



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.

General Explanation

| | |
|---|-----|
| Characteristics of Needle Roller Bearings | A 3 |
| Types and Features of Bearings | A 5 |
| Outline of Bearing Selection | A16 |
| Basic Dynamic Load Rating and Life | A17 |
| Basic Static Load Rating and Static Safety Factor | A21 |
| Calculation of Bearing Loads | A22 |
| Boundary Dimensions and Identification Number | A26 |
| Accuracy | A30 |
| Clearance | A37 |
| Fit | A39 |
| Design of Shaft and Housing | A44 |
| Lubrication | A49 |
| Friction and Allowable Rotational Speed | A56 |
| Operating Temperature Range | A57 |
| Handling of Bearings | A57 |

Description of Each Series & Table of Dimensions

| | | |
|--|------------------------------------|------|
| Shell Type Needle Roller Bearings | TA·TLA·BA·BHA | B 1 |
| Needle Roller Cages for general usage | KT | C 1 |
| Needle Roller Cages for engine connecting rods | KT··EG·KTV··EG | C17 |
| Machined Type Needle Roller Bearings | NA·TAFI·TRI·BRI | D 1 |
| Needle Roller Bearings with separable cage | NAF | D93 |
| Roller Bearings | NAG·NAU·TRU·NAS | E 1 |
| Thrust Bearings | NTB·AS·AZK·WS·GS | F 1 |
| Combined Type Needle Roller Bearings | NAX·NBX·NATA·NATB | G 1 |
| Inner Rings | IRT·IRB·LRT·LRB | H 1 |
| Cam Followers | CF·NUCF·CFS·CR | I 1 |
| Roller Followers | NAST·NART·NURT | I 83 |
| Crossed Roller Bearings | CRBF·CRBH·CRBC·CRB·CRBS·CRBT | J 1 |
| Spherical Bushings | SB·GE·SBB | K 1 |
| Pilloballs | PB·PHS·POS·PHSB·POSB·PHSA | K29 |
| L-balls | LHSA·LHS | K45 |
| Super Flexible Nozzles | SNA·SNM·SNPT | K55 |
| Parts For Needle Roller Bearings | OS·DS·WR·AR·Needle Roller | L 1 |

Applications Miscellaneous Tables

Presentation of Linear Motion Rolling Guide and Mechatronics Series

Alphabetical Index

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:

① 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.

② Stable accuracy can be maintained for long periods.

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

③ Machine reliability is improved.

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

④ 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:

① 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.

② 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.

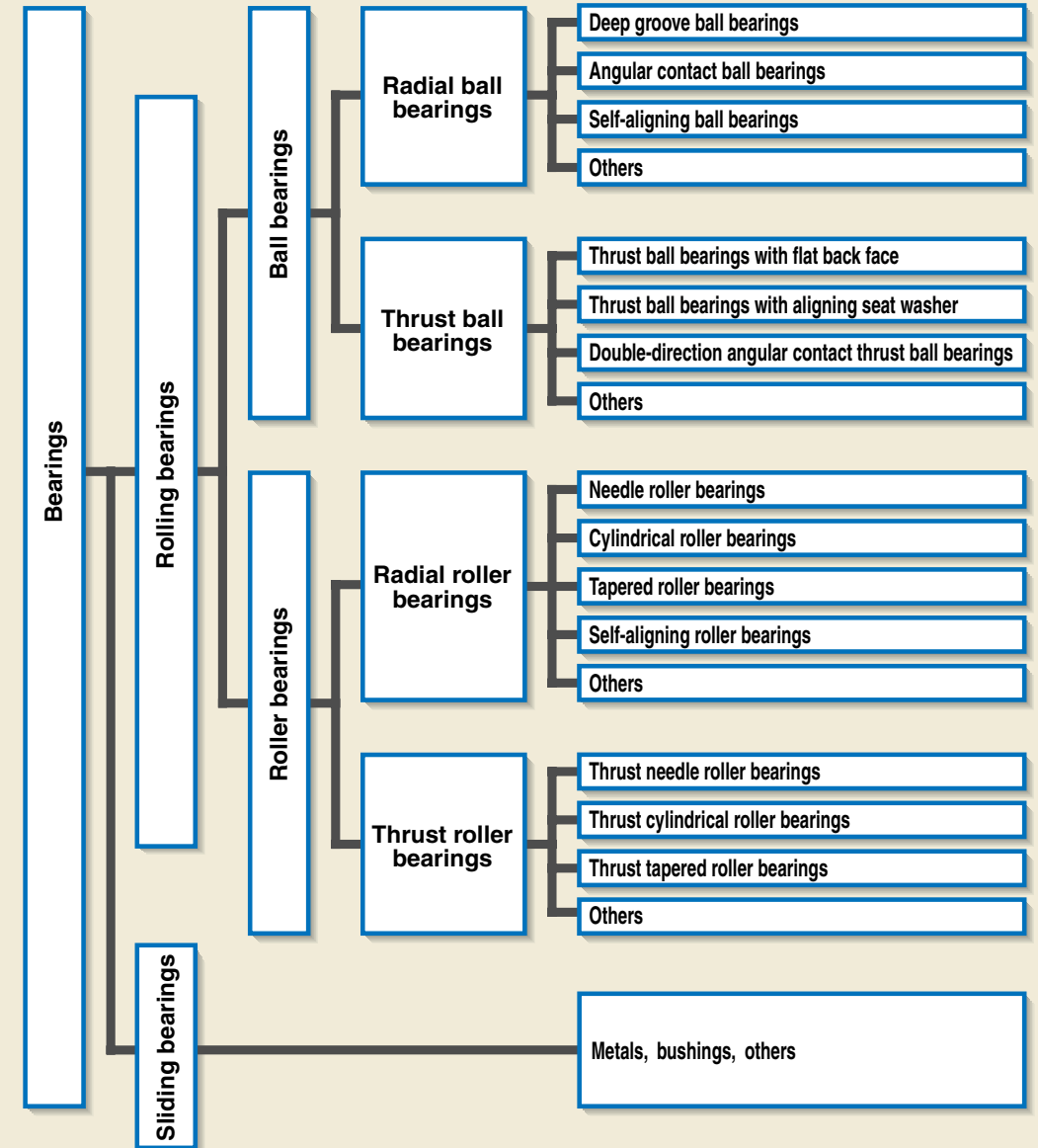
③ Inertia is minimized.

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

④ Most suited to oscillating motions.

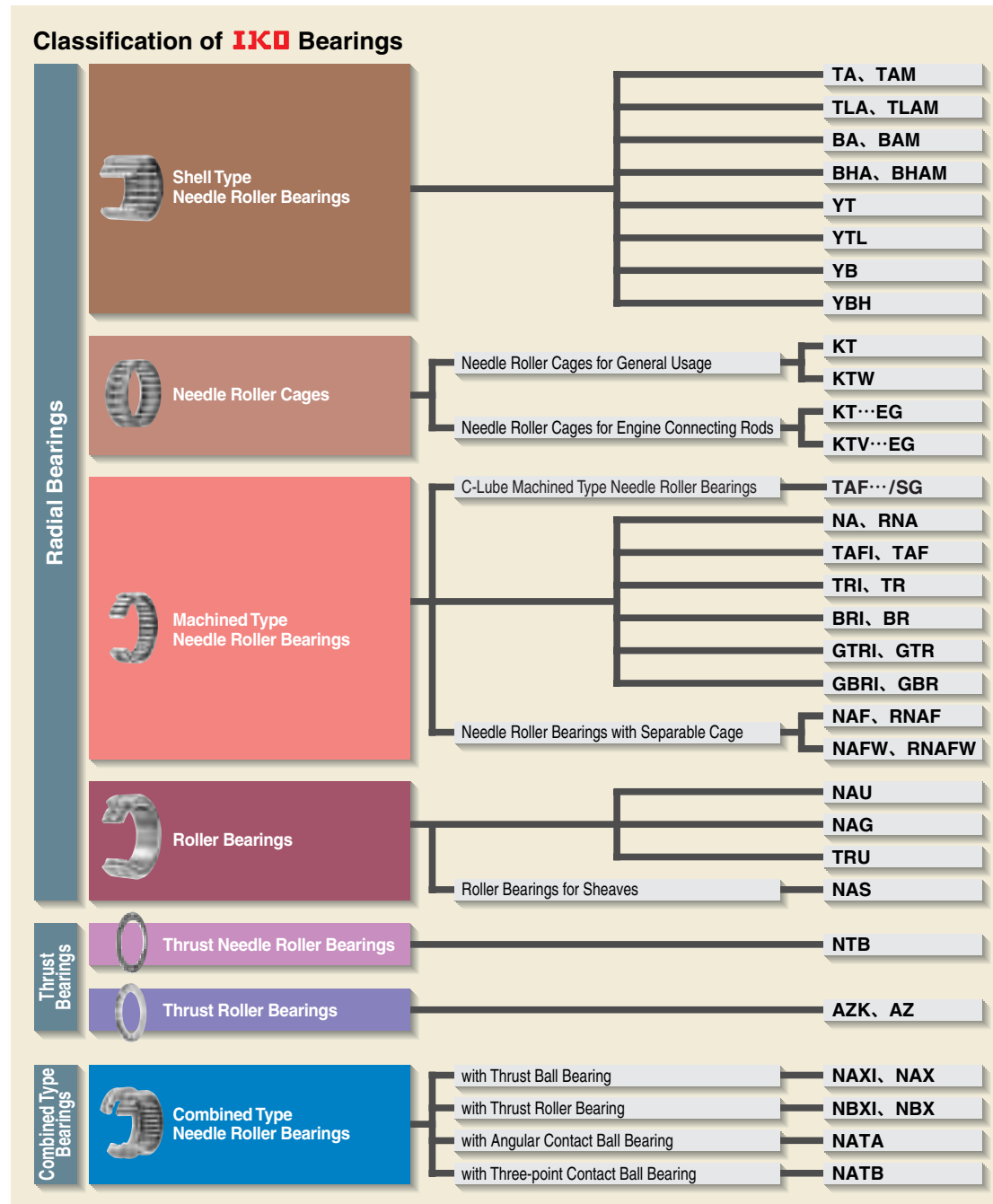
Many rolling elements are arranged at a small spacing pitch, and this configuration is most suited to oscillating motions.

Classification of bearings

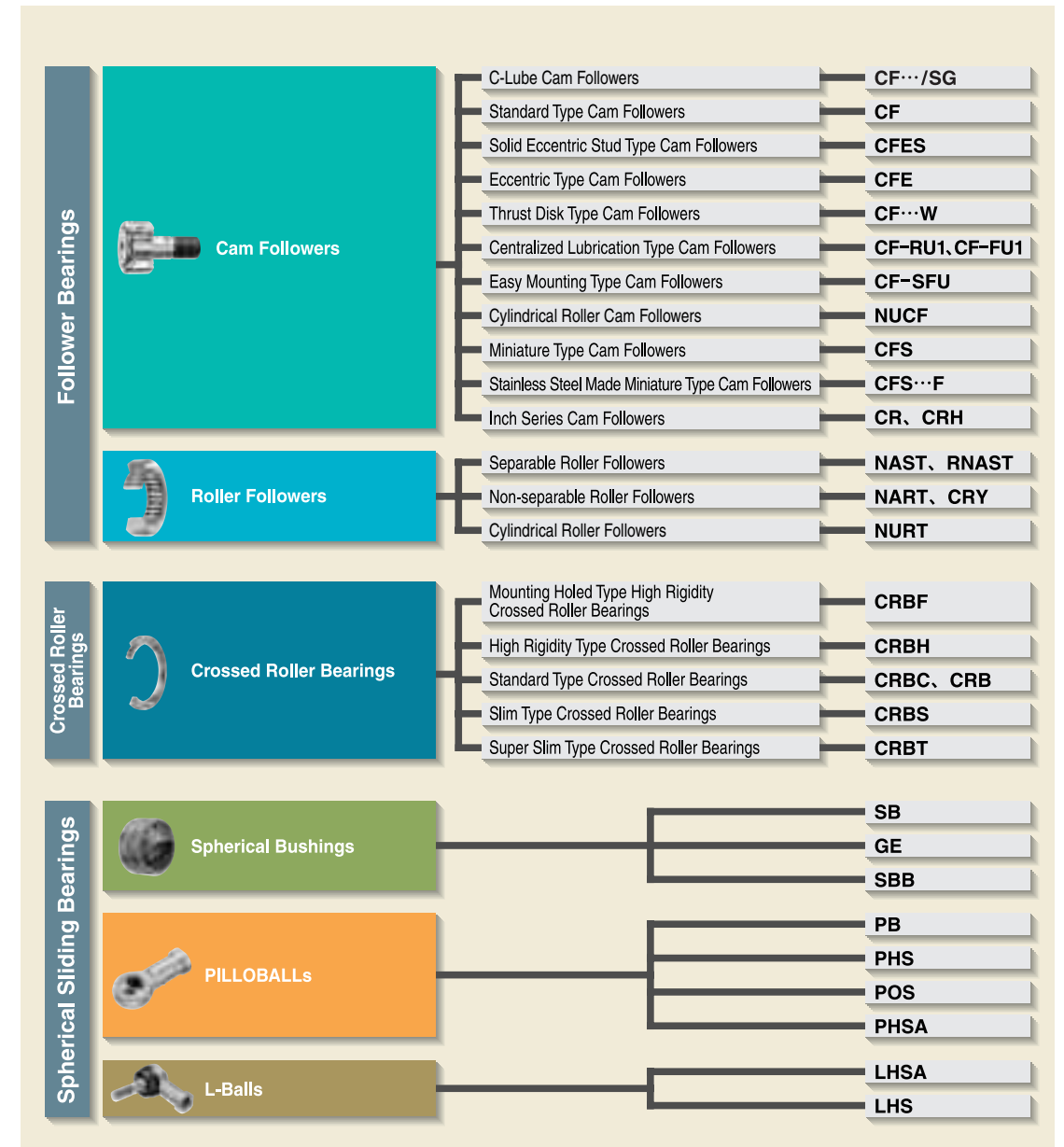


Types and Features of Bearings

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.



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.



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

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 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 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

Needle Roller Cages for Engine Connecting Rods



Needle Roller Cages 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

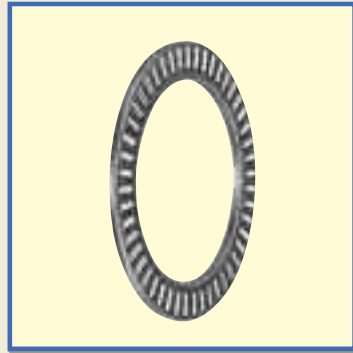
Roller Bearings



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

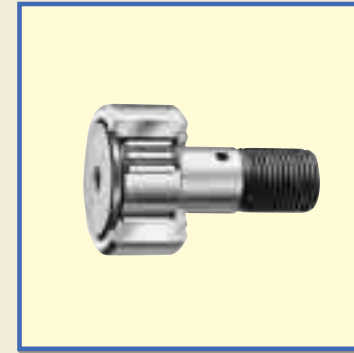
Thrust Bearings



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

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

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

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 I83

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

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

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

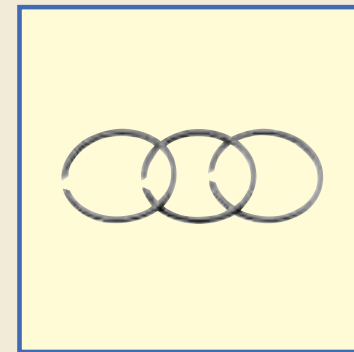
PILLOBALLS



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

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

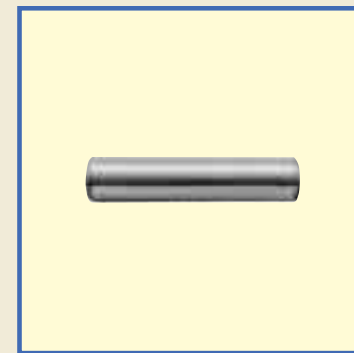
L-Balls



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

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 | | | | | | | B1 ~ |
| | Full complement type | | | | | | | |
| Needle Roller Cages | For general usage | | | | | | | C1 ~ |
| | For engine connecting rods | | | | | | | C17 ~ |
| Machined Type Needle Roller Bearings | Caged type | | | | | | | D1 ~ |
| | Full complement type | | | | | | | |
| Needle Roller Bearings with Separable Cage | Caged type | | | | | | | D93 ~ |
| Roller Bearings | Caged type | | | | | | | E1 ~ |
| | Full complement type | | | | | | | |
| | For sheaves | | | | | | | |

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 | | | | | | | F1 ~ |
| | Roller bearings | | | | | | | |
| Combined Type Needle Roller Bearings | With thrust ball bearing | | | | | | | G1 ~ |
| | With thrust roller bearing | | | | | | | |
| | With angular contact ball bearing | | | | | | | |
| | With three-point contact ball bearing | | | | | | | |
| Cam Followers | Caged type | | | | | | | I1 ~ |
| | Full complement type | | | | | | | |
| Roller Followers | Separable caged type | | | | | | | I83 ~ |
| | Non-separable caged type | | | | | | | |
| | Non-separable full complement type | | | | | | | |

Features of **IKO** Bearings

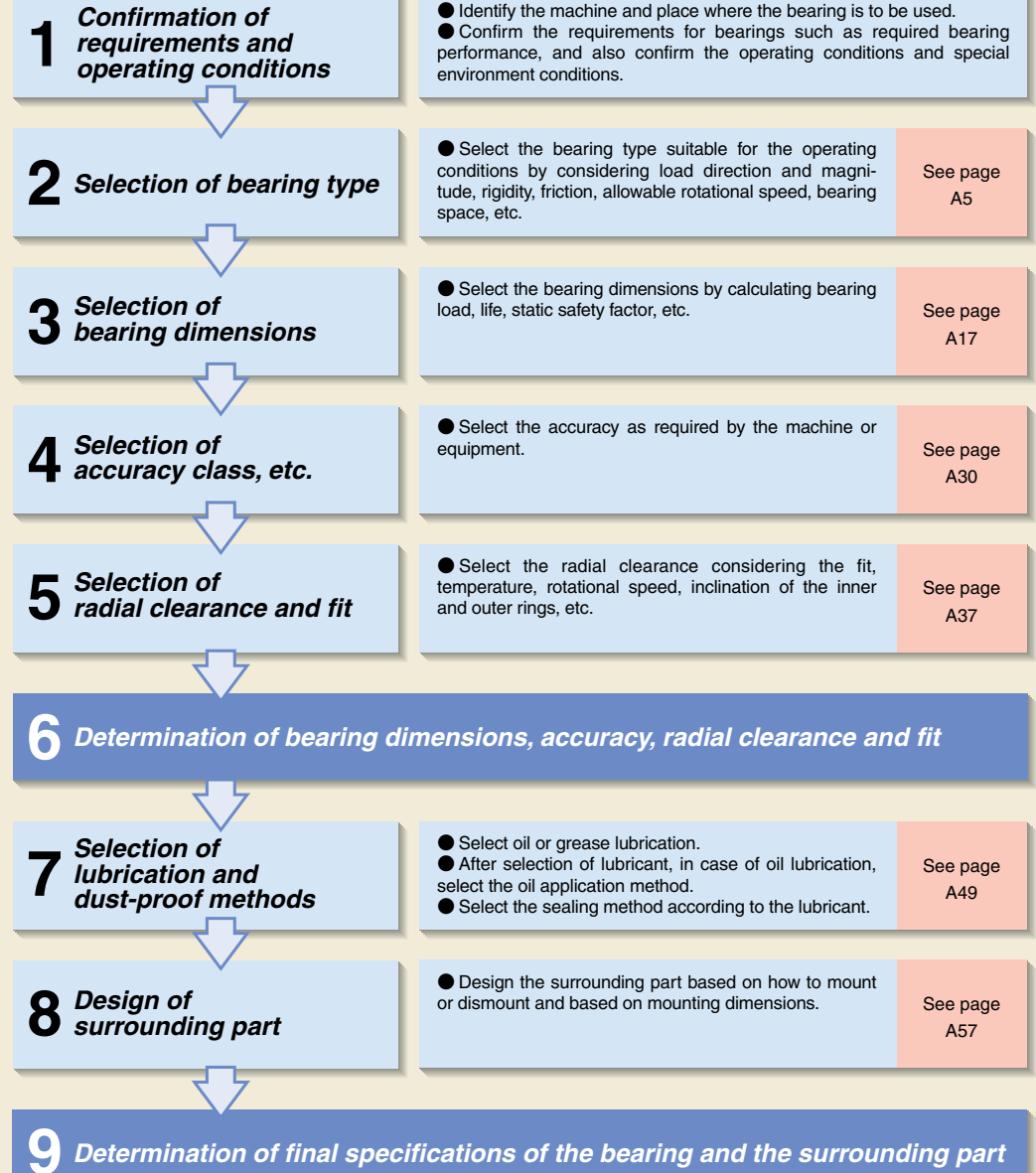
| Bearing series | Appearance | Direction of motion | Load direction and capacity | Allowable rotational speed | Friction | Sectional height | Reference page |
|-------------------------|------------------------------------|---------------------|-----------------------------|----------------------------|----------|------------------|----------------|
| Crowned 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



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.

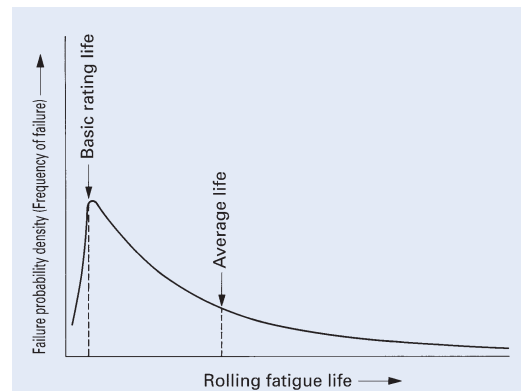


Fig. 1 Variation of rolling fatigue life

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:

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

- 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:

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

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

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

- 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.

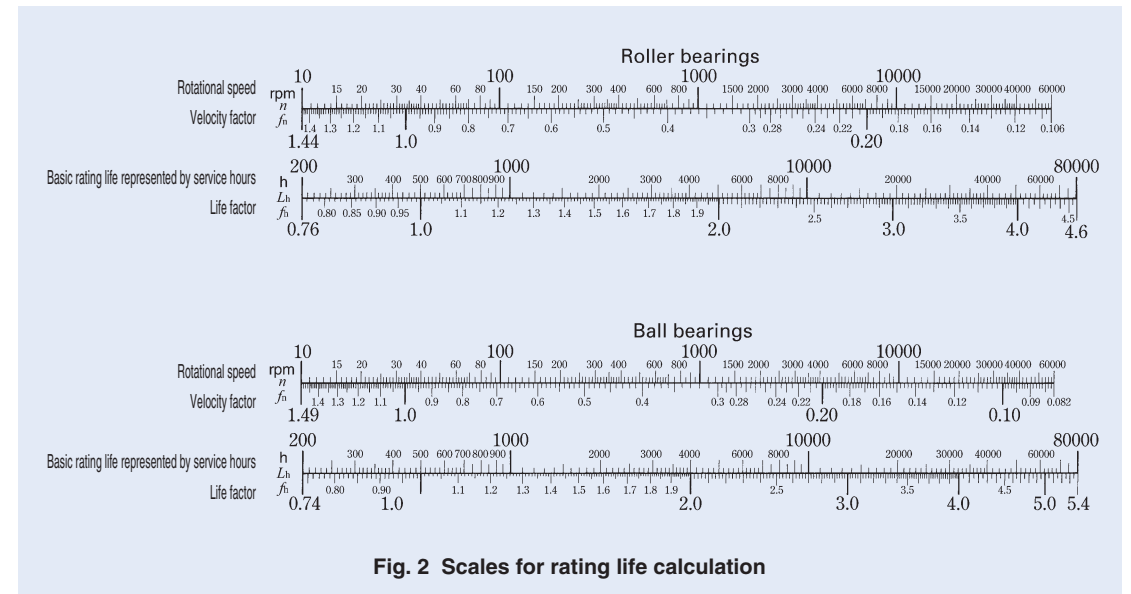


Fig. 2 Scales for rating life calculation

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 |

Life of oscillating bearing

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

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

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.

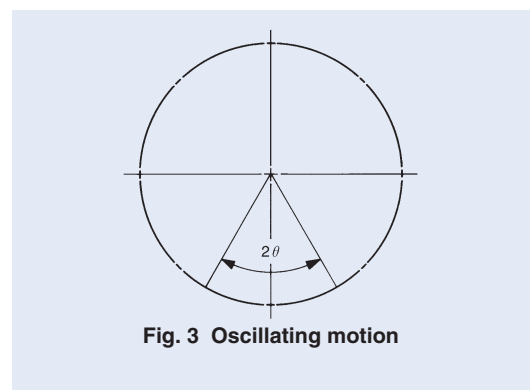


Fig. 3 Oscillating motion

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.

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

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:

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

where, C_t : Basic dynamic load rating considering temperature rise, N
 f_t : Temperature factor (See Fig. 4.)
 C : Basic dynamic load rating, N

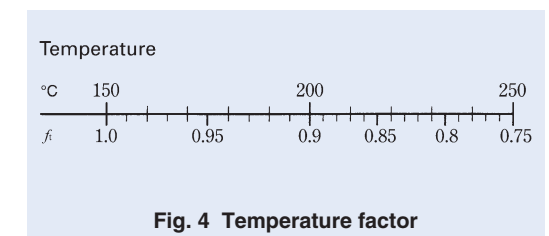


Fig. 4 Temperature factor

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:

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

where, C_H : Basic dynamic load rating considering hardness, N
 f_H : Hardness factor (See Fig. 5.)
 C : Basic dynamic load rating, N

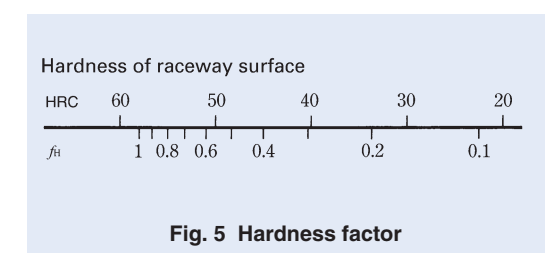


Fig. 5 Hardness factor



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.

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

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.

Table 5 Load distribution to bearings

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

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:

$$F = f_w F_c \dots\dots\dots(10)$$

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 |

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:

$$T = 9550000 \frac{H}{n} \dots\dots\dots(11)$$

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

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.

$$K_r = f_b K_t \dots\dots\dots(13)$$

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:

$$T = 9550000 \frac{H}{n} \dots\dots\dots(14)$$

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

$$K_s = K_t \tan \theta \dots\dots\dots(16)$$

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

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.

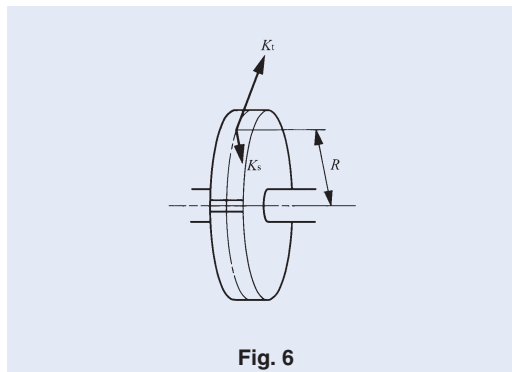


Fig. 6

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.

$$K_r = f_z K_c \dots\dots\dots(18)$$

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:

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

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 |
|---|---|
| <p>Step load</p> | $F_m = \sqrt[p]{\frac{1}{N} (F_1^p N_1 + F_2^p N_2 + \dots + F_n^p N_n)}$ <p>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.</p> |
| <p>Monotonously changing load</p> | $F_m = \frac{1}{3} (2F_{max} + F_{min})$ <p>where, F_{max} : Maximum value of fluctuating load, N F_{min} : Minimum value of fluctuating load, N</p> |
| <p>Sinusoidally fluctuating load</p> | $F_m \doteq 0.65 F_{max}$ |
| <p>Sinusoidally fluctuating load</p> | $F_m \doteq 0.75 F_{max}$ |
| <p>Stationary load plus rotating load</p> | $F_m = F_S + F_R - \frac{F_S F_R}{F_S + F_R}$ <p>where, F_S : Stationary load, N F_R : Rotating load, N</p> |

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]

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

[For thrust bearings]

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

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]

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

[For thrust bearings]

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

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

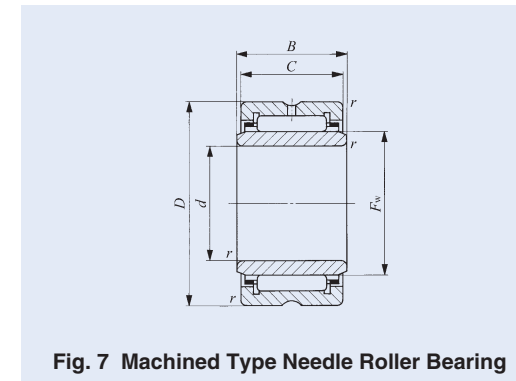


Fig. 7 Machined Type Needle Roller Bearing

Shell Type Needle Roller Bearing

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

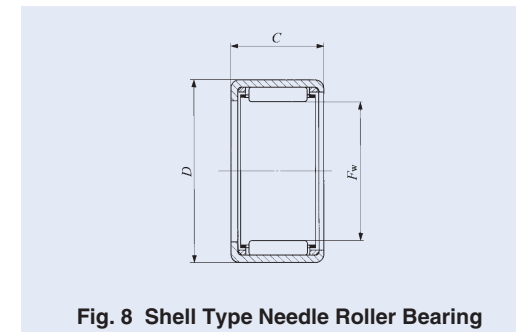


Fig. 8 Shell Type Needle Roller Bearing

Needle Roller Cage

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

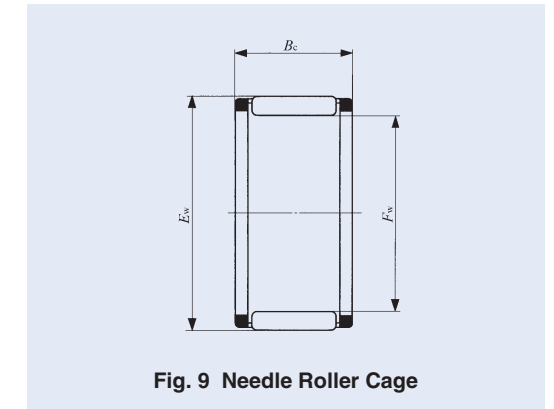


Fig. 9 Needle Roller Cage

Thrust Roller Bearing

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

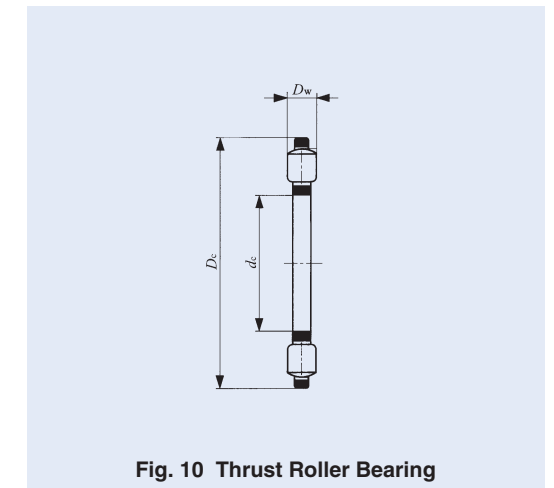


Fig. 10 Thrust Roller Bearing

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 | ① |
|-----------------------|---------------------------|---|
| | Boundary dimensions | ② |
| Supplemental code | Material symbol | ③ |
| | Cage symbol | ④ |
| | Shield symbol | ⑤ |
| | Seal symbol, | ⑥ |
| | Bearing ring shape symbol | ⑦ |
| | Clearance symbol | ⑧ |
| Classification symbol | ⑧ | |

① Model code

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

② Boundary 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

③ Material symbol

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

④ Cage symbol

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

⑤ Seal 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 |

⑥ Bearing 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.

⑦ Clearance 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 | |

⑧ Classification symbol

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

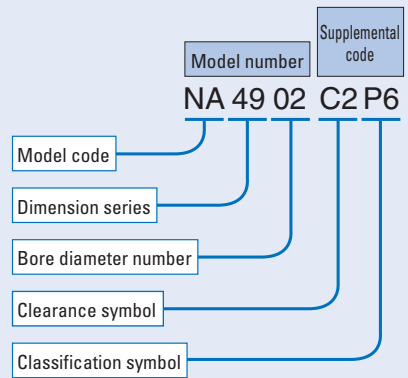
Table 11 Indication of boundary dimensions

| 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 |

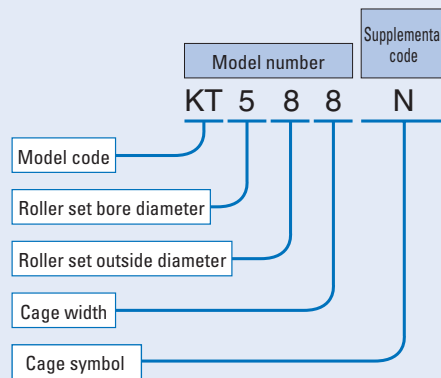
Note⁽¹⁾ The nominal dimensions of inch series bearings are indicated in units of 1/16 inch.

Example of identification number

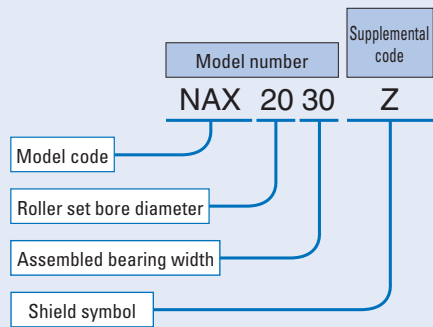
(a) Example of "Dimension series + Bore diameter number"



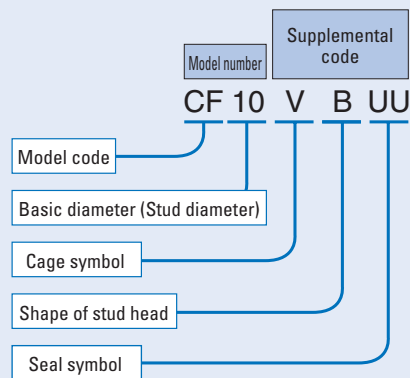
(b) Example of "Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + width"



(c) Example of "Bore diameter or roller set bore diameter + width"



(d) Example of "Basic diameter"



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] $V_{d\subscript{p}}$ means the difference between the largest and the smallest of the bore diameters in a single radial plane (circularity). $V_{d\subscript{mp}}$ means the difference between the largest and the smallest of the single plane mean bore diameters (cylindricity).

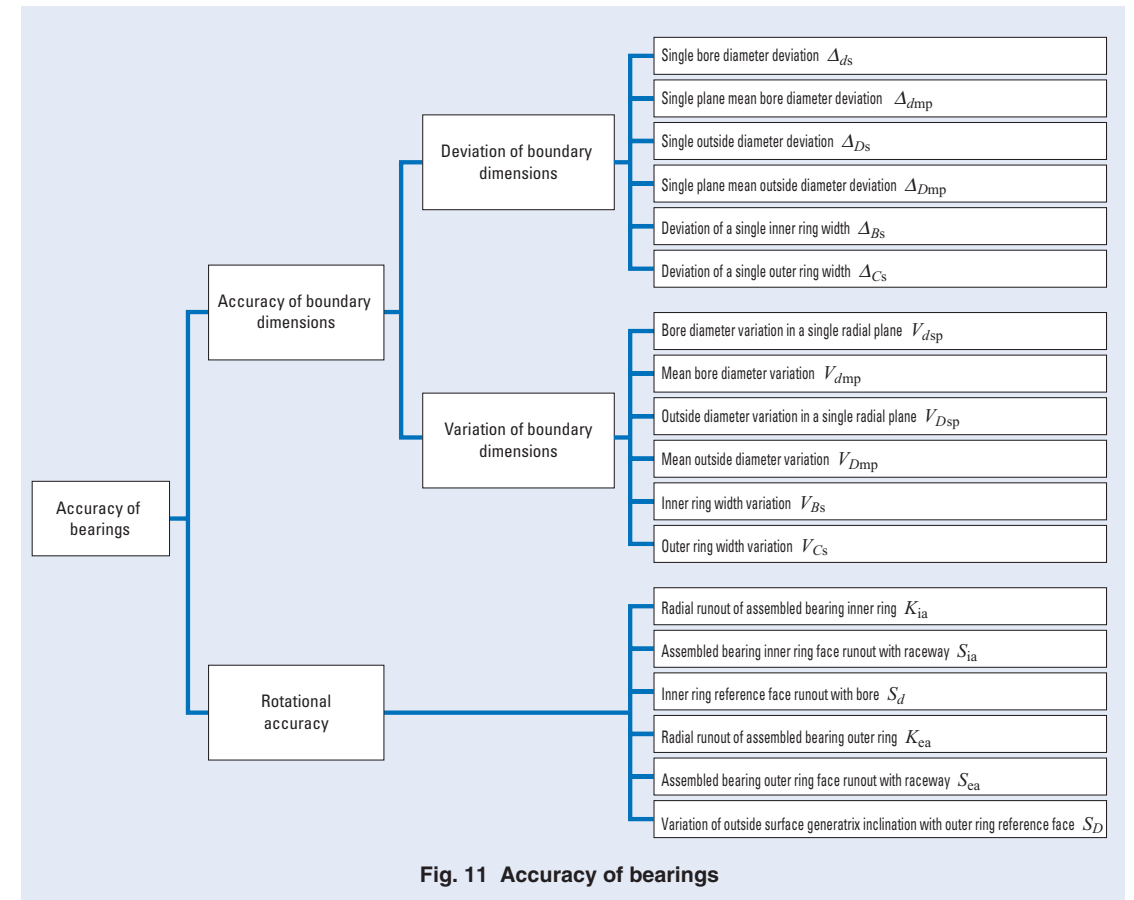


Fig. 11 Accuracy of bearings



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 |
| 0.4 (1) | — | 40 | 0.8 | 1 |
| 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.)

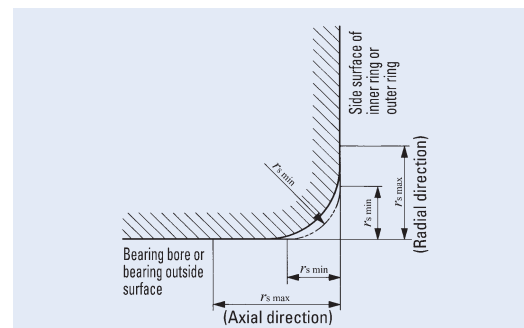


Fig. 12 Permissible values for chamfer dimensions

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. | d_{mp} Single plane mean bore diameter | $d_{mp} = \frac{d_{sp \max} + d_{sp \min}}{2}$ $d_{sp \max}$: 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 |
| | | Δd_{mp} Single plane mean bore diameter deviation | $\Delta d_{mp} = d_{mp} - d$ 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 |
| | | Δd_s Single bore diameter deviation | $\Delta d_s = d_s - d$ 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. | D_{mp} Single plane mean outside diameter | $D_{mp} = \frac{D_{sp \max} + D_{sp \min}}{2}$ $D_{sp \max}$: 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 |
| | | ΔD_{mp} Single plane mean outside diameter deviation | $\Delta D_{mp} = D_{mp} - D$ 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 |
| | | ΔD_s Single outside diameter deviation | $\Delta D_s = D_s - D$ D_s : Any measured outside diameter obtained in any radial plane |

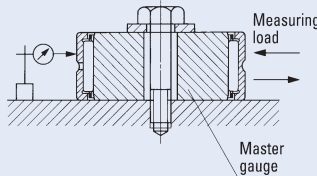
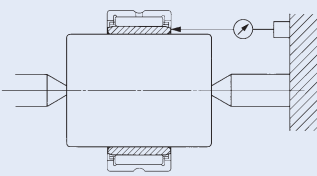
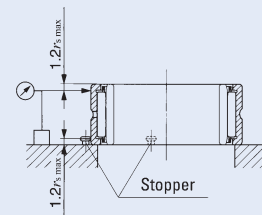
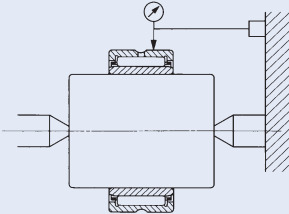
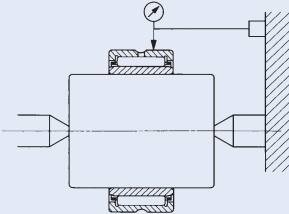
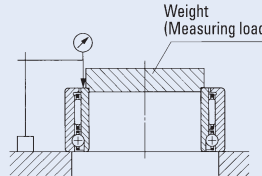
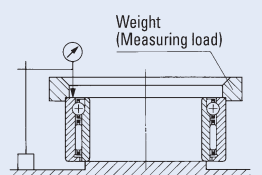
| Measurement methods | | Accuracy and definitions | |
|---------------------------------|---|--|---|
| Roller set bore diameter | In principle, this is measured using a master gauge. The master gauge is fixed on the base with its side surface downward, and the outer ring with needle rollers is fitted 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. | Δ_{Fws} Deviation of a single roller set bore diameter | $\Delta_{Fws} = (d_G + \delta_{1m}) - F_w$ d_G : Outside diameter of master gauge δ_{1m} : Arithmetical mean value of outer ring movement F_w : Nominal dimension of roller set bore diameter |
| |  | $\Delta_{Fws\ min}$ Deviation of smallest single roller set bore diameter | $\Delta_{Fws\ min} = (d_G + \delta_{1min}) - F_w$ δ_{1min} : 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. | Δ_{Bs} Deviation of a single inner ring width | $\Delta_{Bs} = B_s - B$ B_s : Single inner ring width B : Nominal inner ring width |
| | | V_{Bs} Inner ring width variation | $V_{Bs} = B_{s\ max} - B_{s\ min}$ $B_{s\ max}$: Maximum value of single inner ring width $B_{s\ min}$: 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. | Δ_{Cs} Deviation of a single outer ring width | $\Delta_{Cs} = C_s - C$ C_s : Single outer ring width C : Nominal outer ring width |
| | | V_{Cs} Outer ring width variation | $V_{Cs} = C_{s\ max} - C_{s\ min}$ $C_{s\ max}$: Maximum value of single outer ring width $C_{s\ min}$: 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. | Δ_{Ts} Deviation of the actual bearing height | $\Delta_{Ts} = T_s - T$ 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 ($r_{s\ max}$) 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 ($r_{s\ max}$) 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. |  |

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).

① Table 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.

② In 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.

③ For 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

| 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. | C2 or smaller clearance |
| When less noise and vibration are required. | |
| When a loose fit is required for both inner and outer rings. When preload is required. | |

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.

$$\Delta_C = \Delta_F + \Delta_E \dots\dots\dots(24)$$

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

① Amount of expansion of the outside diameter of inner ring

· With solid shaft

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

· With hollow shaft

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

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

② Amount of shrinkage of the bore diameter of outer ring

· With steel housing ($D_0 = \infty$)

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

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

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

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:



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

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

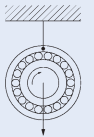
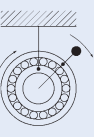
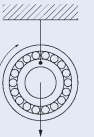
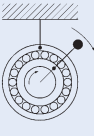
The temperature difference Δ_t is considered to be 5 ~ 10 $^\circ\text{C}$ under normal operating conditions and 15 ~ 20 $^\circ\text{C}$ at high rotational speeds. Therefore, when the temperature difference is great, a correspondingly larger radial internal clearance must be selected.

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 | | Rotating conditions | Fit | |
|--|--|--|------------------|------------------|
| | | | 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.

1 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.

2 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 $F_r \leq 0.2C_0$

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

· When $F_r > 0.2C_0$

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

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

3 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.

$$\Delta_{dT} = (0.1 \sim 0.15) \Delta_T \alpha d \cong 0.0015 \Delta_T d \times 10^{-3} \dots\dots(32)$$

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, $^\circ\text{C}$
 α : Coefficient of linear expansion for bearing steel
 $\cong 12.5 \times 10^{-6} \text{ 1/}^\circ\text{C}$
 d : Bore diameter of inner ring, mm

4 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

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

· For machined shaft

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

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

5 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).

$$\Delta_{df} \geq \frac{d+2}{d} (\Delta_{dF} + 0.0015 \Delta_T d \times 10^{-3}) \dots\dots(35)$$

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 $P \leq 0.06C$, $0.06C < P \leq 0.12C$, 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 | | Tolerance class of shaft (1) | Application examples (Reference) | |
|---|---------------------|-------|------------------------------|---|---|
| | Over | Incl. | | | |
| Stationary load on inner ring | All shaft diameters | | g6 | Wheels on dead axles | |
| | | | h6 | Control lever gears Rope sheaves | |
| | | | h5 | Tension pulleys | |
| Rotating load on inner ring or Directionally indeterminate load | Light load | — | 50 | j5 k5 m6 (2) n6 (3) | Electric appliances, Precision machinery Machine tools, Pumps Blowers, Transportation vehicles |
| | | 50 | 100 | | |
| | | 100 | 200 | | |
| | | 200 | — | | |
| | Normal load | — | 50 | k5 (4) | General bearing applications Pumps, Transmission gearboxes, Wood working machinery, Internal combustion engines |
| | | 50 | 150 | m5, m6 (2) | |
| 150 | | 200 | n6 (3) | | |
| Heavy load Shock load | — | 150 | n6 (3) | Industrial vehicles, Construction machinery Crushers | |
| | 150 | — | p6 (3) | | |

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.



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 | | | | | | |
| 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 | | | | | | | |
| 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 | | | | | | | | | | | |
| 140 | 160 | 0 | -25 | -39 ~ 11 | -18 ~ 25 | -25 ~ 25 | -11 ~ 32 | 3 ~ 46 | 15 ~ 58 | 15 ~ 65 | 27 ~ 77 | 43 ~ 93 |
| 160 | 180 | | | | | | | | | | | |
| 180 | 200 | | | | | | | | | | | |
| 200 | 225 | 0 | -30 | -44 ~ 15 | -20 ~ 30 | -29 ~ 30 | -13 ~ 37 | 4 ~ 54 | 17 ~ 67 | 17 ~ 76 | 31 ~ 90 | 50 ~ 109 |
| 225 | 250 | | | | | | | | | | | |
| 250 | 280 | 0 | -35 | -49 ~ 18 | -23 ~ 35 | -32 ~ 35 | -16 ~ 42 | 4 ~ 62 | 20 ~ 78 | 20 ~ 87 | 34 ~ 101 | 56 ~ 123 |
| 280 | 315 | | | | | | | | | | | |
| 315 | 355 | 0 | -40 | -54 ~ 22 | -25 ~ 40 | -36 ~ 40 | -18 ~ 47 | 4 ~ 69 | 21 ~ 86 | 21 ~ 97 | 37 ~ 113 | 62 ~ 138 |
| 355 | 400 | | | | | | | | | | | |
| 400 | 450 | 0 | -45 | -60 ~ 25 | -27 ~ 45 | -40 ~ 45 | -20 ~ 52 | 5 ~ 77 | 23 ~ 95 | 23 ~ 108 | 40 ~ 125 | 68 ~ 153 |
| 450 | 500 | | | | | | | | | | | |

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 | | |
|-----------------------|-------|-------------------------|-----|-----|
| Over | Incl. | IT5 | IT6 | IT7 |
| | | 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 $\mu\text{m}R_a$ ($\mu\text{m}R_y$) | 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 $\mu\text{m}R_a$ (3.2 $\mu\text{m}R_y$) is allowable.

⁽⁴⁾ An appropriate thickness of the hardened layer is required.

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.

$$E_{ht} \geq 0.8D_w(0.1 + 0.002D_w) \dots\dots\dots(36)$$

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.

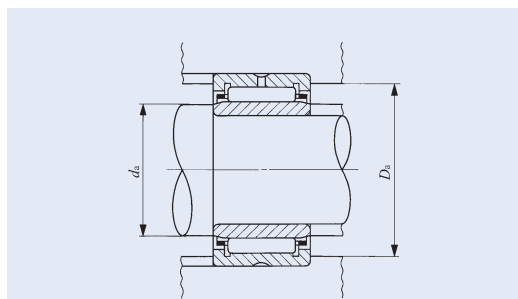


Fig. 13 Dimensions related to mounting

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

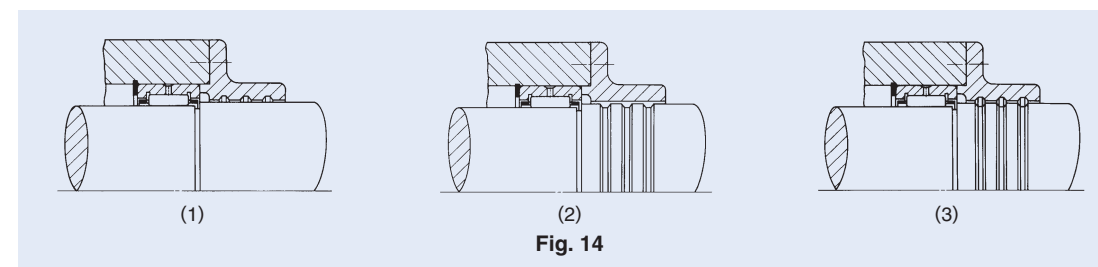
| $r_{s\ min}$ Smallest permissible single chamfer dimension | $r_{as\ max}$ Largest permissible single corner radius of shafts and housings | |
|---|--|--|
| 0.1 | 0.1 | |
| 0.15 | 0.15 | |
| 0.2 | 0.2 | |
| 0.3 | 0.3 | |
| 0.4 | 0.4 | |
| 0.6 | 0.6 | |
| 1 | 1 | |
| 1.1 | 1 | |
| 1.5 | 1.5 | |
| 2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

Table 29 Fillet relief dimensions for ground shafts and housings

| $r_{s\ min}$ 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.

Oil groove

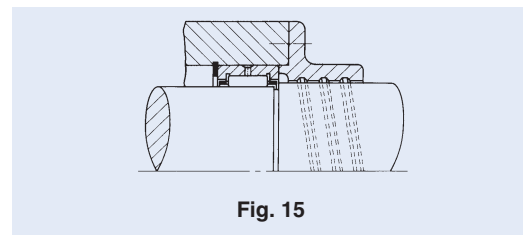
Oil grooves are provided on either the shaft or housing bore, or on both for more effective sealing (See Fig. 14.). The clearance between the shaft and the housing bore should be as small as possible, and the values shown in Table 30 are generally used, taking into consideration errors in machining and 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.



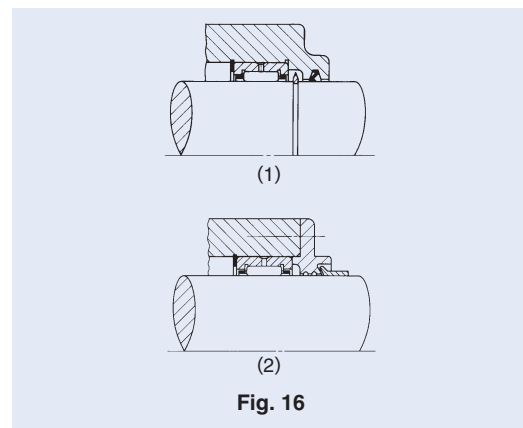
Table 30 Clearance between grooved shaft and housing bore unit: mm

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



2 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.



3 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.

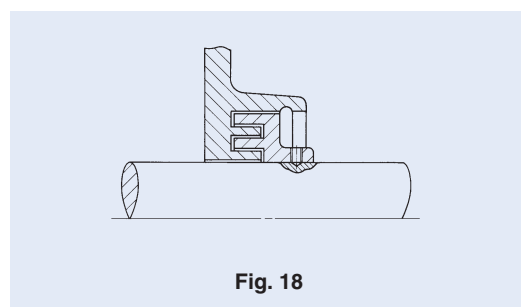
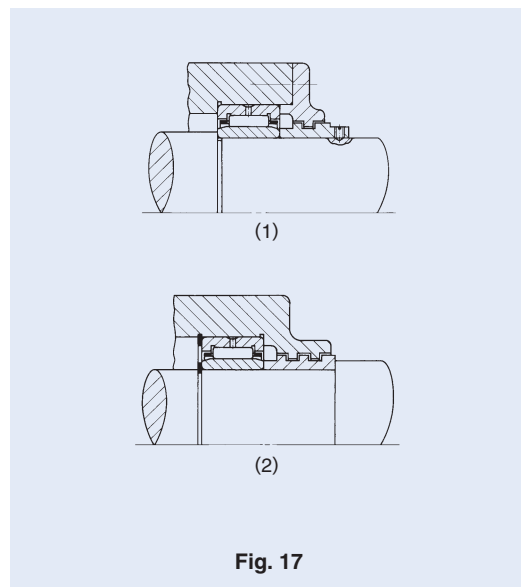


Table 31 Labyrinth clearance unit: mm

| 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.

1 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 °C |
|---------------------------|----------------|--------------------------------|
| Synthetic rubber | Nitrile rubber | - 25 ~ + 120 |
| | Acrylic rubber | - 15 ~ + 130 |
| | Silicon rubber | - 50 ~ + 180 |
| | Fluoro rubber | - 10 ~ + 180 |
| Tetrafluoroethylene 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) |

2 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.



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.

1 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.

2 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.

3 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.

4 Rust prevention

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

5 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

1 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.

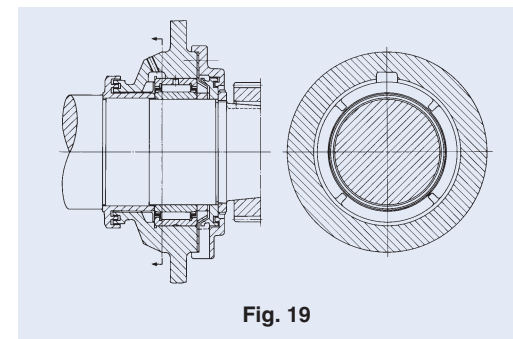


Fig. 19

2 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.

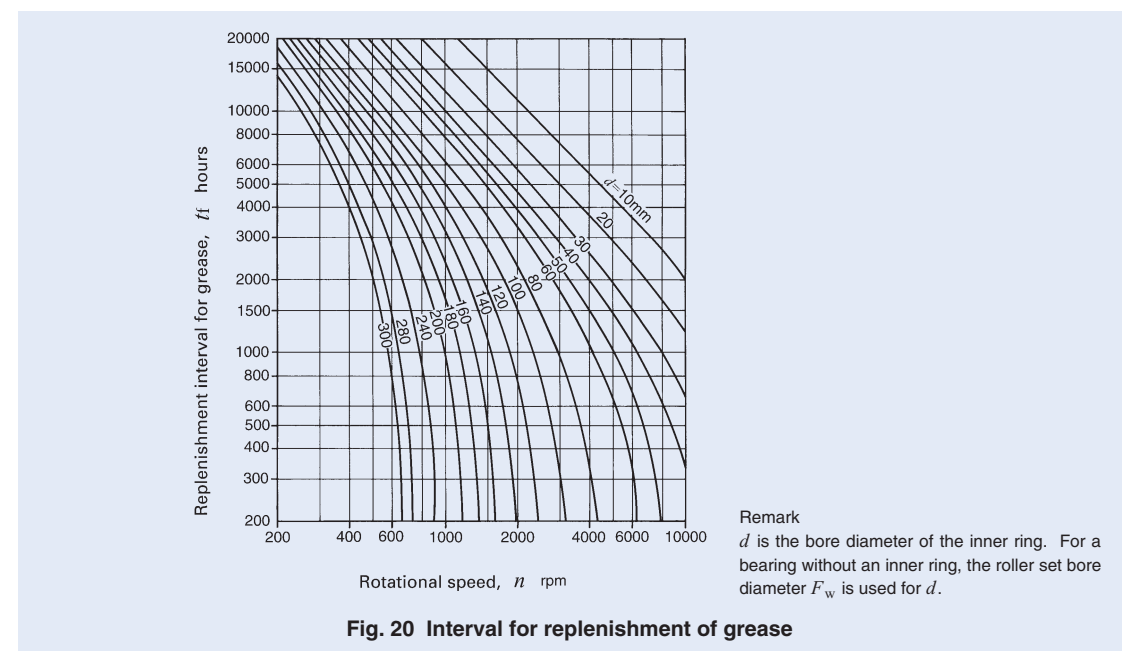


Fig. 20 Interval for replenishment of grease

Oil lubrication

1 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.

2 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.

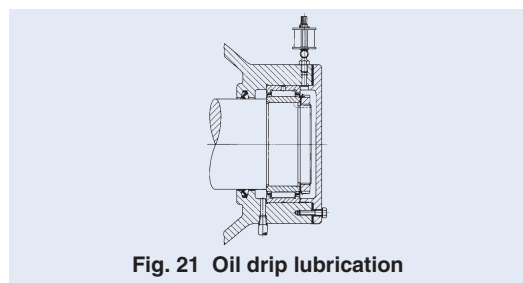


Fig. 21 Oil drip lubrication

3 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.

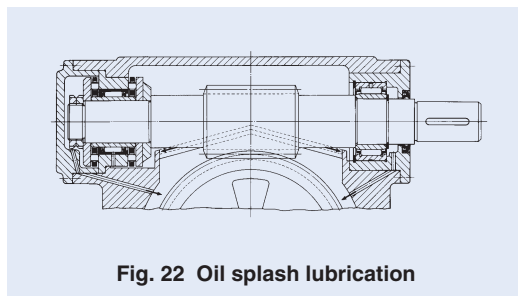


Fig. 22 Oil splash lubrication

4 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.

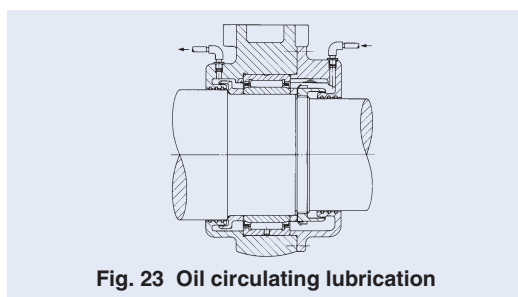


Fig. 23 Oil circulating lubrication

5 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.

6 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.

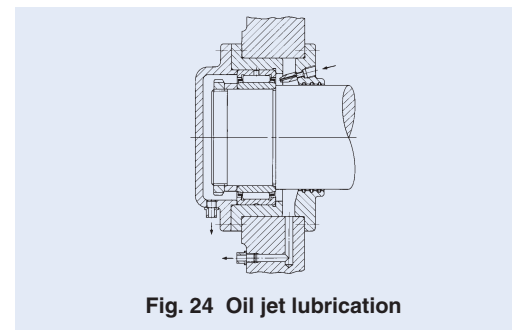


Fig. 24 Oil jet lubrication

Table 35 Properties of various types of grease

| Name (Common name) | Calcium grease | Sodium grease | Aluminum grease | Mixed base grease | Barium grease | Lithium grease | | | Non-soap base grease (Non-soap grease) | | |
|--------------------------------|--|--|--|----------------------------------|--|---|---|---|--|----------------------------|--|
| | (Cup grease) | (Fiber grease) | (Mobile 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 °C | 80 ~ 90 | 150 ~ 180 | 70 ~ 90 | 160 ~ 190 | 150 ~ 180 | 170 ~ 190 | 170 ~ 190 | 200 ~ 250 | 200 ~ | None | |
| Operating temperature range °C | -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. | | |

1 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.

2 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.

3 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 |

4 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.

5 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 mm ² /s or more |
| Crossed roller bearings | 20 mm ² /s or more |
| Thrust needle roller bearings Thrust roller bearings | 32 mm ² /s or more |

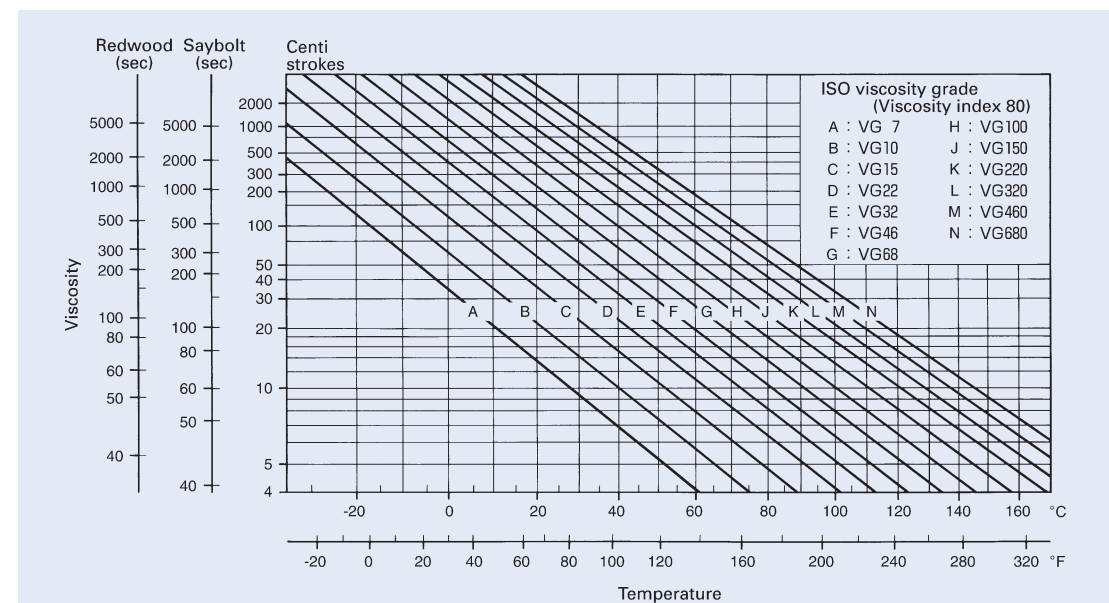


Fig. 25 Relationship between viscosity and temperature of lubricating oil

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°C | Refrigerator oil | | | | | | | | | | | |
| | 0 ~ 50°C | Bearing oil | | | | | | | | | | | |
| | 50 ~ 80°C | Turbine oil | | | | | | | | | | | |
| | 80 ~ 110°C | Bearing oil | | | | | | | | | | | |
| $d_m n$ value Load | Large | Small | | | | | | | | | | | |
| | 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.

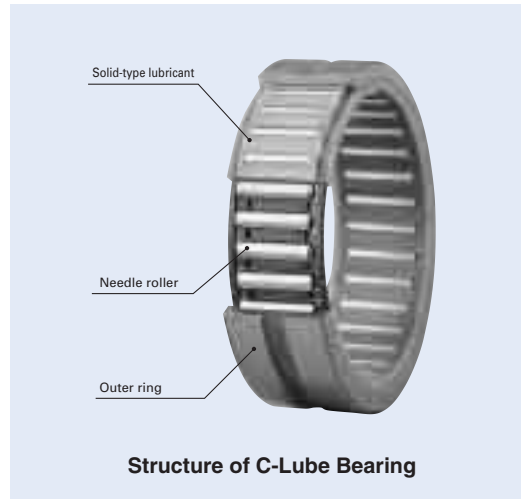


Table 39 Allowable rotational speed of C-Lube Bearing

| 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⁾ $d_m n = (\text{bore diameter of bearing [mm]} + \text{outside diameter of bearing [mm]}) / 2 \times \text{rotational speed [rpm]}$
⁽²⁾ $d_1 n = \text{stud diameter [mm]} \times \text{rotational speed [rpm]}$

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 $M = \mu P \frac{d}{2}$ (37)

· Thrust bearings $M = \mu P \frac{d_m}{2}$ (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.

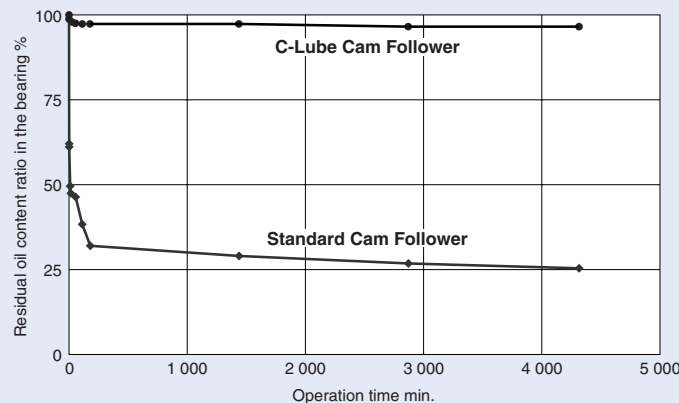
Since the amount of heat generated is approximately proportional to the sliding speed at the contact area, this sliding speed is an approximate guide indicating the limit of the bearing rotational speed.

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.

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



Operating Temperature Range

The allowable operating temperature range for needle roller bearings is generally $-20 \sim +120^{\circ}\text{C}$.

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.

① 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.

② 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.

③ Bearings should be mounted or dismounted with proper tools.
When mounting and dismounting, tools suitable for the bearing type should be used.

④ 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.

① 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.

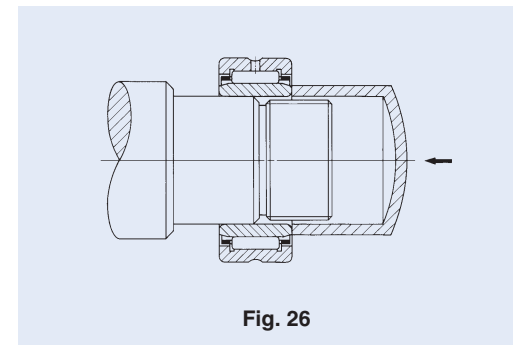


Fig. 26

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.

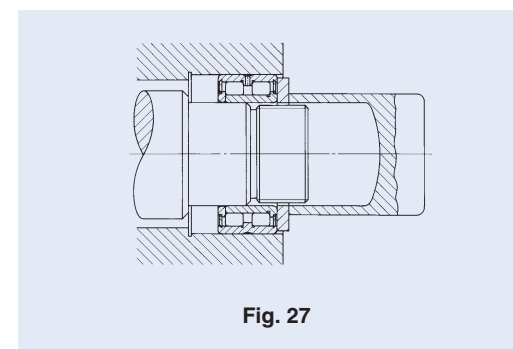


Fig. 27

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.

② 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 $+120^{\circ}\text{C}$, 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.

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.

$$K = f_k \frac{d}{d+2} \Delta_{df} B \left\{ 1 - \left(\frac{d}{F} \right)^2 \right\} \dots\dots\dots(39)$$

- where, K : Pressing or pulling force, N
 f_k : Resistance factor determined by the coefficient of friction
 When pressing in inner ring to shaft, $f_k=4 \times 10^{-4}$
 When pulling out inner ring from shaft, $f_k=6 \times 10^{-4}$
 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.

1 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

2 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.

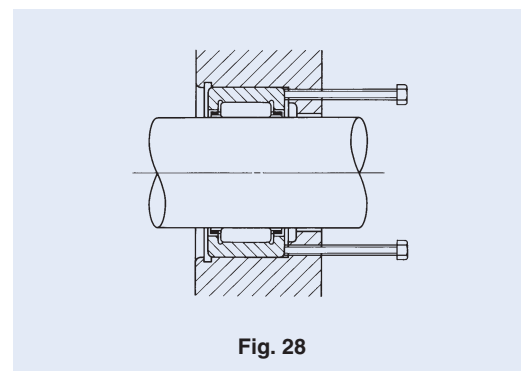


Fig. 28

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.

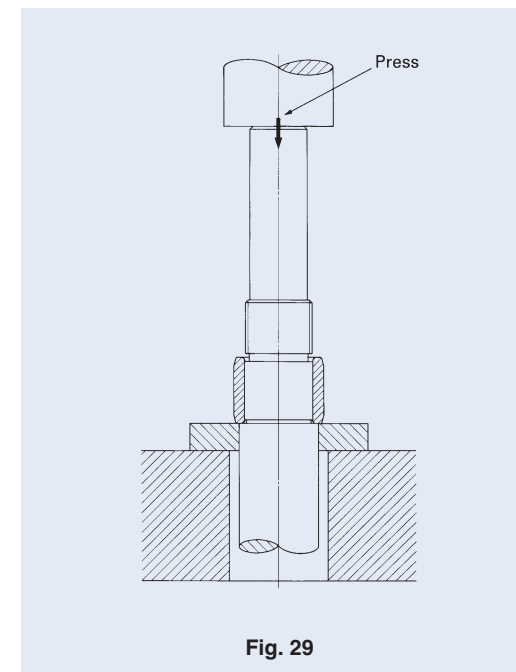


Fig. 29

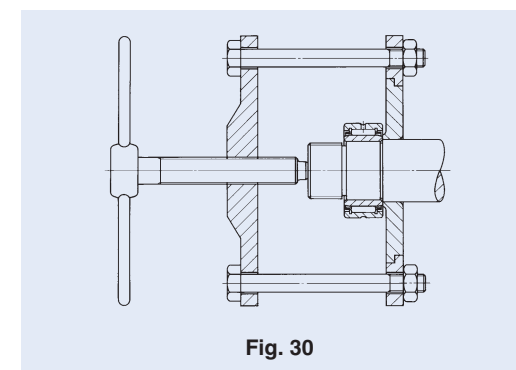


Fig. 30

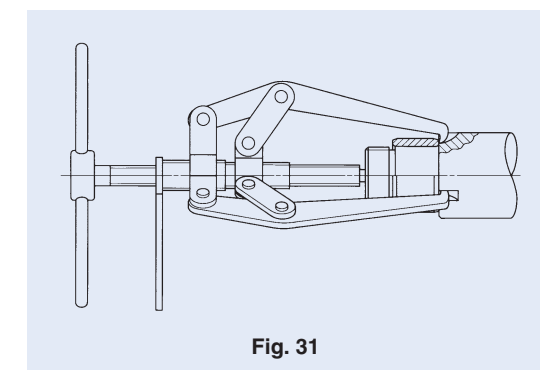


Fig. 31

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.

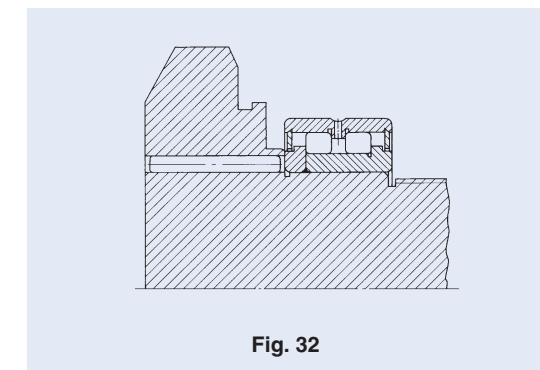


Fig. 32

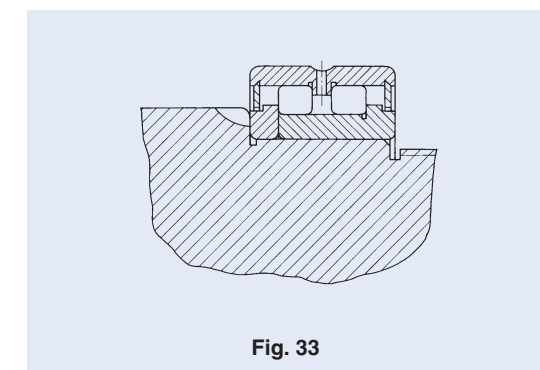


Fig. 33



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 cylindricality 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 |





Description of Each Series & Table of Dimensions

| | | |
|---|---|-----|
| Shell Type Needle Roller Bearings | TA·TLA·BA·BHA | B1 |
| Needle Roller Cages for general usage | KT | C1 |
| Needle Roller Cages for engine connecting rods | KT··EG·KTV··EG | C17 |
| Machined Type Needle Roller Bearings | TAF··/SG·NA·TAFI·TRI·BRI | D1 |
| Needle Roller Bearings with separable cage | NAF | D93 |
| Roller Bearings | NAG·NAU·TRU·NAS | E1 |
| Thrust Bearings | NTB·AS·AZK·WS·GS | F1 |
| Combined Type Needle Roller Bearings | NAX·NBX·NATA·NATB | G1 |
| Inner Rings | IRT·IRB·LRT·LRB | H1 |
| Cam Followers | CF··/SG·CF·NUCF·CFS·CR | I1 |
| Roller Followers | NAST·NART·NURT | I83 |
| Crossed Roller Bearings | CRBF·CRBH·CRBC·CRB·CRBS·CRBT | J1 |
| Spherical Bushings | SB·GE·SBB | K1 |
| Pilloballs | PB·PHS·POS·PHSB·POSB·PHSA | K29 |
| L-balls | LHSA·LHS | K45 |
| Super Flexible Nozzles | SNA·SNM·SNPT | K55 |
| Parts For Needle Roller Bearings | OS·DS·WR·AR·Needle Roller | L1 |

SHELL TYPE NEEDLE ROLLER BEARINGS

- Shell Type Caged Needle Roller Bearings
- Shell Type Grease Retained Full Complement Needle Roller Bearings



Structure and features

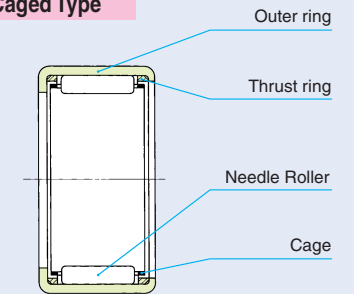
IKO Shell Type Needle Roller Bearings are light-weight bearings with large load ratings. They employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched, thus providing the lowest sectional height among the needle roller bearings.

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.

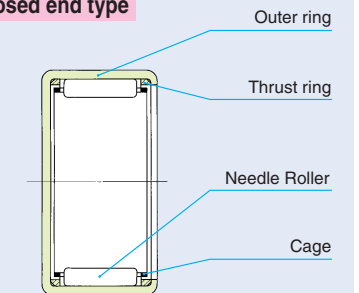
Since these bearings are press-fitted into the housing, no fixtures for axial positioning are needed. They are ideal for use in mass-produced articles that require economy, and have a wide variety of applications.

Structures of Shell Type Needle Roller Bearings

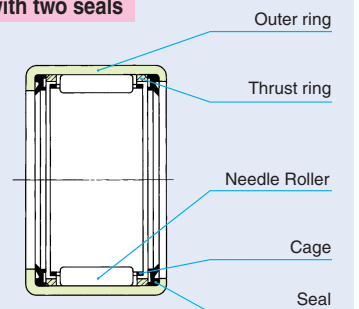
Standard Caged Type



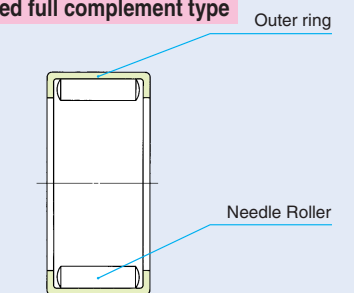
Caged and closed end type



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 | | | Full complement |
|---------------|------------|-----------|------------|---------------------------|-----------------|
| | | Standard | Closed end | With seals ⁽¹⁾ | 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 .

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 $F_w \leq 22$, 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.

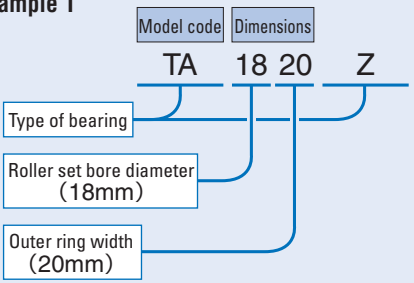
Identification Number

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

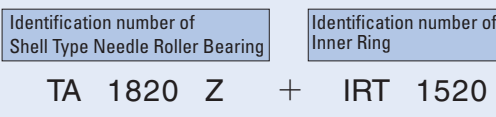
When using with inner rings, the assembled inner rings shown in the dimension tables are used. An example in this case is also shown below. Inner rings are delivered separately.

Examples of identification number

Example 1



Example 2 (With inner ring)



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 | | Plug gauge | |
|--|--|--|------------|--------|
| | TA ... Z ⁽¹⁾ | TLA ... Z ⁽²⁾ | Go | 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 | | | Plug gauge | |
|--|-------------------------|--------------------------|--------|------------|--|
| | BA ... Z ⁽¹⁾ | BHA ... Z ⁽²⁾ | Go | 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 |

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.

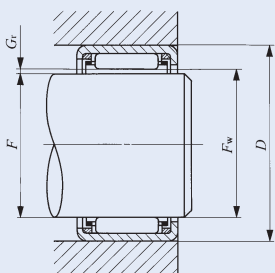
Table 4 Recommended fit

| 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

| Calculation procedure | Example of TLA 2020 Z |
|---|--|
|  <p>① 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</p> | From Table 2.1 on page B4 $D_0 = 25.972$ $F_{w \max} = 20.028$ $F_{w \min} = 20.007$ |
| <p>② 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.</p> | From the dimension table on page B14, $D_{\max} = 25.993$ $D_{\min} = 25.972$ |
| <p>③ 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. ($F_{we \min}$) = $(D_{\min} - D_0) + F_{w \min}$</p> | From the equations, $F_{we \max} = 20.049$ $F_{we \min} = 20.007$ |
| <p>④ 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.</p> | From the dimension table on page B14, $F_{\max} = 20.000$ $F_{\min} = 19.987$ |
| <p>⑤ Radial clearance after mounting Max. value of radial clearance ($G_{r \max}$) = $F_{we \max} - F_{\min}$ Min. value of radial clearance ($G_{r \min}$) = $F_{we \min} - F_{\max}$</p> | From the equations, $G_{r \max} = 0.062$ $G_{r \min} = 0.007$ The radial clearance after mounting becomes 0.007~0.062 mm. |

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

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.

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.

Table 6 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

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

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 $0.2 \mu m R_a$. However, when the operating condition is not severe, a surface roughness $0.8 \mu m R_a$ 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.

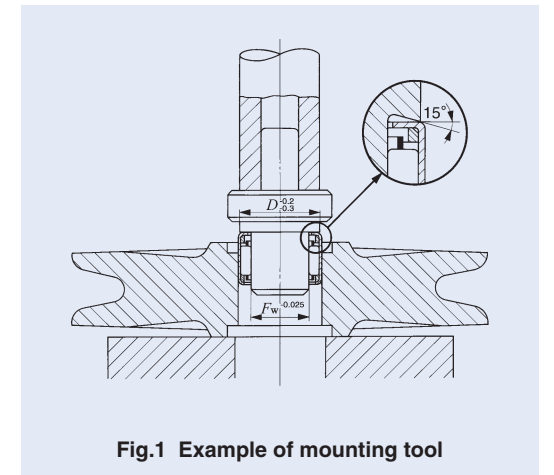


Fig.1 Example of mounting tool

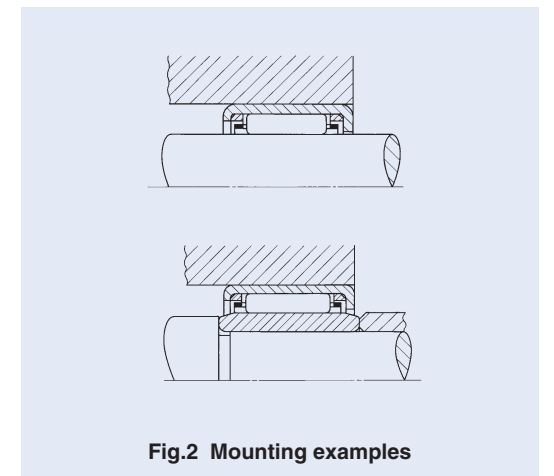


Fig.2 Mounting examples

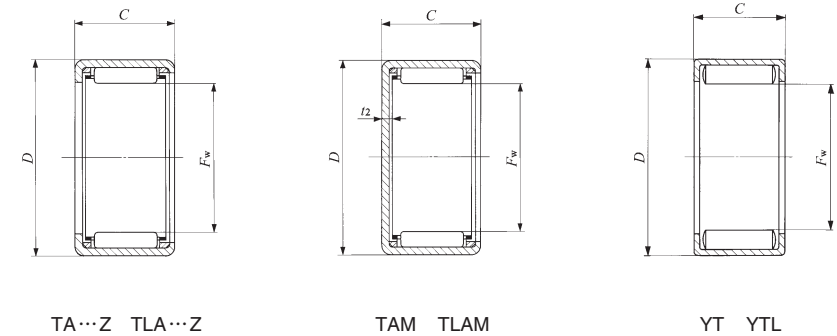
SHELL TYPE NEEDLE ROLLER BEARINGS



Shaft dia. 4 – 10mm

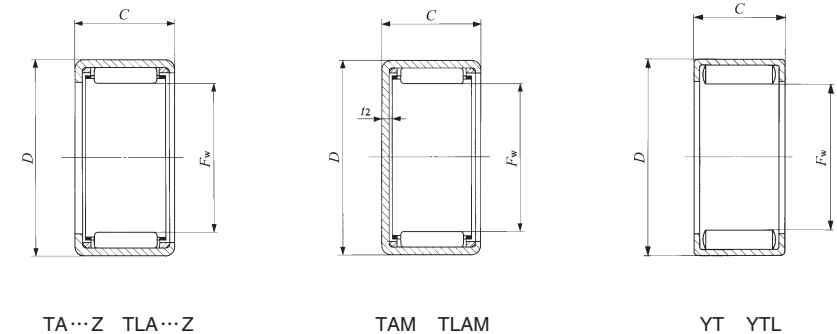
| Shaft dia. mm | Identification number | | | | | | | | | |
|------------------|-----------------------|------------------|-----------------|------------------|-------------------|------------------|------------------|------------------|-----------------|------------------|
| | Standard | Mass (Ref.) 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 | — | — | — | — | — | — |
| — | — | — | — | — | — | — | — | — | — | |
| — | — | — | — | — | — | — | — | — | 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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|-------|-------------------|--------|--------|--------|--------------------------------|--|--|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | J7 | | N7 | | N | N | | |
| | | | | | | Max. | Min. | Max. | Min. | | | | |
| 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 | — | — | — | — | — | — | 3 470 | 2 880 | 45 000 | — |
| 8 | 15 | 15 | 1.3 | 8.000 | 7.991 | 15.010 | 14.992 | — | — | 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 | — | — | — | — | — | — | 5 140 | 4 880 | 45 000 | — |
| 9 | 16 | 16 | 1.3 | 9.000 | 8.991 | 16.010 | 15.992 | — | — | 6 960 | 7 210 | 45 000 | — |
| 9 | 16 | 12 | — | — | — | — | — | — | — | 9 690 | 11 200 | 17 000 | — |
| 10 | 14 | 10 | 1 | — | — | — | — | — | — | 3 870 | 4 740 | 40 000 | IRT 710 |
| 10 | 14 | 12 | 1 | 10.000 | 9.991 | — | — | 13.995 | 13.977 | 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 | — | — | — | — | — | — | 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 | 10.000 | 9.991 | 17.010 | 16.992 | — | — | 6 920 | 7 300 | 40 000 | IRT 715 |
| 10 | 17 | 20 | 1.3 | — | — | — | — | — | — | 9 990 | 11 700 | 40 000 | — |

SHELL TYPE NEEDLE ROLLER BEARINGS



Shaft dia. 12 – 15mm

| 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 |
| 12 | — | — | — | — | TLA 1210 Z | 4.3 | TLAM 1210 | 4.7 | — | — |
| | — | — | — | — | — | — | — | — | YTL 1210 | 5.1 |
| | — | — | — | — | TLA 1212 Z | 8.6 | TLAM 1212 | 9.4 | — | — |
| | TA 1212 Z | 10.5 | TAM 1212 | 11.5 | — | — | — | — | — | — |
| | TA 1215 Z | 13.1 | TAM 1215 | 14 | — | — | — | — | — | — |
| 13 | TA 1220 Z | 17.3 | TAM 1220 | 18.3 | — | — | — | — | — | — |
| | TA 1225 Z | 21.5 | TAM 1225 | 22.5 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YT 1212 | 12.8 |
| | — | — | — | — | TLA 1312 Z | 9.2 | TLAM 1312 | 10.1 | — | — |
| | — | — | — | — | TLA 1412 Z | 9.8 | TLAM 1412 | 10.8 | — | — |
| 14 | — | — | — | — | TLA 1416 Z | 13.2 | TLAM 1416 | 14.3 | — | — |
| | TA 1416 Z | 18.4 | TAM 1416 | 19.6 | — | — | — | — | — | — |
| | TA 1420 Z | 23 | TAM 1420 | 24 | — | — | — | — | — | — |
| 15 | — | — | — | — | TLA 1512 Z | 10.4 | TLAM 1512 | 11.5 | — | — |
| | — | — | — | — | TLA 1516 Z | 14 | TLAM 1516 | 15.2 | — | — |
| | — | — | — | — | TLA 1522 Z | 19.1 | TLAM 1522 | 20.5 | — | — |
| | TA 1510 Z | 10.8 | TAM 1510 | 12.3 | — | — | — | — | — | — |
| | TA 1512 Z | 12.9 | TAM 1512 | 14.3 | — | — | — | — | — | — |
| | TA 1515 Z | 15.9 | TAM 1515 | 17.3 | — | — | — | — | — | — |
| | TA 1520 Z | 21 | TAM 1520 | 22.5 | — | — | — | — | — | — |
| | TA 1525 Z | 25 | TAM 1525 | 26.5 | — | — | — | — | — | — |

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.

| Boundary dimensions mm | | | | Standard mounting dimensions mm | | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------|----|----|------------------------|---------------------------------|--------|-------------------|--------|--------|--------|-------------------------------------|---|--|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | Max. | Min. | | | | |
| 12 | 16 | 10 | 1 | 12.000 | 11.989 | — | — | 15.995 | 15.977 | 4 350 | 5 810 | 35 000 | IRT 810 |
| 12 | 16 | 10 | — | — | — | — | — | — | — | 7 470 | 11 800 | 13 000 | IRT 810 |
| 12 | 18 | 12 | 1.3 | 12.000 | 11.989 | — | — | 17.995 | 17.977 | 6 420 | 7 490 | 35 000 | IRT 812 |
| 12 | 19 | 12 | 1.3 | — | — | — | — | — | — | 6 000 | 6 310 | 35 000 | IRT 812 |
| 12 | 19 | 15 | 1.3 | — | — | — | — | — | — | 7 440 | 8 320 | 35 000 | IRT 815 |
| 12 | 19 | 20 | 1.3 | 12.000 | 11.989 | 19.012 | 18.991 | — | — | 10 700 | 13 300 | 35 000 | — |
| 12 | 19 | 25 | 1.3 | — | — | — | — | — | — | 13 800 | 18 300 | 35 000 | — |
| 12 | 19 | 12 | — | — | — | — | — | — | — | 11 800 | 15 200 | 13 000 | IRT 812 |
| 13 | 19 | 12 | 1.3 | 13.000 | 12.989 | — | — | 18.993 | 18.972 | 6 760 | 8 170 | 30 000 | IRT 1012 |
| 14 | 20 | 12 | 1.3 | 14.000 | 13.989 | — | — | 19.993 | 19.972 | 7 080 | 8 840 | 30 000 | IRT 1012-2 |
| 14 | 20 | 16 | 1.3 | — | — | — | — | — | — | 8 950 | 12 000 | 30 000 | IRT 1016-2 |
| 14 | 22 | 16 | 1.3 | 14.000 | 13.989 | 22.012 | 21.991 | — | — | 10 500 | 12 000 | 30 000 | IRT 1016-2 |
| 14 | 22 | 20 | 1.3 | — | — | — | — | — | — | 13 900 | 17 200 | 30 000 | IRT 1020-2 |
| 15 | 21 | 12 | 1.3 | 15.000 | 14.989 | — | — | 20.993 | 20.972 | 7 380 | 9 520 | 25 000 | IRT 1212 |
| 15 | 21 | 16 | 1.3 | — | — | — | — | — | — | 9 330 | 12 900 | 25 000 | IRT 1216 |
| 15 | 21 | 22 | 1.3 | — | — | — | — | — | — | 13 600 | 20 900 | 25 000 | IRT 1222 |
| 15 | 22 | 10 | 1.3 | 15.000 | 14.989 | 22.012 | 21.991 | — | — | 5 290 | 5 680 | 25 000 | IRT 1010-1 |
| 15 | 22 | 12 | 1.3 | — | — | — | — | — | — | 7 120 | 8 310 | 25 000 | IRT 1012-1 |
| 15 | 22 | 15 | 1.3 | — | — | — | — | — | — | 8 830 | 11 000 | 25 000 | IRT 1015-1 |
| 15 | 22 | 20 | 1.3 | — | — | — | — | — | — | 12 700 | 17 600 | 25 000 | IRT 1020-1 |
| 15 | 22 | 25 | 1.3 | — | — | — | — | — | — | 16 300 | 24 200 | 25 000 | IRT 1025-1 |

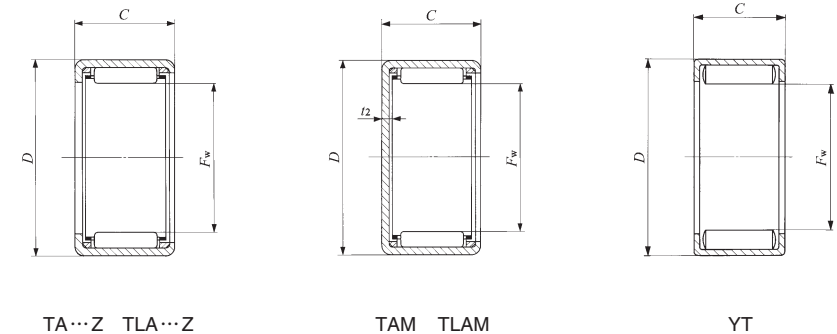
SHELL TYPE NEEDLE ROLLER BEARINGS



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 | — | — |
| 16 | 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 | — | — | — | — | — | — |

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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|--------|-------------------|---------|---------|---------|-----------------------------|---|---|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | Max. J7 | Min. J7 | Max. N7 | Min. N7 | N | N | rpm | |
| 16 | 22 | 12 | 1.3 | | | | | | | 7 670 | 10 200 | 25 000 | IRT 1212-1 |
| 16 | 22 | 16 | 1.3 | 16.000 | 15.989 | — | — | 21.993 | 21.972 | 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 | | | | | | | 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 | 17.000 | 16.989 | 24.012 | 23.991 | — | — | 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 | | | | | | | 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 | 18.000 | 17.989 | 25.012 | 24.991 | — | — | 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 |

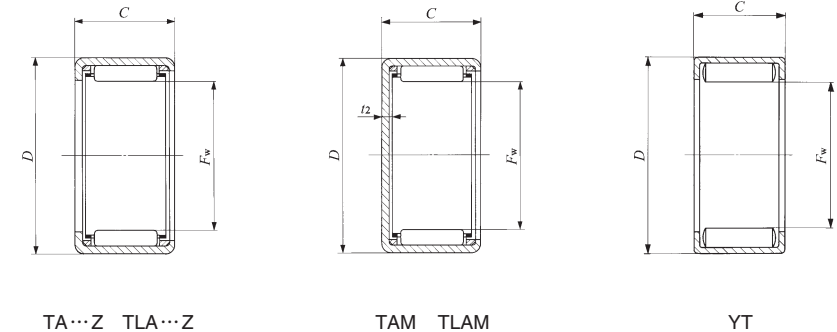
SHELL TYPE NEEDLE ROLLER BEARINGS



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 | |
| — | | — | — | — | — | — | — | — | — | — | |

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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|--------|-------------------|-------------------|--------|--------|-----------------------------|---|---|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | 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 |
| 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 | — | — | | | | |
| 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 |

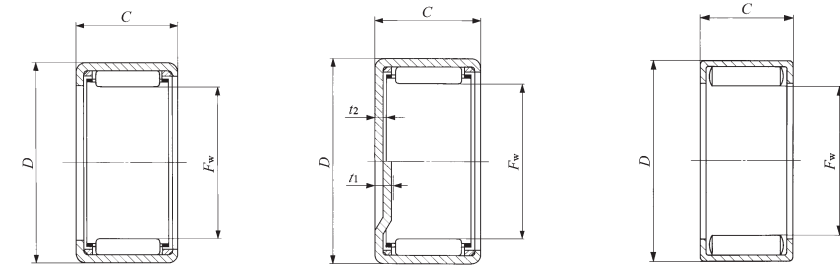
SHELL TYPE NEEDLE ROLLER BEARINGS



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
 $t_1 (F_w \geq 24)$
 $t_2 (F_w \leq 22)$

YT

| Boundary dimensions mm | | | | Standard mounting dimensions mm | | | | | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed(1) rpm | Assembled inner ring |
|------------------------|-----|-----|--------------------|---------------------------------|--------|-------------------|--------|--------|--------|---------------------------------------|--|--------------------------------------|----------------------|
| F_w | D | C | t_1, t_2 Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | Max. | Min. | | | | |
| 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 |

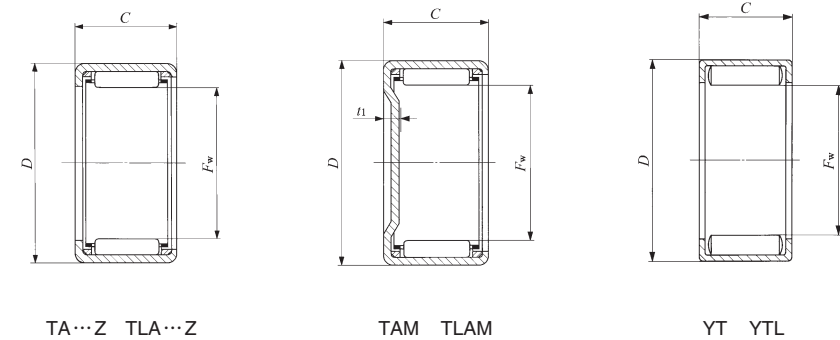
SHELL TYPE NEEDLE ROLLER BEARINGS



Shaft dia. 25 – 28 mm

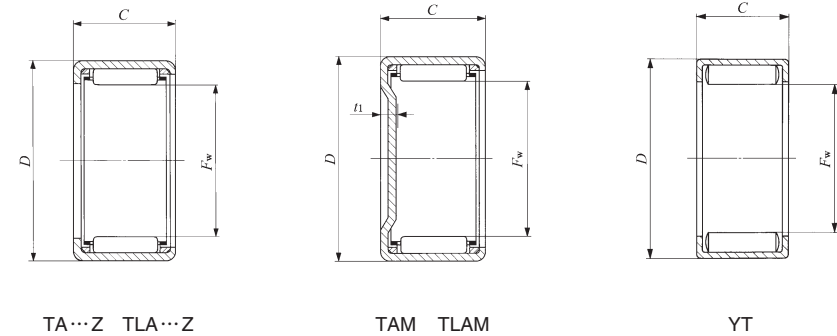
| Shaft dia. mm | Identification number | | | | | | | | | |
|---------------|-----------------------|---------------|-----------------|---------------|-------------------|---------------|------------------|---------------|-----------------|---------------|
| | Standard | Mass (Ref.) g | Closed end | 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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|--------|-------------------|-------------------|--------|--------|-----------------------------|---|---|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | J7 | | N7 | | 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 | — | | | | | | | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS



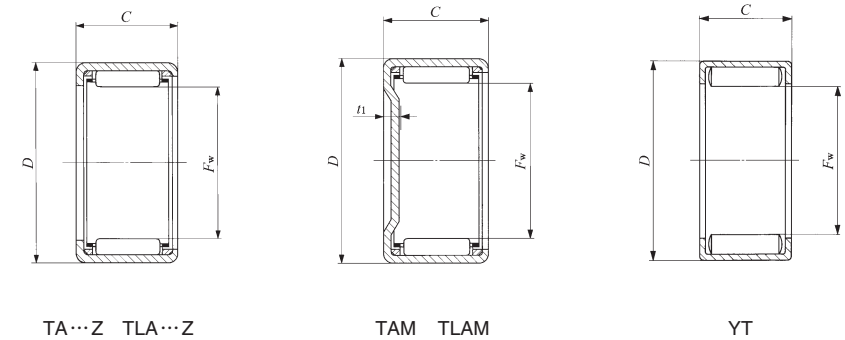
Shaft dia. 29 – 35mm

| 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 |
| 29 | TA 2920 Z | 47 | TAM 2920 | 52 | — | — | — | — | — | — |
| | TA 2930 Z | 70 | TAM 2930 | 75.5 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YT 2920 | 58.5 |
| 30 | — | — | — | — | 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 | — | — |
| | — | — | — | — | 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 | — | — | — | — | — | — | |
| 32 | TA 3220 Z | 57.5 | TAM 3220 | 63.5 | — | — | — | — | — | — |
| | TA 3230 Z | 86 | TAM 3230 | 97.5 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YT 3220 | 71.5 |
| 35 | — | — | — | — | TLA 3512 Z | 27 | TLAM 3512 | 34.5 | — | — |
| | — | — | — | — | TLA 3516 Z | 35 | TLAM 3516 | 42.5 | — | — |
| | — | — | — | — | TLA 3520 Z | 43.5 | TLAM 3520 | 51 | — | — |
| | 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 | | | | Standard mounting dimensions mm | | | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|---------------------------|----|----|------------------------|---------------------------------|--------|----------------------------|--------|--------|--------|-----------------------------------|---|---|-------------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 N7 | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | Max. | Min. | N | N | rpm | |
| 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 | | | | | | | 16 400 | 29 800 | 12 000 | — |
| 30 | 37 | 20 | 2.8 | 30.000 | 29.987 | — | — | 36.992 | 36.967 | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS



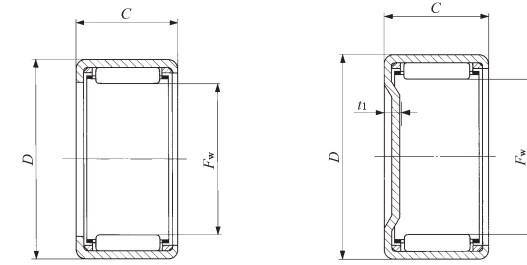
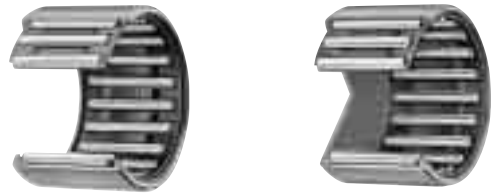
Shaft dia. 37 – 45mm

| 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 |
| | — | — | — | — | — | — | — | — | — | — |

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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|--------|-------------------|--------|--------|--------|-----------------------------|---|---|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | Max. | Min. | N | N | rpm | |
| 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 | 37.000 | 36.984 | 47.014 | 46.989 | — | — | 41 800 | 76 700 | 9 500 | IRT 3230 |
| 37 | 47 | 20 | — | — | — | — | — | — | — | 43 300 | 81 300 | 4 000 | IRT 3220 |
| 38 | 48 | 15 | 3.4 | — | — | — | — | — | — | 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 | 38.000 | 37.984 | 48.014 | 47.989 | — | — | 35 600 | 63 100 | 9 000 | IRT 3225-1 |
| 38 | 48 | 30 | 3.4 | 38.000 | 37.984 | 48.014 | 47.989 | — | — | 43 100 | 80 600 | 9 000 | IRT 3230-1 |
| 38 | 48 | 45 | 3.4 | 38.000 | 37.984 | 48.014 | 47.989 | — | — | 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 | 40.000 | 39.984 | — | — | 46.992 | 46.967 | 16 700 | 33 700 | 8 500 | — |
| 40 | 47 | 20 | 2.8 | 40.000 | 39.984 | — | — | 46.992 | 46.967 | 22 100 | 48 200 | 8 500 | IRT 3520 |
| 40 | 50 | 15 | 3.4 | — | — | — | — | — | — | 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 | 40.000 | 39.984 | 50.014 | 49.989 | — | — | 44 300 | 84 600 | 8 500 | IRT 3530 |
| 40 | 50 | 40 | 3.4 | 40.000 | 39.984 | 50.014 | 49.989 | — | — | 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 | 45.000 | 44.984 | — | — | 51.991 | 51.961 | 23 400 | 54 000 | 7 500 | IRT 4020 |
| 45 | 55 | 20 | 3.4 | — | — | — | — | — | — | 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 | 45.000 | 44.984 | 55.018 | 54.988 | — | — | 47 700 | 96 600 | 7 500 | IRT 4030 |
| 45 | 55 | 40 | 3.4 | 45.000 | 44.984 | 55.018 | 54.988 | — | — | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS



TA...Z TLA...Z

TAM TLAM

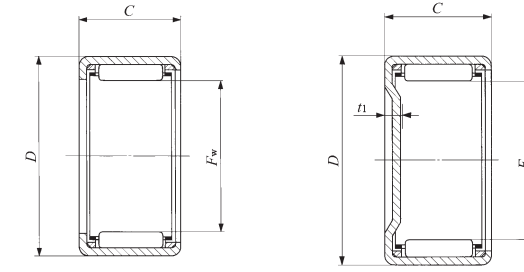
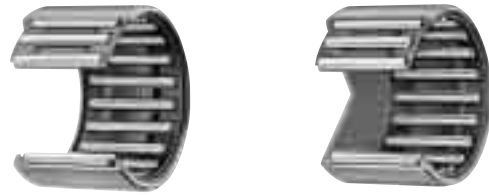
Shaft dia. 50 – 62mm

| 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 | | | | Standard mounting dimensions mm | | | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------|----|----|------------------------|---------------------------------|--------|-------------------|--------|--------|--------|--------------------------------|--|--|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | Max. | Min. | N | N | | |
| 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 | | | | | | | 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 | 50.000 | 49.984 | 62.018 | 61.988 | — | — | 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 | | | | | | | 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 | 55.000 | 54.981 | 67.018 | 66.988 | — | — | 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 | | | | | | | 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 | 60.000 | 59.981 | 72.018 | 71.988 | — | — | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS



TA...Z

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 C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ | Assembled inner ring |
|------------------------|----|----|---------------------|---------------------------------|--------|-------------------|--------|------|------|-----------------------------|---|---|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. | | | | | | | |
| | | | | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS

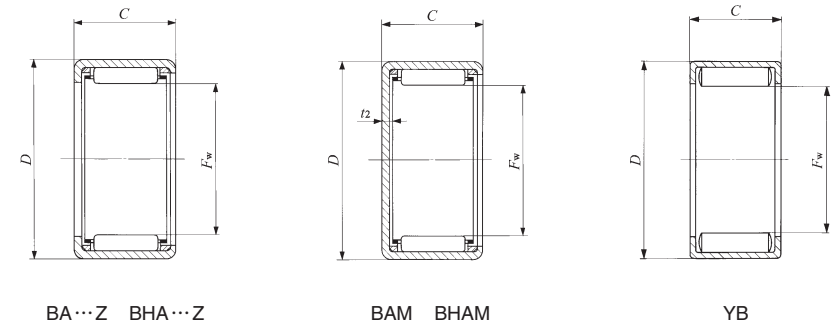
Inch Series



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 |
| 7.938 (5/16) | — | — | — | — | — | — | — | — | YB 47 | 4.6 |
| | 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 |
| 9.525 (3/8) | — | — | — | — | BHA 57 Z | 6.3 | BHAM 57 | 6.6 | — | — |
| | 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) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------------|---------------|-------------|------------------------|---------------------------------|-------|-------------------------|--------|-------------------------------------|---|--|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| 3.969 (5/32) | 7.144 (5/16) | 3.96(.156) | — | Max. | Min. | Max. | Min. | 1 350 | 1 220 | 40 000 | — |
| 3.969 (5/32) | 7.144 (5/16) | 6.35(.250) | — | 3.969 | 3.961 | 7.152 | 7.137 | 2 320 | 2 440 | 40 000 | — |
| 4.762 (3/16) | 8.731 (1/2) | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS

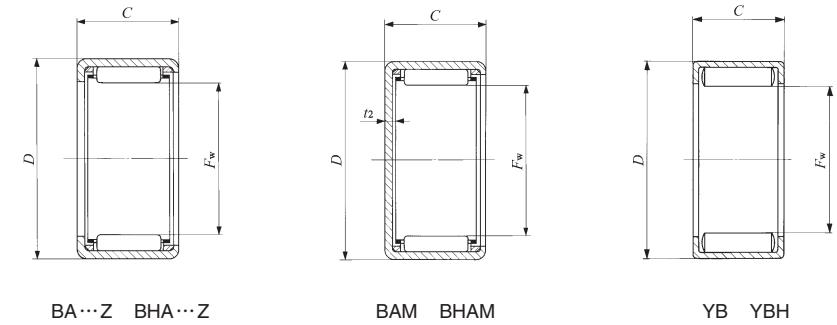
Inch Series



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 |
| 11.112 (⁷ / ₁₆) | BA 76 Z | 4.8 | BAM 76 | 5.3 | — | — | — | — | — | — |
| | BA 77 Z | 5.6 | BAM 77 | 6.2 | — | — | — | — | — | — |
| | BA 78 Z | 6.4 | BAM 78 | 7 | — | — | — | — | — | — |
| | BA 710 Z | 7.9 | BAM 710 | 8.5 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YB 78 | 8.2 |
| | — | — | — | — | BHA 78 Z | 9.3 | BHAM 78 | 10 | — | — |
| 12.700 (¹ / ₂) | — | — | — | — | — | — | — | — | YBH 78 | 10.5 |
| | BA 85 Z | 4.4 | BAM 85 | 5.2 | — | — | — | — | — | — |
| | BA 86 Z | 5.3 | BAM 86 | 6.1 | — | — | — | — | — | — |
| | BA 87 Z | 6.3 | BAM 87 | 7 | — | — | — | — | — | — |
| | BA 88 Z | 7.2 | BAM 88 | 7.9 | — | — | — | — | — | — |
| | BA 810 Z | 8.9 | BAM 810 | 9.6 | — | — | — | — | — | — |
| | BA 812 Z | 10.6 | BAM 812 | 11.3 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YB 84 | 4.3 |
| | — | — | — | — | — | — | — | — | YB 86 | 6.7 |
| | — | — | — | — | — | — | — | — | YB 87 | 7.9 |
| | — | — | — | — | — | — | — | — | YB 88 | 9.1 |
| | — | — | — | — | — | — | — | — | YB 810 | 11.5 |
| | — | — | — | — | — | — | — | — | YB 812 | 13.9 |
| | — | — | — | — | BHA 87 Z | 9.1 | BHAM 87 | 9.9 | — | — |
| | — | — | — | — | BHA 88 Z | 10.4 | BHAM 88 | 11.3 | — | — |
| | — | — | — | — | BHA 810 Z | 12.5 | BHAM 810 | 13.3 | — | — |
| | — | — | — | — | BHA 812 Z | 15 | BHAM 812 | 15.8 | — | — |
| | — | — | — | — | — | — | — | — | YBH 810 | 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(inch) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|---|--|-------------|------------------------|---------------------------------|--------|-------------------------|--------|--------------------------------|--|--|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | N | N | | |
| 11.112 (⁷ / ₁₆) | 15.875 (⁵ / ₈) | 9.52(.375) | 1 | | | | | 3 290 | 3 470 | 35 000 | — |
| 11.112 (⁷ / ₁₆) | 15.875 (⁵ / ₈) | 11.13(.438) | 1 | | | | | 4 150 | 4 680 | 35 000 | — |
| 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 | — |
| 11.112 (⁷ / ₁₆) | 15.875 (⁵ / ₈) | 15.88(.625) | 1 | | | | | 6 020 | 7 550 | 35 000 | — |
| 11.112 (⁷ / ₁₆) | 15.875 (⁵ / ₈) | 12.70(.500) | — | | | | | 10 100 | 15 900 | 14 000 | — |
| 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 | — |
| 11.112 (⁷ / ₁₆) | 17.462 (¹¹ / ₁₆) | 12.70(.500) | — | | | | | 12 500 | 15 800 | 14 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 7.92(.312) | 1 | | | | | 2 490 | 2 510 | 30 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 9.52(.375) | 1 | | | | | 3 470 | 3 850 | 30 000 | — |
| 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 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 12.70(.500) | 1 | | | | | 4 710 | 5 700 | 30 000 | IRB 58 |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 15.88(.625) | 1 | | | | | 6 350 | 8 380 | 30 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 19.05(.750) | 1 | | | | | 7 840 | 11 000 | 30 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 6.35(.250) | — | | | | | 5 260 | 7 150 | 12 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 9.52(.375) | — | | | | | 8 150 | 12 600 | 12 000 | — |
| 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 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 12.70(.500) | — | | | | | 10 800 | 18 100 | 12 000 | IRB 58 |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 15.88(.625) | — | | | | | 13 400 | 23 700 | 12 000 | — |
| 12.700 (¹ / ₂) | 17.462 (¹¹ / ₁₆) | 19.05(.750) | — | | | | | 15 800 | 29 300 | 12 000 | — |
| 12.700 (¹ / ₂) | 19.050 (³ / ₄) | 11.13(.438) | 1.3 | | | | | 5 670 | 6 120 | 30 000 | — |
| 12.700 (¹ / ₂) | 19.050 (³ / ₄) | 12.70(.500) | 1.3 | | | | | 6 040 | 6 650 | 30 000 | IRB 58 |
| 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 | — |
| 12.700 (¹ / ₂) | 19.050 (³ / ₄) | 19.05(.750) | 1.3 | | | | | 11 100 | 14 500 | 30 000 | — |
| 12.700 (¹ / ₂) | 19.050 (³ / ₄) | 15.88(.625) | — | | | | | 16 300 | 23 500 | 12 000 | — |

SHELL TYPE NEEDLE ROLLER BEARINGS

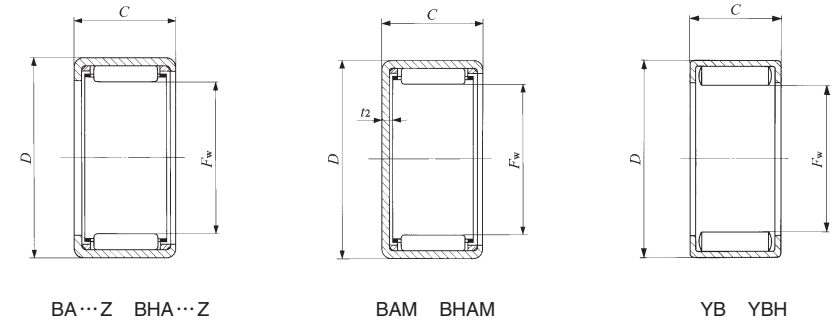
Inch Series



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 |
| 14.288 ($\frac{9}{16}$) | BA 95 Z | 4.9 | BAM 95 | 5.8 | — | — | — | — | — | — |
| | BA 96 Z | 5.9 | BAM 96 | 6.8 | — | — | — | — | — | — |
| | BA 97 Z | 6.9 | BAM 97 | 7.8 | — | — | — | — | — | — |
| | BA 98 Z | 7.9 | BAM 98 | 8.9 | — | — | — | — | — | — |
| | BA 910 Z | 9.9 | BAM 910 | 10.8 | — | — | — | — | — | — |
| | BA 912 Z | 11.7 | BAM 912 | 12.6 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YB 98 | 10.1 |
| | — | — | — | — | — | — | — | — | YB 910 | 12.7 |
| | — | — | — | — | — | — | — | — | YB 912 | 15.4 |
| | — | — | — | — | BHA 98 Z | 11.4 | BHAM 98 | 12.5 | — | — |
| — | — | — | — | BHA 910 Z | 13.6 | BHAM 910 | 14.7 | — | — | |
| — | — | — | — | BHA 912 Z | 16.3 | BHAM 912 | 17.4 | — | — | |
| 15.875 ($\frac{5}{8}$) | BA 105 Z | 5.3 | BAM 105 | 6.5 | — | — | — | — | — | — |
| | BA 107 Z | 7.6 | BAM 107 | 8.7 | — | — | — | — | — | — |
| | BA 108 Z | 8.7 | BAM 108 | 9.9 | — | — | — | — | — | — |
| | BA 1010 Z | 10.8 | BAM 1010 | 12 | — | — | — | — | — | — |
| | BA 1012 Z | 12.9 | BAM 1012 | 14 | — | — | — | — | — | — |
| | BA 1014 Z | 15.1 | BAM 1014 | 16.2 | — | — | — | — | — | — |
| | BA 1016 Z | 17.3 | BAM 1016 | 18.4 | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | YB 105 | 6.7 |
| | — | — | — | — | — | — | — | — | YB 108 | 11 |
| | — | — | — | — | — | — | — | — | YB 1012 | 16.9 |
| — | — | — | — | BHA 108 Z | 12.6 | BHAM 108 | 13.9 | — | — | |
| — | — | — | — | BHA 1010 Z | 14.9 | BHAM 1010 | 16.2 | — | — | |
| — | — | — | — | BHA 1012 Z | 18 | BHAM 1012 | 19.3 | — | — | |
| — | — | — | — | BHA 1016 Z | 24 | BHAM 1016 | 25 | — | — | |
| — | — | — | — | — | — | — | — | YBH 108 | 15.3 | |

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) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------------|----------------------------|---------------|------------------------|---------------------------------|--------|-------------------------|----------------|--------------------------------|--|--|----------------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | N | N | | |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 7.92 (.312) | 1.3 | 14.288 | 14.277 | 19.062 | 19.041 | 2 760 | 2 970 | 30 000 | — |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 9.52 (.375) | 1.3 | | | | | 3 850 | 4 560 | 30 000 | — |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 11.13 (.438) | 1.3 | | | | | 4 860 | 6 140 | 30 000 | — |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 12.70 (.500) | 1.3 | | | | | 5 220 | 6 740 | 30 000 | IRB 68 |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 15.88 (.625) | 1.3 | | | | | 7 050 | 9 910 | 30 000 | — |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 19.05 (.750) | 1.3 | | | | | 8 690 | 13 000 | 30 000 | IRB 612 |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 12.70 (.500) | — | | | | | 11 600 | 20 400 | 11 000 | IRB 68 |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 15.88 (.625) | — | | | | | 14 300 | 26 700 | 11 000 | — |
| 14.288 ($\frac{9}{16}$) | 19.050 ($\frac{3}{4}$) | 19.05 (.750) | — | | | | | 16 800 | 33 000 | 11 000 | IRB 612 |
| 14.288 ($\frac{9}{16}$) | 20.638 ($\frac{13}{16}$) | 12.70 (.500) | 1.3 | | | | | 14.288 | 14.277 | 20.650 | 20.629 |
| 14.288 ($\frac{9}{16}$) | 20.638 ($\frac{13}{16}$) | 15.88 (.625) | 1.3 | 9 280 | 11 900 | 30 000 | — | | | | |
| 14.288 ($\frac{9}{16}$) | 20.638 ($\frac{13}{16}$) | 19.05 (.750) | 1.3 | 11 600 | 15 900 | 30 000 | IRB 612 | | | | |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 7.92 (.312) | 1.3 | 15.875 | 15.864 | 20.650 | 20.629 | 2 870 | 3 220 | 25 000 | — |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 11.13 (.438) | 1.3 | | | | | 5 040 | 6 660 | 25 000 | — |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 12.70 (.500) | 1.3 | | | | | 5 420 | 7 310 | 25 000 | IRB 68-1 |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 15.88 (.625) | 1.3 | | | | | 7 320 | 10 700 | 25 000 | — |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 19.05 (.750) | 1.3 | | | | | 9 020 | 14 100 | 25 000 | IRB 612-1 |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 22.22 (.875) | 1.3 | | | | | 10 700 | 17 500 | 25 000 | IRB 714 |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 25.40 (1.000) | 1.3 | | | | | 12 300 | 20 800 | 25 000 | IRB 716 |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 7.92 (.312) | — | | | | | 7 580 | 12 200 | 9 500 | — |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 12.70 (.500) | — | | | | | 12 300 | 22 700 | 9 500 | IRB 68-1 |
| 15.875 ($\frac{5}{8}$) | 20.638 ($\frac{13}{16}$) | 19.05 (.750) | — | | | | | 17 800 | 36 600 | 9 500 | IRB 612-1 |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 12.70 (.500) | 1.3 | 15.875 | 15.864 | 22.237 | 22.216 | 6 680 | 8 020 | 25 000 | IRB 68-1 |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 15.88 (.625) | 1.3 | | | | | 10 200 | 13 800 | 25 000 | — |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 19.05 (.750) | 1.3 | | | | | 12 700 | 18 500 | 25 000 | IRB 612-1 |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 25.40 (1.000) | 1.3 | | | | | 17 400 | 27 600 | 25 000 | IRB 716 |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 12.70 (.500) | — | | | | | 15 000 | 22 400 | 9 500 | IRB 68-1 |
| 15.875 ($\frac{5}{8}$) | 22.225 ($\frac{7}{8}$) | 12.70 (.500) | — | | | | | — | — | — | — |

SHELL TYPE NEEDLE ROLLER BEARINGS

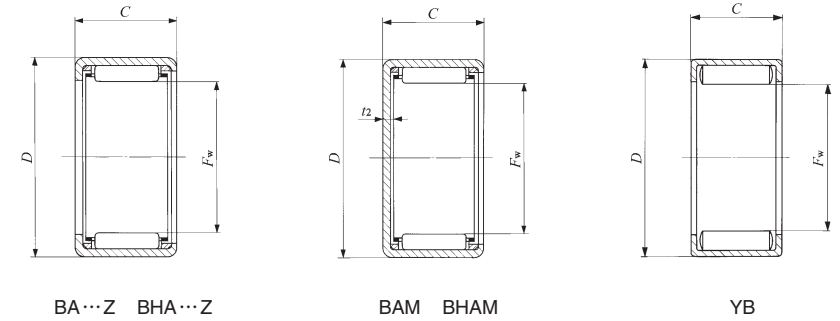
Inch Series



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 | — | — |

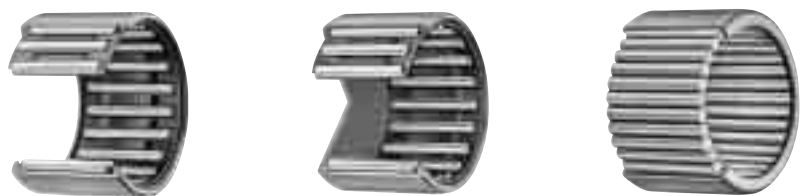
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
 Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided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



| Boundary dimensions mm(inch) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring | | | | |
|--|--|--------------|------------------------|---------------------------------|--------|-------------------------|------------------|-------------------------------------|---|--|----------------------|--------|--------|--------|-----------------|
| F _w | D | C | t ₂ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | | | | | | | | |
| 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 | | | | |

SHELL TYPE NEEDLE ROLLER BEARINGS

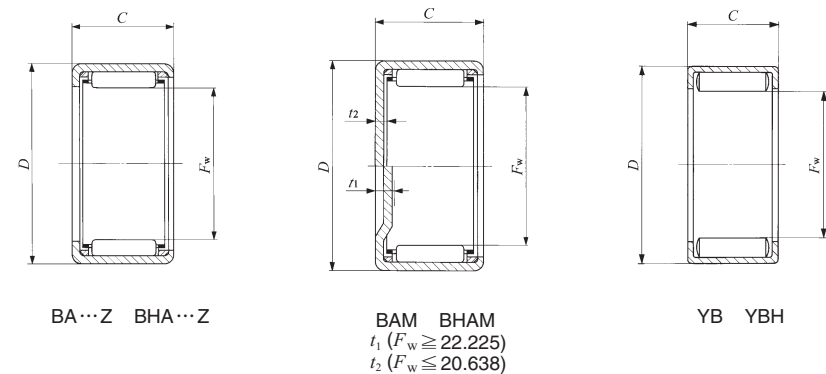
Inch Series



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 | — | — |
| 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.



| F _w | Boundary dimensions mm(inch) | | | t ₁ t ₂ Max. | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed(1) rpm | Assembled inner ring |
|----------------|------------------------------|---------------|-------------------------------|--|--------------------------------------|--------|--------|--------|--|--|--|-------------------------|
| | D | C | Shaft dia. h6 Max. Min. | | Housing bore dia. J7 Max. Min. | | | | | | | |
| 20.638 (3/16) | 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 (3/16) | 26.988 (1 1/16) | 12.70 (.500) | 1.3 | — | — | — | — | 7 170 | 9 450 | 19 000 | IRB 98 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 15.88 (.625) | 1.3 | — | — | — | — | 9 870 | 14 200 | 19 000 | IRB 910 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 19.05 (.750) | 1.3 | — | — | — | — | 12 400 | 19 000 | 19 000 | IRB 912 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 22.22 (.875) | 1.3 | — | — | — | — | 14 700 | 23 800 | 19 000 | IRB 914 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 25.40 (1.000) | 1.3 | — | — | — | — | 16 900 | 28 500 | 19 000 | IRB 916 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 31.75 (1.250) | 1.3 | — | — | — | — | 21 200 | 38 100 | 19 000 | IRB 920 | |
| 20.638 (3/16) | 26.988 (1 1/16) | 9.52 (.375) | — | — | — | — | — | 13 000 | 20 100 | 7 500 | — | |
| 20.638 (3/16) | 26.988 (1 1/16) | 12.70 (.500) | — | — | — | — | — | 17 400 | 29 200 | 7 500 | IRB 98 | |
| 20.638 (3/16) | 28.575 (1 1/8) | 12.70 (.500) | 1.3 | — | — | — | — | 9 500 | 11 200 | 19 000 | IRB 98 | |
| 20.638 (3/16) | 28.575 (1 1/8) | 15.88 (.625) | 1.3 | — | — | — | — | 13 800 | 18 200 | 19 000 | IRB 910 | |
| 20.638 (3/16) | 28.575 (1 1/8) | 19.05 (.750) | 1.3 | 20.638 | 20.625 | 28.587 | 28.566 | 17 300 | 24 400 | 19 000 | IRB 912 | |
| 20.638 (3/16) | 28.575 (1 1/8) | 15.88 (.625) | — | — | — | — | — | 22 900 | 36 300 | 7 500 | IRB 910 | |
| 20.638 (3/16) | 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 | — | — | — | — | 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 | 22.225 | 22.212 | 28.587 | 28.566 | 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 1/8) | 15.88 (.625) | 3.4 | — | — | — | — | 14 300 | 19 500 | 18 000 | — | |
| 22.225 (7/8) | 30.162 (1 1/8) | 19.05 (.750) | 3.4 | 22.225 | 22.212 | 30.176 | 30.151 | 18 000 | 26 100 | 18 000 | IRB 1012 | |
| 22.225 (7/8) | 30.162 (1 1/8) | 25.40 (1.000) | 3.4 | — | — | — | — | 23 600 | 36 900 | 18 000 | IRB 1016 | |
| 22.225 (7/8) | 30.162 (1 1/8) | 19.05 (.750) | — | — | — | — | — | 28 200 | 49 000 | 7 000 | IRB 1012 | |

SHELL TYPE NEEDLE ROLLER BEARINGS

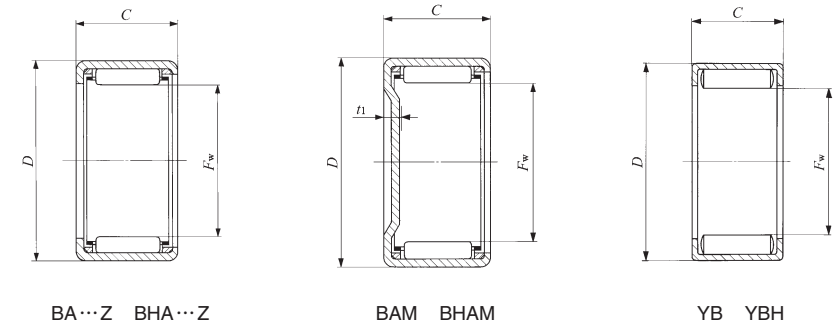
Inch Series



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 | — | — | — | — | — | — |

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) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring | | | | |
|------------------------------|-----------------|---------------|------------------------|---------------------------------|--------|-------------------------|-----------------|-------------------------------------|---|--|----------------------|--------|--------|--------|-----------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | | | | | |
| | | | | Max. | Min. | Max. | Min. | | | | | | | | |
| 23.812 (15/16) | 30.162 (1 1/16) | 12.70 (.500) | 2.8 | 23.812 | 23.799 | 30.176 | 30.151 | 8 000 | 11 400 | 16 000 | — | | | | |
| 23.812 (15/16) | 30.162 (1 1/16) | 15.88 (.625) | 2.8 | | | | | 11 000 | 17 100 | 16 000 | IRB 1110 | | | | |
| 23.812 (15/16) | 30.162 (1 1/16) | 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 | 25.400 | 25.387 | 31.764 | 31.739 | 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 | | | | | 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 1/8) | 12.70 (.500) | 3.4 | | | | | 25.400 | 25.387 | 33.352 | 33.327 | 10 200 | 13 100 | 15 000 | IRB 128 |
| 25.400 (1) | 33.338 (1 1/8) | 15.88 (.625) | 3.4 | | | | | | | | | 15 300 | 22 100 | 15 000 | — |
| 25.400 (1) | 33.338 (1 1/8) | 19.05 (.750) | 3.4 | | | | | | | | | 19 300 | 29 700 | 15 000 | IRB 1212 |
| 25.400 (1) | 33.338 (1 1/8) | 22.22 (.875) | 3.4 | | | | | | | | | 23 000 | 37 200 | 15 000 | IRB 1214 |
| 25.400 (1) | 33.338 (1 1/8) | 25.40 (1.000) | 3.4 | | | | | | | | | 26 400 | 44 500 | 15 000 | IRB 1216 |
| 25.400 (1) | 33.338 (1 1/8) | 31.75 (1.250) | 3.4 | | | | | | | | | 33 200 | 59 600 | 15 000 | IRB 1220 |
| 25.400 (1) | 33.338 (1 1/8) | 38.10 (1.500) | 3.4 | | | | | | | | | 39 400 | 74 400 | 15 000 | — |
| 25.400 (1) | 33.338 (1 1/8) | 12.70 (.500) | — | 20 900 | 34 100 | 6 000 | IRB 128 | | | | | | | | |
| 25.400 (1) | 33.338 (1 1/8) | 19.05 (.750) | — | 30 700 | 56 100 | 6 000 | IRB 1212 | | | | | | | | |
| 25.400 (1) | 33.338 (1 1/8) | 25.40 (1.000) | — | 39 900 | 78 400 | 6 000 | IRB 1216 | | | | | | | | |
| 26.988 (1 1/16) | 33.338 (1 1/8) | 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 1/8) | 25.40 (1.000) | 2.8 | | | | | | | | | 20 000 | 38 300 | 14 000 | — |

SHELL TYPE NEEDLE ROLLER BEARINGS

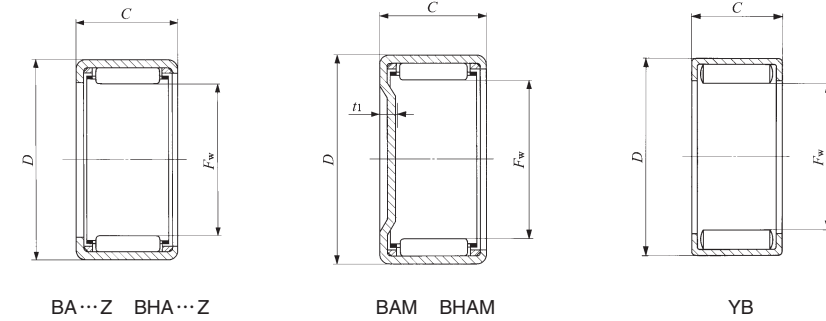
Inch Series



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.



| Boundary dimensions mm(inch) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------------|----------------|---------------|------------------------|---------------------------------|--------|-------------------------|--------|-------------------------------------|---|--|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | | | | |
| 28.575 (1 1/8) | 34.925 (1 3/8) | 9.52 (.375) | 2.8 | | | | | 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 | 28.575 | 28.562 | 34.939 | 34.914 | 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 | | | | | 22 500 | 32 200 | 13 000 | IRB 1412 |
| 28.575 (1 1/8) | 38.100 (1 1/2) | 25.40 (1.000) | 3.4 | 28.575 | 28.562 | 38.114 | 38.089 | 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 | | | | | 15 000 | 22 500 | 12 000 | — |
| 30.162 (1 3/16) | 38.100 (1 1/2) | 25.40 (1.000) | 2.8 | 30.162 | 30.146 | 38.114 | 38.089 | 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 | — |

SHELL TYPE NEEDLE ROLLER BEARINGS

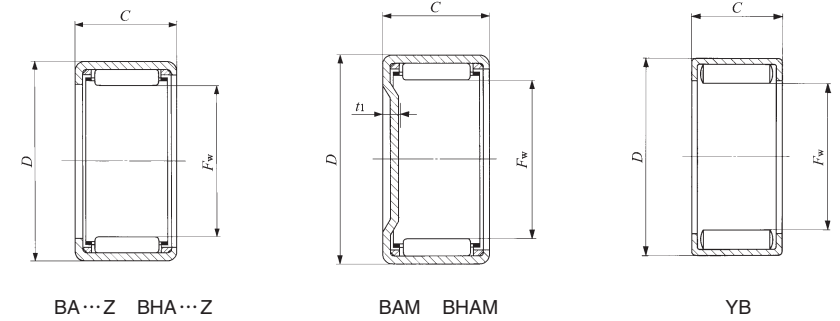
Inch Series



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 | — | — | — | — | — | |

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) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------------|----------------|---------------|------------------------|---------------------------------|--------|-------------------------|--------|-------------------------------------|---|--|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | | | | |
| 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 | | | | | 24 100 | 36 400 | 12 000 | IRB 1612 |
| 31.750 (1 1/4) | 41.275 (1 5/8) | 25.40 (1.000) | 3.4 | 31.750 | 31.734 | 41.289 | 41.264 | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS

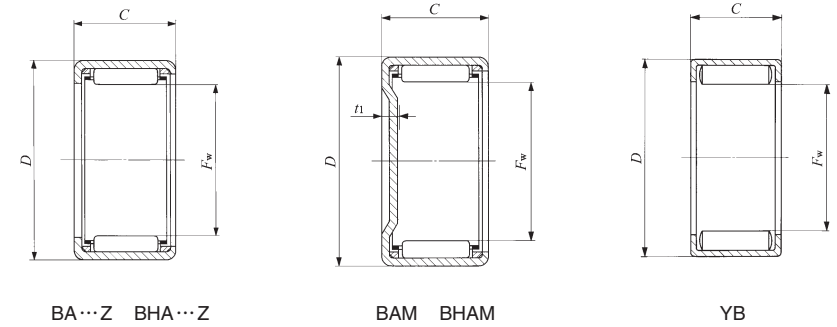
Inch Series



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) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed(1) rpm | Assembled inner ring |
|------------------------------|----------------|--------------|------------------------|---------------------------------|--------|-------------------------|--------|--------------------------------|--|--------------------------------------|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | N | N | | |
| 34.925 (1 3/8) | 41.275 (1 5/8) | 12.70 (.500) | 2.8 | | | | | 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 | 34.925 | 34.909 | 41.289 | 41.264 | 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 | | | | | 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 | 34.925 | 34.909 | 44.464 | 44.439 | 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 | | | | | 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 | 38.100 | 38.084 | 47.639 | 47.614 | 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) | — | | | | | 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) | — | 38.100 | 38.084 | 47.639 | 47.614 | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS

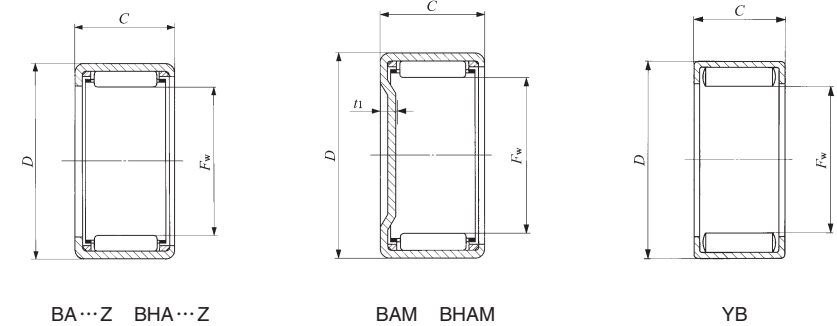
Inch Series



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 | — | — |

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(inch) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm | Assembled inner ring |
|------------------------------|----------------|---------------|------------------------|---------------------------------|---------|-------------------------|----------|-------------------------------------|---|--|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | | | | |
| 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 1/2) | 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 1/2) | 25.40 (1.000) | 3.4 | | | | | 50 600 | 94 700 | 6 000 | — |
| 52.388 (2 1/16) | 64.294 (2 1/2) | 38.10 (1.500) | 3.4 | | | | | 73 900 | 154 000 | 6 000 | — |

SHELL TYPE NEEDLE ROLLER BEARINGS

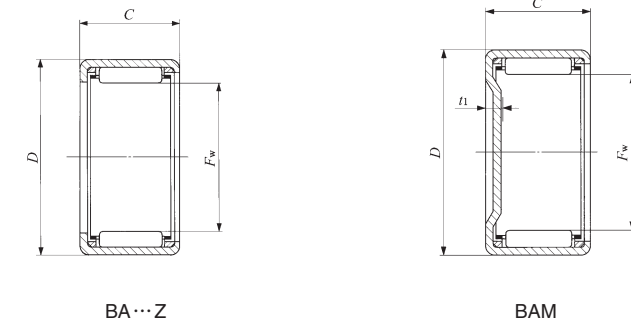
Inch Series



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 | — | — | — | — | — | — |

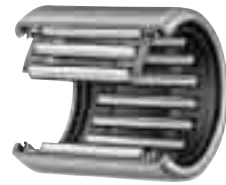
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
 Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided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



| Boundary dimensions mm(inch) | | | | Standard mounting dimensions mm | | | | Basic dynamic load rating C | Basic static load rating C ₀ | Allowable rotational speed(1) rpm | Assembled inner ring |
|------------------------------|----------------|---------------|------------------------|---------------------------------|--------|-------------------------|--------|--------------------------------|--|--------------------------------------|----------------------|
| F _w | D | C | t ₁ Max. | Shaft dia. h6 | | Housing bore dia. J7 | | | | | |
| | | | | Max. | Min. | Max. | Min. | N | N | | |
| 53.975 (2 1/8) | 63.500 (2 1/2) | 12.70 (.500) | 2.8 | 53.975 | 53.956 | 63.518 | 63.488 | 16 100 | 26 600 | 5 500 | — |
| 53.975 (2 1/8) | 63.500 (2 1/2) | 25.40 (1.000) | 2.8 | | | | | 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 | 57.150 | 57.131 | 66.693 | 66.663 | 28 500 | 56 700 | 5 000 | — |
| 57.150 (2 1/4) | 66.675 (2 5/8) | 25.40 (1.000) | 2.8 | | | | | 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 | 69.850 | 69.831 | 79.393 | 79.363 | 25 000 | 50 800 | 3 500 | — |
| 69.850 (2 3/4) | 79.375 (3 1/8) | 19.05 (.750) | 2.8 | | | | | 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 |

SHELL TYPE NEEDLE ROLLER BEARINGS

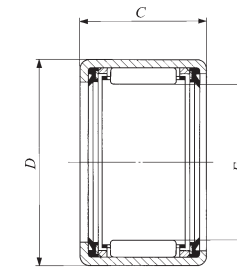
With seals



Shaft dia. 12 – 50mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Standard mounting dimensions mm | | | |
|------------------|-----------------------|---------------------|------------------------|-----|-----|---------------------------------|--------|-------------------------|--------|
| | | | F_w | D | C | Shaft dia. h6 | | Housing bore dia. N7 | |
| | | | | | | Max. | Min. | Max. | Min. |
| 12 | TLA 1216 UU | 11.7 | 12 | 18 | 16 | 12.000 | 11.989 | 17.995 | 17.977 |
| 14 | TLA 1416 UU | 13.3 | 14 | 20 | 16 | 14.000 | 13.989 | 19.993 | 19.972 |
| 15 | TLA 1516 UU | 14 | 15 | 21 | 16 | 15.000 | 14.989 | 20.993 | 20.972 |
| 16 | TLA 1616 UU | 14.8 | 16 | 22 | 16 | 16.000 | 15.989 | 21.993 | 21.972 |
| 18 | TLA 1816 UU | 16.3 | 18 | 24 | 16 | 18.000 | 17.989 | 23.993 | 23.972 |
| 20 | TLA 2016 UU | 17.8 | 20 | 26 | 16 | 20.000 | 19.987 | 25.993 | 25.972 |
| | TLA 2020 UU | 22.5 | 20 | 26 | 20 | | | | |
| 22 | TLA 2216 UU | 19.4 | 22 | 28 | 16 | 22.000 | 21.987 | 27.993 | 27.972 |
| | TLA 2220 UU | 25 | 22 | 28 | 20 | | | | |
| 25 | TLA 2516 UU | 26 | 25 | 32 | 16 | 25.000 | 24.987 | 31.992 | 31.967 |
| | TLA 2520 UU | 33 | 25 | 32 | 20 | | | | |
| 28 | TLA 2820 UU | 36.5 | 28 | 35 | 20 | 28.000 | 27.987 | 34.992 | 34.967 |
| 30 | TLA 3016 UU | 30.5 | 30 | 37 | 16 | 30.000 | 29.987 | 36.992 | 36.967 |
| | TLA 3020 UU | 39 | 30 | 37 | 20 | | | | |
| 35 | TLA 3516 UU | 35 | 35 | 42 | 16 | 35.000 | 34.984 | 41.992 | 41.967 |
| | TLA 3520 UU | 45 | 35 | 42 | 20 | | | | |
| 40 | TLA 4016 UU | 39.5 | 40 | 47 | 16 | 40.000 | 39.984 | 46.992 | 46.967 |
| | TLA 4020 UU | 50.5 | 40 | 47 | 20 | | | | |
| 45 | TLA 4520 UU | 56 | 45 | 52 | 20 | 45.000 | 44.984 | 51.991 | 51.961 |
| 50 | TLA 5026 UU | 89 | 50 | 58 | 26 | 50.000 | 49.984 | 57.991 | 57.961 |

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



TLA...UU

| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽¹⁾ rpm |
|--|---|--|
| 6 420 | 7 490 | 14 000 |
| 7 080 | 8 840 | 12 000 |
| 7 380 | 9 520 | 11 000 |
| 7 670 | 10 200 | 11 000 |
| 8 230 | 11 500 | 9 000 |
| 8 740 | 12 900 | 9 000 |
| 11 100 | 17 500 | 9 000 |
| 9 230 | 14 300 | 8 000 |
| 11 700 | 19 300 | 8 000 |
| 9 440 | 13 900 | 7 000 |
| 12 800 | 20 500 | 7 000 |
| 13 800 | 23 500 | 6 000 |
| 10 400 | 16 600 | 5 500 |
| 14 100 | 24 500 | 5 500 |
| 11 600 | 20 000 | 5 000 |
| 15 700 | 29 600 | 5 000 |
| 12 400 | 22 800 | 4 500 |
| 16 700 | 33 700 | 4 500 |
| 17 800 | 37 800 | 4 000 |
| 28 800 | 64 100 | 3 500 |

NEEDLE ROLLER CAGES FOR GENERAL USAGE



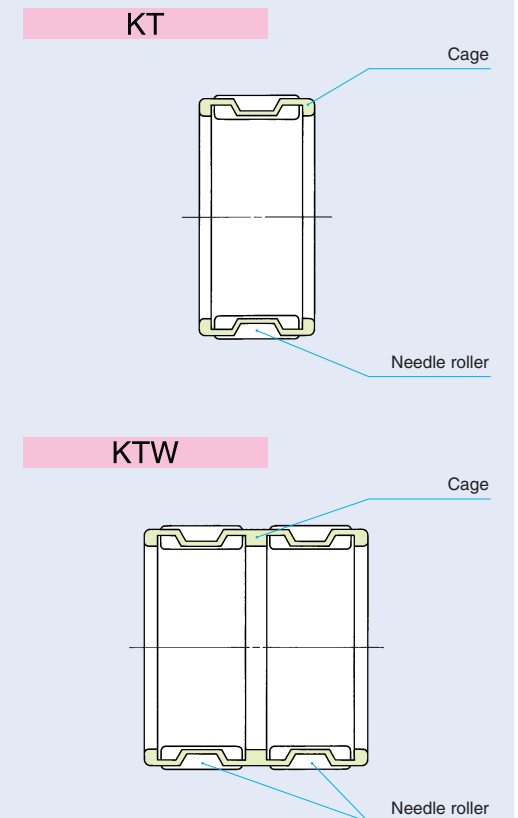
Structure and Features

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



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

Example 1

| | | |
|------------|------------|-------------------|
| Model code | Dimensions | Supplemental code |
| KT | 15 20 10 | C3 |

Type of bearing: KT
 Roller set bore diameter (15mm): 15
 Roller set outside diameter (20mm): 20
 Cage width (10mm): 10
 Tolerance of mean value of roller dia. (Refer to Table 1.): C3

Example 2

| | | |
|------------|------------|-------------------|
| Model code | Dimensions | Supplemental code |
| KTW | 24 28 34 | B4 |

Type of bearing: KTW
 Roller set bore diameter (24mm): 24
 Roller set outside diameter (28mm): 28
 Cage width (34mm): 34
 Tolerance of mean value of roller dia. (Refer to Table 1.): B4

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 $-0.20 \sim -0.55$ 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

| Operating conditions | Shaft | |
|--|------------------------|---------------------|
| | $F_w \leq 68\text{mm}$ | $F_w > 68\text{mm}$ |
| 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 $0.2 \mu\text{m}R_a$ or less are desirable. However, when the operating conditions are not severe, a surface roughness $0.8 \mu\text{m}R_a$ 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 $-20^\circ\text{C} \sim +120^\circ\text{C}$. However, the maximum allowable temperature for synthetic resin cages is $+110^\circ\text{C}$, and when they are continuously operated, it is $+100^\circ\text{C}$.

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.

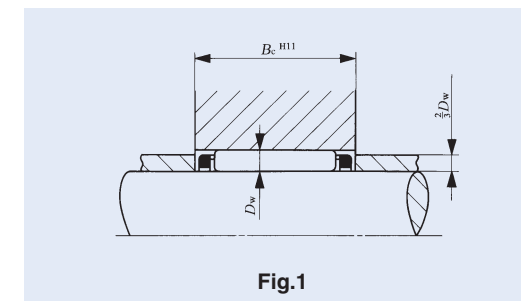


Fig.1

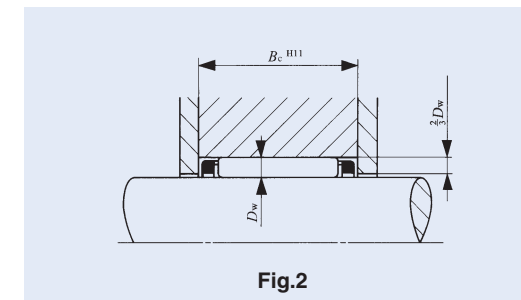


Fig.2

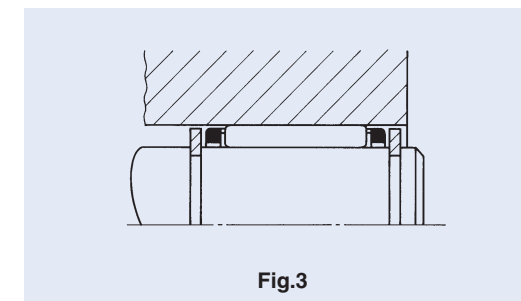


Fig.3

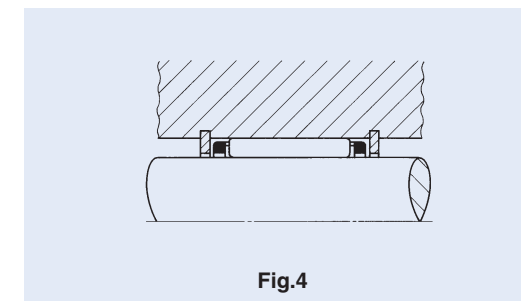


Fig.4

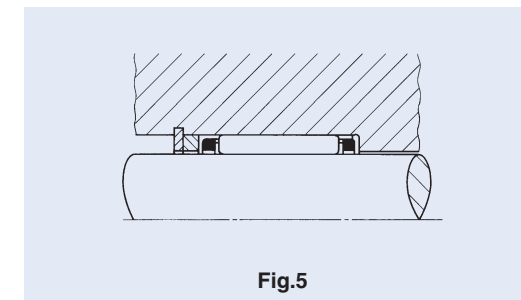
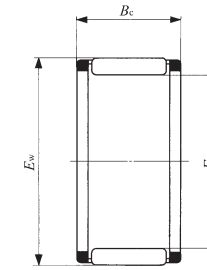


Fig.5

NEEDLE ROLLER CAGES FOR GENERAL USAGE



KT

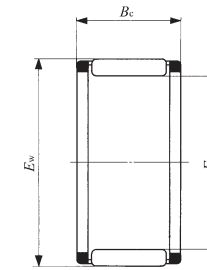
Shaft dia. 3 – 14mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | |

NEEDLE ROLLER CAGES FOR GENERAL USAGE



KT

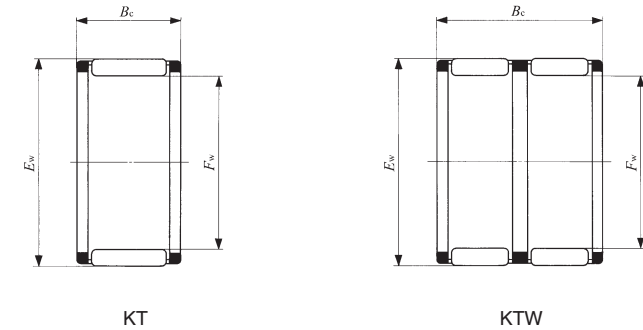
Shaft dia. 15 – 18mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 |

NEEDLE ROLLER CAGES FOR GENERAL USAGE



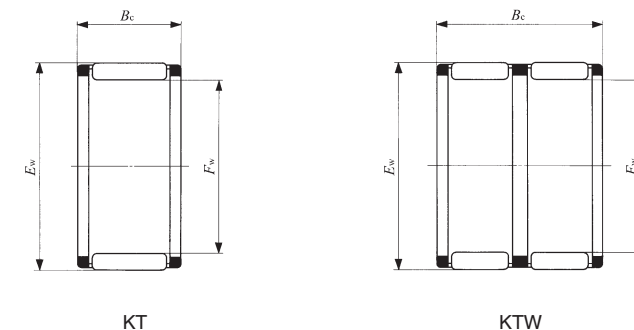
Shaft dia. 20 – 24mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 |

NEEDLE ROLLER CAGES FOR GENERAL USAGE



Shaft dia. 25 – 32mm

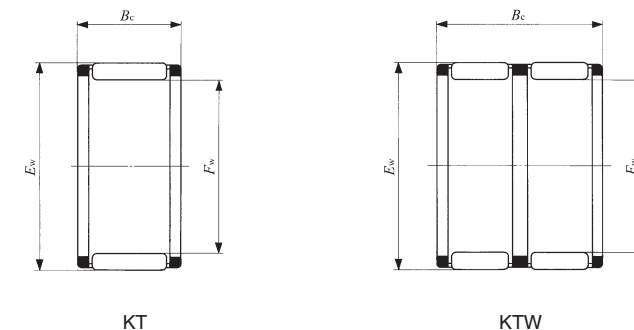
| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 | |



NEEDLE ROLLER CAGES FOR GENERAL USAGE



Shaft dia. 35 – 52mm

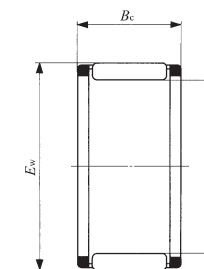
| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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.

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 |
| 48 | 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 |
| | KT 485320 | 37 | 48 | 53 | 20 | 26 800 | 57 600 | 10 000 |
| 50 | KT 485420 | 46 | 48 | 54 | 20 | 30 600 | 60 400 | 10 000 |
| | 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 |



NEEDLE ROLLER CAGES FOR GENERAL USAGE



KT

Shaft dia. 55 – 100mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 |

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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽¹⁾ rpm |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|--|
| | | | F _w | E _w | B _c | | | |
| 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 |

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

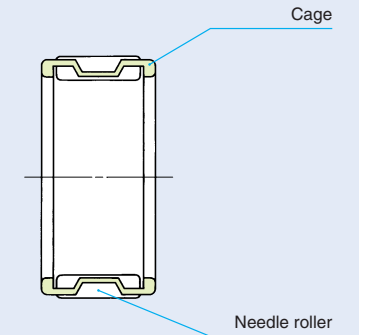
In Needle Roller Cages for Engine Connecting Rods, the types shown in Table 1 are available.

Table 1 Types

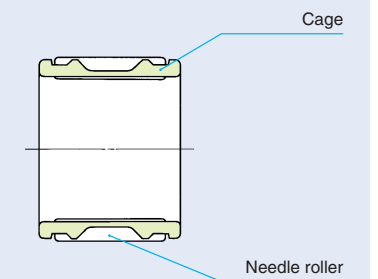
| Type | For big end | For small end |
|------------|-------------|---------------|
| Model code | KT...EG | KTV...EG |

Structures of Needle Roller Cages for Engine Connecting Rods

KT...EG



KTV...EG



KT...EG
KTV...EG

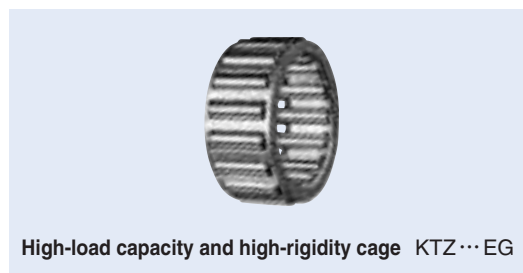
Needle Roller Cages for Big End KT...EG

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 light-weight 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.

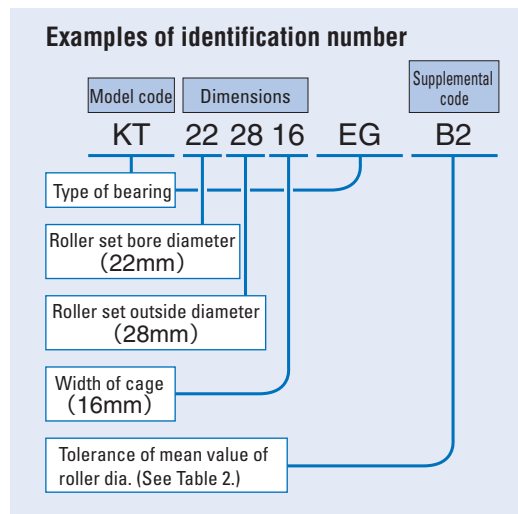
Needle Roller Cages for Small End are classified into two types, the outer surface guide type and the inner surface guide type. This classification is shown in the table of dimensions.

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.



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: μ m

| 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.

1 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.

2 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.

3 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 $0.1 \mu\text{m}R_a$ or less, and the surface roughness of the connecting rod large end and small end bores be $0.2 \mu\text{m}R_a$ or less.

4 Accuracy

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

5 Parallelism and torsional accuracy of connecting rod bores

$L \pm 0.02$ mm and $E \pm 0.02$ 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: μ m

| Shaft dia. mm | | Big end | Small end |
|---------------|-------|-----------------------|-----------|
| Over | Incl. | | |
| — | 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.

$$\text{Roller pitch circle dia.} = \frac{F_w + E_w}{2}$$

Example KT 222814 EG for big end
Recommended clearance is; $17 \sim 25 \mu\text{m}$

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

| 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.

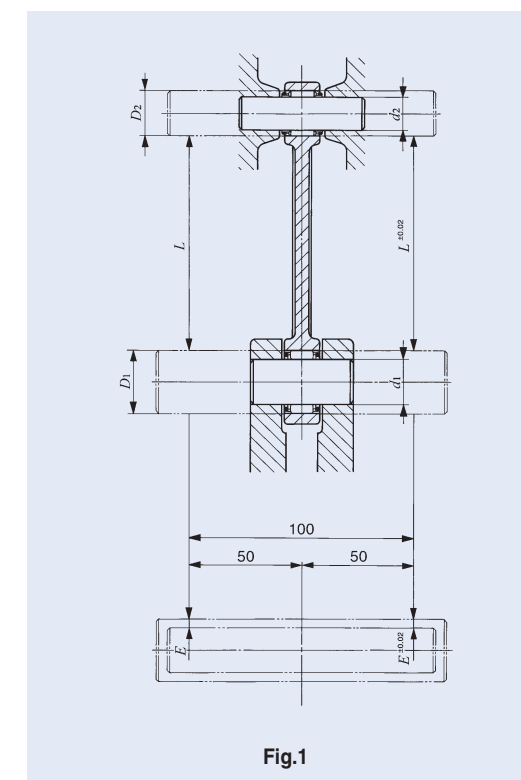


Fig.1

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 | | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|
| | | | F _w | E _w | B _c | | |
| 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 |

Needle Roller Cages for Small End



KTV...EG

Shaft dia. 9 – 18mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Cage guide type |
|------------------|-----------------------|---------------------|---------------------------|----------------|----------------|--|--|---------------------|
| | | | F _w | E _w | B _c | | | |
| 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 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

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



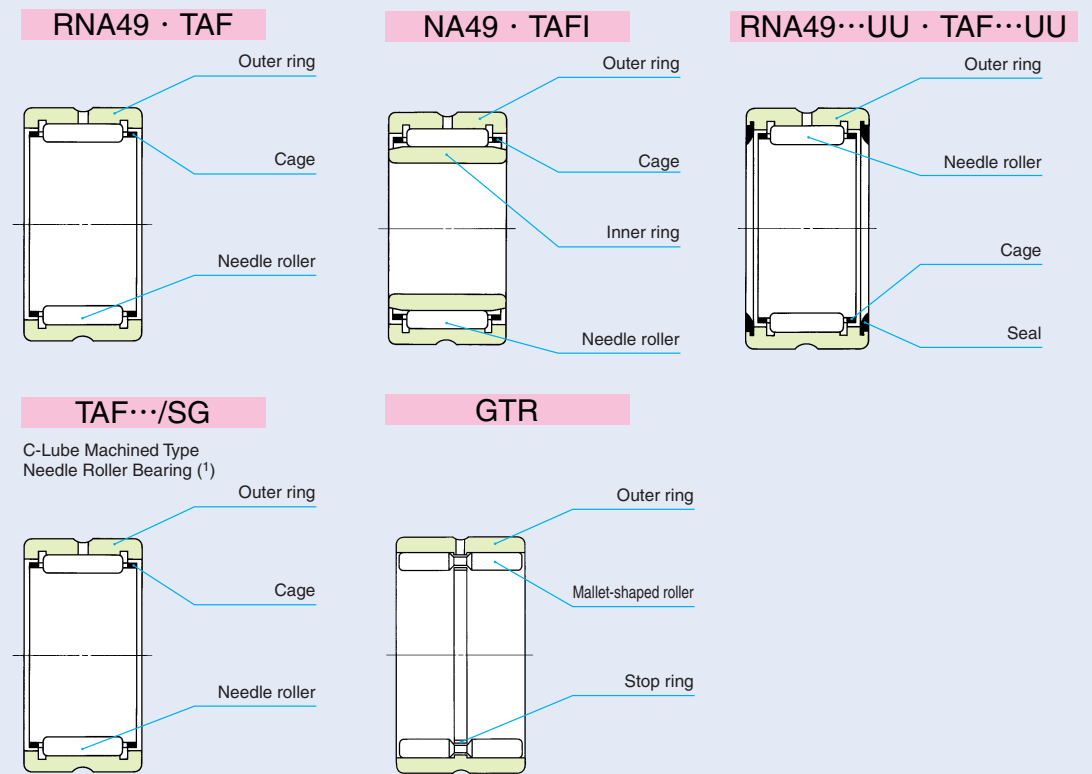
Structure and Features

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.

D

NA
TAFI
TRI
BRI

Structures of Machined Type Needle Roller Bearings



Note(!) 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

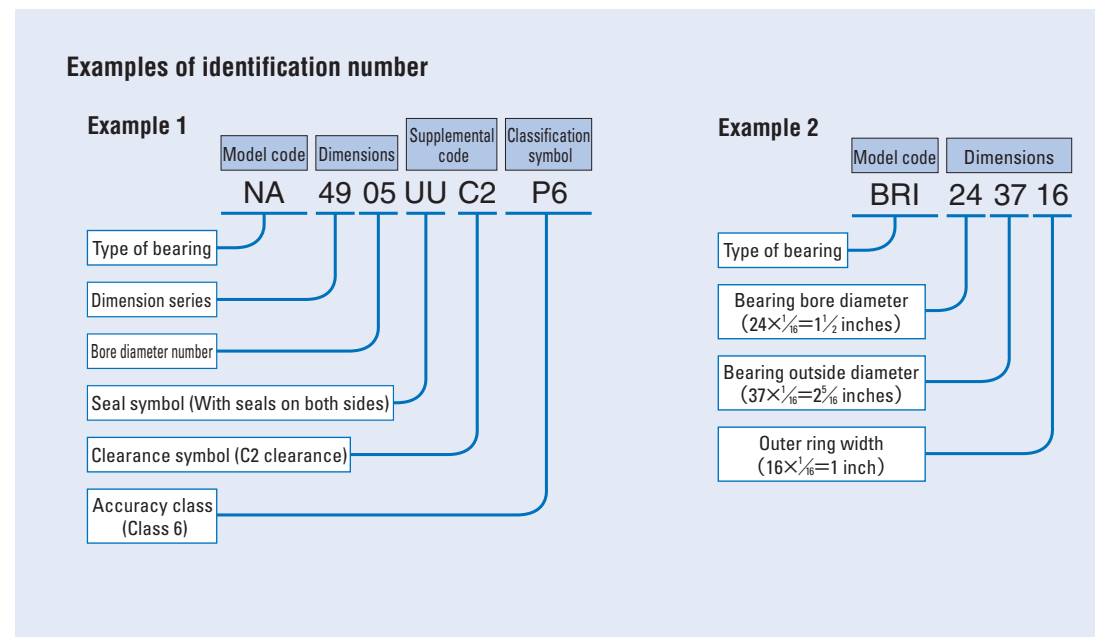
These bearings are full complement type bearings and use mallet-shaped rollers which are guided accurately by the guide rail located at the center of the outer ring raceway and the guide groove of the mallet-shaped roller. This minimizes skewing (tilting of the roller from its rotating axis), which is 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 | | $\Delta_{Bs} (\Delta_{Cs})$ 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.

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 | | $\Delta F_{ws\ min}$ Deviation of smallest single roller set bore diameter | |
|---|---------|--|------|
| Over | Incl. | High | Low |
| — | 18.034 | + 43 | + 20 |
| 18.034 | 30.226 | + 46 | + 23 |
| 30.226 | 41.910 | + 48 | + 25 |
| 41.910 | 50.038 | + 51 | + 25 |
| 50.038 | 70.104 | + 53 | + 28 |
| 70.104 | 80.010 | + 58 | + 28 |
| 80.010 | 102.108 | + 61 | + 31 |

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

Clearance

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

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

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

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

Table 5 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

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

Fit

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

Lubrication

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

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

Oil Hole

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

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

Example: TAFI 203216 — OH C2 P6

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

Table 6.1 Number of oil holes of the outer ring

| Bearing type | | | Number of oil holes of the outer ring | | | |
|------------------------------|---------------|-----------|---------------------------------------|--------------------------|-------------------------|---|
| | | | 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 | 0 | — | — | |
| | Inch series | BR, BRI | $F_w \leq 26$ | 1 | — | — |
| | | | $26 < F_w$ | 1 | 1 | 1 |
| Guide Needle Roller Bearings | Metric series | GTR, GTRI | 1 | — | — | |
| | | GBR, GBRI | 1 | 1 | 1 | |

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

Table 6.2 Number of oil holes of the inner ring

| Bearing type | | | Number of oil holes of the inner ring | | | |
|------------------------------|---------------|------|---------------------------------------|--------------------------|-------------------------|---|
| | | | 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 | $d \leq 76.200$ | 1 | 1 | 1 |
| | | | $76.200 < d$ | 2 | 1 | 1 |
| Guide Needle Roller Bearings | Metric series | GTRI | 0 | — | — | |
| | | GBRI | 0 | 0 | 0 | |

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

Matched Set Bearings

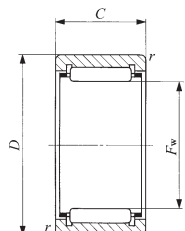
When using two or more Machined Type Needle Roller Bearings adjacent to each other on the same shaft, it is necessary to obtain an even load distribution. On request, a set of bearings is available, in which bearings are matched to obtain an even load distribution.

Mounting

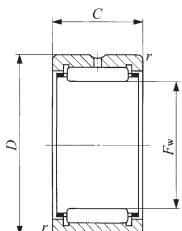
Mounting dimensions for Machined Type Needle Roller Bearings are shown in the table of dimensions.

C-LUBE MACHINED TYPE NEEDLE ROLLER BEARINGS

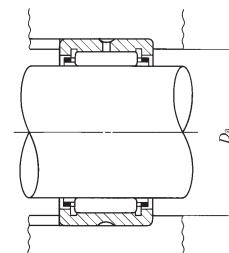
Without Inner Ring



$F_w \leq 26$
(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 | | | | Standard mounting dimension D_a Max. mm | Basic dynamic load rating C N | Basic static load rating C_0 N |
|------------|-----------------------|------------------|------------------------|-----|-----|--------------------|---|---------------------------------------|--|
| | | | F_w | D | C | $r_{s \min}^{(1)}$ | | | |
| 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 |

- Note⁽¹⁾ Minimum allowable value of chamfer dimension r .
- Remarks1. Allowable rotational speed : $d_m n \leq 20000$ ($d_m n = (\text{bore diameter of bearing [mm]} + \text{outside diameter of bearing [mm]})/2 \times \text{rotational speed [mm]}$)
- Please do not wash with organic solvent and/or white kerosene which have the ability to remove fat.
 - To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
 - The operating temperature range is $-15 \sim +80^\circ\text{C}$. Continuous operating temperature is $+60^\circ\text{C}$ or less.
 - Models with a nominal roller set bore diameter F_w 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.

| Shaft dia. | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension D_a Max. mm | Basic dynamic load rating C N | Basic static load rating C_0 N |
|------------|-----------------------|------------------|------------------------|-----|-----|--------------------|---|---------------------------------------|--|
| | | | F_w | D | C | $r_{s \min}^{(1)}$ | | | |
| 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 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

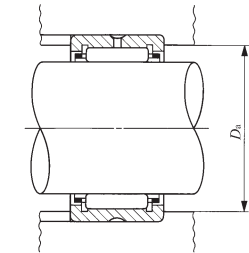
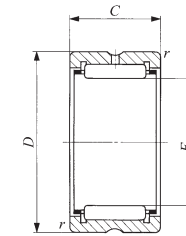
Without Inner Ring



Shaft dia. 5 – 15mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|--------|--------|------------|----|-----|---------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 5 | — | — | — | TAF 51010 | — | — | 3.4 |
| | — | — | — | TAF 51012 | — | — | 4.2 |
| | RNA 493 | — | — | — | — | — | 4.6 |
| 6 | RNA 494 | — | — | — | — | — | 5.3 |
| | — | — | — | TAF 61212 | — | — | 6.4 |
| 7 | RNA 495 | — | — | — | — | — | 5.9 |
| | — | — | — | TAF 71410 | — | — | 6.9 |
| | — | — | — | TAF 71412 | — | — | 8.3 |
| 8 | RNA 496 | — | — | — | — | — | 7.4 |
| | — | — | — | TAF 81512 | — | — | 9.1 |
| | — | — | — | TAF 81516 | — | — | 12.9 |
| 9 | — | — | — | TAF 91612 | — | — | 9.8 |
| | — | — | — | TAF 91616 | — | — | 13.2 |
| | RNA 497 | — | — | — | — | — | 9.3 |
| 10 | — | — | — | TAF 101712 | — | — | 10.7 |
| | — | — | — | TAF 101716 | — | — | 14.3 |
| | RNA 498 | — | — | — | — | — | 12.6 |
| 12 | — | — | — | TAF 121912 | — | — | 12.2 |
| | — | — | — | TAF 121916 | — | — | 16.3 |
| | RNA 499 | — | — | — | — | — | 13.6 |
| 14 | RNA 4900 | — | — | — | — | — | 16.5 |
| | — | — | — | TAF 142216 | — | — | 21 |
| | — | — | — | TAF 142220 | — | — | 26.5 |
| 15 | — | — | — | TAF 152316 | — | — | 22.5 |
| | — | — | — | TAF 152320 | — | — | 28 |

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.



RNA49 TAF
 RNA69 ($F_w \leq 35$)

| Boundary dimensions 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 5 | 10 | 10 | 0.2 | 8.4 | 2 420 | 1 950 | 80 000 |
| 5 | 10 | 12 | 0.2 | 8.4 | 3 080 | 2 660 | 80 000 |
| 5 | 11 | 10 | 0.15 | 9.8 | 2 420 | 1 950 | 80 000 |
| 6 | 12 | 10 | 0.15 | 10.8 | 2 700 | 2 320 | 70 000 |
| 6 | 12 | 12 | 0.2 | 10.4 | 3 440 | 3 170 | 70 000 |
| 7 | 13 | 10 | 0.15 | 11.8 | 2 960 | 2 690 | 60 000 |
| 7 | 14 | 10 | 0.2 | 12.4 | 3 600 | 2 960 | 60 000 |
| 7 | 14 | 12 | 0.2 | 12.4 | 4 610 | 4 050 | 60 000 |
| 8 | 15 | 10 | 0.15 | 13.8 | 3 960 | 3 420 | 50 000 |
| 8 | 15 | 12 | 0.2 | 13.4 | 5 060 | 4 690 | 50 000 |
| 8 | 15 | 16 | 0.2 | 13.4 | 7 080 | 7 220 | 50 000 |
| 9 | 16 | 12 | 0.2 | 14.4 | 5 490 | 5 330 | 45 000 |
| 9 | 16 | 16 | 0.2 | 14.4 | 7 680 | 8 210 | 45 000 |
| 9 | 17 | 10 | 0.15 | 15.8 | 4 530 | 3 650 | 45 000 |
| 10 | 17 | 12 | 0.2 | 15.4 | 5 880 | 5 970 | 40 000 |
| 10 | 17 | 16 | 0.2 | 15.4 | 8 230 | 9 190 | 40 000 |
| 10 | 19 | 11 | 0.2 | 17.4 | 6 180 | 5 030 | 40 000 |
| 12 | 19 | 12 | 0.3 | 17 | 6 610 | 7 260 | 35 000 |
| 12 | 19 | 16 | 0.3 | 17 | 9 250 | 11 200 | 35 000 |
| 12 | 20 | 11 | 0.3 | 18 | 6 600 | 6 310 | 35 000 |
| 14 | 22 | 13 | 0.3 | 20 | 9 230 | 10 100 | 30 000 |
| 14 | 22 | 16 | 0.3 | 20 | 11 700 | 13 700 | 30 000 |
| 14 | 22 | 20 | 0.3 | 20 | 14 800 | 18 600 | 30 000 |
| 15 | 23 | 16 | 0.3 | 21 | 12 300 | 14 900 | 30 000 |
| 15 | 23 | 20 | 0.3 | 21 | 15 600 | 20 200 | 30 000 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

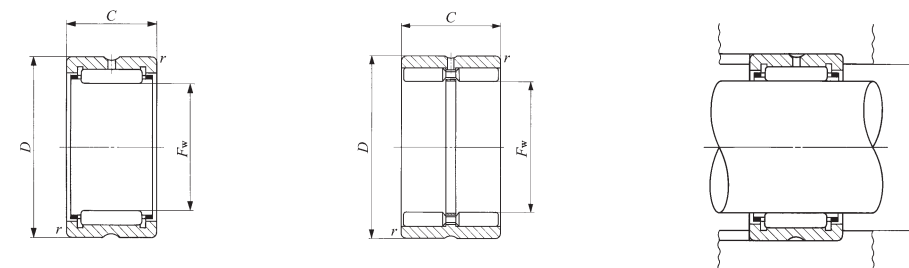
Without Inner Ring



Shaft dia. 16 – 22mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|----------|--------|------------|------------|------------|---------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 16 | RNA 4901 | — | — | — | — | — | 18.1 |
| | — | — | — | TAF 162416 | — | — | 23 |
| | — | — | — | TAF 162420 | — | — | 29 |
| | — | RNA 6901 | — | — | — | — | 30 |
| 17 | — | — | — | TAF 172516 | — | — | 24.5 |
| | — | — | — | TAF 172520 | — | — | 30.5 |
| 18 | RNA 49/14 | — | — | — | — | — | 19.9 |
| | — | — | — | TAF 182616 | — | — | 25.5 |
| | — | — | — | TAF 182620 | — | — | 32 |
| 19 | — | — | — | TAF 192716 | — | — | 27 |
| | — | — | — | TAF 192720 | — | — | 34 |
| 20 | RNA 4902 | — | — | — | — | — | 21.5 |
| | — | — | — | TAF 202816 | — | — | 27.5 |
| | — | — | — | TAF 202820 | — | — | 35.5 |
| | — | RNA 6902 | — | — | — | — | 37 |
| | — | — | — | — | TR 203320 | — | 59.5 |
| | — | — | — | — | — | GTR 203320 | 69 |
| 21 | — | — | — | TAF 212916 | — | — | 29 |
| | — | — | — | TAF 212920 | — | — | 36 |
| 22 | RNA 4903 | — | — | — | — | — | 23.5 |
| | — | — | — | TAF 223016 | — | — | 30 |
| | — | — | — | TAF 223020 | — | — | 37.5 |
| | — | RNA 6903 | — | — | — | — | 40.5 |
| | — | — | — | — | TR 223425 | — | 73.5 |
| — | — | — | — | — | GTR 223425 | 87 | |

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.



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

GTR

| Boundary dimensions 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 16 | 24 | 13 | 0.3 | 22 | 9 660 | 11 100 | 25 000 |
| 16 | 24 | 16 | 0.3 | 22 | 12 300 | 15 100 | 25 000 |
| 16 | 24 | 20 | 0.3 | 22 | 15 500 | 20 400 | 25 000 |
| 16 | 24 | 22 | 0.3 | 22 | 17 100 | 23 000 | 25 000 |
| 17 | 25 | 16 | 0.3 | 23 | 12 900 | 16 300 | 25 000 |
| 17 | 25 | 20 | 0.3 | 23 | 16 300 | 22 000 | 25 000 |
| 18 | 26 | 13 | 0.3 | 24 | 10 600 | 12 800 | 20 000 |
| 18 | 26 | 16 | 0.3 | 24 | 13 400 | 17 500 | 20 000 |
| 18 | 26 | 20 | 0.3 | 24 | 17 000 | 23 600 | 20 000 |
| 19 | 27 | 16 | 0.3 | 25 | 14 000 | 18 700 | 20 000 |
| 19 | 27 | 20 | 0.3 | 25 | 17 700 | 25 300 | 20 000 |
| 20 | 28 | 13 | 0.3 | 26 | 10 900 | 13 800 | 20 000 |
| 20 | 28 | 16 | 0.3 | 26 | 13 900 | 18 800 | 20 000 |
| 20 | 28 | 20 | 0.3 | 26 | 17 600 | 25 400 | 20 000 |
| 20 | 28 | 23 | 0.3 | 26 | 19 300 | 28 800 | 20 000 |
| 20 | 33 | 20 | 0.3 | 31 | 24 300 | 26 500 | 20 000 |
| 20 | 33 | 20 | 0.3 | 31 | 29 200 | 37 200 | 7 500 |
| 21 | 29 | 16 | 0.3 | 27 | 14 400 | 20 000 | 19 000 |
| 21 | 29 | 20 | 0.3 | 27 | 18 200 | 27 100 | 19 000 |
| 22 | 30 | 13 | 0.3 | 28 | 11 700 | 15 600 | 18 000 |
| 22 | 30 | 16 | 0.3 | 28 | 14 900 | 21 200 | 18 000 |
| 22 | 30 | 20 | 0.3 | 28 | 18 900 | 28 700 | 18 000 |
| 22 | 30 | 23 | 0.3 | 28 | 20 800 | 32 500 | 18 000 |
| 22 | 34 | 25 | 0.3 | 32 | 29 100 | 36 800 | 18 000 |
| 22 | 34 | 25 | 0.3 | 32 | 37 900 | 57 800 | 7 000 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

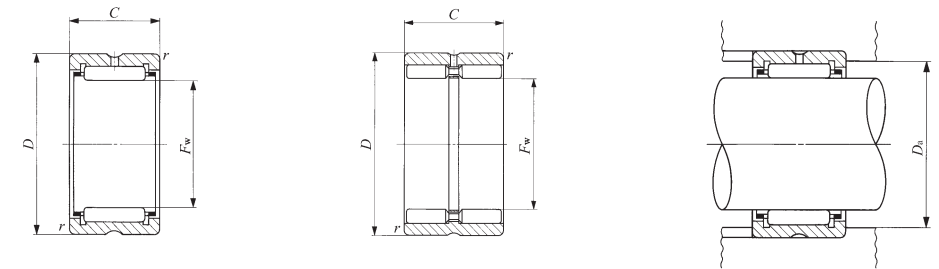
Without Inner Ring



Shaft dia. 24 – 30mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|-----------|--------|------------|-----------|------------|------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 24 | — | — | — | TAF 243216 | — | — | 32 |
| | — | — | — | TAF 243220 | — | — | 40.5 |
| 25 | — | — | — | TAF 253316 | — | — | 33.5 |
| | — | — | — | TAF 253320 | — | — | 42 |
| | RNA 4904 | — | — | — | — | — | 55.5 |
| | — | RNA 6904 | — | — | — | — | 95.5 |
| | — | — | — | — | TR 253820 | — | 71 |
| | — | — | — | — | TR 253825 | — | 89 |
| 26 | — | — | — | TAF 263416 | — | — | 34.5 |
| | — | — | — | TAF 263420 | — | — | 43.5 |
| 28 | — | — | — | TAF 283720 | — | — | 51.5 |
| | — | — | — | TAF 283730 | — | — | 83.5 |
| | RNA 49/22 | — | — | — | — | — | 56.5 |
| | — | RNA 69/22 | — | — | — | — | 97.5 |
| 29 | — | — | — | TAF 293820 | — | — | 57 |
| | — | — | — | TAF 293830 | — | — | 85 |
| 30 | — | — | — | TAF 304020 | — | — | 64.5 |
| | — | — | — | TAF 304030 | — | — | 97.5 |
| | RNA 4905 | — | — | — | — | — | 64 |
| | — | RNA 6905 | — | — | — | — | 111 |
| | — | — | — | — | TR 304425 | — | 115 |
| | — | — | — | — | — | GTR 304425 | 133 |

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.



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

GTR

| Boundary dimensions 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 24 | 32 | 16 | 0.3 | 30 | 15 300 | 22 500 | 17 000 |
| 24 | 32 | 20 | 0.3 | 30 | 19 400 | 30 500 | 17 000 |
| 25 | 33 | 16 | 0.3 | 31 | 15 800 | 23 700 | 16 000 |
| 25 | 33 | 20 | 0.3 | 31 | 20 000 | 32 100 | 16 000 |
| 25 | 37 | 17 | 0.3 | 35 | 21 000 | 25 000 | 16 000 |
| 25 | 37 | 30 | 0.3 | 35 | 35 400 | 48 900 | 16 000 |
| 25 | 38 | 20 | 0.3 | 36 | 28 900 | 35 000 | 16 000 |
| 25 | 38 | 25 | 0.3 | 36 | 34 800 | 44 400 | 16 000 |
| 25 | 38 | 20 | 0.3 | 36 | 33 300 | 46 500 | 6 000 |
| 25 | 38 | 25 | 0.3 | 36 | 42 400 | 63 700 | 6 000 |
| 26 | 34 | 16 | 0.3 | 32 | 16 300 | 24 900 | 15 000 |
| 26 | 34 | 20 | 0.3 | 32 | 20 600 | 33 800 | 15 000 |
| 28 | 37 | 20 | 0.3 | 35 | 21 700 | 37 100 | 14 000 |
| 28 | 37 | 30 | 0.3 | 35 | 31 100 | 58 900 | 14 000 |
| 28 | 39 | 17 | 0.3 | 37 | 21 400 | 28 900 | 14 000 |
| 28 | 39 | 30 | 0.3 | 37 | 36 300 | 56 900 | 14 000 |
| 29 | 38 | 20 | 0.3 | 36 | 21 600 | 37 200 | 14 000 |
| 29 | 38 | 30 | 0.3 | 36 | 30 900 | 59 100 | 14 000 |
| 30 | 40 | 20 | 0.3 | 38 | 25 100 | 40 100 | 13 000 |
| 30 | 40 | 30 | 0.3 | 38 | 36 000 | 63 900 | 13 000 |
| 30 | 42 | 17 | 0.3 | 40 | 23 700 | 30 700 | 13 000 |
| 30 | 42 | 30 | 0.3 | 40 | 42 100 | 64 300 | 13 000 |
| 30 | 44 | 25 | 0.3 | 42 | 37 900 | 52 100 | 13 000 |
| 30 | 44 | 25 | 0.3 | 42 | 47 000 | 76 500 | 5 000 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

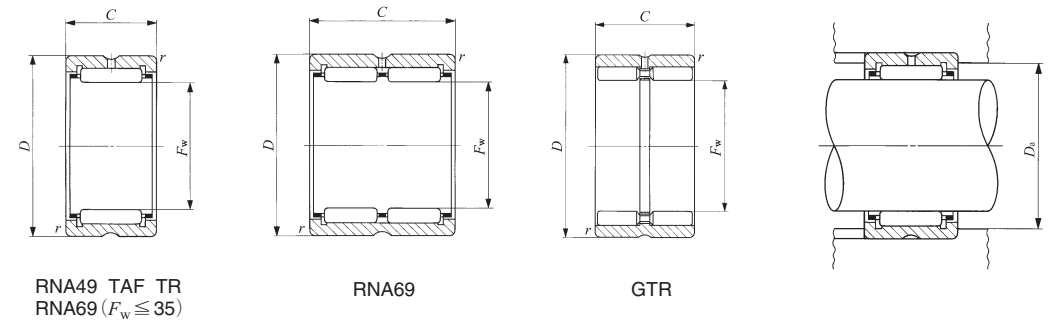
Without Inner Ring



Shaft dia. 32 – 40mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|------------------|--------|-------------------|------------------|-------------------|------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 32 | — | — | — | TAF 324220 | — | — | 68 |
| | — | — | — | TAF 324230 | — | — | 102 |
| | RNA 49/28 | — | — | — | — | — | 76.5 |
| | — | RNA 69/28 | — | — | — | — | 133 |
| | — | — | — | — | — | GTR 324530 | 152 |
| 35 | — | — | — | TAF 354520 | — | — | 73.5 |
| | — | — | — | TAF 354530 | — | — | 112 |
| | RNA 4906 | — | — | — | — | — | 72.5 |
| | — | RNA 6906 | — | — | — | — | 125 |
| | — | — | — | — | TR 354830 | — | 139 |
| | — | — | — | — | — | GTR 354830 | 163 |
| 37 | — | — | — | TAF 374720 | — | — | 77.5 |
| | — | — | — | TAF 374730 | — | — | 117 |
| 38 | — | — | — | TAF 384820 | — | — | 79 |
| | — | — | — | TAF 384830 | — | — | 119 |
| | — | — | — | — | TR 385230 | — | 168 |
| | — | — | — | — | — | GTR 385230 | 195 |
| 40 | — | — | — | TAF 405020 | — | — | 83 |
| | — | — | — | TAF 405030 | — | — | 125 |
| | RNA 49/32 | — | — | — | — | — | 96 |
| | — | RNA 69/32 | — | — | — | — | 172 |
| | — | — | — | — | TR 405520 | — | 129 |
| | — | — | — | — | — | GTR 405520 | 144 |

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 | | | | 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 32 | 42 | 20 | 0.3 | 40 | 25 700 | 42 200 | 12 000 |
| 32 | 42 | 30 | 0.3 | 40 | 36 800 | 67 200 | 12 000 |
| 32 | 45 | 17 | 0.3 | 43 | 24 500 | 32 700 | 12 000 |
| 32 | 45 | 30 | 0.3 | 43 | 41 800 | 64 800 | 12 000 |
| 32 | 45 | 30 | 0.3 | 43 | 58 000 | 101 000 | 4 500 |
| 35 | 45 | 20 | 0.3 | 43 | 26 900 | 46 200 | 11 000 |
| 35 | 45 | 30 | 0.3 | 43 | 38 600 | 73 600 | 11 000 |
| 35 | 47 | 17 | 0.3 | 45 | 25 200 | 34 700 | 11 000 |
| 35 | 47 | 30 | 0.3 | 45 | 43 000 | 69 000 | 11 000 |
| 35 | 48 | 30 | 0.3 | 46 | 47 400 | 72 300 | 11 000 |
| 35 | 48 | 30 | 0.3 | 46 | 61 100 | 110 000 | 4 500 |
| 37 | 47 | 20 | 0.3 | 45 | 28 200 | 50 100 | 11 000 |
| 37 | 47 | 30 | 0.3 | 45 | 40 500 | 79 800 | 11 000 |
| 38 | 48 | 20 | 0.3 | 46 | 28 100 | 50 200 | 11 000 |
| 38 | 48 | 30 | 0.3 | 46 | 40 300 | 80 000 | 11 000 |
| 38 | 52 | 30 | 0.6 | 48 | 50 800 | 81 100 | 11 000 |
| 38 | 52 | 30 | 0.6 | 48 | 64 200 | 121 000 | 4 000 |
| 40 | 50 | 20 | 0.3 | 48 | 29 400 | 54 100 | 10 000 |
| 40 | 50 | 30 | 0.3 | 48 | 42 300 | 86 200 | 10 000 |
| 40 | 52 | 20 | 0.6 | 48 | 31 200 | 47 800 | 10 000 |
| 40 | 52 | 36 | 0.6 | 48 | 53 500 | 95 700 | 10 000 |
| 40 | 55 | 20 | 0.6 | 51 | 37 400 | 55 700 | 10 000 |
| 40 | 55 | 20 | 0.6 | 51 | 44 300 | 73 600 | 3 500 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

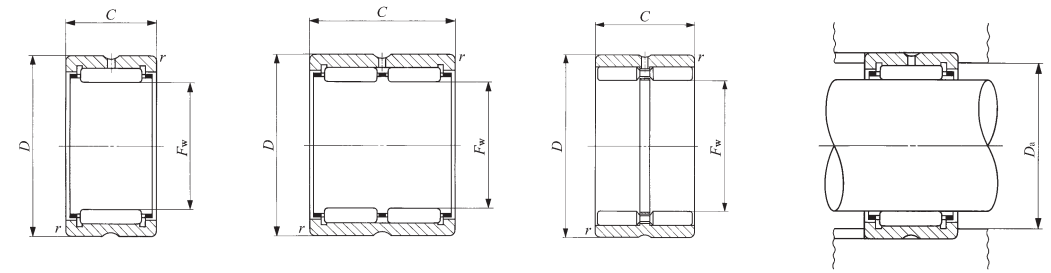
Without Inner Ring



Shaft dia. 42 – 50mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|----------|--------|------------|-----------|------------|------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 42 | — | — | — | TAF 425220 | — | — | 86.5 |
| | — | — | — | TAF 425230 | — | — | 130 |
| | RNA 4907 | — | — | — | — | — | 113 |
| | — | RNA 6907 | — | — | — | — | 200 |
| 42 | — | — | — | — | 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 |
| 45 | — | — | — | — | — | 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 |
| | — | — | — | — | — | — | — |

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.



RNA49 TAF TR

RNA69

GTR

| Boundary dimensions 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 |
|------------------------|-----|-----|---------------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \text{ min}}^{(1)}$ | | | | |
| 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 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

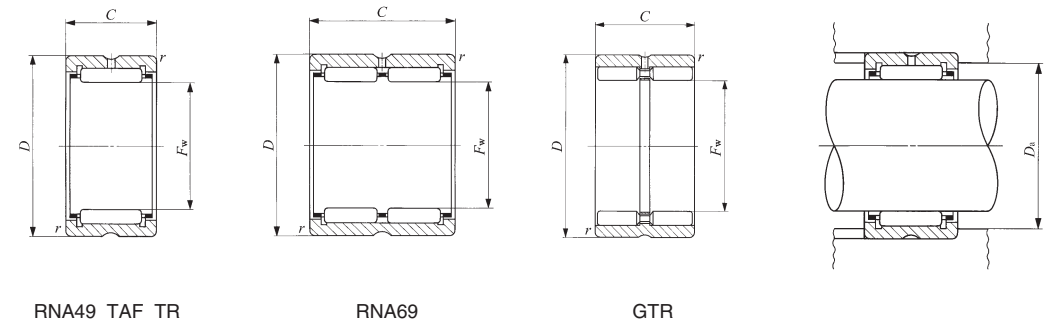
Without Inner Ring



Shaft dia. 52 – 68mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|----------|--------|--------------------------|-----------|------------|-------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 52 | RNA 4909 | — | — | — | — | — | 197 |
| | — | RNA 6909 | — | — | — | — | 355 |
| 55 | — | — | — | TAF 556825 | — | — | 193 |
| | — | — | — | TAF 556835 | — | — | 255 |
| | RNA 49/48 | — | — | — | — | — | 188 |
| 58 | RNA 4910 | — | — | — | — | — | 179 |
| | — | RNA 6910 | — | — | — | — | 320 |
| 60 | — | — | — | — | TR 587745 | — | 515 |
| | — | — | — | — | — | GTR 587745 | 590 |
| | RNA 49/52 | — | — | TAF 607225 TAF 607235 | — | — | 187 260 205 |
| 62 | — | — | — | — | TR 628138 | — | 460 |
| | — | — | — | — | — | GTR 628138 | 520 |
| 63 | RNA 4911 | — | — | — | — | — | 265 |
| | — | RNA 6911 | — | — | — | — | 475 |
| 65 | — | — | — | TAF 657825 | — | — | 225 |
| | — | — | — | TAF 657835 | — | — | 315 |
| | RNA 49/58 | — | — | — | — | — | 275 |
| 68 | — | — | — | TAF 688225 | — | — | 250 |
| | — | — | — | TAF 688235 | — | — | 350 |
| | RNA 4912 | — | — | — | — | — | 285 |
| | — | RNA 6912 | — | — | — | — | 510 |

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 | | | | 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 52 | 68 | 22 | 0.6 | 64 | 43 500 | 73 300 | 7 500 |
| 52 | 68 | 40 | 0.6 | 64 | 74 600 | 147 000 | 7 500 |
| 55 | 68 | 25 | 0.3 | 66 | 45 400 | 94 000 | 7 500 |
| 55 | 68 | 35 | 0.3 | 66 | 61 200 | 138 000 | 7 500 |
| 55 | 70 | 22 | 0.6 | 66 | 44 300 | 76 300 | 7 500 |
| 58 | 72 | 22 | 0.6 | 68 | 46 200 | 82 100 | 7 000 |
| 58 | 72 | 40 | 0.6 | 68 | 79 200 | 164 000 | 7 000 |
| 58 | 77 | 45 | 1 | 72 | 104 000 | 191 000 | 7 000 |
| 58 | 77 | 45 | 1 | 72 | 135 000 | 280 000 | 2 500 |
| 60 | 72 | 25 | 0.3 | 70 | 47 500 | 103 000 | 6 500 |
| 60 | 72 | 35 | 0.3 | 70 | 64 100 | 151 000 | 6 500 |
| 60 | 75 | 22 | 0.6 | 71 | 47 100 | 85 100 | 6 500 |
| 62 | 81 | 38 | 1 | 76 | 92 000 | 166 000 | 6 500 |
| 62 | 81 | 38 | 1 | 76 | 118 000 | 241 000 | 2 500 |
| 63 | 80 | 25 | 1 | 75 | 57 600 | 97 200 | 6 500 |
| 63 | 80 | 45 | 1 | 75 | 98 700 | 194 000 | 6 500 |
| 65 | 78 | 25 | 0.6 | 74 | 49 600 | 112 000 | 6 000 |
| 65 | 78 | 35 | 0.6 | 74 | 67 000 | 164 000 | 6 000 |
| 65 | 82 | 25 | 1 | 77 | 58 900 | 101 000 | 6 000 |
| 68 | 82 | 25 | 0.6 | 78 | 54 800 | 117 000 | 6 000 |
| 68 | 82 | 35 | 0.6 | 78 | 72 000 | 166 000 | 6 000 |
| 68 | 85 | 25 | 1 | 80 | 60 200 | 105 000 | 6 000 |
| 68 | 85 | 45 | 1 | 80 | 103 000 | 211 000 | 6 000 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

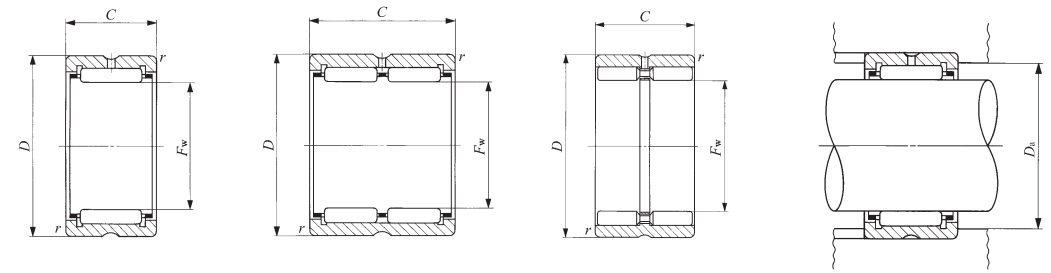
Without Inner Ring



Shaft dia. 70 – 85mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|-----------------|--------|-------------|------------|--------------------|---------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 70 | — | — | — | TAF 708525 | — | — | 280 |
| | — | — | — | TAF 708535 | — | — | 395 |
| | RNA 49/62 | — | — | — | — | — | 320 |
| 72 | — | — | — | — | TR 708945 | — | 605 |
| | — | — | — | — | — | GTR 708945 | 690 |
| 73 | RNA 4913 | — | — | — | — | — | 325 |
| | — | RNA 6913 | — | — | — | — | 585 |
| 75 | — | — | — | TAF 739025 | — | — | 335 |
| | — | — | — | TAF 739035 | — | — | 475 |
| 77 | — | — | — | TAF 759225 | — | — | 345 |
| | — | — | — | TAF 759235 | — | — | 485 |
| | RNA 49/68 | — | — | — | — | — | 470 |
| 80 | — | — | — | TAF 809525 | — | — | 315 |
| | — | — | — | TAF 809535 | — | — | 445 |
| | RNA 4914 | — | — | — | — | — | 495 |
| | — | RNA 6914 | — | — | — | — | 910 |
| 83 | — | — | — | — | TR 8310845 | — | 995 |
| | — | — | — | — | — | GTR 8310845 | 1 090 |
| 85 | — | — | — | TAF 8510525 | — | — | 435 |
| | — | — | — | — | — | — | 525 |
| | — | — | — | TAF 8510535 | — | — | 610 |
| | — | RNA 6915 | — | — | — | — | 960 |

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.



RNA49 TAF TR

RNA69

GTR

| Boundary dimensions mm | | | | Standard mounting dimension <i>D_a</i> Max. mm | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|----------|---|--|--|---|--|
| <i>F_w</i> | <i>D</i> | <i>C</i> | <i>r_s</i> min ⁽¹⁾ | | | | |
| 70 | 85 | 25 | 0.6 | 81 | 55 500 | 120 000 | 5 500 |
| 70 | 85 | 35 | 0.6 | 81 | 73 000 | 171 000 | 5 500 |
| 70 | 88 | 25 | 1 | 83 | 61 500 | 109 000 | 5 500 |
| 70 | 89 | 45 | 1 | 84 | 114 000 | 228 000 | 5 500 |
| 70 | 89 | 45 | 1 | 84 | 147 000 | 336 000 | 2 000 |
| 72 | 90 | 25 | 1 | 85 | 62 700 | 113 000 | 5 500 |
| 72 | 90 | 45 | 1 | 85 | 108 000 | 227 000 | 5 500 |
| 73 | 90 | 25 | 1 | 85 | 61 100 | 127 000 | 5 500 |
| 73 | 90 | 35 | 1 | 85 | 80 400 | 181 000 | 5 500 |
| 75 | 92 | 25 | 1 | 87 | 62 100 | 131 000 | 5 500 |
| 75 | 92 | 35 | 1 | 87 | 81 700 | 186 000 | 5 500 |
| 75 | 95 | 30 | 1 | 90 | 79 900 | 147 000 | 5 500 |
| 80 | 95 | 25 | 1 | 90 | 59 400 | 137 000 | 5 000 |
| 80 | 95 | 35 | 1 | 90 | 78 100 | 195 000 | 5 000 |
| 80 | 100 | 30 | 1 | 95 | 83 200 | 158 000 | 5 000 |
| 80 | 100 | 54 | 1 | 95 | 134 000 | 311 000 | 5 000 |
| 83 | 108 | 45 | 1 | 103 | 146 000 | 270 000 | 5 000 |
| 83 | 108 | 45 | 1 | 103 | 190 000 | 396 000 | 1 800 |
| 85 | 105 | 25 | 1 | 100 | 76 300 | 145 000 | 4 500 |
| 85 | 105 | 30 | 1 | 100 | 86 200 | 169 000 | 4 500 |
| 85 | 105 | 35 | 1 | 100 | 102 000 | 210 000 | 4 500 |
| 85 | 105 | 54 | 1 | 100 | 138 000 | 331 000 | 4 500 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

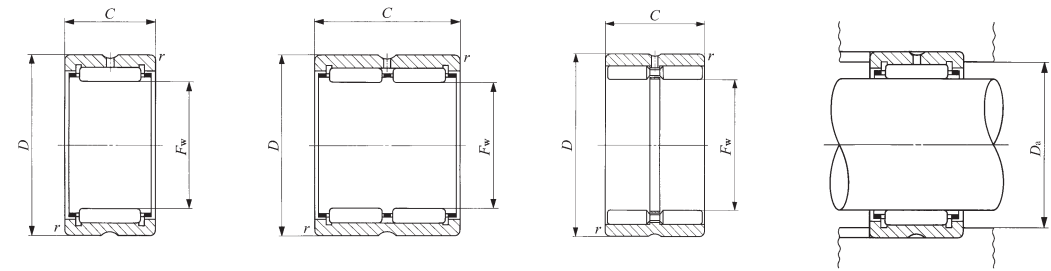
Without Inner Ring



Shaft dia. 90 – 105mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|----------|--------|--------------|-------------|--------------|------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 90 | — | — | — | TAF 9011025 | — | — | 455 |
| | RNA 4916 | — | — | — | — | — | 550 |
| | — | — | — | TAF 9011035 | — | — | 640 |
| | — | RNA 6916 | — | — | — | — | 1 010 |
| 93 | — | — | — | — | TR 9311850 | — | 1 210 |
| | — | — | — | — | — | GTR 9311850 | 1 340 |
| 95 | — | — | — | TAF 9511526 | — | — | 495 |
| | RNA 49/82 | — | — | — | — | — | 575 |
| | — | — | — | TAF 9511536 | — | — | 690 |
| | — | — | — | — | TR 9512045 | — | 1 120 |
| 100 | — | — | — | — | — | GTR 9512045 | 1 230 |
| | — | — | — | TAF 10012026 | — | — | 525 |
| | RNA 4917 | — | — | — | — | — | 705 |
| | — | — | — | TAF 10012036 | — | — | 725 |
| 105 | — | — | — | — | — | — | 1 300 |
| | — | — | — | — | TR 10012550 | — | 1 290 |
| | — | — | — | — | — | GTR 10012550 | 1 440 |
| | — | — | — | TAF 10512526 | — | — | 545 |
| 105 | RNA 4918 | — | — | — | — | — | 740 |
| | — | — | — | TAF 10512536 | — | — | 760 |
| | — | — | — | — | — | — | 1 360 |
| | — | RNA 6918 | — | — | — | — | 1 360 |

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.



RNA49 TAF TR

RNA69

GTR

| Boundary dimensions 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 |
|------------------------|-----|-----|--------------------|---|---------------------------------------|--|--|
| F_w | D | C | $r_{s \min}^{(1)}$ | | | | |
| 90 | 110 | 25 | 1 | 105 | 77 300 | 150 000 | 4 500 |
| 90 | 110 | 30 | 1 | 105 | 87 300 | 175 000 | 4 500 |
| 90 | 110 | 35 | 1 | 105 | 103 000 | 217 000 | 4 500 |
| 90 | 110 | 54 | 1 | 105 | 143 000 | 351 000 | 4 500 |
| 93 | 118 | 50 | 1 | 113 | 165 000 | 329 000 | 4 500 |
| 93 | 118 | 50 | 1 | 113 | 224 000 | 509 000 | 1 600 |
| 95 | 115 | 26 | 1 | 110 | 79 700 | 159 000 | 4 000 |
| 95 | 115 | 30 | 1 | 110 | 90 000 | 186 000 | 4 000 |
| 95 | 115 | 36 | 1 | 110 | 106 000 | 231 000 | 4 000 |
| 95 | 120 | 45 | 1.5 | 112 | 155 000 | 305 000 | 4 000 |
| 95 | 120 | 45 | 1.5 | 112 | 204 000 | 455 000 | 1 600 |
| 100 | 120 | 26 | 1 | 115 | 82 400 | 168 000 | 4 000 |
| 100 | 120 | 35 | 1.1 | 113.5 | 110 000 | 244 000 | 4 000 |
| 100 | 120 | 36 | 1 | 115 | 110 000 | 244 000 | 4 000 |
| 100 | 120 | 63 | 1.1 | 113.5 | 173 000 | 467 000 | 4 000 |
| 100 | 125 | 50 | 1.5 | 117 | 172 000 | 355 000 | 4 000 |
| 100 | 125 | 50 | 1.5 | 117 | 234 000 | 549 000 | 1 500 |
| 105 | 125 | 26 | 1 | 120 | 84 700 | 178 000 | 4 000 |
| 105 | 125 | 35 | 1.1 | 118.5 | 113 000 | 258 000 | 4 000 |
| 105 | 125 | 36 | 1 | 120 | 113 000 | 258 000 | 4 000 |
| 105 | 125 | 63 | 1.1 | 118.5 | 178 000 | 490 000 | 4 000 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

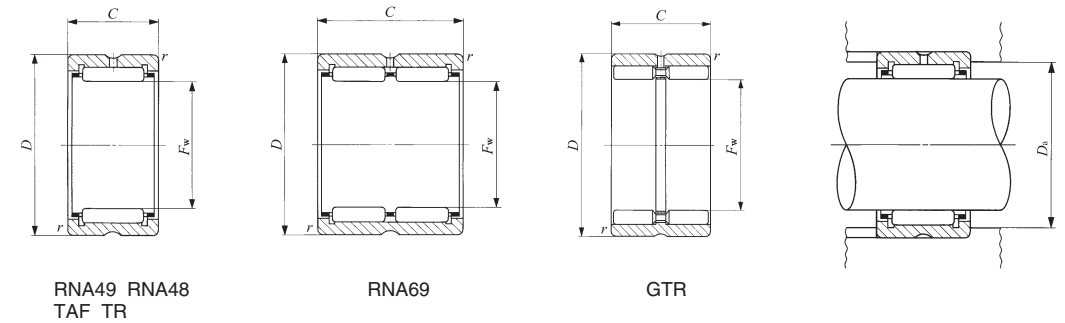
Without Inner Ring



Shaft dia. 110 – 170mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|-----------------|-----------------|---------------------|--------------------|---------------------|---------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 110 | — | — | — | TAF 11013030 | — | — | 660 |
| | RNA 4919 | — | — | — | — | — | 770 |
| | — | — | — | TAF 11013040 | — | — | 880 |
| | — | RNA 6919 | — | — | — | — | 1 420 |
| 115 | — | — | — | — | TR 11013550 | — | 1 400 |
| | — | — | — | — | — | GTR 11013550 | 1 560 |
| 120 | — | — | RNA 4822 | — | — | — | 790 |
| | 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.

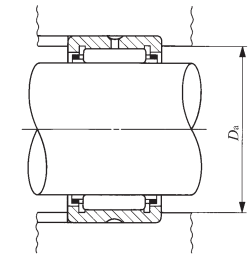
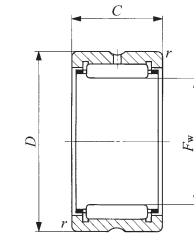


| Boundary dimensions mm | | | | Standard mounting dimension <i>D_a</i> Max. mm | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|----------|---|--|--|---|--|
| <i>F_w</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | | | | |
| 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 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 RNA48

Shaft dia. 175 – 350mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|--------|----------------------|--------|--------|--------|---------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 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 4948 | — — | RNA 4848 — | — — | — — | — — | 5 670 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 |

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 | | | | Standard mounting dimension <i>D_a</i> Max. mm | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|----------|---|--|--|---|--|
| <i>F_w</i> | <i>D</i> | <i>C</i> | <i>r_s min</i> ⁽¹⁾ | | | | |
| 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 |

D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

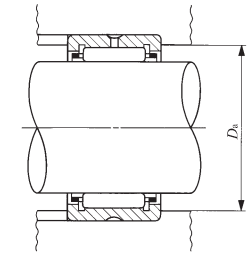
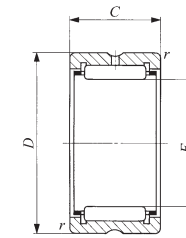
Without Inner Ring



Shaft dia. 360 – 490mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|-----------------------|--------|-----------------|-----|----|-----|------------------|
| | RNA 49 | RNA 69 | RNA 48 | TAF | TR | GTR | |
| 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 |

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.



RNA49 RNA48

| Boundary dimensions mm | | | | Standard mounting dimension <i>D_a</i> Max. mm | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|----------|---|--|--|---|--|
| <i>F_w</i> | <i>D</i> | <i>C</i> | <i>r_s min</i> ⁽¹⁾ | | | | |
| 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 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

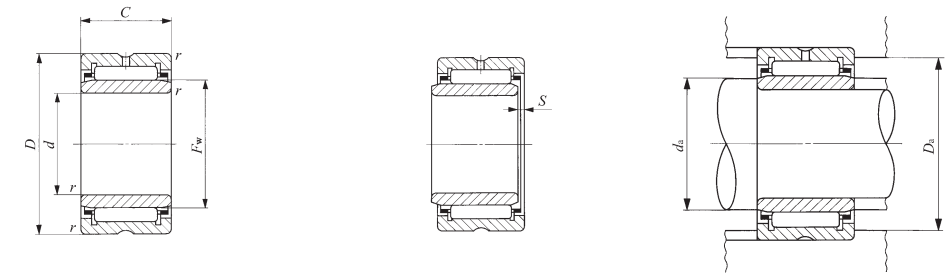
With Inner Ring



Shaft dia. 5 – 12mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|---------|-------|-------------|-----|------|---------------------|----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 5 | NA 495 | — | — | — | — | — | 7.3 | 5 |
| | — | — | — | TAFI 51512 | — | — | 11.9 | 5 |
| | — | — | — | TAFI 51516 | — | — | 16.7 | 5 |
| 6 | NA 496 | — | — | — | — | — | 9.1 | 6 |
| | — | — | — | TAFI 61612 | — | — | 13 | 6 |
| | — | — | — | TAFI 61616 | — | — | 17.5 | 6 |
| 7 | NA 497 | — | — | — | — | — | 11.2 | 7 |
| | — | — | — | TAFI 71712 | — | — | 14.3 | 7 |
| | — | — | — | TAFI 71716 | — | — | 19.2 | 7 |
| 8 | NA 498 | — | — | — | — | — | 15 | 8 |
| 9 | — | — | — | TAFI 91912 | — | — | 16.7 | 9 |
| | — | — | — | TAFI 91916 | — | — | 22.5 | 9 |
| | NA 499 | — | — | — | — | — | 16.7 | 9 |
| 10 | NA 4900 | — | — | — | — | — | 24 | 10 |
| | — | — | — | TAFI 102216 | — | — | 30 | 10 |
| | — | — | — | TAFI 102220 | — | — | 38 | 10 |
| 12 | NA 4901 | — | — | — | — | — | 26.5 | 12 |
| | — | — | — | TAFI 122416 | — | — | 33.5 | 12 |
| | — | — | — | TAFI 122420 | — | — | 42.5 | 12 |
| | — | NA 6901 | — | — | — | — | 44.5 | 12 |

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.

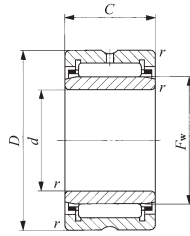


NA49 TAFI
NA69 (*d* ≤ 30)

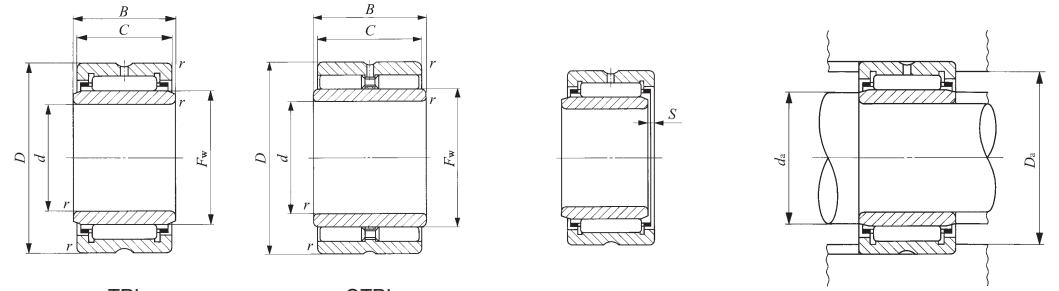
| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----------|----------|--|-----------------------|-------------------------|---------------------------------|------|----------------------------|--|--|--|----------------------|
| <i>D</i> | <i>C</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>F</i> _w | <i>S</i> ⁽²⁾ | Min. <i>d</i> _a | Max. | <i>D</i> _a Max. | | | | |
| 13 | 10 | — | 0.15 | 7 | 0.5 | 6.2 | 6.7 | 11.8 | 2 960 | 2 690 | 60 000 | LRT 5710 |
| 15 | 12 | — | 0.2 | 8 | 0.5 | 6.6 | 7.7 | 13.4 | 5 060 | 4 690 | 50 000 | LRT 5812 |
| 15 | 16 | — | 0.2 | 8 | 0.5 | 6.6 | 7.7 | 13.4 | 7 080 | 7 220 | 50 000 | LRT 5816 |
| 15 | 10 | — | 0.15 | 8 | 0.5 | 7.2 | 7.7 | 13.8 | 3 960 | 3 420 | 50 000 | LRT 6810 |
| 16 | 12 | — | 0.2 | 9 | 0.5 | 7.6 | 8.7 | 14.4 | 5 490 | 5 330 | 45 000 | LRT 6912 |
| 16 | 16 | — | 0.2 | 9 | 0.5 | 7.6 | 8.7 | 14.4 | 7 680 | 8 210 | 45 000 | LRT 6916 |
| 17 | 10 | — | 0.15 | 9 | 0.5 | 8.2 | 8.7 | 15.8 | 4 530 | 3 650 | 45 000 | LRT 7910 |
| 17 | 12 | — | 0.2 | 10 | 0.5 | 8.6 | 9.7 | 15.4 | 5 880 | 5 970 | 40 000 | LRT 71012 |
| 17 | 16 | — | 0.2 | 10 | 0.5 | 8.6 | 9.7 | 15.4 | 8 230 | 9 190 | 40 000 | LRT 71016 |
| 19 | 11 | — | 0.2 | 10 | 0.5 | 9.6 | 9.9 | 17.4 | 6 180 | 5 030 | 40 000 | LRT 81011 |
| 19 | 12 | — | 0.3 | 12 | 0.5 | 11 | 11.5 | 17 | 6 610 | 7 260 | 35 000 | LRT 91212 |
| 19 | 16 | — | 0.3 | 12 | 0.5 | 11 | 11.5 | 17 | 9 250 | 11 200 | 35 000 | LRT 91216 |
| 20 | 11 | — | 0.3 | 12 | 0.5 | 11 | 11.5 | 18 | 6 600 | 6 310 | 35 000 | LRT 91211 |
| 22 | 13 | — | 0.3 | 14 | 0.5 | 12 | 13 | 20 | 9 230 | 10 100 | 30 000 | LRT 101413 |
| 22 | 16 | — | 0.3 | 14 | 0.5 | 12 | 13 | 20 | 11 700 | 13 700 | 30 000 | LRT 101416 |
| 22 | 20 | — | 0.3 | 14 | 0.5 | 12 | 13 | 20 | 14 800 | 18 600 | 30 000 | LRT 101420 |
| 24 | 13 | — | 0.3 | 16 | 0.5 | 14 | 15 | 22 | 9 660 | 11 100 | 25 000 | LRT 121613 |
| 24 | 16 | — | 0.3 | 16 | 0.5 | 14 | 15 | 22 | 12 300 | 15 100 | 25 000 | LRT 121616 |
| 24 | 20 | — | 0.3 | 16 | 0.5 | 14 | 15 | 22 | 15 500 | 20 400 | 25 000 | LRT 121620 |
| 24 | 22 | — | 0.3 | 16 | 0.5 | 14 | 15 | 22 | 17 100 | 23 000 | 25 000 | LRT 121622 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI
NA69 ($d \leq 30$)



TRI

GTRI

Shaft dia. 15 – 22mm

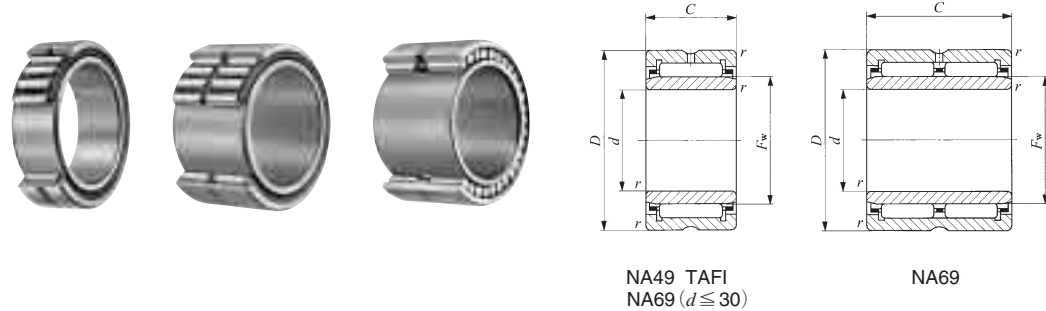
| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|----------|-------|-------------|------------|-------------|---------------------|----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 15 | — | — | — | TAFI 152716 | — | — | 39.5 | 15 |
| | — | — | — | TAFI 152720 | — | — | 50 | 15 |
| | NA 4902 | — | — | — | — | — | 35 | 15 |
| | — | NA 6902 | — | — | — | — | 61 | 15 |
| 17 | — | — | — | — | TRI 153320 | — | 81 | 15 |
| | — | — | — | — | — | GTRI 153320 | 90.5 | 15 |
| | NA 4903 | — | — | TAFI 172916 | — | — | 43.5 | 17 |
| | — | NA 6903 | — | TAFI 172920 | — | — | 54 | 17 |
| 20 | — | — | — | — | — | — | 39 | 17 |
| | — | — | — | — | — | — | 67 | 17 |
| | — | — | — | — | TRI 173425 | — | 104 | 17 |
| | — | — | — | — | — | GTRI 173425 | 117 | 17 |
| 22 | — | — | — | TAFI 203216 | — | — | 48.5 | 20 |
| | — | — | — | TAFI 203220 | — | — | 61 | 20 |
| | NA 4904 | — | — | — | — | — | 78.5 | 20 |
| | — | NA 6904 | — | — | — | — | 136 | 20 |
| 22 | — | — | — | — | TRI 203820 | — | 99 | 20 |
| | — | — | — | — | TRI 203825 | — | 124 | 20 |
| | — | — | — | — | — | GTRI 203820 | 110 | 20 |
| | — | — | — | — | — | GTRI 203825 | 138 | 20 |
| 22 | — | — | — | TAFI 223416 | — | — | 52 | 22 |
| | — | — | — | TAFI 223420 | — | — | 67.5 | 22 |
| | NA 49/22 | — | — | — | — | — | 87 | 22 |
| | — | NA 69/22 | — | — | — | — | 152 | 22 |

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.

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|-----|------|--------------------|-------|-----------|---------------------------------|------|------------|---------------------------------------|--|--|----------------------|
| D | C | B | $r_{s \min}^{(1)}$ | F_w | $S^{(2)}$ | Min. d_a | Max. | D_a Max. | | | | |
| 27 | 16 | — | 0.3 | 19 | 0.5 | 17 | 18 | 25 | 14 000 | 18 700 | 20 000 | LRT 151916 |
| 27 | 20 | — | 0.3 | 19 | 0.5 | 17 | 18 | 25 | 17 700 | 25 300 | 20 000 | LRT 151920 |
| 28 | 13 | — | 0.3 | 20 | 0.3 | 17 | 19 | 26 | 10 900 | 13 800 | 20 000 | LRT 152013 |
| 28 | 23 | — | 0.3 | 20 | 0.3 | 17 | 19 | 26 | 19 300 | 28 800 | 20 000 | LRT 152023 |
| 33 | 20 | 20.5 | 0.3 | 20 | 0.3 | 17 | 19 | 31 | 24 300 | 26 500 | 20 000 | LRT 152020 |
| 33 | 20 | 20.5 | 0.3 | 20 | — | 17 | 19 | 31 | 29 200 | 37 200 | 7 500 | LRTZ 152020 |
| 29 | 16 | — | 0.3 | 21 | 0.5 | 19 | 20 | 27 | 14 400 | 20 000 | 19 000 | LRT 172116 |
| 29 | 20 | — | 0.3 | 21 | 0.5 | 19 | 20 | 27 | 18 200 | 27 100 | 19 000 | LRT 172120 |
| 30 | 13 | — | 0.3 | 22 | 0.3 | 19 | 21 | 28 | 11 700 | 15 600 | 18 000 | LRT 172213 |
| 30 | 23 | — | 0.3 | 22 | 0.3 | 19 | 21 | 28 | 20 800 | 32 500 | 18 000 | LRT 172223 |
| 34 | 25 | 25.5 | 0.3 | 22 | 0.5 | 19 | 21 | 32 | 29 100 | 36 800 | 18 000 | LRT 172225 |
| 34 | 25 | 25.5 | 0.3 | 22 | — | 19 | 21 | 32 | 37 900 | 57 800 | 7 000 | LRTZ 172225 |
| 32 | 16 | — | 0.3 | 24 | 0.5 | 22 | 23 | 30 | 15 300 | 22 500 | 17 000 | LRT 202416 |
| 32 | 20 | — | 0.3 | 24 | 0.5 | 22 | 23 | 30 | 19 400 | 30 500 | 17 000 | LRT 202420 |
| 37 | 17 | — | 0.3 | 25 | 0.5 | 22 | 24 | 35 | 21 000 | 25 000 | 16 000 | LRT 202517 |
| 37 | 30 | — | 0.3 | 25 | 0.5 | 22 | 24 | 35 | 35 400 | 48 900 | 16 000 | LRT 202530 |
| 38 | 20 | 20.5 | 0.3 | 25 | 0.3 | 22 | 24 | 36 | 28 900 | 35 000 | 16 000 | LRT 202520 |
| 38 | 25 | 25.5 | 0.3 | 25 | 0.5 | 22 | 24 | 36 | 34 800 | 44 400 | 16 000 | LRT 202525 |
| 38 | 20 | 20.5 | 0.3 | 25 | — | 22 | 24 | 36 | 33 300 | 46 500 | 6 000 | LRTZ 202520 |
| 38 | 25 | 25.5 | 0.3 | 25 | — | 22 | 24 | 36 | 42 400 | 63 700 | 6 000 | LRTZ 202525 |
| 34 | 16 | — | 0.3 | 26 | 0.5 | 24 | 25 | 32 | 16 300 | 24 900 | 15 000 | LRT 222616 |
| 34 | 20 | — | 0.3 | 26 | 0.5 | 24 | 25 | 32 | 20 600 | 33 800 | 15 000 | LRT 222620 |
| 39 | 17 | — | 0.3 | 28 | 1 | 24 | 27 | 37 | 21 400 | 28 900 | 14 000 | LRT 222817 |
| 39 | 30 | — | 0.3 | 28 | 0.5 | 24 | 27 | 37 | 36 300 | 56 900 | 14 000 | LRT 222830 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



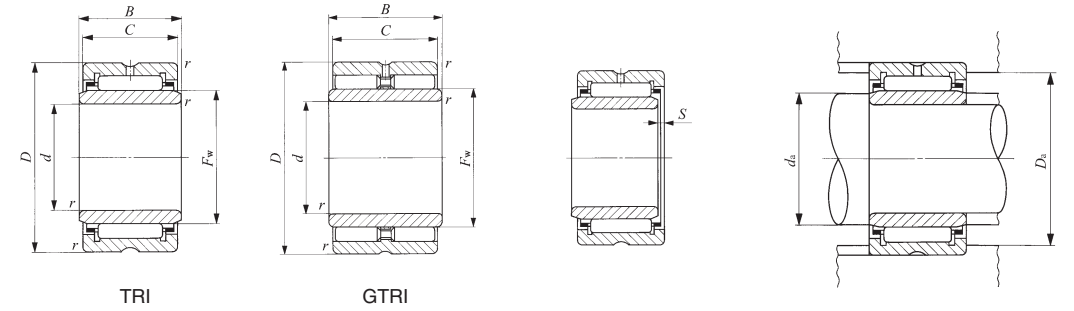
NA49 TAFI
NA69 ($d \leq 30$)

NA69

Shaft dia. 25 – 32mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|----------|-------|-------------|------------|-------------|---------------------|----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 25 | — | — | — | TAFI 253820 | — | — | 82 | 25 |
| | — | — | — | TAFI 253830 | — | — | 123 | 25 |
| | NA 4905 | — | — | — | — | — | 92.5 | 25 |
| | — | NA 6905 | — | — | — | — | 160 | 25 |
| | — | — | — | — | TRI 254425 | — | 157 | 25 |
| | — | — | — | — | — | GTRI 254425 | 175 | 25 |
| 28 | — | — | — | TAFI 284220 | — | — | 96.5 | 28 |
| | — | — | — | TAFI 284230 | — | — | 145 | 28 |
| | NA 49/28 | — | — | — | — | — | 101 | 28 |
| | — | NA 69/28 | — | — | — | — | 176 | 28 |
| | — | — | — | — | — | GTRI 284530 | 196 | 28 |
| | — | — | — | — | — | — | — | — |
| 30 | — | — | — | TAFI 304520 | — | — | 112 | 30 |
| | — | — | — | TAFI 304530 | — | — | 171 | 30 |
| | NA 4906 | — | — | — | — | — | 106 | 30 |
| | — | NA 6906 | — | — | — | — | 184 | 30 |
| | — | — | — | — | TRI 304830 | — | 199 | 30 |
| | — | — | — | — | — | GTRI 304830 | 225 | 30 |
| 32 | — | — | — | TAFI 324720 | — | — | 121 | 32 |
| | — | — | — | TAFI 324730 | — | — | 180 | 32 |
| | NA 49/32 | — | — | — | — | — | 165 | 32 |
| | — | — | — | — | TRI 325230 | — | 245 | 32 |
| | — | NA 69/32 | — | — | — | — | 295 | 32 |
| | — | — | — | — | — | GTRI 325230 | 270 | 32 |

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.



TRI

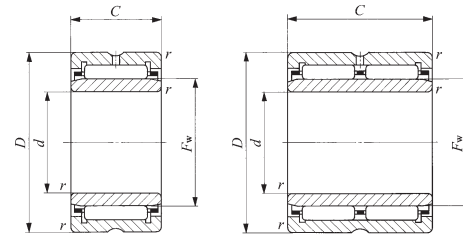
GTRI

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----|------|-----------------------------------|----------------|------------------|---------------------------------|------|---------------------|-------------------------------------|---|--|----------------------|
| D | C | B | r _{s min} ⁽¹⁾ | F _w | S ⁽²⁾ | Min. d _a | Max. | D _a Max. | | | | |
| 38 | 20 | — | 0.3 | 29 | 0.5 | 27 | 28 | 36 | 21 600 | 37 200 | 14 000 | LRT 252920 |
| 38 | 30 | — | 0.3 | 29 | 1 | 27 | 28 | 36 | 30 900 | 59 100 | 14 000 | LRT 252930 |
| 42 | 17 | — | 0.3 | 30 | 0.5 | 27 | 29 | 40 | 23 700 | 30 700 | 13 000 | LRT 253017 |
| 42 | 30 | — | 0.3 | 30 | 0.5 | 27 | 29 | 40 | 42 100 | 64 300 | 13 000 | LRT 253030 |
| 44 | 25 | 25.5 | 0.3 | 30 | 0.5 | 27 | 29 | 42 | 37 900 | 52 100 | 13 000 | LRT 253025 |
| 44 | 25 | 25.5 | 0.3 | 30 | — | 27 | 29 | 42 | 47 000 | 76 500 | 5 000 | LRTZ 253025 |
| 42 | 20 | — | 0.3 | 32 | 0.5 | 30 | 31 | 40 | 25 700 | 42 200 | 12 000 | LRT 283220 |
| 42 | 30 | — | 0.3 | 32 | 1 | 30 | 31 | 40 | 36 800 | 67 200 | 12 000 | LRT 283230 |
| 45 | 17 | — | 0.3 | 32 | 1 | 30 | 31 | 43 | 24 500 | 32 700 | 12 000 | LRT 283217 |
| 45 | 30 | — | 0.3 | 32 | 1 | 30 | 31 | 43 | 41 800 | 64 800 | 12 000 | LRT 283230 |
| 45 | 30 | 30.5 | 0.3 | 32 | — | 30 | 31 | 43 | 58 000 | 101 000 | 4 500 | LRTZ 283230 |
| 45 | 20 | — | 0.3 | 35 | 0.3 | 32 | 34 | 43 | 26 900 | 46 200 | 11 000 | LRT 303520 |
| 45 | 30 | — | 0.3 | 35 | 0.5 | 32 | 34 | 43 | 38 600 | 73 600 | 11 000 | LRT 303530 |
| 47 | 17 | — | 0.3 | 35 | 0.5 | 32 | 34 | 45 | 25 200 | 34 700 | 11 000 | LRT 303517 |
| 47 | 30 | — | 0.3 | 35 | 0.5 | 32 | 34 | 45 | 43 000 | 69 000 | 11 000 | LRT 303530 |
| 48 | 30 | 30.5 | 0.3 | 35 | 1 | 32 | 34 | 46 | 47 400 | 72 300 | 11 000 | LRT 303530-1 |
| 48 | 30 | 30.5 | 0.3 | 35 | — | 32 | 34 | 46 | 61 100 | 110 000 | 4 500 | LRTZ 303530 |
| 47 | 20 | — | 0.3 | 37 | 0.3 | 34 | 36 | 45 | 28 200 | 50 100 | 11 000 | LRT 323720 |
| 47 | 30 | — | 0.3 | 37 | 0.5 | 34 | 36 | 45 | 40 500 | 79 800 | 11 000 | LRT 323730 |
| 52 | 20 | — | 0.6 | 40 | 0.5 | 36 | 39 | 48 | 31 200 | 47 800 | 10 000 | LRT 324020 |
| 52 | 30 | 30.5 | 0.6 | 38 | 0.5 | 36 | 37 | 48 | 50 800 | 81 100 | 11 000 | LRT 323830 |
| 52 | 36 | — | 0.6 | 40 | 0.3 | 36 | 39 | 48 | 53 500 | 95 700 | 10 000 | LRT 324036 |
| 52 | 30 | 30.5 | 0.6 | 38 | — | 36 | 37 | 48 | 64 200 | 121 000 | 4 000 | LRTZ 323830 |

D
NA
TAFI
TRI
BRI

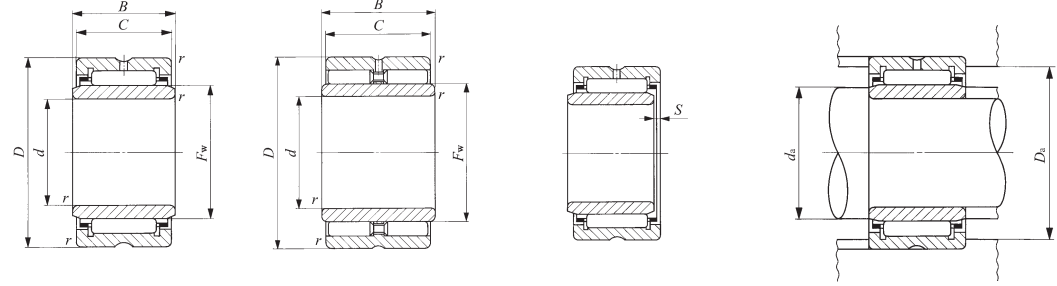
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI

NA69



TRI

GTRI

Shaft dia. 35 – 45mm

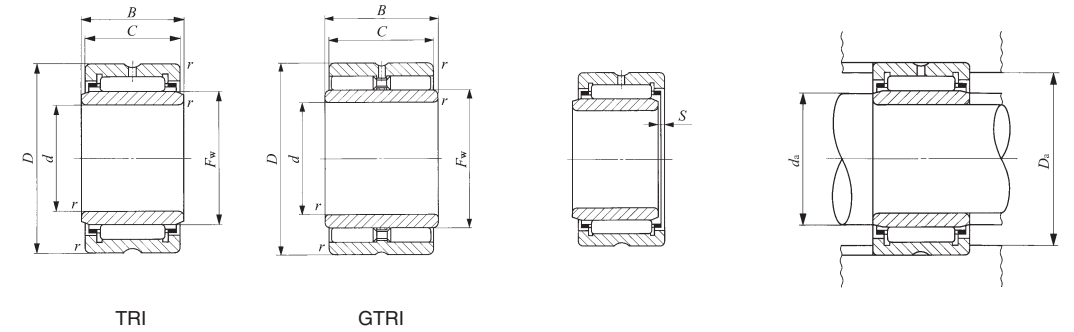
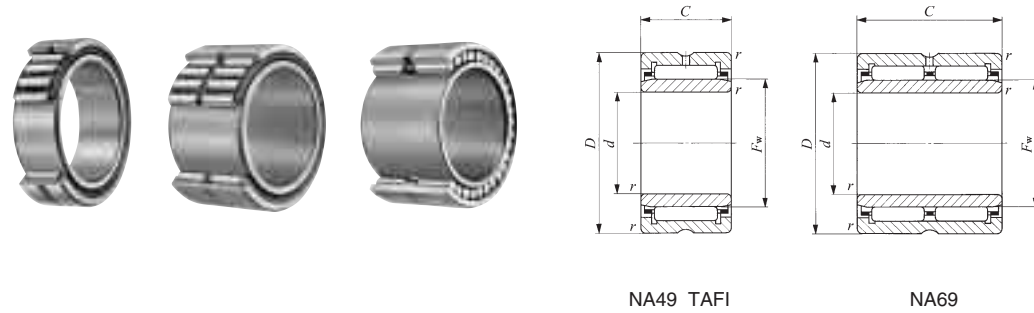
| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|----------------|-------|--------------------|-------------------|--|------------------|----------|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 35 | — | — | — | TAFI 355020 | — | — | 129 | 35 |
| | — | — | — | TAFI 355030 | — | — | 192 | 35 |
| | NA 4907 | — | — | — | — | — | 178 | 35 |
| | — | NA 6907 | — | — | — | — | 320 | 35 |
| | — | — | — | — | TRI 355630 | — | 280 | 35 |
| | — | — | — | — | — | GTRI 355520 GTRI 355630 | 191 310 | 35 35 |
| 38 | — | — | — | TAFI 385320 | — | — | 136 | 38 |
| | — | — | — | TAFI 385330 | — | — | 205 | 38 |
| 40 | — | — | — | TAFI 405520 | — | — | 143 | 40 |
| | — | — | — | TAFI 405530 | — | — | 215 | 40 |
| | — | — | — | — | TRI 405930 | — | 270 | 40 |
| | NA 4908 | — | — | — | — | — | 245 | 40 |
| | — | NA 6908 | — | — | — | — | 440 | 40 |
| | — | — | — | — | — | GTRI 405930 | 300 | 40 |
| 42 | — | — | — | TAFI 425720 | — | — | 149 | 42 |
| | — | — | — | TAFI 425730 | — | — | 225 | 42 |
| | — | — | — | — | TRI 426230 | — | 305 | 42 |
| | — | — | — | — | — | GTRI 426230 | 340 | 42 |
| 45 | — | — | — | TAFI 456225 | — | — | 230 | 45 |
| | — | — | — | TAFI 456235 | — | — | 320 | 45 |
| | — | — | — | — | TRI 456430 | — | 300 | 45 |
| | NA 4909 | — | — | — | — | — | 285 | 45 |
| | — | NA 6909 | — | — | — | — | 520 | 45 |
| | — | — | — | — | — | — | 335 | 45 |
| | — | — | — | — | — | GTRI 456430 | 335 | 45 |
| | — | — | — | — | — | — | 335 | 45 |

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.

| Boundary dimensions mm | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring | |
|------------------------|----|------|-----------------------------------|-------------------------------|---------------------------------|---------------------|---------------------|-------------------------------------|---|--|----------------------|---------------------|
| D | C | B | r _{s min} ⁽¹⁾ | F _w ⁽²⁾ | S ⁽²⁾ | Min. d _a | Max. d _a | | | | | D _a Max. |
| 50 | 20 | — | 0.3 | 40 | 0.3 | 37 | 39 | 48 | 29 400 | 54 100 | 10 000 | LRT 354020 |
| 50 | 30 | — | 0.3 | 40 | 0.5 | 37 | 39 | 48 | 42 300 | 86 200 | 10 000 | LRT 354030 |
| 55 | 20 | — | 0.6 | 42 | 0.5 | 39 | 41 | 51 | 32 000 | 50 100 | 9 500 | LRT 354220 |
| 55 | 36 | — | 0.6 | 42 | 0.3 | 39 | 41 | 51 | 54 900 | 100 000 | 9 500 | LRT 354236 |
| 56 | 30 | 30.5 | 0.6 | 42 | 0.5 | 39 | 41 | 52 | 53 800 | 90 100 | 9 500 | LRT 354230 |
| 55 | 20 | 20.5 | 0.6 | 40 | — | 39 | 39.5 | 51 | 44 300 | 73 600 | 3 500 | LRTZ 354020 |
| 56 | 30 | 30.5 | 0.6 | 42 | — | 39 | 41 | 52 | 67 500 | 133 000 | 3 500 | LRTZ 354230 |
| 53 | 20 | — | 0.3 | 43 | 0.3 | 40 | 42 | 51 | 30 500 | 58 200 | 9 500 | LRT 384320 |
| 53 | 30 | — | 0.3 | 43 | 0.5 | 40 | 42 | 51 | 43 800 | 92 600 | 9 500 | LRT 384330 |
| 55 | 20 | — | 0.3 | 45 | 0.3 | 42 | 44 | 53 | 31 000 | 60 200 | 9 000 | LRT 404520 |
| 55 | 30 | — | 0.3 | 45 | 0.5 | 42 | 44 | 53 | 44 600 | 95 800 | 9 000 | LRT 404530 |
| 59 | 30 | 30.5 | 0.6 | 45 | 1 | 44 | 44.5 | 55 | 55 100 | 94 800 | 9 000 | LRT 404530-1 |
| 62 | 22 | — | 0.6 | 48 | 0.5 | 44 | 47 | 58 | 41 600 | 67 400 | 8 500 | LRT 404822 |
| 62 | 40 | — | 0.6 | 48 | 0.3 | 44 | 47 | 58 | 71 300 | 135 000 | 8 500 | LRT 404840 |
| 59 | 30 | 30.5 | 0.6 | 45 | — | 44 | 44.5 | 55 | 70 300 | 142 000 | 3 500 | LRTZ 404530 |
| 57 | 20 | — | 0.3 | 47 | 0.3 | 44 | 46 | 55 | 31 500 | 62 200 | 8 500 | LRT 424720 |
| 57 | 30 | — | 0.3 | 47 | 0.5 | 44 | 46 | 55 | 45 200 | 99 100 | 8 500 | LRT 424730 |
| 62 | 30 | 30.5 | 0.6 | 48 | 0.5 | 46 | 47 | 58 | 56 300 | 99 500 | 8 500 | LRT 424830 |
| 62 | 30 | 30.5 | 0.6 | 48 | — | 46 | 47 | 58 | 72 700 | 154 000 | 3 000 | LRTZ 424830 |
| 62 | 25 | — | 0.3 | 50 | 0.5 | 47 | 49 | 60 | 43 000 | 85 300 | 8 000 | LRT 455025 |
| 62 | 35 | — | 0.3 | 50 | 1 | 47 | 49 | 60 | 58 000 | 125 000 | 8 000 | LRT 455035 |
| 64 | 30 | 30.5 | 0.6 | 50 | 1 | 49 | 49.5 | 60 | 57 700 | 104 000 | 8 000 | LRT 455030 |
| 68 | 22 | — | 0.6 | 52 | 0.5 | 49 | 51 | 64 | 43 500 | 73 300 | 7 500 | LRT 455222 |
| 68 | 40 | — | 0.6 | 52 | 0.3 | 49 | 51 | 64 | 74 600 | 147 000 | 7 500 | LRT 455240 |
| 64 | 30 | 30.5 | 0.6 | 50 | — | 49 | 49.5 | 60 | 74 600 | 158 000 | 3 000 | LRTZ 455030 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



Shaft dia. 50 – 70mm

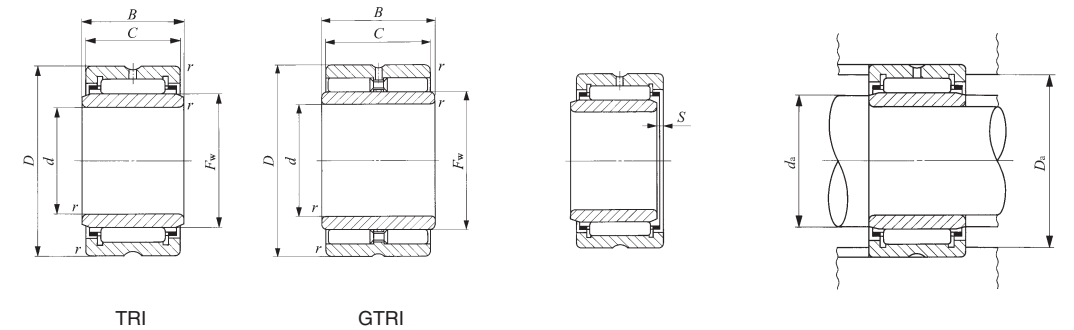
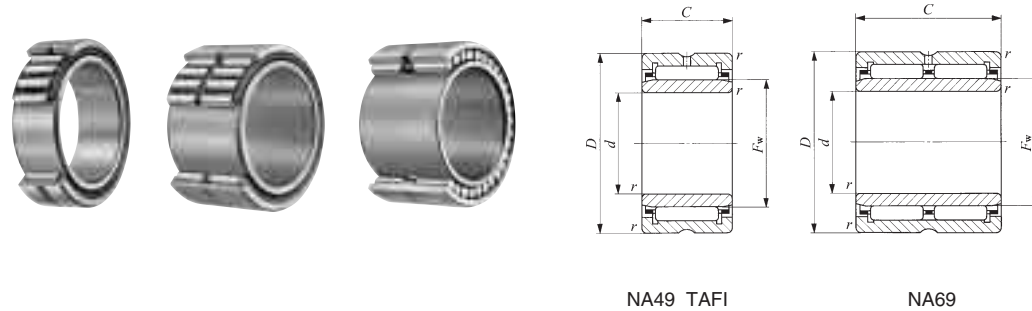
| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|---------|-------|-------------|------------|-------------|------------------|----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 50 | — | — | — | TAFI 506825 | — | — | 270 | 50 |
| | — | — | — | TAFI 506835 | — | — | 365 | 50 |
| | NA 4910 | — | — | — | — | — | 295 | 50 |
| | — | NA 6910 | — | — | — | — | 530 | 50 |
| | — | — | — | — | TRI 507745 | — | 755 | 50 |
| | — | — | — | — | — | GTRI 507745 | 825 | 50 |
| 55 | — | — | — | TAFI 557225 | — | — | 275 | 55 |
| | — | — | — | TAFI 557235 | — | — | 380 | 55 |
| | NA 4911 | — | — | — | — | — | 410 | 55 |
| | — | NA 6911 | — | — | — | — | 730 | 55 |
| | — | — | — | — | TRI 558138 | — | 650 | 55 |
| | — | — | — | — | — | GTRI 558138 | 710 | 55 |
| 60 | — | — | — | TAFI 608225 | — | — | 395 | 60 |
| | — | — | — | TAFI 608235 | — | — | 560 | 60 |
| | NA 4912 | — | — | — | — | — | 440 | 60 |
| | — | NA 6912 | — | — | — | — | 785 | 60 |
| | — | — | — | — | TRI 608945 | — | 960 | 60 |
| | — | — | — | — | — | GTRI 608945 | 1 050 | 60 |
| 65 | NA 4913 | — | — | — | — | — | 470 | 65 |
| | — | — | — | TAFI 659035 | — | — | 710 | 65 |
| | — | NA 6913 | — | — | — | — | 840 | 65 |
| 70 | — | — | — | TAFI 709525 | — | — | 540 | 70 |
| | — | — | — | TAFI 709535 | — | — | 755 | 70 |
| | NA 4914 | — | — | — | — | — | 765 | 70 |
| | — | NA 6914 | — | — | — | — | 1 400 | 70 |

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.

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----|------|-----------------------------------|----------------|------------------|---------------------------------|------|---------------------|-------------------------------------|---|--|----------------------|
| D | C | B | r _{s min} ⁽¹⁾ | F _w | S ⁽²⁾ | Min. d _a | Max. | D _a Max. | | | | |
| 68 | 25 | — | 0.3 | 55 | 0.5 | 52 | 54 | 66 | 45 400 | 94 000 | 7 500 | LRT 505525 |
| 68 | 35 | — | 0.3 | 55 | 1 | 52 | 54 | 66 | 61 200 | 138 000 | 7 500 | LRT 505535 |
| 72 | 22 | — | 0.6 | 58 | 0.5 | 54 | 57 | 68 | 46 200 | 82 100 | 7 000 | LRT 505822 |
| 72 | 40 | — | 0.6 | 58 | 0.3 | 54 | 57 | 68 | 79 200 | 164 000 | 7 000 | LRT 505840 |
| 77 | 45 | 45.5 | 1 | 58 | 2 | 55 | 57 | 72 | 104 000 | 191 000 | 7 000 | LRT 505845 |
| 77 | 45 | 45.5 | 1 | 58 | — | 55 | 57 | 72 | 135 000 | 280 000 | 2 500 | LRTZ 505845 |
| 72 | 25 | — | 0.3 | 60 | 0.5 | 57 | 59 | 70 | 47 500 | 103 000 | 6 500 | LRT 556025 |
| 72 | 35 | — | 0.3 | 60 | 1 | 57 | 59 | 70 | 64 100 | 151 000 | 6 500 | LRT 556035 |
| 80 | 25 | — | 1 | 63 | 1 | 60 | 61 | 75 | 57 600 | 97 200 | 6 500 | LRT 556325 |
| 80 | 45 | — | 1 | 63 | 0.5 | 60 | 61 | 75 | 98 700 | 194 000 | 6 500 | LRT 556345 |
| 81 | 38 | 38.5 | 1 | 62 | 1.5 | 60 | 60.5 | 76 | 92 000 | 166 000 | 6 500 | LRT 556238 |
| 81 | 38 | 38.5 | 1 | 62 | — | 60 | 60.5 | 76 | 118 000 | 241 000 | 2 500 | LRTZ 556238 |
| 82 | 25 | — | 0.6 | 68 | 0.3 | 64 | 66 | 78 | 54 800 | 117 000 | 6 000 | LRT 606825 |
| 82 | 35 | — | 0.6 | 68 | 1 | 64 | 66 | 78 | 72 000 | 166 000 | 6 000 | LRT 606835 |
| 85 | 25 | — | 1 | 68 | 1 | 65 | 66 | 80 | 60 200 | 105 000 | 6 000 | LRT 606825-1 |
| 85 | 45 | — | 1 | 68 | 0.5 | 65 | 66 | 80 | 103 000 | 211 000 | 6 000 | LRT 606845 |
| 89 | 45 | 45.5 | 1 | 70 | 2 | 65 | 68 | 84 | 114 000 | 228 000 | 5 500 | LRT 607045 |
| 89 | 45 | 45.5 | 1 | 70 | — | 65 | 68 | 84 | 147 000 | 336 000 | 2 000 | LRTZ 607045 |
| 90 | 25 | — | 1 | 72 | 1 | 70 | 70.5 | 85 | 62 700 | 113 000 | 5 500 | LRT 657225 |
| 90 | 35 | — | 1 | 73 | 1 | 70 | 71 | 85 | 80 400 | 181 000 | 5 500 | LRT 657335 |
| 90 | 45 | — | 1 | 72 | 0.5 | 70 | 70.5 | 85 | 108 000 | 227 000 | 5 500 | LRT 657245 |
| 95 | 25 | — | 1 | 80 | 0.3 | 75 | 78 | 90 | 59 400 | 137 000 | 5 000 | LRT 708025 |
| 95 | 35 | — | 1 | 80 | 1 | 75 | 78 | 90 | 78 100 | 195 000 | 5 000 | LRT 708035 |
| 100 | 30 | — | 1 | 80 | 1.5 | 75 | 78 | 95 | 83 200 | 158 000 | 5 000 | LRT 708030 |
| 100 | 54 | — | 1 | 80 | 1 | 75 | 78 | 95 | 134 000 | 311 000 | 5 000 | LRT 708054 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



Shaft dia. 75 – 90mm

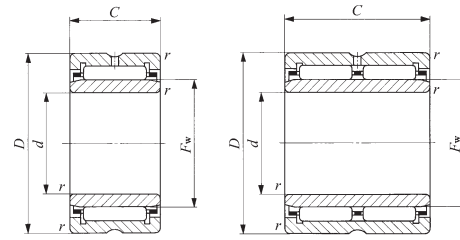
| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|---------|-------|--------------|-------------|--------------|---------------------|----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 75 | — | — | — | TAFI 7510525 | — | — | 675 | 75 |
| | NA 4915 | — | — | — | — | — | 810 | 75 |
| | — | — | — | TAFI 7510535 | — | — | 945 | 75 |
| | — | NA 6915 | — | — | — | — | 1 480 | 75 |
| 80 | — | — | — | — | TRI 7510845 | — | 1 340 | 75 |
| | — | — | — | — | — | GTRI 7510845 | 1 440 | 75 |
| 80 | — | — | — | TAFI 8011025 | — | — | 710 | 80 |
| | NA 4916 | — | — | — | — | — | 855 | 80 |
| | — | — | — | TAFI 8011035 | — | — | 995 | 80 |
| | — | NA 6916 | — | — | — | — | 1 560 | 80 |
| 85 | — | — | — | TAFI 8511526 | — | — | 775 | 85 |
| | — | — | — | TAFI 8511536 | — | — | 1 080 | 85 |
| | NA 4917 | — | — | — | — | — | 1 280 | 85 |
| | — | NA 6917 | — | — | — | — | 2 340 | 85 |
| | — | — | — | — | TRI 8511850 | — | 1 640 | 85 |
| | — | — | — | — | TRI 8512045 | — | 1 610 | 85 |
| | — | — | — | — | — | GTRI 8511850 | 1 780 | 85 |
| | — | — | — | — | — | GTRI 8512045 | 1 720 | 85 |
| 90 | — | — | — | TAFI 9012026 | — | — | 820 | 90 |
| | — | — | — | TAFI 9012036 | — | — | 1 140 | 90 |
| | NA 4918 | — | — | — | — | — | 1 350 | 90 |
| | — | — | — | — | TRI 9012550 | — | 1 870 | 90 |
| 90 | — | NA 6918 | — | — | — | — | 2 460 | 90 |
| | — | — | — | — | — | — | 2 020 | 90 |
| | — | — | — | — | — | GTRI 9012550 | — | 90 |

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.

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----|------|-----------------------------------|-------------------------------|------------------|---------------------------------|------|---------------------|----------------------------------|--|--|----------------------|
| D | C | B | r _{s min} ⁽¹⁾ | F _w ⁽²⁾ | S ⁽²⁾ | Min. d _a | Max. | D _a Max. | | | | |
| 105 | 25 | — | 1 | 85 | 0.5 | 80 | 83 | 100 | 76 300 | 145 000 | 4 500 | LRT 758525 |
| 105 | 30 | — | 1 | 85 | 1.5 | 80 | 83 | 100 | 86 200 | 169 000 | 4 500 | LRT 758530 |
| 105 | 35 | — | 1 | 85 | 1.5 | 80 | 83 | 100 | 102 000 | 210 000 | 4 500 | LRT 758535 |
| 105 | 54 | — | 1 | 85 | 1 | 80 | 83 | 100 | 138 000 | 331 000 | 4 500 | LRT 758554 |
| 108 | 45 | 45.5 | 1 | 83 | 2.5 | 80 | 81 | 103 | 146 000 | 270 000 | 5 000 | LRT 758345 |
| 108 | 45 | 45.5 | 1 | 83 | — | 80 | 81 | 103 | 190 000 | 396 000 | 1 800 | LRTZ 758345 |
| 110 | 25 | — | 1 | 90 | 0.5 | 85 | 88 | 105 | 77 300 | 150 000 | 4 500 | LRT 809025 |
| 110 | 30 | — | 1 | 90 | 1.5 | 85 | 88 | 105 | 87 300 | 175 000 | 4 500 | LRT 809030 |
| 110 | 35 | — | 1 | 90 | 1.5 | 85 | 88 | 105 | 103 000 | 217 000 | 4 500 | LRT 809035 |
| 110 | 54 | — | 1 | 90 | 1 | 85 | 88 | 105 | 143 000 | 351 000 | 4 500 | LRT 809054 |
| 115 | 26 | — | 1 | 95 | 1 | 90 | 93 | 110 | 79 700 | 159 000 | 4 000 | LRT 859526 |
| 115 | 36 | — | 1 | 95 | 2 | 90 | 93 | 110 | 106 000 | 231 000 | 4 000 | LRT 859536 |
| 120 | 35 | — | 1.1 | 100 | 1 | 91.5 | 98 | 113.5 | 110 000 | 244 000 | 4 000 | LRT 8510035 |
| 120 | 63 | — | 1.1 | 100 | 0.5 | 91.5 | 98 | 113.5 | 173 000 | 467 000 | 4 000 | LRT 8510063 |
| 118 | 50 | 50.5 | 1 | 93 | 3 | 90 | 91 | 113 | 165 000 | 329 000 | 4 500 | LRT 859350 |
| 120 | 45 | 45.5 | 1.5 | 95 | 2.5 | 93 | 93.5 | 112 | 155 000 | 305 000 | 4 000 | LRT 859545 |
| 118 | 50 | 50.5 | 1 | 93 | — | 90 | 91 | 113 | 224 000 | 509 000 | 1 600 | LRTZ 859350 |
| 120 | 45 | 45.5 | 1.5 | 95 | — | 93 | 93.5 | 112 | 204 000 | 455 000 | 1 600 | LRTZ 859545 |
| 120 | 26 | — | 1 | 100 | 1 | 95 | 98 | 115 | 82 400 | 168 000 | 4 000 | LRT 9010026 |
| 120 | 36 | — | 1 | 100 | 2 | 95 | 98 | 115 | 110 000 | 244 000 | 4 000 | LRT 9010036 |
| 125 | 35 | — | 1.1 | 105 | 1 | 96.5 | 103 | 118.5 | 113 000 | 258 000 | 4 000 | LRT 9010535 |
| 125 | 50 | 50.5 | 1.5 | 100 | 3 | 98 | 98.5 | 117 | 172 000 | 355 000 | 4 000 | LRT 9010050 |
| 125 | 63 | — | 1.1 | 105 | 0.5 | 96.5 | 103 | 118.5 | 178 000 | 490 000 | 4 000 | LRT 9010563 |
| 125 | 50 | 50.5 | 1.5 | 100 | — | 98 | 98.5 | 117 | 234 000 | 549 000 | 1 500 | LRTZ 9010050 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



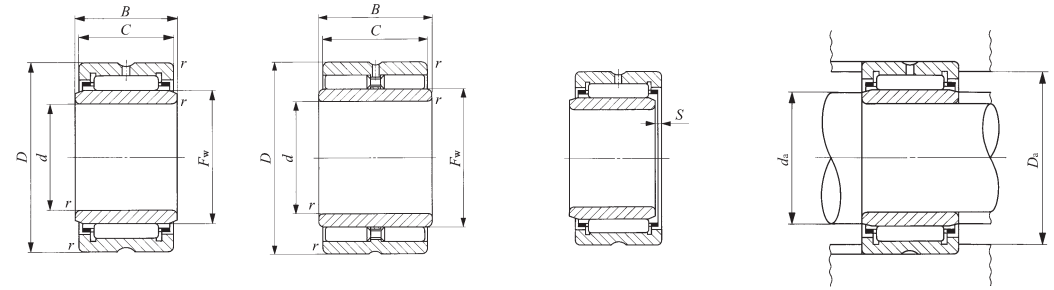
NA49 TAFI
NA48

NA69

Shaft dia. 95 – 150mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|---------|---------|---------------|--------------|---------------|---------------------|-----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 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 |
| | NA 4920 | — | — | — | TRI 10013550 | — | 2 040 | 100 |
| | — | — | — | — | — | GTRI 10013550 | 1 960 | 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 |

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.



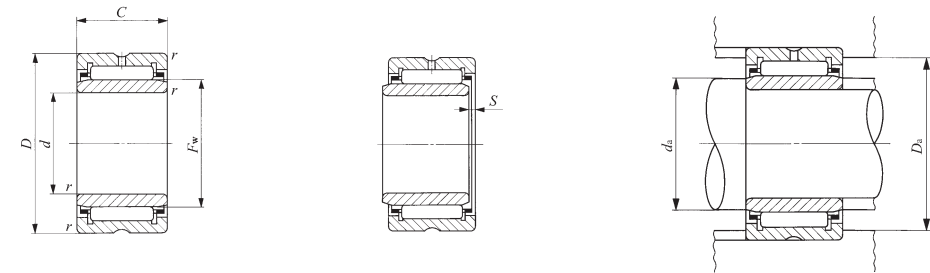
TRI

GTRI

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----------|----------|--|--------------------------------------|-------------------------|---------------------------------|-------|----------------------------|--|--|--|----------------------|
| <i>D</i> | <i>C</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>F</i> _w ⁽²⁾ | <i>S</i> ⁽²⁾ | Min. <i>d</i> _a | Max. | <i>D</i> _a Max. | | | | |
| 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 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 NA48

Shaft dia. 160 – 340mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|-------|---------|------|-----|------|---------------------|-----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 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 |

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.

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----------|----------|--|-----------------------|-------------------------|---------------------------------|------|----------------------------|--|--|--|----------------------|
| <i>D</i> | <i>C</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>F</i> _w | <i>S</i> ⁽²⁾ | Min. <i>d</i> _a | Max. | <i>D</i> _a Max. | | | | |
| 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 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

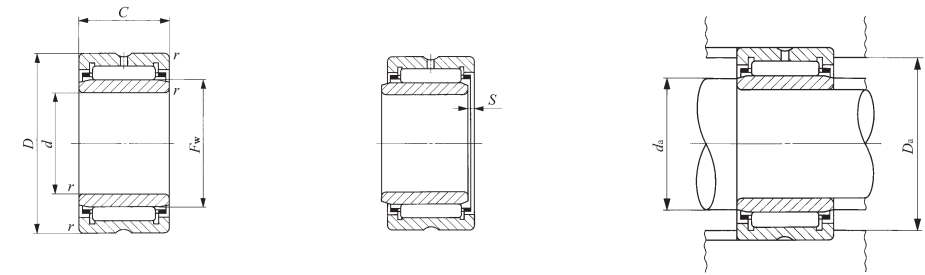
With Inner Ring



Shaft dia. 360 – 440mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g | d |
|------------------|-----------------------|-------|----------------|------|-----|------|---------------------|-----|
| | NA 49 | NA 69 | NA 48 | TAFI | TRI | GTRI | | |
| 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 |

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.



NA49 NA48

| Boundary dimensions mm | | | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|------------------------|----------|----------|--|-----------------------|-------------------------|---------------------------------|------|----------------------------|--|--|--|----------------------|
| <i>D</i> | <i>C</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>F</i> _w | <i>S</i> ⁽²⁾ | Min. <i>d</i> _a | Max. | <i>D</i> _a Max. | | | | |
| 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 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

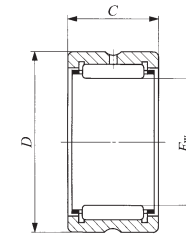
Without Inner Ring, Inch Series



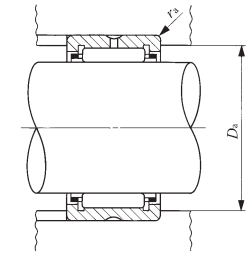
Shaft dia. 15.875 – 47.625mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm | |
|-------------------------------------|--------------------------|---------------------|------------------------------|----------------------------|---------------------------|------------------------------------|---------------------|
| | | | F_w | D | C | D_a Max. | $r_{as\ max}^{(1)}$ |
| 15.875 ($\frac{5}{8}$) | BR 101812 | 49 | 15.875 ($\frac{5}{8}$) | 28.575 ($1\frac{1}{8}$) | 19.050 ($\frac{3}{4}$) | 24.5 | 0.6 |
| 19.050 ($\frac{3}{4}$) | BR 122012 | 56 | 19.050 ($\frac{3}{4}$) | 31.750 ($1\frac{1}{4}$) | 19.050 ($\frac{3}{4}$) | 26.5 | 1 |
| | BR 122016 | 75 | 19.050 ($\frac{3}{4}$) | 31.750 ($1\frac{1}{4}$) | 25.400 (1) | 26.5 | 1 |
| 22.225 ($\frac{7}{8}$) | BR 142212 | 63 | 22.225 ($\frac{7}{8}$) | 34.925 ($1\frac{3}{8}$) | 19.050 ($\frac{3}{4}$) | 29.7 | 1 |
| | BR 142216 | 84.5 | 22.225 ($\frac{7}{8}$) | 34.925 ($1\frac{3}{8}$) | 25.400 (1) | 29.7 | 1 |
| 25.400 (1) | BR 162412 | 69 | 25.400 (1) | 38.100 ($1\frac{1}{2}$) | 19.050 ($\frac{3}{4}$) | 32.9 | 1 |
| | BR 162416 | 92.5 | 25.400 (1) | 38.100 ($1\frac{1}{2}$) | 25.400 (1) | 32.9 | 1 |
| 28.575 ($1\frac{1}{8}$) | BR 182616 | 102 | 28.575 ($1\frac{1}{8}$) | 41.275 ($1\frac{5}{8}$) | 25.400 (1) | 36 | 1 |
| | BR 182620 | 128 | 28.575 ($1\frac{1}{8}$) | 41.275 ($1\frac{5}{8}$) | 31.750 ($1\frac{1}{4}$) | 36 | 1 |
| 31.750 ($1\frac{1}{4}$) | BR 202816 | 110 | 31.750 ($1\frac{1}{4}$) | 44.450 ($1\frac{3}{4}$) | 25.400 (1) | 39.2 | 1 |
| | BR 202820 | 138 | 31.750 ($1\frac{1}{4}$) | 44.450 ($1\frac{3}{4}$) | 31.750 ($1\frac{1}{4}$) | 39.2 | 1 |
| 34.925 ($1\frac{3}{8}$) | BR 223016 | 119 | 34.925 ($1\frac{3}{8}$) | 47.625 ($1\frac{7}{8}$) | 25.400 (1) | 42.4 | 1 |
| | BR 223020 | 149 | 34.925 ($1\frac{3}{8}$) | 47.625 ($1\frac{7}{8}$) | 31.750 ($1\frac{1}{4}$) | 42.4 | 1 |
| 38.100 ($1\frac{1}{2}$) | BR 243316 | 149 | 38.100 ($1\frac{1}{2}$) | 52.388 ($2\frac{1}{16}$) | 25.400 (1) | 45.1 | 1.5 |
| | BR 243320 | 187 | 38.100 ($1\frac{1}{2}$) | 52.388 ($2\frac{1}{16}$) | 31.750 ($1\frac{1}{4}$) | 45.1 | 1.5 |
| 41.275 ($1\frac{5}{8}$) | BR 263516 | 158 | 41.275 ($1\frac{5}{8}$) | 55.562 ($2\frac{3}{16}$) | 25.400 (1) | 48.3 | 1.5 |
| | BR 263520 | 199 | 41.275 ($1\frac{5}{8}$) | 55.562 ($2\frac{3}{16}$) | 31.750 ($1\frac{1}{4}$) | 48.3 | 1.5 |
| 44.450 ($1\frac{3}{4}$) | BR 283716 | 170 | 44.450 ($1\frac{3}{4}$) | 58.738 ($2\frac{3}{16}$) | 25.400 (1) | 51.5 | 1.5 |
| | BR 283720 | 215 | 44.450 ($1\frac{3}{4}$) | 58.738 ($2\frac{3}{16}$) | 31.750 ($1\frac{1}{4}$) | 51.5 | 1.5 |
| | BR 283820 | 250 | 44.450 ($1\frac{3}{4}$) | 60.325 ($2\frac{3}{8}$) | 31.750 ($1\frac{1}{4}$) | 53.1 | 1.5 |
| 47.625 ($1\frac{7}{8}$) | BR 303920 | 225 | 47.625 ($1\frac{7}{8}$) | 61.912 ($2\frac{3}{16}$) | 31.750 ($1\frac{1}{4}$) | 54.7 | 1.5 |

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.



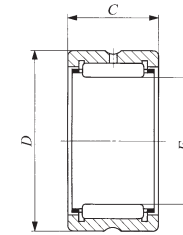
BR



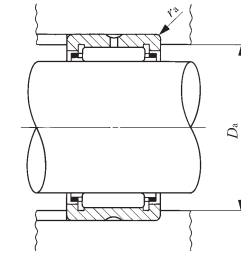
| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|--|---|--|
| 18 900 | 19 700 | 25 000 |
| 21 700 | 24 400 | 20 000 |
| 27 600 | 33 100 | 20 000 |
| 23 000 | 27 100 | 18 000 |
| 29 100 | 36 800 | 18 000 |
| 25 300 | 31 900 | 16 000 |
| 32 100 | 43 300 | 16 000 |
| 34 900 | 49 900 | 14 000 |
| 43 200 | 65 600 | 14 000 |
| 36 000 | 53 500 | 13 000 |
| 44 600 | 70 300 | 13 000 |
| 38 500 | 60 000 | 11 000 |
| 47 700 | 78 900 | 11 000 |
| 43 700 | 66 900 | 11 000 |
| 54 200 | 88 200 | 11 000 |
| 44 800 | 70 900 | 9 500 |
| 55 600 | 93 400 | 9 500 |
| 47 500 | 78 200 | 9 000 |
| 58 900 | 103 000 | 9 000 |
| 58 900 | 103 000 | 9 000 |
| 60 100 | 108 000 | 8 500 |

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) | | | Standard mounting dimensions mm | |
|----------------------------|--------------------------|---------------------|------------------------------|-----------------|----------------|------------------------------------|---------------------|
| | | | F_w | D | C | D_a Max. | $r_{as\ max}^{(1)}$ |
| 50.800 (2) | BR 324116 | 190 | 50.800 (2) | 65.088 (2 5/16) | 25.400 (1) | 57.8 | 1.5 |
| | BR 324120 | 240 | 50.800 (2) | 65.088 (2 5/16) | 31.750 (1 1/4) | 57.8 | 1.5 |
| 57.150 (2 1/4) | BR 364824 | 435 | 57.150 (2 1/4) | 76.200 (3) | 38.100 (1 1/2) | 69 | 1.5 |
| | BR 364828 | 510 | 57.150 (2 1/4) | 76.200 (3) | 44.450 (1 3/4) | 69 | 1.5 |
| 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 |
| | BR 405228 | 555 | 63.500 (2 1/2) | 82.550 (3 1/4) | 44.450 (1 3/4) | 74.3 | 2 |
| 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 |
| | BR 445628 | 600 | 69.850 (2 3/4) | 88.900 (3 1/2) | 44.450 (1 3/4) | 80.7 | 2 |
| 76.200 (3) | BR 486024 | 555 | 76.200 (3) | 95.250 (3 3/4) | 38.100 (1 1/2) | 87 | 2 |
| | BR 486028 | 650 | 76.200 (3) | 95.250 (3 3/4) | 44.450 (1 3/4) | 87 | 2 |
| 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 |
| | BR 526832 | 1 140 | 82.550 (3 1/4) | 107.950 (4 1/4) | 50.800 (2) | 99.7 | 2 |
| 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 |
| 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 |
| 101.600 (4) | BR 648032 | 1 370 | 101.600 (4) | 127.000 (5) | 50.800 (2) | 117.8 | 2.5 |

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.

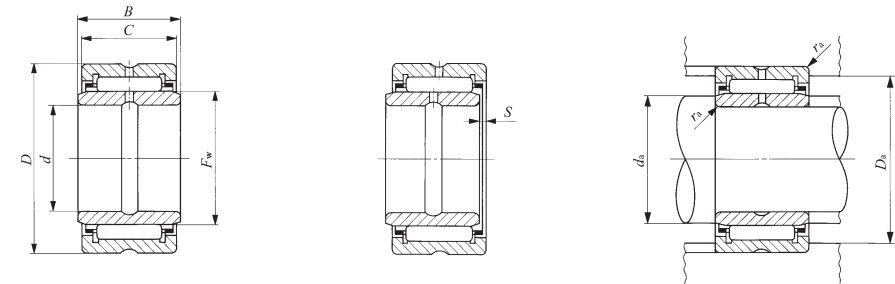
| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|--|---|--|
| 51 000 | 89 400 | 8 000 |
| 63 200 | 118 000 | 8 000 |
| 90 300 | 158 000 | 7 000 |
| 105 000 | 191 000 | 7 000 |
| 94 600 | 174 000 | 6 500 |
| 110 000 | 210 000 | 6 500 |
| 98 700 | 189 000 | 5 500 |
| 114 000 | 228 000 | 5 500 |
| 105 000 | 211 000 | 5 500 |
| 122 000 | 255 000 | 5 500 |
| 141 000 | 259 000 | 5 000 |
| 154 000 | 290 000 | 5 000 |
| 162 000 | 316 000 | 4 500 |
| 169 000 | 342 000 | 4 000 |
| 176 000 | 368 000 | 4 000 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



BRI

Shaft dia. 9.525 – 41.275mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | | ⁽¹⁾ S |
|-------------------------------------|--|---------------------|------------------------------|---------------------------|--------------------------|--------|--------------------------|---------------------|
| | | | d | D | C | B | F _w | |
| 9.525 ($\frac{3}{8}$) | BRI 61812 | 67.5 | 9.525($\frac{3}{8}$) | 28.575($1\frac{1}{8}$) | 19.050($\frac{3}{4}$) | 19.300 | 15.875($\frac{5}{8}$) | 0.3 |
| | | 106 | 12.700($\frac{1}{2}$) | 31.750($1\frac{1}{4}$) | 19.050($\frac{3}{4}$) | 19.300 | 19.050($\frac{3}{4}$) | 0.5 |
| 12.700 ($\frac{1}{2}$) | BRI 82012 BRI 82016 | 91 | 15.875($\frac{5}{8}$) | 34.925($1\frac{3}{8}$) | 19.050($\frac{3}{4}$) | 19.300 | 22.225($\frac{7}{8}$) | 0.3 |
| | | 122 | 15.875($\frac{5}{8}$) | 34.925($1\frac{3}{8}$) | 25.400(1) | 25.650 | 22.225($\frac{7}{8}$) | 0.5 |
| 15.875 ($\frac{5}{8}$) | BRI 102212 BRI 102216 | 102 | 19.050($\frac{3}{4}$) | 38.100($1\frac{1}{2}$) | 19.050($\frac{3}{4}$) | 19.300 | 25.400(1) | 0.3 |
| | | 136 | 19.050($\frac{3}{4}$) | 38.100($1\frac{1}{2}$) | 25.400(1) | 25.650 | 25.400(1) | 0.5 |
| 19.050 ($\frac{3}{4}$) | BRI 122412 BRI 122416 | 152 | 22.225($\frac{7}{8}$) | 41.275($1\frac{5}{8}$) | 25.400(1) | 25.650 | 28.575($1\frac{1}{8}$) | 0.5 |
| | | 190 | 22.225($\frac{7}{8}$) | 41.275($1\frac{5}{8}$) | 31.750($1\frac{1}{4}$) | 32.000 | 28.575($1\frac{1}{8}$) | 0.5 |
| 22.225 ($\frac{7}{8}$) | BRI 142616 BRI 142620 | 166 | 25.400(1) | 44.450($1\frac{3}{4}$) | 25.400(1) | 25.650 | 31.750($1\frac{1}{4}$) | 0.5 |
| | | 210 | 25.400(1) | 44.450($1\frac{3}{4}$) | 31.750($1\frac{1}{4}$) | 32.000 | 31.750($1\frac{1}{4}$) | 0.5 |
| 25.400 (1) | BRI 162816 BRI 162820 | 182 | 28.575($1\frac{1}{8}$) | 47.625($1\frac{7}{8}$) | 25.400(1) | 25.650 | 34.925($1\frac{3}{8}$) | 0.5 |
| | | 225 | 28.575($1\frac{1}{8}$) | 47.625($1\frac{7}{8}$) | 31.750($1\frac{1}{4}$) | 32.000 | 34.925($1\frac{3}{8}$) | 0.5 |
| 28.575 ($1\frac{1}{8}$) | BRI 183016 BRI 183020 | 220 | 31.750($1\frac{1}{4}$) | 52.388($2\frac{1}{16}$) | 25.400(1) | 25.650 | 38.100($1\frac{1}{2}$) | 0.5 |
| | | 275 | 31.750($1\frac{1}{4}$) | 52.388($2\frac{1}{16}$) | 31.750($1\frac{1}{4}$) | 32.000 | 38.100($1\frac{1}{2}$) | 0.5 |
| 31.750 ($1\frac{1}{4}$) | BRI 203316 BRI 203320 | 235 | 34.925($1\frac{3}{8}$) | 55.562($2\frac{3}{16}$) | 25.400(1) | 25.650 | 41.275($1\frac{5}{8}$) | 0.5 |
| | | 295 | 34.925($1\frac{3}{8}$) | 55.562($2\frac{3}{16}$) | 31.750($1\frac{1}{4}$) | 32.000 | 41.275($1\frac{5}{8}$) | 0.5 |
| 34.925 ($1\frac{3}{8}$) | BRI 223516 BRI 223520 | 250 | 38.100($1\frac{1}{2}$) | 58.738($2\frac{3}{16}$) | 25.400(1) | 25.650 | 44.450($1\frac{3}{4}$) | 0.5 |
| | | 315 | 38.100($1\frac{1}{2}$) | 58.738($2\frac{3}{16}$) | 31.750($1\frac{1}{4}$) | 32.000 | 44.450($1\frac{3}{4}$) | 0.5 |
| 38.100 ($1\frac{1}{2}$) | BRI 243716 BRI 243720 BRI 243820 BRI 243920 | 350 | 38.100($1\frac{1}{2}$) | 60.325($2\frac{3}{8}$) | 31.750($1\frac{1}{4}$) | 32.000 | 44.450($1\frac{3}{4}$) | 0.5 |
| | | 380 | 38.100($1\frac{1}{2}$) | 61.912($2\frac{3}{16}$) | 31.750($1\frac{1}{4}$) | 32.000 | 47.625($1\frac{7}{8}$) | 0.5 |
| 41.275 ($1\frac{5}{8}$) | BRI 264116 BRI 264120 | 325 | 41.275($1\frac{5}{8}$) | 65.088($2\frac{5}{16}$) | 25.400(1) | 25.650 | 50.800(2) | 0.5 |
| | | 410 | 41.275($1\frac{5}{8}$) | 65.088($2\frac{5}{16}$) | 31.750($1\frac{1}{4}$) | 32.000 | 50.800(2) | 0.5 |

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.

| Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|---------------------------------|------|----------------|------------------------------------|-------------------------------------|---|--|----------------------|
| d _a | | D _a | r _{as max} ⁽²⁾ | | | | |
| Min. | Max. | Max. | | | | | |
| 14 | 14.5 | 24.5 | 0.6 | 18 900 | 19 700 | 25 000 | LRB 61012 |
| 17.5 | 18 | 26.5 | 1 | 21 700 | 24 400 | 20 000 | LRB 81212 |
| 17.5 | 18 | 26.5 | 1 | 27 600 | 33 100 | 20 000 | LRB 81216 |
| 21 | 21.2 | 29.7 | 1 | 23 000 | 27 100 | 18 000 | LRB 101412 |
| 21 | 21.2 | 29.7 | 1 | 29 100 | 36 800 | 18 000 | LRB 101416 |
| 24 | 24.4 | 32.9 | 1 | 25 300 | 31 900 | 16 000 | LRB 121612 |
| 24 | 24.4 | 32.9 | 1 | 32 100 | 43 300 | 16 000 | LRB 121616 |
| 27 | 27.5 | 36 | 1 | 34 900 | 49 900 | 14 000 | LRB 141816 |
| 27 | 27.5 | 36 | 1 | 43 200 | 65 600 | 14 000 | LRB 141820 |
| 30.5 | 30.7 | 39.2 | 1 | 36 000 | 53 500 | 13 000 | LRB 162016 |
| 30.5 | 30.7 | 39.2 | 1 | 44 600 | 70 300 | 13 000 | LRB 162020 |
| 33.5 | 33.9 | 42.4 | 1 | 38 500 | 60 000 | 11 000 | LRB 182216 |
| 33.5 | 33.9 | 42.4 | 1 | 47 700 | 78 900 | 11 000 | LRB 182220 |
| 37 | 37.1 | 45.1 | 1.5 | 43 700 | 66 900 | 11 000 | LRB 202416 |
| 37 | 37.1 | 45.1 | 1.5 | 54 200 | 88 200 | 11 000 | LRB 202420 |
| 40.2 | 40.2 | 48.3 | 1.5 | 44 800 | 70 900 | 9 500 | LRB 222616 |
| 40.2 | 40.2 | 48.3 | 1.5 | 55 600 | 93 400 | 9 500 | LRB 222620 |
| 43.3 | 43.4 | 51.5 | 1.5 | 47 500 | 78 200 | 9 000 | LRB 242816 |
| 43.3 | 43.4 | 51.5 | 1.5 | 58 900 | 103 000 | 9 000 | LRB 242820 |
| 43.3 | 43.4 | 53.1 | 1.5 | 58 900 | 103 000 | 9 000 | LRB 242820 |
| 43.3 | 43.4 | 54.7 | 1.5 | 60 100 | 108 000 | 8 500 | LRB 243020 |
| 48 | 49 | 57.8 | 1.5 | 51 000 | 89 400 | 8 000 | LRB 263216 |
| 48 | 49 | 57.8 | 1.5 | 63 200 | 118 000 | 8 000 | LRB 263220 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

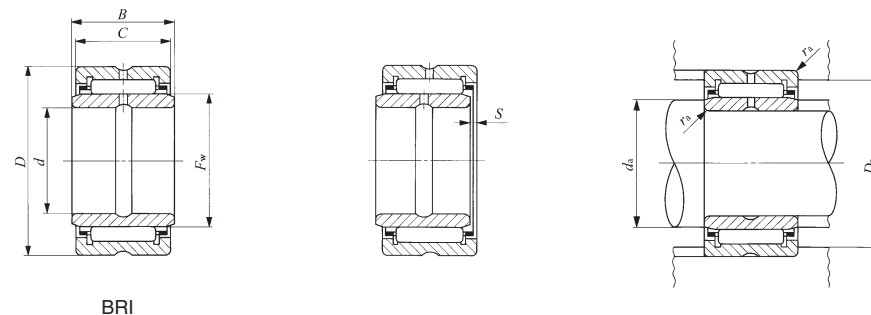
With Inner Ring, Inch Series



Shaft dia. 44.450 – 88.900mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | | |
|----------------------------|--------------------------|---------------------|------------------------------|-----------------|----------------|----------|----------------------|-------------------------|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>B</i> | <i>F_w</i> | <i>S</i> ⁽¹⁾ |
| 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 |
| | BRI 284828 | 855 | 44.450 (1 3/4) | 76.200 (3) | 44.450 (1 3/4) | 44.700 | 57.150 (2 1/4) | 1 |
| 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 |
| | BRI 325228 | 945 | 50.800 (2) | 82.550 (3 1/4) | 44.450 (1 3/4) | 44.700 | 63.500 (2 1/2) | 1 |
| 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 |
| | 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 |
| 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 |
| | 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 |
| 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 |
| | 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 |
| 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 |
| 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 |
| 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 |

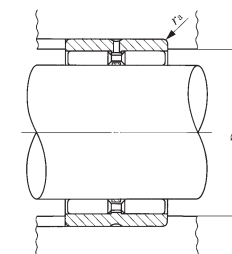
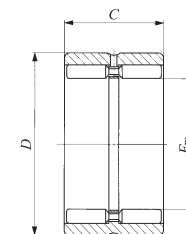
Notes⁽¹⁾ Allowable axial shift amount of inner ring to outer ring
⁽²⁾ Maximum permissible corner radius of the shaft or housing
⁽³⁾ Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
 Remarks1. In bearings with a bearing bore diameter, *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.



| Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽³⁾ rpm | Assembled inner ring |
|---------------------------------|------|-----------------------|---|--|--|--|----------------------|
| <i>d</i> _a | | <i>D</i> _a | <i>r</i> _{as max} ⁽²⁾ | | | | |
| Min. | Max. | Max. | | | | | |
| 52.5 | 55 | 69 | 1.5 | 90 300 | 158 000 | 7 000 | LRB 283624 |
| 52.5 | 55 | 69 | 1.5 | 105 000 | 191 000 | 7 000 | LRB 283628 |
| 58 | 61 | 74.3 | 2 | 94 600 | 174 000 | 6 500 | LRB 324024 |
| 58 | 61 | 74.3 | 2 | 110 000 | 210 000 | 6 500 | LRB 324028 |
| 65 | 67 | 80.7 | 2 | 98 700 | 189 000 | 5 500 | LRB 364424 |
| 65 | 67 | 80.7 | 2 | 114 000 | 228 000 | 5 500 | LRB 364428 |
| 71 | 73 | 87 | 2 | 105 000 | 211 000 | 5 500 | LRB 404824 |
| 71 | 73 | 87 | 2 | 122 000 | 255 000 | 5 500 | LRB 404828 |
| 77 | 79 | 99.7 | 2 | 141 000 | 259 000 | 5 000 | LRB 445228 |
| 77 | 79 | 99.7 | 2 | 154 000 | 290 000 | 5 000 | LRB 445232 |
| 83.5 | 86 | 106.1 | 2 | 162 000 | 316 000 | 4 500 | LRB 485632 |
| 91 | 93 | 111.4 | 2.5 | 169 000 | 342 000 | 4 000 | LRB 526032 |
| 97 | 99 | 117.8 | 2.5 | 176 000 | 368 000 | 4 000 | LRB 566432 |

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) | | | Standard mounting dimensions mm | |
|----------------------------|--------------------------|---------------------|------------------------------|-----------------|----------------|------------------------------------|---------------------|
| | | | F_w | D | C | D_a Max. | $r_{as\ max}^{(1)}$ |
| 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 |
| 19.050 (3/4) | GBR 122012 | 63 | 19.050 (3/4) | 31.750 (1 1/4) | 19.050 (3/4) | 27 | 0.6 |
| 22.225 (7/8) | GBR 142212 | 71 | 22.225 (7/8) | 34.925 (1 3/8) | 19.050 (3/4) | 30 | 0.6 |
| | GBR 142216 | 95.5 | 22.225 (7/8) | 34.925 (1 3/8) | 25.400 (1) | 30 | 0.6 |
| 25.400 (1) | GBR 162412 | 79 | 25.400 (1) | 38.100 (1 1/2) | 19.050 (3/4) | 33.3 | 0.6 |
| | GBR 162416 | 106 | 25.400 (1) | 38.100 (1 1/2) | 25.400 (1) | 33.3 | 0.6 |
| 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 |
| 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 |
| 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 |
| 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 |
| | GBR 243320 | 205 | 38.100 (1 1/2) | 52.388 (2 1/16) | 31.750 (1 1/4) | 47.3 | 0.6 |
| 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 |
| | GBR 263520 | 220 | 41.275 (1 5/8) | 55.562 (2 3/16) | 31.750 (1 1/4) | 50.5 | 0.6 |
| 44.450 (1 3/4) | GBR 283720 | 235 | 44.450 (1 3/4) | 58.738 (2 3/16) | 31.750 (1 1/4) | 53.7 | 0.6 |
| | GBR 283820 | 275 | 44.450 (1 3/4) | 60.325 (2 3/8) | 31.750 (1 1/4) | 55.3 | 0.6 |
| 47.625 (1 7/8) | GBR 303920 | 250 | 47.625 (1 7/8) | 61.912 (2 3/16) | 31.750 (1 1/4) | 56.2 | 1 |
| 50.800 (2) | GBR 324116 | 215 | 50.800 (2) | 65.088 (2 5/16) | 25.400 (1) | 59.2 | 1 |
| | GBR 324120 | 265 | 50.800 (2) | 65.088 (2 5/16) | 31.750 (1 1/4) | 59.2 | 1 |

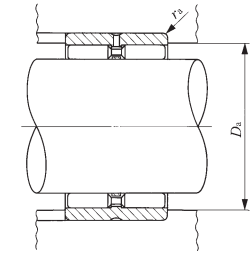
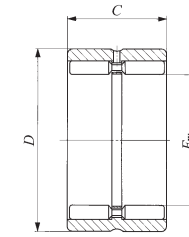
Notes⁽¹⁾ Maximum permissible corner radius of the housing
⁽²⁾ Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
 Remarks1. The outer ring has an oil groove and an oil hole.
 2. No grease is prepacked. Perform proper lubrication.

| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|--|---|--|
| 23 500 | 28 500 | 9 500 |
| 26 400 | 34 500 | 8 000 |
| 28 600 | 40 100 | 7 000 |
| 38 300 | 58 300 | 7 000 |
| 31 000 | 46 100 | 6 000 |
| 41 400 | 67 100 | 6 000 |
| 43 900 | 75 300 | 5 500 |
| 46 600 | 83 900 | 4 500 |
| 49 500 | 91 800 | 4 500 |
| 54 200 | 97 700 | 4 000 |
| 64 100 | 121 000 | 4 000 |
| 56 600 | 105 000 | 3 500 |
| 67 000 | 130 000 | 3 500 |
| 69 700 | 141 000 | 3 500 |
| 69 700 | 141 000 | 3 500 |
| 72 400 | 150 000 | 3 000 |
| 63 100 | 130 000 | 3 000 |
| 74 600 | 162 000 | 3 000 |

D
NA
TAFI
TRI
BRI

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) | | | Standard mounting dimensions mm | |
|----------------------------|--------------------------|---------------------|------------------------------|-----------------|----------------|------------------------------------|---------------------|
| | | | F_w | D | C | D_a Max. | $r_{as\ max}^{(1)}$ |
| 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 |
| | GBR 364828 | 580 | 57.150 (2 1/4) | 76.200 (3) | 44.450 (1 3/4) | 69.2 | 1.5 |
| 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 |
| | GBR 405228 | 635 | 63.500 (2 1/2) | 82.550 (3 1/4) | 44.450 (1 3/4) | 75.7 | 1.5 |
| 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 |
| | GBR 445628 | 690 | 69.850 (2 3/4) | 88.900 (3 1/2) | 44.450 (1 3/4) | 82 | 1.5 |
| 76.200 (3) | GBR 486024 | 630 | 76.200 (3) | 95.250 (3 3/4) | 38.100 (1 1/2) | 88 | 1.5 |
| | GBR 486028 | 745 | 76.200 (3) | 95.250 (3 3/4) | 44.450 (1 3/4) | 88 | 1.5 |
| 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 |
| | GBR 526832 | 1 240 | 82.550 (3 1/4) | 107.950 (4 1/4) | 50.800 (2) | 99.9 | 1.5 |
| 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 |
| 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 |
| 101.600 (4) | GBR 648032 | 1 500 | 101.600 (4) | 127.000 (5) | 50.800 (2) | 119 | 1.5 |
| 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 |

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.

| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|--|---|--|
| 113 000 | 224 000 | 2 500 |
| 133 000 | 276 000 | 2 500 |
| 120 000 | 248 000 | 2 500 |
| 141 000 | 306 000 | 2 500 |
| 125 000 | 273 000 | 2 000 |
| 147 000 | 336 000 | 2 000 |
| 131 000 | 298 000 | 2 000 |
| 154 000 | 368 000 | 2 000 |
| 193 000 | 396 000 | 1 800 |
| 214 000 | 452 000 | 1 800 |
| 221 000 | 488 000 | 1 700 |
| 228 000 | 522 000 | 1 600 |
| 237 000 | 556 000 | 1 500 |
| 242 000 | 590 000 | 1 400 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



Shaft dia. 9.525 – 41.275mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | |
|--|--------------------------|---------------------|--|---|--|----------|--|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>B</i> | <i>F_w</i> |
| 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) |
| 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) |
| 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) |
| | GBRI 102216 | 133 | 15.875(⁵ / ₈) | 34.925(1 ³ / ₈) | 25.400(1) | 25.650 | 22.225(⁷ / ₈) |
| 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) |
| | GBRI 122416 | 150 | 19.050(³ / ₄) | 38.100(1 ¹ / ₂) | 25.400(1) | 25.650 | 25.400(1) |
| 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) |
| 25.400 (1) | GBRI 162816 | 184 | 25.400(1) | 44.450(1 ³ / ₄) | 25.400(1) | 25.650 | 31.750(1 ¹ / ₄) |
| 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 38.100 (1 ¹ / ₂) | GBRI 243720 | 335 | 38.100(1 ¹ / ₂) | 58.738(2 ³ / ₁₆) | 31.750(1 ¹ / ₄) | 32.000 | 44.450(1 ³ / ₄) |
| | 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) |
| | GBRI 243920 | 410 | 38.100(1 ¹ / ₂) | 61.912(2 ³ / ₁₆) | 31.750(1 ¹ / ₄) | 32.000 | 47.625(1 ⁷ / ₈) |
| 41.275 (1 ⁵ / ₈) | GBRI 264116 | 350 | 41.275(1 ⁵ / ₈) | 65.088(2 ⁵ / ₁₆) | 25.400(1) | 25.650 | 50.800(2) |
| | GBRI 264120 | 435 | 41.275(1 ⁵ / ₈) | 65.088(2 ⁵ / ₁₆) | 31.750(1 ¹ / ₄) | 32.000 | 50.800(2) |

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.



GBRI

| Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|---------------------------------|------|----------------------|--|--|---|--|----------------------|
| <i>d_a</i> | | <i>D_a</i> | <i>r_{as max}</i> ⁽¹⁾ | | | | |
| Min. | Max. | Max. | | | | | |
| 14 | 14.5 | 24.5 | 0.6 | 23 500 | 28 500 | 9 500 | LRBZ 61012 |
| 17.5 | 18 | 27 | 0.6 | 26 400 | 34 500 | 8 000 | LRBZ 81212 |
| 21 | 21.2 | 30 | 0.6 | 28 600 | 40 100 | 7 000 | LRBZ 101412 |
| 21 | 21.2 | 30 | 0.6 | 38 300 | 58 300 | 7 000 | LRBZ 101416 |
| 24 | 24.4 | 33.3 | 0.6 | 31 000 | 46 100 | 6 000 | LRBZ 121612 |
| 24 | 24.4 | 33.3 | 0.6 | 41 400 | 67 100 | 6 000 | LRBZ 121616 |
| 27 | 27.5 | 36.3 | 0.6 | 43 900 | 75 300 | 5 500 | LRBZ 141816 |
| 30.5 | 30.7 | 39.6 | 0.6 | 46 600 | 83 900 | 4 500 | LRBZ 162016 |
| 33.5 | 33.9 | 42.8 | 0.6 | 49 500 | 91 800 | 4 500 | LRBZ 182216 |
| 37 | 37.1 | 47.3 | 0.6 | 54 200 | 97 700 | 4 000 | LRBZ 202416 |
| 37 | 37.1 | 47.3 | 0.6 | 64 100 | 121 000 | 4 000 | LRBZ 202420 |
| 40.2 | 40.2 | 50.5 | 0.6 | 56 600 | 105 000 | 3 500 | LRBZ 222616 |
| 40.2 | 40.2 | 50.5 | 0.6 | 67 000 | 130 000 | 3 500 | LRBZ 222620 |
| 43.3 | 43.4 | 53.7 | 0.6 | 69 700 | 141 000 | 3 500 | LRBZ 242820 |
| 43.3 | 43.4 | 55.3 | 0.6 | 69 700 | 141 000 | 3 500 | LRBZ 242820 |
| 43.3 | 45 | 56.2 | 1 | 72 400 | 150 000 | 3 000 | LRBZ 243020 |
| 48 | 49 | 59.2 | 1 | 63 100 | 130 000 | 3 000 | LRBZ 263216 |
| 48 | 49 | 59.2 | 1 | 74 600 | 162 000 | 3 000 | LRBZ 263220 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

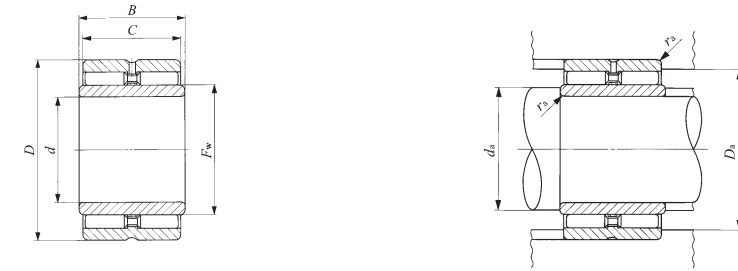
With Inner Ring, Inch Series



Shaft dia. 44.450 – 95.250mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | |
|----------------------------|--------------------------|---------------------|------------------------------|-----------------|----------------|----------|----------------------|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>B</i> | <i>F_w</i> |
| 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) |
| | GBRI 284828 | 925 | 44.450 (1 3/4) | 76.200 (3) | 44.450 (1 3/4) | 44.700 | 57.150 (2 1/4) |
| 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) |
| | GBRI 325228 | 1 030 | 50.800 (2) | 82.550 (3 1/4) | 44.450 (1 3/4) | 44.700 | 63.500 (2 1/2) |
| 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) |
| | 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) |
| 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) |
| | GBRI 406028 | 1 230 | 63.500 (2 1/2) | 95.250 (3 3/4) | 44.450 (1 3/4) | 44.700 | 76.200 (3) |
| 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) |
| | GBRI 446832 | 1 840 | 69.850 (2 3/4) | 107.950 (4 1/4) | 50.800 (2) | 51.050 | 82.550 (3 1/4) |
| 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) |
| 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) |
| 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) |
| 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) |

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.

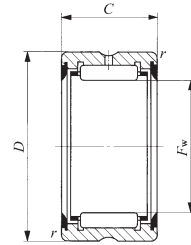
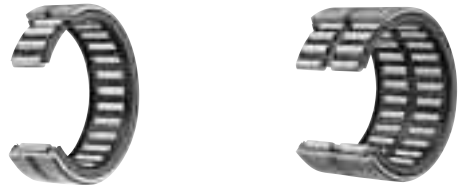


GBRI

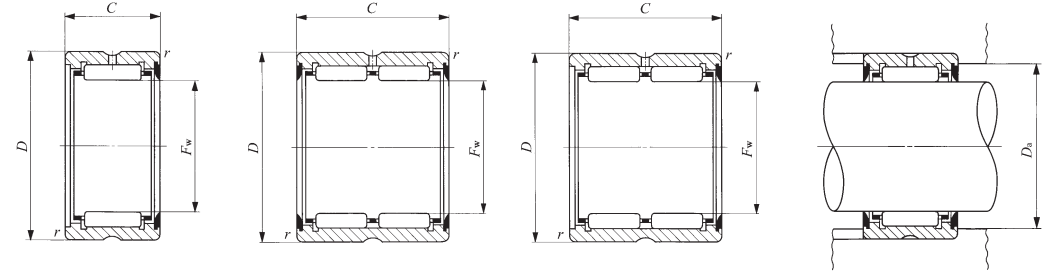
| Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|---------------------------------|------|----------------------|--|--|---|--|----------------------|
| <i>d_a</i> | | <i>D_a</i> | <i>r_{as max}</i> ⁽¹⁾ | | | | |
| Min. | Max. | Max. | | | | | |
| 52.5 | 55 | 69.2 | 1.5 | 113 000 | 224 000 | 2 500 | LRBZ 283624 |
| 52.5 | 55 | 69.2 | 1.5 | 133 000 | 276 000 | 2 500 | LRBZ 283628 |
| 58 | 61 | 75.7 | 1.5 | 120 000 | 248 000 | 2 500 | LRBZ 324024 |
| 58 | 61 | 75.7 | 1.5 | 141 000 | 306 000 | 2 500 | LRBZ 324028 |
| 65 | 67 | 82 | 1.5 | 125 000 | 273 000 | 2 000 | LRBZ 364424 |
| 65 | 67 | 82 | 1.5 | 147 000 | 336 000 | 2 000 | LRBZ 364428 |
| 71 | 73 | 88 | 1.5 | 131 000 | 298 000 | 2 000 | LRBZ 404824 |
| 71 | 73 | 88 | 1.5 | 154 000 | 368 000 | 2 000 | LRBZ 404828 |
| 77 | 79 | 99.9 | 1.5 | 193 000 | 396 000 | 1 800 | LRBZ 445228 |
| 77 | 79 | 99.9 | 1.5 | 214 000 | 452 000 | 1 800 | LRBZ 445232 |
| 83.5 | 86 | 106.3 | 1.5 | 221 000 | 488 000 | 1 700 | LRBZ 485632 |
| 91 | 93 | 112.6 | 1.5 | 228 000 | 522 000 | 1 600 | LRBZ 526032 |
| 97 | 99 | 119 | 1.5 | 237 000 | 556 000 | 1 500 | LRBZ 566432 |
| 103 | 105 | 125.3 | 1.5 | 242 000 | 590 000 | 1 400 | LRBZ 606832 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring



RNA49...UU
RNA69...UU ($F_w \leq 35$)



RNA49...U
RNA69...U ($F_w \leq 35$)

RNA69...UU

RNA69...U

Shaft dia. 14 – 45mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|-----------------|----------------|---------------|------------------|------------------------|-----|-----|--------------------|
| | With two seals | With one seal | With two seals | With one seal | | F_w | D | C | $r_{s \min}^{(1)}$ |
| 14 | RNA 4900UU | RNA 4900U | — | — | 16.3 | 14 | 22 | 13 | 0.3 |
| 16 | RNA 4901UU — | RNA 4901U — | — | — | 17.9 | 16 | 24 | 13 | 0.3 |
| | | | RNA 6901UU | RNA 6901U | 30 | 16 | 24 | 22 | 0.3 |
| 18 | RNA 49/14UU | RNA 49/14U | — | — | 19.7 | 18 | 26 | 13 | 0.3 |
| 20 | RNA 4902UU — | RNA 4902U — | — | — | 21.5 | 20 | 28 | 13 | 0.3 |
| | | | RNA 6902UU | RNA 6902U | 37.5 | 20 | 28 | 23 | 0.3 |
| 22 | RNA 4903UU — | RNA 4903U — | — | — | 23 | 22 | 30 | 13 | 0.3 |
| | | | RNA 6903UU | RNA 6903U | 40.5 | 22 | 30 | 23 | 0.3 |
| 25 | RNA 4904UU — | RNA 4904U — | — | — | 54.5 | 25 | 37 | 17 | 0.3 |
| | | | RNA 6904UU | RNA 6904U | 95.5 | 25 | 37 | 30 | 0.3 |
| 28 | RNA 49/22UU — | RNA 49/22U — | — | — | 55.5 | 28 | 39 | 17 | 0.3 |
| | | | RNA 69/22UU | RNA 69/22U | 97.5 | 28 | 39 | 30 | 0.3 |
| 30 | RNA 4905UU — | RNA 4905U — | — | — | 63 | 30 | 42 | 17 | 0.3 |
| | | | RNA 6905UU | RNA 6905U | 111 | 30 | 42 | 30 | 0.3 |
| 32 | RNA 49/28UU — | RNA 49/28U — | — | — | 75.5 | 32 | 45 | 17 | 0.3 |
| | | | RNA 69/28UU | RNA 69/28U | 133 | 32 | 45 | 30 | 0.3 |
| 35 | RNA 4906UU — | RNA 4906U — | — | — | 71 | 35 | 47 | 17 | 0.3 |
| | | | RNA 6906UU | RNA 6906U | 125 | 35 | 47 | 30 | 0.3 |
| 40 | RNA 49/32UU — | RNA 49/32U — | — | — | 94.5 | 40 | 52 | 20 | 0.6 |
| | | | RNA 69/32UU | RNA 69/32U | 170 | 40 | 52 | 36 | 0.6 |
| 42 | RNA 4907UU — | RNA 4907U — | — | — | 112 | 42 | 55 | 20 | 0.6 |
| | | | RNA 6907UU | RNA 6907U | 200 | 42 | 55 | 36 | 0.6 |
| 45 | RNA 49/38UU | RNA 49/38U | — | — | 119 | 45 | 58 | 20 | 0.6 |

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.

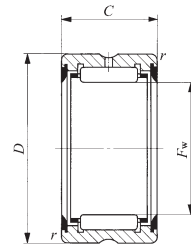
| Standard mounting dimension D_a Max. mm | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|---|---------------------------------------|--|--|
| 20 | 8 080 | 8 490 | 14 000 |
| 22 | 8 470 | 9 320 | 12 000 |
| 22 | 15 500 | 20 400 | 12 000 |
| 24 | 9 260 | 10 800 | 11 000 |
| 26 | 9 570 | 11 600 | 9 500 |
| 26 | 18 500 | 27 100 | 9 500 |
| 28 | 10 300 | 13 100 | 8 500 |
| 28 | 19 800 | 30 600 | 8 500 |
| 35 | 18 000 | 20 500 | 7 500 |
| 35 | 33 000 | 44 600 | 7 500 |
| 37 | 18 300 | 23 700 | 7 000 |
| 37 | 33 800 | 52 000 | 7 000 |
| 40 | 20 300 | 25 100 | 6 500 |
| 40 | 39 200 | 58 700 | 6 500 |
| 43 | 21 000 | 26 800 | 6 000 |
| 43 | 38 900 | 59 100 | 6 000 |
| 45 | 21 500 | 28 400 | 5 500 |
| 45 | 40 100 | 63 000 | 5 500 |
| 48 | 29 400 | 44 200 | 5 000 |
| 48 | 50 300 | 88 300 | 5 000 |
| 51 | 30 100 | 46 300 | 4 500 |
| 51 | 51 600 | 92 600 | 4 500 |
| 54 | 31 600 | 50 400 | 4 000 |

D

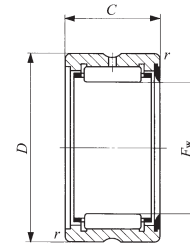
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

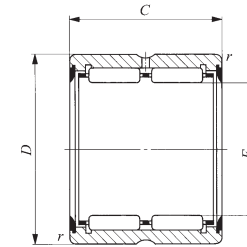
With Seal, Without Inner Ring



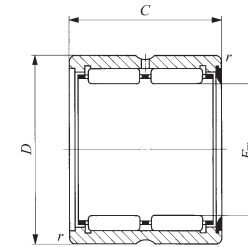
RNA49...UU



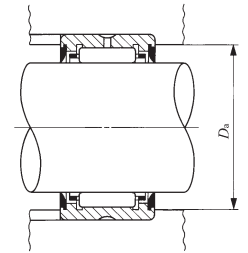
RNA49...U



RNA69...UU



RNA69...U



Shaft dia. 48 – 85mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|---------------|----------------|---------------|------------------|---------------------------|-----|-----|--------------------|
| | With two seals | With one seal | With two seals | With one seal | | F_w | D | C | $r_{s\ min}^{(1)}$ |
| 48 | RNA 4908UU | RNA 4908U | — | — | 150 | 48 | 62 | 22 | 0.6 |
| | — | — | RNA 6908UU | RNA 6908U | 270 | 48 | 62 | 40 | 0.6 |
| 50 | RNA 49/42UU | RNA 49/42U | — | — | 173 | 50 | 65 | 22 | 0.6 |
| 52 | RNA 4909UU | RNA 4909U | — | — | 197 | 52 | 68 | 22 | 0.6 |
| | — | — | RNA 6909UU | RNA 6909U | 355 | 52 | 68 | 40 | 0.6 |
| 55 | RNA 49/48UU | RNA 49/48U | — | — | 187 | 55 | 70 | 22 | 0.6 |
| 58 | RNA 4910UU | RNA 4910U | — | — | 177 | 58 | 72 | 22 | 0.6 |
| | — | — | RNA 6910UU | RNA 6910U | 320 | 58 | 72 | 40 | 0.6 |
| 60 | RNA 49/52UU | RNA 49/52U | — | — | 200 | 60 | 75 | 22 | 0.6 |
| 63 | RNA 4911UU | RNA 4911U | — | — | 265 | 63 | 80 | 25 | 1 |
| | — | — | RNA 6911UU | RNA 6911U | 470 | 63 | 80 | 45 | 1 |
| 65 | RNA 49/58UU | RNA 49/58U | — | — | 275 | 65 | 82 | 25 | 1 |
| 68 | RNA 4912UU | RNA 4912U | — | — | 285 | 68 | 85 | 25 | 1 |
| | — | — | RNA 6912UU | RNA 6912U | 505 | 68 | 85 | 45 | 1 |
| 70 | RNA 49/62UU | RNA 49/62U | — | — | 320 | 70 | 88 | 25 | 1 |
| 72 | RNA 4913UU | RNA 4913U | — | — | 325 | 72 | 90 | 25 | 1 |
| | — | — | RNA 6913UU | RNA 6913U | 580 | 72 | 90 | 45 | 1 |
| 75 | RNA 49/68UU | RNA 49/68U | — | — | 465 | 75 | 95 | 30 | 1 |
| 80 | RNA 4914UU | RNA 4914U | — | — | 495 | 80 | 100 | 30 | 1 |
| | — | — | RNA 6914UU | RNA 6914U | 910 | 80 | 100 | 54 | 1 |
| 85 | RNA 4915UU | RNA 4915U | — | — | 520 | 85 | 105 | 30 | 1 |
| | — | — | RNA 6915UU | RNA 6915U | 960 | 85 | 105 | 54 | 1 |

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.

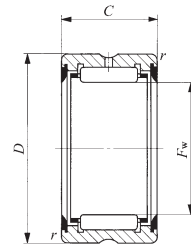
| Standard mounting dimension D_a Max. mm | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|---|---------------------------------------|--|--|
| 58 | 37 200 | 58 400 | 4 000 |
| 58 | 63 700 | 117 000 | 4 000 |
| 61 | 38 000 | 60 900 | 4 000 |
| 64 | 38 900 | 63 400 | 3 500 |
| 64 | 66 600 | 127 000 | 3 500 |
| 66 | 39 600 | 66 100 | 3 500 |
| 68 | 41 300 | 71 100 | 3 500 |
| 68 | 70 800 | 142 000 | 3 500 |
| 71 | 42 100 | 73 600 | 3 000 |
| 75 | 52 200 | 85 700 | 3 000 |
| 75 | 89 400 | 171 000 | 3 000 |
| 77 | 53 400 | 89 200 | 3 000 |
| 80 | 54 500 | 92 800 | 3 000 |
| 80 | 93 400 | 186 000 | 3 000 |
| 83 | 55 700 | 96 300 | 2 500 |
| 85 | 56 800 | 99 800 | 2 500 |
| 85 | 97 400 | 200 000 | 2 500 |
| 90 | 73 900 | 133 000 | 2 500 |
| 95 | 76 900 | 143 000 | 2 500 |
| 95 | 124 000 | 281 000 | 2 500 |
| 100 | 79 600 | 153 000 | 2 000 |
| 100 | 128 000 | 299 000 | 2 000 |

D

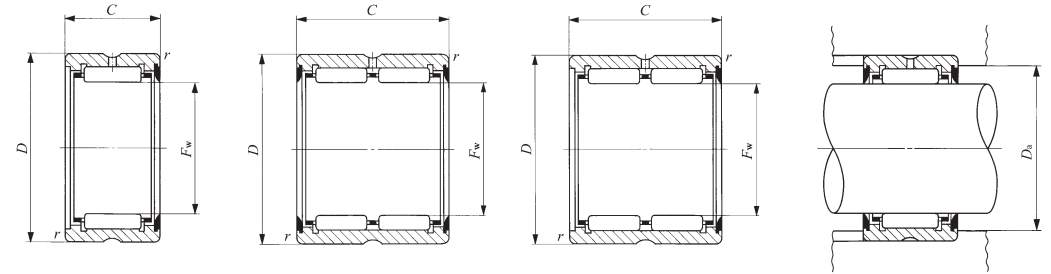
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring



RNA49...UU



RNA49...U

RNA69...UU

RNA69...U

Shaft dia. 90 – 160mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|---------------|----------------|---------------|------------------|------------------------|-----|-----|--------------------|
| | With two seals | With one seal | With two seals | With one seal | | F_w | D | C | $r_{s\ min}^{(1)}$ |
| 90 | RNA 4916UU | RNA 4916U | — | — | 545 | 90 | 110 | 30 | 1 |
| | — | — | RNA 6916UU | RNA 6916U | 1 010 | 90 | 110 | 54 | 1 |
| 95 | RNA 49/82UU | RNA 49/82U | — | — | 570 | 95 | 115 | 30 | 1 |
| 100 | RNA 4917UU | RNA 4917U | — | — | 695 | 100 | 120 | 35 | 1.1 |
| | — | — | RNA 6917UU | RNA 6917U | 1 300 | 100 | 120 | 63 | 1.1 |
| 105 | RNA 4918UU | RNA 4918U | — | — | 730 | 105 | 125 | 35 | 1.1 |
| | — | — | RNA 6918UU | RNA 6918U | 1 360 | 105 | 125 | 63 | 1.1 |
| 110 | RNA 4919UU | RNA 4919U | — | — | 760 | 110 | 130 | 35 | 1.1 |
| | — | — | RNA 6919UU | RNA 6919U | 1 420 | 110 | 130 | 63 | 1.1 |
| 115 | RNA 4920UU | RNA 4920U | — | — | 1 200 | 115 | 140 | 40 | 1.1 |
| 125 | RNA 4922UU | RNA 4922U | — | — | 1 280 | 125 | 150 | 40 | 1.1 |
| 135 | RNA 4924UU | RNA 4924U | — | — | 1 940 | 135 | 165 | 45 | 1.1 |
| 150 | RNA 4926UU | RNA 4926U | — | — | 2 360 | 150 | 180 | 50 | 1.5 |
| 160 | RNA 4928UU | RNA 4928U | — | — | 2 510 | 160 | 190 | 50 | 1.5 |

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.

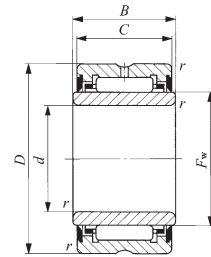
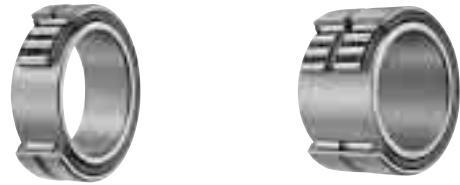
| Standard mounting dimension D_a Max. mm | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|---|---------------------------------------|--|--|
| 105 | 80 700 | 158 000 | 2 000 |
| 105 | 132 000 | 317 000 | 2 000 |
| 110 | 83 200 | 168 000 | 2 000 |
| 113.5 | 103 000 | 225 000 | 1 900 |
| 113.5 | 168 000 | 448 000 | 1 900 |
| 118.5 | 106 000 | 238 000 | 1 800 |
| 118.5 | 172 000 | 471 000 | 1 800 |
| 123.5 | 109 000 | 250 000 | 1 700 |
| 123.5 | 177 000 | 493 000 | 1 700 |
| 133.5 | 134 000 | 297 000 | 1 700 |
| 143.5 | 140 000 | 322 000 | 1 500 |
| 158.5 | 178 000 | 410 000 | 1 400 |
| 172 | 206 000 | 511 000 | 1 300 |
| 182 | 214 000 | 549 000 | 1 200 |

D

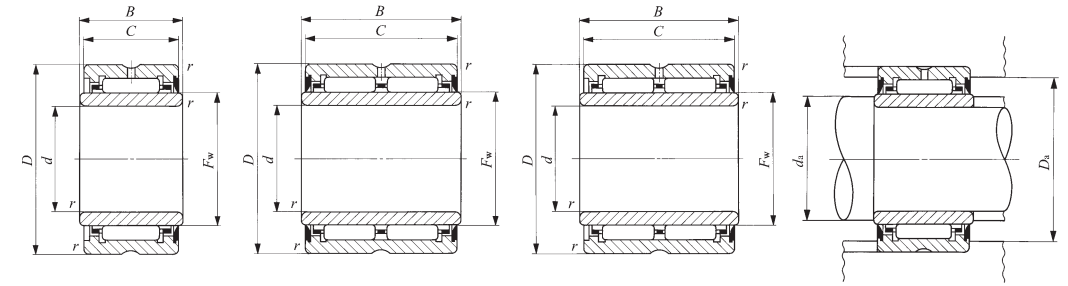
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring



NA49...UU
NA69...UU($d \leq 30$)



NA49...U
NA69...U($d \leq 30$) NA69...UU NA69...U

Shaft dia. 10 – 40mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|----------------|----------------|---------------|---------------------|---------------------------|----|----|----|
| | With two seals | With one seal | With two seals | With one seal | | d | D | C | B |
| 10 | NA 4900UU | NA 4900U | — | — | 24.5 | 10 | 22 | 13 | 14 |
| 12 | NA 4901UU — | NA 4901U — | — | — | 27.5 | 12 | 24 | 13 | 14 |
| | | | NA 6901UU | NA 6901U | 45.5 | 12 | 24 | 22 | 23 |
| 15 | NA 4902UU — | NA 4902U — | — | — | 36 | 15 | 28 | 13 | 14 |
| | | | NA 6902UU | NA 6902U | 62.5 | 15 | 28 | 23 | 24 |
| 17 | NA 4903UU — | NA 4903U — | — | — | 39.5 | 17 | 30 | 13 | 14 |
| | | | NA 6903UU | NA 6903U | 68.5 | 17 | 30 | 23 | 24 |
| 20 | NA 4904UU — | NA 4904U — | — | — | 78.5 | 20 | 37 | 17 | 18 |
| | | | NA 6904UU | NA 6904U | 137 | 20 | 37 | 30 | 31 |
| 22 | NA 49/22UU — | NA 49/22U — | — | — | 87.5 | 22 | 39 | 17 | 18 |
| | | | NA 69/22UU | NA 69/22U | 153 | 22 | 39 | 30 | 31 |
| 25 | NA 4905UU — | NA 4905U — | — | — | 92.5 | 25 | 42 | 17 | 18 |
| | | | NA 6905UU | NA 6905U | 162 | 25 | 42 | 30 | 31 |
| 28 | NA 49/28UU — | NA 49/28U — | — | — | 101 | 28 | 45 | 17 | 18 |
| | | | NA 69/28UU | NA 69/28U | 177 | 28 | 45 | 30 | 31 |
| 30 | NA 4906UU — | NA 4906U — | — | — | 106 | 30 | 47 | 17 | 18 |
| | | | NA 6906UU | NA 6906U | 185 | 30 | 47 | 30 | 31 |
| 32 | NA 49/32UU — | NA 49/32U — | — | — | 167 | 32 | 52 | 20 | 21 |
| | | | NA 69/32UU | NA 69/32U | 300 | 32 | 52 | 36 | 37 |
| 35 | NA 4907UU — | NA 4907U — | — | — | 179 | 35 | 55 | 20 | 21 |
| | | | NA 6907UU | NA 6907U | 320 | 35 | 55 | 36 | 37 |
| 40 | NA 4908UU — | NA 4908U — | — | — | 245 | 40 | 62 | 22 | 23 |
| | | | NA 6908UU | NA 6908U | 440 | 40 | 62 | 40 | 41 |

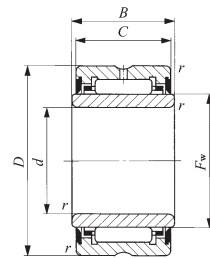
Notes⁽¹⁾ Minimum allowable value of chamfer dimension r
⁽²⁾ Allowable rotational speed applies to grease lubrication.

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.

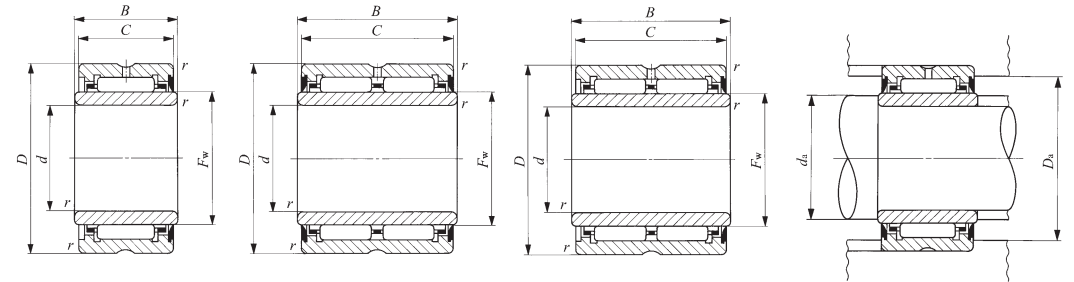
| $r_{s \min}$ ⁽¹⁾ | F_w | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|-----------------------------|-------|---------------------------------|------------|------------|---------------------------------------|--|--|----------------------|
| | | Min. d_a | Max. d_a | D_a Max. | | | | |
| 0.3 | 14 | 12 | 13 | 20 | 8 080 | 8 490 | 14 000 | LRTZ 101414 |
| 0.3 | 16 | 14 | 15 | 22 | 8 470 | 9 320 | 12 000 | LRTZ 121614 |
| | | | | | | | | |
| 0.3 | 20 | 17 | 19 | 26 | 9 570 | 11 600 | 9 500 | LRTZ 152014 |
| | | | | | | | | |
| 0.3 | 22 | 19 | 21 | 28 | 10 300 | 13 100 | 8 500 | LRTZ 172214 |
| | | | | | | | | |
| 0.3 | 25 | 22 | 24 | 35 | 18 000 | 20 500 | 7 500 | LRTZ 202518 |
| | | | | | | | | |
| 0.3 | 28 | 24 | 27 | 37 | 18 300 | 23 700 | 7 000 | LRTZ 222818 |
| | | | | | | | | |
| 0.3 | 30 | 27 | 29 | 40 | 20 300 | 25 100 | 6 500 | LRTZ 253018 |
| | | | | | | | | |
| 0.3 | 32 | 30 | 31 | 43 | 21 000 | 26 800 | 6 000 | LRTZ 283218 |
| | | | | | | | | |
| 0.3 | 35 | 32 | 34 | 45 | 21 500 | 28 400 | 5 500 | LRTZ 303518 |
| | | | | | | | | |
| 0.6 | 40 | 36 | 39 | 48 | 29 400 | 44 200 | 5 000 | LRTZ 324021 |
| | | | | | | | | |
| 0.6 | 42 | 39 | 41 | 51 | 30 100 | 46 300 | 4 500 | LRTZ 354221 |
| | | | | | | | | |
| 0.6 | 48 | 44 | 47 | 58 | 37 200 | 58 400 | 4 000 | LRTZ 404823 |
| | | | | | | | | |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring



NA49...UU



NA49...U

NA69...UU

NA69...U

Shaft dia. 45 – 110mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|---------------|----------------|---------------|------------------|------------------------|-----|----|----|
| | With two seals | With one seal | With two seals | With one seal | | 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 |

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.

| $r_{s \min}^{(1)}$ | F_w | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring | |
|--------------------|-------|---------------------------------|------------|------------|-------------------------------------|--|--|----------------------|----------|
| | | Min. d_a | Max. d_a | Max. D_a | | | | | |
| 0.6 | 52 | 49 | 51 | 64 | 38 900 | 63 400 | 3 500 | LRTZ | 455223 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 125 | 116.5 | 123 | 143.5 | 140 000 | 322 000 | 1 500 | LRTZ | 11012541 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring

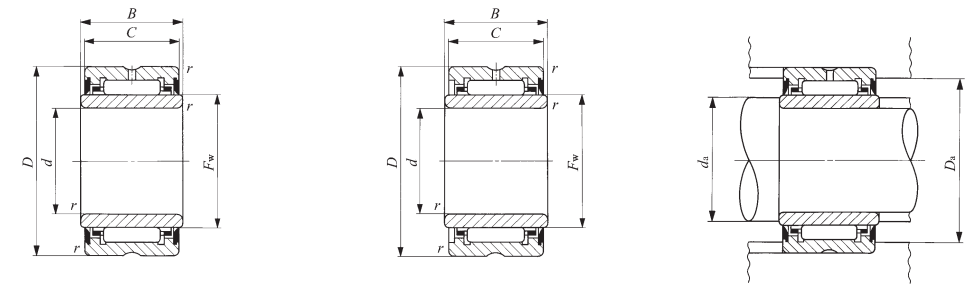


Shaft dia. 120 – 140mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | |
|------------------|-----------------------|---------------|----------------|---------------|------------------|---------------------------|----------|----------|----------|
| | With two seals | With one seal | With two seals | With one seal | | <i>d</i> | <i>D</i> | <i>C</i> | <i>B</i> |
| 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 |

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.



NA49...UU

NA49...U

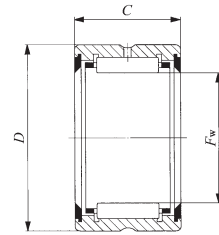
| <i>F_s</i> min ⁽¹⁾ | <i>F_w</i> | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|---|----------------------|------------------------------------|---------------------------|---------------------------|--|---|--|----------------------|
| | | Min. <i>d_a</i> | Max. <i>d_a</i> | <i>D_a</i> Max. | | | | |
| 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 |

D

NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series



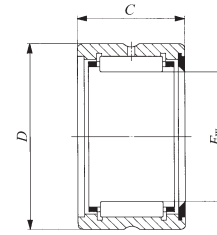
BR...UU

Shaft dia. 15.875 – 50.800mm

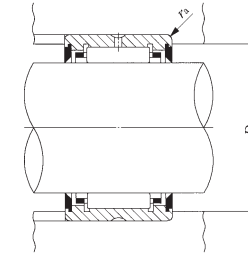
| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|------------------------------|-----------------------|---------------|---------------------|------------------------------|----------------------------|---------------------------|
| | With two seals | With one seal | | F_w | D | C |
| 15.875 ($\frac{5}{8}$) | BR 101816 UU | BR 101816 U | 54 | 15.875 ($\frac{5}{8}$) | 28.575 ($1\frac{1}{8}$) | 25.400 (1) |
| 19.050 ($\frac{3}{4}$) | BR 122016 UU | BR 122016 U | 68 | 19.050 ($\frac{3}{4}$) | 31.750 ($1\frac{1}{4}$) | 25.400 (1) |
| 22.225 ($\frac{7}{8}$) | BR 142216 UU | BR 142216 U | 76 | 22.225 ($\frac{7}{8}$) | 34.925 ($1\frac{3}{8}$) | 25.400 (1) |
| 25.400 (1) | BR 162416 UU | BR 162416 U | 83 | 25.400 (1) | 38.100 ($1\frac{1}{2}$) | 25.400 (1) |
| 28.575 ($1\frac{1}{8}$) | BR 182620 UU | BR 182620 U | 115 | 28.575 ($1\frac{1}{8}$) | 41.275 ($1\frac{5}{8}$) | 31.750 ($1\frac{1}{4}$) |
| 31.750 ($1\frac{1}{4}$) | BR 202820 UU | BR 202820 U | 124 | 31.750 ($1\frac{1}{4}$) | 44.450 ($1\frac{3}{4}$) | 31.750 ($1\frac{1}{4}$) |
| 34.925 ($1\frac{3}{8}$) | BR 223020 UU | BR 223020 U | 134 | 34.925 ($1\frac{3}{8}$) | 47.625 ($1\frac{7}{8}$) | 31.750 ($1\frac{1}{4}$) |
| 38.100 ($1\frac{1}{2}$) | BR 243320 UU | BR 243320 U | 168 | 38.100 ($1\frac{1}{2}$) | 52.388 ($2\frac{1}{16}$) | 31.750 ($1\frac{1}{4}$) |
| 41.275 ($1\frac{5}{8}$) | BR 263520 UU | BR 263520 U | 179 | 41.275 ($1\frac{5}{8}$) | 55.562 ($2\frac{3}{16}$) | 31.750 ($1\frac{1}{4}$) |
| 44.450 ($1\frac{3}{4}$) | BR 283720 UU | BR 283720 U | 193 | 44.450 ($1\frac{3}{4}$) | 58.738 ($2\frac{5}{16}$) | 31.750 ($1\frac{1}{4}$) |
| 47.625 ($1\frac{7}{8}$) | BR 303920 UU | BR 303920 U | 202 | 47.625 ($1\frac{7}{8}$) | 61.912 ($2\frac{7}{16}$) | 31.750 ($1\frac{1}{4}$) |
| 50.800 (2) | BR 324120 UU | BR 324120 U | 216 | 50.800 (2) | 65.088 ($2\frac{9}{16}$) | 31.750 ($1\frac{1}{4}$) |

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.



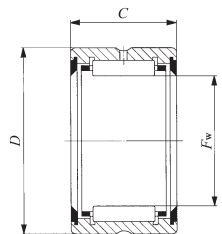
BR...U



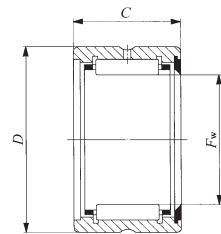
| Standard mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|---------------------------------|---------------------|---------------------------------------|--|--|
| D_a Max. | $r_{as\ max}^{(1)}$ | | | |
| 24.5 | 0.6 | 18 300 | 20 000 | 12 000 |
| 26.5 | 1.0 | 20 700 | 24 400 | 10 000 |
| 29.7 | 1.0 | 21 600 | 26 900 | 9 000 |
| 32.9 | 1.0 | 23 600 | 31 300 | 8 000 |
| 36.0 | 1.0 | 34 900 | 49 900 | 7 000 |
| 39.2 | 1.0 | 36 000 | 53 500 | 6 500 |
| 42.4 | 1.0 | 38 500 | 60 000 | 5 500 |
| 45.1 | 1.5 | 43 700 | 66 900 | 5 500 |
| 48.3 | 1.5 | 44 800 | 70 900 | 4 500 |
| 51.5 | 1.5 | 47 500 | 78 200 | 4 500 |
| 54.7 | 1.5 | 48 500 | 82 100 | 4 000 |
| 57.8 | 1.5 | 51 000 | 89 400 | 4 000 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

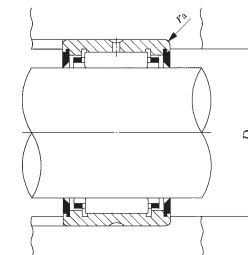
With Seal, Without Inner Ring, Inch Series



BR...UU



BR...U



Shaft dia. 57.150 – 95.250mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|-----------------|----------------|
| | With two seals | With one seal | | F_w | D | C |
| 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) |
| 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) |
| 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) |
| 76.200 (3) | BR 486028 UU | BR 486028 U | 585 | 76.200 (3) | 95.250 (3 3/4) | 44.450 (1 3/4) |
| 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) |
| 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) |
| 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) |

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

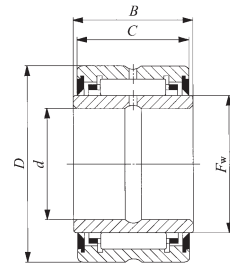
Remarks1. The outer ring has an oil groove and an oil hole.
 2. Bearings with seals on both sides are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

| Standard mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|---------------------------------|---------------------|---------------------------------------|--|--|
| D_a Max. | $r_{as\ max}^{(1)}$ | | | |
| 69.0 | 1.5 | 90 300 | 158 000 | 3 500 |
| 74.3 | 2.0 | 94 600 | 174 000 | 3 000 |
| 80.7 | 2.0 | 98 700 | 189 000 | 2 500 |
| 87.0 | 2.0 | 105 000 | 211 000 | 2 500 |
| 99.7 | 2.0 | 109 000 | 227 000 | 2 500 |
| 106.1 | 2.0 | 142 000 | 265 000 | 2 000 |
| 111.4 | 2.5 | 148 000 | 287 000 | 2 000 |

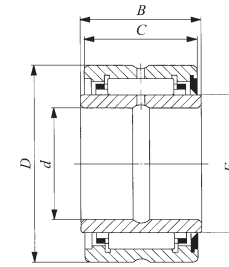
D
NA
TAFI
TRI
BRI

MACHINED TYPE NEEDLE ROLLER BEARINGS

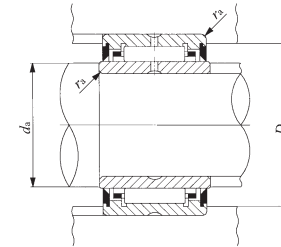
With Seal, With Inner Ring, Inch Series



BRI...UU



BRI...U



Shaft dia. 9.525 – 44.450mm

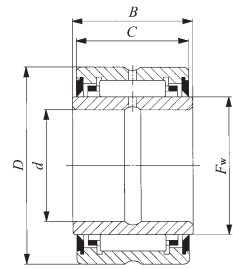
| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|-------------------|------------------|--------|
| | With two seals | With one seal | | d | D | C | B |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| | BRI 243920 UU | BRI 243920 U | 362 | 38.100 (1 1/2) | 61.912 (2 7/16) | 31.750 (1 1/4) | 32.000 |
| 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 |
| 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 |

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.

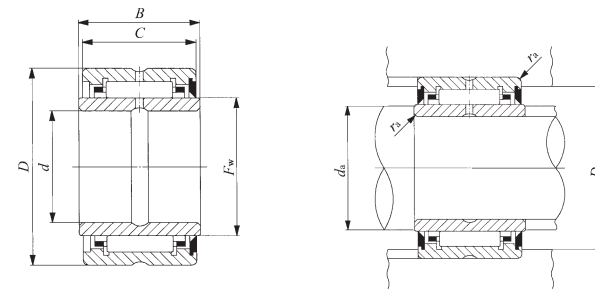
| F _w | Standard mounting dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|------------------|---------------------------------|---------------------|---------------------|------------------------------------|-------------------------------|---|---|----------------------|
| | d _a Min. | d _a Max. | D _a Max. | r _{as max} ⁽¹⁾ | | | | |
| 15.875 (5/8) | 14 | 14.5 | 24.5 | 0.6 | 18 300 | 20 000 | 12 000 | LRBZ 61016 B |
| 19.050 (3/4) | 17.5 | 18 | 26.5 | 0.6 | 20 700 | 24 400 | 10 000 | LRBZ 81216 B |
| 22.225 (7/8) | 21 | 21.2 | 29.7 | 0.6 | 21 600 | 26 900 | 9 000 | LRBZ 101416 B |
| 25.400 (1) | 24 | 24.4 | 32.9 | 0.6 | 23 600 | 31 300 | 8 000 | LRBZ 121616 B |
| 28.575 (1 1/8) | 27 | 27.5 | 36.0 | 0.6 | 34 900 | 49 900 | 7 000 | LRBZ 141820 B |
| 31.750 (1 1/4) | 30.5 | 30.7 | 39.2 | 0.6 | 36 000 | 53 500 | 6 500 | LRBZ 162020 B |
| 34.925 (1 3/8) | 33.5 | 33.9 | 42.4 | 0.6 | 38 500 | 60 000 | 5 500 | LRBZ 182220 B |
| 38.100 (1 1/2) | 37 | 37.1 | 45.1 | 0.6 | 43 700 | 66 900 | 5 500 | LRBZ 202420 B |
| 41.275 (1 5/8) | 40.2 | 40.2 | 48.3 | 0.6 | 44 800 | 70 900 | 4 500 | LRBZ 222620 B |
| 44.450 (1 3/4) | 43.3 | 43.4 | 51.5 | 0.6 | 47 500 | 78 200 | 4 500 | LRBZ 242820 B |
| 47.625 (1 7/8) | 43.3 | 45 | 54.7 | 1 | 48 500 | 82 100 | 4 000 | LRBZ 243020 B |
| 50.800 (2) | 48 | 49 | 57.8 | 1 | 51 000 | 89 400 | 4 000 | LRBZ 263220 B |
| 57.150 (2 1/4) | 52.5 | 55 | 69.0 | 1.5 | 90 300 | 158 000 | 3 500 | LRBZ 283628 B |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



BRI...UU



BRI...U

Shaft dia. 50.800 – 82.550mm

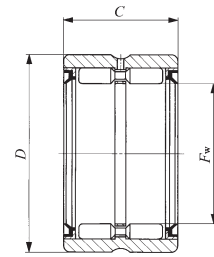
| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|-----------------|----------------|----------|
| | With two seals | With one seal | | <i>d</i> | <i>D</i> | <i>C</i> | <i>B</i> |
| 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 |

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.

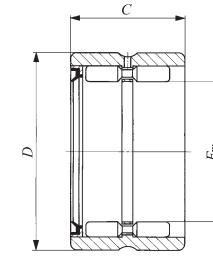
| <i>F_w</i> | Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|----------------------|---------------------------------|------------------------------|------------------------------|--|--|---|--|----------------------|
| | <i>d_a</i> Min. | <i>d_a</i> Max. | <i>D_a</i> Max. | <i>r_{as max}</i> ⁽¹⁾ | | | | |
| 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 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

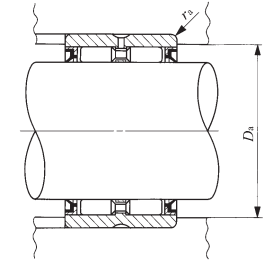
With Seal, Without Inner Ring, Inch Series



GBR...UU



GBR...U



Shaft dia. 15.875 – 50.800mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|-----------------|----------------|
| | With two seals | With one seal | | F_w | D | C |
| 15.875 (5/8) | GBR 101816 UU | GBR 101816 U | 69.5 | 15.875 (5/8) | 28.575 (1 1/8) | 25.400 (1) |
| 19.050 (3/4) | GBR 122016 UU | GBR 122016 U | 79 | 19.050 (3/4) | 31.750 (1 1/4) | 25.400 (1) |
| 22.225 (7/8) | GBR 142216 UU | GBR 142216 U | 89.5 | 22.225 (7/8) | 34.925 (1 3/8) | 25.400 (1) |
| 25.400 (1) | GBR 162416 UU | GBR 162416 U | 99 | 25.400 (1) | 38.100 (1 1/2) | 25.400 (1) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 44.450 (1 3/4) | GBR 283720 UU | GBR 283720 U | 230 | 44.450 (1 3/4) | 58.738 (2 3/16) | 31.750 (1 1/4) |
| 47.625 (1 7/8) | GBR 303920 UU | GBR 303920 U | 240 | 47.625 (1 7/8) | 61.912 (2 3/16) | 31.750 (1 1/4) |
| 50.800 (2) | GBR 324120 UU | GBR 324120 U | 255 | 50.800 (2) | 65.088 (2 3/16) | 31.750 (1 1/4) |

Notes(1) Maximum permissible corner radius of the shaft or housing

(2) Allowable rotational speed applies to grease lubrication.

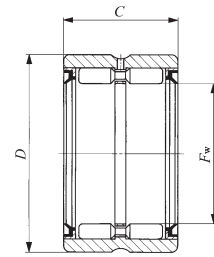
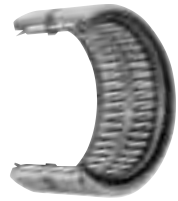
Remarks1. The outer ring has an oil groove and an oil hole.

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.

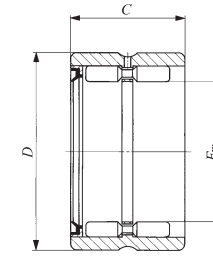
| Standard mounting dimensions mm | | Basic dynamic load rating C | Basic static load rating C_0 | Allowable rotational speed(2) |
|---------------------------------|------------------|-------------------------------|--------------------------------|-------------------------------|
| D_a Max. | r_{as} max (1) | | | |
| 24.5 | 0.6 | 23 500 | 28 500 | 5 000 |
| 27 | 0.6 | 26 400 | 34 500 | 4 000 |
| 30 | 0.6 | 28 600 | 40 100 | 3 500 |
| 33.3 | 0.6 | 31 000 | 46 100 | 3 000 |
| 36.3 | 0.6 | 43 900 | 75 300 | 3 000 |
| 39.6 | 0.6 | 46 600 | 83 900 | 2 500 |
| 42.8 | 0.6 | 49 500 | 91 800 | 2 500 |
| 47.3 | 0.6 | 54 200 | 97 700 | 2 000 |
| 50.5 | 0.6 | 56 600 | 105 000 | 1 900 |
| 53.7 | 0.6 | 58 900 | 114 000 | 1 800 |
| 56.2 | 1 | 61 100 | 121 000 | 1 700 |
| 59.2 | 1 | 63 100 | 130 000 | 1 600 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

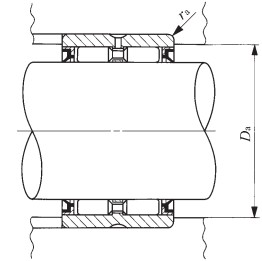
With Seal, Without Inner Ring, Inch Series



GBR...UU



GBR...U



Shaft dia. 57.150 – 107.950mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|----------------|---------------|
| | With two seals | With one seal | | F_w | D | C |
| 57.150 (2 1/4) | GBR 364828 UU | GBR 364828 U | 515 | 57.150(2 1/4) | 76.200(3) | 44.450(1 3/4) |
| 63.500 (2 1/2) | GBR 405228 UU | GBR 405228 U | 560 | 63.500(2 1/2) | 82.550(3 1/4) | 44.450(1 3/4) |
| 69.850 (2 3/4) | GBR 445628 UU | GBR 445628 U | 610 | 69.850(2 3/4) | 88.900(3 1/2) | 44.450(1 3/4) |
| 76.200 (3) | GBR 486028 UU | GBR 486028 U | 660 | 76.200(3) | 95.250(3 3/4) | 44.450(1 3/4) |
| 82.550 (3 1/4) | GBR 526828 UU | GBR 526828 U | 960 | 82.550(3 1/4) | 107.950(4 1/4) | 44.450(1 3/4) |
| 88.900 (3 1/2) | GBR 567232 UU | GBR 567232 U | 1 240 | 88.900(3 1/2) | 114.300(4 1/2) | 50.800(2) |
| 95.250 (3 3/4) | GBR 607632 UU | GBR 607632 U | 1 320 | 95.250(3 3/4) | 120.650(4 3/4) | 50.800(2) |
| 101.600 (4) | GBR 648032 UU | GBR 648032 U | 1 380 | 101.600(4) | 127.000(5) | 50.800(2) |
| 107.950 (4 1/4) | GBR 688432 UU | GBR 688432 U | 1 460 | 107.950(4 1/4) | 133.350(5 1/4) | 50.800(2) |

Notes(1) Maximum permissible corner radius of the shaft or housing

(2) Allowable rotational speed applies to grease lubrication.

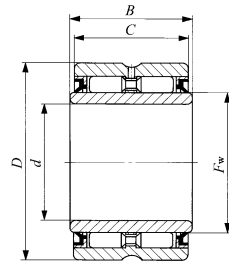
Remarks1. The outer ring has an oil groove and an oil hole.

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.

| Standard mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed(2) rpm |
|---------------------------------|---------------------|---------------------------------------|--|--------------------------------------|
| D_a Max. | $r_{as\ max}^{(1)}$ | | | |
| 69.2 | 1.5 | 87 500 | 161 000 | 1 400 |
| 75.7 | 1.5 | 93 300 | 179 000 | 1 300 |
| 82 | 1.5 | 97 200 | 197 000 | 1 100 |
| 88 | 1.5 | 101 000 | 215 000 | 1 100 |
| 99.9 | 1.5 | 127 000 | 231 000 | 950 |
| 106.3 | 1.5 | 170 000 | 347 000 | 900 |
| 112.6 | 1.5 | 175 000 | 371 000 | 850 |
| 119 | 1.5 | 182 000 | 395 000 | 800 |
| 125.3 | 1.5 | 186 000 | 419 000 | 750 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



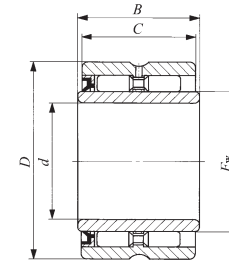
GBRI...UU

Shaft dia. 9.525 – 44.450mm

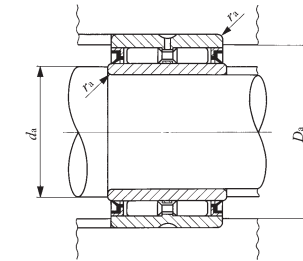
| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|----------------------------|----------------------------------|--------------------------------|---------------------|----------------------------------|------------------------------------|----------------------------------|
| | With two seals | With one seal | | <i>d</i> | <i>D</i> | <i>C</i> |
| 9.525 (3/8) | GBRI 61816 UU | GBRI 61816 U | 94.5 | 9.525 (3/8) | 28.575 (1 1/8) | 25.400 (1) |
| 12.700 (1/2) | GBRI 82016 UU | GBRI 82016 U | 110 | 12.700 (1/2) | 31.750 (1 1/4) | 25.400 (1) |
| 15.875 (5/8) | GBRI 102216 UU | GBRI 102216 U | 127 | 15.875 (5/8) | 34.925 (1 3/8) | 25.400 (1) |
| 19.050 (3/4) | GBRI 122416 UU | GBRI 122416 U | 143 | 19.050 (3/4) | 38.100 (1 1/2) | 25.400 (1) |
| 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) |
| 25.400 (1) | GBRI 162820 UU | GBRI 162820 U | 220 | 25.400 (1) | 44.450 (1 3/4) | 31.750 (1 1/4) |
| 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) |
| 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) |
| 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) |
| 38.100 (1 1/2) | GBRI 243720 UU GBRI 243920 UU | GBRI 243720 U GBRI 243920 U | 330 400 | 38.100 (1 1/2) 38.100 (1 1/2) | 58.738 (2 3/16) 61.912 (2 7/16) | 31.750 (1 1/4) 31.750 (1 1/4) |
| 41.275 (1 5/8) | GBRI 264120 UU | GBRI 264120 U | 425 | 41.275 (1 5/8) | 65.088 (2 5/16) | 31.750 (1 1/4) |
| 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) |

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.



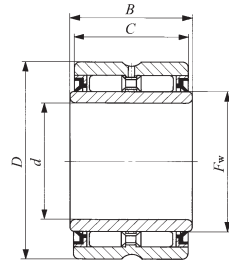
GBRI...U



| <i>B</i> | <i>F_w</i> | Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed(2) rpm | Assembled inner ring |
|----------|----------------------|---------------------------------|---------------------------|---------------------------|--|---|--|--------------------------------------|----------------------|
| | | Min. <i>d_a</i> | Max. <i>d_a</i> | Max. <i>D_a</i> | <i>r_{as max}</i> ⁽¹⁾ | | | | |
| 25.650 | 15.875 (5/8) | 14 | 14.5 | 24.5 | 0.6 | 23 500 | 28 500 | 5 000 | LRBZ 61016 |
| 25.650 | 19.050 (3/4) | 17.5 | 18 | 27 | 0.6 | 26 400 | 34 500 | 4 000 | LRBZ 81216 |
| 25.650 | 22.225 (7/8) | 21 | 21.2 | 30 | 0.6 | 28 600 | 40 100 | 3 500 | LRBZ 101416 |
| 25.650 | 25.400 (1) | 24 | 24.4 | 33.3 | 0.6 | 31 000 | 46 100 | 3 000 | LRBZ 121616 |
| 32.000 | 28.575 (1 1/8) | 27 | 27.5 | 36.3 | 0.6 | 43 900 | 75 300 | 3 000 | LRBZ 141820 |
| 32.000 | 31.750 (1 1/4) | 30.5 | 30.7 | 39.6 | 0.6 | 46 600 | 83 900 | 2 500 | LRBZ 162020 |
| 32.000 | 34.925 (1 3/8) | 33.5 | 33.9 | 42.8 | 0.6 | 49 500 | 91 800 | 2 500 | LRBZ 182220 |
| 32.000 | 38.100 (1 1/2) | 37 | 37.1 | 47.3 | 0.6 | 54 200 | 97 700 | 2 000 | LRBZ 202420 |
| 32.000 | 41.275 (1 5/8) | 40.2 | 40.2 | 50.5 | 0.6 | 56 600 | 105 000 | 1 900 | LRBZ 222620 |
| 32.000 | 44.450 (1 3/4) | 43.3 | 43.4 | 53.7 | 0.6 | 58 900 | 114 000 | 1 800 | LRBZ 242820 |
| 32.000 | 47.625 (1 7/8) | 43.3 | 45 | 56.2 | 1 | 61 100 | 121 000 | 1 700 | LRBZ 243020 |
| 32.000 | 50.800 (2) | 48 | 49 | 59.2 | 1 | 63 100 | 130 000 | 1 600 | LRBZ 263220 |
| 44.700 | 57.150 (2 1/4) | 52.5 | 55 | 69.2 | 1.5 | 87 500 | 161 000 | 1 400 | LRBZ 283628 |

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



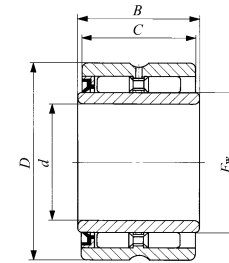
GBRI...UU

Shaft dia. 50.800 – 95.250mm

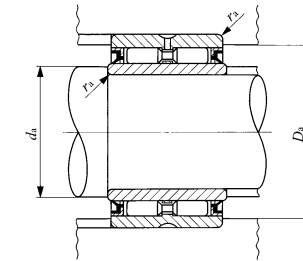
| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | |
|----------------------------|-----------------------|---------------|---------------------|------------------------------|----------------|---------------|
| | With two seals | With one seal | | <i>d</i> | <i>D</i> | <i>C</i> |
| 50.800 (2) | GBRI 325228 UU | GBRI 325228 U | 950 | 50.800(2) | 82.550(3 1/4) | 44.450(1 3/4) |
| 57.150 (2 1/4) | GBRI 365628 UU | GBRI 365628 U | 1 050 | 57.150(2 1/4) | 88.900(3 1/2) | 44.450(1 3/4) |
| 63.500 (2 1/2) | GBRI 406028 UU | GBRI 406028 U | 1 140 | 63.500(2 1/2) | 95.250(3 3/4) | 44.450(1 3/4) |
| 69.850 (2 3/4) | GBRI 446828 UU | GBRI 446828 U | 1 490 | 69.850(2 3/4) | 107.950(4 1/4) | 44.450(1 3/4) |
| 76.200 (3) | GBRI 487232 UU | GBRI 487232 U | 1 880 | 76.200(3) | 114.300(4 1/2) | 50.800(2) |
| 82.550 (3 1/4) | GBRI 527632 UU | GBRI 527632 U | 2 010 | 82.550(3 1/4) | 120.650(4 3/4) | 50.800(2) |
| 88.900 (3 1/2) | GBRI 568032 UU | GBRI 568032 U | 2 130 | 88.900(3 1/2) | 127.000(5) | 50.800(2) |
| 95.250 (3 3/4) | GBRI 608432 UU | GBRI 608432 U | 2 260 | 95.250(3 3/4) | 133.350(5 1/4) | 50.800(2) |

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.



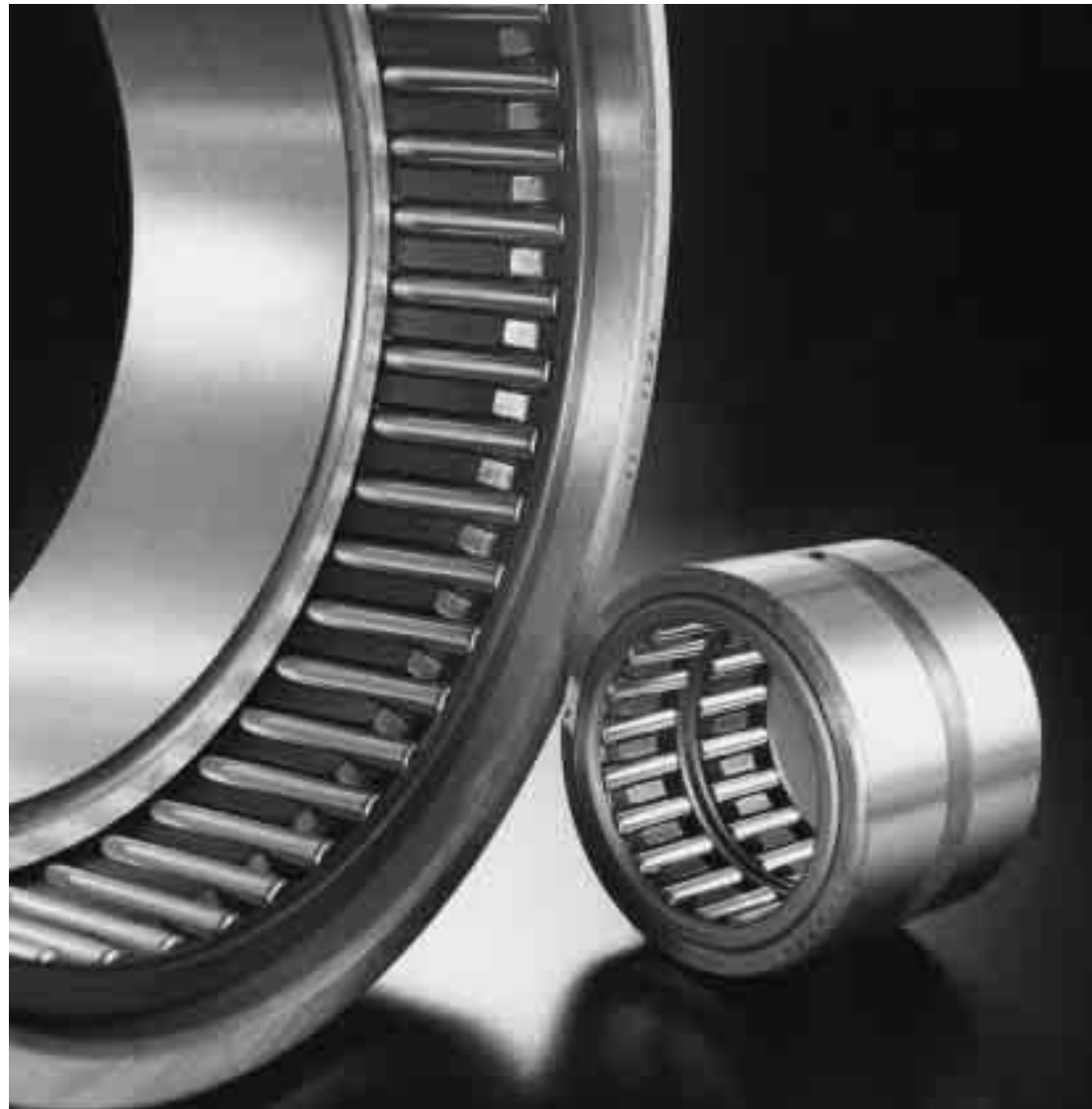
GBRI...U



| <i>B</i> | <i>F_w</i> | Standard mounting dimensions mm | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|----------|----------------------|---------------------------------|------------------------------|------------------------------|--|--|---|--|----------------------|
| | | <i>d_a</i> Min. | <i>d_a</i> Max. | <i>D_a</i> Max. | <i>r_{as max}</i> ⁽¹⁾ | | | | |
| 44.700 | 63.500(2 1/2) | 58 | 61 | 75.7 | 1.5 | 93 300 | 179 000 | 1 300 | LRBZ 324028 |
| 44.700 | 69.850(2 3/4) | 65 | 67 | 82 | 1.5 | 97 200 | 197 000 | 1 100 | LRBZ 364428 |
| 44.700 | 76.200(3) | 71 | 73 | 88 | 1.5 | 101 000 | 215 000 | 1 100 | LRBZ 404828 |
| 44.700 | 82.550(3 1/4) | 77 | 79 | 99.9 | 1.5 | 127 000 | 231 000 | 950 | LRBZ 445228 |
| 51.050 | 88.900(3 1/2) | 83.5 | 86 | 106.3 | 1.5 | 170 000 | 347 000 | 900 | LRBZ 485632 |
| 51.050 | 95.250(3 3/4) | 91 | 93 | 112.6 | 1.5 | 175 000 | 371 000 | 850 | LRBZ 526032 |
| 51.050 | 101.600(4) | 97 | 99 | 119 | 1.5 | 182 000 | 395 000 | 800 | LRBZ 566432 |
| 51.050 | 107.950(4 1/4) | 103 | 105 | 125.3 | 1.5 | 186 000 | 419 000 | 750 | LRBZ 606832 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

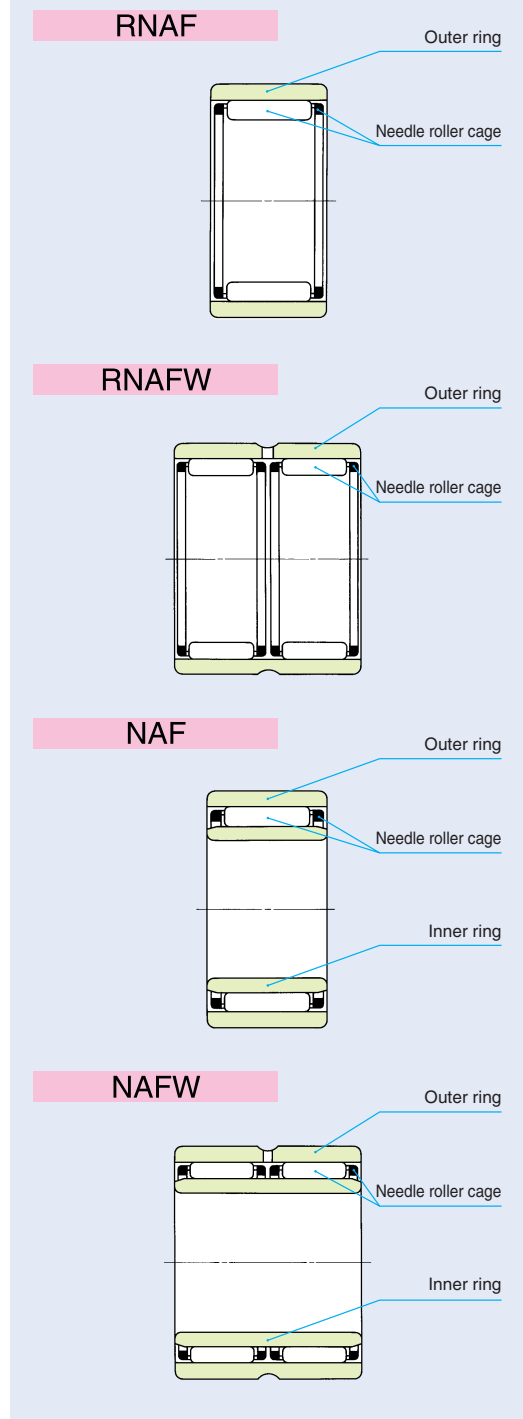
- Needle Roller Bearings with Separable Cage - Without Inner Ring
- Needle Roller Bearings with Separable Cage - With Inner Ring



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

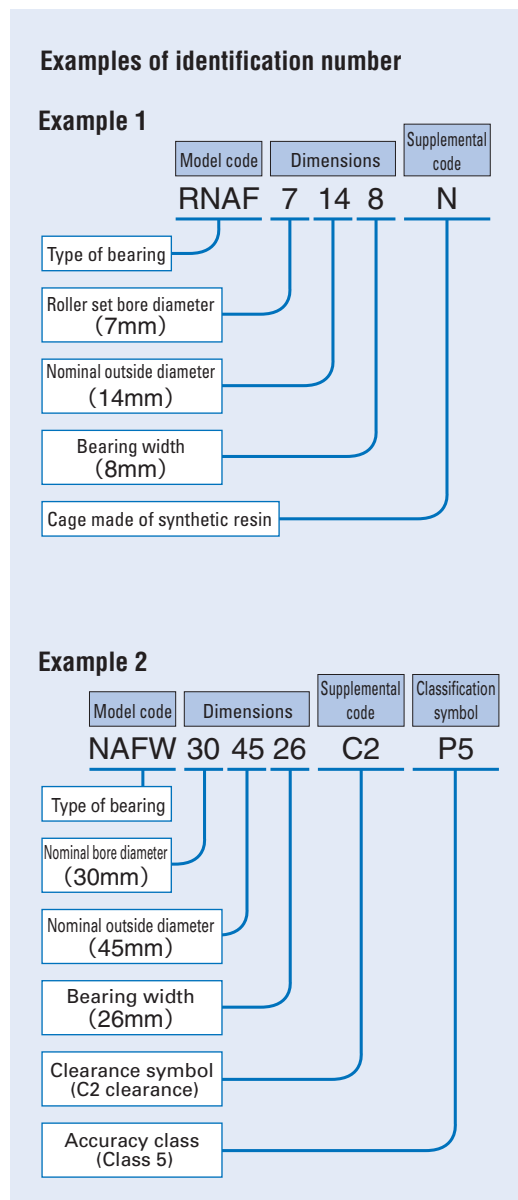
The single-row as well as the double-row types are available with the same sectional height, and either of them can be selected according to load conditions. As shown in the section, "Design of shaft and housing" on page A44, any desired radial internal clearance can be selected by combining a shaft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



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.

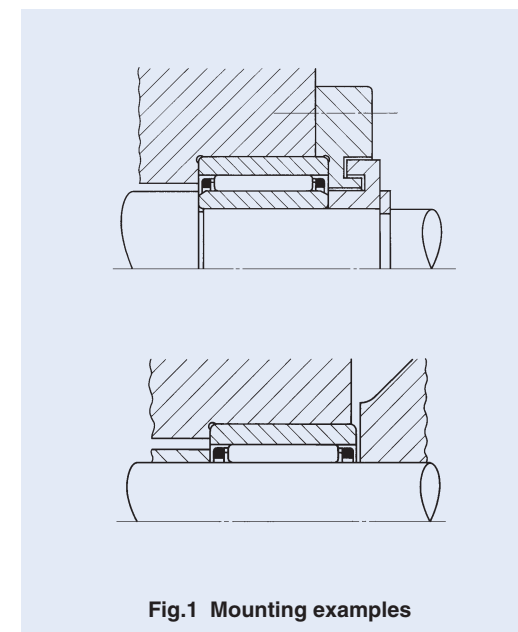


Fig.1 Mounting examples

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

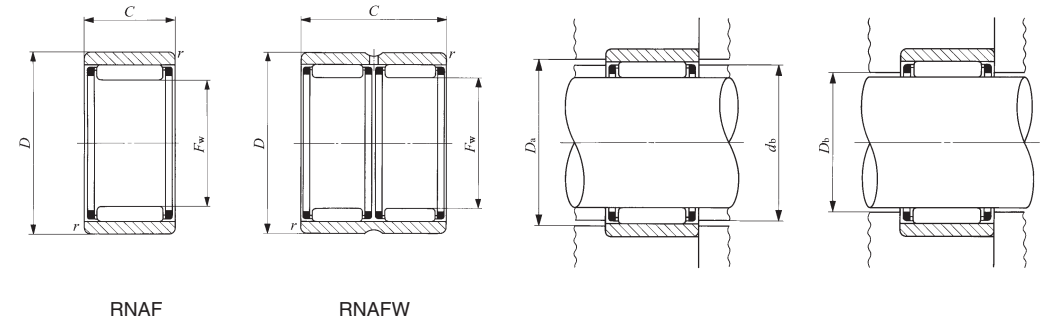
Without Inner Ring



Shaft dia. 5 – 18mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N |
|------------------|-----------------------|------------------|------------------------|----------|----------|--|---------------------------------|----------------------------|-----------------------|--|--|
| | | | <i>F</i> _w | <i>D</i> | <i>C</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>d</i> _b | <i>D</i> _a Max. | <i>D</i> _b | | |
| 5 | RNAF 5108N | 2.8 | 5 | 10 | 8 | 0.2 | 6.7 | 8.4 | 5.4 | 2 420 | 1 950 |
| 6 | RNAF 6138N | 5.5 | 6 | 13 | 8 | 0.3 | 8.4 | 11 | 6.4 | 2 700 | 2 320 |
| 7 | RNAF 7148N | 6.1 | 7 | 14 | 8 | 0.3 | 9.4 | 12 | 7.4 | 2 960 | 2 690 |
| 8 | RNAF 81510 | 8.2 | 8 | 15 | 10 | 0.3 | 10.4 | 13 | 8.4 | 3 630 | 3 600 |
| | RNAFW 81620 | 20.5 | 8 | 16 | 20 | 0.3 | 10.8 | 14 | 8.4 | 6 220 | 7 200 |
| 10 | RNAF 101710 | 9.6 | 10 | 17 | 10 | 0.3 | 12.4 | 15 | 10.4 | 4 160 | 4 550 |
| | RNAF 102012 | 18.7 | 10 | 20 | 12 | 0.3 | 13.5 | 18 | 10.4 | 5 940 | 6 000 |
| 12 | RNAF 122212 | 19.5 | 12 | 22 | 12 | 0.3 | 15.5 | 20 | 12.4 | 9 030 | 8 460 |
| 14 | RNAF 142213 | 18.7 | 14 | 22 | 13 | 0.3 | 17.6 | 20 | 14.6 | 7 860 | 9 410 |
| | RNAFW 142220 | 28.5 | 14 | 22 | 20 | 0.3 | 17.6 | 20 | 14.6 | 10 800 | 14 200 |
| | RNAF 142612 | 29 | 14 | 26 | 12 | 0.3 | 19.4 | 24 | 14.6 | 9 790 | 9 680 |
| 15 | RNAF 152313 | 19.7 | 15 | 23 | 13 | 0.3 | 18.6 | 21 | 15.6 | 8 250 | 10 200 |
| | RNAFW 152320 | 30.5 | 15 | 23 | 20 | 0.3 | 18.6 | 21 | 15.6 | 11 400 | 15 400 |
| 16 | RNAF 162413 | 21 | 16 | 24 | 13 | 0.3 | 19.6 | 22 | 16.6 | 8 620 | 11 000 |
| | RNAFW 162420 | 32 | 16 | 24 | 20 | 0.3 | 19.6 | 22 | 16.6 | 11 900 | 16 700 |
| | RNAF 162812 | 31.5 | 16 | 28 | 12 | 0.3 | 21.4 | 26 | 16.6 | 10 500 | 10 900 |
| 17 | RNAF 172513 | 22 | 17 | 25 | 13 | 0.3 | 20.6 | 23 | 17.6 | 8 980 | 11 800 |
| | RNAFW 172520 | 33.5 | 17 | 25 | 20 | 0.3 | 20.6 | 23 | 17.6 | 12 400 | 17 900 |
| 18 | RNAF 182613 | 23 | 18 | 26 | 13 | 0.3 | 21.6 | 24 | 18.6 | 9 330 | 12 700 |
| | RNAFW 182620 | 35 | 18 | 26 | 20 | 0.3 | 21.6 | 24 | 18.6 | 12 900 | 19 100 |
| | RNAF 183012 | 34.5 | 18 | 30 | 12 | 0.3 | 23.4 | 28 | 18.6 | 11 800 | 13 100 |
| | RNAFW 183024 | 69.5 | 18 | 30 | 24 | 0.3 | 23.4 | 28 | 18.6 | 20 200 | 26 200 |

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.



| Allowable rotational speed ⁽²⁾ rpm |
|--|
| 85 000 |
| 75 000 |
| 65 000 |
| 60 000 |
| 60 000 |
| 50 000 |
| 50 000 |
| 40 000 |
| 35 000 |
| 35 000 |
| 35 000 |
| 35 000 |
| 35 000 |
| 35 000 |
| 30 000 |
| 30 000 |
| 30 000 |
| 30 000 |
| 30 000 |
| 30 000 |
| 30 000 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

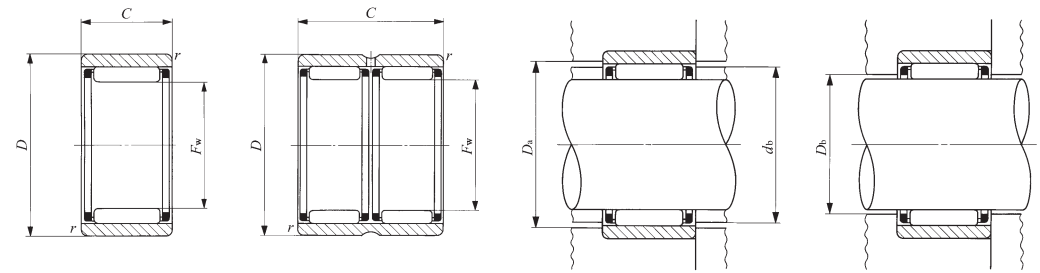
Without Inner Ring



Shaft dia. 20 – 40mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimensions mm | | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|------------------|------------------------|----|----|-----------------------------------|---------------------------------|------------------------|----------------|-------------------------------------|---|
| | | | F _w | D | C | r _{s min} ⁽¹⁾ | d _b | D _a Max. | D _b | | |
| 20 | RNAF 202813 | 25 | 20 | 28 | 13 | 0.3 | 23.6 | 26 | 20.6 | 9 590 | 13 500 |
| | RNAFW 202826 | 49.5 | 20 | 28 | 26 | 0.3 | 23.6 | 26 | 20.6 | 16 400 | 27 100 |
| | RNAF 203212 | 37.5 | 20 | 32 | 12 | 0.3 | 25.4 | 30 | 20.6 | 12 400 | 14 300 |
| | RNAFW 203224 | 75 | 20 | 32 | 24 | 0.3 | 25.4 | 30 | 20.6 | 21 200 | 28 600 |
| 22 | RNAF 223013 | 27 | 22 | 30 | 13 | 0.3 | 25.6 | 28 | 22.6 | 10 200 | 15 200 |
| | RNAFW 223026 | 53.5 | 22 | 30 | 26 | 0.3 | 25.6 | 28 | 22.6 | 17 500 | 30 300 |
| | RNAF 223516 | 58.5 | 22 | 35 | 16 | 0.3 | 27.8 | 33 | 22.6 | 17 600 | 20 900 |
| | RNAFW 223532 | 117 | 22 | 35 | 32 | 0.3 | 27.8 | 33 | 22.6 | 30 200 | 41 800 |
| 25 | RNAF 253517 | 51 | 25 | 35 | 17 | 0.3 | 29.5 | 33 | 25.6 | 17 300 | 26 600 |
| | RNAFW 253526 | 78 | 25 | 35 | 26 | 0.3 | 29.5 | 33 | 25.6 | 22 400 | 37 200 |
| | RNAF 253716 | 57 | 25 | 37 | 16 | 0.3 | 30.4 | 35 | 25.6 | 19 400 | 24 500 |
| | RNAFW 253732 | 114 | 25 | 37 | 32 | 0.3 | 30.4 | 35 | 25.6 | 33 200 | 49 000 |
| 28 | RNAF 284016 | 62.5 | 28 | 40 | 16 | 0.3 | 33.4 | 38 | 28.6 | 20 100 | 26 500 |
| | RNAFW 284032 | 125 | 28 | 40 | 32 | 0.3 | 33.4 | 38 | 28.6 | 34 400 | 53 000 |
| 30 | RNAF 304017 | 59 | 30 | 40 | 17 | 0.3 | 34.5 | 38 | 30.6 | 18 700 | 31 100 |
| | RNAFW 304026 | 90.5 | 30 | 40 | 26 | 0.3 | 34.5 | 38 | 30.6 | 24 200 | 43 400 |
| | RNAF 304216 | 66 | 30 | 42 | 16 | 0.3 | 35.4 | 40 | 30.6 | 20 800 | 28 400 |
| | RNAFW 304232 | 132 | 30 | 42 | 32 | 0.3 | 35.4 | 40 | 30.6 | 35 700 | 56 800 |
| 35 | RNAF 354517 | 67.5 | 35 | 45 | 17 | 0.3 | 39.5 | 43 | 35.6 | 20 500 | 36 900 |
| | RNAFW 354526 | 103 | 35 | 45 | 26 | 0.3 | 39.5 | 43 | 35.6 | 26 600 | 51 500 |
| | RNAF 354716 | 75.5 | 35 | 47 | 16 | 0.3 | 40.4 | 45 | 35.6 | 23 100 | 33 900 |
| | RNAFW 354732 | 151 | 35 | 47 | 32 | 0.3 | 40.4 | 45 | 35.6 | 39 500 | 67 800 |
| 40 | RNAF 405017 | 76 | 40 | 50 | 17 | 0.3 | 43.5 | 48 | 40.8 | 22 200 | 42 700 |
| | RNAFW 405034 | 152 | 40 | 50 | 34 | 0.3 | 43.5 | 48 | 40.8 | 38 000 | 85 400 |
| | RNAF 405520 | 140 | 40 | 55 | 20 | 0.3 | 45.2 | 53 | 40.8 | 31 400 | 48 000 |
| | RNAFW 405540 | 280 | 40 | 55 | 40 | 0.3 | 45.2 | 53 | 40.8 | 53 900 | 96 000 |

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.
 Remarks 1. 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.



RNAF

RNAFW

| Allowable rotational speed ⁽²⁾ rpm |
|--|
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 25 000 |
| 20 000 |
| 20 000 |
| 20 000 |
| 20 000 |
| 18 000 |
| 18 000 |
| 17 000 |
| 17 000 |
| 17 000 |
| 17 000 |
| 14 000 |
| 14 000 |
| 14 000 |
| 14 000 |
| 12 000 |
| 12 000 |
| 12 000 |
| 12 000 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

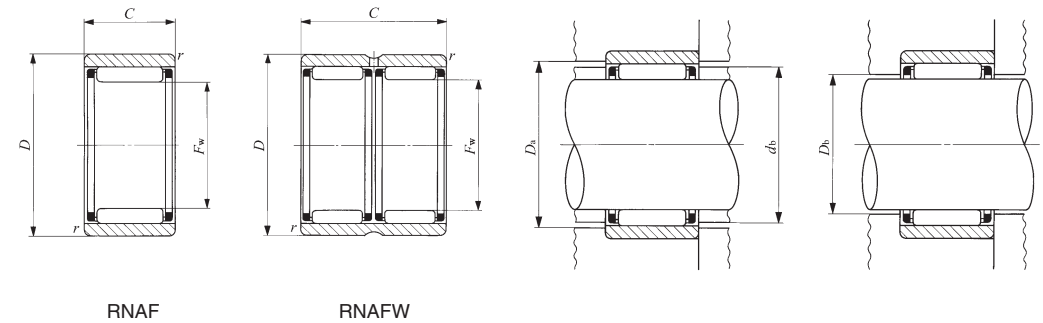
Without Inner Ring



Shaft dia. 45 – 100mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimensions mm | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N |
|------------------|-----------------------|---------------------|------------------------|----------|----------|--|---------------------------------|-------------------------------|-----------------------|--|--|
| | | | <i>F</i> _w | <i>D</i> | <i>C</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>d</i> _b | <i>D</i> _a Max. | <i>D</i> _b | | |
| 45 | RNAF 455517 | 83.5 | 45 | 55 | 17 | 0.3 | 48.5 | 53 | 45.8 | 23 300 | 47 100 |
| | RNAFW 455534 | 167 | 45 | 55 | 34 | 0.3 | 48.5 | 53 | 45.8 | 39 900 | 94 200 |
| | RNAF 456220 | 184 | 45 | 62 | 20 | 0.3 | 50.9 | 60 | 45.8 | 33 200 | 53 300 |
| | RNAFW 456240 | 370 | 45 | 62 | 40 | 0.3 | 50.9 | 60 | 45.8 | 56 900 | 107 000 |
| 50 | RNAF 506220 | 138 | 50 | 62 | 20 | 0.3 | 54.2 | 60 | 50.8 | 27 100 | 59 300 |
| | RNAFW 506240 | 275 | 50 | 62 | 40 | 0.3 | 54.2 | 60 | 50.8 | 46 400 | 119 000 |
| | RNAF 506520 | 170 | 50 | 65 | 20 | 0.3 | 55.2 | 63 | 50.8 | 35 900 | 61 100 |
| | RNAFW 506540 | 340 | 50 | 65 | 40 | 0.6 | 55.2 | 61 | 50.8 | 61 500 | 122 000 |
| 55 | RNAF 556820 | 167 | 55 | 68 | 20 | 0.3 | 59.5 | 66 | 55.8 | 28 600 | 66 000 |
| | RNAFW 556840 | 335 | 55 | 68 | 40 | 0.3 | 59.5 | 66 | 55.8 | 49 000 | 132 000 |
| | RNAF 557220 | 220 | 55 | 72 | 20 | 1 | 60.9 | 67 | 55.8 | 37 400 | 66 400 |
| | RNAFW 557240 | 440 | 55 | 72 | 40 | 1 | 60.9 | 67 | 55.8 | 64 100 | 133 000 |
| 60 | RNAF 607820 | 255 | 60 | 78 | 20 | 1 | 66.3 | 73 | 60.8 | 38 900 | 71 700 |
| | RNAFW 607840 | 510 | 60 | 78 | 40 | 1 | 66.3 | 73 | 60.8 | 66 700 | 143 000 |
| 65 | RNAF 658530 | 470 | 65 | 85 | 30 | 1.5 | 72 | 77 | 66 | 59 300 | 127 000 |
| | RNAFW 658560 | 945 | 65 | 85 | 60 | 1.5 | 72 | 77 | 66 | 102 000 | 255 000 |
| 70 | RNAF 709030 | 500 | 70 | 90 | 30 | 1.5 | 77 | 82 | 71 | 61 200 | 136 000 |
| | RNAFW 709060 | 1 000 | 70 | 90 | 60 | 1.5 | 77 | 82 | 71 | 105 000 | 272 000 |
| 75 | RNAF 759530 | 530 | 75 | 95 | 30 | 1.5 | 82 | 87 | 76 | 63 100 | 144 000 |
| | RNAFW 759560 | 1 060 | 75 | 95 | 60 | 1.5 | 82 | 87 | 76 | 108 000 | 289 000 |
| 80 | RNAF 8010030 | 560 | 80 | 100 | 30 | 1.5 | 87 | 92 | 81 | 65 000 | 153 000 |
| | RNAFW 8010060 | 1 120 | 80 | 100 | 60 | 1.5 | 87 | 92 | 81 | 111 000 | 306 000 |
| 85 | RNAF 8510530 | 590 | 85 | 105 | 30 | 1.5 | 92 | 97 | 86 | 66 600 | 161 000 |
| 90 | RNAF 9011030 | 625 | 90 | 110 | 30 | 1.5 | 97 | 102 | 91 | 69 600 | 174 000 |
| 95 | RNAF 9511530 | 655 | 95 | 115 | 30 | 1.5 | 102 | 107 | 96 | 70 900 | 182 000 |
| 100 | RNAF 10012030 | 685 | 100 | 120 | 30 | 1.5 | 107 | 112 | 101 | 72 500 | 191 000 |

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.



| Allowable rotational speed ⁽²⁾ rpm |
|--|
| 11 000 |
| 11 000 |
| 11 000 |
| 11 000 |
| 10 000 |
| 10 000 |
| 10 000 |
| 10 000 |
| 9 000 |
| 9 000 |
| 9 000 |
| 9 000 |
| 8 500 |
| 8 500 |
| 7 500 |
| 7 500 |
| 7 000 |
| 7 000 |
| 6 500 |
| 6 500 |
| 6 000 |
| 6 000 |
| 6 000 |
| 5 500 |
| 5 500 |
| 4 500 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

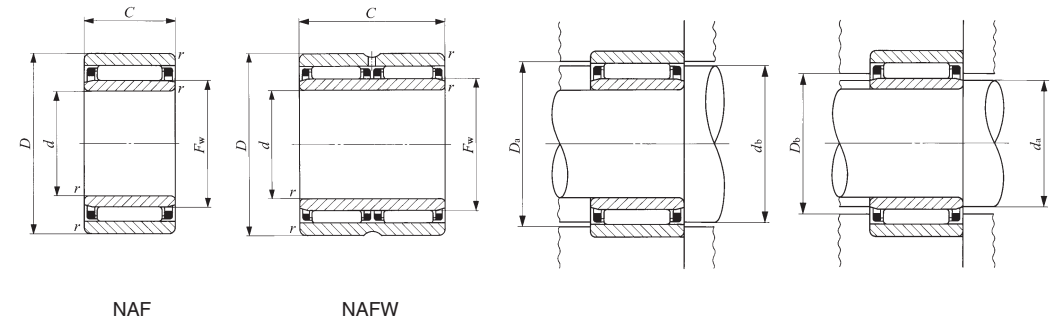
With Inner Ring



Shaft dia. 6 – 25mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | Standard mounting dimensions mm | | | | |
|------------------|-----------------------|---------------------|------------------------|----------|----------|---|----------------------|---------------------------------|------------------------------|--------------------------------------|----------------------|------|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>F_w</i> | <i>d_b</i> | <i>D_a</i> Max. | <i>d_a</i> Min. Max. | <i>D_b</i> | |
| 6 | NAF 61710 | 13.5 | 6 | 17 | 10 | 0.3 | 10 | 12.4 | 15 | 8 | 9.7 | 10.4 |
| 7 | NAF 72012 | 22.5 | 7 | 20 | 12 | 0.3 | 10 | 13.5 | 18 | 9 | 9.7 | 10.4 |
| 9 | NAF 92212 | 24 | 9 | 22 | 12 | 0.3 | 12 | 15.5 | 20 | 11 | 11.5 | 12.4 |
| 10 | NAF 102213 | 26 | 10 | 22 | 13 | 0.3 | 14 | 17.6 | 20 | 12 | 13 | 14.6 |
| | NAFW 102220 | 40 | 10 | 22 | 20 | 0.3 | 14 | 17.6 | 20 | 12 | 13 | 14.6 |
| | NAF 102612 | 36 | 10 | 26 | 12 | 0.3 | 14 | 19.4 | 24 | 12 | 13 | 14.6 |
| 12 | NAF 122413 | 29.5 | 12 | 24 | 13 | 0.3 | 16 | 19.6 | 22 | 14 | 15 | 16.6 |
| | NAFW 122420 | 45.5 | 12 | 24 | 20 | 0.3 | 16 | 19.6 | 22 | 14 | 15 | 16.6 |
| | NAF 122812 | 40 | 12 | 28 | 12 | 0.3 | 16 | 21.4 | 26 | 14 | 15 | 16.6 |
| 15 | NAF 152813 | 38.5 | 15 | 28 | 13 | 0.3 | 20 | 23.6 | 26 | 17 | 19 | 20.6 |
| | NAFW 152826 | 77.5 | 15 | 28 | 26 | 0.3 | 20 | 23.6 | 26 | 17 | 19 | 20.6 |
| | NAF 153212 | 50.5 | 15 | 32 | 12 | 0.3 | 20 | 25.4 | 30 | 17 | 19 | 20.6 |
| 17 | NAF 173013 | 42.5 | 17 | 30 | 13 | 0.3 | 22 | 25.6 | 28 | 19 | 21 | 22.6 |
| | NAFW 173026 | 84.5 | 17 | 30 | 26 | 0.3 | 22 | 25.6 | 28 | 19 | 21 | 22.6 |
| | NAF 173516 | 77.5 | 17 | 35 | 16 | 0.3 | 22 | 27.8 | 33 | 19 | 21 | 22.6 |
| | NAFW 173532 | 155 | 17 | 35 | 32 | 0.3 | 22 | 27.8 | 33 | 19 | 21 | 22.6 |
| 20 | NAF 203517 | 74 | 20 | 35 | 17 | 0.3 | 25 | 29.5 | 33 | 22 | 24 | 25.6 |
| | NAFW 203526 | 114 | 20 | 35 | 26 | 0.3 | 25 | 29.5 | 33 | 22 | 24 | 25.6 |
| | NAF 203716 | 79 | 20 | 37 | 16 | 0.3 | 25 | 30.4 | 35 | 22 | 24 | 25.6 |
| | NAFW 203732 | 158 | 20 | 37 | 32 | 0.3 | 25 | 30.4 | 35 | 22 | 24 | 25.6 |
| 25 | NAF 254017 | 87.5 | 25 | 40 | 17 | 0.3 | 30 | 34.5 | 38 | 27 | 29 | 30.6 |
| | NAFW 254026 | 135 | 25 | 40 | 26 | 0.3 | 30 | 34.5 | 38 | 27 | 29 | 30.6 |
| | NAF 254216 | 94 | 25 | 42 | 16 | 0.3 | 30 | 35.4 | 40 | 27 | 29 | 30.6 |
| | NAFW 254232 | 186 | 25 | 42 | 32 | 0.3 | 30 | 35.4 | 40 | 27 | 29 | 30.6 |

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.



| Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|--|---|--|----------------------|
| 4 160 | 4 550 | 50 000 | LRT 61010 |
| 5 940 | 6 000 | 50 000 | LRT 71012-1 |
| 9 030 | 8 460 | 40 000 | LRT 91212 |
| 7 860 | 9 410 | 35 000 | LRT 101413 |
| 10 800 | 14 200 | 35 000 | LRT 101420 |
| 9 790 | 9 680 | 35 000 | LRT 101412 |
| 8 620 | 11 000 | 30 000 | LRT 121613 |
| 11 900 | 16 700 | 30 000 | LRT 121620 |
| 10 500 | 10 900 | 30 000 | LRT 121612 |
| 9 590 | 13 500 | 25 000 | LRT 152013 |
| 16 400 | 27 100 | 25 000 | LRT 152026 |
| 12 400 | 14 300 | 25 000 | LRT 152012 |
| 10 200 | 15 200 | 25 000 | LRT 172213 |
| 17 500 | 30 300 | 25 000 | LRT 172226 |
| 17 600 | 20 900 | 25 000 | LRT 172216 |
| 30 200 | 41 800 | 25 000 | LRT 172232 |
| 17 300 | 26 600 | 20 000 | LRT 202517 |
| 22 400 | 37 200 | 20 000 | LRT 202526 |
| 19 400 | 24 500 | 20 000 | LRT 202516 |
| 33 200 | 49 000 | 20 000 | LRT 202532 |
| 18 700 | 31 100 | 17 000 | LRT 253017 |
| 24 200 | 43 400 | 17 000 | LRT 253026 |
| 20 800 | 28 400 | 17 000 | LRT 253016 |
| 35 700 | 56 800 | 17 000 | LRT 253032 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

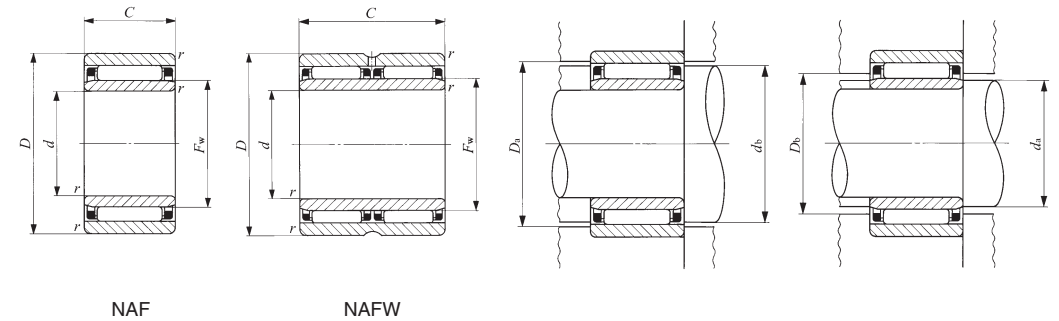
With Inner Ring



Shaft dia. 30 – 65mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | Standard mounting dimensions mm | | | | |
|------------------|-----------------------|---------------------|------------------------|----------|----------|---|----------------------|---------------------------------|------------------------------|-----------------------------------|----------------------|------|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>F_w</i> | <i>d_b</i> | <i>D_a</i> Max. | <i>d_a</i> Min. Max. | <i>D_b</i> | |
| 30 | NAF 304517 | 101 | 30 | 45 | 17 | 0.3 | 35 | 39.5 | 43 | 32 | 34 | 35.6 |
| | NAFW 304526 | 155 | 30 | 45 | 26 | 0.3 | 35 | 39.5 | 43 | 32 | 34 | 35.6 |
| | NAF 304716 | 107 | 30 | 47 | 16 | 0.3 | 35 | 40.4 | 45 | 32 | 34 | 35.6 |
| | NAFW 304732 | 215 | 30 | 47 | 32 | 0.3 | 35 | 40.4 | 45 | 32 | 34 | 35.6 |
| 35 | NAF 355017 | 115 | 35 | 50 | 17 | 0.3 | 40 | 43.5 | 48 | 37 | 39 | 40.8 |
| | NAFW 355034 | 230 | 35 | 50 | 34 | 0.3 | 40 | 43.5 | 48 | 37 | 39 | 40.8 |
| | NAF 355520 | 186 | 35 | 55 | 20 | 0.3 | 40 | 45.2 | 53 | 37 | 39 | 40.8 |
| | NAFW 355540 | 375 | 35 | 55 | 40 | 0.3 | 40 | 45.2 | 53 | 37 | 39 | 40.8 |
| 40 | NAF 405517 | 128 | 40 | 55 | 17 | 0.3 | 45 | 48.5 | 53 | 42 | 44 | 45.8 |
| | NAFW 405534 | 255 | 40 | 55 | 34 | 0.3 | 45 | 48.5 | 53 | 42 | 44 | 45.8 |
| | NAF 406220 | 235 | 40 | 62 | 20 | 0.3 | 45 | 50.9 | 60 | 42 | 44 | 45.8 |
| | NAFW 406240 | 475 | 40 | 62 | 40 | 0.3 | 45 | 50.9 | 60 | 42 | 44 | 45.8 |
| 45 | NAF 456220 | 196 | 45 | 62 | 20 | 0.3 | 50 | 54.2 | 60 | 47 | 49 | 50.8 |
| | NAFW 456240 | 390 | 45 | 62 | 40 | 0.3 | 50 | 54.2 | 60 | 47 | 49 | 50.8 |
| | NAF 457220 | 340 | 45 | 72 | 20 | 1 | 55 | 60.9 | 67 | 50 | 54 | 55.8 |
| | NAFW 457240 | 685 | 45 | 72 | 40 | 1 | 55 | 60.9 | 67 | 50 | 54 | 55.8 |
| 50 | NAF 506820 | 230 | 50 | 68 | 20 | 0.3 | 55 | 59.5 | 66 | 52 | 54 | 55.8 |
| | NAFW 506840 | 465 | 50 | 68 | 40 | 0.3 | 55 | 59.5 | 66 | 52 | 54 | 55.8 |
| | NAF 507820 | 390 | 50 | 78 | 20 | 1 | 60 | 66.3 | 73 | 55 | 59 | 60.8 |
| | NAFW 507840 | 775 | 50 | 78 | 40 | 1 | 60 | 66.3 | 73 | 55 | 59 | 60.8 |
| 55 | NAF 558530 | 690 | 55 | 85 | 30 | 1.5 | 65 | 72 | 77 | 63 | 63.5 | 66 |
| | NAFW 558560 | 1 380 | 55 | 85 | 60 | 1.5 | 65 | 72 | 77 | 63 | 63.5 | 66 |
| 60 | NAF 609030 | 740 | 60 | 90 | 30 | 1.5 | 70 | 77 | 82 | 68 | 68.5 | 71 |
| | NAFW 609060 | 1 480 | 60 | 90 | 60 | 1.5 | 70 | 77 | 82 | 68 | 68.5 | 71 |
| 65 | NAF 659530 | 790 | 65 | 95 | 30 | 1.5 | 75 | 82 | 87 | 73 | 73.5 | 76 |
| | NAFW 659560 | 1 580 | 65 | 95 | 60 | 1.5 | 75 | 82 | 87 | 73 | 73.5 | 76 |

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.



| Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|--|---|--|----------------------|
| 20 500 | 36 900 | 14 000 | LRT 303517 |
| 26 600 | 51 500 | 14 000 | LRT 303526 |
| 23 100 | 33 900 | 14 000 | LRT 303516 |
| 39 500 | 67 800 | 14 000 | LRT 303532 |
| 22 200 | 42 700 | 12 000 | LRT 354017 |
| 38 000 | 85 400 | 12 000 | LRT 354034 |
| 31 400 | 48 000 | 12 000 | LRT 354020 |
| 53 900 | 96 000 | 12 000 | LRT 354040 |
| 23 300 | 47 100 | 11 000 | LRT 404517 |
| 39 900 | 94 200 | 11 000 | LRT 404534 |
| 33 200 | 53 300 | 11 000 | LRT 404520 |
| 56 900 | 107 000 | 11 000 | LRT 404540 |
| 27 100 | 59 300 | 10 000 | LRT 455020 |
| 46 400 | 119 000 | 10 000 | LRT 455040 |
| 37 400 | 66 400 | 9 000 | LRT 455520 |
| 64 100 | 133 000 | 9 000 | LRT 455540 |
| 28 600 | 66 000 | 9 000 | LRT 505520 |
| 49 000 | 132 000 | 9 000 | LRT 505540 |
| 38 900 | 71 700 | 8 500 | LRT 506020 |
| 66 700 | 143 000 | 8 500 | LRT 506040 |
| 59 300 | 127 000 | 7 500 | LRT 556530 |
| 102 000 | 255 000 | 7 500 | LRT 556560 |
| 61 200 | 136 000 | 7 000 | LRT 607030 |
| 105 000 | 272 000 | 7 000 | LRT 607060 |
| 63 100 | 144 000 | 6 500 | LRT 657530 |
| 108 000 | 289 000 | 6 500 | LRT 657560 |

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

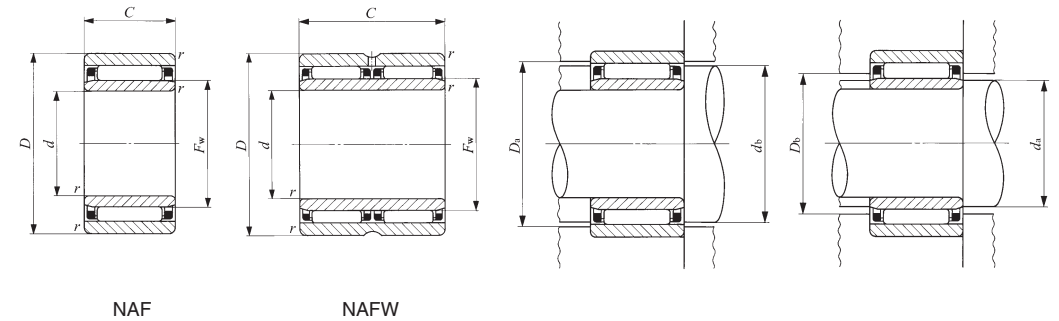
With Inner Ring



Shaft dia. 70 – 90mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | Standard mounting dimensions mm | | | | |
|------------------|-----------------------|---------------------|------------------------|----------|----------|---|----------------------|---------------------------------|------------------------------|--------------------------------------|----------------------|-----|
| | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>F_w</i> | <i>d_b</i> | <i>D_a</i> Max. | <i>d_a</i> Min. Max. | <i>D_b</i> | |
| 70 | NAF 7010030 | 835 | 70 | 100 | 30 | 1.5 | 80 | 87 | 92 | 78 | 78.5 | 81 |
| | NAFW 7010060 | 1 680 | 70 | 100 | 60 | 1.5 | 80 | 87 | 92 | 78 | 78.5 | 81 |
| 75 | NAF 7510530 | 885 | 75 | 105 | 30 | 1.5 | 85 | 92 | 97 | 83 | 83.5 | 86 |
| 80 | NAF 8011030 | 935 | 80 | 110 | 30 | 1.5 | 90 | 97 | 102 | 88 | 88.5 | 91 |
| 85 | NAF 8511530 | 985 | 85 | 115 | 30 | 1.5 | 95 | 102 | 107 | 93 | 93.5 | 96 |
| 90 | NAF 9012030 | 1 040 | 90 | 120 | 30 | 1.5 | 100 | 107 | 112 | 98 | 98.5 | 101 |

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.



| Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|--|---|--|----------------------|
| 65 000 | 153 000 | 6 000 | LRT 708030-1 |
| 111 000 | 306 000 | 6 000 | LRT 708060 |
| 66 600 | 161 000 | 6 000 | LRT 758530-1 |
| 69 600 | 174 000 | 5 500 | LRT 809030-1 |
| 70 900 | 182 000 | 5 500 | LRT 859530 |
| 72 500 | 191 000 | 4 500 | LRT 9010030 |

ROLLER BEARINGS

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

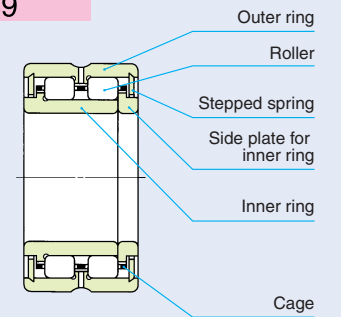


Structure and Features

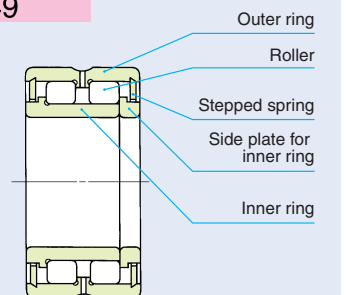
IKO Roller Bearings in which rollers are incorporated in two rows are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are 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

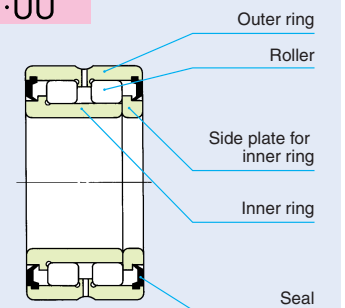
NAU49



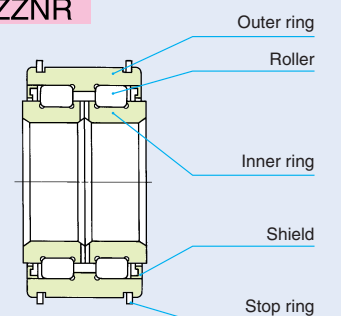
NAG49



NAG49···UU



NAS50···ZZNR



E

NAG
NAU
TRU
NAS

Types

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

Table 1 Type of bearing

| 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

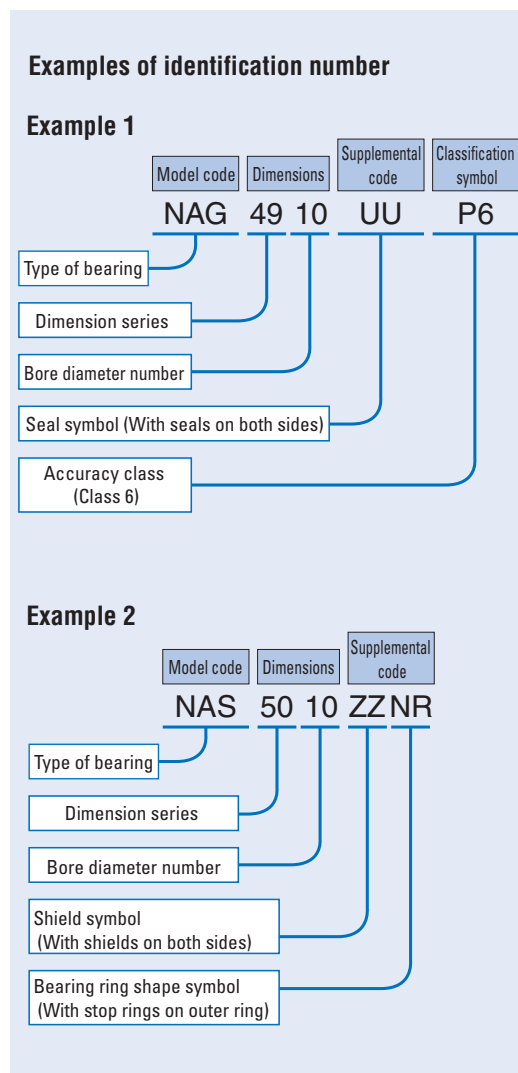
These bearings are the double-row full complement type with a low sectional height designed for use in sheaves. There are two types; the sealed type and the shield type. They can withstand heavy radial loads and shock loads at comparatively low-speed rotations, and can also withstand axial loads.

They can easily be 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.



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 |

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 | | | Number of oil holes of the inner ring |
|----------------------|------------------------------|---------------------------------------|------------|--------------|---------------------------------------|
| | | Standard | With seals | With shields | |
| Caged type | $d \leq 17$ | 0 | 0 | — | 0 |
| | $17 < d$ | 2 | 2 | — | |
| Full complement type | $d \leq 17$ | 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.

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 lives.

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 $-20^{\circ}\text{C} \sim +120^{\circ}\text{C}$. However, the maximum allowable temperature for Roller Bearings for Sheaves is $+110^{\circ}\text{C}$.

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.

$$C_A = f_v a f_A \dots\dots\dots(1)$$

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

$$\left(d_m \doteq \frac{d + D}{2} \right)$$

n : Rotational speed rpm

When $d_m \leq 1000$, $f_v = 1$.

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).

$$a = 1$$

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

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

From Fig. 2, $f_v \doteq 0.87$

Therefore, the axial load capacity C_A is obtained.

$$C_A = f_v a f_A = 0.87 \times 1 \times 18000 \doteq 15700 \text{ N}$$

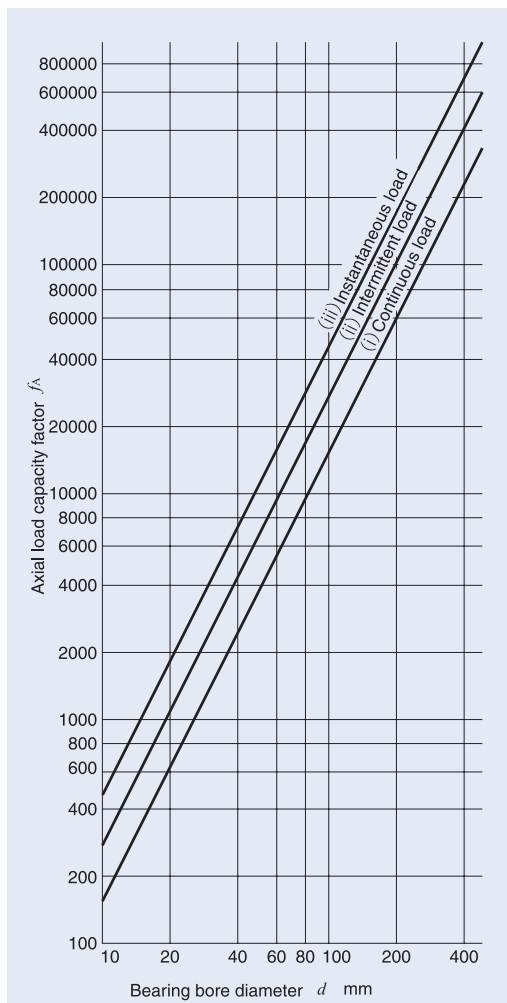


Fig. 1 Axial load capacity factor

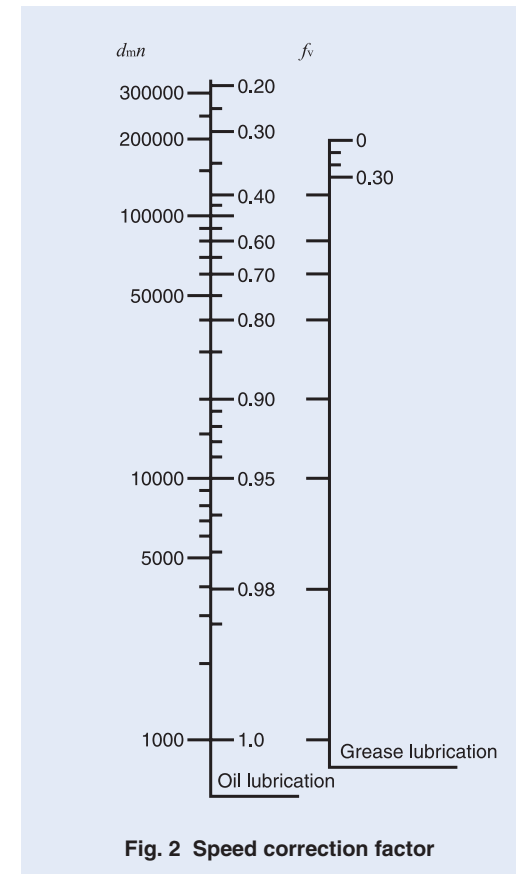


Fig. 2 Speed correction factor

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.

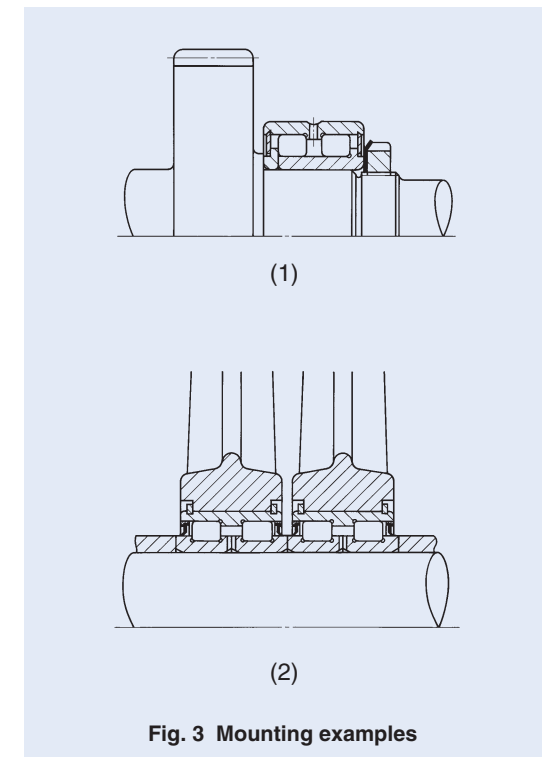


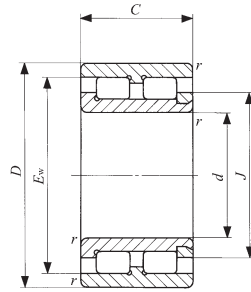
Fig. 3 Mounting examples

E

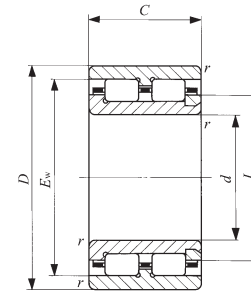
NAG
NAU
TRU
NAS

ROLLER BEARINGS

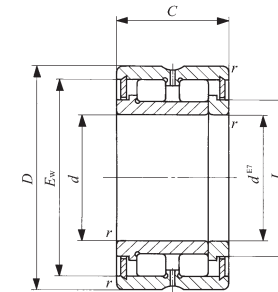
Caged Roller Bearings
Full Complement Roller Bearings



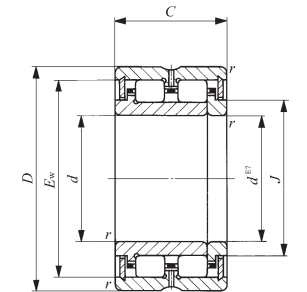
NAG49
($d \leq 17$)



NAU49
($d \leq 17$)



NAG49



NAU49 TRU

Shaft dia. 10 – 35mm

| Shaft dia. mm | Identification number | | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|---------------|-----------------------|------------|------------|---------------|------------------------|-----|-----|--------------------|------|-------|
| | Full complement type | Caged type | | | d | D | C | $r_{s \min}^{(1)}$ | J | E_w |
| 10 | NAG 4900 | — | — | 25.5 | 10 | 22 | 13 | 0.3 | 15.5 | 18.5 |
| | — | NAU 4900 | — | 24.5 | 10 | 22 | 13 | 0.3 | 15.5 | 18.5 |
| 12 | NAG 4901 | — | — | 28.5 | 12 | 24 | 13 | 0.3 | 17 | 20 |
| | — | NAU 4901 | — | 27.5 | 12 | 24 | 13 | 0.3 | 17 | 20 |
| 15 | NAG 4902 | — | — | 38 | 15 | 28 | 13 | 0.3 | 21 | 24 |
| | — | NAU 4902 | — | 36.5 | 15 | 28 | 13 | 0.3 | 21 | 24 |
| | — | — | TRU 153320 | 80.5 | 15 | 33 | 20 | 0.3 | 19.5 | 27 |
| 17 | NAG 4903 | — | — | 41 | 17 | 30 | 13 | 0.3 | 22.5 | 25.5 |
| | — | NAU 4903 | — | 39.5 | 17 | 30 | 13 | 0.3 | 22.5 | 25.5 |
| | — | — | TRU 173425 | 100 | 17 | 34 | 25 | 0.3 | 21.5 | 29.5 |
| 20 | NAG 4904 | — | — | 76.5 | 20 | 37 | 17 | 0.3 | 24 | 31.5 |
| | — | NAU 4904 | — | 76 | 20 | 37 | 17 | 0.3 | 24 | 31.5 |
| | — | — | TRU 203820 | 96.5 | 20 | 38 | 20 | 0.3 | 25 | 32.5 |
| | — | — | TRU 203825 | 122 | 20 | 38 | 25 | 0.3 | 25 | 32.5 |
| 25 | NAG 4905 | — | — | 89.5 | 25 | 42 | 17 | 0.3 | 29.5 | 37 |
| | — | NAU 4905 | — | 89 | 25 | 42 | 17 | 0.3 | 29.5 | 37 |
| | — | — | TRU 254425 | 154 | 25 | 44 | 25 | 0.3 | 30.5 | 38 |
| 28 | — | — | TRU 284530 | 173 | 28 | 45 | 30 | 0.3 | 31.5 | 39.5 |
| 30 | NAG 4906 | — | — | 103 | 30 | 47 | 17 | 0.3 | 34 | 41.5 |
| | — | NAU 4906 | — | 102 | 30 | 47 | 17 | 0.3 | 34 | 41.5 |
| | — | — | TRU 304830 | 197 | 30 | 48 | 30 | 0.3 | 35 | 42.5 |
| 32 | — | — | TRU 325230 | 260 | 32 | 52 | 30 | 0.6 | 38 | 46 |
| 35 | NAG 4907 | — | — | 172 | 35 | 55 | 20 | 0.6 | 40 | 49 |
| | — | NAU 4907 | — | 168 | 35 | 55 | 20 | 0.6 | 40 | 49 |
| | — | — | TRU 355630 | 270 | 35 | 56 | 30 | 0.6 | 40 | 49 |

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.

| Basic dynamic load rating C N | Basic static load rating C_0 N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------------------|-------------------------------------|--|
| 9 650 | 10 800 | 17 000 |
| 6 580 | 6 470 | 30 000 |
| 10 300 | 12 000 | 15 000 |
| 6 950 | 7 120 | 25 000 |
| 11 800 | 15 200 | 12 000 |
| 7 950 | 9 020 | 20 000 |
| 10 400 | 10 400 | 20 000 |
| 12 300 | 16 500 | 11 000 |
| 8 240 | 9 670 | 19 000 |
| 18 000 | 21 600 | 18 000 |
| 15 600 | 18 900 | 9 500 |
| 10 700 | 11 300 | 16 000 |
| 12 100 | 13 400 | 16 000 |
| 18 700 | 23 600 | 16 000 |
| 17 500 | 23 200 | 7 500 |
| 11 900 | 13 900 | 13 000 |
| 21 000 | 28 900 | 13 000 |
| 28 700 | 43 800 | 12 000 |
| 19 400 | 27 600 | 6 500 |
| 13 000 | 16 200 | 12 000 |
| 29 400 | 46 600 | 11 000 |
| 29 800 | 44 200 | 10 000 |
| 28 700 | 43 800 | 5 500 |
| 19 500 | 26 300 | 10 000 |
| 32 200 | 49 800 | 10 000 |

E

NAG
NAU
TRU
NAS

ROLLER BEARINGS

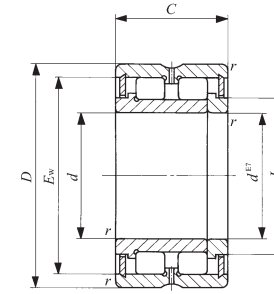
Caged Roller Bearings
Full Complement Roller Bearings



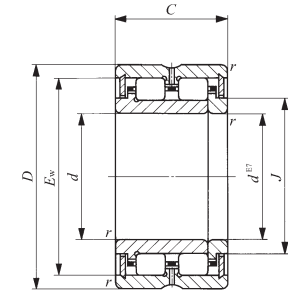
Shaft dia. 40 – 80mm

| Shaft dia. mm | Identification number | | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|---------------|-----------------------|-----------------|--------------------|---------------|------------------------|----------|----------|---|----------|----------------------|
| | Full complement type | Caged type | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>J</i> | <i>E_w</i> |
| 40 | NAG 4908 | — | — | 225 | 40 | 62 | 22 | 0.6 | 46 | 56 |
| | — | — | TRU 405930 | 265 | 40 | 59 | 30 | 0.6 | 45 | 52.5 |
| | — | NAU 4908 | — | 220 | 40 | 62 | 22 | 0.6 | 46 | 56 |
| 42 | — | — | TRU 426230 | 290 | 42 | 62 | 30 | 0.6 | 48 | 56.5 |
| 45 | NAG 4909 | — | — | 265 | 45 | 68 | 22 | 0.6 | 51 | 61 |
| | — | — | TRU 456430 | 295 | 45 | 64 | 30 | 0.6 | 50.5 | 58.5 |
| | — | NAU 4909 | — | 260 | 45 | 68 | 22 | 0.6 | 51 | 61 |
| 50 | NAG 4910 | — | — | 270 | 50 | 72 | 22 | 0.6 | 55.5 | 65.5 |
| | — | NAU 4910 | — | 265 | 50 | 72 | 22 | 0.6 | 55.5 | 65.5 |
| | — | — | TRU 507745 | 710 | 50 | 77 | 45 | 1 | 58 | 69 |
| 55 | NAG 4911 | — | — | 395 | 55 | 80 | 25 | 1 | 61.5 | 72.5 |
| | — | NAU 4911 | — | 385 | 55 | 80 | 25 | 1 | 61.5 | 72.5 |
| | — | — | TRU 558138 | 615 | 55 | 81 | 38 | 1 | 61.5 | 72.5 |
| 60 | NAG 4912 | — | — | 425 | 60 | 85 | 25 | 1 | 67 | 77.5 |
| | — | NAU 4912 | — | 415 | 60 | 85 | 25 | 1 | 67 | 77.5 |
| | — | — | TRU 608945 | 880 | 60 | 89 | 45 | 1 | 69.5 | 81.5 |
| 65 | NAG 4913 | — | — | 455 | 65 | 90 | 25 | 1 | 72 | 83 |
| | — | NAU 4913 | — | 440 | 65 | 90 | 25 | 1 | 72 | 83 |
| 70 | NAG 4914 | — | — | 725 | 70 | 100 | 30 | 1 | 79 | 91.5 |
| | — | NAU 4914 | — | 705 | 70 | 100 | 30 | 1 | 79 | 91.5 |
| 75 | NAG 4915 | — | — | 775 | 75 | 105 | 30 | 1 | 83.5 | 95.5 |
| | — | NAU 4915 | — | 750 | 75 | 105 | 30 | 1 | 83.5 | 95.5 |
| | — | — | TRU 7510845 | 1 240 | 75 | 108 | 45 | 1 | 85.5 | 98.5 |
| 80 | NAG 4916 | — | — | 815 | 80 | 110 | 30 | 1 | 89.5 | 102 |
| | — | NAU 4916 | — | 790 | 80 | 110 | 30 | 1 | 89.5 | 102 |

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.



NAG49



NAU49 TRU

| Basic dynamic load rating <i>C</i> | Basic static load rating <i>C₀</i> | Allowable rotational speed ⁽²⁾ |
|------------------------------------|---|---|
| N | N | rpm |
| 34 600 | 49 500 | 5 000 |
| 34 700 | 62 500 | 8 500 |
| 23 400 | 29 400 | 8 500 |
| 34 600 | 57 800 | 8 000 |
| 36 400 | 54 700 | 4 500 |
| 32 600 | 59 700 | 8 000 |
| 24 800 | 32 800 | 8 000 |
| 38 200 | 59 900 | 4 000 |
| 26 200 | 36 200 | 7 000 |
| 75 700 | 134 000 | 7 000 |
| 48 100 | 77 700 | 3 500 |
| 33 000 | 47 000 | 6 500 |
| 61 400 | 104 000 | 6 500 |
| 50 300 | 84 300 | 3 500 |
| 34 700 | 51 400 | 6 000 |
| 88 100 | 152 000 | 6 000 |
| 53 200 | 93 000 | 3 000 |
| 36 900 | 57 100 | 5 500 |
| 77 700 | 139 000 | 3 000 |
| 53 700 | 84 600 | 5 000 |
| 80 000 | 146 000 | 2 500 |
| 54 800 | 88 200 | 5 000 |
| 103 000 | 190 000 | 4 500 |
| 83 000 | 157 000 | 2 500 |
| 57 200 | 95 500 | 4 500 |

E

NAG
NAU
TRU
NAS

ROLLER BEARINGS

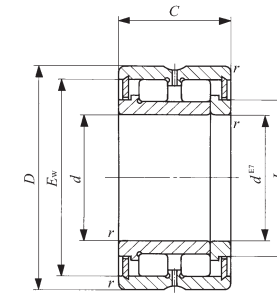
Caged Roller Bearings
Full Complement Roller Bearings



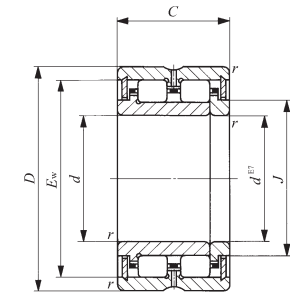
Shaft dia. 85 – 140mm

| Shaft dia. mm | Identification number | | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|---------------|-----------------------|-----------------|---------------------|---------------|------------------------|----------|----------|---|----------|----------------------|
| | Full complement type | Caged type | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>J</i> | <i>E_w</i> |
| 85 | NAG 4917 | — | — | 1 190 | 85 | 120 | 35 | 1.5 | 96 | 110 |
| | — | — | TRU 8511850 | 1 530 | 85 | 118 | 50 | 1 | 94.5 | 107.5 |
| | — | NAU 4917 | — | 1 150 | 85 | 120 | 35 | 1.5 | 96 | 110 |
| | — | — | TRU 8512045 | 1 500 | 85 | 120 | 45 | 1.5 | 96.5 | 110 |
| 90 | NAG 4918 | — | — | 1 250 | 90 | 125 | 35 | 1.5 | 101 | 115.5 |
| | — | NAU 4918 | — | 1 210 | 90 | 125 | 35 | 1.5 | 101 | 115.5 |
| | — | — | TRU 9012550 | 1 740 | 90 | 125 | 50 | 1.5 | 101 | 114 |
| 95 | NAG 4919 | — | — | 1 300 | 95 | 130 | 35 | 1.5 | 106 | 120.5 |
| | — | NAU 4919 | — | 1 270 | 95 | 130 | 35 | 1.5 | 106 | 120.5 |
| 100 | NAG 4920 | — | — | 1 850 | 100 | 140 | 40 | 1.5 | 114.5 | 129.5 |
| | — | — | TRU 10013550 | 1 900 | 100 | 135 | 50 | 1.5 | 112 | 125.5 |
| | — | NAU 4920 | — | 1 770 | 100 | 140 | 40 | 1.5 | 114.5 | 129.5 |
| 105 | — | — | TRU 10515350 | 2 890 | 105 | 153 | 50 | 1.5 | 120 | 138 |
| 110 | NAG 4922 | — | — | 2 010 | 110 | 150 | 40 | 1.5 | 123 | 138.5 |
| | — | NAU 4922 | — | 1 930 | 110 | 150 | 40 | 1.5 | 123 | 138.5 |
| 120 | NAG 4924 | — | — | 2 780 | 120 | 165 | 45 | 1.5 | 136 | 153.5 |
| | — | NAU 4924 | — | 2 680 | 120 | 165 | 45 | 1.5 | 136 | 153.5 |
| 125 | — | — | TRU 12517860 | 4 490 | 125 | 178 | 60 | 1.5 | 143.5 | 162 |
| 130 | NAG 4926 | — | — | 3 750 | 130 | 180 | 50 | 2 | 147 | 165.5 |
| | — | NAU 4926 | — | 3 610 | 130 | 180 | 50 | 2 | 147 | 165.5 |
| 135 | — | — | TRU 13518860 | 4 790 | 135 | 188 | 60 | 1.5 | 154 | 172.5 |
| 140 | NAG 4928 | — | — | 3 990 | 140 | 190 | 50 | 2 | 157.5 | 176 |
| | — | NAU 4928 | — | 3 840 | 140 | 190 | 50 | 2 | 157.5 | 176 |

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.



NAG49



NAU49 TRU

| Basic dynamic load rating <i>C</i> | Basic static load rating <i>C₀</i> | Allowable rotational speed ⁽²⁾ |
|------------------------------------|---|---|
| N | N | rpm |
| 111 000 | 200 000 | 2 500 |
| 114 000 | 222 000 | 4 000 |
| 75 400 | 120 000 | 4 000 |
| 110 000 | 215 000 | 4 000 |
| 114 000 | 211 000 | 2 500 |
| 79 500 | 130 000 | 4 000 |
| 119 000 | 240 000 | 4 000 |
| 117 000 | 222 000 | 2 000 |
| 81 000 | 136 000 | 4 000 |
| 152 000 | 292 000 | 2 000 |
| 124 000 | 264 000 | 3 500 |
| 106 000 | 181 000 | 3 500 |
| 159 000 | 286 000 | 3 500 |
| 161 000 | 322 000 | 1 900 |
| 113 000 | 200 000 | 3 500 |
| 208 000 | 431 000 | 1 700 |
| 146 000 | 268 000 | 3 000 |
| 211 000 | 408 000 | 3 000 |
| 240 000 | 495 000 | 1 600 |
| 166 000 | 304 000 | 2 500 |
| 220 000 | 442 000 | 2 500 |
| 249 000 | 531 000 | 1 500 |
| 174 000 | 327 000 | 2 500 |

ROLLER BEARINGS

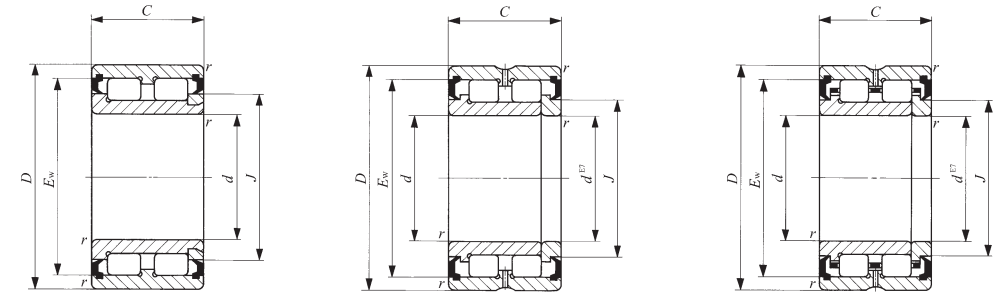
Caged Roller Bearings **With Seal**
 Full Complement Roller Bearings **With Seal**



Shaft dia. 10 – 40mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|---------------|-----------------------|--------------|---------------|------------------------|----------|----------|---|----------|
| | Full complement type | Caged type | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>J</i> |
| 10 | NAG 4900UU | — | 25.5 | 10 | 22 | 13 | 0.3 | 15.5 |
| 12 | NAG 4901UU | — | 28.5 | 12 | 24 | 13 | 0.3 | 17 |
| 15 | NAG 4902UU | — | 38 | 15 | 28 | 13 | 0.3 | 21 |
| | — | TRU 153320UU | 80.5 | 15 | 33 | 20 | 0.3 | 19.5 |
| 17 | NAG 4903UU | — | 41 | 17 | 30 | 13 | 0.3 | 22.5 |
| | — | TRU 173425UU | 100 | 17 | 34 | 25 | 0.3 | 21.5 |
| 20 | NAG 4904UU | — | 76.5 | 20 | 37 | 17 | 0.3 | 24 |
| | — | NAU 4904UU | 76 | 20 | 37 | 17 | 0.3 | 24 |
| | — | TRU 203820UU | 96.5 | 20 | 38 | 20 | 0.3 | 25 |
| 25 | — | TRU 203825UU | 122 | 20 | 38 | 25 | 0.3 | 25 |
| | NAG 4905UU | — | 89.5 | 25 | 42 | 17 | 0.3 | 29.5 |
| | — | NAU 4905UU | 89 | 25 | 42 | 17 | 0.3 | 29.5 |
| 28 | — | TRU 254425UU | 154 | 25 | 44 | 25 | 0.3 | 30.5 |
| | — | TRU 284530UU | 173 | 28 | 45 | 30 | 0.3 | 31.5 |
| 30 | NAG 4906UU | — | 103 | 30 | 47 | 17 | 0.3 | 34 |
| | — | NAU 4906UU | 102 | 30 | 47 | 17 | 0.3 | 34 |
| | — | TRU 304830UU | 197 | 30 | 48 | 30 | 0.3 | 35 |
| 32 | — | TRU 325230UU | 260 | 32 | 52 | 30 | 0.6 | 38 |
| 35 | NAG 4907UU | — | 172 | 35 | 55 | 20 | 0.6 | 40 |
| | — | NAU 4907UU | 168 | 35 | 55 | 20 | 0.6 | 40 |
| | — | TRU 355630UU | 270 | 35 | 56 | 30 | 0.6 | 40 |
| 40 | NAG 4908UU | — | 225 | 40 | 62 | 22 | 0.6 | 46 |
| | — | TRU 405930UU | 265 | 40 | 59 | 30 | 0.6 | 45 |
| | — | NAU 4908UU | 220 | 40 | 62 | 22 | 0.6 | 46 |

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.



NAG49...UU
(*d* ≤ 17)

NAG49...UU

NAU49...UU
TRU...UU

| <i>E_w</i> | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|----------------------|---|--|--|
| 19.5 | 9 650 | 10 800 | 10 000 |
| 21 | 10 300 | 12 000 | 9 000 |
| 25 | 11 800 | 15 200 | 7 000 |
| 27 | 10 400 | 10 400 | 9 500 |
| 26.5 | 12 300 | 16 500 | 6 500 |
| 29.5 | 18 000 | 21 600 | 8 500 |
| 31.5 | 15 600 | 18 900 | 5 500 |
| 31.5 | 10 700 | 11 300 | 8 000 |
| 32.5 | 12 100 | 13 400 | 7 500 |
| 32.5 | 18 700 | 23 600 | 7 500 |
| 37 | 17 500 | 23 200 | 4 500 |
| 37 | 11 900 | 13 900 | 6 500 |
| 38 | 21 000 | 28 900 | 6 000 |
| 39.5 | 28 700 | 43 800 | 6 000 |
| 41.5 | 19 400 | 27 600 | 4 000 |
| 41.5 | 13 000 | 16 200 | 5 500 |
| 42.5 | 29 400 | 46 600 | 5 500 |
| 46 | 29 800 | 44 200 | 5 000 |
| 49 | 28 700 | 43 800 | 3 500 |
| 49 | 19 500 | 26 300 | 4 500 |
| 49 | 32 200 | 49 800 | 4 500 |
| 56 | 34 600 | 49 500 | 3 000 |
| 52.5 | 34 700 | 62 500 | 4 000 |
| 56 | 23 400 | 29 400 | 4 000 |

ROLLER BEARINGS

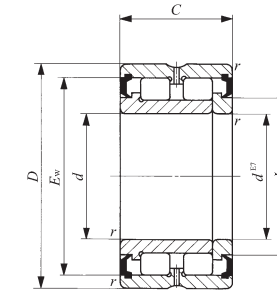
Caged Roller Bearings **With Seal**
 Full Complement Roller Bearings **With Seal**



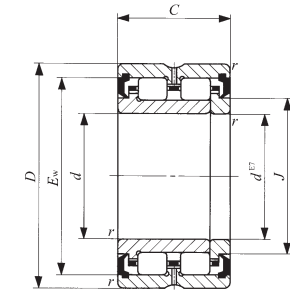
Shaft dia. 42 – 80mm

| Shaft dia. mm | Identification number | | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|---------------|-----------------------|------------|---------------|---------------|------------------------|----------|----------|---|----------|
| | Full complement type | Caged type | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>J</i> |
| 42 | — | — | TRU 426230UU | 290 | 42 | 62 | 30 | 0.6 | 48 |
| 45 | NAG 4909UU | — | — | 265 | 45 | 68 | 22 | 0.6 | 51 |
| | — | NAU 4909UU | TRU 456430UU | 295 | 45 | 64 | 30 | 0.6 | 50.5 |
| 50 | — | — | — | 260 | 45 | 68 | 22 | 0.6 | 51 |
| | NAG 4910UU | — | — | 270 | 50 | 72 | 22 | 0.6 | 55.5 |
| | — | NAU 4910UU | — | 265 | 50 | 72 | 22 | 0.6 | 55.5 |
| 55 | — | — | TRU 507745UU | 710 | 50 | 77 | 45 | 1 | 58 |
| | NAG 4911UU | — | — | 395 | 55 | 80 | 25 | 1 | 61.5 |
| | — | NAU 4911UU | — | 385 | 55 | 80 | 25 | 1 | 61.5 |
| 60 | — | — | TRU 558138UU | 615 | 55 | 81 | 38 | 1 | 61.5 |
| | NAG 4912UU | — | — | 425 | 60 | 85 | 25 | 1 | 67 |
| | — | NAU 4912UU | — | 415 | 60 | 85 | 25 | 1 | 67 |
| 65 | — | — | TRU 608945UU | 880 | 60 | 89 | 45 | 1 | 69.5 |
| | NAG 4913UU | — | — | 455 | 65 | 90 | 25 | 1 | 72 |
| | — | NAU 4913UU | — | 440 | 65 | 90 | 25 | 1 | 72 |
| 70 | NAG 4914UU | — | — | 725 | 70 | 100 | 30 | 1 | 79 |
| | — | NAU 4914UU | — | 705 | 70 | 100 | 30 | 1 | 79 |
| 75 | NAG 4915UU | — | — | 775 | 75 | 105 | 30 | 1 | 83.5 |
| | — | NAU 4915UU | — | 750 | 75 | 105 | 30 | 1 | 83.5 |
| | — | — | TRU 7510845UU | 1 240 | 75 | 108 | 45 | 1 | 85.5 |
| 80 | NAG 4916UU | — | — | 815 | 80 | 110 | 30 | 1 | 89.5 |
| | — | NAU 4916UU | — | 790 | 80 | 110 | 30 | 1 | 89.5 |

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.



NAG49...UU



NAU49...UU
TRU...UU

| <i>E_w</i> | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Allowable rotational speed ⁽²⁾ rpm |
|----------------------|---|--|--|
| 56.5 | 34 600 | 57 800 | 4 000 |
| 61 | 36 400 | 54 700 | 2 500 |
| 58.5 | 32 600 | 59 700 | 3 500 |
| 61 | 24 800 | 32 800 | 3 500 |
| 65.5 | 38 200 | 59 900 | 2 500 |
| 65.5 | 26 200 | 36 200 | 3 500 |
| 69 | 75 700 | 134 000 | 3 500 |
| 72.5 | 48 100 | 77 700 | 2 000 |
| 72.5 | 33 000 | 47 000 | 3 000 |
| 72.5 | 61 400 | 104 000 | 3 000 |
| 77.5 | 50 300 | 84 300 | 2 000 |
| 77.5 | 34 700 | 51 400 | 3 000 |
| 81.5 | 88 100 | 152 000 | 3 000 |
| 83 | 53 200 | 93 000 | 1 900 |
| 83 | 36 900 | 57 100 | 2 500 |
| 91.5 | 77 700 | 139 000 | 1 800 |
| 91.5 | 53 700 | 84 600 | 2 500 |
| 95.5 | 80 000 | 146 000 | 1 700 |
| 95.5 | 54 800 | 88 200 | 2 500 |
| 98.5 | 103 000 | 190 000 | 2 000 |
| 102 | 83 000 | 157 000 | 1 600 |
| 102 | 57 200 | 95 500 | 2 000 |

E

NAG
NAU
TRU
NAS

ROLLER BEARINGS

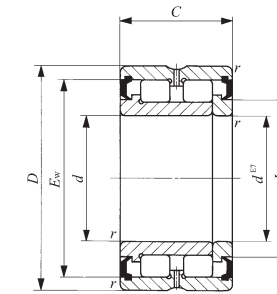
Caged Roller Bearings **With Seal**
 Full Complement Roller Bearings **With Seal**



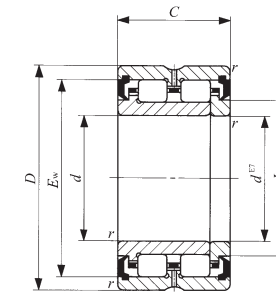
Shaft dia. 85 – 140mm

| Shaft dia. mm | Identification number | | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|---------------|-----------------------|-------------------|-----------------------|---------------|------------------------|----------|----------|---|----------|
| | Full complement type | Caged type | | | <i>d</i> | <i>D</i> | <i>C</i> | <i>r_s</i> ⁽¹⁾ min | <i>J</i> |
| 85 | NAG 4917UU | — | — | 1 190 | 85 | 120 | 35 | 1.5 | 96 |
| | — | — | TRU 8511850UU | 1 530 | 85 | 118 | 50 | 1 | 94.5 |
| | — | NAU 4917UU | — | 1 150 | 85 | 120 | 35 | 1.5 | 96 |
| | — | — | TRU 8512045UU | 1 500 | 85 | 120 | 45 | 1.5 | 96.5 |
| 90 | NAG 4918UU | — | — | 1 250 | 90 | 125 | 35 | 1.5 | 101 |
| | — | NAU 4918UU | — | 1 210 | 90 | 125 | 35 | 1.5 | 101 |
| | — | — | TRU 9012550UU | 1 740 | 90 | 125 | 50 | 1.5 | 101 |
| 95 | NAG 4919UU | — | — | 1 300 | 95 | 130 | 35 | 1.5 | 106 |
| | — | NAU 4919UU | — | 1 270 | 95 | 130 | 35 | 1.5 | 106 |
| 100 | NAG 4920UU | — | — | 1 850 | 100 | 140 | 40 | 1.5 | 114.5 |
| | — | — | TRU 10013550UU | 1 900 | 100 | 135 | 50 | 1.5 | 112 |
| | — | NAU 4920UU | — | 1 770 | 100 | 140 | 40 | 1.5 | 114.5 |
| 105 | — | — | TRU 10515350UU | 2 890 | 105 | 153 | 50 | 1.5 | 120 |
| 110 | NAG 4922UU | — | — | 2 010 | 110 | 150 | 40 | 1.5 | 123 |
| | — | NAU 4922UU | — | 1 930 | 110 | 150 | 40 | 1.5 | 123 |
| 120 | NAG 4924UU | — | — | 2 780 | 120 | 165 | 45 | 1.5 | 136 |
| | — | NAU 4924UU | — | 2 680 | 120 | 165 | 45 | 1.5 | 136 |
| 125 | — | — | TRU 12517860UU | 4 490 | 125 | 178 | 60 | 1.5 | 143.5 |
| 130 | NAG 4926UU | — | — | 3 750 | 130 | 180 | 50 | 2 | 147 |
| | — | NAU 4926UU | — | 3 610 | 130 | 180 | 50 | 2 | 147 |
| 135 | — | — | TRU 13518860UU | 4 790 | 135 | 188 | 60 | 1.5 | 154 |
| 140 | NAG 4928UU | — | — | 3 990 | 140 | 190 | 50 | 2 | 157.5 |
| | — | NAU 4928UU | — | 3 840 | 140 | 190 | 50 | 2 | 157.5 |

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.



NAG49...UU



NAU49...UU
TRU...UU

| <i>E_w</i> | Basic dynamic load rating <i>C</i> | Basic static load rating <i>C₀</i> | Allowable rotational speed ⁽²⁾ |
|----------------------|------------------------------------|---|---|
| | N | N | rpm |
| 110 | 111 000 | 200 000 | 1 500 |
| 107.5 | 114 000 | 222 000 | 2 000 |
| 110 | 75 400 | 120 000 | 2 000 |
| 110 | 110 000 | 215 000 | 2 000 |
| 115.5 | 114 000 | 211 000 | 1 400 |
| 115.5 | 79 500 | 130 000 | 1 900 |
| 114 | 119 000 | 240 000 | 1 900 |
| 120.5 | 117 000 | 222 000 | 1 300 |
| 120.5 | 81 000 | 136 000 | 1 800 |
| 129.5 | 152 000 | 292 000 | 1 200 |
| 125.5 | 124 000 | 264 000 | 1 700 |
| 129.5 | 106 000 | 181 000 | 1 700 |
| 138 | 159 000 | 286 000 | 1 600 |
| 138.5 | 161 000 | 322 000 | 1 100 |
| 138.5 | 113 000 | 200 000 | 1 600 |
| 153.5 | 208 000 | 431 000 | 1 000 |
| 153.5 | 146 000 | 268 000 | 1 400 |
| 162 | 211 000 | 408 000 | 1 400 |
| 165.5 | 240 000 | 495 000 | 950 |
| 165.5 | 166 000 | 304 000 | 1 300 |
| 172.5 | 220 000 | 442 000 | 1 300 |
| 176 | 249 000 | 531 000 | 900 |
| 176 | 174 000 | 327 000 | 1 200 |

ROLLER BEARINGS

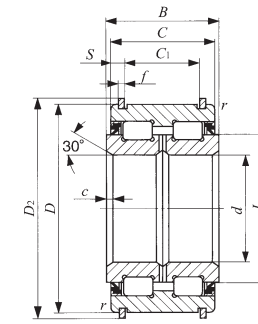
Roller Bearings for Sheaves



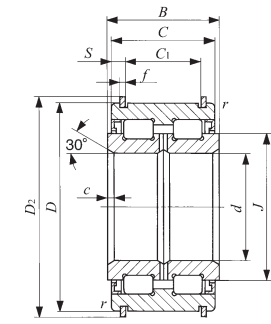
Shaft dia. 40 – 170mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | |
|---------------|-----------------------|--------------|----------------|------------------------|----------|-----------------------|----------|----------|-----------------------|----------|
| | Sealed type | Shield type | | <i>d</i> | <i>D</i> | <i>D</i> ₂ | <i>B</i> | <i>C</i> | <i>C</i> ₁ | <i>S</i> |
| 40 | NAS 5008UUNR | NAS 5008ZZNR | 0.55 | 40 | 68 | 71.8 | 38 | 37 | 28 | 4.5 |
| 45 | NAS 5009UUNR | NAS 5009ZZNR | 0.70 | 45 | 75 | 78.8 | 40 | 39 | 30 | 4.5 |
| 50 | NAS 5010UUNR | NAS 5010ZZNR | 0.75 | 50 | 80 | 83.8 | 40 | 39 | 30 | 4.5 |
| 55 | NAS 5011UUNR | NAS 5011ZZNR | 1.15 | 55 | 90 | 94.8 | 46 | 45 | 34 | 5.5 |
| 60 | NAS 5012UUNR | NAS 5012ZZNR | 1.20 | 60 | 95 | 99.8 | 46 | 45 | 34 | 5.5 |
| 65 | NAS 5013UUNR | NAS 5013ZZNR | 1.30 | 65 | 100 | 104.8 | 46 | 45 | 34 | 5.5 |
| 70 | NAS 5014UUNR | NAS 5014ZZNR | 1.90 | 70 | 110 | 114.5 | 54 | 53 | 42 | 5.5 |
| 75 | NAS 5015UUNR | NAS 5015ZZNR | 2.00 | 75 | 115 | 119.5 | 54 | 53 | 42 | 5.5 |
| 80 | NAS 5016UUNR | NAS 5016ZZNR | 2.65 | 80 | 125 | 129.5 | 60 | 59 | 48 | 5.5 |
| 85 | NAS 5017UUNR | NAS 5017ZZNR | 2.80 | 85 | 130 | 134.5 | 60 | 59 | 48 | 5.5 |
| 90 | NAS 5018UUNR | NAS 5018ZZNR | 3.70 | 90 | 140 | 145.4 | 67 | 66 | 54 | 6 |
| 95 | NAS 5019UUNR | NAS 5019ZZNR | 3.90 | 95 | 145 | 150.4 | 67 | 66 | 54 | 6 |
| 100 | NAS 5020UUNR | NAS 5020ZZNR | 4.05 | 100 | 150 | 155.4 | 67 | 66 | 54 | 6 |
| 110 | NAS 5022UUNR | NAS 5022ZZNR | 6.50 | 110 | 170 | 175.4 | 80 | 79 | 65 | 7 |
| 120 | NAS 5024UUNR | NAS 5024ZZNR | 6.95 | 120 | 180 | 188.4 | 80 | 79 | 65 | 7 |
| 130 | NAS 5026UUNR | NAS 5026ZZNR | 10.5 | 130 | 200 | 208.4 | 95 | 94 | 77 | 8.5 |
| 140 | NAS 5028UUNR | NAS 5028ZZNR | 11.0 | 140 | 210 | 218.4 | 95 | 94 | 77 | 8.5 |
| 150 | NAS 5030UUNR | NAS 5030ZZNR | 13.5 | 150 | 225 | 233.4 | 100 | 99 | 81 | 9 |
| 160 | NAS 5032UUNR | NAS 5032ZZNR | 16.5 | 160 | 240 | 248.4 | 109 | 108 | 89 | 9.5 |
| 170 | NAS 5034UUNR | NAS 5034ZZNR | 22.5 | 170 | 260 | 270 | 122 | 121 | 99 | 11 |

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.



NAS50...UUNR



NAS50...ZZNR

| <i>f</i> | <i>c</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>J</i> | Basic dynamic load rating | Basic static load rating | Allowable rotational speed ⁽²⁾ |
|----------|----------|--|----------|---------------------------|----------------------------|---|
| | | | | <i>C</i> N | <i>C</i> ₀ N | rpm |
| 2 | 1.5 | 0.6 | 50 | 79 500 | 116 000 | 2 500 |
| 2 | 1.5 | 0.6 | 56 | 95 500 | 144 000 | 2 000 |
| 2 | 1.5 | 0.6 | 61 | 100 000 | 158 000 | 2 000 |
| 2.5 | 2 | 0.6 | 68 | 118 000 | 193 000 | 1 800 |
| 2.5 | 2 | 0.6 | 73 | 123 000 | 208 000 | 1 700 |
| 2.5 | 2 | 0.6 | 78 | 128 000 | 224 000 | 1 600 |
| 2.5 | 2 | 0.6 | 84 | 171 000 | 284 000 | 1 400 |
| 2.5 | 2 | 0.6 | 91 | 179 000 | 308 000 | 1 300 |
| 2.5 | 2 | 0.6 | 97 | 251 000 | 428 000 | 1 300 |
| 2.5 | 2 | 0.6 | 101 | 257 000 | 446 000 | 1 200 |
| 2.5 | 2.5 | 0.6 | 110 | 305 000 | 540 000 | 1 100 |
| 2.5 | 2.5 | 0.6 | 114 | 312 000 | 562 000 | 1 100 |
| 2.5 | 2.5 | 0.6 | 118 | 318 000 | 584 000 | 1 000 |
| 2.5 | 3 | 1 | 130 | 384 000 | 697 000 | 900 |
| 3 | 3 | 1 | 139.5 | 400 000 | 750 000 | 850 |
| 3 | 3 | 1 | 156 | 537 000 | 1 000 000 | 750 |
| 3 | 3 | 1 | 167 | 543 000 | 1 070 000 | 700 |
| 3 | 3.5 | 1 | 176.5 | 623 000 | 1 210 000 | 650 |
| 3 | 3.5 | 1.5 | 188.5 | 720 000 | 1 390 000 | 650 |
| 4 | 3.5 | 1.5 | 204.5 | 857 000 | 1 730 000 | 600 |

ROLLER BEARINGS

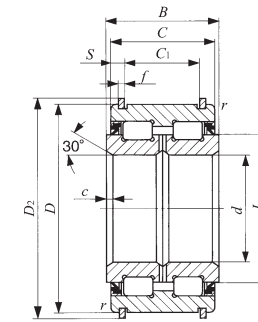
Roller Bearings for Sheaves



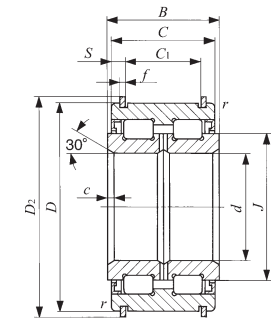
Shaft dia. 180 – 440mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | |
|---------------|-----------------------|--------------|----------------|------------------------|----------|-----------------------|----------|----------|-----------------------|----------|
| | Sealed type | Shield type | | <i>d</i> | <i>D</i> | <i>D</i> ₂ | <i>B</i> | <i>C</i> | <i>C</i> ₁ | <i>S</i> |
| 180 | NAS 5036UUNR | NAS 5036ZZNR | 30.0 | 180 | 280 | 294 | 136 | 135 | 110 | 12.5 |
| 190 | NAS 5038UUNR | NAS 5038ZZNR | 31.5 | 190 | 290 | 306 | 136 | 135 | 110 | 12.5 |
| 200 | NAS 5040UUNR | NAS 5040ZZNR | 40.5 | 200 | 310 | 326 | 150 | 149 | 120 | 14.5 |
| 220 | NAS 5044UUNR | NAS 5044ZZNR | 52.0 | 220 | 340 | 356 | 160 | 159 | 130 | 14.5 |
| 240 | NAS 5048UUNR | NAS 5048ZZNR | 55.5 | 240 | 360 | 376 | 160 | 159 | 130 | 14.5 |
| 260 | NAS 5052UUNR | NAS 5052ZZNR | 85.0 | 260 | 400 | 416 | 190 | 189 | 154 | 17.5 |
| 280 | NAS 5056UUNR | NAS 5056ZZNR | 90.9 | 280 | 420 | 440 | 190 | 189 | 154 | 17.5 |
| 300 | NAS 5060UU | NAS 5060ZZ | 130 | 300 | 460 | — | 218 | 216 | — | — |
| 320 | NAS 5064UU | NAS 5064ZZ | 135 | 320 | 480 | — | 218 | 216 | — | — |
| 340 | NAS 5068UU | NAS 5068ZZ | 180 | 340 | 520 | — | 243 | 241 | — | — |
| 360 | NAS 5072UU | NAS 5072ZZ | 190 | 360 | 540 | — | 243 | 241 | — | — |
| 380 | NAS 5076UU | NAS 5076ZZ | 200 | 380 | 560 | — | 243 | 241 | — | — |
| 400 | NAS 5080UU | NAS 5080ZZ | 265 | 400 | 600 | — | 272 | 270 | — | — |
| 420 | NAS 5084UU | NAS 5084ZZ | 275 | 420 | 620 | — | 272 | 270 | — | — |
| 440 | NAS 5088UU | NAS 5088ZZ | 310 | 440 | 650 | — | 280 | 278 | — | — |

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.



NAS50...UUNR



NAS50...ZZNR

| <i>f</i> | <i>c</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>J</i> | Basic dynamic load rating | Basic static load rating | Allowable rotational speed ⁽²⁾ |
|----------|----------|--|----------|---------------------------|--------------------------|---|
| | | | | <i>C</i> | <i>C</i> ₀ | |
| | | | | N | N | rpm |
| 5 | 3.5 | 1.5 | 217 | 1 070 000 | 2 140 000 | 550 |
| 5 | 3.5 | 1.5 | 225 | 1 120 000 | 2 230 000 | 500 |
| 5 | 3.5 | 1.5 | 242 | 1 310 000 | 2 650 000 | 500 |
| 6 | 4 | 1.5 | 260 | 1 510 000 | 3 110 000 | 450 |
| 6 | 4 | 1.5 | 278.5 | 1 570 000 | 3 350 000 | 400 |
| 7 | 5 | 2 | 312 | 2 130 000 | 4 510 000 | 350 |
| 7 | 5 | 2 | 335 | 2 210 000 | 4 860 000 | 350 |
| — | 5 | 2 | 359 | 2 670 000 | 5 870 000 | 300 |
| — | 5 | 2 | 375 | 2 700 000 | 6 140 000 | 300 |
| — | 6 | 2.5 | 404 | 3 370 000 | 7 560 000 | 300 |
| — | 6 | 2.5 | 423 | 3 420 000 | 7 940 000 | 250 |
| — | 6 | 2.5 | 442 | 3 580 000 | 8 300 000 | 250 |
| — | 6 | 2.5 | 471 | 4 250 000 | 10 100 000 | 250 |
| — | 6 | 2.5 | 490 | 4 390 000 | 10 400 000 | 250 |
| — | 8 | 3 | 516 | 4 570 000 | 10 900 000 | 200 |

E

NAG
 NAU
 TRU
 NAS

THRUST BEARINGS

- Thrust Needle Roller Bearings
- Thrust Roller Bearings



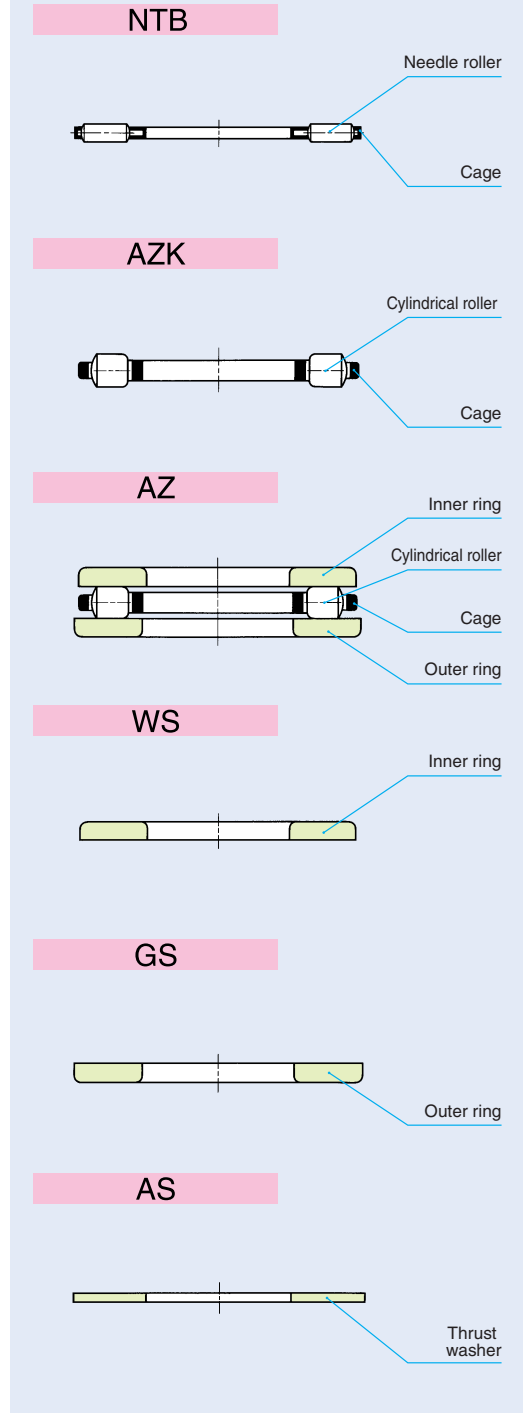
Structure and Features

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.

Structures of Thrust Bearings



F

NTB
AS
AZK
WS·GS

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 $2\mu\text{m}$. 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.

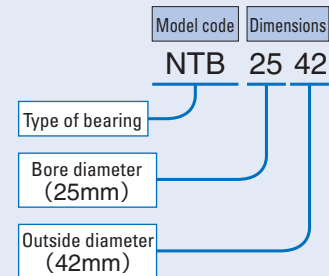
These bearings are generally used by utilizing their inner surface as the guide surface.

Identification Number

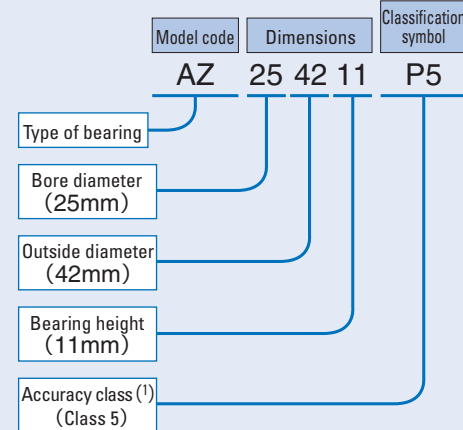
The identification number of Thrust Bearings consists of a model code, dimensions and a classification symbol. Some examples are shown below.

Examples of identification number

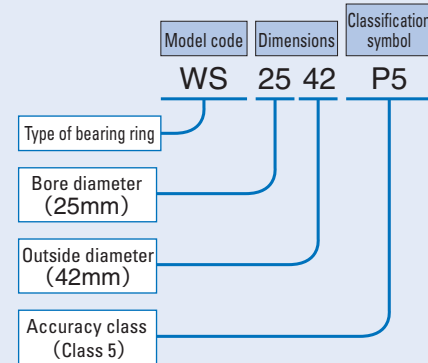
Example 1 (In case of NTB or AS)



Example 2 (In case of AZ or AZK)



Example 3 (In case of WS or GS)



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 | $1 \leq D_w \leq 10$ Equivalent to JIS B 1506 Class 2 $10 < D_w \leq 30$ 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 |
| | | 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 |

Table 2.4 Tolerances and allowable values for WS and GS unit: μm

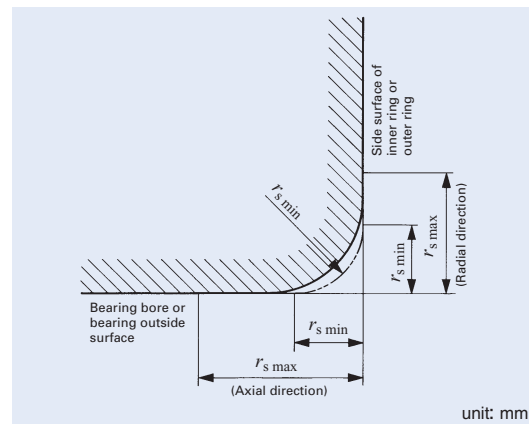
| d or D ⁽¹⁾ Nominal bearing bore dia. or outside dia. mm | | Inner ring | | | Outer ring | | | Inner ring or outer ring | | |
|--|-------|---|------|---|--|------|--|---|---------|---------|
| | | Δ_{dmp} Single plane mean bore diameter deviation | | V_{dsp} Bore diameter variation in a single radial 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 | | |
| | | High | Low | | High | Low | | Class 0 | Class 6 | Class 5 |
| Over | Incl. | | | Max. | | | 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_{dsp} , and D for Δ_{Dmp} and V_{Dsp} , 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 min | r_s max |
| 0.3 | 0.3 | 0.8 |
| 0.6 | 0.6 | 1.5 |
| 1 | 1 | 2.2 |
| 1.1 | 1.1 | 2.7 |
| 1.5 | 1.5 | 3.5 |
| 2 | 2 | 4 |
| 2.1 | 2.1 | 4.5 |
| 3 | 3 | 5.5 |
| 4 | 4 | 6.5 |
| 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) | — |
| | AZK | h6(h8) | — |
| Thrust roller bearings | 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.

- When 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 $0.2 \mu\text{m} R_a$.
- When 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.
- To 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.
- Thrust 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.

F

NTB
AS
AZK
WS·GS

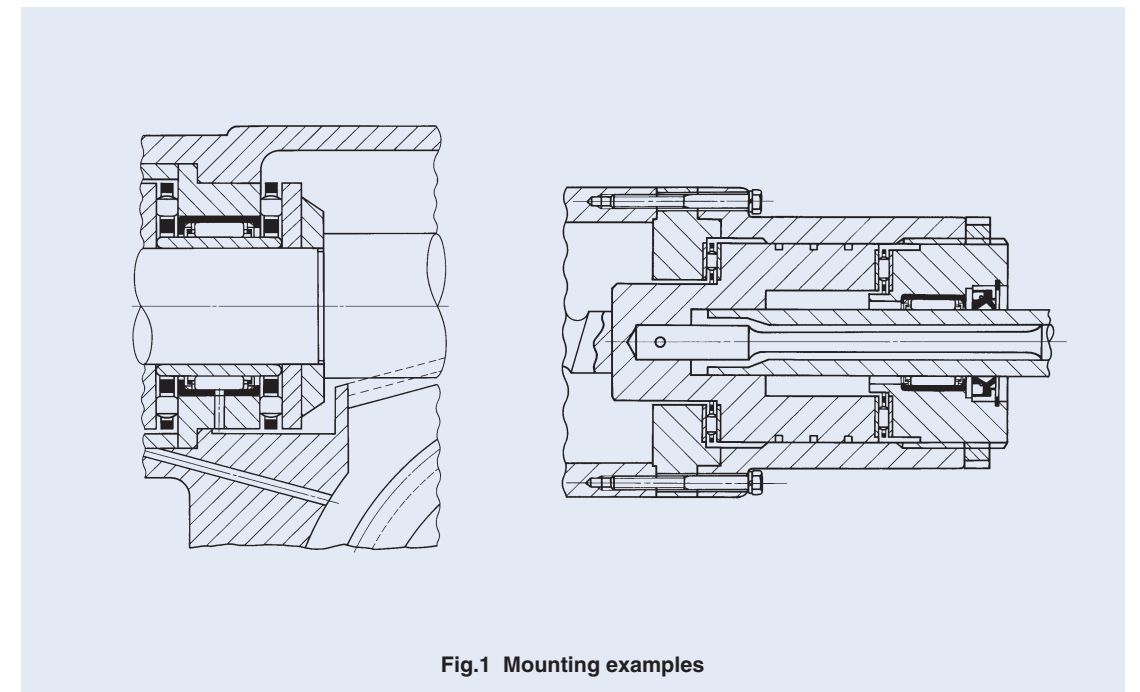


Fig.1 Mounting examples

THRUST BEARINGS

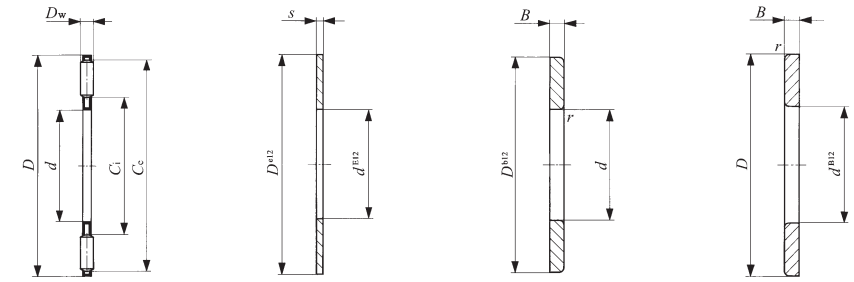
Thrust Needle Roller Bearings



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

| d | Boundary dimensions mm | | | | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Allowable rotational speed ⁽²⁾ rpm |
|----|------------------------|----------------|---|------|-----------------------------------|----------------|----------------|--------|-------------------------------|---|---|
| | D | D _w | s | B | r _{s min} ⁽¹⁾ | C _i | C _e | | | | |
| 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 | |

F
 NTB
 AS
 AZK
 WS-GS

THRUST BEARINGS

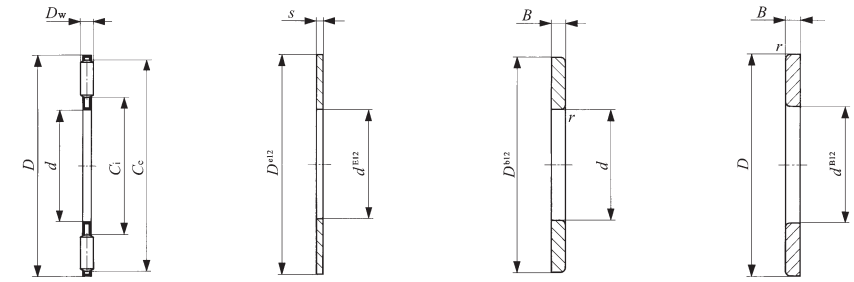
Thrust Needle Roller Bearings



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 |

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.



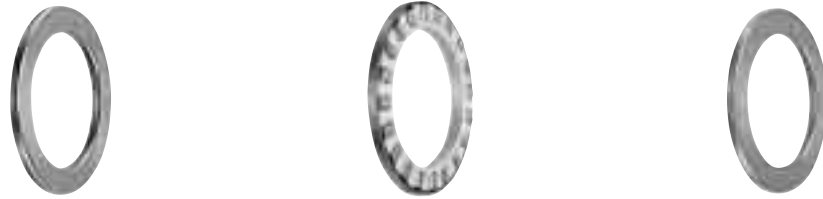
NTB AS WS GS

| Boundary dimensions mm | | | | | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|-----------------------|----------|----------|--|-----------------------|-----------------------|--|--|--|
| <i>d</i> | <i>D</i> | <i>D</i> _w | <i>s</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>C</i> _i | <i>C</i> _e | | | |
| 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 |

F
 NTB
 AS
 AZK
 WS-GS

THRUST BEARINGS

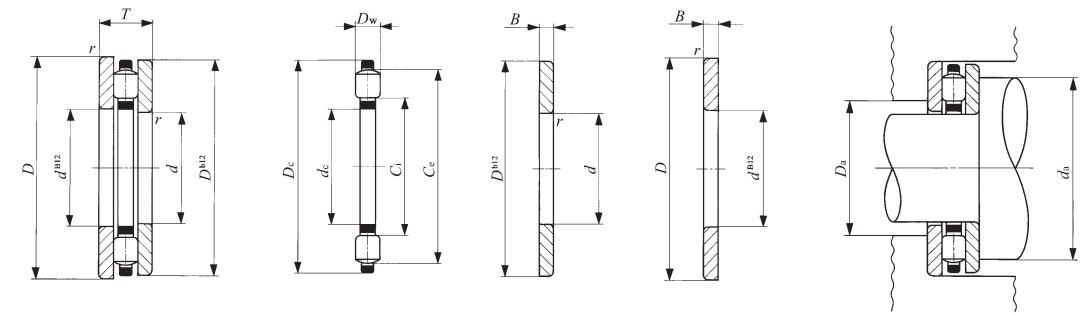
Thrust Roller Bearings



Shaft dia. 10 – 65mm

| 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 | |

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.



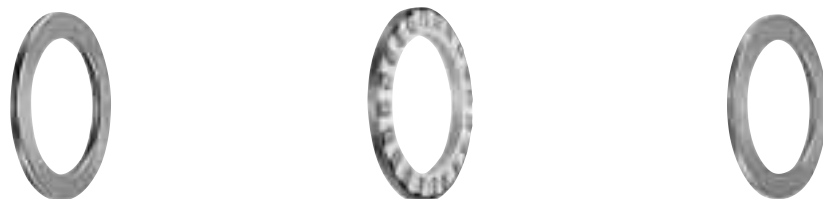
AZ AZK WS GS

| 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 |
|------------------------|----------|----------|----------------------|----------------------|----------------------|----------|---|----------------------|----------------------|---------------------------|---------------------------------|---------|-------------------------------|---|---|
| <i>d</i> | <i>D</i> | <i>T</i> | <i>d_c</i> | <i>D_c</i> | <i>D_w</i> | <i>B</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>C_i</i> | <i>C_e</i> | <i>d_a</i> Min. | <i>D_a</i> 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 | |
| | 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 | |
| | 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 | |
| | 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 | |
| | 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 | |
| | 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 | |
| | 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 | |
| | 95 | 26 | 60.05 | 94.5 | 11 | 7.5 | 1 | 68 | 90 | 89 | 68 | 106 000 | 332 000 | 4 000 | |
| | 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 | |
| | 100 | 27 | 65.05 | 99.5 | 11 | 8 | 1 | 73 | 95 | 94 | 73 | 116 000 | 379 000 | 3 500 | |

F
 NTB
 AS
 AZK
 WS-GS

THRUST BEARINGS

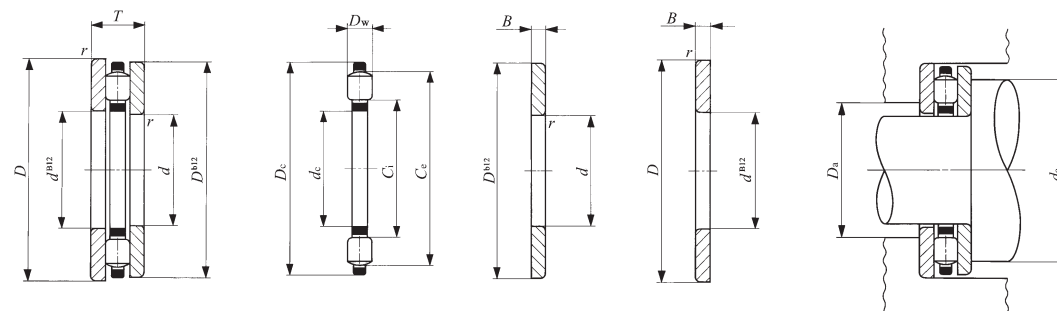
Thrust Roller Bearings



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 |

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.



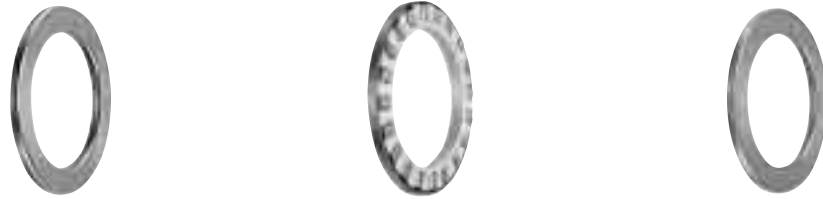
AZ AZK WS GS

| Boundary dimensions mm | | | | | | | | | | | Standard mounting dimensions mm | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Allowable rotational speed ⁽²⁾ rpm |
|------------------------|----------|----------|-----------------------|-----------------------|-----------------------|----------|--|-----------------------|-----------------------|----------------------------|---------------------------------|---------|--|--|--|
| <i>d</i> | <i>D</i> | <i>T</i> | <i>d</i> _c | <i>D</i> _c | <i>D</i> _w | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>C</i> _i | <i>C</i> _e | <i>d</i> _a Min. | <i>D</i> _a Max. | | | | |
| 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 | |

F
 NTB
 AS
 AZK
 WS-GS

THRUST BEARINGS

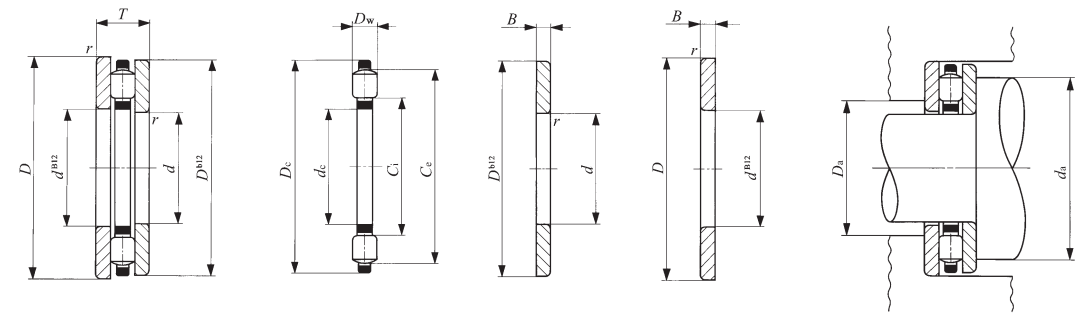
Thrust Roller Bearings



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 |

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.



AZ AZK WS GS

| 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 |
|------------------------|----------|----------|----------------------|----------------------|----------------------|----------|---|----------------------|----------------------|---------------------------|---------------------------------|-----------|-------------------------------|---|---|
| <i>d</i> | <i>D</i> | <i>T</i> | <i>d_c</i> | <i>D_c</i> | <i>D_w</i> | <i>B</i> | <i>r_{s min}</i> ⁽¹⁾ | <i>C_i</i> | <i>C_e</i> | <i>d_a</i> Min. | <i>D_a</i> 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 | |

F
 NTB
 AS
 AZK
 WS-GS

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 |

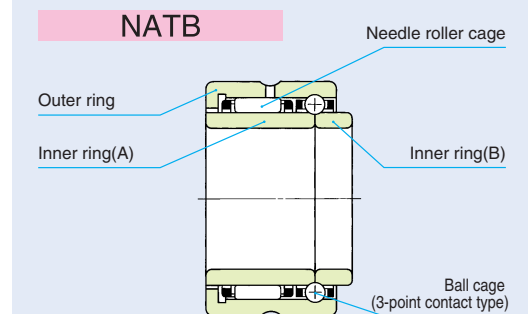
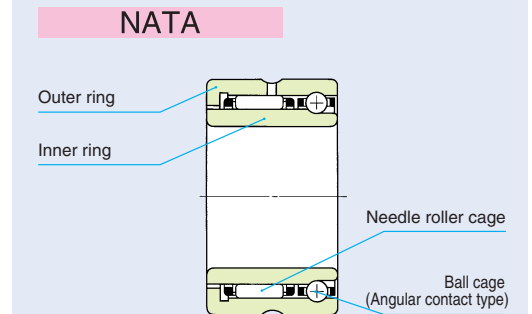
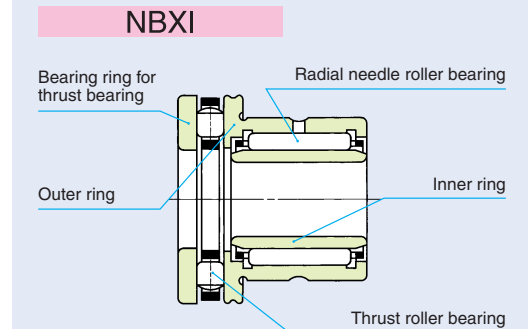
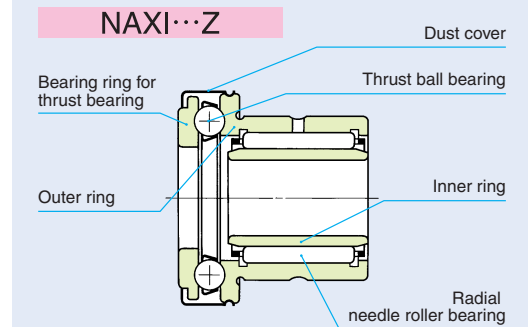
Table 1.2 Type of bearing

| 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



G

NAX
NBX
NATA
NATB

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

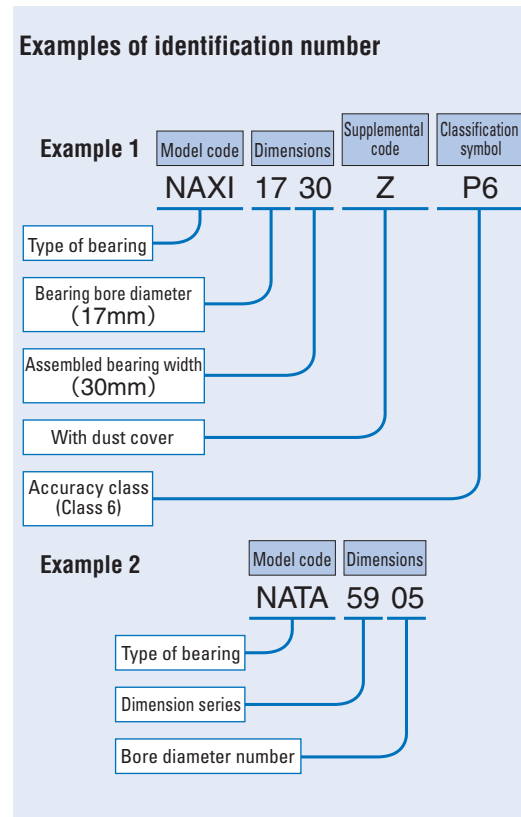
In this series, caged needle roller bearings are combined with angular contact ball bearings to receive thrust loads. These bearings conform to the international dimension series #59, which is based on the ISO Standard. They can withstand heavy radial loads and unidirectional axial loads simultaneously. 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.



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

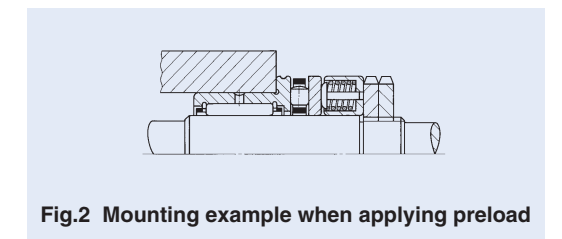
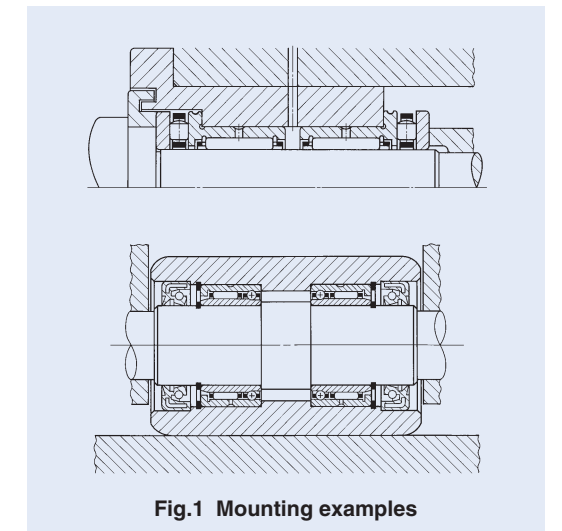
The outer ring of Combined Type Needle Roller Bearings has an oil groove and an oil hole. When outer rings with multiple oil holes or inner rings with oil hole(s) are required, please contact IKO.

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.

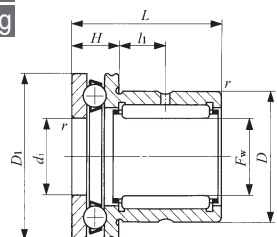


G

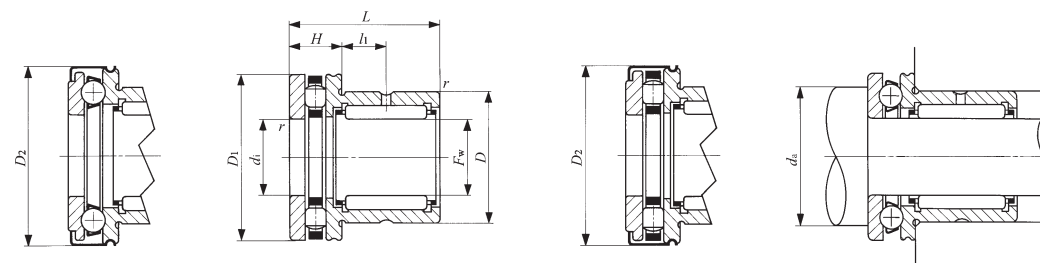
NAX
NBX
NATA
NATB

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 | 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 | — | — | — | — |

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.

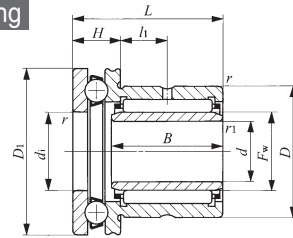
Remarks1. The outer ring has an oil groove and an oil hole.
 2. Grease is not prepacked. Perform proper lubrication.

| F_w | Boundary dimensions mm | | | | | | | | | Standard mounting dimension d_a Min. mm | Basic dynamic load rating C | | Basic static load rating C_0 | | Allowable rotational speed ⁽²⁾ rpm |
|-------|------------------------|-------|-------|-----|-----|-------|-----------------------------|-------|-------------|--|-------------------------------|-------------|--------------------------------|--------|--|
| | D | D_1 | D_2 | L | H | l_1 | $r_{s \min}$ ⁽¹⁾ | d_i | Radial N | | Axial N | Radial N | Axial N | | |
| 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 | |

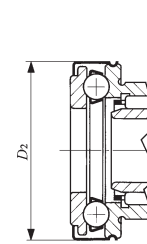
G
 NAX
 NBX
 NATA
 NATB

COMBINED TYPE NEEDLE ROLLER BEARINGS

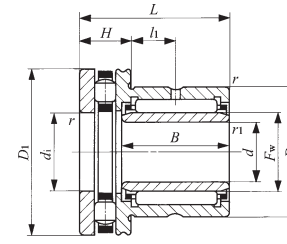
Needle Roller Bearings with Thrust Ball Bearing **With Inner Ring**
 Needle Roller Bearings with Thrust Roller Bearing **With Inner Ring**



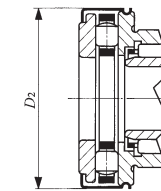
NAXI



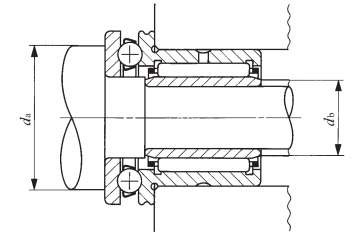
NAXI...Z



NBXI



NBXI...Z



Shaft dia. 7 – 60mm

| Shaft dia. mm | Identification number | | | | | | | | <i>d</i> | <i>D</i> | <i>D</i> ₁ |
|------------------|-----------------------|-----------------|------------------|------------------|-----------------|------------------|-----------------|------------------|----------|----------|-----------------------|
| | Mass (Ref.) g | With dust cover | Mass (Ref.) g | Mass (Ref.) g | With dust cover | Mass (Ref.) g | With dust cover | Mass (Ref.) g | | | |
| 7 | NAXI 723 | 43.5 | NAXI 723Z | 45 | — | — | — | — | 7 | 19 | 24 |
| 9 | NAXI 923 | 49.5 | NAXI 923Z | 51.5 | — | — | — | — | 9 | 21 | 26 |
| 12 | NAXI 1223 | 55.5 | NAXI 1223Z | 56.5 | — | — | — | — | 12 | 24 | 28 |
| | | | | | NBXI 1223 | 62 | NBXI 1223Z | 63 | 12 | 24 | 28 |
| 14 | NAXI 1425 | 63.5 | NAXI 1425Z | 65.5 | — | — | — | — | 14 | 26 | 30 |
| | | | | | NBXI 1425 | 70.5 | NBXI 1425Z | 72.5 | 14 | 26 | 30 |
| 17 | NAXI 1730 | 99 | NAXI 1730Z | 103 | — | — | — | — | 17 | 30 | 35 |
| | | | | | NBXI 1730 | 108 | NBXI 1730Z | 111 | 17 | 30 | 35 |
| 20 | NAXI 2030 | 159 | NAXI 2030Z | 163 | — | — | — | — | 20 | 37 | 42 |
| | | | | | NBXI 2030 | 171 | NBXI 2030Z | 175 | 20 | 37 | 42 |
| 25 | NAXI 2530 | 179 | NAXI 2530Z | 185 | — | — | — | — | 25 | 42 | 47 |
| | | | | | NBXI 2530 | 194 | NBXI 2530Z | 200 | 25 | 42 | 47 |
| 30 | NAXI 3030 | 208 | NAXI 3030Z | 215 | — | — | — | — | 30 | 47 | 52 |
| | | | | | NBXI 3030 | 225 | NBXI 3030Z | 232 | 30 | 47 | 52 |
| 35 | NAXI 3532 | 265 | NAXI 3532Z | 273 | — | — | — | — | 35 | 52 | 60 |
| | | | | | NBXI 3532 | 286 | NBXI 3532Z | 294 | 35 | 52 | 60 |
| 40 | NAXI 4032 | 315 | NAXI 4032Z | 324 | — | — | — | — | 40 | 58 | 65 |
| | | | | | NBXI 4032 | 344 | NBXI 4032Z | 353 | 40 | 58 | 65 |
| 45 | NAXI 4535 | 358 | NAXI 4535Z | 368 | — | — | — | — | 45 | 62 | 70 |
| | | | | | NBXI 4535 | 386 | NBXI 4535Z | 396 | 45 | 62 | 70 |
| 50 | NAXI 5040 | 582 | NAXI 5040Z | 619 | — | — | — | — | 50 | 72 | 85 |
| | | | | | NBXI 5040 | 666 | NBXI 5040Z | 703 | 50 | 72 | 85 |
| 60 | NAXI 6040 | 750 | NAXI 6040Z | 801 | — | — | — | — | 60 | 85 | 95 |

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.

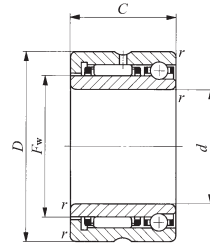
| Boundary dimensions mm | | | | | | | | | | | Standard mounting dimensions mm | | Basic dynamic load rating <i>C</i> | | Basic static load rating <i>C</i> ₀ | | Allowable rotational speed ⁽²⁾ rpm | Assembled inner ring |
|------------------------|----------|----------|----------|-----------------------|--|--|-----------------------|-----------------------|-------------------------------|-----------------------|---------------------------------|------------|------------------------------------|------------|--|------------|--|----------------------|
| <i>D</i> ₂ | <i>L</i> | <i>B</i> | <i>H</i> | <i>l</i> ₁ | <i>r</i> _{s min} ⁽¹⁾ | <i>r</i> _{s min} ⁽¹⁾ | <i>F</i> _w | <i>d</i> _i | <i>d</i> _a Min. | <i>d</i> _b | Radial N | Axial N | Radial N | Axial N | | | | |
| 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 | | |
| 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 | | |
| 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 | | |
| | | | | | | | | | | | | | | | | 15 | 15 | 26 |
| 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 | | |
| | | | | | | | | | | | | | | | | 17 | 17 | 28 |
| 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 | | |
| | | | | | | | | | | | | | | | | 20 | 20 | 33 |
| 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 | | |
| | | | | | | | | | | | | | | | | 25 | 25 | 40 |
| 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 | | |
| | | | | | | | | | | | | | | | | 30 | 30 | 45 |
| 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 | | |
| | | | | | | | | | | | | | | | | 35 | 35 | 50 |
| 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 | | |
| | | | | | | | | | | | | | | | | 40 | 40 | 57 |
| 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 | | |
| | | | | | | | | | | | | | | | | 45 | 45 | 62 |
| 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 | | |
| | | | | | | | | | | | | | | | | 50 | 50 | 67 |
| 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 | | |
| | | | | | | | | | | | | | | | | 60 | 60 | 82 |
| 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 | | |

G

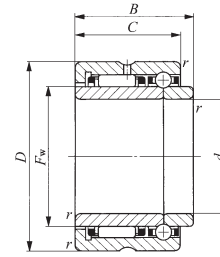
NAX
NBX
NATA
NATB

COMBINED TYPE NEEDLE ROLLER BEARINGS

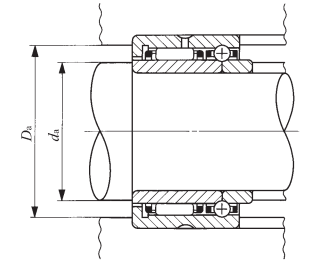
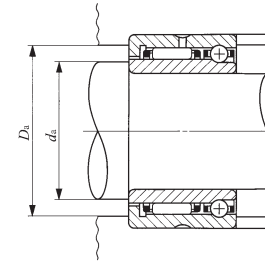
Needle Roller Bearings with Angular Contact Ball Bearing
 Needle Roller Bearings with Three-point Contact Ball Bearing



NATA59



NATB59



Shaft dia. 15 – 70mm

| Shaft dia. mm | Identification number | | | | Boundary dimensions mm | | | | | |
|------------------|-----------------------|---------------------|--------------------------|---------------------|---------------------------|-----|----|----|--------------------|-------|
| | Angular contact type | Mass (Ref.) g | Three-point contact type | Mass (Ref.) g | 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 |

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.

| Standard mounting dimensions mm | | Basic dynamic load rating C | | Basic static load rating C_0 | | Allowable rotational speed ⁽²⁾ rpm |
|------------------------------------|---------------|----------------------------------|------------|-----------------------------------|------------|--|
| d_a Min. | D_a Max. | Radial N | Axial N | Radial N | Axial N | |
| 17 | 26 | 7 710 | 1 900 | 10 200 | 2 920 | 20 000 |
| 19 | 28 | 8 220 | 2 050 | 11 500 | 3 340 | 18 000 |
| 22 | 35 | 14 300 | 3 810 | 18 400 | 6 110 | 16 000 |
| 27 | 40 | 15 800 | 4 300 | 22 100 | 7 520 | 13 000 |
| 32 | 45 | 17 700 | 4 550 | 26 800 | 8 460 | 11 000 |
| 39 | 51 | 24 000 | 4 890 | 42 100 | 9 870 | 9 500 |
| 44 | 58 | 30 600 | 5 350 | 60 400 | 11 800 | 8 500 |
| 49 | 64 | 32 600 | 5 450 | 68 500 | 12 700 | 7 000 |
| 54 | 68 | 33 600 | 5 660 | 72 500 | 13 600 | 7 000 |
| 60 | 75 | 39 500 | 10 400 | 74 400 | 24 700 | 6 500 |
| 65 | 80 | 41 800 | 10 700 | 82 200 | 26 700 | 6 000 |
| 70 | 85 | 43 800 | 11 000 | 90 200 | 28 700 | 5 500 |
| 75 | 95 | 56 400 | 13 500 | 127 000 | 35 000 | 5 000 |

G

NAX
NBX
NATA
NATB

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 |

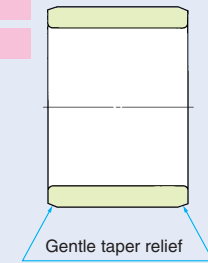
Remark For Inner Rings for Shell Type Needle Roller Bearings with Seal, please consult IKO.

Table 1.2 Inner Rings for General Usage

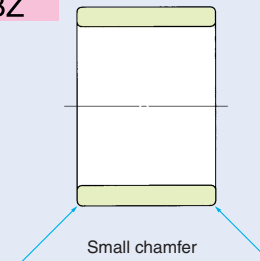
| Series | | Model codes of assembled bearings |
|---------------|----------|---|
| Metric series | LRT | RNA 49, RNA 69 RNA 48, TAF, TR RNAF, NAX, NBX |
| | LRTZ | RNA 49...UU, RNA 69...UU GTR |
| Inch series | LRB | BR |
| | LRBZ...B | BR...UU |
| | LRBZ | GBR, GBR...UU |

Shapes of Inner Rings

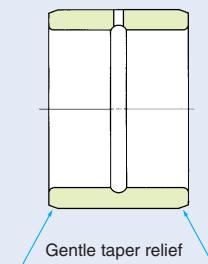
- IRT
- IRB
- LRT



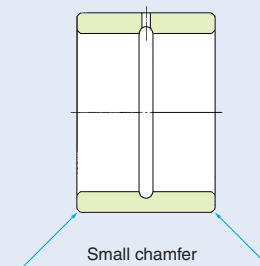
- LRTZ
- LRBZ



- LRB

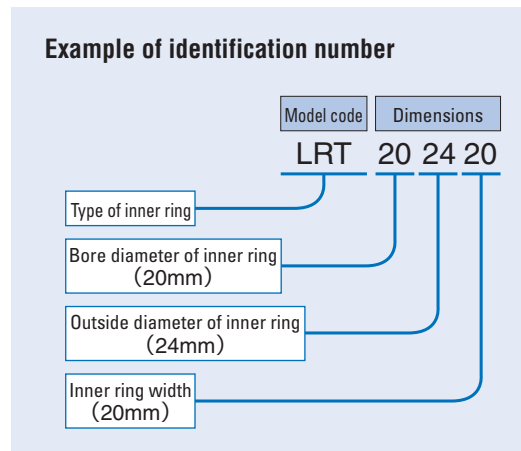


- LRBZ...B



Identification number

The identification number of Inner Rings consists of a model code and dimensions. An example is shown below.



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 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 | | | | | | | | | | | | | | | | | | | | d Bore 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 | | Over | Incl. | | |
| 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 | — 12 | 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 |

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

| 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 runoff of assembled bearing inner ring | |
|--|---|-------|---|-----|---|----|
| | Over | Incl. | High | Low | | |
| 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

| 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 runoff of assembled bearing inner ring | |
|--|---|-------|---|-----|---|----|
| | Over | Incl. | High | Low | | |
| — | 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.

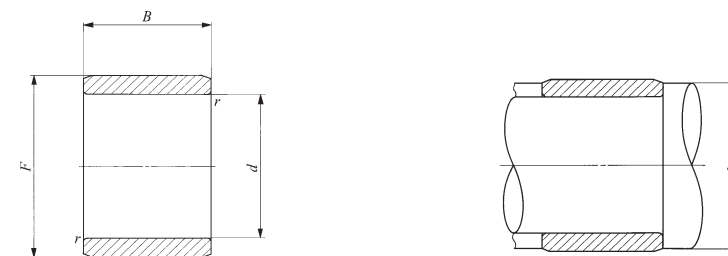
Table 8 Number of oil holes

| Bearing type | Metric series | 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.

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings



IRT

Shaft dia. 7 – 17mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | | |
|------------------|-----------------------|------------------|---------------------------|----|------|--------------------|--------------------------------|------|--------------------|----------------|----------|
| | | | d | F | B | $r_{s \min}^{(1)}$ | Min. | Max. | 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.

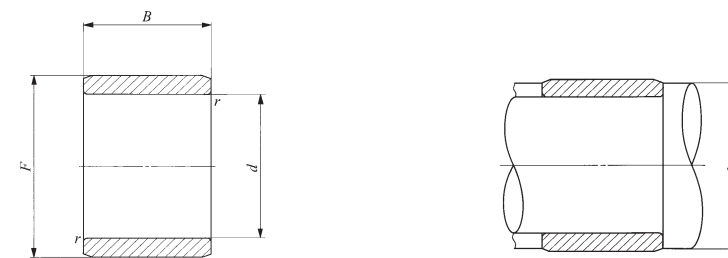
| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | | |
|------------------|-----------------------|------------------|---------------------------|----|------|--------------------|--------------------------------|------|--------------------|----------------|-----------|
| | | | d | F | B | $r_{s \min}^{(1)}$ | Min. | Max. | 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 | 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 | TLA 2020Z | YT 202820 |
| | IRT 1730 | 20.5 | 17 | 20 | 30.5 | 0.3 | 19 | 19.5 | TA 202820Z | — | — |
| | IRT 1716-1 | 15.1 | 17 | 21 | 16.5 | 0.3 | 19 | 20 | TA 2030Z | TLA 2030Z | — |
| | IRT 1720-1 | 18.8 | 17 | 21 | 20.5 | 0.3 | 19 | 20 | TA 2116Z | — | YT 2116 |
| | IRT 1710-2 | 12.4 | 17 | 22 | 10.5 | 0.3 | 19 | 21 | TA 2120Z | — | YT 2120 |
| | IRT 1715-2 | 18.3 | 17 | 22 | 15.5 | 0.3 | 19 | 21 | TA 2210Z | — | — |
| | IRT 1716-2 | 19.4 | 17 | 22 | 16.5 | 0.3 | 19 | 21 | TA 2215Z | — | — |
| | IRT 1720-2 | 24 | 17 | 22 | 20.5 | 0.3 | 19 | 21 | TA 223016Z | TLA 2216Z | YT 223016 |
| | IRT 1725-2 | 30 | 17 | 22 | 25.5 | 0.3 | 19 | 21 | TA 2220Z | TLA 2220Z | YT 223020 |
| | IRT 1730-2 | 36 | 17 | 22 | 30.5 | 0.3 | 19 | 21 | TA 223020Z | — | — |
| | IRT 1725Z | — | — | — | — | — | — | — | TA 2225Z | — | — |
| | IRT 1730Z | — | — | — | — | — | — | — | TA 2230Z | — | — |

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

H
IRT
IRB
LRT
LRB

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings



IRT

Shaft dia. 20 – 45mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | | |
|------------------|-----------------------|---------------------|---------------------------|------|------|-----------------------------------|-----------------------------------|------|--------------------|-------------------|-----------|
| | | | d | F | B | r _s min ⁽¹⁾ | Min. | Max. | 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 | — | YT 243220 |
| | | | | | | | | | TA 243220Z | | |
| | 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.

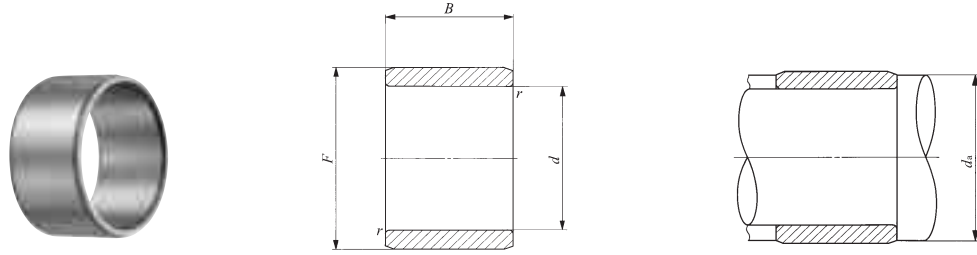
| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | | |
|------------------|-----------------------|---------------------|---------------------------|------|------|-----------------------------------|-----------------------------------|-----------|--------------------|-------------------|-----------|
| | | | d | F | B | r _s min ⁽¹⁾ | Min. | Max. | 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.

H
IRT
IRB
LRT
LRB

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings



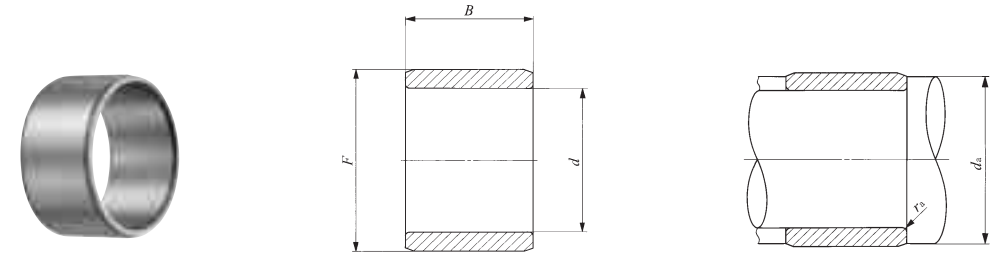
IRT

Shaft dia. 50 – 60mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | | |
|------------------|-----------------------|------------------|------------------------|------|------|-----------------------------------|--------------------------------|-----------|--------------------|----------------|--------|
| | | | d | F | B | r _{s min} ⁽¹⁾ | Min. | Max. | 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

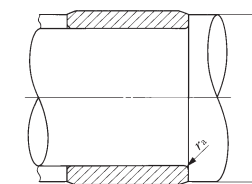
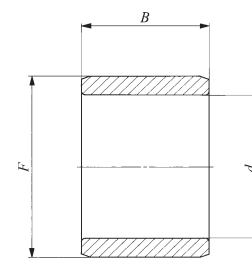
Shaft dia. 7.938 – 15.875mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm (inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | | Assembled bearings | | |
|-------------------------|-----------------------|------------------|-------------------------------|----------------|-------|--|------|----------|--------------------|----------------|---------|
| | | | d | F | B | Min. | Max. | Max. | 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 |
| | IRB 612 | 13.2 | 9.525 (3/8) | 14.288 (9/16) | 19.43 | 12.8 | 13.2 | 0.3 | BA 912Z | — | YB 912 |
| 11.112 (7/16) | 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 |
| | 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 |
| | IRB 712 | 15 | 11.112 (7/16) | 15.875 (5/8) | 19.43 | 14.4 | 14.8 | 0.3 | BA 1012Z | — | YB 1012 |
| 12.700 (1/2) | 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 | — |
| | 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 | — | — |
| | IRB 812 | 16.7 | 12.700 (1/2) | 17.462 (11/16) | 19.43 | 16.9 | 16.9 | 0.3 | BA 1112Z | — | YB 1112 |
| 14.288 (9/16) | 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 | — | 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 | — | — |
| 15.875 (5/8) | IRB 816-1 | 31 | 12.700 (1/2) | 19.050 (3/4) | 25.78 | 16.9 | 17.5 | 0.6 | BA 1216Z | — | — |
| | IRB 98 | 17.3 | 14.288 (9/16) | 20.638 (13/16) | 13.08 | 19 | 19.6 | 0.6 | BA 138Z | — | YB 138 |
| | IRB 910 | 21.5 | 14.288 (9/16) | 20.638 (13/16) | 16.25 | 19 | 19.6 | 0.6 | BA 1310Z | — | YB 1310 |
| | IRB 912 | 26 | 14.288 (9/16) | 20.638 (13/16) | 19.43 | 19 | 19.6 | 0.6 | BA 1312Z | BHA 1312Z | YB 1312 |
| | IRB 914 | 30 | 14.288 (9/16) | 20.638 (13/16) | 22.60 | 19 | 19.6 | 0.6 | BA 1314Z | — | — |
| 15.875 (5/8) | 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 | — | — |
| | 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.

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings **Inch Series**



IRB

Shaft dia. 15.875 — 63.500mm

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | | Assembled bearings | | |
|----------------------------|-----------------------|---------------------|---------------------------------|----------------|-------|--|------------------------|-----------------------------|--------------------|-------------------|---------------------|
| | | | d | F | B | d _a Min. | d _a Max. | r _{as} max Max. | 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 | — | — |
| | 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 | — | — |
| 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 | — | — |
| | 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 | — | 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 | — | — |
| | IRB 168-1 | 36.5 | 25.400 (1) | 33.338 (1 3/8) | 13.08 | 30 | 32.1 | 0.6 | BA 218Z | — | — |
| | IRB 1610-1 | 45.5 | 25.400 (1) | 33.338 (1 3/8) | 16.25 | 30 | 32.1 | 0.6 | BA 2110Z | — | — |
| | IRB 1612-1 | 54.5 | 25.400 (1) | 33.338 (1 3/8) | 19.43 | 30 | 32.1 | 0.6 | BA 2112Z | — | — |

Note⁽¹⁾ Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.

| Shaft dia. mm (inch) | Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | | Assembled bearings | | |
|----------------------------|-------------------------|---------------------|----------------------------------|----------------------------------|----------------|--|------------------------|-----------------------------|---------------------|-------------------|-----------|
| | | | d | F | B | d _a Min. | d _a Max. | r _{as} max Max. | 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 | — | 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 | — | 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 1/16) | IRB 2316 | 99 | 36.512 (1 1/16) | 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 IRB 2410-1 | 64 79.5 | 38.100 (1 1/2) 38.100 (1 1/2) | 47.625 (1 7/8) 47.625 (1 7/8) | 13.08 16.25 | 44.5 44.5 | 45.5 45.5 | 1 1 | BA 308Z 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.

INNER RINGS

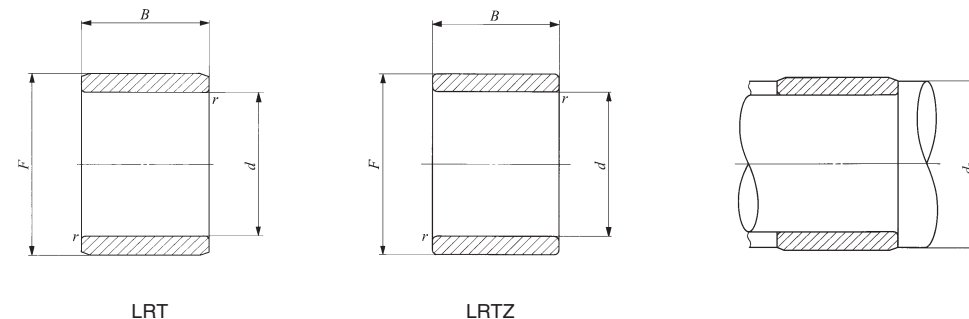
Inner Rings for General Usage



Shaft dia. 5 – 20mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | |
|---------------|-----------------------|-------------|---------------|------------------------|----------|----------|--|--------------------------------|------|------------------------|--|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | Min. | Max. | | |
| 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.



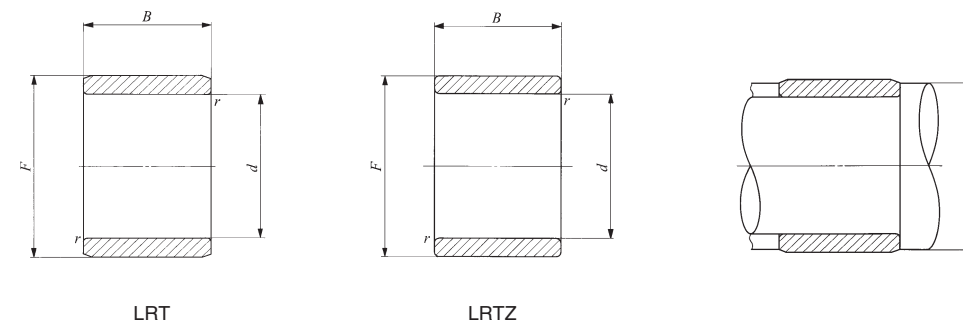
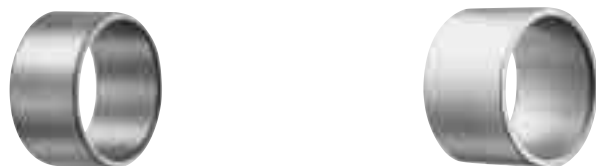
| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | |
|---------------|-----------------------|-------------|---------------|------------------------|----------|----------|--|--------------------------------|--------------|----------------------|--|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>r</i> _{s min} ⁽¹⁾ | Min. | Max. | | |
| 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 | | |
| 17 | LRT 152026 | — | 28 | 15 | 20 | 26 | 0.3 | 17 | 19 | RNAFW 202826 | |
| | 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.



INNER RINGS

Inner Rings for General Usage



Shaft dia. 20 – 32mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | |
|------------------|-----------------------|-------------|---------------------|---------------------------|------|------|--------------------------------------|-----------------------------------|----------|--------------------|-------------|
| | | | | d | F | B | r _s ⁽¹⁾ min | d _a Min. | Max. | | |
| 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 | NAX 2530 |
| | — | LRTZ 202520 | 28 | 20 | 25 | 20.5 | 0.3 | 22 | 24 | NBX 2530 | |
| | LRT 202525 | — | 35 | 20 | 25 | 25.5 | 0.3 | 22 | 24 | GTR 253820 | |
| | — | LRTZ 202525 | 35 | 20 | 25 | 25.5 | 0.3 | 22 | 24 | TR 253825 | |
| | LRT 202526 | — | 36 | 20 | 25 | 26 | 0.3 | 22 | 24 | GTR 253825 | |
| | LRT 202530 | — | 40.5 | 20 | 25 | 30 | 0.3 | 22 | 24 | RNAFW 253526 | |
| 22 | — | LRTZ 202531 | 41.5 | 20 | 25 | 31 | 0.3 | 22 | 24 | RNA 6904 | |
| | LRT 202532 | — | 44 | 20 | 25 | 32 | 0.3 | 22 | 24 | RNA 6904 UU | |
| | LRT 222616 | — | 17.5 | 22 | 26 | 16 | 0.3 | 24 | 25 | RNAFW 253732 | |
| | LRT 222620 | — | 24 | 22 | 26 | 20 | 0.3 | 24 | 25 | TAF 263416 | |
| | LRT 222817 | — | 30.5 | 22 | 28 | 17 | 0.3 | 24 | 27 | TAF 263420 | |
| 25 | — | LRTZ 222818 | 32 | 22 | 28 | 18 | 0.3 | 24 | 27 | RNA 49/22 | |
| | LRT 222830 | — | 55 | 22 | 28 | 30 | 0.3 | 24 | 27 | RNA 49/22 UU | |
| | — | LRTZ 222831 | 55 | 22 | 28 | 31 | 0.3 | 24 | 27 | RNA 69/22 | |
| | LRT 252920 | — | 25 | 25 | 29 | 20 | 0.3 | 27 | 28 | RNA 69/22 UU | |
| | LRT 252930 | — | 38 | 25 | 29 | 30 | 0.3 | 27 | 28 | TAF 293820 | |
| | LRT 253016 | — | 28 | 25 | 30 | 16 | 0.3 | 27 | 29 | TAF 293830 | |
| | LRT 253017 | — | 28.5 | 25 | 30 | 17 | 0.3 | 27 | 29 | RNAF 304216 | |
| | — | LRTZ 253018 | 29.5 | 25 | 30 | 18 | 0.3 | 27 | 29 | RNA 4905 | RNAF 304017 |
| | LRT 253020 | — | 34 | 25 | 30 | 20.5 | 0.3 | 27 | 29 | RNA 4905 UU | |
| LRT 253025 | — | 42 | 25 | 30 | 25.5 | 0.3 | 27 | 29 | NAX 3030 | NBX 3030 | |
| 32 | — | LRTZ 253025 | 42 | 25 | 30 | 25.5 | 0.3 | 27 | 29 | TR 304425 | |
| | LRT 253026 | — | 44.5 | 25 | 30 | 26 | 0.3 | 27 | 29 | GTR 304425 | |
| | LRT 253030 | — | 49 | 25 | 30 | 30 | 0.3 | 27 | 29 | RNAFW 304026 | |
| | — | — | — | — | — | — | — | — | — | RNA 6905 | |
| | — | — | — | — | — | — | — | — | — | — | |

Note⁽¹⁾ Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

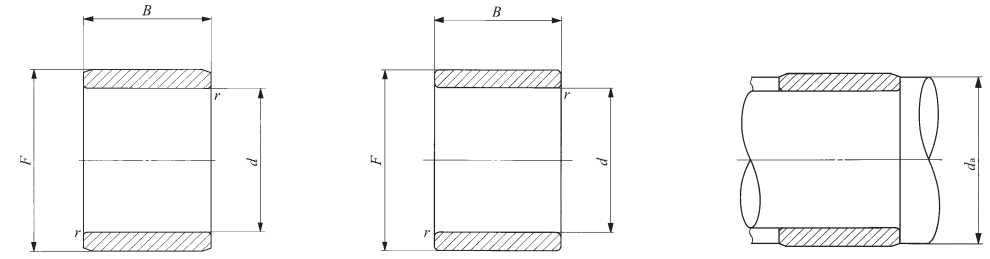
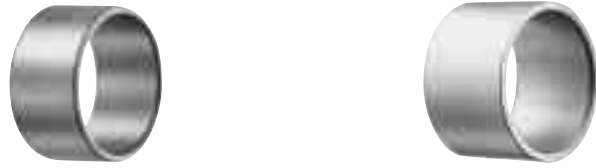
| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | |
|------------------|-----------------------|-------------|---------------------|---------------------------|----|------|--------------------------------------|-----------------------------------|-------------|--------------------|-------------|
| | | | | d | F | B | r _s ⁽¹⁾ min | d _a Min. | Max. | | |
| 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 | |
| 30 | — | LRTZ 283231 | 44 | 28 | 32 | 31 | 0.3 | 30 | 31 | RNA 69/28 UU | |
| | 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 | NAX 3530 |
| | LRT 303526 | — | 52 | 30 | 35 | 26 | 0.3 | 32 | 34 | NBX 3530 | |
| | LRT 303530 | — | 59 | 30 | 35 | 30 | 0.3 | 32 | 34 | RNAFW 354526 | |
| | LRT 303530-1 | — | 59 | 30 | 35 | 30.5 | 0.3 | 32 | 34 | RNA 6906 | TAF 354530 |
| | — | LRTZ 303530 | 59 | 30 | 35 | 30.5 | 0.3 | 32 | 34 | TR 354830 | |
| | — | LRTZ 303531 | 61 | 30 | 35 | 31 | 0.3 | 32 | 34 | GTR 354830 | |
| LRT 303532 | — | 64 | 30 | 35 | 32 | 0.3 | 32 | 34 | RNA 6906 UU | | |
| 32 | LRT 323720 | — | 43.5 | 32 | 37 | 20 | 0.3 | 34 | 36 | RNAFW 354732 | |
| | LRT 323730 | — | 63 | 32 | 37 | 30 | 0.3 | 34 | 36 | TAF 374720 | |
| | LRT 323830 | — | 77 | 32 | 38 | 30.5 | 0.6 | 36 | 37 | TAF 374730 | |
| | — | LRTZ 323830 | 77 | 32 | 38 | 30.5 | 0.6 | 36 | 37 | TR 385230 | |
| | LRT 324020 | — | 69 | 32 | 40 | 20 | 0.6 | 36 | 39 | GTR 385230 | |
| | — | LRTZ 324021 | 72.5 | 32 | 40 | 21 | 0.6 | 36 | 39 | RNA 49/32 | |
| | LRT 324036 | — | 123 | 32 | 40 | 36 | 0.6 | 36 | 39 | RNA 49/32 UU | |
| | — | LRTZ 324037 | 130 | 32 | 40 | 37 | 0.6 | 36 | 39 | RNA 69/32 | |
| | — | — | — | — | — | — | — | — | — | RNA 69/32 UU | |

Note⁽¹⁾ Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

H
IRT
IRB
LRT
LRB

INNER RINGS

Inner Rings for General Usage



LRT

LRTZ

Shaft dia. 35 – 50mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings | |
|------------------|-----------------------|-------------|---------------------|---------------------------|----|------|--------------------------------------|-----------------------------------|------|---|------------|
| | | | | d | F | B | r _s ⁽¹⁾ min | d _a Min. | Max. | | |
| 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.

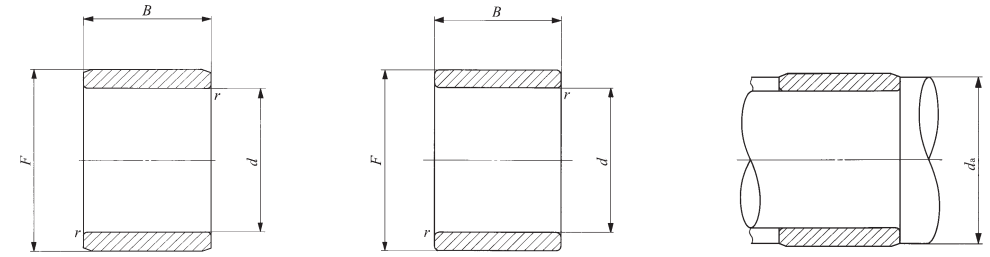
| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings |
|------------------|-----------------------|-------------|---------------------|---------------------------|----|------|--------------------------------------|-----------------------------------|------|---------------------------------|
| | | | | d | F | B | r _s ⁽¹⁾ min | d _a Min. | Max. | |
| 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.

H
 IRT
 IRB
 LRT
 LRB

INNER RINGS

Inner Rings for General Usage



LRT

LRTZ

Shaft dia. 50 – 80mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | Standard mounting dimension mm | | Assembled bearings |
|------------------|-----------------------|---------------------|---------------------------|----------|----------|--|------|-----------------------------------|-----------------------------------|--------------------|
| | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>r_s</i> ⁽¹⁾ min | Min. | Max. | | |
| 50 | LRT 506025 | 165 | 50 | 60 | 25.5 | 1 | 55 | 59 | NAX 6040 NBX 6040 RNAFW 607840 | |
| | LRT 506040 | 265 | 50 | 60 | 40 | 1 | 55 | 59 | | |
| 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 | | |

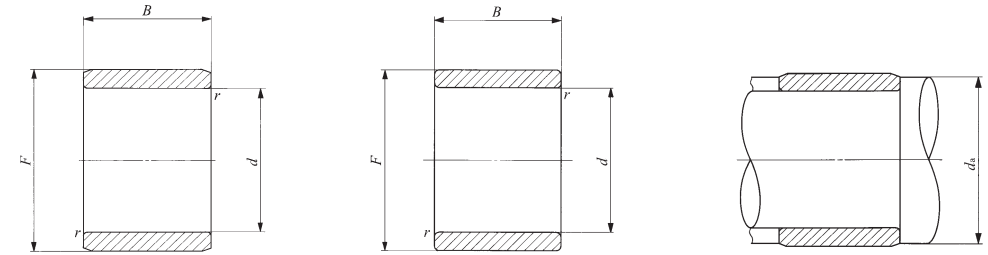
Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remark No oil hole is provided.

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | Standard mounting dimension mm | | Assembled bearings |
|------------------|-----------------------|---------------------|---------------------------|----------|----------|--|------|-----------------------------------|-----------------------------|--------------------|
| | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>r_s</i> ⁽¹⁾ min | Min. | Max. | | |
| 65 | LRT 657530 | 260 | 65 | 75 | 30 | 1.5 | 73 | 73.5 | RNAF 759530 RNAFW 759560 | |
| | LRT 657560 | 520 | 65 | 75 | 60 | 1.5 | 73 | 73.5 | | |
| 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.

INNER RINGS

Inner Rings for General Usage



Shaft dia. 85 – 140mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings |
|---------------|-----------------------|--------------|---------------|------------------------|-----|------|-----------------------------------|--------------------------------|------|--------------------|
| | | | | d | F | B | r _{s min} ⁽¹⁾ | Min. | Max. | |
| 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 |
| 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 |
| | 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.

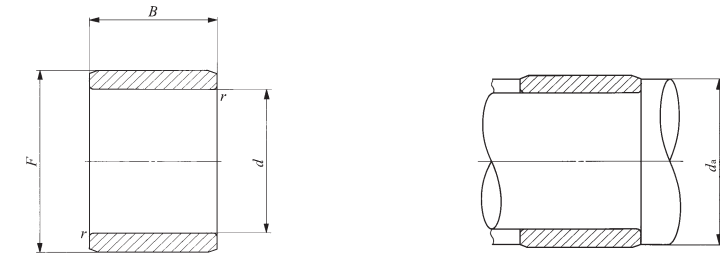
| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings |
|---------------|-----------------------|---------------|---------------|------------------------|-----|------|-----------------------------------|--------------------------------|-------------|--------------------|
| | | | | d | F | B | r _{s min} ⁽¹⁾ | Min. | Max. | |
| 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.



INNER RINGS

Inner Rings for General Usage



LRT

Shaft dia. 150 – 440mm

| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings |
|------------------|-----------------------|---------------------|---------------------------|-----|-----|-----------------------------------|-----------------------------------|------|--------------------|
| | | | d | F | B | r _{s min} ⁽¹⁾ | Min. | Max. | |
| 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.

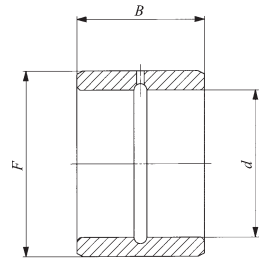
| Shaft dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | Standard mounting dimension mm | | Assembled bearings |
|------------------|-----------------------|---------------------|---------------------------|-----|-----|-----------------------------------|-----------------------------------|------|--------------------|
| | | | d | F | B | r _{s min} ⁽¹⁾ | Min. | Max. | |
| 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.

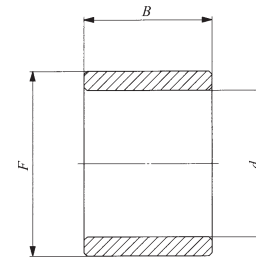
H
IRT
IRB
LRT
LRB

INNER RINGS

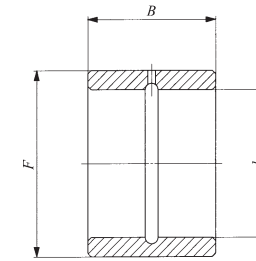
Inner Rings for General Usage **Inch Series**



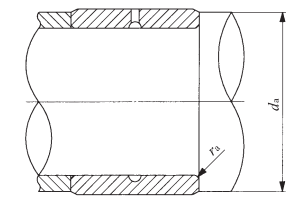
LRB



LRBZ



LRBZ...B



Shaft dia. 9.525 – 22.225mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | |
|----------------------------|-----------------------|--------------|---------------------|---------------------------------|----------------|----------|---|------------------------------|-----------------------------------|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>d_a</i> Min. | <i>d_a</i> Max. | <i>r_{as}</i> max Max. |
| 9.525 (3/8) | LRB 61012 | — | 18.5 | 9.525 (3/8) | 15.875 (5/8) | 19.300 | 14 | 14.5 | 0.6 |
| | — | LRBZ 61012 | 18.5 | 9.525 (3/8) | 15.875 (5/8) | 19.300 | 14 | 14.5 | 0.6 |
| | — | LRBZ 61016 | 25 | 9.525 (3/8) | 15.875 (5/8) | 25.650 | 14 | 14.5 | 0.6 |
| | — | LRBZ 61016 B | 25 | 9.525 (3/8) | 15.875 (5/8) | 25.650 | 14 | 14.5 | 0.6 |
| 12.700 (1/2) | LRB 81212 | — | 23.5 | 12.700 (1/2) | 19.050 (3/4) | 19.300 | 17.5 | 18 | 1 |
| | LRB 81216 | — | 31 | 12.700 (1/2) | 19.050 (3/4) | 25.650 | 17.5 | 18 | 1 |
| | — | LRBZ 81212 | 23.5 | 12.700 (1/2) | 19.050 (3/4) | 19.300 | 17.5 | 18 | 0.6 |
| | — | LRBZ 81216 | 31 | 12.700 (1/2) | 19.050 (3/4) | 25.650 | 17.5 | 18 | 0.6 |
| — | LRBZ 81216 B | 31 | 12.700 (1/2) | 19.050 (3/4) | 25.650 | 17.5 | 18 | 0.6 | |
| 15.875 (5/8) | LRB 101412 | — | 28 | 15.875 (5/8) | 22.225 (7/8) | 19.300 | 21 | 21.2 | 1 |
| | LRB 101416 | — | 37.5 | 15.875 (5/8) | 22.225 (7/8) | 25.650 | 21 | 21.2 | 1 |
| | — | LRBZ 101412 | 28 | 15.875 (5/8) | 22.225 (7/8) | 19.300 | 21 | 21.2 | 0.6 |
| | — | LRBZ 101416 | 37.5 | 15.875 (5/8) | 22.225 (7/8) | 25.650 | 21 | 21.2 | 0.6 |
| — | LRBZ 101416 B | 37.5 | 15.875 (5/8) | 22.225 (7/8) | 25.650 | 21 | 21.2 | 0.6 | |
| 19.050 (3/4) | LRB 121612 | — | 33 | 19.050 (3/4) | 25.400 (1) | 19.300 | 24 | 24.4 | 1 |
| | LRB 121616 | — | 44 | 19.050 (3/4) | 25.400 (1) | 25.650 | 24 | 24.4 | 1 |
| | — | LRBZ 121612 | 33 | 19.050 (3/4) | 25.400 (1) | 19.300 | 24 | 24.4 | 0.6 |
| | — | LRBZ 121616 | 44 | 19.050 (3/4) | 25.400 (1) | 25.650 | 24 | 24.4 | 0.6 |
| — | LRBZ 121616 B | 44 | 19.050 (3/4) | 25.400 (1) | 25.650 | 24 | 24.4 | 0.6 | |
| 22.225 (7/8) | LRB 141816 | — | 50 | 22.225 (7/8) | 28.575 (1 1/8) | 25.650 | 27 | 27.5 | 1 |
| | LRB 141820 | — | 62 | 22.225 (7/8) | 28.575 (1 1/8) | 32.000 | 27 | 27.5 | 1 |
| | — | LRBZ 141816 | 50 | 22.225 (7/8) | 28.575 (1 1/8) | 25.650 | 27 | 27.5 | 0.6 |
| | — | LRBZ 141820 | 62 | 22.225 (7/8) | 28.575 (1 1/8) | 32.000 | 27 | 27.5 | 0.6 |
| — | LRBZ 141820 B | 62 | 22.225 (7/8) | 28.575 (1 1/8) | 32.000 | 27 | 27.5 | 0.6 | |

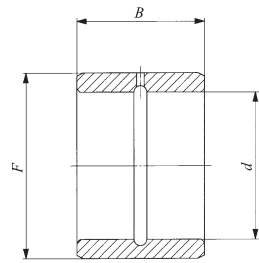
Note⁽¹⁾ Maximum allowable fillet corner radius of shaft
 Remark LRBZ has no oil hole. LRB and LRBZ...B are provided with an oil groove and an oil hole.

| Assembled bearings | |
|--------------------|--------------|
| BR 101812 | GBR 101812 |
| GBR 101816UU | BR 101816UU |
| BR 122012 | BR 122016 |
| GBR 122012 | GBR 122016UU |
| BR 122016UU | |
| BR 142212 | BR 142216 |
| GBR 142212 | GBR 142216 |
| GBR 142216 | GBR 142216UU |
| BR 142216UU | |
| BR 162412 | BR 162416 |
| GBR 162412 | GBR 162416 |
| GBR 162416 | GBR 162416UU |
| BR 162416UU | |
| BR 182616 | BR 182620 |
| GBR 182616 | GBR 182620UU |
| BR 182620UU | |

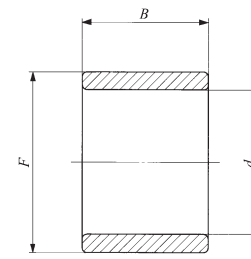
H
IRT
IRB
LRT
LRB

INNER RINGS

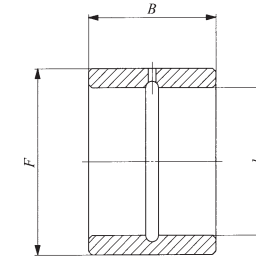
Inner Rings for General Usage **Inch Series**



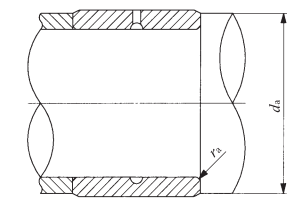
LRB



LRBZ



LRBZ...B



Shaft dia. 25.400 – 38.100mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | |
|----------------------------|-----------------------|---------------|---------------------|---------------------------------|----------------|----------|---|------|---------------------------|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>d_a</i> | | <i>r_{as max}</i> |
| | | | | | | Min. | Max. | Max. | |
| 25.400 (1) | LRB 162016 | — | 56 | 25.400 (1) | 31.750 (1 1/4) | 25.650 | 30.5 | 30.7 | 1 |
| | LRB 162020 | — | 72 | 25.400 (1) | 31.750 (1 1/4) | 32.000 | 30.5 | 30.7 | 1 |
| | — | LRBZ 162016 | 56 | 25.400 (1) | 31.750 (1 1/4) | 25.650 | 30.5 | 30.7 | 0.6 |
| | — | LRBZ 162020 | 72 | 25.400 (1) | 31.750 (1 1/4) | 32.000 | 30.5 | 30.7 | 0.6 |
| | — | LRBZ 162020 B | 72 | 25.400 (1) | 31.750 (1 1/4) | 32.000 | 30.5 | 30.7 | 0.6 |
| 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 |
| | LRB 182220 | — | 77 | 28.575 (1 1/8) | 34.925 (1 3/8) | 32.000 | 33.5 | 33.9 | 1 |
| | — | LRBZ 182216 | 63 | 28.575 (1 1/8) | 34.925 (1 3/8) | 25.650 | 33.5 | 33.9 | 0.6 |
| | — | LRBZ 182220 | 77 | 28.575 (1 1/8) | 34.925 (1 3/8) | 32.000 | 33.5 | 33.9 | 0.6 |
| | — | LRBZ 182220 B | 77 | 28.575 (1 1/8) | 34.925 (1 3/8) | 32.000 | 33.5 | 33.9 | 0.6 |
| 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 |
| | LRB 202420 | — | 86 | 31.750 (1 1/4) | 38.100 (1 1/2) | 32.000 | 37 | 37.1 | 1.5 |
| | — | LRBZ 202416 | 71 | 31.750 (1 1/4) | 38.100 (1 1/2) | 25.650 | 37 | 37.1 | 0.6 |
| | — | LRBZ 202420 | 86 | 31.750 (1 1/4) | 38.100 (1 1/2) | 32.000 | 37 | 37.1 | 0.6 |
| | — | LRBZ 202420 B | 86 | 31.750 (1 1/4) | 38.100 (1 1/2) | 32.000 | 37 | 37.1 | 0.6 |
| 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 |
| | LRB 222620 | — | 96 | 34.925 (1 3/8) | 41.275 (1 5/8) | 32.000 | 40.2 | 40.2 | 1.5 |
| | — | LRBZ 222616 | 77 | 34.925 (1 3/8) | 41.275 (1 5/8) | 25.650 | 40.2 | 40.2 | 0.6 |
| | — | LRBZ 222620 | 96 | 34.925 (1 3/8) | 41.275 (1 5/8) | 32.000 | 40.2 | 40.2 | 0.6 |
| | — | LRBZ 222620 B | 96 | 34.925 (1 3/8) | 41.275 (1 5/8) | 32.000 | 40.2 | 40.2 | 0.6 |
| 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 |
| | LRB 242820 | — | 100 | 38.100 (1 1/2) | 44.450 (1 3/4) | 32.000 | 43.3 | 43.4 | 1.5 |
| | LRB 243020 | — | 155 | 38.100 (1 1/2) | 47.625 (1 7/8) | 32.000 | 43.3 | 45 | 1.5 |
| | — | LRBZ 242820 | 100 | 38.100 (1 1/2) | 44.450 (1 3/4) | 32.000 | 43.3 | 43.4 | 0.6 |
| | — | LRBZ 242820 B | 100 | 38.100 (1 1/2) | 44.450 (1 3/4) | 32.000 | 43.3 | 43.4 | 0.6 |
| | — | LRBZ 243020 | 160 | 38.100 (1 1/2) | 47.625 (1 7/8) | 32.000 | 43.3 | 45 | 1 |
| | — | LRBZ 243020 B | 160 | 38.100 (1 1/2) | 47.625 (1 7/8) | 32.000 | 43.3 | 45 | 1 |

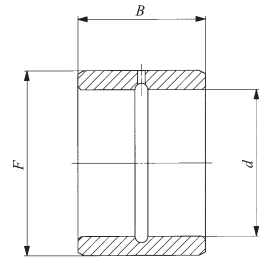
Note⁽¹⁾ Maximum allowable fillet corner radius of shaft
 Remark LRBZ has no oil hole. LRB and LRBZ...B are provided with an oil groove and an oil hole.

| Assembled bearings | |
|--------------------|-------------------------|
| BR 202816 | |
| BR 202820 | |
| GBR 202816 | |
| GBR 202820UU | |
| BR 202820UU | |
| BR 223016 | |
| BR 223020 | |
| GBR 223016 | |
| GBR 223020UU | |
| BR 223020UU | |
| BR 243316 | |
| BR 243320 | |
| GBR 243316 | |
| GBR 243320 | GBR 243320UU |
| BR 243320UU | |
| BR 263516 | |
| BR 263520 | |
| GBR 263516 | |
| GBR 263520 | GBR 263520UU |
| BR 263520UU | |
| BR 283716 | |
| BR 283720 | BR 283820 |
| BR 303920 | |
| GBR 283720 | GBR 283820 GBR 283720UU |
| BR 283720UU | |
| GBR 303920 | GBR 303920UU |
| BR 303920UU | |

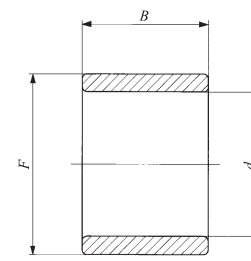
H
 IRT
 IRB
 LRT
 LRB

INNER RINGS

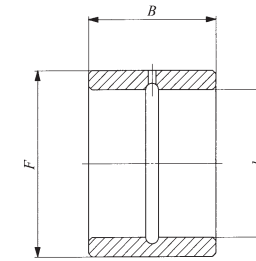
Inner Rings for General Usage **Inch Series**



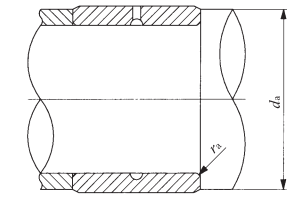
LRB



LRBZ



LRBZ...B



Shaft dia. 41.275 – 63.500mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | |
|----------------------------|-----------------------|---------------|---------------------|---------------------------------|----------------|----------|---|------|---------------------------|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>d_a</i> | | <i>r_{as max}</i> |
| | | | | | | Min. | Max. | Max. | |
| 41.275 (1 5/8) | LRB 263216 | — | 135 | 41.275 (1 5/8) | 50.800 (2) | 25.650 | 48 | 49 | 1.5 |
| | LRB 263220 | — | 170 | 41.275 (1 5/8) | 50.800 (2) | 32.000 | 48 | 49 | 1.5 |
| | — | LRBZ 263216 | 135 | 41.275 (1 5/8) | 50.800 (2) | 25.650 | 48 | 49 | 1 |
| | — | LRBZ 263220 | 170 | 41.275 (1 5/8) | 50.800 (2) | 32.000 | 48 | 49 | 1 |
| | — | LRBZ 263220 B | 170 | 41.275 (1 5/8) | 50.800 (2) | 32.000 | 48 | 49 | 1 |
| 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 |
| | LRB 283628 | — | 345 | 44.450 (1 3/4) | 57.150 (2 1/4) | 44.700 | 52.5 | 55 | 1.5 |
| | — | LRBZ 283624 | 300 | 44.450 (1 3/4) | 57.150 (2 1/4) | 38.350 | 52.5 | 55 | 1.5 |
| | — | LRBZ 283628 | 345 | 44.450 (1 3/4) | 57.150 (2 1/4) | 44.700 | 52.5 | 55 | 1.5 |
| | — | LRBZ 283628 B | 345 | 44.450 (1 3/4) | 57.150 (2 1/4) | 44.700 | 52.5 | 55 | 1.5 |
| 50.800 (2) | LRB 324024 | — | 335 | 50.800 (2) | 63.500 (2 1/2) | 38.350 | 58 | 61 | 2 |
| | LRB 324028 | — | 390 | 50.800 (2) | 63.500 (2 1/2) | 44.700 | 58 | 61 | 2 |
| | — | LRBZ 324024 | 335 | 50.800 (2) | 63.500 (2 1/2) | 38.350 | 58 | 61 | 1.5 |
| | — | LRBZ 324028 | 390 | 50.800 (2) | 63.500 (2 1/2) | 44.700 | 58 | 61 | 1.5 |
| | — | LRBZ 324028 B | 390 | 50.800 (2) | 63.500 (2 1/2) | 44.700 | 58 | 61 | 1.5 |
| 57.150 (2 1/4) | LRB 364424 | — | 375 | 57.150 (2 1/4) | 69.850 (2 3/4) | 38.350 | 65 | 67 | 2 |
| | LRB 364428 | — | 440 | 57.150 (2 1/4) | 69.850 (2 3/4) | 44.700 | 65 | 67 | 2 |
| | — | LRBZ 364424 | 375 | 57.150 (2 1/4) | 69.850 (2 3/4) | 38.350 | 65 | 67 | 1.5 |
| | — | LRBZ 364428 | 440 | 57.150 (2 1/4) | 69.850 (2 3/4) | 44.700 | 65 | 67 | 1.5 |
| | — | LRBZ 364428 B | 440 | 57.150 (2 1/4) | 69.850 (2 3/4) | 44.700 | 65 | 67 | 1.5 |
| 63.500 (2 1/2) | LRB 404824 | — | 410 | 63.500 (2 1/2) | 76.200 (3) | 38.350 | 71 | 73 | 2 |
| | LRB 404828 | — | 480 | 63.500 (2 1/2) | 76.200 (3) | 44.700 | 71 | 73 | 2 |
| | — | LRBZ 404824 | 410 | 63.500 (2 1/2) | 76.200 (3) | 38.350 | 71 | 73 | 1.5 |
| | — | LRBZ 404828 | 480 | 63.500 (2 1/2) | 76.200 (3) | 44.700 | 71 | 73 | 1.5 |
| | — | LRBZ 404828 B | 480 | 63.500 (2 1/2) | 76.200 (3) | 44.700 | 71 | 73 | 1.5 |

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.

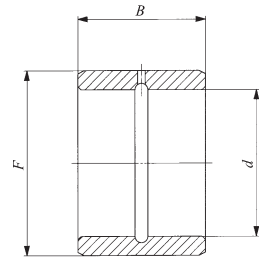
| Assembled bearings | | |
|--------------------|--------------|--|
| BR 324116 | | |
| BR 324120 | | |
| GBR 324116 | | |
| GBR 324120 | GBR 324120UU | |
| BR 324120UU | | |
| BR 364824 | | |
| BR 364828 | | |
| GBR 364824 | | |
| GBR 364828 | GBR 364828UU | |
| BR 364828UU | | |
| BR 405224 | | |
| BR 405228 | | |
| GBR 405224 | | |
| GBR 405228 | GBR 405228UU | |
| BR 405228UU | | |
| BR 445624 | | |
| BR 445628 | | |
| GBR 445624 | | |
| GBR 445628 | GBR 445628UU | |
| BR 445628UU | | |
| BR 486024 | | |
| BR 486028 | | |
| GBR 486024 | | |
| GBR 486028 | GBR 486028UU | |
| BR 486028UU | | |

H

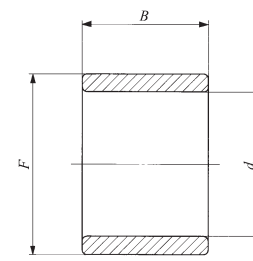
IRT
IRB
LRT
LRB

INNER RINGS

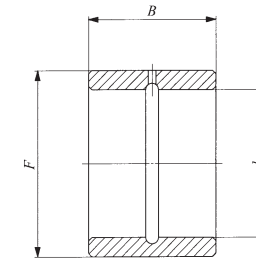
Inner Rings for General Usage **Inch Series**



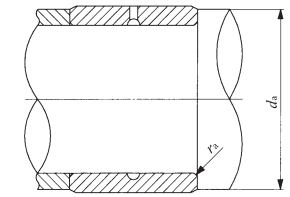
LRB



LRBZ



LRBZ...B



Shaft dia. 69.850 – 95.250mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | Standard mounting dimensions mm ⁽¹⁾ | | |
|----------------------------|-----------------------|---------------|---------------------|---------------------------------|-----------------|----------|---|------|---------------------------|
| | | | | <i>d</i> | <i>F</i> | <i>B</i> | <i>d_a</i> | | <i>r_{as}</i> max |
| | | | | | | Min. | Max. | Max. | |
| 69.850 (2 3/4) | LRB 445228 | — | 530 | 69.850 (2 3/4) | 82.550 (3 1/4) | 44.700 | 77 | 79 | 2 |
| | LRB 445232 | — | 600 | 69.850 (2 3/4) | 82.550 (3 1/4) | 51.050 | 77 | 79 | 2 |
| | — | LRBZ 445228 | 530 | 69.850 (2 3/4) | 82.550 (3 1/4) | 44.700 | 77 | 79 | 1.5 |
| | — | LRBZ 445228 B | 530 | 69.850 (2 3/4) | 82.550 (3 1/4) | 44.700 | 77 | 79 | 1.5 |
| | — | LRBZ 445232 | 600 | 69.850 (2 3/4) | 82.550 (3 1/4) | 51.050 | 77 | 79 | 1.5 |
| 76.200 (3) | LRB 485632 | — | 640 | 76.200 (3) | 88.900 (3 1/2) | 51.050 | 83.5 | 86 | 2 |
| | — | LRBZ 485632 | 640 | 76.200 (3) | 88.900 (3 1/2) | 51.050 | 83.5 | 86 | 1.5 |
| | — | LRBZ 485632 B | 640 | 76.200 (3) | 88.900 (3 1/2) | 51.050 | 83.5 | 86 | 1.5 |
| 82.550 (3 1/4) | LRB 526032 | — | 690 | 82.550 (3 1/4) | 95.250 (3 3/4) | 51.050 | 91 | 93 | 2.5 |
| | — | LRBZ 526032 | 690 | 82.550 (3 1/4) | 95.250 (3 3/4) | 51.050 | 91 | 93 | 1.5 |
| | — | LRBZ 526032 B | 690 | 82.550 (3 1/4) | 95.250 (3 3/4) | 51.050 | 91 | 93 | 1.5 |
| 88.900 (3 1/2) | LRB 566432 | — | 750 | 88.900 (3 1/2) | 101.600 (4) | 51.050 | 97 | 99 | 2.5 |
| | — | LRBZ 566432 | 750 | 88.900 (3 1/2) | 101.600 (4) | 51.050 | 97 | 99 | 1.5 |
| 95.250 (3 3/4) | — | LRBZ 606832 | 800 | 95.250 (3 3/4) | 107.950 (4 1/4) | 51.050 | 103 | 105 | 1.5 |

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.

| Assembled bearings | |
|--------------------|--------------|
| BR 526828 | |
| BR 526832 | |
| GBR 526828 | GBR 526828UU |
| BR 526828UU | |
| GBR 526832 | |
| BR 567232 | |
| GBR 567232 | GBR 567232UU |
| BR 567232UU | |
| BR 607632 | |
| GBR 607632 | GBR 607632UU |
| BR 607632UU | |
| BR 648032 | |
| GBR 648032 | GBR 648032UU |
| GBR 688432 | GBR 688432UU |

H
 IRT
 IRB
 LRT
 LRB

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

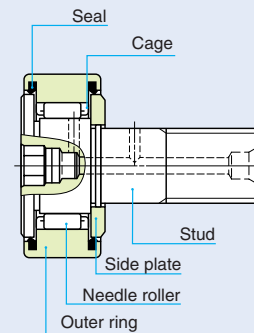
IKO Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring. These bearings are designed for outer ring rotation, and have superior rotational performance with a small coefficient of friction and high load capacity. As studs already have threads or steps, they 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

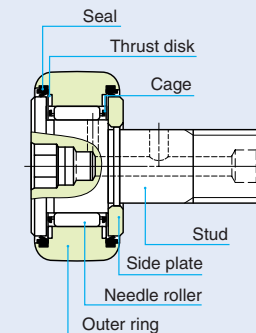
Structure of Standard Type Cam Follower⁽¹⁾

CF···BUU



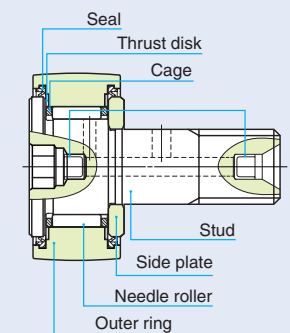
Structure of Thrust Disk Type Cam Follower

CF···WBUUR



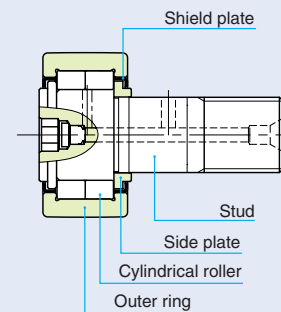
Structure of C-Lube Cam Follower⁽²⁾

CF···WBUUR/SG



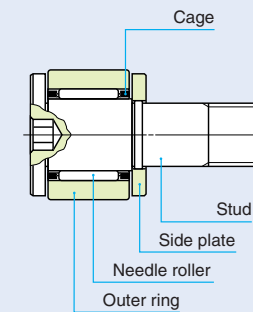
Structure of Cylindrical Roller Cam Follower

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 Capilube, please refer page A55.

For Cam Followers, the types shown in Table 1 are available.

Table 1 Type of Cam Followers

| Type | | | | With cage | | Full complement | | |
|--|---|------------------------|-----------------------|----------------------|------------------------|--------------------|------------------------|-------------|
| | | | | Crowned outer ring | Cylindrical outer ring | Crowned outer ring | Cylindrical outer ring | |
| Metric CF series | Standard Type Cam Follower CF | 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 | |
| | | With screwdriver slot | Shield type | CF ... R | CF ... | CF ...V R | CF ...V | |
| | | | Sealed type | CF ... UUR | CF ... UU | CF ...V UUR | CF ...V UU | |
| | | Stainless steel made | With hexagon hole | Shield type | CF ...FB R | CF ...FB | — | — |
| | | | Sealed type | CF ...FBUUR | CF ...FBUU | — | — | |
| | Solid Eccentric Stud Type Cam Follower CFES | High carbon steel made | With hexagon hole | Shield type | CFES ... B R | CFES ... B | — | — |
| | | | | Sealed type | CFES ... BUUR | CFES ... BUU | — | — |
| | | With screwdriver slot | Shield type | CFES ... R | CFES | — | — | |
| | | | Sealed type | CFES ... UUR | CFES ... UU | — | — | |
| | Eccentric Type Cam Follower CFE | 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 |
| With screwdriver slot | | Shield type | CFE ... R | CFE ... | CFE ...V R | CFE ...V | | |
| | | Sealed type | CFE ... UUR | CFE ... UU | CFE ...V UUR | CFE ...V UU | | |
| Thrust Disk Type Cam Follower CF ... W | 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 Follower CF-RU1, CF-FU1 | High carbon steel made | With screwdriver slot | Sealed type | CF-RU1 | CF-FU1 | — | — | |
| Easy Mounting Type Cam Follower CF-SFU | High carbon steel made | With hexagon hole | Sealed type | — | CF-SFU ... B | — | — | |
| | | | With screwdriver slot | Sealed type | — | CF-SFU | — | — |
| C-Lube Cam Follower CF .../SG | High carbon steel made | With hexagon hole | Sealed type | CF ...WBUUR/SG | — | — | — | |
| Cylindrical Roller Cam Follower NUCF | High carbon steel made | With hexagon hole | Shield type | — | — | NUCF ... BR | — | |
| | | | With screwdriver slot | Shield type | — | — | NUCF ... R | — |
| Miniature CFS series | Miniature Type Cam Follower CFS | High carbon steel made | With hexagon hole | Shield type | — | CFS | — | CFS ... V |
| | | | | Stainless steel made | Shield type | — | CFS ... F | — |
| | Thrust Disk Type Miniature Cam Follower 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 Follower 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 Follower 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 Follower

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

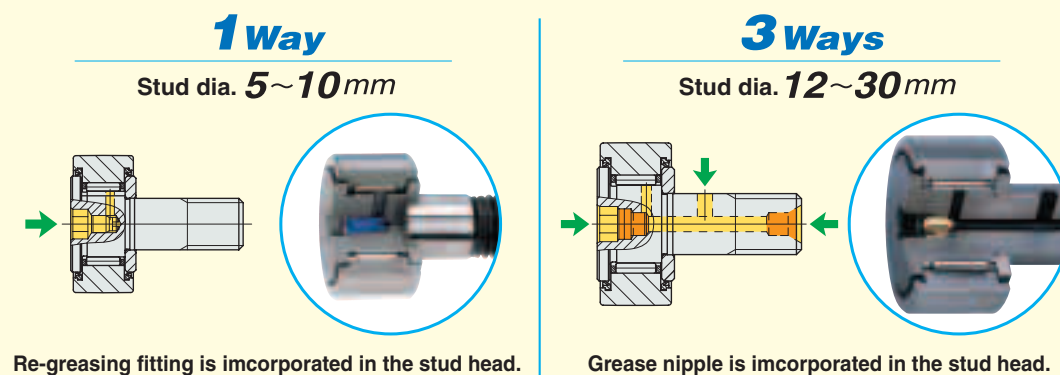
These are compactly designed bearings, incorporating very thin needle rollers in an outer ring with a small outside diameter. They are used in electronic devices, OA equipment, small index devices, etc.

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.

Lubrication method of Hex Head Cam Followers

<Types> Standard Type, Solid Eccentric Stud Type, Eccentric Type, Thrust Disk Type, Easy Mounting Type, Heavy Duty Type.



Remark : All of Easy Mounting Type are 1way port.

Internal Structures and Shapes

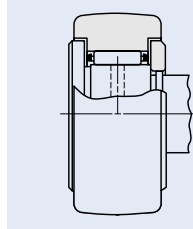
Various types are lined up in Cam Follower series, including the caged type, full complement type, shield type, sealed type, type with crowned outer ring, type

with cylindrical outer ring, type with hexagonal hole, etc.

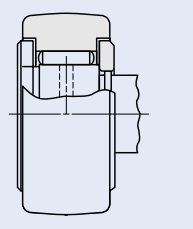
Roller guide method

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》

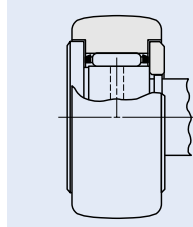


Seal structure

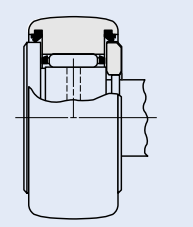
Cam Followers include the shield type and the sealed type. In the shield type, the narrow clearances between the outer ring and the stud flange and between the outer ring and the side plate form labyrinths.

The sealed type incorporates seals in the narrow clearances to prevent the penetration of foreign particles.

《Shield type》



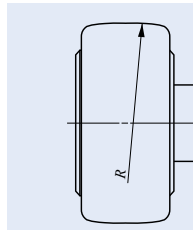
《Sealed type》



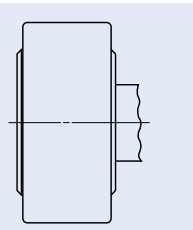
Shape of outer ring outside surface

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》



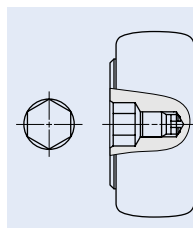
《Cylindrical outer ring》



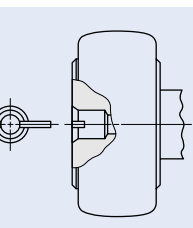
Shape of stud head

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》



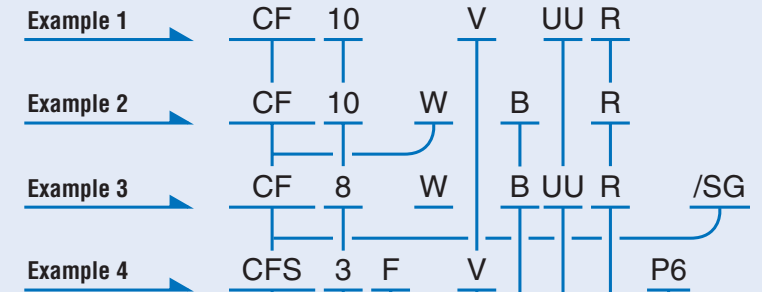
《With screwdriver slot》



Identification number

Some examples of the identification number of Cam Followers are shown below.

Examples of identification number



| Model code | | |
|-------------------------|---------|--|
| Metric CF series | CF | Standard Type Cam Follower |
| | CFES | Solid Eccentric Stud Type Cam Follower |
| | CFE | Eccentric Type Cam Follower |
| | CF...W | Thrust Disk 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 | Easy Mounting Type Cam Follower |
| CF.../SG | | C-Lube Cam Follower |
| NUCF | | Cylindrical Roller Cam Follower |
| Miniature CFS series | CFS | Miniature Type Cam Follower |
| | CFS...W | Thrust Disk Type Miniature Cam Follower |
| Inch series | CR | Inch series Cam Follower |
| | CRH | |

| Size | |
|--|--|
| The value indicates a stud diameter. (unit: mm) | |
| In the inch series, the outside diameter in units of 1/16 inch is indicated. | |

| Material | |
|-----------|------------------------|
| No symbol | High carbon steel made |
| F | Stainless steel made |

| Roller guide method | |
|---------------------|----------------------|
| No symbol | With cage type |
| V | Full complement type |

| Shape of stud head | |
|--------------------------|-----------------------|
| B | With hexagon hole |
| No symbol ⁽¹⁾ | With screwdriver slot |

Note⁽¹⁾ Miniature Type Cam Follower is with hexagon hole with "No symbol".

| Seal structure | |
|----------------|-------------|
| No symbol | Shield type |
| UU | Sealed type |

| Shape of outer ring outside surface | |
|-------------------------------------|-----------------------------|
| R | With crowned outer ring |
| No symbol | With cylindrical outer ring |

| Classification symbol | | |
|-----------------------|---------|--|
| No symbol | Class 0 | Applicable to Miniature CFS series |
| P6 | Class 6 | |
| P5 | Class 5 | |
| P4 | Class 4 | |

Accuracy

The accuracy of Cam Followers is shown in Table 2, Table 3.1, and Table 3.2. Cam Followers with special accuracy are also available. When they are required, please contact IKO.

Table 2 Tolerances

unit: μm

| Series | Metric CF series ⁽¹⁾ | | Miniature CFS series | Inch series | |
|--------------------------------|---------------------------------|------------------------|----------------------|--------------------|------------------------|
| | Crowned outer ring | Cylindrical outer ring | | Crowned outer ring | Cylindrical outer ring |
| Dimensions and symbols | | | | | |
| Outside dia. of outer ring D | 0 ~ -50 | See Table 3.1. | See Table 3.2. | 0 ~ -50 | 0 ~ -25 |
| Stud dia. d_1 | h7 | | h6 | +25 ~ 0 | |
| Width of outer ring C | 0 ~ -120 | | 0 ~ -120 | 0 ~ -130 | |

Note⁽¹⁾ Also applicable to Cylindrical Roller Cam Followers.

Table 3.1 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 3.2 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 3.3 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. | Over | Incl. | | | |
| 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

| Metric CF series ⁽²⁾ | Identification number ⁽¹⁾ | | | Radial internal clearance | |
|---------------------------------|--|-------------------------------------|------------------------------|---------------------------|------|
| | Cylindrical Roller Cam Followers NUCF | Miniature CFS series ⁽³⁾ | Inch series | Min. | Max. |
| CF 3 ~ CF 5 | — | CFS1.4 ~ CFS5 | CR 8, CR 8-1, CRH 8-1, CRH 9 | 3 | 17 |
| CF 6 | — | CFS6 | CR10, CR10-1, CRH10-1, CRH11 | 5 | 20 |
| CF 8 ~ CF12-1 | — | — | CR12 ~ CR22, CRH12 ~ CRH22 | 5 | 25 |
| CF16 ~ CF20-1 | — | — | CR24 ~ CR36, CRH24 ~ CRH36 | 10 | 30 |
| CF24 ~ CF30-2 | — | — | CRH40 ~ CRH56 | 10 | 40 |
| — | — | — | CRH64 | 15 | 50 |
| — | NUCF10 R ~ NUCF24 R | — | — | 20 | 45 |
| — | NUCF24-1R ~ NUCF30-2R | — | — | 25 | 50 |

Notes⁽¹⁾ Also applicable to the full complement type, crowned outer ring type, sealed type, and entire of type with hexagon hole.

⁽²⁾ Only representative types are shown in the table, but this table is applicable to the entire metric CF series.

⁽³⁾ Only representative types are shown in the table, but this table is applicable to the entire miniature CFS 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 |
|--------------------------------|---|
| Metric CF series | H7 |
| Cylindrical Roller NUCF series | H7 |
| Miniature CFS series | H6 |
| Inch series | F7 |

Table 6 Dimensional tolerances of mounting hole

unit: μm

| Nominal outside dia. of stud mm | | F7 | | H6 | | H7 | |
|------------------------------------|-------|------|-----|------|-----|------|-----|
| Over | Incl. | High | Low | High | Low | High | Low |
| — | 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 | 40 | +50 | +25 | +16 | 0 | +25 | 0 |
| 40 | 50 | | | | | | |

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.

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 and 7.2 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 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. (Refer page I18)

Table 7.1 Track capacity

unit: N

| Type | Identification number With crowned outer ring | Track capacity | Identification number With cylindrical outer ring | Track capacity |
|--|---|-------------------|--|-------------------|
| Metric CF series ⁽¹⁾ | CF 3 R | 542 | CF 3 | 1 360 |
| | CF 4 R | 712 | CF 4 | 1 790 |
| | CF 5 R | 794 | CF 5 | 2 210 |
| | CF 6 R | 1 040 | CF 6 | 3 400 |
| | CF 8 R | 1 330 | CF 8 | 4 040 |
| | CF10 R | 1 610 | CF10 | 4 680 |
| | CF10-1R | 2 030 | CF10-1 | 5 530 |
| | CF12 R | 2 470 | CF12 | 7 010 |
| | CF12-1R | 2 710 | CF12-1 | 7 480 |
| | CF16 R | 3 060 | CF16 | 11 200 |
| | CF18 R | 3 660 | CF18 | 14 500 |
| | CF20 R | 5 190 | CF20 | 23 200 |
| | CF20-1R | 4 530 | CF20-1 | 21 000 |
| | CF24 R | 6 580 | CF24 | 34 300 |
| | CF24-1R | 8 020 | CF24-1 | 39 800 |
| | CF30 R | 9 220 | CF30 | 52 700 |
| | CF30-1R | 9 990 | CF30-1 | 56 000 |
| | CF30-2R | 10 800 | CF30-2 | 59 300 |
| Miniature CFS series ⁽²⁾ | — | — | CFS1.4 | 128 |
| | — | — | CFS2 | 220 |
| | — | — | CFS2.5 | 298 |
| | — | — | CFS3 | 485 |
| | — | — | CFS4 | 799 |
| | — | — | CFS5 | 1 210 |
| | — | — | CFS6 | 1 680 |

Notes⁽¹⁾ Only representative types are shown in the table, but this table is applicable to the entire metric CF series, and also to Cylindrical Roller Cam Followers.

⁽²⁾ Only representative types are shown in the table, but this table is applicable to the entire miniature CFS series.

Table 7.2 Track capacity

unit: N

| Type | 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 |
|-------------------------------|---|-------------------|--|-------------------|--|-------------------|--|-------------------|
| Inch series ⁽¹⁾ | 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 | |

Note⁽¹⁾ Only representative types are shown in the table, but this table is applicable to the entire inch series.

Table 8 Track capacity factor

| Hardness HRC | Tensile strength N/mm ² | 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 |

Allowable Rotational Speed

The allowable rotational speed of Cam Followers is affected by mounting and operating conditions. For reference, Table 9 shows d_1n values when only pure radial loads are applied. Considering that axial loads also act under actual operating conditions, the recommended d_1n value is 1/10 of the value shown in the table.

Table 9 d_1n values of Cam Followers (1)(2)

| Lubricant | Grease | Oil |
|------------------------------|--------|---------|
| Caged type | 84 000 | 140 000 |
| Full complement type | 42 000 | 70 000 |
| Heavy Duty Type Cam Follower | 66 000 | 110 000 |

Notes(1) d_1n value = $d_1 \times n$

where, d_1 : Stud diameter mm
 n : Rotational speed rpm

(2) In case of C-Lube Cam Follower, d_1n value is 10000.
In case of C-Lube Cam Follower with axial loads, d_1n value is 10000 or 1/10 of the above table values, whichever smaller.

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 | Type | With cage | | | | Full complement type |
|--|----------------|-------------------|-----------------------|-------------------|-----------------------|----------------------|
| | | Shield type | | Sealed type | | |
| | | With hexagon hole | With screwdriver slot | With hexagon hole | With screwdriver slot | |
| Metric CF series | CF | 3~5 | ○ | ○ | | — |
| | CFES | 6~10 | ○ | ○ | ○ | ○ |
| | CFE | | | | | |
| | CF...W | 12~30 | × | × | | ○ |
| | CF-RU1, CF-FU1 | — | — | — | ○ | — |
| | CF-SFU | — | — | × | ○ | — |
| C-Lube Cam Followers CF.../SG (2) | | — | — | × | — | — |
| Cylindrical Roller Cam Followers NUCF | | — | — | — | — | ○ |
| Miniature CFS series | CFS | ○ | — | — | — | ○ |
| | CFS...W | ○ | — | — | — | ○ |
| Inch series | CR | ○ | ○ | ○ | ○ | ○ |
| | 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

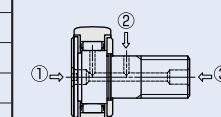
The position of oil hole is shown in Table 11. Re-greasing cannot be made for models without an oil hole.

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.

Table 11 Position of oil hole

○ : Oil hole is prepared.

| Series Size of stud dia. d_1 (1) mm | | | Position of oil hole | ① Stud head | ② Stud outside surface | ③ Stud end | |
|--|-----------------------------|-----------------------|-----------------------|---------------|------------------------|------------|---|
| Metric CF series | CF CFES CFE CF...W | With hexagon hole | $d_1 < 5$ | — | — | — | |
| | | | $5 \leq d_1 \leq 10$ | ○(2) | — | — | |
| | | | $10 < d_1$ | ○(3) | ○ | ○ | |
| | | With screwdriver slot | $d_1 < 5$ | — | — | — | |
| | | | $5 \leq d_1 \leq 10$ | ○ | — | — | |
| | | | $10 < d_1$ | ○ | ○ | ○ | |
| | | CF-RU1, CF-FU1 (4) | | $d_1 \leq 12$ | ○ | — | — |
| | | | $12 < d_1$ | ○ | ○ | ○ | |
| | | CF-SFU | With hexagon hole | $d_1 \leq 10$ | ○(2) | — | — |
| | | | With screwdriver slot | $10 < d_1$ | ○(5) | — | — |
| C-Lube Cam Followers CF.../SG | | | $d_1 \leq 10$ | — | — | — | |
| | | $10 < d_1$ | — | ○(6) | — | | |
| Miniature CFS series | CFS CFS...W | | | — | — | — | |
| Cylindrical Roller Cam Followers | NUCF | With hexagon hole | $d_1 \leq 10$ | ○(2) | — | — | |
| | | | $10 < d_1$ | ○(3) | ○ | ○ | |
| | | With screwdriver slot | $d_1 \leq 10$ | ○ | — | — | |
| | | $10 < d_1$ | ○ | ○ | ○ | | |
| Inch series | CR | With hexagon hole | $d_1 \leq 6.35$ | — | — | — | |
| | | | $6.35 < d_1$ | — | ○ | ○ | |
| | | With screwdriver slot | $d_1 \leq 6.35$ | ○ | — | — | |
| | | $6.35 < d_1$ | ○ | ○ | ○ | | |
| | CRH | With hexagon hole | $d_1 \leq 7.938$ | — | — | — | |
| | | | $7.938 < d_1$ | — | ○ | ○ | |
| With screwdriver slot | | $d_1 \leq 7.938$ | ○ | — | — | | |
| | | $7.938 < d_1$ | ○ | ○ | ○ | | |



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. Refer to page 14.

(3) Grease nipple is incorporated in the hexagon hole. Re-greasing can be made from the stud end by press fitting a supplied grease nipple into the stud end. Refer to page 14.

(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.

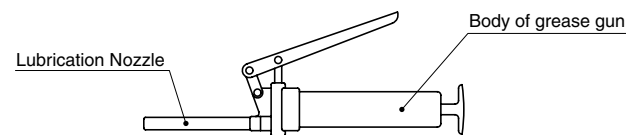
(6) Re-greasing is not possible as the bearing internal space is filled with thermosetting solid-type lubricant C-Lube.

Table 12 Types 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 |
| A-5120R | | NPF4-1 (1) NPF6-1 (1) |
| B-5120R | | |
| A-5120V | | NPT4 NPT6 NPT8 NPB2 NPB3 NPB3-1 |
| A-5240V | | |
| B-5120V | | |
| B-5240V | | |

Note(1) HSP-3(Yamada Corporation)can be used for them.

Remark The above nozzles can be attached on the standard grease gun shown below.



Accessories

Cam Follower accessories are shown in Table 13.
Grease nipple dimensions are shown in Table 14 and 15.
Dimensions of plug for unused oil hole and dimensions of plug inserter are shown in Table 16.

Table 13 Accessories

| Series | | | | Accessories | Grease nipple | Plug | Nut | Spring washer |
|-------------------------------------|----------------|-----------------------|------------------|-------------|---------------|------|------|---------------|
| Size of stud dia. d_1 mm | | | | | | | | |
| Metric CF series | CF | With hexagon hole | $d_1 \leq 10$ | — | — | ○ | —(2) | |
| | | | $10 < d_1$ | ○ | — | ○ | —(2) | |
| | CFE | With screwdriver slot | $d_1 < 5$ | — | — | ○ | —(2) | |
| | | | $5 \leq d_1$ | ○ | ○ | ○ | —(2) | |
| | CF...W | | | | | | | |
| | CF-RU1, CF-FU1 | | | | — | — | ○ | — |
| CF-SFU | | | | — | — | — | — | |
| C-Lube Cam Followers | | | | CF.../SG | — | — | ○ | — |
| Cylindrical Roller Cam Followers | NUCF | With hexagon hole | $d_1 \leq 10$ | — | — | ○ | — | |
| | | | $10 < d_1$ | ○ | — | ○ | — | |
| | | With screwdriver slot | — | ○ | ○ | ○ | — | |
| Miniature CFS series | CFS | | | — | — | ○ | — | |
| | CFS...W | | | | | | | |
| Inch series | CR | With hexagon hole | $d_1 \leq 6.35$ | — | — | ○ | — | |
| | | | $6.35 < d_1$ | ○ | ○ | ○ | — | |
| | CRH | With hexagon hole | $d_1 \leq 7.938$ | — | — | ○ | — | |
| | | | $7.938 < d_1$ | ○ | ○ | ○ | — | |
| | | With screwdriver slot | — | ○ | ○ | ○ | — | |

Notes(1) For Eccentric Type Cam Follower CFE, thread diameter G is applied.

(2) For CFE, spring washer is supplied.

I

CF
NUCF
CFS
CR

Table 14 Dimensions of grease nipple

| Code number | Dimensions mm | | | | | | Applicable Cam Followers (1) |
|-------------|---------------|-----|----------------|----|----------------|-----|------------------------------|
| | d | D | D ₁ | L | L ₁ | W | |
| NPF4-1 | 4 | 5 | — | 5 | — | 1.5 | CF12B ~ CF16B |
| NPF6-1 | 6 | 7 | — | 8 | — | 2 | CF18B ~ CF30B |
| NPT4 | 4 | 7.5 | 6 | 10 | 5.5 | 1.5 | CF 6 ~ CF10-1 |
| NPT6 | 6 | 8 | 6 | 11 | 6 | 2 | CF12 ~ CF18 |
| NPT8 | 8 | 10 | 6 | 16 | 7 | 3 | CF20 ~ CF30-2 |
| NPB2 | 3.18 | 7.5 | 6 | 9 | 5.5 | 1.5 | CF5 |

Note(1) Only representative types are shown in the table. This table is also applicable to Cylindrical Roller Cam Followers.

Table 15 Dimensions of Grease nipple for Inch series

| Code number | Dimensions mm | | | | | | Applicable Cam Followers (1) |
|-------------|---------------|-----|----------------|------|----------------|------|------------------------------|
| | d | D | D ₁ | L | L ₁ | W | |
| 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 |

Note(1) Only representative types are shown in the table.

Table 16 Dimensions of plug

| Code number | Dimensions of plug mm | | | Dimension of inserter mm | Applicable Cam Followers (1) |
|-------------|-----------------------|-----|-----|--------------------------|------------------------------|
| | D | t | B | | |
| UST4F | 4 | 0.4 | 3.3 | 3 | CF 6 ~ CF10-1 |
| UST6F | 6 | 0.4 | 4 | 5 | CF12 ~ CF18 |
| UST8F | 8 | 0.4 | 5.8 | 7 | CF20 ~ CF30-2 |
| USB2F | 3.18 | 0.3 | 3.3 | 2.3 | CF5, 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 | CRH48 ~ CRH64 |

Note(1) Only representative types are shown in the table. This table is also applicable to Cylindrical Roller Cam Followers.

Operating Temperature Range

The operating temperature range for IKO Cam Followers is -20°C ~ +120°C. However, the maximum allowable temperature for the following types is different.

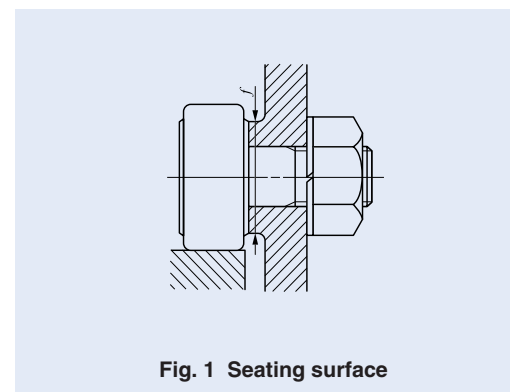
The maximum allowable temperature for the Metric CF series with a stud diameter d_1 of 4 mm or less, Stainless steel mede Cam Followers with a stud diameter d_1 of 5 mm and CFS2 is +110°C, and +100°C when they are continuously operated.

The maximum allowable temperature for the sealed type with a stud diameter d_1 of 5 mm or less is +80°C.

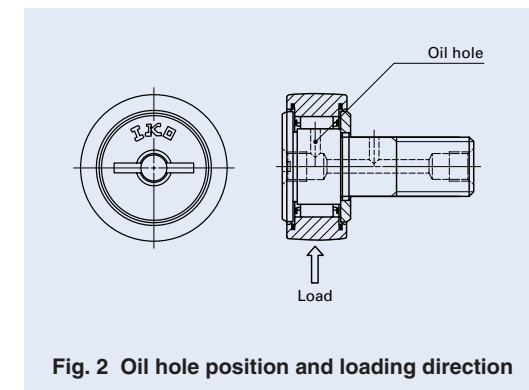
Allowable temperature range of C-Lube Cam Followers is -15°C ~ +80°C. For a long term operation, less than +60°C is recommended.

Mounting

- Make 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.

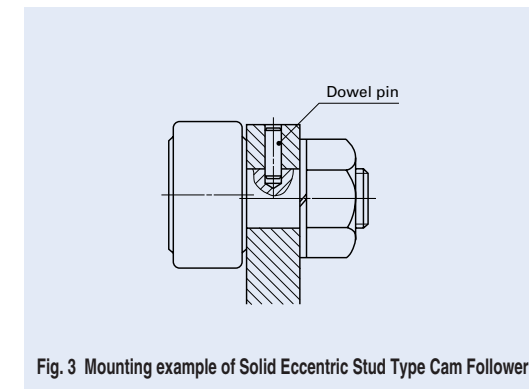


- The IKO mark on the flange head of the stud indicates the position of the oil hole on the raceway. Avoid locating the oil hole within the loading zone. This may lead to a short bearing life. (See Fig. 2.) The hole located in the middle part of the stud perpendicular to the stud center axis is used for greasing or locking.



- When 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.

- In the case of Solid Eccentric Stud Type Cam Followers and Eccentric Type Cam Followers, 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. 3. 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.



I
CF
NUCF
CFS
CR

⑤ In 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. 4.)

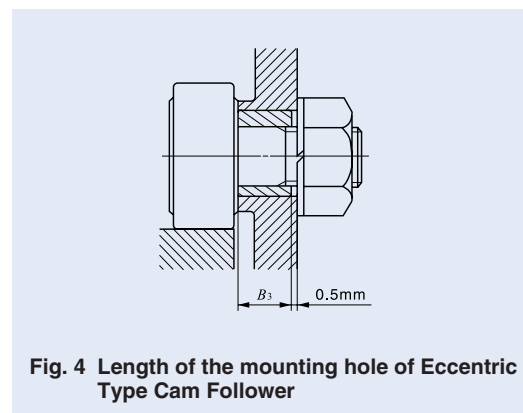


Fig. 4 Length of the mounting hole of Eccentric Type Cam Follower

⑥ For 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. 5.)

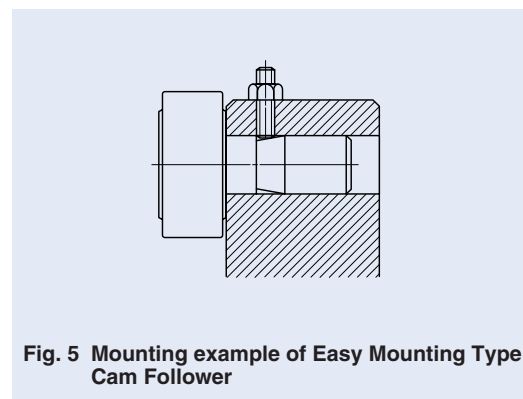


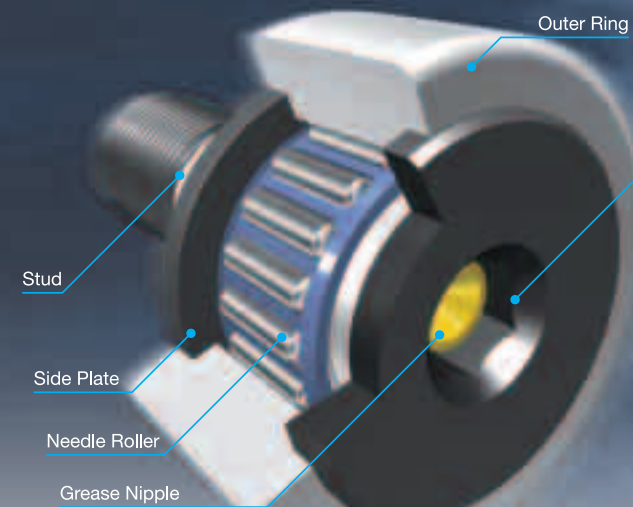
Fig. 5 Mounting example of Easy Mounting Type Cam Follower

Precaution For Use

- ① Do 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.
- ② To ensure normal rotation of the C-Lube Cam Follower, apply a load of 1% or over of the dynamic load rating at use.

IKO Hex Head Cam Followers

Cam Followers are follower bearings for cam mechanisms and linear motions provided with high rigidity and high accuracy. They are, therefore, used widely for machine tools, industrial robots, electronics devices, and OA equipment. Hex Head Cam Followers can be fixed firmly by hexagonal wrench and re-lubrication port can be chosen from three positions. This series contributes easy assembling and easy maintenance in your applications.

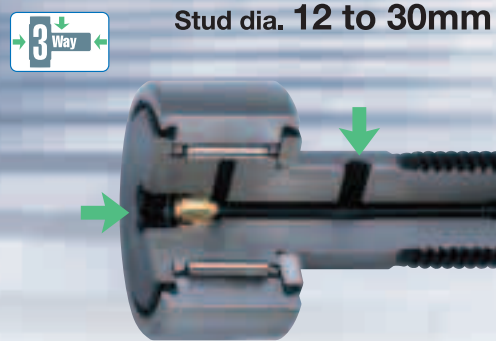


| | | |
|--|--|---|
| <p>Standard Type Cam Follower CF...(F)(V)B(UU R) Stud dia. mm: 3~30</p> <p>5mm to 30mm of stud dia. are available for widely use.</p> | <p>Solid Eccentric Stud Type Cam Follower CFES...B(UU R) Stud dia. mm: 6~18 Eccentricity ϵ</p> <p>The stud is designed eccentric to the center axis of the outer ring. This allows easy adjustment of outer ring position in the radial direction in relation to the mating track surface by turning the stud, which makes load distribution on multiple numbers of Cam Followers uniformed. Mounting dimensions are the same as those of standard Cam Followers with eccentricity of 0.25 to 0.6 mm.</p> | <p>Standard Type Cam Follower CFE...(V)B(UU R) Stud dia. mm: 6~30 Eccentricity ϵ</p> <p>An eccentric collar is assembled over 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 to 1.5mm.</p> |
| <p>C-Lube Cam Follower CF...WB(UU R)/SG Stud dia. mm: 6~20</p> <p>C-Lube Cam Followers are bearings with prepacked thermosetting solid lubricant (C-Lube) inside. As the bearing rotates, the lubricating oil is deposited onto the raceway in the correct volume maintaining the lubrication performance for greatly extended periods of time.</p> | <p>Easy Mounting Type Cam Follower CF-SFU...B Stud dia. mm: 6~20</p> <p>This Cam Follower has stepped tapered portion on the stud that makes easy fixing by tightening a set screw to the stepped portion. This Cam Follower is suite to pallet changer where a large number of Cam Followers are used.</p> | <p>Cylindrical Roller Cam Follower NUCF...BR Stud dia. mm: 10~30</p> <p>This is a full complement type Cam Follower incorporating double rows of cylindrical rollers to support large radial load and some axial load.</p> |
| <p>Thrust Disk Type Cam Follower CF...(F)WB(UU R) Stud dia. mm: 3~20</p> <p>Special resin thrust washers are placed to reduce friction and wear due to unexpected axial load caused by misalignment, etc.</p> | | |

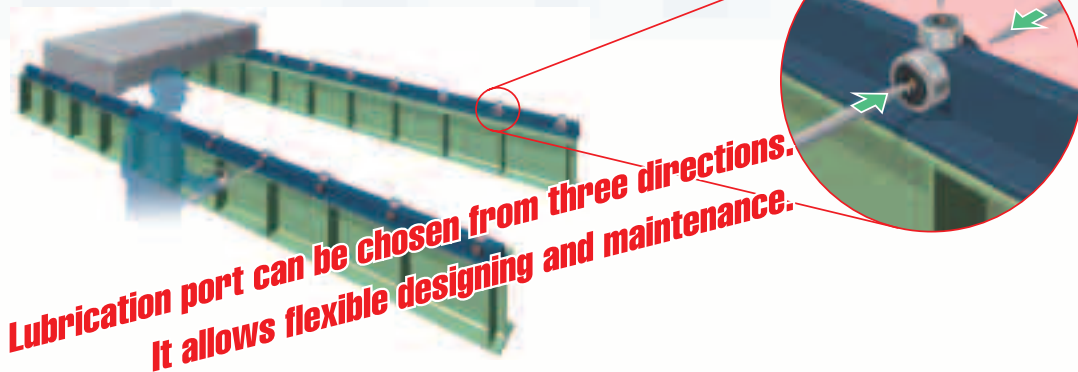
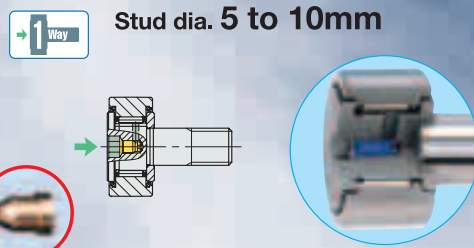
I
CF
NUCF
CFS
CR



Lubrication from three ways

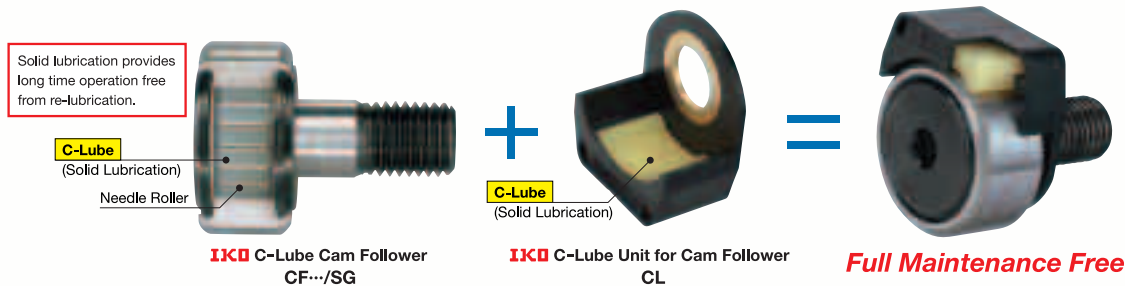


Lubrication from one way



IKO C-Lube Unit for Cam Followers

C-Lube Unit CL is the lubrication-supporting equipment for the track surface of Cam Follower's outer ring. Full maintenance free for both inside and the outside of Cam Follower is possible when CL unit is assembled to C-Lube Cam Follower CF.../SG.



Option Parts

C-Lube Unit for Cam Followers

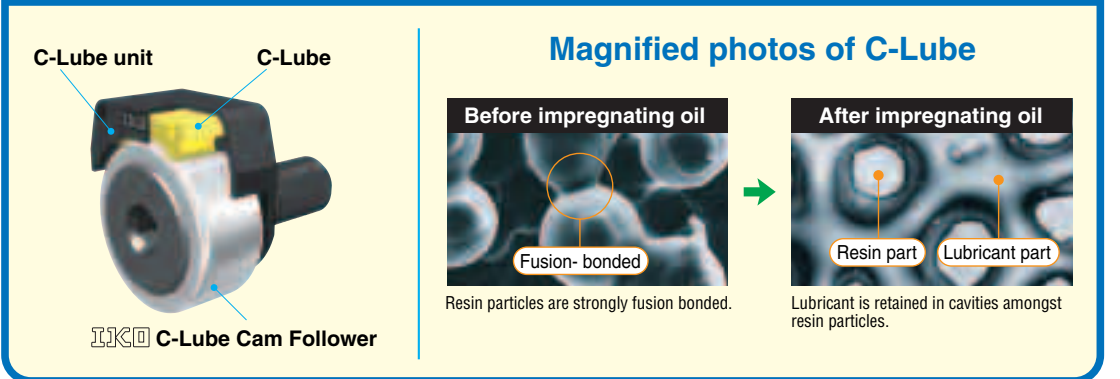
C-Lube Unit CL is the lubrication-supporting equipment for the track surface and Cam Follower's outer ring to keep both surfaces free of maintenance.

Capillary system IKO has developed is a new type lubrication. It is a porous resin Lube-body or plate with steel backing formed by sintering fine resin powder and impregnating a large amount of lubrication oil

in its open pores. Capillary system always supplies proper amount of lubrication oil to the cylindrical rollers and lubrication condition of the raceway can be kept well for long period of time.

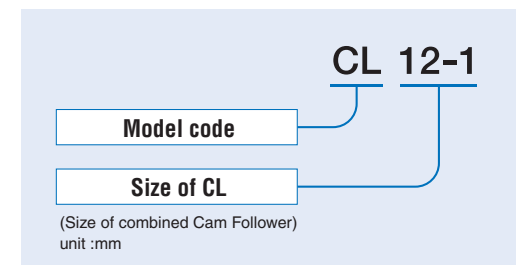
Also it prevents oil scattering causing pollution to the surrounding environment, and helps minimizing oil consumption.

Structure of C-Lube Unit for Cam Followers



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

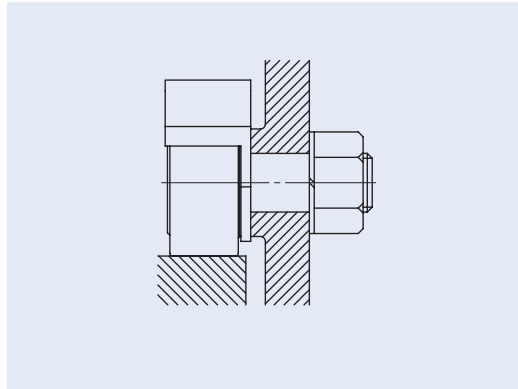
Lubricating oil is supplied to the whole external diameter surface of the outer ring. Accordingly, use the product in a condition in which the outer ring makes one or more turns.

Operating temperature

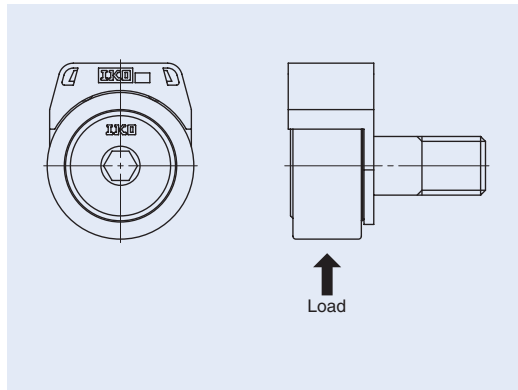
Allowable operating temperature range of IKO Cam Follower with C-Lube Unit is -15 to 80°C.

Mounting

- 1 Set the C-Lube Unit perpendicularly to the center axis of Cam Follower and fix together with Cam Follower by tightening nut.



- 2 Position of C-Lube Unit is adjustable. C-Lube Unit must be positioned avoiding loading direction.

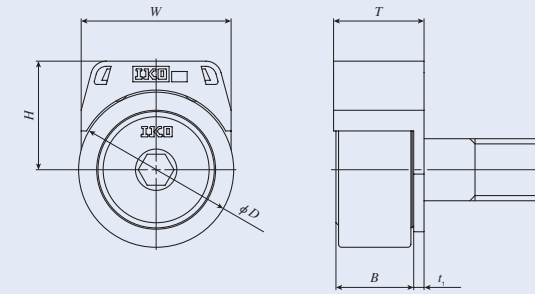


- 3 When tightening the nut, the tightening torque should not be exceeded the value maximum tightening torque on dimension table. In case loosening of the nut is predicted due to vibration, using lock nut, spring washer and other special washer are recommended.

For use

- 1 The maximum allowable load on IKO Cam Follower with C-Lube Unit is, in some cases, limited by the bending strength and shear strength of the C-Lube Unit instead of the load rating of needle bearing part. In order to safety operation, the maximum allowable static load is specified by the limitations of those strengths.
- 2 After assembling 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.
- 3 Do not use in the environment which contamination of liquid and/or harmful foreign matter are expected.
- 4 Do 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.
- 5 To ensure normal rotation of the Cam Follower, apply a load of 1% or over of the dynamic load rating at use.
- 6 Replace with new C-Lube Unit when inside oil finishes completely. Re-lubrication is not possible.
- 7 Do not apply a load onto the C-Lube Unit directly.

Table 19 Dimensions of C-Lube Unit for Cam Followers

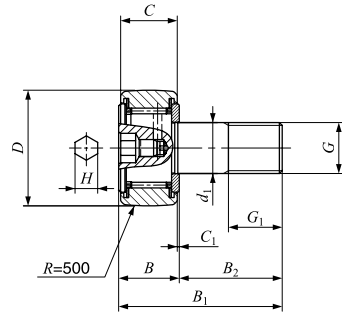
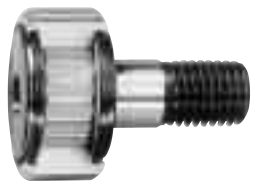


| Model number | Boundary Dimensions mm | | | | Applicable Cam Followers | | | Maximum ⁽²⁾ allowable static load N |
|--------------|------------------------|------|------|----------------|-----------------------------|-----------------------------|----------|--|
| | W | H | T | t ₁ | Model number ⁽¹⁾ | Boundary Dimensions mm D | B Max | |
| CL 6 | 15.4 | 12.6 | 14 | 1.5 | CF 6 B | 16 | 12.2 | 1 560 |
| CL 8 | 18.4 | 14.2 | 14 | 1.5 | CF 8 B | 19 | 12.2 | 3 700 |
| CL 10 | 21 | 17 | 15.5 | 2 | CF 10 B | 22 | 13.2 | 5 510 |
| CL 10-1 | 21 | 19.2 | 15.5 | 2 | CF 10-1 B | 26 | 13.2 | 5 510 |
| CL 12 | 29 | 21 | 17.5 | 2 | CF 12 B | 30 | 15.2 | 7 830 |
| CL 12-1 | 29 | 22 | 17.5 | 2 | CF 12-1 B | 32 | 15.2 | 7 830 |

Note⁽¹⁾ Only representative types shown in the table, but also applicable to the same size of standard type, with thrust washer type, centralized lubrication type, C-Lube maintenance free type and Cylindrical Roller Cam Followers. Combine with C-Lube Cam Follower is strongly recommended for full maintenance free.
 Note⁽²⁾ Actual load should be not exceeded these values. 1N ≒ 0.102kgf

CAM FOLLOWERS

C-Lube Cam Followers **With Cage / With Hexagon Hole**

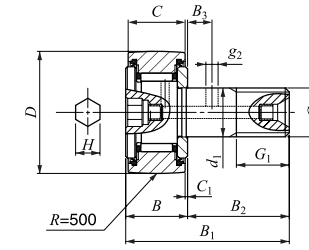


Stud dia. 6 to 10mm

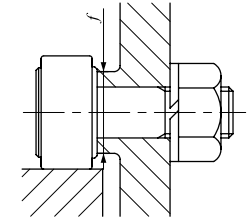
Stud dia. 6–20mm

| Stud dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | |
|-----------------|-----------------------|---------------------|------------------------|----------|-----------------------|----------|-----------------------|-------------------------|--------------------------|
| | | | <i>D</i> | <i>C</i> | <i>d</i> ₁ | <i>G</i> | <i>G</i> ₁ | <i>B</i> _{max} | <i>B</i> _{1max} |
| 6 | CF 6 WBUUR/SG | 18.5 | 16 | 11 | 6 | M 6×1 | 8 | 12.2 | 28.2 |
| 8 | CF 8 WBUUR/SG | 28.5 | 19 | 11 | 8 | M 8×1.25 | 10 | 12.2 | 32.2 |
| 10 | CF 10 WBUUR/SG | 45 | 22 | 12 | 10 | M10×1.25 | 12 | 13.2 | 36.2 |
| | CF 10-1 WBUUR/SG | 60 | 26 | 12 | 10 | M10×1.25 | 12 | 13.2 | 36.2 |
| 12 | CF 12 WBUUR/SG | 95 | 30 | 14 | 12 | M12×1.5 | 13 | 15.2 | 40.2 |
| | CF 12-1 WBUUR/SG | 105 | 32 | 14 | 12 | M12×1.5 | 13 | 15.2 | 40.2 |
| 16 | CF 16 WBUUR/SG | 170 | 35 | 18 | 16 | M16×1.5 | 17 | 19.6 | 52.1 |
| 18 | CF 18 WBUUR/SG | 250 | 40 | 20 | 18 | M18×1.5 | 19 | 21.6 | 58.1 |
| 20 | CF 20 WBUUR/SG | 460 | 52 | 24 | 20 | M10×1.5 | 21 | 25.6 | 66.1 |
| | CF 20-1 WBUUR/SG | 385 | 47 | 24 | 20 | M10×1.5 | 21 | 25.6 | 66.1 |

- Remark1. 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. Models with a stud diameter *d*₁ of 10 mm or less has no oil hole. The others are provided with one oil hole each on the outside surface and end surface of the stud.
 5. Regreasing is not possible as the bearing internal space is filled with thermosetting solid-type lubricant C-Lube.



Stud dia. 12 to 20mm

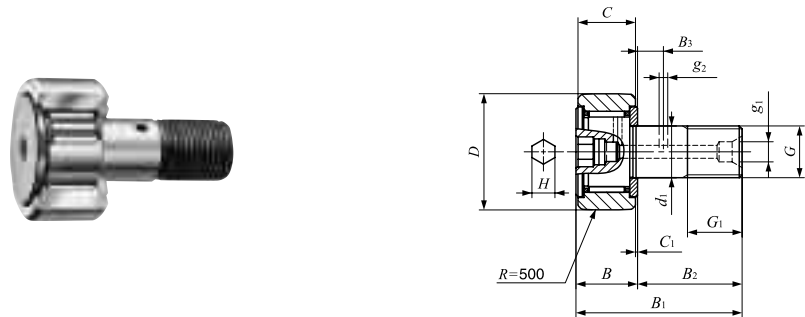


| <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₂ | <i>H</i> | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N-m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable load N |
|-----------------------|-----------------------|-----------------------|-----------------------|----------|---|----------------------------------|--|--|-----------------------------|
| | | | | | | | | | |
| 16 | — | 0.6 | — | 3 | 11 | 2.7 | 3 660 | 3 650 | 1 950 |
| 20 | — | 0.6 | — | 4 | 13 | 6.5 | 4 250 | 4 740 | 4 620 |
| 23 | — | 0.6 | — | 4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 23 | — | 0.6 | — | 4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 25 | 6 | 0.6 | 3 | 6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 25 | 6 | 0.6 | 3 | 6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 32.5 | 8 | 0.8 | 3 | 6 | 26 | 58.5 | 12 000 | 18 300 | 18 300 |
| 36.5 | 8 | 0.8 | 3 | 8 | 29 | 86.2 | 14 800 | 25 200 | 25 200 |
| 40.5 | 9 | 0.8 | 4 | 8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| 40.5 | 9 | 0.8 | 4 | 8 | 34 | 119 | 20 700 | 34 600 | 34 600 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Standard Type Cam Followers **With Cage/With Hexagon Hole**

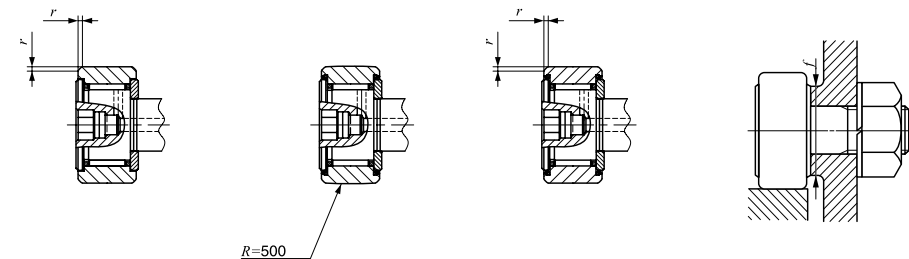


CF...BR

Stud dia. 3–30mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ | G |
|-----------------|----------------------------|--------------------------------|----------------------------|--------------------------------|---------------------|----|----|----------------|----------|
| | Shield type | | Sealed type | | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | |
| 3 | CF 3 BR | CF 3 B | CF 3 BUUR | CF 3 BUU | 4.3 | 10 | 7 | 3 | M 3×0.5 |
| 4 | CF 4 BR | CF 4 B | CF 4 BUUR | CF 4 BUU | 7.4 | 12 | 8 | 4 | M 4×0.7 |
| 5 | CF 5 BR | CF 5 B | CF 5 BUUR | CF 5 BUU | 10.3 | 13 | 9 | 5 | M 5×0.8 |
| 6 | CF 6 BR | CF 6 B | CF 6 BUUR | CF 6 BUU | 18.5 | 16 | 11 | 6 | M 6×1 |
| 8 | CF 8 BR | CF 8 B | CF 8 BUUR | CF 8 BUU | 28.5 | 19 | 11 | 8 | M 8×1.25 |
| | CF 8 BRM | CF 8 BM | CF 8 BUURM | CF 8 BUUM | 28.5 | 19 | 11 | 8 | M 8×1 |
| 10 | CF 10 BR | CF 10 B | CF 10 BUUR | CF 10 BUU | 45 | 22 | 12 | 10 | M10×1.25 |
| | CF 10 BRM | CF 10 BM | CF 10 BUURM | CF 10 BUUM | 45 | 22 | 12 | 10 | M10×1 |
| | CF 10-1 BR | CF 10-1 B | CF 10-1 BUUR | CF 10-1 BUU | 60 | 26 | 12 | 10 | M10×1.25 |
| | CF 10-1 BRM | CF 10-1 BM | CF 10-1 BUURM | CF 10-1 BUUM | 60 | 26 | 12 | 10 | M10×1 |
| 12 | CF 12 BR | CF 12 B | CF 12 BUUR | CF 12 BUU | 95 | 30 | 14 | 12 | M12×1.5 |
| | CF 12-1 BR | CF 12-1 B | CF 12-1 BUUR | CF 12-1 BUU | 105 | 32 | 14 | 12 | M12×1.5 |
| 16 | CF 16 BR | CF 16 B | CF 16 BUUR | CF 16 BUU | 170 | 35 | 18 | 16 | M16×1.5 |
| 18 | CF 18 BR | CF 18 B | CF 18 BUUR | CF 18 BUU | 250 | 40 | 20 | 18 | M18×1.5 |
| 20 | CF 20 BR | CF 20 B | CF 20 BUUR | CF 20 BUU | 460 | 52 | 24 | 20 | M20×1.5 |
| | CF 20-1 BR | CF 20-1 B | CF 20-1 BUUR | CF 20-1 BUU | 385 | 47 | 24 | 20 | M20×1.5 |
| 24 | CF 24 BR | CF 24 B | CF 24 BUUR | CF 24 BUU | 815 | 62 | 29 | 24 | M24×1.5 |
| | CF 24-1 BR | CF 24-1 B | CF 24-1 BUUR | CF 24-1 BUU | 1 140 | 72 | 29 | 24 | M24×1.5 |
| 30 | CF 30 BR | CF 30 B | CF 30 BUUR | CF 30 BUU | 1 870 | 80 | 35 | 30 | M30×1.5 |
| | CF 30-1 BR | CF 30-1 B | CF 30-1 BUUR | CF 30-1 BUU | 2 030 | 85 | 35 | 30 | M30×1.5 |
| | CF 30-2 BR | CF 30-2 B | CF 30-2 BUUR | CF 30-2 BUU | 2 220 | 90 | 35 | 30 | M30×1.5 |

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



CF...B

CF...BUUR

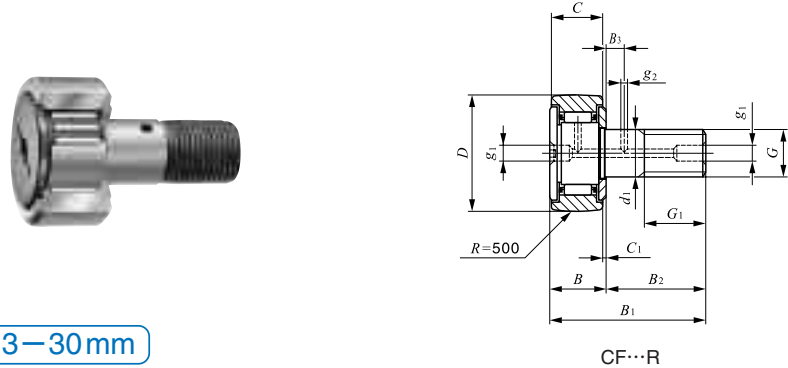
CF...BUU

| Boundary dimensions mm | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|--|---|--|---|---|--|
| <i>G</i> ₁ | <i>B</i> | <i>B</i> ₁ | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>H</i> | <i>r</i> _{s min} ⁽¹⁾ | | | | | |
| 5 | 8 | 17 | 9 | — | 0.5 | — | — | 2 | 0.2 | 6.8 | 0.34 | 1 500 | 1 020 | 384 |
| 6 | 9 | 20 | 11 | — | 0.5 | — | — | 2.5 | 0.3 | 8.3 | 0.78 | 2 070 | 1 590 | 834 |
| 7.5 | 10 | 23 | 13 | — | 0.5 | — | — | 3 | 0.3 | 9.3 | 1.6 | 2 520 | 2 140 | 1 260 |
| 8 | 12.2max | 28.2max | 16 | — | 0.6 | — | — | 3 | 0.3 | 11 | 2.7 | 3 660 | 3 650 | 1 950 |
| 10 | 12.2max | 32.2max | 20 | — | 0.6 | — | — | 4 | 0.3 | 13 | 6.5 | 4 250 | 4 740 | 4 620 |
| 10 | 12.2max | 32.2max | 20 | — | 0.6 | — | — | 4 | 0.3 | 13 | 7.1 | 4 250 | 4 740 | 4 620 |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 14.7 | 5 430 | 6 890 | 6 890 |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 14.7 | 5 430 | 6 890 | 6 890 |
| 13 | 15.2max | 40.2max | 25 | 6 | 0.6 | 6 | 3 | 6 | 0.6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 13 | 15.2max | 40.2max | 25 | 6 | 0.6 | 6 | 3 | 6 | 0.6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 17 | 19.6max | 52.1max | 32.5 | 8 | 0.8 | 6 | 3 | 6 | 0.6 | 26 | 58.5 | 12 000 | 18 300 | 18 300 |
| 19 | 21.6max | 58.1max | 36.5 | 8 | 0.8 | 6 | 3 | 8 | 1 | 29 | 86.2 | 14 800 | 25 200 | 25 200 |
| 21 | 25.6max | 66.1max | 40.5 | 9 | 0.8 | 8 | 4 | 8 | 1 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| 21 | 25.6max | 66.1max | 40.5 | 9 | 0.8 | 8 | 4 | 8 | 1 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| 25 | 30.6max | 80.1max | 49.5 | 11 | 0.8 | 8 | 4 | 12 | 1 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| 25 | 30.6max | 80.1max | 49.5 | 11 | 0.8 | 8 | 4 | 12 | 1 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

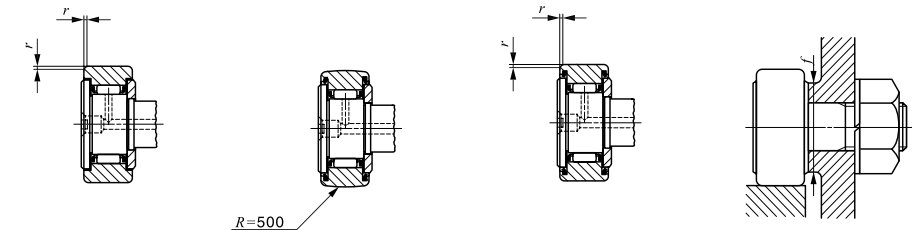
Standard Type Cam Followers With Cage/With Screwdriver Slot



Stud dia. 3–30mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ | G |
|--------------|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------|----|----|----------------|----------|
| | Shield type | | Sealed type | | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | |
| 3 | CF 3 R | CF 3 | CF 3 UUR | CF 3 UU | 4.3 | 10 | 7 | 3 | M 3×0.5 |
| 4 | CF 4 R | CF 4 | CF 4 UUR | CF 4 UU | 7.4 | 12 | 8 | 4 | M 4×0.7 |
| 5 | CF 5 R | CF 5 | CF 5 UUR | CF 5 UU | 10.3 | 13 | 9 | 5 | M 5×0.8 |
| 6 | CF 6 R | CF 6 | CF 6 UUR | CF 6 UU | 18.5 | 16 | 11 | 6 | M 6×1 |
| 8 | CF 8 R | CF 8 | CF 8 UUR | CF 8 UU | 28.5 | 19 | 11 | 8 | M 8×1.25 |
| | CF 8 RM | CF 8 M | CF 8 UURM | CF 8 UUM | 28.5 | 19 | 11 | 8 | M 8×1 |
| 10 | CF 10 R | CF 10 | CF 10 UUR | CF 10 UU | 45 | 22 | 12 | 10 | M10×1.25 |
| | CF 10 RM | CF 10 M | CF 10 UURM | CF 10 UUM | 45 | 22 | 12 | 10 | M10×1 |
| | CF 10-1 R | CF 10-1 | CF 10-1 UUR | CF 10-1 UU | 60 | 26 | 12 | 10 | M10×1.25 |
| | CF 10-1 RM | CF 10-1 M | CF 10-1 UURM | CF 10-1 UUM | 60 | 26 | 12 | 10 | M10×1 |
| 12 | CF 12 R | CF 12 | CF 12 UUR | CF 12 UU | 95 | 30 | 14 | 12 | M12×1.5 |
| | CF 12-1 R | CF 12-1 | CF 12-1 UUR | CF 12-1 UU | 105 | 32 | 14 | 12 | M12×1.5 |
| 16 | CF 16 R | CF 16 | CF 16 UUR | CF 16 UU | 170 | 35 | 18 | 16 | M16×1.5 |
| 18 | CF 18 R | CF 18 | CF 18 UUR | CF 18 UU | 250 | 40 | 20 | 18 | M18×1.5 |
| 20 | CF 20 R | CF 20 | CF 20 UUR | CF 20 UU | 460 | 52 | 24 | 20 | M20×1.5 |
| | CF 20-1 R | CF 20-1 | CF 20-1 UUR | CF 20-1 UU | 385 | 47 | 24 | 20 | M20×1.5 |
| 24 | CF 24 R | CF 24 | CF 24 UUR | CF 24 UU | 815 | 62 | 29 | 24 | M24×1.5 |
| | CF 24-1 R | CF 24-1 | CF 24-1 UUR | CF 24-1 UU | 1 140 | 72 | 29 | 24 | M24×1.5 |
| 30 | CF 30 R | CF 30 | CF 30 UUR | CF 30 UU | 1 870 | 80 | 35 | 30 | M30×1.5 |
| | CF 30-1 R | CF 30-1 | CF 30-1 UUR | CF 30-1 UU | 2 030 | 85 | 35 | 30 | M30×1.5 |
| | CF 30-2 R | CF 30-2 | CF 30-2 UUR | CF 30-2 UU | 2 220 | 90 | 35 | 30 | M30×1.5 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. Models with a stud diameter *d*₁ of 4 mm or less have no oil hole. Models with a stud diameter of more than 5 mm and up to 10 mm (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. Shield type models with a stud diameter *d*₁ of 5 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.

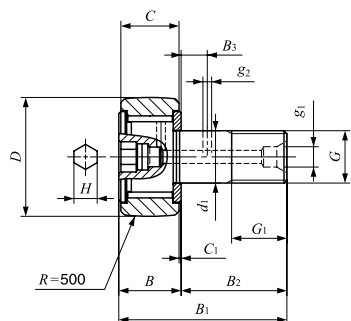


| Boundary dimensions mm | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N-m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|-----|-------------------------------------|-------------------------------|--------------------------------------|--|---------------------------------|
| <i>G</i> ₁ | <i>B</i> | <i>B</i> ₁ | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>r</i> _{s min} ⁽¹⁾ | | | | | | |
| 5 | 8 | 17 | 9 | — | 0.5 | — | — | 0.2 | 6.8 | 0.34 | 1 500 | 1 020 | 384 | |
| 6 | 9 | 20 | 11 | — | 0.5 | — | — | 0.3 | 8.3 | 0.78 | 2 070 | 1 590 | 834 | |
| 7.5 | 10 | 23 | 13 | — | 0.5 | *3.1 | — | 0.3 | 9.3 | 1.6 | 2 520 | 2 140 | 1 260 | |
| 8 | 12.2max | 28.2max | 16 | — | 0.6 | *4 | — | 0.3 | 11 | 2.7 | 3 660 | 3 650 | 1 950 | |
| 10 | 12.2max | 32.2max | 20 | — | 0.6 | *4 | — | 0.3 | 13 | 6.5 | 4 250 | 4 740 | 4 620 | |
| 10 | 12.2max | 32.2max | 20 | — | 0.6 | *4 | — | 0.3 | 13 | 7.1 | 4 250 | 4 740 | 4 620 | |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 13.8 | 5 430 | 6 890 | 6 890 | |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 14.7 | 5 430 | 6 890 | 6 890 | |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 13.8 | 5 430 | 6 890 | 6 890 | |
| 12 | 13.2max | 36.2max | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 14.7 | 5 430 | 6 890 | 6 890 | |
| 13 | 15.2max | 40.2max | 25 | 6 | 0.6 | 6 | 3 | 0.6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 | |
| 13 | 15.2max | 40.2max | 25 | 6 | 0.6 | 6 | 3 | 0.6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 | |
| 17 | 19.6max | 52.1max | 32.5 | 8 | 0.8 | 6 | 3 | 0.6 | 26 | 58.5 | 12 000 | 18 300 | 18 300 | |
| 19 | 21.6max | 58.1max | 36.5 | 8 | 0.8 | 6 | 3 | 1 | 29 | 86.2 | 14 800 | 25 200 | 25 200 | |
| 21 | 25.6max | 66.1max | 40.5 | 9 | 0.8 | 8 | 4 | 1 | 34 | 119 | 20 700 | 34 600 | 34 600 | |
| 21 | 25.6max | 66.1max | 40.5 | 9 | 0.8 | 8 | 4 | 1 | 34 | 119 | 20 700 | 34 600 | 34 600 | |
| 25 | 30.6max | 80.1max | 49.5 | 11 | 0.8 | 8 | 4 | 1 | 40 | 215 | 30 500 | 52 600 | 52 000 | |
| 25 | 30.6max | 80.1max | 49.5 | 11 | 0.8 | 8 | 4 | 1 | 40 | 215 | 30 500 | 52 600 | 52 000 | |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 | |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 | |
| 32 | 37 max | 100 max | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 45 400 | 85 100 | 85 100 | |

I
 CF
 NUCF
 CFS
 CR

CAM FOLLOWERS

Standard Type Cam Followers **Full Complement Type/With Hexagon Hole**

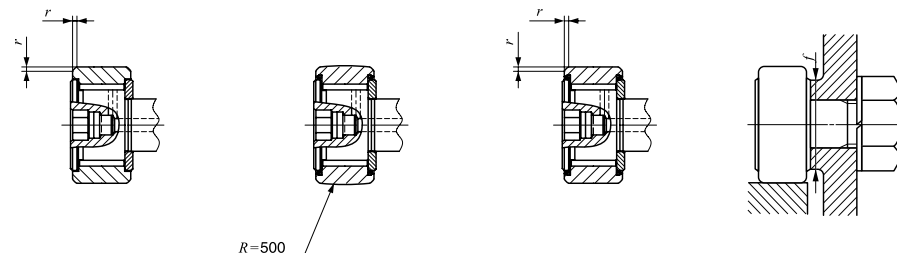


CF...VBR

Stud dia. 6–30mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ |
|-----------------|-------------------------|-----------------------------|-------------------------|-----------------------------|------------------|----|----|----------------|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 6 | CF 6 VBR | CF 6 VB | CF 6 VBUUR | CF 6 VBUU | 19 | 16 | 11 | 6 |
| 8 | CF 8 VBR | CF 8 VB | CF 8 VBUUR | CF 8 VBUU | 29 | 19 | 11 | 8 |
| | CF 8 VBRM | CF 8 VBM | CF 8 VBUURM | CF 8 VBUUM | 29 | 19 | 11 | 8 |
| 10 | CF 10 VBR | CF 10 VB | CF 10 VBUUR | CF 10 VBUU | 46 | 22 | 12 | 10 |
| | CF 10 VBRM | CF 10 VBM | CF 10 VBUURM | CF 10 VBUUM | 46 | 22 | 12 | 10 |
| | CF 10-1 VBR | CF 10-1 VB | CF 10-1 VBUUR | CF 10-1 VBUU | 61 | 26 | 12 | 10 |
| | CF 10-1 VBRM | CF 10-1 VBM | CF 10-1 VBUURM | CF 10-1 VBUUM | 61 | 26 | 12 | 10 |
| 12 | CF 12 VBR | CF 12 VB | CF 12 VBUUR | CF 12 VBUU | 97 | 30 | 14 | 12 |
| | CF 12-1 VBR | CF 12-1 VB | CF 12-1 VBUUR | CF 12-1 VBUU | 107 | 32 | 14 | 12 |
| 16 | CF 16 VBR | CF 16 VB | CF 16 VBUUR | CF 16 VBUU | 173 | 35 | 18 | 16 |
| 18 | CF 18 VBR | CF 18 VB | CF 18 VBUUR | CF 18 VBUU | 255 | 40 | 20 | 18 |
| 20 | CF 20 VBR | CF 20 VB | CF 20 VBUUR | CF 20 VBUU | 465 | 52 | 24 | 20 |
| | CF 20-1 VBR | CF 20-1 VB | CF 20-1 VBUUR | CF 20-1 VBUU | 390 | 47 | 24 | 20 |
| 24 | CF 24 VBR | CF 24 VB | CF 24 VBUUR | CF 24 VBUU | 820 | 62 | 29 | 24 |
| | CF 24-1 VBR | CF 24-1 VB | CF 24-1 VBUUR | CF 24-1 VBUU | 1 140 | 72 | 29 | 24 |
| 30 | CF 30 VBR | CF 30 VB | CF 30 VBUUR | CF 30 VBUU | 1 870 | 80 | 35 | 30 |
| | CF 30-1 VBR | CF 30-1 VB | CF 30-1 VBUUR | CF 30-1 VBUU | 2 030 | 85 | 35 | 30 |
| | CF 30-2 VBR | CF 30-2 VB | CF 30-2 VBUUR | CF 30-2 VBUU | 2 220 | 90 | 35 | 30 |

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. Provided with prepacked grease.



CF...VB

CF...VBUUR

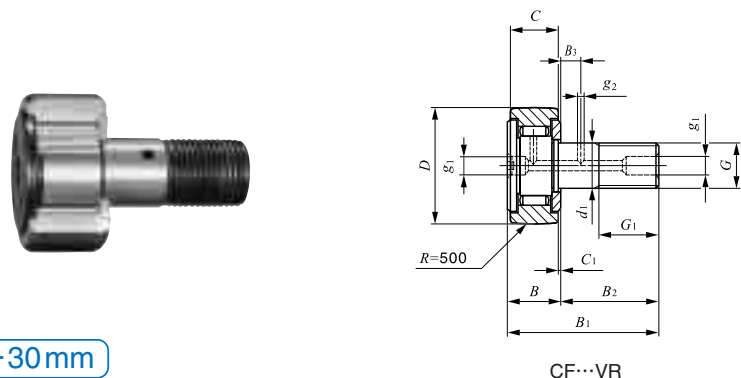
CF...VBUU

| Boundary dimensions mm | | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N-m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-----------------|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|---|---|----------------------------------|--|--|------------------------------------|
| <i>G</i> | <i>G</i> ₁ | <i>B</i> max | <i>B</i> ₁ max | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>H</i> | <i>r</i> _{smin} ⁽¹⁾ | | | | | |
| M 6×1 | 8 | 12.2 | 28.2 | 16 | — | 0.6 | — | — | 3 | 0.3 | 11 | 2.7 | 6 980 | 8 500 | 1 950 |
| M 8×1.25 | 10 | 12.2 | 32.2 | 20 | — | 0.6 | — | — | 4 | 0.3 | 13 | 6.5 | 8 170 | 11 200 | 4 620 |
| M 8×1 | 10 | 12.2 | 32.2 | 20 | — | 0.6 | — | — | 4 | 0.3 | 13 | 7.1 | 8 170 | 11 200 | 4 620 |
| M10×1.25 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 13.8 | 9 570 | 14 500 | 8 650 |
| M10×1 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 14.7 | 9 570 | 14 500 | 8 650 |
| M10×1.25 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 13.8 | 9 570 | 14 500 | 8 650 |
| M10×1 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | — | — | 4 | 0.3 | 16 | 14.7 | 9 570 | 14 500 | 8 650 |
| M12×1.5 | 13 | 15.2 | 40.2 | 25 | 6 | 0.6 | 6 | 3 | 6 | 0.6 | 21 | 21.9 | 13 500 | 19 700 | 13 200 |
| M12×1.5 | 13 | 15.2 | 40.2 | 25 | 6 | 0.6 | 6 | 3 | 6 | 0.6 | 21 | 21.9 | 13 500 | 19 700 | 13 200 |
| M16×1.5 | 17 | 19.6 | 52.1 | 32.5 | 8 | 0.8 | 6 | 3 | 6 | 0.6 | 26 | 58.5 | 20 700 | 37 600 | 23 200 |
| 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 |
| M20×1.5 | 21 | 25.6 | 66.1 | 40.5 | 9 | 0.8 | 8 | 4 | 8 | 1 | 34 | 119 | 33 200 | 64 500 | 37 500 |
| M20×1.5 | 21 | 25.6 | 66.1 | 40.5 | 9 | 0.8 | 8 | 4 | 8 | 1 | 34 | 119 | 33 200 | 64 500 | 37 500 |
| M24×1.5 | 25 | 30.6 | 80.1 | 49.5 | 11 | 0.8 | 8 | 4 | 12 | 1 | 40 | 215 | 46 600 | 92 000 | 52 000 |
| M24×1.5 | 25 | 30.6 | 80.1 | 49.5 | 11 | 0.8 | 8 | 4 | 12 | 1 | 40 | 215 | 46 600 | 92 000 | 52 000 |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 17 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

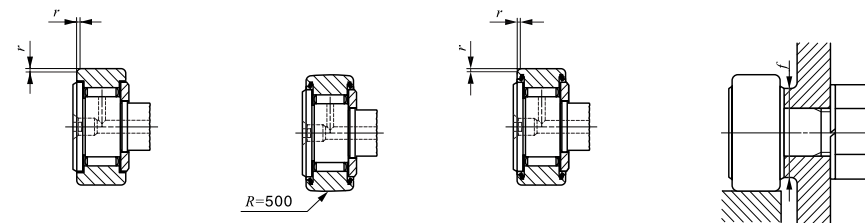
Standard Type Cam Followers **Full Complement Type/With Screwdriver Slot**



Stud dia. 6–30mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ |
|-----------------|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------------|----|----|----------------|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 6 | CF 6 VR | CF 6 V | CF 6 VUUR | CF 6 VUU | 19 | 16 | 11 | 6 |
| 8 | CF 8 VR | CF 8 V | CF 8 VUUR | CF 8 VUU | 29 | 19 | 11 | 8 |
| | CF 8 VRM | CF 8 VM | CF 8 VUURM | CF 8 VUUM | 29 | 19 | 11 | 8 |
| 10 | CF 10 VR | CF 10 V | CF 10 VUUR | CF 10 VUU | 46 | 22 | 12 | 10 |
| | CF 10 VRM | CF 10 VM | CF 10 VUURM | CF 10 VUUM | 46 | 22 | 12 | 10 |
| | CF 10-1 VR | CF 10-1 V | CF 10-1 VUUR | CF 10-1 VUU | 61 | 26 | 12 | 10 |
| | CF 10-1 VRM | CF 10-1 VM | CF 10-1 VUURM | CF 10-1 VUUM | 61 | 26 | 12 | 10 |
| 12 | CF 12 VR | CF 12 V | CF 12 VUUR | CF 12 VUU | 97 | 30 | 14 | 12 |
| | CF 12-1 VR | CF 12-1 V | CF 12-1 VUUR | CF 12-1 VUU | 107 | 32 | 14 | 12 |
| 16 | CF 16 VR | CF 16 V | CF 16 VUUR | CF 16 VUU | 173 | 35 | 18 | 16 |
| 18 | CF 18 VR | CF 18 V | CF 18 VUUR | CF 18 VUU | 255 | 40 | 20 | 18 |
| 20 | CF 20 VR | CF 20 V | CF 20 VUUR | CF 20 VUU | 465 | 52 | 24 | 20 |
| | CF 20-1 VR | CF 20-1 V | CF 20-1 VUUR | CF 20-1 VUU | 390 | 47 | 24 | 20 |
| 24 | CF 24 VR | CF 24 V | CF 24 VUUR | CF 24 VUU | 820 | 62 | 29 | 24 |
| | CF 24-1 VR | CF 24-1 V | CF 24-1 VUUR | CF 24-1 VUU | 1 140 | 72 | 29 | 24 |
| 30 | CF 30 VR | CF 30 V | CF 30 VUUR | CF 30 VUU | 1 870 | 80 | 35 | 30 |
| | CF 30-1 VR | CF 30-1 V | CF 30-1 VUUR | CF 30-1 VUU | 2 030 | 85 | 35 | 30 |
| | CF 30-2 VR | CF 30-2 V | CF 30-2 VUUR | CF 30-2 VUU | 2 220 | 90 | 35 | 30 |

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

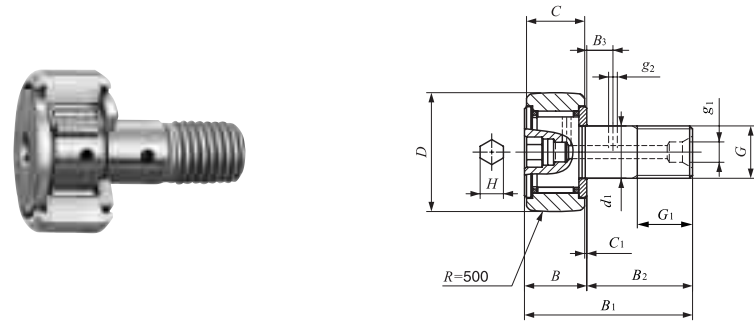


| Boundary dimensions mm | | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N-m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---|----------|---|----------------------------------|--|--|------------------------------------|
| <i>G</i> | <i>G</i> ₁ | <i>B</i> _{max} | <i>B</i> _{1max} | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>r</i> _{smin} ⁽¹⁾ | <i>f</i> | | | | | |
| M 6×1 | 8 | 12.2 | 28.2 | 16 | — | 0.6 | *4 | — | 0.3 | 11 | 2.7 | 6 980 | 8 500 | 1 950 | |
| M 8×1.25 | 10 | 12.2 | 32.2 | 20 | — | 0.6 | *4 | — | 0.3 | 13 | 6.5 | 8 170 | 11 200 | 4 620 | |
| M 8×1 | 10 | 12.2 | 32.2 | 20 | — | 0.6 | *4 | — | 0.3 | 13 | 7.1 | 8 170 | 11 200 | 4 620 | |
| M10×1.25 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 13.8 | 9 570 | 14 500 | 8 650 | |
| M10×1 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 14.7 | 9 570 | 14 500 | 8 650 | |
| M10×1.25 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 13.8 | 9 570 | 14 500 | 8 650 | |
| M10×1 | 12 | 13.2 | 36.2 | 23 | — | 0.6 | *4 | — | 0.3 | 16 | 14.7 | 9 570 | 14 500 | 8 650 | |
| M12×1.5 | 13 | 15.2 | 40.2 | 25 | 6 | 0.6 | 6 | 3 | 0.6 | 21 | 21.9 | 13 500 | 19 700 | 13 200 | |
| M12×1.5 | 13 | 15.2 | 40.2 | 25 | 6 | 0.6 | 6 | 3 | 0.6 | 21 | 21.9 | 13 500 | 19 700 | 13 200 | |
| M16×1.5 | 17 | 19.6 | 52.1 | 32.5 | 8 | 0.8 | 6 | 3 | 0.6 | 26 | 58.5 | 20 700 | 37 600 | 23 200 | |
| M18×1.5 | 19 | 21.6 | 58.1 | 36.5 | 8 | 0.8 | 6 | 3 | 1 | 29 | 86.2 | 25 300 | 51 300 | 31 100 | |
| M20×1.5 | 21 | 25.6 | 66.1 | 40.5 | 9 | 0.8 | 8 | 4 | 1 | 34 | 119 | 33 200 | 64 500 | 37 500 | |
| M20×1.5 | 21 | 25.6 | 66.1 | 40.5 | 9 | 0.8 | 8 | 4 | 1 | 34 | 119 | 33 200 | 64 500 | 37 500 | |
| M24×1.5 | 25 | 30.6 | 80.1 | 49.5 | 11 | 0.8 | 8 | 4 | 1 | 40 | 215 | 46 600 | 92 000 | 52 000 | |
| M24×1.5 | 25 | 30.6 | 80.1 | 49.5 | 11 | 0.8 | 8 | 4 | 1 | 40 | 215 | 46 600 | 92 000 | 52 000 | |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 | |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 | |
| M30×1.5 | 32 | 37 | 100 | 63 | 15 | 1 | 8 | 4 | 1 | 49 | 438 | 67 700 | 144 000 | 85 900 | |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Stainless Steel Made Cam Followers **With Cage/With Hexagon Hole**

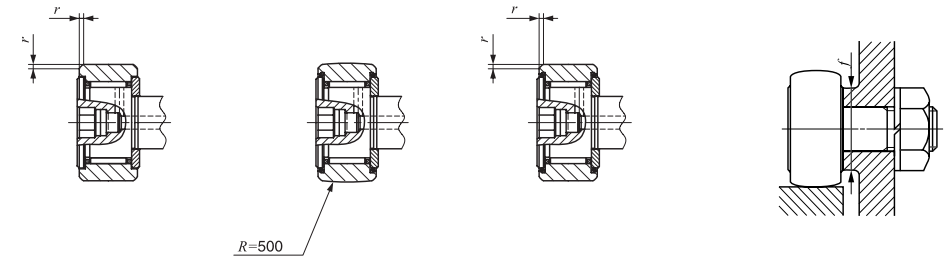


CF...FBR

Stud dia. 3–20mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|--------------|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------|------------------------|----|----------------|----------|----------------|
| | Shield type | | Sealed type | | | D | C | d ₁ | G | G ₁ |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | | |
| 3 | CF 3 FBR | CF 3 FB | CF 3 FBUUR | CF 3 FBUU | 4.3 | 10 | 7 | 3 | M 3×0.5 | 5 |
| 4 | CF 4 FBR | CF 4 FB | CF 4 FBUUR | CF 4 FBUU | 7.4 | 12 | 8 | 4 | M 4×0.7 | 6 |
| 5 | CF 5 FBR | CF 5 FB | CF 5 FBUUR | CF 5 FBUU | 10.3 | 13 | 9 | 5 | M 5×0.8 | 7.5 |
| 6 | CF 6 FBR | — | CF 6 FBUUR | — | 18.5 | 16 | 11 | 6 | M 6×1 | 8 |
| 8 | CF 8 FBR | — | CF 8 FBUUR | — | 28.5 | 19 | 11 | 8 | M 8×1.25 | 10 |
| 10 | CF 10 FBR | — | CF 10 FBUUR | — | 45 | 22 | 12 | 10 | M10×1.25 | 12 |
| 12 | CF 12 FBR | — | CF 12 FBUUR | — | 95 | 30 | 14 | 12 | M12×1.5 | 13 |
| 16 | CF 16 FBR | — | CF 16 FBUUR | — | 170 | 35 | 18 | 16 | M16×1.5 | 17 |
| 18 | CF 18 FBR | — | CF 18 FBUUR | — | 250 | 40 | 20 | 18 | M18×1.5 | 19 |
| 20 | CF 20 FBR | — | CF 20 FBUUR | — | 460 | 52 | 24 | 20 | M20×1.5 | 21 |

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



CF...FB

CF...FBUUR

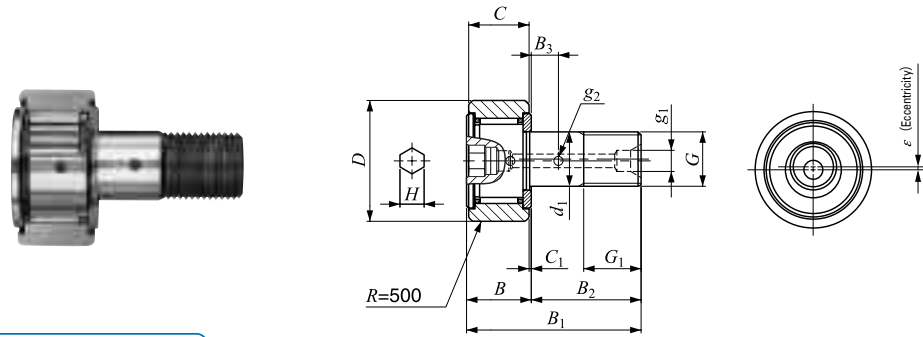
CF...FBUU

| Boundary dimensions mm | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N-m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|--|-----|-------------------------------------|-------------------------------|--------------------------------------|--|---------------------------------|
| <i>B</i> | <i>B</i> ₁ | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>H</i> | <i>r</i> _{s min} ⁽¹⁾ | | | | | | |
| 8 | 17 | 9 | — | 0.5 | — | — | 2 | 0.2 | 6.8 | 0.34 | 1 200 | 813 | 384 | |
| 9 | 20 | 11 | — | 0.5 | — | — | 2.5 | 0.3 | 8.3 | 0.78 | 1 650 | 1 270 | 834 | |
| 10 | 23 | 13 | — | 0.5 | — | — | 3 | 0.3 | 9.3 | 1.6 | 1 930 | 1 730 | 1 260 | |
| 12.2 max | 28.2 max | 16 | — | 0.6 | — | — | 3 | — | 11 | 2.7 | 2 930 | 2 920 | 1 950 | |
| 12.2 max | 32.2 max | 20 | — | 0.6 | — | — | 4 | — | 13 | 6.5 | 3 400 | 3 790 | 3 790 | |
| 13.2 max | 36.2 max | 23 | — | 0.6 | — | — | 5 | — | 16 | 13.8 | 4 340 | 5 510 | 5 510 | |
| 15.2 max | 40.2 max | 25 | 6 | 0.6 | 6 | 3 | 6 | — | 21 | 21.9 | 6 330 | 7 830 | 7 830 | |
| 19.6 max | 52.1 max | 32.5 | 8 | 0.8 | 6 | 3 | 6 | — | 26 | 58.5 | 9 620 | 14 700 | 14 700 | |
| 21.6 max | 58.1 max | 36.5 | 8 | 0.8 | 6 | 3 | 8 | — | 29 | 86.2 | 11 800 | 20 200 | 20 200 | |
| 25.6 max | 66.1 max | 40.5 | 9 | 0.8 | 8 | 4 | 8 | — | 34 | 119 | 16 500 | 27 700 | 27 700 | |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Solid Eccentric Stud Type Cam Followers **With Cage/With Hexagon Hole**

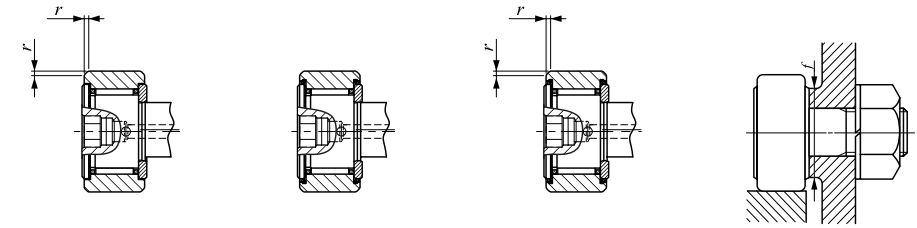


Stud dia. 6–18mm

CFES...BR

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ |
|-----------------|-------------------------|-----------------------------|-------------------------|-----------------------------|------------------|----|----|----------------|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 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 |

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.



CFES...B

CFES...BUUR

CFES...BUU

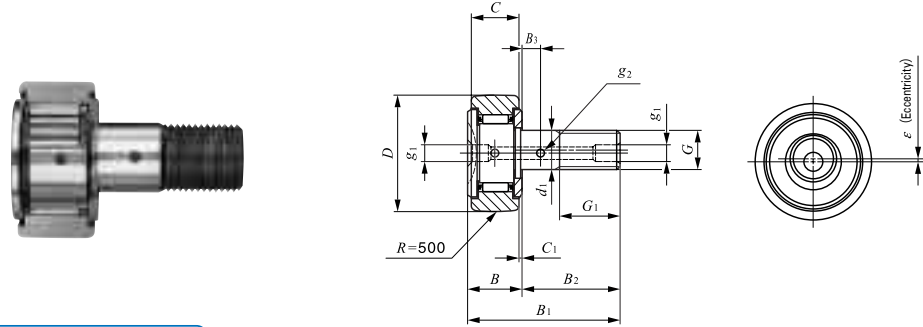
| Boundary dimensions mm | | | | | | | | | | | | Eccentricity ε | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|----------|-----------------------|-------------------------|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|---|-------------------|---|----------------------------------|--|--|------------------------------------|
| | <i>G</i> | <i>G</i> ₁ | <i>B</i> _{max} | <i>B</i> _{1max} | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>H</i> | <i>r</i> _{smin} ⁽¹⁾ | | | | | | |
| 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 | 6 | 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 | 6 | 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 | 6 | 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 | |

I

CF
NUCF
CFS
CR

CAM FOLLOWERS

Solid Eccentric Stud Type Cam Followers **With Cage/With Screwdriver Slot**

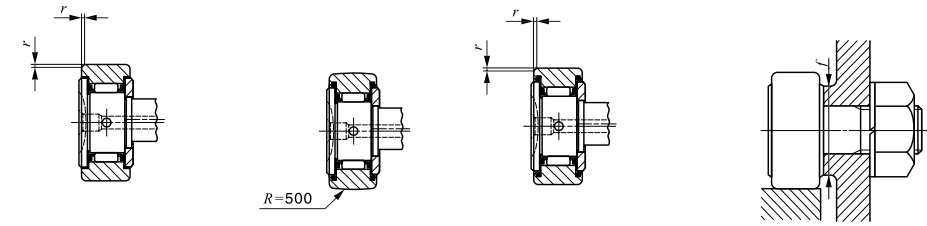


CFES...R

Stud dia. 6–18mm

| Stud dia. mm | Identification number | | | | Mass (Ref.) g | D | C | d ₁ |
|-----------------|-------------------------|-----------------------------|-------------------------|-----------------------------|------------------|----|----|----------------|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 6 | CFES 6 R | CFES 6 | CFES 6 UUR | CFES 6 UU | 18.5 | 16 | 11 | 6 |
| 8 | CFES 8 R | CFES 8 | CFES 8 UUR | CFES 8 UU | 28.5 | 19 | 11 | 8 |
| 10 | CFES 10 R | CFES 10 | CFES 10 UUR | CFES 10 UU | 45 | 22 | 12 | 10 |
| | CFES 10-1 R | CFES 10-1 | CFES 10-1 UUR | CFES 10-1 UU | 60 | 26 | 12 | 10 |
| 12 | CFES 12 R | CFES 12 | CFES 12 UUR | CFES 12 UU | 95 | 30 | 14 | 12 |
| | CFES 12-1 R | CFES 12-1 | CFES 12-1 UUR | CFES 12-1 UU | 105 | 32 | 14 | 12 |
| 16 | CFES 16 R | CFES 16 | CFES 16 UUR | CFES 16 UU | 170 | 35 | 18 | 16 |
| 18 | CFES 18 R | CFES 18 | CFES 18 UUR | CFES 18 UU | 250 | 40 | 20 | 18 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 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. Sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.



CFES

CFES...UUR

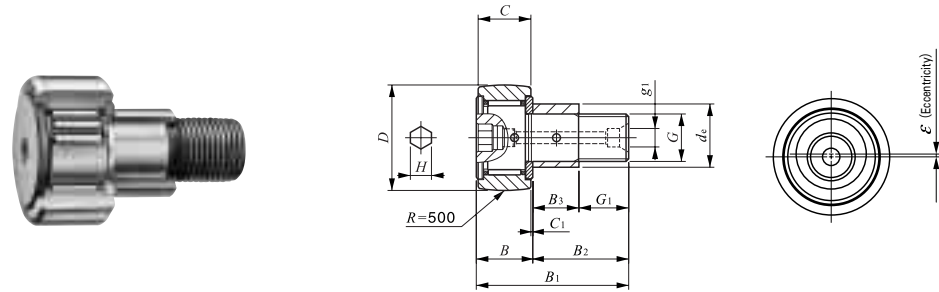
CFES...UU

| Boundary dimensions mm | | | | | | | | | | | Eccentricity ϵ | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|------|----------------------------|---|----------------------------------|--|--|------------------------------------|
| <i>G</i> | <i>G</i> ₁ | <i>B</i> _{max} | <i>B</i> _{1max} | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₁ | <i>g</i> ₂ | <i>r</i> _{s min} ⁽¹⁾ | | | | | | | |
| M 6×1 | 8 | 12.2 | 28.2 | 16 | — | 0.6 | *4 | — | 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 | 6 | 3 | 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 | 6 | 3 | 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 | 6 | 3 | 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 | 1 | 0.6 | 29 | 86.2 | 14 800 | 25 200 | 25 200 | |

I
 CF
 NUFC
 CFS
 CR

CAM FOLLOWERS

Eccentric Type Cam Followers **With Cage/With Hexagon Hole**

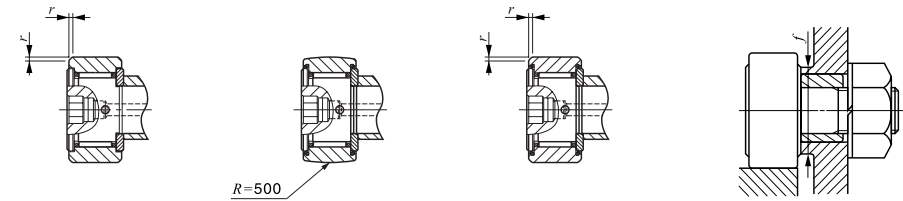


Outside diameter of eccentric collar 9—41 mm

CFE...BR

| Outside diameter of eccentric collar mm | Identification number | | | | Mass (Ref.) g | D | C | de |
|---|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------|----|----|----|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 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 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. 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.



CFE...B

CFE...BUUR

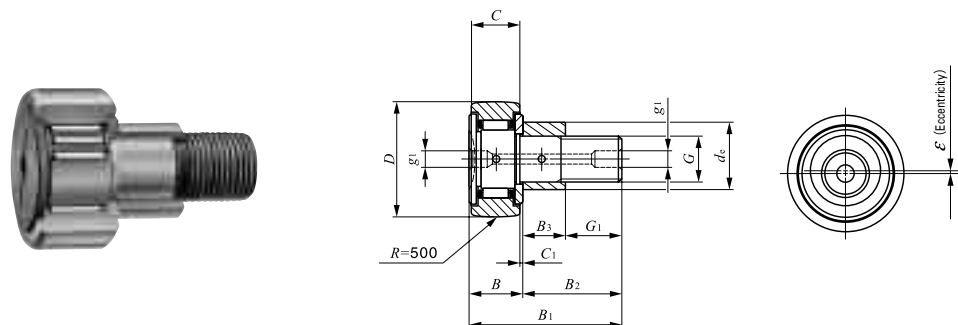
CFE...BUU

| Boundary dimensions mm | | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|--|-----------------------|-------------------------------------|-------------------------------|--------------------------------------|--|---------------------------------|
| <i>G</i> | <i>B</i> ₃ | <i>B</i> _{max} | <i>B</i> _{1 max} | <i>B</i> ₂ | <i>C</i> ₁ | <i>g</i> ₁ | <i>G</i> ₁ | <i>H</i> | <i>r</i> _{s min} ⁽¹⁾ | Eccentricity <i>ε</i> | | | | | |
| 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 |
| 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 |
| 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 |
| 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 |
| M12×1.5 | 11.5 | 15.2 | 40.2 | 25 | 0.6 | 6 | 13.5 | 6 | 0.6 | 0.8 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| M12×1.5 | 11.5 | 15.2 | 40.2 | 25 | 0.6 | 6 | 13.5 | 6 | 0.6 | 0.8 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| M16×1.5 | 15.5 | 19.6 | 52.1 | 32.5 | 0.8 | 6 | 17 | 6 | 0.6 | 0.8 | 26 | 58.5 | 12 000 | 18 300 | 18 300 |
| 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 |
| M20×1.5 | 19.5 | 25.6 | 66.1 | 40.5 | 0.8 | 8 | 21 | 8 | 1 | 0.8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| M20×1.5 | 19.5 | 25.6 | 66.1 | 40.5 | 0.8 | 8 | 21 | 8 | 1 | 0.8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| M24×1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 12 | 1 | 0.8 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| M24×1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 12 | 1 | 0.8 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Eccentric Type Cam Followers **With Cage/With Screwdriver Slot**

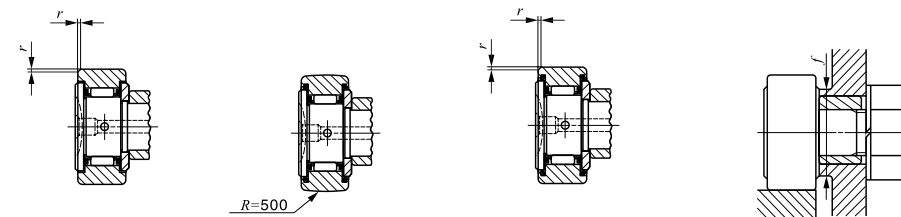


Outside diameter of eccentric collar 9—41 mm

CFE...R

| Outside diameter of eccentric collar mm | Identification number | | | | Mass (Ref.) g | | | |
|---|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------|----|----|----|
| | Shield type | | Sealed type | | | D | C | de |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 9 | CFE 6 R | CFE 6 | CFE 6 UUR | CFE 6 UU | 20.5 | 16 | 11 | 9 |
| 11 | CFE 8 R | CFE 8 | CFE 8 UUR | CFE 8 UU | 32 | 19 | 11 | 11 |
| 13 | CFE 10 R | CFE 10 | CFE 10 UUR | CFE 10 UU | 49.5 | 22 | 12 | 13 |
| | CFE 10-1 R | CFE 10-1 | CFE 10-1 UUR | CFE 10-1 UU | 65 | 26 | 12 | 13 |
| 16 | CFE 12 R | CFE 12 | CFE 12 UUR | CFE 12 UU | 105 | 30 | 14 | 16 |
| | CFE 12-1 R | CFE 12-1 | CFE 12-1 UUR | CFE 12-1 UU | 115 | 32 | 14 | 16 |
| 22 | CFE 16 R | CFE 16 | CFE 16 UUR | CFE 16 UU | 190 | 35 | 18 | 22 |
| 24 | CFE 18 R | CFE 18 | CFE 18 UUR | CFE 18 UU | 280 | 40 | 20 | 24 |
| 27 | CFE 20 R | CFE 20 | CFE 20 UUR | CFE 20 UU | 500 | 52 | 24 | 27 |
| | CFE 20-1 R | CFE 20-1 | CFE 20-1 UUR | CFE 20-1 UU | 425 | 47 | 24 | 27 |
| 33 | CFE 24 R | CFE 24 | CFE 24 UUR | CFE 24 UU | 895 | 62 | 29 | 33 |
| | CFE 24-1 R | CFE 24-1 | CFE 24-1 UUR | CFE 24-1 UU | 1 220 | 72 | 29 | 33 |
| 41 | CFE 30 R | CFE 30 | CFE 30 UUR | CFE 30 UU | 2 030 | 80 | 35 | 41 |
| | CFE 30-1 R | CFE 30-1 | CFE 30-1 UUR | CFE 30-1 UU | 2 190 | 85 | 35 | 41 |
| | CFE 30-2 R | CFE 30-2 | CFE 30-2 UUR | CFE 30-2 UU | 2 380 | 90 | 35 | 41 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. Models with a stud thread diameter *G* 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 and end surface of the stud.
 2. Sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.



CFE

CFE...UUR

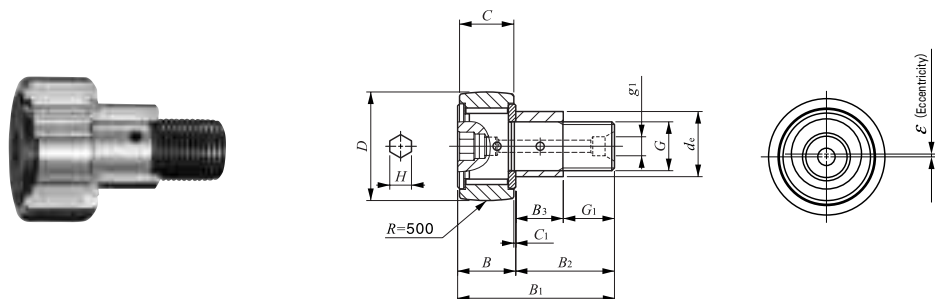
CFE...UU

| Boundary dimensions mm | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|-----------------------|-------------------------------------|-------------------------------|--------------------------------------|--|---------------------------------|
| <i>G</i> | <i>B</i> ₃ | <i>B</i> _{max} | <i>B</i> _{1 max} | <i>B</i> ₂ | <i>C</i> ₁ | <i>g</i> ₁ | <i>G</i> ₁ | <i>r</i> _{s min} ⁽¹⁾ | Eccentricity <i>ε</i> | | | | | |
| M 6×1 | 7.5 | 12.2 | 28.2 | 16 | 0.6 | *4 | 8.5 | 0.3 | 0.4 | 11 | 2.7 | 3 660 | 3 650 | 1 950 |
| M 8×1.25 | 9.5 | 12.2 | 32.2 | 20 | 0.6 | *4 | 10.5 | 0.3 | 0.4 | 13 | 6.5 | 4 250 | 4 740 | 4 620 |
| M10×1.25 | 10.5 | 13.2 | 36.2 | 23 | 0.6 | *4 | 12.5 | 0.3 | 0.4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| M10×1.25 | 10.5 | 13.2 | 36.2 | 23 | 0.6 | *4 | 12.5 | 0.3 | 0.4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| M12×1.5 | 11.5 | 15.2 | 40.2 | 25 | 0.6 | 6 | 13.5 | 0.6 | 0.8 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| M12×1.5 | 11.5 | 15.2 | 40.2 | 25 | 0.6 | 6 | 13.5 | 0.6 | 0.8 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| M16×1.5 | 15.5 | 19.6 | 52.1 | 32.5 | 0.8 | 6 | 17 | 0.6 | 0.8 | 26 | 58.5 | 12 000 | 18 300 | 18 300 |
| M18×1.5 | 17.5 | 21.6 | 58.1 | 36.5 | 0.8 | 6 | 19 | 1 | 0.8 | 29 | 86.2 | 14 800 | 25 200 | 25 200 |
| M20×1.5 | 19.5 | 25.6 | 66.1 | 40.5 | 0.8 | 8 | 21 | 1 | 0.8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| M20×1.5 | 19.5 | 25.6 | 66.1 | 40.5 | 0.8 | 8 | 21 | 1 | 0.8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| M24×1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 1 | 0.8 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| M24×1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 1 | 0.8 | 40 | 215 | 30 500 | 52 600 | 52 000 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 45 400 | 85 100 | 85 100 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Eccentric Type Cam Followers **Full Complement Type/With Hexagon Hole**

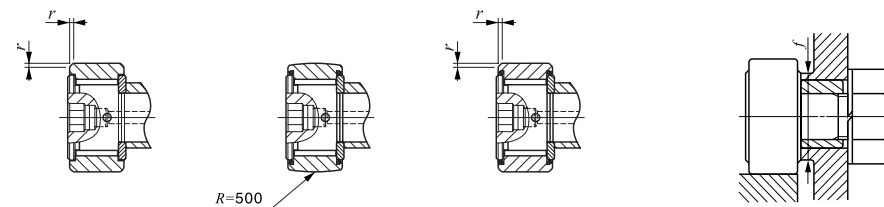


Outside diameter of eccentric collar 9—41 mm

CFE...VBR

| Outside diameter of eccentric collar mm | Identification number | | | | Mass (Ref.) g | D | C | de |
|---|-------------------------|-----------------------------|-------------------------|-----------------------------|---------------|----|----|----|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 9 | CFE 6 VBR | CFE 6 VB | CFE 6 VBUUR | CFE 6 VBUU | 21 | 16 | 11 | 9 |
| | CFE 6 VBR | CFE 6 VB | CFE 6 VBUUR | CFE 6 VBUU | | | | |
| 11 | CFE 8 VBR | CFE 8 VB | CFE 8 VBUUR | CFE 8 VBUU | 32.5 | 19 | 11 | 11 |
| | CFE 8 VBR | CFE 8 VB | CFE 8 VBUUR | CFE 8 VBUU | | | | |
| 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 | | | | |
| 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 | | | | |
| 22 | CFE 16 VBR | CFE 16 VB | CFE 16 VBUUR | CFE 16 VBUU | 193 | 35 | 18 | 22 |
| | CFE 16 VBR | CFE 16 VB | CFE 16 VBUUR | CFE 16 VBUU | | | | |
| 24 | CFE 18 VBR | CFE 18 VB | CFE 18 VBUUR | CFE 18 VBUU | 285 | 40 | 20 | 24 |
| | CFE 18 VBR | CFE 18 VB | CFE 18 VBUUR | CFE 18 VBUU | | | | |
| 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 | | | | |
| 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 | | | | |
| 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 | | | | |
| | CFE 30-2 VBR | CFE 30-2 VB | CFE 30-2 VBUUR | CFE 30-2 VBUU | | | | |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. 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.



CFE...VB

CFE...VBUUR

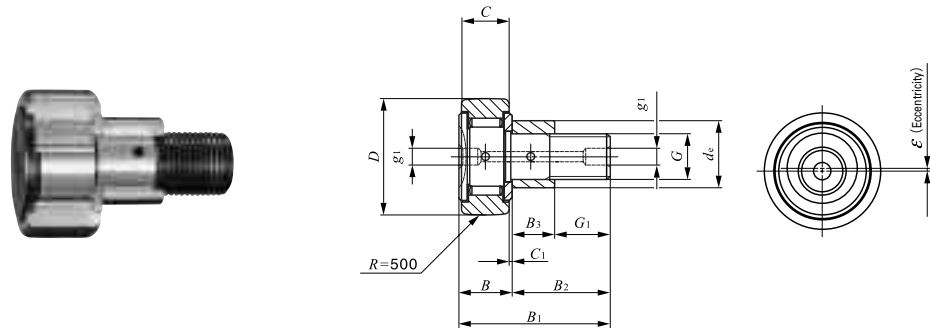
CFE...VBUU

| Boundary dimensions mm | | | | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|--|-----------------------|----|------|-------------------------------------|-------------------------------|--------------------------------------|--|---------------------------------|
| <i>G</i> | <i>B</i> ₃ | <i>B</i> _{max} | <i>B</i> _{1 max} | <i>B</i> ₂ | <i>C</i> ₁ | <i>g</i> ₁ | <i>G</i> ₁ | <i>H</i> | <i>r</i> _{s min} ⁽¹⁾ | Eccentricity <i>ε</i> | | | | | | | |
| 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 | 6 | 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 | 6 | 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 | 6 | 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 | 8 | 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 | 8 | 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 | 8 | 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 | 8 | 24 | 12 | 1 | 0.8 | 40 | 215 | 46 600 | 92 000 | 52 000 | | |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | | |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | | |
| M30×1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 17 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | | |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Eccentric Type Cam Followers **Full Complement Type/With Screwdriver Slot**

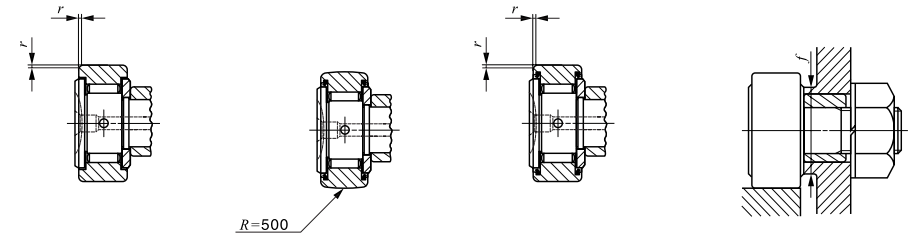


Outside diameter of eccentric collar 9 – 41 mm

CFE...VR

| Outside diameter of eccentric collar mm | Identification number | | | | Mass (Ref.) g | D | C | de |
|--|-------------------------|-----------------------------|-------------------------|-----------------------------|------------------|----|----|----|
| | Shield type | | Sealed type | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | |
| 9 | CFE 6 VR | CFE 6 V | CFE 6 VUUR | CFE 6 VUU | 21 | 16 | 11 | 9 |
| | CFE 6-1 VR | CFE 6-1 V | CFE 6-1 VUUR | CFE 6-1 VUU | | | | |
| 11 | CFE 8 VR | CFE 8 V | CFE 8 VUUR | CFE 8 VUU | 32.5 | 19 | 11 | 11 |
| | CFE 8-1 VR | CFE 8-1 V | CFE 8-1 VUUR | CFE 8-1 VUU | | | | |
| 13 | CFE 10 VR | CFE 10 V | CFE 10 VUUR | CFE 10 VUU | 50.5 | 22 | 12 | 13 |
| | CFE 10-1 VR | CFE 10-1 V | CFE 10-1 VUUR | CFE 10-1 VUU | | | | |
| 16 | CFE 12 VR | CFE 12 V | CFE 12 VUUR | CFE 12 VUU | 107 | 30 | 14 | 16 |
| | CFE 12-1 VR | CFE 12-1 V | CFE 12-1 VUUR | CFE 12-1 VUU | | | | |
| 22 | CFE 16 VR | CFE 16 V | CFE 16 VUUR | CFE 16 VUU | 193 | 35 | 18 | 22 |
| | CFE 16-1 VR | CFE 16-1 V | CFE 16-1 VUUR | CFE 16-1 VUU | | | | |
| 24 | CFE 18 VR | CFE 18 V | CFE 18 VUUR | CFE 18 VUU | 285 | 40 | 20 | 24 |
| | CFE 18-1 VR | CFE 18-1 V | CFE 18-1 VUUR | CFE 18-1 VUU | | | | |
| 27 | CFE 20 VR | CFE 20 V | CFE 20 VUUR | CFE 20 VUU | 505 | 52 | 24 | 27 |
| | CFE 20-1 VR | CFE 20-1 V | CFE 20-1 VUUR | CFE 20-1 VUU | | | | |
| 33 | CFE 24 VR | CFE 24 V | CFE 24 VUUR | CFE 24 VUU | 900 | 62 | 29 | 33 |
| | CFE 24-1 VR | CFE 24-1 V | CFE 24-1 VUUR | CFE 24-1 VUU | | | | |
| 41 | CFE 30 VR | CFE 30 V | CFE 30 VUUR | CFE 30 VUU | 2 030 | 80 | 35 | 41 |
| | CFE 30-1 VR | CFE 30-1 V | CFE 30-1 VUUR | CFE 30-1 VUU | 2 190 | 85 | 35 | 41 |
| | CFE 30-2 VR | CFE 30-2 V | CFE 30-2 VUUR | CFE 30-2 VUU | 2 380 | 90 | 35 | 41 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. Models with a stud thread diameter *G* 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, and end surface of the stud.
 2. Provided with prepacked grease.



CFE...V

CFE...VUUR

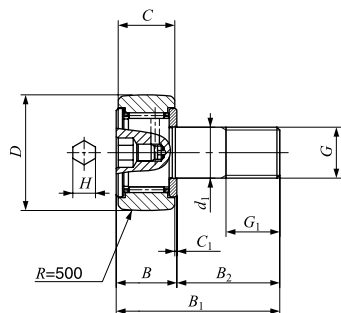
CFE...VUU

| Boundary dimensions mm | | | | | | | | | | | Mounting dimension <i>f</i> Min. mm | Maximum tightening torque N·m | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|------------------------|-----------------------|-------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|--------------------------|----|---|----------------------------------|--|--|------------------------------------|
| <i>G</i> | <i>B</i> ₃ | <i>B</i> _{max} | <i>B</i> _{1 max} | <i>B</i> ₂ | <i>C</i> ₁ | <i>g</i> ₁ | <i>G</i> ₁ | <i>r</i> _{s min} ⁽¹⁾ | Eccentricity <i>ε</i> | | | | | | |
| M 6 × 1 | 7.5 | 12.2 | 28.2 | 16 | 0.6 | *4 | 8.5 | 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 | *4 | 10.5 | 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 | *4 | 12.5 | 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 | *4 | 12.5 | 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 | 6 | 13.5 | 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 | 6 | 13.5 | 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 | 6 | 17 | 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 | 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 | 8 | 21 | 1 | 0.8 | 34 | 119 | 33 200 | 64 500 | 37 500 | |
| M20 × 1.5 | 19.5 | 25.6 | 66.1 | 40.5 | 0.8 | 8 | 21 | 1 | 0.8 | 34 | 119 | 33 200 | 64 500 | 37 500 | |
| M24 × 1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 1 | 0.8 | 40 | 215 | 46 600 | 92 000 | 52 000 | |
| M24 × 1.5 | 25.5 | 30.6 | 80.1 | 49.5 | 0.8 | 8 | 24 | 1 | 0.8 | 40 | 215 | 46 600 | 92 000 | 52 000 | |
| M30 × 1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | |
| M30 × 1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | |
| M30 × 1.5 | 32.5 | 37 | 100 | 63 | 1 | 8 | 30.5 | 1 | 1.5 | 49 | 438 | 67 700 | 144 000 | 85 900 | |

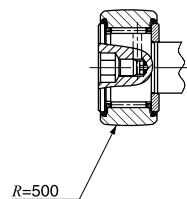
I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Thrust Disk Type Cam Followers **With Cage/With Hexagon Hole**



CF...(F)WBR
Stud dia 3 to 10



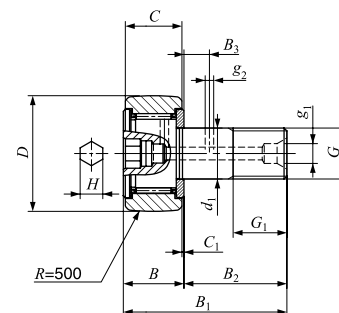
CF...(F)WBUUR

Stud dia. 3—20mm

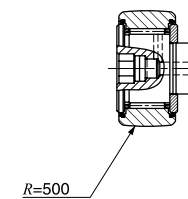
| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|-----------------|-----------------------|---------------|---------------------|------------------------|----|----------------|----------|----------------|
| | Shield type | Sealed type | | D | C | d ₁ | G | G ₁ |
| 3 | CF 3 WBR | CF 3 WBUUR | 4.3 | 10 | 7 | 3 | M 3×0.5 | 5 |
| | CF 3 FWBR | CF 3 FWBUUR | 4.3 | 10 | 7 | 3 | M 3×0.5 | 5 |
| 4 | CF 4 WBR | CF 4 WBUUR | 7.4 | 12 | 8 | 4 | M 4×0.7 | 6 |
| | CF 4 FWBR | CF 4 FWBUUR | 7.4 | 12 | 8 | 4 | M 4×0.7 | 6 |
| 5 | CF 5 WBR | CF 5 WBUUR | 10.3 | 13 | 9 | 5 | M 5×0.8 | 7.5 |
| | CF 5 FWBR | CF 5 FWBUUR | 10.3 | 13 | 9 | 5 | M 5×0.8 | 7.5 |
| 6 | CF 6 WBR | CF 6 WBUUR | 18.5 | 16 | 11 | 6 | M 6×1 | 8 |
| 8 | CF 8 WBR | CF 8 WBUUR | 28.5 | 19 | 11 | 8 | M 8×1.25 | 10 |
| 10 | CF 10 WBR | CF 10 WBUUR | 45 | 22 | 12 | 10 | M10×1.25 | 12 |
| | CF 10-1 WBR | CF 10-1 WBUUR | 60 | 26 | 12 | 10 | M10×1.25 | 12 |
| 12 | CF 12 WBR | CF 12 WBUUR | 95 | 30 | 14 | 12 | M12×1.5 | 13 |
| | CF 12-1 WBR | CF 12-1 WBUUR | 105 | 32 | 14 | 12 | M12×1.5 | 13 |
| 16 | CF 16 WBR | CF 16 WBUUR | 170 | 35 | 18 | 16 | M16×1.5 | 17 |
| 18 | CF 18 WBR | CF 18 WBUUR | 250 | 40 | 20 | 18 | M18×1.5 | 19 |
| 20 | CF 20 WBR | CF 20 WBUUR | 460 | 52 | 24 | 20 | M20×1.5 | 21 |
| | CF 20-1 WBR | CF 20-1 WBUUR | 385 | 47 | 24 | 20 | M20×1.5 | 21 |

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.



CF...(F)WBR
Stud dia 12 to 20mm



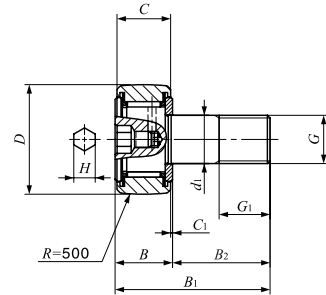
CF...(F)WBUUR

| 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 |
|----------|----------------|----------------|----------------|----------------|----------------|----------------|-----|------------------------------------|----------------------------------|-------------------------------------|---|------------------------------------|
| | | | | | | | | | | | | |
| 8 | 17 | 9 | — | 0.5 | — | — | 2 | 6.8 | 0.34 | 1 200 | 813 | 384 |
| 9 | 20 | 11 | — | 0.5 | — | — | 2.5 | 8.3 | 0.78 | 2 070 | 1 590 | 834 |
| 9 | 20 | 11 | — | 0.5 | — | — | 2.5 | 8.3 | 0.78 | 1 650 | 1 270 | 834 |
| 10 | 23 | 13 | — | 0.5 | — | — | 3 | 9.3 | 1.6 | 2 520 | 2 140 | 1 260 |
| 10 | 23 | 13 | — | 0.5 | — | — | 3 | 9.3 | 1.6 | 1 930 | 1 730 | 1 260 |
| 12.2 max | 28.2 max | 16 | — | 0.6 | — | — | 3 | 11 | 2.7 | 3 660 | 3 650 | 1 950 |
| 12.2 max | 32.2 max | 20 | — | 0.6 | — | — | 4 | 13 | 6.5 | 4 250 | 4 740 | 4 620 |
| 13.2 max | 36.2 max | 23 | — | 0.6 | — | — | 4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 13.2 max | 36.2 max | 23 | — | 0.6 | — | — | 4 | 16 | 13.8 | 5 430 | 6 890 | 6 890 |
| 15.2 max | 40.2 max | 25 | 6 | 0.6 | 4 | 3 | 6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 15.2 max | 40.2 max | 25 | 6 | 0.6 | 4 | 3 | 6 | 21 | 21.9 | 7 910 | 9 790 | 9 790 |
| 19.6 max | 52.1 max | 32.5 | 8 | 0.8 | 4 | 3 | 6 | 26 | 58.5 | 12 000 | 18 300 | 18 300 |
| 21.6 max | 58.1 max | 36.5 | 8 | 0.8 | 6 | 3 | 8 | 29 | 86.2 | 14 800 | 25 200 | 25 200 |
| 25.6 max | 66.1 max | 40.5 | 9 | 0.8 | 6 | 4 | 8 | 34 | 119 | 20 700 | 34 600 | 34 600 |
| 25.6 max | 66.1 max | 40.5 | 9 | 0.8 | 6 | 4 | 8 | 34 | 119 | 20 700 | 34 600 | 34 600 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Thrust Disk Type Stainless Steel Made Cam Followers **With Cage/With Hexagon Hole**



CF...FWBR

Stud dia. 3—5mm

| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|-----------------|-----------------------|-------------|---------------------|------------------------|---|----------------|---------|----------------|
| | Shield type | Sealed type | | D | C | d ₁ | G | G ₁ |
| 3 | CF 3 FWBR | CF 3 FWBUUR | 4.3 | 10 | 7 | 3 | M 3×0.5 | 5 |
| 4 | CF 4 FWBR | CF 4 FWBUUR | 7.4 | 12 | 8 | 4 | M 4×0.7 | 6 |
| 5 | CF 5 FWBR | CF 5 FWBUUR | 10.3 | 13 | 9 | 5 | M 5×0.8 | 7.5 |

Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For models with a stud dia. 5 mm, oil hole (re-greasing fitting) is provided at the head.
2. Provided with prepacked grease.



CF...FWBUUR

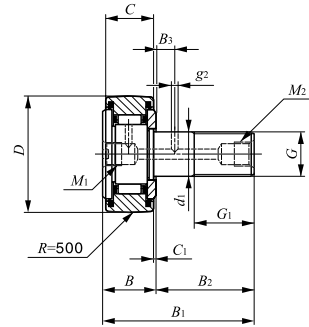
| B | B ₁ | B ₂ | C ₁ | H | Mounting dimension f Min. mm | Maximum tightening torque N·m | Basic dynamic load rating C N | Basic static load rating C ₀ N | Maximum allowable static load N |
|----|----------------|----------------|----------------|-----|---------------------------------------|--|--|--|--|
| | | | | | | | | | |
| 9 | 20 | 11 | 0.5 | 2.5 | 8.3 | 0.78 | 1 650 | 1 270 | 834 |
| 10 | 23 | 13 | 0.5 | 3 | 9.3 | 1.6 | 1 930 | 1 730 | 1 260 |

I

CF
NUCF
CFS
CR

CAM FOLLOWERS

Centralized Lubrication Type Cam Followers **With Cage/With Screwdriver Slot**



CF...RU1

Stud dia. 6 – 30mm

| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | |
|-----------------|---|--------------------------------|---------------------|------------------------|----|----------------|------------|----------------|
| | With crowned outer ring | With cylindrical outer ring | | D | C | d ₁ | G | G ₁ |
| 6 | CF-RU1- 6 | CF-FU1- 6 | 18.5 | 16 | 11 | 6 | M 6 × 1 | 8 |
| | | CF-FU1-10-1 | | | | | | |
| 8 | CF-RU1- 8 | CF-FU1- 8 | 28.5 | 19 | 11 | 8 | M 8 × 1.25 | 10 |
| | | CF-FU1-10-1 | | | | | | |
| 10 | CF-RU1-10 CF-RU1-10-1 | CF-FU1-10 | 45 | 22 | 12 | 10 | M10 × 1.25 | 12 |
| | | CF-FU1-10-1 | | | | | | |
| 12 | CF-RU1-12 CF-RU1-12-1 | CF-FU1-12 | 95 | 30 | 14 | 12 | M12 × 1.5 | 13 |
| | | CF-FU1-12-1 | | | | | | |
| 16 | CF-RU1-16 | CF-FU1-16 | 170 | 35 | 18 | 16 | M16 × 1.5 | 17 |
| | | CF-FU1-18 | | | | | | |
| 18 | CF-RU1-18 | CF-FU1-18 | 250 | 40 | 20 | 18 | M18 × 1.5 | 19 |
| | | CF-FU1-20 | | | | | | |
| 20 | CF-RU1-20 CF-RU1-20-1 | CF-FU1-20 | 460 | 52 | 24 | 20 | M20 × 1.5 | 21 |
| | | CF-FU1-20-1 | | | | | | |
| 24 | CF-RU1-24 CF-RU1-24-1 | CF-FU1-24 | 815 | 62 | 29 | 24 | M24 × 1.5 | 25 |
| | | CF-FU1-24-1 | | | | | | |
| 30 | CF-RU1-30 CF-RU1-30-1 CF-RU1-30-2 | CF-FU1-30 | 1 870 | 80 | 35 | 30 | M30 × 1.5 | 32 |
| | | CF-FU1-30-1 | | | | | | |
| | | CF-FU1-30-2 | | | | | | |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. 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.



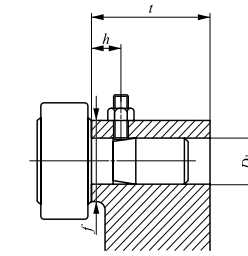
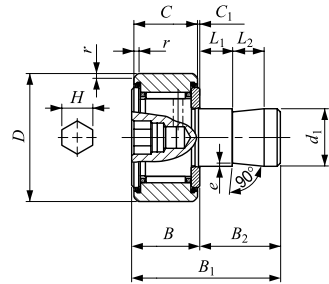
CF...FU1

| <i>B</i> _{max} | <i>B</i> _{1max} | <i>B</i> ₂ | <i>B</i> ₃ | <i>C</i> ₁ | <i>g</i> ₂ | <i>M</i> ₁ | <i>M</i> ₂ | <i>r</i> _{s min} ⁽¹⁾ | <i>f</i> Min. mm | Mounting dimension N-m | Maximum tightening torque N | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|-------------------------|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|------------------------|------------------------------|--------------------------------------|---|---|--|
| | | | | | | | | | | | | | | |
| 12.2 | 28.2 | 16 | — | 0.6 | — | M6× 0.75 | — | 0.3 | 11 | 2.7 | 3 660 | 3 650 | 1 950 | |
| 12.2 | 32.2 | 20 | — | 0.6 | — | | | 0.3 | 13 | 6.5 | 4 250 | 4 740 | 4 620 | |
| 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 | |
| 15.2 | 40.2 | 25 | — | 0.6 | — | PT 1/8 | PT 1/8 | 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 | |
| 19.6 | 52.1 | 32.5 | 8 | 0.8 | 3 | | | 0.6 | 26 | 58.5 | 12 000 | 18 300 | 18 300 | |
| 21.6 | 58.1 | 36.5 | 8 | 0.8 | 3 | | | 1 | 29 | 86.2 | 14 800 | 25 200 | 25 200 | |
| 25.6 | 66.1 | 40.5 | 9 | 0.8 | 4 | PT 1/8 | PT 1/8 | 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 | |
| 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 | |
| 37 | 100 | 63 | 15 | 1 | 4 | PT 1/8 | PT 1/8 | 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 | |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

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 _{1max} | 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 |

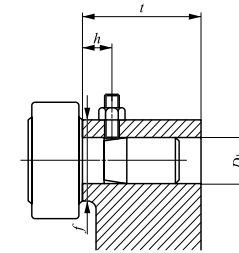
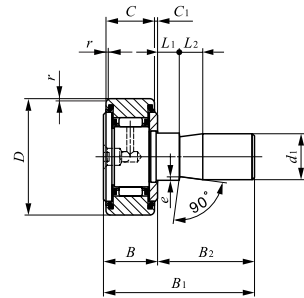
Note⁽¹⁾ Minimum allowable value of chamfer dimension *r*
 Remarks1. Models with a stud diameter *d*₁ of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head.
 2. Provided with prepacked grease.

| | | | | Mounting dimensions mm | | | | | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Maximum allowable static load N |
|-----------------------|----------|----------|--|------------------------|-------------|------------------|------------------|--------------------|--|--|------------------------------------|
| <i>L</i> ₂ | <i>H</i> | <i>e</i> | <i>r</i> _{s min} ⁽¹⁾ | <i>D</i> ₁ | Tolerance | <i>t</i> Min. | <i>f</i> Min. | <i>h</i> (Ref.) | | | |
| 10 | 3 | 0.3 | 0.3 | 6 | +0.012 0 | 20 | 11 | 10 | 3 660 | 3 650 | 1 950 |
| 10 | 4 | 0.5 | 0.3 | 8 | +0.015 0 | 20 | 13 | 10 | 4 250 | 4 740 | 4 620 |
| 10 | 4 | 0.5 | 0.3 | 10 | | 20 | 16 | 10 | 5 430 | 6 890 | 6 890 |
| 10 | 4 | 0.5 | 0.3 | 10 | | 20 | 16 | 10 | 5 430 | 6 890 | 6 890 |
| 10 | 6 | 1 | 0.6 | 12 | +0.018 0 | 20 | 21 | 10 | 7 910 | 9 790 | 9 790 |
| 10 | 6 | 1 | 0.6 | 12 | | 20 | 21 | 10 | 7 910 | 9 790 | 9 790 |
| 10 | 6 | 1 | 0.6 | 16 | | 25 | 26 | 15 | 12 000 | 18 300 | 18 300 |
| 10 | 8 | 1 | 1 | 18 | +0.021 0 | 25 | 29 | 15 | 14 800 | 25 200 | 25 200 |
| 10 | 8 | 1 | 1 | 20 | | 25 | 34 | 15 | 20 700 | 34 600 | 34 600 |
| 10 | 8 | 1 | 1 | 20 | | 25 | 34 | 15 | 20 700 | 34 600 | 34 600 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Easy Mounting Type Cam Followers **With Cage/With Screwdriver Slot**



Stud dia. 6 – 20mm

CF...SFU

| Stud dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | |
|-----------------|-----------------------|------------------|------------------------|----|----------------|------------------|-------------------|----------------|----------------|----------------|
| | | | D | C | d ₁ | B _{max} | B _{1max} | 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 |

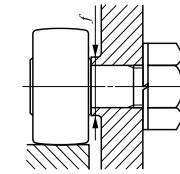
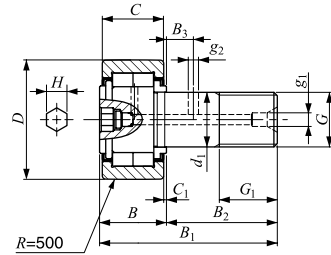
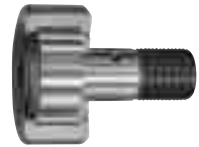
Note(1) Minimum allowable value of chamfer dimension *r*
 Remarks1. No oil hole is provided.
 2. Provided with prepacked grease.

| L ₂ | e | r _{s min} ⁽¹⁾ | Mounting dimensions mm | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Maximum allowable static load N |
|----------------|-----|-----------------------------------|------------------------|-------------|-----------|-----------|-------------|-------------------------------------|---|------------------------------------|
| | | | D ₁ | Tolerance | t Min. | f Min. | h (Ref.) | | | |
| 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 | +0.018 0 | 20 | 16 | 10 | 5 430 | 6 890 | 6 890 |
| 10 | 1 | 0.6 | 12 | | 20 | 21 | 10 | 7 910 | 9 790 | 9 790 |
| 10 | 1 | 0.6 | 12 | +0.018 0 | 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 | +0.021 0 | 25 | 29 | 15 | 14 800 | 25 200 | 25 200 |
| 10 | 1 | 1 | 20 | | 25 | 34 | 15 | 20 700 | 34 600 | 34 600 |
| 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 |

I
 CF
 NUCF
 CFS
 CR

CAM FOLLOWERS

Cylindrical Roller Cam Followers **Full Compliment Type/With Hexagon Hole**



Stud dia. 10 – 30mm

NUCF...BR

| Stud dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | |
|-----------------|-----------------------|------------------|------------------------|----|----------------|------------|----------------|------------------|-------------------|----------------|
| | | | D | C | d ₁ | G | G ₁ | B _{max} | B _{1max} | B ₂ |
| 10 | NUCF 10 BR | 44 | 22 | 12 | 10 | M10 × 1.25 | 12 | 13.2 | 36.2 | 23 |
| | NUCF 10-1 BR | 58 | 26 | 12 | 10 | M10 × 1.25 | 12 | 13.2 | 36.2 | 23 |
| 12 | NUCF 12 BR | 86 | 30 | 14 | 12 | M12 × 1.5 | 13 | 15.2 | 40.2 | 25 |
| | NUCF 12-1 BR | 97 | 32 | 14 | 12 | M12 × 1.5 | 13 | 15.2 | 40.2 | 25 |
| 16 | NUCF 16 BR | 167 | 35 | 18 | 16 | M16 × 1.5 | 17 | 19.6 | 52.1 | 32.5 |
| 18 | NUCF 18 BR | 244 | 40 | 20 | 18 | M18 × 1.5 | 19 | 21.6 | 58.1 | 36.5 |
| 20 | NUCF 20 BR | 457 | 52 | 24 | 20 | M20 × 1.5 | 21 | 25.6 | 66.1 | 40.5 |
| | NUCF 20-1 BR | 384 | 47 | 24 | 20 | M20 × 1.5 | 21 | 25.6 | 66.1 | 40.5 |
| 24 | NUCF 24 BR | 789 | 62 | 29 | 24 | M24 × 1.5 | 25 | 30.6 | 80.1 | 49.5 |
| | NUCF 24-1 BR | 1 020 | 72 | 29 | 24 | M24 × 1.5 | 25 | 30.6 | 80.1 | 49.5 |
| 30 | NUCF 30 BR | 1 600 | 80 | 35 | 30 | M30 × 1.5 | 32 | 37 | 100 | 63 |
| | NUCF 30-2 BR | 1 970 | 90 | 35 | 30 | M30 × 1.5 | 32 | 37 | 100 | 63 |

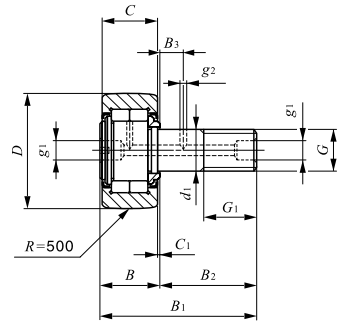
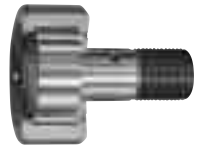
Remarks1. Models with a stud diameter d_1 of 10 mm or less (marked *) are provided with an oil hole (re-greasing fitting) on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.

| 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 |
|----------------|----------------|----------------|----------------|----|---------------------------------------|--|--|--|--|
| — | 0.6 | — | — | 4 | 12 | 13.8 | 10 400 | 11 500 | 5 300 |
| — | 0.6 | — | — | 4 | 12 | 13.8 | 10 400 | 11 500 | 9 210 |
| 6 | 0.6 | 4 | 3 | 6 | 17 | 21.9 | 14 000 | 13 400 | 5 650 |
| 6 | 0.6 | 4 | 3 | 6 | 17 | 21.9 | 14 000 | 13 400 | 9 040 |
| 8 | 0.8 | 4 | 3 | 6 | 20 | 58.5 | 23 400 | 27 300 | 11 800 |
| 8 | 0.8 | 6 | 3 | 8 | 22 | 86.2 | 25 200 | 30 900 | 20 300 |
| 9 | 0.8 | 6 | 4 | 8 | 31 | 119 | 43 100 | 58 100 | 30 000 |
| 9 | 0.8 | 6 | 4 | 8 | 27 | 119 | 38 900 | 49 000 | 27 200 |
| 11 | 0.8 | 6 | 4 | 12 | 38 | 215 | 58 200 | 75 300 | 35 200 |
| 11 | 0.8 | 6 | 4 | 12 | 44 | 215 | 63 900 | 88 800 | 57 000 |
| 15 | 1 | 6 | 4 | 17 | 45 | 438 | 90 300 | 121 000 | 98 300 |
| 15 | 1 | 6 | 4 | 17 | 45 | 438 | 90 300 | 121 000 | 98 300 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Cylindrical Roller Cam Followers **Full Compliment Type/With Screwdriver Slot**

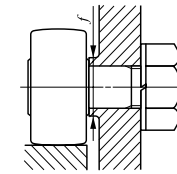


NUCF...R

Stud dia. 10 – 30mm

| Stud dia. mm | Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | |
|-----------------|-----------------------|------------------|------------------------|----|----------------|------------|----------------|------------------|-------------------|----------------|
| | | | D | C | d ₁ | G | G ₁ | B _{max} | B _{1max} | B ₂ |
| 10 | NUCF 10 R | 44 | 22 | 12 | 10 | M10 × 1.25 | 12 | 13.2 | 36.2 | 23 |
| | NUCF 10-1 R | 58 | 26 | 12 | 10 | M10 × 1.25 | 12 | 13.2 | 36.2 | 23 |
| 12 | NUCF 12 R | 86 | 30 | 14 | 12 | M12 × 1.5 | 13 | 15.2 | 40.2 | 25 |
| | NUCF 12-1 R | 97 | 32 | 14 | 12 | M12 × 1.5 | 13 | 15.2 | 40.2 | 25 |
| 16 | NUCF 16 R | 167 | 35 | 18 | 16 | M16 × 1.5 | 17 | 19.6 | 52.1 | 32.5 |
| 18 | NUCF 18 R | 244 | 40 | 20 | 18 | M18 × 1.5 | 19 | 21.6 | 58.1 | 36.5 |
| 20 | NUCF 20 R | 457 | 52 | 24 | 20 | M20 × 1.5 | 21 | 25.6 | 66.1 | 40.5 |
| | NUCF 20-1 R | 384 | 47 | 24 | 20 | M20 × 1.5 | 21 | 25.6 | 66.1 | 40.5 |
| 24 | NUCF 24 R | 789 | 62 | 29 | 24 | M24 × 1.5 | 25 | 30.6 | 80.1 | 49.5 |
| | NUCF 24-1 R | 1 020 | 72 | 29 | 24 | M24 × 1.5 | 25 | 30.6 | 80.1 | 49.5 |
| 30 | NUCF 30 R | 1 600 | 80 | 35 | 30 | M30 × 1.5 | 32 | 37 | 100 | 63 |
| | NUCF 30-2 R | 1 970 | 90 | 35 | 30 | M30 × 1.5 | 32 | 37 | 100 | 63 |

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.

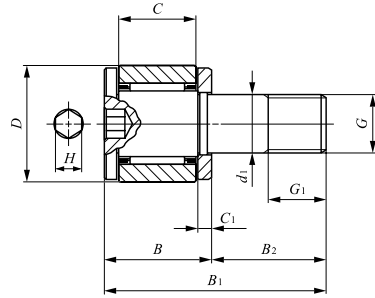
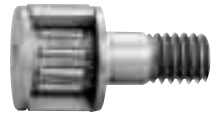


| B ₃ | C ₁ | g ₁ | g ₂ | Mounting dimension f Min. mm | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N | Maximum allowable static load N |
|----------------|----------------|----------------|----------------|---------------------------------------|----------------------------------|-------------------------------------|---|------------------------------------|
| | | | | | | | | |
| — | 0.6 | *4 | — | 12 | 13.8 | 10 400 | 11 500 | 5 300 |
| — | 0.6 | *4 | — | 12 | 13.8 | 10 400 | 11 500 | 9 210 |
| 6 | 0.6 | 6 | 3 | 17 | 21.9 | 14 000 | 13 400 | 5 650 |
| 6 | 0.6 | 6 | 3 | 17 | 21.9 | 14 000 | 13 400 | 9 040 |
| 8 | 0.8 | 6 | 3 | 20 | 58.5 | 23 400 | 27 300 | 11 800 |
| 8 | 0.8 | 6 | 3 | 22 | 86.2 | 25 200 | 30 900 | 20 300 |
| 9 | 0.8 | 8 | 4 | 31 | 119 | 43 100 | 58 100 | 30 000 |
| 9 | 0.8 | 8 | 4 | 27 | 119 | 38 900 | 49 000 | 27 200 |
| 11 | 0.8 | 8 | 4 | 38 | 215 | 58 200 | 75 300 | 35 200 |
| 11 | 0.8 | 8 | 4 | 44 | 215 | 63 900 | 88 800 | 57 000 |
| 15 | 1 | 8 | 4 | 45 | 438 | 90 300 | 121 000 | 98 300 |
| 15 | 1 | 8 | 4 | 45 | 438 | 90 300 | 121 000 | 98 300 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Miniature Type Cam Followers **With Cage/With Hexagon Hole**
Full Complement Type/With Hexagon Hole

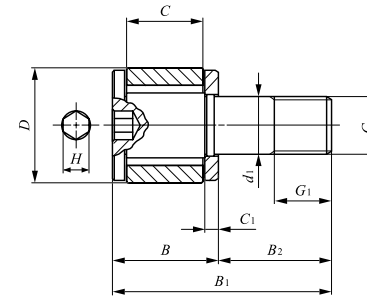


CFS

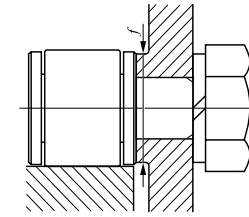
Stud dia. 2 – 6mm

| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|-----------------|-----------------------|-----------------|---------------------|------------------------|-----|----------------|-------------|----------------|-----|
| | With cage | Full complement | | D | C | d ₁ | G | G ₁ | B |
| 2 | CFS 2 | — | 0.6 | 4.5 | 2.5 | 2 | M2 × 0.4 | 2 | 4 |
| | — | CFS 2 V | 0.6 | 4.5 | 2.5 | 2 | M2 × 0.4 | 2 | 4 |
| 2.5 | CFS 2.5 | — | 1 | 5 | 3 | 2.5 | M2.5 × 0.45 | 2.5 | 4.5 |
| | — | CFS 2.5 V | 1 | 5 | 3 | 2.5 | M2.5 × 0.45 | 2.5 | 4.5 |
| 3 | CFS 3 | — | 2 | 6 | 4 | 3 | M3 × 0.5 | 3 | 5.5 |
| | — | CFS 3 V | 2 | 6 | 4 | 3 | M3 × 0.5 | 3 | 5.5 |
| 4 | CFS 4 | — | 4 | 8 | 5 | 4 | M4 × 0.7 | 4 | 7 |
| | — | CFS 4 V | 4 | 8 | 5 | 4 | M4 × 0.7 | 4 | 7 |
| 5 | CFS 5 | — | 7 | 10 | 6 | 5 | M5 × 0.8 | 5 | 8 |
| | — | CFS 5 V | 7 | 10 | 6 | 5 | M5 × 0.8 | 5 | 8 |
| 6 | CFS 6 | — | 13 | 12 | 7 | 6 | M6 × 1 | 6 | 9.5 |
| | — | CFS 6 V | 13 | 12 | 7 | 6 | M6 × 1 | 6 | 9.5 |

Remarks1. No oil hole is provided.
 2. Provided with prepacked grease.



CFS...V

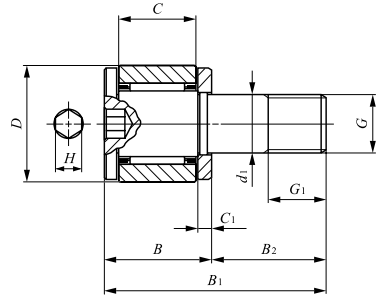
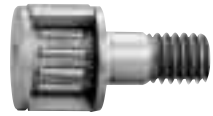


| B ₁ | B ₂ | C ₁ | H | Mounting dimension f Min. mm | Maximum tightening torque N-m | Basic dynamic load rating | Basic static load rating | Maximum allowable static load |
|----------------|----------------|----------------|-----|---------------------------------------|--|------------------------------|-----------------------------|-------------------------------------|
| | | | | | | C | C ₀ | |
| | | | | | | N | N | N |
| 8 | 4 | 0.7 | 0.9 | 4.3 | 9.1 | 288 | 202 | 202 |
| 8 | 4 | 0.7 | 0.9 | 4.3 | 9.1 | 768 | 734 | 229 |
| 9.5 | 5 | 0.7 | 0.9 | 4.8 | 18.7 | 428 | 351 | 351 |
| 9.5 | 5 | 0.7 | 0.9 | 4.8 | 18.7 | 1 000 | 1 080 | 360 |
| 11.5 | 6 | 0.7 | 1.3 | 5.8 | 33.5 | 629 | 611 | 484 |
| 11.5 | 6 | 0.7 | 1.3 | 5.8 | 33.5 | 1 420 | 1 790 | 484 |
| 15 | 8 | 1.0 | 1.5 | 7.7 | 77.7 | 1 120 | 1 120 | 919 |
| 15 | 8 | 1.0 | 1.5 | 7.7 | 77.7 | 2 370 | 3 000 | 919 |
| 18 | 10 | 1.0 | 2 | 9.6 | 158 | 1 570 | 1 850 | 1 570 |
| 18 | 10 | 1.0 | 2 | 9.6 | 158 | 3 180 | 4 700 | 1 570 |
| 21.5 | 12 | 1.2 | 2.5 | 11.6 | 268 | 2 090 | 2 200 | 2 150 |
| 21.5 | 12 | 1.2 | 2.5 | 11.6 | 268 | 4 610 | 6 250 | 2 150 |

I
 CF
 NUCF
 CFS
 CR

CAM FOLLOWERS

Miniature Type Cam Followers Stainless Steel Made **With Cage/With Hexagon Hole**
Full Complement Type/With Hexagon Hole

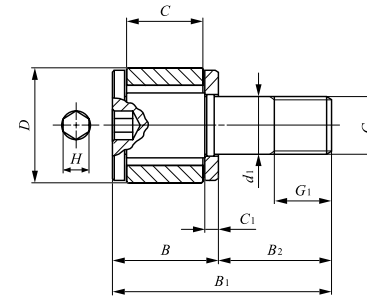


CFS...F

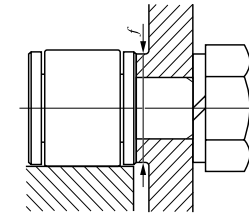
Stud dia. 2 – 6mm

| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|-----------------|-----------------------|-----------------|---------------------|------------------------|-----|----------------|-------------|----------------|-----|
| | With cage | Full complement | | D | C | d ₁ | G | G ₁ | B |
| 2 | CFS 2 F | — | 0.6 | 4.5 | 2.5 | 2 | M2 × 0.4 | 2 | 4 |
| | — | CFS 2 FV | 0.6 | 4.5 | 2.5 | 2 | M2 × 0.4 | 2 | 4 |
| 2.5 | CFS 2.5 F | — | 1 | 5 | 3 | 2.5 | M2.5 × 0.45 | 2.5 | 4.5 |
| | — | CFS 2.5 FV | 1 | 5 | 3 | 2.5 | M2.5 × 0.45 | 2.5 | 4.5 |
| 3 | CFS 3 F | — | 2 | 6 | 4 | 3 | M3 × 0.5 | 3 | 5.5 |
| | — | CFS 3 FV | 2 | 6 | 4 | 3 | M3 × 0.5 | 3 | 5.5 |
| 4 | CFS 4 F | — | 4 | 8 | 5 | 4 | M4 × 0.7 | 4 | 7 |
| | — | CFS 4 FV | 4 | 8 | 5 | 4 | M4 × 0.7 | 4 | 7 |
| 5 | CFS 5 F | — | 7 | 10 | 6 | 5 | M5 × 0.8 | 5 | 8 |
| | — | CFS 5 FV | 7 | 10 | 6 | 5 | M5 × 0.8 | 5 | 8 |
| 6 | CFS 6 F | — | 13 | 12 | 7 | 6 | M6 × 1 | 6 | 9.5 |
| | — | CFS 6 FV | 13 | 12 | 7 | 6 | M6 × 1 | 6 | 9.5 |

Remarks1. No oil hole is provided.
 2. Provided with prepacked grease.



CFS...FV

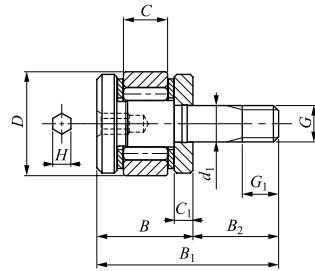


| B ₁ | B ₂ | C ₁ | H | Mounting dimension f Min. mm | Maximum tightening torque N-cm | Basic dynamic | Basic static | Maximum allowable static load N |
|----------------|----------------|----------------|-----|---------------------------------------|---|-----------------------|------------------------------------|--|
| | | | | | | load rating C N | load rating C ₀ N | |
| 8 | 4 | 0.7 | 0.9 | 4.3 | 9.1 | 230 | 161 | 161 |
| 8 | 4 | 0.7 | 0.9 | 4.3 | 9.1 | 614 | 587 | 229 |
| 9.5 | 5 | 0.7 | 0.9 | 4.8 | 18.7 | 342 | 281 | 281 |
| 9.5 | 5 | 0.7 | 0.9 | 4.8 | 18.7 | 800 | 862 | 360 |
| 11.5 | 6 | 0.7 | 1.3 | 5.8 | 33.5 | 504 | 488 | 484 |
| 11.5 | 6 | 0.7 | 1.3 | 5.8 | 33.5 | 1 140 | 1 430 | 484 |
| 15 | 8 | 1.0 | 1.5 | 7.7 | 77.7 | 897 | 894 | 894 |
| 15 | 8 | 1.0 | 1.5 | 7.7 | 77.7 | 1 900 | 2 400 | 919 |
| 18 | 10 | 1.0 | 2 | 9.6 | 158 | 1 250 | 1 480 | 1 480 |
| 18 | 10 | 1.0 | 2 | 9.6 | 158 | 2 540 | 3 760 | 1 570 |
| 21.5 | 12 | 1.2 | 2.5 | 11.6 | 268 | 1 670 | 1 760 | 1 760 |
| 21.5 | 12 | 1.2 | 2.5 | 11.6 | 268 | 3 690 | 5 000 | 2 150 |

I
 CF
 NUCF
 CFS
 CR

CAM FOLLOWERS

Thrust Disk Type Miniature Cam Followers **With Hexagon Hole**

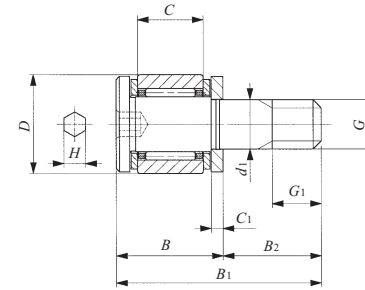


CFS1.4 WV

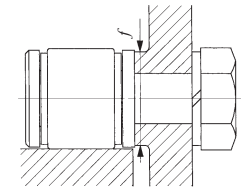
Stud dia. 1.4 – 6 mm

| Stud dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|-----------------|-----------------------|-------------------|---------------------|------------------------|-----|----------------|-------------|----------------|------|
| | With cage | Full complement | | D | C | d ₁ | G | G ₁ | B |
| 1.4 | — | CFS 1.4 WV | 0.35 | 4 | 1.7 | 1.4 | M1.4 × 0.3 | 1.4 | 3.7 |
| 2 | CFS 2 W | — | 0.6 | 4.5 | 2.5 | 2 | M2 × 0.4 | 2 | 4.5 |
| | CFS 2 FW | — | | | | | | | |
| 2.5 | CFS 2.5 W | — | 1 | 5 | 3 | 2.5 | M2.5 × 0.45 | 2.5 | 5 |
| | CFS 2.5 FW | — | | | | | | | |
| 3 | CFS 3 W | — | 2 | 6 | 4 | 3 | M3 × 0.5 | 3 | 6.5 |
| | CFS 3 FW | — | | | | | | | |
| 4 | CFS 4 W | — | 4 | 8 | 5 | 4 | M4 × 0.7 | 4 | 8 |
| | CFS 4 FW | — | | | | | | | |
| 5 | CFS 5 W | — | 7 | 10 | 6 | 5 | M5 × 0.8 | 5 | 9 |
| | CFS 5 FW | — | | | | | | | |
| 6 | CFS 6 W | — | 13 | 12 | 7 | 6 | M6 × 1 | 6 | 10.5 |
| | CFS 6 FW | — | | | | | | | |

Remarks1. No oil hole is provided.
2. Provided with prepacked grease.



CFS... W
CFS... FW

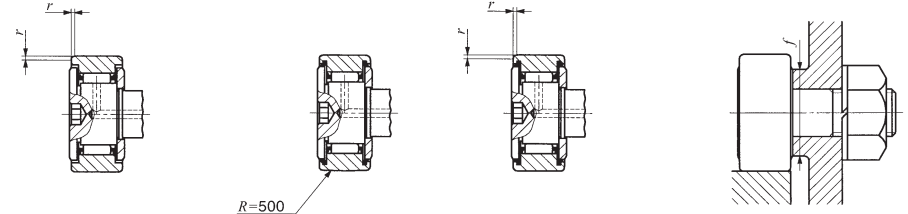
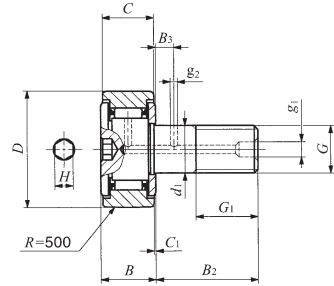


| B ₁ | B ₂ | C ₁ | H | Mounting dimension f Min. mm | Maximum tightening torque N-cm | Basic dynamic load rating C | Basic static load rating C ₀ | Maximum allowable static load |
|----------------|----------------|----------------|-----|---------------------------------------|---|-----------------------------------|---|-------------------------------------|
| | | | | | | N | N | N |
| 7 | 3.3 | 0.7 | 0.9 | 3.8 | 3.0 | 481 | 385 | 105 |
| 8.5 | 4 | 0.7 | 0.9 | 4.3 | 9.1 | 288 | 202 | 194 |
| | | | | | | 230 | 161 | 161 |
| 10 | 5 | 0.7 | 0.9 | 4.8 | 18.7 | 428 | 351 | 313 |
| | | | | | | 342 | 281 | 281 |
| 12.5 | 6 | 0.7 | 1.3 | 5.8 | 33.5 | 629 | 611 | 399 |
| | | | | | | 504 | 488 | 399 |
| 16 | 8 | 1 | 1.5 | 7.7 | 77.7 | 1120 | 1120 | 785 |
| | | | | | | 897 | 894 | 785 |
| 19 | 10 | 1 | 2 | 9.6 | 158 | 1570 | 1850 | 1370 |
| | | | | | | 1250 | 1480 | 1370 |
| 22.5 | 12 | 1.2 | 2.5 | 11.6 | 268 | 2090 | 2200 | 1920 |
| | | | | | | 1670 | 1760 | 1760 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Cam Followers **With Cage/With Hexagon Hole**



Stud dia. 4.826 – 22.225 mm

CR...BR

| Stud dia. mm (inch) | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | |
|---------------------------|----------------------------|--------------------------------|----------------------------|--------------------------------|---------------------|-------------------------------|------------------|-----------------|-----------|----------------|
| | Shield type | | Sealed type | | | D | C | d ₁ | G UNF | G ₁ |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | | |
| 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) |

Remarks1. Models with a stud diameter d₁ 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.

CR...B

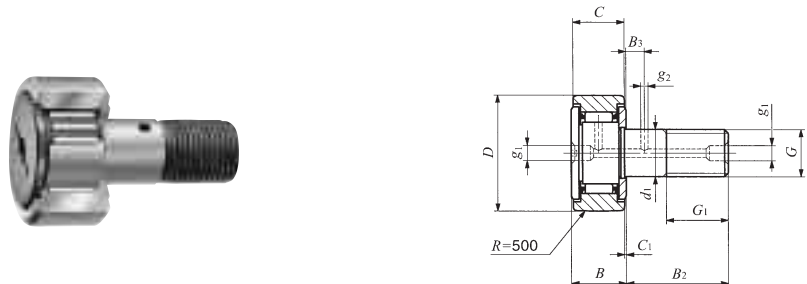
CR...BUUR

CR...BUU

| Boundary dimensions mm (inch) | | | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N·m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|-------------------------------|------------------|-----------------|----------------|----------------|----------------|-----------------|----------------|---|--|--|--|
| B max | B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | H | r | | | | |
| 10.2 (0.40) | 12.700 (1/2) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/16) | 8.334 (21/64) | 1.4 | 2 520 | 2 140 |
| 10.9 (0.43) | 15.875 (5/8) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/16) | 8.334 (21/64) | 1.4 | 2 520 | 2 140 |
| 11.8 (0.46) | 15.875 (5/8) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/16) | 11.509 (29/64) | 3.4 | 3 650 | 3 670 |
| 12.5 (0.49) | 19.050 (3/4) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/16) | 11.509 (29/64) | 3.4 | 3 650 | 3 670 |
| 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 |
| 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 |
| 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 (3/16) | 17.859 (45/64) | 17.4 | 8 810 | 10 800 |
| 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 |
| 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 |
| 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 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (5/16) | 1.588 (1/16) | 26.196 (1 1/16) | 55.7 | 18 600 | 24 300 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (5/16) | 1.588 (1/16) | 26.196 (1 1/16) | 55.7 | 18 600 | 24 300 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (5/16) | 1.588 (1/16) | 32.543 (1 1/32) | 100 | 25 100 | 38 200 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (5/16) | 1.588 (1/16) | 32.543 (1 1/32) | 100 | 25 100 | 38 200 |
| 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 |
| 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 |

CAM FOLLOWERS

Inch Series Cam Followers **With Cage/With Screwdriver Slot**

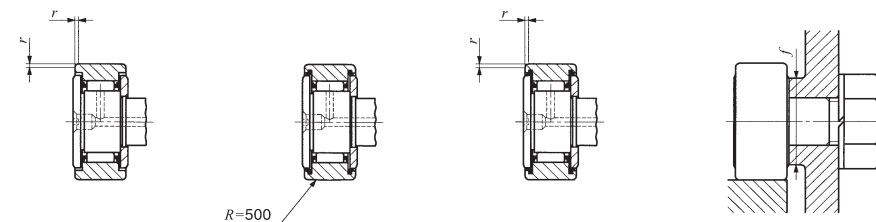


Stud dia. 4.826 – 22.225 mm

CR...R

| Stud dia. mm (inch) | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | |
|---------------------------|----------------------------|--------------------------------|----------------------------|--------------------------------|---------------------|-------------------------------|------------------|-----------------|-----------|----------------|
| | Shield type | | Sealed type | | | D | C | d ₁ | G UNF | G ₁ |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | | |
| 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) |

Remarks1. Models with a stud diameter d₁ 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.



CR

CR...UUR

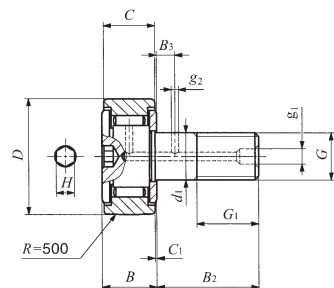
CR...UU

| Boundary dimensions mm (inch) | | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|-------------------------------|------------------|-----------------|----------------|----------------|----------------|----------------|---|--|--|--|
| B max | B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | 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 |
| 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 |
| 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 |
| 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 |
| 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 (1/2) | 10.8 | 4 420 | 5 110 |
| 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 (23/32) | 10.8 | 4 790 | 5 810 |
| 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 (5/8) | 17.4 | 8 810 | 10 800 |
| 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 |
| 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 (5/8) | 27.7 | 14 200 | 16 000 |
| 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 (5/8) | 27.7 | 14 200 | 16 000 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 26.196 (1 1/16) | 55.7 | 18 600 | 24 300 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 26.196 (1 1/16) | 55.7 | 18 600 | 24 300 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 32.543 (1 1/2) | 100 | 25 100 | 38 200 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/32) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 32.543 (1 1/2) | 100 | 25 100 | 38 200 |
| 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 1/2) | 162 | 32 500 | 63 900 |
| 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 1/2) | 162 | 32 500 | 63 900 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Cam Followers **Full Complement Type/With Hexagon Hole**

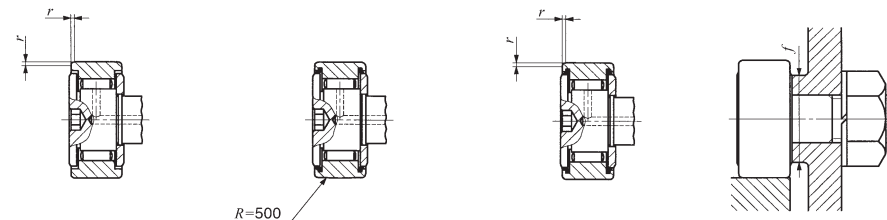


Stud dia. 4.826 – 22.225 mm

CR...VBR

| Stud dia. mm (inch) | Identification number | | | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | |
|---------------------------|----------------------------|--------------------------------|----------------------------|--------------------------------|---------------------|-------------------------------|----------------|----------------|-----------|----------------|
| | Shield type | | Sealed type | | | D | C | d ₁ | G UNF | G ₁ |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | | |
| 4.826 | CR 8 VBR | CR 8 VB | CR 8 VBUUR | CR 8 VBUU | 9 | 12.700 (1/2) | 8.731 (1/2) | 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 (3/2) | 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) |

Remarks1. Models with a stud diameter d₁ 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.



CR...VB

CR...VBUUR

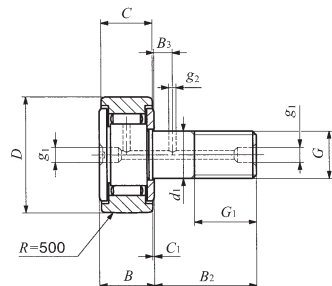
CR...VBUU

| Stud dia. mm (inch) | Boundary dimensions mm (inch) | | | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|---------------------------|-------------------------------|----------------|----------------|----------------|----------------|----------------|---------------|--------------|---|--|--|--|
| | B max | B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | H | r | | | | |
| 10.2 (0.40) | 12.700 (1/2) | — (—) | — (—) | 0.794 (1/2) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/4) | 8.334 (21/64) | 1.4 | 4 260 | 4 750 |
| 10.9 (0.43) | 15.875 (5/8) | — (—) | — (—) | 0.794 (1/2) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/4) | 8.334 (21/64) | 1.4 | 4 710 | 5 410 |
| 11.8 (0.46) | 15.875 (5/8) | — (—) | — (—) | 0.794 (1/2) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/4) | 11.509 (29/64) | 3.4 | 5 830 | 7 660 |
| 12.5 (0.49) | 19.050 (3/4) | — (—) | — (—) | 0.794 (1/2) | — (—) | — (—) | 3.175 (1/8) | 0.397 (1/4) | 11.509 (29/64) | 3.4 | 6 340 | 8 530 |
| 14.2 (0.56) | 22.225 (7/8) | 6.350 (1/4) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 2.381 (3/32) | 4.762 (3/16) | 0.794 (1/2) | 13.494 (17/32) | 10.8 | 8 710 | 12 300 |
| 14.2 (0.56) | 22.225 (7/8) | 6.350 (1/4) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 2.381 (3/32) | 4.762 (3/16) | 0.794 (1/2) | 15.081 (19/32) | 10.8 | 8 710 | 12 300 |
| 17.3 (0.68) | 25.400 (1) | 6.350 (1/4) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.175 (1/8) | 6.350 (1/4) | 1.191 (3/16) | 17.859 (45/64) | 17.4 | 13 100 | 22 700 |
| 17.3 (0.68) | 25.400 (1) | 6.350 (1/4) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.175 (1/8) | 6.350 (1/4) | 1.588 (1/4) | 19.050 (3/4) | 17.4 | 13 100 | 22 700 |
| 20.4 (0.80) | 31.750 (1 1/4) | 7.938 (5/16) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.175 (1/8) | 6.350 (1/4) | 1.588 (1/4) | 21.828 (55/64) | 27.7 | 23 600 | 31 700 |
| 20.4 (0.80) | 31.750 (1 1/4) | 7.938 (5/16) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.175 (1/8) | 6.350 (1/4) | 1.588 (1/4) | 21.828 (55/64) | 27.7 | 23 600 | 31 700 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (3/16) | 1.588 (1/4) | 26.196 (1 1/16) | 55.7 | 28 200 | 40 100 |
| 23.6 (0.93) | 38.100 (1 1/2) | 9.525 (3/8) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (3/16) | 1.588 (1/4) | 26.196 (1 1/16) | 55.7 | 28 200 | 40 100 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (3/16) | 1.588 (1/4) | 32.543 (1 1/2) | 100 | 35 300 | 55 600 |
| 26.8 (1.06) | 44.450 (1 3/4) | 11.112 (7/16) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 3.969 (3/32) | 7.938 (3/16) | 1.588 (1/4) | 32.543 (1 1/2) | 100 | 35 300 | 55 600 |
| 33.5 (1.32) | 50.800 (2) | 12.700 (1/2) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 4.762 (3/16) | 11.112 (7/16) | 1.588 (1/4) | 37.306 (1 15/32) | 162 | 45 700 | 80 600 |
| 33.5 (1.32) | 50.800 (2) | 12.700 (1/2) | — (—) | 0.794 (1/2) | 4.762 (3/16) | 4.762 (3/16) | 11.112 (7/16) | 1.588 (1/4) | 37.306 (1 15/32) | 162 | 45 700 | 80 600 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Cam Followers **Full Complement Type/With Screwdriver Slot**

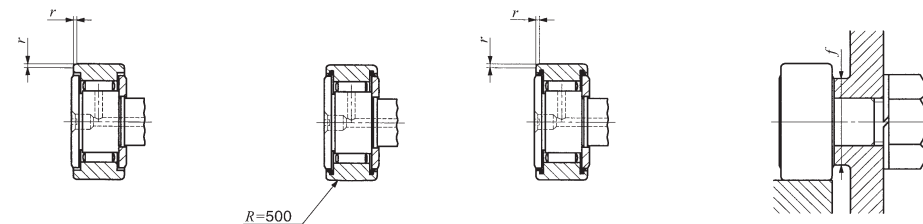


Stud dia. 4.826 – 31.750mm

CR...VR

| Stud dia. mm (inch) | Identification number | | | | Mass (Ref.) g | D | C | d ₁ | G UNF | G ₁ |
|---------------------------|----------------------------|--------------------------------|----------------------------|--------------------------------|---------------------|----------------|----------------|----------------|------------|----------------|
| | Shield type | | Sealed type | | | | | | | |
| | With crowned outer ring | With cylindrical outer ring | With crowned outer ring | With cylindrical outer ring | | | | | | |
| 4.826 | CR 8 VR | CR 8 V | CR 8 VUUR | CR 8 VUU | 9 | 12.700 (1/2) | 8.731 (1/20) | 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 (3/20) | 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 | 1960 | 76.200 (3) | 44.450 (1 3/4) | 31.750 (1 1/4) | 1 1/4 - 12 | 31.750 (1 1/4) |

Remarks1. Models with a stud diameter d₁ 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.



CR...V

CR...VUUR

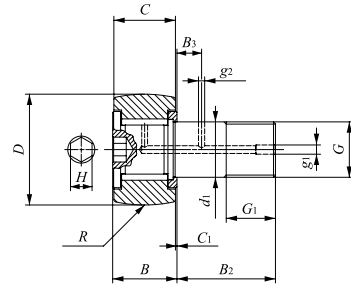
CR...VUU

| Boundary dimensions mm(inch) | | | | | | | Mounting dimension f Min. mm(inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------------------|----------------|----------------|----------------|----------------|----------------|--------------|---|--|--|--|
| B max | B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | r | | | | |
| 10.2(0.40) | 12.700 (1/2) | — (—) | 0.794 (1/20) | *3.175 (1/8) | — (—) | 0.397 (1/64) | 8.334 (21/64) | 1.4 | 4 260 | 4 750 |
| 10.9(0.43) | 15.875 (5/8) | — (—) | 0.794 (1/20) | *3.175 (1/8) | — (—) | 0.397 (1/64) | 8.334 (21/64) | 1.4 | 4 710 | 5 410 |
| 11.8(0.46) | 15.875 (5/8) | — (—) | 0.794 (1/20) | *3.175 (1/8) | — (—) | 0.397 (1/64) | 11.509 (29/64) | 3.4 | 5 830 | 7 660 |
| 12.5(0.49) | 19.050 (3/4) | — (—) | 0.794 (1/20) | *3.175 (1/8) | — (—) | 0.397 (1/64) | 11.509 (29/64) | 3.4 | 6 340 | 8 530 |
| 14.2(0.56) | 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/20) | 4.762 (3/16) | 2.381 (3/32) | 0.794 (1/20) | 13.494 (17/20) | 10.8 | 8 710 | 12 300 |
| 14.2(0.56) | 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/20) | 4.762 (3/16) | 2.381 (3/32) | 0.794 (1/20) | 15.081 (19/20) | 10.8 | 8 710 | 12 300 |
| 17.3(0.68) | 25.400 (1) | 6.350 (1/4) | 0.794 (1/20) | 4.762 (3/16) | 3.175 (1/8) | 1.191 (3/64) | 17.859 (45/64) | 17.4 | 13 100 | 22 700 |
| 17.3(0.68) | 25.400 (1) | 6.350 (1/4) | 0.794 (1/20) | 4.762 (3/16) | 3.175 (1/8) | 1.588 (1/16) | 19.050 (3/4) | 17.4 | 13 100 | 22 700 |
| 20.4(0.80) | 31.750 (1 1/4) | 7.938 (5/16) | 0.794 (1/20) | 4.762 (3/16) | 3.175 (1/8) | 1.588 (1/16) | 21.828 (55/64) | 27.7 | 23 600 | 31 700 |
| 20.4(0.80) | 31.750 (1 1/4) | 7.938 (5/16) | 0.794 (1/20) | 4.762 (3/16) | 3.175 (1/8) | 1.588 (1/16) | 21.828 (55/64) | 27.7 | 23 600 | 31 700 |
| 23.6(0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/20) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 26.196 (1 1/64) | 55.7 | 28 200 | 40 100 |
| 23.6(0.93) | 38.100 (1 1/2) | 9.525 (3/8) | 0.794 (1/20) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 26.196 (1 1/64) | 55.7 | 28 200 | 40 100 |
| 26.8(1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/20) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 32.543 (1 1/20) | 100 | 35 300 | 55 600 |
| 26.8(1.06) | 44.450 (1 3/4) | 11.112 (7/16) | 0.794 (1/20) | 4.762 (3/16) | 3.969 (3/32) | 1.588 (1/16) | 32.543 (1 1/20) | 100 | 35 300 | 55 600 |
| 33.5(1.32) | 50.800 (2) | 12.700 (1/2) | 0.794 (1/20) | 4.762 (3/16) | 4.762 (3/16) | 1.588 (1/16) | 37.306 (1 15/64) | 162 | 45 700 | 80 600 |
| 33.5(1.32) | 50.800 (2) | 12.700 (1/2) | 0.794 (1/20) | 4.762 (3/16) | 4.762 (3/16) | 1.588 (1/16) | 37.306 (1 15/64) | 162 | 45 700 | 80 600 |
| 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 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers **Full Complement Type/With Hexagon Hole**



Stud dia. 6.350 — 50.800mm

CRH...VBR

| Stud dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | | |
|---------------------------|-----------------------|----------------|---------------------|-------------------------------|----------------|----------------|------------|----------------|-------------|
| | Shield type | Sealed type | | D | C | d ₁ | G UNF | G ₁ | B max |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| 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) |

Remarks 1. 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.



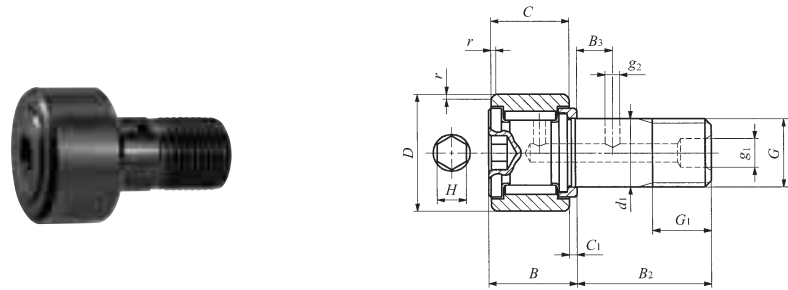
CRH...VBUUR

| Boundary dimensions mm (inch) | | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|-------------------------------|----------------|----------------|----------------|----------------|---------------|----------|--|--|--|--|
| B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | H | R | | | | |
| 15.875 (5/8) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 180 (7) | 8.334 (21/64) | 3.4 | 4 710 | 5 410 |
| 15.875 (5/8) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 180 (7) | 8.334 (21/64) | 3.4 | 4 710 | 5 410 |
| 19.050 (3/4) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 200 (8) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 19.050 (3/4) | — (—) | 0.794 (1/32) | — (—) | — (—) | 3.175 (1/8) | 200 (8) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 15/64) | 258 | 35 300 | 55 600 |
| 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 15/64) | 258 | 35 300 | 55 600 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 25/64) | 1 450 | 111 000 | 239 000 |
| 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 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers Full Complement Type/With Hexagon Hole

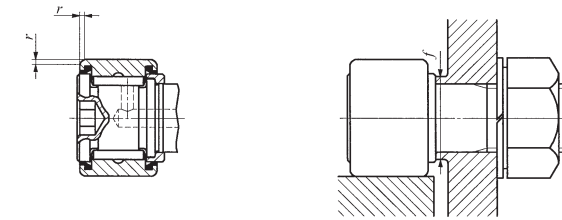


Stud dia. 6.350 – 50.800mm

CRH...VB

| Stud dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | | |
|---------------------------|-----------------------|---------------|---------------------|-------------------------------|----------------|----------------|-------------|----------------|------------------|
| | Shield type | Sealed type | | 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 1/8) | 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) |

Remarks1. Models with a stud diameter d₁ 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.



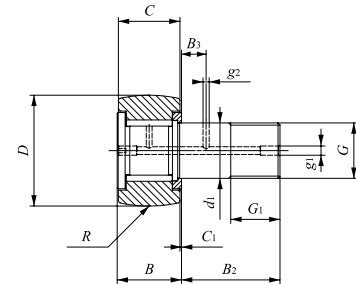
CRH...VBUU

| Boundary dimensions mm (inch) | | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N·m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|-------------------------------|----------------|----------------|----------------|----------------|---------------|--------------|--|--|--|--|
| B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | H | r | | | | |
| 15.875 (5/8) | — (-) | 0.794 (1/2) | — (-) | — (-) | 3.175 (1/8) | 0.397 (1/4) | 8.334 (21/64) | 3.4 | 4 710 | 5 410 |
| 15.875 (5/8) | — (-) | 0.794 (1/2) | — (-) | — (-) | 3.175 (1/8) | 0.397 (1/4) | 8.334 (21/64) | 3.4 | 4 710 | 5 410 |
| 19.050 (3/4) | — (-) | 0.794 (1/2) | — (-) | — (-) | 3.175 (1/8) | 0.397 (1/4) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 19.050 (3/4) | — (-) | 0.794 (1/2) | — (-) | — (-) | 3.175 (1/8) | 0.397 (1/4) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/2) | 4.762 (3/16) | 2.381 (3/32) | 4.762 (3/16) | 0.794 (1/2) | 13.494 (11/16) | 17.6 | 8 710 | 12 300 |
| 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/2) | 4.762 (3/16) | 2.381 (3/32) | 4.762 (3/16) | 0.794 (1/2) | 13.494 (11/16) | 17.6 | 8 710 | 12 300 |
| 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 (1/4) | 18.256 (3/2) | 57.8 | 13 100 | 22 700 |
| 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 (3/2) | 57.8 | 13 100 | 22 700 |
| 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 (9/16) | 103 | 23 600 | 31 700 |
| 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 (9/16) | 103 | 23 600 | 31 700 |
| 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 |
| 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 |
| 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 15/16) | 258 | 35 300 | 55 600 |
| 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 15/16) | 258 | 35 300 | 55 600 |
| 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 15/16) | 356 | 45 700 | 80 600 |
| 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 15/16) | 356 | 45 700 | 80 600 |
| 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 |
| 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 |
| 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 3/4) | 892 | 77 600 | 172 000 |
| 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 3/4) | 892 | 77 600 | 172 000 |
| 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 3/4) | 1 450 | 111 000 | 239 000 |
| 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 5/8) | 2 190 | 142 000 | 317 000 |

CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers **Full Complement Type/With Screwdriver Slot**



Stud dia. 6.350 – 50.800mm

CRH...VR

CRH...VUUR

| Stud dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | | |
|---------------------------|-----------------------|---------------|---------------------|------------------------------|----------------|----------------|---------------|----------------|------------|
| | Shield type | Sealed type | | D | C | d ₁ | G UNF | G ₁ | B max |
| 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) |
| | CRH 9 VR | CRH 9 VUUR | 15 | 14.288 (5/8) | 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 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | CRH 52 VR | CRH 52 VUUR | 2 380 | 82.550 (3 1/8) | 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 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) |
| 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) |

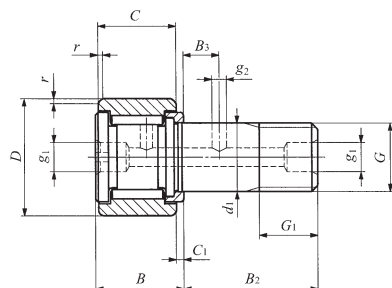
Remarks 1. Models with a stud diameter d_1 of 7.938 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.

| Boundary dimensions mm(inch) | | | | | | Mounting dimension f Min. mm(inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------------------|----------------|----------------|----------------|----------------|---------|---|----------------------------------|-------------------------------------|---|
| B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | R | | | | |
| 15.875 (5/8) | — (-) | 0.794 (1/8) | *3.175 (1/8) | — (-) | 180 (7) | 8.334 (21/16) | 3.4 | 4 710 | 5 410 |
| 15.875 (5/8) | — (-) | 0.794 (1/8) | *3.175 (1/8) | — (-) | 180 (7) | 8.334 (21/16) | 3.4 | 4 710 | 5 410 |
| 19.050 (3/4) | — (-) | 0.794 (1/8) | *3.175 (1/8) | — (-) | 200 (8) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 19.050 (3/4) | — (-) | 0.794 (1/8) | *3.175 (1/8) | — (-) | 200 (8) | 11.112 (7/16) | 6.8 | 6 340 | 8 530 |
| 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/8) | 4.762 (3/16) | 2.381 (3/32) | 250(10) | 13.494 (11/16) | 17.6 | 8 710 | 12 300 |
| 22.225 (7/8) | 6.350 (1/4) | 0.794 (1/8) | 4.762 (3/16) | 2.381 (3/32) | 250(10) | 13.494 (11/16) | 17.6 | 8 710 | 12 300 |
| 25.400 (1) | 6.350 (1/4) | 1.588 (1/16) | 4.762 (3/16) | 2.381 (3/32) | 300(12) | 18.256 (29/16) | 57.8 | 13 100 | 22 700 |
| 25.400 (1) | 6.350 (1/4) | 1.588 (1/16) | 4.762 (3/16) | 2.381 (3/32) | 300(12) | 18.256 (29/16) | 57.8 | 13 100 | 22 700 |
| 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 (39/16) | 103 | 23 600 | 31 700 |
| 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 (39/16) | 103 | 23 600 | 31 700 |
| 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 |
| 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 |
| 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 1/8) | 258 | 35 300 | 55 600 |
| 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 1/8) | 258 | 35 300 | 55 600 |
| 50.800 (2) | 12.700 (1/2) | 1.588 (1/16) | 4.762 (3/16) | 3.175 (1/8) | 600(24) | 37.306 (1 1/2) | 356 | 45 700 | 80 600 |
| 50.800 (2) | 12.700 (1/2) | 1.588 (1/16) | 4.762 (3/16) | 3.175 (1/8) | 600(24) | 37.306 (1 1/2) | 356 | 45 700 | 80 600 |
| 57.150 (2 1/4) | 14.288 (5/8) | 1.588 (1/16) | 4.762 (3/16) | 3.175 (1/8) | 760(30) | 40.878 (1 3/8) | 500 | 61 400 | 116 000 |
| 57.150 (2 1/4) | 14.288 (5/8) | 1.588 (1/16) | 4.762 (3/16) | 3.175 (1/8) | 760(30) | 40.878 (1 3/8) | 500 | 61 400 | 116 000 |
| 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 1/8) | 892 | 77 600 | 172 000 |
| 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 1/8) | 892 | 77 600 | 172 000 |
| 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 3/8) | 1 450 | 111 000 | 239 000 |
| 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 5/8) | 2 190 | 142 000 | 317 000 |

I
CF
NUCF
CFS
CR

CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers Full Complement Type/With Screwdriver Slot

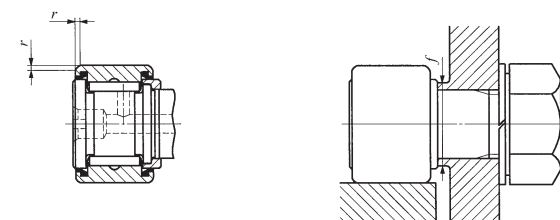


Stud dia. 6.350 – 50.800mm

CRH...V

| Stud dia. mm (inch) | Identification number | | Mass (Ref.) g | Boundary dimensions mm (inch) | | | | | |
|---------------------|-----------------------|--------------|---------------|-------------------------------|----------------|----------------|---------------|----------------|-------------|
| | Shield type | Sealed type | | 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 1/8) | 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) |

Remarks 1. 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.



CRH...VUU

| Boundary dimensions mm (inch) | | | | | | Mounting dimension f Min. mm (inch) | Maximum tightening torque N-m | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|-------------------------------|----------------|----------------|----------------|----------------|--------------|-------------------------------------|-------------------------------|-------------------------------|---|
| B ₂ | B ₃ | C ₁ | g ₁ | g ₂ | r | | | | |
| 15.875 (5/8) | — (-) | 0.794 (1/32) | *3.175 (1/8) | — (-) | 0.397 (1/64) | 8.334 (1/32) | 3.4 | 4 710 | 5 410 |
| 15.875 (5/8) | — (-) | 0.794 (1/32) | *3.175 (1/8) | — (-) | 0.397 (1/64) | 8.334 (1/32) | 3.4 | 4 710 | 5 410 |
| 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 |
| 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 |
| 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 (1/2) | 17.6 | 8 710 | 12 300 |
| 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 (1/2) | 17.6 | 8 710 | 12 300 |
| 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 (3/32) | 57.8 | 13 100 | 22 700 |
| 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 (3/32) | 57.8 | 13 100 | 22 700 |
| 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 (9/16) | 103 | 23 600 | 31 700 |
| 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 (9/16) | 103 | 23 600 | 31 700 |
| 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 |
| 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 |
| 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 1/8) | 258 | 35 300 | 55 600 |
| 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 1/8) | 258 | 35 300 | 55 600 |
| 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 1/2) | 356 | 45 700 | 80 600 |
| 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 1/2) | 356 | 45 700 | 80 600 |
| 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 3/8) | 500 | 61 400 | 116 000 |
| 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 3/8) | 500 | 61 400 | 116 000 |
| 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 3/16) | 892 | 77 600 | 172 000 |
| 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 3/16) | 892 | 77 600 | 172 000 |
| 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 3/8) | 1 450 | 111 000 | 239 000 |
| 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 5/16) | 2 190 | 142 000 | 317 000 |

CF
NUCF
CFS
CR

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.

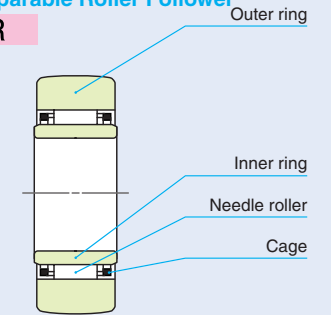
Roller Followers include separable and non-separable types. Also, in addition to the open type, shield type and sealed type are available. The clearances between the side plates and outer ring of the shield type are narrow, and form labyrinths. In the sealed type, special synthetic rubber seals are assembled 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

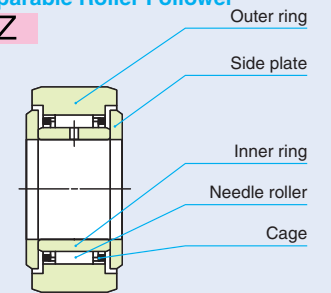
Structure of Separable Roller Follower

NAST...R



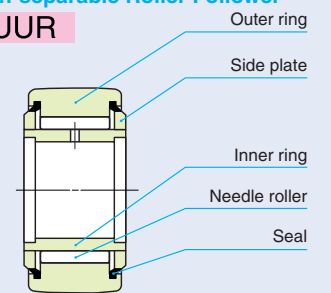
Structure of Separable Roller Follower

NAST...ZZ



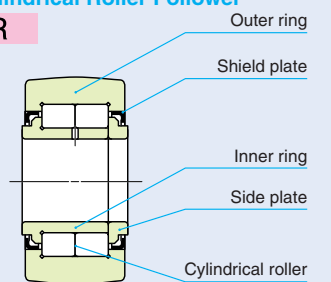
Structure of Non-separable Roller Follower

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 RNAS ^t , NAST | Without inner ring | Open type | RNAS ^t ... R | RNAS ^t | — | — |
| | | With inner ring | Open type | NAS ^t ... R | NAS ^t | — | — |
| | | | Shield type | NAS ^t ...ZZ R | NAS ^t ...ZZ | — | — |
| | | 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.

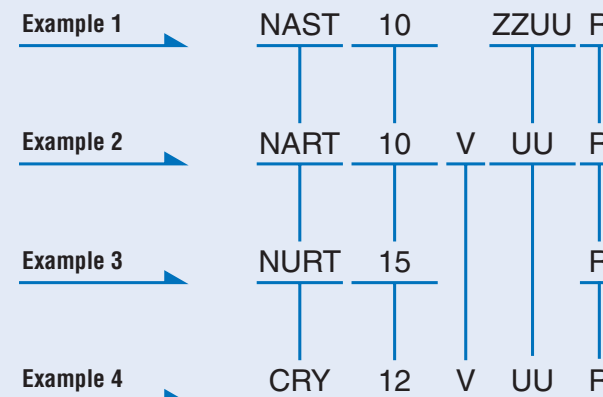
Cylindrical Roller Followers

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



| Model code | | |
|---|-----------------------------|--|
| Metric series | RNAS ^t | Separable Roller Follower Without inner ring |
| | NAS ^t | Separable Roller Follower 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 bore diameter 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 | |

I
NAST
NART
NURT

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 info@iko.com.

Table 2 Tolerances

unit: μm

| Dimensions and symbols | Series | Metric series | | Inch series | |
|--------------------------------|-------------------------------|--------------------|------------------------|--------------------|------------------------|
| | | Crowned outer ring | Cylindrical outer ring | Crowned outer ring | Cylindrical outer ring |
| Bore dia. of inner ring d | $d \leq 19.05$ | 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⁾ | | | | Radial internal clearance | |
|--------------------------------------|--------------------------------|------------------------------|--------------------------------|---------------------------|------|
| Metric series | | | Inch series | Min. | Max. |
| Separable Roller Followers | Non-separable Roller Followers | Cylindrical Roller Followers | Non-separable Roller Followers | | |
| 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 |
| | with inner ring |
| Non-separable Roller Followers | g6, h6 |
| 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/mm ² | 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* × *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

- 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.)
- 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.)
- 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.

- 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.)

- In Non-separable Roller Followers, the side plates are press-fitted. Therefore, when mounting the Roller Followers, do not push the side plates.

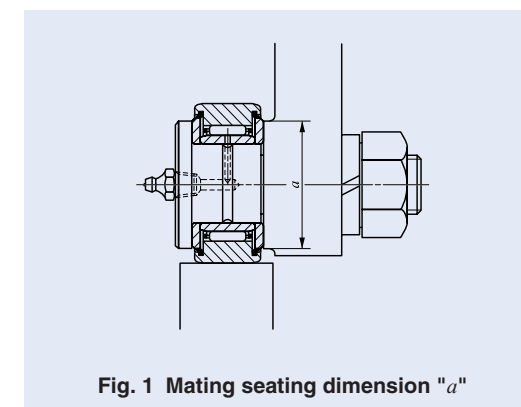


Fig. 1 Mating seating dimension "a"

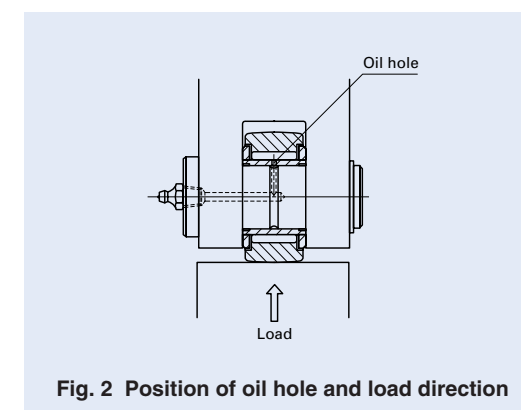


Fig. 2 Position of oil hole and load direction

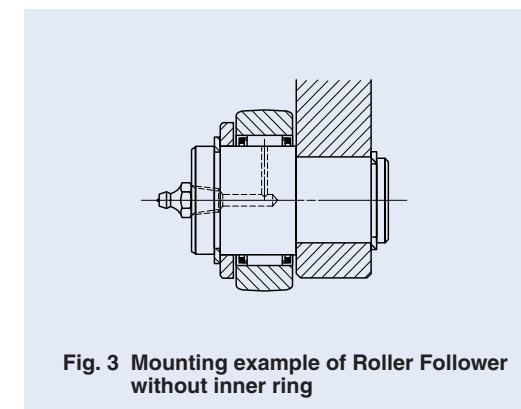
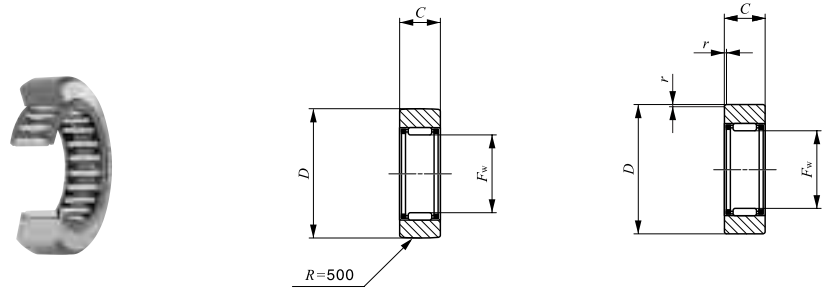


Fig. 3 Mounting example of Roller Follower without inner ring

ROLLER FOLLOWERS

Separable Roller Followers, Open Type **With Cage/Without Inner Ring**



Shaft dia. 7 – 60mm

RNAS...R

RNAS

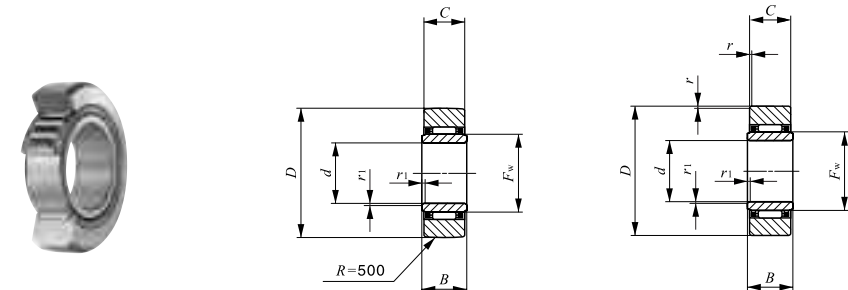
| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|------------------------|---------------------|---------------------------|----|------|-----------------------------------|--|--|
| | Open type | | | F _w | D | C | r _{s min} ⁽¹⁾ | | |
| | Crowned outer ring | Cylindrical outer ring | | | | | | | |
| 7 | RNAS 5 R | RNAS 5 | 8.9 | 7 | 16 | 7.8 | 0.3 | 2 710 | 2 390 |
| 10 | RNAS 6 R | RNAS 6 | 13.9 | 10 | 19 | 9.8 | 0.3 | 4 160 | 4 550 |
| 12 | RNAS 8 R | RNAS 8 | 23.5 | 12 | 24 | 9.8 | 0.6 | 5 650 | 5 890 |
| 14 | RNAS 10 R | RNAS 10 | 42.5 | 14 | 30 | 11.8 | 1 | 9 790 | 9 680 |
| 16 | RNAS 12 R | RNAS 12 | 49.5 | 16 | 32 | 11.8 | 1 | 10 500 | 10 900 |
| 20 | RNAS 15 R | RNAS 15 | 50 | 20 | 35 | 11.8 | 1 | 12 400 | 14 300 |
| 22 | RNAS 17 R | RNAS 17 | 90 | 22 | 40 | 15.8 | 1 | 17 600 | 20 900 |
| 25 | RNAS 20 R | RNAS 20 | 135 | 25 | 47 | 15.8 | 1 | 19 400 | 24 500 |
| 30 | RNAS 25 R | RNAS 25 | 152 | 30 | 52 | 15.8 | 1 | 20 800 | 28 400 |
| 38 | RNAS 30 R | RNAS 30 | 255 | 38 | 62 | 19.8 | 1 | 30 500 | 45 400 |
| 42 | RNAS 35 R | RNAS 35 | 375 | 42 | 72 | 19.8 | 1 | 32 400 | 50 600 |
| 50 | RNAS 40 R | RNAS 40 | 420 | 50 | 80 | 19.8 | 1.5 | 35 900 | 61 100 |
| 55 | RNAS 45 R | RNAS 45 | 460 | 55 | 85 | 19.8 | 1.5 | 37 400 | 66 400 |
| 60 | RNAS 50 R | RNAS 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**



Shaft dia. 6 – 50mm

NAST...R

NAST

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Assembled inner ring | |
|------------------|-----------------------|------------------------|---------------------|---------------------------|----|----|------|-----------------------------------|------------------------------------|--|--|-------------------------|----------------|
| | Open type | | | d | D | B | C | r _{s min} ⁽¹⁾ | r _{1s min} ⁽¹⁾ | | | | F _w |
| | Crowned outer ring | Cylindrical outer 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 |

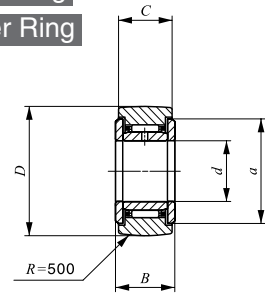
Note⁽¹⁾ Minimum allowable value of chamfer dimension *r* or *r*₁

Remarks1. No oil hole is provided.

2. Not provided with prepacked grease. Perform proper lubrication for use.

ROLLER FOLLOWERS

Separable Roller Followers, Shield Type **With Cage/With Inner Ring**
 Separable Roller Followers, Sealed Type **With Cage/With Inner Ring**

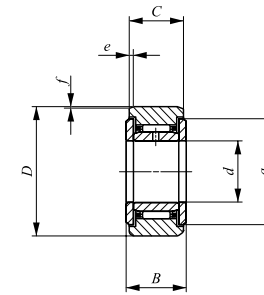


NAST...ZZR

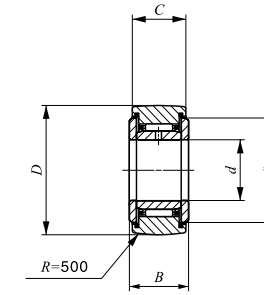
Shaft dia. 6 – 50mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g |
|------------------|-----------------------|------------------------|--------------------|------------------------|------------------|
| | Shield type | | Sealed type | | |
| | Crowned outer ring | Cylindrical outer ring | Crowned outer ring | Cylindrical outer ring | |
| 6 | NAST 6 ZZR | NAST 6 ZZ | NAST 6 ZZUUR | NAST 6 ZZUU | 24.5 |
| 8 | NAST 8 ZZR | NAST 8 ZZ | NAST 8 ZZUUR | NAST 8 ZZUU | 39 |
| 10 | NAST 10 ZZR | NAST 10 ZZ | NAST 10 ZZUUR | NAST 10 ZZUU | 65 |
| 12 | NAST 12 ZZR | NAST 12 ZZ | NAST 12 ZZUUR | NAST 12 ZZUU | 75 |
| 15 | NAST 15 ZZR | NAST 15 ZZ | NAST 15 ZZUUR | NAST 15 ZZUU | 83 |
| 17 | NAST 17 ZZR | NAST 17 ZZ | NAST 17 ZZUUR | NAST 17 ZZUU | 135 |
| 20 | NAST 20 ZZR | NAST 20 ZZ | NAST 20 ZZUUR | NAST 20 ZZUU | 195 |
| 25 | NAST 25 ZZR | NAST 25 ZZ | NAST 25 ZZUUR | NAST 25 ZZUU | 225 |
| 30 | NAST 30 ZZR | NAST 30 ZZ | NAST 30 ZZUUR | NAST 30 ZZUU | 400 |
| 35 | NAST 35 ZZR | NAST 35 ZZ | NAST 35 ZZUUR | NAST 35 ZZUU | 550 |
| 40 | NAST 40 ZZR | NAST 40 ZZ | NAST 40 ZZUUR | NAST 40 ZZUU | 710 |
| 45 | NAST 45 ZZR | NAST 45 ZZ | NAST 45 ZZUUR | NAST 45 ZZUU | 760 |
| 50 | NAST 50 ZZR | NAST 50 ZZ | NAST 50 ZZUUR | NAST 50 ZZUU | 830 |

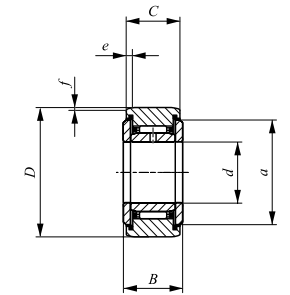
Remarks1. The inner ring has an oil hole.
 2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.



NAST...ZZ



NAST...ZZUUR



NAST...ZZUU

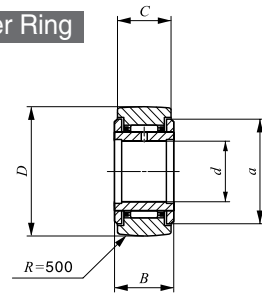
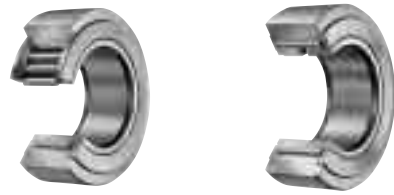
| d | Boundary dimensions mm | | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|----|------------------------|----|------|------|-----|-----|-------------------------------------|---|
| | D | B | C | a | e | f | | |
| 6 | 19 | 14 | 13.8 | 14 | 2.5 | 0.8 | 4 160 | 4 550 |
| 8 | 24 | 14 | 13.8 | 17.5 | 2.5 | 0.8 | 5 650 | 5 890 |
| 10 | 30 | 16 | 15.8 | 23.5 | 2.5 | 0.8 | 9 790 | 9 680 |
| 12 | 32 | 16 | 15.8 | 25.5 | 2.5 | 0.8 | 10 500 | 10 900 |
| 15 | 35 | 16 | 15.8 | 29 | 2.5 | 0.8 | 12 400 | 14 300 |
| 17 | 40 | 20 | 19.8 | 32.5 | 3 | 1 | 17 600 | 20 900 |
| 20 | 47 | 20 | 19.8 | 38 | 3 | 1 | 19 400 | 24 500 |
| 25 | 52 | 20 | 19.8 | 43 | 3 | 1 | 20 800 | 28 400 |
| 30 | 62 | 25 | 24.8 | 50.5 | 4 | 1.2 | 30 500 | 45 400 |
| 35 | 72 | 25 | 24.8 | 53.5 | 4 | 1.2 | 32 400 | 50 600 |
| 40 | 80 | 26 | 25.8 | 61.5 | 4 | 1.2 | 35 900 | 61 100 |
| 45 | 85 | 26 | 25.8 | 66.5 | 4 | 1.2 | 37 400 | 66 400 |
| 50 | 90 | 26 | 25.8 | 76 | 4 | 1.2 | 38 900 | 71 700 |

I
 NAST
 NART
 NURT

ROLLER FOLLOWERS

Non-separable Roller Followers **With Cage/With Inner Ring**

Full Complement Type/With Inner Ring

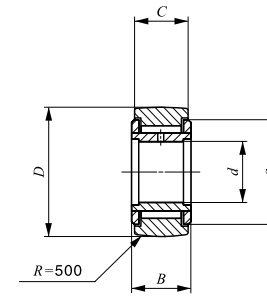


NART...R

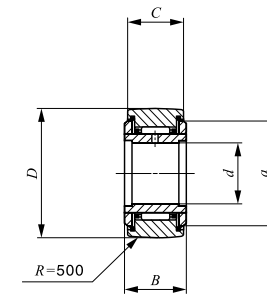
Shaft dia. 5 – 40mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g |
|------------------|-----------------------------------|-----------------|-----------------------------------|-----------------|---------------------|
| | Shield type Crowned outer ring | | Sealed type Crowned outer ring | | |
| | With cage | Full complement | With cage | Full complement | |
| 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 |

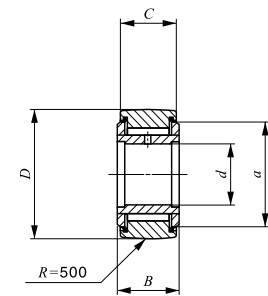
Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.



NART...VR



NART...UUR



NART...VUUR

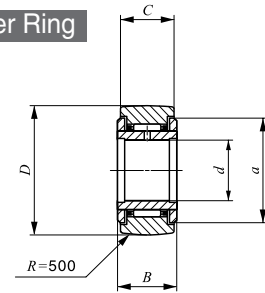
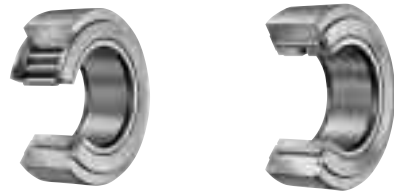
| Boundary dimensions mm | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Maximum allowable static load N |
|---------------------------|----|----|----|------|--|--|--|
| d | D | B | C | a | | | |
| 5 | 16 | 12 | 11 | 12 | 3 650 | 3 680 | 3 680 |
| 5 | 16 | 12 | 11 | 12 | 6 810 | 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 |

I
NAST
NART
NURT

ROLLER FOLLOWERS

Non-separable Roller Followers **With Cage/With Inner Ring**

Full Complement Type/With Inner Ring

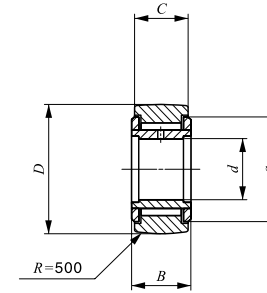


NART...R

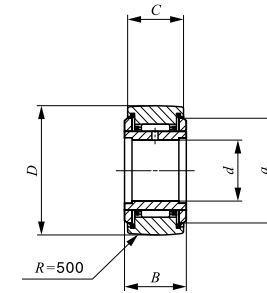
Shaft dia. 45 – 50mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) g |
|------------------|-----------------------------------|-------------------|-----------------------------------|---------------------|------------------|
| | Shield type Crowned outer ring | | Sealed type Crowned outer ring | | |
| | With cage | Full complement | With cage | Full complement | |
| 45 | NART 45 R | — | NART 45 UUR | — | 915 |
| | — | NART 45 VR | — | NART 45 VUUR | 935 |
| 50 | NART 50 R | — | NART 50 UUR | — | 980 |
| | — | NART 50 VR | — | NART 50 VUUR | 1 010 |

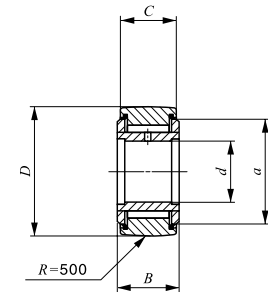
Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.



NART...VR



NART...UUR



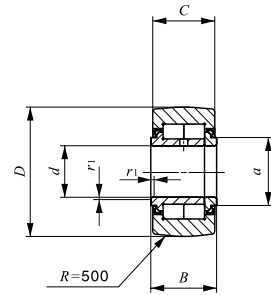
NART...VUUR

| Boundary dimensions mm | | | | | Basic dynamic load rating C N | Basic static load rating C ₀ N | Maximum allowable static load N |
|---------------------------|----|----|----|------|--|--|--|
| d | D | B | C | a | | | |
| 45 | 85 | 32 | 30 | 66.5 | 46 800 | 88 600 | 88 600 |
| 45 | 85 | 32 | 30 | 66.5 | 80 300 | 181 000 | 181 000 |
| 50 | 90 | 32 | 30 | 76 | 48 600 | 95 600 | 95 600 |
| 50 | 90 | 32 | 30 | 76 | 84 300 | 198 000 | 198 000 |

I
NAST
NART
NURT

ROLLER FOLLOWERS

Cylindrical Roller Followers **Full Complement Type/With Inner Ring**

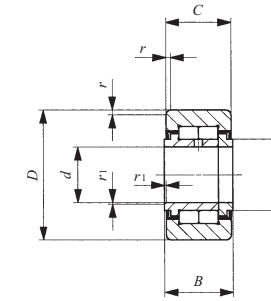


NURT...R

Shaft dia. 15 – 50mm

| Shaft dia. mm | Identification number | | Mass (Ref.) g | Boundary dimensions mm | | | | | |
|------------------|-----------------------|------------------------|---------------------|---------------------------|----------|----------|----------|----------|---|
| | Crowned outer ring | Cylindrical outer ring | | <i>d</i> | <i>D</i> | <i>B</i> | <i>C</i> | <i>a</i> | <i>r_s</i> min ⁽¹⁾ |
| 15 | NURT 15 R | NURT 15 | 100 | 15 | 35 | 19 | 18 | 20 | 0.6 |
| | NURT 15-1 R | NURT 15-1 | 160 | 15 | 42 | 19 | 18 | 20 | 0.6 |
| 17 | NURT 17 R | NURT 17 | 147 | 17 | 40 | 21 | 20 | 22 | 1 |
| | NURT 17-1 R | NURT 17-1 | 222 | 17 | 47 | 21 | 20 | 22 | 1 |
| 20 | NURT 20 R | NURT 20 | 245 | 20 | 47 | 25 | 24 | 27 | 1 |
| | NURT 20-1 R | NURT 20-1 | 321 | 20 | 52 | 25 | 24 | 27 | 1 |
| 25 | NURT 25 R | NURT 25 | 281 | 25 | 52 | 25 | 24 | 31 | 1 |
| | NURT 25-1 R | NURT 25-1 | 450 | 25 | 62 | 25 | 24 | 31 | 1 |
| 30 | NURT 30 R | NURT 30 | 466 | 30 | 62 | 29 | 28 | 38 | 1 |
| | NURT 30-1 R | NURT 30-1 | 697 | 30 | 72 | 29 | 28 | 38 | 1 |
| 35 | NURT 35 R | NURT 35 | 630 | 35 | 72 | 29 | 28 | 44 | 1 |
| | NURT 35-1 R | NURT 35-1 | 840 | 35 | 80 | 29 | 28 | 44 | 1 |
| 40 | NURT 40 R | NURT 40 | 817 | 40 | 80 | 32 | 30 | 49 | 1 |
| | NURT 40-1 R | NURT 40-1 | 1 130 | 40 | 90 | 32 | 30 | 49 | 1 |
| 45 | NURT 45 R | NURT 45 | 883 | 45 | 85 | 32 | 30 | 53 | 1 |
| | NURT 45-1 R | NURT 45-1 | 1 400 | 45 | 100 | 32 | 30 | 53 | 1 |
| 50 | NURT 50 R | NURT 50 | 950 | 50 | 90 | 32 | 30 | 58 | 1 |
| | NURT 50-1 R | NURT 50-1 | 1 690 | 50 | 110 | 32 | 30 | 58 | 1 |

Note⁽¹⁾ Minimum allowable value of chamfer dimension *r* or *r₁*
 Remarks1. The inner ring has an oil hole.
 2. Provided with prepacked grease.



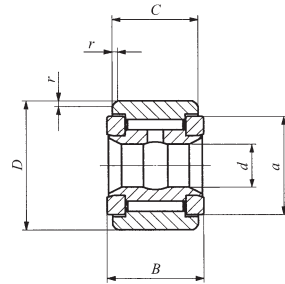
NURT

| <i>r_{1s}</i> min ⁽¹⁾ | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C₀</i> N | Maximum allowable static load N |
|--|---|--|--|
| 0.3 | 23 400 | 27 300 | 11 800 |
| 0.3 | 23 400 | 27 300 | 27 300 |
| 0.3 | 25 200 | 30 900 | 20 300 |
| 0.3 | 25 200 | 30 900 | 30 900 |
| 0.3 | 38 900 | 49 000 | 27 200 |
| 0.3 | 38 900 | 49 000 | 49 000 |
| 0.3 | 43 100 | 58 100 | 30 000 |
| 0.3 | 43 100 | 58 100 | 58 100 |
| 0.3 | 58 200 | 75 300 | 35 200 |
| 0.3 | 58 200 | 75 300 | 75 300 |
| 0.6 | 63 900 | 88 800 | 57 000 |
| 0.6 | 63 900 | 88 800 | 88 800 |
| 0.6 | 86 500 | 122 000 | 75 300 |
| 0.6 | 86 500 | 122 000 | 122 000 |
| 0.6 | 91 500 | 135 000 | 78 700 |
| 0.6 | 91 500 | 135 000 | 135 000 |
| 0.6 | 96 300 | 148 000 | 82 100 |
| 0.6 | 96 300 | 148 000 | 148 000 |

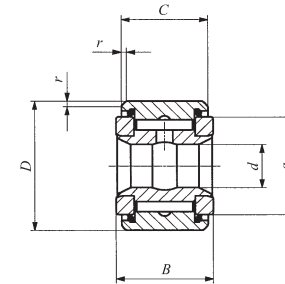
I
NAST
NART
NURT

ROLLER FOLLOWERS

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 | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | |
|----------------------------|---------------------------------------|---------------------------------------|---------------------|------------------------------|----------------|----------------|----------------|
| | Shield type Cylindrical outer ring | Sealed type Cylindrical outer ring | | d | D | B | C |
| 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) |
| | CRY 14 V | CRY 14 VUU | 36 | 6.350 (1/4) | 22.225 (7/8) | 14.288(0.5625) | 12.700 (1/2) |
| 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) |
| | CRY 18 V | CRY 18 VUU | 77 | 7.938 (5/16) | 28.575 (1 1/8) | 17.463(0.6875) | 15.875 (5/8) |
| 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) |
| | CRY 22 V | CRY 22 VUU | 136 | 9.525 (3/8) | 34.925 (1 3/8) | 20.638(0.8125) | 19.050 (3/4) |
| 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) |
| | CRY 26 V | CRY 26 VUU | 227 | 11.112 (7/16) | 41.275 (1 5/8) | 23.813(0.9375) | 22.225 (7/8) |
| 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) |
| | CRY 30 V | CRY 30 VUU | 363 | 12.700 (1/2) | 47.625 (1 7/8) | 26.988(1.0625) | 25.400 (1) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| | 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) |
| 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) |
| 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) |

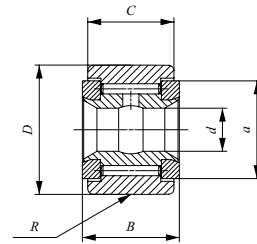
Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

| a | r | Shaft dia. | | | | | | Basic dynamic load rating C | Basic static load rating C ₀ |
|-------------|-------------|------------|--------|-----------|--------|-----------|--------|-----------------------------------|---|
| | | Push fit | | Drive fit | | Press fit | | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | | |
| 14.4(0.567) | 0.794 (1/2) | 6.332 | 6.342 | 6.348 | 6.358 | 6.353 | 6.363 | 8 710 | 12 300 |
| | | 6.332 | 6.342 | 6.348 | 6.358 | 6.353 | 6.363 | | |
| 19.6(0.772) | 1.191 (3/8) | 7.920 | 7.930 | 7.935 | 7.945 | 7.940 | 7.950 | 13 100 | 22 700 |
| | | 7.920 | 7.930 | 7.935 | 7.945 | 7.940 | 7.950 | | |
| 25.0(0.984) | 1.588 (1/2) | 9.507 | 9.517 | 9.523 | 9.533 | 9.528 | 9.538 | 23 600 | 31 700 |
| | | 9.507 | 9.517 | 9.523 | 9.533 | 9.528 | 9.538 | | |
| 28.8(1.134) | 1.588 (1/2) | 11.095 | 11.105 | 11.110 | 11.120 | 11.115 | 11.125 | 28 200 | 40 100 |
| | | 11.095 | 11.105 | 11.110 | 11.120 | 11.115 | 11.125 | | |
| 32.7(1.287) | 1.588 (1/2) | 12.682 | 12.692 | 12.698 | 12.708 | 12.708 | 12.718 | 35 300 | 55 600 |
| | | 12.682 | 12.692 | 12.698 | 12.708 | 12.708 | 12.718 | | |
| 36.0(1.417) | 1.588 (1/2) | 15.857 | 15.867 | 15.873 | 15.883 | 15.883 | 15.893 | 45 700 | 80 600 |
| | | 15.857 | 15.867 | 15.873 | 15.883 | 15.883 | 15.893 | | |
| 43.3(1.705) | 2.381 (3/2) | 19.032 | 19.042 | 19.048 | 19.058 | 19.058 | 19.068 | 61 400 | 116 000 |
| | | 19.032 | 19.042 | 19.048 | 19.058 | 19.058 | 19.068 | | |
| 54.0(2.125) | 2.381 (3/2) | 25.377 | 25.390 | 25.397 | 25.410 | 25.408 | 25.420 | 77 600 | 172 000 |
| | | 25.377 | 25.390 | 25.397 | 25.410 | 25.408 | 25.420 | | |
| 61.9(2.437) | 2.381 (3/2) | 28.522 | 28.565 | 28.572 | 28.585 | 28.583 | 28.595 | 111 000 | 239 000 |
| 71.0(2.797) | 2.381 (3/2) | 31.727 | 31.740 | 31.747 | 31.760 | 31.758 | 31.770 | 142 000 | 317 000 |

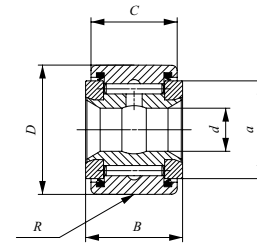
I
NAST
NART
NURT

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 | | Mass (Ref.) g | Boundary dimensions mm(inch) | | | |
|-------------------------------------|-----------------------------------|-----------------------------------|---------------------|------------------------------|---------------------------|----------------|---------------------------|
| | Shield type Crowned outer ring | Sealed type Crowned outer ring | | d | D | B | C |
| 6.350 ($\frac{1}{4}$) | CRY 12 VR | CRY 12 VUUR | 27 | 6.350 ($\frac{1}{4}$) | 19.050 ($\frac{3}{4}$) | 14.288(0.5625) | 12.700 ($\frac{1}{2}$) |
| | CRY 14 VR | CRY 14 VUUR | 36 | 6.350 ($\frac{1}{4}$) | 22.225 ($\frac{7}{8}$) | 14.288(0.5625) | 12.700 ($\frac{1}{2}$) |
| 7.938 ($\frac{5}{16}$) | CRY 16 VR | CRY 16 VUUR | 68 | 7.938 ($\frac{5}{16}$) | 25.400 (1) | 17.463(0.6875) | 15.875 ($\frac{5}{8}$) |
| | CRY 18 VR | CRY 18 VUUR | 77 | 7.938 ($\frac{5}{16}$) | 28.575 (1 $\frac{1}{8}$) | 17.463(0.6875) | 15.875 ($\frac{5}{8}$) |
| 9.525 ($\frac{3}{8}$) | CRY 20 VR | CRY 20 VUUR | 109 | 9.525 ($\frac{3}{8}$) | 31.750 (1 $\frac{1}{4}$) | 20.638(0.8125) | 19.050 ($\frac{3}{4}$) |
| | CRY 22 VR | CRY 22 VUUR | 136 | 9.525 ($\frac{3}{8}$) | 34.925 (1 $\frac{3}{8}$) | 20.638(0.8125) | 19.050 ($\frac{3}{4}$) |
| 11.112 ($\frac{7}{16}$) | CRY 24 VR | CRY 24 VUUR | 186 | 11.112 ($\frac{7}{16}$) | 38.100 (1 $\frac{1}{2}$) | 23.813(0.9375) | 22.225 ($\frac{7}{8}$) |
| | CRY 26 VR | CRY 26 VUUR | 227 | 11.112 ($\frac{7}{16}$) | 41.275 (1 $\frac{5}{8}$) | 23.813(0.9375) | 22.225 ($\frac{7}{8}$) |
| 12.700 ($\frac{1}{2}$) | CRY 28 VR | CRY 28 VUUR | 290 | 12.700 ($\frac{1}{2}$) | 44.450 (1 $\frac{3}{4}$) | 26.988(1.0625) | 25.400 (1) |
| | CRY 30 VR | CRY 30 VUUR | 363 | 12.700 ($\frac{1}{2}$) | 47.625 (1 $\frac{7}{8}$) | 26.988(1.0625) | 25.400 (1) |
| 15.875 ($\frac{5}{8}$) | CRY 32 VR | CRY 32 VUUR | 476 | 15.875 ($\frac{5}{8}$) | 50.800 (2) | 33.338(1.3125) | 31.750 (1 $\frac{1}{4}$) |
| | CRY 36 VR | CRY 36 VUUR | 599 | 15.875 ($\frac{5}{8}$) | 57.150 (2 $\frac{1}{4}$) | 33.338(1.3125) | 31.750 (1 $\frac{1}{4}$) |
| 19.050 ($\frac{3}{4}$) | CRY 40 VR | CRY 40 VUUR | 816 | 19.050 ($\frac{3}{4}$) | 63.500 (2 $\frac{1}{2}$) | 39.688(1.5625) | 38.100 (1 $\frac{1}{2}$) |
| | CRY 44 VR | CRY 44 VUUR | 1 020 | 19.050 ($\frac{3}{4}$) | 69.850 (2 $\frac{3}{4}$) | 39.688(1.5625) | 38.100 (1 $\frac{1}{2}$) |
| 25.400 (1) | CRY 48 VR | CRY 48 VUUR | 1 410 | 25.400 (1) | 76.200 (3) | 46.038(1.8125) | 44.450 (1 $\frac{3}{4}$) |
| | CRY 52 VR | CRY 52 VUUR | 1 640 | 25.400 (1) | 82.550 (3 $\frac{1}{4}$) | 46.038(1.8125) | 44.450 (1 $\frac{3}{4}$) |
| 28.575 (1 $\frac{1}{8}$) | CRY 56 VR | CRY 56 VUUR | 2 250 | 28.575 (1 $\frac{1}{8}$) | 88.900 (3 $\frac{1}{2}$) | 52.388(2.0625) | 50.800 (2) |
| 31.750 (1 $\frac{1}{4}$) | CRY 64 VR | CRY 64 VUUR | 3 200 | 31.750 (1 $\frac{1}{4}$) | 101.600 (4) | 58.738(2.3125) | 57.150 (2 $\frac{1}{4}$) |

Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

| a | R | Shaft dia. | | | | | | Basic dynamic load rating C | Basic static load rating C ₀ |
|-------------|----------|------------|--------|-----------|--------|-----------|--------|-----------------------------------|---|
| | | Push fit | | Drive fit | | Press fit | | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | | |
| 14.4(0.567) | 250 (10) | 6.332 | 6.342 | 6.348 | 6.358 | 6.353 | 6.363 | 8 710 | 12 300 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |

I
NAST
NURT
NURT

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

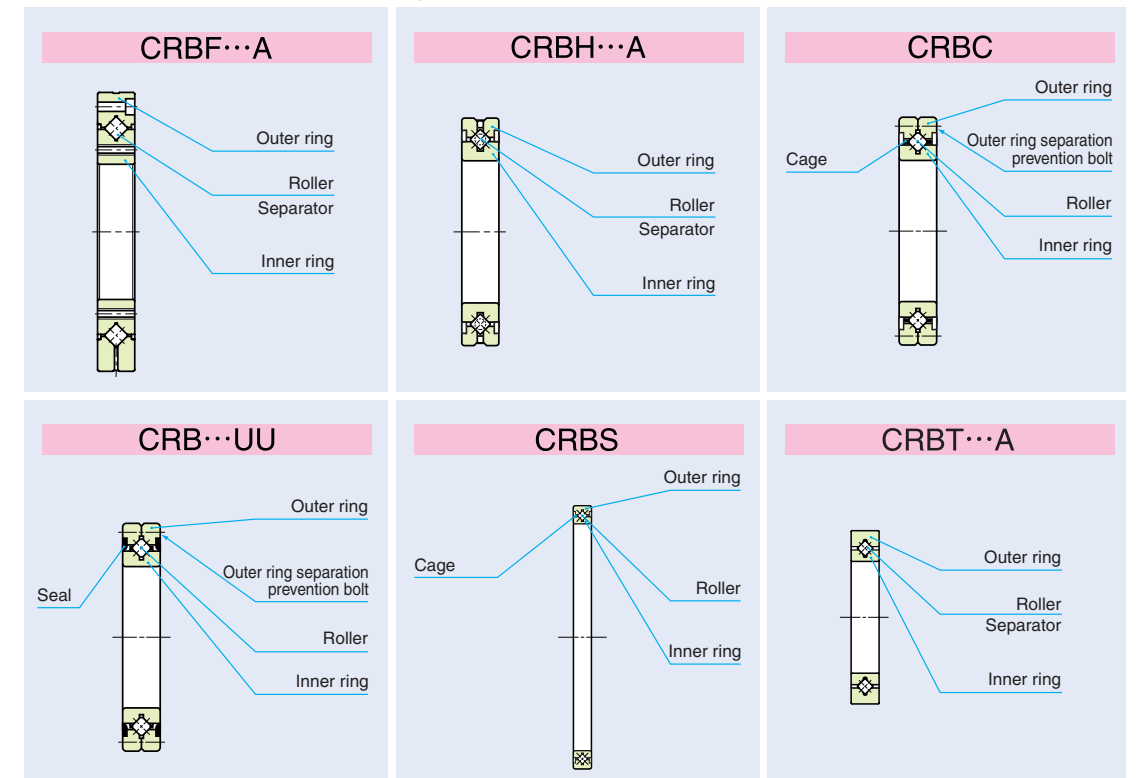


Structure and Features

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



J
 CRBF
 CRBH
 CRBC
 CRB
 CRBS
 CRBT

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.

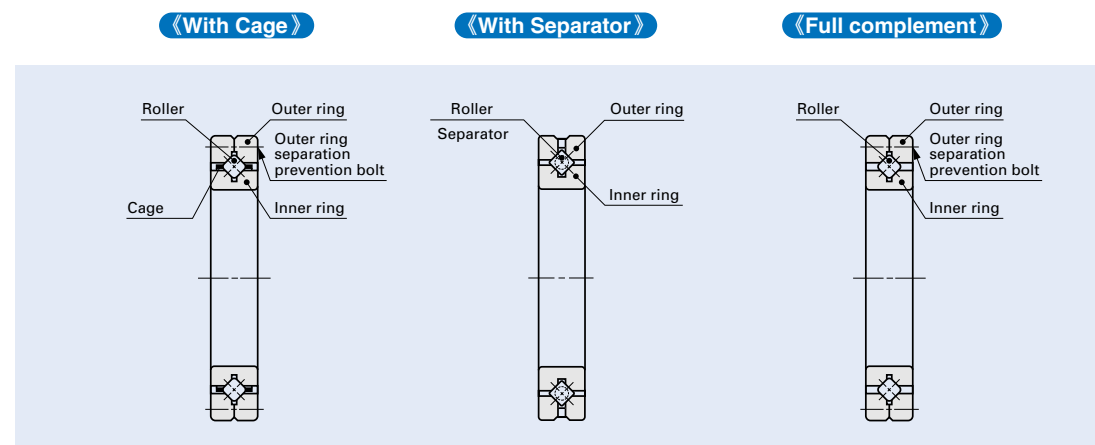
Internal Structures and Shapes

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 com-

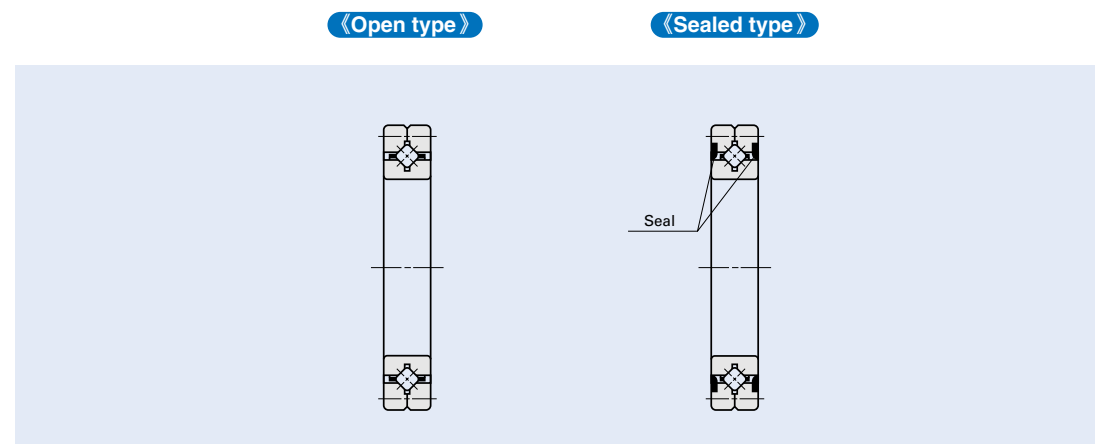
paratively high speed rotations, while the full complement type is suitable for heavy load applications at low speed rotations.



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

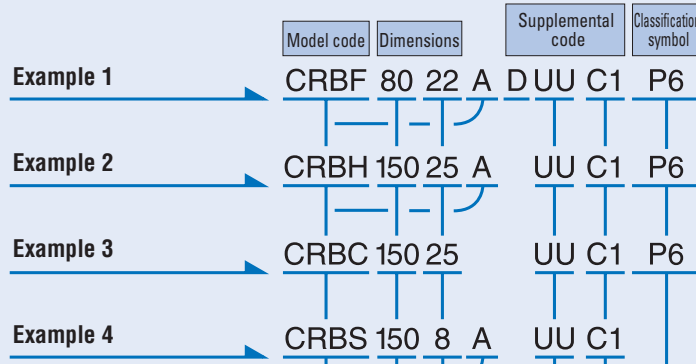
excellent sealing performance against dust and dirt penetration and grease leakage.



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 | Description |
|------------|--|
| 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 | Description |
|-----------|---|
| | The dimension indicates the bore diameter of the bearing. (unit : mm) |
| | The dimension indicates the bearing width. (unit : mm) |

| Supplemental code - 1 ⁽¹⁾ | Description |
|--------------------------------------|--|
| 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 | Description | Notes |
|-----------------------|---|--------------------------------------|
| 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 | Description | Notes | |
|-----------------------|-------------------|--------------------------------------|-------------------------|
| 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 | Description | Notes |
|-----------------------|------------------|--------------------------------------|
| No symbol | Accuracy class 0 | For application, please see table 4. |
| P6 | Accuracy class 6 | |
| 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.

$$P_r = X \left(F_r + \frac{2M}{D_{pw}} \right) + Y F_a \dots\dots\dots(1)$$

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

$$\left(D_{pw} \doteq \frac{d+D}{2} \right)$$

X : Radial load factor (Refer to Table 2.)

Y : Axial load factor (Refer to Table 2.)

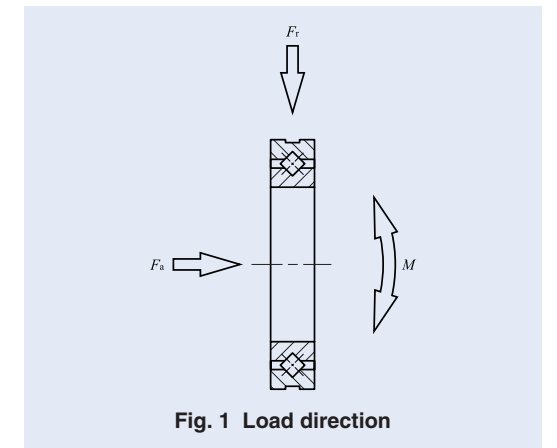


Fig. 1 Load direction

Table 5 Radial load factor and axial load factor

| Conditions | X | Y |
|--|------|------|
| $\frac{F_a}{F_r + 2M/D_{pw}} \leq 1.5$ | 1 | 0.45 |
| $\frac{F_a}{F_r + 2M/D_{pw}} > 1.5$ | 0.67 | 0.67 |

Static Equivalent Load

The static equivalent radial load of Crossed Roller Bearings can be obtained from the following equation.

$$P_{0r} = F_r + \frac{2M}{D_{pw}} + 0.44 F_a \dots\dots\dots(2)$$

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

$$\left(D_{pw} \doteq \frac{d+D}{2} \right)$$

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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 .

Table 6 Tolerances and allowable values of inner rings and tolerances of outer ring width unit: μm

| Nominal bore diameter mm | $\Delta_{dmp}^{(1)}$ Single plane mean bore dia. deviation | | | | | | | | | | Δ_{Bs} Deviation of a single inner ring width | | $\Delta_{Cs}^{(2)}$ 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 | | High | Low | High | Low | 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 |
| 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 | - | 0 | -120 | 0 | -150 | 50 | 25 | 13 | 10 | 7 | 50 | 25 | 13 | 10 | 7 | |
| 315 | 400 | 0 | -40 | 0 | -30 | 0 | -23 | 0 | - | 0 | -150 | 0 | -200 | 60 | 30 | 15 | 12 | 8 | 60 | 30 | 15 | 12 | 8 | |
| 400 | 500 | 0 | -45 | 0 | -35 | 0 | - | 0 | - | 0 | -150 | 0 | -200 | 65 | 35 | 18 | 14 | 10 | 65 | 35 | 18 | 14 | 10 | |
| 500 | 630 | 0 | -50 | 0 | -40 | 0 | - | 0 | - | 0 | -150 | 0 | -200 | 70 | 40 | 20 | 16 | 12 | 70 | 40 | 20 | 16 | 12 | |
| 630 | 800 | 0 | -75 | 0 | - | 0 | - | 0 | - | 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

| Nominal outside diameter mm | $\Delta_{dmp}^{(1)}$ 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 | 0 | - | 70 | 35 | 20 | - | - | 70 | 35 | 20 | - | - | |
| 400 | 500 | 0 | -45 | 0 | -33 | 0 | -23 | 0 | - | 80 | 40 | 23 | - | - | 80 | 40 | 23 | - | - | |
| 500 | 630 | 0 | -50 | 0 | -38 | 0 | -28 | 0 | - | 100 | 50 | 25 | - | - | 100 | 50 | 25 | - | - | |
| 630 | 800 | 0 | -75 | 0 | -45 | 0 | - | 0 | - | 120 | 60 | 30 | - | - | 120 | 60 | 30 | - | - | |
| 800 | 1000 | 0 | -100 | 0 | -60 | 0 | - | 0 | - | 120 | 75 | 35 | - | - | 120 | 75 | 35 | - | - | |
| 1000 | 1030 | 0 | -125 | 0 | - | 0 | - | 0 | - | 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

| Nominal bore diameter mm | $\Delta_{dmp}^{(1)}$ 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 | | High | Low | 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 |
| - | 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

| Nominal bore diameter mm | $\Delta_{dmp}^{(1)}$ 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 | | High | Low | 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 |
| 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

| 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

| 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 |

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 Table 12.4.

Table 12.1 Radial internal clearances unit: μm

| 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

| 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

| 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

| 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 pre-load 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

| Nominal bore diameter mm | Inner ring rotating load | | | | Outer ring rotating load | | | |
|-----------------------------|--------------------------|-----|--------------|-----|--------------------------|-----|--------------|-----|
| | Shaft | | Housing bore | | 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 |
|-----------------------------|-------------|-----------|-------------|
| | | Open type | Sealed type |
| 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

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°C~+120°C. However, the maximum allowable temperature for types with separator and with seal is +110°C, and +100°C 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
 $(D_{pw} \doteq \frac{d+D}{2})$

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

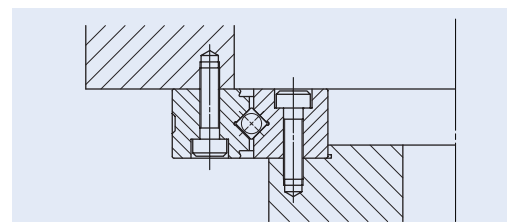


Fig.2 Mounting example -1
Mounting Holed Type High Rigidity Crossed Roller Bearing

① Mounting Holed Type High Rigidity Crossed Roller Bearing can be mounted directly to the mounting surface by fixing bolts. (See Fig.3)

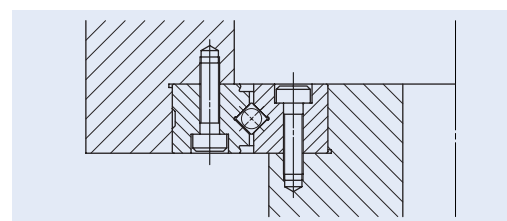


Fig.3 Mounting example -2
Mounting Holed Type High Rigidity Crossed Roller Bearing

② If large number of radial load and/or moment is expected, it is recommended to prepare flange part. (See Fig.4)

③ Mounting 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

① When 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.

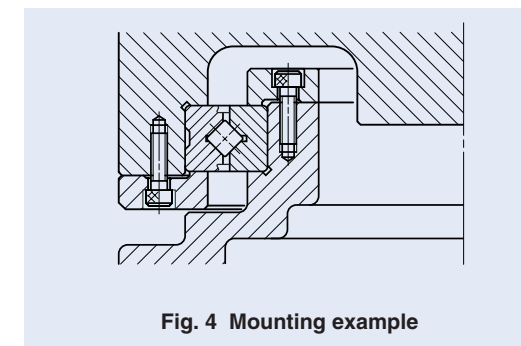


Fig.4 Mounting example

② The 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.

③ The 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.

④ The depth of the housing bore is recommended to be equal to or larger than the bearing width.

⑤ Separation 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.

⑥ High 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.

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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.

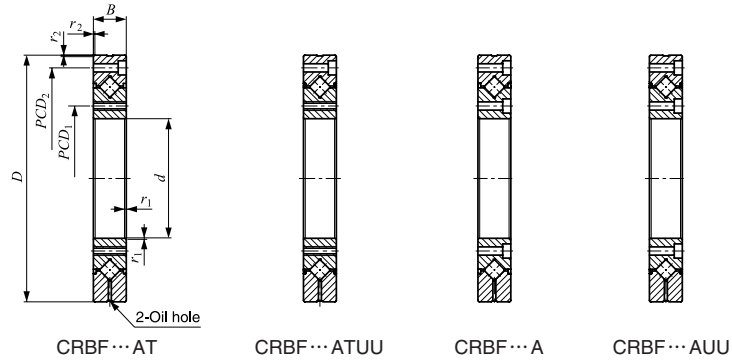


CROSSED ROLLER BEARINGS

Mounting Holed Type High Rigidity **Open type with separator**
 Crossed Roller Bearings **Two sides sealed type with separator**

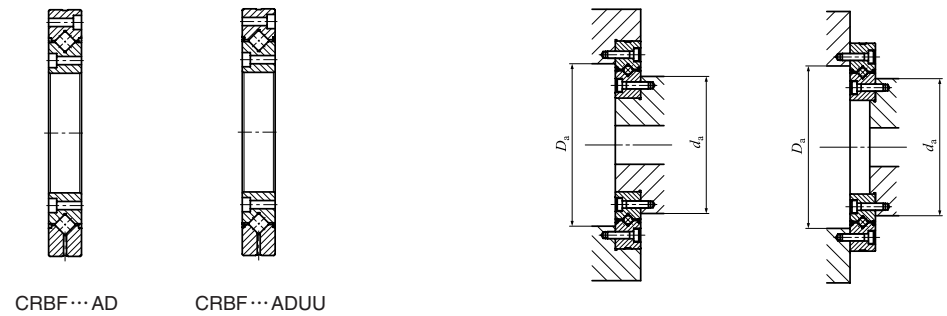


Shaft dia. 10 – 80mm



| Shaft diameter mm | Identification number | | Weight (Ref.) kg | Boundary dim. mm | | | | |
|----------------------|-----------------------|----------------------|------------------------|------------------|-----|----|----------------------------------|----------------------------------|
| | Open type | Two side sealed type | | d | D | B | r _{1min} ⁽¹⁾ | r _{2min} ⁽¹⁾ |
| 10 | CRBF 108 AT | CRBF 108 AT UU | 0.12 | 10 | 52 | 8 | 0.3 | 0.3 |
| 20 | CRBF 2012 AT | CRBF 2012 AT UU | 0.31 | 20 | 70 | 12 | 0.3 | 0.3 |
| 25 | CRBF 2512 AT | CRBF 2512 AT UU | 0.40 | 25 | 80 | 12 | 0.6 | 0.6 |
| 35 | CRBF 3515 AT | CRBF 3515 AT UU | 0.66 | 35 | 95 | 15 | 0.6 | 0.6 |
| 55 | CRBF 5515 AT | CRBF 5515 AT UU | 0.96 | 55 | 120 | 15 | 0.6 | 0.6 |
| 80 | CRBF 8022 AT | CRBF 8022 AT UU | 2.63 | 80 | 165 | 22 | 0.6 | 1 |
| | CRBF 8022 A | CRBF 8022 A UU | 2.60 | | | | | |
| | CRBF 8022 AD | CRBF 8022 AD UU | | | | | | |

Note⁽¹⁾ Minimum allowable single value of chamfer r₁ and r₂.
 Remarks1. 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.

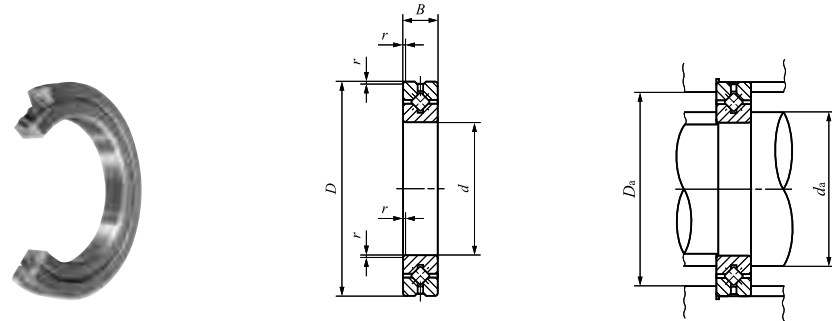


| PCD ₁ | Mounting holes mm | | PCD ₂ | Mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|--|--|------------------|------------------------|----------------|-------------------------------------|---|
| | Inner ring Mounting holes | Outer ring Mounting holes | | d _a | D _a | | |
| 16 | 4-M3 through | 6-φ 3.4 through φ 6.5 counter bore depth 3.3 | 42 | 24 | 31 | 2 910 | 2 430 |
| 28 | 6-M3 through | 6-φ 3.4 through φ 6.5 counter bore depth 3.3 | 57 | 36.5 | 48.5 | 7 600 | 8 370 |
| 35 | 6-M3 through | 6-φ 3.4 through φ 6.5 counter bore depth 3.3 | 67 | 46.5 | 58.5 | 8 610 | 10 600 |
| 45 | 8-M4 through | 8-φ 4.5 through φ 8 counter bore depth 4.4 | 83 | 56 | 74 | 17 300 | 20 900 |
| 65 | 8-M5 through | 8-φ 5.5 through φ 9.5 counter bore depth 5.4 | 105 | 76 | 94 | 20 100 | 27 700 |
| 97 | 10-M5 through | 10-φ 5.5 through φ 9.5 counter bore depth 5.4 | 148 | 107 | 137 | 51 100 | 72 000 |
| | 10-φ 5.5 through φ 9.5 counter bore depth 5.4 | | | | | | |

J
 CRBF
 CRBH
 CRBC
 CRB
 CRBS
 CRBT

CROSSED ROLLER BEARINGS

High Rigidity Type Crossed Roller Bearings **Open Type/With Separator**



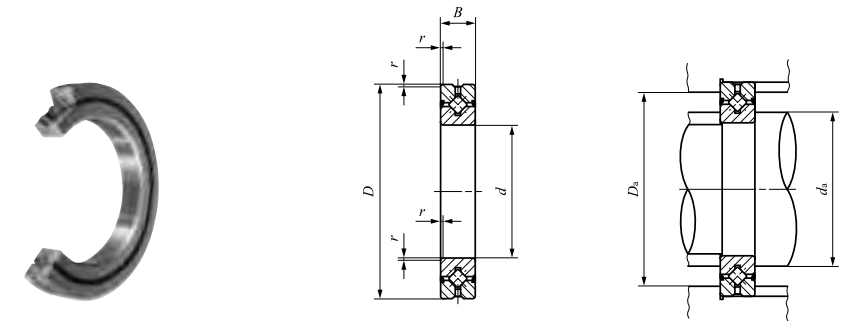
Shaft dia. 20 – 250mm

CRBH...A

| Shaft dia. mm | Identification number | Mass (Ref.) kg | Boundary dimensions mm | | | | Mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|----------------------|---------------------------|-----|----|---------------------------------|---------------------------|----------------|--|--|
| | | | d | D | B | r ⁽¹⁾ _{min} | d _a | D _a | | |
| 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 | | | | Mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|----------------------|---------------------------|-----|----|---------------------------------|---------------------------|----------------|--|--|
| | | | d | D | B | r ⁽¹⁾ _{min} | d _a | D _a | | |
| 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.

CROSSED ROLLER BEARINGS

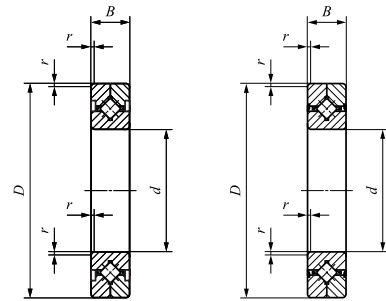
Standard Type Crossed Roller Bearings

Open Type/With Cage

Sealed Type/With Cage

Open Type/Full Complement Type

Sealed Type/Full Complement Type



CRBC

CRBC...UU

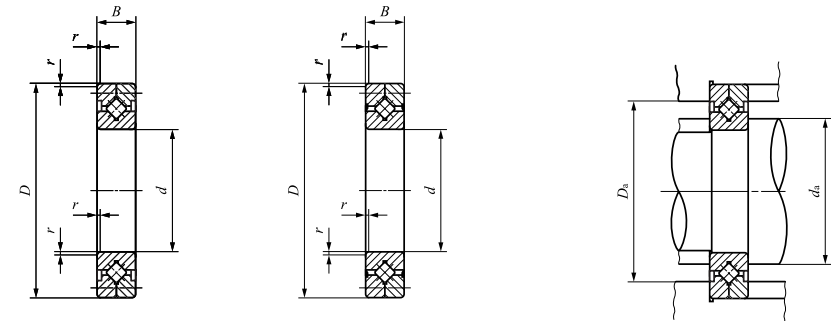
Shaft dia. 30 – 200mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) kg | Boundary dimensions mm | | |
|------------------|-----------------------|---------------|-----------------|--------------|-------------------|---------------------------|-----|----|
| | With Cage | | Full complement | | | d | D | B |
| | Open Type | Seald Type | Open Type | Seald Type | | | | |
| 30 | CRBC 3010 | CRBC 3010 UU | CRB 3010 | CRB 3010 UU | 0.12 | 30 | 55 | 10 |
| 40 | CRBC 4010 | CRBC 4010 UU | CRB 4010 | CRB 4010 UU | 0.15 | 40 | 65 | 10 |
| 50 | CRBC 5013 | CRBC 5013 UU | CRB 5013 | CRB 5013 UU | 0.29 | 50 | 80 | 13 |
| 60 | CRBC 6013 | CRBC 6013 UU | CRB 6013 | CRB 6013 UU | 0.33 | 60 | 90 | 13 |
| 70 | CRBC 7013 | CRBC 7013 UU | CRB 7013 | CRB 7013 UU | 0.38 | 70 | 100 | 13 |
| 80 | CRBC 8016 | CRBC 8016 UU | CRB 8016 | CRB 8016 UU | 0.74 | 80 | 120 | 16 |
| 90 | CRBC 9016 | CRBC 9016 UU | CRB 9016 | CRB 9016 UU | 0.81 | 90 | 130 | 16 |
| 100 | CRBC 10020 | CRBC 10020 UU | CRB 10020 | CRB 10020 UU | 1.45 | 100 | 150 | 20 |
| 110 | CRBC 11020 | CRBC 11020 UU | CRB 11020 | CRB 11020 UU | 1.56 | 110 | 160 | 20 |
| 120 | CRBC 12025 | CRBC 12025 UU | CRB 12025 | CRB 12025 UU | 2.62 | 120 | 180 | 25 |
| 130 | CRBC 13025 | CRBC 13025 UU | CRB 13025 | CRB 13025 UU | 2.82 | 130 | 190 | 25 |
| 140 | CRBC 14025 | CRBC 14025 UU | CRB 14025 | CRB 14025 UU | 2.96 | 140 | 200 | 25 |
| 150 | CRBC 15025 | CRBC 15025 UU | CRB 15025 | CRB 15025 UU | 3.16 | 150 | 210 | 25 |
| | CRBC 15030 | CRBC 15030 UU | CRB 15030 | CRB 15030 UU | 5.3 | 150 | 230 | 30 |
| 200 | CRBC 20025 | CRBC 20025 UU | CRB 20025 | CRB 20025 UU | 4.0 | 200 | 260 | 25 |
| | CRBC 20030 | — | CRB 20030 | — | 6.7 | 200 | 280 | 30 |
| | CRBC 20035 | — | CRB 20035 | — | 9.58 | 200 | 295 | 35 |

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

Remarks1. No oil hole is provided.

2. Grease is not prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.



CRB

CRB...UU

| $r_{min}^{(1)}$ | Mounting dimensions mm | | CRBC | | CRB | |
|-----------------|------------------------|-------|-------------------------------------|--|-------------------------------------|--|
| | d_a | D_a | Basic dynamic load rating C N | Basic static load rating C_0 N | Basic dynamic load rating C N | Basic static load rating C_0 N |
| | 0.3 | 34 | 44 | 3 830 | 4 130 | 5 290 |
| 0.3 | 44 | 54 | 4 280 | 5 140 | 5 980 | 8 040 |
| 0.6 | 55 | 71 | 10 700 | 12 600 | 14 200 | 18 400 |
| 0.6 | 64 | 81 | 11 600 | 14 600 | 15 400 | 21 500 |
| 0.6 | 75 | 91 | 12 300 | 16 700 | 17 000 | 25 500 |
| 0.6 | 86 | 107 | 18 200 | 25 500 | 24 300 | 37 500 |
| 1 | 98 | 118 | 19 400 | 28 600 | 25 900 | 42 100 |
| 1 | 108 | 134 | 31 500 | 45 100 | 39 400 | 61 100 |
| 1 | 118 | 144 | 33 500 | 50 700 | 41 200 | 66 700 |
| 1.5 | 132 | 164 | 47 700 | 70 500 | 59 900 | 95 400 |
| 1.5 | 140 | 172 | 49 200 | 74 800 | 61 000 | 99 800 |
| 1.5 | 151 | 183 | 50 700 | 79 200 | 64 100 | 108 000 |
| 1.5 | 160 | 192 | 53 800 | 87 700 | 65 000 | 113 000 |
| 1.5 | 166 | 202 | 69 200 | 108 000 | 85 900 | 144 000 |
| 2 | 208 | 239 | 60 200 | 110 000 | 75 300 | 148 000 |
| 2 | 218 | 262 | 108 000 | 178 000 | 133 000 | 234 000 |
| 2 | 221 | 274 | 137 000 | 215 000 | 168 000 | 282 000 |

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

CROSSED ROLLER BEARINGS

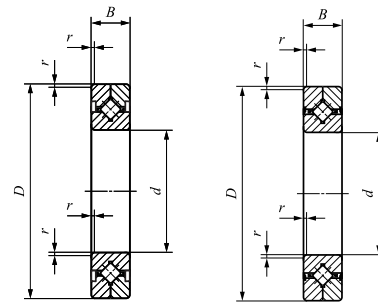
Standard Type Crossed Roller Bearings

Open Type/With Cage

Sealed Type/With Cage

Open Type/Full Complement Type

Sealed Type/Full Complement Type



CRBC 25025
CRBC 30025 CRB 25025UU
CRB 30025UU

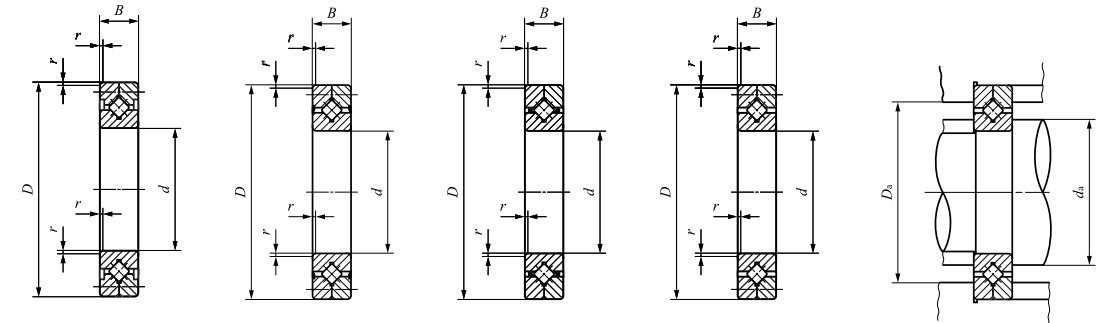
Shaft dia. 250 – 800mm

| Shaft dia. mm | Identification number | | | | Mass (Ref.) kg | Boundary dimensions mm | | |
|------------------|-----------------------|---------------|-----------------|--------------|-------------------|------------------------|-------|-----|
| | With Cage | | Full complement | | | d | D | B |
| | Open Type | Seald Type | Open Type | Seald Type | | | | |
| 250 | CRBC 25025 | CRBC 25025 UU | CRB 25025 | CRB 25025 UU | 4.97 | 250 | 310 | 25 |
| | CRBC 25030 | — | CRB 25030 | — | 8.1 | 250 | 330 | 30 |
| | CRBC 25040 | — | CRB 25040 | — | 14.8 | 250 | 355 | 40 |
| 300 | CRBC 30025 | CRBC 30025 UU | CRB 30025 | CRB 30025 UU | 5.88 | 300 | 360 | 25 |
| | CRBC 30035 | — | CRB 30035 | — | 13.4 | 300 | 395 | 35 |
| | CRBC 30040 | — | CRB 30040 | — | 17.2 | 300 | 405 | 40 |
| 400 | CRBC 40035 | — | CRB 40035 | — | 14.5 | 400 | 480 | 35 |
| | CRBC 40040 | — | CRB 40040 | — | 23.5 | 400 | 510 | 40 |
| | CRBC 40070 | — | CRB 40070 | — | 72.4 | 400 | 580 | 70 |
| 500 | CRBC 50040 | — | CRB 50040 | — | 26.0 | 500 | 600 | 40 |
| | CRBC 50050 | — | CRB 50050 | — | 41.7 | 500 | 625 | 50 |
| | CRBC 50070 | — | CRB 50070 | — | 86.1 | 500 | 680 | 70 |
| 600 | CRBC 60040 | — | CRB 60040 | — | 30.6 | 600 | 700 | 40 |
| | CRBC 60070 | — | CRB 60070 | — | 102 | 600 | 780 | 70 |
| | CRBC 600120 | — | CRB 600120 | — | 274 | 600 | 870 | 120 |
| 700 | CRBC 70045 | — | CRB 70045 | — | 46.5 | 700 | 815 | 45 |
| | CRBC 70070 | — | CRB 70070 | — | 115 | 700 | 880 | 70 |
| | CRBC 700150 | — | CRB 700150 | — | 478 | 700 | 1 020 | 150 |
| 800 | CRBC 80070 | — | CRB 80070 | — | 109 | 800 | 950 | 70 |
| | CRBC 800100 | — | CRB 800100 | — | 247 | 800 | 1 030 | 100 |

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

Remarks1. No oil hole is provided.

2. Grease is not prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.



CRBC 25025
CRB 30025 CRB 25025UU
CRB 30025UU CRBC CRB

| $r_{min}^{(1)}$ | Mounting dimensions mm | | CRBC | | CRB | |
|-----------------|------------------------|-------|-----------------------------|--------------------------------|-----------------------------|--------------------------------|
| | d_a | D_a | Basic dynamic load rating C | Basic static load rating C_0 | Basic dynamic load rating C | Basic static load rating C_0 |
| | | | N | N | N | N |
| 2.5 | 259 | 290 | 67 200 | 136 000 | 83 900 | 183 000 |
| 2.5 | 265 | 310 | 116 000 | 208 000 | 146 000 | 283 000 |
| 2.5 | 271 | 330 | 179 000 | 299 000 | 215 000 | 382 000 |
| 2.5 | 310 | 341 | 73 800 | 162 000 | 91 900 | 217 000 |
| 2.5 | 318 | 372 | 163 000 | 299 000 | 205 000 | 408 000 |
| 2.5 | 321 | 381 | 194 000 | 351 000 | 235 000 | 451 000 |
| 2.5 | 414 | 457 | 133 000 | 300 000 | 165 000 | 400 000 |
| 2.5 | 423 | 483 | 222 000 | 455 000 | 270 000 | 590 000 |
| 2.5 | 430 | 532 | 470 000 | 811 000 | 576 000 | 1 060 000 |
| 2.5 | 517 | 573 | 212 000 | 497 000 | 259 000 | 648 000 |
| 2.5 | 531 | 592 | 247 000 | 561 000 | 306 000 | 747 000 |
| 2.5 | 530 | 633 | 536 000 | 1 020 000 | 653 000 | 1 330 000 |
| 3 | 621 | 676 | 231 000 | 581 000 | 287 000 | 774 000 |
| 3 | 630 | 734 | 591 000 | 1 230 000 | 700 000 | 1 540 000 |
| 3 | 643 | 817 | 1 250 000 | 2 210 000 | 1 490 000 | 2 800 000 |
| 3 | 730 | 785 | 250 000 | 681 000 | 313 000 | 917 000 |
| 3 | 731 | 834 | 630 000 | 1 390 000 | 766 000 | 1 810 000 |
| 3 | 751 | 953 | 1 660 000 | 3 010 000 | 1 980 000 | 3 820 000 |
| 4 | 831 | 907 | 417 000 | 1 090 000 | 513 000 | 1 440 000 |
| 4 | 840 | 972 | 936 000 | 2 040 000 | 1 140 000 | 2 640 000 |

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

CROSSED ROLLER BEARINGS

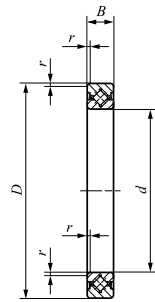
Slim Type Crossed Roller Bearings

Open Type/With Cage

Sealed Type/With Cage

Open Type/Full Complement Type

Sealed Type/Full Complement Type

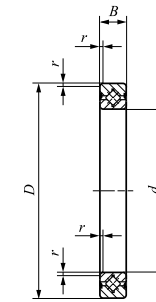


CRBS

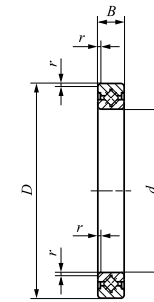
Shaft dia. 50 – 200mm

| Shaft dia. mm | Identification number | | | | | | Mass (Ref.) g |
|------------------|------------------------|------------------------------|--------------|-----------------|------------|-----|---------------------|
| | With Cage Open Type | With Separator Seald Type | | Full complement | | | |
| | | | | Open Type | Seald Type | | |
| 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 | |

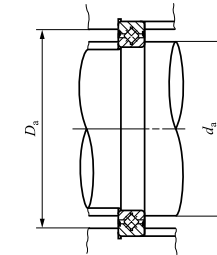
Note⁽¹⁾ Minimum allowable single value of chamfer dimension *r*
⁽²⁾ Grease is not prepacked. Perform proper lubrication.
⁽³⁾ Grease is prepacked.
 Remarks1. No oil hole is provided.



CRBS...AUU
...VUU



CRBS...V

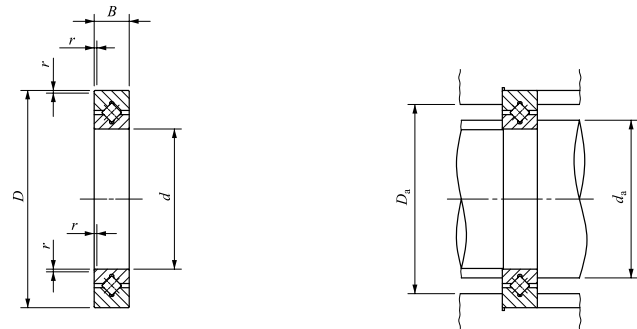


| Boundary dimensions mm | | | | Mounting dimensions mm | | CRBS ⁽²⁾ With cage | | CRBS...AUU ⁽³⁾ With Separator | | CRBS...V ⁽²⁾ CRBS...VUU ⁽³⁾ Full complement | |
|---------------------------|----------|----------|--|---------------------------|-----------------------|--|--|---|--|---|--|
| <i>d</i> | <i>D</i> | <i>B</i> | <i>r</i> _{min} ⁽¹⁾ | <i>d</i> _a | <i>D</i> _a | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> ₀ N | Basic dynamic load rating <i>C</i> N | Basic static load rating <i>C</i> 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 |

J
CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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 | | | | Mounting dimensions mm | | Basic dynamic load rating C N | Basic static load rating C ₀ N |
|------------------|-----------------------|------------------|------------------------|----|---|---------------------------------|------------------------|----------------|-------------------------------------|---|
| | | | d | D | B | r ⁽¹⁾ _{min} | d _a | D _a | | |
| 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.

Remarks1. Oil hole is not provided.
2. Grease is pre-packed.



J

CRBF
CRBH
CRBC
CRB
CRBS
CRBT

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 (MoS₂). 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.

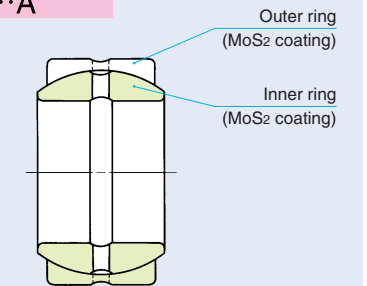
Table 1 Type of bearing

| Type | Steel-on-steel | | Maintenance-free | |
|--------|----------------|-------------|------------------|-------------|
| | Without seals | With seals | Without seals | 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

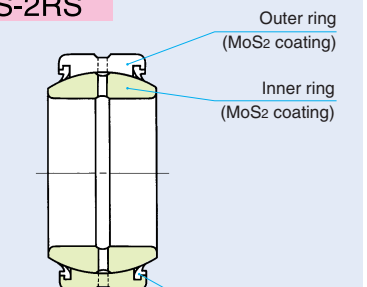
Steel-on-steel type

SB···A



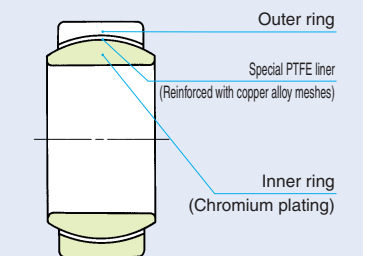
Steel-on-steel type

GE···ES-2RS



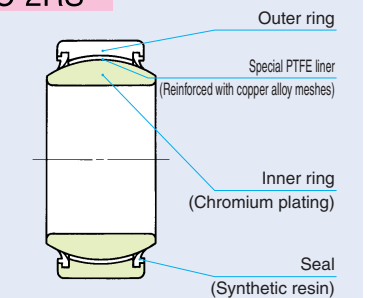
Maintenance-free type

GE···EC



Maintenance-free type

GE···EC-2RS



K

SB
GE
SBB

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

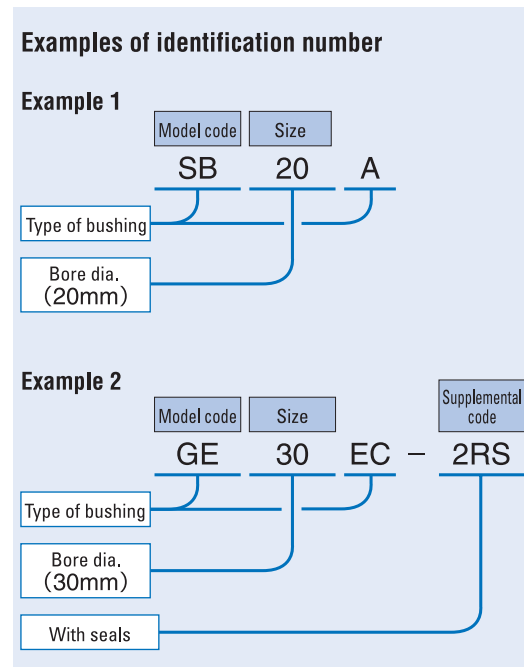
These bushings have the same boundary dimensions as the GE...ES type and can be used internationally. A special PTFE liner reinforced with copper alloy meshes is used on the sliding surface. Therefore, creep deformation due to compressive loads is small, and wear resistance is superior. These bushings 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.



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 | |
|--|---|--------|--|------|--|------|
| | 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 | |
|--|---|--------|--|--------|--|-------|
| | 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

| Nominal bore dia. mm | SB type | | SB...A type | |
|----------------------|---------|------|-------------|------|
| | Min. | Max. | Min. | Max. |
| 12 | 70 | 125 | 32 | 68 |
| 15 | | | 40 | 82 |
| 20 | | | | |
| 22 | 75 | 140 | | |
| 25 | | | 50 | 100 |
| 30 | | | | |
| 35 | | | | |
| 40 | 85 | 150 | | |
| 45 | | | 60 | 120 |
| 50 | | | | |
| 55 | | | | |
| 60 | 90 | 160 | | |
| 65 | | | | |
| 70 | | | 72 | 142 |
| 75 | 95 | 170 | | |
| 80 | | | | |
| 85 | | | | |
| 90 | 100 | 185 | | |
| 95 | | | | |
| 100 | | | 85 | 165 |
| 110 | | | | |
| 115 | 110 | 200 | | |
| 120 | | | | |
| 130 | | | | |
| 150 | 120 | 215 | 100 | 192 |

Table 5 Radial internal clearance of GE type (Steel-on-steel)

unit: μm

| Nominal bore dia. mm | Radial internal clearance | Min. | Max. |
|----------------------|---------------------------|------|------|
| | | | |
| GE...E GE...ES | GE...G GE...GS | | |
| 4 | — | 32 | 68 |
| 5 | — | | |
| 6 | — | | |
| 8 | 6 | | |
| 10 | 8 | | |
| 12 | 10 | | |
| 15 | 12 | 40 | 82 |
| 17 | 15 | | |
| 20 | 17 | | |
| 25 | 20 | | |
| 30 | 25 | 50 | 100 |
| 35 | 30 | | |
| 40 | 35 | | |
| 45 | 40 | | |
| 50 | 45 | | |
| 60 | 50 | | |
| 70 | 60 | 72 | 142 |
| 80 | 70 | | |
| 90 | 80 | | |
| 100 | 90 | | |
| 110 | 100 | 85 | 165 |
| 120 | 110 | | |
| 140 | 120 | | |
| 160 | 140 | | |
| 180 | 160 | | |
| 200 | 180 | 100 | 192 |
| 220 | 200 | | |
| 240 | 220 | | |
| 260 | 240 | | |
| 280 | 260 | 110 | 214 |
| 300 | 280 | | |

Remark Also applicable to bushings with seals.

Table 6 Radial internal clearance of GE...EC type (Maintenance-free)

unit: μm

| Nominal bore dia. mm | Radial internal clearance | |
|----------------------|---------------------------|------|
| | Min. | Max. |
| 15 | 0 | 40 |
| 17 | | |
| 20 | | |
| 25 | 0 | 50 |
| 30 | | |
| 35 | | |
| 40 | 0 | 60 |
| 45 | | |
| 50 | | |
| 60 | | |
| 70 | | |

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 | 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

1 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 | Alternate |
| Steel-on-steel | $\leq 0.3C_d$ | $\leq 0.6C_d$ |
| Maintenance-free | $\leq C_d$ | $\leq 0.5C_d$ |

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.

$$C_{dt} = f_t C_d \quad \text{.....(1)}$$

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 $^{\circ}\text{C}$ | | | | | |
|------------------|--------------------------------|------------|-------------|--------------|--------------|--------------|
| | -30 +80 | +80 +90 | +90 +100 | +100 +120 | +120 +150 | +150 +180 |
| Steel-on-steel | Without seals | 1 | 1 | 1 | 1 | 0.7 |
| | With seals | 1 | — | — | — | — |
| Maintenance-free | Without seals | 1 | 1 | 0.9 | 0.75 | 0.55 |
| | With seals | 1 | — | — | — | — |

2 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.

$$P = F_r + YF_a \quad \text{.....(2)}$$

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.

1 Life 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.

$$p = \frac{100P}{C_{dt}} \quad \text{.....(3)}$$

$$V = 5.82 \times 10^{-4} d_k \beta f \quad \text{.....(4)}$$

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 $\beta < 5^{\circ}$, $\beta = 5$

when rotating, $\beta = 90$

f : Number of oscillations per minute cpm

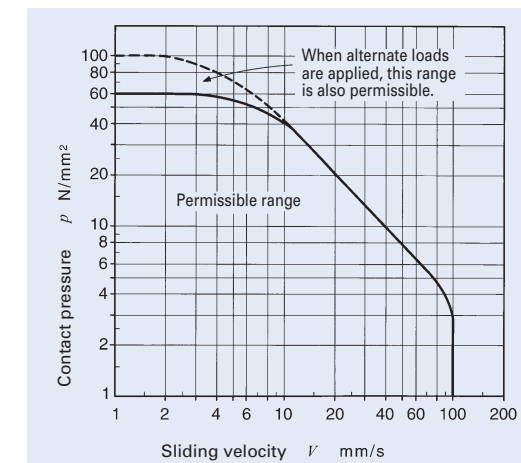


Fig.1 pV diagram of Steel-on-steel spherical bushings

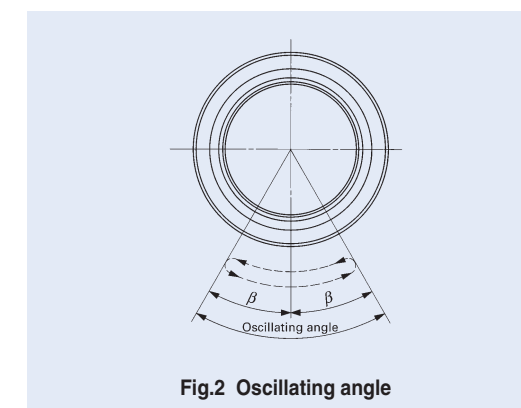


Fig.2 Oscillating angle

[2] Life calculation

The life of steel-on-steel spherical bushings can be calculated from the following formulae.

$$G = \frac{3.18b_1b_2b_3}{\sqrt{d_k\beta}} \left(\frac{C_{dt}}{P}\right)^2 \times 10^5 \dots\dots(5)$$

$$L_h = \frac{G}{60f} \dots\dots(6)$$

- 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 |

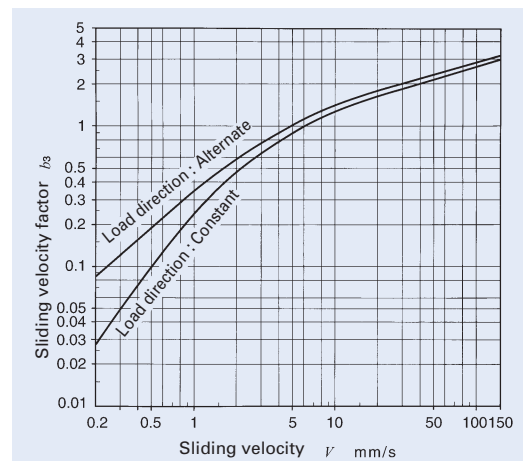


Fig.3 Sliding velocity factor

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.

$$G = 16.67 \times b_1 \frac{Sf}{V} \dots\dots(7)$$

$$L_h = \frac{G}{60f} \dots\dots(8)$$

- 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

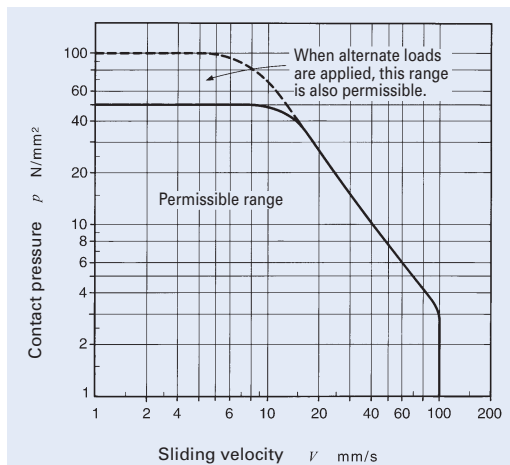


Fig.4 pV diagram of Maintenance-free spherical bushings

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 decreases sharply.

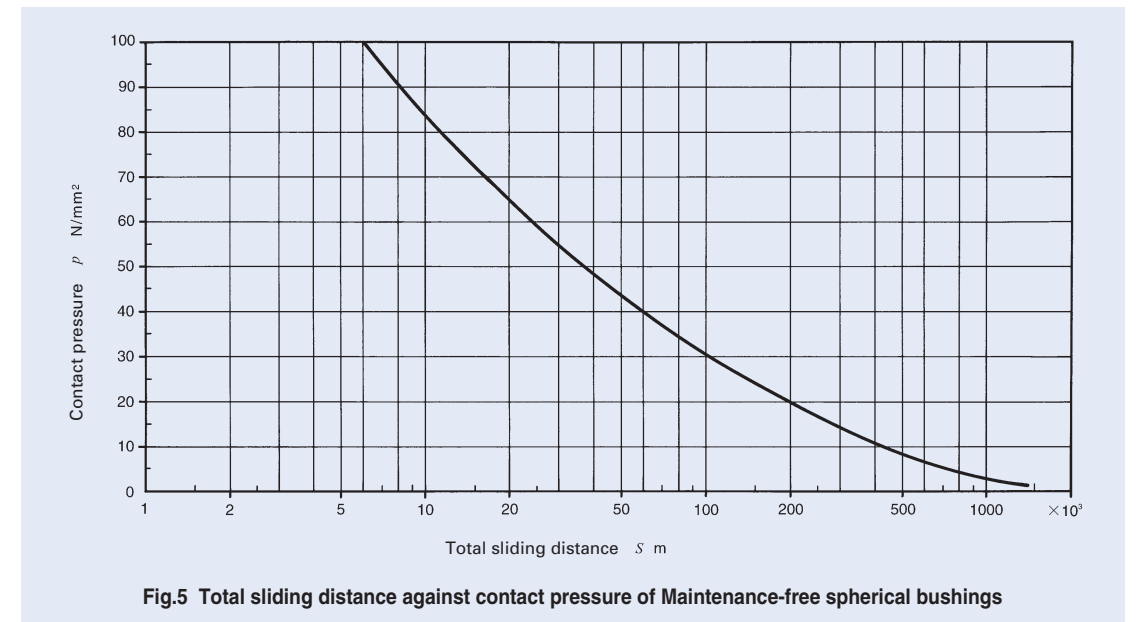


Fig.5 Total sliding distance against contact pressure of Maintenance-free spherical bushings

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 (MoS₂) 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 | 0 |
| | | GE...G | |
| | Inch series | SB, SB...A | 2 |
| | | GE...ES, GE...GS | |
| 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.

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.

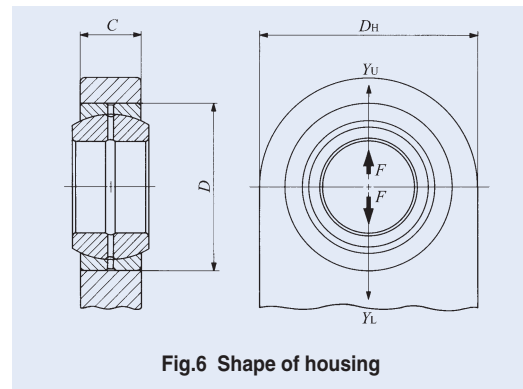


Fig.6 Shape of housing

① When the load acts in the Y_L direction; Select the housing material considering the compressive stress obtained from the following formula.

$$\sigma_1 = \frac{F}{CD} \dots\dots\dots(9)$$

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

② When the load acts in the Y_U direction ; Select the housing material considering the tensile stress obtained from the following formula.

$$\sigma_2 = \frac{F}{C(D_H - D)} k \dots\dots\dots(10)$$

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.)

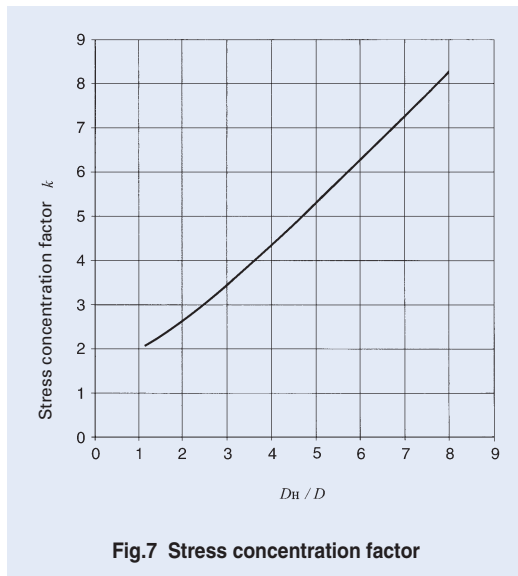


Fig.7 Stress concentration factor

Mounting

- ① When 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.
- ② The shoulder dimensions of shaft and housing are shown in the dimension tables.

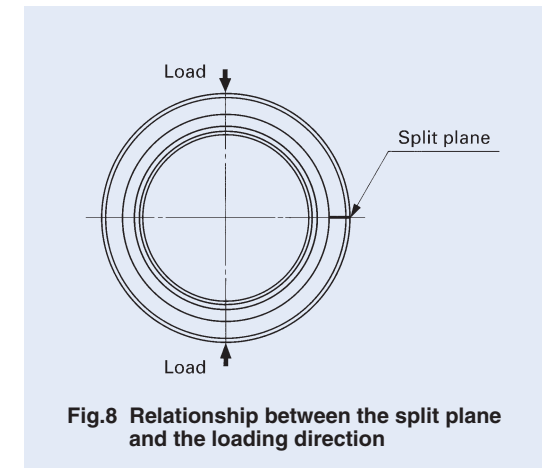


Fig.8 Relationship between the split plane and the loading direction

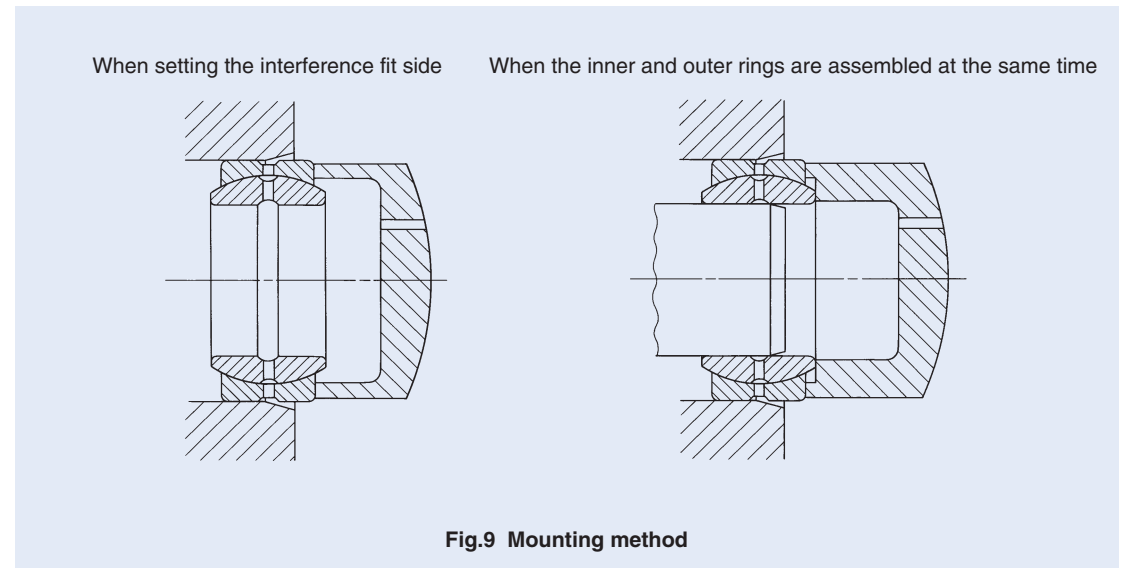


Fig.9 Mounting method

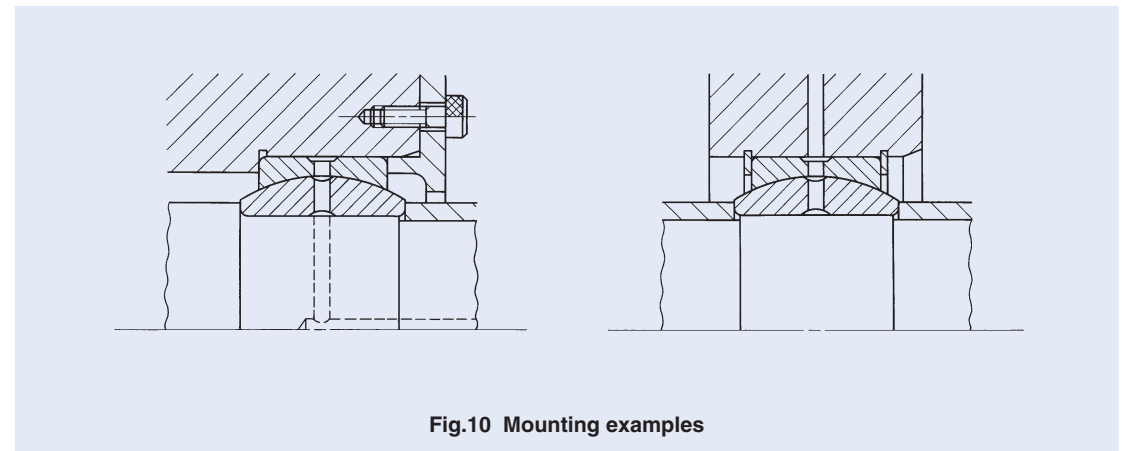


Fig.10 Mounting examples

SPHERICAL BUSHINGS

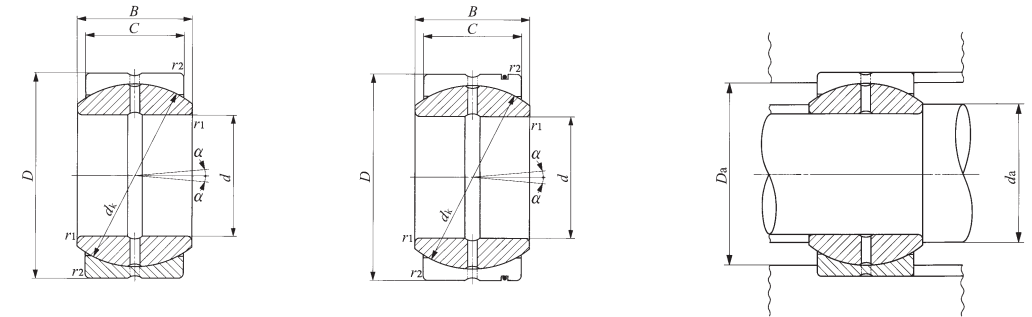
Steel-on-steel Spherical Bushings



Shaft dia. 12 – 100mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | Permissible tilting angle α |
|------------------|-----------------------|-------------|----------------------|---------------------------|-----|----|----|----------------|-----------------------------------|-----------------------------------|
| | SB | SB | | d | D | B | C | d _k | r _{s min} ⁽¹⁾ | |
| 12 | SB 12A | SB 122211 | 0.019 | 12 | 22 | 11 | 9 | 18 | 0.3 | 7 |
| 15 | SB 15A | SB 152613 | 0.028 | 15 | 26 | 13 | 11 | 22 | 0.3 | 6 |
| 20 | SB 20A | SB 203216 | 0.053 | 20 | 32 | 16 | 14 | 28 | 0.3 | 4 |
| 22 | SB 22A | SB 223719 | 0.085 | 22 | 37 | 19 | 16 | 32 | 0.3 | 6 |
| 25 | SB 25A | SB 254221 | 0.116 | 25 | 42 | 21 | 18 | 36 | 0.3 | 5 |
| 30 | SB 30A | SB 305027 | 0.225 | 30 | 50 | 27 | 23 | 45 | 0.6 | 6 |
| 35 | SB 35A | SB 355530 | 0.300 | 35 | 55 | 30 | 26 | 50 | 0.6 | 5 |
| 40 | SB 40A | SB 406233 | 0.375 | 40 | 62 | 33 | 28 | 55 | 0.6 | 6 |
| 45 | SB 45A | SB 457236 | 0.600 | 45 | 72 | 36 | 31 | 62 | 0.6 | 5 |
| 50 | SB 50A | SB 508042 | 0.870 | 50 | 80 | 42 | 36 | 72 | 0.6 | 5 |
| 55 | SB 55A | SB 559047 | 1.26 | 55 | 90 | 47 | 40 | 80 | 0.6 | 5 |
| 60 | SB 60A | SB 6010053 | 1.70 | 60 | 100 | 53 | 45 | 90 | 0.6 | 6 |
| 65 | SB 65A | SB 6510555 | 2.05 | 65 | 105 | 55 | 47 | 94 | 0.6 | 5 |
| 70 | SB 70A | SB 7011058 | 2.22 | 70 | 110 | 58 | 50 | 100 | 0.6 | 5 |
| 75 | SB 75A | SB 7512064 | 3.02 | 75 | 120 | 64 | 55 | 110 | 0.6 | 5 |
| 80 | SB 80A | SB 8013070 | 3.98 | 80 | 130 | 70 | 60 | 120 | 0.6 | 5 |
| 85 | SB 85A | SB 8513574 | 4.29 | 85 | 135 | 74 | 63 | 125 | 0.6 | 6 |
| 90 | SB 90A | SB 9014076 | 4.71 | 90 | 140 | 76 | 65 | 130 | 0.6 | 5 |
| 95 | SB 95A | SB 9515082 | 6.05 | 95 | 150 | 82 | 70 | 140 | 0.6 | 5 |
| 100 | SB 100A | SB 10016088 | 7.42 | 100 | 160 | 88 | 75 | 150 | 1 | 5 |

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.



SB...A

SB

| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 14 | 14 | 19.5 | 17 | 15 900 | 95 300 |
| 17.5 | 17.5 | 23.5 | 21 | 23 700 | 142 000 |
| 22.5 | 23 | 29.5 | 26 | 38 400 | 231 000 |
| 24.5 | 25.5 | 34.5 | 30 | 50 200 | 301 000 |
| 27.5 | 29 | 39.5 | 34 | 63 500 | 381 000 |
| 34.5 | 36 | 45.5 | 42 | 101 000 | 609 000 |
| 39.5 | 40 | 50.5 | 46.5 | 127 000 | 765 000 |
| 44 | 44 | 57.5 | 51.5 | 151 000 | 906 000 |
| 49.5 | 50.5 | 67.5 | 58 | 188 000 | 1 130 000 |
| 54.5 | 58.5 | 75.5 | 67 | 254 000 | 1 530 000 |
| 59.5 | 64.5 | 85.5 | 74.5 | 314 000 | 1 880 000 |
| 64.5 | 72.5 | 95.5 | 83.5 | 397 000 | 2 380 000 |
| 69.5 | 76 | 100.5 | 87 | 433 000 | 2 600 000 |
| 74.5 | 81.5 | 105.5 | 93 | 490 000 | 2 940 000 |
| 79.5 | 89.5 | 115.5 | 102 | 593 000 | 3 560 000 |
| 84.5 | 97.5 | 125.5 | 112 | 706 000 | 4 240 000 |
| 89.5 | 100.5 | 130.5 | 116 | 772 000 | 4 630 000 |
| 94.5 | 105.5 | 135.5 | 121 | 829 000 | 4 970 000 |
| 99.5 | 113.5 | 145.5 | 130 | 961 000 | 5 770 000 |
| 105.5 | 121.5 | 154.5 | 139 | 1 100 000 | 6 620 000 |

K

SB
GE
SBB

SPHERICAL BUSHINGS

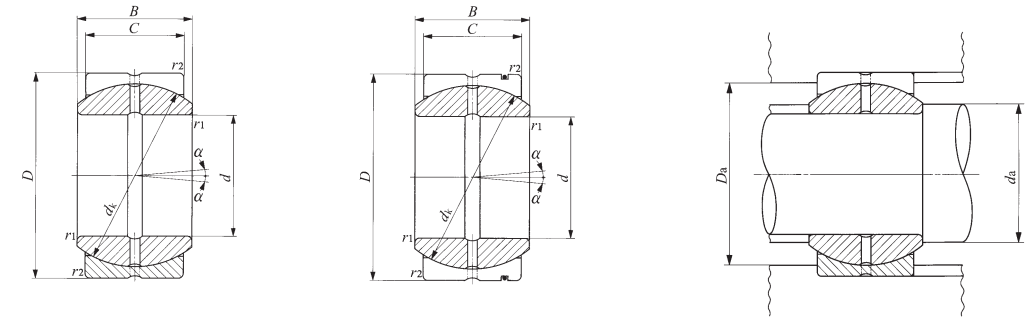
Steel-on-steel Spherical Bushings



Shaft dia. 110 – 150mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | Permissible tilting angle degree α |
|------------------|-----------------------|---------------------|----------------------|---------------------------|-----|-----|-----|-------|--------------------|--|
| | | | | d | D | B | C | d_k | $r_{s\ min}^{(1)}$ | |
| 110 | SB 110A | SB 11017093 | 8.55 | 110 | 170 | 93 | 80 | 160 | 1 | 5 |
| 115 | SB 115A | SB 11518098 | 10.3 | 115 | 180 | 98 | 85 | 165 | 1 | 5 |
| 120 | SB 120A | SB 120190105 | 12.4 | 120 | 190 | 105 | 90 | 175 | 1 | 5 |
| 130 | SB 130A | SB 130200110 | 13.8 | 130 | 200 | 110 | 95 | 185 | 1 | 5 |
| 150 | SB 150A | SB 150220120 | 17.0 | 150 | 220 | 120 | 105 | 205 | 1 | 5 |

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.



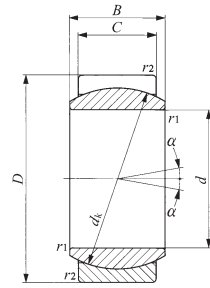
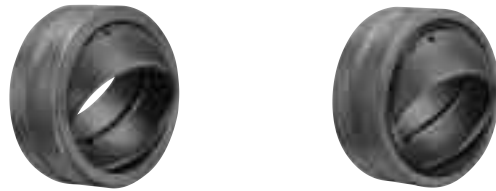
SB...A

SB

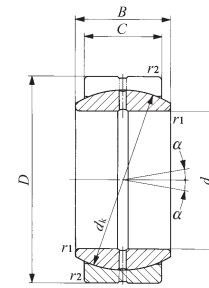
| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|------------------------------|---------------|---------------|--|---------------------------------------|
| d_a Min. | d_a Max. ⁽²⁾ | D_a Max. | D_a Min. | | |
| 115.5 | 130 | 164.5 | 149 | 1 260 000 | 7 530 000 |
| 120.5 | 132.5 | 174.5 | 152 | 1 380 000 | 8 250 000 |
| 125.5 | 140 | 184.5 | 162 | 1 540 000 | 9 270 000 |
| 135.5 | 148.5 | 194.5 | 171 | 1 720 000 | 10 300 000 |
| 155.5 | 166 | 214.5 | 189 | 2 110 000 | 12 700 000 |

SPHERICAL BUSHINGS

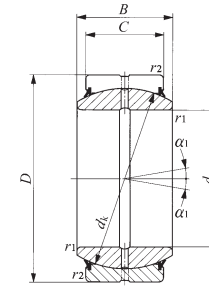
Steel-on-steel Spherical Bushings



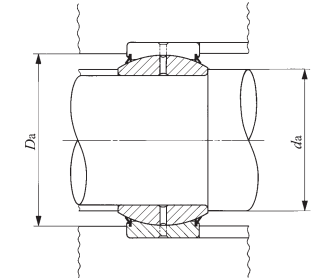
GE...E



GE...ES



GE...ES-2RS



Shaft dia. 4 – 100mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | | Permissible tilting angle degree | |
|------------------|-----------------------|--------------|----------------------|---------------------------|-----|-----|-----|-------|---------------------|---------------------|--|------------|
| | Without seals | With seals | | d | D | B | C | d_k | $r_{1s \min}^{(1)}$ | $r_{2s \min}^{(1)}$ | α | α_1 |
| 4 | GE 4E | — | 0.003 | 4 | 12 | 5 | 3 | 8 | 0.3 | 0.3 | 16 | — |
| 5 | GE 5E | — | 0.004 | 5 | 14 | 6 | 4 | 10 | 0.3 | 0.3 | 13 | — |
| 6 | GE 6E | — | 0.004 | 6 | 14 | 6 | 4 | 10 | 0.3 | 0.3 | 13 | — |
| 8 | GE 8E | — | 0.008 | 8 | 16 | 8 | 5 | 13 | 0.3 | 0.3 | 15 | — |
| 10 | GE 10E | — | 0.012 | 10 | 19 | 9 | 6 | 16 | 0.3 | 0.3 | 12 | — |
| 12 | GE 12E | — | 0.017 | 12 | 22 | 10 | 7 | 18 | 0.3 | 0.3 | 11 | — |
| 15 | GE 15ES | GE 15ES-2RS | 0.032 | 15 | 26 | 12 | 9 | 22 | 0.3 | 0.3 | 8 | 5 |
| 17 | GE 17ES | GE 17ES-2RS | 0.049 | 17 | 30 | 14 | 10 | 25 | 0.3 | 0.3 | 10 | 7 |
| 20 | GE 20ES | GE 20ES-2RS | 0.065 | 20 | 35 | 16 | 12 | 29 | 0.3 | 0.3 | 9 | 6 |
| 25 | GE 25ES | GE 25ES-2RS | 0.115 | 25 | 42 | 20 | 16 | 35.5 | 0.6 | 0.6 | 7 | 4 |
| 30 | GE 30ES | GE 30ES-2RS | 0.160 | 30 | 47 | 22 | 18 | 40.7 | 0.6 | 0.6 | 6 | 4 |
| 35 | GE 35ES | GE 35ES-2RS | 0.258 | 35 | 55 | 25 | 20 | 47 | 0.6 | 1 | 6 | 4 |
| 40 | GE 40ES | GE 40ES-2RS | 0.315 | 40 | 62 | 28 | 22 | 53 | 0.6 | 1 | 7 | 4 |
| 45 | GE 45ES | GE 45ES-2RS | 0.413 | 45 | 68 | 32 | 25 | 60 | 0.6 | 1 | 7 | 4 |
| 50 | GE 50ES | GE 50ES-2RS | 0.560 | 50 | 75 | 35 | 28 | 66 | 0.6 | 1 | 6 | 4 |
| 60 | GE 60ES | GE 60ES-2RS | 1.10 | 60 | 90 | 44 | 36 | 80 | 1 | 1 | 6 | 3 |
| 70 | GE 70ES | GE 70ES-2RS | 1.54 | 70 | 105 | 49 | 40 | 92 | 1 | 1 | 6 | 4 |
| 80 | GE 80ES | GE 80ES-2RS | 2.29 | 80 | 120 | 55 | 45 | 105 | 1 | 1 | 6 | 4 |
| 90 | GE 90ES | GE 90ES-2RS | 2.82 | 90 | 130 | 60 | 50 | 115 | 1 | 1 | 5 | 3 |
| 100 | GE 100ES | GE 100ES-2RS | 4.43 | 100 | 150 | 70 | 55 | 130 | 1 | 1 | 7 | 5 |

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.

| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 6 | 6 | 9.5 | 8 | 2 350 | 14 100 |
| 7.5 | 8 | 11.5 | 10 | 3 920 | 23 500 |
| 8 | 8 | 11.5 | 10 | 3 920 | 23 500 |
| 10 | 10 | 13.5 | 13 | 6 370 | 38 200 |
| 12.5 | 13 | 16.5 | 15.5 | 9 410 | 56 500 |
| 14.5 | 15 | 19.5 | 17 | 12 400 | 74 100 |
| 17.5 | 18 | 23.5 | 22.5 | 19 400 | 117 000 |
| 19.5 | 20.5 | 27.5 | 26 | 24 500 | 147 000 |
| 22.5 | 24 | 32.5 | 30.5 | 34 100 | 205 000 |
| 29 | 29 | 37.5 | 37 | 55 700 | 334 000 |
| 34 | 34 | 42.5 | 41.5 | 71 800 | 431 000 |
| 39.5 | 39.5 | 49.5 | 48 | 92 200 | 553 000 |
| 44.5 | 45 | 56.5 | 54.5 | 114 000 | 686 000 |
| 49.5 | 50.5 | 62.5 | 60 | 147 000 | 883 000 |
| 54.5 | 56 | 69.5 | 66 | 181 000 | 1 090 000 |
| 65.5 | 66.5 | 84.5 | 79 | 282 000 | 1 690 000 |
| 75.5 | 77.5 | 99.5 | 91 | 361 000 | 2 170 000 |
| 85.5 | 89 | 114.5 | 103 | 463 000 | 2 780 000 |
| 95.5 | 98 | 124.5 | 112 | 564 000 | 3 380 000 |
| 105.5 | 109.5 | 144.5 | 127 | 701 000 | 4 210 000 |

SPHERICAL BUSHINGS

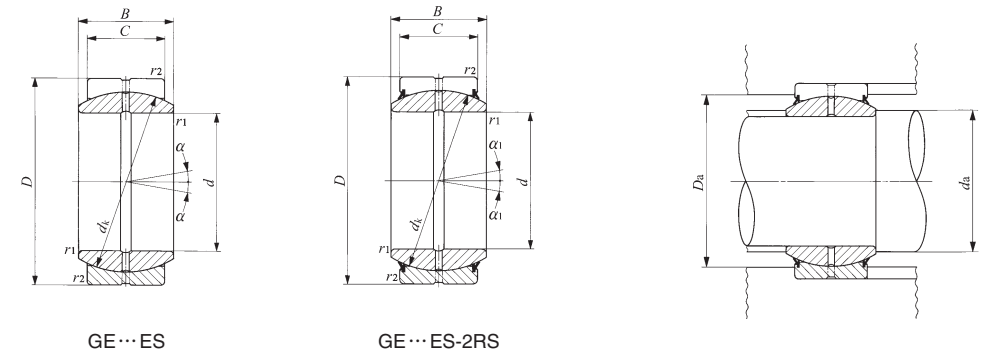
Steel-on-steel Spherical Bushings



Shaft dia. 110 – 300mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | | Permissible tilting angle degree | |
|------------------|-----------------------|--------------|----------------------|---------------------------|-----|-----|-----|-------|---------------------|---------------------|--|------------|
| | Without seals | With seals | | d | D | B | C | d_k | $r_{1s \min}^{(1)}$ | $r_{2s \min}^{(1)}$ | α | α_1 |
| 110 | GE 110ES | GE 110ES-2RS | 4.94 | 110 | 160 | 70 | 55 | 140 | 1 | 1 | 6 | 4 |
| 120 | GE 120ES | GE 120ES-2RS | 8.12 | 120 | 180 | 85 | 70 | 160 | 1 | 1 | 6 | 4 |
| 140 | GE 140ES | GE 140ES-2RS | 11.4 | 140 | 210 | 90 | 70 | 180 | 1 | 1 | 7 | 5 |
| 160 | GE 160ES | GE 160ES-2RS | 14.4 | 160 | 230 | 105 | 80 | 200 | 1 | 1 | 8 | 6 |
| 180 | GE 180ES | GE 180ES-2RS | 18.9 | 180 | 260 | 105 | 80 | 225 | 1.1 | 1.1 | 6 | 5 |
| 200 | GE 200ES | GE 200ES-2RS | 28.1 | 200 | 290 | 130 | 100 | 250 | 1.1 | 1.1 | 7 | 6 |
| 220 | GE 220ES | GE 220ES-2RS | 36.1 | 220 | 320 | 135 | 100 | 275 | 1.1 | 1.1 | 8 | 6 |
| 240 | GE 240ES | GE 240ES-2RS | 40.4 | 240 | 340 | 140 | 100 | 300 | 1.1 | 1.1 | 8 | 6 |
| 260 | GE 260ES | GE 260ES-2RS | 52.0 | 260 | 370 | 150 | 110 | 325 | 1.1 | 1.1 | 7 | 6 |
| 280 | GE 280ES | GE 280ES-2RS | 66.0 | 280 | 400 | 155 | 120 | 350 | 1.1 | 1.1 | 6 | 5 |
| 300 | GE 300ES | GE 300ES-2RS | 76.0 | 300 | 430 | 165 | 120 | 375 | 1.1 | 1.1 | 7 | 6 |

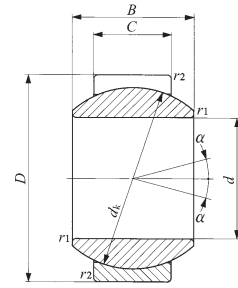
Notes⁽¹⁾ Minimum allowable value of chamfer dimensions r_1 and r_2
⁽²⁾ When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a .
 Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
 2. Not provided with prepacked grease. Perform proper lubrication for use.



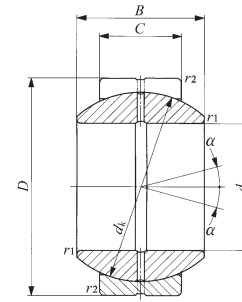
| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 115.5 | 121 | 154.5 | 138 | 755 000 | 4 530 000 |
| 125.5 | 135.5 | 174.5 | 154 | 1 100 000 | 6 590 000 |
| 145.5 | 155.5 | 204.5 | 176 | 1 240 000 | 7 410 000 |
| 165.5 | 170 | 224.5 | 195 | 1 570 000 | 9 410 000 |
| 187 | 199 | 253 | 221 | 1 770 000 | 10 600 000 |
| 207 | 213.5 | 283 | 244 | 2 450 000 | 14 700 000 |
| 227 | 239.5 | 313 | 269 | 2 700 000 | 16 200 000 |
| 247 | 265 | 333 | 296 | 2 940 000 | 17 700 000 |
| 267 | 288 | 363 | 320 | 3 510 000 | 21 000 000 |
| 287 | 313.5 | 393 | 345 | 4 120 000 | 24 700 000 |
| 307 | 336.5 | 423 | 371 | 4 410 000 | 26 500 000 |

SPHERICAL BUSHINGS

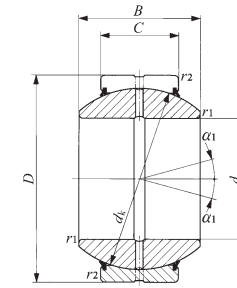
Steel-on-steel Spherical Bushings



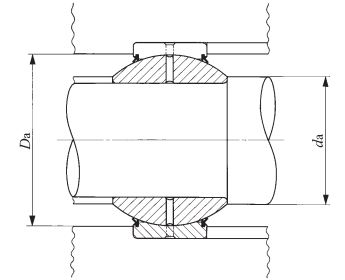
GE...G



GE...GS



GE...GS-2RS



Shaft dia. 6 – 120mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | | Permissible tilting angle degree | |
|------------------|-----------------------|--------------|----------------------|---------------------------|-----|-----|-----|-------|---------------------|---------------------|--|------------|
| | Without seals | With seals | | d | D | B | C | d_k | $r_{1s \min}^{(1)}$ | $r_{2s \min}^{(1)}$ | α | α_1 |
| 6 | GE 6G | — | 0.010 | 6 | 16 | 9 | 5 | 13 | 0.3 | 0.3 | 21 | — |
| 8 | GE 8G | — | 0.015 | 8 | 19 | 11 | 6 | 16 | 0.3 | 0.3 | 21 | — |
| 10 | GE 10G | — | 0.022 | 10 | 22 | 12 | 7 | 18 | 0.3 | 0.3 | 18 | — |
| 12 | GE 12G | — | 0.041 | 12 | 26 | 15 | 9 | 22 | 0.3 | 0.3 | 18 | — |
| 15 | GE 15GS | GE 15GS-2RS | 0.059 | 15 | 30 | 16 | 10 | 25 | 0.3 | 0.3 | 16 | 13 |
| 17 | GE 17GS | GE 17GS-2RS | 0.083 | 17 | 35 | 20 | 12 | 29 | 0.3 | 0.3 | 19 | 16 |
| 20 | GE 20GS | GE 20GS-2RS | 0.155 | 20 | 42 | 25 | 16 | 35.5 | 0.3 | 0.6 | 17 | 16 |
| 25 | GE 25GS | GE 25GS-2RS | 0.215 | 25 | 47 | 28 | 18 | 40.7 | 0.6 | 0.6 | 17 | 15 |
| 30 | GE 30GS | GE 30GS-2RS | 0.330 | 30 | 55 | 32 | 20 | 47 | 0.6 | 1 | 17 | 16 |
| 35 | GE 35GS | GE 35GS-2RS | 0.400 | 35 | 62 | 35 | 22 | 53 | 0.6 | 1 | 16 | 15 |
| 40 | GE 40GS | GE 40GS-2RS | 0.515 | 40 | 68 | 40 | 25 | 60 | 0.6 | 1 | 17 | 14 |
| 45 | GE 45GS | GE 45GS-2RS | 0.660 | 45 | 75 | 43 | 28 | 66 | 0.6 | 1 | 15 | 13 |
| 50 | GE 50GS | GE 50GS-2RS | 1.50 | 50 | 90 | 56 | 36 | 80 | 0.6 | 1 | 17 | 16 |
| 60 | GE 60GS | GE 60GS-2RS | 2.05 | 60 | 105 | 63 | 40 | 92 | 1 | 1 | 17 | 15 |
| 70 | GE 70GS | GE 70GS-2RS | 3.00 | 70 | 120 | 70 | 45 | 105 | 1 | 1 | 16 | 14 |
| 80 | GE 80GS | GE 80GS-2RS | 3.60 | 80 | 130 | 75 | 50 | 115 | 1 | 1 | 14 | 13 |
| 90 | GE 90GS | GE 90GS-2RS | 5.41 | 90 | 150 | 85 | 55 | 130 | 1 | 1 | 15 | 14 |
| 100 | GE 100GS | GE 100GS-2RS | 6.15 | 100 | 160 | 85 | 55 | 140 | 1 | 1 | 14 | 12 |
| 110 | GE 110GS | GE 110GS-2RS | 9.70 | 110 | 180 | 100 | 70 | 160 | 1 | 1 | 12 | 11 |
| 120 | GE 120GS | GE 120GS-2RS | 15.5 | 120 | 210 | 115 | 70 | 180 | 1 | 1 | 16 | 15 |

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...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.

| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 8.5 | 9 | 13.5 | 13 | 6 370 | 38 200 |
| 10.5 | 11.5 | 16.5 | 15.5 | 9 410 | 56 500 |
| 12.5 | 13 | 19.5 | 17 | 12 400 | 74 100 |
| 14.5 | 16 | 23.5 | 21 | 19 400 | 117 000 |
| 17.5 | 19 | 27.5 | 26 | 24 500 | 147 000 |
| 19.5 | 21 | 32.5 | 30.5 | 34 100 | 205 000 |
| 22.5 | 25 | 37.5 | 37 | 55 700 | 334 000 |
| 29.5 | 29.5 | 42.5 | 41.5 | 71 800 | 431 000 |
| 34 | 34 | 49.5 | 48 | 92 200 | 553 000 |
| 39.5 | 39.5 | 56.5 | 54.5 | 114 000 | 686 000 |
| 44.5 | 44.5 | 62.5 | 60 | 147 000 | 883 000 |
| 49.5 | 50 | 69.5 | 66 | 181 000 | 1 090 000 |
| 54.5 | 57 | 84.5 | 79 | 282 000 | 1 690 000 |
| 65.5 | 67 | 99.5 | 91 | 361 000 | 2 170 000 |
| 75.5 | 78 | 114.5 | 103 | 463 000 | 2 780 000 |
| 85.5 | 87 | 124.5 | 112 | 564 000 | 3 380 000 |
| 95.5 | 98 | 144.5 | 127 | 701 000 | 4 210 000 |
| 105.5 | 111 | 154.5 | 138 | 755 000 | 4 530 000 |
| 115.5 | 124.5 | 174.5 | 154 | 1 100 000 | 6 590 000 |
| 125.5 | 138.5 | 204.5 | 176 | 1 240 000 | 7 410 000 |

SPHERICAL BUSHINGS

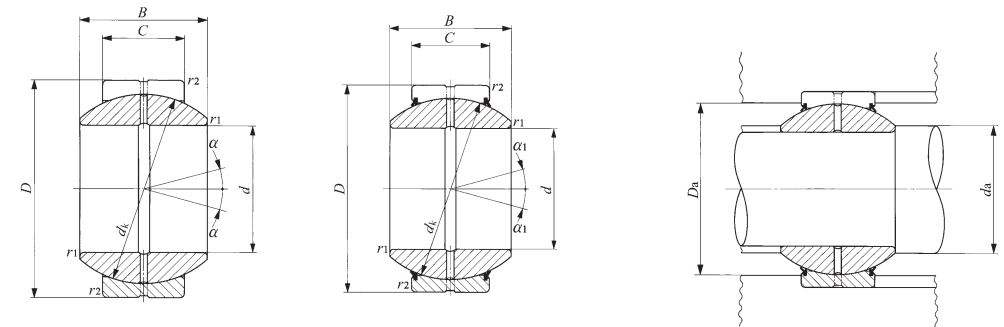
Steel-on-steel Spherical Bushings



Shaft dia. 140 – 280mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | | Permissible tilting angle degree | |
|------------------|-----------------------|--------------|----------------------|---------------------------|-----|-----|-----|-------|---------------------|---------------------|--|------------|
| | Without seals | With seals | | d | D | B | C | d_k | $r_{1s \min}^{(1)}$ | $r_{2s \min}^{(1)}$ | α | α_1 |
| 140 | GE 140GS | GE 140GS-2RS | 19.2 | 140 | 230 | 130 | 80 | 200 | 1 | 1 | 16 | 15 |
| 160 | GE 160GS | GE 160GS-2RS | 25.4 | 160 | 260 | 135 | 80 | 225 | 1 | 1.1 | 16 | 14 |
| 180 | GE 180GS | GE 180GS-2RS | 34.7 | 180 | 290 | 155 | 100 | 250 | 1.1 | 1.1 | 14 | 13 |
| 200 | GE 200GS | GE 200GS-2RS | 43.8 | 200 | 320 | 165 | 100 | 275 | 1.1 | 1.1 | 15 | 14 |
| 220 | GE 220GS | GE 220GS-2RS | 51.3 | 220 | 340 | 175 | 100 | 300 | 1.1 | 1.1 | 16 | 14 |
| 240 | GE 240GS | GE 240GS-2RS | 66.1 | 240 | 370 | 190 | 110 | 325 | 1.1 | 1.1 | 15 | 14 |
| 260 | GE 260GS | GE 260GS-2RS | 81.8 | 260 | 400 | 205 | 120 | 350 | 1.1 | 1.1 | 15 | 14 |
| 280 | GE 280GS | GE 280GS-2RS | 97.4 | 280 | 430 | 210 | 120 | 375 | 1.1 | 1.1 | 15 | 14 |

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.



GE...GS

GE...GS-2RS

| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 145.5 | 152 | 224.5 | 195 | 1 570 000 | 9 410 000 |
| 165.5 | 180 | 253 | 221 | 1 770 000 | 10 600 000 |
| 187 | 196 | 283 | 244 | 2 450 000 | 14 700 000 |
| 207 | 220 | 313 | 269 | 2 700 000 | 16 200 000 |
| 227 | 243.5 | 333 | 296 | 2 940 000 | 17 700 000 |
| 247 | 263.5 | 363 | 320 | 3 510 000 | 21 000 000 |
| 267 | 283.5 | 393 | 345 | 4 120 000 | 24 700 000 |
| 287 | 310.5 | 423 | 371 | 4 410 000 | 26 500 000 |

SPHERICAL BUSHINGS

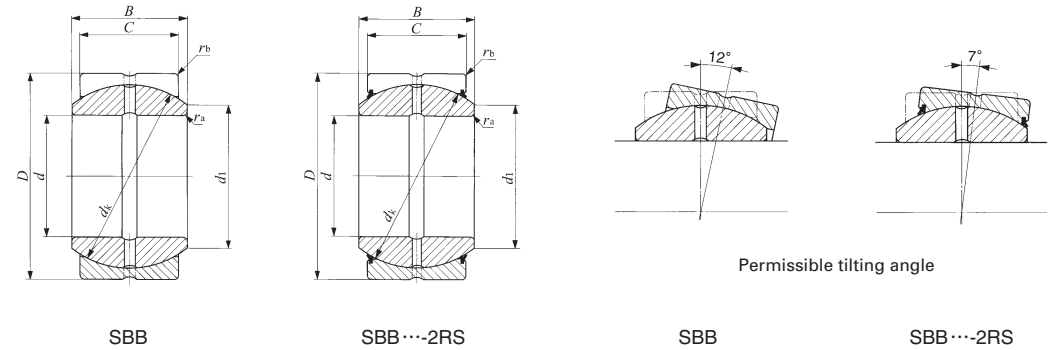
Steel-on-steel Spherical Bushings **Inch Series**



Shaft dia. 12.700 – 63.500mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) kg | Boundary dimensions mm(inch) | | | |
|----------------------------|-----------------------|-------------------|----------------------|---------------------------------|------------------|--------------|--------------|
| | Without seal | With seals | | <i>d</i> | <i>D</i> | <i>B</i> | <i>C</i> |
| 12.700 (1/2) | SBB 8 | — | 0.020 | 12.700(1/2) | 22.225(7/8) | 11.10(.437) | 9.52(.375) |
| 15.875 (5/8) | SBB 10 | — | 0.036 | 15.875(5/8) | 26.988(1 1/16) | 13.89(.547) | 11.91(.469) |
| 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) |
| 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) |
| 25.400 (1) | SBB 16 | SBB 16-2RS | 0.125 | 25.400(1) | 41.275(1 5/8) | 22.22(.875) | 19.05(.750) |
| 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) |
| 34.925 (1 3/8) | SBB 22 | SBB 22-2RS | 0.349 | 34.925(1 3/8) | 55.562(2 1/16) | 30.15(1.187) | 26.19(1.031) |
| 38.100 (1 1/2) | SBB 24 | SBB 24-2RS | 0.424 | 38.100(1 1/2) | 61.912(2 3/16) | 33.32(1.312) | 28.58(1.125) |
| 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) |
| 50.800 (2) | SBB 32 | SBB 32-2RS | 0.939 | 50.800(2) | 80.962(3 1/16) | 44.45(1.750) | 38.10(1.500) |
| 57.150 (2 1/4) | SBB 36 | SBB 36-2RS | 1.32 | 57.150(2 1/4) | 90.488(3 3/16) | 50.01(1.969) | 42.85(1.687) |
| 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) |

Note(1) Maximum allowable corner radius of the shaft or housing
 Remarks1. 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.



| <i>d_k</i> | Radial internal clearance mm Min./Max. | Mounting dimensions mm | | | Dynamic load capacity <i>C_d</i> N | Static load capacity <i>C_s</i> N |
|----------------------|--|---------------------------|--|--|--|---|
| | | <i>d₁</i> | <i>r_{as}</i> ⁽¹⁾ Max. | <i>r_{bs}</i> ⁽¹⁾ Max. | | |
| 18 (.709) | 0.05 / 0.15 | 14.0 | 0.2 | 0.6 | 16 800 | 101 000 |
| 23 (.906) | 0.05 / 0.15 | 17.9 | 0.2 | 0.8 | 26 900 | 161 000 |
| 27.5(1.083) | 0.08 / 0.18 | 21.4 | 0.6 | *0.8 | 38 500 | 231 000 |
| 32 (1.260) | 0.08 / 0.18 | 25.0 | 0.6 | *0.8 | 52 300 | 314 000 |
| 36 (1.417) | 0.08 / 0.18 | 28.0 | 0.6 | *0.8 | 67 300 | 404 000 |
| 45 (1.772) | 0.08 / 0.18 | 35.1 | 0.6 | 0.8 | 105 000 | 630 000 |
| 49 (1.929) | 0.08 / 0.18 | 38.5 | 0.6 | 0.8 | 126 000 | 755 000 |
| 55 (2.165) | 0.08 / 0.18 | 43.3 | 0.6 | 0.8 | 154 000 | 925 000 |
| 64 (2.520) | 0.08 / 0.18 | 50.4 | 0.6 | 0.8 | 209 000 | 1 250 000 |
| 73 (2.874) | 0.08 / 0.18 | 57.6 | 0.6 | 0.8 | 273 000 | 1 640 000 |
| 82 (3.228) | 0.10 / 0.20 | 64.9 | 0.6 | 0.8 | 345 000 | 2 070 000 |
| 91 (3.583) | 0.10 / 0.20 | 72.0 | 0.6 | 0.8 | 425 000 | 2 550 000 |

SPHERICAL BUSHINGS

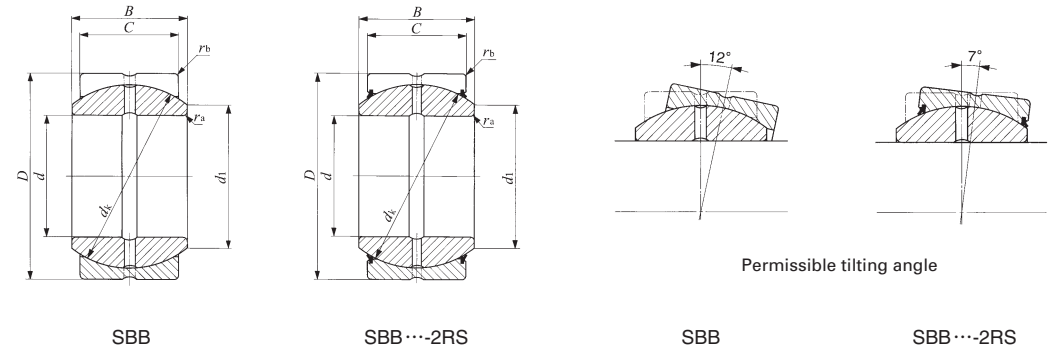
Steel-on-steel Spherical Bushings **Inch Series**



Shaft dia. 69.850 – 152.400mm

| Shaft dia. mm (inch) | Identification number | | Mass (Ref.) kg | Boundary dimensions mm(inch) | | | |
|----------------------------|-----------------------|-------------------|----------------------|---------------------------------|----------------|---------------|---------------|
| | Without seal | With seals | | <i>d</i> | <i>D</i> | <i>B</i> | <i>C</i> |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |
| 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) |

Note(1) Maximum allowable corner radius of the shaft or housing
 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.



| <i>d_k</i> | Radial internal clearance mm Min./Max. | Mounting dimensions mm | | | Dynamic load capacity <i>C_d</i> N | Static load capacity <i>C_s</i> N |
|----------------------|--|---------------------------|---|---|--|---|
| | | <i>d₁</i> | ⁽¹⁾ <i>r_{as}</i> max Max. | ⁽¹⁾ <i>r_{bs}</i> max Max. | | |
| 100(3.937) | 0.10 / 0.20 | 79.0 | 0.6 | 0.8 | 514 000 | 3 080 000 |
| 110(4.331) | 0.10 / 0.20 | 86.5 | 0.6 | 0.8 | 616 000 | 3 700 000 |
| 119(4.685) | 0.13 / 0.23 | 94.1 | 0.6 | 0.8 | 722 000 | 4 330 000 |
| 128(5.039) | 0.13 / 0.23 | 101.6 | 0.6 | 0.8 | 837 000 | 5 020 000 |
| 137(5.394) | 0.13 / 0.23 | 108.4 | 0.6 | 0.8 | 960 000 | 5 760 000 |
| 146(5.748) | 0.13 / 0.23 | 115.8 | 0.6 | 0.8 | 1 090 000 | 6 550 000 |
| 155(6.102) | 0.13 / 0.23 | 122.6 | 0.8 | 1.1 | 1 230 000 | 7 380 000 |
| 164(6.457) | 0.13 / 0.23 | 129.8 | 0.8 | 1.1 | 1 380 000 | 8 270 000 |
| 173(6.811) | 0.13 / 0.23 | 136.8 | 0.8 | 1.1 | 1 530 000 | 9 210 000 |
| 183(7.205) | 0.13 / 0.23 | 144.9 | 0.8 | 1.1 | 1 710 000 | 10 300 000 |
| 207(8.150) | 0.13 / 0.23 | 167.5 | 0.8 | 1.1 | 2 130 000 | 12 800 000 |

SPHERICAL BUSHINGS

Maintenance-free Spherical Bushings



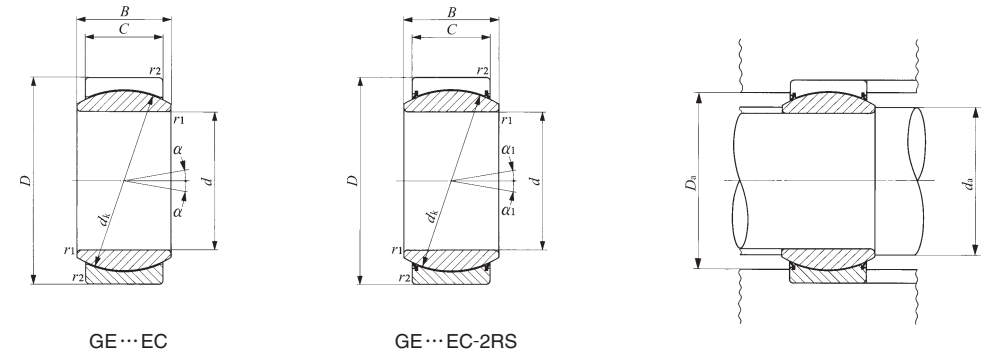
Shaft dia. 15 – 70mm

| Shaft dia. mm | Identification number | | Mass (Ref.) kg | Boundary dimensions mm | | | | | | | Permissible tilting angle degree | |
|------------------|-----------------------|--------------------|----------------------|---------------------------|-----|-----|-----|-------|---------------------|---------------------|--|------------|
| | Without seals | With seals | | d | D | B | C | d_k | $r_{1s \min}^{(1)}$ | $r_{2s \min}^{(1)}$ | 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 |

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.



| Mounting dimensions mm | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|---------------------------|---------------------|-------|------|--|---------------------------------------|
| d_a | | D_a | | | |
| Min. | Max. ⁽²⁾ | Max. | Min. | | |
| 17.5 | 18 | 23.5 | 21.5 | 19 400 | 48 500 |
| 19.5 | 20.5 | 27.5 | 24.5 | 24 500 | 61 300 |
| 22.5 | 24 | 32.5 | 28 | 34 100 | 85 300 |
| 29 | 29 | 37.5 | 34 | 55 700 | 139 000 |
| 34 | 34 | 42.5 | 41.5 | 71 800 | 180 000 |
| 39.5 | 39.5 | 49.5 | 48 | 92 200 | 230 000 |
| 44.5 | 45 | 56.5 | 54.5 | 114 000 | 286 000 |
| 49.5 | 50.5 | 62.5 | 60 | 147 000 | 368 000 |
| 54.5 | 56 | 69.5 | 66 | 181 000 | 453 000 |
| 65.5 | 66.5 | 84.5 | 79 | 282 000 | 706 000 |
| 75.5 | 77.5 | 99.5 | 91 | 361 000 | 902 000 |

PILLOBALLS

- PILLOBALL Spherical Bushings - Insert Type
- PILLOBALL Rod Ends - Insert Type
- PILLOBALL Rod Ends - Die-cast Type
- PILLOBALL Rod Ends - Maintenance-free Type

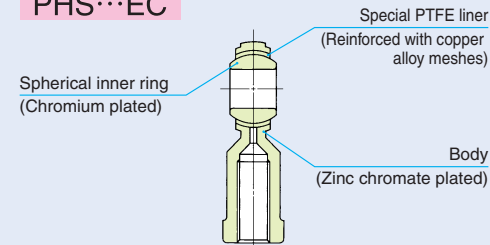


Structure and Features

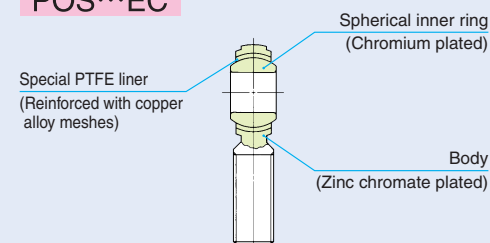
IKO PILLOBALLS are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time. These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner 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

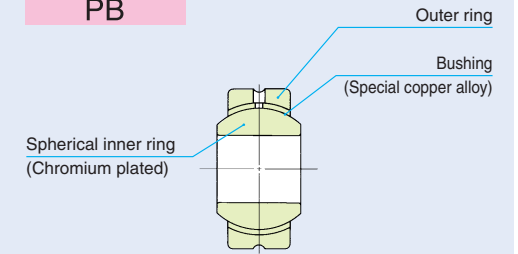


POS...EC

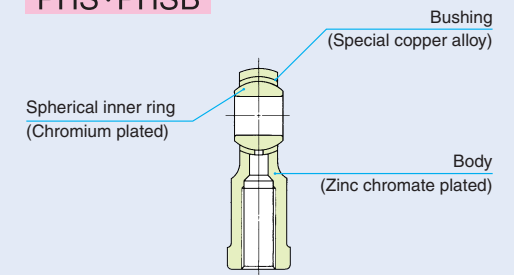


Structures of lubrication type PILLOBALLS

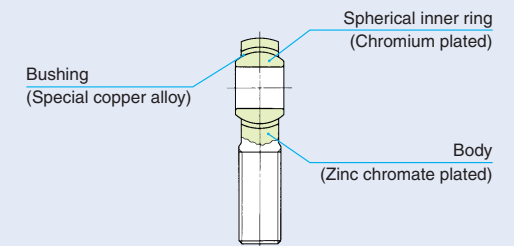
PB



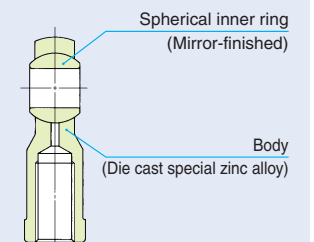
PHS·PHSB



POS·POSB



PHSA



- 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 | — | — | — |

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 ring, 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 (MoS₂) 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

Model code: PHSB 10 NP
 Type: PHSB
 Size: 10 (Bore diameter: 10/16"=15.875mm)
 Supplemental code: NP (With grease nipple⁽¹⁾, Flash type:NP, Zerk type:NF)

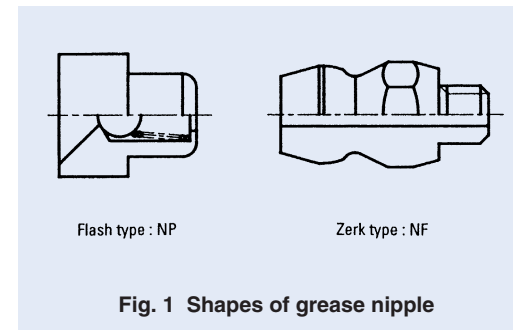
Example 2

Model code: PHS 10 EC L
 Type: PHS
 Size: 10 (Bore diameter: 10mm)
 Supplemental code: EC L (Left hand thread⁽²⁾)

Example 3

Model code: PB 10
 Type: PB
 Size: 10 (Bore diameter: 10mm)

Notes⁽¹⁾ Shapes of grease nipple are shown in Fig.1. In case of no indication of grease nipple type, zerk type is supplied.
⁽²⁾ Right hand thread is indicated with no code.



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

| Type | Dimension | Dimension symbol | Tolerance |
|------------------------------------|----------------------------|-----------------------|--------------------|
| PB | Bore dia. of inner ring | <i>d</i> | H7 |
| | Outside dia. of outer ring | <i>D</i> | h6 |
| | Width of inner ring | <i>B</i> | 0 - 0.1 |
| | Width of outer ring | <i>C</i> | ± 0.1 |
| PHS POS PHS···EC POS···EC | Bore dia. of inner ring | <i>d</i> | H7 |
| | Width of inner ring | <i>B</i> | 0 - 0.1 |
| PHSB POSB | Bore dia. of inner ring | <i>d</i> | + 0.038 - 0.013 |
| | Width of inner ring | <i>B</i> ₁ | 0 - 0.127 |
| PHSA | Bore dia. of inner ring | <i>d</i> | + 0.063 - 0.012 |
| | Width of inner ring | <i>B</i> | See Table 3. |

Table 3 Tolerance of width *B* of inner ring of PHSA type

| Nominal bore dia. of inner ring | Δ_{Bs} | | | |
|---------------------------------|---------------|-------|-------|-----|
| | 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

① 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.

$$C_{dt} = f_t C_d \dots \dots \dots (1)$$

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 °C | | | | | |
|------------------------------|----------------|--------------|---------------|----------------|----------------|----------------|
| | - 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 | — |

② 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.

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.

$$P = F_r + YF_a \dots\dots\dots(2)$$

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 | 1 | 2 | 3 | 4 | 5 | Unusable |
| 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.

**① 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.

$$p = \frac{50P}{C_{dt}} \dots\dots\dots(3)$$

$$V = 5.82 \times 10^{-4} d_k \beta f \dots\dots\dots(4)$$

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 $\beta < 5^\circ$, $\beta = 5$

when rotating, $\beta = 90$

f : Number of oscillations per minute, cpm

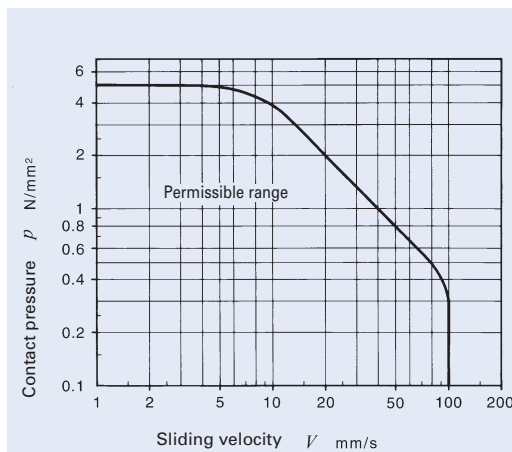


Fig. 2 pV diagram of lubrication type PILLOBALLS

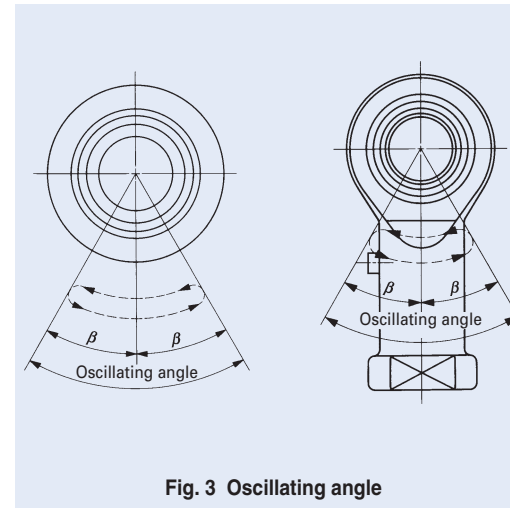


Fig. 3 Oscillating angle

[2] Life calculation

The life of lubrication type PILLOBALLS can be calculated by the following formulae.

$$G = \frac{3.18b_1b_2b_3}{\sqrt{d_k \beta}} \left(\frac{C_{dt}}{P} \right)^2 \times 10^5 \dots\dots\dots(5)$$

$$L_h = \frac{G}{60f} \dots\dots\dots(6)$$

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 |

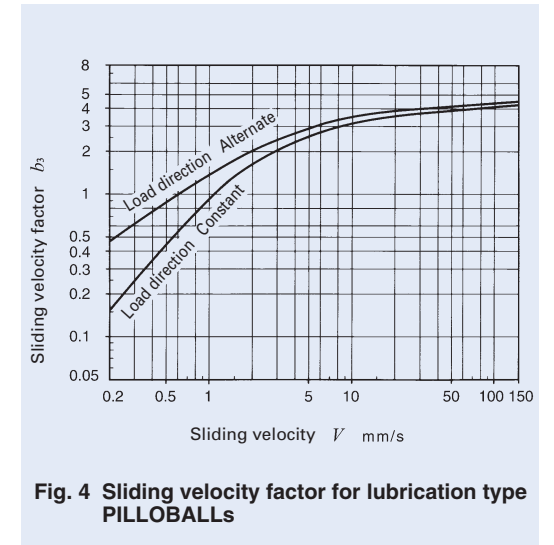


Fig. 4 Sliding velocity factor for lubrication type PILLOBALLS

② 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.

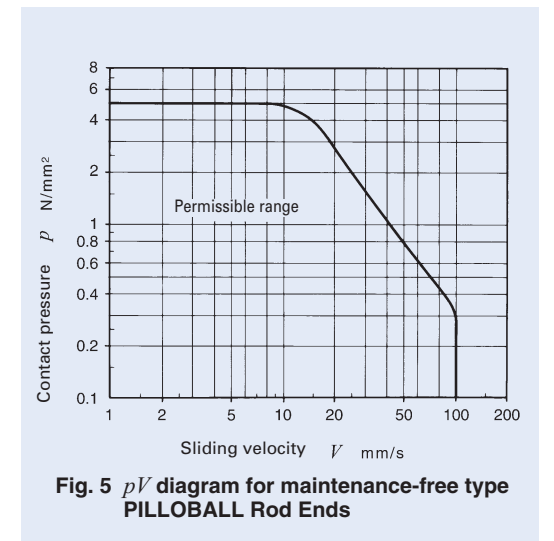


Fig. 5 pV diagram for maintenance-free type PILLOBALL Rod Ends

K

PB
PHS
PHSB
POS
POSB
PHSA

[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.


$$G = 16.67 \times b_1 \times \frac{Sf}{V} \dots\dots\dots(7)$$

$$L_h = \frac{G}{60f} \dots\dots\dots(8)$$

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 , as the factor decreases sharply.

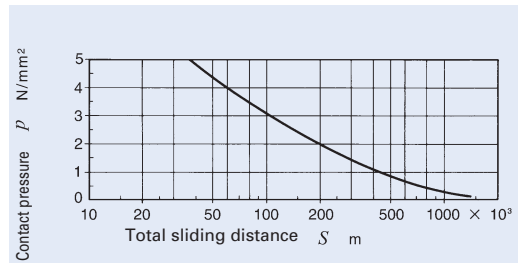



Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

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 .

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

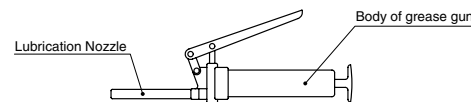
| Type | Specification | |
|------------------------|------------------------------------|-------------------------|
| | Bore diameter of inner ring d mm | |
| PB | | 1 oil hole + oil groove |
| PHS | $d \leq 4$ | None |
| | $4 < d$ | With grease nipple |
| POS | $d \leq 4$ | None |
| | $4 < d \leq 6$ | 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 attached 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

1 Tightening depth

The recommended tightening depth of the screw into the PILLOBALL Rod End body is shown below.

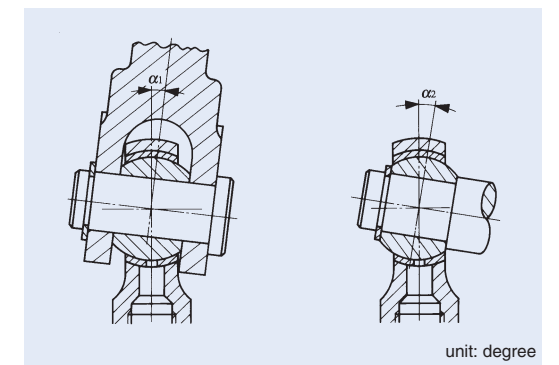
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

Die-cast type: 2 times the nominal thread dia. or more.

2 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 | | PHSA | |
|----------------------------|--|------------|------------|------------|
| | α_1 | α_2 | 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.

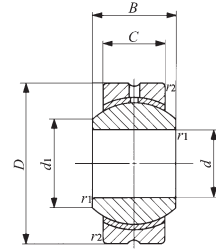
Table 13 Allowable tilting angle for inch series

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 |

PILLOBALL

Lubrication Type PILLOBALL Spherical Bushings **Insert Type**



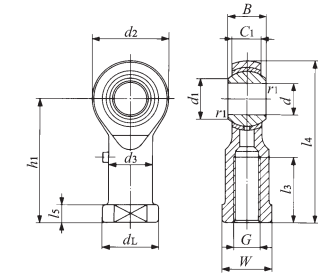
PB

| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|-----------------------|------------------|------------------------|-----|------|-----|-------|--------------------|--------------------------------|-------------------------------------|------------------------------------|
| | | d | D | C | B | d_1 | $r_{s \min}^{(1)}$ | Ball dia. mm (inch) | | |
| PB 5 | 8.5 | 5 | 16 | 6 | 8 | 7.7 | 0.2 | 11.112 ($\frac{7}{16}$) | 3 270 | 7 850 |
| PB 6 | 13 | 6 | 18 | 6.75 | 9 | 9 | 0.2 | 12.700 ($\frac{1}{2}$) | 4 200 | 10 100 |
| PB 8 | 24 | 8 | 22 | 9 | 12 | 10.4 | 0.2 | 15.875 ($\frac{5}{8}$) | 7 010 | 16 800 |
| PB 10 | 39 | 10 | 26 | 10.5 | 14 | 12.9 | 0.2 | 19.050 ($\frac{3}{4}$) | 9 810 | 23 500 |
| PB 12 | 58 | 12 | 30 | 12 | 16 | 15.4 | 0.2 | 22.225 ($\frac{7}{8}$) | 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 ($1\frac{1}{8}$) | 21 000 | 50 400 |
| PB 18 | 160 | 18 | 42 | 16.5 | 23 | 21.9 | 0.3 | 31.750 ($1\frac{1}{4}$) | 25 700 | 61 600 |
| PB 20 | 210 | 20 | 46 | 18 | 25 | 24.4 | 0.3 | 34.925 ($1\frac{3}{8}$) | 30 800 | 74 000 |
| PB 22 | 265 | 22 | 50 | 20 | 28 | 25.8 | 0.3 | 38.100 ($1\frac{1}{2}$) | 37 400 | 89 700 |
| PB 25 | 390 | 25 | 56 | 22 | 31 | 29.6 | 0.6 | 42.862 ($1\frac{11}{16}$) | 46 200 | 111 000 |
| PB 28 | 410 | 28 | 62 | 25 | 35 | 32.3 | 0.6 | 47.625 ($1\frac{7}{8}$) | 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

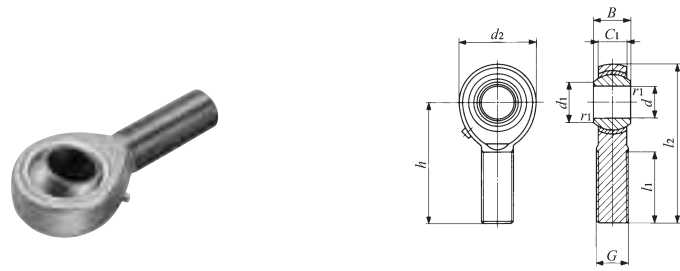
| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|-----------------------|------------------|------------------------|---------------|-------|-------|-----|-------|-------|-------|-------|-------|-----|-------|-------|---------------------|--------------------------------|-------------------------------------|------------------------------------|
| | | 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) | | |
| 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 ($\frac{5}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 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 ($\frac{1}{2}$) | 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 ($\frac{5}{8}$) | 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 ($\frac{3}{4}$) | 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 ($\frac{7}{8}$) | 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 ($1\frac{1}{8}$) | 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 ($1\frac{1}{4}$) | 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 ($1\frac{3}{8}$) | 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 ($1\frac{1}{2}$) | 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 ($1\frac{11}{16}$) | 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 ($1\frac{7}{8}$) | 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.

PILLOBALL

Lubrication Type PILLOBALL Rod Ends **Insert Type/With Male Thread**

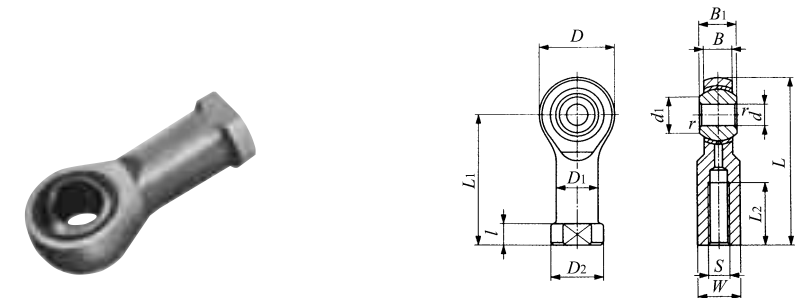


POS

| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N | |
|-----------------------|------------------|------------------------|---------------|-------|-------|-----|-------|-------|-----|-------|--------------------|-------------------------------------|------------------------------------|---------------------------|
| | | d | Thread G | d_2 | C_1 | B | d_1 | l_2 | h | l_1 | $r_{1s\min}^{(1)}$ | | | Ball dia. mm (inch) |
| POS 3 | 5.0 | 3 | M 3×0.5 | 12 | 4.5 | 6 | 5.2 | 33 | 27 | 15 | 0.2 | 7.938 ($\frac{5}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 3 270 | 3 340 |
| POS 6 | 19 | 6 | M 6×1 | 18 | 6.75 | 9 | 9 | 45 | 36 | 22 | 0.2 | 12.700 ($\frac{1}{2}$) | 4 200 | 4 730 |
| POS 8 | 32 | 8 | M 8×1.25 | 22 | 9 | 12 | 10.4 | 53 | 42 | 25 | 0.2 | 15.875 ($\frac{5}{8}$) | 7 010 | 8 640 |
| POS 10 | 54 | 10 | M10×1.5 | 26 | 10.5 | 14 | 12.9 | 61 | 48 | 29 | 0.2 | 19.050 ($\frac{3}{4}$) | 9 810 | 13 300 |
| POS 12 | 85 | 12 | M12×1.75 | 30 | 12 | 16 | 15.4 | 69 | 54 | 33 | 0.2 | 22.225 ($\frac{7}{8}$) | 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 $\frac{1}{8}$) | 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 $\frac{1}{4}$) | 25 700 | 30 200 |
| POS 20 | 340 | 20 | M20×1.5 | 46 | 18 | 25 | 24.4 | 101 | 78 | 47 | 0.2 | 34.925 (1 $\frac{3}{8}$) | 30 800 | 35 500 |
| POS 22 | 435 | 22 | M22×1.5 | 50 | 20 | 28 | 25.8 | 109 | 84 | 51 | 0.2 | 38.100 (1 $\frac{1}{2}$) | 37 400 | 41 700 |
| POS 25 | 650 | 25 | M24×2 | 60 | 22 | 31 | 29.6 | 124 | 94 | 57 | 0.6 | 42.862 (1 $\frac{11}{16}$) | 46 200 | 72 700 |
| POS 28 | 875 | 28 | M27×2 | 66 | 25 | 35 | 32.3 | 136 | 103 | 62 | 0.6 | 47.625 (1 $\frac{7}{8}$) | 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**



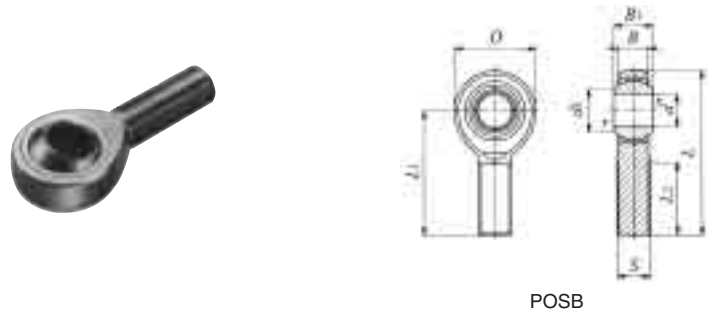
PHSB

| Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | | | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|-----------------------|------------------|------------------------------|---------------------------|------------------|------------------|------------------|------------------|-------------------|-----------------|-------------------|------------------|------------------|------------------|------------------|--------------------|-------------------------------|-------------------------------------|------------------------------------|
| | | d | Thread S class 3B | D | B | B_1 | d_1 | L | l | L_1 | L_2 | W | D_1 | D_2 | $r_{1s\min}^{(1)}$ | Ball dia. mm (inch) | | |
| 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 ($\frac{5}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 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 ($\frac{33}{64}$) | 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 ($\frac{5}{8}$) | 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 ($\frac{23}{32}$) | 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 ($\frac{13}{16}$) | 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 ($\frac{15}{16}$) | 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 $\frac{1}{8}$) | 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 $\frac{5}{8}$) | 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 $\frac{7}{8}$) | 59 300 | 86 800 |

Note⁽¹⁾ r_s min stands for minimum allowable value of chamfer r .

PILLOBALL

Inch series PILLOBALL Rod Ends **Insert Type/With Male Thread**

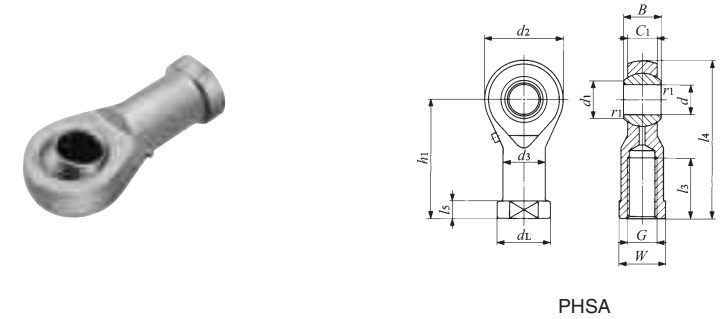


POSB

| Identification number | Mass (Ref.) g | Boundary dimensions mm(inch) | | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|-----------------------|------------------|------------------------------|---------------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|-------------------|-------------------------------|-------------------------------------|------------------------------------|
| | | d | Thread S class 3A | D | B | B_1 | d_1 | L | L_1 | L_2 | $r_{s\min}^{(1)}$ | Ball dia. mm (inch) | | |
| 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 ($\frac{5}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 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 ($\frac{33}{64}$) | 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 ($\frac{5}{8}$) | 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 ($\frac{23}{32}$) | 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 ($\frac{13}{16}$) | 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 ($\frac{15}{16}$) | 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 ($1\frac{1}{8}$) | 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 ($1\frac{3}{16}$) | 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 ($1\frac{7}{8}$) | 59 300 | 112 000 |

Note(1) r_s min stands for minimum allowable value of chamfer r .

Lubrication Type PILLOBALL Rod Ends **Die-cast Type/With Female Thread**



PHSA

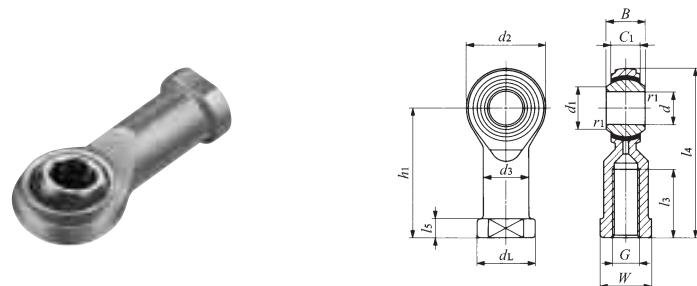
| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | | | | | | | | | | Static load capacity C_s N |
|-----------------------|------------------|------------------------|---------------|-------|-------|-----|-------|-------|-------|-------|-------|-----|-------|-------|-------------------|------------------------------|--------|------------------------------------|
| | | d | Thread G | d_2 | C_1 | B | d_1 | l_4 | h_1 | l_3 | l_5 | W | d_3 | d_L | $r_{s\min}^{(1)}$ | Ball dia. mm (inch) | | |
| 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 ($\frac{7}{16}$) | 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 ($\frac{1}{2}$) | 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 ($\frac{5}{8}$) | 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 ($\frac{3}{4}$) | 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 ($\frac{7}{8}$) | 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 ($1\frac{1}{8}$) | 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 ($1\frac{1}{4}$) | 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 ($1\frac{3}{8}$) | 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 ($1\frac{1}{2}$) | 40 400 | |

Note(1) Minimum allowable value of chamfer dimension r_1

- Remarks1. 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 .

PILLOBALL

Maintenance-free Type PILLOBALL Rod Ends **With Female Thread**

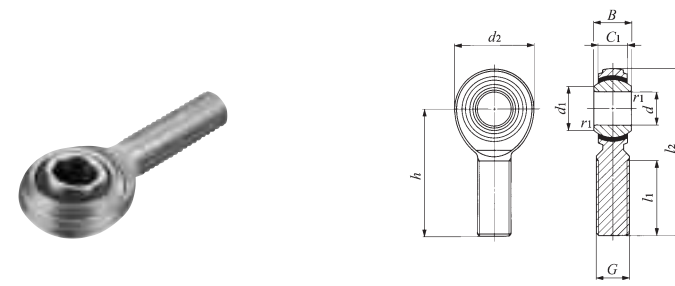


PHS...EC

| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N | |
|-----------------------|------------------|------------------------|---------------|-------|-------|-----|-------|-------|-------|-------|-------|-----|-------|-------|---------------------|-------------------------------------|------------------------------------|---------------------------|
| | | 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) |
| 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 ($\frac{3}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 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 ($\frac{1}{2}$) | 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 ($\frac{5}{8}$) | 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 ($\frac{3}{4}$) | 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 ($\frac{7}{8}$) | 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 ($1\frac{1}{8}$) | 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 ($1\frac{1}{4}$) | 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 ($1\frac{3}{8}$) | 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 ($1\frac{1}{2}$) | 74 700 | 36 400 |

Note(1) Minimum allowable value of chamfer dimension r_1
 Remarks1. 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 | Boundary dimensions mm | | | | | | | | | | | | | | Dynamic load capacity C_d N | Static load capacity C_s N |
|-----------------------|------------------|------------------------|---------------|-------|-------|-----|-------|-------|-----|-------|---------------------|------------------------------|--------|--------|--|-------------------------------------|------------------------------------|
| | | d | Thread G | d_2 | C_1 | B | d_1 | l_2 | h | l_1 | $r_{1s \min}^{(1)}$ | Ball dia. mm (inch) | | | | | |
| POS 3EC | 5.0 | 3 | M 3×0.5 | 12 | 4.5 | 6 | 5.2 | 33 | 27 | 15 | 0.2 | 7.938 ($\frac{3}{16}$) | 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 ($\frac{3}{8}$) | 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 ($\frac{7}{16}$) | 6 540 | 3 340 | | | |
| POS 6EC | 19 | 6 | M 6×1 | 18 | 6.75 | 9 | 9 | 45 | 36 | 22 | 0.2 | 12.700 ($\frac{1}{2}$) | 8 410 | 4 730 | | | |
| POS 8EC | 32 | 8 | M 8×1.25 | 22 | 9 | 12 | 10.4 | 53 | 42 | 25 | 0.2 | 15.875 ($\frac{5}{8}$) | 14 000 | 7 760 | | | |
| POS 10EC | 54 | 10 | M10×1.5 | 26 | 10.5 | 14 | 12.9 | 61 | 48 | 29 | 0.2 | 19.050 ($\frac{3}{4}$) | 19 600 | 10 500 | | | |
| POS 12EC | 85 | 12 | M12×1.75 | 30 | 12 | 16 | 15.4 | 69 | 54 | 33 | 0.2 | 22.225 ($\frac{7}{8}$) | 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 ($1\frac{1}{8}$) | 42 000 | 21 100 | | | |
| POS 18EC | 260 | 18 | M18×1.5 | 42 | 16.5 | 23 | 21.9 | 93 | 72 | 44 | 0.2 | 31.750 ($1\frac{1}{4}$) | 51 400 | 25 100 | | | |
| POS 20EC | 340 | 20 | M20×1.5 | 46 | 18 | 25 | 24.4 | 101 | 78 | 47 | 0.2 | 34.925 ($1\frac{3}{8}$) | 61 600 | 30 000 | | | |
| POS 22EC | 435 | 22 | M22×1.5 | 50 | 20 | 28 | 25.8 | 109 | 84 | 51 | 0.2 | 38.100 ($1\frac{1}{2}$) | 74 700 | 36 400 | | | |

Note(1) Minimum allowable value of chamfer dimension r_1
 Remarks1. Neither oil hole nor grease nipple is provided.
 2. When a metric fine thread specification is required, please contact IKO.

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.

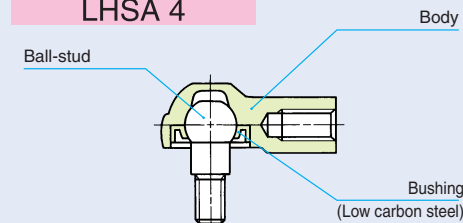
L-Ball LHS

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.

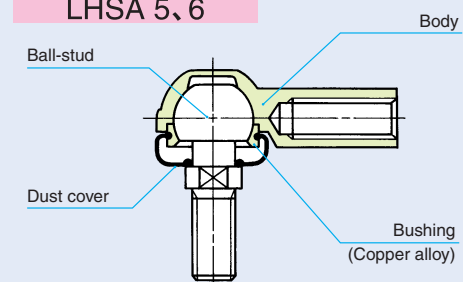
An L-Ball dust cover can be attached to these rod-ends. If the rod-ends are lubricated with lithium soap

Structures of L-Ball LHSA

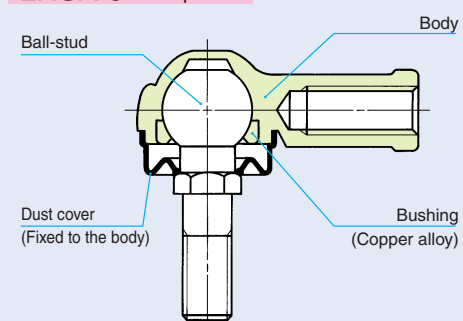
LHSA 4



LHSA 5, 6

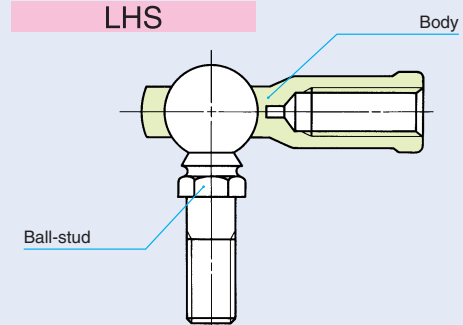


LHSA 8 and upwards



Structure of L-Ball LHS

LHS



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.

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: LHS, Size: 8

Type: LHS, Size of thread (M8): 8

Example 2 (Female thread of the body : In case of left threaded)

Model code: LHS, Size: 8, Supplemental code: L

Left-handed thread: L

Example 3 (when a dust cover PRC is attached to LHS)

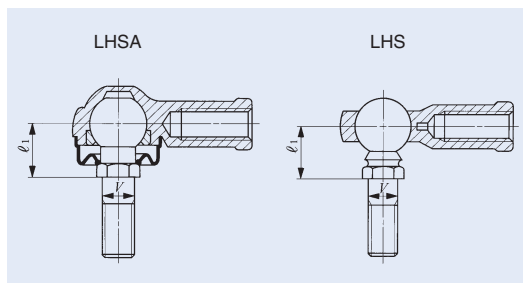
Model code: LHS, Size: 8, Supplemental code: D

With dust cover: D

Accuracy

The accuracy of L-Balls is shown in Table 2.

Table 2 Tolerance



| Type | Dimension symbol | Tolerance |
|------|------------------|---------------------------|
| LBSA | l_1 | ± 0.5 |
| | V | 0 - 0.2 ⁽¹⁾ |
| LBS | l_1 | ± 0.4 |
| | V | h9 |

unit: mm

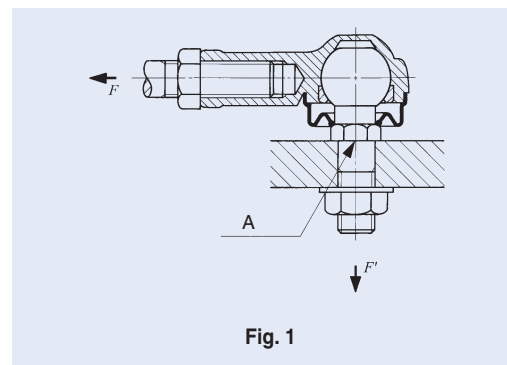
Note⁽¹⁾ This dimensional tolerance applies to LBSA 5 and higher.

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.



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

| Identification number | Maximum operating load | Identification number | Maximum operating load |
|-----------------------|------------------------|-----------------------|------------------------|
| LBSA 4 | 840 | LBS 5 | 880 |
| LBSA 5 | 1 180 | LBS 6 | 1 080 |
| LBSA 6 | 1 080 | LBS 8 | 1 630 |
| LBSA 8 | 1 900 | LBS10 | 2 100 |
| LBSA10 | 2 170 | LBS12 | 2 620 |
| LBSA10M | 2 170 | LBS14 | 3 190 |
| LBSA12 | 2 790 | LBS16 | 3 820 |
| LBSA14 | 3 540 | LBS18 | 4 610 |
| — | — | LBS20 | 5 340 |
| — | — | LBS22 | 6 460 |

unit: N

Lubrication

LBSA is prepacked with lubricating grease ALVANIA GREASE 2 (SHELL). LBS is not provided with prepacked grease. Perform proper lubrication for use.

Operating LBS without lubrication will increase the wear of the sliding contact surface or cause seizure.

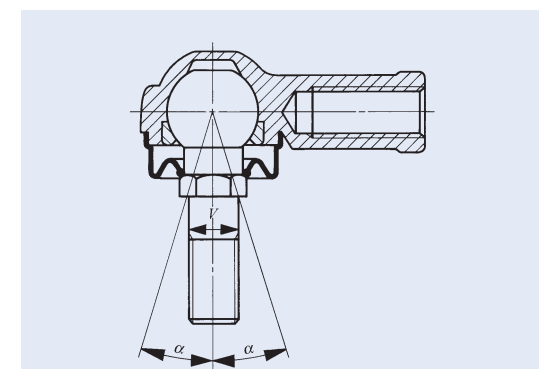
Operating Temperature Range

The maximum allowable temperature for L-Balls is +80°C.

Precautions for Use

- Depth of thread**
It is recommended that the depth of thread engagement into the body is more than twice the nominal diameter of thread.
- Permissible angle of tilt**
The permissible angle of tilt is shown in Table 4.

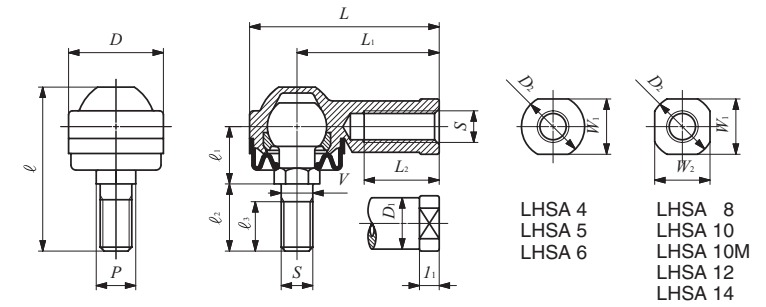
Table 4 Permissible angle of tilt



| Nominal dia. V mm | LBSA α | LBS 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 |

unit: degree

L-BALL



LHSA 4
LHSA 5
LHSA 6

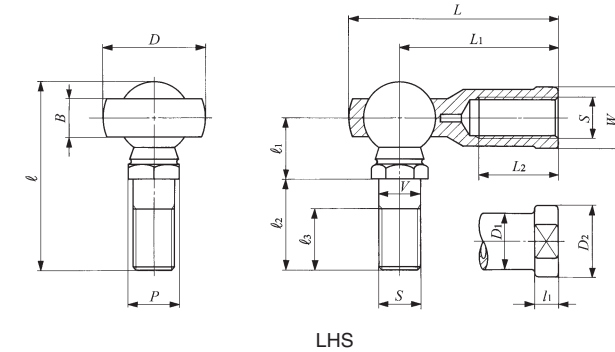
LHSA 8
LHSA 10
LHSA 10M
LHSA 12
LHSA 14

| Identification number | Mass (Ref.) g | Boundary dimensions mm | | | | | | | | | | | | |
|-----------------------|------------------|------------------------|----|----|------|----------------|----------------|----------------|----------------|---------------------------------|----------------|----------------|------|------|
| | | Thread S | V | D | L | L ₁ | L ₂ | l ₁ | W ₁ | W ₂ (¹) | D ₁ | D ₂ | ℓ | P |
| LHSA 4 | 11 | M 4 × 0.7 | *4 | 14 | 25 | 18 | 8 | 4 | 8 | — | 8 | 10 | 19.5 | *5.5 |
| LHSA 5 | 27 | M 5 × 0.8 | 5 | 17 | 38.5 | 30 | 16 | 5 | 10 | — | 10 | 12 | 32.5 | 8 |
| LHSA 6 | 27 | M 6 × 1 | 6 | 19 | 39.5 | 30 | 16 | 5 | 10 | — | 10 | 12 | 32.5 | 8 |
| LHSA 8 | 64 | M 8 × 1.25 | 8 | 24 | 48 | 36 | 19 | 5 | 14 | 14 | 13 | 16 | 41.5 | 10 |
| LHSA 10 | 106 | M10 × 1.25 | 10 | 28 | 57 | 43 | 23 | 6.5 | 17 | 17 | 15 | 19 | 49 | 12 |
| LHSA 10M | 106 | M10 × 1.5 | 10 | 28 | 57 | 43 | 23 | 6.5 | 17 | 17 | 15 | 19 | 49 | 12 |
| LHSA 12 | 180 | M12 × 1.75 | 12 | 34 | 67 | 50 | 27 | 6.5 | 19 | 19 | 17.5 | 22 | 64 | 14 |
| LHSA 14 | 260 | M14 × 2 | 14 | 38 | 76 | 57 | 30 | 8 | 22 | 22 | 20 | 25 | 72 | 17 |

Note(1) Previous specification does not have the flat surfaces of W₂ 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.

| ℓ ₁ | ℓ ₂ | ℓ ₃ | Ball dia. | Static load capacity |
|----------------|----------------|----------------|-----------|----------------------|
| | | | | C _s N |
| 7 | 7 | 5 | 8 | 880 |
| 12 | 13 | 10 | 11.112 | 1 180 |
| 12 | 13 | 10 | 11.112 | 1 670 |
| 14.5 | 17 | 12.5 | 15 | 4 380 |
| 16 | 21 | 17 | 19.05 | 7 400 |
| 16 | 21 | 17 | 19.05 | 7 400 |
| 20 | 30 | 20 | 22.225 | 9 900 |
| 22.5 | 33.5 | 22 | 25.4 | 14 600 |

L-BALL



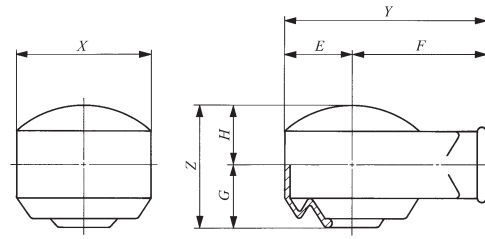
| Identification number | Mass (Ref.) g | Thread S | Boundary dimensions mm | | | | | | | | | | | |
|-----------------------|------------------|-------------|------------------------|------|------|-------|----------------|----------------|----------------|----|----------------|----------------|------|----|
| | | | V | D | B | L | L ₁ | L ₂ | l ₁ | W | D ₁ | D ₂ | ℓ | P |
| LHS 5 | 22 | M 5 × 0.8 | 5 | 17 | 6 | 35.5 | 27 | 16 | 4 | 9 | 9 | 11 | 30.5 | 8 |
| LHS 6 | 32 | M 6 × 1 | 6 | 19.5 | 6.75 | 39.7 | 30 | 16 | 5 | 11 | 10 | 13 | 36.5 | 10 |
| LHS 8 | 60 | M 8 × 1.25 | 8 | 24 | 9 | 48 | 36 | 19 | 5 | 14 | 12.5 | 16 | 44 | 11 |
| LHS 10 | 102 | M10 × 1.5 | 10 | 28 | 10.5 | 57 | 43 | 23 | 6.5 | 17 | 15 | 19 | 52.5 | 13 |
| LHS 12 | 160 | M12 × 1.75 | 12 | 32 | 12 | 66 | 50 | 27 | 6.5 | 19 | 17.5 | 22 | 61 | 17 |
| LHS 14 | 227 | M14 × 2 | 14 | 36 | 13.5 | 75 | 57 | 30 | 8 | 22 | 20 | 25 | 69 | 17 |
| LHS 16 | 300 | M16 × 2 | 16 | 40 | 15 | 84 | 64 | 36 | 8 | 22 | 22 | 27 | 74 | 19 |
| LHS 18 | 445 | M18 × 1.5 | 18 | 45 | 16.5 | 93.5 | 71 | 40 | 10 | 27 | 25 | 31 | 84 | 22 |
| LHS 20 | 580 | M20 × 1.5 | 20 | 49 | 18 | 101.5 | 77 | 43 | 10 | 30 | 27.5 | 34 | 90.5 | 24 |
| LHS 22 | 765 | M22 × 1.5 | 22 | 54 | 20 | 111 | 84 | 47 | 12 | 32 | 30 | 37 | 99 | 27 |

Remark Not provided with prepacked grease. Perform proper lubrication for use.

| ℓ ₁ | ℓ ₂ | ℓ ₃ | Ball dia. | Static load capacity |
|----------------|----------------|----------------|-----------|----------------------|
| | | | | C _s N |
| 10 | 15 | 11 | 11.112 | 2 080 |
| 11.5 | 18.5 | 14 | 12.7 | 3 290 |
| 14.5 | 21.5 | 15 | 15.875 | 4 900 |
| 17 | 26 | 18 | 19.05 | 7 640 |
| 20 | 30 | 20 | 22.225 | 12 400 |
| 22.5 | 33.5 | 22 | 25.4 | 14 600 |
| 24.5 | 35.5 | 23 | 28.575 | 19 500 |
| 27.5 | 40.5 | 25 | 31.75 | 25 600 |
| 30 | 43 | 27 | 34.925 | 31 600 |
| 32.5 | 47.5 | 30 | 38.1 | 39 800 |

L-BALL

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 |



K

LHSA
LHS

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.

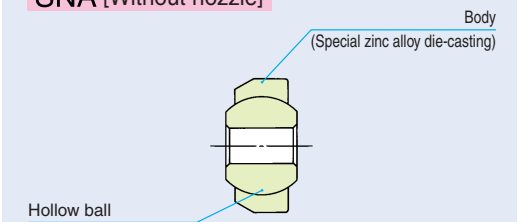
The Super Flexible Nozzle is used in many places such as at the spindle end of Machining Center and at the tool holder of N/C lathe.

The features of Super Flexible Nozzle are as follows.

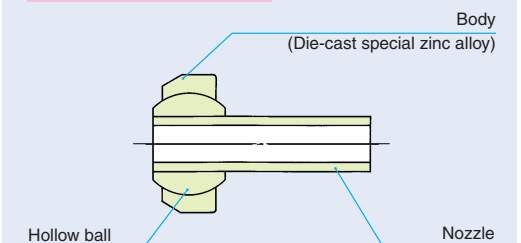
- ① A spherical bushing is incorporated to adjust the tilting angle of nozzle easily.
- ② The Super Flexible Nozzle is compact in size, and the design on parts around the spindle and tool can be made simple.
- ③ The nozzle length is short, and winding of cutting chips around the nozzle will not occur.
- ④ By using a number of Super Flexible Nozzles, cutting oil can be supplied and cutting chips can be removed more effectively.
- ⑤ The press fitting type and screw fitting type are available. The press fitting type is economical.

Structures of Super Flexible Nozzles

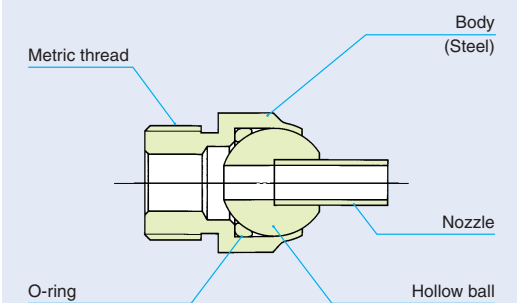
SNA [Without nozzle]



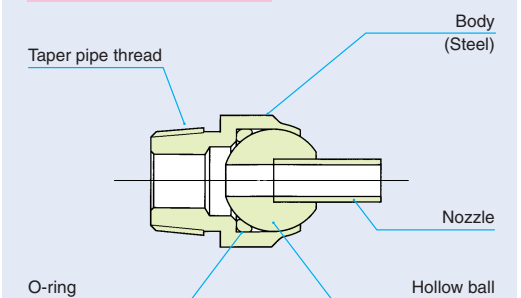
SNA [With nozzle]



SNM



SNPT



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: SNM
 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 $\phi 15$ (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.

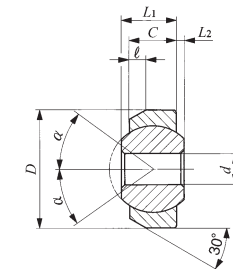
Special Specifications

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 IICO by preparing a drawing or sketch with necessary specifications.

SUPER FLEXIBLE NOZZLE

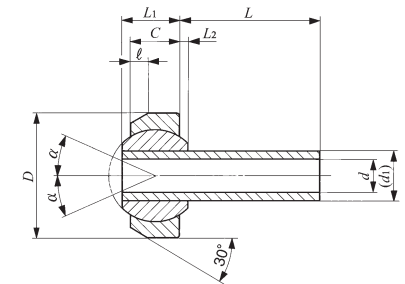
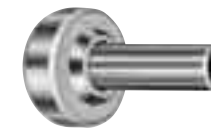
Press Fitting Type Without Nozzle



SNA

| Identification number | Boundary dimensions mm | | | | | | Ball dia. mm (inch) | Allowable tilting angle α degree |
|-----------------------|------------------------|----|----------------|----------------|---|--------|---------------------------|---|
| | d | D | L ₁ | L ₂ | C | ℓ | | |
| SNA 4 | 4 | 15 | 7 | 1 | 6 | 2 | 11.112 ($\frac{7}{16}$) | 36 |
| SNA 6 | 6 | | | | | | | 24 |

Press Fitting Type With Nozzle

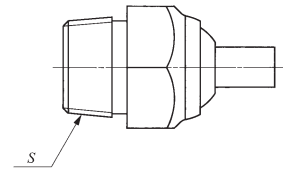
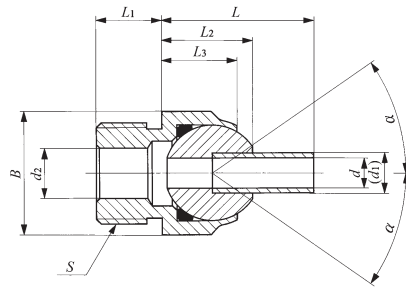
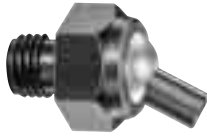


SNA

| Identification number | Boundary dimensions mm | | | | | | | | | Ball dia. mm (inch) | Allowable tilting angle α degree | |
|-----------------------|------------------------|----|---|----|----|----------------|----------------|---|--------|---------------------|---|----------------|
| | d | D | L | | | L ₁ | L ₂ | C | ℓ | | | d ₁ |
| SNA 3-L | 3 | 15 | 6 | 15 | 32 | 7 | 1 | 6 | 2 | 6 | 11.112 ($\frac{7}{16}$) | 24 |
| SNA 4-L | 4 | | 6 | 16 | 40 | | | | | | | |

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 | 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 | |
| SNPT 3/8-L | | PT 3/8 | | | | | | | | | | | |
| SNM 24-L | 8 | M24 × 2.0 | 40 | 60 | 80 | 18 | 23 | 19 | 10 | 12 | 32 | 37 | |
| SNPT 1/2-L | | PT 1/2 | | | | | | | | | | | |

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.

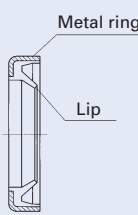
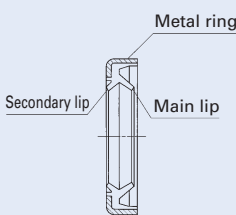
As these seals are manufactured to the same sectional height as IKO Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings shown in the dimension table.

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

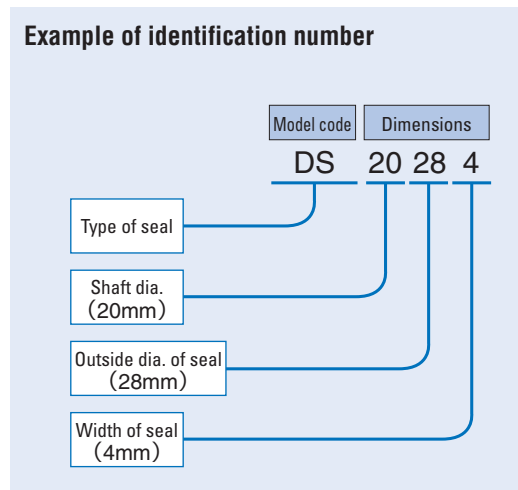
Seals for Needle Roller Bearings are available as shown in Table 1.

Table 1 Seal type

| Type | Single lip | Double lips |
|------------|---|---|
| Structure |  |  |
| 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

① For 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.

② The permissible temperature range is -20 ~ +120°C.

For use at higher or lower temperatures, a special seal is required. Please contact IKO for further information.

③ The 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.

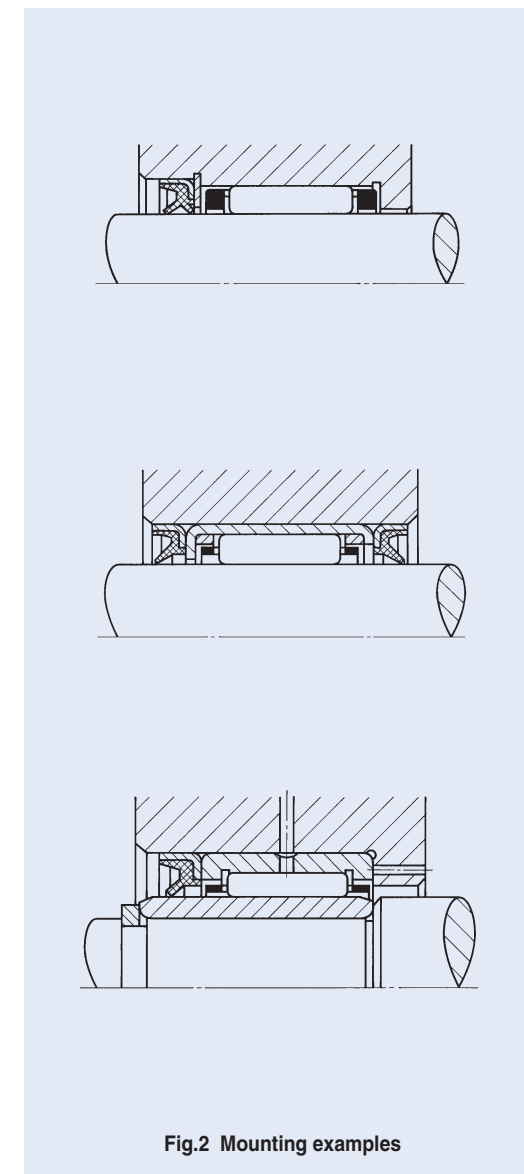
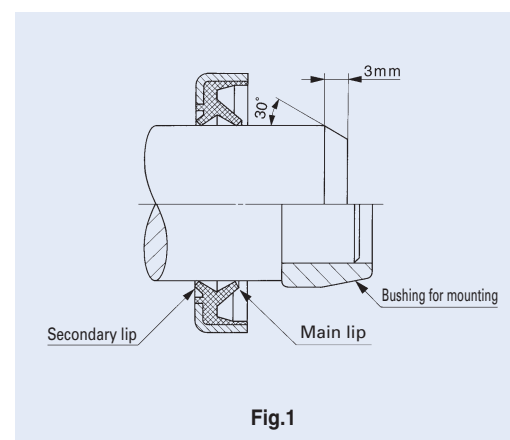


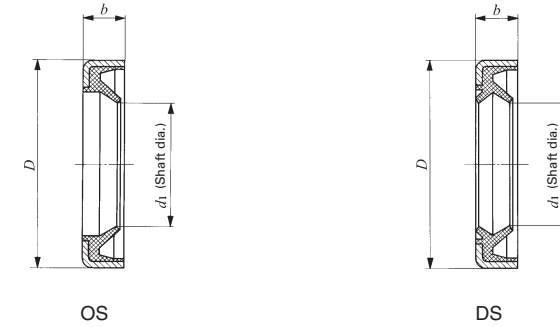
Fig. 2 Mounting examples

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 6 – 15mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|----|-----|--|-----------------------------------|-------------|------------|
| | Single lip | Double lips | d ₁ | D | b | 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 | — | | | | 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 | — | | | | TA 912Z TA 916Z YT 912 | TAF 91612 TAF 91616 | — | — |
| 10 | OS 10143 | — | 10 | 14 | 3 | TLA 1010Z TLA 1012Z TLA 1015Z | — | — | — |
| | OS 10173 | — | | | | TA 1010Z TA 1012Z TA 1015Z TA 1020Z | TAF 101712 TAF 101716 | RNAF 101710 | — |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|----|---|--|--------------------------------------|-----------------------------|------------|
| | Single lip | Double lips | d ₁ | D | b | 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 | — | | | | TLA 1212Z | — | — | — |
| | OS 12193 | — | | | | 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 | | | | 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 | | | | TA 1510Z TA 1512Z TA 1515Z TA 1520Z TA 1525Z | — | — | — |
| | OS 15235 | DS 15235 | | | | — | TAF 152316 TAF 152320 | RNAF 152313 RNAFW 152320 | — |

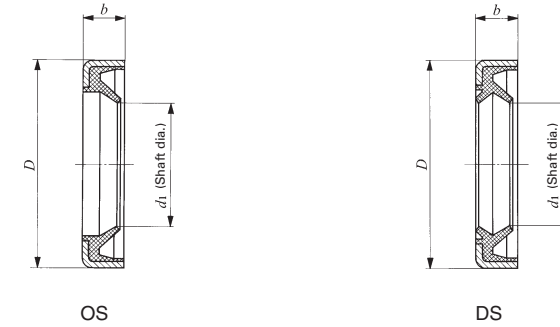


SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 16 – 19mm

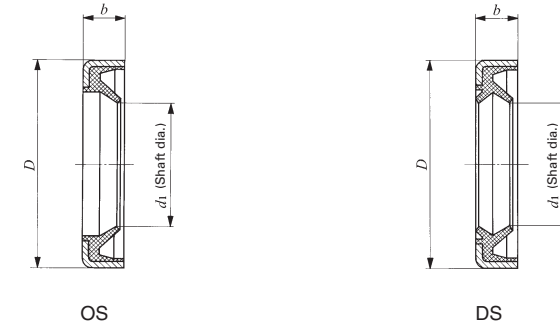
| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|--|-----------------------------|------------|
| | Single lip | Double lips | d_1 | D | b | TA···Z YT 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 | — |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|---------------------------------------|-----------------------------|------------|
| | Single lip | Double lips | d_1 | D | b | 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 | — | — |



SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 20 – 24mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|--|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z YT TLA...Z YTL | RNA TR TAF 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 | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|--|-----------------------------|------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z YT TLA...Z YTL | RNA TR TAF 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 | — | — |

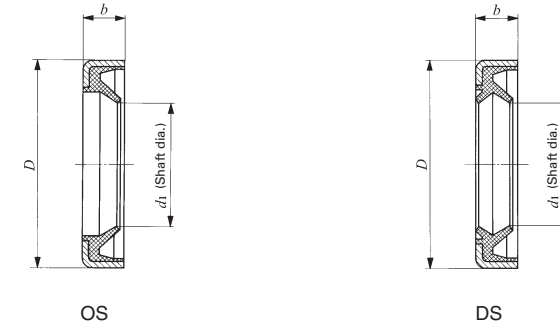


SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 25 – 29mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|--------------------------|-----------------------------|----------------------|------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TR TAF 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 | — |
| | OS 26344 | DS 26344 | 26 | 34 | 4 | TA 2616Z TA 2620Z YT 2616 YT 2620 | TAF 263416 TAF 263420 | — | — | — |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|---------------------------------|-----------|--------------------------|-----------------------------|------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TR TAF GTR | RNAF | NAX NBX |
| 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 | — | — |

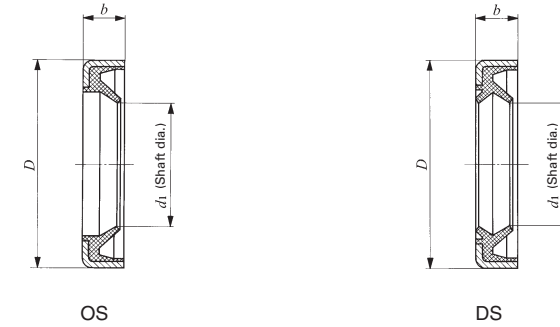


SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 30 – 38mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|---|-----------|--------------------------------------|-----------|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TAF | TR 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 | | | |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|---|-----------|--------------------------|-----------|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TAF | TR 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 | — | | | | | |

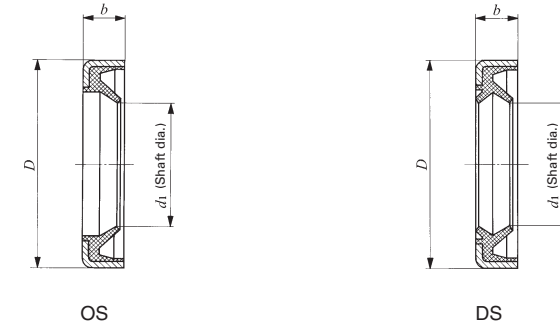
OS
DS

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 40 – 50mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|--------------------------|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | 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 | — |
| | OS 42557 | DS 42557 | 42 | 55 | 7 | — | RNA 4907 RNA 6907 | — | — |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|---|---|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | 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 | — |
| | 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 | — |

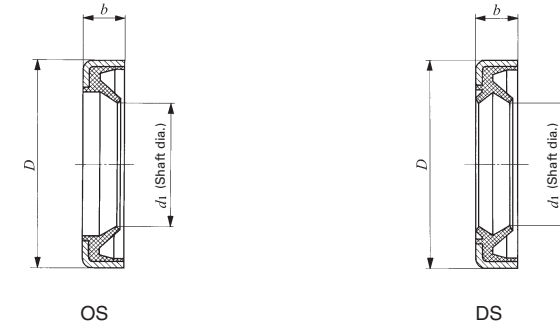


SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 52 – 72mm

| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|-----------|--------------------------|-----------|-----------------------------|----------------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TAF | TR 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 | — | — | — |



| Shaft dia. mm | Identification number | | Boundary dimensions mm | | | Combinable bearings | | | | | |
|------------------|-----------------------|-------------|------------------------|-----|-----|--|-----------|----------------------|-----------|-----------------------------|------------|
| | Single lip | Double lips | d_1 | D | b | TA...Z TLA...Z | YT YTL | RNA TAF | TR 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 | — | — | — | — | — |
| | OS 70907 | DS 70907 | 70 | 90 | 7 | YT 7025 YT 7030 YT 7040 | — | — | — | RNAF 709030 RNAFW 709060 | — |
| 72 | OS 72907 | DS 72907 | 72 | 90 | 7 | — | — | RNA 4913 RNA 6913 | — | — | — |



Cir-clips for Needle Roller Bearings

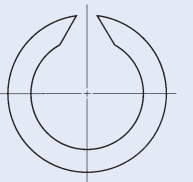
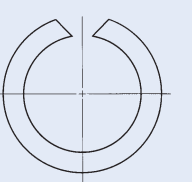
Features

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

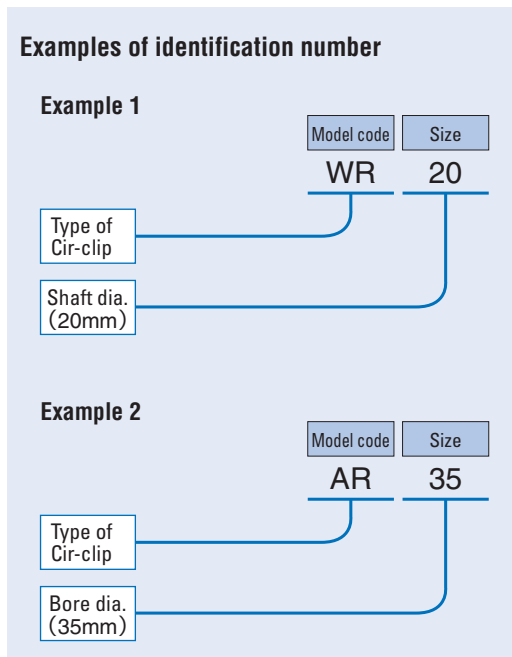
Cir-clips for Needle Roller Bearings are available as shown in Table. 1.

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.

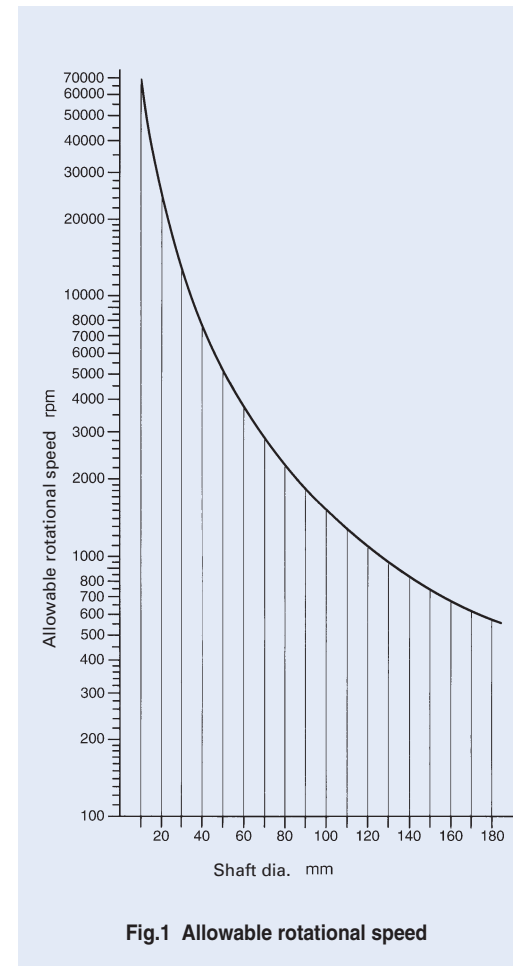


Allowable Rotational Speed

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.

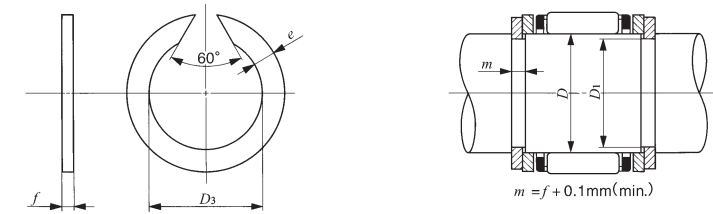
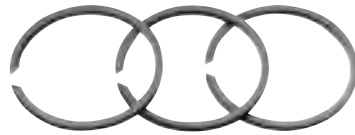
Mounting

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.



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 | |
| 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 | 0 -0.11 |
| 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 | |
| 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 | 0 -0.13 |
| 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 | |
| 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 | 0 -0.16 |

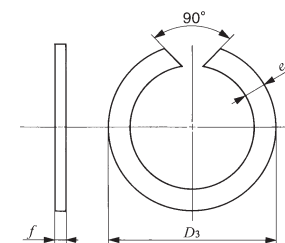
| Identification number | Boundary dimensions mm | | | | | |
|-----------------------|------------------------|-----------------------|-----|-----|----------------------------|------------|
| | Shaft dia. D | D ₃ (Max.) | e | f | Groove dia. D ₁ | Tolerance |
| WR 42 | 42 | 39.8 | 2.3 | 1.5 | 40.5 | 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 | |
| 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 | 0 -0.19 |
| 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 | |
| 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 | |
| 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 | 0 -0.25 |

| 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 | | |
| WR 340 | 340 | 333 | 7.5 | 4 | 335 | | |
| WR 350 | 350 | 343 | 7.5 | 4 | 345 | 0 -0.36 | |
| WR 360 | 360 | 353 | 7.5 | 4 | 355 | | |
| WR 370 | 370 | 363 | 7.5 | 4 | 365 | | |
| WR 390 | 390 | 383 | 7.5 | 4 | 385 | | |

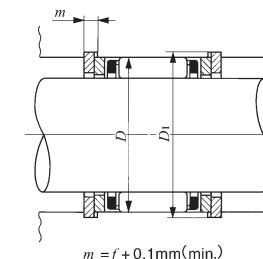


CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Bore



AR



$m = f + 0.1\text{mm}(\text{min.})$

Bore dia. 7 – 440mm

| Identification number | Boundary dimensions mm | | | | | Tolerance |
|-----------------------|------------------------|--------------|------|-----|-------------------|------------|
| | Bore dia. D | D_3 (Min.) | e | f | Groove dia. D_1 | |
| 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 | +0.13 0 |
| AR 17 | 17 | 17.8 | 1.6 | 1.2 | 17.5 | |
| AR 18 | 18 | 18.9 | 1.75 | 1.2 | 18.5 | |
| 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 | +0.16 0 |
| 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 | +0.19 0 |
| AR 29 | 29 | 30.2 | 1.75 | 1.2 | 29.8 | |
| AR 30 | 30 | 31.4 | 2.3 | 1.5 | 31 | |
| 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 | +0.22 0 |
| 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 | | | | | Tolerance |
|-----------------------|------------------------|--------------|-----|-----|-------------------|------------|
| | Bore dia. D | D_3 (Min.) | e | f | Groove dia. D_1 | |
| 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 | +0.19 0 |
| AR 50 | 50 | 51.8 | 2.3 | 1.5 | 51.2 | |
| 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 | +0.22 0 |
| 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 | +0.25 0 |
| 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 | |
| AR 81 | 81 | 83.6 | 2.8 | 2 | 82.8 | +0.29 0 |
| 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 | +0.32 0 |
| AR 92 | 92 | 95 | 3.4 | 2.5 | 94 | |

| Identification number | Boundary dimensions mm | | | | | Tolerance |
|-----------------------|------------------------|--------------|-----|-----|-------------------|------------|
| | Bore dia. D | D_3 (Min.) | e | f | Groove dia. D_1 | |
| 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 | +0.25 0 |
| 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 | +0.36 0 |
| 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 | |
| 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 | +0.4 0 |
| 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 | +0.4 0 |
| 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 | +0.4 0 |
| AR 165 | 165 | 168.6 | 4 | 2.5 | 167.6 | |

| Identification number | Boundary dimensions mm | | | | | Tolerance |
|-----------------------|------------------------|--------------|-----|-----|-------------------|------------|
| | Bore dia. D | D_3 (Min.) | e | f | Groove dia. D_1 | |
| 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 | +0.29 0 |
| AR 183 | 183 | 186.6 | 4 | 2.5 | 185.6 | |
| 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 | +0.32 0 |
| 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 | +0.36 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 | +0.4 0 |
| AR 320 | 320 | 327 | 7.5 | 4 | 325 | |
| 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 | |



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 $0.1 \mu\text{m}R_a$ 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) |

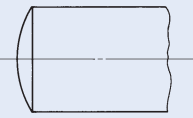
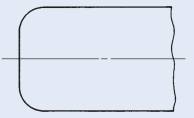
Remarks1. Hardness is flat surface hardness.
 2. The values in parentheses are converted values for reference.

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⁾ | Circularity ⁽¹⁾ | Gauge lot diameter variation ⁽¹⁾ | Deviation of a single length ⁽²⁾ |
|-------|--|----------------------------|---|---|
| | V_{Dwp} (Max.) | Δ_R (Max.) | V_{DwL} (Max.) | 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.



Roller dia. 1.5 – 5mm

| Nominal dimensions mm | | Mass (Ref.) | Nominal dimensions mm | | Mass (Ref.) | Nominal dimensions mm | | Mass (Ref.) |
|-----------------------|-------|-------------|-----------------------|-------|-------------|-----------------------|-------|-------------|
| D_w | L_w | g | D_w | L_w | g | D_w | L_w | g |
| 1.5 | 6.8 | 0.09 | 3.5 | 11.8 | 0.86 | 4.5 | 17.8 | 2.1 |
| | 7.8 | 0.1 | | 13.8 | 1 | | 19.8 | 2.4 |
| | 9.8 | 0.13 | | 15.8 | 1.15 | | 21.8 | 2.6 |
| | 11.8 | 0.16 | | 17.8 | 1.29 | | 23.8 | 2.9 |
| | 13.8 | 0.18 | | 19.8 | 1.44 | | 25.8 | 3.1 |
| 2 | 6.8 | 0.16 | | 21.8 | 1.58 | | 29.8 | 3.6 |
| | 7.8 | 0.19 | | 23.8 | 1.73 | | 31.8 | 3.8 |
| | 9.8 | 0.23 | | 25.8 | 1.88 | | 34.8 | 4.2 |
| | 11.8 | 0.28 | | 29.8 | 2.2 | | 37.8 | 4.5 |
| | 13.8 | 0.33 | | 31.8 | 2.3 | | 39.8 | 4.8 |
| | 15.8 | 0.38 | | 34.8 | 2.5 | | 44.8 | 5.4 |
| | 17.8 | 0.42 | 4 | 13.8 | 1.31 | 5 | 19.8 | 2.9 |
| | 19.8 | 0.47 | | 15.8 | 1.5 | | 21.8 | 3.2 |
| 2.5 | 7.8 | 0.29 | | 17.8 | 1.69 | | 23.8 | 3.5 |
| | 9.8 | 0.36 | | 19.8 | 1.88 | | 25.8 | 3.8 |
| | 11.8 | 0.44 | | 21.8 | 2.1 | | 29.8 | 4.4 |
| | 13.8 | 0.51 | | 23.8 | 2.3 | | 31.8 | 4.7 |
| | 15.8 | 0.59 | | 25.8 | 2.5 | | 34.8 | 5.2 |
| | 17.8 | 0.66 | | 27.8 | 2.6 | | 37.8 | 5.6 |
| | 19.8 | 0.73 | 29.8 | 2.8 | 39.8 | | 5.9 | |
| | 21.8 | 0.81 | 31.8 | 3 | 49.8 | | 7.4 | |
| 23.8 | 0.88 | 34.8 | 3.3 | | | | | |
| 3 | 9.8 | 0.52 | 37.8 | 3.6 | | | | |
| | 11.8 | 0.63 | 39.8 | 3.8 | | | | |
| | 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 | | | | | | | |

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

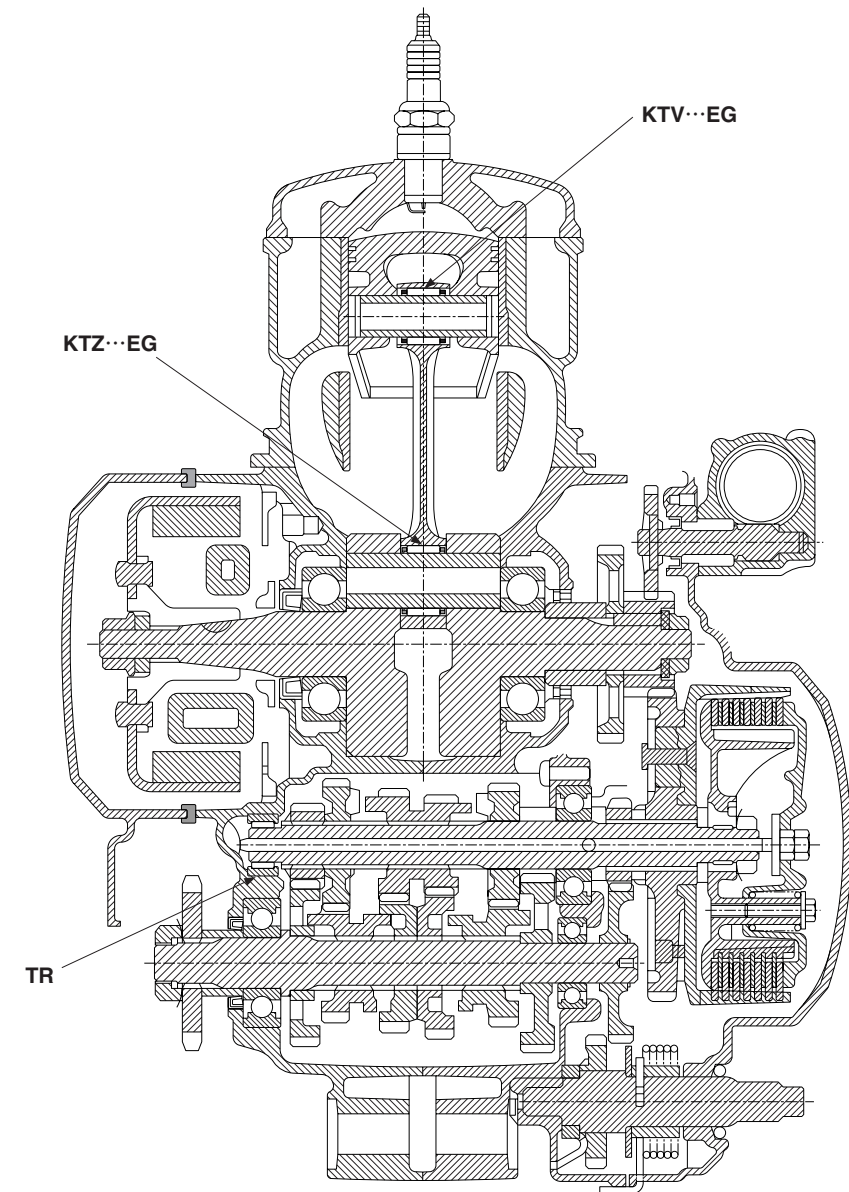
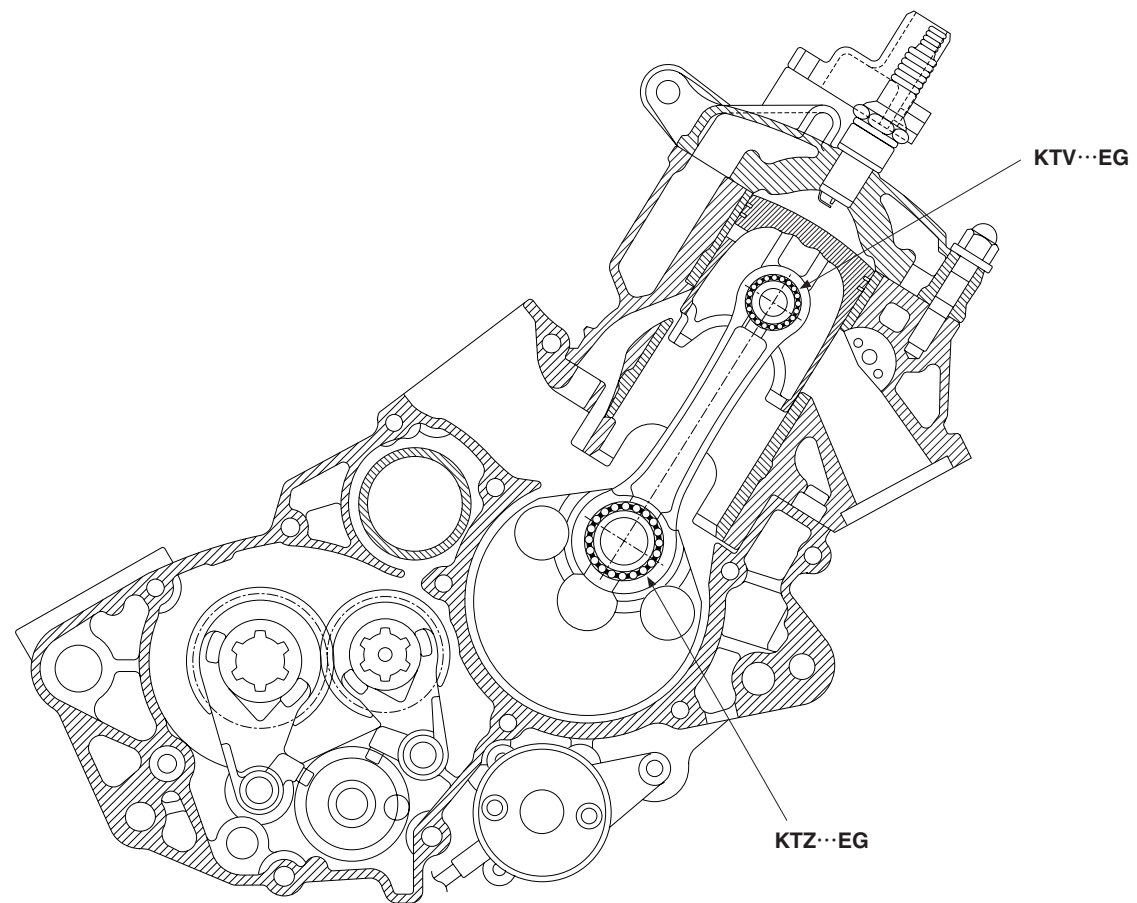
Applications M1
 Miscellaneous Tables M33

APPLICATIONS/ MISCELLANEOUS TABLES

| | |
|-----------------------------------|-----|
| Applications | M1 |
| Miscellaneous Tables | M33 |

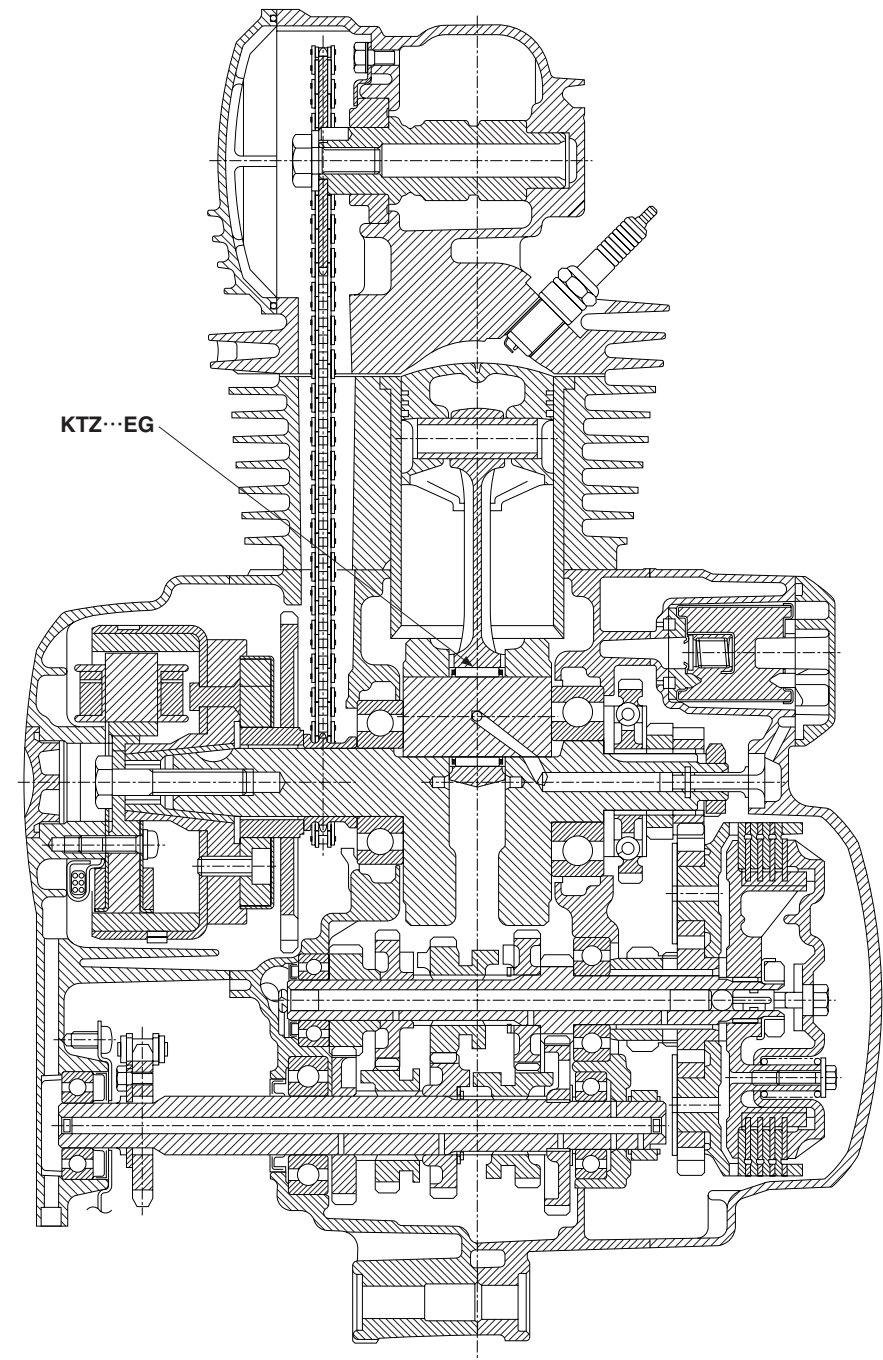
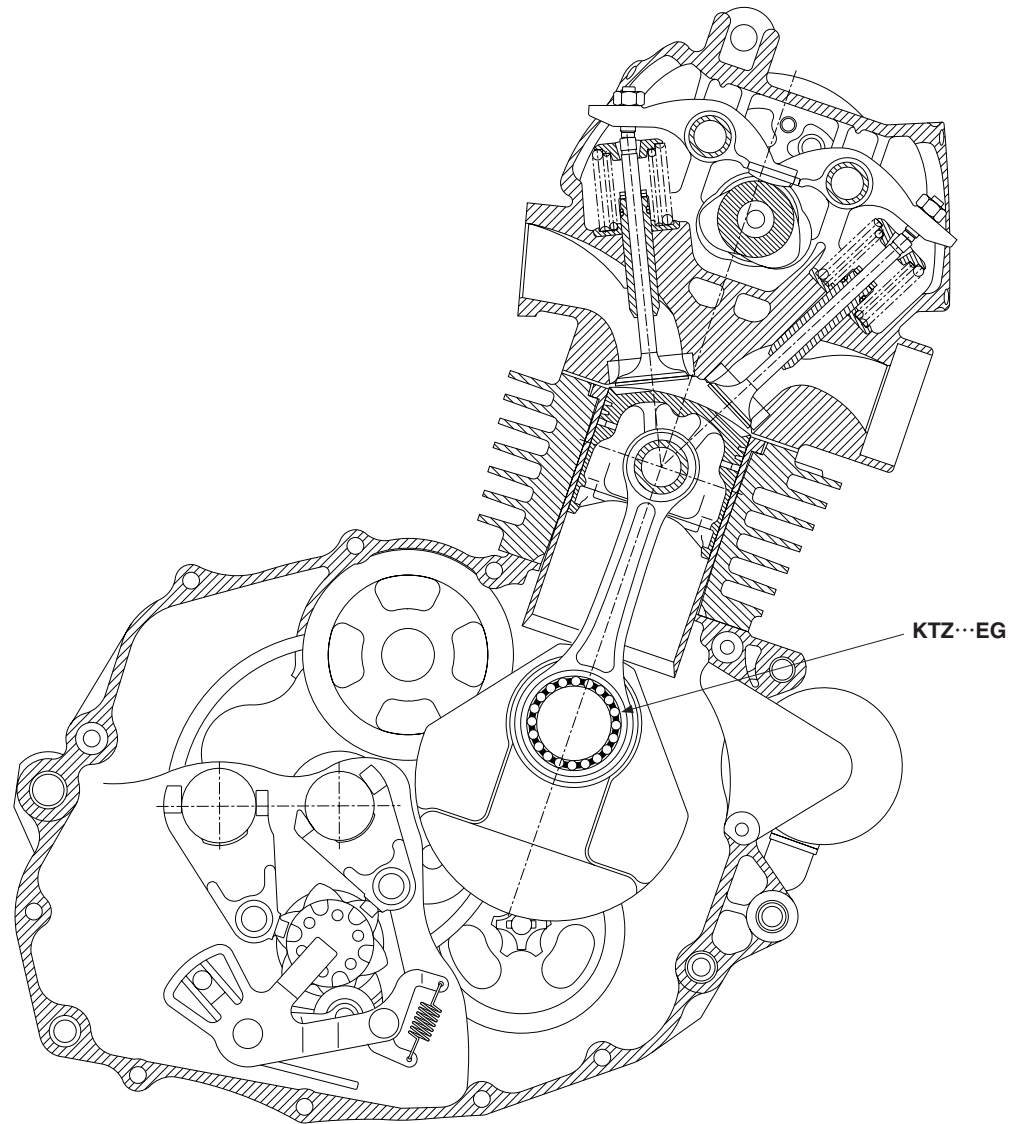
Automobiles, vehicles

- Engine and transmission of 2-cycle motor cycle



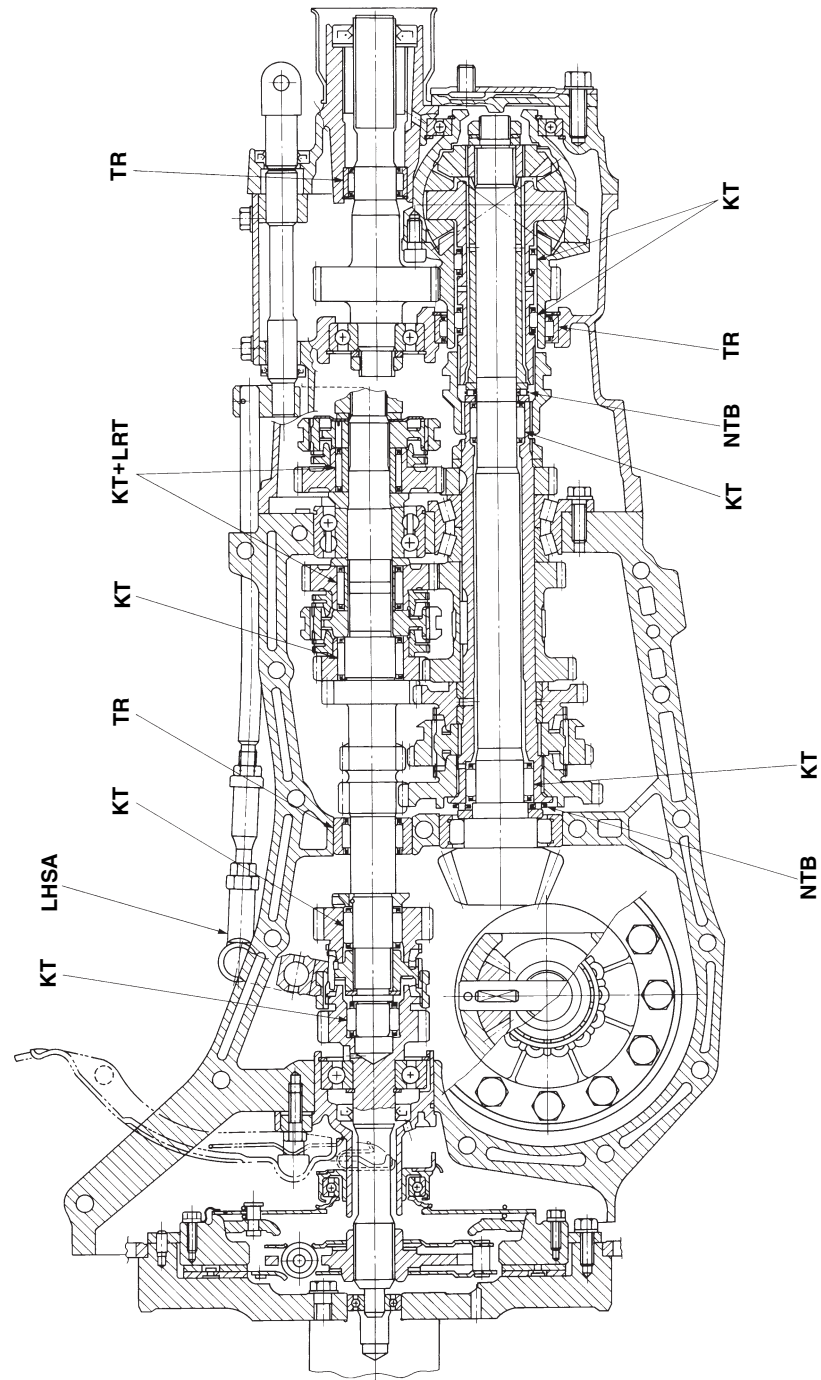
Automobiles, vehicles

- Engine and transmission of 4-cycle motor cycle



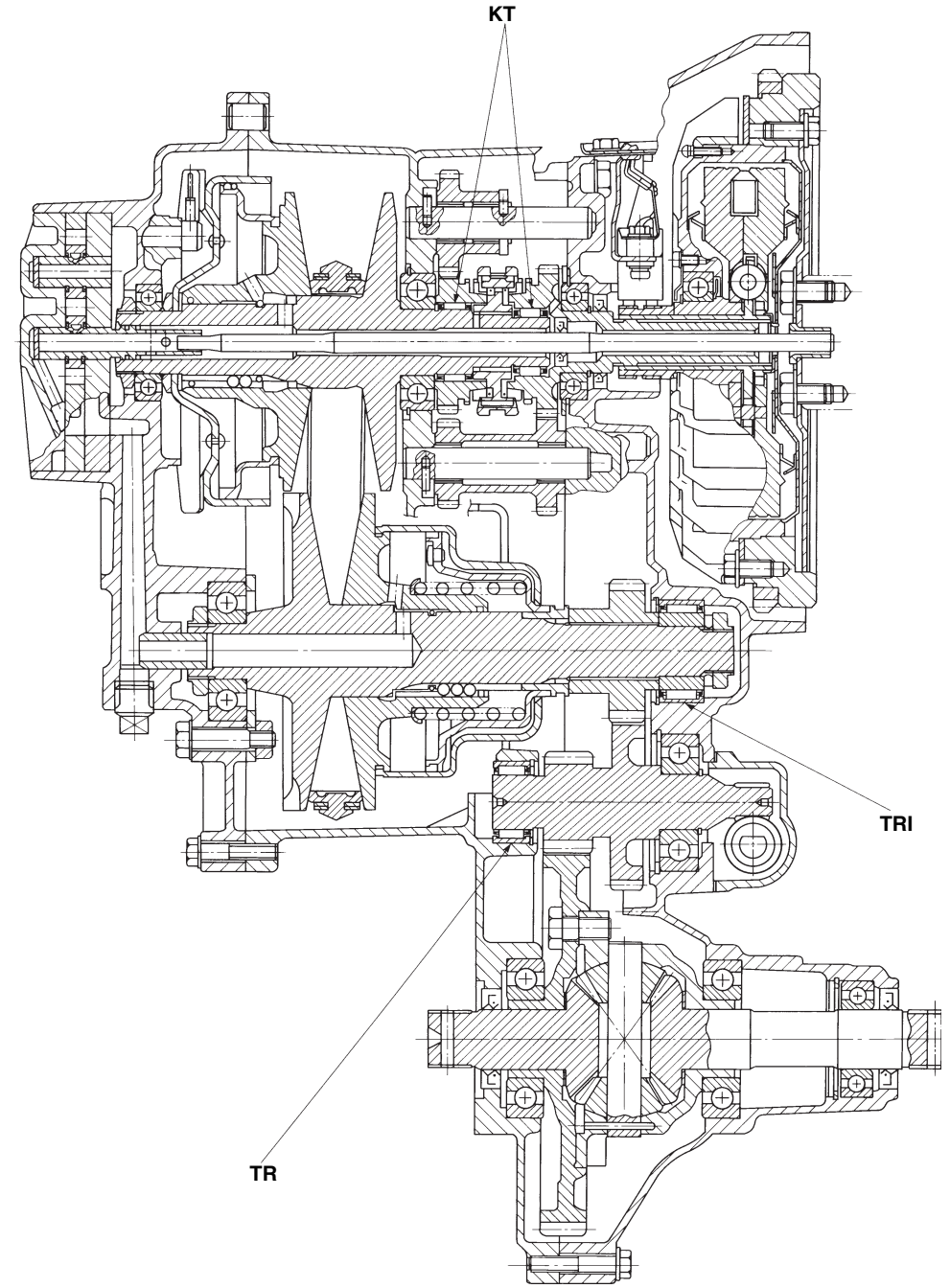
Automobiles, vehicles

● Automobile transmission



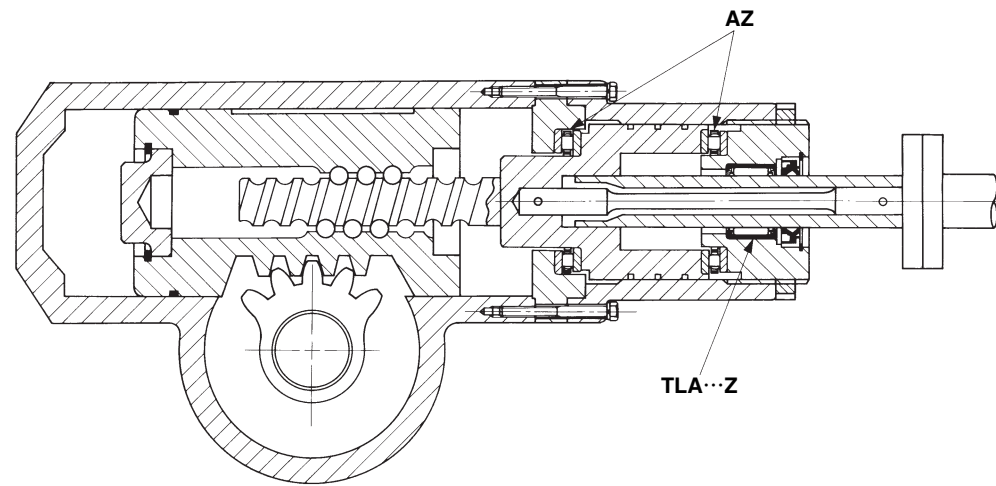
Automobiles, vehicles

● Automobile automatic transmission

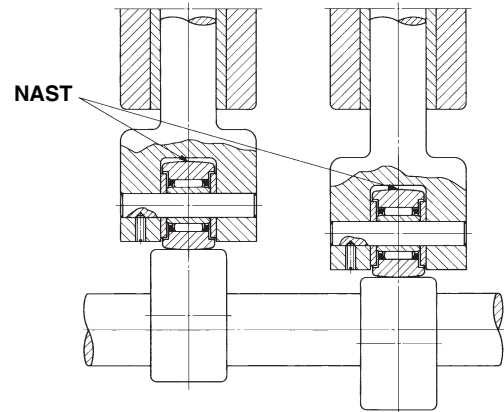


Automobiles, vehicles

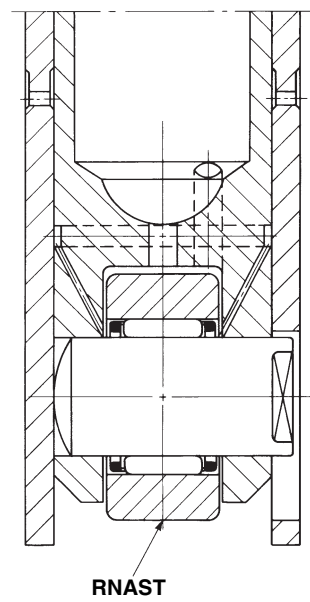
● Power steering



● Cam shaft valve lifter of diesel engine

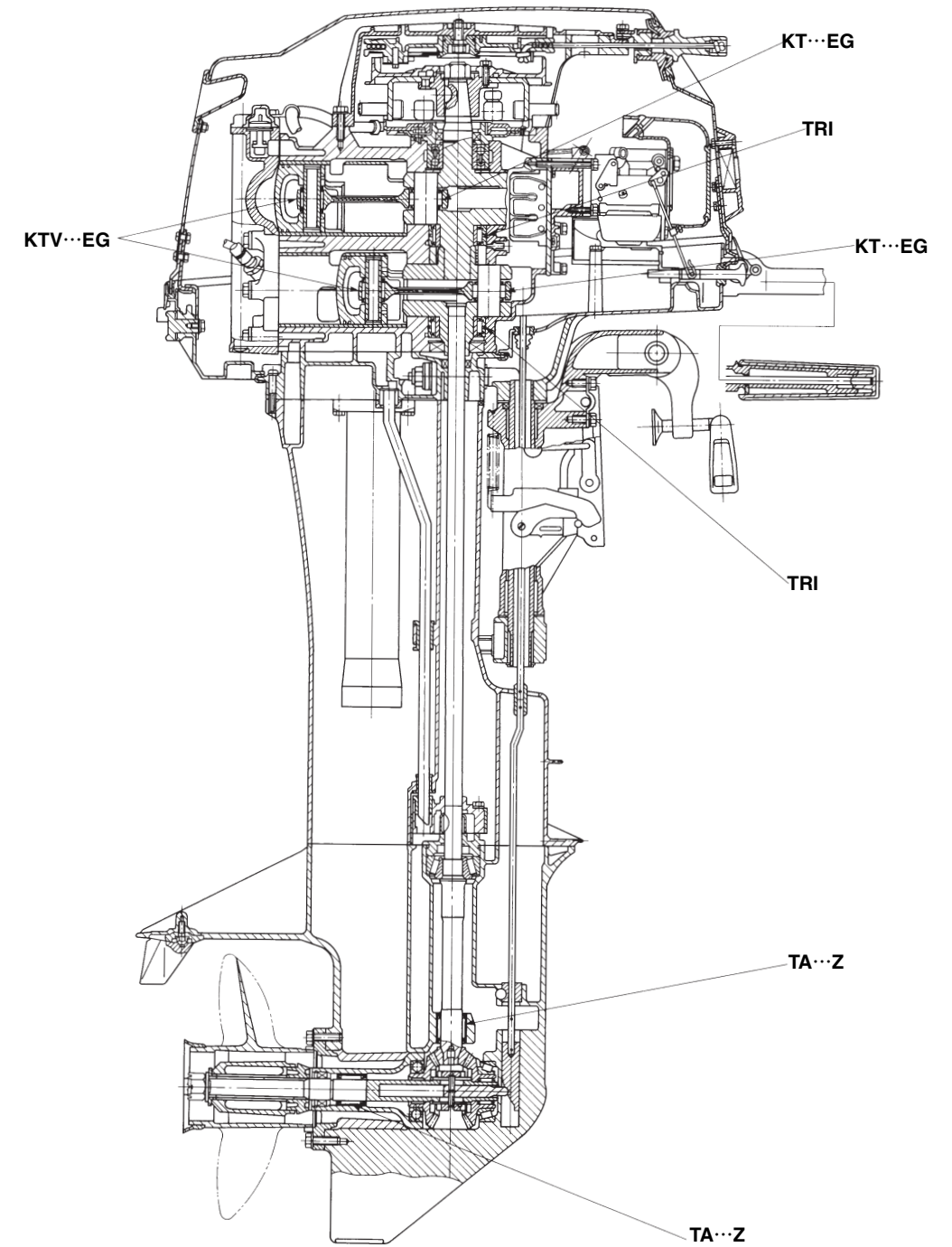


● Cam roller of diesel engine



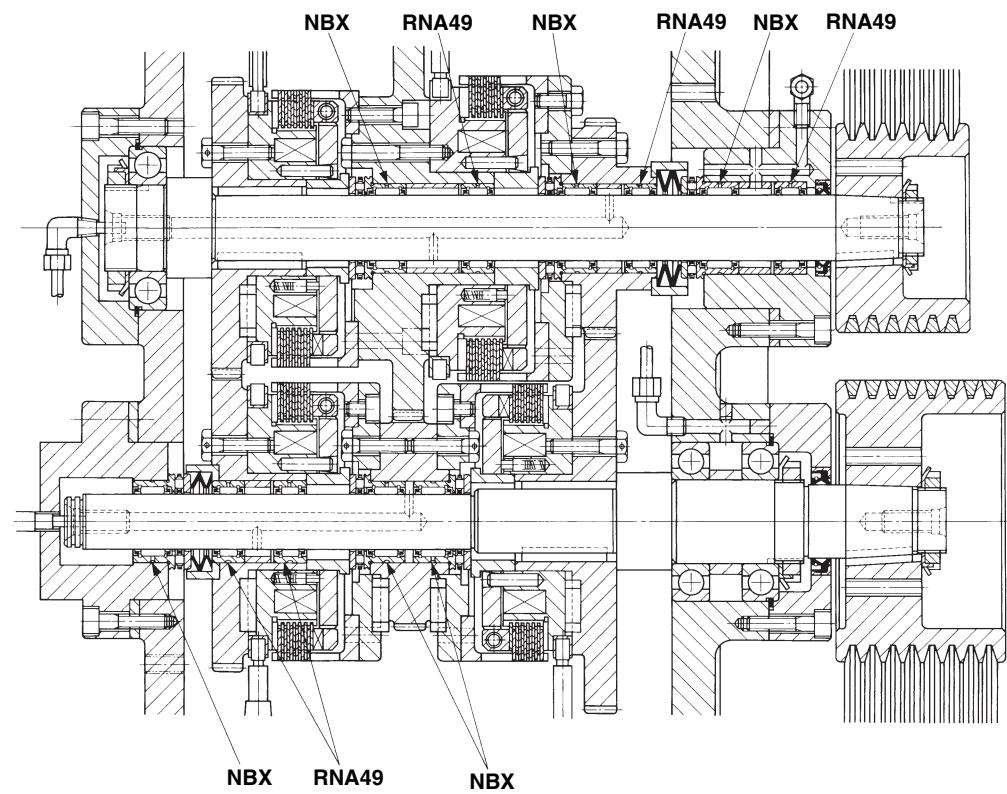
Automobiles, vehicles

● Outboard engine



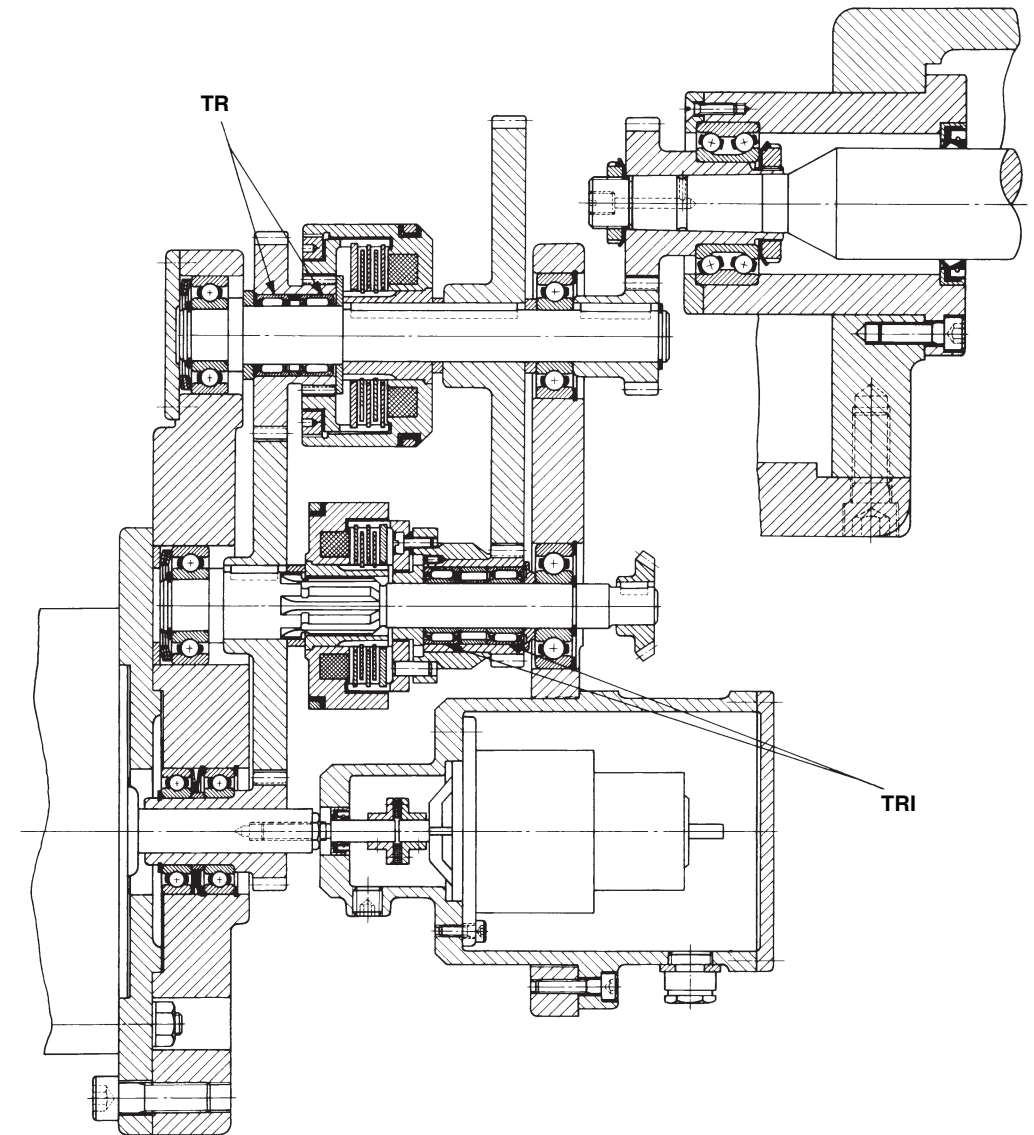
Machine tools

- Transmission of NC lathe



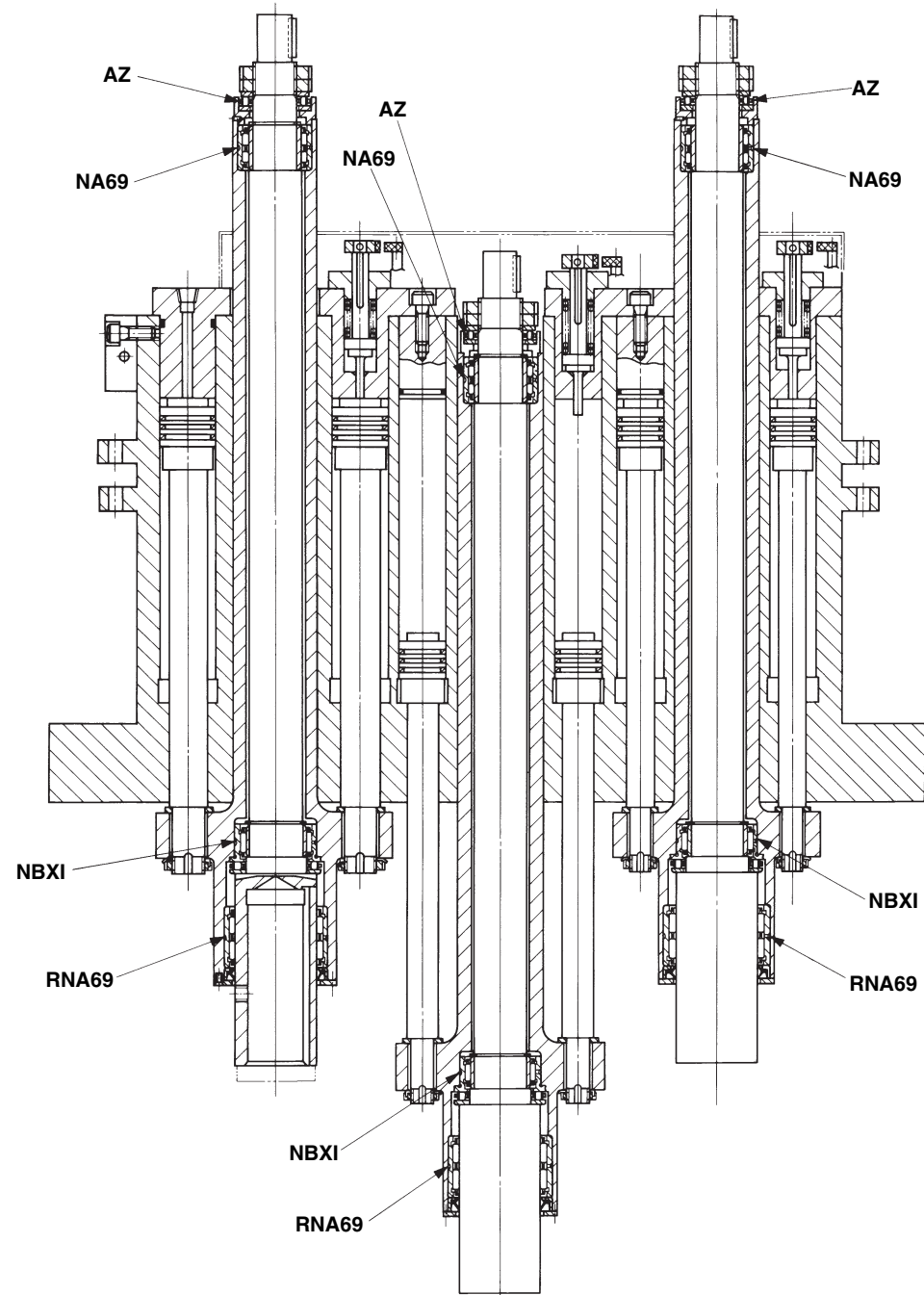
Machine tools

- Gear box for traversing feed of automatic lathe



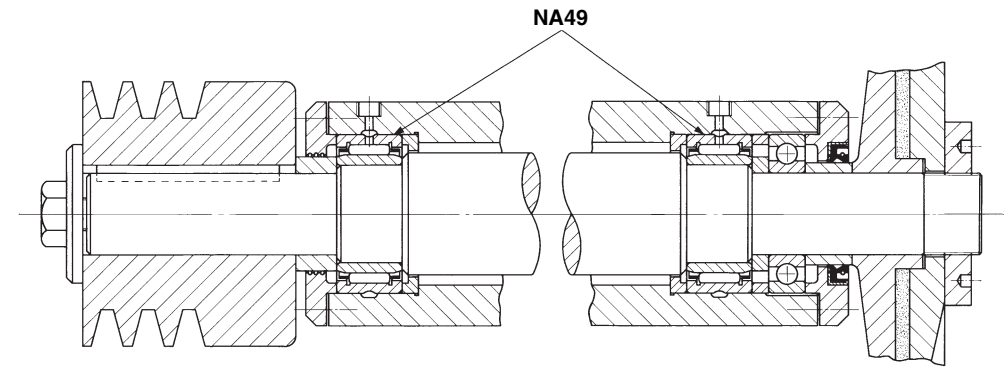
Machine tools

- Main spindles of multi-spindle drilling machine

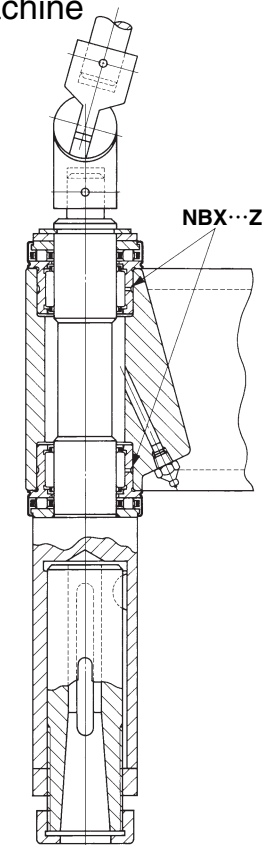


Machine tools

- Main spindle of cutting-off wheel

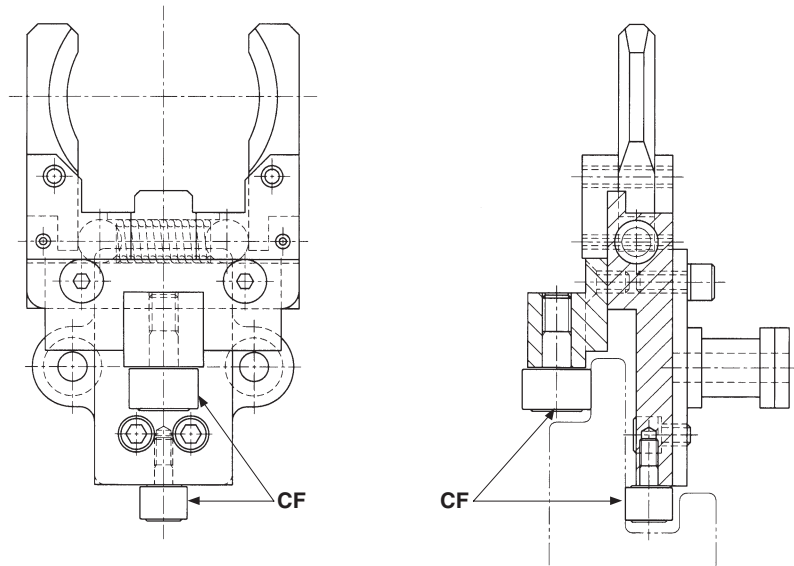


- Main spindle of drilling machine

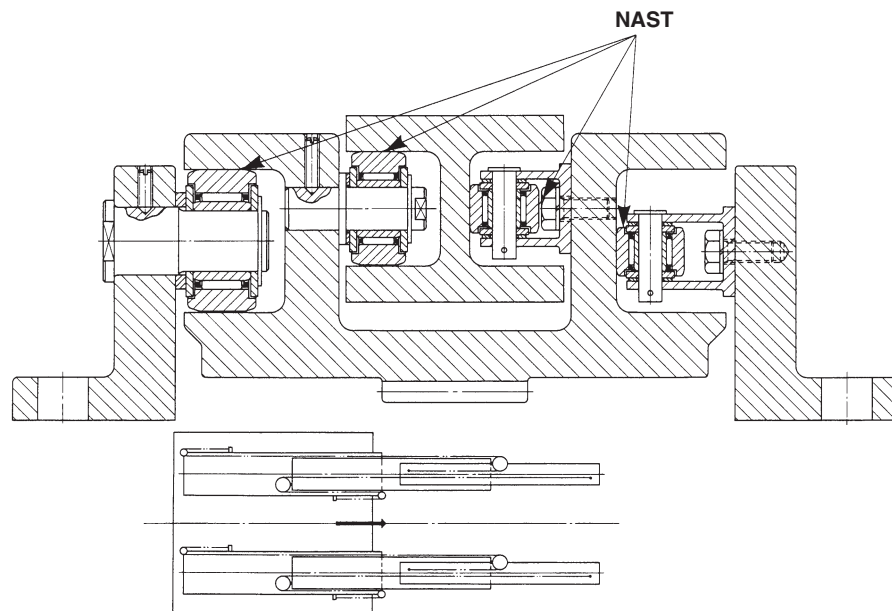


Machine tools

● Automatic tool changer

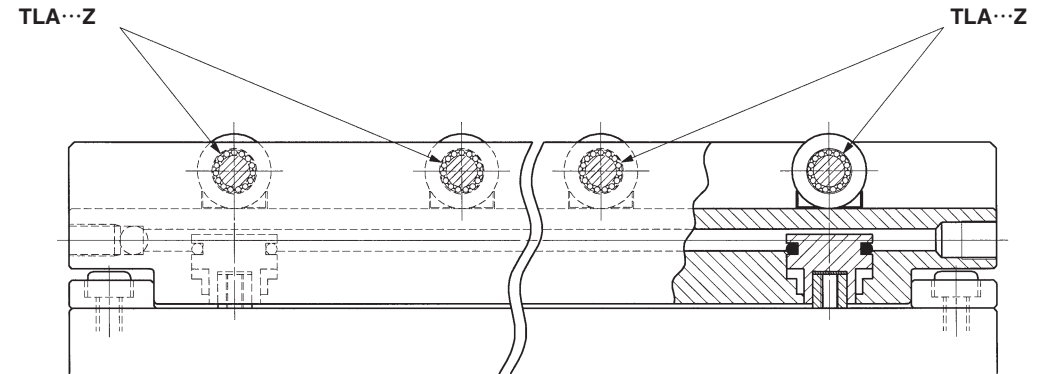


● Shuttle fork

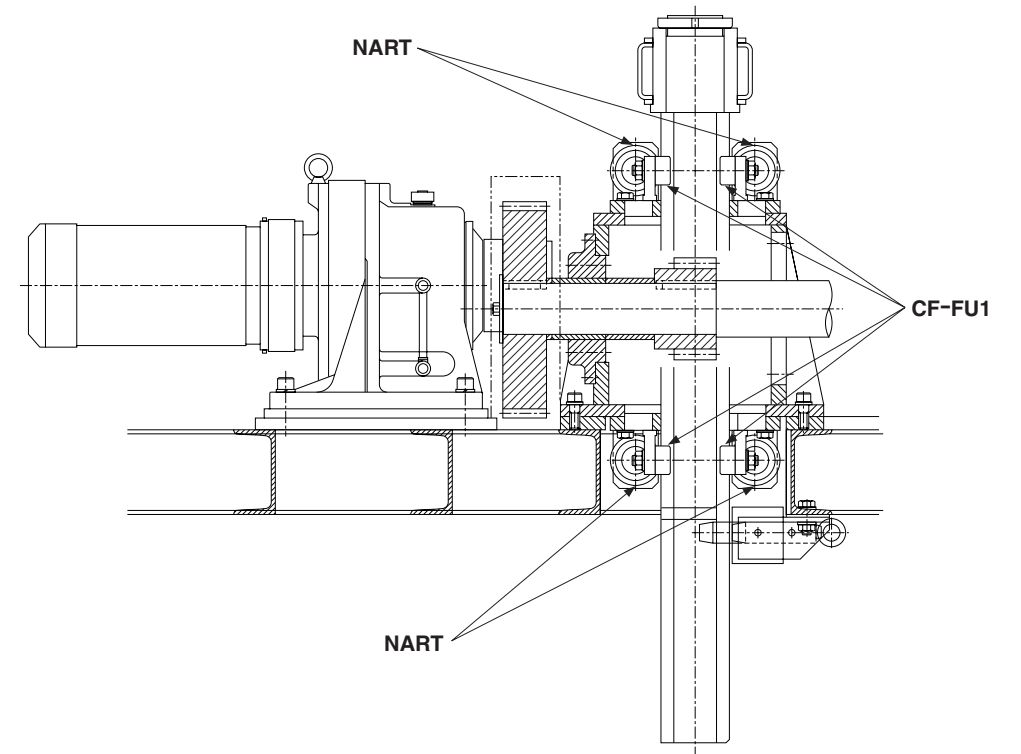


Machine tools

● Die lifter

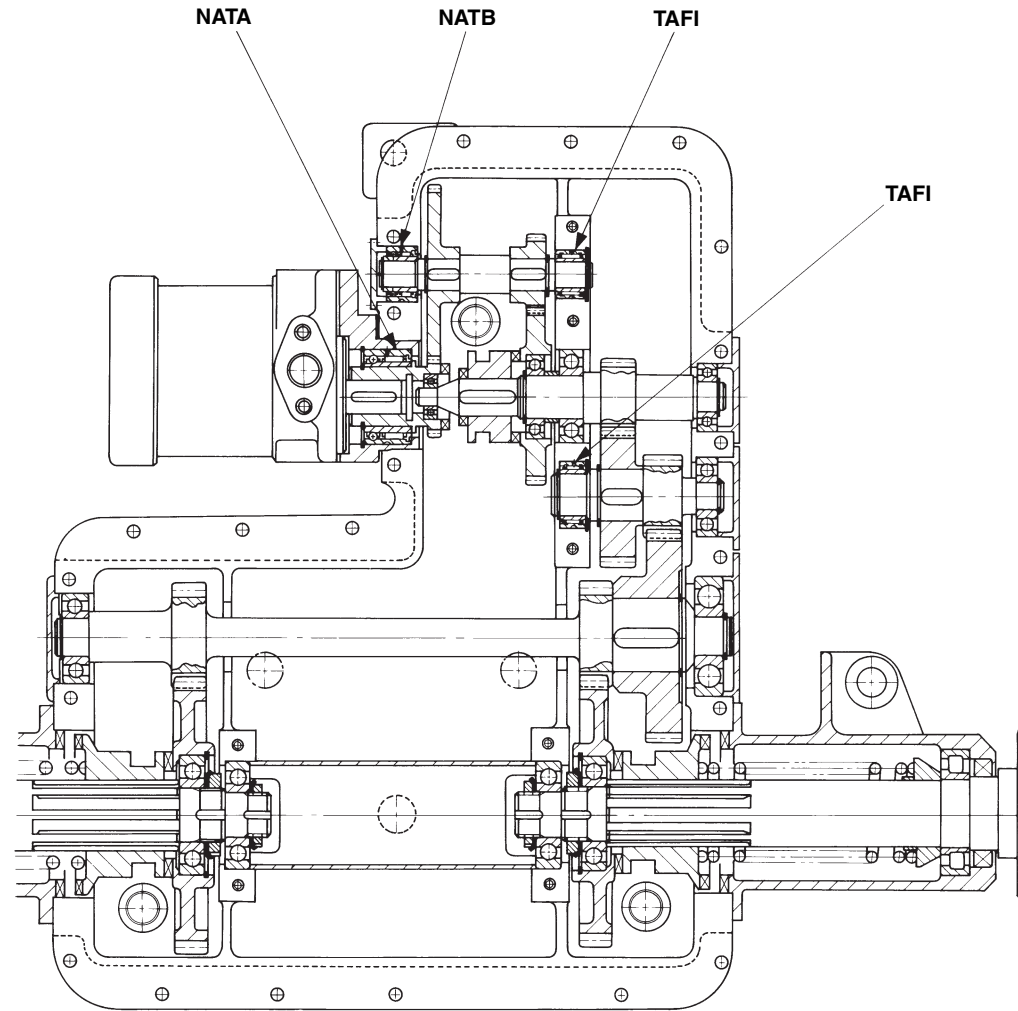


● Elevator of manufacturing line



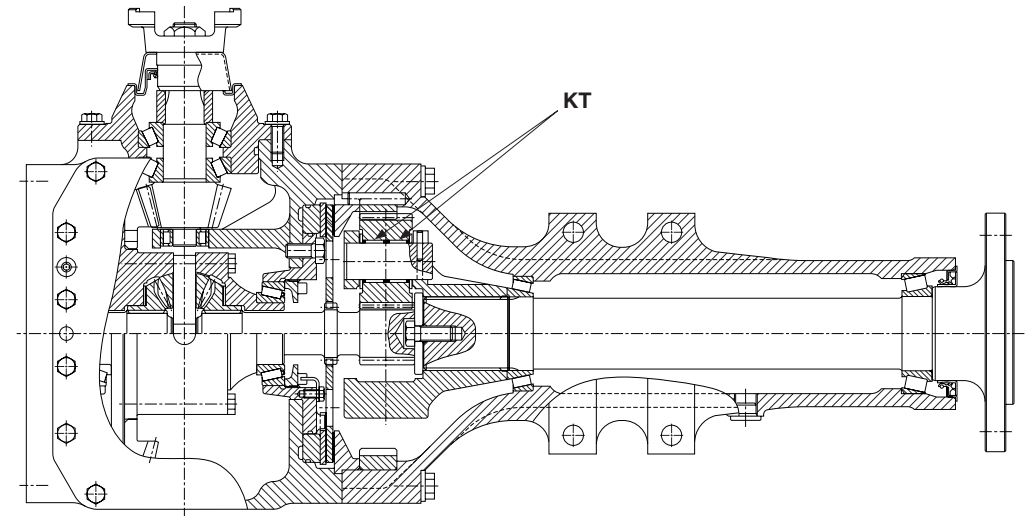
Construction machinery

● Transmission of construction machine

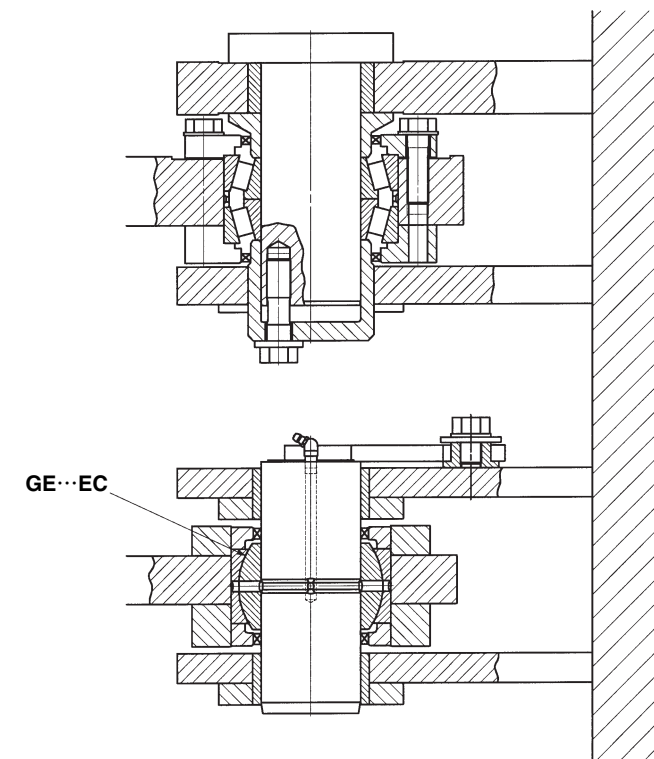


Construction machinery

● Axle of wheel loader

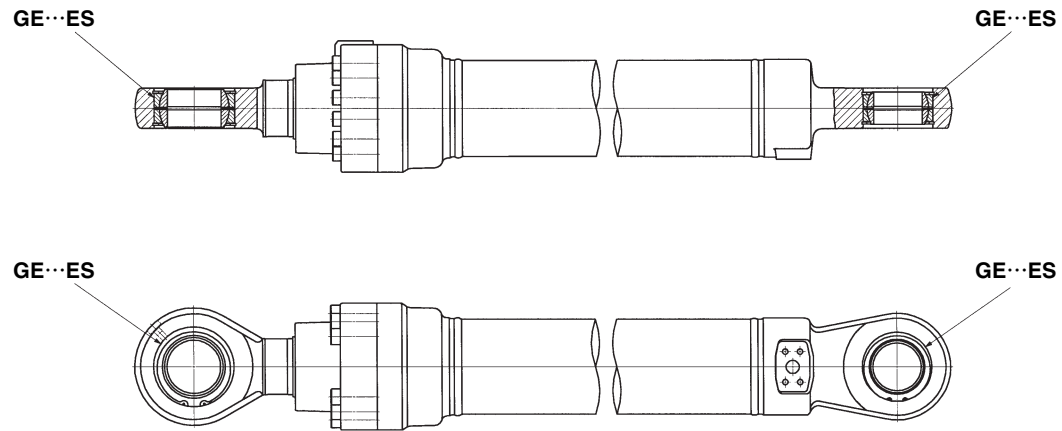


● Center pin of wheel loader

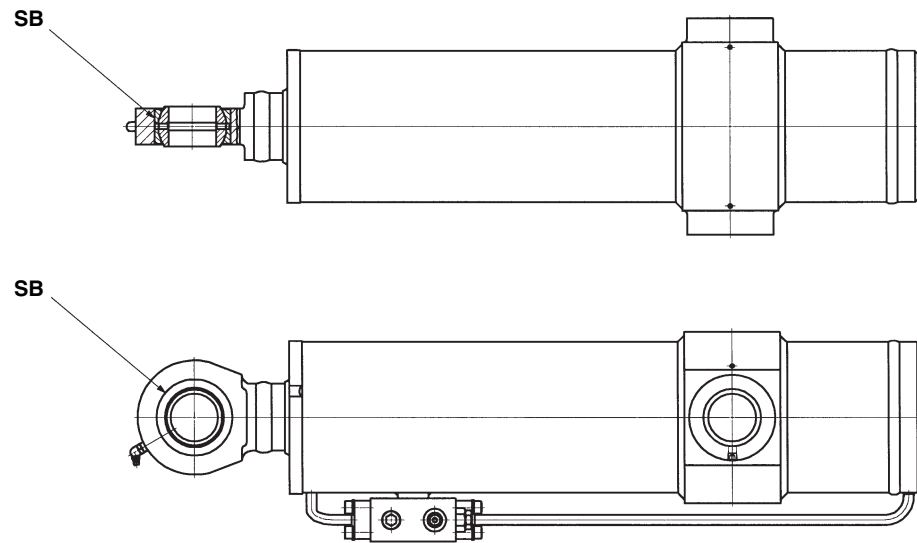


Transfer system

- Hydraulic cylinder arm of construction machine

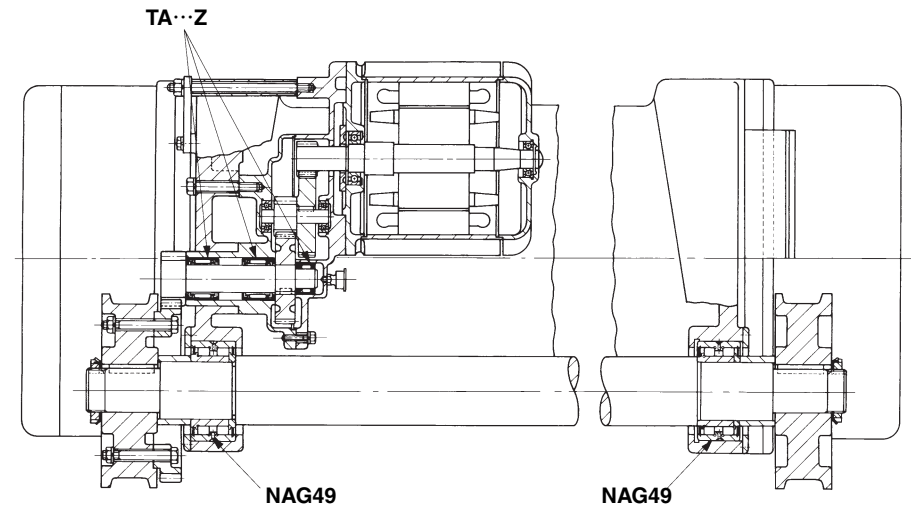


- Leveler of high lift work vehicle

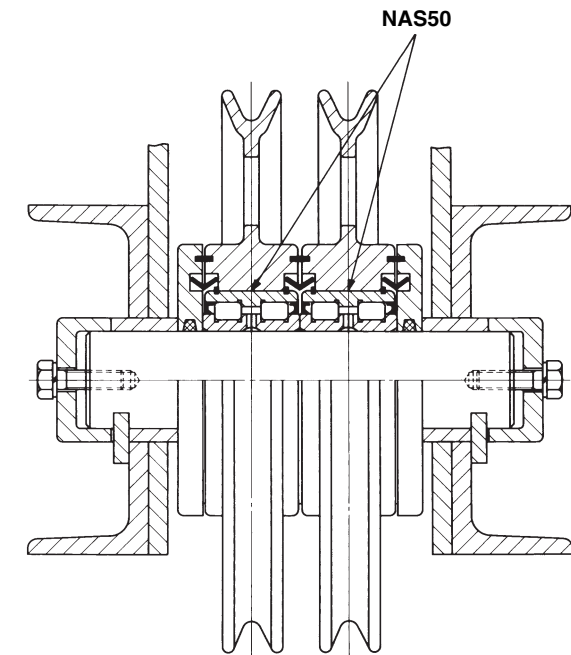


Transfer system

- Overhead crane

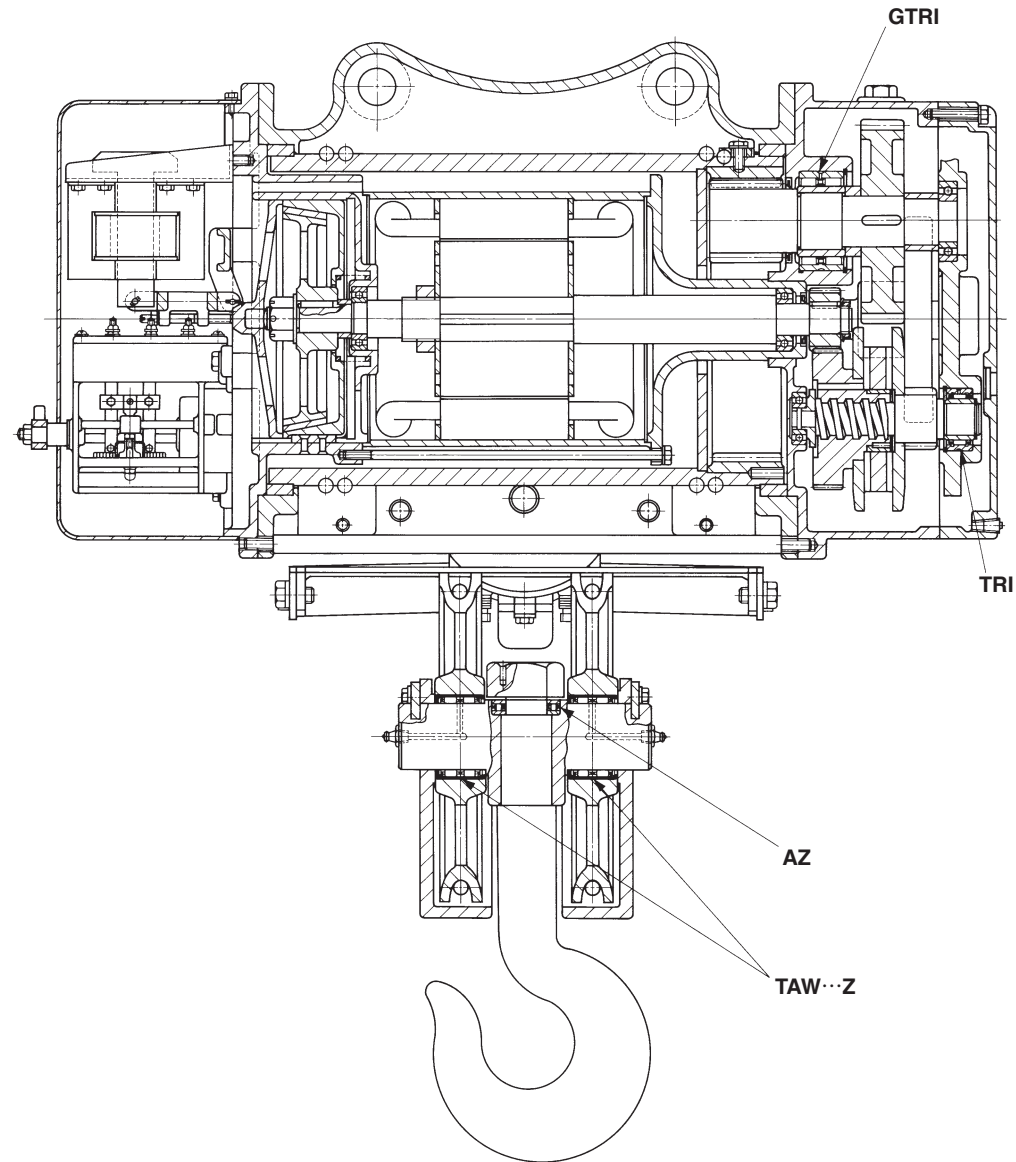


- Sheave



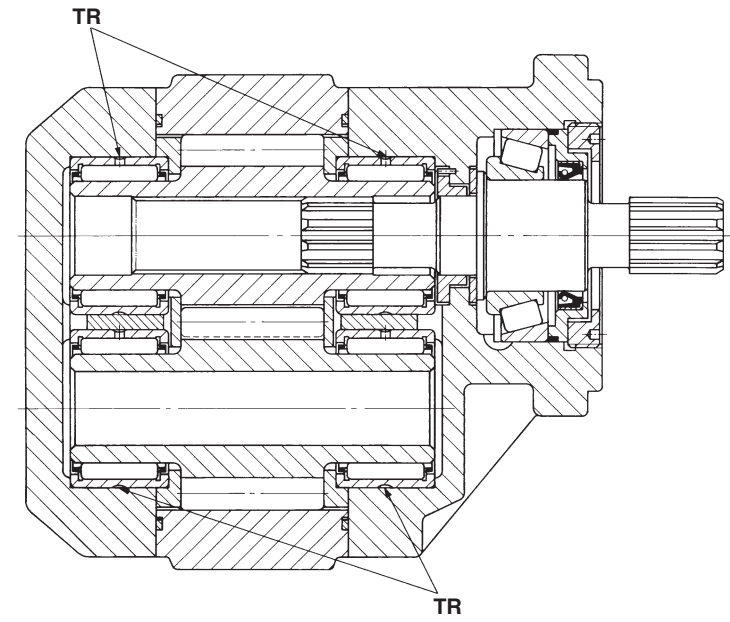
Transfer system

- Transfer system

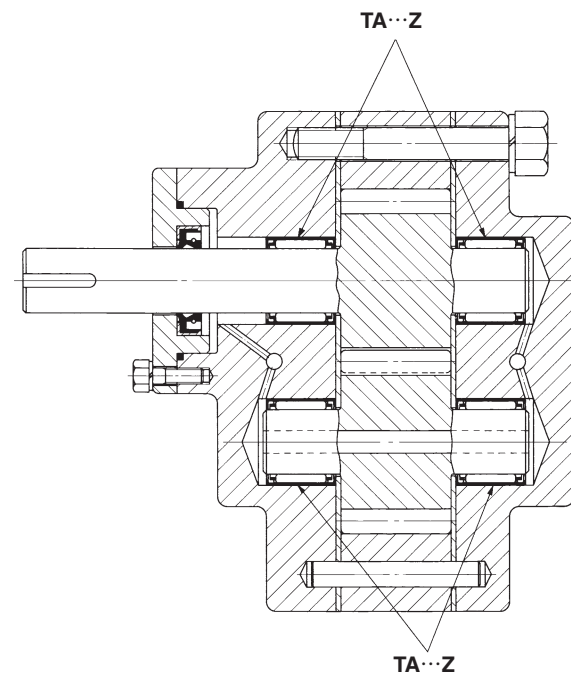


Hydraulic machines

- High pressure gear pump

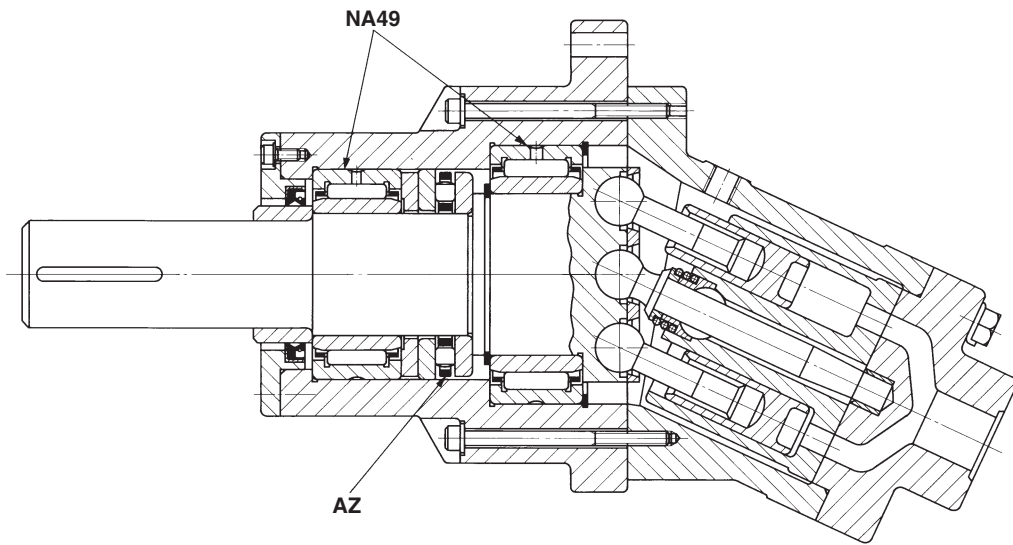


- Low pressure gear pump

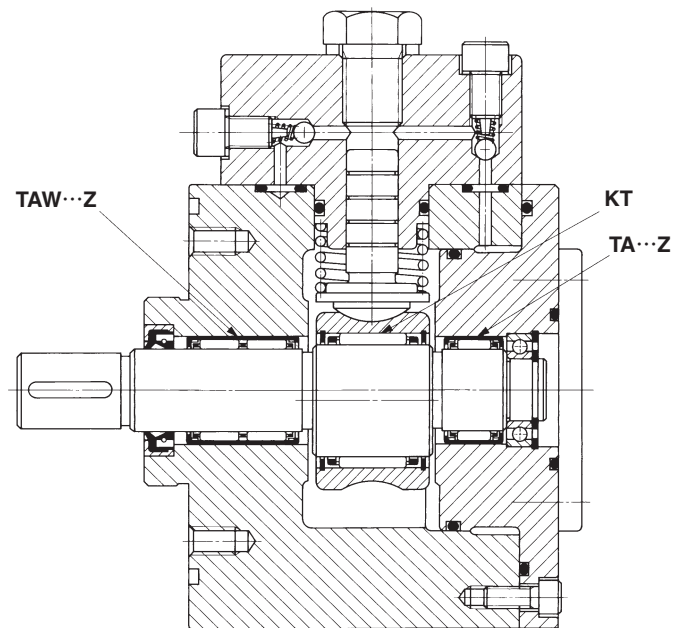


Hydraulic machines

● Rotary plunger pump

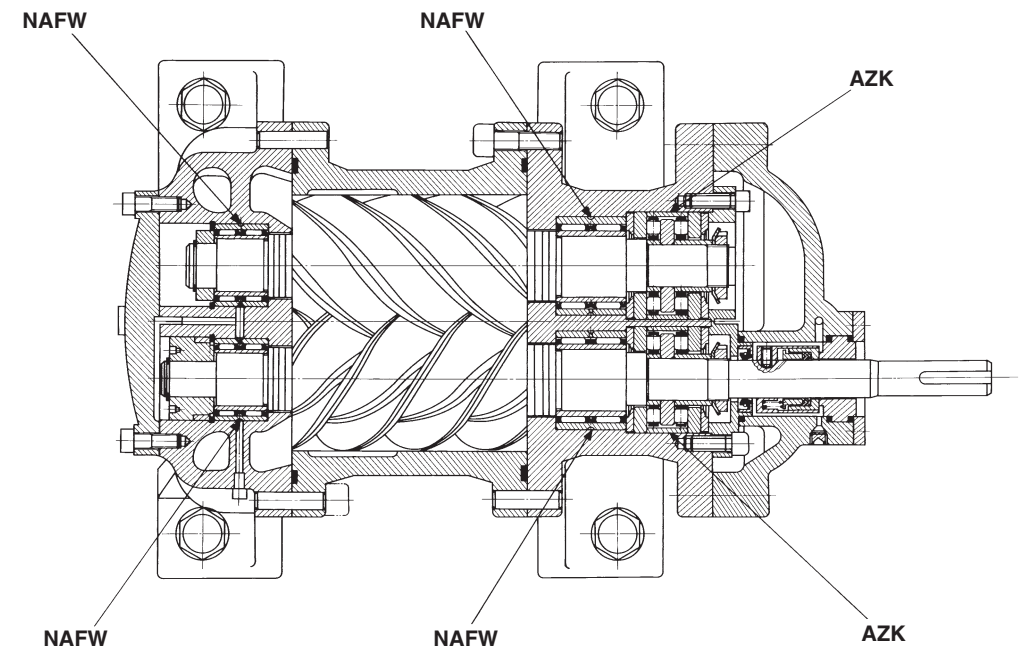


● Radial plunger pump

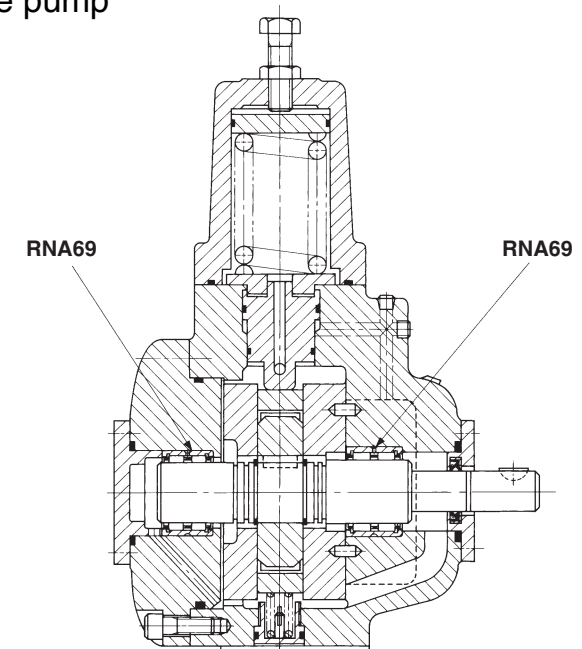


Hydraulic machines

● Screw pump

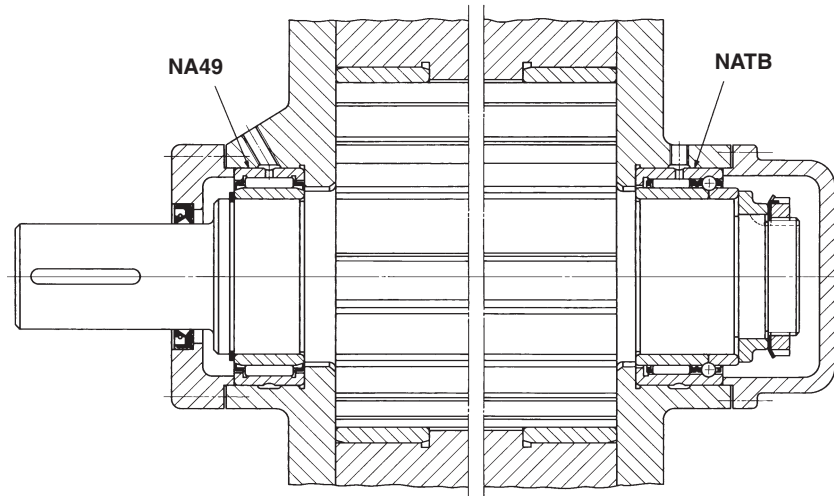


● Variable vane pump

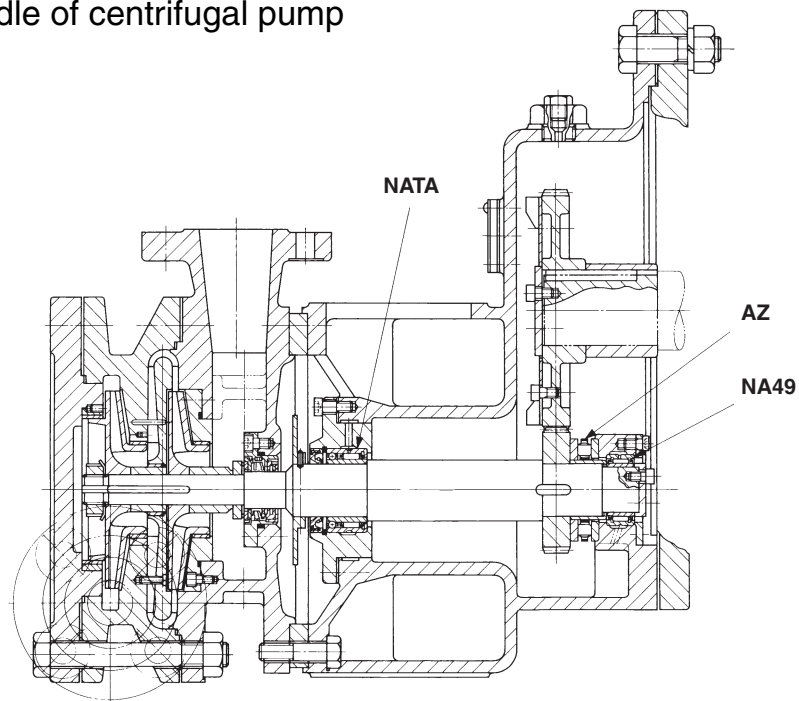


Fluid machines

- Multi-vane rotary compressor

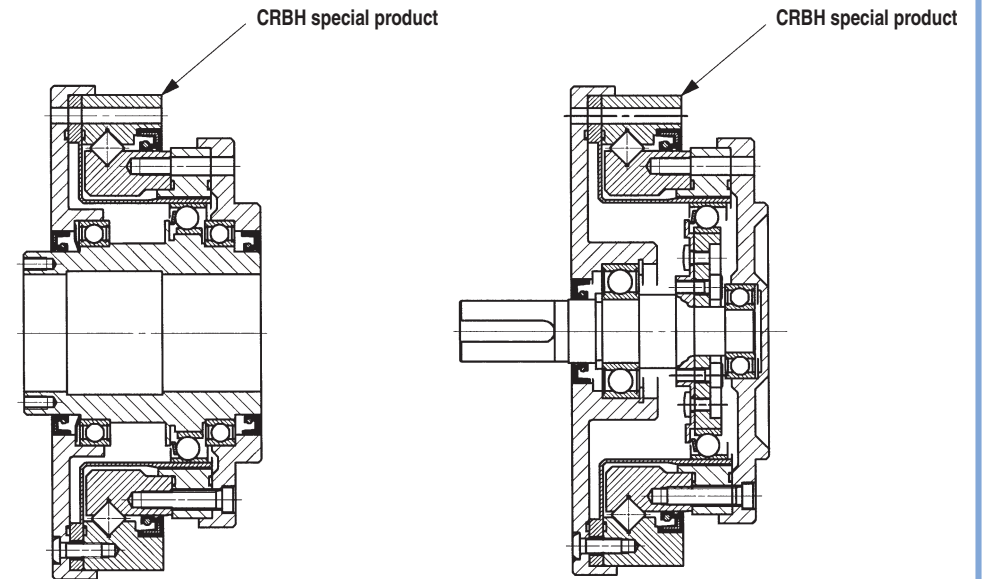


- Spindle of centrifugal pump

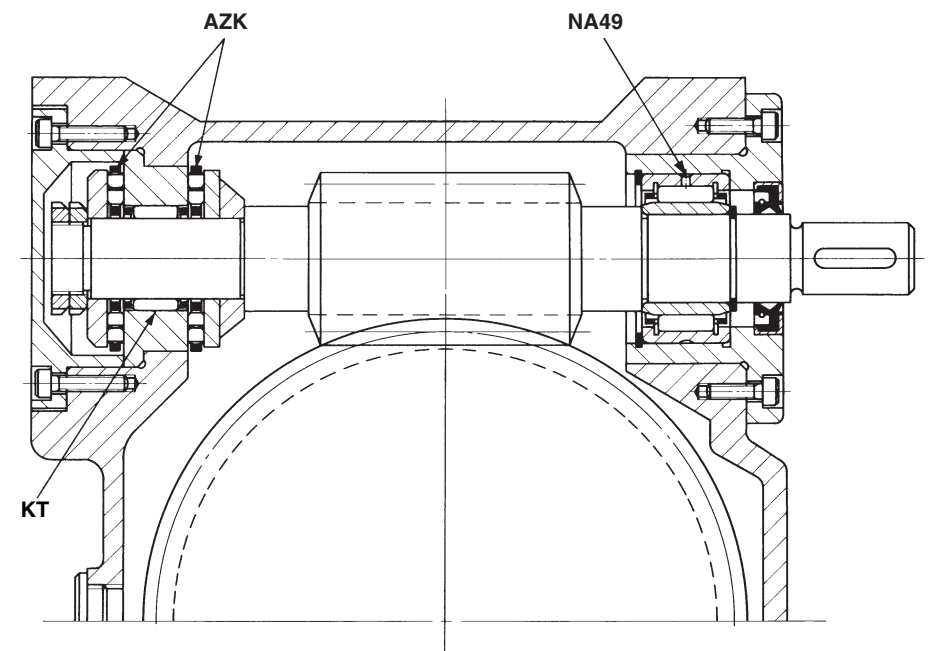


Transmissions

- Special thin type transmission

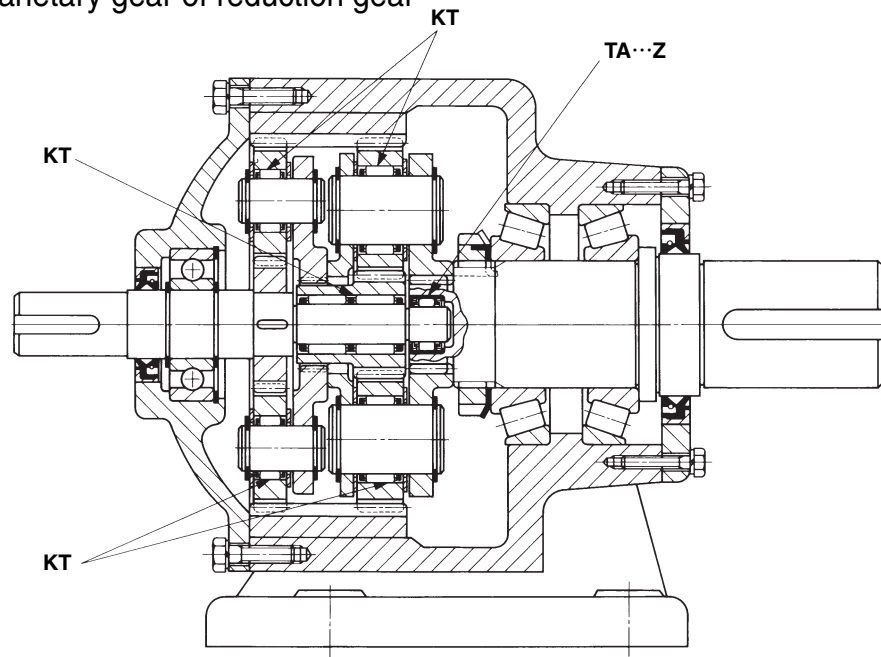


- Reduction worm gear

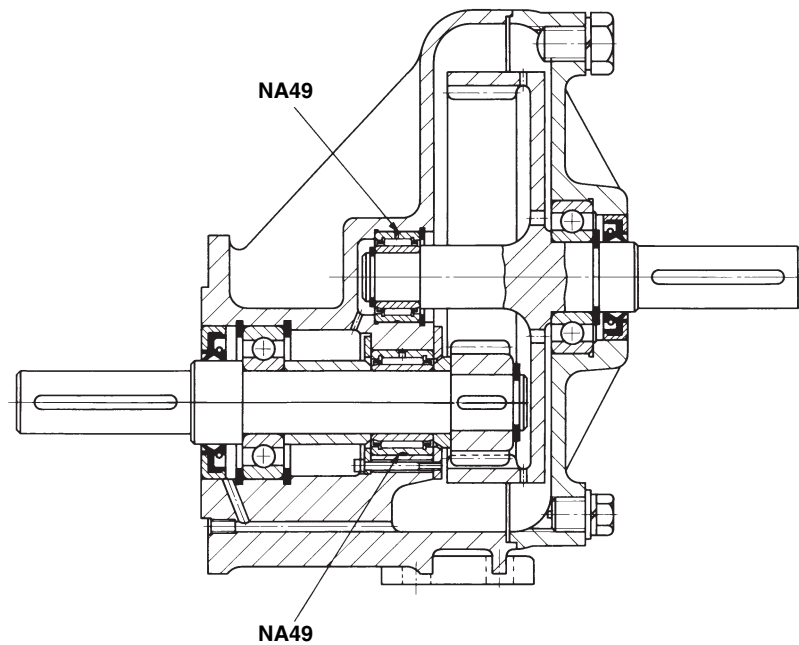


Transmissions

- Planetary gear of reduction gear

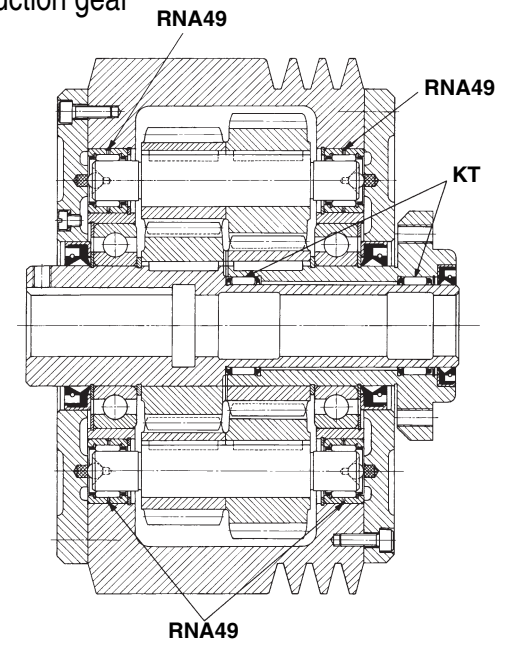


- Special small size reduction gear



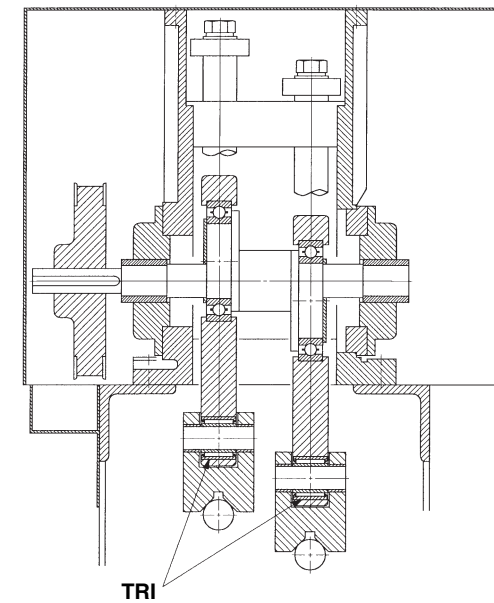
Transmission

- Belt pulley with reduction gear



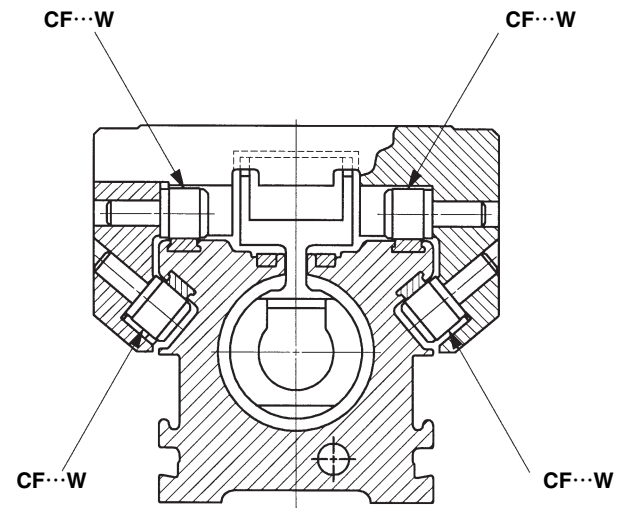
Food processing machine

- Food cutter

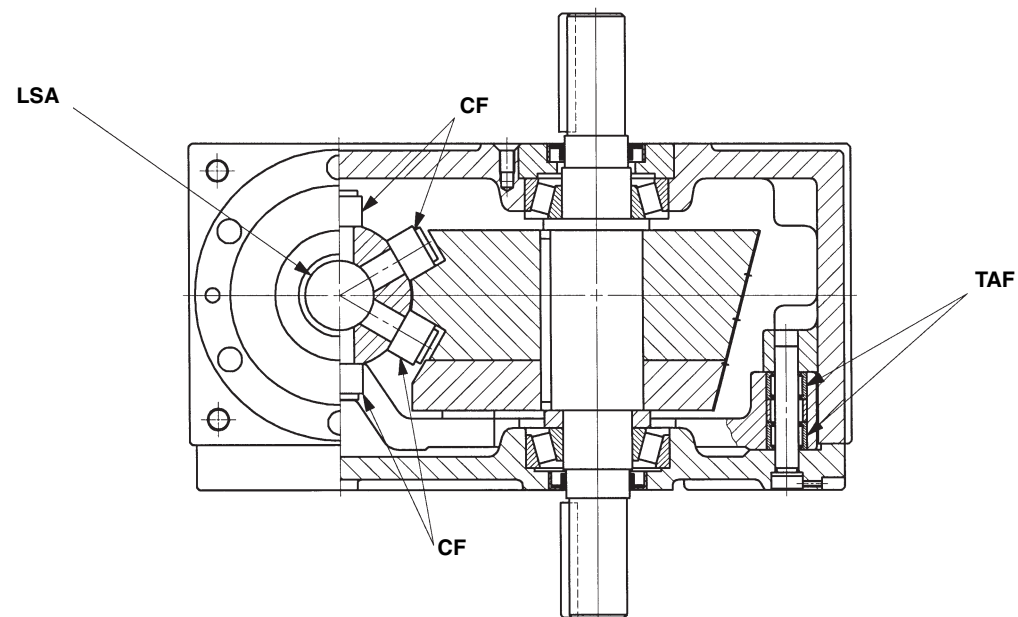


Pneumatic equipment

● Rodless cylinder

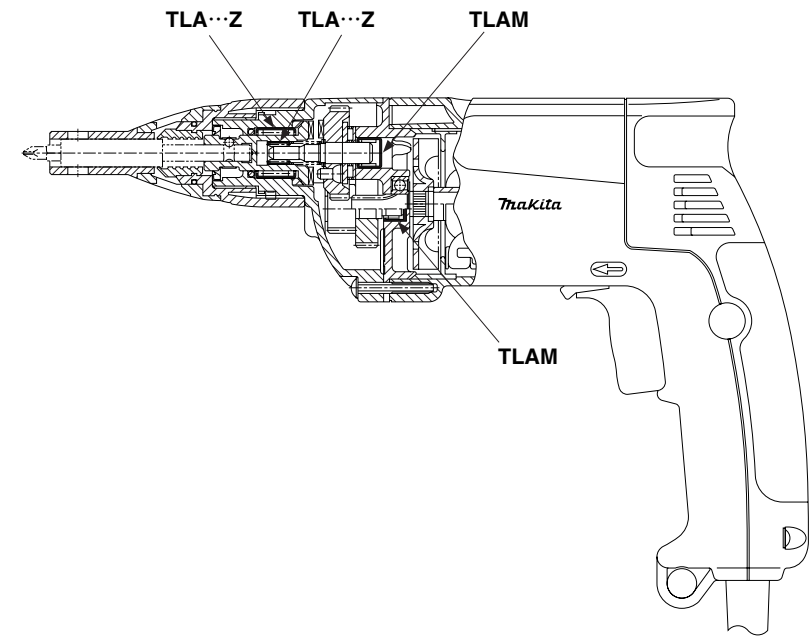


● Swivel type pick & place unit

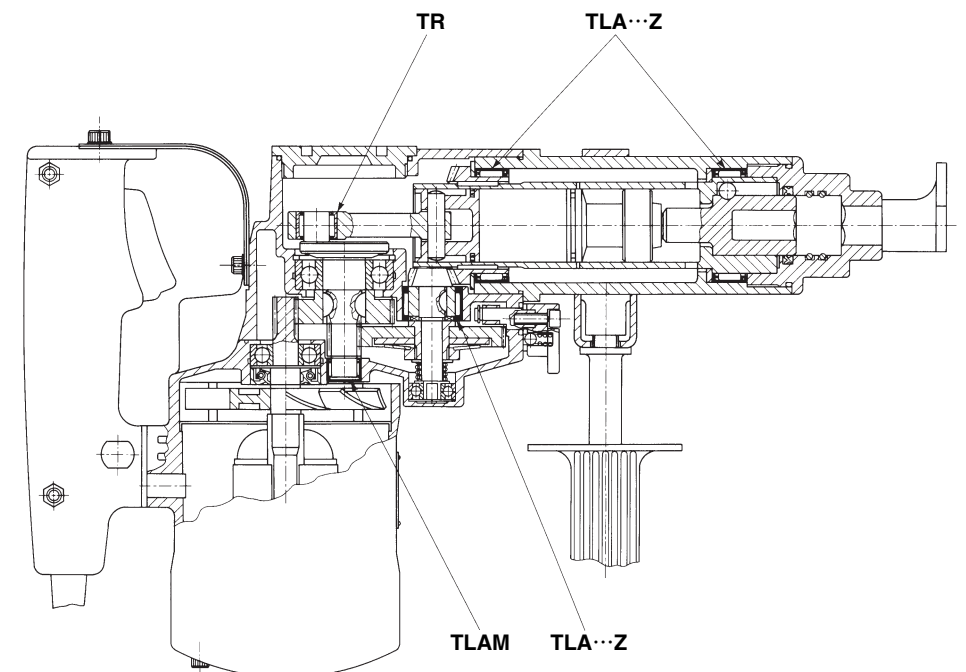


Power tools

● Screwdriver

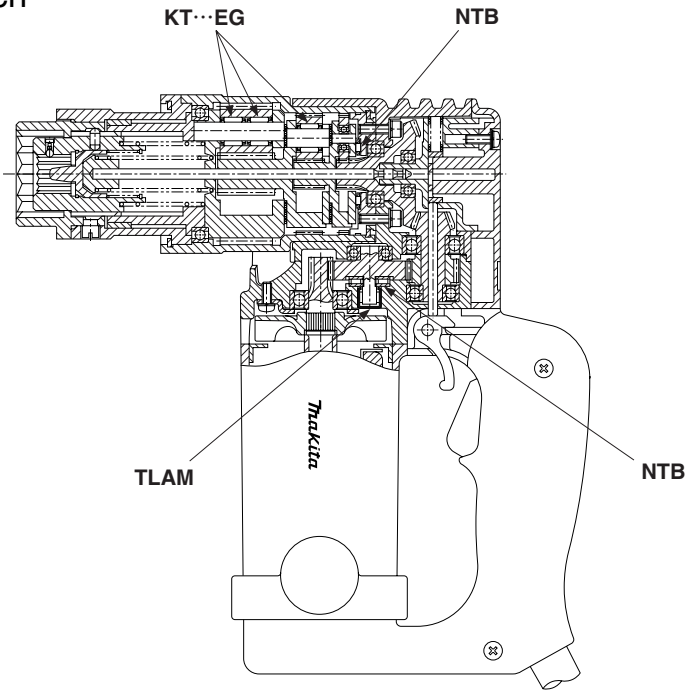


● Hammer drill

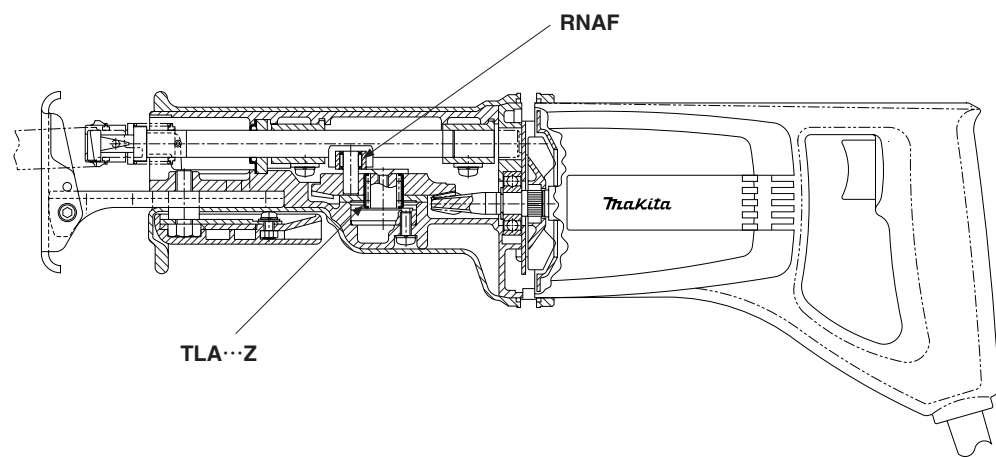


Power tools

● Shear wrench

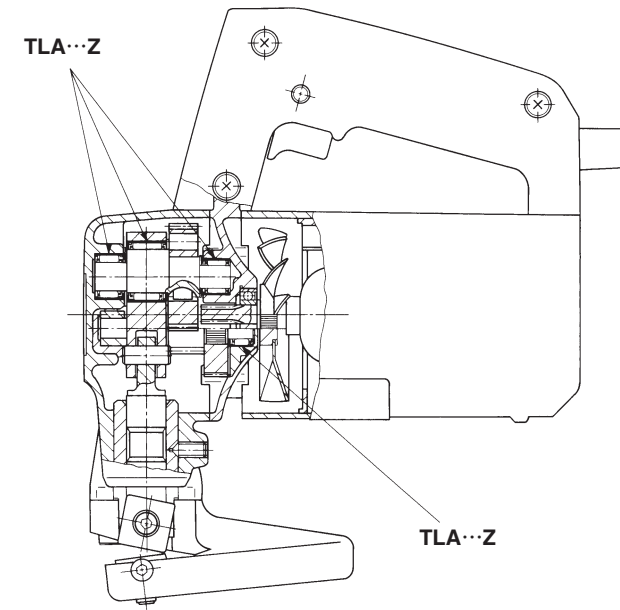


● Reciprocating saw

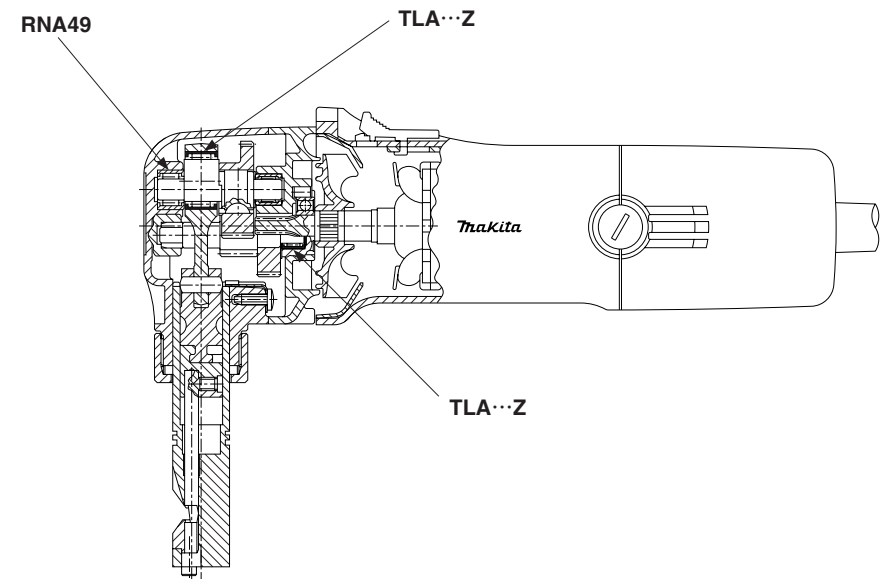


Power tools

● Shear

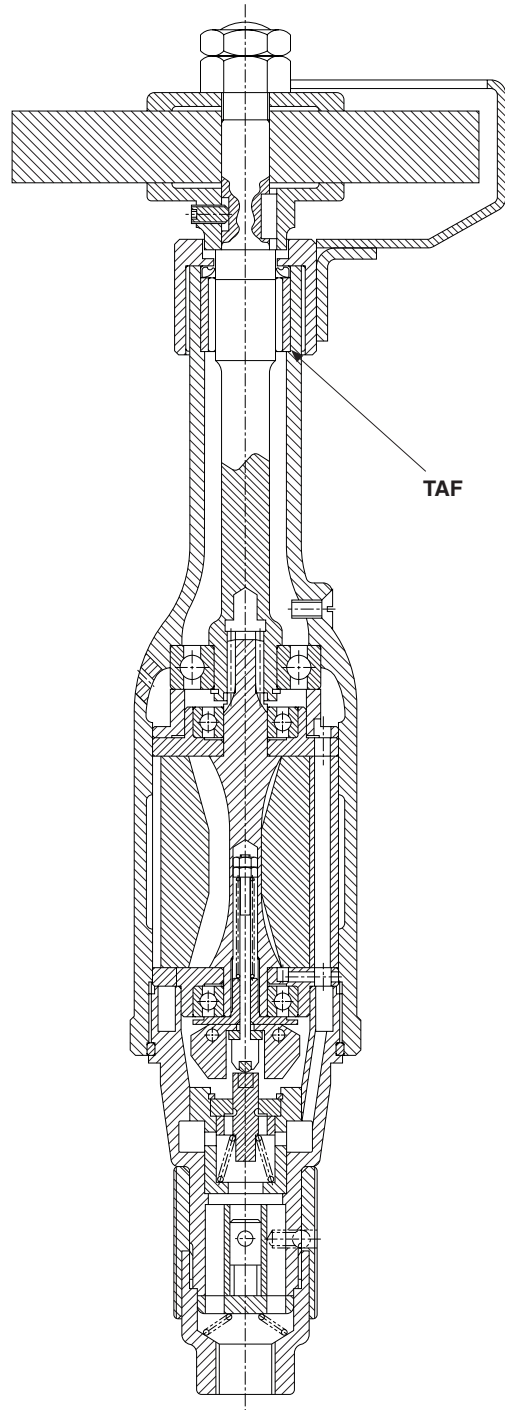


● Nibbler



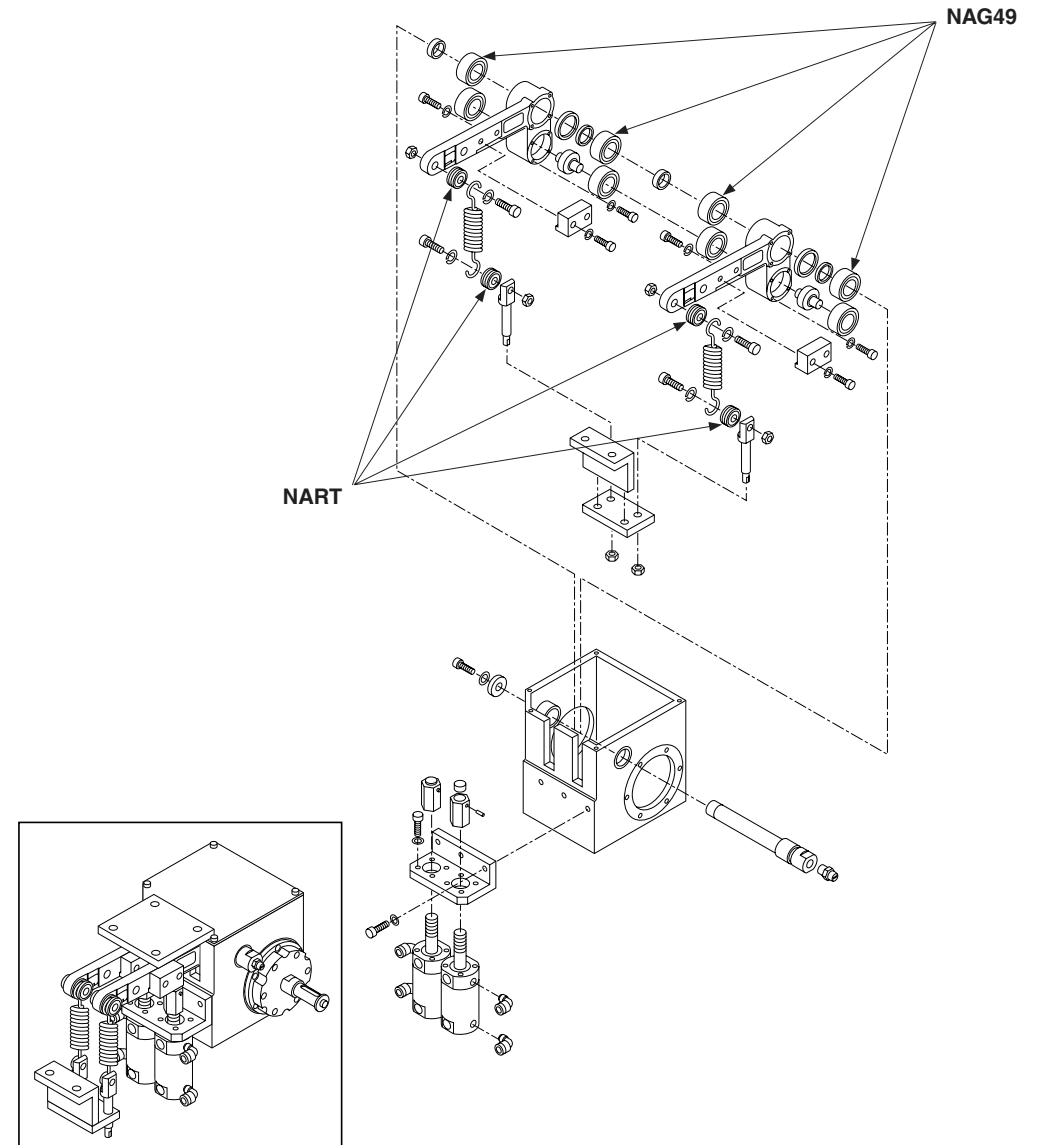
Power tools

- Portable grinder



High-speed chip moulder

- Cam box



MISCELLANEOUS TABLES

● Conversion Table of Units

Comparison table between SI units (system of international units), CGS units and gravitational 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 |

Conversion rates into SI units

| Item | Unit name | Symbol | Conversion rate into SI | SI unit name | Symbol |
|---|--------------------------------------|---------------------|-------------------------------------|-------------------------|------------------|
| Angle | Degree | ° | $\pi/180$ | Radian | rad |
| | Minute | ' | $\pi/10\ 800$ | | |
| | Second | " | $\pi/648\ 000$ | | |
| Length | Meter | m | 1 | Meter | m |
| | Micrometer | μ | 10 ⁻⁶ | | |
| | Angstrom | Å | 10 ⁻¹⁰ | | |
| | X-ray unit | | $\approx 1.002\ 08 \times 10^{-13}$ | | |
| Nautical mile | n mile | 1852 | | | |
| Area | Square meter | m ² | 1 | Square meter | m ² |
| | Are | a | 10 ² | | |
| | Hectare | ha | 10 ⁴ | | |
| Volume | Cubic meter | m ³ | 1 | Cubic meter | m ³ |
| | Liter | l, L | 10 ⁻³ | | |
| Mass | Kilogram | kg | 1 | Kilogram | kg |
| | Ton | t | 10 ³ | | |
| | Atomic mass unit | u | $\approx 1.660\ 57 \times 10^{-27}$ | | |
| Time | Second | s | 1 | Second | s |
| | Minute | min | 60 | | |
| | Hour | h | 3 600 | | |
| | Day | d | 86 400 | | |
| Velocity | Meter per second | m/s | 1 | Meter per second | m/s |
| | Knot | kn | 1 852/3 600 | | |
| 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 | m/s ² | 1 | Meter per square second | m/s ² |
| | G | G | 9.806 65 | | |
| Force | Kilogram force | kgf | 9.806 65 | Newton | N |
| | Ton force | tf | 9 806.65 | | |
| | Dyne | dyn | 10 ⁻⁵ | | |
| Moment of force | Kilogram force-meter | kgf·m | 9.806 65 | Newton-meter | N·m |
| Stress and pressure | Kilogram force per square meter | kgf/m ² | 9.806 65 | Pascal | Pa |
| | Kilogram force per square centimeter | kgf/cm ² | $9.806\ 65 \times 10^4$ | | |
| | Kilogram force per square millimeter | kgf/mm ² | $9.806\ 65 \times 10^6$ | | |

| Energy | Power | Temperature | Viscosity | Kinematic viscosity | Magnetic flux | Magnetic flux density | Magnetic field intensity |
|--------|---------|-------------|----------------------|---------------------|---------------|-----------------------|--------------------------|
| J | W | K | Pa·s | m ² /s | Wb | T | A/m |
| erg | erg/s | °C | P | St | Mx | Gs | Oe |
| kgf·m | kgf·m/s | °C | kgf·s/m ² | m ² /s | — | — | — |

| Item | Unit name | Symbol | Conversion rate into SI | SI unit name | Symbol |
|-------------------------------|--|-------------------------------------|---------------------------------|-------------------------|-------------------|
| Pressure | Hydro-column meter | mH ₂ O | 9 806.65 | Pascal | Pa |
| | Mercurial column millimeter | mmHg | 101 325/760 | | |
| | Torr | Torr | 101 325/760 | | |
| | Atmosphere | atm | 101 325 | | |
| Energy | Erg | erg | 10 ⁻⁷ | Joule | J |
| | IT calorie | cal _{IT} | 4.186 8 | | |
| | Kilogram force - meter | kgf·m | 9.806 65 | | |
| | Kilowatt hour | kW·h | 3.600×10^6 | | |
| | Horse power hour (French) | PS·h | $\approx 2.647\ 79 \times 10^6$ | | |
| Electron volt | eV | $\approx 1.602\ 19 \times 10^{-19}$ | | | |
| Power | Watt | W | 1 | Watt | W |
| | Horse power (French) | PS | ≈ 735.5 | | |
| | Kilogram force -meter per second | kgf·m/s | 9.806 65 | | |
| Viscosity | Poise | P | 10 ⁻¹ | Pascal-second | Pa·s |
| | Centipoise | cP | 10 ⁻³ | | |
| | Kilogram force-second per square meter | kgf·s/m ² | 9.806 65 | | |
| Kinematic viscosity | Stokes | St | 10 ⁻⁴ | Square meter per second | m ² /s |
| | Centistokes | cSt | 10 ⁻⁶ | | |
| Temperature | Degree | °C | +273.15 | Kelvin | K |
| Radioactivity | Curie | Ci | 3.7×10^{10} | Becquerel | Bq |
| | Exposure dose | Roentgen | 2.58×10^{-4} | Coulomb per kilogram | C/kg |
| | Absorbed dose | Rad | 10 ⁻² | Gray | Gy |
| | Dose equivalent | Rem | 10 ⁻² | Sievert | Sv |
| Magnetic flux | Maxwell | Mx | 10 ⁻⁸ | Weber | Wb |
| Magnetic flux density | Gamma | γ | 10 ⁻⁹ | Tesla | T |
| | Gauss | Gs | 10 ⁻⁴ | | |
| 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 |

Inch-mm Conversion Table

1 inch = 25.4 mm

| inch | | 0" | 1" | 2" | 3" | 4" | 5" | 6" | 7" | 8" |
|----------|----------|--------|--------|--------|--------|---------|---------|---------|---------|---------|
| Fraction | Decimal | | | | | | | | | |
| 1 / 64" | 0 | | 25.400 | 50.800 | 76.200 | 101.600 | 127.000 | 152.400 | 177.800 | 203.200 |
| 1 / 32" | 0.015625 | 0.397 | 25.797 | 51.197 | 76.597 | 101.997 | 127.397 | 152.797 | 178.197 | 203.597 |
| 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 | | 0" | 1" | 2" | 3" | 4" | 5" | 6" | 7" | 8" |
|----------|----------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| Fraction | Decimal | | | | | | | | | |
| 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 | Vickers' hardness | Brinell hardness | | Rockwell hardness | | Shore hardness |
|---|-------------------|------------------|-----------------------|---|--------------------------------------|----------------|
| | | Standard ball | Tungsten carbide ball | A scale Load 588.4N Diamond circular cone | B scale Load 980.7N 1/16" ball | |
| HRC | HV | | | | | HS |
| 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 |

| Rockwell C scale hardness Load 1471N | Vickers' hardness | Brinell hardness | | Rockwell hardness | | Shore hardness |
|---|-------------------|------------------|-----------------------|---|--------------------------------------|----------------|
| | | Standard ball | Tungsten carbide ball | A scale Load 588.4N Diamond circular cone | B scale Load 980.7N 1/16" ball | |
| HRC | HV | | | | | HS |
| 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

unit : μm

| 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 | | | | | | | | | | | | |

| Nominal Diameter mm | | g6 | | h5 | | h6 | | h7 | | h8 | | h9 | | h10 | | h11 | |
|---------------------|-----|------|-----|------|-----|------|-----|------|-----|------|------|------|------|------|------|------|-----|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| -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 |
| -10 | -29 | 0 | -13 | 0 | -19 | 0 | -30 | 0 | -46 | 0 | -74 | 0 | -120 | 0 | -190 | 40 | 50 |
| -12 | -34 | 0 | -15 | 0 | -22 | 0 | -35 | 0 | -54 | 0 | -87 | 0 | -140 | 0 | -220 | 50 | 65 |
| -14 | -39 | 0 | -18 | 0 | -25 | 0 | -40 | 0 | -63 | 0 | -100 | 0 | -160 | 0 | -250 | 65 | 80 |
| -15 | -44 | 0 | -20 | 0 | -29 | 0 | -46 | 0 | -72 | 0 | -115 | 0 | -185 | 0 | -290 | 80 | 100 |
| -17 | -49 | 0 | -23 | 0 | -32 | 0 | -52 | 0 | -81 | 0 | -130 | 0 | -210 | 0 | -320 | 100 | 120 |
| -18 | -54 | 0 | -25 | 0 | -36 | 0 | -57 | 0 | -89 | 0 | -140 | 0 | -230 | 0 | -360 | 120 | 140 |
| -20 | -60 | 0 | -27 | 0 | -40 | 0 | -63 | 0 | -97 | 0 | -155 | 0 | -250 | 0 | -400 | 140 | 160 |
| | | | | | | | | | | | | | | | | 160 | 180 |
| | | | | | | | | | | | | | | | | 180 | 200 |
| | | | | | | | | | | | | | | | | 200 | 225 |
| | | | | | | | | | | | | | | | | 225 | 250 |
| | | | | | | | | | | | | | | | | 250 | 280 |
| | | | | | | | | | | | | | | | | 280 | 315 |
| | | | | | | | | | | | | | | | | 315 | 355 |
| | | | | | | | | | | | | | | | | 355 | 400 |
| | | | | | | | | | | | | | | | | 400 | 450 |
| | | | | | | | | | | | | | | | | 450 | 500 |

| Nominal Diameter mm | | h12 | | js5 | | j5 | | js6 | | j6 | | j7 | | k5 | | k6 | |
|---------------------|-------|------|------|-------|-------|------|-----|-------|-------|------|-----|------|-----|------|-----|------|-----|
| Over | Incl. | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| — | 3 | 0 | -100 | +2 | -2 | +2 | -2 | +3 | -3 | +4 | -2 | +6 | -4 | +4 | 0 | +6 | 0 |
| 3 | 6 | 0 | -120 | +2.5 | -2.5 | +3 | -2 | +4 | -4 | +6 | -2 | +8 | -4 | +6 | +1 | +9 | +1 |
| 6 | 10 | 0 | -150 | +3 | -3 | +4 | -2 | +4.5 | -4.5 | +7 | -2 | +10 | -5 | +7 | +1 | +10 | +1 |
| 10 | 18 | 0 | -180 | +4 | -4 | +5 | -3 | +5.5 | -5.5 | +8 | -3 | +12 | -6 | +9 | +1 | +12 | +1 |
| 18 | 30 | 0 | -210 | +4.5 | -4.5 | +5 | -4 | +6.5 | -6.5 | +9 | -4 | +13 | -8 | +11 | +2 | +15 | +2 |
| 30 | 40 | 0 | -250 | +5.5 | -5.5 | +6 | -5 | +8 | -8 | +11 | -5 | +15 | -10 | +13 | +2 | +18 | +2 |
| 40 | 50 | | | | | | | | | | | | | | | | |
| 50 | 65 | 0 | -300 | +6.5 | -6.5 | +6 | -7 | +9.5 | -9.5 | +12 | -7 | +18 | -12 | +15 | +2 | +21 | +2 |
| 65 | 80 | | | | | | | | | | | | | | | | |
| 80 | 100 | 0 | -350 | +7.5 | -7.5 | +6 | -9 | +11 | -11 | +13 | -9 | +20 | -15 | +18 | +3 | +25 | +3 |
| 100 | 120 | | | | | | | | | | | | | | | | |
| 120 | 140 | 0 | -400 | +9 | -9 | +7 | -11 | +12.5 | -12.5 | +14 | -11 | +22 | -18 | +21 | +3 | +28 | +3 |
| 140 | 160 | | | | | | | | | | | | | | | | |
| 160 | 180 | | | | | | | | | | | | | | | | |
| 180 | 200 | 0 | -460 | +10 | -10 | +7 | -13 | +14.5 | -14.5 | +16 | -13 | +25 | -21 | +24 | +4 | +33 | +4 |
| 200 | 225 | | | | | | | | | | | | | | | | |
| 225 | 250 | | | | | | | | | | | | | | | | |
| 250 | 280 | 0 | -520 | +11.5 | -11.5 | +7 | -16 | +16 | -16 | +16 | -16 | +26 | -26 | +27 | +4 | +36 | +4 |
| 280 | 315 | | | | | | | | | | | | | | | | |
| 315 | 355 | 0 | -570 | +12.5 | -12.5 | +7 | -18 | +18 | -18 | +18 | -18 | +29 | -28 | +29 | +4 | +40 | +4 |
| 355 | 400 | | | | | | | | | | | | | | | | |
| 400 | 450 | 0 | -630 | +13.5 | -13.5 | +7 | -20 | +20 | -20 | +20 | -20 | +31 | -32 | +32 | +5 | +45 | +5 |
| 450 | 500 | | | | | | | | | | | | | | | | |

unit : μm

| Nominal Diameter mm | | m5 | | m6 | | n5 | | n6 | | p6 | |
|---------------------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| +6 | +2 | +8 | +2 | +8 | +4 | +10 | +4 | +12 | +6 | — | 3 |
| +9 | +4 | +12 | +4 | +13 | +8 | +16 | +8 | +20 | +12 | 3 | 6 |
| +12 | +6 | +15 | +6 | +16 | +10 | +19 | +10 | +24 | +15 | 6 | 10 |
| +15 | +7 | +18 | +7 | +20 | +12 | +23 | +12 | +29 | +18 | 10 | 18 |
| +17 | +8 | +21 | +8 | +24 | +15 | +28 | +15 | +35 | +22 | 18 | 30 |
| +20 | +9 | +25 | +9 | +28 | +17 | +33 | +17 | +42 | +26 | 30 | 40 |
| +24 | +11 | +30 | +11 | +33 | +20 | +39 | +20 | +51 | +32 | 40 | 50 |
| +28 | +13 | +35 | +13 | +38 | +23 | +45 | +23 | +59 | +37 | 50 | 65 |
| +33 | +15 | +40 | +15 | +45 | +27 | +52 | +27 | +68 | +43 | 65 | 80 |
| +37 | +17 | +46 | +17 | +51 | +31 | +60 | +31 | +79 | +50 | 80 | 100 |
| +43 | +20 | +52 | +20 | +57 | +34 | +66 | +34 | +88 | +56 | 100 | 120 |
| +46 | +21 | +57 | +21 | +62 | +37 | +73 | +37 | +98 | +62 | 120 | 140 |
| +50 | +23 | +63 | +23 | +67 | +40 | +80 | +40 | +108 | +68 | 140 | 160 |
| | | | | | | | | | | 160 | 180 |
| | | | | | | | | | | 180 | 200 |
| | | | | | | | | | | 200 | 225 |
| | | | | | | | | | | 225 | 250 |
| | | | | | | | | | | 250 | 280 |
| | | | | | | | | | | 280 | 315 |
| | | | | | | | | | | 315 | 355 |
| | | | | | | | | | | 355 | 400 |
| | | | | | | | | | | 400 | 450 |
| | | | | | | | | | | 450 | 500 |

● Tolerance of Housing Bore Diameter

unit : μm

| 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 | | | | | | | | | | | | | | |

| 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 |
| +19 | 0 | +30 | 0 | +46 | 0 | +74 | 0 | +120 | 0 | +190 | 0 | +9.5 | -9.5 | +13 | -6 | 40 | 50 |
| +22 | 0 | +35 | 0 | +54 | 0 | +87 | 0 | +140 | 0 | +220 | 0 | +11 | -11 | +16 | -6 | 50 | 65 |
| +25 | 0 | +40 | 0 | +63 | 0 | +100 | 0 | +160 | 0 | +250 | 0 | +12.5 | -12.5 | +18 | -7 | 65 | 80 |
| +29 | 0 | +46 | 0 | +72 | 0 | +115 | 0 | +185 | 0 | +290 | 0 | +14.5 | -14.5 | +22 | -7 | 80 | 100 |
| +32 | 0 | +52 | 0 | +81 | 0 | +130 | 0 | +210 | 0 | +320 | 0 | +16 | -16 | +25 | -7 | 100 | 120 |
| +36 | 0 | +57 | 0 | +89 | 0 | +140 | 0 | +230 | 0 | +360 | 0 | +18 | -18 | +29 | -7 | 120 | 140 |
| +40 | 0 | +63 | 0 | +97 | 0 | +155 | 0 | +250 | 0 | +400 | 0 | +20 | -20 | +33 | -7 | 140 | 160 |
| | | | | | | | | | | | | | | | | 160 | 180 |
| | | | | | | | | | | | | | | | | 180 | 200 |
| | | | | | | | | | | | | | | | | 200 | 225 |
| | | | | | | | | | | | | | | | | 225 | 250 |
| | | | | | | | | | | | | | | | | 250 | 280 |
| | | | | | | | | | | | | | | | | 280 | 315 |
| | | | | | | | | | | | | | | | | 315 | 355 |
| | | | | | | | | | | | | | | | | 355 | 400 |
| | | | | | | | | | | | | | | | | 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 |
| | | | | | | | | | | 65 | 80 |
| -10 | -45 | -30 | -52 | -24 | -59 | -38 | -73 | -58 | -93 | 80 | 100 |
| | | | | | | | | | | 100 | 120 |
| -12 | -52 | -36 | -61 | -28 | -68 | -48 | -88 | -77 | -117 | 120 | 140 |
| | | | | | | | | | | 140 | 160 |
| | | | | | | | | | | 160 | 180 |
| -14 | -60 | -41 | -70 | -33 | -79 | -60 | -106 | -105 | -151 | 180 | 200 |
| | | | | | | | | | | 200 | 225 |
| | | | | | | | | | | 225 | 250 |
| -14 | -66 | -47 | -79 | -36 | -88 | -74 | -126 | -138 | -190 | 250 | 280 |
| | | | | | | | | | | 280 | 315 |
| -16 | -73 | -51 | -87 | -41 | -98 | -87 | -144 | -169 | -226 | 315 | 355 |
| | | | | | | | | | | 355 | 400 |
| -17 | -80 | -55 | -95 | -45 | -108 | -103 | -166 | -209 | -272 | 400 | 450 |
| | | | | | | | | | | 450 | 500 |

N-lbf Conversion Table

| N | | lbf | N | | lbf |
|--------|----|-------|--------|----|--------|
| 4.448 | 1 | 0.225 | 151.24 | 34 | 7.643 |
| 8.896 | 2 | 0.450 | 155.69 | 35 | 7.868 |
| 13.345 | 3 | 0.674 | 160.14 | 36 | 8.093 |
| 17.793 | 4 | 0.899 | 164.58 | 37 | 8.318 |
| 22.241 | 5 | 1.124 | 169.03 | 38 | 8.543 |
| 26.689 | 6 | 1.349 | 173.48 | 39 | 8.768 |
| 31.138 | 7 | 1.574 | 177.93 | 40 | 8.992 |
| 35.586 | 8 | 1.798 | 182.38 | 41 | 9.217 |
| 40.034 | 9 | 2.023 | 186.83 | 42 | 9.442 |
| 44.482 | 10 | 2.248 | 191.27 | 43 | 9.667 |
| 48.930 | 11 | 2.473 | 195.72 | 44 | 9.892 |
| 53.379 | 12 | 2.698 | 200.17 | 45 | 10.116 |
| 57.827 | 13 | 2.923 | 204.62 | 46 | 10.341 |
| 62.275 | 14 | 3.147 | 209.07 | 47 | 10.566 |
| 66.723 | 15 | 3.372 | 213.51 | 48 | 10.791 |
| 71.171 | 16 | 3.597 | 217.96 | 49 | 11.016 |
| 75.620 | 17 | 3.822 | 222.41 | 50 | 11.240 |
| 80.068 | 18 | 4.047 | 226.86 | 51 | 11.465 |
| 84.516 | 19 | 4.271 | 231.31 | 52 | 11.690 |
| 88.964 | 20 | 4.496 | 235.76 | 53 | 11.915 |
| 93.413 | 21 | 4.721 | 240.20 | 54 | 12.140 |
| 97.861 | 22 | 4.946 | 244.65 | 55 | 12.364 |
| 102.31 | 23 | 5.171 | 249.10 | 56 | 12.589 |
| 106.76 | 24 | 5.395 | 253.55 | 57 | 12.814 |
| 111.21 | 25 | 5.620 | 258.00 | 58 | 13.039 |
| 115.65 | 26 | 5.845 | 262.44 | 59 | 13.264 |
| 120.10 | 27 | 6.070 | 266.89 | 60 | 13.489 |
| 124.55 | 28 | 6.295 | 271.34 | 61 | 13.713 |
| 129.00 | 29 | 6.519 | 275.79 | 62 | 13.938 |
| 133.45 | 30 | 6.744 | 280.24 | 63 | 14.163 |
| 137.89 | 31 | 6.969 | 284.69 | 64 | 14.388 |
| 142.34 | 32 | 7.194 | 289.13 | 65 | 14.613 |
| 146.79 | 33 | 7.419 | 293.58 | 66 | 14.837 |

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.

1N = 0.224809 lbf 1lbf = 4.44822 N

| N | | lbf | N | | lbf |
|--------|----|--------|--------|----|--------|
| 298.03 | 67 | 15.062 | 320.27 | 72 | 16.186 |
| 302.48 | 68 | 15.287 | 324.72 | 73 | 16.411 |
| 306.93 | 69 | 15.512 | 329.17 | 74 | 16.636 |
| 311.38 | 70 | 15.737 | 333.62 | 75 | 16.861 |
| 315.82 | 71 | 15.961 | 338.06 | 76 | 17.085 |
| 342.51 | 77 | 17.310 | 342.51 | 77 | 17.310 |
| 346.96 | 78 | 17.535 | 346.96 | 78 | 17.535 |
| 351.41 | 79 | 17.760 | 351.41 | 79 | 17.760 |
| 355.86 | 80 | 17.985 | 355.86 | 80 | 17.985 |
| 360.31 | 81 | 18.210 | 360.31 | 81 | 18.210 |
| 364.75 | 82 | 18.434 | 364.75 | 82 | 18.434 |
| 369.20 | 83 | 18.659 | 369.20 | 83 | 18.659 |
| 373.65 | 84 | 18.884 | 373.65 | 84 | 18.884 |
| 378.10 | 85 | 19.109 | 378.10 | 85 | 19.109 |
| 382.55 | 86 | 19.334 | 382.55 | 86 | 19.334 |
| 386.99 | 87 | 19.558 | 386.99 | 87 | 19.558 |
| 391.44 | 88 | 19.783 | 391.44 | 88 | 19.783 |
| 395.89 | 89 | 20.008 | 395.89 | 89 | 20.008 |
| 400.34 | 90 | 20.233 | 400.34 | 90 | 20.233 |
| 404.79 | 91 | 20.458 | 404.79 | 91 | 20.458 |
| 409.24 | 92 | 20.682 | 409.24 | 92 | 20.682 |
| 413.68 | 93 | 20.907 | 413.68 | 93 | 20.907 |
| 418.13 | 94 | 21.132 | 418.13 | 94 | 21.132 |
| 422.58 | 95 | 21.357 | 422.58 | 95 | 21.357 |
| 427.03 | 96 | 21.582 | 427.03 | 96 | 21.582 |
| 431.48 | 97 | 21.806 | 431.48 | 97 | 21.806 |
| 435.93 | 98 | 22.031 | 435.93 | 98 | 22.031 |
| 440.37 | 99 | 22.256 | 440.37 | 99 | 22.256 |

N-kgf Conversion Table

| N | | kgf | N | | kgf |
|--------|----|--------|--------|----|--------|
| 9.8066 | 1 | 0.1020 | 333.43 | 34 | 3.4670 |
| 19.613 | 2 | 0.2039 | 343.23 | 35 | 3.5690 |
| 29.420 | 3 | 0.3059 | 353.04 | 36 | 3.6710 |
| 39.227 | 4 | 0.4079 | 362.85 | 37 | 3.7729 |
| 49.033 | 5 | 0.5099 | 372.65 | 38 | 3.8749 |
| 58.840 | 6 | 0.6118 | 382.46 | 39 | 3.9769 |
| 68.647 | 7 | 0.7138 | 392.27 | 40 | 4.0789 |
| 78.453 | 8 | 0.8158 | 402.07 | 41 | 4.1808 |
| 88.260 | 9 | 0.9177 | 411.88 | 42 | 4.2828 |
| 98.066 | 10 | 1.0197 | 421.69 | 43 | 4.3848 |
| 107.87 | 11 | 1.1217 | 431.49 | 44 | 4.4868 |
| 117.68 | 12 | 1.2237 | 441.30 | 45 | 4.5887 |
| 127.49 | 13 | 1.3256 | 451.11 | 46 | 4.6907 |
| 137.29 | 14 | 1.4276 | 460.91 | 47 | 4.7927 |
| 147.10 | 15 | 1.5296 | 470.72 | 48 | 4.8946 |
| 156.91 | 16 | 1.6315 | 480.53 | 49 | 4.9966 |
| 166.71 | 17 | 1.7335 | 490.33 | 50 | 5.0986 |
| 176.52 | 18 | 1.8355 | 500.14 | 51 | 5.2006 |
| 186.33 | 19 | 1.9375 | 509.95 | 52 | 5.3025 |
| 196.13 | 20 | 2.0394 | 519.75 | 53 | 5.4045 |
| 205.94 | 21 | 2.1414 | 529.56 | 54 | 5.5065 |
| 215.75 | 22 | 2.2434 | 539.37 | 55 | 5.6084 |
| 225.55 | 23 | 2.3453 | 549.17 | 56 | 5.7104 |
| 235.36 | 24 | 2.4473 | 558.98 | 57 | 5.8124 |
| 245.17 | 25 | 2.5493 | 568.79 | 58 | 5.9144 |
| 254.97 | 26 | 2.6513 | 578.59 | 59 | 6.0163 |
| 264.78 | 27 | 2.7532 | 588.40 | 60 | 6.1183 |
| 274.59 | 28 | 2.8552 | 598.21 | 61 | 6.2203 |
| 284.39 | 29 | 2.9572 | 608.01 | 62 | 6.3222 |
| 294.20 | 30 | 3.0591 | 617.82 | 63 | 6.4242 |
| 304.01 | 31 | 3.1611 | 627.63 | 64 | 6.5262 |
| 313.81 | 32 | 3.2631 | 637.43 | 65 | 6.6282 |
| 323.62 | 33 | 3.3651 | 647.24 | 66 | 6.7301 |

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.

1N = 0.1019716 kgf 1kgf = 9.80665 N

| N | | kgf | N | | kgf |
|--------|----|---------|--------|----|---------|
| 657.05 | 67 | 6.8321 | 706.08 | 72 | 7.3420 |
| 666.85 | 68 | 6.9341 | 715.89 | 73 | 7.4439 |
| 676.66 | 69 | 7.0360 | 725.69 | 74 | 7.5459 |
| 686.47 | 70 | 7.1380 | 735.50 | 75 | 7.6479 |
| 696.27 | 71 | 7.2400 | 745.31 | 76 | 7.7498 |
| 755.11 | 77 | 7.8518 | 755.11 | 77 | 7.8518 |
| 764.92 | 78 | 7.9538 | 764.92 | 78 | 7.9538 |
| 774.73 | 79 | 8.0558 | 774.73 | 79 | 8.0558 |
| 784.53 | 80 | 8.1577 | 784.53 | 80 | 8.1577 |
| 794.34 | 81 | 8.2597 | 794.34 | 81 | 8.2597 |
| 804.15 | 82 | 8.3617 | 804.15 | 82 | 8.3617 |
| 813.95 | 83 | 8.4636 | 813.95 | 83 | 8.4636 |
| 823.76 | 84 | 8.5656 | 823.76 | 84 | 8.5656 |
| 833.57 | 85 | 8.6676 | 833.57 | 85 | 8.6676 |
| 843.37 | 86 | 8.7696 | 843.37 | 86 | 8.7696 |
| 853.18 | 87 | 8.8715 | 853.18 | 87 | 8.8715 |
| 862.99 | 88 | 8.9735 | 862.99 | 88 | 8.9735 |
| 872.79 | 89 | 9.0755 | 872.79 | 89 | 9.0755 |
| 882.60 | 90 | 9.1774 | 882.60 | 90 | 9.1774 |
| 892.41 | 91 | 9.2794 | 892.41 | 91 | 9.2794 |
| 902.21 | 92 | 9.3814 | 902.21 | 92 | 9.3814 |
| 912.02 | 93 | 9.4834 | 912.02 | 93 | 9.4834 |
| 921.83 | 94 | 9.5853 | 921.83 | 94 | 9.5853 |
| 931.63 | 95 | 9.6873 | 931.63 | 95 | 9.6873 |
| 941.44 | 96 | 9.7893 | 941.44 | 96 | 9.7893 |
| 951.25 | 97 | 9.8912 | 951.25 | 97 | 9.8912 |
| 961.05 | 98 | 9.9932 | 961.05 | 98 | 9.9932 |
| 970.86 | 99 | 10.0952 | 970.86 | 99 | 10.0952 |

● Temperature Conversion Table

$$C = \frac{5}{9} (F - 32) \quad F = 32 + \frac{9}{5} C$$

| °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 | Consistency | 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 |
| Extreme pressure | MULTINOC WIDE No.2 | NIPPON OIL | Li+special Na | 247 | 203 | -40~+135 | Wide temperature range |
| | 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 |
| Others | MOLUB-ALLOY #777-2 | CASTROL | Li | 280 | 182 | 0~+135 | With MoS ₂ , Extreme pressure |
| | G 40M | SHIN-ETSU | Li | 260 | ≥200 | -30~+200 | Wide temperature range, Superior at high temperature with stable anti-oxidation and water proof, Chemically inert |
| | G 40H | SHIN-ETSU | Li | 220 | ≥200 | -30~+200 | Wide temperature 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.

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.

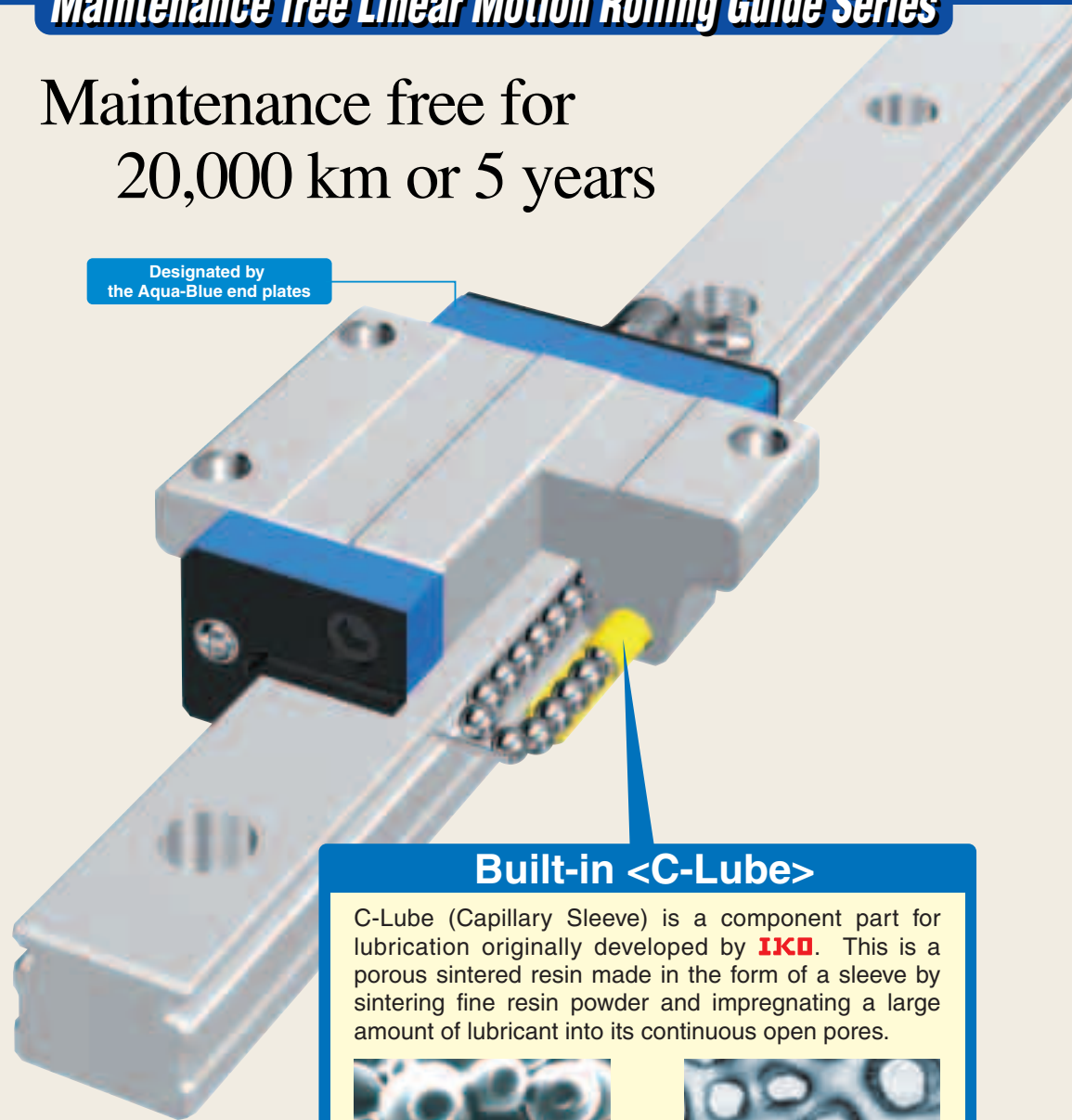
For details, refer to the "General Catalog for Linear Motion Rolling Guide Series" and "Catalog of Mechatronics Series".



Maintenance free Linear Motion Rolling Guide Series

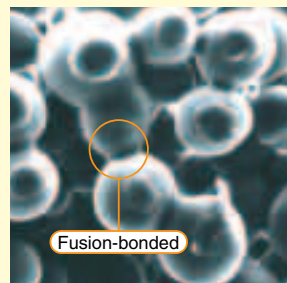
Maintenance free for
20,000 km or 5 years

Designated by
the Aqua-Blue end plates

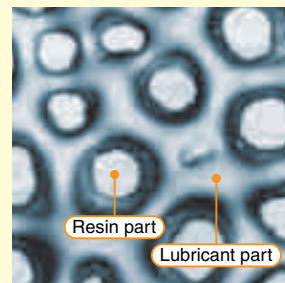


Built-in <C-Lube>

C-Lube (Capillary Sleeve) is a component part for lubrication originally developed by **IKO**. This is a porous sintered resin made in the form of a sleeve by sintering fine resin powder and impregnating a large amount of lubricant into its continuous open pores.



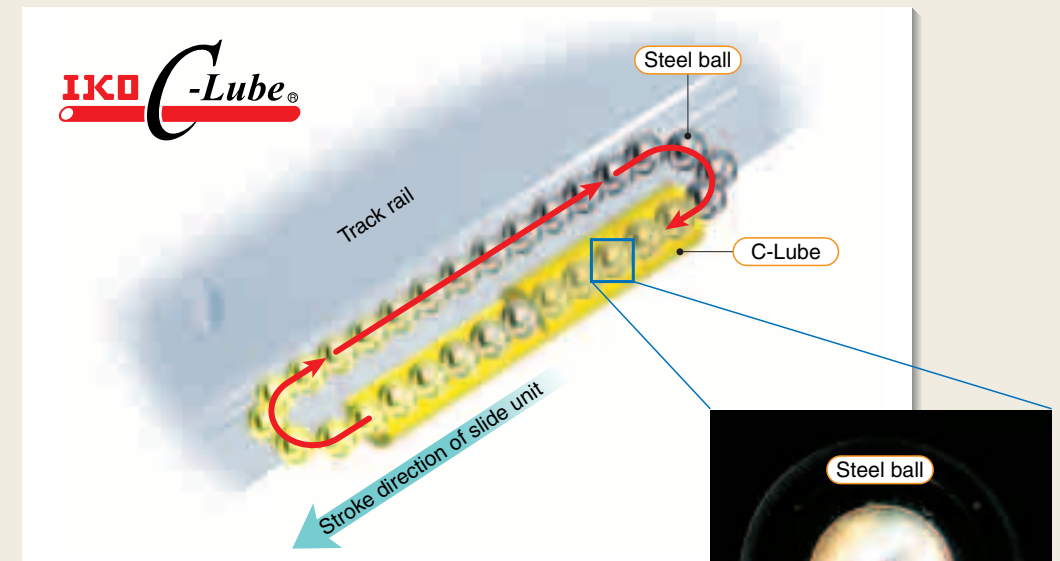
Before impregnating oil
Resin particles are fusion-bonded.



After impregnating oil
(Capillary lubrication structure)
Lubrication is retained in cavities amongst resin particles.

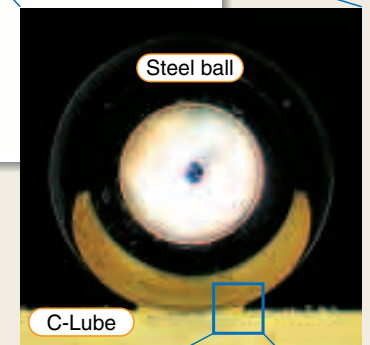


IKO C-Lube Linear Way is a linear motion rolling guide that has the same overall dimensions with existing Linear Ways because the lubrication components are part of the steel ball recirculation path. C-Lube is a porous sintered resin made in the form of a tube (sleeve) that has been impregnated with a large amount of lubricant. Proper lubrication can be maintained for a long time since a suitable amount of lubricant is deposited on the surface of the steel balls as they pass through the C-Lube. Thus, the C-Lube reduces the man-hours needed for troublesome lubrication control and achieves long-term maintenance free operation (20,000 km or 5 years, whichever comes first).



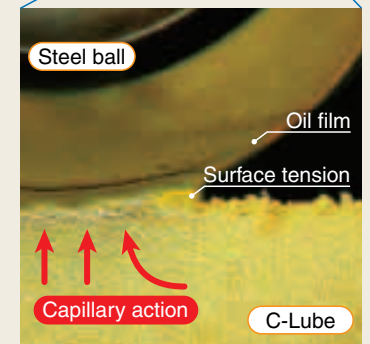
Lubricant is distributed by the circulation of the steel balls

Lubricant is supplied directly to the steel balls. As the steel balls circulate, the lubricant is distributed to the loading area along the track rail. This results in adequate lubrication being properly maintained in the loading area for a long time.



Lubricant is deposited directly to the surface of the steel balls

The surface of C-Lube is always covered with the lubricant. Lubricant is continuously supplied to the surface of steel ball by surface tension in the contact of C-Lube surface and steel balls. New oil permeates automatically from the core of C-Lube to the internal surface that comes in contact with steel balls.



C-Lube Linear Way



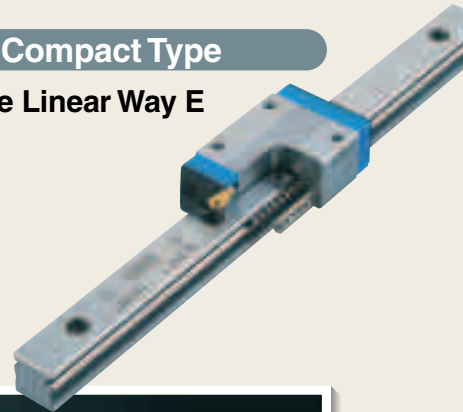
Miniature Type

C-Lube Linear Way L
ML·MLF



Compact Type

C-Lube Linear Way E
ME



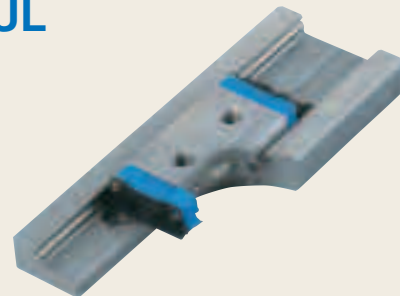
High Rigidity Type

C-Lube Linear Way H
MH



U-Shaped Track Rail Type

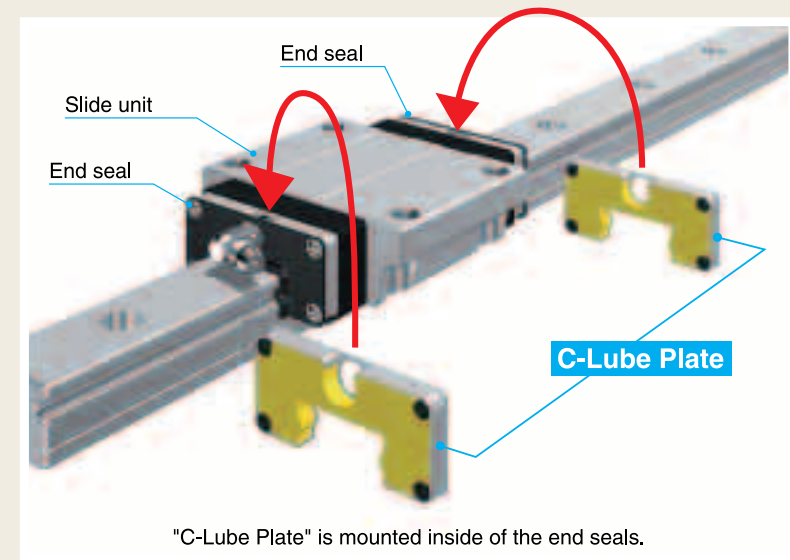
C-Lube Linear Way UL
MUL



Linear Motion Rolling Guide Series with C-Lube Plate



IKO Linear Motion Rolling Guide Series with C-Lube Plate has lubricating parts "C-Lube Plate" inside of the end seals of the slide unit or external cylinder. This lubricating part can be applied to most of the abundant **IKO** products and added to the standard products as the option parts. Also, this part includes a great amount of lubricating oil as it is mounted outboard of the slide unit or external cylinder.



Abundant variation

- Linear Way L
- Linear Way E
- Low Decibel Linear Way E
- Linear Way H
- Linear Way F
- Linear Way U
- Linear Roller Way Super X
- Linear Ball Spline G

Linear Way Series

LWL·LWLF

IKO Linear Way L Series is a very small and lightweight Linear Way. The slide unit of the ball-retained type is free from concern that balls may drop out and is easy to handle.

The standard type LWL···B and the wide type LWLF···B suitable for use in a single row of track rail are available. Each of these types are classified into short type, standard type, and high-rigidity long type. The user can se-

lect the most suitable type fit for each application out of abundant size variations. In particular, the stainless steel type that has excellent corrosion resistance, is most suitable for machines and equipment operated in clean rooms such as medical equipment, disk read devices, and semiconductor manufacturing equipment.



Miniature Linear Way

Available with:

Interchangeable series

Stainless steel types

C-Lube plates

LWE

IKO Linear Way E Series is a new Linear Way with a compact slide unit. This realizes space saving and can greatly extend the range of design with its abundant size variations.

"Lower, Narrower, Shorter,..." In every phase, LWE is in pursuit of compactness. Its standard type has a slide unit whose length has been shortened by 86% compared with other

IKO similar types (mean value in comparison with the standard type of Linear Way H). Furthermore, shorter types are also available. Such abundant size variations can meet diversified needs. With high accuracy, large load capacity, good load balance, and other merits, the Linear Way E Series is widely used for linear motion rolling guides.



Compact Linear Way

Available with:

Interchangeable series

Stainless steel types

C-Lube plates

LWH

In the recognized Linear Way Series, IKO Linear Way H Series comprises of high-rigidity products that are resistant to complex loads.

In addition to the standard flanged type, a slim type with a small width, a slim type with a smaller sectional height, and other types are available in various size variations. In addition, another type that has higher rigidity with

a longer slide unit and more effective balls, but with the same sectional height, is available.

The IKO Linear Way H Series obtains high-accuracy, stable, and smooth linear motion and is widely used in machine tools, industrial robots, assembly equipment, inspection equipment, etc. Its excellent performance has been practically proven.



High-rigidity Linear Way

Available with:

Interchangeable series

Stainless steel types

C-Lube plates

LWU

The Linear Way U is Linear Motion Rolling Guide equipment provided with a raceway groove inside the track rail with a U-shaped sectional area and a slide unit inside the raceway.

Adopting the U-shaped track rail improves the rigidity for moment and torsion of the track rail. Accordingly, Linear Way U can be used in situations where the track rail is fixed on

the mounting base, at the cantilever position or at both ends, and also used as a structural member of machines and equipment. Thus, the degree of freedom in design can be extended by free and optional configurations.



U-shape Track Rail with new conception

Available with:

C-Lube plates

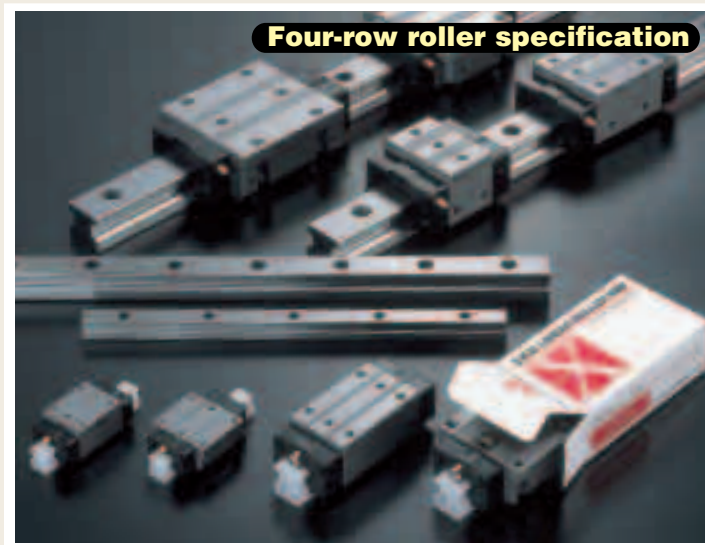
Linear Roller Way Series

LRX

IKO Linear Roller Way Super X making the most of the characteristics of rollers is Linear Motion Rolling Guide equipment which has realized smooth motion, high reliability, and high accuracy because four-row cylindrical rollers are arranged in high-rigidity casing and the cylindrical rollers of each row are arranged in parallel form without crossing at right angles.

LRX has the same mounting dimensions as those of the ball type. This requires no design

change of machines and equipment. Flanged type LRX, block type LRXD and compact block type LRXS are available. Each of these types can be subdivided into short type, standard type, and long type, although its sectional dimensions are the same. That is, a total of 9 types are available.



Four-row roller specification

Available with:

Interchangeable series

Stainless steel type

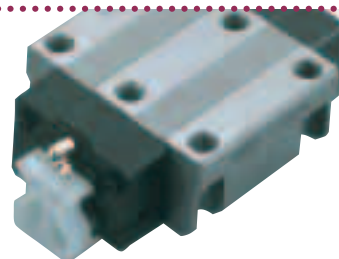
C-Lube plates

Now, the interchangeable types forms a mainstream group in the IKO Linear Motion Rolling Guide Series.

Interchangeable

"IKO Interchangeable" is a system that permits free combination changes and replacement of slide units and track rails (or outer rings and spline shafts) while completely main-

taining accuracy and pre-load.



Unit interchangeability

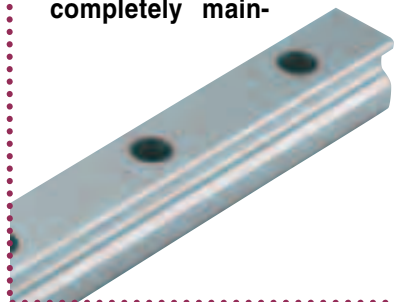
Various types of slide unit with different sectional shapes and lengths are prepared. Any of them can be freely mounted on the same track rail.

Accuracy interchangeability

The three classes of Ordinary, High, and Precision class are set as accuracy classes so that the interchangeable series can be used for applications requiring high traveling accuracy. As mutual height variation among multiple sets is controlled at a high accuracy level so that the interchangeable series may be used securely when track rails are used in parallel form.

High rigidity interchangeability

High-accuracy dimensional control is exerted by using a simple structure. This has realized interchangeability of preloaded slide units. The interchangeable series can be used for applications requiring one-rank higher rigidity.

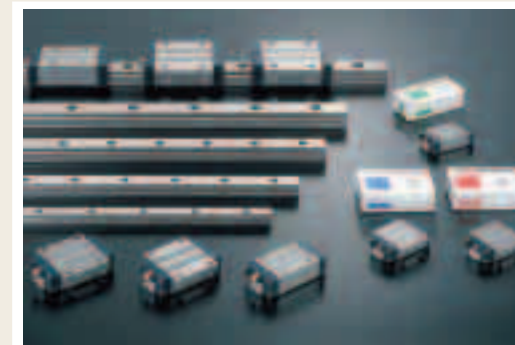


Linear Motion Rolling Guide Series with Special Environment Specifications

Various product groups and special specifications for special environments

Stainless steel type Linear Way and Linear Roller Way

Stainless steel is used for their steel made parts. These products have excellent corrosion resistance and are most suitable for environments that are adversely affected by oil or where water splashes.



Highly Sealed Linear Way H

This is a highly sealed type that has excellent dust protection properties. The type with a track rail mounted in the upper direction (LWH...MU) provides higher sealing performance.



Type with C-Lube plate Linear Motion Rolling Guide Series

C-Lube plate slide in contact with the raceway of the track rail. This supplies the lubricant in the plate to the raceway surface, thereby greatly reducing maintenance.



Low-noise Linear Way E LWE...Q

The IKO Low-noise Linear Way E provides smooth and quiet motion even in a high-speed area. This product contributes to noise reduction in machines and equipment requiring high productivity.



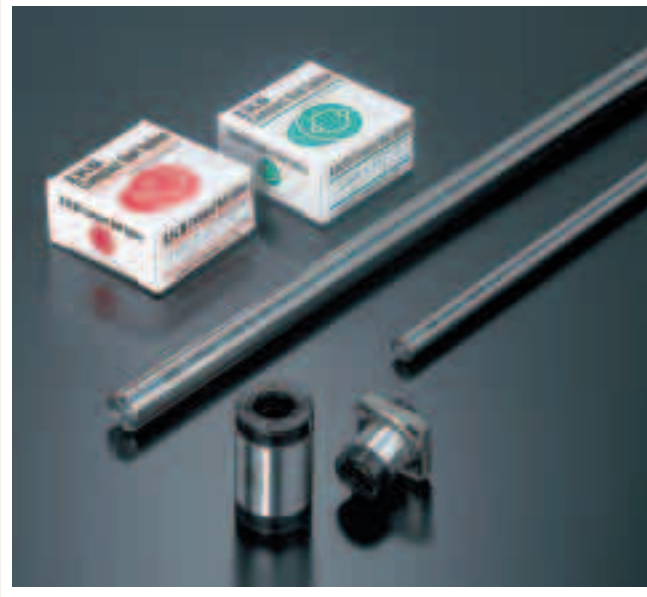
Other Linear Motion Rolling Guides

LSAG

Using a two-row and four-contact point structure, LASG is a very compact **Ball Spline G Series** with high rigidity and a small outer ring diameter.

For outer ring shapes, there are two shapes, the standard type (cylindrical shape) **LSAG** and the flanged type **LSAGF**. The standard type and the flanged type include 2 types of different outer ring length, a standard type and a high-rigidity long type, both of which have the same sectional dimensions.

For spline shafts, solid shaft and hollow shaft are available. A spline shaft made of stainless steel is also available. LSAG is most suitable for applications requiring smooth linear motion and accurate positioning in the direction of rotation.



Available with:

Interchangeable series

C-Lube plate

LSB

Block Type Ball Spline has excellent spine functions and maintainability and easy mounting of the Linear Way.



Available with:

Interchangeable series

Stainless steel type



LMG

Available with:

Interchangeable series

LMG is **Linear Bushing G** adopting a shaft with raceway grooves to achieve both high rigidity and high load capacity.



BWU

Stainless steel type

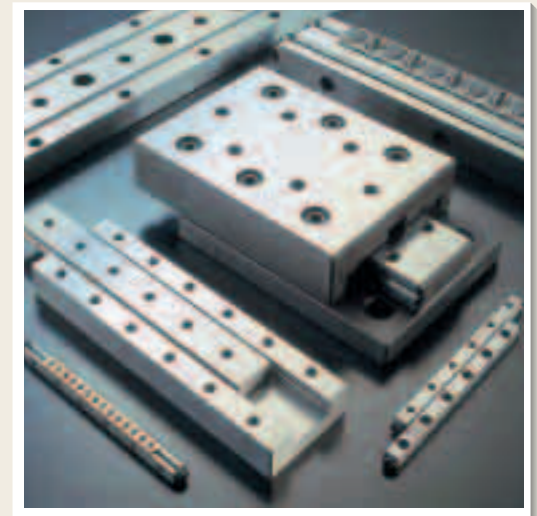
BWU is a compact **Linear Slide with high precision and high rigidity** that is made entirely of stainless steel. This Linear Slide is the most suitable for precision equipment operated in clean rooms.



BSP·BSPG·BSR

Stainless steel type

These are very small and lightweight **precision Linear Slides**. They can be widely used as functional parts for precision linear motion.



CRW·CRWU

Available with:

Stainless steel type

These are high-reliability **Crossed Roller Way Series** with very small frictional resistance, very high accuracy and high rigidity.

Mechatronics Series

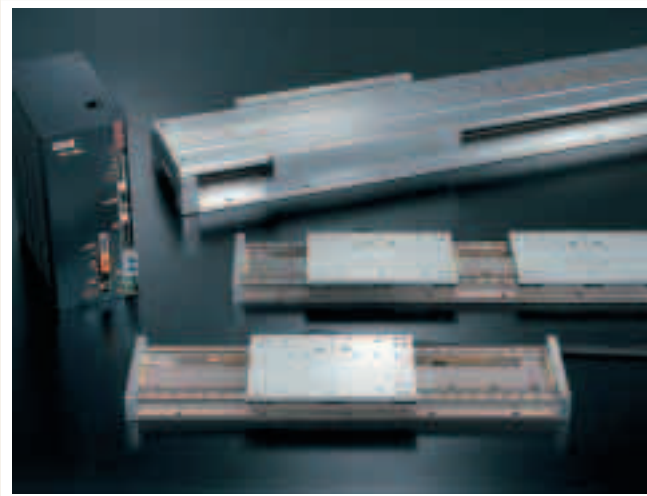
TU Series

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.



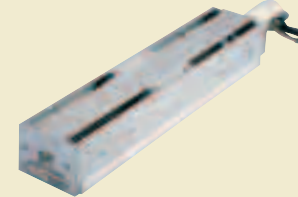
Linear Motor Table LT

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

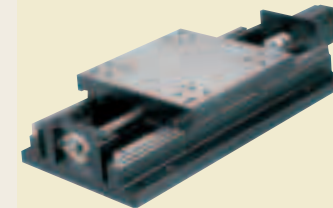
- Standard type which has been practically used in many fields.
- Stable characteristics in parallel use together with Linear Way



TSL...M

High-rigidity Series

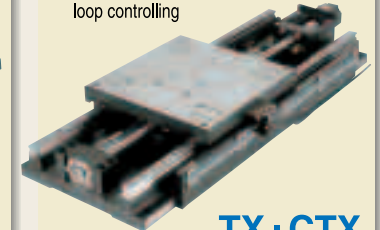
- High reliability and high accuracy with component parts strictly selected
- High rigidity and large mounting weight



TSLH...M·CTLH...M

Super Precision Series

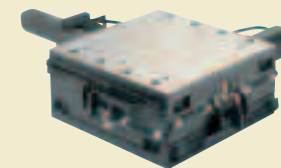
- XY configuration available for advanced inspection stage
- High positioning accuracy realized with IKO Roller technology and full closed loop controlling



TX·CTX

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

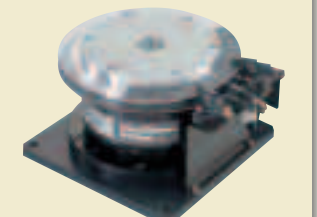
- High-speed type using a timing belt drive
- Stable and high travelling performance in parallel use together with Linear Way



TSLB

Precision Rotary Table

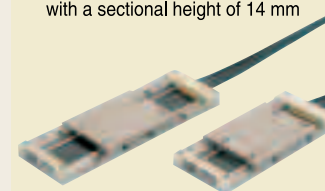
- High-speed and high-resolution rotation positioning table
- High accuracy and high rigidity achieved by using Crossed Roller Bearing



RT

Nano Linear

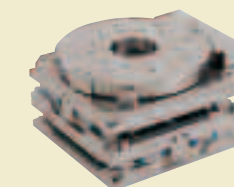
- Direct drive type with high speed and high response
- Maximum thrust of 25 N achieved with a sectional height of 14 mm



NT·NT...V

Alignment Stage Direct Drive

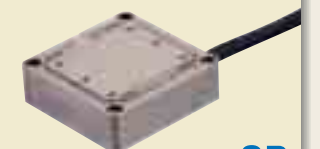
- Ultra compact XY θ stage contributing to space saving
- High resolution and response realized with optical scale



SA...DE

Piezo Stage

- Super micromotion realized with piezoelectric element and distortion gauge
- Complicated positioning operation is available when combined with Precision Positioning Stage



SP

Index of Model Codes

| A | | |
|---------------|-----|--------------------------------------|
| AR | L21 | Cir-clips for Needle Roller Bearings |
| AS | F7 | Thrust Bearings |
| AZ | F11 | Thrust Bearings |
| AZK | F11 | Thrust Bearings |
| B | | |
| BA···Z | B27 | Shell Type Needle Roller Bearings |
| BAM | B27 | Shell Type Needle Roller Bearings |
| BAMW | B45 | Shell Type Needle Roller Bearings |
| BAW···Z | B45 | Shell Type Needle Roller Bearings |
| BHA···Z | B27 | Shell Type Needle Roller Bearings |
| BHAM | B27 | Shell Type Needle Roller Bearings |
| BR | D49 | Machined Type Needle Roller Bearings |
| BR···UU | D77 | Machined Type Needle Roller Bearings |
| BRI | D53 | Machined Type Needle Roller Bearings |
| BRI···UU | D81 | Machined Type Needle Roller Bearings |
| C | | |
| CF | I27 | Cam Followers |
| CF···B | I25 | Cam Followers |
| CF···BM | I25 | Cam Followers |
| CF···BR | I25 | Cam Followers |
| CF···BRM | I25 | Cam Followers |
| CF···BUU | I25 | Cam Followers |
| CF···BUUM | I25 | Cam Followers |
| CF···BUUR | I25 | Cam Followers |
| CF···BUURM | I25 | Cam Followers |
| CF···FB | I33 | Cam Followers |
| CF···FBR | I33 | Cam Followers |
| CF···FBUU | I33 | Cam Followers |
| CF···FBUUR | I33 | Cam Followers |
| CF···FWBR | I49 | Cam Followers |
| CF···FWBUUR | I49 | Cam Followers |
| CF···M | I27 | Cam Followers |
| CF···R | I27 | Cam Followers |
| CF···RM | I27 | Cam Followers |
| CF···UU | I27 | Cam Followers |
| CF···UUM | I27 | Cam Followers |
| CF···UUR | I27 | Cam Followers |
| CF···UURM | I27 | Cam Followers |
| CF···V | I31 | Cam Followers |
| CF···VB | I29 | Cam Followers |
| CF···VBM | I29 | Cam Followers |
| CF···VBR | I29 | Cam Followers |
| CF···VBRM | I29 | Cam Followers |
| CF···VBUU | I29 | Cam Followers |
| CF···VBUUM | I29 | Cam Followers |
| CF···VBUUR | I29 | Cam Followers |
| CF···VBUURM | I29 | Cam Followers |
| CF···VM | I31 | Cam Followers |
| CF···VR | I31 | Cam Followers |
| CF···VRM | I31 | Cam Followers |
| CF···VUU | I31 | Cam Followers |
| CF···VUUM | I31 | Cam Followers |
| CF···VUUR | I31 | Cam Followers |
| CF···VUURM | I31 | Cam Followers |
| CF···WBR | I47 | Cam Followers |
| CF···WBUUR | I47 | Cam Followers |
| CF···WBUUR/SG | I23 | C-Lube Cam Followers |
| CF-FU1 | I51 | Cam Followers |
| CF-RU1 | I51 | Cam Followers |
| CF-SFU | I55 | Cam Followers |
| CF-SFU···B | I53 | Cam Followers |
| CFE | I41 | Cam Followers |
| CFE···B | I39 | Cam Followers |
| CFE···BR | I39 | Cam Followers |
| CFE···BUU | I39 | Cam Followers |
| CFE···BUUR | I39 | Cam Followers |
| CFE···R | I41 | Cam Followers |

Index of Model Codes

| CFE···UU | I41 | Cam Followers |
|-------------|------|----------------------------------|
| CFE···UUR | I41 | Cam Followers |
| CFE···V | I45 | Cam Followers |
| CFE···VB | I43 | Cam Followers |
| CFE···VBR | I43 | Cam Followers |
| CFE···VBUU | I43 | Cam Followers |
| CFE···VBUUR | I43 | Cam Followers |
| CFE···VR | I45 | Cam Followers |
| CFE···VUU | I45 | Cam Followers |
| CFE···VUUR | I45 | Cam Followers |
| CFES | I37 | Cam Followers |
| CFES···B | I35 | Cam Followers |
| CFES···BR | I35 | Cam Followers |
| CFES···BUU | I35 | Cam Followers |
| CFES···BUUR | I35 | Cam Followers |
| CFES···R | I37 | Cam Followers |
| CFES···UU | I37 | Cam Followers |
| CFES···UUR | I37 | Cam Followers |
| CFS | I61 | Miniature Type Cam Followers |
| CFS···F | I63 | Miniature Type Cam Followers |
| CFS···FW | I65 | Miniature Type Cam Followers |
| CFS···FV | I63 | Miniature Type Cam Followers |
| CFS···V | I61 | Miniature Type Cam Followers |
| CFS···W | I65 | Miniature Type Cam Followers |
| CFS···WV | I65 | Miniature Type Cam Followers |
| CL | I20 | C-Lube Unit for Cam Followers |
| CR | I69 | Cam Followers |
| CR···B | I67 | Cam Followers |
| CR···BR | I67 | Cam Followers |
| CR···BUU | I67 | Cam Followers |
| CR···BUUR | I67 | Cam Followers |
| CR···R | I69 | Cam Followers |
| CR···UU | I69 | Cam Followers |
| CR···UUR | I69 | Cam Followers |
| CR···V | I73 | Cam Followers |
| CR···VB | I71 | Cam Followers |
| CR···VBR | I71 | Cam Followers |
| CR···VBUU | I71 | Cam Followers |
| CR···VBUUR | I71 | Cam Followers |
| CR···VR | I73 | Cam Followers |
| CR···VUU | I73 | Cam Followers |
| CR···VUUR | I73 | Cam Followers |
| CRB | J19 | Crossed Roller Bearings |
| CRB···UU | J19 | Crossed Roller Bearings |
| CRBC | J19 | Crossed Roller Bearings |
| CRBC···UU | J19 | Crossed Roller Bearings |
| CRBF | J15 | Crossed Roller Bearings |
| CRBH···A | J17 | Crossed Roller Bearings |
| CRBH···AUU | J18 | Crossed Roller Bearings |
| CRBS | J23 | Crossed Roller Bearings |
| CRBS···AUU | J23 | Crossed Roller Bearings |
| CRBS···V | J23 | Crossed Roller Bearings |
| CRBS···VUU | J23 | Crossed Roller Bearings |
| CRBT···A | J25 | Crossed Roller Bearings |
| CRH···V | I81 | Cam Followers |
| CRH···VR | I79 | Cam Followers |
| CRH···VB | I77 | Cam Followers |
| CRH···VBR | I75 | Cam Followers |
| CRH···VBUU | I77 | Cam Followers |
| CRH···VBUUR | I75 | Cam Followers |
| CRH···VUU | I81 | Cam Followers |
| CRH···VUUR | I79 | Cam Followers |
| CRY···V | I101 | Roller Followers |
| CRY···VR | I103 | Roller Followers |
| CRY···VUUR | I103 | Roller Followers |
| CRY···VUU | I101 | Roller Followers |
| D | | |
| DS | L4 | Seals for Needle Roller Bearings |

Index of Model Codes

| G | | | N | | |
|-------------|-----|--|---------------|------|--|
| GBR | D57 | Machined Type Needle Roller Bearings | NA 48 | D43 | Machined Type Needle Roller Bearings |
| GBR...UU | D85 | Machined Type Needle Roller Bearings | NA 49 | D31 | Machined Type Needle Roller Bearings |
| GBRI | D61 | Machined Type Needle Roller Bearings | NA 49...UU | D71 | Machined Type Needle Roller Bearings |
| GBRI...UU | D89 | Machined Type Needle Roller Bearings | NA 69 | D31 | Machined Type Needle Roller Bearings |
| GE...E | K15 | Spherical Bushings | NA 69...UU | D71 | Machined Type Needle Roller Bearings |
| GE...EC | K27 | Spherical Bushings | NAF | D103 | Needle Roller Bearings with Separable Cage |
| GE...EC-2RS | K27 | Spherical Bushings | NAFW | D103 | Needle Roller Bearings with Separable Cage |
| GE...ES | K15 | Spherical Bushings | NAG 49 | E7 | Roller Bearings |
| GE...ES-2RS | K15 | Spherical Bushings | NAG 49...UU | E13 | Roller Bearings |
| GE...G | K19 | Spherical Bushings | NART...R | I95 | Roller Followers |
| GE...GS | K19 | Spherical Bushings | NART...UUR | I95 | Roller Followers |
| GE...GS-2RS | K19 | Spherical Bushings | NART...VR | I95 | Roller Followers |
| GS | F7 | Thrust Bearings | NART...VUUR | I95 | Roller Followers |
| GTR | D11 | Machined Type Needle Roller Bearings | NAS 50...UUNR | E19 | Roller Bearings |
| GTRI | D33 | Machined Type Needle Roller Bearings | NAS 50...ZZNR | E19 | Roller Bearings |
| I | | | NAST | I92 | Roller Followers |
| IRB | H10 | Inner Rings | NAST...R | I92 | Roller Followers |
| IRT | H5 | Inner Rings | NAST...ZZ | I93 | Roller Followers |
| K | | | NAST...ZZR | I93 | Roller Followers |
| KT | C5 | Needle Roller Cages for General Usage | NAST...ZZUU | I93 | Roller Followers |
| KT...EG | C21 | Needle Roller Cages for Engine Connecting Rods | NAST...ZZUUR | I93 | Roller Followers |
| KTV...EG | C22 | Needle Roller Cages for Engine Connecting Rods | NATA 59 | G9 | Combined Type Needle Roller Bearings |
| KTW | C9 | Needle Roller Cages for General Usage | NATB 59 | G9 | Combined Type Needle Roller Bearings |
| L | | | NAU 49 | E7 | Roller Bearings |
| LHS | K51 | L-Balls | NAU 49...UU | E13 | Roller Bearings |
| LHSA | K49 | L-Balls | NAX | G5 | Combined Type Needle Roller Bearings |
| LRB | H25 | Inner Rings | NAX...Z | G5 | Combined Type Needle Roller Bearings |
| LRBZ | H25 | Inner Rings | NAXI | G7 | Combined Type Needle Roller Bearings |
| LRBZ...B | H25 | Inner Rings | NAXI...Z | G7 | Combined Type Needle Roller Bearings |
| LRT | H13 | Inner Rings | NBX | G5 | Combined Type Needle Roller Bearings |
| LRT...S | I92 | Inner Rings | NBX...Z | G5 | Combined Type Needle Roller Bearings |
| LRTZ | H13 | Inner Rings | NBXI | G7 | Combined Type Needle Roller Bearings |
| | | | NBXI...Z | G7 | Combined Type Needle Roller Bearings |

Index of Model Codes

| NTB | F7 | Thrust Needle bearings | SNPT | K59 | Super Flexible Nozzle |
|-------------|-----|--|-----------|-----|---|
| NUCF...BR | I57 | Cam Followers | T | | |
| NUCF...R | I59 | Cam Followers | TA...Z | B7 | Shell Type Needle Roller Bearings |
| NURT | I99 | Roller Followers | TAF | D9 | Machined Type Needle Roller Bearings |
| NURT...R | I99 | Roller Followers | TAF.../SG | D7 | C-Lube Machined Type Needle Roller Bearings |
| O | | | TAFI | D31 | Machined Type Needle Roller Bearings |
| OS | L3 | Seals for Needle Roller Bearings | TAM | B7 | Shell Type Needle Roller Bearings |
| P | | | TAMW | B21 | Shell Type Needle Roller Bearings |
| PB | K37 | PILLOBALLs | TAW...Z | B21 | Shell Type Needle Roller Bearings |
| PHS | K38 | PILLOBALLs | TLA...UU | B49 | Shell Type Needle Roller Bearings |
| PHS...EC | K43 | PILLOBALLs | TLA...Z | B7 | Shell Type Needle Roller Bearings |
| PHSA | K42 | PILLOBALLs | TLAM | B7 | Shell Type Needle Roller Bearings |
| PHSB | K40 | PILLOBALLs | TLAMW | B17 | Shell Type Needle Roller Bearings |
| POS | K39 | PILLOBALLs | TLAW...Z | B17 | Shell Type Needle Roller Bearings |
| POSB | K41 | PILLOBALLs | TR | D11 | Machined Type Needle Roller Bearings |
| POS...EC | K44 | PILLOBALLs | TRI | D33 | Machined Type Needle Roller Bearings |
| PRC | K53 | PILLOBALLs | TRU | E7 | Roller Bearings |
| R | | | TRU...UU | E13 | Roller Bearings |
| RNA 48 | D25 | Machined Type Needle Roller Bearings | W | | |
| RNA 49 | D9 | Machined Type Needle Roller Bearings | WR | L19 | Cir-clips for Needle Roller Bearings |
| RNA 49...UU | D65 | Machined Type Needle Roller Bearings | WS | F7 | Thrust Bearings |
| RNA 69 | D11 | Machined Type Needle Roller Bearings | Y | | |
| RNA 69...UU | D65 | Machined Type Needle Roller Bearings | YB | B27 | Shell Type Needle Roller Bearings |
| RNAF | D97 | Needle Roller Bearings with Separable Cage | YBH | B29 | Shell Type Needle Roller Bearings |
| RNAFW | D97 | Needle Roller Bearings with Separable Cage | YT | B7 | Shell Type Needle Roller Bearings |
| RNAST | I91 | Roller Followers | YTL | B7 | Shell Type Needle Roller Bearings |
| RNAST...R | I91 | Roller Followers | | | |
| S | | | | | |
| SB | K11 | Spherical Bushings | | | |
| SB...A | K11 | Spherical Bushings | | | |
| SBB | K23 | Spherical Bushings | | | |
| SBB...-2RS | K23 | Spherical Bushings | | | |
| SNA | K58 | Super Flexible Nozzle | | | |
| SNM | K59 | Super Flexible Nozzle | | | |

● Although all data in this catalog has been carefully compiled to make the information as complete as possible, NIPPON THOMPSON CO., LTD. shall not be liable for any damage whatsoever, direct or indirect, based on on any of the information contained in this catalog.
NIPPON THOMPSON CO., LTD. makes no warranty, either express or implied, including the implied warranty of merchantability or fitness for a particular purpose.

NIPPON THOMPSON CO., LTD.

CAT-5508 ©All rights reserved SAS

Printed in Japan 2009.02