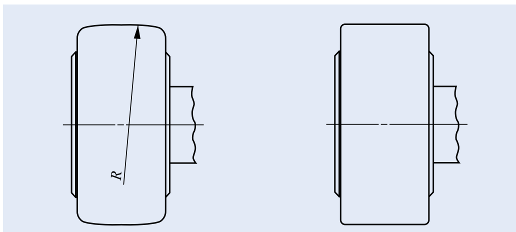
《Shield type》 《Sealed type》



Shape of outer ring outside surface

The outside surface of the outer ring of Cam Followers, which makes direct contact with the mating track surface, is either crowned or cylindrical. The crowned outer rings are effective in moderating the edge load due to mounting errors. The cylindrical outer rings have a large contact area with the mating track surface, and are suitable for applications in which the applied load is large or the track surface hardness is low.

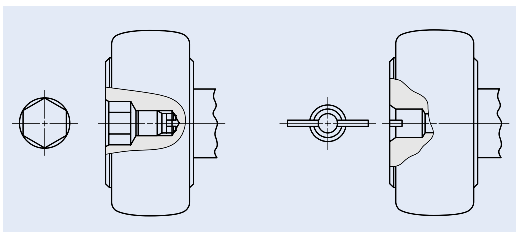
《Crowned outer ring》 《Cylindrical outer ring》



Shape of stud head

Cam Followers are available in two stud head shape types, namely, the type with screwdriver slot and the type with hexagon hole for hexagon bar wrench.

《With hexagon hole》 《With screwdriver slot》



Identification number

Some examples of the identification number of Cam Followers are shown below. For applicable material symbol, roller guide method, seal structure and shape of outer ring outside surface, refer dimension table of each series.

Examples of identification number

Example 1	CFS	3	F		V				P6	
Example 2	CF	10			V	B	UU	R		
Example 3	CF	5	F	W		B	UU	R		
Example 4	CF	8		W		B	UU	R		/SG

Model code	
CFS	Miniature Type Cam Follower
CFS···W	Thrust Disk Type Miniature Cam Follower
CF···B	Standard Type Cam Follower
CF···WB	Thrust Disk Type Cam Follower
CF···WB···/SG	C-Lube Cam Follower
CFES···B	Solid Eccentric Stud Type Cam Follower
CFE···B	Eccentric Type Cam Follower
CF-RU1	Centralized Lubrication Type Cam Follower (With crowned outer ring)
CF-FU1	Centralized Lubrication Type Cam Follower (With cylindrical outer ring)
CF-SFU···B	Easy Mounting Type Cam Follower
NUCF···B	Cylindrical Roller Cam Follower
CR···B	Inch series Cam Follower(With Hexagon socket)
CR	Inch series Cam Follower(With Screw driverslot)
CRH···B	Inch series Cam Follower(With Hexagon socket)
CRH	Inch series Cam Follower(With Screw driverslot)

Size
The value indicates a stud diameter. (unit: mm) In the inch series, the outside diameter of the outerring in units of 1/16 inch is indicated.

Material	
No symbol	High carbon steel made
F	Stainless steel made

Roller guide method(1)	
No symbol	With cage type
V	Full complement type

Note(1) Cylindrical Roller Cam Follwer is Full conplement type with "No Symbol".

Seal structure	
No symbol	Shield type
UU	Sealed type

Note(1) Centralized Lubrication Type and Easy Mounting Type are sealed Type with "No Symbol".

Shape of outer ring outside surface	
R	With crowned outer ring
No symbol	With cylindrical outer ring

Classification symbol		
No symbol	Class 0	
P6	Class 6	Applicable to Miniature CFS series
P5	Class 5	
P4	Class 4	

I
CF
NUCF
CFS
CR

Accuracy

The accuracy of Cam Followers is shown in Table 2, Table 3.1, Table 3.2 and Table 3.3. Cam Followers with special accuracy are also available. When they are required, please contact IKO.

Table 2 Tolerances

unit: μm

Dimensions and symbols \ Series	Miniature CFS series	Metric CF series (1)		Inch series	
		Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring
Outside dia. of outer ring D	See Table 3.1	0 -50	See Table 3.2	0 -50	See Table 3.3
Stud dia. d_1	h6	h7		+25 0	
Width of outer ring C	0 -120	0 -120		0 -130	

Note(1) Also applicable to the entire Cam Followers except Miniature series and Inch series.

Table 3.1 Tolerances and allowable values of outer rings (Miniature CFS series)

unit: μm

Δ_{Dmp} Single plane mean outside dia. deviation								K_{ea} Radial runout of assembled bearing outer ring (Max.)			
Class 0		Class 6		Class 5		Class 4		Class 0	Class 6	Class 5	Class 4
High	Low	High	Low	High	Low	High	Low				
0	-8	0	-7	0	-5	0	-4	15	8	5	4

Table 3.2 Tolerances and allowable values of outer rings (Metric CF series cylindrical outer rings)

unit: μm

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dsp} Outside dia. variation in a single radial plane (Max.)	V_{Dmp} Mean outside dia. variation (Max.)	K_{ea} Radial runout of assembled bearing outer ring (Max.)
Over	Incl.	High	Low			
6	18	0	- 8	10	6	15
18	30	0	- 9	12	7	15
30	50	0	-11	14	8	20
50	80	0	-13	16	10	25
80	120	0	-15	19	11	35

Table 3.3 Tolerances and allowable values of outer rings (Inch series cylindrical outer ring)

unit: μm

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dsp} Outside dia. variation in a single radial plane (Max.)	V_{Dmp} Mean outside dia. variation (Max.)	K_{ea} Radial runout of assembled bearing outer ring (Max.)
Over	Incl.	High	Low			
6	18	0	-25	10	6	15
18	30			12	7	15
30	50			14	8	20
50	80			16	10	25
80	120			19	11	35

Clearance

The radial internal clearances of Cam Followers are shown in Table 4.

Table 4 Radial internal clearance

unit: μm

Identification number				Radial internal clearance	
Miniature CFS series CFS, CFS…W	Metric CF series (1)	Cylindrical Roller Cam Followers	Inch series	Min.	Max.
CFS1.4～CFS5	CF 3B～CF 5 B	—	CR 8、CR 8-1、CRH 8-1、CRH 9	3	17
CFS6	CF 6B	—	CR10、CR10-1、CRH10-1、CRH11	5	20
—	CF 8B～CF12-1B	—	CR12～CR22、CRH12～CRH22	5	25
—	CF16B～CF20-1B	—	CR24～CR36、CRH24～CRH36	10	30
—	CF24B～CF30-2B	—	CR48、CRH40～CRH56	10	40
—	—	—	CRH64	15	50
—	—	NUCF10 B～NUCF24 B	—	20	45
—	—	NUCF24-1B～NUCF30-2B	—	25	50

Note(1) Only representative types are shown in the table, but this table is applicable to the entire Cam Followers except Miniature series, Cylindrical Roller Cam Followers, and Inch series.

Fit

Tables 5 and 6 show recommended tolerances of mounting holes for Cam Follower studs. Since the Cam Follower is supported in a cantilever position, the mounting hole diameter should be prepared without play between the stud and the hole especially when heavy shock loads are applied.

Table 5 Recommended fit

Type	Tolerance class of mounting hole for stud
Miniature CFS series	H6
Metric CF series (1)	H7
Inch series	F7

Note(1) Only representative types are shown in the table, but this table is applicable to the entire Cam Followers except Miniature series and Inch series.

Table 6 Dimensional tolerances of mounting hole

unit: μm

Nominal outside dia. of stud mm		F7		H6		H7	
Over	Incl.	Over	Incl.	Over	Incl.	Over	Incl.
—	3	+16	+ 6	+ 6	0	+10	0
3	6	+22	+10	+ 8	0	+12	0
6	10	+28	+13	+ 9	0	+15	0
10	18	+34	+16	+11	0	+18	0
18	30	+41	+20	+13	0	+21	0
30	50	+50	+25	+16	0	+25	0

Track Capacity

Track capacity is defined as a load which can be continuously applied on a Cam Follower placed on a steel track surface without causing any deformation or indentation on the track surface when the outer ring of the Cam Follower makes contact with the mating track surface (plane). The track capacities shown in Tables 7.1, 7.2 and 7.3 are applicable when the hardness of the mating track surface is 40HRC (Tensile strength 1250N/mm²). When the hardness of the mating track surface differs from 40HRC, the track capacity is obtained by multiplying the value by the track capacity factor shown in Table 8.
If lubrication between the outer ring and the mating track surface is insufficient, seizure and/or wear may occur depending on the application. Therefore, attention must be paid to lubrication and surface roughness of the mating track especially for high-speed rotations such as cam mechanisms.
For lubrication between the outer ring and the mating track surface, C-Lube Unit for Cam Followers is recommended.

Table 7.1 Track Capacity for Miniature Type Cam Follower CFS, CFS…W unit: N

Identification number with cylindrical outer ring	Track capacity
CFS1.4	128
CFS2	220
CFS2.5	298
CFS3	485
CFS4	799
CFS5	1 210
CFS6	1 680

Table 7.2 Track capacity for Metric series Cam Follower (1) unit: N

Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity
CF 3 BR	542	CF 3 B	1 360
CF 4 BR	712	CF 4 B	1 790
CF 5 BR	794	CF 5 B	2 210
CF 6 BR	1 040	CF 6 B	3 400
CF 8 BR	1 330	CF 8 B	4 040
CF10 BR	1 610	CF10 B	4 680
CF10-1BR	2 030	CF10-1B	5 530
CF12 BR	2 470	CF12 B	7 010
CF12-1BR	2 710	CF12-1B	7 480
CF16 BR	3 060	CF16 B	11 200
CF18 BR	3 660	CF18 B	14 500
CF20 BR	5 190	CF20 B	23 200
CF20-1BR	4 530	CF20-1B	21 000
CF24 BR	6 580	CF24 B	34 300
CF24-1BR	8 020	CF24-1B	39 800
CF30 BR	9 220	CF30 B	52 700
CF30-1BR	9 990	CF30-1B	56 000
CF30-2BR	10 800	CF30-2B	59 300

Note(1) This table is applicable to the entire Cam Followers except Miniature series and Inch series.

IKO

Table 7.3 Track capacity for Inch series Cam Followers unit: N

Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity	Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity
CR 8 R	770	CR 8	2 140	—	—	—	—
CR 8-1R	770	CR 8-1	2 360	CRH 8-1R	401	CRH 8-1	2 360
—	—	—	—	CRH 9 R	469	CRH 9	2 650
CR10 R	1 030	CR10	3 210	—	—	—	—
CR10-1R	1 030	CR10-1	3 480	CRH10-1R	579	CRH10-1	3 480
—	—	—	—	CRH11 R	658	CRH11	3 830
CR12 R	1 340	CR12	4 500	CRH12 R	853	CRH12	4 500
CR14 R	1 630	CR14	5 250	CRH14 R	1 050	CRH14	5 250
CR16 R	1 970	CR16	7 280	CRH16 R	1 420	CRH16	7 280
CR18 R	2 300	CR18	7 710	CRH18 R	1 660	CRH18	7 710
CR20 R	2 680	CR20	10 700	CRH20 R	2 160	CRH20	10 700
CR22 R	3 050	CR22	11 800	CRH22 R	2 450	CRH22	11 800
CR24 R	3 410	CR24	15 400	CRH24 R	3 410	CRH24	15 400
CR26 R	3 820	CR26	16 700	CRH26 R	3 820	CRH26	16 700
CR28 R	4 210	CR28	21 000	CRH28 R	4 210	CRH28	21 000
CR30 R	4 610	CR30	22 500	CRH30 R	4 610	CRH30	22 500
CR32 R	5 050	CR32	30 900	CRH32 R	5 690	CRH32	30 900
CR36 R	5 900	CR36	34 700	CRH36 R	6 640	CRH36	34 700
—	—	—	—	CRH40 R	8 970	CRH40	45 000
—	—	—	—	CRH44 R	10 200	CRH44	49 500
—	—	CR48	64 300	CRH48 R	11 400	CRH48	64 300
—	—	—	—	CRH52 R	12 700	CRH52	69 600
—	—	—	—	CRH56 R	14 100	CRH56	87 000
—	—	—	—	CRH64 R	16 800	CRH64	113 000

Table 8 Track capacity factor unit: N

Hardness HRC	Tensile strength N/mm²	Track capacity factor	
		With crowned outer ring	With cylindrical outer ring
20	760	0.22	0.37
25	840	0.31	0.46
30	950	0.45	0.58
35	1 080	0.65	0.75
38	1 180	0.85	0.89
40	1 250	1.00	1.00
42	1 340	1.23	1.15
44	1 435	1.52	1.32
46	1 530	1.85	1.51
48	1 635	2.27	1.73
50	1 760	2.80	1.99
52	1 880	3.46	2.29
54	2 015	4.21	2.61
56	2 150	5.13	2.97
58	2 290	6.26	3.39

Maximum Allowable Static Load

The applicable load on Cam Followers is, in some cases, limited by the bending strength and shear strength of the stud and the strength of the outer ring instead of the load rating of the needle roller bearing. Therefore, the maximum allowable static load that is limited by these strengths is specified.

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

Allowable Rotational Speed

The allowable rotational speed of Cam Followers is affected by mounting and operating conditions. For reference, Table 9 shows $d_1 n$ values when only pure radial loads are applied. Considering that axial loads also act under actual operating conditions, the recommended $d_1 n$ value is 1/10 of the value shown in the table.

In case of C-Lube Cam Follower or with C-Lube unit, $d_1 n$ value is 10000 or less.

In case of C-Lube Cam Follower or with C-Lube unit with axial loads, $d_1 n$ value is 10000 or 1/10 of the values in Table 9, whichever smaller.

Table 9 $d_1 n$ values of Cam Followers (1)

Type \ Lubricant	Grease	Oil
Caged type	84 000	140 000
Full complement type	42 000	70 000
Cylindrical Roller Cam Follower	66 000	110 000

Note(1) $d_1 n$ value $= d_1 \times n$
where, d_1 : Stud diameter mm
n : Rotational speed rpm

Lubrication

Grease-prepacked Cam Followers are shown in Table 10. The lubricating grease prepacked in these bearings is ALVANIA GREASE S2 (SHELL).

For Cam Followers without prepacked grease, grease should be packed through the oil hole in the stud for use. If they are used without grease, wear of rolling contact surfaces may take place, leading to a short bearing life.

Table 10 Grease-prepacked Cam Followers

○ : **With prepacked grease**
× : **Without prepacked grease**

Series	Size of stud dia. d_1 (1) mm		With cage: Shield type	With cage: Sealed type	Full complement type
Miniature series	CFS CFS···W		○	—	○
Metric series	CF···B CF···WB CFES···B CFE···B	$d_1 \leqq 5$	○	○	—
		$6 \leqq d_1 \leqq 10$	○	○	○
		$12 \leqq d_1$	×	○	○
C-Lube Cam Followers	CF···WB···/SG(2)		—	×	—
Centralized Lubrication Type Cam Followers	CF-RU1 CF-FU1		—	○	—
Easy Mounting Type Cam Followers	CF-SFU···B		—	○	—
Cylindrical Roller Cam Followers	NUCF···B		—	—	○
Inch series	CR···B CR		○	○	○
Inch series	CRH···B CRH		—	—	○

Notes(1) For Eccentric Type Cam Followers (CFE), thread diameter G shown in the table of dimensions is applicable.
(2) This Cam Follower incorporates C-Lube which includes a large amount of lubricating oil.

Oil Hole

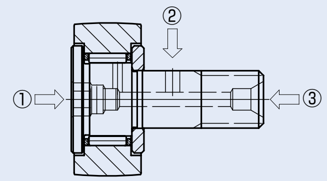
The position of oil hole is shown in Table 11. Regreasing cannot be made for models without a oil hole.

Grease should be supplied gently with a straight type grease gun as specified by JIS B 9808:1991, which is applied carefully to the nipple head from the front.

When NPT type grease nipple on Table 17 or NPB type grease nipple on Table 15 is attached on stud end, it is possible to lubricate with a general grease gun from NPT or NPB type grease nipple without lubrication nozzle on Table 12.

Some type of Cam Followers that oil hole is not prepared on Table 11 cannot be lubricated.

Table 11 Position of oil hole



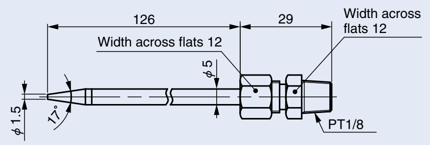
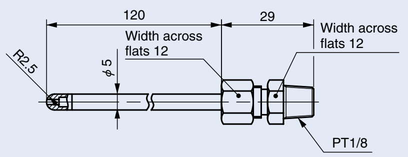
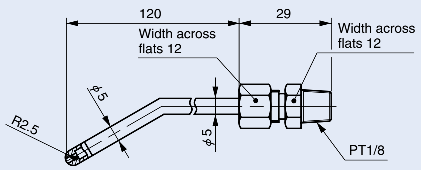
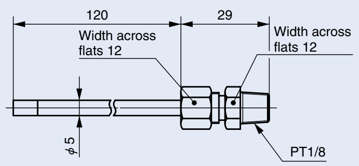
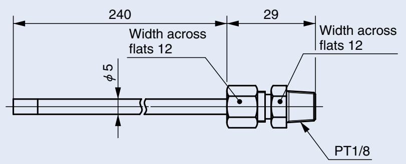
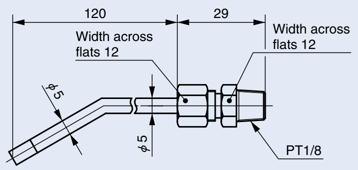
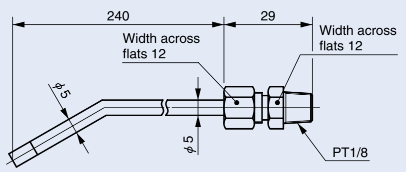
○ : **Oil hole is prepared.**

Series		Size of stud dia. d_1 (1) mm	① Stud head	② Stud outside surface	③ Stud end
Miniature Type Cam Follower Thrust Disk Type Miniature Cam Follower	CFS CFS···W		—	—	—
Standard Type Cam Follower Thrust Disk Type Cam Follower Solid Eccentric Stud Type Cam Follower Eccentric Type Cam Follower Cylindrical Roller Cam Follower	CF···B CF···WB CFES···B CFE···B NUCF···B	$d_1 \leqq 4$	—	—	—
		$5 \leqq d_1 \leqq 10$	○(2)	—	—
		$10 < d_1$	○(3)	○	○
C-Lube Cam Follower	CF···WB···/SG		—	—	—
Centralized Lubrication Type Cam Follower(4)	CF－RU1, CF－FU1	$d_1 \leqq 12$	○	—	—
		$12 < d_1$	○	○	○
Easy Mounting Type Cam Follower	CF－SFU···B	$d_1 \leqq 10$	○(2)	—	—
		$10 < d_1$	○(5)	—	—
Inch series Cam Follower	CR···B (With Hexagon socket)	$d_1 \leqq 6.35$	—	—	—
		$6.35 < d_1$	—	○	○
Inch series Cam Follower	CR (With Screw driverslot)	$d_1 \leqq 6.35$	○	—	—
		$6.35 < d_1$	○	○	○
Inch series Cam Follower	CRH···B (With Hexagon socket)	$d_1 \leqq 7.938$	—	—	—
		$7.938 < d_1$	—	○	○
Inch series Cam Follower	CRH (With Screw driverslot)	$d_1 \leqq 7.938$	○	—	—
		$7.938 < d_1$	○	○	○

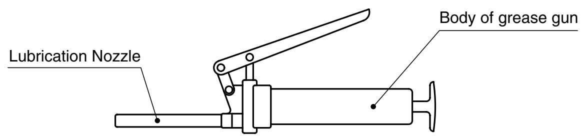
Notes(1) In case of Eccentric Type Cam Followers (CFE), thread diameter G shown in the table of dimensions is applicable in place of stud dia. and the oil hole on the outer surface of the stud cannot be used for lubrication.
(2) Re-lubrication can be made from the re-greasing fitting that is inserted into the hexagon hole.
(3) Grease nipple is incorporated in the hexagon hole. Re-greasing can be made from the stud head and the stud end by press fitting a supplied grease nipple into the stud end.
(4) Tapped holes for oil connectors are provided at the stud end and hole of the head.
(5) Re-greasing can be made from the grease nipple in the hexagon hole.

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

Table 12 Type and Dimension of Lubrication Nozzles

Type	Dimension	Applicable grease nipple and re-grease fitting
A-5126T		NPF4-1 (1) NPF6-1 (1) Re-grease fitting (1)
A-5120R		NPF4-1 (1) NPF6-1 (1)
B-5120R		
A-5120V		NPT4-1 NPT6-1 NPB2 NPB3 NPB3-1 NPB4
A-5240V		
B-5120V		
B-5240V		

Note(1) HSP-3(Yamada Corporation)can be used for them.
Remark The above nozzles can be atached on the standard grease gun shown below.
If required, please consule to IKO with type of lubrication Nozzle.



Accessories

Cam Follower accessories are shown in Table 13.
Grease nipple dimensions are shown in Table 14.
Dimensions of plug for unused oil hole and dimensions of plug inserter are shown in Table 16.

Table 13 Accessories

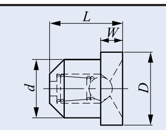
○ : Attached

Series (1)	Size of stud dia. d_1 mm	Grease nipple	Plug	Nut	Spring washer
Miniature Type Cam Follower CFS Thrust Disk Type Miniature Cam Follower CFS…W		–	–	○	–
Standard Type Cam Follower CF…B Thrust Disk Type Cam Follower CF…WB Solid Eccentric Stud Type Cam Follower CFES…B Cylindrical Roller Cam Follower NUCF…B	$d_1 \leqq 10$	–	–	○	–
	$12 \leqq d_1$	○	–	○	–
C-Lube Cam Follower CF…WB…/SG		–	–	○	–
Eccentric Type Cam Follower CFE…B	$d_1 \leqq 10$	–	–	○	○
	$12 \leqq d_1$	○	–	○	○
Centralized Lubrication Type Cam Follower CF－RU1、CF－FU1		–	–	○	–
Easy Mounting Type Cam Follower CF－SFU…B		–	–	–	–
Inch series Cam Follower CR…B (With Hexagon socket)	$d_1 \leqq 6.35$	–	–	○	–
	$9.525 \leqq d_1$	○	○	○	–
Inch series Cam Follower CR (With Screw driverslot)		○	○	○	–
Inch series Cam Follower CRH…B (With Hexagon socket)	$d_1 \leqq 7.938$	–	–	○	–
	$11.112 \leqq d_1$	○	○	○	–
Inch series Cam Follower CRH (With Screw driverslot)		○	○	○	–

Note(1) For Eccentric Type Cam Follower CFE, thead diameter G is applied.

Table 14 Dimensions of grease nipple for standerd Cam Follwer(1)

Code number	Dimensions mm d	D	L	W	Size of stud dia. d_1 (2) mm
NPF4-1	4	5	5	1.5	12～16
NPF6-1	6	7	8	2	18～30



Notes(1) This table is applicable except Inch series.
(2) For Eccentric Type Cam Follower CFE, thread diameter G is applied.

Table 15 Dimensions of Grease nipple for Inch series

Code number	Dimensions mm d	D	D_1	L	L_1	W	Applicable Cam Followers
NPB2	3.18	7.5	6	9	5.5	1.5	CR8～CR10-1、CRH8-1～CRH11
NPB3	4.76	7.5	6	10	5.5	1.5	CR12～CR22、CRH12～CRH22
NPB3-1	4.76	7.5	6	12.5	5.5	1.55	CR24～CR36、CRH24～CRH44
NPB4	6.35	8.5	6	13	6	2	CR48、CRH48～CRH64

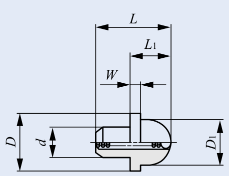
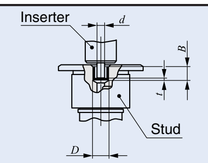


Table 16 Dimensions of plug for Inch series

Code number	Dimensions of plug mm D	t	B	Dimension of inserter mm $d\,^{0}_{-0.1}$	Applicable Cam Followers
USB2F	3.18	0.3	3.3	2.3	CR8 ～CR10-1
USB3F	4.76	0.4	4.3	3.7	CR12～CR36、CRH12 ～CRH44
USB4F	6.35	0.5	4.8	5.2	CR48、CRH48～CRH64



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

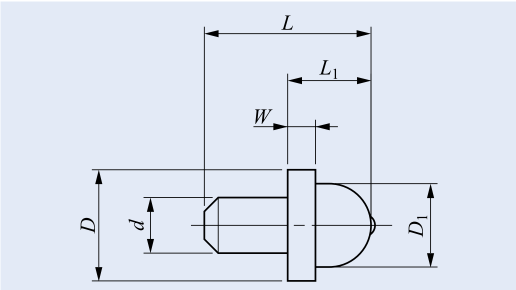
Optional Specification

NPT type grease nipple in Table 17 can be attached instead of standard accessories by direction. With NPT type grease nipple, it is possible to lubricate with a general grease gun (JIS B 9808:1991) without lubrication nozzle on Table 12. If required, please order with supplemental code, "/NP" at the end of identification number.

Example of Identification Number.

CF 12 BUUR ／ NP

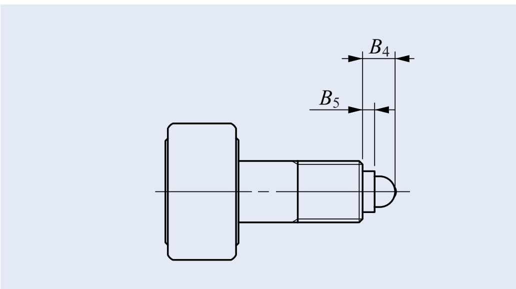
Table 17 Dimension of NPT type grease nipple.



Code number	Dimension of grease nipple mm						Size of stud dia. d_1 (1) mm
	d	D	D_1	L	L_1	W	
NPT4-1	4	8	6	12	6	2	12～16
NPT6-1	6	8	6	14	8	4	18～30

Note(1) For Eccentric Type Cam Follower CFE, thread diameter G is applied.

Table 18 Dimension of assembled NPT type grease nipple.



Code number	Dimension mm		Size of stud dia. d_1 (1) mm
	B_4	B_5	
NPT4-1	6	2	12～16
NPT6-1	6	2	18～30

Note(1) For Eccentric Type Cam Follower CFE, thread diameter G is applied.

Operating Temperature Range

The operating temperature range for IKO Cam Followers is -20˚C～+120˚C. Please pay attention as the types shown in table 19 have different range.

Table 19 Restricted Operating Temperature Range

Type / Size of stud dia. d_1 mm		With cage: Shield type	With cage: Sealed type
Miniature Type Cam Followers CFS Thrust Disk Type Miniature Cam Followers CFS…W	d_1＝2	−20℃～110℃(1)	—
Standard Type Cam Followers CF…B Thrust Disk Type Cam Followers CF…WB	d_1＝3、4	−20℃～110℃(1)	−20℃～80℃
	d_1＝5	−20℃～120℃	−20℃～80℃
Stainless Steel Standard Type Cam Followers CF…FB Stainless Steel Thrust Disk Type Cam Followers CF…FWB	$3 \leqq d_1 \leqq 5$	−20℃～110℃(1)	−20℃～80℃
C-Lube Cam Followers CF…WB…/SG	$5 \leqq d_1 \leqq 20$	—	−15℃～80℃(2)

Notes(1) 100 degree C in continuous operation.
(2) 60 degree C or lower is recommended in long time.

Mounting

❶Make the center axis of the mounting hole perpendicular to the moving direction of the Cam Follower and match the side shoulder accurately with the seating surface indicated by dimension f in the table of dimensions. (See Fig. 1.) Then, fix the Cam Follower with the nut. Do not hit the flange head of the Cam Follower directly with a hammer, etc. This may lead to a bearing failure such as irregular rotation or cracking.

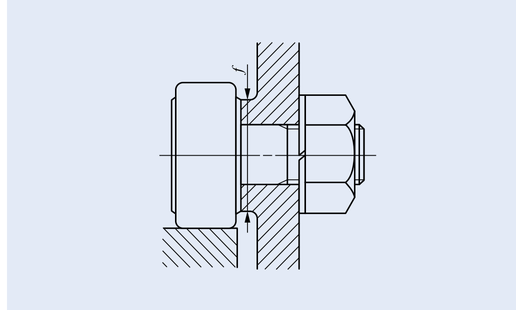


Fig. 1 Seating surface

❷The IKO mark on the flange head of the stud indicates the position of the oil hole on the raceway. Avoid locating the oil hole within the loading zone. This may lead to a short bearing life. (See Fig. 2.) The hole located in the middle part of the stud perpendicular to the stud center axis is used for greasing or locking.

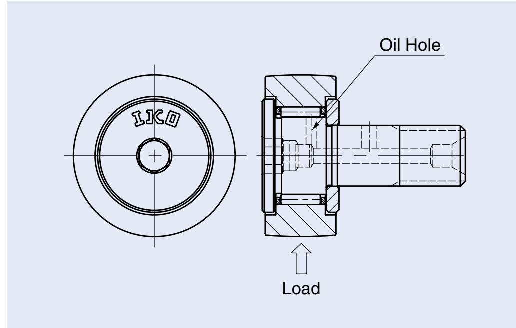


Fig. 2 Oil hole position and loading direction

❸When tightening the nut, the tightening torque should not exceed the values shown in the table of dimensions . If the tightening torque is too large, it is possible that the threaded portion of the stud will be broken. When there is a possibility of loosening, a special nut such as a lock nut, spring washer, or self-locking nut should be used.

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

❹Solid Eccentric Stud Type Cam Followers and Eccentric Type Cam Followers, are mounted in reference position where IKO mark on the head of stud is located as Fig.3. The outer ring position can be adjusted appropriately by turning the stud with a screwdriver or hexagon bar wrench using the screwdriver slot or hexagon hole of the stud head. The stud is fixed with a nut and a spring washer, etc. The tightening torque should not exceed the values of maximum tightening torque shown in the table of dimensions.
When shock loads are applied and the adjusted eccentricity has to be ensured, it is recommended to make holes in the housing, stud and eccentric collar, and fix the stud with a dowel pin as shown in Fig. 4. However, when the stud diameter is less than 8 mm (Eccentric collar diameter 11 mm), it is difficult to make a hole in the stud because the stud is through-hardened.

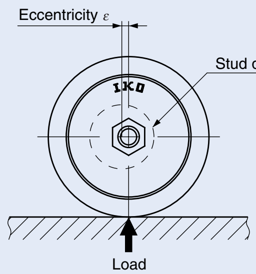


Fig. 3 Reference position for adjusting of Solid Eccentric Stud Type Cam Followers and Eccentric Type Cam Follwers

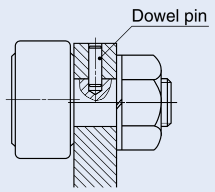


Fig. 4 Mounting example of Solid Eccentric Stud Type Cam Follower

❺In case of Eccentric Type Cam Followers (CFE), the length of the mounting hole should be more than 0.5 mm longer than the dimension B_3 (Eccentric collar width) shown in the table of dimensions. (See Fig. 5.)

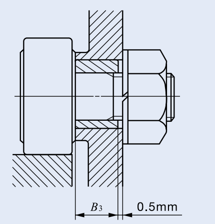
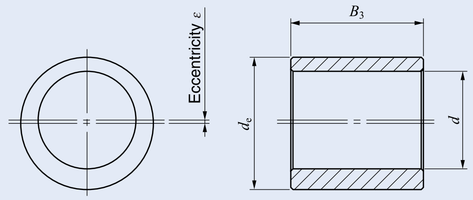


Fig. 5 Length of the mounting hole of Eccentric Type Cam Follower

❻Eccentric callor is available for Inch series Cam Followers.
Cam Followers with Eccentric collars, CRE are also available. If required, please consult with IKO.

Table 20 Eccentric collars for Inch series Cam Followers



unit: mm

Identifical number of collar	Outer diameter of collar de	Length of collar B_3	Eccentricity ε	Stud dia. d	Applicable Cam Followers
EB 8	6.350 (1/4)	6.350 (1/4)	0.250	4.826	CR 8, CR 8-1 (V)(B)(R)(UU)
EB10	9.525 (3/8)	9.525 (3/8)	0.380	6.350 (1/4)	CR10, CR10-1 (V)(B)(R)(UU)
EB12	12.700 (1/2)	12.700 (1/2)	0.380	9.525 (3/8)	CR12, CR14 (V)(B)(R)(UU)
EB16	15.875 (5/8)	15.875 (5/8)	0.760	11.112 (7/16)	CR16, CR18 (V)(B)(R)(UU)
EB20	17.450	17.450	0.760	12.700 (1/2)	CR20, CR22 (V)(B)(R)(UU)
EB24	22.225 (7/8)	22.225 (7/8)	0.760	15.875 (5/8)	CR24, CR26 (V)(B)(R)(UU)
EB28	25.400 (1)	25.400 (1)	0.760	19.050 (3/4)	CR28, CR30 (V)(B)(R)(UU)
EB32	30.150	30.150	0.760	22.225 (7/8)	CR32, CR36 (V)(B)(R)(UU)
EB48	44.450 (1 3/4)	44.450 (1 3/4)	1.520	31.750 (1 1/4)	CR48 VUU

❼For mounting Easy Mounting Type Cam Followers, it is recommended to fix the fixing screw from the upper side to the stepped portion of the stud. (See Fig. 6.)

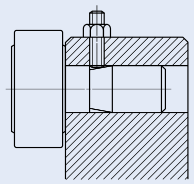


Fig. 6 Mounting example of Easy Mounting Type Cam Follower

Precaution For Use

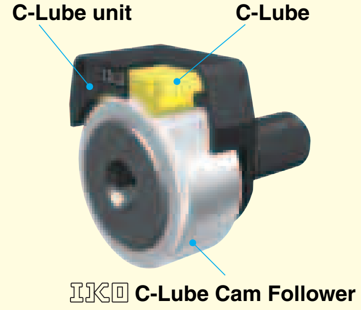
❶Do not wash C-Lube Cam Follower with organic solvent and/or white kerosene, which have the ability of removing fat nor leave them in contact with the above agents.

❷To ensure normal rotation of the C-Lube Cam Follower, apply a load of 1% or over of the dynamic load rating at use.

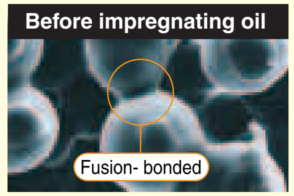
Option Parts

C-Lube Unit for Cam Followers

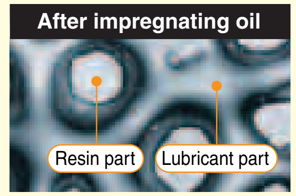
Structure of C-Lube Unit for Cam Followers



Magnified photos of C-Lube



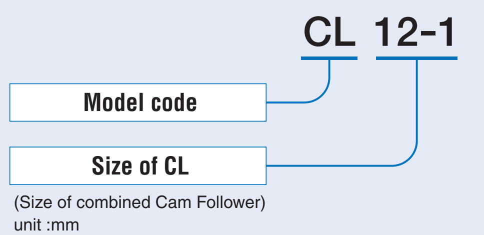
Resin particles are strongly fusion bonded.



Lubricant is retained in cavities amongst resin particles.

Identification number

The identification number example of IKO C-Lube Unit is shown below.



Allowable rotation speed

The rotation speed of IKO Cam Follower with C-Lube Unit should not exceeded d_1n=10,000 for reference.

$$d_1n=d_1 \times n$$

d_1 : Stud diameter of Cam Follower, mm
n : Rotational speed, rpm

Minimum rotational angle

Lubricating oil is supplied to the whole external diameter surface of the outer ring. Accordingly, use the product in a condition in which the outer ring makes one or more turns.

Operating temperature

Allowable operating temperature range of IKO Cam Follower with C-Lube Unit is -15 to 80˚C.

Mounting

❶Set the C-Lube Unit perpendicularly to the center axis of Cam Follower and fix together with Cam Follower by tightening nut.

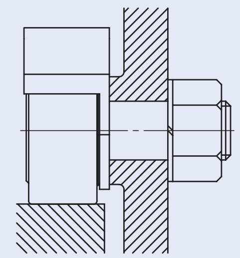


Fig. 7 Mounting of C-Lube Unit

❷Position of C-Lube Unit is adjustable. C-Lube Unit must be positioned avoiding loading direction.

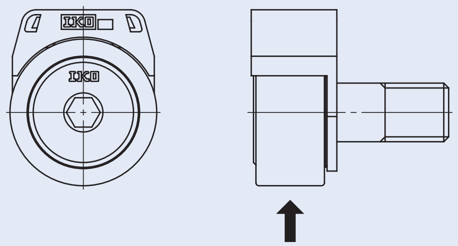


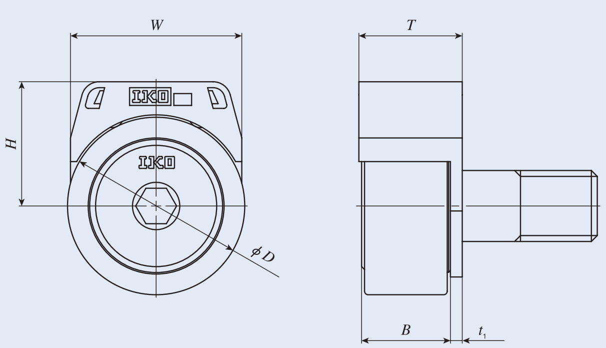
Fig. 8 Load direction of Cam Follwer

❸When tightening the nut, the tightening torque should not be exceeded the value maximum tightening torque on dimension table.

❹In case loosening of the nut is predicted due to vibration, using lock nut, spring washer and other special washer are recommended.

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

Table 21 Dimensions of C-Lube Unit for Cam Followers



Model number	Boundary Dimensions mm				Applicable Cam Followers		
						Boundary Dimensions mm	
	W	*H*	*T*	t_1	Model number [1]	*D*	*B* max
CL 5	12.4	10.7	12.1	1.5	CF 5 B	13	10
CL 6	15.4	12.6	14	1.5	CF 6 B	16	12.2
CL 8	18.4	14.2	14	1.5	CF 8 B	19	12.2
CL 10	21	17	15.5	2	CF 10 B	22	13.2
CL 10-1	21	19.2	15.5	2	CF 10-1 B	26	13.2
CL 12	29	21	17.5	2	CF 12 B	30	15.2
CL 12-1	29	22	17.5	2	CF 12-1 B	32	15.2
CL 16	33.8	27.4	23.4	2.5	CF 16 B	35	19.6
CL 18	38.8	30.4	25.4	2.5	CF 18 B	40	21.6
CL 20	45.8	38.4	29.9	3	CF 20 B	52	25.6
CL 20-1	45.8	35.4	29.9	3	CF 20-1 B	47	25.6

Note[1] Only representative types shown in the table, but also applicable to the same size of Metric series, with thrust disk type, centralized lubrication type, C-Lube Cam Followers and Cylindrical Roller Cam Followers. Combine with C-Lube Cam Followers is strongly recommended for full maintenance free.

Precaution for use

❶The maximum allowable load on IKO Cam Follower with C-Lube Unit is, 80% of the maximum allowable load of the needle bearing.
C-Lube Unit may be damaged and influenced to the smooth roatation and lubricating performance by excessive load.

❷After assemling C-Lube Unit and Cam Followers in the machine, please confirm that C-Lube unit provides oil correctly to the track surface before actual operation.

❸Do not use in the environment which contamination of liquid and/or harmful foreign matter are expected.

❹Do not wash with organic solvent and/or white kerosene, which have the ability of removing fat nor leave them in contact with the above agents.

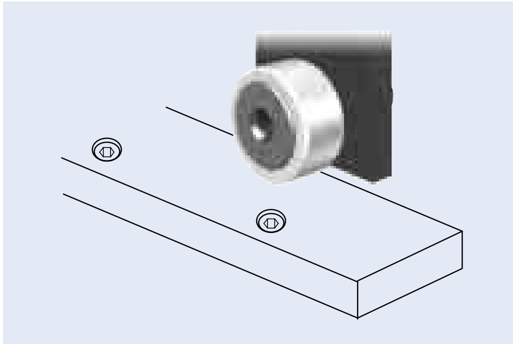
❺To ensure normal rotation of the Cam Follower, apply a load of 1% or over of the dynamic load rating at use.
Also, the outer ring needs to be rotate over a revolution to supply lubricant on entire outer diameter surface.

❻Replace with new C-Lube Unit when inside oil finishes completely. Re-lubrication is not possible.

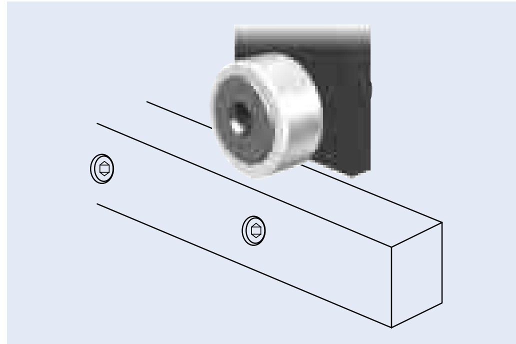
❼Do not apply a load onto the C-Lube Unit directly.

Ready-made Track for Cam Followers

The accuracy of the track, which an outer ring of Cam Followers contacts, greatly influences to the running performance of Cam Followers and equipments. Ready-made Track for Cam Followers is a high precision track, which was designed to achieve the original performance of Cam Followers. It can be easily installed with fixing bolts. Depending on mounting direction, two forms of A type and the B type can be selectable.



≪A type Track≫



≪B type Track≫

❶Identification Number
An example of identification number is shown below.

TRLA - 800 - 49 - 22

Model code
TRLA TRLB

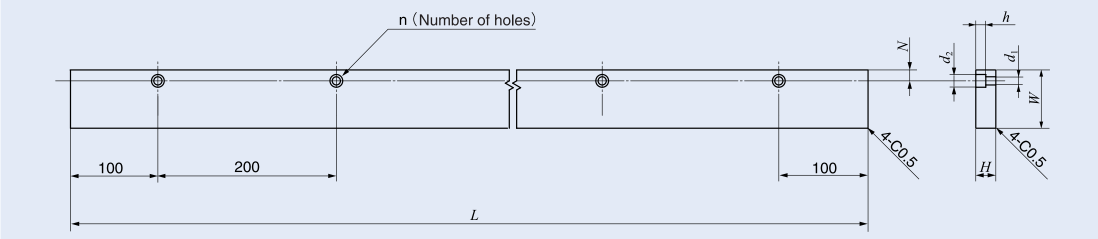
Overall length
mm

Width
mm

Height
mm

❷Dimensions

≪A type Track≫

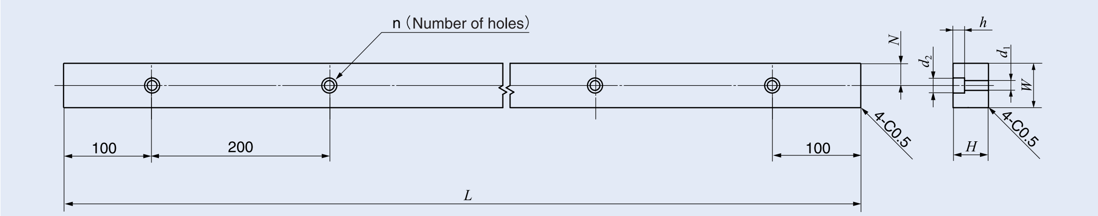


Material : SKS3 or equivalent
Surface hardness : HRC40 or more

Identification number	Nominal dimensions mm						
	L(n)	W	H	N	d_1	d_2	h
TRLA- 600-40-22		40					
TRLA- 600-49-22	600(3)	49					
TRLA- 600-64-22		64					
TRLA- 800-40-22		40					
TRLA- 800-49-22	800(4)	49	22	12	9	14	11
TRLA- 800-64-22		64					
TRLA-1000-40-22		40					
TRLA-1000-49-22	1000(5)	49					
TRLA-1000-64-22		64					

Remark : When a special track with different dimensions, please consult with IKO.

≪B type Track≫



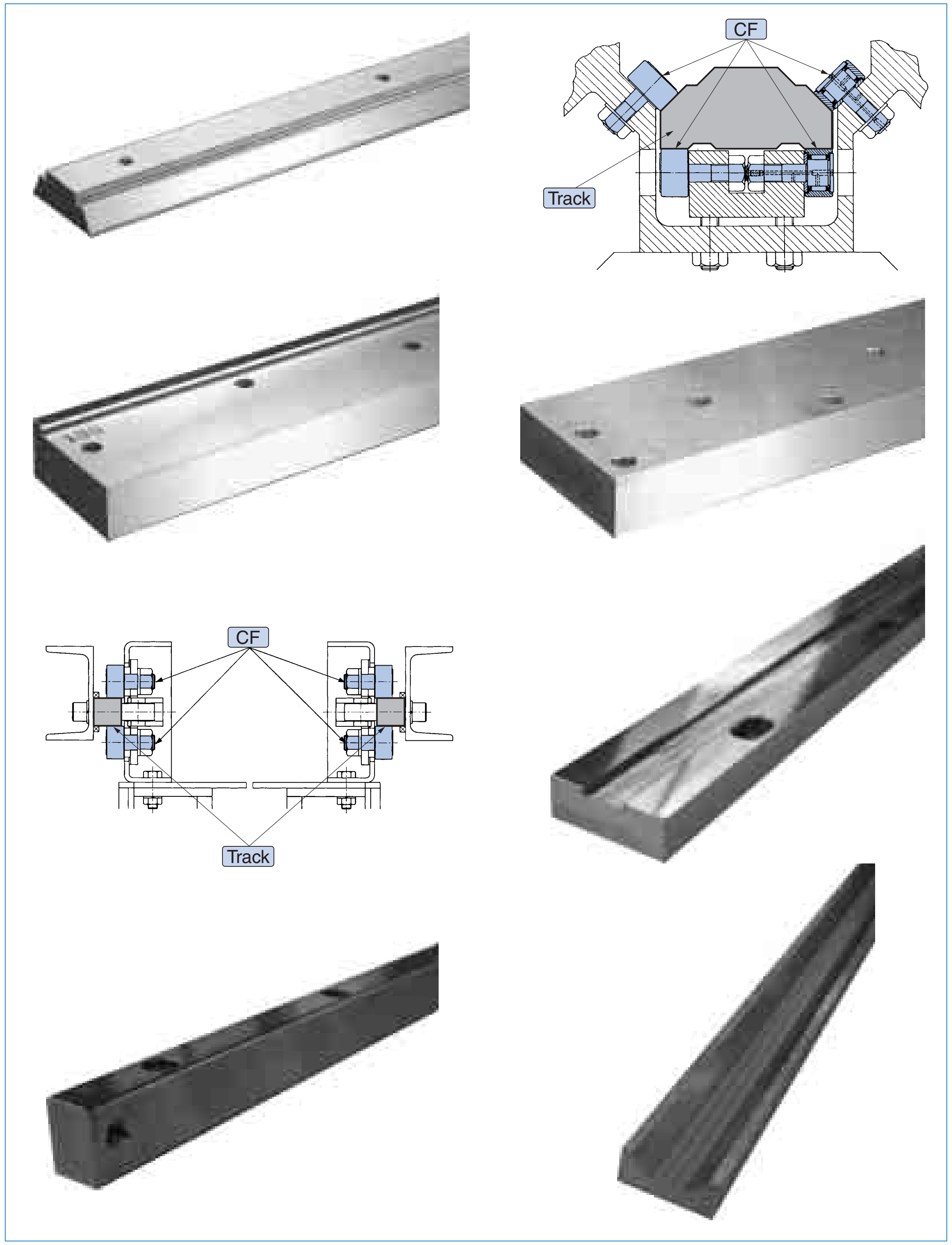
Material : SKS3 or equivalent
Surface hardness : HRC40 or more

Identification number	Nominal dimensions mm						
	L(n)	W	H	N	d_1	d_2	h
TRLB- 600-34-22	600(3)	34	22	17	9	14	11
TRLB- 600-50-40		50	40	25	11	17	13
TRLB- 800-34-22	800(4)	34	22	17	9	14	11
TRLB- 800-50-40		50	40	25	11	17	13
TRLB-1000-34-22	1000(5)	34	22	17	9	14	11
TRLB-1000-50-40		50	40	25	11	17	13

Remark : When a special track with different dimensions, please consult with IKO.

Application Example

Application examples of special track for Cam Followers are shown as below.
When a special track with different dimensions. please consult with IKO.

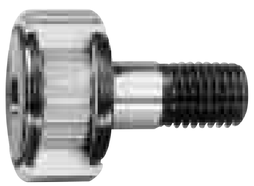


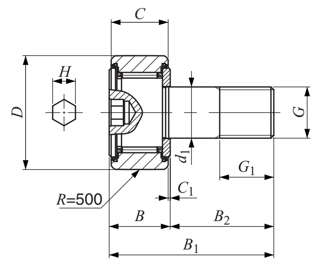
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

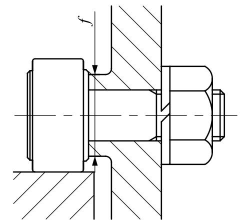
CAM FOLLOWERS

IKO

C-Lube Cam Followers With Cage / With Hexagon Hole







Stud dia. 5—20mm

Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
5	CF 5 WBUUR/SG	10.3	13	9	5	M 5×0.8	7.5	10	23	13	0.5	3	9.3	1.6	2 520	2 140	1 260
6	CF 6 WBUUR/SG	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	0.6	3	11	2.7	3 660	3 650	1 950
8	CF 8 WBUUR/SG	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	0.6	4	13	6.5	4 250	4 740	4 620
10	CF 10 WBUUR/SG	45	22	12	10	M10×1.25	12	13.2 max	36.2 max	23	0.6	4	16	13.8	5 430	6 890	6 890
	CF 10-1 WBUUR/SG	60	26	12	10	M10×1.25	12	13.2 max	36.2 max	23	0.6	4	16	13.8	5 430	6 890	6 890
12	CF 12 WBUUR/SG	95	30	14	12	M12×1.5	13	15.2 max	40.2 max	25	0.6	6	21	21.9	7 910	9 790	9 790
	CF 12-1 WBUUR/SG	105	32	14	12	M12×1.5	13	15.2 max	40.2 max	25	0.6	6	21	21.9	7 910	9 790	9 790
16	CF 16 WBUUR/SG	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	0.8	6	26	58.5	12 000	18 300	18 300
18	CF 18 WBUUR/SG	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	0.8	8	29	86.2	14 800	25 200	25 200
20	CF 20 WBUUR/SG	460	52	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	0.8	8	34	119	20 700	34 600	34 600
	CF 20-1 WBUUR/SG	385	47	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	0.8	8	34	119	20 700	34 600	34 600

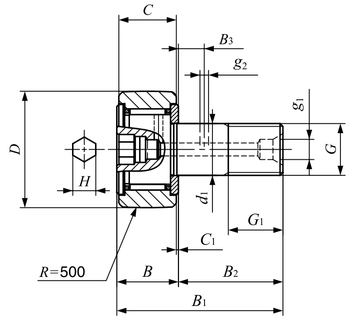
Remarks
1. Please do not Wash with organic solvent and/or white kerosene which have the ability to remove fat.
2. To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
3. The operating temperature range is -15～+80°C. Continuous operating temperature is +60°C or less.
4. Regreasing is not possible as the bearing internal space is filled with thermosetting solid-type lubricant C-Lube.
5. A nut is supplied with the stud.

I
CF
NUCF
CFS
CR

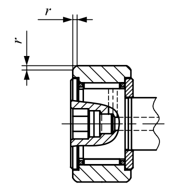
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

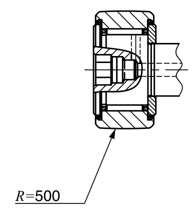
Standard Type Cam Followers With Cage/With Hexagon Hole



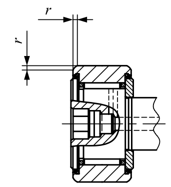
CF…BR



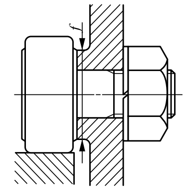
CF…B



CF…BUUR



CF…BUU



Stud dia. 3—30 mm

Stud dia.	Identification number				Mass (Ref.)					Boundary dimensions mm										Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring		D	C	d_1	G	G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$[1]	f Min.		C	C_0	
mm					g															mm	N-m	N	N	N
3	CF 3 BR	CF 3 B	CF 3 BUUR	CF 3 BUU	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	0.2	6.8	0.34	1 500	1 020	384
4	CF 4 BR	CF 4 B	CF 4 BUUR	CF 4 BUU	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	0.3	8.3	0.78	2 070	1 590	834
5	CF 5 BR	CF 5 B	CF 5 BUUR	CF 5 BUU	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	0.3	9.3	1.6	2 520	2 140	1 260
6	CF 6 BR	CF 6 B	CF 6 BUUR	CF 6 BUU	18.5	16	11	6	M 6×1	8	12.2max	28.2max	16	—	0.6	—	—	3	0.3	11	2.7	3 660	3 650	1 950
8	CF 8 BR	CF 8 B	CF 8 BUUR	CF 8 BUU	28.5	19	11	8	M 8×1.25	10	12.2max	32.2max	20	—	0.6	—	—	4	0.3	13	6.5	4 250	4 740	4 620
	CF 8 BRM	CF 8 BM	CF 8 BUURM	CF 8 BUUM	28.5	19	11	8	M 8×1	10	12.2max	32.2max	20	—	0.6	—	—	4	0.3	13	7.1	4 250	4 740	4 620
10	CF 10 BR	CF 10 B	CF 10 BUUR	CF 10 BUU	45	22	12	10	M10×1.25	12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	13.8	5 430	6 890	6 890
	CF 10 BRM	CF 10 BM	CF 10 BUURM	CF 10 BUUM	45	22	12	10	M10×1	12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	14.7	5 430	6 890	6 890
	CF 10-1 BR	CF 10-1 B	CF 10-1 BUUR	CF 10-1 BUU	60	26	12	10	M10×1.25	12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	13.8	5 430	6 890	6 890
	CF 10-1 BRM	CF 10-1 BM	CF 10-1 BUURM	CF 10-1 BUUM	60	26	12	10	M10×1	12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	14.7	5 430	6 890	6 890
12	CF 12 BR	CF 12 B	CF 12 BUUR	CF 12 BUU	95	30	14	12	M12×1.5	13	15.2max	40.2max	25	6	0.6	4	3	6	0.6	21	21.9	7 910	9 790	9 790
	CF 12-1 BR	CF 12-1 B	CF 12-1 BUUR	CF 12-1 BUU	105	32	14	12	M12×1.5	13	15.2max	40.2max	25	6	0.6	4	3	6	0.6	21	21.9	7 910	9 790	9 790
16	CF 16 BR	CF 16 B	CF 16 BUUR	CF 16 BUU	170	35	18	16	M16×1.5	17	19.6max	52.1max	32.5	8	0.8	4	3	6	0.6	26	58.5	12 000	18 300	18 300
18	CF 18 BR	CF 18 B	CF 18 BUUR	CF 18 BUU	250	40	20	18	M18×1.5	19	21.6max	58.1max	36.5	8	0.8	6	3	8	1	29	86.2	14 800	25 200	25 200
20	CF 20 BR	CF 20 B	CF 20 BUUR	CF 20 BUU	460	52	24	20	M20×1.5	21	25.6max	66.1max	40.5	9	0.8	6	4	8	1	34	119	20 700	34 600	34 600
	CF 20-1 BR	CF 20-1 B	CF 20-1 BUUR	CF 20-1 BUU	385	47	24	20	M20×1.5	21	25.6max	66.1max	40.5	9	0.8	6	4	8	1	34	119	20 700	34 600	34 600
24	CF 24 BR	CF 24 B	CF 24 BUUR	CF 24 BUU	815	62	29	24	M24×1.5	25	30.6max	80.1max	49.5	11	0.8	6	4	12	1	40	215	30 500	52 600	52 000
	CF 24-1 BR	CF 24-1 B	CF 24-1 BUUR	CF 24-1 BUU	1 140	72	29	24	M24×1.5	25	30.6max	80.1max	49.5	11	0.8	6	4	12	1	40	215	30 500	52 600	52 000
30	CF 30 BR	CF 30 B	CF 30 BUUR	CF 30 BUU	1 870	80	35	30	M30×1.5	32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100
	CF 30-1 BR	CF 30-1 B	CF 30-1 BUUR	CF 30-1 BUU	2 030	85	35	30	M30×1.5	32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100
	CF 30-2 BR	CF 30-2 B	CF 30-2 BUUR	CF 30-2 BUU	2 220	90	35	30	M30×1.5	32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100

Note[1] Minimum allowable value of chamfer dimension r

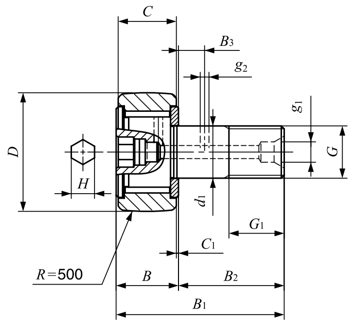
Remarks 1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For models with a stud dia. 5 to 10mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

2. Shield type models with a stud diameter d_1 of 10mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

3. A nut is supplied with the stud.

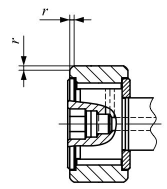
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Standard Type Cam Followers Full Complement Type/With Hexagon Hole

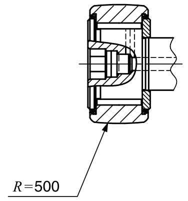


CF…VBR

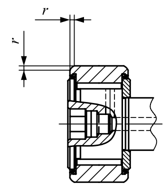
Stud dia. 6－30 mm



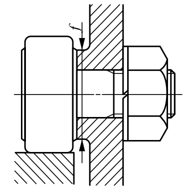
CF…VB



CF…VBUUR



CF…VBUU



Stud dia. mm	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	r_{smin} (1)	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
6	CF 6 VBR	CF 6 VB	CF 6 VBUUR	CF 6 VBUU	19	16	11	6	M 6×1	8	12.2	28.2	16	—	0.6	—	—	3	0.3	11	2.7	6 980	8 500	1 950
8	CF 8 VBR	CF 8 VB	CF 8 VBUUR	CF 8 VBUU	29	19	11	8	M 8×1.25	10	12.2	32.2	20	—	0.6	—	—	4	0.3	13	6.5	8 170	11 200	4 620
	CF 8 VBRM	CF 8 VBM	CF 8 VBUURM	CF 8 VBUUM	29	19	11	8	M 8×1	10	12.2	32.2	20	—	0.6	—	—	4	0.3	13	7.1	8 170	11 200	4 620
10	CF 10 VBR	CF 10 VB	CF 10 VBUUR	CF 10 VBUU	46	22	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	13.8	9 570	14 500	8 650
	CF 10 VBRM	CF 10 VBM	CF 10 VBUURM	CF 10 VBUUM	46	22	12	10	M10×1	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	14.7	9 570	14 500	8 650
	CF 10-1 VBR	CF 10-1 VB	CF 10-1 VBUUR	CF 10-1 VBUU	61	26	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	13.8	9 570	14 500	8 650
	CF 10-1 VBRM	CF 10-1 VBM	CF 10-1 VBUURM	CF 10-1 VBUUM	61	26	12	10	M10×1	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	14.7	9 570	14 500	8 650
12	CF 12 VBR	CF 12 VB	CF 12 VBUUR	CF 12 VBUU	97	30	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	13 500	19 700	13 200
	CF 12-1 VBR	CF 12-1 VB	CF 12-1 VBUUR	CF 12-1 VBUU	107	32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	13 500	19 700	13 200
16	CF 16 VBR	CF 16 VB	CF 16 VBUUR	CF 16 VBUU	173	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	0.6	26	58.5	20 700	37 600	23 200
18	CF 18 VBR	CF 18 VB	CF 18 VBUUR	CF 18 VBUU	255	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	29	86.2	25 300	51 300	31 100
20	CF 20 VBR	CF 20 VB	CF 20 VBUUR	CF 20 VBUU	465	52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	1	34	119	33 200	64 500	37 500
	CF 20-1 VBR	CF 20-1 VB	CF 20-1 VBUUR	CF 20-1 VBUU	390	47	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	1	34	119	33 200	64 500	37 500
24	CF 24 VBR	CF 24 VB	CF 24 VBUUR	CF 24 VBUU	820	62	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	1	40	215	46 600	92 000	52 000
	CF 24-1 VBR	CF 24-1 VB	CF 24-1 VBUUR	CF 24-1 VBUU	1 140	72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	1	40	215	46 600	92 000	52 000
30	CF 30 VBR	CF 30 VB	CF 30 VBUUR	CF 30 VBUU	1 870	80	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900
	CF 30-1 VBR	CF 30-1 VB	CF 30-1 VBUUR	CF 30-1 VBUU	2 030	85	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900
	CF 30-2 VBR	CF 30-2 VB	CF 30-2 VBUUR	CF 30-2 VBUU	2 220	90	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900

Note(1) Minimum allowable value of chamfer dimension r

Remarks 1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

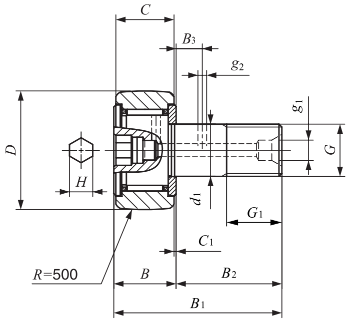
I

CF
NUCF
CFS
CR

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

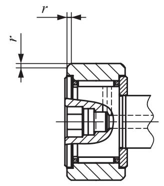
IKO

Stainless Steel Made Cam Followers With Cage/With Hexagon Hole

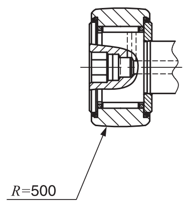


Stud dia. 3—20mm

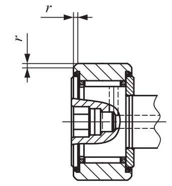
CF…FBR



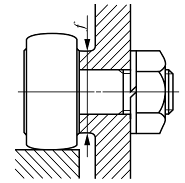
CF…FB



CF…FBUUR



CF…FBUU



Stud dia. mm	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G	G_1	Boundary dimensions mm: B	B_1	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (1)	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
3	CF 3 FBR	CF 3 FB	CF 3 FBUUR	CF 3 FBUU	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	0.2	6.8	0.34	1 200	813	384
4	CF 4 FBR	CF 4 FB	CF 4 FBUUR	CF 4 FBUU	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	0.3	8.3	0.78	1 650	1 270	834
5	CF 5 FBR	CF 5 FB	CF 5 FBUUR	CF 5 FBUU	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	0.3	9.3	1.6	1 930	1 730	1 260
6	CF 6 FBR	—	CF 6 FBUUR	—	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	—	0.6	—	—	3	—	11	2.7	2 930	2 920	1 950
8	CF 8 FBR	—	CF 8 FBUUR	—	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	—	0.6	—	—	4	—	13	6.5	3 400	3 790	3 790
10	CF 10 FBR	—	CF 10 FBUUR	—	45	22	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	5	—	16	13.8	4 340	5 510	5 510
12	CF 12 FBR	—	CF 12 FBUUR	—	95	30	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	—	21	21.9	6 330	7 830	7 830
16	CF 16 FBR	—	CF 16 FBUUR	—	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	8	0.8	4	3	6	—	26	58.5	9 620	14 700	14 700
18	CF 18 FBR	—	CF 18 FBUUR	—	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	8	0.8	6	3	8	—	29	86.2	11 800	20 200	20 200
20	CF 20 FBR	—	CF 20 FBUUR	—	460	52	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	8	4	8	—	34	119	16 500	27 700	27 700

Note(1) Minimum allowable value of chamfer dimension r

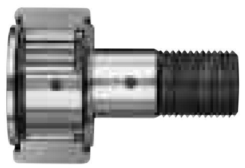
Remarks 1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For models with a stud dia. 5 to 10 mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

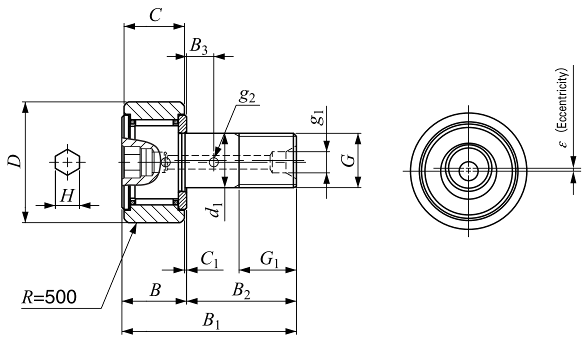
2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

3. A nut is supplied with the stud.

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

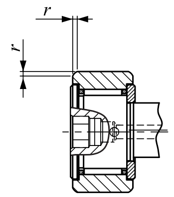
Solid Eccentric Stud Type Cam Followers **With Cage/With Hexagon Hole**



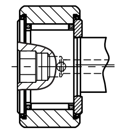


CFES…BR

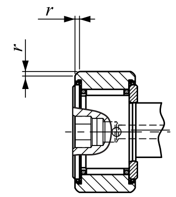
Stud dia. 6－18 mm



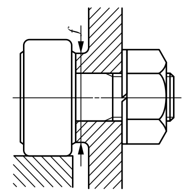
CFES…B



CFES…BUUR



CFES…BUU



Stud dia. mm	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1
6	CFES 6 BR	CFES 6 B	CFES 6 BUUR	CFES 6 BUU	18.5	16	11	6
8	CFES 8 BR	CFES 8 B	CFES 8 BUUR	CFES 8 BUU	28.5	19	11	8
10	CFES 10 BR	CFES 10 B	CFES 10 BUUR	CFES 10 BUU	45	22	12	10
	CFES 10-1 BR	CFES 10-1 B	CFES 10-1 BUUR	CFES 10-1 BUU	60	26	12	10
12	CFES 12 BR	CFES 12 B	CFES 12 BUUR	CFES 12 BUU	95	30	14	12
	CFES 12-1 BR	CFES 12-1 B	CFES 12-1 BUUR	CFES 12-1 BUU	105	32	14	12
16	CFES 16 BR	CFES 16 B	CFES 16 BUUR	CFES 16 BUU	170	35	18	16
18	CFES 18 BR	CFES 18 B	CFES 18 BUUR	CFES 18 BUU	250	40	20	18

Boundary dimensions mm: G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (1)	Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
M 6×1	8	12.2	28.2	16	—	0.6	—	—	3	0.3	0.25	11	2.7	3 660	3 650	1 980
M 8×1.25	10	12.2	32.2	20	—	0.6	—	—	4	0.3	0.25	13	6.5	4 250	4 740	4 670
M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	0.3	16	13.8	5 430	6 890	6 890
M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	0.3	16	13.8	5 430	6 890	6 890
M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	0.4	21	21.9	7 910	9 790	9 790
M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	0.4	21	21.9	7 910	9 790	9 790
M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	0.6	0.5	26	58.5	12 000	18 300	18 300
M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	0.6	29	86.2	14 800	25 200	25 200

Note(1) Minimum allowable value of chamfer dimension r

Remarks1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

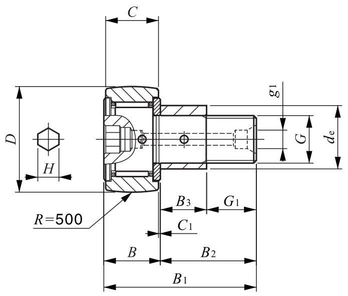
3. A nut is supplied with the stud.

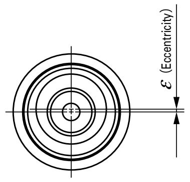
I
CF
NUCF
CFS
CR

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

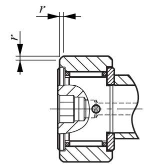
CAM FOLLOWERS

Eccentric Type Cam Followers With Cage/With Hexagon Hole

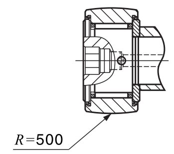




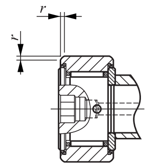
CFE···BR



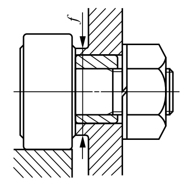
CFE···B



CFE···BUUR



CFE···BUU



Outside diameter of eccentric collar 9－41 mm

Outside diameter of eccentric collar (mm)	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_e
9	CFE 6 BR	CFE 6 B	CFE 6 BUUR	CFE 6 BUU	20.5	16	11	9
11	CFE 8 BR	CFE 8 B	CFE 8 BUUR	CFE 8 BUU	32	19	11	11
13	CFE 10 BR	CFE 10 B	CFE 10 BUUR	CFE 10 BUU	49.5	22	12	13
	CFE 10-1 BR	CFE 10-1 B	CFE 10-1 BUUR	CFE 10-1 BUU	65	26	12	13
16	CFE 12 BR	CFE 12 B	CFE 12 BUUR	CFE 12 BUU	105	30	14	16
	CFE 12-1 BR	CFE 12-1 B	CFE 12-1 BUUR	CFE 12-1 BUU	115	32	14	16
22	CFE 16 BR	CFE 16 B	CFE 16 BUUR	CFE 16 BUU	190	35	18	22
24	CFE 18 BR	CFE 18 B	CFE 18 BUUR	CFE 18 BUU	280	40	20	24
27	CFE 20 BR	CFE 20 B	CFE 20 BUUR	CFE 20 BUU	500	52	24	27
	CFE 20-1 BR	CFE 20-1 B	CFE 20-1 BUUR	CFE 20-1 BUU	425	47	24	27
33	CFE 24 BR	CFE 24 B	CFE 24 BUUR	CFE 24 BUU	895	62	29	33
	CFE 24-1 BR	CFE 24-1 B	CFE 24-1 BUUR	CFE 24-1 BUU	1 220	72	29	33
41	CFE 30 BR	CFE 30 B	CFE 30 BUUR	CFE 30 BUU	2 030	80	35	41
	CFE 30-1 BR	CFE 30-1 B	CFE 30-1 BUUR	CFE 30-1 BUU	2 190	85	35	41
	CFE 30-2 BR	CFE 30-2 B	CFE 30-2 BUUR	CFE 30-2 BUU	2 380	90	35	41

Identification number (shield type, crowned)	Boundary dimensions mm: G	B_3	B max	B_1 max	B_2	C_1	g_1	G_1	H	$r_{s\,min}$(1)	Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
CFE 6 BR	M 6×1	7.5	12.2	28.2	16	0.6	—	8.5	3	0.3	0.4	11	2.7	3 660	3 650	1 950
CFE 8 BR	M 8×1.25	9.5	12.2	32.2	20	0.6	—	10.5	4	0.3	0.4	13	6.5	4 250	4 740	4 620
CFE 10 BR	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	5 430	6 890	6 890
CFE 10-1 BR	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	5 430	6 890	6 890
CFE 12 BR	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	7 910	9 790	9 790
CFE 12-1 BR	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	7 910	9 790	9 790
CFE 16 BR	M16×1.5	15.5	19.6	52.1	32.5	0.8	4	17	6	0.6	0.8	26	58.5	12 000	18 300	18 300
CFE 18 BR	M18×1.5	17.5	21.6	58.1	36.5	0.8	6	19	8	1	0.8	29	86.2	14 800	25 200	25 200
CFE 20 BR	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	20 700	34 600	34 600
CFE 20-1 BR	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	20 700	34 600	34 600
CFE 24 BR	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	30 500	52 600	52 000
CFE 24-1 BR	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	30 500	52 600	52 000
CFE 30 BR	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100
CFE 30-1 BR	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100
CFE 30-2 BR	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100

Note(1) Minimum allowable value of chamfer dimension r

Remarks 1. Models with a thread diameter G of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole on the end surface of the stud.

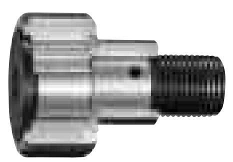
2. Shield type models with a stud thread diameter G of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

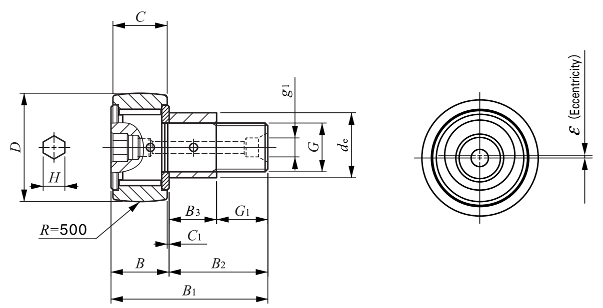
3. A nut is supplied with the stud.

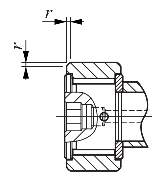
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

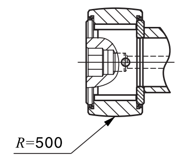
CAM FOLLOWERS

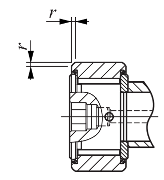
Eccentric Type Cam Followers Full Complement Type/With Hexagon Hole

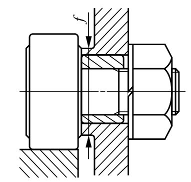












Outside diameter of eccentric collar 9－41 mm

CFE···VBR　CFE···VB　CFE···VBUUR　CFE···VBUU

Outside diameter of eccentric collar mm	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_e
9	CFE 6 VBR	CFE 6 VB	CFE 6 VBUUR	CFE 6 VBUU	21	16	11	9
11	CFE 8 VBR	CFE 8 VB	CFE 8 VBUUR	CFE 8 VBUU	32.5	19	11	11
13	CFE 10 VBR	CFE 10 VB	CFE 10 VBUUR	CFE 10 VBUU	50.5	22	12	13
	CFE 10-1 VBR	CFE 10-1 VB	CFE 10-1 VBUUR	CFE 10-1 VBUU	66	26	12	13
16	CFE 12 VBR	CFE 12 VB	CFE 12 VBUUR	CFE 12 VBUU	107	30	14	16
	CFE 12-1 VBR	CFE 12-1 VB	CFE 12-1 VBUUR	CFE 12-1 VBUU	117	32	14	16
22	CFE 16 VBR	CFE 16 VB	CFE 16 VBUUR	CFE 16 VBUU	193	35	18	22
24	CFE 18 VBR	CFE 18 VB	CFE 18 VBUUR	CFE 18 VBUU	285	40	20	24
27	CFE 20 VBR	CFE 20 VB	CFE 20 VBUUR	CFE 20 VBUU	505	52	24	27
	CFE 20-1 VBR	CFE 20-1 VB	CFE 20-1 VBUUR	CFE 20-1 VBUU	430	47	24	27
33	CFE 24 VBR	CFE 24 VB	CFE 24 VBUUR	CFE 24 VBUU	900	62	29	33
	CFE 24-1 VBR	CFE 24-1 VB	CFE 24-1 VBUUR	CFE 24-1 VBUU	1 220	72	29	33
41	CFE 30 VBR	CFE 30 VB	CFE 30 VBUUR	CFE 30 VBUU	2 030	80	35	41
	CFE 30-1 VBR	CFE 30-1 VB	CFE 30-1 VBUUR	CFE 30-1 VBUU	2 190	85	35	41
	CFE 30-2 VBR	CFE 30-2 VB	CFE 30-2 VBUUR	CFE 30-2 VBUU	2 380	90	35	41

Boundary dimensions mm: G	B_3	B max	B_1 max	B_2	C_1	g_1	G_1	H	$r_{s\,min}$ (1)	Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
M 6×1	7.5	12.2	28.2	16	0.6	—	8.5	3	0.3	0.4	11	2.7	6 980	8 500	1 950
M 8×1.25	9.5	12.2	32.2	20	0.6	—	10.5	4	0.3	0.4	13	6.5	8 170	11 200	4 620
M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	9 570	14 500	8 650
M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	9 570	14 500	8 650
M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	13 500	19 700	13 200
M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	13 500	19 700	13 200
M16×1.5	15.5	19.6	52.1	32.5	0.8	4	17	6	0.6	0.8	26	58.5	20 700	37 600	23 200
M18×1.5	17.5	21.6	58.1	36.5	0.8	6	19	8	1	0.8	29	86.2	25 300	51 300	31 100
M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	33 200	64 500	37 500
M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	33 200	64 500	37 500
M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	46 600	92 000	52 000
M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	46 600	92 000	52 000
M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900
M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900
M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900

Note(1) Minimum allowable value of chamfer dimension r

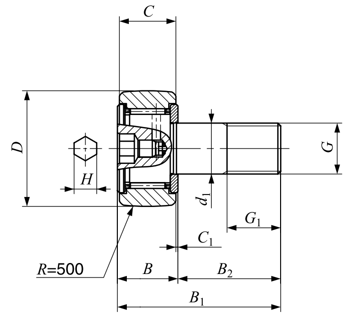
Remarks 1. Models with a thread diameter G of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole on the end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

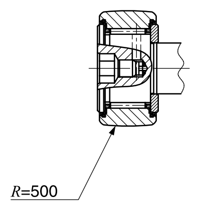
CAM FOLLOWERS

Thrust Disk Type Cam Followers **With Cage/With Hexagon Hole**

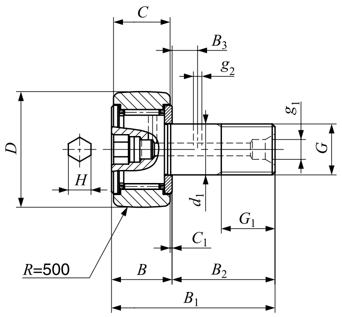
Stud dia. 3 – 20mm



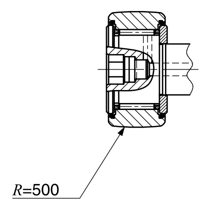
CF···(F)WBR
Stud dia 3 to 10



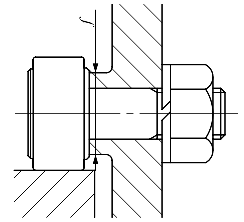
CF···(F)WBUUR



CF···(F)WBR
Stud dia 12 to 20mm



CF···(F)WBUUR



Stud dia. mm	Identification number: Shield type	Identification number: Sealed type	Mass (Ref.) g	Boundary dimensions mm: D	C	d_1	G	G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
3	CF 3 WBR	CF 3 WBUUR	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	6.8	0.34	1 500	1 020	384
	CF 3 FWBR	CF 3 FWBUUR	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	6.8	0.34	1 200	813	384
4	CF 4 WBR	CF 4 WBUUR	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	8.3	0.78	2 070	1 590	834
	CF 4 FWBR	CF 4 FWBUUR	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	8.3	0.78	1 650	1 270	834
5	CF 5 WBR	CF 5 WBUUR	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	9.3	1.6	2 520	2 140	1 260
	CF 5 FWBR	CF 5 FWBUUR	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	9.3	1.6	1 930	1 730	1 260
6	CF 6 WBR	CF 6 WBUUR	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	—	0.6	—	—	3	11	2.7	3 660	3 650	1 950
8	CF 8 WBR	CF 8 WBUUR	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	—	0.6	—	—	4	13	6.5	4 250	4 740	4 620
10	CF 10 WBR	CF 10 WBUUR	45	22	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	4	16	13.8	5 430	6 890	6 890
	CF 10-1 WBR	CF 10-1 WBUUR	60	26	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	4	16	13.8	5 430	6 890	6 890
12	CF 12 WBR	CF 12 WBUUR	95	30	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	21	21.9	7 910	9 790	9 790
	CF 12-1 WBR	CF 12-1 WBUUR	105	32	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	21	21.9	7 910	9 790	9 790
16	CF 16 WBR	CF 16 WBUUR	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	8	0.8	4	3	6	26	58.5	12 000	18 300	18 300
18	CF 18 WBR	CF 18 WBUUR	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	8	0.8	6	3	8	29	86.2	14 800	25 200	25 200
20	CF 20 WBR	CF 20 WBUUR	460	52	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	6	4	8	34	119	20 700	34 600	34 600
	CF 20-1 WBR	CF 20-1 WBUUR	385	47	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	6	4	8	34	119	20 700	34 600	34 600

Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For Models with a stud dia. 5 to 10 mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.
2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.
3. A nut is supplied with the stud.

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

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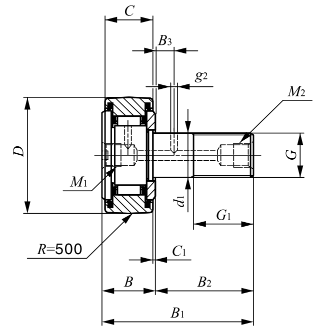
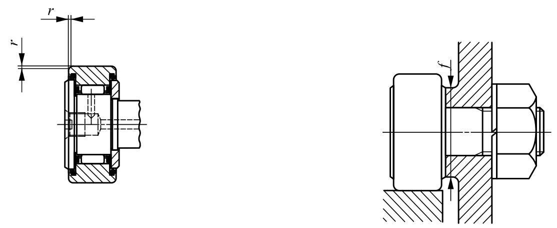
CAM FOLLOWERS

Centralized Lubrication Type Cam Followers With Cage/With Screwdriver Slot



CF…RU1



CF…FU1

Stud dia. 6－30mm

Stud dia. mm	Identification number With crowned outer ring	With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G	G_1
6	**CF-RU1- 6**	**CF-FU1- 6**	18.5	16	11	6	M 6×1	8
8	**CF-RU1- 8**	**CF-FU1- 8**	28.5	19	11	8	M 8×1.25	10
10	**CF-RU1-10**	**CF-FU1-10**	45	22	12	10	M10×1.25	12
	CF-RU1-10-1	**CF-FU1-10-1**	60	26	12	10	M10×1.25	12
12	**CF-RU1-12**	**CF-FU1-12**	95	30	14	12	M12×1.5	13
	CF-RU1-12-1	**CF-FU1-12-1**	105	32	14	12	M12×1.5	13
16	**CF-RU1-16**	**CF-FU1-16**	170	35	18	16	M16×1.5	17
18	**CF-RU1-18**	**CF-FU1-18**	250	40	20	18	M18×1.5	19
20	**CF-RU1-20**	**CF-FU1-20**	460	52	24	20	M20×1.5	21
	CF-RU1-20-1	**CF-FU1-20-1**	385	47	24	20	M20×1.5	21
24	**CF-RU1-24**	**CF-FU1-24**	815	62	29	24	M24×1.5	25
	CF-RU1-24-1	**CF-FU1-24-1**	1 140	72	29	24	M24×1.5	25
30	**CF-RU1-30**	**CF-FU1-30**	1 870	80	35	30	M30×1.5	32
	CF-RU1-30-1	**CF-FU1-30-1**	2 030	85	35	30	M30×1.5	32
	CF-RU1-30-2	**CF-FU1-30-2**	2 220	90	35	30	M30×1.5	32

Boundary dimensions mm (continued)

Stud dia. mm	B max	B_1 max	B_2	B_3	C_1	g_2	M_1	M_2	$r_{s\,min}$ (1)	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
6	12.2	28.2	16	—	0.6	—	M6×0.75	—	0.3	11	2.7	3 660	3 650	1 950
8	12.2	32.2	20	—	0.6	—			0.3	13	6.5	4 250	4 740	4 620
10	13.2	36.2	23	—	0.6	—			0.3	16	13.8	5 430	6 890	6 890
	13.2	36.2	23	—	0.6	—			0.3	16	13.8	5 430	6 890	6 890
12	15.2	40.2	25	—	0.6	—			0.6	21	23.9	7 910	9 790	9 790
	15.2	40.2	25	—	0.6	—			0.6	21	23.9	7 910	9 790	9 790
16	19.6	52.1	32.5	8	0.8	3	PT 1/8	PT 1/8	0.6	26	58.5	12 000	18 300	18 300
18	21.6	58.1	36.5	8	0.8	3			1	29	86.2	14 800	25 200	25 200
20	25.6	66.1	40.5	9	0.8	4			1	34	119	20 700	34 600	34 600
	25.6	66.1	40.5	9	0.8	4			1	34	119	20 700	34 600	34 600
24	30.6	80.1	49.5	11	0.8	4			1	40	215	30 500	52 600	52 000
	30.6	80.1	49.5	11	0.8	4			1	40	215	30 500	52 600	52 000
30	37	100	63	15	1	4			1	49	438	45 400	85 100	85 100
	37	100	63	15	1	4			1	49	438	45 400	85 100	85 100
	37	100	63	15	1	4			1	49	438	45 400	85 100	85 100

Note(1) Minimum allowable value of chamfer dimension r

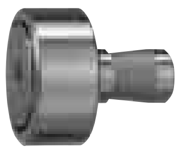
Remarks 1. Models with a stud diameter d_1 of 12 mm or less are provided with a lubrication tapped hole on the stud head only. Other models are provided with one lubrication tapped hole each on the head and end surface of the stud.

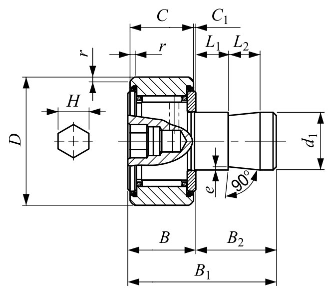
2. Provided with prepacked grease.

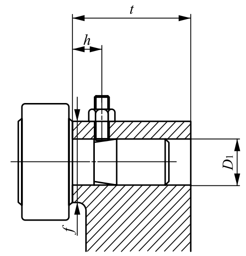
3. A nut is supplied with the stud.

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

Easy Mounting Type Cam Followers With Cage/With Hexagon Hole







Stud dia. 6－20mm

CF-SFU…B

Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	B max	B_1 max	B_2	C_1	L_1
6	CF-SFU- 6 B	19.5	16	11	6	12.2	32	19.8	0.6	5
8	CF-SFU- 8 B	29	19	11	8	12.2	32	19.8	0.6	5
10	CF-SFU-10 B	44	22	12	10	13.2	33	19.8	0.6	5
	CF-SFU-10-1 B	59	26	12	10	13.2	33	19.8	0.6	5
12	CF-SFU-12 B	94	30	14	12	15.2	35	19.8	0.6	5
	CF-SFU-12-1 B	104	32	14	12	15.2	35	19.8	0.6	5
16	CF-SFU-16 B	164	35	18	16	19.6	44.5	24.9	0.8	10
18	CF-SFU-18 B	235	40	20	18	21.6	46.5	24.9	0.8	10
20	CF-SFU-20 B	435	52	24	20	25.6	50.5	24.9	0.8	10
	CF-SFU-20-1 B	360	47	24	20	25.6	50.5	24.9	0.8	10

Identification number	L_2	H	e	$r_{s\ min}$ (1)	Mounting dimensions mm D_1	Tolerance	t Min.	f Min.	h (Ref.)	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
CF-SFU- 6 B	10	3	0.3	0.3	6	+0.012 0	20	11	10	3 660	3 650	1 950
CF-SFU- 8 B	10	4	0.5	0.3	8	+0.015 0	20	13	10	4 250	4 740	4 620
CF-SFU-10 B	10	4	0.5	0.3	10		20	16	10	5 430	6 890	6 890
CF-SFU-10-1 B	10	4	0.5	0.3	10		20	16	10	5 430	6 890	6 890
CF-SFU-12 B	10	6	1	0.6	12	+0.018 0	20	21	10	7 910	9 790	9 790
CF-SFU-12-1 B	10	6	1	0.6	12		20	21	10	7 910	9 790	9 790
CF-SFU-16 B	10	6	1	0.6	16		25	26	15	12 000	18 300	18 300
CF-SFU-18 B	10	8	1	1	18		25	29	15	14 800	25 200	25 200
CF-SFU-20 B	10	8	1	1	20	+0.021 0	25	34	15	20 700	34 600	34 600
CF-SFU-20-1 B	10	8	1	1	20		25	34	15	20 700	34 600	34 600

Note(1) Minimum allowable value of chamfer dimension r

Remarks 1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head.

2. Provided with prepacked grease.

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

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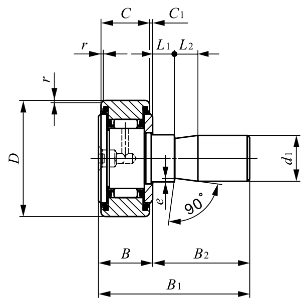
Easy Mounting Type Cam Followers With Cage/With Screwdriver Slot



CF…SFU

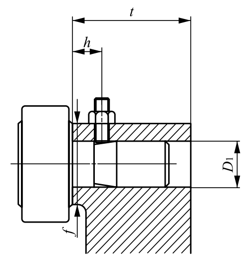
Stud dia. 6－20mm

Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	B max	B_1 max	B_2	C_1	L_1
6	**CF-SFU- 6**	19.5	16	11	6	12.2	32	19.8	0.6	5
8	**CF-SFU- 8**	29	19	11	8	12.2	32	19.8	0.6	5
10	**CF-SFU-10**	44	22	12	10	13.2	33	19.8	0.6	5
	CF-SFU-10-1	59	26	12	10	13.2	33	19.8	0.6	5
12	**CF-SFU-12**	94	30	14	12	15.2	35	19.8	0.6	5
	CF-SFU-12-1	104	32	14	12	15.2	35	19.8	0.6	5
16	**CF-SFU-16**	164	35	18	16	19.6	44.5	24.9	0.8	10
18	**CF-SFU-18**	235	40	20	18	21.6	46.5	24.9	0.8	10
20	**CF-SFU-20**	435	52	24	20	25.6	50.5	24.9	0.8	10
	CF-SFU-20-1	360	47	24	20	25.6	50.5	24.9	0.8	10

Note(1) Minimum allowable value of chamfer dimension r

Remarks 1. No oil hole is provided.

2. Provided with prepacked grease.



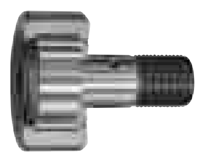
L_2	e	$r_{s\ min}$ (1)	Mounting dimensions mm D_1	Tolerance	t Min.	f Min.	h (Ref.)	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
10	0.3	0.3	6	+0.012 0	20	11	10	3 660	3 650	1 950
10	0.5	0.3	8	+0.015 0	20	13	10	4 250	4 740	4 620
10	0.5	0.3	10		20	16	10	5 430	6 890	6 890
10	0.5	0.3	10		20	16	10	5 430	6 890	6 890
10	1	0.6	12	+0.018 0	20	21	10	7 910	9 790	9 790
10	1	0.6	12		20	21	10	7 910	9 790	9 790
10	1	0.6	16		25	26	15	12 000	18 300	18 300
10	1	1	18		25	29	15	14 800	25 200	25 200
10	1	1	20	+0.021 0	25	34	15	20 700	34 600	34 600
10	1	1	20		25	34	15	20 700	34 600	34 600

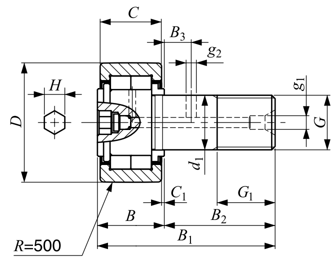
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

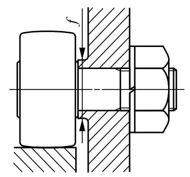
IKO

Cylindrical Roller Cam Followers Full Compliment Type/With Hexagon Hole





NUCF···BR



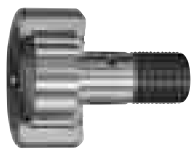
Stud dia. 10—30mm

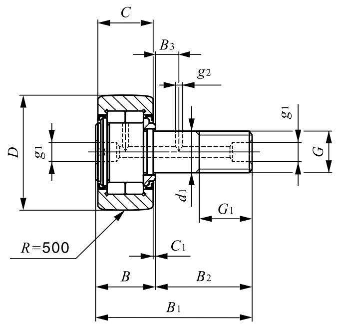
Stud dia. (mm)	Identification number	Mass (Ref.) (g)	D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	Mounting dimension f Min. (mm)	Maximum tightening torque (N-m)	Basic dynamic load rating C (N)	Basic static load rating C_0 (N)	Maximum allowable static load (N)
			Boundary dimensions mm																	
10	**NUCF 10 BR**	44	22	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	12	13.8	10 400	11 500	5 300
	NUCF 10-1 BR	58	26	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	12	13.8	10 400	11 500	9 210
12	**NUCF 12 BR**	86	30	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	17	21.9	14 000	13 400	5 650
	NUCF 12-1 BR	97	32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	17	21.9	14 000	13 400	9 040
16	**NUCF 16 BR**	167	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	20	58.5	23 400	27 300	11 800
18	**NUCF 18 BR**	244	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	22	86.2	25 200	30 900	20 300
20	**NUCF 20 BR**	457	52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	31	119	43 100	58 100	30 000
	NUCF 20-1 BR	384	47	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	27	119	38 900	49 000	27 200
24	**NUCF 24 BR**	789	62	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	38	215	58 200	75 300	35 200
	NUCF 24-1 BR	1 020	72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	44	215	63 900	88 800	57 000
30	**NUCF 30 BR**	1 600	80	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	45	438	90 300	121 000	98 300
	NUCF 30-2 BR	1 970	90	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	45	438	90 300	121 000	98 300

Remarks1. Models with a stud diameter d_1 of 10 mm or less (marked *) are provided with an oil hole (re-greasing fitting) on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

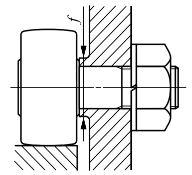
Cylindrical Roller Cam Followers **Full Compliment Type/With Screwdriver Slot**





Stud dia. 10－30mm

NUCF…R



Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
10	**NUCF 10 R**	44	22	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	*4	—	12	13.8	10 400	11 500	5 300
	NUCF 10-1 R	58	26	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	*4	—	12	13.8	10 400	11 500	9 210
12	**NUCF 12 R**	86	30	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	6	3	17	21.9	14 000	13 400	5 650
	NUCF 12-1 R	97	32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	6	3	17	21.9	14 000	13 400	9 040
16	**NUCF 16 R**	167	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	6	3	20	58.5	23 400	27 300	11 800
18	**NUCF 18 R**	244	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	22	86.2	25 200	30 900	20 300
20	**NUCF 20 R**	457	52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	8	4	31	119	43 100	58 100	30 000
	NUCF 20-1 R	384	47	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	8	4	27	119	38 900	49 000	27 200
24	**NUCF 24 R**	789	62	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	8	4	38	215	58 200	75 300	35 200
	NUCF 24-1 R	1 020	72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	8	4	44	215	63 900	88 800	57 000
30	**NUCF 30 R**	1 600	80	35	30	M30×1.5	32	37	100	63	15	1	8	4	45	438	90 300	121 000	98 300
	NUCF 30-2 R	1 970	90	35	30	M30×1.5	32	37	100	63	15	1	8	4	45	438	90 300	121 000	98 300

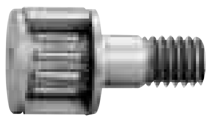
Remarks1. Models with a stud diameter d_1 of 10 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

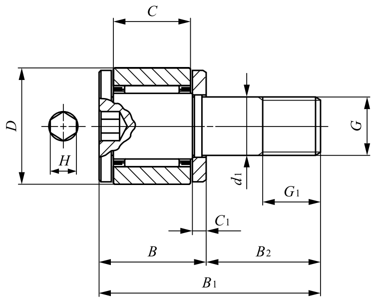
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

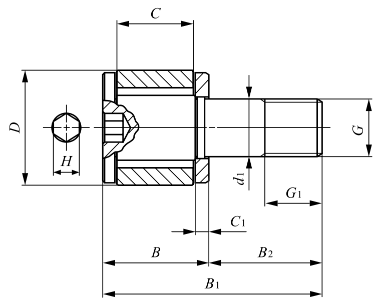
IKO

Miniature Type Cam Followers **With Cage/With Hexagon Hole**
Full Complement Type/With Hexagon Hole

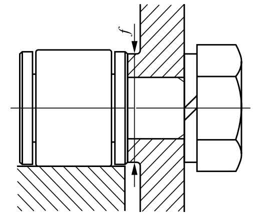




CFS



CFS···V



Stud dia. 2－6mm

Stud dia. mm	Identification number: With cage	Identification number: Full complement	Mass (Ref.) g	D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
2	CFS 2	—	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	288	202	202
	—	CFS 2 V	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	768	734	229
2.5	CFS 2.5	—	1	5	3	2.5	M2.5×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	428	351	351
	—	CFS 2.5 V	1	5	3	2.5	M2.5×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	1 000	1 080	360
3	CFS 3	—	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	629	611	484
	—	CFS 3 V	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	1 420	1 790	484
4	CFS 4	—	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	1 120	1 120	919
	—	CFS 4 V	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	2 370	3 000	919
5	CFS 5	—	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	1 570	1 850	1 570
	—	CFS 5 V	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	3 180	4 700	1 570
6	CFS 6	—	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	2 090	2 200	2 150
	—	CFS 6 V	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	4 610	6 250	2 150

Boundary dimensions mm

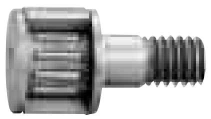
Remarks1. No oil hole is provided.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

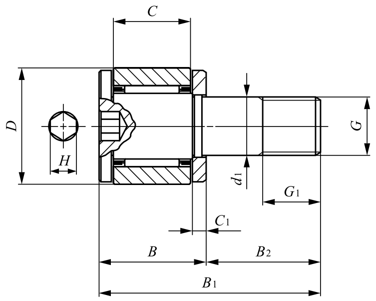
I
CF
NUCF
CFS
CR

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

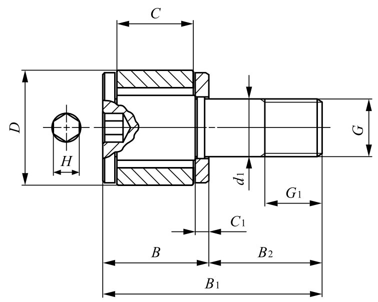
CAM FOLLOWERS

Miniature Type Cam Followers Stainless Steel Made **With Cage/With Hexagon Hole** **Full Complement Type/With Hexagon Hole**

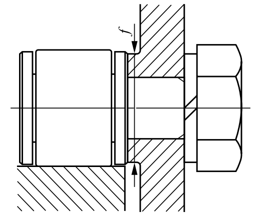




CFS…F



CFS…FV



Stud dia. 2 — 6mm

Stud dia. mm	Identification number: With cage	Identification number: Full complement	Mass (Ref.) g	Boundary dimensions mm: D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-cm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
2	**CFS 2 F**	—	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	230	161	161
	—	**CFS 2 FV**	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	614	587	229
2.5	**CFS 2.5 F**	—	1	5	3	2.5	M2.5×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	342	281	281
	—	**CFS 2.5 FV**	1	5	3	2.5	M2.5×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	800	862	360
3	**CFS 3 F**	—	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	504	488	484
	—	**CFS 3 FV**	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	1 140	1 430	484
4	**CFS 4 F**	—	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	897	894	894
	—	**CFS 4 FV**	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	1 900	2 400	919
5	**CFS 5 F**	—	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	1 250	1 480	1 480
	—	**CFS 5 FV**	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	2 540	3 760	1 570
6	**CFS 6 F**	—	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	1 670	1 760	1 760
	—	**CFS 6 FV**	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	3 690	5 000	2 150

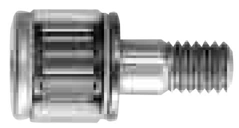
Remarks 1. No oil hole is provided.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

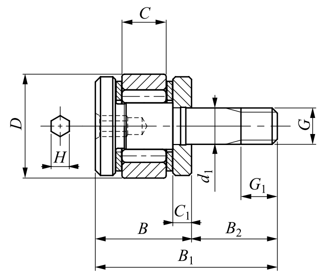
I
CF
NUCF
CFS
CR

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

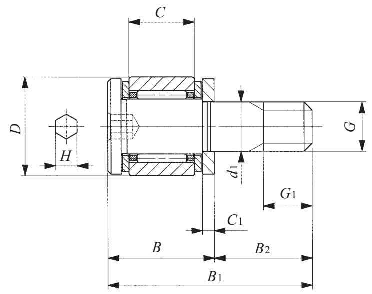
CAM FOLLOWERS

Thrust Disk Type Miniature Cam Followers With Hexagon Hole

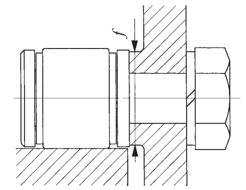




CFS1.4 WV



CFS… W
CFS… FW



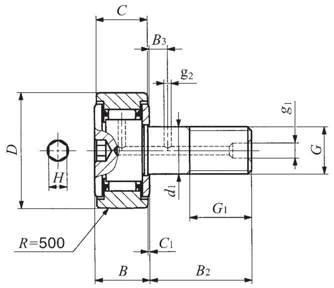
Stud dia. 1.4－6 mm

Stud dia. mm	Identification number: With cage	Identification number: Full complement	Mass (Ref.) g	D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-cm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
1.4	—	**CFS 1.4 WV**	0.35	4	1.7	1.4	M1.4×0.3	1.4	3.7	7	3.3	0.7	0.9	3.8	3.0	481	385	105
2	**CFS 2 W**	—	0.6	4.5	2.5	2	M2×0.4	2	4.5	8.5	4	0.7	0.9	4.3	9.1	288	202	194
	CFS 2 FW	—														230	161	161
2.5	**CFS 2.5 W**	—	1	5	3	2.5	M2.5×0.45	2.5	5	10	5	0.7	0.9	4.8	18.7	428	351	313
	CFS 2.5 FW	—														342	281	281
3	**CFS 3 W**	—	2	6	4	3	M3×0.5	3	6.5	12.5	6	0.7	1.3	5.8	33.5	629	611	399
	CFS 3 FW	—														504	488	399
4	**CFS 4 W**	—	4	8	5	4	M4×0.7	4	8	16	8	1	1.5	7.7	77.7	1120	1120	785
	CFS 4 FW	—														897	894	785
5	**CFS 5 W**	—	7	10	6	5	M5×0.8	5	9	19	10	1	2	9.6	158	1570	1850	1370
	CFS 5 FW	—														1250	1480	1370
6	**CFS 6 W**	—	13	12	7	6	M6×1	6	10.5	22.5	12	1.2	2.5	11.6	268	2090	2200	1920
	CFS 6 FW	—														1670	1760	1760

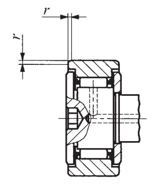
Remarks1. No oil hole is provided.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

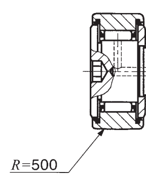
Inch Series Cam Followers With Cage/With Hexagon Hole



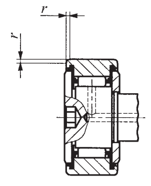
CR…BR



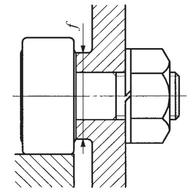
CR…B



CR…BUUR



CR…BUU



Stud dia. 4.826 — 22.225 mm

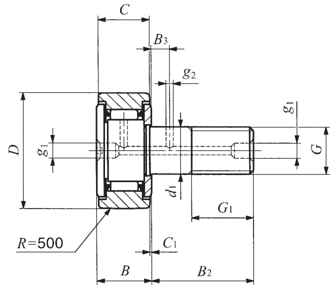
Stud dia. mm (inch)	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1
4.826	CR 8 BR	CR 8 B	CR 8 BUUR	CR 8 BUU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)
	CR 8-1 BR	CR 8-1 B	CR 8-1 BUUR	CR 8-1 BUU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)
6.350 (1/4)	CR 10 BR	CR 10 B	CR 10 BUUR	CR 10 BUU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
	CR 10-1 BR	CR 10-1 B	CR 10-1 BUUR	CR 10-1 BUU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
9.525 (3/8)	CR 12 BR	CR 12 B	CR 12 BUUR	CR 12 BUU	35	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
	CR 14 BR	CR 14 B	CR 14 BUUR	CR 14 BUU	46	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
11.112 (7/16)	CR 16 BR	CR 16 B	CR 16 BUUR	CR 16 BUU	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
	CR 18 BR	CR 18 B	CR 18 BUUR	CR 18 BUU	88	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
12.700 (1/2)	CR 20 BR	CR 20 B	CR 20 BUUR	CR 20 BUU	132	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
	CR 22 BR	CR 22 B	CR 22 BUUR	CR 22 BUU	157	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
15.875 (5/8)	CR 24 BR	CR 24 B	CR 24 BUUR	CR 24 BUU	225	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
	CR 26 BR	CR 26 B	CR 26 BUUR	CR 26 BUU	260	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
19.050 (3/4)	CR 28 BR	CR 28 B	CR 28 BUUR	CR 28 BUU	365	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
	CR 30 BR	CR 30 B	CR 30 BUUR	CR 30 BUU	410	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
22.225 (7/8)	CR 32 BR	CR 32 B	CR 32 BUUR	CR 32 BUU	615	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
	CR 36 BR	CR 36 B	CR 36 BUUR	CR 36 BUU	750	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)

Identification number	Boundary dimensions mm(inch): B max	B_2	B_3	C_1	g_1	g_2	H	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
CR 8 BR	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
CR 8-1 BR	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
CR 10 BR	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
CR 10-1 BR	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
CR 12 BR	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	4 420	5 110
CR 14 BR	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	4 790	5 810
CR 16 BR	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.191 (3/64)	17.859 (45/64)	17.4	8 810	10 800
CR 18 BR	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	19.050 (3/4)	17.4	9 180	11 600
CR 20 BR	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
CR 22 BR	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
CR 24 BR	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
CR 26 BR	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
CR 28 BR	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
CR 30 BR	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
CR 32 BR	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900
CR 36 BR	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900

Remarks1. Models with a stud diameter d_1 of 6.35 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

Inch Series Cam Followers With Cage/With Screwdriver Slot



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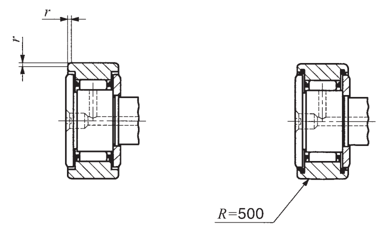
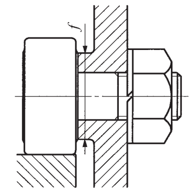


CR CR···UUR CR···UU



Stud dia. 4.826 — 22.225 mm

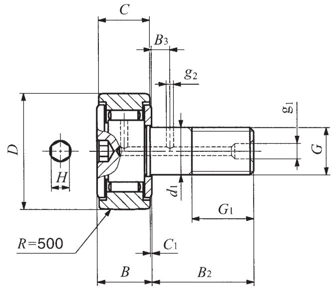
Stud dia. mm (inch)	Identification number: Shield type, With crowned outer ring	Identification number: Shield type, With cylindrical outer ring	Identification number: Sealed type, With crowned outer ring	Identification number: Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1
4.826	CR 8 R	CR 8	CR 8 UUR	CR 8 UU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)
	CR 8-1 R	CR 8-1	CR 8-1 UUR	CR 8-1 UU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)
6.350 (1/4)	CR 10 R	CR 10	CR 10 UUR	CR 10 UU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
	CR 10-1 R	CR 10-1	CR 10-1 UUR	CR 10-1 UU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
9.525 (3/8)	CR 12 R	CR 12	CR 12 UUR	CR 12 UU	35	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
	CR 14 R	CR 14	CR 14 UUR	CR 14 UU	46	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
11.112 (7/16)	CR 16 R	CR 16	CR 16 UUR	CR 16 UU	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
	CR 18 R	CR 18	CR 18 UUR	CR 18 UU	88	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
12.700 (1/2)	CR 20 R	CR 20	CR 20 UUR	CR 20 UU	132	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
	CR 22 R	CR 22	CR 22 UUR	CR 22 UU	157	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
15.875 (5/8)	CR 24 R	CR 24	CR 24 UUR	CR 24 UU	225	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
	CR 26 R	CR 26	CR 26 UUR	CR 26 UU	260	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
19.050 (3/4)	CR 28 R	CR 28	CR 28 UUR	CR 28 UU	365	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
	CR 30 R	CR 30	CR 30 UUR	CR 30 UU	410	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
22.225 (7/8)	CR 32 R	CR 32	CR 32 UUR	CR 32 UU	615	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
	CR 36 R	CR 36	CR 36 UUR	CR 36 UU	750	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)

Identification number (Shield type, With crowned outer ring)	Boundary dimensions mm(inch): B max	B_2	B_3	C_1	g_1	g_2	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
CR 8 R	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
CR 8-1 R	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
CR 10 R	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
CR 10-1 R	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
CR 12 R	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	10.8	4 420	5 110
CR 14 R	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	15.081 (19/32)	10.8	4 790	5 810
CR 16 R	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.191 (3/64)	17.859 (45/64)	17.4	8 810	10 800
CR 18 R	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	19.050 (3/4)	17.4	9 180	11 600
CR 20 R	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
CR 22 R	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
CR 24 R	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
CR 26 R	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
CR 28 R	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
CR 30 R	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
CR 32 R	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900
CR 36 R	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900

Remarks1. Models with a stud diameter d_1 of 6.35 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

Inch Series Cam Followers **Full Complement Type/With Hexagon Hole**



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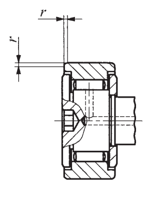

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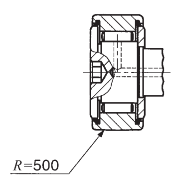

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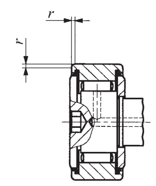

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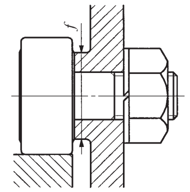


Stud dia. 4.826 — 22.225 mm

Stud dia. mm (inch)	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1
4.826	CR 8 VBR	CR 8 VB	CR 8 VBUUR	CR 8 VBUU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)
	CR 8-1 VBR	CR 8-1VB	CR 8-1 VBUUR	CR 8-1 VBUU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)
6.350 (1/4)	CR 10 VBR	CR 10 VB	CR 10 VBUUR	CR 10 VBUU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
	CR 10-1 VBR	CR 10-1VB	CR 10-1 VBUUR	CR 10-1 VBUU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
9.525 (3/8)	CR 12 VBR	CR 12 VB	CR 12 VBUUR	CR 12 VBUU	36	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
	CR 14 VBR	CR 14 VB	CR 14 VBUUR	CR 14 VBUU	47	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
11.112 (7/16)	CR 16 VBR	CR 16 VB	CR 16 VBUUR	CR 16 VBUU	74	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
	CR 18 VBR	CR 18 VB	CR 18 VBUUR	CR 18 VBUU	85	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
12.700 (1/2)	CR 20 VBR	CR 20 VB	CR 20 VBUUR	CR 20 VBUU	137	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
	CR 22 VBR	CR 22 VB	CR 22 VBUUR	CR 22 VBUU	160	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
15.875 (5/8)	CR 24 VBR	CR 24 VB	CR 24 VBUUR	CR 24 VBUU	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
	CR 26 VBR	CR 26 VB	CR 26 VBUUR	CR 26 VBUU	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
19.050 (3/4)	CR 28 VBR	CR 28 VB	CR 28 VBUUR	CR 28 VBUU	372	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
	CR 30 VBR	CR 30 VB	CR 30 VBUUR	CR 30 VBUU	418	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
22.225 (7/8)	CR 32 VBR	CR 32 VB	CR 32 VBUUR	CR 32 VBUU	627	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
	CR 36 VBR	CR 36 VB	CR 36 VBUUR	CR 36 VBUU	759	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)

Boundary dimensions mm(inch)

Identification number	B max	B_2	B_3	C_1	g_1	g_2	H	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
CR 8 VBR	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750
CR 8-1 VBR	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 710	5 410
CR 10 VBR	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660
CR 10-1 VBR	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	6 340	8 530
CR 12 VBR	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	8 710	12 300
CR 14 VBR	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	8 710	12 300
CR 16 VBR	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.191 (3/64)	17.859 (45/64)	17.4	13 100	22 700
CR 18 VBR	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	19.050 (3/4)	17.4	13 100	22 700
CR 20 VBR	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
CR 22 VBR	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
CR 24 VBR	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
CR 26 VBR	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
CR 28 VBR	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
CR 30 VBR	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
CR 32 VBR	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
CR 36 VBR	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600

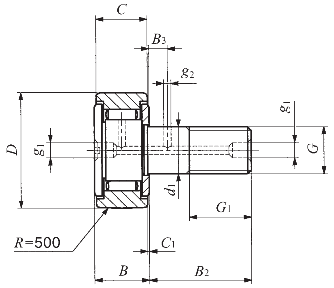
Remarks 1. Models with a stud diameter d_1 of 6.35 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Cam Followers Full Complement Type/With Screwdriver Slot



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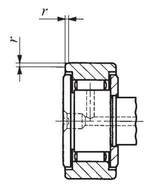
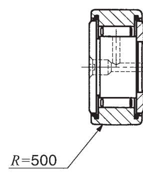
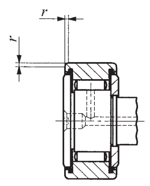


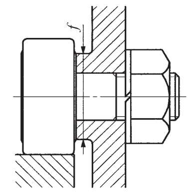
CR…V



CR…VUUR



CR…VUU



Stud dia. 4.826 — 31.750mm

Stud dia. mm (inch)	Identification number: Shield type, With crowned outer ring	Shield type, With cylindrical outer ring	Sealed type, With crowned outer ring	Sealed type, With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1
4.826	CR 8 VR	CR 8 V	CR 8 VUUR	CR 8 VUU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)
	CR 8-1 VR	CR 8-1 V	CR 8-1 VUUR	CR 8-1 VUU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)
6.350 (1/4)	CR 10 VR	CR 10 V	CR 10 VUUR	CR 10 VUU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
	CR 10-1 VR	CR 10-1 V	CR 10-1 VUUR	CR 10-1 VUU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
9.525 (3/8)	CR 12 VR	CR 12 V	CR 12 VUUR	CR 12 VUU	36	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
	CR 14 VR	CR 14 V	CR 14 VUUR	CR 14 VUU	47	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
11.112 (7/16)	CR 16 VR	CR 16 V	CR 16 VUUR	CR 16 VUU	74	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
	CR 18 VR	CR 18 V	CR 18 VUUR	CR 18 VUU	85	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
12.700 (1/2)	CR 20 VR	CR 20 V	CR 20 VUUR	CR 20 VUU	137	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
	CR 22 VR	CR 22 V	CR 22 VUUR	CR 22 VUU	160	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
15.875 (5/8)	CR 24 VR	CR 24 V	CR 24 VUUR	CR 24 VUU	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
	CR 26 VR	CR 26 V	CR 26 VUUR	CR 26 VUU	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
19.050 (3/4)	CR 28 VR	CR 28 V	CR 28 VUUR	CR 28 VUU	372	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
	CR 30 VR	CR 30 V	CR 30 VUUR	CR 30 VUU	418	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
22.225 (7/8)	CR 32 VR	CR 32 V	CR 32 VUUR	CR 32 VUU	627	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
	CR 36 VR	CR 36 V	CR 36 VUUR	CR 36 VUU	759	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
31.750 (1 1/4)	—	—	—	CR 48 VUU	1 960	76.200 (3)	44.450 (1 3/4)	31.750 (1 1/4)	1 1/4 - 12	31.750 (1 1/4)

Stud dia. mm (inch)	Identification number	Boundary dimensions mm(inch): B max	B_2	B_3	C_1	g_1	g_2	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
4.826	CR 8	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750
	CR 8-1	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	4 710	5 410
6.350 (1/4)	CR 10	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660
	CR 10-1	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	6 340	8 530
9.525 (3/8)	CR 12	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	10.8	8 710	12 300
	CR 14	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	15.081 (19/32)	10.8	8 710	12 300
11.112 (7/16)	CR 16	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.191 (3/64)	17.859 (45/64)	17.4	13 100	22 700
	CR 18	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	19.050 (3/4)	17.4	13 100	22 700
12.700 (1/2)	CR 20	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
	CR 22	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
15.875 (5/8)	CR 24	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
	CR 26	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
19.050 (3/4)	CR 28	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
	CR 30	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
22.225 (7/8)	CR 32	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
	CR 36	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
31.750 (1 1/4)	CR 48	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	4.762 (3/16)	2.381 (3/32)	51.991 (2 3/64)	500	77 600	172 000

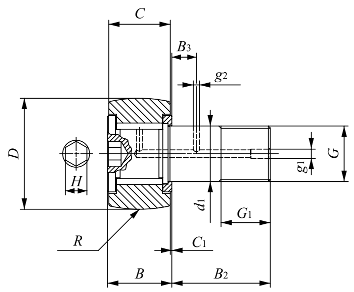
Remarks1. Models with a stud diameter d_1 of 6.35 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

I

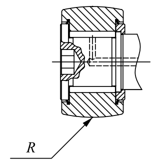
CF
NUCF
CFS
CR

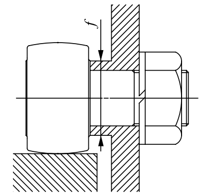
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inch Series Heavy Duty Cam Followers **Full Complement Type/With Hexagon Hole**



CRH···VBR





CRH···VBUUR

Stud dia. 6.350 — 50.800mm

Stud dia. mm (inch)	Identification number Shield type	Identification number Sealed type	Mass (Ref.) g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	H	R	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
6.350 (1/4)	CRH 8-1 VBR	CRH 8-1 VBUUR	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (–)	0.794 (1/32)	— (–)	— (–)	3.175 (1/8)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
	CRH 9 VBR	CRH 9 VBUUR	15	14.288 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (–)	0.794 (1/32)	— (–)	— (–)	3.175 (1/8)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
7.938 (5/16)	CRH 10-1 VBR	CRH 10-1 VBUUR	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (–)	0.794 (1/32)	— (–)	— (–)	3.175 (1/8)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
	CRH 11 VBR	CRH 11 VBUUR	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (–)	0.794 (1/32)	— (–)	— (–)	3.175 (1/8)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
11.112 (7/16)	CRH 12 VBR	CRH 12 VBUUR	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
	CRH 14 VBR	CRH 14 VBUUR	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
15.875 (5/8)	CRH 16 VBR	CRH 16 VBUUR	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
	CRH 18 VBR	CRH 18 VBUUR	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
19.050 (3/4)	CRH 20 VBR	CRH 20 VBUUR	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	360 (14)	24.209 (61/64)	103	23 600	31 700
	CRH 22 VBR	CRH 22 VBUUR	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	360 (14)	24.209 (61/64)	103	23 600	31 700
22.225 (7/8)	CRH 24 VBR	CRH 24 VBUUR	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
	CRH 26 VBR	CRH 26 VBUUR	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
25.400 (1)	CRH 28 VBR	CRH 28 VBUUR	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
	CRH 30 VBR	CRH 30 VBUUR	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
28.575 (1 1/8)	CRH 32 VBR	CRH 32 VBUUR	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
	CRH 36 VBR	CRH 36 VBUUR	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
31.750 (1 1/4)	CRH 40 VBR	CRH 40 VBUUR	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
	CRH 44 VBR	CRH 44 VBUUR	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
38.100 (1 1/2)	CRH 48 VBR	CRH 48 VBUUR	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
	CRH 52 VBR	CRH 52 VBUUR	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
44.450 (1 3/4)	CRH 56 VBR	CRH 56 VBUUR	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4-12UN	34.925 (1 3/8)	52.8 (2.08)	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	59.928 (2 23/64)	1 450	111 000	239 000
50.800 (2)	CRH 64 VBR	CRH 64 VBUUR	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2-12 UN	38.100 (1 1/2)	59.4 (2.34)	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	64.691 (2 35/64)	2 190	142 000	317 000

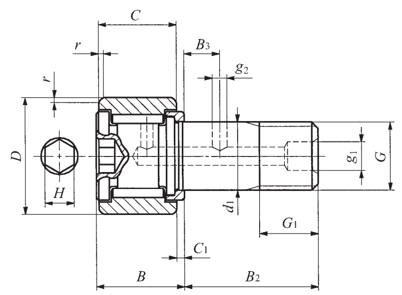
Boundary dimensions mm(inch)

Remarks1. Models with a stud diameter d_1 of 7.938 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

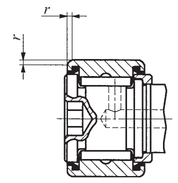
CAM FOLLOWERS

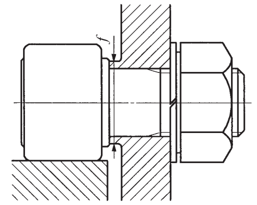
Inch Series Heavy Duty Cam Followers Full Complement Type/With Hexagon Hole



Stud dia. 6.350 — 50.800mm

CRH…VB





CRH…VBUU

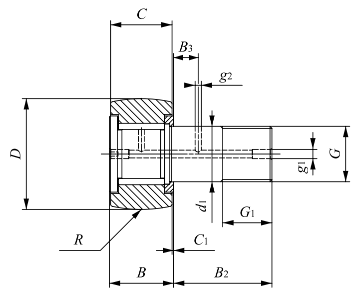
Stud dia. mm (inch)	Identification number: Shield type	Identification number: Sealed type	Mass (Ref.) g	Boundary dimensions mm(inch): D	C	d_1	G UNF	G_1	B max
6.350 (1/4)	CRH 8-1 VB	CRH 8-1 VBUU	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)
	CRH 9 VB	CRH 9 VBUU	15	14.288 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)
7.938 (5/16)	CRH 10-1 VB	CRH 10-1 VBUU	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)
	CRH 11 VB	CRH 11 VBUU	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)
11.112 (7/16)	CRH 12 VB	CRH 12 VBUU	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)
	CRH 14 VB	CRH 14 VBUU	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)
15.875 (5/8)	CRH 16 VB	CRH 16 VBUU	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)
	CRH 18 VB	CRH 18 VBUU	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)
19.050 (3/4)	CRH 20 VB	CRH 20 VBUU	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)
	CRH 22 VB	CRH 22 VBUU	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)
22.225 (7/8)	CRH 24 VB	CRH 24 VBUU	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)
	CRH 26 VB	CRH 26 VBUU	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)
25.400 (1)	CRH 28 VB	CRH 28 VBUU	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)
	CRH 30 VB	CRH 30 VBUU	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)
28.575 (1 1/8)	CRH 32 VB	CRH 32 VBUU	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)
	CRH 36 VB	CRH 36 VBUU	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)
31.750 (1 1/4)	CRH 40 VB	CRH 40 VBUU	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)
	CRH 44 VB	CRH 44 VBUU	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)
38.100 (1 1/2)	CRH 48 VB	CRH 48 VBUU	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)
	CRH 52 VB	CRH 52 VBUU	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)
44.450 (1 3/4)	CRH 56 VB	CRH 56 VBUU	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4-12 UN	34.925 (1 3/8)	52.8 (2.08)
50.800 (2)	CRH 64 VB	CRH 64 VBUU	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2-12 UN	38.100 (1 1/2)	59.4 (2.34)

Identification number (Shield type)	Boundary dimensions mm(inch): B_2	B_3	C_1	g_1	g_2	H	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
CRH 8-1 VB	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
CRH 9 VB	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
CRH 10-1 VB	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
CRH 11 VB	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
CRH 12 VB	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
CRH 14 VB	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
CRH 16 VB	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.191 (3/64)	18.256 (23/32)	57.8	13 100	22 700
CRH 18 VB	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	18.256 (23/32)	57.8	13 100	22 700
CRH 20 VB	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
CRH 22 VB	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
CRH 24 VB	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
CRH 26 VB	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
CRH 28 VB	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
CRH 30 VB	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
CRH 32 VB	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
CRH 36 VB	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
CRH 40 VB	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
CRH 44 VB	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
CRH 48 VB	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
CRH 52 VB	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
CRH 56 VB	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	59.928 (2 23/64)	1 450	111 000	239 000
CRH 64 VB	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	64.691 (2 35/64)	2 190	142 000	317 000

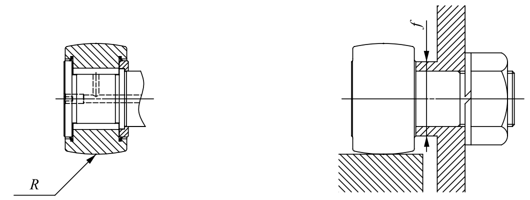
Remarks1. Models with a stud diameter d_1 of 7.938 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

Inch Series Heavy Duty Cam Followers Full Complement Type/With Screwdriver Slot



CRH···VR



CRH···VUUR

Stud dia. 6.350 — 50.800mm

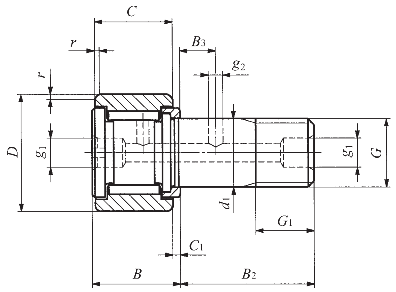
Stud dia. mm (inch)	Identification number: Shield type	Identification number: Sealed type	Mass (Ref.) g	Boundary dimensions mm(inch) D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	R	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
6.350 (1/4)	CRH 8-1 VR	CRH 8-1 VUUR	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (–)	0.794 (1/32)	*3.175 (1/8)	— (–)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
	CRH 9 VR	CRH 9 VUUR	15	14.288 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (–)	0.794 (1/32)	*3.175 (1/8)	— (–)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
7.938 (5/16)	CRH 10-1 VR	CRH 10-1 VUUR	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (–)	0.794 (1/32)	*3.175 (1/8)	— (–)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
	CRH 11 VR	CRH 11 VUUR	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (–)	0.794 (1/32)	*3.175 (1/8)	— (–)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
11.112 (7/16)	CRH 12 VR	CRH 12 VUUR	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
	CRH 14 VR	CRH 14 VUUR	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
15.875 (5/8)	CRH 16 VR	CRH 16 VUUR	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
	CRH 18 VR	CRH 18 VUUR	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
19.050 (3/4)	CRH 20 VR	CRH 20 VUUR	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	360 (14)	24.209 (61/64)	103	23 600	31 700
	CRH 22 VR	CRH 22 VUUR	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	360 (14)	24.209 (61/64)	103	23 600	31 700
22.225 (7/8)	CRH 24 VR	CRH 24 VUUR	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
	CRH 26 VR	CRH 26 VUUR	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
25.400 (1)	CRH 28 VR	CRH 28 VUUR	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
	CRH 30 VR	CRH 30 VUUR	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
28.575 (1 1/8)	CRH 32 VR	CRH 32 VUUR	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
	CRH 36 VR	CRH 36 VUUR	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
31.750 (1 1/4)	CRH 40 VR	CRH 40 VUUR	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
	CRH 44 VR	CRH 44 VUUR	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
38.100 (1 1/2)	CRH 48 VR	CRH 48 VUUR	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
	CRH 52 VR	CRH 52 VUUR	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
44.450 (1 3/4)	CRH 56 VR	CRH 56 VUUR	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4-12 UN	34.925 (1 3/8)	52.8 (2.08)	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	760 (30)	59.928 (2 23/64)	1 450	111 000	239 000
50.800 (2)	CRH 64 VR	CRH 64 VUUR	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2-12 UN	38.100 (1 1/2)	59.4 (2.34)	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	760 (30)	64.691 (2 35/64)	2 190	142 000	317 000

Remarks1. Models with a stud diameter d_1 of 7.938 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

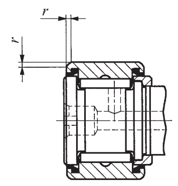
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

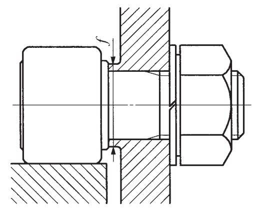
CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers Full Complement Type/With Screwdriver Slot



CRH…V





CRH…VUU

Stud dia. 6.350 – 50.800mm

Stud dia. mm (inch)	Identification number: Shield type	Identification number: Sealed type	Mass (Ref.) g	D	C	d_1	G UNF	G_1	B max
6.350 (1/4)	CRH 8-1 V	CRH 8-1 VUU	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)
	CRH 9 V	CRH 9 VUU	15	14.228 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)
7.938 (5/16)	CRH 10-1 V	CRH 10-1 VUU	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)
	CRH 11 V	CRH 11 VUU	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)
11.112 (7/16)	CRH 12 V	CRH 12 VUU	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)
	CRH 14 V	CRH 14 VUU	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)
15.875 (5/8)	CRH 16 V	CRH 16 VUU	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)
	CRH 18 V	CRH 18 VUU	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)
19.050 (3/4)	CRH 20 V	CRH 20 VUU	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)
	CRH 22 V	CRH 22 VUU	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)
22.225 (7/8)	CRH 24 V	CRH 24 VUU	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)
	CRH 26 V	CRH 26 VUU	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)
25.400 (1)	CRH 28 V	CRH 28 VUU	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)
	CRH 30 V	CRH 30 VUU	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)
28.575 (1 1/8)	CRH 32 V	CRH 32 VUU	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)
	CRH 36 V	CRH 36 VUU	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)
31.750 (1 1/4)	CRH 40 V	CRH 40 VUU	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)
	CRH 44 V	CRH 44 VUU	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)
38.100 (1 1/2)	CRH 48 V	CRH 48 VUU	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)
	CRH 52 V	CRH 52 VUU	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)
44.450 (1 3/4)	CRH 56 V	CRH 56 VUU	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4-12 UN	34.925 (1 3/8)	52.8 (2.08)
50.800 (2)	CRH 64 V	CRH 64 VUU	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2-12 UN	38.100 (1 1/2)	59.4 (2.34)

Shield type	Boundary dimensions mm(inch): B_2	B_3	C_1	g_1	g_2	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
CRH 8-1 V	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
CRH 9 V	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
CRH 10-1 V	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
CRH 11 V	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
CRH 12 V	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
CRH 14 V	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
CRH 16 V	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.191 (3/64)	18.256 (23/32)	57.8	13 100	22 700
CRH 18 V	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	18.256 (23/32)	57.8	13 100	22 700
CRH 20 V	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
CRH 22 V	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
CRH 24 V	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
CRH 26 V	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
CRH 28 V	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
CRH 30 V	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
CRH 32 V	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
CRH 36 V	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
CRH 40 V	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
CRH 44 V	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
CRH 48 V	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
CRH 52 V	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
CRH 56 V	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	2.381 (3/32)	59.928 (2 23/64)	1 450	111 000	239 000
CRH 64 V	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	2.381 (3/32)	64.691 (2 35/64)	2 190	142 000	317 000

Remarks1. Models with a stud diameter d_1 of 7.938 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. A nut is supplied with the stud.

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

ROLLER FOLLOWERS

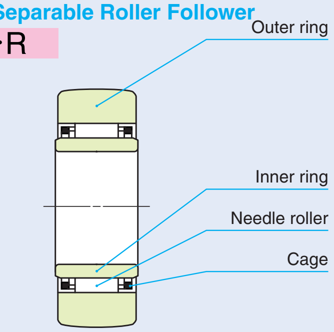
●Separable Roller Followers
●Non-separable Roller Followers
●Cylindrical Roller Followers

Structure and Features

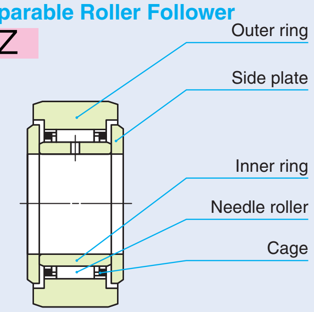
IKO Roller Followers are bearings designed for outer ring rotation, in which needle rollers are incorporated in a thick walled outer ring. Both crowned and cylindrical outer rings are available. The outer rings run directly on mating track surfaces, and the crowned outer ring is effective in relieving the edge load caused by mounting errors. The cylindrical outer ring, on the other hand, has a large contact area with the mating track surface and is suitable for applications involving large loads or low track surface hardness.
In Roller Followers, there are two types of bearings available, the caged type and the full complement type. The caged type is useful for applications at high-speed rotation. The full complement type, on the other hand, is suitable for heavy-load applications at low-speed rotation or oscillating motions.
Roller Followers include separable and non-separable types. Also, in addition to the open type, shield type and sealed type are available. The clearances between the side plates and outer ring of the shield type are narrow, and form labyrinths. In the sealed type, special synthetic rubber seals are assembled in these clearances, and they are effective in preventing penetration of dust and dirt.
These bearings are available in a variety of types to suit almost any kind of application. They are widely used for cam mechanisms and for linear motions of conveying equipment.

Structures of Roller Followers

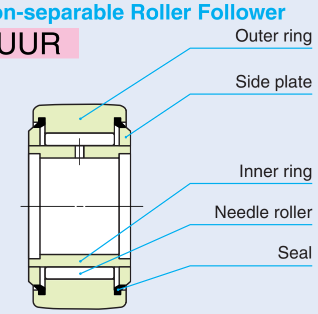
Structure of Separable Roller Follower
NAST…R



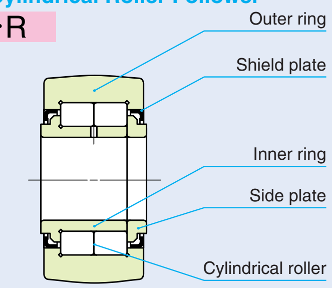
Structure of Separable Roller Follower
NAST…ZZ



Structure of Non-separable Roller Follower
NART…VUUR



Structure of Cylindrical Roller Follower
NURT…R



Types

In Roller Followers, types shown in Table 1 are available.

Table 1 Type of Roller Followers

Type				With cage		Full complement type	
				Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring
Metric series	Separable Roller Followers RNAST, NAST	Without inner ring	Open type	RNAST… R	RNAST	—	—
		With inner ring	Open type	NAST… R	NAST	—	—
			Shield type	NAST…ZZ R	NAST…ZZ	—	—
			Sealed type	NAST…ZZUUR	NAST…ZZUU	—	—
	Non-separable Roller Followers NART		Shield type	NART… R	—	NART…V R	—
			Sealed type	NART… UUR	—	NART…VUUR	—
	Cylindrical Roller Followers NURT		Shield type	—	—	NURT… R	NURT
Inch series	Non-separable Roller Followers CRY		Shield type	—	—	CRY …V R	CRY…V
			Sealed type	—	—	CRY …VUUR	CRY…VUU

Separable Roller Followers

These bearings are assembled by combining an outer ring, inner ring and Needle Roller Cage, which can be separated from one another. Thus, handling is easy. Oil lubrication is also easy, making them suitable for high-speed rotations.
There are two types: type without inner ring RNAST and type with inner ring NAST. The type with inner ring includes open type, shield type, and sealed type.

Non-separable Roller Followers

These non-separable type bearings have side plates fixed on both sides of the inner ring, and include the caged type and the full complement type. Both shield type and sealed type are available.
Inch series Non-separable Roller Followers are full complement type bearings and their surface is treated with black oxide surface treatment.

Cylindrical Roller Followers

These full complement type bearings incorporate cylindrical rollers in the outer ring in two rows and can withstand large radial loads and some axial loads. These bearings are shield type with non-separable structure.

Identification Number

Some examples of the identification number of Roller Followers are shown below.

Examples of identification number

Example 1	NAST	10		ZZUU	R
Example 2	NART	10	V	UU	R
Example 3	NURT	15			R
Example 4	CRY	12	V	UU	R

Model code

Metric series	RNAST	Separable Roller Follower	Without inner ring
	NAST		With inner ring
	NART	Non-separable Roller Follower	
	NURT	Cylindrical Roller Follower	
Inch series	CRY	Non-separable Roller Follower	

Size

The size indicates the bore diameter of the inner ring. (unit: mm)
In the inch series, the outer diameter of the outer ring is indicated in units of 1/16 inch.

Roller guide method

No symbol	With cage
V	Full complement type

Seal structure (Separable Roller Follower)

No symbol	Open type
ZZ	Shield type
ZZUU	Sealed type

Seal structure (Other Roller Follower)

No symbol	Shield type
UU	Sealed type

Shape of outer ring outside surface

R	With crowned outer ring
No symbol	With cylindrical outer ring

Accuracy

Dimensional accuracy and rotational accuracy of Roller Followers are based on Tables 2, 3 and 4. Tolerances for the smallest single roller set bore diameter of Separable Roller Followers are shown in Table 5. Roller Followers with special accuracy can also be manufactured. Please contact IKO.

Table 2 Tolerances

unit: μm

Dimensions and symbols		Metric series Crowned outer ring	Metric series Cylindrical outer ring	Inch series Crowned outer ring	Inch series Cylindrical outer ring
Bore dia. of inner ring d	$d \leqq 19.05$	See Table 3.		+ 5 − 10	+ 5 − 10
	$19.05 < d$			+ 2 − 12	
Outside dia. of outer ring D		0 − 50	See Table 4.	0 − 50	0 − 25
Width of outer ring C		0 − 120		0 − 130	
Width of inner ring B	Separable Roller Follower	0 − 120		—	
Width of bearing B	Non-separable Roller Follower	h12	—	+ 130 − 250	
	Cylindrical Roller Follower		h12		
Roller set bore dia. F_w	Separable Roller Follower	See Table 5.		—	

Table 3 Tolerances and allowable values of inner rings (Metric series)

unit: μm

d Nominal bore dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		V_{dp} Bore dia. variation in a single radial plane	V_{dmp} Mean bore dia. variation	K_{ia} Radial runout of assembled bearing inner ring	V_{Bs} Width variation
Over	Incl.	High	Low	(Max.)	(Max.)	(Max.)	(Max.)
2.5	10	0	− 8	10	6	10	15
10	18	0	− 8	10	6	10	20
18	30	0	− 10	13	8	13	20
30	50	0	− 12	15	9	15	20

Table 4 Tolerances and allowable values of outer rings (Metric series)

unit: μm

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dp} (1) Outside dia. variation in a single radial plane	V_{Dmp} (1) Mean outside dia. variation	K_{ea} (1) Radial runout of assembled bearing outer ring	V_{Cs} Width variation
Over	Incl.	High	Low	(Max.)	(Max.)	(Max.)	(Max.)
6	18	0	− 8	10	6	15	Same as the tolerance values of V_{Bs} for d of the inner of the same bearing
18	30	0	− 9	12	7	15	
30	50	0	− 11	14	8	20	
50	80	0	− 13	16	10	25	
80	120	0	− 15	19	11	35	

Note(1) Also applicable to the inch series.

Table 5 Tolerances of smallest single roller set bore diameter $F_{ws\ min}$

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
6	10	+ 22	+ 13
10	18	+ 27	+ 16
18	30	+ 33	+ 20
30	50	+ 41	+ 25
50	80	+ 49	+ 30

Clearance

Radial internal clearances of Roller Followers are based on Table 6.

Table 6 Radial internal clearance

unit: μm

Identification number (1) Metric series Separable Roller Followers	Identification number (1) Metric series Non-separable Roller Followers	Identification number (1) Metric series Cylindrical Roller Followers	Identification number (1) Inch series Non-separable Roller Followers	Radial internal clearance Min.	Radial internal clearance Max.
NAST 6R	NART 5R	—	—	5	20
NAST 8R～NAST12R	NART 6R～NART12R	—	—	5	25
NAST15R～NAST25R	NART15R～NART20R	—	—	10	30
NAST30R～NAST40R	NART25R～NART40R	—	—	10	40
NAST45R, NAST50R	NART45R, NART50R	—	—	15	50
—	—	NURT15R～NURT30-1R	—	20	45
—	—	NURT35R～NURT40-1R	—	25	50
—	—	NURT45R～NURT50-1R	—	30	60
—	—	—	CRY12R～CRY56R	35	60
—	—	—	CRY64R	45	70

Note(1) Also applicable to the full complement type, cylindrical outer ring type, shield type and sealed type.

Fit

Roller Followers are generally used under the loading conditions in which the load direction is fixed in relation to the inner ring and rotates in relation to the outer ring. The recommended fits for shafts are shown in Table 7. Those for the inch series are shown in the dimension table.

Table 7 Recommended fit (Metric series)

Type		Tolerance class of shaft
Separable Roller Followers	without inner ring	k5, k6
	with inner ring	g6, h6
Non-separable Roller Followers		
Cylindrical Roller Followers		

Maximum allowable static load

The load that is applicable to Roller Followers is, in some cases, determined by the strength of the outer ring rather than by the load rating of the needle roller bearing. Therefore, the maximum allowable load that is limited by the strength of outer ring is specified.

Track Capacity

Track capacity is defined as the load that can be continuously applied on a Roller Follower placed on a steel track surface without causing deformation and indentation on the track surface when the outer ring of the Roller Follower makes contact with the mating track surface (plane). The track capacities shown in Tables 8.1 and 8.2 are applicable when the hardness of the mating track surface is 40HRC (Tensile strength 1250N/mm²). When the hardness of the mating track surface differs from 40HRC, the track capacity is obtained by multiplying the value by the track capacity factor shown in Table 9.

If lubrication between the outer ring and the mating track surface is insufficient, seizure and/or wear may occur depending on the application. Therefore, pay attention to lubrication and surface roughness of the mating track especially in the case of high-speed rotation such as for cam mechanisms.

Table 8.1 Track capacity (Metric series)

unit: N

Roller Followers with crowned outer ring				Roller Followers with cylindrical outer ring					
Identification number (1)			Track capacity	Identification number	Track capacity	Identification number (2)	Track capacity	Identification number	Track capacity
Separable Roller Followers	Non-separable Roller Followers	Cylindrical Roller Followers							
RNAST 5R	NART 5R	—	1 040	RNAST 5	2 310	—	—	—	—
(R)NAST 6R	NART 6R	—	1 330	(R)NAST 6	3 550	NAST 6ZZ	3 550	—	—
(R)NAST 8R	NART 8R	—	1 850	(R)NAST 8	3 980	NAST 8ZZ	4 490	—	—
(R)NAST10R	NART10R	—	2 470	(R)NAST10	5 610	NAST10ZZ	6 890	—	—
(R)NAST12R	NART12R	—	2 710	(R)NAST12	5 990	NAST12ZZ	7 350	—	—
(R)NAST15R	NART15R	NURT15 R	3 060	(R)NAST15	6 550	NAST15ZZ	8 030	NURT15	11 500
—	—	NURT15-1R	3 910	—	—	—	—	NURT15-1	13 700
(R)NAST17R	NART17R	NURT17 R	3 660	(R)NAST17	10 900	NAST17ZZ	11 700	NURT17	13 600
—	—	NURT17-1R	4 530	—	—	—	—	NURT17-1	16 000
(R)NAST20R	NART20R	NURT20 R	4 530	(R)NAST20	12 800	NAST20ZZ	13 800	NURT20	20 000
—	—	NURT20-1R	5 190	—	—	—	—	NURT20-1	22 100
(R)NAST25R	NART25R	NURT25 R	5 190	(R)NAST25	14 100	NAST25ZZ	15 300	NURT25	22 100
—	—	NURT25-1R	6 580	—	—	—	—	NURT25-1	26 400
(R)NAST30R	NART30R	NURT30 R	6 580	(R)NAST30	22 100	NAST30ZZ	22 100	NURT30	31 600
—	—	NURT30-1R	8 020	—	—	—	—	NURT30-1	36 700
(R)NAST35R	NART35R	NURT35 R	8 020	(R)NAST35	25 700	NAST35ZZ	25 700	NURT35	36 700
—	—	NURT35-1R	9 220	—	—	—	—	NURT35-1	40 800
(R)NAST40R	NART40R	NURT40 R	9 220	(R)NAST40	26 900	NAST40ZZ	30 300	NURT40	44 200
—	—	NURT40-1R	10 800	—	—	—	—	NURT40-1	49 700
(R)NAST45R	NART45R	NURT45 R	9 990	(R)NAST45	28 500	NAST45ZZ	32 200	NURT45	47 000
—	—	NURT45-1R	12 400	—	—	—	—	NURT45-1	55 300
(R)NAST50R	NART50R	NURT50 R	10 800	(R)NAST50	30 200	NAST50ZZ	34 000	NURT50	49 700
—	—	NURT50-1R	14 000	—	—	—	—	NURT50-1	60 800

Notes(1) Also applicable to the full complement type, shield type, and sealed type.
(2) Also applicable to the sealed type.

Table 8.2 Track capacity (Inch series)

unit: N

Crowned outer ring		Cylindrical outer ring	
Identification number (1)	Track capacity	Identification number (1)	Track capacity
CRY12R	853	CRY12	4 490
CRY14R	1 050	CRY14	5 240
CRY16R	1 420	CRY16	7 270
CRY18R	1 660	CRY18	7 700
CRY20R	2 160	CRY20	10 700
CRY22R	2 450	CRY22	11 800
CRY24R	3 410	CRY24	15 400
CRY26R	3 820	CRY26	16 700
CRY28R	4 210	CRY28	21 000
CRY30R	4 610	CRY30	22 500
CRY32R	5 690	CRY32	30 800
CRY36R	6 640	CRY36	34 700
CRY40R	8 970	CRY40	44 900
CRY44R	10 200	CRY44	49 400
CRY48R	11 400	CRY48	64 300
CRY52R	12 700	CRY52	69 600
CRY56R	14 100	CRY56	87 000
CRY64R	16 800	CRY64	113 000

Note(1) Also applicable to the sealed type.

Table 9 Track capacity factor

Hardness HRC	Tensile strength N/mm²	Track capacity factor	
		Crowned outer ring	Cylindrical outer ring
20	760	0.22	0.37
25	840	0.31	0.46
30	950	0.45	0.58
35	1 080	0.65	0.75
38	1 180	0.85	0.89
40	1 250	1.00	1.00
42	1 340	1.23	1.15
44	1 435	1.52	1.32
46	1 530	1.85	1.51
48	1 635	2.27	1.73
50	1 760	2.80	1.99
52	1 880	3.46	2.29
54	2 015	4.21	2.61
56	2 150	5.13	2.97
58	2 290	6.26	3.39

Allowable Rotational Speed

The allowable rotational speed of Roller Followers is affected by mounting and operating conditions. For reference, Table 10 shows dn values when only pure radial loads are applied. Under actual operating conditions, the recommended dn value is 1/10 of the value shown in the table in consideration of the axial loads that may act on the bearing.

Table 10 dn values of Roller Followers(1)

Type \ Lubricant	Grease	Oil
Caged type	84 000	140 000
Full complement type	42 000	70 000
Cylindrical Roller Follower	72 000	120 000

Note(1) dn value $= d \times n$
where, d : Bore diameter of bearing mm
n : Rotational speed rpm

Lubrication

In Sealed Type Roller Followers, Heavy Duty Type Roller Followers and Inch series Roller Followers, ALVANIA GREASE S2 (SHELL) is prepacked as the lubricating grease.

For Roller Followers without prepacked grease, grease or oil should be supplied through the oil hole of the inner ring for use. If they are used without lubrication, wear of rolling contact surfaces may take place, leading to a short bearing life.

Oil Hole

Open Type Separable Roller Followers have no oil hole. Inner rings of other types of Metric series Roller Followers have an oil hole. Inch series inner rings have an oil groove and an oil hole.

Mounting

❶ In case of shield and sealed types, match the side surface correctly to the mating seating surface indicated by the dimension a shown in the dimension table, and fix them. (See Fig. 1.)

❷ When mounting Roller Followers, pay special attention to avoid locating the oil hole of the inner ring within the loading zone. This may lead to a short bearing life. (See Fig. 2.)

❸ When mounting Sealed Type Separable Roller Followers, do not cause the side plates to come off. If they come off, set them again in place taking care to avoid damaging the seal lips.

❹ In case of Roller Followers without an inner ring, the shaft requires heat treatment and grinding finish. The recommended surface hardness of the shaft is 58～64HRC, and the recommended roughness of the shaft is 0.2 μmR_a or less.
Also, the outer ring and cage are guided by side surfaces of the mounting parts. Therefore, it is recommended that the side surfaces of the mounting parts be finished by grinding or at least by machining. (See Fig. 3.)

❺ In Non-separable Roller Followers, the side plates are press-fitted. Therefore, when mounting the Roller Followers, do not push the side plates.

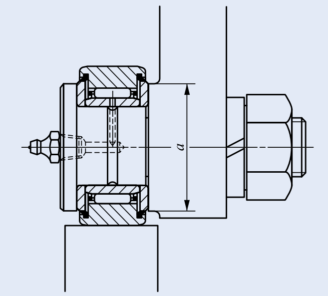


Fig. 1 Mating seating dimension "a"

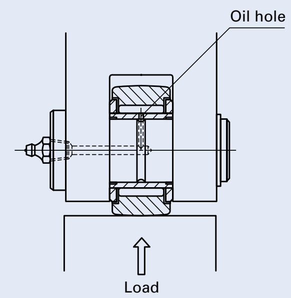


Fig. 2 Position of oil hole and load direction

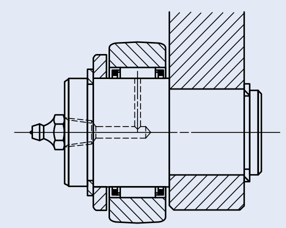
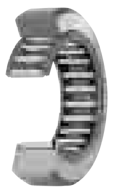


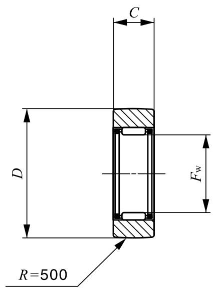
Fig. 3 Mounting example of Roller Follower without inner ring

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

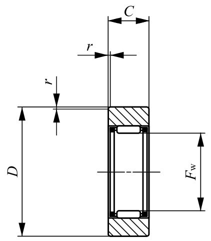
ROLLER FOLLOWERS

Separable Roller Followers, Open Type With Cage/Without Inner Ring





RNAST…R



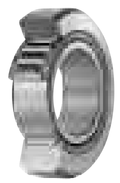
RNAST

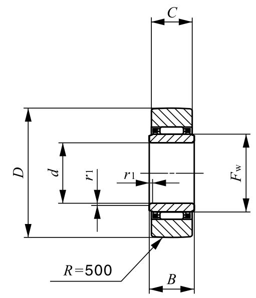
Shaft dia. 7 — 60mm

Shaft dia. mm	Identification number, Open type: Crowned outer ring	Identification number, Open type: Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	$r_{s\,min}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N
7	RNAST 5 R	RNAST 5	8.9	7	16	7.8	0.3	2 710	2 390
10	RNAST 6 R	RNAST 6	13.9	10	19	9.8	0.3	4 160	4 550
12	RNAST 8 R	RNAST 8	23.5	12	24	9.8	0.6	5 650	5 890
14	RNAST 10 R	RNAST 10	42.5	14	30	11.8	1	9 790	9 680
16	RNAST 12 R	RNAST 12	49.5	16	32	11.8	1	10 500	10 900
20	RNAST 15 R	RNAST 15	50	20	35	11.8	1	12 400	14 300
22	RNAST 17 R	RNAST 17	90	22	40	15.8	1	17 600	20 900
25	RNAST 20 R	RNAST 20	135	25	47	15.8	1	19 400	24 500
30	RNAST 25 R	RNAST 25	152	30	52	15.8	1	20 800	28 400
38	RNAST 30 R	RNAST 30	255	38	62	19.8	1	30 500	45 400
42	RNAST 35 R	RNAST 35	375	42	72	19.8	1	32 400	50 600
50	RNAST 40 R	RNAST 40	420	50	80	19.8	1.5	35 900	61 100
55	RNAST 45 R	RNAST 45	460	55	85	19.8	1.5	37 400	66 400
60	RNAST 50 R	RNAST 50	500	60	90	19.8	1.5	38 900	71 700

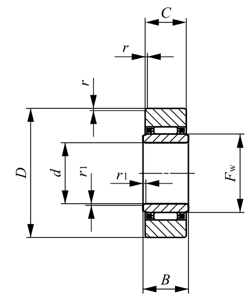
Note(1) Minimum allowable value of chamfer dimension r
Remarks1. No oil hole is provided.
2. Not provided with prepacked grease. Perform proper lubrication for use.

Separable Roller Followers, Open Type With Cage/With Inner Ring





NAST…R



NAST

Shaft dia. 6 — 50mm

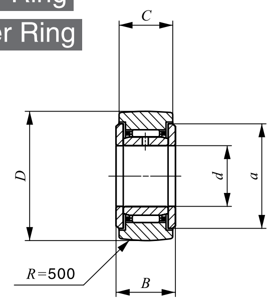
Shaft dia. mm	Identification number, Open type: Crowned outer ring	Identification number, Open type: Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm: d	D	B	C	$r_{s\,min}$ (1)	$r_{1s\,min}$ (1)	F_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Assembled inner ring
6	NAST 6 R	NAST 6	17.8	6	19	10	9.8	0.3	0.3	10	4 160	4 550	LRT 61010 S
8	NAST 8 R	NAST 8	28	8	24	10	9.8	0.6	0.3	12	5 650	5 890	LRT 81210 S
10	NAST 10 R	NAST 10	49.5	10	30	12	11.8	1	0.3	14	9 790	9 680	LRT 101412 S
12	NAST 12 R	NAST 12	58	12	32	12	11.8	1	0.3	16	10 500	10 900	LRT 121612 S
15	NAST 15 R	NAST 15	62	15	35	12	11.8	1	0.3	20	12 400	14 300	LRT 152012 S
17	NAST 17 R	NAST 17	109	17	40	16	15.8	1	0.3	22	17 600	20 900	LRT 172216 S
20	NAST 20 R	NAST 20	157	20	47	16	15.8	1	0.3	25	19 400	24 500	LRT 202516 S
25	NAST 25 R	NAST 25	180	25	52	16	15.8	1	0.3	30	20 800	28 400	LRT 253016 S
30	NAST 30 R	NAST 30	320	30	62	20	19.8	1	0.6	38	30 500	45 400	LRT 303820 S
35	NAST 35 R	NAST 35	440	35	72	20	19.8	1	0.6	42	32 400	50 600	LRT 354220 S
40	NAST 40 R	NAST 40	530	40	80	20	19.8	1.5	1	50	35 900	61 100	LRT 405020 S
45	NAST 45 R	NAST 45	580	45	85	20	19.8	1.5	1	55	37 400	66 400	LRT 455520 S
50	NAST 50 R	NAST 50	635	50	90	20	19.8	1.5	1	60	38 900	71 700	LRT 506020 S

Note(1) Minimum allowable value of chamfer dimension r or r_1
Remarks1. No oil hole is provided.
2. Not provided with prepacked grease. Perform proper lubrication for use.

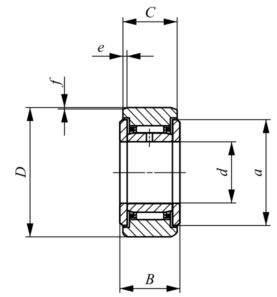
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

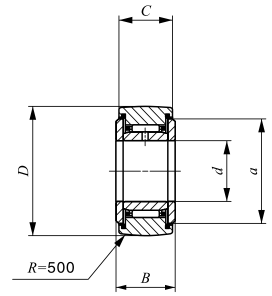
Separable Roller Followers, Shield Type **With Cage/With Inner Ring**
Separable Roller Followers, Sealed Type **With Cage/With Inner Ring**



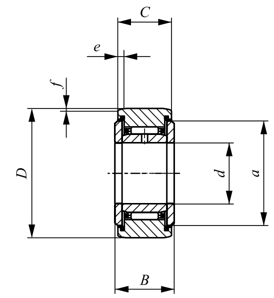
NAST…ZZR



NAST…ZZ



NAST…ZZUR



NAST…ZZUU

Shaft dia. 6 — 50mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring	Identification number: Shield type, Cylindrical outer ring	Identification number: Sealed type, Crowned outer ring	Identification number: Sealed type, Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm: d	D	B	C	a	e	f	Basic dynamic load rating C N	Basic static load rating C_0 N
6	NAST 6 ZZR	NAST 6 ZZ	NAST 6 ZZUUR	NAST 6 ZZUU	24.5	6	19	14	13.8	14	2.5	0.8	4 160	4 550
8	NAST 8 ZZR	NAST 8 ZZ	NAST 8 ZZUUR	NAST 8 ZZUU	39	8	24	14	13.8	17.5	2.5	0.8	5 650	5 890
10	NAST 10 ZZR	NAST 10 ZZ	NAST 10 ZZUUR	NAST 10 ZZUU	65	10	30	16	15.8	23.5	2.5	0.8	9 790	9 680
12	NAST 12 ZZR	NAST 12 ZZ	NAST 12 ZZUUR	NAST 12 ZZUU	75	12	32	16	15.8	25.5	2.5	0.8	10 500	10 900
15	NAST 15 ZZR	NAST 15 ZZ	NAST 15 ZZUUR	NAST 15 ZZUU	83	15	35	16	15.8	29	2.5	0.8	12 400	14 300
17	NAST 17 ZZR	NAST 17 ZZ	NAST 17 ZZUUR	NAST 17 ZZUU	135	17	40	20	19.8	32.5	3	1	17 600	20 900
20	NAST 20 ZZR	NAST 20 ZZ	NAST 20 ZZUUR	NAST 20 ZZUU	195	20	47	20	19.8	38	3	1	19 400	24 500
25	NAST 25 ZZR	NAST 25 ZZ	NAST 25 ZZUUR	NAST 25 ZZUU	225	25	52	20	19.8	43	3	1	20 800	28 400
30	NAST 30 ZZR	NAST 30 ZZ	NAST 30 ZZUUR	NAST 30 ZZUU	400	30	62	25	24.8	50.5	4	1.2	30 500	45 400
35	NAST 35 ZZR	NAST 35 ZZ	NAST 35 ZZUUR	NAST 35 ZZUU	550	35	72	25	24.8	53.5	4	1.2	32 400	50 600
40	NAST 40 ZZR	NAST 40 ZZ	NAST 40 ZZUUR	NAST 40 ZZUU	710	40	80	26	25.8	61.5	4	1.2	35 900	61 100
45	NAST 45 ZZR	NAST 45 ZZ	NAST 45 ZZUUR	NAST 45 ZZUU	760	45	85	26	25.8	66.5	4	1.2	37 400	66 400
50	NAST 50 ZZR	NAST 50 ZZ	NAST 50 ZZUUR	NAST 50 ZZUU	830	50	90	26	25.8	76	4	1.2	38 900	71 700

Remarks 1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

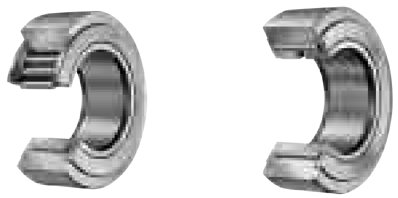
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

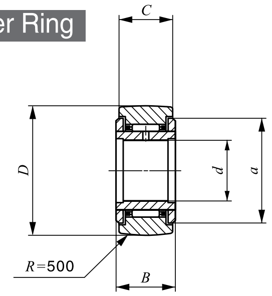
ROLLER FOLLOWERS

IKO

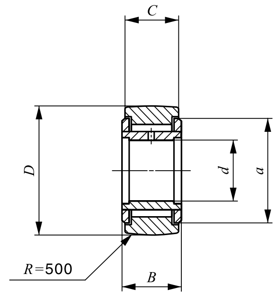
Non-separable Roller Followers With Cage/With Inner Ring

Full Complement Type/With Inner Ring

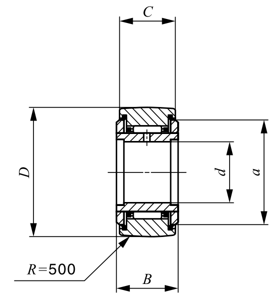




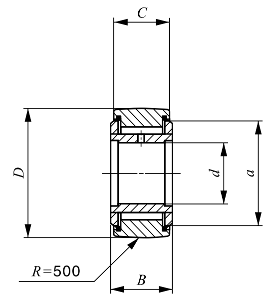
NART…R



NART…VR



NART…UUR



NART…VUUR

Shaft dia. 5 — 40mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring, With cage	Shield type, Crowned outer ring, Full complement	Sealed type, Crowned outer ring, With cage	Sealed type, Crowned outer ring, Full complement	Mass (Ref.) g
5	NART 5 R	—	NART 5 UUR	—	14.5
	—	NART 5 VR	—	NART 5 VUUR	15.1
6	NART 6 R	—	NART 6 UUR	—	20.5
	—	NART 6 VR	—	NART 6 VUUR	21.5
8	NART 8 R	—	NART 8 UUR	—	41.5
	—	NART 8 VR	—	NART 8 VUUR	42.5
10	NART 10 R	—	NART 10 UUR	—	64.5
	—	NART 10 VR	—	NART 10 VUUR	66.5
12	NART 12 R	—	NART 12 UUR	—	71
	—	NART 12 VR	—	NART 12 VUUR	73
15	NART 15 R	—	NART 15 UUR	—	102
	—	NART 15 VR	—	NART 15 VUUR	106
17	NART 17 R	—	NART 17 UUR	—	149
	—	NART 17 VR	—	NART 17 VUUR	155
20	NART 20 R	—	NART 20 UUR	—	250
	—	NART 20 VR	—	NART 20 VUUR	255
25	NART 25 R	—	NART 25 UUR	—	285
	—	NART 25 VR	—	NART 25 VUUR	295
30	NART 30 R	—	NART 30 UUR	—	470
	—	NART 30 VR	—	NART 30 VUUR	485
35	NART 35 R	—	NART 35 UUR	—	640
	—	NART 35 VR	—	NART 35 VUUR	655
40	NART 40 R	—	NART 40 UUR	—	845
	—	NART 40 VR	—	NART 40 VUUR	865

Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

Boundary dimensions mm: d	D	B	C	a	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
5	16	12	11	12	3 650	3 680	3 680
5	16	12	11	12	6 810	8 370	7 310
6	19	12	11	14	4 250	4 740	4 740
6	19	12	11	14	7 690	10 300	10 300
8	24	15	14	17.5	5 640	5 900	5 900
8	24	15	14	17.5	11 800	15 600	15 600
10	30	15	14	23.5	8 030	7 540	7 540
10	30	15	14	23.5	15 600	18 100	17 500
12	32	15	14	25.5	8 580	8 470	8 470
12	32	15	14	25.5	16 800	20 500	18 600
15	35	19	18	29	13 700	16 400	16 400
15	35	19	18	29	25 200	36 400	24 000
17	40	21	20	32.5	17 600	21 000	21 000
17	40	21	20	32.5	32 000	46 300	33 100
20	47	25	24	38	23 000	30 700	30 700
20	47	25	24	38	41 600	67 300	67 300
25	52	25	24	43	24 700	35 400	35 400
25	52	25	24	43	45 500	79 100	79 100
30	62	29	28	50.5	33 600	51 400	51 400
30	62	29	28	50.5	59 900	110 000	92 500
35	72	29	28	53.5	35 700	57 400	57 400
35	72	29	28	53.5	63 100	121 000	121 000
40	80	32	30	61.5	44 900	81 500	81 500
40	80	32	30	61.5	76 300	164 000	164 000

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

I
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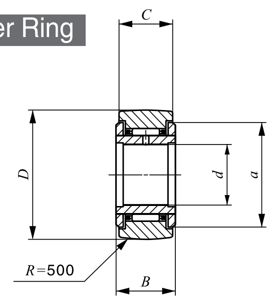
NART
NURT

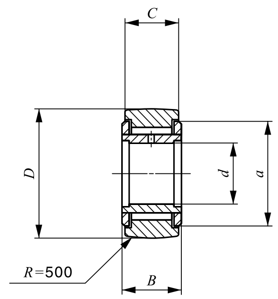
ROLLER FOLLOWERS

Non-separable Roller Followers With Cage/With Inner Ring

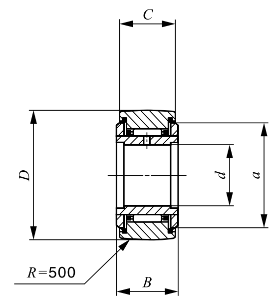
Full Complement Type/With Inner Ring



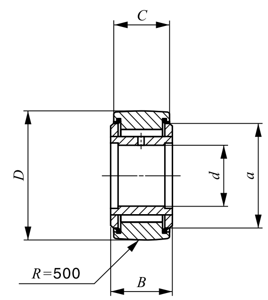
NART…R



NART…VR



NART…UUR



NART…VUUR

Shaft dia. 45 — 50mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring, With cage	Shield type, Crowned outer ring, Full complement	Sealed type, Crowned outer ring, With cage	Sealed type, Crowned outer ring, Full complement	Mass (Ref.) g	Boundary dimensions mm d	D	B	C	a	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
45	**NART 45 R**	—	**NART 45 UUR**	—	915	45	85	32	30	66.5	46 800	88 600	88 600
	—	**NART 45 VR**	—	**NART 45 VUUR**	935	45	85	32	30	66.5	80 300	181 000	181 000
50	**NART 50 R**	—	**NART 50 UUR**	—	980	50	90	32	30	76	48 600	95 600	95 600
	—	**NART 50 VR**	—	**NART 50 VUUR**	1 010	50	90	32	30	76	84 300	198 000	198 000

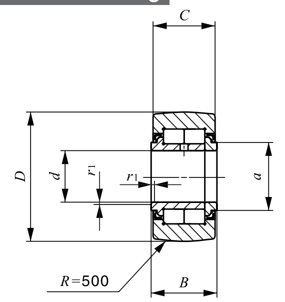
Remarks 1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

I

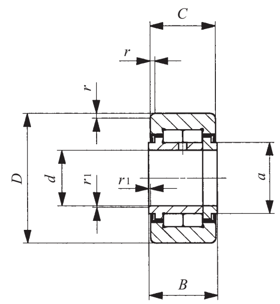
NAST
NART
NURT

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

Cylindrical Roller Followers Full Complement Type/With Inner Ring



NURT···R



NURT

Shaft dia. 15 — 50mm

Shaft dia. mm	Identification number: Crowned outer ring	Identification number: Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm: d	D	B	C	a	$r_{s\,min}$(1)	$r_{1s\,min}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
15	**NURT 15 R**	**NURT 15**	100	15	35	19	18	20	0.6	0.3	23 400	27 300	11 800
	NURT 15-1 R	**NURT 15-1**	160	15	42	19	18	20	0.6	0.3	23 400	27 300	27 300
17	**NURT 17 R**	**NURT 17**	147	17	40	21	20	22	1	0.3	25 200	30 900	20 300
	NURT 17-1 R	**NURT 17-1**	222	17	47	21	20	22	1	0.3	25 200	30 900	30 900
20	**NURT 20 R**	**NURT 20**	245	20	47	25	24	27	1	0.3	38 900	49 000	27 200
	NURT 20-1 R	**NURT 20-1**	321	20	52	25	24	27	1	0.3	38 900	49 000	49 000
25	**NURT 25 R**	**NURT 25**	281	25	52	25	24	31	1	0.3	43 100	58 100	30 000
	NURT 25-1 R	**NURT 25-1**	450	25	62	25	24	31	1	0.3	43 100	58 100	58 100
30	**NURT 30 R**	**NURT 30**	466	30	62	29	28	38	1	0.3	58 200	75 300	35 200
	NURT 30-1 R	**NURT 30-1**	697	30	72	29	28	38	1	0.3	58 200	75 300	75 300
35	**NURT 35 R**	**NURT 35**	630	35	72	29	28	44	1	0.6	63 900	88 800	57 000
	NURT 35-1 R	**NURT 35-1**	840	35	80	29	28	44	1	0.6	63 900	88 800	88 800
40	**NURT 40 R**	**NURT 40**	817	40	80	32	30	49	1	0.6	86 500	122 000	75 300
	NURT 40-1 R	**NURT 40-1**	1 130	40	90	32	30	49	1	0.6	86 500	122 000	122 000
45	**NURT 45 R**	**NURT 45**	883	45	85	32	30	53	1	0.6	91 500	135 000	78 700
	NURT 45-1 R	**NURT 45-1**	1 400	45	100	32	30	53	1	0.6	91 500	135 000	135 000
50	**NURT 50 R**	**NURT 50**	950	50	90	32	30	58	1	0.6	96 300	148 000	82 100
	NURT 50-1 R	**NURT 50-1**	1 690	50	110	32	30	58	1	0.6	96 300	148 000	148 000

Note(1) Minimum allowable value of chamfer dimension r or r_1

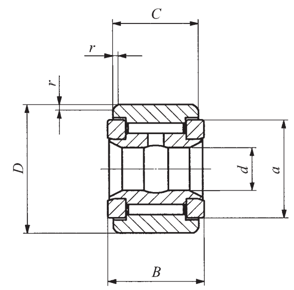
Remarks 1. The inner ring has an oil hole.
2. Provided with prepacked grease.

I NAST NART NURT

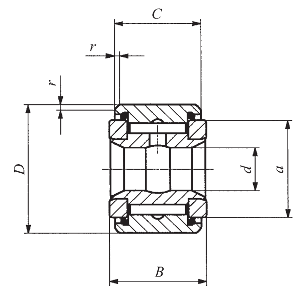
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO

Non-separable Roller Followers, Inch Series Full Complement Type /With Inner Ring



CRY…V



CRY…VUU

Shaft dia. 6.350 — 31.750mm

Shaft dia. mm (inch)	Identification number: Shield type Cylindrical outer ring	Identification number: Sealed type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm(inch) *d*	*D*	*B*	*C*	*a*	*r*	Shaft dia. mm Push fit Min.	Push fit Max.	Drive fit Min.	Drive fit Max.	Press fit Min.	Press fit Max.	Basic dynamic load rating *C* N	Basic static load rating C_0 N
6.350 (1/4)	CRY 12 V	CRY 12 VUU	27	6.350 (1/4)	19.050 (3/4)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	0.794 (1/32)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
	CRY 14 V	CRY 14 VUU	36	6.350 (1/4)	22.225 (7/8)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	0.794 (1/32)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
7.938 (5/16)	CRY 16 V	CRY 16 VUU	68	7.938 (5/16)	25.400 (1)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	1.191 (3/64)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
	CRY 18 V	CRY 18 VUU	77	7.938 (5/16)	28.575 (1 1/8)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	1.588 (1/16)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
9.525 (3/8)	CRY 20 V	CRY 20 VUU	109	9.525 (3/8)	31.750 (1 1/4)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	1.588 (1/16)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
	CRY 22 V	CRY 22 VUU	136	9.525 (3/8)	34.925 (1 3/8)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	1.588 (1/16)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
11.112 (7/16)	CRY 24 V	CRY 24 VUU	186	11.112 (7/16)	38.100 (1 1/2)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	1.588 (1/16)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
	CRY 26 V	CRY 26 VUU	227	11.112 (7/16)	41.275 (1 5/8)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	1.588 (1/16)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
12.700 (1/2)	CRY 28 V	CRY 28 VUU	290	12.700 (1/2)	44.450 (1 3/4)	26.988(1.0625)	25.400 (1)	32.7(1.287)	1.588 (1/16)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
	CRY 30 V	CRY 30 VUU	363	12.700 (1/2)	47.625 (1 7/8)	26.988(1.0625)	25.400 (1)	32.7(1.287)	1.588 (1/16)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
15.875 (5/8)	CRY 32 V	CRY 32 VUU	476	15.875 (5/8)	50.800 (2)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	1.588 (1/16)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
	CRY 36 V	CRY 36 VUU	599	15.875 (5/8)	57.150 (2 1/4)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	1.588 (1/16)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
19.050 (3/4)	CRY 40 V	CRY 40 VUU	816	19.050 (3/4)	63.500 (2 1/2)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	2.381 (3/32)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
	CRY 44 V	CRY 44 VUU	1 020	19.050 (3/4)	69.850 (2 3/4)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	2.381 (3/32)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
25.400 (1)	CRY 48 V	CRY 48 VUU	1 410	25.400 (1)	76.200 (3)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	2.381 (3/32)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
	CRY 52 V	CRY 52 VUU	1 640	25.400 (1)	82.550 (3 1/4)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	2.381 (3/32)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
28.575 (1 1/8)	CRY 56 V	CRY 56 VUU	2 250	28.575 (1 1/8)	88.900 (3 1/2)	52.388(2.0625)	50.800 (2)	61.9(2.437)	2.381 (3/32)	28.522	28.565	28.572	28.585	28.583	28.595	111 000	239 000
31.750 (1 1/4)	CRY 64 V	CRY 64 VUU	3 200	31.750 (1 1/4)	101.600 (4)	58.738(2.3125)	57.150 (2 1/4)	71.0(2.797)	2.381 (3/32)	31.727	31.740	31.747	31.760	31.758	31.770	142 000	317 000

Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

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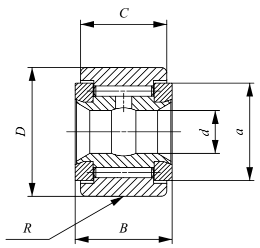
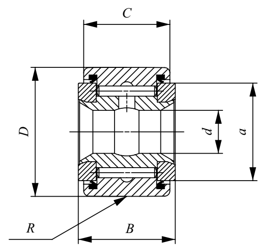
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

Non-separable Roller Followers, Inch Series Full Complement Type / With Inner Ring



CRY…VR



CRY…VUUR

Shaft dia. 6.350 — 31.750mm

Shaft dia. mm (inch)	Identification number Shield type Crowner outer ring	Identification number Sealed type Crowned outer ring	Mass (Ref.) g	Boundary dimensions mm(inch) *d*	*D*	*B*	*C*
6.350 (1/4)	CRY 12 VR	CRY 12 VUUR	27	6.350 (1/4)	19.050 (3/4)	14.288(0.5625)	12.700 (1/2)
	CRY 14 VR	CRY 14 VUUR	36	6.350 (1/4)	22.225 (7/8)	14.288(0.5625)	12.700 (1/2)
7.938 (5/16)	CRY 16 VR	CRY 16 VUUR	68	7.938 (5/16)	25.400 (1)	17.463(0.6875)	15.875 (5/8)
	CRY 18 VR	CRY 18 VUUR	77	7.938 (5/16)	28.575 (1 1/8)	17.463(0.6875)	15.875 (5/8)
9.525 (3/8)	CRY 20 VR	CRY 20 VUUR	109	9.525 (3/8)	31.750 (1 1/4)	20.638(0.8125)	19.050 (3/4)
	CRY 22 VR	CRY 22 VUUR	136	9.525 (3/8)	34.925 (1 3/8)	20.638(0.8125)	19.050 (3/4)
11.112 (7/16)	CRY 24 VR	CRY 24 VUUR	186	11.112 (7/16)	38.100 (1 1/2)	23.813(0.9375)	22.225 (7/8)
	CRY 26 VR	CRY 26 VUUR	227	11.112 (7/16)	41.275 (1 5/8)	23.813(0.9375)	22.225 (7/8)
12.700 (1/2)	CRY 28 VR	CRY 28 VUUR	290	12.700 (1/2)	44.450 (1 3/4)	26.988(1.0625)	25.400 (1)
	CRY 30 VR	CRY 30 VUUR	363	12.700 (1/2)	47.625 (1 7/8)	26.988(1.0625)	25.400 (1)
15.875 (5/8)	CRY 32 VR	CRY 32 VUUR	476	15.875 (5/8)	50.800 (2)	33.338(1.3125)	31.750 (1 1/4)
	CRY 36 VR	CRY 36 VUUR	599	15.875 (5/8)	57.150 (2 1/4)	33.338(1.3125)	31.750 (1 1/4)
19.050 (3/4)	CRY 40 VR	CRY 40 VUUR	816	19.050 (3/4)	63.500 (2 1/2)	39.688(1.5625)	38.100 (1 1/2)
	CRY 44 VR	CRY 44 VUUR	1 020	19.050 (3/4)	69.850 (2 3/4)	39.688(1.5625)	38.100 (1 1/2)
25.400 (1)	CRY 48 VR	CRY 48 VUUR	1 410	25.400 (1)	76.200 (3)	46.038(1.8125)	44.450 (1 3/4)
	CRY 52 VR	CRY 52 VUUR	1 640	25.400 (1)	82.550 (3 1/4)	46.038(1.8125)	44.450 (1 3/4)
28.575 (1 1/8)	CRY 56 VR	CRY 56 VUUR	2 250	28.575 (1 1/8)	88.900 (3 1/2)	52.388(2.0625)	50.800 (2)
31.750 (1 1/4)	CRY 64 VR	CRY 64 VUUR	3 200	31.750 (1 1/4)	101.600 (4)	58.738(2.3125)	57.150 (2 1/4)

Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

a	*R*	Shaft dia. mm Push fit Min.	Push fit Max.	Drive fit Min.	Drive fit Max.	Press fit Min.	Press fit Max.	Basic dynamic load rating *C* N	Basic static load rating C_0 N
14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
61.9(2.437)	760 (30)	28.522	28.565	28.572	28.585	28.583	28.595	111 000	239 000
71.0(2.797)	760 (30)	31.727	31.740	31.747	31.760	31.758	31.770	142 000	317 000

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

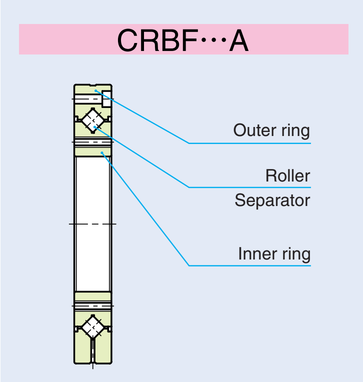
CROSSED ROLLER BEARINGS

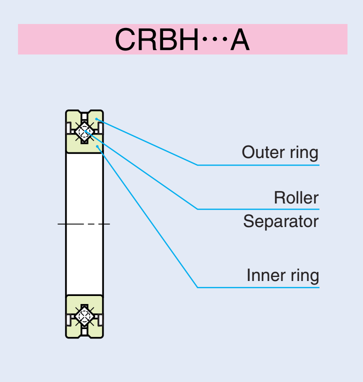
- Mounting Holed Type High Rigidity Crossed Roller Bearing
- High Rigidity Type Crossed Roller Bearings
- Standard Type Crossed Roller Bearings
- Slim Type Crossed Roller Bearings
- Super Slim Type Crossed Roller Bearings

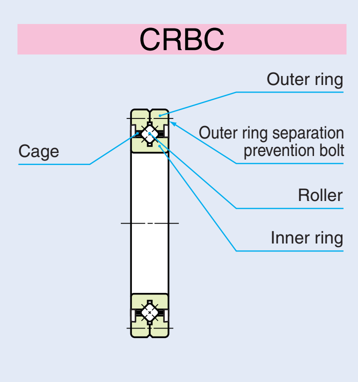
Structure and Features

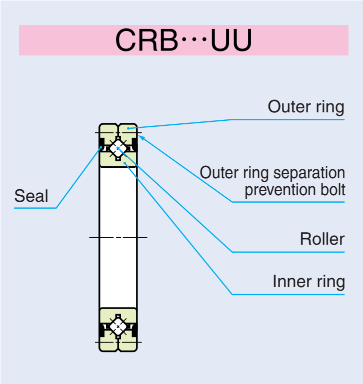
IKO Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between inner and outer rings. They can take loads from any directions at the same time such as radial, thrust and moment loads. The rollers make line-contact with raceway surfaces, and, therefore, elastic deformation due to bearing loads is very small.
These bearings are widely used in the rotating parts of industrial robots, machine tools, medical equipment, etc., which require compactness, high rigidity and high rotational accuracy.
In addition, bearings made of stainless steel or those with inner and outer rings provided with mounting holes are also available on request. Please contact IKO.

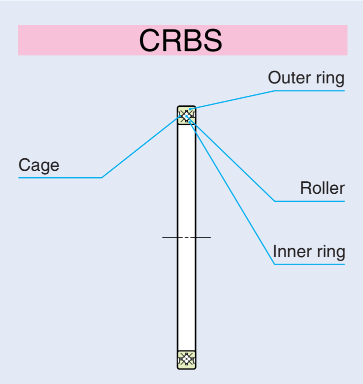
Structure of Crossed Roller Bearings

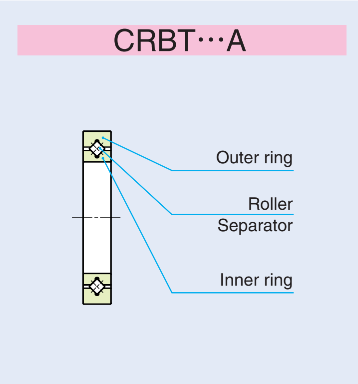












Types

Crossed Roller Bearings are available in the types shown in Table 1.

Table 1 Crossed Roller Bearing Type

Type		With Cage	With Separator	Full complement
Mounting Holed Type High Rigidity Crossed Roller Bearing CRBF	Open type	—	CRBF ··· A	—
	Sealed type	—	CRBF ··· AUU	—
High Rigidity Type Crossed Roller Bearings CRBH	Open type	—	CRBH ··· A	—
	Sealed type	—	CRBH ··· AUU	—
Standard Type Crossed Roller Bearings CRBC, CRB	Open type	CRBC	—	CRB
	Sealed type	CRBC ··· UU	—	CRB ··· UU
Slim Type Crossed Roller Bearings CRBS	Open type	CRBS	—	CRBS ··· V
	Sealed type	—	CRBS ··· AUU	CRBS ··· VUU
Super Slim Type Crossed Roller Bearings CRBT	Open type	—	CRBT ··· A	—

Mounting Holed Type High Rigidity Crossed Roller Bearing

Mounting holes are prepared on outer ring and inner ring providing easy mounting together with high rigidity and high accuracy.

High Rigidity Type Crossed Roller Bearings

Both inner and outer rings have a solid one-piece construction. Therefore, high accuracy and high rigidity are achieved, and mounting errors can be minimized. As separators are incorporated between the cylindrical rollers for smooth rotation, these bearings are suitable for applications where rotational speed is comparatively high.

Standard Type Crossed Roller Bearings

The outer ring is made of two split pieces, which are bolted together to prevent separation during transportation or mounting. So, handling is easy.

Slim Type Crossed Roller Bearings

These bearings are slim bearings having a small outside diameter, in comparison with the bore diameter, and a narrow width. The type with cage and the type with separator provide smooth rotation and are suitable for applications where rotational speed is comparatively high.

Super Slim Type Crossed Roller Bearings

This Type is extremely compact bearing having 5.5mm of sectional height and 5mm of width. Separators are incorporated between Cylindrical rollers for smooth rotation. These compactness, lightness and smoothness contribute downsizing of the machine and saving driving power.

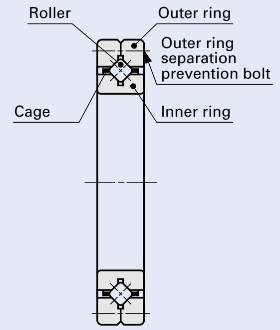
Internal Structures and Shapes

Various types are lined up in Crossed Roller Bearing series, including the type with cage, the type with separator, open type, sealed type, etc..

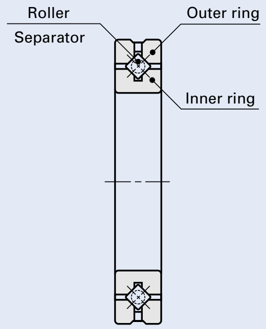
Roller guide method

Crossed Roller Bearings include the type with cage, type with separator and full complement type. The type with cage and the type with separator have a small coefficient of friction and are suitable for comparatively high speed rotations, while the full complement type is suitable for heavy load applications at low speed rotations.

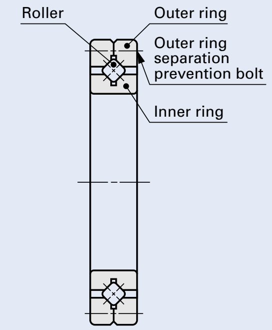
《With Cage》



《With Separator》



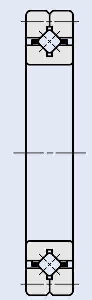
《Full complement》



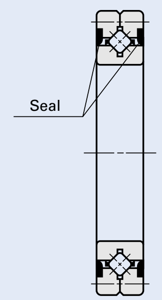
Seal structure

Crossed Roller Bearings include the open type and sealed type. The sealed type bearing incorporates seals made of special synthetic rubber that have excellent sealing performance against dust and dirt penetration and grease leakage.

《Open type》



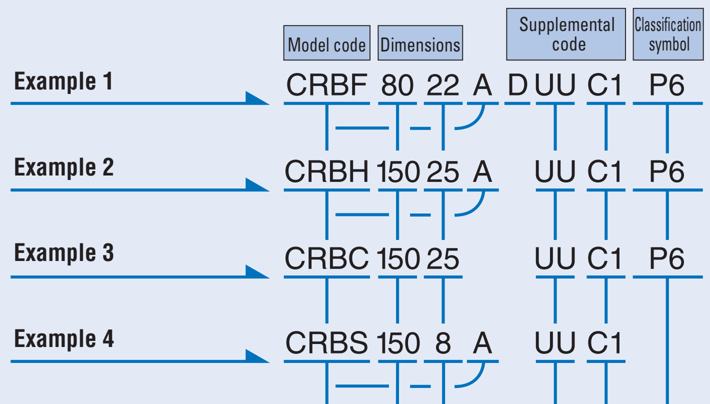
《Sealed type》



Identification number

The identification number of Crossed Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Some examples are shown below.

Examples of identification number



Model code	
CRBF···A	Mounting Holed Type High Rigidity Crossed Roller Bearing
CRBH···A	High Rigidity Type Crossed Roller Bearing (With separator)
CRBC	Standard Type Crossed Roller Bearing (With cage)
CRB	Standard Type Crossed Roller Bearing (Full complement)
CRBS	Slim Type Crossed Roller Bearing (With cage)
CRBS···A	Slim Type Crossed Roller Bearing (With separator)
CRBS···V	Slim Type Crossed Roller Bearing (Full complement)
CRBT···A	Super Slim Type Crossed Roller Bearing (With separator)

Dimension
The dimension indicates the bore diameter of the bearing. (unit : mm)
The dimension indicates the bearing width. (unit : mm)

Supplemental code - 1(1)	
T	With female threaded mounting holes on the inner ring
No symbol	With counter-bored mounting holes on both inner ring and outer ring in the same direction.
D	With counter-bored mounting holes on both inner ring and outer ring in the opposite direction.

Note(1) Applicable to Mounting Holed Type High Rigidity Crossed Roller Bearing.

Supplemental code - 2		
No symbol	Open type	For application, please see table 2.
UU	Sealed type	
U	One side sealed type(2)	
UD	One side sealed in the opposite direction to counter bored mounting holes on outer ring	

Note(2) For CRBF···A, sealed at the side with counter bored mounting holes of outer ring.

Supplemental code - 3		
T1	: T1 clearance	For application, please see table 3.
C1	: C1 clearance	
C2	: C2 clearance Crossed Roller Bearing.	
No symbol	:Normal clearance Crossed Roller Bearing.	

Classification symbol		
No symbol	Accuracy class 0	
P6	Accuracy class 6	For application, please see table 4.
P5	Accuracy class 5	
P4	Accuracy class 4	
P2	Accuracy class 2	

Table 2 Seal Specification

Model code	No Symbol	UU	U	UD
CRBF···A	○	○	○	○
CRBH···A	○	○	○	–
CRBC	○	○	○	–
CRB	○	○	○	–
CRBS	○	–	–	–
CRBS···A	–	○	○	–
CRBS···V	○	○	○	–
CRBT···A	○	–	–	–

Table 3 Clearance Specification

Model code	T1	C1	C2	No Symbol
CRBF···A	○	○	○	–
CRBH···A	○	○	○	–
CRBC	○	○	○	–
CRB	○	○	○	–
CRBS	○	○	–	○
CRBS···A	○	○	–	○
CRBS···V	○	○	–	○
CRBT···A	–	○	–	–

Table 4 Accuracy Class

Model code	No Symbol	P6	P5	P4	P2
CRBF···A	○	○	○	○	○
CRBH···A	○	○	○	○	○
CRBC	○	○	○	○	○
CRB	○	○	○	○	○
CRBS	○	–	–	–	–
CRBS···A	○	–	–	–	–
CRBS···V	○	–	–	–	–
CRBT···A	○	–	–	–	–

Dynamic Equivalent Load

The dynamic equivalent radial load of Crossed Roller Bearings can be obtained from the following equation.

$$P_r = X\left(F_r + \frac{2M}{D_{pw}}\right) + YF_a \quad \cdots\cdots(1)$$

where, P_r : Dynamic equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
M : Moment, N-mm
D_{pw} : Pitch circle diameter of roller set, mm

$$\left(D_{pw} \fallingdotseq \frac{d+D}{2}\right)$$

X : Radial load factor (Refer to Table 2.)
Y : Axial load factor (Refer to Table 2.)

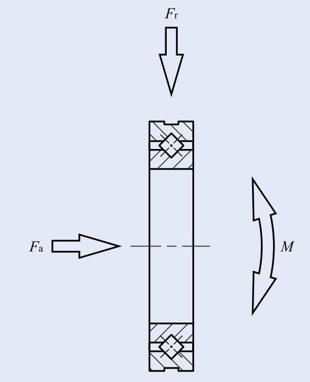


Fig. 1 Load direction

Table 5 Radial load factor and axial load factor

Conditions	X	Y
$\dfrac{F_a}{F_r + 2M/D_{pw}} \leqq 1.5$	1	0.45
$\dfrac{F_a}{F_r + 2M/D_{pw}} > 1.5$	0.67	0.67

Static Equivalent Load

The static equivalent radial load of Crossed Roller Bearings can be obtained from the following equation.

$$P_{0r} = F_r + \frac{2M}{D_{pw}} + 0.44\,F_a \quad \cdots\cdots(2)$$

where, P_{0r} : Static equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
M : Moment, N-mm
D_{pw} : Pitch circle diameter of roller set, mm

$$\left(D_{pw} \fallingdotseq \frac{d+D}{2}\right)$$

J

CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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

Accuracy

The accuracy of Crossed Roller Bearings is shown in Tables 6 and 7. However the accuracy of Mounting Holed type High Rigidity Crossed Roller Bearings is based on Table 8 and 9, the accuracy of Slim Type Crossed Roller Bearings is based on Table 10, and the accuracy of Super Slim Type Crossed Roller Bearings is based on Table 11.

Bearings with special accuracy are also optionally available. Please consult IKO.

Table 6 Tolerances and allowable values of inner rings and tolerances of outer ring width unit: μm

d Nominal bore diameter mm		Δ_{dmp} (1) Single plane mean bore dia. deviation								Δ_{Bs} Deviation of a single inner ring width		Δ_{Cs} (2) Deviation of a single outer ring width		K_{ia} Radial run-out of assembled bearing inner ring					S_{ia} Assembled bearing inner ring face run-out with raceway				
		Class 0		Class 6		Class 5		Class 4						Class 0	Class 6	Class 5	Class 4	Class 2	Class 0	Class 6	Class 5	Class 4	Class 2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low										
18	30	0	− 10	0	− 8	0	− 6	0	− 5	0	− 75	0	− 100	13	8	4	3	2.5	13	8	4	3	2.5
30	50	0	− 12	0	− 10	0	− 8	0	− 6	0	− 75	0	− 100	15	10	5	4	2.5	15	10	5	4	2.5
50	80	0	− 15	0	− 12	0	− 9	0	− 7	0	− 75	0	− 100	20	10	5	4	2.5	20	10	5	4	2.5
80	120	0	− 20	0	− 15	0	− 10	0	− 8	0	− 75	0	− 100	25	13	6	5	2.5	25	13	6	5	2.5
120	150	0	− 25	0	− 18	0	− 13	0	− 10	0	− 100	0	− 120	30	18	8	6	2.5	30	18	8	6	2.5
150	180	0	− 25	0	− 18	0	− 13	0	− 10	0	− 100	0	− 120	30	18	8	6	5	30	18	8	6	5
180	250	0	− 30	0	− 22	0	− 15	0	− 12	0	− 100	0	− 120	40	20	10	8	5	40	20	10	8	5
250	315	0	− 35	0	− 25	0	− 18	—	—	0	− 120	0	− 150	50	25	13	10	7	50	25	13	10	7
315	400	0	− 40	0	− 30	0	− 23	—	—	0	− 150	0	− 200	60	30	15	12	8	60	30	15	12	8
400	500	0	− 45	0	− 35	—	—	—	—	0	− 150	0	− 200	65	35	18	14	10	65	35	18	14	10
500	630	0	− 50	0	− 40	—	—	—	—	0	− 150	0	− 200	70	40	20	16	12	70	40	20	16	12
630	800	0	− 75	—	—	—	—	—	—	0	− 150	0	− 200	80	50	25	20	15	80	50	25	20	15

Notes(1) When values are not indicated in the table (Class 2, etc.), those for the highest class for which the values are indicated are applicable.
(2) In case of High Rigidity Type Crossed Roller Bearings, the tolerances for deviation of a single inner ring width are applicable to those of a single outer ring width.

Remark The accuracy specified in this table is not applicable to Mounting Holed Type High Rigidity Crossed Roller Bearings. Slim Type Crossed Roller Bearings and Super Slim Type Crossed Roller Bearings.

Table 7 Tolerances and allowable values of outer ring unit: μm

D Nominal outside diameter mm		Δ_{dmp} (1) Single plane mean outside dia. deviation								K_{ea} Radial run-out of assembled bearing outer ring					S_{ea} Assembled bearing outer ring face run-out with raceway				
		Class 0		Class 6		Class 5		Class 4		Class 0	Class 6	Class 5	Class 4(2)	Class 2(2)	Class 0	Class 6	Class 5	Class 4(2)	Class 2(2)
Over	Incl.	High	Low	High	Low	High	Low	High	Low										
30	50	0	− 11	0	− 9	0	− 7	0	− 6	20	10	7	5	2.5	20	10	7	5	2.5
50	80	0	− 13	0	− 11	0	− 9	0	− 7	25	13	8	5	4	25	13	8	5	4
80	120	0	− 15	0	− 13	0	− 10	0	− 8	35	18	10	6	5	35	18	10	6	5
120	150	0	− 18	0	− 15	0	− 11	0	− 9	40	20	11	7	5	40	20	11	7	5
150	180	0	− 25	0	− 18	0	− 13	0	− 10	45	23	13	8	5	45	23	13	8	5
180	250	0	− 30	0	− 20	0	− 15	0	− 11	50	25	15	10	7	50	25	15	10	7
250	315	0	− 35	0	− 25	0	− 18	0	− 13	60	30	18	11	7	60	30	18	11	7
315	400	0	− 40	0	− 28	0	− 20	—	—	70	35	20	—	—	70	35	20	—	—
400	500	0	− 45	0	− 33	0	− 23	—	—	80	40	23	—	—	80	40	23	—	—
500	630	0	− 50	0	− 38	0	− 28	—	—	100	50	25	—	—	100	50	25	—	—
630	800	0	− 75	0	− 45	—	—	—	—	120	60	30	—	—	120	60	30	—	—
800	1000	0	− 100	0	− 60	—	—	—	—	120	75	35	—	—	120	75	35	—	—
1000	1030	0	− 125	—	—	—	—	—	—	120	75	35	—	—	120	75	35	—	—

Notes(1) When values are not indicated in the table (Class 2, etc.), those for the highest class for which the values are indicated are applicable.
(2) Classes 4 and 2 apply to High Rigidity Type Crossed Roller Bearings. For Standard Type Crossed Roller Bearings, the tolerance values for Class 5 are applicable to Classes 4 and 2.

Remark The accuracy specified in this table is not applicable to Mounting Holed Type High Rigidity Crossed Roller Bearings. Slim Type Crossed Roller Bearings and Super Slim Type Crossed Roller Bearings.

Table 8 Tolerances and allowable values of inner rings of Mounting Holed Type High Rigidity Crossed Roller Bearings unit: μm

d Nominal bore diameter mm		Δ_{dmp} (1) Single plane mean bore dia. deviation								Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial run-out of assembled bearing inner ring					S_{ia} Assembled bearing inner ring face run-out with raceway				
		Class 0		Class 6		Class 5		Class 4				Class 0	Class 6	Class 5	Class 4	Class 2	Class 0	Class 6	Class 5	Class 4	Class 2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low										
—	20	0	− 10	0	− 8	0	− 6	0	− 5	0	− 75	13	8	4	3	2.5	13	8	4	3	2.5
20	30	0	− 10	0	− 8	0	− 6	0	− 5	0	− 75	15	10	5	4	2.5	15	10	5	4	2.5
30	35	0	− 12	0	− 10	0	− 8	0	− 6	0	− 75	15	10	5	4	2.5	15	10	5	4	2.5
35	50	0	− 12	0	− 10	0	− 8	0	− 6	0	− 75	20	10	5	4	2.5	20	10	5	4	2.5
50	65	0	− 15	0	− 12	0	− 9	0	− 7	0	− 75	20	10	5	4	2.5	20	10	5	4	2.5
65	80	0	− 15	0	− 12	0	− 9	0	− 7	0	− 75	25	13	6	5	2.5	25	13	6	5	2.5

Table 9 Tolerances and allowable values of outer rings of Mounting Holed Type High Rigidity Crossed Roller Bearings unit: μm

d Nominal bore diameter mm		Δ_{dmp} (1) Single plane mean bore dia. deviation								Δ_{Cs} Deviation of a single outer ring width		K_{ia} Radial run-out of assembled bearing inner ring					S_{ia} Assembled bearing inner ring face run-out with raceway				
		Class 0		Class 6		Class 5		Class 4				Class 0	Class 6	Class 5	Class 4	Class 2	Class 0	Class 6	Class 5	Class 4	Class 2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low										
50	60	0	− 13	0	− 11	0	− 9	0	− 7	0	− 75	20	10	7	5	2.5	20	10	7	5	2.5
60	80	0	− 13	0	− 11	0	− 9	0	− 7	0	− 75	25	13	8	5	4	25	13	8	5	4
80	95	0	− 15	0	− 13	0	− 10	0	− 8	0	− 75	25	13	8	5	4	25	13	8	5	4
95	120	0	− 15	0	− 13	0	− 10	0	− 8	0	− 75	35	18	10	6	5	35	18	10	6	5
120	140	0	− 18	0	− 15	0	− 11	0	− 9	0	− 75	35	18	10	6	5	35	18	10	6	5
140	150	0	− 18	0	− 15	0	− 11	0	− 9	0	− 75	40	20	11	7	5	40	20	11	7	5
150	165	0	− 25	0	− 18	0	− 13	0	− 10	0	− 75	40	20	11	7	5	40	20	11	7	5

Table 10 Tolerances and allowable values of Slim Type Crossed Roller Bearings unit: μm

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width		K_{ia} and S_{ia} Radial and axial run-out of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial run-out of assembled bearing outer ring
	High	Low	High	Low	High	Low		
50	0	− 15	0	− 13	0	− 127	13	13
60	0	− 15	0	− 13	0	− 127	13	13
70	0	− 15	0	− 15	0	− 127	15	15
80	0	− 20	0	− 15	0	− 127	15	15
90	0	− 20	0	− 15	0	− 127	15	15
100	0	− 20	0	− 15	0	− 127	15	15
110	0	− 20	0	− 20	0	− 127	20	20
120	0	− 25	0	− 20	0	− 127	20	20
130	0	− 25	0	− 25	0	− 127	25	25
140	0	− 25	0	− 25	0	− 127	25	25
150	0	− 25	0	− 25	0	− 127	25	25
160	0	− 25	0	− 25	0	− 127	25	25
170	0	− 25	0	− 30	0	− 127	25	25
180	0	− 30	0	− 30	0	− 127	30	30
190	0	− 30	0	− 30	0	− 127	30	30
200	0	− 30	0	− 30	0	− 127	30	30

Table 11 Tolerances and allowable values of Super Slim Type Crossed Roller Bearings unit: μm

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width		K_{ia} and S_{ia} Radial and axial run-out of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial run-out of assembled bearing outer ring
	High	Low	High	Low	High	Low		
20	0	− 10	0	− 11	0	− 75	13	20
30	0	− 10	0	− 11	0	− 75	13	20
40	0	− 12	0	− 13	0	− 75	15	25
50	0	− 12	0	− 13	0	− 75	15	25

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

Clearance

The radial internal clearances of Crossed Roller Bearings are shown in Table 12.1. However, the radial internal clearances of Mounting Holed Type High Rigidity Crossed Roller Bearings are based on Table 12.2, Slim Type Crossed Roller Bearings are based on Table 12.3, and Super Slim Type Crossed Roller Bearings are based on Table12.4.

Table 12.1 Radial internal clearances unit: μm

d Nominal bore diameter mm		Radial internal clearance T1		C1		C2	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.
—	30	−10	0	0	10	10	20
30	40	−10	0	0	10	10	20
40	50	−10	0	0	10	10	25
50	65	−10	0	0	10	10	25
65	80	−10	0	0	15	15	30
80	100	−10	0	0	15	15	35
100	120	−15	0	0	15	15	35
120	140	−15	0	0	20	20	45
140	160	−15	0	0	20	20	50
160	200	−15	0	0	20	20	50
200	250	−20	0	0	25	25	60
250	315	−20	0	0	25	25	60
315	400	−25	0	0	30	30	70
400	500	−30	0	0	40	40	85
500	630	−30	0	0	50	50	100
630	710	−30	0	0	60	60	120
710	800	−40	0	0	70	70	140

Remark This table is not applicable to Slim Type Crossed Roller Bearings.

Table 12.2 Radial internal clearances of Mounting Holed Type High Rigidity Crossed Roller Bearings unit: μm

d Nominal bore diameter mm		Radial internal clearance T1		C1		C2	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.
—	20	−10	0	0	10	10	20
20	25	−10	0	0	10	10	20
25	35	−10	0	0	10	10	25
35	65	−10	0	0	15	15	30
65	80	−10	0	0	15	15	35

Table 12.3 Radial internal clearances of Slim Type Crossed Roller Bearings unit: μm

d Nominal bore diameter mm	Radial internal clearance T1		C1		Normal	
	Min.	Max.	Min.	Max.	Min.	Max.
50	−8	0	0	15	30	56
60	−8	0	0	15	30	56
70	−8	0	0	15	30	56
80	−8	0	0	15	41	66
90	−8	0	0	15	41	66
100	−8	0	0	15	41	66
110	−8	0	0	15	41	66
120	−8	0	0	15	51	76
130	−8	0	0	15	51	76
140	−8	0	0	15	51	76
150	−8	0	0	15	51	76
160	−10	0	0	20	51	76
170	−10	0	0	20	51	76
180	−10	0	0	20	61	86
190	−10	0	0	20	61	86
200	−10	0	0	20	61	86

Table 12.4 Radial internal clearances for Super Slim Type Crossed Roller Bearings unit: μm

d Nominal bore diameter of bearing mm	Radial internal clearance C1	
	Min.	Max.
20	0	15
30	0	15
40	0	15
50	0	15

Fit

The standard fits of Crossed Roller Bearings are shown in Table 13.1, and recommended fits for Slim Type Crossed Roller Bearings with normal clearances are shown in Table 13.2. For large bearings, fit based on the actual measured dimensions of the bearings is recommended, and fit allowance should be chosen as small as possible in accordance with the tolerance class given in Table 13.1. When complex loads or shock loads are applied or when high rotational accuracy and rigidity of the bearing are required or for Super Slim Type Crossed Roller Bearings, it is recommended to use a slight interference fit adjusted to the actual measured dimensions for both inner and outer rings.

For the interference fit, the radial internal clearance after the fit decreases by approximately 70% to 90% of the interference amount. To avoid excessive preload due to fit, it is recommended to use a slight interference fit adjusted to the actual measured dimensions for both T1 and C1 clearances.

Table 13.1 Recommended fits for Crossed Roller Bearings under normal load

Radial internal clearance	Tolerance class: Inner ring rotating load		Outer ring rotating load	
	Shaft	Housing bore	Shaft	Housing bore
C1 clearance	h5	H7	g5	J7 (1)
C2 clearance	j5	H7	g5	J7 (1)

Note(1) It is recommended that a slight interference fit adjusted to the actual measured dimensions of the bearing is used.

Table 13.2 Recommended fits for Slim Type Crossed Roller Bearings with normal clearances

(Dimensional tolerances of shaft and housing bore) unit: μm

d Nominal bore diameter mm	Inner ring rotating load: Shaft		Housing bore		Outer ring rotating load: Shaft		Housing bore	
	High	Low	High	Low	High	Low	High	Low
50	+15	0	+13	0	−15	−30	−13	−25
60	+15	0	+13	0	−15	−30	−13	−25
70	+15	0	+15	0	−15	−30	−15	−30
80	+20	0	+15	0	−20	−40	−15	−30
90	+20	0	+15	0	−20	−40	−15	−30
100	+20	0	+15	0	−20	−40	−15	−30
110	+20	0	+20	0	−20	−40	−20	−40
120	+25	0	+20	0	−25	−50	−20	−40
130	+25	0	+25	0	−25	−50	−25	−50
140	+25	0	+25	0	−25	−50	−25	−50
150	+25	0	+25	0	−25	−50	−25	−50
160	+25	0	+25	0	−25	−50	−25	−50
170	+25	0	+30	0	−25	−50	−30	−60
180	+30	0	+30	0	−30	−60	−30	−60
190	+30	0	+30	0	−30	−60	−30	−60
200	+30	0	+30	0	−30	−60	−30	−60

Allowable rotational speed

Allowable rotational speeds of Crossed Roller Bearings are affected by mounting and operating conditions. The values in general operation are shown in Table 14.

Table 14 $d_m n$ values(1) of Crossed Roller Bearings

Type		Lubricant: Grease	Oil
With cage or with separator	Open type	75 000	150 000
	Sealed type	60 000	—
Full complement	Open type	50 000	75 000
	Sealed type	40 000	—

Note(1) · $d_m n$ value $= d_m \times n$
where, d_m : Mean value of bearing bore and outside diameters, mm
n : Number of rotations per minute, rpm

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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

Lubrication

These bearings are generally lubricated with grease. Grease is supplied through the clearance between the inner ring and the outer ring.
Grease specification is shown in Table 15, ALVANIA GREASE EP2 is prepacked as the lubricating grease.
For bearings without prepacked grease, supply grease or oil for use. Operating without grease or oil will increase the wear of the rolling contact surfaces and cause a short bearing life.
When using a special grease, carefully examine the grease properties and contents such as base oil viscosity and extreme pressure additives. In this case, please contact IKO.

Table 15 Grease Specification

○ : With grease prepacked ✕ : No grease

Model code	Seal specification		
	Open type (No symbol)	Sealed type (UU)	One side sealed type (U)
CRBF ··· A	✕	○	✕
CRBH ··· A	✕	○	✕
CRBC	✕	○	✕
CRB	✕	○	✕
CRBS	✕	—	—
CRBS ··· A	—	○	✕
CRBS ··· V	✕	○	✕
CRBT ··· A	○	—	—

Oil Hole

For Crossed Roller Bearings, oil holes and oil grooves can be provided on bearing rings on request. When an oil hole is required on the outer ring, attach "-OH" before the clearance symbol in the identification number. When an oil hole and an oil groove are required on the outer ring, attach "-OG" at the same place in the identification number. For an oil hole on the inner ring, attach "/OH", and for an oil hole and an oil groove on the inner ring, attach "/OG", at the same place in the identification number. High Rigidity Type Crossed Roller Bearings have an oil groove and two oil holes on the outer ring as standard. Table 16 shows availability of oil holes for each bearing type.

Table 16 Oil holes

Bearing type (1)	Oil hole code			
	/nOH	/nOG	-nOH	-nOG
CRBF ··· A	—	—	—	— (2)
CRBH ··· A	○	○	—	— (2)
CRBC	○	○	○	○
CRB	○	○	○	○
CRBS	○	—	○	—
CRBS ··· A	○	—	○	—
CRBS ··· V	○	—	○	—
CRBT ··· A	—	—	—	—

Notes (1) Only representative types are shown in the table, but this table is applicable to all Crossed Roller Bearings.
(2) CRBH and CRBF are provided with an oil groove and two oil holes on the outer ring.
Remark n denotes the number of oil holes not exceeding 4. For one oil hole, number is not indicated.
When preparing multiple oil holes, please contact IKO.

Example 1 When the inner ring has 4 oil holes

CRBC 10020 / 4OH C1
- 4 Oil holes
- In inner ring

Example 2 When the outer ring has a single oil hole

CRBC 10020 - OH C1
- 1 Oil hole
- In outer ring

Operating Temperature Range

The operating temperature range for Crossed Roller Bearings is −20℃～+120℃. However, the maximum allowable temperature for types with separator and with seal is +110℃, and +100℃ when they are continuously operated.

Rotational torque

Rotational torque of IKO Crossed Roller Bearings are lower than that of plain bearings and the difference between the static torque and the dynamic (kinetic) torque is small. Therefore, these bearings minimize power consumption and operating temperature rise of machinery and increase the overall efficiency of machines.
The rotational torque is affected by many factors, but the following formula can be used expediently.

$$T = \mu P_{0r} \frac{D_{pw}}{2}$$

where, T : Rotational torque, N・mm
μ : Friction coefficient (Approx. 0.010)
P_{0r} : Static equivalent radial load, N
D_{pw} : Pitch circle diameter, mm

$$\left(D_{pw} \fallingdotseq \frac{d+D}{2}\right)$$

Mounting

When the rigidity of the mounting parts is not sufficient, stress concentration will occur at the contact area between the rollers and raceways, and the bearing performance will be deteriorated significantly.
Therefore, it is necessary to carefully examine the rigidity of housing and the strength of fixing bolts when a large moment will be applied.
The shoulder height diameters (d_a and D_a) that are related to mounting should certainly satisfy the values shown in the dimension tables. When these dimensions are incorrect, deformations of inner and outer rings will occur and the bearing performance will be deteriorated remarkably.

1. For Mounting Holed Type High Rigidity Crossed Roller Bearing

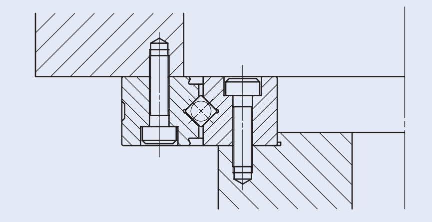


Fig.2 Mounting example -1
Mounting Holed Type High Rigidity Crossed Roller Bearing

❶Mounting Holed Type High Rigidity Crossed Roller Bearing can be mounted directly to the mounting surface by fixing bolts. (See Fig.3)

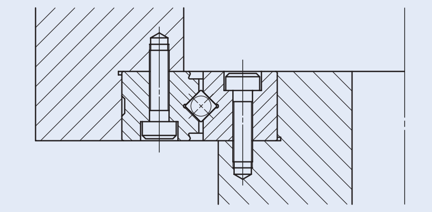


Fig.3 Mounting example -2
Mounting Holed Type High Rigidity Crossed Roller Bearing

❷If large number of radial load and/or moment is expected, it is recommended to prepare flange part. (See Fig.4)

❸Mounting Holed Type High Rigidity Crossed Roller Bearing has a plug for hole for inserting cylindrical rollers. When mounting the bearings, locate the plug at a position that is not included in the maximum loading zone. The plug location can be found by the pin that is at the side of the outer ring.

2. For other Crossed Roller Bearings

❶When the rigidity of the mounting parts is insufficient, stress concentration will occur at the contact area between the rollers and the raceways, and the bearing performance will be deteriorated significantly . Therefore, carefully examine the rigidity of housing and the strength of fixing bolts when a large moment is applied.

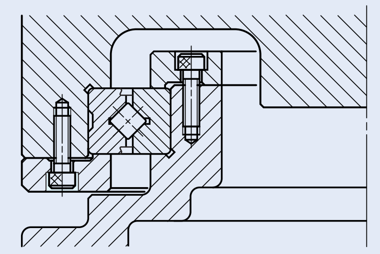


Fig. 4 Mounting example

❷The inner and outer rings should be securely fixed in the axial direction by using fixing plates, etc. Recommended thickness of the fixing plate is 1/2 or more of the bearing width B. The dimensions in the axial direction of the housing bore and the fixing plates should be determined to get a secure fixing while considering the dimension of bearing width which is given a minus tolerance.
❸The shoulder height diameters (d_a and D_a) that are related to mounting should satisfy the values shown in the dimension tables. When these dimensions are incorrect, deformations of inner and outer rings will occur and the bearing performance will be remarkably impaired.
❹The depth of the housing bore is recommended to be equal to or larger than the bearing width.
❺Separation prevention bolts for the outer ring are provided to prevent separation of two halves of the outer ring during transportation or mounting. When mounting, they should be loosened slightly.
❻High Rigidity Type Crossed Roller Bearings and Slim Type Crossed Roller Bearings have a plug for hole for inserting rollers. When mounting the bearings, locate the plug at a position that is not included in the maximum loading zone. The plug location can be found by the pin that is at the side of the outer ring.

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

Tightening torque of mounting bolts

The standard torque values for Mounting Holed Type High Rigidity Crossed Roller Bearings mounting bolts are shown in Tables 17.

When machines or equipment are subjected to severe vibration, shock, large fluctuating load, or moment load, the bolts should be tightened with a torque 1.2 to 1.5 times higher than the standard torque values shown.

When the mating member material is cast iron or aluminum, tightening torque should be lowered in accordance with the strength characteristics of the material. Please do not tighten with too much torque as abnormal frictional torque or short life may occur.

Table 17 Tightening torque of mounting bolts

Bolt size	Tightening torque N・m
M3 × 0.5	1.7
M4 × 0.7	4.0
M5 × 0.8	7.9

Above values are for Carbon steel bolt (Strength division 12.9)

Applications of Crossed Roller Bearing

Features of Crossed Roller Bearing

High load capacity and high rigidity.

Taking load of any direction and moment at the same time.

Compactness contributes your space saving.

Wide mounting variations for your best choice.

IKO

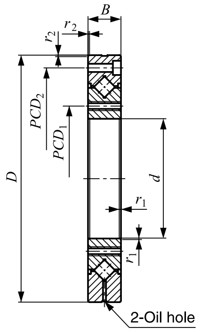
CROSSED ROLLER BEARINGS

Mounting Holed Type High Rigidity Crossed Roller Bearings

Open type with separator

Two sides sealed type with separator

Shaft dia. 10 ─ 80mm



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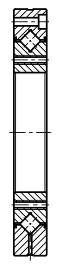

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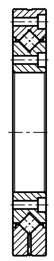

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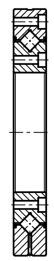

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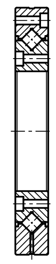

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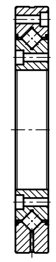

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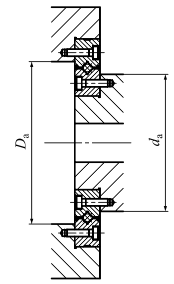
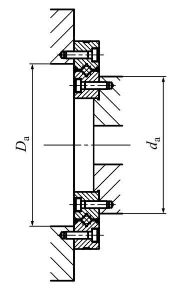




Shaft diameter mm	Identification number: Open type	Identification number: Two side sealed type	Weight (Ref.) kg	Boundary dim. mm: d	D	B	r_{1min} (1)	r_{2min} (1)	Mounting holes mm: PCD_1	Inner ring Mounting holes	PCD_2	Outer ring Mounting holes	Mounting dimensions mm: d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
10	CRBF 108 AT	CRBF 108 AT UU	0.12	10	52	8	0.3	0.3	16	4-M3 through	42	6-ϕ 3.4 through ϕ 6.5 counter bore depth 3.3	24	31	2 910	2 430
20	CRBF 2012 AT	CRBF 2012 AT UU	0.31	20	70	12	0.3	0.3	28	6-M3 through	57	6-ϕ 3.4 through ϕ 6.5 counter bore depth 3.3	36.5	48.5	7 600	8 370
25	CRBF 2512 AT	CRBF 2512 AT UU	0.40	25	80	12	0.6	0.6	35	6-M3 through	67	6-ϕ 3.4 through ϕ 6.5 counter bore depth 3.3	46.5	58.5	8 610	10 600
35	CRBF 3515 AT	CRBF 3515 AT UU	0.66	35	95	15	0.6	0.6	45	8-M4 through	83	8-ϕ 4.5 through ϕ 8 counter bore depth 4.4	56	74	17 300	20 900
55	CRBF 5515 AT	CRBF 5515 AT UU	0.96	55	120	15	0.6	0.6	65	8-M5 through	105	8-ϕ 5.5 through ϕ 9.5 counter bore depth 5.4	76	94	20 100	27 700
80	CRBF 8022 AT	CRBF 8022 AT UU	2.63	80	165	22	0.6	1	97	10-M5 through	148	10-ϕ 5.5 through ϕ 9.5 counter bore depth 5.4	107	137	51 100	72 000
	CRBF 8022 A	CRBF 8022 A UU	2.60							10-ϕ 5.5 through ϕ 9.5 counter bore depth 5.4						
	CRBF 8022 AD	CRBF 8022 AD UU														

Note(1) Minimum allowable single value of chamfer r_1 and r_2.

Remarks 1. Outer ring has an oil groove and two oil holes.

2. Open type is supplied without grease. Perform proper lubrication. Grease is pre-packed in two sides sealed type.

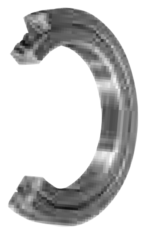
J

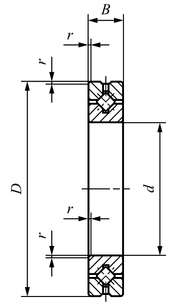
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

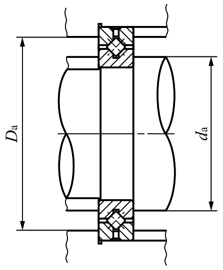
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CROSSED ROLLER BEARINGS

High Rigidity Type Crossed Roller Bearings Open Type/With Separator







Shaft dia. 20 — 250mm

CRBH···A

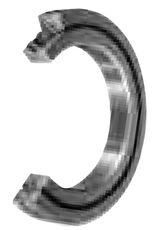
Shaft dia. mm	Identification number	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (1)	Mounting dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
20	CRBH 208 A	0.04	20	36	8	0.3	24	31	2 910	2 430
25	CRBH 258 A	0.05	25	41	8	0.3	29	36	3 120	2 810
30	CRBH 3010 A	0.12	30	55	10	0.3	36.5	48.5	7 600	8 370
35	CRBH 3510 A	0.13	35	60	10	0.3	41.5	53.5	7 900	9 130
40	CRBH 4010 A	0.15	40	65	10	0.3	46.5	58.5	8 610	10 600
45	CRBH 4510 A	0.16	45	70	10	0.3	51.5	63.5	8 860	11 300
50	CRBH 5013 A	0.29	50	80	13	0.6	56	74	17 300	20 900
60	CRBH 6013 A	0.33	60	90	13	0.6	66	84	18 800	24 300
70	CRBH 7013 A	0.38	70	100	13	0.6	76	94	20 100	27 700
80	CRBH 8016 A	0.74	80	120	16	0.6	88	112	32 100	43 400
90	CRBH 9016 A	0.81	90	130	16	0.6	98	122	33 100	46 800
100	CRBH 10020 A	1.45	100	150	20	0.6	110	140	50 900	72 200
110	CRBH 11020 A	1.56	110	160	20	0.6	120	150	52 400	77 400
120	CRBH 12025 A	2.62	120	180	25	1	132	168	73 400	108 000
130	CRBH 13025 A	2.82	130	190	25	1	142	178	75 900	115 000
140	CRBH 14025 A	2.96	140	200	25	1	152	188	81 900	130 000
150	CRBH 15025 A	3.16	150	210	25	1	162	198	84 300	138 000
200	CRBH 20025 A	4.0	200	260	25	1	212	248	92 300	169 000
250	CRBH 25025 A	4.97	250	310	25	1.5	262	298	102 000	207 000

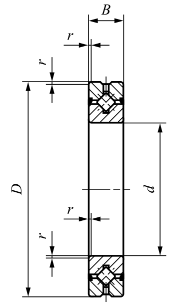
Note(1) Minimum allowable single value of chamfer dimension r

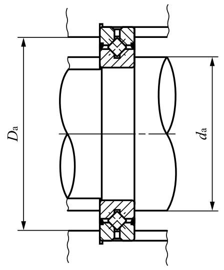
Remarks1. The outer ring has an oil groove and two oil holes.

2. Grease is not prepacked. Perform proper lubrication.

High Rigidity Type Crossed Roller Bearings Sealed Type/With Separator







Shaft dia. 20 — 250mm

CRBH···AUU

Shaft dia. mm	Identification number	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (1)	Mounting dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
20	CRBH 208 A UU	0.04	20	36	8	0.3	24	31	2 910	2 430
25	CRBH 258 A UU	0.05	25	41	8	0.3	29	36	3 120	2 810
30	CRBH 3010 A UU	0.12	30	55	10	0.3	36.5	48.5	7 600	8 370
35	CRBH 3510 A UU	0.13	35	60	10	0.3	41.5	53.5	7 900	9 130
40	CRBH 4010 A UU	0.15	40	65	10	0.3	46.5	58.5	8 610	10 600
45	CRBH 4510 A UU	0.16	45	70	10	0.3	51.5	63.5	8 860	11 300
50	CRBH 5013 A UU	0.29	50	80	13	0.6	56	74	17 300	20 900
60	CRBH 6013 A UU	0.33	60	90	13	0.6	66	84	18 800	24 300
70	CRBH 7013 A UU	0.38	70	100	13	0.6	76	94	20 100	27 700
80	CRBH 8016 A UU	0.74	80	120	16	0.6	88	112	32 100	43 400
90	CRBH 9016 A UU	0.81	90	130	16	0.6	98	122	33 100	46 800
100	CRBH 10020 A UU	1.45	100	150	20	0.6	110	140	50 900	72 200
110	CRBH 11020 A UU	1.56	110	160	20	0.6	120	150	52 400	77 400
120	CRBH 12025 A UU	2.62	120	180	25	1	132	168	73 400	108 000
130	CRBH 13025 A UU	2.82	130	190	25	1	142	178	75 900	115 000
140	CRBH 14025 A UU	2.96	140	200	25	1	152	188	81 900	130 000
150	CRBH 15025 A UU	3.16	150	210	25	1	162	198	84 300	138 000
200	CRBH 20025 A UU	4.0	200	260	25	1	212	248	92 300	169 000
250	CRBH 25025 A UU	4.97	250	310	25	1.5	262	298	102 000	207 000

Note(1) Minimum allowable single value of chamfer dimension r

Remarks1. The outer ring has an oil groove and two oil holes.

2. Provided with prepacked grease.

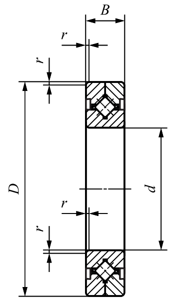
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CROSSED ROLLER BEARINGS

Standard Type Crossed Roller Bearings

Open Type/With Cage | Sealed Type/With Cage

Open Type/Full Complement Type | Sealed Type/Full Complement Type



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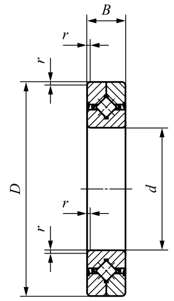
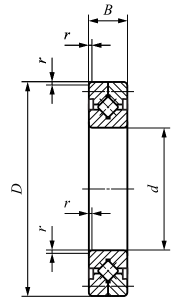
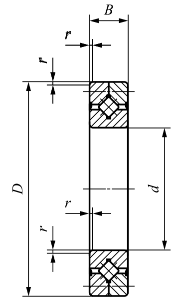


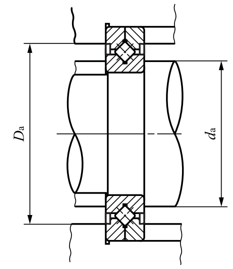
CRBC···UU



CRB



CRB···UU



Shaft dia. 30 — 200mm

Shaft dia. mm	Identification number: With Cage, Open Type	With Cage, Seald Type	Full complement, Open Type	Full complement, Seald Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (1)	Mounting dimensions mm d_a	D_a	CRBC Basic dynamic load rating C N	CRBC Basic static load rating C_0 N	CRB Basic dynamic load rating C N	CRB Basic static load rating C_0 N
30	CRBC 3010	CRBC 3010 UU	CRB 3010	CRB 3010 UU	0.12	30	55	10	0.3	34	44	3 830	4 130	5 290	6 350
40	CRBC 4010	CRBC 4010 UU	CRB 4010	CRB 4010 UU	0.15	40	65	10	0.3	44	54	4 280	5 140	5 980	8 040
50	CRBC 5013	CRBC 5013 UU	CRB 5013	CRB 5013 UU	0.29	50	80	13	0.6	55	71	10 700	12 600	14 200	18 400
60	CRBC 6013	CRBC 6013 UU	CRB 6013	CRB 6013 UU	0.33	60	90	13	0.6	64	81	11 600	14 600	15 400	21 500
70	CRBC 7013	CRBC 7013 UU	CRB 7013	CRB 7013 UU	0.38	70	100	13	0.6	75	91	12 300	16 700	17 000	25 500
80	CRBC 8016	CRBC 8016 UU	CRB 8016	CRB 8016 UU	0.74	80	120	16	0.6	86	107	18 200	25 500	24 300	37 500
90	CRBC 9016	CRBC 9016 UU	CRB 9016	CRB 9016 UU	0.81	90	130	16	1	98	118	19 400	28 600	25 900	42 100
100	CRBC 10020	CRBC 10020 UU	CRB 10020	CRB 10020 UU	1.45	100	150	20	1	108	134	31 500	45 100	39 400	61 100
110	CRBC 11020	CRBC 11020 UU	CRB 11020	CRB 11020 UU	1.56	110	160	20	1	118	144	33 500	50 700	41 200	66 700
120	CRBC 12025	CRBC 12025 UU	CRB 12025	CRB 12025 UU	2.62	120	180	25	1.5	132	164	47 700	70 500	59 900	95 400
130	CRBC 13025	CRBC 13025 UU	CRB 13025	CRB 13025 UU	2.82	130	190	25	1.5	140	172	49 200	74 800	61 000	99 800
140	CRBC 14025	CRBC 14025 UU	CRB 14025	CRB 14025 UU	2.96	140	200	25	1.5	151	183	50 700	79 200	64 100	108 000
150	CRBC 15025	CRBC 15025 UU	CRB 15025	CRB 15025 UU	3.16	150	210	25	1.5	160	192	53 800	87 700	65 000	113 000
	CRBC 15030	CRBC 15030 UU	CRB 15030	CRB 15030 UU	5.3	150	230	30	1.5	166	202	69 200	108 000	85 900	144 000
200	CRBC 20025	CRBC 20025 UU	CRB 20025	CRB 20025 UU	4.0	200	260	25	2	208	239	60 200	110 000	75 300	148 000
	CRBC 20030	—	CRB 20030	—	6.7	200	280	30	2	218	262	108 000	178 000	133 000	234 000
	CRBC 20035	—	CRB 20035	—	9.58	200	295	35	2	221	274	137 000	215 000	168 000	282 000

Note(1) Minimum allowable single value of chamfer dimension r

Remarks 1. No oil hole is provided.

2. Grease is not prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.

J

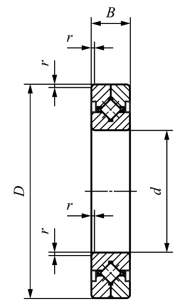
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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

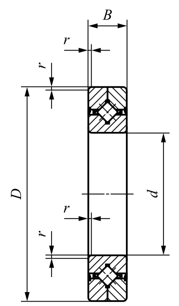
CROSSED ROLLER BEARINGS

Standard Type Crossed Roller Bearings

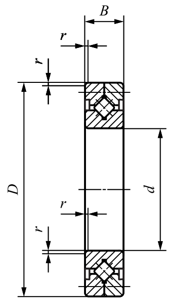
Open Type/With Cage | Sealed Type/With Cage
Open Type/Full Complement Type | Sealed Type/Full Complement Type



CRBC 25025
CRBC 30025



CRBC 25025UU
CRBC 30025UU



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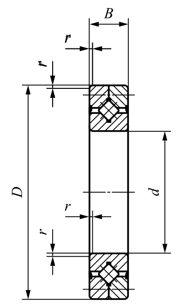
CRB 30025



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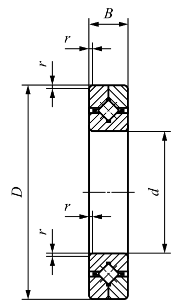

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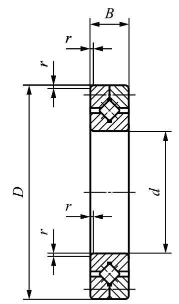

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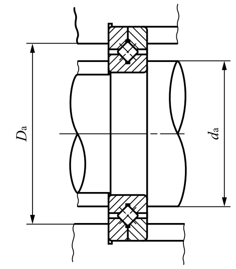


Shaft dia. 250 ─ 800mm

Shaft dia. mm	Identification number: With Cage, Open Type	With Cage, Seald Type	Full complement, Open Type	Full complement, Seald Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (1)	Mounting dimensions mm d_a	D_a	CRBC Basic dynamic load rating C N	CRBC Basic static load rating C_0 N	CRB Basic dynamic load rating C N	CRB Basic static load rating C_0 N
250	CRBC 25025	CRBC 25025 UU	CRB 25025	CRB 25025 UU	4.97	250	310	25	2.5	259	290	67 200	136 000	83 900	183 000
	CRBC 25030	—	CRB 25030	—	8.1	250	330	30	2.5	265	310	116 000	208 000	146 000	283 000
	CRBC 25040	—	CRB 25040	—	14.8	250	355	40	2.5	271	330	179 000	299 000	215 000	382 000
300	CRBC 30025	CRBC 30025 UU	CRB 30025	CRB 30025 UU	5.88	300	360	25	2.5	310	341	73 800	162 000	91 900	217 000
	CRBC 30035	—	CRB 30035	—	13.4	300	395	35	2.5	318	372	163 000	299 000	205 000	408 000
	CRBC 30040	—	CRB 30040	—	17.2	300	405	40	2.5	321	381	194 000	351 000	235 000	451 000
400	CRBC 40035	—	CRB 40035	—	14.5	400	480	35	2.5	414	457	133 000	300 000	165 000	400 000
	CRBC 40040	—	CRB 40040	—	23.5	400	510	40	2.5	423	483	222 000	455 000	270 000	590 000
	CRBC 40070	—	CRB 40070	—	72.4	400	580	70	2.5	430	532	470 000	811 000	576 000	1 060 000
500	CRBC 50040	—	CRB 50040	—	26.0	500	600	40	2.5	517	573	212 000	497 000	259 000	648 000
	CRBC 50050	—	CRB 50050	—	41.7	500	625	50	2.5	531	592	247 000	561 000	306 000	747 000
	CRBC 50070	—	CRB 50070	—	86.1	500	680	70	2.5	530	633	536 000	1 020 000	653 000	1 330 000
600	CRBC 60040	—	CRB 60040	—	30.6	600	700	40	3	621	676	231 000	581 000	287 000	774 000
	CRBC 60070	—	CRB 60070	—	102	600	780	70	3	630	734	591 000	1 230 000	700 000	1 540 000
	CRBC 600120	—	CRB 600120	—	274	600	870	120	3	643	817	1 250 000	2 210 000	1 490 000	2 800 000
700	CRBC 70045	—	CRB 70045	—	46.5	700	815	45	3	730	785	250 000	681 000	313 000	917 000
	CRBC 70070	—	CRB 70070	—	115	700	880	70	3	731	834	630 000	1 390 000	766 000	1 810 000
	CRBC 700150	—	CRB 700150	—	478	700	1 020	150	3	751	953	1 660 000	3 010 000	1 980 000	3 820 000
800	CRBC 80070	—	CRB 80070	—	109	800	950	70	4	831	907	417 000	1 090 000	513 000	1 440 000
	CRBC 800100	—	CRB 800100	—	247	800	1 030	100	4	840	972	936 000	2 040 000	1 140 000	2 640 000

Note(1) Minimum allowable single value of chamfer dimension r

Remarks 1. No oil hole is provided.

2. Grease is not prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.

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

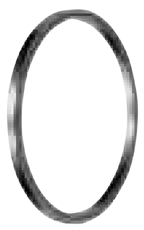
IKO

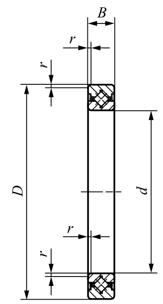
CROSSED ROLLER BEARINGS

Slim Type Crossed Roller Bearings

Open Type/With Cage | Sealed Type/With Cage

Open Type/Full Complement Type | Sealed Type/Full Complement Type



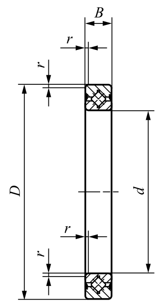


CRBS

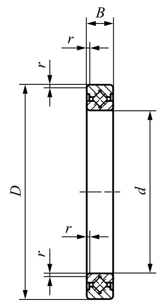
Shaft dia. 50 — 200mm

Shaft dia. mm	Identification number: With Cage, Open Type	With Separator, Seal Type	Full complement, Open Type	Full complement, Seald Type	Mass (Ref.) g
50	CRBS 508	CRBS 508 A UU	CRBS 508 V	CRBS 508 V UU	84
60	CRBS 608	CRBS 608 A UU	CRBS 608 V	CRBS 608 V UU	94
70	CRBS 708	CRBS 708 A UU	CRBS 708 V	CRBS 708 V UU	108
80	CRBS 808	CRBS 808 A UU	CRBS 808 V	CRBS 808 V UU	122
90	CRBS 908	CRBS 908 A UU	CRBS 908 V	CRBS 908 V UU	135
100	CRBS 1008	CRBS 1008 A UU	CRBS 1008 V	CRBS 1008 V UU	152
110	CRBS 1108	CRBS 1108 A UU	CRBS 1108 V	CRBS 1108 V UU	163
120	CRBS 1208	CRBS 1208 A UU	CRBS 1208 V	CRBS 1208 V UU	184
130	CRBS 1308	CRBS 1308 A UU	CRBS 1308 V	CRBS 1308 V UU	199
140	CRBS 1408	CRBS 1408 A UU	CRBS 1408 V	CRBS 1408 V UU	205
150	CRBS 1508	CRBS 1508 A UU	CRBS 1508 V	CRBS 1508 V UU	220
160	CRBS 16013	CRBS 16013 A UU	CRBS 16013 V	CRBS 16013 V UU	620
170	CRBS 17013	CRBS 17013 A UU	CRBS 17013 V	CRBS 17013 V UU	675
180	CRBS 18013	CRBS 18013 A UU	CRBS 18013 V	CRBS 18013 V UU	710
190	CRBS 19013	CRBS 19013 A UU	CRBS 19013 V	CRBS 19013 V UU	740
200	CRBS 20013	CRBS 20013 A UU	CRBS 20013 V	CRBS 20013 V UU	780

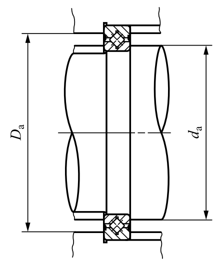
Note(1) Minimum allowable single value of chamfer dimension r
(2) Grease is not prepacked. Perform proper lubrication.
(3) Grease is prepacked.
Remarks1. No oil hole is provided.



CRBS···AUU
···VUU



CRBS···V

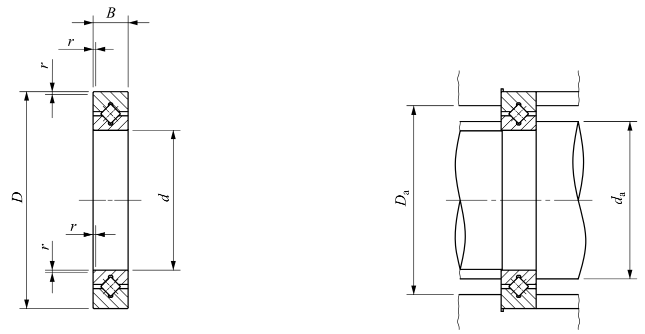


Boundary dimensions mm d	D	B	r_{min}(1)	Mounting dimensions mm d_a	D_a	CRBS(2) With cage, Basic dynamic load rating C N	Basic static load rating C_0 N	CRBS···AUU(3) With Separator, Basic dynamic load rating C N	Basic static load rating C_0 N	CRBS···V(2) CRBS···VUU(3) Full complement, Basic dynamic load rating C N	Basic static load rating C_0 N
50	66	8	0.4	54	61	4 900	6 170	4 680	5 810	6 930	9 800
60	76	8	0.4	64	71	5 350	7 310	5 350	7 310	7 600	11 700
70	86	8	0.4	74	81	5 740	8 440	5 740	8 440	8 190	13 600
80	96	8	0.4	84	91	6 130	9 590	6 130	9 590	8 790	15 500
90	106	8	0.4	94	101	6 490	10 700	6 490	10 700	9 310	17 400
100	116	8	0.4	104	111	6 850	11 900	6 530	11 100	9 850	19 300
110	126	8	0.4	114	121	7 160	13 000	6 850	12 300	10 300	21 200
120	136	8	0.4	124	131	7 530	14 100	7 070	13 000	10 900	23 000
130	146	8	0.4	134	141	7 860	15 300	7 270	13 800	11 200	24 600
140	156	8	0.4	144	151	8 060	16 400	7 510	14 900	11 700	26 800
150	166	8	0.4	154	161	8 350	17 500	7 810	16 000	12 100	28 700
160	186	13	0.6	166	179	20 300	39 900	19 400	37 700	26 900	58 200
170	196	13	0.6	176	189	20 900	42 200	20 000	39 900	27 800	61 600
180	206	13	0.6	186	199	21 500	44 600	21 900	45 700	28 600	65 200
190	216	13	0.6	196	209	22 100	46 900	22 900	49 200	29 300	68 600
200	226	13	0.6	206	219	22 500	49 300	23 300	51 600	30 000	72 200

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

CROSSED ROLLER BEARINGS

Super Slim Type Crossed Roller Bearings



Shaft dia. 20 — 50mm

CRBT…A

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	B	r_{min} (1)	Mounting dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
20	CRBT 205 A	14.8	20	31	5	0.15	22.5	27	1 400	1 290
30	CRBT 305 A	20.7	30	41	5	0.15	32.5	37	1 770	1 970
40	CRBT 405 A	26.5	40	51	5	0.15	42.5	47	2 000	2 520
50	CRBT 505 A	32.3	50	61	5	0.15	52.5	57	2 280	3 200

Note(1) Minimum allowable single value of chamfer r .
Remarks 1. Oil hole is not provided.
2. Grease is pre-packed.

SPHERICAL BUSHINGS

- Steel-on-steel Spherical Bushings
- Maintenance-free Spherical Bushings

Structure and Features

IKO Spherical Bushings are self-aligning spherical plain bushings that have inner and outer rings with spherical sliding surfaces, and can take a large radial load and a bi-directional axial load at the same time. There are many types of Spherical Bushings, but they are basically divided into steel-on-steel types and maintenance-free types according to the kind of sliding surfaces.

Steel-on-steel Spherical Bushings have inner and outer rings of high carbon chromium bearing steel, of which sliding surfaces are phosphate-treated and then dry-coated with molybdenum disulfide (MoS_2). They can, therefore, operate with low torque, and have excellent wear resistance and large load capacity. They are especially suitable for applications where there are alternate loads and shock loads. They have wide applications mainly in industrial and construction machinery.

Maintenance-free Spherical Bushings consist of an outer ring which has a special PTFE liner reinforced with copper alloy meshes on the sliding surface, and a spherical inner ring of which sliding surface has a hard chromium plating. Creep deformation due to compressive load is small, and wear resistance is superior. Thus, they are maintenance-free and can be used for extended periods of time without re-lubrication. They are especially suitable in cases where fixed directional loads are applied and are used mainly in food processing machines and construction machinery and in other applications in which the use of oil is undesirable or lubrication is not possible.

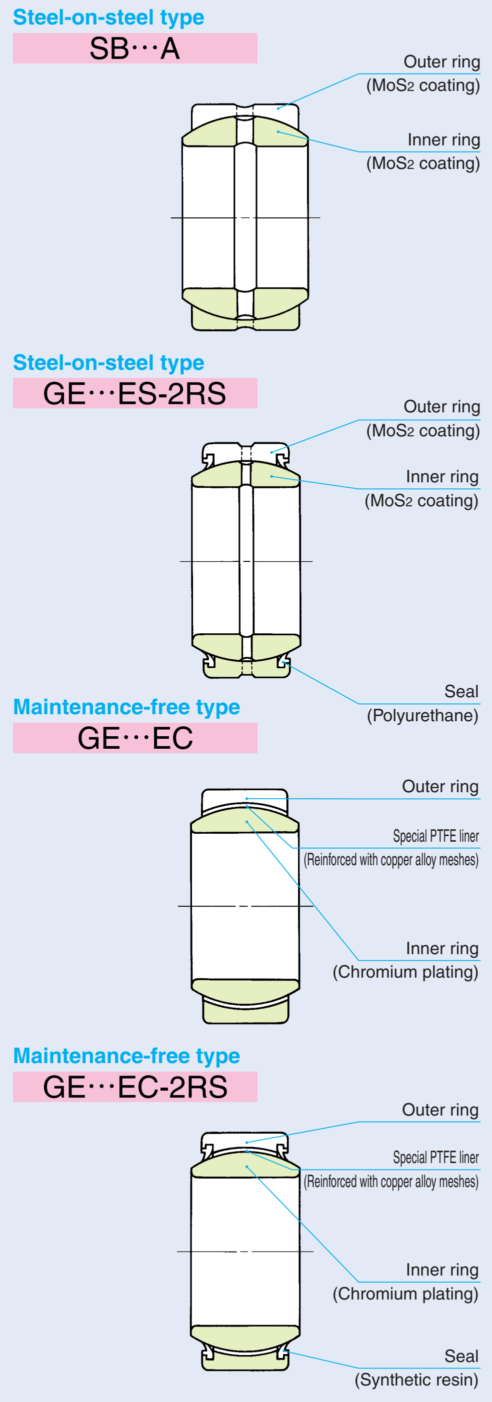
Types

Spherical Bushings are available in various types shown in Table 1.

Table 1 Type of bearing

Series \ Type	Steel-on-steel: Without seals	Steel-on-steel: With seals	Maintenance-free: Without seals	Maintenance-free: With seals
Metric	SB	—	GE…EC	GE…EC-2RS
	SB…A	—		
	GE…E, ES	GE…ES-2RS		
	GE…G, GS	GE…GS-2RS		
Inch	SBB	SBB… -2RS	—	—

Structures of Spherical Bushings



Steel-on-steel Spherical Bushings SB

These bushings have an outer ring split into halves. The split outer ring and the inner ring are held together by a snap ring placed in the groove around the outer periphery of the outer ring.

Steel-on-steel Spherical Bushings SB···A

These bushings have an outer ring split only at one position, and therefore, the outer and inner rings will not separate. Handling before mounting and mounting to the housing are simple. The boundary dimensions are the same as those of the SB type.Therefore, SB and SB···A types are dimensionally interchangeable, but the radial internal clearances of the SB···A type are smaller than those of the SB type.

Steel-on-steel Spherical Bushings GE···E,GE···ES

The dimension series of these types conform to ISO standards and they can be used internationally. The outer ring is split at one position. The GE···E and GE···ES types are available. These are classified by bushing size.
The GE···ES type can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration. The sealed type is indicated by the suffix "-2RS" at the end of the identification number.

Steel-on-steel Spherical Bushings GE···G,GE···GS

As compared with the GE···E and GE···ES types, these bushings have larger load capacities and larger permissible tilting angles. The dimension series also conform to ISO standards, and they can be used internationally. The outer ring is split at one position. The GE···G and GE···GS types are available. They are classified by bushing size.
The GE···GS type can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration.

Steel-on-steel Spherical Bushings SBB

These are inch series bushings. The outer ring is split at one position.
These bushings can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration.

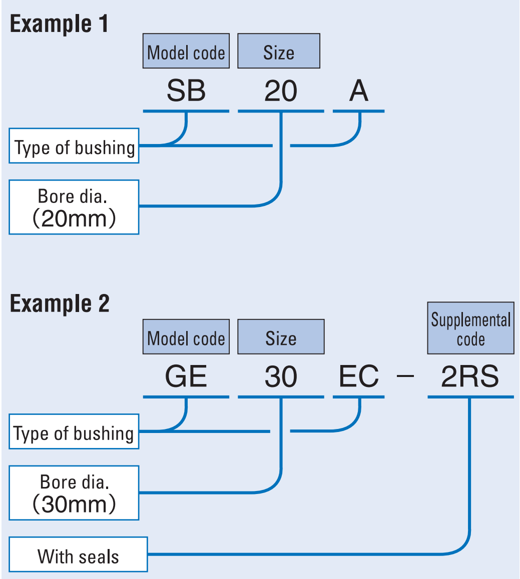
Maintenance-free Spherical Bushings GE···EC

These bushings have the same boundary dimensions as the GE···ES type and can be used internationally. A special PTFE liner reinforced with copper alloy meshes is used on the sliding surface. Therefore, creep deformation due to compressive loads is small, and wear resistance is superior. These bushings are used as maintenance-free bushings.
These bushings can be provided with synthetic resin seals which are effective in preventing dust penetration. They are indicated by the suffix "-2RS" at the end of the identification number.
Spherical Bushings with superior rust prevention properties, which can be used in a corrosive environment or in an environment where water splashes, are also available on request. Please consult IKO.

Identification number

The identification number of Spherical Bushings consists of a model code, a size and any supplemental codes. Examples are shown below.

Examples of identification number



Accuracy

The tolerances of Steel-on-steel Spherical Bushings of the metric series is shown in Table 2.
The tolerances of the GE type are applicable to bushings before splitting the outer ring and after surface treatment.
The tolerances of the SB and SB···A types are applicable to bushings before splitting the outer ring and before surface treatment.
The tolerances of the GE···EC type are applicable to bushings before splitting the outer ring.
The tolerances of the Spherical Bushings of the inch series are shown in Table 3. The tolerances of the bore diameter are applicable to bushings after surface treatment, while other tolerances are applicable to bushings before splitting the outer ring and before surface treatment.
Although minor dimensional changes may occur during surface treatment, they have negligible influence on the overall performance.

Table 2 Tolerances of inner and outer rings of metric series (JIS Class 0) unit: μm

d or D(1) Nominal bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} or Δ_{Cs} Deviation of a single inner ring width or outer ring width	
Over	Incl.	High	Low	High	Low	High	Low
2.5	6	0	− 8	–	–	0	− 120
6	18	0	− 8	0	− 8	0	− 120
18	30	0	− 10	0	− 9	0	− 120
30	50	0	− 12	0	− 11	0	− 120
50	80	0	− 15	0	− 13	0	− 150
80	120	0	− 20	0	− 15	0	− 200
120	150	0	− 25	0	− 18	0	− 250
150	180	0	− 25	0	− 25	0	− 250
180	250	0	− 30	0	− 30	0	− 300
250	315	0	− 35	0	− 35	0	− 350
315	400	0	− 40	0	− 40	0	− 400
400	500	0	− 45	0	− 45	0	− 450

Note(1) d for Δ_{dmp}, Δ_{Bs} and Δ_{Cs} and D for Δ_{Dmp}, respectively.

Table 3 Tolerances of inner and outer rings of inch series SBB unit: μm

d or D(1) Nominal bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} or Δ_{Cs} Deviation of a single inner ring width or outer ring width	
Over	Incl.	High	Low	High	Low	High	Low
–	50.800	0	− 13	0	− 13	0	− 130
50.800	76.200	0	− 15	0	− 15	0	− 130
76.200	80.962	0	− 20	0	− 15	0	− 130
80.962	120.650	0	− 20	0	− 20	0	− 130
120.650	152.400	0	− 25	0	− 25	0	− 130
152.400	177.800	–	–	0	− 25	0	− 130
177.800	222.250	–	–	0	− 30	0	− 130

Note(1) d for Δ_{dmp}, Δ_{Bs} and Δ_{Cs} and D for Δ_{Dmp}, respectively.

Clearance

The radial internal clearances of Spherical Bushings are the values before splitting the outer ring, and are shown in Tables 4, 5 and 6. The radial internal clearances of the inch series are shown in the dimension table.
Clearances other than these can also be prepared on request. Please consult IKO.

Table 4 Radial internal clearance of SB and SB···A types (Steel-on-steel) unit: μm

d Nominal bore dia. mm	SB type		SB···A type	
	Min.	Max.	Min.	Max.
12	70	125	32	68
15			40	82
20	75	140		
22			50	100
25				
30				
35	85	150		
40			60	120
45				
50				
55	90	160		
60			72	142
65				
70	95	170		
75				
80				
85	100	185	85	165
90				
95				
100				
110	110	200		
115				
120				
130	120	215	100	192
150				

K

SB
GE
SBB

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

Table 5 Radial internal clearance of GE type (Steel-on-steel)

unit: μm

d Nominal bore dia. mm GE⋯E GE⋯ES	d Nominal bore dia. mm GE⋯G GE⋯GS	Radial internal clearance Min.	Radial internal clearance Max.
4	—	32	68
5	—		
6	—		
8	6		
10	8		
12	10		
15	12	40	82
17	15		
20	17		
25	20	50	100
30	25		
35	30		
40	35	60	120
45	40		
50	45		
60	50		
70	60	72	142
80	70		
90	80		
100	90	85	165
110	100		
120	110		
140	120		
160	140	100	192
180	160		
200	180		
220	200		
240	220		
260	240	110	214
280	260		
300	280		

Remark Also applicable to bushings with seals.

Table 6 Radial internal clearance of GE⋯EC type (Maintenance-free)

unit: μm

d Nominal bore dia. mm	Radial internal clearance Min.	Radial internal clearance Max.
15	0	40
17		
20		
25	0	50
30		
35		
40	0	60
45		
50		
60		
70	0	72

Remark Also applicable to bushings with seals.

Fit

The recommended fits for Spherical Bushings are shown in Tables 7 and 8.

Table 7 Recommended fits for Steel-on-steel Spherical Bushings

Condition	Tolerance class Shaft	Tolerance class Housing bore
Normal operation	h6, j6	H7, J7
With directionally indeterminate load	m6, n6	M7, N7

Remark N7 tolerance is recommended for light metal housings.

Table 8 Recommended fits for Maintenance-free Spherical Bushings

Tolerance class of shaft	Tolerance class of housing bore
h6, j6	H7, J7, K7

Remark K7 tolerance is recommended for light metal housings.

Selection of Spherical Bushings

Selection between the steel-on-steel type and the maintenance-free type is made considering the operating conditions such as load, lubrication, temperature, and sliding velocity.

Load capacity

❶ Dynamic load capacity

The dynamic load capacity C_d is the maximum allowable load that can be applied on a spherical bushing under oscillating motion. It is obtained on the basis of the contact pressure on the spherical surfaces. The dynamic load capacity is also used for calculating the life of spherical bushings.

The recommended value of bushing load is obtained by multiplying the dynamic load capacity C_d by a numerical factor, which differs depending on the bushing type and the load condition. A guideline for selection is shown in Table 9.

Table 9 Guide for determination of load

Type of bushing	Load direction Constant	Load direction Alternate
Steel-on-steel	$\leqq 0.3C_d$	$\leqq 0.6C_d$
Maintenance-free	$\leqq C_d$	$\leqq 0.5C_d$

When the magnitude of load exceeds the value given in Table 9, please consult IKO.

The dynamic load capacity C_{dt} considering the influence of bushing temperature can be obtained from the following equation using the temperature factor.

$$C_{dt} = f_t C_d \quad \cdots\cdots(1)$$

where, C_{dt} : Dynamic load capacity considering temperature increase N
f_t : Temperature factor (Refer to Table 10.)
C_d : Dynamic load capacity N (Refer to the dimension tables.)

Table 10 Temperature factor f_t

Type of bushing		Temperature ℃ −30 +80	+80 +90	+90 +100	+100 +120	+120 +150	+150 +180
Steel-on-steel	Without seals	1	1	1	1	1	0.7
	With seals	1	—	—	—	—	—
Maintenance-free	Without seals	1	1	0.9	0.75	0.55	—
	With seals	1	—	—	—	—	—

❷ Static load capacity

The static load capacity C_s is the maximum static load that can be applied on the spherical bushing without breaking inner and outer rings or causing any permanent deformation severe enough to render the bushing unusable.

It must be noted that if the magnitude of the applied load becomes comparable to the static load capacity of bushing, the stresses in the shaft or housing may also reach to their limits. This possibility must be taken into consideration in the design.

Equivalent radial load

Spherical Bushings can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained from the following formula.

$$P = F_r + YF_a \quad \cdots\cdots(2)$$

where, P : Equivalent radial load N
F_r : Radial load N
F_a : Axial load N
Y : Axial load factor (Refer to Table 11.)

Table 11 Axial load factor Y

Type of bushing \ F_a/F_r	0.1	0.2	0.3	0.4	0.5	>0.5
Steel-on-steel	1	2	3	4	5	Unusable
Maintenance-free	1	2	3	Unusable		

Life

The life of Spherical Bushings is defined as the total number of oscillating motions before the bushings cannot be operated normally because of wear, increase in internal clearance, increase in sliding torque, rise of operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a practical measure of expected service life.

❶Life of Steel-on-steel spherical bushings

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.1.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure p and the sliding velocity V are obtained from the following formulae.

$$p = \frac{100P}{C_{dt}} \quad \cdots\cdots(3)$$

$$V = 5.82 \times 10^{-4} d_k \beta f \quad \cdots\cdots(4)$$

where, p : Contact pressure N/mm²
P : Equivalent radial load N (Refer to Formula (2).)
C_{dt} : Dynamic load capacity considering temperature increase N (Refer to Formula (1).)
V : Sliding velocity mm/s
d_k : Sphere diameter mm (Refer to the dimension tables.)
2β : Oscillating angle degrees (Refer to Fig.2.)
when $\beta < 5°$, $\beta = 5$
when rotating, $\beta = 90$
f : Number of oscillations per minute cpm

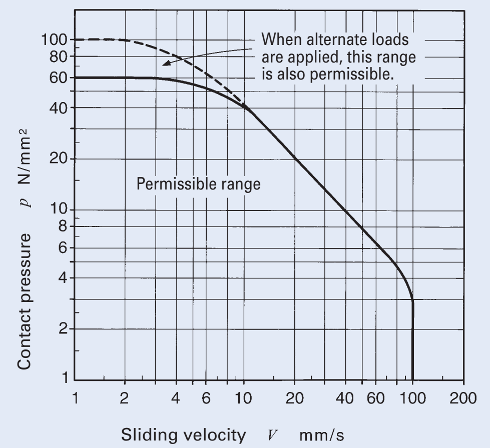


Fig.1 pV diagram of Steel-on-steel spherical bushings

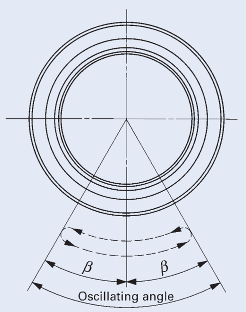


Fig.2 Oscillating angle

K

SB
GE
SBB

[2] Life calculation

The life of steel-on-steel spherical bushings can be calculated from the following formulae.

$$G=\frac{3.18b_1b_2b_3}{\sqrt{d_k}\,\beta}\left(\frac{C_{dt}}{P}\right)^2\times10^5 \quad\cdots\cdots(5)$$

$$L_h=\frac{G}{60f}\quad\cdots\cdots(6)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 12.)
b_2 : Lubrication factor (Refer to Table 13.)
b_3 : Sliding velocity factor (Refer to Fig.3.)
C_{dt} : Dynamic load capacity considering temperature increase N (Refer to Formula (1).)
P : Equivalent radial load N (Refer to Formula (2).)
L_h : Life in hours h
f : Number of oscillations per minute cpm

Table 12 Load directional factor b_1 (Steel-on-steel)

Load direction	Constant	Alternate
Load directional factor b_1	1	5

Table 13 Lubrication factor b_2

Periodical lubrication	None	Regular
Lubrication factor b_2	1	15

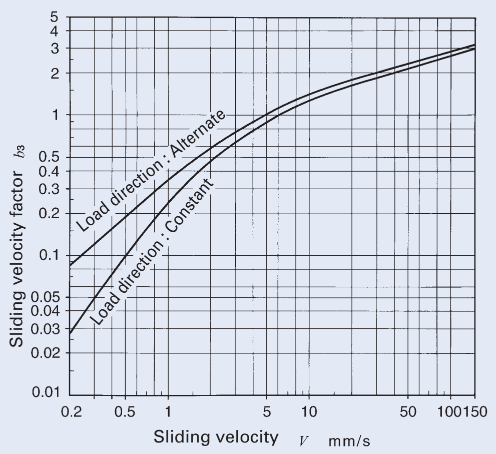


Fig.3 Sliding velocity factor

❷ **Life of Maintenance-free spherical bushings**

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.4.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure p and the sliding velocity V are obtained from Formulae (3) and (4) shown on page 439.

[2] Life calculation

The life of maintenance-free spherical bushings is obtained from the total sliding distance S which is given in Fig.5 for the contact pressure p obtained from Formula (3).

The total number of oscillations and life in hours can be obtained from the following formulae.

$$G=16.67\times b_1\frac{Sf}{V}\quad\cdots\cdots(7)$$

$$L_h=\frac{G}{60f}\quad\cdots\cdots(8)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 14.)
S : Total sliding distance m (Refer to Fig.5.)
f : Number of oscillations per minute cpm
V : Sliding velocity mm/s
L_h : Life in hours h

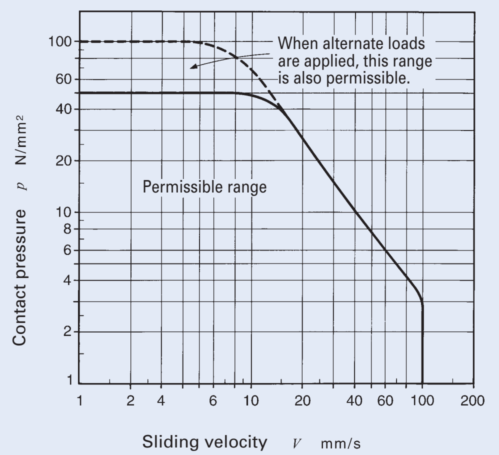


Fig.4 pV diagram of Maintenance-free spherical bushings

Table 14 Load directional factor b_1 (Maintenance-free)

Load direction	Constant	Alternate
Load directional factor b_1	1	0.2(1)

Note(1) This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult IKO, as the factor degreases sharply.

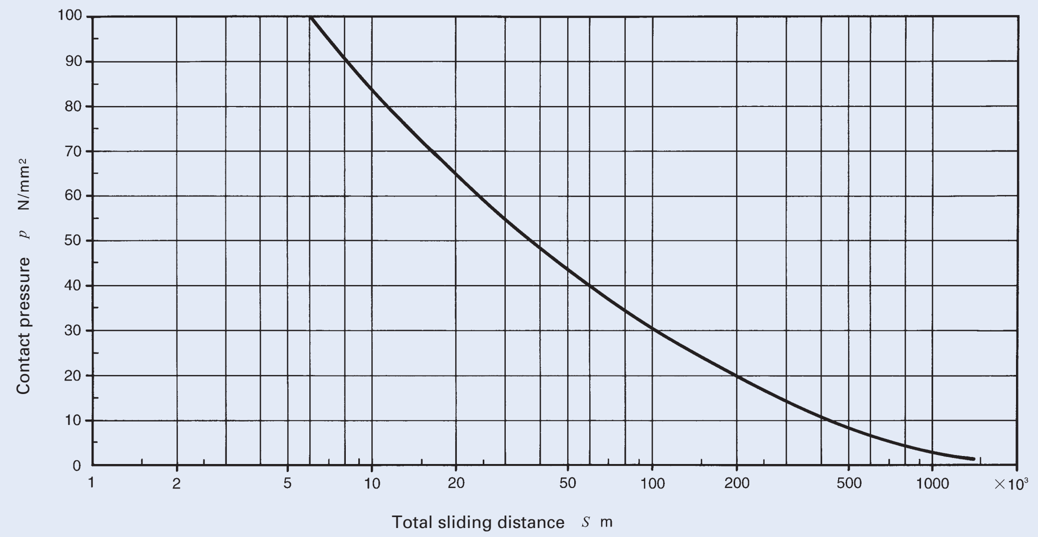


Fig.5 Total sliding distance against contact pressure of Maintenance-free spherical bushings

Lubrication

Steel-on-steel Spherical Bushings can be operated without lubrication when the magnitude of applied load is small and the sliding velocity of oscillation is small. However, in general, it is necessary to supply grease periodically. During initial operation, it is recommended to shorten the lubrication interval. Lithium soap base grease (NLGI consistency No.2) containing molybdenum disulfide (MoS_2) is widely used as the lubricating grease.

Maintenance-free Spherical Bushings can be used without lubrication. However, if lithium soap base grease is supplied before operation, the spherical bushings can be operated for an extended period of time. The spherical bushings can be effectively protected from dust and rust if the space around the bushings is filled with grease.

Oil Hole

The number of oil holes on inner and outer rings is shown in Table 15.

Table 15 Number of oil holes on inner and outer rings

Bushing type			Number of oil holes on inner and outer rings
Steel-on-steel Spherical Bushings	Metric series	GE…E GE…G	0
		SB, SB…A GE…ES, GE…GS	2
	Inch series	SBB	2
Maintenance-free Spherical Bushings	Metric series	GE…EC	0

Remark Types with oil holes are also provided with oil grooves on inner and outer rings.

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

Operating Temperature Range

The operating temperature range for Spherical Bushings with seals is -30˚C～+80˚C.
The maximum allowable temperature for Spherical Bushings without seals is +180˚C for the steel-on-steel type and +150˚C for the maintenance-free type.

Precautions for Use

Design of shaft

When the load is large, sliding may occur between the shaft and the inner ring bore of bushing. For such cases, it is necessary to prepare the shaft with a hardness of 58HRC or greater and surface roughness of 0.8 μmR_a or less.
Furthermore, attention must be paid to the strength of shaft because the shear and/or bending stresses in the shaft may surpass the allowable values even when the load is below the static load capacity of Spherical Bushings.

Design of housing

The housing should have sufficient rigidity to avoid harmful deformation under load.
When the housing shown in Fig.6 is used, it should be designed with sufficient strength as follows.

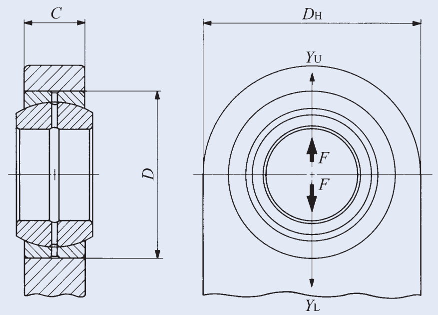


Fig.6 Shape of housing

❶When the load acts in the Y_L direction;
Select the housing material considering the compressive stress obtained from the following formula.

$$\sigma_1 = \frac{F}{CD} \quad \cdots\cdots(9)$$

where,
- σ_1 : Maximum compressive stress occurring in the housing bore N/mm²
- F : Applied load N
- C : Width of outer ring and housing mm
- D : Outside diameter of outer ring mm

❷When the load acts in the Yu direction ;
Select the housing material considering the tensile stress obtained from the following formula.

$$\sigma_2 = \frac{F}{C\,(D_H - D)}\,k \quad \cdots\cdots(10)$$

where,
- σ_2 : Maximum tensile stress occurring in the housing bore N/mm²
- F : Applied load N
- C : Width of outer ring and housing mm
- D_H : Outside diameter of housing mm
- D : Outside diameter of outer ring mm
- k : Stress concentration factor (Refer to Fig.7.)

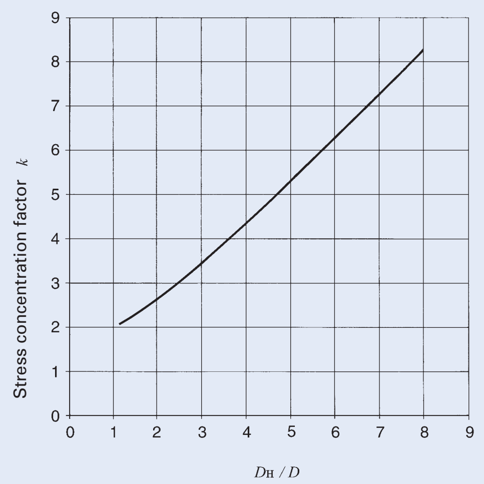


Fig.7 Stress concentration factor

Mounting

❶When mounting Spherical Bushings, pay attention to the location of the split plane of the outer ring. Set the split plane at right angles to the direction of load to avoid the application of load to the split plane as shown in Fig. 8.
❷The shoulder dimensions of shaft and housing are shown in the dimension tables.

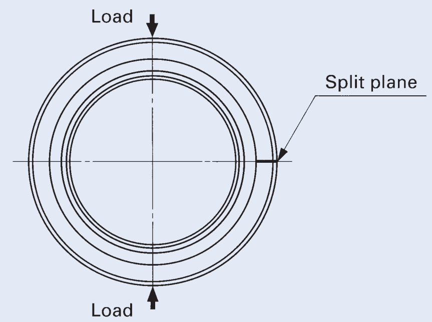


Fig.8 Relationship between the split plane and the loading direction

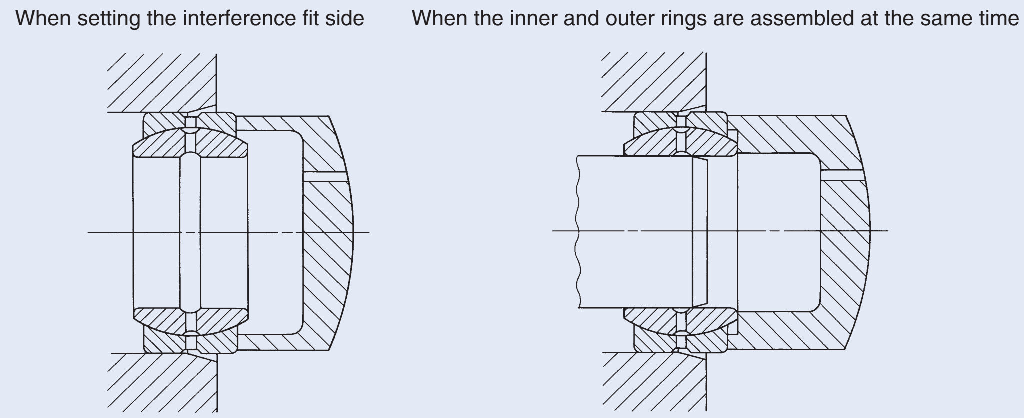


Fig.9 Mounting method

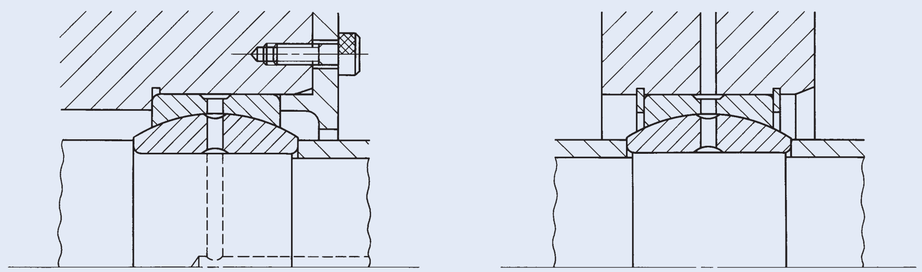
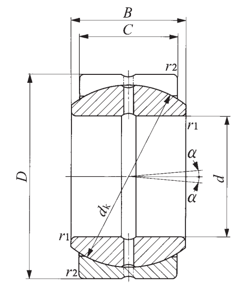


Fig.10 Mounting examples

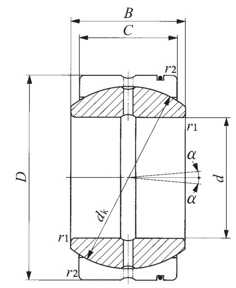
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

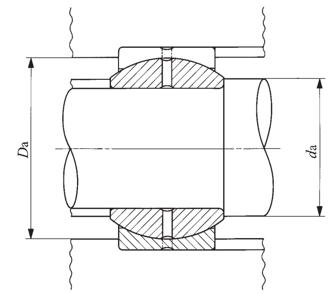
Steel-on-steel Spherical Bushings



SB…A



SB



Shaft dia. 12 – 100mm

Shaft dia. (mm)	Identification number		Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{s\,min}$ (1)	Permissible tilting angle degree α	Mounting dimensions mm d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
12	SB 12A	SB 122211	0.019	12	22	11	9	18	0.3	7	14	14	19.5	17	15 900	95 300
15	SB 15A	SB 152613	0.028	15	26	13	11	22	0.3	6	17.5	17.5	23.5	21	23 700	142 000
20	SB 20A	SB 203216	0.053	20	32	16	14	28	0.3	4	22.5	23	29.5	26	38 400	231 000
22	SB 22A	SB 223719	0.085	22	37	19	16	32	0.3	6	24.5	25.5	34.5	30	50 200	301 000
25	SB 25A	SB 254221	0.116	25	42	21	18	36	0.3	5	27.5	29	39.5	34	63 500	381 000
30	SB 30A	SB 305027	0.225	30	50	27	23	45	0.6	6	34.5	36	45.5	42	101 000	609 000
35	SB 35A	SB 355530	0.300	35	55	30	26	50	0.6	5	39.5	40	50.5	46.5	127 000	765 000
40	SB 40A	SB 406233	0.375	40	62	33	28	55	0.6	6	44	44	57.5	51.5	151 000	906 000
45	SB 45A	SB 457236	0.600	45	72	36	31	62	0.6	5	49.5	50.5	67.5	58	188 000	1 130 000
50	SB 50A	SB 508042	0.870	50	80	42	36	72	0.6	5	54.5	58.5	75.5	67	254 000	1 530 000
55	SB 55A	SB 559047	1.26	55	90	47	40	80	0.6	5	59.5	64.5	85.5	74.5	314 000	1 880 000
60	SB 60A	SB 6010053	1.70	60	100	53	45	90	0.6	6	64.5	72.5	95.5	83.5	397 000	2 380 000
65	SB 65A	SB 6510555	2.05	65	105	55	47	94	0.6	5	69.5	76	100.5	87	433 000	2 600 000
70	SB 70A	SB 7011058	2.22	70	110	58	50	100	0.6	5	74.5	81.5	105.5	93	490 000	2 940 000
75	SB 75A	SB 7512064	3.02	75	120	64	55	110	0.6	5	79.5	89.5	115.5	102	593 000	3 560 000
80	SB 80A	SB 8013070	3.98	80	130	70	60	120	0.6	5	84.5	97.5	125.5	112	706 000	4 240 000
85	SB 85A	SB 8513574	4.29	85	135	74	63	125	0.6	6	89.5	100.5	130.5	116	772 000	4 630 000
90	SB 90A	SB 9014076	4.71	90	140	76	65	130	0.6	5	94.5	105.5	135.5	121	829 000	4 970 000
95	SB 95A	SB 9515082	6.05	95	150	82	70	140	0.6	5	99.5	113.5	145.5	130	961 000	5 770 000
100	SB 100A	SB 10016088	7.42	100	160	88	75	150	1	5	105.5	121.5	154.5	139	1 100 000	6 620 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimesion must be less than the maximum value of d_a.

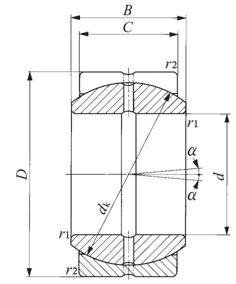
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. Not provided with prepacked grease. Perform proper lubrication for use.

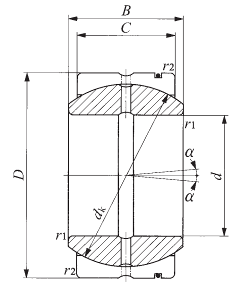
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings



SB···A



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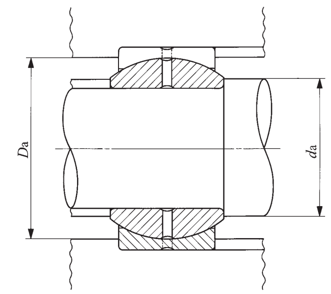


Shaft dia. 110 ─ 150mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{s\,min}$ (1)	Permissible tilting angle degree α	Mounting dimensions mm d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
110	**SB 110A**	**SB 11017093**	8.55	110	170	93	80	160	1	5	115.5	130	164.5	149	1 260 000	7 530 000
115	**SB 115A**	**SB 11518098**	10.3	115	180	98	85	165	1	5	120.5	132.5	174.5	152	1 380 000	8 250 000
120	**SB 120A**	**SB 120190105**	12.4	120	190	105	90	175	1	5	125.5	140	184.5	162	1 540 000	9 270 000
130	**SB 130A**	**SB 130200110**	13.8	130	200	110	95	185	1	5	135.5	148.5	194.5	171	1 720 000	10 300 000
150	**SB 150A**	**SB 150220120**	17.0	150	220	120	105	205	1	5	155.5	166	214.5	189	2 110 000	12 700 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. Not provided with prepacked grease. Perform proper lubrication for use.

K

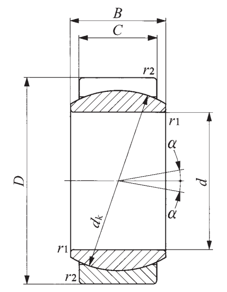
SB
GE
SBB

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

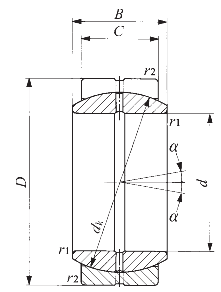
IKO

SPHERICAL BUSHINGS

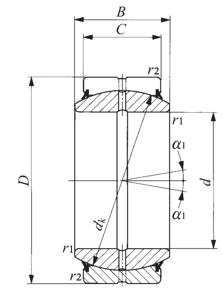
Steel-on-steel Spherical Bushings



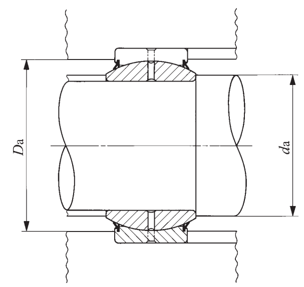
GE⋯E



GE⋯ES



GE⋯ES-2RS



Shaft dia. 4 — 100mm

Shaft dia. mm	Identification number: Without seals	Identification number: With seals	Mass (Ref.) kg	Boundary dimensions mm: d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	Permissible tilting angle degree: α	α_1	Mounting dimensions mm: d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
4	GE 4E	—	0.003	4	12	5	3	8	0.3	0.3	16	—	6	6	9.5	8	2 350	14 100
5	GE 5E	—	0.004	5	14	6	4	10	0.3	0.3	13	—	7.5	8	11.5	10	3 920	23 500
6	GE 6E	—	0.004	6	14	6	4	10	0.3	0.3	13	—	8	8	11.5	10	3 920	23 500
8	GE 8E	—	0.008	8	16	8	5	13	0.3	0.3	15	—	10	10	13.5	13	6 370	38 200
10	GE 10E	—	0.012	10	19	9	6	16	0.3	0.3	12	—	12.5	13	16.5	15.5	9 410	56 500
12	GE 12E	—	0.017	12	22	10	7	18	0.3	0.3	11	—	14.5	15	19.5	17	12 400	74 100
15	GE 15ES	GE 15ES-2RS	0.032	15	26	12	9	22	0.3	0.3	8	5	17.5	18	23.5	22.5	19 400	117 000
17	GE 17ES	GE 17ES-2RS	0.049	17	30	14	10	25	0.3	0.3	10	7	19.5	20.5	27.5	26	24 500	147 000
20	GE 20ES	GE 20ES-2RS	0.065	20	35	16	12	29	0.3	0.3	9	6	22.5	24	32.5	30.5	34 100	205 000
25	GE 25ES	GE 25ES-2RS	0.115	25	42	20	16	35.5	0.6	0.6	7	4	29	29	37.5	37	55 700	334 000
30	GE 30ES	GE 30ES-2RS	0.160	30	47	22	18	40.7	0.6	0.6	6	4	34	34	42.5	41.5	71 800	431 000
35	GE 35ES	GE 35ES-2RS	0.258	35	55	25	20	47	0.6	1	6	4	39.5	39.5	49.5	48	92 200	553 000
40	GE 40ES	GE 40ES-2RS	0.315	40	62	28	22	53	0.6	1	7	4	44.5	45	56.5	54.5	114 000	686 000
45	GE 45ES	GE 45ES-2RS	0.413	45	68	32	25	60	0.6	1	7	4	49.5	50.5	62.5	60	147 000	883 000
50	GE 50ES	GE 50ES-2RS	0.560	50	75	35	28	66	0.6	1	6	4	54.5	56	69.5	66	181 000	1 090 000
60	GE 60ES	GE 60ES-2RS	1.10	60	90	44	36	80	1	1	6	3	65.5	66.5	84.5	79	282 000	1 690 000
70	GE 70ES	GE 70ES-2RS	1.54	70	105	49	40	92	1	1	6	4	75.5	77.5	99.5	91	361 000	2 170 000
80	GE 80ES	GE 80ES-2RS	2.29	80	120	55	45	105	1	1	6	4	85.5	89	114.5	103	463 000	2 780 000
90	GE 90ES	GE 90ES-2RS	2.82	90	130	60	50	115	1	1	5	3	95.5	98	124.5	112	564 000	3 380 000
100	GE 100ES	GE 100ES-2RS	4.43	100	150	70	55	130	1	1	7	5	105.5	109.5	144.5	127	701 000	4 210 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remarks1. GE⋯E has no oil hole. Others are provided with an oil groove and two oil holes on the inner ring and outer ring, respectively.

2. Not provided with prepacked grease. Perform proper lubrication for use.

K

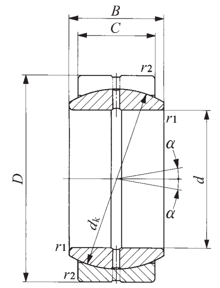
SB
GE
SBB

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

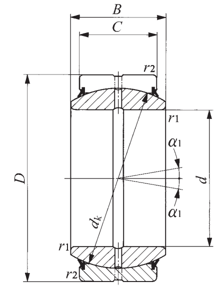
SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings

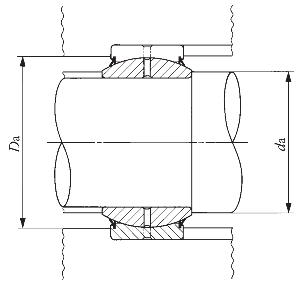
IKO



GE⋯ES



GE⋯ES-2RS



Shaft dia. 110 ─ 300mm

Shaft dia.	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity	Static load capacity
	Without seals	With seals		d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	α	α_1	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	C_d	C_s
mm			kg														N	N
110	GE 110ES	GE 110ES-2RS	4.94	110	160	70	55	140	1	1	6	4	115.5	121	154.5	138	755 000	4 530 000
120	GE 120ES	GE 120ES-2RS	8.12	120	180	85	70	160	1	1	6	4	125.5	135.5	174.5	154	1 100 000	6 590 000
140	GE 140ES	GE 140ES-2RS	11.4	140	210	90	70	180	1	1	7	5	145.5	155.5	204.5	176	1 240 000	7 410 000
160	GE 160ES	GE 160ES-2RS	14.4	160	230	105	80	200	1	1	8	6	165.5	170	224.5	195	1 570 000	9 410 000
180	GE 180ES	GE 180ES-2RS	18.9	180	260	105	80	225	1.1	1.1	6	5	187	199	253	221	1 770 000	10 600 000
200	GE 200ES	GE 200ES-2RS	28.1	200	290	130	100	250	1.1	1.1	7	6	207	213.5	283	244	2 450 000	14 700 000
220	GE 220ES	GE 220ES-2RS	36.1	220	320	135	100	275	1.1	1.1	8	6	227	239.5	313	269	2 700 000	16 200 000
240	GE 240ES	GE 240ES-2RS	40.4	240	340	140	100	300	1.1	1.1	8	6	247	265	333	296	2 940 000	17 700 000
260	GE 260ES	GE 260ES-2RS	52.0	260	370	150	110	325	1.1	1.1	7	6	267	288	363	320	3 510 000	21 000 000
280	GE 280ES	GE 280ES-2RS	66.0	280	400	155	120	350	1.1	1.1	6	5	287	313.5	393	345	4 120 000	24 700 000
300	GE 300ES	GE 300ES-2RS	76.0	300	430	165	120	375	1.1	1.1	7	6	307	336.5	423	371	4 410 000	26 500 000

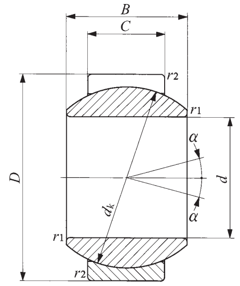
Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
2. Not provided with prepacked grease. Perform proper lubrication for use.

K
SB
GE
SBB

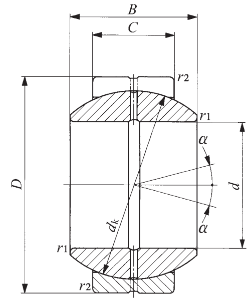
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

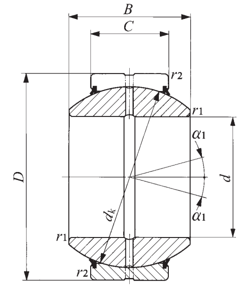
Steel-on-steel Spherical Bushings



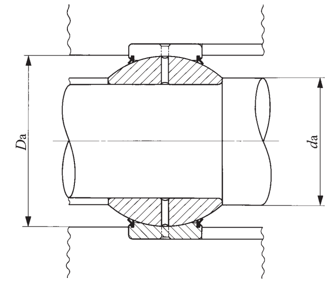
GE…G



GE…GS



GE…GS-2RS



Shaft dia. 6 — 120mm

Shaft dia. mm	Identification number: Without seals	Identification number: With seals	Mass (Ref.) kg	Boundary dimensions mm: d	D	B	C	d_k	$r_{1s\,min}$(1)	$r_{2s\,min}$(1)	Permissible tilting angle degree: α	α_1	Mounting dimensions mm: d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
6	GE 6G	—	0.010	6	16	9	5	13	0.3	0.3	21	—	8.5	9	13.5	13	6 370	38 200
8	GE 8G	—	0.015	8	19	11	6	16	0.3	0.3	21	—	10.5	11.5	16.5	15.5	9 410	56 500
10	GE 10G	—	0.022	10	22	12	7	18	0.3	0.3	18	—	12.5	13	19.5	17	12 400	74 100
12	GE 12G	—	0.041	12	26	15	9	22	0.3	0.3	18	—	14.5	16	23.5	21	19 400	117 000
15	GE 15GS	GE 15GS-2RS	0.059	15	30	16	10	25	0.3	0.3	16	13	17.5	19	27.5	26	24 500	147 000
17	GE 17GS	GE 17GS-2RS	0.083	17	35	20	12	29	0.3	0.3	19	16	19.5	21	32.5	30.5	34 100	205 000
20	GE 20GS	GE 20GS-2RS	0.155	20	42	25	16	35.5	0.3	0.6	17	16	22.5	25	37.5	37	55 700	334 000
25	GE 25GS	GE 25GS-2RS	0.215	25	47	28	18	40.7	0.6	0.6	17	15	29.5	29.5	42.5	41.5	71 800	431 000
30	GE 30GS	GE 30GS-2RS	0.330	30	55	32	20	47	0.6	1	17	16	34	34	49.5	48	92 200	553 000
35	GE 35GS	GE 35GS-2RS	0.400	35	62	35	22	53	0.6	1	16	15	39.5	39.5	56.5	54.5	114 000	686 000
40	GE 40GS	GE 40GS-2RS	0.515	40	68	40	25	60	0.6	1	17	14	44.5	44.5	62.5	60	147 000	883 000
45	GE 45GS	GE 45GS-2RS	0.660	45	75	43	28	66	0.6	1	15	13	49.5	50	69.5	66	181 000	1 090 000
50	GE 50GS	GE 50GS-2RS	1.50	50	90	56	36	80	0.6	1	17	16	54.5	57	84.5	79	282 000	1 690 000
60	GE 60GS	GE 60GS-2RS	2.05	60	105	63	40	92	1	1	17	15	65.5	67	99.5	91	361 000	2 170 000
70	GE 70GS	GE 70GS-2RS	3.00	70	120	70	45	105	1	1	16	14	75.5	78	114.5	103	463 000	2 780 000
80	GE 80GS	GE 80GS-2RS	3.60	80	130	75	50	115	1	1	14	13	85.5	87	124.5	112	564 000	3 380 000
90	GE 90GS	GE 90GS-2RS	5.41	90	150	85	55	130	1	1	15	14	95.5	98	144.5	127	701 000	4 210 000
100	GE 100GS	GE 100GS-2RS	6.15	100	160	85	55	140	1	1	14	12	105.5	111	154.5	138	755 000	4 530 000
110	GE 110GS	GE 110GS-2RS	9.70	110	180	100	70	160	1	1	12	11	115.5	124.5	174.5	154	1 100 000	6 590 000
120	GE 120GS	GE 120GS-2RS	15.5	120	210	115	70	180	1	1	16	15	125.5	138.5	204.5	176	1 240 000	7 410 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

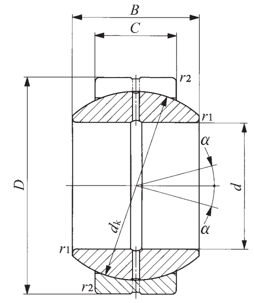
Remarks 1. GE…G has no oil hole. Others are provided with an oil groove and two oil holes on the inner ring and outer ring, respectively.

2. Not provided with prepacked grease. Perform proper lubrication for use.

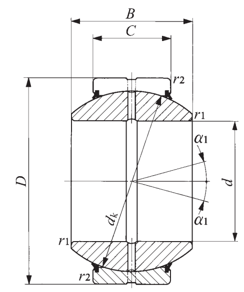
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

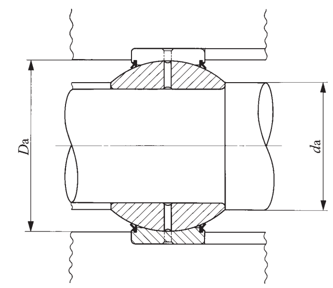
Steel-on-steel Spherical Bushings



GE···GS



GE···GS-2RS



Shaft dia. 140 ー 280mm

Shaft dia. mm	Identification number Without seals	Identification number With seals	Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	Permissible tilting angle degree α	α_1	Mounting dimensions mm d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
140	**GE 140GS**	**GE 140GS-2RS**	19.2	140	230	130	80	200	1	1	16	15	145.5	152	224.5	195	1 570 000	9 410 000
160	**GE 160GS**	**GE 160GS-2RS**	25.4	160	260	135	80	225	1	1.1	16	14	165.5	180	253	221	1 770 000	10 600 000
180	**GE 180GS**	**GE 180GS-2RS**	34.7	180	290	155	100	250	1.1	1.1	14	13	187	196	283	244	2 450 000	14 700 000
200	**GE 200GS**	**GE 200GS-2RS**	43.8	200	320	165	100	275	1.1	1.1	15	14	207	220	313	269	2 700 000	16 200 000
220	**GE 220GS**	**GE 220GS-2RS**	51.3	220	340	175	100	300	1.1	1.1	16	14	227	243.5	333	296	2 940 000	17 700 000
240	**GE 240GS**	**GE 240GS-2RS**	66.1	240	370	190	110	325	1.1	1.1	15	14	247	263.5	363	320	3 510 000	21 000 000
260	**GE 260GS**	**GE 260GS-2RS**	81.8	260	400	205	120	350	1.1	1.1	15	14	267	283.5	393	345	4 120 000	24 700 000
280	**GE 280GS**	**GE 280GS-2RS**	97.4	280	430	210	120	375	1.1	1.1	15	14	287	310.5	423	371	4 410 000	26 500 000

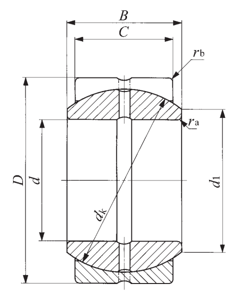
Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
2. Not provided with prepacked grease. Perform proper lubrication for use.

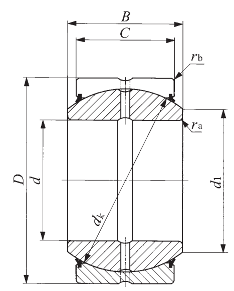
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

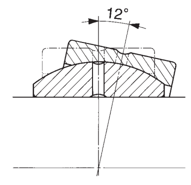
K
SB
GE
SBB

SPHERICAL BUSHINGS

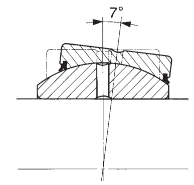
Steel-on-steel Spherical Bushings Inch Series


SBB


SBB···-2RS



SBB



SBB···-2RS

Permissible tilting angle

Shaft dia. 12.700 — 63.500mm

Shaft dia. mm (inch)	Identification number Without seal	With seals	Mass (Ref.) kg	Boundary dimensions mm(inch) d	D	B	C	d_k	Radial internal clearance mm Min./Max.	Mounting dimensions mm d_1	$r_{as\,max}$(1) Max.	$r_{bs\,max}$(1) Max.	Dynamic load capacity C_d N	Static load capacity C_s N
12.700 (1/2)	SBB 8	—	0.020	12.700(1/2)	22.225(7/8)	11.10(.437)	9.52(.375)	18 (.709)	0.05/0.15	14.0	0.2	0.6	16 800	101 000
15.875 (5/8)	SBB 10	—	0.036	15.875(5/8)	26.988(1 1/16)	13.89(.547)	11.91(.469)	23 (.906)	0.05/0.15	17.9	0.2	0.8	26 900	161 000
19.050 (3/4)	SBB 12	SBB 12-2RS	0.057	19.050(3/4)	31.750(1 1/4)	16.66(.656)	14.27(.562)	27.5(1.083)	0.08/0.18	21.4	0.6	*0.8	38 500	231 000
22.225 (7/8)	SBB 14	SBB 14-2RS	0.088	22.225(7/8)	36.512(1 7/16)	19.43(.765)	16.66(.656)	32 (1.260)	0.08/0.18	25.0	0.6	*0.8	52 300	314 000
25.400 (1)	SBB 16	SBB 16-2RS	0.125	25.400(1)	41.275(1 5/8)	22.22(.875)	19.05(.750)	36 (1.417)	0.08/0.18	28.0	0.6	*0.8	67 300	404 000
31.750 (1 1/4)	SBB 20	SBB 20-2RS	0.234	31.750(1 1/4)	50.800(2)	27.76(1.093)	23.80(.937)	45 (1.772)	0.08/0.18	35.1	0.6	0.8	105 000	630 000
34.925 (1 3/8)	SBB 22	SBB 22-2RS	0.349	34.925(1 3/8)	55.562(2 3/16)	30.15(1.187)	26.19(1.031)	49 (1.929)	0.08/0.18	38.5	0.6	0.8	126 000	755 000
38.100 (1 1/2)	SBB 24	SBB 24-2RS	0.424	38.100(1 1/2)	61.912(2 7/16)	33.32(1.312)	28.58(1.125)	55 (2.165)	0.08/0.18	43.3	0.6	0.8	154 000	925 000
44.450 (1 3/4)	SBB 28	SBB 28-2RS	0.649	44.450(1 3/4)	71.438(2 13/16)	38.89(1.531)	33.32(1.312)	64 (2.520)	0.08/0.18	50.4	0.6	0.8	209 000	1 250 000
50.800 (2)	SBB 32	SBB 32-2RS	0.939	50.800(2)	80.962(3 3/16)	44.45(1.750)	38.10(1.500)	73 (2.874)	0.08/0.18	57.6	0.6	0.8	273 000	1 640 000
57.150 (2 1/4)	SBB 36	SBB 36-2RS	1.32	57.150(2 1/4)	90.488(3 9/16)	50.01(1.969)	42.85(1.687)	82 (3.228)	0.10/0.20	64.9	0.6	0.8	345 000	2 070 000
63.500 (2 1/2)	SBB 40	SBB 40-2RS	1.85	63.500(2 1/2)	100.012(3 15/16)	55.55(2.187)	47.62(1.875)	91 (3.583)	0.10/0.20	72.0	0.6	0.8	425 000	2 550 000

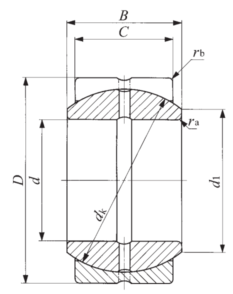
Note(1) Maximum allowable corner radius of the shaft or housing

Remarks
1. The value with mark * is applicable to types without seals. For types with seals, the value is 0.4 mm.
2. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
3. Not provided with prepacked grease. Perform proper lubrication for use.

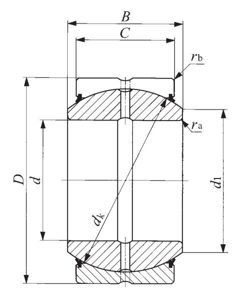
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

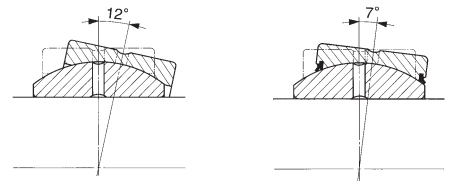
Steel-on-steel Spherical Bushings Inch Series



SBB



SBB···-2RS



Permissible tilting angle

SBB　　SBB···-2RS

Shaft dia. 69.850 — 152.400mm

Shaft dia. mm (inch)	Identification number Without seal	Identification number With seals	Mass (Ref.) kg	Boundary dimensions mm(inch) d	D	B	C	d_k	Radial internal clearance mm Min./Max.	Mounting dimensions mm d_1	$r_{as\ max}$ (1) Max.	$r_{bs\ max}$ (1) Max.	Dynamic load capacity C_d N	Static load capacity C_s N
69.850 (2 3/4)	**SBB 44**	**SBB 44-2RS**	2.44	69.850 (2 3/4)	111.125 (4 3/8)	61.11 (2.406)	52.37 (2.062)	100 (3.937)	0.10／0.20	79.0	0.6	0.8	514 000	3 080 000
76.200 (3)	**SBB 48**	**SBB 48-2RS**	3.12	76.200 (3)	120.650 (4 3/4)	66.68 (2.625)	57.15 (2.250)	110 (4.331)	0.10／0.20	86.5	0.6	0.8	616 000	3 700 000
82.550 (3 1/4)	**SBB 52**	**SBB 52-2RS**	3.92	82.550 (3 1/4)	130.175 (5 1/8)	72.24 (2.844)	61.90 (2.437)	119 (4.685)	0.13／0.23	94.1	0.6	0.8	722 000	4 330 000
88.900 (3 1/2)	**SBB 56**	**SBB 56-2RS**	4.83	88.900 (3 1/2)	139.700 (5 1/2)	77.77 (3.062)	66.68 (2.625)	128 (5.039)	0.13／0.23	101.6	0.6	0.8	837 000	5 020 000
95.250 (3 3/4)	**SBB 60**	**SBB 60-2RS**	5.87	95.250 (3 3/4)	149.225 (5 7/8)	83.34 (3.281)	71.42 (2.812)	137 (5.394)	0.13／0.23	108.4	0.6	0.8	960 000	5 760 000
101.600 (4)	**SBB 64**	**SBB 64-2RS**	7.07	101.600 (4)	158.750 (6 1/4)	88.90 (3.500)	76.20 (3.000)	146 (5.748)	0.13／0.23	115.8	0.6	0.8	1 090 000	6 550 000
107.950 (4 1/4)	**SBB 68**	**SBB 68-2RS**	8.46	107.950 (4 1/4)	168.275 (6 5/8)	94.46 (3.719)	80.95 (3.187)	155 (6.102)	0.13／0.23	122.6	0.8	1.1	1 230 000	7 380 000
114.300 (4 1/2)	**SBB 72**	**SBB 72-2RS**	9.94	114.300 (4 1/2)	177.800 (7)	100.00 (3.937)	85.72 (3.375)	164 (6.457)	0.13／0.23	129.8	0.8	1.1	1 380 000	8 270 000
120.650 (4 3/4)	**SBB 76**	**SBB 76-2RS**	11.6	120.650 (4 3/4)	187.325 (7 3/8)	105.56 (4.156)	90.47 (3.562)	173 (6.811)	0.13／0.23	136.8	0.8	1.1	1 530 000	9 210 000
127.000 (5)	**SBB 80**	**SBB 80-2RS**	13.5	127.000 (5)	196.850 (7 3/4)	111.12 (4.375)	95.25 (3.750)	183 (7.205)	0.13／0.23	144.9	0.8	1.1	1 710 000	10 300 000
152.400 (6)	**SBB 96**	**SBB 96-2RS**	17.6	152.400 (6)	222.250 (8 3/4)	120.65 (4.750)	104.78 (4.125)	207 (8.150)	0.13／0.23	167.5	0.8	1.1	2 130 000	12 800 000

Note(1) Maximum allowable corner radius of the shaft or housing

Remarks 1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. Not provided with prepacked grease. Perform proper lubrication for use.

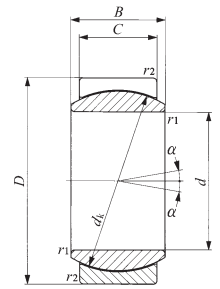
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

K
SB
GE
SBB

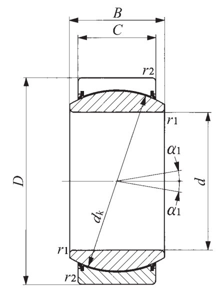
SPHERICAL BUSHINGS

Maintenance-free Spherical Bushings

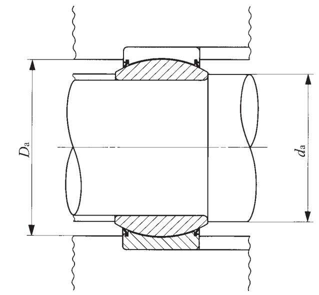
IKO



GE···EC



GE···EC-2RS



Shaft dia. 15 — 70mm

Shaft dia. (mm)	Identification number: Without seals	Identification number: With seals	Mass (Ref.) kg	Boundary dimensions mm: d	D	B	C	d_k	$r_{1s\,min}$(1)	$r_{2s\,min}$(1)	Permissible tilting angle degree: α	α_1
15	**GE 15EC**	—	0.032	15	26	12	9	22	0.3	0.3	8	—
17	**GE 17EC**	—	0.049	17	30	14	10	25	0.3	0.3	10	—
20	**GE 20EC**	—	0.065	20	35	16	12	29	0.3	0.3	9	—
25	**GE 25EC**	—	0.115	25	42	20	16	35.5	0.6	0.6	7	—
30	**GE 30EC**	**GE 30EC-2RS**	0.160	30	47	22	18	40.7	0.6	0.6	6	4
35	—	**GE 35EC-2RS**	0.258	35	55	25	20	47	0.6	1	—	4
40	—	**GE 40EC-2RS**	0.315	40	62	28	22	53	0.6	1	—	4
45	—	**GE 45EC-2RS**	0.413	45	68	32	25	60	0.6	1	—	4
50	—	**GE 50EC-2RS**	0.560	50	75	35	28	66	0.6	1	—	4
60	—	**GE 60EC-2RS**	1.10	60	90	44	36	80	1	1	—	3
70	—	**GE 70EC-2RS**	1.54	70	105	49	40	92	1	1	—	4

Shaft dia. (mm)	Mounting dimensions mm: d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
15	17.5	18	23.5	21.5	19 400	48 500
17	19.5	20.5	27.5	24.5	24 500	61 300
20	22.5	24	32.5	28	34 100	85 300
25	29	29	37.5	34	55 700	139 000
30	34	34	42.5	41.5	71 800	180 000
35	39.5	39.5	49.5	48	92 200	230 000
40	44.5	45	56.5	54.5	114 000	286 000
45	49.5	50.5	62.5	60	147 000	368 000
50	54.5	56	69.5	66	181 000	453 000
60	65.5	66.5	84.5	79	282 000	706 000
70	75.5	77.5	99.5	91	361 000	902 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remark No oil hole is provided.

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

PILLOBALLS

- ●PILLOBALL Spherical Bushings - Insert Type
- ●PILLOBALL Rod Ends - Insert Type
- ●PILLOBALL Rod Ends - Die-cast Type
- ●PILLOBALL Rod Ends - Maintenance-free Type

Structure and Features

IKO PILLOBALLs are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time.

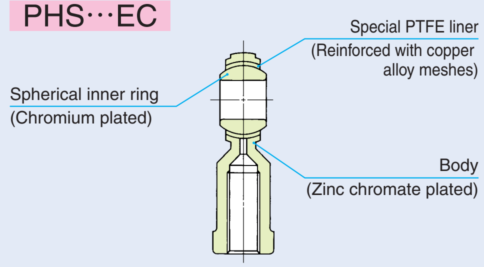
These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner ring makes contact with the special copper alloy bushing with superior run-in properties. In the die-cast type, a spherical inner ring makes direct contact with the bore surface of the body of special zinc die-cast alloy. In the maintenance-free type, a spherical inner ring makes contact with the special PTFE liner of maintenance-free type. Thus, a smooth rotational and oscillatory motion can be achieved with superior anti-wear and loading properties in each type.

PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, and they can be easily assembled onto machines.

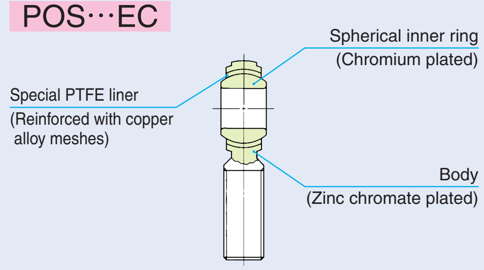
PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc. The maintenance-free type is especially suitable for loading in one direction and is the best choice for machines in which oil must be avoided such as food processing machines, or machines which cannot be re-lubricated.

Structures of maintenance-free type PILLOBALLs

PHS···EC

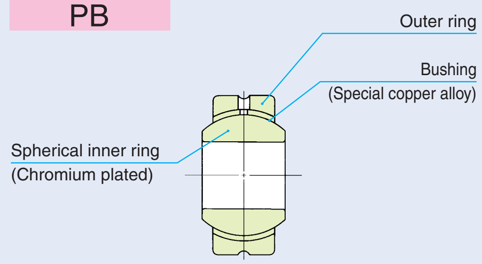


POS···EC

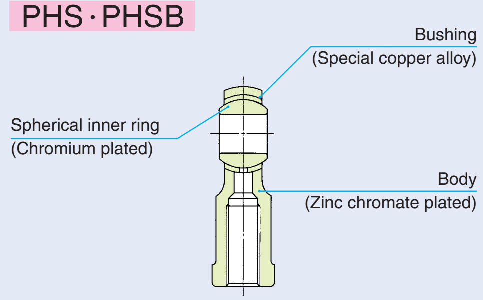


Structures of lubrication type PILLOBALLs

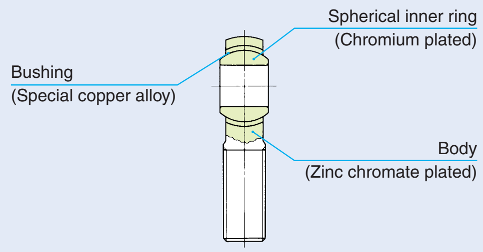
PB



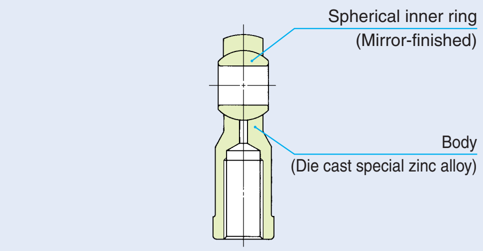
PHS・PHSB



POS・POSB



PHSA



Types

In PILLOBALLs, the types shown in Table 1 are available.

Table 1 Type

Type	Lubrication type			Maintenance-free type	
	Spherical Bushings	Rod end		Rod end	
		female thread	male thread	female thread	male thread
Insert type	PB	PHS · PHSB	POS · POSB	PHS ··· EC	POS ··· EC
Die-cast type	—	PHSA	—	PHS ··· EC	POS ··· EC

Lubrication Type PILLOBALL Spherical Bushings Insert Type PB

This type has superior anti-wear properties and high rigidity. It consists of a spherical inner ring, an outer rigidity, and a bushing of special copper alloy with superior run-in properties inserted in between. The spherical surface of the inner ring is chromium plated after heat treatment and grinding. This type is assembled with a shaft and a housing.
When especially large radial and/or axial loads are applied, Spherical Bushings with molybdenum disulfide (MoS_2) treated inner and outer rings are recommended. (See page J17.)

Lubrication Type PILLOBALL Rod Ends Insert Type PHS, POS, PHSB and POSB

This type has superior anti-wear and anti-corrosion properties as well as high rigidity. It consists of a spherical inner ring of which spherical surface is chromium-plated after heat treatment and grinding, a body with a zinc chromate treated outer surface, and an inserted bushing of special copper alloy having superior run-in properties. This type includes PHS and PHSB, which has a female thread in the body, and POS and POSB, which has a male thread on the body

Lubrication Type PILLOBALL Rod Ends Die-cast Type PHSA

The spherical inner ring of this type is mirror-finished after heat treatment and is built in a body of die-cast special zinc alloy. The sliding surfaces of the inner ring and body are in close contact with each other. Thus, this type is an economical rod end with superior anti-wear and loading properties.

Maintenance-free Type PILLOBALL Rod Ends PHS···EC, POS···EC

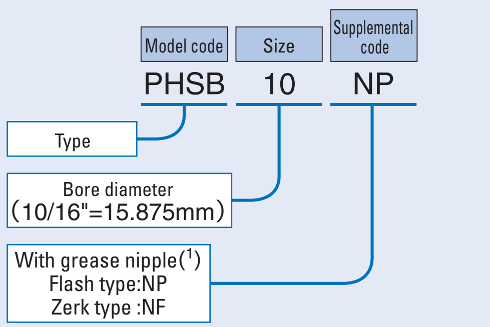
This type has superior anti-corrosion properties as the body is zinc chromate treated and the spherical inner ring is chromium plated on the sphere surface after heat treatment and grinding.
A special PTFE liner, reinforced with copper alloy meshes, which is superior in anti-wear properties with little creep deformation is used for lining on the sliding surface of the body, and this type is maintenance-free.
PHS···EC, which has a female thread in the body, and POS ···EC, which has a male thread on the body, are available.

Identification number

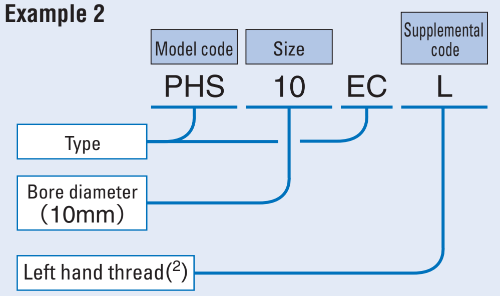
The identification number of PILLOBALLs consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

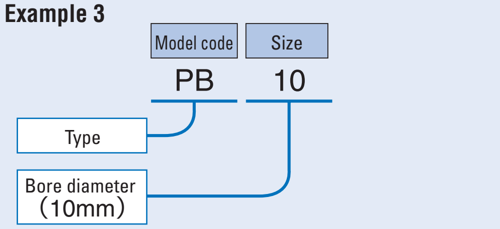
Example 1



Example 2



Example 3



Notes(1) Shapes of greace nipple are shown in Fig.1. In case of no indication of grease nipple type, grease nipple is not prepared.
(2) Right hand thread is indicated with no code.

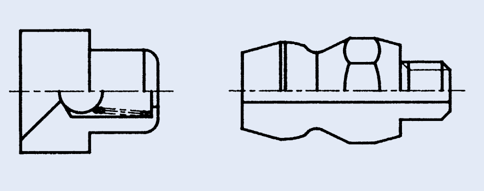


Fig. 1 Shapes of grease nipple

Accuracy

The accuracy of PILLOBALLs is shown in Tables 2 and 3. The maximum radial internal clearance of the insert type is 0.035 mm.

Table 2 Tolerance unit: mm

Type	Dimension	Dimension symbol	Tolerance
PB	Bore dia. of inner ring	d	H7
	Outside dia. of outer ring	D	h6
	Width of inner ring	B	0 −0.1
	Width of outer ring	C	±0.1
PHS POS PHS···EC POS···EC	Bore dia. of inner ring	d	H7
	Width of inner ring	B	0 −0.1
PHSB POSB	Bore dia. of inner ring	d	+0.038 −0.013
	Width of inner ring	B_1	0 −0.127
PHSA	Bore dia. of inner ring	d	+0.063 −0.012
	Width of inner ring	B	See Table 3.

Table 3 Tolerance of width B of inner ring of PHSA type unit: mm

d Nominal bore dia. of inner ring		Δ_{Bs} Deviation of a single inner ring width	
Over	Incl.	High	Low
—	14	0	−0.2
14	20	0	−0.3
20	22	0	−0.4

Fit

Recommended fits for PILLOBALLs are shown in Table 4.

Table 4 Recommended fits

Condition	Tolerance class	
	Shaft	Housing bore(1)
Normal operation	h7	H7
Directionally indeterminate loading	n6, p6	N7

Note(1) This is applicable to PILLOBALL Spherical Bushings, Insert type.

Selection of PILLOBALL

Load capacities of PILLOBALLs are determined based on the allowable contact pressure on sliding surfaces and the strength of body for each type. Thus, a suitable type and size should be selected based on the dynamic load capacity C_d and static load capacity C_s shown in the dimension tables.

Load capacity

❶ Dynamic load capacity

The dynamic load capacity C_d is obtained on the basis of the contact pressure on the sliding surface. The dynamic load capacity is used for calculating the life.
The dynamic load capacity considering temperature increase is obtained from the following equation using the temperature factor, which is a correction factor for the effect of PILLOBALL temperature.

$$C_{dt} = f_t C_d \quad \cdots\cdots (1)$$

where, C_{dt} : Dynamic load capacity considering temperature increase, N
f_t : Temperature factor (Refer to Table 5.)
C_d : Dynamic load capacity, N (Refer to the dimension tables.)

Table 5 Temperature factor f_t

Type	Temperature ℃					
	−30 +80	+80 +90	+ 90 +100	+100 +120	+120 +150	+150 +180
PB PHS, POS PHSB, POSB	1	1	1	1	1	0.7
PHS···EC POS···EC	1	1	0.9	0.75	0.55	—

❷ Static load capacity

The static load capacity C_s is the maximum static load that can be applied on the PILLOBALL without breaking the inner or outer ring of the PILLOBALL Spherical Bushing (or the inner ring or body of the PILLOBALL Rod End), and without causing severe permanent deformation that will make the PILLOBALL unusable.

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

Maximum Operating Load

The recommended value of bushing load is obtained by multiplying the dynamic load capacity C_d by a numerical factor, which differs depending on the bushing type and load condition. For PILLOBALL Rod Ends, the static load capacity C_s must also be considered in determining the applicable bushing load.
Table 6 shows the guidelines for maximum operating load of PILLOBALLs. When axial loads are added in addition to radial loads, bending stress occurs in the body. Pay attention to this bending stress.

Table 6 Maximum operating load

Type	Load direction	
	Constant	Alternate
PB	$\leq 0.3C_d$ $(\leq C_s)$	$\leq 0.6C_d$
PHS,POS,PHSB,POSB	$\leq 0.3C_d$ $(\leq 0.3C_s)$	$(\leq 0.6C_d)$ $\leq 0.2C_s$
PHSA	$\leq 0.16C_s$	
PHS…EC,POS…EC	$(\leq C_d)$ $\leq 0.3C_s$	$(\leq 0.5C_d)$ $\leq 0.2C_s$

Remark C_d is the dynamic load capacity and C_s is the static load capacity.
When the magnitude of applied load is within the value shown outside the parenthesis, it is also within the value in the parenthesis.

Equivalent radial load

PILLOBALLs can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained by the following formula.

$$P = F_r + YF_a \quad \cdots\cdots(2)$$

where, P : Equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
Y : Axial load factor (Refer to Table 7.)

Table 7 Axial load factor Y

Type \ F_a/F_r	0.1	0.2	0.3	0.4	0.5	>0.5
PB PHS,POS PHSB,POSB	1	2	3	4	5	Unusable
PHS…EC POS…EC	1	2	3	Unusable		

Life

The life of PILLOBALLs is defined as the total number of oscillating motions during which the PILLOBALLs can be operated without failure or malfunction due to wear, increase in internal clearance, increase in sliding torque and operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a measure of expected service life.

❶ Life of lubrication type PILLOBALLs
PB · PHS · POS · PHSB · POSB

[1] Confirmation of pV value
Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.2.
When the operating conditions are out of the permissible range, please consult IKO.
The contact pressure p and the sliding velocity V are obtained from the following formulae.

$$p = \frac{50P}{C_{dt}} \quad \cdots\cdots(3)$$

$$V = 5.82 \times 10^{-4} d_k \beta f \quad \cdots\cdots(4)$$

where, p : Contact pressure, N/mm²
P : Equivalent radial load, N
(Refer to Formula (2).)
C_{dt} : Dynamic load capacity considering temperature increase, N
(Refer to Formula (1).)
V : Sliding velocity, mm/s
d_k : Sphere diameter, mm
(Refer to the dimensional tables.)
2β : Oscillating angle degrees (Refer to Fig.2.)
when $\beta < 5°$, $\beta = 5$
when rotating, $\beta = 90$
f : Number of oscillations per minute, cpm

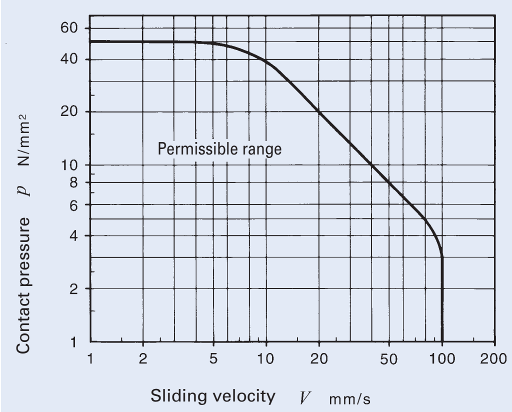


Fig. 2 pV diagram of lubrication type PILLOBALLs

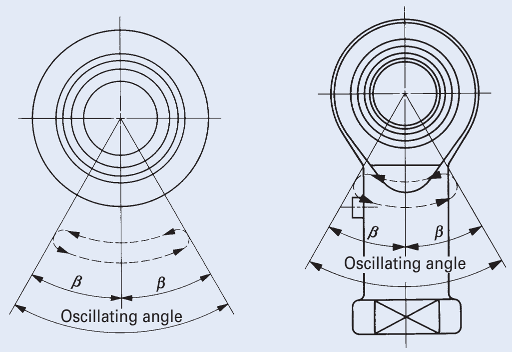


Fig. 3 Oscillating angle

[2] Life calculation
The life of lubrication type PILLOBALLs can be calculated by the following formulae.

$$G = \frac{3.18 b_1 b_2 b_3}{\sqrt{d_k \beta}} \left(\frac{C_{dt}}{P}\right)^2 \times 10^5 \quad \cdots\cdots(5)$$

$$L_h = \frac{G}{60f} \quad \cdots\cdots(6)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 8.)
b_2 : Lubrication factor (Refer to Table 8.)
b_3 : Sliding velocity factor (Refer to Fig. 3.)
C_{dt} : Dynamic load capacity considering temperature increase, N
(Refer to Formula (1).)
P : Equivalent radial load, N
(Refer to Formula (2).)
L_h : Life in hours, h
f : Number of oscillations per minute, cpm

Table 8 Load directional factor b_1 and lubrication factor b_2 for lubrication type PILLOBALLs

Load directional factor b_1		Lubrication factor b_2	
Load direction		Periodical lubrication	
Constant	Alternate	None	Regular
1	5	1	15

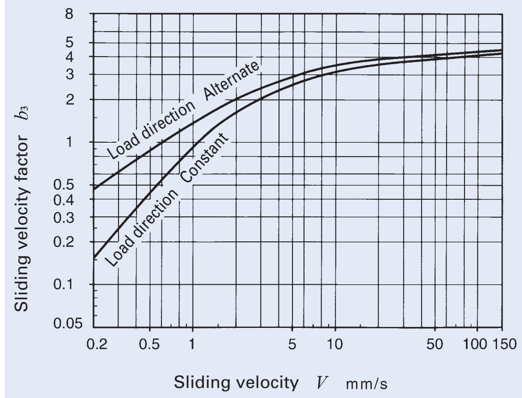


Fig. 4 Sliding velocity factor for lubrication type PILLOBALLs

❷ Life of maintenance-free type PILLOBALLs PHS…EC・POS…EC

[1] Confirmation of pV value
Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.4.
When the operating conditions are out of the permissible range, please consult IKO.
The contact pressure p and sliding velocity V are obtained from Formulae (3) and (4) on page K6.

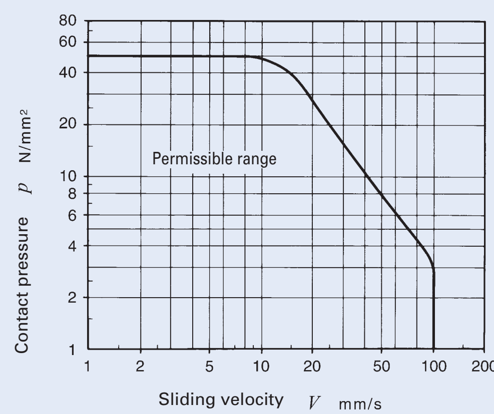


Fig. 5 pV diagram for maintenance-free type PILLOBALL Rod Ends

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

[2] Life calculation

The life of maintenance-free type PILLOBALL Rod Ends is obtained from the total sliding distance S which is given in Fig.5 for the contact pressure p obtained from Formula (3).

The total number of oscillations and life in hours can be obtained from the following formulae.

$$G = 16.67 \times b_1 \times \frac{Sf}{V} \quad \cdots\cdots(7)$$

$$L_h = \frac{G}{60f} \quad \cdots\cdots(8)$$

where, G : Life (Total number of oscillations)

b_1 : Load directional factor (Refer to Table 9.)

S : Total sliding distance m

f : Number of oscillations per minute cpm

V : Sliding velocity mm/s

L_h : Life in hours h

Table 9 Load directional factor for maintenance-free type PILLOBALLs b_1

Load direction	Constant	Alternate
Load directional factor b_1	1	0.2(1)

Note(1) This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult IKO, as the factor degreases sharply.

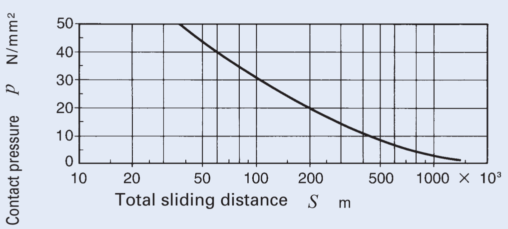


Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

Lubrication

Maintenance-free type PILLOBALL Rod Ends have a sliding surface lined with a self-lubricating lining. Therefore, they can be used without lubrication.

Lubrication type PILLOBALLs are not provided with prepacked grease. Perform proper lubrication for use. Operating without lubrication will increase the wear of the sliding contact surfaces and cause seizure.

Oil Hole and Grease Nipple

Table 10 shows the specifications of oil hole and grease nipple on the outer ring or body. When a grease gun that fits the grease nipple is required, please contact IKO.

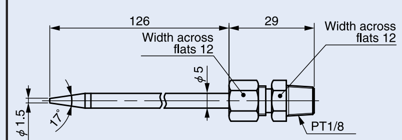
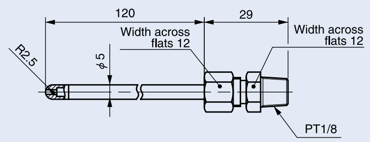
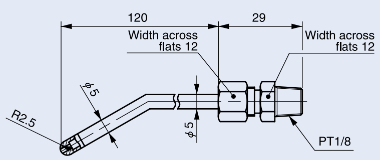
For PILLOBALLs without an oil hole and grease nipple, apply grease directly on the spherical surface.

Table 10 Specifications of oil hole and grease nipple

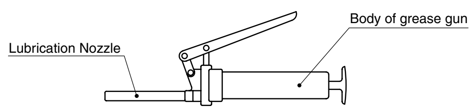
Type	Bore diameter of inner ring d mm	Specification
PB		1 oil hole + oil groove
PHS	$d \leqq 4$	None
	$4 < d$	With grease nipple
POS	$d \leqq 4$	None
	$4 < d \leqq 6$	1 oil hole
	$6 < d$	With grease nipple
PHSB · POSB		None(1)
PHSA		With grease nipple
PHS···EC, POS···EC		None

Note(1) Grease Nipple is available for size 4 or larger with saplemental code.

Table 11 Types and Dimension of Lubrication Nozzles

Type	Dimension
A-5126T	
A-5120R	
B-5120R	

Remark HSP-3(Yamada Corporation)can be used for them.
The above nozzles can be atached on the standard grease gun shown below.



Operating Temperature Range

The maximum allowable temperature for Lubrication type PILLOBALLs is +180˚C for the insert type and +80˚C for the die-cast type.

The maximum allowable temperature for Maintenance-free type PILLOBALL Rod Ends is +150˚C.

Precautions for Use

❶ Tightening depth

The recommended tightening depth of the screw into the PILLOBALL Rod End body is shown below.

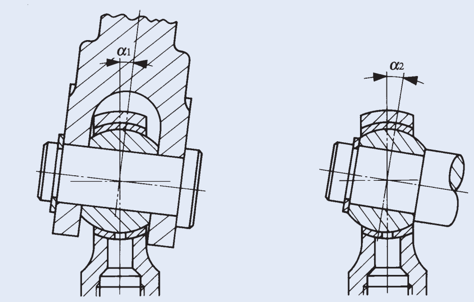
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

Die-cast type: 2 times the nominal thread dia. or more.

❷ Allowable tilting angle

The allowable tilting angle differs depending on the mounting structure as shown in Table 11.

Table 12 Allowable tilting angle



unit: degree

d Bore diameter mm	PB(1), PHS, POS PHS···EC, POS···EC α_1	α_2	PHSA α_1	α_2
3	7	13	–	–
4	7	13	–	–
5	8	13	7	13
6	8	13	7	13
8	8	14	8	14
10	8	14	8	14
12	8	13	8	13
14	10	16	9	16
16	9	15	9	15
18	9	15	9	15
20	9	15	9	15
22	10	15	9	15
25	9	15	–	–
28	9	15	–	–
30	10	17	–	–

Note(1) In the case of the PB series, α_2 is applicable in general.

Table 13 Allowable tilting angle for inch series

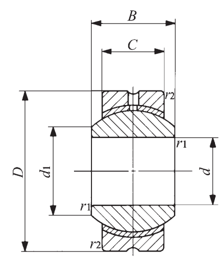
unit: degree

With female thread	With male thread	α_1	α_2
PHSB 2	POSB 2	8	16
PHSB 2.5	POSB 2.5	7	12
PHSB 3	POSB 3	6	10
PHSB 4	POSB 4	7	13
PHSB 5	POSB 5	6	10
PHSB 6	POSB 6	6	11
PHSB 7	POSB 7	7	11
PHSB 8	POSB 8	6	9
PHSB 10	POSB 10	7	11
PHSB 12	POSB 12	6	10
PHSB 16	POSB 16	7	14

K
PB
PHS
PHSB
POS
POSB
PHSA

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

Lubrication Type PILLOBALL Spherical Bushings Insert Type



PB

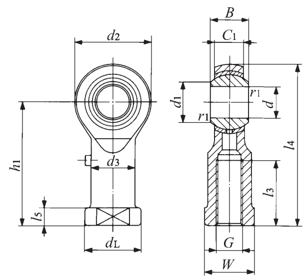
Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	B	d_1	$r_{s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
PB 5	8.5	5	16	6	8	7.7	0.2	11.112 (7/16)	3 270	7 850
PB 6	13	6	18	6.75	9	9	0.2	12.700 (1/2)	4 200	10 100
PB 8	24	8	22	9	12	10.4	0.2	15.875 (5/8)	7 010	16 800
PB 10	39	10	26	10.5	14	12.9	0.2	19.050 (3/4)	9 810	23 500
PB 12	58	12	30	12	16	15.4	0.2	22.225 (7/8)	13 100	31 400
PB 14	84	14	34	13.5	19	16.9	0.3	25.400 (1)	16 800	40 400
PB 16	111	16	38	15	21	19.4	0.3	28.575 (1 1/8)	21 000	50 400
PB 18	160	18	42	16.5	23	21.9	0.3	31.750 (1 1/4)	25 700	61 600
PB 20	210	20	46	18	25	24.4	0.3	34.925 (1 3/8)	30 800	74 000
PB 22	265	22	50	20	28	25.8	0.3	38.100 (1 1/2)	37 400	89 700
PB 25	390	25	56	22	31	29.6	0.6	42.862 (1 11/16)	46 200	111 000
PB 28	410	28	62	25	35	32.3	0.6	47.625 (1 7/8)	58 400	140 000
PB 30	610	30	66	25	37	34.8	0.6	50.800 (2)	62 300	149 000

Note(1) Minimum allowable value of chamfer dimensions r_1 and r_2

Remarks1. The outer ring has an oil groove and an oil hole.

2. Not provided with prepacked grease. Perform proper lubrication for use.

Lubrication Type PILLOBALL Rod Ends Insert Type/With Female Thread



PHS

Identification number	Mass (Ref.) g	Boundary dimensions mm d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
PHS 3	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 (5/16)	1 750	3 670
PHS 4	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 (3/8)	2 480	4 680
PHS 5	16.5	5	M 5×0.8	16	6	8	7.7	35	27	14	4	9	9	11	0.2	11.112 (7/16)	3 270	5 730
PHS 6	25	6	M 6×1	18	6.75	9	9	39	30	14	5	11	10	13	0.2	12.700 (1/2)	4 200	6 910
PHS 8	43	8	M 8×1.25	22	9	12	10.4	47	36	17	5	14	12.5	16	0.2	15.875 (5/8)	7 010	10 200
PHS 10	72	10	M10×1.5	26	10.5	14	12.9	56	43	21	6.5	17	15	19	0.2	19.050 (3/4)	9 810	13 300
PHS 12	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 (7/8)	13 100	16 900
PHS 14	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	16 800	20 900
PHS 16	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 (1 1/8)	21 000	25 400
PHS 18	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 (1 1/4)	25 700	30 200
PHS 20	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 (1 3/8)	30 800	35 500
PHS 22	490	22	M22×1.5	50	20	28	25.8	109	84	43	12	32	30	37	0.2	38.100 (1 1/2)	37 400	41 700
PHS 25	750	25	M24×2	60	22	31	29.6	124	94	48	12	36	33.5	42	0.6	42.862 (1 11/16)	46 200	72 700
PHS 28	950	28	M27×2	66	25	35	32.3	136	103	53	12	41	37	46	0.6	47.625 (1 7/8)	58 400	87 000
PHS 30	1 130	30	M30×2	70	25	37	34.8	145	110	56	15	41	40	50	0.6	50.800 (2)	62 300	92 200

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided for PHS with an inner ring bore diameter d of 4 mm or less. For others, a grease nipple is provided on the body.

2. Not provided with prepacked grease. Perform proper lubrication for use.

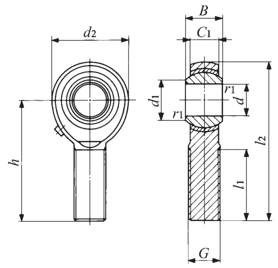
3. When a metric fine thread specification is required, please contact IKO.

K
PB
PHS
PHSB
POS
POSB
PHSA

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

PILLOBALL

Lubrication Type PILLOBALL Rod Ends Insert Type/With Male Thread



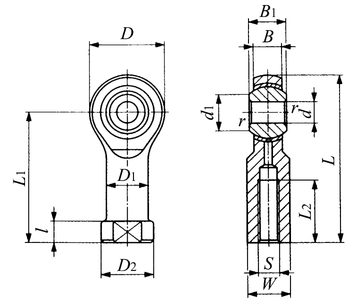
POS

Identification number	Mass (Ref.) g	d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
POS 3	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 (5/16)	1 750	1 220
POS 4	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 (3/8)	2 480	2 060
POS 5	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 (7/16)	3 270	3 340
POS 6	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 (1/2)	4 200	4 730
POS 8	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 (5/8)	7 010	8 640
POS 10	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 (3/4)	9 810	13 300
POS 12	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 (7/8)	13 100	16 900
POS 14	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	16 800	20 900
POS 16	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 (1 1/8)	21 000	25 400
POS 18	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 (1 1/4)	25 700	30 200
POS 20	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 (1 3/8)	30 800	35 500
POS 22	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 (1 1/2)	37 400	41 700
POS 25	650	25	M24×2	60	22	31	29.6	124	94	57	0.6	42.862 (1 11/16)	46 200	72 700
POS 28	875	28	M27×2	66	25	35	32.3	136	103	62	0.6	47.625 (1 7/8)	58 400	87 000
POS 30	1 070	30	M30×2	70	25	37	34.8	145	110	66	0.6	50.800 (2)	62 300	92 200

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided for POS with an inner ring bore diameter d of 4 mm or less.
For those with an inner ring bore diameter d of 5 to 6 mm, an oil hole is provided on the body. For others, a grease nipple is provided on the body.
2. Not provided with prepacked grease. Perform proper lubrication for use.
3. When a metric fine thread specification is required, please contact IKO.

Inch series PILLOBALL Rod Ends Insert Type/With Female Thread



PHSB

Identification number	Mass (Ref.) g	d	Thread S class 3B	D	B	B_1	d_1	L	l	L_1	L_2	W	D_1	D_2	$r_{s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
PHSB 2	6.8	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	26.57 (1.046)	4.75 (.187)	20.62 (.812)	9.53 (.375)	6.35 (.250)	6.35 (.250)	7.92 (.312)	0.3 (.012)	7.938 (5/16)	1 850	5 840
PHSB 2.5	11	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	29.36 (1.156)	4.75 (.187)	22.23 (.875)	9.53 (.375)	7.14 (.281)	7.14 (.281)	8.74 (.344)	0.3 (.012)	9.525 (3/8)	2 600	8 210
PHSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	34.93 (1.375)	4.75 (.187)	26.97 (1.062)	14.27 (.562)	7.92 (.312)	7.92 (.312)	10.31 (.406)	0.3 (.012)	11.112 (7/16)	3 460	9 090
PHSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	42.85 (1.687)	4.75 (.187)	33.32 (1.312)	19.05 (.750)	9.53 (.375)	9.53 (.375)	11.89 (.468)	0.5 (.020)	13.097 (33/64)	4 590	13 200
PHSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	46.02 (1.812)	4.75 (.187)	34.93 (1.375)	19.05 (.750)	11.10 (.437)	11.10 (.437)	12.70 (.500)	0.5 (.020)	15.875 (5/8)	6 800	16 500
PHSB 6	59	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	53.98 (2.125)	6.35 (.250)	41.28 (1.625)	23.80 (.937)	14.27 (.562)	14.27 (.562)	17.45 (.687)	0.5 (.020)	18.256 (23/32)	9 230	21 600
PHSB 7	82	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	60.33 (2.375)	6.35 (.250)	46.02 (1.812)	26.97 (1.062)	15.88 (.625)	15.88 (.625)	19.05 (.750)	0.5 (.020)	20.638 (13/16)	11 200	26 100
PHSB 8	132	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	70.64 (2.781)	6.35 (.250)	53.98 (2.125)	30.15 (1.187)	19.05 (.750)	19.05 (.750)	22.23 (.875)	0.5 (.020)	23.812 (15/16)	14 800	36 200
PHSB 10	191	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	82.55 (3.250)	7.92 (.312)	63.50 (2.500)	38.10 (1.500)	22.23 (.875)	22.23 (.875)	25.40 (1.000)	0.5 (.020)	28.575 (1 1/8)	20 000	39 300
PHSB 12	286	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	7.92 (.312)	73.03 (2.875)	44.45 (1.750)	25.40 (1.000)	25.40 (1.000)	28.58 (1.125)	0.5 (.020)	33.338 (1 5/16)	28 500	55 000
PHSB 16	998	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	11.07 (.436)	104.78 (4.125)	53.98 (2.125)	38.10 (1.500)	38.10 (1.500)	44.45 (1.750)	0.5 (.020)	47.625 (1 7/8)	59 300	86 800

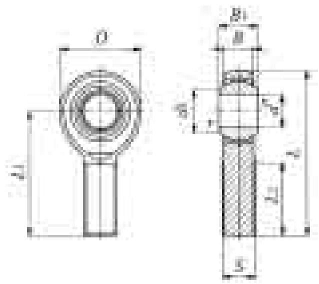
Note(1) r_s min stands for minimum allowable value of chamfer r.

K
PB
PHS
PHSB
POS
POSB
PHSA

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

PILLOBALL

Inch series PILLOBALL Rod Ends Insert Type/With Male Thread



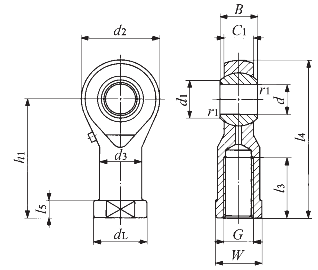
POSB

Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	Thread S class 3A	D	B	B_1	d_1	L	L_1	L_2	$r_{s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
POSB 2	5.4	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	29.77 (1.172)	23.80 (.937)	12.70 (.500)	0.3 (.012)	7.938 (5/16)	1 850	2 160
POSB 2.5	9.1	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	35.71 (1.406)	28.58 (1.125)	15.88 (.625)	0.3 (.012)	9.525 (3/8)	2 600	3 370
POSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	39.70 (1.563)	31.75 (1.250)	19.05 (.750)	0.3 (.012)	11.112 (7/16)	3 460	4 850
POSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	49.20 (1.937)	39.67 (1.562)	25.40 (1.000)	0.5 (.020)	13.097 (33/64)	4 590	8 870
POSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	58.72 (2.312)	47.63 (1.875)	31.75 (1.250)	0.5 (.020)	15.875 (5/8)	6 800	14 200
POSB 6	54	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	61.93 (2.438)	49.23 (1.938)	31.75 (1.250)	0.5 (.020)	18.256 (23/32)	9 230	21 600
POSB 7	77	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	68.28 (2.688)	53.98 (2.125)	34.93 (1.375)	0.5 (.020)	20.638 (13/16)	11 200	26 100
POSB 8	122	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	78.59 (3.094)	61.93 (2.438)	38.10 (1.500)	0.5 (.020)	23.812 (15/16)	14 800	36 200
POSB 10	186	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	85.73 (3.375)	66.68 (2.625)	41.28 (1.625)	0.5 (.020)	28.575 (1 1/8)	20 000	39 300
POSB 12	295	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	73.03 (2.875)	44.45 (1.750)	0.5 (.020)	33.338 (1 5/16)	28 500	55 000
POSB 16	1 129	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	104.78 (4.125)	53.98 (2.125)	0.5 (.020)	47.625 (1 7/8)	59 300	112 000

Note(1) r_s min stands for minimum allowable value of chamfer r.

IKO

Lubrication Type PILLOBALL Rod Ends Die-cast Type/With Female Thread



PHSA

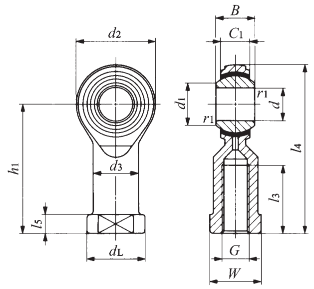
Identification number	Mass (Ref.) g	Boundary dimensions mm d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Static load capacity C_s N
PHSA 5	17	5	M 5×0.8	17	6	8	7.7	35.5	27	16	4	9	9	11	0.2	11.112 (7/16)	5 470
PHSA 6	25	6	M 6×1	19.5	6.75	9	9	39.7	30	16	5	11	10	13	0.2	12.700 (1/2)	6 760
PHSA 8	45	8	M 8×1.25	24	9	12	10.4	48	36	19	5	14	12.5	16	0.2	15.875 (5/8)	10 200
PHSA 10	70	10	M10×1.5	28	10.5	14	12.9	57	43	23	6.5	17	15	19	0.2	19.050 (3/4)	13 100
PHSA 12	105	12	M12×1.75	32	12	16	15.4	66	50	27	6.5	19	17.5	22	0.2	22.225 (7/8)	16 400
PHSA 14	155	14	M14×2	36	13.5	19	16.9	75	57	30	8	22	20	25	0.3	25.400 (1)	20 000
PHSA 16	190	16	M16×2	40	15	21	19.4	84	64	36	8	22	22	27	0.3	28.575 (1 1/8)	23 900
PHSA 18	290	18	M18×1.5	45	16.5	23	21.9	93.5	71	40	10	27	25	31	0.3	31.750 (1 1/4)	28 800
PHSA 20	400	20	M20×1.5	49	18	25	24.4	101.5	77	43	10	30	27.5	34	0.3	34.925 (1 3/8)	33 400
PHSA 22	500	22	M22×1.5	54	20	28	25.8	111	84	47	12	32	30	37	0.3	38.100 (1 1/2)	40 400

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks 1. A grease nipple is provided on the body.
2. Not provided with prepacked grease. Perform proper lubrication for use.
3. When a metric fine thread specification is required, please contact IKO.

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

Maintenance-free Type PILLOBALL Rod Ends With Female Thread



PHS···EC

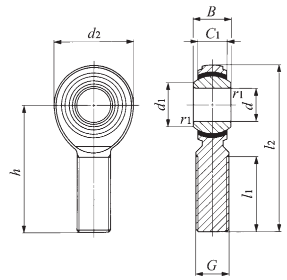
Identification number	Mass (Ref.) g	d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
PHS 3EC	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 (5/16)	3 500	2 480
PHS 4EC	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 (3/8)	4 950	3 260
PHS 5EC	16.5	5	M 5×0.8	16	6	8	7.7	35	27	12.5	4	9	9	11	0.2	11.112 (7/16)	6 540	4 010
PHS 6EC	25	6	M 6×1	18	6.75	9	9	39	30	13.5	5	11	10	13	0.2	12.700 (1/2)	8 410	4 940
PHS 8EC	43	8	M 8×1.25	22	9	12	10.4	47	36	16	5	14	12.5	16	0.2	15.875 (5/8)	14 000	7 760
PHS 10EC	72	10	M10×1.5	26	10.5	14	12.9	56	43	19.5	6.5	17	15	19	0.2	19.050 (3/4)	19 600	10 500
PHS 12EC	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 (7/8)	26 200	13 700
PHS 14EC	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	33 600	17 200
PHS 16EC	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 (1 1/8)	42 000	21 100
PHS 18EC	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 (1 1/4)	51 400	25 100
PHS 20EC	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 (1 3/8)	61 600	30 000
PHS 22EC	490	22	M22×1.5	50	20	28	25.8	109	84	41	12	32	30	37	0.2	38.100 (1 1/2)	74 700	36 400

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks 1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification is required, please contact IKO.

Maintenance-free Type PILLOBALL Rod Ends With Male Thread



POS···EC

Identification number	Mass (Ref.) g	d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
POS 3EC	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 (5/16)	3 500	1 220
POS 4EC	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 (3/8)	4 950	2 060
POS 5EC	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 (7/16)	6 540	3 340
POS 6EC	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 (1/2)	8 410	4 730
POS 8EC	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 (5/8)	14 000	7 760
POS 10EC	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 (3/4)	19 600	10 500
POS 12EC	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 (7/8)	26 200	13 700
POS 14EC	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	33 600	17 200
POS 16EC	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 (1 1/8)	42 000	21 100
POS 18EC	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 (1 1/4)	51 400	25 100
POS 20EC	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 (1 3/8)	61 600	30 000
POS 22EC	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 (1 1/2)	74 700	36 400

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks 1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification is required, please contact IKO.

K
PB
PHS
PHSB
POS
POSB
PHSA

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

L-BALLS

- ●L-Balls
- ●L-Ball Dust Cover

Structure and Features

IKO L-Balls are self-aligning rod-ends consisting of a special die-cast zinc alloy body and a studded ball which has its axis at right angles to the body.
They can perform tilting movement, oscillating movement and rotation with low torque, and transmit power smoothly due to uniform clearance between the sliding surfaces.
Their superior wear resistance assures stable accuracy for long periods of time, and maintenance is simple. They are very economical bearings.
For these reasons, they are widely used in link mechanisms in automobiles, construction machinery, farm and packaging machines, etc.

Types

IKO L-Balls are available in various types as shown in Table 1.

Table 1 Type of L-Balls

Type	L-Ball		L-Ball dust cover
Model code	LHSA	LHS	PRC

L-Ball LHSA

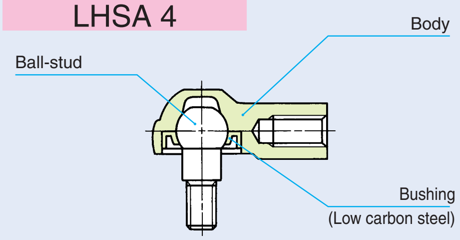
These are compact rod-ends in which the spherical part of the ball-stud are held by the special die-cast zinc alloy body. There is a dust cover on the stud side and good quality lithium soap base grease is prepacked. They can be run for long periods of time without re-lubrication and have excellent lubrication and anti-dust properties.
As shown in the structural drawing, these rod-ends are classified into 3 types by size. In addition, the ball-studs of LHSA 10 and lower are formed in one solid body, but those of LHSA 12 and higher, which are used under large loads, have the stud friction-welded to a high precision steel ball to give greater resistance to wear.

L-Ball LHS

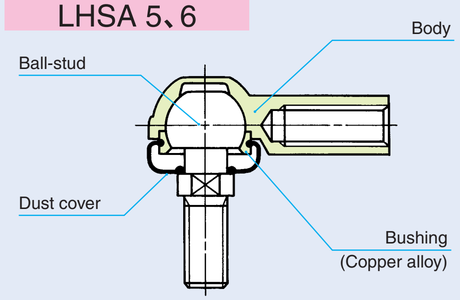
These rod-ends have a friction-welded ball-stud, and a special die-cast zinc alloy body which houses the spherical surface of the high precision steel ball. There is an almost complete contact across the sliding surfaces, and the uniform clearance guarantees a stable bearing life.
An L-Ball dust cover can be attached to these rod-ends. If the rod-ends are lubricated with lithium soap base grease, they have excellent lubrication and anti-dust properties and can run for long periods of time without re-lubrication.
When the L-Ball LHS is delivered with a dust cover on request, lithium soap base grease is prepacked.

Structures of L-Ball LHSA

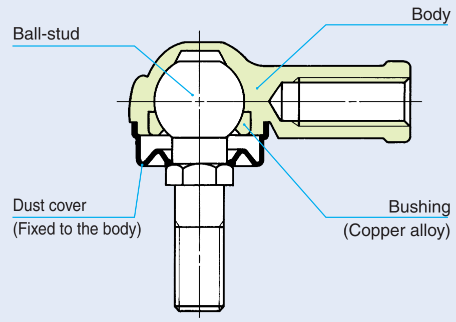
LHSA 4



LHSA 5、6

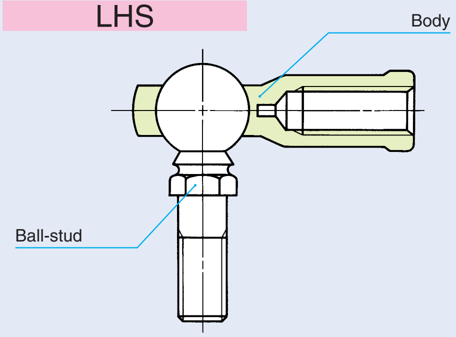


LHSA 8 and upwards



Structure of L-Ball LHS

LHS



L-Ball Dust Cover PRC

This is for the L-Ball LHS series. It is made of special synthetic rubber which has excellent resistance to oil and ozone. The cover offers very effective dust protection and prevents grease leakage.

Identification Number

The identification number of L-Balls consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

Example 1 (Female thread of the body : In case of right-hand threaded)

Model code	Size
LHSA	8

Type: LHSA
Size of thread (M8): 8

Example 2 (Female thread of the body : In case of left threaded)

Model code	Size	Supplemental code
LHSA	8	L

Left-handed thread: L

Example 3 (when a dust cover PRC is attached to LHS)

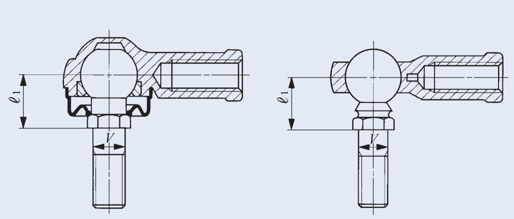
Model code	Size	Supplemental code
LHS	8	D

With dust cover: D

Accuracy

The accuracy of L-Balls is shown in Table 2.

Table 2 Tolerance



unit: mm

Type	Dimension symbol	Tolerance
LHSA	ℓ_1	±0.5
	V	$\begin{smallmatrix}0\\-0.2\end{smallmatrix}$ (1)
LHS	ℓ_1	±0.4
	V	h9

Note(1) This dimensional tolerance applies to LHSA 5 and higher.

Selection of L-Balls

The static load capacity and maximum operating load of L-Balls are determined in consideration of the strength of the ball stud and the body. Accordingly, L-Balls are selected on the basis of the static load capacity C_s shown in the dimension table and the maximum operating load shown in Table 3.

Static load capacity

The static load capacity C_s shown in the dimension table represents the allowable axial force F which is determined by the mechanical strength of the ball-stud at the section 'A' under the bending moment due to the force F as illustrated in Fig. 1. If F increases beyond the static load capacity, deformation will begin at A, leading to breakage.

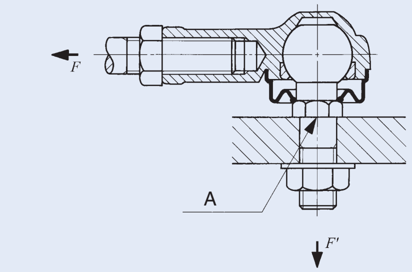


Fig. 1

Maximum operating load

The strength of the body must also be taken into consideration when L-Balls are operated in a high-temperature or low-temperature atmosphere or receive repetitive loads of long duration or shock loads. A guideline for maximum operating load of L-Balls is shown in Table 3. When the fixing bolt in the main body is fixed and a load is applied in the direction of F', the bending stress in the fixing bolt must be taken into consideration.

Table 3 Maximum operating load unit: N

Identification number	Maximum operating load	Identification number	Maximum operating load
LHSA 4	840	LHS 5	880
LHSA 5	1 180	LHS 6	1 080
LHSA 6	1 080	LHS 8	1 630
LHSA 8	1 900	LHS10	2 100
LHSA10	2 170	LHS12	2 620
LHSA10M	2 170	LHS14	3 190
LHSA12	2 790	LHS16	3 820
LHSA14	3 540	LHS18	4 610
–	–	LHS20	5 340
–	–	LHS22	6 460

Lubrication

LHSA is prepacked with lubricating grease ALVANIA GREASE 2 (SHELL). LHS is not provided with prepacked grease. Perform proper lubrication for use.
Operating LHS without lubrication will increase the wear of the sliding contact surface or cause seizure.

Operating Temperature Range

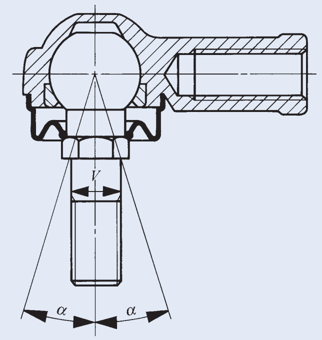
The maximum allowable temperature for L-Balls is +80℃.

Precautions for Use

❶ **Depth of thread**
It is recommended that the depth of thread engagement into the body is more than twice the nominal diameter of thread.

❷ **Permissible angle of tilt**
The permissible angle of tilt is shown in Table 4.

Table 4 Permissible angle of tilt

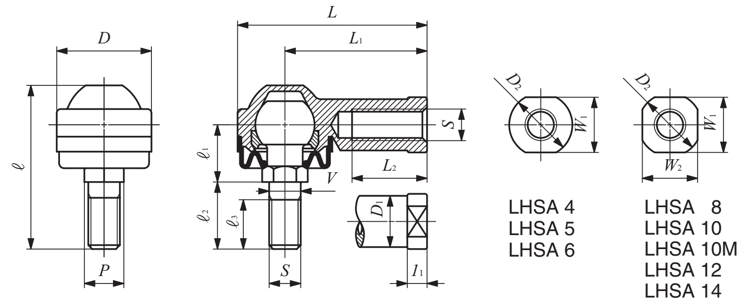


unit: degree

Nominal dia. mm V	LHSA α	LHS α
4	15	–
5	17	15
6	17	17
8	18	18
10	19	19
12	19	19
14	20	20
16	–	20
18	–	21
20	–	20
22	–	21

K
LHSA
LHS

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



Identification number	Mass (Ref.) g	Thread S	V	D	L	L_1	L_2	l_1	W_1	W_2(1)	D_1	D_2	ℓ	P	ℓ_1	ℓ_2	ℓ_3	Ball dia.	Static load capacity C_s N
LHSA 4	11	M 4×0.7	*4	14	25	18	8	4	8	—	8	10	19.5	**5.5	7	7	5	8	880
LHSA 5	27	M 5×0.8	5	17	38.5	30	16	5	10	—	10	12	32.5	8	12	13	10	11.112	1 180
LHSA 6	27	M 6×1	6	19	39.5	30	16	5	10	—	10	12	32.5	8	12	13	10	11.112	1 670
LHSA 8	64	M 8×1.25	8	24	48	36	19	5	14	14	13	16	41.5	10	14.5	17	12.5	15	4 380
LHSA 10	106	M10×1.25	10	28	57	43	23	6.5	17	17	15	19	49	12	16	21	17	19.05	7 400
LHSA 10M	106	M10×1.5	10	28	57	43	23	6.5	17	17	15	19	49	12	16	21	17	19.05	7 400
LHSA 12	180	M12×1.75	12	34	67	50	27	6.5	19	19	17.5	22	64	14	20	30	20	22.225	9 900
LHSA 14	260	M14×2	14	38	76	57	30	8	22	22	20	25	72	17	22.5	33.5	22	25.4	14 600

Boundary dimensions mm

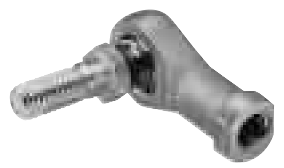
Note(1) Previous specification does not have the flat surfaces of W_2 dimension.
Remarks1. The item marked * is manufactured with a neck diameter of φ 3.4. The item marked ** is manufactured with a diameter of φ 5.5 instead of a width across flats.
2. Provided with prepacked grease.

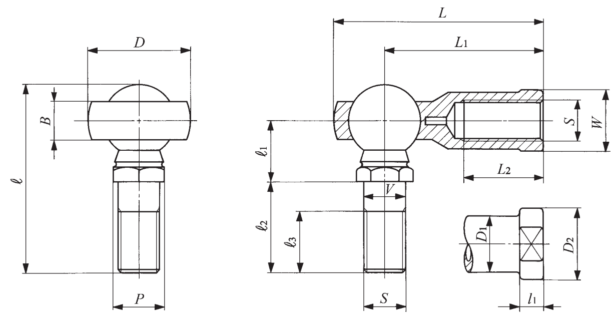
K
LHSA
LHS

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

L-BALL

IKO





LHS

Identification number	Mass (Ref.) g	Thread S	V	D	B	L	L_1	L_2	l_1	W	D_1	D_2	ℓ	P	ℓ_1	ℓ_2	ℓ_3	Ball dia.	Static load capacity C_s N
		Boundary dimensions mm																	
LHS 5	22	M 5×0.8	5	17	6	35.5	27	16	4	9	9	11	30.5	8	10	15	11	11.112	2 080
LHS 6	32	M 6×1	6	19.5	6.75	39.7	30	16	5	11	10	13	36.5	10	11.5	18.5	14	12.7	3 290
LHS 8	60	M 8×1.25	8	24	9	48	36	19	5	14	12.5	16	44	11	14.5	21.5	15	15.875	4 900
LHS 10	102	M10×1.5	10	28	10.5	57	43	23	6.5	17	15	19	52.5	13	17	26	18	19.05	7 640
LHS 12	160	M12×1.75	12	32	12	66	50	27	6.5	19	17.5	22	61	17	20	30	20	22.225	12 400
LHS 14	227	M14×2	14	36	13.5	75	57	30	8	22	20	25	69	17	22.5	33.5	22	25.4	14 600
LHS 16	300	M16×2	16	40	15	84	64	36	8	22	22	27	74	19	24.5	35.5	23	28.575	19 500
LHS 18	445	M18×1.5	18	45	16.5	93.5	71	40	10	27	25	31	84	22	27.5	40.5	25	31.75	25 600
LHS 20	580	M20×1.5	20	49	18	101.5	77	43	10	30	27.5	34	90.5	24	30	43	27	34.925	31 600
LHS 22	765	M22×1.5	22	54	20	111	84	47	12	32	30	37	99	27	32.5	47.5	30	38.1	39 800

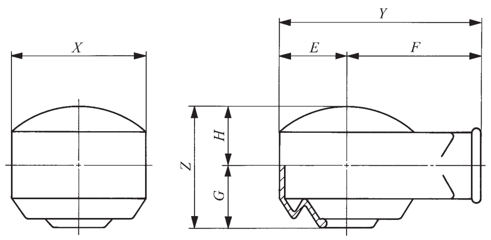
Remark Not provided with prepacked grease. Perform proper lubrication for use.

K

LHSA
LHS

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

L-Ball Dust Cover



PRC

Identification number	Boundary dimensions mm						
	X	Y	E	F	Z	G	H
PRC 5	20	29	10	19	16	8	8
PRC 6	22	31	11	20	19	9.5	9.5
PRC 8	27	38.5	13.5	25	24	12	12
PRC 10	31	45.5	15.5	30	27	14	13
PRC 12	36	53	18	35	32	16.5	15.5
PRC 14	40	60	20	40	36.5	19	17.5
PRC 16	44	68	22	46	40	20.5	19.5
PRC 18	49	74.5	24.5	50	46	23.5	22.5
PRC 20	54	82	27	55	50	25.5	24.5
PRC 22	59	89.5	29.5	60	53.5	27.5	26

SUPER FLEXIBLE NOZZLES

Structure and Features

IKO Super Flexible Nozzle is a compact nozzle for use on a machine tool to supply and spray cutting oil exactly at the required positions.

The angle of the nozzle can be changed easily and freely. Therefore, oil supply can be concentrated upon the working area, and cooling and lubrication can be performed effectively. As a result, cutting resistance is reduced and superior finish is obtained, achieving high machining accuracy. Also, tool life is longer.

The Super Flexible Nozzle is used in many places such as at the spindle end of Machining Center and at the tool holder of N/C lathe.

The features of Super Flexible Nozzle are as follows.

❶A spherical bushing is incorporated to adjust the tilting angle of nozzle easily.

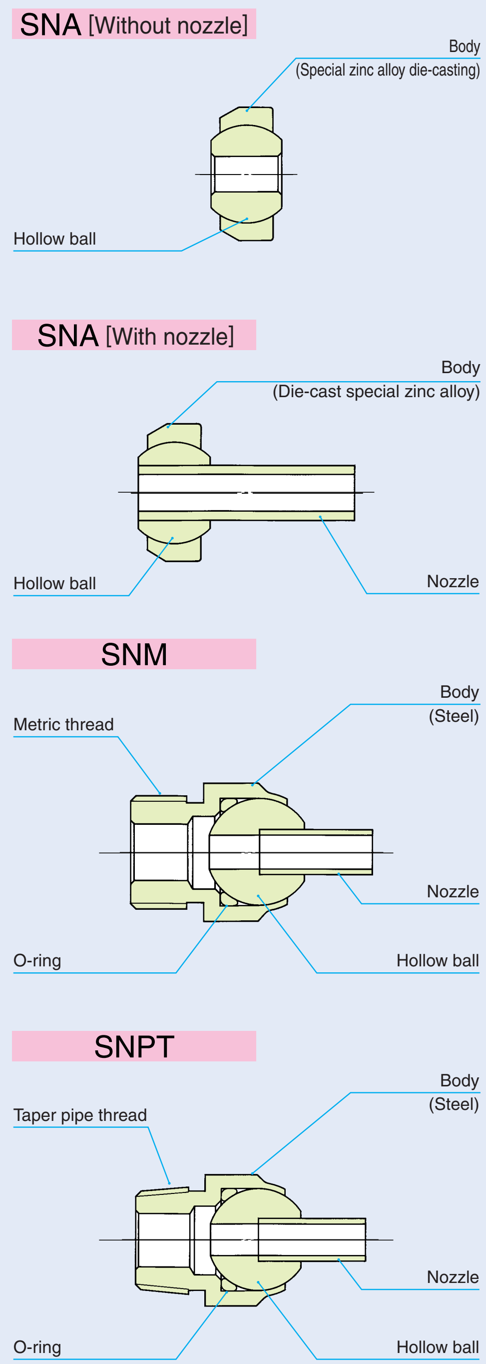
❷The Super Flexible Nozzle is compact in size, and the design on parts around the spindle and tool can be made simple.

❸The nozzle length is short, and winding of cutting chips around the nozzle will not occur.

❹By using a number of Super Flexible Nozzles, cutting oil can be supplied and cutting chips can be removed more effectively.

❺The press fitting type and screw fitting type are available. The press fitting type is economical.

Structures of Super Flexible Nozzles



Types

Super Flexible Nozzles shown in Table 1 are available.

Table 1 Type of Super Flexible Nozzle

Type		Model code
Press fitting type	Without nozzle	SNA
	With nozzle	
Screw fitting type	With metric threads	SNM
	With taper pipe threads	SNPT

Identification Number

The identification number of Super Flexible Nozzle consists of a model code and a size. An example is shown as follows.

Example of identification number

Model code　Size

SNM　10−20

Type of nozzle

Nozzle bore or thread size: (M10×1.25)

Dimension from shoulder surface to nozzle top:※ (20mm)

※In case of press fitting type without nozzle, this dimension is not indicated.

Precautions for Use

When the press fitting type Super Flexible Nozzle is used, a ϕ 15 (H8) $^{+0.027}_{\ 0}$ bore for fitting hole must be prepared and fitting is made from the 30° chamfered end of the outer body. In this case, the body portion should be pushed for press fitting.

When the screw fitting type Super Flexible Nozzle is used and prevention of oil leakage from the fitting part is required, it is recommended to wind sealing tape on the thread portion or use rubber packing for the shoulder face of the outer body.

The direction of lubrication can be adjusted by inserting a screwdriver, etc. in the bore of the nozzle.

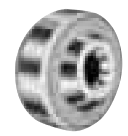
Special Specifications

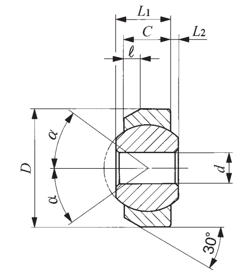
Super Flexible Nozzles with special length are also available. In this case, specify the necessary nozzle length in units of 1 mm, but do not exceed the maximum length shown in the dimension table as "L".

Super Flexible Nozzles with curved nozzle end or with special bore diameter are also available. In this case, please contact IKO by preparing a drawing or sketch with necessary specifications.

SUPER FLEXIBLE NOZZLE

Press Fitting Type Without Nozzle

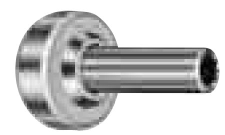


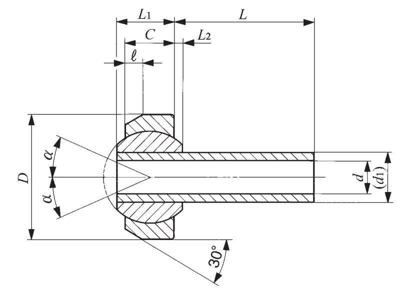


SNA

Identification number	Boundary dimensions mm d	D	L_1	L_2	C	ℓ	Ball dia. mm (inch)	Allowable tilting angle α degree
SNA 4	4	15	7	1	6	2	11.112 (7/16)	36
SNA 6	6							24

Press Fitting Type With Nozzle





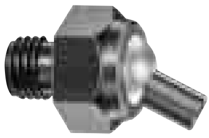
SNA

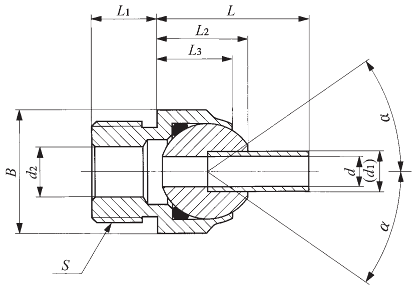
Identification number	Boundary dimensions mm d	D	L			L_1	L_2	C	ℓ	d_1	Ball dia. mm (inch)	Allowable tilting angle α degree
SNA 3-*L*	3	15	6	15	32	7	1	6	2	6	11.112 (7/16)	24
SNA 4-*L*	4		6	16	40							

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

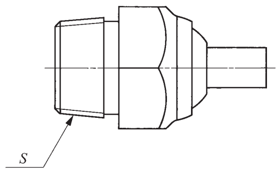
SUPER FLEXIBLE NOZZLE

Screw Fitting Type





SNM



SNPT

Identification number	Boundary dimensions mm										Ball dia. mm (inch)	Allowable tilting angle α degree
	d	Thread S	L	L_1	L_2	L_3	d_1	d_2	Width across flats B	Width across corners (Ref.)		
SNM 10-*L*	4	M10×1.25	20 40 60	9	13	10.5	6	6	17	19.6	12.700 (1/2)	35
SNPT 1/4-*L*		PT 1/4										
SNM 20-*L*	6	M20×1.5	30 50 70	13	18	15	8	10	24	27.7	19.050 (3/4)	
SNPT 3/8-*L*		PT 3/8										
SNM 24-*L*	8	M24×2.0	40 60 80	18	23	19	10	12	32	37	25.400 (1)	
SNPT 1/2-*L*		PT 1/2										

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

PARTS FOR NEEDLE ROLLER BEARINGS

- ●Seals for Needle Roller Bearings
- ●Cir-clips for Needle Roller Bearings
- ●Needle Rollers

Seals for Needle Roller Bearings

Features

IKO Seals for Needle Roller Bearings have a low sectional height and consist of a sheet metal ring and special synthetic rubber.

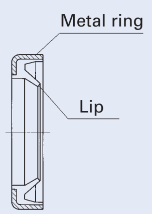
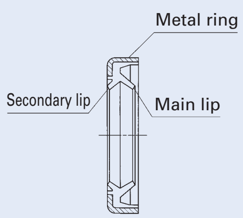
As these seals are manufactured to the same sectional height as IKO Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings shown in the dimension table.

When fitting seals to needle roller bearings with inner ring, wide inner rings (see page H2) must be used, as shown in the mounting examples.

Types

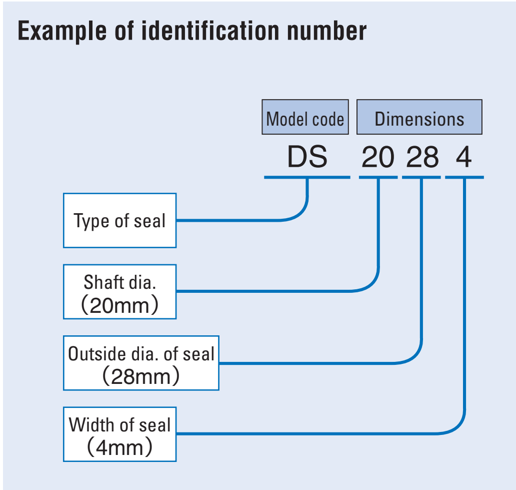
Seals for Needle Roller Bearings are available as shown in Table1.

Table 1 Seal type

Type	Single lip	Double lips
Structure	 Metal ring, Lip	 Metal ring, Secondary lip, Main lip
Model code	OS	DS

Identification Number

The identification number of Seals for Needle Roller Bearings consists of a model code and dimensions. An example of an identification number is shown as follows.



Accuracy

Tolerances of Seals for Needle Roller Bearings are based on JIS B 2402:1996.

Tolerances of outside diameter and width are based on Tables 2 and 3, respectively.

Table 2 Tolerance of outside diameter unit: mm

Nominal outside diameter		Tolerance	
Over	Incl.	High	Low
–	30	+0.09	+0.04
30	50	+0.11	+0.05
50	80	+0.14	+0.06
80	120	+0.17	+0.08

Table 3 Tolerance of width unit: mm

Nominal size of width		Tolerance	
Over	Incl.	High	Low
–	6	+0.2	−0.2
6	10	+0.3	−0.3

Precautions for Use

❶For the single lip OS type, the lip has to face inward when using the seal to prevent grease leakage, and outward to prevent the penetration of foreign particles. The DS type of double-lips is effective for prevention of grease leakage and dust penetration. However, when the main purpose is to prevent grease leakage, the main lip should face inward, and when used mainly to prevent dust penetration, it should face outward.

❷The permissible temperature range is -20～+120℃.

For use at higher or lower temperatures, a special seal is required. Please contact IKO for further information.

❸The limiting peripheral speed of shaft depends on the conditions of use, but is normally 6 to 8 m/s. Double this speed is possible if the conditions (lubrication, temperature, shaft finish, etc.) are good.

Mounting

When inserting the shaft, damage to the lip should be prevented by chamfering the end of the shaft, as shown in the upper part of Fig. 1. When this cannot be performed, a mounting bushing should be used, as shown in the lower part of Fig.1.

When press fitting the seal to the housing, do not strike it directly, but fit it gently, using a suitable tool.

To prevent early wear and heat generation at the seal surface, it is necessary to thickly coat the tip of the lip for the OS type, or to fill the space between the two lips for the DS type, with bearing grease.

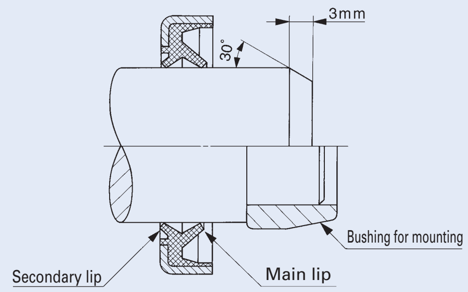


Fig.1

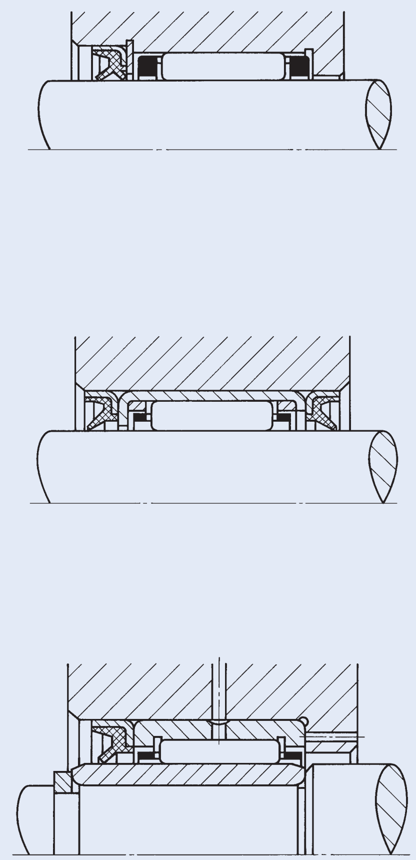
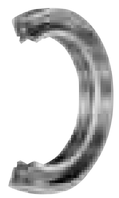


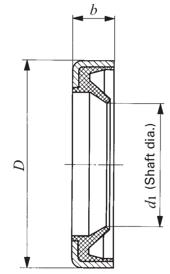
Fig.2 Mounting examples

L
OS
DS

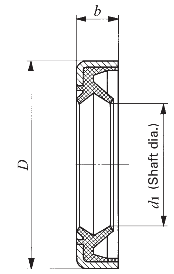
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SEALS FOR NEEDLE ROLLER BEARINGS





OS



DS

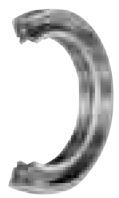
Shaft dia. 6 — 15mm

Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm: d_1	D	b	Combinable bearings: TA···Z YT / TLA···Z YTL	RNA TR / TAF GTR	RNAF	NAX NBX
6	OS 6102.5	—	6	10	2.5	TLA 69Z	—	—	—
7	OS 7112.5	—	7	11	2.5	TLA 79Z	—	—	—
8	OS 8123	—	8	12	3	TLA 810Z	—	—	—
	OS 8153	— —	8	15	3	TA 810Z TA 815Z TA 820Z YT 810	RNA 496 TAF 81512 TAF 81516	RNAF 81510	—
9	OS 9133	—	9	13	3	TLA 910Z TLA 912Z	—	—	—
	OS 9163	—	9	16	3	TA 912Z TA 916Z YT 912	TAF 91612 TAF 91616	—	—
10	OS 10143	—	10	14	3	TLA 1010Z TLA 1012Z TLA 1015Z	—	—	—
	OS 10173	—	10	17	3	TA 1010Z TA 1012Z TA 1015Z TA 1020Z	TAF 101712 TAF 101716	RNAF 101710	—

Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm: d_1	D	b	Combinable bearings: TA···Z YT / TLA···Z YTL	RNA TR / TAF GTR	RNAF	NAX NBX
12	OS 12163	—	12	16	3	TLA 1210Z YTL 1210	—	—	—
	OS 12183	—	12	18	3	TLA 1212Z	—	—	—
	OS 12193	—	12	19	3	TA 1212Z TA 1215Z TA 1220Z TA 1225Z YT 1212	TAF 121912 TAF 121916	—	—
13	OS 13193	—	13	19	3	TLA 1312Z	—	—	—
14	OS 14203	DS 14203	14	20	3	TLA 1412Z TLA 1416Z	—	—	—
	OS 14223	DS 14223	14	22	3	TA 1416Z TA 1420Z	RNA 4900 TAF 142216 TAF 142220	RNAF 142213 RNAFW 142220	—
15	OS 15213	DS 15213	15	21	3	TLA 1512Z TLA 1516Z TLA 1522Z	—	—	—
	OS 15223	DS 15223	15	22	3	TA 1510Z TA 1512Z TA 1515Z TA 1520Z TA 1525Z	—	—	—
	OS 15235	DS 15235	15	23	5	—	TAF 152316 TAF 152320	RNAF 152313 RNAFW 152320	—

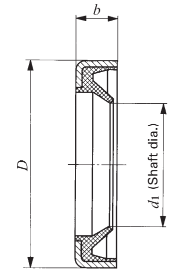
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 16 — 19mm

Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings: TA···Z YT / TLA···Z YTL	RNA TR / TAF GTR	RNAF	NAX / NBX
16	**OS 16223**	**DS 16223**	16	22	3	**TLA 1612Z** **TLA 1616Z** **TLA 1622Z**	—	—	—
	OS 16243	**DS 16243**	16	24	3	**TA 1616Z** **TA 1620Z**	**RNA 4901** **RNA 6901** **TAF 162416** **TAF 162420**	**RNAF 162413** **RNAFW 162420**	—
	OS 16285	**DS 16285**	16	28	5	—	—	**RNAF 162812**	—
17	**OS 17233**	**DS 17233**	17	23	3	**TLA 1712Z**	—	—	—
	OS 17243	**DS 17243**	17	24	3	**TA 1715Z** **TA 1720Z** **TA 1725Z** **YT 1715** **YT 1725**	—	—	—
	OS 17253	**DS 17253**	17	25	3	—	**TAF 172516** **TAF 172520**	**RNAF 172513** **RNAFW 172520**	—



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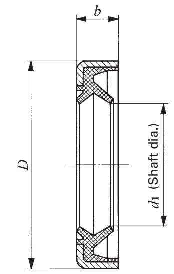


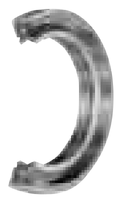
DS

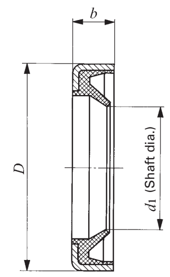
Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings: TA···Z YT / TLA···Z YTL	RNA TR / TAF GTR	RNAF	NAX / NBX
18	**OS 18243**	**DS 18243**	18	24	3	**TLA 1812Z** **TLA 1816Z**	—	—	—
	OS 18253	**DS 18253**	18	25	3	**TA 1813Z** **TA 1815Z** **TA 1817Z** **TA 1819Z** **TA 1820Z** **TA 1825Z**	—	—	—
	OS 18264	**DS 18264**	18	26	4	—	**RNA 49/14** **TAF 182616** **TAF 182620**	**RNAF 182613** **RNAFW 182620**	—
19	**OS 19274**	**DS 19274**	19	27	4	**TA 1916Z** **TA 1920Z**	**TAF 192716** **TAF 192720**	—	—

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

SEALS FOR NEEDLE ROLLER BEARINGS

IKO





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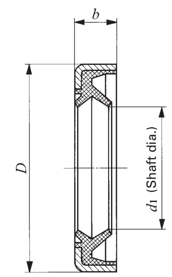


DS

Shaft dia. 20 — 24mm

Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm: d_1	D	b	Combinable bearings: TA···Z TLA···Z YT YTL	RNA TAF TR GTR	RNAF	NAX NBX
20	OS 20264	DS 20264	20	26	4	TLA 2012Z TLA 2016Z TLA 2020Z TLA 2030Z	—	—	—
	OS 20274	DS 20274	20	27	4	TA 2015Z TA 2020Z TA 2025Z TA 2030Z YT 2015 YT 2025	—	—	—
	OS 20284	DS 20284	20	28	4	TA 202820Z YT 202820	RNA 4902 RNA 6902 TAF 202816 TAF 202820	RNAF 202813 RNAFW 202826	—
	OS 20304	DS 20304	20	30	4	—	—	—	NAX 2030 NBX 2030
	OS 20324	DS 20324	20	32	4	—	—	RNAF 203212 RNAFW 203224	—
	OS 20326	DS 20326	20	32	6	—	—	RNAF 203212 RNAFW 203224	—
21	OS 21294	DS 21294	21	29	4	TA 2116Z TA 2120Z YT 2116 YT 2120	TAF 212916 TAF 212920	—	—

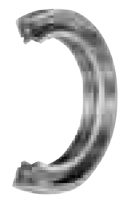
Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm: d_1	D	b	Combinable bearings: TA···Z TLA···Z YT YTL	RNA TAF TR GTR	RNAF	NAX NBX
22	OS 22284	DS 22284	22	28	4	TLA 2212Z TLA 2216Z TLA 2220Z	—	—	—
	OS 22294	DS 22294	22	29	4	TA 2210Z TA 2215Z TA 2220Z TA 2225Z TA 2230Z	—	—	—
	OS 22304	DS 22304	22	30	4	TA 223016Z TA 223020Z YT 223016 YT 223020	RNA 4903 RNA 6903 TAF 223016 TAF 223020	RNAF 223013 RNAFW 223026	—
24	OS 24314	DS 24314	24	31	4	TA 2420Z TA 2428Z YT 2428	—	—	—
	OS 24324	DS 24324	24	32	4	TA 243216Z TA 243220Z YT 243216 YT 243220	TAF 243216 TAF 243220	—	—

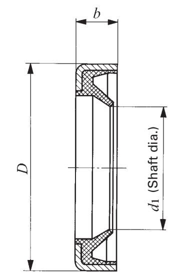
L
OS
DS

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

SEALS FOR NEEDLE ROLLER BEARINGS

IKO





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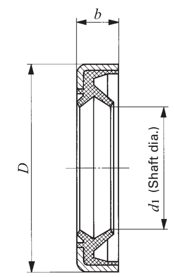
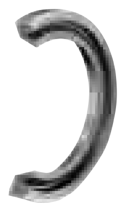


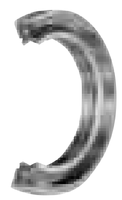
DS

Shaft dia. 25 — 29mm

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA···Z TLA···Z YT YTL	RNA TAF TR GTR	RNAF	NAX NBX
25	**OS 25324**	**DS 25324**	25	32	4	**TLA 2512Z TLA 2516Z TLA 2520Z TLA 2526Z TLAW 2538Z YTL 2526**	—	—	—
	OS 25334	**DS 25334**	25	33	4	**TA 2510Z TA 2515Z TA 2520Z TA 2525Z TA 2530Z YT 2510 YT 2515 YT 2520 YT 2525**	**TAF 253316 TAF 253320**	—	—
	OS 25356	**DS 25356**	25	35	6	—	—	**RNAF 253517 RNAFW 253526**	—
	OS 25376	**DS 25376**	25	37	6	—	**RNA 4904 RNA 6904**	**RNAF 253716 RNAFW 253732**	**NAX 2530 NBX 2530**
26	**OS 26344**	**DS 26344**	26	34	4	**TA 2616Z TA 2620Z YT 2616 YT 2620**	**TAF 263416 TAF 263420**	—	—
28	**OS 28354**	**DS 28354**	28	35	4	**TLA 2816Z TLA 2820Z**	—	—	—
	OS 28374	**DS 28374**	28	37	4	**TA 2820Z TA 2830Z YT 2820**	**TAF 283720 TAF 283730**	—	—
	OS 28396	**DS 28396**	28	39	6	—	**RNA 49/22 RNA 69/22**	—	—
	OS 28406	**DS 28406**	28	40	6	—	—	**RNAF 284016 RNAFW 284032**	—
29	**OS 29384**	**DS 29384**	29	38	4	**TA 2920Z TA 2930Z YT 2920**	**TAF 293820 TAF 293830**	—	—

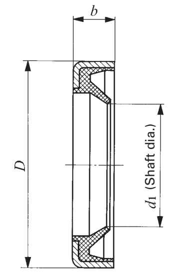
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch





Shaft dia. 30 — 38mm

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA…Z YT / TLA…Z YTL	RNA TR / TAF GTR	RNAF	NAX / NBX
30	OS 30374	DS 30374	30	37	4	TLA 3012Z TLA 3016Z TLA 3018Z TLA 3020Z TLA 3026Z TLAW 3038Z	—	—	—
	OS 30404	DS 30404	30	40	4	TA 3013Z TA 3015Z TA 3020Z TA 3025Z TA 3030Z	TAF 304020 TAF 304030	RNAF 304017 RNAFW 304026	—
	OS 30426	DS 30426	30	42	6	—	RNA 4905 RNA 6905	RNAF 304216 RNAFW 304232	NAX 3030 NBX 3030
32	OS 32424	DS 32424	32	42	4	TA 3220Z TA 3230Z YT 3220	TAF 324220 TAF 324230	—	—
	OS 32456	DS 32456	32	45	6	—	RNA 49/28 RNA 69/28 GTR 324530	—	—



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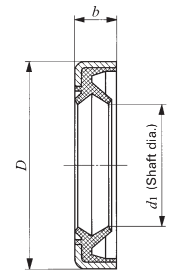
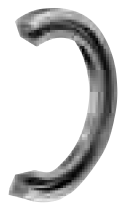


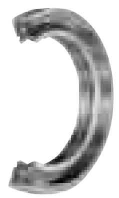
DS

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA…Z YT / TLA…Z YTL	RNA TR / TAF GTR	RNAF	NAX / NBX
35	OS 35424	DS 35424	35	42	4	TLA 3512Z TLA 3516Z TLA 3520Z	—	—	—
	OS 35454	DS 35454	35	45	4	TA 3512Z TA 3515Z TA 3520Z TA 3525Z TA 3530Z	TAF 354520 TAF 354530	RNAF 354517 RNAFW 354526	—
	OS 35476	DS 35476	35	47	6	—	RNA 4906 RNA 6906	RNAF 354716 RNAFW 354732	NAX 3530 NBX 3530
37	OS 37474	DS 37474	37	47	4	TA 3720Z TA 3730Z YT 3720	TAF 374720 TAF 374730	—	—
38	OS 38484	DS 38484	38	48	4	TA 3815Z TA 3820Z TA 3825Z TA 3830Z TAW 3845Z	TAF 384820 TAF 384830	—	—
	OS 38506	DS 38506	38	50	6	—	—	—	—

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

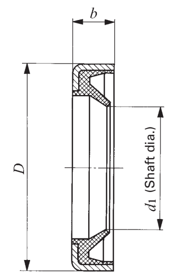
SEALS FOR NEEDLE ROLLER BEARINGS





Shaft dia. 40 — 50mm

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
40	OS 40474	DS 40474	40	47	4	TLA 4012Z TLA 4016Z TLA 4020Z	—	—	—
	OS 40504	DS 40504	40	50	4	TA 4015Z TA 4020Z TA 4025Z TA 4030Z TA 4040Z YT 4015 YT 4025	TAF 405020 TAF 405030	RNAF 405017 RNAFW 405034	—
	OS 40526	DS 40526	40	52	6	—	RNA 49/32 RNA 69/32	—	NAX 4032 NBX 4032
	OS 40556	DS 40556	40	55	6	—	TR 405520 GTR 405520	RNAF 405520 RNAFW 405540	—
42	OS 42557	DS 42557	42	55	7	—	RNA 4907 RNA 6907	—	—



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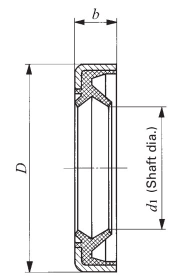
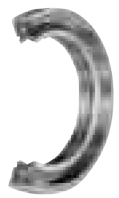


DS

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
45	OS 45524	DS 45524	45	52	4	TLA 4516Z TLA 4520Z	—	—	—
	OS 45554	DS 45554	45	55	4	TA 4520Z TA 4525Z TA 4530Z TA 4540Z YT 4520 YT 4525	TAF 455520 TAF 455530	RNAF 455517 RNAFW 455534	—
	OS 45627	DS 45627	45	62	7	—	—	RNAF 456220 RNAFW 456240	—
48	OS 48627	DS 48627	48	62	7	—	RNA 4908 RNA 6908 TR 486230 GTR 486230	—	—
50	OS 50584	DS 50584	50	58	4	TLA 5020Z TLA 5025Z	—	—	—
	OS 50624	DS 50624	50	62	4	TA 5012Z TA 5015Z TA 5020Z TA 5025Z TA 5030Z TA 5040Z TAW 5045Z	TAF 506225 TAF 506235	RNAF 506220 RNAFW 506240	NAX 5035 NBX 5035
	OS 50657	DS 50657	50	65	7	—	RNA 49/42	RNAF 506520 RNAFW 506540	—

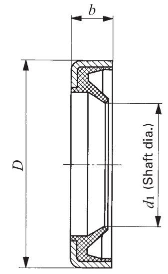
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 52 — 72mm

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
52	OS 52687	DS 52687	52	68	7	—	RNA 4909 RNA 6909	—	—
55	OS 55674	DS 55674	55	67	4	TA 5520Z TA 5525Z TA 5530Z TA 5540Z TAW 5545Z TAW 5550Z	—	—	—
	OS 55687	DS 55687	55	68	7	—	TAF 556825 TAF 556835	RNAF 556820 RNAFW 556840	—
	OS 55727	—	55	72	7	—	—	RNAF 557220 RNAFW 557240	—
58	OS 58727	DS 58727	58	72	7	—	RNA 4910 RNA 6910	—	—
60	OS 60724	DS 60724	60	72	4	TA 6025Z TA 6030Z TA 6040Z TAW 6045Z TAW 6050Z	TAF 607225 TAF 607235	—	NAX 6040 NBX 6040
	OS 60787	DS 60787	60	78	7	—	—	RNAF 607820 RNAFW 607840	—
62	OS 62744	DS 62744	62	74	4	TA 6212Z	—	—	—
	OS 62747	DS 62747	62	74	7	TA 6212Z	—	—	—
63	OS 63807	DS 63807	63	80	7	—	RNA 4911 RNA 6911	—	—



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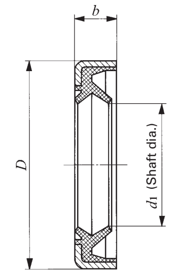


DS

Shaft dia. mm	Identification number Single lip	Identification number Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
65	OS 65774	DS 65774	65	77	4	TA 6525Z TA 6530Z TAW 6545Z TAW 6550Z	—	—	—
	OS 65857	DS 65857	65	85	7	—	—	RNAF 658530 RNAFW 658560	—
68	OS 68857	DS 68857	68	85	7	—	RNA 4912 RNA 6912	—	—
70	OS 70824	DS 70824	70	82	4	TA 7025Z TA 7030Z TA 7040Z TAW 7050Z YT 7025 YT 7030 YT 7040	—	—	—
	OS 70907	DS 70907	70	90	7	—	—	RNAF 709030 RNAFW 709060	—
72	OS 72907	DS 72907	72	90	7	—	RNA 4913 RNA 6913	—	

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

Cir-clips for Needle Roller Bearings

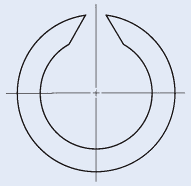
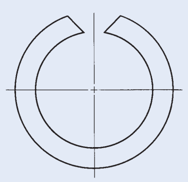
Features

IKO Cir-clips for Needle Roller Bearings have been specially designed for needle roller bearings on which, in many cases, generally available Cir-clips cannot be used. They have a low sectional height and are very rigid. They are made of spring steel.
There are Cir-clips for shafts and for bores, and they are used for positioning to prevent bearing movement in the axial direction.

Types

Cir-clips for Needle Roller Bearings are available as shown in Table. 1.

Table 1 Type of Cir-clip

Type	For shaft	For bore
Shape		
Model code	WR	AR

Identification number

The identification number of Cir-clips consists of a model code and a size as shown below.

Examples of identification number

Example 1

Model code	Size
WR	20

WR: Type of Cir-clip
20: Shaft dia. (20mm)

Example 2

Model code	Size
AR	35

AR: Type of Cir-clip
35: Bore dia. (35mm)

Allowable Rotational Speed

Cir-clips for Needle Roller Bearings are fixed in the groove with a certain amount of pressure on the bottom of the groove. In the case of Cir-clips for shaft WR type, the centrifugal force causes a decrease in the gripping pressure. Therefore, when using them at high rotational speeds, it is necessary to first check the allowable rotational speed shown in Fig.1.

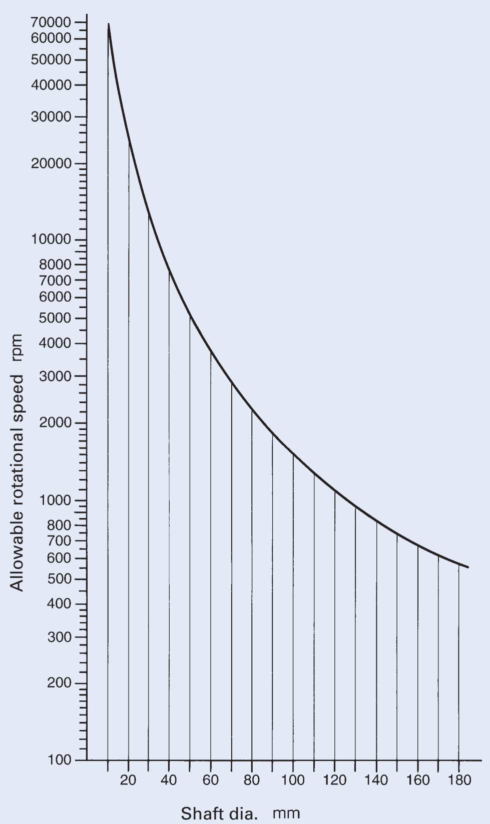


Fig.1 Allowable rotational speed

Mounting

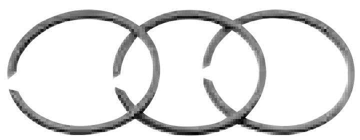
The mounting dimensions for Cir-clips for Needle Roller Bearings are shown in the dimension table.
When using these Cir-clips to restrict the movement of the needle roller cage in the axial direction, it is recommended that a spacer be used between the Cir-clip and the cage. Spacers are not required at low rotational speeds.
When it is difficult to reach Cir-clips with dismounting tools and disassembly is difficult, or when the frequency of dismounting is high, it is necessary to consider the use of a C type retaining ring (JIS B 2804:1978) or C type concentric retaining ring (JIS B 2806:1978), although they have a higher sectional height.

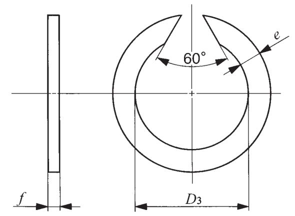
L
WR
AR

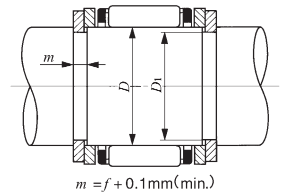
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Shaft







WR

Shaft dia. 4 — 390mm

Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 4	4	3.7	0.8	0.5	3.8	0 −0.09
WR 5	5	4.7	1	0.5	4.8	
WR 6	6	5.6	1.1	0.7	5.7	
WR 7	7	6.5	1.2	0.7	6.7	
WR 8	8	7.4	1.3	1	7.6	
WR 9	9	8.4	1.3	1	8.6	
WR 10	10	9.4	1.3	1	9.6	
WR 11	11	10.2	1.3	1	10.5	0 −0.11
WR 12	12	11.2	1.3	1	11.5	
WR 13	13	12.1	1.3	1	12.5	
WR 14	14	13.1	1.5	1.2	13.5	
WR 15	15	14	1.75	1.2	14.4	
WR 16	16	15	1.75	1.2	15.4	
WR 17	17	16	1.75	1.2	16.4	
WR 18	18	17	1.75	1.2	17.4	
WR 19	19	17.9	1.75	1.2	18.4	0 −0.13
WR 20	20	18.7	1.75	1.2	19.2	
WR 21	21	19.7	1.75	1.2	20.2	
WR 22	22	20.7	1.75	1.2	21.2	
WR 23	23	21.7	1.75	1.2	22.2	
WR 24	24	22.5	1.75	1.2	23	
WR 25	25	23.5	1.75	1.2	24	
WR 26	26	24.5	1.75	1.2	25	
WR 28	28	26.5	2.3	1.5	27	
WR 29	29	27.5	2.3	1.5	28	
WR 30	30	28.5	2.3	1.5	29	
WR 32	32	30.2	2.3	1.5	30.8	0 −0.16
WR 35	35	33.2	2.3	1.5	33.8	
WR 36	36	34.2	2.3	1.5	34.8	
WR 37	37	35.2	2.3	1.5	35.8	
WR 38	38	36.2	2.3	1.5	36.8	
WR 40	40	37.8	2.3	1.5	38.5	

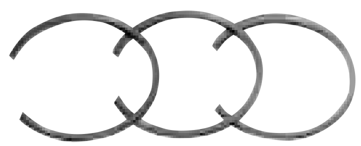
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 42	42	39.8	2.3	1.5	40.5	0 −0.16
WR 43	43	40.8	2.3	1.5	41.5	
WR 45	45	42.8	2.3	1.5	43.5	
WR 47	47	44.8	2.3	1.5	45.5	
WR 50	50	47.8	2.3	1.5	48.5	
WR 52	52	49.8	2.3	1.5	50.5	0 −0.19
WR 55	55	52.6	2.3	1.5	53.5	
WR 60	60	57.6	2.3	1.5	58.5	
WR 63	63	60.6	2.3	1.5	61.5	
WR 65	65	62.6	2.3	1.5	63.5	
WR 68	68	65.4	2.8	2	66.2	
WR 70	70	67.4	2.8	2	68.2	
WR 75	75	72.4	2.8	2	73.2	
WR 80	80	77.4	2.8	2	78.2	
WR 82	82	79.3	3.4	2.5	80.2	0 −0.22
WR 85	85	82	3.4	2.5	83	
WR 90	90	87	3.4	2.5	88	
WR 95	95	92	3.4	2.5	93	
WR 100	100	97	3.4	2.5	98	
WR 105	105	101.7	3.4	2.5	102.7	
WR 110	110	106.7	3.4	2.5	107.7	
WR 115	115	111.7	3.4	2.5	112.7	
WR 120	120	116.7	3.4	2.5	117.7	
WR 125	125	121.7	3.4	2.5	122.7	0 −0.25
WR 130	130	126.7	3.4	2.5	127.7	
WR 135	135	131.6	4	2.5	132.4	
WR 140	140	136.6	4	2.5	137.4	
WR 145	145	141.6	4	2.5	142.4	
WR 150	150	146.6	4	2.5	147.4	
WR 155	155	151.6	4	2.5	152.4	
WR 160	160	156.6	4	2.5	157.4	
WR 165	165	161.6	4	2.5	162.4	

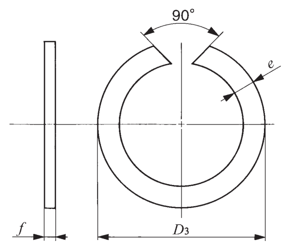
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 170	170	166.6	4	2.5	167.4	0 −0.25
WR 175	175	171.6	4	2.5	172.4	
WR 180	180	175.6	5	3	177	
WR 185	185	180.6	5	3	182	0 −0.29
WR 190	190	185.6	5	3	187	
WR 195	195	190.6	5	3	192	
WR 200	200	195.6	5	3	197	
WR 210	210	205.6	5	3	207	
WR 220	220	215.6	5	3	217	
WR 230	230	225.6	5	3	227	
WR 240	240	235.6	5	3	237	
WR 260	260	253	7.5	4	255	0 −0.32
WR 265	265	258	7.5	4	260	
WR 270	270	263	7.5	4	265	
WR 280	280	273	7.5	4	275	
WR 285	285	278	7.5	4	280	
WR 300	300	293	7.5	4	295	
WR 305	305	298	7.5	4	300	
WR 320	320	313	7.5	4	315	
WR 330	330	323	7.5	4	325	0 −0.36
WR 340	340	333	7.5	4	335	
WR 350	350	343	7.5	4	345	
WR 360	360	353	7.5	4	355	
WR 370	370	363	7.5	4	365	
WR 390	390	383	7.5	4	385	

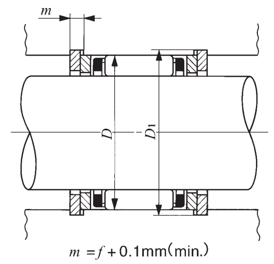
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Bore







AR

Bore dia. 7 — 440mm

Identification number	Boundary dimensions mm Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Tolerance
AR 7	7	7.5	1	0.8	7.3	$^{+0.09}_{0}$
AR 8	8	8.5	1	0.8	8.3	
AR 9	9	9.5	1.1	0.8	9.3	
AR 10	10	10.6	1.2	0.8	10.4	$^{+0.11}_{0}$
AR 11	11	11.6	1.3	1	11.4	
AR 12	12	12.7	1.3	1	12.4	
AR 13	13	13.8	1.3	1	13.5	
AR 14	14	14.8	1.3	1	14.5	
AR 15	15	15.8	1.3	1	15.5	
AR 16	16	16.8	1.6	1.2	16.5	
AR 17	17	17.8	1.6	1.2	17.5	
AR 18	18	18.9	1.75	1.2	18.5	$^{+0.13}_{0}$
AR 19	19	19.9	1.75	1.2	19.6	
AR 20	20	21	1.75	1.2	20.6	
AR 21	21	22	1.75	1.2	21.6	
AR 22	22	23	1.75	1.2	22.6	
AR 23	23	24	1.75	1.2	23.6	
AR 24	24	25.2	1.75	1.2	24.8	
AR 25	25	26.2	1.75	1.2	25.8	
AR 26	26	27.2	1.75	1.2	26.8	
AR 27	27	28.2	1.75	1.2	27.8	
AR 28	28	29.2	1.75	1.2	28.8	
AR 29	29	30.2	1.75	1.2	29.8	
AR 30	30	31.4	2.3	1.5	31	$^{+0.16}_{0}$
AR 31	31	32.4	2.3	1.5	32	
AR 32	32	33.4	2.3	1.5	33	
AR 33	33	34.4	2.3	1.5	34	
AR 34	34	35.4	2.3	1.5	35	
AR 35	35	36.4	2.3	1.5	36	
AR 37	37	38.8	2.3	1.5	38.2	
AR 38	38	39.8	2.3	1.5	39.2	
AR 39	39	40.8	2.3	1.5	40.2	

Identification number	Boundary dimensions mm Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Tolerance
AR 40	40	41.8	2.3	1.5	41.2	$^{+0.16}_{0}$
AR 42	42	43.8	2.3	1.5	43.2	
AR 43	43	44.8	2.3	1.5	44.2	
AR 44	44	45.8	2.3	1.5	45.2	
AR 45	45	46.8	2.3	1.5	46.2	
AR 47	47	48.8	2.3	1.5	48.2	
AR 48	48	49.8	2.3	1.5	49.2	
AR 50	50	51.8	2.3	1.5	51.2	$^{+0.19}_{0}$
AR 52	52	54.3	2.3	1.5	53.5	
AR 53	53	55.3	2.3	1.5	54.5	
AR 55	55	57.3	2.3	1.5	56.5	
AR 57	57	59.3	2.3	1.5	58.5	
AR 58	58	60.3	2.3	1.5	59.5	
AR 60	60	62.3	2.3	1.5	61.5	
AR 62	62	64.3	2.3	1.5	63.5	
AR 65	65	67.3	2.3	1.5	66.5	
AR 68	68	70.3	2.3	1.5	69.5	
AR 70	70	72.3	2.3	1.5	71.5	
AR 72	72	74.6	2.8	2	73.8	
AR 73	73	75.6	2.8	2	74.8	
AR 75	75	77.6	2.8	2	76.8	
AR 76	76	78.6	2.8	2	77.8	
AR 78	78	80.6	2.8	2	79.8	
AR 80	80	82.6	2.8	2	81.8	$^{+0.22}_{0}$
AR 81	81	83.6	2.8	2	82.8	
AR 82	82	84.6	2.8	2	83.8	
AR 83	83	85.6	2.8	2	84.8	
AR 85	85	87.6	2.8	2	86.8	
AR 86	86	88.6	2.8	2	87.8	
AR 88	88	91	3.4	2.5	90	
AR 90	90	93	3.4	2.5	92	
AR 92	92	95	3.4	2.5	94	

Identification number	Boundary dimensions mm Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Tolerance
AR 93	93	96	3.4	2.5	95	$^{+0.22}_{0}$
AR 95	95	98	3.4	2.5	97	
AR 97	97	100	3.4	2.5	99	
AR 98	98	101	3.4	2.5	100	
AR 100	100	103	3.4	2.5	102	
AR 102	102	105.3	3.4	2.5	104.3	
AR 103	103	106.3	3.4	2.5	105.3	
AR 105	105	108.3	3.4	2.5	107.3	
AR 107	107	110.3	3.4	2.5	109.3	
AR 108	108	111.3	3.4	2.5	110.3	
AR 110	110	113.3	3.4	2.5	112.3	
AR 112	112	115.3	3.4	2.5	114.3	
AR 113	113	116.3	3.4	2.5	115.3	
AR 115	115	118.3	3.4	2.5	117.3	
AR 117	117	120.3	3.4	2.5	119.3	
AR 118	118	121.3	3.4	2.5	120.3	$^{+0.25}_{0}$
AR 120	120	123.3	3.4	2.5	122.3	
AR 123	123	126.3	3.4	2.5	125.3	
AR 125	125	128.3	3.4	2.5	127.3	
AR 127	127	130.3	3.4	2.5	129.3	
AR 130	130	133.3	3.4	2.5	132.3	
AR 133	133	136.3	3.4	2.5	135.3	
AR 135	135	138.3	3.4	2.5	137.3	
AR 137	137	140.3	3.4	2.5	139.3	
AR 140	140	143.6	4	2.5	142.6	
AR 143	143	146.6	4	2.5	145.6	
AR 145	145	148.6	4	2.5	147.6	
AR 150	150	153.6	4	2.5	152.6	
AR 153	153	156.6	4	2.5	155.6	
AR 160	160	163.6	4	2.5	162.6	
AR 163	163	166.6	4	2.5	165.6	
AR 165	165	168.6	4	2.5	167.6	

Identification number	Boundary dimensions mm Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Tolerance
AR 170	170	173.6	4	2.5	172.6	$^{+0.25}_{0}$
AR 173	173	176.6	4	2.5	175.6	
AR 175	175	178.6	4	2.5	177.6	
AR 180	180	183.6	4	2.5	182.6	
AR 183	183	186.6	4	2.5	185.6	$^{+0.29}_{0}$
AR 190	190	194.5	5	3	193	
AR 195	195	199.5	5	3	198	
AR 200	200	204.5	5	3	203	
AR 205	205	209.5	5	3	208	
AR 210	210	214.5	5	3	213	
AR 215	215	219.5	5	3	218	
AR 220	220	224.5	5	3	223	
AR 225	225	229.5	5	3	228	
AR 230	230	234.5	5	3	233	
AR 235	235	239.5	5	3	238	
AR 240	240	244.5	5	3	243	$^{+0.32}_{0}$
AR 245	245	249.5	5	3	248	
AR 250	250	254.5	5	3	253	
AR 260	260	267	7.5	4	265	
AR 270	270	277	7.5	4	275	
AR 280	280	287	7.5	4	285	
AR 300	300	307	7.5	4	305	
AR 320	320	327	7.5	4	325	$^{+0.36}_{0}$
AR 325	325	332	7.5	4	330	
AR 355	355	362	7.5	4	360	
AR 375	375	382	7.5	4	380	
AR 395	395	402	7.5	4	400	
AR 415	415	422	7.5	4	420	$^{+0.4}_{0}$
AR 420	420	427	7.5	4	425	
AR 440	440	447	7.5	4	445	

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

Needle Rollers

Features

IKO Needle Rollers are made of high carbon chromium bearing steel. They are rigid and highly accurate and are finished to a hardness of 58HRC or more (See Table 1.) and a surface roughness of 0.1 μmR_a or less.

These needle rollers are widely used as rolling elements for bearings, and also as pins and shafts.

Please contact IKO, if Needle Rollers made of stainless steel are required.

Table 1 Hardness

Nominal diameter D_w mm		Hardness	
Over	Incl.	HRC	HV
–	3	(60～67)	697～900
3	–	58～66	(653～865)

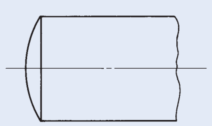
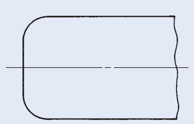
Remarks1. Hardness is flat surface hardness.
2. The values in parentheses are converted values for reference.

End Shapes

Needle Rollers come in spherical and flat end shapes, as shown in Table 2.

Please contact IKO, if other shapes are required.

Table 2 Shapes of ends

Type	Spherical end	Flat end
Shapes		
Symbol	A	F

Accuracy

The dimensional accuracy of Needle Rollers conforms to JIS B 1506:1991 (Rollers for Roller Bearings), and is shown in Table 3.

The selective classification for the mean diameter tolerance is shown in Table 4. The selective classification rollers according to Table 4 can be provided as requested.

Table 3 Dimensional accuracy of needle rollers unit: μm

Class	Diameter variation in a single radial plane (1) V_{Dwp} (Max.)	Circularity (1) Δ_R (Max.)	Gauge lot diameter variation (1) V_{DwL} (Max.)	Deviation of a single length (2) Δ_{Lws}
2	1	1	2	h13
3	1.5	1.5	3	h13
5	2	2.5	5	h13

Notes(1) Applicable to the measurement at the center of roller length

(2) Tolerance is based on the classification according to the nominal length L_w.

Remark Any measured diameter along the total length of roller must not be larger than the actual maximum diameter at the center of roller length by the amount exceeding the values given below.

0.5 μm for Class 2
0.8 μm for Class 3
1 μm for Class 5

Table 4 Classification of needle rollers unit: μm

Classification symbol	Tolerance for mean dia.
C 3	0～－ 3
B 2	0～－ 2
B 4	－2～－ 4
B 6	－4～－ 6
B 8	－6～－ 8
B10	－8～－10

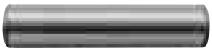
Use as Full-complement Bearings

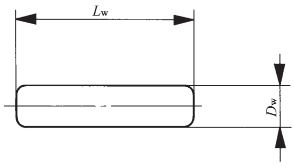
For normal rotation, Needle Roller Bearings with cage are most suitable, but for low rotational speeds and for oscillating movement, full-complement bearings are also used.

If Needle Rollers are combined with a shaft and a housing which have been hardened and ground to form a suitable raceway surface, the combined assembly can be used as a full-complement bearing which has a large load capacity and a low sectional height. (See page A44, Design of shaft and housing.)

Normally in this case, the radial clearance is made a little larger than that of a bearing with cage and the circumferential clearance is made to be approximately 1/10 of the diameter of needle rollers. When the bearing is used under severe conditions, please contact IKO for further information.

Needle Rollers





Roller dia. 1.5 — 5mm

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
1.5	6.8	0.09
	7.8	0.1
	9.8	0.13
	11.8	0.16
	13.8	0.18
2	6.8	0.16
	7.8	0.19
	9.8	0.23
	11.8	0.28
	13.8	0.33
	15.8	0.38
	17.8	0.42
	19.8	0.47
2.5	7.8	0.29
	9.8	0.36
	11.8	0.44
	13.8	0.51
	15.8	0.59
	17.8	0.66
	19.8	0.73
	21.8	0.81
	23.8	0.88
3	9.8	0.52
	11.8	0.63
	13.8	0.74
	15.8	0.84
	17.8	0.95
	19.8	1.06
	21.8	1.16
	23.8	1.27
	25.8	1.38
	27.8	1.48

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
3.5	11.8	0.86
	13.8	1
	15.8	1.15
	17.8	1.29
	19.8	1.44
	21.8	1.58
	23.8	1.73
	25.8	1.88
	29.8	2.2
	31.8	2.3
	34.8	2.5
4	13.8	1.31
	15.8	1.5
	17.8	1.69
	19.8	1.88
	21.8	2.1
	23.8	2.3
	25.8	2.5
	27.8	2.6
	29.8	2.8
	31.8	3
	34.8	3.3
	37.8	3.6
	39.8	3.8

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
4.5	17.8	2.1
	19.8	2.4
	21.8	2.6
	23.8	2.9
	25.8	3.1
	29.8	3.6
	31.8	3.8
	34.8	4.2
	37.8	4.5
	39.8	4.8
	44.8	5.4
5	19.8	2.9
	21.8	3.2
	23.8	3.5
	25.8	3.8
	29.8	4.4
	31.8	4.7
	34.8	5.2
	37.8	5.6
	39.8	5.9
	49.8	7.4

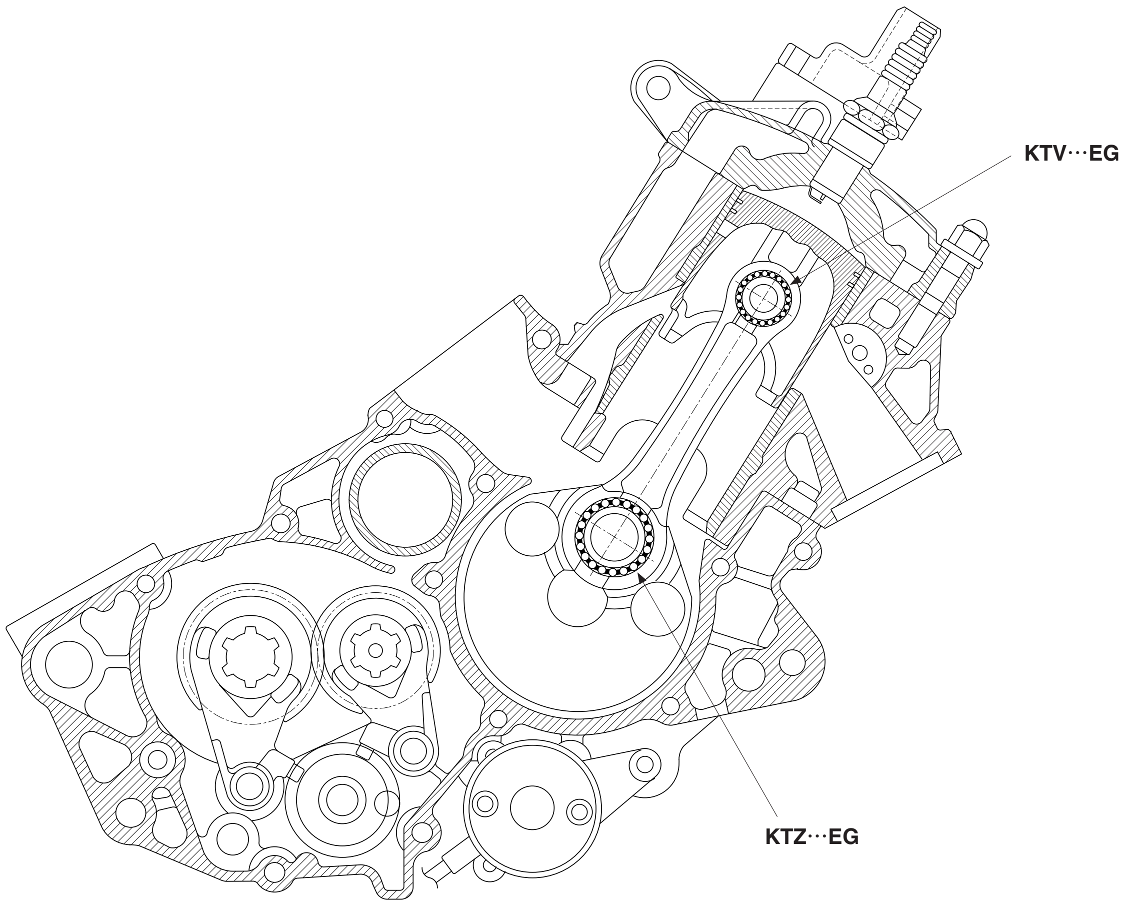
Remark For the names of the needle rollers, nominal dimensions are used.
Needle Rollers other than those shown in the dimension table can also be manufactured. Please contact IKO for further information.

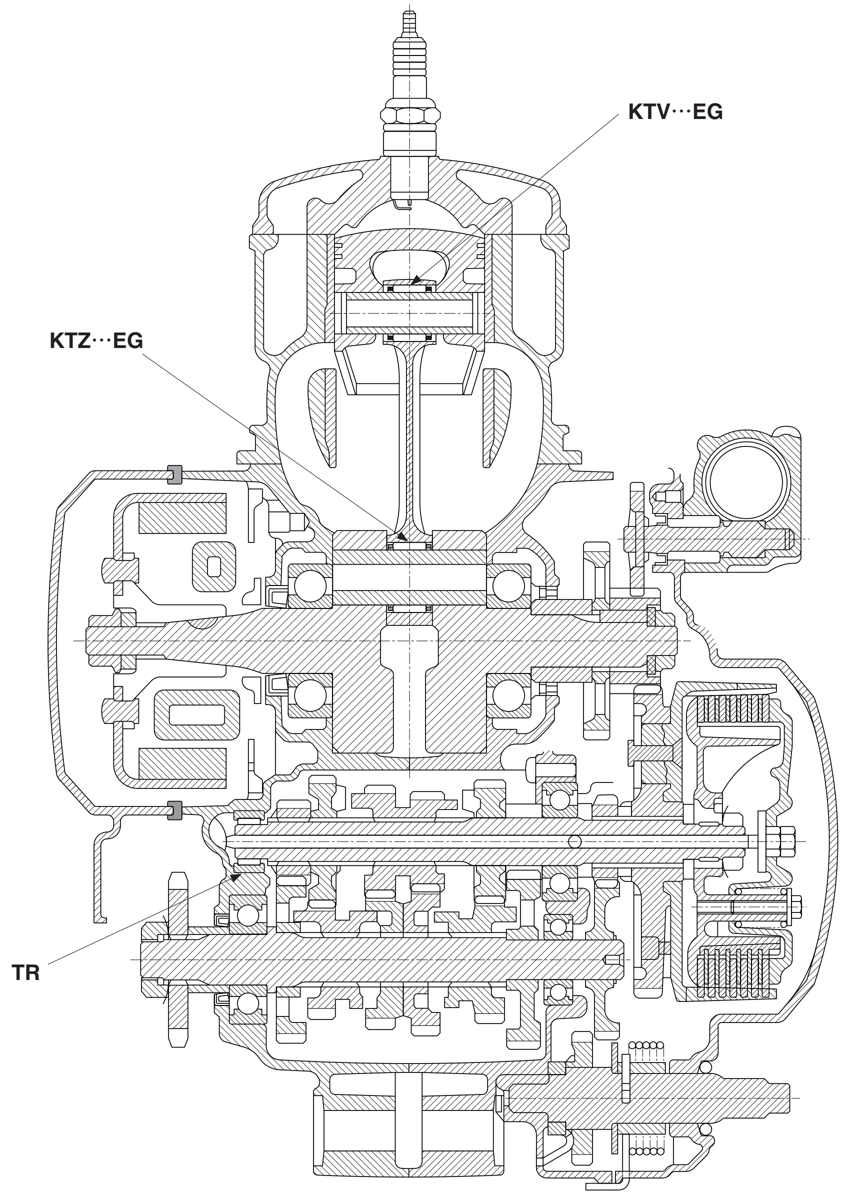
APPLICATIONS/ MISCELLANEOUS TABLES

IKO

Automobiles, vehicles

●Engine and transmission of 2-cycle motor cycle

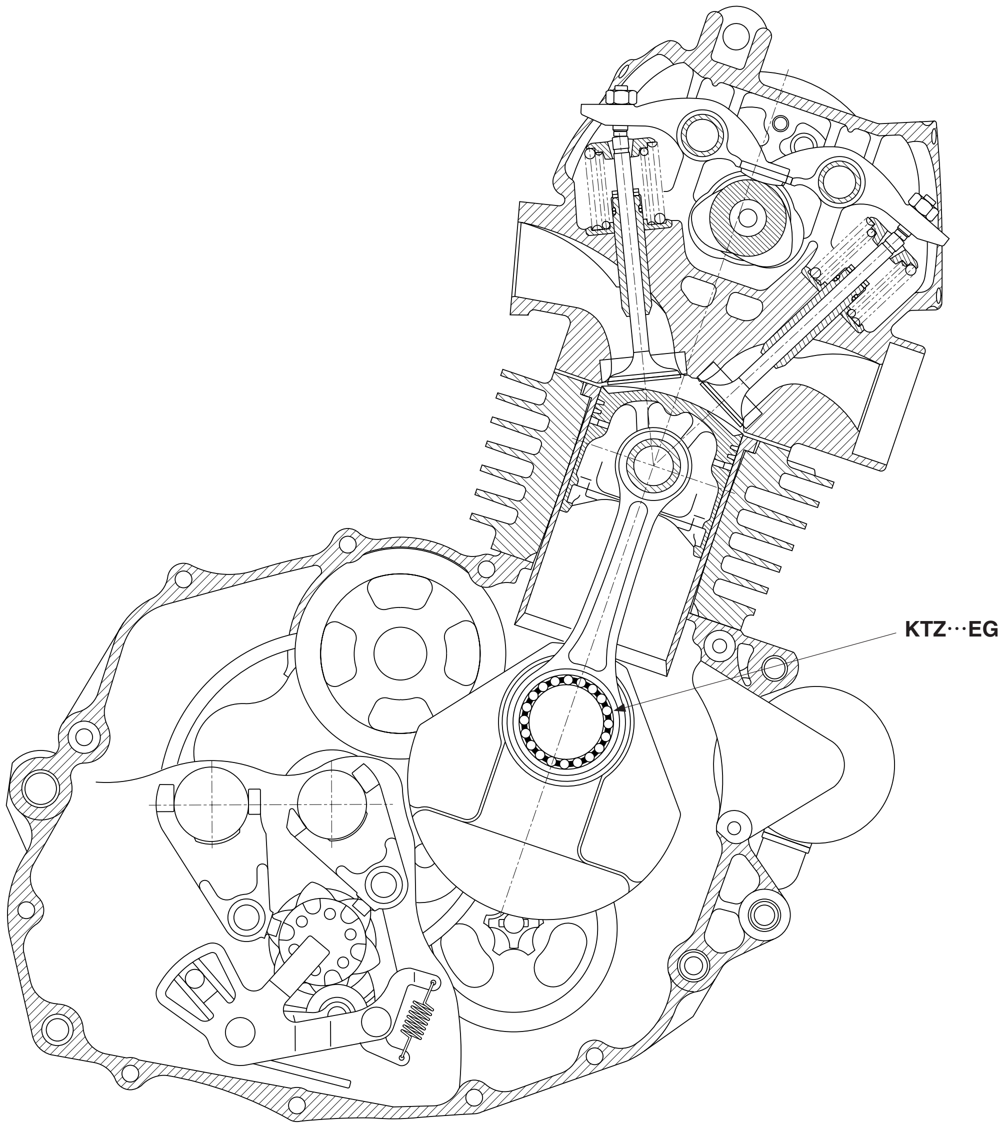


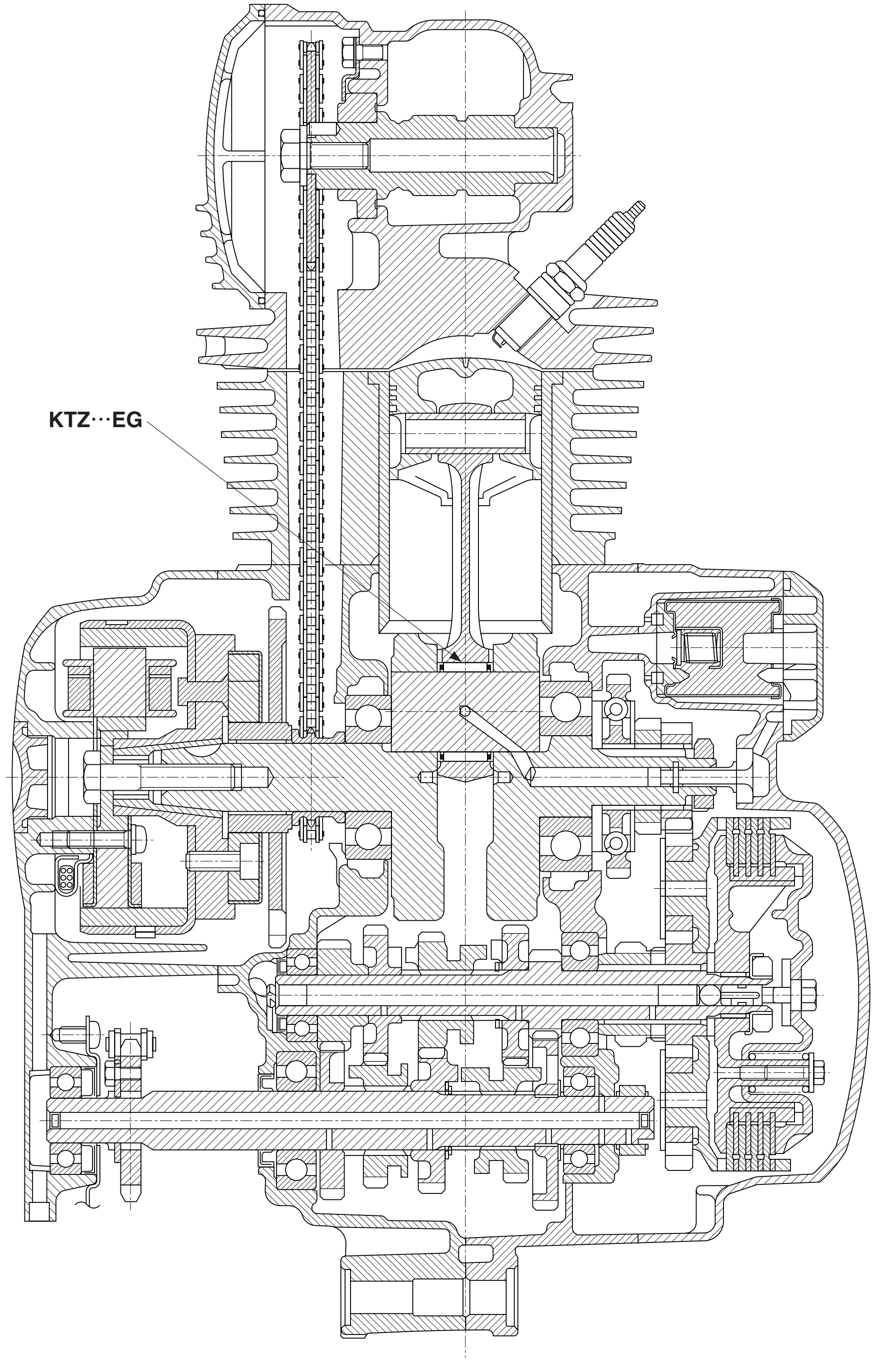


IKO

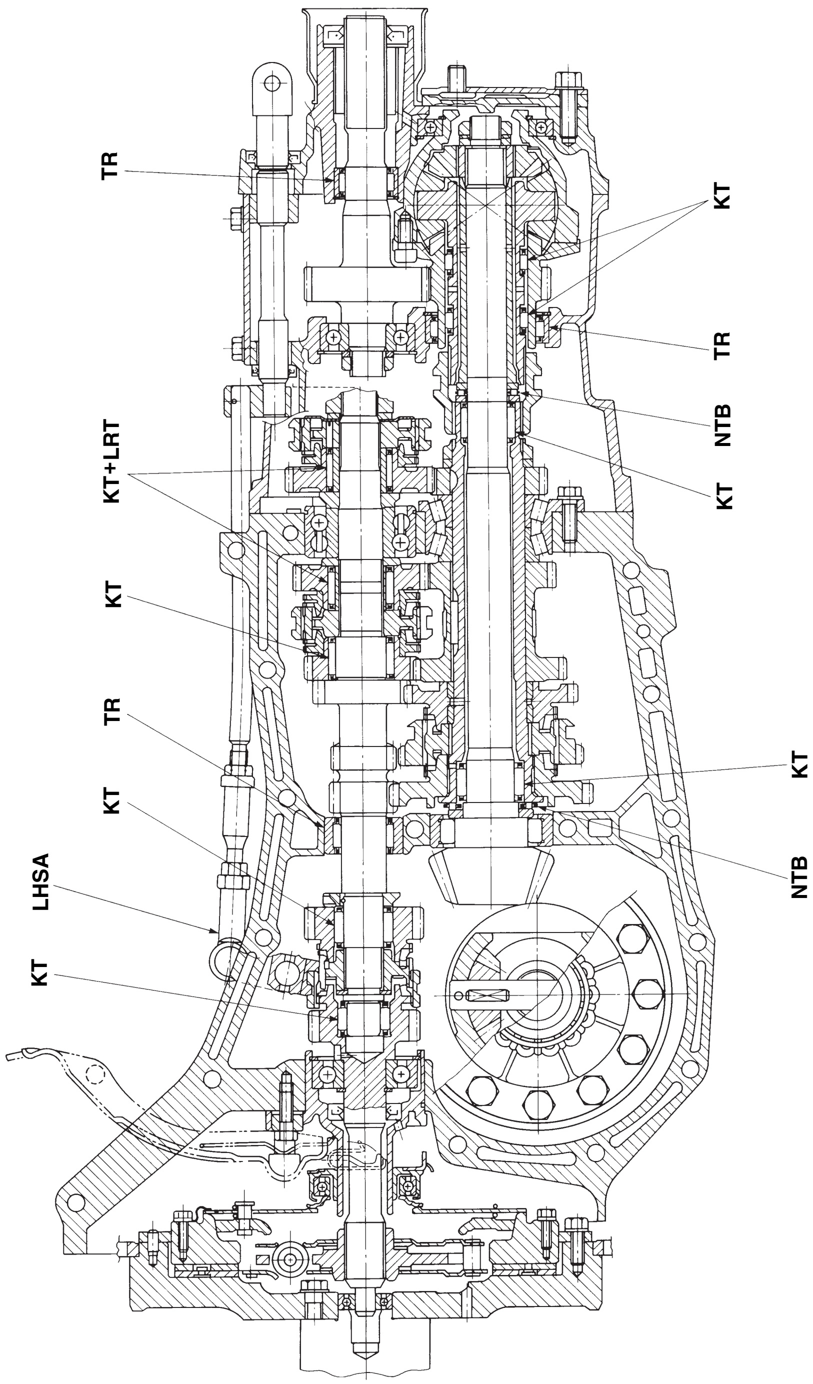
Automobiles, vehicles

●Engine and transmission of 4-cycle motor cycle





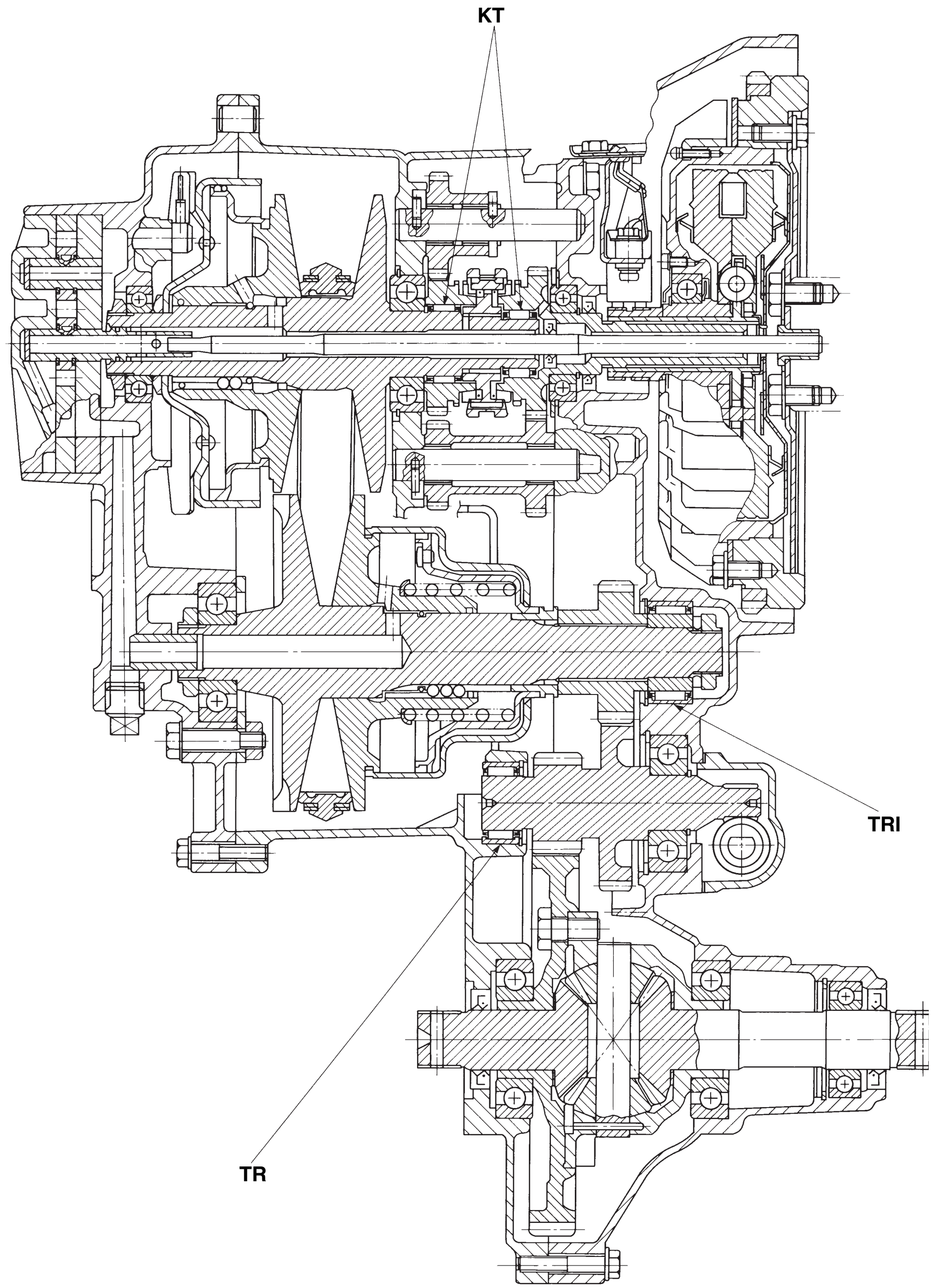
Automobiles, vehicles



●Automobile transmission

Automobiles, vehicles

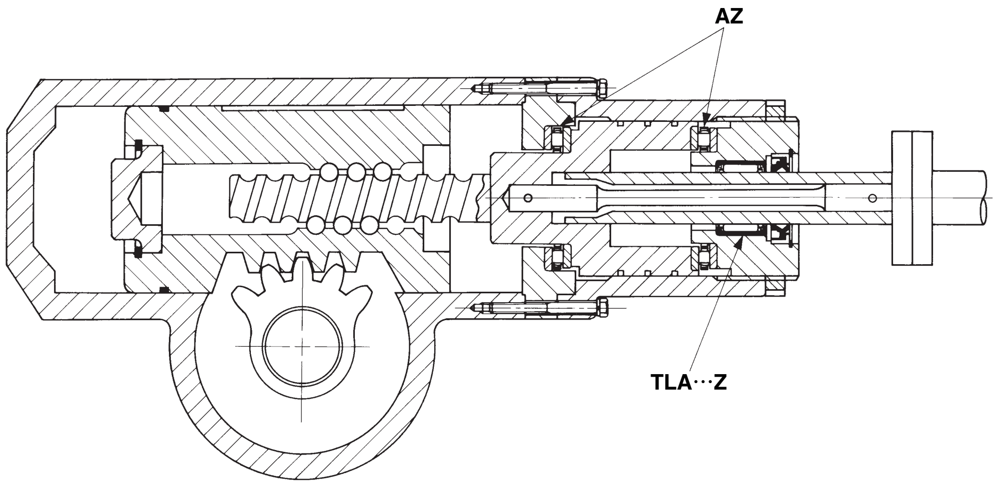
●Automobile automatic transmission



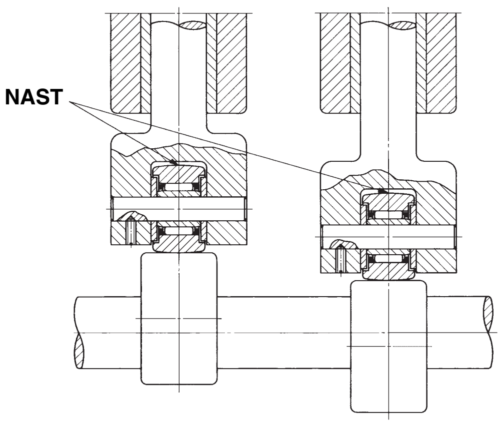
M

Automobiles, vehicles

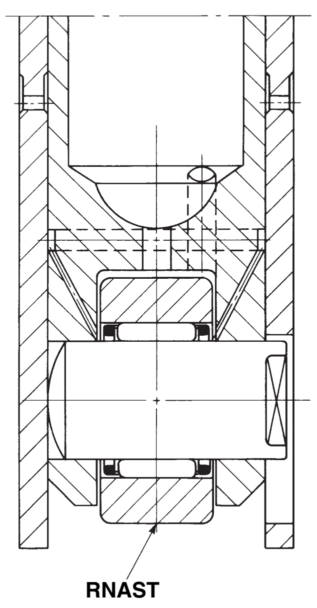
●Power steering



●Cam shaft valve lifter of diesel engine

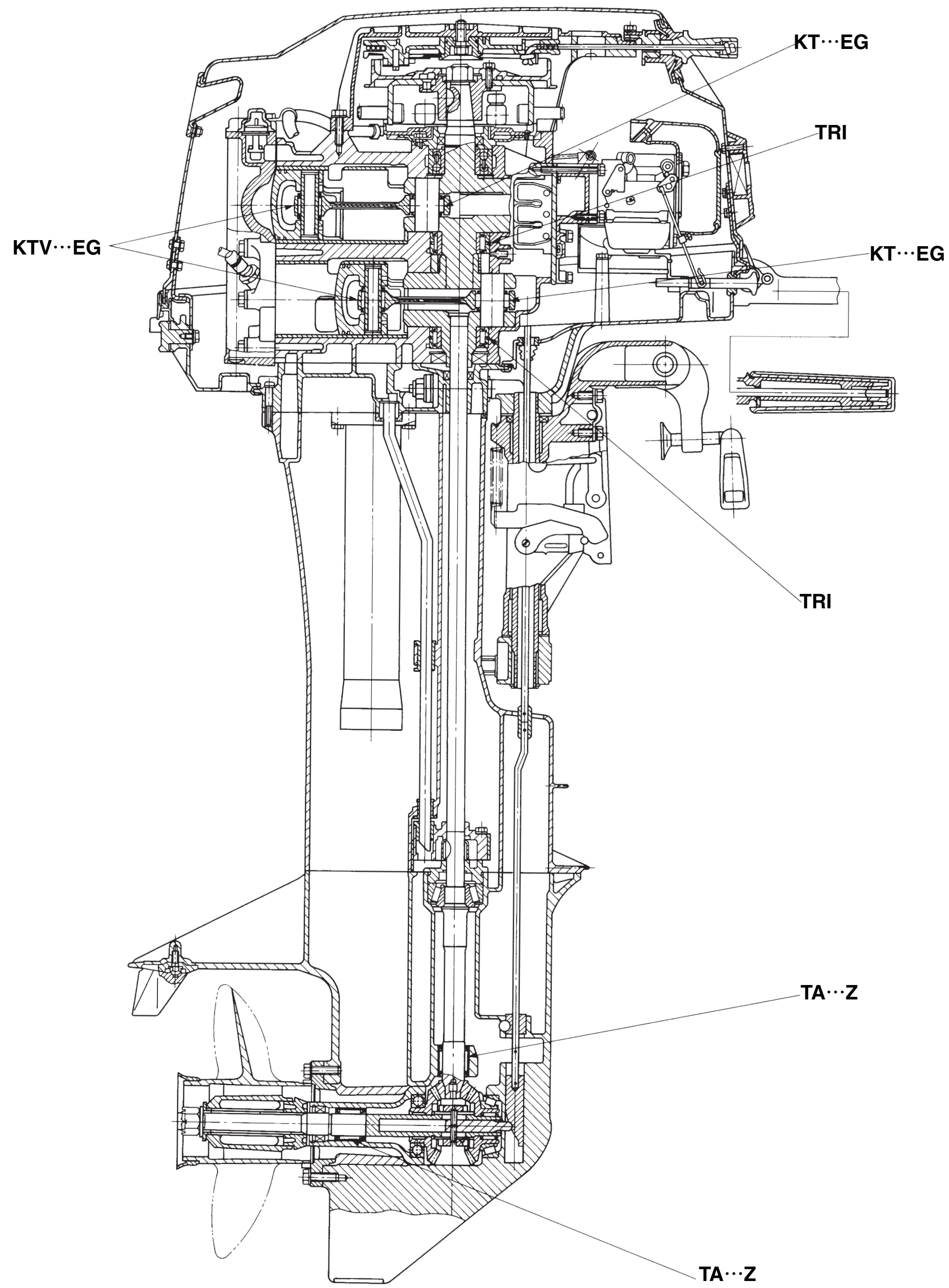


●Cam roller of diesel engine



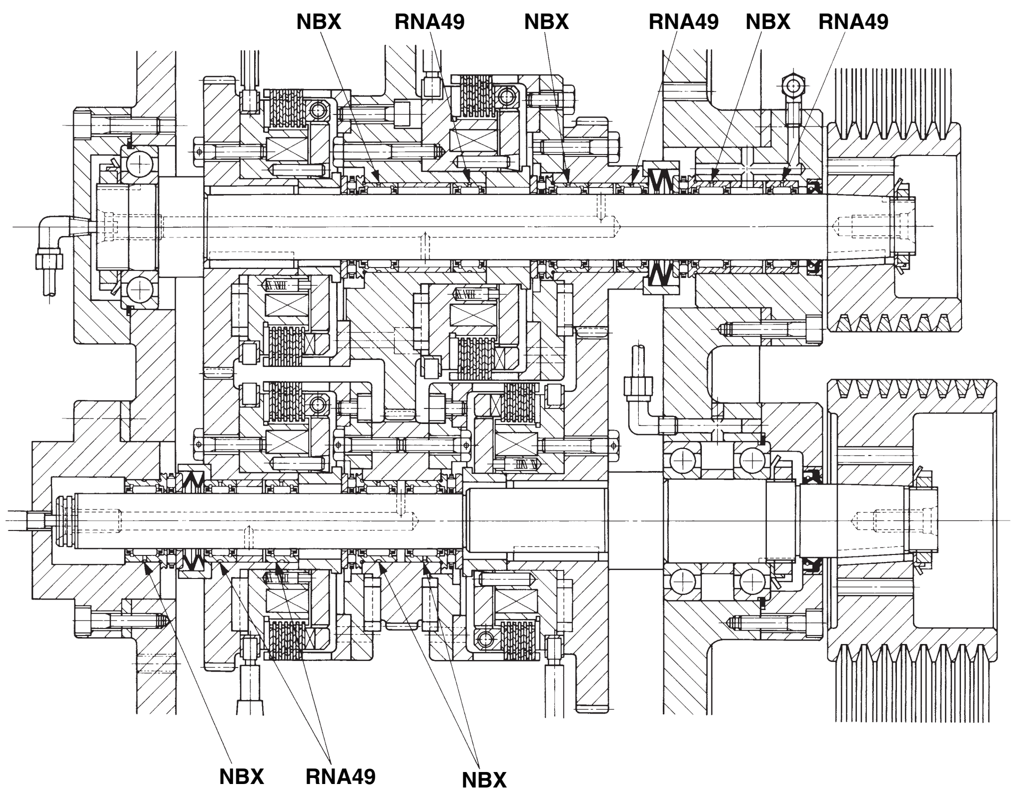
Automobiles, vehicles

●Outboard engine



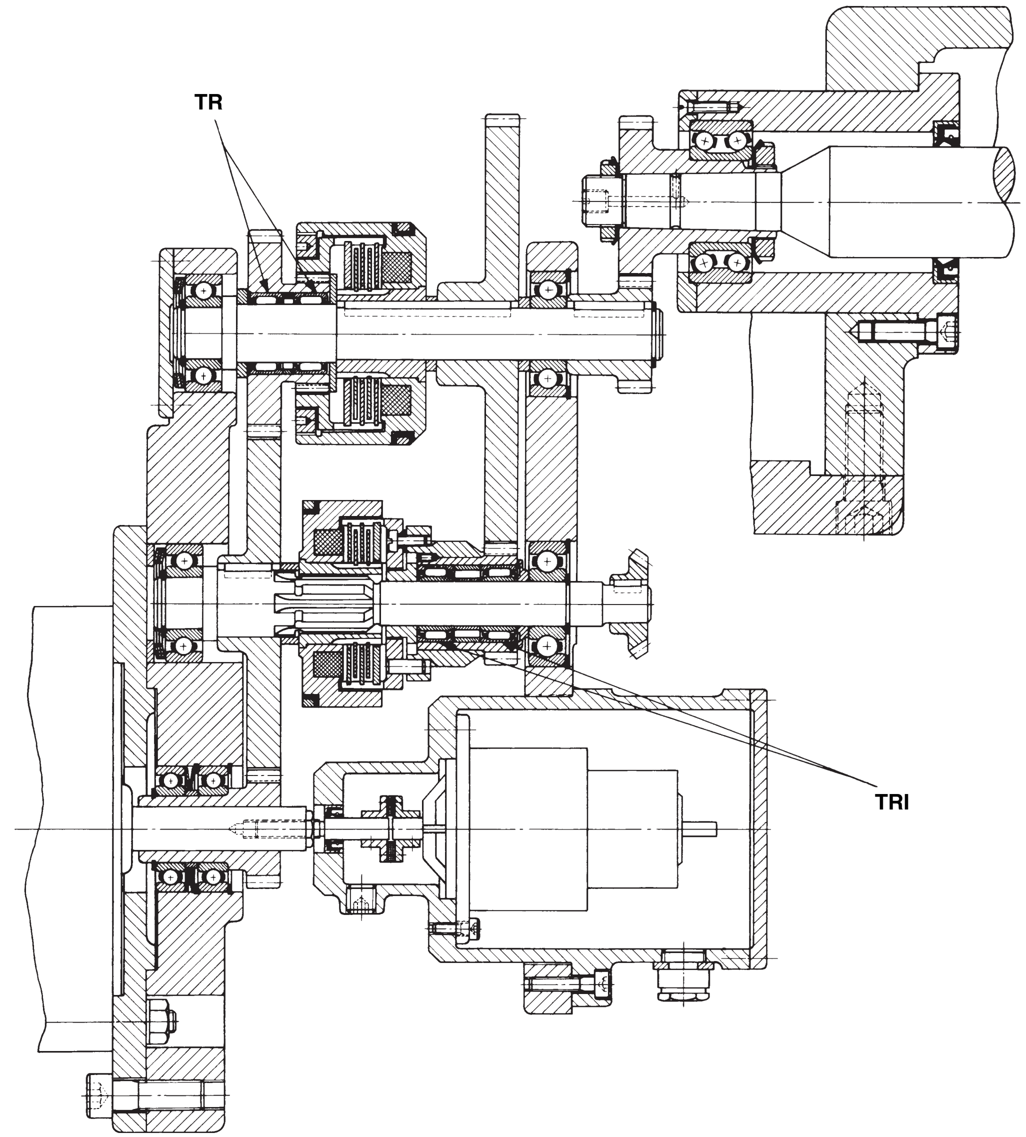
Machine tools

●Transmission of NC lathe



Machine tools

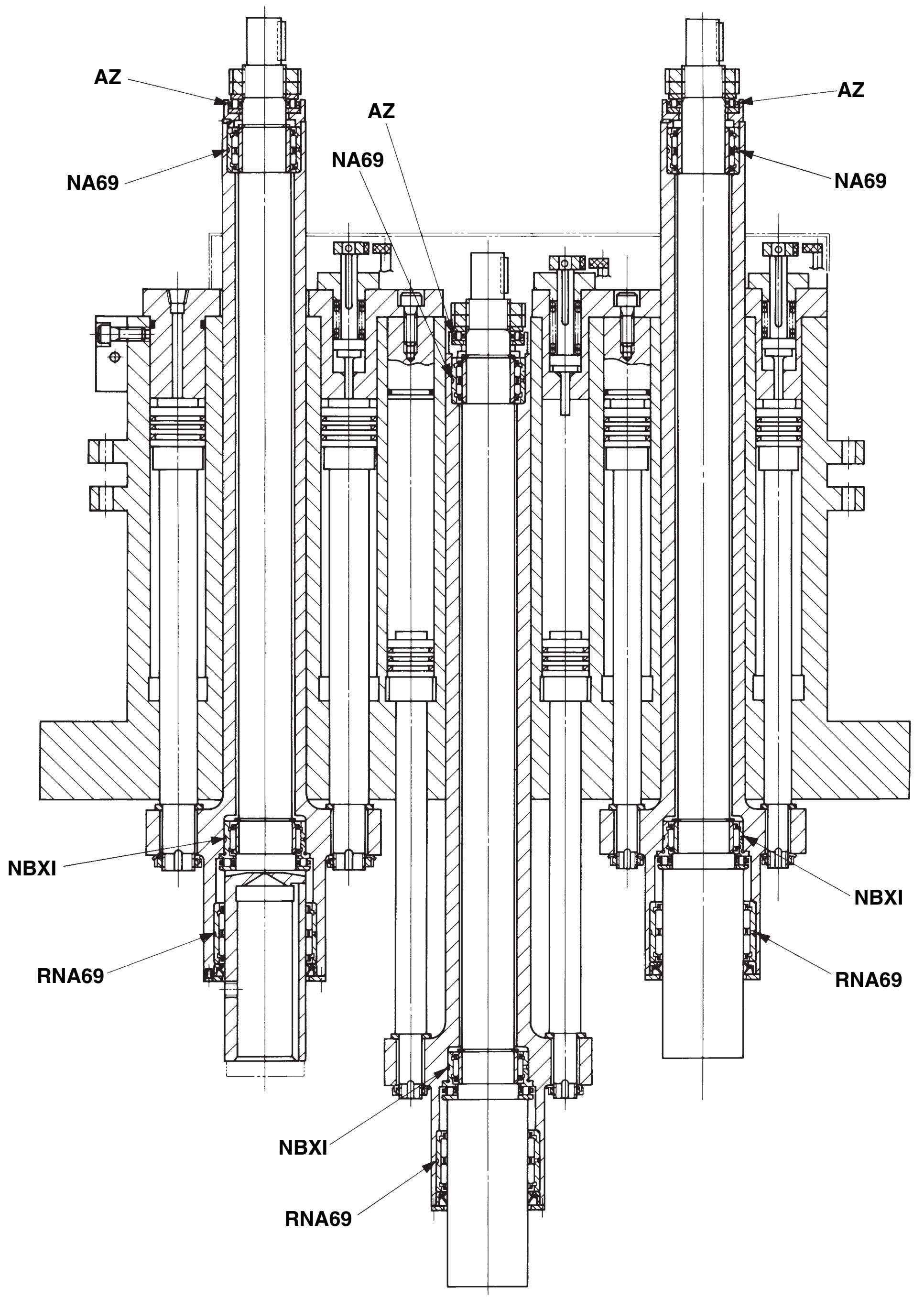
●Gear box for traversing feed of automatic lathe



M

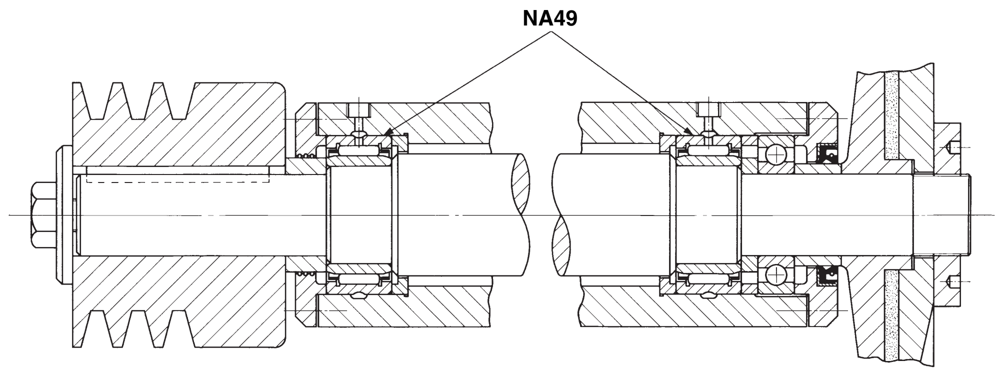
Machine tools

●Main spindles of multi-spindle drilling machine

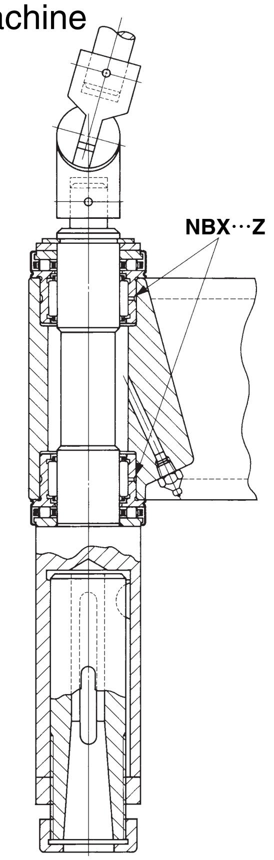


Machine tools

●Main spindle of cutting-off wheel

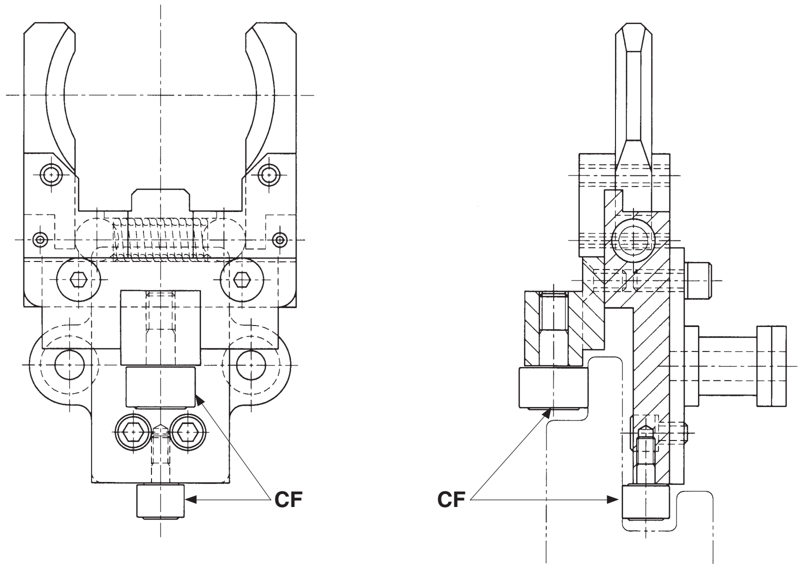


●Main spindle of drilling machine

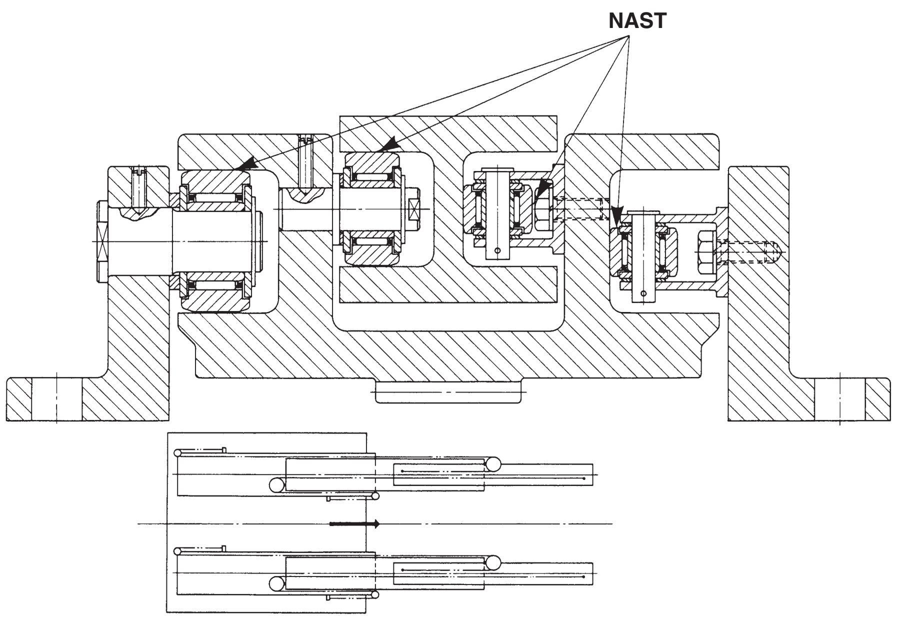


Machine tools

● Automatic tool changer



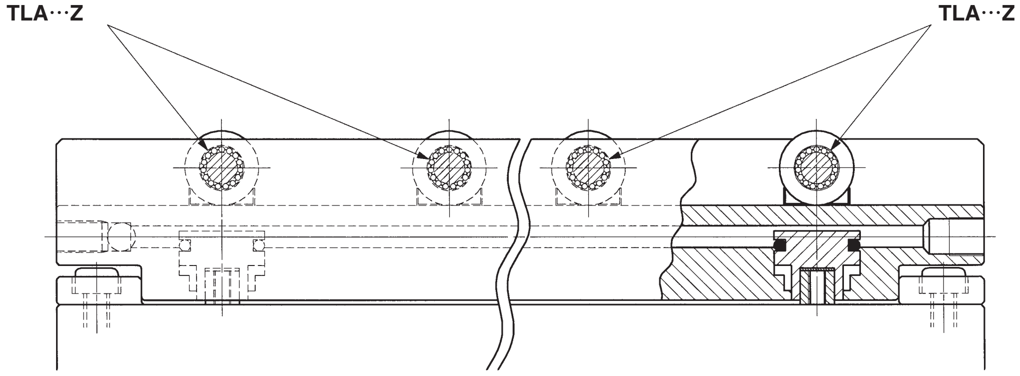
● Shuttle fork



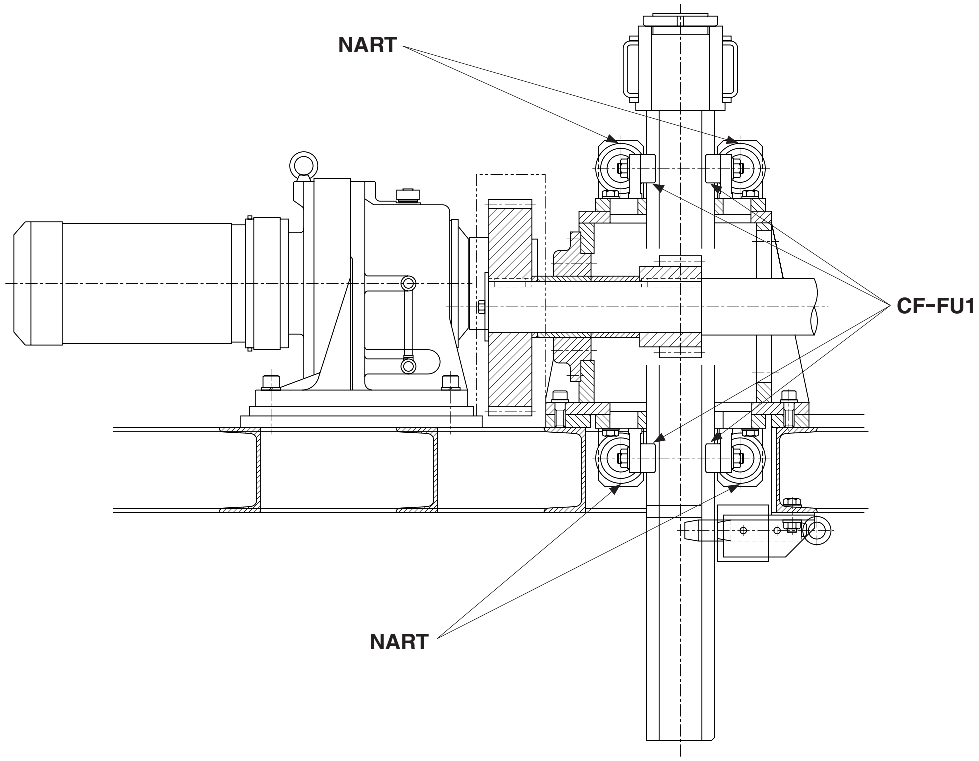
IKO

Machine tools

● Die lifter



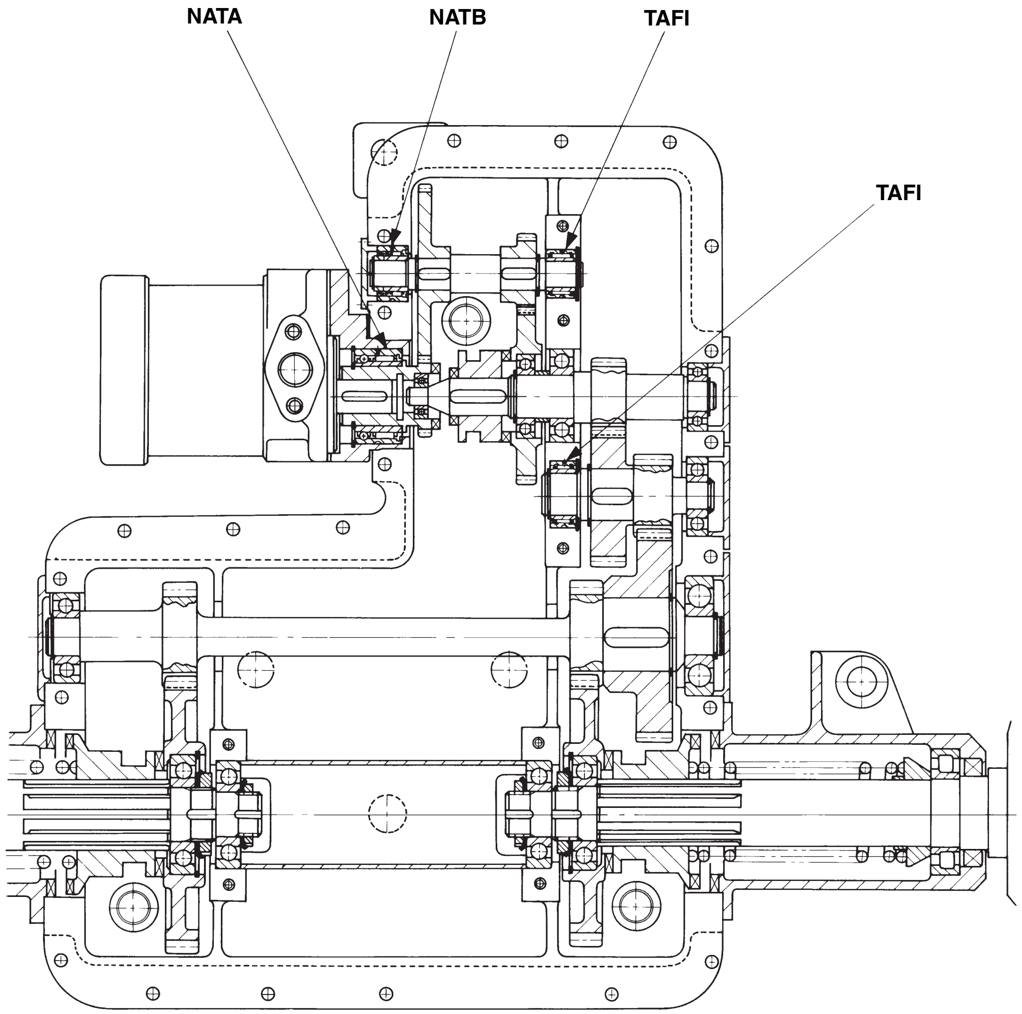
● Elevator of manufacturing line



M

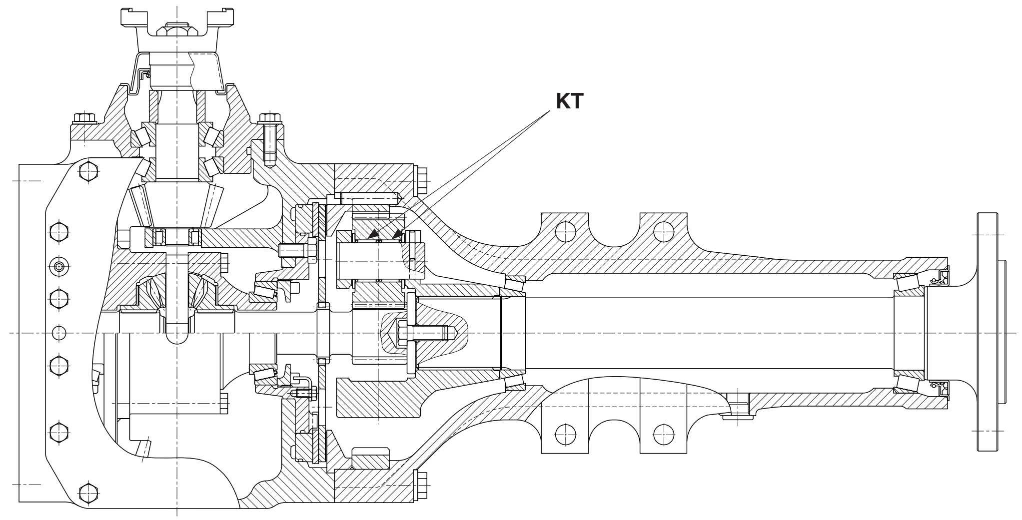
Construction machinery

●Transmission of construction machine

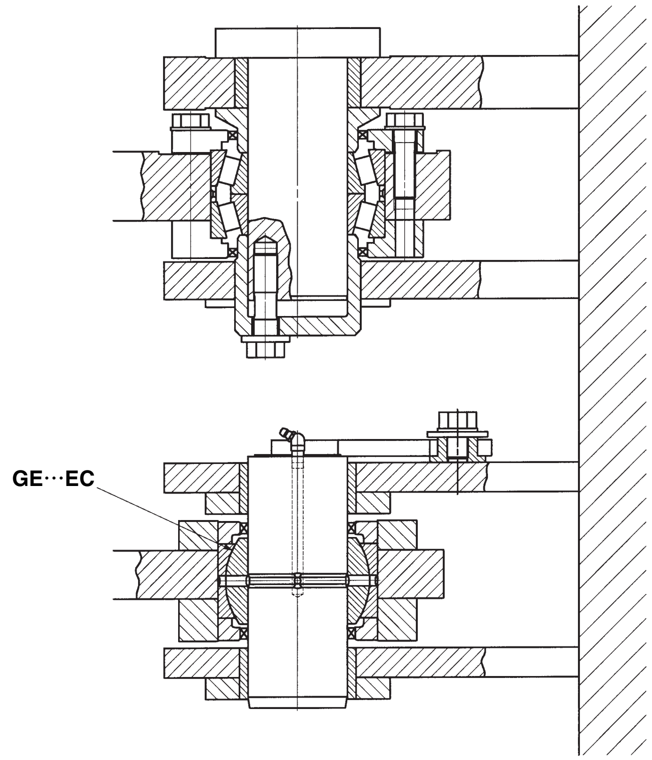


Construction machinery

●Axle of wheel loader

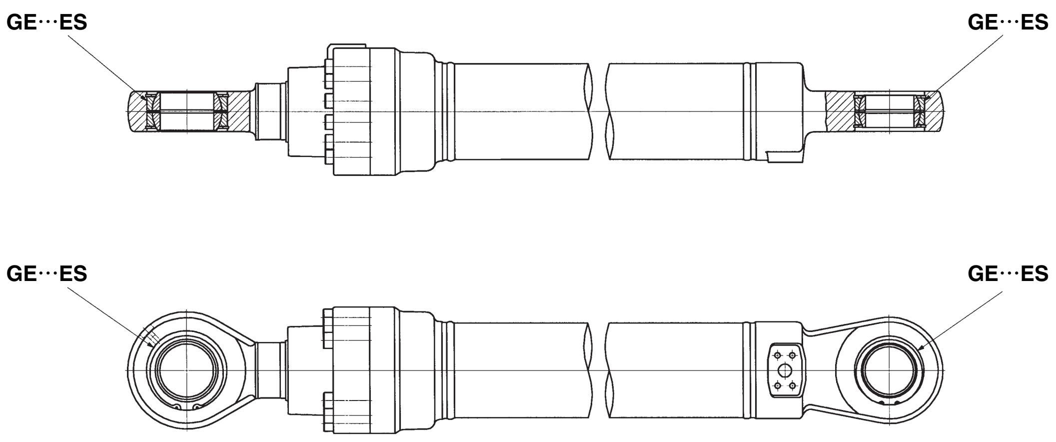


●Center pin of wheel loader

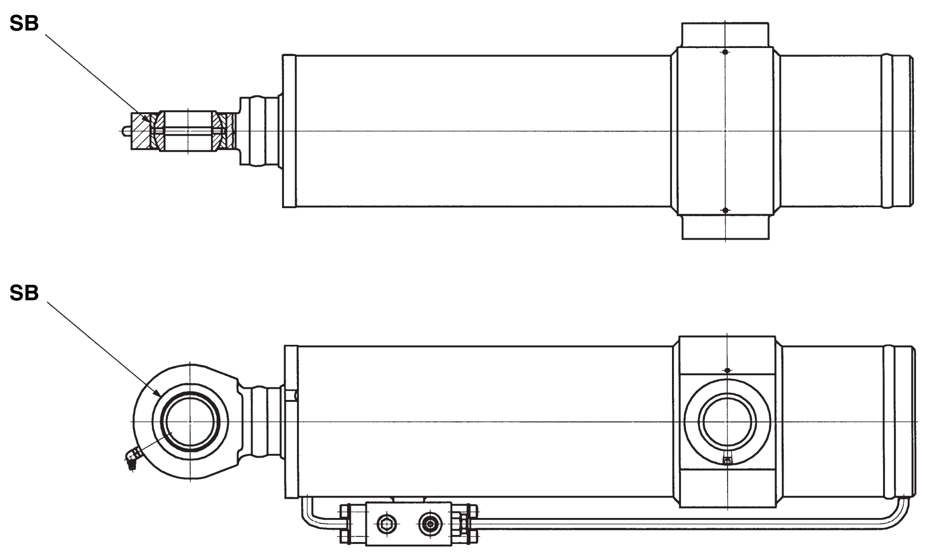


Transfer system

●Hydraulic cylinder arm of construction machine



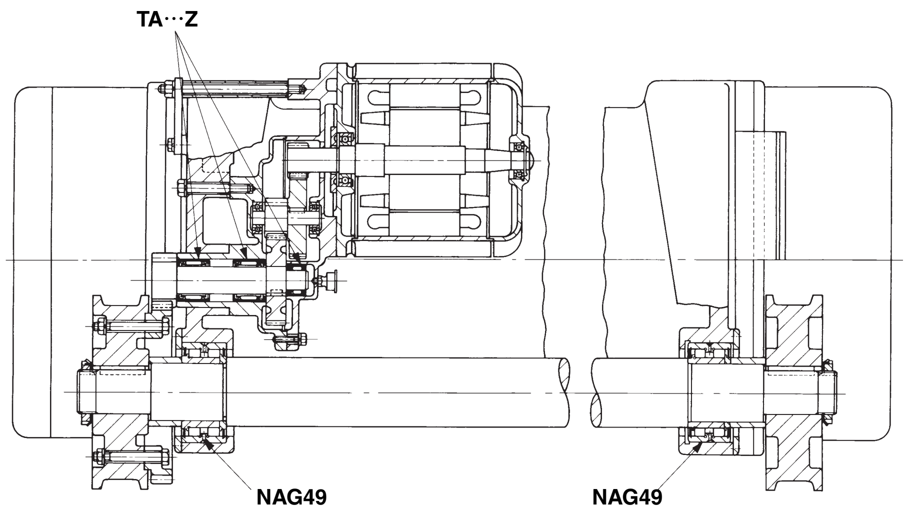
●Leveler of high lift work vehicle



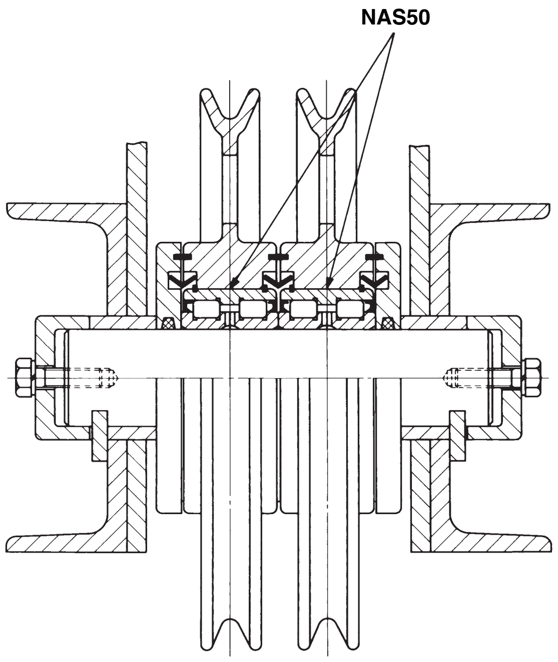
IKO

Transfer system

●Overhead crane

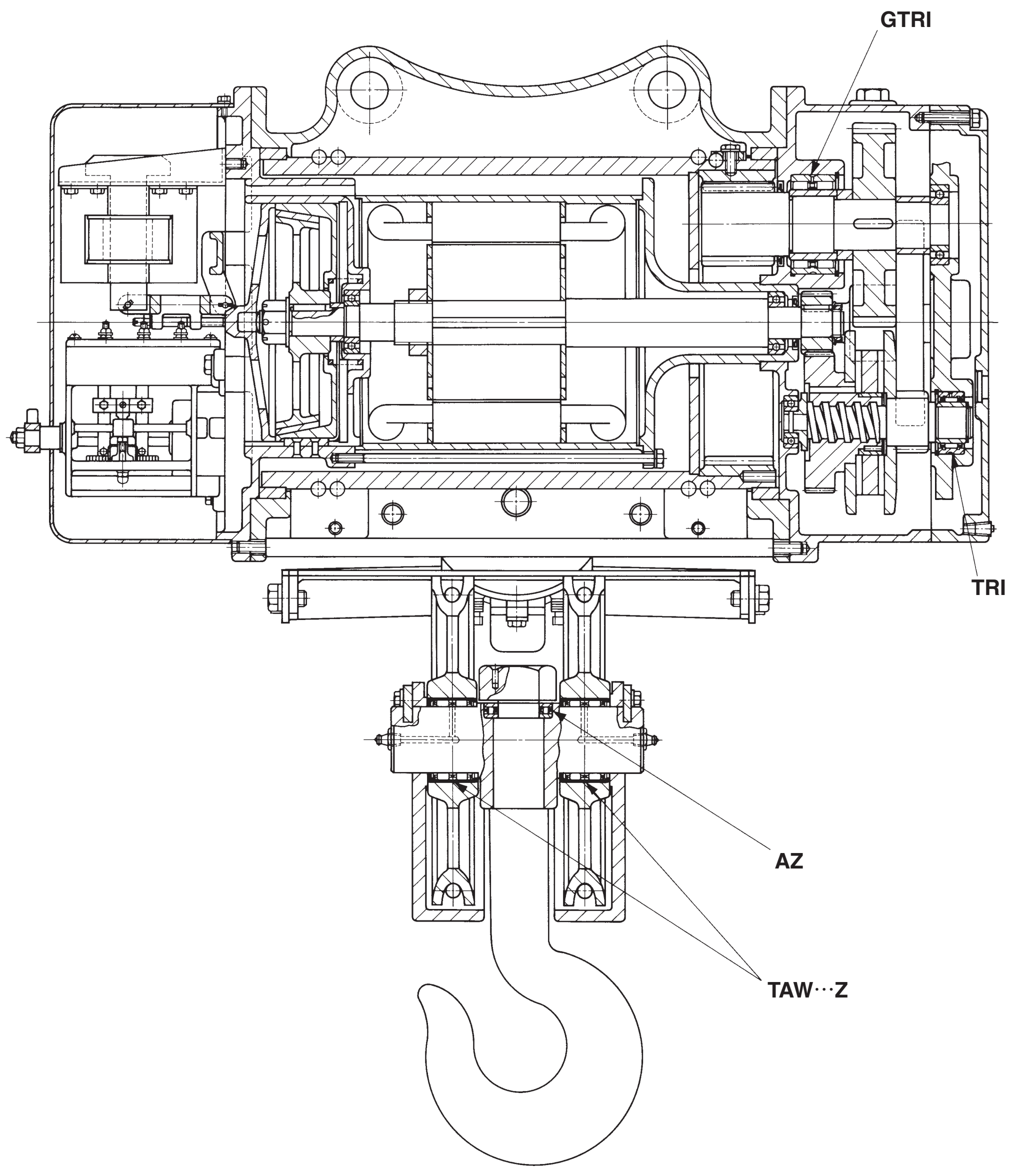


●Sheave



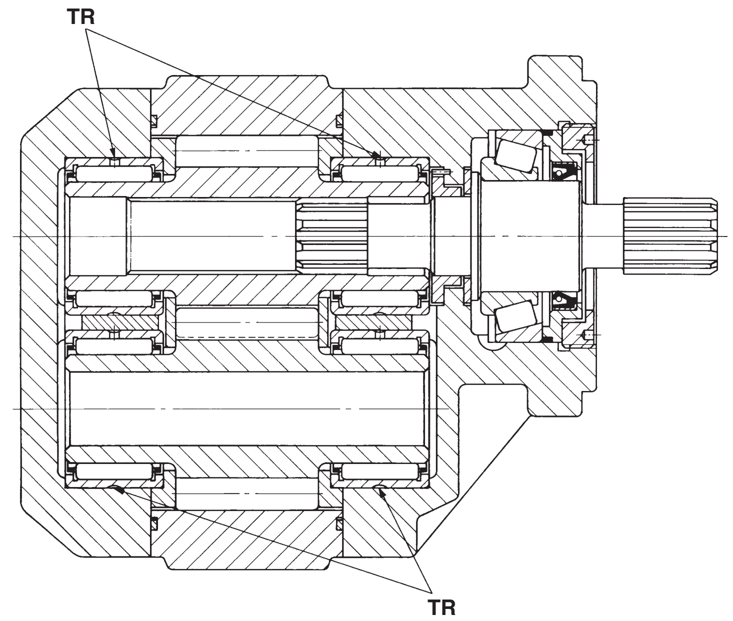
Transfer system

● Transfer system

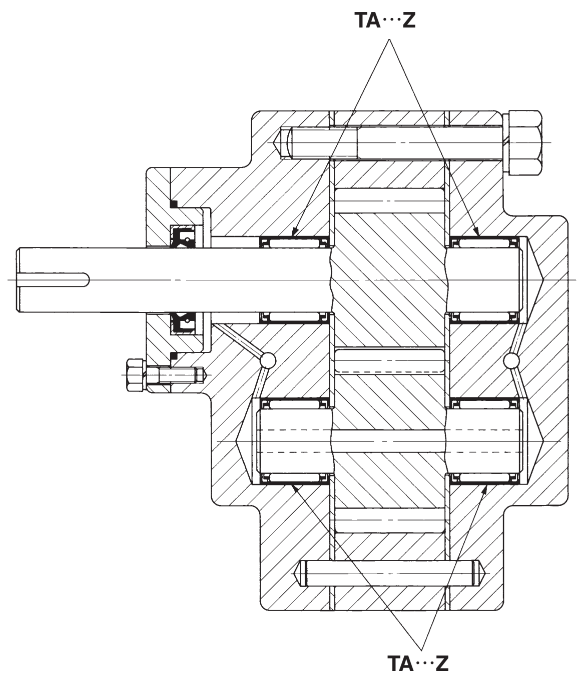


Hydraulic machines

● High pressure gear pump

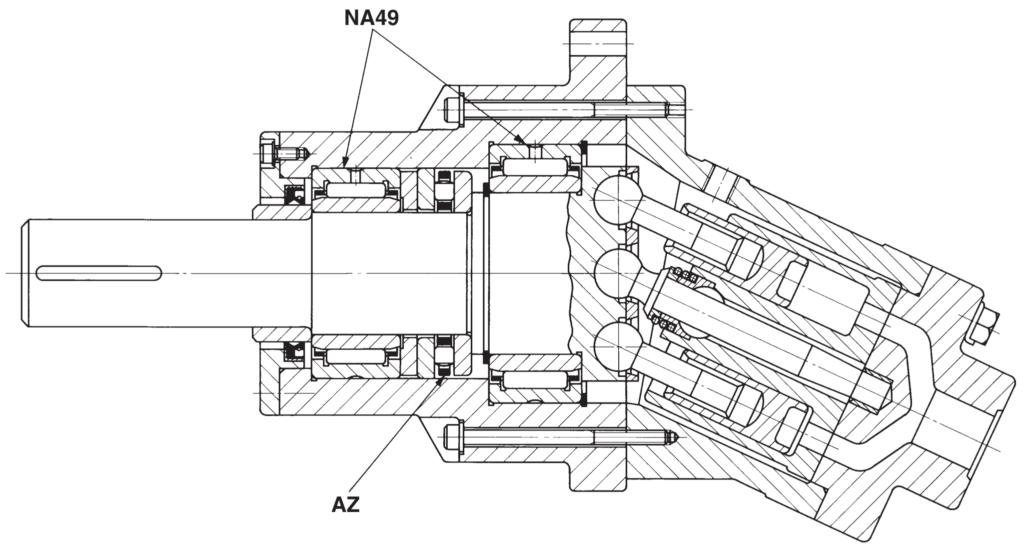


● Low pressure gear pump

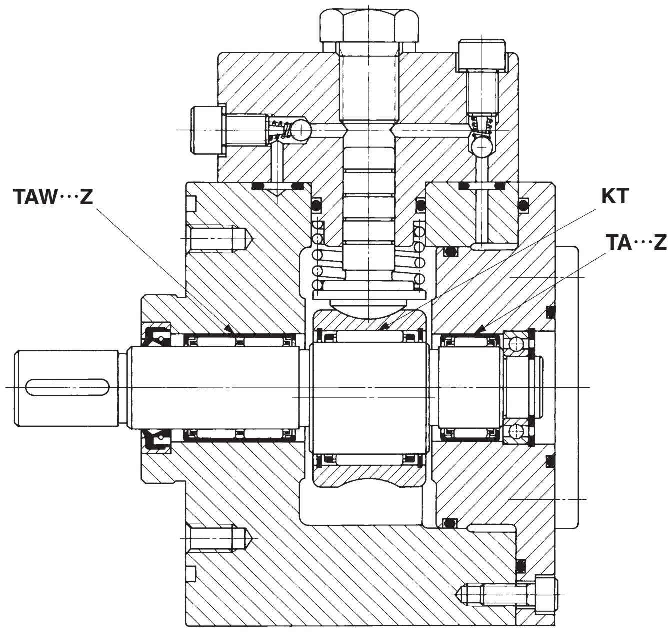


Hydraulic machines

● Rotary plunger pump

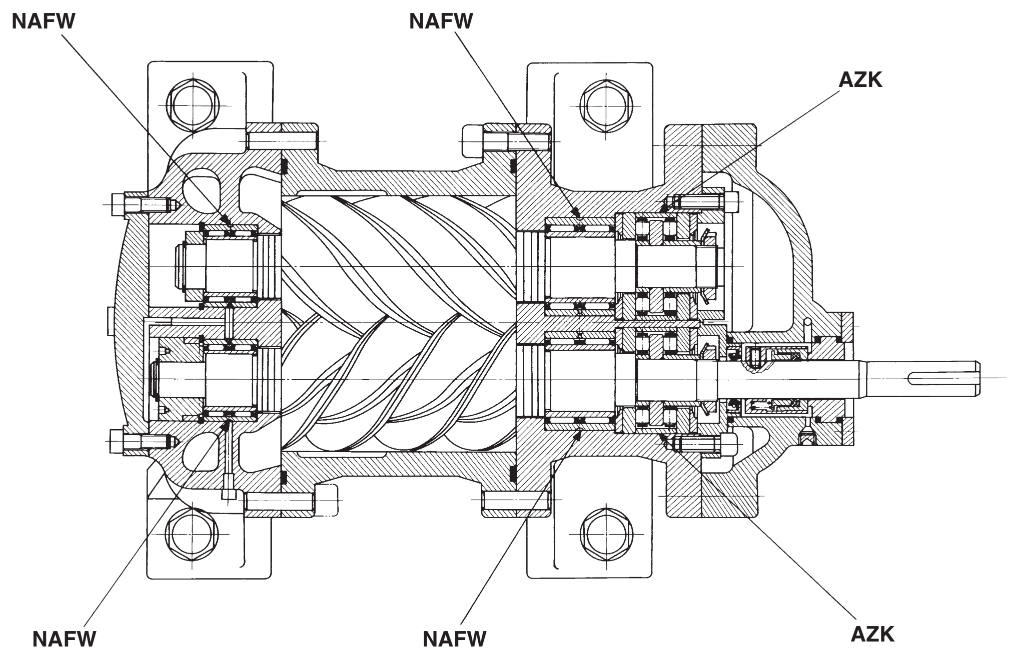


● Radial plunger pump

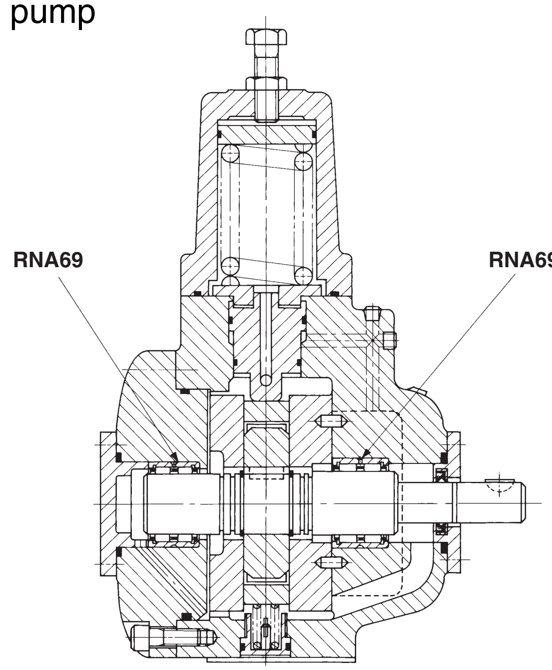


Hydraulic machines

● Screw pump

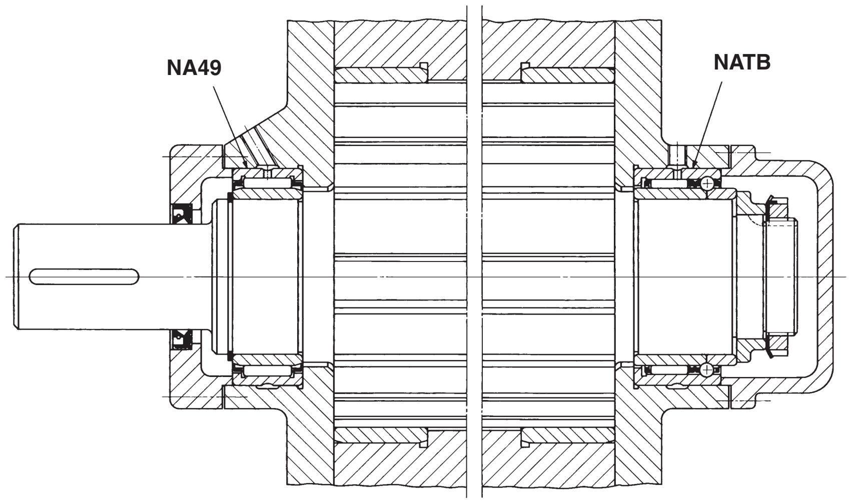


● Variable vane pump

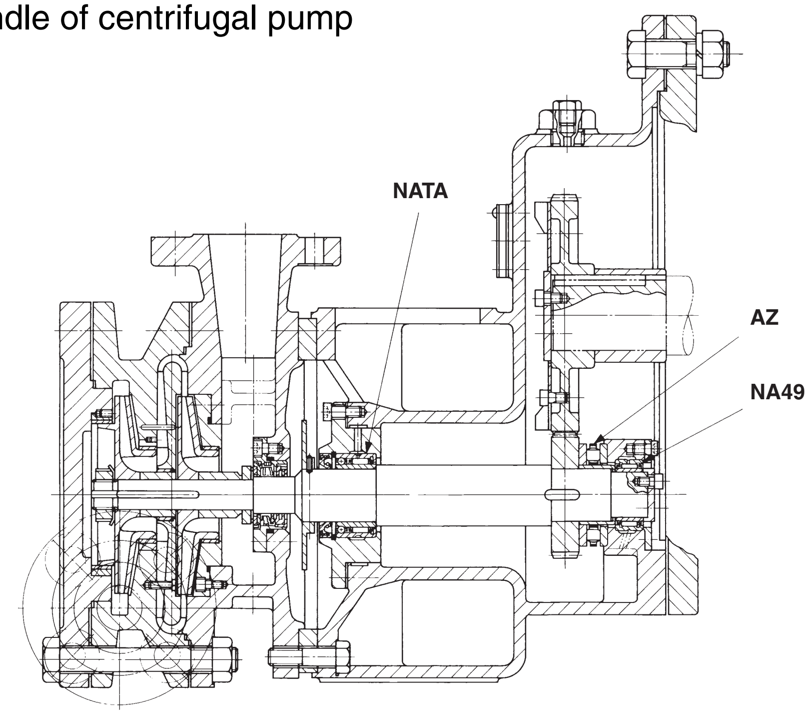


Fluid machines

●Multi-vane rotary compressor

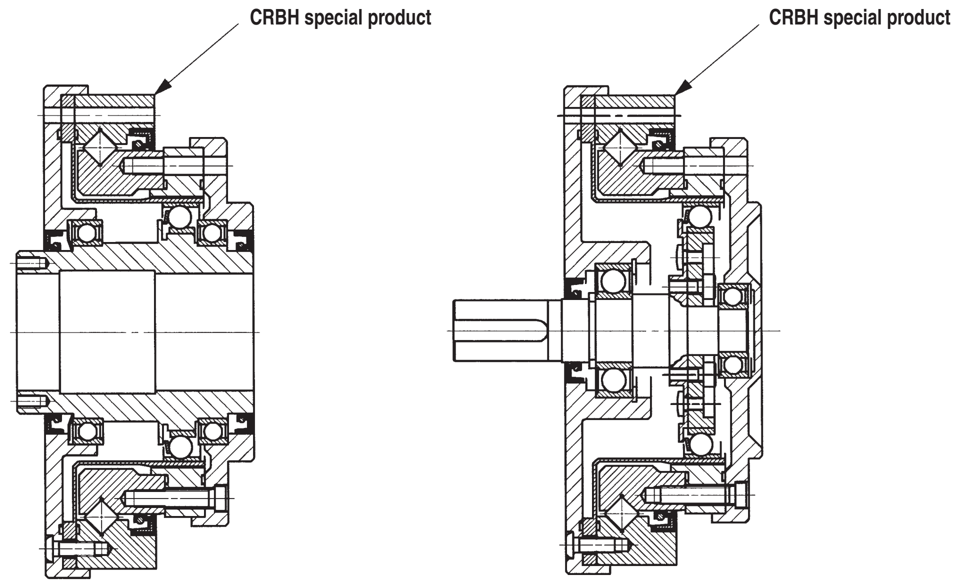


●Spindle of centrifugal pump

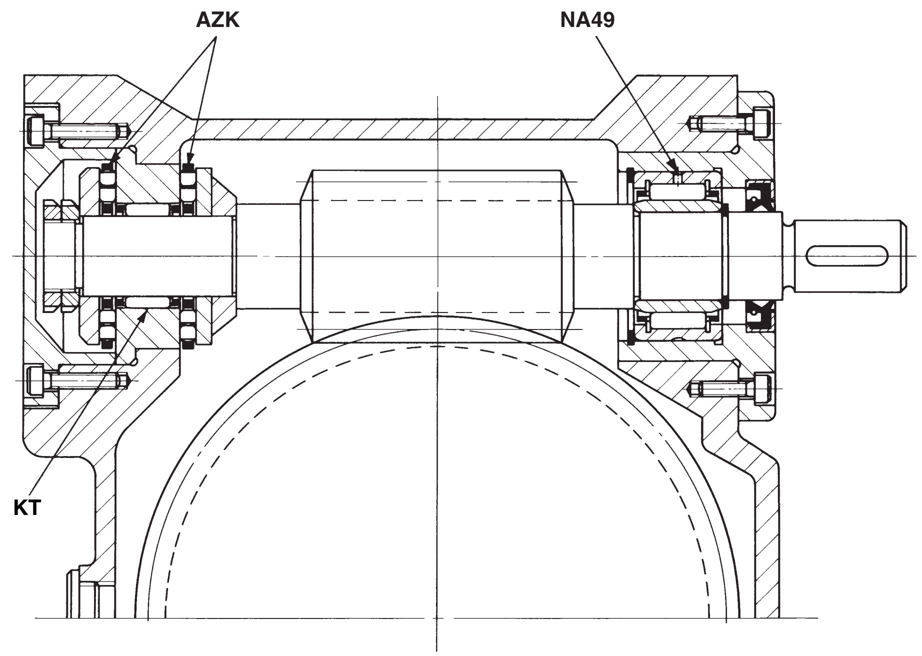


Transmissions

●Special thin type transmission

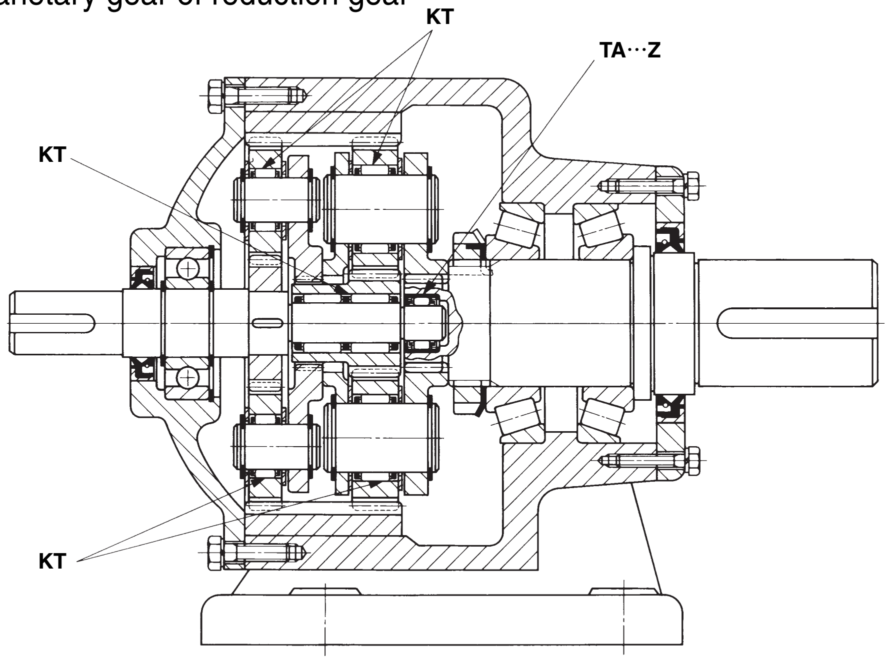


●Reduction worm gear

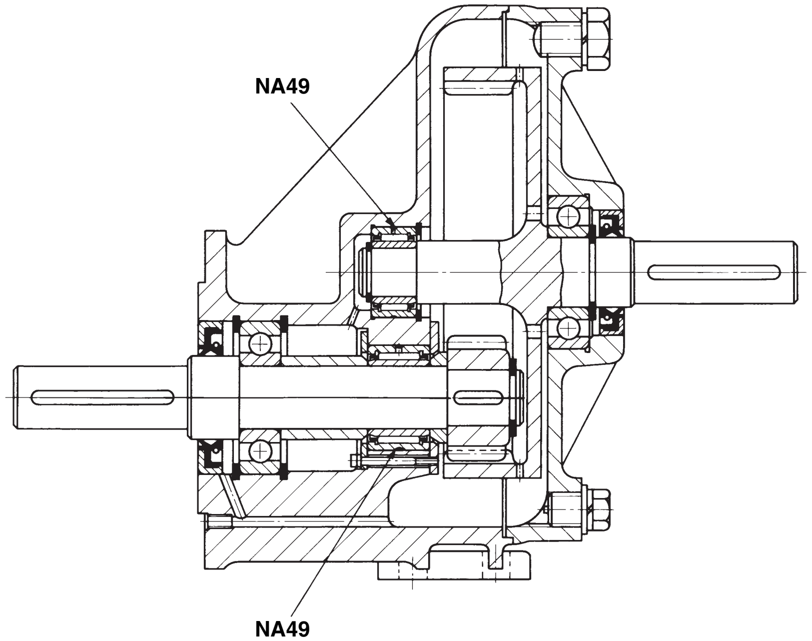


Transmissions

● Planetary gear of reduction gear

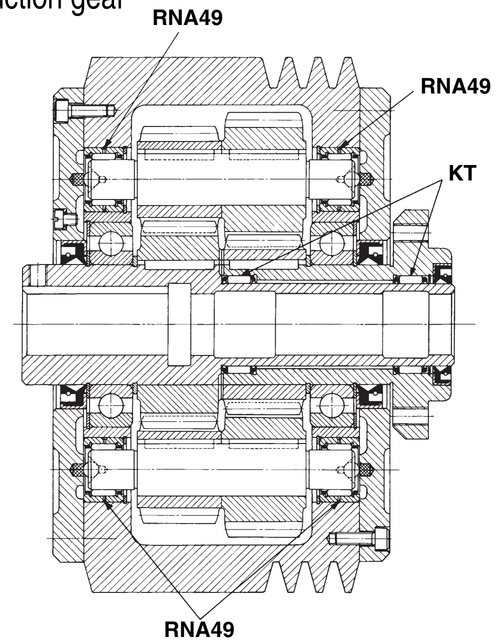


● Special small size reduction gear



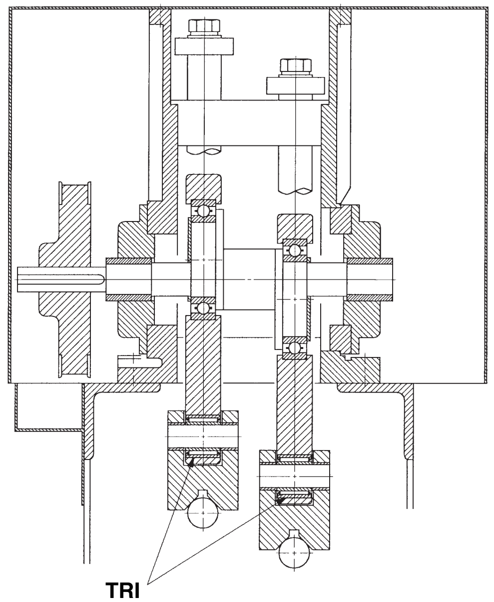
Transmission

● Belt pulley with reduction gear



Food processing machine

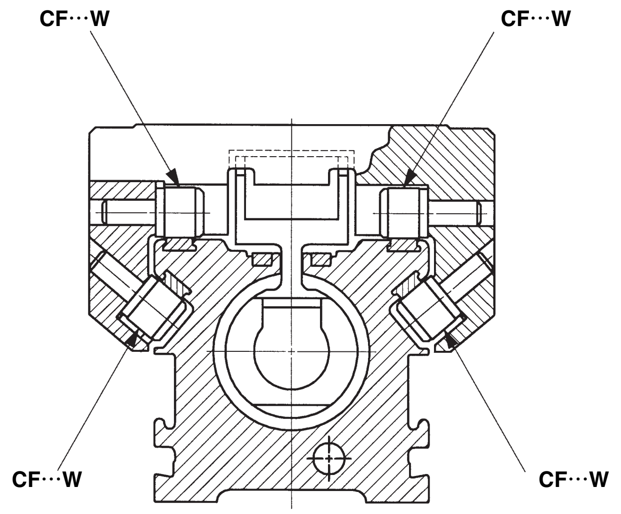
● Food cutter



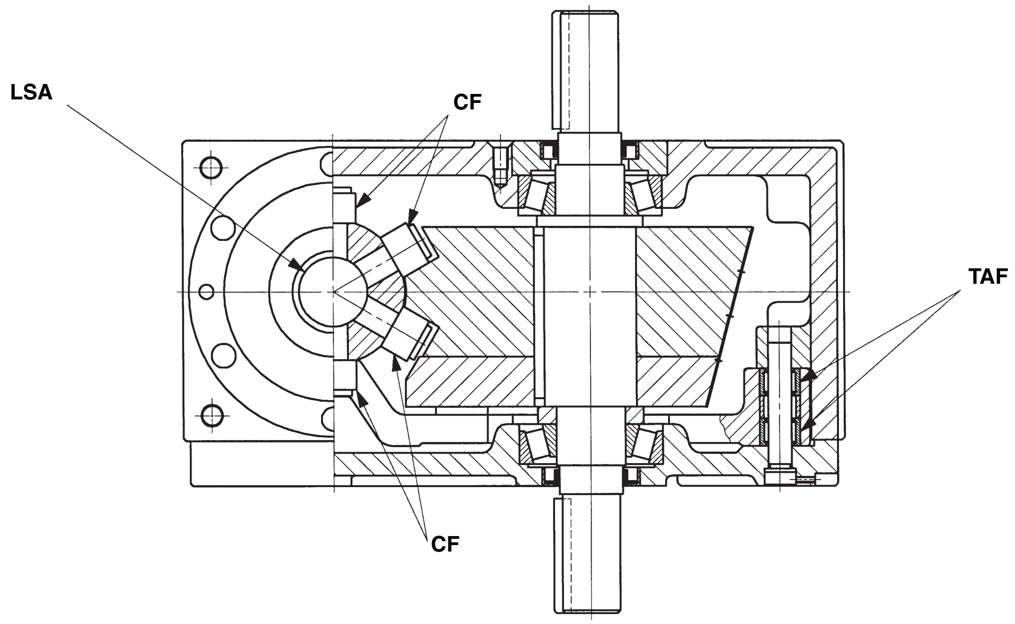
M

Pneumatic equipment

● Rodless cylinder

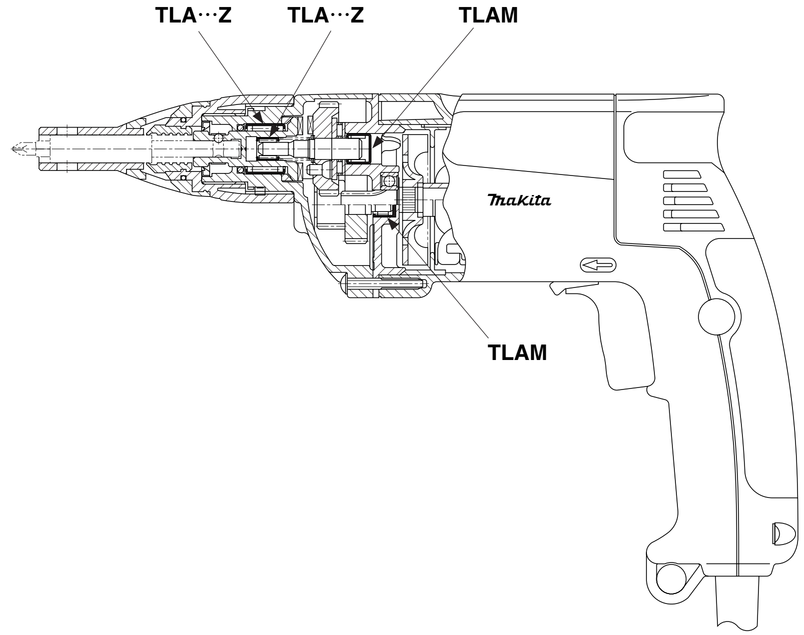


● Swivel type pick & place unit

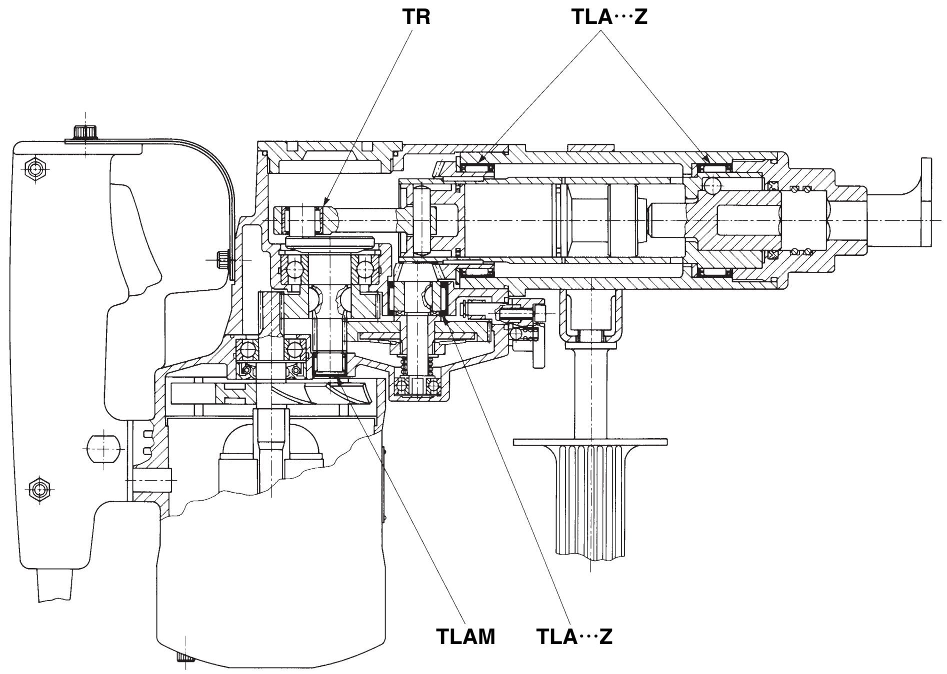


Power tools

● Screwdriver

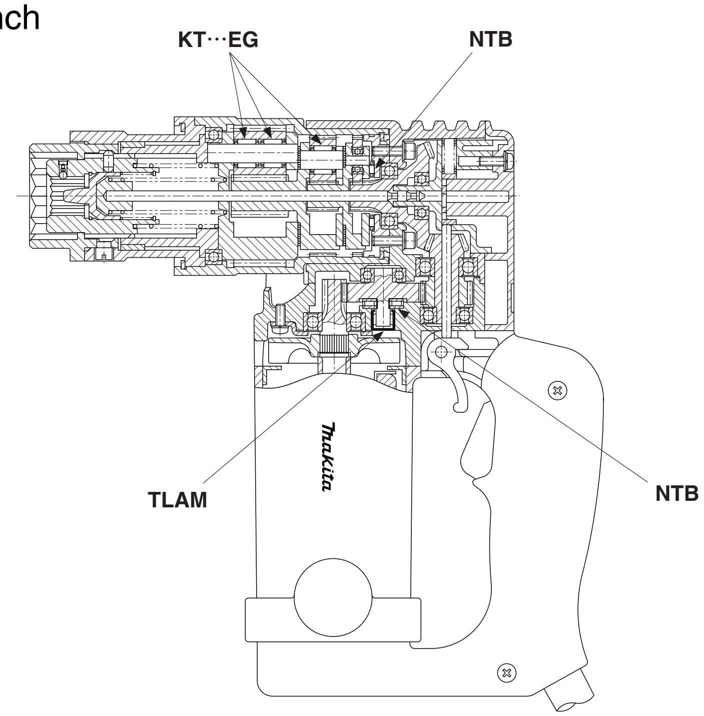


● Hammer drill

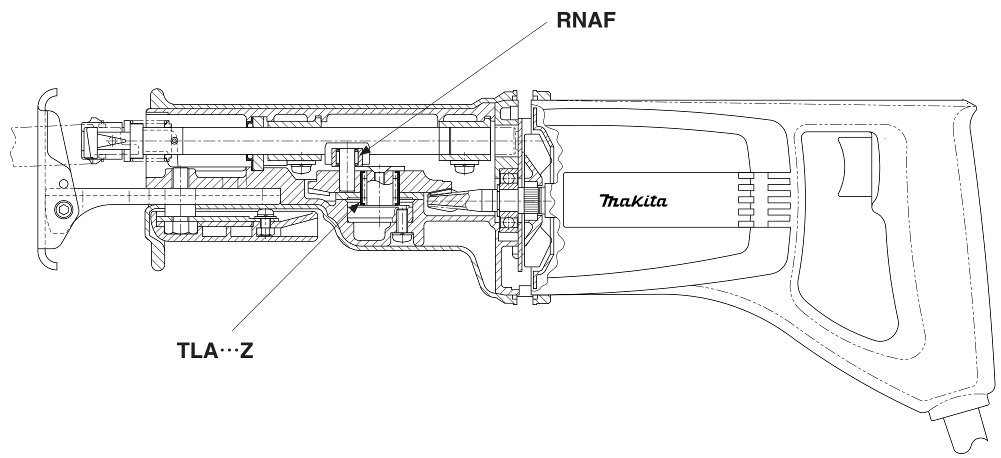


Power tools

● Shear wrench

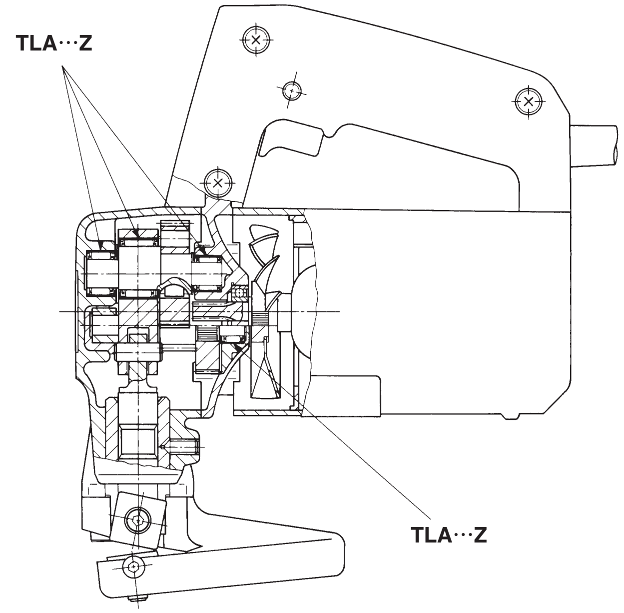


● Reciprocating saw

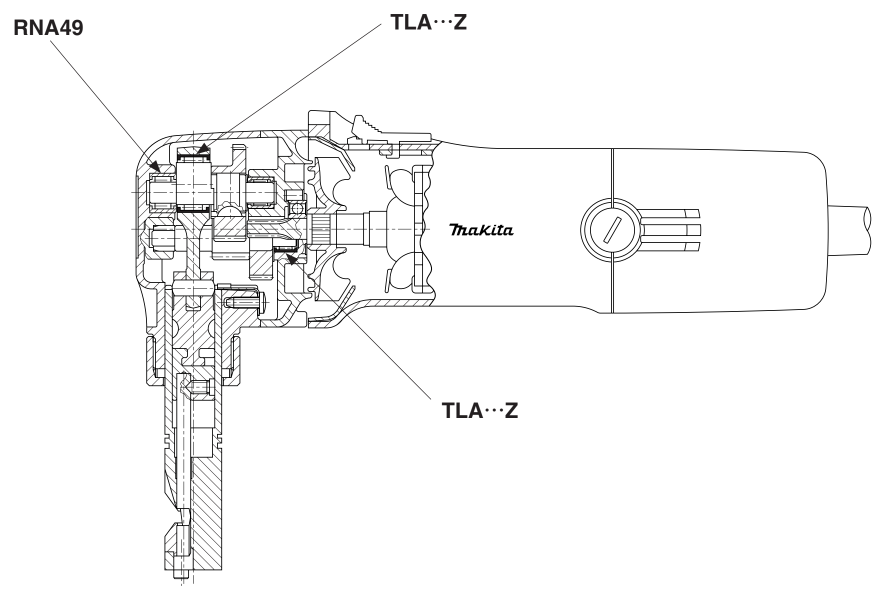


Power tools

● Shear



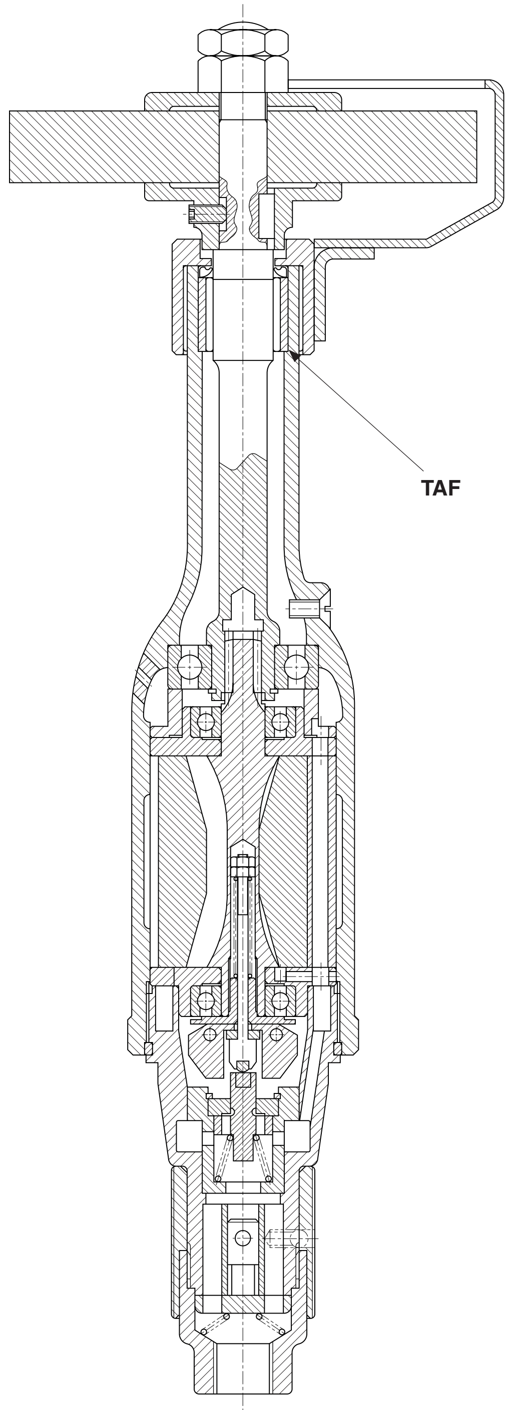
● Nibbler



IKO

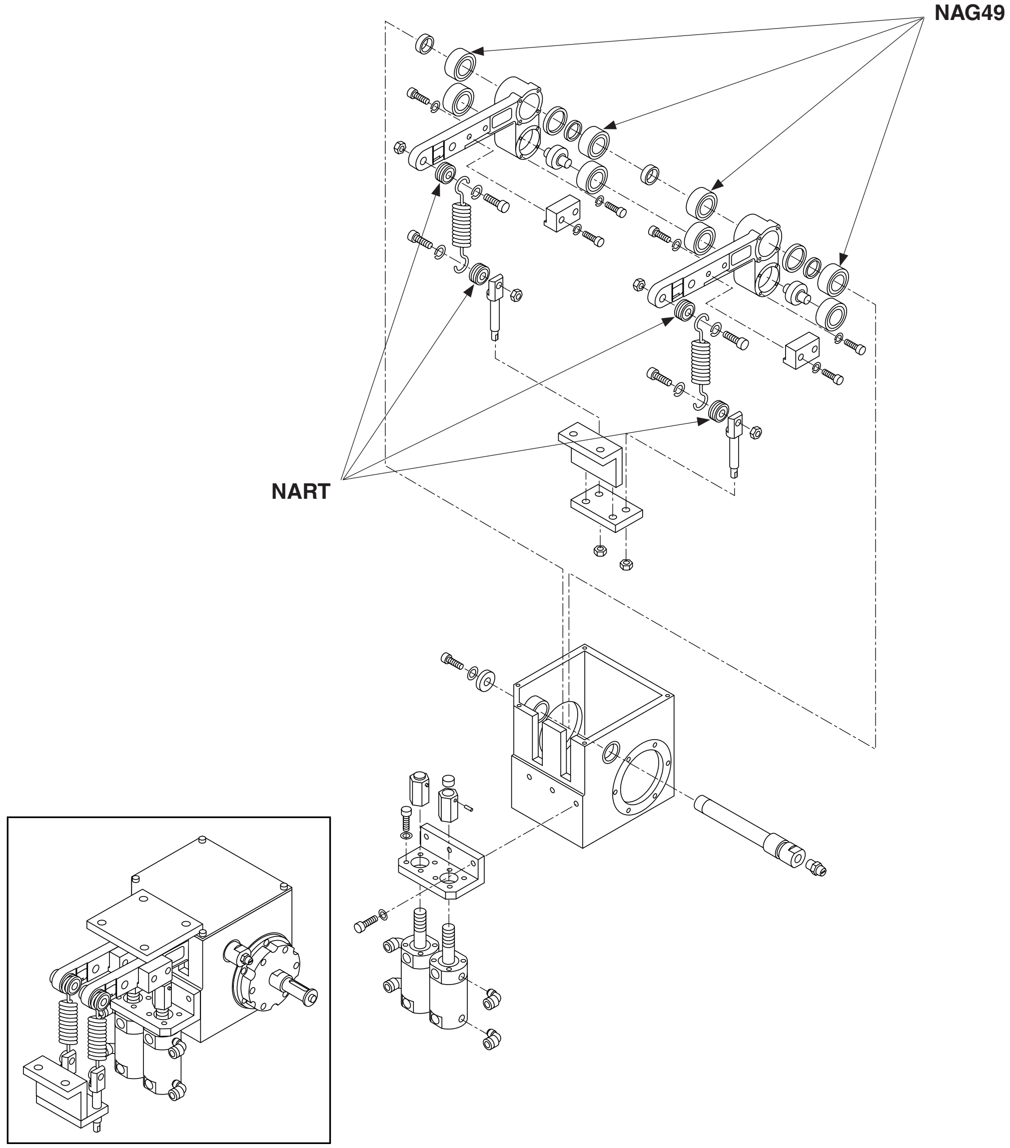
Power tools

●Portable grinder



High-speed chip mounter

●Cam box



MISCELLANEOUS TABLES

Conversion Table of Units

Comparison table between SI units (system of international units), CGS units and gravitational system of units

System of units \ Item	Length	Mass	Time	Acceleration	Force	Stress	Pressure
SI units	m	kg	s	m/s^2	N	Pa	Pa
CGS units	cm	g	s	Gal	dyn	dyn/cm^2	dyn/cm^2
Grav. units	m	kgf·s^2/m	s	m/s^2	kgf	kgf/m^2	kgf/m^2

System of units \ Item	Energy	Power	Temperature	Viscosity	Kinematic viscosity	Magnetic flux	Magnetic flux density	Magnetic field intensity
SI units	J	W	K	Pa·s	m^2/s	Wb	T	A/m
CGS units	erg	erg/s	°C	P	St	Mx	Gs	Oe
Grav. units	kgf·m	kgf·m/s	°C	kgf·s/m^2	m^2/s	—	—	—

Conversion rates into SI units

Item	Unit name	Symbol	Conversion rate into SI	SI unit name	Symbol
Angle	Degree Minute Second	° ′ ″	π/180 π/10 800 π/648 000	Radian	rad
Length	Meter Micronmeter Angstrom X-ray unit Nautical mile	m µ Å n mile	1 10^{-6} 10^{-10} ≈1.002 08×10^{-13} 1852	Meter	m
Area	Square meter Are Hectare	m^2 a ha	1 10^2 10^4	Square meter	m^2
Volume	Cubic meter Liter	m^3 l, L	1 10^{-3}	Cubic meter	m^3
Mass	Kilogram Ton Atomic mass unit	kg t u	1 10^3 ≈1.660 57×10^{-27}	Kilogram	kg
Time	Second Minute Hour Day	s min h d	1 60 3 600 86 400	Second	s
Velocity	Meter per second Knot	m/s kn	1 1 852/3 600	Meter per second	m/s
Frequency and number of oscillations per time	Cycle	s^{-1}	1	Hertz	Hz
Rotation speed	Rotation per minute	rpm	1/60	Per second	s^{-1}
Angular velocity	Radian per second	rad/s	1	Radian per second	rad/s
Acceleration	Meter per square second G	m/s^2 G	1 9.806 65	Meter per square second	m/s^2
Force	Kilogram force Ton force Dyne	kgf tf dyn	9.806 65 9 806.65 10^{-5}	Newton	N
Moment of force	Kilogram force-meter	kgf·m	9.806 65	Newton-meter	N·m
Stress and pressure	Kilogram force per square meter Kilogram force per square centimeter Kilogram force per square millimeter	kgf/m^2 kgf/cm^2 kgf/mm^2	9.806 65 9.806 65×10^4 9.806 65×10^6	Pascal	Pa
Pressure	Hydro-column meter Mercurial column millimeter Torr Atmosphere Bar	mH$_2$O mmHg Torr atm bar	9 806.65 101 325/760 101 325/760 101 325 10^5	Pascal	Pa
Energy	Erg IT calorie Kilogram force - meter Kilowatt hour Horse power hour (French) Electron volt	erg cal$_{IT}$ kgf·m kW·h PS·h eV	10^{-7} 4.186 8 9.806 65 3.600×10^6 ≈2.647 79×10^6 ≈1.602 19×10^{-19}	Joule	J
Power	Watt Horse power (French) Kilogram force -meter per second	W PS kgf·m/s	1 ≈735.5 9.806 65	Watt	W
Viscosity	Poise Centipoise Kilogram force-second per square meter	P cP kgf·s/m^2	10^{-1} 10^{-3} 9.806 65	Pascal-second	Pa·s
Kinematic viscosity	Stokes Centistokes	St cSt	10^{-4} 10^{-6}	Square meter per second	m^2/s
Temperature	Degree	°C	+273.15	Kelvin	K
Radioactivity	Curie	Ci	3.7×10^{10}	Becquerel	Bq
Exposure dose	Roentgen	R	2.58×10^{-4}	Coulomb per kilogram	C/kg
Absorbed dose	Rad	rad	10^{-2}	Gray	Gy
Dose equivalent	Rem	rem	10^{-2}	Sievert	Sv
Magnetic flux	Maxwell	Mx	10^{-8}	Weber	Wb
Magnetic flux density	Gamma Gauss	γ Gs	10^{-9} 10^{-4}	Tesla	T
Magnetic field intensity	Oersted	Oe	$10^3/4\pi$	Ampere per meter	A/m
Quantity of electricity	Coulomb	C	1	Coulomb	C
Electric potential difference	Volt	V	1	Volt	V
Electrostatic capacity	Farad	F	1	Farad	F
(Electric) resistance	Ohm	Ω	1	Ohm	Ω
(Electric) conductance	Siemens	S	1	Siemens	S
Inductance	Henry	H	1	Henry	H
Current	Ampere	A	1	Ampere	A

M

Inch-mm Conversion Table

1 inch = 25.4 mm

inch Fraction	inch Decimal	0″	1″	2″	3″	4″	5″	6″	7″	8″
	0		25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200
1 / 64″	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597
1 / 32″	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994
3 / 64″	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391
1 / 16″	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788
5 / 64″	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184
3 / 32″	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581
7 / 64″	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978
1 / 8″	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375
9 / 64″	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772
5 / 32″	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169
11 / 64″	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566
3 / 16″	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962
13 / 64″	0.203125	5.159	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359
7 / 32″	0.218750	5.556	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756
15 / 64″	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153
1 / 4″	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550
17 / 64″	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947
9 / 32″	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344
19 / 64″	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741
5 / 16″	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138
21 / 64″	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534
11 / 32″	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931
23 / 64″	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.528	186.928	212.328
3 / 8″	0.375000	9.525	34.925	60.325	85.725	111.125	136.525	161.925	187.325	212.725
25 / 64″	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	213.122
13 / 32″	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519
27 / 64″	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	213.916
7 / 16″	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312
29 / 64″	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709
15 / 32″	0.468750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106
31 / 64″	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503
1 / 2″	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900

1 inch = 25.4 mm

inch Fraction	inch Decimal	0″	1″	2″	3″	4″	5″	6″	7″	8″
33 / 64″	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297
17 / 32″	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694
35 / 64″	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091
9 / 16″	0.562500	14.288	39.688	65.088	90.488	115.888	141.288	166.688	192.088	217.488
37 / 64″	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884
19 / 32″	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281
39 / 64″	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678
5 / 8″	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075
41 / 64″	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472
21 / 32″	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869
43 / 64″	0.671875	17.066	42.466	67.866	93.266	118.666	144.066	169.466	194.866	220.266
11 / 16″	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662
45 / 64″	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059
23 / 32″	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456
47 / 64″	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853
3 / 4″	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250
49 / 64″	0.765625	19.447	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647
25 / 32″	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044
51 / 64″	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441
13 / 16″	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838
53 / 64″	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234
27 / 32″	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631
55 / 64″	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028
7 / 8″	0.875000	22.225	47.625	73.025	98.425	123.825	149.225	174.625	200.025	225.425
57 / 64″	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822
29 / 32″	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219
59 / 64″	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616
15 / 16″	0.937500	23.812	49.212	74.612	100.012	125.412	150.812	176.212	201.612	227.012
61 / 64″	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409
31 / 32″	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.406	227.806
63 / 64″	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203

Hardness Conversion Table (Reference)

Rockwell C scale hardness Load 1471N HRC	Vickers' hardness HV	Brinell hardness		Rockwell hardness		Shore hardness HS
		Standard ball	Tungsten carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N 1/16" ball	
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	(739)	83.9	—	91
64	800	—	(722)	83.4	—	88
63	772	—	(705)	82.8	—	87
62	746	—	(688)	82.3	—	85
61	720	—	(670)	81.8	—	83
60	697	—	(654)	81.2	—	81
59	674	—	(634)	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71
52	544	(500)	512	76.8	—	69
51	528	(487)	496	76.3	—	68
50	513	(475)	481	75.9	—	67
49	498	(464)	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

Tolerance of Shaft Diameter

Nominal Diameter mm		b12		c12		d6		e6		e12		f5		f6		g5	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	−140	− 240	− 60	− 160	− 20	− 26	− 14	− 20	− 14	−114	− 6	−10	− 6	− 12	− 2	− 6
3	6	−140	− 260	− 70	− 190	− 30	− 38	− 20	− 28	− 20	−140	−10	−15	−10	− 18	− 4	− 9
6	10	−150	− 300	− 80	− 230	− 40	− 49	− 25	− 34	− 25	−175	−13	−19	−13	− 22	− 5	−11
10	18	−150	− 330	− 95	− 275	− 50	− 61	− 32	− 43	− 32	−212	−16	−24	−16	− 27	− 6	−14
18	30	−160	− 370	−110	− 320	− 65	− 78	− 40	− 53	− 40	−250	−20	−29	−20	− 33	− 7	−16
30	40	−170	− 420	−120	− 370	− 80	− 96	− 50	− 66	− 50	−300	−25	−36	−25	− 41	− 9	−20
40	50	−180	− 430	−130	− 380												
50	65	−190	− 490	−140	− 440	−100	−119	− 60	− 79	− 60	−360	−30	−43	−30	− 49	−10	−23
65	80	−200	− 500	−150	− 450												
80	100	−220	− 570	−170	− 520	−120	−142	− 72	− 94	− 72	−422	−36	−51	−36	− 58	−12	−27
100	120	−240	− 590	−180	− 530												
120	140	−260	− 660	−200	− 600	−145	−170	− 85	−110	− 85	−485	−43	−61	−43	− 68	−14	−32
140	160	−280	− 680	−210	− 610												
160	180	−310	− 710	−230	− 630												
180	200	−340	− 800	−240	− 700	−170	−199	−100	−129	−100	−560	−50	−70	−50	− 79	−15	−35
200	225	−380	− 840	−260	− 720												
225	250	−420	− 880	−280	− 740												
250	280	−480	−1000	−300	− 820	−190	−222	−110	−142	−110	−630	−56	−79	−56	− 88	−17	−40
280	315	−540	−1060	−330	− 850												
315	355	−600	−1170	−360	− 930	−210	−246	−125	−161	−125	−695	−62	−87	−62	− 98	−18	−43
355	400	−680	−1250	−400	− 970												
400	450	−760	−1390	−440	−1070	−230	−270	−135	−175	−135	−765	−68	−95	−68	−108	−20	−47
450	500	−840	−1470	−480	−1110												

unit : μm

g6		h5		h6		h7		h8		h9		h10		h11		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
− 2	− 8	0	− 4	0	− 6	0	−10	0	−14	0	− 25	0	− 40	0	− 60	—	3
− 4	−12	0	− 5	0	− 8	0	−12	0	−18	0	− 30	0	− 48	0	− 75	3	6
− 5	−14	0	− 6	0	− 9	0	−15	0	−22	0	− 36	0	− 58	0	− 90	6	10
− 6	−17	0	− 8	0	−11	0	−18	0	−27	0	− 43	0	− 70	0	−110	10	18
− 7	−20	0	− 9	0	−13	0	−21	0	−33	0	− 52	0	− 84	0	−130	18	30
− 9	−25	0	−11	0	−16	0	−25	0	−39	0	− 62	0	−100	0	−160	30	40
																40	50
−10	−29	0	−13	0	−19	0	−30	0	−46	0	− 74	0	−120	0	−190	50	65
																65	80
−12	−34	0	−15	0	−22	0	−35	0	−54	0	− 87	0	−140	0	−220	80	100
																100	120
−14	−39	0	−18	0	−25	0	−40	0	−63	0	−100	0	−160	0	−250	120	140
																140	160
																160	180
−15	−44	0	−20	0	−29	0	−46	0	−72	0	−115	0	−185	0	−290	180	200
																200	225
																225	250
−17	−49	0	−23	0	−32	0	−52	0	−81	0	−130	0	−210	0	−320	250	280
																280	315
−18	−54	0	−25	0	−36	0	−57	0	−89	0	−140	0	−230	0	−360	315	355
																355	400
−20	−60	0	−27	0	−40	0	−63	0	−97	0	−155	0	−250	0	−400	400	450
																450	500

Nominal Diameter mm		h12		h13		js5		j5		js6		j6		j7		k5	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	0	−100	0	−140	+ 2	− 2	+2	− 2	+ 3	− 3	+ 4	− 2	+ 6	− 4	+ 4	0
3	6	0	−120	0	−180	+ 2.5	− 2.5	+3	− 2	+ 4	− 4	+ 6	− 2	+ 8	− 4	+ 6	+1
6	10	0	−150	0	−220	+ 3	− 3	+4	− 2	+ 4.5	− 4.5	+ 7	− 2	+10	− 5	+ 7	+1
10	18	0	−180	0	−270	+ 4	− 4	+5	− 3	+ 5.5	− 5.5	+ 8	− 3	+12	− 6	+ 9	+1
18	30	0	−210	0	−330	+ 4.5	− 4.5	+5	− 4	+ 6.5	− 6.5	+ 9	− 4	+13	− 8	+11	+2
30	40	0	−250	0	−390	+ 5.5	− 5.5	+6	− 5	+ 8	− 8	+11	− 5	+15	−10	+13	+2
40	50																
50	65	0	−300	0	−460	+ 6.5	− 6.5	+6	− 7	+ 9.5	− 9.5	+12	− 7	+18	−12	+15	+2
65	80																
80	100	0	−350	0	−540	+ 7.5	− 7.5	+6	− 9	+11	−11	+13	− 9	+20	−15	+18	+3
100	120																
120	140	0	−400	0	−630	+ 9	− 9	+7	−11	+12.5	−12.5	+14	−11	+22	−18	+21	+3
140	160																
160	180																
180	200	0	−460	0	−720	+10	−10	+7	−13	+14.5	−14.5	+16	−13	+25	−21	+24	+4
200	225																
225	250																
250	280	0	−520	0	−810	+11.5	−11.5	+7	−16	+16	−16	+16	−16	+26	−26	+27	+4
280	315																
315	355	0	−570	0	−890	+12.5	−12.5	+7	−18	+18	−18	+18	−18	+29	−28	+29	+4
355	400																
400	450	0	−630	0	−970	+13.5	−13.5	+7	−20	+20	−20	+20	−20	+31	−32	+32	+5
450	500																

unit : μm

k6		m5		m6		n5		n6		p6		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
+ 6	0	+ 6	+ 2	+ 8	+ 2	+ 8	+ 4	+10	+ 4	+ 12	+ 6	—	3
+ 9	+1	+ 9	+ 4	+12	+ 4	+13	+ 8	+16	+ 8	+ 20	+12	3	6
+10	+1	+12	+ 6	+15	+ 6	+16	+10	+19	+10	+ 24	+15	6	10
+12	+1	+15	+ 7	+18	+ 7	+20	+12	+23	+12	+ 29	+18	10	18
+15	+2	+17	+ 8	+21	+ 8	+24	+15	+28	+15	+ 35	+22	18	30
+18	+2	+20	+ 9	+25	+ 9	+28	+17	+33	+17	+ 42	+26	30	40
												40	50
+21	+2	+24	+11	+30	+11	+33	+20	+39	+20	+ 51	+32	50	65
												65	80
+25	+3	+28	+13	+35	+13	+38	+23	+45	+23	+ 59	+37	80	100
												100	120
+28	+3	+33	+15	+40	+15	+45	+27	+52	+27	+ 68	+43	120	140
												140	160
												160	180
+33	+4	+37	+17	+46	+17	+51	+31	+60	+31	+ 79	+50	180	200
												200	225
												225	250
+36	+4	+43	+20	+52	+20	+57	+34	+66	+34	+ 88	+56	250	280
												280	315
+40	+4	+46	+21	+57	+21	+62	+37	+73	+37	+ 98	+62	315	355
												355	400
+45	+5	+50	+23	+63	+23	+67	+40	+80	+40	+108	+68	400	450
												450	500

Tolerance of Housing Bore Diameter

Nominal Diameter mm		B12		E7		E11		E12		F6		F7		G6		G7	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	+240	+140	+24	+14	+74	+14	+114	+14	+12	+6	+16	+6	+8	+2	+12	+2
3	6	+260	+140	+32	+20	+95	+20	+140	+20	+18	+10	+22	+10	+12	+4	+16	+4
6	10	+300	+150	+40	+25	+115	+25	+175	+25	+22	+13	+28	+13	+14	+5	+20	+5
10	18	+330	+150	+50	+32	+142	+32	+212	+32	+27	+16	+34	+16	+17	+6	+24	+6
18	30	+370	+160	+61	+40	+170	+40	+250	+40	+33	+20	+41	+20	+20	+7	+28	+7
30	40	+420	+170	+75	+50	+210	+50	+300	+50	+41	+25	+50	+25	+25	+9	+34	+9
40	50	+430	+180														
50	65	+490	+190	+90	+60	+250	+60	+360	+60	+49	+30	+60	+30	+29	+10	+40	+10
65	80	+500	+200														
80	100	+570	+220	+107	+72	+292	+72	+422	+72	+58	+36	+71	+36	+34	+12	+47	+12
100	120	+590	+240														
120	140	+660	+260	+125	+85	+335	+85	+485	+85	+68	+43	+83	+43	+39	+14	+54	+14
140	160	+680	+280														
160	180	+710	+310														
180	200	+800	+340	+146	+100	+390	+100	+560	+100	+79	+50	+96	+50	+44	+15	+61	+15
200	225	+840	+380														
225	250	+880	+420														
250	280	+1000	+480	+162	+110	+430	+110	+630	+110	+88	+56	+108	+56	+49	+17	+69	+17
280	315	+1060	+540														
315	355	+1170	+600	+182	+125	+485	+125	+695	+125	+98	+62	+119	+62	+54	+18	+75	+18
355	400	+1250	+680														
400	450	+1390	+760	+198	+135	+535	+135	+765	+135	+108	+68	+131	+68	+60	+20	+83	+20
450	500	+1470	+840														

unit : μm

H6		H7		H8		H9		H10		H11		JS6		J6		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
+6	0	+10	0	+14	0	+25	0	+40	0	+60	0	+3	−3	+2	−4	—	3
+8	0	+12	0	+18	0	+30	0	+48	0	+75	0	+4	−4	+5	−3	3	6
+9	0	+15	0	+22	0	+36	0	+58	0	+90	0	+4.5	−4.5	+5	−4	6	10
+11	0	+18	0	+27	0	+43	0	+70	0	+110	0	+5.5	−5.5	+6	−5	10	18
+13	0	+21	0	+33	0	+52	0	+84	0	+130	0	+6.5	−6.5	+8	−5	18	30
+16	0	+25	0	+39	0	+62	0	+100	0	+160	0	+8	−8	+10	−6	30	40
																40	50
+19	0	+30	0	+46	0	+74	0	+120	0	+190	0	+9.5	−9.5	+13	−6	50	65
																65	80
+22	0	+35	0	+54	0	+87	0	+140	0	+220	0	+11	−11	+16	−6	80	100
																100	120
+25	0	+40	0	+63	0	+100	0	+160	0	+250	0	+12.5	−12.5	+18	−7	120	140
																140	160
																160	180
+29	0	+46	0	+72	0	+115	0	+185	0	+290	0	+14.5	−14.5	+22	−7	180	200
																200	225
																225	250
+32	0	+52	0	+81	0	+130	0	+210	0	+320	0	+16	−16	+25	−7	250	280
																280	315
+36	0	+57	0	+89	0	+140	0	+230	0	+360	0	+18	−18	+29	−7	315	355
																355	400
+40	0	+63	0	+97	0	+155	0	+250	0	+400	0	+20	−20	+33	−7	400	450
																450	500

Nominal Diameter mm		JS7		J7		K5		K6		K7		M6		M7		N6	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	+5	−5	+4	−6	0	−4	0	−6	0	−10	−2	−8	−2	−12	−4	−10
3	6	+6	−6	+6	−6	0	−5	+2	−6	+3	−9	−1	−9	0	−12	−5	−13
6	10	+7	−7	+8	−7	+1	−5	+2	−7	+5	−10	−3	−12	0	−15	−7	−16
10	18	+9	−9	+10	−8	+2	−6	+2	−9	+6	−12	−4	−15	0	−18	−9	−20
18	30	+10	−10	+12	−9	+1	−8	+2	−11	+6	−15	−4	−17	0	−21	−11	−24
30	40	+12	−12	+14	−11	+2	−9	+3	−13	+7	−18	−4	−20	0	−25	−12	−28
40	50																
50	65	+15	−15	+18	−12	+3	−10	+4	−15	+9	−21	−5	−24	0	−30	−14	−33
65	80																
80	100	+17	−17	+22	−13	+2	−13	+4	−18	+10	−25	−6	−28	0	−35	−16	−38
100	120																
120	140	+20	−20	+26	−14	+3	−15	+4	−21	+12	−28	−8	−33	0	−40	−20	−45
140	160																
160	180																
180	200	+23	−23	+30	−16	+2	−18	+5	−24	+13	−33	−8	−37	0	−46	−22	−51
200	225																
225	250																
250	280	+26	−26	+36	−16	+3	−20	+5	−27	+16	−36	−9	−41	0	−52	−25	−57
280	315																
315	355	+28	−28	+39	−18	+3	−22	+7	−29	+17	−40	−10	−46	0	−57	−26	−62
355	400																
400	450	+31	−31	+43	−20	+2	−25	+8	−32	+18	−45	−10	−50	0	−63	−27	−67
450	500																

unit : μm

N7		P6		P7		R7		S7		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
−4	−14	−6	−12	−6	−16	−10	−20	−14	−24	—	3
−4	−16	−9	−17	−8	−20	−11	−23	−15	−27	3	6
−4	−19	−12	−21	−9	−24	−13	−28	−17	−32	6	10
−5	−23	−15	−26	−11	−29	−16	−34	−21	−39	10	18
−7	−28	−18	−31	−14	−35	−20	−41	−27	−48	18	30
−8	−33	−21	−37	−17	−42	−25	−50	−34	−59	30	40
										40	50
−9	−39	−26	−45	−21	−51	−30	−60	−42	−72	50	65
						−32	−62	−48	−78	65	80
−10	−45	−30	−52	−24	−59	−38	−73	−58	−93	80	100
						−41	−76	−66	−101	100	120
−12	−52	−36	−61	−28	−68	−48	−88	−77	−117	120	140
						−50	−90	−85	−125	140	160
						−53	−93	−93	−133	160	180
−14	−60	−41	−70	−33	−79	−60	−106	−105	−151	180	200
						−63	−109	−113	−159	200	225
						−67	−113	−123	−169	225	250
−14	−66	−47	−79	−36	−88	−74	−126	−138	−190	250	280
						−78	−130	−150	−202	280	315
−16	−73	−51	−87	−41	−98	−87	−144	−169	−226	315	355
						−93	−150	−187	−244	355	400
−17	−80	−55	−95	−45	−108	−103	−166	−209	−272	400	450
						−109	−172	−229	−292	450	500

M

N-lbf Conversion Table

1N = 0.224809 lbf 1lbf = 4.44822 N

N		lbf	N		lbf	N		lbf
4.448	1	0.225	151.24	34	7.643	298.03	67	15.062
8.896	2	0.450	155.69	35	7.868	302.48	68	15.287
13.345	3	0.674	160.14	36	8.093	306.93	69	15.512
17.793	4	0.899	164.58	37	8.318	311.38	70	15.737
22.241	5	1.124	169.03	38	8.543	315.82	71	15.961
26.689	6	1.349	173.48	39	8.768	320.27	72	16.186
31.138	7	1.574	177.93	40	8.992	324.72	73	16.411
35.586	8	1.798	182.38	41	9.217	329.17	74	16.636
40.034	9	2.023	186.83	42	9.442	333.62	75	16.861
44.482	10	2.248	191.27	43	9.667	338.06	76	17.085
48.930	11	2.473	195.72	44	9.892	342.51	77	17.310
53.379	12	2.698	200.17	45	10.116	346.96	78	17.535
57.827	13	2.923	204.62	46	10.341	351.41	79	17.760
62.275	14	3.147	209.07	47	10.566	355.86	80	17.985
66.723	15	3.372	213.51	48	10.791	360.31	81	18.210
71.171	16	3.597	217.96	49	11.016	364.75	82	18.434
75.620	17	3.822	222.41	50	11.240	369.20	83	18.659
80.068	18	4.047	226.86	51	11.465	373.65	84	18.884
84.516	19	4.271	231.31	52	11.690	378.10	85	19.109
88.964	20	4.496	235.76	53	11.915	382.55	86	19.334
93.413	21	4.721	240.20	54	12.140	386.99	87	19.558
97.861	22	4.946	244.65	55	12.364	391.44	88	19.783
102.31	23	5.171	249.10	56	12.589	395.89	89	20.008
106.76	24	5.395	253.55	57	12.814	400.34	90	20.233
111.21	25	5.620	258.00	58	13.039	404.79	91	20.458
115.65	26	5.845	262.44	59	13.264	409.24	92	20.682
120.10	27	6.070	266.89	60	13.489	413.68	93	20.907
124.55	28	6.295	271.34	61	13.713	418.13	94	21.132
129.00	29	6.519	275.79	62	13.938	422.58	95	21.357
133.45	30	6.744	280.24	63	14.163	427.03	96	21.582
137.89	31	6.969	284.69	64	14.388	431.48	97	21.806
142.34	32	7.194	289.13	65	14.613	435.93	98	22.031
146.79	33	7.419	293.58	66	14.837	440.37	99	22.256

How to use : For example, to convert 20 N into lbf, find the number 20 in the center of the first column. By referring to the lbf column on the right, it will be found that 20 N equals 4.496 lbf.
To convert 20 lbf into N, refer to the N column on the left and it will be found that 20 lbf equals 88.964 N.

N-kgf Conversion Table

1N = 0.1019716 kgf 1kgf = 9.80665 N

N		kgf	N		kgf	N		kgf
9.8066	1	0.1020	333.43	34	3.4670	657.05	67	6.8321
19.613	2	0.2039	343.23	35	3.5690	666.85	68	6.9341
29.420	3	0.3059	353.04	36	3.6710	676.66	69	7.0360
39.227	4	0.4079	362.85	37	3.7729	686.47	70	7.1380
49.033	5	0.5099	372.65	38	3.8749	696.27	71	7.2400
58.840	6	0.6118	382.46	39	3.9769	706.08	72	7.3420
68.647	7	0.7138	392.27	40	4.0789	715.89	73	7.4439
78.453	8	0.8158	402.07	41	4.1808	725.69	74	7.5459
88.260	9	0.9177	411.88	42	4.2828	735.50	75	7.6479
98.066	10	1.0197	421.69	43	4.3848	745.31	76	7.7498
107.87	11	1.1217	431.49	44	4.4868	755.11	77	7.8518
117.68	12	1.2237	441.30	45	4.5887	764.92	78	7.9538
127.49	13	1.3256	451.11	46	4.6907	774.73	79	8.0558
137.29	14	1.4276	460.91	47	4.7927	784.53	80	8.1577
147.10	15	1.5296	470.72	48	4.8946	794.34	81	8.2597
156.91	16	1.6315	480.53	49	4.9966	804.15	82	8.3617
166.71	17	1.7335	490.33	50	5.0986	813.95	83	8.4636
176.52	18	1.8355	500.14	51	5.2006	823.76	84	8.5656
186.33	19	1.9375	509.95	52	5.3025	833.57	85	8.6676
196.13	20	2.0394	519.75	53	5.4045	843.37	86	8.7696
205.94	21	2.1414	529.56	54	5.5065	853.18	87	8.8715
215.75	22	2.2434	539.37	55	5.6084	862.99	88	8.9735
225.55	23	2.3453	549.17	56	5.7104	872.79	89	9.0755
235.36	24	2.4473	558.98	57	5.8124	882.60	90	9.1774
245.17	25	2.5493	568.79	58	5.9144	892.41	91	9.2794
254.97	26	2.6513	578.59	59	6.0163	902.21	92	9.3814
264.78	27	2.7532	588.40	60	6.1183	912.02	93	9.4834
274.59	28	2.8552	598.21	61	6.2203	921.83	94	9.5853
284.39	29	2.9572	608.01	62	6.3222	931.63	95	9.6873
294.20	30	3.0591	617.82	63	6.4242	941.44	96	9.7893
304.01	31	3.1611	627.63	64	6.5262	951.25	97	9.8912
313.81	32	3.2631	637.43	65	6.6282	961.05	98	9.9932
323.62	33	3.3651	647.24	66	6.7301	970.86	99	10.0952

How to use : For example, to convert 20 N into kgf, find the number 20 in the center of the first column. By referring to the kgf column on the right, it will be found that 20 N equals 2.0394 kgf.
To convert 20 kgf into N, refer to the N column on the left and it will be found that 20 kgf equals 196.13 N.

Temperature Conversion Table

$C = \frac{5}{9}(F-32)$ $F = 32+\frac{9}{5}C$

°C		°F	°C		°F	°C		°F	°C		°F
-73.3	-100	-148.0	-2.2	28	82.4	16.1	61	141.8	34.4	94	201.2
-62.2	- 80	-112.0	-1.7	29	84.2	16.7	62	143.6	35.0	95	203.0
-51.1	- 60	- 76.0	-1.1	30	86.0	17.2	63	145.4	35.6	96	204.8
-40.0	- 40	- 40.0	-0.6	31	87.8	17.8	64	147.2	36.1	97	206.6
-28.9	- 20	- 4.0	0	32	89.6	18.3	65	149.0	36.7	98	208.4
-17.8	0	32.0	0.6	33	91.4	18.9	66	150.8	37.2	99	210.2
-17.2	1	33.8	1.1	34	93.2	19.4	67	152.6	37.8	100	212
-16.7	2	35.6	1.7	35	95.0	20.0	68	154.4	43.3	110	230
-16.1	3	37.4	2.2	36	96.8	20.6	69	156.2	48.9	120	248
-15.6	4	39.2	2.8	37	98.6	21.1	70	158.0	54.4	130	266
-15.0	5	41.0	3.3	38	100.4	21.7	71	159.8	60.0	140	284
-14.4	6	42.8	3.9	39	102.2	22.2	72	161.6	65.6	150	302
-13.9	7	44.6	4.4	40	104.0	22.8	73	163.4	71.1	160	320
-13.3	8	46.4	5.0	41	105.8	23.3	74	165.2	76.7	170	338
-12.8	9	48.2	5.6	42	107.6	23.9	75	167.0	82.2	180	356
-12.2	10	50.0	6.1	43	109.4	24.4	76	168.8	87.8	190	374
-11.7	11	51.8	6.7	44	111.2	25.0	77	170.6	93.3	200	392
-11.1	12	53.6	7.2	45	113.0	25.6	78	172.4	121.1	250	482
-10.6	13	55.4	7.8	46	114.8	26.1	79	174.2	149	300	572
-10.0	14	57.2	8.3	47	116.6	26.7	80	176.0	177	350	662
- 9.4	15	59.0	8.9	48	118.4	27.2	81	177.8	204	400	752
- 8.9	16	60.8	9.4	49	120.2	27.8	82	179.6	232	450	842
- 8.3	17	62.6	10.0	50	122.0	28.3	83	181.4	260	500	932
- 7.8	18	64.4	10.6	51	123.8	28.9	84	183.2	288	550	1022
- 7.2	19	66.2	11.1	52	125.6	29.4	85	185.0	316	600	1112
- 6.7	20	68.0	11.7	53	127.4	30.0	86	186.8	343	650	1202
- 6.1	21	69.8	12.2	54	129.2	30.6	87	188.6	371	700	1292
- 5.6	22	71.6	12.8	55	131.0	31.1	88	190.4	399	750	1382
- 5.0	23	73.4	13.3	56	132.8	31.7	89	192.2	427	800	1472
- 4.4	24	75.2	13.9	57	134.6	32.2	90	194.0	454	850	1562
- 3.9	25	77.0	14.4	58	136.4	32.8	91	195.8	482	900	1652
- 3.3	26	78.8	15.0	59	138.2	33.3	92	197.6	510	950	1742
- 2.8	27	80.6	15.6	60	140.0	33.9	93	199.4	538	1000	1832

How to use : For example, to convert 20°C into °F, find the number 20 in the center of the first column. By referring the °F column on the right, it will be found that 20°C equals 68.0°F.
To convert 20°F into °C, refer to the °C column on the left and it will be found that 20°F equals -6.7°C.

Grease names and the characteristics (Reference)

Sort	Name	Supplier	Thickener of metallic soap	Con-sistency	Dropping point (°C)	Service range(1) (°C)	Remarks
General purpose	ALVANIA GREASE S1	SHELL	Li	323	182	−35～+120	General, Centralized greasing
	ALVANIA GREASE S2	SHELL	Li	275	185	−25～+120	General, Centralized greasing
	ALVANIA GREASE S3	SHELL	Li	242	185	−20～+135	General
	DAPHNE EPONEX GREASE No.2	IDEMITSU	Li	276	195	−20～+120	General
	COSMO GREASE DYNAMAX No.2	COSMO	Li	280	188	−20～+120	General
	MULTINOC GREASE 2	NIPPON OIL	Li	278	212	−30～+125	General
	MOBILAX GREASE No.2	MOBIL	Li	280	196	−35～+120	General
Low temperature	ALVANIA GREASE RA	SHELL	Li	252	183	−40～+130	Low temperature
	BEACON 325	ESSO	Li	280	193	(+160) −60～+120	Low temperature, Low torque
	ISOFLEX LDS 18 SPECIAL A	KLÜBER	Li	280	≧185	−60～+130	Low temperature, High speed,Extreme pressure
	ISOFLEX SUPER LDS 18	KLÜBER	Li	280	≧185	−60～+130	Low temperature, High speed,Low noise
	LT GREASE No.2	JAPAN ENERGY	Li	275	181	−50～+150	Low temperature
Wide temperature range	TEMPREX N3	ESSO	Li Complex	235	≧300	(+200) −20～+160	Wide temperature range, High temperature
	AEROSHELL GREASE 7	SHELL	Microgel	288	≧260	−73～+149	Wide temperature range, Low temperature
	MULTEMP PS No.2	KYODO YUSHI	Li	275	190	−50～+130	Wide temperature range, For low temperature & low noise
	MULTEMP SRL	KYODO YUSHI	Li	242	192	−50～+150	Wide temperature range, For low temperature & low noise
	MULTINOC WIDE No.2	NIPPON OIL	Li+special Na	247	203	−40～+135	Wide temperature range
Extreme pressure	ALVANIA EP-2	SHELL	Li	276	187	−20～+110	Extreme pressure, Centralized greasing
	MOLYKOTE BR2-PLUS	DOW CORNING	Li	265	185	−30～+150	With MoS_2, Extreme pressure
	MOLUB-ALLOY #777-2	CASTROL	Li	280	182	0～+135	With MoS_2, Extreme pressure
Others	G 40M	SHIN-ETSU	Li	260	≧200	−30～+200	Wide temperatur range, Superior at high temperature with stable anti-oxidation and water proof, Chemically inert
	G 40H	SHIN-ETSU	Li	220	≧200	−30～+200	Wide temperatur range, Superior at high temperature with stable anti-oxidation and water proof, Chemically inert
	KRYTOX 240AD	DU PONT	Fluorinated	275	None	−30～+288	Stabl at high temperature, Chemically inert, Anti-solvent
	BARRIERTA L55/2	KLÜBER	Fluorinated	No.2	None	(+250) −35～+220	General, Low evaporation at high temperature, Chemically inert
	BARRIERTA IMI/V	KLÜBER	Fluorinated	No.2	None	−50～+220	For high vacuum
	DEMNUM GREASE L-200	DAIKIN	Fluorinated	280	None	−60～+300	Stabl at high temperature, Anti-solvent, Chemically inert
	DOLIUM GREASE R	SHELL	Polyurea	281	249	−30～+150	Heat resistant, Superior at high temperature with stable anti-oxidation
	STAMINA GREASE RL2	SHELL	Polyurea	268	271	−20～+180	Heat resistant, Superior at high temperature with stable anti-oxidation

Note(1) : Figures in parentheses show the maximum allowable temperature in very short time operation, and they are not applicable for continuous operation.
Remark When using these products, see individual manufacturer's catalogs.

Index of Model Codes

IKO

Index of Model Codes

Index of Model Codes

Index of Model Codes

M

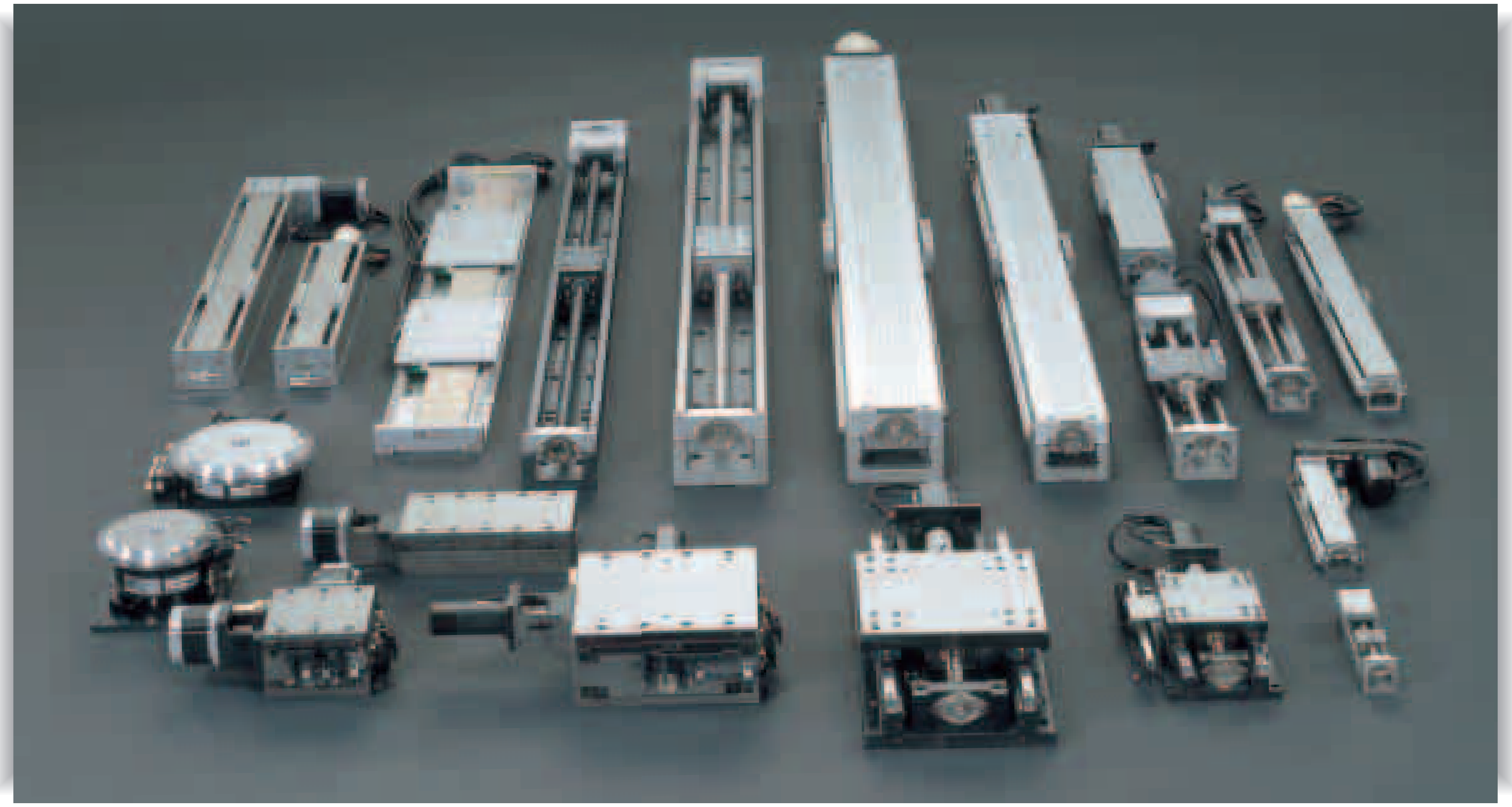
Presentation of Linear Motion Rolling Guide and Mechatronics Series

"Linear Motion Rolling Guide Series" being a leader of growth and "Mechatronics Series" being a pioneer of the next generation

IKO Nippon Thompson Co., Ltd. has been developing various products related to linear motion rolling guides. With their high quality and excellent functional characteristics recognized, IKO is supplying its products to a wide range of different applications.

The following IKO linear motion rolling guide series and mechatronics series show a remarkable increase in sales in advanced industries including semiconductor manufacturing equipment requiring precise positioning, and are also expected to grow further in the high technology industry.

For details, refer to the "General Catalog for Linear Motion Rolling Guide Series" and "Catalog of Mechatronics Series".



M

IKO Linear Motion Rolling Guide Series, Configuration of General Catalog

IKO Linear Motion Rolling Guide Series General Catalog Consists of BLUE (CAT-1552E) and RED (CAT-1553E), the two volumes.

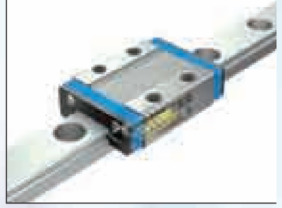
BLUE

CAT-1552E

【Models】

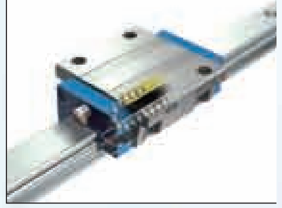
- Rail Guide Type
  - Endless Linear Motion Type

C-Lube Linear Way ML
Linear Way L
ML·LWL

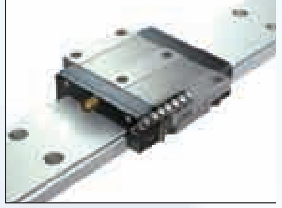


C-Lube Linear Way ME
Linear Way E
ME·LWE

C-Lube Linear Way MH
Linear Way H
MH·LWH



Linear Way F
LWF



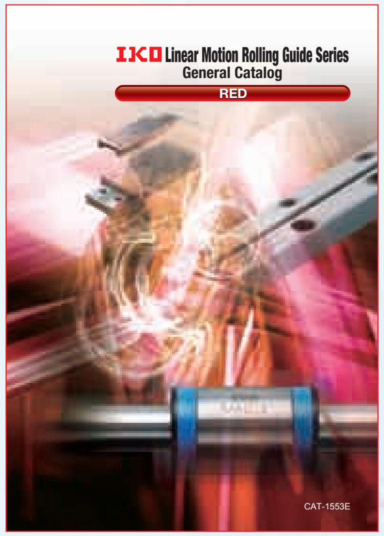
C-Lube Linear Way MUL
Linear Way U
MUL·LWU

C-Lube Linear Roller Way Super MX
Linear Roller Way Super X
MX·LRX

Linear Roller Way X
LRWX

Linear Way Module
LWLM·LWM
LRWM

RED



CAT-1553E

【Models】

- Rail Guide Type
  - Limited Linear Motion Type
- Shaft Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type
  - Limited Linear Motion Type + Rolling Motion Type
- Flat Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type

Rail Guide Type
Crossed Roller Way
CRW(G)(…H)
CRWU(G)

Rail Guide Type
Linear Slide Unit
BWU·BSP(G)
BSU…A

Shaft Guide Type
Linear Ball Spline
MAG·LSAG
LSB · LS

Shaft Guide Type
Linear Bushing
LMG · LM · LMS

Shaft Guide Type
Stroke Rotary Bushing
ST · STSI · BG

Flat Guide Type
Roller Way & Flat Roller Cage
RW · SR · GSN
FT·FTW…A

Ball screw
Slide Shaft
Shaft Support Block

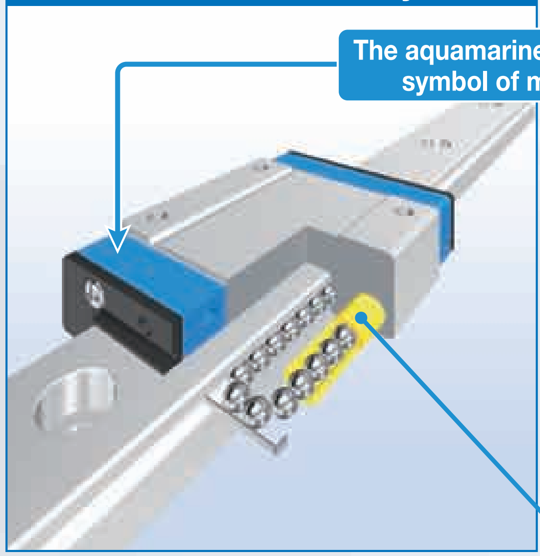
M

Oil Minimum
IKO Gentle to The Earth

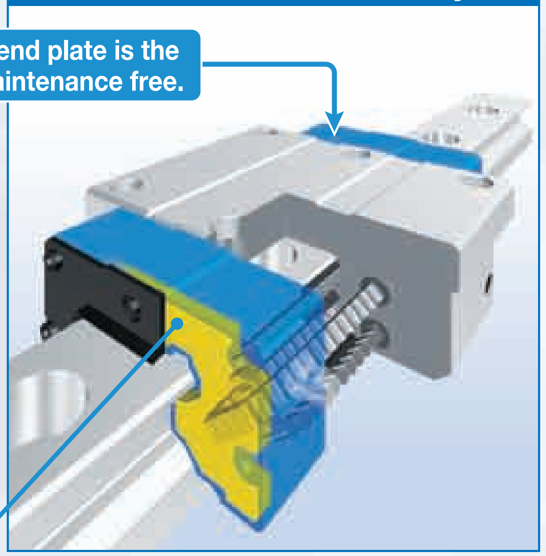
Features of C-Lube Linear Way and C-Lube Linear Roller Way

Original and world's first structure with [C-Lube]

C-Lube Linear Way



C-Lube Linear Roller Way

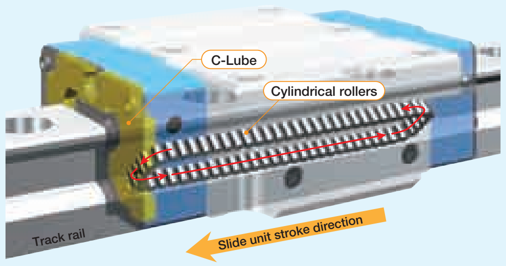


The aquamarine end plate is the symbol of maintenance free.

C-Lube integrated

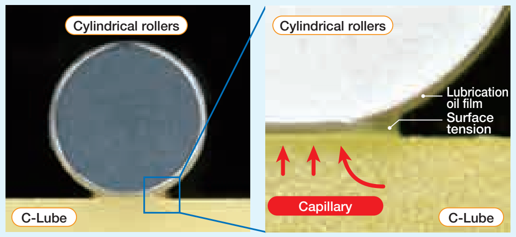
Lubrication oil is carried through circulation of rolling elements

The lubrication oil is supplied directly to the rolling elements, not to the track rail.
When rolling elements make contact with the capillary lubricating element integrated with the circulation path of slide unit rolling elements, the lubrication oil is supplied to surfaces of rolling elements and carried to the loading area through circulation of rolling elements.
This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.



Lubrication oil is directly supplied to surfaces of the rolling elements

The surface of capillary lubricating element is always covered with the lubrication oil.
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of capillary lubricating element surface and rolling elements.
On the surface of capillary lubricating element with which the rolling elements make contact, new lubrication oil is always supplied from the other sections.



Long period maintenance free is realized with oil impregnated with C-Lube only !!

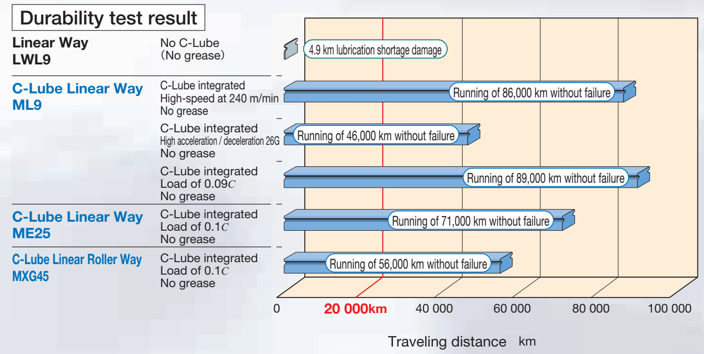
IKO C-Lube Maintenance-free

Maintenance free

This endures running over 20,000 km without oil feeding with lubrication oil in the C-Lube only.
Furthermore, grease is pre-packed in the slide unit so long period maintenance free can be realized.

*Maintenance free is achieved until the end of device life[*1]!*

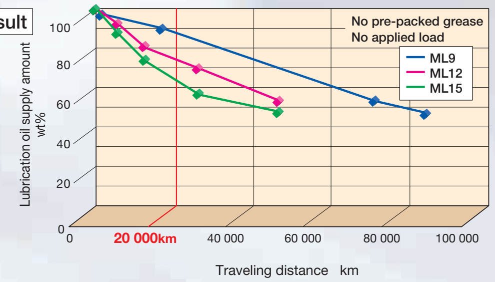
*1. Typical device life is assumed. Re-greasing may be necessary depending on use conditions.



Ecology

As lubrication oil in C-Lube is supplied by the amount necessary to maintain lubrication performance of the rolling guide, the consumption of lubrication oil is reduced and lubrication performance is maintained even when it run for a long period.

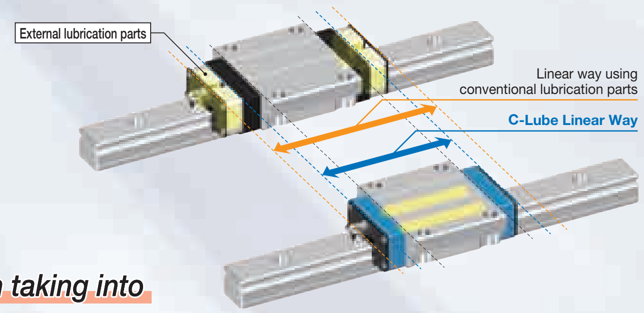
Ecology specification reducing usage of lubrication oil!



Compact

As C-Lube Linear Way and C-Lube Linear Roller Way are integrated with lubrication part C-Lube, their slide units are not long unlike types with external lubrication parts.
Replacement of conventional parts is easy free from constraints of mounting space and stroke length.

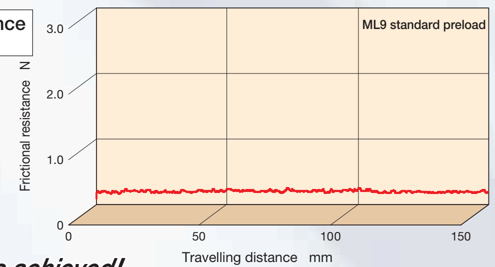
Compact design taking into account compactness!



Smooth

C-Lube Linear Way and C-Lube Linear Roller Way do not generate slide resistance unlike lubrication parts external to the slide unit that make contact with the track rail.
Driving force follow-up property is superior and energy is saved by improvement of accuracy and reduction of friction loss.

Light and smooth motion is achieved!



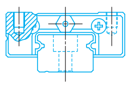
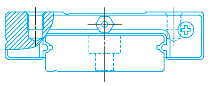
M

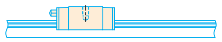
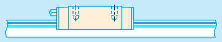
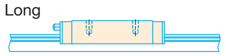
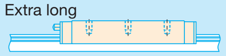
A variety of models and size variations

Ball Type Miniature Series

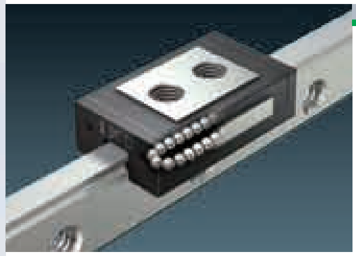
C-Lube Linear Way ML
Linear Way L

Thanks to the structure with two rows of balls to contact with the way at four points, stable accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied, despite its very small body.

Standard type	Wide type
ML LWL	MLF LWLF
	

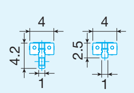
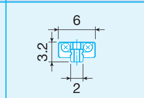
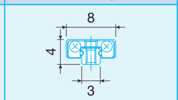
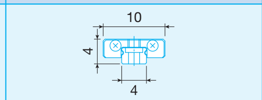
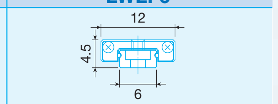
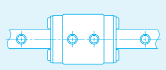
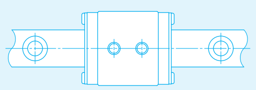
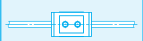
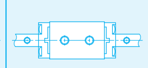
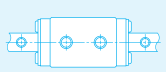
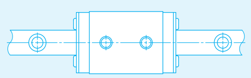
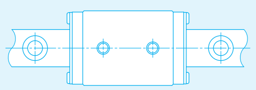
Length of slide unit		
C	Short	
No symbol	Standard	
G	Long	
L	Extra long	

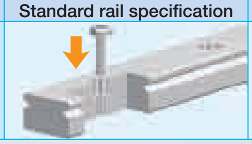
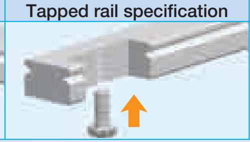
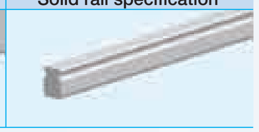
Size	
Standard type	1, 2, 3, 5, 7, 9, 12, 15, 20, 25
Wide type	4, 6, 10, 14, 18, 24, 30, 42

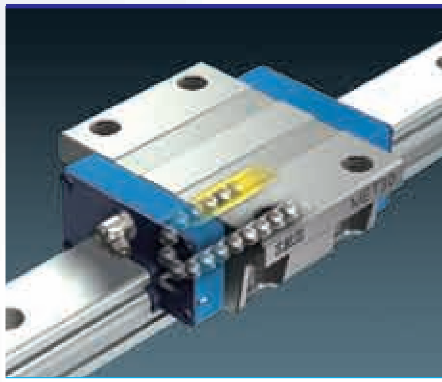


Micro Linear Way L

As the lineup of track rail width from 1 mm to 6 mm is available, i.e. standard and long, you can select an optimal linear bushing for the specifications of your machine and device. For LWL1, world's smallest size is realized: track rail width of 1 mm, slide unit width of 4 mm and assembly height of 2.5 mm.

		Standard type			Wide type	
		LWL1	LWL2	LWL3	LWLF4	LWLF6
Sectional shape (Original size) unit: mm						
Length of slide unit (original size)	Short	—	—		—	
	Standard					

	Standard rail specification	Tapped rail specification	Tapped rail specification (mounting from lateral)	Solid rail specification
Track rail model				

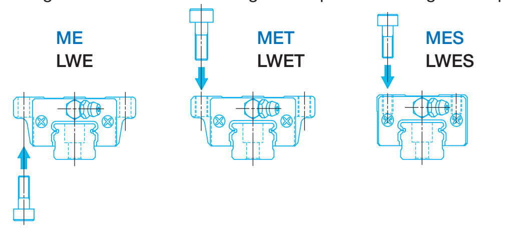


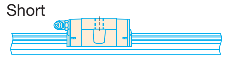
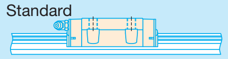
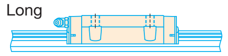
Ball Type Compact Series

C-Lube Linear Way ME
Linear Way E
Low Decibel Linear Way E

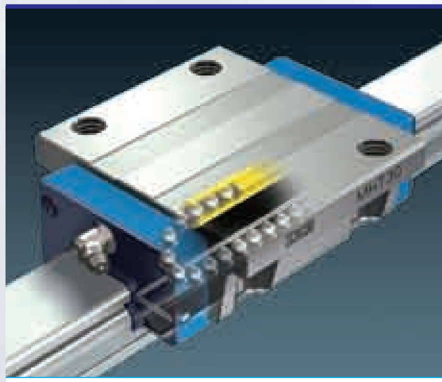
Versatile linear motion rolling guide achieved utility pursuing compactness in every aspect just like lower, narrower, and shorter. Low decibel types with resin separator to prevent direct contact between balls are also available.

Flange type mounting from bottom	Flange type mounting from top	Block type mounting from top
ME LWE	MET LWET	MES LWES



Length of slide unit		
C	Short	
No symbol	Standard	
G	Long	

Size
15, 20, 25, 30, 35, 45

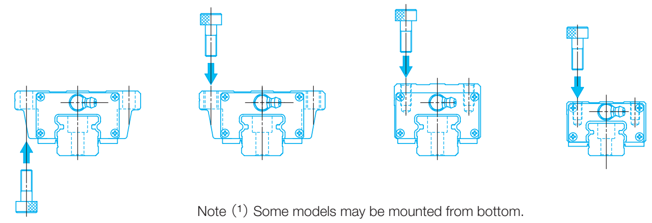


Ball Type High Rigidity Series

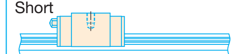
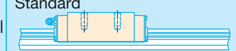
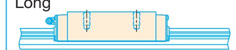
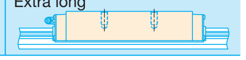
C-Lube Linear Way MH
Linear Way H

Linear motion rolling guide having a maximum load rating among ball type units by incorporating a large-diameter ball. Stable accuracy and rigidity can be achieved even in applications where load with variable direction and size and complex load are applied.

Flange type mounting from bottom	Flange type mounting from top(1)	Block type mounting from top	Compact block type mounting from top
MH LWH	MHT LWHT	MHD LWHD	MHS LWHS



Note (1) Some models may be mounted from bottom.

Length of slide unit		
C	Short	
No symbol	Standard	
G	Long	
L	Extra long	

Size
8, 10, 12, 15, 20, 25, 30, 35, 45, 55, 65, 85

M

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

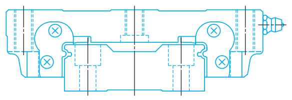
A variety of models and size variations

Ball Type Wide Type Series

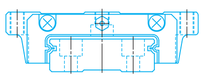
Linear Way F

As wide track rail is used and the distance between the load points is long, this is a linear motion rolling guide suitable to single-row use due to the structure resistant to across-the-width moment load. It is also resistant to complex load.

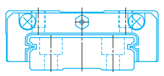
Flange type
mounting from top / bottom
LWFH

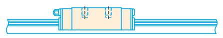


Flange type
mounting from top / bottom
LWFF



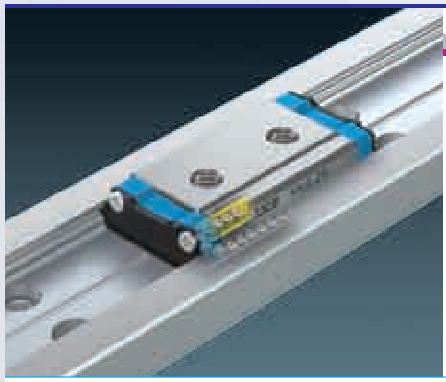
Block type
mounting from top
LWFS



Length of slide unit	
No symbol	Standard 

Size	
LWFH	40,60,90
LWFF	33,37,42,69
LWFS	33,37,42

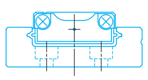
Ball Type U-Shaped Track Rail Series



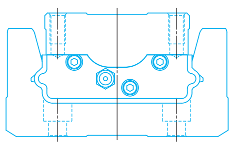
C-Lube Linear Way MUL
Linear Way U

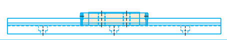
Linear motion rolling guide of the structure with way inside the track rail of U-shaped section and slide unit therein. With the U-shaped track rail, rigidity against the track rail moment load and torsion is significantly improved.

Small type
MUL
LWUL



Standard type
LWU



Length of slide unit	
No symbol	Standard 

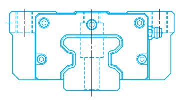
Size	
MUL	25, 30
LWUL	25, 30
LWU	40, 50, 60, 86, 100, 130

Roller Type

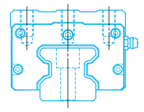
C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic, such as rigidity, load capacity, running accuracy and vibration damping property. With high accuracy and high rigidity long unit with the maximum slide unit length, load capacity and rigidity are improved and running performance with super high accuracy is realized.

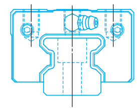
Flange type
mounting from top / bottom
MX[(1)]
LRX



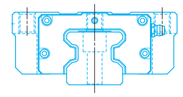
Block type
mounting from top
MXD
LRXD



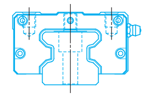
Compact block type
mounting from top
MXS
LRXS



Low section flange type
mounting from top
MXN

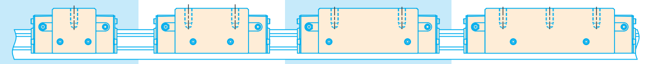


Low section block type
mounting from top
MXNS



Note (1) Size 20 series allows only for mounting from top and model mounting from bottom is MXH.

Length of slide unit			
C	No symbol	G	L
Short	Standard	Long	Extra long



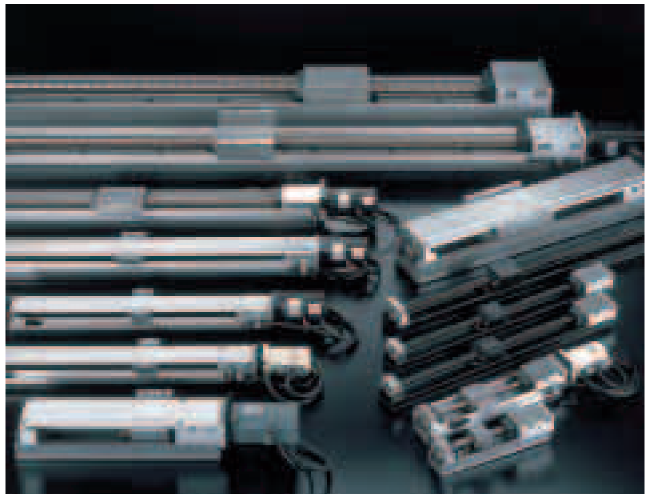
Size
10, 12, 15, 20, 25, 30, 35, 45, 55, 65, 85, 100

M

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

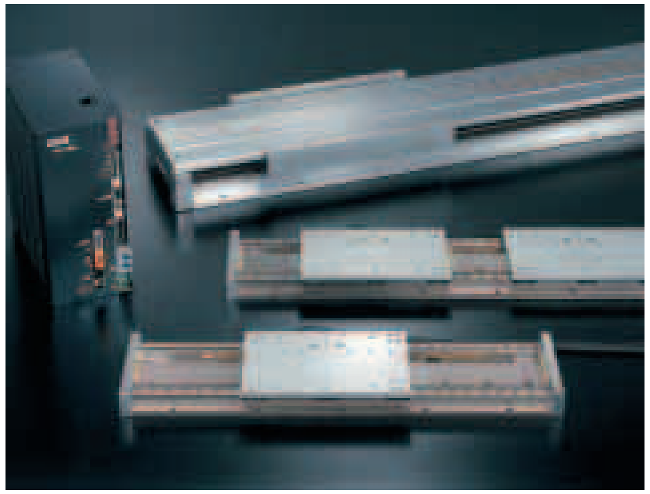
Mechatronics Series

TU Series



IKO Precision Positioning Table TU is a compact and slim positioning table with good load balance and high resistance to complex loads, in which the side table is arranged inside the U-shape track rail. Six types with a track rail width of 25～130mm are available. Each slide table length can be selected as required. Different table specifications including ball screw, motor, sensor, etc. can be selected. This allows each user to configure the most suitable positioning table for each application.
Abundant options meet diversified market needs such as a motor loopback specification, table with bellows, table with bridge cover, and table finished by black chrome surface treatment.

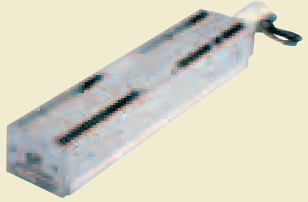
Linear Motor Table LT



The IKO **Linear Motor Table LT** is a compact and lightweight direct-drive positioning table with a very small sectional height in which an AC servo-motor and an optional linear scale are integrated in a moving table and a bed made of aluminum alloy.
The IKO **Linear Motor Table LT** employs a C-shaped magnet yoke, and a coil board is sandwiched between two stator magnets. It provides a high thrust of 450N though its height is only 40 mm. The moving table is as light as 1.5 kg but provides high thrust. It permits high acceleration and deceleration exceeding 10 G. (In the case of LT150 CG.) Also, High Thrust Series **LT…H** outputs 900N thrust.
Using advanced servo technology, this product achieves high static stability and high-speed stability.

Long-stroke Series

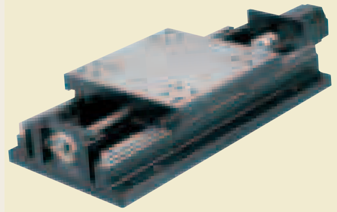
- Standard type which has been practically used in many fields.
- Stable characteristics in parallel use together with Linear Way



TSL…M

High-rigidity Series

- High reliability and high accuracy with component parts strictly selected
- High rigidity and large mounting weight



TSLH…M・CTLH…M

Super Precision Series

- XY configuration available for advanced inspection stage
- High positioning accuracy realized with IKO Roller technology and full closed loop controlling

TX…M CTX…M

Compact Series

- Compact structure with a small sectional height
- High reliability and high accuracy achieved by using Crossed Roller Way

TS・CT

High-speed Long Stroke Series

- High-speed type using a timing belt drive
- Stable and high traveling performance in parallel use together with Linear Way

TSLB

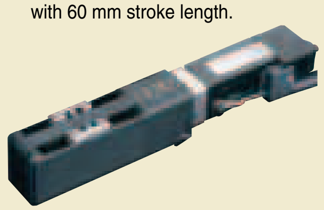
Precision Positioning Table

- Light weight precision positioning table made of high-strength aluminum alloy.
- Built-in C-Lube for long-term maintenance-free service.

TE

Micro Precision Positioning Table

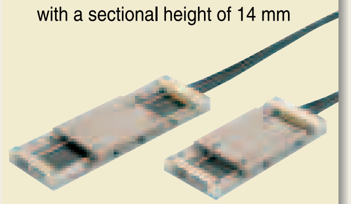
- Very compact positioning table that is 20mm high (sectional) and 17mm wide driven by a ground ball screw.
- +/-0.5micron repeatability is achieved with 60 mm stroke length.



TM

Nano Linear

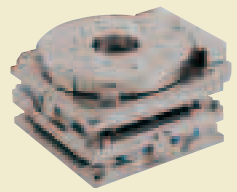
- Direct drive type with high speed and high response
- Maximum thrust of 25 N achieved with a sectional height of 14 mm



NT…V

Alignment Stage Direct Drive

- Ultra compact XY θ stage contributing to space saving
- High resolution and response realized with optical scale



SA…DE

M

IKO Introduction of Technical Service Site

"IKO Technical Service Site" can be accessed from our home page IKO. The site also distributes various tools, etc., to select linear ways/linear roller ways, and please utilize the site for the assistance to select products. Additionally the site also provides CAD data and product catalog of needle series, linear motion rolling guide series and mechatronics series for you to download. Please consider to use for enhancing your design efficiency.

http://www.ikont.co.jp/eg/

1. Technical calculations

In the section of linear way/linear roller way load and life calculation, you can have the calculated load and the rating life by entering the use conditions.
Also you can derive the motor torque required for operation and the effective propulsion force during operation in the sections of motor torque calculation and calculation of effective propulsion force of linear motor tables respectively, and output the calculation results in PDF format, as well as save the histories.

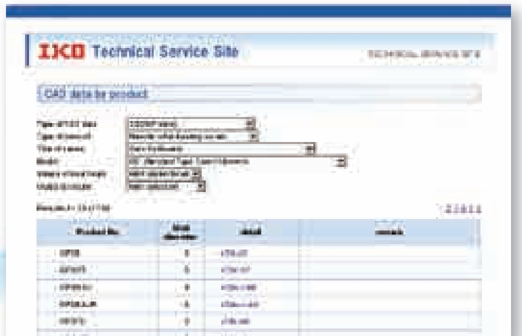
2. Selection of Identification Number

By selecting such specification as model code, dimensions, part code, material code, preload symbol, classification symbol, interchangeable code and supplemental code of linear ways/linear roller ways, you can easily specify the identification number used for ordering.
Also you can browse the CAD data of the selected products, calculate the load, and output the selection results in PDF format, as well as save the histories.

3. Downloading CAD data

2-dimensional CAD data (DXF file)

There are two types of figures, brief figure and detailed figure. The brief figure shows only the external view lines, and the detailed figure shows the detailed lines. The drawing consists of three drawings: front view, side view and plain view. The scale shows only the original size (1:1), and it does not show dimension lines.



3-dimensional CAD data

It is linked to the mechanical parts CAD library "PART community". Entering the rail dimension and option contents to the detail, you can view the 2D/3D CAD data suitable for the specification for free of charge.

4. Downloading Catalog and Operation Manual

You can download product catalogs of needle series, linear motion rolling guide series and mechatronics series, operation manuals of precision positioning tables and various electrical components in PDF format, as well as support software for precision positioning tables.
For a brochure version of the catalogs, please ask from IKO home page, or contact the nearest branch or sales office.

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Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products.
It is committed to developing products that make its customers' machinery and equipment more reliable, thereby contributing to preserving the global environment.
This development stance manifests well in the keyword "**Oil Minimum.**"
Our pursuit of Oil Minimum has led to the creation of IKO's proprietary family of lubricating parts as "C-Lube."

- IKO Linear Motion Rolling Guides are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 and ISO 9001.
- The standard products listed in this catalog comply with the specifications of the six hazardous materials mentioned cited in the European RoHS Directive. For information on all other products, please check with IKO.

IKO Products Underpin Sustain Technology Leaps

Nippon Thompson Co., Ltd. was the first Japanese manufacturer to develop needle bearings on its own and has since expanded into the arena of linear motion rolling guides (Linear Motion Series and Mechatro Series) on the support of its advanced expertise. The company now offers a vast assortment of ingenious products, including the world's first C-Lube maintenance-free series, to address increasingly diversified customer needs and thus sustain technology leaps.

C-Lube Maintenance-Free Series Products Evolving from the "Oil Minimum" Concept

We have developed lubricating parts impregnated with a large amount of lubricant as C-Lube Series to save the customer's oiling management workload and built them into bearings and linear motion rolling guides.
The C-Lube Series not only keeps products maintenance-free for long by giving them an optimal and minimal amount of a lubricant for an extended period of time but also contributes greatly to preserving the global environment.

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