MOTION & CONTROL™
NSK

# Rolling Bearings

| | Page No. | |
|---|---|---|
| Technical Information | A7 | Tech. Info. |
| Deep Groove Ball Brgs. | B4 | |
| Angular Contact Ball Brgs. | B46 | |
| Self-Aligning Ball Brgs. | B76 | |
| Cylindrical Roller Brgs. | B84 | |
| Tapered Roller Brgs. | B110 | |
| Spherical Roller Brgs. | B182 | |
| Thrust Brgs. | B206 | Thrust Brgs. |
| Needle Roller Brgs. | B244 | |
| Ball Brg. Units | B280 | |
| Plummer Blocks | B304 | |
| Cylindrical Roller Brgs. for Sheaves | B326 | Sheaves |
| Roll-Neck Brgs. (4-Rows)<br>Railway Rolling Stock Brgs. | B334 | Roll Neck Railway |
| Balls and Rollers | B346 | |
| Accessories for Rolling Brgs. | B356 | Sleeves |
| NSK Products and Appendices | C1 | Appendices |

MOTION & CONTROL™

NSK

# Rolling Bearings

CAT. No. E1102g

## Introduction to Revised NSK Rolling Bearing Catalog (CAT.No.E1102g)

We want to thank you for your interest in this edition of our Rolling Bearing Catalog. It has been revised with our customers in mind, and we hope it fills your needs.

Recently, technology has been advancing at a remarkable pace, and with it has come a host of new products in many fields including computers, office automation, audio-visual equipment, medical equipment, and many others. These striking innovations present a challenge to bearing manufacturers since there are ever increasing demand to offer bearings with higher performance, accuracy, and reliability. Manufacturers of diverse equipment have many different bearing requirements including higher speeds, less torque, less noise and vibration, zero maintenance, survival in harsh environments, integration into units, and many more.

This catalog was revised to reflect the growing number of NSK products and certain revisions in JIS and ISO and to better serve our customers. The first part contains general information about rolling bearings to facilitate selection of the most appropriate type. Next supplementary technical information is provided regarding bearing life, load ratings, limiting speeds, handling and mounting, lubrication, etc. Finally, the catalog presents extensive tables containing most bearing numbers and showing dimensions and pertinent design data listed in the order of increasing bore size. Data in the table are given in both the international Unit System (SI) and Engineering Unit System (Gravitational System of Units).

We hope this catalog will allow you to select the optimum bearing for your application. However, if assistance is required, please contact NSK, and the company's engineers and computer programs can quickly supply the information you need.

# CONTENTS

## TECHNICAL INFORMATION


Pages

**1 TYPES AND FEATURES OF ROLLING BEARINGS** ..... A 7
1.1 Design and Classification ..... A 7
1.2 Characteristics of Rolling Bearings ..... A 7

**2 BEARING SELECTION PROCEDURE** ..... A16

**3 SELECTION OF BEARING TYPE** ..... A18
3.1 Allowable Bearing Space ..... A18
3.2 Load Capacity and Bearing Types ..... A18
3.3 Permissible Speed and Bearing Types ..... A18
3.4 Misalignment of Inner/Outer Rings and Bearing Types ..... A18
3.5 Rigidity and Bearing Types ..... A19
3.6 Noise and Torque of Various Bearing Types ..... A19
3.7 Running Accuracy and Bearing Types ..... A19
3.8 Mounting and Dismounting of Various Bearing Types ..... A19

**4 SELECTION OF BEARING ARRANGEMENT** ..... A20
4.1 Fixed-End and Free-End Bearings ..... A20
4.2 Examples of Bearing Arrangements ..... A21

**5 SELECTION OF BEARING SIZE** ..... A24
5.1 Bearing Life ..... A24
5.1.1 Rolling Fatigue Life and Basic Rating Life ..... A24
5.2 Basic Load Rating and Fatigue Life ..... A24
5.2.1 Basic Load Rating ..... A24
5.2.2 Machinery in which Bearings are Used and Projected Life ..... A24
5.2.3 Selection of Bearing Size Based on Basic Load Rating ..... A25
5.2.4 Temperature Correction for Basic Load Rating ..... A26
5.2.5 Correction of Basic Rating Life ..... A27
5.3 Calculation of Bearing Loads ..... A28
5.3.1 Load Factor ..... A28
5.3.2 Bearing Loads in Belt or Chain Transmission Applications ..... A28
5.3.3 Bearing Loads in Gear Transmission Applications ..... A29
5.3.4 Load Distribution on Bearings ..... A29
5.3.5 Average of Fluctuating load ..... A29

Pages
5.4 Equivalent Load ..... A30
5.4.1 Calculation of Equivalent Loads ..... A31
5.4.2 Axial Load Components in Angular Contact Ball Bearings and Tapered Roller Bearings ..... A31
5.5 Static Load Ratings and Static Equivalent Loads ..... A32
5.5.1 Static Load Ratings ..... A32
5.5.2 Static Equivalent Loads ..... A32
5.5.3 Permissible Static Load Factor ..... A32
5.6 Maximum Permissible Axial Loads for Cylindrical Roller Bearings ..... A33
5.7 Examples of Bearing Calculations ..... A34

**6 LIMITING SPEED** ..... A37
6.1 Correction of Limiting Speed ..... A37
6.2 Limiting Speed for Rubber Contact Seals for Ball Bearings ..... A37

**7 BOUNDARY DIMENSIONS AND IDENTIFYING NUMBERS FOR BEARINGS** ..... A38
7.1 Boundary Dimensions and Dimensions of Snap Ring Grooves ..... A38
7.1.1 Boundary Dimensions ..... A38
7.1.2 Dimensions of Snap Ring Grooves and Locating Snap Rings ..... A38
7.2 Formulation of Bearing Numbers ..... A54

**8 BEARING TOLERANCES** ..... A58
8.1 Bearing Tolerance Standards ..... A58
8.2 Selection of Accuracy Classes ..... A81

**9 FITS AND INTERNAL CLEARANCES** ..... A82
9.1 Fits ..... A82
9.1.1 Importance of Proper Fits ..... A82
9.1.2 Selection of Fit ..... A82
9.1.3 Recommended Fits ..... A83
9.2 Bearing Internal Clearances ..... A88
9.2.1 Internal Clearances and Their Standards ..... A88
9.2.2 Selection of Bearing Internal Clearances ..... A94

**10 PRELOAD** ..... A96
10.1 Purpose of Preload ..... A96
10.2 Preloading Methods ..... A96
10.2.1 Position Preload ..... A96
10.2.2 Constant-Pressure Preload ..... A96

Pages
10.3 Preload and Rigidity ..... A96
10.3.1 Position Preload and Rigidity ..... A96
10.3.2 Constant-Pressure Preload and Rigidity ..... A97
10.4 Selection of Preloading Method and Amount of Preload ..... A97
10.4.1 Comparison of Preloading Methods ..... A97
10.4.2 Amount of Preload ..... A98

**11 DESIGN OF SHAFTS AND HOUSINGS** ..... A100
11.1 Accuracy and Surface Finish of Shafts and Housings ..... A100
11.2 Shoulder and Fillet Dimensions ..... A100
11.3 Bearing Seals ..... A102
11.3.1 Non-Contact Types Seals ..... A102
11.3.2 Contact Type Seals ..... A104

**12 LUBRICATION** ..... A105
12.1 Purposes of Lubrication ..... A105
12.2 Lubricating Methods ..... A105
12.2.1 Grease Lubrication ..... A105
12.2.2 Oil Lubrication ..... A107
12.3 Lubricants ..... A110
12.3.1 Lubricating Grease ..... A110
12.3.2 Lubricating Oil ..... A112

**13 BEARING MATERIALS** ..... A114
13.1 Materials for Bearing Rings and Rolling Elements ..... A114
13.2 Cage Materials ..... A115

**14 BEARING HANDLING** ..... A116
14.1 Precautions for Proper Handling of Bearings ..... A116
14.2 Mounting ..... A116
14.2.1 Mounting of Bearings with Cylindrical Bores ..... A116
14.2.2 Mounting of Bearings with Tapered Bores ..... A118
14.3 Operation Inspection ..... A118
14.4 Dismounting ..... A121
14.4.1 Dismounting of Outer Rings ..... A121
14.4.2 Dismounting of Bearings with Cylindrical Bores ..... A121
14.4.3 Dismounting of Bearings with Tapered Bores ..... A122
14.5 Inspection of Bearings ..... A123
14.5.1 Bearing Cleaning ..... A123
14.5.2 Inspection and Evaluation of Bearings ..... A123

Pages
14.6 Maintenance and Inspection ..... A124
14.6.1 Detecting and Correcting Irregularities ..... A124
14.6.2 Bearing Failures and Countermeasures ..... A124

**15 TECHNICAL DATA** ..... A126
15.1 Axial Displacement of Bearings ..... A128
15.2 Fits ..... A130
15.3 Radial and Axial Internal Clearances ..... A132
15.4 Preload and Starting Torque ..... A134
15.5 Coefficients of Dynamic Friction and Other Bearing Data ..... A136
15.6 Brands and Properties of Lubricating Greases ..... A138


## BEARING TABLES


**CONTENTS** ..... B2


## INTRODUCTION OF NSK PRODUCTS-APPENDICES


**CONTENTS** ..... C 1
Photos of NSK Products ..... C 2
Appendix 1 Conversion from SI (International Units) System ..... C 8
Appendix 2 N-kgf Conversion Table ..... C10
Appendix 3 kg-lb Conversion Table ..... C11
Appendix 4 °C-°F Temperature Conversion Table ..... C12
Appendix 5 Viscosity Conversion Table ..... C13
Appendix 6 Inch-mm Conversion Table ..... C14
Appendix 7 Hardness Conversion Table ..... C16
Appendix 8 Physical and Mechanical Properties of Materials ..... C17
Appendix 9 Tolerances for Shaft Diameters ..... C18
Appendix 10 Tolerances for Housing Bore Diameters ..... C20
Appendix 11 Values of Standard Tolerance Grades IT ..... C22
Appendix 12 Speed Factor $f_n$ ..... C24
Appendix 13 Fatigue Life Factor $f_h$ and Fatigue Life $L$-$L_h$ ..... C25
Appendix 14 Index of Inch Design Tapered Roller Bearings ..... C26

# 1.TYPES AND FEATURES OF ROLLING BEARINGS

## 1.1 Design and Classification

Rolling bearings generally consist of two rings, rolling elements, and a cage, and they are classified into radial bearings or thrust bearings depending on the direction of the main load. In addition, depending on the type of rolling elements, they are classified into ball bearings or roller bearings, and they are further segregated by differences in their design or specific purpose.
The most common bearing types and nomenclature of bearing parts are shown in Fig.1.1, and a general classification of rolling bearings is shown in Fig. 1.2.

## 1.2 Characteristics of Rolling Bearings

Compared with plain bearings, rolling bearings have the following major advantages:

(1) Their starting torque or friction is low and the difference between the starting torque and running torque is small.
(2) With the advancement of worldwide standardization, rolling bearings are internationally available and interchangeable.
(3) Maintenance, replacement, and inspection are easy because the structure surrounding rolling bearings is simple.
(4) Many rolling bearings are capable of taking both radial and axial loads simultaneously or independently.
(5) Rolling bearings can be used under a wide range of temperatures.
(6) Rolling bearings can be preloaded to produce a negative clearance and achieve greater rigidity.

Furthermore, different types of rolling bearings have their own individual advantages. The features of the most common rolling bearings are described on Pages A10 to A12 and in Table 1.1 (Pages A14 and A15).

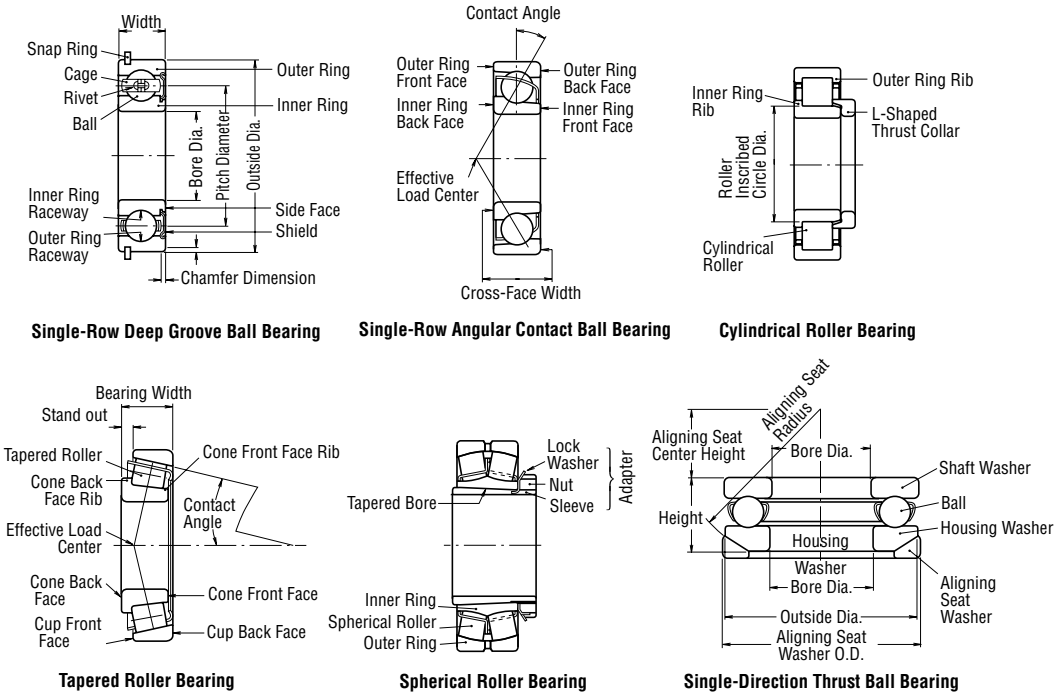



**Fig. 1.1 Nomenclature for Bearing Parts**

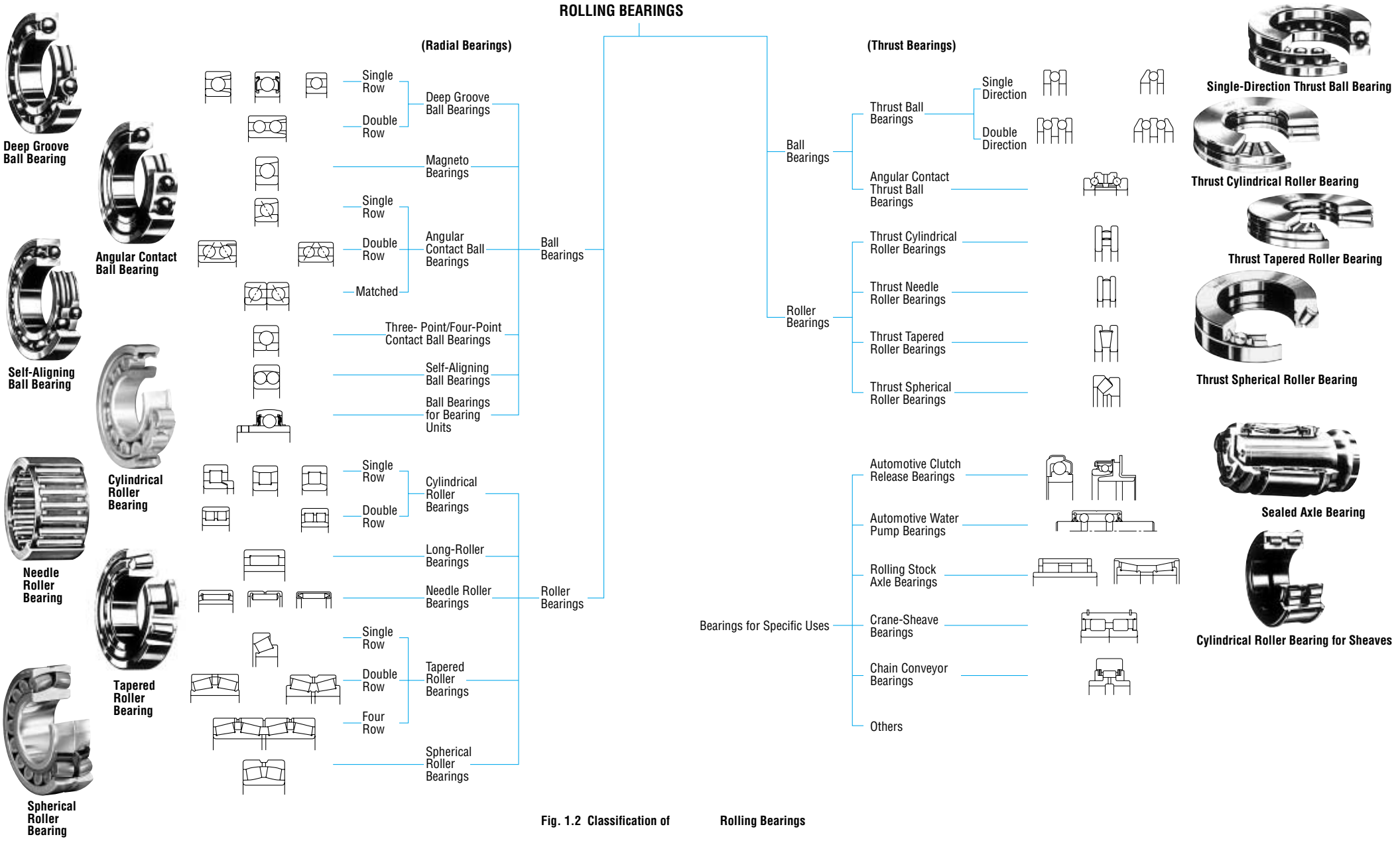
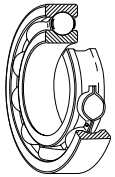


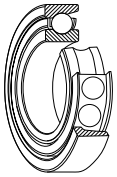

**Fig. 1.2 Classification of Rolling Bearings**

**Single-Row Deep Groove Ball Bearings**



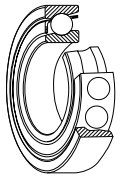
Single-row deep groove ball bearings are the most common type of rolling bearings. Their use is very widespread. The raceway grooves on both the inner and outer rings have circular arcs of slightly larger radius than that of the balls. In addition to radial loads, axial loads can be imposed in either direction. Because of their low torque, they are highly suitable for applications where high speeds and low power loss are required.
In addition to open type bearings, these bearings often have steel shields or rubber seals installed on one or both sides and are prelubricated with grease. Also, snap rings are sometimes used on the periphery. As to cages, pressed steel ones are the most common.

**Magneto Bearings**



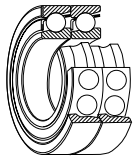
The inner groove of magneto bearings is a little shallower than that of deep groove bearings. Since the outer ring has a shoulder on only one side, the outer ring may be removed. This is often advantageous for mounting. In general, two such bearings are used in duplex pairs. Magneto bearings are small bearings with a bore diameter of 4 to 20 mm and are mainly used for small magnetos, gyroscopes, instruments, etc. Pressed brass cages are generally used.

**Single-Row Angular Contact Ball Bearings**



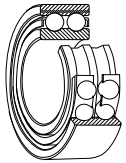
Individual bearings of this type are capable of taking radial loads and also axial loads in one direction. Four contact angles of 15°, 25°, 30°, and 40° are available. The larger the contact angle, the higher the axial load capacity. For high speed operation, however, the smaller contact angles are preferred. Usually, two bearings are used in duplex pairs, and the clearance between them must be adjusted properly.
Pressed-steel cages are commonly used, however, for high precision bearings with a contact angle less than 30°, polyamide resin cages are often used.

**Duplex Bearings**



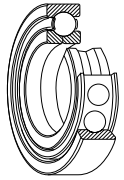
A combination of two radial bearings is called a duplex pair. Usually, they are formed using angular contact ball bearings or tapered roller bearings. Possible combinations include face-to-face, which have the outer ring faces together (type DF), back-to-back (type DB), or both front faces in the same direction (type DT). DF and DB duplex bearings are capable of taking radial loads and axial loads in either direction. Type DT is used when there is a strong axial load in one direction and it is necessary to impose the load equally on each bearing.

**Double-Row Angular Contact Ball Bearings**



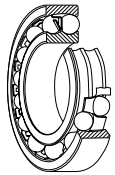
Double-row angular contact ball bearings are basically two single-row angular contact ball bearings mounted back-to-back except that they have only one inner ring and one outer ring, each having raceways. They can take axial loads in either direction.

**Four-Point Contact Ball Bearings**



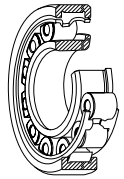
The inner and outer rings of four-point contact ball bearings are separable because the inner ring is split in a radial plane. They can take axial loads from either direction. The balls have a contact angle of 35° with each ring. Just one bearing of this type can replace a combination of face-to-face or back-to-back angular contact bearings.
Machined brass cages are generally used.

**Self-Aligning Ball Bearings**



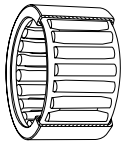
The inner ring of this type of bearing has two raceways and the outer ring has a single spherical raceway with its center of curvature coincident with the bearing axis. Therefore, the axis of the inner ring, balls, and cage can deflect to some extent around the bearing center. Consequently, minor angular misalignment of the shaft and housing caused by machining or mounting error is automatically corrected.
This type of bearing often has a tapered bore for mounting using an adapter sleeve.

**Cylindrical Roller Bearings**



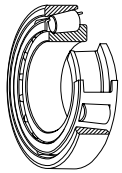
In bearings of this type, the cylindrical rollers are in linear contact with the raceways. They have a high radial load capacity and are suitable for high speeds.
There are different types designated NU, NJ, NUP, N, NF for single-row bearings, and NNU, NN for double-row bearings depending on the design or absence of side ribs.
The outer and inner rings of all types are separable.
Some cylindrical roller bearings have no ribs on either the inner or outer ring, so the rings can move axially relative to each other. These can be used as free-end bearings. Cylindrical roller bearings, in which either the inner or outer rings has two ribs and the other ring has one, are capable of taking some axial load in one direction. Double-row cylindrical roller bearings have high radial rigidity and are used primarily for precision machine tools.
Pressed steel or machined brass cages are generally used, but sometimes molded polyamide cages are also used.

**Needle Roller Bearings**



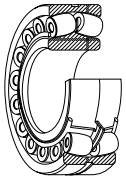
Needle roller bearings contain many slender rollers with a length 3 to 10 times their diameter. As a result, the ratio of the bearing outside diameter to the inscribed circle diameter is small, and they have a rather high radial load capacity.
There are numerous types available, and many have no inner rings. The drawn-cup type has a pressed steel outer ring and the solid type has a machined outer ring. There are also cage and roller assemblies without rings. Most bearings have pressed steel cages, but some are without cages.

**Tapered Roller Bearings**



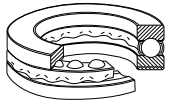
Bearings of this type use conical rollers guided by a back-face rib on the cone. These bearings are capable of taking high radial loads and also axial loads in one direction. In the HR series, the rollers are increased in both size and number giving it an even higher load capacity.
They are generally mounted in pairs in a manner similar to single-row angular contact ball bearings. In this case, the proper internal clearance can be obtained by adjusting the axial distance between the cones or cups of the two opposed bearings. Since they are separable, the cone assemblies and cups can be mounted independently.
Depending upon the contact angle, tapered roller bearings are divided into three types called the normal angle, medium angle, and steep angle. Double-row and four-row tapered roller bearings are also available. Pressed steel cages are generally used.

**Spherical Roller Bearings**



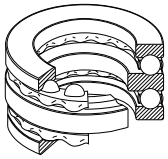
These bearings have barrel-shaped rollers between the inner ring, which has two raceways, and the outer ring which has one spherical raceway. Since the center of curvature of the outer ring raceway surface coincides with the bearing axis, they are self-aligning in a manner similar to that of self-aligning ball bearings. Therefore, if there is deflection of the shaft or housing or misalignment of their axes, it is automatically corrected so excessive force is not applied to the bearings.
Spherical roller bearings can take, not only heavy radial loads, but also some axial loads in either direction. They have excellent radial load-carrying capacity and are suitable for use where there are heavy or impact loads.
Some bearings have tapered bores and may be mounted directly on tapered shafts or cylindrical shafts using adapters or withdrawal sleeves.
Pressed steel and machined brass cages are used.

**Single-Direction Thrust Ball Bearings**

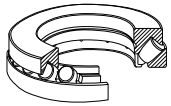


Single-direction thrust ball bearings are composed of washer-like bearing rings with raceway grooves. The ring attached to the shaft is called the shaft washer (or inner ring) while that attached to the housing is called the housing washer(or outer ring).
In double-direction thrust ball bearings, there are three rings with the middle one (center ring) being fixed to the shaft.
There are also thrust ball bearings with an aligning seat washer beneath the housing washer in order to compensate for shaft misalignment or mounting error.
Pressed steel cages are usually used in the smaller bearings and machined cages in the larger

**Double-Direction Thrust Ball Bearings**



**Spherical Thrust Roller Bearings**



These bearings have a spherical raceway in the housing washer and barrel-shaped rollers obliquely arranged around it. Since the raceway in the housing washer in spherical, these bearings are self-aligning. They have a very high axial load capacity and are capable of taking moderate radial loads when an axial load is applied.
Pressed steel cages or machined brass cages are usually used.

**Table 1. 1 Types and Characteristics of Rolling Bearings**

| Features \ Bearing Types | Deep Groove Ball Bearings | Magneto Bearings | Angular Contact Ball Bearings | Double-Row Angular Contact Ball Bearings | Duplex Angular Contact Ball Bearings | Four-Point Contact Ball Bearings | Self-Aligning Ball Bearings | Cylindrical Roller Bearings | Double-Row Cylindrical Roller Bearings | Cylindrical Roller Bearings with Single Rib |
|---|---|---|---|---|---|---|---|---|---|---|
| Load Capacity — Radial Loads | ◯ | ○ | ◎ | ◎ | ◎ | ○ | ◯ | ◎ | ◉ | ◎ |
| Load Capacity — Axial Loads | ◯ ⟷ | ○ ⟵ | ◎ ⟵ | ◎ ⟷ | ◎ ⟷ | ◎ ⟷ | ○ ⟷ | × | × | ◯ ⟵ |
| Load Capacity — Combined Loads | ◯ | ○ | ◎ | ◎ | ◎ | ◯ | ○ | × | × | ◯ |
| High Speeds | ◉ | ◎ | ◉ | ◯ | ◎ | ◎ | ◎ | ◉ | ◎ | ◎ |
| High Accuracy | ◉ | | ◉ | | ◉ | ◎ | | ◉ | ◉ | |
| Low Noise and Torque | ◉ | | | | | | | ◎ | | |
| Rigidity | | | | | ◎ | | | ◎ | ◉ | ◎ |
| Angular Misalignment | ◎ | ○ | ○ | ○ | ○ | ○ | ◉ | ◯ | ○ | ◯ |
| Self-Aligning Capability | | | | | | | ☆ | | | |
| Ring Separability | | ☆ | | | | ☆ | | ☆ | ☆ | ☆ |
| Fixed-End Bearing | ☆ | | | ☆ | ☆ | ☆ | ☆ | | | |
| Free-End Bearing | ★ | | | ★ | ★ | ★ | ★ | ☆ | ☆ | |
| Tapered Bore in Inner Ring | | | | | | | ☆ | | ☆ | |
| Remarks | | Two bearings are usually mounted in opposition. | Contact angles of 15°, 25°, 30°, and 40°. Two bearings are usually mounted in opposition. Clearance adjustment is necessary. | | Combination of DF and DT pairs is possible, but use on free-end is not possible. | Contact angle of 35° | | Including N type | Including NNU type | Including NF type |
| Page No. | B5 B31 | B5 B28 | B47 | B47 B70 | B47 | B47 B72 | B77 | B85 | B85 B110 | B85 |

| Features \ Bearing Types | Cylindrical Roller Bearings with Thrust Collars | Needle Roller Bearings | Tapered Roller Bearings | Double-and Multiple-Row Tapered Roller Bearings | Spherical Roller Bearings | Thrust Ball Bearings | Thrust Ball Bearings with Aligning Seat | Double-Direction Angular Contact Thrust Ball Bearings | Thrust Cylindrical Roller Bearings | Thrust Tapered Roller Bearings | Thrust Spherical Roller Bearings | Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Load Capacity — Radial Loads | ◎ | ◎ | ◎ | ◉ | ◉ | × | × | × | × | × | ○ | — |
| Load Capacity — Axial Loads | ◯ ⟷ | × | ◎ ⟷ | ◎ ⟷ | ◯ ⟷ | ◎ ⟵ | ◎ ⟵ | ◎ ⟷ | ◉ ⟵ | ◉ ⟵ | ◉ ⟵ | — |
| Load Capacity — Combined Loads | ◯ | × | ◎ | ◉ | ◎ | × | × | × | × | × | ○ | — |
| High Speeds | ◎ | ◎ | ◯ | ◯ | ◯ | × | × | ◯ | ○ | ○ | ○ | A18 A37 |
| High Accuracy | | | ◎ | | | ◎ | | ◉ | | | | A19 A58 A81 |
| Low Noise and Torque | | | | | | | | | | | | A19 |
| Rigidity | ◎ | ◎ | ◎ | ◉ | | | | ◎ | ◉ | ◉ | | A19 A96 |
| Angular Misalignment | ◯ | ○ | ◯ | ○ | ◉ | × | ◉ | × | × | × | ◉ | A18 Blue pages of each brg. type |
| Self-Aligning Capability | | | | | ☆ | | ☆ | | | | ☆ | A18 |
| Ring Separability | ☆ | ☆ | ☆ | ☆ | | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | A19 A20 |
| Fixed-End Bearing | ☆ | | | ☆ | ☆ | | | | | | | A20 ~A21 |
| Free-End Bearing | | ☆ | | ★ | ★ | | | | | | | A20 ~A27 |
| Tapered Bore in Inner Ring | | | | | ☆ | | | | | | | A80 A118 A122 |
| Remarks | Including NUP type | | Two bearings are usually mounted in opposition. Clearance adjustment is necessary. | KH, KV types are also available but use on free-end is impossible. | | | | | Including needle roller thrust bearings | | To be used with oil lubrication | |
| Page No. | B85 | — | B115 | B115 B176 B299 | B183 | B207 | B207 | B235 | B207 B224 | — | B207 B228 | |

◉ Excellent ◎ Good ◯ Fair ○ Poor × Impossible ⟵ One direction only ⟷ Two directions

☆ Applicable ★ Applicable, but it is necessary to allow shaft contraction/elongation at fitting surfaces of bearings.

# 2. BEARING SELECTION PROCEDURE

The number of applications for rolling bearings is almost countless and the operating conditions and environments also vary greatly. In addition, the diversity of operating conditions and bearing requirements continue to grow with the rapid advancement of technology. Therefore, it is necessary to study bearings carefully from many angles to select the best one from the thousands of types and sizes available.
Usually, a bearing type is provisionally chosen considering the operating conditions, mounting arrangement, ease of mounting in the machine, allowable space, cost, availability, and other factors.

Then the size of the bearing is chosen to satisfy the desired life requirement. When doing this, in addition to fatigue life, it is necessary to consider grease life, noise and vibration, wear, and other factors.
There is no fixed procedure for selecting bearings. It is good to investigate experience with similar applications and studies relevant to any special requirements for your specific application. When selecting bearings for new machines, unusual operating conditions, or harsh environments, please consult with NSK.
The following diagram (Fig.2.1) shows an example of the bearing selection procedure.

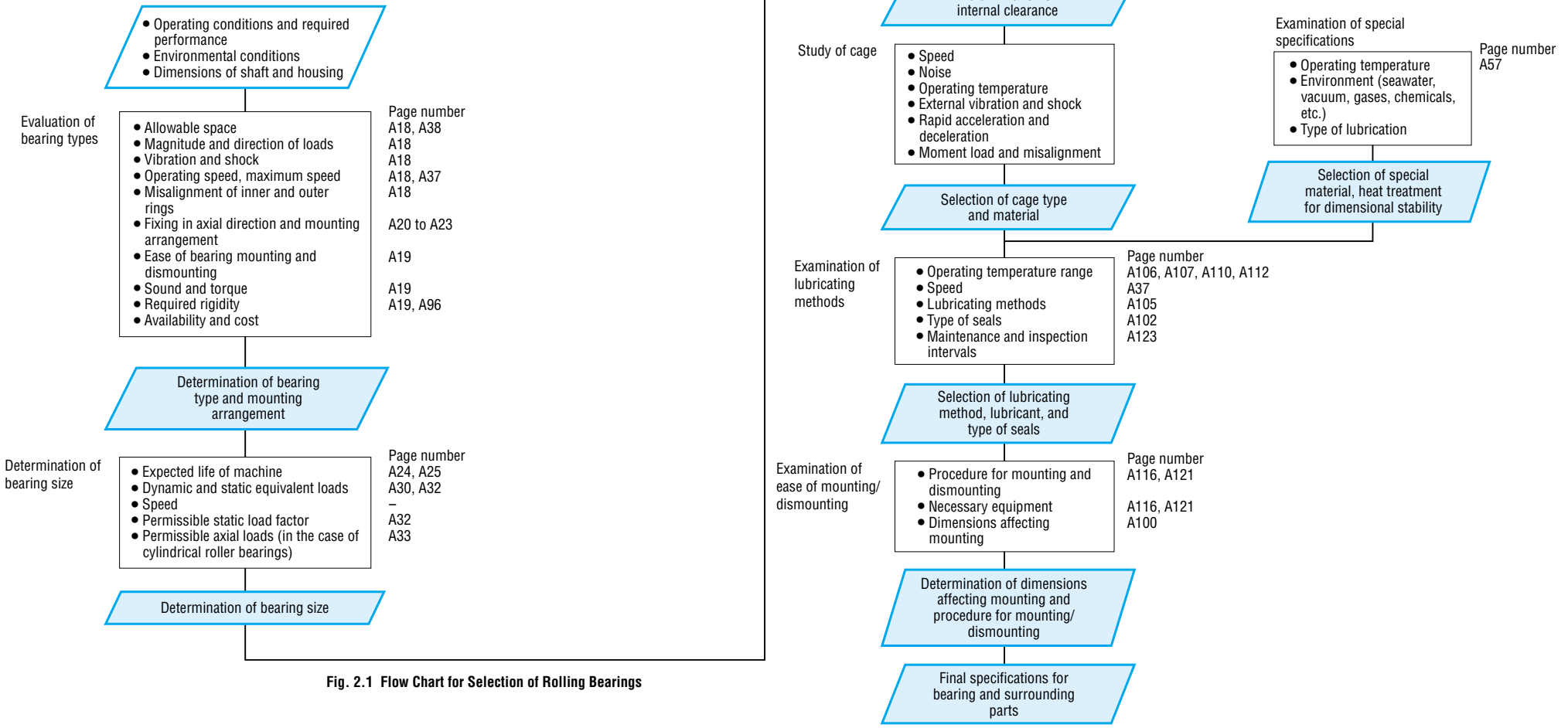



**Fig. 2.1 Flow Chart for Selection of Rolling Bearings**

# 3. SELECTION OF BEARING TYPES

## 3.1 Allowable Bearing Space

The allowable space for a rolling bearing and its adjacent parts is generally limited so the type and size of the bearing must be selected within such limits. In most cases, the shaft diameter is fixed first by the machine design; therefore, the bearing is often selected based on its bore size. For rolling bearings, there are numerous standardized dimension series and types, and the selection of the optimum bearing from among them is necessary. Fig. 3.1 shows the dimension series of radial bearings and corresponding bearing types.

## 3.2 Load Capacity and Bearing Types

The axial load carrying capacity of a bearing is closely related to the radial load capacity (see Page A24) in a manner that depends on the bearing design as shown in Fig. 3.2. This figure makes it clear that when bearings of the same dimension series are compared, roller bearings have a higher load capacity than ball bearings and are superior if shock loads exist.

## 3.3 Permissible Speed and Bearing Types

The maximum speed of rolling bearings varies depending, not only the type of bearing, but also its size, type of cage, loads, lubricating method, heat dissipation, etc. Assuming the common oil bath lubrication method, the bearing types are roughly ranked from higher speed to lower as shown in Fig. 3.3.

## 3.4 Misalignment of Inner/Outer Rings and Bearing Types

Because of deflection of a shaft caused by applied loads, dimensional error of the shaft and housing, and mounting errors, the inner and outer rings are slightly misaligned. The permissible misalignment varies depending on the bearing type and operating conditions, but usually it is a small angle less than 0.0012 radian (4').
When a large misalignment is expected, bearings having a self-aligning capability, such as self-aligning ball bearings, spherical roller bearings, and certain bearing units should be selected (Figs. 3.4 and 3.5).

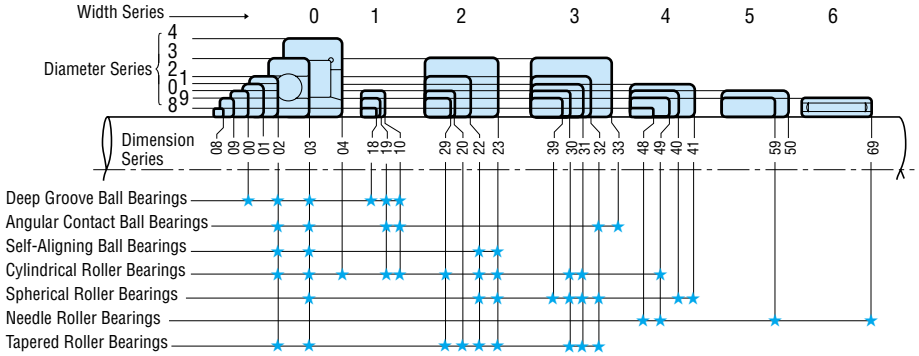
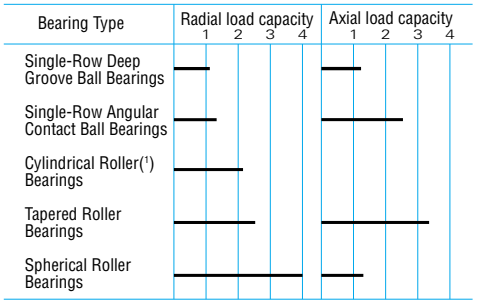



**Fig. 3.1 Dimension Series of Radial Bearings**




Note(1) The bearings with ribs can take some axial loads.

**Fig. 3.2 Relative Load Capacities of Various Bearing Types**

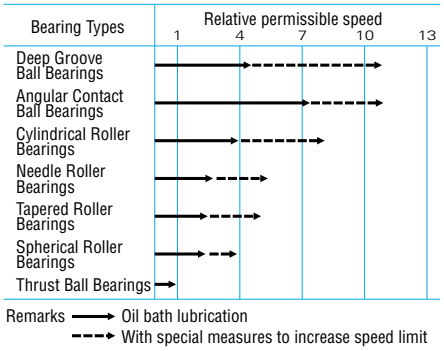



**Fig. 3.3 Relative Permissible Speeds of Various Bearing Types**

Permissible bearing misalignment is given at the beginning of the dimensional tables for each bearing type.

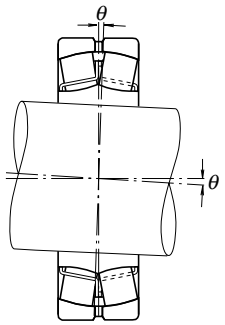



**Fig. 3.4 Permissible Misalignment of Spherical Roller Bearings**

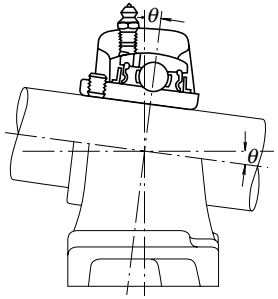



**Fig. 3.5 Permissible Misalignment of Ball Bearing Units**

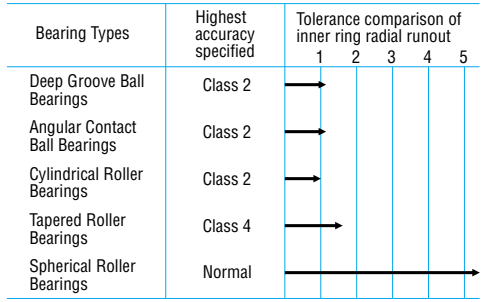



**Fig. 3.6 Relative Inner Ring Radial Runout of Highest Accuracy Class for Various Bearing Types**

## 3.5 Rigidity and Bearing Types

When loads are imposed on a rolling bearing, some elastic deformation occurs in the contact areas between the rolling elements and raceways. The rigidity of the bearing is determined by the ratio of bearing load to the amount of elastic deformation of the inner and outer rings and rolling elements. For the main spindles of machine tools, it is necessary to have high rigidity of the bearings together with the rest of the spindle. Consequently, since roller bearings are deformed less by load, they are more often selected than ball bearings. When extra high rigidity is required, bearings are given a preload, which means that they have a negative clearance. Angular contract ball bearings and tapered roller bearings are often preloaded.

## 3.6 Noise and Torque of Various Bearing Types

Since rolling bearings are manufactured with very high precision, noise and torque are minimal. For deep groove ball bearings and cylindrical roller bearings particularly, the noise level is sometimes specified depending on their purpose. For high precision miniature ball bearings, the starting torque is specified. Deep groove ball bearings are recommended for applications in which low noise and torque are required, such as motors and instruments.

## 3.7 Running Accuracy and Bearing Types

For the main spindles of machine tools that require high running accuracy or high speed applications like superchargers, high precision bearings of Class 5, 4 or 2 are usually used.
The running accuracy of rolling bearings is specified in various ways, and the specified accuracy classes vary depending on the bearing type. A comparison of the inner ring radial runout for the highest running accuracy specified for each bearing type is shown in Fig. 3.6.
For applications requiring high running accuracy, deep groove ball bearings, angular contact ball bearings, and cylindrical roller bearings are most suitable.

## 3.8 Mounting and Dismounting of Various Bearing Types

Separable types of bearings like cylindrical roller bearings, needle roller bearings and tapered roller bearings are convenient for mounting and dismounting. For machines in which bearings are mounted and dismounted rather often for periodic inspection, these types of bearings are recommended. Also, self-aligning ball bearings and spherical roller bearings (small ones) with tapered bores can be mounted and dismounted relatively easily using sleeves.

# 4. SELECTION OF BEARING ARRANGEMENT

In general, shafts are supported by only two bearings. When considering the bearing mounting arrangement, the following items must be investigated:

(1) Expansion and contraction of the shaft caused by temperature variations.
(2) Ease of bearing mounting and dismounting.
(3) Misalignment of the inner and outer rings caused by deflection of the shaft or mounting error.
(4) Rigidity of the entire system including bearings and preloading method.
(5) Capability to sustain the loads at their proper positions and to transmit them.

## 4.1 Fixed-End and Free-End Bearings

Among the bearings on a shaft, only one can be a "fixed-end" bearing that is used to fix the shaft axially. For this fixed-end bearing, a type which can carry both radial and axial loads must be selected.

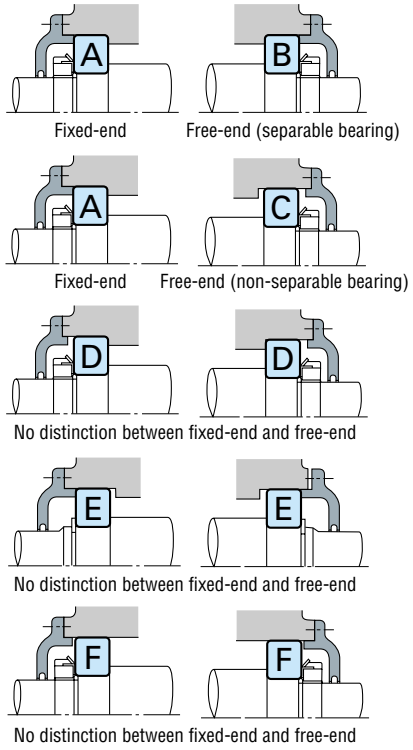
Bearings other than the fixed-end one must be "free-end" bearings that carry only radial loads to relieve the shaft's thermal elongation and contraction.

If measures to relieve a shaft's thermal elongation and contraction are insufficient, abnormal axial loads are applied to the bearings, which can cause premature failure.

For free-end bearings, cylindrical roller bearings or needle roller bearings with separable inner and outer rings that are free to move axially (NU, N types, etc.) are recommended. When these types are used, mounting and dismounting are also easier.

When non-separable types are used as free-end bearings, usually the fit between the outer ring and housing is loose to allow axial movement of the running shaft together with the bearing. Sometimes, such elongation is relieved by a loose fitting between the inner ring and shaft.

When the distance between the bearings is short and the influence of the shaft elongation and contraction is negligible, two opposed angular contact ball bearings or tapered roller bearings are used. The axial clearance (possible axial movement) after the mounting is adjusted using nuts or shims.




**BEARING A**
- Deep Groove Ball Bearing
- Matched Angular Contact Ball Bearing
- Double-Row Angular Contact Ball Bearing
- Self-Aligning Ball Bearing
- Cylindrical Roller Bearing with Ribs (NH, NUP types)
- Double-Row Tapered Roller Bearing
- Spherical Roller Bearing

**BEARING B**
- Cylindrical Roller Bearing (NU, N types)
- Needle Roller Bearing (NA type, etc.)

**BEARING C(1)**
- Deep Groove Ball Bearing
- Matched Angular Contact Ball Bearing (back-to-back)
- Double-Row Angular Contact Ball Bearing
- Self-Aligning Ball Bearing
- Double-Row Tapered Roller Bearing (KBE type)
- Spherical Roller Bearing

**BEARING D,E(2)**
- Angular Contact Ball Bearing
- Tapered Roller Bearing
- Magneto Bearing
- Cylindrical Roller Bearing (NJ, NF types)

**BEARING F**
- Deep Groove Ball Bearing
- Self-Aligning Ball Bearing
- Spherical Roller Bearing

Notes: (1) In the figure, shaft elongation and contraction are relieved at the outside surface of the outer ring, but sometimes it is done at the bore.
(2) For each type, two bearings are used in opposition.

**Fig. 4.1 Bearing Mounting Arrangements and Bearing Types**



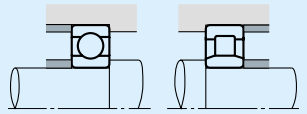
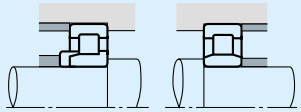
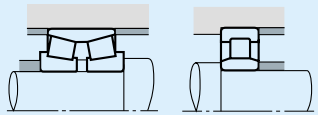
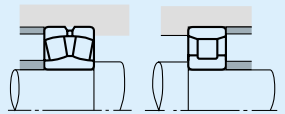
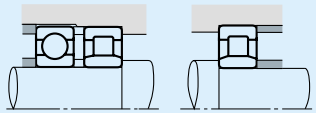


The distinction between free-end and fixed-end bearings and some possible bearing mounting arrangements for various bearing types are shown in Fig. 4.1.

## 4.2 Example of Bearing Arrangements

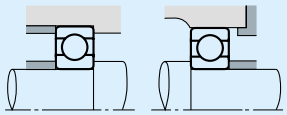
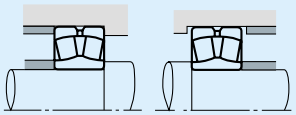
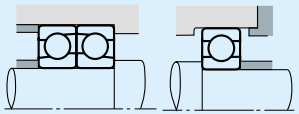
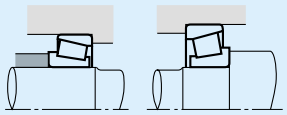
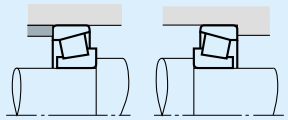
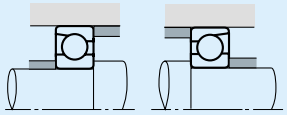
Some representative bearing mounting arrangements considering preload and rigidity of the entire assembly, shaft elongation and contraction, mounting error, etc. are shown in Table 4.1.

**Table 4. 1 Representative Bearing Mounting Arrangements and Application Examples**

| Bearing Arrangements | | Remarks | Application Examples |
|---|---|---|---|
| Fixed-end | Free-end | | |
|  | | ○This is a common arrangement in which abnormal loads are not applied to bearings even if the shaft expands or contracts.<br>○If the mounting error is small, this is suitable for high speeds. | Medium size electric motors, blowers |
|  | | ○This can withstand heavy loads and shock loads and can take some axial load.<br>○Every type of cylindrical roller bearing is separable. This is helpful when interference is necessary for both the inner and outer rings. | Traction motors for rolling stock |
|  | | ○This is used when loads are relatively heavy.<br>○For maximum rigidity of the fixed-end bearing, it is a back-to-back type.<br>○Both the shaft and housing must have high accuracy and the mounting error must be small. | Table rollers for steel mills, main spindles of lathes |
|  | | ○This is also suitable when interference is necessary for both the inner and outer rings. Heavy axial loads cannot be applied. | Calender rolls of paper making machines, axles of diesel locomotives |
|  | | ○This is suitable for high speeds and heavy radial loads. Moderate axial loads can also be applied.<br>○It is necessary to provide some clearance between the outer ring of the deep groove ball bearing and the housing bore in order to avoid subjecting it to radial loads. | Reduction gears in diesel locomotives |

Continued on next page

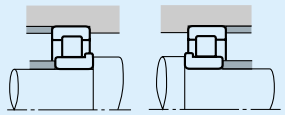
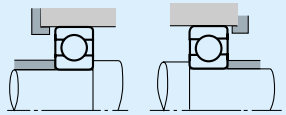
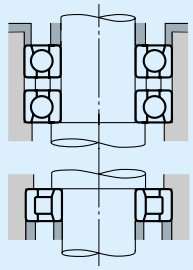
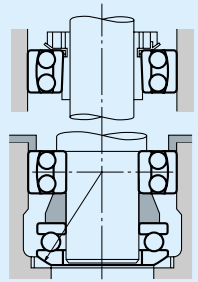
**Table 4. 1 Representative Bearing Mounting Arrangements and Application Examples (cont'd)**

| Bearing Arrangements (Fixed-end / Free-end) | Remarks | Application Examples |
|---|---|---|
|  | ○This is the most common arrangement.<br>○It can sustain not only radial loads, but moderate axial loads also. | Double suction volute pumps, automotive transmissions |
|  | ○This is the most suitable arrangement when there is mounting error or shaft deflection.<br>○It is often used for general and industrial applications in which heavy loads are applied. | Speed reducers, table rollers of steel mills, wheels for overhead travelling cranes |
|  | ○This is suitable when there are rather heavy axial loads in both directions.<br>○Double row angular contact bearings may be used instead of a arrangement of two angular contact ball bearings. | Worm gear reducers |
| **When there is no distinction between fixed-end and free-end** | **Remarks** | **Application Examples** |
|  <br>Back-to-back mounting<br>  <br>Face-to-face mounting | ○This arrangement is widely used since it can withstand heavy loads and shock loads.<br>○The back-to-back arrangement is especially good when the distance between bearings is short and moment loads are applied.<br>○Face-to-face mounting makes mounting easier when interference is necessary for the inner ring. In general, this arrangement is good when there is mounting error.<br>○To use this arrangement with a preload, affection must be paid to the amount of preload and clearance adjustment. | Pinion shafts of automotive differential gears, automotive front and rear axles, worm gear reducers |
|  <br>Back-to-back mounting | ○This is used at high speeds when radial loads are not so heavy and axial loads are relatively heavy.<br>○It provides good rigidity of the shaft by preloading.<br>○For moment loads, back-to-back mounting is better than face-to-face mounting. | Grinding wheel shafts |

Continued on next page





| When there is no distinction between fixed-end and free-end | Remarks | Application Examples |
|---|---|---|
|  <br>NJ + NJ mounting | ○This can withstand heavy loads and shock loads.<br>○It can be used if interference is necessary for both the inner and outer rings.<br>○Care must be taken so the axial clearance doesn't become too small during running.<br>○NF type + NF type mounting is also possible. | Final reduction gears of construction machines |
|  | ○Sometimes a spring is used at the side of the outer ring of one bearing. | Small electric motors, small speed reducers, small pumps |
| **Vertical arrangements** | **Remarks** | **Application Examples** |
|  | ○Matched angular contact ball bearings are on the fixed end.<br>○Cylindrical roller bearing is on the free end. | Vertical electric motors |
|  | ○The spherical center of the self-aligning seat must coincide with that of the self-aligning ball bearing.<br>○The upper bearing is on the free end. | Vertical openers (spinning and weaving machines) |

# 5. SELECTION OF BEARING SIZE

## 5.1 Bearing Life

The various functions required of rolling bearings vary according to the bearing application. These functions must be performed for a prolonged period. Even if bearings are properly mounted and correctly operated, they will eventually fail to perform satisfactorily due to an increase in noise and vibration, loss of running accuracy, deterioration of grease, or fatigue flaking of the rolling surfaces.

Bearing life, in the broad sense of the term, is the period during which bearings continue to operate and to satisfy their required functions. This bearing life may be defined as noise life, abrasion life, grease life, or rolling fatigue life, depending on which one causes loss of bearing service.

Aside from the failure of bearings to function due to natural deterioration, bearings may fail when conditions such as heat-seizure, fracture, scoring of the rings, damage of the seals or the cage, or other damage occurs.

Conditions such as these should not be interpreted as normal bearing failure since they often occur as a result of errors in bearing selection, improper design or manufacture of the bearing surroundings, incorrect mounting, or insufficient maintenance.

### 5.1.1 Rolling Fatigue Life and Basic Rating Life

When rolling bearings are operated under load, the raceways of their inner and outer rings and rolling elements are subjected to repeated cyclic stress. Because of metal fatigue of the rolling contact surfaces of the raceways and rolling elements, scaly particles may separate from the bearing material (Fig. 5.1). This phenomenon is called "flaking". Rolling fatigue life is represented by the total number of revolutions at which time the bearing surface will start flaking due to stress. This is called fatigue life. As shown in Fig. 5.2, even for seemingly identical bearings, which are of the same type, size, and material and receive the same heat treatment and other processing, the rolling fatigue life varies greatly even under identical operating conditions. This is because the flaking of materials due to fatigue is subject to many other variables. Consequently, "basic rating life", in which rolling fatigue life is treated as a statistical phenomenon, is used in preference to actual rolling fatigue life.

Suppose a number of bearings of the same type are operated individually under the same conditions. After a certain period of time, 10% of them fail as a result of flaking caused by rolling fatigue. The total number of revolutions at this point is defined as the basic rating life or, if the speed is constant, the basic rating life is often expressed by the total number of operating hours completed when 10% of the bearings become inoperable due to flaking.

In determining bearing life, basic rating life is often the only factor considered. However, other factors must also be taken into account. For example, the grease life of grease-prelubricated bearings (refer to Section 12, Lubrication, Page A107) can be estimated. Since noise life and abrasion life are judged according to individual standards for different applications, specific values for noise or abrasion life must be determined empirically.

## 5.2 Basic Load Rating and Fatigue Life

### 5.2.1 Basic Load Rating

The basic load rating is defined as the constant load applied on bearings with stationary outer rings that the inner rings can endure for a rating life of one million revolutions ($10^6$ rev). The basic load rating of radial bearings is defined as a central radial load of constant direction and magnitude, while the basic load rating of thrust bearings is defined as an axial load of constant magnitude in the same direction as the central axis. The load ratings are listed under $C_r$ for radial bearings and $C_a$ for thrust bearings in the dimension tables.

### 5.2.2 Machinery in which Bearings are Used and Projected Life

It is not advisable to select bearings with unnecessarily high load ratings, for such bearings may be too large and uneconomical. In addition, the bearing life alone should not be the deciding factor in the selection of bearings. The strength, rigidity, and design of the shaft

Fig. 5.1 Example of Flaking

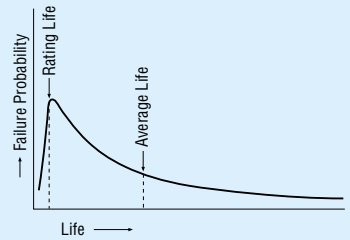



Fig. 5.2 Failure Probability and Bearing Life





Table 5. 1 Fatigue Life Factor $f_h$ for Various Bearing Applications

| Operating Periods | Fatigue Life Factor $f_h$ | | | | |
|---|---|---|---|---|---|
| | ~3 | 2~4 | 3~5 | 4~7 | 6~ |
| Infrequently used or only for short periods | ・Small motors for home appliances like vacuum cleaners and washing machines<br>・Hand power tools | ・Agricultural equipment | | | |
| Used only occasionally but reliability is important | | ・Motors for home heaters and air conditioners<br>・Construction equipment | ・Conveyors<br>・Elevator cable sheaves | | |
| Used intermittently for relatively long periods | ・Rolling mill roll necks | ・Small motors<br>・Deck cranes<br>・General cargo cranes<br>・Pinion stands<br>・Passenger cars | ・Factory motors<br>・Machine tools<br>・Transmissions<br>・Vibrating screens<br>・Crushers | ・Crane sheaves<br>・Compressors<br>・Specialized transmissions | |
| Used intermittently for more than eight hours daily | | ・Escalators | ・Centrifugal separators<br>・Air conditioning equipment<br>・Blowers<br>・Woodworking machines<br>・Large motors<br>・Axle boxes on railway rolling stock | ・Mine hoists<br>・Press flywheels<br>・Railway traction motors<br>・Locomotive axle boxes | ・Paper making machines |
| Used continuously and high reliability is important | | | | | ・Waterworks pumps<br>・Electric power stations<br>・Mine draining pumps |

on which the bearings are to be mounted should also be considered. Bearings are used in a wide range of applications and the design life varies with specific applications and operating conditions. Table 5.1 gives an empirical fatigue life factor derived from customary operating experience for various machines. Also refer to Table 5.2.

### 5.2.3 Selection of Bearing Size Based on Basic Load Rating

The following relation exists between bearing load and basic rating life:

For ball bearings $$L = \left(\frac{C}{P}\right)^3 \quad \cdots\cdots\cdots\cdots\cdots\cdots (5.1)$$

For roller bearings $$L = \left(\frac{C}{P}\right)^{\frac{10}{3}} \quad \cdots\cdots\cdots\cdots\cdots\cdots (5.2)$$

where $L$ : Basic rating life ($10^6$ rev)

$P$ : Bearing load (equivalent load) (N), {kgf}
.....(Refer to Page A30)

$C$ : Basic load rating (N), {kgf}
For radial bearings, $C$ is written $C_r$
For thrust bearings, $C$ is written $C_a$

In the case of bearings that run at a constant speed, it is convenient to express the fatigue life in terms of hours. In general, the fatigue life of bearings used in automobiles and other vehicles is given in terms of mileage.

By designating the basic rating life as $L_h$ (h), bearing speed as $n$ ($\text{min}^{-1}$), fatigue life factor as $f_h$, and speed factor as $f_n$, the relations shown in Table 5.2 are obtained:

Table 5. 2 Basic Rating Life, Fatigue Life Factor and Speed Factor

| Life Parameters | Ball Bearings | Roller Bearings |
|---|---|---|
| Basic Rating Life | $L_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = 500 f_h^3$ | $L_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^{\frac{10}{3}} = 500 f_h^{\frac{10}{3}}$ |
| Fatigue Life Factor | $f_h = f_n \frac{C}{P}$ | $f_h = f_n \frac{C}{P}$ |
| Speed Factor | $f_n = \left(\frac{10^6}{500\times 60n}\right)^{\frac{1}{3}} = (0.03n)^{-\frac{1}{3}}$ | $f_n = \left(\frac{10^6}{500\times 60n}\right)^{\frac{3}{10}} = (0.03n)^{-\frac{3}{10}}$ |

$n$, $f_n$·····Fig. 5.3 (See Page A26), Appendix Table 12 (See Page C24)
$L_h$, $f_h$····Fig. 5.4 (See Page A26), Appendix Table 13 (See Page C25)

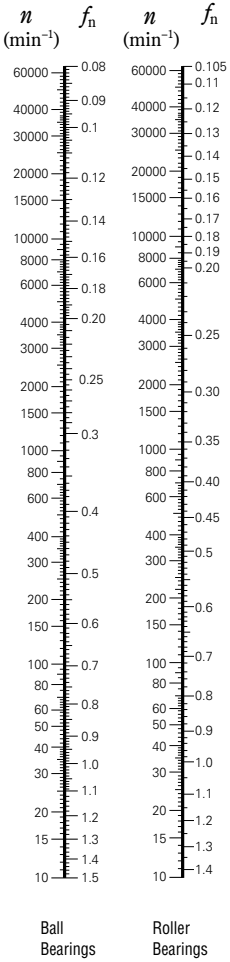



Fig. 5.3 Bearing Speed and Speed Factor

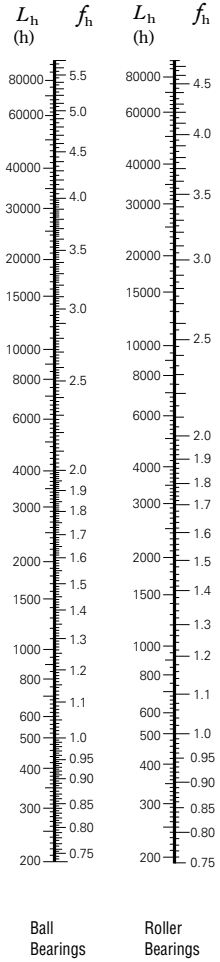



Fig. 5.4 Fatigue Life Factor and Fatigue Life

If the bearing load $P$ and speed $n$ are known, determine a fatigue life factor $f_h$ appropriate for the projected life of the machine and then calculate the basic load rating $C$ by means of the following equation.

$$C = \frac{f_h \cdot P}{f_n} \quad \cdots\cdots (5.3)$$

A bearing which satisfies this value of $C$ should then be selected from the bearing tables.

### 5.2.4 Temperature Adjustment for Basic Load Rating

If rolling bearings are used at high temperature, the hardness of the bearing steel decreases. Consequently, the basic load rating, which depends on the physical properties of the material, also decreases. Therefore, the basic load rating should be adjusted for the higher temperature using the following equation:

$$C_t = f_t \cdot C \quad \cdots\cdots (5.4)$$

where $C_t$ : Basic load rating after temperature correction (N), {kgf}

$f_t$ : Temperature factor (See Table 5.3.)

$C$ : Basic load rating before temperature adjustment (N), {kgf}

If large bearings are used at higher than 120°C, they must be given special dimensional stability heat treatment to prevent excessive dimensional changes. The basic load rating of bearings given such special dimensional stability heat treatment may become lower than the basic load rating listed in the bearing tables.

Table 5.3 Temperature Factor $f_t$

| Bearing Temperature °C | 125 | 150 | 175 | 200 | 250 |
|---|---|---|---|---|---|
| Temperature Factor $f_t$ | 1.00 | 1.00 | 0.95 | 0.90 | 0.75 |

### 5.2.5 Correction of Basic Rating Life

As described previously, the basic equations for calculating the basic rating life are as follows:

For ball bearings $L_{10} = \left(\frac{C}{P}\right)^3 \quad \cdots\cdots (5.5)$

For roller bearings $L_{10} = \left(\frac{C}{P}\right)^{\frac{10}{3}} \quad \cdots\cdots (5.6)$

The $L_{10}$ life is defined as the basic rating life with a statistical reliability of 90%. Depending on the machines in which the bearings are used, sometimes a reliability higher than 90% may be required. However, recent improvements in bearing material have greatly extended the fatigue life. In addition, the developent of the Elasto-Hydrodynamic Theory of Lubrication proves that the thickness of the lubricating film in the contact zone between rings and rolling elements greatly influences bearing life. To reflect such improvements in the calculation of fatigue life, the basic rating life is adjusted using the following adjustment factors:

$$L_{na} = a_1\, a_2\, a_3\, L_{10} \quad \cdots\cdots (5.7)$$

where $L_{na}$ : Adjusted rating life in which reliability, material improvements, lubricating conditions, etc. are considered

$L_{10}$ : Basic rating life with a reliability of 90%

$a_1$ : Life adjustment factor for reliability

$a_2$ : Life adjustment factor for special bearing properties

$a_3$ : Life adjustment factor for operating conditions

The life adjustment factor for reliability, $a_1$, is listed in Table 5.4 for reliabilities higher than 90%.

The life adjustment factor for special bearing properties, $a_2$, is used to reflect improvements in bearing steel.

NSK now uses vacuum degassed bearing steel, and the results of tests by NSK show that life is greatly improved when compared with earlier materials. The basic load ratings $C_r$ and $C_a$ listed in the bearing tables were calculated considering the extended life achieved by improvements in materials and manufacturing techniques. Consequently, when estimating life using Equation (5.7), it is sufficient to assume that is greater than one.

Table 5.4 Reliability Factor $a_1$

| Reliability (%) | 90 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|
| $a_1$ | 1.00 | 0.62 | 0.53 | 0.44 | 0.33 | 0.21 |

The life adjustment factor for operating conditions $a_3$ is used to adjust for various factors, particularly lubrication. If there is no misalignment between the inner and outer rings and the thickness of the lubricating film in the contact zones of the bearing is sufficient, it is possible for $a_3$ to be greater than one; however, $a_3$ is less than one in the following cases:

- When the viscosity of the lubricant in the contact zones between the raceways and rolling elements is low.
- When the circumferential speed of the rolling elements is very slow.
- When the bearing temperature is high.
- When the lubricant is contaminated by water or foreign matter.
- When misalignment of the inner and outer rings is excessive.

It is difficult to determine the proper value for $a_3$ for specific operating conditions because there are still many unknowns. Since the special bearing property factor $a_2$ is also influenced by the operating conditions, there is a proposal to combine $a_2$ and $a_3$ into one quantity($a_2 \times a_3$), and not consider them independently. In this case, under normal lubricating and operating conditions, the product ($a_2 \times a_3$) should be assumed equal to one. However, if the viscosity of the lubricant is too low, the value drops to as low as 0.2.
If there is no misalignment and a lubricant with high viscosity is used so sufficient fluid-film thickness is secured, the product of ($a_2 \times a_3$) may be about two.

When selecting a bearing based on the basic load rating, it is best to choose an $a_1$ reliability factor appropriate for the projected use and an empirically determined $C/P$ or $f_h$ value derived from past results for lubrication, temperature, mounting conditions, etc. in similar machines.

The basic rating life equations (5.1), (5.2), (5.5), and (5.6) give satisfactory results for a broad range of bearing loads. However, extra heavy loads may cause detrimental plastic deformation at ball/raceway contact points. When $P_r$ exceeds $C_{0r}$ (Basic static load rating) or 0.5 $C_r$, whichever is smaller, for radial bearings or $P_a$ exceeds 0.5 $C_a$ for thrust bearings, please consult NSK to establish the applicablity of the rating fatigue life equations.

## 5.3 Calculation of Bearing Loads

The loads applied on bearings generally include the weight of the body to be supported by the bearings, the weight of the revolving elements themselves, the transmission power of gears and belting, the load produced by the operation of the machine in which the bearings are used, etc. These loads can be theoretically calculated, but some of them are difficult to estimate. Therefore, it becomes necessary to correct the estimated using empirically derived data.

### 5.3.1 Load Factor

When a radial or axial load has been mathematically calculated, the actual load on the bearing may be greater than the calculated load because of vibration and shock present during operation of the machine. The actual load may be calculated using the following equation:

$$\left.\begin{aligned} F_r &= f_w \cdot F_{rc} \\ F_a &= f_w \cdot F_{ac} \end{aligned}\right\} \quad \cdots\cdots (5.8)$$

where $F_r$, $F_a$ : Loads applied on bearing (N), {kgf}

$F_{rc}$, $F_{ac}$ : Theoretically calculated load (N), {kgf}

$f_w$ : Load factor

The values given in Table 5.5 are usually used for the load factor $f_w$.

### 5.3.2 Bearing Loads in Belt or Chain Transmission Applications

The force acting on the pulley or sprocket wheel when power is transmitted by a belt or chain is calculated using the following equations.

$$\left.\begin{aligned} M &= 9\,550\,000 H / n \ \ldots.(\mathrm{N \cdot mm}) \\ &= 974\,000 H / n \ \ldots.\{\mathrm{kgf \cdot mm}\} \end{aligned}\right\} \cdots\cdots (5.9)$$

$$P_k = M / r \quad \cdots\cdots (5.10)$$

where $M$ : Torque acting on pulley or sprocket wheel (N·mm), {kgf·mm}

$P_k$ : Effective force transmitted by belt or chain (N), {kgf}

$H$ : Power transmitted(kW)

$n$ : Speed ($\mathrm{min^{-1}}$)

$r$ : Effective radius of pulley or sprocket wheel (mm)

When calculating the load on a pulley shaft, the belt tension must be included. Thus, to calculate the actual load $K_b$ in the case of a belt transmission, the effective transmitting power is multiplied by the belt factor $f_b$, which represents the belt tension. The values of the belt factor $f_b$ for different types of belts are shown in Table 5.6.

$$K_b = f_b \cdot P_k \quad \cdots\cdots (5.11)$$

In the case of a chain transmission, the values corresponding to $f_b$ should be 1.25 to 1.5.

**Table 5. 5 Values of Load Factor $f_w$**

| Operating Conditions | Typical Applications | $f_w$ |
|---|---|---|
| Smooth operation free from shocks | Electric motors, Machine tools, Air conditioners | 1 to 1.2 |
| Normal operation | Air blowers, Compressors, Elevators, Cranes, Paper making machines | 1.2 to 1.5 |
| Operation accompanied by shock and vibration | Construction equipment, Crushers, Vibrating screens, Rolling mills | 1.5 to 3 |

**Table 5. 6 Belt Factor $f_b$**

| Type of Belt | $f_b$ |
|---|---|
| Toothed belts | 1.3 to 2 |
| V belts | 2 to 2.5 |
| Flat belts with tension pulley | 2.5 to 3 |
| Flat belts | 4 to 5 |

### 5.3.3 Bearing Loads in Gear Transmission Applications

The loads imposed on gears in gear transmissions vary according to the type of gears used. In the simplest case of spur gears, the load is calculated as follows:

$$\left.\begin{aligned} M &= 9\,550\,000 H / n \ \ldots.(\mathrm{N \cdot mm}) \\ &= 974\,000 H / n \ \ldots.\{\mathrm{kgf \cdot mm}\} \end{aligned}\right\} \cdots\cdots (5.12)$$

$$P_k = M / r \quad \cdots\cdots (5.13)$$

$$S_k = P_k \tan\theta \quad \cdots\cdots (5.14)$$

$$K_c = \sqrt{P_k^2 + S_k^2} = P_k \sec\theta \quad \cdots\cdots (5.15)$$

where $M$ : Torque applied to gear (N·mm), {kgf·mm}

$P_k$ : Tangential force on gear (N), {kgf}

$S_k$ : Radial force on gear (N), {kgf}

$K_c$ : Combined force imposed on gear (N), {kgf}

$H$ : Power transmitted (kW)

$n$ : Speed ($\mathrm{min^{-1}}$)

$r$ : Pitch circle radius of drive gear (mm)

$\theta$ : Pressure angle

In addition to the theoretical load calculated above, vibration and shock (which depend on how accurately the gear is finished) should be included using the gear factor $f_g$ by multiplying the theoretically calculated load by this factor.
The values of $f_g$ should generally be those in Table 5.7. When vibration from other sources accompanies gear operation, the actual load is obtained by multiplying the load factor by this gear factor.

**Table 5. 7 Values of Gear Factor $f_g$**

| Gear Finish Accuracy | $f_g$ |
|---|---|
| Precision ground gears | 1 ～1.1 |
| Ordinary machined gears | 1.1～1.3 |

### 5.3.4 Load Distribution on Bearings

In the simple examples shown in Figs. 5.5 and 5.6. The radial loads on bearings Ⅰ and Ⅱ can be calculated using the following equations:

$$F_{CⅠ} = \frac{b}{c} K \quad \cdots\cdots (5.16)$$

$$F_{CⅡ} = \frac{a}{c} K \quad \cdots\cdots (5.17)$$

where $F_{CⅠ}$ : Radial load applied on bearing Ⅰ (N), {kgf}

$F_{CⅡ}$ : Radial load applied on bearing Ⅱ (N), {kgf}

$K$ : Shaft load (N), {kgf}

When these loads are applied simultaneously, first the radial load for each should be obtained, and then, the sum of the vectors may be calculated according to the load direction.

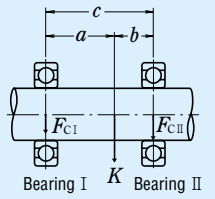



**Fig. 5.5 Radial Load Distribution (1)**

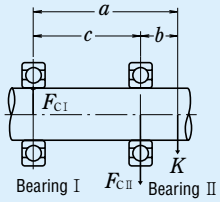



**Fig. 5.6 Radial Load Distribution (2)**

### 5.3.5 Average of Fluctuating Load

When the load applied on bearings fluctuates, an average load which will yield the same bearing life as the fluctuating load should be calculated.

(1) When the relation between load and rotating speed is divided into the following steps (Fig. 5.7)

Load $F_1$ : Speed $n_1$ ; Operating time $t_1$
Load $F_2$ : Speed $n_2$ ; Operating time $t_2$
⋮ ⋮ ⋮
Load $F_n$ : Speed $n_n$ ; Operating time $t_n$

Then, the average load $F_m$ may be calculated using the following equation:

$$F_m = \sqrt[p]{\frac{F_1^p n_1 t_1 + F_2^p n_2 t_2 + \cdots + F_n^p n_n t_n}{n_1 t_1 + n_2 t_2 + \cdots\cdots + n_n t_n}} \quad \cdots\cdots (5.18)$$

where $F_m$ : Average fluctuating load (N), {kgf}

p = 3 for ball bearings

p = 10/3 for roller bearings

The average speed $n_m$ may be calculated as follows:

$$n_m = \frac{n_1t_1 + n_2t_2 + \cdots + n_nt_n}{t_1 + t_2 + \cdots\cdots + t_n} \quad \cdots\cdots\cdots\cdots (5.19)$$

(2) When the load fluctuates almost linearly (Fig. 5.8), the average load may be calculated as follows:

$$F_m \fallingdotseq \frac{1}{3}(F_{min} + 2F_{max}) \quad \cdots\cdots\cdots\cdots (5.20)$$

where $F_{min}$ : Minimum value of fluctuating load (N), {kgf}

$F_{max}$ : Maximum value of fluctuating load (N), {kgf}

(3) When the load fluctuation is similar to a sine wave (Fig. 5.9), an approximate value for the average load $F_m$ may be calculated from the following equation:

In the case of Fig. 5.9 (a)

$$F_m \fallingdotseq 0.65\ F_{max} \quad \cdots\cdots\cdots\cdots (5.21)$$

In the case of Fig. 5.9 (b)

$$F_m \fallingdotseq 0.75\ F_{max} \quad \cdots\cdots\cdots\cdots (5.22)$$

(4) When both a rotating load and a stationary load are applied (Fig. 5.10).

$F_R$ : Rotating load (N), {kgf}

$F_S$ : Stationary load (N), {kgf}

An approximate value for the average load $F_m$ may be calculated as follows:

a) Where $F_R \geqq F_S$

$$F_m \fallingdotseq F_R + 0.3F_S + 0.2\frac{F_S^2}{F_R} \quad \cdots\cdots\cdots\cdots (5.23)$$

b) Where $F_R < F_S$

$$F_m \fallingdotseq F_S + 0.3F_R + 0.2\frac{F_R^2}{F_S} \quad \cdots\cdots\cdots\cdots (5.24)$$

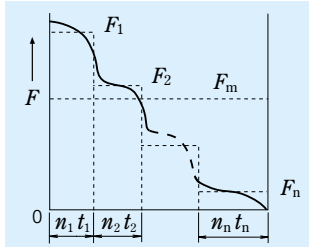



Fig. 5.7 Incremental Load Variation

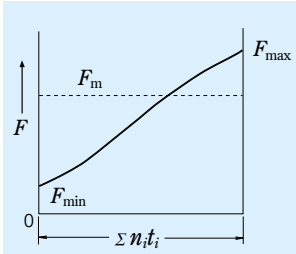



Fig. 5.8 Simple Load Fluctuation

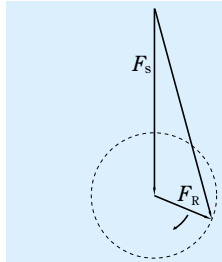



Fig. 5.10 Rotating Load and Stationary Load

## 5.4 Equivalent Load

In some cases, the loads applied on bearings are purely radial or axial loads; however, in most cases, the loads are a combination of both. In addition, such loads usually fluctuate in both magnitude and direction. In such cases, the loads actually applied on bearings cannot be used for bearing life calculations; therefore, a hypothetical load that has a constant magnitude and passes through the center of the bearing, and will give the same bearing life that the bearing would attain under actual conditions of load and rotation should be estimated. Such a hypothetical load is called the equivalent load.

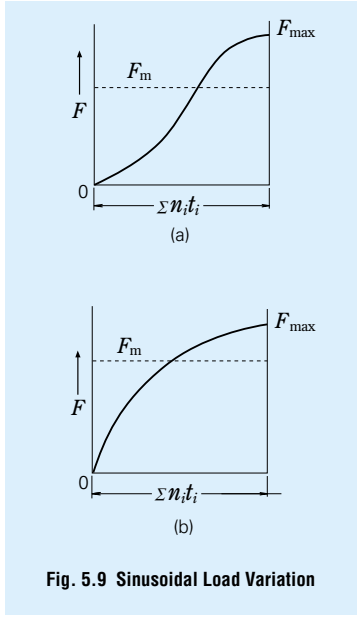



Fig. 5.9 Sinusoidal Load Variation

### 5.4.1 Calculation of Equivalent Loads

The equivalent load on radial bearings may be calculated using the following equation:

$$P = XF_r + YF_a \quad \cdots\cdots\cdots\cdots (5.25)$$

where $P$ : Equivalent Load (N), {kgf}

$F_r$ : Radial load (N), {kgf}

$F_a$ : Axial load (N), {kgf}

$X$ : Radial load factor

$Y$ : Axial load factor

The values of $X$ and $Y$ are listed in the bearing tables. The equivalent radial load for radial roller bearings with $\alpha = 0°$ is

$$P = F_r$$

In general, thrust ball bearings cannot take radial loads, but spherical thrust roller bearings can take some radial loads. In this case, the equivalent load may be calculated using the following equation:

$$P = F_a + 1.2F_r \quad \cdots\cdots\cdots\cdots (5.26)$$

where $\frac{F_r}{F_a} \leqq 0.55$

### 5.4.2 Axial Load Components in Angular Contact Ball Bearings and Tapered Roller Bearings

The effective load center of both angular contact ball bearings and tapered roller bearings is at the point of intersection of the shaft center line and a line representing the load applied on the rolling element by the outer ring as shown in Fig. 5.11. This effective load center for each bearing is listed in the bearing tables. When radial loads are applied to these types of bearings, a component of load is produced in the axial direction. In order to balance this component load, bearings of the same type are used in pairs, placed face to face or back to back. These axial loads can be calculated using the following equation:

$$F_{ai} = \frac{0.6}{Y}F_r \quad \cdots\cdots\cdots\cdots (5.27)$$

where $F_{ai}$ : Component load in the axial direction (N), {kgf}

$F_r$ : Radial load (N), {kgf}

$Y$ : Axial load factor

Assume that radial loads $F_{rI}$ and $F_{rII}$ are applied on bearings I and II (Fig. 5.12) respectively, and an external axial load $F_{ae}$ is applied as shown. If the axial load factors are $Y_I$, $Y_{II}$ and the radial load factor is $X$, then the equivalent loads $P_I$ , $P_{II}$ may be calculated as follows:

where $F_{ae} + \frac{0.6}{Y_{II}}F_{rII} \geqq \frac{0.6}{Y_I}F_{rI}$

$$\left.\begin{aligned} P_I &= XF_{rI} + Y_I\left(F_{ae} + \frac{0.6}{Y_{II}}F_{rII}\right) \\ P_{II} &= F_{rII} \end{aligned}\right\} \quad \cdots\cdots\cdots\cdots (5.28)$$

where $F_{ae} + \frac{0.6}{Y_{II}}F_{rII} < \frac{0.6}{Y_I}F_{rI}$

$$\left.\begin{aligned} P_I &= F_{rI} \\ P_{II} &= XF_{rII} + Y_{II}\left(\frac{0.6}{Y_I}F_{rI} - F_{ae}\right) \end{aligned}\right\} \quad \cdots\cdots\cdots\cdots (5.29)$$

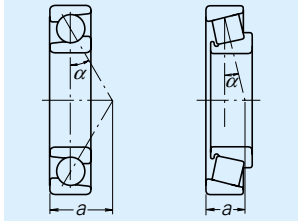



Fig. 5.11 Effective Load Centers

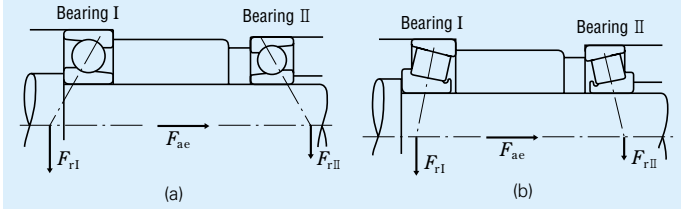



Fig. 5.12 Loads in Opposed Duplex Arrangement

## 5.5 Static Load Ratings and Static Equivalent Loads

### 5.5.1 Static Load Ratings

When subjected to an excessive load or a strong shock load, rolling bearings may incur a local permanent deformation of the rolling elements and permanent deformation of the rolling elements and raceway surface if the elastic limit is exceeded. The nonelastic deformation increases in area and depth as the load increases, and when the load exceeds a certain limit, the smooth running of the bearing is impeded.
The basic static load rating is defined as that static load which produces the following calculated contact stress at the center of the contact area between the rolling element subjected to the maximum stress and the raceway surface.

| | |
|---|---|
| For self-aligning ball bearings | 4 600MPa {469kgf/mm$^2$} |
| For other ball bearings | 4 200MPa {428kgf/mm$^2$} |
| For roller bearings | 4 000MPa {408kgf/mm$^2$} |

In this most heavily stressed contact area, the sum of the permanent deformation of the rolling element and that of the raceway is nearly 0.0001 times the rolling element's diameter. The basic static load rating $C_o$ is written $C_{or}$ for radial bearings and $C_{oa}$ for thrust bearings in the bearing tables.
In addition, following the modification of the criteria for basic static load rating by ISO, the new $C_o$ values for NSK's ball bearings became about 0.8 to 1.3 times the past values and those for roller bearings about 1.5 to 1.9 times. Consequently, the values of permissible static load factor $f_s$ have also changed, so please pay attention to this.

### 5.5.2 Static Equivalent Loads

The static equivalent load is a hypothetical load that produces a contact stress equal to the above maximum stress under actual conditions, while the bearing is stationary (including very slow rotation or oscillation), in the area of contact between the most heavily stressed rolling element and bearing raceway. The static radial load passing through the bearing center is taken as the static equivalent load for radial bearings, while the static axial load in the direction coinciding with the central axis is taken as the static equivalent load for thrust bearings.

(a) Static equivalent load on radial bearings

The greater of the two values calculated from the following equations should be adopted as the static equivalent load on radial bearings.

$$P_o = X_o F_r + Y_o F_a \quad \text{.....(5.30)}$$

$$P_o = F_r \quad \text{.....(5.31)}$$

where $P_o$ : Static equivalent load (N), {kgf}
$F_r$ : Radial load (N), {kgf}
$F_a$ : Axial load (N), {kgf}
$X_o$ : Static radial load factor
$Y_o$ : Static axial load factor

(b)Static equivalent load on thrust bearings

$$P_o = X_o F_r + F_a \qquad \alpha \neq 90° \quad \text{.....(5.32)}$$

where $P_o$ : Static equivalent load (N), {kgf}
$\alpha$ : Contact angle

When $F_a < X_o F_r$, this equation becomes less accurate. The values of $X_o$ and $Y_o$ for Equations (5.30) and (5.32) are listed in the bearing tables.
The static equivalent load for thrust roller bearings with

$\alpha = 90°$ is $P_o = F_a$

### 5.5.3 Permissible Static Load Factor

The permissible static equivalent load on bearings varies depending on the basic static load rating and also their application and operating conditions.
The permissible static load factor $f_s$ is a safety factor that is applied to the basic static load rating, and it is defined by the ratio in Equation (5.33). The generally recommended values of $f_s$ are listed in Table 5.8. Conforming to the modification of the static load rating, the values of $f_s$ were revised, especially for bearings for which the values of $C_o$ were increased, please keep this in mind when selecting bearings.

$$f_s = \frac{C_o}{P_o} \quad \text{.....(5.33)}$$

where $C_o$ : Basic static load rating (N), {kgf}
$P_o$ : Static equivalent load (N), {kgf}

For spherical thrust roller bearings, the values of $f_s$ should be greater than 4.

**Table 5. 8 Values of Permissible Static Load Factor $f_s$**

| Operating Conditions | Lower Limit of $f_s$ | |
|---|---|---|
| | Ball Bearings | Roller Bearings |
| Low-noise applications | 2 | 3 |
| Bearings subjected to vibration and shock loads | 1.5 | 2 |
| Standard operating conditions | 1 | 1.5 |

## 5.6 Maximum Permissible Axial Loads for Cylindrical Roller Bearings

Cylindrical roller bearings having inner and outer rings with ribs, loose ribs or thrust collars are capable of sustaining radial loads and limited axial loads simultaneously. The maximum permissible axial load is limited by an abnormal temperature rise or heat seizure due to sliding friction between the end faces of rollers and the rib face, or the rib strength.
The maximum permissible axial load (the load considered the heat generation between the end face of rollers and the rib face) for bearings of diameter series 3 that are continuously loaded and lubricated with grease or oil is shown in Fig. 5.13.

Grease lubrication (Empirical equation)

$$\left.\begin{aligned} C_A &= 9.8 f \left\{ \frac{900\,(k\cdot d)^2}{n+1\,500} - 0.023 \times (k\cdot d)^{2.5} \right\} \text{...(N)} \\ &= f \left\{ \frac{900\,(k\cdot d)^2}{n+1\,500} - 0.023 \times (k\cdot d)^{2.5} \right\} \text{.....\{kgf\}} \end{aligned}\right\} \text{.....(5.34)}$$

Oil lubrication (Empirical equation)

$$\left.\begin{aligned} C_A &= 9.8 f \left\{ \frac{490\,(k\cdot d)^2}{n+1\,000} - 0.000135 \times (k\cdot d)^{3.4} \right\} \text{...(N)} \\ &= f \left\{ \frac{490\,(k\cdot d)^2}{n+1\,000} - 0.000135 \times (k\cdot d)^{3.4} \right\} \text{.....\{kgf\}} \end{aligned}\right\} \text{...(5.35)}$$

where $C_A$ : Permissible axial load (N), {kgf}
$d$ : Bearing bore diameter (mm)
$n$ : Speed (min$^{-1}$)

**$f$: Load Factor**

| Loading Interval | Value of $f$ |
|---|---|
| Continuous | 1 |
| Intermittent | 2 |
| Short time only | 3 |

**$k$ : Size Factor**

| Diameter series | Value of $k$ |
|---|---|
| 2 | 0.75 |
| 3 | 1 |
| 4 | 1.2 |

In the equations (5.34) and (5.35), the examination for the rib strength is excluded. Concerning the rib strength, please consult with NSK.
In addition, for cylindrical roller bearings to have a stable axial-load carrying capacity, the following precautions are required for the bearings and their surroundings:

- Radial load must be applied and the magnitude of radial load should be larger than that of axial load by 2.5 times or more.
- Sufficient lubricant must exist between the roller end faces and ribs.
- Superior extreme-pressure grease must be used.
- Sufficient running-in should be done.
- The mounting accuracy must be good.
- The radial clearance should not be more than necessary.

In cases where the bearing speed is extremely slow, the speed exceeds the limiting speed by more than 50%, or the bore diameter is more than 200mm, careful study is necessary for each case regarding lubrication, cooling, etc. In such a case, please consult with NSK.

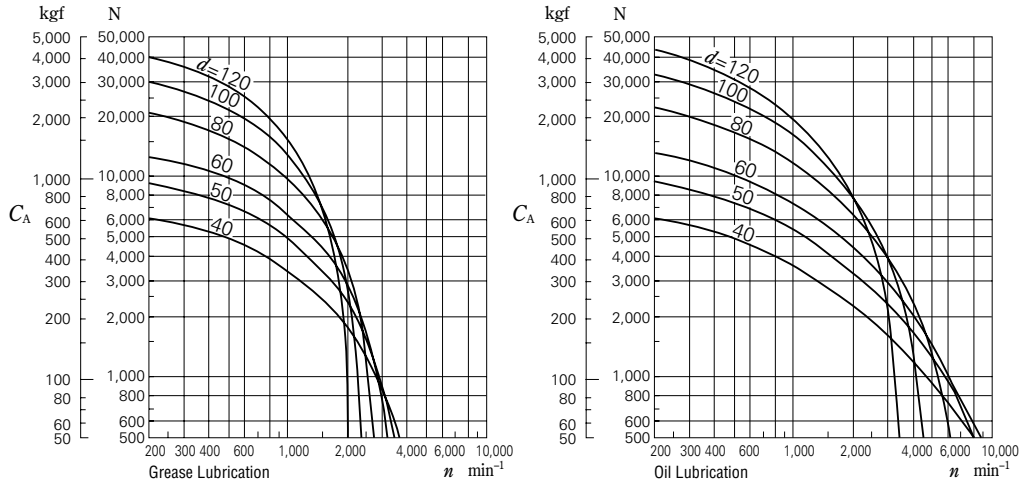



**Fig. 5.13 Permissible Axial Load for Cylindrical Roller Bearings**
For Diameter Series 3 bearings ($k$=1.0) operating under a continuous load and lubricated with grease or oil.

## 5.7 Examples of Bearing Calculations

**(Example1)**
Obtain the fatigue life factor $f_h$ of single-row deep groove ball bearing **6208** when it is used under a radial load $F_r$=2 500 N, {255kgf} and speed $n$ =900min$^{-1}$.

The basic load rating $C_r$ of **6208** is 29 100N, {2 970kgf} (Bearing Table, Page B10). Since only a radial load is applied, the equivalent load $P$ may be obtained as follows:

$$P = F_r = 2\,500\text{N}, \quad \{255\text{kgf}\}$$

Since the speed is $n$ = 900min$^{-1}$, the speed factor $f_n$ can be obtained from the equation in Table 5.2 (Page A25) or Fig. 5.3(Page A26).

$$f_n = 0.333$$

The fatigue life factor $f_h$, under these conditions, can be calculated as follows:

$$f_h = f_n \frac{C_r}{P} = 0.333 \times \frac{29\,100}{2\,500} = 3.88$$

This value is suitable for industrial applications, air conditioners being regularly used, etc., and according to the equation in Table 5.2 or Fig. 5.4 (Page A26), it corresponds approximately to 29 000 hours of service life.

**(Example 2)**
Select a single-row deep groove ball bearing with a bore diameter of 50 mm and outside diameter under 100 mm that satisfies the following conditions:
Radial load $F_r$ = 3 000N, {306kgf}
Speed $n$ =1 900min$^{-1}$
Basic rating life $L_h \geqq 10\,000$h

The fatigue life factor $f_h$ of ball bearings with a rating fatigue life longer than 10 000 hours is $f_h \geqq 2.72$.
Because $f_n$ = 0.26, $P = F_r$ = 3 000N. {306kgf}

$$f_h = f_n \frac{C_r}{P} = 0.26 \times \frac{C_r}{3\,000} \geqq 2.72$$

therefore, $C_r \geqq 2.72 \times \dfrac{3\,000}{0.26} = 31\,380\text{N}$, {3 200kgf}

Among the data listed in the bearing table on Page B12, **6210** should be selected as one that satisfies the above conditions.

**(Example3)**
Obtain $C_r/P$ or fatigue life factor $f_h$ when an axial load $F_a$=1 000N, {102kgf} is added to the conditions of (Example 1)

When the radial load $F_r$ and axial load $F_a$ are applied on single-row deep groove ball bearing **6208**, the dynamic equivalent load $P$ should be calculated in accordance with the following procedure.
Obtain the radial load factor $X$, axial load factor $Y$ and constant $e$ obtainable, depending on the magnitude of $f_o F_a / C_{or}$, from the table above the single-row deep groove ball bearing table.
The basic static load rating $C_{or}$ of ball bearing **6208** is 17 900 N, {1 820kgf} (Page B10)

$$f_o F_a / C_{or} = 14.0 \times 1\,000/17\,900 = 0.782$$

$$e \fallingdotseq 0.26$$

and $F_a / F_r = 1\,000/2\,500 = 0.4 > e$

$X = 0.56$

$Y = 1.67$ (the value of $Y$ is obtained by linear interpolation)

Therefore, the dynamic equivalent load $P$ is

$$P = XF_r + YF_a$$
$$= 0.56 \times 2\,500 + 1.67 \times 1\,000$$
$$= 3\,070\text{N}, \quad \{313\text{kgf}\}$$

$$\frac{C_r}{P} = \frac{29\,100}{3\,070} = 9.48$$

$$f_h = f_n \frac{C_r}{P} = 0.333 \times \frac{29\,100}{3\,070} = 3.16$$

This value of $f_h$ corresponds approximately to 15 800 hours for ball bearings.

**(Example 4)**
Select a spherical roller bearing of series 231 satisfying the following conditions:
Radial load $F_r$ = 45 000N, {4 950kgf}
Axial load $F_a$ = 8 000N, {816kgf}
Speed $n$ = 500min$^{-1}$
Basic rating life $L_h \geqq 30\,000$h

The value of the fatigue life factor $f_h$ which makes $L_h \geqq 30\,000$h is bigger than 3.45 from Fig. 5.4 (Page A26).

The dynamic equivalent load $P$ of spherical roller bearings is given by:

when $F_a / F_r \leqq e$

$$P = XF_r + YX_a = F_r + Y_3 F_a$$

when $F_a / F_r > e$

$$P = XF_r + YF_a = 0.67\,F_r + Y_2 F_a$$

$$F_a / F_r = 8\,000/45\,000 = 0.18$$

We can see in the bearing table that the value of $e$ is about 0.3 and that of $Y_3$ is about 2.2 for bearings of series 231:

Therefore, $P = XF_r + YF_a = F_r + Y_3 F_a$
$= 45\,000 + 2.2 \times 8\,000$
$= 62\,600\text{N}$, {6 380kgf}

From the fatigue life factor $f_h$, the basic load rating can be obtained as follows:

$$f_h = f_n \frac{C_r}{P} = 0.444 \times \frac{C_r}{62\,600} \geqq 3.45$$

consequently, $C_r \geqq 490\,000\text{N}$, {50 000kgf}
Among spherical roller bearings of series 231 satisfying this value of $C_r$, the smallest is **23126CE4** ($C_r$ = 505 000N, {51 500kgf})
Once the bearing is determined, substitute the value of $Y_3$ in the equation and obtain the value of $P$.

$$P = F_r + Y_3 F_a = 45\,000 + 2.4 \times 8\,000$$
$$= 64\,200\text{N}, \quad \{6\,550\text{kgf}\}$$

$$L_h = 500 \left( f_n \frac{C_r}{P} \right)^{\frac{10}{3}}$$
$$= 500 \left( 0.444 \times \frac{505\,000}{64\,200} \right)^{\frac{10}{3}}$$
$$= 500 \times 3.49^{\frac{10}{3}} \fallingdotseq 32\,000\text{h}$$

**(Example 5)**
Assume that tapered roller bearings **HR30305DJ** and **HR30206J** are used in a back-to-back arrangement as shown in Fig. 5.14, and the distance between the cup back faces is 50mm.
Calculate the basic rating life of each bearing when beside the radial load $F_r$ = 5 500N, {561kgf}, axial load $F_{ae}$=2 000N, {204kgf} are applied to **HR30305DJ** as shown in Fig. 5.14. The speed is 600min$^{-1}$.

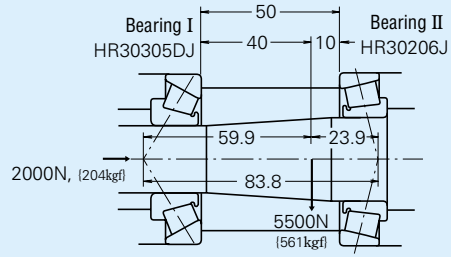



**Fig. 5.14 Loads on Tapered Roller Bearings**

To distribute the radial load $F_r$ on bearings Ⅰ and Ⅱ, the effective load centers must be located for tapered roller bearings. Obtain the effective load center $a$ for bearings Ⅰ and Ⅱ from the bearing table, then obtain the relative position of the radial load $F_r$ and effective load centers. The result will be as shown in Fig. 5.14. Consequently, the radial load applied on bearings Ⅰ (**HR30305DJ**) and Ⅱ (**HR30206J**) can be obtained from the following equations:

$$F_{r\text{Ⅰ}} = 5\,500 \times \frac{23.9}{83.8} = 1\,569\text{N}, \quad \{160\text{kgf}\}$$

$$F_{r\text{Ⅱ}} = 5\,500 \times \frac{59.9}{83.8} = 3\,931\text{N}, \quad \{401\text{kgf}\}$$

From the data in the bearing table, the following values are obtained;

| Bearings | Basic dynamic load rating $C_r$ (N) {kgf} | Axial load factor $Y_1$ | Constant $e$ |
|---|---|---|---|
| Bearing Ⅰ (**HR30305DJ**) | 38 000 {3 900} | $Y_\text{Ⅰ} = 0.73$ | 0.83 |
| Bearing Ⅱ (**HR30206J**) | 43 000 {4 400} | $Y_\text{Ⅱ} = 1.6$ | 0.38 |

When radial loads are applied on tapered roller bearings, an axial load component is produced, which must be considered to obtain the dynamic equivalent radial load (Refer to Paragraph 5.4.2, Page A31).

$$F_{ae}+\frac{0.6}{Y_{II}}F_{rII}=2\,000+\frac{0.6}{1.6}\times 3\,931$$
$$=3\,474\text{N},\ \{354\text{kgf}\}$$

$$\frac{0.6}{Y_I}F_{rI}=\frac{0.6}{0.73}\times 1\,569=1\,290\text{N},\ \{132\text{kgf}\}$$

Therefore, with this bearing arrangement, the axial load $F_{ae}+\frac{0.6}{Y_{II}}F_{rII}$ is applied on bearing Ⅰ but not on bearing Ⅱ.
For bearing Ⅰ

$F_{rI}=1\,569\text{N},\ \{160\text{kgf}\}$

$F_{aI}=3\,474\text{N},\ \{354\text{kgf}\}$

since $F_{aI}/F_{rI}=2.2>e=0.83$

the dynamic equivalent load $P_I=XF_{rI}+Y_IF_{aI}$

$=0.4\times 1\,569+0.73\times 3\,474$

$=3\,164\text{N},\ \{323\text{kgf}\}$

The fatigue life factor $f_h=f_n\frac{C_r}{P_I}$

$$=\frac{0.42\times 38\,000}{3\,164}=5.04$$

and the rating fatigue life $L_h=500\times 5.04^{\frac{10}{3}}=109\,750\text{h}$

For bearing Ⅱ

since $F_{rII}=3\,931\text{N},\ \{401\text{kgf}\},\ F_{aII}=0$

the dynamic equivalent load

$P_{II}=F_{rII}=3\,931\text{N},\ \{401\text{kgf}\}$

the fatigue life factor

$$f_h=f_n\frac{C_r}{P_{II}}=\frac{0.42\times 43\,000}{3\,931}=4.59$$

and the rating fatigue life $L_h=500\times 4.59^{\frac{10}{3}}=80\,400\text{h}$ are obtained.

Remarks For face-to-face arrangements (DF type), please contact NSK.

**(Example 6)**
Select a bearing for a speed reducer under the following conditions:
Operating conditions

Radial load $F_r=245\,000\text{ N},\ \{25\,000\text{kgf}\}$

Axial load $F_a=49\,000\text{N},\ \{5\,000\text{kgf}\}$

Speed $n=500\text{min}^{-1}$

Size limitation

Shaft diameter: 300mm

Bore of housing: Less than 500mm

In this application, heavy loads, shocks, and shaft deflection are expected; therefore, spherical roller bearings are appropriate.
The following spherical roller bearings satisfy the above size limitation (refer to Page B196)

| $d$ | $D$ | $B$ | Bearing No. | Basic dynamic load rating $C_r$ (N) | {kgf} | Constant $e$ | Factor $Y_3$ |
|---|---|---|---|---|---|---|---|
| 300 | 420 | 90 | **23960 CAE4** | 1 230 000 | 125 000 | 0.19 | 3.5 |
| | 460 | 118 | **23060 CAE4** | 1 920 000 | 196 000 | 0.24 | 2.8 |
| | 460 | 160 | **24060 CAE4** | 2 310 000 | 235 000 | 0.32 | 2.1 |
| | 500 | 160 | **23160 CAE4** | 2 670 000 | 273 000 | 0.31 | 2.2 |
| | 500 | 200 | **24160 CAE4** | 3 100 000 | 315 000 | 0.38 | 1.8 |

since $F_a/F_r=0.20<e$
the dynamic equivalent load $P$ is

$$P=F_r+Y_3F_a$$

Judging from the fatigue life factor $f_h$ in Table 5.1 and examples of applications (refer to Page A25), a value of $f_h$, between 3 and 5 seems appropriate.

$$f_h=f_n\frac{C_r}{P}=\frac{0.444\,C_r}{F_r+Y_3F_a}=3\text{ to }5$$

Assuming that $Y_3=2.1$, then the necessary basic load rating $C_r$ can be obtained

$$C_r=\frac{(F_r+Y_3F_a)\times(3\text{ to }5)}{0.444}$$

$$=\frac{(245\,000+2.1\times 49\,000)\times(3\text{ to }5)}{0.444}$$

$=2\,350\,000\text{ to }3\,900\,000\text{N},$
$\{240\,000\text{ to }400\,000\text{kgf}\}$

The bearings which satisfy this range are **23160CAE4**, and **24160CAE4**.





# 6. LIMITING SPEED

The speed of rolling bearings is subject to certain limits. When bearings are operating, the higher the speed, the higher the bearing temperature due to friction. The limiting speed is the empirically obtained value for the maximum speed at which bearings can be continuously operated without failing from seizure or generation of excessive heat. Consequently, the limiting speed of bearings varies depending on such factors as bearing type and size, cage form and material, load, lubricating method, and heat dissipating method including the design of the bearing's surroundings.
The limiting speeds for bearings lubricated by grease and oil are listed in the bearing tables. The limiting speeds in the tables are applicable to bearings of standard design and subjected to normal loads, i. e. $C/P\geqq 12$ and $F_a/F_r\leqq 0.2$ approximately. The limiting speeds for oil lubrication listed in the bearing tables are for conventional oil bath lubrication.
Some types of lubricants are not suitable for high speed, even though they may be markedly superior in other respects. When speeds are more than 70 percent of the listed limiting speed, it is necessary to select an oil or grease which has good high speed characteristics.

(Refer to)
Table 12.2 Grease Properties (Pages A110 and 111)
Table 12.5 Example of Selection of Lubricant for Bearing Operating Conditions (Page A113)
Table 15.8 Brands and Properties of Lubricating Grease (Pages A138 to A141)

## 6.1 Correction of Limiting Speed

When the bearing load $P$ exceeds 8% of the basic load rating $C$, or when the axial load $F_a$ exceeds 20% of the radial load $F_r$, the limiting speed must be corrected by multiplying the limiting speed found in the bearing tables by the correction factor shown in Figs. 6.1 and 6.2.
When the required speed exceeds the limiting speed of the desired bearing; then the accuracy grade, internal clearance, cage type and material, lubrication, etc., must be carefully studied in order to select a bearing capable of the required speed. In such a case, forced-circulation oil lubrication, jet lubrication, oil mist lubrication, or oil-air lubrication must be used.
If all these conditions are considered. The maximum permissible speed may be corrected by multiplying the limiting speed found in the bearing tables by the correction factor shown in Table 6.1. It is recommended that NSK be consulted regarding high speed applications.

## 6.2 Limiting Speed for Rubber Contact Seals for Ball Bearings

The maximum permissible speed for contact rubber sealed bearings (DDU type) is determined mainly by the sliding surface speed of the inner circumference of the seal. Values for the limiting speed are listed in the bearing tables.

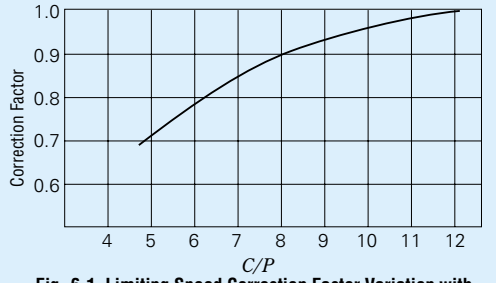



**Fig. 6.1 Limiting Speed Correction Factor Variation with Load Ratio**

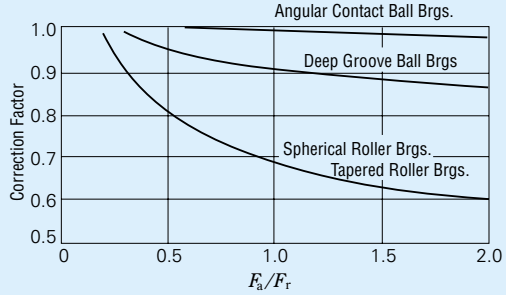



**Fig. 6.2 Limiting Speed Correction Factor for Combined Radial and Axial Loads**

**Table 6.1 Limiting Speed Correction Factor for High-Speed Applications**

| Bearing Types | Correction Factor |
|---|---|
| Cylindrical Roller Brgs.(single row) | 2 |
| Needle Roller Brgs.(except broad width) | 2 |
| Tapered Roller Brgs. | 2 |
| Spherical Roller Brgs. | 1.5 |
| Deep Grooove Ball Brgs. | 2.5 |
| Angular Contact Ball Brgs.(except matched bearings) | 1.5 |

# 7. BOUNDARY DIMENSIONS AND IDENTIFYING NUMBERS FOR BEARINGS

## 7.1 Boundary Dimensions and Dimensions of Snap Ring Grooves

### 7.1.1 Boundary Dimensions

The boundary dimensions of rolling bearings, which are shown in Figs.7.1 through 7.5, are the dimensions that define their external geometry. They include bore diameter $d$, outside diameter $D$, width $B$, bearing width(or height) $T$, chamfer dimension $r$, etc. It is necessary to know all of these dimensions when mounting a bearing on a shaft and in a housing. These boundary dimensions have been internationally standardized (ISO15) and adopted by JIS B 1512 (Boundary Dimensions of Rolling Bearings).

The boundary dimensions and dimension series of radial bearings, tapered roller bearings, and thrust bearings are listed in Table 7.1 to 7.3 (Pages A40 to A49).

In these boundary dimension tables, for each bore number, which prescribes the bore diameter, other boundary dimensions are listed for each diameter series and dimension series. A very large number of series are possible; however, not all of them are commercially available so more can be added in the future. Across the top of each bearing table (7.1 to 7.3), representative bearing types and series symbols are shown (refer to Table 7.5, Bearing Series Symbols, Page A55).

The relative cross-sectional dimensions of radial bearings (except tapered roller bearings) and thrust bearings for the various series classifications are shown in Figs. 7.6 and 7.7 respectively.

### 7.1.2 Dimensions of Snap Ring Grooves and Locating Snap Rings

The dimensions of Snap ring grooves in the outer surfaces of bearings are specified by ISO 464. Also, the dimensions and accuracy of the locating snap rings themselves are specified by ISO 464. The dimensions of snap ring grooves and locating snap ring for bearings of diameter series 8, 9, 0, 2, 3, and 4, are shown in Table 7.4 (Pages A50 to A53).

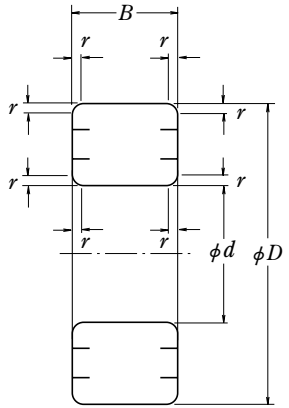



Fig. 7.1 Boundary Dimensions of Radial Ball and Roller Bearings

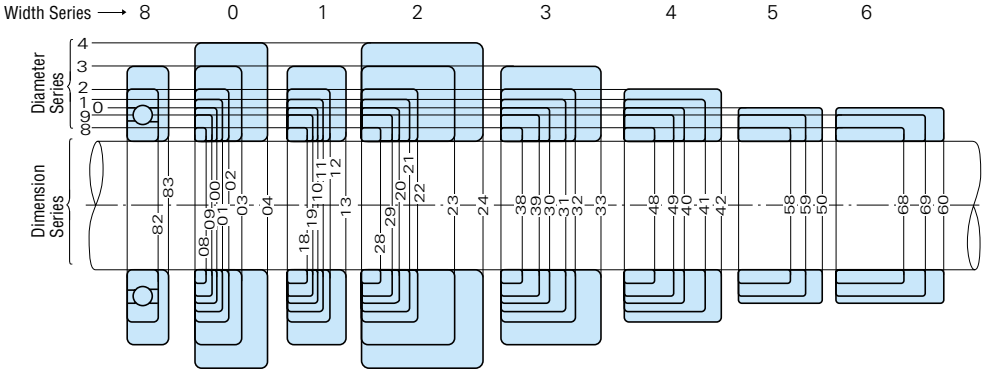



Fig. 7.6 Comparison of Cross Sections of Radial Bearings (except Tapered Roller Bearings) for various Dimensional Series

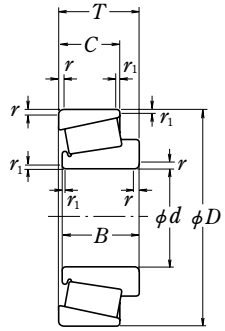



Fig. 7.2 Tapered Roller Bearings

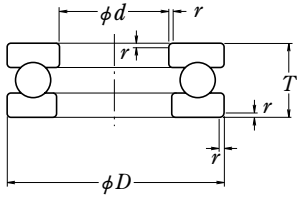



Fig. 7.3 Single-Direction Thrust Ball Bearings

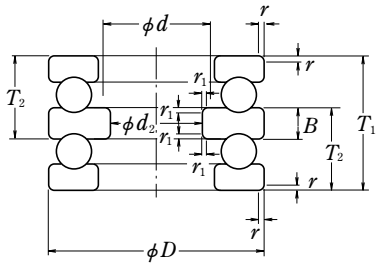



Fig. 7.4 Double-Direction Thrust Ball Bearings

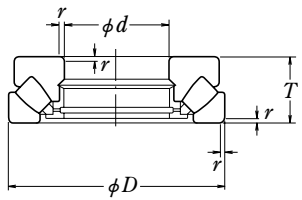



Fig. 7.5 Spherical Thrust Roller Bearings

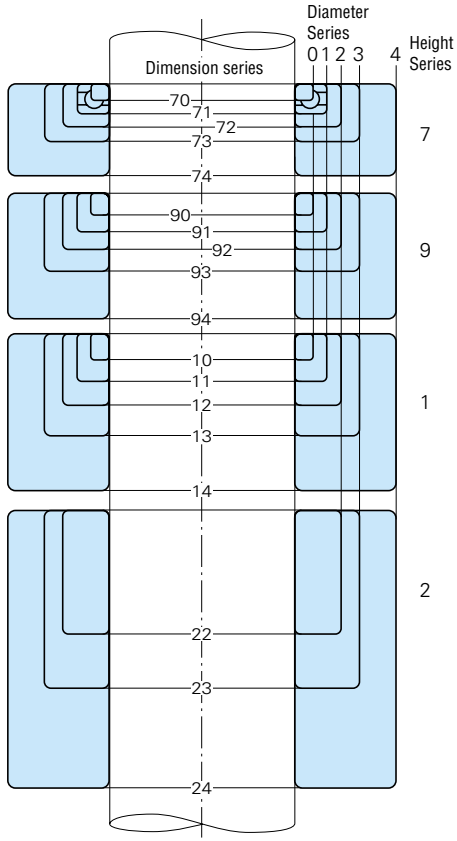



Fig. 7.7 Comparison of Cross Sections of Thrust Bearings (except Diameter Series 5) for Various Dimension Series

## Table 7. 1 Boundary Dimensions of Radial Bearings (except Tapered Roller Bearings) — 1 —

Units: mm

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Single-Row Ball Brgs. | | | | | | | | 68 | | | | | | | | | | 69<br>79 | | | | | | | | | 160 | 60<br>70 | | | | | | |
| Double-Row Ball Brgs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cylindrical Roller Brgs. | | | | | | | | | N28 | NN38 | NN48 | | | | | | | N19 | N29 | NN39 | NN49 | | | | | | N10 | N20 | NN30 | NN40 | | | | |
| Needle Roller Brgs. | | | | | | | | | | | NA48 | | | | | | | | | | NA49 | NA59 | NA69 | | | | | | | | | | |
| Spherical Roller Brgs. | | | | | | | | | | | | | | | | | | | | 239 | | | | | | | | | 230 | 240 | | | | |

| Bore Number | $d$ | Diameter Series 7 | | | | | Diameter Series 8 | | | | | | | | | Diameter Series 9 | | | | | | | | | | Diameter Series 0 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dimension Series | | | | | Dimension Series | | | | | | | | Dimension Series | Dimension Series | | | | | | | Dimension Series | | Dimension Series | Dimension Series | | | | | | | Dimension Series | |
| | | $D$ | 17 | 27 | 37 | 17~37 | $D$ | 08 | 18 | 28 | 38 | 48 | 58 | 68 | 08 | 18~68 | $D$ | 09 | 19 | 29 | 39 | 49 | 59 | 69 | 09 | 19~39 | 49~69 | $D$ | 00 | 10 | 20 | 30 | 40 | 50 | 60 | 00 | 10~60 |
| | | | $B$ | | | $r$ (min.) | | $B$ | | | | | | | $r$ (min.) | | | $B$ | | | | | | | $r$ (min.) | | | | $B$ | | | | | | | $r$ (min.) | |
| — | 0.6 | 2 | 0.8 | — | — | 0.05 | 2.5 | — | 1 | — | 1.4 | — | — | — | — | 0.05 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 1 | 1 | 2.5 | 1 | — | — | 0.05 | 3 | — | 1 | — | 1.5 | — | — | — | — | 0.05 | 4 | — | 1.6 | — | 2.3 | — | — | — | — | 0.1 | — | — | — | — | — | — | — | — | — | — | — |
| — | 1.5 | 3 | 1 | — | 1.8 | 0.05 | 4 | — | 1.2 | — | 2 | — | — | — | — | 0.05 | 5 | — | 2 | — | 2.6 | — | — | — | — | 0.15 | — | 6 | — | 2.5 | — | 3 | — | — | — | — | 0.15 |
| 2 | 2 | 4 | 1.2 | — | 2 | 0.05 | 5 | — | 1.5 | — | 2.3 | — | — | — | — | 0.08 | 6 | — | 2.3 | — | 3 | — | — | — | — | 0.15 | — | 7 | — | 2.8 | — | 3.5 | — | — | — | — | 0.15 |
| — | 2.5 | 5 | 1.5 | — | 2.3 | 0.08 | 6 | — | 1.8 | — | 2.6 | — | — | — | — | 0.08 | 7 | — | 2.5 | — | 3.5 | — | — | — | — | 0.15 | — | 8 | — | 2.8 | — | 4 | — | — | — | — | 0.15 |
| 3 | 3 | 6 | 2 | 2.5 | 3 | 0.08 | 7 | — | 2 | — | 3 | — | — | — | — | 0.1 | 8 | — | 3 | — | 4 | — | — | — | — | 0.15 | — | 9 | — | 3 | — | 5 | — | — | — | — | 0.15 |
| 4 | 4 | 7 | 2 | 2.5 | 3 | 0.08 | 9 | — | 2.5 | 3.5 | 4 | — | — | — | — | 0.1 | 11 | — | 4 | — | 5 | — | — | — | — | 0.15 | — | 12 | — | 4 | — | 6 | — | — | — | — | 0.2 |
| 5 | 5 | 8 | 2 | 2.5 | 3 | 0.08 | 11 | — | 3 | 4 | 5 | — | — | — | — | 0.15 | 13 | — | 4 | — | 6 | 10 | — | — | — | 0.2 | 0.15 | 14 | — | 5 | — | 7 | — | — | — | — | 0.2 |
| 6 | 6 | 10 | 2.5 | 3 | 3.5 | 0.1 | 13 | — | 3.5 | 5 | 6 | — | — | — | — | 0.15 | 15 | — | 5 | — | 7 | 10 | — | — | — | 0.2 | 0.15 | 17 | — | 6 | — | 9 | — | — | — | — | 0.3 |
| 7 | 7 | 11 | 2.5 | 3 | 3.5 | 0.1 | 14 | — | 3.5 | 5 | 6 | — | — | — | — | 0.15 | 17 | — | 5 | — | 7 | 10 | — | — | — | 0.3 | 0.15 | 19 | — | 6 | 8 | 10 | — | — | — | — | 0.3 |
| 8 | 8 | 12 | 2.5 | — | 3.5 | 0.1 | 16 | — | 4 | 5 | 6 | 8 | — | — | — | 0.2 | 19 | — | 6 | — | 9 | 11 | — | — | — | 0.3 | 0.2 | 22 | — | 7 | 9 | 11 | 14 | 19 | 25 | — | 0.3 |
| 9 | 9 | 14 | 3 | — | 4.5 | 0.1 | 17 | — | 4 | 5 | 6 | 8 | — | — | — | 0.2 | 20 | — | 6 | — | 9 | 11 | — | — | — | 0.3 | 0.3 | 24 | — | 7 | 10 | 12 | 15 | 20 | 27 | — | 0.3 |
| 00 | 10 | 15 | 3 | — | 4.5 | 0.1 | 19 | — | 5 | 6 | 7 | 9 | — | — | — | 0.3 | 22 | — | 6 | 8 | 10 | 13 | 16 | 22 | — | 0.3 | 0.3 | 26 | — | 8 | 10 | 12 | 16 | 21 | 29 | — | 0.3 |
| 01 | 12 | 18 | 4 | — | 5 | 0.2 | 21 | — | 5 | 6 | 7 | 9 | — | — | — | 0.3 | 24 | — | 6 | 8 | 10 | 13 | 16 | 22 | — | 0.3 | 0.3 | 28 | 7 | 8 | 10 | 12 | 16 | 21 | 29 | 0.3 | 0.3 |
| 02 | 15 | 21 | 4 | — | 5 | 0.2 | 24 | — | 5 | 6 | 7 | 9 | — | — | — | 0.3 | 28 | — | 7 | 8.5 | 10 | 13 | 18 | 23 | — | 0.3 | 0.3 | 32 | 8 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 |
| 03 | 17 | 23 | 4 | — | 5 | 0.2 | 26 | — | 5 | 6 | 7 | 9 | — | — | — | 0.3 | 30 | — | 7 | 8.5 | 10 | 13 | 18 | 23 | — | 0.3 | 0.3 | 35 | 8 | 10 | 12 | 14 | 18 | 24 | 32 | 0.3 | 0.3 |
| 04 | 20 | 27 | 4 | — | 5 | 0.2 | 32 | 4 | 7 | 8 | 10 | 12 | 16 | 22 | 0.3 | 0.3 | 37 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 0.3 | 42 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 |
| /22 | 22 | — | — | — | — | — | 34 | 4 | 7 | — | 10 | — | 16 | 22 | 0.3 | 0.3 | 39 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 0.3 | 44 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 |
| 05 | 25 | 32 | 4 | — | 5 | 0.2 | 37 | 4 | 7 | 8 | 10 | 12 | 16 | 22 | 0.3 | 0.3 | 42 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 0.3 | 47 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 |
| /28 | 28 | — | — | — | — | — | 40 | 4 | 7 | — | 10 | — | 16 | 22 | 0.3 | 0.3 | 45 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 0.3 | 52 | 8 | 12 | 15 | 18 | 24 | 32 | 43 | 0.3 | 0.6 |
| 06 | 30 | 37 | 4 | — | 5 | 0.2 | 42 | 4 | 7 | 8 | 10 | 12 | 16 | 22 | 0.3 | 0.3 | 47 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 0.3 | 55 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 |
| /32 | 32 | — | — | — | — | — | 44 | 4 | 7 | — | 10 | — | 16 | 22 | 0.3 | 0.3 | 52 | 7 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 0.6 | 58 | 9 | 13 | 16 | 20 | 26 | 35 | 47 | 0.3 | 1 |
| 07 | 35 | — | — | — | — | — | 47 | 4 | 7 | 8 | 10 | 12 | 16 | 22 | 0.3 | 0.3 | 55 | 7 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 0.6 | 62 | 9 | 14 | 17 | 20 | 27 | 36 | 48 | 0.3 | 1 |
| 08 | 40 | — | — | — | — | — | 52 | 4 | 7 | 8 | 10 | 12 | 16 | 22 | 0.3 | 0.3 | 62 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 | 0.6 | 68 | 9 | 15 | 18 | 21 | 28 | 38 | 50 | 0.3 | 1 |
| 09 | 45 | — | — | — | — | — | 58 | 4 | 7 | 8 | 10 | 13 | 18 | 23 | 0.3 | 0.3 | 68 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 | 0.6 | 75 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 |
| 10 | 50 | — | — | — | — | — | 65 | 5 | 7 | 10 | 12 | 15 | 20 | 27 | 0.3 | 0.3 | 72 | 8 | 12 | 14 | 16 | 22 | 30 | 40 | 0.3 | 0.6 | 0.6 | 80 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 |
| 11 | 55 | — | — | — | — | — | 72 | 7 | 9 | 11 | 13 | 17 | 23 | 30 | 0.3 | 0.3 | 80 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 1 | 90 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 |
| 12 | 60 | — | — | — | — | — | 78 | 7 | 10 | 12 | 14 | 18 | 24 | 32 | 0.3 | 0.3 | 85 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 1 | 95 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 |
| 13 | 65 | — | — | — | — | — | 85 | 7 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 90 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 1 | 100 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 |
| 14 | 70 | — | — | — | — | — | 90 | 8 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 100 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 | 1 | 110 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 |
| 15 | 75 | — | — | — | — | — | 95 | 8 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 105 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 | 1 | 115 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 |
| 16 | 80 | — | — | — | — | — | 100 | 8 | 10 | 13 | 15 | 20 | 27 | 36 | 0.3 | 0.6 | 110 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 | 1 | 125 | 14 | 22 | 27 | 34 | 45 | 60 | 80 | 0.6 | 1.1 |
| 17 | 85 | — | — | — | — | — | 110 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 120 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 | 1.1 | 130 | 14 | 22 | 27 | 34 | 45 | 60 | 80 | 0.6 | 1.1 |
| 18 | 90 | — | — | — | — | — | 115 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 125 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 | 1.1 | 140 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 |
| 19 | 95 | — | — | — | — | — | 120 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 130 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 | 1.1 | 145 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 |
| 20 | 100 | — | — | — | — | — | 125 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 140 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 | 1.1 | 150 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 |
| 21 | 105 | — | — | — | — | — | 130 | 9 | 13 | 16 | 19 | 25 | 34 | 45 | 0.3 | 1 | 145 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 | 1.1 | 160 | 18 | 26 | 33 | 41 | 56 | 75 | 100 | 1 | 2 |
| 22 | 110 | — | — | — | — | — | 140 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 | 150 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 | 1.1 | 170 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 |
| 24 | 120 | — | — | — | — | — | 150 | 10 | 16 | 19 | 23 | 30 | 40 | 54 | 0.6 | 1 | 165 | 14 | 22 | 27 | 34 | 45 | 60 | 80 | 0.6 | 1.1 | 1.1 | 180 | 19 | 28 | 36 | 46 | 60 | 80 | 109 | 1 | 2 |
| 26 | 130 | — | — | — | — | — | 165 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 | 180 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 | 1.5 | 200 | 22 | 33 | 42 | 52 | 69 | 95 | 125 | 1.1 | 2 |
| 28 | 140 | — | — | — | — | — | 175 | 11 | 18 | 22 | 26 | 35 | 46 | 63 | 0.6 | 1.1 | 190 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 | 1.5 | 210 | 22 | 33 | 42 | 53 | 69 | 95 | 125 | 1.1 | 2 |
| 30 | 150 | — | — | — | — | — | 190 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 | 210 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 | 2 | 225 | 24 | 35 | 45 | 56 | 75 | 100 | 136 | 1.1 | 2.1 |
| 32 | 160 | — | — | — | — | — | 200 | 13 | 20 | 24 | 30 | 40 | 54 | 71 | 0.6 | 1.1 | 220 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 | 2 | 240 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 |
| 34 | 170 | — | — | — | — | — | 215 | 14 | 22 | 27 | 34 | 45 | 60 | 80 | 0.6 | 1.1 | 230 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 | 2 | 260 | 28 | 42 | 54 | 67 | 90 | 122 | 160 | 1.5 | 2.1 |
| 36 | 180 | — | — | — | — | — | 225 | 14 | 22 | 27 | 34 | 45 | 60 | 80 | 0.6 | 1.1 | 250 | 22 | 33 | 42 | 52 | 69 | 95 | 125 | 1.1 | 2 | 2 | 280 | 31 | 46 | 60 | 74 | 100 | 136 | 180 | 2 | 2.1 |
| 38 | 190 | — | — | — | — | — | 240 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 | 260 | 22 | 33 | 42 | 52 | 69 | 95 | 125 | 1.1 | 2 | 2 | 290 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 |
| 40 | 200 | — | — | — | — | — | 250 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 | 280 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 2.1 | 310 | 34 | 51 | 66 | 82 | 109 | 150 | 200 | 2 | 2.1 |
| 44 | 220 | — | — | — | — | — | 270 | 16 | 24 | 30 | 37 | 50 | 67 | 90 | 1 | 1.5 | 300 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 2.1 | 340 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 |
| 48 | 240 | — | — | — | — | — | 300 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 | 320 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 2.1 | 360 | 37 | 56 | 72 | 92 | 118 | 160 | 218 | 2.1 | 3 |
| 52 | 260 | — | — | — | — | — | 320 | 19 | 28 | 36 | 45 | 60 | 80 | 109 | 1 | 2 | 360 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 2.1 | 400 | 44 | 65 | 82 | 104 | 140 | 190 | 250 | 3 | 4 |
| 56 | 280 | — | — | — | — | — | 350 | 22 | 33 | 42 | 52 | 69 | 95 | 125 | 1.1 | 2 | 380 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 2.1 | 420 | 44 | 65 | 82 | 106 | 140 | 190 | 250 | 3 | 4 |
| 60 | 300 | — | — | — | — | — | 380 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 420 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 3 | 460 | 50 | 74 | 95 | 118 | 160 | 218 | 290 | 4 | 4 |
| 64 | 320 | — | — | — | — | — | 400 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 440 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 3 | 480 | 50 | 74 | 95 | 121 | 160 | 218 | 290 | 4 | 4 |
| 68 | 340 | — | — | — | — | — | 420 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 460 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 3 | 520 | 57 | 82 | 106 | 133 | 180 | 243 | 325 | 4 | 5 |
| 72 | 360 | — | — | — | — | — | 440 | 25 | 38 | 48 | 60 | 80 | 109 | 145 | 1.5 | 2.1 | 480 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 3 | 540 | 57 | 82 | 106 | 134 | 180 | 243 | 325 | 4 | 5 |
| 76 | 380 | — | — | — | — | — | 480 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 520 | 44 | 65 | 82 | 106 | 140 | 190 | 250 | 3 | 4 | 4 | 560 | 57 | 82 | 106 | 135 | 180 | 243 | 325 | 4 | 5 |
| 80 | 400 | — | — | — | — | — | 500 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 540 | 44 | 65 | 82 | 106 | 140 | 190 | 250 | 3 | 4 | 4 | 600 | 63 | 90 | 118 | 148 | 200 | 272 | 355 | 5 | 5 |
| 84 | 420 | — | — | — | — | — | 520 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 560 | 44 | 65 | 82 | 106 | 140 | 190 | 250 | 3 | 4 | 4 | 620 | 63 | 90 | 118 | 150 | 200 | 272 | 355 | 5 | 5 |
| 88 | 440 | — | — | — | — | — | 540 | 31 | 46 | 60 | 75 | 100 | 136 | 180 | 2 | 2.1 | 600 | 50 | 74 | 95 | 118 | 160 | 218 | 290 | 4 | 4 | 4 | 650 | 67 | 94 | 122 | 157 | 212 | 280 | 375 | 5 | 6 |
| 92 | 460 | — | — | — | — | — | 580 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 620 | 50 | 74 | 95 | 118 | 160 | 218 | 290 | 4 | 4 | 4 | 680 | 71 | 100 | 128 | 163 | 218 | 300 | 400 | 5 | 6 |
| 96 | 480 | — | — | — | — | — | 600 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 650 | 54 | 78 | 100 | 128 | 170 | 230 | 308 | 4 | 5 | 5 | 700 | 71 | 100 | 128 | 165 | 218 | 300 | 400 | 5 | 6 |
| /500 | 500 | — | — | — | — | — | 620 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 670 | 54 | 78 | 100 | 128 | 170 | 230 | 308 | 4 | 5 | 5 | 720 | 71 | 100 | 128 | 167 | 218 | 300 | 400 | 5 | 6 |
| /530 | 530 | — | — | — | — | — | 650 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 710 | 57 | 82 | 106 | 136 | 180 | 243 | 325 | 4 | 5 | 5 | 780 | 80 | 112 | 145 | 185 | 250 | 335 | 450 | 6 | 6 |
| /560 | 560 | — | — | — | — | — | 680 | 37 | 56 | 72 | 90 | 118 | 160 | 218 | 2.1 | 3 | 750 | 60 | 85 | 112 | 140 | 190 | 258 | 345 | 5 | 5 | 5 | 820 | 82 | 115 | 150 | 195 | 258 | 355 | 462 | 6 | 6 |
| /600 | 600 | — | — | — | — | — | 730 | 42 | 60 | 78 | 98 | 128 | 175 | 236 | 3 | 3 | 800 | 63 | 90 | 118 | 150 | 200 | 272 | 355 | 5 | 5 | 5 | 870 | 85 | 118 | 155 | 200 | 272 | 365 | 488 | 6 | 6 |
| /630 | 630 | — | — | — | — | — | 780 | 48 | 69 | 88 | 112 | 150 | 200 | 272 | 3 | 4 | 850 | 71 | 100 | 128 | 165 | 218 | 300 | 400 | 5 | 6 | 6 | 920 | 92 | 128 | 170 | 212 | 290 | 388 | 515 | 6 | 7.5 |
| /670 | 670 | — | — | — | — | — | 820 | 48 | 69 | 88 | 112 | 150 | 200 | 272 | 3 | 4 | 900 | 73 | 103 | 136 | 170 | 230 | 308 | 412 | 5 | 6 | 6 | 980 | 100 | 136 | 180 | 230 | 308 | 425 | 560 | 6 | 7.5 |
| /710 | 710 | — | — | — | — | — | 870 | 50 | 74 | 95 | 118 | 160 | 218 | 290 | 4 | 4 | 950 | 78 | 106 | 140 | 180 | 243 | 325 | 438 | 5 | 6 | 6 | 1030 | 103 | 140 | 185 | 236 | 315 | 438 | 580 | 6 | 7.5 |
| /750 | 750 | — | — | — | — | — | 920 | 54 | 78 | 100 | 128 | 170 | 230 | 308 | 4 | 5 | 1000 | 80 | 112 | 145 | 185 | 250 | 335 | 450 | 6 | 6 | 6 | 1090 | 109 | 150 | 195 | 250 | 335 | 462 | 615 | 7.5 | 7.5 |
| /800 | 800 | — | — | — | — | — | 980 | 57 | 82 | 106 | 136 | 180 | 243 | 325 | 4 | 5 | 1060 | 82 | 115 | 150 | 195 | 258 | 355 | 462 | 6 | 6 | 6 | 1150 | 112 | 155 | 200 | 258 | 345 | 475 | 630 | 7.5 | 7.5 |
| /850 | 850 | — | — | — | — | — | 1030 | 57 | 82 | 106 | 136 | 180 | 243 | 325 | 4 | 5 | 1120 | 85 | 118 | 155 | 200 | 272 | 365 | 488 | 6 | 6 | 6 | 1220 | 118 | 165 | 212 | 272 | 365 | 500 | 670 | 7.5 | 7.5 |
| /900 | 900 | — | — | — | — | — | 1090 | 60 | 85 | 112 | 140 | 190 | 258 | 345 | 5 | 5 | 1180 | 88 | 122 | 165 | 206 | 280 | 375 | 500 | 6 | 6 | 6 | 1280 | 122 | 170 | 218 | 280 | 375 | 515 | 690 | 7.5 | 7.5 |
| /950 | 950 | — | — | — | — | — | 1150 | 63 | 90 | 118 | 150 | 200 | 272 | 355 | 5 | 5 | 1250 | 95 | 132 | 175 | 224 | 300 | 400 | 545 | 6 | 7.5 | 7.5 | 1360 | 132 | 180 | 236 | 300 | 412 | 560 | 730 | 7.5 | 7.5 |
| '1000 | 1000 | — | — | — | — | — | 1220 | 71 | 100 | 128 | 165 | 218 | 300 | 400 | 5 | 6 | 1320 | 103 | 140 | 185 | 236 | 315 | 438 | 580 | 6 | 7.5 | 7.5 | 1420 | 136 | 185 | 243 | 308 | 412 | 560 | 750 | 7.5 | 7.5 |
| '1060 | 1060 | — | — | — | — | — | 1280 | 71 | 100 | 128 | 165 | 218 | 300 | 400 | 5 | 6 | 1400 | 109 | 150 | 195 | 250 | 335 | 462 | 615 | 7.5 | 7.5 | 7.5 | 1500 | 140 | 195 | 250 | 325 | 438 | 600 | 800 | 9.5 | 9.5 |
| '1120 | 1120 | — | — | — | — | — | 1360 | 78 | 106 | 140 | 180 | 243 | 325 | 438 | 5 | 6 | 1460 | 109 | 150 | 195 | 250 | 335 | 462 | 615 | 7.5 | 7.5 | 7.5 | 1580 | 145 | 200 | 265 | 345 | 462 | 615 | 825 | 9.5 | 9.5 |
| '1180 | 1180 | — | — | — | — | — | 1420 | 78 | 106 | 140 | 180 | 243 | 325 | 438 | 5 | 6 | 1540 | 115 | 160 | 206 | 272 | 355 | 488 | 650 | 7.5 | 7.5 | 7.5 | 1660 | 155 | 212 | 272 | 355 | 475 | 650 | 875 | 9.5 | 9.5 |
| '1250 | 1250 | — | — | — | — | — | 1500 | 80 | 112 | 145 | 185 | 250 | 335 | 450 | 6 | 6 | 1630 | 122 | 170 | 218 | 280 | 375 | 515 | 690 | 7.5 | 7.5 | 7.5 | 1750 | — | 218 | 290 | 375 | 500 | — | — | — | 9.5 |
| '1320 | 1320 | — | — | — | — | — | 1600 | 88 | 122 | 165 | 206 | 280 | 375 | 500 | 6 | 6 | 1720 | 128 | 175 | 230 | 300 | 400 | 545 | 710 | 7.5 | 7.5 | 7.5 | 1850 | — | 230 | 300 | 400 | 530 | — | — | — | 12 |
| '1400 | 1400 | — | — | — | — | — | 1700 | 95 | 132 | 175 | 224 | 300 | 400 | 545 | 6 | 7.5 | 1820 | — | 185 | 243 | 315 | 425 | — | — | — | 9.5 | 9.5 | 1950 | — | 243 | 315 | 412 | 545 | — | — | — | 12 |
| '1500 | 1500 | — | — | — | — | — | 1820 | — | 140 | 185 | 243 | 315 | — | — | — | 7.5 | 1950 | — | 195 | 258 | 335 | 450 | — | — | — | 9.5 | 9.5 | 2120 | — | 272 | 355 | 462 | 615 | — | — | — | 12 |
| '1600 | 1600 | — | — | — | — | — | 1950 | — | 155 | 200 | 265 | 345 | — | — | — | 7.5 | 2060 | — | 200 | 265 | 345 | 462 | — | — | — | 9.5 | 9.5 | 2240 | — | 280 | 365 | 475 | 630 | — | — | — | 12 |
| '1700 | 1700 | — | — | — | — | — | 2060 | — | 160 | 206 | 272 | 355 | — | — | — | 7.5 | 2180 | — | 212 | 280 | 355 | 475 | — | — | — | 9.5 | 9.5 | 2360 | — | 290 | 375 | 500 | 650 | — | — | — | 15 |
| '1800 | 1800 | — | — | — | — | — | 2180 | — | 165 | 218 | 290 | 375 | — | — | — | 9.5 | 2300 | — | 218 | 290 | 375 | 500 | — | — | — | 12 | 12 | 2500 | — | 308 | 400 | 530 | 690 | — | — | — | 15 |
| '1900 | 1900 | — | — | — | — | — | 2300 | — | 175 | 230 | 300 | 400 | — | — | — | 9.5 | 2430 | — | 230 | 308 | 400 | 530 | — | — | — | 12 | 12 | — | — | — | — | — | — | — | — | — | — |
| '2000 | 2000 | — | — | — | — | — | 2430 | — | 190 | 250 | 325 | 425 | — | — | — | 9.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

**Remarks** The chamfer dimensions listed in this table do not necessarily apply to the following chamfers: (a) Chamfers of the grooves in outer rings that have snap ring grooves. (b) For thin section cylindrical roller bearings, the chamfers on side without rib and bearing bore (in case of an inner ring) or outer surface (in case of an outer ring). (c) For angular contact ball bearings, the chamfers between the front face and bore (in case of an inner ring) or outer surface (in case of an outer ring). (d) Chamfers on inner rings of bearings with tapered bores.

## Table 7. 1 Boundary Dimensions of Radial Bearings (except Tapered Roller Bearings) —2—

Units: mm

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Single-Row Ball Brgs. | | | | | | | | | | | 62<br>72 | | 622 | 632 | | | | | | 63<br>73 | | 623 | 633 | | | | 64<br>74 | | |
| Double-Row Ball Brgs. | | | | | | | | | | | 12 | | 42<br>22 | 52<br>53 | | | | | | 13 | | 43<br>23 | 53<br>33 | | | | 104 | | |
| Cylindrical Roller Brgs. | | | | NN 31 | | | | | | | N 2 | | N 22 | N 32 | | | | | | N 3 | | N 23 | N 33 | | | | N 4 | | |
| Needle Roller Brgs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spherical Roller Brgs. | | | | 231 | 241 | | | | | | | | 222 | 232 | | | | | | 213 | | 223 | | | | | | | |

| Bore Number | $d$ | Diameter Series 1 | | | | | | | | Diameter Series 2 | | | | | | | | | Diameter Series 3 | | | | | | | | | Diameter Series 4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dimension Series | | | | | | Dimension Series | | Dimension Series | | | | | | | Dimension Series | | Dimension Series | | | | | | Dimension Series | | Dimension Series | | Dimension Series | | Dimension Series |
| | | $D$ | 01 | 11 | 21 | 31 | 41 | 01 | 11~41 | $D$ | 82 | 02 | 12 | 22 | 32 | 42 | 82 | 02~42 | $D$ | 83 | 03 | 13 | 23 | 33 | 83 | 03~33 | $D$ | 04 | 24 | 04~24 |
| | | | $B$ | | | | | $r$ (min.) | | | $B$ | | | | | | $r$ (min.) | | | $B$ | | | | | $r$ (min.) | | | $B$ | | $r$ (min.) |
| — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 1 | 1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| — | 1.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 2 | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| — | 2.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 3 | 3 | — | — | — | — | — | — | — | — | 10 | 2.5 | 4 | — | — | 5 | — | 0.1 | 0.15 | 13 | — | 5 | — | — | 7 | — | 0.2 | — | — | — | — |
| 4 | 4 | — | — | — | — | — | — | — | — | 13 | 3 | 5 | — | — | 7 | — | 0.15 | 0.2 | 16 | — | 5 | — | — | 9 | — | 0.3 | — | — | — | — |
| 5 | 5 | — | — | — | — | 7 | — | — | — | 16 | 3.5 | 5 | — | — | 8 | — | 0.15 | 0.3 | 19 | — | 6 | — | — | 10 | — | 0.3 | — | — | — | — |
| 6 | 6 | — | — | — | 8 | 10 | — | — | — | 19 | 4 | 6 | — | — | 10 | — | 0.2 | 0.3 | 22 | — | 7 | — | 11 | 13 | — | 0.3 | — | — | — | — |
| 7 | 7 | — | — | — | 9 | 11 | 14 | — | — | 22 | 5 | 7 | — | — | 11 | — | 0.3 | 0.3 | 26 | — | 9 | — | 13 | 15 | — | 0.3 | — | — | — | — |
| 8 | 8 | — | — | — | 10 | 12 | 15 | — | — | 24 | 5 | 8 | — | — | 12 | — | 0.3 | 0.3 | 28 | — | 9 | — | 13 | 15 | — | 0.3 | 30 | 10 | 14 | 0.6 |
| 9 | 9 | — | — | — | 10 | 12 | 16 | — | — | 26 | 6 | 8 | — | — | 13 | — | 0.3 | 0.3 | 30 | — | 10 | — | 14 | 16 | — | 0.6 | 32 | 11 | 15 | 0.6 |
| 00 | 10 | — | — | — | 12 | 14 | 18 | — | — | 30 | 7 | 9 | — | 14 | 14.3 | — | 0.3 | 0.6 | 35 | 9 | 11 | — | 17 | 19 | 0.3 | 0.6 | 37 | 12 | 16 | 0.6 |
| 01 | 12 | — | — | — | 12 | 14 | 18 | — | — | 32 | 7 | 10 | — | 14 | 15.9 | — | 0.3 | 0.6 | 37 | 9 | 12 | — | 17 | 19 | 0.3 | 1 | 42 | 13 | 19 | 1 |
| 02 | 15 | — | — | — | 12 | 14 | 18 | — | — | 35 | 8 | 11 | — | 14 | 15.9 | 20 | 0.3 | 0.6 | 42 | 9 | 13 | — | 17 | 19 | 0.3 | 1 | 52 | 15 | 24 | 1.1 |
| 03 | 17 | — | — | — | 13 | 15 | 20 | — | — | 40 | 8 | 12 | — | 16 | 17.5 | 22 | 0.3 | 0.6 | 47 | 10 | 14 | — | 19 | 22.2 | 0.6 | 1 | 62 | 17 | 29 | 1.1 |
| 04 | 20 | — | — | — | 15 | 18 | 24 | — | — | 47 | 9 | 14 | — | 18 | 20.6 | 27 | 0.3 | 1 | 52 | 10 | 15 | — | 21 | 22.2 | 0.6 | 1.1 | 72 | 19 | 33 | 1.1 |
| /22 | 22 | — | — | — | 16 | 19 | 25 | — | — | 50 | 9 | 14 | — | 18 | 20.6 | 27 | 0.3 | 1 | 56 | 11 | 16 | — | 21 | 25 | 0.6 | 1.1 | — | — | — | — |
| 05 | 25 | — | — | — | 16 | 19 | 25 | — | — | 52 | 10 | 15 | — | 18 | 20.6 | 27 | 0.3 | 1 | 62 | 12 | 17 | — | 24 | 25.4 | 0.6 | 1.1 | 80 | 21 | 36 | 1.5 |
| /28 | 28 | — | — | — | 17 | 20 | 27 | — | — | 58 | 10 | 16 | — | 19 | 23 | 30 | 0.6 | 1 | 68 | 13 | 18 | — | 24 | 30 | 0.6 | 1.1 | — | — | — | — |
| 06 | 30 | — | — | — | 18 | 21 | 28 | — | — | 62 | 10 | 16 | — | 20 | 23.8 | 32 | 0.6 | 1 | 72 | 13 | 19 | — | 27 | 30.2 | 0.6 | 1.1 | 90 | 23 | 40 | 1.5 |
| /32 | 32 | — | — | — | 19 | 23 | 30 | — | — | 65 | 11 | 17 | — | 21 | 25 | 33 | 0.6 | 1 | 75 | 14 | 20 | — | 28 | 32 | 0.6 | 1.1 | — | — | — | — |
| 07 | 35 | — | — | — | 21 | 25 | 33 | — | — | 72 | 12 | 17 | — | 23 | 27 | 37 | 0.6 | 1.1 | 80 | 14 | 21 | — | 31 | 34.9 | 0.6 | 1.5 | 100 | 25 | 43 | 1.5 |
| 08 | 40 | — | — | — | 22 | 26 | 35 | — | — | 80 | 13 | 18 | — | 23 | 30.2 | 40 | 0.6 | 1.1 | 90 | 16 | 23 | — | 33 | 36.5 | 1 | 1.5 | 110 | 27 | 46 | 2 |
| 09 | 45 | — | — | — | 22 | 26 | 35 | — | — | 85 | 13 | 19 | — | 23 | 30.2 | 40 | 0.6 | 1.1 | 100 | 17 | 25 | — | 36 | 39.7 | 1 | 1.5 | 120 | 29 | 50 | 2 |
| 10 | 50 | — | — | — | 22 | 26 | 35 | — | — | 90 | 13 | 20 | — | 23 | 30.2 | 40 | 0.6 | 1.1 | 110 | 19 | 27 | — | 40 | 44.4 | 1 | 2 | 130 | 31 | 53 | 2.1 |
| 11 | 55 | — | — | — | 24 | 30 | 40 | — | — | 100 | 14 | 21 | — | 25 | 33.3 | 45 | 0.6 | 1.5 | 120 | 21 | 29 | — | 43 | 49.2 | 1.1 | 2 | 140 | 33 | 57 | 2.1 |
| 12 | 60 | — | — | — | 24 | 30 | 40 | — | — | 110 | 16 | 22 | — | 28 | 36.5 | 50 | 1 | 1.5 | 130 | 22 | 31 | — | 46 | 54 | 1.1 | 2.1 | 150 | 35 | 60 | 2.1 |
| 13 | 65 | — | — | — | 27 | 34 | 45 | — | — | 120 | 18 | 23 | — | 31 | 38.1 | 56 | 1 | 1.5 | 140 | 24 | 33 | — | 48 | 58.7 | 1.1 | 2.1 | 160 | 37 | 64 | 2.1 |
| 14 | 70 | — | — | — | 27 | 34 | 45 | — | — | 125 | 18 | 24 | — | 31 | 39.7 | 56 | 1 | 1.5 | 150 | 25 | 35 | — | 51 | 63.5 | 1.5 | 2.1 | 180 | 42 | 74 | 3 |
| 15 | 75 | — | — | — | 30 | 37 | 50 | — | — | 130 | 18 | 25 | — | 31 | 41.3 | 56 | 1 | 1.5 | 160 | 27 | 37 | — | 55 | 68.3 | 1.5 | 2.1 | 190 | 45 | 77 | 3 |
| 16 | 80 | — | — | — | 30 | 37 | 50 | — | — | 140 | 19 | 26 | — | 33 | 44.4 | 60 | 1 | 2 | 170 | 28 | 39 | — | 58 | 68.3 | 1.5 | 2.1 | 200 | 48 | 80 | 3 |
| 17 | 85 | — | — | — | 31 | 41 | 56 | — | — | 150 | 21 | 28 | — | 36 | 49.2 | 65 | 1.1 | 2 | 180 | 30 | 41 | — | 60 | 73 | 2 | 3 | 210 | 52 | 86 | 4 |
| 18 | 90 | 150 | — | — | 33 | 45 | 60 | — | 2 | 160 | 22 | 30 | — | 40 | 52.4 | 69 | 1.1 | 2 | 190 | 30 | 43 | — | 64 | 73 | 2 | 3 | 225 | 54 | 90 | 4 |
| 19 | 95 | 160 | — | — | 39 | 52 | 65 | — | 2 | 170 | 24 | 32 | — | 43 | 55.6 | 75 | 1.1 | 2.1 | 200 | 33 | 45 | — | 67 | 77.8 | 2 | 3 | 240 | 55 | 95 | 4 |
| 20 | 100 | 165 | 21 | 30 | 39 | 52 | 65 | 1.1 | 2 | 180 | 25 | 34 | — | 46 | 60.3 | 80 | 1.5 | 2.1 | 215 | 36 | 47 | 51 | 73 | 82.6 | 2.1 | 3 | 250 | 58 | 98 | 4 |
| 21 | 105 | 175 | 22 | 33 | 42 | 56 | 69 | 1.1 | 2 | 190 | 27 | 36 | — | 50 | 65.1 | 85 | 1.5 | 2.1 | 225 | 37 | 49 | 53 | 77 | 87.3 | 2.1 | 3 | 260 | 60 | 100 | 4 |
| 22 | 110 | 180 | 22 | 33 | 42 | 56 | 69 | 1.1 | 2 | 200 | 28 | 38 | — | 53 | 69.8 | 90 | 1.5 | 2.1 | 240 | 42 | 50 | 57 | 80 | 92.1 | 3 | 3 | 280 | 65 | 108 | 4 |
| 24 | 120 | 200 | 25 | 38 | 48 | 62 | 80 | 1.5 | 2 | 215 | — | 40 | 42 | 58 | 76 | 95 | — | 2.1 | 260 | 44 | 55 | 62 | 86 | 106 | 3 | 3 | 310 | 72 | 118 | 5 |
| 26 | 130 | 210 | 25 | 38 | 48 | 64 | 80 | 1.5 | 2 | 230 | — | 40 | 46 | 64 | 80 | 100 | — | 3 | 280 | 48 | 58 | 66 | 93 | 112 | 3 | 4 | 340 | 78 | 128 | 5 |
| 28 | 140 | 225 | 27 | 40 | 50 | 68 | 85 | 1.5 | 2.1 | 250 | — | 42 | 50 | 68 | 88 | 109 | — | 3 | 300 | 50 | 62 | 70 | 102 | 118 | 4 | 4 | 360 | 82 | 132 | 5 |
| 30 | 150 | 250 | 31 | 46 | 60 | 80 | 100 | 2 | 2.1 | 270 | — | 45 | 54 | 73 | 96 | 118 | — | 3 | 320 | — | 65 | 75 | 108 | 128 | — | 4 | 380 | 85 | 138 | 5 |
| 32 | 160 | 270 | 34 | 51 | 66 | 86 | 109 | 2 | 2.1 | 290 | — | 48 | 58 | 80 | 104 | 128 | — | 3 | 340 | — | 68 | 79 | 114 | 136 | — | 4 | 400 | 88 | 142 | 5 |
| 34 | 170 | 280 | 34 | 51 | 66 | 88 | 109 | 2 | 2.1 | 310 | — | 52 | 62 | 86 | 110 | 140 | — | 4 | 360 | — | 72 | 84 | 120 | 140 | — | 4 | 420 | 92 | 145 | 5 |
| 36 | 180 | 300 | 37 | 56 | 72 | 96 | 118 | 2.1 | 3 | 320 | — | 52 | 62 | 86 | 112 | 140 | — | 4 | 380 | — | 75 | 88 | 126 | 150 | — | 4 | 440 | 95 | 150 | 6 |
| 38 | 190 | 320 | 42 | 60 | 78 | 104 | 128 | 3 | 3 | 340 | — | 55 | 65 | 92 | 120 | 150 | — | 4 | 400 | — | 78 | 92 | 132 | 155 | — | 5 | 460 | 98 | 155 | 6 |
| 40 | 200 | 340 | 44 | 65 | 82 | 112 | 140 | 3 | 3 | 360 | — | 58 | 70 | 98 | 128 | 160 | — | 4 | 420 | — | 80 | 97 | 138 | 165 | — | 5 | 480 | 102 | 160 | 6 |
| 44 | 220 | 370 | 48 | 69 | 88 | 120 | 150 | 3 | 4 | 400 | — | 65 | 78 | 108 | 144 | 180 | — | 4 | 460 | — | 88 | 106 | 145 | 180 | — | 5 | 540 | 115 | 180 | 6 |
| 48 | 240 | 400 | 50 | 74 | 95 | 128 | 160 | 4 | 4 | 440 | — | 72 | 85 | 120 | 160 | 200 | — | 4 | 500 | — | 95 | 114 | 155 | 195 | — | 5 | 580 | 122 | 190 | 6 |
| 52 | 260 | 440 | 57 | 82 | 106 | 144 | 180 | 4 | 4 | 480 | — | 80 | 90 | 130 | 174 | 218 | — | 5 | 540 | — | 102 | 123 | 165 | 206 | — | 6 | 620 | 132 | 206 | 7.5 |
| 56 | 280 | 460 | 57 | 82 | 106 | 146 | 180 | 4 | 5 | 500 | — | 80 | 90 | 130 | 176 | 218 | — | 5 | 580 | — | 108 | 132 | 175 | 224 | — | 6 | 670 | 140 | 224 | 7.5 |
| 60 | 300 | 500 | 63 | 90 | 118 | 160 | 200 | 5 | 5 | 540 | — | 85 | 98 | 140 | 192 | 243 | — | 5 | 620 | — | 109 | 140 | 185 | 236 | — | 7.5 | 710 | 150 | 236 | 7.5 |
| 64 | 320 | 540 | 71 | 100 | 128 | 176 | 218 | 5 | 5 | 580 | — | 92 | 105 | 150 | 208 | 258 | — | 5 | 670 | — | 112 | 155 | 200 | 258 | — | 7.5 | 750 | 155 | 250 | 9.5 |
| 68 | 340 | 580 | 78 | 106 | 140 | 190 | 243 | 5 | 5 | 620 | — | 92 | 118 | 165 | 224 | 280 | — | 6 | 710 | — | 118 | 165 | 212 | 272 | — | 7.5 | 800 | 165 | 265 | 9.5 |
| 72 | 360 | 600 | 78 | 106 | 140 | 192 | 243 | 5 | 5 | 650 | — | 95 | 122 | 170 | 232 | 290 | — | 6 | 750 | — | 125 | 170 | 224 | 290 | — | 7.5 | 850 | 180 | 280 | 9.5 |
| 76 | 380 | 620 | 78 | 106 | 140 | 194 | 243 | 5 | 5 | 680 | — | 95 | 132 | 175 | 240 | 300 | — | 6 | 780 | — | 128 | 175 | 230 | 300 | — | 7.5 | 900 | 190 | 300 | 9.5 |
| 80 | 400 | 650 | 80 | 112 | 145 | 200 | 250 | 6 | 6 | 720 | — | 103 | 140 | 185 | 256 | 315 | — | 6 | 820 | — | 136 | 185 | 243 | 308 | — | 7.5 | 950 | 200 | 315 | 12 |
| 84 | 420 | 700 | 88 | 122 | 165 | 224 | 280 | 6 | 6 | 760 | — | 109 | 150 | 195 | 272 | 335 | — | 7.5 | 850 | — | 136 | 190 | 250 | 315 | — | 9.5 | 980 | 206 | 325 | 12 |
| 88 | 440 | 720 | 88 | 122 | 165 | 226 | 280 | 6 | 6 | 790 | — | 112 | 155 | 200 | 280 | 345 | — | 7.5 | 900 | — | 145 | 200 | 265 | 345 | — | 9.5 | 1030 | 212 | 335 | 12 |
| 92 | 460 | 760 | 95 | 132 | 175 | 240 | 300 | 6 | 7.5 | 830 | — | 118 | 165 | 212 | 296 | 365 | — | 7.5 | 950 | — | 155 | 212 | 280 | 365 | — | 9.5 | 1060 | 218 | 345 | 12 |
| 96 | 480 | 790 | 100 | 136 | 180 | 248 | 308 | 6 | 7.5 | 870 | — | 125 | 170 | 224 | 310 | 388 | — | 7.5 | 980 | — | 160 | 218 | 290 | 375 | — | 9.5 | 1120 | 230 | 365 | 15 |
| /500 | 500 | 830 | 106 | 145 | 190 | 264 | 325 | 7.5 | 7.5 | 920 | — | 136 | 185 | 243 | 336 | 412 | — | 7.5 | 1030 | — | 170 | 230 | 300 | 388 | — | 12 | 1150 | 236 | 375 | 15 |
| /530 | 530 | 870 | 109 | 150 | 195 | 272 | 335 | 7.5 | 7.5 | 980 | — | 145 | 200 | 258 | 355 | 450 | — | 9.5 | 1090 | — | 180 | 243 | 325 | 412 | — | 12 | 1220 | 250 | 400 | 15 |
| /560 | 560 | 920 | 115 | 160 | 206 | 280 | 355 | 7.5 | 7.5 | 1030 | — | 150 | 206 | 272 | 365 | 475 | — | 9.5 | 1150 | — | 190 | 258 | 335 | 438 | — | 12 | 1280 | 258 | 412 | 15 |
| /600 | 600 | 980 | 122 | 170 | 218 | 300 | 375 | 7.5 | 7.5 | 1090 | — | 155 | 212 | 280 | 388 | 488 | — | 9.5 | 1220 | — | 200 | 272 | 355 | 462 | — | 15 | 1360 | 272 | 438 | 15 |
| /630 | 630 | 1030 | 128 | 175 | 230 | 315 | 400 | 7.5 | 7.5 | 1150 | — | 165 | 230 | 300 | 412 | 515 | — | 12 | 1280 | — | 206 | 280 | 375 | 488 | — | 15 | 1420 | 280 | 450 | 15 |
| /670 | 670 | 1090 | 136 | 185 | 243 | 336 | 412 | 7.5 | 7.5 | 1220 | — | 175 | 243 | 315 | 438 | 545 | — | 12 | 1360 | — | 218 | 300 | 400 | 515 | — | 15 | 1500 | 290 | 475 | 15 |
| /710 | 710 | 1150 | 140 | 195 | 250 | 345 | 438 | 9.5 | 9.5 | 1280 | — | 180 | 250 | 325 | 450 | 560 | — | 12 | 1420 | — | 224 | 308 | 412 | 530 | — | 15 | — | — | — | — |
| /750 | 750 | 1220 | 150 | 206 | 272 | 365 | 475 | 9.5 | 9.5 | 1360 | — | 195 | 265 | 345 | 475 | 615 | — | 15 | 1500 | — | 236 | 325 | 438 | 560 | — | 15 | — | — | — | — |
| /800 | 800 | 1280 | 155 | 212 | 272 | 375 | 475 | 9.5 | 9.5 | 1420 | — | 200 | 272 | 355 | 488 | 615 | — | 15 | 1600 | — | 258 | 355 | 462 | 600 | — | 15 | — | — | — | — |
| /850 | 850 | 1360 | 165 | 224 | 290 | 400 | 500 | 12 | 12 | 1500 | — | 206 | 280 | 375 | 515 | 650 | — | 15 | 1700 | — | 272 | 375 | 488 | 630 | — | 19 | — | — | — | — |
| /900 | 900 | 1420 | 165 | 230 | 300 | 412 | 515 | 12 | 12 | 1580 | — | 218 | 300 | 388 | 515 | 670 | — | 15 | 1780 | — | 280 | 388 | 500 | 650 | — | 19 | — | — | — | — |
| /950 | 950 | 1500 | 175 | 243 | 315 | 438 | 545 | 12 | 12 | 1660 | — | 230 | 315 | 412 | 530 | 710 | — | 15 | 1850 | — | 290 | 400 | 515 | 670 | — | 19 | — | — | — | — |
| /1000 | 1000 | 1580 | 185 | 258 | 335 | 462 | 580 | 12 | 12 | 1750 | — | 243 | 330 | 425 | 560 | 750 | — | 15 | 1950 | — | 300 | 412 | 545 | 710 | — | 19 | — | — | — | — |
| /1060 | 1060 | 1660 | 190 | 265 | 345 | 475 | 600 | 12 | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1120 | 1120 | 1750 | — | 280 | 365 | 475 | 630 | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1180 | 1180 | 1850 | — | 290 | 388 | 500 | 670 | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1250 | 1250 | 1950 | — | 308 | 400 | 530 | 710 | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1320 | 1320 | 2060 | — | 325 | 425 | 560 | 750 | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1400 | 1400 | 2180 | — | 345 | 450 | 580 | 775 | — | 19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| /1500 | 1500 | 2300 | — | 355 | 462 | 600 | 800 | — | 19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

**Remarks** The chamfer dimensions listed in this table do not necessarily apply to the following chamfers: (a) Chamfers of the grooves in outer rings that have snap ring grooves.
(b) For thin section cylindrical roller bearings, the chamfers on side without rib and bearing bore (in case of an inner ring) or outer surface (in case of an outer ring).
(c) For angular contact ball bearings, the chamfers between the front face and bore (in case of an inner ring) or outer surface (in case of an outer ring).
(d) Chamfers on inner rings of bearings with tapered bores.

## Table 7. 2 Boundary Dimensions of Tapered Roller Bearings

Units: mm

| Tapered Roller Brgs. | | 329 | | | | | | | | | 320 X | | | | 330 | | | | | 331 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Diameter Series 9 | | | | | | | | | Diameter Series 0 | | | | | | | | | Diameter Series 1 | | | | | |
| | | | Dimension Series 29 | | | | | | Chamfer Dimension | | | Dimension Series 20 | | | Dimension Series 30 | | | Chamfer Dimension | | | Dimension Series 31 | | | Chamfer Dimension | |
| | | | I | | | II | | | Cone | Cup | | | | | | | | Cone | Cup | | | | | Cone | Cup |
| Bore Number | $d$ | $D$ | $B$ | $C$ | $T$ | $B$ | $C$ | $T$ | $r$ (min.) | | $D$ | $B$ | $C$ | $T$ | $B$ | $C$ | $T$ | $r$ (min.) | | $D$ | $B$ | $C$ | $T$ | $r$ (min.) | |
| 00 | 10 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 01 | 12 | — | — | — | — | — | — | — | — | — | 28 | 11 | — | 11 | 13 | — | 13 | 0.3 | 0.3 | — | — | — | — | — | — |
| 02 | 15 | — | — | — | — | — | — | — | — | — | 32 | 12 | — | 12 | 14 | — | 14 | 0.3 | 0.3 | — | — | — | — | — | — |
| 03 | 17 | — | — | — | — | — | — | — | — | — | 35 | 13 | — | 13 | 15 | — | 15 | 0.3 | 0.3 | — | — | — | — | — | — |
| 04 | 20 | 37 | 11 | — | 11.6 | 12 | 9 | 12 | 0.3 | 0.3 | 42 | 15 | 12 | 15 | 17 | — | 17 | 0.6 | 0.6 | — | — | — | — | — | — |
| /22 | 22 | 40 | — | — | — | 12 | 9 | 12 | 0.3 | 0.3 | 44 | 15 | 11.5 | 15 | — | — | — | 0.6 | 0.6 | — | — | — | — | — | — |
| 05 | 25 | 42 | 11 | — | 11.6 | 12 | 9 | 12 | 0.3 | 0.3 | 47 | 15 | 11.5 | 15 | 17 | 14 | 17 | 0.6 | 0.6 | — | — | — | — | — | — |
| /28 | 28 | 45 | — | — | — | 12 | 9 | 12 | 0.3 | 0.3 | 52 | 16 | 12 | 16 | — | — | — | 1 | 1 | — | — | — | — | — | — |
| 06 | 30 | 47 | 11 | — | 11.6 | 12 | 9 | 12 | 0.3 | 0.3 | 55 | 17 | 13 | 17 | 20 | 16 | 20 | 1 | 1 | — | — | — | — | — | — |
| /32 | 32 | 52 | — | — | — | 15 | 10 | 14 | 0.6 | 0.6 | 58 | 17 | 13 | 17 | — | — | — | 1 | 1 | — | — | — | — | — | — |
| 07 | 35 | 55 | 13 | — | 14 | 14 | 11.5 | 14 | 0.6 | 0.6 | 62 | 18 | 14 | 18 | 21 | 17 | 21 | 1 | 1 | — | — | — | — | — | — |
| 08 | 40 | 62 | 14 | — | 15 | 15 | 12 | 15 | 0.6 | 0.6 | 68 | 19 | 14.5 | 19 | 22 | 18 | 22 | 1 | 1 | 75 | 26 | 20.5 | 26 | 1.5 | 1.5 |
| 09 | 45 | 68 | 14 | — | 15 | 15 | 12 | 15 | 0.6 | 0.6 | 75 | 20 | 15.5 | 20 | 24 | 19 | 24 | 1 | 1 | 80 | 26 | 20.5 | 26 | 1.5 | 1.5 |
| 10 | 50 | 72 | 14 | — | 15 | 15 | 12 | 15 | 0.6 | 0.6 | 80 | 20 | 15.5 | 20 | 24 | 19 | 24 | 1 | 1 | 85 | 26 | 20 | 26 | 1.5 | 1.5 |
| 11 | 55 | 80 | 16 | — | 17 | 17 | 14 | 17 | 1 | 1 | 90 | 23 | 17.5 | 23 | 27 | 21 | 27 | 1.5 | 1.5 | 95 | 30 | 23 | 30 | 1.5 | 1.5 |
| 12 | 60 | 85 | 16 | — | 17 | 17 | 14 | 17 | 1 | 1 | 95 | 23 | 17.5 | 23 | 27 | 21 | 27 | 1.5 | 1.5 | 100 | 30 | 23 | 30 | 1.5 | 1.5 |
| 13 | 65 | 90 | 16 | — | 17 | 17 | 14 | 17 | 1 | 1 | 100 | 23 | 17.5 | 23 | 27 | 21 | 27 | 1.5 | 1.5 | 110 | 34 | 26.5 | 34 | 1.5 | 1.5 |
| 14 | 70 | 100 | 19 | — | 20 | 20 | 16 | 20 | 1 | 1 | 110 | 25 | 19 | 25 | 31 | 25.5 | 31 | 1.5 | 1.5 | 120 | 37 | 29 | 37 | 2 | 1.5 |
| 15 | 75 | 105 | 19 | — | 20 | 20 | 16 | 20 | 1 | 1 | 115 | 25 | 19 | 25 | 31 | 25.5 | 31 | 1.5 | 1.5 | 125 | 37 | 29 | 37 | 2 | 1.5 |
| 16 | 80 | 110 | 19 | — | 20 | 20 | 16 | 20 | 1 | 1 | 125 | 29 | 22 | 29 | 36 | 29.5 | 36 | 1.5 | 1.5 | 130 | 37 | 29 | 37 | 2 | 1.5 |
| 17 | 85 | 120 | 22 | — | 23 | 23 | 18 | 23 | 1.5 | 1.5 | 130 | 29 | 22 | 29 | 36 | 29.5 | 36 | 1.5 | 1.5 | 140 | 41 | 32 | 41 | 2.5 | 2 |
| 18 | 90 | 125 | 22 | — | 23 | 23 | 18 | 23 | 1.5 | 1.5 | 140 | 32 | 24 | 32 | 39 | 32.5 | 39 | 2 | 1.5 | 150 | 45 | 35 | 45 | 2.5 | 2 |
| 19 | 95 | 130 | 22 | — | 23 | 23 | 18 | 23 | 1.5 | 1.5 | 145 | 32 | 24 | 32 | 39 | 32.5 | 39 | 2 | 1.5 | 160 | 49 | 38 | 49 | 2.5 | 2 |
| 20 | 100 | 140 | 24 | — | 25 | 25 | 20 | 25 | 1.5 | 1.5 | 150 | 32 | 24 | 32 | 39 | 32.5 | 39 | 2 | 1.5 | 165 | 52 | 40 | 52 | 2.5 | 2 |
| 21 | 105 | 145 | 24 | — | 25 | 25 | 20 | 25 | 1.5 | 1.5 | 160 | 35 | 26 | 35 | 43 | 34 | 43 | 2.5 | 2 | 175 | 56 | 44 | 56 | 2.5 | 2 |
| 22 | 110 | 150 | 24 | — | 25 | 25 | 20 | 25 | 1.5 | 1.5 | 170 | 38 | 29 | 38 | 47 | 37 | 47 | 2.5 | 2 | 180 | 56 | 43 | 56 | 2.5 | 2 |
| 24 | 120 | 165 | 27 | — | 29 | 29 | 23 | 29 | 1.5 | 1.5 | 180 | 38 | 29 | 38 | 48 | 38 | 48 | 2.5 | 2 | 200 | 62 | 48 | 62 | 2.5 | 2 |
| 26 | 130 | 180 | 30 | — | 32 | 32 | 25 | 32 | 2 | 1.5 | 200 | 45 | 34 | 45 | 55 | 43 | 55 | 2.5 | 2 | — | — | — | — | — | — |
| 28 | 140 | 190 | 30 | — | 32 | 32 | 25 | 32 | 2 | 1.5 | 210 | 45 | 34 | 45 | 56 | 44 | 56 | 2.5 | 2 | — | — | — | — | — | — |
| 30 | 150 | 210 | 36 | — | 38 | 38 | 30 | 38 | 2.5 | 2 | 225 | 48 | 36 | 48 | 59 | 46 | 59 | 3 | 2.5 | — | — | — | — | — | — |
| 32 | 160 | 220 | 36 | — | 38 | 38 | 30 | 38 | 2.5 | 2 | 240 | 51 | 38 | 51 | — | — | — | 3 | 2.5 | — | — | — | — | — | — |
| 34 | 170 | 230 | 36 | — | 38 | 38 | 30 | 38 | 2.5 | 2 | 260 | 57 | 43 | 57 | — | — | — | 3 | 2.5 | — | — | — | — | — | — |
| 36 | 180 | 250 | 42 | — | 45 | 45 | 34 | 45 | 2.5 | 2 | 280 | 64 | 48 | 64 | — | — | — | 3 | 2.5 | — | — | — | — | — | — |
| 38 | 190 | 260 | 42 | — | 45 | 45 | 34 | 45 | 2.5 | 2 | 290 | 64 | 48 | 64 | — | — | — | 3 | 2.5 | — | — | — | — | — | — |
| 40 | 200 | 280 | 48 | — | 51 | 51 | 39 | 51 | 3 | 2.5 | 310 | 70 | 53 | 70 | — | — | — | 3 | 2.5 | — | — | — | — | — | — |
| 44 | 220 | 300 | 48 | — | 51 | 51 | 39 | 51 | 3 | 2.5 | 340 | 76 | 57 | 76 | — | — | — | 4 | 3 | — | — | — | — | — | — |
| 48 | 240 | 320 | 48 | — | 51 | 51 | 39 | 51 | 3 | 2.5 | 360 | 76 | 57 | 76 | — | — | — | 4 | 3 | — | — | — | — | — | — |
| 52 | 260 | 360 | — | — | — | 63.5 | 48 | 63.5 | 3 | 2.5 | 400 | 87 | 65 | 87 | — | — | — | 5 | 4 | — | — | — | — | — | — |
| 56 | 280 | 380 | — | — | — | 63.5 | 48 | 63.5 | 3 | 2.5 | 420 | 87 | 65 | 87 | — | — | — | 5 | 4 | — | — | — | — | — | — |
| 60 | 300 | 420 | — | — | — | 76 | 57 | 76 | 4 | 3 | 460 | 100 | 74 | 100 | — | — | — | 5 | 4 | — | — | — | — | — | — |
| 64 | 320 | 440 | — | — | — | 76 | 57 | 76 | 4 | 3 | 480 | 100 | 74 | 100 | — | — | — | 5 | 4 | — | — | — | — | — | — |
| 68 | 340 | 460 | — | — | — | 76 | 57 | 76 | 4 | 3 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 72 | 360 | 480 | — | — | — | 76 | 57 | 76 | 4 | 3 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

| Tapered Roller Brgs. | | 302 | | | | 322 | | | | 332 | | | | | 303 or 303D | | | | | 313 | | | | 323 | | | | | Tapered Roller Brgs. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Diameter Series 2 | | | | | | | | | | | | | Diameter Series 3 | | | | | | | | | | | | | | | |
| | | | Dimension Series 02 | | | Dimension Series 22 | | | | Dimension Series 32 | | | Chamfer Dimension | | | Dimension Series 03 | | | | | Dimension Series 13 | | | Dimension Series 23 | | | Chamfer Dimension | | | |
| | | | | | | | | | | | | | Cone | Cup | | | | | | | | | | | | | Cone | Cup | | |
| Bore Number | $d$ | $D$ | $B$ | $C$ | $T$ | $B$ | $C$ | $T$ | $r$ (min.) | $B$ | $C$ | $T$ | | | $D$ | $B$ | $C$ | $C$ (1) | $T$ | $B$ | $C$ | $T$ | $B$ | $C$ | $T$ | $r$ (min.) | | | $d$ | Bore Number |
| 30 | 9 | — | 9.7 | 14 | — | 14.7 | — | — | — | 0.6 | 0.6 | | | | 35 | 11 | — | — | 11.9 | — | — | — | 17 | — | 17.9 | 0.6 | 0.6 | | 10 | 00 |
| 32 | 10 | 9 | 10.75 | 14 | — | 14.75 | — | — | — | 0.6 | 0.6 | | | | 37 | 12 | — | — | 12.9 | — | — | — | 17 | — | 17.9 | 1 | 1 | | 12 | 01 |
| 35 | 11 | 10 | 11.75 | 14 | — | 14.75 | — | — | — | 0.6 | 0.6 | | | | 42 | 13 | 11 | — | 14.25 | — | — | — | 17 | 14 | 18.25 | 1 | 1 | | 15 | 02 |
| 40 | 12 | 11 | 13.25 | 16 | 14 | 17.25 | — | — | — | 1 | 1 | | | | 47 | 14 | 12 | — | 15.25 | — | — | — | 19 | 16 | 20.25 | 1 | 1 | | 17 | 03 |
| 47 | 14 | 12 | 15.25 | 18 | 15 | 19.25 | — | — | — | 1 | 1 | | | | 52 | 15 | 13 | — | 16.25 | — | — | — | 21 | 18 | 22.25 | 1.5 | 1.5 | | 20 | 04 |
| 50 | 14 | 12 | 15.25 | 18 | 15 | 19.25 | — | — | — | 1 | 1 | | | | 56 | 16 | 14 | — | 17.25 | — | — | — | 21 | 18 | 22.25 | 1.5 | 1.5 | | 22 | /22 |
| 52 | 15 | 13 | 16.25 | 18 | 15 | 19.25 | 22 | 18 | 22 | 1 | 1 | | | | 62 | 17 | 15 | 13 | 18.25 | — | — | — | 24 | 20 | 25.25 | 1.5 | 1.5 | | 25 | 05 |
| 58 | 16 | 14 | 17.25 | 19 | 16 | 20.25 | 24 | 19 | 24 | 1 | 1 | | | | 68 | 18 | 15 | 14 | 19.75 | — | — | — | 24 | 20 | 25.75 | 1.5 | 1.5 | | 28 | /28 |
| 62 | 16 | 14 | 17.25 | 20 | 17 | 21.25 | 25 | 19.5 | 25 | 1 | 1 | | | | 72 | 19 | 16 | 14 | 20.75 | — | — | — | 27 | 23 | 28.75 | 1.5 | 1.5 | | 30 | 06 |
| 65 | 17 | 15 | 18.25 | 21 | 18 | 22.25 | 26 | 20.5 | 26 | 1 | 1 | | | | 75 | 20 | 17 | 15 | 21.75 | — | — | — | 28 | 24 | 29.75 | 1.5 | 1.5 | | 32 | /32 |
| 72 | 17 | 15 | 18.25 | 23 | 19 | 24.25 | 28 | 22 | 28 | 1.5 | 1.5 | | | | 80 | 21 | 18 | 15 | 22.75 | — | — | — | 31 | 25 | 32.75 | 2 | 1.5 | | 35 | 07 |
| 80 | 18 | 16 | 19.75 | 23 | 19 | 24.75 | 32 | 25 | 32 | 1.5 | 1.5 | | | | 90 | 23 | 20 | 17 | 25.25 | — | — | — | 33 | 27 | 35.25 | 2 | 1.5 | | 40 | 08 |
| 85 | 19 | 16 | 20.75 | 23 | 19 | 24.75 | 32 | 25 | 32 | 1.5 | 1.5 | | | | 100 | 25 | 22 | 18 | 27.25 | — | — | — | 36 | 30 | 38.25 | 2 | 1.5 | | 45 | 09 |
| 90 | 20 | 17 | 21.75 | 23 | 19 | 24.75 | 32 | 24.5 | 32 | 1.5 | 1.5 | | | | 110 | 27 | 23 | 19 | 29.25 | — | — | — | 40 | 33 | 42.25 | 2.5 | 2 | | 50 | 10 |
| 100 | 21 | 18 | 22.75 | 25 | 21 | 26.75 | 35 | 27 | 35 | 2 | 1.5 | | | | 120 | 29 | 25 | 21 | 31.5 | — | — | — | 43 | 35 | 45.5 | 2.5 | 2 | | 55 | 11 |
| 110 | 22 | 19 | 23.75 | 28 | 24 | 29.75 | 38 | 29 | 38 | 2 | 1.5 | | | | 130 | 31 | 26 | 22 | 33.5 | — | — | — | 46 | 37 | 48.5 | 3 | 2.5 | | 60 | 12 |
| 120 | 23 | 20 | 24.75 | 31 | 27 | 32.75 | 41 | 32 | 41 | 2 | 1.5 | | | | 140 | 33 | 28 | 23 | 36 | — | — | — | 48 | 39 | 51 | 3 | 2.5 | | 65 | 13 |
| 125 | 24 | 21 | 26.25 | 31 | 27 | 33.25 | 41 | 32 | 41 | 2 | 1.5 | | | | 150 | 35 | 30 | 25 | 38 | — | — | — | 51 | 42 | 54 | 3 | 2.5 | | 70 | 14 |
| 130 | 25 | 22 | 27.25 | 31 | 27 | 33.25 | 41 | 31 | 41 | 2 | 1.5 | | | | 160 | 37 | 31 | 26 | 40 | — | — | — | 55 | 45 | 58 | 3 | 2.5 | | 75 | 15 |
| 140 | 26 | 22 | 28.25 | 33 | 28 | 35.25 | 46 | 35 | 46 | 2.5 | 2 | | | | 170 | 39 | 33 | 27 | 42.5 | — | — | — | 58 | 48 | 61.5 | 3 | 2.5 | | 80 | 16 |
| 150 | 28 | 24 | 30.5 | 36 | 30 | 38.5 | 49 | 37 | 49 | 2.5 | 2 | | | | 180 | 41 | 34 | 28 | 44.5 | — | — | — | 60 | 49 | 63.5 | 4 | 3 | | 85 | 17 |
| 160 | 30 | 26 | 32.5 | 40 | 34 | 42.5 | 55 | 42 | 55 | 2.5 | 2 | | | | 190 | 43 | 36 | 30 | 46.5 | — | — | — | 64 | 53 | 67.5 | 4 | 3 | | 90 | 18 |
| 170 | 32 | 27 | 34.5 | 43 | 37 | 45.5 | 58 | 44 | 58 | 3 | 2.5 | | | | 200 | 45 | 38 | 32 | 49.5 | — | — | — | 67 | 55 | 71.5 | 4 | 3 | | 95 | 19 |
| 180 | 34 | 29 | 37 | 46 | 39 | 49 | 63 | 48 | 63 | 3 | 2.5 | | | | 215 | 47 | 39 | — | 51.5 | 51 | 35 | 56.5 | 73 | 60 | 77.5 | 4 | 3 | | 100 | 20 |
| 190 | 36 | 30 | 39 | 50 | 43 | 53 | 68 | 52 | 68 | 3 | 2.5 | | | | 225 | 49 | 41 | — | 53.5 | 53 | 36 | 58 | 77 | 63 | 81.5 | 4 | 3 | | 105 | 21 |
| 200 | 38 | 32 | 41 | 53 | 46 | 56 | — | — | — | 3 | 2.5 | | | | 240 | 50 | 42 | — | 54.5 | 57 | 38 | 63 | 80 | 65 | 84.5 | 4 | 3 | | 110 | 22 |
| 215 | 40 | 34 | 43.5 | 58 | 50 | 61.5 | — | — | — | 3 | 2.5 | | | | 260 | 55 | 46 | — | 59.5 | 62 | 42 | 68 | 86 | 69 | 90.5 | 4 | 3 | | 120 | 24 |
| 230 | 40 | 34 | 43.75 | 64 | 54 | 67.75 | — | — | — | 4 | 3 | | | | 280 | 58 | 49 | — | 63.75 | 66 | 44 | 72 | 93 | 78 | 98.75 | 5 | 4 | | 130 | 26 |
| 250 | 42 | 36 | 45.75 | 68 | 58 | 71.75 | — | — | — | 4 | 3 | | | | 300 | 62 | 53 | — | 67.75 | 70 | 47 | 77 | 102 | 85 | 107.75 | 5 | 4 | | 140 | 28 |
| 270 | 45 | 38 | 49 | 73 | 60 | 77 | — | — | — | 4 | 3 | | | | 320 | 65 | 55 | — | 72 | 75 | 50 | 82 | 108 | 90 | 114 | 5 | 4 | | 150 | 30 |
| 290 | 48 | 40 | 52 | 80 | 67 | 84 | — | — | — | 4 | 3 | | | | 340 | 68 | 58 | — | 75 | 79 | — | 87 | 114 | 95 | 121 | 5 | 4 | | 160 | 32 |
| 310 | 52 | 43 | 57 | 86 | 71 | 91 | — | — | — | 5 | 4 | | | | 360 | 72 | 62 | — | 80 | 84 | — | 92 | 120 | 100 | 127 | 5 | 4 | | 170 | 34 |
| 320 | 52 | 43 | 57 | 86 | 71 | 91 | — | — | — | 5 | 4 | | | | 380 | 75 | 64 | — | 83 | 88 | — | 97 | 126 | 106 | 134 | 5 | 4 | | 180 | 36 |
| 340 | 55 | 46 | 60 | 92 | 75 | 97 | — | — | — | 5 | 4 | | | | 400 | 78 | 65 | — | 86 | 92 | — | 101 | 132 | 109 | 140 | 6 | 5 | | 190 | 38 |
| 360 | 58 | 48 | 64 | 98 | 82 | 104 | — | — | — | 5 | 4 | | | | 420 | 80 | 67 | — | 89 | 97 | — | 107 | 138 | 115 | 146 | 6 | 5 | | 200 | 40 |
| 400 | 65 | 54 | 72 | 108 | 90 | 114 | — | — | — | 5 | 4 | | | | 460 | 88 | 73 | — | 97 | 106 | — | 117 | 145 | 122 | 154 | 6 | 5 | | 220 | 44 |
| 440 | 72 | 60 | 79 | 120 | 100 | 127 | — | — | — | 5 | 4 | | | | 500 | 95 | 80 | — | 105 | 114 | — | 125 | 155 | 132 | 165 | 6 | 5 | | 240 | 48 |
| 480 | 80 | 67 | 89 | 130 | 106 | 137 | — | — | — | 6 | 5 | | | | 540 | 102 | 85 | — | 113 | 123 | — | 135 | 165 | 136 | 176 | 6 | 6 | | 260 | 52 |
| 500 | 80 | 67 | 89 | 130 | 106 | 137 | — | — | — | 6 | 5 | | | | 580 | 108 | 90 | — | 119 | 132 | — | 145 | 175 | 145 | 187 | 6 | 6 | | 280 | 56 |
| 540 | 85 | 71 | 96 | 140 | 115 | 149 | — | — | — | 6 | 5 | | | | — | — | — | — | — | — | — | — | — | — | — | — | — | | 300 | 60 |
| 580 | 92 | 75 | 104 | 150 | 125 | 159 | — | — | — | 6 | 5 | | | | — | — | — | — | — | — | — | — | — | — | — | — | — | | 320 | 64 |
| — | — | — | — | — | — | — | — | — | — | — | — | | | | — | — | — | — | — | — | — | — | — | — | — | — | — | | 340 | 68 |
| — | — | — | — | — | — | — | — | — | — | — | — | | | | — | — | — | — | — | — | — | — | — | — | — | — | — | | 360 | 72 |

**Remarks**
1. Other series not conforming to this table are also specified by ISO.
2. In the Dimension Series of Diameter Series 9, Classification I is those specified by the old standard, Classification II is those specified by the ISO.
2. Dimension Series not classified conform to dimensions (D, B, C, T) specified by ISO.
3. The chamfer dimensions listed are the minimum permissible dimensions specified by ISO. They do not apply to chamfers on the front face.

**Note** (1) Regarding steep-slope bearing 303D, in DIN, the one corresponding to 303D of JIS is numbered 313. For bearings with bore diameters larger than 100 mm, those of dimension series 13 are numbered 313.

## Table 7. 3 Boundary Dimensions of Thrust Bearings (Flat Seats) — 1 —

Units: mm

| Thrust Ball Brgs. | | | | | | | | | 511 | | | | | 512 | 522 | | | | | | | 513 | 523 | | | | | | | 514 | 524 | | | | | | Thrust Ball Brgs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spherical Thrust Roller Brgs. | | | | | | | | | | | | | 292 | | | | | | | | | 293 | | | | | | | 294 | | | | | | | Spherical Thrust Roller Brgs. |
| Bore Number | $d$ | Diameter Series 0 | | | | | Diameter Series 1 | | | | | Diameter Series 2 | | | | | | | | | | Diameter Series 3 | | | | | | | | Diameter Series 4 | | | | | | | Diameter Series 5 | | | | Bore Number |
| | | Dimension Series | | | | | Dimension Series | | | | | Dimension Series | | | | | | | | | | Dimension Series | | | | | | | | Dimension Series | | | | | | | Dimension Series | | | | |
| | | 70 | 90 | 10 | | | 71 | 91 | 11 | | | 72 | 92 | 12 | 22 | 22 | | | | | | 73 | 93 | 13 | 23 | 23 | | | | 74 | 94 | 14 | 24 | 24 | | | 95 | | | |
| | | $D$ | $T$ | | | $r$ (min.) | $D$ | $T$ | | | $r$ (min.) | $D$ | $T$ | | | | Central Washer | | $r$ (min.) | $r_1$ (min.) | $D$ | $T$ | | | | Central Washer | | $r$ (min.) | $r_1$ (min.) | $D$ | $T$ | | | | Central Washer | | $r$ (min.) | $r_1$ (min.) | $D$ | $T$ | $r$ (min.) | $d$ | |
| | | | | | | | | | | | | | | | | $d_2$ | $B$ | | | | | | | | $d_2$ | $B$ | | | | | | | $d_2$ | $B$ | | | | | | |
| 4 | 4 | 12 | 4 | — | 6 | 0.3 | — | — | — | — | — | 16 | 6 | — | 8 | — | — | — | 0.3 | — | 20 | 7 | — | 11 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 4 | 4 |
| 6 | 6 | 16 | 5 | — | 7 | 0.3 | — | — | — | — | — | 20 | 6 | — | 9 | — | — | — | 0.3 | — | 24 | 8 | — | 12 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 6 | 6 |
| 8 | 8 | 18 | 5 | — | 7 | 0.3 | — | — | — | — | — | 22 | 6 | — | 9 | — | — | — | 0.3 | — | 26 | 8 | — | 12 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 8 | 8 |
| 00 | 10 | 20 | 5 | — | 7 | 0.3 | 24 | 6 | — | 9 | 0.3 | 26 | 7 | — | 11 | — | — | — | 0.6 | — | 30 | 9 | — | 14 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 10 | 00 |
| 01 | 12 | 22 | 5 | — | 7 | 0.3 | 26 | 6 | — | 9 | 0.3 | 28 | 7 | — | 11 | — | — | — | 0.6 | — | 32 | 9 | — | 14 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 12 | 01 |
| 02 | 15 | 26 | 5 | — | 7 | 0.3 | 28 | 6 | — | 9 | 0.3 | 32 | 8 | — | 12 | 22 | 10 | 5 | 0.6 | 0.3 | 37 | 10 | — | 15 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | — | — | 15 | 02 |
| 03 | 17 | 28 | 5 | — | 7 | 0.3 | 30 | 6 | — | 9 | 0.3 | 35 | 8 | — | 12 | — | — | — | 0.6 | — | 40 | 10 | — | 16 | — | — | — | 0.6 | — | — | — | — | — | — | — | — | — | — | 52 | 21 | 1 | 17 | 03 |
| 04 | 20 | 32 | 6 | — | 8 | 0.3 | 35 | 7 | — | 10 | 0.3 | 40 | 9 | — | 14 | 26 | 15 | 6 | 0.6 | 0.3 | 47 | 12 | — | 18 | — | — | — | 1 | — | — | — | — | — | — | — | — | — | — | 60 | 24 | 1 | 20 | 04 |
| 05 | 25 | 37 | 6 | — | 8 | 0.3 | 42 | 8 | — | 11 | 0.6 | 47 | 10 | — | 15 | 28 | 20 | 7 | 0.6 | 0.3 | 52 | 12 | — | 18 | 34 | 20 | 8 | 1 | 0.3 | 60 | 16 | 21 | 24 | 45 | 15 | 11 | 1 | 0.6 | 73 | 29 | 1.1 | 25 | 05 |
| 06 | 30 | 42 | 6 | — | 8 | 0.3 | 47 | 8 | — | 11 | 0.6 | 52 | 10 | — | 16 | 29 | 25 | 7 | 0.6 | 0.3 | 60 | 14 | — | 21 | 38 | 25 | 9 | 1 | 0.3 | 70 | 18 | 24 | 28 | 52 | 20 | 12 | 1 | 0.6 | 85 | 34 | 1.1 | 30 | 06 |
| 07 | 35 | 47 | 6 | — | 8 | 0.3 | 52 | 8 | — | 12 | 0.6 | 62 | 12 | — | 18 | 34 | 30 | 8 | 1 | 0.3 | 68 | 15 | — | 24 | 44 | 30 | 10 | 1 | 0.3 | 80 | 20 | 27 | 32 | 59 | 25 | 14 | 1.1 | 0.6 | 100 | 39 | 1.1 | 35 | 07 |
| 08 | 40 | 52 | 6 | — | 9 | 0.3 | 60 | 9 | — | 13 | 0.6 | 68 | 13 | — | 19 | 36 | 30 | 9 | 1 | 0.6 | 78 | 17 | 22 | 26 | 49 | 30 | 12 | 1 | 0.6 | 90 | 23 | 30 | 36 | 65 | 30 | 15 | 1.1 | 0.6 | 110 | 42 | 1.5 | 40 | 08 |
| 09 | 45 | 60 | 7 | — | 10 | 0.3 | 65 | 9 | — | 14 | 0.6 | 73 | 13 | — | 20 | 37 | 35 | 9 | 1 | 0.6 | 85 | 18 | 24 | 28 | 52 | 35 | 12 | 1 | 0.6 | 100 | 25 | 34 | 39 | 72 | 35 | 17 | 1.1 | 0.6 | 120 | 45 | 2 | 45 | 09 |
| 10 | 50 | 65 | 7 | — | 10 | 0.3 | 70 | 9 | — | 14 | 0.6 | 78 | 13 | — | 22 | 39 | 40 | 9 | 1 | 0.6 | 95 | 20 | 27 | 31 | 58 | 40 | 14 | 1.1 | 0.6 | 110 | 27 | 36 | 43 | 78 | 40 | 18 | 1.5 | 0.6 | 135 | 51 | 2 | 50 | 10 |
| 11 | 55 | 70 | 7 | — | 10 | 0.3 | 78 | 10 | — | 16 | 0.6 | 90 | 16 | 21 | 25 | 45 | 45 | 10 | 1 | 0.6 | 105 | 23 | 30 | 35 | 64 | 45 | 15 | 1.1 | 0.6 | 120 | 29 | 39 | 48 | 87 | 45 | 20 | 1.5 | 0.6 | 150 | 58 | 2.1 | 55 | 11 |
| 12 | 60 | 75 | 7 | — | 10 | 0.3 | 85 | 11 | — | 17 | 1 | 95 | 16 | 21 | 26 | 46 | 50 | 10 | 1 | 0.6 | 110 | 23 | 30 | 35 | 64 | 50 | 15 | 1.1 | 0.6 | 130 | 32 | 42 | 51 | 93 | 50 | 21 | 1.5 | 0.6 | 160 | 60 | 2.1 | 60 | 12 |
| 13 | 65 | 80 | 7 | — | 10 | 0.3 | 90 | 11 | — | 18 | 1 | 100 | 16 | 21 | 27 | 47 | 55 | 10 | 1 | 0.6 | 115 | 23 | 30 | 36 | 65 | 55 | 15 | 1.1 | 0.6 | 140 | 34 | 45 | 56 | 101 | 50 | 23 | 2 | 1 | 170 | 63 | 2.1 | 65 | 13 |
| 14 | 70 | 85 | 7 | — | 10 | 0.3 | 95 | 11 | — | 18 | 1 | 105 | 16 | 21 | 27 | 47 | 55 | 10 | 1 | 1 | 125 | 25 | 34 | 40 | 72 | 55 | 16 | 1.1 | 1 | 150 | 36 | 48 | 60 | 107 | 55 | 24 | 2 | 1 | 180 | 67 | 3 | 70 | 14 |
| 15 | 75 | 90 | 7 | — | 10 | 0.3 | 100 | 11 | — | 19 | 1 | 110 | 16 | 21 | 27 | 47 | 60 | 10 | 1 | 1 | 135 | 27 | 36 | 44 | 79 | 60 | 18 | 1.5 | 1 | 160 | 38 | 51 | 65 | 115 | 60 | 26 | 2 | 1 | 190 | 69 | 3 | 75 | 15 |
| 16 | 80 | 95 | 7 | — | 10 | 0.3 | 105 | 11 | — | 19 | 1 | 115 | 16 | 21 | 28 | 48 | 65 | 10 | 1 | 1 | 140 | 27 | 36 | 44 | 79 | 65 | 18 | 1.5 | 1 | 170 | 41 | 54 | 68 | 120 | 65 | 27 | 2.1 | 1 | 200 | 73 | 3 | 80 | 16 |
| 17 | 85 | 100 | 7 | — | 10 | 0.3 | 110 | 11 | — | 19 | 1 | 125 | 18 | 24 | 31 | 55 | 70 | 12 | 1 | 1 | 150 | 29 | 39 | 49 | 87 | 70 | 19 | 1.5 | 1 | 180 | 42 | 58 | 72 | 128 | 65 | 29 | 2.1 | 1.1 | 215 | 78 | 4 | 85 | 17 |
| 18 | 90 | 105 | 7 | — | 10 | 0.3 | 120 | 14 | — | 22 | 1 | 135 | 20 | 27 | 35 | 62 | 75 | 14 | 1.1 | 1 | 155 | 29 | 39 | 50 | 88 | 75 | 19 | 1.5 | 1 | 190 | 45 | 60 | 77 | 135 | 70 | 30 | 2.1 | 1.1 | 225 | 82 | 4 | 90 | 18 |
| 20 | 100 | 120 | 9 | — | 14 | 0.6 | 135 | 16 | 21 | 25 | 1 | 150 | 23 | 30 | 38 | 67 | 85 | 15 | 1.1 | 1 | 170 | 32 | 42 | 55 | 97 | 85 | 21 | 1.5 | 1 | 210 | 50 | 67 | 85 | 150 | 80 | 33 | 3 | 1.1 | 250 | 90 | 4 | 100 | 20 |
| 22 | 110 | 130 | 9 | — | 14 | 0.6 | 145 | 16 | 21 | 25 | 1 | 160 | 23 | 30 | 38 | 67 | 95 | 15 | 1.1 | 1 | 190 | 36 | 48 | 63 | 110 | 95 | 24 | 2 | 1 | 230 | 54 | 73 | 95 | 166 | 90 | 37 | 3 | 1.1 | 270 | 95 | 5 | 110 | 22 |
| 24 | 120 | 140 | 9 | — | 14 | 0.6 | 155 | 16 | 21 | 25 | 1 | 170 | 23 | 30 | 39 | 68 | 100 | 15 | 1.1 | 1.1 | 210 | 41 | 54 | 70 | 123 | 100 | 27 | 2.1 | 1.1 | 250 | 58 | 78 | 102 | 177 | 95 | 40 | 4 | 1.5 | 300 | 109 | 5 | 120 | 24 |
| 26 | 130 | 150 | 9 | — | 14 | 0.6 | 170 | 18 | 24 | 30 | 1 | 190 | 27 | 36 | 45 | 80 | 110 | 18 | 1.5 | 1.1 | 225 | 42 | 58 | 75 | 130 | 110 | 30 | 2.1 | 1.1 | 270 | 63 | 85 | 110 | 192 | 100 | 42 | 4 | 2 | 320 | 115 | 5 | 130 | 26 |
| 28 | 140 | 160 | 9 | — | 14 | 0.6 | 180 | 18 | 24 | 31 | 1 | 200 | 27 | 36 | 46 | 81 | 120 | 18 | 1.5 | 1.1 | 240 | 45 | 60 | 80 | 140 | 120 | 31 | 2.1 | 1.1 | 280 | 63 | 85 | 112 | 196 | 110 | 44 | 4 | 2 | 340 | 122 | 5 | 140 | 28 |
| 30 | 150 | 170 | 9 | — | 14 | 0.6 | 190 | 18 | 24 | 31 | 1 | 215 | 29 | 39 | 50 | 89 | 130 | 20 | 1.5 | 1.1 | 250 | 45 | 60 | 80 | 140 | 130 | 31 | 2.1 | 1.1 | 300 | 67 | 90 | 120 | 209 | 120 | 46 | 4 | 2 | 360 | 125 | 6 | 150 | 30 |
| 32 | 160 | 180 | 9 | — | 14 | 0.6 | 200 | 18 | 24 | 31 | 1 | 225 | 29 | 39 | 51 | 90 | 140 | 20 | 1.5 | 1.1 | 270 | 50 | 67 | 87 | 153 | 140 | 33 | 3 | 1.1 | 320 | 73 | 95 | 130 | 226 | 130 | 50 | 5 | 2 | 380 | 132 | 6 | 160 | 32 |
| 34 | 170 | 190 | 9 | — | 14 | 0.6 | 215 | 20 | 27 | 34 | 1.1 | 240 | 32 | 42 | 55 | 97 | 150 | 21 | 1.5 | 1.1 | 280 | 50 | 67 | 87 | 153 | 150 | 33 | 3 | 1.1 | 340 | 78 | 103 | 135 | 236 | 135 | 50 | 5 | 2.1 | 400 | 140 | 6 | 170 | 34 |
| 36 | 180 | 200 | 9 | — | 14 | 0.6 | 225 | 20 | 27 | 34 | 1.1 | 250 | 32 | 42 | 56 | 98 | 150 | 21 | 1.5 | 2 | 300 | 54 | 73 | 95 | 165 | 150 | 37 | 3 | 2 | 360 | 82 | 109 | 140 | 245 | 140 | 52 | 5 | 3 | 420 | 145 | 6 | 180 | 36 |
| 38 | 190 | 215 | 11 | — | 17 | 1 | 240 | 23 | 30 | 37 | 1.1 | 270 | 36 | 48 | 62 | 109 | 160 | 24 | 2 | 2 | 320 | 58 | 78 | 105 | 183 | 160 | 40 | 4 | 2 | 380 | 85 | 115 | 150 | — | — | — | 5 | — | 440 | 150 | 6 | 190 | 38 |
| 40 | 200 | 225 | 11 | — | 17 | 1 | 250 | 23 | 30 | 37 | 1.1 | 280 | 36 | 48 | 62 | 109 | 170 | 24 | 2 | 2 | 340 | 63 | 85 | 110 | 192 | 170 | 42 | 4 | 2 | 400 | 90 | 122 | 155 | — | — | — | 5 | — | 460 | 155 | 7.5 | 200 | 40 |
| 44 | 220 | 250 | 14 | — | 22 | 1 | 270 | 23 | 30 | 37 | 1.1 | 300 | 36 | 48 | 63 | 110 | 190 | 24 | 2 | 2 | 360 | 63 | 85 | 112 | — | — | — | 4 | — | 420 | 90 | 122 | 160 | — | — | — | 6 | — | 500 | 170 | 7.5 | 220 | 44 |
| 48 | 240 | 270 | 14 | — | 22 | 1 | 300 | 27 | 36 | 45 | 1.5 | 340 | 45 | 60 | 78 | — | — | — | 2.1 | — | 380 | 63 | 85 | 112 | — | — | — | 4 | — | 440 | 90 | 122 | 160 | — | — | — | 6 | — | 540 | 180 | 7.5 | 240 | 48 |
| 52 | 260 | 290 | 14 | — | 22 | 1 | 320 | 27 | 36 | 45 | 1.5 | 360 | 45 | 60 | 79 | — | — | — | 2.1 | — | 420 | 73 | 95 | 130 | — | — | — | 5 | — | 480 | 100 | 132 | 175 | — | — | — | 6 | — | 580 | 190 | 9.5 | 260 | 52 |
| 56 | 280 | 310 | 14 | — | 22 | 1 | 350 | 32 | 42 | 53 | 1.5 | 380 | 45 | 60 | 80 | — | — | — | 2.1 | — | 440 | 73 | 95 | 130 | — | — | — | 5 | — | 520 | 109 | 145 | 190 | — | — | — | 6 | — | 620 | 206 | 9.5 | 280 | 56 |
| 60 | 300 | 340 | 18 | 24 | 30 | 1 | 380 | 36 | 48 | 62 | 2 | 420 | 54 | 73 | 95 | — | — | — | 3 | — | 480 | 82 | 109 | 140 | — | — | — | 5 | — | 540 | 109 | 145 | 190 | — | — | — | 6 | — | 670 | 224 | 9.5 | 300 | 60 |
| 64 | 320 | 360 | 18 | 24 | 30 | 1 | 400 | 36 | 48 | 63 | 2 | 440 | 54 | 73 | 95 | — | — | — | 3 | — | 500 | 82 | 109 | 140 | — | — | — | 5 | — | 580 | 118 | 155 | 205 | — | — | — | 7.5 | — | 710 | 236 | 9.5 | 320 | 64 |

**Remarks**
1. Dimension Series 22, 23, and 24 are double direction bearings.
2. The maximum permissible outside diameter of shaft and central washers and minimum permissible bore diameter of housing washers are omitted here. (Refer to the bearing tables for Thrust Bearings).

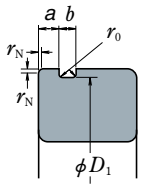
## Table 7. 3 Boundary Dimensions of Thrust Bearings (Flat Seats) — 2 —

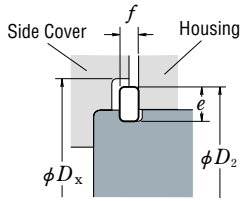
Units: mm

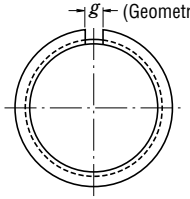
| Thrust Ball Brgs. | | | | | | | | | 511 | | | | | 512 | 522 | | | | 513 | 523 | | | | 514 | 524 | | | | Thrust Ball Brgs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spherical Thrust Roller Brgs. | | | | | | | | | | | | | 292 | | | | | | 293 | | | | | 294 | | | | | Spherical Thrust Roller Brgs. |
| Bore Number | $d$ | Diameter Series 0 | | | | | Diameter Series 1 | | | | | Diameter Series 2 | | | | | | | | Diameter Series 3 | | | | | | | | | | Diameter Series 4 | | | | | | | | Diameter Series 5 | | | | $d$ | Bore Number |
| | | $D$ | Dimension Series 70 $T$ | Dimension Series 90 $T$ | Dimension Series 10 $T$ | $r$ (min.) | $D$ | Dimension Series 71 $T$ | Dimension Series 91 $T$ | Dimension Series 11 $T$ | $r$ (min.) | $D$ | Dimension Series 72 $T$ | Dimension Series 92 $T$ | Dimension Series 12 $T$ | Dimension Series 22 $T$ | Dimension Series 22 Central Washer $d_2$ | Dimension Series 22 Central Washer $B$ | $r$ (min.) | $r_1$ (min.) | $D$ | Dimension Series 73 $T$ | Dimension Series 93 $T$ | Dimension Series 13 $T$ | Dimension Series 23 $T$ | Dimension Series 23 Central Washer $d_2$ | Dimension Series 23 Central Washer $B$ | $r$ (min.) | $r_1$ (min.) | $D$ | Dimension Series 74 $T$ | Dimension Series 94 $T$ | Dimension Series 14 $T$ | Dimension Series 24 $T$ | Dimension Series 24 Central Washer $d_2$ | Dimension Series 24 Central Washer $B$ | $r$ (min.) | $r_1$ (min.) | $D$ | Dimension Series 95 $T$ | $r$ (min.) | | |
| **68** | **340** | **380** | 18 | 24 | 30 | 1 | **420** | 36 | 48 | 64 | 2 | **460** | 54 | 73 | 96 | — | — | — | 3 | — | **540** | 90 | 122 | 160 | — | — | — | 5 | — | **620** | 125 | 170 | 220 | — | — | — | 7.5 | — | **750** | 243 | 12 | **340** | **68** |
| **72** | **360** | **400** | 18 | 24 | 30 | 1 | **440** | 36 | 48 | 65 | 2 | **500** | 63 | 85 | 110 | — | — | — | 4 | — | **560** | 90 | 122 | 160 | — | — | — | 5 | — | **640** | 125 | 170 | 220 | — | — | — | 7.5 | — | **780** | 250 | 12 | **360** | **72** |
| **76** | **380** | **420** | 18 | 24 | 30 | 1 | **460** | 36 | 48 | 65 | 2 | **520** | 63 | 85 | 112 | — | — | — | 4 | — | **600** | 100 | 132 | 175 | — | — | — | 6 | — | **670** | 132 | 175 | 224 | — | — | — | 7.5 | — | **820** | 265 | 12 | **380** | **76** |
| **80** | **400** | **440** | 18 | 24 | 30 | 1 | **480** | 36 | 48 | 65 | 2 | **540** | 63 | 85 | 112 | — | — | — | 4 | — | **620** | 100 | 132 | 175 | — | — | — | 6 | — | **710** | 140 | 185 | 243 | — | — | — | 7.5 | — | **850** | 272 | 12 | **400** | **80** |
| **84** | **420** | **460** | 18 | 24 | 30 | 1 | **500** | 36 | 48 | 65 | 2 | **580** | 73 | 95 | 130 | — | — | — | 5 | — | **650** | 103 | 140 | 180 | — | — | — | 6 | — | **730** | 140 | 185 | 243 | — | — | — | 7.5 | — | **900** | 290 | 15 | **420** | **84** |
| **88** | **440** | **480** | 18 | 24 | 30 | 1 | **540** | 45 | 60 | 80 | 2.1 | **600** | 73 | 95 | 130 | — | — | — | 5 | — | **680** | 109 | 145 | 190 | — | — | — | 6 | — | **780** | 155 | 206 | 265 | — | — | — | 9.5 | — | **950** | 308 | 15 | **440** | **88** |
| **92** | **460** | **500** | 18 | 24 | 30 | 1 | **560** | 45 | 60 | 80 | 2.1 | **620** | 73 | 95 | 130 | — | — | — | 5 | — | **710** | 112 | 150 | 195 | — | — | — | 6 | — | **800** | 155 | 206 | 265 | — | — | — | 9.5 | — | **980** | 315 | 15 | **460** | **92** |
| **96** | **480** | **520** | 18 | 24 | 30 | 1 | **580** | 45 | 60 | 80 | 2.1 | **650** | 78 | 103 | 135 | — | — | — | 5 | — | **730** | 112 | 150 | 195 | — | — | — | 6 | — | **850** | 165 | 224 | 290 | — | — | — | 9.5 | — | **1000** | 315 | 15 | **480** | **96** |
| **/500** | **500** | **540** | 18 | 24 | 30 | 1 | **600** | 45 | 60 | 80 | 2.1 | **670** | 78 | 103 | 135 | — | — | — | 5 | — | **750** | 112 | 150 | 195 | — | — | — | 6 | — | **870** | 165 | 224 | 290 | — | — | — | 9.5 | — | **1060** | 335 | 15 | **500** | **/500** |
| **/530** | **530** | **580** | 23 | 30 | 38 | 1.1 | **640** | 50 | 67 | 85 | 3 | **710** | 82 | 109 | 140 | — | — | — | 5 | — | **800** | 122 | 160 | 212 | — | — | — | 7.5 | — | **920** | 175 | 236 | 308 | — | — | — | 9.5 | — | **1090** | 335 | 15 | **530** | **/530** |
| **/560** | **560** | **610** | 23 | 30 | 38 | 1.1 | **670** | 50 | 67 | 85 | 3 | **750** | 85 | 115 | 150 | — | — | — | 5 | — | **850** | 132 | 175 | 224 | — | — | — | 7.5 | — | **980** | 190 | 250 | 335 | — | — | — | 12 | — | **1150** | 355 | 15 | **560** | **/560** |
| **/600** | **600** | **650** | 23 | 30 | 38 | 1.1 | **710** | 50 | 67 | 85 | 3 | **800** | 90 | 122 | 160 | — | — | — | 5 | — | **900** | 136 | 180 | 236 | — | — | — | 7.5 | — | **1030** | 195 | 258 | 335 | — | — | — | 12 | — | **1220** | 375 | 15 | **600** | **/600** |
| **/630** | **630** | **680** | 23 | 30 | 38 | 1.1 | **750** | 54 | 73 | 95 | 3 | **850** | 100 | 132 | 175 | — | — | — | 6 | — | **950** | 145 | 190 | 250 | — | — | — | 9.5 | — | **1090** | 206 | 280 | 365 | — | — | — | 12 | — | **1280** | 388 | 15 | **630** | **/630** |
| **/670** | **670** | **730** | 27 | 36 | 45 | 1.5 | **800** | 58 | 78 | 105 | 4 | **900** | 103 | 140 | 180 | — | — | — | 6 | — | **1000** | 150 | 200 | 258 | — | — | — | 9.5 | — | **1150** | 218 | 290 | 375 | — | — | — | 15 | — | **1320** | 388 | 15 | **670** | **/670** |
| **/710** | **710** | **780** | 32 | 42 | 53 | 1.5 | **850** | 63 | 85 | 112 | 4 | **950** | 109 | 145 | 190 | — | — | — | 6 | — | **1060** | 160 | 212 | 272 | — | — | — | 9.5 | — | **1220** | 230 | 308 | 400 | — | — | — | 15 | — | **1400** | 412 | 15 | **710** | **/710** |
| **/750** | **750** | **820** | 32 | 42 | 53 | 1.5 | **900** | 67 | 90 | 120 | 4 | **1000** | 112 | 150 | 195 | — | — | — | 6 | — | **1120** | 165 | 224 | 290 | — | — | — | 9.5 | — | **1280** | 236 | 315 | 412 | — | — | — | 15 | — | — | — | — | **750** | **/750** |
| **/800** | **800** | **870** | 32 | 42 | 53 | 1.5 | **950** | 67 | 90 | 120 | 4 | **1060** | 118 | 155 | 205 | — | — | — | 7.5 | — | **1180** | 170 | 230 | 300 | — | — | — | 9.5 | — | **1360** | 250 | 335 | 438 | — | — | — | 15 | — | — | — | — | **800** | **/800** |
| **/850** | **850** | **920** | 32 | 42 | 53 | 1.5 | **1000** | 67 | 90 | 120 | 4 | **1120** | 122 | 160 | 212 | — | — | — | 7.5 | — | **1250** | 180 | 243 | 315 | — | — | — | 12 | — | **1440** | — | 354 | — | — | — | — | 15 | — | — | — | — | **850** | **/850** |
| **/900** | **900** | **980** | 36 | 48 | 63 | 2 | **1060** | 73 | 95 | 130 | 5 | **1180** | 125 | 170 | 220 | — | — | — | 7.5 | — | **1320** | 190 | 250 | 335 | — | — | — | 12 | — | **1520** | — | 372 | — | — | — | — | 15 | — | — | — | — | **900** | **/900** |
| **/950** | **950** | **1030** | 36 | 48 | 63 | 2 | **1120** | 78 | 103 | 135 | 5 | **1250** | 136 | 180 | 236 | — | — | — | 7.5 | — | **1400** | 200 | 272 | 355 | — | — | — | 12 | — | **1600** | — | 390 | — | — | — | — | 15 | — | — | — | — | **950** | **/950** |
| **/1000** | **1000** | **1090** | 41 | 54 | 70 | 2.1 | **1180** | 82 | 109 | 140 | 5 | **1320** | 145 | 190 | 250 | — | — | — | 9.5 | — | **1460** | — | 276 | — | — | — | — | 12 | — | **1670** | — | 402 | — | — | — | — | 15 | — | — | — | — | **1000** | **/1000** |
| **/1060** | **1060** | **1150** | 41 | 54 | 70 | 2.1 | **1250** | 85 | 115 | 150 | 5 | **1400** | 155 | 206 | 265 | — | — | — | 9.5 | — | **1540** | — | 288 | — | — | — | — | 15 | — | **1770** | — | 426 | — | — | — | — | 15 | — | — | — | — | **1060** | **/1060** |
| **/1120** | **1120** | **1220** | 45 | 60 | 80 | 2.1 | **1320** | 90 | 122 | 160 | 5 | **1460** | — | 206 | — | — | — | — | 9.5 | — | **1630** | — | 306 | — | — | — | — | 15 | — | **1860** | — | 444 | — | — | — | — | 15 | — | — | — | — | **1120** | **/1120** |
| **/1180** | **1180** | **1280** | 45 | 60 | 80 | 2.1 | **1400** | 100 | 132 | 175 | 6 | **1520** | — | 206 | — | — | — | — | 9.5 | — | **1710** | — | 318 | — | — | — | — | 15 | — | **1950** | — | 462 | — | — | — | — | 19 | — | — | — | — | **1180** | **/1180** |
| **/1250** | **1250** | **1360** | 50 | 67 | 85 | 3 | **1460** | — | — | 175 | 6 | **1610** | — | 216 | — | — | — | — | 9.5 | — | **1800** | — | 330 | — | — | — | — | 19 | — | **2050** | — | 480 | — | — | — | — | 19 | — | — | — | — | **1250** | **/1250** |
| **/1320** | **1320** | **1440** | — | — | 95 | 3 | **1540** | — | — | 175 | 6 | **1700** | — | 228 | — | — | — | — | 9.5 | — | **1900** | — | 348 | — | — | — | — | 19 | — | **2160** | — | 505 | — | — | — | — | 19 | — | — | — | — | **1320** | **/1320** |
| **/1400** | **1400** | **1520** | — | — | 95 | 3 | **1630** | — | — | 180 | 6 | **1790** | — | 234 | — | — | — | — | 12 | — | **2000** | — | 360 | — | — | — | — | 19 | — | **2280** | — | 530 | — | — | — | — | 19 | — | — | — | — | **1400** | **/1400** |
| **/1500** | **1500** | **1630** | — | — | 105 | 4 | **1750** | — | — | 195 | 6 | **1920** | — | 252 | — | — | — | — | 12 | — | **2140** | — | 384 | — | — | — | — | 19 | — | — | — | — | — | — | — | — | — | — | — | — | — | **1500** | **/1500** |
| **/1600** | **1600** | **1730** | — | — | 105 | 4 | **1850** | — | — | 195 | 6 | **2040** | — | 264 | — | — | — | — | 15 | — | **2270** | — | 402 | — | — | — | — | 19 | — | — | — | — | — | — | — | — | — | — | — | — | — | **1600** | **/1600** |
| **/1700** | **1700** | **1840** | — | — | 112 | 4 | **1970** | — | — | 212 | 7.5 | **2160** | — | 276 | — | — | — | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **1700** | **/1700** |
| **/1800** | **1800** | **1950** | — | — | 120 | 4 | **2080** | — | — | 220 | 7.5 | **2280** | — | 288 | — | — | — | — | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **1800** | **/1800** |
| **/1900** | **1900** | **2060** | — | — | 130 | 5 | **2180** | — | — | 220 | 7.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **1900** | **/1900** |
| **/2000** | **2000** | **2160** | — | — | 130 | 5 | **2300** | — | — | 236 | 7.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **2000** | **/2000** |
| **/2120** | **2120** | **2300** | — | — | 140 | 5 | **2430** | — | — | 243 | 7.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **2120** | **/2120** |
| **/2240** | **2240** | **2430** | — | — | 150 | 5 | **2570** | — | — | 258 | 9.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **2240** | **/2240** |
| **/2360** | **2360** | **2550** | — | — | 150 | 5 | **2700** | — | — | 265 | 9.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **2360** | **/2360** |
| **/2500** | **2500** | **2700** | — | — | 160 | 5 | **2850** | — | — | 272 | 9.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **2500** | **/2500** |

**Remarks**
1. Dimension Series 22, 23, and 24 are double direction bearings.
2. The maximum permissible outside diameter of shaft and central washers and minimum permissible bore diameter of housing washers are omitted here. (Refer to the bearings tables for Thrust Bearings).

## Table 7. 4 Dimensions of Snap Ring Grooves and Locating Snap Rings — (1)
## Bearings of Dimension Series 18 and 19



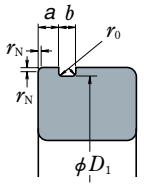

Units: mm

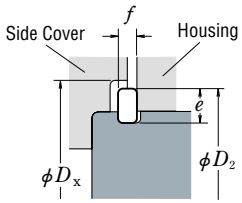
| Applicable Bearings | | | Snap Ring Groove | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | | $D$ | Snap Ring Groove Diameter $D_1$ | | Snap Ring Groove Position $a$ | | | | Snap Ring Groove Width $b$ | | Radius of Bottom Corners $r_0$ |
| | | | | | Bearing Dimension Series | | | | | | |
| Dimension Series | | | | | 18 | | 19 | | | | |
| 18 | 19 | | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| — | 10 | **22** | 20.8 | 20.5 | — | — | 1.05 | 0.9 | 1.05 | 0.8 | 0.2 |
| — | 12 | **24** | 22.8 | 22.5 | — | — | 1.05 | 0.9 | 1.05 | 0.8 | 0.2 |
| — | 15 | **28** | 26.7 | 26.4 | — | — | 1.3 | 1.15 | 1.2 | 0.95 | 0.25 |
| — | 17 | **30** | 28.7 | 28.4 | — | — | 1.3 | 1.15 | 1.2 | 0.95 | 0.25 |
| 20 | — | **32** | 30.7 | 30.4 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| 22 | — | **34** | 32.7 | 32.4 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| 25 | 20 | **37** | 35.7 | 35.4 | 1.3 | 1.15 | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| — | 22 | **39** | 37.7 | 37.4 | — | — | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 28 | — | **40** | 38.7 | 38.4 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| 30 | 25 | **42** | 40.7 | 40.4 | 1.3 | 1.15 | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 32 | — | **44** | 42.7 | 42.4 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| — | 28 | **45** | 43.7 | 43.4 | — | — | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 35 | 30 | **47** | 45.7 | 45.4 | 1.3 | 1.15 | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 40 | 32 | **52** | 50.7 | 50.4 | 1.3 | 1.15 | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| — | 35 | **55** | 53.7 | 53.4 | — | — | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 45 | — | **58** | 56.7 | 56.4 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| — | 40 | **62** | 60.7 | 60.3 | — | — | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 50 | — | **65** | 63.7 | 63.3 | 1.3 | 1.15 | — | — | 1.2 | 0.95 | 0.25 |
| — | 45 | **68** | 66.7 | 66.3 | — | — | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 55 | 50 | **72** | 70.7 | 70.3 | 1.7 | 1.55 | 1.7 | 1.55 | 1.2 | 0.95 | 0.25 |
| 60 | — | **78** | 76.2 | 75.8 | 1.7 | 1.55 | — | — | 1.6 | 1.3 | 0.4 |
| — | 55 | **80** | 77.9 | 77.5 | — | — | 2.1 | 1.9 | 1.6 | 1.3 | 0.4 |
| 65 | 60 | **85** | 82.9 | 82.5 | 1.7 | 1.55 | 2.1 | 1.9 | 1.6 | 1.3 | 0.4 |
| 70 | 65 | **90** | 87.9 | 87.5 | 1.7 | 1.55 | 2.1 | 1.9 | 1.6 | 1.3 | 0.4 |
| 75 | — | **95** | 92.9 | 92.5 | 1.7 | 1.55 | — | — | 1.6 | 1.3 | 0.4 |
| 80 | 70 | **100** | 97.9 | 97.5 | 1.7 | 1.55 | 2.5 | 2.3 | 1.6 | 1.3 | 0.4 |
| — | 75 | **105** | 102.6 | 102.1 | — | — | 2.5 | 2.3 | 1.6 | 1.3 | 0.4 |
| 85 | 80 | **110** | 107.6 | 107.1 | 2.1 | 1.9 | 2.5 | 2.3 | 1.6 | 1.3 | 0.4 |
| 90 | — | **115** | 112.6 | 112.1 | 2.1 | 1.9 | — | — | 1.6 | 1.3 | 0.4 |
| 95 | 85 | **120** | 117.6 | 117.1 | 2.1 | 1.9 | 3.3 | 3.1 | 1.6 | 1.3 | 0.4 |
| 100 | 90 | **125** | 122.6 | 122.1 | 2.1 | 1.9 | 3.3 | 3.1 | 1.6 | 1.3 | 0.4 |
| 105 | 95 | **130** | 127.6 | 127.1 | 2.1 | 1.9 | 3.3 | 3.1 | 1.6 | 1.3 | 0.4 |
| 110 | 100 | **140** | 137.6 | 137.1 | 2.5 | 2.3 | 3.3 | 3.1 | 2.2 | 1.9 | 0.6 |
| — | 105 | **145** | 142.6 | 142.1 | — | — | 3.3 | 3.1 | 2.2 | 1.9 | 0.6 |
| 120 | 110 | **150** | 147.6 | 147.1 | 2.5 | 2.3 | 3.3 | 3.1 | 2.2 | 1.9 | 0.6 |
| 130 | 120 | **165** | 161.8 | 161.3 | 3.3 | 3.1 | 3.7 | 3.5 | 2.2 | 1.9 | 0.6 |
| 140 | — | **175** | 171.8 | 171.3 | 3.3 | 3.1 | — | — | 2.2 | 1.9 | 0.6 |
| — | 130 | **180** | 176.8 | 176.3 | — | — | 3.7 | 3.5 | 2.2 | 1.9 | 0.6 |
| 150 | 140 | **190** | 186.8 | 186.3 | 3.3 | 3.1 | 3.7 | 3.5 | 2.2 | 1.9 | 0.6 |
| 160 | — | **200** | 196.8 | 196.3 | 3.3 | 3.1 | — | — | 2.2 | 1.9 | 0.6 |

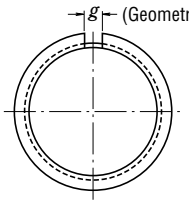
| Locating Snap Ring | | | | | | | Side Cover |
|---|---|---|---|---|---|---|---|
| Locating Snap Ring Number | Cross Sectional Height $e$ | | Thickness $f$ | | Geometry of snap ring fitted in groove (Reference) Slit Width $g$ | Snap Ring Outside Diameter $D_2$ | Stepped Bore Diameter (Reference) $D_X$ |
| | max. | min. | max. | min. | approx. | max. | min. |
| **NR 1022** | 2.0 | 1.85 | 0.7 | 0.6 | 2 | 24.8 | 25.5 |
| **NR 1024** | 2.0 | 1.85 | 0.7 | 0.6 | 2 | 26.8 | 27.5 |
| **NR 1028** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 30.8 | 31.5 |
| **NR 1030** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 32.8 | 33.5 |
| **NR 1032** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 34.8 | 35.5 |
| **NR 1034** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 36.8 | 37.5 |
| **NR 1037** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 39.8 | 40.5 |
| **NR 1039** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 41.8 | 42.5 |
| **NR 1040** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 42.8 | 43.5 |
| **NR 1042** | 2.05 | 1.9 | 0.85 | 0.75 | 3 | 44.8 | 45.5 |
| **NR 1044** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 46.8 | 47.5 |
| **NR 1045** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 47.8 | 48.5 |
| **NR 1047** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 49.8 | 50.5 |
| **NR 1052** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 54.8 | 55.5 |
| **NR 1055** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 57.8 | 58.5 |
| **NR 1058** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 60.8 | 61.5 |
| **NR 1062** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 64.8 | 65.5 |
| **NR 1065** | 2.05 | 1.9 | 0.85 | 0.75 | 4 | 67.8 | 68.5 |
| **NR 1068** | 2.05 | 1.9 | 0.85 | 0.75 | 5 | 70.8 | 72 |
| **NR 1072** | 2.05 | 1.9 | 0.85 | 0.75 | 5 | 74.8 | 76 |
| **NR 1078** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 82.7 | 84 |
| **NR 1080** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 84.4 | 86 |
| **NR 1085** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 89.4 | 91 |
| **NR 1090** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 94.4 | 96 |
| **NR 1095** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 99.4 | 101 |
| **NR 1100** | 3.25 | 3.1 | 1.12 | 1.02 | 5 | 104.4 | 106 |
| **NR 1105** | 4.04 | 3.89 | 1.12 | 1.02 | 5 | 110.7 | 112 |
| **NR 1110** | 4.04 | 3.89 | 1.12 | 1.02 | 5 | 115.7 | 117 |
| **NR 1115** | 4.04 | 3.89 | 1.12 | 1.02 | 5 | 120.7 | 122 |
| **NR 1120** | 4.04 | 3.89 | 1.12 | 1.02 | 7 | 125.7 | 127 |
| **NR 1125** | 4.04 | 3.89 | 1.12 | 1.02 | 7 | 130.7 | 132 |
| **NR 1130** | 4.04 | 3.89 | 1.12 | 1.02 | 7 | 135.7 | 137 |
| **NR 1140** | 4.04 | 3.89 | 1.7 | 1.6 | 7 | 145.7 | 147 |
| **NR 1145** | 4.04 | 3.89 | 1.7 | 1.6 | 7 | 150.7 | 152 |
| **NR 1150** | 4.04 | 3.89 | 1.7 | 1.6 | 7 | 155.7 | 157 |
| **NR 1165** | 4.85 | 4.7 | 1.7 | 1.6 | 7 | 171.5 | 173 |
| **NR 1175** | 4.85 | 4.7 | 1.7 | 1.6 | 10 | 181.5 | 183 |
| **NR 1180** | 4.85 | 4.7 | 1.7 | 1.6 | 10 | 186.5 | 188 |
| **NR 1190** | 4.85 | 4.7 | 1.7 | 1.6 | 10 | 196.5 | 198 |
| **NR 1200** | 4.85 | 4.7 | 1.7 | 1.6 | 10 | 206.5 | 208 |

**Remarks** The minimum permissible chamfer dimensions $r_N$ on the snap-ring-groove side of the outer rings are as follows:
Dimension series 18 : For outside diameters of 78mm and less, use 0.3mm chamfer.
For all others exceeding 78mm, use 0.5mm chamfer.
Dimension series 19 : For outside diameters of 24mm and less, use 0.2mm chamfer.
For 47mm and less, use 0.3mm chamfer.
For all others exceeding 47mm, use 0.5mm chamfer.

## Table 7. 4 Dimensions of Snap Ring Grooves and Locating Snap Rings — (2)
## Bearing of Diameter Series 0, 2, 3, and 4




Units: mm

| Applicable Bearings | | | | | Snap Ring Groove | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | | | | $D$ | Snap Ring Groove Diameter $D_1$ | | Snap Ring Groove Position $a$ | | | | Snap Ring Groove Width $b$ | | Radius of Bottom Corners $r_0$ |
| | | | | | | | Bearing Diameter Series | | | | | | |
| Diameter Series | | | | | | | 0 | | 2, 3, 4 | | | | |
| 0 | 2 | 3 | 4 | | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| 10 | — | — | — | **26** | 24.5 | 24.25 | 1.35 | 1.19 | — | — | 1.17 | 0.87 | 0.2 |
| 12 | — | — | — | **28** | 26.5 | 26.25 | 1.35 | 1.19 | — | — | 1.17 | 0.87 | 0.2 |
| — | 10 | 9 | 8 | **30** | 28.17 | 27.91 | — | — | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| 15 | 12 | — | 9 | **32** | 30.15 | 29.9 | 2.06 | 1.9 | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| 17 | 15 | 10 | — | **35** | 33.17 | 32.92 | 2.06 | 1.9 | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| — | — | 12 | 10 | **37** | 34.77 | 34.52 | — | — | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| — | 17 | — | — | **40** | 38.1 | 37.85 | — | — | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| 20 | — | 15 | 12 | **42** | 39.75 | 39.5 | 2.06 | 1.9 | 2.06 | 1.9 | 1.65 | 1.35 | 0.4 |
| 22 | — | — | — | **44** | 41.75 | 41.5 | 2.06 | 1.9 | — | — | 1.65 | 1.35 | 0.4 |
| 25 | 20 | 17 | — | **47** | 44.6 | 44.35 | 2.06 | 1.9 | 2.46 | 2.31 | 1.65 | 1.35 | 0.4 |
| — | 22 | — | — | **50** | 47.6 | 47.35 | — | — | 2.46 | 2.31 | 1.65 | 1.35 | 0.4 |
| 28 | 25 | 20 | 15 | **52** | 49.73 | 49.48 | 2.06 | 1.9 | 2.46 | 2.31 | 1.65 | 1.35 | 0.4 |
| 30 | — | — | — | **55** | 52.6 | 52.35 | 2.08 | 1.88 | — | — | 1.65 | 1.35 | 0.4 |
| — | — | 22 | — | **56** | 53.6 | 53.35 | — | — | 2.46 | 2.31 | 1.65 | 1.35 | 0.4 |
| 32 | 28 | — | — | **58** | 55.6 | 55.35 | 2.08 | 1.88 | 2.46 | 2.31 | 1.65 | 1.35 | 0.4 |
| 35 | 30 | 25 | 17 | **62** | 59.61 | 59.11 | 2.08 | 1.88 | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| — | 32 | — | — | **65** | 62.6 | 62.1 | — | — | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| 40 | — | 28 | — | **68** | 64.82 | 64.31 | 2.49 | 2.29 | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| — | 35 | 30 | 20 | **72** | 68.81 | 68.3 | — | — | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| 45 | — | 32 | — | **75** | 71.83 | 71.32 | 2.49 | 2.29 | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| 50 | 40 | 35 | 25 | **80** | 76.81 | 76.3 | 2.49 | 2.29 | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| — | 45 | — | — | **85** | 81.81 | 81.31 | — | — | 3.28 | 3.07 | 2.2 | 1.9 | 0.6 |
| 55 | 50 | 40 | 30 | **90** | 86.79 | 86.28 | 2.87 | 2.67 | 3.28 | 3.07 | 3 | 2.7 | 0.6 |
| 60 | — | — | — | **95** | 91.82 | 91.31 | 2.87 | 2.67 | — | — | 3 | 2.7 | 0.6 |
| 65 | 55 | 45 | 35 | **100** | 96.8 | 96.29 | 2.87 | 2.67 | 3.28 | 3.07 | 3 | 2.7 | 0.6 |
| 70 | 60 | 50 | 40 | **110** | 106.81 | 106.3 | 2.87 | 2.67 | 3.28 | 3.07 | 3 | 2.7 | 0.6 |
| 75 | — | — | — | **115** | 111.81 | 111.3 | 2.87 | 2.67 | — | — | 3 | 2.7 | 0.6 |
| — | 65 | 55 | 45 | **120** | 115.21 | 114.71 | — | — | 4.06 | 3.86 | 3.4 | 3.1 | 0.6 |
| 80 | 70 | — | — | **125** | 120.22 | 119.71 | 2.87 | 2.67 | 4.06 | 3.86 | 3.4 | 3.1 | 0.6 |
| 85 | 75 | 60 | 50 | **130** | 125.22 | 124.71 | 2.87 | 2.67 | 4.06 | 3.86 | 3.4 | 3.1 | 0.6 |
| 90 | 80 | 65 | 55 | **140** | 135.23 | 134.72 | 3.71 | 3.45 | 4.9 | 4.65 | 3.4 | 3.1 | 0.6 |
| 95 | — | — | — | **145** | 140.23 | 139.73 | 3.71 | 3.45 | — | — | 3.4 | 3.1 | 0.6 |
| 100 | 85 | 70 | 60 | **150** | 145.24 | 144.73 | 3.71 | 3.45 | 4.9 | 4.65 | 3.4 | 3.1 | 0.6 |
| 105 | 90 | 75 | 65 | **160** | 155.22 | 154.71 | 3.71 | 3.45 | 4.9 | 4.65 | 3.4 | 3.1 | 0.6 |
| 110 | 95 | 80 | — | **170** | 163.65 | 163.14 | 3.71 | 3.45 | 5.69 | 5.44 | 3.8 | 3.5 | 0.6 |
| 120 | 100 | 85 | 70 | **180** | 173.66 | 173.15 | 3.71 | 3.45 | 5.69 | 5.44 | 3.8 | 3.5 | 0.6 |
| — | 105 | 90 | 75 | **190** | 183.64 | 183.13 | — | — | 5.69 | 5.44 | 3.8 | 3.5 | 0.6 |
| 130 | 110 | 95 | 80 | **200** | 193.65 | 193.14 | 5.69 | 5.44 | 5.69 | 5.44 | 3.8 | 3.5 | 0.6 |

| Locating Snap Ring | | | | | | | Side Cover |
|---|---|---|---|---|---|---|---|
| Locating Snap Ring Number | Cross Sectional Height $e$ | | Thickness $f$ | | Geometry of snap ring fitted in groove (Reference) | | Stepped Bore Diameter (Reference) $D_X$ |
| | | | | | Slit Width $g$ | Snap Ring Outside Diameter $D_2$ | |
| | max. | min. | max. | min. | approx. | max. | min. |
| **NR 26** (1) | 2.06 | 1.91 | 0.84 | 0.74 | 3 | 28.7 | 29.4 |
| **NR 28** (1) | 2.06 | 1.91 | 0.84 | 0.74 | 3 | 30.7 | 31.4 |
| **NR 30** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 34.7 | 35.5 |
| **NR 32** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 36.7 | 37.5 |
| **NR 35** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 39.7 | 40.5 |
| **NR 37** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 41.3 | 42 |
| **NR 40** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 44.6 | 45.5 |
| **NR 42** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 46.3 | 47 |
| **NR 44** | 3.25 | 3.1 | 1.12 | 1.02 | 3 | 48.3 | 49 |
| **NR 47** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 52.7 | 53.5 |
| **NR 50** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 55.7 | 56.5 |
| **NR 52** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 57.9 | 58.5 |
| **NR 55** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 60.7 | 61.5 |
| **NR 56** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 61.7 | 62.5 |
| **NR 58** | 4.04 | 3.89 | 1.12 | 1.02 | 4 | 63.7 | 64.5 |
| **NR 62** | 4.04 | 3.89 | 1.7 | 1.6 | 4 | 67.7 | 68.5 |
| **NR 65** | 4.04 | 3.89 | 1.7 | 1.6 | 4 | 70.7 | 71.5 |
| **NR 68** | 4.85 | 4.7 | 1.7 | 1.6 | 5 | 74.6 | 76 |
| **NR 72** | 4.85 | 4.7 | 1.7 | 1.6 | 5 | 78.6 | 80 |
| **NR 75** | 4.85 | 4.7 | 1.7 | 1.6 | 5 | 81.6 | 83 |
| **NR 80** | 4.85 | 4.7 | 1.7 | 1.6 | 5 | 86.6 | 88 |
| **NR 85** | 4.85 | 4.7 | 1.7 | 1.6 | 5 | 91.6 | 93 |
| **NR 90** | 4.85 | 4.7 | 2.46 | 2.36 | 5 | 96.5 | 98 |
| **NR 95** | 4.85 | 4.7 | 2.46 | 2.36 | 5 | 101.6 | 103 |
| **NR 100** | 4.85 | 4.7 | 2.46 | 2.36 | 5 | 106.5 | 108 |
| **NR 110** | 4.85 | 4.7 | 2.46 | 2.36 | 5 | 116.6 | 118 |
| **NR 115** | 4.85 | 4.7 | 2.46 | 2.36 | 5 | 121.6 | 123 |
| **NR 120** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 129.7 | 131.5 |
| **NR 125** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 134.7 | 136.5 |
| **NR 130** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 139.7 | 141.5 |
| **NR 140** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 149.7 | 152 |
| **NR 145** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 154.7 | 157 |
| **NR 150** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 159.7 | 162 |
| **NR 160** | 7.21 | 7.06 | 2.82 | 2.72 | 7 | 169.7 | 172 |
| **NR 170** | 9.6 | 9.45 | 3.1 | 3 | 10 | 182.9 | 185 |
| **NR 180** | 9.6 | 9.45 | 3.1 | 3 | 10 | 192.9 | 195 |
| **NR 190** | 9.6 | 9.45 | 3.1 | 3 | 10 | 202.9 | 205 |
| **NR 200** | 9.6 | 9.45 | 3.1 | 3 | 10 | 212.9 | 215 |

**Note** (1) The locating snap rings and snap ring grooves of these bearings are not specified by ISO.

**Remarks** 1. The dimensions of these snap ring grooves are not applicable to bearings of dimension series 00, 82, and 83.
2. The minimum permissible chamfer dimension $r_N$ on the snap-ring side of outer rings is 0.5mm. However, for bearings of diameter series 0 having outside diameters 35mm and below, it is 0.3mm.

## 7.2 Formulation of Bearing Numbers

Bearing numbers are alphanumeric combinations that indicate the bearing type, boundary dimensions, dimensional and running accuracies, internal clearance, and other related specifications. They consist of basic numbers and supplementary symbols. The boundary dimensions of commonly used bearings mostly conform to the organizational concept of ISO, and the bearing numbers of these standard bearings are specified by JIS B 1513 (Bearing Numbers for Rolling Bearings). Due to a need for more detailed classification, NSK uses auxiliary symbols other than those specified by JIS.

Bearing numbers consist of a basic number and supplementary symbols. The basic number indicates the bearing series(type) and the width and diameter series as shown in Table 7.5. Basic numbers, supplementary symbols, and the meanings of common numbers and symbols are listed in Table 7.6 (Pages A56 and A57). The contact angle symbols and other supplementary designations are shown in successive columns from left to right in Table 7.6. For reference, some examples of bearing designations are shown here:

(Example 1) **6 3 0 8 ZZ C3**

- Radial Clearance **C3** (Internal Clearance Symbol)
- Shields on Both Sides (Shield Symbol)
- Bearing Bore **40mm** (Bore Number)
- Diameter Series **3** } Bearing Series Symbol
- Single-Row Deep Groove Ball Bearing } Bearing Series Symbol

(Example 2) **7 2 2 0 A DB C3**

- Axial Clearance **C3**
- Back-to-Back Arrangement
- Contact Angle **30°**
- Bearing Bore **100mm**
- Diameter Series **2**
- Single-Row Angular Contact Ball Bearing

(Example 3) **1 2 0 6 K +H206X**

- Adapter with **25 mm** Bore
- Tapered Bore (Taper **1:12**)
- Bearing Bore **30mm**
- Diameter Series **2**
- Self-Aligning Ball Bearing

(Example 4) **NU 3 1 8 M CM**

- Radial Clearance for Electric-Motor Bearings **CM**
- Machined Brass Cage
- Bearing Bore **90mm**
- Diameter Series **3**
- **NU** Type Cylindrical Roller Bearing

(Example 5) **NN 3 0 1 7 K CC1 P4**

- Accuracy of ISO **Class 4**
- Radial Clearance in Non-Interchangeable Cylindrical Roller Bearings **CC1**
- Tapered Bore (Taper **1:12**)
- Bearing Bore **85mm**
- Diameter Series **0**
- Width Series **3**
- **NN** Type Cylindrical Roller Bearing

(Example 6) **HR 3 0 2 0 7 J**

- Small Diameter of Cup Raceway and Contact Angle Conform to ISO
- Bearing Bore **35mm**
- Diameter Series **2**
- Width Series **0**
- Tapered Roller Bearing
- High Capacity Bearing

(Example 7) **2 4 0 /1000 M K30 E4 C3**

- Radial Clearance **C3**
- Outer Ring with Oil Groove and Oil Holes
- Tapered Bore (Taper **1:30**)
- Machined Brass Cage
- Bearing Bore **1000mm**
- Diameter Series **0**
- Width Series **4**
- Spherical Roller Bearing

(Example 8) **5 1 2 1 5**

- Bearing Bore **75mm**
- Diameter Series **2**
- Height Series **1**
- Thrust Ball Bearing

**Table 7. 5 Bearing Series Symbols**

| Bearing Type | Bearing Series Symbols | Type Symbols | Dimension Symbols: Width Symbols | Dimension Symbols: Diameter Symbols |
|---|---|---|---|---|
| Single-Row Deep Groove Ball Bearings | **68** | 6 | (1) | 8 |
| | **69** | 6 | (1) | 9 |
| | **60** | 6 | (1) | 0 |
| | **62** | 6 | (0) | 2 |
| | **63** | 6 | (0) | 3 |
| Single-Row Angular Contact Ball Bearings | **79** | 7 | (1) | 9 |
| | **70** | 7 | (1) | 0 |
| | **72** | 7 | (0) | 2 |
| | **73** | 7 | (0) | 3 |
| Self-Aligning Ball Bearings | **12** | 1 | (0) | 2 |
| | **13** | 1 | (0) | 3 |
| | **22** | (1) | 2 | 2 |
| | **23** | (1) | 2 | 3 |
| Single-Row Cylindrical Roller Bearings | **NU10** | NU | 1 | 0 |
| | **NU2** | NU | (0) | 2 |
| | **NU22** | NU | 2 | 2 |
| | **NU3** | NU | (0) | 3 |
| | **NU23** | NU | 2 | 3 |
| | **NU4** | NU | (0) | 4 |
| | **NJ2** | NJ | (0) | 2 |
| | **NJ22** | NJ | 2 | 2 |
| | **NJ3** | NJ | (0) | 3 |
| | **NJ23** | NJ | 2 | 3 |
| | **NJ4** | NJ | (0) | 4 |
| | **NUP2** | NUP | (0) | 2 |
| | **NUP22** | NUP | 2 | 2 |
| | **NUP3** | NUP | (0) | 3 |
| | **NUP23** | NUP | 2 | 3 |
| | **NUP4** | NUP | (0) | 4 |
| | **N10** | N | 1 | 0 |
| | **N2** | N | (0) | 2 |
| | **N3** | N | (0) | 3 |
| | **N4** | N | (0) | 4 |
| | **NF2** | NF | (0) | 2 |
| | **NF3** | NF | (0) | 3 |
| | **NF4** | NF | (0) | 4 |

| Bearing Type | Bearing Series Symbols | Type Symbols | Dimension Symbols: Width Symbols or Height Symbols | Dimension Symbols: Diameter Symbols |
|---|---|---|---|---|
| Double-Row Cylindrical Roller Bearings | **NNU49** | NNU | 4 | 9 |
| | **NN30** | NN | 3 | 0 |
| Needle Roller Bearings | **NA48** | NA | 4 | 8 |
| | **NA49** | NA | 4 | 9 |
| | **NA59** | NA | 5 | 9 |
| | **NA69** | NA | 6 | 9 |
| Tapered Roller Bearings | **329** | 3 | 2 | 9 |
| | **320** | 3 | 2 | 0 |
| | **330** | 3 | 3 | 0 |
| | **331** | 3 | 3 | 1 |
| | **302** | 3 | 0 | 2 |
| | **322** | 3 | 2 | 2 |
| | **332** | 3 | 3 | 2 |
| | **303** | 3 | 0 | 3 |
| | **323** | 3 | 2 | 3 |
| Spherical Roller Bearings | **230** | 2 | 3 | 0 |
| | **231** | 2 | 3 | 1 |
| | **222** | 2 | 2 | 2 |
| | **232** | 2 | 3 | 2 |
| | **213** (1) | 2 | 0 | 3 |
| | **223** | 2 | 2 | 3 |
| Thrust Ball Bearings with Flat Seats | **511** | 5 | 1 | 1 |
| | **512** | 5 | 1 | 2 |
| | **513** | 5 | 1 | 3 |
| | **514** | 5 | 1 | 4 |
| | **522** | 5 | 2 | 2 |
| | **523** | 5 | 2 | 3 |
| | **524** | 5 | 2 | 4 |
| Spherical Thrust Roller Bearings | **292** | 2 | 9 | 2 |
| | **293** | 2 | 9 | 3 |
| | **294** | 2 | 9 | 4 |

**Note** (1) Bearing Series Symbol 213 should logically be 203, but customarily it is numbered 213.
**Remarks** Numbers in ( ) in the column of width symbols are usually omitted from the bearing number.

**Table 7. 6 Formulation of Bearing Numbers**

## Basic Numbers

### Bearing Series Symbols (1)

| Symbol | Meaning |
|---|---|
| 68<br>69<br>60<br>: | Single-Row Deep Groove Ball Bearings |
| 70<br>72<br>73<br>: | Single-Row Angular Contact Ball Bearings |
| 12<br>13<br>22<br>: | Self-Aligning Ball Bearings |
| NU10<br>NJ 2<br>N 3<br>NN 30<br>: | Cylindrical Roller Bearings |
| NA48<br>NA49<br>NA69<br>: | Needle Roller Bearings |
| 320<br>322<br>323<br>: | Tapered Roller Bearings (2) |
| 230<br>222<br>223<br>: | Spherical Roller Bearings |
| 511<br>512<br>513<br>: | Thrust Ball Bearing with Flat Seats |
| 292<br>293<br>294<br>: | Thrust Spherical Roller Bearings |
| HR(4) | High Capacity Tapered Roller Bearings, and others |

### Bore Number

| Symbol | Meaning (Bearing Bore 1mm) |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| ⋮ | ⋮ |
| 9 | 9 |
| 00 | 10 |
| 01 | 12 |
| 02 | 15 |
| 03 | 17 |
| /22 | 22 |
| /28 | 28 |
| /32 | 32 |
| 04(3) | 20 |
| 05 | 25 |
| 06 | 30 |
| ⋮ | ⋮ |
| 88 | 440 |
| 92 | 460 |
| 96 | 480 |
| /500 | 500 |
| /530 | 530 |
| /560 | 560 |
| ⋮ | ⋮ |
| /2 360 | 2 360 |
| /2 500 | 2 500 |

### Contact Angle Symbol

(Angular Contact Ball Bearings)

| Symbol | Meaning |
|---|---|
| A | Standard Contact Angle of 30° |
| A5 | Standard Contact Angle of 25° |
| B | Standard Contact Angle of 40° |
| C | Standard Contact Angle of 15° |

(Tapered Roller Bearings)

| Symbol | Meaning |
|---|---|
| Omitted | Contact Angle Less than 17° |
| C | Contact Angle about 20° |
| D | Contact Angle about 28° |

### Internal Design Symbol

| Symbol | Meaning |
|---|---|
| A | Internal Design Differs from Standard One |
| J | Smaller Diameter of Outer Ring Raceway, Contact Angle, and Outer Ring Width of Tapered Roller Bearings Conform to ISO 355 |

(For High Capacity Bearings)

| Symbol | Meaning |
|---|---|
| C<br>CA<br>CD<br>EA | Spherical Roller Bearings |
| E | Cylindrical Roller Bearings |
| E | Spherical Thrust Roller Bearings |

### Material Symbol

| Symbol | Meaning |
|---|---|
| g | Case-Hardened Steel Used in Rings, Rolling Elements |
| h | Stainless Steel Used in Rings, Rolling Elements |

### Cage Symbol

| Symbol | Meaning |
|---|---|
| M | Machined Brass Cage |
| W | Pressed Steel Cage |
| T | Synthetic Resin Cage |
| V | Without Cage |

### External Features Seals, Shields Symbol

| Symbol | Meaning |
|---|---|
| Z<br>ZS | Shield on One Side Only |
| ZZ<br>ZZS | Shields on Both Sides |
| DU | Contact Rubber Seal on One Side Only |
| DDU | Contact Rubber Seals on Both Sides |
| V | Non-Contact Rubber Seal on One Side Only |
| VV | Non-Contact Rubber Seals on Both Sides |

Symbols and Numbers Conform to JIS(5) | NSK Symbol | NSK Symbol

Marked on Bearings | Not Marked on Bearings

## Auxiliary Symbols

### Symbol for Design of Rings

| Symbol | Meaning |
|---|---|
| K | Tapered Bore of Inner Ring (Taper 1:12) |
| K30 | Tapered Bore of Inner Ring (Taper 1:30) |
| E | Notch or Lubricating Groove in Ring |
| E4 | Lubricating Groove in Outside Surface and Holes in Outer Ring |
| N | Snap Ring Groove in Outer Ring |
| NR | Snap Ring Groove with Snap Ring in Outer Ring |

### Arrangement Symbol

| Symbol | Meaning |
|---|---|
| DB | Back-to-Back Arrangement |
| DF | Face-to-Face Arrangement |
| DT | Tandem Arrangement |

### Internal Clearance Symbol Preload Symbol

| Symbol | Meaning (radial clearance) |
|---|---|
| C1 | Clearance Less than C2 |
| C2 | Clearance Less than CN |
| Omitted | CN Clearance |
| C3 | Clearance Greater than CN |
| C4 | Clearance Greater than C3 |
| C5 | Clearance Greater than C4 |

For All Radial Brgs.

| Symbol | Meaning |
|---|---|
| CC1 | Clearance Less than CC2 |
| CC2 | Clearance Less than CC |
| CC | Normal Clearance |
| CC3 | Clearance Greater than CC |
| CC4 | Clearance Greater than CC3 |
| CC5 | Clearance Greater than CC4 |

For Non-Interchangeable Cylindrical Roller Brgs.

| Symbol | Meaning |
|---|---|
| MC1 | Clearance Less than MC2 |
| MC2 | Clearance Less than MC3 |
| MC3 | Normal Clearance |
| MC4 | Clearance Greater than MC3 |
| MC5 | Clearance Greater than MC4 |
| MC6 | Clearance Greater than MC5 |

For Extra-Small and Miniature Ball Brgs.

| Symbol | Meaning |
|---|---|
| CM | Clearance in Deep Groove Ball Bearings for Electric Motors |
| CT<br>CM | Clearance in Cylindrical Roller Bearings for Electric Motors |

(Preload of Angular Contact Ball Bearing)

| Symbol | Meaning |
|---|---|
| EL | Extra light Preload |
| L | Light Preload |
| M | Medium Preload |
| H | Heavy Preload |

### Tolerance Class Symbol

| Symbol | Meaning |
|---|---|
| Omitted | ISO Normal |
| P6 | ISO Class 6 |
| P6X | ISO Class 6X |
| P5 | ISO Class 5 |
| P4 | ISO Class 4 |
| P2 | ISO Class 2 |

(ABMA(7) Tapered roller bearing)

| Symbol | Meaning |
|---|---|
| Omitted | Class 4 |
| PN2 | Class 2 |
| PN3 | Class 3 |
| PN0 | Class 0 |
| PN00 | Class 00 |

### Special Specification Symbol

(Bearings treated for Dimensional Stabilization)

| Symbol | Meaning |
|---|---|
| X26 | Working Temperature Lower than 150°C |
| X28 | Working Temperature Lower than 200°C |
| X29 | Working Temperature Lower than 250°C |

(Spherical Roller Bearings)

| Symbol | Meaning |
|---|---|
| S11 | Dimensional Stabilizing Treatment Working Temperature Lower than 200°C |

### Spacer or Sleeve Symbol

| Symbol | Meaning |
|---|---|
| +K | Bearings with Outer Ring Spacers |
| +L | Bearings with Inner Ring Spacers |
| +KL | Bearings with Both Inner and Outer Ring Spacers |
| H | Adapter Designation |
| AH | Withdrawal Sleeve Designation |
| HJ | Thrust Collar Designation |

### Grease Symbol

| Symbol | Meaning |
|---|---|
| AS2 | Shell Alvania Grease S2 |
| ENS | ENS Grease |
| NS7 | NS Hi-lube |
| PS2 | Multemp PS No. 2 |

Partially the same as JIS(5) | Same as JIS(5) | NSK Symbol | Partially the same as JIS(5)/BAS(6) | Same as JIS(5) | NSK Symbol, Partially the same as JIS(5)

In Principle, Marked on Bearings | Not Marked on Bearings

**Notes** (1) Bearing Series Symbols conform to Table 7.5.
(2) For basic numbers of tapered roller bearings in ISO's new series, refer to Page B111.
(3) For Bearing Bore Numbers 04 through 96, five times the bore number gives the bore size (mm) (except double-direction thrust ball bearings).
(4) HR is prefix to bearing series symbols and it is NSK's original prefix.
(5) JIS : Japanese Industrial Standards.
(6) BAS : The Japan Bearing Industrial Association Standard.
(7) ABMA : The American Bearing Manufacturers Association.

# 8. BEARING TOLERANCES

## 8.1 Bearing Tolerance Standards

The tolerances for the boundary dimensions and running accuracy of rolling bearings are specified by ISO 492/199/582 (Accuracies of Rolling Bearings). Tolerances are specified for the following items:

Regarding bearing accuracy classes, besides ISO normal accuracy, as the accuracy improves there are Class 6X (for tapered roller bearings), Class 6, Class 5, Class 4, and Class 2, with Class 2 being the highest in ISO. The applicable accuracy classes for each bearing type and the correspondence of these classes are shown in Table 8.1.

- Accuracy of Rolling Bearings
  - Tolerances for Dimensions (Items necessary to mount bearings on shafts or in housings)
    - Tolerances for bore and outside diameters, ring width and bearing width
    - Tolerances for inscribed and circumscribed circle diameters of rollers
    - Tolerances for chamfer dimensions
    - Tolerances for width variation
    - Tolerances for tapered bore diameters
  - Running Accuracy (Items necessary to specify the runout of rotating machine parts)
    - Permissible radial runout of inner and outer rings
    - Permissible face runout with raceway inner and outer rings
    - Permissible inner ring face runout with bore
    - Permissible outer ring variation of outside surface generatrix inclination with face
    - Permissible raceway to back face thickness variation of thrust bearings

**Table 8. 1 Bearing Types and Tolerance Classes**

| Bearing Types | | Applicable Tolerance Classes | | | | | Applicable Tables | Reference Pages |
|---|---|---|---|---|---|---|---|---|
| Deep Groove Ball Bearings | | Normal | Class 6 | Class 5 | Class 4 | Class 2 | Table 8.2 | A60 to A63 |
| Angular Contact Ball Bearings | | Normal | Class 6 | Class 5 | Class 4 | Class 2 | | |
| Self-Aligning Ball Bearings | | Normal | Class 6 equivalent | Class 5 equivalent | — | — | | |
| Cylindrical Roller Bearings | | Normal | Class 6 | Class 5 | Class 4 | Class 2 | | |
| Needle Roller Bearings (solid type) | | Normal | Class 6 | Class 5 | Class 4 | — | | |
| Spherical Roller Bearings | | Normal | Class 6 | Class 5 | — | — | | |
| Tapered Roller Bearings | Metric Design | Normal Class 6X | — | Class 5 | Class 4 | — | Table 8.3 | A64 to A67 |
| | Inch Design | ANSI/ABMA CLASS 4 | ANSI/ABMA CLASS 2 | ANSI/ABMA CLASS 3 | ANSI/ABMA CLASS 0 | ANSI/ABMA CLASS 00 | Table 8.4 | A68 and A69 |
| Magneto Bearings | | Normal | Class 6 | Class 5 | — | — | Table 8.5 | A70 and A71 |
| Thrust Ball Bearings | | Normal | Class 6 | Class 5 | Class 4 | — | Table 8.4 | A72 to A74 |
| Thrust Spherical Roller Bearings | | Normal | — | — | — | — | Table 8.7 | A75 |
| Equivalent standards (Reference) JIS(1) | | Class 0 | Class 6 | Class 5 | Class 4 | Class 2 | — | — |
| DIN(2) | | P0 | P6 | P5 | P4 | P2 | — | — |
| ANSI/ABMA(3) | Ball Bearings | ABEC 1 | ABEC 3 | ABEC 5 (CLASS 5P) | ABEC 7 (CLASS 7P) | ABEC 9 (CLASS 9P) | Table 8.2 [Table 8.8] | A60 to A63 (A76 and A77) |
| | Roller Bearings | RBEC 1 | RBEC 3 | RBEC 5 | — | — | | |
| | Tapered Roller Bearings | CLASS 4 | CLASS 2 | CLASS 3 | CLASS 0 | CLASS 00 | [Table 8.4] | (A68 and A69) |

**Notes** (1) JIS : Japanese Industrial Standards (2) DIN : Deutsch Industrie Norm
(3) ANSI/ABMA : The American Bearing Manufacturers Association

**Remarks** The permissible limit of chamfer dimensions shall conform to Table 8.9 (Page A78), and the tolerances and permissible tapered bore diameters shall conform to Table 8.10 (Page A80).





**(Reference)** Rough definitions of the items listed for Running Accuracy and their measuring methods are shown in Fig. 8.1, and they are described in detail in ISO 5593 (Rolling Bearings-Vocabulary) and JIS B 1515 (Rolling Bearings-Tolerances) and elsewhere.

Supplementary Table

| Running Accuracy | Inner Ring | Outer Ring | Dial Gauge |
|---|---|---|---|
| $K_{ia}$ | Rotating | Stationary | A |
| $K_{ea}$ | Stationary | Rotating | A |
| $S_{ia}$ | Rotating | Stationary | $B_1$ |
| $S_{ea}$ | Stationary | Rotating | $B_2$ |
| $S_d$ | Rotating | Stationary | C |
| $S_D$ | — | Rotating | D |
| $S_i$ , $S_e$ | Only the shaft or housing or central washer is to be rotated. | | E |

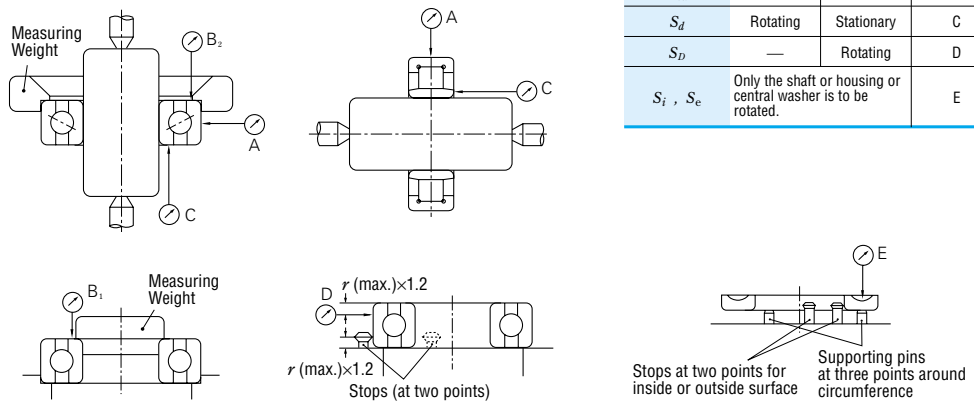
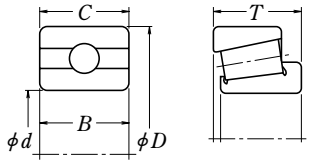



**Fig. 8.1 Measuring Methods for Running Accuracy (summarized)**

### Symbols for Boundary Dimensions and Running Accuracy

| | |
|---|---|
| $d$ | Brg bore dia., nominal |
| $\Delta_{ds}$ | Deviation of a single bore dia. |
| $\Delta_{dmp}$ | Single plane mean bore dia. deviation |
| $V_{dp}$ | Bore dia. Variation in a single radial plane |
| $V_{dmp}$ | Mean bore dia. Variation |
| $B$ | Inner ring width, nominal |
| $\Delta_{Bs}$ | Deviation of a single inner ring width |
| $V_{Bs}$ | Inner ring width variation |
| $K_{ia}$ | Radial runout of assembles brg inner ring |
| $S_d$ | inner ring reference face (backface, where applicable) runout with bore |
| $S_{ia}$ | Assembled brg inner ring face (back face) runout with raceway |
| $S_i$, $S_e$ | Raceway to backface thickness variation of thrust brg |
| $T$ | Brg width, nominal |
| $\Delta_{Ts}$ | Deviation of the actual brg width |
| $D$ | Brg outside dia., nominal |
| $\Delta_{Ds}$ | Deviation of a single outside dia. |
| $\Delta_{Dmp}$ | Single plane mean outside dia. Deviation |
| $V_{Dp}$ | Outside dia. Variation in a single radial plane |
| $V_{Dmp}$ | Mean outside dia. Variation |
| $C$ | Outer ring width, nominal |
| $\Delta_{Cs}$ | Deviation of a single outer ring width |
| $V_{Cs}$ | Outer ring width variation |
| $K_{ea}$ | Radial runout of assembled brg outer ring |
| $S_D$ | Variation of brg outside surface generatrix inclination with outer ring reference face (backface) |
| $S_{ea}$ | Assembled brg outer ring face (backface) runout with raceway |



## Table 8. 2 Tolerances for Radial Bearings

### Table 8. 2. 1 Tolerances for Inner Rings and

| Nominal Bore Diameter $d$ (mm) over | incl | $\Delta_{dmp}$ (2) Normal high | Normal low | Class 6 high | Class 6 low | Class 5 high | Class 5 low | Class 4 high | Class 4 low | Class 2 high | Class 2 low | $\Delta_{ds}$ (2) Class 4 Diameter Series 0, 1, 2, 3, 4 high | Class 4 Diameter Series 0, 1, 2, 3, 4 low | Class 2 high | Class 2 low |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.6**(1) | **2.5** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 4 | 0 | −2.5 | 0 | − 4 | 0 | −2.5 |
| **2.5** | **10** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 4 | 0 | −2.5 | 0 | − 4 | 0 | −2.5 |
| **10** | **18** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 4 | 0 | −2.5 | 0 | − 4 | 0 | −2.5 |
| **18** | **30** | 0 | − 10 | 0 | − 8 | 0 | − 6 | 0 | − 5 | 0 | −2.5 | 0 | − 5 | 0 | −2.5 |
| **30** | **50** | 0 | − 12 | 0 | −10 | 0 | − 8 | 0 | − 6 | 0 | −2.5 | 0 | − 6 | 0 | −2.5 |
| **50** | **80** | 0 | − 15 | 0 | −12 | 0 | − 9 | 0 | − 7 | 0 | −4 | 0 | − 7 | 0 | −4 |
| **80** | **120** | 0 | − 20 | 0 | −15 | 0 | −10 | 0 | − 8 | 0 | −5 | 0 | − 8 | 0 | −5 |
| **120** | **150** | 0 | − 25 | 0 | −18 | 0 | −13 | 0 | −10 | 0 | −7 | 0 | −10 | 0 | −7 |
| **150** | **180** | 0 | − 25 | 0 | −18 | 0 | −13 | 0 | −10 | 0 | −7 | 0 | −10 | 0 | −7 |
| **180** | **250** | 0 | − 30 | 0 | −22 | 0 | −15 | 0 | −12 | 0 | −8 | 0 | −12 | 0 | −8 |
| **250** | **315** | 0 | − 35 | 0 | −25 | 0 | −18 | – | – | – | – | – | – | – | – |
| **315** | **400** | 0 | − 40 | 0 | −30 | 0 | −23 | – | – | – | – | – | – | – | – |
| **400** | **500** | 0 | − 45 | 0 | −35 | – | – | – | – | – | – | – | – | – | – |
| **500** | **630** | 0 | − 50 | 0 | −40 | – | – | – | – | – | – | – | – | – | – |
| **630** | **800** | 0 | − 75 | – | – | – | – | – | – | – | – | – | – | – | – |
| **800** | **1 000** | 0 | −100 | – | – | – | – | – | – | – | – | – | – | – | – |
| **1 000** | **1 250** | 0 | −125 | – | – | – | – | – | – | – | – | – | – | – | – |
| **1 250** | **1 600** | 0 | −160 | – | – | – | – | – | – | – | – | – | – | – | – |
| **1 600** | **2 000** | 0 | −200 | – | – | – | – | – | – | – | – | – | – | – | – |

## (excluding Tapered Roller Bearings)

### Widths of Outer Rings

| $V_{dp}$ (2) Normal Diameter Series 9 | 0, 1 | 2, 3, 4 | Class 6 Diameter Series 9 | 0, 1 | 2, 3, 4 | Class 5 Diameter Series 9 | 0,1,2,3,4 | Class 4 Diameter Series 9 | 0,1,2,3,4 | Class 2 Diameter Series 0,1,2,3,4 | $V_{dmp}$ (2) Normal | Class 6 | Class 5 | Class 4 | Class 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| max. | | | max. | | | max. | | max. | | max. | max. | max. | max. | max. | max. |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 2.5 | 6 | 5 | 3 | 2 | 1.5 |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 2.5 | 6 | 5 | 3 | 2 | 1.5 |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 2.5 | 6 | 5 | 3 | 2 | 1.5 |
| 13 | 10 | 8 | 10 | 8 | 6 | 6 | 5 | 5 | 4 | 2.5 | 8 | 6 | 3 | 2.5 | 1.5 |
| 15 | 12 | 9 | 13 | 10 | 8 | 8 | 6 | 6 | 5 | 2.5 | 9 | 8 | 4 | 3 | 1.5 |
| 19 | 19 | 11 | 15 | 15 | 9 | 9 | 7 | 7 | 5 | 4 | 11 | 9 | 5 | 3.5 | 2 |
| 25 | 25 | 15 | 19 | 19 | 11 | 10 | 8 | 8 | 6 | 5 | 15 | 11 | 5 | 4 | 2.5 |
| 31 | 31 | 19 | 23 | 23 | 14 | 13 | 10 | 10 | 8 | 7 | 19 | 14 | 7 | 5 | 3.5 |
| 31 | 31 | 19 | 23 | 23 | 14 | 13 | 10 | 10 | 8 | 7 | 19 | 14 | 7 | 5 | 3.5 |
| 38 | 38 | 23 | 28 | 28 | 17 | 15 | 12 | 12 | 9 | 8 | 23 | 17 | 8 | 6 | 4 |
| 44 | 44 | 26 | 31 | 31 | 19 | 18 | 14 | – | – | – | 26 | 19 | 9 | – | – |
| 50 | 50 | 30 | 38 | 38 | 23 | 23 | 18 | – | – | – | 30 | 23 | 12 | – | – |
| 56 | 56 | 34 | 44 | 44 | 26 | – | – | – | – | – | 34 | 26 | – | – | – |
| 63 | 63 | 38 | 50 | 50 | 30 | – | – | – | – | – | 38 | 30 | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |

Units : μm

| $\Delta_{Bs}$ (or $\Delta_{Cs}$)(3) Single Bearing Normal Class 6 high | Normal Class 6 low | Class 5 Class 4 high | Class 5 Class 4 low | Class 2 high | Class 2 low | Combined Bearings (4) Normal Class 6 high | Normal Class 6 low | Class 5 Class 4 high | Class 5 Class 4 low | Class 2 high | Class 2 low | $V_{Bs}$ (or $V_{Cs}$) Inner Ring (or Outer Ring) (3) Normal | Inner Ring Class 6 | Class 5 | Class 4 | Class 2 | $K_{ia}$ Normal | Class 6 | Class 5 | Class 4 | Class 2 | $S_d$ Class 5 | Class 4 | Class 2 | $S_{ia}$ (5) Class 5 | Class 4 | Class 2 | Nominal Bore Diameter $d$ (mm) over | incl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| max. | | max. | | max. | | max. | | max. | | max. | | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | | |
| 0 | − 40 | 0 | − 40 | 0 | − 40 | – | – | 0 | −250 | 0 | −250 | 12 | 12 | 5 | 2.5 | 1.5 | 10 | 5 | 4 | 2.5 | 1.5 | 7 | 3 | 1.5 | 7 | 3 | 1.5 | **0.6**(1) | **2.5** |
| 0 | − 120 | 0 | − 40 | 0 | − 40 | 0 | −250 | 0 | −250 | 0 | −250 | 15 | 15 | 5 | 2.5 | 1.5 | 10 | 6 | 4 | 2.5 | 1.5 | 7 | 3 | 1.5 | 7 | 3 | 1.5 | **2.5** | **10** |
| 0 | − 120 | 0 | − 80 | 0 | − 80 | 0 | −250 | 0 | −250 | 0 | −250 | 20 | 20 | 5 | 2.5 | 1.5 | 10 | 7 | 4 | 2.5 | 1.5 | 7 | 3 | 1.5 | 7 | 3 | 1.5 | **10** | **18** |
| 0 | − 120 | 0 | −120 | 0 | −120 | 0 | −250 | 0 | −250 | 0 | −250 | 20 | 20 | 5 | 2.5 | 1.5 | 13 | 8 | 4 | 3 | 2.5 | 8 | 4 | 1.5 | 8 | 4 | 2.5 | **18** | **30** |
| 0 | − 120 | 0 | −120 | 0 | −120 | 0 | −250 | 0 | −250 | 0 | −250 | 20 | 20 | 5 | 3 | 1.5 | 15 | 10 | 5 | 4 | 2.5 | 8 | 4 | 1.5 | 8 | 4 | 2.5 | **30** | **50** |
| 0 | − 150 | 0 | −150 | 0 | −150 | 0 | −380 | 0 | −250 | 0 | −250 | 25 | 25 | 6 | 4 | 1.5 | 20 | 10 | 5 | 4 | 2.5 | 8 | 5 | 1.5 | 8 | 5 | 2.5 | **50** | **80** |
| 0 | − 200 | 0 | −200 | 0 | −200 | 0 | −380 | 0 | −380 | 0 | −380 | 25 | 25 | 7 | 4 | 2.5 | 25 | 13 | 6 | 5 | 2.5 | 9 | 5 | 2.5 | 9 | 5 | 2.5 | **80** | **120** |
| 0 | − 250 | 0 | −250 | 0 | −250 | 0 | −500 | 0 | −380 | 0 | −380 | 30 | 30 | 8 | 5 | 2.5 | 30 | 18 | 8 | 6 | 2.5 | 10 | 6 | 2.5 | 10 | 7 | 2.5 | **120** | **150** |
| 0 | − 250 | 0 | −250 | 0 | −250 | 0 | −500 | 0 | −380 | 0 | −380 | 30 | 30 | 8 | 5 | 4 | 30 | 18 | 8 | 6 | 5 | 10 | 6 | 4 | 10 | 7 | 5 | **150** | **180** |
| 0 | − 300 | 0 | −300 | 0 | −300 | 0 | −500 | 0 | −500 | 0 | −500 | 30 | 30 | 10 | 6 | 5 | 40 | 20 | 10 | 8 | 5 | 11 | 7 | 5 | 13 | 8 | 5 | **180** | **250** |
| 0 | − 350 | 0 | −350 | – | – | 0 | −500 | 0 | −500 | – | – | 35 | 35 | 13 | – | – | 50 | 25 | 13 | – | – | 13 | – | – | 15 | – | – | **250** | **315** |
| 0 | − 400 | 0 | −400 | – | – | 0 | −630 | 0 | −630 | – | – | 40 | 40 | 15 | – | – | 60 | 30 | 15 | – | – | 15 | – | – | 20 | – | – | **315** | **400** |
| 0 | − 450 | – | – | – | – | – | – | – | – | – | – | 50 | 45 | – | – | – | 65 | 35 | – | – | – | – | – | – | – | – | – | **400** | **500** |
| 0 | − 500 | – | – | – | – | – | – | – | – | – | – | 60 | 50 | – | – | – | 70 | 40 | – | – | – | – | – | – | – | – | – | **500** | **630** |
| 0 | − 750 | – | – | – | – | – | – | – | – | – | – | 70 | – | – | – | – | 80 | – | – | – | – | – | – | – | – | – | – | **630** | **800** |
| 0 | −1 000 | – | – | – | – | – | – | – | – | – | – | 80 | – | – | – | – | 90 | – | – | – | – | – | – | – | – | – | – | **800** | **1 000** |
| 0 | −1 250 | – | – | – | – | – | – | – | – | – | – | 100 | – | – | – | – | 100 | – | – | – | – | – | – | – | – | – | – | **1 000** | **1 250** |
| 0 | −1 600 | – | – | – | – | – | – | – | – | – | – | 120 | – | – | – | – | 120 | – | – | – | – | – | – | – | – | – | – | **1 250** | **1 600** |
| 0 | −2 000 | – | – | – | – | – | – | – | – | – | – | 140 | – | – | – | – | 140 | – | – | – | – | – | – | – | – | – | – | **1 600** | **2 000** |

**Notes** (1) 0.6mm is included in the group.
(2) Applicable to bearings with cylindrical bores.
(3) Tolerance for width deviation and tolerance limits for the width variation of the outer ring should be the same bearing. Tolerances for the width variation of the outer ring of Class 5, 4, and 2 are shown in Table 8.2.2.
(4) Applicable to individual rings manufactured for combined bearings.
(5) Applicable to ball bearings such as deep groove ball bearings, angular contact ball bearings, etc.

**Remarks** 1. The cylindrical bore diameter "no-go side" tolerance limit (high) specified in this table does not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.
2. ABMA Std 20-1996: ABEC1·RBEC1, ABEC3·RBEC3, ABEC5·RBEC5, ABEC7·RBEC7, and ABEC9·RBEC9 are equivalent to Classes Normal, 6, 5, 4, and 2 respectively.

## Table 8. 2 Tolerances for Radial Bearings

### Table 8. 2. 2 Tolerances

| Nominal Outside Diameter $D$ (mm) over | incl | $\Delta_{Dmp}$ Normal high | Normal low | Class 6 high | Class 6 low | Class 5 high | Class 5 low | Class 4 high | Class 4 low | Class 2 high | Class 2 low | $\Delta_{Ds}$ Class 4 (Diameter Series 0, 1, 2, 3, 4) high | Class 4 low | Class 2 high | Class 2 low |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2.5**(1) | **6** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 4 | 0 | − 2.5 | 0 | − 4 | 0 | − 2.5 |
| **6** | **18** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 4 | 0 | − 2.5 | 0 | − 4 | 0 | − 2.5 |
| **18** | **30** | 0 | − 9 | 0 | − 8 | 0 | − 6 | 0 | − 5 | 0 | − 4 | 0 | − 5 | 0 | − 4 |
| **30** | **50** | 0 | − 11 | 0 | − 9 | 0 | − 7 | 0 | − 6 | 0 | − 4 | 0 | − 6 | 0 | − 4 |
| **50** | **80** | 0 | − 13 | 0 | −11 | 0 | − 9 | 0 | − 7 | 0 | − 4 | 0 | − 7 | 0 | − 4 |
| **80** | **120** | 0 | − 15 | 0 | −13 | 0 | −10 | 0 | − 8 | 0 | − 5 | 0 | − 8 | 0 | − 5 |
| **120** | **150** | 0 | − 18 | 0 | −15 | 0 | −11 | 0 | − 9 | 0 | − 5 | 0 | − 9 | 0 | − 5 |
| **150** | **180** | 0 | − 25 | 0 | −18 | 0 | −13 | 0 | −10 | 0 | − 7 | 0 | −10 | 0 | − 7 |
| **180** | **250** | 0 | − 30 | 0 | −20 | 0 | −15 | 0 | −11 | 0 | − 8 | 0 | −11 | 0 | − 8 |
| **250** | **315** | 0 | − 35 | 0 | −25 | 0 | −18 | 0 | −13 | 0 | − 8 | 0 | −13 | 0 | − 8 |
| **315** | **400** | 0 | − 40 | 0 | −28 | 0 | −20 | 0 | −15 | 0 | −10 | 0 | −15 | 0 | −10 |
| **400** | **500** | 0 | − 45 | 0 | −33 | 0 | −23 | – | – | – | – | – | – | – | – |
| **500** | **630** | 0 | − 50 | 0 | −38 | 0 | −28 | – | – | – | – | – | – | – | – |
| **630** | **800** | 0 | − 75 | 0 | −45 | 0 | −35 | – | – | – | – | – | – | – | – |
| **800** | **1 000** | 0 | −100 | 0 | −60 | – | – | – | – | – | – | – | – | – | – |
| **1 000** | **1 250** | 0 | −125 | – | – | – | – | – | – | – | – | – | – | – | – |
| **1 250** | **1 600** | 0 | −160 | – | – | – | – | – | – | – | – | – | – | – | – |
| **1 600** | **2 000** | 0 | −200 | – | – | – | – | – | – | – | – | – | – | – | – |
| **2 000** | **2 500** | 0 | −250 | – | – | – | – | – | – | – | – | – | – | – | – |

**Notes** (1) 2.5mm is included in the group.
(2) Applicable only when a locating snap ring is not used.
(3) Applicable to ball bearings such as deep groove ball bearings and angular contact ball bearings.
(4) The tolerances for outer ring width variation of bearings of Classes Normal and 6 are shown in Table 8.2.1.

**Remarks** 1. The outside diameter "no-go side" tolerances (low) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.
2. ABMA Std 20-1996: ABEC1·RBEC1, ABEC3·RBEC3, ABEC5·RBEC5, ABEC7·RBEC7, and ABEC9· RBEC9 are equivalent to Classes Normal, 6, 5, 4, and 2 respectively.





## (excluding Tapered Roller Bearings)

### for Outer Rings

Units : μm

| $V_{Dp}$ (2) Normal, Open Type, Diameter Series 9 max. | $V_{Dp}$ (2) Normal, Open Type, Diameter Series 0, 1 max. | $V_{Dp}$ (2) Normal, Open Type, Diameter Series 2, 3, 4 max. | $V_{Dp}$ (2) Normal, Shielded Sealed, Diameter Series 2, 3, 4 max. | $V_{Dp}$ (2) Class 6, Open Type, Diameter Series 9 max. | $V_{Dp}$ (2) Class 6, Open Type, Diameter Series 0, 1 max. | $V_{Dp}$ (2) Class 6, Open Type, Diameter Series 2, 3, 4 max. | $V_{Dp}$ (2) Class 6, Shielded Sealed, Diameter Series 0,1,2,3,4 max. | $V_{Dp}$ (2) Class 5, Open Type, Diameter Series 9 max. | $V_{Dp}$ (2) Class 5, Open Type, Diameter Series 0,1,2,3,4 max. | $V_{Dp}$ (2) Class 4, Open Type, Diameter Series 9 max. | $V_{Dp}$ (2) Class 4, Open Type, Diameter Series 0,1,2,3,4 max. | $V_{Dp}$ (2) Class 2, Open Type, Diameter Series 0,1,2,3,4 max. | $V_{Dmp}$ (2) Normal max. | $V_{Dmp}$ (2) Class 6 max. | $V_{Dmp}$ (2) Class 5 max. | $V_{Dmp}$ (2) Class 4 max. | $V_{Dmp}$ (2) Class 2 max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 8 | 6 | 10 | 9 | 7 | 5 | 9 | 5 | 4 | 4 | 3 | 2.5 | 6 | 5 | 3 | 2 | 1.5 |
| 10 | 8 | 6 | 10 | 9 | 7 | 5 | 9 | 5 | 4 | 4 | 3 | 2.5 | 6 | 5 | 3 | 2 | 1.5 |
| 12 | 9 | 7 | 12 | 10 | 8 | 6 | 10 | 6 | 5 | 5 | 4 | 4 | 7 | 6 | 3 | 2.5 | 2 |
| 14 | 11 | 8 | 16 | 11 | 9 | 7 | 13 | 7 | 5 | 6 | 5 | 4 | 8 | 7 | 4 | 3 | 2 |
| 16 | 13 | 10 | 20 | 14 | 11 | 8 | 16 | 9 | 7 | 7 | 5 | 4 | 10 | 8 | 5 | 3.5 | 2 |
| 19 | 19 | 11 | 26 | 16 | 16 | 10 | 20 | 10 | 8 | 8 | 6 | 5 | 11 | 10 | 5 | 4 | 2.5 |
| 23 | 23 | 14 | 30 | 19 | 19 | 11 | 25 | 11 | 8 | 9 | 7 | 5 | 14 | 11 | 6 | 5 | 2.5 |
| 31 | 31 | 19 | 38 | 23 | 23 | 14 | 30 | 13 | 10 | 10 | 8 | 7 | 19 | 14 | 7 | 5 | 3.5 |
| 38 | 38 | 23 | – | 25 | 25 | 15 | – | 15 | 11 | 11 | 8 | 8 | 23 | 15 | 8 | 6 | 4 |
| 44 | 44 | 26 | – | 31 | 31 | 19 | – | 18 | 14 | 13 | 10 | 8 | 26 | 19 | 9 | 7 | 4 |
| 50 | 50 | 30 | – | 35 | 35 | 21 | – | 20 | 15 | 15 | 11 | 10 | 30 | 21 | 10 | 8 | 5 |
| 56 | 56 | 34 | – | 41 | 41 | 25 | – | 23 | 17 | – | – | – | 34 | 25 | 12 | – | – |
| 63 | 63 | 38 | – | 48 | 48 | 29 | – | 28 | 21 | – | – | – | 38 | 29 | 14 | – | – |
| 94 | 94 | 55 | – | 56 | 56 | 34 | – | 35 | 26 | – | – | – | 55 | 34 | 18 | – | – |
| 125 | 125 | 75 | – | 75 | 75 | 45 | – | – | – | – | – | – | 75 | 45 | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |

| $K_{ea}$ Normal max. | $K_{ea}$ Class 6 max. | $K_{ea}$ Class 5 max. | $K_{ea}$ Class 4 max. | $K_{ea}$ Class 2 max. | $S_D$ Class 5 max. | $S_D$ Class 4 max. | $S_D$ Class 2 max. | $S_{ea}$ (3) Class 5 max. | $S_{ea}$ (3) Class 4 max. | $S_{ea}$ (3) Class 2 max. | $V_{Cs}$ (4) Class 5 max. | $V_{Cs}$ (4) Class 4 max. | $V_{Cs}$ (4) Class 2 max. | Nominal Outside Diameter $D$ (mm) over | incl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 8 | 5 | 3 | 1.5 | 8 | 4 | 1.5 | 8 | 5 | 1.5 | 5 | 2.5 | 1.5 | **2.5** (1) | **6** |
| 15 | 8 | 5 | 3 | 1.5 | 8 | 4 | 1.5 | 8 | 5 | 1.5 | 5 | 2.5 | 1.5 | **6** | **18** |
| 15 | 9 | 6 | 4 | 2.5 | 8 | 4 | 1.5 | 8 | 5 | 2.5 | 5 | 2.5 | 1.5 | **18** | **30** |
| 20 | 10 | 7 | 5 | 2.5 | 8 | 4 | 1.5 | 8 | 5 | 2.5 | 5 | 2.5 | 1.5 | **30** | **50** |
| 25 | 13 | 8 | 5 | 4 | 8 | 4 | 1.5 | 10 | 5 | 4 | 6 | 3 | 1.5 | **50** | **80** |
| 35 | 18 | 10 | 6 | 5 | 9 | 5 | 2.5 | 11 | 6 | 5 | 8 | 4 | 2.5 | **80** | **120** |
| 40 | 20 | 11 | 7 | 5 | 10 | 5 | 2.5 | 13 | 7 | 5 | 8 | 5 | 2.5 | **120** | **150** |
| 45 | 23 | 13 | 8 | 5 | 10 | 5 | 2.5 | 14 | 8 | 5 | 8 | 5 | 2.5 | **150** | **180** |
| 50 | 25 | 15 | 10 | 7 | 11 | 7 | 4 | 15 | 10 | 7 | 10 | 7 | 4 | **180** | **250** |
| 60 | 30 | 18 | 11 | 7 | 13 | 8 | 5 | 18 | 10 | 7 | 11 | 7 | 5 | **250** | **315** |
| 70 | 35 | 20 | 13 | 8 | 13 | 10 | 7 | 20 | 13 | 8 | 13 | 8 | 7 | **315** | **400** |
| 80 | 40 | 23 | – | – | 15 | – | – | 23 | – | – | 15 | – | – | **400** | **500** |
| 100 | 50 | 25 | – | – | 18 | – | – | 25 | – | – | 18 | – | – | **500** | **630** |
| 120 | 60 | 30 | – | – | 20 | – | – | 30 | – | – | 20 | – | – | **630** | **800** |
| 140 | 75 | – | – | – | – | – | – | – | – | – | – | – | – | **800** | **1 000** |
| 160 | – | – | – | – | – | – | – | – | – | – | – | – | – | **1 000** | **1 250** |
| 190 | – | – | – | – | – | – | – | – | – | – | – | – | – | **1 250** | **1 600** |
| 220 | – | – | – | – | – | – | – | – | – | – | – | – | – | **1 600** | **2 000** |
| 250 | – | – | – | – | – | – | – | – | – | – | – | – | – | **2 000** | **2 500** |

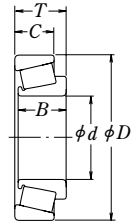
## Table 8. 3 Tolerances for Metric Design Tapered Roller Bearings

### Table 8. 3. 1 Tolerances for Inner Ring Bore Diameter and Running Accuracy

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | | | | | $\Delta_{ds}$ | | $V_{dp}$ | | | | $V_{dmp}$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal Class 6X | | Class 6 Class 5 | | Class 4 | | Class 4 | | Normal Class 6X | Class 6 | Class 5 | Class 4 | Normal Class 6X | Class 6 | Class 5 | Class 4 |
| over | incl | high | low | high | low | high | low | high | low | max. | max. | max. | max. | max. | max. | max. | max. |
| **10** | **18** | 0 | − 8 | 0 | − 7 | 0 | − 5 | 0 | − 5 | 8 | 7 | 5 | 4 | 6 | 5 | 5 | 4 |
| **18** | **30** | 0 | −10 | 0 | − 8 | 0 | − 6 | 0 | − 6 | 10 | 8 | 6 | 5 | 8 | 6 | 5 | 4 |
| **30** | **50** | 0 | −12 | 0 | −10 | 0 | − 8 | 0 | − 8 | 12 | 10 | 8 | 6 | 9 | 8 | 5 | 5 |
| **50** | **80** | 0 | −15 | 0 | −12 | 0 | − 9 | 0 | − 9 | 15 | 12 | 9 | 7 | 11 | 9 | 6 | 5 |
| **80** | **120** | 0 | −20 | 0 | −15 | 0 | −10 | 0 | −10 | 20 | 15 | 11 | 8 | 15 | 11 | 8 | 5 |
| **120** | **180** | 0 | −25 | 0 | −18 | 0 | −13 | 0 | −13 | 25 | 18 | 14 | 10 | 19 | 14 | 9 | 7 |
| **180** | **250** | 0 | −30 | 0 | −22 | 0 | −15 | 0 | −15 | 30 | 22 | 17 | 11 | 23 | 16 | 11 | 8 |
| **250** | **315** | 0 | −35 | 0 | −25 | 0 | −18 | 0 | −18 | 35 | − | − | − | 26 | − | − | − |
| **315** | **400** | 0 | −40 | 0 | −30 | 0 | −23 | 0 | −23 | 40 | − | − | − | 30 | − | − | − |
| **400** | **500** | 0 | −45 | 0 | −35 | 0 | −27 | 0 | −27 | − | − | − | − | − | − | − | − |
| **500** | **630** | 0 | −50 | 0 | −40 | − | − | − | − | − | − | − | − | − | − | − | − |
| **630** | **800** | 0 | −75 | 0 | −60 | − | − | − | − | − | − | − | − | − | − | − | − |

| $K_{ia}$ | | | | $S_d$ | | $S_{ia}$ |
|---|---|---|---|---|---|---|
| Normal Class 6X | Class 6 | Class 5 | Class 4 | Class 5 | Class 4 | Class 4 |
| max. | max. | max. | max. | max. | max. | max. |
| 15 | 7 | 3.5 | 2.5 | 7 | 3 | 3 |
| 18 | 8 | 4 | 3 | 8 | 4 | 4 |
| 20 | 10 | 5 | 4 | 8 | 4 | 4 |
| 25 | 10 | 5 | 4 | 8 | 5 | 4 |
| 30 | 13 | 6 | 5 | 9 | 5 | 5 |
| 35 | 18 | 8 | 6 | 10 | 6 | 7 |
| 50 | 20 | 10 | 8 | 11 | 7 | 8 |
| 60 | 25 | 13 | 10 | 13 | 8 | 10 |
| 70 | 30 | 15 | 12 | 15 | 10 | 14 |
| 70 | 35 | 18 | 14 | 19 | 13 | 17 |
| 85 | 40 | 20 | − | 22 | − | − |
| 100 | 45 | 22 | − | 27 | − | − |



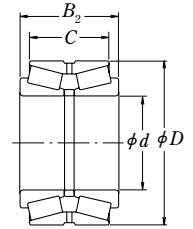

**Remarks**
1. The bore diameter "no-go side" tolerances (high) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.
2. Some of these tolerances conform to the NSK Standard.

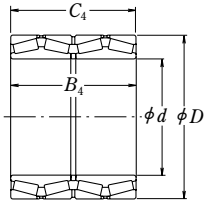
### Table 8. 3. 2 Tolerances for Outer Ring Outside Diameter and Running Accuracy

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Dmp}$ | | | | | | $\Delta_{Ds}$ | | $V_{Dp}$ | | | | $V_{Dmp}$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal Class 6X | | Class 6 Class 5 | | Class 4 | | Class 4 | | Normal Class 6X | Class 6 | Class 5 | Class 4 | Normal Class 6X | Class 6 | Class 5 | Class 4 |
| over | incl | high | low | high | low | high | low | high | low | max. | max. | max. | max. | max. | max. | max. | max. |
| **18** | **30** | 0 | − 9 | 0 | − 8 | 0 | − 6 | 0 | − 6 | 9 | 8 | 6 | 5 | 7 | 6 | 5 | 4 |
| **30** | **50** | 0 | − 11 | 0 | − 9 | 0 | − 7 | 0 | − 7 | 11 | 9 | 7 | 5 | 8 | 7 | 5 | 5 |
| **50** | **80** | 0 | − 13 | 0 | −11 | 0 | − 9 | 0 | − 9 | 13 | 11 | 8 | 7 | 10 | 8 | 6 | 5 |
| **80** | **120** | 0 | − 15 | 0 | −13 | 0 | −10 | 0 | −10 | 15 | 13 | 10 | 8 | 11 | 10 | 7 | 5 |
| **120** | **150** | 0 | − 18 | 0 | −15 | 0 | −11 | 0 | −11 | 18 | 15 | 11 | 8 | 14 | 11 | 8 | 6 |
| **150** | **180** | 0 | − 25 | 0 | −18 | 0 | −13 | 0 | −13 | 25 | 18 | 14 | 10 | 19 | 14 | 9 | 7 |
| **180** | **250** | 0 | − 30 | 0 | −20 | 0 | −15 | 0 | −15 | 30 | 20 | 15 | 11 | 23 | 15 | 10 | 8 |
| **250** | **315** | 0 | − 35 | 0 | −25 | 0 | −18 | 0 | −18 | 35 | 25 | 19 | 14 | 26 | 19 | 13 | 9 |
| **315** | **400** | 0 | − 40 | 0 | −28 | 0 | −20 | 0 | −20 | 40 | 28 | 22 | 15 | 30 | 21 | 14 | 10 |
| **400** | **500** | 0 | − 45 | 0 | −33 | 0 | −23 | 0 | −23 | 45 | − | − | − | 34 | − | − | − |
| **500** | **630** | 0 | − 50 | 0 | −38 | 0 | −28 | 0 | −28 | 50 | − | − | − | 38 | − | − | − |
| **630** | **800** | 0 | − 75 | 0 | −45 | − | − | − | − | − | − | − | − | − | − | − | − |
| **800** | **1 000** | 0 | −100 | 0 | −60 | − | − | − | − | − | − | − | − | − | − | − | − |

| $K_{ea}$ | | | | $S_D$ | | $S_{ea}$ |
|---|---|---|---|---|---|---|
| Normal Class 6X | Class 6 | Class 5 | Class 4 | Class 5 | Class 4 | Class 4 |
| max. | max. | max. | max. | max. | max. | max. |
| 18 | 9 | 6 | 4 | 8 | 4 | 5 |
| 20 | 10 | 7 | 5 | 8 | 4 | 5 |
| 25 | 13 | 8 | 5 | 8 | 4 | 5 |
| 35 | 18 | 10 | 6 | 9 | 5 | 6 |
| 40 | 20 | 11 | 7 | 10 | 5 | 7 |
| 45 | 23 | 13 | 8 | 10 | 5 | 8 |
| 50 | 25 | 15 | 10 | 11 | 7 | 10 |
| 60 | 30 | 18 | 11 | 13 | 8 | 10 |
| 70 | 35 | 20 | 13 | 13 | 10 | 13 |
| 80 | 40 | 23 | 15 | 15 | 11 | 15 |
| 100 | 50 | 25 | 18 | 18 | 13 | 18 |
| 120 | 60 | 30 | − | 20 | − | − |
| 120 | 75 | 35 | − | 23 | − | − |



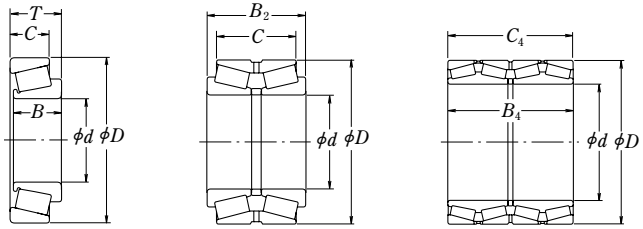

**Remarks**
1. The outside diameter "no-go side" tolerances (low) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.
2. Some of these tolerances conform to the NSK Standard.

**Table 8. 3 Tolerances for Metric Design**

**Table 8. 3. 3 Tolerances for Width, Overall Bearing Width,**

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{Bs}$ | | | | | | $\Delta_{Cs}$ | | | | | | $\Delta_{Ts}$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal Class 6 | | Class 6X | | Class 5 Class 4 | | Normal Class 6 | | Class 6X | | Class 5 Class 4 | | Normal Class 6 | | Class 6X | | Class 5 Class 4 | |
| over | incl | high | low | high | low | high | low | high | low | high | low | high | low | high | low | high | low | high | low |
| **10** | **18** | 0 | −120 | 0 | −50 | 0 | −200 | 0 | −120 | 0 | −100 | 0 | −200 | +200 | 0 | +100 | 0 | +200 | −200 |
| **18** | **30** | 0 | −120 | 0 | −50 | 0 | −200 | 0 | −120 | 0 | −100 | 0 | −200 | +200 | 0 | +100 | 0 | +200 | −200 |
| **30** | **50** | 0 | −120 | 0 | −50 | 0 | −240 | 0 | −120 | 0 | −100 | 0 | −240 | +200 | 0 | +100 | 0 | +200 | −200 |
| **50** | **80** | 0 | −150 | 0 | −50 | 0 | −300 | 0 | −150 | 0 | −100 | 0 | −300 | +200 | 0 | +100 | 0 | +200 | −200 |
| **80** | **120** | 0 | −200 | 0 | −50 | 0 | −400 | 0 | −200 | 0 | −100 | 0 | −400 | +200 | −200 | +100 | 0 | +200 | −200 |
| **120** | **180** | 0 | −250 | 0 | −50 | 0 | −500 | 0 | −250 | 0 | −100 | 0 | −500 | +350 | −250 | +150 | 0 | +350 | −250 |
| **180** | **250** | 0 | −300 | 0 | −50 | 0 | −600 | 0 | −300 | 0 | −100 | 0 | −600 | +350 | −250 | +150 | 0 | +350 | −250 |
| **250** | **315** | 0 | −350 | 0 | −50 | 0 | −700 | 0 | −350 | 0 | −100 | 0 | −700 | +350 | −250 | +200 | 0 | +350 | −250 |
| **315** | **400** | 0 | −400 | 0 | −50 | 0 | −800 | 0 | −400 | 0 | −100 | 0 | −800 | +400 | −400 | +200 | 0 | +400 | −400 |
| **400** | **500** | 0 | −450 | – | – | 0 | −800 | 0 | −450 | – | – | 0 | −800 | +400 | −400 | – | – | +400 | −400 |
| **500** | **630** | 0 | −500 | – | – | 0 | −800 | 0 | −500 | – | – | 0 | −800 | +500 | −500 | – | – | +500 | −500 |
| **630** | **800** | 0 | −750 | – | – | 0 | −800 | 0 | −750 | – | – | 0 | −800 | +600 | −600 | – | – | +600 | −600 |

**Remarks** The effective width of an inner ring with rollers $T_1$ is defined as the overall bearing width of an inner ring with rollers combined with a master outer ring.
The effective width of an outer ring $T_2$ is defined as the overall bearing width of an outer ring combined with a master inner ring with rollers.

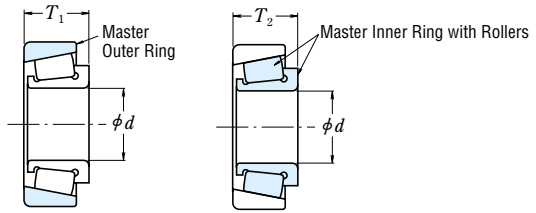



**Tapered Roller Bearings**

**and Combined Bearing Width**

Units : μm

| Ring Width with Rollers $\Delta_{T1s}$ | | | | Outer Ring Effective Width Deviation $\Delta_{T2s}$ | | | | Overall Combined Bearing Width Deviation $\Delta_{B2s}$ | | $\Delta_{B4s}$ , $\Delta_{C4s}$ | | Nominal Bore Diameter $d$ (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal | | Class 6X | | Normal | | Class 6X | | All classes of double-row bearings | | All classes of four-row bearings | | | |
| high | low | high | low | high | low | high | low | high | low | high | low | over | incl |
| +100 | 0 | + 50 | 0 | +100 | 0 | + 50 | 0 | + 200 | − 200 | – | – | **10** | **18** |
| +100 | 0 | + 50 | 0 | +100 | 0 | + 50 | 0 | + 200 | − 200 | – | – | **18** | **30** |
| +100 | 0 | + 50 | 0 | +100 | 0 | + 50 | 0 | + 200 | − 200 | – | – | **30** | **50** |
| +100 | 0 | + 50 | 0 | +100 | 0 | + 50 | 0 | + 300 | − 300 | + 300 | − 300 | **50** | **80** |
| +100 | −100 | + 50 | 0 | +100 | −100 | + 50 | 0 | + 300 | − 300 | + 400 | − 400 | **80** | **120** |
| +150 | −150 | + 50 | 0 | +200 | −100 | +100 | 0 | + 400 | − 400 | + 500 | − 500 | **120** | **180** |
| +150 | −150 | + 50 | 0 | +200 | −100 | +100 | 0 | + 450 | − 450 | + 600 | − 600 | **180** | **250** |
| +150 | −150 | +100 | 0 | +200 | −100 | +100 | 0 | + 550 | − 550 | + 700 | − 700 | **250** | **315** |
| +200 | −200 | +100 | 0 | +200 | −200 | +100 | 0 | + 600 | − 600 | + 800 | − 800 | **315** | **400** |
| – | – | – | – | – | – | – | – | + 700 | − 700 | + 900 | − 900 | **400** | **500** |
| – | – | – | – | – | – | – | – | + 800 | − 800 | +1 000 | −1 000 | **500** | **630** |
| – | – | – | – | – | – | – | – | +1 200 | −1 200 | +1 500 | −1 500 | **630** | **800** |

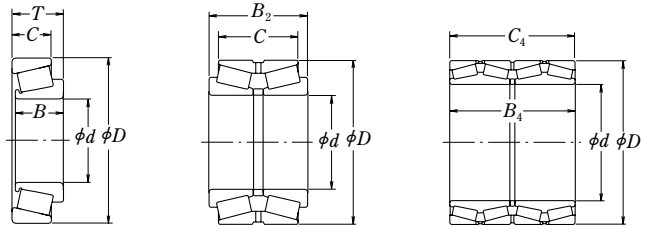


## Table 8. 4 Tolerances for Inch Design Tapered Roller Bearings

### Table 8. 4. 1 Tolerances for Inner Ring Bore Diameter

Units : μm

| Nominal Bore Diameter $d$ | | | | $\Delta_{ds}$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| over | | incl | | CLASS 4, 2 | | CLASS 3, 0 | | CLASS 00 | |
| (mm) | 1/25.4 | (mm) | 1/25.4 | high | low | high | low | high | low |
| – | – | **76.200** | 3.0000 | + 13 | 0 | +13 | 0 | +8 | 0 |
| **76.200** | 3.0000 | **266.700** | 10.5000 | + 25 | 0 | +13 | 0 | +8 | 0 |
| **266.700** | 10.5000 | **304.800** | 12.0000 | + 25 | 0 | +13 | 0 | – | – |
| **304.800** | 12.0000 | **609.600** | 24.0000 | + 51 | 0 | +25 | 0 | – | – |
| **609.600** | 24.0000 | **914.400** | 36.0000 | + 76 | 0 | +38 | 0 | – | – |
| **914.400** | 36.0000 | **1 219.200** | 48.0000 | +102 | 0 | +51 | 0 | – | – |
| **1 219.200** | 48.0000 | – | – | +127 | 0 | +76 | 0 | – | – |




KBE KV

### Table 8. 4. 2 Tolerances for Outer Ring Outside Diameter and Radial Runout of Inner and Outer Rings

Units : μm

| Nominal Outside Diameter $D$ | | | | $\Delta_{Ds}$ | | | | | | $K_{ia}$, $K_{ea}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| over | | incl | | CLASS 4, 2 | | CLASS 3, 0 | | CLASS 00 | | CLASS 4 | CLASS 2 | CLASS 3 | CLASS 0 | CLASS 00 |
| (mm) | 1/25.4 | (mm) | 1/25.4 | high | low | high | low | high | low | max. | max. | max. | max. | max. |
| – | – | **266.700** | 10.5000 | + 25 | 0 | +13 | 0 | +8 | 0 | 51 | 38 | 8 | 4 | 2 |
| **266.700** | 10.5000 | **304.800** | 12.0000 | + 25 | 0 | +13 | 0 | +8 | 0 | 51 | 38 | 8 | 4 | 2 |
| **304.800** | 12.0000 | **609.600** | 24.0000 | + 51 | 0 | +25 | 0 | – | – | 51 | 38 | 18 | – | – |
| **609.600** | 24.0000 | **914.400** | 36.0000 | + 76 | 0 | +38 | 0 | – | – | 76 | 51 | 51 | – | – |
| **914.400** | 36.0000 | **1 219.200** | 48.0000 | +102 | 0 | +51 | 0 | – | – | 76 | – | 76 | – | – |
| **1 219.200** | 48.0000 | – | – | +127 | 0 | +76 | 0 | – | – | 76 | – | 76 | – | – |

### Table 8. 4. 3 Tolerances for Overall Width and Combined Width

Units : μm

| Nominal Bore Diameter $d$ | | | | $\Delta_{Ts}$ | | | | | | | | Double-Row Bearings (KBE Type) $\Delta_{B2s}$ | | | | | | | | Four-Row Bearings (KV Type) $\Delta_{B4s}$, $\Delta_{C4s}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| over | | incl | | CLASS 4 | | CLASS 2 | | CLASS 3 | | | CLASS 0, 00 | CLASS 4 | | CLASS 2 | | CLASS 3 | | | | CLASS 0,00 | | CLASS 4, 3 | |
| | | | | | | | | $D \leqq 508.000$ (mm) | | $D > 508.000$ (mm) | | | | | | $D \leqq 508.000$ (mm) | | $D > 508.000$ (mm) | | | | | |
| (mm) | 1/25.4 | (mm) | 1/25.4 | high | low | high | low | high | low | high | low | high | low | high | low | high | low | high | low | high | low | high | low |
| – | – | **101.600** | 4.0000 | +203 | 0 | +203 | 0 | +203 | −203 | +203 | −203 | +203 | −203 | +406 | 0 | +406 | 0 | +406 | −406 | +406 | −406 | +406 | −406 | +1 524 | −1 524 |
| **101.600** | 4.0000 | **304.800** | 12.0000 | +356 | −254 | +203 | 0 | +203 | −203 | +203 | −203 | +203 | −203 | +711 | −508 | +406 | −203 | +406 | −406 | +406 | −406 | +406 | −406 | +1 524 | −1 524 |
| **304.800** | 12.0000 | **609.600** | 24.0000 | +381 | −381 | +381 | −381 | +203 | −203 | +381 | −381 | – | – | +762 | −762 | +762 | −762 | +406 | −406 | +762 | −762 | – | – | +1 524 | −1 524 |
| **609.600** | 24.0000 | – | – | +381 | −381 | – | – | +381 | −381 | +381 | −381 | – | – | +762 | −762 | – | – | +762 | −762 | +762 | −762 | – | – | +1 524 | −1 524 |

## Table 8. 5 Tolerances for Magneto Bearings and Width of Outer Rings

### Table 8. 5. 1 Tolerances for Inner Rings

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | | | | | $V_{dp}$ | | | $V_{dmp}$ | | | $\Delta_{Bs}$ (or $\Delta_{Cs}$) (1) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal | | Class 6 | | Class 5 | | Normal | Class 6 | Class 5 | Normal | Class 6 | Class 5 | Normal Class 6 | | Class 5 | |
| over | incl | high | low | high | low | high | low | max. | max. | max. | max. | max. | max. | high | low | high | low |
| 2.5 | 10 | 0 | − 8 | 0 | −7 | 0 | −5 | 6 | 5 | 4 | 6 | 5 | 3 | 0 | −120 | 0 | − 40 |
| 10 | 18 | 0 | − 8 | 0 | −7 | 0 | −5 | 6 | 5 | 4 | 6 | 5 | 3 | 0 | −120 | 0 | − 80 |
| 18 | 30 | 0 | −10 | 0 | −8 | 0 | −6 | 8 | 6 | 5 | 8 | 6 | 3 | 0 | −120 | 0 | −120 |

| $V_{Bs}$ (or $V_{Cs}$) (1) | | $\Delta_{Ts}$ | | $K_{ia}$ | | | $S_d$ | $S_{ia}$ |
|---|---|---|---|---|---|---|---|---|
| Normal Class 6 | Class 5 | Normal Class 6 Class 5 | | Normal | Class 6 | Class 5 | Class 5 | Class 5 |
| max. | max. | high | low | max. | max. | max. | max. | max. |
| 15 | 5 | +120 | −120 | 10 | 6 | 4 | 7 | 7 |
| 20 | 5 | +120 | −120 | 10 | 7 | 4 | 7 | 7 |
| 20 | 5 | +120 | −120 | 13 | 8 | 4 | 8 | 8 |

**Note** (1) The width deviation and width variation of an outer ring is determined according to the inner ring of the same bearing.

**Remarks** The bore diameter "no-go side" tolerances (high) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.

### Table 8. 5. 2 Tolerances for Outer Rings

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Dmp}$ | | | | | | | | | | | | $V_{Dp}$ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Bearing Series E | | | | | | Bearing Series EN | | | | | | | | |
| | | Normal | | Class 6 | | Class 5 | | Normal | | Class 6 | | Class 5 | | Normal | Class 6 | Class 5 |
| over | incl | high | low | high | low | high | low | high | low | high | low | high | low | max. | max. | max. |
| 6 | 18 | + 8 | 0 | +7 | 0 | +5 | 0 | 0 | − 8 | 0 | −7 | 0 | −5 | 6 | 5 | 4 |
| 18 | 30 | + 9 | 0 | +8 | 0 | +6 | 0 | 0 | − 9 | 0 | −8 | 0 | −6 | 7 | 6 | 5 |
| 30 | 50 | +11 | 0 | +9 | 0 | +7 | 0 | 0 | −11 | 0 | −9 | 0 | −7 | 8 | 7 | 5 |

| $V_{Dmp}$ | | | $K_{ea}$ | | | $S_{ea}$ | $S_D$ |
|---|---|---|---|---|---|---|---|
| Normal | Class 6 | Class 5 | Normal | Class 6 | Class 5 | Class 5 | Class 5 |
| max. | max. | max. | max. | max. | max. | max. | max. |
| 6 | 5 | 3 | 15 | 8 | 5 | 8 | 8 |
| 7 | 6 | 3 | 15 | 9 | 6 | 8 | 8 |
| 8 | 7 | 4 | 20 | 10 | 7 | 8 | 8 |

**Remarks** The outside diameter "no-go side" tolerances (low) do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.

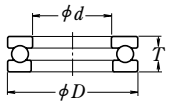
## Table 8. 6 Tolerances for Thrust Ball Bearings

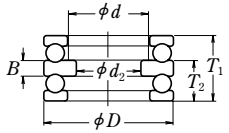
### Table 8. 6. 1 Tolerances for Shaft Washer Bore Diameter and Running Accuracy

Units : μm

| Nominal Bore Diameter $d$ or $d_2$ (mm) | | $\Delta_{dmp}$ or $\Delta_{d2mp}$ | | | | $V_{dp}$ or $V_{d2p}$ | | $S_i$ or $S_e$ (1) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal Class 6 Class 5 | | Class 4 | | Normal Class 6 Class 5 | Class 4 | Normal | Class 6 | Class 5 | Class 4 |
| over | incl | high | low | high | low | max. | max. | max. | max. | max. | max. |
| – | **18** | 0 | − 8 | 0 | − 7 | 6 | 5 | 10 | 5 | 3 | 2 |
| **18** | **30** | 0 | − 10 | 0 | − 8 | 8 | 6 | 10 | 5 | 3 | 2 |
| **30** | **50** | 0 | − 12 | 0 | −10 | 9 | 8 | 10 | 6 | 3 | 2 |
| **50** | **80** | 0 | − 15 | 0 | −12 | 11 | 9 | 10 | 7 | 4 | 3 |
| **80** | **120** | 0 | − 20 | 0 | −15 | 15 | 11 | 15 | 8 | 4 | 3 |
| **120** | **180** | 0 | − 25 | 0 | −18 | 19 | 14 | 15 | 9 | 5 | 4 |
| **180** | **250** | 0 | − 30 | 0 | −22 | 23 | 17 | 20 | 10 | 5 | 4 |
| **250** | **315** | 0 | − 35 | 0 | −25 | 26 | 19 | 25 | 13 | 7 | 5 |
| **315** | **400** | 0 | − 40 | 0 | −30 | 30 | 23 | 30 | 15 | 7 | 5 |
| **400** | **500** | 0 | − 45 | 0 | −35 | 34 | 26 | 30 | 18 | 9 | 6 |
| **500** | **630** | 0 | − 50 | 0 | −40 | 38 | 30 | 35 | 21 | 11 | 7 |
| **630** | **800** | 0 | − 75 | 0 | −50 | – | – | 40 | 25 | 13 | 8 |
| **800** | **1 000** | 0 | −100 | – | – | – | – | 45 | 30 | 15 | – |
| **1 000** | **1 250** | 0 | −125 | – | – | – | – | 50 | 35 | 18 | – |

**Note** (1) For double-direction bearings, the thickness variation doesn't depend on the bore diameter $d_2$, but on $d$ for single-direction bearings with the same $D$ in the same diameter series.
The thickness variation of housing washers, $S_e$, applies only to flat-seat thrust bearings.

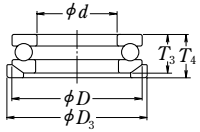



### Table 8. 6. 2 Tolerances for Outside Diameter of Housing Washers and Aligning Seat Washers

Units : μm

| Nominal Outside Diameter of Bearing or Aligning Seat Washer $D$ or $D_3$ (mm) | | $\Delta_{Dmp}$ | | | | | | $V_{Dp}$ | | Aligning Seat Washer Outside Diameter Deviation $\Delta_{D3s}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flat Seat Type | | | | Aligning Seat Washer Type | | | | | |
| | | Normal Class 6 Class 5 | | Class 4 | | Normal Class 6 | | Normal Class 6 Class 5 | Class 4 | Normal Class 6 | |
| over | incl | high | low | high | low | high | low | max. | max. | high | low |
| **10** | **18** | 0 | − 11 | 0 | − 7 | 0 | − 17 | 8 | 5 | 0 | − 25 |
| **18** | **30** | 0 | − 13 | 0 | − 8 | 0 | − 20 | 10 | 6 | 0 | − 30 |
| **30** | **50** | 0 | − 16 | 0 | − 9 | 0 | − 24 | 12 | 7 | 0 | − 35 |
| **50** | **80** | 0 | − 19 | 0 | −11 | 0 | − 29 | 14 | 8 | 0 | − 45 |
| **80** | **120** | 0 | − 22 | 0 | −13 | 0 | − 33 | 17 | 10 | 0 | − 60 |
| **120** | **180** | 0 | − 25 | 0 | −15 | 0 | − 38 | 19 | 11 | 0 | − 75 |
| **180** | **250** | 0 | − 30 | 0 | −20 | 0 | − 45 | 23 | 15 | 0 | − 90 |
| **250** | **315** | 0 | − 35 | 0 | −25 | 0 | − 53 | 26 | 19 | 0 | −105 |
| **315** | **400** | 0 | − 40 | 0 | −28 | 0 | − 60 | 30 | 21 | 0 | −120 |
| **400** | **500** | 0 | − 45 | 0 | −33 | 0 | − 68 | 34 | 25 | 0 | −135 |
| **500** | **630** | 0 | − 50 | 0 | −38 | 0 | − 75 | 38 | 29 | 0 | −180 |
| **630** | **800** | 0 | − 75 | 0 | −45 | 0 | −113 | 55 | 34 | 0 | −225 |
| **800** | **1 000** | 0 | −100 | – | – | – | – | 75 | – | – | – |
| **1 000** | **1 250** | 0 | −125 | – | – | – | – | – | – | – | – |
| **1 250** | **1 600** | 0 | −160 | – | – | – | – | – | – | – | – |



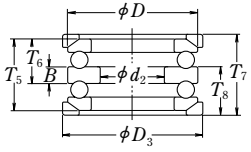



**Table 8. 6. 3 Tolerances for Thrust Ball Bearing Height and Central Washer Height**

Units : μm

| Nominal Bore Diameter $d$ (1) (mm) | | Flat Seat Type | | | | Aligning Seat Washer Type | | | | With Aligning Seat Washer | | | | Height Deviation of Central Washer $\Delta_{Bs}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\Delta_{Ts}$ or $\Delta_{T2s}$ | | $\Delta_{T1s}$ | | $\Delta_{T3s}$ or $\Delta_{T6s}$ | | $\Delta_{T5s}$ | | $\Delta_{T4s}$ or $\Delta_{T8s}$ | | $\Delta_{T7s}$ | | | |
| | | Normal, Class 6 Class 5, Class 4 | | Normal, Class 6 Class 5, Class 4 | | Normal Class 6 | | Normal Class 6 | | Normal Class 6 | | Normal Class 6 | | Normal, Class 6 Class 5, Class 4 | |
| over | incl | high | low | high | low | high | low | high | low | high | low | high | low | high | low |
| – | **30** | 0 | − 75 | + 50 | −150 | 0 | − 75 | + 50 | −150 | + 50 | − 75 | +150 | −150 | 0 | − 50 |
| **30** | **50** | 0 | −100 | + 75 | −200 | 0 | −100 | + 75 | −200 | + 50 | −100 | +175 | −200 | 0 | − 75 |
| **50** | **80** | 0 | −125 | +100 | −250 | 0 | −125 | +100 | −250 | + 75 | −125 | +250 | −250 | 0 | −100 |
| **80** | **120** | 0 | −150 | +125 | −300 | 0 | −150 | +125 | −300 | + 75 | −150 | +275 | −300 | 0 | −125 |
| **120** | **180** | 0 | −175 | +150 | −350 | 0 | −175 | +150 | −350 | +100 | −175 | +350 | −350 | 0 | −150 |
| **180** | **250** | 0 | −200 | +175 | −400 | 0 | −200 | +175 | −400 | +100 | −200 | +375 | −400 | 0 | −175 |
| **250** | **315** | 0 | −225 | +200 | −450 | 0 | −225 | +200 | −450 | +125 | −225 | +450 | −450 | 0 | −200 |
| **315** | **400** | 0 | −300 | +250 | −600 | 0 | −300 | +250 | −600 | +150 | −275 | +550 | −550 | 0 | −250 |

**Note** (1) For double-direction bearings, its classification depends on $d$ for single-direction bearings with the same $D$ in the same diameter series.

**Remarks** $\Delta_{Ts}$ in the table is the deviation in the respective heights $T$ in figures below.

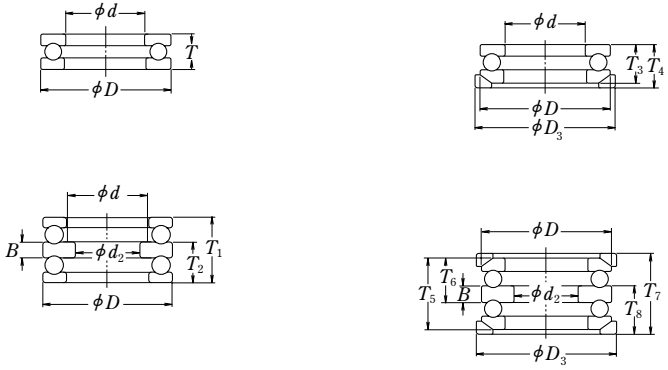



**Table 8. 7 Tolerances for Thrust Spherical Roller Bearings**

**Table 8. 7. 1 Tolerances for Bore Diameters of Shaft Rings and Height (Class Normal)**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $V_{dp}$ | Reference $S_d$ | Reference $\Delta_{Ts}$ | |
|---|---|---|---|---|---|---|---|
| over | incl | high | low | max. | max. | high | low |
| **50** | **80** | 0 | −15 | 11 | 25 | +150 | −150 |
| **80** | **120** | 0 | −20 | 15 | 25 | +200 | −200 |
| **120** | **180** | 0 | −25 | 19 | 30 | +250 | −250 |
| **180** | **250** | 0 | −30 | 23 | 30 | +300 | −300 |
| **250** | **315** | 0 | −35 | 26 | 35 | +350 | −350 |
| **315** | **400** | 0 | −40 | 30 | 40 | +400 | −400 |
| **400** | **500** | 0 | −45 | 34 | 45 | +450 | −450 |

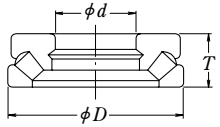
**Remarks** The bore diameter "no-go side" tolerances (high) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.

**Table 8. 7. 2 Tolerances for Housing Ring Diameter (Class Normal)**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Dmp}$ | |
|---|---|---|---|
| over | incl | high | low |
| **120** | **180** | 0 | − 25 |
| **180** | **250** | 0 | − 30 |
| **250** | **315** | 0 | − 35 |
| **315** | **400** | 0 | − 40 |
| **400** | **500** | 0 | − 45 |
| **500** | **630** | 0 | − 50 |
| **630** | **800** | 0 | − 75 |
| **800** | **1 000** | 0 | −100 |

**Remarks** The outside diameter "no-go side" tolerances (low) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension $r$ (max.) from the ring face.



## Table 8. 8 Tolerances of CLASS 5P, CLASS 7P, and CLASS 9P Instrument Ball Bearings (Inch design)

### (1) Tolerances for Inner Rings

(ANSI/ABMA Equivalent)

Units : μm

| Nominal Bore Diameter $d$ (mm) over | incl | $\Delta_{dmp}$ CLASS 5P CLASS 7P high | low | $\Delta_{dmp}$ CLASS 9P high | low | $\Delta_{ds}$ CLASS 5P CLASS 7P high | low | $\Delta_{ds}$ CLASS 9P high | low | $V_{dp}$ CLASS 5P CLASS 7P max. | $V_{dp}$ CLASS 9P max. | $V_{dmp}$ CLASS 5P CLASS 7P max. | $V_{dmp}$ CLASS 9P max. | $\Delta_{Bs}$ Single Brgs CLASS 5P CLASS 7P CLASS 9P high | low |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | **10** | 0 | −5.1 | 0 | −2.5 | 0 | −5.1 | 0 | −2.5 | 2.5 | 1.3 | 2.5 | 1.3 | 0 | −25.4 |
| **10** | **18** | 0 | −5.1 | 0 | −2.5 | 0 | −5.1 | 0 | −2.5 | 2.5 | 1.3 | 2.5 | 1.3 | 0 | −25.4 |
| **18** | **30** | 0 | −5.1 | 0 | −2.5 | 0 | −5.1 | 0 | −2.5 | 2.5 | 1.3 | 2.5 | 1.3 | 0 | −25.4 |

**Note** (1) Applicable to bearings for which the axial clearance (preload) is to be adjusted by combining two selected bearings.
**Remarks** For the CLASS 3P and the tolerances of Metric design Instrument Ball Bearings, it is advisable to consult NSK.

### (2) Tolerances for Outer Rings

Units : μm

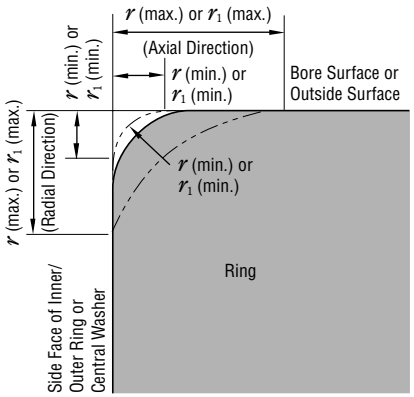
| Nominal Outside Diameter $D$ (mm) over | incl | $\Delta_{Dmp}$ CLASS 5P CLASS 7P high | low | $\Delta_{Dmp}$ CLASS 9P high | low | $\Delta_{Ds}$ CLASS 5P CLASS 7P Open high | low | $\Delta_{Ds}$ CLASS 5P CLASS 7P Shielded Sealed high | low | $\Delta_{Ds}$ CLASS 9P Open high | low | $V_{Dp}$ CLASS 5P CLASS 7P Open max. | $V_{Dp}$ CLASS 5P CLASS 7P Shielded Sealed max. | $V_{Dp}$ CLASS 9P Open max. | $V_{Dmp}$ CLASS 5P CLASS 7P Open max. | $V_{Dmp}$ CLASS 5P CLASS 7P Shielded Sealed max. | $V_{Dmp}$ CLASS 9P Open max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | **18** | 0 | −5.1 | 0 | −2.5 | 0 | −5.1 | +1 | −6.1 | 0 | −2.5 | 2.5 | 5.1 | 1.3 | 2.5 | 5.1 | 1.3 |
| **18** | **30** | 0 | −5.1 | 0 | −3.8 | 0 | −5.1 | +1 | −6.1 | 0 | −3.8 | 2.5 | 5.1 | 2 | 2.5 | 5.1 | 2 |
| **30** | **50** | 0 | −5.1 | 0 | −3.8 | 0 | −5.1 | +1 | −6.1 | 0 | −3.8 | 2.5 | 5.1 | 2 | 2.5 | 5.1 | 2 |

**Notes** (1) Applicable to flange width variation for flanged bearings.
(2) Applicable to flange back face.

| (or $\Delta_{Cs}$) Combined Brgs (1) CLASS 5P CLASS 7P CLASS 9P high | low | $V_{Bs}$ CLASS 5P max. | $V_{Bs}$ CLASS 7P max. | $V_{Bs}$ CLASS 9P max. | $K_{ia}$ CLASS 5P max. | $K_{ia}$ CLASS 7P max. | $K_{ia}$ CLASS 9P max. | $S_{ia}$ CLASS 5P max. | $S_{ia}$ CLASS 7P max. | $S_{ia}$ CLASS 9P max. | $S_d$ CLASS 5P max. | $S_d$ CLASS 7P max. | $S_d$ CLASS 9P max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | −400 | 5.1 | 2.5 | 1.3 | 3.8 | 2.5 | 1.3 | 7.6 | 2.5 | 1.3 | 7.6 | 2.5 | 1.3 |
| 0 | −400 | 5.1 | 2.5 | 1.3 | 3.8 | 2.5 | 1.3 | 7.6 | 2.5 | 1.3 | 7.6 | 2.5 | 1.3 |
| 0 | −400 | 5.1 | 2.5 | 1.3 | 3.8 | 3.8 | 2.5 | 7.6 | 3.8 | 1.3 | 7.6 | 3.8 | 1.3 |

Units : μm

| $V_{Cs}$ (1) CLASS 5P | CLASS 7P | CLASS 9P | $S_D$ CLASS 5P | CLASS 7P | CLASS 9P | $K_{ea}$ CLASS 5P | CLASS 7P | CLASS 9P | $S_{ea}$ CLASS 5P | CLASS 7P | CLASS 9P | Deviation of Flange Outside Diameter $\Delta_{D1s}$ CLASS 5P CLASS 7P high | low | Deviation of Flange Width $\Delta_{C1s}$ CLASS 5P CLASS 7P high | low | Flange Backface Runout with Raceway (2) $S_{ea1}$ CLASS 5P CLASS 7P max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | | | | | |
| 5.1 | 2.5 | 1.3 | 7.6 | 3.8 | 1.3 | 5.1 | 3.8 | 1.3 | 7.6 | 5.1 | 1.3 | 0 | −25.4 | 0 | −50.8 | 7.6 |
| 5.1 | 2.5 | 1.3 | 7.6 | 3.8 | 1.3 | 5.1 | 3.8 | 2.5 | 7.6 | 5.1 | 2.5 | 0 | −25.4 | 0 | −50.8 | 7.6 |
| 5.1 | 2.5 | 1.3 | 7.6 | 3.8 | 1.3 | 5.1 | 5.1 | 2.5 | 7.6 | 5.1 | 2.5 | 0 | −25.4 | 0 | −50.8 | 7.6 |




$r$ : Chamfer Dimension of Inner/Outer Ring
$r_1$ : Chamfer Dimension of Inner/Outer Ring (Front Side) or of Central Washer of Thrust Ball Bearings

**Remarks** The precise shape of chamfer surfaces has not been specified but its profile in the axial plane shall not intersect an arc of radius $r$ (min.) or $r_1$ (min.) touching the side face of an inner ring or central washer and bore surface, or the side face of an outer ring and outside surface.

## Table 8. 9 Chamfer Dimension Limits (for Metric Design Bearings)

### Table 8. 9. 1 Chamfer Dimension Limits for Radial Bearings (excluding Tapered Roller Bearings)

Units : mm

| Permissible Chamfer Dimension for Inner/Outer Rings $r$ (min.) or $r_1$ (min.) | Nominal Bore Diameter $d$ over | Nominal Bore Diameter $d$ incl | Permissible Chamfer Dimension for Inner/Outer Rings $r$ (max.) or $r_1$ (max.) Radial Direction | Permissible Chamfer Dimension for Inner/Outer Rings $r$ (max.) or $r_1$ (max.) Axial Direction | Reference Corner Radius of Shaft or Housing $r_a$ max. |
|---|---|---|---|---|---|
| **0.05** | – | – | 0.1 | 0.2 | 0.05 |
| **0.08** | – | – | 0.16 | 0.3 | 0.08 |
| **0.1** | – | – | 0.2 | 0.4 | 0.1 |
| **0.15** | – | – | 0.3 | 0.6 | 0.15 |
| **0.2** | – | – | 0.5 | 0.8 | 0.2 |
| **0.3** | – | 40 | 0.6 | 1 | 0.3 |
| | 40 | – | 0.8 | 1 | |
| **0.6** | – | 40 | 1 | 2 | 0.6 |
| | 40 | – | 1.3 | 2 | |
| **1** | – | 50 | 1.5 | 3 | 1 |
| | 50 | – | 1.9 | 3 | |
| **1.1** | – | 120 | 2 | 3.5 | 1 |
| | 120 | – | 2.5 | 4 | |
| **1.5** | – | 120 | 2.3 | 4 | 1.5 |
| | 120 | – | 3 | 5 | |
| **2** | – | 80 | 3 | 4.5 | 2 |
| | 80 | 220 | 3.5 | 5 | |
| | 220 | – | 3.8 | 6 | |
| **2.1** | – | 280 | 4 | 6.5 | 2 |
| | 280 | – | 4.5 | 7 | |
| **2.5** | – | 100 | 3.8 | 6 | 2 |
| | 100 | 280 | 4.5 | 6 | |
| | 280 | – | 5 | 7 | |
| **3** | – | 280 | 5 | 8 | 2.5 |
| | 280 | – | 5.5 | 8 | |
| **4** | – | – | 6.5 | 9 | 3 |
| **5** | – | – | 8 | 10 | 4 |
| **6** | – | – | 10 | 13 | 5 |
| **7.5** | – | – | 12.5 | 17 | 6 |
| **9.5** | – | – | 15 | 19 | 8 |
| **12** | – | – | 18 | 24 | 10 |
| **15** | – | – | 21 | 30 | 12 |
| **19** | – | – | 25 | 38 | 15 |

**Remarks** For bearings with nominal widths less than 2mm, the value of $r$ (max.) in the axial direction is the same as that in the radial direction.

### Table 8. 9. 2 Chamfer Dimension Limits for Tapered Roller Bearings

Units : mm

| Permissible Chamfer Dimension for Inner/Outer Rings $r$ (min.) | Nominal Bore or Nominal Outside Diameter (1) $d$ or $D$ over | Nominal Bore or Nominal Outside Diameter (1) $d$ or $D$ incl | Permissible Chamfer Dimension for Inner/Outer Rings $r$ (max.) Radial Direction | Permissible Chamfer Dimension for Inner/Outer Rings $r$ (max.) Axial Direction | Reference Corner Radius of Shaft or Housing $r_a$ max. |
|---|---|---|---|---|---|
| **0.15** | – | – | 0.3 | 0.6 | 0.15 |
| **0.3** | – | 40 | 0.7 | 1.4 | 0.3 |
| | 40 | – | 0.9 | 1.6 | |
| **0.6** | – | 40 | 1.1 | 1.7 | 0.6 |
| | 40 | – | 1.3 | 2 | |
| **1** | – | 50 | 1.6 | 2.5 | 1 |
| | 50 | – | 1.9 | 3 | |
| **1.5** | – | 120 | 2.3 | 3 | 1.5 |
| | 120 | 250 | 2.8 | 3.5 | |
| | 250 | – | 3.5 | 4 | |
| **2** | – | 120 | 2.8 | 4 | 2 |
| | 120 | 250 | 3.5 | 4.5 | |
| | 250 | – | 4 | 5 | |
| **2.5** | – | 120 | 3.5 | 5 | 2 |
| | 120 | 250 | 4 | 5.5 | |
| | 250 | – | 4.5 | 6 | |
| **3** | – | 120 | 4 | 5.5 | 2.5 |
| | 120 | 250 | 4.5 | 6.5 | |
| | 250 | 400 | 5 | 7 | |
| | 400 | – | 5.5 | 7.5 | |
| **4** | – | 120 | 5 | 7 | 3 |
| | 120 | 250 | 5.5 | 7.5 | |
| | 250 | 400 | 6 | 8 | |
| | 400 | – | 6.5 | 8.5 | |
| **5** | – | 180 | 6.5 | 8 | 4 |
| | 180 | – | 7.5 | 9 | |
| **6** | – | 180 | 7.5 | 10 | 5 |
| | 180 | – | 9 | 11 | |

**Note** (1) Inner Rings are classified by $d$ and Outer Rings by $D$.

### Table 8. 9. 3 Chamfer Dimension Limits for Thrust Bearings

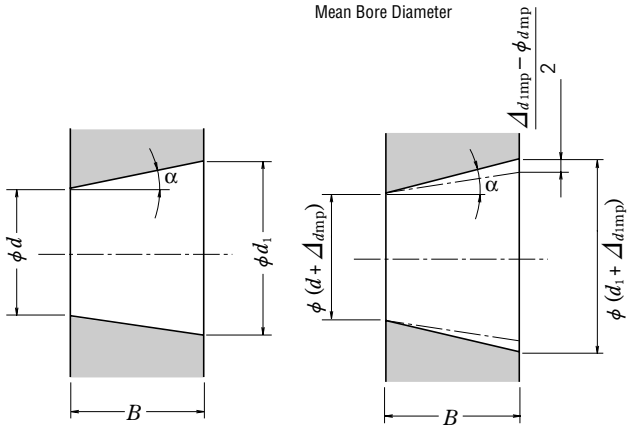
Units : mm

| Permissible Chamfer Dimension for Shaft (or Central)/Housing Washers $r$ (min.) or $r_1$ (min.) | Permissible Chamfer Dimension for Shaft (or Central)/Housing Washers $r$ (max.) or $r_1$ (max.) Radial or Axial Direction | Reference Corner Radius of Shaft or Housing $r_a$ max. |
|---|---|---|
| **0.05** | 0.1 | 0.05 |
| **0.08** | 0.16 | 0.08 |
| **0.1** | 0.2 | 0.1 |
| **0.15** | 0.3 | 0.15 |
| **0.2** | 0.5 | 0.2 |
| **0.3** | 0.8 | 0.3 |
| **0.6** | 1.5 | 0.6 |
| **1** | 2.2 | 1 |
| **1.1** | 2.7 | 1 |
| **1.5** | 3.5 | 1.5 |
| **2** | 4 | 2 |
| **2.1** | 4.5 | 2 |
| **3** | 5.5 | 2.5 |
| **4** | 6.5 | 3 |
| **5** | 8 | 4 |
| **6** | 10 | 5 |
| **7.5** | 12.5 | 6 |
| **9.5** | 15 | 8 |
| **12** | 18 | 10 |
| **15** | 21 | 12 |
| **19** | 25 | 15 |

### Table 8.10 Tolerances for Tapered Bores (Class Normal)

Nominal Tapered Bore

Tapered Bore with Deviation in Single Plane Mean Bore Diameter




$d$ : Nominal Bore Diameter
$d_1$ : Theoretical Diameter of Larger End of Tapered Bore
Taper 1:12 $d_1 = d + 1/12\,B$ Taper 1:30 $d_1 = d + /30\,B$
$\Delta_{dmp}$ : Single Plane Mean Bore Diameter Deviation in Theoretical Diameter of Smaller End of Bore
$\Delta_{d1mp}$ : Single Plane Mean Bore Diameter Deviation in Theoretical Diameter of Larger End of Bore
$V_{dp}$ : Bore diameter variation in a single radial plane
$B$ : Nominal Inner Ring width
$\alpha$ : Half of Taper Angle of Tapered Bore

Taper 1:12
$\alpha$=2°23´9.4˝
=2.38594°
=0.041643 rad

Taper 1:30
$\alpha$=57´17.4˝
=0.95484°
=0.016665 rad

**Taper1 : 12**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $\Delta_{d1mp} - \Delta_{dmp}$ | | $V_{dp}$ (1) (2) |
|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | max. |
| **18** | **30** | +33 | 0 | +21 | 0 | 13 |
| **30** | **50** | +39 | 0 | +25 | 0 | 16 |
| **50** | **80** | +46 | 0 | +30 | 0 | 19 |
| **80** | **120** | +54 | 0 | +35 | 0 | 22 |
| **120** | **180** | +63 | 0 | +40 | 0 | 40 |
| **180** | **250** | +72 | 0 | +46 | 0 | 46 |
| **250** | **315** | +81 | 0 | +52 | 0 | 52 |
| **315** | **400** | +89 | 0 | +57 | 0 | 57 |
| **400** | **500** | +97 | 0 | +63 | 0 | 63 |
| **500** | **630** | +110 | 0 | +70 | 0 | 70 |
| **630** | **800** | +125 | 0 | +80 | 0 | – |
| **800** | **1 000** | +140 | 0 | +90 | 0 | – |
| **1 000** | **1 250** | +165 | 0 | +105 | 0 | – |
| **1 250** | **1 600** | +195 | 0 | +125 | 0 | – |

**Notes** (1) Applicable to all radial planes of tapered bores.
(2) Not applicable to diameter series 7 and 8.

**Taper 1 : 30**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $\Delta_{d1mp} - \Delta_{dmp}$ | | $V_{dp}$ (1) (2) |
|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | max. |
| **80** | **120** | +20 | 0 | +35 | 0 | 22 |
| **120** | **180** | +25 | 0 | +40 | 0 | 40 |
| **180** | **250** | +30 | 0 | +46 | 0 | 46 |
| **250** | **315** | +35 | 0 | +52 | 0 | 52 |
| **315** | **400** | +40 | 0 | +57 | 0 | 57 |
| **400** | **500** | +45 | 0 | +63 | 0 | 63 |
| **500** | **630** | +50 | 0 | +70 | 0 | 70 |

**Notes** (1) Applicable to all radial planes of tapered bores.
(2) Not applicable to diameter series 7 and 8.
**Remarks** For a value exceeding 630 mm, please contact NSK.

## 8.2 Selection of Accuracy Classes

For general applications, Class Normal tolerances are adequate in nearly all cases for satisfactory performance, but for the following applications, bearings having an accuracy class of 5,4 or higher are more suitable.
For reference, in Table 8.11, examples of applications and appropriate tolerance classes are listed for various bearing requirements and operating conditions.

### Table 8. 11 Typical Tolerance Classes for Specific Applications (Reference)

| Bearing Requirement, Operating Conditions | Examples of Applications | Tolerance Classes |
|---|---|---|
| High running accuracy is required | VTR Drum Spindles | P5 |
| | Magnetic Disk Spindles for Computers | P5, P4, P2 |
| | Machine-Tool Main Spindles | P5, P4, P2 |
| | Rotary Printing Presses | P5 |
| | Rotary Tables of Vertical Presses, etc. | P5, P4 |
| | Roll Necks of Cold Rolling Mill Backup Rolls | Higher than P4 |
| | Slewing Bearings for Parabolic Antennas | Higher than P4 |
| Extra high speed is required | Dental Drills | CLASS 7P, CLASS 5P |
| | Gyroscopes | CLASS 7P, P4 |
| | High Frequency Spindles | CLASS 7P, P4 |
| | Superchargers | P5, P4 |
| | Centrifugal Separators | P5, P4 |
| | Main Shafts of Jet Engines | Higher than P4 |
| Low torque and low torque variation are required | Gyroscope Gimbals | CLASS 7P, P4 |
| | Servomechanisms | CLASS 7P, CLASS 5P |
| | Potentiometric Controllers | CLASS 7P |

# 9. FITS AND INTERNAL CLEARANCES

## 9.1 Fits

### 9.1.1 Importance of Proper Fits

In the case of a rolling bearing with the inner ring fitted to the shaft with only slight interference, a harmful circumferential slipping may occur between the inner ring and shaft. This slipping of the inner ring, which is called "creep", results in a circumferential displacement of the ring relative to the shaft if the interference fit is not sufficiently tight. When creep occurs, the fitted surfaces become abraded, causing wear and considerable damage to the shaft. Abnormal heating and vibration may also occur due to abrasive metallic particles entering the interior of the bearing.
It is important to prevent creep by having sufficient interference to firmly secure that ring which rotates to either the shaft or housing. Creep cannot always be eliminated using only axial tightening through the bearing ring faces. Generally, it is not necessary, however, to provide interference for rings subjected only to stationary loads. Fits are sometimes made without any interference for either the inner or outer ring, to accommodate certain operating conditions, or to facilitate mounting and dismounting. In this case, to prevent damage to the fitting surfaces due to creep, lubrication of other applicable methods should be considered.

### 9.1.2 Selection of Fit

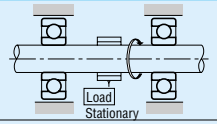
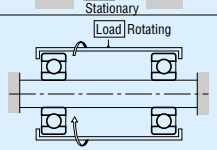
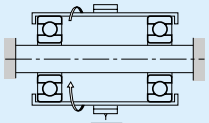
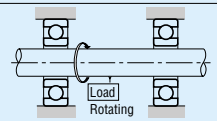
**(1) Load Conditions and Fit**
The proper fit may be selected from Table 9.1 based on the load and operating conditions.

**(2) Magnitude of Load and Interference**
The interference of the inner ring is slightly reduced by the bearing load; therefore, the loss of interference should be estimated using the following equations:

$$\left.\begin{aligned} \Delta d_F &= 0.08\sqrt{\frac{d}{B}F_r}\times 10^{-3} \quad \cdots\cdots\cdots (\mathrm{N}) \\ \Delta d_F &= 0.25\sqrt{\frac{d}{B}F_r}\times 10^{-3} \quad \cdots\cdots\cdots \{\mathrm{kgf}\} \end{aligned}\right\} \cdots (\mathbf{9.1})$$

where $\Delta d_F$ : Interference decrease of inner ring (mm)
$d$ : Bearing bore diameter (mm)
$B$ : Nominal inner ring width (mm)
$F_r$ : Radial load applied on bearing (N), {kgf}

**Table 9.1 Loading Conditions and Fits**

| Load Application | Bearing Operation | | Load Conditions | Fitting | |
|---|---|---|---|---|---|
| | Inner Ring | Outer Ring | | Inner Ring | Outer Ring |
|   | Rotating | Stationary | Rotating Inner Ring Load / Stationary Outer Ring Load | Tight Fit | Loose Fit |
|   | Stationary | Rotating | | | |
|   | Stationary | Rotating | Rotating Outer Ring Load / Stationary Inner Ring Load | Loose Fit | Tight Fit |
|   | Rotating | Stationary | | | |
| Direction of load indeterminate due to variation of direction or unbalanced load | Rotating or Stationary | Rotating or Stationary | Direction of Load Indeterminate | Tight Fit | Tight Fit |





Therefore, the effective interference $\Delta d$ should be larger than the interference given by Equation (9.1). However, in the case of heavy loads where the radial load exceeds 20% of the basic static load rating $C_{0r}$, under the operating condition, interference often becomes shortage. Therefore, interference should be estimated using Equation (9.2):

$$\left.\begin{aligned} \Delta d &\geqq 0.02\frac{F_r}{B}\times 10^{-3} \quad \cdots\cdots\cdots (\mathrm{N}) \\ \Delta d &\geqq 0.2\frac{F_r}{B}\times 10^{-3} \quad \cdots\cdots\cdots \{\mathrm{kgf}\} \end{aligned}\right\} \cdots\cdots (\mathbf{9.2})$$

where $\Delta d$ : Effective interference (mm)
$F_r$ : Radial load applied on bearing (N), {kgf}
$B$ : Nominal inner ring width (mm)

**(3) Interference Variation Caused by Temperature Difference between Bearing and Shaft or Housing**
The effective interference decreases due to the increasing bearing temperature during operation. If the temperature difference between the bearing and housing is $\Delta T$ (°C), then the temperature difference between the fitted surfaces of the shaft and inner ring is estimated to be about (0.1~0.15) $\Delta T$ in case that the shaft is cooled. The decrease in the interference of the inner ring due to this temperature difference $\Delta d_T$ may be calculated using Equation (9.3):

$$\begin{aligned} \Delta d_T &= (0.10 \text{ to } 0.15)\times \Delta T\cdot\alpha\cdot d \\ &\fallingdotseq 0.0015\Delta T\cdot d\times 10^{-3} \quad \cdots\cdots\cdots\cdots\cdots (\mathbf{9.3}) \end{aligned}$$

where $\Delta d_T$ : Decrease in interference of inner ring due to temperature difference (mm)
$\Delta T$ : Temperature difference between bearing interior and surrounding parts (°C)
$\alpha$ : Coefficient of linear expansion of bearing steel=$12.5\times 10^{-6}$ (1/°C)
$d$ : Bearing nominal bore diameter (mm)

In addition, depending on the temperature difference between the outer ring and housing, or difference in their coefficients of linear expansion, the interference may increase.

**(4) Effective Interference and Finish of Shaft and Housing**
Since the roughness of fitted surfaces is reduced during fitting, the effective interference becomes less than the apparent interference. The amount of this interference decrease varies depending on the roughness of the surfaces and may be estimated using the following equations:

For ground shafts $\Delta d = \frac{d}{d+2}\Delta d_a$ ..... (**9.4**)

For machined shafts $\Delta d = \frac{d}{d+3}\Delta d_a$ ..... (**9.5**)

where $\Delta d$ : Effective interference (mm)
$\Delta d_a$ : Apparent interference (mm)
$d$ : Bearing nominal bore diameter (mm)

According to Equations (9.4) and (9.5), the effective interference of bearings with a bore diameter of 30 to 150 mm is about 95% of the apparent interference.

**(5) Fitting Stress and Ring Expansion and Contraction**
When bearings are mounted with interference on a shaft or in a housing, the rings either expand or contract and stress is produced. Excessive interference may damage the bearings; therefore, as a general guide, the maximum interference should be kept under approximately 7/10 000 of the shaft diameter.
The pressure between fitted surfaces, expansion or contraction of the rings, and circumferential stress may be calculated using the equations in Section **15.2**, Fitting(1) (Pages A130 and 131).

### 9.1.3 Recommended Fits

As described previously, many factors, such as the characteristics and magnitude of bearing load, temperature differences, means of bearing mounting and dismounting, must be considered when selecting the proper fit.
If the housing is thin or the bearing is mounted on a hollow shaft, a tighter than usual tit is necessary. A split housing often deforms the bearing into an oval shape; therefore, a split housing should be avoided when a tight fit with the outer ring is required.
The fits of both the inner and outer rings should be tight in applications where the shaft is subjected to considerable vibration.
The recommended fits for some common applications are shown in Table 9.2 to 9.7. In the case of unusual operating conditions, it is advisable to consult NSK. For the accuracy and surface finish of shafts and housings, please refer to Section **11.1** (Page A100).

### Table 9.2 Fits of Radial Bearings with Shafts

| Load Conditions | | Examples | Shaft Diameter (mm) | | | Tolerance of Shaft | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Ball Brgs | Cylindrical Roller Brgs, Tapered Roller Brgs | Spherical Roller Brgs | | |
| **Radial Bearings with Cylindrical Bores** | | | | | | | |
| Rotating Outer Ring Load | Easy axial displacement of inner ring on shaft desirable. | Wheels on Stationary Axles | All Shaft Diameters | | | g6 | Use g5 and h5 where accuracy is required. In case of large bearings, f6 can be used to allow easy axial movement. |
| | Easy axial displacement of inner ring on shaft unnecessary | Tension Pulleys Rope Sheaves | | | | h6 | |
| Rotating Inner Ring Load or Direction of Load Indeterminate | Light Loads or Variable Loads ($<0.06C_r$(1)) | Electrical Home Appliances Pumps, Blowers, Transport Vehicles, Precision Machinery, Machine Tools | <18 | — | — | js5 | |
| | | | 18 to 100 | <40 | — | js6(j6) | |
| | | | 100 to 200 | 40 to 140 | — | k6 | |
| | | | — | 140 to 200 | — | m6 | |
| | Normal Loads (0.06 to $0.13C_r$(1)) | General Bearing Applications, Medium and Large Motors, Turbines, Pumps, Engine Main Bearings, Gears, Woodworking Machines | <18 | — | — | js5 or js6 (j5 or j6) | k6 and m6 can be used for single-row tapered roller bearings and single-row angular contact ball bearings instead of k5 and m5. |
| | | | 18 to 100 | <40 | <40 | k5 or k6 | |
| | | | 100 to 140 | 40 to 100 | 40 to 65 | m5 or m6 | |
| | | | 140 to 200 | 100 to 140 | 65 to 100 | m6 | |
| | | | 200 to 280 | 140 to 200 | 100 to 140 | n6 | |
| | | | — | 200 to 400 | 140 to 280 | p6 | |
| | | | — | — | 280 to 500 | r6 | |
| | | | — | — | over 500 | r7 | |
| | Heavy Loads or Shock Loads ($>0.13C_r$(1)) | Railway Axleboxes, Industrial Vehicles, Traction Motors, Construction Equipment, Crushers | — | 50 to 140 | 50 to 100 | n6 | More than CN bearing internal clearance is necessary. |
| | | | — | 140 to 200 | 100 to 140 | p6 | |
| | | | — | over 200 | 140 to 200 | r6 | |
| | | | — | — | 200 to 500 | r7 | |
| Axial Loads Only | | | All Shaft Diameters | | | js6 (j6) | — |
| **Radial Bearings with Tapered Bores and Sleeves** | | | | | | | |
| All Types of Loading | | General bearing Applications, Railway Axleboxes | All Shaft Diameters | | | h9/IT5 | IT5 and IT7 mean that the deviation of the shaft from its true geometric form, e. g. roundness and cylindricity should be within the tolerances of IT5 and IT7 respectively. |
| | | Transmission Shafts, Woodworking Spindles | | | | h10/IT7 | |

**Note** (1) $C_r$ represents the basic load rating of the bearing.
**Remarks** This table is applicable only to solid steel shafts.

### Table 9.3 Fits of Thrust Bearings with Shafts

| Load Conditions | | Examples | Shaft Diameter (mm) | Tolerance of Shaft | Remarks |
|---|---|---|---|---|---|
| Central Axial Load Only | | Main Shafts of Lathes | All Shaft Diameters | h6 or js6 (j6) | — |
| Combined Radial and Axial Loads (Spherical Thrust Roller Bearings) | Stationary Inner Ring Load | Cone Crushers | All Shaft Diameters | js6 (j6) | |
| | Rotating Inner Ring Load or Direction of Load Indeterminate | Paper Pulp Refiners, Plastic Extruders | <200 | k6 | |
| | | | 200 to 400 | m6 | |
| | | | over 400 | n6 | |



### Table 9.4 Fits of Radial Bearings with Housings

| Load Conditions | | | Examples | Tolerances for Housing Bores | Axial Displacement of Outer Ring | Remarks |
|---|---|---|---|---|---|---|
| Solid Housings | Rotating Outer Ring Load | Heavy Loads on Bearing in Thin-Walled Housing or Heavy Shock Loads | Automotive Wheel Hubs (Roller Bearings) Crane Travelling Wheels | P7 | Impossible | — |
| | | Normal or Heavy Loads | Automotive Wheel Hubs (Ball Bearings) Vibrating Screens | N7 | | |
| | | Light or Variable Loads | Conveyor Rollers Rope Sheaves Tension Pulleys | M7 | | |
| | Direction of Load Indeterminate | Heavy Shock Loads | Traction Motors | | | |
| | | Normal or Heavy Loads | Pumps Crankshaft Main Bearings Medium and Large Motors | K7 | Generally Impossible | If axial displacement of the outer ring is not required. |
| | | Normal or Light Loads | | JS7 (J7) | Possible | Axial displacement of outer ring is necessary. |
| Solid or Split Housings | Rotating Inner Ring Load | Loads of All kinds | General Bearing Applications, Railway Axleboxes | H7 | Easily possible | — |
| | | Normal or Light Loads | Plummer Blocks | H8 | | |
| | | High Temperature Rise of Inner Ring Through Shaft | Paper Dryers | G7 | | |
| Solid Housing | Rotating Inner Ring Load | Accurate Running Desirable under Normal or Light Loads | Grinding Spindle Rear Ball Bearings High Speed Centrifugal Compressor Free Bearings | JS6 (J6) | Possible | — |
| | Direction of Load Indeterminate | | Grinding Spindle Front Ball Bearings High Speed Centrifugal Compressor Fixed Bearings | K6 | Generally Impossible | For heavy loads, interference fit tighter than K is used. When high accuracy is required, very strict tolerances should be used for fitting. |
| | Rotating Inner Ring Load | Accurate Running and High Rigidity Desirable under Variable Loads | Cylindrical Roller Bearings for Machine Tool Main Spindle | M6 or N6 | Impossible | |
| | | Minimum noise is required. | Electrical Home Appliances | H6 | Easily Possible | — |

**Remarks** This table is applicable to cast iron and steel housings. For housings made of light alloys, the interference should be tighter than those in this table.

### Table 9.5 Fits of Thrust Bearings with Housings

| Load Conditions | | Bearing Types | Tolerances for Housing Bores | Remarks |
|---|---|---|---|---|
| Axial Loads Only | | Thrust Ball Bearings | Clearance over 0.25mm | For General Applications |
| | | | H8 | When precision is required |
| | | Spherical Thrust Roller Bearings Steep Angle Tapered Roller Bearings | Outer ring has radial clearance. | When radial loads are sustained by other bearings. |
| Combined Radial and Axial Loads | Stationary Outer Ring Loads | Spherical Thrust Roller Bearings | H7 or JS7 (J7) | — |
| | Rotating Outer Ring Loads or Direction of Load Indeterminate | | K7 | Normal Loads |
| | | | M7 | Relatively Heavy Radial Loads |

## Table 9.6 Fits of Inch Design Tapered Roller Bearings with Shafts

### (1) Bearings of Precision Classes 4 and 2

Units : μm

| Operating Conditions | | Nominal Bore Diameters $d$ over (mm) | over 1/25.4 | incl (mm) | incl 1/25.4 | Bore Diameter Tolerances $\Delta_{ds}$ high | Bore Diameter Tolerances $\Delta_{ds}$ low | Shaft Diameter Tolerances high | Shaft Diameter Tolerances low | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Rotating Inner Ring Loads | Normal Loads | — | | 76.200 | 3.0000 | +13 | 0 | + 38 | + 25 | For bearings with $d \leqq 152.4$mm, clearance is usually larger than CN. |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +25 | 0 | + 64 | + 38 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | +127 | + 76 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | +190 | +114 | |
| | Heavy Loads Shock Loads High Speeds | — | | 76.200 | 3.0000 | +13 | 0 | + 64 | + 38 | In general, bearings with a clearance larger than CN are used. ※ means that the average interference is about 0.0005 $d$. |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +25 | 0 | ※ | | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | ※ | | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | +381 | +305 | |
| Rotating Outer Ring Loads | Normal Loads without Shocks | — | | 76.200 | 3.0000 | +13 | 0 | + 13 | 0 | The inner ring cannot be displaced axially. When heavy or shock loads exist, the figures in the above (Rotating inner ring loads, heavy or shock loads) apply. |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +25 | 0 | + 25 | 0 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | + 51 | 0 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | + 76 | 0 | |
| | | — | | 76.200 | 3.0000 | +13 | 0 | 0 | − 13 | The inner ring can be displaced axially. |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +25 | 0 | 0 | − 25 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | 0 | − 51 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | 0 | − 76 | |

### (2) Bearings of Precision Classes 3 and 0 (1)

Units : μm

| Operating Conditions | | Nominal Bore Diameters $d$ over (mm) | over 1/25.4 | incl (mm) | incl 1/25.4 | Bore Diameter Tolerances $\Delta_{ds}$ high | Bore Diameter Tolerances $\Delta_{ds}$ low | Shaft Diameter Tolerances high | Shaft Diameter Tolerances low | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Rotating Inner Ring Loads | Precision Machine-Tool Main Spindles | — | | 76.200 | 3.0000 | +13 | 0 | + 30 | +18 | — |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +13 | 0 | + 30 | +18 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | + 64 | +38 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | +102 | +64 | |
| | Heavy Loads Shock Loads High Speeds | — | | 76.200 | 3.0000 | +13 | 0 | — | | A minimum interference of about 0.00025 $d$ is used. |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +13 | 0 | — | | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | — | | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | — | | |
| Rotating Outer Ring Loads | Precision Machine-Tool Main Spindles | — | | 76.200 | 3.0000 | +13 | 0 | + 30 | +18 | — |
| | | 76.200 | 3.0000 | 304.800 | 12.0000 | +13 | 0 | + 30 | +18 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | + 64 | +38 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | +102 | +64 | |

**Note** (1) For bearings with $d$ greater than 304.8mm, Class 0 does not exist.

## Table 9.7 Fits of Inch Design Tapered Roller Bearings with Housings

### (1) Bearings of Precision Classes 4 and 2

Units : μm

| Operating Conditions | | Nominal Outside Diameters $D$ over (mm) | over 1/25.4 | incl (mm) | incl 1/25.4 | Outside Diameter Tolerances $\Delta_{Ds}$ high | Outside Diameter Tolerances $\Delta_{Ds}$ low | Housing Bore Diameter Tolerances high | Housing Bore Diameter Tolerances low | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Rotating Inner Ring Loads | Used either on free-end or fixed-end | — | | 76.200 | 3.0000 | +25 | 0 | + 76 | + 51 | The outer ring can be easily displaced axially. |
| | | 76.200 | 3.0000 | 127.000 | 5.0000 | +25 | 0 | + 76 | + 51 | |
| | | 127.000 | 5.0000 | 304.800 | 12.0000 | +25 | 0 | + 76 | + 51 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | +152 | +102 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | +229 | +152 | |
| | The outer ring position can be adjusted axially. | — | | 76.200 | 3.0000 | +25 | 0 | + 25 | 0 | The outer ring can be displaced axially. |
| | | 76.200 | 3.0000 | 127.000 | 5.0000 | +25 | 0 | + 25 | 0 | |
| | | 127.000 | 5.0000 | 304.800 | 12.0000 | +25 | 0 | + 51 | 0 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | + 76 | + 25 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | +127 | + 51 | |
| | The outer ring position cannot be adjusted axially. | — | | 76.200 | 3.0000 | +25 | 0 | − 13 | − 38 | Generally, the outer ring is fixed axially. |
| | | 76.200 | 3.0000 | 127.000 | 5.0000 | +25 | 0 | − 25 | − 51 | |
| | | 127.000 | 5.0000 | 304.800 | 12.0000 | +25 | 0 | − 25 | − 51 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | − 25 | − 76 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | − 25 | −102 | |
| Rotating Outer Ring Loads | Normal Loads The outer ring position cannot be adjusted axially. | — | | 76.200 | 3.0000 | +25 | 0 | − 13 | − 38 | The outer ring is fixed axially. |
| | | 76.200 | 3.0000 | 127.000 | 5.0000 | +25 | 0 | − 25 | − 51 | |
| | | 127.000 | 5.0000 | 304.800 | 12.0000 | +25 | 0 | − 25 | − 51 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +51 | 0 | − 25 | − 76 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +76 | 0 | − 25 | −102 | |

### (2) Bearings of Precision Classes 3 and 0 (1)

Units : μm

| Operating Conditions | | Nominal Outside Diameters $D$ over (mm) | over 1/25.4 | incl (mm) | incl 1/25.4 | Outside Diameter Tolerances $\Delta_{Ds}$ high | Outside Diameter Tolerances $\Delta_{Ds}$ low | Housing Bore Diameter Tolerances high | Housing Bore Diameter Tolerances low | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Rotating Inner Ring Loads | Used on free-end | — | | 152.400 | 6.0000 | +13 | 0 | +38 | +25 | The outer ring can be easily displaced axially. |
| | | 152.400 | 6.0000 | 304.800 | 12.0000 | +13 | 0 | +38 | +25 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | +64 | +38 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | +89 | +51 | |
| | Used on fixed-end | — | | 152.400 | 6.0000 | +13 | 0 | +25 | +13 | The outer ring can be displaced axially. |
| | | 152.400 | 6.0000 | 304.800 | 12.0000 | +13 | 0 | +25 | +13 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | +51 | +25 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | +76 | +38 | |
| | The outer ring position can be adjusted axially. | — | | 152.400 | 6.0000 | +13 | 0 | +13 | 0 | Generally, the outer ring is fixed axially. |
| | | 152.400 | 6.0000 | 304.800 | 12.0000 | +13 | 0 | +25 | 0 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | +25 | 0 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | +38 | 0 | |
| | The outer ring position cannot be adjusted axially. | — | | 152.400 | 6.0000 | +13 | 0 | 0 | −13 | The outer ring is fixed axially. |
| | | 152.400 | 6.0000 | 304.800 | 12.0000 | +13 | 0 | 0 | −25 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | 0 | −25 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | 0 | −38 | |
| Rotating Outer Ring Loads | Normal Loads The outer ring position cannot be adjusted axially. | — | | 76.200 | 3.0000 | +13 | 0 | −13 | −25 | The outer ring is fixed axially. |
| | | 76.200 | 3.0000 | 152.400 | 6.0000 | +13 | 0 | −13 | −25 | |
| | | 152.400 | 6.0000 | 304.800 | 12.0000 | +13 | 0 | −13 | −38 | |
| | | 304.800 | 12.0000 | 609.600 | 24.0000 | +25 | 0 | −13 | −38 | |
| | | 609.600 | 24.0000 | 914.400 | 36.0000 | +38 | 0 | −13 | −51 | |

**Note** (1) For bearings with $D$ greater than 304.8 mm, Class 0 does not exist.

## 9.2 Bearing Internal Clearances

### 9.2.1 Internal Clearances and Their Standards

The internal clearance in rolling bearings in operation greatly influences bearing performance including fatigue life, vibration, noise, heart-generation, etc. Consequently, the selection of the proper internal clearance is one of the most important tasks when choosing a bearing after the type and size have been determined.

This bearing internal clearance is the combined clearances between the inner/outer rings and rolling elements. The radial and axial clearances are defined as the total amount that one ring can be displaced relative to the other in the radial and axial directions respectively (Fig. 9.1).

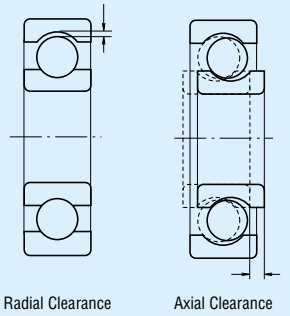



**Table 9.8 Bearing Internal Clearance**

To obtain accurate measurements, the clearance is generally measured by applying a specified measuring load on the bearing; therefore, the measured clearance (sometimes called "measured clearance" to make a distinction) is always slightly larger than the theoretical internal clearance (called "geometrical clearance" for radial bearings) by the amount of elastic deformation caused by the measuring load.

Therefore, the theoretical internal clearance may be obtained by correcting the measured clearance by the amount of elastic deformation. However, in the case of roller bearings this elastic deformation is negligibly small.

Usually the clearance before mounting is the one specified as the theoretical internal clearance.

In Table 9.8, reference table and page numbers are listed by bearing types.

**Table 9.8 Index for Radial Internal Clearances by Bearing Types**

| Bearing Types | | Table Number | Page Number |
|---|---|---|---|
| Deep Groove Ball Bearings | | 9.9 | A89 |
| Extra Small and Miniature Ball Bearings | | 9.10 | A89 |
| Magneto Bearings | | 9.11 | A89 |
| Self-Aligning Ball Bearings | | 9.12 | A90 |
| Deep Groove Ball Bearings | For Motors | 9.13.1 | A90 |
| Cylindrical Roller Bearings | For Motors | 9.13.2 | A90 |
| Cylindrical Roller Bearings | With Cylindrical Bores<br>With Cylindrical Bores (Matched)<br>With Tapered Bores (Matched) | 9.14 | A91 |
| Spherical Roller Bearings | With Cylindrical Bores<br>With Tapered Bores | 9.15 | A92 |
| Double-Row and Combined Tapered Roller Bearings | | 9.15 | A93 |
| Combined Angular Contact Ball Bearings (1) | | 9.17 | A94 |
| Four-Point Contact Ball Bearings (1) | | 9.18 | A94 |

**Note** (1) Values given are axial clearances.

**Table 9.9 Radial Internal Clearances in Deep Groove Ball Bearings**

Units : μm

| Nominal Bore Diameter $d$ (mm) over | incl | Clearance C2 min. | C2 max. | CN min. | CN max. | C3 min. | C3 max. | C4 min. | C4 max. | C5 min. | C5 max. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **10 only** | | 0 | 7 | 2 | 13 | 8 | 23 | 14 | 29 | 20 | 37 |
| **10** | **18** | 0 | 9 | 3 | 18 | 11 | 25 | 18 | 33 | 25 | 45 |
| **18** | **24** | 0 | 10 | 5 | 20 | 13 | 28 | 20 | 36 | 28 | 48 |
| **24** | **30** | 1 | 11 | 5 | 20 | 13 | 28 | 23 | 41 | 30 | 53 |
| **30** | **40** | 1 | 11 | 6 | 20 | 15 | 33 | 28 | 46 | 40 | 64 |
| **40** | **50** | 1 | 11 | 6 | 23 | 18 | 36 | 30 | 51 | 45 | 73 |
| **50** | **65** | 1 | 15 | 8 | 28 | 23 | 43 | 38 | 61 | 55 | 90 |
| **65** | **80** | 1 | 15 | 10 | 30 | 25 | 51 | 46 | 71 | 65 | 105 |
| **80** | **100** | 1 | 18 | 12 | 36 | 30 | 58 | 53 | 84 | 75 | 120 |
| **100** | **120** | 2 | 20 | 15 | 41 | 36 | 66 | 61 | 97 | 90 | 140 |
| **120** | **140** | 2 | 23 | 18 | 48 | 41 | 81 | 71 | 114 | 105 | 160 |
| **140** | **160** | 2 | 23 | 18 | 53 | 46 | 91 | 81 | 130 | 120 | 180 |
| **160** | **180** | 2 | 25 | 20 | 61 | 53 | 102 | 91 | 147 | 135 | 200 |
| **180** | **200** | 2 | 30 | 25 | 71 | 63 | 117 | 107 | 163 | 150 | 230 |
| **200** | **225** | 2 | 35 | 25 | 85 | 75 | 140 | 125 | 195 | 175 | 265 |
| **225** | **250** | 2 | 40 | 30 | 95 | 85 | 160 | 145 | 225 | 205 | 300 |
| **250** | **280** | 2 | 45 | 35 | 105 | 90 | 170 | 155 | 245 | 225 | 340 |
| **280** | **315** | 2 | 55 | 40 | 115 | 100 | 190 | 175 | 270 | 245 | 370 |
| **315** | **355** | 3 | 60 | 45 | 125 | 110 | 210 | 195 | 300 | 275 | 410 |
| **355** | **400** | 3 | 70 | 55 | 145 | 130 | 240 | 225 | 340 | 315 | 460 |
| **400** | **450** | 3 | 80 | 60 | 170 | 150 | 270 | 250 | 380 | 350 | 510 |
| **450** | **500** | 3 | 90 | 70 | 190 | 170 | 300 | 280 | 420 | 390 | 570 |
| **500** | **560** | 10 | 100 | 80 | 210 | 190 | 330 | 310 | 470 | 440 | 630 |
| **560** | **630** | 10 | 110 | 90 | 230 | 210 | 360 | 340 | 520 | 490 | 690 |
| **630** | **710** | 20 | 130 | 110 | 260 | 240 | 400 | 380 | 570 | 540 | 760 |
| **710** | **800** | 20 | 140 | 120 | 290 | 270 | 450 | 430 | 630 | 600 | 840 |

**Remarks** To obtain the measured values, use the clearance correction for radial clearance increase caused by the measuring load in the table below.
For the C2 clearance class, the smaller value should be used for bearings with minimum clearance and the larger value for bearings near the maximum clearance range.

Units : μm

| Nominal Bore Dia. $d$ (mm) over | incl | Measuring Load (N) | {kgf} | Radial Clearance Correction Amount C2 | CN | C3 | C4 | C5 |
|---|---|---|---|---|---|---|---|---|
| **10 (incl)** | **18** | 24.5 | {2.5} | 3 to 4 | 4 | 4 | 4 | 4 |
| **18** | **50** | 49 | {5} | 4 to 5 | 5 | 6 | 6 | 6 |
| **50** | **280** | 147 | {15} | 6 to 8 | 8 | 9 | 9 | 9 |

**Remarks** For values exceeding 280mm, please contact NSK.

**Table 9.10 Radial Internal Clearances in Extra Small and Miniature Ball Bearings**

Units : μm

| Clearance Symbol | MC1 | | MC2 | | MC3 | | MC4 | | MC5 | | MC6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| Clearance | 0 | 5 | 3 | 8 | 5 | 10 | 8 | 13 | 13 | 20 | 20 | 28 |

**Remarks**
1. The standard clearance is MC3.
2. To obtain the measured value, add correction amount in the table below.

Units : μm

| Clearance Symbol | MC1 | MC2 | MC3 | MC4 | MC5 | MC6 |
|---|---|---|---|---|---|---|
| Clearance Correction Value | 1 | 1 | 1 | 1 | 2 | 2 |

The measuring loads are as follows :
For miniature ball bearings∗ 2.5N {0.25kgf}
For extra small ball bearings∗ 4.4N {0.45kgf}
∗For their classification, refer to Table 1 on Page B 31.

**Table 9.11 Radial Internal Clearances in Magneto Bearings**

Units : μm

| Nominal Bore Diameter $d$ (mm) over | incl | Bearing Series | Clearance min. | max. |
|---|---|---|---|---|
| **2.5** | **30** | EN | 10 | 50 |
| | | E | 30 | 60 |

## Table 9.12 Radial Internal Clearances in Self-Aligning Ball Bearings

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearance in Bearings with Cylindrical Bores | | | | | | | | | | Clearance in Bearings with Tapered Bores | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C2 | | CN | | C3 | | C4 | | C5 | | C2 | | CN | | C3 | | C4 | | C5 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| 2.5 | 6 | 1 | 8 | 5 | 15 | 10 | 20 | 15 | 25 | 21 | 33 | — | — | — | — | — | — | — | — | — | — |
| 6 | 10 | 2 | 9 | 6 | 17 | 12 | 25 | 19 | 33 | 27 | 42 | — | — | — | — | — | — | — | — | — | — |
| 10 | 14 | 2 | 10 | 6 | 19 | 13 | 26 | 21 | 35 | 30 | 48 | — | — | — | — | — | — | — | — | — | — |
| 14 | 18 | 3 | 12 | 8 | 21 | 15 | 28 | 23 | 37 | 32 | 50 | — | — | — | — | — | — | — | — | — | — |
| 18 | 24 | 4 | 14 | 10 | 23 | 17 | 30 | 25 | 39 | 34 | 52 | 7 | 17 | 13 | 26 | 20 | 33 | 28 | 42 | 37 | 55 |
| 24 | 30 | 5 | 16 | 11 | 24 | 19 | 35 | 29 | 46 | 40 | 58 | 9 | 20 | 15 | 28 | 23 | 39 | 33 | 50 | 44 | 62 |
| 30 | 40 | 6 | 18 | 13 | 29 | 23 | 40 | 34 | 53 | 46 | 66 | 12 | 24 | 19 | 35 | 29 | 46 | 40 | 59 | 52 | 72 |
| 40 | 50 | 6 | 19 | 14 | 31 | 25 | 44 | 37 | 57 | 50 | 71 | 14 | 27 | 22 | 39 | 33 | 52 | 45 | 65 | 58 | 79 |
| 50 | 65 | 7 | 21 | 16 | 36 | 30 | 50 | 45 | 69 | 62 | 88 | 18 | 32 | 27 | 47 | 41 | 61 | 56 | 80 | 73 | 99 |
| 65 | 80 | 8 | 24 | 18 | 40 | 35 | 60 | 54 | 83 | 76 | 108 | 23 | 39 | 35 | 57 | 50 | 75 | 69 | 98 | 91 | 123 |
| 80 | 100 | 9 | 27 | 22 | 48 | 42 | 70 | 64 | 96 | 89 | 124 | 29 | 47 | 42 | 68 | 62 | 90 | 84 | 116 | 109 | 144 |
| 100 | 120 | 10 | 31 | 25 | 56 | 50 | 83 | 75 | 114 | 105 | 145 | 35 | 56 | 50 | 81 | 75 | 108 | 100 | 139 | 130 | 170 |
| 120 | 140 | 10 | 38 | 30 | 68 | 60 | 100 | 90 | 135 | 125 | 175 | 40 | 68 | 60 | 98 | 90 | 130 | 120 | 165 | 155 | 205 |
| 140 | 160 | 15 | 44 | 35 | 80 | 70 | 120 | 110 | 161 | 150 | 210 | 45 | 74 | 65 | 110 | 100 | 150 | 140 | 191 | 180 | 240 |

## Table 9.13 Radial Internal Clearances in Bearings for Electric Motors

### Table 9.13. 1 Deep Groove Ball Bearings for Electric Motors

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearance | | Remarks | |
|---|---|---|---|---|---|
| | | CM | | Recommended fit | |
| over | incl | min. | max. | Shaft | Housing Bore |
| 10 (incl) | 18 | 4 | 11 | js5 (j5) | H6, H7 or JS6, JS7 (J6, J7) |
| 18 | 30 | 5 | 12 | k5 | |
| 30 | 50 | 9 | 17 | | |
| 50 | 80 | 12 | 22 | | |
| 80 | 100 | 18 | 30 | | |
| 100 | 120 | 18 | 30 | m5 | |
| 120 | 160 | 24 | 38 | | |

**Remarks** The radial clearance increase caused by the measuring load is equal to the correction amount for CN clearance in the remarks under Table 9.9.

### Table 9.13.2 Cylindrical Roller Bearings for Electric Motors

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearance | | | | Remarks | |
|---|---|---|---|---|---|---|---|
| | | Interchangeable CT | | Non-Interchangeable CM | | Recommended Fit | |
| over | incl | min. | max. | min. | max. | Shaft | Housing Bore |
| 24 | 40 | 15 | 35 | 15 | 30 | k5 | JS6, JS7 (J6, J7) or K6, K7 |
| 40 | 50 | 20 | 40 | 20 | 35 | m5 | |
| 50 | 65 | 25 | 45 | 25 | 40 | | |
| 65 | 80 | 30 | 50 | 30 | 45 | | |
| 80 | 100 | 35 | 60 | 35 | 55 | | |
| 100 | 120 | 35 | 65 | 35 | 60 | | |
| 120 | 140 | 40 | 70 | 40 | 65 | | |
| 140 | 160 | 50 | 85 | 50 | 80 | | |
| 160 | 180 | 60 | 95 | 60 | 90 | n6 | |
| 180 | 200 | 65 | 105 | 65 | 100 | | |

## Table 9.14 Radial Internal Clearances in Cylindrical Roller Bearings and Solid-Type Needle Roller Bearings

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearances in Bearings with Cylindrical Bores | | | | | | | | | | Clearances in Non-Interchangeable Bearings with Cylindrical Bores | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C2 | | CN | | C3 | | C4 | | C5 | | CC1 | | CC2 | | CC (1) | | CC3 | | CC4 | | CC5 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | 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 | 5 | 15 | 10 | 20 | 20 | 30 | 35 | 45 | 45 | 55 | 65 | 75 |
| 24 | 30 | 0 | 25 | 20 | 45 | 35 | 60 | 50 | 75 | 70 | 95 | 5 | 15 | 10 | 25 | 25 | 35 | 40 | 50 | 50 | 60 | 70 | 80 |
| 30 | 40 | 5 | 30 | 25 | 50 | 45 | 70 | 60 | 85 | 80 | 105 | 5 | 15 | 12 | 25 | 25 | 40 | 45 | 55 | 55 | 70 | 80 | 95 |
| 40 | 50 | 5 | 35 | 30 | 60 | 50 | 80 | 70 | 100 | 95 | 125 | 5 | 18 | 15 | 30 | 30 | 45 | 50 | 65 | 65 | 80 | 95 | 110 |
| 50 | 65 | 10 | 40 | 40 | 70 | 60 | 90 | 80 | 110 | 110 | 140 | 5 | 20 | 15 | 35 | 35 | 50 | 55 | 75 | 75 | 90 | 110 | 130 |
| 65 | 80 | 10 | 45 | 40 | 75 | 65 | 100 | 90 | 125 | 130 | 165 | 10 | 25 | 20 | 40 | 40 | 60 | 70 | 90 | 90 | 110 | 130 | 150 |
| 80 | 100 | 15 | 50 | 50 | 85 | 75 | 110 | 105 | 140 | 155 | 190 | 10 | 30 | 25 | 45 | 45 | 70 | 80 | 105 | 105 | 125 | 155 | 180 |
| 100 | 120 | 15 | 55 | 50 | 90 | 85 | 125 | 125 | 165 | 180 | 220 | 10 | 30 | 25 | 50 | 50 | 80 | 95 | 120 | 120 | 145 | 180 | 205 |
| 120 | 140 | 15 | 60 | 60 | 105 | 100 | 145 | 145 | 190 | 200 | 245 | 10 | 35 | 30 | 60 | 60 | 90 | 105 | 135 | 135 | 160 | 200 | 230 |
| 140 | 160 | 20 | 70 | 70 | 120 | 115 | 165 | 165 | 215 | 225 | 275 | 10 | 35 | 35 | 65 | 65 | 100 | 115 | 150 | 150 | 180 | 225 | 260 |
| 160 | 180 | 25 | 75 | 75 | 125 | 120 | 170 | 170 | 220 | 250 | 300 | 10 | 40 | 35 | 75 | 75 | 110 | 125 | 165 | 165 | 200 | 250 | 285 |
| 180 | 200 | 35 | 90 | 90 | 145 | 140 | 195 | 195 | 250 | 275 | 330 | 15 | 45 | 40 | 80 | 80 | 120 | 140 | 180 | 180 | 220 | 275 | 315 |
| 200 | 225 | 45 | 105 | 105 | 165 | 160 | 220 | 220 | 280 | 305 | 365 | 15 | 50 | 45 | 90 | 90 | 135 | 155 | 200 | 200 | 240 | 305 | 350 |
| 225 | 250 | 45 | 110 | 110 | 175 | 170 | 235 | 235 | 300 | 330 | 395 | 15 | 50 | 50 | 100 | 100 | 150 | 170 | 215 | 215 | 265 | 330 | 380 |
| 250 | 280 | 55 | 125 | 125 | 195 | 190 | 260 | 260 | 330 | 370 | 440 | 20 | 55 | 55 | 110 | 110 | 165 | 185 | 240 | 240 | 295 | 370 | 420 |
| 280 | 315 | 55 | 130 | 130 | 205 | 200 | 275 | 275 | 350 | 410 | 485 | 20 | 60 | 60 | 120 | 120 | 180 | 205 | 265 | 265 | 325 | 410 | 470 |
| 315 | 355 | 65 | 145 | 145 | 225 | 225 | 305 | 305 | 385 | 455 | 535 | 20 | 65 | 65 | 135 | 135 | 200 | 225 | 295 | 295 | 360 | 455 | 520 |
| 355 | 400 | 100 | 190 | 190 | 280 | 280 | 370 | 370 | 460 | 510 | 600 | 25 | 75 | 75 | 150 | 150 | 225 | 255 | 330 | 330 | 405 | 510 | 585 |
| 400 | 450 | 110 | 210 | 210 | 310 | 310 | 410 | 410 | 510 | 565 | 665 | 25 | 85 | 85 | 170 | 170 | 255 | 285 | 370 | 370 | 455 | 565 | 650 |
| 450 | 500 | 110 | 220 | 220 | 330 | 330 | 440 | 440 | 550 | 625 | 735 | 25 | 95 | 95 | 190 | 190 | 285 | 315 | 410 | 410 | 505 | 625 | 720 |

**Note** (1) CC denotes normal clearance for non-Interchangeable cylindrical roller bearings and solid-type needle roller bearings.

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearances in Non-Interchangeable Bearings with Tapered Bores | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CC9 (1) | | CC0 | | CC1 | | CC2 | | CC (2) | | CC3 | | CC4 | | CC5 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| 10 | 24 | 5 | 10 | — | — | 10 | 20 | 20 | 30 | 35 | 45 | 45 | 55 | 55 | 65 | 75 | 85 |
| 24 | 30 | 5 | 10 | 8 | 15 | 10 | 25 | 25 | 35 | 40 | 50 | 50 | 60 | 60 | 70 | 80 | 95 |
| 30 | 40 | 5 | 12 | 8 | 15 | 12 | 25 | 25 | 40 | 45 | 55 | 55 | 70 | 70 | 80 | 95 | 110 |
| 40 | 50 | 5 | 15 | 10 | 20 | 15 | 30 | 30 | 45 | 50 | 65 | 65 | 80 | 80 | 95 | 110 | 125 |
| 50 | 65 | 5 | 15 | 10 | 20 | 15 | 35 | 35 | 50 | 55 | 75 | 75 | 90 | 90 | 110 | 130 | 150 |
| 65 | 80 | 10 | 20 | 15 | 30 | 20 | 40 | 40 | 60 | 70 | 90 | 90 | 110 | 110 | 130 | 150 | 170 |
| 80 | 100 | 10 | 25 | 20 | 35 | 25 | 45 | 45 | 70 | 80 | 105 | 105 | 125 | 125 | 150 | 180 | 205 |
| 100 | 120 | 10 | 25 | 20 | 35 | 25 | 50 | 50 | 80 | 95 | 120 | 120 | 145 | 145 | 170 | 205 | 230 |
| 120 | 140 | 15 | 30 | 25 | 40 | 30 | 60 | 60 | 90 | 105 | 135 | 135 | 160 | 160 | 190 | 230 | 260 |
| 140 | 160 | 15 | 35 | 30 | 50 | 35 | 65 | 65 | 100 | 115 | 150 | 150 | 180 | 180 | 215 | 260 | 295 |
| 160 | 180 | 15 | 35 | 30 | 50 | 35 | 75 | 75 | 110 | 125 | 165 | 165 | 200 | 200 | 240 | 285 | 320 |
| 180 | 200 | 20 | 40 | 30 | 50 | 40 | 80 | 80 | 120 | 140 | 180 | 180 | 220 | 220 | 260 | 315 | 355 |
| 200 | 225 | 20 | 45 | 35 | 60 | 45 | 90 | 90 | 135 | 155 | 200 | 200 | 240 | 240 | 285 | 350 | 395 |
| 225 | 250 | 25 | 50 | 40 | 65 | 50 | 100 | 100 | 150 | 170 | 215 | 215 | 265 | 265 | 315 | 380 | 430 |
| 250 | 280 | 25 | 55 | 40 | 70 | 55 | 110 | 110 | 165 | 185 | 240 | 240 | 295 | 295 | 350 | 420 | 475 |
| 280 | 315 | 30 | 60 | — | — | 60 | 120 | 120 | 180 | 205 | 265 | 265 | 325 | 325 | 385 | 470 | 530 |
| 315 | 355 | 30 | 65 | — | — | 65 | 135 | 135 | 200 | 225 | 295 | 295 | 360 | 360 | 430 | 520 | 585 |
| 355 | 400 | 35 | 75 | — | — | 75 | 150 | 150 | 225 | 255 | 330 | 330 | 405 | 405 | 480 | 585 | 660 |
| 400 | 450 | 40 | 85 | — | — | 85 | 170 | 170 | 255 | 285 | 370 | 370 | 455 | 455 | 540 | 650 | 735 |
| 450 | 500 | 45 | 95 | — | — | 95 | 190 | 190 | 285 | 315 | 410 | 410 | 505 | 505 | 600 | 720 | 815 |

**Notes** (1) Clearance CC9 is applicable to cylindrical roller bearings with tapered bores in ISO Tolerance Classes 5 and 4.
(2) CC denotes normal clearance for non-Interchangeable cylindrical roller bearings and solid-type needle roller bearings.

## Table 9.15 Radial Internal Clearances in Spherical Roller Bearings

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Clearance in Bearings with Cylindrical Bores | | | | | | | | | | Clearance in Bearings with Tapered Bores | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C2 | | CN | | C3 | | C4 | | C5 | | C2 | | CN | | C3 | | C4 | | C5 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| **24** | **30** | 15 | 25 | 25 | 40 | 40 | 55 | 55 | 75 | 75 | 95 | 20 | 30 | 30 | 40 | 40 | 55 | 55 | 75 | 75 | 95 |
| **30** | **40** | 15 | 30 | 30 | 45 | 45 | 60 | 60 | 80 | 80 | 100 | 25 | 35 | 35 | 50 | 50 | 65 | 65 | 85 | 85 | 105 |
| **40** | **50** | 20 | 35 | 35 | 55 | 55 | 75 | 75 | 100 | 100 | 125 | 30 | 45 | 45 | 60 | 60 | 80 | 80 | 100 | 100 | 130 |
| **50** | **65** | 20 | 40 | 40 | 65 | 65 | 90 | 90 | 120 | 120 | 150 | 40 | 55 | 55 | 75 | 75 | 95 | 95 | 120 | 120 | 160 |
| **65** | **80** | 30 | 50 | 50 | 80 | 80 | 110 | 110 | 145 | 145 | 180 | 50 | 70 | 70 | 95 | 95 | 120 | 120 | 150 | 150 | 200 |
| **80** | **100** | 35 | 60 | 60 | 100 | 100 | 135 | 135 | 180 | 180 | 225 | 55 | 80 | 80 | 110 | 110 | 140 | 140 | 180 | 180 | 230 |
| **100** | **120** | 40 | 75 | 75 | 120 | 120 | 160 | 160 | 210 | 210 | 260 | 65 | 100 | 100 | 135 | 135 | 170 | 170 | 220 | 220 | 280 |
| **120** | **140** | 50 | 95 | 95 | 145 | 145 | 190 | 190 | 240 | 240 | 300 | 80 | 120 | 120 | 160 | 160 | 200 | 200 | 260 | 260 | 330 |
| **140** | **160** | 60 | 110 | 110 | 170 | 170 | 220 | 220 | 280 | 280 | 350 | 90 | 130 | 130 | 180 | 180 | 230 | 230 | 300 | 300 | 380 |
| **160** | **180** | 65 | 120 | 120 | 180 | 180 | 240 | 240 | 310 | 310 | 390 | 100 | 140 | 140 | 200 | 200 | 260 | 260 | 340 | 340 | 430 |
| **180** | **200** | 70 | 130 | 130 | 200 | 200 | 260 | 260 | 340 | 340 | 430 | 110 | 160 | 160 | 220 | 220 | 290 | 290 | 370 | 370 | 470 |
| **200** | **225** | 80 | 140 | 140 | 220 | 220 | 290 | 290 | 380 | 380 | 470 | 120 | 180 | 180 | 250 | 250 | 320 | 320 | 410 | 410 | 520 |
| **225** | **250** | 90 | 150 | 150 | 240 | 240 | 320 | 320 | 420 | 420 | 520 | 140 | 200 | 200 | 270 | 270 | 350 | 350 | 450 | 450 | 570 |
| **250** | **280** | 100 | 170 | 170 | 260 | 260 | 350 | 350 | 460 | 460 | 570 | 150 | 220 | 220 | 300 | 300 | 390 | 390 | 490 | 490 | 620 |
| **280** | **315** | 110 | 190 | 190 | 280 | 280 | 370 | 370 | 500 | 500 | 630 | 170 | 240 | 240 | 330 | 330 | 430 | 430 | 540 | 540 | 680 |
| **315** | **355** | 120 | 200 | 200 | 310 | 310 | 410 | 410 | 550 | 550 | 690 | 190 | 270 | 270 | 360 | 360 | 470 | 470 | 590 | 590 | 740 |
| **355** | **400** | 130 | 220 | 220 | 340 | 340 | 450 | 450 | 600 | 600 | 750 | 210 | 300 | 300 | 400 | 400 | 520 | 520 | 650 | 650 | 820 |
| **400** | **450** | 140 | 240 | 240 | 370 | 370 | 500 | 500 | 660 | 660 | 820 | 230 | 330 | 330 | 440 | 440 | 570 | 570 | 720 | 720 | 910 |
| **450** | **500** | 140 | 260 | 260 | 410 | 410 | 550 | 550 | 720 | 720 | 900 | 260 | 370 | 370 | 490 | 490 | 630 | 630 | 790 | 790 | 1 000 |
| **500** | **560** | 150 | 280 | 280 | 440 | 440 | 600 | 600 | 780 | 780 | 1 000 | 290 | 410 | 410 | 540 | 540 | 680 | 680 | 870 | 870 | 1 100 |
| **560** | **630** | 170 | 310 | 310 | 480 | 480 | 650 | 650 | 850 | 850 | 1 100 | 320 | 460 | 460 | 600 | 600 | 760 | 760 | 980 | 980 | 1 230 |
| **630** | **710** | 190 | 350 | 350 | 530 | 530 | 700 | 700 | 920 | 920 | 1 190 | 350 | 510 | 510 | 670 | 670 | 850 | 850 | 1 090 | 1 090 | 1 360 |
| **710** | **800** | 210 | 390 | 390 | 580 | 580 | 770 | 770 | 1 010 | 1 010 | 1 300 | 390 | 570 | 570 | 750 | 750 | 960 | 960 | 1 220 | 1 220 | 1 500 |
| **800** | **900** | 230 | 430 | 430 | 650 | 650 | 860 | 860 | 1 120 | 1 120 | 1 440 | 440 | 640 | 640 | 840 | 840 | 1 070 | 1 070 | 1 370 | 1 370 | 1 690 |
| **900** | **1 000** | 260 | 480 | 480 | 710 | 710 | 930 | 930 | 1 220 | 1 220 | 1 570 | 490 | 710 | 710 | 930 | 930 | 1 190 | 1 190 | 1 520 | 1 520 | 1 860 |
| **1 000** | **1 120** | 290 | 530 | 530 | 780 | 780 | 1 020 | 1 020 | 1 330 | — | — | 530 | 770 | 770 | 1 030 | 1 030 | 1 300 | 1 300 | 1 670 | — | — |
| **1 120** | **1 250** | 320 | 580 | 580 | 860 | 860 | 1 120 | 1 120 | 1 460 | — | — | 570 | 830 | 830 | 1 120 | 1 120 | 1 420 | 1 420 | 1 830 | — | — |
| **1 250** | **1 400** | 350 | 640 | 640 | 950 | 950 | 1 240 | 1 240 | 1 620 | — | — | 620 | 910 | 910 | 1 230 | 1 230 | 1 560 | 1 560 | 2 000 | — | — |

## Table 9.16 Radial Internal Clearances in Double-Row and Combined Tapered Roller Bearings

Units : μm

| Cylindrical Bore / Tapered Bore / Nominal Bore Dia. $d$ (mm) | | Clearance | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C1 | | C2 | | CN | | C3 | | C4 | | C5 | |
| | | — | | C1 | | C2 | | CN | | C3 | | C4 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| — | **18** | 0 | 10 | 10 | 20 | 20 | 30 | 35 | 45 | 50 | 60 | 65 | 75 |
| **18** | **24** | 0 | 10 | 10 | 20 | 20 | 30 | 35 | 45 | 50 | 60 | 65 | 75 |
| **24** | **30** | 0 | 10 | 10 | 20 | 20 | 30 | 40 | 50 | 50 | 60 | 70 | 80 |
| **30** | **40** | 0 | 12 | 12 | 25 | 25 | 40 | 45 | 60 | 60 | 75 | 80 | 95 |
| **40** | **50** | 0 | 15 | 15 | 30 | 30 | 45 | 50 | 65 | 65 | 80 | 95 | 110 |
| **50** | **65** | 0 | 15 | 15 | 35 | 35 | 55 | 60 | 80 | 80 | 100 | 110 | 130 |
| **65** | **80** | 0 | 20 | 20 | 40 | 40 | 60 | 70 | 90 | 90 | 110 | 130 | 150 |
| **80** | **100** | 0 | 25 | 25 | 50 | 50 | 75 | 80 | 105 | 105 | 130 | 155 | 180 |
| **100** | **120** | 5 | 30 | 30 | 55 | 55 | 80 | 90 | 115 | 120 | 145 | 180 | 210 |
| **120** | **140** | 5 | 35 | 35 | 65 | 65 | 95 | 100 | 130 | 135 | 165 | 200 | 230 |
| **140** | **160** | 10 | 40 | 40 | 70 | 70 | 100 | 110 | 140 | 150 | 180 | 220 | 260 |
| **160** | **180** | 10 | 45 | 45 | 80 | 80 | 115 | 125 | 160 | 165 | 200 | 250 | 290 |
| **180** | **200** | 10 | 50 | 50 | 90 | 90 | 130 | 140 | 180 | 180 | 220 | 280 | 320 |
| **200** | **225** | 20 | 60 | 60 | 100 | 100 | 140 | 150 | 190 | 200 | 240 | 300 | 340 |
| **225** | **250** | 20 | 65 | 65 | 110 | 110 | 155 | 165 | 210 | 220 | 270 | 330 | 380 |
| **250** | **280** | 20 | 70 | 70 | 120 | 120 | 170 | 180 | 230 | 240 | 290 | 370 | 420 |
| **280** | **315** | 30 | 80 | 80 | 130 | 130 | 180 | 190 | 240 | 260 | 310 | 410 | 460 |
| **315** | **355** | 30 | 80 | 80 | 130 | 140 | 190 | 210 | 260 | 290 | 350 | 450 | 510 |
| **355** | **400** | 40 | 90 | 90 | 140 | 150 | 200 | 220 | 280 | 330 | 390 | 510 | 570 |
| **400** | **450** | 45 | 95 | 95 | 145 | 170 | 220 | 250 | 310 | 370 | 430 | 560 | 620 |
| **450** | **500** | 50 | 100 | 100 | 150 | 190 | 240 | 280 | 340 | 410 | 470 | 620 | 680 |
| **500** | **560** | 60 | 110 | 110 | 160 | 210 | 260 | 310 | 380 | 450 | 520 | 700 | 770 |
| **560** | **630** | 70 | 120 | 120 | 170 | 230 | 290 | 350 | 420 | 500 | 570 | 780 | 850 |
| **630** | **710** | 80 | 130 | 130 | 180 | 260 | 310 | 390 | 470 | 560 | 640 | 870 | 950 |
| **710** | **800** | 90 | 140 | 150 | 200 | 290 | 340 | 430 | 510 | 630 | 710 | 980 | 1 060 |
| **800** | **900** | 100 | 150 | 160 | 210 | 320 | 370 | 480 | 570 | 700 | 790 | 1 100 | 1 200 |
| **900** | **1 000** | 120 | 170 | 180 | 230 | 360 | 410 | 540 | 630 | 780 | 870 | 1 200 | 1 300 |
| **1 000** | **1 120** | 130 | 190 | 200 | 260 | 400 | 460 | 600 | 700 | — | — | — | — |
| **1 120** | **1 250** | 150 | 210 | 220 | 280 | 450 | 510 | 670 | 770 | — | — | — | — |
| **1 250** | **1 400** | 170 | 240 | 250 | 320 | 500 | 570 | 750 | 870 | — | — | — | — |

**Remarks** Axial internal clearance $\Delta_a = \Delta_r \cot\alpha \fallingdotseq \frac{1.5}{e}\Delta_r$

where $\Delta_r$ : Radial internal clearance
$\alpha$ : Contact angle
$e$ : Constant (Listed in bearing tables)

**Table 9.17 Axial Internal Clearances in Combined Angular Contact Ball Bearings (Measured Clearance)**

Units : μm

| Nominal Bore Diameter. $d$ (mm) | | Axial Internal Clearance | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Contact Angle 30° | | | | | | Contact Angle 40° | | | | | |
| | | CN | | C3 | | C4 | | CN | | C3 | | C4 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| — | **10** | 9 | 29 | 29 | 49 | 49 | 69 | 6 | 26 | 26 | 46 | 46 | 66 |
| **10** | **18** | 10 | 30 | 30 | 50 | 50 | 70 | 7 | 27 | 27 | 47 | 47 | 67 |
| **18** | **24** | 19 | 39 | 39 | 59 | 59 | 79 | 13 | 33 | 33 | 53 | 53 | 73 |
| **24** | **30** | 20 | 40 | 40 | 60 | 60 | 80 | 14 | 34 | 34 | 54 | 54 | 74 |
| **30** | **40** | 26 | 46 | 46 | 66 | 66 | 86 | 19 | 39 | 39 | 59 | 59 | 79 |
| **40** | **50** | 29 | 49 | 49 | 69 | 69 | 89 | 21 | 41 | 41 | 61 | 61 | 81 |
| **50** | **65** | 35 | 60 | 60 | 85 | 85 | 110 | 25 | 50 | 50 | 75 | 75 | 100 |
| **65** | **80** | 38 | 63 | 63 | 88 | 88 | 115 | 27 | 52 | 52 | 77 | 77 | 100 |
| **80** | **100** | 49 | 74 | 74 | 99 | 99 | 125 | 35 | 60 | 60 | 85 | 85 | 110 |
| **100** | **120** | 72 | 97 | 97 | 120 | 120 | 145 | 52 | 77 | 77 | 100 | 100 | 125 |
| **120** | **140** | 85 | 115 | 115 | 145 | 145 | 175 | 63 | 93 | 93 | 125 | 125 | 155 |
| **140** | **160** | 90 | 120 | 120 | 150 | 150 | 180 | 66 | 96 | 96 | 125 | 125 | 155 |
| **160** | **180** | 95 | 125 | 125 | 155 | 155 | 185 | 68 | 98 | 98 | 130 | 130 | 160 |
| **180** | **200** | 110 | 140 | 140 | 170 | 170 | 200 | 80 | 110 | 110 | 140 | 140 | 170 |

**Remarks** This table is applicable to bearings in Tolerance Classes Normal and 6. For internal axial clearances in bearings in tolerance classes better than 5 and contact angles of 15° and 25°, it is advisable to consult NSK.

**Table 9.18 Axial Internal Clearance in Four-Point Contact Ball Bearings (Measured Clearances)**

Units : μm

| Nominal Bore Dia. $d$ (mm) | | Axial Internal Clearance | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | C2 | | CN | | C3 | | C4 | |
| over | incl | min. | max. | min. | max. | min. | max. | min. | max. |
| **10** | **18** | 15 | 55 | 45 | 85 | 75 | 125 | 115 | 165 |
| **18** | **40** | 26 | 66 | 56 | 106 | 96 | 146 | 136 | 186 |
| **40** | **60** | 36 | 86 | 76 | 126 | 116 | 166 | 156 | 206 |
| **60** | **80** | 46 | 96 | 86 | 136 | 126 | 176 | 166 | 226 |
| **80** | **100** | 56 | 106 | 96 | 156 | 136 | 196 | 186 | 246 |
| **100** | **140** | 66 | 126 | 116 | 176 | 156 | 216 | 206 | 266 |
| **140** | **180** | 76 | 156 | 136 | 196 | 176 | 246 | 226 | 296 |
| **180** | **220** | 96 | 176 | 156 | 226 | 206 | 276 | 256 | 326 |
| **220** | **260** | 115 | 196 | 175 | 245 | 225 | 305 | 285 | 365 |
| **260** | **300** | 135 | 215 | 195 | 275 | 255 | 335 | 315 | 395 |
| **300** | **350** | 155 | 235 | 215 | 305 | 275 | 365 | 345 | 425 |
| **350** | **400** | 175 | 265 | 245 | 335 | 315 | 405 | 385 | 475 |
| **400** | **500** | 205 | 305 | 285 | 385 | 355 | 455 | 435 | 525 |

### 9.2.2 Selection of Bearing Internal Clearances

Among the bearing internal clearances listed in the tables, the CN Clearance is adequate for standard operating conditions. The clearance becomes progressively smaller from C2 to C1 and larger from C3 to C5.

Standard operating conditions are defined as those where the inner ring speed is less than approximately 50% of the limiting speed listed in the bearing tables, the load is less than normal ($P \fallingdotseq 0.1C_r$), and the bearing is tight-fitted on the shaft.

As a measure to reduce bearing noise for electric motors, the radial clearance range is narrower than the normal class and the values are somewhat smaller for deep groove ball bearings and cylindrical roller bearings for electric motors. (Refer to Table 9.13.1 and 9.13.2)

Internal clearance varies with the fit and temperature differences in operation. The changes in radial clearance in a roller bearing are shown in Fig. 9.2.

#### (1) Decrease in Radial Clearance Caused by Fitting and Residual Clearance

When the inner ring or the outer ring is tight-fitted on a shaft or in a housing, a decrease in the radial internal clearance is caused by the expansion or contraction of the bearing rings. The decrease varies according to the bearing type and size and design of the shaft and housing. The amount of this decrease is approximately 70 to 90% of the interference (refer to Section **15.2**, Fits (1), Pages A130 to A133). The internal clearance after subtracting this decrease from the theoretical internal clearance $\Delta_0$ is called the residual clearance, $\Delta_f$.

#### (2) Decrease in Radial Internal Clearance Caused by Temperature Differences between Inner and Outer Rings and Effective Clearance

The frictional heat generated during operation is conducted away through the shaft and housing. Since housings generally conduct heat better than shafts, the temperature of the inner ring and the rolling elements is usually higher than that of the outer ring by 5 to 10 °C. If the shaft is heated or the housing is cooled, the difference in temperature between the inner and outer rings is greater. The radial clearance decreases due to the thermal expansion caused by the temperature difference between the inner and outer rings. The amount of this decrease can be calculated using the following equations:

$$\delta_t \fallingdotseq \alpha \Delta_t D_e \quad \cdots\cdots (9.6)$$

where $\delta_t$ : Decrease in radial clearance due to temperature difference between inner and outer rings (mm)
$\alpha$ : Coefficient of linear expansion of bearing steel $\fallingdotseq 12.5\times10^{-6}$ (1/°C)
$\Delta_t$ : Temperature difference between inner and outer rings (°C)
$D_e$ : Outer ring raceway diameter (mm)

For ball bearings

$$D_e \fallingdotseq \frac{1}{5}(4D+d) \quad \cdots\cdots (9.7)$$

For roller bearings

$$D_e \fallingdotseq \frac{1}{4}(3D+d) \quad \cdots\cdots (9.8)$$

The clearance after substracting this $\delta_t$ from the residual clearance, $\Delta_f$ is called the effective clearance, $\Delta$. Theoretically, the longest life of a bearing can be expected when the effective clearance is slightly negative. However, it is difficult to achieve such an ideal condition, and an excessive negative clearance will greatly shorten the bearing life. Therefore, a clearance of zero or a slightly positive amount, instead of a negative one, should be selected. When single-row angular contact ball bearings or tapered roller bearings are used facing each other, there should be a small effective clearance, unless a preload is required. When two cylindrical roller bearings with a rib on one side are used facing each other, it is necessary to provide adequate axial clearance to allow for shaft elongation during operation.

The radial clearances used in some specific applications are given in Table9.19. Under special operating conditions, it is advisable to consult NSK.

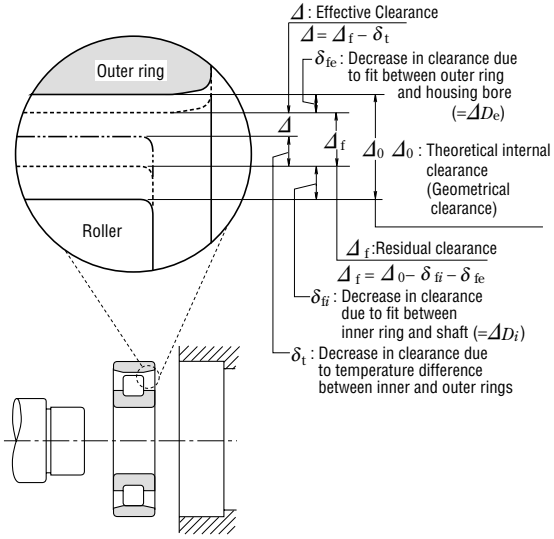



**Fig. 9.2 Changes in Radial Internal Clearance of Bearings**

**Table 9. 19 Examples of Clearances for Specific Applications**

| Operating Conditions | Examples | Internal Clearance |
|---|---|---|
| When shaft deflection is large. | Semi-floating rear wheels of automobiles | C5 or equivalent |
| When steam passes through hollow shafts or roller shafts are heated. | Dryers in paper making machines | C3, C4 |
| | Table rollers for rolling mills | C3 |
| When impact loads and vibration are severe or when both the inner and outer rings are tight-fitted. | Traction motors for railways | C4 |
| | Vibrating screens | C3, C4 |
| | Fluid couplings | C4 |
| | Final reduction gears for tractors | C4 |
| When both the inner and outer rings are loose-fitted | Rolling mill roll necks | C2 or equivalent |
| When noise and vibration restrictions are severe | Small motors with special specifications | C1, C2, CM |
| When clearance is adjusted after mounting to prevent shaft deflection, etc. | Main shafts of lathes | CC9, CC1 |

# 10. PRELOAD

Rolling bearings usually retain some internal clearance while in operation. In some cases, however, it is desirable to provide a negative clearance to keep them internally stressed. This is called “preloading”. A preload is usually applied to bearings in which the clearance can be adjusted during mounting, such as angular contact ball bearings or tapered roller bearings. Usually, two bearings are mounted face-to-face or back-to-back to form a duplex set with a preload.

## 10.1 Purpose of Preload

The main purposes and some typical applications of preloaded bearings are as follows:

(1) To maintain the bearings in exact position both radially and axially and to maintain the running accuracy of the shaft.
…Main shafts of machine tools, precision instruments, etc.
(2) To increase bearing rigidity
…Main shafts of machine tools, pinion shafts of final drive gears of automobiles, etc.
(3) To minimize noise due to axial vibration and resonance
…Small electric motors, etc.
(4) To prevent sliding between the rolling elements and raceways due to gyroscopic moments
…High speed or high acceleration applications of angular contact ball bearings, and thrust ball bearings
(5) To maintain the rolling elements in their proper position with the bearing rings
…Thrust ball bearings and spherical thrust roller bearings mounted on a horizontal shaft

## 10.2 Preloading Methods

### 10.2.1 Position Preload

A position preload is achieved by fixing two axially opposed bearings in such a way that a preload is imposed on them. Their position, once fixed, remain unchanged while in operation.
In practice, the following three methods are generally used to obtain a position preload.

(1) By installing a duplex bearing set with previously adjusted stand-out dimensions (see Page A7, Fig. 1.1) and axial clearance.
(2) By using a spacer or shim of proper size to obtain the required spacing and preload. (Refer to Fig. 10.1)
(3) By utilizing bolts or nuts to allow adjustment of the axial preload. In this case, the starting torque should be measured to verify the proper preload.

### 10.2.2 Constant-Pressure Preload

A constant pressure preload is achieved using a coil or leaf spring to impose a constant preload. Even if the relative position of the bearings changes during operation, the magnitude of the preload remains relatively constant (refer to Fig. 10.2)

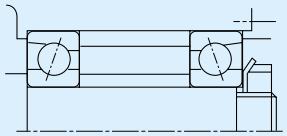


Fig. 10.1 Position Preload

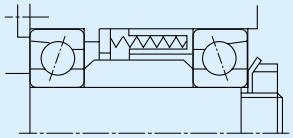


Fig. 10.2 Constant-Pressure Preload

## 10.3 Preload and Rigidity

### 10.3.1 Position Preload and Rigidity

When the inner rings of the duplex bearings shown in Fig.10.3 are fixed axially, bearings A and B are displaced $\delta_{a0}$ and axial space $2\delta_{a0}$ between the inner rings is eliminated. With this condition, a preload $F_{a0}$ is imposed on each bearing. A preload diagram showing bearing rigidity, that is the relation between load and displacement with a given axial load $F_a$ imposed on a duplex set, is shown in Fig. 10.4.

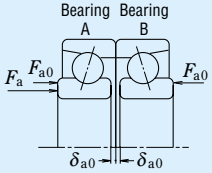



Fig. 10.3 Back-to-Back Duplex Bearing Preload

### 10.3.2 Constant-Pressure Preload and Rigidity

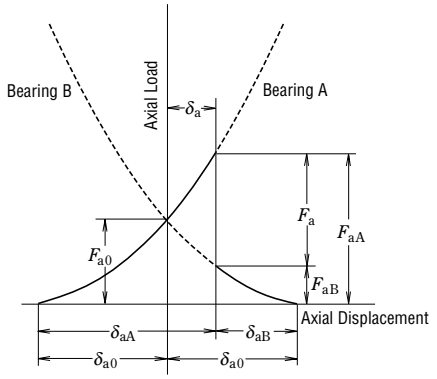
A preload diagram for duplex bearings under a constant-pressure preload is shown in Fig. 10.5. The deflection curve of the spring is nearly parallel to the horizontal axis because the rigidity of springs is lower than that of the bearing. As a result, the rigidity under a constant-pressure preload is approximately equal to that for a single bearing with a preload $F_{a0}$ applied to it. Fig. 10.6 presents a comparison of the rigidity of a bearing with a position preload and one with a constant-pressure preload.

## 10.4 Selection of Preloading Method and Amount of Preload

### 10.4.1 Comparison of Preloading Methods

A comparison of the rigidity using both preloading methods is shown in Fig. 10.6. The position preload and constant-pressure preload may be compared as follows:

(1) When both of the preloads are equal, the position preload provides greater bearing rigidity, in other words, the deflection due to external loads is less for bearings with a position preload.
(2) In the case of a position preload, the preload varies depending on such factors as a difference in axial expansion due to a temperature difference between the shaft and housing, a difference in radial expansion due to a temperature difference between the inner and outer rings, deflection due to load, etc.




$F_a$ : Axial load applied from outside
$F_{aA}$: Axial load imposed on Bearing A
$F_{aB}$: Axial load imposed on Bearing B
$\delta_a$ : Displacement of duplex bearing set
$\delta_{aA}$ : Displacement of Bearing A
$\delta_{aB}$ : Displacement of Bearing B

Fig. 10.4 Axial Displacement with Position Preload

In the case of a constant-pressure preload, it is possible to minimize any change in the preload because the variation of the spring load with shaft expansion and contraction is negligible. From the foregoing explanation, it is seen that position preloads are generally preferred for increasing rigidity and constant-pressure preloads are more suitable for high speed applications, for prevention of axial vibration, for use with thrust bearings on horizontal shafts, etc.

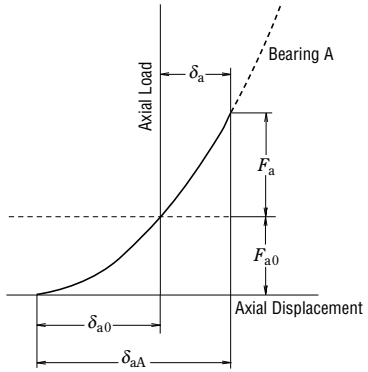



Fig. 10.5 Axial Displacement with Constant-Pressure Preload

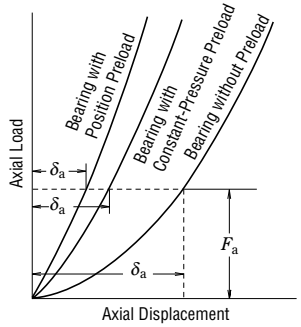



Fig. 10.6 Comparison of Rigidities and Preloading Methods

### 10.4.2 Amount of Preload

If the preload is larger than necessary, abnormal heart generation, increased frictional torque, reduced fatigue life, etc. may occur. The amount of the preload should be carefully determined considering the operating conditions and the purpose of the preload.

#### (1) Preloading of Duplex Angular Contact Ball Bearings

Average preloads for duplex angular contact ball bearings (contact angle of 15°) with precision better than P5 class, which are used on the main shafts of machine tools, are listed in Table 10.2.
The recommended fitting between the shaft and inner ring and between the housing and outer ring are listed in Table 10.1. In the case of fits with housings, the lower limit of the fitting range should be selected for fixed-end bearings and the upper limit for free-end bearings.
As a general rule, an extra light or light preload should be selected for grinding spindles and the main shafts of machining centers, while a medium preload should be adopted for the main shafts of lathes requiring rigidity.
When speeds result in a value of $D_{pw} \times n$ ($d_m n$ value) higher than 500000, the preload should be very carefully studied and selected. In such a case, please consult with NSK beforehand.

**Table 10. 1 Recommended Fitting for High Accuracy Duplex Angular Contact Ball Bearings with Preload**

Units : μm

| Nominal Bore Dia. $d$ (mm) over | Nominal Bore Dia. $d$ (mm) incl | Target Shaft Interference | Nominal Outside Dia. $D$ (mm) over | Nominal Outside Dia. $D$ (mm) incl | Target Housing Clearance |
|---|---|---|---|---|---|
| — | **18** | 0 to 2 | — | **18** | — |
| **18** | **30** | 0 to 2.5 | **18** | **30** | 2 to 6 |
| **30** | **50** | 0 to 2.5 | **30** | **50** | 2 to 6 |
| **50** | **80** | 0 to 3 | **50** | **80** | 3 to 8 |
| **80** | **120** | 0 to 4 | **80** | **120** | 3 to 9 |
| **120** | **150** | — | **120** | **150** | 4 to 12 |
| **150** | **180** | — | **150** | **180** | 4 to 12 |
| **180** | **250** | — | **180** | **250** | 5 to 15 |

#### (2) Preload of Thrust Ball Bearings

When the balls in thrust ball bearings rotate at relatively high speeds, sliding due to gyroscopic moments on the balls may occur. The larger of the two values obtained from Equations(10.1) and (10.2) below should be adopted as the minimum axial load in order to prevent such sliding

$$F_{a\,min} = \frac{C_{0a}}{100}\left(\frac{n}{N_{max}}\right)^2 \quad \cdots\cdots (\mathbf{10.1})$$

$$F_{a\,min} = \frac{C_{0a}}{1000} \quad \cdots\cdots (\mathbf{10.2})$$

where $F_{a\,min}$ : Minimum axial load (N), {kgf}
$n$ : Speed ($min^{-1}$)
$C_{0a}$ : Basic static load rating (N), {kgf}
$N_{max}$ : Limiting speed (oil lubrication) ($min^{-1}$)

#### (3) Preload of Spherical Thrust Roller Bearings

When spherical thrust roller bearings are used, damage such as scoring may occur due to sliding between the rollers and outer ring raceway. The minimum axial load $F_{a\,min}$ necessary to prevent such sliding is obtained from the following equation:

$$F_{a\,min} = \frac{C_{0a}}{1000} \quad \cdots\cdots (\mathbf{10.3})$$

### Table 10. 2 Preloads for Duplex Angular Contact Ball Bearings

**Table 10. 2. 1 Duplex Bearings of Series 79**

Units : N

| Bearing No. | Preloads Extra light Preload EL | Light Preload L | Medium Preload M | Heavy Preload H |
|---|---|---|---|---|
| **7900 C** | 7 | 15 | 29 | 59 |
| **7901 C** | 8.6 | 15 | 39 | 78 |
| **7902 C** | 12 | 25 | 49 | 100 |
| **7903 C** | 12 | 25 | 59 | 120 |
| **7904 C** | 19 | 39 | 78 | 150 |
| **7905 C** | 19 | 39 | 100 | 200 |
| **7906 C** | 24 | 49 | 100 | 200 |
| **7907 C** | 34 | 69 | 150 | 290 |
| **7908 C** | 39 | 78 | 200 | 390 |
| **7909 C** | 50 | 100 | 200 | 390 |
| **7910 C** | 50 | 100 | 250 | 490 |
| **7911 C** | 60 | 120 | 290 | 590 |
| **7912 C** | 60 | 120 | 290 | 590 |
| **7913 C** | 75 | 150 | 340 | 690 |
| **7914 C** | 100 | 200 | 490 | 980 |
| **7915 C** | 100 | 200 | 490 | 980 |
| **7916 C** | 100 | 200 | 490 | 980 |
| **7917 C** | 145 | 290 | 640 | 1 270 |
| **7918 C** | 145 | 290 | 740 | 1 470 |
| **7919 C** | 145 | 290 | 780 | 1 570 |
| **7920 C** | 195 | 390 | 880 | 1 770 |

**Table 10. 2. 2 Duplex Bearings of Series 70**

Units : N

| Bearing No. | Preloads Extra light Preload EL | Light Preload L | Medium Preload M | Heavy Preload H |
|---|---|---|---|---|
| **7000 C** | 12 | 25 | 49 | 100 |
| **7001 C** | 12 | 25 | 59 | 120 |
| **7002 C** | 14 | 29 | 69 | 150 |
| **7003 C** | 14 | 29 | 69 | 150 |
| **7004 C** | 24 | 49 | 120 | 250 |
| **7005 C** | 29 | 59 | 150 | 290 |
| **7006 C** | 39 | 78 | 200 | 390 |
| **7007 C** | 60 | 120 | 250 | 490 |
| **7008 C** | 60 | 120 | 290 | 590 |
| **7009 C** | 75 | 150 | 340 | 690 |
| **7010 C** | 75 | 150 | 390 | 780 |
| **7011 C** | 100 | 200 | 490 | 980 |
| **7012 C** | 100 | 200 | 540 | 1 080 |
| **7013 C** | 125 | 250 | 540 | 1 080 |
| **7014 C** | 145 | 290 | 740 | 1 470 |
| **7015 C** | 145 | 290 | 780 | 1 570 |
| **7016 C** | 195 | 390 | 930 | 1 860 |
| **7017 C** | 195 | 390 | 980 | 1 960 |
| **7018 C** | 245 | 490 | 1 180 | 2 350 |
| **7019 C** | 270 | 540 | 1 180 | 2 350 |
| **7020 C** | 270 | 540 | 1 270 | 2 550 |

**Table 10. 2. 3 Duplex Bearings of Series 72**

Units : N

| Bearing No. | Preloads Extra light Preload EL | Light Preload L | Medium Preload M | Heavy Preload H |
|---|---|---|---|---|
| **7200 C** | 14 | 29 | 69 | 150 |
| **7201 C** | 19 | 39 | 100 | 200 |
| **7202 C** | 19 | 39 | 100 | 200 |
| **7203 C** | 24 | 49 | 150 | 290 |
| **7204 C** | 34 | 69 | 200 | 390 |
| **7205 C** | 39 | 78 | 200 | 390 |
| **7206 C** | 60 | 120 | 290 | 590 |
| **7207 C** | 75 | 150 | 390 | 780 |
| **7208 C** | 100 | 200 | 490 | 980 |
| **7209 C** | 125 | 250 | 540 | 1 080 |
| **7210 C** | 125 | 250 | 590 | 1 180 |
| **7211 C** | 145 | 290 | 780 | 1 570 |
| **7212 C** | 195 | 390 | 930 | 1 860 |
| **7213 C** | 220 | 440 | 1 080 | 2 160 |
| **7214 C** | 245 | 490 | 1 180 | 2 350 |
| **7215 C** | 270 | 540 | 1 230 | 2 450 |
| **7216 C** | 295 | 590 | 1 370 | 2 750 |
| **7217 C** | 345 | 690 | 1 670 | 3 330 |
| **7218 C** | 390 | 780 | 1 860 | 3 730 |
| **7219 C** | 440 | 880 | 2 060 | 4 120 |
| **7220 C** | 490 | 980 | 2 350 | 4 710 |

# 11. DESIGN OF SHAFTS AND HOUSINGS

## 11.1 Accuracy and Surface Finish of Shafts and Housings

If the accuracy of a shaft or housing does not meet the specification, the performance of the bearings will be affected and they will not provide their full capability. For example, inaccuracy in the squareness of the shaft shoulder may cause misalignment of the bearing inner and outer rings, which may reduce the bearing fatigue life by adding an edge load in addition to the normal load. Cage fracture and seizure sometimes occur for this same reason. Housings should be rigid in order to provide firm bearing support. High rigidity housings are advantageous also from he standpoint of noise, load distribution, etc.

For normal operating conditions, a turned finish or smooth bored finish is sufficient for the fitting surface; however, a ground finish is necessary for applications where vibration and noise must be low or where heavy loads are applied.

In cases where two or more bearings are mounted in one single-piece housing, the fitting surfaces of the housing bore should be designed so both bearing seats may be finished together with one operation such as in -line boring. In the case of split housings, care must be taken in the fabrication of the housing so the outer ring will not become deformed during installation. The accuracy and surface finish of shafts and housings are listed in Table 11.1 for normal operating conditions.

**Table 11. 1 Accuracy and Roughness of Shaft and Housing**

| Item | Class of Bearings | Shaft | Housing Bore |
|---|---|---|---|
| Tolerance for Out-of-roundness | Normal, Class 6 | $\frac{IT3}{2}$ to $\frac{IT4}{2}$ | $\frac{IT4}{2}$ to $\frac{IT5}{2}$ |
| | Class 5, Class 4 | $\frac{IT2}{2}$ to $\frac{IT3}{2}$ | $\frac{IT2}{2}$ to $\frac{IT3}{2}$ |
| Tolerance for Cylindricality | Normal, Class 6 | $\frac{IT3}{2}$ to $\frac{IT4}{2}$ | $\frac{IT4}{2}$ to $\frac{IT5}{2}$ |
| | Class 5, Class 4 | $\frac{IT2}{2}$ to $\frac{IT3}{2}$ | $\frac{IT2}{2}$ to $\frac{IT3}{2}$ |
| Tolerance for Shoulder Runout | Normal, Class 6 | IT3 | IT3 to IT4 |
| | Class 5, Class 4 | IT3 | IT3 |
| Roughness of Fitting Surfaces $R_a$ | Small Bearings | 0.8 | 1.6 |
| | Large Bearings | 1.6 | 3.2 |

**Remarks** This table is for general recommendation using radius measuring method, the basic tolerance (IT) class should be selected in accordance with the bearing precision class. Regarding the figures of IT, please refer to the Appendix Table 11 (page C22).
In cases that the outer ring is mounted in the housing bore with interference or that a thin cross-section bearing is mounted on a shaft and housing, the accuracy of the shaft and housing should be higher since this affects the bearing raceway directly.

## 11.2 Shoulder and Fillet Dimensions

The shoulders of the shaft or housing in contact with the face of a bearing must be perpendicular to the shaft center line. (Refer to Table 11.1) The front face side shoulder bore of the housing for a tapered roller bearing should be parallel with the bearing axis in order to avoid interference with the cage.

The fillets of the shaft and housing should not come in contact with the bearing chamfer; therefore, the fillet radius $r_a$ must be smaller than the minimum bearing chamfer dimension $r$ or $r_1$ .

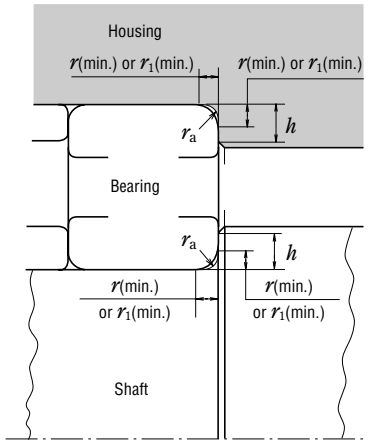



**Fig. 11.1 Chamfer Dimensions, Fillet Radius of Shaft and Housing, and Shoulder Height**

The shoulder heights for both shafts and housings for radial bearings should be sufficient to provide good support over the face of the bearings, but enough face should extend beyond the shoulder to permit use of special dismounting tools. The recommended minimum shoulder heights for metric series radial bearings are listed in Table 11.2

Nominal dimensions associated with bearing mounting are listed in the bearing tables including the proper shoulder diameters. Sufficient shoulder height is particularly important for supporting the side ribs of tapered roller bearings and cylindrical roller bearings subjected to high axial loads.

The values of $h$ and $r_a$ in Table 11.2 should be adopted in those cases where the fillet radius of the shaft or housing is as shown in Fig. 11.2 (a), while the values in Table 11.3 are generally used with an undercut fillet radius produced when grinding the shaft as shown in Fig. 11.2 (b).

**Table 11. 2 Recommended Minimum Shoulder Heights for Use with Metric Series Radial Bearings**

Units : mm

| Nominal Chamfer Dimensions | Shaft or Housing | | |
|---|---|---|---|
| | Fillet Radius | Minimun Shoulder Heights $h$ (min.) | |
| $r$ (min.) or $r_1$ (min.) | $r_a$ (max.) | Deep Groove Ball Bearings, Self-Aligning Ball Bearings, Cylindrical Roller Bearings, Solid Needle Roller Bearings | Angular Contact Ball Bearings, Tapered Roller Bearings, Spherical Roller Bearings |
| 0.05 | 0.05 | 0.2 | — |
| 0.08 | 0.08 | 0.3 | — |
| 0.1 | 0.1 | 0.4 | — |
| 0.15 | 0.15 | 0.6 | — |
| 0.2 | 0.2 | 0.8 | — |
| 0.3 | 0.3 | 1 | 1.25 |
| 0.6 | 0.6 | 2 | 2.5 |
| 1 | 1 | 2.5 | 3 |
| 1.1 | 1 | 3.25 | 3.5 |
| 1.5 | 1.5 | 4 | 4.5 |
| 2 | 2 | 4.5 | 5 |
| 2.1 | 2 | 5.5 | 6 |
| 2.5 | 2 | — | 6 |
| 3 | 2.5 | 6.5 | 7 |
| 4 | 3 | 8 | 9 |
| 5 | 4 | 10 | 11 |
| 6 | 5 | 13 | 14 |
| 7.5 | 6 | 16 | 18 |
| 9.5 | 8 | 20 | 22 |
| 12 | 10 | 24 | 27 |
| 15 | 12 | 29 | 32 |
| 19 | 15 | 38 | 42 |

**Remarks**
1. When heavy axial loads are applied, the shoulder height must be sufficiently higher than the values listed.
2. The fillet radius of the corner is also applicable to thrust bearings.
3. The shoulder diameter is listed instead of shoulder height in the bearing tables.

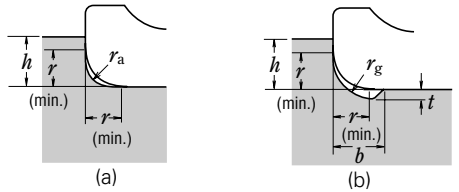



**Fig. 11. 2 Chamfer Dimensions, Fillet Radius, and Shoulder Height**

**Table 11. 3 Shaft Undercut**

Units : mm

| Chamfer Dimensions of Inner and Outer Rings $r$ (min.) or $r_1$ (min.) | Undercut Dimensions | | |
|---|---|---|---|
| | $t$ | $r_g$ | $b$ |
| 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 |
| 2.5 | 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 |

For thrust bearings, the squareness and contact area of the supporting face for the bearing rings must be adequate. In the case of thrust ball bearings, the housing shoulder diameter $D_a$ should be less than the pitch circle diameter of the balls, and the shaft shoulder diameter $d_a$ should be greater than the pitch circle diameter of the balls (Fig. 11.3).
For thrust roller bearings, it is advisable for the full contact length between rollers and rings to be supported by the shaft and housing shoulder (Fig. 11.4).
These diameters $d_a$ and $D_a$ are listed in the bearing tables.

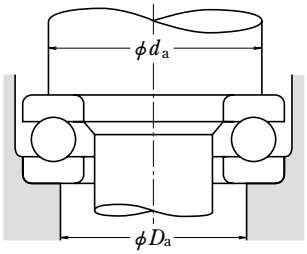



**Fig. 11.3 Face Supporting Diameters for Thrust Ball Bearings**

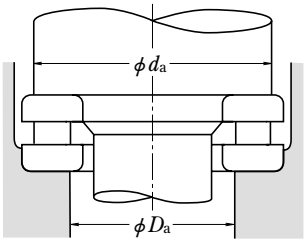



**Fig. 11.4 Face Supporting Diameters for Thrust Roller Bearings**

## 11.3 Bearing Seals

To insure the longest possible life of a bearing, it may be necessary to provide seals to prevent leakage of lubricant and entry of dust, water and other harmful material like metallic particles. The seals must be free from excessive running friction and the probability of seizure. They should also be easy to assemble and disassemble. It is necessary to select a suitable seal for each application considering the lubricating method.

### 11.3.1 Non-Contact Type Seals

Various sealing devices that do not contact the shaft, such as oil grooves, flingers, and labyrinths, are available. Satisfactory sealing can usually be obtained with such seals because of their close running clearance. Centrifugal force may also assist in preventing internal contamination and leakage of the lubricant.

#### (1) Oil Groove Seals

The effectiveness of oil groove seals is obtained by means of the small gap between the shaft and housing bore and by multiple grooves on either or both of the housing bore and shaft surface (Fig. 11.5 (a), (b)).
Since the use of oil grooves alone is not completely effective, except at low speeds, a flinger or labyrinth type seal is often combined with an oil groove seal (Fig. 11.5 (c)). The entry of dust is impeded by packing grease with a consistency of about 200 into the grooves.
The smaller the gap between the shaft and housing, the greater the sealing effect; however, the shaft and housing must not come in contact while running. The recommended gaps are given in Table 11.4.
The recommended groove width is approximately 3 to 5mm, with a depth of about 4 to 5mm. In the case of sealing methods using grooves only, there should be three or more grooves.

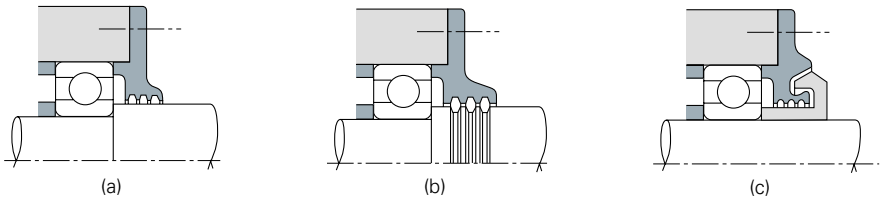



**Fig. 11.5 Examples of Oil Grooves**

#### (2) Flinger (Slinger) Type Seals

A flinger is designed to force water and dust away by means of the centrifugal force acting on any contaminants on the shaft. Sealing mechanisms with flingers inside the housing as shown in Fig. 11.6 (a), (b) are mainly intended to prevent oil leakage, and are used in environments with relatively little dust. Dust and moisture are prevented from entering by the centrifugal force of flingers shown in Figs 11.6 (c), (d).

#### (3) Labyrinth Seals

Labyrinth seals are formed by interdigitated segments attached to the shaft and housing that are separated by a very small gap. They are particularly suitable for preventing oil leakage from the shaft at high speeds.
The type shown in Fig. 11.7 (a) is widely used because of its ease of assembly, but those shown in Fig. 11.7 (b), (c) have better seal effectiveness.

**Table 11. 4 Gaps between Shafts and Housings for Oil-Groove Type Seals**

Units : mm

| Nominal Shaft Diameter | Radial Gap |
|---|---|
| Under 50 | 0.25 to 0.4 |
| 50-200 | 0.5 to 1.5 |

**Table 11. 5 Labyrinth Seal Gaps**

Units : mm

| Nominal Shaft Diameter | Labyrinth Gaps | |
|---|---|---|
| | Radial Gap | Axiall Gap |
| Under 50 | 0.25 to 0.4 | 1 to 2 |
| 50-200 | 0.5 to 1.5 | 2 to 5 |

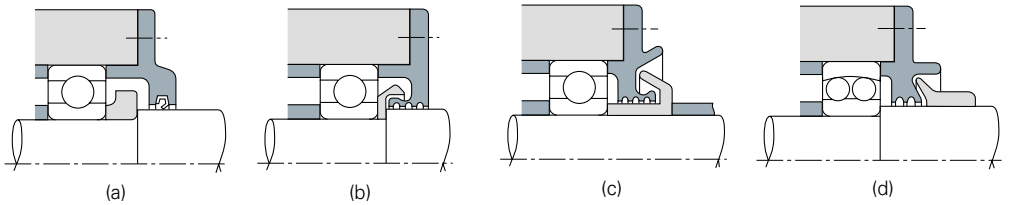



**Fig. 11.6 Examples of Flinger Configurations**

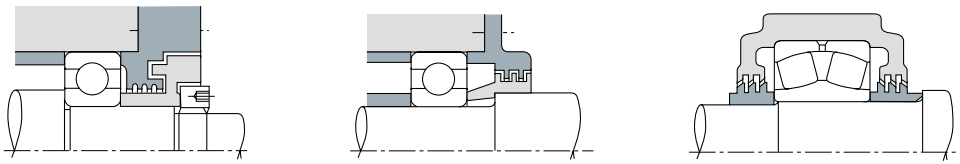



**Fig. 11.7 Examples of Labyrinth Designs**

### 11.3.2 Contact Type Seals

The effectiveness of contact seals is achieved by the physical contact between the shaft and seal, which may be made of synthetic rubber, synthetic resin, felt, etc. Oil seals with synthetic rubber lips are most frequently used.

#### (1) Oil Seals

Many types of oil seals are used to prevent lubricant from leaking out as well as to prevent dust, water, and other foreign matter from entering (Figs. 11.8 and 11.9)
In Japan, such oil seals are standardized (Refer to JIS B 2402) on the basis of type and size. Since many oil seals are equipped with circumferential springs to maintain adequate contact force, oil seals can follow the non-uniform rotational movement of a shaft to some degree.
Seal lip materials are usually synthetic rubber including nitrile, acrylate, silicone, and fluorine. Tetrafluoride ethylene is also used. The maximum allowable operating temperature for each material increases in this same order.
Synthetic rubber oil seals may cause trouble such as overheating, wear, and seizure, unless there is an oil film between the seal lip and shaft. Therefore, some lubricant should be applied to the seal lip when the seals are installed. It is also desirable for the lubricant inside the housing to spread a little between the sliding surfaces.

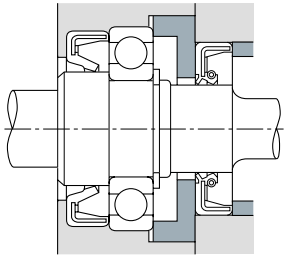


**Fig. 11.8 Example of Application of Oil Seal (1)**

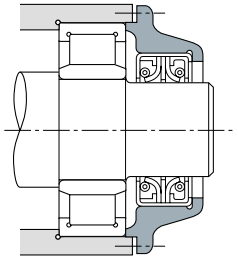


**Fig. 11.9 Example of Application of Oil Seal (2)**

The permissible circumferential speed for oil seals varies depending on the type, the finish of the shaft surface, liquid to be sealed, temperature, shaft eccentricity, etc. The temperature range for oil seals is restricted by the lip material. Approximate circumferential surface speeds and temperature permitted under favorable conditions are listed in Table 11.6.
When oil seals are used at high circumferential surface speed or under high internal pressure, the contact surface of the shaft must be smoothly finished and the shaft eccentricity should be less than 0.02 to 0.05mm. The hardness of the shaft's contact surface should be made higher than HRC40 by means of heat treatment or hard chrome plating in order to gain abrasion resistance. If possible, a hardness of more than HRC 55 is recommended.
The approximate level of contact surface finish required for several shaft circumferential surface speeds is given in Table 11.7.

#### (2) Felt Seals

Felt seals are one of the simplest and most common seals being used for transmission shafts, etc.
However, since oil permeation and leakage are unavoidable if oil is used, this type of seal is used only for grease lubrication, primarily to prevent dust and other foreign matter from entering. Felt seals are not suitable for circumferential surface speeds exceeding 4m/sec; therefore, it is preferable to replace them with synthetic rubber seals depending on the application.

**Table 11. 6 Permissible Circumferential Surface Speeds and Temperature Range for Oil Seals**

| Seal Materials | | Permissible Circumferential Speeds(m/sec) | Operating Temperature Range(℃)(1) |
|---|---|---|---|
| Synthetic Rubber | Nitrile Rubber | Under 16 | −25 to +100 |
| | Acrylic Rubber | Under 25 | −15 to +130 |
| | Silicone Rubber | Under 32 | −70 to +200 |
| | Fluorine-containes Rubber | Under 32 | −30 to +200 |
| Tetrafluoride Ethylene Resin | | Under 15 | −50 to +220 |

**Note** (1) The upper limit of the temperature range may be raised about 20 ℃ for operation for short intervals.

**Table 11. 7 Shaft Circumferential Surface Speeds and Finish of Contact Surfaces**

| Circumferential Surface Speeds(m/s) | Surface Finish $R_a$ (μm) |
|---|---|
| Under 5 | 0.8 |
| 5 to 10 | 0.4 |
| Over 10 | 0.2 |





# 12. LUBRICATION

## 12.1 Purposes of Lubrication

The main purposes of lubrication are to reduce friction and wear inside the bearings that may cause premature failure. The effects of lubrication may be briefly explained as follows:

(1) Reduction of Friction and Wear
Direct metallic contact between the bearing rings, rolling elements and cage, which are the basic components of a bearing, is prevented by an oil film which reduces the friction and wear in the contact areas.
(2) Extension of Fatigue Life
The rolling fatigue life of bearings depends greatly upon the viscosity and film thickness between the rolling contact surfaces. A heavy film thickness prolongs the fatigue life, but it is shortened if the viscosity of the oil is too low so the film thickness is insufficient.
(3) Dissipation of Frictional Heat and Cooling
Circulation lubrication may be used to carry away frictional heat or heat transferred from the outside to prevent the bearing from overheating and the oil from deteriorating.
(4) Others
Adequate lubrication also helps to prevent foreign material from entering the bearings and guards against corrosion or rusting.

## 12.2 Lubricating Methods

The various lubricating methods are first divided into either grease or oil lubrication. Satisfactory bearing performance can be achieved by adopting the lubricating method which is most suitable for the particular application and operating condition.
In general, oil offers superior lubrication; however, grease lubrication allows a simpler structure around the bearings. A comparison of grease and oil lubrication is given in Table 12.1.

**Table 12. 1 Comparison of Grease and Oil Lubrication**

| Item | Grease Lubrication | Oil Lubrication |
|---|---|---|
| Housing Structure and Sealing Method | Simple | May be complex, Careful maintenance required. |
| Speed | Limiting speed is 65% to 80% of that with oil lubrication. | Higher limiting speed. |
| Cooling Effect | Poor | Heat transter is possible using forced oil circulation. |
| Fluidity | Poor | Good |
| Full Lubricant Replacement | Sometimes difficult | Easy |
| Removal of Foreign Matter | Removal of particles from grese is impossible. | Easy |
| External Contamination due to Leakage | Surroundings seldom contaminated by leakage. | Often leaks without proper countermeasures. Not suitable if external contamination must be avoided. |

### 12.2.1 Grease Lubrication

#### (1) Grease Quantity

The quantity of grease to be packed in a housing depends on the housing design and free space, grease characteristics, and ambient temperature. For example, the bearings for the main shafts of machine tools, where the accuracy may be impaired by a small temperature rise, require only a small amount of grease. The quantity of grease for ordinary bearings is determined as follows.
Sufficient grease must be packed inside the bearing including the cage guide face. The available space inside the housing to be packed with grease depends on the speed as follows:
1/2 to 2/3 of the space … When the speed is less than 50% of the limiting speed.
1/3 to 1/2 of the space … When the speed is more than 50% of the limiting speed.

### (2) Replacement of Grease

Grease, once packed, usually need not be replenished for a long time; however, for severe operating conditions, grease should be frequently replenished or replaced. In such cases, the bearing housing should be designed to facilitate grease replenishment and replacement.

When replenishment intervals are short, provide replenishment and discharge ports at appropriate positions so deteriorated grease is replaced by fresh grease. For example, the housing space on the grease supply side can be divided into several sections with partitions. The grease on the partitioned side gradually passes through the bearings and old grease forced from the bearing is discharged through a grease valve (Fig. 12.1). If a grease valve is not used, the space on the discharge side is made larger than the partitioned side so it can retain the old grease, which is removed periodically by removing the cover.

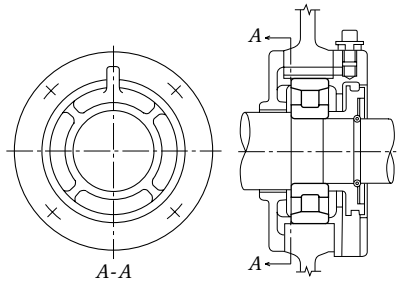



**Fig. 12.1 Combination of Partitioned Grease Reservoir and Grease Valve**

### (3) Replenishing Interval

Even if high-quality grease is used, there is deterioration of its properties with time; therefore, periodic replenishment is required. Figs 12.2 (1) and (2) show the replenishment time intervals for various bearing types running at different speeds. Figs.12.2 (1) and (2) apply for the condition of high-quality lithium soap-mineral oil grease, bearing temperature of 70°C, and normal load ($P/C$=0.1).

· Temperature

If the bearing temperature exceeds 70°C, the replenishment time interval must be reduced by half for every 15°C temperature rise of the bearings.

· Grease

In case of ball bearings especially, the replenishing time interval can be extended depending on used grease type. (For example, high-quality lithium soap-synthetic oil grease may extend about two times of replenishing time interval shown in Fig.12.2 (1). If the temperature of the bearings is less than 70°C, the usage of lithium soap-mineral oil grease or lithium soap-synthetic oil grease is appropriate.)

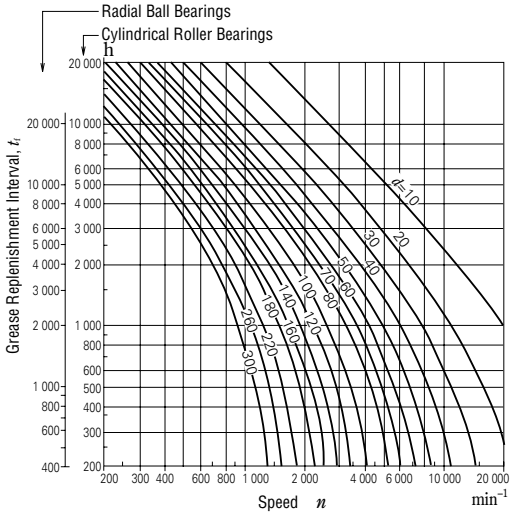
It is advisable to consult NSK.

· Load

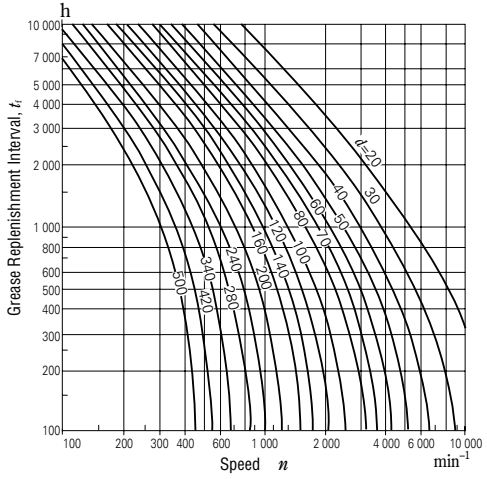
The replenishing time interval depends on the magnitude of the bearing load.

Please refer to Fig.12.2 (3).

If $P/C$ exceeds 0.16, it is advisable to consult NSK.




(1) Radial Ball Bearings, Cylindrical Roller Bearings




(2) Tapered Roller Bearings, Spherical Roller Bearings

(3) Load factor

| $P/C$ | ≦0.06 | 0.1 | 0.13 | 0.16 |
|---|---|---|---|---|
| Load factor | 1.5 | 1 | 0.65 | 0.45 |

**Fig. 12.2 Grease Replenishment Intervals**

### (4) Grease Life of Sealed Ball Bearings

When grease is packed into single-row deep groove ball bearings, the grease life may be estimated using Equation (12.1) or (12.2) or Fig. 12.3:

(General purpose grease ([1]))

$$\log t = 6.54 - 2.6\frac{n}{N_{max}} - \left(0.025 - 0.012\frac{n}{N_{max}}\right)T \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\textbf{(12.1)}$$

(Wide-range grease ([2]))

$$\log t = 6.12 - 1.4\frac{n}{N_{max}} - \left(0.018 - 0.006\frac{n}{N_{max}}\right)T \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\textbf{(12.2)}$$

where $t$ : Average grease life, (h)
$n$ : Speed ($min^{-1}$)
$N_{max}$ : Limiting speed with grease lubrication ($min^{-1}$)
(values for ZZ and VV types listed in the bearing tables)
$T$ : Operating temperature °C

Equations (12.1) and (12.2) and Fig. 12.3 apply under the following conditions:

(a) Speed, $n$

$$0.25 \leqq \frac{n}{N_{max}} \leqq 1$$

when $\frac{n}{N_{max}} < 0.25$, assume $\frac{n}{N_{max}} = 0.25$

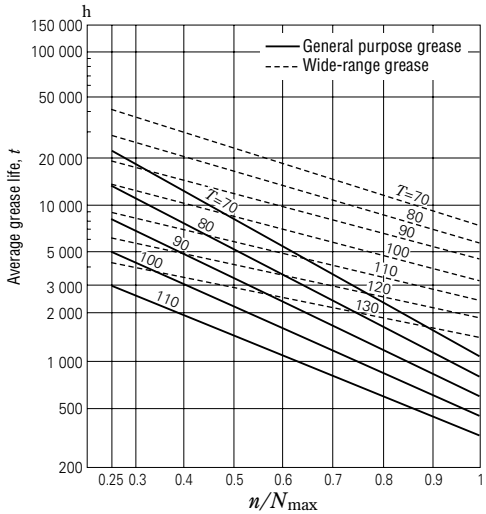



**Fig. 12.3 Grease Life of Sealed Ball Bearings**

(b) Operating Temperature, $T$

For general purpose grease ([1])

$$70\ °C \leqq T \leqq 110\ °C$$

For wide-range grease ([2])

$$70\ °C \leqq T \leqq 130\ °C$$

When $T$<70 °C assume $T$ = 70 °C

(c) Bearing Loads

The bearing loads should be about 1/10 or less of the basic load rating $C_r$.

**Notes** ([1]) Mineral-oil base greases (e.g. lithium soap base grease) which are often used over a temperature range of around – 10 to 110 °C.
([2]) Synthetic-oil base greases are usable over a wide temperature range of around – 40 to 130 °C.

### 12.2.2 Oil Lubrication

### (1) Oil Bath Lubrication

Oil bath lubrication is a widely used with low or medium speeds. The oil level should be at the center of the lowest rolling element. It is desirable to provide a sight gauge so the proper oil level may be maintained (Fig. 12.4)

### (2) Drip-Feed Lubrication

Drip feed lubrication is widely used for small ball bearings operated at relatively high speeds. As shown in Fig. 12.5, oil is stored in a visible oiler. The oil drip rate is controlled with the screw in the top.

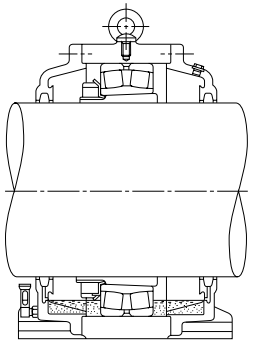


**Fig. 12.4 Oil Bath Lubrication**

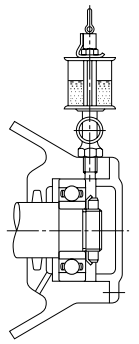


**Fig. 12.5 Drip Feed Lubrication**

### (3) Splash Lubrication

With this lubricating method, oil is splashed onto the bearings by gears or a simple rotating disc installed near bearings without submerging the bearings in oil. It is commonly used in automobile transmissions and final drive gears. Fig. 12.6 shows this lubricating method used on a reduction gear.

### (4) Circulating Lubrication

Circulating lubrication is commonly used for high speed operation requiring bearing cooling and for bearings used at high temperatures. As shown in Fig. 12.7 (a), oil is supplied by the pipe on the right side, it travels through the bearing, and drains out through the pipe on the left. After being cooled in a reservoir, it returns to the bearing through a pump and filter.
The oil discharge pipe should be larger than the supply pipe so an excessive amount of oil will not back up in the housing.

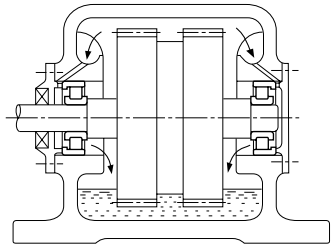


Fig. 12.6 Splash Lubrication

### (5) Jet Lubrication

Jet lubrication is often used for ultra high speed bearings, such as the bearings in jet engines with a $d_m n$ valve ($d_m$: pitch diameter of rolling element set in mm; $n$: rotational speed in $min^{-1}$) exceeding one million. Lubricating oil is sprayed under pressure from one or more nozzles directly into the bearing.
Fig. 12.8 shows an example of ordinary jet lubrication. The lubricating oil is sprayed on the inner ring and cage guide face. In the case of high speed operation, the air surrounding the bearing rotates with it causing the oil jet to be deflected. The jetting speed of the oil from the nozzle should be more than 20% of the circumferential speed of the inner ring outer surface (which is also the guide face for the cage).
More uniform cooling and a better temperature distribution is achieved using more nozzles for a given amount of oil. It is desirable for the oil to be forcibly discharged so the agitating resistance of the lubricant can be reduced and the oil can effectively carry away the heat.

### (6) Oil Mist Lubrication

Oil mist lubrication, also called oil fog lubrication, utilizes an oil mist sprayed into a bearing. This method has the following advantages:
(a) Because of the small quantity of oil required, the oil agitation resistance is small, and higher speeds are possible.
(b) Contamination of the vicinity around the bearing is slight because the oil leakage is small.
(c) It is relatively easy to continuously supply fresh oil; therefore, the bearing life is extended.

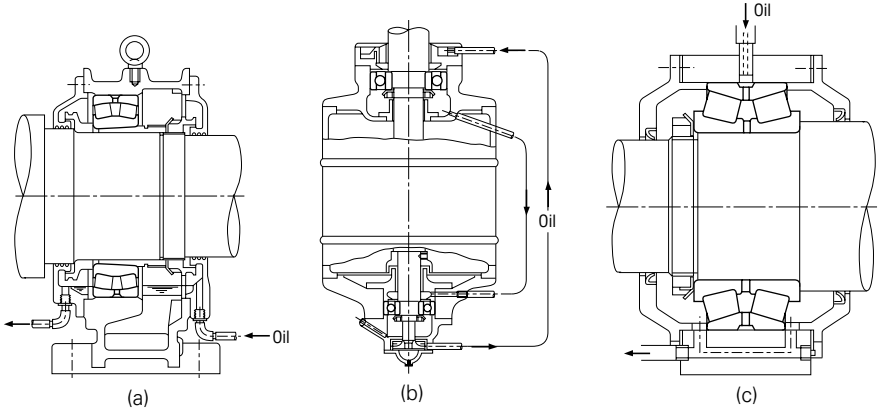



Fig. 12.7 Circulating Lubrication

This lubricating method is used in bearings for the high speed spindles of machine tools, high speed pumps, roll necks of rolling mills, etc (Fig. 12.9).
For oil mist lubrication of large bearings, it is advisable to consult NSK.

### (7) Oil/Air Lubricating Method

Using the oil/air lubricating method, a very small amount of oil is discharged intermittently by a constant-quantity piston into a pipe carrying a constant flow of compressed air. The oil flows along the wall of the pipe and approaches a constant flow rate.
The major advantages of oil/air lubrication are:
(a) Since the minimum necessary amount of oil is supplied, this method is suitable for high speeds because less heat is generated.
(b) Since the minimum amount of oil is fed continuously, bearing temperature remains stable. Also, because of the small amount of oil, there is almost no atmospheric pollution.
(c) Since only fresh oil is fed to the bearings, oil deterioration need not be considered.
(d) Since compressed air is always fed to the bearings, the internal pressure is high, so dust, cutting fluid, etc. cannot enter.
For these reasons, this method is used in the main spindles of machine tools and other high speed applications (Fig. 12.10).

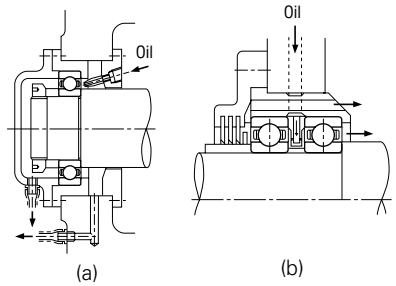



Fig. 12.8 Jet Lubrication

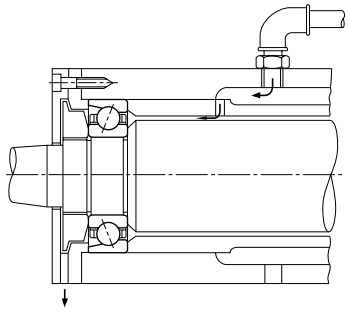


Fig. 12.9 Oil Mist Lubrication

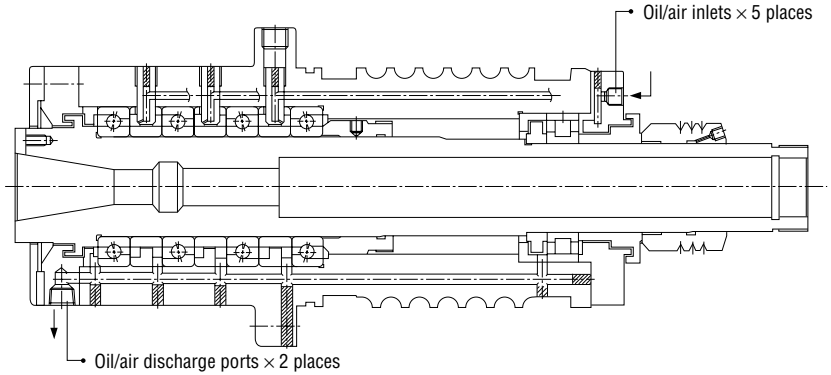



Fig. 12.10 Oil/Air Lubrication

## 12.3 Lubricants

### 12.3.1 Lubricating Grease

Grease is a semi-solid lubricant consisting of base oil, a thickener and additives. The main types and general properties of grease are shown in Table 12.2. It should be remembered that different brands of the same type of grease may have different properties.

#### (1) Base Oil

Mineral oils or synthetic oils such as silicone or diester oil are mainly used as the base oil for grease. The lubricating properties of grease depend mainly on the characteristics of its base oil. Therefore, the viscosity of the base oil is just as important when selecting grease as when selecting an oil. Usually, grease made with low viscosity base oils is more suitable for high speeds and low temperatures, while greases made with high viscosity base oils are more suited for high temperatures and heavy loads.
However, the thickener also influences the lubricating properties of grease; therefore, the selection criteria for grease is not the same as for lubricating oil.

#### (2) Thickener

As thickeners for lubricating grease, there are several types of metallic soaps, inorganic thickeners such as silica gel and bentonite, and heat resisting organic thickeners such as polyurea and fluoric compounds.
The type of thickener is closely related to the grease dropping point (1); generally, grease with a high dropping point also has a high temperature capability during operation. However, this type of grease does not have a high working temperature unless the base oil is heat-resistant. The highest possible working temperature for grease should be determined considering the heat resistance of the base oil.
The water resistance of grease depends upon the type of thickener. Sodium soap grease or compound grease containing sodium soap emulsifies when exposed to water or high humidity, and therefore, cannot be used where moisture is prevalent.

#### (3) Additives

Grease often contains various additives such as antioxidants, corrosion inhibitors, and extreme pressure additives to give it special properties. It is recommended that extreme pressure additives be used in heavy load applications. For long use without replenishment, an antioxidant should be added.

**Note** (1) The grease dropping point is that temperature at which a grease heated in a specified small container becomes sufficiently fluid to drip.

**Table 12.2 Grease Properties**

| Name (Popular name) | Lithium Grease | | | Sodium Grease (Fiber Grease) | Calcium Grease (Cup Grease) | Mixed Base Grease | Complex Base Grease (Complex Grease) | Non-Soap Base Grease (Non-Soap Grease) | |
|---|---|---|---|---|---|---|---|---|---|
| Thickener | Li Soap | | | Na Soap | Ca Soap | Na + Ca Soap, Li + Ca Soap, etc. | Ca Complex Soap, Al Complex Soap, Li Complex Soap, etc. | Urea, Bentonite, Carbon Black, Fluoric Compounds, Heat Resistant Organic Compound, etc. | |
| Base Oil / Properties | Mineral Oil | Diester Oil, Polyatomic Ester Oil | Silicone Oil | Mineral Oil | Mineral Oil | Mineral Oil | Mineral Oil | Mineral Oil | Synthetic Oil (Ester Oil, Polyatomic Ester Oil, Synthetic Hydrocarbon Oil, Silicone Oil, Fluoric Based Oil) |
| Dropping Point, ℃ | 170 to 195 | 170 to 195 | 200 to 210 | 170 to 210 | 70 to 90 | 160 to 190 | 180 to 300 | > 230 | > 230 |
| Working Temperatures, ℃ | –20 to +110 | –50 to +130 | –50 to +160 | –20 to +130 | –20 to +60 | –20 to +80 | –20 to +130 | –10 to +130 | < +220 |
| Working Speed, %(1) | 70 | 100 | 60 | 70 | 40 | 70 | 70 | 70 | 40 to 100 |
| Mechanical Stability | Good | Good | Good | Good | Poor | Good | Good | Good | Good |
| Pressure Resistance | Fair | Fair | Poor | Fair | Poor | Fair to Good | Fair to Good | Fair | Fair |
| Water Resistance | Good | Good | Good | Poor | Good | Poor for Na Soap Grease | Good | Good | Good |
| Rust Prevention | Good | Good | Poor | Poor to Good | Good | Fair to Good | Fair to Good | Fair to Good | Fair to Good |
| Remarks | General purpose grease used for numerous applications | Good low temperature and torque characteristics. Often used for small motors and instrument bearings. Pay attention to rust caused by insulation varnish. | Mainly for high temperature applications. Unsuitable for bearings for high and low speeds or heavy loads or those having numerous sliding-contact areas (roller bearings, etc.) | Long and short fiber types are available. Long fiber grease is unsuitable for high speeds. Attention to water and high temperature is requred. | Extreme pressure grease containing high viscosity mineral oil and extreme pressure additive (Pb soap, etc.) has high pressure resistance. | Often used for roller bearings and large ball bearing. | Suitable for extreme pressures mechanically stable | Mineral oil base grease is middle and high temperature purpose lubricant. Synthetic oil base grease is recommended for low or high temperature. Some silicone and fluoric oil based grease have poor rust prevention and noise. | |

**Note** (1) The values listed are percentages of the limiting speeds given in the bearing tables.

**Remarks** The grease properties shown here can vary between brands.

#### (4) Consistency

Consistency indicates the “softness” of grease. Table 12.3 shows the relation between consistency and working conditions.

#### (5) Mixing Different Types of Grease

In general, different brands of grease must not be mixed. Mixing grease with different types of thickneners may destroy its composition and physical properties. Even if the thickeners are of the same type, possible differences in the additive may cause detrimental effects.

**Table 12.3 Consistency and Working Conditions**

| Consistency Number | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Consistency(1) 1/10 mm | 355 to 385 | 310 to 340 | 265 to 295 | 220 to 250 | 175 to 205 |
| Working Conditions (Application) | ·For centralized oiling<br>·When fretting is likely to occur | ·For centralized oiling<br>·When fretting is likely to occur<br>·For low temperatures | ·For general use<br>·For sealed ball bearings | ·For general use<br>·For sealed ball bearings<br>·For high temperatures | ·For high temperatures<br>·For grease seals |

**Note** (1) Consistency: The depth to which a cone descends into grease when a specified weight is applied, indicated in units of 1/10mm. The larger the value, the softer the grease.

### 12.3.2 Lubricating Oil

The lubricating oils used for rolling bearings are usually highly refined mineral oil or synthetic oil that have a high oil film strength and superior oxidation and corrosion resistance. When selecting a lubricating oil, the viscosity at the operating conditions is important. If the viscosity is too low, a proper oil film is not formed and abnormal wear and seizure may occur. On the other hand, if the viscosity is too high, excessive viscous resistance may cause heating or large power loss. In general, low viscosity oils should be used at high speed; however, the viscosity should increase with increasing bearing load and size.
Table 12.4 gives generally recommended viscosities for bearings under normal operating conditions.

For use when selecting the proper lubricating oil, Fig. 12.11 shows the relationship between oil temperature and viscosity, and examples of selection are shown in Table 12.5.

**Table 12. 4 Bearing Types and Proper Viscosity of Lubricating Oils**

| Bearing Type | Proper Viscosity at Operating Temperature |
|---|---|
| Ball Bearings and Cylindrical Roller Bearings | Higher than 13mm²/s |
| Tapered Roller Bearings and Spherical Roller Bearings | Higher than 20mm²/s |
| Spherical Thrust Roller Bearings | Higher than 32mm²/s |

**Remarks** 1mm²/s=1cSt (centistokes)

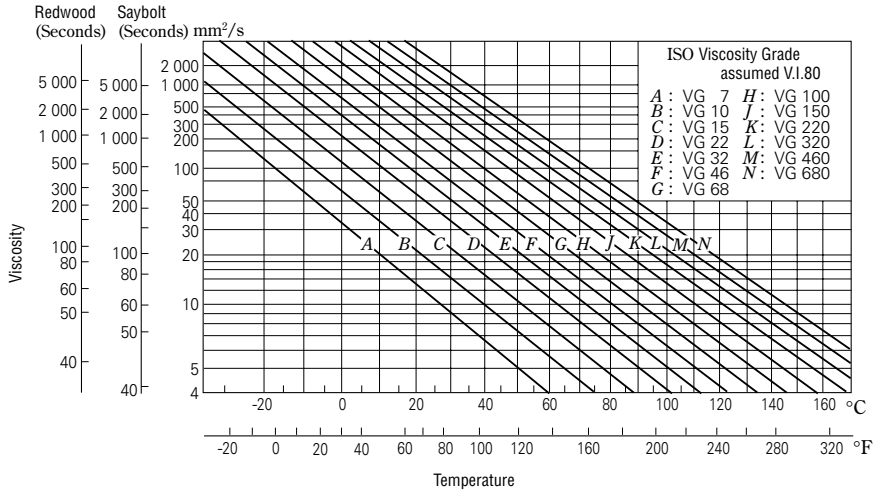



**Fig. 12.11 Temperature-Viscosity Chart**

### Oil Replacement Intervals

Oil replacement intervals depend on the operating conditions and oil quantity.
In those cases where the operating temperature is less than 50°C, and the environmental conditions are good with little dust, the oil should be replaced approximately once a year. However, in cases where the oil temperature is about 100°C, the oil must be changed at least once every three months.

If moisture may enter or if foreign matter may be mixed in the oil, then the oil replacement interval must be shortened.
Mixing different brands of oil must be prevented for the same reason given previously for grease.

**Table 12. 5 Examples of Selection Lubricating Oils**

| Operating Temperature | Speed | Light or normal Load | Heavy or Shock Load |
|---|---|---|---|
| −30 to 0°C | Less than limiting speed | ISO VG 15, 22, 32 (refrigerating machine oil) | – |
| 0 to 50°C | Less than 50% of limiting speed | ISO VG 32, 46, 68 (bearing oil, turbine oil) | ISO VG 46, 68, 100 (bearing oil, turbine oil) |
| | 50 to 100% of limiting speed | ISO VG 15, 22, 32 (bearing oil, turbine oil) | ISO VG 22, 32, 46 (bearing oil, turbine oil) |
| | More than limiting speed | ISO VG 10, 15, 22 (bearing oil) | – |
| 50 to 80°C | Less than 50% of limiting speed | ISO VG 100, 150, 220 (bearings oil) | ISO VG 150, 220, 320 (bearing oil) |
| | 50 to 100% of limiting speed | ISO VG 46, 68, 100 (bearing oil, turbine oil) | ISO VG 68, 100, 150 (bearing oil, turbine oil) |
| | More than limiting speed | ISO VG 32, 46, 68 (bearing oil, turbine oil) | – |
| 80 to 110°C | Less than 50% of limiting speed | ISO VG 320, 460 (bearing oil) | ISO VG 460, 680 (bearing oil, gear oil) |
| | 50 to 100% of limiting speed | ISO VG 150, 220 (bearing oil) | ISO VG 220, 320 (bearing oil) |
| | More than limiting speed | ISO VG 68, 100 (bearing oil, turbine oil) | – |

**Remarks**
1. For the limiting speed, use the values listed in the bearing tables.
2. Refer to Refrigerating Machine Oils (JIS K 2211), Bearing Oils (JIS K 2239), Turbine Oils (JIS K 2213), Gear Oils (JIS K 2219).
3. If the operating temperature is near the high end of the temperature range listed in the left column, select a high viscosity oil.
4. If the operating temperature is lower than -30°C or higher than 110°C , it is advisable to consult NSK.

# 13. BEARING MATERIALS

The bearing rings and rolling elements of rolling bearings are subjected to repetitive high pressure with a small amount of sliding. The cages are subjected to tension and compression and sliding contact with the rolling elements and either or both of the bearing rings.
Therefore, the materials used for the rings, rolling elements, and cages require the following characteristics:

Material characteristics required for bearing rings and rolling elements
- High rolling contact fatigue strength
- High hardness
- High wear resistance
- High dimensional stability
- High mechanical strength

(High wear resistance, High dimensional stability, High mechanical strength) → Characteristics required for cage material

Other necessary characteristics, such as easy production, shock and heat resistance, and corrosion resistance, are required depending on individual applications.

## 13.1 Materials for Bearing Rings and Rolling Elements

Primarily, high carbon chromium bearing steel (Table 13.1) is used for the bearing rings and rolling elements. Most NSK bearings are made of SUJ2 among the JIS steel types listed in Table 13.1, while the larger bearings generally use SUJ3. The chemical composition of SUJ2 is approximately the same as AISI 52100 specified in the USA, DIN 100 Cr6 in Germany, and BS 535A99 in England.
For bearings that are subjected to very severe shock loads, carburized low-carbon alloy steels such as chrome steel, chrome molybdenum steel, nickel chrome molybdenum steel, etc. are often used. Such steels, when they are carburized to the proper depth and have sufficient surface hardness, are more shock resistant than normal, through-hardened bearing steels because of the softer energy-absorbing core. The chemical composition of common carburized bearing steels is listed in Table 13.2.

**Table 13. 1 Chemical Composition of High-Carbon Chromium Bearing Steel (Major Elements)**

| Standard | Symbols | Chemical Composition (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | C | Si | Mn | P | S | Cr | Mo |
| JIS G 4805 | SUJ 2 | 0.95 to 1.10 | 0.15 to 0.35 | Less than 0.50 | Less than 0.025 | Less than 0.025 | 1.30 to 1.60 | — |
| | SUJ 3 | 0.95 to 1.10 | 0.40 to 0.70 | 0.90 to 1.15 | Less than 0.025 | Less than 0.025 | 0.90 to 1.20 | — |
| | SUJ 4 | 0.95 to 1.10 | 0.15 to 0.35 | Less than 0.50 | Less than 0.025 | Less than 0.025 | 1.30 to 1.60 | 0.10 to 0.25 |
| ASTM A 295 | 52100 | 0.93 to 1.05 | 0.15 to 0.35 | 0.25 to 0.45 | Less than 0.025 | Less than 0.015 | 1.35 to 1.60 | Less than 0.10 |

**Table 13. 2 Chemical Composition of Carburizing Bearing Steels (Major Elements)**

| Standard | Symbols | Chemical Composition (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | C | Si | Mn | P | S | Ni | Cr | Mo |
| JIS G 4052 | SCr 420 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.55 to 0.95 | Less than 0.030 | Less than 0.030 | Less than 0.25 | 0.85 to 1.25 | — |
| | SCM 420 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.55 to 0.95 | Less than 0.030 | Less than 0.030 | Less than 0.25 | 0.85 to 1.25 | 0.15 to 0.35 |
| | SNCM 220 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.60 to 0.95 | Less than 0.030 | Less than 0.030 | 0.35 to 0.75 | 0.35 to 0.65 | 0.15 to 0.30 |
| | SNCM 420 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.40 to 0.70 | Less than 0.030 | Less than 0.030 | 1.55 to 2.00 | 0.35 to 0.65 | 0.15 to 0.30 |
| JIS G 4053 | SNCM 815 | 0.12 to 0.18 | 0.15 to 0.35 | 0.30 to 0.60 | Less than 0.030 | Less than 0.030 | 4.00 to 4.50 | 0.70 to 1.00 | 0.15 to 0.30 |
| ASTM A 534 | 8620 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.60 to 0.95 | Less than 0.025 | Less than 0.015 | 0.35 to 0.75 | 0.35 to 0.65 | 0.15 to 0.25 |
| | 4320 H | 0.17 to 0.23 | 0.15 to 0.35 | 0.40 to 0.70 | Less than 0.025 | Less than 0.015 | 1.55 to 2.00 | 0.35 to 0.65 | 0.20 to 0.30 |
| | 9310 H | 0.07 to 0.13 | 0.15 to 0.35 | 0.40 to 0.70 | Less than 0.025 | Less than 0.015 | 2.95 to 3.55 | 1.00 to 1.40 | 0.08 to 0.15 |

**Table 13. 3 Chemical Composition of High Speed Steel for Bearings Used at High Temperatures**

| Standard | Symbols | Chemical Composition (%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C | Si | Mn | P | S | Cr | Mo | V | Ni | Cu | Co | W |
| AISI | M50 | 0.77 to 0.85 | Less than 0.25 | Less than 0.35 | Less than 0.015 | Less than 0.015 | 3.75 to 4.25 | 4.00 to 4.50 | 0.90 to 1.10 | Less than 0.10 | Less than 0.10 | Less than 0.25 | Less than 0.25 |





NSK uses highly pure vacuum-degassed bearing steel containing a minimum of oxygen, nitrogen, and hydrogen compound impurities. The rolling fatigue life of bearings has been remarkably improved using this material combined with the appropriate heat treatment.
For special purpose bearings, high temperature bearing steel, which has superior heat resistance, and stainless steel having good corrosion resistance may be used. The chemical composition of these special materials are given in Tables 13.3 and 13.4.

## 13.2 Cage Materials

The low carbon steels shown in Table 13.5 are the main ones for the pressed cages for bearings. Depending on the purpose, brass or stainless steel may be used. For machined cages, high strength brass (Table 13.6) or carbon steel (Table 13.5) is used. Sometimes synthetic resin is also used.

**Table 13. 4 Chemical Composition of Stainless Steel for Rolling Bearing (Major Elements)**

| Standard | Symbols | Chemical Composition (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | C | Si | Mn | P | S | Cr | Mo |
| JIS G 4303 | SUS 440 C | 0.95 to 1.20 | Less than 1.00 | Less than 1.00 | Less than 0.040 | Less than 0.030 | 16.00 to 18.00 | Less than 0.75 |
| SAE J 405 | 51440 C | 0.95 to 1.20 | Less than 1.00 | Less than 1.00 | Less than 0.040 | Less than 0.030 | 16.00 to 18.00 | Less than 0.75 |

**Table 13. 5 Chemical Composition of Steel sheet and Carbon Steel for Cages (Major Elements)**

| Classification | Standard | Symbols | Chemical Composition (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | C | Si | Mn | P | S |
| Steel sheet and strip for pressed cages | JIS G 3141 | SPCC | Less than 0.12 | — | Less than 0.05 | Less than 0.04 | Less than 0.045 |
| | BAS 361 | SPB 2 | 0.13 to 0.20 | Less than 0.04 | 0.25 to 0.60 | Less than 0.03 | Less than 0.030 |
| | JIS G 3311 | S 50 CM | 0.47 to 0.53 | 0.15 to 0.35 | 0.60 to 0.90 | Less than 0.03 | Less than 0.035 |
| Carbon steel for machined cages | JIS G 4051 | S 25 C | 0.22 to 0.28 | 0.15 to 0.35 | 0.30 to 0.60 | Less than 0.03 | Less than 0.035 |

**Remarks** BAS is Japanese Bearing Association Standard.

**Table 13. 6 Chemical Composition of High Strength Brass for Machined Cages**

| Standard | Symbols | Chemical Composition (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cu | Zn | Mn | Fe | Al | Sn | Ni | Impurities | |
| | | | | | | | | | Pb | Si |
| JIS H 5120 | CAC301 (HBsC 1) | 55.0 to 60.0 | 33.0 to 42.0 | 0.1 to 1.5 | 0.5 to 1.5 | 0.5 to 1.5 | Less than 1.0 | Less than 1.0 | Less than 0.4 | Less than 0.1 |
| JIS H 3250 | C 6782 | 56.0 to 60.5 | Residual | 0.5 to 2.5 | 0.1 to 1.0 | 0.2 to 2.0 | — | — | Less than 0.5 | — |

**Remarks** Improved HBsC 1 is also used.

# 14. BEARING HANDLING

## 14.1 Precautions for Proper Handling of Bearings

Since rolling bearings are high precision machine parts, they must be handled accordingly. Even if high quality bearings are used, their expected performance cannot be achieved if they are not handled properly.
The main precautions to be observed are as follows:

### (1) Keep Bearings and Surrounding Area Clean

Dust and dirt, even if invisible to the naked eye, have harmful effects on bearings. It is necessary to prevent the entry of dust and dirt by keeping the bearings and their environment as clean as possible.

### (2) Careful Handling

Heavy shocks during handling may cause bearings to be scratched or otherwise damaged possibly resulting in their failure. Excessively strong impacts may cause brinelling, breaking, or cracking.

### (3) Use Proper Tools

Always use the proper equipment when handling bearings and avoid general purpose tools.

### (4) Prevent Corrosion

Since perspiration on the hands and various other contaminants may cause corrosion, keep the hands clean when handling bearings. Wear gloves if possible. Pay attention to rust of bearing caused by corrosive gasses.

## 14.2 Mounting

The method of mounting rolling bearings strongly affects their accuracy, life, and performance, so their mounting deserves careful attention. Their characteristics should first be thoroughly studied, and then they should be mounted in the proper manner. It is recommended that the handling procedures for bearings be fully investigated by the design engineers and that standards be established with respect to the following items:

(1) Cleaning the bearings and related parts.
(2) Checking the dimensions and finish of related parts.
(3) Mounting
(4) Inspection after mounting.
(5) Supply of lubricants.

Bearings should not be unpacked until immediately before mounting. When using ordinary grease lubrication, the grease should be packed in the bearings without first cleaning them. Even in the case of ordinary oil lubrication, cleaning the bearings is not required. However, bearings for instruments or for high speed operation must first be cleaned with clean filtered oil in order to remove the anti-corrosion agent.

After the bearings are cleaned with filtered oil, they should be protected to prevent corrosion.
Prelubricated bearings must be used without cleaning.
Bearing mounting methods depend on the bearing type and type of fit. As bearings are usually used on rotating shafts, the inner rings require a tight fit.
Bearings with cylindrical bores are usually mounted by pressing them on the shafts (press fit) or heating them to expand their diameter (shrink fit). Bearings with tapered bores can be mounted directly on tapered shafts or cylindrical shafts using tapered sleeves.
Bearings are usually mounted in housings with a loose fit. However, in cases where the outer ring has an interference fit, a press may be used. Bearings can be interference-fitted by cooling them before mounting using dry ice. In this case, a rust preventive treatment must be applied to the bearing because moisture in the air condenses on its surface.

### 14.2.1 Mounting of Bearings with Cylindrical Bores

#### (1) Press Fits

Fitting with a press is widely used for small bearings. A mounting tool is placed on the inner ring as shown in Fig. 14.1 and the bearing is slowly pressed on the shaft with a press until the side of the inner ring rests against the shoulder of the shaft. The mounting tool must not be placed on the outer ring for press mounting, since the bearing may be damaged. Before mounting, applying oil to the fitted shaft surface is recommended for smooth insertion. The mounting method using a hammer should only be used for small ball bearings with minimally tight fits and when a press is not available. In the case of tight interference fits or for medium and large bearings, this method should not be used. Any time a hammer is used, a mounting tool must be placed on the inner ring.
When both the inner and outer rings of non-separable bearings, such as deep groove ball bearings, require tight-fit, a mounting tool is placed on both rings as shown in Fig. 14.2, and both rings are fitted at the same time using a screw or hydraulic press. Since the outer ring of self-aligning ball bearings may deflect a mounting tool such as that shown in Fig. 14.2 should always be used for mounting them.
In the case of separable bearings, such as cylindrical roller bearings and tapered roller bearings, the inner and outer rings may be mounted separately. Assembly of the inner and outer rings, which were previously mounted separately, should be done carefully to align the inner and outer rings correctly. Careless or forced assembly may cause scratches on the rolling contact surfaces.

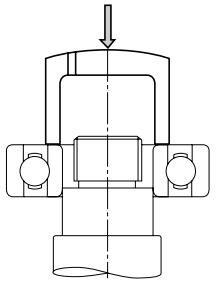


Fig. 14.1 Press Fitting Inner Ring

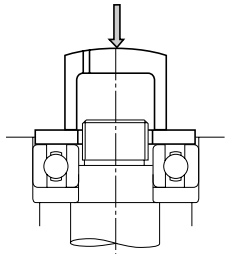


Fig. 14.2 Simultaneous Press Fitting of Inner and Outer Rings

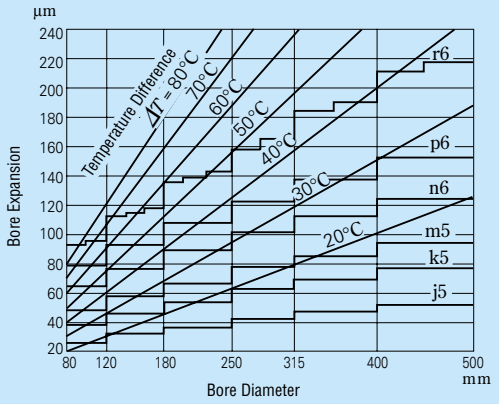



Fig. 14.3 Temperature and Thermal Expansion of Inner Ring

### (2) Shrink Fits

Since press fitting large bearings requires a large force, a shrink fit is widely used. The bearings are first heated in oil to expand them before mounting.
This method prevents an excessive force from being imposed on the bearings and allows mounting them in a short time.
The expansion of the inner ring for various temperature differences and bearing sizes is shown in Fig. 14.3.
The precautions to follow when making shrink fits are as follows:

(a) Do not heat bearings to more than 120˚C.
(b) Put the bearings on a wire net or suspend them in an oil tank in order to prevent them from touching the tank's bottom directly.
(c) Heat the bearings to a temperature 20˚ to 30˚C higher than the lowest temperature required for mounting without interference since the inner ring will cool a little during mounting.
(d) After mounting, the bearings will shrink in the axial direction as well as the radial direction while cooling. Therefore, press the bearing firmly against the shaft shoulder using locating methods to avoid a clearance between the bearing and shoulder.

### NSK Bearing Induction Heaters

Besides heating in oil, NSK Bearing Heaters, which use electromagnetic induction to heat bearings, are widely used. (Refer to Page C7.)
In NSK Bearing Heaters, electricity (AC) in a coil produces a magnetic field that induces a current inside the bearing that generates heat. Consequently, without using flames or oil uniform heating in a short time is possible, making bearing shrink fitting efficient and clean.
In the case of relatively frequent mounting and dismounting such as cylindrical roller bearings for roll necks of rolling mills and for railway journal boxes, induction heating should be used for mounting and dismounting inner rings.

### 14.2.2 Mounting of Bearings with Tapered Bores

Bearings with tapered bores are mounted on tapered shafts directly or on cylindrical shafts with adapters or withdrawal sleeves (Figs. 14.4 and 14.5). Large spherical roller bearings are often mounted using hydraulic pressure. Fig. 14.6 shows a bearing mounting utilizing a sleeve and hydraulic nut. Fig. 14.7 shows another mounting method. Holes are drilled in the sleeve which are used to feed oil under pressure to the bearing seat. As the bearing expands radially, the sleeve is inserted axially with adjusting bolts.

Spherical roller bearings should be mounted while checking their radial-clearance reduction and referring to the push-in amounts listed in Table 14.1. The radial clearance must be measured using clearance gauges.

In this measurement, as shown in Fig. 14.8, the clearance for both rows of rollers must be measured simultaneously, and these two values should be kept roughly the same by adjusting the relative position of the outer and inner rings.

When a large bearing is mounted on a shaft, the outer ring may be deformed into an oval shape by its own weight. If the clearance is measured at the lowest part of the deformed bearing, the measured value may be bigger than the true value. If an incorrect radial internal clearance is obtained in this manner and the values in Table 14.1 are used, then the interference fit may become too tight and the true residual clearance may become too small. In this case, as shown in Fig. 14.9. one half of the total clearance at points $a$ and $b$ (which are on a horizontal line passing through the bearing center) and $c$ (which is at the lowest position of the bearing) may be used as the residual clearance.

When a self-aligning ball bearing is mounted on a shaft with an adapter, be sure that the residual clearance does not become too small. Sufficient clearance for easy alignment of the outer ring must be allowed.

## 14.3 Operation Inspection

After the mounting has been completed, a running test should be conducted to determine if the bearing has been mounted correctly. Small machines may be manually operated to assure that they rotate smoothly. Items to be checked include sticking due to foreign matter or visible flaws, uneven torque caused by improper mounting or an improper mounting surface, and excessive torque caused by an inadequate clearance, mounting error, or seal friction. If there are no abnormalities, powered operation may be started.

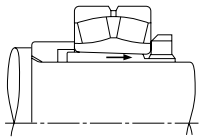


Fig. 14.4 Mounting with Adapter

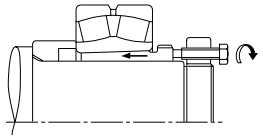


Fig. 14.5 Mounting with Withdrawal Sleeve

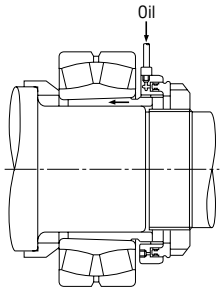



Fig. 14.6 Mounting with Hydraulic Nut

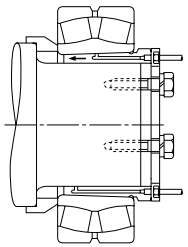


Fig. 14.7 Mounting with Special Sleeve and Hydraulic Pressure

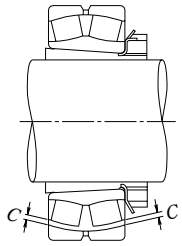



Fig. 14.8 Clearance Measurement of Spherical Roller Bearing

**Table 14.1 Mounting of Spherical Roller Bearings with Tapered Bores**

Units : mm

| Bearing Bore Diameter $d$ | | Reduction in Radial Clearance | | Push-in amount in axial direction | | | | Minimum Permissible Residual Clearance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Taper 1 : 12 | | Taper 1 : 30 | | | |
| over | incl | min. | max. | min. | max. | min. | max. | CN | C3 |
| **30** | **40** | 0.025 | 0.030 | 0.40 | 0.45 | — | — | 0.010 | 0.025 |
| **40** | **50** | 0.030 | 0.035 | 0.45 | 0.55 | — | — | 0.015 | 0.030 |
| **50** | **65** | 0.030 | 0.035 | 0.45 | 0.55 | — | — | 0.025 | 0.035 |
| **65** | **80** | 0.040 | 0.045 | 0.60 | 0.70 | — | — | 0.030 | 0.040 |
| **80** | **100** | 0.045 | 0.055 | 0.70 | 0.85 | 1.75 | 2.15 | 0.035 | 0.050 |
| **100** | **120** | 0.050 | 0.060 | 0.75 | 0.90 | 1.9 | 2.25 | 0.045 | 0.065 |
| **120** | **140** | 0.060 | 0.070 | 0.90 | 1.1 | 2.25 | 2.75 | 0.055 | 0.080 |
| **140** | **160** | 0.065 | 0.080 | 1.0 | 1.3 | 2.5 | 3.25 | 0.060 | 0.100 |
| **160** | **180** | 0.070 | 0.090 | 1.1 | 1.4 | 2.75 | 3.5 | 0.070 | 0.110 |
| **180** | **200** | 0.080 | 0.100 | 1.3 | 1.6 | 3.25 | 4.0 | 0.070 | 0.110 |
| **200** | **225** | 0.090 | 0.110 | 1.4 | 1.7 | 3.5 | 4.25 | 0.080 | 0.130 |
| **225** | **250** | 0.100 | 0.120 | 1.6 | 1.9 | 4.0 | 4.75 | 0.090 | 0.140 |
| **250** | **280** | 0.110 | 0.140 | 1.7 | 2.2 | 4.25 | 5.5 | 0.100 | 0.150 |
| **280** | **315** | 0.120 | 0.150 | 1.9 | 2.4 | 4.75 | 6.0 | 0.110 | 0.160 |
| **315** | **355** | 0.140 | 0.170 | 2.2 | 2.7 | 5.5 | 6.75 | 0.120 | 0.180 |
| **355** | **400** | 0.150 | 0.190 | 2.4 | 3.0 | 6.0 | 7.5 | 0.130 | 0.200 |
| **400** | **450** | 0.170 | 0.210 | 2.7 | 3.3 | 6.75 | 8.25 | 0.140 | 0.220 |
| **450** | **500** | 0.190 | 0.240 | 3.0 | 3.7 | 7.5 | 9.25 | 0.160 | 0.240 |
| **500** | **560** | 0.210 | 0.270 | 3.4 | 4.3 | 8.5 | 11.0 | 0.170 | 0.270 |
| **560** | **630** | 0.230 | 0.300 | 3.7 | 4.8 | 9.25 | 12.0 | 0.200 | 0.310 |
| **630** | **710** | 0.260 | 0.330 | 4.2 | 5.3 | 10.5 | 13.0 | 0.220 | 0.330 |
| **710** | **800** | 0.280 | 0.370 | 4.5 | 5.9 | 11.5 | 15.0 | 0.240 | 0.390 |
| **800** | **900** | 0.310 | 0.410 | 5.0 | 6.6 | 12.5 | 16.5 | 0.280 | 0.430 |
| **900** | **1 000** | 0.340 | 0.460 | 5.5 | 7.4 | 14.0 | 18.5 | 0.310 | 0.470 |
| **1 000** | **1 120** | 0.370 | 0.500 | 5.9 | 8.0 | 15.0 | 20.0 | 0.360 | 0.530 |

**Remarks** The values for reduction in radial internal clearance are for bearings with CN clearance. For bearing with C3 Clearance,the maximum values listed should be used for the reduction in radial internal clearance.

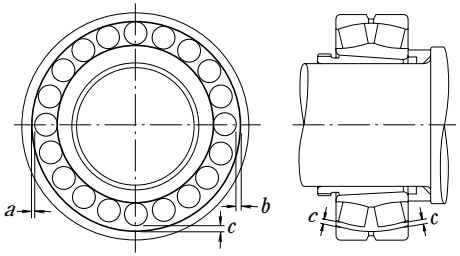



Fig. 14.9 Measuring Clearance in Large Spherical Roller Bearing

Large machines, which cannot be turned by hand, can be started after examination with no load, and the power immediately cutoff and the machine allowed to coast to a stop. Confirm that there is no abnormality such as vibration, noise, contact of rotating parts, etc. Powered operation should be started slowly without load and the operation should be observed carefully until it is determined that no abnormalities exist, then gradually increase the speed, load, etc. to their normal levels. Items to be checked during the test operation include the existence of abnormal noise, excessive rise of bearing temperature, leakage and contamination of lubricants, etc. If any abnormality is found during the test operation, it must be stopped immediately and the machine should be inspected. If necessary, the bearing should be dismounted for examination.

Although the bearing temperature can generally be estimated by the temperature of the outside surface of the housing, it is more desirable to directly measure the temperature of the outer ring using oil holes for access.
The bearing temperature should rise gradually to the steady state level within one to two hours after the operation starts. If the bearing or its mounting is improper, the bearing temperature may increase rapidly and become abnormally high. The cause of this abnormal temperature may be an excessive amount of lubricant, insufficient bearing clearance, incorrect mounting, or excessive friction of the seals.
In the case of high speed operation, an incorrect selection of bearing type or lubricating method may also cause an abnormal temperature rise.
The sound of a bearing may be checked with a noise locater or other instruments. Abnormal conditions are indicated by a loud metallic sound, or other irregular noise, and the possible cause may include incorrect lubrication, poor alignment of the shaft and housing, or the entry of foreign matter into the bearing. The possible causes and countermeasures for irregularities are listed in Table 14.2.

**Table 14. 2 Causes of and Countermeasures for Operating Irregularities**

| Irregularities | | Possible Causes | Countermeasures |
|---|---|---|---|
| Noise | Loud Metallic Sound (1) | Abnormal Load | Improve the fit, internal clearance, preload, position of housing shoulder, etc. |
| | | Incorrect mounting | Improve the machining accuracy and alignment of shaft and housing, accuracy of mounting method. |
| | | Insufficient or improper Lubricant | Replenish the lubricant or select another lubricant. |
| | | Contact of rotating parts | Modify the labyrinth seal, etc. |
| | Loud Regular Sound | Flaws,corrosion,or scratches on raceways | Replace or clean the bearing, improve the seals, and use clean lubricant. |
| | | Brinelling | Replace the bearing and use care when handling bearings. |
| | | Flaking on raceway | Replace the bearing. |
| | Irregular Sound | Excessive clearance | Improve the fit, clearance and preload. |
| | | Penetration of foreign particles | Replace or clean the bearing, improve the seals, and use clean lubricant. |
| | | Flaws or flaking on balls | Replace the bearing. |
| Abnormal Temperature Rise | | Excessive amount of lubricant | Reduce amount of lubricant, select stiffer grease. |
| | | Insufficient or improper lubricant | Replenish lubricant or select a better one. |
| | | Abnormal load | Improve the fit, internal clearance, preload, position of housing shoulder. |
| | | Incorrect mounting | Improve the machining accuracy and alignment of shaft and housing, accuracy of mounting, or mounting method. |
| | | Creep on fitted surface, excessive seal friction | Correct the seals, replace the bearing, correct the fitting or mounting. |
| Vibration (Axial runout) | | Brinelling | Replace the bearing and use care when handling bearings. |
| | | Flaking | Replace the bearing. |
| | | Incorrect mounting | Correct the squareness between the shaft and housing shoulder or side of spacer. |
| | | Penetration of foreign particles | Replace or clean the bearing, improve the seals. |
| Leakage or Discoloration of Lubricant | | Too much lubricant, Penetration by foreign matter or abrasion chips | Reduce the amount of lubricant, select a stiffer grease. Replace the bearing or lubricant. Clean the housing and adjacent parts. |

**Note** (1) Intermittent squeal or high-pitch noise may be heard in medium- to large-sized cylindrical roller bearings or ball bearings that are operating under grease lubrication in low-temperature environments. Under such low-temperature conditions, bearing temperature will not rise resulting in fatigue nor is grease performance affected. Although intermittent squeal or high-pitch noise may occur under these conditions, the bearing is fully functional and can continue to be used. In the event that greater noise reduction or quieter running properties are needed, please contact your nearest NSK branch office.

## 14.4 Dismounting

A bearing may be removed for periodic inspection or for other reasons. If the removed bearing is to be used again or it is removed only for inspection, it should be dismounted as carefully as when it was mounted. If the bearing has a tight fit, its removal may be difficult. The means for removal should be considered in the original design of the adjacent parts of the machine. When dismounting, the procedure and sequence of removal should first be studied using the machine drawing and considering the type of mounting fit in order to perform the operation properly.

### 14.4.1 Dismounting of Outer Rings

In order to remove an outer ring that is tightly fitted, first place bolts in the push-out holes in the housing at several locations on its circumference as shown in Fig. 14.10, and remove the outer ring by uniformly tightening the bolts. These bolt holes should always be fitted with blank plugs when not being used for dismounting. In the case of separable bearings, such as tapered roller bearings, some notches should be made at several positions in the housing shoulder, as shown in Fig. 14.11, so the outer ring may be pressed out using a dismounting tool or by tapping it.

### 14.4.2 Dismounting of Bearings with Cylindrical Bores

If the mounting design allows space to press out the inner ring, this is an easy and fast method. In this case, the withdrawal force should be imposed only on the inner ring (Fig. 14.12). Withdrawal tools like those shown in Figs. 14.13 and 14.14 are often used.

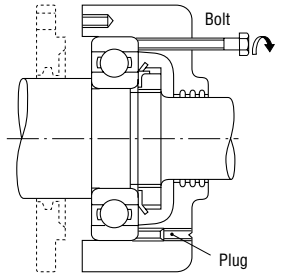



**Fig. 14.10 Removal of Outer Ring with Dismounting Bolts**

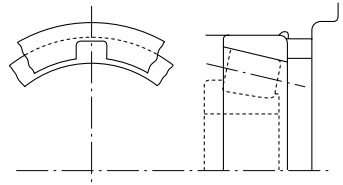


**Fig. 14.11 Removal Notches**

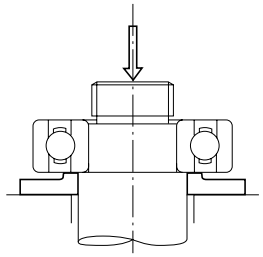


**Fig. 14.12 Removal of Inner Ring Using a Press**

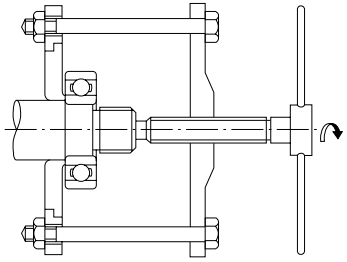


**Fig. 14.13 Removal of Inner Ring Using Withdrawal Tool (1)**

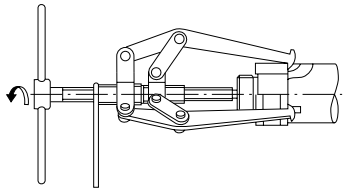


**Fig. 14.14 Removal of Inner Ring Using Withdrawal Tool (2)**

In both cases, the claws of the tools must substantially engage the face of the inner ring; therefore, it is advisable to consider the size of the shaft shoulder or to cut grooves in the shoulder to accommodate the withdrawal tools (Fig. 14.14).
The oil injection method is usually used for the withdrawal of large bearings. The withdrawal is achieved easily by mean of oil pressure applied through holes in the shaft. In the case of extra wide bearings, the oil injection method is used together with a withdrawal tool.
Induction heating is used to remove the inner rings of NU and NJ types of cylindrical roller bearings. The inner rings are expanded by brief local heating, and then withdrawn (Fig. 14.15). Induction heating is also used to mount several bearings of these types on a shaft.

### 14.4.3 Dismounting of Bearings with Tapered Bores

When dismounting relatively small bearings with adapters, the inner ring is held by a stop fastened to the shaft and the nut is loosened several turns. This is followed by hammering on the sleeve using a suitable tool as shown in Fig. 14.18. Fig. 14.16 shows one procedure for dismounting a withdrawal sleeve by tightening the removal nut. If this procedure is difficult, it may be possible to drill and tap bolt holes in the nut and withdraw the sleeve by tightening the bolts as shown in Fig. 14.17.
Large bearings may be withdrawn easily using oil pressure. Fig. 14.19 illustrates the removal of a bearing by forcing oil under pressure through a hole and groove in a tapered shaft to expand the inner ring. The bearing may suddenly move axially when the interference is relieved during this procedure so a stop nut is recommended for protection. Fig. 14.20 shows a withdrawal using a hydraulic nut.

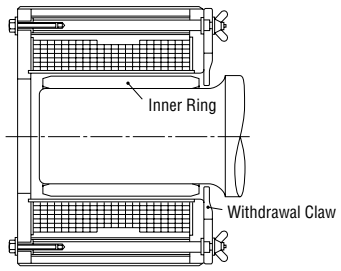



Fig. 14.15 Removal of Inner Ring Using Induction Heater

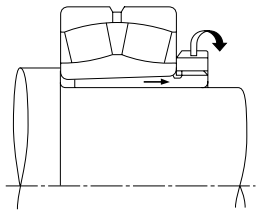


Fig. 14.16 Removal of Withdrawal Sleeve Using Withdrawal Nut (1)

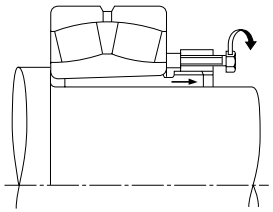


Fig. 14.17 Removal of Withdrawal Sleeve Using Withdrawal Nut (2)

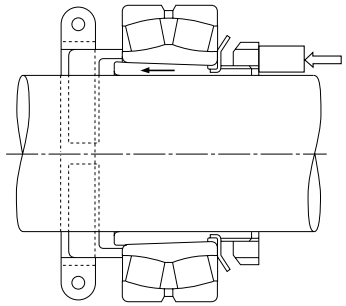


Fig. 14.18 Removal of Adapter with Stop and Axial Pressure

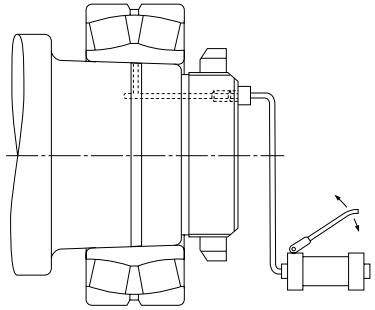


Fig. 14.19 Removal Using Oil Injection Hydraulic Pump

## 14.5 Inspection of Bearings

### 14.5.1 Bearing Cleaning

When bearings are inspected, the appearance of the bearings should first be recorded and the amount and condition of the residual lubricant should be checked.
After the lubricant has been sampled for examination, the bearings should be cleaned. In general, light oil or kerosene may be used as a cleaning solution.
Dismounted bearings should first be given a preliminary cleaning followed by a finishing rinse. Each bath should be provided with a metal net to support the bearings in the oil without touching the sides or bottom of the tank. If the bearings are rotated with foreign matter in them during preliminary cleaning, the raceways may be damaged. The lubricant and other deposits should be removed in the oil bath during the initial rough cleaning with a brush or other means. After the bearing is relatively clean, it is given the finishing rinse. The finishing rinse should be done carefully with the bearing being rotated while immersed in the rinsing oil. It is necessary to always keep the rinsing oil clean.

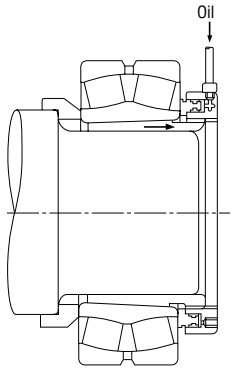



Fig. 14.20 Removal Using Hydraulic Nut

### 14.5.2 Inspection and Evaluation of Bearings

After being thoroughly cleaned, bearings should be examined for the condition of their raceways and external surfaces, the amount of cage wear, the increase in internal clearance, and degradation of tolerances. These should be carefully checked, in addition to examination for possible damage or other abnormalities, in order to determine the possibility for its reuse.
In the case of small non-separable ball bearings, hold the bearing horizontally in one hand, and then rotate the outer ring to confirm that it turns smoothly.
Separable bearings such as tapered roller bearings may be checked by individually examining their rolling elements and the outer ring raceway.
Large bearings cannot be rotated manually; however, the rolling elements, raceway surfaces, cages, and contact surface of the ribs should be carefully examined visually. The more important a bearing is, the more carefully it should be inspected.
The determination to reuse a bearing should be made only after considering the degree of bearing wear, the function of the machine, the importance of the bearings in the machine, operating conditions, and the time until the next inspection. However, if any of the following defects exist, reuse is impossible and replacement is necessary.

(a) When there are cracks in the inner or outer rings, rolling elements, or cage.
(b) When there is flaking of the raceway or rolling elements.
(c) When there is significant smearing of the raceway surfaces, ribs, or rolling elements.
(d) When the cage is significantly worn or rivets are loose.
(e) When there is rust or scoring on the raceway surfaces or rolling elements.
(f) When there are any significant impact or brinell traces on the raceway surfaces or rolling elements.
(g) When there is significant evidence of creep on the bore or the periphery of the outer ring.
(h) When discoloration by heat is evident.
(i) When significant damage to the seals or shields of grease sealed bearings has occurred.

## 14.6 Maintenance and Inspection

### 14.6.1 Detecting and Correcting Irregularities

In order to maintain the original performance of a bearing for as long as possible, proper maintenance and inspection should be performed. If proper procedures are used, many bearing problems can be avoided and the reliability, productivity, and operating costs of the equipment containing the bearings are all improved. It is suggested that periodic maintenance be done following the procedure specified. This periodic maintenance encompasses the supervision of operating conditions, the supply or replacement of lubricants, and regular periodic inspection. Items that should be regularly checked during operation include bearing noise, vibration, temperature, and lubrication.
If an irregularity is found during operation, the cause should be determined and the proper corrective actions should be taken after referring to Table 14.2.
If necessary, the bearing should be dismounted and examined in detail. As for the procedure for dismounting and inspection, refer to Section 14.5, Inspection of Bearings.

### NSK BEARING MONITOR (Bearing Abnormality Detector)

It is important during operation to detect signs of irregularities early before damage becomes severe.
The NSK Bearing Monitor (see Page C5) is an instrument that checks the condition of bearings and gives a warning of any abnormality, or it stops a machine automatically in order to prevent serious trouble. In addition, it helps to improve maintenance and reduce its cost.

### 14.6.2 Bearing Failures and Countermeasures

In general, if rolling bearings are used correctly they will survive to their predicted fatigue life. However, they often fail prematurely due to avoidable mistakes.
In contrast to fatigue life, this premature failure is caused by improper mounting, handling, or lubrication, entry of foreign matter, or abnormal heat generation.
For instance, the causes of rib scoring, as one example of premature failure, may include insufficient lubrication, use of improper lubricant, faulty lubrication system, entry of foreign matter, bearing mounting error, excessive deflection of the shaft, or any combination of these. Thus, it is difficult to determine the real cause of some premature failures.
If all the conditions at the time of failure and previous to the time of failure are known, including the application, the operating conditions, and environment; then by studying the nature of the failure and its probable causes, the possibility of similar future failures can be reduced. The most frequent types of bearing failure, along with their causes and corrective actions, are listed in Table 14.3.

**Table 14.3 Causes and Countermeasure for Bearing Failures**

| Type of Failure | Probable Causes | Countermeasure |
|---|---|---|
| **Flaking** | | |
| Flaking of one-side of the raceway of radial bearing. | Abnomal axial load. | A loose fit should be used when mounting the outer ring of free-end bearings to allow axial expansion of the shaft. |
| Flaking of the raceway in symmetrical patterm. | Out-of-roundness of the housing bore. | Correct the faulty housing. |
| Flaking pattern inclined relative to the raceway in radial ball bearings. Flaking near the edge of the raceway and rolling surfaces in roller bearings. | Improper muonting, deflection of shaft, inadequate tolerances for shaft and housing. | Use care in mounting and centering, select a bearing with a large clearance, and correct the shaft and housing shoulder. |
| Flaking of raceway with same spacing as rolling elements. | Large shock load during mounting, rusting while bearing is out of operation for prolonged period. | Use care in mounting and apply a rust preventive when machine operation is suspended for a long time. |
| Premature flaking of raceway and rolling elements. | Insufficient clearance, excessive load, improper lubrication, rust, etc. | Select proper fit, bearing clearance, and lubricant. |
| Premature flaking of duplex bearings. | Excessive preload. | Adjust the preload. |
| **Scoring** | | |
| Scoring or smearing between raceway and rolling surfaces. | Inadequate initial lubrication, excessively hard grease and high acceleration when starting. | Use a softer grease and avoid rapid acceleration. |
| Spiral scoring or smearing of raceway surface of thrust ball bearing. | Raceway rings are not parallel and excessive speed. | Correct the mounting, apply a preload, or select another bearing type. |
| Scoring or smearing between the end face of the rollers and guide rib. | Inadequate lubrication, incorrect mounting and large axial load. | Select proper lubricant and modify the mounting. |
| **Cracks** | | |
| Crack in outer or inner ring. | Excessive shock load, excessive interference in fitting, poor surface cylindricality, improper sleeve taper, large fillet radius, development of thermal cracks and advancement of flaking. | Examine the loading conditions, modify the fit of bearing and sleeve. The fillet radius must be smaller than the bearing chamfer. |
| Crack in rolling element.<br>Broken rib. | Advancement of flaking, shock applied to the rib during mounting or dropped during handling. | Be carefull in handling and mounting. |
| Fractured cage. | Abnormal loading of cage due to incorrect mounting and improper lubrication. | Reduce the mounting error and review the lubricating method and lubricant. |
| **Indentations** | | |
| Indentations in raceway in same pattern as rolling elements. | Shock load during mounting or excessive load when not rotating. | Use care in handling. |
| Indentations in raceway and rolling elements. | Foreign matter such as metallic chips or sand. | Clean the housing, improve the seals, and use a clean lubricant. |
| **Abnormal Wear** | | |
| False brinelling (phenomenon similar to brinelling) | Vibration of the bearing without rotation during shipment or rocking motion of small amplitude. | Secure the shaft and housing, use oil as a lubricant and reduce vibration by applying a preload. |
| Fretting | Slight wear of the fitting surface. | Increase interference and apply oil. |
| Wearing of raceway, rolling elements, rib, and cage. | Penentration by foreign matter, incorrect lubrication, and rust. | Improve the seals, clean the housing, and use a clean lubricant. |
| Creep | Insufficient interference or insufficient tightening of sleeve. | Modify the fit or tighten the sleeve |
| **Seizure** | | |
| Discoloration and melting of raceway, rolling elements, and ribs. | Insufficient clearance, incorrect lubrication, or improper mounting. | Review the internal clearance and bearing fit, supply an adequate amount of the proper lubricant and improve the mounting method and related parts. |
| **Electric Burng** | | |
| Fluting or corrugations. | Melting due to electric arcing. | Install a ground wire to stop the flow of electricity or insulate the beaning. |
| **Corrosion & Rust** | | |
| Rust and corrosion of fitting surfaces and bearing interior. | Condensation of water from the air, or fretting.<br>Penetration by corrosive substance(especially varnish-gas, etc). | Use care in storing and avoid high temperature and high humidity, treatment for rust prevention is necessary when operation is stopped for long time.<br>Selection of varnish and grease. |

# 15. TECHNICAL DATA


Page

**15. 1 AXIAL DISPLACEMENT OF BEARINGS** ..... A 128

(1) Contact Angle and Axial Displacement of Deep Groove Ball Bearings and Angular Contact Ball Bearings ..... A 128

(2) Axial Load and Axial Displacement of Tapered Roller Bearings ..... A 128

**15. 2 FITS** ..... A 130

(1) Surface Pressure, Maximum Stress on Fitted Surfaces and Expansion or Contraction of Raceway Diameter ..... A 130

(2) Interferences or Clearances for Shafts and Inner Rings ..... A 130

(3) Interferences or Clearances for Housing Bores and Outer Rings ..... A 130

**15. 3 RADIAL AND AXIAL INTERNAL CLEARANCES** ..... A 132

(1) Radial and Axial Internal Clearances for Single-Row Deep Groove Ball Bearings ..... A 132

(2) Radial and Axial Internal Clearances for Double-Row Angular Contact Ball Bearings ..... A 132

**15. 4 PRELOAD AND STARTING TORQUE** ..... A 134

(1) Axial Load and Starting Torque of Tapered Roller Bearings ..... A 134

(2) Preload and Starting Torque of Angular Contact Ball Bearings and Double-Direction Angular Contact Thrust Ball Bearings ..... A 134

**15. 5 COEFFICIENTS OF FRICTION AND OTHER BEARING DATA** ..... A 136

(1) Bearing Types and Their Coefficients of Friction ..... A 136

(2) Circumferential Speed of Rolling Elements about Their Centers and Bearing Center ..... A 136

(3) Radial Internal Clearance and Fatigue Life ..... A 136

**15. 6 BRANDS AND PROPERTIES OF LUBRICATING GREASES** ..... A 138






## DEFINIONS OF SYMBOLS AND THEIR UNITS

| Symbols | Nomenclature | Units |
|---|---|---|
| $a$ | Contact Ellipse Major Axis | (mm) |
| $b$ | Contact Ellipse Major Axis | (mm) |
| $C_r$ | Basic Dynamic Load Rating of Radial Bearings | (N){kgf} |
| $C_{0r}$ | Basic Static Load Radial of Radial Bearings | (N){kgf} |
| $C_a$ | Basic Dynamic Load Rating of Thrust Bearings | (N){kgf} |
| $C_{0a}$ | Basic Static Load Rating of Thrust Bearings | (N){kgf} |
| $d$ | Shaft Diameter, Nominal Bearing Bore Diameter | (mm) |
| $D$ | Housing Bore Diameter, Nominal Bearing Outside Diameter | (mm) |
| $D_e$ | Outer Ring Raceway Diameter | (mm) |
| $D_i$ | Inner Ring Raceway Diameter | (mm) |
| $D_0$ | Housing Outside Diameter | (mm) |
| $D_{pw}$ | Rolling Element Pitch Diameter | (mm) |
| $D_w$ | Nominal Rolling Element Diameter | (mm) |
| $e$ | Contact Position of Tapered Roller End Face with Rib | (mm) |
| $E$ | Modulus of Longitudinal Elasticity (Bearing Steel) 208 000 $MP_a${21 200kgf/$mm^2$} | |
| $E(k)$ | Complete elliptic integral of the 2nd kind for which the population parameter is $k=\sqrt{1-\left(\frac{b}{a}\right)^2}$ | |
| $f_0$ | factor which depends on the geometry of the bearing components and on the applicable stress level | |
| $f(\varepsilon)$ | Function of $\varepsilon$ | |
| $F_a$ | Axial Load, Preload | (N){kgf} |
| $F_r$ | Radial Load | (N){kgf} |
| $h$ | $D_e/D$ | |
| $h_0$ | $D/D_0$ | |
| $k$ | $d/D_i$ | |
| $K$ | Constant Determined by Internal Design of Bearing | |
| $L$ | Fatigue Life when Effective Clearance is 0 | |
| $L_{we}$ | Effective Leng of Roller | (mm) |
| $L_\varepsilon$ | Fatigue Life when Effective Clearance is $\Delta$ | |
| $m_0$ | Distance between Centers of Curvature of Inner and Outer Rings $r_i+r_e-D_w$ | (mm) |
| $M$ | Frictional Torque | (N·mm){kgf·mm} |
| $M_s$ | Spin Friction | (N·mm){kgf·mm} |

| Symbols | Nomenclature | Units |
|---|---|---|
| $n_a$ | Rotating Speed of Rolling Elements | ($min^{-1}$) |
| $n_c$ | Revolving Speed of Rolling Elements (Cape Speed) | ($min^{-1}$) |
| $n_e$ | Speed of Ouder Ring | ($min^{-1}$) |
| $n_i$ | Speed of Inner Ring | ($min^{-1}$) |
| $p_m$ | Surface Pressure on Fitted Surface | ($MP_a$){$kgf/mm^2$} |
| $P$ | Bearing Load | (N){kgf} |
| $Q$ | Rolling Element Load | (N){kgf} |
| $r_e$ | Groove Radius of Outer Ring | (mm) |
| $r_i$ | Groove Radius of Inner Ring | (mm) |
| $v_a$ | Circumferential Speed of Rolling Element about Its Center | (m/sec) |
| $v_c$ | Circumferential Speed of Rolling Element about Beaing Center | (m/sec) |
| $Z$ | Number of Rolling Elements per Row | |
| $\alpha$ | Contact Angle (when axial load is applied on Radial Ball Bearning | (°) |
| $\alpha_0$ | Initial Confact Angle (Geometri) (when inner and outer rings of Angular Contact Ball Bearings are pushed axially) | (°) |
| $\alpha_R$ | Initial Contact Angle (Geometric) (when inner and outer rings Angular Contact Ball Bearing are pushed radially) | (°) |
| $\beta$ | 1/2 of Conical Angle of Roller | (°) |
| $\delta_a$ | Relative Axial Displacement of Inner and Outer Rings | (mm) |
| $\Delta_a$ | Axial Internal Clearance | (mm) |
| $\Delta d$ | Effective Interference of Inner Ring and Shaft | (mm) |
| $\Delta_r$ | Radial Internal Clearance | (mm) |
| $\Delta D$ | Effective Interference of Outer Ring and Housing | (mm) |
| $\Delta D_e$ | Contraction of Outer Ring Raceway Diameter due to Fit | (mm) |
| $\Delta D_i$ | Expansion of Inner Ring Raceway Diameter dus to Fit | (mm) |
| $\varepsilon$ | Load Factor | |
| $\mu$ | Coefficient of Dynamic Friction of Rolling Bearing | |
| $\mu_e$ | Coefficient of Friction between Roller End Face and Rib | |
| $\mu_s$ | Coefficient of Sliding Friction | |
| $\sigma_{t\,max}$ | Maximum Stress on Fitted Surfaces | ($MP_a$){$kgf/mm^2$} |

## 15. 1 Axial Displacement of Bearings

**(1) Contact Angle $\alpha$ and Axial Displacement $\delta_a$ of Deep Groove Ball Bearing and Angular Contact Ball Bearings**

(Figs. 15.1 to 15.3)

$$\delta_a = \frac{0.00044}{\sin\alpha}\left(\frac{Q^2}{D_w}\right)^{\frac{1}{3}} \quad \cdots\cdots (N)$$

$$\delta_a = \frac{0.002}{\sin\alpha}\left(\frac{Q^2}{D_w}\right)^{\frac{1}{3}} \quad \cdots\cdots \{kgf\}$$

$\Big\}$ (mm)

$$Q = \frac{F_a}{Z\sin\alpha} \quad (N),\ \{kgf\}$$

**(2) Axial Load $F_a$ and Axial Displacement $\delta_a$ of Tapered Roller Bearings**

(Fig. 15.4)

$$\delta_a = \frac{0.000077\,F_a^{0.9}}{(\sin\alpha)^{1.9}\,Z^{0.9}\,L_{we}^{0.8}} \quad \cdots\cdots (N)$$

$$\delta_a = \frac{0.0006\,F_a^{0.9}}{(\sin\alpha)^{1.9}\,Z^{0.9}\,L_{we}^{0.8}} \quad \cdots\cdots \{kgf\}$$

$\Big\}$ (mm)

**Remarks:**
Actual axial displacement may vary depending on the shaft/housing thickness, material, and fitting interference with the bearing. Please contact NSK about such factors of axial displacement which are not discussed in detail in this catalog.

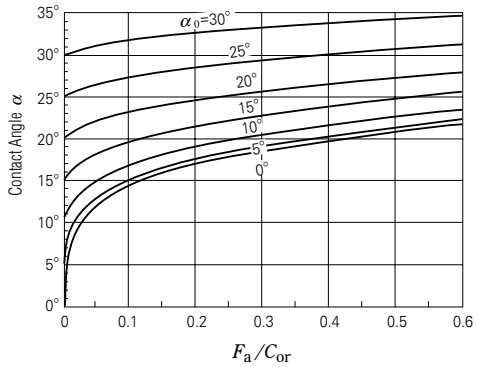



**Fig. 15.1 $F_a/C_{or}$ and Contact Angle of Deep Groove and Angular Contact Ball Bearings**

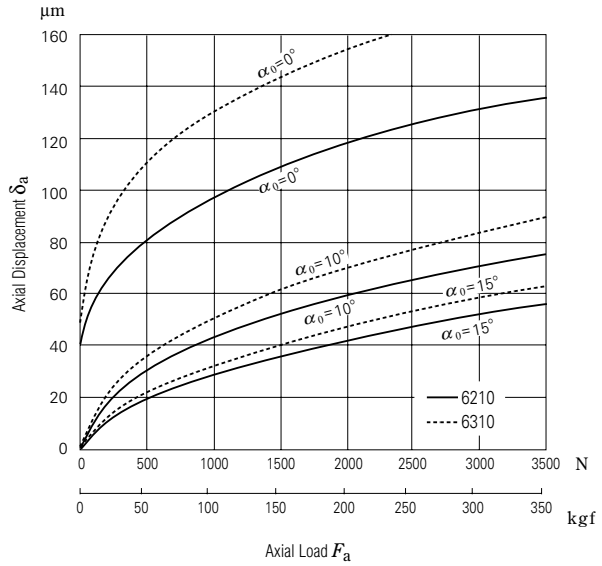



**Fig. 15.2 Axial Load and Axial Displacement of Deep Groove Ball Bearings**

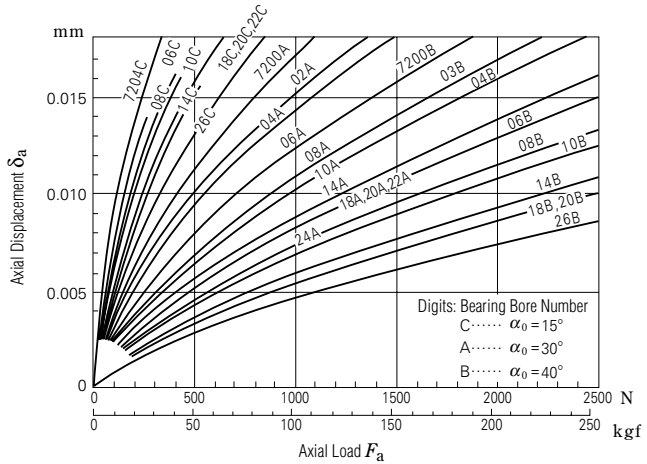



**Fig. 15.3 Axial Load and Axial Displacement of Angular Contact Ball Bearings**

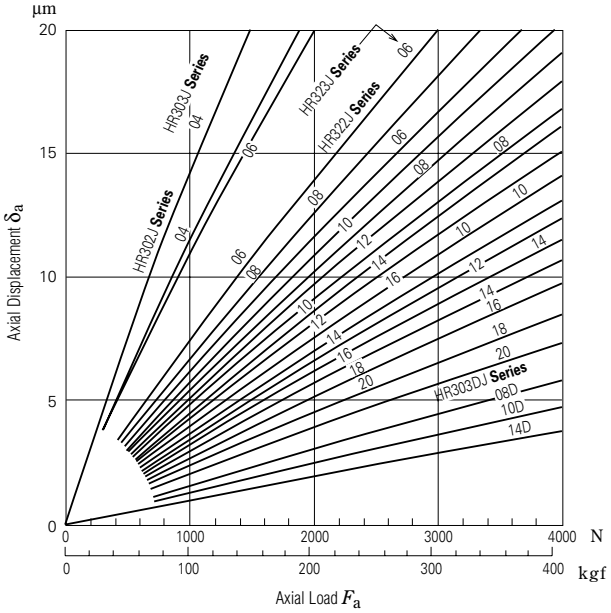



**Fig. 15.4 Axial Load and Axial Displacement of Tapered Roller Bearings**

## 15.2 Fits

**(1) Surface Pressure $p_m$, Maximum Stress $\sigma_{tmax}$ on Fitted Surfaces and Expansion of Inner Ring Raceway Diameter $\Delta D_i$ or Contraction of Outer Ring Raceway Diameter $\Delta D_e$**
(Table 15.1, Figs. 15.5 and 15.6)

**(2) Interferences or Clearances of Shafts and Inner Rings** (Table 15.2)

**(3) Interferences or Clearances of Housing Bores and Outer Rings** (Table 15.3)

**Table. 15. 1 Surface Pressure, Maximum Stress on Fitted Surfaces and Expansion or Contraction**

| Items | Shaft & Inner Ring | Housing & Bore & Outer Ring |
|---|---|---|
| Surface Pressure $p_m$ (MPa) {kgf/mm²} | (In case of sold shaft) $p_m = \frac{E}{2}\frac{\Delta d}{2}(1-k^2)$ | In case of housing outside dia. $D_0 \neq \infty$ $p_m = \frac{E}{2}\frac{\Delta D}{D}\frac{(1-h^2)(1-h_0^2)}{1-h^2 h_0^2}$ In case $D_0 = \infty$ $p_m = \frac{E}{2}\frac{\Delta D}{D}(1-h^2)$ |
| Maximum stress $\sigma_{t\,max}$ (MPa) {kgf/mm²} | Maximum circumferential stress on fitted surface of inner ring bore is $\sigma_{t\,max} = p_m\frac{1+k^2}{1-k^2}$ | Maximum circumferential stress on outer ring bore surface is $\sigma_{t\,max} = p_m\frac{2}{1-h^2}$ |
| Expansion of inner ring raceway dia. $\Delta D_i$ (mm) Contraction of outer ring raceway dia. $\Delta D_e$ (mm) | In case of solid shaft $\Delta D_i = \Delta d \cdot k$ | In case $D_0 \neq \infty$ $\Delta D_e = \Delta D \cdot h\frac{1-h_0^2}{1-h^2 h_0^2}$ In case $D_0 = \infty$ $\Delta D_e = \Delta D \cdot h$ |

**Remarks** The modulus of longitudinal elasticity and Poisson's ratio for the shaft and housing material are the same as those for inner and outer rings.

**Reference** $1MPa = 1N/mm^2 = 0.102kgf/mm^2$

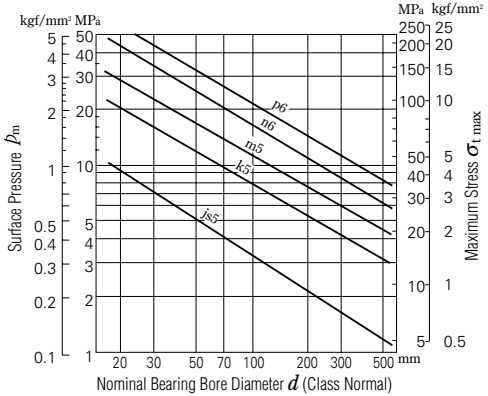



**Fig. 15.5 Surface Pressure $p_m$ and Maximum Stress $\sigma_{t\,max}$ for Average Fitting Interference**

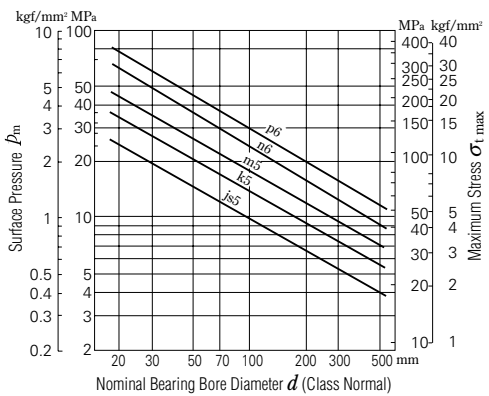



**Fig. 15.6 Surface Pressure $p_m$ and Maximum Stress $\sigma_{t\,max}$ for Maximum Fitting Interference**

**Table 15. 2 Interferences or Clearances of Shafts and Inner Rings**

Units : μm

| Size Classification (mm) over | incl | Single Plane Mean Bore Dia. Deviation (Normal) $\Delta d_{mp}$ high | over | Interferences or Clearances for f6 Clearance max. | min. | g5 Clearance max. | Interference max. | g6 Clearance max. | Interference max. | h5 Clearance max. | Interference max. | h6 Clearance max. | Interference max. | js5 Clearance max. | Interference max. | j5 Clearance max. | Interference max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **6** | 0 | − 8 | 18 | 2 | 9 | 4 | 12 | 4 | 5 | 8 | 8 | 8 | — | — | — | — |
| **6** | **10** | 0 | − 8 | 22 | 5 | 11 | 3 | 14 | 3 | 6 | 8 | 9 | 8 | 3 | 11 | 2 | 12 |
| **10** | **18** | 0 | − 8 | 27 | 8 | 14 | 2 | 17 | 2 | 8 | 8 | 11 | 8 | 4 | 12 | 3 | 13 |
| **18** | **30** | 0 | −10 | 33 | 10 | 16 | 3 | 20 | 3 | 9 | 10 | 13 | 10 | 4.5 | 14.5 | 4 | 15 |
| **30** | **50** | 0 | −12 | 41 | 13 | 20 | 3 | 25 | 3 | 11 | 12 | 16 | 12 | 5.5 | 17.5 | 5 | 18 |
| **50** | **65** | 0 | −15 | 49 | 15 | 23 | 5 | 29 | 5 | 13 | 15 | 19 | 15 | 6.5 | 21.5 | 7 | 21 |
| **65** | **80** | 0 | −15 | 49 | 15 | 23 | 5 | 29 | 5 | 13 | 15 | 19 | 15 | 6.5 | 21.5 | 7 | 21 |
| **80** | **100** | 0 | −20 | 58 | 16 | 27 | 8 | 34 | 8 | 15 | 20 | 22 | 20 | 7.5 | 27.5 | 9 | 26 |
| **100** | **120** | 0 | −20 | 58 | 16 | 27 | 8 | 34 | 8 | 15 | 20 | 22 | 20 | 7.5 | 27.5 | 9 | 26 |
| **120** | **140** | 0 | −25 | 68 | 18 | 32 | 11 | 39 | 11 | 18 | 25 | 25 | 25 | 9 | 34 | 11 | 32 |
| **140** | **160** | 0 | −25 | 68 | 18 | 32 | 11 | 39 | 11 | 18 | 25 | 25 | 25 | 9 | 34 | 11 | 32 |
| **160** | **180** | 0 | −25 | 68 | 18 | 32 | 11 | 39 | 11 | 18 | 25 | 25 | 25 | 9 | 34 | 11 | 32 |
| **180** | **200** | 0 | −30 | 79 | 20 | 35 | 15 | 44 | 15 | 20 | 30 | 29 | 30 | 10 | 40 | 13 | 37 |
| **200** | **225** | 0 | −30 | 79 | 20 | 35 | 15 | 44 | 15 | 20 | 30 | 29 | 30 | 10 | 40 | 13 | 37 |
| **225** | **250** | 0 | −30 | 79 | 20 | 35 | 15 | 44 | 15 | 20 | 30 | 29 | 30 | 10 | 40 | 13 | 37 |
| **250** | **280** | 0 | −35 | 88 | 21 | 40 | 18 | 49 | 18 | 23 | 35 | 32 | 35 | 11.5 | 46.5 | 16 | 42 |
| **280** | **315** | 0 | −35 | 88 | 21 | 40 | 18 | 49 | 18 | 23 | 35 | 32 | 35 | 11.5 | 46.5 | 16 | 42 |
| **315** | **355** | 0 | −40 | 98 | 22 | 43 | 22 | 54 | 22 | 25 | 40 | 36 | 40 | 12.5 | 52.5 | 18 | 47 |
| **355** | **400** | 0 | −40 | 98 | 22 | 43 | 22 | 54 | 22 | 25 | 40 | 36 | 40 | 12.5 | 52.5 | 18 | 47 |
| **400** | **450** | 0 | −45 | 108 | 23 | 47 | 25 | 60 | 25 | 27 | 45 | 40 | 45 | 13.5 | 58.5 | 20 | 52 |
| **450** | **500** | 0 | −45 | 108 | 23 | 47 | 25 | 60 | 25 | 27 | 45 | 40 | 45 | 13.5 | 58.5 | 20 | 52 |

Each Fitting Class

| js6 Clearance max. | Interference max. | j6 Clearance max. | Interference max. | k5 Interference min. | max. | k6 Interference min. | max. | m5 Interference min. | max. | m6 Interference min. | max. | n6 Interference min. | max. | p6 Interference min. | max. | r6 Interference min. | max. | Size Classification (mm) over | incl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **3** | **6** |
| 4.5 | 12.5 | 2 | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **6** | **10** |
| 5.5 | 13.5 | 3 | 16 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | **10** | **18** |
| 6.5 | 16.5 | 4 | 19 | 2 | 21 | 2 | 25 | — | — | — | — | — | — | — | — | — | — | **18** | **30** |
| 8 | 20 | 5 | 23 | 2 | 25 | 2 | 30 | 9 | 32 | 9 | 37 | — | — | — | — | — | — | **30** | **50** |
| 9.5 | 24.5 | 7 | 27 | 2 | 30 | 2 | 36 | 11 | 39 | 11 | 45 | — | — | — | — | — | — | **50** | **65** |
| 9.5 | 24.5 | 7 | 27 | 2 | 30 | 2 | 36 | 11 | 39 | 11 | 45 | 20 | 54 | — | — | — | — | **65** | **80** |
| 11 | 31 | 9 | 33 | 3 | 38 | 3 | 45 | 13 | 48 | 13 | 55 | 23 | 65 | 37 | 79 | — | — | **80** | **100** |
| 11 | 31 | 9 | 33 | 3 | 38 | 3 | 45 | 13 | 48 | 13 | 55 | 23 | 65 | 37 | 79 | — | — | **100** | **120** |
| 12.5 | 37.5 | 11 | 39 | 3 | 46 | 3 | 53 | 15 | 58 | 15 | 65 | 27 | 77 | 43 | 93 | 63 | 113 | **120** | **140** |
| 12.5 | 37.5 | 11 | 39 | 3 | 46 | 3 | 53 | 15 | 58 | 15 | 65 | 27 | 77 | 43 | 93 | 65 | 115 | **140** | **160** |
| 12.5 | 37.5 | 11 | 39 | 3 | 46 | 3 | 53 | 15 | 58 | 15 | 65 | 27 | 77 | 43 | 93 | 68 | 118 | **160** | **180** |
| 14.5 | 44.5 | 13 | 46 | 4 | 54 | 4 | 63 | 17 | 67 | 17 | 76 | 31 | 90 | 50 | 109 | 77 | 136 | **180** | **200** |
| 14.5 | 44.5 | 13 | 46 | 4 | 54 | 4 | 63 | 17 | 67 | 17 | 76 | 31 | 90 | 50 | 109 | 80 | 139 | **200** | **225** |
| 14.5 | 44.5 | 13 | 46 | 4 | 54 | 4 | 63 | 17 | 67 | 17 | 76 | 31 | 90 | 50 | 109 | 84 | 143 | **225** | **250** |
| 16 | 51 | 16 | 51 | 4 | 62 | 4 | 71 | 20 | 78 | 20 | 87 | 34 | 101 | 56 | 123 | 94 | 161 | **250** | **280** |
| 16 | 51 | 16 | 51 | 4 | 62 | 4 | 71 | 20 | 78 | 20 | 87 | 34 | 101 | 56 | 123 | 98 | 165 | **280** | **315** |
| 18 | 58 | 18 | 58 | 4 | 69 | 4 | 80 | 21 | 86 | 21 | 97 | 37 | 113 | 62 | 138 | 108 | 184 | **315** | **355** |
| 18 | 58 | 18 | 58 | 4 | 69 | 4 | 80 | 21 | 86 | 21 | 97 | 37 | 113 | 62 | 138 | 114 | 190 | **355** | **400** |
| 20 | 65 | 20 | 65 | 5 | 77 | 5 | 90 | 23 | 95 | 23 | 108 | 40 | 125 | 68 | 153 | 126 | 211 | **400** | **450** |
| 20 | 65 | 20 | 65 | 5 | 77 | 5 | 90 | 23 | 95 | 23 | 108 | 40 | 125 | 68 | 153 | 132 | 217 | **450** | **500** |

**Remarks** 1. The figures for tolerance classes where stress caused by the fitting of the shaft and inner ring becomes excessive are omitted.
2. The tolerance range js is now recommended instead of j.

**Table 15. 3 Interferences or Clearances of Housing Bores and Outer Rings**

Units : μm

| Size Classification (mm) | | Single Plane Mean O. D. Deviation (Normal) $\Delta_{Dmp}$ | | Interferences or Clearances for Each Fitting Class | | | | | | | | | | | | | | | | Size Classification (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | G7 | | H6 | | H7 | | H8 | | J6 | | JS6 | | J7 | | JS7 | | K6 | |
| | | | | Clearance | | Clearance | | Clearance | | Clearance | | Clearance | Interference | Clearance | Interference | Clearance | Interference | Clearance | Interference | Clearance | Interference |
| over | incl | high | low | max. | min. | max. | min. | max. | min. | max. | min. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. |
| **6** | **10** | 0 | − 8 | 28 | 5 | 17 | 0 | 23 | 0 | 30 | 0 | 13 | 4 | 12.5 | 4.5 | 16 | 7 | 15 | 7 | 10 | 7 |
| **10** | **18** | 0 | − 8 | 32 | 6 | 19 | 0 | 26 | 0 | 35 | 0 | 14 | 5 | 13.5 | 5.5 | 18 | 8 | 17 | 9 | 10 | 9 |
| **18** | **30** | 0 | − 9 | 37 | 7 | 22 | 0 | 30 | 0 | 42 | 0 | 17 | 5 | 15.5 | 6.5 | 21 | 9 | 19 | 10 | 11 | 11 |
| **30** | **50** | 0 | − 11 | 45 | 9 | 27 | 0 | 36 | 0 | 50 | 0 | 21 | 6 | 19 | 8 | 25 | 11 | 23 | 12 | 14 | 13 |
| **50** | **80** | 0 | − 13 | 53 | 10 | 32 | 0 | 43 | 0 | 59 | 0 | 26 | 6 | 22.5 | 9.5 | 31 | 12 | 28 | 15 | 17 | 15 |
| **80** | **120** | 0 | − 15 | 62 | 12 | 37 | 0 | 50 | 0 | 69 | 0 | 31 | 6 | 26 | 11 | 37 | 13 | 32 | 17 | 19 | 18 |
| **120** | **150** | 0 | − 18 | 72 | 14 | 43 | 0 | 58 | 0 | 81 | 0 | 36 | 7 | 30.5 | 12.5 | 44 | 14 | 38 | 20 | 22 | 21 |
| **150** | **180** | 0 | − 25 | 79 | 14 | 50 | 0 | 65 | 0 | 88 | 0 | 43 | 7 | 37.5 | 12.5 | 51 | 14 | 45 | 20 | 29 | 21 |
| **180** | **250** | 0 | − 30 | 91 | 15 | 59 | 0 | 76 | 0 | 102 | 0 | 52 | 7 | 44.5 | 14.5 | 60 | 16 | 53 | 23 | 35 | 24 |
| **250** | **315** | 0 | − 35 | 104 | 17 | 67 | 0 | 87 | 0 | 116 | 0 | 60 | 7 | 51 | 16 | 71 | 16 | 61 | 26 | 40 | 27 |
| **315** | **400** | 0 | − 40 | 115 | 18 | 76 | 0 | 97 | 0 | 129 | 0 | 69 | 7 | 58 | 18 | 79 | 18 | 68 | 28 | 47 | 29 |
| **400** | **500** | 0 | − 45 | 128 | 20 | 85 | 0 | 108 | 0 | 142 | 0 | 78 | 7 | 65 | 20 | 88 | 20 | 76 | 31 | 53 | 32 |
| **500** | **630** | 0 | − 50 | 142 | 22 | 94 | 0 | 120 | 0 | 160 | 0 | — | — | 72 | 22 | — | — | 85 | 35 | 50 | 44 |
| **630** | **800** | 0 | − 75 | 179 | 24 | 125 | 0 | 155 | 0 | 200 | 0 | — | — | 100 | 25 | — | — | 115 | 40 | 75 | 50 |
| **800** | **1 000** | 0 | −100 | 216 | 26 | 156 | 0 | 190 | 0 | 240 | 0 | — | — | 128 | 28 | — | — | 145 | 45 | 100 | 56 |

| K6 | | K7 | | M6 | | M7 | | N6 | | N7 | | P6 | | P7 | | Size Classification (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clearance | Interference | Clearance | Interference | Clearance | Interference | Clearance | Interference | Clearance | Interference | Clearance | Interference | Interference | | Interference | | | |
| max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | max. | min. | max. | over | incl |
| 10 | 12 | 13 | 16 | 5 | 12 | 8 | 15 | 1 | 16 | 4 | 19 | 4 | 21 | 1 | 24 | **6** | **10** |
| 12 | 15 | 14 | 18 | 4 | 15 | 8 | 18 | 1∗ | 20 | 3 | 23 | 7 | 26 | 3 | 29 | **10** | **18** |
| 11 | 17 | 15 | 21 | 5 | 17 | 9 | 21 | 2∗ | 24 | 2 | 28 | 9 | 31 | 5 | 35 | **18** | **30** |
| 14 | 20 | 18 | 25 | 7 | 20 | 11 | 25 | 1∗ | 28 | 3 | 33 | 10 | 37 | 6 | 42 | **30** | **50** |
| 17 | 24 | 21 | 29 | 8 | 24 | 13 | 30 | 1∗ | 33 | 4 | 39 | 13 | 45 | 8 | 51 | **50** | **80** |
| 19 | 28 | 25 | 33 | 9 | 28 | 15 | 35 | 1∗ | 38 | 5 | 45 | 15 | 52 | 9 | 59 | **80** | **120** |
| 18 | 33 | 28 | 36 | 10 | 33 | 18 | 40 | 2∗ | 45 | 6 | 52 | 18 | 61 | 10 | 68 | **120** | **150** |
| 21 | 33 | 28 | 40 | 17 | 33 | 25 | 40 | 5 | 45 | 13 | 52 | 11 | 61 | 3 | 68 | **150** | **180** |
| 24 | 37 | 33 | 46 | 22 | 37 | 30 | 46 | 8 | 51 | 16 | 60 | 11 | 70 | 3 | 79 | **180** | **250** |
| 27 | 41 | 36 | 52 | 26 | 41 | 35 | 52 | 10 | 57 | 21 | 66 | 12 | 79 | 1 | 88 | **250** | **315** |
| 29 | 46 | 40 | 57 | 30 | 46 | 40 | 57 | 14 | 62 | 24 | 73 | 11 | 87 | 1 | 98 | **315** | **400** |
| 32 | 50 | 45 | 63 | 35 | 50 | 45 | 63 | 18 | 67 | 28 | 80 | 10 | 95 | 0 | 108 | **400** | **500** |
| 44 | 70 | 50 | 70 | 24 | 70 | 24 | 96 | 6 | 88 | 6 | 114 | 28 | 122 | 28 | 148 | **500** | **630** |
| 50 | 80 | 75 | 80 | 45 | 80 | 45 | 110 | 25 | 100 | 25 | 130 | 13 | 138 | 13 | 168 | **630** | **800** |
| 56 | 90 | 100 | 90 | 66 | 90 | 66 | 124 | 44 | 112 | 44 | 146 | 0 | 156 | 0 | 190 | **800** | **1 000** |

**Note** (∗) Indicates the minimum interference
**Remarks** The tolerance range JS is now recommended instead of J.

## 15.3 Radial and Axial Internal Clearances

**(1) Radial Internal Clearance $\Delta_r$ and Axial Internal Clearance $\Delta_a$ in Single-Row Deep Groove Ball Bearings**
(Fig. 15.7)

$$\Delta_a \fallingdotseq K \Delta_r^{\frac{1}{2}} \qquad \text{(mm)}$$

where

$$K = 2\,(r_e + r_i - D_w)^{\frac{1}{2}}$$

**(2) Radial Internal Clearance $\Delta_r$ and Axial Internal Clearance $\Delta_a$ in Double-Row Angular Contact Ball Bearings**
(Fig. 15.8)

$$\Delta_a = 2\sqrt{m_0^2 - \left(m_0 \cos\alpha_R - \frac{\Delta_r}{2}\right)^2} - 2m_0 \sin\alpha_R \qquad \text{(mm)}$$

**Table 15. 4 Constant $K$**

| Bore No. | Values of $K$ | | | |
|---|---|---|---|---|
| | 160XX | 60XX | 62XX | 63XX |
| **00** | — | — | 0.93 | 1.14 |
| **01** | 0.80 | 0.80 | 0.93 | 1.06 |
| **02** | 0.80 | 0.93 | 0.93 | 1.06 |
| **03** | 0.80 | 0.93 | 0.99 | 1.11 |
| **04** | 0.90 | 0.96 | 1.06 | 1.07 |
| **05** | 0.90 | 0.96 | 1.06 | 1.20 |
| **06** | 0.96 | 1.01 | 1.07 | 1.19 |
| **07** | 0.96 | 1.06 | 1.25 | 1.37 |
| **08** | 0.96 | 1.06 | 1.29 | 1.45 |
| **09** | 1.01 | 1.11 | 1.29 | 1.57 |
| **10** | 1.01 | 1.11 | 1.33 | 1.64 |
| **11** | 1.06 | 1.20 | 1.40 | 1.70 |
| **12** | 1.06 | 1.20 | 1.50 | 2.09 |
| **13** | 1.06 | 1.20 | 1.54 | 1.82 |
| **14** | 1.16 | 1.29 | 1.57 | 1.88 |
| **15** | 1.16 | 1.29 | 1.57 | 1.95 |
| **16** | 1.20 | 1.37 | 1.64 | 2.01 |
| **17** | 1.20 | 1.37 | 1.70 | 2.06 |
| **18** | 1.29 | 1.44 | 1.76 | 2.11 |
| **19** | 1.29 | 1.44 | 1.82 | 2.16 |
| **20** | 1.29 | 1.44 | 1.88 | 2.25 |
| **21** | 1.37 | 1.54 | 1.95 | 2.32 |
| **22** | 1.40 | 1.64 | 2.01 | 2.40 |
| **24** | 1.40 | 1.64 | 2.06 | 2.40 |
| **26** | 1.54 | 1.70 | 2.11 | 2.49 |
| **28** | 1.54 | 1.70 | 2.11 | 2.59 |
| **30** | 1.57 | 1.76 | 2.11 | 2.59 |

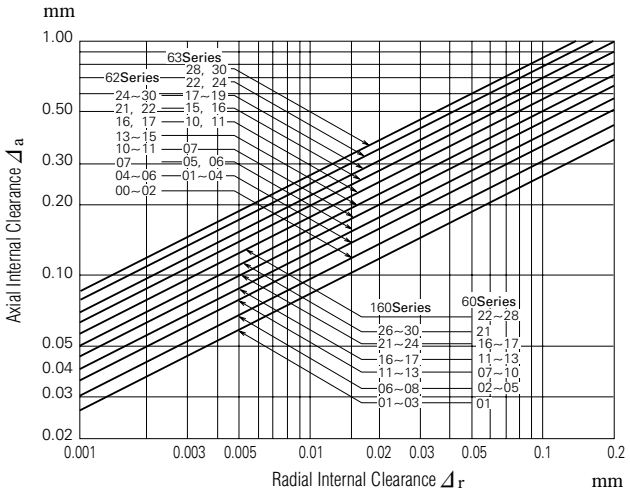



Fig. 15.7 $\Delta_r$ and $\Delta_a$ in Single-Row Deep Groove Ball Bearings

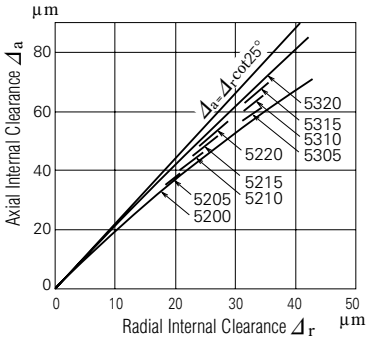



Fig. 15.8 $\Delta_r$ and $\Delta_a$ in Double-Row Angular Contact Ball Bearings (52, 53 Series)

## 15. 4 Preload and Staring Torque

**(1) Axial Load $F_a$ and Starting Torque $M$ of Tapered Roller Bearings** (Figs. 15.9 and 15.10)

$$M = e\,\mu_e\,F_a\cos\beta \qquad \text{(N·mm), \{kgf·mm\}}$$

where

$\mu_e$ : 0.20

When bearings with the same number are used in opposition, the torque $M$ caused by the preload becomes $2M$.

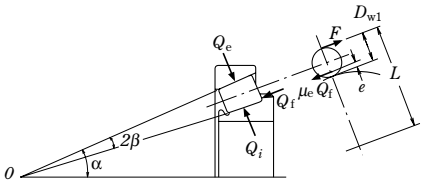



Fig. 15.9 Relation between $e$ and $\beta$

**(2) Preload $F_a$ and Starting Torque $M$ of Angular Contact Ball Bearings and Double-Direction Angular Contact Thrust Ball Bearings** (Figs. 15.11 and 15.12)

$$M = M_s\,Z\sin\alpha \qquad \text{(N·mm), \{kgf·mm\}}$$

where $M_S$ is spin friction

$$M_S = \frac{3}{8}\,\mu_s\,Q\,a\,E(k) \qquad \text{(N·mm), \{kgf·mm\}}$$

where

$\mu_s$ = 0.15

When bearings with the same number are used in opposition, the torque $M$ caused by the preload becomes $2M$.

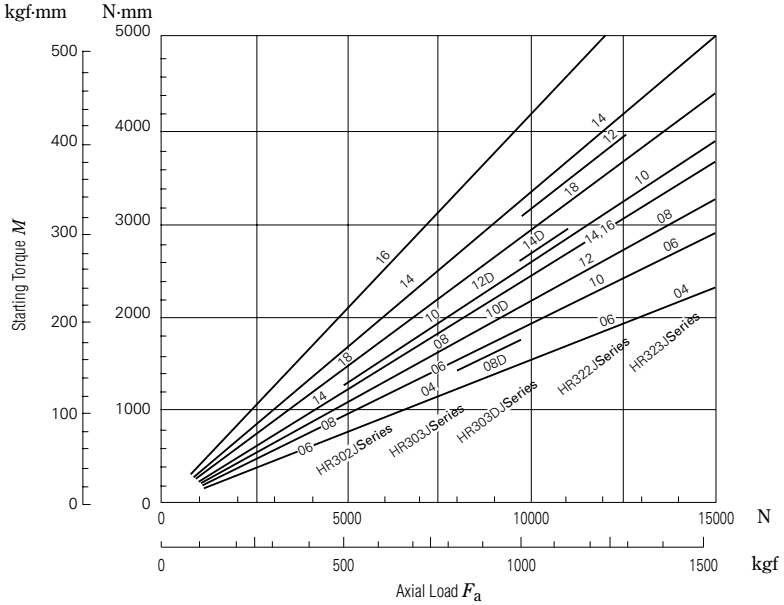



Fig. 15.10 Relation between Axial Load and Starting Torque of Tapered Roller Bearings

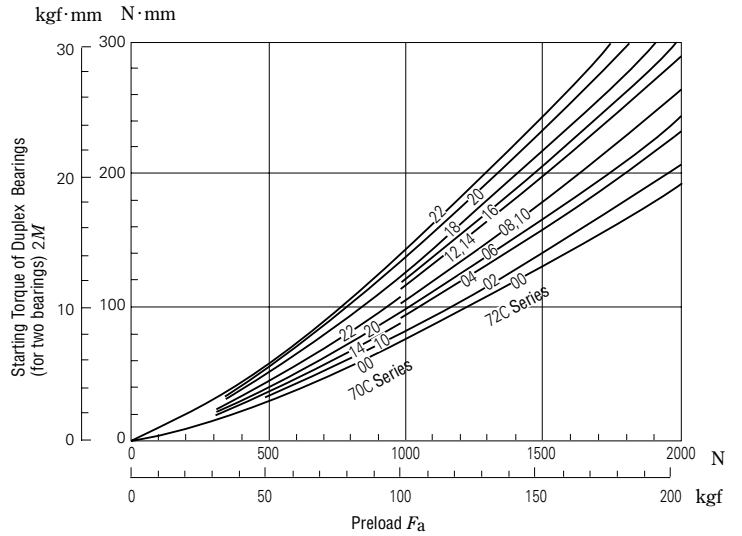



Fig. 15.11 Preload and Starting Torque for Back-to-Back or Face-to-Face Arrangements of Angular Contact Ball Bearings ($\alpha$ =15°)

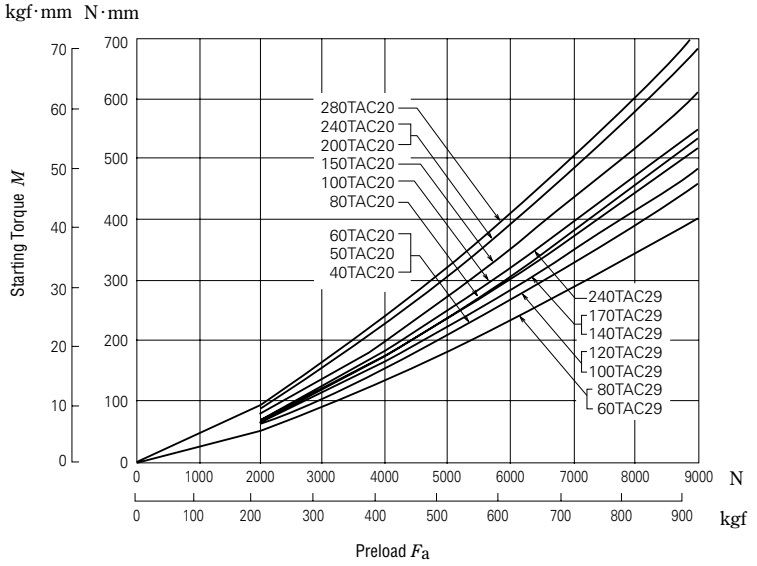



Fig. 15.12 Preload and Starting Torque of Double-Direction Angular Contact Thrust Ball Bearings

## 15.5 Coefficients of Dynamic Friction and Other Bearing Data

### (1) Bearing Types and Their Coefficients of Dynamic Friction $\mu$

$$\mu = \frac{M}{P \cdot \frac{d}{2}}$$

**Table 15.5 Coefficients of Dynamic Friction**

| Bearing Types | Approximate values of $\mu$ |
|---|---|
| Deep Groove Ball Bearings | 0.0013 |
| Angular Contact Ball Bearings | 0.0015 |
| Self-Aligning Ball Bearings | 0.0010 |
| Thrust Ball Bearings | 0.0011 |
| Cylindrical Roller Bearings | 0.0010 |
| Tapered Roller Bearings | 0.0022 |
| Spherical Roller Bearings | 0.0028 |
| Needle Roller Bearings with Cages | 0.0015 |
| Full Complement Needle Roller Bearings | 0.0025 |
| Spherical Thrust Roller Bearings | 0.0028 |

### (3) Radial Internal Clearance $\Delta_r$ and Fatigue Life $L$ (Fig. 15.13)

For the radial internal clearance $\Delta_r$ and the function $f(\varepsilon)$ of the load factor, the following equations are valid:

For Deep Groove Ball Bearings

$$f(\varepsilon) = \frac{\Delta_r \cdot D_w^{\frac{1}{3}}}{0.00044\left(\frac{F_r}{Z}\right)^{\frac{2}{3}}} \quad \cdots\cdots (N)$$

$$f(\varepsilon) = \frac{\Delta_r \cdot D_w^{\frac{1}{3}}}{0.002\left(\frac{F_r}{Z}\right)^{\frac{2}{3}}} \quad \cdots\cdots \{kgf\}$$

For Cylindrical Roller Bearings

$$f(\varepsilon) = \frac{\Delta_r \cdot L_{we}^{0.8}}{0.000077\left(\frac{F_r}{Z}\right)^{0.9}} \quad \cdots\cdots (N)$$

$$f(\varepsilon) = \frac{\Delta_r \cdot L_{we}^{0.8}}{0.0006\left(\frac{F_r}{Z}\right)^{0.9}} \quad \cdots\cdots \{kgf\}$$

The relation between the load factor $\varepsilon$ and $f(\varepsilon)$ and $L_\varepsilon/L$, when the radial internal clearance is $\Delta_r$ is as shown in Table 15.7.
From the above equations, first obtain $f(\varepsilon)$ and then $\varepsilon$ and $L_\varepsilon/L$ can be obtained.

### (2) Circumferential Speeds of Rolling Elements about Their Centers and Bearing Center

**Table 15.6 Circumferential Speeds of Rolling Elements about Their Centers and Bearing Center**

| Items | Rotating inner ring, fixed outer ring | Rotating outer ring, fixed inner ring |
|---|---|---|
| Ball rotating speed $n_a$ (min$^{-1}$) | $-\left(\frac{D_{pw}}{D_w} - \frac{\cos^2\alpha}{D_{pw}/D_w}\right)\frac{n_i}{2}$ | $+\left(\frac{D_{pw}}{D_w} - \frac{\cos^2\alpha}{D_{pw}/D_w}\right)\frac{n_e}{2}$ |
| Cicumferential speed around bearing ball's center $v_a$ (m/sec) | $-\frac{\pi \cdot D_w}{60\times10^3}\left(\frac{D_{pw}}{D_w} - \frac{\cos^2\alpha}{D_{pw}/D_w}\right)\frac{n_i}{2}$ | $+\frac{\pi \cdot D_w}{60\times10^3}\left(\frac{D_{pw}}{D_w} - \frac{\cos^2\alpha}{D_{pw}/D_w}\right)\frac{n_e}{2}$ |
| Revolving speed around bearing center $n_c$ (min$^{-1}$) | $+\left(1 - \frac{\cos\alpha}{D_{pw}/D_w}\right)\frac{n_i}{2}$ | $+\left(1 - \frac{\cos\alpha}{D_{pw}/D_w}\right)\frac{n_e}{2}$ |
| Cicumferential speed around bearing center $v_c$ (m/sec) | $-\frac{\pi \cdot D_{pw}}{60\times10^3}\left(1 - \frac{\cos\alpha}{D_{pw}/D_w}\right)\frac{n_i}{2}$ | $+\frac{\pi \cdot D_{pw}}{60\times10^3}\left(1 - \frac{\cos\alpha}{D_{pw}/D_w}\right)\frac{n_e}{2}$ |

**Remarks** 1. + sign indicates CW rotation and – sign CCW
2. The revolving speed and circumferential speed of the rolling elements are the same as those of the cage.

**Table 15.7 $\varepsilon$ and $f(\varepsilon)$, $L_\varepsilon/L$**

| $\varepsilon$ | Deep Groove Ball Bearings | | Cylindrical Roller Bearings | |
|---|---|---|---|---|
| | $f(\varepsilon)$ | $\frac{L_\varepsilon}{L}$ | $f(\varepsilon)$ | $\frac{L_\varepsilon}{L}$ |
| 0.1 | 33.713 | 0.294 | 51.315 | 0.220 |
| 0.2 | 10.221 | 0.546 | 14.500 | 0.469 |
| 0.3 | 4.045 | 0.737 | 5.539 | 0.691 |
| 0.4 | 1.408 | 0.889 | 1.887 | 0.870 |
| 0.5 | 0 | 1.0 | 0 | 1.0 |
| 0.6 | – 0.859 | 1.069 | – 1.133 | 1.075 |
| 0.7 | – 1.438 | 1.098 | – 1.897 | 1.096 |
| 0.8 | – 1.862 | 1.094 | – 2.455 | 1.065 |
| 0.9 | – 2.195 | 1.041 | – 2.929 | 0.968 |
| 1.0 | – 2.489 | 0.948 | – 3.453 | 0.805 |
| 1.25 | – 3.207 | 0.605 | – 4.934 | 0.378 |
| 1.5 | – 3.877 | 0.371 | – 6.387 | 0.196 |
| 1.67 | – 4.283 | 0.276 | – 7.335 | 0.133 |
| 1.8 | – 4.596 | 0.221 | – 8.082 | 0.100 |
| 2.0 | – 5.052 | 0.159 | – 9.187 | 0.067 |
| 2.5 | – 6.114 | 0.078 | –11.904 | 0.029 |
| 3 | – 7.092 | 0.043 | –14.570 | 0.015 |
| 4 | – 8.874 | 0.017 | –19.721 | 0.005 |
| 5 | –10.489 | 0.008 | –24.903 | 0.002 |
| 10 | –17.148 | 0.001 | –48.395 | 0.0002 |

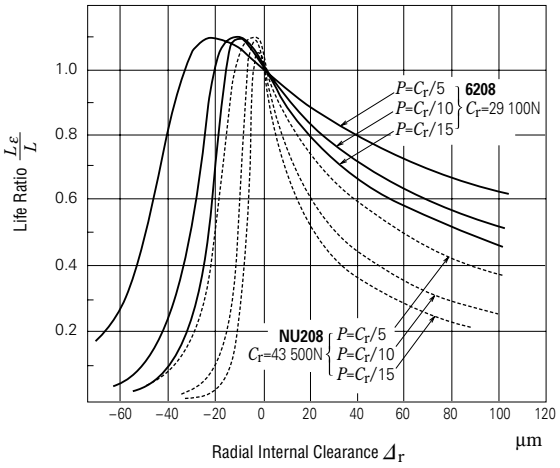



**Fig. 15.13 Radial Internal Clearance and Life Ratio**

## 15. 6 BRANDS AND PROPERTIES OF LUBRICATING GREASES

**Table 15. 8 Brands of Lubricating Greases and Comparison of Properties**

| Brands | Thickeners | Base Oils | Dropping Point (°C) | Consistency | Working Temperature Range(1)(°C) | Pressure Resistance | Usable Limit Compared to Listed Limiting Speed(2)(%) |
|---|---|---|---|---|---|---|---|
| ADREX | Lithium | Mineral oil | 198 | 300 | 0 to +110 | Good | 70 |
| APPOLOIL AUTOREX A | Lithium | Mineral oil | 198 | 280 | −10 to +110 | Fair | 60 |
| Arapen RB 300 | Lithium/Calcium | Mineral oil | 177 | 294 | −10 to + 80 | Fair | 70 |
| EA2 Grease | Urea | Poly-α-olefin oil | ≧260 | 243 | −40 to +150 | Fair | 100 |
| EA3 Grease | Urea | Poly-α-olefin oil | ≧260 | 230 | −40 to +150 | Fair | 100 |
| EA5 Grease | Urea | Poly-α-olefin oil | ≧260 | 251 | −40 to +160 | Good | 60 |
| EA7 Grease | Urea | Poly-α-olefin oil | ≧260 | 243 | −40 to +160 | Fair | 100 |
| ENC Grease | Urea | Polyol ester oil + Mineral oil | ≧260 | 262 | −40 to +160 | Fair | 70 |
| ENS Grease | Urea | Polyol ester oil | ≧260 | 264 | −40 to +160 | Poor | 100 |
| ECZ | Lithium + Carbon black | Poly-α-olefin oil | ≧260 | 243 | −10 to +120 | Fair | 100 |
| ISOFLEX NBU 15 | Barium Complex | Diester oil + Mineral oil | ≧260 | 280 | −30 to +120 | Poor | 100 |
| ISOFLEX SUPER LDS 18 | Lithium | Diester oil | 195 | 280 | −50 to +110 | Poor | 100 |
| ISOFLEX TOPAS NB52 | Barium Complex | Poly-α-olefin oil | ≧260 | 280 | −40 to +130 | Poor | 90 |
| Aero Shell Grease 7 | Micro Gel | Diester oil | ≧260 | 288 | −55 to +100 | Poor | 100 |
| SH 33 L Grease | Lithium | Silicone oil | 210 | 310 | −60 to +120 | Poor | 60 |
| SH 44 M Grease | Lithium | Silicone oil | 210 | 260 | −30 to +130 | Poor | 60 |
| NS Hi-LUBE | Lithium | Polyol ester oil + Diester oil | 192 | 250 | −40 to +130 | Poor | 100 |
| NSA | Lithium | Poly-α-olefin oil + Ester oil | 201 | 311 | −40 to +130 | Fair | 70 |
| NSC Grease | Lithium | Alkyldiphenyl ether oil + Polyol ester oil | 192 | 235 | −30 to +140 | Fair | 70 |
| NSK Clean Grease LG2 | Lithium | Poly-α-olefin oil + Mineral oil | 201 | 199 | −40 to +130 | Poor | 100 |
| EMALUBE 8030 | Urea | Mineral oil | ≧260 | 280 | 0 to +130 | Good | 60 |
| MA8 Grease | Urea | Alkyldiphenyl ether oil + Poly-α-olefin oil | ≧260 | 283 | −30 to +160 | Fair | 70 |
| KRYTOX GPL-524 | PTFE | Perfluoropolyether oil | ≧260 | 265 | 0 to +200 | Fair | 70 |
| KP1 | PTFE | Perfluoropolyether oil | ≧260 | 280 | −30 to +200 | Fair | 60 |
| Cosmo Wide Grease WR No.3 | Sodium Terephtalamate | Polyol ester oil + Mineral oil | ≧230 | 227 | −40 to +130 | Poor | 100 |
| G-40M | Lithium | Silicone oil | 223 | 252 | −30 to +130 | Poor | 60 |
| Shell Alvania EP Grease 2 | Lithium | Mineral oil | 187 | 276 | 0 to + 80 | Good | 60 |
| Shell Alvania Grease S1 | Lithium | Mineral oil | 182 | 323 | −10 to +110 | Fair | 70 |
| Shell Alvania Grease S2 | Lithium | Mineral oil | 185 | 275 | −10 to +110 | Fair | 70 |
| Shell Alvania Grease S3 | Lithium | Mineral oil | 185 | 242 | −10 to +110 | Fair | 70 |
| Shell Cassida Grease RLS 2 | Aluminum Complex | Poly-α-olefin oil | ≧260 | 280 | 0 to +120 | Fair | 70 |
| SHELL SUNLIGHT Grease 2 | Lithium | Mineral oil | 200 | 274 | −10 to +110 | Fair | 70 |
| WPH Grease | Urea | Poly-α-olefin oil | 259 | 240 | −40 to +150 | Fair | 70 |
| DEMNUM Grease L-200 | PTFE | Perfluoropolyether oil | ≧260 | 280 | −30 to +200 | Fair | 60 |

**Notes** (1) If grease will be used at the upper or lower limit sufficient of the temperature range or in a special environment such as vacuum, it is advisable to consult NSK.
(2) For short-term operation or when cooling is grease may be used at speeds exceeding the above limits provided the supply of grease is appropriate.

(continued on next page)

| Brands | Thickeners | Base Oils | Dropping Point (°C) | Consistency | Working Temperature Range(1)(°C) | Pressure Resistance | Usable Limit Compared to Listed Limiting Speed(2)(%) |
|---|---|---|---|---|---|---|---|
| NIGACE WR-S | Urea | Mixed oil | ≧260 | 230 | −30 to +150 | Poor | 70 |
| NIGLUB RSH | Sodium Complex | Polyalkylene Glycol oil | ≧260 | 270 | −20 to +120 | Fair | 60 |
| PYRONOC UNIVERSAL N6B | Urea | Mineral oil | 238 | 290 | 0 to +130 | Fair | 70 |
| PALMAX RBG | Lithium Complex | Mineral oil | 216 | 300 | −10 to +130 | Good | 70 |
| Beacon 325 | Lithium | Diester oil | 190 | 274 | −50 to +110 | Poor | 100 |
| MULTEMP PS No.2 | Lithium | Mineral oil + Diester oil | 190 | 275 | −50 to +110 | Poor | 100 |
| MOLYKOTE FS-3451 Grease | PTFE | Fluorosilicone oil | ≧260 | 285 | 0 to +180 | Fair | 70 |
| UME Grease | Urea | Mineral oil | ≧260 | 268 | −10 to +130 | Fair | 70 |
| UMM Grease 2 | Urea | Mineral oil | ≧260 | 267 | −10 to +130 | Fair | 70 |
| RAREMAX AF-1 | Urea | Mineral oil | ≧260 | 300 | −10 to +130 | Fair | 70 |

**Notes** (1) If grease will be used at the upper or lower limit sufficient of the temperature range or in a special environment such as vacuum, it is advisable to consult NSK.
(2) For short-term operation or when cooling is grease may be used at speeds exceeding the above limits provided the supply of grease is appropriate.

# BEARING TABLES

# BEARING TABLE CONTENTS


| | | Page |
|---|---|---|
| **DEEP GROOVE BALL BEARINGS** | | B4 |
| | Bore Dia. | |
| SINGLE-ROW DEEP GROOVE BALL BEARINGS | 10 – 800mm | B8 |
| MAXIMUM TYPE BALL BEARINGS | 25 – 110mm | B26 |
| MAGNETO BEARINGS | 4 – 20mm | B28 |
| EXTRA SMALL BALL BEARINGS AND MINIATURE BALL BEARINGS | | B30 |
| Metric Design | 1 – 9mm | B34 |
| Inch Design | 1.016 – 9.525mm | B42 |
| **ANGULAR CONTACT BALL BEARINGS** | | B46 |
| | Bore Dia. | |
| SINGLE-ROW ANGULAR CONTACT BALL BEARINGS | 10 – 200mm | B50 |
| MATCHED ANGULAR CONTACT BALL BEARINGS | 10 – 200mm | B50 |
| DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS | 10 – 85mm | B70 |
| FOUR-POINT CONTACT BALL BEARINGS | 30 – 200mm | B72 |
| **SELF-ALIGNING BALL BEARINGS** | | B76 |
| | Bore Dia. | |
| SELF-ALIGNING BALL BEARINGS | 5 – 110mm | B78 |
| **CYLINDRICAL ROLLER BEARINGS** | | B84 |
| | Bore Dia. | |
| SINGLE-ROW CYLINDRICAL ROLLER BEARINGS | 20 – 500mm | B88 |
| L-SHAPED THRUST COLLARS FOR CYLINDRICAL ROLLER BEARINGS | 20 – 320mm | B104 |
| DOUBLE-ROW CYLINDRICAL ROLLER BEARINGS | 25 – 360mm | B106 |
| **TAPERED ROLLER BEARINGS** | | B110 |
| | Bore Dia. | |
| METRIC DESIGN TAPERED ROLLER BEARINGS | 15 – 440mm | B116 |
| INCH DESIGN TAPERED ROLLER BEARINGS | 12.000 – 206.375mm | B136 |
| DOUBLE-ROW TAPERED ROLLER BEARINGS | 80 – 260mm | B172 |
| **SPHERICAL ROLLER BEARINGS** | | B182 |
| | Bore Dia. | |
| SPHERICAL ROLLER BEARINGS | 25 – 1400mm | B184 |
| **THRUST BEARINGS** | | B206 |
| | Bore Dia. | |
| SINGLE-DIRECTION THRUST BALL BEARINGS | 10 – 360mm | B210 |
| DOUBLE-DIRECTION THRUST BALL BEARINGS | 10 – 190mm | B218 |
| CYLINDRICAL ROLLER THRUST BEARINGS | 35 – 320mm | B224 |
| SPHERICAL THRUST ROLLER BEARINGS | 60 – 500mm | B228 |
| ANGULAR CONTACT THRUST BALL BEARINGS | | B234 |
| Double-Direction Angular Contact Thrust Ball Bearings | 35 – 280mm | B238 |
| Angular Contact Thrust Ball Bearings for Ball Screws | 15 – 60mm | B242 |
| **Needle Roller Bearings** | | B244 |
| | Bore Dia. | |
| CAGE & NEEDLE ROLLER ASSEMBLIES | 5 – 100mm | B252 |
| DRAWN CUP NEEDLE ROLLER BEARINGS | 4 – 55mm | B258 |
| SOLID NEEDLE ROLLER BEARINGS | 9 – 390mm | B264 |
| THRUST NEEDLE ROLLER BEARINGS | 10 – 100mm | B274 |
| CAM FOLLOWERS | 16 – 90mm | B276 |
| ROLLER FOLLOWERS | 5 – 50mm | B278 |







| | | Page |
|---|---|---|
| **BALL BEARING UNITS** | | B280 |
| SET SCREW TYPE | | |
| Pillow blocks cast housing | | |
| UCP2 | | B286 |
| Flanged units cast housing | | |
| UCF2 | | B292 |
| UCFL2 | | B298 |
| **PLUMMER BLOCKS** | | B304 |
| | Shaft Dia. | |
| STANDARD TYPE PLUMMER BLOCKS | 20 – 140mm | B306 |
| LARGE PLUMMER BLOCKS | 150 – 450mm | B312 |
| DUSTPROOF PLUMMER BLOCKS | 50 – 180mm | B316 |
| STEPPED-SHAFT TYPE PLUMMER BLOCKS | 25 – 320mm | B318 |
| **CYLINDRICAL ROLLER BEARINGS FOR SHEAVES** | | B326 |
| | Bore Dia. | |
| Open Type | 50 – 560mm | B328 |
| Prelubricated Type | 40 – 400mm | B332 |
| **ROLL-NECK BEARINGS** | | B334 |
| FOUR-ROW TAPERED ROLLER BEARINGS | 100 – 939.800mm | B338 |
| FOUR-ROW CYLINDRICAL ROLLER BEARINGS | 100 – 920mm | B340 |
| **RAILWAY ROLLING STOCK BEARINGS** | | B344 |
| **ROLLING ELEMENTS** | | B346 |
| | Basic Dia. | |
| STEEL BALLS FOR BALL BEARINGS | 0.3 – 114.3mm | B348 |
| CYLINDRICAL ROLLERS FOR ROLLER BEARINGS | 3 – 80mm | B350 |
| LONG CYLINDRICAL ROLLERS FOR ROLLER BEARINGS | 5.5 – 15mm | B352 |
| NEEDLE ROLLERS FOR ROLLER BEARINGS | 1 – 5mm | B354 |
| **ACCESSORIES FOR ROLLING BEARINGS** | | B356 |
| | Shaft Dia. | |
| ADAPTERS FOR ROLLING BEARINGS | 17 – 470mm | B358 |
| WITHDRAWAL SLEEVES FOR ROLLING BEARINGS | 35 – 480mm | B366 |
| NUTS FOR ROLLING BEARINGS | | B372 |
| STOPPERS FOR ROLLING BEARINGS | | B377 |
| WASHERS FOR ROLLING BEARINGS | | B378 |

# DEEP GROOVE BALL BEARINGS

## SINGLE-ROW DEEP GROOVE BALL BEARINGS


Open Type, Shielded Type, Sealed Type — Bore Diameter 10 – 240mm ····· B8

Open Type — Bore Diameter 260 – 800mm ····· B20

**MAXIMUM TYPE BALL BEARINGS** — Bore Diameter 25 – 110mm ····· B26

**MAGNETO BEARINGS** — Bore Diameter 4 – 20mm ····· B28

**Extra Small and Miniature Ball Bearings** are described on Pages B30 to B45.


## DESIGN, TYPES, AND FEATURES

### SINGLE-ROW DEEP GROOVE BALL BEARINGS

Single-Row Deep Groove Ball Bearings are classified into the types shown below.

The proper amount of good quality grease is packed in shielded and sealed ball bearings. A comparison of the features of each type is shown in Table 1.

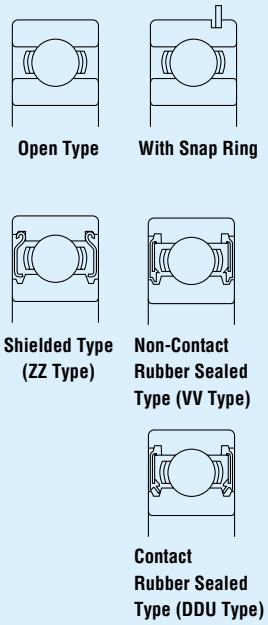



**Table 1 Features of Sealed Ball Bearings**

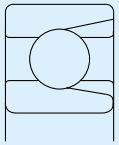
| Type | Shielded Type (ZZ Type) | Non-Contact Rubber Sealed Type (VV Type) | Contact Rubber Sealed Type (DDU Type) |
|---|---|---|---|
| Torque | Low | Low | Higher than ZZ, VV types due to contact seal |
| Speed capability | Good | Good | Limited by contact seals |
| Grease sealing effectiveness | Good | Better than ZZ type | A little better than VV type |
| Dust resistance | Good | Better than ZZ type (usable in moderately dusty environment) | Best (usable even in very dusty environment) |
| Water resistance | Not suitable | Not suitable | Good (usable even if fluid is splashed on bearing) |
| Operating temperature (1) | –10 to +110°C | –10 to +110°C | –10 to +100°C |

**Note** (1) The above temperature range applies to standard bearings. By using cold or heat resistant grease and changing the type of rubber, the operating temperature range can be extended. For such applications, please contact NSK.

For deep groove ball bearings, pressed cages are usually used. For big bearings, machined brass cages are used. (Refer to Table 2)
Machined cages are also used for high speed applications.

**Table 2 Standard Cages for Deep Groove Ball Bearings**

| Series | Pressed Steel Cages | Machined Brass Cages |
|---|---|---|
| 68 | 6800 – 6838 | 6840 – 68/800 |
| 69 | 6900 – 6936 | 6938 – 69/800 |
| 160 | 16001 – 16026 | 16028 – 16064 |
| 60 | 6000 – 6040 | 6044 – 60/670 |
| 62 | 6200 – 6240 | 6244 – 6272 |
| 63 | 6300 – 6332 | 6334 – 6356 |



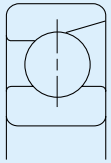
### MAXIMUM TYPE BALL BEARINGS

Maximum Type Ball Bearings contain a larger number of balls than normal deep groove ball bearings because of filling slots in the inner and outer rings. Because of their filling slots, they are not suitable for applications with high axial loads.

BL2 and BL3 types of bearings have boundary dimensions equal to those of single-row deep groove ball bearings of Series 62 and 63 respectively. Besides the open type, ZZ type shielded bearings are also available.

When using these bearings, it is important for the filling slot in the outer ring to be outside of the loaded zone as much as possible.

Their cages are pressed steel.



### MAGNETO BEARINGS

The groove in the inner ring is a little shallower than that of deep groove ball bearings and one side of the outer ring is relieved. Consequently, the outer ring is separable, which makes it convenient for mounting.

Pressed cages are standard, but for high speed applications, machined synthetic resin cages are used.

## PRECAUTIONS FOR USE OF DEEP GROOVE BALL BEARINGS

For deep groove ball bearings, if the bearing load is too small during operation, slippage occurs between the balls and raceways, which may result in smearing. The higher the weight of balls and cage, the higher this tendency becomes, especially for large bearings. If very small bearing loads are expected, please contact NSK for selection of an appropriate bearing.





## TOLERANCES AND RUNNING ACCURACY

**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 8.2 (Pages A60 to A63)
**MAXIMUM TYPE BALL BEARINGS**.....Table 8.2 (Pages A60 to A63)
**MAGNETO BEARINGS**.....Table 8.5 (Pages A70 and A71)

## RECOMMENDED FITS

**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 9.2 (Page A84)
Table 9.4 (Page A85)
**MAXIMUM TYPE BALL BEARINGS**.....Table 9.2 (Page A84)
Table 9.4 (Page A85)
**MAGNETO BEARINGS**.....Table 9.2 (Page A84)
Table 9.4 (Page A85)

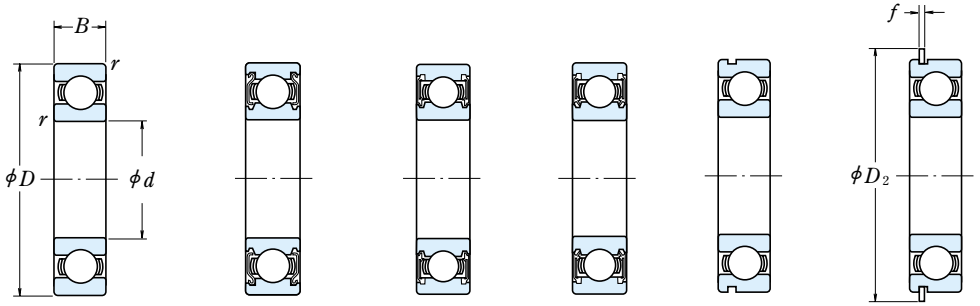
## INTERNAL CLEARANCES

**SINGLE-ROW DEEP GROOVE BALL BEARINGS**.....Table 9.9 (Page A89)
**MAXIMUM TYPE BALL BEARINGS**.....Table 9.9 (Page A89)
**MAGNETO BEARINGS**.....Table 9.11 (Page A89)

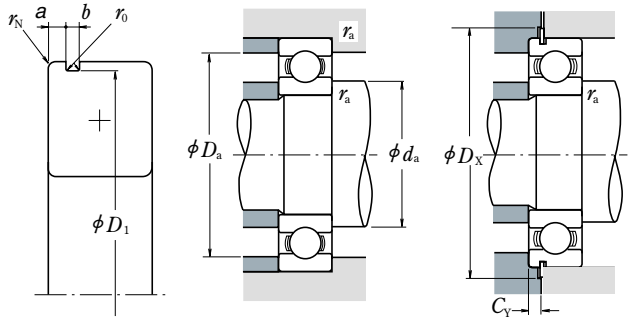
## LIMITING SPEEDS

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

## Bore Diameter 10 – 22 mm




Open Type | Shielded Type ZZ | Non-Contact Sealed Type VV | Contact Sealed Type DD · DDU | With Snap Ring Groove N | With Snap Ring NR




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

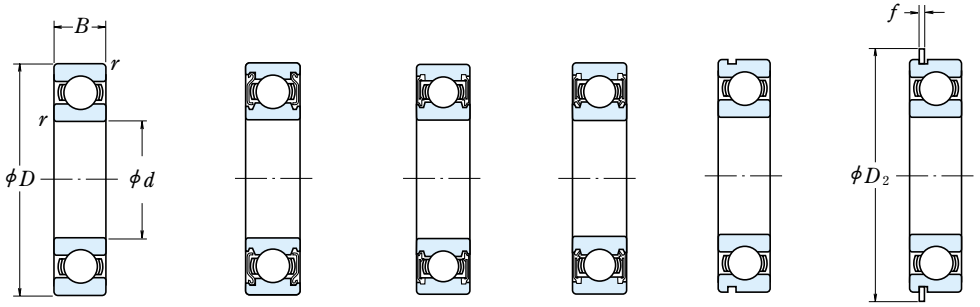
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Oil | Bearing Numbers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed | |
| **10** | 19 | 5 | 0.3 | 1 720 | 840 | 175 | 86 | 14.8 | 34 000 | 24 000 | 40 000 | **6800** | **ZZ** | **VV** | **DD** |
| | 22 | 6 | 0.3 | 2 700 | 1 270 | 275 | 129 | 14.0 | 32 000 | 22 000 | 38 000 | **6900** | **ZZ** | **VV** | **DD** |
| | 26 | 8 | 0.3 | 4 550 | 1 970 | 465 | 201 | 12.4 | 30 000 | 22 000 | 36 000 | **6000** | **ZZ** | **VV** | **DDU** |
| | 30 | 9 | 0.6 | 5 100 | 2 390 | 520 | 244 | 13.2 | 24 000 | 18 000 | 30 000 | **6200** | **ZZ** | **VV** | **DDU** |
| | 35 | 11 | 0.6 | 8 100 | 3 450 | 825 | 350 | 11.2 | 22 000 | 17 000 | 26 000 | **6300** | **ZZ** | **VV** | **DDU** |
| **12** | 21 | 5 | 0.3 | 1 920 | 1 040 | 195 | 106 | 15.3 | 32 000 | 20 000 | 38 000 | **6801** | **ZZ** | **VV** | **DD** |
| | 24 | 6 | 0.3 | 2 890 | 1 460 | 295 | 149 | 14.5 | 30 000 | 20 000 | 36 000 | **6901** | **ZZ** | **VV** | **DD** |
| | 28 | 7 | 0.3 | 5 100 | 2 370 | 520 | 241 | 13.0 | 28 000 | — | 32 000 | **16001** | — | — | — |
| | 28 | 8 | 0.3 | 5 100 | 2 370 | 520 | 241 | 13.0 | 28 000 | 18 000 | 32 000 | **6001** | **ZZ** | **VV** | **DDU** |
| | 32 | 10 | 0.6 | 6 800 | 3 050 | 695 | 310 | 12.3 | 22 000 | 17 000 | 28 000 | **6201** | **ZZ** | **VV** | **DDU** |
| | 37 | 12 | 1 | 9 700 | 4 200 | 990 | 425 | 11.1 | 20 000 | 16 000 | 24 000 | **6301** | **ZZ** | **VV** | **DDU** |
| **15** | 24 | 5 | 0.3 | 2 070 | 1 260 | 212 | 128 | 15.8 | 28 000 | 17 000 | 34 000 | **6802** | **ZZ** | **VV** | **DD** |
| | 28 | 7 | 0.3 | 4 350 | 2 260 | 440 | 230 | 14.3 | 26 000 | 17 000 | 30 000 | **6902** | **ZZ** | **VV** | **DD** |
| | 32 | 8 | 0.3 | 5 600 | 2 830 | 570 | 289 | 13.9 | 24 000 | — | 28 000 | **16002** | — | — | — |
| | 32 | 9 | 0.3 | 5 600 | 2 830 | 570 | 289 | 13.9 | 24 000 | 15 000 | 28 000 | **6002** | **ZZ** | **VV** | **DDU** |
| | 35 | 11 | 0.6 | 7 650 | 3 750 | 780 | 380 | 13.2 | 20 000 | 14 000 | 24 000 | **6202** | **ZZ** | **VV** | **DDU** |
| | 42 | 13 | 1 | 11 400 | 5 450 | 1 170 | 555 | 12.3 | 17 000 | 13 000 | 20 000 | **6302** | **ZZ** | **VV** | **DDU** |
| **17** | 26 | 5 | 0.3 | 2 630 | 1 570 | 268 | 160 | 15.7 | 26 000 | 15 000 | 30 000 | **6803** | **ZZ** | **VV** | **DD** |
| | 30 | 7 | 0.3 | 4 600 | 2 550 | 470 | 260 | 14.7 | 24 000 | 15 000 | 28 000 | **6903** | **ZZ** | **VV** | **DDU** |
| | 35 | 8 | 0.3 | 6 000 | 3 250 | 610 | 330 | 14.4 | 22 000 | — | 26 000 | **16003** | — | — | — |
| | 35 | 10 | 0.3 | 6 000 | 3 250 | 610 | 330 | 14.4 | 22 000 | 13 000 | 26 000 | **6003** | **ZZ** | **VV** | **DDU** |
| | 40 | 12 | 0.6 | 9 550 | 4 800 | 975 | 490 | 13.2 | 17 000 | 12 000 | 20 000 | **6203** | **ZZ** | **VV** | **DDU** |
| | 47 | 14 | 1 | 13 600 | 6 650 | 1 390 | 675 | 12.4 | 15 000 | 11 000 | 18 000 | **6303** | **ZZ** | **VV** | **DDU** |
| **20** | 32 | 7 | 0.3 | 4 000 | 2 470 | 410 | 252 | 15.5 | 22 000 | 13 000 | 26 000 | **6804** | **ZZ** | **VV** | **DD** |
| | 37 | 9 | 0.3 | 6 400 | 3 700 | 650 | 375 | 14.7 | 19 000 | 12 000 | 22 000 | **6904** | **ZZ** | **VV** | **DDU** |
| | 42 | 8 | 0.3 | 7 900 | 4 450 | 810 | 455 | 14.5 | 18 000 | — | 20 000 | **16004** | — | — | — |
| | 42 | 12 | 0.6 | 9 400 | 5 000 | 955 | 510 | 13.8 | 18 000 | 11 000 | 20 000 | **6004** | **ZZ** | **VV** | **DDU** |
| | 47 | 14 | 1 | 12 800 | 6 600 | 1 300 | 670 | 13.1 | 15 000 | 11 000 | 18 000 | **6204** | **ZZ** | **VV** | **DDU** |
| | 52 | 15 | 1.1 | 15 900 | 7 900 | 1 620 | 805 | 12.4 | 14 000 | 10 000 | 17 000 | **6304** | **ZZ** | **VV** | **DDU** |
| **22** | 44 | 12 | 0.6 | 9 400 | 5 050 | 960 | 515 | 14.0 | 17 000 | 11 000 | 20 000 | **60/22** | **ZZ** | **VV** | **DDU** |
| | 50 | 14 | 1 | 12 900 | 6 800 | 1 320 | 695 | 13.5 | 14 000 | 9 500 | 16 000 | **62/22** | **ZZ** | **VV** | **DDU** |
| | 56 | 16 | 1.1 | 18 400 | 9 250 | 1 870 | 940 | 12.4 | 13 000 | 9 500 | 16 000 | **63/22** | **ZZ** | **VV** | **DDU** |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) $a$ max. | $b$ min. | $D_1$ max. | $r_0$ max. | $r_N$ min. | Snap Ring (1) Dimensions (mm) $D_2$ max. | $f$ max. | Abutment and Fillet Dimensions (mm) $d_a$(2) min. | $d_a$(2) max. | $D_a$(2) max. | $r_a$ max. | $D_x$ min. | $C_Y$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | — | — | — | — | — | — | — | — | 12 | 12 | 17 | 0.3 | — | — | 0.005 |
| **N**(3) | **NR**(3) | 1.05 | 0.8 | 20.8 | 0.2 | 0.2 | 24.8 | 0.7 | 12 | 12.5 | 20 | 0.3 | 25.5 | 1.5 | 0.009 |
| **N**(4) | **NR**(4) | 1.35 | 0.87 | 24.5 | 0.2 | 0.3 | 28.7 | 0.84 | 12 | 13 | 24 | 0.3 | 29.4 | 1.9 | 0.018 |
| **N** | **NR** | 2.06 | 1.35 | 28.17 | 0.4 | 0.5 | 34.7 | 1.12 | 14 | 16 | 26 | 0.6 | 35.5 | 2.9 | 0.032 |
| **N** | **NR** | 2.06 | 1.35 | 33.17 | 0.4 | 0.5 | 39.7 | 1.12 | 14 | 16.5 | 31 | 0.6 | 40.5 | 2.9 | 0.052 |
| — | — | — | — | — | — | — | — | — | 14 | 14 | 19 | 0.3 | — | — | 0.006 |
| **N** | **NR** | 1.05 | 0.8 | 22.8 | 0.2 | 0.2 | 26.8 | 0.7 | 14 | 14.5 | 22 | 0.3 | 27.5 | 1.5 | 0.010 |
| — | — | — | — | — | — | — | — | — | 14 | — | 26 | 0.3 | — | — | 0.019 |
| **N**(4) | **NR**(4) | 1.35 | 0.87 | 26.5 | 0.2 | 0.3 | 30.7 | 0.84 | 14 | 15.5 | 26 | 0.3 | 31.4 | 1.9 | 0.022 |
| **N** | **NR** | 2.06 | 1.35 | 30.15 | 0.4 | 0.5 | 36.7 | 1.12 | 16 | 17 | 28 | 0.6 | 37.5 | 2.9 | 0.037 |
| **N** | **NR** | 2.06 | 1.35 | 34.77 | 0.4 | 0.5 | 41.3 | 1.12 | 17 | 18 | 32 | 1 | 42 | 2.9 | 0.060 |
| — | — | — | — | — | — | — | — | — | 17 | 17 | 22 | 0.3 | — | — | 0.007 |
| **N** | **NR** | 1.3 | 0.95 | 26.7 | 0.25 | 0.3 | 30.8 | 0.85 | 17 | 17 | 26 | 0.3 | 31.5 | 1.8 | 0.015 |
| — | — | — | — | — | — | — | — | — | 17 | — | 30 | 0.3 | — | — | 0.027 |
| **N** | **NR** | 2.06 | 1.35 | 30.15 | 0.4 | 0.3 | 36.7 | 1.12 | 17 | 19 | 30 | 0.3 | 37.5 | 2.9 | 0.031 |
| **N** | **NR** | 2.06 | 1.35 | 33.17 | 0.4 | 0.5 | 39.7 | 1.12 | 19 | 20.5 | 31 | 0.6 | 40.5 | 2.9 | 0.045 |
| **N** | **NR** | 2.06 | 1.35 | 39.75 | 0.4 | 0.5 | 46.3 | 1.12 | 20 | 22.5 | 37 | 1 | 47 | 2.9 | 0.083 |
| — | — | — | — | — | — | — | — | — | 19 | 19 | 24 | 0.3 | — | — | 0.007 |
| **N** | **NR** | 1.3 | 0.95 | 28.7 | 0.25 | 0.3 | 32.8 | 0.85 | 19 | 19.5 | 28 | 0.3 | 33.5 | 1.8 | 0.017 |
| — | — | — | — | — | — | — | — | — | 19 | — | 33 | 0.3 | — | — | 0.033 |
| **N** | **NR** | 2.06 | 1.35 | 33.17 | 0.4 | 0.3 | 39.7 | 1.12 | 19 | 21.5 | 33 | 0.3 | 40.5 | 2.9 | 0.041 |
| **N** | **NR** | 2.06 | 1.35 | 38.1 | 0.4 | 0.5 | 44.6 | 1.12 | 21 | 23.5 | 36 | 0.6 | 45.5 | 2.9 | 0.067 |
| **N** | **NR** | 2.46 | 1.35 | 44.6 | 0.4 | 0.5 | 52.7 | 1.12 | 22 | 25.5 | 42 | 1 | 53.5 | 3.3 | 0.113 |
| **N** | **NR** | 1.3 | 0.95 | 30.7 | 0.25 | 0.3 | 34.8 | 0.85 | 22 | 22 | 30 | 0.3 | 35.5 | 1.8 | 0.017 |
| **N** | **NR** | 1.7 | 0.95 | 35.7 | 0.25 | 0.3 | 39.8 | 0.85 | 22 | 24 | 35 | 0.3 | 40.5 | 2.3 | 0.037 |
| — | — | — | — | — | — | — | — | — | 22 | — | 40 | 0.3 | — | — | 0.048 |
| **N** | **NR** | 2.06 | 1.35 | 39.75 | 0.4 | 0.5 | 46.3 | 1.12 | 24 | 25.5 | 38 | 0.6 | 47 | 2.9 | 0.068 |
| **N** | **NR** | 2.46 | 1.35 | 44.6 | 0.4 | 0.5 | 52.7 | 1.12 | 25 | 26.5 | 42 | 1 | 53.5 | 3.3 | 0.107 |
| **N** | **NR** | 2.46 | 1.35 | 49.73 | 0.4 | 0.5 | 57.9 | 1.12 | 26.5 | 28 | 45.5 | 1 | 58.5 | 3.3 | 0.145 |
| **N** | **NR** | 2.06 | 1.35 | 41.75 | 0.4 | 0.5 | 48.3 | 1.12 | 26 | 26.5 | 40 | 0.6 | 49 | 2.9 | 0.074 |
| **N** | **NR** | 2.46 | 1.35 | 47.6 | 0.4 | 0.5 | 55.7 | 1.12 | 27 | 29.5 | 45 | 1 | 56.5 | 3.3 | 0.119 |
| **N** | **NR** | 2.46 | 1.35 | 53.6 | 0.4 | 0.5 | 61.7 | 1.12 | 28.5 | 30.5 | 49.5 | 1 | 62.5 | 3.3 | 0.179 |

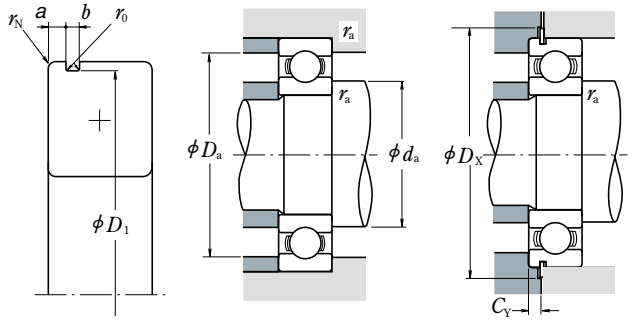
**Notes** (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages **A50** to **A53**.
(2) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.
(3) Ring types N and NR applicable only to open-type bearings.
(4) Snap ring groove dimensions and snap ring dimensions are not conformed to ISO15.

**Remarks** 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

## Bore Diameter 25 – 45 mm




Open Type | Shielded Type ZZ | Non-Contact Sealed Type VV | Contact Sealed Type DD · DDU | With Snap Ring Groove N | With Snap Ring NR




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

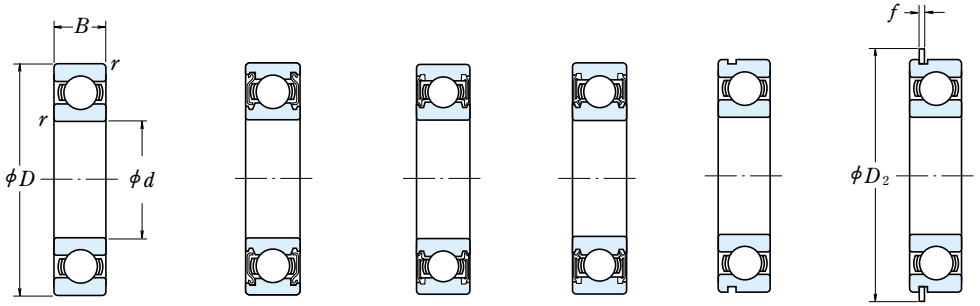
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Limiting Speeds (min⁻¹) Oil | Bearing Numbers | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed |
| **25** | 37 | 7 | 0.3 | 4 500 | 3 150 | 455 | 320 | 16.1 | 18 000 | 10 000 | 22 000 | **6805** | **ZZ** | **VV** **DD** |
| | 42 | 9 | 0.3 | 7 050 | 4 550 | 715 | 460 | 15.4 | 16 000 | 10 000 | 19 000 | **6905** | **ZZ** | **VV** **DDU** |
| | 47 | 8 | 0.3 | 8 850 | 5 600 | 905 | 570 | 15.1 | 15 000 | — | 18 000 | **16005** | — | — — |
| | 47 | 12 | 0.6 | 10 100 | 5 850 | 1 030 | 595 | 14.5 | 15 000 | 9 500 | 18 000 | **6005** | **ZZ** | **VV** **DDU** |
| | 52 | 15 | 1 | 14 000 | 7 850 | 1 430 | 800 | 13.9 | 13 000 | 9 000 | 15 000 | **6205** | **ZZ** | **VV** **DDU** |
| | 62 | 17 | 1.1 | 20 600 | 11 200 | 2 100 | 1 150 | 13.2 | 11 000 | 8 000 | 13 000 | **6305** | **ZZ** | **VV** **DDU** |
| **28** | 52 | 12 | 0.6 | 12 500 | 7 400 | 1 270 | 755 | 14.5 | 14 000 | 8 500 | 16 000 | **60/28** | **ZZ** | **VV** **DDU** |
| | 58 | 16 | 1 | 16 600 | 9 500 | 1 700 | 970 | 13.9 | 12 000 | 8 000 | 14 000 | **62/28** | **ZZ** | **VV** **DDU** |
| | 68 | 18 | 1.1 | 26 700 | 14 000 | 2 730 | 1 430 | 12.4 | 10 000 | 7 500 | 13 000 | **63/28** | **ZZ** | **VV** **DDU** |
| **30** | 42 | 7 | 0.3 | 4 700 | 3 650 | 480 | 370 | 16.4 | 15 000 | 9 000 | 18 000 | **6806** | **ZZ** | **VV** **DD** |
| | 47 | 9 | 0.3 | 7 250 | 5 000 | 740 | 510 | 15.8 | 14 000 | 8 500 | 17 000 | **6906** | **ZZ** | **VV** **DDU** |
| | 55 | 9 | 0.3 | 11 200 | 7 350 | 1 150 | 750 | 15.2 | 13 000 | — | 15 000 | **16006** | — | — — |
| | 55 | 13 | 1 | 13 200 | 8 300 | 1 350 | 845 | 14.7 | 13 000 | 8 000 | 15 000 | **6006** | **ZZ** | **VV** **DDU** |
| | 62 | 16 | 1 | 19 500 | 11 300 | 1 980 | 1 150 | 13.8 | 11 000 | 7 500 | 13 000 | **6206** | **ZZ** | **VV** **DDU** |
| | 72 | 19 | 1.1 | 26 700 | 15 000 | 2 720 | 1 530 | 13.3 | 9 500 | 6 700 | 12 000 | **6306** | **ZZ** | **VV** **DDU** |
| **32** | 58 | 13 | 1 | 15 100 | 9 150 | 1 530 | 935 | 14.5 | 12 000 | 7 500 | 14 000 | **60/32** | **ZZ** | **VV** **DDU** |
| | 65 | 17 | 1 | 20 700 | 11 600 | 2 120 | 1 190 | 13.6 | 10 000 | 7 100 | 12 000 | **62/32** | **ZZ** | **VV** **DDU** |
| | 75 | 20 | 1.1 | 29 900 | 17 000 | 3 050 | 1 730 | 13.2 | 9 000 | 6 300 | 11 000 | **63/32** | **ZZ** | **VV** **DDU** |
| **35** | 47 | 7 | 0.3 | 4 900 | 4 100 | 500 | 420 | 16.7 | 14 000 | 7 500 | 16 000 | **6807** | **ZZ** | **VV** **DD** |
| | 55 | 10 | 0.6 | 10 600 | 7 250 | 1 080 | 740 | 15.5 | 12 000 | 7 500 | 15 000 | **6907** | **ZZ** | **VV** **DDU** |
| | 62 | 9 | 0.3 | 11 700 | 8 200 | 1 190 | 835 | 15.6 | 11 000 | — | 13 000 | **16007** | — | — — |
| | 62 | 14 | 1 | 16 000 | 10 300 | 1 630 | 1 050 | 14.8 | 11 000 | 6 700 | 13 000 | **6007** | **ZZ** | **VV** **DDU** |
| | 72 | 17 | 1.1 | 25 700 | 15 300 | 2 620 | 1 560 | 13.8 | 9 500 | 6 300 | 11 000 | **6207** | **ZZ** | **VV** **DDU** |
| | 80 | 21 | 1.5 | 33 500 | 19 200 | 3 400 | 1 960 | 13.2 | 8 500 | 6 000 | 10 000 | **6307** | **ZZ** | **VV** **DDU** |
| **40** | 52 | 7 | 0.3 | 6 350 | 5 550 | 650 | 565 | 17.0 | 12 000 | 6 700 | 14 000 | **6808** | **ZZ** | **VV** **DD** |
| | 62 | 12 | 0.6 | 13 700 | 10 000 | 1 390 | 1 020 | 15.7 | 11 000 | 6 300 | 13 000 | **6908** | **ZZ** | **VV** **DDU** |
| | 68 | 9 | 0.3 | 12 600 | 9 650 | 1 290 | 985 | 16.0 | 10 000 | — | 12 000 | **16008** | — | — — |
| | 68 | 15 | 1 | 16 800 | 11 500 | 1 710 | 1 180 | 15.3 | 10 000 | 6 000 | 12 000 | **6008** | **ZZ** | **VV** **DDU** |
| | 80 | 18 | 1.1 | 29 100 | 17 900 | 2 970 | 1 820 | 14.0 | 8 500 | 5 600 | 10 000 | **6208** | **ZZ** | **VV** **DDU** |
| | 90 | 23 | 1.5 | 40 500 | 24 000 | 4 150 | 2 450 | 13.2 | 7 500 | 5 300 | 9 000 | **6308** | **ZZ** | **VV** **DDU** |
| **45** | 58 | 7 | 0.3 | 6 600 | 6 150 | 670 | 625 | 17.2 | 11 000 | 6 000 | 13 000 | **6809** | **ZZ** | **VV** **DD** |
| | 68 | 12 | 0.6 | 14 100 | 10 900 | 1 440 | 1 110 | 15.9 | 9 500 | 5 600 | 12 000 | **6909** | **ZZ** | **VV** **DDU** |
| | 75 | 10 | 0.6 | 14 900 | 11 400 | 1 520 | 1 160 | 15.9 | 9 000 | — | 11 000 | **16009** | — | — — |
| | 75 | 16 | 1 | 20 900 | 15 200 | 2 140 | 1 550 | 15.3 | 9 000 | 5 300 | 11 000 | **6009** | **ZZ** | **VV** **DDU** |
| | 85 | 19 | 1.1 | 31 500 | 20 400 | 3 200 | 2 080 | 14.4 | 7 500 | 5 300 | 9 000 | **6209** | **ZZ** | **VV** **DDU** |
| | 100 | 25 | 1.5 | 53 000 | 32 000 | 5 400 | 3 250 | 13.1 | 6 700 | 4 800 | 8 000 | **6309** | **ZZ** | **VV** **DDU** |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) $a$ max. | $b$ min. | $D_1$ max. | $r_0$ max. | $r_N$ min. | Snap Ring (1) Dimensions (mm) $D_2$ max. | $f$ max. | Abutment and Fillet Dimensions (mm) $d_a$(2) min. | $d_a$(2) max. | $D_a$(2) max. | $r_a$ max. | $D_x$ min. | $C_Y$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N** | **NR** | 1.3 | 0.95 | 35.7 | 0.25 | 0.3 | 39.8 | 0.85 | 27 | 27 | 35 | 0.3 | 40.5 | 1.8 | 0.021 |
| **N** | **NR** | 1.7 | 0.95 | 40.7 | 0.25 | 0.3 | 44.8 | 0.85 | 27 | 28.5 | 40 | 0.3 | 45.5 | 2.3 | 0.042 |
| — | — | — | — | — | — | — | — | — | 27 | — | 45 | 0.3 | — | — | 0.059 |
| **N** | **NR** | 2.06 | 1.35 | 44.6 | 0.4 | 0.5 | 52.7 | 1.12 | 29 | 30 | 43 | 0.6 | 53.5 | 2.9 | 0.079 |
| **N** | **NR** | 2.46 | 1.35 | 49.73 | 0.4 | 0.5 | 57.9 | 1.12 | 30 | 32 | 47 | 1 | 58.5 | 3.3 | 0.129 |
| **N** | **NR** | 3.28 | 1.9 | 59.61 | 0.6 | 0.5 | 67.7 | 1.7 | 31.5 | 36 | 55.5 | 1 | 68.5 | 4.6 | 0.235 |
| **N** | **NR** | 2.06 | 1.35 | 49.73 | 0.4 | 0.5 | 57.9 | 1.12 | 32 | 34 | 48 | 0.6 | 58.5 | 2.9 | 0.096 |
| **N** | **NR** | 2.46 | 1.35 | 55.6 | 0.4 | 0.5 | 63.7 | 1.12 | 33 | 35.5 | 53 | 1 | 64.5 | 3.3 | 0.175 |
| **N** | **NR** | 3.28 | 1.9 | 64.82 | 0.6 | 0.5 | 74.6 | 1.7 | 34.5 | 38 | 61.5 | 1 | 76 | 4.6 | 0.287 |
| **N** | **NR** | 1.3 | 0.95 | 40.7 | 0.25 | 0.3 | 44.8 | 0.85 | 32 | 32 | 40 | 0.3 | 45.5 | 1.8 | 0.024 |
| **N** | **NR** | 1.7 | 0.95 | 45.7 | 0.25 | 0.3 | 49.8 | 0.85 | 32 | 34 | 45 | 0.3 | 50.5 | 2.3 | 0.052 |
| — | — | — | — | — | — | — | — | — | 32 | — | 53 | 0.3 | — | — | 0.087 |
| **N** | **NR** | 2.08 | 1.35 | 52.6 | 0.4 | 0.5 | 60.7 | 1.12 | 35 | 36.5 | 50 | 1 | 61.5 | 2.9 | 0.116 |
| **N** | **NR** | 3.28 | 1.9 | 59.61 | 0.6 | 0.5 | 67.7 | 1.7 | 35 | 38.5 | 57 | 1 | 68.5 | 4.6 | 0.199 |
| **N** | **NR** | 3.28 | 1.9 | 68.81 | 0.6 | 0.5 | 78.6 | 1.7 | 36.5 | 42.5 | 65.5 | 1 | 80 | 4.6 | 0.345 |
| **N** | **NR** | 2.08 | 1.35 | 55.6 | 0.4 | 0.5 | 63.7 | 1.12 | 37 | 38.5 | 53 | 1 | 64.5 | 2.9 | 0.122 |
| **N** | **NR** | 3.28 | 1.9 | 62.6 | 0.6 | 0.5 | 70.7 | 1.7 | 37 | 40 | 60 | 1 | 71.5 | 4.6 | 0.225 |
| **N** | **NR** | 3.28 | 1.9 | 71.83 | 0.6 | 0.5 | 81.6 | 1.7 | 38.5 | 44.5 | 68.5 | 1 | 83 | 4.6 | 0.389 |
| **N** | **NR** | 1.3 | 0.95 | 45.7 | 0.25 | 0.3 | 49.8 | 0.85 | 37 | 37 | 45 | 0.3 | 50.5 | 1.8 | 0.027 |
| **N** | **NR** | 1.7 | 0.95 | 53.7 | 0.25 | 0.5 | 57.8 | 0.85 | 39 | 39 | 51 | 0.6 | 58.5 | 2.3 | 0.075 |
| — | — | — | — | — | — | — | — | — | 37 | — | 60 | 0.3 | — | — | 0.107 |
| **N** | **NR** | 2.08 | 1.9 | 59.61 | 0.6 | 0.5 | 67.7 | 1.7 | 40 | 41.5 | 57 | 1 | 68.5 | 3.4 | 0.151 |
| **N** | **NR** | 3.28 | 1.9 | 68.81 | 0.6 | 0.5 | 78.6 | 1.7 | 41.5 | 44.5 | 65.5 | 1 | 80 | 4.6 | 0.284 |
| **N** | **NR** | 3.28 | 1.9 | 76.81 | 0.6 | 0.5 | 86.6 | 1.7 | 43 | 47 | 72 | 1.5 | 88 | 4.6 | 0.464 |
| **N** | **NR** | 1.3 | 0.95 | 50.7 | 0.25 | 0.3 | 54.8 | 0.85 | 42 | 42 | 50 | 0.3 | 55.5 | 1.8 | 0.031 |
| **N** | **NR** | 1.7 | 0.95 | 60.7 | 0.25 | 0.5 | 64.8 | 0.85 | 44 | 46 | 58 | 0.6 | 65.5 | 2.3 | 0.112 |
| — | — | — | — | — | — | — | — | — | 42 | — | 66 | 0.3 | — | — | 0.13 |
| **N** | **NR** | 2.49 | 1.9 | 64.82 | 0.6 | 0.5 | 74.6 | 1.7 | 45 | 47.5 | 63 | 1 | 76 | 3.8 | 0.19 |
| **N** | **NR** | 3.28 | 1.9 | 76.81 | 0.6 | 0.5 | 86.6 | 1.7 | 46.5 | 50.5 | 73.5 | 1 | 88 | 4.6 | 0.366 |
| **N** | **NR** | 3.28 | 2.7 | 86.79 | 0.6 | 0.5 | 96.5 | 2.46 | 48 | 53 | 82 | 1.5 | 98 | 5.4 | 0.636 |
| **N** | **NR** | 1.3 | 0.95 | 56.7 | 0.25 | 0.3 | 60.8 | 0.85 | 47 | 47.5 | 56 | 0.3 | 61.5 | 1.8 | 0.038 |
| **N** | **NR** | 1.7 | 0.95 | 66.7 | 0.25 | 0.5 | 70.8 | 0.85 | 49 | 50 | 64 | 0.6 | 72 | 2.3 | 0.126 |
| — | — | — | — | — | — | — | — | — | 49 | — | 71 | 0.6 | — | — | 0.167 |
| **N** | **NR** | 2.49 | 1.9 | 71.83 | 0.6 | 0.5 | 81.6 | 1.7 | 50 | 53.5 | 70 | 1 | 83 | 3.8 | 0.241 |
| **N** | **NR** | 3.28 | 1.9 | 81.81 | 0.6 | 0.5 | 91.6 | 1.7 | 51.5 | 55.5 | 78.5 | 1 | 93 | 4.6 | 0.42 |
| **N** | **NR** | 3.28 | 2.7 | 96.8 | 0.6 | 0.5 | 106.5 | 2.46 | 53 | 61.5 | 92 | 1.5 | 108 | 5.4 | 0.829 |

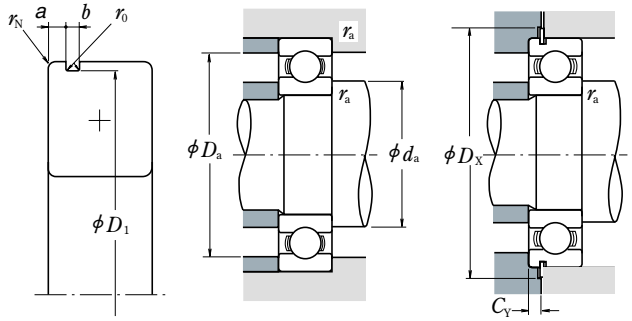
**Notes** (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages **A50** to **A53**.
(2) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

**Remarks** 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

## Bore Diameter 50 – 75 mm




Open Type | Shielded Type ZZ | Non-Contact Sealed Type VV | Contact Sealed Type DD · DDU | With Snap Ring Groove N | With Snap Ring NR




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

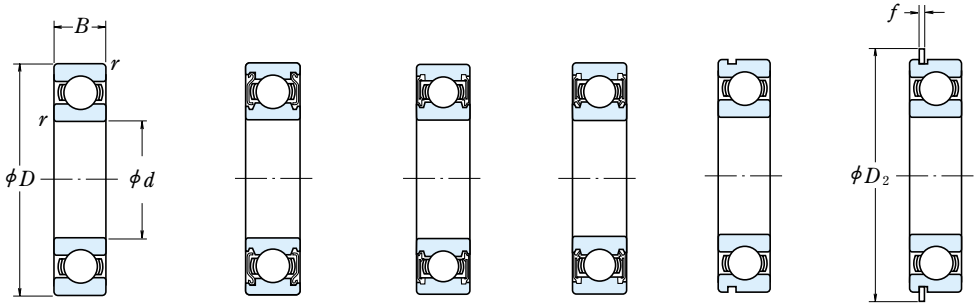
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Oil | Bearing Numbers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed | |
| **50** | 65 | 7 | 0.3 | 6 400 | 6 200 | 655 | 635 | 17.2 | 9 500 | 5 300 | 11 000 | **6810** | **ZZ** | **VV** | **DDU** |
| | 72 | 12 | 0.6 | 14 500 | 11 700 | 1 480 | 1 200 | 16.1 | 9 000 | 5 300 | 11 000 | **6910** | **ZZ** | **VV** | **DDU** |
| | 80 | 10 | 0.6 | 15 400 | 12 400 | 1 570 | 1 260 | 16.1 | 8 500 | — | 10 000 | **16010** | — | — | — |
| | 80 | 16 | 1 | 21 800 | 16 600 | 2 220 | 1 700 | 15.6 | 8 500 | 4 800 | 10 000 | **6010** | **ZZ** | **VV** | **DDU** |
| | 90 | 20 | 1.1 | 35 000 | 23 200 | 3 600 | 2 370 | 14.4 | 7 100 | 4 800 | 8 500 | **6210** | **ZZ** | **VV** | **DDU** |
| | 110 | 27 | 2 | 62 000 | 38 500 | 6 300 | 3 900 | 13.2 | 6 000 | 4 300 | 7 500 | **6310** | **ZZ** | **VV** | **DDU** |
| **55** | 72 | 9 | 0.3 | 8 800 | 8 500 | 900 | 865 | 17.0 | 8 500 | 4 800 | 10 000 | **6811** | **ZZ** | **VV** | **DDU** |
| | 80 | 13 | 1 | 16 000 | 13 300 | 1 630 | 1 350 | 16.2 | 8 000 | 4 500 | 9 500 | **6911** | **ZZ** | **VV** | **DDU** |
| | 90 | 11 | 0.6 | 19 400 | 16 300 | 1 980 | 1 660 | 16.2 | 7 500 | — | 9 000 | **16011** | — | — | — |
| | 90 | 18 | 1.1 | 28 300 | 21 200 | 2 880 | 2 170 | 15.3 | 7 500 | 4 500 | 9 000 | **6011** | **ZZ** | **VV** | **DDU** |
| | 100 | 21 | 1.5 | 43 500 | 29 300 | 4 450 | 2 980 | 14.3 | 6 300 | 4 300 | 7 500 | **6211** | **ZZ** | **VV** | **DDU** |
| | 120 | 29 | 2 | 71 500 | 44 500 | 7 300 | 4 550 | 13.1 | 5 600 | 4 000 | 6 700 | **6311** | **ZZ** | **VV** | **DDU** |
| **60** | 78 | 10 | 0.3 | 11 500 | 10 900 | 1 170 | 1 120 | 16.9 | 8 000 | 4 500 | 9 500 | **6812** | **ZZ** | **VV** | **DD** |
| | 85 | 13 | 1 | 19 400 | 16 300 | 1 980 | 1 660 | 16.2 | 7 500 | 4 300 | 9 000 | **6912** | **ZZ** | **VV** | **DDU** |
| | 95 | 11 | 0.6 | 20 000 | 17 500 | 2 040 | 1 780 | 16.3 | 7 100 | — | 8 500 | **16012** | — | — | — |
| | 95 | 18 | 1.1 | 29 500 | 23 200 | 3 000 | 2 370 | 15.6 | 7 100 | 4 000 | 8 500 | **6012** | **ZZ** | **VV** | **DDU** |
| | 110 | 22 | 1.5 | 52 500 | 36 000 | 5 350 | 3 700 | 14.3 | 5 600 | 3 800 | 7 100 | **6212** | **ZZ** | **VV** | **DDU** |
| | 130 | 31 | 2.1 | 82 000 | 52 000 | 8 350 | 5 300 | 13.1 | 5 300 | 3 600 | 6 300 | **6312** | **ZZ** | **VV** | **DDU** |
| **65** | 85 | 10 | 0.6 | 11 900 | 12 100 | 1 220 | 1 230 | 17.0 | 7 500 | 4 000 | 8 500 | **6813** | **ZZ** | **VV** | **DD** |
| | 90 | 13 | 1 | 17 400 | 16 100 | 1 770 | 1 640 | 16.6 | 7 100 | 4 000 | 8 500 | **6913** | **ZZ** | **VV** | **DDU** |
| | 100 | 11 | 0.6 | 20 500 | 18 700 | 2 090 | 1 910 | 16.5 | 6 700 | — | 8 000 | **16013** | — | — | — |
| | 100 | 18 | 1.1 | 30 500 | 25 200 | 3 100 | 2 570 | 15.8 | 6 700 | 4 000 | 8 000 | **6013** | **ZZ** | **VV** | **DDU** |
| | 120 | 23 | 1.5 | 57 500 | 40 000 | 5 850 | 4 100 | 14.4 | 5 300 | 3 600 | 6 300 | **6213** | **ZZ** | **VV** | **DDU** |
| | 140 | 33 | 2.1 | 92 500 | 60 000 | 9 450 | 6 100 | 13.2 | 4 800 | 3 400 | 6 000 | **6313** | **ZZ** | **VV** | **DDU** |
| **70** | 90 | 10 | 0.6 | 12 100 | 12 700 | 1 230 | 1 300 | 17.2 | 6 700 | 3 800 | 8 000 | **6814** | **ZZ** | **VV** | **DD** |
| | 100 | 16 | 1 | 23 700 | 21 200 | 2 420 | 2 160 | 16.3 | 6 300 | 3 600 | 7 500 | **6914** | **ZZ** | **VV** | **DDU** |
| | 110 | 13 | 0.6 | 26 800 | 23 600 | 2 730 | 2 410 | 16.3 | 6 000 | — | 7 100 | **16014** | — | — | — |
| | 110 | 20 | 1.1 | 38 000 | 31 000 | 3 900 | 3 150 | 15.6 | 6 000 | 3 600 | 7 100 | **6014** | **ZZ** | **VV** | **DDU** |
| | 125 | 24 | 1.5 | 62 000 | 44 000 | 6 350 | 4 500 | 14.5 | 5 000 | 3 400 | 6 300 | **6214** | **ZZ** | **VV** | **DDU** |
| | 150 | 35 | 2.1 | 104 000 | 68 000 | 10 600 | 6 950 | 13.2 | 4 500 | 3 200 | 5 300 | **6314** | **ZZ** | **VV** | **DDU** |
| **75** | 95 | 10 | 0.6 | 12 500 | 13 900 | 1 280 | 1 410 | 17.3 | 6 300 | 3 600 | 7 500 | **6815** | **ZZ** | **VV** | **DDU** |
| | 105 | 16 | 1 | 24 400 | 22 600 | 2 480 | 2 300 | 16.5 | 6 000 | 3 400 | 7 100 | **6915** | **ZZ** | **VV** | **DDU** |
| | 115 | 13 | 0.6 | 27 600 | 25 300 | 2 820 | 2 580 | 16.4 | 5 600 | — | 6 700 | **16015** | — | — | — |
| | 115 | 20 | 1.1 | 39 500 | 33 500 | 4 050 | 3 400 | 15.8 | 5 600 | 3 400 | 6 700 | **6015** | **ZZ** | **VV** | **DDU** |
| | 130 | 25 | 1.5 | 66 000 | 49 500 | 6 750 | 5 050 | 14.7 | 4 800 | 3 200 | 5 600 | **6215** | **ZZ** | **VV** | **DDU** |
| | 160 | 37 | 2.1 | 113 000 | 77 000 | 11 600 | 7 850 | 13.2 | 4 300 | 2 800 | 5 000 | **6315** | **ZZ** | **VV** | **DDU** |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) $a$ max. | $b$ min. | $D_1$ max. | $r_0$ max. | $r_N$ min. | Snap Ring (1) Dimensions (mm) $D_2$ max. | $f$ max. | Abutment and Fillet Dimensions (mm) $d_a$(2) min. | $d_a$(2) max. | $D_a$(2) max. | $r_a$ max. | $D_x$ min. | $C_Y$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N** | **NR** | 1.3 | 0.95 | 63.7 | 0.25 | 0.3 | 67.8 | 0.85 | 52 | 52.5 | 63 | 0.3 | 68.5 | 1.8 | 0.050 |
| **N** | **NR** | 1.7 | 0.95 | 70.7 | 0.25 | 0.5 | 74.8 | 0.85 | 54 | 55 | 68 | 0.6 | 76 | 2.3 | 0.135 |
| — | — | — | — | — | — | — | — | — | 54 | — | 76 | 0.6 | — | — | 0.175 |
| **N** | **NR** | 2.49 | 1.9 | 76.81 | 0.6 | 0.5 | 86.6 | 1.7 | 55 | 58.5 | 75 | 1 | 88 | 3.8 | 0.261 |
| **N** | **NR** | 3.28 | 2.7 | 86.79 | 0.6 | 0.5 | 96.5 | 2.46 | 56.5 | 60 | 83.5 | 1 | 98 | 5.4 | 0.459 |
| **N** | **NR** | 3.28 | 2.7 | 106.81 | 0.6 | 0.5 | 116.6 | 2.46 | 59 | 68 | 101 | 2 | 118 | 5.4 | 1.06 |
| **N** | **NR** | 1.7 | 0.95 | 70.7 | 0.25 | 0.3 | 74.8 | 0.85 | 57 | 59 | 70 | 0.3 | 76 | 2.3 | 0.081 |
| **N** | **NR** | 2.1 | 1.3 | 77.9 | 0.4 | 0.5 | 84.4 | 1.12 | 60 | 61.5 | 75 | 1 | 86 | 2.9 | 0.189 |
| — | — | — | — | — | — | — | — | — | 59 | — | 86 | 0.6 | — | — | 0.257 |
| **N** | **NR** | 2.87 | 2.7 | 86.79 | 0.6 | 0.5 | 96.5 | 2.46 | 61.5 | 64 | 83.5 | 1 | 98 | 5 | 0.381 |
| **N** | **NR** | 3.28 | 2.7 | 96.8 | 0.6 | 0.5 | 106.5 | 2.46 | 63 | 66.5 | 92 | 1.5 | 108 | 5.4 | 0.619 |
| **N** | **NR** | 4.06 | 3.1 | 115.21 | 0.6 | 0.5 | 129.7 | 2.82 | 64 | 72.5 | 111 | 2 | 131.5 | 6.5 | 1.37 |
| **N** | **NR** | 1.7 | 1.3 | 76.2 | 0.4 | 0.3 | 82.7 | 1.12 | 62 | 64 | 76 | 0.3 | 84 | 2.5 | 0.103 |
| **N** | **NR** | 2.1 | 1.3 | 82.9 | 0.4 | 0.5 | 89.4 | 1.12 | 65 | 66 | 80 | 1 | 91 | 2.9 | 0.192 |
| — | — | — | — | — | — | — | — | — | 64 | — | 91 | 0.6 | — | — | 0.281 |
| **N** | **NR** | 2.87 | 2.7 | 91.82 | 0.6 | 0.5 | 101.6 | 2.46 | 66.5 | 69 | 88.5 | 1 | 103 | 5 | 0.412 |
| **N** | **NR** | 3.28 | 2.7 | 106.81 | 0.6 | 0.5 | 116.6 | 2.46 | 68 | 74.5 | 102 | 1.5 | 118 | 5.4 | 0.783 |
| **N** | **NR** | 4.06 | 3.1 | 125.22 | 0.6 | 0.5 | 139.7 | 2.82 | 71 | 79 | 119 | 2 | 141.5 | 6.5 | 1.72 |
| **N** | **NR** | 1.7 | 1.3 | 82.9 | 0.4 | 0.5 | 89.4 | 1.12 | 69 | 69 | 81 | 0.6 | 91 | 2.5 | 0.128 |
| **N** | **NR** | 2.1 | 1.3 | 87.9 | 0.4 | 0.5 | 94.4 | 1.12 | 70 | 71.5 | 85 | 1 | 96 | 2.9 | 0.218 |
| — | — | — | — | — | — | — | — | — | 69 | — | 96 | 0.6 | — | — | 0.30 |
| **N** | **NR** | 2.87 | 2.7 | 96.8 | 0.6 | 0.5 | 106.5 | 2.46 | 71.5 | 73 | 93.5 | 1 | 108 | 5 | 0.439 |
| **N** | **NR** | 4.06 | 3.1 | 115.21 | 0.6 | 0.5 | 129.7 | 2.82 | 73 | 80 | 112 | 1.5 | 131.5 | 6.5 | 1.0 |
| **N** | **NR** | 4.9 | 3.1 | 135.23 | 0.6 | 0.5 | 149.7 | 2.82 | 76 | 85.5 | 129 | 2 | 152 | 7.3 | 2.11 |
| **N** | **NR** | 1.7 | 1.3 | 87.9 | 0.4 | 0.5 | 94.4 | 1.12 | 74 | 74.5 | 86 | 0.6 | 96 | 2.5 | 0.134 |
| **N** | **NR** | 2.5 | 1.3 | 97.9 | 0.4 | 0.5 | 104.4 | 1.12 | 75 | 77.5 | 95 | 1 | 106 | 3.3 | 0.349 |
| — | — | — | — | — | — | — | — | — | 74 | — | 106 | 0.6 | — | — | 0.441 |
| **N** | **NR** | 2.87 | 2.7 | 106.81 | 0.6 | 0.5 | 116.6 | 2.46 | 76.5 | 80.5 | 103.5 | 1 | 118 | 5 | 0.608 |
| **N** | **NR** | 4.06 | 3.1 | 120.22 | 0.6 | 0.5 | 134.7 | 2.82 | 78 | 84 | 117 | 1.5 | 136.5 | 6.5 | 1.09 |
| **N** | **NR** | 4.9 | 3.1 | 145.24 | 0.6 | 0.5 | 159.7 | 2.82 | 81 | 92 | 139 | 2 | 162 | 7.3 | 2.57 |
| **N** | **NR** | 1.7 | 1.3 | 92.9 | 0.4 | 0.5 | 99.4 | 1.12 | 79 | 79.5 | 91 | 0.6 | 101 | 2.5 | 0.149 |
| **N** | **NR** | 2.5 | 1.3 | 102.6 | 0.4 | 0.5 | 110.7 | 1.12 | 80 | 82 | 100 | 1 | 112 | 3.3 | 0.364 |
| — | — | — | — | — | — | — | — | — | 79 | — | 111 | 0.6 | — | — | 0.463 |
| **N** | **NR** | 2.87 | 2.7 | 111.81 | 0.6 | 0.5 | 121.6 | 2.46 | 81.5 | 85.5 | 108.5 | 1 | 123 | 5 | 0.649 |
| **N** | **NR** | 4.06 | 3.1 | 125.22 | 0.6 | 0.5 | 139.7 | 2.82 | 83 | 90 | 122 | 1.5 | 141.5 | 6.5 | 1.19 |
| **N** | **NR** | 4.9 | 3.1 | 155.22 | 0.6 | 0.5 | 169.7 | 2.82 | 86 | 98.5 | 149 | 2 | 172 | 7.3 | 3.08 |

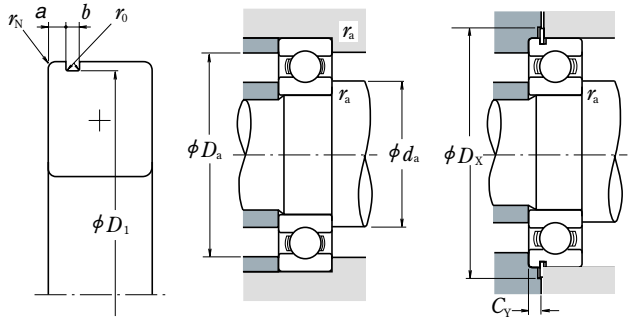
**Notes** (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages **A50** to **A53**.
(2) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

**Remarks** 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

## Bore Diameter 80 – 105 mm




Open Type | Shielded Type ZZ | Non-Contact Sealed Type VV | Contact Sealed Type DD · DDU | With Snap Ring Groove N | With Snap Ring NR




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

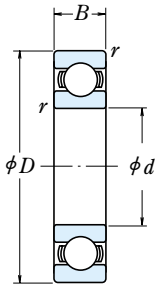
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Oil | Bearing Numbers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed | |
| **80** | 100 | 10 | 0.6 | 12 700 | 14 500 | 1 290 | 1 470 | 17.4 | 6 000 | 3 400 | 7 100 | **6816** | **ZZ** | **VV** | **DDU** |
| | 110 | 16 | 1 | 25 000 | 24 000 | 2 540 | 2 450 | 16.6 | 5 600 | 3 200 | 6 700 | **6916** | **ZZ** | **VV** | **DDU** |
| | 125 | 14 | 0.6 | 32 000 | 29 600 | 3 250 | 3 000 | 16.4 | 5 300 | — | 6 300 | **16016** | — | — | — |
| | 125 | 22 | 1.1 | 47 500 | 40 000 | 4 850 | 4 050 | 15.6 | 5 300 | 3 200 | 6 300 | **6016** | **ZZ** | **VV** | **DDU** |
| | 140 | 26 | 2 | 72 500 | 53 000 | 7 400 | 5 400 | 14.6 | 4 500 | 3 000 | 5 300 | **6216** | **ZZ** | **VV** | **DDU** |
| | 170 | 39 | 2.1 | 123 000 | 86 500 | 12 500 | 8 850 | 13.3 | 4 000 | 2 800 | 4 800 | **6316** | **ZZ** | **VV** | **DDU** |
| **85** | 110 | 13 | 1 | 18 700 | 20 000 | 1 910 | 2 040 | 17.1 | 5 600 | 3 200 | 6 700 | **6817** | **ZZ** | **VV** | **DDU** |
| | 120 | 18 | 1.1 | 32 000 | 29 600 | 3 250 | 3 000 | 16.4 | 5 300 | 3 000 | 6 300 | **6917** | **ZZ** | **VV** | **DDU** |
| | 130 | 14 | 0.6 | 33 000 | 31 500 | 3 350 | 3 200 | 16.5 | 5 000 | — | 6 000 | **16017** | — | — | — |
| | 130 | 22 | 1.1 | 49 500 | 43 000 | 5 050 | 4 400 | 15.8 | 5 000 | 3 000 | 6 000 | **6017** | **ZZ** | **VV** | **DDU** |
| | 150 | 28 | 2 | 84 000 | 62 000 | 8 550 | 6 300 | 14.5 | 4 300 | 2 800 | 5 000 | **6217** | **ZZ** | **VV** | **DDU** |
| | 180 | 41 | 3 | 133 000 | 97 000 | 13 500 | 9 850 | 13.3 | 3 800 | 2 600 | 4 500 | **6317** | **ZZ** | **VV** | **DDU** |
| **90** | 115 | 13 | 1 | 19 000 | 21 000 | 1 940 | 2 140 | 17.2 | 5 300 | 3 000 | 6 300 | **6818** | **ZZ** | **VV** | **DDU** |
| | 125 | 18 | 1.1 | 33 000 | 31 500 | 3 350 | 3 200 | 16.5 | 5 000 | 2 800 | 6 000 | **6918** | **ZZ** | **VV** | **DDU** |
| | 140 | 16 | 1 | 41 500 | 39 500 | 4 250 | 4 000 | 16.3 | 4 800 | — | 5 600 | **16018** | — | — | — |
| | 140 | 24 | 1.5 | 58 000 | 50 000 | 5 950 | 5 050 | 15.6 | 4 800 | 2 800 | 5 600 | **6018** | **ZZ** | **VV** | **DDU** |
| | 160 | 30 | 2 | 96 000 | 71 500 | 9 800 | 7 300 | 14.5 | 4 000 | 2 600 | 4 800 | **6218** | **ZZ** | **VV** | **DDU** |
| | 190 | 43 | 3 | 143 000 | 107 000 | 14 500 | 11 000 | 13.3 | 3 600 | 2 400 | 4 300 | **6318** | **ZZ** | **VV** | **DDU** |
| **95** | 120 | 13 | 1 | 19 300 | 22 000 | 1 970 | 2 240 | 17.2 | 5 000 | 2 800 | 6 000 | **6819** | **ZZ** | **VV** | **DD** |
| | 130 | 18 | 1.1 | 33 500 | 33 500 | 3 450 | 3 400 | 16.6 | 4 800 | 2 800 | 5 600 | **6919** | **ZZ** | **VV** | **DDU** |
| | 145 | 16 | 1 | 43 000 | 42 000 | 4 350 | 4 250 | 16.4 | 4 500 | — | 5 300 | **16019** | — | — | — |
| | 145 | 24 | 1.5 | 60 500 | 54 000 | 6 150 | 5 500 | 15.8 | 4 500 | 2 600 | 5 300 | **6019** | **ZZ** | **VV** | **DDU** |
| | 170 | 32 | 2.1 | 109 000 | 82 000 | 11 100 | 8 350 | 14.4 | 3 800 | 2 600 | 4 500 | **6219** | **ZZ** | **VV** | **DDU** |
| | 200 | 45 | 3 | 153 000 | 119 000 | 15 600 | 12 100 | 13.3 | 3 000 | 2 400 | 3 600 | **6319** | **ZZ** | **VV** | **DDU** |
| **100** | 125 | 13 | 1 | 19 600 | 23 000 | 2 000 | 2 340 | 17.3 | 4 800 | 2 800 | 5 600 | **6820** | **ZZ** | **VV** | **DD** |
| | 140 | 20 | 1.1 | 43 000 | 42 000 | 4 350 | 4 250 | 16.4 | 4 500 | 2 600 | 5 300 | **6920** | **ZZ** | **VV** | **DDU** |
| | 150 | 16 | 1 | 42 500 | 42 000 | 4 300 | 4 300 | 16.5 | 4 300 | — | 5 300 | **16020** | — | — | — |
| | 150 | 24 | 1.5 | 60 000 | 54 000 | 6 150 | 5 550 | 15.9 | 4 300 | 2 600 | 5 300 | **6020** | **ZZ** | **VV** | **DDU** |
| | 180 | 34 | 2.1 | 122 000 | 93 000 | 12 500 | 9 500 | 14.4 | 3 600 | 2 400 | 4 300 | **6220** | **ZZ** | **VV** | **DDU** |
| | 215 | 47 | 3 | 173 000 | 141 000 | 17 700 | 14 400 | 13.2 | 2 800 | 2 200 | 3 400 | **6320** | **ZZ** | **VV** | **DDU** |
| **105** | 130 | 13 | 1 | 19 800 | 23 900 | 2 020 | 2 440 | 17.4 | 4 800 | 2 600 | 5 600 | **6821** | **ZZ** | **VV** | **DDU** |
| | 145 | 20 | 1.1 | 42 500 | 42 000 | 4 300 | 4 300 | 16.5 | 4 300 | — | 5 300 | **6921** | **ZZ** | **VV** | — |
| | 160 | 18 | 1 | 52 000 | 50 500 | 5 300 | 5 150 | 16.3 | 4 000 | — | 4 800 | **16021** | — | — | — |
| | 160 | 26 | 2 | 72 500 | 66 000 | 7 400 | 6 700 | 15.8 | 4 000 | 2 400 | 4 800 | **6021** | **ZZ** | **VV** | **DDU** |
| | 190 | 36 | 2.1 | 133 000 | 105 000 | 13 600 | 10 700 | 14.4 | 3 400 | 2 200 | 4 000 | **6221** | **ZZ** | **VV** | **DDU** |
| | 225 | 49 | 3 | 184 000 | 154 000 | 18 700 | 15 700 | 13.2 | 2 600 | 2 000 | 3 200 | **6321** | **ZZ** | — | **DDU** |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) $a$ max. | $b$ min. | $D_1$ max. | $r_0$ max. | $r_N$ min. | Snap Ring (1) Dimensions (mm) $D_2$ max. | $f$ max. | Abutment and Fillet Dimensions (mm) $d_a$(2) min. | $d_a$(2) max. | $D_a$(2) max. | $r_a$ max. | $D_x$ min. | $C_Y$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N** | **NR** | 1.7 | 1.3 | 97.9 | 0.4 | 0.5 | 104.4 | 1.12 | 84 | 84.5 | 96 | 0.6 | 106 | 2.5 | 0.151 |
| **N** | **NR** | 2.5 | 1.3 | 107.6 | 0.4 | 0.5 | 115.7 | 1.12 | 85 | 87.5 | 105 | 1 | 117 | 3.3 | 0.391 |
| — | — | — | — | — | — | — | — | — | 84 | — | 121 | 0.6 | — | — | 0.621 |
| **N** | **NR** | 2.87 | 3.1 | 120.22 | 0.6 | 0.5 | 134.7 | 2.82 | 86.5 | 91 | 118.5 | 1 | 136.5 | 5.3 | 0.872 |
| **N** | **NR** | 4.9 | 3.1 | 135.23 | 0.6 | 0.5 | 149.7 | 2.82 | 89 | 95.5 | 131 | 2 | 152 | 7.3 | 1.42 |
| **N** | **NR** | 5.69 | 3.5 | 163.65 | 0.6 | 0.5 | 182.9 | 3.1 | 91 | 104.5 | 159 | 2 | 185 | 8.4 | 3.67 |
| **N** | **NR** | 2.1 | 1.3 | 107.6 | 0.4 | 0.5 | 115.7 | 1.12 | 90 | 90.5 | 105 | 1 | 117 | 2.9 | 0.263 |
| **N** | **NR** | 3.3 | 1.3 | 117.6 | 0.4 | 0.5 | 125.7 | 1.12 | 91.5 | 94.5 | 113.5 | 1 | 127 | 4.1 | 0.55 |
| — | — | — | — | — | — | — | — | — | 89 | — | 126 | 0.6 | — | — | 0.652 |
| **N** | **NR** | 2.87 | 3.1 | 125.22 | 0.6 | 0.5 | 139.7 | 2.82 | 91.5 | 96 | 123.5 | 1 | 141.5 | 5.3 | 0.918 |
| **N** | **NR** | 4.9 | 3.1 | 145.24 | 0.6 | 0.5 | 159.7 | 2.82 | 94 | 102 | 141 | 2 | 162 | 7.3 | 1.76 |
| **N** | **NR** | 5.69 | 3.5 | 173.66 | 0.6 | 0.5 | 192.9 | 3.1 | 98 | 110.5 | 167 | 2.5 | 195 | 8.4 | 4.28 |
| **N** | **NR** | 2.1 | 1.3 | 112.6 | 0.4 | 0.5 | 120.7 | 1.12 | 95 | 95.5 | 110 | 1 | 122 | 2.9 | 0.276 |
| **N** | **NR** | 3.3 | 1.3 | 122.6 | 0.4 | 0.5 | 130.7 | 1.12 | 96.5 | 98.5 | 118.5 | 1 | 132 | 4.1 | 0.585 |
| — | — | — | — | — | — | — | — | — | 95 | — | 135 | 1 | — | — | 0.873 |
| **N** | **NR** | 3.71 | 3.1 | 135.23 | 0.6 | 0.5 | 149.7 | 2.82 | 98 | 103 | 132 | 1.5 | 152 | 6.1 | 1.19 |
| **N** | **NR** | 4.9 | 3.1 | 155.22 | 0.6 | 0.5 | 169.7 | 2.82 | 99 | 107.5 | 151 | 2 | 172 | 7.3 | 2.18 |
| **N** | **NR** | 5.69 | 3.5 | 183.64 | 0.6 | 0.5 | 202.9 | 3.1 | 103 | 117 | 177 | 2.5 | 205 | 8.4 | 4.98 |
| **N** | **NR** | 2.1 | 1.3 | 117.6 | 0.4 | 0.5 | 125.7 | 1.12 | 100 | 101.5 | 115 | 1 | 127 | 2.9 | 0.297 |
| **N** | **NR** | 3.3 | 1.3 | 127.6 | 0.4 | 0.5 | 135.7 | 1.12 | 101.5 | 103.5 | 123.5 | 1 | 137 | 4.1 | 0.601 |
| — | — | — | — | — | — | — | — | — | 100 | — | 140 | 1 | — | — | 0.904 |
| **N** | **NR** | 3.71 | 3.1 | 140.23 | 0.6 | 0.5 | 154.7 | 2.82 | 103 | 108.5 | 137 | 1.5 | 157 | 6.1 | 1.23 |
| **N** | **NR** | 5.69 | 3.5 | 163.65 | 0.6 | 0.5 | 182.9 | 3.1 | 106 | 114 | 159 | 2 | 185 | 8.4 | 2.64 |
| **N** | **NR** | 5.69 | 3.5 | 193.65 | 0.6 | 0.5 | 212.9 | 3.1 | 108 | 123.5 | 187 | 2.5 | 215 | 8.4 | 5.76 |
| **N** | **NR** | 2.1 | 1.3 | 122.6 | 0.4 | 0.5 | 130.7 | 1.12 | 105 | 105.5 | 120 | 1 | 132 | 2.9 | 0.31 |
| **N** | **NR** | 3.3 | 1.9 | 137.6 | 0.6 | 0.5 | 145.7 | 1.7 | 106.5 | 111 | 133.5 | 1 | 147 | 4.7 | 0.828 |
| — | — | — | — | — | — | — | — | — | 105 | — | 145 | 1 | — | — | 0.945 |
| **N** | **NR** | 3.71 | 3.1 | 145.24 | 0.6 | 0.5 | 159.7 | 2.82 | 108 | 112.5 | 142 | 1.5 | 162 | 6.1 | 1.29 |
| **N** | **NR** | 5.69 | 3.5 | 173.66 | 0.6 | 0.5 | 192.9 | 3.1 | 111 | 121.5 | 169 | 2 | 195 | 8.4 | 3.17 |
| — | — | — | — | — | — | — | — | — | 113 | 133 | 202 | 2.5 | — | — | 7.04 |
| **N** | **NR** | 2.1 | 1.3 | 127.6 | 0.4 | 0.5 | 135.7 | 1.12 | 110 | 110.5 | 125 | 1 | 137 | 2.9 | 0.324 |
| **N** | **NR** | 3.3 | 1.9 | 142.6 | 0.6 | 0.5 | 150.7 | 1.7 | 111.5 | 116 | 138.5 | 1 | 152 | 4.7 | 0.856 |
| — | — | — | — | — | — | — | — | — | 110 | — | 155 | 1 | — | — | 1.24 |
| **N** | **NR** | 3.71 | 3.1 | 155.22 | 0.6 | 0.5 | 169.7 | 2.82 | 114 | 120 | 151 | 2 | 172 | 6.1 | 1.58 |
| **N** | **NR** | 5.69 | 3.5 | 183.64 | 0.6 | 0.5 | 202.9 | 3.1 | 116 | 127.5 | 179 | 2 | 205 | 8.4 | 3.79 |
| — | — | — | — | — | — | — | — | — | 118 | 138 | 212 | 2.5 | — | — | 8.09 |

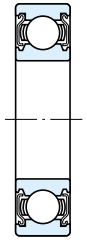
**Notes** (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages **A50** to **A53**.
(2) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

**Remarks** 1. Diameter Series 7 (extra thin section bearings) are also available, please contact NSK.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

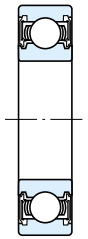
## Bore Diameter 110 – 160 mm



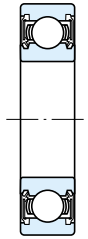

Open Type



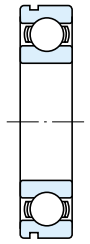
Shielded Type
ZZ · ZZS



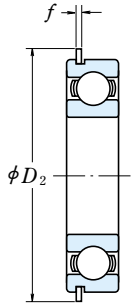
Non-Contact
Sealed Type
VV



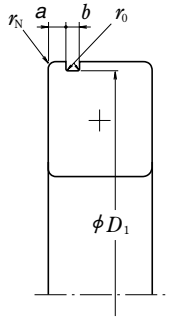
Contact
Sealed Type
DD · DDU

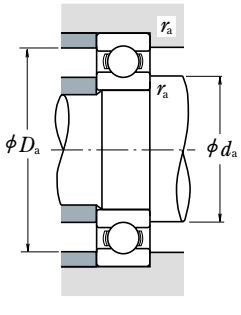


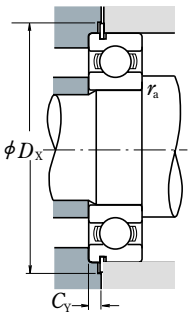
With Snap
Ring Groove
N




With
Snap Ring
NR




### Dynamic Equivalent Load

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

### Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

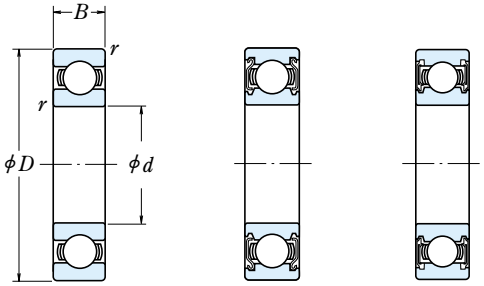
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Oil | Bearing Numbers | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed |
| **110** | 140 | 16 | 1 | 28 100 | 32 500 | 2 860 | 3 350 | 17.1 | 4 300 | 2 400 | 5 300 | **6822** | **ZZ** | **VV** **DDU** |
| | 150 | 20 | 1.1 | 43 500 | 44 500 | 4 450 | 4 550 | 16.6 | 4 300 | 2 400 | 5 000 | **6922** | **ZZ** | **VV** **DDU** |
| | 170 | 19 | 1 | 57 500 | 56 500 | 5 850 | 5 800 | 16.3 | 3 800 | — | 4 500 | **16022** | — | — — |
| | 170 | 28 | 2 | 85 000 | 73 000 | 8 650 | 7 450 | 15.5 | 3 800 | 2 200 | 4 500 | **6022** | **ZZ** | **VV** **DDU** |
| | 200 | 38 | 2.1 | 144 000 | 117 000 | 14 700 | 11 900 | 14.3 | 2 800 | 2 200 | 3 400 | **6222** | **ZZ** | **VV** **DDU** |
| | 240 | 50 | 3 | 205 000 | 179 000 | 20 900 | 18 300 | 13.2 | 2 400 | — | 3 000 | **6322** | **ZZ** | — — |
| **120** | 150 | 16 | 1 | 28 900 | 35 500 | 2 950 | 3 650 | 17.3 | 4 000 | 2 200 | 4 800 | **6824** | **ZZ** | **VV** **DD** |
| | 165 | 22 | 1.1 | 53 000 | 54 000 | 5 400 | 5 500 | 16.5 | 3 800 | — | 4 500 | **6924** | **ZZ** | — — |
| | 180 | 19 | 1 | 56 500 | 57 500 | 5 800 | 5 850 | 16.5 | 3 600 | — | 4 300 | **16024** | — | — — |
| | 180 | 28 | 2 | 88 000 | 80 000 | 9 000 | 8 150 | 15.7 | 3 600 | 2 200 | 4 300 | **6024** | **ZZ** | **VV** **DDU** |
| | 215 | 40 | 2.1 | 155 000 | 131 000 | 15 800 | 13 400 | 14.4 | 2 600 | 2 000 | 3 200 | **6224** | **ZZ** | **VV** **DDU** |
| | 260 | 55 | 3 | 207 000 | 185 000 | 21 100 | 18 800 | 13.5 | 2 200 | 1 800 | 2 800 | **6324** | **ZZS** | — **DDU** |
| **130** | 165 | 18 | 1.1 | 37 000 | 44 000 | 3 750 | 4 450 | 17.1 | 3 600 | 2 000 | 4 300 | **6826** | **ZZS** | **VV** **DD** |
| | 180 | 24 | 1.5 | 65 000 | 67 500 | 6 650 | 6 850 | 16.5 | 3 400 | — | 4 000 | **6926** | **ZZ** | — — |
| | 200 | 22 | 1.1 | 75 500 | 77 500 | 7 700 | 7 900 | 16.4 | 3 000 | — | 3 600 | **16026** | — | — — |
| | 200 | 33 | 2 | 106 000 | 101 000 | 10 800 | 10 300 | 15.8 | 3 000 | 1 900 | 3 600 | **6026** | **ZZ** | — **DDU** |
| | 230 | 40 | 3 | 167 000 | 146 000 | 17 000 | 14 900 | 14.5 | 2 400 | — | 3 000 | **6226** | **ZZ** | — — |
| | 280 | 58 | 4 | 229 000 | 214 000 | 23 400 | 21 800 | 13.6 | 2 200 | — | 2 600 | **6326** | **ZZS** | — — |
| **140** | 175 | 18 | 1.1 | 38 500 | 48 000 | 3 900 | 4 850 | 17.3 | 3 400 | 1 900 | 4 000 | **6828** | **ZZ** | **VV** **DDU** |
| | 190 | 24 | 1.5 | 66 500 | 72 000 | 6 800 | 7 300 | 16.6 | 3 200 | — | 3 800 | **6928** | **ZZS** | **VV** — |
| | 210 | 22 | 1.1 | 77 500 | 82 500 | 7 900 | 8 400 | 16.5 | 2 800 | — | 3 400 | **16028** | — | — — |
| | 210 | 33 | 2 | 110 000 | 109 000 | 11 200 | 11 100 | 16.0 | 2 800 | 1 800 | 3 400 | **6028** | **ZZ** | — **DDU** |
| | 250 | 42 | 3 | 166 000 | 150 000 | 17 000 | 15 300 | 14.9 | 2 200 | 1 700 | 2 800 | **6228** | **ZZS** | — **DDU** |
| | 300 | 62 | 4 | 253 000 | 246 000 | 25 800 | 25 100 | 13.6 | 2 000 | — | 2 400 | **6328** | **ZZS** | — — |
| **150** | 190 | 20 | 1.1 | 47 500 | 58 500 | 4 850 | 5 950 | 17.1 | 3 200 | 1 800 | 3 800 | **6830** | **ZZ** | **VV** **DDU** |
| | 210 | 28 | 2 | 85 000 | 90 500 | 8 650 | 9 200 | 16.5 | 2 600 | 1 700 | 3 200 | **6930** | **ZZS** | — **DDU** |
| | 225 | 24 | 1.1 | 84 000 | 91 000 | 8 550 | 9 250 | 16.6 | 2 600 | — | 3 000 | **16030** | — | — — |
| | 225 | 35 | 2.1 | 126 000 | 126 000 | 12 800 | 12 800 | 15.9 | 2 600 | 1 700 | 3 000 | **6030** | **ZZ** | **VV** **DDU** |
| | 270 | 45 | 3 | 176 000 | 168 000 | 18 000 | 17 100 | 15.1 | 2 000 | — | 2 600 | **6230** | **ZZS** | — — |
| | 320 | 65 | 4 | 274 000 | 284 000 | 28 000 | 28 900 | 13.9 | 1 800 | — | 2 200 | **6330** | **ZZS** | — — |
| **160** | 200 | 20 | 1.1 | 48 500 | 61 000 | 4 950 | 6 250 | 17.2 | 2 600 | 1 700 | 3 200 | **6832** | **ZZS** | **VV** **DDU** |
| | 220 | 28 | 2 | 87 000 | 96 000 | 8 850 | 9 800 | 16.6 | 2 600 | 1 600 | 3 000 | **6932** | **ZZS** | — **DDU** |
| | 240 | 25 | 1.5 | 99 000 | 108 000 | 10 100 | 11 000 | 16.5 | 2 400 | — | 2 800 | **16032** | — | — — |
| | 240 | 38 | 2.1 | 137 000 | 135 000 | 13 900 | 13 800 | 15.9 | 2 400 | 1 600 | 2 800 | **6032** | **ZZ** | — **DDU** |
| | 290 | 48 | 3 | 185 000 | 186 000 | 18 900 | 19 000 | 15.4 | 1 900 | — | 2 400 | **6232** | **ZZS** | — — |
| | 340 | 68 | 4 | 278 000 | 287 000 | 28 300 | 29 200 | 13.9 | 1 700 | — | 2 000 | **6332** | **ZZS** | — — |

| With Snap Ring Groove | With Snap Ring | Snap Ring Groove Dimensions (1) (mm) $a$ max. | $b$ min. | $D_1$ max. | $r_0$ max. | $r_N$ min. | Snap Ring (1) Dimensions (mm) $D_2$ max. | $f$ max. | Abutment and Fillet Dimensions (mm) $d_a$(2) min. | $d_a$(2) max. | $D_a$(2) max. | $r_a$ max. | $D_x$ min. | $C_Y$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N** | **NR** | 2.5 | 1.9 | 137.6 | 0.6 | 0.5 | 145.7 | 1.7 | 115 | 117 | 135 | 1 | 147 | 3.9 | 0.497 |
| **N** | **NR** | 3.3 | 1.9 | 147.6 | 0.6 | 0.5 | 155.7 | 1.7 | 116.5 | 121 | 143.5 | 1 | 157 | 4.7 | 0.893 |
| — | — | — | — | — | — | — | — | — | 115 | — | 165 | 1 | — | — | 1.51 |
| **N** | **NR** | 3.71 | 3.5 | 163.65 | 0.6 | 0.5 | 182.9 | 3.1 | 119 | 124.5 | 161 | 2 | 185 | 6.4 | 1.94 |
| **N** | **NR** | 5.69 | 3.5 | 193.65 | 0.6 | 0.5 | 212.9 | 3.1 | 121 | 134 | 189 | 2 | 215 | 8.4 | 4.45 |
| — | — | — | — | — | — | — | — | — | 123 | 147 | 227 | 2.5 | — | — | 9.51 |
| **N** | **NR** | 2.5 | 1.9 | 147.6 | 0.6 | 0.5 | 155.7 | 1.7 | 125 | 127 | 145 | 1 | 157 | 3.9 | 0.537 |
| **N** | **NR** | 3.7 | 1.9 | 161.8 | 0.6 | 0.5 | 171.5 | 1.7 | 126.5 | 132 | 158.5 | 1 | 173 | 5.1 | 1.21 |
| — | — | — | — | — | — | — | — | — | 125 | — | 175 | 1 | — | — | 1.6 |
| **N** | **NR** | 3.71 | 3.5 | 173.66 | 0.6 | 0.5 | 192.9 | 3.1 | 129 | 134.5 | 171 | 2 | 195 | 6.4 | 2.08 |
| — | — | — | — | — | — | — | — | — | 131 | 146 | 204 | 2 | — | — | 5.29 |
| — | — | — | — | — | — | — | — | — | 133 | 161 | 247 | 2.5 | — | — | 12.5 |
| **N** | **NR** | 3.3 | 1.9 | 161.8 | 0.6 | 0.5 | 171.5 | 1.7 | 136.5 | 138 | 158.5 | 1 | 173 | 4.7 | 0.758 |
| **N** | **NR** | 3.7 | 1.9 | 176.8 | 0.6 | 0.5 | 186.5 | 1.7 | 138 | 144 | 172 | 1.5 | 188 | 5.1 | 1.57 |
| — | — | — | — | — | — | — | — | — | 136.5 | — | 193.5 | 1 | — | — | 2.4 |
| **N** | **NR** | 5.69 | 3.5 | 193.65 | 0.6 | 0.5 | 212.9 | 3.1 | 139 | 148.5 | 191 | 2 | 215 | 8.4 | 3.26 |
| — | — | — | — | — | — | — | — | — | 143 | 157 | 217 | 2.5 | — | — | 5.96 |
| — | — | — | — | — | — | — | — | — | 146 | 175 | 264 | 3 | — | — | 15.2 |
| **N** | **NR** | 3.3 | 1.9 | 171.8 | 0.6 | 0.5 | 181.5 | 1.7 | 146.5 | 148.5 | 168.5 | 1 | 183 | 4.7 | 0.832 |
| **N** | **NR** | 3.7 | 1.9 | 186.8 | 0.6 | 0.5 | 196.5 | 1.7 | 148 | 153.5 | 182 | 1.5 | 198 | 5.1 | 1.67 |
| — | — | — | — | — | — | — | — | — | 146.5 | — | 203.5 | 1 | — | — | 2.84 |
| — | — | — | — | — | — | — | — | — | 149 | 158.5 | 201 | 2 | — | — | 3.48 |
| — | — | — | — | — | — | — | — | — | 153 | 171.5 | 237 | 2.5 | — | — | 7.68 |
| — | — | — | — | — | — | — | — | — | 156 | 187 | 284 | 3 | — | — | 18.5 |
| **N** | **NR** | 3.3 | 1.9 | 186.8 | 0.6 | 0.5 | 196.5 | 1.7 | 156.5 | 160 | 183.5 | 1 | 198 | 4.7 | 1.15 |
| — | — | — | — | — | — | — | — | — | 159 | 166 | 201 | 2 | — | — | 3.01 |
| — | — | — | — | — | — | — | — | — | 156.5 | — | 218.5 | 1 | — | — | 3.62 |
| — | — | — | — | — | — | — | — | — | 161 | 170 | 214 | 2 | — | — | 4.24 |
| — | — | — | — | — | — | — | — | — | 163 | 186 | 257 | 2.5 | — | — | 10 |
| — | — | — | — | — | — | — | — | — | 166 | 203 | 304 | 3 | — | — | 22.7 |
| **N** | **NR** | 3.3 | 1.9 | 196.8 | 0.6 | 0.5 | 206.5 | 1.7 | 166.5 | 170.5 | 193.5 | 1 | 208 | 4.7 | 1.23 |
| — | — | — | — | — | — | — | — | — | 169 | 176 | 211 | 2 | — | — | 2.71 |
| — | — | — | — | — | — | — | — | — | 168 | — | 232 | 1.5 | — | — | 4.2 |
| — | — | — | — | — | — | — | — | — | 171 | 181.5 | 229 | 2 | — | — | 5.15 |
| — | — | — | — | — | — | — | — | — | 173 | 202 | 277 | 2.5 | — | — | 12.8 |
| — | — | — | — | — | — | — | — | — | 176 | 215.5 | 324 | 3 | — | — | 26.2 |

**Notes** (1) For tolerances for the snap ring grooves and snap ring dimensions, refer to Pages **A50** to **A53**.
(2) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

**Remarks** When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

## Bore Diameter 170 – 240 mm



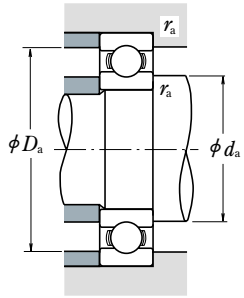

Open Type



Shielded Type
ZZS



Non-Contact
Sealed Type
VV




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

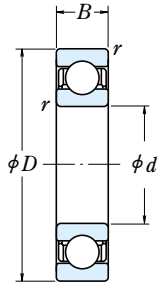
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Factor | Limiting Speeds (min⁻¹) Grease | | Limiting Speeds (min⁻¹) Oil | Bearing Numbers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Open Z · ZZ V · VV | DU DDU | Open Z | Open | Shielded | Sealed | |
| **170** | 215 | 22 | 1.1 | 60 000 | 75 000 | 6 100 | 7 650 | 17.1 | 2 600 | 1 600 | 3 000 | **6834** | **ZZS** | **VV** | **DDU** |
| | 230 | 28 | 2 | 86 000 | 97 000 | 8 750 | 9 850 | 16.7 | 2 400 | — | 2 800 | **6934** | **ZZS** | — | — |
| | 260 | 28 | 1.5 | 114 000 | 126 000 | 11 700 | 12 900 | 16.5 | 2 200 | — | 2 600 | **16034** | — | — | — |
| | 260 | 42 | 2.1 | 161 000 | 161 000 | 16 400 | 16 400 | 15.8 | 2 200 | — | 2 600 | **6034** | **ZZS** | **VV** | — |
| | 310 | 52 | 4 | 212 000 | 224 000 | 21 700 | 22 800 | 15.3 | 1 800 | — | 2 200 | **6234** | **ZZS** | — | — |
| | 360 | 72 | 4 | 325 000 | 355 000 | 33 500 | 36 000 | 13.6 | 1 600 | — | 2 000 | **6334** | — | — | — |
| **180** | 225 | 22 | 1.1 | 60 500 | 78 500 | 6 200 | 8 000 | 17.2 | 2 400 | — | 2 800 | **6836** | — | **VV** | — |
| | 250 | 33 | 2 | 119 000 | 128 000 | 12 100 | 13 100 | 16.4 | 2 200 | — | 2 600 | **6936** | **ZZS** | — | — |
| | 280 | 31 | 2 | 145 000 | 157 000 | 14 700 | 16 000 | 16.3 | 2 000 | — | 2 400 | **16036** | — | — | — |
| | 280 | 46 | 2.1 | 180 000 | 185 000 | 18 400 | 18 800 | 15.6 | 2 000 | — | 2 400 | **6036** | **ZZS** | **VV** | — |
| | 320 | 52 | 4 | 227 000 | 241 000 | 23 200 | 24 600 | 15.1 | 1 700 | — | 2 000 | **6236** | **ZZS** | — | — |
| | 380 | 75 | 4 | 355 000 | 405 000 | 36 000 | 41 500 | 13.9 | 1 500 | — | 1 800 | **6336** | — | — | — |
| **190** | 240 | 24 | 1.5 | 73 000 | 93 500 | 7 450 | 9 550 | 17.1 | 2 200 | — | 2 600 | **6838** | — | **VV** | — |
| | 260 | 33 | 2 | 113 000 | 127 000 | 11 500 | 13 000 | 16.6 | 2 200 | — | 2 600 | **6938** | — | — | — |
| | 290 | 31 | 2 | 149 000 | 168 000 | 15 200 | 17 100 | 16.4 | 2 000 | — | 2 400 | **16038** | — | — | — |
| | 290 | 46 | 2.1 | 188 000 | 201 000 | 19 200 | 20 500 | 15.8 | 2 000 | — | 2 400 | **6038** | **ZZS** | — | — |
| | 340 | 55 | 4 | 255 000 | 282 000 | 26 000 | 28 700 | 15.0 | 1 600 | — | 2 000 | **6238** | **ZZS** | — | — |
| | 400 | 78 | 5 | 355 000 | 415 000 | 36 000 | 42 500 | 14.1 | 1 400 | — | 1 700 | **6338** | — | — | — |
| **200** | 250 | 24 | 1.5 | 74 000 | 98 000 | 7 550 | 10 000 | 17.2 | 2 200 | — | 2 600 | **6840** | — | — | — |
| | 280 | 38 | 2.1 | 143 000 | 158 000 | 14 600 | 16 100 | 16.4 | 2 000 | — | 2 400 | **6940** | **ZZS** | — | — |
| | 310 | 34 | 2 | 161 000 | 180 000 | 16 400 | 18 300 | 16.4 | 1 900 | — | 2 200 | **16040** | — | — | — |
| | 310 | 51 | 2.1 | 207 000 | 226 000 | 21 100 | 23 000 | 15.6 | 1 900 | — | 2 200 | **6040** | **ZZS** | — | — |
| | 360 | 58 | 4 | 269 000 | 310 000 | 27 400 | 31 500 | 15.2 | 1 500 | — | 1 800 | **6240** | **ZZS** | — | — |
| | 420 | 80 | 5 | 380 000 | 445 000 | 38 500 | 45 500 | 13.8 | 1 300 | — | 1 600 | **6340** | — | — | — |
| **220** | 270 | 24 | 1.5 | 76 500 | 107 000 | 7 800 | 10 900 | 17.4 | 1 900 | — | 2 400 | **6844** | **ZZS** | — | — |
| | 300 | 38 | 2.1 | 146 000 | 169 000 | 14 900 | 17 300 | 16.6 | 1 800 | — | 2 200 | **6944** | **ZZS** | — | — |
| | 340 | 37 | 2.1 | 180 000 | 217 000 | 18 400 | 22 100 | 16.5 | 1 600 | — | 2 000 | **16044** | — | — | — |
| | 340 | 56 | 3 | 235 000 | 271 000 | 24 000 | 27 600 | 15.6 | 1 700 | — | 2 000 | **6044** | **ZZS** | — | — |
| | 400 | 65 | 4 | 310 000 | 375 000 | 31 500 | 38 500 | 15.1 | 1 300 | — | 1 600 | **6244** | — | — | — |
| | 460 | 88 | 5 | 410 000 | 520 000 | 42 000 | 53 000 | 14.3 | 1 200 | — | 1 500 | **6344** | — | — | — |
| **240** | 300 | 28 | 2 | 98 500 | 137 000 | 10 000 | 14 000 | 17.3 | 1 700 | — | 2 000 | **6848** | — | — | — |
| | 320 | 38 | 2.1 | 154 000 | 190 000 | 15 700 | 19 400 | 16.8 | 1 700 | — | 2 000 | **6948** | **ZZS** | — | — |
| | 360 | 37 | 2.1 | 196 000 | 243 000 | 19 900 | 24 700 | 16.5 | 1 500 | — | 1 900 | **16048** | — | — | — |
| | 360 | 56 | 3 | 244 000 | 296 000 | 24 900 | 30 000 | 15.9 | 1 500 | — | 1 900 | **6048** | — | — | — |
| | 440 | 72 | 4 | 340 000 | 430 000 | 34 500 | 44 000 | 15.2 | 1 200 | — | 1 500 | **6248** | — | — | — |
| | 500 | 95 | 5 | 470 000 | 625 000 | 48 000 | 63 500 | 14.2 | 1 100 | — | 1 300 | **6348** | — | — | — |

| Abutment and Fillet Dimensions (mm) | | | | Mass (kg) |
|---|---|---|---|---|
| $d_a$(1) min. | $d_a$(1) max. | $D_a$(1) max. | $r_a$ max. | approx. |
| 176.5 | 182 | 208.5 | 1 | 1.86 |
| 179 | 186 | 221 | 2 | 3.34 |
| 178 | — | 252 | 1.5 | 5.71 |
| 181 | 194.5 | 249 | 2 | 6.89 |
| 186 | 215 | 294 | 3 | 15.8 |
| 186 | — | 344 | 3 | 36.6 |
| 186.5 | 192 | 218.5 | 1 | 1.98 |
| 189 | 198.5 | 241 | 2 | 4.16 |
| 189 | — | 271 | 2 | 7.5 |
| 191 | 208 | 269 | 2 | 8.88 |
| 196 | 223 | 304 | 3 | 15.9 |
| 196 | — | 364 | 3 | 43.1 |
| 198 | 202.5 | 232 | 1.5 | 2.53 |
| 199 | — | 251 | 2 | 5.18 |
| 199 | — | 281 | 2 | 7.78 |
| 201 | 218 | 279 | 2 | 9.39 |
| 206 | 236 | 324 | 3 | 22.3 |
| 210 | — | 380 | 4 | 49.7 |
| 208 | — | 242 | 1.5 | 2.67 |
| 211 | 222 | 269 | 2 | 7.28 |
| 209 | — | 301 | 2 | 10 |
| 211 | 231.5 | 299 | 2 | 12 |
| 216 | 252 | 344 | 3 | 26.7 |
| 220 | — | 400 | 4 | 55.3 |
| 228 | 233.5 | 262 | 1.5 | 2.9 |
| 231 | 242 | 289 | 2 | 7.88 |
| 231 | — | 329 | 2 | 13.1 |
| 233 | 254.5 | 327 | 2.5 | 18.6 |
| 236 | — | 384 | 3 | 37.4 |
| 240 | — | 440 | 4 | 73.9 |
| 249 | — | 291 | 2 | 4.48 |
| 251 | 262 | 309 | 2 | 8.49 |
| 251 | — | 349 | 2 | 13.9 |
| 253 | — | 347 | 2.5 | 19.9 |
| 256 | — | 424 | 3 | 50.5 |
| 260 | — | 480 | 4 | 94.4 |

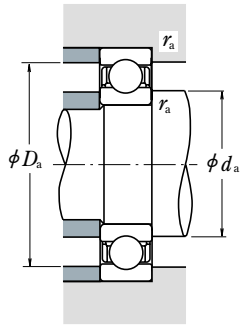
**Note** (1) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

**Remarks** When using bearings with rotating outer rings, contact NSK if they are sealed or shielded.

## Bore Diameter 260 – 360 mm




Open Type




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

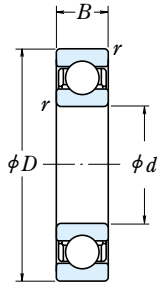
$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

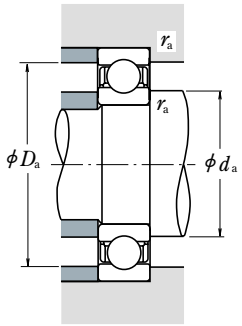
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Factor | Limiting Speeds ($min^{-1}$) | | Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Grease | Oil | Open | $d_a$(1) min. | $D_a$(1) max. | $r_a$ max. | approx. |
| **260** | 320 | 28 | 2 | 101 000 | 148 000 | 10 300 | 15 100 | 17.4 | 1 600 | 1 900 | **6852** | 269 | 311 | 2 | 4.84 |
| | 360 | 46 | 2.1 | 204 000 | 255 000 | 20 800 | 26 000 | 16.5 | 1 500 | 1 800 | **6952** | 271 | 349 | 2 | 14 |
| | 400 | 44 | 3 | 237 000 | 310 000 | 24 100 | 31 500 | 16.4 | 1 400 | 1 700 | **16052** | 273 | 387 | 2.5 | 21.1 |
| | 400 | 65 | 4 | 291 000 | 375 000 | 29 700 | 38 500 | 15.8 | 1 400 | 1 700 | **6052** | 276 | 384 | 3 | 29.4 |
| | 480 | 80 | 5 | 400 000 | 540 000 | 41 000 | 55 000 | 15.1 | 1 100 | 1 300 | **6252** | 280 | 460 | 4 | 67 |
| | 540 | 102 | 6 | 505 000 | 710 000 | 51 500 | 72 500 | 14.6 | 1 000 | 1 200 | **6352** | 286 | 514 | 5 | 118 |
| **280** | 350 | 33 | 2 | 133 000 | 191 000 | 13 600 | 19 500 | 17.3 | 1 500 | 1 700 | **6856** | 289 | 341 | 2 | 7.2 |
| | 380 | 46 | 2.1 | 209 000 | 272 000 | 21 300 | 27 700 | 16.6 | 1 400 | 1 700 | **6956** | 291 | 369 | 2 | 15.1 |
| | 420 | 44 | 3 | 243 000 | 330 000 | 24 700 | 33 500 | 16.5 | 1 300 | 1 600 | **16056** | 293 | 407 | 2.5 | 22.7 |
| | 420 | 65 | 4 | 300 000 | 410 000 | 31 000 | 41 500 | 16.0 | 1 300 | 1 600 | **6056** | 296 | 404 | 3 | 31.2 |
| | 500 | 80 | 5 | 400 000 | 550 000 | 41 000 | 56 000 | 15.2 | 1 000 | 1 300 | **6256** | 300 | 480 | 4 | 70.4 |
| | 580 | 108 | 6 | 570 000 | 840 000 | 58 000 | 86 000 | 14.5 | 900 | 1 100 | **6356** | 306 | 554 | 5 | 144 |
| **300** | 380 | 38 | 2.1 | 166 000 | 233 000 | 17 000 | 23 800 | 17.1 | 1 300 | 1 600 | **6860** | 311 | 369 | 2 | 10.3 |
| | 420 | 56 | 3 | 269 000 | 370 000 | 27 400 | 38 000 | 16.4 | 1 300 | 1 500 | **6960** | 313 | 407 | 2.5 | 23.9 |
| | 460 | 50 | 4 | 285 000 | 405 000 | 29 000 | 41 000 | 16.4 | 1 200 | 1 400 | **16060** | 316 | 444 | 3 | 31.5 |
| | 460 | 74 | 4 | 355 000 | 500 000 | 36 500 | 51 000 | 15.8 | 1 200 | 1 400 | **6060** | 316 | 444 | 3 | 44.2 |
| | 540 | 85 | 5 | 465 000 | 670 000 | 47 500 | 68 500 | 15.1 | 950 | 1 200 | **6260** | 320 | 520 | 4 | 87.8 |
| **320** | 400 | 38 | 2.1 | 168 000 | 244 000 | 17 200 | 24 900 | 17.2 | 1 300 | 1 500 | **6864** | 331 | 389 | 2 | 10.8 |
| | 440 | 56 | 3 | 266 000 | 375 000 | 27 100 | 38 000 | 16.5 | 1 200 | 1 400 | **6964** | 333 | 427 | 2.5 | 25.3 |
| | 480 | 50 | 4 | 293 000 | 430 000 | 29 800 | 44 000 | 16.5 | 1 100 | 1 300 | **16064** | 336 | 464 | 3 | 33.2 |
| | 480 | 74 | 4 | 390 000 | 570 000 | 40 000 | 58 000 | 15.7 | 1 100 | 1 300 | **6064** | 336 | 464 | 3 | 46.5 |
| | 580 | 92 | 5 | 530 000 | 805 000 | 54 500 | 82 500 | 15.0 | 850 | 1 100 | **6264** | 340 | 560 | 4 | 111 |
| **340** | 420 | 38 | 2.1 | 175 000 | 265 000 | 17 800 | 27 100 | 17.3 | 1 200 | 1 400 | **6868** | 351 | 409 | 2 | 11.5 |
| | 460 | 56 | 3 | 273 000 | 400 000 | 27 800 | 40 500 | 16.6 | 1 100 | 1 300 | **6968** | 353 | 447 | 2.5 | 26.6 |
| | 520 | 82 | 5 | 440 000 | 660 000 | 45 000 | 67 500 | 15.6 | 1 000 | 1 200 | **6068** | 360 | 500 | 4 | 62.3 |
| | 620 | 92 | 6 | 530 000 | 820 000 | 54 000 | 83 500 | 15.3 | 800 | 1 000 | **6268** | 366 | 594 | 5 | 129 |
| **360** | 440 | 38 | 2.1 | 192 000 | 290 000 | 19 600 | 29 600 | 17.3 | 1 100 | 1 300 | **6872** | 371 | 429 | 2 | 11.8 |
| | 480 | 56 | 3 | 280 000 | 425 000 | 28 500 | 43 000 | 16.7 | 1 100 | 1 300 | **6972** | 373 | 467 | 2.5 | 27.9 |
| | 540 | 82 | 5 | 460 000 | 720 000 | 47 000 | 73 500 | 15.7 | 950 | 1 200 | **6072** | 380 | 520 | 4 | 65.3 |
| | 650 | 95 | 6 | 555 000 | 905 000 | 57 000 | 92 000 | 15.4 | 750 | 950 | **6272** | 386 | 624 | 5 | 145 |

**Note** (1) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

## Bore Diameter 380 – 600 mm




Open Type




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

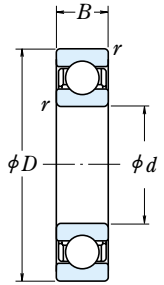
$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

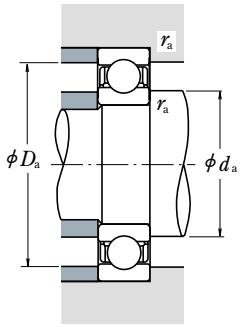
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Factor | Limiting Speeds ($min^{-1}$) | | Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Grease | Oil | Open | $d_a$(1) min. | $D_a$(1) max. | $r_a$ max. | approx. |
| **380** | 480 | 46 | 2.1 | 238 000 | 375 000 | 24 200 | 38 000 | 17.1 | 1 000 | 1 200 | **6876** | 391 | 469 | 2 | 19.5 |
| | 520 | 65 | 4 | 325 000 | 510 000 | 33 000 | 52 000 | 16.6 | 950 | 1 200 | **6976** | 396 | 504 | 3 | 40 |
| | 560 | 82 | 5 | 455 000 | 725 000 | 46 500 | 74 000 | 15.9 | 900 | 1 100 | **6076** | 400 | 540 | 4 | 68 |
| **400** | 500 | 46 | 2.1 | 241 000 | 390 000 | 24 600 | 40 000 | 17.2 | 950 | 1 200 | **6880** | 411 | 489 | 2 | 20.5 |
| | 540 | 65 | 4 | 335 000 | 540 000 | 34 000 | 55 000 | 16.7 | 900 | 1 100 | **6980** | 416 | 524 | 3 | 42 |
| | 600 | 90 | 5 | 510 000 | 825 000 | 52 000 | 84 000 | 15.7 | 850 | 1 000 | **6080** | 420 | 580 | 4 | 88.4 |
| **420** | 520 | 46 | 2.1 | 245 000 | 410 000 | 25 000 | 41 500 | 17.3 | 900 | 1 100 | **6884** | 431 | 509 | 2 | 21.4 |
| | 560 | 65 | 4 | 340 000 | 570 000 | 35 000 | 58 500 | 16.8 | 900 | 1 100 | **6984** | 436 | 544 | 3 | 43.6 |
| | 620 | 90 | 5 | 530 000 | 895 000 | 54 000 | 91 000 | 15.8 | 800 | 1 000 | **6084** | 440 | 600 | 4 | 92.2 |
| **440** | 540 | 46 | 2.1 | 248 000 | 425 000 | 25 300 | 43 500 | 17.4 | 900 | 1 100 | **6888** | 451 | 529 | 2 | 22.3 |
| | 600 | 74 | 4 | 395 000 | 680 000 | 40 500 | 69 000 | 16.6 | 800 | 1 000 | **6988** | 456 | 584 | 3 | 60.2 |
| | 650 | 94 | 6 | 550 000 | 965 000 | 56 000 | 98 500 | 16.0 | 750 | 900 | **6088** | 466 | 624 | 5 | 106 |
| **460** | 580 | 56 | 3 | 310 000 | 550 000 | 31 500 | 56 000 | 17.1 | 800 | 1 000 | **6892** | 473 | 567 | 2.5 | 34.3 |
| | 620 | 74 | 4 | 405 000 | 720 000 | 41 500 | 73 500 | 16.7 | 800 | 950 | **6992** | 476 | 604 | 3 | 62.6 |
| | 680 | 100 | 6 | 605 000 | 1 080 000 | 62 000 | 110 000 | 15.8 | 710 | 850 | **6092** | 486 | 654 | 5 | 123 |
| **480** | 600 | 56 | 3 | 315 000 | 575 000 | 32 000 | 58 500 | 17.2 | 800 | 950 | **6896** | 493 | 587 | 2.5 | 35.4 |
| | 650 | 78 | 5 | 450 000 | 815 000 | 45 500 | 83 000 | 16.6 | 750 | 900 | **6996** | 500 | 630 | 4 | 73.5 |
| | 700 | 100 | 6 | 605 000 | 1 090 000 | 61 500 | 111 000 | 15.9 | 710 | 850 | **6096** | 506 | 674 | 5 | 127 |
| **500** | 620 | 56 | 3 | 320 000 | 600 000 | 33 000 | 61 000 | 17.3 | 750 | 900 | **68/500** | 513 | 607 | 2.5 | 37.2 |
| | 670 | 78 | 5 | 460 000 | 865 000 | 47 000 | 88 000 | 16.7 | 710 | 850 | **69/500** | 520 | 650 | 4 | 82 |
| | 720 | 100 | 6 | 630 000 | 1 170 000 | 64 000 | 120 000 | 16.0 | 670 | 800 | **60/500** | 526 | 694 | 5 | 131 |
| **530** | 650 | 56 | 3 | 325 000 | 625 000 | 33 000 | 63 500 | 17.4 | 710 | 850 | **68/530** | 543 | 637 | 2.5 | 39.8 |
| | 710 | 82 | 5 | 455 000 | 870 000 | 46 500 | 88 500 | 16.8 | 670 | 800 | **69/530** | 550 | 690 | 4 | 89.8 |
| | 780 | 112 | 6 | 680 000 | 1 300 000 | 69 500 | 133 000 | 16.0 | 600 | 750 | **60/530** | 556 | 754 | 5 | 184 |
| **560** | 680 | 56 | 3 | 330 000 | 650 000 | 33 500 | 66 500 | 17.4 | 670 | 800 | **68/560** | 573 | 667 | 2.5 | 41.5 |
| | 750 | 85 | 5 | 525 000 | 1 040 000 | 53 500 | 106 000 | 16.7 | 600 | 750 | **69/560** | 580 | 730 | 4 | 105 |
| | 820 | 115 | 6 | 735 000 | 1 500 000 | 75 000 | 153 000 | 16.2 | 560 | 670 | **60/560** | 586 | 793.5 | 5 | 203 |
| **600** | 730 | 60 | 3 | 355 000 | 735 000 | 36 000 | 75 000 | 17.5 | 600 | 710 | **68/600** | 613 | 717 | 2.5 | 50.9 |
| | 800 | 90 | 5 | 550 000 | 1 160 000 | 56 500 | 118 000 | 16.9 | 560 | 670 | **69/600** | 620 | 780 | 4 | 120 |
| | 870 | 118 | 6 | 790 000 | 1 640 000 | 80 500 | 168 000 | 16.1 | 530 | 630 | **60/600** | 626 | 844 | 5 | 236 |

**Note** (1) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

## Bore Diameter 630 – 800 mm




Open Type




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $\frac{f_0 F_a}{C_{0r}}$ | $e$ | $\frac{F_a}{F_r} \leqq e$ | | $\frac{F_a}{F_r} > e$ | |
|---|---|---|---|---|---|
| | | $X$ | $Y$ | $X$ | $Y$ |
| 0.172 | 0.19 | 1 | 0 | 0.56 | 2.30 |
| 0.345 | 0.22 | 1 | 0 | 0.56 | 1.99 |
| 0.689 | 0.26 | 1 | 0 | 0.56 | 1.71 |
| 1.03 | 0.28 | 1 | 0 | 0.56 | 1.55 |
| 1.38 | 0.30 | 1 | 0 | 0.56 | 1.45 |
| 2.07 | 0.34 | 1 | 0 | 0.56 | 1.31 |
| 3.45 | 0.38 | 1 | 0 | 0.56 | 1.15 |
| 5.17 | 0.42 | 1 | 0 | 0.56 | 1.04 |
| 6.89 | 0.44 | 1 | 0 | 0.56 | 1.00 |

**Static Equivalent Load**

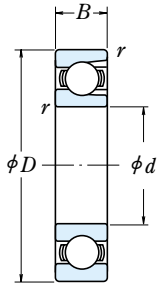
$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

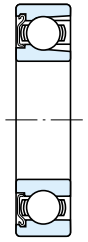
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Factor | Limiting Speeds (min⁻¹) | | Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | $f_0$ | Grease | Oil | Open | $d_a$(1) min. | $D_a$(1) max. | $r_a$ max. | approx. |
| **630** | 780 | 69 | 4 | 420 000 | 890 000 | 43 000 | 90 500 | 17.3 | 560 | 670 | **68/630** | 646 | 764 | 3 | 71.3 |
| | 850 | 100 | 6 | 625 000 | 1 350 000 | 64 000 | 138 000 | 16.7 | 530 | 630 | **69/630** | 656 | 824 | 5 | 163 |
| | 920 | 128 | 7.5 | 750 000 | 1 620 000 | 76 500 | 165 000 | 16.4 | 480 | 600 | **60/630** | 662 | 888 | 6 | 285 |
| **670** | 820 | 69 | 4 | 435 000 | 965 000 | 44 500 | 98 000 | 17.4 | 500 | 630 | **68/670** | 686 | 804 | 3 | 75.4 |
| | 900 | 103 | 6 | 675 000 | 1 460 000 | 68 500 | 149 000 | 16.7 | 480 | 560 | **69/670** | 696 | 874 | 5 | 181 |
| | 980 | 136 | 7.5 | 765 000 | 1 730 000 | 78 000 | 177 000 | 16.6 | 450 | 530 | **60/670** | 702 | 948 | 6 | 351 |
| **710** | 870 | 74 | 4 | 480 000 | 1 100 000 | 49 000 | 113 000 | 17.4 | 480 | 560 | **68/710** | 726 | 854 | 3 | 92.6 |
| | 950 | 106 | 6 | 715 000 | 1 640 000 | 72 500 | 167 000 | 16.8 | 450 | 530 | **69/710** | 736 | 924 | 5 | 208 |
| **750** | 920 | 78 | 5 | 525 000 | 1 260 000 | 53 500 | 128 000 | 17.4 | 430 | 530 | **68/750** | 770 | 900 | 4 | 110 |
| | 1 000 | 112 | 6 | 785 000 | 1 840 000 | 80 000 | 188 000 | 16.7 | 400 | 500 | **69/750** | 776 | 974 | 5 | 245 |
| **800** | 980 | 82 | 5 | 530 000 | 1 310 000 | 54 000 | 133 000 | 17.5 | 400 | 480 | **68/800** | 820 | 960 | 4 | 132 |
| | 1 060 | 115 | 6 | 825 000 | 2 050 000 | 84 500 | 209 000 | 16.8 | 380 | 450 | **69/800** | 826 | 1 034 | 5 | 275 |

**Note** (1) When heavy axial loads are applied, increase $d_a$ and decrease $D_a$ from the above values.

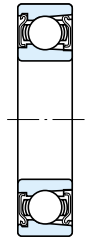
**Bore Diameter 25 – 110 mm**



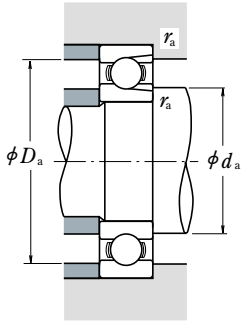

Open Type

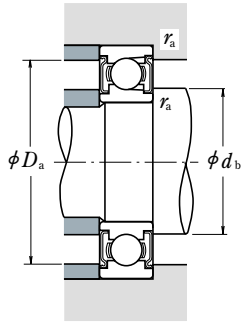


Shielded Type
(One Shield) Z



Shielded Type
(Two Shields) ZZ



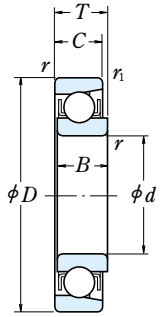




| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Open |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease Open Z · ZZ | Oil Open Z | |
| **25** | 52 | 15 | 1 | 14 400 | 10 500 | 1 470 | 1 070 | 12 000 | 15 000 | **BL 205** |
| | 62 | 17 | 1.1 | 21 500 | 15 500 | 2 200 | 1 580 | 11 000 | 13 000 | **BL 305** |
| **30** | 62 | 16 | 1 | 21 000 | 16 300 | 2 150 | 1 660 | 10 000 | 12 000 | **BL 206** |
| | 72 | 19 | 1.1 | 27 900 | 20 700 | 2 840 | 2 110 | 9 000 | 11 000 | **BL 306** |
| **35** | 72 | 17 | 1.1 | 27 800 | 22 100 | 2 830 | 2 250 | 9 000 | 11 000 | **BL 207** |
| | 80 | 21 | 1.5 | 37 000 | 29 100 | 3 800 | 2 970 | 8 000 | 9 500 | **BL 307** |
| **40** | 80 | 18 | 1.1 | 35 500 | 28 800 | 3 600 | 2 940 | 8 000 | 9 500 | **BL 208** |
| | 90 | 23 | 1.5 | 46 500 | 36 000 | 4 750 | 3 650 | 7 500 | 9 000 | **BL 308** |
| **45** | 85 | 19 | 1.1 | 37 000 | 32 000 | 3 800 | 3 250 | 7 500 | 9 000 | **BL 209** |
| | 100 | 25 | 1.5 | 55 500 | 44 000 | 5 650 | 4 500 | 6 300 | 8 000 | **BL 309** |
| **50** | 90 | 20 | 1.1 | 39 000 | 35 000 | 3 950 | 3 550 | 6 700 | 8 500 | **BL 210** |
| | 110 | 27 | 2 | 65 000 | 52 500 | 6 600 | 5 350 | 6 000 | 7 100 | **BL 310** |
| **55** | 100 | 21 | 1.5 | 48 000 | 44 000 | 4 900 | 4 500 | 6 300 | 7 500 | **BL 211** |
| | 120 | 29 | 2 | 75 000 | 61 500 | 7 650 | 6 250 | 5 600 | 6 700 | **BL 311** |
| **60** | 110 | 22 | 1.5 | 58 000 | 54 000 | 5 950 | 5 550 | 5 600 | 6 700 | **BL 212** |
| | 130 | 31 | 2.1 | 85 500 | 71 500 | 8 700 | 7 300 | 5 000 | 6 000 | **BL 312** |
| **65** | 120 | 23 | 1.5 | 63 500 | 60 000 | 6 450 | 6 150 | 5 300 | 6 300 | **BL 213** |
| | 140 | 33 | 2.1 | 103 000 | 89 500 | 10 500 | 9 150 | 4 800 | 5 600 | **BL 313** |
| **70** | 125 | 24 | 1.5 | 69 000 | 66 000 | 7 050 | 6 750 | 5 000 | 6 000 | **BL 214** |
| | 150 | 35 | 2.1 | 115 000 | 102 000 | 11 800 | 10 400 | 4 300 | 5 300 | **BL 314** |
| **75** | 130 | 25 | 1.5 | 72 000 | 72 000 | 7 350 | 7 300 | 4 500 | 5 600 | **BL 215** |
| | 160 | 37 | 2.1 | 126 000 | 116 000 | 12 800 | 11 800 | 4 000 | 5 000 | **BL 315** |
| **80** | 140 | 26 | 2 | 84 000 | 85 000 | 8 600 | 8 650 | 4 300 | 5 300 | **BL 216** |
| | 170 | 39 | 2.1 | 136 000 | 130 000 | 13 900 | 13 300 | 3 800 | 4 500 | **BL 316** |
| **85** | 150 | 28 | 2 | 93 000 | 93 000 | 9 500 | 9 450 | 4 000 | 5 000 | **BL 217** |
| | 180 | 41 | 3 | 147 000 | 145 000 | 15 000 | 14 800 | 3 600 | 4 300 | **BL 317** |
| **90** | 160 | 30 | 2 | 107 000 | 107 000 | 10 900 | 10 900 | 3 800 | 4 500 | **BL 218** |
| | 190 | 43 | 3 | 158 000 | 161 000 | 16 100 | 16 400 | 3 400 | 4 000 | **BL 318** |
| **95** | 170 | 32 | 2.1 | 121 000 | 123 000 | 12 300 | 12 500 | 3 600 | 4 300 | **BL 219** |
| | 200 | 45 | 3 | 169 000 | 178 000 | 17 300 | 18 100 | 2 800 | 3 600 | **BL 319** |
| **100** | 180 | 34 | 2.1 | 136 000 | 140 000 | 13 800 | 14 200 | 3 400 | 4 000 | **BL 220** |
| **105** | 190 | 36 | 2.1 | 148 000 | 157 000 | 15 000 | 16 000 | 3 200 | 3 800 | **BL 221** |
| **110** | 200 | 38 | 2.1 | 160 000 | 176 000 | 16 300 | 17 900 | 2 800 | 3 400 | **BL 222** |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | Mass (kg) |
|---|---|---|---|---|---|---|
| With One Shielded | With Two Shields | $d_a$ min. | $d_b$ max. | $D_a$ max. | $r_a$ max. | approx. |
| **BL 205 Z** | **BL 205 ZZ** | 30 | 32 | 47 | 1 | 0.133 |
| **BL 305 Z** | **BL 305 ZZ** | 31.5 | 36 | 55.5 | 1 | 0.246 |
| **BL 206 Z** | **BL 206 ZZ** | 35 | 38.5 | 57 | 1 | 0.215 |
| **BL 306 Z** | **BL 306 ZZ** | 36.5 | 42 | 65.5 | 1 | 0.364 |
| **BL 207 Z** | **BL 207 ZZ** | 41.5 | 44.5 | 65.5 | 1 | 0.307 |
| **BL 307 Z** | **BL 307 ZZ** | 43 | 44.5 | 72 | 1.5 | 0.486 |
| **BL 208 Z** | **BL 208 ZZ** | 46.5 | 50 | 73.5 | 1 | 0.394 |
| **BL 308 Z** | **BL 308 ZZ** | 48 | 52.5 | 82 | 1.5 | 0.685 |
| **BL 209 Z** | **BL 209 ZZ** | 51.5 | 55.5 | 78.5 | 1 | 0.449 |
| **BL 309 Z** | **BL 309 ZZ** | 53 | 61.5 | 92 | 1.5 | 0.883 |
| **BL 210 Z** | **BL 210 ZZ** | 56.5 | 60 | 83.5 | 1 | 0.504 |
| **BL 310 Z** | **BL 310 ZZ** | 59 | 68 | 101 | 2 | 1.16 |
| **BL 211 Z** | **BL 211 ZZ** | 63 | 66.5 | 92 | 1.5 | 0.667 |
| **BL 311 Z** | **BL 311 ZZ** | 64 | 72.5 | 111 | 2 | 1.49 |
| **BL 212 Z** | **BL 212 ZZ** | 68 | 74.5 | 102 | 1.5 | 0.856 |
| **BL 312 Z** | **BL 312 ZZ** | 71 | 79 | 119 | 2 | 1.88 |
| **BL 213 Z** | **BL 213 ZZ** | 73 | 80 | 112 | 1.5 | 1.09 |
| **BL 313 Z** | **BL 313 ZZ** | 76 | 85.5 | 129 | 2 | 2.36 |
| **BL 214 Z** | **BL 214 ZZ** | 78 | 84 | 117 | 1.5 | 1.19 |
| **BL 314 Z** | **BL 314 ZZ** | 81 | 92 | 139 | 2 | 2.87 |
| **BL 215 Z** | **BL 215 ZZ** | 83 | 90 | 122 | 1.5 | 1.29 |
| **BL 315 Z** | **BL 315 ZZ** | 86 | 98.5 | 149 | 2 | 3.43 |
| **BL 216 Z** | **BL 216 ZZ** | 89 | 95.5 | 131 | 2 | 1.61 |
| **BL 316 Z** | **BL 316 ZZ** | 91 | 104.5 | 159 | 2 | 4.08 |
| **BL 217 Z** | **BL 217 ZZ** | 94 | 102 | 141 | 2 | 1.97 |
| **BL 317 Z** | **BL 317 ZZ** | 98 | 110.5 | 167 | 2.5 | 4.77 |
| **BL 218 Z** | **BL 218 ZZ** | 99 | 107.5 | 151 | 2 | 2.43 |
| **BL 318 Z** | **BL 318 ZZ** | 103 | 117 | 177 | 2.5 | 5.45 |
| **BL 219 Z** | **BL 219 ZZ** | 106 | 114 | 159 | 2 | 2.95 |
| **BL 319 Z** | **BL 319 ZZ** | 108 | 124 | 187 | 2.5 | 6.4 |
| **BL 220 Z** | **BL 220 ZZ** | 111 | 121.5 | 169 | 2 | 3.54 |
| **BL 221 Z** | **BL 221 ZZ** | 116 | 127.5 | 179 | 2 | 4.23 |
| — | — | 121 | — | 189 | 2 | 4.84 |

**Remarks** When using Maximum Type Ball Bearings, please contact NSK.

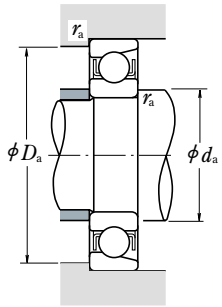
## Bore Diameter 4 – 20 mm




**Outside Diameter Tolerance (Class N)**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | Single Plane Mean Outside Diameter $\Delta_{Dmp}$ | | | |
|---|---|---|---|---|---|
| | | E Series | | EN Series | |
| Over | Incl | High | Low | High | Low |
| — | 10 | + 8 | 0 | 0 | − 8 |
| 10 | 18 | + 8 | 0 | 0 | − 8 |
| 18 | 30 | + 9 | 0 | 0 | − 9 |
| 30 | 50 | +11 | 0 | 0 | −11 |



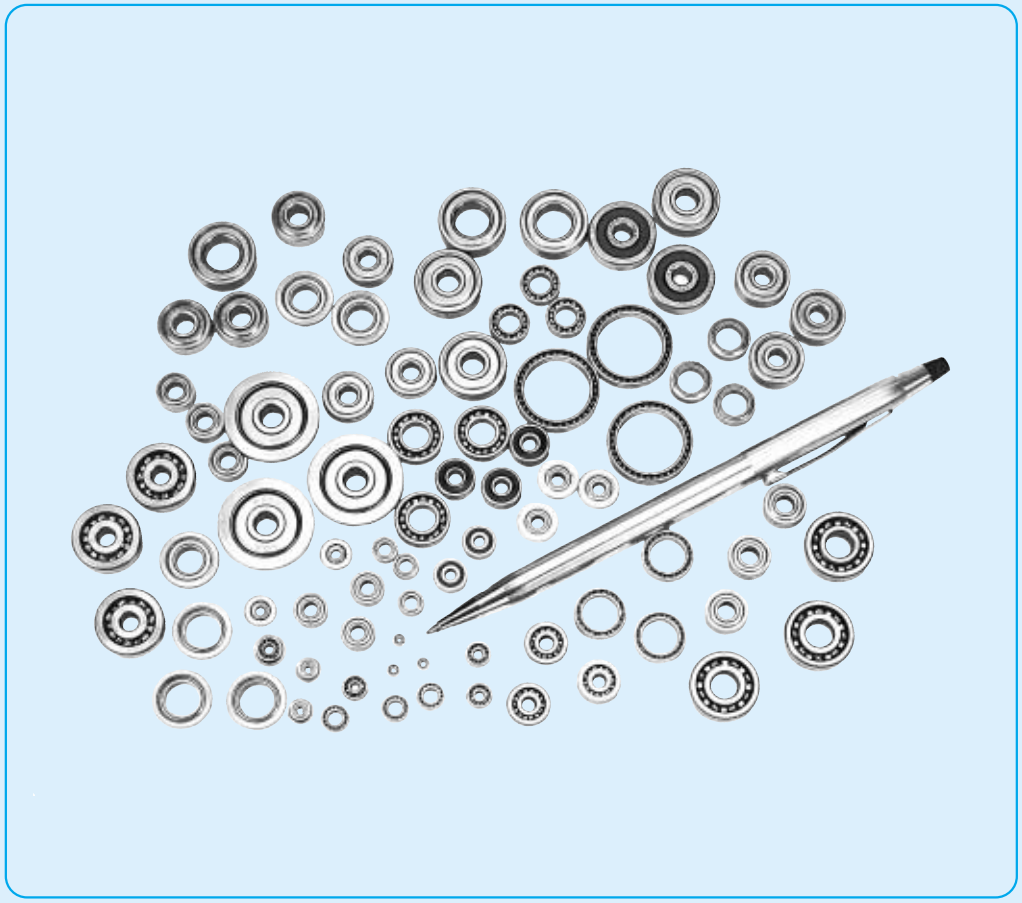

**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leq e$ | | $F_a/F_r > e$ | | $e$ |
|---|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ | |
| 1 | 0 | 0.5 | 2.5 | 0.2 |

| Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B,C,T$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | E Series | EN Series | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **4** | 16 | 5 | 0.15 | 0.1 | 1 650 | 288 | 168 | 29 | 34 000 | 40 000 | **E 4** | **EN 4** | 5.2 | 14.8 | 0.15 | 0.005 |
| **5** | 16 | 5 | 0.15 | 0.1 | 1 650 | 288 | 168 | 29 | 34 000 | 40 000 | **E 5** | **EN 5** | 6.2 | 14.8 | 0.15 | 0.004 |
| **6** | 21 | 7 | 0.3 | 0.15 | 2 490 | 445 | 254 | 46 | 30 000 | 36 000 | **E 6** | **EN 6** | 8 | 19 | 0.3 | 0.011 |
| **7** | 22 | 7 | 0.3 | 0.15 | 2 490 | 445 | 254 | 46 | 30 000 | 36 000 | **E 7** | **EN 7** | 9 | 20 | 0.3 | 0.013 |
| **8** | 24 | 7 | 0.3 | 0.15 | 3 450 | 650 | 350 | 66 | 28 000 | 34 000 | **E 8** | **EN 8** | 10 | 22 | 0.3 | 0.014 |
| **9** | 28 | 8 | 0.3 | 0.15 | 4 550 | 880 | 465 | 90 | 24 000 | 30 000 | **E 9** | **EN 9** | 11 | 26 | 0.3 | 0.022 |
| **10** | 28 | 8 | 0.3 | 0.15 | 4 550 | 880 | 465 | 90 | 24 000 | 30 000 | **E 10** | **EN 10** | 12 | 26 | 0.3 | 0.021 |
| **11** | 32 | 7 | 0.3 | 0.15 | 4 400 | 845 | 450 | 86 | 22 000 | 26 000 | **E 11** | **EN 11** | 13 | 30 | 0.3 | 0.029 |
| **12** | 32 | 7 | 0.3 | 0.15 | 4 400 | 845 | 450 | 86 | 22 000 | 26 000 | **E 12** | **EN 12** | 14 | 30 | 0.3 | 0.028 |
| **13** | 30 | 7 | 0.3 | 0.15 | 4 400 | 845 | 450 | 86 | 22 000 | 26 000 | **E 13** | **EN 13** | 15 | 28 | 0.3 | 0.021 |
| **14** | 35 | 8 | 0.3 | 0.15 | 5 800 | 1 150 | 590 | 117 | 19 000 | 22 000 | — | **EN 14** | 16 | 33 | 0.3 | 0.035 |
| **15** | 35 | 8 | 0.3 | 0.15 | 5 800 | 1 150 | 590 | 117 | 19 000 | 22 000 | **E 15** | **EN 15** | 17 | 33 | 0.3 | 0.034 |
| | 40 | 10 | 0.6 | 0.3 | 7 400 | 1 500 | 750 | 153 | 17 000 | 20 000 | **BO 15** | — | 19 | 36 | 0.6 | 0.055 |
| **16** | 38 | 10 | 0.6 | 0.2 | 6 900 | 1 380 | 705 | 141 | 17 000 | 22 000 | — | **EN 16** | 20 | 34 | 0.6 | 0.049 |
| **17** | 40 | 10 | 0.6 | 0.3 | 7 400 | 1 500 | 750 | 153 | 17 000 | 20 000 | **L 17** | — | 21 | 36 | 0.6 | 0.051 |
| | 44 | 11 | 0.6 | 0.3 | 7 350 | 1 500 | 750 | 153 | 16 000 | 19 000 | — | **EN 17** | 21 | 40 | 0.6 | 0.080 |
| | 44 | 11 | 0.6 | 0.3 | 7 350 | 1 500 | 750 | 153 | 16 000 | 19 000 | **BO 17** | — | 21 | 40 | 0.6 | 0.080 |
| **18** | 40 | 9 | 0.6 | 0.2 | 5 050 | 1 030 | 515 | 105 | 17 000 | 20 000 | — | **EN 18** | 22 | 36 | 0.6 | 0.051 |
| **19** | 40 | 9 | 0.6 | 0.2 | 5 050 | 1 030 | 515 | 105 | 17 000 | 20 000 | **E 19** | **EN 19** | 23 | 36 | 0.6 | 0.049 |
| **20** | 47 | 12 | 1 | 0.6 | 11 000 | 2 380 | 1 120 | 243 | 14 000 | 17 000 | **E 20** | **EN 20** | 25 | 42 | 1 | 0.089 |
| | 47 | 14 | 1 | 0.6 | 11 000 | 2 380 | 1 120 | 243 | 14 000 | 17 000 | **L 20** | — | 25 | 42 | 1 | 0.101 |

**Remarks** 1. The outside diameters of Magneto Bearings Series E always have plus tolerances.
2. When using Magneto Bearings other than E, please contact NSK.



# EXTRA SMALL BALL BEARINGS AND MINIATURE BALL BEARINGS

## EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS


Metric Design — Bore Diameter 1 – 9mm ····· B34
With Flange — Bore Diameter 1 – 9mm ····· B38
Inch Design — Bore Diameter 1.016 – 9.525mm ····· B42
With Flange — Bore Diameter 1.191 – 9.525mm ····· B44


## DESIGN AND TYPES

The size ranges of extra small and miniature ball bearings are shown in Table 1. The design, types, and type symbols are shown in Table 2. Those types among them that are listed in the bearing tables are indicated by the shading ▬ in Table 2.

**Table 1 Size Ranges of Bearings**

Units : mm

| Design | Extra Small Ball Bearings | Miniature Ball Bearings |
|---|---|---|
| Metric | Outside diameter $D \geqq 9$<br>Bore diameter $d < 10$ | Outside diameter $D < 9$ |
| Inch | Outside diameter $D \geqq 9.525$<br>Bore diameter $d < 10$ | Outside diameter $D < 9.525$ |

Please refer to NSK Miniature Ball Bearings (CAT. No. E126) for details.

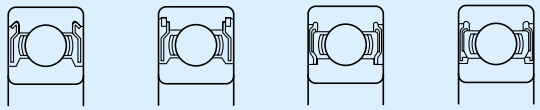
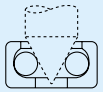
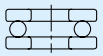


**Table 2 Design, Types, and Type Symbols**

| Design · Types | | Type Symbols: Metric | Type Symbols: Inch | Type Symbols: Special Metric | Type Symbols: Special Inch | Remarks |
|---|---|---|---|---|---|---|
| Single-Row Deep Groove Ball Bearings | | 6○○ | R | MR | — | Shielded · sealed bearings are available. |
| | Thin section | — | — | SMT | — | |
| | With flange | F6○○ | FR | MF | — | Shielded · sealed bearings are available. |
| | Extended inner ring | — | — | — | RW | Shielded bearings are available. |
| | With flange and extended inner ring | — | — | — | FRW | Shielded bearings are available. |
| | For synchro motors | — | — | — | SR00X00 | Shielded bearings are available. |
| Pivot Ball Bearings |  | — | — | BCF | — | |
| Thrust Ball Bearings |  | — | — | F | — | |

**Remarks** Single-row angular contact ball bearings are available besides those shown above.





## TOLERANCES AND RUNNING ACCURACY

**METRIC DESIGN BEARINGS** ·····Table 8.2(Pages A60 to A63)

The flange tolerances for metric design bearings are listed in Table 3.

**Table 3 Flange Tolerances for Metric Flanged Bearings**

(1) Tolerances of Flange Outside Diameter Units : μm

| Nominal Flange Outside Diameter $D_1$(mm) over | incl | Deviation of Flange Outside Diameter $\Delta_{D_{1s}}$ ① high | ① low | ② high | ② low |
|---|---|---|---|---|---|
| | 10 | +220 | –36 | 0 | –36 |
| 10 | 18 | +270 | –43 | 0 | –43 |
| 18 | 30 | +330 | –52 | 0 | –52 |

**Remarks** ②is applied when the flange outside diameter is used for positioning.

(2) Flange Width Tolerances and Running Accuracies Related to Flange Units : μm

| Nominal Bearing Outside Diameter $D$ (mm) over | incl | Deviation of Flange Width $\Delta_{C_{1s}}$ high | low | Variation of Flange Width $\Delta_{C_{1s}}$ $VC_{1s}$ Normal and class 6 | Class 5 | Class 4 | Class 2 | Variation of Bearing Outside Surface Generatrix Inclination with Flange Backface $S_{D1}$ Class 5 | Class 4 | Class 2 | Flange Backface Runout with Raceway $S_{ea1}$ Class 5 | Class 4 | Class 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal and Classes 6,5,4,2 | | | | | | | | | | | |
| | | | | max. | | | | max. | | | max. | | |
| 2.5(1) | 6 | Use the $\Delta_{B_s}$ tolerance for $d$ of the same bearing of the same class | | Use the $\Delta_{V_{BS}}$ tolerance for $d$ of the same bearing of the same class | 5 | 2.5 | 1.5 | 8 | 4 | 1.5 | 11 | 7 | 3 |
| 6 | 18 | | | | 5 | 2.5 | 1.5 | 8 | 4 | 1.5 | 11 | 7 | 3 |
| 18 | 30 | | | | 5 | 2.5 | 1.5 | 8 | 4 | 1.5 | 11 | 7 | 3 |

**Notes** (1) 2.5mm is included

**INCH DESIGN BEARINGS**·····Table 8.2 (Pages A60 to A63)

The flange tolerances for inch design flanged bearings are listed in Table 8.8(2) (Pages A76 and A77).

**INSTRUMENT BALL BEARINGS**·····Table 8.8 (Pages A76 to A77)

## RECOMMENDED FITS

Please refer to NSK Miniature Ball Bearings (CAT.No.E126).

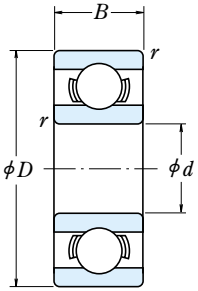
## INTERNAL CLEARANCES ·····Table 9.10 (Page A89)

## LIMITING SPEEDS

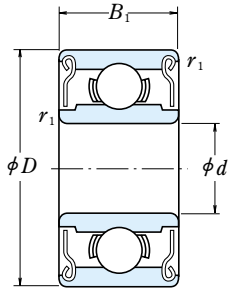
The limiting speeds listed in the bearing tables should be adjusted depending on the bearing toad conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

**Metric Design**

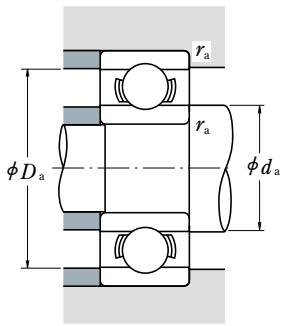
**Bore Diameter 1 – 4 mm**

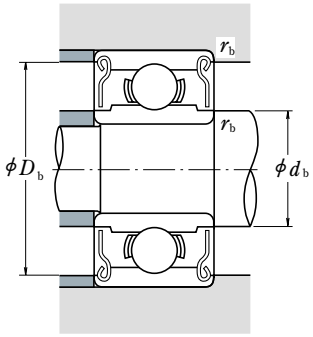



Open Type




Shielded Type
ZZ · ZZ1




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Open |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $B_1$ | $r$ (1) min. | $r_1$(1) min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease Open Z · ZZ | Oil Open Z | |
| **1** | 3 | 1 | — | 0.05 | — | 80 | 23 | 8 | 2.5 | 130 000 | 150 000 | **681** |
| | 3 | 1.5 | — | 0.05 | — | 80 | 23 | 8 | 2.5 | 130 000 | 150 000 | **MR 31** |
| | 4 | 1.6 | — | 0.1 | — | 138 | 35 | 14 | 3.5 | 100 000 | 120 000 | **691** |
| **1.2** | 4 | 1.8 | 2.5 | 0.1 | 0.1 | 138 | 35 | 14 | 3.5 | 110 000 | 130 000 | **MR 41 X** |
| **1.5** | 4 | 1.2 | 2 | 0.05 | 0.05 | 112 | 33 | 11 | 3.5 | 100 000 | 120 000 | **681 X** |
| | 5 | 2 | 2.6 | 0.15 | 0.15 | 237 | 69 | 24 | 7 | 85 000 | 100 000 | **691 X** |
| | 6 | 2.5 | 3 | 0.15 | 0.15 | 330 | 98 | 34 | 10 | 75 000 | 90 000 | **601 X** |
| **2** | 5 | 1.5 | 2.3 | 0.08 | 0.08 | 169 | 50 | 17 | 5 | 85 000 | 100 000 | **682** |
| | 5 | 2 | 2.5 | 0.1 | 0.1 | 187 | 58 | 19 | 6 | 85 000 | 100 000 | **MR 52 B** |
| | 6 | 2.3 | 3 | 0.15 | 0.15 | 330 | 98 | 34 | 10 | 75 000 | 90 000 | **692** |
| | 6 | 2.5 | 2.5 | 0.15 | 0.15 | 330 | 98 | 34 | 10 | 75 000 | 90 000 | **MR 62** |
| | 7 | 2.5 | 3 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 | **MR 72** |
| | 7 | 2.8 | 3.5 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 | **602** |
| **2.5** | 6 | 1.8 | 2.6 | 0.08 | 0.08 | 208 | 74 | 21 | 7.5 | 71 000 | 80 000 | **682 X** |
| | 7 | 2.5 | 3.5 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 | **692 X** |
| | 8 | 2.5 | — | 0.2 | — | 560 | 179 | 57 | 18 | 60 000 | 67 000 | **MR 82 X** |
| | 8 | 2.8 | 4 | 0.15 | 0.15 | 550 | 175 | 56 | 18 | 60 000 | 71 000 | **602 X** |
| **3** | 6 | 2 | 2.5 | 0.1 | 0.1 | 208 | 74 | 21 | 7.5 | 71 000 | 80 000 | **MR 63** |
| | 7 | 2 | 3 | 0.1 | 0.1 | 390 | 130 | 40 | 13 | 63 000 | 75 000 | **683 A** |
| | 8 | 2.5 | — | 0.15 | — | 560 | 179 | 57 | 18 | 60 000 | 67 000 | **MR 83** |
| | 8 | 3 | 4 | 0.15 | 0.15 | 560 | 179 | 57 | 18 | 60 000 | 67 000 | **693** |
| | 9 | 2.5 | 4 | 0.2 | 0.15 | 570 | 187 | 58 | 19 | 56 000 | 67 000 | **MR 93** |
| | 9 | 3 | 5 | 0.15 | 0.15 | 570 | 187 | 58 | 19 | 56 000 | 67 000 | **603** |
| | 10 | 4 | 4 | 0.15 | 0.15 | 630 | 218 | 64 | 22 | 50 000 | 60 000 | **623** |
| | 13 | 5 | 5 | 0.2 | 0.2 | 1 300 | 485 | 133 | 49 | 40 000 | 48 000 | **633** |
| **4** | 7 | 2 | — | 0.1 | — | 310 | 115 | 32 | 12 | 60 000 | 67 000 | **MR 74** |
| | 7 | — | 2.5 | — | 0.1 | 255 | 107 | 26 | 11 | 60 000 | 71 000 | — |
| | 8 | 2 | 3 | 0.15 | 0.1 | 395 | 139 | 40 | 14 | 56 000 | 67 000 | **MR 84** |
| | 9 | 2.5 | 4 | (0.15) | (0.15) | 640 | 225 | 65 | 23 | 53 000 | 63 000 | **684 A** |
| | 10 | 3 | 4 | 0.2 | 0.15 | 710 | 270 | 73 | 28 | 50 000 | 60 000 | **MR 104 B** |
| | 11 | 4 | 4 | 0.15 | 0.15 | 960 | 345 | 98 | 35 | 48 000 | 56 000 | **694** |
| | 12 | 4 | 4 | 0.2 | 0.2 | 960 | 345 | 98 | 35 | 48 000 | 56 000 | **604** |
| | 13 | 5 | 5 | 0.2 | 0.2 | 1 300 | 485 | 133 | 49 | 40 000 | 48 000 | **624** |
| | 16 | 5 | 5 | 0.3 | 0.3 | 1 730 | 670 | 177 | 68 | 36 000 | 43 000 | **634** |

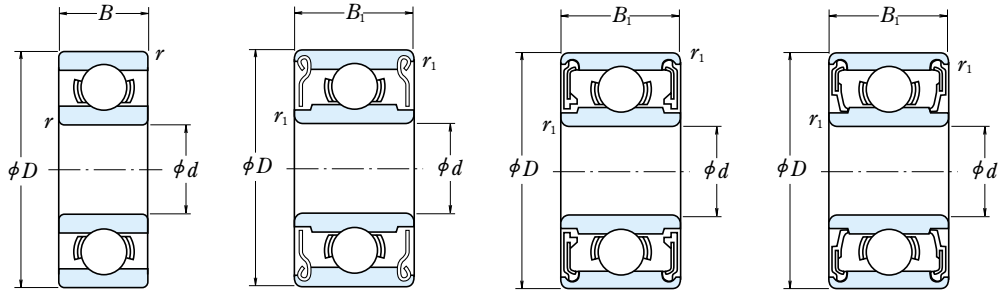
| Bearing Numbers | | | Abutment and Fillet Dimensions (mm) | | | | | | Mass (g) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Shielded | Sealed | | $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. Open | Shielded |
| — | — | — | 1.4 | — | 2.6 | — | 0.05 | — | 0.03 | — |
| — | — | — | 1.4 | — | 2.6 | — | 0.05 | — | 0.04 | — |
| — | — | — | 1.8 | — | 3.2 | — | 0.1 | — | 0.09 | — |
| **MR 41 XZZ** | — | — | 2.0 | 1.9 | 3.2 | 3.5 | 0.1 | 0.1 | 0.10 | 0.14 |
| **681 XZZ** | — | — | 1.9 | 2.1 | 3.6 | 3.6 | 0.05 | 0.05 | 0.07 | 0.11 |
| **691 XZZ** | — | — | 2.7 | 2.5 | 3.8 | 4.3 | 0.15 | 0.15 | 0.17 | 0.20 |
| **601 XZZ** | — | — | 2.7 | 3.0 | 4.8 | 5.4 | 0.15 | 0.15 | 0.33 | 0.38 |
| **682 ZZ** | — | — | 2.6 | 2.7 | 4.4 | 4.2 | 0.08 | 0.08 | 0.12 | 0.17 |
| **MR 52 BZZ** | — | — | 2.8 | 2.7 | 4.2 | 4.4 | 0.1 | 0.1 | 0.16 | 0.23 |
| **692 ZZ** | — | — | 3.2 | 3.0 | 4.8 | 5.4 | 0.15 | 0.15 | 0.28 | 0.38 |
| **MR 62 ZZ** | — | — | 3.2 | 3.0 | 4.8 | 5.2 | 0.15 | 0.15 | 0.30 | 0.29 |
| **MR 72 ZZ** | — | — | 3.2 | 3.8 | 5.8 | 6.2 | 0.15 | 0.15 | 0.45 | 0.49 |
| **602 ZZ** | — | — | 3.2 | 3.8 | 5.8 | 6.2 | 0.15 | 0.15 | 0.51 | 0.58 |
| **682 XZZ** | — | — | 3.1 | 3.7 | 5.4 | 5.4 | 0.08 | 0.08 | 0.23 | 0.29 |
| **692 XZZ** | — | — | 3.7 | 3.8 | 5.8 | 6.2 | 0.15 | 0.15 | 0.41 | 0.55 |
| — | — | — | 4.1 | — | 6.4 | — | 0.2 | — | 0.56 | — |
| **602 XZZ** | — | — | 3.7 | 4.1 | 6.8 | 7.0 | 0.15 | 0.15 | 0.63 | 0.83 |
| **MR 63 ZZ** | — | — | 3.8 | 3.7 | 5.2 | 5.4 | 0.1 | 0.1 | 0.20 | 0.27 |
| **683 AZZ** | — | — | 3.8 | 4.0 | 6.2 | 6.4 | 0.1 | 0.1 | 0.32 | 0.45 |
| — | — | — | 4.2 | — | 6.8 | — | 0.15 | — | 0.54 | — |
| **693 ZZ** | — | — | 4.2 | 4.3 | 6.8 | 7.3 | 0.15 | 0.15 | 0.61 | 0.83 |
| **MR 93 ZZ** | — | — | 4.6 | 4.3 | 7.4 | 7.9 | 0.2 | 0.15 | 0.73 | 1.18 |
| **603 ZZ** | — | — | 4.2 | 4.3 | 7.8 | 7.9 | 0.15 | 0.15 | 0.87 | 1.45 |
| **623 ZZ** | — | — | 4.2 | 4.3 | 8.8 | 8.0 | 0.15 | 0.15 | 1.65 | 1.66 |
| **633 ZZ** | — | — | 4.6 | 6.0 | 11.4 | 11.3 | 0.2 | 0.2 | 3.38 | 3.33 |
| — | — | — | 4.8 | — | 6.2 | — | 0.1 | — | 0.22 | — |
| **MR 74 ZZ** | — | — | — | 4.8 | — | 6.3 | — | 0.1 | — | 0.29 |
| **MR 84 ZZ** | — | — | 5.2 | 5.0 | 6.8 | 7.4 | 0.15 | 0.1 | 0.36 | 0.56 |
| **684 AZZ** | — | — | 4.8 | 5.2 | 8.2 | 8.1 | 0.1 | 0.1 | 0.63 | 1.01 |
| **MR 104 BZZ** | — | — | 5.6 | 5.9 | 8.4 | 8.8 | 0.2 | 0.15 | 1.04 | 1.42 |
| **694 ZZ** | — | — | 5.2 | 5.6 | 9.8 | 9.9 | 0.15 | 0.15 | 1.7 | 1.75 |
| **604 ZZ** | — | — | 5.6 | 5.6 | 10.4 | 9.9 | 0.2 | 0.2 | 2.25 | 2.29 |
| **624 ZZ** | — | — | 5.6 | 6.0 | 11.4 | 11.3 | 0.2 | 0.2 | 3.03 | 3.04 |
| **634 ZZ1** | — | — | 6.0 | 7.5 | 14.0 | 13.8 | 0.3 | 0.3 | 5.24 | 5.21 |

**Note** (1) The values in parentheses are not based on ISO 15.

**Remark** 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

**Metric Design**

**Bore Diameter 5 – 9 mm**

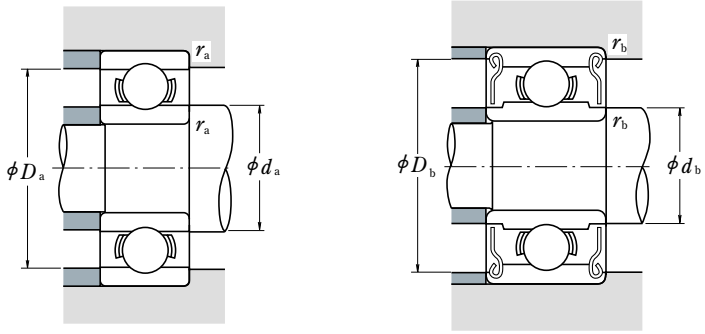



Open Type

Shielded Type
ZZ · ZZ1

Non-Contact
Sealed Type
VV

Contact
Sealed Type
DD




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) Grease | | Oil | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d | D | B | $B_1$ | r(1) min. | $r_1$(1) min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Open Z · ZZ V · VV | D · DD | Open Z | Open |
| 5 | 8 | 2 | — | 0.1 | — | 310 | 120 | 31 | 12 | 53 000 | — | 63 000 | MR 85 |
| | 8 | — | 2.5 | — | 0.1 | 278 | 131 | 28 | 13 | 53 000 | — | 63 000 | — |
| | 9 | 2.5 | 3 | 0.15 | 0.15 | 430 | 168 | 44 | 17 | 50 000 | — | 60 000 | MR 95 |
| | 10 | 3 | 4 | 0.15 | 0.15 | 430 | 168 | 44 | 17 | 50 000 | — | 60 000 | MR 105 |
| | 11 | — | 4 | — | 0.15 | 715 | 276 | 73 | 28 | 48 000 | — | 56 000 | — |
| | 11 | 3 | 5 | 0.15 | 0.15 | 715 | 281 | 73 | 29 | 45 000 | — | 53 000 | 685 |
| | 13 | 4 | 4 | 0.2 | 0.2 | 1 080 | 430 | 110 | 44 | 43 000 | 40 000 | 50 000 | 695 |
| | 14 | 5 | 5 | 0.2 | 0.2 | 1 330 | 505 | 135 | 52 | 40 000 | 38 000 | 50 000 | 605 |
| | 16 | 5 | 5 | 0.3 | 0.3 | 1 730 | 670 | 177 | 68 | 36 000 | 32 000 | 43 000 | 625 |
| | 19 | 6 | 6 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 32 000 | 30 000 | 40 000 | 635 |
| 6 | 10 | 2.5 | 3 | 0.15 | 0.1 | 495 | 218 | 51 | 22 | 45 000 | — | 53 000 | MR 106 |
| | 12 | 3 | 4 | 0.2 | 0.15 | 715 | 292 | 73 | 30 | 43 000 | 40 000 | 50 000 | MR 126 |
| | 13 | 3.5 | 5 | 0.15 | 0.15 | 1 080 | 440 | 110 | 45 | 40 000 | 38 000 | 50 000 | 686 A |
| | 15 | 5 | 5 | 0.2 | 0.2 | 1 730 | 670 | 177 | 68 | 40 000 | 36 000 | 45 000 | 696 |
| | 17 | 6 | 6 | 0.3 | 0.3 | 2 260 | 835 | 231 | 85 | 38 000 | 34 000 | 45 000 | 606 |
| | 19 | 6 | 6 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 32 000 | 30 000 | 40 000 | 626 |
| | 22 | 7 | 7 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 30 000 | 28 000 | 36 000 | 636 |
| 7 | 11 | 2.5 | 3 | 0.15 | 0.1 | 455 | 201 | 47 | 21 | 43 000 | — | 50 000 | MR 117 |
| | 13 | 3 | 4 | 0.2 | 0.15 | 540 | 276 | 55 | 28 | 40 000 | — | 48 000 | MR 137 |
| | 14 | 3.5 | 5 | 0.15 | 0.15 | 1 170 | 510 | 120 | 52 | 40 000 | 34 000 | 45 000 | 687 |
| | 17 | 5 | 5 | 0.3 | 0.3 | 1 610 | 710 | 164 | 73 | 36 000 | 28 000 | 43 000 | 697 |
| | 19 | 6 | 6 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 36 000 | 32 000 | 43 000 | 607 |
| | 22 | 7 | 7 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 30 000 | 28 000 | 36 000 | 627 |
| | 26 | 9 | 9 | 0.3 | 0.3 | 4 550 | 1 970 | 465 | 201 | 28 000 | 22 000 | 34 000 | 637 |
| 8 | 12 | 2.5 | 3.5 | 0.15 | 0.1 | 545 | 274 | 56 | 28 | 40 000 | — | 48 000 | MR 128 |
| | 14 | 3.5 | 4 | 0.2 | 0.15 | 820 | 385 | 83 | 39 | 38 000 | 32 000 | 45 000 | MR 148 |
| | 16 | 4 | 5 | 0.2 | 0.2 | 1 610 | 710 | 164 | 73 | 36 000 | 28 000 | 43 000 | 688 A |
| | 19 | 6 | 6 | 0.3 | 0.3 | 2 240 | 910 | 228 | 93 | 36 000 | 28 000 | 43 000 | 698 |
| | 22 | 7 | 7 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 34 000 | 28 000 | 40 000 | 608 |
| | 24 | 8 | 8 | 0.3 | 0.3 | 3 350 | 1 430 | 340 | 146 | 28 000 | 24 000 | 34 000 | 628 |
| | 28 | 9 | 9 | 0.3 | 0.3 | 4 550 | 1 970 | 465 | 201 | 28 000 | 22 000 | 34 000 | 638 |
| 9 | 17 | 4 | 5 | 0.2 | 0.2 | 1 330 | 665 | 136 | 68 | 36 000 | 24 000 | 43 000 | 689 |
| | 20 | 6 | 6 | 0.3 | 0.3 | 1 720 | 840 | 175 | 86 | 34 000 | 24 000 | 40 000 | 699 |
| | 24 | 7 | 7 | 0.3 | 0.3 | 3 350 | 1 430 | 340 | 146 | 32 000 | 24 000 | 38 000 | 609 |
| | 26 | 8 | 8 | (0.6) | (0.6) | 4 550 | 1 970 | 465 | 201 | 28 000 | 22 000 | 34 000 | 629 |
| | 30 | 10 | 10 | 0.6 | 0.6 | 5 100 | 2 390 | 520 | 244 | 24 000 | — | 30 000 | 639 |

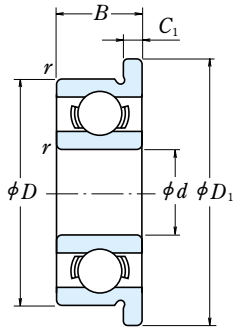
| Bearing Numbers | | | Abutment and Fillet Dimensions (mm) | | | | | | Mass (g) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Shielded | Sealed | | $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. Open | Shielded |
| — | — | — | 5.8 | — | 7.2 | — | 0.1 | — | 0.26 | — |
| MR 85 ZZ | — | — | — | 5.8 | — | 7.4 | — | 0.1 | — | 0.34 |
| MR 95 ZZ1 | — | — | 6.2 | 6.0 | 7.8 | 8.2 | 0.15 | 0.15 | 0.50 | 0.58 |
| MR 105 ZZ | — | — | 6.2 | 6.0 | 8.8 | 8.4 | 0.15 | 0.15 | 0.95 | 1.29 |
| MR 115 ZZ | VV | — | — | 6.3 | — | 9.8 | — | 0.15 | — | 1.49 |
| 685 ZZ | — | — | 6.2 | 6.2 | 9.8 | 9.9 | 0.15 | 0.15 | 1.2 | 1.96 |
| 695 ZZ | VV | DD | 6.6 | 6.6 | 11.4 | 11.2 | 0.2 | 0.2 | 2.45 | 2.5 |
| 605 ZZ | — | DD | 6.6 | 6.9 | 12.4 | 12.2 | 0.2 | 0.2 | 3.54 | 3.48 |
| 625 ZZ1 | VV | DD | 7.0 | 7.5 | 14.0 | 13.8 | 0.3 | 0.3 | 4.95 | 4.86 |
| 635 ZZ1 | VV | DD | 7.0 | 8.5 | 17.0 | 16.5 | 0.3 | 0.3 | 8.56 | 8.34 |
| MR 106 ZZ1 | — | — | 7.2 | 7.0 | 8.8 | 9.3 | 0.15 | 0.1 | 0.56 | 0.68 |
| MR 126 ZZ | — | DD | 7.6 | 7.2 | 10.4 | 10.9 | 0.2 | 0.15 | 1.27 | 1.74 |
| 686 AZZ | VV | DD | 7.2 | 7.4 | 11.8 | 11.7 | 0.15 | 0.15 | 1.91 | 2.69 |
| 696 ZZ1 | VV | DD | 7.6 | 7.9 | 13.4 | 13.3 | 0.2 | 0.2 | 3.88 | 3.72 |
| 606 ZZ | VV | DD | 8.0 | 8.2 | 15.0 | 14.8 | 0.3 | 0.3 | 5.97 | 6.08 |
| 626 ZZ1 | VV | DD | 8.0 | 8.5 | 17.0 | 16.5 | 0.3 | 0.3 | 8.15 | 7.94 |
| 636 ZZ | VV | DD | 8.0 | 10.5 | 20.0 | 19.0 | 0.3 | 0.3 | 14 | 14 |
| MR 117 ZZ | — | — | 8.2 | 8.0 | 9.8 | 10.5 | 0.15 | 0.1 | 0.62 | 0.72 |
| MR 137 ZZ | — | — | 8.6 | 9.0 | 11.4 | 11.6 | 0.2 | 0.15 | 1.58 | 2.02 |
| 687 ZZ1 | VV | DD | 8.2 | 8.5 | 12.8 | 12.7 | 0.15 | 0.15 | 2.13 | 2.97 |
| 697 ZZ1 | VV | DD | 9.0 | 10.2 | 15.0 | 14.8 | 0.3 | 0.3 | 5.26 | 5.12 |
| 607 ZZ1 | VV | DD | 9.0 | 9.1 | 17.0 | 16.5 | 0.3 | 0.3 | 7.67 | 7.51 |
| 627 ZZ | VV | DD | 9.0 | 10.5 | 20.0 | 19.0 | 0.3 | 0.3 | 12.7 | 12.9 |
| 637 ZZ1 | VV | DD | 9.0 | 12.8 | 24.0 | 22.8 | 0.3 | 0.3 | 24 | 25 |
| MR 128 ZZ1 | — | — | 9.2 | 9.0 | 10.8 | 11.3 | 0.15 | 0.1 | 0.71 | 0.97 |
| MR 148 ZZ | VV | DD | 9.6 | 9.2 | 12.4 | 12.8 | 0.2 | 0.15 | 1.86 | 2.16 |
| 688 AZZ1 | VV | DD | 9.6 | 10.2 | 14.4 | 14.2 | 0.2 | 0.2 | 3.12 | 4.02 |
| 698 ZZ | VV | DD | 10.0 | 10.0 | 17.0 | 16.5 | 0.3 | 0.3 | 7.23 | 7.18 |
| 608 ZZ | VV | DD | 10.0 | 10.5 | 20.0 | 19.0 | 0.3 | 0.3 | 12.1 | 12.2 |
| 628 ZZ | VV | DD | 10.0 | 12.0 | 22.0 | 20.5 | 0.3 | 0.3 | 17.2 | 17.4 |
| 638 ZZ1 | VV | DD | 10.0 | 12.8 | 26.0 | 22.8 | 0.3 | 0.3 | 28.3 | 28.6 |
| 689 ZZ1 | VV | DD | 10.6 | 11.5 | 15.4 | 15.2 | 0.2 | 0.2 | 3.53 | 4.43 |
| 699 ZZ1 | VV | DD | 11.0 | 12.0 | 18.0 | 17.2 | 0.3 | 0.3 | 8.45 | 8.33 |
| 609 ZZ | VV | DD | 11.0 | 12.0 | 22.8 | 20.5 | 0.3 | 0.3 | 14.5 | 14.7 |
| 629 ZZ | VV | DD | 11.0 | 12.8 | 24.0 | 22.8 | 0.3 | 0.3 | 19.5 | 19.3 |
| 639 ZZ | VV | — | 13.0 | 16.1 | 26.0 | 25.6 | 0.6 | 0.6 | 36.5 | 36 |

**Note** (1) The values in parentheses are not based on ISO 15.

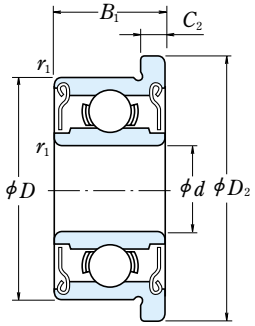
**Remarks** 1. When using bearings with a rotating outer ring, please contact NSK if they are sealed or shielded.

2. Bearings with snap rings are also available, please contact NSK.

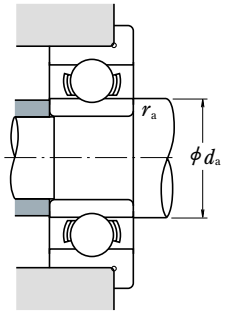
## Metric Design With Flange
## Bore Diameter 1 – 4 mm

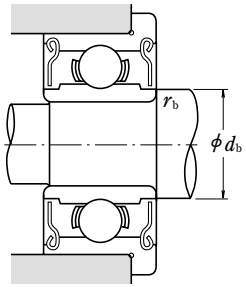



Open Type




Shielded Type
ZZ · ZZ1



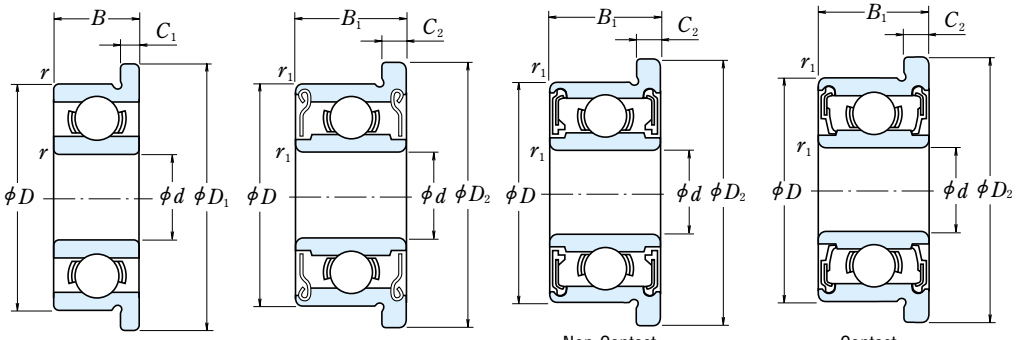

| Boundary Dimensions (mm) | | | | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $D_1$ | $D_2$ | $B$ | $B_1$ | $C_1$ | $C_2$ | $r$(1) min. | $r_1$(1) min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease Open Z · ZZ | Oil Open Z |
| **1** | 3 | 3.8 | — | 1 | — | 0.3 | — | 0.05 | — | 80 | 23 | 8 | 2.5 | 130 000 | 150 000 |
| | 4 | 5 | — | 1.6 | — | 0.5 | — | 0.1 | — | 140 | 36 | 14 | 3.5 | 100 000 | 120 000 |
| **1.2** | 4 | 4.8 | — | 1.8 | — | 0.4 | — | 0.1 | — | 138 | 35 | 14 | 3.5 | 110 000 | 130 000 |
| **1.5** | 4 | 5 | 5 | 1.2 | 2 | 0.4 | 0.6 | 0.05 | 0.05 | 112 | 33 | 11 | 3.5 | 100 000 | 120 000 |
| | 5 | 6.5 | 6.5 | 2 | 2.6 | 0.6 | 0.8 | 0.15 | 0.15 | 237 | 69 | 24 | 7 | 85 000 | 100 000 |
| | 6 | 7.5 | 7.5 | 2.5 | 3 | 0.6 | 0.8 | 0.15 | 0.15 | 330 | 98 | 34 | 10 | 75 000 | 90 000 |
| **2** | 5 | 6.1 | 6.1 | 1.5 | 2.3 | 0.5 | 0.6 | 0.08 | 0.08 | 169 | 50 | 17 | 5 | 85 000 | 100 000 |
| | 5 | 6.2 | 6.2 | 2 | 2.5 | 0.6 | 0.6 | 0.1 | 0.1 | 187 | 58 | 19 | 6 | 85 000 | 100 000 |
| | 6 | 7.5 | 7.5 | 2.3 | 3 | 0.6 | 0.8 | 0.15 | 0.15 | 330 | 98 | 34 | 10 | 75 000 | 90 000 |
| | 6 | 7.2 | — | 2.5 | — | 0.6 | — | 0.15 | — | 330 | 98 | 34 | 10 | 75 000 | 90 000 |
| | 7 | 8.2 | 8.2 | 2.5 | 3 | 0.6 | 0.6 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 |
| | 7 | 8.5 | 8.5 | 2.8 | 3.5 | 0.7 | 0.9 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 |
| **2.5** | 6 | 7.1 | 7.1 | 1.8 | 2.6 | 0.5 | 0.8 | 0.08 | 0.08 | 208 | 74 | 21 | 7.5 | 71 000 | 80 000 |
| | 7 | 8.5 | 8.5 | 2.5 | 3.5 | 0.7 | 0.9 | 0.15 | 0.15 | 385 | 127 | 39 | 13 | 63 000 | 75 000 |
| | 8 | 9.2 | — | 2.5 | — | 0.6 | — | 0.2 | — | 560 | 179 | 57 | 18 | 60 000 | 67 000 |
| | 8 | 9.5 | 9.5 | 2.8 | 4 | 0.7 | 0.9 | 0.15 | 0.15 | 550 | 175 | 56 | 18 | 60 000 | 71 000 |
| **3** | 6 | 7.2 | 7.2 | 2 | 2.5 | 0.6 | 0.6 | 0.1 | 0.1 | 208 | 74 | 21 | 7.5 | 71 000 | 80 000 |
| | 7 | 8.1 | 8.1 | 2 | 3 | 0.5 | 0.8 | 0.1 | 0.1 | 390 | 130 | 40 | 13 | 63 000 | 75 000 |
| | 8 | 9.2 | — | 2.5 | — | 0.6 | — | 0.15 | — | 560 | 179 | 57 | 18 | 60 000 | 67 000 |
| | 8 | 9.5 | 9.5 | 3 | 4 | 0.7 | 0.9 | 0.15 | 0.15 | 560 | 179 | 57 | 18 | 60 000 | 67 000 |
| | 9 | 10.2 | 10.6 | 2.5 | 4 | 0.6 | 0.8 | 0.2 | 0.15 | 570 | 187 | 58 | 19 | 56 000 | 67 000 |
| | 9 | 10.5 | 10.5 | 3 | 5 | 0.7 | 1 | 0.15 | 0.15 | 570 | 187 | 58 | 19 | 56 000 | 67 000 |
| | 10 | 11.5 | 11.5 | 4 | 4 | 1 | 1 | 0.15 | 0.15 | 630 | 218 | 64 | 22 | 50 000 | 60 000 |
| | 13 | 15 | 15 | 5 | 5 | 1 | 1 | 0.2 | 0.2 | 1 300 | 485 | 133 | 49 | 36 000 | 43 000 |
| **4** | 7 | 8.2 | — | 2 | — | 0.6 | — | 0.1 | — | 310 | 115 | 32 | 12 | 60 000 | 67 000 |
| | 7 | — | 8.2 | — | 2.5 | — | 0.6 | — | 0.1 | 255 | 107 | 26 | 11 | 60 000 | 71 000 |
| | 8 | 9.2 | 9.2 | 2 | 3 | 0.6 | 0.6 | 0.15 | 0.1 | 395 | 139 | 40 | 14 | 56 000 | 67 000 |
| | 9 | 10.3 | 10.3 | 2.5 | 4 | 0.6 | 1 | (0.15) | (0.15) | 640 | 225 | 65 | 23 | 53 000 | 63 000 |
| | 10 | 11.2 | 11.6 | 3 | 4 | 0.6 | 0.8 | 0.2 | 0.15 | 710 | 270 | 73 | 28 | 50 000 | 60 000 |
| | 11 | 12.5 | 12.5 | 4 | 4 | 1 | 1 | 0.15 | 0.15 | 960 | 345 | 98 | 35 | 48 000 | 56 000 |
| | 12 | 13.5 | 13.5 | 4 | 4 | 1 | 1 | 0.2 | 0.2 | 960 | 345 | 98 | 35 | 48 000 | 56 000 |
| | 13 | 15 | 15 | 5 | 5 | 1 | 1 | 0.2 | 0.2 | 1 300 | 485 | 133 | 49 | 40 000 | 48 000 |
| | 16 | 18 | 18 | 5 | 5 | 1 | 1 | 0.3 | 0.3 | 1 730 | 670 | 177 | 68 | 36 000 | 43 000 |

| Bearing Numbers | | | Abutment and Fillet Dimensions (mm) | | | | Mass (g) | |
|---|---|---|---|---|---|---|---|---|
| Open | Shielded | Sealed | $d_a$ min. | $d_b$ max. | $r_a$ max. | $r_b$ max. | approx. Open | Shielded |
| **F 681** | — | — — | 1.4 | — | 0.05 | — | 0.04 | — |
| **F 691** | — | — — | 1.8 | — | 0.1 | — | 0.14 | — |
| **MF 41 X** | — | — — | 2.0 | — | 0.1 | — | 0.12 | — |
| **F 681 X** | **F 681 XZZ** | — — | 1.9 | 2.1 | 0.05 | 0.05 | 0.09 | 0.14 |
| **F 691 X** | **F 691 XZZ** | — — | 2.7 | 2.5 | 0.15 | 0.15 | 0.23 | 0.28 |
| **F 601 X** | **F 601 XZZ** | — — | 2.7 | 3.0 | 0.15 | 0.15 | 0.42 | 0.52 |
| **F 682** | **F 682 ZZ** | — — | 2.6 | 2.7 | 0.08 | 0.08 | 0.16 | 0.22 |
| **MF 52 B** | **MF 52 BZZ** | — — | 2.8 | 2.7 | 0.1 | 0.1 | 0.21 | 0.27 |
| **F 692** | **F 692 ZZ** | — — | 3.2 | 3.0 | 0.15 | 0.15 | 0.35 | 0.48 |
| **MF 62** | — | — — | 3.2 | — | 0.15 | — | 0.36 | — |
| **MF 72** | **MF 72 ZZ** | — — | 3.2 | 3.8 | 0.15 | 0.15 | 0.52 | 0.56 |
| **F 602** | **F 602 ZZ** | — — | 3.2 | 3.1 | 0.15 | 0.15 | 0.60 | 0.71 |
| **F 682 X** | **F 682 XZZ** | — — | 3.1 | 3.7 | 0.08 | 0.08 | 0.25 | 0.36 |
| **F 692 X** | **F 692 XZZ** | — — | 3.7 | 3.8 | 0.15 | 0.15 | 0.51 | 0.68 |
| **MF 82 X** | — | — — | 4.1 | — | 0.2 | — | 0.62 | — |
| **F 602 X** | **F 602 XZZ** | — — | 3.7 | 3.5 | 0.15 | 0.15 | 0.74 | 0.98 |
| **MF 63** | **MF 63 ZZ** | — — | 3.8 | 3.7 | 0.1 | 0.1 | 0.27 | 0.33 |
| **F 683 A** | **F 683 AZZ** | — — | 3.8 | 4.0 | 0.1 | 0.1 | 0.37 | 0.53 |
| **MF 83** | — | — — | 4.2 | — | 0.15 | — | 0.56 | — |
| **F 693** | **F 693 ZZ** | — — | 4.2 | 4.3 | 0.15 | 0.15 | 0.70 | 0.97 |
| **MF 93** | **MF 93 ZZ** | — — | 4.6 | 4.3 | 0.2 | 0.15 | 0.81 | 1.34 |
| **F 603** | **F 603 ZZ** | — — | 4.2 | 4.3 | 0.15 | 0.15 | 1.0 | 1.63 |
| **F 623** | **F 623 ZZ** | — — | 4.2 | 4.3 | 0.15 | 0.15 | 1.85 | 1.86 |
| **F 633** | **F 633 ZZ** | — — | 4.6 | 6.0 | 0.2 | 0.2 | 3.73 | 3.59 |
| **MF 74** | — | — — | 4.8 | — | 0.1 | — | 0.29 | — |
| — | **MF 74 ZZ** | — — | — | 4.8 | — | 0.1 | — | 0.35 |
| **MF 84** | **MF 84 ZZ** | — — | 5.2 | 5.0 | 0.15 | 0.1 | 0.44 | 0.63 |
| **F 684** | **F 684 ZZ** | — — | 4.8 | 5.2 | 0.1 | 0.1 | 0.70 | 1.14 |
| **MF 104 B** | **MF 104 BZZ** | — — | 5.6 | 5.9 | 0.2 | 0.15 | 1.13 | 1.59 |
| **F 694** | **F 694 ZZ** | — — | 5.2 | 5.6 | 0.15 | 0.15 | 1.91 | 1.96 |
| **F 604** | **F 604 ZZ** | — — | 5.6 | 5.6 | 0.2 | 0.2 | 2.53 | 2.53 |
| **F 624** | **F 624 ZZ** | — — | 5.6 | 6.0 | 0.2 | 0.2 | 3.38 | 3.53 |
| **F 634** | **F 634 ZZ1** | — — | 6.0 | 7.5 | 0.3 | 0.3 | 5.73 | 5.62 |

**Note** (1) The values in parentheses are not based on ISO 15.

**Remark** 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

## Metric Design With Flange
## Bore Diameter 5 – 9 mm

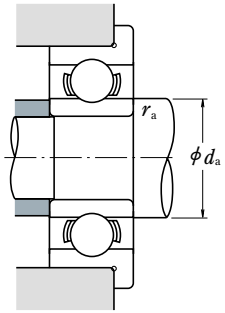


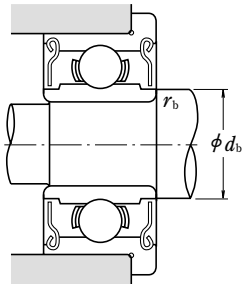

Open Type

Shielded Type
ZZ · ZZ1

Non-Contact
Sealed Type
VV

Contact
Sealed Type
DD



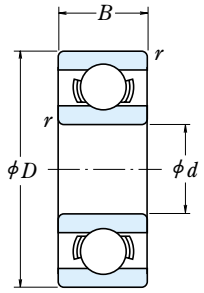




| Boundary Dimensions (mm) | | | | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) Grease | | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $D_1$ | $D_2$ | $B$ | $B_1$ | $C_1$ | $C_2$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Open Z · ZZ V · VV | D · DD | Open Z |
| **5** | 8 | 9.2 | — | 2 | — | 0.6 | — | 0.1 | — | 310 | 120 | 31 | 12 | 53 000 | — | 63 000 |
| | 8 | — | 9.2 | — | 2.5 | — | 0.6 | — | 0.1 | 278 | 131 | 28 | 13 | 53 000 | — | 63 000 |
| | 9 | 10.2 | 10.2 | 2.5 | 3 | 0.6 | 0.6 | 0.15 | 0.15 | 430 | 168 | 44 | 17 | 50 000 | — | 60 000 |
| | 10 | 11.2 | 11.6 | 3 | 4 | 0.6 | 0.8 | 0.15 | 0.15 | 430 | 168 | 44 | 17 | 50 000 | — | 60 000 |
| | 11 | 12.5 | 12.5 | 3 | 5 | 0.8 | 1 | 0.15 | 0.15 | 715 | 281 | 73 | 29 | 45 000 | — | 53 000 |
| | 13 | 15 | 15 | 4 | 4 | 1 | 1 | 0.2 | 0.2 | 1 080 | 430 | 110 | 44 | 43 000 | 40 000 | 50 000 |
| | 14 | 16 | 16 | 5 | 5 | 1 | 1 | 0.2 | 0.2 | 1 330 | 505 | 135 | 52 | 40 000 | 38 000 | 50 000 |
| | 16 | 18 | 18 | 5 | 5 | 1 | 1 | 0.3 | 0.3 | 1 730 | 670 | 177 | 68 | 36 000 | 32 000 | 43 000 |
| | 19 | 22 | 22 | 6 | 6 | 1.5 | 1.5 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 32 000 | 30 000 | 40 000 |
| **6** | 10 | 11.2 | 11.2 | 2.5 | 3 | 0.6 | 0.6 | 0.15 | 0.1 | 495 | 218 | 51 | 22 | 45 000 | — | 53 000 |
| | 12 | 13.2 | 13.6 | 3 | 4 | 0.6 | 0.8 | 0.2 | 0.15 | 715 | 292 | 73 | 30 | 43 000 | 40 000 | 50 000 |
| | 13 | 15 | 15 | 3.5 | 5 | 1 | 1.1 | 0.15 | 0.15 | 1 080 | 440 | 110 | 45 | 40 000 | 38 000 | 50 000 |
| | 15 | 17 | 17 | 5 | 5 | 1.2 | 1.2 | 0.2 | 0.2 | 1 730 | 670 | 177 | 68 | 40 000 | 36 000 | 45 000 |
| | 17 | 19 | 19 | 6 | 6 | 1.2 | 1.2 | 0.3 | 0.3 | 2 260 | 835 | 231 | 85 | 38 000 | 34 000 | 45 000 |
| | 19 | 22 | 22 | 6 | 6 | 1.5 | 1.5 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 32 000 | 30 000 | 40 000 |
| | 22 | 25 | 25 | 7 | 7 | 1.5 | 1.5 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 30 000 | 28 000 | 36 000 |
| **7** | 11 | 12.2 | 12.2 | 2.5 | 3 | 0.6 | 0.6 | 0.15 | 0.1 | 455 | 201 | 47 | 21 | 43 000 | — | 50 000 |
| | 13 | 14.2 | 14.6 | 3 | 4 | 0.6 | 0.8 | 0.2 | 0.15 | 540 | 276 | 55 | 28 | 40 000 | — | 48 000 |
| | 14 | 16 | 16 | 3.5 | 5 | 1 | 1.1 | 0.15 | 0.15 | 1 170 | 510 | 120 | 52 | 40 000 | 34 000 | 45 000 |
| | 17 | 19 | 19 | 5 | 5 | 1.2 | 1.2 | 0.3 | 0.3 | 1 610 | 715 | 164 | 73 | 36 000 | 28 000 | 43 000 |
| | 19 | 22 | 22 | 6 | 6 | 1.5 | 1.5 | 0.3 | 0.3 | 2 340 | 885 | 238 | 90 | 36 000 | 32 000 | 43 000 |
| | 22 | 25 | 25 | 7 | 7 | 1.5 | 1.5 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 30 000 | 28 000 | 36 000 |
| **8** | 12 | 13.2 | 13.6 | 2.5 | 3.5 | 0.6 | 0.8 | 0.15 | 0.1 | 545 | 274 | 56 | 28 | 40 000 | — | 48 000 |
| | 14 | 15.6 | 15.6 | 3.5 | 4 | 0.8 | 0.8 | 0.2 | 0.15 | 820 | 385 | 83 | 39 | 38 000 | 32 000 | 45 000 |
| | 16 | 18 | 18 | 4 | 5 | 1 | 1.1 | 0.2 | 0.2 | 1 610 | 710 | 164 | 73 | 36 000 | 30 000 | 43 000 |
| | 19 | 22 | 22 | 6 | 6 | 1.5 | 1.5 | 0.3 | 0.3 | 2 240 | 910 | 228 | 93 | 36 000 | 28 000 | 43 000 |
| | 22 | 25 | 25 | 7 | 7 | 1.5 | 1.5 | 0.3 | 0.3 | 3 300 | 1 370 | 335 | 140 | 34 000 | 28 000 | 40 000 |
| **9** | 17 | 19 | 19 | 4 | 5 | 1 | 1.1 | 0.2 | 0.2 | 1 330 | 665 | 136 | 68 | 36 000 | 24 000 | 43 000 |
| | 20 | 23 | 23 | 6 | 6 | 1.5 | 1.5 | 0.3 | 0.3 | 1 720 | 840 | 175 | 86 | 34 000 | 24 000 | 40 000 |

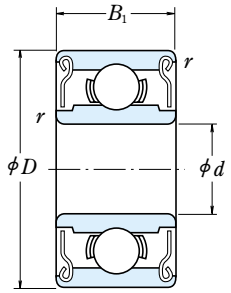
| Bearing Numbers | | | | Abutment and Fillet Dimensions (mm) | | | | Mass (g) | |
|---|---|---|---|---|---|---|---|---|---|
| Open | Shielded | Sealed | | $d_a$ min. | $d_b$ max. | $r_a$ max. | $r_b$ max. | approx. Open | Shielded |
| **MF 85** | — | — | — | 5.8 | — | 0.1 | — | 0.33 | — |
| — | **MF 85 ZZ** | — | — | — | 5.8 | — | 0.1 | — | 0.41 |
| **MF 95** | **MF 95 ZZ1** | — | — | 6.2 | 6.0 | 0.15 | 0.15 | 0.59 | 0.66 |
| **MF 105** | **MF 105 ZZ** | — | — | 6.2 | 6.0 | 0.15 | 0.15 | 1.05 | 1.46 |
| **F 685** | **F 685 ZZ** | — | — | 6.2 | 6.2 | 0.15 | 0.15 | 1.37 | 2.18 |
| **F 695** | **F 695 ZZ** | **VV** | **DD** | 6.6 | 6.6 | 0.2 | 0.2 | 2.79 | 2.84 |
| **F 605** | **F 605 ZZ** | — | **DD** | 6.6 | 6.9 | 0.2 | 0.2 | 3.9 | 3.85 |
| **F 625** | **F 625 ZZ1** | **VV** | **DD** | 7.0 | 7.5 | 0.3 | 0.3 | 5.37 | 5.27 |
| **F 635** | **F 635 ZZ1** | **VV** | **DD** | 7.0 | 8.5 | 0.3 | 0.3 | 9.49 | 9.49 |
| **MF 106** | **MF 106 ZZ1** | — | — | 7.2 | 7.0 | 0.15 | 0.1 | 0.65 | 0.77 |
| **MF 126** | **MF 126 ZZ** | — | **DD** | 7.6 | 7.2 | 0.2 | 0.15 | 1.38 | 1.94 |
| **F 686 A** | **F 686 AZZ** | **VV** | **DD** | 7.2 | 7.4 | 0.15 | 0.15 | 2.25 | 3.04 |
| **F 696** | **F 696 ZZ1** | **VV** | **DD** | 7.6 | 7.9 | 0.2 | 0.2 | 4.34 | 4.26 |
| **F 606** | **F 606 ZZ** | **VV** | **DD** | 8.0 | 8.2 | 0.3 | 0.3 | 6.58 | 6.61 |
| **F 626** | **F 626 ZZ1** | **VV** | **DD** | 8.0 | 8.5 | 0.3 | 0.3 | 9.09 | 9.09 |
| **F 636** | **F 636 ZZ** | **VV** | **DD** | 8.0 | 10.5 | 0.3 | 0.3 | 14.6 | 14.7 |
| **MF 117** | **MF 117 ZZ** | — | — | 8.2 | 8.0 | 0.15 | 0.1 | 0.72 | 0.82 |
| **MF 137** | **MF 137 ZZ** | — | — | 8.6 | 9.0 | 0.2 | 0.15 | 1.7 | 2.23 |
| **F 687** | **F 687 ZZ1** | **VV** | **DD** | 8.2 | 8.5 | 0.15 | 0.15 | 2.48 | 3.37 |
| **F 697** | **F 697 ZZ1** | **VV** | **DD** | 9.0 | 10.2 | 0.3 | 0.3 | 5.65 | 5.65 |
| **F 607** | **F 607 ZZ1** | **VV** | **DD** | 9.0 | 9.1 | 0.3 | 0.3 | 8.66 | 8.66 |
| **F 627** | **F 627 ZZ** | **VV** | **DD** | 9.0 | 10.5 | 0.3 | 0.3 | 14.2 | 14.2 |
| **MF 128** | **MF 128 ZZ1** | — | — | 9.2 | 9.0 | 0.15 | 0.1 | 0.82 | 1.15 |
| **MF 148** | **MF 148 ZZ** | **VV** | **DD** | 9.6 | 9.2 | 0.2 | 0.15 | 2.09 | 2.39 |
| **F 688 A** | **F 688 AZZ** | **VV** | **DD** | 9.6 | 10.2 | 0.2 | 0.2 | 3.54 | 4.47 |
| **F 698** | **F 698 ZZ** | **VV** | **DD** | 10.0 | 10.0 | 0.3 | 0.3 | 8.35 | 8.3 |
| **F 608** | **F 608 ZZ** | **VV** | **DD** | 10.0 | 10.5 | 0.3 | 0.3 | 13.4 | 13.5 |
| **F 689** | **F 689 ZZ1** | **VV** | **DD** | 10.6 | 11.5 | 0.2 | 0.2 | 3.97 | 4.91 |
| **F 699** | **F 699 ZZ1** | **VV** | **DD** | 11.0 | 12.0 | 0.3 | 0.3 | 9.51 | 9.51 |

**Remark** 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.

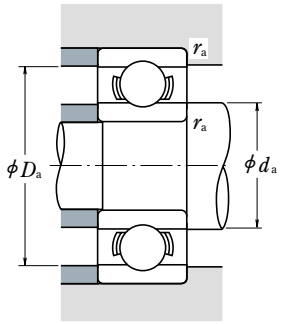
## Inch Design
## Bore Diameter 1.016 – 9.525 mm

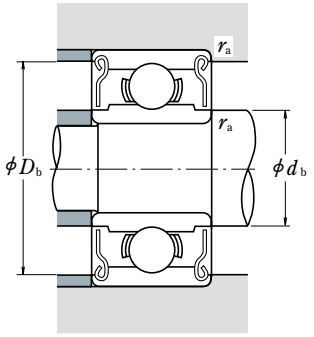



Open Type




Shielded Type
ZZ · ZZS



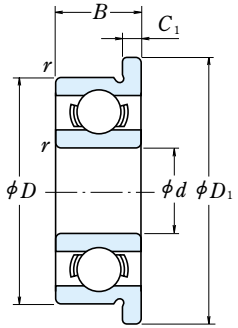

| Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $B_1$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease Open Z · ZZ | Oil Open Z | Open |
| **1.016** | 3.175 | 1.191 | — | 0.1 | 80 | 23 | 8 | 2.5 | 130 000 | 150 000 | **R 09** |
| **1.191** | 3.967 | 1.588 | 2.380 | 0.1 | 138 | 35 | 14 | 3.5 | 110 000 | 130 000 | **R 0** |
| **1.397** | 4.762 | 1.984 | 2.779 | 0.1 | 231 | 66 | 24 | 6.5 | 90 000 | 110 000 | **R 1** |
| **1.984** | 6.350 | 2.380 | 3.571 | 0.1 | 310 | 108 | 32 | 11 | 67 000 | 80 000 | **R 1-4** |
| **2.380** | 4.762 | 1.588 | — | 0.1 | 188 | 60 | 19 | 6 | 80 000 | 95 000 | **R 133** |
| | 4.762 | — | 2.380 | 0.1 | 143 | 52 | 15 | 5.5 | 80 000 | 95 000 | — |
| | 7.938 | 2.779 | 3.571 | 0.15 | 550 | 175 | 56 | 18 | 60 000 | 71 000 | **R 1-5** |
| **3.175** | 6.350 | 2.380 | 2.779 | 0.1 | 283 | 95 | 29 | 9.5 | 67 000 | 80 000 | **R 144** |
| | 7.938 | 2.779 | 3.571 | 0.1 | 560 | 179 | 57 | 18 | 60 000 | 67 000 | **R 2-5** |
| | 9.525 | 2.779 | 3.571 | 0.15 | 640 | 225 | 65 | 23 | 53 000 | 63 000 | **R 2-6** |
| | 9.525 | 3.967 | 3.967 | 0.3 | 630 | 218 | 64 | 22 | 56 000 | 67 000 | **R 2** |
| | 12.700 | 4.366 | 4.366 | 0.3 | 640 | 225 | 65 | 23 | 53 000 | 63 000 | **R 2A** |
| **3.967** | 7.938 | 2.779 | 3.175 | 0.1 | 360 | 149 | 37 | 15 | 53 000 | 63 000 | **R 155** |
| **4.762** | 7.938 | 2.779 | 3.175 | 0.1 | 360 | 149 | 37 | 15 | 53 000 | 63 000 | **R 156** |
| | 9.525 | 3.175 | 3.175 | 0.1 | 710 | 270 | 73 | 28 | 50 000 | 60 000 | **R 166** |
| | 12.700 | 3.967 | 4.978 | 0.3 | 1 300 | 485 | 133 | 49 | 43 000 | 53 000 | **R 3** |
| **6.350** | 9.525 | 3.175 | 3.175 | 0.1 | 420 | 204 | 43 | 21 | 48 000 | 56 000 | **R 168B** |
| | 12.700 | 3.175 | 4.762 | 0.15 | 1 080 | 440 | 110 | 45 | 40 000 | 50 000 | **R 188** |
| | 15.875 | 4.978 | 4.978 | 0.3 | 1 610 | 660 | 164 | 68 | 38 000 | 45 000 | **R 4B** |
| | 19.050 | 5.558 | 7.142 | 0.4 | 2 620 | 1 060 | 267 | 108 | 36 000 | 43 000 | **R 4AA** |
| **7.938** | 12.700 | 3.967 | 3.967 | 0.15 | 540 | 276 | 55 | 28 | 40 000 | 48 000 | **R 1810** |
| **9.525** | 22.225 | 5.558 | 7.142 | 0.4 | 3 350 | 1 410 | 340 | 144 | 32 000 | 38 000 | **R 6** |

| Numbers | Abutment and Fillet Dimensions (mm) | | | | | Mass (g) | |
|---|---|---|---|---|---|---|---|
| Shielded | $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_b$ min. | $r_a$ max. | approx. Open | Shielded |
| — | 1.9 | — | 2.3 | — | 0.1 | 0.04 | — |
| **R 0 ZZ** | 2.0 | 1.9 | 3.1 | 3.5 | 0.1 | 0.09 | 0.11 |
| **R 1 ZZ** | 2.2 | 2.3 | 3.9 | 4.1 | 0.1 | 0.15 | 0.19 |
| **R 1-4 ZZ** | 2.8 | 3.9 | 5.5 | 5.9 | 0.1 | 0.35 | 0.50 |
| — | 3.2 | — | 3.9 | — | 0.1 | 0.10 | — |
| **R 133 ZZS** | — | 3.0 | — | 4.2 | 0.1 | — | 0.13 |
| **R 1-5 ZZ** | 3.6 | 4.1 | 6.7 | 7.0 | 0.15 | 0.60 | 0.72 |
| **R 144 ZZ** | 4.0 | 3.9 | 5.5 | 5.9 | 0.1 | 0.25 | 0.27 |
| **R 2-5 ZZ** | 4.0 | 4.3 | 7.1 | 7.3 | 0.1 | 0.55 | 0.72 |
| **R 2-6 ZZS** | 4.4 | 4.6 | 8.3 | 8.2 | 0.15 | 0.96 | 1.13 |
| **R 2 ZZ** | 5.2 | 4.8 | 7.5 | 8.0 | 0.3 | 1.36 | 1.39 |
| **R 2A ZZ** | 5.2 | 4.6 | 10.7 | 8.2 | 0.3 | 3.3 | 3.23 |
| **R 155 ZZS** | 4.8 | 5.5 | 7.1 | 7.3 | 0.1 | 0.51 | 0.56 |
| **R 156 ZZS** | 5.6 | 5.5 | 7.1 | 7.3 | 0.1 | 0.39 | 0.42 |
| **R 166 ZZ** | 5.6 | 5.9 | 8.7 | 8.8 | 0.1 | 0.81 | 0.85 |
| **R 3 ZZ** | 6.8 | 6.5 | 10.7 | 11.2 | 0.3 | 2.21 | 2.79 |
| **R 168 BZZ** | 7.2 | 7.0 | 8.7 | 8.9 | 0.1 | 0.58 | 0.62 |
| **R 188 ZZ** | 7.6 | 7.4 | 11.5 | 11.6 | 0.15 | 1.53 | 2.21 |
| **R 4B ZZ** | 8.4 | 8.4 | 13.8 | 13.8 | 0.3 | 4.5 | 4.43 |
| **R 4AA ZZ** | 9.4 | 9.0 | 16.0 | 16.6 | 0.4 | 7.48 | 9.17 |
| **R 1810 ZZ** | 9.2 | 9.0 | 11.5 | 11.6 | 0.15 | 1.56 | 1.48 |
| **R 6 ZZ** | 12.6 | 11.9 | 19.2 | 20.0 | 0.4 | 9.02 | 11 |

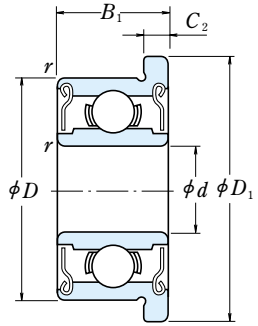
**Remarks** 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.
2. Bearings with double shields (ZZ, ZZS) are also available with single shields (Z, ZS).

## Inch Design With Flange

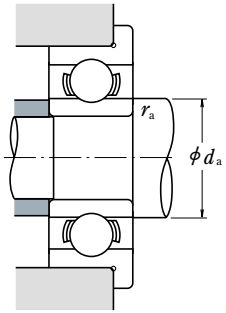
**Bore Diameter 1.191 – 9.525 mm**

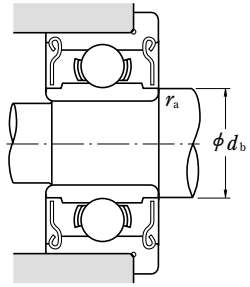



Open Type




Shielded Type
ZZ · ZZS




| Boundary Dimensions (mm) | | | | | | | | Basic Load Ratings (N) | | {kgf} | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $D_1$ | $B$ | $B_1$ | $C_1$ | $C_2$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ |
| **1.191** | 3.967 | 5.156 | 1.588 | 2.380 | 0.330 | 0.790 | 0.1 | 138 | 35 | 14 | 3.5 |
| **1.397** | 4.762 | 5.944 | 1.984 | 2.779 | 0.580 | 0.790 | 0.1 | 231 | 66 | 24 | 6.5 |
| **1.984** | 6.350 | 7.518 | 2.380 | 3.571 | 0.580 | 0.790 | 0.1 | 310 | 108 | 32 | 11 |
| **2.380** | 4.762 | 5.944 | 1.588 | — | 0.460 | — | 0.1 | 188 | 60 | 19 | 6 |
| | 4.762 | 5.944 | — | 2.380 | — | 0.790 | 0.1 | 143 | 52 | 15 | 5.5 |
| | 7.938 | 9.119 | 2.779 | 3.571 | 0.580 | 0.790 | 0.15 | 550 | 175 | 56 | 18 |
| **3.175** | 6.350 | 7.518 | 2.380 | 2.779 | 0.580 | 0.790 | 0.1 | 283 | 95 | 29 | 9.5 |
| | 7.938 | 9.119 | 2.779 | 3.571 | 0.580 | 0.790 | 0.1 | 560 | 179 | 57 | 18 |
| | 9.525 | 10.719 | 2.779 | 3.571 | 0.580 | 0.790 | 0.15 | 640 | 225 | 65 | 23 |
| | 9.525 | 11.176 | 3.967 | 3.967 | 0.760 | 0.760 | 0.3 | 630 | 218 | 64 | 22 |
| **3.967** | 7.938 | 9.119 | 2.779 | 3.175 | 0.580 | 0.910 | 0.1 | 360 | 149 | 37 | 15 |
| **4.762** | 7.938 | 9.119 | 2.779 | 3.175 | 0.580 | 0.910 | 0.1 | 360 | 149 | 37 | 15 |
| | 9.525 | 10.719 | 3.175 | 3.175 | 0.580 | 0.790 | 0.1 | 710 | 270 | 73 | 28 |
| | 12.700 | 14.351 | 4.978 | 4.978 | 1.070 | 1.070 | 0.3 | 1 300 | 485 | 133 | 49 |
| **6.350** | 9.525 | 10.719 | 3.175 | 3.175 | 0.580 | 0.910 | 0.1 | 420 | 204 | 43 | 21 |
| | 12.700 | 13.894 | 3.175 | 4.762 | 0.580 | 1.140 | 0.15 | 1 080 | 440 | 110 | 45 |
| | 15.875 | 17.526 | 4.978 | 4.978 | 1.070 | 1.070 | 0.3 | 1 610 | 660 | 164 | 68 |
| **7.938** | 12.700 | 13.894 | 3.967 | 3.967 | 0.790 | 0.790 | 0.15 | 540 | 276 | 55 | 28 |
| **9.525** | 22.225 | 24.613 | 7.142 | 7.142 | 1.570 | 1.570 | 0.4 | 3 350 | 1 410 | 340 | 144 |

| Limiting Speeds (min⁻¹) | | Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | Mass (g) | |
|---|---|---|---|---|---|---|---|---|
| Grease Open Z · ZZ | Oil Open Z | Open | Shielded | $d_a$ min. | $d_b$ max. | $r_a$ max. | approx. Open | Shielded |
| 110 000 | 130 000 | **FR 0** | **FR 0 ZZ** | 2.0 | 1.9 | 0.1 | 0.11 | 0.16 |
| 90 000 | 110 000 | **FR 1** | **FR 1 ZZ** | 2.2 | 2.3 | 0.1 | 0.20 | 0.25 |
| 67 000 | 80 000 | **FR 1-4** | **FR 1-4 ZZ** | 2.8 | 3.9 | 0.1 | 0.41 | 0.58 |
| 80 000 | 95 000 | **FR 133** | — | 3.2 | — | 0.1 | 0.13 | — |
| 80 000 | 95 000 | — | **FR 133 ZZS** | — | 3.0 | 0.1 | — | 0.19 |
| 60 000 | 71 000 | **FR 1-5** | **FR 1-5 ZZ** | 3.6 | 4.1 | 0.15 | 0.68 | 0.82 |
| 67 000 | 80 000 | **FR 144** | **FR 144 ZZ** | 4.0 | 3.9 | 0.1 | 0.31 | 0.35 |
| 60 000 | 67 000 | **FR 2-5** | **FR 2-5 ZZ** | 4.0 | 4.3 | 0.1 | 0.62 | 0.81 |
| 53 000 | 63 000 | **FR 2-6** | **FR 2-6 ZZS** | 4.4 | 4.6 | 0.15 | 1.04 | 1.25 |
| 56 000 | 67 000 | **FR 2** | **FR 2 ZZ** | 5.2 | 4.8 | 0.3 | 1.51 | 1.55 |
| 53 000 | 63 000 | **FR 155** | **FR 155 ZZS** | 4.8 | 5.5 | 0.1 | 0.59 | 0.67 |
| 53 000 | 63 000 | **FR 156** | **FR 156 ZZS** | 5.6 | 5.5 | 0.1 | 0.47 | 0.53 |
| 50 000 | 60 000 | **FR 166** | **FR 166 ZZ** | 5.6 | 5.9 | 0.1 | 0.90 | 0.98 |
| 43 000 | 53 000 | **FR 3** | **FR 3 ZZ** | 6.8 | 6.5 | 0.3 | 2.97 | 3.09 |
| 48 000 | 56 000 | **FR 168B** | **FR 168 BZZ** | 7.2 | 7.0 | 0.1 | 0.66 | 0.75 |
| 40 000 | 50 000 | **FR 188** | **FR 188 ZZ** | 7.6 | 7.4 | 0.15 | 1.64 | 2.49 |
| 38 000 | 45 000 | **FR 4B** | **FR 4B ZZ** | 8.4 | 8.4 | 0.3 | 4.78 | 4.78 |
| 40 000 | 48 000 | **FR 1810** | **FR 1810 ZZ** | 9.2 | 9.0 | 0.15 | 1.71 | 1.63 |
| 32 000 | 38 000 | **FR 6** | **FR 6 ZZ** | 12.6 | 11.9 | 0.4 | 10.1 | 12.1 |

**Remarks** 1. When using bearings with a rotating outer ring, please contact NSK if they are shielded.
2. Bearings with double shields (ZZ, ZZS) are also available with single shields (Z, ZS).

# ANGULAR CONTACT BALL BEARINGS

## SINGLE-ROW AND MATCHED ANGULAR CONTACT BALL BEARINGS

Bore Diameter 10 – 65mm ····· B50
Bore Diameter 70 – 120mm ····· B60
Bore Diameter 130 – 200mm ····· B66

## DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

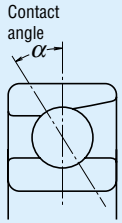
Bore Diameter 10 – 85mm ····· B70

## FOUR-POINT CONTACT BALL BEARINGS

Bore Diameter 30 – 200mm ····· B72

## DESIGN, TYPES, AND FEATURES

### SINGLE-ROW ANGULAR CONTACT BALL BEARINGS




Since these bearings have a contact angle, they can sustain significant axial loads in one direction together with radial loads. Because of their design, when a radial load is applied, an axial force component is produced; therefore, two opposed bearings or a combination of more than two must be used.

Since the rigidity of single-row angular contact ball bearings can be increased by preloading, they are often used in the main spindles of machine tools, for which high running accuracy is required. (Refer to Chapter 10, Preload, Page A96).

Usually, the cages for angular contact ball bearings with a contact angle of 30° (Symbol **A**) or 40°(Symbol **B**) are in accordance with Table 1,but depending on the application, machined synthetic resin cages or molded polyamide resin cages are also used. The basic load ratings given in the bearing tables are based on the cage classification listed in Table 1.

Though the figures in the bearing tables (Pages B50 to B65; bearing bore diameters of 10 to 120) show bearings with single-shoulder-type inner rings, both-shoulder-type bearings are also available. Please consult NSK for more detailed information.

**Table 1 Standard Cages for Angular Contact Ball Bearings**

| Series | Pressed Steel Cages | Machined Brass Cages |
|---|---|---|
| 79A5, C | — | 7900 – 7940 |
| 70A | 7000 – 7018 | 7019 – 7040 |
| 70C | — | 7000 – 7022 |
| 72A, B | 7200 – 7222 | 7224 – 7240 |
| 72C | — | 7200 – 7240 |
| 73A, B | 7300 – 7320 | 7321 – 7340 |

In addition, for bearings with the same serial number, if the type of cages are different, the number of balls may also be different. In such a case, the load rating will differ from the one listed in the bearing tables.

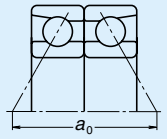
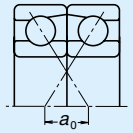
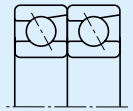
Angular Contact Ball Bearings with contact angles of 15° (Symbol **C**) and 25° (Symbol **A5**) are primarily for high precision or high speed applications, and machined brass or synthetic resin cages or molded polyamide cages are used.

The maximum operating temperature of molded polyamide cages is 120℃.

## MATCHED ANGULAR CONTACT BALL BEARINGS

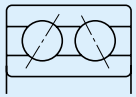
The types and features of matched angular contact ball bearings are shown in Table 2.

**Table 2 Types and Features of Matched Angular Contact Ball Bearings**

| Figure | Arrangement | Features |
|---|---|---|
|   | Back-to-back (DB) (Example) 7208 A DB | Radial loads and axial loads in both directions can be sustained. Since the distance between the effective load centers $a_0$ is big, this type is suitable if moments are applied. |
|   | Face-to-face (DF) (Example) 7208 B DF | Radial loads and axial loads in both directions can be sustained. Compared with the DB Type, the distance between the effective load centers is small, so the capacity to sustain moments is inferior to the DB Type. |
|  | Tandem (DT) (Example) 7208 A DT | Radial loads and axial loads in one direction can be sustained. Since two bearings share the axial load, this arrangement is used when the load in one direction is heavy. |

## HPS ANGULAR CONTACT BALL BEARINGS

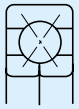
In comparison with standard angular contact ball bearings, these bearings have high capacity, high limiting speed, and highly accurate universal matching as the features. The molded polyamide cages are standard specification for the HPS type.



## DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

This is basically a back-to-back mounting of two single-row angular contact ball bearings, but their inner and outer rings are each integrated into one. Axial loads in both directions can be sustained, and the capacity to sustain moments is good. This type is used as fixed-end bearings.

Their cages are pressed steel.



## FOUR-POINT CONTACT BALL BEARINGS

The inner ring is split radially into two pieces. Their design allows one bearing to sustain significant axial loads in either direction.

The contact angle is 35°, so the axial load capacity is high. This type is suitable for carrying pure axial loads or combined loads where the axial loads are high.

The cages are made of machined brass.

## PRECAUTIONS FOR USE OF ANGULAR CONTACT BALL BEARINGS

Under severe operating conditions where the speed and temperature are close to their limits, lubrication is marginal, vibration and moment loads are heavy, they may not be suitable, particularly for certain types of cages. In such a case, please consult with NSK beforehand.

And if the load on angular contact ball bearings becomes too small, or if the ratio of the axial and radial loads for matched bearings exceeds '$e$' ($e$ is listed in the bearings tables) during operation, slippage occurs between the balls and raceways, which may result in smearing. Especially with large bearings since the weight of the balls and cage is high. If such load conditions are expected, please consult with NSK for selection of the bearings.





## TOLERANCES AND RUNNING ACCURACY


**SINGLE-ROW ANGULAR CONTACT BALL BEARINGS** ..... Table 8.2 (Pages A60 to A63)
**HPS ANGULAR CONTACT BALL BEARINGS Tolerance for Dimensions: Class 6, Running Accuracy: Class 5** ..... Table 8.2 (Pages A60 to A63)
**MATCHED ANGULAR CONTACT BALL BEARINGS** ..... Table 8.2 (Pages A60 to A63)
**DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS** ..... Table 8.2 (Pages A60 to A63)
**FOUR-POINT CONTACT BALL BEARINGS** ..... Table 8.2 (Pages A60 to A63)


## RECOMMENDED FITS


**SINGLE-ROW ANGULAR CONTACT BALL BEARINGS AND HPS ANGULAR CONTACT BALL BEARINGS** ..... Table 9.2 (Page A84) Table 9.4 (Page A85)
**MATCHED ANGULAR CONTACT BALL BEARINGS** ..... Table 9.2 (Page A84) Table 9.4 (Page A85)
**DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS** ..... Table 9.2 (Page A84) Table 9.4 (Page A85)
**FOUR-POINT CONTACT BALL BEARINGS** ..... Table 9.2 (Page A84) Table 9.4 (Page A85)


## INTERNAL CLEARANCES


**MATCHED ANGULAR CONTACT BALL BEARINGS** ..... Table 9. 17 (Page A94)


Matched angular contact ball bearings with precision better than P5 are primarily used in the main spindles of machine tools, so they are used with a preload for rigidity. For convenience of selection, internal clearances are adjusted to produce Very Light, Light, Medium, and Heavy Preloads. Their fitting is also special. Concerning these matters, please refer to Tables 10.1 and 10.2 (Pages A98 and A99).

The clearance (or preload) of matched bearings is obtained by axially tightening a pair of bearings till the side faces of their inner or outer rings are pressed against each other.

### HPS ANGULAR CONTACT BALL BEARINGS

**Axial Internal Clearance** (Measured Clearances) Units : μm

| Nominal Bore Diameter $d$ (mm) | | Axial Internal Clearance | | | |
|---|---|---|---|---|---|
| | | CNB | | GA | |
| over | incl | min. | max. | min. | max. |
| **12** | **18** | 17 | 25 | –2 | 6 |
| **18** | **30** | 20 | 28 | | |
| **30** | **50** | 24 | 32 | | |
| **50** | **80** | 29 | 41 | –3 | 9 |

### DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

For the clearance in double-row angular contact ball bearings, please consult with NSK.


**FOUR-POINT CONTACT BALL BEARINGS** ..... Table 9.18 (Page A94)


## LIMITING SPEEDS

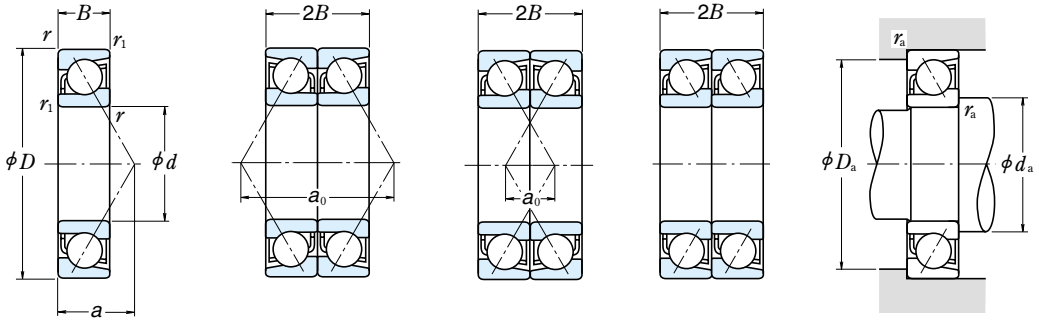
In cases of single-row and matched angular contact ball bearings, the Limiting speeds listed in the bearing table are for bearings with machined cage. For those with pressed cages, the listed speeds must be reduced by 20%.

The limiting speeds of bearings with contact angles of 15° (Symbol **C**) and 25° (Symbol **A5**) are for bearings with precision of P5 and better (with machined synthetic-resin cages or molded polyamide cages).

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 10 – 15 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10** | 22 | 6 | 0.3 | 0.15 | 2 880 | 1 450 | 294 | 148 | — | 40 000 | 56 000 | 6.7 | 12.5 | 19.5 | 0.3 | 0.009 |
| | 22 | 6 | 0.3 | 0.15 | 3 000 | 1 520 | 305 | 155 | 14.1 | 48 000 | 63 000 | 5.1 | 12.5 | 19.5 | 0.3 | 0.009 |
| | 26 | 8 | 0.3 | 0.15 | 5 350 | 2 600 | 550 | 266 | — | 32 000 | 43 000 | 9.2 | 12.5 | 23.5 | 0.3 | 0.019 |
| | 26 | 8 | 0.3 | 0.15 | 5 300 | 2 490 | 540 | 254 | 12.6 | 45 000 | 63 000 | 6.4 | 12.5 | 23.5 | 0.3 | 0.021 |
| | 30 | 9 | 0.6 | 0.3 | 5 400 | 2 710 | 555 | 276 | — | 28 000 | 38 000 | 10.3 | 15 | 25 | 0.6 | 0.032 |
| | 30 | 9 | 0.6 | 0.3 | 5 000 | 2 500 | 510 | 255 | — | 20 000 | 28 000 | 12.9 | 15 | 25 | 0.6 | 0.032 |
| | 30 | 9 | 0.6 | 0.3 | 5 400 | 2 610 | 550 | 266 | 13.2 | 40 000 | 56 000 | 7.2 | 15 | 25 | 0.6 | 0.036 |
| | 35 | 11 | 0.6 | 0.3 | 9 300 | 4 300 | 950 | 440 | — | 20 000 | 26 000 | 12.0 | 15 | 30 | 0.6 | 0.053 |
| | 35 | 11 | 0.6 | 0.3 | 8 750 | 4 050 | 890 | 410 | — | 18 000 | 24 000 | 14.9 | 15 | 30 | 0.6 | 0.054 |
| **12** | 24 | 6 | 0.3 | 0.15 | 3 200 | 1 770 | 325 | 181 | — | 38 000 | 53 000 | 7.2 | 14.5 | 21.5 | 0.3 | 0.011 |
| | 24 | 6 | 0.3 | 0.15 | 3 350 | 1 860 | 340 | 189 | 14.7 | 45 000 | 63 000 | 5.4 | 14.5 | 21.5 | 0.3 | 0.011 |
| | 28 | 8 | 0.3 | 0.15 | 5 800 | 2 980 | 590 | 305 | — | 28 000 | 38 000 | 9.8 | 14.5 | 25.5 | 0.3 | 0.021 |
| | 28 | 8 | 0.3 | 0.15 | 5 800 | 2 900 | 590 | 296 | 13.2 | 40 000 | 56 000 | 6.7 | 14.5 | 25.5 | 0.3 | 0.024 |
| | 32 | 10 | 0.6 | 0.3 | 8 000 | 4 050 | 815 | 410 | — | 26 000 | 34 000 | 11.4 | 17 | 27 | 0.6 | 0.037 |
| | 32 | 10 | 0.6 | 0.3 | 7 450 | 3 750 | 760 | 380 | — | 18 000 | 26 000 | 14.2 | 17 | 27 | 0.6 | 0.038 |
| | 32 | 10 | 0.6 | 0.3 | 8 150 | 3 750 | 830 | 380 | — | 20 000 | 30 000 | 14.2 | 17 | 27 | 0.6 | 0.036 |
| | 32 | 10 | 0.6 | 0.3 | 7 900 | 3 850 | 805 | 395 | 12.5 | 36 000 | 50 000 | 7.9 | 17 | 27 | 0.6 | 0.041 |
| | 37 | 12 | 1 | 0.6 | 9 450 | 4 500 | 965 | 460 | — | 18 000 | 24 000 | 13.1 | 18 | 31 | 1 | 0.060 |
| | 37 | 12 | 1 | 0.6 | 8 850 | 4 200 | 900 | 425 | — | 16 000 | 22 000 | 16.3 | 18 | 31 | 1 | 0.062 |
| | 37 | 12 | 1 | 0.6 | 11 100 | 4 950 | 1 130 | 505 | — | 18 000 | 26 000 | 16.3 | 18 | 31 | 1 | 0.061 |
| **15** | 28 | 7 | 0.3 | 0.15 | 4 550 | 2 530 | 465 | 258 | — | 32 000 | 43 000 | 8.5 | 17.5 | 25.5 | 0.3 | 0.015 |
| | 28 | 7 | 0.3 | 0.15 | 4 750 | 2 640 | 485 | 270 | 14.5 | 38 000 | 53 000 | 6.4 | 17.5 | 25.5 | 0.3 | 0.015 |
| | 32 | 9 | 0.3 | 0.15 | 6 100 | 3 450 | 625 | 350 | — | 24 000 | 32 000 | 11.3 | 17.5 | 29.5 | 0.3 | 0.030 |
| | 32 | 9 | 0.3 | 0.15 | 6 250 | 3 400 | 635 | 345 | 14.1 | 34 000 | 48 000 | 7.6 | 17.5 | 29.5 | 0.3 | 0.034 |
| | 35 | 11 | 0.6 | 0.3 | 8 650 | 4 650 | 880 | 475 | — | 22 000 | 30 000 | 12.7 | 20 | 30 | 0.6 | 0.045 |
| | 35 | 11 | 0.6 | 0.3 | 7 950 | 4 300 | 810 | 440 | — | 16 000 | 22 000 | 16.0 | 20 | 30 | 0.6 | 0.046 |
| | 35 | 11 | 0.6 | 0.3 | 9 800 | 4 800 | 995 | 490 | — | 18 000 | 26 000 | 16.0 | 20 | 30 | 0.6 | 0.044 |
| | 35 | 11 | 0.6 | 0.3 | 8 650 | 4 550 | 885 | 460 | 13.2 | 32 000 | 45 000 | 8.8 | 20 | 30 | 0.6 | 0.052 |
| | 42 | 13 | 1 | 0.6 | 13 400 | 7 100 | 1 370 | 720 | — | 16 000 | 22 000 | 14.7 | 21 | 36 | 1 | 0.084 |
| | 42 | 13 | 1 | 0.6 | 12 500 | 6 600 | 1 270 | 670 | — | 14 000 | 19 000 | 18.5 | 21 | 36 | 1 | 0.086 |
| | 42 | 13 | 1 | 0.6 | 14 300 | 6 900 | 1 460 | 705 | — | 16 000 | 22 000 | 18.5 | 21 | 36 | 1 | 0.084 |

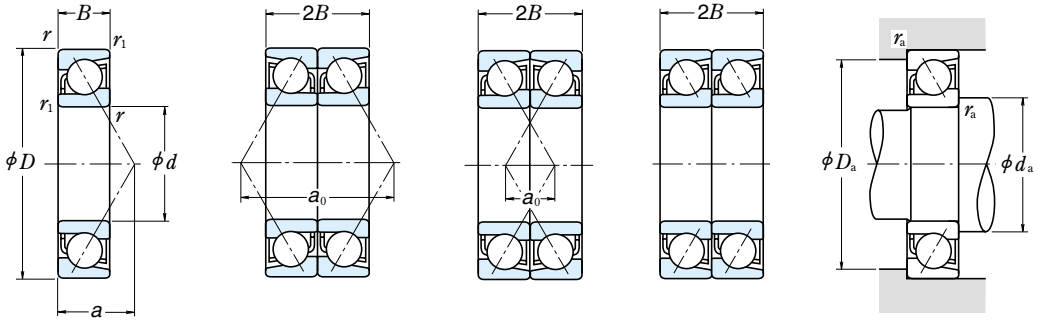
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7900 A5** | **DB DF DT** | 4 700 | 2 900 | 475 | 296 | 32 000 | 43 000 | 13.5 | 1.5 | — | 20.8 | 0.15 |
| **7900 C** | **DB DF DT** | 4 900 | 3 050 | 500 | 310 | 38 000 | 53 000 | 10.3 | 1.7 | — | 20.8 | 0.15 |
| **7000 A** | **DB DF DT** | 8 750 | 5 200 | 890 | 530 | 24 000 | 34 000 | 18.4 | 2.4 | 11.2 | 24.8 | 0.15 |
| **7000 C** | **DB DF DT** | 8 650 | 5 000 | 880 | 510 | 36 000 | 50 000 | 12.8 | 3.2 | — | 24.8 | 0.15 |
| **7200 A** | **DB DF DT** | 8 800 | 5 400 | 900 | 555 | 22 000 | 30 000 | 20.5 | 2.5 | 12.5 | 27.5 | 0.3 |
| **7200 B** | **DB DF DT** | 8 100 | 5 000 | 825 | 510 | 16 000 | 22 000 | 25.8 | 7.8 | 12.5 | 27.5 | 0.3 |
| **7200 C** | **DB DF DT** | 8 800 | 5 200 | 895 | 530 | 32 000 | 45 000 | 14.4 | 3.6 | — | 27.5 | 0.3 |
| **7300 A** | **DB DF DT** | 15 100 | 8 600 | 1 540 | 880 | 16 000 | 22 000 | 24.0 | 2.0 | 12.5 | 32.5 | 0.3 |
| **7300 B** | **DB DF DT** | 14 200 | 8 100 | 1 450 | 825 | 14 000 | 20 000 | 29.9 | 7.9 | 12.5 | 32.5 | 0.3 |
| **7901 A5** | **DB DF DT** | 5 200 | 3 550 | 530 | 360 | 30 000 | 43 000 | 14.4 | 2.4 | — | 22.8 | 0.15 |
| **7901 C** | **DB DF DT** | 5 450 | 3 700 | 555 | 380 | 36 000 | 50 000 | 10.8 | 1.2 | — | 22.8 | 0.15 |
| **7001 A** | **DB DF DT** | 9 400 | 5 950 | 955 | 610 | 22 000 | 30 000 | 19.5 | 3.5 | 13.2 | 26.8 | 0.15 |
| **7001 C** | **DB DF DT** | 9 400 | 5 800 | 960 | 590 | 32 000 | 45 000 | 13.4 | 2.6 | — | 26.8 | 0.15 |
| **7201 A** | **DB DF DT** | 13 000 | 8 050 | 1 330 | 820 | 20 000 | 28 000 | 22.7 | 2.7 | 14.5 | 29.5 | 0.3 |
| **7201 B** | **DB DF DT** | 12 100 | 7 500 | 1 230 | 765 | 15 000 | 20 000 | 28.5 | 8.5 | 14.5 | 29.5 | 0.3 |
| ***7201 BEA** | | — | — | — | — | 16 000 | 24 000 | 28.5 | 8.5 | 14.5 | 29.5 | 0.3 |
| **7201 C** | **DB DF DT** | 12 800 | 7 700 | 1 310 | 785 | 30 000 | 40 000 | 15.9 | 4.1 | — | 29.5 | 0.3 |
| **7301 A** | **DB DF DT** | 15 400 | 9 000 | 1 570 | 915 | 15 000 | 20 000 | 26.1 | 2.1 | 17 | 32 | 0.6 |
| **7301 B** | **DB DF DT** | 14 400 | 8 400 | 1 460 | 855 | 13 000 | 18 000 | 32.6 | 8.6 | 17 | 32 | 0.6 |
| ***7301 BEA** | | — | — | — | — | 15 000 | 22 000 | 32.6 | 8.6 | 17 | 32 | 0.6 |
| **7902 A5** | **DB DF DT** | 7 400 | 5 050 | 755 | 515 | 26 000 | 34 000 | 17.0 | 3.0 | — | 26.8 | 0.15 |
| **7902 C** | **DB DF DT** | 7 750 | 5 300 | 790 | 540 | 30 000 | 43 000 | 12.8 | 1.2 | — | 26.8 | 0.15 |
| **7002 A** | **DB DF DT** | 9 950 | 6 850 | 1 010 | 700 | 19 000 | 26 000 | 22.6 | 4.6 | 16.2 | 30.8 | 0.15 |
| **7002 C** | **DB DF DT** | 10 100 | 6 750 | 1 030 | 690 | 28 000 | 38 000 | 15.3 | 2.7 | — | 30.8 | 0.15 |
| **7202 A** | **DB DF DT** | 14 000 | 9 300 | 1 430 | 950 | 18 000 | 24 000 | 25.4 | 3.4 | 17.5 | 32.5 | 0.3 |
| **7202 B** | **DB DF DT** | 12 900 | 8 600 | 1 310 | 875 | 13 000 | 18 000 | 32.0 | 10.0 | 17.5 | 32.5 | 0.3 |
| ***7202 BEA** | | — | — | — | — | 14 000 | 20 000 | 32.0 | 10.0 | 17.5 | 32.5 | 0.3 |
| **7202 C** | **DB DF DT** | 14 100 | 9 050 | 1 440 | 925 | 26 000 | 36 000 | 17.7 | 4.3 | — | 32.5 | 0.3 |
| **7302 A** | **DB DF DT** | 21 800 | 14 200 | 2 220 | 1 440 | 13 000 | 17 000 | 29.5 | 3.5 | 20 | 37 | 0.6 |
| **7302 B** | **DB DF DT** | 20 200 | 13 200 | 2 060 | 1 340 | 11 000 | 15 000 | 36.9 | 10.9 | 20 | 37 | 0.6 |
| ***7302 BEA** | | — | — | — | — | 13 000 | 18 000 | 36.9 | 10.9 | 20 | 37 | 0.6 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min) and $r_a$ (max) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 17 – 25 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leq e$ $X$ | $Y$ | Single, DT $F_a/F_r > e$ $X$ | $Y$ | DB or DF $F_a/F_r \leq e$ $X$ | $Y$ | DB or DF $F_a/F_r > e$ $X$ | $Y$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | $Y_0$ | DB or DF $X_0$ | $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **17** | 30 | 7 | 0.3 | 0.15 | 4 750 | 2 800 | 485 | 286 | — | 30 000 | 40 000 | 9.0 | 19.5 | 27.5 | 0.3 | 0.017 |
| | 30 | 7 | 0.3 | 0.15 | 5 000 | 2 940 | 510 | 299 | 14.8 | 34 000 | 48 000 | 6.6 | 19.5 | 27.5 | 0.3 | 0.017 |
| | 35 | 10 | 0.3 | 0.15 | 6 400 | 3 800 | 655 | 390 | — | 22 000 | 30 000 | 12.5 | 19.5 | 32.5 | 0.3 | 0.040 |
| | 35 | 10 | 0.3 | 0.15 | 6 600 | 3 800 | 675 | 390 | 14.5 | 32 000 | 43 000 | 8.5 | 19.5 | 32.5 | 0.3 | 0.044 |
| | 40 | 12 | 0.6 | 0.3 | 10 800 | 6 000 | 1 100 | 610 | — | 20 000 | 28 000 | 14.2 | 22 | 35 | 0.6 | 0.067 |
| | 40 | 12 | 0.6 | 0.3 | 9 950 | 5 500 | 1 010 | 565 | — | 14 000 | 19 000 | 18.0 | 22 | 35 | 0.6 | 0.068 |
| | 40 | 12 | 0.6 | 0.3 | 11 600 | 6 100 | 1 180 | 625 | — | 16 000 | 22 000 | 18.2 | 22 | 35 | 0.6 | 0.065 |
| | 40 | 12 | 0.6 | 0.3 | 10 900 | 5 850 | 1 110 | 595 | 13.3 | 28 000 | 38 000 | 9.8 | 22 | 35 | 0.6 | 0.075 |
| | 47 | 14 | 1 | 0.6 | 15 900 | 8 650 | 1 630 | 880 | — | 14 000 | 19 000 | 16.2 | 23 | 41 | 1 | 0.116 |
| | 47 | 14 | 1 | 0.6 | 14 800 | 8 000 | 1 510 | 820 | — | 13 000 | 17 000 | 20.4 | 23 | 41 | 1 | 0.118 |
| | 47 | 14 | 1 | 0.6 | 16 800 | 8 300 | 1 720 | 850 | — | 14 000 | 20 000 | 20.4 | 23 | 41 | 1 | 0.113 |
| **20** | 37 | 9 | 0.3 | 0.15 | 6 600 | 4 050 | 675 | 410 | — | 24 000 | 32 000 | 11.1 | 22.5 | 34.5 | 0.3 | 0.036 |
| | 37 | 9 | 0.3 | 0.15 | 6 950 | 4 250 | 710 | 430 | 14.9 | 28 000 | 38 000 | 8.3 | 22.5 | 34.5 | 0.3 | 0.036 |
| | 42 | 12 | 0.6 | 0.3 | 10 800 | 6 600 | 1 110 | 670 | — | 18 000 | 24 000 | 14.9 | 25 | 37 | 0.6 | 0.068 |
| | 42 | 12 | 0.6 | 0.3 | 11 100 | 6 550 | 1 130 | 665 | 14.0 | 26 000 | 36 000 | 10.1 | 25 | 37 | 0.6 | 0.076 |
| | 47 | 14 | 1 | 0.6 | 14 500 | 8 300 | 1 480 | 845 | — | 17 000 | 22 000 | 16.7 | 26 | 41 | 1 | 0.106 |
| | 47 | 14 | 1 | 0.6 | 13 300 | 7 650 | 1 360 | 780 | — | 12 000 | 16 000 | 21.1 | 26 | 41 | 1 | 0.109 |
| | 47 | 14 | 1 | 0.6 | 15 600 | 8 150 | 1 590 | 830 | — | 13 000 | 19 000 | 21.1 | 26 | 41 | 1 | 0.103 |
| | 47 | 14 | 1 | 0.6 | 14 600 | 8 050 | 1 480 | 825 | 13.3 | 24 000 | 34 000 | 11.5 | 26 | 41 | 1 | 0.118 |
| | 52 | 15 | 1.1 | 0.6 | 18 700 | 10 400 | 1 910 | 1 060 | — | 13 000 | 17 000 | 17.9 | 27 | 45 | 1 | 0.146 |
| | 52 | 15 | 1.1 | 0.6 | 17 300 | 9 650 | 1 770 | 985 | — | 11 000 | 15 000 | 22.6 | 27 | 45 | 1 | 0.15 |
| | 52 | 15 | 1.1 | 0.6 | 19 800 | 10 500 | 2 020 | 1 070 | — | 13 000 | 18 000 | 22.6 | 27 | 45 | 1 | 0.149 |
| **25** | 42 | 9 | 0.3 | 0.15 | 7 450 | 5 150 | 760 | 525 | — | 20 000 | 28 000 | 12.3 | 27.5 | 39.5 | 0.3 | 0.043 |
| | 42 | 9 | 0.3 | 0.15 | 7 850 | 5 400 | 800 | 555 | 15.5 | 24 000 | 34 000 | 9.0 | 27.5 | 39.5 | 0.3 | 0.042 |
| | 47 | 12 | 0.6 | 0.3 | 11 300 | 7 400 | 1 150 | 750 | — | 16 000 | 22 000 | 16.4 | 30 | 42 | 0.6 | 0.079 |
| | 47 | 12 | 0.6 | 0.3 | 11 700 | 7 400 | 1 190 | 755 | 14.7 | 22 000 | 30 000 | 10.8 | 30 | 42 | 0.6 | 0.089 |
| | 52 | 15 | 1 | 0.6 | 16 200 | 10 300 | 1 650 | 1 050 | — | 15 000 | 20 000 | 18.6 | 31 | 46 | 1 | 0.13 |
| | 52 | 15 | 1 | 0.6 | 14 800 | 9 400 | 1 510 | 960 | — | 10 000 | 14 000 | 23.7 | 31 | 46 | 1 | 0.133 |
| | 52 | 15 | 1 | 0.6 | 17 600 | 10 200 | 1 790 | 1 040 | — | 12 000 | 17 000 | 23.7 | 31 | 46 | 1 | 0.127 |
| | 52 | 15 | 1 | 0.6 | 16 600 | 10 200 | 1 690 | 1 040 | 14.0 | 22 000 | 28 000 | 12.7 | 31 | 46 | 1 | 0.143 |
| | 62 | 17 | 1.1 | 0.6 | 26 400 | 15 800 | 2 690 | 1 610 | — | 10 000 | 14 000 | 21.1 | 32 | 55 | 1 | 0.235 |

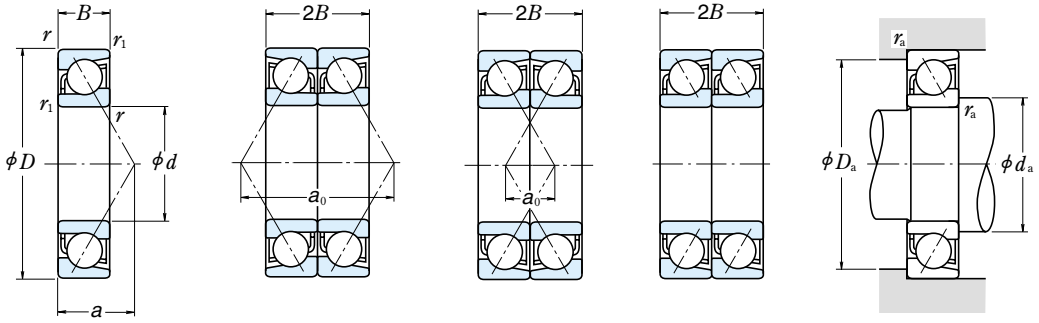
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7903 A5** | **DB DF DT** | 7 750 | 5 600 | 790 | 570 | 24 000 | 32 000 | 18.0 | 4.0 | — | 28.8 | 0.15 |
| **7903 C** | **DB DF DT** | 8 150 | 5 850 | 830 | 600 | 28 000 | 38 000 | 13.3 | 0.7 | — | 28.8 | 0.15 |
| **7003 A** | **DB DF DT** | 10 400 | 7 650 | 1 060 | 780 | 17 000 | 24 000 | 25.0 | 5.0 | 18.2 | 33.8 | 0.15 |
| **7003 C** | **DB DF DT** | 10 700 | 7 600 | 1 100 | 775 | 26 000 | 34 000 | 17.0 | 3.0 | — | 33.8 | 0.15 |
| **7203 A** | **DB DF DT** | 17 600 | 12 000 | 1 790 | 1 220 | 16 000 | 22 000 | 28.5 | 4.5 | 19.5 | 37.5 | 0.3 |
| **7203 B** | **DB DF DT** | 16 100 | 11 000 | 1 650 | 1 130 | 11 000 | 15 000 | 35.9 | 11.9 | 19.5 | 37.5 | 0.3 |
| ***7203 BEA** | | — | — | — | — | 13 000 | 18 000 | 36.3 | 12.3 | 19.5 | 37.5 | 0.3 |
| **7203 C** | **DB DF DT** | 17 600 | 11 700 | 1 800 | 1 190 | 22 000 | 32 000 | 19.6 | 4.4 | — | 37.5 | 0.3 |
| **7303 A** | **DB DF DT** | 25 900 | 17 300 | 2 640 | 1 760 | 11 000 | 15 000 | 32.5 | 4.5 | 22 | 42 | 0.6 |
| **7303 B** | **DB DF DT** | 24 000 | 16 000 | 2 450 | 1 640 | 10 000 | 14 000 | 40.9 | 12.9 | 22 | 42 | 0.6 |
| ***7303 BEA** | | — | — | — | — | 11 000 | 16 000 | 40.9 | 12.9 | 22 | 42 | 0.6 |
| **7904 A5** | **DB DF DT** | 10 700 | 8 100 | 1 090 | 825 | 19 000 | 26 000 | 22.3 | 4.3 | — | 35.8 | 0.15 |
| **7904 C** | **DB DF DT** | 11 300 | 8 500 | 1 150 | 865 | 22 000 | 32 000 | 16.6 | 1.4 | — | 35.8 | 0.15 |
| **7004 A** | **DB DF DT** | 17 600 | 13 200 | 1 800 | 1 340 | 15 000 | 20 000 | 29.9 | 5.9 | 22.5 | 39.5 | 0.3 |
| **7004 C** | **DB DF DT** | 18 000 | 13 100 | 1 840 | 1 330 | 20 000 | 30 000 | 20.3 | 3.7 | — | 39.5 | 0.3 |
| **7204 A** | **DB DF DT** | 23 500 | 16 600 | 2 400 | 1 690 | 13 000 | 19 000 | 33.3 | 5.3 | 25 | 42 | 0.6 |
| **7204 B** | **DB DF DT** | 21 600 | 15 300 | 2 210 | 1 560 | 9 500 | 13 000 | 42.1 | 14.1 | 25 | 42 | 0.6 |
| ***7204 BEA** | | — | — | — | — | 11 000 | 16 000 | 42.1 | 14.1 | 25 | 42 | 0.6 |
| **7204 C** | **DB DF DT** | 23 600 | 16 100 | 2 410 | 1 650 | 19 000 | 26 000 | 23.0 | 5.0 | — | 42 | 0.6 |
| **7304 A** | **DB DF DT** | 30 500 | 20 800 | 3 100 | 2 130 | 10 000 | 13 000 | 35.8 | 5.8 | 25 | 47 | 0.6 |
| **7304 B** | **DB DF DT** | 28 200 | 19 300 | 2 870 | 1 970 | 9 000 | 12 000 | 45.2 | 15.2 | 25 | 47 | 0.6 |
| ***7304 BEA** | | — | — | — | — | 10 000 | 14 000 | 45.2 | 15.2 | 25 | 47 | 0.6 |
| **7905 A5** | **DB DF DT** | 12 100 | 10 300 | 1 230 | 1 050 | 16 000 | 22 000 | 24.6 | 6.6 | — | 40.8 | 0.15 |
| **7905 C** | **DB DF DT** | 12 700 | 10 800 | 1 300 | 1 110 | 19 000 | 26 000 | 18.0 | 0.0 | — | 40.8 | 0.15 |
| **7005 A** | **DB DF DT** | 18 300 | 14 800 | 1 870 | 1 510 | 13 000 | 17 000 | 32.8 | 8.8 | 27.5 | 44.5 | 0.3 |
| **7005 C** | **DB DF DT** | 19 000 | 14 800 | 1 940 | 1 510 | 18 000 | 26 000 | 21.6 | 2.4 | — | 44.5 | 0.3 |
| **7205 A** | **DB DF DT** | 26 300 | 20 500 | 2 690 | 2 090 | 12 000 | 16 000 | 37.2 | 7.2 | 30 | 47 | 0.6 |
| **7205 B** | **DB DF DT** | 24 000 | 18 800 | 2 450 | 1 920 | 8 500 | 11 000 | 47.3 | 17.3 | 30 | 47 | 0.6 |
| ***7205 BEA** | | — | — | — | — | 9 500 | 14 000 | 47.3 | 17.3 | 30 | 47 | 0.6 |
| **7205 C** | **DB DF DT** | 27 000 | 20 400 | 2 750 | 2 080 | 17 000 | 24 000 | 25.3 | 4.7 | — | 47 | 0.6 |
| **7305 A** | **DB DF DT** | 43 000 | 31 500 | 4 400 | 3 250 | 8 500 | 11 000 | 42.1 | 8.1 | 30 | 57 | 0.6 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min) and $r_a$ (max) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 25 – 40 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT: $F_a/F_r \leqq e$ X | Y | Single, DT: $F_a/F_r > e$ X | Y | DB or DF: $F_a/F_r \leqq e$ X | Y | DB or DF: $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **25** | 62 | 17 | 1.1 | 0.6 | 24 400 | 14 600 | 2 490 | 1 490 | — | 9 000 | 13 000 | 26.7 | 32 | 55 | 1 | 0.241 |
| | 62 | 17 | 1.1 | 0.6 | 27 200 | 14 900 | 2 770 | 1 520 | — | 10 000 | 15 000 | 26.8 | 32 | 55 | 1 | 0.229 |
| **30** | 47 | 9 | 0.3 | 0.15 | 7 850 | 5 950 | 800 | 605 | — | 18 000 | 24 000 | 13.5 | 32.5 | 44.5 | 0.3 | 0.049 |
| | 47 | 9 | 0.3 | 0.15 | 8 300 | 6 250 | 845 | 640 | 15.9 | 22 000 | 28 000 | 9.7 | 32.5 | 44.5 | 0.3 | 0.049 |
| | 55 | 13 | 1 | 0.6 | 14 500 | 10 100 | 1 480 | 1 030 | — | 13 000 | 18 000 | 18.8 | 36 | 49 | 1 | 0.116 |
| | 55 | 13 | 1 | 0.6 | 15 100 | 10 300 | 1 540 | 1 050 | 14.9 | 19 000 | 26 000 | 12.2 | 36 | 49 | 1 | 0.134 |
| | 62 | 16 | 1 | 0.6 | 22 500 | 14 800 | 2 300 | 1 510 | — | 12 000 | 17 000 | 21.3 | 36 | 56 | 1 | 0.197 |
| | 62 | 16 | 1 | 0.6 | 20 500 | 13 500 | 2 090 | 1 380 | — | 8 500 | 12 000 | 27.3 | 36 | 56 | 1 | 0.202 |
| | 62 | 16 | 1 | 0.6 | 23 700 | 14 300 | 2 420 | 1 460 | — | 10 000 | 14 000 | 27.3 | 36 | 56 | 1 | 0.194 |
| | 62 | 16 | 1 | 0.6 | 23 000 | 14 700 | 2 350 | 1 500 | 13.9 | 18 000 | 24 000 | 14.2 | 36 | 56 | 1 | 0.222 |
| | 72 | 19 | 1.1 | 0.6 | 33 500 | 20 900 | 3 450 | 2 130 | — | 9 000 | 12 000 | 24.2 | 37 | 65 | 1 | 0.346 |
| | 72 | 19 | 1.1 | 0.6 | 31 000 | 19 300 | 3 150 | 1 960 | — | 8 000 | 11 000 | 30.9 | 37 | 65 | 1 | 0.354 |
| | 72 | 19 | 1.1 | 0.6 | 36 500 | 20 600 | 3 700 | 2 100 | — | 9 000 | 13 000 | 30.9 | 37 | 65 | 1 | 0.336 |
| **35** | 55 | 10 | 0.6 | 0.3 | 11 400 | 8 700 | 1 170 | 885 | — | 15 000 | 20 000 | 15.5 | 40 | 50 | 0.6 | 0.074 |
| | 55 | 10 | 0.6 | 0.3 | 12 100 | 9 150 | 1 230 | 930 | 15.7 | 18 000 | 24 000 | 11.0 | 40 | 50 | 0.6 | 0.074 |
| | 62 | 14 | 1 | 0.6 | 18 300 | 13 400 | 1 870 | 1 370 | — | 12 000 | 16 000 | 21.0 | 41 | 56 | 1 | 0.153 |
| | 62 | 14 | 1 | 0.6 | 19 100 | 13 700 | 1 950 | 1 390 | 15.0 | 17 000 | 22 000 | 13.5 | 41 | 56 | 1 | 0.173 |
| | 72 | 17 | 1.1 | 0.6 | 29 700 | 20 100 | 3 050 | 2 050 | — | 10 000 | 14 000 | 23.9 | 42 | 65 | 1 | 0.287 |
| | 72 | 17 | 1.1 | 0.6 | 27 100 | 18 400 | 2 760 | 1 870 | — | 7 500 | 10 000 | 30.9 | 42 | 65 | 1 | 0.294 |
| | 72 | 17 | 1.1 | 0.6 | 32 500 | 19 600 | 3 300 | 1 990 | — | 8 500 | 12 000 | 30.9 | 42 | 65 | 1 | 0.271 |
| | 72 | 17 | 1.1 | 0.6 | 30 500 | 19 900 | 3 100 | 2 030 | 13.9 | 15 000 | 20 000 | 15.7 | 42 | 65 | 1 | 0.32 |
| | 80 | 21 | 1.5 | 1 | 40 000 | 26 300 | 4 050 | 2 680 | — | 8 000 | 10 000 | 27.1 | 44 | 71 | 1.5 | 0.464 |
| | 80 | 21 | 1.5 | 1 | 36 500 | 24 200 | 3 750 | 2 460 | — | 7 100 | 9 500 | 34.6 | 44 | 71 | 1.5 | 0.474 |
| | 80 | 21 | 1.5 | 1 | 40 500 | 24 400 | 4 100 | 2 490 | — | 8 000 | 11 000 | 34.6 | 44 | 71 | 1.5 | 0.451 |
| **40** | 62 | 12 | 0.6 | 0.3 | 14 300 | 11 200 | 1 460 | 1 140 | — | 14 000 | 18 000 | 17.9 | 45 | 57 | 0.6 | 0.11 |
| | 62 | 12 | 0.6 | 0.3 | 15 100 | 11 700 | 1 540 | 1 200 | 15.7 | 16 000 | 22 000 | 12.8 | 45 | 57 | 0.6 | 0.109 |
| | 68 | 15 | 1 | 0.6 | 19 500 | 15 400 | 1 990 | 1 570 | — | 10 000 | 14 000 | 23.1 | 46 | 62 | 1 | 0.19 |
| | 68 | 15 | 1 | 0.6 | 20 600 | 15 900 | 2 100 | 1 620 | 15.4 | 15 000 | 20 000 | 14.7 | 46 | 62 | 1 | 0.213 |
| | 80 | 18 | 1.1 | 0.6 | 35 500 | 25 100 | 3 600 | 2 560 | — | 9 500 | 13 000 | 26.3 | 47 | 73 | 1 | 0.375 |
| | 80 | 18 | 1.1 | 0.6 | 32 000 | 23 000 | 3 250 | 2 340 | — | 6 700 | 9 000 | 34.2 | 47 | 73 | 1 | 0.383 |

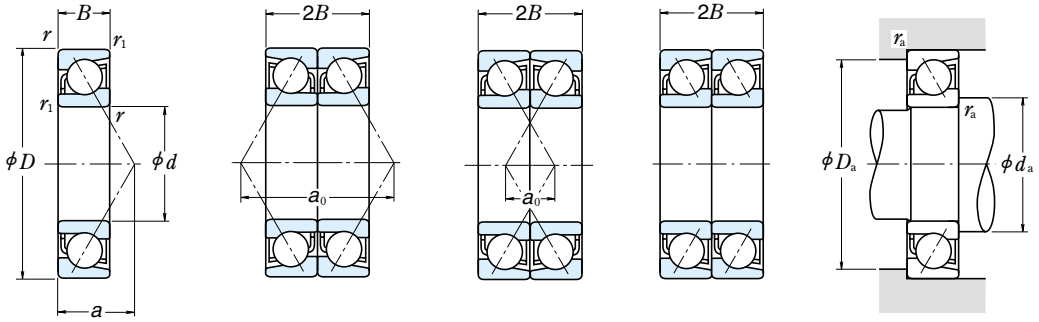
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7305 B** | **DB DF DT** | 39 500 | 29 300 | 4 050 | 2 980 | 7 500 | 10 000 | 53.5 | 19.5 | 30 | 57 | 0.6 |
| ***7305 BEA** | | — | — | — | — | 8 500 | 12 000 | 53.5 | 19.5 | 30 | 57 | 0.6 |
| **7906 A5** | **DB DF DT** | 12 800 | 11 900 | 1 300 | 1 210 | 14 000 | 19 000 | 27.0 | 9.0 | — | 45.8 | 0.15 |
| **7906 C** | **DB DF DT** | 13 500 | 12 500 | 1 380 | 1 280 | 17 000 | 24 000 | 19.3 | 1.3 | — | 45.8 | 0.15 |
| **7006 A** | **DB DF DT** | 23 600 | 20 200 | 2 410 | 2 060 | 11 000 | 15 000 | 37.5 | 11.5 | 35 | 50 | 0.6 |
| **7006 C** | **DB DF DT** | 24 600 | 20 500 | 2 510 | 2 090 | 15 000 | 22 000 | 24.4 | 1.6 | — | 50 | 0.6 |
| **7206 A** | **DB DF DT** | 36 500 | 29 500 | 3 750 | 3 000 | 10 000 | 13 000 | 42.6 | 10.6 | 35 | 57 | 0.6 |
| **7206 B** | **DB DF DT** | 33 500 | 27 000 | 3 400 | 2 760 | 7 100 | 9 500 | 54.6 | 22.6 | 35 | 57 | 0.6 |
| ***7206 BEA** | | — | — | — | — | 8 000 | 11 000 | 54.6 | 22.6 | 35 | 57 | 0.6 |
| **7206 C** | **DB DF DT** | 37 500 | 29 300 | 3 800 | 2 990 | 14 000 | 20 000 | 28.3 | 3.7 | — | 57 | 0.6 |
| **7306 A** | **DB DF DT** | 54 500 | 41 500 | 5 600 | 4 250 | 7 100 | 9 500 | 48.4 | 10.4 | 35 | 67 | 0.6 |
| **7306 B** | **DB DF DT** | 50 500 | 38 500 | 5 150 | 3 950 | 6 300 | 8 500 | 61.8 | 23.8 | 35 | 67 | 0.6 |
| ***7306 BEA** | | — | — | — | — | 7 100 | 10 000 | 61.8 | 23.8 | 35 | 67 | 0.6 |
| **7907 A5** | **DB DF DT** | 18 600 | 17 400 | 1 890 | 1 770 | 12 000 | 17 000 | 31.0 | 11.0 | — | 52.5 | 0.3 |
| **7907 C** | **DB DF DT** | 19 600 | 18 300 | 2 000 | 1 860 | 14 000 | 20 000 | 22.1 | 2.1 | — | 52.5 | 0.3 |
| **7007 A** | **DB DF DT** | 29 700 | 26 800 | 3 050 | 2 740 | 9 500 | 13 000 | 42.0 | 14.0 | 40 | 57 | 0.6 |
| **7007 C** | **DB DF DT** | 31 000 | 27 300 | 3 150 | 2 790 | 13 000 | 19 000 | 27.0 | 1.0 | — | 57 | 0.6 |
| **7207 A** | **DB DF DT** | 48 500 | 40 000 | 4 900 | 4 100 | 8 500 | 12 000 | 47.9 | 13.9 | 40 | 67 | 0.6 |
| **7207 B** | **DB DF DT** | 44 000 | 36 500 | 4 500 | 3 750 | 6 000 | 8 000 | 61.9 | 27.9 | 40 | 67 | 0.6 |
| ***7207BEA** | | — | — | — | — | 6 700 | 9 500 | 61.9 | 27.9 | 40 | 67 | 0.6 |
| **7207 C** | **DB DF DT** | 49 500 | 40 000 | 5 050 | 4 050 | 12 000 | 17 000 | 31.3 | 2.7 | — | 67 | 0.6 |
| **7307 A** | **DB DF DT** | 65 000 | 52 500 | 6 600 | 5 350 | 6 300 | 8 500 | 54.2 | 12.2 | 41 | 74 | 1 |
| **7307 B** | **DB DF DT** | 59 500 | 48 500 | 6 100 | 4 950 | 5 600 | 7 500 | 69.2 | 27.2 | 41 | 74 | 1 |
| ***7307 BEA** | | — | — | — | — | 6 300 | 9 000 | 69.2 | 27.2 | 41 | 74 | 1 |
| **7908 A5** | **DB DF DT** | 23 300 | 22 300 | 2 370 | 2 270 | 11 000 | 15 000 | 35.8 | 11.8 | — | 59.5 | 0.3 |
| **7908 C** | **DB DF DT** | 24 600 | 23 500 | 2 510 | 2 390 | 13 000 | 18 000 | 25.7 | 1.7 | — | 59.5 | 0.3 |
| **7008 A** | **DB DF DT** | 31 500 | 31 000 | 3 250 | 3 150 | 8 500 | 11 000 | 46.2 | 16.2 | 45 | 63 | 0.6 |
| **7008 C** | **DB DF DT** | 33 500 | 32 000 | 3 400 | 3 250 | 12 000 | 17 000 | 29.5 | 0.5 | — | 63 | 0.6 |
| **7208 A** | **DB DF DT** | 57 500 | 50 500 | 5 850 | 5 150 | 7 500 | 10 000 | 52.6 | 16.6 | 45 | 75 | 0.6 |
| **7208 B** | **DB DF DT** | 52 000 | 46 000 | 5 300 | 4 700 | 5 300 | 7 500 | 68.3 | 32.3 | 45 | 75 | 0.6 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 40 – 55 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **40** | 80 | 18 | 1.1 | 0.6 | 38 500 | 24 500 | 3 900 | 2 500 | — | 7 500 | 11 000 | 34.2 | 47 | 73 | 1 | 0.357 |
| | 80 | 18 | 1.1 | 0.6 | 36 500 | 25 200 | 3 700 | 2 570 | 14.1 | 14 000 | 19 000 | 17.0 | 47 | 73 | 1 | 0.418 |
| | 90 | 23 | 1.5 | 1 | 49 000 | 33 000 | 5 000 | 3 350 | — | 7 100 | 9 000 | 30.3 | 49 | 81 | 1.5 | 0.633 |
| | 90 | 23 | 1.5 | 1 | 45 000 | 30 500 | 4 550 | 3 100 | — | 6 300 | 8 500 | 38.8 | 49 | 81 | 1.5 | 0.648 |
| | 90 | 23 | 1.5 | 1 | 53 000 | 33 000 | 5 400 | 3 350 | — | 7 100 | 10 000 | 38.8 | 49 | 81 | 1.5 | 0.619 |
| **45** | 68 | 12 | 0.6 | 0.3 | 15 100 | 12 700 | 1 540 | 1 290 | — | 12 000 | 17 000 | 19.2 | 50 | 63 | 0.6 | 0.13 |
| | 68 | 12 | 0.6 | 0.3 | 16 000 | 13 400 | 1 630 | 1 360 | 16.0 | 14 000 | 20 000 | 13.6 | 50 | 63 | 0.6 | 0.129 |
| | 75 | 16 | 1 | 0.6 | 23 100 | 18 700 | 2 360 | 1 910 | — | 9 500 | 13 000 | 25.3 | 51 | 69 | 1 | 0.25 |
| | 75 | 16 | 1 | 0.6 | 24 400 | 19 300 | 2 490 | 1 960 | 15.4 | 14 000 | 19 000 | 16.0 | 51 | 69 | 1 | 0.274 |
| | 85 | 19 | 1.1 | 0.6 | 39 500 | 28 700 | 4 050 | 2 930 | — | 8 500 | 12 000 | 28.3 | 52 | 78 | 1 | 0.411 |
| | 85 | 19 | 1.1 | 0.6 | 36 000 | 26 200 | 3 650 | 2 680 | — | 6 300 | 8 500 | 36.8 | 52 | 78 | 1 | 0.421 |
| | 85 | 19 | 1.1 | 0.6 | 40 500 | 27 100 | 4 100 | 2 760 | — | 7 100 | 10 000 | 36.8 | 52 | 78 | 1 | 0.40 |
| | 85 | 19 | 1.1 | 0.6 | 41 000 | 28 800 | 4 150 | 2 940 | 14.2 | 12 000 | 17 000 | 18.2 | 52 | 78 | 1 | 0.468 |
| | 100 | 25 | 1.5 | 1 | 63 500 | 43 500 | 6 450 | 4 450 | — | 6 300 | 8 500 | 33.4 | 54 | 91 | 1.5 | 0.848 |
| | 100 | 25 | 1.5 | 1 | 58 500 | 40 000 | 5 950 | 4 100 | — | 5 600 | 7 500 | 42.9 | 54 | 91 | 1.5 | 0.869 |
| | 100 | 25 | 1.5 | 1 | 62 500 | 39 500 | 6 400 | 4 050 | — | 6 300 | 9 000 | 42.9 | 54 | 91 | 1.5 | 0.823 |
| **50** | 72 | 12 | 0.6 | 0.3 | 15 900 | 14 200 | 1 630 | 1 450 | — | 11 000 | 15 000 | 20.2 | 55 | 67 | 0.6 | 0.132 |
| | 72 | 12 | 0.6 | 0.3 | 16 900 | 15 000 | 1 720 | 1 530 | 16.2 | 13 000 | 18 000 | 14.2 | 55 | 67 | 0.6 | 0.13 |
| | 80 | 16 | 1 | 0.6 | 24 500 | 21 100 | 2 500 | 2 150 | — | 8 500 | 12 000 | 26.8 | 56 | 74 | 1 | 0.263 |
| | 80 | 16 | 1 | 0.6 | 26 000 | 21 900 | 2 650 | 2 230 | 15.7 | 12 000 | 17 000 | 16.7 | 56 | 74 | 1 | 0.293 |
| | 90 | 20 | 1.1 | 0.6 | 41 500 | 31 500 | 4 200 | 3 200 | — | 8 000 | 11 000 | 30.2 | 57 | 83 | 1 | 0.466 |
| | 90 | 20 | 1.1 | 0.6 | 37 500 | 28 600 | 3 800 | 2 920 | — | 5 600 | 8 000 | 39.4 | 57 | 83 | 1 | 0.477 |
| | 90 | 20 | 1.1 | 0.6 | 42 000 | 29 700 | 4 300 | 3 050 | — | 6 300 | 9 500 | 39.4 | 57 | 83 | 1 | 0.453 |
| | 90 | 20 | 1.1 | 0.6 | 43 000 | 31 500 | 4 350 | 3 250 | 14.5 | 12 000 | 16 000 | 19.4 | 57 | 83 | 1 | 0.528 |
| | 110 | 27 | 2 | 1 | 74 000 | 52 000 | 7 550 | 5 300 | — | 5 600 | 7 500 | 36.6 | 60 | 100 | 2 | 1.1 |
| | 110 | 27 | 2 | 1 | 68 000 | 48 000 | 6 950 | 4 900 | — | 5 000 | 6 700 | 47.1 | 60 | 100 | 2 | 1.12 |
| | 110 | 27 | 2 | 1 | 78 000 | 50 500 | 7 950 | 5 150 | — | 5 600 | 8 000 | 47.1 | 60 | 100 | 2 | 1.07 |
| **55** | 80 | 13 | 1 | 0.6 | 18 100 | 16 800 | 1 840 | 1 710 | — | 10 000 | 14 000 | 22.2 | 61 | 74 | 1 | 0.184 |
| | 80 | 13 | 1 | 0.6 | 19 100 | 17 700 | 1 950 | 1 810 | 16.3 | 12 000 | 16 000 | 15.5 | 61 | 74 | 1 | 0.182 |
| | 90 | 18 | 1.1 | 0.6 | 32 500 | 27 700 | 3 300 | 2 830 | — | 7 500 | 11 000 | 29.9 | 62 | 83 | 1 | 0.391 |

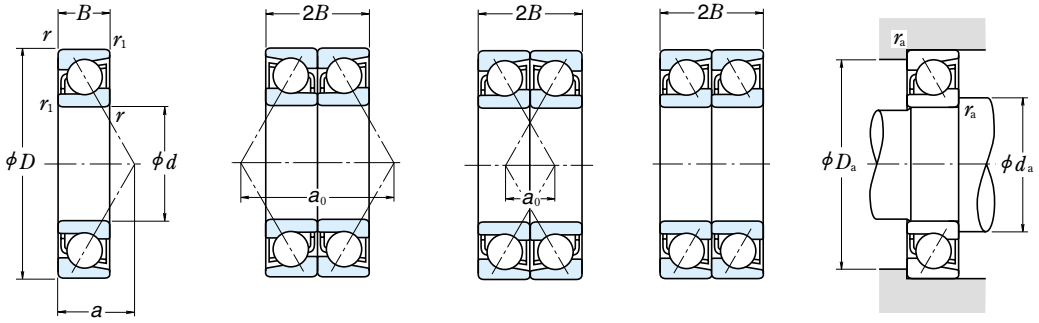
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***7208 BEA** | | — | — | — | — | 6 000 | 8 500 | 68.3 | 32.3 | 45 | 75 | 0.6 |
| **7208 C** | **DB DF DT** | 59 000 | 50 500 | 6 000 | 5 150 | 11 000 | 15 000 | 34.1 | 1.9 | — | 75 | 0.6 |
| **7308 A** | **DB DF DT** | 79 500 | 66 000 | 8 100 | 6 700 | 5 600 | 7 500 | 60.5 | 14.5 | 46 | 84 | 1 |
| **7308 B** | **DB DF DT** | 73 000 | 60 500 | 7 400 | 6 200 | 5 000 | 6 700 | 77.5 | 31.5 | 46 | 84 | 1 |
| ***7308 BEA** | | — | — | — | — | 5 600 | 8 000 | 77.5 | 31.5 | 46 | 84 | 1 |
| **7909 A5** | **DB DF DT** | 24 600 | 25 400 | 2 510 | 2 590 | 9 500 | 13 000 | 38.4 | 14.4 | — | 65.5 | 0.3 |
| **7909 C** | **DB DF DT** | 26 000 | 26 800 | 2 660 | 2 730 | 12 000 | 16 000 | 27.1 | 3.1 | — | 65.5 | 0.3 |
| **7009 A** | **DB DF DT** | 37 500 | 37 500 | 3 850 | 3 800 | 7 500 | 10 000 | 50.6 | 18.6 | 50 | 70 | 0.6 |
| **7009 C** | **DB DF DT** | 39 500 | 38 500 | 4 050 | 3 950 | 11 000 | 15 000 | 32.1 | 0.1 | — | 70 | 0.6 |
| **7209 A** | **DB DF DT** | 64 500 | 57 500 | 6 550 | 5 850 | 7 100 | 9 500 | 56.5 | 18.5 | 50 | 80 | 0.6 |
| **7209 B** | **DB DF DT** | 58 500 | 52 500 | 5 950 | 5 350 | 5 000 | 6 700 | 73.5 | 35.5 | 50 | 80 | 0.6 |
| ***7209 BEA** | | — | — | — | — | 5 600 | 8 000 | 73.5 | 35.5 | 50 | 80 | 0.6 |
| **7209 C** | **DB DF DT** | 66 500 | 57 500 | 6 750 | 5 850 | 10 000 | 14 000 | 36.4 | 1.6 | — | 80 | 0.6 |
| **7309 A** | **DB DF DT** | 103 000 | 87 000 | 10 500 | 8 900 | 5 000 | 6 700 | 66.9 | 16.9 | 51 | 94 | 1 |
| **7309 B** | **DB DF DT** | 95 000 | 80 500 | 9 650 | 8 200 | 4 500 | 6 000 | 85.8 | 35.8 | 51 | 94 | 1 |
| ***7309 BEA** | | — | — | — | — | 5 000 | 7 100 | 85.8 | 35.8 | 51 | 94 | 1 |
| **7910 A5** | **DB DF DT** | 25 900 | 28 400 | 2 640 | 2 900 | 9 000 | 12 000 | 40.5 | 16.5 | — | 69.5 | 0.3 |
| **7910 C** | **DB DF DT** | 27 400 | 30 000 | 2 800 | 3 050 | 11 000 | 15 000 | 28.3 | 4.3 | — | 69.5 | 0.3 |
| **7010 A** | **DB DF DT** | 40 000 | 42 000 | 4 050 | 4 300 | 7 100 | 9 500 | 53.5 | 21.5 | 55 | 75 | 0.6 |
| **7010 C** | **DB DF DT** | 42 000 | 44 000 | 4 300 | 4 450 | 10 000 | 14 000 | 33.4 | 1.4 | — | 75 | 0.6 |
| **7210 A** | **DB DF DT** | 67 000 | 63 000 | 6 850 | 6 400 | 6 300 | 9 000 | 60.4 | 20.4 | 55 | 85 | 0.6 |
| **7210 B** | **DB DF DT** | 60 500 | 57 000 | 6 200 | 5 850 | 4 500 | 6 300 | 78.7 | 38.7 | 55 | 85 | 0.6 |
| ***7210 BEA** | | — | — | — | — | 5 000 | 7 500 | 78.7 | 38.7 | 55 | 85 | 0.6 |
| **7210 C** | **DB DF DT** | 69 500 | 63 500 | 7 100 | 6 450 | 9 500 | 13 000 | 38.7 | 1.3 | — | 85 | 0.6 |
| **7310 A** | **DB DF DT** | 121 000 | 104 000 | 12 300 | 10 600 | 4 500 | 6 000 | 73.2 | 19.2 | 56 | 104 | 1 |
| **7310 B** | **DB DF DT** | 111 000 | 96 000 | 11 300 | 9 800 | 4 000 | 5 600 | 94.1 | 40.1 | 56 | 104 | 1 |
| ***7310 BEA** | | — | — | — | — | 4 500 | 6 700 | 94.1 | 40.1 | 56 | 104 | 1 |
| **7911 A5** | **DB DF DT** | 29 300 | 33 500 | 2 990 | 3 400 | 8 000 | 11 000 | 44.5 | 18.5 | — | 75 | 0.6 |
| **7911 C** | **DB DF DT** | 31 000 | 35 500 | 3 150 | 3 600 | 9 500 | 13 000 | 31.1 | 5.1 | — | 75 | 0.6 |
| **7011 A** | **DB DF DT** | 52 500 | 55 500 | 5 350 | 5 650 | 6 300 | 8 500 | 59.9 | 23.9 | 60 | 85 | 0.6 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 55 – 65 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **55** | 90 | 18 | 1.1 | 0.6 | 34 000 | 28 600 | 3 500 | 2 920 | 15.5 | 11 000 | 15 000 | 18.7 | 62 | 83 | 1 | 0.43 |
| | 100 | 21 | 1.5 | 1 | 51 000 | 39 500 | 5 200 | 4 050 | — | 7 100 | 10 000 | 32.9 | 64 | 91 | 1.5 | 0.613 |
| | 100 | 21 | 1.5 | 1 | 46 500 | 36 000 | 4 700 | 3 700 | — | 5 300 | 7 100 | 43.0 | 64 | 91 | 1.5 | 0.627 |
| | 100 | 21 | 1.5 | 1 | 51 500 | 37 000 | 5 250 | 3 800 | — | 6 000 | 8 500 | 43.0 | 64 | 91 | 1.5 | 0.596 |
| | 100 | 21 | 1.5 | 1 | 53 000 | 40 000 | 5 400 | 4 100 | 14.5 | 10 000 | 14 000 | 20.9 | 64 | 91 | 1.5 | 0.688 |
| | 120 | 29 | 2 | 1 | 86 000 | 61 500 | 8 750 | 6 250 | — | 5 000 | 6 700 | 39.8 | 65 | 110 | 2 | 1.41 |
| | 120 | 29 | 2 | 1 | 79 000 | 56 500 | 8 050 | 5 750 | — | 4 500 | 6 300 | 51.2 | 65 | 110 | 2 | 1.45 |
| | 120 | 29 | 2 | 1 | 89 000 | 58 500 | 9 100 | 6 000 | — | 5 000 | 7 500 | 51.2 | 65 | 110 | 2 | 1.36 |
| **60** | 85 | 13 | 1 | 0.6 | 18 300 | 17 700 | 1 870 | 1 810 | — | 9 500 | 13 000 | 23.4 | 66 | 79 | 1 | 0.197 |
| | 85 | 13 | 1 | 0.6 | 19 400 | 18 700 | 1 980 | 1 910 | 16.5 | 11 000 | 15 000 | 16.2 | 66 | 79 | 1 | 0.194 |
| | 95 | 18 | 1.1 | 0.6 | 33 000 | 29 500 | 3 350 | 3 000 | — | 7 100 | 10 000 | 31.4 | 67 | 88 | 1 | 0.417 |
| | 95 | 18 | 1.1 | 0.6 | 35 000 | 30 500 | 3 600 | 3 150 | 15.7 | 10 000 | 14 000 | 19.4 | 67 | 88 | 1 | 0.46 |
| | 110 | 22 | 1.5 | 1 | 62 000 | 48 500 | 6 300 | 4 950 | — | 6 700 | 9 000 | 35.5 | 69 | 101 | 1.5 | 0.798 |
| | 110 | 22 | 1.5 | 1 | 56 000 | 44 500 | 5 700 | 4 550 | — | 4 800 | 6 300 | 46.7 | 69 | 101 | 1.5 | 0.815 |
| | 110 | 22 | 1.5 | 1 | 61 500 | 45 000 | 6 300 | 4 600 | — | 5 300 | 7 500 | 46.7 | 69 | 101 | 1.5 | 0.791 |
| | 110 | 22 | 1.5 | 1 | 64 000 | 49 000 | 6 550 | 5 000 | 14.4 | 9 500 | 13 000 | 22.4 | 69 | 101 | 1.5 | 0.889 |
| | 130 | 31 | 2.1 | 1.1 | 98 000 | 71 500 | 10 000 | 7 250 | — | 4 800 | 6 300 | 42.9 | 72 | 118 | 2 | 1.74 |
| | 130 | 31 | 2.1 | 1.1 | 90 000 | 65 500 | 9 200 | 6 700 | — | 4 300 | 5 600 | 55.4 | 72 | 118 | 2 | 1.78 |
| | 130 | 31 | 2.1 | 1.1 | 102 000 | 68 500 | 10 500 | 7 000 | — | 4 800 | 6 700 | 55.4 | 72 | 118 | 2 | 1.7 |
| **65** | 90 | 13 | 1 | 0.6 | 19 100 | 19 400 | 1 940 | 1 980 | — | 9 000 | 12 000 | 24.6 | 71 | 84 | 1 | 0.211 |
| | 90 | 13 | 1 | 0.6 | 20 200 | 20 500 | 2 060 | 2 090 | 16.7 | 10 000 | 14 000 | 16.9 | 71 | 84 | 1 | 0.208 |
| | 100 | 18 | 1.1 | 0.6 | 35 000 | 33 000 | 3 550 | 3 350 | — | 6 700 | 9 500 | 32.8 | 72 | 93 | 1 | 0.455 |
| | 100 | 18 | 1.1 | 0.6 | 37 000 | 34 500 | 3 800 | 3 500 | 15.9 | 10 000 | 13 000 | 20.0 | 72 | 93 | 1 | 0.493 |
| | 120 | 23 | 1.5 | 1 | 70 500 | 58 000 | 7 150 | 5 900 | — | 6 000 | 8 500 | 38.2 | 74 | 111 | 1.5 | 1.03 |
| | 120 | 23 | 1.5 | 1 | 63 500 | 52 500 | 6 500 | 5 350 | — | 4 300 | 6 000 | 50.3 | 74 | 111 | 1.5 | 1.05 |
| | 120 | 23 | 1.5 | 1 | 70 000 | 53 500 | 7 150 | 5 450 | — | 4 800 | 7 100 | 50.3 | 74 | 111 | 1.5 | 1.01 |
| | 120 | 23 | 1.5 | 1 | 73 000 | 58 500 | 7 450 | 6 000 | 14.6 | 9 000 | 12 000 | 23.9 | 74 | 111 | 1.5 | 1.14 |
| | 140 | 33 | 2.1 | 1.1 | 111 000 | 82 000 | 11 300 | 8 350 | — | 4 300 | 6 000 | 46.1 | 77 | 128 | 2 | 2.12 |
| | 140 | 33 | 2.1 | 1.1 | 102 000 | 75 500 | 10 400 | 7 700 | — | 3 800 | 5 300 | 59.5 | 77 | 128 | 2 | 2.17 |
| | 140 | 33 | 2.1 | 1.1 | 114 000 | 77 000 | 11 600 | 7 850 | — | 4 300 | 6 300 | 59.5 | 77 | 128 | 2 | 2.09 |

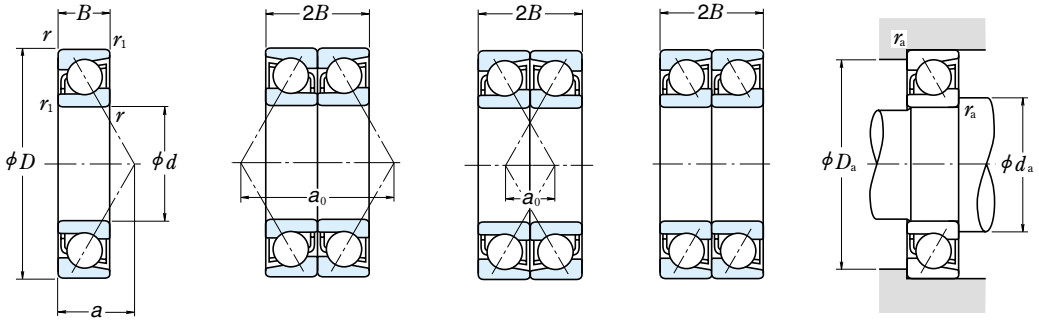
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7011 C** | **DB DF DT** | 55 500 | 57 500 | 5 650 | 5 850 | 9 000 | 12 000 | 37.4 | 1.4 | — | 85 | 0.6 |
| **7211 A** | **DB DF DT** | 83 000 | 79 000 | 8 450 | 8 050 | 6 000 | 8 000 | 65.7 | 23.7 | 61 | 94 | 1 |
| **7211 B** | **DB DF DT** | 75 000 | 72 000 | 7 650 | 7 350 | 4 000 | 5 600 | 86.0 | 44.0 | 61 | 94 | 1 |
| ***7211 BEA** | | — | — | — | — | 4 500 | 6 700 | 86.0 | 44.0 | 61 | 94 | 1 |
| **7211 C** | **DB DF DT** | 86 000 | 80 000 | 8 800 | 8 150 | 8 500 | 12 000 | 41.7 | 0.3 | — | 94 | 1 |
| **7311 A** | **DB DF DT** | 139 000 | 123 000 | 14 200 | 12 500 | 4 000 | 5 600 | 79.5 | 21.5 | 61 | 114 | 1 |
| **7311 B** | **DB DF DT** | 128 000 | 113 000 | 13 100 | 11 500 | 3 600 | 5 000 | 102.4 | 44.4 | 61 | 114 | 1 |
| ***7311 BEA** | | — | — | — | — | 4 000 | 6 000 | 102.4 | 44.4 | 61 | 114 | 1 |
| **7912 A5** | **DB DF DT** | 29 800 | 35 500 | 3 050 | 3 600 | 7 500 | 10 000 | 46.8 | 20.8 | — | 80 | 0.6 |
| **7912 C** | **DB DF DT** | 31 500 | 37 500 | 3 200 | 3 800 | 9 000 | 12 000 | 32.4 | 6.4 | — | 80 | 0.6 |
| **7012 A** | **DB DF DT** | 53 500 | 59 000 | 5 450 | 6 000 | 6 000 | 8 000 | 62.7 | 26.7 | 65 | 90 | 0.6 |
| **7012 C** | **DB DF DT** | 57 000 | 61 500 | 5 800 | 6 250 | 8 500 | 12 000 | 38.8 | 2.8 | — | 90 | 0.6 |
| **7212 A** | **DB DF DT** | 100 000 | 97 500 | 10 200 | 9 950 | 5 300 | 7 100 | 71.1 | 27.1 | 66 | 104 | 1 |
| **7212 B** | **DB DF DT** | 91 000 | 89 000 | 9 300 | 9 050 | 3 800 | 5 300 | 93.3 | 49.3 | 66 | 104 | 1 |
| ***7212 BEA** | | — | — | — | — | 4 300 | 6 000 | 93.3 | 49.3 | 66 | 104 | 1 |
| **7212 C** | **DB DF DT** | 104 000 | 98 500 | 10 600 | 10 000 | 7 500 | 11 000 | 44.8 | 0.8 | — | 104 | 1 |
| **7312 A** | **DB DF DT** | 159 000 | 143 000 | 16 200 | 14 500 | 3 800 | 5 000 | 85.9 | 23.9 | 67 | 123 | 1 |
| **7312 B** | **DB DF DT** | 146 000 | 131 000 | 14 900 | 13 400 | 3 400 | 4 500 | 110.7 | 48.7 | 67 | 123 | 1 |
| ***7312 BEA** | | — | — | — | — | 3 800 | 5 600 | 110.7 | 48.7 | 67 | 123 | 1 |
| **7913 A5** | **DB DF DT** | 31 000 | 39 000 | 3 150 | 3 950 | 7 100 | 9 500 | 49.1 | 23.1 | — | 85 | 0.6 |
| **7913 C** | **DB DF DT** | 33 000 | 41 000 | 3 350 | 4 200 | 8 500 | 12 000 | 33.8 | 7.8 | — | 85 | 0.6 |
| **7013 A** | **DB DF DT** | 56 500 | 65 500 | 5 750 | 6 700 | 5 600 | 7 500 | 65.6 | 29.6 | 70 | 95 | 0.6 |
| **7013 C** | **DB DF DT** | 60 500 | 68 500 | 6 150 | 7 000 | 8 000 | 11 000 | 40.1 | 4.1 | — | 95 | 0.6 |
| **7213 A** | **DB DF DT** | 114 000 | 116 000 | 11 600 | 11 800 | 4 800 | 6 700 | 76.4 | 30.4 | 71 | 114 | 1 |
| **7213 B** | **DB DF DT** | 103 000 | 105 000 | 10 500 | 10 700 | 3 400 | 4 800 | 100.6 | 54.6 | 71 | 114 | 1 |
| ***7213 BEA** | | — | — | — | — | 3 800 | 5 600 | 100.6 | 54.6 | 71 | 114 | 1 |
| **7213 C** | **DB DF DT** | 119 000 | 117 000 | 12 100 | 12 000 | 7 100 | 9 500 | 47.8 | 1.8 | — | 114 | 1 |
| **7313 A** | **DB DF DT** | 180 000 | 164 000 | 18 400 | 16 700 | 3 600 | 4 800 | 92.2 | 26.2 | 72 | 133 | 1 |
| **7313 B** | **DB DF DT** | 166 000 | 151 000 | 16 900 | 15 400 | 3 200 | 4 300 | 119.0 | 53.0 | 72 | 133 | 1 |
| ***7313 BEA** | | — | — | — | — | 3 600 | 5 000 | 119.0 | 53.0 | 72 | 133 | 1 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 70 – 80 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **70** | 100 | 16 | 1 | 0.6 | 26 500 | 26 300 | 2 710 | 2 680 | — | 8 000 | 11 000 | 27.8 | 76 | 94 | 1 | 0.341 |
| | 100 | 16 | 1 | 0.6 | 28 100 | 27 800 | 2 870 | 2 830 | 16.4 | 9 500 | 13 000 | 19.4 | 76 | 94 | 1 | 0.338 |
| | 110 | 20 | 1.1 | 0.6 | 44 000 | 41 500 | 4 500 | 4 200 | — | 6 300 | 8 500 | 36.0 | 77 | 103 | 1 | 0.625 |
| | 110 | 20 | 1.1 | 0.6 | 47 000 | 43 000 | 4 800 | 4 400 | 15.7 | 9 000 | 12 000 | 22.1 | 77 | 103 | 1 | 0.698 |
| | 125 | 24 | 1.5 | 1 | 76 500 | 63 500 | 7 800 | 6 500 | — | 5 600 | 8 000 | 40.1 | 79 | 116 | 1.5 | 1.11 |
| | 125 | 24 | 1.5 | 1 | 69 000 | 58 000 | 7 050 | 5 900 | — | 4 000 | 5 600 | 52.9 | 79 | 116 | 1.5 | 1.14 |
| | 125 | 24 | 1.5 | 1 | 75 500 | 58 500 | 7 700 | 6 000 | — | 4 500 | 6 700 | 52.9 | 79 | 116 | 1.5 | 1.08 |
| | 125 | 24 | 1.5 | 1 | 79 500 | 64 500 | 8 100 | 6 600 | 14.6 | 8 500 | 11 000 | 25.1 | 79 | 116 | 1.5 | 1.24 |
| | 150 | 35 | 2.1 | 1.1 | 125 000 | 93 500 | 12 700 | 9 550 | — | 4 000 | 5 300 | 49.3 | 82 | 138 | 2 | 2.6 |
| | 150 | 35 | 2.1 | 1.1 | 114 000 | 86 000 | 11 700 | 8 750 | — | 3 600 | 5 000 | 63.6 | 82 | 138 | 2 | 2.65 |
| | 150 | 35 | 2.1 | 1.1 | 124 000 | 87 500 | 12 600 | 8 900 | — | 4 000 | 6 000 | 63.7 | 82 | 138 | 2 | 2.53 |
| **75** | 105 | 16 | 1 | 0.6 | 26 900 | 27 700 | 2 750 | 2 820 | — | 7 500 | 10 000 | 29.0 | 81 | 99 | 1 | 0.355 |
| | 105 | 16 | 1 | 0.6 | 28 600 | 29 300 | 2 910 | 2 980 | 16.6 | 9 000 | 12 000 | 20.1 | 81 | 99 | 1 | 0.357 |
| | 115 | 20 | 1.1 | 0.6 | 45 000 | 43 500 | 4 600 | 4 450 | — | 6 000 | 8 000 | 37.4 | 82 | 108 | 1 | 0.661 |
| | 115 | 20 | 1.1 | 0.6 | 48 000 | 45 500 | 4 900 | 4 650 | 15.9 | 8 500 | 12 000 | 22.7 | 82 | 108 | 1 | 0.748 |
| | 130 | 25 | 1.5 | 1 | 76 000 | 64 500 | 7 750 | 6 550 | — | 5 600 | 7 500 | 42.1 | 84 | 121 | 1.5 | 1.19 |
| | 130 | 25 | 1.5 | 1 | 68 500 | 58 500 | 7 000 | 5 950 | — | 3 800 | 5 300 | 55.5 | 84 | 121 | 1.5 | 1.22 |
| | 130 | 25 | 1.5 | 1 | 78 500 | 63 500 | 8 000 | 6 450 | — | 4 300 | 6 300 | 55.5 | 84 | 121 | 1.5 | 1.18 |
| | 130 | 25 | 1.5 | 1 | 83 000 | 70 000 | 8 450 | 7 100 | 14.8 | 8 000 | 11 000 | 26.2 | 84 | 121 | 1.5 | 1.36 |
| | 160 | 37 | 2.1 | 1.1 | 136 000 | 106 000 | 13 800 | 10 800 | — | 3 800 | 5 000 | 52.4 | 87 | 148 | 2 | 3.13 |
| | 160 | 37 | 2.1 | 1.1 | 125 000 | 97 500 | 12 700 | 9 900 | — | 3 400 | 4 800 | 67.8 | 87 | 148 | 2 | 3.19 |
| **80** | 110 | 16 | 1 | 0.6 | 27 300 | 29 000 | 2 790 | 2 960 | — | 7 100 | 10 000 | 30.2 | 86 | 104 | 1 | 0.38 |
| | 110 | 16 | 1 | 0.6 | 29 000 | 30 500 | 2 960 | 3 150 | 16.7 | 8 500 | 12 000 | 20.7 | 86 | 104 | 1 | 0.376 |
| | 125 | 22 | 1.1 | 0.6 | 55 000 | 53 000 | 5 650 | 5 400 | — | 5 600 | 7 500 | 40.6 | 87 | 118 | 1 | 0.88 |
| | 125 | 22 | 1.1 | 0.6 | 58 500 | 55 500 | 6 000 | 5 650 | 15.7 | 8 000 | 11 000 | 24.7 | 87 | 118 | 1 | 0.966 |
| | 140 | 26 | 2 | 1 | 89 000 | 76 000 | 9 100 | 7 750 | — | 5 000 | 7 100 | 44.8 | 90 | 130 | 2 | 1.46 |
| | 140 | 26 | 2 | 1 | 80 500 | 69 500 | 8 200 | 7 050 | — | 3 600 | 5 000 | 59.1 | 90 | 130 | 2 | 1.49 |
| | 140 | 26 | 2 | 1 | 87 500 | 70 000 | 8 950 | 7 150 | — | 4 000 | 6 000 | 59.2 | 87 | 148 | 2 | 1.42 |
| | 140 | 26 | 2 | 1 | 93 000 | 77 500 | 9 450 | 7 900 | 14.7 | 7 500 | 10 000 | 27.7 | 90 | 130 | 2 | 1.63 |
| | 170 | 39 | 2.1 | 1.1 | 147 000 | 119 000 | 15 000 | 12 100 | — | 3 600 | 4 800 | 55.6 | 92 | 158 | 2 | 3.71 |
| | 170 | 39 | 2.1 | 1.1 | 135 000 | 109 000 | 13 800 | 11 100 | — | 3 200 | 4 300 | 71.9 | 92 | 158 | 2 | 3.79 |

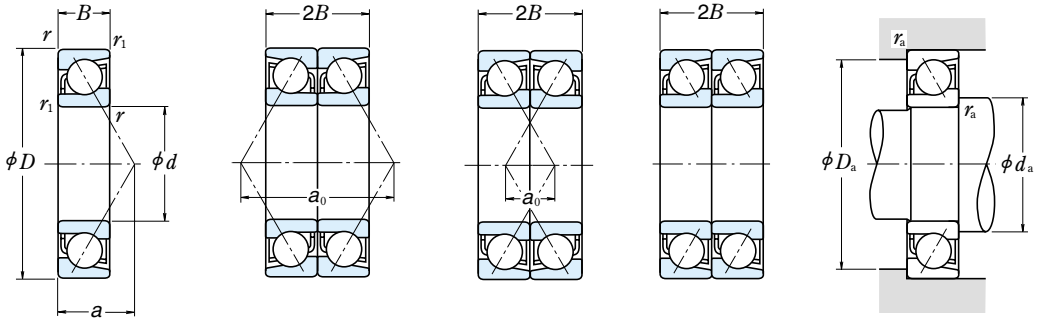
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7914 A5** | **DB DF DT** | 43 000 | 52 500 | 4 400 | 5 350 | 6 300 | 9 000 | 55.6 | 23.6 | — | 95 | 0.6 |
| **7914 C** | **DB DF DT** | 45 500 | 55 500 | 4 650 | 5 650 | 7 500 | 11 000 | 38.8 | 6.8 | — | 95 | 0.6 |
| **7014 A** | **DB DF DT** | 71 500 | 82 500 | 7 300 | 8 450 | 5 000 | 6 700 | 72.0 | 32.0 | 75 | 105 | 0.6 |
| **7014 C** | **DB DF DT** | 76 000 | 86 000 | 7 750 | 8 750 | 7 100 | 10 000 | 44.1 | 4.1 | — | 105 | 0.6 |
| **7214 A** | **DB DF DT** | 124 000 | 127 000 | 12 600 | 13 000 | 4 500 | 6 300 | 80.3 | 32.3 | 76 | 119 | 1 |
| **7214 B** | **DB DF DT** | 112 000 | 116 000 | 11 500 | 11 800 | 3 200 | 4 500 | 105.8 | 57.8 | 76 | 119 | 1 |
| ***7214 BEA** | | — | — | — | — | 3 600 | 5 300 | 105.8 | 57.8 | 76 | 119 | 1 |
| **7214 C** | **DB DF DT** | 129 000 | 129 000 | 13 200 | 13 200 | 6 700 | 9 000 | 50.1 | 2.1 | — | 119 | 1 |
| **7314 A** | **DB DF DT** | 203 000 | 187 000 | 20 700 | 19 100 | 3 200 | 4 300 | 98.5 | 28.5 | 77 | 143 | 1 |
| **7314 B** | **DB DF DT** | 186 000 | 172 000 | 19 000 | 17 500 | 2 800 | 4 000 | 127.3 | 57.3 | 77 | 143 | 1 |
| ***7314 BEA** | | — | — | — | — | 3 200 | 4 800 | 127.3 | 57.3 | 77 | 143 | 1 |
| **7915 A5** | **DB DF DT** | 44 000 | 55 500 | 4 450 | 5 650 | 6 000 | 8 500 | 58.0 | 26.0 | — | 100 | 0.6 |
| **7915 C** | **DB DF DT** | 46 500 | 58 500 | 4 750 | 5 950 | 7 100 | 10 000 | 40.1 | 8.1 | — | 100 | 0.6 |
| **7015 A** | **DB DF DT** | 73 000 | 87 500 | 7 450 | 8 900 | 4 800 | 6 700 | 74.8 | 34.8 | 80 | 110 | 0.6 |
| **7015 C** | **DB DF DT** | 78 000 | 91 500 | 7 950 | 9 300 | 6 700 | 9 500 | 45.4 | 5.4 | — | 110 | 0.6 |
| **7215 A** | **DB DF DT** | 123 000 | 129 000 | 12 600 | 13 100 | 4 300 | 6 000 | 84.2 | 34.2 | 81 | 124 | 1 |
| **7215 B** | **DB DF DT** | 112 000 | 117 000 | 11 400 | 11 900 | 3 200 | 4 300 | 111.0 | 61.0 | 81 | 124 | 1 |
| ***7215 BEA** | | — | — | — | — | 3 600 | 5 000 | 111.0 | 61.0 | 81 | 124 | 1 |
| **7215 C** | **DB DF DT** | 134 000 | 140 000 | 13 700 | 14 200 | 6 300 | 9 000 | 52.4 | 2.4 | — | 124 | 1 |
| **7315 A** | **DB DF DT** | 221 000 | 212 000 | 22 500 | 21 600 | 3 000 | 4 000 | 104.8 | 30.8 | 82 | 153 | 1 |
| **7315 B** | **DB DF DT** | 202 000 | 195 000 | 20 600 | 19 800 | 2 800 | 3 800 | 135.6 | 61.6 | 82 | 153 | 1 |
| **7916 A5** | **DB DF DT** | 44 500 | 58 000 | 4 550 | 5 900 | 5 600 | 8 000 | 60.3 | 28.3 | — | 105 | 0.6 |
| **7916 C** | **DB DF DT** | 47 000 | 61 500 | 4 800 | 6 250 | 6 700 | 9 500 | 41.5 | 9.5 | — | 105 | 0.6 |
| **7016 A** | **DB DF DT** | 89 500 | 106 000 | 9 150 | 10 800 | 4 300 | 6 000 | 81.2 | 37.2 | 85 | 120 | 0.6 |
| **7016 C** | **DB DF DT** | 95 500 | 111 000 | 9 700 | 11 300 | 6 300 | 9 000 | 49.4 | 5.4 | — | 120 | 0.6 |
| **7216 A** | **DB DF DT** | 145 000 | 152 000 | 14 700 | 15 600 | 4 000 | 5 600 | 89.5 | 37.5 | 86 | 134 | 1 |
| **7216 B** | **DB DF DT** | 131 000 | 139 000 | 13 300 | 14 100 | 2 800 | 4 000 | 118.3 | 66.3 | 86 | 134 | 1 |
| ***7216 BEA** | | — | — | — | — | 3 200 | 4 800 | 118.3 | 66.3 | 82 | 153 | 1 |
| **7216 C** | **DB DF DT** | 151 000 | 155 000 | 15 400 | 15 800 | 6 000 | 8 000 | 55.5 | 3.5 | — | 134 | 1 |
| **7316 A** | **DB DF DT** | 239 000 | 238 000 | 24 400 | 24 200 | 2 800 | 3 800 | 111.2 | 33.2 | 87 | 163 | 1 |
| **7316 B** | **DB DF DT** | 219 000 | 218 000 | 22 400 | 22 300 | 2 600 | 3 400 | 143.9 | 65.9 | 87 | 163 | 1 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.
**Remarks** The bearings denoted by an asterisk (*) are HPS Angular contact ball bearings and the column of Duplex in Bearing Numbers indicates the universal matching.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 85 – 100 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **85** | 120 | 18 | 1.1 | 0.6 | 36 500 | 38 500 | 3 750 | 3 900 | — | 6 700 | 9 000 | 32.9 | 92 | 113 | 1 | 0.541 |
| | 120 | 18 | 1.1 | 0.6 | 39 000 | 40 500 | 3 950 | 4 150 | 16.5 | 8 000 | 11 000 | 22.7 | 92 | 113 | 1 | 0.534 |
| | 130 | 22 | 1.1 | 0.6 | 56 500 | 56 000 | 5 750 | 5 700 | — | 5 300 | 7 100 | 42.0 | 92 | 123 | 1 | 0.913 |
| | 130 | 22 | 1.1 | 0.6 | 60 000 | 58 500 | 6 150 | 6 000 | 15.9 | 7 500 | 10 000 | 25.4 | 92 | 123 | 1 | 1.01 |
| | 150 | 28 | 2 | 1 | 103 000 | 89 000 | 10 500 | 9 100 | — | 4 800 | 6 700 | 47.9 | 95 | 140 | 2 | 1.83 |
| | 150 | 28 | 2 | 1 | 93 000 | 81 000 | 9 500 | 8 250 | — | 3 400 | 4 800 | 63.3 | 95 | 140 | 2 | 1.87 |
| | 150 | 28 | 2 | 1 | 107 000 | 90 500 | 10 900 | 9 250 | 14.7 | 6 700 | 9 500 | 29.7 | 95 | 140 | 2 | 2.04 |
| | 180 | 41 | 3 | 1.1 | 159 000 | 133 000 | 16 200 | 13 500 | — | 3 400 | 4 500 | 58.8 | 99 | 166 | 2.5 | 4.33 |
| | 180 | 41 | 3 | 1.1 | 146 000 | 122 000 | 14 800 | 12 400 | — | 3 000 | 4 000 | 76.1 | 99 | 166 | 2.5 | 4.42 |
| **90** | 125 | 18 | 1.1 | 0.6 | 39 500 | 43 500 | 4 000 | 4 450 | — | 6 300 | 8 500 | 34.1 | 97 | 118 | 1 | 0.56 |
| | 125 | 18 | 1.1 | 0.6 | 41 500 | 46 000 | 4 250 | 4 700 | 16.6 | 7 500 | 10 000 | 23.4 | 97 | 118 | 1 | 0.563 |
| | 140 | 24 | 1.5 | 1 | 67 500 | 66 500 | 6 850 | 6 750 | — | 4 800 | 6 700 | 45.2 | 99 | 131 | 1.5 | 1.19 |
| | 140 | 24 | 1.5 | 1 | 71 500 | 69 000 | 7 300 | 7 050 | 15.7 | 7 100 | 9 500 | 27.4 | 99 | 131 | 1.5 | 1.34 |
| | 160 | 30 | 2 | 1 | 118 000 | 103 000 | 12 000 | 10 500 | — | 4 500 | 6 000 | 51.1 | 100 | 150 | 2 | 2.25 |
| | 160 | 30 | 2 | 1 | 107 000 | 94 000 | 10 900 | 9 550 | — | 3 200 | 4 300 | 67.4 | 100 | 150 | 2 | 2.29 |
| | 160 | 30 | 2 | 1 | 123 000 | 105 000 | 12 500 | 10 700 | 14.6 | 6 300 | 9 000 | 31.7 | 100 | 150 | 2 | 2.51 |
| | 190 | 43 | 3 | 1.1 | 171 000 | 147 000 | 17 400 | 15 000 | — | 3 200 | 4 300 | 61.9 | 104 | 176 | 2.5 | 5.06 |
| | 190 | 43 | 3 | 1.1 | 156 000 | 135 000 | 15 900 | 13 800 | — | 2 800 | 3 800 | 80.2 | 104 | 176 | 2.5 | 5.17 |
| **95** | 130 | 18 | 1.1 | 0.6 | 40 000 | 45 500 | 4 050 | 4 650 | — | 6 000 | 8 500 | 35.2 | 102 | 123 | 1 | 0.597 |
| | 130 | 18 | 1.1 | 0.6 | 42 500 | 48 000 | 4 300 | 4 900 | 16.7 | 7 100 | 10 000 | 24.1 | 102 | 123 | 1 | 0.591 |
| | 145 | 24 | 1.5 | 1 | 67 000 | 67 000 | 6 800 | 6 800 | — | 4 500 | 6 300 | 46.6 | 104 | 136 | 1.5 | 1.43 |
| | 145 | 24 | 1.5 | 1 | 73 500 | 73 000 | 7 500 | 7 450 | 15.9 | 6 700 | 9 000 | 28.1 | 104 | 136 | 1.5 | 1.42 |
| | 170 | 32 | 2.1 | 1.1 | 128 000 | 111 000 | 13 000 | 11 300 | — | 4 300 | 5 600 | 54.2 | 107 | 158 | 2 | 2.68 |
| | 170 | 32 | 2.1 | 1.1 | 116 000 | 101 000 | 11 800 | 10 300 | — | 3 000 | 4 000 | 71.6 | 107 | 158 | 2 | 2.74 |
| | 170 | 32 | 2.1 | 1.1 | 133 000 | 112 000 | 13 500 | 11 400 | 14.6 | 6 000 | 8 500 | 33.7 | 107 | 158 | 2 | 3.05 |
| | 200 | 45 | 3 | 1.1 | 183 000 | 162 000 | 18 600 | 16 600 | — | 3 000 | 4 000 | 65.1 | 109 | 186 | 2.5 | 5.83 |
| | 200 | 45 | 3 | 1.1 | 167 000 | 149 000 | 17 100 | 15 200 | — | 2 600 | 3 600 | 84.3 | 109 | 186 | 2.5 | 5.98 |
| **100** | 140 | 20 | 1.1 | 0.6 | 47 500 | 51 500 | 4 850 | 5 250 | — | 5 600 | 8 000 | 38.0 | 107 | 133 | 1 | 0.804 |
| | 140 | 20 | 1.1 | 0.6 | 50 000 | 54 000 | 5 100 | 5 550 | 16.5 | 6 700 | 9 000 | 26.1 | 107 | 133 | 1 | 0.794 |
| | 150 | 24 | 1.5 | 1 | 68 500 | 70 500 | 6 950 | 7 200 | — | 4 500 | 6 000 | 48.1 | 109 | 141 | 1.5 | 1.48 |

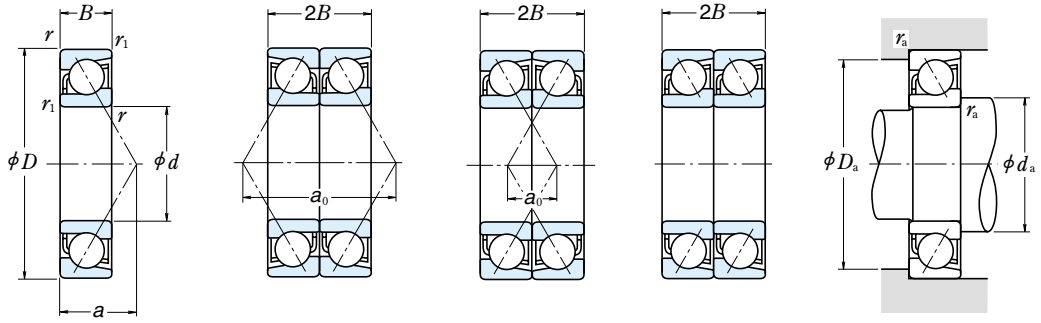
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7917 A5** | **DB DF DT** | 59 500 | 77 000 | 6 100 | 7 850 | 5 300 | 7 500 | 65.8 | 29.8 | — | 115 | 0.6 |
| **7917 C** | **DB DF DT** | 63 000 | 81 500 | 6 450 | 8 300 | 6 300 | 9 000 | 45.5 | 9.5 | — | 115 | 0.6 |
| **7017 A** | **DB DF DT** | 91 500 | 112 000 | 9 350 | 11 400 | 4 300 | 5 600 | 84.1 | 40.1 | 90 | 125 | 0.6 |
| **7017 C** | **DB DF DT** | 98 000 | 117 000 | 9 950 | 12 000 | 6 000 | 8 500 | 50.8 | 6.8 | — | 125 | 0.6 |
| **7217 A** | **DB DF DT** | 167 000 | 178 000 | 17 100 | 18 200 | 3 800 | 5 300 | 95.8 | 39.8 | 91 | 144 | 1 |
| **7217 B** | **DB DF DT** | 151 000 | 162 000 | 15 400 | 16 500 | 2 800 | 3 800 | 126.6 | 70.6 | 91 | 144 | 1 |
| **7217 C** | **DB DF DT** | 174 000 | 181 000 | 17 800 | 18 500 | 5 600 | 7 500 | 59.5 | 3.5 | — | 144 | 1 |
| **7317 A** | **DB DF DT** | 258 000 | 265 000 | 26 300 | 27 000 | 2 600 | 3 600 | 117.5 | 35.5 | 92 | 173 | 1 |
| **7317 B** | **DB DF DT** | 236 000 | 244 000 | 24 100 | 24 800 | 2 400 | 3 200 | 152.2 | 70.2 | 92 | 173 | 1 |
| **7918 A5** | **DB DF DT** | 64 000 | 87 000 | 6 500 | 8 900 | 5 000 | 7 100 | 68.1 | 32.1 | — | 120 | 0.6 |
| **7918 C** | **DB DF DT** | 67 500 | 92 000 | 6 900 | 9 400 | 6 000 | 8 500 | 46.8 | 10.8 | — | 120 | 0.6 |
| **7018 A** | **DB DF DT** | 109 000 | 133 000 | 11 200 | 13 500 | 3 800 | 5 300 | 90.4 | 42.4 | 96 | 134 | 1 |
| **7018 C** | **DB DF DT** | 116 000 | 138 000 | 11 900 | 14 100 | 5 600 | 8 000 | 54.8 | 6.8 | — | 134 | 1 |
| **7218 A** | **DB DF DT** | 191 000 | 206 000 | 19 500 | 21 000 | 3 600 | 5 000 | 102.2 | 42.2 | 96 | 154 | 1 |
| **7218 B** | **DB DF DT** | 173 000 | 188 000 | 17 700 | 19 100 | 2 600 | 3 400 | 134.9 | 74.9 | 96 | 154 | 1 |
| **7218 C** | **DB DF DT** | 199 000 | 209 000 | 20 300 | 21 400 | 5 300 | 7 100 | 63.5 | 3.5 | — | 154 | 1 |
| **7318 A** | **DB DF DT** | 277 000 | 294 000 | 28 300 | 30 000 | 2 600 | 3 400 | 123.8 | 37.8 | 97 | 183 | 1 |
| **7318 B** | **DB DF DT** | 254 000 | 270 000 | 25 900 | 27 600 | 2 200 | 3 000 | 160.5 | 74.5 | 97 | 183 | 1 |
| **7919 A5** | **DB DF DT** | 64 500 | 91 000 | 6 600 | 9 250 | 4 800 | 6 700 | 70.5 | 34.5 | — | 125 | 0.6 |
| **7919 C** | **DB DF DT** | 68 500 | 96 000 | 7 000 | 9 800 | 5 600 | 8 000 | 48.1 | 12.1 | — | 125 | 0.6 |
| **7019 A** | **DB DF DT** | 109 000 | 134 000 | 11 100 | 13 600 | 3 800 | 5 000 | 93.3 | 45.3 | — | 139 | 1 |
| **7019 C** | **DB DF DT** | 119 000 | 146 000 | 12 200 | 14 900 | 5 300 | 7 500 | 56.1 | 8.1 | — | 139 | 1 |
| **7219 A** | **DB DF DT** | 208 000 | 221 000 | 21 200 | 22 600 | 3 400 | 4 500 | 108.5 | 44.5 | 102 | 163 | 1 |
| **7219 B** | **DB DF DT** | 188 000 | 202 000 | 19 200 | 20 500 | 2 400 | 3 200 | 143.2 | 79.2 | 102 | 163 | 1 |
| **7219 C** | **DB DF DT** | 216 000 | 224 000 | 22 000 | 22 800 | 4 800 | 6 700 | 67.5 | 3.5 | — | 163 | 1 |
| **7319 A** | **DB DF DT** | 297 000 | 325 000 | 30 500 | 33 000 | 2 400 | 3 200 | 130.2 | 40.2 | 102 | 193 | 1 |
| **7319 B** | **DB DF DT** | 272 000 | 298 000 | 27 700 | 30 500 | 2 200 | 3 000 | 168.7 | 78.7 | 102 | 193 | 1 |
| **7920 A5** | **DB DF DT** | 77 000 | 103 000 | 7 850 | 10 500 | 4 500 | 6 300 | 76.0 | 36.0 | — | 135 | 0.6 |
| **7920 C** | **DB DF DT** | 81 500 | 108 000 | 8 300 | 11 100 | 5 300 | 7 500 | 52.2 | 12.2 | — | 135 | 0.6 |
| **7020 A** | **DB DF DT** | 111 000 | 141 000 | 11 300 | 14 400 | 3 600 | 5 000 | 96.2 | 48.2 | — | 144 | 1 |

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.

## SINGLE/MATCHED MOUNTINGS

### Bore Diameter 100 – 120 mm




Single | Back-to-Back DB | Face-to-Face DF | Tandem DT

**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **100** | 150 | 24 | 1.5 | 1 | 75 500 | 77 000 | 7 700 | 7 900 | 16.0 | 6 300 | 9 000 | 28.7 | 109 | 141 | 1.5 | 1.46 |
| | 180 | 34 | 2.1 | 1.1 | 144 000 | 126 000 | 14 700 | 12 800 | — | 4 000 | 5 300 | 57.4 | 112 | 168 | 2 | 3.22 |
| | 180 | 34 | 2.1 | 1.1 | 130 000 | 114 000 | 13 300 | 11 700 | — | 2 800 | 3 800 | 75.7 | 112 | 168 | 2 | 3.28 |
| | 180 | 34 | 2.1 | 1.1 | 149 000 | 127 000 | 15 200 | 12 900 | 14.5 | 5 600 | 8 000 | 35.7 | 112 | 168 | 2 | 3.65 |
| | 215 | 47 | 3 | 1.1 | 207 000 | 193 000 | 21 100 | 19 700 | — | 2 800 | 3 800 | 69.0 | 114 | 201 | 2.5 | 7.29 |
| | 215 | 47 | 3 | 1.1 | 190 000 | 178 000 | 19 400 | 18 100 | — | 2 400 | 3 400 | 89.6 | 114 | 201 | 2.5 | 7.43 |
| **105** | 145 | 20 | 1.1 | 0.6 | 48 000 | 54 000 | 4 900 | 5 500 | — | 5 600 | 7 500 | 39.2 | 112 | 138 | 1 | 0.82 |
| | 145 | 20 | 1.1 | 0.6 | 51 000 | 57 000 | 5 200 | 5 800 | 16.6 | 6 300 | 9 000 | 26.7 | 112 | 138 | 1 | 0.826 |
| | 160 | 26 | 2 | 1 | 80 000 | 81 500 | 8 150 | 8 350 | — | 4 300 | 5 600 | 51.2 | 115 | 150 | 2 | 1.84 |
| | 160 | 26 | 2 | 1 | 88 000 | 89 500 | 9 000 | 9 100 | 15.9 | 6 000 | 8 500 | 30.7 | 115 | 150 | 2 | 1.82 |
| | 190 | 36 | 2.1 | 1.1 | 157 000 | 142 000 | 16 000 | 14 400 | — | 3 800 | 5 000 | 60.6 | 117 | 178 | 2 | 3.84 |
| | 190 | 36 | 2.1 | 1.1 | 142 000 | 129 000 | 14 500 | 13 100 | — | 2 600 | 3 600 | 79.9 | 117 | 178 | 2 | 3.92 |
| | 190 | 36 | 2.1 | 1.1 | 162 000 | 143 000 | 16 600 | 14 600 | 14.5 | 5 300 | 7 500 | 37.7 | 117 | 178 | 2 | 4.33 |
| | 225 | 49 | 3 | 1.1 | 208 000 | 193 000 | 21 200 | 19 700 | — | 2 600 | 3 600 | 72.1 | 119 | 211 | 2.5 | 9.34 |
| | 225 | 49 | 3 | 1.1 | 191 000 | 177 000 | 19 400 | 18 100 | — | 2 400 | 3 200 | 93.7 | 119 | 211 | 2.5 | 9.43 |
| **110** | 150 | 20 | 1.1 | 0.6 | 49 000 | 56 000 | 5 000 | 5 750 | — | 5 300 | 7 100 | 40.3 | 117 | 143 | 1 | 0.877 |
| | 150 | 20 | 1.1 | 0.6 | 52 000 | 59 500 | 5 300 | 6 050 | 16.7 | 6 300 | 8 500 | 27.4 | 117 | 143 | 1 | 0.867 |
| | 170 | 28 | 2 | 1 | 96 500 | 95 500 | 9 850 | 9 700 | — | 4 000 | 5 300 | 54.4 | 120 | 160 | 2 | 2.28 |
| | 170 | 28 | 2 | 1 | 106 000 | 104 000 | 10 800 | 10 600 | 15.6 | 5 600 | 8 000 | 32.7 | 120 | 160 | 2 | 2.26 |
| | 200 | 38 | 2.1 | 1.1 | 170 000 | 158 000 | 17 300 | 16 100 | — | 3 600 | 4 800 | 63.7 | 122 | 188 | 2 | 4.49 |
| | 200 | 38 | 2.1 | 1.1 | 154 000 | 144 000 | 15 700 | 14 700 | — | 2 600 | 3 400 | 84.0 | 122 | 188 | 2 | 4.58 |
| | 200 | 38 | 2.1 | 1.1 | 176 000 | 160 000 | 17 900 | 16 300 | 14.5 | 5 000 | 7 100 | 39.8 | 122 | 188 | 2 | 5.1 |
| | 240 | 50 | 3 | 1.1 | 220 000 | 215 000 | 22 500 | 21 900 | — | 2 600 | 3 400 | 75.5 | 124 | 226 | 2.5 | 11.1 |
| | 240 | 50 | 3 | 1.1 | 201 000 | 197 000 | 20 500 | 20 100 | — | 2 200 | 3 000 | 98.4 | 124 | 226 | 2.5 | 11.2 |
| **120** | 165 | 22 | 1.1 | 0.6 | 67 500 | 77 000 | 6 900 | 7 850 | — | 4 800 | 6 300 | 44.2 | 127 | 158 | 1 | 1.15 |
| | 165 | 22 | 1.1 | 0.6 | 72 000 | 81 000 | 7 300 | 8 300 | 16.5 | 5 600 | 7 500 | 30.1 | 127 | 158 | 1 | 1.15 |
| | 180 | 28 | 2 | 1 | 102 000 | 107 000 | 10 400 | 10 900 | — | 3 600 | 5 000 | 57.3 | 130 | 170 | 2 | 2.45 |
| | 215 | 40 | 2.1 | 1.1 | 183 000 | 177 000 | 18 600 | 18 100 | — | 3 200 | 4 500 | 68.3 | 132 | 203 | 2 | 6.22 |
| | 215 | 40 | 2.1 | 1.1 | 165 000 | 162 000 | 16 900 | 16 500 | — | 2 400 | 3 200 | 90.3 | 132 | 203 | 2 | 6.26 |
| | 260 | 55 | 3 | 1.1 | 246 000 | 252 000 | 25 100 | 25 700 | — | 2 200 | 3 000 | 82.3 | 134 | 246 | 2.5 | 14.5 |
| | 260 | 55 | 3 | 1.1 | 225 000 | 231 000 | 23 000 | 23 600 | — | 2 000 | 2 800 | 107.2 | 134 | 246 | 2.5 | 14.4 |

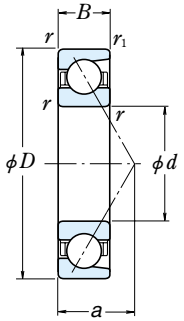
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7020 C** | **DB DF DT** | 122 000 | 154 000 | 12 500 | 15 800 | 5 300 | 7 100 | 57.5 | 9.5 | — | 144 | 1 |
| **7220 A** | **DB DF DT** | 233 000 | 251 000 | 23 800 | 25 600 | 3 200 | 4 300 | 114.8 | 46.8 | 107 | 173 | 1 |
| **7220 B** | **DB DF DT** | 212 000 | 229 000 | 21 600 | 23 300 | 2 200 | 3 000 | 151.5 | 83.5 | 107 | 173 | 1 |
| **7220 C** | **DB DF DT** | 242 000 | 254 000 | 24 700 | 25 900 | 4 500 | 6 300 | 71.5 | 3.5 | — | 173 | 1 |
| **7320 A** | **DB DF DT** | 335 000 | 385 000 | 34 500 | 39 500 | 2 200 | 3 000 | 137.9 | 43.9 | 107 | 208 | 1 |
| **7320 B** | **DB DF DT** | 310 000 | 355 000 | 31 500 | 36 000 | 2 000 | 2 800 | 179.2 | 85.2 | 107 | 208 | 1 |
| **7921 A5** | **DB DF DT** | 78 500 | 108 000 | 8 000 | 11 000 | 4 300 | 6 000 | 78.3 | 38.3 | — | 140 | 0.6 |
| **7921 C** | **DB DF DT** | 83 000 | 114 000 | 8 450 | 11 600 | 5 300 | 7 100 | 53.5 | 13.5 | — | 140 | 0.6 |
| **7021 A** | **DB DF DT** | 130 000 | 163 000 | 13 300 | 16 700 | 3 400 | 4 500 | 102.5 | 50.5 | — | 154 | 1 |
| **7021 C** | **DB DF DT** | 143 000 | 179 000 | 14 600 | 18 200 | 4 800 | 6 700 | 61.5 | 9.5 | — | 154 | 1 |
| **7221 A** | **DB DF DT** | 254 000 | 283 000 | 25 900 | 28 900 | 3 000 | 4 000 | 121.2 | 49.2 | 112 | 183 | 1 |
| **7221 B** | **DB DF DT** | 231 000 | 258 000 | 23 500 | 26 300 | 2 200 | 3 000 | 159.8 | 87.8 | 112 | 183 | 1 |
| **7221 C** | **DB DF DT** | 264 000 | 286 000 | 26 900 | 29 100 | 4 300 | 6 000 | 75.5 | 3.5 | — | 183 | 1 |
| **7321 A** | **DB DF DT** | 335 000 | 385 000 | 34 500 | 39 500 | 2 200 | 2 800 | 144.3 | 46.3 | — | 218 | 1 |
| **7321 B** | **DB DF DT** | 310 000 | 355 000 | 31 500 | 36 000 | 1 900 | 2 600 | 187.4 | 89.4 | — | 218 | 1 |
| **7922 A5** | **DB DF DT** | 79 500 | 112 000 | 8 100 | 11 500 | 4 300 | 5 600 | 80.6 | 40.6 | — | 145 | 0.6 |
| **7922 C** | **DB DF DT** | 84 500 | 119 000 | 8 600 | 12 100 | 5 000 | 6 700 | 54.8 | 14.8 | — | 145 | 0.6 |
| **7022 A** | **DB DF DT** | 157 000 | 191 000 | 16 000 | 19 400 | 3 200 | 4 300 | 108.8 | 52.8 | — | 164 | 1 |
| **7022 C** | **DB DF DT** | 172 000 | 208 000 | 17 600 | 21 200 | 4 500 | 6 300 | 65.5 | 9.5 | — | 164 | 1 |
| **7222 A** | **DB DF DT** | 276 000 | 315 000 | 28 100 | 32 500 | 2 800 | 4 000 | 127.5 | 51.5 | 117 | 193 | 1 |
| **7222 B** | **DB DF DT** | 250 000 | 289 000 | 25 500 | 29 400 | 2 000 | 2 800 | 168.1 | 92.1 | 117 | 193 | 1 |
| **7222 C** | **DB DF DT** | 286 000 | 320 000 | 29 200 | 32 500 | 4 000 | 5 600 | 79.5 | 3.5 | — | 193 | 1 |
| **7322 A** | **DB DF DT** | 360 000 | 430 000 | 36 500 | 44 000 | 2 000 | 2 600 | 151.0 | 51.0 | — | 233 | 1 |
| **7322 B** | **DB DF DT** | 325 000 | 395 000 | 33 500 | 40 000 | 1 800 | 2 400 | 196.8 | 96.8 | — | 233 | 1 |
| **7924 A5** | **DB DF DT** | 110 000 | 154 000 | 11 200 | 15 700 | 3 800 | 5 300 | 88.5 | 44.5 | — | 160 | 0.6 |
| **7924 C** | **DB DF DT** | 117 000 | 162 000 | 11 900 | 16 600 | 4 500 | 6 300 | 60.2 | 16.2 | — | 160 | 0.6 |
| **7024 A** | **DB DF DT** | 166 000 | 213 000 | 16 900 | 21 700 | 3 000 | 4 000 | 114.6 | 58.6 | — | 174 | 1 |
| **7224 A** | **DB DF DT** | 297 000 | 355 000 | 30 500 | 36 000 | 2 600 | 3 600 | 136.7 | 56.7 | — | 208 | 1 |
| **7224 B** | **DB DF DT** | 269 000 | 325 000 | 27 400 | 33 000 | 1 900 | 2 600 | 180.5 | 100.5 | — | 208 | 1 |
| **7324 A** | **DB DF DT** | 400 000 | 505 000 | 41 000 | 51 500 | 1 800 | 2 400 | 164.7 | 54.7 | — | 253 | 1 |
| **7324 B** | **DB DF DT** | 365 000 | 460 000 | 37 500 | 47 000 | 1 600 | 2 200 | 214.4 | 104.4 | — | 253 | 1 |

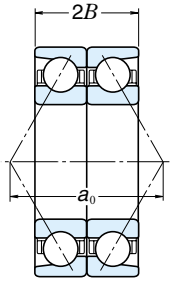
**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.

## SINGLE/MATCHED MOUNTINGS

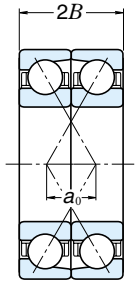
### Bore Diameter 130 – 170 mm



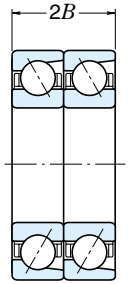
Single



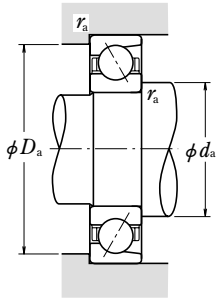
Back-to-Back
DB

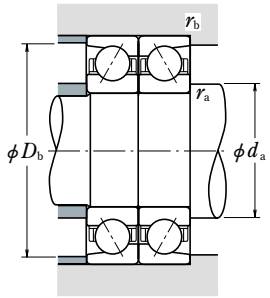


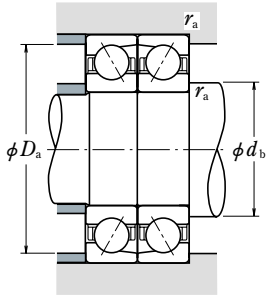
Face-to-Face
DF



Tandem
DT




**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{or}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **130** | 180 | 24 | 1.5 | 1 | 74 000 | 86 000 | 7 550 | 8 750 | — | 4 300 | 6 000 | 48.1 | 139 | 171 | 1.5 | 1.54 |
| | 180 | 24 | 1.5 | 1 | 78 500 | 91 000 | 8 000 | 9 250 | 16.5 | 5 000 | 7 100 | 32.8 | 139 | 171 | 1.5 | 1.5 |
| | 200 | 33 | 2 | 1 | 117 000 | 125 000 | 12 000 | 12 800 | — | 3 400 | 4 500 | 64.1 | 140 | 190 | 2 | 3.68 |
| | 230 | 40 | 3 | 1.1 | 189 000 | 193 000 | 19 300 | 19 600 | — | 2 400 | 3 200 | 72.0 | 144 | 216 | 2.5 | 7.06 |
| | 230 | 40 | 3 | 1.1 | 171 000 | 175 000 | 17 400 | 17 800 | — | 2 200 | 3 000 | 95.5 | 144 | 216 | 2.5 | 7.1 |
| | 280 | 58 | 4 | 1.5 | 273 000 | 293 000 | 27 900 | 29 800 | — | 2 200 | 2 800 | 88.2 | 148 | 262 | 3 | 17.5 |
| | 280 | 58 | 4 | 1.5 | 250 000 | 268 000 | 25 500 | 27 400 | — | 1 900 | 2 600 | 115.0 | 148 | 262 | 3 | 17.6 |
| **140** | 190 | 24 | 1.5 | 1 | 75 000 | 90 000 | 7 650 | 9 200 | — | 4 000 | 5 600 | 50.5 | 149 | 181 | 1.5 | 1.63 |
| | 190 | 24 | 1.5 | 1 | 79 500 | 95 500 | 8 100 | 9 700 | 16.7 | 4 800 | 6 700 | 34.1 | 149 | 181 | 1.5 | 1.63 |
| | 210 | 33 | 2 | 1 | 120 000 | 133 000 | 12 200 | 13 500 | — | 3 200 | 4 300 | 67.0 | 150 | 200 | 2 | 3.9 |
| | 250 | 42 | 3 | 1.1 | 218 000 | 234 000 | 22 300 | 23 900 | — | 2 200 | 3 000 | 77.3 | 154 | 236 | 2.5 | 8.92 |
| | 250 | 42 | 3 | 1.1 | 197 000 | 213 000 | 20 100 | 21 700 | — | 2 000 | 2 800 | 102.8 | 154 | 236 | 2.5 | 8.94 |
| | 300 | 62 | 4 | 1.5 | 300 000 | 335 000 | 30 500 | 34 500 | — | 2 000 | 2 600 | 94.5 | 158 | 282 | 3 | 21.4 |
| | 300 | 62 | 4 | 1.5 | 275 000 | 310 000 | 28 100 | 31 500 | — | 1 700 | 2 400 | 123.3 | 158 | 282 | 3 | 21.6 |
| **150** | 210 | 28 | 2 | 1 | 96 500 | 115 000 | 9 850 | 11 800 | — | 3 800 | 5 000 | 56.0 | 160 | 200 | 2 | 2.97 |
| | 210 | 28 | 2 | 1 | 102 000 | 122 000 | 10 400 | 12 400 | 16.6 | 4 300 | 6 000 | 38.1 | 160 | 200 | 2 | 2.96 |
| | 225 | 35 | 2.1 | 1.1 | 137 000 | 154 000 | 14 000 | 15 700 | — | 2 400 | 3 000 | 71.6 | 162 | 213 | 2 | 4.75 |
| | 270 | 45 | 3 | 1.1 | 248 000 | 280 000 | 25 300 | 28 500 | — | 2 000 | 2 800 | 83.1 | 164 | 256 | 2.5 | 11.2 |
| | 270 | 45 | 3 | 1.1 | 225 000 | 254 000 | 22 900 | 25 900 | — | 1 800 | 2 600 | 110.6 | 164 | 256 | 2.5 | 11.2 |
| | 320 | 65 | 4 | 1.5 | 315 000 | 370 000 | 32 500 | 38 000 | — | 1 800 | 2 400 | 100.3 | 168 | 302 | 3 | 26 |
| | 320 | 65 | 4 | 1.5 | 289 000 | 340 000 | 29 400 | 34 500 | — | 1 600 | 2 200 | 131.1 | 168 | 302 | 3 | 25.9 |
| **160** | 220 | 28 | 2 | 1 | 106 000 | 133 000 | 10 800 | 13 500 | 16.7 | 3 800 | 5 000 | 39.4 | 170 | 210 | 2 | 3.1 |
| | 240 | 38 | 2.1 | 1.1 | 155 000 | 176 000 | 15 800 | 18 000 | — | 2 200 | 2 800 | 76.7 | 172 | 228 | 2 | 5.77 |
| | 290 | 48 | 3 | 1.1 | 263 000 | 305 000 | 26 800 | 31 500 | — | 1 900 | 2 600 | 89.0 | 174 | 276 | 2.5 | 14.1 |
| | 290 | 48 | 3 | 1.1 | 238 000 | 279 000 | 24 200 | 28 400 | — | 1 700 | 2 400 | 118.4 | 174 | 276 | 2.5 | 14.2 |
| | 340 | 68 | 4 | 1.5 | 345 000 | 420 000 | 35 500 | 43 000 | — | 1 700 | 2 200 | 106.2 | 178 | 322 | 3 | 30.7 |
| | 340 | 68 | 4 | 1.5 | 315 000 | 385 000 | 32 000 | 39 500 | — | 1 500 | 2 000 | 138.9 | 178 | 322 | 3 | 30.8 |
| **170** | 230 | 28 | 2 | 1 | 113 000 | 148 000 | 11 500 | 15 100 | 16.8 | 3 600 | 4 800 | 40.8 | 180 | 220 | 2 | 3.36 |
| | 260 | 42 | 2.1 | 1.1 | 186 000 | 214 000 | 19 000 | 21 900 | — | 2 000 | 2 600 | 83.1 | 182 | 248 | 2 | 7.9 |
| | 310 | 52 | 4 | 1.5 | 295 000 | 360 000 | 30 000 | 36 500 | — | 1 800 | 2 400 | 95.3 | 188 | 292 | 3 | 17.3 |
| | 310 | 52 | 4 | 1.5 | 266 000 | 325 000 | 27 200 | 33 000 | — | 1 600 | 2 200 | 126.7 | 188 | 292 | 3 | 17.6 |
| | 360 | 72 | 4 | 1.5 | 390 000 | 485 000 | 39 500 | 49 500 | — | 1 600 | 2 200 | 112.5 | 188 | 342 | 3 | 35.8 |
| | 360 | 72 | 4 | 1.5 | 355 000 | 445 000 | 36 000 | 45 500 | — | 1 400 | 2 000 | 147.2 | 188 | 342 | 3 | 35.6 |

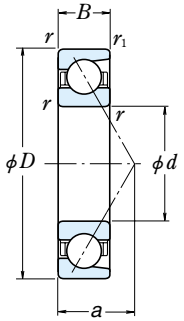
**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7926 A5** | **DB DF DT** | 120 000 | 172 000 | 12 300 | 17 500 | 3 400 | 4 800 | 96.3 | 48.3 | — | 174 | 1 |
| **7926 C** | **DB DF DT** | 128 000 | 182 000 | 13 000 | 18 500 | 4 000 | 5 600 | 65.5 | 17.5 | — | 174 | 1 |
| **7026 A** | **DB DF DT** | 191 000 | 251 000 | 19 400 | 25 600 | 2 600 | 3 600 | 128.3 | 62.3 | — | 194 | 1 |
| **7226 A** | **DB DF DT** | 310 000 | 385 000 | 31 500 | 39 500 | 1 900 | 2 600 | 143.9 | 63.9 | — | 223 | 1 |
| **7226 B** | **DB DF DT** | 278 000 | 350 000 | 28 300 | 35 500 | 1 700 | 2 400 | 191.0 | 111.0 | — | 223 | 1 |
| **7326 A** | **DB DF DT** | 445 000 | 585 000 | 45 500 | 59 500 | 1 700 | 2 200 | 176.3 | 60.3 | — | 271 | 1.5 |
| **7326 B** | **DB DF DT** | 405 000 | 535 000 | 41 500 | 54 500 | 1 500 | 2 000 | 230.0 | 114.0 | — | 271 | 1.5 |
| **7928 A5** | **DB DF DT** | 122 000 | 180 000 | 12 400 | 18 400 | 3 200 | 4 500 | 100.9 | 52.9 | — | 184 | 1 |
| **7928 C** | **DB DF DT** | 129 000 | 191 000 | 13 200 | 19 400 | 3 800 | 5 300 | 68.2 | 20.2 | — | 184 | 1 |
| **7028 A** | **DB DF DT** | 194 000 | 265 000 | 19 800 | 27 000 | 2 600 | 3 400 | 134.0 | 68.0 | — | 204 | 1 |
| **7228 A** | **DB DF DT** | 355 000 | 470 000 | 36 000 | 48 000 | 1 800 | 2 400 | 154.6 | 70.6 | — | 243 | 1 |
| **7228 B** | **DB DF DT** | 320 000 | 425 000 | 32 500 | 43 500 | 1 600 | 2 200 | 205.6 | 121.6 | — | 243 | 1 |
| **7328 A** | **DB DF DT** | 490 000 | 670 000 | 50 000 | 68 500 | 1 600 | 2 000 | 189.0 | 65.0 | — | 291 | 1.5 |
| **7328 B** | **DB DF DT** | 445 000 | 615 000 | 45 500 | 63 000 | 1 400 | 1 900 | 246.6 | 122.6 | — | 291 | 1.5 |
| **7930 A5** | **DB DF DT** | 157 000 | 231 000 | 16 000 | 23 500 | 3 000 | 4 000 | 112.0 | 56.0 | — | 204 | 1 |
| **7930 C** | **DB DF DT** | 166 000 | 244 000 | 16 900 | 24 900 | 3 600 | 4 800 | 76.2 | 20.2 | — | 204 | 1 |
| **7030 A** | **DB DF DT** | 222 000 | 305 000 | 22 700 | 31 500 | 1 900 | 2 400 | 143.3 | 73.3 | — | 218 | 1 |
| **7230 A** | **DB DF DT** | 405 000 | 560 000 | 41 000 | 57 000 | 1 600 | 2 200 | 166.3 | 76.3 | — | 263 | 1 |
| **7230 B** | **DB DF DT** | 365 000 | 510 000 | 37 000 | 52 000 | 1 500 | 2 000 | 221.2 | 131.2 | — | 263 | 1 |
| **7330 A** | **DB DF DT** | 515 000 | 745 000 | 52 500 | 75 500 | 1 500 | 1 900 | 200.7 | 70.7 | — | 311 | 1.5 |
| **7330 B** | **DB DF DT** | 470 000 | 680 000 | 48 000 | 69 500 | 1 300 | 1 800 | 262.2 | 132.2 | — | 311 | 1.5 |
| **7932 C** | **DB DF DT** | 173 000 | 265 000 | 17 600 | 27 000 | 3 000 | 4 000 | 78.9 | 22.9 | — | 214 | 1 |
| **7032 A** | **DB DF DT** | 252 000 | 355 000 | 25 700 | 36 000 | 1 700 | 2 400 | 153.5 | 77.5 | — | 233 | 1 |
| **7232 A** | **DB DF DT** | 425 000 | 615 000 | 43 500 | 62 500 | 1 500 | 2 000 | 177.9 | 81.9 | — | 283 | 1 |
| **7232 B** | **DB DF DT** | 385 000 | 555 000 | 39 500 | 57 000 | 1 400 | 1 900 | 236.8 | 140.8 | — | 283 | 1 |
| **7332 A** | **DB DF DT** | 565 000 | 845 000 | 57 500 | 86 000 | 1 400 | 1 800 | 212.3 | 76.3 | — | 331 | 1.5 |
| **7332 B** | **DB DF DT** | 515 000 | 770 000 | 52 500 | 78 500 | 1 200 | 1 700 | 277.8 | 141.8 | — | 331 | 1.5 |
| **7934 C** | **DB DF DT** | 183 000 | 297 000 | 18 700 | 30 000 | 2 800 | 3 800 | 81.6 | 25.6 | — | 224 | 1 |
| **7034 A** | **DB DF DT** | 300 000 | 430 000 | 31 000 | 43 500 | 1 600 | 2 200 | 166.1 | 82.1 | — | 253 | 1 |
| **7234 A** | **DB DF DT** | 480 000 | 715 000 | 49 000 | 73 000 | 1 400 | 1 900 | 190.6 | 86.6 | — | 301 | 1.5 |
| **7234 B** | **DB DF DT** | 435 000 | 650 000 | 44 000 | 66 500 | 1 300 | 1 700 | 253.4 | 149.4 | — | 301 | 1.5 |
| **7334 A** | **DB DF DT** | 630 000 | 970 000 | 64 500 | 99 000 | 1 300 | 1 700 | 225.0 | 81.0 | — | 351 | 1.5 |
| **7334 B** | **DB DF DT** | 575 000 | 890 000 | 59 000 | 90 500 | 1 100 | 1 600 | 294.3 | 150.3 | — | 351 | 1.5 |

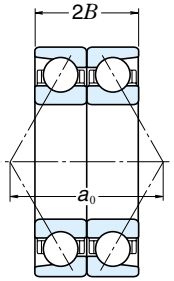
**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.

## SINGLE/MATCHED MOUNTINGS

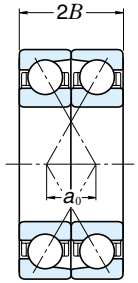
### Bore Diameter 180 – 200 mm



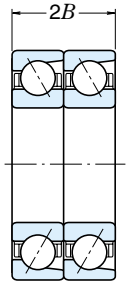
Single



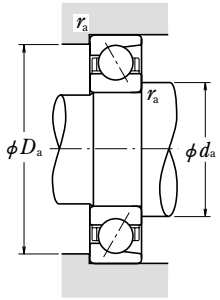
Back-to-Back
DB

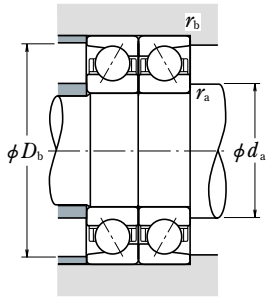


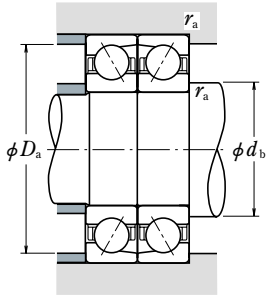
Face-to-Face
DF



Tandem
DT




**Dynamic Equivalent Load** $P = XF_r + YF_a$

| Contact Angle | $if_0F_a^*/C_{0r}$ | $e$ | Single, DT $F_a/F_r \leqq e$ X | Y | Single, DT $F_a/F_r > e$ X | Y | DB or DF $F_a/F_r \leqq e$ X | Y | DB or DF $F_a/F_r > e$ X | Y |
|---|---|---|---|---|---|---|---|---|---|---|
| 15° | 0.178 | 0.38 | 1 | 0 | 0.44 | 1.47 | 1 | 1.65 | 0.72 | 2.39 |
| | 0.357 | 0.40 | 1 | 0 | 0.44 | 1.40 | 1 | 1.57 | 0.72 | 2.28 |
| | 0.714 | 0.43 | 1 | 0 | 0.44 | 1.30 | 1 | 1.46 | 0.72 | 2.11 |
| | 1.07 | 0.46 | 1 | 0 | 0.44 | 1.23 | 1 | 1.38 | 0.72 | 2.00 |
| | 1.43 | 0.47 | 1 | 0 | 0.44 | 1.19 | 1 | 1.34 | 0.72 | 1.93 |
| | 2.14 | 0.50 | 1 | 0 | 0.44 | 1.12 | 1 | 1.26 | 0.72 | 1.82 |
| | 3.57 | 0.55 | 1 | 0 | 0.44 | 1.02 | 1 | 1.14 | 0.72 | 1.66 |
| | 5.35 | 0.56 | 1 | 0 | 0.44 | 1.00 | 1 | 1.12 | 0.72 | 1.63 |
| 25° | — | 0.68 | 1 | 0 | 0.41 | 0.87 | 1 | 0.92 | 0.67 | 1.41 |
| 30° | — | 0.80 | 1 | 0 | 0.39 | 0.76 | 1 | 0.78 | 0.63 | 1.24 |
| 40° | — | 1.14 | 1 | 0 | 0.35 | 0.57 | 1 | 0.55 | 0.57 | 0.93 |

*For $i$, use 2 for DB, DF and 1 for DT

**Static Equivalent Load** $P_0 = X_0F_r + Y_0F_a$

| Contact Angle | Single, DT $X_0$ | Single, DT $Y_0$ | DB or DF $X_0$ | DB or DF $Y_0$ |
|---|---|---|---|---|
| 15° | 0.5 | 0.46 | 1 | 0.92 |
| 25° | 0.5 | 0.38 | 1 | 0.76 |
| 30° | 0.5 | 0.33 | 1 | 0.66 |
| 40° | 0.5 | 0.26 | 1 | 0.52 |

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

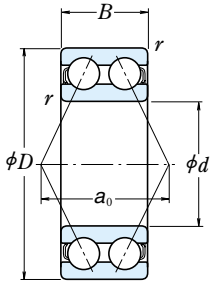
| Boundary Dimensions (mm) $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | Basic Load Ratings (Single) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Factor $f_0$ | Limiting Speeds (1) ($min^{-1}$) Grease | Oil | Eff.Load Centers (mm) $a$ | Abutment and Fillet Dimensions (mm) $d_a$ min. | $D_a$ max. | $r_a$ max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **180** | 250 | 33 | 2 | 1 | 145 000 | 184 000 | 14 800 | 18 800 | 16.6 | 3 200 | 4 500 | 45.3 | 190 | 240 | 2 | 4.9 |
| | 280 | 46 | 2.1 | 1.1 | 207 000 | 252 000 | 21 100 | 25 700 | — | 1 900 | 2 400 | 89.4 | 192 | 268 | 2 | 10.5 |
| | 320 | 52 | 4 | 1.5 | 305 000 | 385 000 | 31 000 | 39 000 | — | 1 700 | 2 200 | 98.2 | 198 | 302 | 3 | 18.1 |
| | 320 | 52 | 4 | 1.5 | 276 000 | 350 000 | 28 100 | 35 500 | — | 1 500 | 2 000 | 130.9 | 198 | 302 | 3 | 18.4 |
| | 380 | 75 | 4 | 1.5 | 410 000 | 535 000 | 41 500 | 54 500 | — | 1 500 | 2 000 | 118.3 | 198 | 362 | 3 | 42.1 |
| | 380 | 75 | 4 | 1.5 | 375 000 | 490 000 | 38 000 | 50 000 | — | 1 300 | 1 800 | 155.0 | 198 | 362 | 3 | 42.6 |
| **190** | 260 | 33 | 2 | 1 | 147 000 | 192 000 | 15 000 | 19 600 | 16.7 | 3 000 | 4 300 | 46.6 | 200 | 250 | 2 | 4.98 |
| | 290 | 46 | 2.1 | 1.1 | 224 000 | 280 000 | 22 800 | 28 600 | — | 1 800 | 2 400 | 92.3 | 202 | 278 | 2 | 11.3 |
| | 340 | 55 | 4 | 1.5 | 315 000 | 410 000 | 32 000 | 42 000 | — | 1 600 | 2 200 | 104.0 | 208 | 322 | 3 | 22.4 |
| | 340 | 55 | 4 | 1.5 | 284 000 | 375 000 | 28 900 | 38 000 | — | 1 400 | 2 000 | 138.7 | 208 | 322 | 3 | 22.5 |
| | 400 | 78 | 5 | 2 | 450 000 | 600 000 | 46 000 | 61 000 | — | 1 400 | 1 900 | 124.2 | 212 | 378 | 4 | 47.5 |
| | 400 | 78 | 5 | 2 | 410 000 | 550 000 | 42 000 | 56 000 | — | 1 300 | 1 700 | 162.8 | 212 | 378 | 4 | 47.2 |
| **200** | 280 | 38 | 2.1 | 1.1 | 189 000 | 244 000 | 19 300 | 24 900 | 16.5 | 2 800 | 4 000 | 51.2 | 212 | 268 | 2 | 6.85 |
| | 310 | 51 | 2.1 | 1.1 | 240 000 | 310 000 | 24 500 | 31 500 | — | 1 700 | 2 200 | 99.1 | 212 | 298 | 2 | 13.7 |
| | 360 | 58 | 4 | 1.5 | 335 000 | 450 000 | 34 500 | 46 000 | — | 1 500 | 2 000 | 109.8 | 218 | 342 | 3 | 26.5 |
| | 360 | 58 | 4 | 1.5 | 305 000 | 410 000 | 31 000 | 41 500 | — | 1 300 | 1 800 | 146.5 | 218 | 342 | 3 | 26.6 |
| | 420 | 80 | 5 | 2 | 475 000 | 660 000 | 48 500 | 67 000 | — | 1 300 | 1 800 | 129.5 | 222 | 398 | 4 | 54.4 |
| | 420 | 80 | 5 | 2 | 430 000 | 600 000 | 44 000 | 61 500 | — | 1 200 | 1 600 | 170.1 | 222 | 398 | 4 | 55.3 |

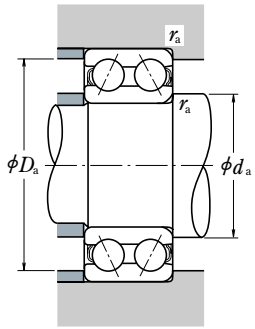
| Bearing Numbers (2) Single | Duplex | Basic Load Ratings (Matched) (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (1) (Matched) ($min^{-1}$) Grease | Oil | Load Center Spacings (mm) $a_0$ DB | DF | Abutment and Fillet Dimensions (mm) $d_b$ (3) min. | $D_b$ max. | $r_b$ (3) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7936 C** | **DB DF DT** | 236 000 | 370 000 | 24 000 | 37 500 | 2 600 | 3 600 | 90.6 | 24.6 | — | 244 | 1 |
| **7036 A** | **DB DF DT** | 335 000 | 505 000 | 34 500 | 51 500 | 1 500 | 2 000 | 178.8 | 86.8 | — | 273 | 1 |
| **7236 A** | **DB DF DT** | 495 000 | 770 000 | 50 500 | 78 500 | 1 400 | 1 800 | 196.3 | 92.3 | — | 311 | 1.5 |
| **7236 B** | **DB DF DT** | 450 000 | 700 000 | 45 500 | 71 000 | 1 200 | 1 700 | 261.8 | 157.8 | — | 311 | 1.5 |
| **7336 A** | **DB DF DT** | 665 000 | 1 070 000 | 68 000 | 109 000 | 1 200 | 1 600 | 236.6 | 86.6 | — | 371 | 1.5 |
| **7336 B** | **DB DF DT** | 605 000 | 975 000 | 62 000 | 99 500 | 1 100 | 1 500 | 309.9 | 159.9 | — | 371 | 1.5 |
| **7938 C** | **DB DF DT** | 239 000 | 385 000 | 24 400 | 39 000 | 2 400 | 3 400 | 93.3 | 27.3 | — | 254 | 1 |
| **7038 A** | **DB DF DT** | 365 000 | 560 000 | 37 000 | 57 000 | 1 400 | 1 900 | 184.6 | 92.6 | — | 283 | 1 |
| **7238 A** | **DB DF DT** | 510 000 | 825 000 | 52 000 | 84 000 | 1 300 | 1 700 | 208.0 | 98.0 | — | 331 | 1.5 |
| **7238 B** | **DB DF DT** | 460 000 | 750 000 | 47 000 | 76 000 | 1 100 | 1 600 | 277.3 | 167.3 | — | 331 | 1.5 |
| **7338 A** | **DB DF DT** | 730 000 | 1 200 000 | 74 500 | 122 000 | 1 100 | 1 500 | 248.3 | 92.3 | — | 390 | 2 |
| **7338 B** | **DB DF DT** | 670 000 | 1 100 000 | 68 000 | 112 000 | 1 000 | 1 400 | 325.5 | 169.5 | — | 390 | 2 |
| **7940 C** | **DB DF DT** | 305 000 | 490 000 | 31 500 | 50 000 | 2 200 | 3 200 | 102.3 | 26.3 | — | 273 | 1 |
| **7040 A** | **DB DF DT** | 390 000 | 620 000 | 40 000 | 63 500 | 1 300 | 1 800 | 198.2 | 96.2 | — | 303 | 1 |
| **7240 A** | **DB DF DT** | 550 000 | 900 000 | 56 000 | 92 000 | 1 200 | 1 600 | 219.6 | 103.6 | — | 351 | 1.5 |
| **7240 B** | **DB DF DT** | 495 000 | 815 000 | 50 500 | 83 000 | 1 100 | 1 500 | 292.9 | 176.9 | — | 351 | 1.5 |
| **7340 A** | **DB DF DT** | 770 000 | 1 320 000 | 78 500 | 134 000 | 1 100 | 1 400 | 259.0 | 99.0 | — | 410 | 2 |
| **7340 B** | **DB DF DT** | 700 000 | 1 200 000 | 71 500 | 123 000 | 950 | 1 300 | 340.1 | 180.1 | — | 410 | 2 |

**Notes** (1) For applications operating near the limiting speed, refer to Page **B49**.
(2) The suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.

**Note** (3) For bearings marked — in the column for $d_b$, $d_b$ and $r_b$ for shafts are $d_a$ (min.) and $r_a$ (max.) respectively.

**Bore Diameter 10 – 85 mm**




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | | $e$ |
|---|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ | |
| 1 | 0.92 | 0.67 | 1.41 | 0.68 |

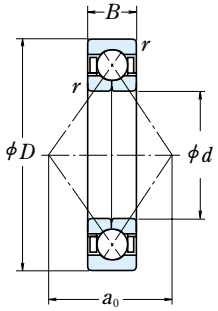
**Static Equivalent Load**

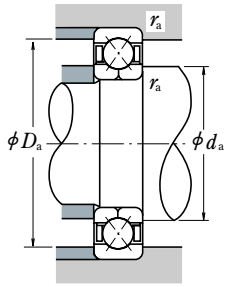
$P_0 = F_r + 0.76\,F_a$

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | |
| **10** | 30 | 14.3 | 0.6 | 7 150 | 3 900 | 730 | 400 | 17 000 | 22 000 | **5200** |
| **12** | 32 | 15.9 | 0.6 | 10 500 | 5 800 | 1 070 | 590 | 15 000 | 20 000 | **5201** |
| **15** | 35 | 15.9 | 0.6 | 11 700 | 7 050 | 1 190 | 715 | 13 000 | 17 000 | **5202** |
| | 42 | 19 | 1 | 17 600 | 10 200 | 1 800 | 1 040 | 11 000 | 15 000 | **5302** |
| **17** | 40 | 17.5 | 0.6 | 14 600 | 9 050 | 1 490 | 920 | 11 000 | 15 000 | **5203** |
| | 47 | 22.2 | 1 | 21 000 | 12 600 | 2 140 | 1 280 | 10 000 | 13 000 | **5303** |
| **20** | 47 | 20.6 | 1 | 19 600 | 12 400 | 2 000 | 1 270 | 10 000 | 13 000 | **5204** |
| | 52 | 22.2 | 1.1 | 24 600 | 15 000 | 2 510 | 1 530 | 9 000 | 12 000 | **5304** |
| **25** | 52 | 20.6 | 1 | 21 300 | 14 700 | 2 170 | 1 500 | 8 500 | 11 000 | **5205** |
| | 62 | 25.4 | 1.1 | 32 500 | 20 700 | 3 350 | 2 110 | 7 500 | 10 000 | **5305** |
| **30** | 62 | 23.8 | 1 | 29 600 | 21 100 | 3 000 | 2 150 | 7 100 | 9 500 | **5206** |
| | 72 | 30.2 | 1.1 | 40 500 | 28 100 | 4 150 | 2 870 | 6 300 | 8 500 | **5306** |
| **35** | 72 | 27 | 1.1 | 39 000 | 28 700 | 4 000 | 2 920 | 6 300 | 8 000 | **5207** |
| | 80 | 34.9 | 1.5 | 51 000 | 36 000 | 5 200 | 3 700 | 5 600 | 7 500 | **5307** |
| **40** | 80 | 30.2 | 1.1 | 44 000 | 33 500 | 4 500 | 3 400 | 5 600 | 7 100 | **5208** |
| | 90 | 36.5 | 1.5 | 56 500 | 41 000 | 5 800 | 4 200 | 5 300 | 6 700 | **5308** |
| **45** | 85 | 30.2 | 1.1 | 49 500 | 38 000 | 5 050 | 3 900 | 5 000 | 6 700 | **5209** |
| | 100 | 39.7 | 1.5 | 68 500 | 51 000 | 7 000 | 5 200 | 4 500 | 6 000 | **5309** |
| **50** | 90 | 30.2 | 1.1 | 53 000 | 43 500 | 5 400 | 4 400 | 4 800 | 6 000 | **5210** |
| | 110 | 44.4 | 2 | 81 500 | 61 500 | 8 300 | 6 250 | 4 300 | 5 600 | **5310** |
| **55** | 100 | 33.3 | 1.5 | 56 000 | 49 000 | 5 700 | 5 000 | 4 300 | 5 600 | **5211** |
| | 120 | 49.2 | 2 | 95 000 | 73 000 | 9 700 | 7 450 | 3 800 | 5 000 | **5311** |
| **60** | 110 | 36.5 | 1.5 | 69 000 | 62 000 | 7 050 | 6 300 | 3 800 | 5 000 | **5212** |
| | 130 | 54 | 2.1 | 125 000 | 98 500 | 12 800 | 10 000 | 3 400 | 4 500 | **5312** |
| **65** | 120 | 38.1 | 1.5 | 76 500 | 69 000 | 7 800 | 7 050 | 3 600 | 4 500 | **5213** |
| | 140 | 58.7 | 2.1 | 142 000 | 113 000 | 14 500 | 11 500 | 3 200 | 4 300 | **5313** |
| **70** | 125 | 39.7 | 1.5 | 94 000 | 82 000 | 9 600 | 8 400 | 3 400 | 4 500 | **5214** |
| | 150 | 63.5 | 2.1 | 159 000 | 128 000 | 16 200 | 13 100 | 3 000 | 3 800 | **5314** |
| **75** | 130 | 41.3 | 1.5 | 93 500 | 83 000 | 9 550 | 8 500 | 3 200 | 4 300 | **5215** |
| **80** | 140 | 44.4 | 2 | 99 000 | 93 000 | 10 100 | 9 500 | 3 000 | 3 800 | **5216** |
| **85** | 150 | 49.2 | 2 | 116 000 | 110 000 | 11 800 | 11 200 | 2 800 | 3 600 | **5217** |

| Load Center Spacings (mm) | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|
| $a_0$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| 14.5 | 15 | 25 | 0.6 | 0.050 |
| 16.7 | 17 | 27 | 0.6 | 0.060 |
| 18.3 | 20 | 30 | 0.6 | 0.070 |
| 22.0 | 21 | 36 | 1 | 0.11 |
| 20.8 | 22 | 35 | 0.6 | 0.090 |
| 25.0 | 23 | 41 | 1 | 0.14 |
| 24.3 | 26 | 41 | 1 | 0.12 |
| 26.7 | 27 | 45 | 1 | 0.23 |
| 26.8 | 31 | 46 | 1 | 0.19 |
| 31.8 | 32 | 55 | 1 | 0.34 |
| 31.6 | 36 | 56 | 1 | 0.29 |
| 36.5 | 37 | 65 | 1 | 0.51 |
| 36.6 | 42 | 65 | 1 | 0.43 |
| 41.6 | 44 | 71 | 1.5 | 0.79 |
| 41.5 | 47 | 73 | 1 | 0.57 |
| 45.5 | 49 | 81 | 1.5 | 1.05 |
| 43.4 | 52 | 78 | 1 | 0.62 |
| 50.6 | 54 | 91 | 1.5 | 1.4 |
| 45.9 | 57 | 83 | 1 | 0.67 |
| 55.6 | 60 | 100 | 2 | 1.95 |
| 50.1 | 64 | 91 | 1.5 | 0.96 |
| 60.6 | 65 | 110 | 2 | 2.3 |
| 56.5 | 69 | 101 | 1.5 | 1.35 |
| 69.2 | 72 | 118 | 2 | 3.15 |
| 59.7 | 74 | 111 | 1.5 | 1.65 |
| 72.8 | 77 | 128 | 2 | 3.85 |
| 63.8 | 79 | 116 | 1.5 | 1.8 |
| 78.3 | 82 | 138 | 2 | 4.9 |
| 66.1 | 84 | 121 | 1.5 | 1.9 |
| 69.6 | 90 | 130 | 2 | 2.5 |
| 75.3 | 95 | 140 | 2 | 3.4 |

## Bore Diameter 30 – 95 mm




**Dynamic Equivalent Load**

$P_a = F_a$

**Static Equivalent Load**

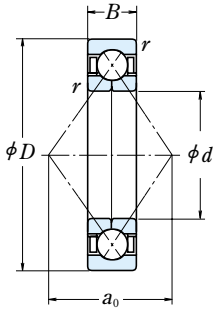
$P_{0a} = F_a$

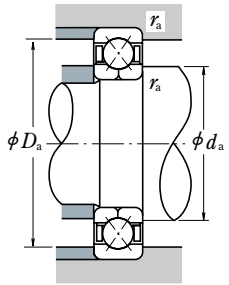
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil |
| **30** | 62 | 16 | 1 | 31 000 | 45 000 | 3 150 | 4 600 | 8 500 | 12 000 |
| | 72 | 19 | 1.1 | 46 000 | 63 000 | 4 700 | 6 450 | 8 000 | 11 000 |
| **35** | 72 | 17 | 1.1 | 41 000 | 61 500 | 4 200 | 6 250 | 7 500 | 10 000 |
| | 80 | 21 | 1.5 | 55 000 | 80 000 | 5 600 | 8 150 | 7 100 | 9 500 |
| **40** | 80 | 18 | 1.1 | 49 000 | 77 500 | 5 000 | 7 900 | 6 700 | 9 000 |
| | 90 | 23 | 1.5 | 67 000 | 100 000 | 6 850 | 10 200 | 6 300 | 8 500 |
| **45** | 85 | 19 | 1.1 | 55 000 | 88 500 | 5 600 | 9 000 | 6 300 | 8 500 |
| | 100 | 25 | 1.5 | 87 500 | 133 000 | 8 900 | 13 500 | 5 600 | 7 500 |
| **50** | 90 | 20 | 1.1 | 57 000 | 97 000 | 5 850 | 9 900 | 5 600 | 8 000 |
| | 110 | 27 | 2 | 102 000 | 159 000 | 10 400 | 16 200 | 5 000 | 6 700 |
| **55** | 100 | 21 | 1.5 | 71 000 | 122 000 | 7 200 | 12 500 | 5 300 | 7 100 |
| | 120 | 29 | 2 | 118 000 | 187 000 | 12 000 | 19 100 | 4 500 | 6 300 |
| **60** | 110 | 22 | 1.5 | 85 500 | 150 000 | 8 750 | 15 300 | 4 800 | 6 300 |
| | 130 | 31 | 2.1 | 135 000 | 217 000 | 13 800 | 22 200 | 4 300 | 5 600 |
| **65** | 120 | 23 | 1.5 | 97 500 | 179 000 | 9 950 | 18 300 | 4 300 | 6 000 |
| | 140 | 33 | 2.1 | 153 000 | 250 000 | 15 600 | 25 500 | 3 800 | 5 300 |
| **70** | 125 | 24 | 1.5 | 106 000 | 197 000 | 10 800 | 20 100 | 4 000 | 5 600 |
| | 150 | 35 | 2.1 | 172 000 | 285 000 | 17 500 | 29 100 | 3 600 | 5 000 |
| **75** | 130 | 25 | 1.5 | 110 000 | 212 000 | 11 200 | 21 700 | 3 800 | 5 300 |
| | 160 | 37 | 2.1 | 187 000 | 320 000 | 19 100 | 33 000 | 3 400 | 4 800 |
| **80** | 125 | 22 | 1.1 | 77 000 | 167 000 | 7 850 | 17 000 | 3 800 | 5 300 |
| | 140 | 26 | 2 | 124 000 | 236 000 | 12 600 | 24 100 | 3 600 | 5 000 |
| | 170 | 39 | 2.1 | 202 000 | 360 000 | 20 600 | 37 000 | 3 200 | 4 300 |
| **85** | 130 | 22 | 1.1 | 79 000 | 176 000 | 8 050 | 18 000 | 3 800 | 5 000 |
| | 150 | 28 | 2 | 143 000 | 276 000 | 14 600 | 28 200 | 3 400 | 4 800 |
| | 180 | 41 | 3 | 218 000 | 405 000 | 22 300 | 41 000 | 3 000 | 4 000 |
| **90** | 140 | 24 | 1.5 | 94 000 | 208 000 | 9 600 | 21 200 | 3 400 | 4 800 |
| | 160 | 30 | 2 | 164 000 | 320 000 | 16 700 | 32 500 | 3 200 | 4 300 |
| | 190 | 43 | 3 | 235 000 | 450 000 | 23 900 | 45 500 | 2 800 | 3 800 |
| **95** | 145 | 24 | 1.5 | 96 500 | 220 000 | 9 800 | 22 500 | 3 400 | 4 500 |
| | 170 | 32 | 2.1 | 177 000 | 340 000 | 18 000 | 35 000 | 3 000 | 4 000 |
| | 200 | 45 | 3 | 251 000 | 495 000 | 25 600 | 50 500 | 2 600 | 3 600 |

| Bearing Numbers | Load Center Spacings (mm) | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|
| | $a_0$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **QJ 206** | 32.2 | 36 | 56 | 1 | 0.24 |
| **QJ 306** | 35.7 | 37 | 65 | 1 | 0.42 |
| **QJ 207** | 37.5 | 42 | 65 | 1 | 0.35 |
| **QJ 307** | 40.3 | 44 | 71 | 1.5 | 0.57 |
| **QJ 208** | 42.0 | 47 | 73 | 1 | 0.45 |
| **QJ 308** | 45.5 | 49 | 81 | 1.5 | 0.78 |
| **QJ 209** | 45.5 | 52 | 78 | 1 | 0.52 |
| **QJ 309** | 50.8 | 54 | 91 | 1.5 | 1.05 |
| **QJ 210** | 49.0 | 57 | 83 | 1 | 0.59 |
| **QJ 310** | 56.0 | 60 | 100 | 2 | 1.35 |
| **QJ 211** | 54.3 | 64 | 91 | 1.5 | 0.77 |
| **QJ 311** | 61.3 | 65 | 110 | 2 | 1.75 |
| **QJ 212** | 59.5 | 69 | 101 | 1.5 | 0.98 |
| **QJ 312** | 66.5 | 72 | 118 | 2 | 2.15 |
| **QJ 213** | 64.8 | 74 | 111 | 1.5 | 1.2 |
| **QJ 313** | 71.8 | 77 | 128 | 2 | 2.7 |
| **QJ 214** | 68.3 | 79 | 116 | 1.5 | 1.3 |
| **QJ 314** | 77.0 | 82 | 138 | 2 | 3.18 |
| **QJ 215** | 71.8 | 84 | 121 | 1.5 | 1.5 |
| **QJ 315** | 82.3 | 87 | 148 | 2 | 3.9 |
| **QJ 1016** | 71.8 | 87 | 118 | 1 | 1.05 |
| **QJ 216** | 77.0 | 90 | 130 | 2 | 1.85 |
| **QJ 316** | 87.5 | 92 | 158 | 2 | 4.6 |
| **QJ 1017** | 75.3 | 92 | 123 | 1 | 1.1 |
| **QJ 217** | 82.3 | 95 | 140 | 2 | 2.2 |
| **QJ 317** | 92.8 | 99 | 166 | 2.5 | 5.34 |
| **QJ 1018** | 80.5 | 99 | 131 | 1.5 | 1.45 |
| **QJ 218** | 87.5 | 100 | 150 | 2 | 2.75 |
| **QJ 318** | 98.0 | 104 | 176 | 2.5 | 6.4 |
| **QJ 1019** | 84.0 | 104 | 136 | 1.5 | 1.5 |
| **QJ 219** | 92.8 | 107 | 158 | 2 | 3.35 |
| **QJ 319** | 103.3 | 109 | 186 | 2.5 | 7.4 |

**Remarks** When using four-point contact ball bearings, please contact NSK.

## Bore Diameter 100 – 200 mm




**Dynamic Equivalent Load**

$P_a = F_a$

**Static Equivalent Load**

$P_{0a} = F_a$

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil |
| **100** | 150 | 24 | 1.5 | 98 500 | 232 000 | 10 000 | 23 700 | 3 200 | 4 300 |
| | 180 | 34 | 2.1 | 199 000 | 390 000 | 20 300 | 39 500 | 2 800 | 3 800 |
| | 215 | 47 | 3 | 300 000 | 640 000 | 31 000 | 65 500 | 2 400 | 3 400 |
| **105** | 160 | 26 | 2 | 115 000 | 269 000 | 11 800 | 27 400 | 3 000 | 4 000 |
| | 190 | 36 | 2.1 | 217 000 | 435 000 | 22 100 | 44 500 | 2 600 | 3 600 |
| | 225 | 49 | 3 | 305 000 | 640 000 | 31 000 | 65 500 | 2 400 | 3 200 |
| **110** | 170 | 28 | 2 | 139 000 | 315 000 | 14 200 | 32 000 | 2 800 | 3 800 |
| | 200 | 38 | 2.1 | 235 000 | 490 000 | 24 000 | 50 000 | 2 600 | 3 400 |
| | 240 | 50 | 3 | 320 000 | 710 000 | 32 500 | 72 500 | 2 200 | 3 000 |
| **120** | 180 | 28 | 2 | 147 000 | 350 000 | 15 000 | 36 000 | 2 600 | 3 600 |
| | 215 | 40 | 2.1 | 265 000 | 585 000 | 27 000 | 60 000 | 2 400 | 3 200 |
| | 260 | 55 | 3 | 360 000 | 835 000 | 36 500 | 85 500 | 2 000 | 2 800 |
| **130** | 200 | 33 | 2 | 169 000 | 415 000 | 17 300 | 42 000 | 2 400 | 3 200 |
| | 230 | 40 | 3 | 274 000 | 635 000 | 28 000 | 65 000 | 2 200 | 3 000 |
| | 280 | 58 | 4 | 400 000 | 970 000 | 40 500 | 99 000 | 1 900 | 2 600 |
| **140** | 210 | 33 | 2 | 172 000 | 435 000 | 17 600 | 44 500 | 2 200 | 3 000 |
| | 250 | 42 | 3 | 239 000 | 710 000 | 29 900 | 72 500 | 2 000 | 2 800 |
| | 300 | 62 | 4 | 440 000 | 1 110 000 | 44 500 | 114 000 | 1 700 | 2 400 |
| **150** | 225 | 35 | 2.1 | 197 000 | 505 000 | 20 100 | 51 500 | 2 000 | 2 800 |
| | 270 | 45 | 3 | 315 000 | 785 000 | 32 000 | 80 000 | 1 800 | 2 600 |
| | 320 | 65 | 4 | 460 000 | 1 230 000 | 47 000 | 125 000 | 1 600 | 2 200 |
| **160** | 240 | 38 | 2.1 | 224 000 | 580 000 | 22 800 | 59 000 | 1 900 | 2 600 |
| | 290 | 48 | 3 | 380 000 | 1 010 000 | 39 000 | 103 000 | 1 700 | 2 400 |
| | 340 | 68 | 4 | 505 000 | 1 400 000 | 51 500 | 143 000 | 1 500 | 2 000 |
| **170** | 260 | 42 | 2.1 | 268 000 | 705 000 | 27 300 | 72 000 | 1 800 | 2 400 |
| | 310 | 52 | 4 | 425 000 | 1 180 000 | 43 500 | 121 000 | 1 600 | 2 200 |
| | 360 | 72 | 4 | 565 000 | 1 610 000 | 57 500 | 164 000 | 1 400 | 2 000 |
| **180** | 280 | 46 | 2.1 | 299 000 | 830 000 | 30 500 | 84 500 | 1 700 | 2 200 |
| | 320 | 52 | 4 | 440 000 | 1 270 000 | 45 000 | 130 000 | 1 500 | 2 000 |
| | 380 | 75 | 4 | 595 000 | 1 770 000 | 60 500 | 180 000 | 1 300 | 1 800 |
| **190** | 290 | 46 | 2.1 | 325 000 | 925 000 | 33 000 | 94 000 | 1 600 | 2 200 |
| | 340 | 55 | 4 | 440 000 | 1 290 000 | 44 500 | 131 000 | 1 400 | 2 000 |
| | 400 | 78 | 5 | 655 000 | 1 980 000 | 67 000 | 202 000 | 1 300 | 1 700 |
| **200** | 310 | 51 | 2.1 | 345 000 | 1 020 000 | 35 500 | 104 000 | 1 500 | 2 000 |
| | 360 | 58 | 4 | 490 000 | 1 480 000 | 49 500 | 151 000 | 1 300 | 1 800 |
| | 420 | 80 | 5 | 690 000 | 2 180 000 | 70 500 | 222 000 | 1 200 | 1 600 |

| Bearing Numbers | Load Center Spacings (mm) | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|
| | $a_0$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **QJ 1020** | 87.5 | 109 | 141 | 1.5 | 1.6 |
| **QJ 220** | 98.0 | 112 | 168 | 2 | 4.0 |
| **QJ 320** | 110.3 | 114 | 201 | 2.5 | 9.3 |
| **QJ 1021** | 92.8 | 115 | 150 | 2 | 2.0 |
| **QJ 221** | 103.3 | 117 | 178 | 2 | 4.7 |
| **QJ 321** | 115.5 | 119 | 211 | 2.5 | 10.5 |
| **QJ 1022** | 98.0 | 120 | 160 | 2 | 2.5 |
| **QJ 222** | 108.5 | 122 | 188 | 2 | 5.6 |
| **QJ 322** | 122.5 | 124 | 226 | 2.5 | 12.5 |
| **QJ 1024** | 105.0 | 130 | 170 | 2 | 2.65 |
| **QJ 224** | 117.3 | 132 | 203 | 2 | 6.9 |
| **QJ 324** | 133.0 | 134 | 246 | 2.5 | 15.4 |
| **QJ 1026** | 115.5 | 140 | 190 | 2 | 4.0 |
| **QJ 226** | 126.0 | 144 | 216 | 2.5 | 7.7 |
| **QJ 326** | 143.5 | 148 | 262 | 3 | 19 |
| **QJ 1028** | 122.5 | 150 | 200 | 2 | 4.3 |
| **QJ 228** | 136.5 | 154 | 236 | 2.5 | 9.8 |
| **QJ 328** | 154.0 | 158 | 282 | 3 | 24 |
| **QJ 1030** | 131.3 | 162 | 213 | 2 | 5.2 |
| **QJ 230** | 147.0 | 164 | 256 | 2.5 | 12 |
| **QJ 330** | 164.5 | 168 | 302 | 3 | 29 |
| **QJ 1032** | 140.0 | 172 | 228 | 2 | 6.4 |
| **QJ 232** | 157.5 | 174 | 276 | 2.5 | 15 |
| **QJ 332** | 175.1 | 178 | 322 | 3 | 31 |
| **QJ 1034** | 150.5 | 182 | 248 | 2 | 8.6 |
| **QJ 234** | 168.0 | 188 | 292 | 3 | 19.5 |
| **QJ 334** | 185.6 | 188 | 342 | 3 | 41 |
| **QJ 1036** | 161.0 | 192 | 268 | 2 | 11 |
| **QJ 236** | 175.1 | 198 | 302 | 3 | 20.5 |
| **QJ 336** | 196.1 | 198 | 362 | 3 | 48 |
| **QJ 1038** | 168.0 | 202 | 278 | 2 | 11.5 |
| **QJ 238** | 185.6 | 208 | 322 | 3 | 23 |
| **QJ 338** | 206.6 | 212 | 378 | 4 | 54.5 |
| **QJ 1040** | 178.6 | 212 | 298 | 2 | 15 |
| **QJ 240** | 196.1 | 218 | 342 | 3 | 27 |
| **QJ 340** | 217.1 | 222 | 398 | 4 | 61.5 |

**Remarks** When using four-point contact ball bearings, please contact NSK.

# SELF-ALIGNING BALL BEARINGS

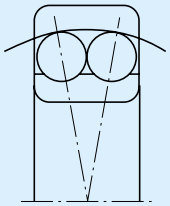
## SELF-ALIGNING BALL BEARINGS

Bore Diameter 5 – 110mm ····· B78

### DESIGN, TYPES, AND FEATURES

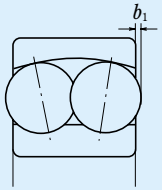
The outer ring has a spherical raceway and its center of curvature coincides with that of the bearing; therefore, the axis of the inner ring, balls and cage can deflect to some extent around the bearing center. This type is recommended when the alignment of the shaft and housing is difficult and when the shaft may bend. Since the contact angle is small, the axial load capacity is low.

Pressed steel cages are usually used.



### PROTRUSION AMOUNT OF BALLS

Among self-aligning ball bearings, there are some in which the balls protrude from the side face as shown below. This protrusion amount $b_1$ is listed in the following table.




| Bearing No. | $b_1$ (mm) |
|---|---|
| 2222(K), 2316(K) | 0.5 |
| 2319(K), 2320(K)<br>2321 , 2322(K) | 0.5 |
| 1318(K) | 1.5 |
| 1319(K) | 2 |
| 1320(K), 1321<br>1322(K) | 3 |

**TOLERANCES AND RUNNING ACCURACY** ····· Table 8.2 (Pages A60 to A63)

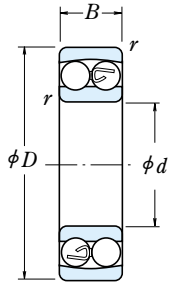
**RECOMMENDED FITS** ····· Table 9.2 (Page A84)
Table 9.4 (Page A85)

**INTERNAL CLEARANCE** ····· Table 9.12 (Page A90)

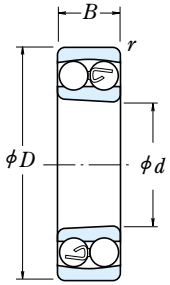
### PERMISSIBLE MISALIGNMENT

The permissible misalignment of self-aligning ball bearings is approximately 0.07 to 0.12 radian (4° to 7°) under normal loads. However, depending on the surrounding structure, such an angle may not be possible. Use care in the structural design.

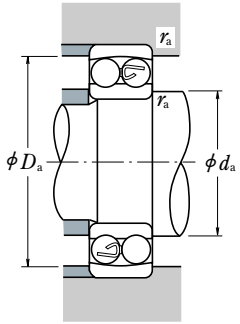
## Bore Diameter 5 – 30 mm




Cylindrical Bore




Tapered Bore




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.65 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are listed in the table below.

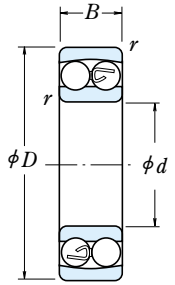
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **5** | 19 | 6 | 0.3 | 2 530 | 475 | 258 | 49 | 30 000 | 36 000 | **135** |
| **6** | 19 | 6 | 0.3 | 2 530 | 475 | 258 | 49 | 30 000 | 36 000 | **126** |
| **7** | 22 | 7 | 0.3 | 2 750 | 600 | 280 | 61 | 26 000 | 32 000 | **127** |
| **8** | 22 | 7 | 0.3 | 2 750 | 600 | 280 | 61 | 26 000 | 32 000 | **108** |
| **9** | 26 | 8 | 0.6 | 4 150 | 895 | 425 | 91 | 26 000 | 30 000 | **129** |
| **10** | 30 | 9 | 0.6 | 5 550 | 1 190 | 570 | 121 | 22 000 | 28 000 | **1200** |
| | 30 | 14 | 0.6 | 7 450 | 1 590 | 760 | 162 | 24 000 | 28 000 | **2200** |
| | 35 | 11 | 0.6 | 7 350 | 1 620 | 750 | 165 | 20 000 | 24 000 | **1300** |
| | 35 | 17 | 0.6 | 9 200 | 2 010 | 935 | 205 | 18 000 | 22 000 | **2300** |
| **12** | 32 | 10 | 0.6 | 5 700 | 1 270 | 580 | 130 | 22 000 | 26 000 | **1201** |
| | 32 | 14 | 0.6 | 7 750 | 1 730 | 790 | 177 | 22 000 | 26 000 | **2201** |
| | 37 | 12 | 1 | 9 650 | 2 160 | 985 | 221 | 18 000 | 22 000 | **1301** |
| | 37 | 17 | 1 | 12 100 | 2 730 | 1 240 | 278 | 17 000 | 22 000 | **2301** |
| **15** | 35 | 11 | 0.6 | 7 600 | 1 750 | 775 | 179 | 18 000 | 22 000 | **1202** |
| | 35 | 14 | 0.6 | 7 800 | 1 850 | 795 | 188 | 18 000 | 22 000 | **2202** |
| | 42 | 13 | 1 | 9 700 | 2 290 | 990 | 234 | 16 000 | 20 000 | **1302** |
| | 42 | 17 | 1 | 12 300 | 2 910 | 1 250 | 296 | 14 000 | 18 000 | **2302** |
| **17** | 40 | 12 | 0.6 | 8 000 | 2 010 | 815 | 205 | 16 000 | 20 000 | **1203** |
| | 40 | 16 | 0.6 | 9 950 | 2 420 | 1 010 | 247 | 16 000 | 20 000 | **2203** |
| | 47 | 14 | 1 | 12 700 | 3 200 | 1 300 | 325 | 14 000 | 17 000 | **1303** |
| | 47 | 19 | 1 | 14 700 | 3 550 | 1 500 | 365 | 13 000 | 16 000 | **2303** |
| **20** | 47 | 14 | 1 | 10 000 | 2 610 | 1 020 | 266 | 14 000 | 17 000 | **1204** |
| | 47 | 18 | 1 | 12 800 | 3 300 | 1 310 | 340 | 14 000 | 17 000 | **2204** |
| | 52 | 15 | 1.1 | 12 600 | 3 350 | 1 280 | 340 | 12 000 | 15 000 | **1304** |
| | 52 | 21 | 1.1 | 18 500 | 4 700 | 1 880 | 480 | 11 000 | 14 000 | **2304** |
| **25** | 52 | 15 | 1 | 12 200 | 3 300 | 1 250 | 335 | 12 000 | 14 000 | **1205** |
| | 52 | 18 | 1 | 12 400 | 3 450 | 1 270 | 350 | 12 000 | 14 000 | **2205** |
| | 62 | 17 | 1.1 | 18 200 | 5 000 | 1 850 | 510 | 10 000 | 13 000 | **1305** |
| | 62 | 24 | 1.1 | 24 900 | 6 600 | 2 530 | 675 | 9 500 | 12 000 | **2305** |
| **30** | 62 | 16 | 1 | 15 800 | 4 650 | 1 610 | 475 | 10 000 | 12 000 | **1206** |
| | 62 | 20 | 1 | 15 300 | 4 550 | 1 560 | 460 | 10 000 | 12 000 | **2206** |
| | 72 | 19 | 1.1 | 21 400 | 6 300 | 2 190 | 645 | 8 500 | 11 000 | **1306** |
| | 72 | 27 | 1.1 | 32 000 | 8 750 | 3 250 | 895 | 8 000 | 10 000 | **2306** |

| Numbers | Abutment and Fillet Dimensions (mm) | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| — | 7 | 17 | 0.3 | 0.34 | 2.9 | 1.9 | 1.9 | 0.009 |
| — | 8 | 17 | 0.3 | 0.34 | 2.9 | 1.9 | 1.9 | 0.008 |
| — | 9 | 20 | 0.3 | 0.31 | 3.1 | 2.0 | 2.1 | 0.013 |
| — | 10 | 20 | 0.3 | 0.31 | 3.1 | 2.0 | 2.1 | 0.016 |
| — | 13 | 22 | 0.6 | 0.32 | 3.1 | 2.0 | 2.1 | 0.021 |
| — | 14 | 26 | 0.6 | 0.32 | 3.1 | 2.0 | 2.1 | 0.033 |
| — | 14 | 26 | 0.6 | 0.64 | 1.5 | 0.98 | 1.0 | 0.042 |
| — | 14 | 31 | 0.6 | 0.35 | 2.8 | 1.8 | 1.9 | 0.057 |
| — | 14 | 31 | 0.6 | 0.71 | 1.4 | 0.89 | 0.93 | 0.077 |
| — | 16 | 28 | 0.6 | 0.36 | 2.7 | 1.8 | 1.8 | 0.039 |
| — | 16 | 28 | 0.6 | 0.58 | 1.7 | 1.1 | 1.1 | 0.048 |
| — | 17 | 32 | 1 | 0.33 | 2.9 | 1.9 | 2.0 | 0.066 |
| — | 17 | 32 | 1 | 0.60 | 1.6 | 1.1 | 1.1 | 0.082 |
| — | 19 | 31 | 0.6 | 0.32 | 3.1 | 2.0 | 2.1 | 0.051 |
| — | 19 | 31 | 0.6 | 0.50 | 1.9 | 1.3 | 1.3 | 0.055 |
| — | 20 | 37 | 1 | 0.33 | 2.9 | 1.9 | 2.0 | 0.093 |
| — | 20 | 37 | 1 | 0.51 | 1.9 | 1.2 | 1.3 | 0.108 |
| — | 21 | 36 | 0.6 | 0.31 | 3.1 | 2.0 | 2.1 | 0.072 |
| — | 21 | 36 | 0.6 | 0.50 | 1.9 | 1.3 | 1.3 | 0.085 |
| — | 22 | 42 | 1 | 0.32 | 3.1 | 2.0 | 2.1 | 0.13 |
| — | 22 | 42 | 1 | 0.51 | 1.9 | 1.2 | 1.3 | 0.15 |
| **1204 K** | 25 | 42 | 1 | 0.29 | 3.4 | 2.2 | 2.3 | 0.12 |
| **2204 K** | 25 | 42 | 1 | 0.47 | 2.1 | 1.3 | 1.4 | 0.133 |
| **1304 K** | 26.5 | 45.5 | 1 | 0.29 | 3.4 | 2.2 | 2.3 | 0.165 |
| **2304 K** | 26.5 | 45.5 | 1 | 0.50 | 1.9 | 1.2 | 1.3 | 0.193 |
| **1205 K** | 30 | 47 | 1 | 0.28 | 3.5 | 2.3 | 2.4 | 0.14 |
| **2205 K** | 30 | 47 | 1 | 0.41 | 2.4 | 1.5 | 1.6 | 0.15 |
| **1305 K** | 31.5 | 55.5 | 1 | 0.28 | 3.5 | 2.3 | 2.4 | 0.255 |
| **2305 K** | 31.5 | 55.5 | 1 | 0.47 | 2.1 | 1.4 | 1.4 | 0.319 |
| **1206 K** | 35 | 57 | 1 | 0.25 | 3.9 | 2.5 | 2.6 | 0.22 |
| **2206 K** | 35 | 57 | 1 | 0.38 | 2.5 | 1.6 | 1.7 | 0.249 |
| **1306 K** | 36.5 | 65.5 | 1 | 0.26 | 3.7 | 2.4 | 2.5 | 0.385 |
| **2306 K** | 36.5 | 65.5 | 1 | 0.44 | 2.2 | 1.4 | 1.5 | 0.48 |

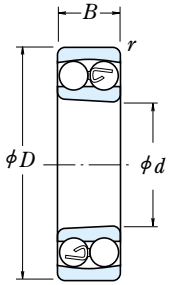
**Note** (1) The suffix K represents bearings with tapered bores (1 : 12)

**Remarks** For the dimensions related to adapters, refer to Page **B358**.

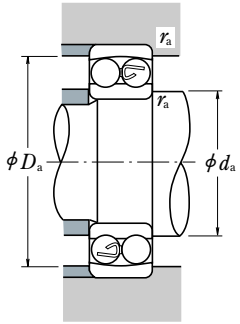
## Bore Diameter 35 – 70 mm




Cylindrical Bore




Tapered Bore




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.65 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are listed in the table below.

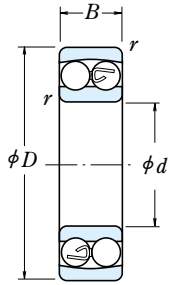
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **35** | 72 | 17 | 1.1 | 15 900 | 5 100 | 1 620 | 520 | 8 500 | 10 000 | **1207** |
| | 72 | 23 | 1.1 | 21 700 | 6 600 | 2 210 | 675 | 8 500 | 10 000 | **2207** |
| | 80 | 21 | 1.5 | 25 300 | 7 850 | 2 580 | 800 | 7 500 | 9 500 | **1307** |
| | 80 | 31 | 1.5 | 40 000 | 11 300 | 4 100 | 1 150 | 7 100 | 9 000 | **2307** |
| **40** | 80 | 18 | 1.1 | 19 300 | 6 500 | 1 970 | 665 | 7 500 | 9 000 | **1208** |
| | 80 | 23 | 1.1 | 22 400 | 7 350 | 2 290 | 750 | 7 500 | 9 000 | **2208** |
| | 90 | 23 | 1.5 | 29 800 | 9 700 | 3 050 | 990 | 6 700 | 8 500 | **1308** |
| | 90 | 33 | 1.5 | 45 500 | 13 500 | 4 650 | 1 380 | 6 300 | 8 000 | **2308** |
| **45** | 85 | 19 | 1.1 | 22 000 | 7 350 | 2 240 | 750 | 7 100 | 8 500 | **1209** |
| | 85 | 23 | 1.1 | 23 300 | 8 150 | 2 380 | 830 | 7 100 | 8 500 | **2209** |
| | 100 | 25 | 1.5 | 38 500 | 12 700 | 3 900 | 1 300 | 6 000 | 7 500 | **1309** |
| | 100 | 36 | 1.5 | 55 000 | 16 700 | 5 600 | 1 700 | 5 600 | 7 100 | **2309** |
| **50** | 90 | 20 | 1.1 | 22 800 | 8 100 | 2 330 | 830 | 6 300 | 8 000 | **1210** |
| | 90 | 23 | 1.1 | 23 300 | 8 450 | 2 380 | 865 | 6 300 | 8 000 | **2210** |
| | 110 | 27 | 2 | 43 500 | 14 100 | 4 450 | 1 440 | 5 600 | 6 700 | **1310** |
| | 110 | 40 | 2 | 65 000 | 20 200 | 6 650 | 2 060 | 5 000 | 6 300 | **2310** |
| **55** | 100 | 21 | 1.5 | 26 900 | 10 000 | 2 750 | 1 020 | 6 000 | 7 100 | **1211** |
| | 100 | 25 | 1.5 | 26 700 | 9 900 | 2 720 | 1 010 | 6 000 | 7 100 | **2211** |
| | 120 | 29 | 2 | 51 500 | 17 900 | 5 250 | 1 820 | 5 000 | 6 300 | **1311** |
| | 120 | 43 | 2 | 76 500 | 24 000 | 7 800 | 2 450 | 4 800 | 6 000 | **2311** |
| **60** | 110 | 22 | 1.5 | 30 500 | 11 500 | 3 100 | 1 180 | 5 300 | 6 300 | **1212** |
| | 110 | 28 | 1.5 | 34 000 | 12 600 | 3 500 | 1 290 | 5 300 | 6 300 | **2212** |
| | 130 | 31 | 2.1 | 57 500 | 20 800 | 5 900 | 2 130 | 4 500 | 5 600 | **1312** |
| | 130 | 46 | 2.1 | 88 500 | 28 300 | 9 000 | 2 880 | 4 300 | 5 300 | **2312** |
| **65** | 120 | 23 | 1.5 | 31 000 | 12 500 | 3 150 | 1 280 | 4 800 | 6 000 | **1213** |
| | 120 | 31 | 1.5 | 43 500 | 16 400 | 4 450 | 1 670 | 4 800 | 6 000 | **2213** |
| | 140 | 33 | 2.1 | 62 500 | 22 900 | 6 350 | 2 330 | 4 300 | 5 300 | **1313** |
| | 140 | 48 | 2.1 | 97 000 | 32 500 | 9 900 | 3 300 | 3 800 | 4 800 | **2313** |
| **70** | 125 | 24 | 1.5 | 35 000 | 13 800 | 3 550 | 1 410 | 4 800 | 5 600 | **1214** |
| | 125 | 31 | 1.5 | 44 000 | 17 100 | 4 500 | 1 740 | 4 500 | 5 600 | **2214** |
| | 150 | 35 | 2.1 | 75 000 | 27 700 | 7 650 | 2 830 | 4 000 | 5 000 | **1314** |
| | 150 | 51 | 2.1 | 111 000 | 37 500 | 11 300 | 3 850 | 3 600 | 4 500 | **2314** |

| Numbers | Abutment and Fillet Dimensions (mm) | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **1207 K** | 41.5 | 65.5 | 1 | 0.23 | 4.2 | 2.7 | 2.8 | 0.32 |
| **2207 K** | 41.5 | 65.5 | 1 | 0.37 | 2.6 | 1.7 | 1.8 | 0.378 |
| **1307 K** | 43 | 72 | 1.5 | 0.26 | 3.8 | 2.5 | 2.6 | 0.51 |
| **2307 K** | 43 | 72 | 1.5 | 0.46 | 2.1 | 1.4 | 1.4 | 0.642 |
| **1208 K** | 46.5 | 73.5 | 1 | 0.22 | 4.3 | 2.8 | 2.9 | 0.415 |
| **2208 K** | 46.5 | 73.5 | 1 | 0.33 | 3.0 | 1.9 | 2.0 | 0.477 |
| **1308 K** | 48 | 82 | 1.5 | 0.24 | 4.0 | 2.6 | 2.7 | 0.715 |
| **2308 K** | 48 | 82 | 1.5 | 0.43 | 2.3 | 1.5 | 1.5 | 0.889 |
| **1209 K** | 51.5 | 78.5 | 1 | 0.21 | 4.7 | 3.0 | 3.1 | 0.465 |
| **2209 K** | 51.5 | 78.5 | 1 | 0.30 | 3.2 | 2.1 | 2.2 | 0.522 |
| **1309 K** | 53 | 92 | 1.5 | 0.25 | 4.0 | 2.6 | 2.7 | 0.955 |
| **2309 K** | 53 | 92 | 1.5 | 0.41 | 2.4 | 1.5 | 1.6 | 1.2 |
| **1210 K** | 56.5 | 83.5 | 1 | 0.21 | 4.7 | 3.1 | 3.2 | 0.525 |
| **2210 K** | 56.5 | 83.5 | 1 | 0.28 | 3.4 | 2.2 | 2.3 | 0.564 |
| **1310 K** | 59 | 101 | 2 | 0.23 | 4.2 | 2.7 | 2.8 | 1.25 |
| **2310 K** | 59 | 101 | 2 | 0.42 | 2.3 | 1.5 | 1.6 | 1.58 |
| **1211 K** | 63 | 92 | 1.5 | 0.20 | 4.9 | 3.2 | 3.3 | 0.705 |
| **2211 K** | 63 | 92 | 1.5 | 0.28 | 3.5 | 2.3 | 2.4 | 0.746 |
| **1311 K** | 64 | 111 | 2 | 0.23 | 4.2 | 2.7 | 2.8 | 1.6 |
| **2311 K** | 64 | 111 | 2 | 0.41 | 2.4 | 1.5 | 1.6 | 2.03 |
| **1212 K** | 68 | 102 | 1.5 | 0.18 | 5.3 | 3.4 | 3.6 | 0.90 |
| **2212 K** | 68 | 102 | 1.5 | 0.28 | 3.5 | 2.3 | 2.4 | 1.03 |
| **1312 K** | 71 | 119 | 2 | 0.23 | 4.3 | 2.8 | 2.9 | 2.03 |
| **2312 K** | 71 | 119 | 2 | 0.40 | 2.4 | 1.6 | 1.6 | 2.57 |
| **1213 K** | 73 | 112 | 1.5 | 0.17 | 5.7 | 3.7 | 3.8 | 1.15 |
| **2213 K** | 73 | 112 | 1.5 | 0.28 | 3.5 | 2.3 | 2.4 | 1.4 |
| **1313 K** | 76 | 129 | 2 | 0.23 | 4.2 | 2.7 | 2.9 | 2.54 |
| **2313 K** | 76 | 129 | 2 | 0.39 | 2.5 | 1.6 | 1.7 | 3.2 |
| — | 78 | 117 | 1.5 | 0.18 | 5.3 | 3.4 | 3.6 | 1.3 |
| — | 78 | 117 | 1.5 | 0.26 | 3.7 | 2.4 | 2.5 | 1.52 |
| — | 81 | 139 | 2 | 0.22 | 4.4 | 2.8 | 3.0 | 3.19 |
| — | 81 | 139 | 2 | 0.38 | 2.6 | 1.7 | 1.8 | 3.9 |

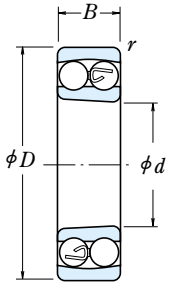
**Note** (1) The suffix K represents bearings with tapered bores (1 : 12)

**Remarks** For the dimensions related to adapters, refer to Page **B358** and **B359**.

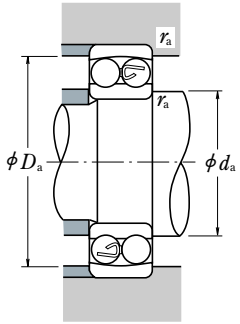
## Bore Diameter 75 – 110 mm




Cylindrical Bore




Tapered Bore




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.65 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

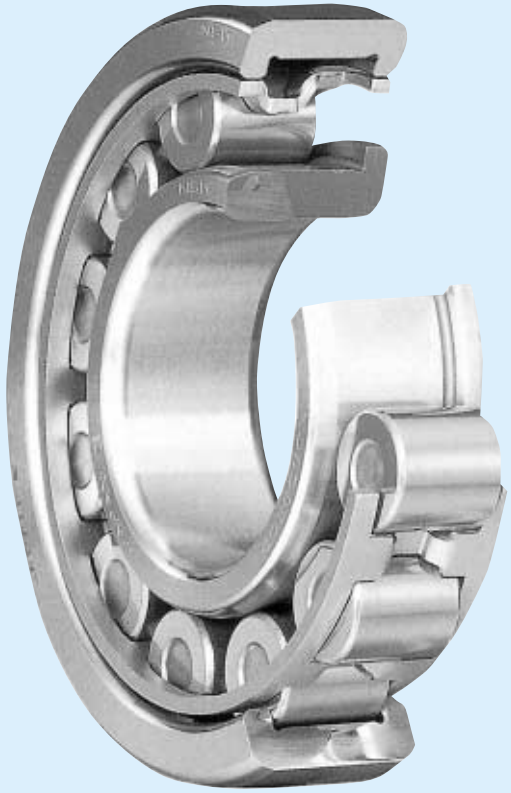
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are listed in the table below.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing | Numbers | Abutment and Fillet Dimensions (mm) | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore | Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **75** | 130 | 25 | 1.5 | 39 000 | 15 700 | 4 000 | 1 600 | 4 300 | 5 300 | **1215** | **1215 K** | 83 | 122 | 1.5 | 0.17 | 5.6 | 3.6 | 3.8 | 1.41 |
| | 130 | 31 | 1.5 | 44 500 | 17 800 | 4 550 | 1 820 | 4 300 | 5 300 | **2215** | **2215 K** | 83 | 122 | 1.5 | 0.25 | 3.9 | 2.5 | 2.6 | 1.6 |
| | 160 | 37 | 2.1 | 80 000 | 30 000 | 8 150 | 3 050 | 3 800 | 4 500 | **1315** | **1315 K** | 86 | 149 | 2 | 0.22 | 4.4 | 2.8 | 2.9 | 3.65 |
| | 160 | 55 | 2.1 | 125 000 | 43 000 | 12 700 | 4 400 | 3 400 | 4 300 | **2315** | **2315 K** | 86 | 149 | 2 | 0.38 | 2.5 | 1.6 | 1.7 | 4.77 |
| **80** | 140 | 26 | 2 | 40 000 | 17 000 | 4 100 | 1 730 | 4 000 | 5 000 | **1216** | **1216 K** | 89 | 131 | 2 | 0.16 | 6.0 | 3.9 | 4.1 | 1.73 |
| | 140 | 33 | 2 | 49 000 | 19 900 | 5 000 | 2 030 | 4 000 | 5 000 | **2216** | **2216 K** | 89 | 131 | 2 | 0.25 | 3.9 | 2.5 | 2.7 | 1.97 |
| | 170 | 39 | 2.1 | 89 000 | 33 000 | 9 100 | 3 400 | 3 600 | 4 300 | **1316** | **1316 K** | 91 | 159 | 2 | 0.22 | 4.5 | 2.9 | 3.1 | 4.31 |
| | 170 | 58 | 2.1 | 130 000 | 45 000 | 13 200 | 4 600 | 3 200 | 4 000 | ∗ **2316** | ∗ **2316 K** | 91 | 159 | 2 | 0.39 | 2.5 | 1.6 | 1.7 | 5.54 |
| **85** | 150 | 28 | 2 | 49 500 | 20 800 | 5 050 | 2 120 | 3 800 | 4 500 | **1217** | **1217 K** | 94 | 141 | 2 | 0.17 | 5.7 | 3.7 | 3.8 | 2.09 |
| | 150 | 36 | 2 | 58 500 | 23 600 | 5 950 | 2 400 | 3 800 | 4 800 | **2217** | **2217 K** | 94 | 141 | 2 | 0.25 | 3.9 | 2.5 | 2.6 | 2.48 |
| | 180 | 41 | 3 | 98 500 | 38 000 | 10 000 | 3 850 | 3 400 | 4 000 | **1317** | **1317 K** | 98 | 167 | 2.5 | 0.21 | 4.6 | 2.9 | 3.1 | 5.13 |
| | 180 | 60 | 3 | 142 000 | 51 500 | 14 500 | 5 250 | 3 000 | 3 800 | **2317** | **2317 K** | 98 | 167 | 2.5 | 0.37 | 2.6 | 1.7 | 1.8 | 6.56 |
| **90** | 160 | 30 | 2 | 57 500 | 23 500 | 5 850 | 2 400 | 3 600 | 4 300 | **1218** | **1218 K** | 99 | 151 | 2 | 0.17 | 5.8 | 3.8 | 3.9 | 2.55 |
| | 160 | 40 | 2 | 70 500 | 28 700 | 7 200 | 2 930 | 3 600 | 4 300 | **2218** | **2218 K** | 99 | 151 | 2 | 0.27 | 3.7 | 2.4 | 2.5 | 3.13 |
| | 190 | 43 | 3 | 117 000 | 44 500 | 12 000 | 4 550 | 3 200 | 3 800 | ∗ **1318** | ∗ **1318 K** | 103 | 177 | 2.5 | 0.22 | 4.3 | 2.8 | 2.9 | 5.94 |
| | 190 | 64 | 3 | 154 000 | 57 500 | 15 700 | 5 850 | 2 800 | 3 600 | **2318** | **2318 K** | 103 | 177 | 2.5 | 0.38 | 2.6 | 1.7 | 1.7 | 7.76 |
| **95** | 170 | 32 | 2.1 | 64 000 | 27 100 | 6 550 | 2 770 | 3 400 | 4 000 | **1219** | **1219 K** | 106 | 159 | 2 | 0.17 | 5.8 | 3.7 | 3.9 | 3.21 |
| | 170 | 43 | 2.1 | 84 000 | 34 500 | 8 550 | 3 500 | 3 400 | 4 000 | **2219** | **2219 K** | 106 | 159 | 2 | 0.27 | 3.7 | 2.4 | 2.5 | 3.87 |
| | 200 | 45 | 3 | 129 000 | 51 000 | 13 200 | 5 200 | 3 000 | 3 600 | ∗ **1319** | ∗ **1319 K** | 108 | 187 | 2.5 | 0.23 | 4.3 | 2.8 | 2.9 | 6.84 |
| | 200 | 67 | 3 | 161 000 | 64 500 | 16 400 | 6 550 | 2 800 | 3 400 | ∗ **2319** | ∗ **2319 K** | 108 | 187 | 2.5 | 0.38 | 2.6 | 1.7 | 1.8 | 9.01 |
| **100** | 180 | 34 | 2.1 | 69 500 | 29 700 | 7 100 | 3 050 | 3 200 | 3 800 | **1220** | **1220 K** | 111 | 169 | 2 | 0.17 | 5.6 | 3.6 | 3.8 | 3.82 |
| | 180 | 46 | 2.1 | 94 500 | 38 500 | 9 650 | 3 900 | 3 200 | 3 800 | **2220** | **2220 K** | 111 | 169 | 2 | 0.27 | 3.7 | 2.4 | 2.5 | 4.53 |
| | 215 | 47 | 3 | 140 000 | 57 500 | 14 300 | 5 850 | 2 800 | 3 400 | ∗ **1320** | ∗ **1320 K** | 113 | 202 | 2.5 | 0.24 | 4.1 | 2.7 | 2.8 | 8.46 |
| | 215 | 73 | 3 | 187 000 | 79 000 | 19 100 | 8 050 | 2 400 | 3 200 | ∗ **2320** | ∗ **2320 K** | 113 | 202 | 2.5 | 0.38 | 2.6 | 1.7 | 1.8 | 11.6 |
| **105** | 190 | 36 | 2.1 | 75 000 | 32 500 | 7 650 | 3 300 | 3 000 | 3 600 | **1221** | — | 116 | 179 | 2 | 0.18 | 5.5 | 3.6 | 3.7 | 4.52 |
| | 190 | 50 | 2.1 | 109 000 | 45 000 | 11 100 | 4 550 | 3 000 | 3 600 | **2221** | — | 116 | 179 | 2 | 0.28 | 3.5 | 2.3 | 2.4 | 5.64 |
| | 225 | 49 | 3 | 154 000 | 64 500 | 15 700 | 6 600 | 2 600 | 3 200 | ∗ **1321** | — | 118 | 212 | 2.5 | 0.23 | 4.2 | 2.7 | 2.9 | 10 |
| | 225 | 77 | 3 | 200 000 | 87 000 | 20 400 | 8 850 | 2 400 | 3 000 | ∗ **2321** | — | 118 | 212 | 2.5 | 0.38 | 2.6 | 1.7 | 1.7 | 14.4 |
| **110** | 200 | 38 | 2.1 | 87 000 | 38 500 | 8 900 | 3 950 | 2 800 | 3 400 | **1222** | **1222 K** | 121 | 189 | 2 | 0.17 | 5.7 | 3.7 | 3.9 | 5.33 |
| | 200 | 53 | 2.1 | 122 000 | 51 500 | 12 500 | 5 250 | 2 800 | 3 400 | ∗ **2222** | ∗ **2222 K** | 121 | 189 | 2 | 0.28 | 3.5 | 2.2 | 2.3 | 6.64 |
| | 240 | 50 | 3 | 161 000 | 72 000 | 16 400 | 7 300 | 2 400 | 3 000 | ∗ **1322** | ∗ **1322 K** | 123 | 227 | 2.5 | 0.22 | 4.4 | 2.8 | 3.0 | 12 |
| | 240 | 80 | 3 | 211 000 | 94 500 | 21 600 | 9 650 | 2 200 | 2 800 | ∗ **2322** | ∗ **2322 K** | 123 | 227 | 2.5 | 0.37 | 2.6 | 1.7 | 1.8 | 17.4 |

**Notes** (1) The suffix K represents bearings with tapered bores (1 : 12)

(∗) The balls of the bearings marked ∗ protrude slightly from the bearing face. The protrusion amounts are shown on Page **B77.**

**Remarks** For the dimensions related to adapters, refer to Pages **B360** and **B361**.



# CYLINDRICAL ROLLER BEARINGS

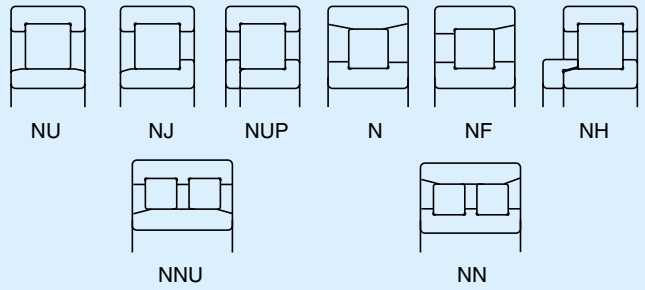

**SINGLE-ROW CYLINDRICAL ROLLER BEARINGS** Bore Diameter 20 – 65mm ····· B 88
Bore Diameter 70 – 160mm ····· B 94
Bore Diameter 170 – 500mm ····· B102
L-SHAPED THRUST COLLARS FOR CYLINDRICAL ROLLER BEARINGS Bore Diameter 20 – 320mm ····· B106

**DOUBLE-ROW CYLINDRICAL ROLLER BEARINGS** Bore Diameter 25 – 360mm ····· B110


Four-Row Cylindrical Roller Bearings are described on Pages B334 to B343.

## DESIGN, TYPES, AND FEATURES

Depending on the existence of ribs on their rings, Cylindrical Roller Bearings are classified into the following types.




Types NU, N, NNU, and NN are suitable as free-end bearings. Types NJ and NF can sustain limited axial loads in one direction. Types NH and NUP can be used as fixed-end bearings.

NH-type cylindrical roller bearings consist of the NJ-type cylindrical roller bearings and HJ-type L-shaped thrust collars (See Page B106 to B109).

The inner ring loose rib of a NUP-type cylindrical roller bearing should be mounted so that the marked side is on the outside.

Use pressed, machined, or molded cages for standard cylindrical roller bearings as shown in Table 1.

**Table 1 Standard Cages for Cylindrical Roller Bearings**

| Series | Pressed Steel Cages (W) | Machined Brass Cages (M) | Molded Polyamide Cages (T) |
|---|---|---|---|
| NU10** | — | 1005 – 10/500 | — |
| N2** | 204 – 230 | 232 – 264 | — |
| NU2** | 214 – 230 | 232 – 264 | — |
| NU2**E | 205E – 213E | 214E – 240E | 204E |
| NU22** | 2204 – 2230 | 2232 – 2252 | — |
| NU22**E | — | 2222E – 2240E | 2204E – 2220E |
| N3** | 304 – 324 | 326 – 352 | — |
| NU3** | 312 – 330 | 332 – 352 | — |
| NU3**E | 305E – 311E | 312E – 340E | 304E |
| NU23** | 2304 – 2320 | 2322 – 2340 | — |
| NU23**E | — | 2322E – 2340E | 2304E – 2320E |
| NU4** | 405 – 416 | 417 – 430 | — |

The basic load ratings listed in the bearing tables are based on the Cage Classification in Table 1.

For a given bearing number, if the type of cage is not the standard one, the number of rollers may vary; in such a case, the load rating will differ from the one listed in the bearing tables.

Among the NN Type of double-row bearings, there are many of high precision that have tapered bores, and they are primarily used in the main spindles of machine tools. Their cages are either molded polyphenylenesulfide (PPS) or machined brass.

## PRECAUTIONS FOR USE OF CYLINDRICAL ROLLER BEARINGS

If the load on cylindrical roller bearings becomes too small during operation, slippage between the rollers and raceways occurs, which may result in smearing. Especially with large bearings since the weight of the roller and cage is high.

In case of strong shock loads or vibration, pressed-steel cages are sometimes inadequate.

If very small bearing load or strong shock loads or vibration are expected, please consult with NSK for selection of the bearings.

Bearings with molded polyamide cages (ET type) can be used continuously at temperatures between −40 and 120°C. If the bearings are used in gear oil, nonflammable hydraulic oil, or ester oil at a high temperature over 100°C, please contact NSK beforehand.

## TOLERANCES AND RUNNING ACCURACY

**CYLINDRICAL ROLLER BEARINGS** ..... Table 8.2 (Pages A60 to A63)

**DOUBLE-ROW CYLINDRICAL ROLLER BEARINGS** ..... Table 8.2 (Pages A60 to A63)





**Table 2 Tolerances for Roller Inscribed Circle Diameter $F_w$ and Roller Circumscribed Circle Diameter $E_w$ of Cylindrical Roller Bearings Having Interchangeable Rings**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | Tolerances for $F_w$ of types NU, NJ, NUP, NH, and NNU $\Delta_{F_w}$ | | Tolerances for $E_w$ of types N, NF, and NN $\Delta_{E_w}$ | |
|---|---|---|---|---|---|
| over | incl | high | low | high | low |
| — | 20 | +10 | 0 | 0 | −10 |
| 20 | 50 | +15 | 0 | 0 | −15 |
| 50 | 120 | +20 | 0 | 0 | −20 |
| 120 | 200 | +25 | 0 | 0 | −25 |
| 200 | 250 | +30 | 0 | 0 | −30 |
| 250 | 315 | +35 | 0 | 0 | −35 |
| 315 | 400 | +40 | 0 | 0 | −40 |
| 400 | 500 | +45 | 0 | — | — |

## RECOMMENDED FITS

**CYLINDRICAL ROLLER BEARINGS** ..... Table 9.2 (Page A84)
Table 9.4 (Page A85)

**DOUBLE-ROW CYLINDRICAL ROLLER BEARINGS** ..... Table 9.2 (Page A84)
Table 9.4 (Page A85)

## INTERNAL CLEARANCES

**CYLINDRICAL ROLLER BEARINGS** ..... Table 9.14 (Page A91)

**DOUBLE-ROW CYLINDRICAL ROLLER BEARINGS** .... Table 9.14 (Page A91)

## PERMISSIBLE MISALIGNMENT

The permissible misalignment of cylindrical roller bearings varies depending on the type and internal specifications, but under normal loads, the angles are approximately as follows:

Cylindrical Roller Bearings of width series 0 or 1 ..... 0.0012 radian (4′)

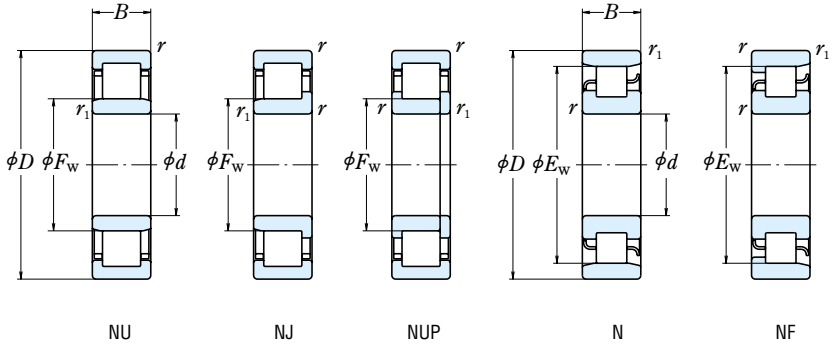
Cylindrical Roller Bearings of width series 2 ..... 0.0006 radian (2′)

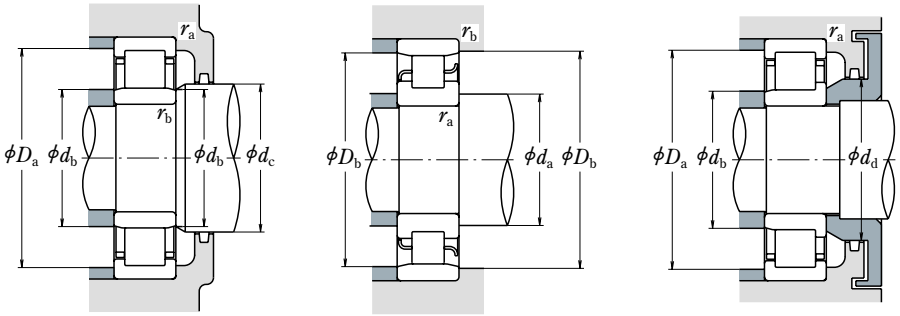
For double-row cylindrical roller bearings, nearly no misalignment is allowed.

## LIMITING SPEEDS

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

## Bore Diameter 20 – 35 mm




| d | Boundary Dimensions (mm) D | B | r min. | r1 min. | Fw | Ew | Basic Load Ratings (N) Cr | C0r | Limiting Speeds(1) (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|
| **20** | 47 | 14 | 1 | 0.6 | — | 40 | 15 400 | 12 700 | 15 000 | 18 000 |
| | 47 | 14 | 1 | 0.6 | 26.5 | — | 25 700 | 22 600 | 13 000 | 16 000 |
| | 47 | 18 | 1 | 0.6 | 27 | — | 20 700 | 18 400 | 13 000 | 16 000 |
| | 47 | 18 | 1 | 0.6 | 26.5 | — | 30 500 | 28 300 | 13 000 | 16 000 |
| | 52 | 15 | 1.1 | 0.6 | — | 44.5 | 21 400 | 17 300 | 12 000 | 15 000 |
| | 52 | 15 | 1.1 | 0.6 | 27.5 | — | 31 500 | 26 900 | 12 000 | 15 000 |
| | 52 | 21 | 1.1 | 0.6 | 28.5 | — | 30 500 | 27 200 | 11 000 | 14 000 |
| | 52 | 21 | 1.1 | 0.6 | 27.5 | — | 42 000 | 39 000 | 11 000 | 14 000 |
| **25** | 47 | 12 | 0.6 | 0.3 | 30.5 | — | 14 300 | 13 100 | 15 000 | 18 000 |
| | 52 | 15 | 1 | 0.6 | — | 45 | 17 700 | 15 700 | 13 000 | 16 000 |
| | 52 | 15 | 1 | 0.6 | 31.5 | — | 29 300 | 27 700 | 12 000 | 14 000 |
| | 52 | 18 | 1 | 0.6 | 31.5 | — | 35 000 | 34 500 | 12 000 | 14 000 |
| | 62 | 17 | 1.1 | 1.1 | — | 53 | 29 300 | 25 200 | 10 000 | 13 000 |
| | 62 | 17 | 1.1 | 1.1 | 34 | — | 41 500 | 37 500 | 10 000 | 12 000 |
| | 62 | 24 | 1.1 | 1.1 | 34 | — | 57 000 | 56 000 | 9 000 | 11 000 |
| | 80 | 21 | 1.5 | 1.5 | 38.8 | 62.8 | 46 500 | 40 000 | 9 000 | 11 000 |
| **30** | 55 | 13 | 1 | 0.6 | 36.5 | 48.5 | 19 700 | 19 600 | 12 000 | 15 000 |
| | 62 | 16 | 1 | 0.6 | — | 53.5 | 24 900 | 23 300 | 11 000 | 13 000 |
| | 62 | 16 | 1 | 0.6 | 37.5 | — | 39 000 | 37 500 | 9 500 | 12 000 |
| | 62 | 20 | 1 | 0.6 | 37.5 | — | 49 000 | 50 000 | 9 500 | 12 000 |
| | 72 | 19 | 1.1 | 1.1 | — | 62 | 38 500 | 35 000 | 8 500 | 11 000 |
| | 72 | 19 | 1.1 | 1.1 | 40.5 | — | 53 000 | 50 000 | 8 500 | 10 000 |
| | 72 | 27 | 1.1 | 1.1 | 40.5 | — | 74 500 | 77 500 | 8 000 | 9 500 |
| | 90 | 23 | 1.5 | 1.5 | 45 | 73 | 62 500 | 55 000 | 7 500 | 9 500 |
| **35** | 62 | 14 | 1 | 0.6 | 42 | 55 | 22 600 | 23 200 | 11 000 | 13 000 |
| | 72 | 17 | 1.1 | 0.6 | — | 61.8 | 35 500 | 34 000 | 9 500 | 11 000 |
| | 72 | 17 | 1.1 | 0.6 | 44 | — | 50 500 | 50 000 | 8 500 | 10 000 |
| | 72 | 23 | 1.1 | 0.6 | 44 | — | 61 500 | 65 500 | 8 500 | 10 000 |
| | 80 | 21 | 1.5 | 1.1 | — | 68.2 | 49 500 | 47 000 | 8 000 | 9 500 |
| | 80 | 21 | 1.5 | 1.1 | 46.2 | — | 66 500 | 65 500 | 7 500 | 9 500 |
| | 80 | 31 | 1.5 | 1.1 | 46.2 | — | 93 000 | 101 000 | 6 700 | 8 500 |
| | 100 | 25 | 1.5 | 1.5 | 53 | 83 | 75 500 | 69 000 | 6 700 | 8 000 |

| Bearing Numbers(2) (3) NU | NJ | NUP | N | NF | Abutment and Fillet Dimensions (mm) da(4) min. | db min. | db(5) max. | dc min. | dd min. | Da(4) max. | Db max. | Db min. | ra max. | rb max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **N 204** | — | — | — | **N** | **NF** | 25 | — | — | — | — | — | 43 | 42 | 1 | 0.6 | 0.107 |
| **NU 204 ET** | **NU** | **NJ** | **NUP** | — | — | 25 | 24 | 25 | 29 | 32 | 42 | — | — | 1 | 0.6 | 0.107 |
| **NU2204** | **NU** | **NJ** | — | — | — | 25 | 24 | 25 | 29 | 32 | 42 | — | — | 1 | 0.6 | 0.144 |
| **NU2204 ET** | **NU** | **NJ** | **NUP** | — | — | 25 | 24 | 25 | 29 | 32 | 42 | — | — | 1 | 0.6 | 0.138 |
| **N 304** | — | — | — | **N** | **NF** | 26.5 | — | — | — | — | — | 48 | 46 | 1 | 0.6 | 0.148 |
| **NU 304 ET** | **NU** | **NJ** | **NUP** | — | — | 26.5 | 24 | 26 | 30 | 33 | 45.5 | — | — | 1 | 0.6 | 0.145 |
| **NU2304** | **NU** | **NJ** | **NUP** | — | — | 26.5 | 24 | 27 | 30 | 33 | 45.5 | — | — | 1 | 0.6 | 0.217 |
| **NU2304 ET** | **NU** | **NJ** | **NUP** | — | — | 26.5 | 24 | 26 | 30 | 33 | 45.5 | — | — | 1 | 0.6 | 0.209 |
| **NU1005** | **NU** | — | — | — | — | — | 27 | 30 | 32 | — | 43 | — | — | 0.6 | 0.3 | 0.094 |
| **N 205** | — | — | — | **N** | **NF** | 30 | — | — | — | — | — | 48 | 46 | 1 | 0.6 | 0.135 |
| **NU 205 EW** | **NU** | **NJ** | **NUP** | — | — | 30 | 29 | 30 | 34 | 37 | 47 | — | — | 1 | 0.6 | 0.136 |
| **NU2205 ET** | **NU** | **NJ** | **NUP** | — | — | 30 | 29 | 30 | 34 | 37 | 47 | — | — | 1 | 0.6 | 0.16 |
| **N 305** | — | — | — | **N** | **NF** | 31.5 | — | — | — | — | — | 55.5 | 50 | 1 | 1 | 0.233 |
| **NU 305 EW** | **NU** | **NJ** | **NUP** | — | — | 31.5 | 31.5 | 32 | 37 | 40 | 55.5 | — | — | 1 | 1 | 0.269 |
| **NU2305 ET** | **NU** | **NJ** | **NUP** | — | — | 31.5 | 31.5 | 32 | 37 | 40 | 55.5 | — | — | 1 | 1 | 0.338 |
| **NU 405** | **NU** | **NJ** | — | **N** | **NF** | 33 | 33 | 37 | 41 | 46 | 72 | 72 | 64 | 1.5 | 1.5 | 0.57 |
| **NU1006** | **NU** | — | — | **N** | — | 35 | 34 | 36 | 38 | — | 50 | 51 | 49 | 1 | 0.5 | 0.136 |
| **N 206** | — | — | — | **N** | **NF** | 35 | — | — | — | — | — | 58 | 56 | 1 | 0.6 | 0.208 |
| **NU 206 EW** | **NU** | **NJ** | **NUP** | — | — | 35 | 34 | 36 | 40 | 44 | 57 | — | — | 1 | 0.6 | 0.205 |
| **NU2206 ET** | **NU** | **NJ** | **NUP** | — | — | 35 | 34 | 36 | 40 | 44 | 57 | — | — | 1 | 0.6 | 0.255 |
| **N 306** | — | — | — | **N** | **NF** | 36.5 | — | — | — | — | — | 65.5 | 64 | 1 | 1 | 0.353 |
| **NU 306 EW** | **NU** | **NJ** | **NUP** | — | — | 36.5 | 36.5 | 39 | 44 | 48 | 65.5 | — | — | 1 | 1 | 0.409 |
| **NU2306 ET** | **NU** | **NJ** | **NUP** | — | — | 36.5 | 36.5 | 39 | 44 | 48 | 65.5 | — | — | 1 | 1 | 0.518 |
| **NU 406** | **NU** | **NJ** | — | **N** | **NF** | 38 | 38 | 43 | 47 | 52 | 82 | 82 | 75 | 1.5 | 1.5 | 0.758 |
| **NU1007** | **NU** | **NJ** | — | **N** | — | 40 | 39 | 41 | 44 | — | 57 | 58 | 56 | 1 | 0.5 | 0.18 |
| **N 207** | — | — | — | **N** | **NF** | 41.5 | — | — | — | — | — | 68 | 64 | 1 | 0.6 | 0.301 |
| **NU 207 EW** | **NU** | **NJ** | **NUP** | — | — | 41.5 | 39 | 42 | 46 | 50 | 65.5 | — | — | 1 | 0.6 | 0.304 |
| **NU2207 ET** | **NU** | **NJ** | **NUP** | — | — | 41.5 | 39 | 42 | 46 | 50 | 65.5 | — | — | 1 | 0.6 | 0.40 |
| **N 307** | — | — | — | **N** | **NF** | 43 | — | — | — | — | — | 73.5 | 70 | 1.5 | 1 | 0.476 |
| **NU 307 EW** | **NU** | **NJ** | **NUP** | — | — | 41.5 | 41.5 | 44 | 48 | 53 | 72 | — | — | 1.5 | 1 | 0.545 |
| **NU2307 ET** | **NU** | **NJ** | **NUP** | — | — | 43 | 41.5 | 44 | 48 | 53 | 72 | — | — | 1.5 | 1 | 0.711 |
| **NU 407** | **NU** | **NJ** | — | **N** | **NF** | 43 | 43 | 51 | 55 | 61 | 92 | 92 | 85 | 1.5 | 1.5 | 1.01 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

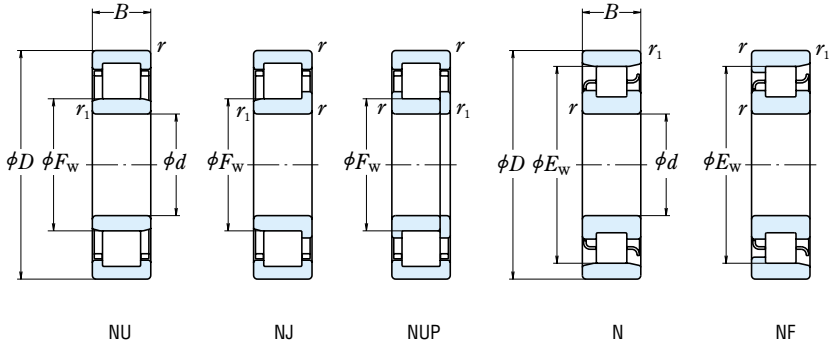
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

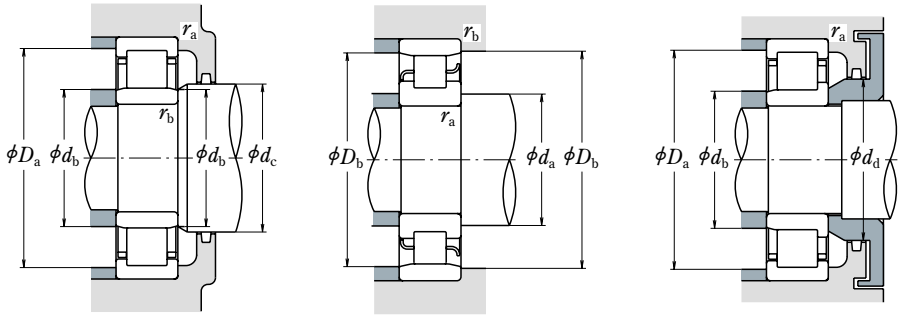
(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 40 – 55 mm




| d | Boundary Dimensions (mm) D | B | r min. | r1 min. | Fw | Ew | Basic Load Ratings (N) Cr | C0r | Limiting Speeds(1) (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|
| **40** | 68 | 15 | 1 | 0.6 | 47 | 61 | 27 300 | 29 000 | 10 000 | 12 000 |
| | 80 | 18 | 1.1 | 1.1 | — | 70 | 43 500 | 43 000 | 8 500 | 10 000 |
| | 80 | 18 | 1.1 | 1.1 | 49.5 | — | 55 500 | 55 500 | 7 500 | 9 000 |
| | 80 | 23 | 1.1 | 1.1 | 49.5 | — | 72 500 | 77 500 | 7 500 | 9 000 |
| | 90 | 23 | 1.5 | 1.5 | — | 77.5 | 58 500 | 57 000 | 6 700 | 8 500 |
| | 90 | 23 | 1.5 | 1.5 | 52 | — | 83 000 | 81 500 | 6 700 | 8 000 |
| | 90 | 33 | 1.5 | 1.5 | 52 | — | 114 000 | 122 000 | 6 000 | 7 500 |
| | 110 | 27 | 2 | 2 | 58 | 92 | 95 500 | 89 000 | 6 000 | 7 500 |
| **45** | 75 | 16 | 1 | 0.6 | 52.5 | 67.5 | 32 500 | 35 500 | 9 000 | 11 000 |
| | 85 | 19 | 1.1 | 1.1 | — | 75 | 46 000 | 47 000 | 7 500 | 9 000 |
| | 85 | 19 | 1.1 | 1.1 | 54.5 | — | 63 000 | 66 500 | 6 700 | 8 000 |
| | 85 | 23 | 1.1 | 1.1 | 54.5 | — | 76 000 | 84 500 | 6 700 | 8 500 |
| | 100 | 25 | 1.5 | 1.5 | — | 86.5 | 79 000 | 77 500 | 6 300 | 7 500 |
| | 100 | 25 | 1.5 | 1.5 | 58.5 | — | 97 500 | 98 500 | 6 000 | 7 500 |
| | 100 | 36 | 1.5 | 1.5 | 58.5 | — | 137 000 | 153 000 | 5 300 | 6 700 |
| | 120 | 29 | 2 | 2 | 64.5 | 100.5 | 107 000 | 102 000 | 5 600 | 6 700 |
| **50** | 80 | 16 | 1 | 0.6 | 57.5 | 72.5 | 32 000 | 36 000 | 8 000 | 10 000 |
| | 90 | 20 | 1.1 | 1.1 | — | 80.4 | 48 000 | 51 000 | 7 100 | 8 500 |
| | 90 | 20 | 1.1 | 1.1 | 59.5 | — | 69 000 | 76 500 | 6 300 | 7 500 |
| | 90 | 23 | 1.1 | 1.1 | 59.5 | — | 83 500 | 97 000 | 6 300 | 8 000 |
| | 110 | 27 | 2 | 2 | — | 95 | 87 000 | 86 000 | 5 600 | 6 700 |
| | 110 | 27 | 2 | 2 | 65 | — | 110 000 | 113 000 | 5 000 | 6 000 |
| | 110 | 40 | 2 | 2 | 65 | — | 163 000 | 187 000 | 5 000 | 6 300 |
| | 130 | 31 | 2.1 | 2.1 | — | 110.8 | 139 000 | 136 000 | 5 000 | 6 000 |
| | 130 | 31 | 2.1 | 2.1 | 70.8 | 110.8 | 129 000 | 124 000 | 5 000 | 6 000 |
| **55** | 90 | 18 | 1.1 | 1 | 64.5 | 80.5 | 37 500 | 44 000 | 7 500 | 9 000 |
| | 100 | 21 | 1.5 | 1.1 | — | 88.5 | 58 000 | 62 500 | 6 300 | 7 500 |
| | 100 | 21 | 1.5 | 1.1 | 66 | — | 86 500 | 98 500 | 5 600 | 7 100 |
| | 100 | 25 | 1.5 | 1.1 | 66 | — | 101 000 | 122 000 | 5 600 | 7 100 |
| | 120 | 29 | 2 | 2 | — | 104.5 | 111 000 | 111 000 | 5 000 | 6 300 |
| | 120 | 29 | 2 | 2 | 70.5 | — | 137 000 | 143 000 | 4 500 | 5 600 |
| | 120 | 43 | 2 | 2 | 70.5 | — | 201 000 | 233 000 | 4 500 | 5 600 |
| | 140 | 33 | 2.1 | 2.1 | 77.2 | 117.2 | 139 000 | 138 000 | 4 500 | 5 600 |

| Bearing Numbers(2) (3) NU | NJ | NUP | N | NF | Abutment and Fillet Dimensions (mm) da(4) min. | db min. | db(5) max. | dc min. | dd min. | Da(4) max. | Db max. | Db min. | ra max. | rb max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NU1008** | **NJ** | **NUP** | **N** | — | 45 | 44 | 46 | 49 | — | 63 | 64 | 62 | 1 | 0.6 | 0.223 |
| **N 208** | — | — | **N** | **NF** | 46.5 | — | — | — | — | — | 73.5 | 72 | 1 | 1 | 0.375 |
| **NU 208 EW** | **NJ** | **NUP** | — | — | 46.5 | 46.5 | 48 | 52 | 56 | 73.5 | — | — | 1 | 1 | 0.379 |
| **NU2208 ET** | **NJ** | **NUP** | — | — | 46.5 | 46.5 | 48 | 52 | 56 | 73.5 | — | — | 1 | 1 | 0.480 |
| **N 308** | — | — | **N** | **NF** | 48 | — | — | — | — | — | 82 | 79 | 1.5 | 1.5 | 0.649 |
| **NU 308 EW** | **NJ** | **NUP** | — | — | 48 | 48 | 50 | 55 | 60 | 82 | — | — | 1.5 | 1.5 | 0.747 |
| **NU2308 ET** | **NJ** | **NUP** | — | — | 48 | 48 | 50 | 55 | 60 | 82 | — | — | 1.5 | 1.5 | 0.933 |
| **NU 408** | **NJ** | **NUP** | **N** | **NF** | 49 | 49 | 56 | 60 | 67 | 101 | 101 | 94 | 2 | 2 | 1.28 |
| **NU1009** | — | — | **N** | **NF** | 50 | 49 | 51 | 54 | — | 70 | 71 | 68 | 1 | 0.6 | 0.279 |
| **N 209** | — | — | **N** | **NF** | 51.5 | — | — | — | — | — | 78.5 | 77 | 1 | 1 | 0.429 |
| **NU 209 EW** | **NJ** | **NUP** | — | — | 51.5 | 51.5 | 52 | 57 | 61 | 78.5 | — | — | 1 | 1 | 0.438 |
| **NU2209 ET** | **NJ** | **NUP** | — | — | 51.5 | 51.5 | 52 | 57 | 61 | 78.5 | — | — | 1 | 1 | 0.521 |
| **N 309** | — | — | **N** | **NF** | 53 | — | — | — | — | — | 92 | 77 | 1.5 | 1.5 | 0.869 |
| **NU 309 EW** | **NJ** | **NUP** | — | — | 53 | 53 | 56 | 60 | 66 | 92 | — | — | 1.5 | 1.5 | 1.01 |
| **NU2309 ET** | **NJ** | **NUP** | — | — | 53 | 53 | 56 | 60 | 66 | 92 | — | — | 1.5 | 1.5 | 1.28 |
| **NU 409** | **NJ** | **NUP** | **N** | **NF** | 54 | 54 | 62 | 66 | 74 | 111 | 111 | 103 | 2 | 2 | 1.62 |
| **NU1010** | **NJ** | **NUP** | **N** | — | 55 | 54 | 56 | 59 | — | 75 | 76 | 73 | 1 | 0.6 | 0.301 |
| **N 210** | — | — | **N** | **NF** | 56.5 | — | — | — | — | — | 83.5 | 82 | 1 | 1 | 0.483 |
| **NU 210 EW** | **NJ** | **NUP** | — | — | 56.5 | 56.5 | 57 | 62 | 67 | 83.5 | — | — | 1 | 1 | 0.50 |
| **NU2210 ET** | **NJ** | **NUP** | — | — | 56.5 | 56.5 | 57 | 62 | 67 | 83.5 | — | — | 1 | 1 | 0.562 |
| **N 310** | — | — | **N** | **NF** | 59 | — | — | — | — | — | 101 | 97 | 2 | 2 | 1.11 |
| **NU 310 EW** | **NJ** | **NUP** | — | — | 59 | 59 | 63 | 67 | 73 | 101 | — | — | 2 | 2 | 1.3 |
| **NU2310 ET** | **NJ** | **NUP** | — | — | 59 | 59 | 63 | 67 | 73 | 101 | — | — | 2 | 2 | 1.7 |
| **N 410** | — | — | **N** | **NF** | 65 | — | — | — | — | — | 117 | 113 | 2 | 2 | 2.0 |
| **NU 410** | **NJ** | **NUP** | **N** | **NF** | 61 | 61 | 68 | 73 | 81 | 119 | 119 | 113.3 | 2 | 2 | 1.99 |
| **NU1011** | **NJ** | — | **N** | — | 61.5 | 60 | 63 | 66 | — | 83.5 | 85 | 82 | 1 | 1 | 0.445 |
| **N 211** | — | — | **N** | **NF** | 63 | — | — | — | — | — | 93.5 | 91 | 1.5 | 1 | 0.634 |
| **NU 211 EW** | **NJ** | **NUP** | — | — | 63 | 61.5 | 64 | 68 | 73 | 92 | — | — | 1.5 | 1 | 0.669 |
| **NU2211 ET** | **NJ** | **NUP** | — | — | 63 | 61.5 | 64 | 68 | 73 | 92 | — | — | 1.5 | 1 | 0.783 |
| **N 311** | — | — | **N** | **NF** | 64 | — | — | — | — | — | 111 | 107 | 2 | 2 | 1.42 |
| **NU 311 EW** | **NJ** | **NUP** | — | — | 64 | 64 | 68 | 72 | 80 | 111 | — | — | 2 | 2 | 1.64 |
| **NU2311 ET** | **NJ** | **NUP** | — | — | 64 | 64 | 68 | 72 | 80 | 111 | — | — | 2 | 2 | 2.18 |
| **NU 411** | **NJ** | **NUP** | **N** | **NF** | 66 | 66 | 75 | 79 | 87 | 129 | 129 | 119 | 2 | 2 | 2.5 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

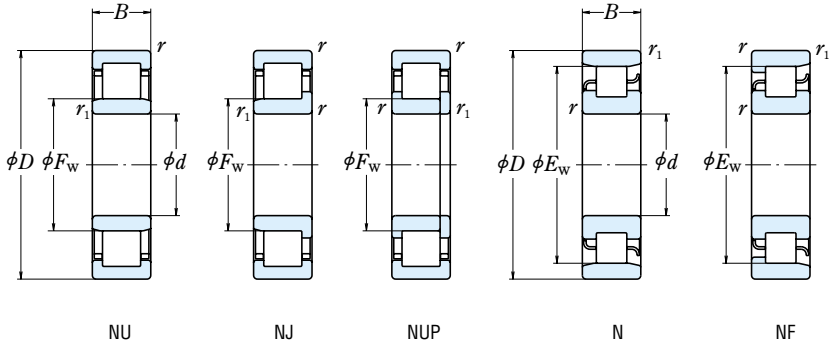
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

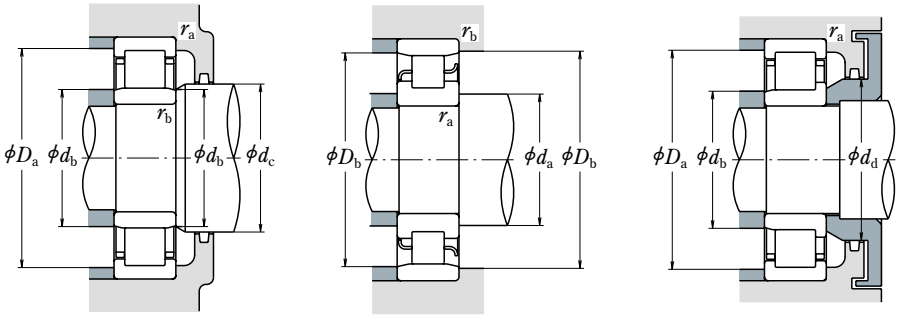
(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 60 – 75 mm




| d | Boundary Dimensions (mm) D | B | r min. | r1 min. | Fw | Ew | Basic Load Ratings (N) Cr | C0r | Limiting Speeds(1) (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|
| **60** | 95 | 18 | 1.1 | 1 | 69.5 | 85.5 | 40 000 | 48 500 | 6 700 | 8 500 |
| | 110 | 22 | 1.5 | 1.5 | — | 97.5 | 68 500 | 75 000 | 6 000 | 7 100 |
| | 110 | 22 | 1.5 | 1.5 | 72 | — | 97 500 | 107 000 | 5 300 | 6 300 |
| | 110 | 28 | 1.5 | 1.5 | 72 | — | 131 000 | 157 000 | 5 300 | 6 300 |
| | 130 | 31 | 2.1 | 2.1 | — | 113 | 124 000 | 126 000 | 4 800 | 5 600 |
| | 130 | 31 | 2.1 | 2.1 | 77 | — | 124 000 | 126 000 | 4 800 | 5 600 |
| | 130 | 31 | 2.1 | 2.1 | 77 | — | 150 000 | 157 000 | 4 800 | 5 600 |
| | 130 | 46 | 2.1 | 2.1 | 77 | — | 222 000 | 262 000 | 4 300 | 5 300 |
| | 150 | 35 | 2.1 | 2.1 | 83 | 127 | 167 000 | 168 000 | 4 300 | 5 300 |
| **65** | 100 | 18 | 1.1 | 1 | 74.5 | 90.5 | 41 000 | 51 000 | 6 300 | 8 000 |
| | 120 | 23 | 1.5 | 1.5 | — | 105.6 | 84 000 | 94 500 | 5 300 | 6 300 |
| | 120 | 23 | 1.5 | 1.5 | 78.5 | — | 108 000 | 119 000 | 4 800 | 5 600 |
| | 120 | 31 | 1.5 | 1.5 | 78.5 | — | 149 000 | 181 000 | 4 800 | 6 000 |
| | 140 | 33 | 2.1 | 2.1 | — | 121.5 | 135 000 | 139 000 | 4 300 | 5 300 |
| | 140 | 33 | 2.1 | 2.1 | 83.5 | — | 135 000 | 139 000 | 4 300 | 5 300 |
| | 140 | 33 | 2.1 | 2.1 | 82.5 | — | 181 000 | 191 000 | 4 300 | 5 300 |
| | 140 | 48 | 2.1 | 2.1 | 82.5 | — | 233 000 | 265 000 | 3 800 | 4 800 |
| | 160 | 37 | 2.1 | 2.1 | 89.3 | 135.3 | 182 000 | 186 000 | 4 000 | 4 800 |
| **70** | 110 | 20 | 1.1 | 1 | 80 | 100 | 58 500 | 70 500 | 6 000 | 7 100 |
| | 125 | 24 | 1.5 | 1.5 | — | 110.5 | 83 500 | 95 000 | 5 000 | 6 300 |
| | 125 | 24 | 1.5 | 1.5 | 83.5 | — | 119 000 | 137 000 | 5 000 | 6 300 |
| | 125 | 31 | 1.5 | 1.5 | 83.5 | — | 156 000 | 194 000 | 4 500 | 5 600 |
| | 150 | 35 | 2.1 | 2.1 | — | 130 | 149 000 | 156 000 | 4 000 | 5 000 |
| | 150 | 35 | 2.1 | 2.1 | 90 | — | 158 000 | 168 000 | 4 000 | 5 000 |
| | 150 | 35 | 2.1 | 2.1 | 89 | — | 205 000 | 222 000 | 4 000 | 5 000 |
| | 150 | 51 | 2.1 | 2.1 | 89 | — | 274 000 | 325 000 | 3 600 | 4 500 |
| | 180 | 42 | 3 | 3 | 100 | 152 | 228 000 | 236 000 | 3 600 | 4 300 |
| **75** | 115 | 20 | 1.1 | 1 | 85 | 105 | 60 000 | 74 500 | 5 600 | 6 700 |
| | 130 | 25 | 1.5 | 1.5 | — | 116.5 | 96 500 | 111 000 | 4 800 | 6 000 |
| | 130 | 25 | 1.5 | 1.5 | 88.5 | — | 130 000 | 156 000 | 4 800 | 6 000 |
| | 130 | 31 | 1.5 | 1.5 | 88.5 | — | 162 000 | 207 000 | 4 300 | 5 300 |
| | 160 | 37 | 2.1 | 2.1 | — | 139.5 | 179 000 | 189 000 | 3 800 | 4 800 |
| | 160 | 37 | 2.1 | 2.1 | 95.5 | — | 179 000 | 189 000 | 3 800 | 4 800 |
| | 160 | 37 | 2.1 | 2.1 | 95 | — | 240 000 | 263 000 | 3 800 | 4 800 |
| | 160 | 55 | 2.1 | 2.1 | 95 | — | 330 000 | 395 000 | 3 400 | 4 300 |
| | 190 | 45 | 3 | 3 | 104.5 | 160.5 | 262 000 | 274 000 | 3 400 | 4 000 |

| Bearing Numbers(2) (3) NU | NJ | NUP | N | NF | Abutment and Fillet Dimensions (mm) da(4) min. | db min. | db(5) max. | dc min. | dd min. | Da(4) max. | Db max. | Db min. | ra max. | rb max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NU1012** | **NJ** | — | **N** | **NF** | 66.5 | 65 | 68 | 71 | — | 88.5 | 90 | 87 | 1 | 1 | 0.474 |
| **N 212** | — | — | **N** | **NF** | 68 | — | — | — | — | — | 102 | 100 | 1.5 | 1.5 | 0.823 |
| **NU 212 EW** | **NJ** | **NUP** | — | — | 68 | 68 | 70 | 75 | 80 | 102 | — | — | 1.5 | 1.5 | 0.824 |
| **NU2212 ET** | **NJ** | **NUP** | — | — | 68 | 68 | 70 | 75 | 80 | 102 | — | — | 1.5 | 1.5 | 1.06 |
| **N 312** | — | — | **N** | **NF** | 71 | — | — | — | — | — | 119 | 115 | 2 | 2 | 1.78 |
| **NU 312** | **NJ** | **NUP** | — | — | 71 | 71 | 75 | 79 | 86 | 119 | — | — | 2 | 2 | 1.82 |
| **NU 312 EM** | **NJ** | **NUP** | — | — | 71 | 71 | 75 | 79 | 86 | 119 | — | — | 2 | 2 | 2.06 |
| **NU2312 ET** | **NJ** | **NUP** | — | — | 71 | 71 | 75 | 79 | 86 | 119 | — | — | 2 | 2 | 2.7 |
| **NU 412** | **NJ** | **NUP** | **N** | **NF** | 71 | 71 | 80 | 85 | 94 | 139 | 139 | 130 | 2 | 2 | 3.04 |
| **NU1013** | **NJ** | — | **N** | **NF** | 71.5 | 70 | 73 | 76 | — | 93.5 | 95 | 92 | 1 | 1 | 0.504 |
| **N 213** | — | — | **N** | **NF** | 73 | — | — | — | — | — | 112 | 108 | 1.5 | 1.5 | 1.05 |
| **NU 213 EW** | **NJ** | **NUP** | — | — | 73 | 73 | 76 | 81 | 87 | 112 | — | — | 1.5 | 1.5 | 1.05 |
| **NU2213 ET** | **NJ** | **NUP** | — | — | 73 | 73 | 76 | 81 | 87 | 112 | — | — | 1.5 | 1.5 | 1.41 |
| **N 313** | — | — | **N** | **NF** | 76 | — | — | — | — | — | 129 | 125 | 2 | 2 | 2.17 |
| **NU 313** | **NJ** | **NUP** | — | — | 76 | 76 | 81 | 85 | 93 | 129 | — | — | 2 | 2 | 2.23 |
| **NU 313 EM** | **NJ** | **NUP** | — | — | 76 | 76 | 80 | 85 | 93 | 129 | — | — | 2 | 2 | 2.56 |
| **NU2313 ET** | **NJ** | **NUP** | — | — | 76 | 76 | 80 | 85 | 93 | 129 | — | — | 2 | 2 | 3.16 |
| **NU 413** | **NJ** | — | **N** | **NF** | 76 | 76 | 86 | 91 | 100 | 149 | 149 | 138.8 | 2 | 2 | 3.63 |
| **NU1014** | **NJ** | **NUP** | **N** | **NF** | 76.5 | 75 | 79 | 82 | — | 103.5 | 105 | 101 | 1 | 1 | 0.693 |
| **N 214** | — | — | **N** | **NF** | 78 | — | — | — | — | — | 117 | 113 | 1.5 | 1.5 | 1.14 |
| **NU 214 EM** | **NJ** | **NUP** | — | — | 78 | 78 | 81 | 86 | 92 | 117 | — | — | 1.5 | 1.5 | 1.29 |
| **NU2214 ET** | **NJ** | **NUP** | — | — | 78 | 78 | 81 | 86 | 92 | 117 | — | — | 1.5 | 1.5 | 1.49 |
| **N 314** | — | — | **N** | **NF** | 81 | — | — | — | — | — | 139 | 133.5 | 2 | 2 | 2.67 |
| **NU 314** | **NJ** | **NUP** | — | — | 81 | 81 | 87 | 92 | 100 | 139 | — | — | 2 | 2 | 2.75 |
| **NU 314 EM** | **NJ** | **NUP** | — | — | 81 | 81 | 86 | 92 | 100 | 139 | — | — | 2 | 2 | 3.09 |
| **NU2314 ET** | **NJ** | **NUP** | — | — | 81 | 81 | 86 | 92 | 100 | 139 | — | — | 2 | 2 | 3.92 |
| **NU 414** | **NJ** | **NUP** | **N** | **NF** | 83 | 83 | 97 | 102 | 112 | 167 | 167 | 155 | 2.5 | 2.5 | 5.28 |
| **NU1015** | **NU** | — | **N** | **NF** | 81.5 | 80 | 83 | 87 | — | 108.5 | 110 | 106 | 1 | 1 | 0.731 |
| **N 215** | — | — | **N** | **NF** | 83 | — | — | — | — | — | 122 | 119 | 1.5 | 1.5 | 1.23 |
| **NU 215 EM** | **NJ** | **NUP** | — | — | 83 | 83 | 86 | 90 | 96 | 122 | — | — | 1.5 | 1.5 | 1.44 |
| **NU2215 ET** | **NJ** | **NUP** | — | — | 83 | 83 | 86 | 90 | 96 | 122 | — | — | 1.5 | 1.5 | 1.57 |
| **N 315** | — | — | **N** | **NF** | 86 | — | — | — | — | — | 149 | 143 | 2 | 2 | 3.2 |
| **NU 315** | **NJ** | **NUP** | — | — | 86 | 86 | 93 | 97 | 106 | 149 | — | — | 2 | 2 | 3.26 |
| **NU 315 EM** | **NJ** | **NUP** | — | — | 86 | 86 | 92 | 97 | 106 | 149 | — | — | 2 | 2 | 3.73 |
| **NU2315 ET** | **NJ** | **NUP** | — | — | 86 | 86 | 92 | 97 | 106 | 149 | — | — | 2 | 2 | 4.86 |
| **NU 415** | **NJ** | — | **N** | **NF** | 88 | 88 | 102 | 107 | 118 | 177 | 177 | 164 | 2.5 | 2.5 | 6.27 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

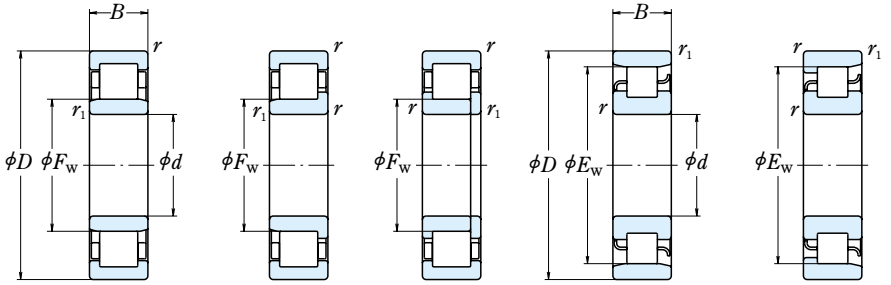
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

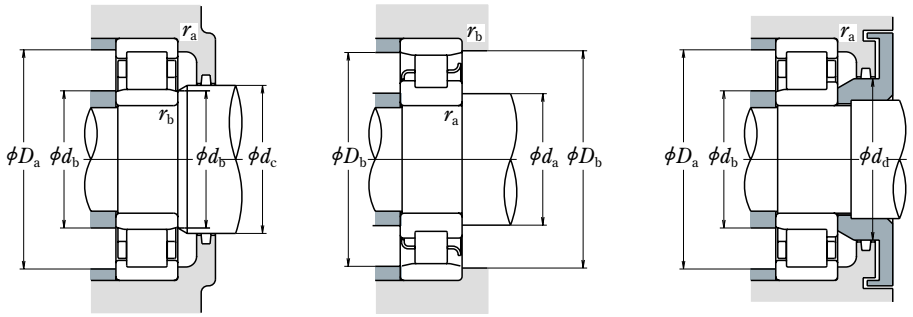
(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 80 – 95 mm




NU NJ NUP N NF




| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Limiting Speeds(1) (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | $F_W$ | $E_W$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **80** | 125 | 22 | 1.1 | 1 | 91.5 | 113.5 | 72 500 | 90 500 | 5 300 | 6 300 |
| | 140 | 26 | 2 | 2 | — | 125.3 | 106 000 | 122 000 | 4 500 | 5 300 |
| | 140 | 26 | 2 | 2 | 95.3 | — | 139 000 | 167 000 | 4 500 | 5 300 |
| | 140 | 33 | 2 | 2 | 95.3 | — | 186 000 | 243 000 | 4 000 | 5 000 |
| | 170 | 39 | 2.1 | 2.1 | — | 147 | 190 000 | 207 000 | 3 600 | 4 300 |
| | 170 | 39 | 2.1 | 2.1 | 101 | — | 256 000 | 282 000 | 3 600 | 4 300 |
| | 170 | 58 | 2.1 | 2.1 | 101 | — | 355 000 | 430 000 | 3 200 | 4 000 |
| | 200 | 48 | 3 | 3 | 110 | 170 | 299 000 | 315 000 | 3 200 | 3 800 |
| **85** | 130 | 22 | 1.1 | 1 | 96.5 | 118.5 | 74 500 | 95 500 | 5 000 | 6 000 |
| | 150 | 28 | 2 | 2 | — | 133.8 | 120 000 | 140 000 | 4 300 | 5 000 |
| | 150 | 28 | 2 | 2 | 100.5 | — | 167 000 | 199 000 | 4 300 | 5 000 |
| | 150 | 36 | 2 | 2 | 100.5 | — | 217 000 | 279 000 | 3 800 | 4 500 |
| | 180 | 41 | 3 | 3 | — | 156 | 225 000 | 247 000 | 3 400 | 4 000 |
| | 180 | 41 | 3 | 3 | 108 | — | 212 000 | 228 000 | 3 400 | 4 000 |
| | 180 | 41 | 3 | 3 | 108 | — | 291 000 | 330 000 | 3 400 | 4 000 |
| | 180 | 60 | 3 | 3 | 108 | — | 395 000 | 485 000 | 3 000 | 3 800 |
| | 210 | 52 | 4 | 4 | 113 | 177 | 335 000 | 350 000 | 3 000 | 3 800 |
| **90** | 140 | 24 | 1.5 | 1.1 | 103 | 127 | 88 000 | 114 000 | 4 500 | 5 600 |
| | 160 | 30 | 2 | 2 | — | 143 | 152 000 | 178 000 | 4 000 | 4 800 |
| | 160 | 30 | 2 | 2 | 107 | — | 182 000 | 217 000 | 4 000 | 4 800 |
| | 160 | 40 | 2 | 2 | 107 | — | 242 000 | 315 000 | 3 600 | 4 300 |
| | 190 | 43 | 3 | 3 | — | 165 | 240 000 | 265 000 | 3 200 | 3 800 |
| | 190 | 43 | 3 | 3 | 115 | — | 240 000 | 265 000 | 3 200 | 3 800 |
| | 190 | 43 | 3 | 3 | 113.5 | — | 315 000 | 355 000 | 3 200 | 3 800 |
| | 190 | 64 | 3 | 3 | 113.5 | — | 435 000 | 535 000 | 2 800 | 3 400 |
| | 225 | 54 | 4 | 4 | 123.5 | 191.5 | 375 000 | 400 000 | 2 800 | 3 400 |
| **95** | 145 | 24 | 1.5 | 1.1 | 108 | 132 | 90 500 | 120 000 | 4 300 | 5 300 |
| | 170 | 32 | 2.1 | 2.1 | — | 151.5 | 166 000 | 196 000 | 3 800 | 4 500 |
| | 170 | 32 | 2.1 | 2.1 | 112.5 | — | 220 000 | 265 000 | 3 800 | 4 500 |
| | 170 | 43 | 2.1 | 2.1 | 112.5 | — | 286 000 | 370 000 | 3 400 | 4 000 |
| | 200 | 45 | 3 | 3 | — | 173.5 | 259 000 | 289 000 | 3 000 | 3 600 |
| | 200 | 45 | 3 | 3 | 121.5 | — | 259 000 | 289 000 | 3 000 | 3 600 |
| | 200 | 45 | 3 | 3 | 121.5 | — | 335 000 | 385 000 | 3 000 | 3 600 |
| | 200 | 67 | 3 | 3 | 121.5 | — | 460 000 | 585 000 | 2 600 | 3 400 |
| | 240 | 55 | 4 | 4 | 133.5 | 201.5 | 400 000 | 445 000 | 2 600 | 3 200 |

| Bearing Numbers(2) (3) | | | | | | Abutment and Fillet Dimensions (mm) | | | | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NU | NJ | NUP | N | NF | | $d_a$(4) min. | $d_b$ min. | $d_b$(5) max. | $d_c$ min. | $d_d$ min. | $D_a$(4) max. | $D_b$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. |
| **NU1016** | **NU** | — | **NUP** | **N** | — | 86.5 | 85 | 90 | 94 | — | 118.5 | 120 | 115 | 1 | 1 | 0.969 |
| **N 216** | — | — | — | **N** | **NF** | 89 | — | — | — | — | — | 131 | 128 | 2 | 2 | 1.47 |
| **NU 216 EM** | **NU** | **NJ** | **NUP** | — | — | 89 | 89 | 92 | 97 | 104 | 131 | — | — | 2 | 2 | 1.7 |
| **NU2216 ET** | **NU** | **NJ** | **NUP** | — | — | 89 | 89 | 92 | 97 | 104 | 131 | — | — | 2 | 2 | 1.96 |
| **N 316** | — | — | — | **N** | **NF** | 91 | — | — | — | — | — | 159 | 150 | 2 | 2 | 3.85 |
| **NU 316 EM** | **NU** | **NJ** | **NUP** | — | — | 91 | 91 | 98 | 105 | 114 | 159 | — | — | 2 | 2 | 4.45 |
| **NU2316 ET** | **NU** | **NJ** | **NUP** | — | — | 91 | 91 | 98 | 105 | 114 | 159 | — | — | 2 | 2 | 5.73 |
| **NU 416** | **NU** | **NJ** | — | **N** | **NF** | 93 | 93 | 107 | 112 | 124 | 187 | 187 | 173 | 2.5 | 2.5 | 7.36 |
| **NU1017** | **NU** | — | — | **N** | — | 91.5 | 90 | 95 | 99 | — | 123.5 | 125 | 120 | 1 | 1 | 1.01 |
| **N 217** | — | — | — | **N** | **NF** | 94 | — | — | — | — | — | 141 | 137 | 2 | 2 | 1.87 |
| **NU 217 EM** | **NU** | **NJ** | **NUP** | — | — | 94 | 94 | 98 | 104 | 110 | 141 | — | — | 2 | 2 | 2.11 |
| **NU2217 ET** | **NU** | **NJ** | **NUP** | — | — | 94 | 94 | 98 | 104 | 110 | 141 | — | — | 2 | 2 | 2.44 |
| **N 317** | — | — | — | **N** | **NF** | 98 | — | — | — | — | — | 167 | 159 | 2.5 | 2.5 | 4.53 |
| **NU 317** | **NU** | **NJ** | **NUP** | — | — | 98 | 98 | 105 | 110 | 119 | 167 | — | — | 2.5 | 2.5 | 4.6 |
| **NU 317 EM** | **NU** | **NJ** | **NUP** | — | — | 98 | 98 | 105 | 110 | 119 | 167 | — | — | 2.5 | 2.5 | 5.26 |
| **NU2317 ET** | **NU** | **NJ** | **NUP** | — | — | 98 | 98 | 105 | 110 | 119 | 167 | — | — | 2.5 | 2.5 | 6.77 |
| **NU 417** | **NU** | **NJ** | — | **N** | **NF** | 101 | 101 | 110 | 115 | 128 | 194 | 194 | 180 | 3 | 3 | 9.56 |
| **NU1018** | **NU** | — | **NUP** | **N** | — | 98 | 96.5 | 101 | 106 | — | 132 | 133.5 | 129 | 1.5 | 1 | 1.35 |
| **N 218** | — | — | — | **N** | **NF** | 99 | — | — | — | — | — | 151 | 146 | 2 | 2 | 2.31 |
| **NU 218 EM** | **NU** | **NJ** | **NUP** | — | — | 99 | 99 | 104 | 109 | 116 | 151 | — | — | 2 | 2 | 2.6 |
| **NU2218 ET** | **NU** | **NJ** | **NUP** | — | — | 99 | 99 | 104 | 109 | 116 | 151 | — | — | 2 | 2 | 3.11 |
| **N 318** | — | — | — | **N** | **NF** | 103 | — | — | — | — | — | 177 | 168 | 2.5 | 2.5 | 5.31 |
| **NU 318** | **NU** | **NJ** | **NUP** | — | — | 103 | 103 | 112 | 117 | 127 | 177 | — | — | 2.5 | 2.5 | 5.38 |
| **NU 318 EM** | **NU** | **NJ** | **NUP** | — | — | 103 | 103 | 111 | 117 | 127 | 177 | — | — | 2.5 | 2.5 | 6.1 |
| **NU2318 ET** | **NU** | **NJ** | **NUP** | — | — | 103 | 103 | 111 | 117 | 127 | 177 | — | — | 2.5 | 2.5 | 7.9 |
| **NU 418** | **NU** | **NJ** | — | **N** | **NF** | 106 | 106 | 120 | 125 | 139 | 209 | 209 | 196 | 3 | 3 | 11.5 |
| **NU1019** | **NU** | **NJ** | — | **N** | — | 103 | 101.5 | 106 | 111 | — | 137 | 138.5 | 134 | 1.5 | 1 | 1.41 |
| **N 219** | — | — | — | **N** | **NF** | 106 | — | — | — | — | — | 159 | 155 | 2 | 2 | 2.79 |
| **NU 219 EM** | **NU** | **NJ** | **NUP** | — | — | 106 | 106 | 110 | 116 | 123 | 159 | — | — | 2 | 2 | 3.17 |
| **NU2219 ET** | **NU** | **NJ** | **NUP** | — | — | 106 | 106 | 110 | 116 | 123 | 159 | — | — | 2 | 2 | 3.81 |
| **N 319** | — | — | — | **N** | **NF** | 108 | — | — | — | — | — | 187 | 177 | 2.5 | 2.5 | 6.09 |
| **NU 319** | **NU** | **NJ** | **NUP** | — | — | 108 | 108 | 118 | 124 | 134 | 187 | — | — | 2.5 | 2.5 | 6.23 |
| **NU 319 EM** | **NU** | **NJ** | **NUP** | — | — | 108 | 108 | 118 | 124 | 134 | 187 | — | — | 2.5 | 2.5 | 7.13 |
| **NU2319 ET** | **NU** | **NJ** | **NUP** | — | — | 108 | 108 | 118 | 124 | 134 | 187 | — | — | 2.5 | 2.5 | 9.21 |
| **NU 419** | **NU** | **NJ** | **NUP** | — | **NF** | 111 | 111 | 130 | 136 | 149 | 224 | 224 | 206 | 3 | 3 | 13.6 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

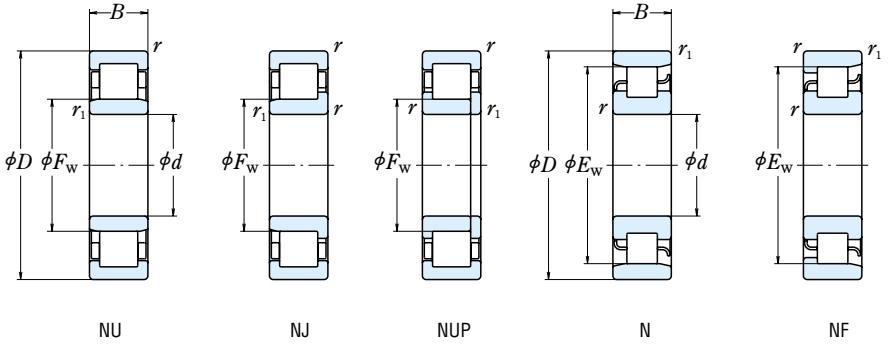
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

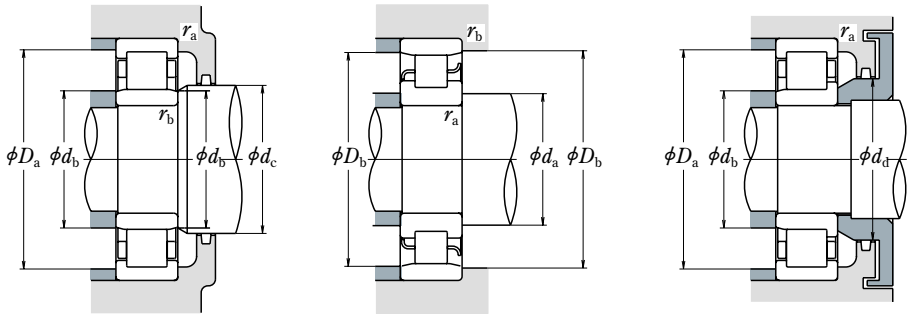
(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 100 – 120 mm




NU NJ NUP N NF




| d | Boundary Dimensions (mm) D | B | r min. | r1 min. | Fw | Ew | Basic Load Ratings (N) Cr | C0r | Limiting Speeds(1) (min−1) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|
| **100** | 150 | 24 | 1.5 | 1.1 | 113 | 137 | 93 000 | 126 000 | 4 300 | 5 300 |
| | 180 | 34 | 2.1 | 2.1 | — | 160 | 183 000 | 217 000 | 3 600 | 4 300 |
| | 180 | 34 | 2.1 | 2.1 | 119 | — | 249 000 | 305 000 | 3 600 | 4 300 |
| | 180 | 46 | 2.1 | 2.1 | 119 | — | 335 000 | 445 000 | 3 200 | 3 800 |
| | 215 | 47 | 3 | 3 | — | 185.5 | 299 000 | 335 000 | 2 800 | 3 400 |
| | 215 | 47 | 3 | 3 | 129.5 | — | 299 000 | 335 000 | 2 800 | 3 400 |
| | 215 | 47 | 3 | 3 | 127.5 | — | 380 000 | 425 000 | 2 800 | 3 400 |
| | 215 | 73 | 3 | 3 | 127.5 | — | 570 000 | 715 000 | 2 400 | 3 000 |
| | 250 | 58 | 4 | 4 | 139 | 211 | 450 000 | 500 000 | 2 600 | 3 000 |
| **105** | 160 | 26 | 2 | 1.1 | 119.5 | 145.5 | 109 000 | 149 000 | 4 000 | 4 800 |
| | 190 | 36 | 2.1 | 2.1 | — | 168.8 | 201 000 | 241 000 | 3 400 | 4 000 |
| | 190 | 36 | 2.1 | 2.1 | 125 | — | 262 000 | 310 000 | 3 400 | 4 000 |
| | 225 | 49 | 3 | 3 | — | 195 | 340 000 | 390 000 | 2 600 | 3 200 |
| | 225 | 49 | 3 | 3 | 133 | — | 425 000 | 480 000 | 2 600 | 3 200 |
| | 260 | 60 | 4 | 4 | 144.5 | 220.5 | 495 000 | 555 000 | 2 400 | 3 000 |
| **110** | 170 | 28 | 2 | 1.1 | 125 | 155 | 131 000 | 174 000 | 3 800 | 4 500 |
| | 200 | 38 | 2.1 | 2.1 | — | 178.5 | 229 000 | 272 000 | 3 200 | 3 800 |
| | 200 | 38 | 2.1 | 2.1 | 132.5 | — | 293 000 | 365 000 | 3 200 | 3 800 |
| | 200 | 53 | 2.1 | 2.1 | 132.5 | — | 385 000 | 515 000 | 2 800 | 3 400 |
| | 240 | 50 | 3 | 3 | — | 207 | 380 000 | 435 000 | 2 600 | 3 000 |
| | 240 | 50 | 3 | 3 | 143 | — | 450 000 | 525 000 | 2 600 | 3 000 |
| | 280 | 65 | 4 | 4 | 155 | — | 550 000 | 620 000 | 2 200 | 2 800 |
| **120** | 180 | 28 | 2 | 1.1 | 135 | 165 | 139 000 | 191 000 | 3 400 | 4 300 |
| | 215 | 40 | 2.1 | 2.1 | — | 191.5 | 260 000 | 320 000 | 3 000 | 3 400 |
| | 215 | 40 | 2.1 | 2.1 | 143.5 | — | 335 000 | 420 000 | 3 000 | 3 400 |
| | 215 | 58 | 2.1 | 2.1 | 143.5 | — | 450 000 | 620 000 | 2 600 | 3 200 |
| | 260 | 55 | 3 | 3 | — | 226 | 450 000 | 510 000 | 2 200 | 2 800 |
| | 260 | 55 | 3 | 3 | 154 | — | 530 000 | 610 000 | 2 200 | 2 800 |
| | 260 | 86 | 3 | 3 | 154 | — | 795 000 | 1 030 000 | 2 000 | 2 600 |
| | 310 | 72 | 5 | 5 | 170 | 260 | 675 000 | 770 000 | 2 000 | 2 400 |

| Bearing Numbers(2) (3) NU | NJ | NUP | N | NF | Abutment and Fillet Dimensions (mm) da(4) min. | db min. | db(5) max. | dc min. | dd min. | Da(4) max. | Db max. | Db min. | ra max. | rb max. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NU1020** | **NJ** | **NUP** | **N** | — | 108 | 106.5 | 111 | 116 | — | 142 | 143.5 | 139 | 1.5 | 1 | 1.47 |
| **N 220** | — | — | **N** | **NF** | 111 | — | — | — | — | — | 169 | 163 | 2 | 2 | 3.36 |
| **NU 220 EM** | **NJ** | **NUP** | — | — | 111 | 111 | 116 | 122 | 130 | 169 | — | — | 2 | 2 | 3.81 |
| **NU2220 ET** | **NJ** | **NUP** | — | — | 111 | 111 | 116 | 122 | 130 | 169 | — | — | 2 | 2 | 4.69 |
| **N 320** | — | — | **N** | **NF** | 113 | — | — | — | — | — | 202 | 190 | 2.5 | 2.5 | 7.59 |
| **NU 320** | **NJ** | **NUP** | — | — | 113 | 113 | 126 | 132 | 143 | 202 | — | — | 2.5 | 2.5 | 7.69 |
| **NU 320 EM** | **NJ** | **NUP** | — | — | 113 | 113 | 124 | 132 | 143 | 202 | — | — | 2.5 | 2.5 | 8.63 |
| **NU2320 ET** | **NJ** | **NUP** | — | — | 113 | 113 | 124 | 132 | 143 | 202 | — | — | 2.5 | 2.5 | 11.8 |
| **NU 420** | **NJ** | — | **N** | **NF** | 116 | 116 | 135 | 141 | 156 | 234 | 234 | 215 | 3 | 3 | 15.5 |
| **NU1021** | **NU** | — | — | **N** | **NF** | 114 | 111.5 | 118 | 122 | — | 151 | 153.5 | 147 | 2 | 1 | 1.83 |
| **N 221** | — | — | — | **N** | **NF** | 116 | — | — | — | — | — | 179 | 172 | 2 | 2 | 4.0 |
| **NU 221 EM** | **NJ** | **NUP** | — | — | 116 | 116 | 121 | 129 | 137 | 179 | — | — | 2 | 2 | 4.58 |
| **N 321** | — | — | — | **N** | **NF** | 118 | — | — | — | — | — | 212 | 199 | 2.5 | 2.5 | 8.69 |
| **NU 321 EM** | **NJ** | **NUP** | — | — | 118 | 118 | 131 | 137 | 149 | 212 | — | — | 2.5 | 2.5 | 9.84 |
| **NU 421** | **NJ** | — | **N** | **NF** | 121 | 121 | 141 | 147 | 162 | 244 | 244 | 225 | 3 | 3 | 17.3 |
| **NU1022** | **NJ** | — | **N** | **NF** | 119 | 116.5 | 123 | 128 | — | 161 | 163.5 | 157 | 2 | 1 | 2.27 |
| **N 222** | — | — | **N** | **NF** | 121 | — | — | — | — | — | 189 | 182 | 2 | 2 | 4.64 |
| **NU 222 EM** | **NJ** | **NUP** | — | — | 121 | 121 | 129 | 135 | 144 | 189 | — | — | 2 | 2 | 5.37 |
| **NU2222 EM** | **NJ** | **NUP** | — | — | 121 | 121 | 129 | 135 | 144 | 189 | — | — | 2 | 2 | 7.65 |
| **N 322** | — | — | **N** | **NF** | 123 | — | — | — | — | — | 227 | 211 | 2.5 | 2.5 | 10.3 |
| **NU 322 EM** | **NJ** | **NUP** | — | — | 123 | 123 | 139 | 145 | 158 | 227 | — | — | 2.5 | 2.5 | 11.8 |
| **NU 422** | **NJ** | — | — | — | 126 | 126 | 151 | 157 | 173 | 264 | — | — | 3 | 3 | 22.1 |
| **NU1024** | **NJ** | **NUP** | **N** | — | 129 | 126.5 | 133 | 138 | — | 171 | 173.5 | 167 | 2 | 1 | 2.43 |
| **N 224** | — | — | **N** | **NF** | 131 | — | — | — | — | — | 204 | 196 | 2 | 2 | 5.63 |
| **NU 224 EM** | **NJ** | **NUP** | — | — | 131 | 131 | 140 | 146 | 156 | 204 | — | — | 2 | 2 | 6.43 |
| **NU2224 EM** | **NJ** | **NUP** | — | — | 131 | 131 | 140 | 146 | 156 | 204 | — | — | 2 | 2 | 9.51 |
| **N 324** | — | — | **N** | **NF** | 133 | — | — | — | — | — | 247 | 230 | 2.5 | 2.5 | 12.9 |
| **NU 324 EM** | **NJ** | **NUP** | — | — | 133 | 133 | 150 | 156 | 171 | 247 | — | — | 2.5 | 2.5 | 15 |
| **NU2324 EM** | **NJ** | **NUP** | — | — | 133 | 133 | 150 | 156 | 171 | 247 | — | — | 2.5 | 2.5 | 25 |
| **NU 424** | **NJ** | **NUP** | **N** | — | 140 | 140 | 166 | 172 | 190 | 290 | 290 | 266 | 4 | 4 | 30.2 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

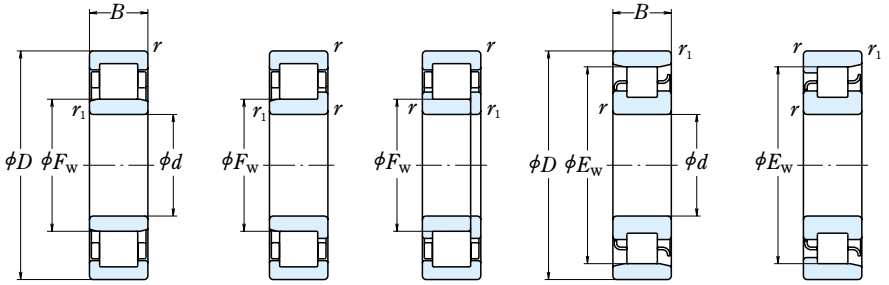
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

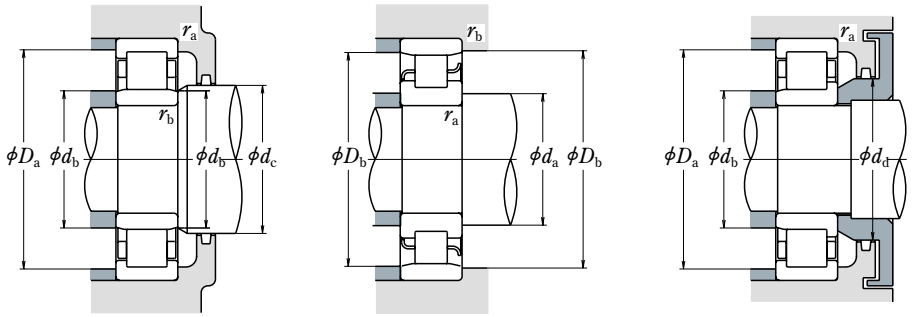
(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

**Bore Diameter 130 – 160 mm**




| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Limiting Speeds(1) (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | $F_W$ | $E_W$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **130** | 200 | 33 | 2 | 1.1 | 148 | 182 | 172 000 | 238 000 | 3 200 | 3 800 |
| | 230 | 40 | 3 | 3 | — | 204 | 270 000 | 340 000 | 2 600 | 3 200 |
| | 230 | 40 | 3 | 3 | 153.5 | — | 365 000 | 455 000 | 2 600 | 3 200 |
| | 230 | 64 | 3 | 3 | 153.5 | — | 530 000 | 735 000 | 2 400 | 3 000 |
| | 280 | 58 | 4 | 4 | — | 243 | 500 000 | 570 000 | 2 200 | 2 600 |
| | 280 | 58 | 4 | 4 | 167 | — | 615 000 | 735 000 | 2 200 | 2 600 |
| | 280 | 93 | 4 | 4 | 167 | — | 920 000 | 1 230 000 | 1 900 | 2 400 |
| | 340 | 78 | 5 | 5 | 185 | 285 | 825 000 | 955 000 | 1 800 | 2 200 |
| **140** | 210 | 33 | 2 | 1.1 | 158 | 192 | 176 000 | 250 000 | 3 000 | 3 600 |
| | 250 | 42 | 3 | 3 | — | 221 | 297 000 | 375 000 | 2 400 | 3 000 |
| | 250 | 42 | 3 | 3 | 169 | — | 395 000 | 515 000 | 2 400 | 3 000 |
| | 250 | 68 | 3 | 3 | 169 | — | 550 000 | 790 000 | 2 200 | 2 800 |
| | 300 | 62 | 4 | 4 | — | 260 | 550 000 | 640 000 | 2 000 | 2 400 |
| | 300 | 62 | 4 | 4 | 180 | — | 665 000 | 795 000 | 2 000 | 2 400 |
| | 300 | 102 | 4 | 4 | 180 | — | 1 020 000 | 1 380 000 | 1 700 | 2 200 |
| | 360 | 82 | 5 | 5 | 198 | 302 | 875 000 | 1 020 000 | 1 700 | 2 000 |
| **150** | 225 | 35 | 2.1 | 1.5 | 169.5 | 205.5 | 202 000 | 294 000 | 2 800 | 3 400 |
| | 270 | 45 | 3 | 3 | — | 238 | 360 000 | 465 000 | 2 200 | 2 800 |
| | 270 | 45 | 3 | 3 | 182 | — | 450 000 | 595 000 | 2 200 | 2 800 |
| | 270 | 73 | 3 | 3 | 182 | — | 635 000 | 930 000 | 2 000 | 2 600 |
| | 320 | 65 | 4 | 4 | — | 277 | 665 000 | 805 000 | 1 800 | 2 200 |
| | 320 | 65 | 4 | 4 | 193 | — | 760 000 | 920 000 | 1 800 | 2 200 |
| | 320 | 108 | 4 | 4 | 193 | — | 1 160 000 | 1 600 000 | 1 600 | 2 000 |
| | 380 | 85 | 5 | 5 | 213 | — | 930 000 | 1 120 000 | 1 600 | 2 000 |
| **160** | 240 | 38 | 2.1 | 1.5 | 180 | 220 | 238 000 | 340 000 | 2 600 | 3 200 |
| | 290 | 48 | 3 | 3 | — | 255 | 430 000 | 570 000 | 2 200 | 2 600 |
| | 290 | 48 | 3 | 3 | 195 | — | 500 000 | 665 000 | 2 200 | 2 600 |
| | 290 | 80 | 3 | 3 | 193 | — | 810 000 | 1 190 000 | 1 900 | 2 400 |
| | 340 | 68 | 4 | 4 | — | 292 | 700 000 | 875 000 | 1 700 | 2 000 |
| | 340 | 68 | 4 | 4 | 204 | — | 860 000 | 1 050 000 | 1 700 | 2 000 |
| | 340 | 114 | 4 | 4 | 204 | — | 1 310 000 | 1 820 000 | 1 500 | 1 900 |

| Bearing Numbers(2) (3) | | | | | | Abutment and Fillet Dimensions (mm) | | | | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NU | NJ | NUP | N | NF | $d_a$(4) min. | $d_b$ min. | $d_b$(5) max. | $d_c$ min. | $d_d$ min. | $D_a$(4) max. | $D_b$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. |
| **NU1026** | **NJ** | — | **N** | **NF** | 139 | 136.5 | 146 | 151 | — | 191 | 193.5 | 184 | 2 | 1 | 3.66 |
| **N 226** | — | — | **N** | **NF** | 143 | — | — | — | — | — | 217 | 208 | 2.5 | 2.5 | 6.48 |
| **NU 226 EM** | **NJ** | **NUP** | — | — | 143 | 143 | 150 | 158 | 168 | 217 | — | — | 2.5 | 2.5 | 8.03 |
| **NU2226 EM** | **NJ** | **NUP** | — | — | 143 | 143 | 150 | 158 | 168 | 217 | — | — | 2.5 | 2.5 | 9.44 |
| **N 326** | — | — | **N** | **NF** | 146 | — | — | — | — | — | 264 | 247.5 | 3 | 3 | 17.7 |
| **NU326EM** | **NJ** | **NUP** | — | — | 146 | 146 | 163 | 169 | 184 | 264 | — | — | 3 | 3 | 18.7 |
| **NU2326EM** | **NJ** | **NUP** | — | — | 146 | 146 | 163 | 169 | 184 | 264 | — | — | 3 | 3 | 30 |
| **NU 426** | **NJ** | — | — | **NF** | 150 | 150 | 180 | 187 | 208 | 320 | 320 | 291 | 4 | 4 | 39.6 |
| **NU1028** | **NJ** | **NUP** | **N** | — | 149 | 146.5 | 156 | 161 | — | 201 | 203.5 | 194 | 2 | 1 | 3.87 |
| **N 228** | — | — | **N** | **NF** | 153 | — | — | — | — | — | 237 | 225 | 2.5 | 2.5 | 8.08 |
| **NU228EM** | **NJ** | **NUP** | — | — | 153 | 153 | 165 | 171 | 182 | 237 | — | — | 2.5 | 2.5 | 9.38 |
| **NU2228EM** | **NJ** | **NUP** | — | — | 153 | 153 | 165 | 171 | 182 | 237 | — | — | 2.5 | 2.5 | 15.2 |
| **N 328** | — | — | **N** | **NF** | 156 | — | — | — | — | — | 284 | 266 | 3 | 3 | 21.7 |
| **NU328EM** | **NJ** | **NUP** | — | — | 156 | 156 | 176 | 182 | 198 | 284 | — | — | 3 | 3 | 22.8 |
| **NU2328EM** | **NJ** | **NUP** | — | — | 156 | 156 | 176 | 182 | 198 | 284 | — | — | 3 | 3 | 37.7 |
| **NU 428** | **NJ** | — | **N** | — | 160 | 160 | 193 | 200 | 222 | 340 | 340 | 308 | 4 | 4 | 46.4 |
| **NU1030** | **NJ** | — | **N** | **NF** | 161 | 158 | 167 | 173 | — | 214 | 217 | 208 | 2 | 1.5 | 4.77 |
| **N 230** | — | — | **N** | **NF** | 163 | — | — | — | — | — | 257 | 242 | 2.5 | 2.5 | 10.4 |
| **NU230EM** | **NJ** | **NUP** | — | — | 163 | 163 | 177 | 184 | 196 | 257 | — | — | 2.5 | 2.5 | 11.9 |
| **NU2230EM** | **NJ** | **NUP** | — | — | 163 | 163 | 177 | 184 | 196 | 257 | — | — | 2.5 | 2.5 | 19.3 |
| **N 330** | — | — | **N** | **NF** | 166 | — | — | — | — | — | 304 | 283 | 3 | 3 | 25.8 |
| **NU330EM** | **NJ** | **NUP** | — | — | 166 | 166 | 188 | 195 | 213 | 304 | — | — | 3 | 3 | 27.1 |
| **NU2330EM** | **NJ** | **NUP** | — | — | 166 | 166 | 188 | 195 | 213 | 304 | — | — | 3 | 3 | 45.1 |
| **NU 430** | **NJ** | — | — | — | 170 | 170 | 208 | 216 | 237 | 360 | — | — | 4 | 4 | 55.8 |
| **NU1032** | **NJ** | — | **N** | **NF** | 171 | 168 | 178 | 184 | — | 229 | 232 | 222 | 2 | 1.5 | 5.81 |
| **N 232** | — | — | **N** | **NF** | 173 | — | — | — | — | — | 277 | 261 | 2.5 | 2.5 | 14.1 |
| **NU232EM** | **NJ** | **NUP** | — | — | 173 | 173 | 190 | 197 | 210 | 277 | — | — | 2.5 | 2.5 | 14.7 |
| **NU2232EM** | **NJ** | **NUP** | — | — | 173 | 173 | 188 | 197 | 210 | 277 | — | — | 2.5 | 2.5 | 24.5 |
| **N 332** | — | — | **N** | — | 176 | — | — | — | — | — | 324 | 298 | 3 | 3 | 30.8 |
| **NU332EM** | **NJ** | **NUP** | — | — | 176 | 176 | 199 | 211 | 228 | 324 | — | — | 3 | 3 | 32.1 |
| **NU2332EM** | **NJ** | **NUP** | — | — | 176 | 176 | 199 | 211 | 228 | 324 | — | — | 3 | 3 | 53.9 |

**Notes** (1) The limiting speeds listed above apply to bearings with machined cages (No suffix). For bearings with pressed cages, reduce the limiting speed by 20%. (Not applicable to bearing numbers with an EM, EW, or ET suffix.)

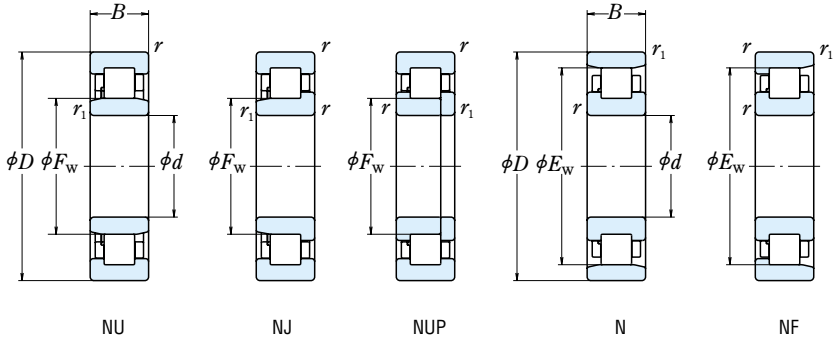
(2) The bearings with suffix ET have polyamide cage. The maximum operating temperature should be less than 120 °C.

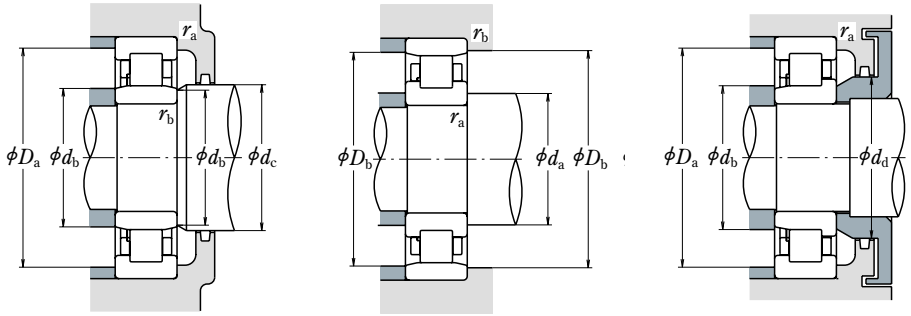
(3) When L-shaped thrust collars (See section for L-Shaped Thrust Collars starting on page **B104**) are used, the bearings become the NH type.

(4) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.

(5) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 170 – 220 mm



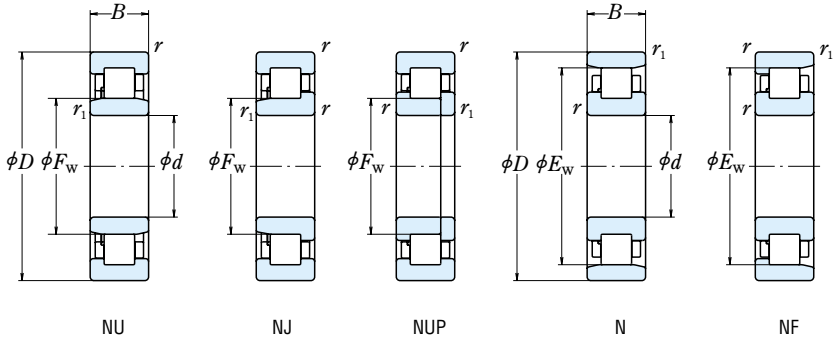




| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | $F_W$ | $E_W$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **170** | 260 | 42 | 2.1 | 2.1 | 193 | 237 | 287 000 | 415 000 | 2 400 | 2 800 |
| | 310 | 52 | 4 | 4 | — | 272 | 475 000 | 635 000 | 2 000 | 2 400 |
| | 310 | 52 | 4 | 4 | 207 | — | 605 000 | 800 000 | 2 000 | 2 400 |
| | 310 | 86 | 4 | 4 | 205 | — | 925 000 | 1 330 000 | 1 800 | 2 200 |
| | 360 | 72 | 4 | 4 | — | 310 | 795 000 | 1 010 000 | 1 600 | 2 000 |
| | 360 | 72 | 4 | 4 | 218 | — | 930 000 | 1 150 000 | 1 600 | 2 000 |
| | 360 | 120 | 4 | 4 | 216 | — | 1 490 000 | 2 070 000 | 1 400 | 1 800 |
| **180** | 280 | 46 | 2.1 | 2.1 | 205 | 255 | 355 000 | 510 000 | 2 200 | 2 600 |
| | 320 | 52 | 4 | 4 | — | 282 | 495 000 | 675 000 | 1 900 | 2 200 |
| | 320 | 52 | 4 | 4 | 217 | — | 625 000 | 850 000 | 1 900 | 2 200 |
| | 320 | 86 | 4 | 4 | 215 | — | 1 010 000 | 1 510 000 | 1 700 | 2 000 |
| | 380 | 75 | 4 | 4 | — | 328 | 905 000 | 1 150 000 | 1 500 | 1 800 |
| | 380 | 75 | 4 | 4 | 231 | — | 985 000 | 1 230 000 | 1 500 | 1 800 |
| | 380 | 126 | 4 | 4 | 227 | — | 1 560 000 | 2 220 000 | 1 300 | 1 700 |
| **190** | 290 | 46 | 2.1 | 2.1 | 215 | 265 | 365 000 | 535 000 | 2 000 | 2 600 |
| | 340 | 55 | 4 | 4 | — | 299 | 555 000 | 770 000 | 1 800 | 2 200 |
| | 340 | 55 | 4 | 4 | 230 | — | 695 000 | 955 000 | 1 800 | 2 200 |
| | 340 | 92 | 4 | 4 | 228 | — | 1 100 000 | 1 670 000 | 1 600 | 2 000 |
| | 400 | 78 | 5 | 5 | — | 345 | 975 000 | 1 260 000 | 1 400 | 1 700 |
| | 400 | 78 | 5 | 5 | 245 | — | 1 060 000 | 1 340 000 | 1 400 | 1 700 |
| | 400 | 132 | 5 | 5 | 240 | — | 1 770 000 | 2 520 000 | 1 300 | 1 600 |
| **200** | 310 | 51 | 2.1 | 2.1 | 229 | 281 | 390 000 | 580 000 | 2 000 | 2 400 |
| | 360 | 58 | 4 | 4 | — | 316 | 620 000 | 865 000 | 1 700 | 2 000 |
| | 360 | 58 | 4 | 4 | 243 | — | 765 000 | 1 060 000 | 1 700 | 2 000 |
| | 360 | 98 | 4 | 4 | 241 | — | 1 220 000 | 1 870 000 | 1 500 | 1 800 |
| | 420 | 80 | 5 | 5 | — | 360 | 975 000 | 1 270 000 | 1 300 | 1 600 |
| | 420 | 80 | 5 | 5 | 258 | — | 1 140 000 | 1 450 000 | 1 300 | 1 600 |
| | 420 | 138 | 5 | 5 | 253 | — | 1 910 000 | 2 760 000 | 1 200 | 1 500 |
| **220** | 340 | 56 | 3 | 3 | 250 | 310 | 500 000 | 750 000 | 1 800 | 2 200 |
| | 400 | 65 | 4 | 4 | — | 350 | 760 000 | 1 080 000 | 1 500 | 1 800 |
| | 400 | 65 | 4 | 4 | 270 | — | 760 000 | 1 080 000 | 1 500 | 1 800 |
| | 400 | 108 | 4 | 4 | 270 | — | 1 140 000 | 1 810 000 | 1 300 | 1 600 |
| | 460 | 88 | 5 | 5 | — | 396 | 1 190 000 | 1 570 000 | 1 200 | 1 500 |
| | 460 | 88 | 5 | 5 | 284 | — | 1 190 000 | 1 570 000 | 1 200 | 1 500 |

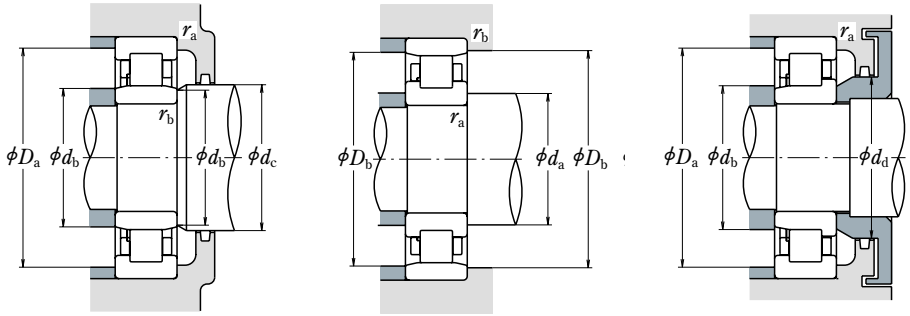
| Bearing Numbers (1) | | | | | | Abutment and Fillet Dimensions (mm) | | | | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NU | NJ | NUP | N | NF | | $d_a$(2) min. | $d_b$ min. | $d_b$(3) max. | $d_c$ min. | $d_d$ min. | $D_a$(2) max. | $D_b$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. |
| **NU1034** | **NJ** | — | **N** | — | | 181 | 181 | 190 | 197 | — | 249 | 249 | 239 | 2 | 2 | 7.91 |
| **N 234** | — | — | **N** | **NF** | | 186 | — | — | — | — | — | 294 | 278 | 3 | 3 | 17.4 |
| **NU234EM** | **NJ** | **NUP** | — | — | | 186 | 186 | 202 | 211 | 223 | 294 | — | — | 3 | 3 | 18.3 |
| **NU2234EM** | **NJ** | **NUP** | — | — | | 186 | 186 | 200 | 211 | 223 | 294 | — | — | 3 | 3 | 29.9 |
| **N 334** | — | — | **N** | — | | 186 | — | — | — | — | — | 344 | 316 | 3 | 3 | 36.6 |
| **NU334EM** | **NJ** | **NUP** | — | — | | 186 | 186 | 213 | 223 | 241 | 344 | — | — | 3 | 3 | 37.9 |
| **NU2334EM** | **NJ** | **NUP** | — | — | | 186 | 186 | 210 | 223 | 241 | 344 | — | — | 3 | 3 | 63.4 |
| **NU1036** | **NJ** | — | **N** | **NF** | | 191 | 191 | 202 | 209 | — | 269 | 269 | 258 | 2 | 2 | 10.2 |
| **N 236** | — | — | **N** | **NF** | | 196 | — | — | — | — | — | 304 | 288 | 3 | 3 | 18.1 |
| **NU236EM** | **NJ** | **NUP** | — | — | | 196 | 196 | 212 | 221 | 233 | 304 | — | — | 3 | 3 | 19 |
| **NU2236EM** | **NJ** | **NUP** | — | — | | 196 | 196 | 210 | 221 | 233 | 304 | — | — | 3 | 3 | 31.4 |
| **N 336** | — | — | **N** | **NF** | | 196 | — | — | — | — | — | 364 | 335 | 3 | 3 | 42.6 |
| **NU336EM** | **NJ** | **NUP** | — | — | | 196 | 196 | 226 | 235 | 255 | 364 | — | — | 3 | 3 | 44 |
| **NU2336EM** | **NJ** | **NUP** | — | — | | 196 | 196 | 222 | 235 | 255 | 364 | — | — | 3 | 3 | 74.6 |
| **NU1038** | **NJ** | — | **N** | — | | 201 | 201 | 212 | 219 | — | 279 | 279 | 268 | 2 | 2 | 10.7 |
| **N 238** | — | — | **N** | **NF** | | 206 | — | — | — | — | — | 324 | 305 | 3 | 3 | 22 |
| **NU238EM** | **NJ** | **NUP** | — | — | | 206 | 206 | 225 | 234 | 247 | 324 | — | — | 3 | 3 | 23 |
| **NU2238EM** | **NJ** | **NUP** | — | — | | 206 | 206 | 223 | 234 | 247 | 324 | — | — | 3 | 3 | 38.3 |
| **N 338** | — | — | **N** | — | | 210 | — | — | — | — | — | 380 | 352 | 4 | 4 | 48.7 |
| **NU338EM** | **NJ** | **NUP** | — | — | | 210 | 210 | 240 | 248 | 268 | 380 | — | — | 4 | 4 | 50.6 |
| **NU2338EM** | **NJ** | **NUP** | — | — | | 210 | 210 | 235 | 248 | 268 | 380 | — | — | 4 | 4 | 86.2 |
| **NU1040** | **NJ** | — | **N** | **NF** | | 211 | 211 | 226 | 233 | — | 299 | 299 | 284 | 2 | 2 | 14 |
| **N 240** | — | — | **N** | **NF** | | 216 | — | — | — | — | — | 344 | 323 | 3 | 3 | 26.2 |
| **NU240EM** | **NJ** | **NUP** | — | — | | 216 | 216 | 238 | 247 | 261 | 344 | — | — | 3 | 3 | 27.4 |
| **NU2240EM** | **NJ** | **NUP** | — | — | | 216 | 216 | 235 | 247 | 261 | 344 | — | — | 3 | 3 | 46.1 |
| **N 340** | — | — | **N** | **NF** | | 220 | — | — | — | — | — | 400 | 367 | 4 | 4 | 55.3 |
| **NU340EM** | **NJ** | **NUP** | — | — | | 220 | 220 | 252 | 263 | 283 | 400 | — | — | 4 | 4 | 57.1 |
| **NU2340EM** | **NJ** | **NUP** | — | — | | 220 | 220 | 247 | 263 | 283 | 400 | — | — | 4 | 4 | 99.3 |
| **NU1044** | **NJ** | — | **N** | — | | 233 | 233 | 247 | 254 | — | 327 | 327 | 313 | 2.5 | 2.5 | 18.2 |
| **N 244** | — | — | **N** | **NF** | | 236 | — | — | — | — | — | 384 | 357 | 3 | 3 | 37 |
| **NU 244** | **NJ** | **NUP** | — | — | | 236 | 236 | 264 | 273 | 289 | 384 | — | — | 3 | 3 | 37.3 |
| **NU2244** | **NU** | — | — | — | | — | 236 | 264 | 273 | 289 | 384 | — | — | 3 | 3 | 61.8 |
| **N 344** | — | — | **N** | — | | 240 | — | — | — | — | — | 440 | 403 | 4 | 4 | 72.8 |
| **NU 344** | **NU** | **NJ** | — | — | | 240 | 240 | 278 | 287 | 307 | 440 | — | — | 4 | 4 | 74.6 |

**Notes** (1) When L-shaped thrust collars (Refer to page **B105**) are used, the bearings become the NH Type.
(2) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.
(3) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## Bore Diameter 240 – 500 mm




NU NJ NUP N NF



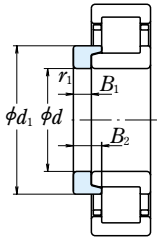

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | $F_w$ | $E_w$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **240** | 360 | 56 | 3 | 3 | 270 | 330 | 530 000 | 820 000 | 1 600 | 2 000 |
| | 440 | 72 | 4 | 4 | — | 385 | 935 000 | 1 340 000 | 1 300 | 1 600 |
| | 440 | 72 | 4 | 4 | 295 | — | 935 000 | 1 340 000 | 1 300 | 1 600 |
| | 440 | 120 | 4 | 4 | 295 | — | 1 440 000 | 2 320 000 | 1 200 | 1 500 |
| | 500 | 95 | 5 | 5 | — | 430 | 1 360 000 | 1 820 000 | 1 100 | 1 300 |
| | 500 | 95 | 5 | 5 | 310 | — | 1 360 000 | 1 820 000 | 1 100 | 1 300 |
| **260** | 400 | 65 | 4 | 4 | 296 | 364 | 645 000 | 1 000 000 | 1 500 | 1 800 |
| | 480 | 80 | 5 | 5 | — | 420 | 1 100 000 | 1 580 000 | 1 200 | 1 500 |
| | 480 | 80 | 5 | 5 | 320 | — | 1 100 000 | 1 580 000 | 1 200 | 1 500 |
| | 480 | 130 | 5 | 5 | 320 | — | 1 710 000 | 2 770 000 | 1 100 | 1 300 |
| | 540 | 102 | 6 | 6 | 336 | — | 1 540 000 | 2 090 000 | 1 000 | 1 200 |
| **280** | 420 | 65 | 4 | 4 | 316 | 384 | 660 000 | 1 050 000 | 1 400 | 1 700 |
| | 500 | 80 | 5 | 5 | — | 440 | 1 140 000 | 1 680 000 | 1 100 | 1 400 |
| | 500 | 80 | 5 | 5 | 340 | — | 1 140 000 | 1 680 000 | 1 100 | 1 400 |
| **300** | 460 | 74 | 4 | 4 | 340 | 420 | 885 000 | 1 400 000 | 1 300 | 1 500 |
| | 540 | 85 | 5 | 5 | 364 | — | 1 400 000 | 2 070 000 | 1 100 | 1 300 |
| **320** | 480 | 74 | 4 | 4 | 360 | 440 | 905 000 | 1 470 000 | 1 200 | 1 400 |
| | 580 | 92 | 5 | 5 | — | 510 | 1 540 000 | 2 270 000 | 950 | 1 200 |
| | 580 | 92 | 5 | 5 | 390 | — | 1 540 000 | 2 270 000 | 950 | 1 200 |
| **340** | 520 | 82 | 5 | 5 | 385 | 475 | 1 080 000 | 1 740 000 | 1 100 | 1 300 |
| **360** | 540 | 82 | 5 | 5 | 405 | 495 | 1 110 000 | 1 830 000 | 1 000 | 1 300 |
| **380** | 560 | 82 | 5 | 5 | 425 | — | 1 140 000 | 1 910 000 | 1 000 | 1 200 |
| **400** | 600 | 90 | 5 | 5 | 450 | 550 | 1 360 000 | 2 280 000 | 900 | 1 100 |
| **420** | 620 | 90 | 5 | 5 | 470 | 570 | 1 390 000 | 2 380 000 | 850 | 1 100 |
| **440** | 650 | 94 | 6 | 6 | 493 | — | 1 470 000 | 2 530 000 | 800 | 1 000 |
| **460** | 680 | 100 | 6 | 6 | 516 | 624 | 1 580 000 | 2 740 000 | 750 | 950 |
| **480** | 700 | 100 | 6 | 6 | 536 | 644 | 1 620 000 | 2 860 000 | 750 | 900 |
| **500** | 720 | 100 | 6 | 6 | 556 | 664 | 1 660 000 | 2 970 000 | 710 | 850 |

| Bearing Numbers (1) | | | | | | Abutment and Fillet Dimensions (mm) | | | | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NU | NJ | NUP | N | NF | | $d_a$(2) min. | $d_b$ min. | $d_b$(3) max. | $d_c$ min. | $d_d$ min. | $D_a$(2) max. | $D_b$ max. | $D_b$ min. | $r_a$ max. | $r_b$ max. | approx. |
| **NU1048** | **NJ** | — | **N** | — | | 253 | 253 | 266 | 275 | — | 347 | 347 | 333 | 2.5 | 2.5 | 19.5 |
| **N 248** | — | — | **N** | **NF** | | 256 | — | — | — | — | — | 424 | 392 | 3 | 3 | 49.6 |
| **NU 248** | **NJ** | **NUP** | — | — | | 256 | 256 | 289 | 298 | 316 | 424 | — | — | 3 | 3 | 50.4 |
| **NU2248** | **NU** | — | — | — | — | — | 256 | 289 | 298 | 316 | 424 | — | — | 3 | 3 | 84.9 |
| **N 348** | — | — | **N** | — | | 260 | — | — | — | — | — | 480 | 438 | 4 | 4 | 92.3 |
| **NU 348** | **NJ** | — | — | — | | 260 | 260 | 304 | 313 | 333 | 480 | — | — | 4 | 4 | 94.6 |
| **NU1052** | **NJ** | — | **N** | **NF** | | 276 | 276 | 292 | 300 | — | 384 | 384 | 367 | 3 | 3 | 29.1 |
| **N 252** | — | — | **N** | — | | 280 | — | — | — | — | — | 460 | 428 | 4 | 4 | 66.2 |
| **NU 252** | **NJ** | — | — | — | | 280 | 280 | 314 | 323 | 343 | 460 | — | — | 4 | 4 | 67.1 |
| **NU2252** | **NU** | — | **NUP** | — | — | 280 | 280 | 314 | 323 | 343 | 460 | — | — | 4 | 4 | 111 |
| **NU 352** | **NU** | **NJ** | — | — | — | 286 | 286 | 330 | 339 | 359 | 514 | — | — | 5 | 5 | 118 |
| **NU1056** | **NJ** | **NUP** | **N** | **NF** | | 296 | 296 | 312 | 320 | — | 404 | 404 | 387 | 3 | 3 | 30.8 |
| **N 256** | — | — | **N** | **NF** | | 300 | — | — | — | — | — | 480 | 448 | 4 | 4 | 69.6 |
| **NU 256** | **NJ** | — | — | — | | 300 | 300 | 334 | 344 | 364 | 480 | — | — | 4 | 4 | 70.7 |
| **NU1060** | **NJ** | — | **N** | **NF** | | 316 | 316 | 336 | 344 | — | 444 | 444 | 424 | 3 | 3 | 43.7 |
| **NU 260** | **NJ** | — | — | — | | 320 | 320 | 358 | 368 | 391 | 520 | — | — | 4 | 4 | 89.2 |
| **NU1064** | **NU** | — | **N** | **NF** | | 336 | 336 | 356 | 365 | — | 464 | 464 | 444 | 3 | 3 | 46.1 |
| **N 264** | — | — | **N** | — | | 340 | — | — | — | — | — | 560 | 519 | 4 | 4 | 110 |
| **NU 264** | **NJ** | — | — | — | | 340 | 340 | 384 | 394 | 420 | 560 | — | — | 4 | 4 | 112 |
| **NU1068** | **NJ** | — | **N** | **NF** | | 360 | 360 | 381 | 390 | — | 500 | 500 | 479 | 4 | 4 | 61.8 |
| **NU1072** | **NU** | — | — | **N** | **NF** | 380 | 380 | 400 | 410 | — | 520 | 520 | 499 | 4 | 4 | 64.6 |
| **NU1076** | **NU** | — | — | — | — | — | 400 | 420 | 430 | — | 540 | — | — | 4 | 4 | 67.5 |
| **NU1080** | **NU** | — | **NUP** | **N** | — | 420 | 420 | 445 | 455 | — | 580 | 580 | 554.5 | 4 | 4 | 88.2 |
| **NU1084** | **NU** | — | — | **N** | — | 440 | 440 | 465 | 475 | — | 600 | 600 | 574.5 | 4 | 4 | 91.7 |
| **NU1088** | **NU** | — | — | — | — | — | 466 | 488 | 498 | — | 624 | — | — | 5 | 5 | 105 |
| **NU1092** | **NU** | — | **NUP** | **N** | — | 486 | 486 | 511 | 521 | — | 654 | 654 | 628.5 | 5 | 5 | 123 |
| **NU1096** | **NU** | **NJ** | — | **N** | — | 506 | 506 | 531 | 541 | — | 674 | 674 | 654 | 5 | 5 | 127 |
| **NU10/500** | **NU** | — | — | **N** | — | 526 | 526 | 551 | 558 | — | 694 | 694 | 674 | 5 | 5 | 131 |

**Notes** (1) When L-shaped thrust collars (Refer to page **B105**) are used, the bearings become the NH Type.
(2) If axial loads are applied, increase $d_a$ and reduce $D_a$ from the values listed above.
(3) $d_b$ (max.) are values for adjusting rings for NU, NJ Types.

## L-Shaped Thrust Collars

**Bore Diameter 20 – 85 mm**



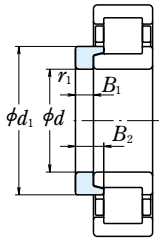

L-Shaped Thrust Collar

| Boundary Dimensions (mm) | | | | | Bearing Numbers | Mass (kg) |
|---|---|---|---|---|---|---|
| $d$ | $d_1$ | $B_1$ | $B_2$ | $r_1$ min. | | approx. |
| **20** | 30 | 3 | 6.75 | 0.6 | **HJ 204** | 0.012 |
| | 29.8 | 3 | 5.5 | 0.6 | **HJ 204 E** | 0.011 |
| | 30 | 3 | 7.5 | 0.6 | **HJ 2204** | 0.012 |
| | 29.8 | 3 | 6.5 | 0.6 | **HJ 2204 E** | 0.012 |
| | 31.7 | 4 | 7.5 | 0.6 | **HJ 304** | 0.017 |
| | 31.4 | 4 | 6.5 | 0.6 | **HJ 304 E** | 0.017 |
| | 31.8 | 4 | 8.5 | 0.6 | **HJ 2304** | 0.017 |
| | 31.4 | 4 | 7.5 | 0.6 | HJ 2304 E | 0.018 |
| **25** | 34.8 | 3 | 6 | 0.6 | **HJ 205 E** | 0.014 |
| | 34.8 | 3 | 6.5 | 0.6 | **HJ 2205 E** | 0.014 |
| | 38.2 | 4 | 7 | 1.1 | **HJ 305 E** | 0.025 |
| | 38.2 | 4 | 8 | 1.1 | HJ 2305 E | 0.026 |
| | 43.6 | 6 | 10.5 | 1.5 | **HJ 405** | 0.057 |
| **30** | 41.3 | 4 | 7 | 0.6 | **HJ 206 E** | 0.025 |
| | 41.4 | 4 | 7.5 | 0.6 | **HJ 2206 E** | 0.025 |
| | 45.1 | 5 | 8.5 | 1.1 | **HJ 306 E** | 0.042 |
| | 45.1 | 5 | 9.5 | 1.1 | HJ 2306 E | 0.043 |
| | 50.5 | 7 | 11.5 | 1.5 | **HJ 406** | 0.080 |
| **35** | 48.2 | 4 | 7 | 0.6 | **HJ 207 E** | 0.033 |
| | 48.2 | 4 | 8.5 | 0.6 | **HJ 2207 E** | 0.035 |
| | 51.1 | 6 | 9.5 | 1.1 | **HJ 307 E** | 0.060 |
| | 51.1 | 6 | 11 | 1.1 | HJ 2307 E | 0.062 |
| | 59 | 8 | 13 | 1.5 | **HJ 407** | 0.12 |
| **40** | 54.1 | 5 | 8.5 | 1.1 | **HJ 208 E** | 0.049 |
| | 54.1 | 5 | 9 | 1.1 | **HJ 2208 E** | 0.050 |
| | 57.6 | 7 | 11 | 1.5 | **HJ 308 E** | 0.088 |
| | 57.7 | 7 | 12.5 | 1.5 | HJ 2308 E | 0.091 |
| | 64.8 | 8 | 13 | 2 | **HJ 408** | 0.14 |
| **45** | 59.1 | 5 | 8.5 | 1.1 | **HJ 209 E** | 0.055 |
| | 59.1 | 5 | 9 | 1.1 | **HJ 2209 E** | 0.055 |
| | 64.5 | 7 | 11.5 | 1.5 | **HJ 309 E** | 0.11 |
| | 64.5 | 7 | 13 | 1.5 | HJ 2309 E | 0.113 |
| | 71.7 | 8 | 13.5 | 2 | **HJ 409** | 0.175 |
| **50** | 64.1 | 5 | 9 | 1.1 | **HJ 210 E** | 0.061 |
| | 64.1 | 5 | 9 | 1.1 | **HJ 2210 E** | 0.061 |
| | 71.4 | 8 | 13 | 2 | **HJ 310 E** | 0.151 |
| | 71.4 | 8 | 14.5 | 2 | HJ 2310 E | 0.155 |
| | 78.8 | 9 | 14.5 | 2.1 | **HJ 410** | 0.23 |
| **55** | 70.9 | 6 | 9.5 | 1.1 | **HJ 211 E** | 0.087 |
| | 70.9 | 6 | 10 | 1.1 | **HJ 2211 E** | 0.088 |
| | 77.6 | 9 | 14 | 2 | **HJ 311 E** | 0.195 |
| | 77.6 | 9 | 15.5 | 2 | HJ 2311 E | 0.20 |
| | 85.2 | 10 | 16.5 | 2.1 | **HJ 411** | 0.29 |
| **60** | 77.7 | 6 | 10 | 1.5 | **HJ 212 E** | 0.108 |
| | 77.7 | 6 | 10 | 1.5 | **HJ 2212 E** | 0.108 |
| | 84.5 | 9 | 14.5 | 2.1 | **HJ 312 E** | 0.231 |
| | 84.5 | 9 | 16 | 2.1 | HJ 2312 E | 0.237 |
| | 91.8 | 10 | 16.5 | 2.1 | **HJ 412** | 0.34 |
| **65** | 84.5 | 6 | 10 | 1.5 | HJ 213 E | 0.129 |
| | 84.5 | 6 | 10.5 | 1.5 | HJ 2213 E | 0.131 |
| | 90.6 | 10 | 15.5 | 2.1 | HJ 313 E | 0.288 |
| | 90.6 | 10 | 18 | 2.1 | HJ 2313 E | 0.298 |
| | 98.5 | 11 | 18 | 2.1 | **HJ 413** | 0.42 |
| **70** | 89.5 | 7 | 11 | 1.5 | HJ 214 E | 0.157 |
| | 89.5 | 7 | 11.5 | 1.5 | HJ 2214 E | 0.158 |
| | 97.5 | 10 | 15.5 | 2.1 | HJ 314 E | 0.33 |
| | 97.5 | 10 | 18.5 | 2.1 | HJ 2314 E | 0.345 |
| | 110.5 | 12 | 20 | 3 | **HJ 414** | 0.605 |
| **75** | 94.5 | 7 | 11 | 1.5 | HJ 215 E | 0.166 |
| | 94.5 | 7 | 11.5 | 1.5 | HJ 2215 E | 0.167 |
| | 104.2 | 11 | 16.5 | 2.1 | HJ 315 E | 0.41 |
| | 104.2 | 11 | 19.5 | 2.1 | HJ 2315 E | 0.43 |
| | 116 | 13 | 21.5 | 3 | **HJ 415** | 0.71 |
| **80** | 101.6 | 8 | 12.5 | 2 | HJ 216 E | 0.222 |
| | 101.6 | 8 | 12.5 | 2 | HJ 2216 E | 0.222 |
| | 110.6 | 11 | 17 | 2.1 | HJ 316 E | 0.46 |
| | 110.6 | 11 | 20 | 2.1 | HJ 2316 E | 0.48 |
| | 122 | 13 | 22 | 3 | **HJ 416** | 0.78 |
| **85** | 107.6 | 8 | 12.5 | 2 | HJ 217 E | 0.25 |
| | 107.6 | 8 | 13 | 2 | HJ 2217 E | 0.252 |
| | 117.9 | 12 | 18.5 | 3 | HJ 317 E | 0.575 |
| | 117.9 | 12 | 22 | 3 | HJ 2317 E | 0.595 |
| | 126 | 14 | 24 | 4 | **HJ 417** | 0.88 |





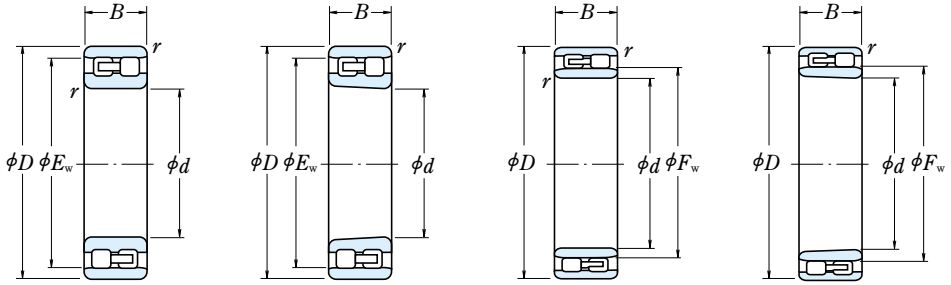
**Bore Diameter 90～320 mm**



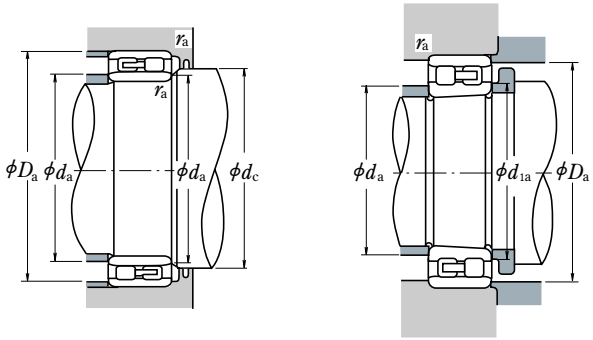

L-Shaped Thrust Collar

| Boundary Dimensions (mm) | | | | | Bearing Numbers | Mass (kg) |
|---|---|---|---|---|---|---|
| $d$ | $d_1$ | $B_1$ | $B_2$ | $r_1$ min. | | approx. |
| **90** | 114.3 | 9 | 14 | 2 | HJ 218 E | 0.32 |
| | 114.3 | 9 | 15 | 2 | HJ 2218 E | 0.325 |
| | 124.2 | 12 | 18.5 | 3 | HJ 318 E | 0.63 |
| | 124.2 | 12 | 22 | 3 | HJ 2318 E | 0.66 |
| | 137 | 14 | 24 | 4 | **HJ 418** | 1.05 |
| **95** | 120.6 | 9 | 14 | 2.1 | HJ 219 E | 0.355 |
| | 120.6 | 9 | 15.5 | 2.1 | HJ 2219 E | 0.365 |
| | 132.2 | 13 | 20.5 | 3 | HJ 319 E | 0.785 |
| | 132.2 | 13 | 24.5 | 3 | HJ 2319 E | 0.815 |
| | 147 | 15 | 25.5 | 4 | **HJ 419** | 1.3 |
| **100** | 127.5 | 10 | 15 | 2.1 | HJ 220 E | 0.44 |
| | 127.5 | 10 | 16 | 2.1 | HJ 2220 E | 0.45 |
| | 139.6 | 13 | 20.5 | 3 | HJ 320 E | 0.89 |
| | 139.6 | 13 | 23.5 | 3 | HJ 2320 E | 0.92 |
| | 153.5 | 16 | 27 | 4 | **HJ 420** | 1.5 |
| **105** | 145 | 13 | 20.5 | 3 | **HJ 321 E** | 0.97 |
| | 159.5 | 16 | 27 | 4 | **HJ 421** | 1.65 |
| **110** | 141.7 | 11 | 17 | 2.1 | HJ 222 E | 0.62 |
| | 141.7 | 11 | 19.5 | 2.1 | HJ 2222 E | 0.645 |
| | 155.8 | 14 | 22 | 3 | HJ 322 E | 1.21 |
| | 155.8 | 14 | 26.5 | 3 | HJ 2322 E | 1.27 |
| | 171 | 17 | 29.5 | 4 | **HJ 422** | 2.1 |
| **120** | 153.4 | 11 | 17 | 2.1 | HJ 224 E | 0.71 |
| | 153.4 | 11 | 20 | 2.1 | HJ 2224 E | 0.745 |
| | 168.6 | 14 | 22.5 | 3 | HJ 324 E | 1.41 |
| | 168.6 | 14 | 26 | 3 | HJ 2324 E | 1.46 |
| | 188 | 17 | 30.5 | 5 | **HJ 424** | 2.6 |
| **130** | 164.2 | 11 | 17 | 3 | HJ 226 E | 0.79 |
| | 164.2 | 11 | 21 | 3 | HJ 2226 E | 0.84 |
| | 182.3 | 14 | 23 | 4 | HJ 326 E | 1.65 |
| | 182.3 | 14 | 28 | 4 | HJ 2326 E | 1.73 |
| | 205 | 18 | 32 | 5 | **HJ 426** | 3.3 |
| **140** | 180 | 11 | 18 | 3 | HJ 228 E | 0.99 |
| | 180 | 11 | 23 | 3 | HJ 2228 E | 1.07 |
| | 196 | 15 | 25 | 4 | HJ 328 E | 2.04 |
| | 196 | 15 | 31 | 4 | HJ 2328 E | 2.14 |
| | 219 | 18 | 33 | 5 | **HJ 428** | 3.75 |
| **150** | 193.7 | 12 | 19.5 | 3 | HJ 230 E | 1.26 |
| | 193.7 | 12 | 24.5 | 3 | HJ 2230 E | 1.35 |
| | 210 | 15 | 25 | 4 | HJ 330 E | 2.35 |
| | 210 | 15 | 31.5 | 4 | HJ 2330 E | 2.48 |
| | 234 | 20 | 36.5 | 5 | **HJ 430** | 4.7 |
| **160** | 207.3 | 12 | 20 | 3 | HJ 232 E | 1.48 |
| | 206.1 | 12 | 24.5 | 3 | HJ 2232 E | 1.55 |
| | 222 | 15 | 25 | 4 | HJ 332 E | 2.59 |
| | 222.1 | 15 | 32 | 4 | HJ 2332 E | 2.76 |
| **170** | 220.8 | 12 | 20 | 4 | HJ 234 E | 1.7 |
| | 219.5 | 12 | 24 | 4 | HJ 2234 E | 1.79 |
| | 238 | 16 | 33.5 | 4 | **HJ 2334 E** | 3.25 |
| **180** | 230.8 | 12 | 20 | 4 | HJ 236 E | 1.79 |
| | 229.5 | 12 | 24 | 4 | HJ 2236 E | 1.88 |
| | 252 | 17 | 35 | 4 | **HJ 2336 E** | 3.85 |
| **190** | 244.5 | 13 | 21.5 | 4 | HJ 238 E | 2.19 |
| | 243.2 | 13 | 26.5 | 4 | HJ 2238 E | 2.31 |
| | 260.6 | 18 | 36.5 | 5 | **HJ 2338 E** | 4.45 |
| **200** | 258.2 | 14 | 23 | 4 | HJ 240 E | 2.65 |
| | 258 | 14 | 34 | 4 | **HJ 2240** | 2.6 |
| | 256.9 | 14 | 28 | 4 | HJ 2240 E | 2.78 |
| | 280 | 18 | 30 | 5 | **HJ 340 E** | 5.0 |
| **220** | 286 | 15 | 27.5 | 4 | **HJ 244** | 3.55 |
| | 286 | 15 | 36.5 | 4 | **HJ 2244** | 3.55 |
| | 307 | 20 | 36 | 5 | **HJ 344** | 7.05 |
| **240** | 313 | 16 | 29.5 | 4 | **HJ 248** | 4.65 |
| | 313 | 16 | 38.5 | 4 | **HJ 2248** | 4.65 |
| | 334 | 22 | 39.5 | 5 | **HJ 348** | 8.2 |
| **260** | 340 | 18 | 33 | 5 | **HJ 252** | 6.2 |
| | 340 | 18 | 40.5 | 5 | **HJ 2252** | 6.2 |
| | 362 | 24 | 43 | 6 | **HJ 352** | 11.4 |
| **280** | 360 | 18 | 33 | 5 | **HJ 256** | 7.4 |
| **300** | 387 | 20 | 34.5 | 5 | **HJ 260** | 9.15 |
| **320** | 415 | 21 | 37 | 5 | **HJ 264** | 11.3 |

**Bore Diameter 25 – 140 mm**




NN Cylindrical Bore | NN Tapered Bore | NNU Cylindrical Bore | NNU Tapered Bore




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $F_W$ | $E_W$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **25** | 47 | 16 | 0.6 | — | 41.3 | 25 800 | 30 000 | 14 000 | 17 000 |
| **30** | 55 | 19 | 1 | — | 48.5 | 31 000 | 37 000 | 12 000 | 14 000 |
| **35** | 62 | 20 | 1 | — | 55 | 39 500 | 50 000 | 10 000 | 12 000 |
| **40** | 68 | 21 | 1 | — | 61 | 43 500 | 55 500 | 9 000 | 11 000 |
| **45** | 75 | 23 | 1 | — | 67.5 | 52 000 | 68 500 | 8 500 | 10 000 |
| **50** | 80 | 23 | 1 | — | 72.5 | 53 000 | 72 500 | 7 500 | 9 000 |
| **55** | 90 | 26 | 1.1 | — | 81 | 69 500 | 96 500 | 6 700 | 8 000 |
| **60** | 95 | 26 | 1.1 | — | 86.1 | 73 500 | 106 000 | 6 300 | 7 500 |
| **65** | 100 | 26 | 1.1 | — | 91 | 77 000 | 116 000 | 6 000 | 7 100 |
| **70** | 110 | 30 | 1.1 | — | 100 | 97 500 | 148 000 | 5 600 | 6 700 |
| **75** | 115 | 30 | 1.1 | — | 105 | 96 500 | 149 000 | 5 300 | 6 300 |
| **80** | 125 | 34 | 1.1 | — | 113 | 119 000 | 186 000 | 4 800 | 6 000 |
| **85** | 130 | 34 | 1.1 | — | 118 | 125 000 | 201 000 | 4 500 | 5 600 |
| **90** | 140 | 37 | 1.5 | — | 127 | 143 000 | 228 000 | 4 300 | 5 000 |
| **95** | 145 | 37 | 1.5 | — | 132 | 150 000 | 246 000 | 4 000 | 5 000 |
| **100** | 140 | 40 | 1.1 | 112 | — | 155 000 | 295 000 | 4 000 | 5 000 |
| | 150 | 37 | 1.5 | — | 137 | 157 000 | 265 000 | 4 000 | 4 800 |
| **105** | 145 | 40 | 1.1 | 117 | — | 161 000 | 315 000 | 3 800 | 4 800 |
| | 160 | 41 | 2 | — | 146 | 198 000 | 320 000 | 3 800 | 4 500 |
| **110** | 150 | 40 | 1.1 | 122 | — | 167 000 | 335 000 | 3 600 | 4 500 |
| | 170 | 45 | 2 | — | 155 | 229 000 | 375 000 | 3 400 | 4 300 |
| **120** | 165 | 45 | 1.1 | 133.5 | — | 183 000 | 360 000 | 3 200 | 4 000 |
| | 180 | 46 | 2 | — | 165 | 239 000 | 405 000 | 3 200 | 3 800 |
| **130** | 180 | 50 | 1.5 | 144 | — | 274 000 | 545 000 | 3 000 | 3 800 |
| | 200 | 52 | 2 | — | 182 | 284 000 | 475 000 | 3 000 | 3 600 |
| **140** | 190 | 50 | 1.5 | 154 | — | 283 000 | 585 000 | 2 800 | 3 600 |
| | 210 | 53 | 2 | — | 192 | 298 000 | 515 000 | 2 800 | 3 400 |

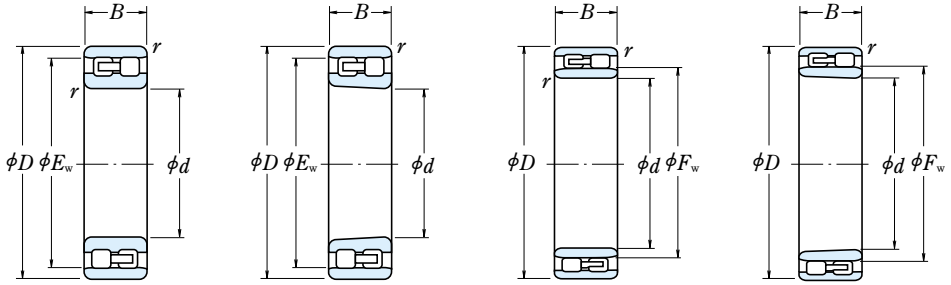
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Cylindrical Bore | Tapered Bore(1) | $d_a$(2) min. | $d_a$(2) max. | $d_{1a}$ min. | $d_c$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | approx. |
| **NN 3005** | **NN 3005 K** | 29 | — | 29 | — | 43 | 42 | 0.6 | 0.127 |
| **NN 3006** | **NN 3006 K** | 35 | — | 36 | — | 50 | 50 | 1 | 0.198 |
| **NN 3007** | **NN 3007 K** | 40 | — | 41 | — | 57 | 56 | 1 | 0.258 |
| **NN 3008** | **NN 3008 K** | 45 | — | 46 | — | 63 | 62 | 1 | 0.309 |
| **NN 3009** | **NN 3009 K** | 50 | — | 51 | — | 70 | 69 | 1 | 0.407 |
| **NN 3010** | **NN 3010 K** | 55 | — | 56 | — | 75 | 74 | 1 | 0.436 |
| **NN 3011** | **NN 3011 K** | 61.5 | — | 62 | — | 83.5 | 83 | 1 | 0.647 |
| **NN 3012** | **NN 3012 K** | 66.5 | — | 67 | — | 88.5 | 88 | 1 | 0.693 |
| **NN 3013** | **NN 3013 K** | 71.5 | — | 72 | — | 93.5 | 93 | 1 | 0.741 |
| **NN 3014** | **NN 3014 K** | 76.5 | — | 77 | — | 103.5 | 102 | 1 | 1.06 |
| **NN 3015** | **NN 3015 K** | 81.5 | — | 82 | — | 108.5 | 107 | 1 | 1.11 |
| **NN 3016** | **NN 3016 K** | 86.5 | — | 87 | — | 118.5 | 115 | 1 | 1.54 |
| **NN 3017** | **NN 3017 K** | 91.5 | — | 92 | — | 123.5 | 120 | 1 | 1.63 |
| **NN 3018** | **NN 3018 K** | 98 | — | 99 | — | 132 | 129 | 1.5 | 2.09 |
| **NN 3019** | **NN 3019 K** | 103 | — | 104 | — | 137 | 134 | 1.5 | 2.19 |
| **NNU 4920** | **NNU 4920 K** | 106.5 | 111 | 108 | 115 | 133.5 | — | 1 | 1.9 |
| **NN 3020** | **NN 3020 K** | 108 | — | 109 | — | 142 | 139 | 1.5 | 2.28 |
| **NNU 4921** | **NNU 4921 K** | 111.5 | 116 | 113 | 120 | 138.5 | — | 1 | 1.99 |
| **NN 3021** | **NN 3021 K** | 114 | — | 115 | — | 151 | 148 | 2 | 2.88 |
| **NNU 4922** | **NNU 4922 K** | 116.5 | 121 | 118 | 125 | 143.5 | — | 1 | 2.07 |
| **NN 3022** | **NN 3022 K** | 119 | — | 121 | — | 161 | 157 | 2 | 3.71 |
| **NNU 4924** | **NNU 4924 K** | 126.5 | 133 | 128 | 137 | 158.5 | — | 1 | 2.85 |
| **NN 3024** | **NN 3024 K** | 129 | — | 131 | — | 171 | 167 | 2 | 4.04 |
| **NNU 4926** | **NNU 4926 K** | 138 | 143 | 140 | 148 | 172 | — | 1.5 | 3.85 |
| **NN 3026** | **NN 3026 K** | 139 | — | 141 | — | 191 | 185 | 2 | 5.88 |
| **NNU 4928** | **NNU 4928 K** | 148 | 153 | 150 | 158 | 182 | — | 1.5 | 4.08 |
| **NN 3028** | **NN 3028 K** | 149 | — | 151 | — | 201 | 195 | 2 | 6.34 |

**Note** (1) The suffix K represents bearings with tapered bores (taper 1 : 12).

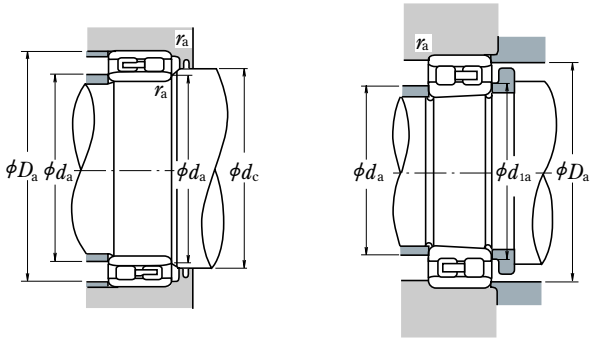
**Remarks** Production of double-row cylindrical roller bearings is generally in the high precision classes (Class 5 or better).

**Note** (2) $d_a$ (max.) are values for adjusting rings for the NNU Type.

**Bore Diameter 150 – 360 mm**




NN Cylindrical Bore | NN Tapered Bore | NNU Cylindrical Bore | NNU Tapered Bore




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $F_W$ | $E_W$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **150** | 210 | 60 | 2 | 167 | — | 350 000 | 715 000 | 2 600 | 3 200 |
| | 225 | 56 | 2.1 | — | 206 | 335 000 | 585 000 | 2 600 | 3 000 |
| **160** | 220 | 60 | 2 | 177 | — | 365 000 | 760 000 | 2 400 | 3 000 |
| | 240 | 60 | 2.1 | — | 219 | 375 000 | 660 000 | 2 400 | 2 800 |
| **170** | 230 | 60 | 2 | 187 | — | 375 000 | 805 000 | 2 400 | 2 800 |
| | 260 | 67 | 2.1 | — | 236 | 450 000 | 805 000 | 2 200 | 2 600 |
| **180** | 250 | 69 | 2 | 200 | — | 480 000 | 1 020 000 | 2 200 | 2 600 |
| | 280 | 74 | 2.1 | — | 255 | 565 000 | 995 000 | 2 000 | 2 400 |
| **190** | 260 | 69 | 2 | 211.5 | — | 485 000 | 1 060 000 | 2 000 | 2 600 |
| | 290 | 75 | 2.1 | — | 265 | 595 000 | 1 080 000 | 2 000 | 2 400 |
| **200** | 280 | 80 | 2.1 | 223 | — | 570 000 | 1 220 000 | 1 900 | 2 400 |
| | 310 | 82 | 2.1 | — | 282 | 655 000 | 1 170 000 | 1 800 | 2 200 |
| **220** | 300 | 80 | 2.1 | 243 | — | 600 000 | 1 330 000 | 1 700 | 2 200 |
| | 340 | 90 | 3 | — | 310 | 815 000 | 1 480 000 | 1 700 | 2 000 |
| **240** | 320 | 80 | 2.1 | 263 | — | 625 000 | 1 450 000 | 1 600 | 2 000 |
| | 360 | 92 | 3 | — | 330 | 855 000 | 1 600 000 | 1 500 | 1 800 |
| **260** | 360 | 100 | 2.1 | 289 | — | 935 000 | 2 100 000 | 1 400 | 1 800 |
| | 400 | 104 | 4 | — | 364 | 1 030 000 | 1 920 000 | 1 400 | 1 700 |
| **280** | 380 | 100 | 2.1 | 309 | — | 960 000 | 2 230 000 | 1 300 | 1 700 |
| | 420 | 106 | 4 | — | 384 | 1 080 000 | 2 080 000 | 1 300 | 1 500 |
| **300** | 420 | 118 | 3 | 336 | — | 1 230 000 | 2 870 000 | 1 200 | 1 500 |
| | 460 | 118 | 4 | — | 418 | 1 290 000 | 2 460 000 | 1 200 | 1 400 |
| **320** | 440 | 118 | 3 | 356 | — | 1 260 000 | 3 050 000 | 1 100 | 1 400 |
| | 480 | 121 | 4 | — | 438 | 1 350 000 | 2 670 000 | 1 100 | 1 300 |
| **340** | 520 | 133 | 5 | — | 473 | 1 670 000 | 3 300 000 | 1 000 | 1 200 |
| **360** | 540 | 134 | 5 | — | 493 | 1 700 000 | 3 450 000 | 950 | 1 200 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Cylindrical Bore | Tapered Bore(1) | $d_a$(2) min. | $d_a$(2) max. | $d_{1a}$ min. | $d_c$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | approx. |
| **NNU 4930** | **NNU 4930 K** | 159 | 166 | 162 | 171 | 201 | — | 2 | 6.39 |
| **NN 3030** | **NN 3030 K** | 161 | — | 162 | — | 214 | 209 | 2 | 7.77 |
| **NNU 4932** | **NNU 4932 K** | 169 | 176 | 172 | 182 | 211 | — | 2 | 6.76 |
| **NN 3032** | **NN 3032 K** | 171 | — | 172 | — | 229 | 222 | 2 | 9.41 |
| **NNU 4934** | **NNU 4934 K** | 179 | 186 | 182 | 192 | 221 | — | 2 | 7.12 |
| **NN 3034** | **NN 3034 K** | 181 | — | 183 | — | 249 | 239 | 2 | 12.8 |
| **NNU 4936** | **NNU 4936 K** | 189 | 199 | 193 | 205 | 241 | — | 2 | 10.4 |
| **NN 3036** | **NN 3036 K** | 191 | — | 193 | — | 269 | 258 | 2 | 16.8 |
| **NNU 4938** | **NNU 4938 K** | 199 | 211 | 203 | 217 | 251 | — | 2 | 10.9 |
| **NN 3038** | **NN 3038 K** | 201 | — | 203 | — | 279 | 268 | 2 | 17.8 |
| **NNU 4940** | **NNU 4940 K** | 211 | 222 | 214 | 228 | 269 | — | 2 | 15.3 |
| **NN 3040** | **NN 3040 K** | 211 | — | 214 | — | 299 | 285 | 2 | 22.7 |
| **NNU 4944** | **NNU 4944 K** | 231 | 242 | 234 | 248 | 289 | — | 2 | 16.6 |
| **NN 3044** | **NN 3044 K** | 233 | — | 236 | — | 327 | 313 | 2.5 | 29.6 |
| **NNU 4948** | **NNU 4948 K** | 251 | 262 | 254 | 269 | 309 | — | 2 | 18 |
| **NN 3048** | **NN 3048 K** | 253 | — | 256 | — | 347 | 334 | 2.5 | 32.7 |
| **NNU 4952** | **NNU 4952 K** | 271 | 288 | 275 | 295 | 349 | — | 2 | 31.1 |
| **NN 3052** | **NN 3052 K** | 276 | — | 278 | — | 384 | 368 | 3 | 47.7 |
| **NNU 4956** | **NNU 4956 K** | 291 | 308 | 295 | 315 | 369 | — | 2 | 33 |
| **NN 3056** | **NN 3056 K** | 296 | — | 298 | — | 404 | 388 | 3 | 51.1 |
| **NNU 4960** | **NNU 4960 K** | 313 | 335 | 318 | 343 | 407 | — | 2.5 | 51.9 |
| **NN 3060** | **NN 3060 K** | 316 | — | 319 | — | 444 | 422 | 3 | 70.7 |
| **NNU 4964** | **NNU 4964 K** | 333 | 355 | 338 | 363 | 427 | — | 2.5 | 54.9 |
| **NN 3064** | **NN 3064 K** | 336 | — | 340 | — | 464 | 442 | 3 | 76.6 |
| **NN 3068** | **NN 3068 K** | 360 | — | 365 | — | 500 | 477 | 4 | 102 |
| **NN 3072** | **NN 3072 K** | 380 | — | 385 | — | 520 | 497 | 4 | 106 |

**Note** (1) The suffix K represents bearings with tapered bores (taper 1 : 12).
**Remarks** Production of double-row cylindrical roller bearings is generally in the high precision classes (Class 5 or better).

**Note** (2) $d_a$ (max.) are values for adjusting rings for the NNU Type.

# TAPERED ROLLER BEARINGS


**METRIC DESIGN TAPERED ROLLER BEARINGS**

Bore Diameter 15 – 100mm ..... B120

Bore Diameter 105 – 240mm ..... B128

Bore Diameter 260 – 440mm ..... B134

**INCH DESIGN TAPERED ROLLER BEARINGS**

Bore Diameter 12.000 – 47.625mm ..... B136

Bore Diameter 48.412 – 69.850mm ..... B150

Bore Diameter 70.000 – 206.375mm ..... B158

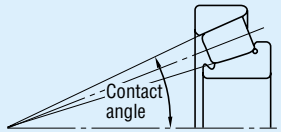
The index for inch design tapered roller bearings is in Appendix 14 (Page C26).

**DOUBLE-ROW TAPERED ROLLER BEARINGS**

Bore Diameter 40 – 260mm ..... B172

**Four-Row Tapered Roller Bearings** are described on pages B334 to B339.


## DESIGN, TYPES, AND FEATURES

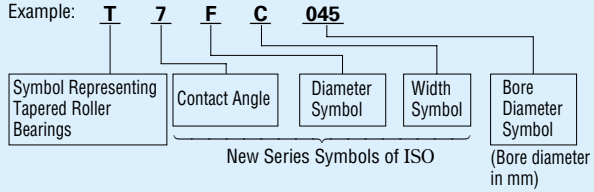



Tapered roller bearings are designed so the apices of the cones formed by the raceways of the cone and cup and the conical rollers all coincide at one point on the axis of the bearing. When a radial load is imposed, an axial force component occurs; therefore, it is necessary to use two bearings in opposition or some other multiple arrangement.

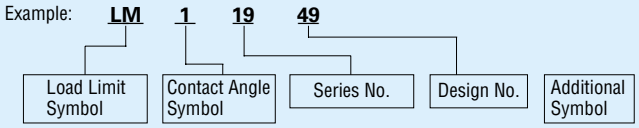
For metric-design medium-angle and steep-angle tapered roller bearings, the respective contact angle symbol C or D is added after the bore number. For normal-angle tapered roller bearings, no contact angle symbol is used. Medium-angle tapered roller bearings are primarily used for the pinion shafts of differential gears of automobiles.

Among those with high load capacity(HR series), some bearings have the basic number suffixed by J to conform to the specifications of ISO for the cup back face raceway diameter, cup width, and contact angle. Therefore, the cone assembly and cup of bearings with the same basic number suffixed by J are internationally interchangeable.

Among metric-design tapered roller bearings specified by ISO 355, there are those having new dimensions that are different than the dimension series 3XX used in the past. Part of them are listed in the bearing tables. They conform to the specifications of ISO for the smaller end diameter of the cup and contact angle. The cone and cup assemblies are internationally interchangeable. The bearing number formulation, which is different than that for past metric design, is as follows:

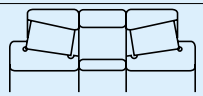
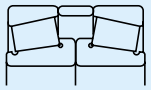
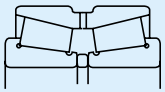
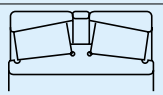


Besides metric design tapered roller bearings, there are also inch design bearings. For the cone assemblies and cups of inch design bearings, except four-row tapered roller bearings, the bearing numbers are approximately formulated as follows:




For tapered roller bearings, besides single-row bearings, there are also various combinations of bearings.
The cages of tapered roller bearings are usually pressed steel.

**Table 1 Design and Featured of Combinations of Tapered Roller Bearings**

| Figure | Arrangement | Examples of Bearing No. | Features |
|---|---|---|---|
|  | Back-to-back | HR30210JDB+KLR10 | Two standard bearings are combined. The bearing clearances are adjusted by cone spacers or cup spacers. The cones and cups and spacers are marked with serial numbers and mating marks. Components with the same serial number can be assembled referring to the matching symbols. |
|  | Face-to-face | HR30210JDF+KR | |
|  | KBE Type | 100KBE31+L | The KBE type is a back-to-back arrangement of bearings with the cup and spacer integrated, and the KH type is a face-to-face arrangement in which the cones are integrated. Since the bearing clearance is adjusted using spacers, it is necessary for components to have the same serial number for assembly with reference to matching symbols. |
|  | KH Type | 110KH31+K | |





## TOLERANCES AND RUNNING ACCURACY

**METRIC DESIGN TAPERED ROLLER BEARINGS** ..... Table 8.3 (Pages A64 to A67)
**INCH DESIGN TAPERED ROLLER BEARINGS** ..... Table 8.4 (Pages A68 and A69)

Among inch design tapered roller bearings, there are those to which the following precision classes apply. For more details, please consult with NSK.

(1) J line bearings(in the bearing tables, bearings preceeded by ▲)

**Table 2 Tolerances for Cones(CLASS K)**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $V_{dp}$ | $V_{dmp}$ | $K_{ia}$ |
|---|---|---|---|---|---|---|
| over | incl | high | low | max. | max. | max. |
| 10 | 18 | 0 | −12 | 12 | 9 | 15 |
| 18 | 30 | 0 | −12 | 12 | 9 | 18 |
| 30 | 50 | 0 | −12 | 12 | 9 | 20 |
| 50 | 80 | 0 | −15 | 15 | 11 | 25 |
| 80 | 120 | 0 | −20 | 20 | 15 | 30 |
| 120 | 180 | 0 | −25 | 25 | 19 | 35 |
| 180 | 250 | 0 | −30 | 30 | 23 | 50 |
| 250 | 315 | 0 | −35 | 35 | 26 | 60 |
| 315 | 400 | 0 | −40 | 40 | 30 | 70 |

**Table 3 Tolerances for Cups(CALSS K)**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Dmp}$ | | $V_{Dp}$ | $V_{Dmp}$ | $K_{ea}$ |
|---|---|---|---|---|---|---|
| over | incl | high | low | max. | max. | max. |
| 18 | 30 | 0 | −12 | 12 | 9 | 18 |
| 30 | 50 | 0 | −14 | 14 | 11 | 20 |
| 50 | 80 | 0 | −16 | 16 | 12 | 25 |
| 80 | 120 | 0 | −18 | 18 | 14 | 35 |
| 120 | 150 | 0 | −20 | 20 | 15 | 40 |
| 150 | 180 | 0 | −25 | 25 | 19 | 45 |
| 180 | 250 | 0 | −30 | 30 | 23 | 50 |
| 250 | 315 | 0 | −35 | 35 | 26 | 60 |
| 315 | 400 | 0 | −40 | 40 | 30 | 70 |
| 400 | 500 | 0 | −45 | 45 | 34 | 80 |

**Table 4 Tolerances for Effective Widths of Cone Assemblies and Cups, and Overall Width (CLASS K)**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | Effective Width Deviation of Cone Assembly $\Delta_{T1s}$ | | Effective Width Deviation of Cup $\Delta_{T2s}$ | | Overall Width Deviation $\Delta_{Ts}$ | |
|---|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | high | low |
| 10 | 80 | +100 | 0 | +100 | 0 | +200 | 0 |
| 80 | 120 | +100 | −100 | +100 | −100 | +200 | −200 |
| 120 | 315 | +150 | −150 | +200 | −100 | +350 | −250 |
| 315 | 400 | +200 | −200 | +200 | −200 | +400 | −400 |

(2) Bearings for Front Axles of Automobiles

(In the bearing tables, those preceded by t)

**Table 5 Tolerances for Bore Diameter and Overall Width**

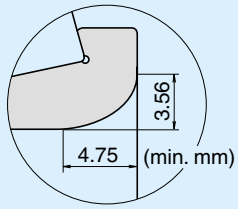
Units : μm

| Nominal Bore Diameter $d$ | | | | Bore Diameter Deviation $\Delta_{ds}$ | | Overall Width Deviation $\Delta_{Ts}$ | |
|---|---|---|---|---|---|---|---|
| over | | incl | | hig | hlow | hig | hlow |
| (mm) | 1/25.4 | (mm) | 1/25.4 | | | | |
| — | | 76.200 | 3.0000 | +20 | 0 | +356 | 0 |

The tolerances for outside diameter and those for radial runout of the cones and cups conform to Table 8.4.2 (Pages A68 and A69).

(3) Special Chamfer Dimensions

For bearings marked "spec." in the column of $r$ in the bearing tables, the chamfer dimension of the cone back-face side is as shown on the following figure.




## RECOMMENDED FITS

**METRIC DESIGN TAPERED ROLLER BEARINGS** ..... Table 9.2 (Page A84)
Table 9.4 (Page A85)

**INCH DESIGN TAPERED ROLLER BEARINGS** ..... Table 9.6 (Page A86)
Table 9.7 (Page A87)





## INTERNAL CLEARANCE

**METRIC DESIGN TAPERED ROLLER BEARINGS (Matched and Double-Row)** ..... Table 9.16 (Page A93)

**INCH DESIGN TAPERED ROLLER BEARINGS (Matched and Double-Row)** ..... Table 9.16 (Page A93)

## DIMENSIONS RELATED TO MOUNTING

The dimensions related to mounting tapered roller bearings are listed in the bearing tables. Since the cages protrude from the ring faces of tapered roller bearings, please use care when designing shafts and housings.

When heavy axial loads are imposed, the shaft shoulder dimensions and strength must be sufficient to support the cone rib.

## PERMISSIBLE MISALIGNMENT

The permissible misalignment angle for tapered roller bearings is approximately 0.0009 radian (3′).

## LIMITING SPEEDS

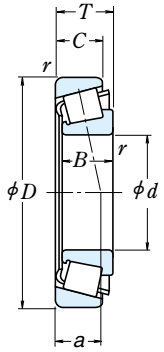
The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

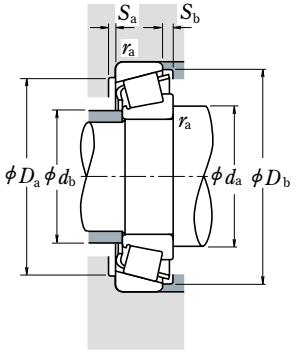
## PRECAUTIONS FOR USE OF TAPERED ROLLER BEARINGS

1. If the load on tapered roller bearings becomes too small, or if the ratio of the axial and radial loads for matched bearings exceeds '$e$'($e$ is listed in the bearing tables)during operation, slippage between the rollers and raceways occurs, which may result in smearing. Especially with large bearings since the weight of the rollers and cage is high. If such load conditions are expected, please contact NSK for selection of the bearings.

2. Confirm the dimension of "Abutment and Fillet Dimensions" of $D_a$, $D_b$, $S_a$, $S_b$ at the time of the HR series adoption.

## Bore Diameter 15 – 28 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

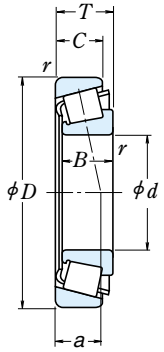
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

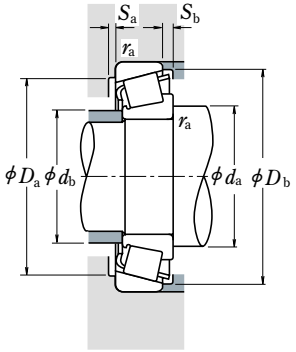
| Bearing Numbers | ISO355 Dimension Series approx. | Boundary Dimensions (mm) d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) Cr | C0r | {kgf} Cr | C0r | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **30202** | — | **15** | 35 | 11.75 | 11 | 10 | 0.6 | 0.6 | 14 800 | 13 200 | 1 510 | 1 350 | 11 000 | 15 000 |
| **HR 30302 J** | 2FB | | 42 | 14.25 | 13 | 11 | 1 | 1 | 23 600 | 21 100 | 2 400 | 2 160 | 9 500 | 13 000 |
| **HR 30203 J** | 2DB | **17** | 40 | 13.25 | 12 | 11 | 1 | 1 | 20 100 | 19 900 | 2 050 | 2 030 | 9 500 | 13 000 |
| **HR 32203 J** | 2DD | | 40 | 17.25 | 16 | 14 | 1 | 1 | 27 100 | 28 000 | 2 770 | 2 860 | 9 500 | 13 000 |
| **HR 30303 J** | 2FB | | 47 | 15.25 | 14 | 12 | 1 | 1 | 29 200 | 26 700 | 2 980 | 2 720 | 8 500 | 12 000 |
| **30303 D** | — | | 47 | 15.25 | 14 | 10.5 | 1 | 1 | 22 000 | 20 300 | 2 240 | 2 070 | 8 000 | 11 000 |
| **HR 32303 J** | 2FD | | 47 | 20.25 | 19 | 16 | 1 | 1 | 37 500 | 36 500 | 3 800 | 3 750 | 8 500 | 11 000 |
| **HR 32004 XJ** | 3CC | **20** | 42 | 15 | 15 | 12 | 0.6 | 0.6 | 24 600 | 27 400 | 2 510 | 2 800 | 9 000 | 12 000 |
| **HR 30204 J** | 2DB | | 47 | 15.25 | 14 | 12 | 1 | 1 | 27 900 | 28 500 | 2 850 | 2 900 | 8 000 | 11 000 |
| **HR 30204 C-A-** | — | | 47 | 15.25 | 14 | 12 | 0.3 | 1 | 23 900 | 24 000 | 2 430 | 2 450 | 8 000 | 11 000 |
| **HR 32204 J** | 2DD | | 47 | 19.25 | 18 | 15 | 1 | 1 | 35 500 | 37 500 | 3 650 | 3 850 | 8 500 | 11 000 |
| **HR 32204 CJ** | 5DD | | 47 | 19.25 | 18 | 15 | 1 | 1 | 31 500 | 33 500 | 3 200 | 3 400 | 8 000 | 11 000 |
| **HR 30304 J** | 2FB | | 52 | 16.25 | 15 | 13 | 1.5 | 1.5 | 35 000 | 33 500 | 3 550 | 3 400 | 7 500 | 10 000 |
| **30304 D** | — | | 52 | 16.25 | 15 | 12 | 1.5 | 1.5 | 25 300 | 24 500 | 2 580 | 2 490 | 7 100 | 10 000 |
| **HR 32304 J** | 2FD | | 52 | 22.25 | 21 | 18 | 1.5 | 1.5 | 45 500 | 47 500 | 4 650 | 4 850 | 8 000 | 11 000 |
| **HR 320/22 XJ** | 3CC | **22** | 44 | 15 | 15 | 11.5 | 0.6 | 0.6 | 25 600 | 29 400 | 2 610 | 3 000 | 8 500 | 11 000 |
| **HR 302/22** | — | | 50 | 15.25 | 14 | 12 | 1 | 1 | 29 200 | 30 500 | 2 980 | 3 150 | 7 500 | 10 000 |
| **HR 302/22 C** | — | | 50 | 15.25 | 14 | 12 | 1 | 1 | 27 200 | 29 500 | 2 780 | 3 000 | 7 500 | 10 000 |
| **HR 322/22** | — | | 50 | 19.25 | 18 | 15 | 1 | 1 | 36 500 | 40 500 | 3 750 | 4 100 | 7 500 | 11 000 |
| **HR 322/22 C** | — | | 50 | 19.25 | 18 | 15 | 1 | 1 | 33 500 | 39 500 | 3 400 | 4 000 | 7 500 | 10 000 |
| **HR 303/22** | — | | 56 | 17.25 | 16 | 14 | 1.5 | 1.5 | 37 000 | 36 500 | 3 750 | 3 750 | 7 100 | 9 500 |
| **HR 303/22 C** | — | | 56 | 17.25 | 16 | 13 | 1.5 | 1.5 | 34 500 | 34 000 | 3 500 | 3 500 | 6 700 | 9 500 |
| **HR 32005 XJ** | 4CC | **25** | 47 | 15 | 15 | 11.5 | 0.6 | 0.6 | 27 400 | 33 000 | 2 800 | 3 400 | 8 000 | 11 000 |
| **HR 33005 J** | 2CE | | 47 | 17 | 17 | 14 | 0.6 | 0.6 | 31 000 | 38 000 | 3 150 | 3 900 | 8 000 | 11 000 |
| **HR 30205 J** | 3CC | | 52 | 16.25 | 15 | 13 | 1 | 1 | 32 000 | 35 000 | 3 300 | 3 550 | 7 100 | 10 000 |
| **HR 30205 C** | — | | 52 | 16.25 | 15 | 12 | 1 | 1 | 28 100 | 31 500 | 2 860 | 3 200 | 9 700 | 9 500 |
| **HR 32205 J** | 2CD | | 52 | 19.25 | 18 | 16 | 1 | 1 | 40 000 | 45 000 | 4 050 | 4 600 | 7 100 | 10 000 |
| **HR 32205 C** | — | | 52 | 19.25 | 18 | 15 | 1 | 1 | 35 000 | 42 000 | 3 550 | 4 250 | 7 100 | 9 500 |
| **HR 33205 J** | 2DE | | 52 | 22 | 22 | 18 | 1 | 1 | 47 500 | 56 500 | 4 850 | 5 750 | 7 500 | 10 000 |
| **HR 30305 J** | 2FB | | 62 | 18.25 | 17 | 15 | 1.5 | 1.5 | 47 500 | 46 000 | 4 850 | 4 700 | 6 300 | 8 500 |
| **HR 30305 C** | — | | 62 | 18.25 | 17 | 14 | 1.5 | 1.5 | 42 000 | 45 000 | 4 300 | 4 550 | 6 000 | 8 500 |
| **HR 30305 DJ** | (7FB) | | 62 | 18.25 | 17 | 13 | 1.5 | 1.5 | 38 000 | 40 500 | 3 900 | 4 100 | 5 600 | 8 000 |
| **HR 31305 J** | 7FB | | 62 | 18.25 | 17 | 13 | 1.5 | 1.5 | 38 000 | 40 500 | 3 900 | 4 100 | 5 600 | 8 000 |
| **HR 32305 J** | 2FD | | 62 | 25.25 | 24 | 20 | 1.5 | 1.5 | 62 500 | 66 000 | 6 400 | 6 750 | 6 300 | 8 500 |
| **HR 320/28 XJ** | 4CC | **28** | 52 | 16 | 16 | 12 | 1 | 1 | 32 000 | 39 000 | 3 300 | 3 950 | 7 100 | 9 500 |
| **HR 302/28** | — | | 58 | 17.25 | 16 | 14 | 1 | 1 | 39 500 | 41 500 | 4 050 | 4 200 | 6 300 | 9 000 |
| **HR 302/28 C** | — | | 58 | 17.25 | 16 | 12 | 1 | 1 | 34 000 | 38 500 | 3 450 | 3 900 | 6 300 | 8 500 |
| **HR 322/28** | — | | 58 | 20.25 | 19 | 16 | 1 | 1 | 47 500 | 54 000 | 4 850 | 5 500 | 6 300 | 9 000 |
| **HR 322/28 CJ** | 5DD | | 58 | 20.25 | 19 | 16 | 1 | 1 | 42 000 | 49 500 | 4 300 | 5 050 | 6 300 | 9 000 |
| **HR 303/28** | — | | 68 | 19.75 | 18 | 15 | 1.5 | 1.5 | 55 000 | 55 500 | 5 650 | 5 650 | 6 000 | 8 000 |
| **HR 303/28 C** | — | | 68 | 19.75 | 18 | 14 | 1.5 | 1.5 | 49 500 | 50 500 | 5 000 | 5 150 | 5 600 | 7 500 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) da min. | db max. | Da max. | Da min. | Db min. | Sa min. | Sb min. | Cone ra max. | Cup ra max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors Y1 | Y0 | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **30202** | 23 | 19 | 30 | 30 | 33 | 2 | 1.5 | 0.6 | 0.6 | 8.2 | 0.32 | 1.9 | 1.0 | 0.053 |
| **HR 30302 J** | 24 | 22 | 36 | 36 | 38.5 | 2 | 3 | 1 | 1 | 9.5 | 0.29 | 2.1 | 1.2 | 0.098 |
| **HR 30203 J** | 26 | 23 | 34 | 34 | 37.5 | 2 | 2 | 1 | 1 | 9.7 | 0.35 | 1.7 | 0.96 | 0.079 |
| **HR 32203 J** | 26 | 22 | 34 | 34 | 37 | 2 | 3 | 1 | 1 | 11.2 | 0.31 | 1.9 | 1.1 | 0.103 |
| **HR 30303 J** | 26 | 24 | 41 | 40 | 43 | 2 | 3 | 1 | 1 | 10.4 | 0.29 | 2.1 | 1.2 | 0.134 |
| **30303 D** | 29 | 23 | 41 | 34 | 44 | 2 | 4.5 | 1 | 1 | 15.4 | 0.81 | 0.74 | 0.41 | 0.129 |
| **HR 32303 J** | 28 | 23 | 41 | 39 | 43 | 2 | 4 | 1 | 1 | 12.5 | 0.29 | 2.1 | 1.2 | 0.178 |
| **HR 32004 XJ** | 28 | 24 | 37 | 35 | 40 | 3 | 3 | 0.6 | 0.6 | 10.6 | 0.37 | 1.6 | 0.88 | 0.097 |
| **HR 30204 J** | 29 | 27 | 41 | 40 | 44 | 2 | 3 | 1 | 1 | 11.0 | 0.35 | 1.7 | 0.96 | 0.127 |
| **HR 30204 C-A-** | 29 | 26 | 41 | 37 | 44 | 2 | 3 | 0.3 | 1 | 13.0 | 0.55 | 1.1 | 0.60 | 0.126 |
| **HR 32204 J** | 29 | 25 | 41 | 38 | 44.5 | 3 | 4 | 1 | 1 | 12.6 | 0.33 | 1.8 | 1.0 | 0.161 |
| **HR 32204 CJ** | 29 | 25 | 41 | 36 | 44 | 2 | 4 | 1 | 1 | 14.5 | 0.52 | 1.2 | 0.64 | 0.166 |
| **HR 30304 J** | 31 | 27 | 44 | 44 | 47.5 | 2 | 3 | 1.5 | 1.5 | 11.6 | 0.30 | 2.0 | 1.1 | 0.172 |
| **30304 D** | 34 | 26 | 43 | 37 | 49 | 2 | 4 | 1.5 | 1.5 | 16.7 | 0.81 | 0.74 | 0.41 | 0.168 |
| **HR 32304 J** | 33 | 26 | 43 | 42 | 48 | 3 | 4 | 1.5 | 1.5 | 13.9 | 0.30 | 2.0 | 1.1 | 0.241 |
| **HR 320/22 XJ** | 30 | 27 | 39 | 37 | 42 | 3 | 3.5 | 0.6 | 0.6 | 11.1 | 0.40 | 1.5 | 0.83 | 0.103 |
| **HR 302/22** | 31 | 29 | 44 | 42 | 47 | 2 | 3 | 1 | 1 | 11.6 | 0.37 | 1.6 | 0.90 | 0.139 |
| **HR 302/22 C** | 31 | 29 | 44 | 40 | 47 | 2 | 3 | 1 | 1 | 13.0 | 0.49 | 1.2 | 0.67 | 0.144 |
| **HR 322/22** | 31 | 28 | 44 | 41 | 47 | 2 | 4 | 1 | 1 | 13.5 | 0.37 | 1.6 | 0.89 | 0.18 |
| **HR 322/22 C** | 31 | 29 | 44 | 39 | 48 | 2 | 4 | 1 | 1 | 15.2 | 0.51 | 1.2 | 0.65 | 0.185 |
| **HR 303/22** | 33 | 30 | 47 | 46 | 50 | 2 | 3 | 1.5 | 1.5 | 12.4 | 0.32 | 1.9 | 1.0 | 0.208 |
| **HR 303/22 C** | 33 | 30 | 47 | 44 | 52.5 | 3 | 4 | 1.5 | 1.5 | 15.9 | 0.59 | 1.0 | 0.56 | 0.207 |
| **HR 32005 XJ** | 33 | 30 | 42 | 40 | 45 | 3 | 3.5 | 0.6 | 0.6 | 11.8 | 0.43 | 1.4 | 0.77 | 0.116 |
| **HR 33005 J** | 33 | 29 | 42 | 41 | 44 | 3 | 3 | 0.6 | 0.6 | 11.0 | 0.29 | 2.1 | 1.1 | 0.131 |
| **HR 30205 J** | 34 | 31 | 46 | 44 | 48.5 | 2 | 3 | 1 | 1 | 12.7 | 0.37 | 1.6 | 0.88 | 0.157 |
| **HR 30205 C** | 34 | 32 | 46 | 43 | 49.5 | 2 | 4 | 1 | 1 | 14.4 | 0.53 | 1.1 | 0.62 | 0.155 |
| **HR 32205 J** | 34 | 30 | 46 | 44 | 50 | 2 | 3 | 1 | 1 | 13.5 | 0.36 | 1.7 | 0.92 | 0.189 |
| **HR 32205 C** | 34 | 30 | 46 | 40 | 50 | 2 | 4 | 1 | 1 | 15.8 | 0.53 | 1.1 | 0.62 | 0.19 |
| **HR 33205 J** | 34 | 29 | 46 | 43 | 49.5 | 4 | 4 | 1 | 1 | 14.1 | 0.35 | 1.7 | 0.94 | 0.221 |
| **HR 30305 J** | 36 | 34 | 54 | 54 | 57 | 2 | 3 | 1.5 | 1.5 | 13.2 | 0.30 | 2.0 | 1.1 | 0.27 |
| **HR 30305 C** | 36 | 35 | 53 | 49 | 58.5 | 3 | 4 | 1.5 | 1.5 | 16.4 | 0.55 | 1.1 | 0.60 | 0.276 |
| **HR 30305 DJ** | 39 | 34 | 53 | 47 | 59 | 2 | 5 | 1.5 | 1.5 | 19.9 | 0.83 | 0.73 | 0.40 | 0.265 |
| **HR 31305 J** | 39 | 33 | 53 | 47 | 59 | 3 | 5 | 1.5 | 1.5 | 19.9 | 0.83 | 0.73 | 0.40 | 0.265 |
| **HR 32305 J** | 38 | 32 | 53 | 51 | 57 | 3 | 5 | 1.5 | 1.5 | 15.6 | 0.30 | 2.0 | 1.1 | 0.376 |
| **HR 320/28 XJ** | 37 | 33 | 46 | 44 | 50 | 3 | 4 | 1 | 1 | 12.8 | 0.43 | 1.4 | 0.77 | 0.146 |
| **HR 302/28** | 37 | 34 | 52 | 50 | 55 | 2 | 3 | 1 | 1 | 13.2 | 0.35 | 1.7 | 0.93 | 0.203 |
| **HR 302/28 C** | 37 | 34 | 52 | 48 | 54 | 2 | 5 | 1 | 1 | 16.9 | 0.64 | 0.94 | 0.52 | 0.198 |
| **HR 322/28** | 37 | 34 | 52 | 49 | 55 | 2 | 4 | 1 | 1 | 14.6 | 0.37 | 1.6 | 0.89 | 0.243 |
| **HR 322/28 CJ** | 37 | 33 | 52 | 45 | 55 | 2 | 4 | 1 | 1 | 16.8 | 0.56 | 1.1 | 0.59 | 0.251 |
| **HR 303/28** | 39 | 37 | 59 | 58 | 61 | 2 | 4.5 | 1.5 | 1.5 | 14.5 | 0.31 | 1.9 | 1.1 | 0.341 |
| **HR 303/28 C** | 39 | 38 | 59 | 57 | 63 | 3 | 5.5 | 1.5 | 1.5 | 17.4 | 0.52 | 1.2 | 0.64 | 0.335 |

**Remarks** The suffix C represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix C.

## Bore Diameter 30 – 35 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

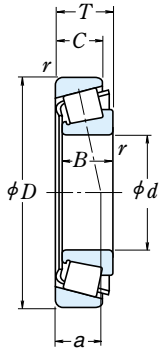
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

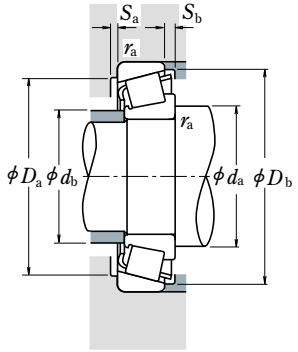
| d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) $C_r$ | $C_{0r}$ | Basic Load Ratings {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **30** | 47 | 12 | 12 | 9 | 0.3 | 0.3 | 17 600 | 24 400 | 1 800 | 2 490 | 7 500 | 10 000 |
| | 55 | 17 | 17 | 13 | 1 | 1 | 36 000 | 44 500 | 3 700 | 4 550 | 6 700 | 9 000 |
| | 55 | 20 | 20 | 16 | 1 | 1 | 42 000 | 54 000 | 4 250 | 5 500 | 6 700 | 9 000 |
| | 62 | 17.25 | 16 | 14 | 1 | 1 | 43 000 | 47 500 | 4 400 | 4 850 | 6 000 | 8 000 |
| | 62 | 17.25 | 16 | 12 | 1 | 1 | 35 500 | 37 000 | 3 650 | 3 800 | 5 600 | 7 500 |
| | 62 | 21.25 | 20 | 17 | 1 | 1 | 52 000 | 60 000 | 5 300 | 6 150 | 6 000 | 8 500 |
| | 62 | 21.25 | 20 | 16 | 1 | 1 | 48 000 | 56 000 | 4 900 | 5 750 | 6 000 | 8 000 |
| | 62 | 25 | 25 | 19.5 | 1 | 1 | 66 500 | 79 500 | 6 800 | 8 100 | 6 000 | 8 000 |
| | 72 | 20.75 | 19 | 16 | 1.5 | 1.5 | 59 500 | 60 000 | 6 050 | 6 100 | 5 300 | 7 500 |
| | 72 | 20.75 | 19 | 14 | 1.5 | 1.5 | 56 500 | 55 500 | 5 800 | 5 650 | 5 300 | 7 100 |
| | 72 | 20.75 | 19 | 14 | 1.5 | 1.5 | 49 000 | 52 500 | 5 000 | 5 350 | 4 800 | 6 700 |
| | 72 | 20.75 | 19 | 14 | 1.5 | 1.5 | 49 000 | 52 500 | 5 000 | 5 350 | 4 800 | 6 800 |
| | 72 | 28.75 | 27 | 23 | 1.5 | 1.5 | 80 000 | 88 500 | 8 150 | 9 000 | 5 600 | 7 500 |
| | 72 | 28.75 | 27 | 23 | 1.5 | 1.5 | 76 000 | 86 500 | 7 750 | 8 800 | 5 600 | 7 500 |
| **32** | 58 | 17 | 17 | 13 | 1 | 1 | 37 500 | 47 000 | 3 800 | 4 800 | 6 300 | 8 500 |
| | 58 | 21 | 20 | 16 | 1 | 1 | 41 000 | 50 000 | 4 150 | 5 100 | 6 300 | 8 500 |
| | 65 | 18.25 | 17 | 15 | 1 | 1 | 48 500 | 54 000 | 4 950 | 5 500 | 5 600 | 8 000 |
| | 65 | 18.25 | 17 | 14 | 1 | 1 | 45 500 | 52 500 | 4 650 | 5 350 | 5 600 | 7 500 |
| | 65 | 22.25 | 21 | 18 | 1 | 1 | 56 000 | 65 000 | 5 700 | 6 650 | 6 000 | 8 000 |
| | 65 | 22.25 | 21 | 17 | 1 | 1 | 49 500 | 60 000 | 5 050 | 6 100 | 5 600 | 7 500 |
| | 65 | 26 | 26 | 20.5 | 1 | 1 | 70 000 | 86 500 | 7 150 | 8 850 | 5 600 | 8 000 |
| | 75 | 21.75 | 20 | 17 | 1.5 | 1.5 | 56 000 | 56 000 | 5 700 | 5 700 | 5 300 | 7 100 |
| **35** | 55 | 14 | 14 | 11.5 | 0.6 | 0.6 | 27 400 | 39 000 | 2 790 | 3 950 | 6 300 | 8 500 |
| | 62 | 18 | 18 | 14 | 1 | 1 | 43 500 | 55 500 | 4 400 | 5 650 | 5 600 | 8 000 |
| | 62 | 21 | 21 | 17 | 1 | 1 | 49 000 | 65 000 | 4 950 | 6 650 | 5 600 | 8 000 |
| | 72 | 18.25 | 17 | 15 | 1.5 | 1.5 | 54 000 | 59 500 | 5 500 | 6 050 | 5 300 | 7 100 |
| | 72 | 18.25 | 17 | 13 | 1.5 | 1.5 | 47 000 | 54 500 | 4 750 | 5 550 | 5 000 | 6 700 |
| | 72 | 24.25 | 23 | 19 | 1.5 | 1.5 | 70 500 | 83 500 | 7 150 | 8 550 | 5 300 | 7 100 |
| | 72 | 24.25 | 23 | 18 | 1.5 | 1.5 | 60 500 | 71 500 | 6 200 | 7 300 | 5 000 | 7 100 |
| | 72 | 28 | 28 | 22 | 1.5 | 1.5 | 86 500 | 108 000 | 8 850 | 11 100 | 5 300 | 7 100 |
| | 80 | 22.75 | 21 | 18 | 2 | 1.5 | 76 000 | 79 000 | 7 750 | 8 050 | 4 800 | 6 700 |
| | 80 | 22.75 | 21 | 16 | 2 | 1.5 | 68 000 | 70 500 | 6 900 | 7 200 | 4 800 | 6 300 |
| | 80 | 22.75 | 21 | 15 | 2 | 1.5 | 62 000 | 68 000 | 6 350 | 6 950 | 4 300 | 6 000 |
| | 80 | 22.75 | 21 | 15 | 2 | 1.5 | 62 000 | 68 000 | 6 350 | 6 950 | 4 300 | 6 000 |
| | 80 | 32.75 | 31 | 25 | 2 | 1.5 | 99 000 | 111 000 | 10 100 | 11 300 | 5 000 | 6 700 |

| Bearing Numbers | ISO355 Dimension Series approx. | Abutment and Fillet Dimensions (mm) $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors $Y_1$ | $Y_0$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32906 J** | 2BD | 34 | 34 | 44 | 42 | 44 | 3 | 3 | 0.3 | 0.3 | 9.2 | 0.32 | 1.9 | 1.0 | 0.074 |
| **HR 32006 XJ** | 4CC | 39 | 35 | 49 | 47 | 53 | 3 | 4 | 1 | 1 | 13.5 | 0.43 | 1.4 | 0.77 | 0.172 |
| **HR 33006 J** | 2CE | 39 | 35 | 49 | 48 | 52 | 3 | 4 | 1 | 1 | 13.1 | 0.29 | 2.1 | 1.1 | 0.208 |
| **HR 30206 J** | 3DB | 39 | 37 | 56 | 52 | 58 | 2 | 3 | 1 | 1 | 13.9 | 0.37 | 1.6 | 0.88 | 0.238 |
| **HR 30206 C** | — | 39 | 36 | 56 | 49 | 59 | 2 | 5 | 1 | 1 | 17.8 | 0.68 | 0.88 | 0.49 | 0.221 |
| **HR 32206 J** | 3DC | 39 | 36 | 56 | 51 | 58.5 | 2 | 4 | 1 | 1 | 15.4 | 0.37 | 1.6 | 0.88 | 0.297 |
| **HR 32206 C** | — | 39 | 35 | 56 | 48 | 59 | 2 | 5 | 1 | 1 | 17.8 | 0.55 | 1.1 | 0.60 | 0.293 |
| **HR 33206 J** | 2DE | 39 | 35 | 56 | 52 | 59.5 | 5 | 5.5 | 1 | 1 | 16.1 | 0.34 | 1.8 | 0.97 | 0.355 |
| **HR 30306 J** | 2FB | 41 | 40 | 63 | 62 | 66 | 3 | 4.5 | 1.5 | 1.5 | 15.1 | 0.32 | 1.9 | 1.1 | 0.403 |
| **HR 30306 C** | — | 41 | 38 | 63 | 59 | 67 | 3 | 6.5 | 1.5 | 1.5 | 18.5 | 0.55 | 1.1 | 0.60 | 0.383 |
| **HR 30306 DJ** | (7FB) | 44 | 40 | 63 | 55 | 68 | 3 | 6.5 | 1.5 | 1.5 | 23.1 | 0.83 | 0.73 | 0.40 | 0.393 |
| **HR 31306 J** | 7FB | 44 | 40 | 63 | 55 | 68 | 3 | 6.5 | 1.5 | 1.5 | 23.1 | 0.83 | 0.73 | 0.40 | 0.393 |
| **HR 32306 J** | 2FD | 43 | 38 | 63 | 59 | 66 | 3 | 5.5 | 1.5 | 1.5 | 18.0 | 0.32 | 1.9 | 1.1 | 0.57 |
| **HR 32306 CJ** | 5FD | 43 | 36 | 63 | 54 | 68 | 3 | 5.5 | 1.5 | 1.5 | 22.0 | 0.55 | 1.1 | 0.60 | 0.583 |
| **HR 320/32 XJ** | 4CC | 41 | 37 | 52 | 49 | 55 | 3 | 4 | 1 | 1 | 14.2 | 0.45 | 1.3 | 0.73 | 0.191 |
| **330/32** | — | 41 | 37 | 52 | 50 | 55 | 2 | 4 | 1 | 1 | 13.8 | 0.31 | 1.9 | 1.1 | 0.225 |
| **HR 302/32** | — | 41 | 39 | 59 | 56 | 61 | 3 | 3 | 1 | 1 | 14.7 | 0.37 | 1.6 | 0.88 | 0.277 |
| **HR 302/32 C** | — | 41 | 39 | 59 | 54 | 62 | 3 | 4 | 1 | 1 | 16.9 | 0.55 | 1.1 | 0.60 | 0.273 |
| **HR 322/32** | — | 41 | 38 | 59 | 54 | 61 | 3 | 4 | 1 | 1 | 15.9 | 0.37 | 1.6 | 0.88 | 0.336 |
| **HR 322/32 C** | — | 41 | 39 | 59 | 51 | 62 | 3 | 5 | 1 | 1 | 20.2 | 0.59 | 1.0 | 0.56 | 0.335 |
| **HR 332/32 J** | 2DE | 41 | 38 | 59 | 55 | 62 | 5 | 5.5 | 1 | 1 | 17.0 | 0.35 | 1.7 | 0.95 | 0.40 |
| **303/32** | — | 44 | 42 | 66 | 64 | 68 | 3 | 4.5 | 1.5 | 1.5 | 15.9 | 0.33 | 1.8 | 1.0 | 0.435 |
| **HR 32907 J** | 2BD | 43 | 40 | 50 | 50 | 52.5 | 3 | 2.5 | 0.6 | 0.6 | 10.7 | 0.29 | 2.1 | 1.1 | 0.123 |
| **HR 32007 XJ** | 4CC | 44 | 40 | 56 | 54 | 60 | 4 | 4 | 1 | 1 | 15.0 | 0.45 | 1.3 | 0.73 | 0.229 |
| **HR 33007 J** | 2CE | 44 | 40 | 56 | 55 | 59 | 4 | 4 | 1 | 1 | 14.1 | 0.31 | 2.0 | 1.1 | 0.267 |
| **HR 30207 J** | 3DB | 46 | 43 | 63 | 62 | 67 | 3 | 3 | 1.5 | 1.5 | 15.0 | 0.37 | 1.6 | 0.88 | 0.34 |
| **HR 30207 C** | — | 46 | 44 | 63 | 59 | 68 | 3 | 5 | 1.5 | 1.5 | 19.6 | 0.66 | 0.91 | 0.50 | 0.331 |
| **HR 32207 J** | 3DC | 46 | 42 | 63 | 61 | 67.5 | 3 | 5 | 1.5 | 1.5 | 17.9 | 0.37 | 1.6 | 0.88 | 0.456 |
| **HR 32207 C** | — | 46 | 42 | 63 | 58 | 68.5 | 3 | 6 | 1.5 | 1.5 | 20.6 | 0.55 | 1.1 | 0.60 | 0.442 |
| **HR 33207 J** | 2DE | 46 | 41 | 63 | 61 | 68 | 5 | 6 | 1.5 | 1.5 | 18.3 | 0.35 | 1.7 | 0.93 | 0.54 |
| **HR 30307 J** | 2FB | 47 | 45 | 71 | 69 | 74 | 3 | 4.5 | 2 | 1.5 | 16.7 | 0.32 | 1.9 | 1.1 | 0.538 |
| **HR 30307 C** | — | 47 | 44 | 71 | 65 | 74 | 3 | 6.5 | 2 | 1.5 | 20.3 | 0.55 | 1.1 | 0.60 | 0.518 |
| **HR 30307 DJ** | 7FB | 51 | 44 | 71 | 62 | 77 | 3 | 7.5 | 2 | 1.5 | 25.2 | 0.83 | 0.73 | 0.40 | 0.519 |
| **HR 31307 J** | 7FB | 51 | 44 | 71 | 62 | 77 | 3 | 7.5 | 2 | 1.5 | 25.2 | 0.83 | 0.73 | 0.40 | 0.52 |
| **HR 32307 J** | 2FE | 49 | 43 | 71 | 66 | 74 | 3 | 7.5 | 2 | 1.5 | 20.7 | 0.32 | 1.9 | 1.1 | 0.765 |

**Remarks** The suffix C represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix C.

## Bore Diameter 40 – 50 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

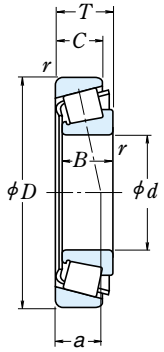
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

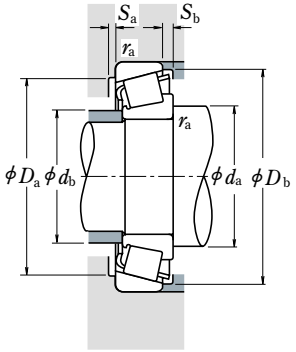
| Bearing Numbers | ISO355 Dimension Series approx. | Boundary Dimensions (mm) d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) Cr | C0r | {kgf} Cr | C0r | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32908 J** | 2BC | **40** | 62 | 15 | 15 | 12 | 0.6 | 0.6 | 34 000 | 47 000 | 3 450 | 4 800 | 5 600 | 7 500 |
| **HR 32008 XJ** | 3CD | | 68 | 19 | 19 | 14.5 | 1 | 1 | 53 000 | 71 000 | 5 400 | 7 250 | 5 300 | 7 100 |
| **HR 33008 J** | 2BE | | 68 | 22 | 22 | 18 | 1 | 1 | 59 000 | 81 500 | 6 000 | 8 300 | 5 300 | 7 100 |
| **HR 33108 J** | 2CE | | 75 | 26 | 26 | 20.5 | 1.5 | 1.5 | 78 500 | 101 000 | 8 000 | 10 300 | 4 800 | 6 700 |
| **HR 30208 J** | 3DB | | 80 | 19.75 | 18 | 16 | 1.5 | 1.5 | 63 500 | 70 000 | 6 450 | 7 150 | 4 800 | 6 300 |
| **HR 32208 J** | 3DC | | 80 | 24.75 | 23 | 19 | 1.5 | 1.5 | 77 000 | 90 500 | 7 900 | 9 200 | 4 800 | 6 300 |
| **HR 32208 CJ** | 5DC | | 80 | 24.75 | 23 | 19 | 1.5 | 1.5 | 74 000 | 90 500 | 7 550 | 9 200 | 4 500 | 6 300 |
| **HR 33208 J** | 2DE | | 80 | 32 | 32 | 25 | 1.5 | 1.5 | 107 000 | 137 000 | 10 900 | 14 000 | 4 800 | 6 300 |
| **HR 30308 J** | 2FB | | 90 | 25.25 | 23 | 20 | 2 | 1.5 | 90 500 | 101 000 | 9 250 | 10 300 | 4 300 | 5 600 |
| **HR 30308 C** | — | | 90 | 25.25 | 23 | 18 | 2 | 1.5 | 84 500 | 93 500 | 8 600 | 9 500 | 4 300 | 5 600 |
| **HR 30308 DJ** | 7FB | | 90 | 25.25 | 23 | 17 | 2 | 1.5 | 80 000 | 89 500 | 8 150 | 9 150 | 3 800 | 5 300 |
| **HR 31308 J** | 7FB | | 90 | 25.25 | 23 | 17 | 2 | 1.5 | 80 000 | 89 500 | 8 150 | 9 150 | 3 800 | 5 300 |
| **HR 32308 J** | 2FD | | 90 | 35.25 | 33 | 27 | 2 | 1.5 | 120 000 | 145 000 | 12 200 | 14 800 | 4 300 | 6 000 |
| **HR 32909 J** | 2BC | **45** | 68 | 15 | 15 | 12 | 0.6 | 0.6 | 34 500 | 50 500 | 3 550 | 5 150 | 5 000 | 6 700 |
| **HR 32009 XJ** | 3CC | | 75 | 20 | 20 | 15.5 | 1 | 1 | 60 000 | 83 000 | 6 150 | 8 450 | 4 500 | 6 300 |
| **HR 33009 J** | 2CE | | 75 | 24 | 24 | 19 | 1 | 1 | 69 000 | 99 000 | 7 050 | 10 100 | 4 800 | 6 300 |
| **HR 33109 J** | 3CE | | 80 | 26 | 26 | 20.5 | 1.5 | 1.5 | 84 000 | 113 000 | 8 550 | 11 600 | 4 500 | 6 000 |
| **HR 30209 J** | 3DB | | 85 | 20.75 | 19 | 16 | 1.5 | 1.5 | 68 500 | 79 500 | 6 950 | 8 100 | 4 300 | 6 000 |
| **HR 32209 J** | 3DC | | 85 | 24.75 | 23 | 19 | 1.5 | 1.5 | 83 000 | 102 000 | 8 500 | 10 400 | 4 300 | 6 000 |
| **HR 32209 CJ** | 5DC | | 85 | 24.75 | 23 | 19 | 1.5 | 1.5 | 75 500 | 95 500 | 7 700 | 9 750 | 4 300 | 5 600 |
| **HR 33209 J** | 3DE | | 85 | 32 | 32 | 25 | 1.5 | 1.5 | 111 000 | 147 000 | 11 300 | 15 000 | 4 300 | 6 000 |
| **T 7 FC045** | 7FC | | 95 | 29 | 26.5 | 20 | 2.5 | 2.5 | 88 500 | 109 000 | 9 050 | 11 100 | 3 600 | 5 000 |
| **T 2 ED045** | 2ED | | 95 | 36 | 35 | 30 | 2.5 | 2.5 | 139 000 | 174 000 | 14 200 | 17 800 | 4 000 | 5 300 |
| **HR 30309 J** | 2FB | | 100 | 27.25 | 25 | 22 | 2 | 1.5 | 112 000 | 127 000 | 11 400 | 12 900 | 3 800 | 5 300 |
| **HR 30309 DJ** | 7FB | | 100 | 27.25 | 25 | 18 | 2 | 1.5 | 95 500 | 109 000 | 9 750 | 11 100 | 3 400 | 4 800 |
| **HR 31309 J** | 7FB | | 100 | 27.25 | 25 | 18 | 2 | 1.5 | 95 500 | 109 000 | 9 750 | 11 100 | 3 400 | 4 800 |
| **HR 32309 J** | 2FD | | 100 | 38.25 | 36 | 30 | 2 | 1.5 | 144 000 | 177 000 | 14 700 | 18 000 | 3 800 | 5 300 |
| **T 2 ED050** | 2ED | **50** | 100 | 36 | 35 | 30 | 2.5 | 2.5 | 144 000 | 185 000 | 14 600 | 18 800 | 3 800 | 5 000 |
| **HR 32910 J** | 2BC | | 72 | 15 | 15 | 12 | 0.6 | 0.6 | 36 000 | 54 000 | 3 650 | 5 500 | 4 500 | 6 300 |
| **HR 32010 XJ** | 3CC | | 80 | 20 | 20 | 15.5 | 1 | 1 | 61 000 | 87 000 | 6 250 | 8 900 | 4 300 | 6 000 |
| **HR 33010 J** | 2CE | | 80 | 24 | 24 | 19 | 1 | 1 | 70 500 | 104 000 | 7 150 | 10 600 | 4 300 | 6 000 |
| **HR 33110 J** | 3CE | | 85 | 26 | 26 | 20 | 1.5 | 1.5 | 89 000 | 126 000 | 9 100 | 12 800 | 4 300 | 5 600 |
| **HR 30210 J** | 3DB | | 90 | 21.75 | 20 | 17 | 1.5 | 1.5 | 76 000 | 91 500 | 7 750 | 9 300 | 4 000 | 5 300 |
| **HR 32210 J** | 3DC | | 90 | 24.75 | 23 | 19 | 1.5 | 1.5 | 87 500 | 109 000 | 8 900 | 11 100 | 4 000 | 5 300 |
| **HR 32210 CJ** | 5DC | | 90 | 24.75 | 23 | 18 | 1.5 | 1.5 | 77 500 | 102 000 | 7 900 | 10 400 | 3 800 | 5 300 |
| **HR 33210 J** | 3DE | | 90 | 32 | 32 | 24.5 | 1.5 | 1.5 | 118 000 | 165 000 | 12 100 | 16 800 | 4 000 | 5 300 |
| **T 7 FC050** | 7FC | | 105 | 32 | 29 | 22 | 3 | 3 | 109 000 | 133 000 | 11 100 | 13 600 | 3 200 | 4 500 |
| **HR 30310 J** | 2FB | | 110 | 29.25 | 27 | 23 | 2.5 | 2 | 130 000 | 148 000 | 13 300 | 15 100 | 3 400 | 4 800 |
| **HR 30310 DJ** | 7FB | | 110 | 29.25 | 27 | 19 | 2.5 | 2 | 114 000 | 132 000 | 11 700 | 13 400 | 3 200 | 4 300 |
| **HR 31310 J** | 7FB | | 110 | 29.25 | 27 | 19 | 2.5 | 2 | 114 000 | 132 000 | 11 700 | 13 400 | 3 200 | 4 300 |
| **HR 32310 J** | 2FD | | 110 | 42.25 | 40 | 33 | 2.5 | 2 | 176 000 | 220 000 | 17 900 | 22 400 | 3 600 | 4 800 |
| **HR 32310 CJ** | 5FD | | 110 | 42.25 | 40 | 33 | 2.5 | 2 | 164 000 | 218 000 | 16 800 | 22 200 | 3 400 | 4 800 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) da min. | db max. | Da max. | Da min. | Db min. | Sa min. | Sb min. | Cone ra max. | Cup ra max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors Y1 | Y0 | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32908 J** | 48 | 44 | 57 | 57 | 59 | 3 | 3 | 0.6 | 0.6 | 11.5 | 0.29 | 2.1 | 1.1 | 0.161 |
| **HR 32008 XJ** | 49 | 45 | 62 | 60 | 65.5 | 4 | 4.5 | 1 | 1 | 15.0 | 0.38 | 1.6 | 0.87 | 0.28 |
| **HR 33008 J** | 49 | 45 | 62 | 61 | 65 | 4 | 4 | 1 | 1 | 14.6 | 0.28 | 2.1 | 1.2 | 0.322 |
| **HR 33108 J** | 51 | 46 | 66 | 65 | 71 | 4 | 5.5 | 1.5 | 1.5 | 18.0 | 0.36 | 1.7 | 0.93 | 0.503 |
| **HR 30208 J** | 51 | 48 | 71 | 69 | 75 | 3 | 3.5 | 1.5 | 1.5 | 16.6 | 0.37 | 1.6 | 0.88 | 0.437 |
| **HR 32208 J** | 51 | 48 | 71 | 68 | 75 | 3 | 5.5 | 1.5 | 1.5 | 18.9 | 0.37 | 1.6 | 0.88 | 0.548 |
| **HR 32208 CJ** | 51 | 47 | 71 | 65 | 76 | 3 | 5.5 | 1.5 | 1.5 | 21.9 | 0.55 | 1.1 | 0.60 | 0.558 |
| **HR 33208 J** | 51 | 46 | 71 | 67 | 76 | 5 | 7 | 1.5 | 1.5 | 20.8 | 0.36 | 1.7 | 0.92 | 0.744 |
| **HR 30308 J** | 52 | 52 | 81 | 76 | 82 | 3 | 5 | 2 | 1.5 | 19.5 | 0.35 | 1.7 | 0.96 | 0.758 |
| **HR 30308 C** | 52 | 50 | 81 | 72 | 84 | 3 | 7 | 2 | 1.5 | 22.8 | 0.53 | 1.1 | 0.62 | 0.735 |
| **HR 30308 DJ** | 56 | 50 | 81 | 70 | 87 | 3 | 8 | 2 | 1.5 | 28.7 | 0.83 | 0.73 | 0.40 | 0.728 |
| **HR 31308 J** | 56 | 50 | 81 | 70 | 87 | 3 | 8 | 2 | 1.5 | 28.7 | 0.83 | 0.73 | 0.40 | 0.728 |
| **HR 32308 J** | 54 | 50 | 81 | 73 | 82 | 3 | 8 | 2 | 1.5 | 23.4 | 0.35 | 1.7 | 0.96 | 1.05 |
| **HR 32909 J** | 53 | 50 | 63 | 62 | 64 | 3 | 3 | 0.6 | 0.6 | 12.3 | 0.32 | 1.9 | 1.0 | 0.187 |
| **HR 32009 XJ** | 54 | 51 | 69 | 67 | 72 | 4 | 4.5 | 1 | 1 | 16.6 | 0.39 | 1.5 | 0.84 | 0.354 |
| **HR 33009 J** | 54 | 51 | 69 | 67 | 71 | 4 | 5 | 1 | 1 | 16.3 | 0.29 | 2.0 | 1.1 | 0.414 |
| **HR 33109 J** | 56 | 51 | 71 | 69 | 77 | 4 | 5.5 | 1.5 | 1.5 | 19.1 | 0.38 | 1.6 | 0.86 | 0.552 |
| **HR 30209 J** | 56 | 53 | 76 | 74 | 80 | 3 | 4.5 | 1.5 | 1.5 | 18.3 | 0.41 | 1.5 | 0.81 | 0.488 |
| **HR 32209 J** | 56 | 53 | 76 | 73 | 81 | 3 | 5.5 | 1.5 | 1.5 | 20.1 | 0.41 | 1.5 | 0.81 | 0.602 |
| **HR 32209 CJ** | 56 | 52 | 76 | 70 | 82 | 3 | 5.5 | 1.5 | 1.5 | 23.6 | 0.59 | 1.0 | 0.56 | 0.603 |
| **HR 33209 J** | 56 | 51 | 76 | 72 | 81 | 5 | 7 | 1.5 | 1.5 | 22.0 | 0.39 | 1.6 | 0.86 | 0.817 |
| **T 7 FC045** | 60 | 53 | 83 | 71 | 91 | 3 | 9 | 2 | 2 | 32.1 | 0.87 | 0.69 | 0.38 | 0.918 |
| **T 2 ED045** | 60 | 54 | 83 | 79 | 89 | 5 | 6 | 2 | 2 | 23.5 | 0.32 | 1.9 | 1.02 | 1.22 |
| **HR 30309 J** | 57 | 58 | 91 | 86 | 93 | 3 | 5 | 2 | 1.5 | 21.1 | 0.35 | 1.7 | 0.96 | 1.01 |
| **HR 30309 DJ** | 61 | 57 | 91 | 79 | 96 | 3 | 9 | 2 | 1.5 | 31.5 | 0.83 | 0.73 | 0.40 | 0.957 |
| **HR 31309 J** | 61 | 57 | 91 | 79 | 96 | 3 | 9 | 2 | 1.5 | 31.5 | 0.83 | 0.73 | 0.40 | 0.947 |
| **HR 32309 J** | 59 | 56 | 91 | 82 | 93 | 3 | 8 | 2 | 1.5 | 25.0 | 0.35 | 1.7 | 0.96 | 1.42 |
| **T 2 ED050** | 65 | 59 | 88 | 83 | 94 | 6 | 6 | 2 | 2 | 24.2 | 0.34 | 1.8 | 0.96 | 1.3 |
| **HR 32910 J** | 58 | 54 | 67 | 66 | 69 | 3 | 3 | 0.6 | 0.6 | 13.5 | 0.34 | 1.8 | 0.97 | 0.193 |
| **HR 32010 XJ** | 59 | 56 | 74 | 71 | 77 | 4 | 4.5 | 1 | 1 | 17.9 | 0.42 | 1.4 | 0.78 | 0.38 |
| **HR 33010 J** | 59 | 55 | 74 | 71 | 76 | 4 | 5 | 1 | 1 | 17.4 | 0.32 | 1.9 | 1.0 | 0.452 |
| **HR 33110 J** | 61 | 56 | 76 | 74 | 82 | 4 | 6 | 1.5 | 1.5 | 20.3 | 0.41 | 1.5 | 0.8 | 0.597 |
| **HR 30210 J** | 61 | 58 | 81 | 79 | 85 | 3 | 4.5 | 1.5 | 1.5 | 19.6 | 0.42 | 1.4 | 0.79 | 0.557 |
| **HR 32210 J** | 61 | 57 | 81 | 78 | 86 | 3 | 5.5 | 1.5 | 1.5 | 21.0 | 0.42 | 1.4 | 0.79 | 0.642 |
| **HR 32210 CJ** | 61 | 58 | 81 | 76 | 87 | 3 | 6.5 | 1.5 | 1.5 | 24.6 | 0.59 | 1.0 | 0.56 | 0.655 |
| **HR 33210 J** | 61 | 56 | 81 | 76 | 87 | 5 | 7.5 | 1.5 | 1.5 | 23.2 | 0.41 | 1.5 | 0.80 | 0.867 |
| **T 7 FC050** | 74 | 59 | 91 | 78 | 100 | 5 | 10 | 2.5 | 2.5 | 36.4 | 0.87 | 0.69 | 0.38 | 1.22 |
| **HR 30310 J** | 65 | 65 | 100 | 95 | 102 | 3 | 6 | 2 | 2 | 23.1 | 0.35 | 1.7 | 0.96 | 1.28 |
| **HR 30310 DJ** | 70 | 62 | 100 | 87 | 105 | 3 | 10 | 2 | 2 | 34.3 | 0.83 | 0.73 | 0.40 | 1.26 |
| **HR 31310 J** | 70 | 62 | 100 | 87 | 105 | 3 | 10 | 2 | 2 | 34.3 | 0.83 | 0.73 | 0.40 | 1.26 |
| **HR 32310 J** | 68 | 62 | 100 | 91 | 102 | 3 | 9 | 2 | 2 | 28.0 | 0.35 | 1.7 | 0.96 | 1.88 |
| **HR 32310 CJ** | 68 | 59 | 100 | 82 | 103 | 3 | 9 | 2 | 2 | 32.8 | 0.55 | 1.1 | 0.60 | 1.93 |

**Remarks** The suffix C represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix C.

## Bore Diameter 55 – 65 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

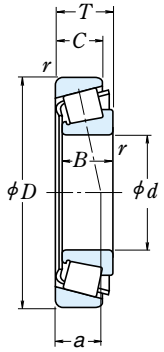
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

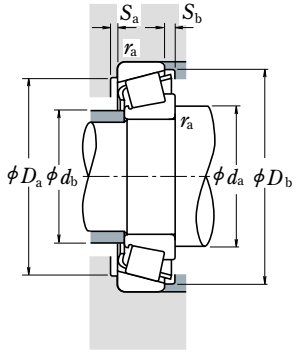
| Bearing Numbers | ISO355 Dimension Series approx. | Boundary Dimensions (mm) $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | Basic Load Ratings (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds ($min^{-1}$) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **55** | 80 | 17 | 17 | 14 | 1 | 1 | 45 500 | 74 500 | 4 600 | 7 600 | 4 300 | 5 600 |
| | | | 90 | 23 | 23 | 17.5 | 1.5 | 1.5 | 81 500 | 117 000 | 8 300 | 11 900 | 3 800 | 5 300 |
| | | | 90 | 27 | 27 | 21 | 1.5 | 1.5 | 91 500 | 138 000 | 9 300 | 14 000 | 3 800 | 5 300 |
| | | | 95 | 30 | 30 | 23 | 1.5 | 1.5 | 112 000 | 158 000 | 11 500 | 16 100 | 3 800 | 5 000 |
| | | | 100 | 22.75 | 21 | 18 | 2 | 1.5 | 94 500 | 113 000 | 9 650 | 11 500 | 3 600 | 5 000 |
| | | | 100 | 26.75 | 25 | 21 | 2 | 1.5 | 110 000 | 137 000 | 11 200 | 14 000 | 3 600 | 5 000 |
| | | | 100 | 35 | 35 | 27 | 2 | 1.5 | 141 000 | 193 000 | 14 400 | 19 700 | 3 600 | 5 000 |
| | | | 115 | 34 | 31 | 23.5 | 3 | 3 | 126 000 | 164 000 | 12 800 | 16 700 | 3 000 | 4 300 |
| | | | 120 | 31.5 | 29 | 25 | 2.5 | 2 | 150 000 | 171 000 | 15 200 | 17 500 | 3 200 | 4 300 |
| | | | 120 | 31.5 | 29 | 21 | 2.5 | 2 | 131 000 | 153 000 | 13 400 | 15 600 | 2 800 | 4 000 |
| | | | 120 | 31.5 | 29 | 21 | 2.5 | 2 | 131 000 | 153 000 | 13 400 | 15 600 | 2 800 | 4 000 |
| | | | 120 | 45.5 | 43 | 35 | 2.5 | 2 | 204 000 | 258 000 | 20 800 | 26 300 | 3 200 | 4 300 |
| | | | 120 | 45.5 | 43 | 35 | 2.5 | 2 | 195 000 | 262 000 | 19 900 | 26 700 | 3 200 | 4 300 |
| | | **60** | 85 | 17 | 17 | 14 | 1 | 1 | 49 000 | 84 500 | 5 000 | 8 650 | 3 800 | 5 300 |
| | | | 95 | 23 | 23 | 17.5 | 1.5 | 1.5 | 85 500 | 127 000 | 8 700 | 12 900 | 3 600 | 5 000 |
| | | | 95 | 27 | 27 | 21 | 1.5 | 1.5 | 96 000 | 150 000 | 9 800 | 15 300 | 3 600 | 5 000 |
| | | | 100 | 30 | 30 | 23 | 1.5 | 1.5 | 115 000 | 166 000 | 11 700 | 16 900 | 3 400 | 4 800 |
| | | | 110 | 23.75 | 22 | 19 | 2 | 1.5 | 104 000 | 123 000 | 10 600 | 12 500 | 3 400 | 4 500 |
| | | | 110 | 29.75 | 28 | 24 | 2 | 1.5 | 131 000 | 167 000 | 13 400 | 17 000 | 3 400 | 4 500 |
| | | | 110 | 38 | 38 | 29 | 2 | 1.5 | 166 000 | 231 000 | 16 900 | 23 600 | 3 400 | 4 500 |
| | | | 125 | 37 | 33.5 | 26 | 3 | 3 | 151 000 | 197 000 | 15 400 | 20 100 | 2 800 | 3 800 |
| | | | 130 | 33.5 | 31 | 26 | 3 | 2.5 | 174 000 | 201 000 | 17 700 | 20 500 | 3 000 | 4 000 |
| | | | 130 | 33.5 | 31 | 22 | 3 | 2.5 | 151 000 | 177 000 | 15 400 | 18 100 | 2 600 | 3 800 |
| | | | 130 | 33.5 | 31 | 22 | 3 | 2.5 | 151 000 | 177 000 | 15 400 | 18 100 | 2 600 | 3 800 |
| | | | 130 | 48.5 | 46 | 37 | 3 | 2.5 | 233 000 | 295 000 | 23 700 | 30 000 | 3 000 | 4 000 |
| | | | 130 | 48.5 | 46 | 35 | 3 | 2.5 | 196 000 | 249 000 | 20 000 | 25 400 | 2 800 | 3 800 |
| | | **65** | 90 | 17 | 17 | 14 | 1 | 1 | 49 000 | 86 500 | 5 000 | 8 800 | 3 600 | 5 000 |
| | | | 100 | 23 | 23 | 17.5 | 1.5 | 1.5 | 86 500 | 132 000 | 8 800 | 13 500 | 3 400 | 4 500 |
| | | | 100 | 27 | 27 | 21 | 1.5 | 1.5 | 97 500 | 156 000 | 9 950 | 15 900 | 3 400 | 4 500 |
| | | | 110 | 34 | 34 | 26.5 | 1.5 | 1.5 | 148 000 | 218 000 | 15 100 | 22 200 | 3 200 | 4 300 |
| | | | 120 | 24.75 | 23 | 20 | 2 | 1.5 | 122 000 | 151 000 | 12 500 | 15 400 | 3 000 | 4 000 |
| | | | 120 | 32.75 | 31 | 27 | 2 | 1.5 | 157 000 | 202 000 | 16 000 | 20 600 | 3 000 | 4 000 |
| | | | 120 | 41 | 41 | 32 | 2 | 1.5 | 202 000 | 282 000 | 20 600 | 28 800 | 3 000 | 4 000 |
| | | | 140 | 36 | 33 | 28 | 3 | 2.5 | 200 000 | 233 000 | 20 400 | 23 800 | 2 600 | 3 600 |
| | | | 140 | 36 | 33 | 23 | 3 | 2.5 | 173 000 | 205 000 | 17 700 | 20 900 | 2 400 | 3 400 |
| | | | 140 | 36 | 33 | 23 | 3 | 2.5 | 173 000 | 205 000 | 17 700 | 20 900 | 2 400 | 3 400 |
| | | | 140 | 51 | 48 | 39 | 3 | 2.5 | 267 000 | 340 000 | 27 300 | 35 000 | 2 800 | 3 800 |

| Bearing Numbers | ISO355 Dimension Series approx. | Abutment and Fillet Dimensions (mm) $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | Eff. Load Centers (mm) $a$ | Constant $e$ | Axial Load Factors $Y_1$ | $Y_0$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32911 J** | 2BC | 64 | 60 | 74 | 73 | 76 | 4 | 3 | 1 | 1 | 14.6 | 0.31 | 1.9 | 1.1 | 0.282 |
| **HR 32011 XJ** | 3CC | 66 | 62 | 81 | 80 | 86 | 4 | 5.5 | 1.5 | 1.5 | 19.7 | 0.41 | 1.5 | 0.81 | 0.568 |
| **HR 33011 J** | 2CE | 66 | 62 | 81 | 80 | 86 | 5 | 6 | 1.5 | 1.5 | 19.2 | 0.31 | 1.9 | 1.1 | 0.657 |
| **HR 33111 J** | 3CE | 66 | 62 | 86 | 82 | 91 | 5 | 7 | 1.5 | 1.5 | 22.4 | 0.37 | 1.6 | 0.88 | 0.877 |
| **HR 30211 J** | 3DB | 67 | 64 | 91 | 89 | 94 | 4 | 4.5 | 2 | 1.5 | 20.9 | 0.41 | 1.5 | 0.81 | 0.736 |
| **HR 32211 J** | 3DC | 67 | 63 | 91 | 87 | 95 | 4 | 5.5 | 2 | 1.5 | 22.7 | 0.41 | 1.5 | 0.81 | 0.859 |
| **HR 33211 J** | 3DE | 67 | 62 | 91 | 86 | 96 | 6 | 8 | 2 | 1.5 | 25.2 | 0.40 | 1.5 | 0.83 | 1.18 |
| **T 7 FC055** | 7FC | 73 | 66 | 101 | 86 | 109 | 4 | 10.5 | 2.5 | 2.5 | 39.0 | 0.87 | 0.69 | 0.38 | 1.58 |
| **HR 30311 J** | 2FB | 70 | 71 | 110 | 104 | 111 | 4 | 6.5 | 2 | 2 | 24.6 | 0.35 | 1.7 | 0.96 | 1.63 |
| **HR 30311 DJ** | 7FB | 75 | 67 | 110 | 94 | 114 | 4 | 10.5 | 2 | 2 | 37.0 | 0.83 | 0.73 | 0.40 | 1.58 |
| **HR 31311 J** | 7FB | 75 | 67 | 110 | 94 | 114 | 4 | 10.5 | 2 | 2 | 37.0 | 0.83 | 0.73 | 0.40 | 1.58 |
| **HR 32311 J** | 2FD | 73 | 67 | 110 | 99 | 111 | 4 | 10.5 | 2 | 2 | 29.9 | 0.35 | 1.7 | 0.96 | 2.39 |
| **HR 32311 CJ** | 5FD | 73 | 65 | 110 | 91 | 112 | 4 | 10.5 | 2 | 2 | 35.8 | 0.55 | 1.1 | 0.60 | 2.47 |
| **HR 32912 J** | 2BC | 69 | 65 | 79 | 78 | 81 | 4 | 3 | 1 | 1 | 15.5 | 0.33 | 1.8 | 1.0 | 0.306 |
| **HR 32012 XJ** | 4CC | 71 | 66 | 86 | 85 | 91 | 4 | 5.5 | 1.5 | 1.5 | 20.9 | 0.43 | 1.4 | 0.77 | 0.608 |
| **HR 33012 J** | 2CE | 71 | 66 | 86 | 85 | 90 | 5 | 6 | 1.5 | 1.5 | 20.0 | 0.33 | 1.8 | 1.0 | 0.713 |
| **HR 33112 J** | 3CE | 71 | 68 | 91 | 88 | 96 | 5 | 7 | 1.5 | 1.5 | 23.6 | 0.40 | 1.5 | 0.83 | 0.91 |
| **HR 30212 J** | 3EB | 72 | 69 | 101 | 96 | 103 | 4 | 4.5 | 2 | 1.5 | 22.0 | 0.41 | 1.5 | 0.81 | 0.930 |
| **HR 32212 J** | 3EC | 72 | 68 | 101 | 95 | 104 | 4 | 5.5 | 2 | 1.5 | 24.1 | 0.41 | 1.5 | 0.81 | 1.18 |
| **HR 33212 J** | 3EE | 72 | 68 | 101 | 94 | 105 | 6 | 9 | 2 | 1.5 | 27.6 | 0.40 | 1.5 | 0.82 | 1.56 |
| **T 7 FC060** | 7FC | 78 | 72 | 111 | 94 | 119 | 4 | 11 | 2.5 | 2.5 | 41.4 | 0.82 | 0.73 | 0.40 | 2.03 |
| **HR 30312 J** | 2FB | 78 | 77 | 118 | 112 | 120 | 4 | 7.5 | 2.5 | 2 | 26.0 | 0.35 | 1.7 | 0.96 | 2.03 |
| **HR 30312 DJ** | 7FB | 84 | 74 | 118 | 103 | 125 | 4 | 11.5 | 2.5 | 2 | 40.3 | 0.83 | 0.73 | 0.40 | 1.98 |
| **HR 31312 J** | 7FB | 84 | 74 | 118 | 103 | 125 | 4 | 11.5 | 2.5 | 2 | 40.3 | 0.83 | 0.73 | 0.40 | 1.98 |
| **HR 32312 J** | 2FD | 81 | 74 | 118 | 107 | 120 | 4 | 11.5 | 2.5 | 2 | 31.4 | 0.35 | 1.7 | 0.96 | 2.96 |
| **32312 C** | — | 81 | 74 | 116 | 102 | 125 | 4 | 13.5 | 2.5 | 2 | 39.9 | 0.58 | 1.0 | 0.57 | 2.86 |
| **HR 32913 J** | 2BC | 74 | 70 | 84 | 82 | 86 | 4 | 3 | 1 | 1 | 16.8 | 0.35 | 1.7 | 0.93 | 0.323 |
| **HR 32013 XJ** | 4CC | 76 | 71 | 91 | 90 | 97 | 4 | 5.5 | 1.5 | 1.5 | 22.4 | 0.46 | 1.3 | 0.72 | 0.646 |
| **HR 33013 J** | 2CE | 76 | 71 | 91 | 90 | 96 | 5 | 6 | 1.5 | 1.5 | 21.1 | 0.35 | 1.7 | 0.95 | 0.76 |
| **HR 33113 J** | 3DE | 76 | 73 | 101 | 96 | 106 | 6 | 7.5 | 1.5 | 1.5 | 26.0 | 0.39 | 1.5 | 0.85 | 1.32 |
| **HR 30213 J** | 3EB | 77 | 78 | 111 | 106 | 113 | 4 | 4.5 | 2 | 1.5 | 23.8 | 0.41 | 1.5 | 0.81 | 1.18 |
| **HR 32213 J** | 3EC | 77 | 75 | 111 | 104 | 115 | 4 | 5.5 | 2 | 1.5 | 27.1 | 0.41 | 1.5 | 0.81 | 1.55 |
| **HR 33213 J** | 3EE | 77 | 74 | 111 | 102 | 115 | 6 | 9 | 2 | 1.5 | 29.2 | 0.39 | 1.5 | 0.85 | 2.04 |
| **HR 30313 J** | 2GB | 83 | 83 | 128 | 121 | 130 | 4 | 8 | 2.5 | 2 | 27.9 | 0.35 | 1.7 | 0.96 | 2.51 |
| **HR 30313 DJ** | 7GB | 89 | 80 | 128 | 111 | 133 | 4 | 13 | 2.5 | 2 | 43.2 | 0.83 | 0.73 | 0.40 | 2.43 |
| **HR 31313 J** | 7GB | 89 | 80 | 128 | 111 | 133 | 4 | 13 | 2.5 | 2 | 43.2 | 0.83 | 0.73 | 0.40 | 2.43 |
| **HR 32313 J** | 2GD | 86 | 80 | 128 | 116 | 130 | 4 | 12 | 2.5 | 2 | 34.0 | 0.35 | 1.7 | 0.96 | 3.6 |

**Remarks** The suffix C represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix C.

## Bore Diameter 70 – 80 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

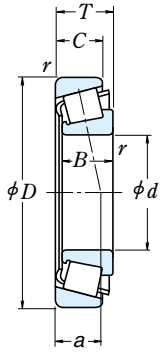
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

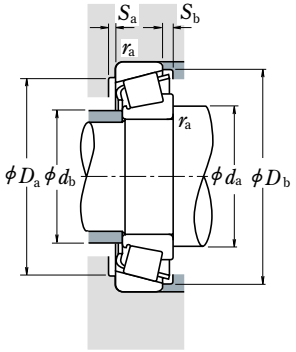
| d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) Cr | C0r | {kgf} Cr | C0r | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **70** | 100 | 20 | 20 | 16 | 1 | 1 | 70 000 | 113 000 | 7 150 | 11 500 | 3 200 | 4 500 |
| | 110 | 25 | 25 | 19 | 1.5 | 1.5 | 104 000 | 158 000 | 10 600 | 16 100 | 3 200 | 4 300 |
| | 110 | 31 | 31 | 25.5 | 1.5 | 1.5 | 127 000 | 204 000 | 12 900 | 20 800 | 3 000 | 4 300 |
| | 120 | 37 | 37 | 29 | 2 | 1.5 | 177 000 | 262 000 | 18 100 | 26 700 | 3 000 | 4 000 |
| | 125 | 26.25 | 24 | 21 | 2 | 1.5 | 132 000 | 163 000 | 13 500 | 16 700 | 2 800 | 4 000 |
| | 125 | 33.25 | 31 | 27 | 2 | 1.5 | 157 000 | 205 000 | 16 100 | 20 900 | 2 800 | 4 000 |
| | 125 | 41 | 41 | 32 | 2 | 1.5 | 209 000 | 299 000 | 21 300 | 30 500 | 2 800 | 4 000 |
| | 140 | 39 | 35.5 | 27 | 3 | 3 | 177 000 | 229 000 | 18 000 | 23 400 | 2 400 | 3 400 |
| | 150 | 38 | 35 | 30 | 3 | 2.5 | 227 000 | 268 000 | 23 200 | 27 400 | 2 400 | 3 400 |
| | 150 | 38 | 35 | 25 | 3 | 2.5 | 192 000 | 229 000 | 19 600 | 23 300 | 2 200 | 3 200 |
| | 150 | 38 | 35 | 25 | 3 | 2.5 | 192 000 | 229 000 | 19 600 | 23 300 | 2 200 | 3 200 |
| | 150 | 54 | 51 | 42 | 3 | 2.5 | 300 000 | 390 000 | 30 500 | 39 500 | 2 600 | 3 400 |
| | 150 | 54 | 51 | 42 | 3 | 2.5 | 280 000 | 390 000 | 28 600 | 39 500 | 2 400 | 3 400 |
| **75** | 105 | 20 | 20 | 16 | 1 | 1 | 72 500 | 120 000 | 7 400 | 12 300 | 3 200 | 4 300 |
| | 115 | 25 | 25 | 19 | 1.5 | 1.5 | 109 000 | 171 000 | 11 100 | 17 400 | 3 000 | 4 000 |
| | 115 | 31 | 31 | 25.5 | 1.5 | 1.5 | 133 000 | 220 000 | 13 500 | 22 500 | 3 000 | 4 000 |
| | 125 | 37 | 37 | 29 | 2 | 2 | 182 000 | 275 000 | 18 600 | 28 100 | 2 800 | 3 800 |
| | 130 | 27.25 | 25 | 22 | 2 | 1.5 | 143 000 | 182 000 | 14 600 | 18 500 | 2 800 | 3 800 |
| | 130 | 33.25 | 31 | 27 | 2 | 1.5 | 165 000 | 219 000 | 16 900 | 22 400 | 2 800 | 3 800 |
| | 130 | 41 | 41 | 31 | 2 | 1.5 | 215 000 | 315 000 | 21 900 | 32 000 | 2 800 | 3 800 |
| | 160 | 40 | 37 | 31 | 3 | 2.5 | 253 000 | 300 000 | 25 800 | 30 500 | 2 400 | 3 200 |
| | 160 | 40 | 37 | 26 | 3 | 2.5 | 211 000 | 251 000 | 21 500 | 25 600 | 2 200 | 3 000 |
| | 160 | 40 | 37 | 26 | 3 | 2.5 | 211 000 | 251 000 | 21 500 | 25 600 | 2 200 | 3 000 |
| | 160 | 58 | 55 | 45 | 3 | 2.5 | 340 000 | 445 000 | 35 000 | 45 500 | 2 400 | 3 200 |
| | 160 | 58 | 55 | 43 | 3 | 2.5 | 310 000 | 420 000 | 32 000 | 43 000 | 2 200 | 3 200 |
| **80** | 110 | 20 | 20 | 16 | 1 | 1 | 75 000 | 128 000 | 7 650 | 13 100 | 3 000 | 4 000 |
| | 125 | 29 | 29 | 22 | 1.5 | 1.5 | 140 000 | 222 000 | 14 300 | 22 700 | 2 800 | 3 600 |
| | 125 | 36 | 36 | 29.5 | 1.5 | 1.5 | 172 000 | 282 000 | 17 500 | 28 800 | 2 800 | 3 600 |
| | 130 | 37 | 37 | 29 | 2 | 1.5 | 186 000 | 289 000 | 19 000 | 29 400 | 2 600 | 3 600 |
| | 140 | 28.25 | 26 | 22 | 2.5 | 2 | 157 000 | 195 000 | 16 000 | 19 900 | 2 600 | 3 400 |
| | 140 | 28.25 | 26 | 20 | 2.5 | 2 | 147 000 | 190 000 | 15 000 | 19 400 | 2 400 | 3 400 |
| | 140 | 35.25 | 33 | 28 | 2.5 | 2 | 192 000 | 254 000 | 19 600 | 25 900 | 2 600 | 3 400 |
| | 140 | 46 | 46 | 35 | 2.5 | 2 | 256 000 | 385 000 | 26 200 | 39 000 | 2 600 | 3 400 |
| | 170 | 42.5 | 39 | 33 | 3 | 2.5 | 276 000 | 330 000 | 28 200 | 33 500 | 2 200 | 3 000 |
| | 170 | 42.5 | 39 | 27 | 3 | 2.5 | 235 000 | 283 000 | 24 000 | 28 900 | 2 000 | 2 800 |
| | 170 | 42.5 | 39 | 27 | 3 | 2.5 | 235 000 | 283 000 | 24 000 | 28 900 | 2 000 | 2 800 |
| | 170 | 61.5 | 58 | 48 | 3 | 2.5 | 385 000 | 505 000 | 39 000 | 51 500 | 2 200 | 3 000 |
| | 170 | 61.5 | 58 | 48 | 3 | 2.5 | 365 000 | 530 000 | 37 500 | 54 000 | 2 200 | 3 000 |

| Bearing Numbers | ISO355 Dimension Series approx. | da min. | db max. | Da max. | Da min. | Db min. | Sa min. | Sb min. | Cone ra max. | Cup ra max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors Y1 | Y0 | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32914 J** | 2BC | 79 | 76 | 94 | 93 | 96 | 4 | 4 | 1 | 1 | 17.6 | 0.32 | 1.9 | 1.1 | 0.494 |
| **HR 32014 XJ** | 4CC | 81 | 77 | 101 | 98 | 105 | 5 | 6 | 1.5 | 1.5 | 23.7 | 0.43 | 1.4 | 0.76 | 0.869 |
| **HR 33014 J** | 2CE | 81 | 78 | 101 | 100 | 105 | 5 | 5.5 | 1.5 | 1.5 | 22.2 | 0.28 | 2.1 | 1.2 | 1.11 |
| **HR 33114 J** | 3DE | 82 | 79 | 111 | 104 | 115 | 6 | 8 | 2 | 1.5 | 27.9 | 0.38 | 1.6 | 0.87 | 1.71 |
| **HR 30214 J** | 3EB | 82 | 81 | 116 | 110 | 118 | 4 | 5 | 2 | 1.5 | 25.6 | 0.42 | 1.4 | 0.79 | 1.3 |
| **HR 32214 J** | 3EC | 82 | 80 | 116 | 108 | 119 | 4 | 6 | 2 | 1.5 | 28.6 | 0.42 | 1.4 | 0.79 | 1.66 |
| **HR 33214 J** | 3EE | 82 | 78 | 116 | 107 | 120 | 7 | 9 | 2 | 1.5 | 30.4 | 0.41 | 1.5 | 0.81 | 2.15 |
| **T 7 FC070** | 7FC | 88 | 79 | 126 | 106 | 133 | 5 | 12 | 2.5 | 2.5 | 46.4 | 0.87 | 0.69 | 0.38 | 2.55 |
| **HR 30314 J** | 2GB | 88 | 89 | 138 | 132 | 140 | 4 | 8 | 2.5 | 2 | 29.7 | 0.35 | 1.7 | 0.96 | 3.03 |
| **HR 30314 DJ** | 7GB | 94 | 85 | 138 | 118 | 142 | 4 | 13 | 2.5 | 2 | 45.8 | 0.83 | 0.73 | 0.40 | 2.94 |
| **HR 31314 J** | 7GB | 94 | 85 | 138 | 118 | 142 | 4 | 13 | 2.5 | 2 | 45.8 | 0.83 | 0.73 | 0.40 | 2.94 |
| **HR 32314 J** | 2GD | 91 | 86 | 138 | 124 | 140 | 4 | 12 | 2.5 | 2 | 36.1 | 0.35 | 1.7 | 0.96 | 4.35 |
| **HR 32314 CJ** | 5GD | 91 | 84 | 138 | 115 | 141 | 4 | 12 | 2.5 | 2 | 43.3 | 0.55 | 1.1 | 0.60 | 4.47 |
| **HR 32915 J** | 2BC | 84 | 81 | 99 | 98 | 101 | 4 | 4 | 1 | 1 | 18.7 | 0.33 | 1.8 | 0.99 | 0.53 |
| **HR 32015 XJ** | 4CC | 86 | 82 | 106 | 103 | 110 | 5 | 6 | 1.5 | 1.5 | 25.1 | 0.46 | 1.3 | 0.72 | 0.925 |
| **HR 33015 J** | 2CE | 86 | 83 | 106 | 104 | 110 | 6 | 5.5 | 1.5 | 1.5 | 23.0 | 0.30 | 2.0 | 1.1 | 1.18 |
| **HR 33115 J** | 3DE | 87 | 83 | 115 | 109 | 120 | 6 | 8 | 2 | 2 | 29.2 | 0.40 | 1.5 | 0.83 | 1.8 |
| **HR 30215 J** | 4DB | 87 | 85 | 121 | 115 | 124 | 4 | 5 | 2 | 1.5 | 27.0 | 0.44 | 1.4 | 0.76 | 1.43 |
| **HR 32215 J** | 4DC | 87 | 84 | 121 | 113 | 125 | 4 | 6 | 2 | 1.5 | 29.8 | 0.44 | 1.4 | 0.76 | 1.72 |
| **HR 33215 J** | 3EE | 87 | 83 | 121 | 111 | 125 | 7 | 10 | 2 | 1.5 | 31.6 | 0.43 | 1.4 | 0.77 | 2.25 |
| **HR 30315 J** | 2GB | 93 | 95 | 148 | 141 | 149 | 4 | 9 | 2.5 | 2 | 31.8 | 0.35 | 1.7 | 0.96 | 3.63 |
| **HR 30315 DJ** | 7GB | 99 | 91 | 148 | 129 | 152 | 6 | 14 | 2.5 | 2 | 48.8 | 0.83 | 0.73 | 0.40 | 3.47 |
| **HR 31315 J** | 7GB | 99 | 91 | 148 | 129 | 152 | 6 | 14 | 2.5 | 2 | 48.8 | 0.83 | 0.73 | 0.40 | 3.47 |
| **HR 32315 J** | 2GD | 96 | 91 | 148 | 134 | 149 | 4 | 13 | 2.5 | 2 | 38.9 | 0.35 | 1.7 | 0.96 | 5.31 |
| **32315 CA** | — | 96 | 90 | 148 | 124 | 153 | 4 | 15 | 2.5 | 2 | 47.7 | 0.58 | 1.0 | 0.57 | 5.3 |
| **HR 32916 J** | 2BC | 89 | 85 | 104 | 102 | 106 | 4 | 4 | 1 | 1 | 19.8 | 0.35 | 1.7 | 0.94 | 0.56 |
| **HR 32016 XJ** | 3CC | 91 | 89 | 116 | 112 | 120 | 6 | 7 | 1.5 | 1.5 | 26.9 | 0.42 | 1.4 | 0.78 | 1.32 |
| **HR 33016 J** | 2CE | 91 | 88 | 116 | 112 | 119 | 6 | 6.5 | 1.5 | 1.5 | 25.5 | 0.28 | 2.2 | 1.2 | 1.66 |
| **HR 33116 J** | 3DE | 82 | 88 | 121 | 113 | 126 | 6 | 8 | 2 | 1.5 | 30.4 | 0.42 | 1.4 | 0.79 | 1.88 |
| **HR 30216 J** | 3EB | 95 | 91 | 130 | 124 | 132 | 4 | 6 | 2 | 2 | 28.1 | 0.42 | 1.4 | 0.79 | 1.68 |
| **30216 CA** | — | 95 | 92 | 130 | 122 | 133 | 4 | 8 | 2 | 2 | 33.8 | 0.58 | 1.0 | 0.57 | 1.66 |
| **HR 32216 J** | 3EC | 95 | 90 | 130 | 122 | 134 | 4 | 7 | 2 | 2 | 30.6 | 0.42 | 1.4 | 0.79 | 2.13 |
| **HR 33216 J** | 3EE | 95 | 89 | 130 | 119 | 135 | 7 | 11 | 2 | 2 | 34.8 | 0.43 | 1.4 | 0.78 | 2.93 |
| **HR 30316 J** | 2GB | 98 | 102 | 158 | 150 | 159 | 4 | 9.5 | 2.5 | 2 | 34.0 | 0.35 | 1.7 | 0.96 | 4.27 |
| **HR 30316 DJ** | 7GB | 104 | 97 | 158 | 136 | 159 | 6 | 15.5 | 2.5 | 2 | 51.8 | 0.83 | 0.73 | 0.40 | 4.07 |
| **HR 31316 J** | 7GB | 104 | 97 | 158 | 136 | 159 | 6 | 15.5 | 2.5 | 2 | 51.8 | 0.83 | 0.73 | 0.40 | 4.07 |
| **HR 32316 J** | 2GD | 101 | 98 | 158 | 143 | 159 | 4 | 13.5 | 2.5 | 2 | 41.4 | 0.35 | 1.7 | 0.96 | 6.35 |
| **HR 32316 CJ** | 5GD | 101 | 95 | 158 | 132 | 160 | 4 | 13.5 | 2.5 | 2 | 49.3 | 0.55 | 1.1 | 0.60 | 6.59 |

**Remarks** The suffix CA represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix CA.

## Bore Diameter 85 – 100 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

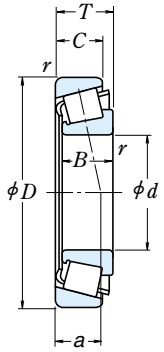
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

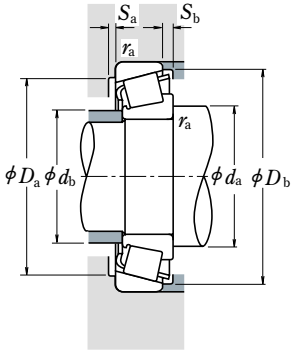
| d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) $C_r$ | $C_{0r}$ | Basic Load Ratings {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **85** | 120 | 23 | 23 | 18 | 1.5 | 1.5 | 93 500 | 157 000 | 9 550 | 16 000 | 2 800 | 3 800 |
| | 130 | 29 | 29 | 22 | 1.5 | 1.5 | 143 000 | 231 000 | 14 600 | 23 600 | 2 600 | 3 600 |
| | 130 | 36 | 36 | 29.5 | 1.5 | 1.5 | 180 000 | 305 000 | 18 400 | 31 000 | 2 600 | 3 600 |
| | 140 | 41 | 41 | 32 | 2.5 | 2 | 230 000 | 365 000 | 23 500 | 37 000 | 2 400 | 3 400 |
| | 150 | 30.5 | 28 | 24 | 2.5 | 2 | 184 000 | 233 000 | 18 700 | 23 800 | 2 400 | 3 200 |
| | 150 | 30.5 | 28 | 22 | 2.5 | 2 | 171 000 | 226 000 | 17 500 | 23 000 | 2 200 | 3 200 |
| | 150 | 38.5 | 36 | 30 | 2.5 | 2 | 210 000 | 277 000 | 21 400 | 28 200 | 2 200 | 3 200 |
| | 150 | 49 | 49 | 37 | 2.5 | 2 | 281 000 | 415 000 | 28 700 | 42 500 | 2 400 | 3 200 |
| | 180 | 44.5 | 41 | 34 | 4 | 3 | 310 000 | 375 000 | 31 500 | 38 000 | 2 000 | 2 800 |
| | 180 | 44.5 | 41 | 28 | 4 | 3 | 261 000 | 315 000 | 26 600 | 32 000 | 1 900 | 2 600 |
| | 180 | 44.5 | 41 | 28 | 4 | 3 | 261 000 | 315 000 | 26 600 | 32 000 | 1 900 | 2 600 |
| | 180 | 63.5 | 60 | 49 | 4 | 3 | 410 000 | 535 000 | 42 000 | 54 500 | 2 000 | 2 800 |
| **90** | 125 | 23 | 23 | 18 | 1.5 | 1.5 | 97 000 | 167 000 | 9 850 | 17 000 | 2 600 | 3 600 |
| | 140 | 32 | 32 | 24 | 2 | 1.5 | 170 000 | 273 000 | 17 300 | 27 800 | 2 400 | 3 200 |
| | 140 | 39 | 39 | 32.5 | 2 | 1.5 | 220 000 | 360 000 | 22 400 | 37 000 | 2 400 | 3 200 |
| | 150 | 45 | 45 | 35 | 2.5 | 2 | 259 000 | 405 000 | 26 500 | 41 500 | 2 400 | 3 200 |
| | 160 | 32.5 | 30 | 26 | 2.5 | 2 | 201 000 | 256 000 | 20 500 | 26 100 | 2 200 | 3 000 |
| | 160 | 42.5 | 40 | 34 | 2.5 | 2 | 256 000 | 350 000 | 26 100 | 35 500 | 2 200 | 3 000 |
| | 190 | 46.5 | 43 | 36 | 4 | 3 | 345 000 | 425 000 | 35 500 | 43 000 | 1 900 | 2 600 |
| | 190 | 46.5 | 43 | 30 | 4 | 3 | 264 000 | 315 000 | 26 900 | 32 000 | 1 800 | 2 400 |
| | 190 | 46.5 | 43 | 30 | 4 | 3 | 264 000 | 315 000 | 26 900 | 32 000 | 1 800 | 2 400 |
| | 190 | 67.5 | 64 | 53 | 4 | 3 | 450 000 | 590 000 | 46 000 | 60 500 | 2 000 | 2 600 |
| **95** | 130 | 23 | 23 | 18 | 1.5 | 1.5 | 98 000 | 172 000 | 10 000 | 17 500 | 2 400 | 3 400 |
| | 145 | 32 | 32 | 24 | 2 | 1.5 | 173 000 | 283 000 | 17 600 | 28 900 | 2 400 | 3 200 |
| | 145 | 39 | 39 | 32.5 | 2 | 1.5 | 231 000 | 390 000 | 23 500 | 39 500 | 2 400 | 3 200 |
| | 160 | 46 | 46 | 38 | 3 | 3 | 283 000 | 445 000 | 28 800 | 45 500 | 2 200 | 3 000 |
| | 170 | 34.5 | 32 | 27 | 3 | 2.5 | 223 000 | 286 000 | 22 800 | 29 200 | 2 200 | 2 800 |
| | 170 | 45.5 | 43 | 37 | 3 | 2.5 | 289 000 | 400 000 | 29 500 | 40 500 | 2 200 | 2 800 |
| | 200 | 49.5 | 45 | 38 | 4 | 3 | 370 000 | 455 000 | 38 000 | 46 500 | 1 900 | 2 600 |
| | 200 | 49.5 | 45 | 36 | 4 | 3 | 350 000 | 435 000 | 35 500 | 44 000 | 1 800 | 2 400 |
| | 200 | 49.5 | 45 | 32 | 4 | 3 | 310 000 | 375 000 | 31 500 | 38 500 | 1 700 | 2 400 |
| | 200 | 49.5 | 45 | 32 | 4 | 3 | 310 000 | 375 000 | 31 500 | 38 500 | 1 700 | 2 400 |
| | 200 | 71.5 | 67 | 55 | 4 | 3 | 525 000 | 710 000 | 53 500 | 72 500 | 1 900 | 2 600 |
| **100** | 140 | 25 | 25 | 20 | 1.5 | 1.5 | 117 000 | 205 000 | 12 000 | 20 900 | 2 200 | 3 200 |
| | 145 | 24 | 22.5 | 17.5 | 3 | 3 | 113 000 | 163 000 | 11 500 | 16 600 | 2 200 | 3 000 |
| | 150 | 32 | 32 | 24 | 2 | 1.5 | 176 000 | 294 000 | 17 900 | 30 000 | 2 200 | 3 000 |
| | 150 | 39 | 39 | 32.5 | 2 | 1.5 | 235 000 | 405 000 | 24 000 | 41 500 | 2 200 | 3 000 |
| | 165 | 52 | 52 | 40 | 2.5 | 2 | 315 000 | 515 000 | 32 500 | 52 500 | 2 000 | 2 800 |
| | 180 | 37 | 34 | 29 | 3 | 2.5 | 255 000 | 330 000 | 26 000 | 34 000 | 2 000 | 2 600 |
| | 180 | 49 | 46 | 39 | 3 | 2.5 | 325 000 | 450 000 | 33 000 | 46 000 | 2 000 | 2 600 |
| | 180 | 63 | 63 | 48 | 3 | 2.5 | 410 000 | 635 000 | 42 000 | 65 000 | 2 000 | 2 600 |
| | 215 | 51.5 | 47 | 39 | 4 | 3 | 425 000 | 525 000 | 43 000 | 53 500 | 1 700 | 2 400 |
| | 215 | 56.5 | 51 | 35 | 4 | 3 | 385 000 | 505 000 | 39 000 | 51 500 | 1 500 | 2 200 |
| | 215 | 77.5 | 73 | 60 | 4 | 3 | 565 000 | 755 000 | 57 500 | 77 000 | 1 700 | 2 400 |

| Bearing Numbers | ISO355 Dimension Series approx. | Abutment and Fillet Dimensions (mm) $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors $Y_1$ | $Y_0$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32917 J** | 2BC | 96 | 92 | 111 | 111 | 115 | 5 | 5 | 1.5 | 1.5 | 20.9 | 0.33 | 1.8 | 1.0 | 0.8 |
| **HR 32017 XJ** | 4CC | 96 | 94 | 121 | 116 | 125 | 6 | 7 | 1.5 | 1.5 | 28.2 | 0.44 | 1.4 | 0.75 | 1.38 |
| **HR 33017 J** | 2CE | 96 | 94 | 121 | 117 | 125 | 6 | 6.5 | 1.5 | 1.5 | 26.5 | 0.29 | 2.1 | 1.1 | 1.75 |
| **HR 33117 J** | 3DE | 100 | 94 | 130 | 122 | 135 | 7 | 9 | 2 | 2 | 32.7 | 0.41 | 1.5 | 0.81 | 2.51 |
| **HR 30217 J** | 3EB | 100 | 97 | 140 | 133 | 141 | 5 | 6.5 | 2 | 2 | 30.3 | 0.42 | 1.4 | 0.79 | 2.12 |
| **30217 CA** | — | 100 | 98 | 140 | 131 | 142 | 5 | 8.5 | 2 | 2 | 36.2 | 0.58 | 1.0 | 0.57 | 2.07 |
| **HR 32217 J** | 3EC | 100 | 96 | 140 | 131 | 142 | 5 | 8.5 | 2 | 2 | 33.9 | 0.42 | 1.4 | 0.79 | 2.64 |
| **HR 33217 J** | 3EE | 100 | 95 | 140 | 129 | 144 | 7 | 12 | 2 | 2 | 37.3 | 0.42 | 1.4 | 0.79 | 3.57 |
| **HR 30317 J** | 2GB | 106 | 108 | 166 | 157 | 167 | 5 | 10.5 | 3 | 2.5 | 35.8 | 0.35 | 1.7 | 0.96 | 5.08 |
| **HR 30317 DJ** | 7GB | 113 | 103 | 166 | 144 | 169 | 6 | 16.5 | 3 | 2.5 | 55.4 | 0.83 | 0.73 | 0.40 | 4.88 |
| **HR 31317 J** | 7GB | 113 | 103 | 166 | 144 | 169 | 6 | 16.5 | 3 | 2.5 | 55.4 | 0.83 | 0.73 | 0.40 | 4.88 |
| **HR 32317 J** | 2GD | 110 | 104 | 166 | 151 | 167 | 5 | 14.5 | 3 | 2.5 | 43.6 | 0.35 | 1.7 | 0.96 | 7.31 |
| **HR 32918 J** | 2BC | 101 | 97 | 116 | 116 | 120 | 5 | 5 | 1.5 | 1.5 | 22.0 | 0.34 | 1.8 | 0.96 | 0.838 |
| **HR 32018 XJ** | 3CC | 102 | 99 | 131 | 124 | 134 | 6 | 8 | 2 | 1.5 | 29.7 | 0.42 | 1.4 | 0.78 | 1.78 |
| **HR 33018 J** | 2CE | 102 | 99 | 131 | 129 | 135 | 7 | 6.5 | 2 | 1.5 | 27.9 | 0.27 | 2.2 | 1.2 | 2.21 |
| **HR 33118 J** | 3DE | 105 | 100 | 140 | 132 | 144 | 7 | 10 | 2 | 2 | 35.2 | 0.40 | 1.5 | 0.83 | 3.14 |
| **HR 30218 J** | 3FB | 105 | 103 | 150 | 141 | 150 | 5 | 6.5 | 2 | 2 | 31.7 | 0.42 | 1.4 | 0.79 | 2.6 |
| **HR 32218 J** | 3FC | 105 | 102 | 150 | 139 | 152 | 5 | 8.5 | 2 | 2 | 36.2 | 0.42 | 1.4 | 0.79 | 3.41 |
| **HR 30318 J** | 2GB | 111 | 114 | 176 | 176 | 176 | 5 | 10.5 | 3 | 2.5 | 37.3 | 0.35 | 1.7 | 0.96 | 5.91 |
| **HR 30318 DJ** | 7GB | 118 | 110 | 176 | 152 | 179 | 6 | 16.5 | 3 | 2.5 | 58.7 | 0.83 | 0.73 | 0.40 | 5.52 |
| **HR 31318 J** | 7GB | 118 | 110 | 176 | 152 | 179 | 6 | 16.5 | 3 | 2.5 | 58.7 | 0.83 | 0.73 | 0.40 | 5.52 |
| **HR 32318 J** | 2GD | 115 | 109 | 176 | 158 | 177 | 5 | 14.5 | 3 | 2.5 | 46.5 | 0.35 | 1.7 | 0.96 | 8.6 |
| **HR 32919 J** | 2BC | 106 | 102 | 121 | 121 | 125 | 5 | 5 | 1.5 | 1.5 | 23.2 | 0.36 | 1.7 | 0.92 | 0.877 |
| **HR 32019 XJ** | 4CC | 107 | 104 | 136 | 131 | 140 | 6 | 8 | 2 | 1.5 | 31.2 | 0.44 | 1.4 | 0.75 | 1.88 |
| **HR 33019 J** | 2CE | 107 | 103 | 136 | 133 | 139 | 7 | 6.5 | 2 | 1.5 | 28.6 | 0.28 | 2.2 | 1.2 | 2.3 |
| **T 2 ED095** | 2ED | 113 | 108 | 146 | 141 | 152 | 6 | 8 | 2.5 | 2.5 | 34.5 | 0.34 | 1.8 | 0.97 | 3.74 |
| **HR 30219 J** | 3FB | 113 | 110 | 158 | 150 | 159 | 5 | 7.5 | 2.5 | 2 | 33.7 | 0.42 | 1.4 | 0.79 | 3.13 |
| **HR 32219 J** | 3FC | 113 | 108 | 158 | 147 | 161 | 5 | 8.5 | 2.5 | 2 | 39.3 | 0.42 | 1.4 | 0.79 | 4.22 |
| **HR 30319 J** | 2GB | 116 | 119 | 186 | 172 | 184 | 5 | 11.5 | 3 | 2.5 | 38.6 | 0.35 | 1.7 | 0.96 | 6.92 |
| **30319 CA** | — | 116 | 119 | 186 | 168 | 188 | 5 | 13.5 | 3 | 2.5 | 48.6 | 0.54 | 1.1 | 0.61 | 6.71 |
| **HR 30319 DJ** | 7GB | 123 | 115 | 186 | 158 | 187 | 6 | 17.5 | 3 | 2.5 | 61.9 | 0.83 | 0.73 | 0.40 | 6.64 |
| **HR 31319 J** | 7GB | 123 | 115 | 186 | 158 | 187 | 6 | 17.5 | 3 | 2.5 | 61.9 | 0.83 | 0.73 | 0.40 | 6.64 |
| **HR 32319 J** | 2GD | 120 | 115 | 186 | 167 | 186 | 5 | 16.5 | 3 | 2.5 | 48.6 | 0.35 | 1.7 | 0.96 | 10.4 |
| **HR 32920 J** | 2CC | 111 | 109 | 132 | 132 | 134 | 5 | 5 | 1.5 | 1.5 | 24.2 | 0.33 | 1.8 | 1.0 | 1.18 |
| **T 4 CB100** | 4CB | 118 | 108 | 135 | 135 | 142 | 6 | 6.5 | 2.5 | 2.5 | 30.1 | 0.47 | 1.3 | 0.70 | 1.18 |
| **HR 32020 XJ** | 4CC | 112 | 109 | 141 | 136 | 144 | 6 | 8 | 2 | 1.5 | 32.5 | 0.46 | 1.3 | 0.72 | 1.95 |
| **HR 33020 J** | 2CE | 112 | 107 | 141 | 137 | 143 | 7 | 6.5 | 2 | 1.5 | 29.3 | 0.29 | 2.1 | 1.2 | 2.38 |
| **HR 33120 J** | 3EE | 115 | 110 | 155 | 144 | 159 | 8 | 12 | 2 | 2 | 40.5 | 0.41 | 1.5 | 0.81 | 4.32 |
| **HR 30220 J** | 3FB | 118 | 116 | 168 | 158 | 168 | 5 | 8 | 2.5 | 2 | 36.1 | 0.42 | 1.4 | 0.79 | 3.78 |
| **HR 32220 J** | 3FC | 118 | 115 | 168 | 155 | 171 | 5 | 10 | 2.5 | 2 | 41.5 | 0.42 | 1.4 | 0.79 | 5.05 |
| **HR 33220 J** | 3FE | 118 | 113 | 168 | 152 | 172 | 10 | 15 | 2.5 | 2 | 46.0 | 0.40 | 1.5 | 0.82 | 6.76 |
| **HR 30320 J** | 2GB | 121 | 128 | 201 | 185 | 197 | 5 | 12.5 | 3 | 2.5 | 41.4 | 0.35 | 1.7 | 0.96 | 8.41 |
| **HR 31320 J** | 7GB | 136 | 125 | 201 | 169 | 202 | 7 | 21.5 | 3 | 2.5 | 67.7 | 0.83 | 0.73 | 0.40 | 9.02 |
| **HR 32320 J** | 2GD | 125 | 125 | 201 | 178 | 200 | 5 | 17.5 | 3 | 2.5 | 53.2 | 0.35 | 1.7 | 0.96 | 12.7 |

**Remarks** The suffix CA represents medium-angle tapered roller bearings. Since they are designed for specific applications, please consult NSK when using bearings with suffix CA.

## Bore Diameter 105 – 130 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

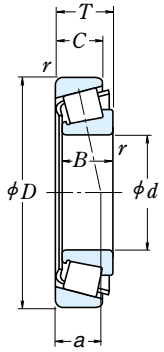
When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

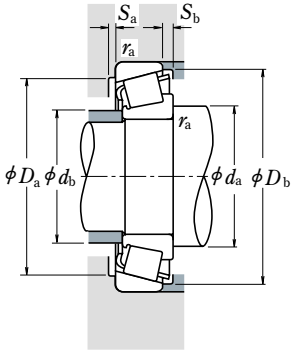
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) $C_r$ | $C_{0r}$ | Basic Load Ratings {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (min⁻¹) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **105** | 145 | 25 | 25 | 20 | 1.5 | 1.5 | 119 000 | 212 000 | 12 100 | 21 600 | 2 200 | 3 000 |
| | 160 | 35 | 35 | 26 | 2.5 | 2 | 204 000 | 340 000 | 20 800 | 34 500 | 2 000 | 2 800 |
| | 160 | 43 | 43 | 34 | 2.5 | 2 | 256 000 | 435 000 | 26 100 | 44 000 | 2 000 | 2 800 |
| | 190 | 39 | 36 | 30 | 3 | 2.5 | 280 000 | 365 000 | 28 500 | 37 500 | 1 900 | 2 600 |
| | 190 | 53 | 50 | 43 | 3 | 2.5 | 360 000 | 510 000 | 37 000 | 52 000 | 1 900 | 2 600 |
| | 225 | 53.5 | 49 | 41 | 4 | 3 | 455 000 | 565 000 | 46 500 | 57 500 | 1 600 | 2 200 |
| | 225 | 58 | 53 | 36 | 4 | 3 | 415 000 | 540 000 | 42 000 | 55 000 | 1 500 | 2 000 |
| | 225 | 81.5 | 77 | 63 | 4 | 3 | 670 000 | 925 000 | 68 000 | 94 500 | 1 700 | 2 200 |
| **110** | 150 | 25 | 25 | 20 | 1.5 | 1.5 | 123 000 | 224 000 | 12 500 | 22 800 | 2 200 | 2 800 |
| | 170 | 38 | 38 | 29 | 2.5 | 2 | 236 000 | 390 000 | 24 000 | 40 000 | 2 000 | 2 600 |
| | 170 | 47 | 47 | 37 | 2.5 | 2 | 294 000 | 515 000 | 30 000 | 52 500 | 2 000 | 2 600 |
| | 180 | 56 | 56 | 43 | 2.5 | 2 | 365 000 | 610 000 | 37 500 | 62 000 | 1 900 | 2 600 |
| | 200 | 41 | 38 | 32 | 3 | 2.5 | 315 000 | 420 000 | 32 000 | 43 000 | 1 800 | 2 400 |
| | 200 | 56 | 53 | 46 | 3 | 2.5 | 400 000 | 565 000 | 40 500 | 57 500 | 1 800 | 2 400 |
| | 240 | 54.5 | 50 | 42 | 4 | 3 | 485 000 | 595 000 | 49 500 | 60 500 | 1 500 | 2 000 |
| | 240 | 63 | 57 | 38 | 4 | 3 | 470 000 | 605 000 | 48 000 | 62 000 | 1 400 | 1 900 |
| | 240 | 84.5 | 80 | 65 | 4 | 3 | 675 000 | 910 000 | 68 500 | 93 000 | 1 500 | 2 000 |
| **120** | 165 | 29 | 29 | 23 | 1.5 | 1.5 | 161 000 | 291 000 | 16 400 | 29 700 | 1 900 | 2 600 |
| | 170 | 27 | 25 | 19.5 | 3 | 3 | 153 000 | 243 000 | 51 600 | 24 800 | 1 800 | 2 600 |
| | 180 | 38 | 38 | 29 | 2.5 | 2 | 242 000 | 405 000 | 24 600 | 41 000 | 1 800 | 2 400 |
| | 180 | 48 | 48 | 38 | 2.5 | 2 | 300 000 | 540 000 | 30 500 | 55 000 | 1 800 | 2 600 |
| | 200 | 62 | 62 | 48 | 2.5 | 2 | 460 000 | 755 000 | 46 500 | 77 000 | 1 700 | 2 400 |
| | 215 | 43.5 | 40 | 34 | 3 | 2.5 | 335 000 | 450 000 | 34 000 | 46 000 | 1 600 | 2 200 |
| | 215 | 61.5 | 58 | 50 | 3 | 2.5 | 440 000 | 635 000 | 44 500 | 65 000 | 1 600 | 2 200 |
| | 260 | 59.5 | 55 | 46 | 4 | 3 | 535 000 | 655 000 | 54 500 | 67 000 | 1 400 | 1 900 |
| | 260 | 68 | 62 | 42 | 4 | 3 | 560 000 | 730 000 | 57 000 | 74 500 | 1 300 | 1 800 |
| | 260 | 90.5 | 86 | 69 | 4 | 3 | 770 000 | 1 060 000 | 78 500 | 108 000 | 1 400 | 1 900 |
| **130** | 180 | 32 | 30 | 26 | 2 | 1.5 | 167 000 | 281 000 | 17 000 | 28 600 | 1 800 | 2 400 |
| | 180 | 32 | 32 | 25 | 2 | 1.5 | 200 000 | 365 000 | 20 400 | 37 500 | 1 800 | 2 400 |
| | 185 | 29 | 27 | 21 | 3 | 3 | 183 000 | 296 000 | 18 600 | 30 000 | 1 700 | 2 400 |
| | 200 | 45 | 45 | 34 | 2.5 | 2 | 320 000 | 535 000 | 32 500 | 54 500 | 1 600 | 2 200 |
| | 200 | 55 | 55 | 43 | 2.5 | 2 | 395 000 | 715 000 | 40 500 | 73 000 | 1 700 | 2 200 |
| | 230 | 43.75 | 40 | 34 | 4 | 3 | 375 000 | 505 000 | 38 000 | 51 500 | 1 500 | 2 000 |
| | 230 | 67.75 | 64 | 54 | 4 | 3 | 530 000 | 790 000 | 54 000 | 80 500 | 1 500 | 2 000 |
| | 280 | 63.75 | 58 | 49 | 5 | 4 | 545 000 | 675 000 | 56 000 | 68 500 | 1 300 | 1 800 |
| | 280 | 63.75 | 58 | 49 | 5 | 4 | 650 000 | 820 000 | 66 000 | 83 500 | 1 300 | 1 800 |
| | 280 | 72 | 66 | 44 | 5 | 4 | 625 000 | 820 000 | 63 500 | 83 500 | 1 200 | 1 700 |
| | 280 | 98.75 | 93 | 78 | 5 | 4 | 830 000 | 1 150 000 | 84 500 | 117 000 | 1 300 | 1 800 |

| Bearing Numbers | ISO355 Dimension Series approx. | Abutment and Fillet Dimensions (mm) $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors $Y_1$ | $Y_0$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32921 J** | 2CC | 116 | 114 | 137 | 137 | 140 | 5 | 5 | 1.5 | 1.5 | 25.3 | 0.34 | 1.8 | 0.96 | 1.23 |
| **HR 32021 XJ** | 4DC | 120 | 115 | 150 | 144 | 154 | 6 | 9 | 2 | 2 | 34.3 | 0.44 | 1.4 | 0.74 | 2.48 |
| **HR 33021 J** | 2DE | 120 | 115 | 150 | 146 | 153 | 7 | 9 | 2 | 2 | 30.9 | 0.28 | 2.1 | 1.2 | 3.03 |
| **HR 30221 J** | 3FB | 123 | 123 | 178 | 166 | 177 | 6 | 9 | 2.5 | 2 | 38.1 | 0.42 | 1.4 | 0.79 | 4.51 |
| **HR 32221 J** | 3FC | 123 | 120 | 178 | 162 | 180 | 5 | 10 | 2.5 | 2 | 44.8 | 0.42 | 1.4 | 0.79 | 6.25 |
| **HR 30321 J** | 2GB | 126 | 133 | 211 | 195 | 206 | 6 | 12.5 | 3 | 2.5 | 43.3 | 0.35 | 1.7 | 0.96 | 9.52 |
| **HR 31321 J** | 7GB | 141 | 130 | 211 | 177 | 211 | 7 | 22 | 3 | 2.5 | 70.2 | 0.83 | 0.73 | 0.40 | 10 |
| **HR 32321 J** | 2GD | 130 | 129 | 211 | 186 | 209 | 6 | 18.5 | 3 | 2.5 | 55.2 | 0.35 | 1.7 | 0.96 | 14.9 |
| **HR 32922 J** | 2CC | 121 | 119 | 142 | 142 | 145 | 5 | 5 | 1.5 | 1.5 | 26.5 | 0.36 | 1.7 | 0.93 | 1.29 |
| **HR 32022 XJ** | 4DC | 125 | 121 | 160 | 153 | 163 | 7 | 9 | 2 | 2 | 35.9 | 0.43 | 1.4 | 0.77 | 3.09 |
| **HR 33022 J** | 2DE | 125 | 121 | 160 | 153 | 161 | 7 | 10 | 2 | 2 | 33.7 | 0.29 | 2.1 | 1.2 | 3.84 |
| **HR 33122 J** | 3EE | 125 | 121 | 170 | 156 | 174 | 9 | 13 | 2 | 2 | 44.1 | 0.42 | 1.4 | 0.79 | 5.54 |
| **HR 30222 J** | 3FB | 128 | 129 | 188 | 175 | 187 | 6 | 9 | 2.5 | 2 | 40.2 | 0.42 | 1.4 | 0.79 | 5.28 |
| **HR 32222 J** | 3FC | 128 | 127 | 188 | 171 | 190 | 5 | 10 | 2.5 | 2 | 47.2 | 0.42 | 1.4 | 0.79 | 7.35 |
| **HR 30322 J** | 2GB | 131 | 143 | 226 | 208 | 220 | 6 | 12.5 | 3 | 2.5 | 45.1 | 0.35 | 1.7 | 0.96 | 11 |
| **HR 31322 J** | 7GB | 146 | 136 | 226 | 191 | 224 | 7 | 25 | 3 | 2.5 | 74.8 | 0.83 | 0.73 | 0.40 | 12.3 |
| **HR 32322 J** | 2GD | 135 | 139 | 226 | 201 | 222 | 6 | 19.5 | 3 | 2.5 | 58.6 | 0.35 | 1.7 | 0.96 | 17.1 |
| **HR 32924 J** | 2CC | 131 | 129 | 156 | 155 | 160 | 6 | 6 | 1.5 | 1.5 | 29.2 | 0.35 | 1.7 | 0.95 | 1.8 |
| **T 4 CB120** | 4CB | 138 | 129 | 158 | 158 | 164 | 7 | 7.5 | 2.5 | 2.5 | 35.0 | 0.47 | 1.3 | 0.70 | 1.78 |
| **HR 32024 XJ** | 4DC | 135 | 131 | 170 | 162 | 173 | 7 | 9 | 2 | 2 | 39.7 | 0.46 | 1.3 | 0.72 | 3.27 |
| **HR 33024 J** | 2DE | 135 | 130 | 168 | 161 | 171 | 6 | 10 | 2 | 2 | 36.0 | 0.31 | 2.0 | 1.1 | 4.2 |
| **HR 33124 J** | 3FE | 135 | 133 | 190 | 173 | 192 | 9 | 14 | 2 | 2 | 47.9 | 0.40 | 1.5 | 0.83 | 7.67 |
| **HR 30224 J** | 4FB | 138 | 141 | 203 | 190 | 201 | 6 | 9.5 | 2.5 | 2 | 44.4 | 0.44 | 1.4 | 0.76 | 6.28 |
| **HR 32224 J** | 4FD | 138 | 137 | 203 | 181 | 204 | 6 | 11.5 | 2.5 | 2 | 52.1 | 0.44 | 1.4 | 0.76 | 9.0 |
| **HR 30324 J** | 2GB | 141 | 154 | 246 | 223 | 237 | 6 | 13.5 | 3 | 2.5 | 50.0 | 0.35 | 1.7 | 0.96 | 13.9 |
| **HR 31324 J** | 7GB | 156 | 148 | 246 | 206 | 244 | 9 | 26 | 3 | 2.5 | 81.7 | 0.83 | 0.73 | 0.40 | 15.6 |
| **HR 32324 J** | 2GD | 145 | 149 | 246 | 216 | 239 | 6 | 21.5 | 3 | 2.5 | 62.5 | 0.35 | 1.7 | 0.96 | 21.8 |
| **32926** | — | 142 | 141 | 171 | 168 | 175 | 6 | 6 | 2 | 1.5 | 34.7 | 0.36 | 1.7 | 0.92 | 2.25 |
| **HR 32926 J** | 2CC | 142 | 140 | 170 | 168 | 173 | 6 | 7 | 2 | 1.5 | 31.4 | 0.34 | 1.8 | 0.97 | 2.46 |
| **T 4 CB130** | 4CB | 148 | 141 | 171 | 171 | 179 | 8 | 8 | 2.5 | 2.5 | 37.5 | 0.47 | 1.3 | 0.70 | 2.32 |
| **HR 32026 XJ** | 4EC | 145 | 144 | 190 | 179 | 192 | 8 | 11 | 2 | 2 | 43.9 | 0.43 | 1.4 | 0.76 | 5.06 |
| **HR 33026 J** | 2EE | 145 | 144 | 188 | 179 | 192 | 8 | 12 | 2 | 2 | 42.4 | 0.34 | 1.8 | 0.97 | 6.25 |
| **HR 30226 J** | 4FB | 151 | 151 | 216 | 205 | 217 | 7 | 9.5 | 3 | 2.5 | 45.9 | 0.44 | 1.4 | 0.76 | 7.25 |
| **HR 32226 J** | 4FD | 151 | 147 | 216 | 196 | 219 | 7 | 13.5 | 3 | 2.5 | 57.0 | 0.44 | 1.4 | 0.76 | 11.3 |
| **30326** | — | 157 | 168 | 262 | 239 | 255 | 8 | 14.5 | 4 | 3 | 53.9 | 0.36 | 1.7 | 0.92 | 16.6 |
| **HR 30326 J** | 2GB | 157 | 166 | 262 | 241 | 255 | 8 | 14.5 | 4 | 3 | 52.8 | 0.35 | 1.7 | 0.96 | 17.2 |
| **HR 31326 J** | 7GB | 174 | 159 | 262 | 220 | 261 | 9 | 28 | 4 | 3 | 87.1 | 0.83 | 0.73 | 0.40 | 18.8 |
| **32326** | — | 162 | 165 | 262 | 233 | 263 | 8 | 20.5 | 4 | 3 | 69.2 | 0.36 | 1.7 | 0.92 | 26.6 |

## Bore Diameter 140 – 170 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

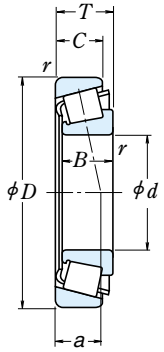
When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

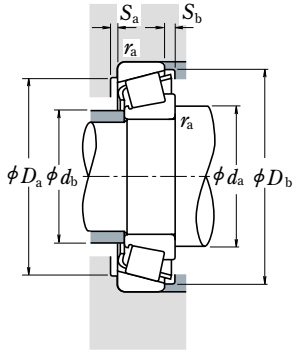
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **140** | 190 | 32 | 32 | 25 | 2 | 1.5 | 206 000 | 390 000 | 21 000 | 39 500 | 1 700 | 2 200 |
| | 210 | 45 | 45 | 34 | 2.5 | 2 | 325 000 | 555 000 | 33 000 | 57 000 | 1 600 | 2 200 |
| | 210 | 56 | 56 | 44 | 2.5 | 2 | 410 000 | 770 000 | 42 000 | 78 500 | 1 600 | 2 200 |
| | 250 | 45.75 | 42 | 36 | 4 | 3 | 390 000 | 515 000 | 40 000 | 52 500 | 1 400 | 1 900 |
| | 250 | 71.75 | 68 | 58 | 4 | 3 | 610 000 | 915 000 | 62 000 | 93 500 | 1 400 | 1 900 |
| | 300 | 67.75 | 62 | 53 | 5 | 4 | 740 000 | 945 000 | 75 500 | 96 500 | 1 200 | 1 700 |
| | 300 | 77 | 70 | 47 | 5 | 4 | 695 000 | 955 000 | 71 000 | 97 500 | 1 100 | 1 500 |
| | 300 | 107.75 | 102 | 85 | 5 | 4 | 985 000 | 1 440 000 | 101 000 | 147 000 | 1 200 | 1 600 |
| **150** | 210 | 38 | 36 | 31 | 2.5 | 2 | 247 000 | 440 000 | 25 200 | 45 000 | 1 500 | 2 000 |
| | 210 | 38 | 38 | 30 | 2.5 | 2 | 281 000 | 520 000 | 28 600 | 53 000 | 1 500 | 2 000 |
| | 225 | 48 | 48 | 36 | 3 | 2.5 | 375 000 | 650 000 | 38 000 | 66 500 | 1 400 | 2 000 |
| | 225 | 59 | 59 | 46 | 3 | 2.5 | 435 000 | 805 000 | 44 000 | 82 000 | 1 400 | 2 000 |
| | 270 | 49 | 45 | 38 | 4 | 3 | 485 000 | 665 000 | 49 000 | 67 500 | 1 300 | 1 800 |
| | 270 | 77 | 73 | 60 | 4 | 3 | 705 000 | 1 080 000 | 71 500 | 110 000 | 1 300 | 1 800 |
| | 320 | 72 | 65 | 55 | 5 | 4 | 690 000 | 860 000 | 70 000 | 87 500 | 1 100 | 1 500 |
| | 320 | 72 | 65 | 55 | 5 | 4 | 825 000 | 1 060 000 | 84 500 | 108 000 | 1 100 | 1 600 |
| | 320 | 82 | 75 | 50 | 5 | 4 | 790 000 | 1 100 000 | 80 500 | 112 000 | 1 000 | 1 400 |
| | 320 | 114 | 108 | 90 | 5 | 4 | 1 120 000 | 1 700 000 | 114 000 | 174 000 | 1 100 | 1 500 |
| **160** | 220 | 38 | 38 | 30 | 2.5 | 2 | 296 000 | 570 000 | 30 000 | 58 000 | 1 400 | 1 900 |
| | 240 | 51 | 51 | 38 | 3 | 2.5 | 425 000 | 750 000 | 43 500 | 76 500 | 1 300 | 1 800 |
| | 290 | 52 | 48 | 40 | 4 | 3 | 530 000 | 730 000 | 54 000 | 74 500 | 1 200 | 1 600 |
| | 290 | 84 | 80 | 67 | 4 | 3 | 795 000 | 1 220 000 | 81 000 | 125 000 | 1 200 | 1 600 |
| | 340 | 75 | 68 | 58 | 5 | 4 | 765 000 | 960 000 | 78 000 | 98 000 | 1 000 | 1 400 |
| | 340 | 75 | 68 | 58 | 5 | 4 | 870 000 | 1 110 000 | 89 000 | 113 000 | 1 100 | 1 400 |
| | 340 | 75 | 68 | 48 | 5 | 4 | 675 000 | 875 000 | 69 000 | 89 000 | 950 | 1 300 |
| | 340 | 121 | 114 | 95 | 5 | 4 | 1 210 000 | 1 770 000 | 123 000 | 181 000 | 1 000 | 1 400 |
| **170** | 230 | 38 | 36 | 31 | 2.5 | 2.5 | 258 000 | 485 000 | 26 300 | 49 500 | 1 300 | 1 800 |
| | 230 | 38 | 38 | 30 | 2.5 | 2 | 294 000 | 560 000 | 30 000 | 57 000 | 1 400 | 1 800 |
| | 260 | 57 | 57 | 43 | 3 | 2.5 | 505 000 | 890 000 | 51 500 | 90 500 | 1 200 | 1 700 |
| | 310 | 57 | 52 | 43 | 5 | 4 | 630 000 | 885 000 | 64 000 | 90 000 | 1 100 | 1 500 |
| | 310 | 91 | 86 | 71 | 5 | 4 | 930 000 | 1 450 000 | 94 500 | 148 000 | 1 100 | 1 500 |
| | 360 | 80 | 72 | 62 | 5 | 4 | 845 000 | 1 080 000 | 86 000 | 110 000 | 950 | 1 300 |
| | 360 | 80 | 72 | 62 | 5 | 4 | 960 000 | 1 230 000 | 98 000 | 125 000 | 1 000 | 1 300 |
| | 360 | 80 | 72 | 50 | 5 | 4 | 760 000 | 1 040 000 | 77 500 | 106 000 | 900 | 1 200 |
| | 360 | 127 | 120 | 100 | 5 | 4 | 1 370 000 | 2 050 000 | 140 000 | 209 000 | 1 000 | 1 300 |

| Bearing Numbers | ISO355 Dimension Series approx. | Abutment and Fillet Dimensions (mm) | | | | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $d_a$ min. | $d_b$ max. | $D_a$ max. | $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. |
| **HR 32928 J** | 2CC | 152 | 150 | 180 | 178 | 184 | 6 | 7 | 2 | 1.5 | 33.6 | 0.36 | 1.7 | 0.92 | 2.64 |
| **HR 32028 XJ** | 4DC | 155 | 152 | 200 | 189 | 202 | 8 | 11 | 2 | 2 | 46.6 | 0.46 | 1.3 | 0.72 | 5.32 |
| **HR 33028 J** | 2DE | 155 | 153 | 198 | 189 | 202 | 7 | 12 | 2 | 2 | 45.5 | 0.36 | 1.7 | 0.92 | 6.74 |
| **HR 30228 J** | 4FB | 161 | 164 | 236 | 221 | 234 | 7 | 9.5 | 3 | 2.5 | 48.9 | 0.44 | 1.4 | 0.76 | 8.74 |
| **HR 32228 J** | 4FD | 161 | 159 | 236 | 213 | 238 | 9 | 13.5 | 3 | 2.5 | 60.5 | 0.44 | 1.4 | 0.76 | 14.3 |
| **HR 30328 J** | 2GB | 167 | 177 | 282 | 256 | 273 | 9 | 14.5 | 4 | 3 | 55.7 | 0.35 | 1.7 | 0.96 | 21.1 |
| **HR 31328 J** | 7GB | 184 | 174 | 282 | 236 | 280 | 9 | 30 | 4 | 3 | 92.9 | 0.83 | 0.73 | 0.40 | 28.5 |
| **32328** | — | 172 | 177 | 282 | 246 | 281 | 9 | 22.5 | 4 | 3 | 76.4 | 0.37 | 1.6 | 0.88 | 33.9 |
| **32930** | — | 165 | 162 | 200 | 195 | 201 | 7 | 7 | 2 | 2 | 36.7 | 0.33 | 1.8 | 1.0 | 3.8 |
| **HR 32930 J** | 2DC | 165 | 163 | 198 | 196 | 202 | 7 | 8 | 2 | 2 | 36.5 | 0.33 | 1.8 | 1.0 | 4.05 |
| **HR 32030 XJ** | 4EC | 168 | 164 | 213 | 202 | 216 | 8 | 12 | 2.5 | 2 | 49.8 | 0.46 | 1.3 | 0.72 | 6.6 |
| **HR 33030 J** | 2EE | 168 | 165 | 213 | 203 | 217 | 8 | 13 | 2.5 | 2 | 48.7 | 0.36 | 1.7 | 0.90 | 8.07 |
| **HR 30230 J** | 2GB | 171 | 175 | 256 | 236 | 250 | 7 | 11 | 3 | 2.5 | 51.3 | 0.44 | 1.4 | 0.76 | 11.2 |
| **HR 32230 J** | 4GD | 171 | 171 | 256 | 228 | 254 | 8 | 17 | 3 | 2.5 | 64.7 | 0.44 | 1.4 | 0.76 | 17.8 |
| **30330** | — | 177 | 193 | 302 | 275 | 292 | 8 | 17 | 4 | 3 | 61.4 | 0.36 | 1.7 | 0.92 | 24.2 |
| **HR 30330 J** | 2GB | 177 | 190 | 302 | 276 | 292 | 8 | 17 | 4 | 3 | 60.0 | 0.35 | 1.7 | 0.96 | 25 |
| **HR 31330 J** | 7GB | 194 | 187 | 302 | 253 | 300 | 9 | 32 | 4 | 3 | 99.3 | 0.83 | 0.73 | 0.40 | 28.5 |
| **32330** | — | 182 | 191 | 302 | 262 | 297 | 8 | 24 | 4 | 3 | 81.5 | 0.37 | 1.6 | 0.88 | 41.4 |
| **HR 32932 J** | 2DC | 175 | 173 | 208 | 206 | 212 | 7 | 8 | 2 | 2 | 38.7 | 0.35 | 1.7 | 0.95 | 4.32 |
| **HR 32032 XJ** | 4EC | 178 | 175 | 228 | 216 | 231 | 8 | 13 | 2.5 | 2 | 53.0 | 0.46 | 1.3 | 0.72 | 7.93 |
| **HR 30232 J** | 4GB | 181 | 189 | 276 | 253 | 269 | 8 | 12 | 3 | 2.5 | 55.0 | 0.44 | 1.4 | 0.76 | 13.7 |
| **HR 32232 J** | 4GD | 181 | 184 | 276 | 243 | 274 | 10 | 17 | 3 | 2.5 | 70.5 | 0.44 | 1.4 | 0.76 | 22.7 |
| **30332** | — | 187 | 205 | 322 | 293 | 311 | 10 | 17 | 4 | 3 | 64.6 | 0.36 | 1.7 | 0.92 | 28.4 |
| **HR 30332 J** | 2GB | 187 | 201 | 322 | 293 | 310 | 10 | 17 | 4 | 3 | 62.9 | 0.35 | 1.7 | 0.96 | 29.2 |
| **30332 D** | — | 196 | 198 | 322 | 270 | 313 | 9 | 27 | 4 | 3 | 99.4 | 0.81 | 0.74 | 0.41 | 27.5 |
| **32332** | — | 192 | 202 | 322 | 281 | 319 | 10 | 26 | 4 | 3 | 87.1 | 0.37 | 1.6 | 0.88 | 48.3 |
| **32934** | — | 185 | 183 | 220 | 216 | 223 | 7 | 7 | 2 | 2 | 41.6 | 0.36 | 1.7 | 0.90 | 4.3 |
| **HR 32934 J** | 3DC | 185 | 180 | 218 | 215 | 222 | 7 | 8 | 2 | 2 | 41.7 | 0.38 | 1.6 | 0.86 | 4.44 |
| **HR 32034 XJ** | 4EC | 188 | 187 | 248 | 232 | 249 | 10 | 14 | 2.5 | 2 | 56.6 | 0.44 | 1.4 | 0.74 | 10.6 |
| **HR 30234 J** | 4GB | 197 | 202 | 292 | 273 | 288 | 8 | 14 | 4 | 3 | 59.4 | 0.44 | 1.4 | 0.76 | 17.1 |
| **HR 32234 J** | 4GD | 197 | 197 | 292 | 262 | 294 | 10 | 20 | 4 | 3 | 76.4 | 0.44 | 1.4 | 0.76 | 28 |
| **30334** | — | 197 | 221 | 342 | 312 | 332 | 10 | 18 | 4 | 3 | 70.1 | 0.37 | 1.6 | 0.90 | 33.5 |
| **HR 30334 J** | 2GB | 197 | 214 | 342 | 310 | 329 | 10 | 18 | 4 | 3 | 67.3 | 0.35 | 1.7 | 0.96 | 34.5 |
| **30334 D** | — | 206 | 215 | 342 | 288 | 332 | 10 | 30 | 4 | 3 | 107.3 | 0.81 | 0.74 | 0.41 | 33.4 |
| **32334** | — | 202 | 213 | 342 | 297 | 337 | 10 | 27 | 4 | 3 | 91.3 | 0.37 | 1.6 | 0.88 | 57 |

## Bore Diameter 180 – 240 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

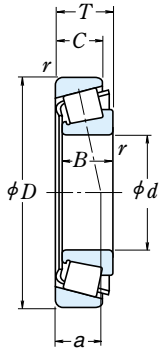
$P_0 = 0.5F_r + Y_0F_a$

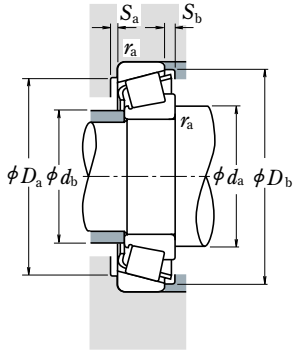
When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Bearing Numbers | ISO355 Dimension Series approx. | Boundary Dimensions (mm) d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) Cr | C0r | {kgf} Cr | C0r | Limiting Speeds (min⁻¹) Grease | Oil | Abutment and Fillet Dimensions (mm) da min. | db max. | Da max. | Db min. | Sa min. | Sb min. | Cone ra max. | Cup ra max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors Y1 | Y0 | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32936 J** | 4DC | **180** | 250 | 45 | 45 | 34 | 2.5 | 2 | 350 000 | 685 000 | 36 000 | 69 500 | 1 300 | 1 700 | 195 | 192 | 240 | 227 | 241 | 8 | 11 | 2 | 2 | 53.9 | 0.48 | 1.3 | 0.69 | 6.56 |
| **HR 32036 XJ** | 3FD | | 280 | 64 | 64 | 48 | 3 | 2.5 | 640 000 | 1 130 000 | 65 000 | 115 000 | 1 200 | 1 600 | 198 | 199 | 268 | 248 | 267 | 10 | 16 | 2.5 | 2 | 60.4 | 0.42 | 1.4 | 0.78 | 14.3 |
| **HR 30236 J** | 4GB | | 320 | 57 | 52 | 43 | 5 | 4 | 650 000 | 930 000 | 66 000 | 95 000 | 1 100 | 1 400 | 207 | 210 | 302 | 281 | 297 | 9 | 14 | 4 | 3 | 61.8 | 0.45 | 1.3 | 0.73 | 17.8 |
| **HR 32236 J** | 4GD | | 320 | 91 | 86 | 71 | 5 | 4 | 960 000 | 1 540 000 | 98 000 | 157 000 | 1 100 | 1 400 | 207 | 205 | 302 | 270 | 303 | 10 | 20 | 4 | 3 | 78.9 | 0.45 | 1.3 | 0.73 | 29.8 |
| **30336** | — | | 380 | 83 | 75 | 64 | 5 | 4 | 935 000 | 1 230 000 | 95 500 | 126 000 | 900 | 1 300 | 207 | 233 | 362 | 324 | 345 | 10 | 19 | 4 | 3 | 72.5 | 0.36 | 1.7 | 0.92 | 39.3 |
| **30336 D** | — | | 380 | 83 | 75 | 53 | 5 | 4 | 820 000 | 1 120 000 | 83 500 | 114 000 | 850 | 1 200 | 216 | 229 | 362 | 304 | 352 | 10 | 30 | 4 | 3 | 113.1 | 0.81 | 0.74 | 0.41 | 38.5 |
| **32336** | — | | 380 | 134 | 126 | 106 | 5 | 4 | 1 520 000 | 2 290 000 | 155 000 | 234 000 | 950 | 1 300 | 212 | 225 | 362 | 310 | 353 | 10 | 28 | 4 | 3 | 96.6 | 0.37 | 1.6 | 0.88 | 66.8 |
| **HR 32938 J** | 4DC | **190** | 260 | 45 | 45 | 34 | 2.5 | 2 | 365 000 | 715 000 | 37 000 | 73 000 | 1 200 | 1 600 | 205 | 201 | 250 | 237 | 251 | 8 | 11 | 2 | 2 | 55.3 | 0.48 | 1.3 | 0.69 | 6.83 |
| **HR 32038 XJ** | 4FD | | 290 | 64 | 64 | 48 | 3 | 2.5 | 650 000 | 1 170 000 | 66 000 | 119 000 | 1 100 | 1 500 | 208 | 209 | 278 | 258 | 279 | 10 | 16 | 2.5 | 2 | 63.4 | 0.44 | 1.4 | 0.75 | 14.9 |
| **HR 30238 J** | 4GB | | 340 | 60 | 55 | 46 | 5 | 4 | 715 000 | 1 020 000 | 73 000 | 104 000 | 1 000 | 1 300 | 217 | 223 | 322 | 302 | 318 | 9 | 14 | 4 | 3 | 65.6 | 0.44 | 1.4 | 0.76 | 21.4 |
| **HR 32238 J** | 4GD | | 340 | 97 | 92 | 75 | 5 | 4 | 1 110 000 | 1 770 000 | 113 000 | 181 000 | 1 000 | 1 400 | 217 | 216 | 322 | 290 | 323 | 10 | 22 | 4 | 3 | 80.5 | 0.44 | 1.4 | 0.76 | 35.2 |
| **30338** | — | | 400 | 86 | 78 | 65 | 6 | 5 | 1 010 000 | 1 340 000 | 103 000 | 136 000 | 850 | 1 200 | 223 | 248 | 378 | 346 | 366 | 11 | 21 | 5 | 4 | 76.1 | 0.36 | 1.7 | 0.92 | 46 |
| **32338** | — | | 400 | 140 | 132 | 109 | 6 | 5 | 1 660 000 | 2 580 000 | 169 000 | 263 000 | 850 | 1 200 | 229 | 243 | 378 | 332 | 375 | 11 | 31 | 5 | 4 | 102.7 | 0.37 | 1.6 | 0.88 | 78.9 |
| **32940** | — | **200** | 280 | 51 | 48 | 41 | 3 | 2.5 | 410 000 | 780 000 | 42 000 | 80 000 | 1 100 | 1 500 | 218 | 217 | 268 | 256 | 269 | 9 | 10 | 2.5 | 2 | 53.4 | 0.37 | 1.6 | 0.88 | 9.26 |
| **HR 32940 J** | 3EC | | 280 | 51 | 51 | 39 | 3 | 2.5 | 480 000 | 935 000 | 48 500 | 95 000 | 1 100 | 1 500 | 218 | 216 | 268 | 258 | 271 | 9 | 12 | 2.5 | 2 | 54.2 | 0.39 | 1.5 | 0.84 | 9.65 |
| **HR 32040 XJ** | 4FD | | 310 | 70 | 70 | 53 | 3 | 2.5 | 760 000 | 1 370 000 | 77 500 | 139 000 | 1 000 | 1 400 | 218 | 221 | 298 | 277 | 297 | 11 | 17 | 2.5 | 2 | 67.4 | 0.43 | 1.4 | 0.77 | 18.9 |
| **HR 30240 J** | 4GB | | 360 | 64 | 58 | 48 | 5 | 4 | 795 000 | 1 120 000 | 81 000 | 114 000 | 950 | 1 300 | 227 | 236 | 342 | 318 | 336 | 10 | 16 | 4 | 3 | 69.1 | 0.44 | 1.4 | 0.76 | 25.5 |
| **HR 32240 J** | 3GD | | 360 | 104 | 98 | 82 | 5 | 4 | 1 210 000 | 1 920 000 | 123 000 | 196 000 | 950 | 1 300 | 227 | 230 | 342 | 305 | 340 | 11 | 22 | 4 | 3 | 85.1 | 0.41 | 1.5 | 0.81 | 42.6 |
| **30340** | — | | 420 | 89 | 80 | 67 | 6 | 5 | 1 030 000 | 1 390 000 | 105 000 | 142 000 | 850 | 1 200 | 233 | 253 | 398 | 346 | 368 | 11 | 22 | 5 | 4 | 81.4 | 0.37 | 1.6 | 0.88 | 52.3 |
| **30340 D** | — | | 420 | 89 | 80 | 56 | 6 | 5 | 965 000 | 1 330 000 | 98 500 | 136 000 | 750 | 1 000 | 244 | 253 | 398 | 336 | 385 | 11 | 33 | 5 | 4 | 122.9 | 0.81 | 0.74 | 0.41 | 49.6 |
| **32340** | — | | 420 | 146 | 138 | 115 | 6 | 5 | 1 820 000 | 2 870 000 | 185 000 | 292 000 | 800 | 1 100 | 239 | 253 | 398 | 346 | 392 | 11 | 31 | 5 | 4 | 106.7 | 0.37 | 1.6 | 0.88 | 90.9 |
| **HR 32944 J** | 3EC | **220** | 300 | 51 | 51 | 39 | 3 | 2.5 | 490 000 | 990 000 | 50 000 | 101 000 | 1 000 | 1 400 | 238 | 235 | 288 | 278 | 293 | 9 | 12 | 2.5 | 2 | 59.2 | 0.43 | 1.4 | 0.78 | 10.3 |
| **HR 32044 XJ** | 4FD | | 340 | 76 | 76 | 57 | 4 | 3 | 885 000 | 1 610 000 | 90 500 | 164 000 | 950 | 1 300 | 241 | 244 | 326 | 303 | 326 | 12 | 19 | 3 | 2.5 | 73.6 | 0.43 | 1.4 | 0.77 | 24.4 |
| **30244** | — | | 400 | 72 | 65 | 54 | 5 | 4 | 810 000 | 1 150 000 | 82 500 | 117 000 | 850 | 1 100 | 247 | 267 | 382 | 350 | 367 | 11 | 18 | 4 | 3 | 74.7 | 0.40 | 1.5 | 0.82 | 33.6 |
| **32244** | — | | 400 | 114 | 108 | 90 | 5 | 4 | 1 340 000 | 2 210 000 | 137 000 | 225 000 | 850 | 1 100 | 247 | 260 | 382 | 340 | 377 | 12 | 24 | 4 | 3 | 93.0 | 0.40 | 1.5 | 0.82 | 57.4 |
| **30344** | — | | 460 | 97 | 88 | 73 | 6 | 5 | 1 430 000 | 1 990 000 | 146 000 | 203 000 | 750 | 1 000 | 253 | 283 | 438 | 390 | 414 | 12 | 24 | 5 | 4 | 85.4 | 0.36 | 1.7 | 0.92 | 72.4 |
| **32344** | — | | 460 | 154 | 145 | 122 | 6 | 5 | 2 020 000 | 3 200 000 | 206 000 | 325 000 | 750 | 1 000 | 259 | 274 | 438 | 372 | 421 | 12 | 32 | 5 | 4 | 114.9 | 0.37 | 1.6 | 0.88 | 114 |
| **HR 32948 J** | 4EC | **240** | 320 | 51 | 51 | 39 | 3 | 2.5 | 500 000 | 1 040 000 | 51 000 | 107 000 | 950 | 1 300 | 258 | 255 | 308 | 297 | 314 | 9 | 12 | 2.5 | 2 | 65.1 | 0.46 | 1.3 | 0.72 | 11.1 |
| **HR 32048 XJ** | 4FD | | 360 | 76 | 76 | 57 | 4 | 3 | 920 000 | 1 730 000 | 94 000 | 177 000 | 850 | 1 200 | 261 | 262 | 346 | 321 | 346 | 12 | 19 | 3 | 2.5 | 79.1 | 0.46 | 1.3 | 0.72 | 26.2 |
| **30248** | — | | 440 | 79 | 72 | 60 | 5 | 4 | 990 000 | 1 400 000 | 101 000 | 142 000 | 750 | 1 000 | 267 | 288 | 422 | 384 | 408 | 11 | 19 | 4 | 3 | 85.1 | 0.44 | 1.4 | 0.74 | 45.2 |
| **32248** | — | | 440 | 127 | 120 | 100 | 5 | 4 | 1 630 000 | 2 730 000 | 166 000 | 278 000 | 750 | 1 000 | 267 | 285 | 422 | 374 | 416 | 12 | 27 | 4 | 3 | 102.5 | 0.40 | 1.5 | 0.82 | 78 |
| **30348** | — | | 500 | 105 | 95 | 80 | 6 | 5 | 1 660 000 | 2 340 000 | 169 000 | 238 000 | 670 | 950 | 273 | 308 | 478 | 422 | 447 | 12 | 25 | 5 | 4 | 92.8 | 0.36 | 1.7 | 0.92 | 92.6 |
| **32348** | — | | 500 | 165 | 155 | 132 | 6 | 5 | 2 520 000 | 4 100 000 | 257 000 | 415 000 | 670 | 900 | 279 | 301 | 478 | 410 | 464 | 12 | 33 | 5 | 4 | 123.2 | 0.37 | 1.6 | 0.88 | 145 |

## Bore Diameter 260 – 440 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

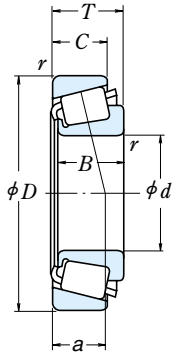
$P_0 = 0.5F_r + Y_0F_a$

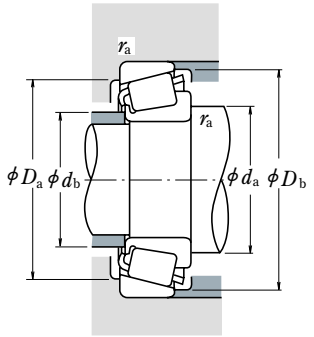
When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Bearing Numbers | ISO355 Dimension Series approx. | Boundary Dimensions (mm) d | D | T | B | C | Cone r min. | Cup r min. | Basic Load Ratings (N) $C_r$ | $C_{0r}$ | {kgf} $C_r$ | $C_{0r}$ | Limiting Speeds (min⁻¹) Grease | Oil | Abutment and Fillet Dimensions (mm) $d_a$ min. | $d_b$ max. | Cone $D_a$ max. | Cup $D_a$ min. | $D_b$ min. | $S_a$ min. | $S_b$ min. | Cone $r_a$ max. | Cup $r_a$ max. | Eff. Load Centers (mm) a | Constant e | Axial Load Factors $Y_1$ | $Y_0$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HR 32952 J** | 3EC | **260** | 360 | 63.5 | 63.5 | 48 | 3 | 2.5 | 730 000 | 1 450 000 | 74 500 | 148 000 | 850 | 1 100 | 278 | 278 | 348 | 333 | 347 | 11 | 15.5 | 2.5 | 2 | 69.8 | 0.41 | 1.5 | 0.81 | 18.6 |
| **HR 32052 XJ** | 4FC | | 400 | 87 | 87 | 65 | 5 | 4 | 1 160 000 | 2 160 000 | 118 000 | 220 000 | 800 | 1 100 | 287 | 287 | 382 | 357 | 383 | 14 | 22 | 4 | 3 | 86.3 | 0.43 | 1.4 | 0.76 | 38.5 |
| **30252** | — | | 480 | 89 | 80 | 67 | 6 | 5 | 1 190 000 | 1 700 000 | 121 000 | 174 000 | 670 | 900 | 293 | 316 | 458 | 421 | 447 | 12 | 22 | 5 | 4 | 94.6 | 0.44 | 1.4 | 0.74 | 60.7 |
| **32252** | — | | 480 | 137 | 130 | 106 | 6 | 5 | 1 900 000 | 3 300 000 | 194 000 | 335 000 | 670 | 950 | 293 | 305 | 458 | 394 | 446 | 14 | 31 | 5 | 4 | 116.0 | 0.45 | 1.3 | 0.73 | 103 |
| **30352** | — | | 540 | 113 | 102 | 85 | 6 | 6 | 1 870 000 | 2 640 000 | 190 000 | 269 000 | 630 | 850 | 293 | 336 | 512 | 460 | 487 | 16 | 28 | 5 | 5 | 101.6 | 0.36 | 1.7 | 0.92 | 114 |
| **32352** | — | | 540 | 176 | 165 | 136 | 6 | 6 | 2 910 000 | 4 800 000 | 297 000 | 490 000 | 630 | 850 | 293 | 328 | 512 | 441 | 495 | 13 | 40 | 5 | 5 | 130.5 | 0.37 | 1.6 | 0.88 | 188 |
| **HR 32956 J** | 4EC | **280** | 380 | 63.5 | 63.5 | 48 | 3 | 2.5 | 765 000 | 1 580 000 | 78 000 | 162 000 | 800 | 1 100 | 298 | 297 | 368 | 352 | 368 | 12 | 15.5 | 2.5 | 2 | 75.3 | 0.43 | 1.4 | 0.76 | 20 |
| **HR 32056 XJ** | 4FC | | 420 | 87 | 87 | 65 | 5 | 4 | 1 180 000 | 2 240 000 | 120 000 | 228 000 | 710 | 1 000 | 307 | 305 | 402 | 374 | 402 | 14 | 22 | 4 | 3 | 91.6 | 0.46 | 1.3 | 0.72 | 40.6 |
| **30256** | — | | 500 | 89 | 80 | 67 | 6 | 5 | 1 240 000 | 1 900 000 | 127 000 | 194 000 | 630 | 850 | 313 | 339 | 478 | 436 | 462 | 12 | 22 | 5 | 4 | 98.5 | 0.44 | 1.4 | 0.74 | 66.3 |
| **32256** | — | | 500 | 137 | 130 | 106 | 6 | 5 | 1 950 000 | 3 450 000 | 199 000 | 355 000 | 630 | 850 | 313 | 325 | 478 | 412 | 467 | 14 | 31 | 5 | 4 | 123.1 | 0.47 | 1.3 | 0.70 | 109 |
| **32356** | — | | 580 | 187 | 175 | 145 | 6 | 6 | 3 300 000 | 5 400 000 | 335 000 | 550 000 | 560 | 800 | 319 | 353 | 552 | 475 | 532 | 14 | 42 | 5 | 5 | 139.6 | 0.37 | 1.6 | 0.89 | 224 |
| **32960** | — | **300** | 420 | 76 | 72 | 62 | 4 | 3 | 895 000 | 1 820 000 | 91 000 | 186 000 | 710 | 950 | 321 | 326 | 406 | 386 | 405 | 13 | 14 | 3 | 2.5 | 79.3 | 0.37 | 1.6 | 0.88 | 30.5 |
| **HR 32960 J** | 3FD | | 420 | 76 | 76 | 57 | 4 | 3 | 1 010 000 | 2 100 000 | 103 000 | 214 000 | 710 | 950 | 321 | 324 | 406 | 387 | 405 | 13 | 19 | 3 | 2.5 | 79.9 | 0.39 | 1.5 | 0.84 | 31.4 |
| **HR 32060 XJ** | 4GD | | 460 | 100 | 100 | 74 | 5 | 4 | 1 440 000 | 2 700 000 | 147 000 | 275 000 | 670 | 900 | 327 | 330 | 442 | 408 | 439 | 15 | 26 | 4 | 3 | 98.4 | 0.43 | 1.4 | 0.76 | 56.6 |
| **30260** | — | | 540 | 96 | 85 | 71 | 6 | 5 | 1 440 000 | 2 100 000 | 147 000 | 214 000 | 600 | 800 | 333 | 355 | 518 | 470 | 499 | 14 | 25 | 5 | 4 | 105.1 | 0.44 | 1.4 | 0.74 | 80.6 |
| **32260** | — | | 540 | 149 | 140 | 115 | 6 | 5 | 2 220 000 | 3 700 000 | 226 000 | 380 000 | 600 | 800 | 333 | 352 | 518 | 458 | 514 | 15 | 34 | 5 | 4 | 131.7 | 0.46 | 1.3 | 0.72 | 132 |
| **32964** | — | **320** | 440 | 76 | 72 | 63 | 4 | 3 | 900 000 | 1 880 000 | 92 000 | 192 000 | 970 | 900 | 341 | 345 | 426 | 404 | 425 | 13 | 13 | 3 | 2.5 | 84.3 | 0.39 | 1.5 | 0.84 | 32 |
| **HR 32964 J** | 3FD | | 440 | 76 | 76 | 57 | 4 | 3 | 1 040 000 | 2 220 000 | 106 000 | 227 000 | 670 | 900 | 341 | 344 | 426 | 406 | 426 | 13 | 19 | 3 | 2.5 | 85.0 | 0.42 | 1.4 | 0.79 | 33.3 |
| **HR 32064 XJ** | 4GD | | 480 | 100 | 100 | 74 | 5 | 4 | 1 510 000 | 2 910 000 | 153 000 | 297 000 | 630 | 850 | 347 | 350 | 462 | 430 | 461 | 15 | 26 | 4 | 3 | 104.5 | 0.46 | 1.3 | 0.72 | 60 |
| **30264** | — | | 580 | 104 | 92 | 75 | 6 | 5 | 1 640 000 | 2 420 000 | 168 000 | 247 000 | 530 | 750 | 353 | 381 | 558 | 503 | 533 | 14 | 29 | 5 | 4 | 113.7 | 0.44 | 1.4 | 0.74 | 99.3 |
| **32264** | — | | 580 | 159 | 150 | 125 | 6 | 5 | 2 860 000 | 5 050 000 | 292 000 | 515 000 | 530 | 750 | 353 | 383 | 558 | 487 | 550 | 15 | 34 | 5 | 4 | 141.7 | 0.46 | 1.3 | 0.72 | 175 |
| **32364** | — | | 670 | 210 | 200 | 170 | 7.5 | 7.5 | 4 200 000 | 7 100 000 | 430 000 | 725 000 | 480 | 670 | 383 | 412 | 634 | 547 | 616 | 14 | 42 | 6 | 6 | 157.5 | 0.37 | 1.6 | 0.88 | 343 |
| **32968** | — | **340** | 460 | 76 | 72 | 63 | 4 | 3 | 910 000 | 1 940 000 | 93 000 | 197 000 | 630 | 850 | 361 | 364 | 446 | 426 | 446 | 13 | 13 | 3 | 2.5 | 89.2 | 0.41 | 1.5 | 0.80 | 33.6 |
| **HR 32968 J** | 4FD | | 460 | 76 | 76 | 57 | 4 | 3 | 1 050 000 | 2 220 000 | 107 000 | 226 000 | 630 | 850 | 361 | 362 | 446 | 427 | 446 | 13 | 19 | 3 | 2.5 | 91.0 | 0.44 | 1.4 | 0.75 | 34.3 |
| **32068** | — | | 520 | 112 | 106 | 92 | 6 | 5 | 1 650 000 | 3 400 000 | 168 000 | 345 000 | 560 | 750 | 373 | 386 | 498 | 464 | 496 | 3.5 | 22 | 5 | 4 | 104.5 | 0.37 | 1.6 | 0.89 | 83.7 |
| **32972** | — | **360** | 480 | 76 | 72 | 62 | 4 | 3 | 945 000 | 2 100 000 | 96 500 | 214 000 | 600 | 800 | 381 | 386 | 466 | 445 | 465 | 14 | 14 | 3 | 2.5 | 91.4 | 0.40 | 1.5 | 0.82 | 35.8 |
| **HR 32972 J** | 4FD | | 480 | 76 | 76 | 57 | 4 | 3 | 1 080 000 | 2 340 000 | 110 000 | 239 000 | 560 | 800 | 381 | 381 | 466 | 445 | 466 | 13 | 19 | 3 | 2.5 | 96.8 | 0.46 | 1.3 | 0.72 | 36.1 |
| **32072** | — | | 540 | 112 | 106 | 92 | 6 | 5 | 1 680 000 | 3 500 000 | 171 000 | 355 000 | 530 | 750 | 393 | 402 | 518 | 480 | 514 | 5.5 | 22 | 5 | 4 | 108.6 | 0.38 | 1.6 | 0.86 | 86.5 |
| **32976** | — | **380** | 520 | 87 | 82 | 71 | 5 | 4 | 1 210 000 | 2 550 000 | 124 000 | 260 000 | 560 | 750 | 407 | 406 | 502 | 478 | 501 | 16 | 16 | 4 | 3 | 95.2 | 0.39 | 1.6 | 0.86 | 49.5 |
| **32980** | — | **400** | 540 | 87 | 82 | 71 | 5 | 4 | 1 250 000 | 2 700 000 | 128 000 | 276 000 | 530 | 710 | 427 | 428 | 522 | 499 | 524 | 16 | 16 | 4 | 3 | 100.8 | 0.40 | 1.5 | 0.82 | 52.7 |
| **32080** | — | | 600 | 125 | 118 | 100 | 6 | 5 | 1 960 000 | 4 050 000 | 200 000 | 415 000 | 480 | 670 | 433 | 443 | 578 | 533 | 565 | 5 | 25 | 5 | 4 | 115.3 | 0.36 | 1.7 | 0.92 | 116 |
| **32984** | — | **420** | 560 | 87 | 82 | 72 | 5 | 4 | 1 300 000 | 2 810 000 | 132 000 | 287 000 | 500 | 670 | 447 | 448 | 542 | 521 | 544 | 3.5 | 15 | 4 | 3 | 106.1 | 0.41 | 1.5 | 0.81 | 54.8 |
| **32084** | — | | 620 | 125 | 118 | 100 | 6 | 5 | 2 000 000 | 4 200 000 | 204 000 | 430 000 | 450 | 630 | 453 | 463 | 598 | 552 | 586 | 6.5 | 25 | 5 | 4 | 120.0 | 0.37 | 1.6 | 0.88 | 121 |
| **32088** | — | **440** | 650 | 130 | 122 | 104 | 6 | 6 | 2 230 000 | 4 600 000 | 227 000 | 470 000 | 430 | 600 | 473 | 487 | 622 | 582 | 616 | 5 | 26 | 5 | 5 | 126.3 | 0.36 | 1.7 | 0.92 | 136 |

## Bore Diameter 12.000 – 22.225 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **12.000** | 31.991 | 10.008 | 10.785 | 7.938 | 0.8 | 1.3 | 10 300 | 8 900 | 1 050 | 905 | 13 000 | 18 000 |
| **12.700** | 34.988 | 10.998 | 10.988 | 8.730 | 1.3 | 1.3 | 11 700 | 10 900 | 1 200 | 1 110 | 12 000 | 16 000 |
| **15.000** | 34.988 | 10.998 | 10.988 | 8.730 | 0.8 | 1.3 | 11 700 | 10 900 | 1 200 | 1 110 | 12 000 | 16 000 |
| **15.875** | 34.988 | 10.998 | 10.998 | 8.712 | 1.3 | 1.3 | 13 800 | 13 400 | 1 410 | 1 360 | 11 000 | 15 000 |
| | 39.992 | 12.014 | 11.153 | 9.525 | 1.3 | 1.3 | 14 900 | 15 700 | 1 520 | 1 600 | 9 500 | 13 000 |
| | 41.275 | 14.288 | 14.681 | 11.112 | 1.3 | 2.0 | 21 300 | 19 900 | 2 170 | 2 030 | 10 000 | 13 000 |
| | 42.862 | 14.288 | 14.288 | 9.525 | 1.5 | 1.5 | 17 300 | 17 200 | 1 770 | 1 750 | 8 500 | 12 000 |
| | 42.862 | 16.670 | 16.670 | 13.495 | 1.5 | 1.5 | 26 900 | 26 300 | 2 750 | 2 680 | 9 500 | 13 000 |
| | 44.450 | 15.494 | 14.381 | 11.430 | 1.5 | 1.5 | 23 800 | 23 900 | 2 430 | 2 440 | 8 500 | 11 000 |
| | 49.225 | 19.845 | 21.539 | 14.288 | 0.8 | 1.3 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| **16.000** | 47.000 | 21.000 | 21.000 | 16.000 | 1.0 | 2.0 | 35 000 | 36 500 | 3 600 | 3 750 | 9 000 | 12 000 |
| **16.993** | 39.992 | 12.014 | 11.153 | 9.525 | 0.8 | 1.3 | 14 900 | 15 700 | 1 520 | 1 600 | 9 500 | 13 000 |
| **17.455** | 36.525 | 11.112 | 11.112 | 7.938 | 1.5 | 1.5 | 11 600 | 11 000 | 1 190 | 1 120 | 10 000 | 14 000 |
| **17.462** | 39.878 | 13.843 | 14.605 | 10.668 | 1.3 | 1.3 | 22 500 | 22 500 | 2 290 | 2 290 | 10 000 | 13 000 |
| | 47.000 | 14.381 | 14.381 | 11.112 | 0.8 | 1.3 | 23 800 | 23 900 | 2 430 | 2 440 | 8 500 | 11 000 |
| **19.050** | 39.992 | 12.014 | 11.153 | 9.525 | 1.0 | 1.3 | 14 900 | 15 700 | 1 520 | 1 600 | 9 500 | 13 000 |
| | 45.237 | 15.494 | 16.637 | 12.065 | 1.3 | 1.3 | 28 500 | 28 900 | 2 910 | 2 950 | 9 000 | 12 000 |
| | 47.000 | 14.381 | 14.381 | 11.112 | 1.3 | 1.3 | 23 800 | 23 900 | 2 430 | 2 440 | 8 500 | 11 000 |
| | 49.225 | 18.034 | 19.050 | 14.288 | 1.3 | 1.3 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| | 49.225 | 19.845 | 21.539 | 14.288 | 1.2 | 1.3 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| | 49.225 | 21.209 | 19.050 | 17.462 | 1.3 | 1.5 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| | 49.225 | 23.020 | 21.539 | 17.462 | C1.5 | 3.5 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| | 53.975 | 22.225 | 21.839 | 15.875 | 1.5 | 2.3 | 40 500 | 39 500 | 4 150 | 4 000 | 7 500 | 10 000 |
| **19.990** | 47.000 | 14.381 | 14.381 | 11.112 | 1.5 | 1.3 | 23 800 | 23 900 | 2 430 | 2 440 | 8 500 | 11 000 |
| **20.000** | 51.994 | 15.011 | 14.260 | 12.700 | 1.5 | 1.3 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| **20.625** | 49.225 | 23.020 | 21.539 | 17.462 | 1.5 | 1.5 | 37 500 | 37 000 | 3 800 | 3 800 | 8 500 | 11 000 |
| **20.638** | 49.225 | 19.845 | 19.845 | 15.875 | 1.5 | 1.5 | 36 000 | 37 000 | 3 650 | 3 750 | 8 000 | 11 000 |
| **21.430** | 50.005 | 17.526 | 18.288 | 13.970 | 1.3 | 1.3 | 38 500 | 40 000 | 3 950 | 4 100 | 8 000 | 11 000 |
| **22.000** | 45.237 | 15.494 | 16.637 | 12.065 | 1.3 | 1.3 | 29 200 | 33 500 | 2 980 | 3 400 | 8 500 | 11 000 |
| | 45.975 | 15.494 | 16.637 | 12.065 | 1.3 | 1.3 | 29 200 | 33 500 | 2 980 | 3 400 | 8 500 | 11 000 |
| **22.225** | 50.005 | 13.495 | 14.260 | 9.525 | 1.3 | 1.0 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 50.005 | 17.526 | 18.288 | 13.970 | 1.3 | 1.3 | 38 500 | 40 000 | 3 950 | 4 100 | 8 000 | 11 000 |
| | 52.388 | 19.368 | 20.168 | 14.288 | 1.5 | 1.5 | 40 500 | 43 000 | 4 100 | 4 400 | 7 500 | 10 000 |
| | 53.975 | 19.368 | 20.168 | 14.288 | 1.5 | 1.5 | 40 500 | 43 000 | 4 100 | 4 400 | 7 500 | 10 000 |
| | 56.896 | 19.368 | 19.837 | 15.875 | 1.3 | 1.3 | 38 000 | 40 500 | 3 900 | 4 150 | 7 100 | 9 500 |
| | 57.150 | 22.225 | 22.225 | 17.462 | 0.8 | 1.5 | 48 000 | 50 000 | 4 850 | 5 100 | 7 100 | 9 500 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ***A 2047** | **A 2126** | 16.5 | 15.5 | 26 | 29 | 0.8 | 1.3 | 6.8 | 0.41 | 1.5 | 0.81 | 0.023 | 0.017 |
| **A 4050** | **A 4138** | 18.5 | 17 | 29 | 32 | 1.3 | 1.3 | 8.2 | 0.45 | 1.3 | 0.73 | 0.033 | 0.022 |
| ***A 4059** | **A 4138** | 19.5 | 19 | 29 | 32 | 0.8 | 1.3 | 8.2 | 0.45 | 1.3 | 0.73 | 0.029 | 0.022 |
| **L 21549** | **L 21511** | 21.5 | 19.5 | 29 | 32.5 | 1.3 | 1.3 | 7.7 | 0.32 | 1.9 | 1.0 | 0.031 | 0.018 |
| **A 6062** | **A 6157** | 22 | 20.5 | 34 | 37 | 1.3 | 1.3 | 10.3 | 0.53 | 1.1 | 0.63 | 0.044 | 0.031 |
| **03062** | **03162** | 21.5 | 20 | 34 | 37.5 | 1.3 | 2 | 9.1 | 0.31 | 1.9 | 1.1 | 0.061 | 0.035 |
| **11590** | **11520** | 24.5 | 22.5 | 34.5 | 39.5 | 1.5 | 1.5 | 13.0 | 0.70 | 0.85 | 0.47 | 0.061 | 0.040 |
| **17580** | **17520** | 23 | 21 | 36.5 | 39 | 1.5 | 1.5 | 10.6 | 0.33 | 1.8 | 1.0 | 0.075 | 0.048 |
| **05062** | **05175** | 23.5 | 21 | 38 | 42 | 1.5 | 1.5 | 11.2 | 0.36 | 1.7 | 0.93 | 0.081 | 0.039 |
| **09062** | **09195** | 22 | 21.5 | 42 | 44.5 | 0.8 | 1.3 | 10.7 | 0.27 | 2.3 | 1.2 | 0.139 | 0.065 |
| ***HM 81649** | ****HM 81610** | 27.5 | 23 | 37.5 | 43 | 1 | 2 | 14.9 | 0.55 | 1.1 | 0.60 | 0.115 | 0.082 |
| **A 6067** | **A 6157** | 22 | 21 | 34 | 37 | 0.8 | 1.3 | 10.3 | 0.53 | 1.1 | 0.63 | 0.042 | 0.031 |
| **A 5069** | **A 5144** | 23.5 | 21.5 | 30 | 33.5 | 1.5 | 1.5 | 8.9 | 0.49 | 1.2 | 0.68 | 0.030 | 0.020 |
| **† LM 11749** | **† LM 11710** | 23 | 21.5 | 34 | 37 | 1.3 | 1.3 | 8.7 | 0.29 | 2.1 | 1.2 | 0.055 | 0.028 |
| **05068** | **05185** | 23 | 22.5 | 40.5 | 42.5 | 0.8 | 1.3 | 10.1 | 0.36 | 1.7 | 0.93 | 0.082 | 0.047 |
| **A 6075** | **A 6157** | 24 | 23 | 34 | 37 | 1 | 1.3 | 10.3 | 0.53 | 1.1 | 0.63 | 0.037 | 0.031 |
| **† LM 11949** | **† LM 11910** | 25 | 23.5 | 39.5 | 41.5 | 1.3 | 1.3 | 9.5 | 0.30 | 2.0 | 1.1 | 0.081 | 0.044 |
| **05075** | **05185** | 25 | 23.5 | 40.5 | 42.5 | 1.3 | 1.3 | 10.1 | 0.36 | 1.7 | 0.93 | 0.077 | 0.047 |
| **09067** | **09195** | 25.5 | 24 | 42 | 44.5 | 1.3 | 1.3 | 10.7 | 0.27 | 2.3 | 1.2 | 0.115 | 0.065 |
| **09078** | **09195** | 25.5 | 24 | 42 | 44.5 | 1.2 | 1.3 | 10.7 | 0.27 | 2.3 | 1.2 | 0.124 | 0.065 |
| **09067** | **09196** | 25.5 | 24 | 41.5 | 44.5 | 1.3 | 1.5 | 13.8 | 0.27 | 2.3 | 1.2 | 0.115 | 0.085 |
| **09074** | **09194** | 26 | 24 | 39 | 44.5 | 1.5 | 3.5 | 13.8 | 0.27 | 2.3 | 1.2 | 0.124 | 0.082 |
| **21075** | **21212** | 31.5 | 26 | 43 | 50 | 1.5 | 2.3 | 16.3 | 0.59 | 1.0 | 0.56 | 0.156 | 0.097 |
| **05079** | **05185** | 26.5 | 24 | 40.5 | 42.5 | 1.5 | 1.3 | 10.1 | 0.36 | 1.7 | 0.93 | 0.073 | 0.047 |
| **07079** | **07204** | 27.5 | 27 | 45 | 48 | 1.5 | 1.3 | 12.1 | 0.40 | 1.5 | 0.82 | 0.105 | 0.061 |
| **09081** | **09196** | 27.5 | 25.5 | 41.5 | 44.5 | 1.5 | 1.5 | 13.8 | 0.27 | 2.3 | 1.2 | 0.115 | 0.085 |
| **12580** | **12520** | 28.5 | 26 | 42.5 | 45.5 | 1.5 | 1.5 | 12.9 | 0.32 | 1.9 | 1.0 | 0.114 | 0.067 |
| **† M 12649** | **† M 12610** | 27.5 | 25.5 | 44 | 46 | 1.3 | 1.3 | 10.9 | 0.28 | 2.2 | 1.2 | 0.115 | 0.059 |
| ***† LM 12749** | **† LM 12710** | 27.5 | 26 | 39.5 | 42.5 | 1.3 | 1.3 | 10.0 | 0.31 | 2.0 | 1.1 | 0.078 | 0.038 |
| ***† LM 12749** | **† LM 12711** | 27.5 | 26 | 40 | 42.5 | 1.3 | 1.3 | 10.0 | 0.31 | 2.0 | 1.1 | 0.078 | 0.043 |
| **07087** | **07196** | 28.5 | 27 | 44.5 | 47 | 1.3 | 1 | 10.6 | 0.40 | 1.5 | 0.82 | 0.097 | 0.035 |
| **† M 12648** | **† M 12610** | 28.5 | 26.5 | 44 | 46 | 1.3 | 1.3 | 10.9 | 0.28 | 2.2 | 1.2 | 0.111 | 0.059 |
| **1380** | **1328** | 29.5 | 27 | 45 | 48.5 | 1.5 | 1.5 | 11.3 | 0.29 | 2.1 | 1.1 | 0.137 | 0.067 |
| **1380** | **1329** | 29.5 | 27 | 46 | 49 | 1.5 | 1.5 | 11.3 | 0.29 | 2.1 | 1.1 | 0.137 | 0.082 |
| **1755** | **1729** | 29 | 27.5 | 49 | 51 | 1.3 | 1.3 | 12.2 | 0.31 | 2.0 | 1.1 | 0.152 | 0.102 |
| **1280** | **1220** | 29.5 | 29 | 49 | 52 | 0.8 | 1.5 | 15.1 | 0.35 | 1.7 | 0.95 | 0.183 | 0.106 |

**Notes**

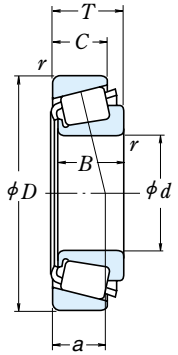
* The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

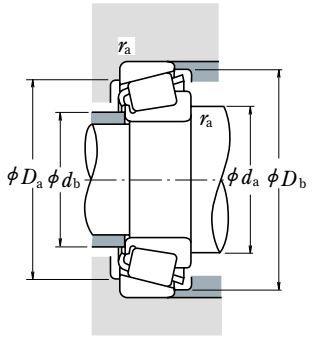
** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

† The tolerances for the bore diameter and overall bearing width differ from the standard (See Table **5** on Page **B114**).

*† The tolerance for the bore diameter is 0 to −20 μm, and for overall bearing width is +356 to 0 μm.

## Bore Diameter 22.606 – 28.575 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

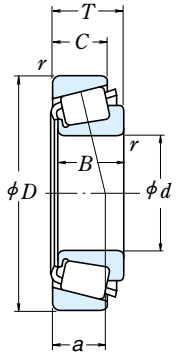
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | (kgf) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **22.606** | 47.000 | 15.500 | 15.500 | 12.000 | 1.5 | 1.0 | 26 300 | 30 000 | 2 680 | 3 100 | 8 000 | 11 000 |
| **23.812** | 50.292 | 14.224 | 14.732 | 10.668 | 1.5 | 1.3 | 27 600 | 32 000 | 2 820 | 3 250 | 7 100 | 10 000 |
| | 56.896 | 19.368 | 19.837 | 15.875 | 0.8 | 1.3 | 38 000 | 40 500 | 3 900 | 4 150 | 7 100 | 9 500 |
| **24.000** | 55.000 | 25.000 | 25.000 | 21.000 | 2.0 | 2.0 | 49 500 | 55 000 | 5 050 | 5 650 | 7 100 | 9 500 |
| **24.981** | 51.994 | 15.011 | 14.260 | 12.700 | 1.5 | 1.3 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 52.001 | 15.011 | 14.260 | 12.700 | 1.5 | 2.0 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 62.000 | 16.002 | 16.566 | 14.288 | 1.5 | 1.5 | 37 000 | 39 500 | 3 750 | 4 000 | 6 300 | 8 500 |
| **25.000** | 50.005 | 13.495 | 14.260 | 9.525 | 1.5 | 1.0 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 51.994 | 15.011 | 14.260 | 12.700 | 1.5 | 1.3 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| **25.400** | 50.005 | 13.495 | 14.260 | 9.525 | 3.3 | 1.0 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 50.005 | 13.495 | 14.260 | 9.525 | 1.0 | 1.0 | 26 000 | 27 900 | 2 650 | 2 840 | 7 500 | 10 000 |
| | 50.292 | 14.224 | 14.732 | 10.668 | 1.3 | 1.3 | 27 600 | 32 000 | 2 820 | 3 250 | 7 100 | 10 000 |
| | 57.150 | 17.462 | 17.462 | 13.495 | 1.3 | 1.5 | 39 500 | 45 500 | 4 050 | 4 650 | 6 700 | 9 000 |
| | 57.150 | 19.431 | 19.431 | 14.732 | 1.5 | 1.5 | 42 500 | 49 000 | 4 300 | 5 000 | 6 700 | 9 000 |
| | 59.530 | 23.368 | 23.114 | 18.288 | 0.8 | 1.5 | 50 000 | 58 000 | 5 100 | 5 900 | 6 300 | 9 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 63.500 | 20.638 | 20.638 | 15.875 | 3.5 | 1.5 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 64.292 | 21.433 | 21.433 | 16.670 | 1.5 | 1.5 | 51 000 | 64 500 | 5 200 | 6 600 | 5 600 | 8 000 |
| | 65.088 | 22.225 | 21.463 | 15.875 | 1.5 | 1.5 | 45 000 | 47 500 | 4 600 | 4 850 | 5 600 | 8 000 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 0.8 | 1.5 | 55 000 | 64 000 | 5 600 | 6 550 | 5 600 | 7 500 |
| | 72.233 | 25.400 | 25.400 | 19.842 | 0.8 | 2.3 | 63 500 | 83 500 | 6 500 | 8 500 | 5 000 | 7 100 |
| | 72.626 | 24.608 | 24.257 | 17.462 | 2.3 | 1.5 | 60 000 | 58 000 | 6 100 | 5 900 | 5 600 | 7 500 |
| **26.988** | 50.292 | 14.224 | 14.732 | 10.668 | 3.5 | 1.3 | 27 600 | 32 000 | 2 820 | 3 250 | 7 100 | 10 000 |
| | 57.150 | 19.845 | 19.355 | 15.875 | 3.3 | 1.5 | 40 000 | 44 500 | 4 100 | 4 500 | 6 700 | 9 000 |
| | 60.325 | 19.842 | 17.462 | 15.875 | 3.5 | 1.5 | 39 500 | 45 500 | 4 050 | 4 650 | 6 700 | 9 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| **28.575** | 57.150 | 19.845 | 19.355 | 15.875 | 3.5 | 1.5 | 40 000 | 44 500 | 4 100 | 4 500 | 6 700 | 9 000 |
| | 59.131 | 15.875 | 16.764 | 11.811 | spec. | 1.3 | 34 500 | 41 500 | 3 550 | 4 200 | 6 300 | 8 500 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 3.5 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 64.292 | 21.433 | 21.433 | 16.670 | 1.5 | 1.5 | 51 000 | 64 500 | 5 200 | 6 600 | 5 600 | 8 000 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 0.8 | 1.5 | 55 000 | 64 000 | 5 600 | 6 550 | 5 600 | 7 500 |
| | 72.626 | 24.608 | 24.257 | 17.462 | 4.8 | 1.5 | 60 000 | 58 000 | 6 100 | 5 900 | 5 600 | 7 500 |
| | 72.626 | 24.608 | 24.257 | 17.462 | 1.5 | 1.5 | 60 000 | 58 000 | 6 100 | 5 900 | 5 600 | 7 500 |
| | 73.025 | 22.225 | 22.225 | 17.462 | 0.8 | 3.3 | 54 500 | 64 500 | 5 550 | 6 600 | 5 300 | 7 100 |

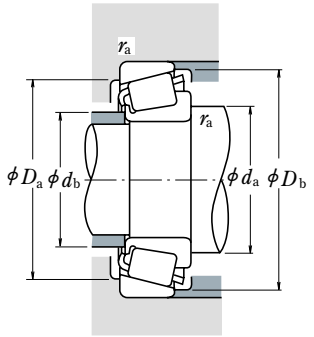
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **LM 72849** | **LM 72810** | 29 | 27 | 40.5 | 44.5 | 1.5 | 1 | 12.2 | 0.47 | 1.3 | 0.70 | 0.086 | 0.046 |
| **† L 44640** | **† L 44610** | 30.5 | 28.5 | 44.5 | 47 | 1.5 | 1.3 | 10.9 | 0.37 | 1.6 | 0.88 | 0.097 | 0.039 |
| **1779** | **1729** | 29.5 | 28.5 | 49 | 51 | 0.8 | 1.3 | 12.2 | 0.31 | 2.0 | 1.1 | 0.143 | 0.102 |
| **▲JHM 33449** | **▲JHM 33410** | 35 | 30 | 47 | 52 | 2 | 2 | 15.8 | 0.35 | 1.7 | 0.93 | 0.181 | 0.107 |
| **07098** | **07204** | 31 | 29 | 45 | 48 | 1.5 | 1.3 | 12.1 | 0.40 | 1.5 | 0.82 | 0.085 | 0.061 |
| **07098** | **07205** | 31 | 29 | 44.5 | 48 | 1.5 | 2 | 12.1 | 0.40 | 1.5 | 0.82 | 0.085 | 0.061 |
| **17098** | **17244** | 33 | 30.5 | 54 | 57 | 1.5 | 1.5 | 12.8 | 0.38 | 1.6 | 0.86 | 0.165 | 0.091 |
| **07097** | **07196** | 31 | 29 | 44.5 | 47 | 1.5 | 1 | 10.6 | 0.40 | 1.5 | 0.82 | 0.085 | 0.035 |
| **07097** | **07204** | 31 | 29 | 45 | 48 | 1.5 | 1.3 | 12.1 | 0.40 | 1.5 | 0.82 | 0.085 | 0.061 |
| **07100 SA** | **07196** | 35 | 29.5 | 44.5 | 47 | 3.3 | 1 | 10.6 | 0.40 | 1.5 | 0.82 | 0.082 | 0.035 |
| **07100** | **07196** | 30.5 | 29.5 | 44.5 | 47 | 1 | 1 | 10.6 | 0.40 | 1.5 | 0.82 | 0.084 | 0.035 |
| **† L 44643** | **† L 44610** | 31.5 | 29.5 | 44.5 | 47 | 1.3 | 1.3 | 10.9 | 0.37 | 1.6 | 0.88 | 0.090 | 0.039 |
| **15578** | **15520** | 32.5 | 30.5 | 51 | 53 | 1.3 | 1.5 | 12.4 | 0.35 | 1.7 | 0.95 | 0.151 | 0.070 |
| **M 84548** | **M 84510** | 36 | 33 | 48.5 | 54 | 1.5 | 1.5 | 16.1 | 0.55 | 1.1 | 0.60 | 0.156 | 0.089 |
| **M 84249** | **M 84210** | 36 | 32.5 | 49.5 | 56 | 0.8 | 1.5 | 18.3 | 0.55 | 1.1 | 0.60 | 0.194 | 0.13 |
| **15101** | **15245** | 32.5 | 31.5 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.222 | 0.081 |
| **15100** | **15250 X** | 38 | 31.5 | 55 | 59 | 3.5 | 1.5 | 14.9 | 0.35 | 1.7 | 0.94 | 0.22 | 0.113 |
| **M 86643** | **M 86610** | 38 | 36.5 | 54 | 61 | 1.5 | 1.5 | 17.7 | 0.55 | 1.1 | 0.60 | 0.246 | 0.128 |
| **23100** | **23256** | 39 | 34.5 | 53 | 61 | 1.5 | 1.5 | 20.0 | 0.73 | 0.82 | 0.45 | 0.214 | 0.142 |
| **02473** | **02420** | 34.5 | 33.5 | 59 | 63 | 0.8 | 1.5 | 16.9 | 0.42 | 1.4 | 0.79 | 0.28 | 0.152 |
| **HM 88630** | **HM 88610** | 39.5 | 39.5 | 60 | 69 | 0.8 | 2.3 | 20.7 | 0.55 | 1.1 | 0.60 | 0.398 | 0.188 |
| **41100** | **41286** | 41 | 36.5 | 61 | 68 | 2.3 | 1.5 | 20.7 | 0.60 | 1.0 | 0.55 | 0.32 | 0.177 |
| **† L 44649** | **† L 44610** | 37.5 | 31 | 44.5 | 47 | 3.5 | 1.3 | 10.9 | 0.37 | 1.6 | 0.88 | 0.081 | 0.039 |
| **1997 X** | **1922** | 37.5 | 31.5 | 51 | 53.5 | 3.3 | 1.5 | 13.9 | 0.33 | 1.8 | 1.0 | 0.152 | 0.077 |
| **15580** | **15523** | 38.5 | 32 | 51 | 54 | 3.5 | 1.5 | 14.7 | 0.35 | 1.7 | 0.95 | 0.141 | 0.123 |
| **15106** | **15245** | 33.5 | 33 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.211 | 0.081 |
| **1988** | **1922** | 39.5 | 33.5 | 51 | 53.5 | 3.5 | 1.5 | 13.9 | 0.33 | 1.8 | 1.0 | 0.141 | 0.077 |
| **† LM 67043** | **† LM 67010** | 40 | 33.5 | 52 | 56 | 3.5 | 1.3 | 12.6 | 0.41 | 1.5 | 0.80 | 0.147 | 0.062 |
| **15112** | **15245** | 40 | 34 | 55 | 58 | 3.5 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.199 | 0.081 |
| **15113** | **15245** | 34.5 | 34 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.20 | 0.081 |
| **M 86647** | **M 86610** | 40 | 38 | 54 | 61 | 1.5 | 1.5 | 17.7 | 0.55 | 1.1 | 0.60 | 0.223 | 0.128 |
| **02474** | **02420** | 36.5 | 36 | 59 | 63 | 0.8 | 1.5 | 16.9 | 0.42 | 1.4 | 0.79 | 0.257 | 0.152 |
| **41125** | **41286** | 48 | 36.5 | 61 | 68 | 4.8 | 1.5 | 20.7 | 0.60 | 1.0 | 0.55 | 0.292 | 0.177 |
| **41126** | **41286** | 41.5 | 36.5 | 61 | 68 | 1.5 | 1.5 | 20.7 | 0.60 | 1.0 | 0.55 | 0.295 | 0.177 |
| **02872** | **02820** | 37.5 | 37 | 62 | 68 | 0.8 | 3.3 | 18.3 | 0.45 | 1.3 | 0.73 | 0.321 | 0.16 |

**Notes** † The tolerances for the bore diameter and overall bearing width differ from the standard (See Table **5** on Page **B114**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 29.000 – 32.000 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

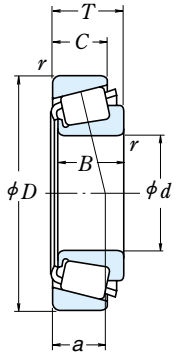
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **29.000** | 50.292 | 14.224 | 14.732 | 10.668 | 3.5 | 1.3 | 26 800 | 34 000 | 2 730 | 3 500 | 7 100 | 9 500 |
| **29.367** | 66.421 | 23.812 | 25.433 | 19.050 | 3.5 | 1.3 | 65 000 | 73 000 | 6 600 | 7 450 | 6 000 | 8 000 |
| **30.000** | 62.000 | 16.002 | 16.566 | 14.288 | 1.5 | 1.5 | 37 000 | 39 500 | 3 750 | 4 000 | 6 300 | 8 500 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 1.3 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 63.500 | 20.638 | 20.638 | 15.875 | 1.3 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 72.000 | 19.000 | 18.923 | 15.875 | 1.5 | 1.5 | 52 000 | 56 000 | 5 300 | 5 700 | 5 600 | 7 500 |
| **30.112** | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| **30.162** | 58.738 | 14.684 | 15.080 | 10.716 | 3.5 | 1.0 | 28 800 | 33 500 | 2 940 | 3 450 | 6 000 | 8 000 |
| | 64.292 | 21.433 | 21.433 | 16.670 | 1.5 | 1.5 | 51 000 | 64 500 | 5 200 | 6 600 | 5 600 | 8 000 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 2.3 | 1.5 | 55 500 | 70 500 | 5 650 | 7 200 | 5 300 | 7 500 |
| | 69.850 | 23.812 | 25.357 | 19.050 | 2.3 | 1.3 | 71 000 | 84 000 | 7 200 | 8 550 | 5 600 | 7 500 |
| | 69.850 | 23.812 | 25.357 | 19.050 | 0.8 | 1.3 | 71 000 | 84 000 | 7 200 | 8 550 | 5 600 | 7 500 |
| | 76.200 | 24.608 | 24.074 | 16.670 | 1.5 | C3.3 | 67 500 | 69 500 | 6 850 | 7 100 | 5 000 | 6 700 |
| **30.213** | 62.000 | 19.050 | 20.638 | 14.288 | 3.5 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 1.5 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| **30.955** | 64.292 | 21.433 | 21.433 | 16.670 | 1.5 | 1.5 | 51 000 | 64 500 | 5 200 | 6 600 | 5 600 | 8 000 |
| **31.750** | 58.738 | 14.684 | 15.080 | 10.716 | 1.0 | 1.0 | 28 800 | 33 500 | 2 940 | 3 450 | 6 000 | 8 000 |
| | 59.131 | 15.875 | 16.764 | 11.811 | spec. | 1.3 | 34 500 | 41 500 | 3 550 | 4 200 | 6 300 | 8 500 |
| | 62.000 | 18.161 | 19.050 | 14.288 | spec. | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 62.000 | 19.050 | 20.638 | 14.288 | 3.5 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 63.500 | 20.638 | 20.638 | 15.875 | 0.8 | 1.3 | 46 000 | 53 000 | 4 700 | 5 400 | 6 000 | 8 000 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 3.5 | 1.5 | 55 000 | 64 000 | 5 600 | 6 550 | 5 600 | 7 500 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 1.5 | 1.5 | 55 500 | 70 500 | 5 650 | 7 200 | 5 300 | 7 500 |
| | 69.012 | 19.845 | 19.583 | 15.875 | 3.5 | 1.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 69.012 | 26.982 | 26.721 | 15.875 | 4.3 | 3.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 69.850 | 23.812 | 25.357 | 19.050 | 0.8 | 1.3 | 71 000 | 84 000 | 7 200 | 8 550 | 5 600 | 7 500 |
| | 69.850 | 23.812 | 25.357 | 19.050 | 3.5 | 1.3 | 71 000 | 84 000 | 7 200 | 8 550 | 5 600 | 7 500 |
| | 72.626 | 30.162 | 29.997 | 23.812 | 0.8 | 3.3 | 79 500 | 90 000 | 8 100 | 9 200 | 5 300 | 7 500 |
| | 73.025 | 29.370 | 27.783 | 23.020 | 1.3 | 3.3 | 74 000 | 100 000 | 7 550 | 10 200 | 5 000 | 7 100 |
| | 80.000 | 21.000 | 22.403 | 17.826 | 0.8 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| **32.000** | 72.233 | 25.400 | 25.400 | 19.842 | 3.3 | 2.3 | 63 500 | 83 500 | 6 500 | 8 500 | 5 000 | 7 100 |

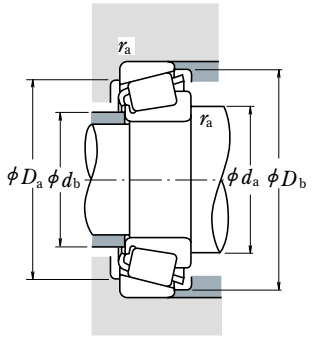
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **† L 45449** | **† L 45410** | 39.5 | 33 | 44.5 | 48 | 3.5 | 1.3 | 10.8 | 0.37 | 1.6 | 0.89 | 0.079 | 0.036 |
| **2690** | **2631** | 41 | 35 | 58 | 60 | 3.5 | 1.3 | 14.3 | 0.25 | 2.4 | 1.3 | 0.242 | 0.165 |
| **∗ 17118** | **17244** | 37 | 34.5 | 54 | 57 | 1.5 | 1.5 | 12.8 | 0.38 | 1.6 | 0.86 | 0.136 | 0.091 |
| **∗ 15117** | **15245** | 36.5 | 35 | 55 | 58 | 1.3 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.189 | 0.081 |
| **∗ 15117** | **15250** | 36.5 | 35 | 56 | 59 | 1.3 | 1.3 | 14.9 | 0.35 | 1.7 | 0.94 | 0.189 | 0.113 |
| **∗ 26118** | **26283** | 38 | 36 | 62 | 65 | 1.5 | 1.5 | 14.8 | 0.36 | 1.7 | 0.92 | 0.225 | 0.163 |
| **15116** | **15245** | 36 | 35.5 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.189 | 0.081 |
| **08118** | **08231** | 41.5 | 35 | 52 | 55 | 3.5 | 1 | 13.3 | 0.47 | 1.3 | 0.70 | 0.12 | 0.057 |
| **M 86649** | **M 86610** | 41 | 38 | 54 | 61 | 1.5 | 1.5 | 17.7 | 0.55 | 1.1 | 0.60 | 0.211 | 0.128 |
| **M 88043** | **M 88010** | 43.5 | 39.5 | 58 | 65 | 2.3 | 1.5 | 19.1 | 0.55 | 1.1 | 0.60 | 0.263 | 0.146 |
| **2558** | **2523** | 40 | 36.5 | 61 | 64 | 2.3 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.297 | 0.169 |
| **2559** | **2523** | 37 | 36.5 | 61 | 64 | 0.8 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.298 | 0.169 |
| **43118** | **43300** | 45 | 42 | 64 | 73 | 1.5 | 3.3 | 22.9 | 0.67 | 0.90 | 0.49 | 0.383 | 0.146 |
| **15118** | **15245** | 41.5 | 35.5 | 55 | 58 | 3.5 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.186 | 0.081 |
| **15120** | **15245** | 36 | 35.5 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.188 | 0.081 |
| **15119** | **15245** | 37.5 | 35.5 | 55 | 58 | 1.5 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.188 | 0.081 |
| **M 86648 A** | **M 86610** | 42 | 38 | 54 | 61 | 1.5 | 1.5 | 17.7 | 0.55 | 1.1 | 0.60 | 0.205 | 0.128 |
| **08125** | **08231** | 37.5 | 36 | 52 | 55 | 1 | 1 | 13.3 | 0.47 | 1.3 | 0.70 | 0.113 | 0.057 |
| **† LM 67048** | **† LM 67010** | 42.5 | 36 | 52 | 56 | 3.5 | 1.3 | 12.6 | 0.41 | 1.5 | 0.80 | 0.127 | 0.062 |
| **15123** | **15245** | 42.5 | 36.5 | 55 | 58 | 3.5 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.165 | 0.081 |
| **15126** | **15245** | 37 | 36.5 | 55 | 58 | 0.8 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.176 | 0.081 |
| **15125** | **15245** | 42.5 | 36.5 | 55 | 58 | 3.5 | 1.3 | 13.3 | 0.35 | 1.7 | 0.94 | 0.174 | 0.081 |
| **15126** | **15250** | 37 | 36.5 | 56 | 59 | 0.8 | 1.3 | 14.9 | 0.35 | 1.7 | 0.94 | 0.176 | 0.113 |
| **02475** | **02420** | 44.5 | 38.5 | 59 | 63 | 3.5 | 1.5 | 16.9 | 0.42 | 1.4 | 0.79 | 0.229 | 0.152 |
| **M 88046** | **M 88010** | 43 | 40.5 | 58 | 65 | 1.5 | 1.5 | 19.1 | 0.55 | 1.1 | 0.60 | 0.25 | 0.146 |
| **14125 A** | **14276** | 44 | 37.5 | 60 | 63 | 3.5 | 1.3 | 15.3 | 0.38 | 1.6 | 0.86 | 0.219 | 0.135 |
| **14123 A** | **14274** | 41.5 | 37.5 | 59 | 63 | 4.3 | 3.3 | 15.1 | 0.38 | 1.6 | 0.87 | 0.289 | 0.132 |
| **2580** | **2523** | 38.5 | 37.5 | 61 | 64 | 0.8 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.282 | 0.169 |
| **2582** | **2523** | 44 | 37.5 | 61 | 64 | 3.5 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.28 | 0.169 |
| **3188** | **3120** | 39.5 | 39.5 | 61 | 67 | 0.8 | 3.3 | 19.6 | 0.33 | 1.8 | 0.99 | 0.368 | 0.225 |
| **HM 88542** | **HM 88510** | 45.5 | 42.5 | 59 | 70 | 1.3 | 3.3 | 23.5 | 0.55 | 1.1 | 0.60 | 0.379 | 0.242 |
| **346** | **332** | 40 | 39.5 | 73 | 75 | 0.8 | 1.3 | 14.6 | 0.27 | 2.2 | 1.2 | 0.419 | 0.146 |
| **∗HM 88638** | **HM 88610** | 48.5 | 42.5 | 60 | 69 | 3.3 | 2.3 | 20.7 | 0.55 | 1.1 | 0.60 | 0.337 | 0.188 |

**Notes** ∗ The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

† The tolerances for the bore diameter and overall bearing width differ from the standard (See Table **5** on Page **B114**).

## Bore Diameter 33.338 – 35.000 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | (kgf) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **33.338** | 66.675 | 20.638 | 20.638 | 15.875 | 3.5 | 1.5 | 46 000 | 53 500 | 4 650 | 5 450 | 5 600 | 7 500 |
| | 68.262 | 22.225 | 22.225 | 17.462 | 0.8 | 1.5 | 55 500 | 70 500 | 5 650 | 7 200 | 5 300 | 7 500 |
| | 69.012 | 19.845 | 19.583 | 15.875 | 3.5 | 3.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 69.012 | 19.845 | 19.583 | 15.875 | 0.8 | 1.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 69.850 | 23.812 | 25.357 | 19.050 | 3.5 | 1.3 | 71 000 | 84 000 | 7 200 | 8 550 | 5 600 | 7 500 |
| | 72.000 | 19.000 | 18.923 | 15.875 | 3.5 | 1.5 | 52 000 | 56 000 | 5 300 | 5 700 | 5 600 | 7 500 |
| | 72.626 | 30.162 | 29.997 | 23.812 | 0.8 | 3.3 | 79 500 | 90 000 | 8 100 | 9 200 | 5 300 | 7 500 |
| | 73.025 | 29.370 | 27.783 | 23.020 | 0.8 | 3.3 | 74 000 | 100 000 | 7 550 | 10 200 | 5 000 | 7 100 |
| | 76.200 | 29.370 | 28.575 | 23.020 | 3.8 | 0.8 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 76.200 | 29.370 | 28.575 | 23.020 | 0.8 | 3.3 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 79.375 | 25.400 | 24.074 | 17.462 | 3.5 | 1.5 | 67 500 | 69 500 | 6 850 | 7 100 | 5 000 | 6 700 |
| **34.925** | 65.088 | 18.034 | 18.288 | 13.970 | spec. | 1.3 | 47 500 | 57 500 | 4 850 | 5 900 | 5 600 | 7 500 |
| | 65.088 | 20.320 | 18.288 | 16.256 | spec. | 1.3 | 47 500 | 57 500 | 4 850 | 5 900 | 5 600 | 7 500 |
| | 66.675 | 20.638 | 20.638 | 16.670 | 3.5 | 2.3 | 53 000 | 62 500 | 5 400 | 6 400 | 5 600 | 7 500 |
| | 69.012 | 19.845 | 19.583 | 15.875 | 3.5 | 1.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 69.012 | 19.845 | 19.583 | 15.875 | 1.5 | 1.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 72.233 | 25.400 | 25.400 | 19.842 | 2.3 | 2.3 | 63 500 | 83 500 | 6 500 | 8 500 | 5 000 | 7 100 |
| | 73.025 | 22.225 | 22.225 | 17.462 | 0.8 | 3.3 | 54 500 | 64 500 | 5 550 | 6 600 | 5 300 | 7 100 |
| | 73.025 | 22.225 | 23.812 | 17.462 | 3.5 | 3.3 | 63 500 | 77 000 | 6 500 | 7 850 | 5 300 | 7 100 |
| | 73.025 | 23.812 | 24.608 | 19.050 | 1.5 | 0.8 | 71 000 | 86 000 | 7 250 | 8 750 | 5 300 | 7 100 |
| | 73.025 | 23.812 | 24.608 | 19.050 | 3.5 | 2.3 | 71 000 | 86 000 | 7 250 | 8 750 | 5 300 | 7 100 |
| | 76.200 | 29.370 | 28.575 | 23.020 | 0.8 | 0.8 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 76.200 | 29.370 | 28.575 | 23.020 | 3.5 | 0.8 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 76.200 | 29.370 | 28.575 | 23.020 | 3.5 | 3.3 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 76.200 | 29.370 | 28.575 | 23.812 | 1.5 | 3.3 | 80 500 | 96 500 | 8 200 | 9 850 | 5 000 | 6 700 |
| | 79.375 | 29.370 | 29.771 | 23.812 | 3.5 | 3.3 | 88 000 | 106 000 | 8 950 | 10 800 | 4 800 | 6 700 |
| **34.976** | 68.262 | 15.875 | 16.520 | 11.908 | 1.5 | 1.5 | 45 000 | 53 500 | 4 600 | 5 450 | 5 300 | 7 100 |
| | 72.085 | 22.385 | 19.583 | 18.415 | 1.3 | 2.3 | 47 000 | 56 000 | 4 800 | 5 700 | 5 600 | 7 500 |
| | 80.000 | 21.006 | 20.940 | 15.875 | 1.5 | 1.5 | 56 500 | 64 500 | 5 750 | 6 600 | 5 000 | 6 700 |
| **35.000** | 59.131 | 15.875 | 16.764 | 11.938 | spec. | 1.3 | 35 000 | 47 000 | 3 550 | 4 750 | 6 000 | 8 000 |
| | 59.975 | 15.875 | 16.764 | 11.938 | spec. | 1.3 | 35 000 | 47 000 | 3 550 | 4 750 | 6 000 | 8 000 |
| | 62.000 | 16.700 | 17.000 | 13.600 | spec. | 1.0 | 38 000 | 50 000 | 3 900 | 5 100 | 5 600 | 8 000 |
| | 62.000 | 16.700 | 17.000 | 13.600 | spec. | 1.5 | 38 000 | 50 000 | 3 900 | 5 100 | 5 600 | 8 000 |
| | 65.987 | 20.638 | 20.638 | 16.670 | 3.5 | 2.3 | 53 000 | 62 500 | 5 400 | 6 400 | 5 600 | 7 500 |
| | 73.025 | 26.988 | 26.975 | 22.225 | 3.5 | 0.8 | 75 500 | 88 500 | 7 650 | 9 050 | 5 300 | 7 500 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **1680** | **1620** | 44.5 | 38.5 | 58 | 61 | 3.5 | 1.5 | 15.2 | 0.37 | 1.6 | 0.89 | 0.196 | 0.121 |
| **M 88048** | **M 88010** | 42.5 | 41 | 58 | 65 | 0.8 | 1.5 | 19.0 | 0.55 | 1.1 | 0.60 | 0.236 | 0.146 |
| **14130** | **14274** | 45 | 38.5 | 59 | 63 | 3.5 | 3.3 | 15.3 | 0.38 | 1.6 | 0.86 | 0.207 | 0.132 |
| **14131** | **14276** | 39.5 | 38.5 | 60 | 63 | 0.8 | 1.3 | 15.3 | 0.38 | 1.6 | 0.86 | 0.209 | 0.135 |
| **2585** | **2523** | 45 | 39 | 61 | 64 | 3.5 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.263 | 0.169 |
| **26131** | **26283** | 44.5 | 38.5 | 62 | 65 | 3.5 | 1.5 | 14.7 | 0.36 | 1.7 | 0.92 | 0.20 | 0.163 |
| **3197** | **3120** | 41.5 | 40.5 | 61 | 67 | 0.8 | 3.3 | 19.6 | 0.33 | 1.8 | 0.99 | 0.348 | 0.225 |
| **HM 88547** | **HM 88510** | 45.5 | 42.5 | 59 | 70 | 0.8 | 3.3 | 23.5 | 0.55 | 1.1 | 0.60 | 0.362 | 0.242 |
| **HM 89444** | **HM 89411** | 53 | 44.5 | 65 | 73 | 3.8 | 0.8 | 23.6 | 0.55 | 1.1 | 0.60 | 0.419 | 0.261 |
| **HM 89443** | **HM 89410** | 46.5 | 44.5 | 62 | 73 | 0.8 | 3.3 | 23.6 | 0.55 | 1.1 | 0.60 | 0.421 | 0.257 |
| **43131** | **43312** | 51 | 42 | 67 | 74 | 3.5 | 1.5 | 23.7 | 0.67 | 0.90 | 0.49 | 0.348 | 0.22 |
| **† LM 48548** | **† LM 48510** | 46 | 40 | 58 | 61 | 3.5 | 1.3 | 14.1 | 0.38 | 1.6 | 0.88 | 0.172 | 0.087 |
| **† LM 48548** | **† LM 48511** | 46 | 40 | 58 | 61 | 3.5 | 1.3 | 16.4 | 0.38 | 1.6 | 0.88 | 0.172 | 0.108 |
| **M 38549** | **M 38510** | 46.5 | 40 | 58 | 62 | 3.5 | 2.3 | 15.2 | 0.35 | 1.7 | 0.94 | 0.194 | 0.112 |
| **14138 A** | **14276** | 46 | 40 | 60 | 63 | 3.5 | 1.3 | 15.3 | 0.38 | 1.6 | 0.86 | 0.194 | 0.135 |
| **14137 A** | **14276** | 42 | 40 | 60 | 63 | 1.5 | 1.3 | 15.1 | 0.38 | 1.6 | 0.86 | 0.196 | 0.135 |
| **HM 88649** | **HM 88610** | 48.5 | 42.5 | 60 | 69 | 2.3 | 2.3 | 20.7 | 0.55 | 1.1 | 0.60 | 0.307 | 0.188 |
| **02878** | **02820** | 42.5 | 42 | 62 | 68 | 0.8 | 3.3 | 18.3 | 0.45 | 1.3 | 0.73 | 0.266 | 0.16 |
| **2877** | **2820** | 47 | 41.5 | 63 | 68 | 3.5 | 3.3 | 16.1 | 0.37 | 1.6 | 0.90 | 0.291 | 0.15 |
| **25877** | **25821** | 43 | 40.5 | 65 | 68 | 1.5 | 0.8 | 15.7 | 0.29 | 2.1 | 1.1 | 0.306 | 0.167 |
| **25878** | **25820** | 47 | 40.5 | 64 | 68 | 3.5 | 2.3 | 15.7 | 0.29 | 2.1 | 1.1 | 0.304 | 0.165 |
| **HM 89446 A** | **HM 89411** | 47.5 | 44.5 | 65 | 73 | 0.8 | 0.8 | 23.6 | 0.55 | 1.1 | 0.60 | 0.403 | 0.261 |
| **HM 89446** | **HM 89411** | 53 | 44.5 | 65 | 73 | 3.5 | 0.8 | 23.6 | 0.55 | 1.1 | 0.60 | 0.40 | 0.261 |
| **HM 89446** | **HM 89410** | 53 | 44.5 | 62 | 73 | 3.5 | 3.3 | 23.6 | 0.55 | 1.1 | 0.60 | 0.40 | 0.257 |
| **31594** | **31520** | 46 | 43.5 | 64 | 72 | 1.5 | 3.3 | 21.6 | 0.40 | 1.5 | 0.82 | 0.404 | 0.235 |
| **3478** | **3420** | 50 | 43.5 | 67 | 74 | 3.5 | 3.3 | 20.0 | 0.37 | 1.6 | 0.90 | 0.448 | 0.259 |
| **19138** | **19268** | 42.5 | 40.5 | 61 | 65 | 1.5 | 1.5 | 14.5 | 0.44 | 1.4 | 0.74 | 0.196 | 0.073 |
| **14139** | **14283** | 41.5 | 40 | 60 | 65 | 1.3 | 2.3 | 17.7 | 0.38 | 1.6 | 0.87 | 0.198 | 0.21 |
| **28138** | **28315** | 43.5 | 41 | 69 | 73 | 1.5 | 1.5 | 16.0 | 0.40 | 1.5 | 0.82 | 0.308 | 0.199 |
| ***† L 68149** | **† L 68110** | 45.5 | 39 | 52 | 56 | 3.5 | 1.3 | 13.2 | 0.42 | 1.4 | 0.79 | 0.117 | 0.056 |
| ***† L 68149** | **† L 68111** | 45.5 | 39 | 53 | 56 | 3.5 | 1.3 | 13.2 | 0.42 | 1.4 | 0.79 | 0.117 | 0.064 |
| *** LM 78349** | **** LM 78310** | 46 | 40 | 55 | 59 | 3.5 | 1 | 14.4 | 0.44 | 1.4 | 0.74 | 0.137 | 0.074 |
| *** LM 78349** | **** LM 78310 A** | 46 | 40 | 54 | 59 | 3.5 | 1.5 | 14.4 | 0.44 | 1.4 | 0.74 | 0.138 | 0.073 |
| **M 38547** | **M 38511** | 46 | 39.5 | 59 | 61 | 3.5 | 2.3 | 15.2 | 0.35 | 1.7 | 0.94 | 0.193 | 0.103 |
| **23691** | **23621** | 49 | 42 | 63 | 68 | 3.5 | 0.8 | 18.1 | 0.37 | 1.6 | 0.89 | 0.309 | 0.212 |

**Notes**

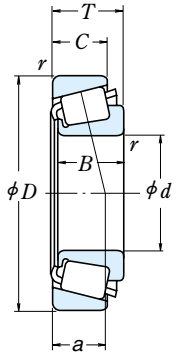
* The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

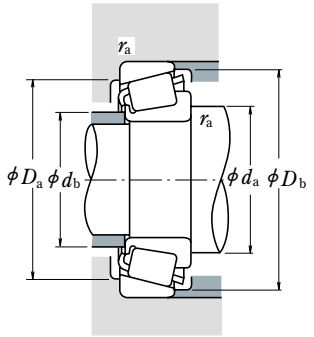
** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

† The tolerances for the bore diameter and overall bearing width differ from the standard (See Table **5** on Page **B114**).

*† The tolerance for the bore diameter is 0 to −20 μm, and for overall bearing width is +356 to 0 μm.

## Bore Diameter 35.717 – 41.275 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **35.717** | 72.233 | 25.400 | 25.400 | 19.842 | 3.5 | 2.3 | 63 500 | 83 500 | 6 500 | 8 500 | 5 000 | 7 100 |
| **36.487** | 73.025 | 23.812 | 24.608 | 19.050 | 1.5 | 0.8 | 71 000 | 86 000 | 7 250 | 8 750 | 5 300 | 7 100 |
| **36.512** | 76.200 | 29.370 | 28.575 | 23.020 | 3.5 | 3.3 | 78 500 | 106 000 | 8 000 | 10 800 | 4 800 | 6 700 |
| | 79.375 | 29.370 | 29.771 | 23.812 | 0.8 | 3.3 | 88 000 | 106 000 | 8 950 | 10 800 | 4 800 | 6 700 |
| | 88.501 | 25.400 | 23.698 | 17.462 | 2.3 | 1.5 | 73 000 | 81 000 | 7 450 | 8 250 | 4 000 | 5 600 |
| | 93.662 | 31.750 | 31.750 | 26.195 | 1.5 | 3.3 | 110 000 | 142 000 | 11 200 | 14 400 | 4 000 | 5 600 |
| **38.000** | 63.000 | 17.000 | 17.000 | 13.500 | spec. | 1.3 | 38 500 | 52 000 | 3 900 | 5 300 | 5 600 | 7 500 |
| **38.100** | 63.500 | 12.700 | 11.908 | 9.525 | 1.5 | 0.8 | 24 100 | 30 500 | 2 460 | 3 100 | 5 300 | 7 100 |
| | 65.088 | 18.034 | 18.288 | 13.970 | 2.3 | 1.3 | 42 500 | 55 000 | 4 300 | 5 650 | 5 300 | 7 500 |
| | 65.088 | 18.034 | 18.288 | 13.970 | spec. | 1.3 | 42 500 | 55 000 | 4 300 | 5 650 | 5 300 | 7 500 |
| | 65.088 | 19.812 | 18.288 | 15.748 | 2.3 | 1.3 | 42 500 | 55 000 | 4 300 | 5 650 | 5 300 | 7 500 |
| | 68.262 | 15.875 | 16.520 | 11.908 | 1.5 | 1.5 | 45 000 | 53 500 | 4 600 | 5 450 | 5 300 | 7 100 |
| | 69.012 | 19.050 | 19.050 | 15.083 | 2.0 | 2.3 | 49 000 | 61 000 | 4 950 | 6 250 | 5 300 | 7 100 |
| | 69.012 | 19.050 | 19.050 | 15.083 | 3.5 | 0.8 | 49 000 | 61 000 | 4 950 | 6 250 | 5 300 | 7 100 |
| | 72.238 | 20.638 | 20.638 | 15.875 | 3.5 | 1.3 | 48 500 | 59 500 | 4 950 | 6 050 | 5 300 | 7 100 |
| | 73.025 | 23.812 | 25.654 | 19.050 | 3.5 | 0.8 | 73 500 | 91 000 | 7 500 | 9 300 | 5 000 | 6 700 |
| | 76.200 | 23.812 | 25.654 | 19.050 | 3.5 | 3.3 | 73 500 | 91 000 | 7 500 | 9 300 | 5 000 | 6 700 |
| | 76.200 | 23.812 | 25.654 | 19.050 | 3.5 | 0.8 | 73 500 | 91 000 | 7 500 | 9 300 | 5 000 | 6 700 |
| | 79.375 | 29.370 | 29.771 | 23.812 | 3.5 | 3.3 | 88 000 | 106 000 | 8 950 | 10 800 | 4 800 | 6 700 |
| | 80.035 | 24.608 | 23.698 | 18.512 | 0.8 | 1.5 | 69 000 | 84 500 | 7 000 | 8 600 | 4 500 | 6 300 |
| | 82.550 | 29.370 | 28.575 | 23.020 | 0.8 | 3.3 | 87 000 | 117 000 | 8 850 | 11 900 | 4 500 | 6 000 |
| | 88.501 | 25.400 | 23.698 | 17.462 | 2.3 | 1.5 | 73 000 | 81 000 | 7 450 | 8 250 | 4 000 | 5 600 |
| | 88.501 | 26.988 | 29.083 | 22.225 | 3.5 | 1.5 | 96 500 | 109 000 | 9 800 | 11 100 | 4 500 | 6 000 |
| | 95.250 | 30.958 | 28.301 | 20.638 | 1.5 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| **39.688** | 73.025 | 25.654 | 22.098 | 21.336 | 0.8 | 2.3 | 62 500 | 80 000 | 6 400 | 8 150 | 5 000 | 6 700 |
| | 76.200 | 23.812 | 25.654 | 19.050 | 3.5 | 3.3 | 73 500 | 91 000 | 7 500 | 9 300 | 5 000 | 6 700 |
| | 80.167 | 29.370 | 30.391 | 23.812 | 0.8 | 3.3 | 92 500 | 108 000 | 9 450 | 11 000 | 4 800 | 6 300 |
| **40.000** | 80.000 | 21.000 | 22.403 | 17.826 | 3.5 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| | 80.000 | 21.000 | 22.403 | 17.826 | 0.8 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| | 88.501 | 25.400 | 23.698 | 17.462 | 2.3 | 1.5 | 73 000 | 81 000 | 7 450 | 8 250 | 4 000 | 5 600 |
| **41.000** | 68.000 | 17.500 | 18.000 | 13.500 | spec. | 1.5 | 43 500 | 58 000 | 4 450 | 5 950 | 5 300 | 7 100 |
| **41.275** | 73.025 | 16.667 | 17.462 | 12.700 | 3.5 | 1.5 | 44 500 | 54 000 | 4 550 | 5 500 | 4 800 | 6 700 |
| | 73.431 | 19.558 | 19.812 | 14.732 | 3.5 | 0.8 | 54 500 | 67 000 | 5 550 | 6 850 | 4 800 | 6 700 |
| | 73.431 | 21.430 | 19.812 | 16.604 | 3.5 | 0.8 | 54 500 | 67 000 | 5 550 | 6 850 | 4 800 | 6 700 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **HM 88648** | **HM 88610** | 52 | 43 | 60 | 69 | 3.5 | 2.3 | 20.7 | 0.55 | 1.1 | 0.60 | 0.298 | 0.188 |
| **25880** | **25821** | 44 | 42 | 65 | 68 | 1.5 | 0.8 | 15.7 | 0.29 | 2.1 | 1.1 | 0.291 | 0.167 |
| **HM 89449** | **HM 89410** | 54 | 44.5 | 62 | 73 | 3.5 | 3.3 | 23.6 | 0.55 | 1.1 | 0.60 | 0.38 | 0.257 |
| **3479** | **3420** | 45.5 | 44.5 | 67 | 74 | 0.8 | 3.3 | 20.0 | 0.37 | 1.6 | 0.90 | 0.429 | 0.259 |
| **44143** | **44348** | 54 | 50 | 75 | 84 | 2.3 | 1.5 | 27.9 | 0.78 | 0.77 | 0.42 | 0.502 | 0.245 |
| **46143** | **46368** | 48.5 | 46.5 | 79 | 87 | 1.5 | 3.3 | 24.0 | 0.40 | 1.5 | 0.82 | 0.765 | 0.405 |
| ▲ **JL 69349** | ▲ **JL 69310** | 49 | 42.5 | 56 | 60 | 3.5 | 1.3 | 14.6 | 0.42 | 1.4 | 0.79 | 0.132 | 0.071 |
| **13889** | **13830** | 45 | 42.5 | 59 | 60 | 1.5 | 0.8 | 11.9 | 0.35 | 1.7 | 0.95 | 0.109 | 0.046 |
| **LM 29749** | **LM 29710** | 46 | 42.5 | 59 | 62 | 2.3 | 1.3 | 13.7 | 0.33 | 1.8 | 0.99 | 0.16 | 0.079 |
| **LM 29748** | **LM 29710** | 49 | 42.5 | 59 | 62 | 3.5 | 1.3 | 13.7 | 0.33 | 1.8 | 0.99 | 0.158 | 0.079 |
| **LM 29749** | **LM 29711** | 46 | 42.5 | 58 | 62 | 2.3 | 1.3 | 15.5 | 0.33 | 1.8 | 0.99 | 0.16 | 0.094 |
| **19150** | **19268** | 45 | 43 | 61 | 65 | 1.5 | 1.5 | 14.5 | 0.44 | 1.4 | 0.74 | 0.173 | 0.073 |
| **13687** | **13621** | 46.5 | 43 | 61 | 65 | 2 | 2.3 | 15.8 | 0.40 | 1.5 | 0.82 | 0.193 | 0.104 |
| **13685** | **13620** | 49.5 | 43 | 62 | 65 | 3.5 | 0.8 | 15.8 | 0.40 | 1.5 | 0.82 | 0.191 | 0.105 |
| **16150** | **16284** | 49.5 | 43 | 63 | 67 | 3.5 | 1.3 | 16.0 | 0.40 | 1.5 | 0.82 | 0.212 | 0.146 |
| **2788** | **2735 X** | 50 | 43.5 | 66 | 69 | 3.5 | 0.8 | 15.9 | 0.30 | 2.0 | 1.1 | 0.312 | 0.135 |
| **2788** | **2720** | 50 | 43.5 | 66 | 70 | 3.5 | 3.3 | 15.9 | 0.30 | 2.0 | 1.1 | 0.312 | 0.187 |
| **2788** | **2729** | 50 | 43.5 | 68 | 70 | 3.5 | 0.8 | 15.9 | 0.30 | 2.0 | 1.1 | 0.312 | 0.191 |
| **3490** | **3420** | 52 | 45.5 | 67 | 74 | 3.5 | 3.3 | 20.0 | 0.37 | 1.6 | 0.90 | 0.404 | 0.259 |
| **27880** | **27820** | 48 | 47 | 68 | 75 | 0.8 | 1.5 | 21.5 | 0.56 | 1.1 | 0.59 | 0.362 | 0.209 |
| **HM 801346** | **HM 801310** | 51 | 49 | 68 | 78 | 0.8 | 3.3 | 24.2 | 0.55 | 1.1 | 0.60 | 0.483 | 0.282 |
| **44150** | **44348** | 55 | 51 | 75 | 84 | 2.3 | 1.5 | 27.9 | 0.78 | 0.77 | 0.42 | 0.484 | 0.245 |
| **418** | **414** | 51 | 44.5 | 77 | 80 | 3.5 | 1.5 | 17.1 | 0.26 | 2.3 | 1.3 | 0.50 | 0.329 |
| **53150** | **53375** | 55 | 53 | 81 | 89 | 1.5 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.665 | 0.365 |
| **M 201047** | **M 201011** | 45.5 | 48 | 64 | 69 | 0.8 | 2.3 | 19.7 | 0.33 | 1.8 | 0.99 | 0.266 | 0.169 |
| **2789** | **2720** | 52 | 45 | 66 | 70 | 3.5 | 3.3 | 15.9 | 0.30 | 2.0 | 1.1 | 0.292 | 0.187 |
| **3386** | **3320** | 46.5 | 45.5 | 70 | 75 | 0.8 | 3.3 | 18.4 | 0.27 | 2.2 | 1.2 | 0.442 | 0.217 |
| **344** | **332** | 52 | 45.5 | 73 | 75 | 3.5 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.338 | 0.146 |
| **344 A** | **332** | 46 | 45.5 | 73 | 75 | 0.8 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.339 | 0.146 |
| **44157** | **44348** | 56 | 51 | 75 | 84 | 2.3 | 1.5 | 27.9 | 0.78 | 0.77 | 0.42 | 0.463 | 0.245 |
| * **LM 300849** | ** **LM 300811** | 52 | 45 | 61 | 65 | 3.5 | 1.5 | 13.9 | 0.35 | 1.7 | 0.95 | 0.16 | 0.082 |
| **18590** | **18520** | 53 | 46 | 66 | 69 | 3.5 | 1.5 | 14.0 | 0.35 | 1.7 | 0.94 | 0.199 | 0.086 |
| **LM 501349** | **LM 501310** | 53 | 46.5 | 67 | 70 | 3.5 | 0.8 | 16.3 | 0.40 | 1.5 | 0.83 | 0.226 | 0.108 |
| **LM 501349** | **LM 501314** | 53 | 46.5 | 66 | 70 | 3.5 | 0.8 | 18.2 | 0.40 | 1.5 | 0.83 | 0.226 | 0.129 |

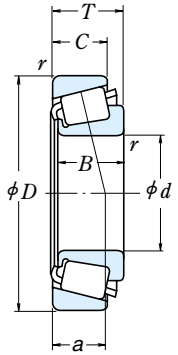
**Notes**

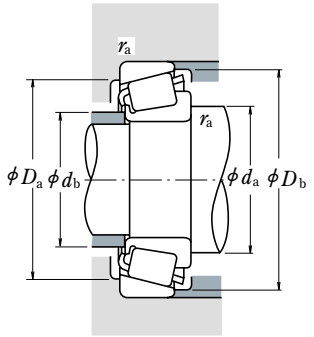
* The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 41.275 – 44.450 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

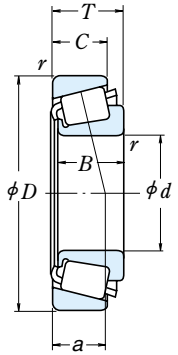
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

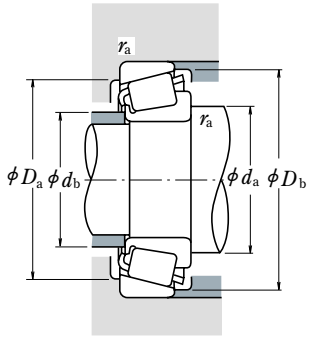
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **41.275** | 76.200 | 18.009 | 17.384 | 14.288 | 1.5 | 1.5 | 42 500 | 51 000 | 4 350 | 5 200 | 4 500 | 6 300 |
| | 76.200 | 22.225 | 23.020 | 17.462 | 3.5 | 0.8 | 66 000 | 82 000 | 6 700 | 8 400 | 4 800 | 6 700 |
| | 76.200 | 25.400 | 23.020 | 20.638 | 3.5 | 2.3 | 66 000 | 82 000 | 6 700 | 8 400 | 4 800 | 6 700 |
| | 79.375 | 23.812 | 25.400 | 19.050 | 3.5 | 0.8 | 77 000 | 98 500 | 7 850 | 10 000 | 4 800 | 6 300 |
| | 80.000 | 21.000 | 22.403 | 17.826 | 0.8 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| | 80.000 | 21.000 | 22.403 | 17.826 | 3.5 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| | 80.167 | 25.400 | 25.400 | 20.638 | 3.5 | 3.3 | 77 000 | 98 500 | 7 850 | 10 000 | 4 800 | 6 300 |
| | 82.550 | 26.543 | 25.654 | 20.193 | 3.5 | 3.3 | 78 500 | 102 000 | 8 000 | 10 400 | 4 300 | 6 000 |
| | 85.725 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 91 000 | 115 000 | 9 300 | 11 700 | 4 300 | 6 000 |
| | 87.312 | 30.162 | 30.886 | 23.812 | 0.8 | 3.3 | 96 000 | 120 000 | 9 800 | 12 200 | 4 300 | 6 000 |
| | 88.501 | 25.400 | 23.698 | 17.462 | 2.3 | 1.5 | 73 000 | 81 000 | 7 450 | 8 250 | 4 000 | 5 600 |
| | 88.900 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 96 500 | 129 000 | 9 800 | 13 200 | 4 000 | 5 600 |
| | 88.900 | 30.162 | 29.370 | 23.020 | 0.8 | 3.3 | 96 500 | 129 000 | 9 800 | 13 200 | 4 000 | 5 600 |
| | 90.488 | 39.688 | 40.386 | 33.338 | 3.5 | 3.3 | 139 000 | 180 000 | 14 200 | 18 400 | 4 300 | 5 600 |
| | 93.662 | 31.750 | 31.750 | 26.195 | 0.8 | 3.3 | 110 000 | 142 000 | 11 200 | 14 400 | 4 000 | 5 600 |
| | 95.250 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 106 000 | 143 000 | 10 800 | 14 500 | 3 800 | 5 300 |
| | 98.425 | 30.958 | 28.301 | 20.638 | 1.5 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| **42.862** | 76.992 | 17.462 | 17.145 | 11.908 | 1.5 | 1.5 | 44 000 | 54 000 | 4 450 | 5 500 | 4 500 | 6 000 |
| | 82.550 | 19.842 | 19.837 | 15.080 | 2.3 | 1.5 | 58 500 | 69 000 | 5 950 | 7 050 | 4 500 | 6 300 |
| | 82.931 | 23.812 | 25.400 | 19.050 | 2.3 | 0.8 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| | 82.931 | 26.988 | 25.400 | 22.225 | 2.3 | 2.3 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| **42.875** | 76.200 | 25.400 | 25.400 | 20.638 | 3.5 | 1.5 | 77 000 | 98 500 | 7 850 | 10 000 | 4 800 | 6 300 |
| | 80.000 | 21.000 | 22.403 | 17.826 | 3.5 | 1.3 | 68 500 | 75 500 | 6 950 | 7 700 | 4 500 | 6 300 |
| | 82.931 | 26.988 | 25.400 | 22.225 | 3.5 | 2.3 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| | 83.058 | 23.812 | 25.400 | 19.050 | 3.5 | 3.3 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| **43.000** | 74.988 | 19.368 | 19.837 | 14.288 | 1.5 | 1.3 | 52 500 | 68 000 | 5 350 | 6 900 | 4 800 | 6 300 |
| **44.450** | 80.962 | 19.050 | 17.462 | 14.288 | 0.3 | 1.5 | 45 000 | 57 000 | 4 600 | 5 800 | 4 300 | 6 000 |
| | 82.931 | 23.812 | 25.400 | 19.050 | 3.5 | 0.8 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| | 83.058 | 23.812 | 25.400 | 19.050 | 3.5 | 3.3 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| | 87.312 | 30.162 | 30.886 | 23.812 | 3.5 | 3.3 | 96 000 | 120 000 | 9 800 | 12 200 | 4 300 | 6 000 |
| | 88.900 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 96 500 | 129 000 | 9 800 | 13 200 | 4 000 | 5 600 |
| | 93.264 | 30.162 | 30.302 | 23.812 | 3.5 | 3.2 | 103 000 | 136 000 | 10 500 | 13 900 | 3 800 | 5 300 |
| | 93.662 | 31.750 | 31.750 | 25.400 | 0.8 | 3.3 | 120 000 | 147 000 | 12 200 | 15 000 | 4 000 | 5 600 |
| | 93.662 | 31.750 | 31.750 | 25.400 | 3.5 | 3.3 | 120 000 | 147 000 | 12 200 | 15 000 | 4 000 | 5 600 |
| | 93.662 | 31.750 | 31.750 | 26.195 | 3.5 | 3.3 | 110 000 | 142 000 | 11 200 | 14 400 | 4 000 | 5 600 |
| | 95.250 | 27.783 | 29.901 | 22.225 | 3.5 | 2.3 | 106 000 | 126 000 | 10 800 | 12 900 | 4 300 | 5 600 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **11162** | **11300** | 49 | 46.5 | 67 | 71 | 1.5 | 1.5 | 17.4 | 0.49 | 1.2 | 0.68 | 0.212 | 0.129 |
| **24780** | **24720** | 53 | 47.5 | 68 | 72 | 3.5 | 0.8 | 17.0 | 0.39 | 1.5 | 0.84 | 0.279 | 0.15 |
| **24780** | **24721** | 54 | 47 | 66 | 72 | 3.5 | 2.3 | 20.2 | 0.39 | 1.5 | 0.84 | 0.279 | 0.189 |
| **26882** | **26822** | 54 | 47 | 71 | 74 | 3.5 | 0.8 | 16.4 | 0.32 | 1.9 | 1.0 | 0.349 | 0.186 |
| **336** | **332** | 47 | 46 | 73 | 75 | 0.8 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.325 | 0.146 |
| **342** | **332** | 53 | 46 | 73 | 75 | 3.5 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.323 | 0.146 |
| **26882** | **26820** | 54 | 47 | 69 | 74 | 3.5 | 3.3 | 18.0 | 0.32 | 1.9 | 1.0 | 0.349 | 0.219 |
| **M 802048** | **M 802011** | 57 | 51 | 70 | 79 | 3.5 | 3.3 | 22.9 | 0.55 | 1.1 | 0.60 | 0.406 | 0.23 |
| **3877** | **3820** | 57 | 50 | 73 | 81 | 3.5 | 3.3 | 21.8 | 0.40 | 1.5 | 0.82 | 0.506 | 0.285 |
| **3576** | **3525** | 49 | 48 | 75 | 81 | 0.8 | 3.3 | 19.5 | 0.31 | 2.0 | 1.1 | 0.532 | 0.304 |
| **44162** | **44348** | 57 | 51 | 75 | 84 | 2.3 | 1.5 | 28.0 | 0.78 | 0.77 | 0.42 | 0.447 | 0.245 |
| **HM 803146** | **HM 803110** | 60 | 53 | 74 | 85 | 3.5 | 3.3 | 25.6 | 0.55 | 1.1 | 0.60 | 0.579 | 0.322 |
| **HM 803145** | **HM 803110** | 54 | 53 | 74 | 85 | 0.8 | 3.3 | 25.6 | 0.55 | 1.1 | 0.60 | 0.582 | 0.322 |
| **4388** | **4335** | 57 | 51 | 77 | 85 | 3.5 | 3.3 | 24.6 | 0.28 | 2.1 | 1.2 | 0.789 | 0.459 |
| **46162** | **46368** | 52 | 51 | 79 | 87 | 0.8 | 3.3 | 24.0 | 0.40 | 1.5 | 0.82 | 0.695 | 0.405 |
| **HM 804840** | **HM 804810** | 61 | 54 | 81 | 91 | 3.5 | 3.3 | 26.1 | 0.55 | 1.1 | 0.60 | 0.726 | 0.354 |
| **53162** | **53387** | 57 | 53 | 82 | 91 | 1.5 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.618 | 0.442 |
| **12168** | **12303** | 51 | 48.5 | 68 | 73 | 1.5 | 1.5 | 17.7 | 0.51 | 1.2 | 0.65 | 0.228 | 0.098 |
| **22168** | **22325** | 52 | 48.5 | 73 | 76 | 2.3 | 1.5 | 17.6 | 0.43 | 1.4 | 0.77 | 0.283 | 0.176 |
| **25578** | **25520** | 53 | 49.5 | 74 | 77 | 2.3 | 0.8 | 17.6 | 0.33 | 1.8 | 0.99 | 0.383 | 0.203 |
| **25578** | **25523** | 53 | 49.5 | 72 | 77 | 2.3 | 2.3 | 20.8 | 0.33 | 1.8 | 0.99 | 0.383 | 0.248 |
| **26884** | **26823** | 55 | 48.5 | 69 | 73 | 3.5 | 1.5 | 18.0 | 0.32 | 1.9 | 1.0 | 0.337 | 0.136 |
| **342 S** | **332** | 54 | 47.5 | 73 | 75 | 3.5 | 1.3 | 14.5 | 0.27 | 2.2 | 1.2 | 0.305 | 0.146 |
| **25577** | **25523** | 55 | 49 | 72 | 77 | 3.5 | 2.3 | 20.8 | 0.33 | 1.8 | 0.99 | 0.381 | 0.248 |
| **25577** | **25521** | 55 | 49 | 72 | 77 | 3.5 | 3.3 | 17.6 | 0.33 | 1.8 | 0.99 | 0.381 | 0.201 |
| **＊16986** | **16929** | 51 | 48.5 | 67 | 71 | 1.5 | 1.3 | 17.2 | 0.44 | 1.4 | 0.74 | 0.24 | 0.106 |
| **13175** | **13318** | 50 | 50 | 72 | 76 | 0.3 | 1.5 | 20.1 | 0.53 | 1.1 | 0.63 | 0.252 | 0.144 |
| **25580** | **25520** | 57 | 50 | 74 | 77 | 3.5 | 0.8 | 17.6 | 0.33 | 1.8 | 0.99 | 0.359 | 0.203 |
| **25580** | **25521** | 56 | 51 | 72 | 78 | 3.5 | 3.3 | 17.6 | 0.33 | 1.8 | 0.99 | 0.359 | 0.201 |
| **3578** | **3525** | 57 | 51 | 75 | 81 | 3.5 | 3.3 | 19.5 | 0.31 | 2.0 | 1.1 | 0.477 | 0.304 |
| **HM 803149** | **HM 803110** | 62 | 53 | 74 | 85 | 3.5 | 3.3 | 25.6 | 0.55 | 1.1 | 0.60 | 0.528 | 0.322 |
| **3782** | **3720** | 58 | 52 | 82 | 88 | 3.5 | 3.2 | 22.4 | 0.34 | 1.8 | 0.97 | 0.678 | 0.292 |
| **49176** | **49368** | 54 | 53 | 82 | 87 | 0.8 | 3.3 | 21.6 | 0.36 | 1.7 | 0.92 | 0.648 | 0.371 |
| **49175** | **49368** | 59 | 53 | 82 | 87 | 3.5 | 3.3 | 21.6 | 0.36 | 1.7 | 0.92 | 0.645 | 0.371 |
| **46176** | **46368** | 60 | 54 | 79 | 87 | 3.5 | 3.3 | 24.0 | 0.40 | 1.5 | 0.82 | 0.635 | 0.405 |
| **438** | **432** | 57 | 51 | 83 | 87 | 3.5 | 2.3 | 18.6 | 0.28 | 2.1 | 1.2 | 0.555 | 0.384 |

**Note** ＊ The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

## Bore Diameter 44.450 – 47.625 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

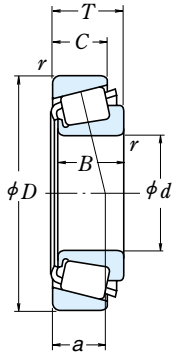
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **44.450** | 95.250 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 106 000 | 143 000 | 10 800 | 14 500 | 3 800 | 5 300 |
| | 95.250 | 30.958 | 28.301 | 20.638 | 3.5 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| | 95.250 | 30.958 | 28.301 | 20.638 | 1.3 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| | 95.250 | 30.958 | 28.301 | 20.638 | 2.0 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| | 95.250 | 30.958 | 28.301 | 22.225 | 1.3 | 0.8 | 100 000 | 122 000 | 10 200 | 12 500 | 3 600 | 5 000 |
| | 95.250 | 30.958 | 28.575 | 22.225 | 3.5 | 0.8 | 100 000 | 122 000 | 10 200 | 12 500 | 3 600 | 5 000 |
| | 98.425 | 30.958 | 28.301 | 20.638 | 3.5 | 0.8 | 87 500 | 97 000 | 8 950 | 9 850 | 3 600 | 5 300 |
| | 103.188 | 43.658 | 44.475 | 36.512 | 1.3 | 3.3 | 178 000 | 238 000 | 18 100 | 24 300 | 3 800 | 5 000 |
| | 104.775 | 36.512 | 36.512 | 28.575 | 3.5 | 3.3 | 139 000 | 192 000 | 14 200 | 19 600 | 3 400 | 4 800 |
| | 107.950 | 27.783 | 29.317 | 22.225 | 3.5 | 0.8 | 116 000 | 149 000 | 11 800 | 15 200 | 3 400 | 4 800 |
| | 111.125 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 92 500 | 110 000 | 9 450 | 11 200 | 3 200 | 4 300 |
| | 114.300 | 44.450 | 44.450 | 34.925 | 3.5 | 3.3 | 172 000 | 205 000 | 17 500 | 20 900 | 3 600 | 4 800 |
| **44.983** | 82.931 | 23.812 | 25.400 | 19.050 | 1.5 | 0.8 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| **45.000** | 93.264 | 20.638 | 22.225 | 15.082 | 0.8 | 1.3 | 77 000 | 93 000 | 7 900 | 9 500 | 3 800 | 5 300 |
| **45.230** | 79.985 | 19.842 | 20.638 | 15.080 | 2.0 | 1.3 | 62 000 | 78 500 | 6 300 | 8 000 | 4 500 | 6 000 |
| **45.242** | 73.431 | 19.558 | 19.812 | 15.748 | 3.5 | 0.8 | 53 500 | 75 000 | 5 450 | 7 650 | 4 800 | 6 300 |
| | 77.788 | 19.842 | 19.842 | 15.080 | 3.5 | 0.8 | 56 000 | 71 000 | 5 700 | 7 250 | 4 500 | 6 300 |
| | 77.788 | 21.430 | 19.842 | 16.667 | 3.5 | 0.8 | 56 000 | 71 000 | 5 700 | 7 250 | 4 500 | 6 300 |
| **45.618** | 82.931 | 23.812 | 25.400 | 19.050 | 3.5 | 0.8 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| | 82.931 | 26.988 | 25.400 | 22.225 | 3.5 | 2.3 | 76 500 | 99 000 | 7 800 | 10 100 | 4 500 | 6 000 |
| **46.000** | 75.000 | 18.000 | 18.000 | 14.000 | 2.3 | 1.5 | 51 000 | 71 500 | 5 200 | 7 300 | 4 500 | 6 300 |
| **46.038** | 79.375 | 17.462 | 17.462 | 13.495 | 2.8 | 1.5 | 46 000 | 57 000 | 4 700 | 5 800 | 4 500 | 6 000 |
| | 80.962 | 19.050 | 17.462 | 14.288 | 0.8 | 1.5 | 45 000 | 57 000 | 4 600 | 5 800 | 4 300 | 6 000 |
| | 85.000 | 20.638 | 21.692 | 17.462 | 2.3 | 1.3 | 71 500 | 81 500 | 7 300 | 8 300 | 4 300 | 6 000 |
| | 85.000 | 25.400 | 25.608 | 20.638 | 3.5 | 1.3 | 79 500 | 105 000 | 8 100 | 10 700 | 4 300 | 6 000 |
| | 95.250 | 27.783 | 29.901 | 22.225 | 3.5 | 0.8 | 106 000 | 126 000 | 10 800 | 12 900 | 4 300 | 5 600 |
| **47.625** | 88.900 | 20.638 | 22.225 | 16.513 | 3.5 | 1.3 | 73 000 | 85 000 | 7 450 | 8 650 | 4 000 | 5 600 |
| | 88.900 | 25.400 | 25.400 | 19.050 | 3.5 | 3.3 | 86 000 | 107 000 | 8 750 | 10 900 | 4 000 | 5 600 |
| | 95.250 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 106 000 | 143 000 | 10 800 | 14 500 | 3 800 | 5 300 |
| | 101.600 | 34.925 | 36.068 | 26.988 | 3.5 | 3.3 | 137 000 | 169 000 | 14 000 | 17 200 | 3 800 | 5 000 |
| | 111.125 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 92 500 | 110 000 | 9 450 | 11 200 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 92 500 | 110 000 | 9 450 | 11 200 | 3 200 | 4 300 |
| | 117.475 | 33.338 | 31.750 | 23.812 | 3.5 | 3.3 | 137 000 | 156 000 | 13 900 | 15 900 | 3 200 | 4 300 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 143 000 | 160 000 | 14 600 | 16 400 | 3 000 | 4 000 |

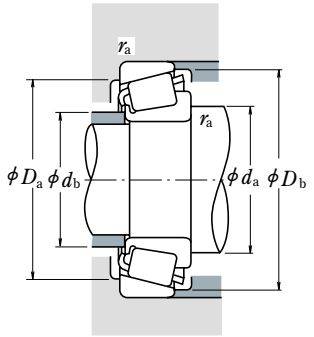
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **HM 804843** | **HM 804810** | 63 | 57 | 81 | 91 | 3.5 | 3.3 | 26.1 | 0.55 | 1.1 | 0.60 | 0.677 | 0.354 |
| **53177** | **53375** | 63 | 53 | 81 | 89 | 3.5 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.572 | 0.365 |
| **53176** | **53375** | 59 | 53 | 81 | 89 | 1.3 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.574 | 0.365 |
| **53178** | **53375** | 60 | 53 | 81 | 89 | 2 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.574 | 0.365 |
| **HM 903247** | **HM 903210** | 61 | 54 | 81 | 91 | 1.3 | 0.8 | 31.5 | 0.74 | 0.81 | 0.45 | 0.651 | 0.389 |
| **HM 903249** | **HM 903210** | 65 | 54 | 81 | 91 | 3.5 | 0.8 | 31.5 | 0.74 | 0.81 | 0.45 | 0.635 | 0.389 |
| **53177** | **53387** | 63 | 53 | 82 | 91 | 3.5 | 0.8 | 30.7 | 0.74 | 0.81 | 0.45 | 0.568 | 0.442 |
| **5356** | **5335** | 58 | 56 | 89 | 97 | 1.3 | 3.3 | 27.0 | 0.30 | 2.0 | 1.1 | 1.23 | 0.637 |
| **HM 807040** | **HM 807010** | 66 | 59 | 89 | 100 | 3.5 | 3.3 | 29.7 | 0.49 | 1.2 | 0.68 | 1.14 | 0.502 |
| **460** | **453 A** | 60 | 54 | 97 | 100 | 3.5 | 0.8 | 20.7 | 0.34 | 1.8 | 0.98 | 0.93 | 0.42 |
| **55175** | **55437** | 67 | 60 | 92 | 105 | 3.5 | 3.3 | 37.3 | 0.88 | 0.68 | 0.37 | 0.867 | 0.514 |
| **65385** | **65320** | 65 | 59 | 97 | 107 | 3.5 | 3.3 | 32.2 | 0.43 | 1.4 | 0.77 | 1.39 | 0.894 |
| **25584** | **25520** | 53 | 51 | 74 | 77 | 1.5 | 0.8 | 17.6 | 0.33 | 1.8 | 0.99 | 0.354 | 0.203 |
| **376** | **374** | 54 | 54 | 85 | 88 | 0.8 | 1.3 | 17.1 | 0.34 | 1.8 | 0.97 | 0.492 | 0.174 |
| **17887** | **17831** | 57 | 52 | 68 | 74 | 2 | 1.3 | 15.9 | 0.37 | 1.6 | 0.90 | 0.274 | 0.136 |
| **LM 102949** | **LM 102910** | 56 | 50 | 68 | 70 | 3.5 | 0.8 | 14.6 | 0.31 | 2.0 | 1.1 | 0.213 | 0.102 |
| **LM 603049** | **LM 603011** | 57 | 50 | 71 | 74 | 3.5 | 0.8 | 17.2 | 0.43 | 1.4 | 0.77 | 0.249 | 0.119 |
| **LM 603049** | **LM 603012** | 57 | 50 | 70 | 74 | 3.5 | 0.8 | 18.8 | 0.43 | 1.4 | 0.77 | 0.249 | 0.137 |
| **25590** | **25520** | 58 | 51 | 74 | 77 | 3.5 | 0.8 | 17.6 | 0.33 | 1.8 | 0.99 | 0.343 | 0.203 |
| **25590** | **25523** | 58 | 51 | 72 | 77 | 3.5 | 2.3 | 20.8 | 0.33 | 1.8 | 0.99 | 0.343 | 0.248 |
| *** LM 503349** | **** LM 503310** | 55 | 51 | 67 | 71 | 2.3 | 1.5 | 15.9 | 0.40 | 1.5 | 0.82 | 0.209 | 0.096 |
| **18690** | **18620** | 56 | 51 | 71 | 74 | 2.8 | 1.5 | 15.5 | 0.37 | 1.6 | 0.88 | 0.211 | 0.126 |
| **13181** | **13318** | 52 | 52 | 72 | 76 | 0.8 | 1.5 | 20.1 | 0.53 | 1.1 | 0.63 | 0.236 | 0.144 |
| **359 S** | **354 A** | 55 | 51 | 77 | 80 | 2.3 | 1.3 | 15.4 | 0.31 | 2.0 | 1.1 | 0.343 | 0.162 |
| **2984** | **2924** | 58 | 52 | 76 | 80 | 3.5 | 1.3 | 19.0 | 0.35 | 1.7 | 0.95 | 0.397 | 0.223 |
| **436** | **432 A** | 59 | 52 | 84 | 87 | 3.5 | 0.8 | 18.6 | 0.28 | 2.1 | 1.2 | 0.536 | 0.381 |
| **369 A** | **362 A** | 60 | 53 | 81 | 84 | 3.5 | 1.3 | 16.6 | 0.32 | 1.9 | 1.0 | 0.381 | 0.166 |
| **M 804049** | **M 804010** | 63 | 56 | 77 | 85 | 3.5 | 3.3 | 23.8 | 0.55 | 1.1 | 0.60 | 0.455 | 0.218 |
| **HM 804846** | **HM 804810** | 66 | 57 | 81 | 91 | 3.5 | 3.3 | 26.1 | 0.55 | 1.1 | 0.60 | 0.626 | 0.354 |
| **528** | **522** | 62 | 55 | 89 | 95 | 3.5 | 3.3 | 22.1 | 0.29 | 2.1 | 1.2 | 0.894 | 0.416 |
| **55187** | **55437** | 69 | 62 | 92 | 105 | 3.5 | 3.3 | 37.3 | 0.88 | 0.68 | 0.37 | 0.817 | 0.514 |
| **55187** | **55443** | 69 | 62 | 92 | 106 | 3.5 | 3.3 | 37.3 | 0.88 | 0.68 | 0.37 | 0.816 | 0.554 |
| **66187** | **66462** | 66 | 62 | 100 | 111 | 3.5 | 3.3 | 32.1 | 0.63 | 0.96 | 0.53 | 1.19 | 0.552 |
| **72187** | **72487** | 72 | 66 | 102 | 116 | 3.5 | 3.3 | 37.0 | 0.74 | 0.81 | 0.45 | 1.29 | 0.79 |

**Notes** * The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

**Bore Diameter 48.412 – 52.388 mm**




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

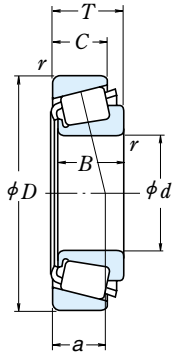
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **48.412** | 95.250 | 30.162 | 29.370 | 23.020 | 3.5 | 3.3 | 106 000 | 143 000 | 10 800 | 14 500 | 3 800 | 5 300 |
| | 95.250 | 30.162 | 29.370 | 23.020 | 2.3 | 3.3 | 106 000 | 143 000 | 10 800 | 14 500 | 3 800 | 5 300 |
| **49.212** | 104.775 | 36.512 | 36.512 | 28.575 | 3.5 | 0.8 | 139 000 | 192 000 | 14 200 | 19 600 | 3 400 | 4 800 |
| | 114.300 | 44.450 | 44.450 | 36.068 | 3.5 | 3.3 | 196 000 | 243 000 | 20 000 | 24 800 | 3 400 | 4 800 |
| **50.000** | 82.000 | 21.500 | 21.500 | 17.000 | 3.0 | 0.5 | 71 000 | 96 000 | 7 250 | 9 800 | 4 300 | 5 600 |
| | 82.550 | 21.590 | 22.225 | 16.510 | 0.5 | 1.3 | 71 000 | 96 000 | 7 250 | 9 800 | 4 300 | 5 600 |
| | 88.900 | 20.638 | 22.225 | 16.513 | 2.3 | 1.3 | 73 000 | 85 000 | 7 450 | 8 650 | 4 000 | 5 600 |
| | 90.000 | 28.000 | 28.000 | 23.000 | 3.0 | 2.5 | 104 000 | 136 000 | 10 600 | 13 900 | 4 000 | 5 600 |
| | 105.000 | 37.000 | 36.000 | 29.000 | 3.0 | 2.5 | 139 000 | 192 000 | 14 200 | 19 600 | 3 400 | 4 800 |
| **50.800** | 80.962 | 18.258 | 18.258 | 14.288 | 1.5 | 1.5 | 53 000 | 81 000 | 5 400 | 8 250 | 4 300 | 5 600 |
| | 82.550 | 23.622 | 22.225 | 18.542 | 3.5 | 0.8 | 71 000 | 96 000 | 7 250 | 9 800 | 4 300 | 5 600 |
| | 82.931 | 21.590 | 22.225 | 16.510 | 3.5 | 1.3 | 71 000 | 96 000 | 7 250 | 9 800 | 4 300 | 5 600 |
| | 85.000 | 17.462 | 17.462 | 13.495 | 3.5 | 1.5 | 48 500 | 63 000 | 4 950 | 6 450 | 4 300 | 5 600 |
| | 85.725 | 19.050 | 18.263 | 12.700 | 1.5 | 1.5 | 42 500 | 54 000 | 4 350 | 5 500 | 4 000 | 5 300 |
| | 88.900 | 20.638 | 22.225 | 16.513 | 3.5 | 1.3 | 73 000 | 85 000 | 7 450 | 8 650 | 4 000 | 5 600 |
| | 88.900 | 20.638 | 22.225 | 16.513 | 1.5 | 1.3 | 73 000 | 85 000 | 7 450 | 8 650 | 4 000 | 5 600 |
| | 92.075 | 24.608 | 25.400 | 19.845 | 3.5 | 0.8 | 84 500 | 117 000 | 8 600 | 11 900 | 4 000 | 5 300 |
| | 93.264 | 30.162 | 30.302 | 23.812 | 0.8 | 0.8 | 103 000 | 136 000 | 10 500 | 13 900 | 3 800 | 5 300 |
| | 93.264 | 30.162 | 30.302 | 23.812 | 3.5 | 0.8 | 103 000 | 136 000 | 10 500 | 13 900 | 3 800 | 5 300 |
| | 95.250 | 27.783 | 28.575 | 22.225 | 3.5 | 2.3 | 110 000 | 144 000 | 11 200 | 14 700 | 3 800 | 5 300 |
| | 101.600 | 31.750 | 31.750 | 25.400 | 3.5 | 3.3 | 118 000 | 150 000 | 12 100 | 15 200 | 3 600 | 5 000 |
| | 101.600 | 34.925 | 36.068 | 26.988 | 0.8 | 3.3 | 137 000 | 169 000 | 14 000 | 17 200 | 3 800 | 5 000 |
| | 101.600 | 34.925 | 36.068 | 26.988 | 3.5 | 3.3 | 137 000 | 169 000 | 14 000 | 17 200 | 3 800 | 5 000 |
| | 104.775 | 36.512 | 36.512 | 28.575 | 3.5 | 0.8 | 139 000 | 192 000 | 14 200 | 19 600 | 3 400 | 4 800 |
| | 104.775 | 36.512 | 36.512 | 28.575 | 3.5 | 3.3 | 139 000 | 192 000 | 14 200 | 19 600 | 3 400 | 4 800 |
| | 108.966 | 34.925 | 36.512 | 26.988 | 3.5 | 3.3 | 145 000 | 181 000 | 14 700 | 18 500 | 3 600 | 4 800 |
| | 111.125 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 113 000 | 152 000 | 11 500 | 15 400 | 3 000 | 4 300 |
| | 111.125 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 92 500 | 110 000 | 9 450 | 11 200 | 3 200 | 4 300 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 162 000 | 199 000 | 16 500 | 20 300 | 2 800 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 143 000 | 160 000 | 14 600 | 16 400 | 3 000 | 4 000 |
| | 127.000 | 44.450 | 44.450 | 34.925 | 3.5 | 3.3 | 199 000 | 258 000 | 20 200 | 26 300 | 3 000 | 4 000 |
| | 127.000 | 50.800 | 52.388 | 41.275 | 3.5 | 3.3 | 236 000 | 300 000 | 24 000 | 31 000 | 3 200 | 4 300 |
| **52.388** | 92.075 | 24.608 | 25.400 | 19.845 | 3.5 | 0.8 | 84 500 | 117 000 | 8 600 | 11 900 | 4 000 | 5 300 |
| | 100.000 | 25.000 | 22.225 | 21.824 | 2.3 | 2.0 | 77 000 | 93 000 | 7 900 | 9 500 | 3 800 | 5 300 |
| | 111.125 | 30.162 | 26.909 | 20.638 | 3.5 | 3.3 | 92 500 | 110 000 | 9 450 | 11 200 | 3 200 | 4 300 |

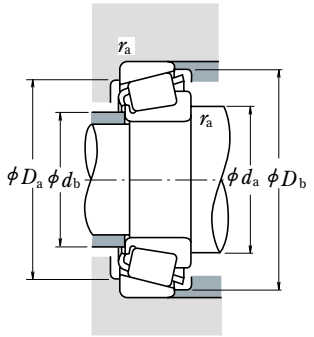
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **HM 804849** | **HM 804810** | 66 | 57 | 81 | 91 | 3.5 | 3.3 | 26.1 | 0.55 | 1.1 | 0.60 | 0.61 | 0.354 |
| **HM 804848** | **HM 804810** | 63 | 57 | 81 | 91 | 2.3 | 3.3 | 26.1 | 0.55 | 1.1 | 0.60 | 0.614 | 0.354 |
| **HM 807044** | **HM 807011** | 69 | 63 | 91 | 100 | 3.5 | 0.8 | 29.7 | 0.49 | 1.2 | 0.68 | 1.03 | 0.508 |
| **HH 506348** | **HH 506310** | 71 | 61 | 97 | 107 | 3.5 | 3.3 | 30.8 | 0.40 | 1.5 | 0.82 | 1.43 | 0.837 |
| ▲**JLM 104948** | ▲**JLM 104910** | 60 | 55 | 76 | 78 | 3 | 0.5 | 16.1 | 0.31 | 2.0 | 1.1 | 0.306 | 0.129 |
| ＊**LM 104947 A** | **LM 104911** | 55 | 55 | 75 | 78 | 0.5 | 1.3 | 15.7 | 0.31 | 2.0 | 1.1 | 0.316 | 0.133 |
| **366** | **362 A** | 59 | 55 | 81 | 84 | 2.3 | 1.3 | 16.6 | 0.32 | 1.9 | 1.0 | 0.351 | 0.166 |
| ▲**JM 205149** | ▲**JM 205110** | 62 | 57 | 80 | 85 | 3 | 2.5 | 19.9 | 0.33 | 1.8 | 1.0 | 0.507 | 0.246 |
| ▲**JHM 807045** | ▲**JHM 807012** | 69 | 63 | 90 | 100 | 3 | 2.5 | 29.7 | 0.49 | 1.2 | 0.68 | 1.01 | 0.523 |
| **L 305649** | **L 305610** | 58 | 56 | 73 | 77 | 1.5 | 1.5 | 15.7 | 0.36 | 1.7 | 0.93 | 0.239 | 0.119 |
| **LM 104949** | **LM 104911 A** | 62 | 55 | 75 | 78 | 3.5 | 0.8 | 17.8 | 0.31 | 2.0 | 1.1 | 0.303 | 0.156 |
| **LM 104949** | **LM 104912** | 62 | 55 | 75 | 78 | 3.5 | 1.3 | 15.7 | 0.31 | 2.0 | 1.1 | 0.301 | 0.14 |
| **18790** | **18720** | 62 | 56 | 77 | 80 | 3.5 | 1.5 | 16.7 | 0.41 | 1.5 | 0.81 | 0.239 | 0.136 |
| **18200** | **18337** | 59 | 56 | 76 | 81 | 1.5 | 1.5 | 21.0 | 0.57 | 1.1 | 0.58 | 0.268 | 0.136 |
| **368 A** | **362 A** | 62 | 56 | 81 | 84 | 3.5 | 1.3 | 16.6 | 0.32 | 1.9 | 1.0 | 0.338 | 0.166 |
| **368** | **362 A** | 58 | 56 | 81 | 84 | 1.5 | 1.3 | 16.6 | 0.32 | 1.9 | 1.0 | 0.341 | 0.166 |
| **28580** | **28521** | 63 | 57 | 83 | 87 | 3.5 | 0.8 | 20.0 | 0.38 | 1.6 | 0.87 | 0.46 | 0.247 |
| **3775** | **3730** | 58 | 58 | 84 | 88 | 0.8 | 0.8 | 22.4 | 0.34 | 1.8 | 0.97 | 0.568 | 0.297 |
| **3780** | **3730** | 64 | 58 | 84 | 88 | 3.5 | 0.8 | 22.4 | 0.34 | 1.8 | 0.97 | 0.564 | 0.297 |
| **33889** | **33821** | 64 | 58 | 85 | 90 | 3.5 | 2.3 | 19.8 | 0.33 | 1.8 | 1.0 | 0.601 | 0.267 |
| **49585** | **49520** | 66 | 59 | 88 | 96 | 3.5 | 3.3 | 23.4 | 0.40 | 1.5 | 0.82 | 0.744 | 0.389 |
| **529** | **522** | 59 | 58 | 89 | 95 | 0.8 | 3.3 | 22.1 | 0.29 | 2.1 | 1.2 | 0.822 | 0.416 |
| **529 X** | **522** | 65 | 58 | 89 | 95 | 3.5 | 3.3 | 22.1 | 0.29 | 2.1 | 1.2 | 0.819 | 0.416 |
| **HM 807046** | **HM 807011** | 70 | 63 | 91 | 100 | 3.5 | 0.8 | 29.7 | 0.49 | 1.2 | 0.68 | 0.992 | 0.508 |
| **HM 807046** | **HM 807010** | 70 | 63 | 89 | 100 | 3.5 | 3.3 | 29.7 | 0.49 | 1.2 | 0.68 | 0.993 | 0.502 |
| **59200** | **59429** | 68 | 61 | 93 | 101 | 3.5 | 3.3 | 25.4 | 0.40 | 1.5 | 0.82 | 0.943 | 0.594 |
| **55200 C** | **55437** | 71 | 65 | 92 | 105 | 3.5 | 3.3 | 37.6 | 0.88 | 0.68 | 0.37 | 0.845 | 0.514 |
| **55200** | **55437** | 71 | 64 | 92 | 105 | 3.5 | 3.3 | 37.3 | 0.88 | 0.68 | 0.37 | 0.767 | 0.514 |
| **72200 C** | **72487** | 77 | 67 | 102 | 116 | 3.5 | 3.3 | 38.0 | 0.74 | 0.81 | 0.45 | 1.33 | 0.79 |
| **72200** | **72487** | 74 | 66 | 102 | 116 | 3.5 | 3.3 | 37.0 | 0.74 | 0.81 | 0.45 | 1.22 | 0.79 |
| **65200** | **65500** | 75 | 69 | 107 | 119 | 3.5 | 3.3 | 35.0 | 0.49 | 1.2 | 0.68 | 1.86 | 1.03 |
| **6279** | **6220** | 71 | 65 | 108 | 117 | 3.5 | 3.3 | 30.7 | 0.30 | 2.0 | 1.1 | 2.08 | 1.22 |
| **28584** | **28521** | 65 | 58 | 83 | 87 | 3.5 | 0.8 | 20.0 | 0.38 | 1.6 | 0.87 | 0.435 | 0.247 |
| **377** | **372** | 62 | 58 | 86 | 90 | 2.3 | 2 | 21.4 | 0.34 | 1.8 | 0.97 | 0.392 | 0.435 |
| **55206** | **55437** | 72 | 64 | 92 | 105 | 3.5 | 3.3 | 37.3 | 0.88 | 0.68 | 0.37 | 0.737 | 0.514 |

**Notes** ＊ The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 53.975 – 58.738 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

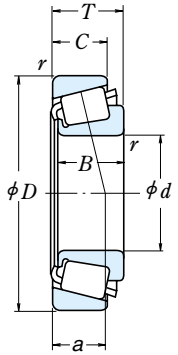
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

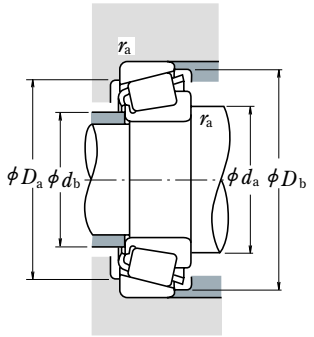
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **53.975** | 104.775 | 39.688 | 40.157 | 33.338 | 3.5 | 3.3 | 148 000 | 207 000 | 15 100 | 21 100 | 3 600 | 4 800 |
| | 107.950 | 36.512 | 36.957 | 28.575 | 3.5 | 3.3 | 144 000 | 182 000 | 14 700 | 18 500 | 3 600 | 4 800 |
| | 122.238 | 33.338 | 31.750 | 23.812 | 3.5 | 3.3 | 135 000 | 156 000 | 13 800 | 15 900 | 3 000 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 143 000 | 160 000 | 14 600 | 16 400 | 3 000 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 162 000 | 199 000 | 16 500 | 20 300 | 2 800 | 4 000 |
| | 123.825 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 127.000 | 44.450 | 44.450 | 34.925 | 3.5 | 3.3 | 199 000 | 258 000 | 20 200 | 26 300 | 3 000 | 4 000 |
| | 127.000 | 50.800 | 52.388 | 41.275 | 3.5 | 3.3 | 236 000 | 300 000 | 24 000 | 31 000 | 3 200 | 4 300 |
| | 130.175 | 36.512 | 33.338 | 23.812 | 3.5 | 3.3 | 133 000 | 154 000 | 13 600 | 15 700 | 2 600 | 3 600 |
| **55.000** | 90.000 | 23.000 | 23.000 | 18.500 | 1.5 | 0.5 | 79 000 | 111 000 | 8 050 | 11 300 | 3 800 | 5 300 |
| | 95.000 | 29.000 | 29.000 | 23.500 | 1.5 | 2.5 | 111 000 | 152 000 | 11 300 | 15 500 | 3 800 | 5 000 |
| | 96.838 | 21.000 | 21.946 | 15.875 | 2.3 | 0.8 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| | 110.000 | 39.000 | 39.000 | 32.000 | 3.0 | 2.5 | 177 000 | 225 000 | 18 000 | 23 000 | 3 400 | 4 500 |
| | 115.000 | 41.021 | 41.275 | 31.496 | 3.0 | 3.0 | 172 000 | 214 000 | 17 500 | 21 800 | 3 200 | 4 500 |
| **55.562** | 97.630 | 24.608 | 24.608 | 19.446 | 3.5 | 0.8 | 89 000 | 129 000 | 9 100 | 13 100 | 3 600 | 5 000 |
| | 122.238 | 43.658 | 43.764 | 36.512 | 1.3 | 3.3 | 198 000 | 292 000 | 20 200 | 29 700 | 3 000 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 143 000 | 160 000 | 14 600 | 16 400 | 3 000 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 162 000 | 199 000 | 16 500 | 20 300 | 2 800 | 4 000 |
| **57.150** | 96.838 | 21.000 | 21.946 | 15.875 | 3.5 | 0.8 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| | 96.838 | 21.000 | 21.946 | 15.875 | 2.3 | 0.8 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| | 96.838 | 25.400 | 21.946 | 20.275 | 3.5 | 2.3 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| | 98.425 | 21.000 | 21.946 | 17.826 | 3.5 | 0.8 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| | 104.775 | 30.162 | 29.317 | 24.605 | 3.5 | 3.3 | 116 000 | 149 000 | 11 800 | 15 200 | 3 400 | 4 800 |
| | 104.775 | 30.162 | 29.317 | 24.605 | 2.3 | 3.3 | 116 000 | 149 000 | 11 800 | 15 200 | 3 400 | 4 800 |
| | 104.775 | 30.162 | 30.958 | 23.812 | 0.8 | 3.3 | 130 000 | 170 000 | 13 300 | 17 400 | 3 400 | 4 800 |
| | 104.775 | 30.162 | 30.958 | 23.812 | 0.8 | 0.8 | 130 000 | 170 000 | 13 300 | 17 400 | 3 400 | 4 800 |
| | 122.238 | 33.338 | 31.750 | 23.812 | 3.5 | 3.3 | 135 000 | 156 000 | 13 800 | 15 900 | 3 000 | 4 000 |
| | 123.825 | 36.512 | 32.791 | 25.400 | 3.5 | 3.3 | 162 000 | 199 000 | 16 500 | 20 300 | 2 800 | 4 000 |
| | 123.825 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 140.030 | 36.512 | 33.236 | 23.520 | 3.5 | 2.3 | 152 000 | 183 000 | 15 500 | 18 700 | 2 600 | 3 600 |
| | 144.983 | 36.000 | 33.236 | 23.007 | 3.5 | 3.5 | 152 000 | 183 000 | 15 500 | 18 700 | 2 600 | 3 600 |
| | 149.225 | 53.975 | 54.229 | 44.450 | 3.5 | 3.3 | 287 000 | 410 000 | 29 300 | 41 500 | 2 600 | 3 400 |
| **57.531** | 96.838 | 21.000 | 21.946 | 15.875 | 3.5 | 0.8 | 80 500 | 100 000 | 8 200 | 10 200 | 3 600 | 5 000 |
| **58.738** | 112.712 | 33.338 | 30.048 | 26.988 | 3.5 | 3.3 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **4595** | **4535** | 70 | 63 | 90 | 99 | 3.5 | 3.3 | 27.4 | 0.34 | 1.79 | 0.98 | 0.989 | 0.589 |
| **539** | **532 X** | 68 | 61 | 94 | 100 | 3.5 | 3.3 | 24.3 | 0.30 | 2.0 | 1.1 | 0.88 | 0.57 |
| **66584** | **66520** | 75 | 68 | 105 | 116 | 3.5 | 3.3 | 34.3 | 0.67 | 0.90 | 0.50 | 1.2 | 0.558 |
| **72212** | **72487** | 77 | 66 | 102 | 116 | 3.5 | 3.3 | 37.0 | 0.74 | 0.81 | 0.45 | 1.16 | 0.79 |
| **72212 C** | **72487** | 79 | 67 | 102 | 116 | 3.5 | 3.3 | 38.0 | 0.74 | 0.81 | 0.45 | 1.27 | 0.79 |
| **557 S** | **552 A** | 71 | 65 | 109 | 116 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.49 | 0.764 |
| **65212** | **65500** | 77 | 71 | 107 | 119 | 3.5 | 3.3 | 35.0 | 0.49 | 1.2 | 0.68 | 1.76 | 1.03 |
| **6280** | **6220** | 74 | 67 | 108 | 117 | 3.5 | 3.3 | 30.7 | 0.30 | 2.0 | 1.1 | 1.97 | 1.22 |
| **HM911242** | **HM911210** | 79 | 74 | 109 | 124 | 3.5 | 3.3 | 42.2 | 0.82 | 0.73 | 0.40 | 1.45 | 0.725 |
| ▲ **JLM506849** | ▲ **JLM506810** | 63 | 61 | 82 | 86 | 1.5 | 0.5 | 19.7 | 0.40 | 1.5 | 0.82 | 0.378 | 0.186 |
| ▲ **JM207049** | ▲ **JM207010** | 64 | 62 | 85 | 91 | 1.5 | 2.5 | 21.3 | 0.33 | 1.8 | 0.99 | 0.59 | 0.26 |
| **385** | **382 A** | 65 | 61 | 89 | 92 | 2.3 | 0.8 | 17.6 | 0.35 | 1.7 | 0.93 | 0.455 | 0.179 |
| ▲ **JH307749** | ▲ **JH307710** | 71 | 64 | 97 | 104 | 3 | 2.5 | 27.2 | 0.35 | 1.7 | 0.95 | 1.13 | 0.567 |
| **622 X** | **614 X** | 70 | 64 | 101 | 108 | 3 | 3 | 26.6 | 0.31 | 1.9 | 1.1 | 1.3 | 0.597 |
| **28680** | **28622** | 68 | 62 | 88 | 92 | 3.5 | 0.8 | 21.3 | 0.40 | 1.5 | 0.82 | 0.499 | 0.27 |
| **5566** | **5535** | 70 | 68 | 106 | 116 | 1.3 | 3.3 | 29.9 | 0.36 | 1.7 | 0.92 | 1.76 | 0.815 |
| **72218** | **72487** | 78 | 66 | 102 | 116 | 3.5 | 3.3 | 37.0 | 0.74 | 0.81 | 0.45 | 1.12 | 0.79 |
| **72218 C** | **72487** | 80 | 67 | 102 | 116 | 3.5 | 3.3 | 38.0 | 0.74 | 0.81 | 0.45 | 1.23 | 0.79 |
| **387 A** | **382 A** | 69 | 62 | 89 | 92 | 3.5 | 0.8 | 17.6 | 0.35 | 1.7 | 0.93 | 0.42 | 0.179 |
| **387** | **382 A** | 66 | 62 | 89 | 92 | 2.3 | 0.8 | 17.6 | 0.35 | 1.7 | 0.93 | 0.423 | 0.179 |
| **387 A** | **382 S** | 69 | 62 | 87 | 91 | 3.5 | 2.3 | 22.0 | 0.35 | 1.7 | 0.93 | 0.42 | 0.249 |
| **387 A** | **382** | 69 | 62 | 90 | 92 | 3.5 | 0.8 | 17.6 | 0.35 | 1.7 | 0.93 | 0.42 | 0.226 |
| **469** | **453 X** | 70 | 63 | 92 | 98 | 3.5 | 3.3 | 23.1 | 0.34 | 1.8 | 0.98 | 0.692 | 0.376 |
| **462** | **453 X** | 67 | 63 | 92 | 98 | 2.3 | 3.3 | 23.1 | 0.34 | 1.8 | 0.98 | 0.694 | 0.376 |
| **45289** | **45220** | 65 | 65 | 93 | 99 | 0.8 | 3.3 | 21.9 | 0.33 | 1.8 | 0.99 | 0.752 | 0.347 |
| **45289** | **45221** | 65 | 65 | 95 | 99 | 0.8 | 0.8 | 21.9 | 0.33 | 1.8 | 0.99 | 0.76 | 0.35 |
| **66587** | **66520** | 77 | 71 | 105 | 116 | 3.5 | 3.3 | 34.3 | 0.67 | 0.90 | 0.50 | 1.14 | 0.558 |
| **72225 C** | **72487** | 81 | 67 | 102 | 116 | 3.5 | 3.3 | 38.0 | 0.74 | 0.81 | 0.45 | 1.19 | 0.79 |
| **555 S** | **552 A** | 83 | 68 | 109 | 116 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.41 | 0.764 |
| **78225** | **78551** | 83 | 77 | 117 | 132 | 3.5 | 2.3 | 44.2 | 0.87 | 0.69 | 0.38 | 1.67 | 0.926 |
| **78225** | **78571** | 83 | 77 | 118 | 132 | 3.5 | 3.5 | 43.6 | 0.87 | 0.69 | 0.38 | 1.68 | 1.08 |
| **6455** | **6420** | 81 | 75 | 129 | 140 | 3.5 | 3.3 | 39.0 | 0.36 | 1.7 | 0.91 | 3.49 | 1.63 |
| **388 A** | **382 A** | 69 | 63 | 89 | 92 | 3.5 | 0.8 | 17.6 | 0.35 | 1.7 | 0.93 | 0.416 | 0.179 |
| **3981** | **3926** | 73 | 67 | 98 | 106 | 3.5 | 3.3 | 28.7 | 0.40 | 1.5 | 0.82 | 0.899 | 0.541 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

**Bore Diameter 60.000 – 64.963 mm**




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

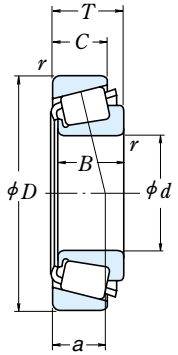
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **60.000** | 95.000 | 24.000 | 24.000 | 19.000 | 5.0 | 2.5 | 86 500 | 125 000 | 8 800 | 12 800 | 3 600 | 5 000 |
| | 104.775 | 21.433 | 22.000 | 15.875 | 2.3 | 2.0 | 83 500 | 107 000 | 8 500 | 10 900 | 3 400 | 4 500 |
| | 110.000 | 22.000 | 21.996 | 18.824 | 0.8 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 122.238 | 33.338 | 31.750 | 23.812 | 3.5 | 3.3 | 135 000 | 156 000 | 13 800 | 15 900 | 3 000 | 4 000 |
| **60.325** | 100.000 | 25.400 | 25.400 | 19.845 | 3.5 | 3.3 | 91 000 | 135 000 | 9 250 | 13 700 | 3 400 | 4 800 |
| | 101.600 | 25.400 | 25.400 | 19.845 | 3.5 | 3.3 | 91 000 | 135 000 | 9 250 | 13 700 | 3 400 | 4 800 |
| | 122.238 | 38.100 | 36.678 | 30.162 | 2.3 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 8.0 | 1.5 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 122.238 | 43.658 | 43.764 | 36.512 | 0.8 | 3.3 | 198 000 | 292 000 | 20 200 | 29 700 | 3 000 | 4 000 |
| | 127.000 | 44.450 | 44.450 | 34.925 | 3.5 | 3.3 | 199 000 | 258 000 | 20 200 | 26 300 | 3 000 | 4 000 |
| | 130.175 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 135.755 | 53.975 | 56.007 | 44.450 | 3.5 | 3.3 | 264 000 | 355 000 | 27 000 | 36 000 | 2 800 | 3 800 |
| **61.912** | 136.525 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 233 000 | 370 000 | 23 800 | 37 500 | 2 600 | 3 400 |
| | 146.050 | 41.275 | 39.688 | 25.400 | 3.5 | 3.3 | 193 000 | 225 000 | 19 700 | 22 900 | 2 400 | 3 400 |
| | 152.400 | 47.625 | 46.038 | 31.750 | 3.5 | 3.3 | 237 000 | 267 000 | 24 200 | 27 300 | 2 400 | 3 400 |
| **63.500** | 94.458 | 19.050 | 19.050 | 15.083 | 1.5 | 1.5 | 59 000 | 100 000 | 6 050 | 10 200 | 3 600 | 4 800 |
| | 104.775 | 21.433 | 22.000 | 15.875 | 2.0 | 2.0 | 83 500 | 107 000 | 8 500 | 10 900 | 3 400 | 4 500 |
| | 107.950 | 25.400 | 25.400 | 19.050 | 1.5 | 3.3 | 90 000 | 138 000 | 9 150 | 14 100 | 3 200 | 4 300 |
| | 110.000 | 22.000 | 21.996 | 18.824 | 3.5 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 110.000 | 22.000 | 21.996 | 18.824 | 1.5 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.048 | 23.812 | 3.5 | 3.2 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 142 000 | 202 000 | 14 500 | 20 600 | 3 200 | 4 300 |
| | 112.712 | 33.338 | 30.048 | 26.988 | 3.5 | 3.3 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 7.0 | 3.3 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 7.0 | 1.5 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 3.5 | 1.5 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 122.238 | 43.658 | 43.764 | 36.512 | 3.5 | 3.3 | 198 000 | 292 000 | 20 200 | 29 700 | 3 000 | 4 000 |
| | 123.825 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 130.175 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 136.525 | 36.512 | 33.236 | 23.520 | 2.3 | 3.3 | 152 000 | 183 000 | 15 500 | 18 700 | 2 600 | 3 600 |
| | 136.525 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 140.030 | 36.512 | 33.236 | 23.520 | 2.3 | 2.3 | 152 000 | 183 000 | 15 500 | 18 700 | 2 600 | 3 600 |
| **64.963** | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |

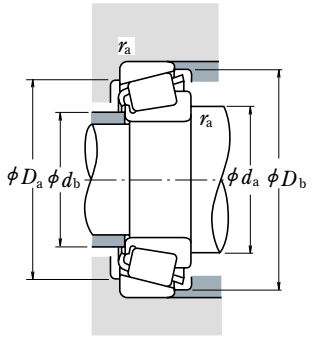
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ▲ **JLM 508748** | ▲ **JLM 508710** | 75 | 66 | 85 | 91 | 5 | 2.5 | 21.6 | 0.40 | 1.5 | 0.82 | 0.43 | 0.20 |
| ✻ **39236** | **39412** | 71 | 67 | 96 | 100 | 2.3 | 2 | 20.0 | 0.39 | 1.5 | 0.85 | 0.559 | 0.186 |
| **397** | **394 A** | 69 | 68 | 101 | 104 | 0.8 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.642 | 0.263 |
| **66585** | **66520** | 79 | 73 | 105 | 116 | 3.5 | 3.3 | 34.3 | 0.67 | 0.90 | 0.50 | 1.07 | 0.558 |
| **28985** | **28921** | 73 | 67 | 89 | 96 | 3.5 | 3.3 | 22.9 | 0.43 | 1.4 | 0.78 | 0.538 | 0.232 |
| **28985** | **28920** | 73 | 67 | 90 | 97 | 3.5 | 3.3 | 22.9 | 0.43 | 1.4 | 0.78 | 0.538 | 0.272 |
| **558** | **553 X** | 73 | 69 | 108 | 115 | 2.3 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.33 | 0.692 |
| **HM 212044** | **HM 212010** | 85 | 70 | 110 | 116 | 8 | 1.5 | 27.0 | 0.34 | 1.8 | 0.98 | 1.43 | 0.604 |
| **5582** | **5535** | 73 | 72 | 106 | 116 | 0.8 | 3.3 | 29.9 | 0.36 | 1.7 | 0.92 | 1.61 | 0.815 |
| **65237** | **65500** | 82 | 71 | 107 | 119 | 3.5 | 3.3 | 35.0 | 0.49 | 1.2 | 0.68 | 1.56 | 1.03 |
| **637** | **633** | 78 | 72 | 116 | 124 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.87 | 0.712 |
| **6376** | **6320** | 81 | 74 | 117 | 126 | 3.5 | 3.3 | 35.0 | 0.32 | 1.8 | 1.0 | 2.45 | 1.39 |
| **H 715334** | **H 715311** | 84 | 78 | 119 | 132 | 3.5 | 3.3 | 37.1 | 0.47 | 1.3 | 0.70 | 2.51 | 0.961 |
| **H 913842** | **H 913810** | 90 | 82 | 124 | 138 | 3.5 | 3.3 | 44.4 | 0.78 | 0.77 | 0.42 | 2.2 | 0.898 |
| **9180** | **9121** | 90 | 81 | 130 | 145 | 3.5 | 3.3 | 44.3 | 0.66 | 0.92 | 0.50 | 2.77 | 1.21 |
| **L 610549** | **L 610510** | 71 | 69 | 86 | 91 | 1.5 | 1.5 | 19.6 | 0.42 | 1.4 | 0.78 | 0.306 | 0.154 |
| **39250** | **39412** | 73 | 69 | 96 | 100 | 2 | 2 | 20.0 | 0.39 | 1.5 | 0.85 | 0.501 | 0.186 |
| **29586** | **29520** | 73 | 71 | 96 | 103 | 1.5 | 3.3 | 24.0 | 0.46 | 1.3 | 0.72 | 0.661 | 0.281 |
| **395** | **394 A** | 77 | 70 | 101 | 104 | 3.5 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.58 | 0.263 |
| **390 A** | **394 A** | 73 | 70 | 101 | 104 | 1.5 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.583 | 0.263 |
| **3982** | **3920** | 77 | 71 | 99 | 106 | 3.5 | 3.2 | 25.5 | 0.40 | 1.5 | 0.82 | 0.789 | 0.454 |
| **39585** | **39520** | 77 | 71 | 101 | 107 | 3.5 | 3.3 | 23.5 | 0.34 | 1.8 | 0.97 | 0.899 | 0.359 |
| **3982** | **3926** | 78 | 71 | 98 | 106 | 3.5 | 3.3 | 28.7 | 0.40 | 1.5 | 0.82 | 0.789 | 0.541 |
| **HM 212047** | **HM 212011** | 87 | 73 | 108 | 116 | 7 | 3.3 | 26.9 | 0.34 | 1.8 | 0.98 | 1.34 | 0.598 |
| **HM 212047** | **HM 212010** | 87 | 73 | 110 | 116 | 7 | 1.5 | 26.9 | 0.34 | 1.8 | 0.98 | 1.34 | 0.604 |
| **HM 212046** | **HM 212010** | 80 | 73 | 110 | 116 | 3.5 | 1.5 | 26.9 | 0.34 | 1.8 | 0.98 | 1.35 | 0.604 |
| **5584** | **5535** | 81 | 75 | 106 | 116 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.92 | 1.5 | 0.815 |
| **559** | **522 A** | 78 | 73 | 109 | 116 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.23 | 0.764 |
| **565** | **563** | 80 | 73 | 112 | 120 | 3.5 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.46 | 0.655 |
| **639** | **633** | 81 | 74 | 116 | 124 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.77 | 0.712 |
| **78250** | **78537** | 85 | 79 | 115 | 130 | 2.3 | 3.3 | 44.2 | 0.87 | 0.69 | 0.38 | 1.51 | 0.782 |
| **639** | **632** | 79 | 76 | 119 | 125 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.77 | 1.04 |
| **78250** | **78551** | 85 | 79 | 117 | 132 | 2.3 | 2.3 | 44.2 | 0.87 | 0.69 | 0.38 | 1.51 | 0.926 |
| **569** | **563** | 81 | 74 | 112 | 120 | 3.5 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.41 | 0.655 |

**Notes** ✻ The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 65.000 – 69.850 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

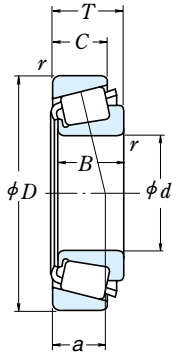
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

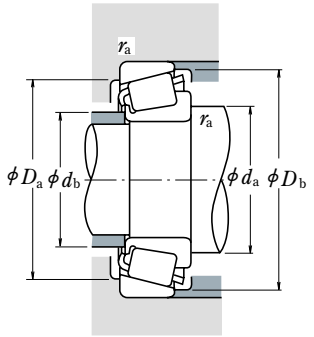
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **65.000** | 105.000 | 24.000 | 23.000 | 18.500 | 3.0 | 1.0 | 93 000 | 126 000 | 9 500 | 12 900 | 3 400 | 4 500 |
| | 110.000 | 28.000 | 28.000 | 22.500 | 3.0 | 2.5 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |
| | 120.000 | 29.002 | 29.007 | 23.444 | 2.3 | 3.3 | 123 000 | 169 000 | 12 500 | 17 200 | 3 000 | 4 000 |
| | 120.000 | 39.000 | 38.500 | 32.000 | 3.0 | 2.5 | 185 000 | 249 000 | 18 800 | 25 400 | 3 000 | 4 000 |
| **65.088** | 135.755 | 53.975 | 56.007 | 44.450 | 3.5 | 3.3 | 264 000 | 355 000 | 27 000 | 36 000 | 2 800 | 3 800 |
| | 136.525 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 233 000 | 370 000 | 23 800 | 37 500 | 2 600 | 3 400 |
| **66.675** | 110.000 | 22.000 | 21.996 | 18.824 | 0.8 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 110.000 | 22.000 | 21.996 | 18.824 | 3.5 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.048 | 23.812 | 3.5 | 3.2 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.048 | 23.812 | 5.5 | 3.2 | 120 000 | 173 000 | 12 200 | 17 700 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.162 | 23.812 | 3.5 | 0.8 | 142 000 | 202 000 | 14 500 | 20 600 | 3 200 | 4 300 |
| | 112.712 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 142 000 | 202 000 | 14 500 | 20 600 | 3 200 | 4 300 |
| | 117.475 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 119 000 | 179 000 | 12 200 | 18 300 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 3.5 | 1.5 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 38.354 | 29.718 | 3.5 | 3.3 | 188 000 | 245 000 | 19 200 | 25 000 | 3 000 | 4 000 |
| | 123.825 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 136.525 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 233 000 | 370 000 | 23 800 | 37 500 | 2 600 | 3 400 |
| **68.262** | 110.000 | 22.000 | 21.996 | 18.824 | 2.3 | 1.3 | 85 500 | 113 000 | 8 750 | 11 500 | 3 200 | 4 300 |
| | 120.000 | 29.795 | 29.007 | 24.237 | 3.5 | 2.0 | 123 000 | 169 000 | 12 500 | 17 200 | 3 000 | 4 000 |
| | 122.238 | 38.100 | 36.678 | 30.162 | 3.5 | 3.3 | 161 000 | 221 000 | 16 400 | 22 500 | 3 000 | 4 000 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 136.525 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 229 000 | 297 000 | 23 300 | 30 500 | 2 600 | 3 600 |
| | 136.525 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 233 000 | 370 000 | 23 800 | 37 500 | 2 600 | 3 400 |
| | 152.400 | 47.625 | 46.038 | 31.750 | 3.5 | 3.3 | 237 000 | 267 000 | 24 200 | 27 300 | 2 400 | 3 400 |
| **69.850** | 112.712 | 22.225 | 21.996 | 15.875 | 1.5 | 0.8 | 85 000 | 113 000 | 8 650 | 11 500 | 3 000 | 4 000 |
| | 112.712 | 25.400 | 25.400 | 19.050 | 1.5 | 3.3 | 96 000 | 152 000 | 9 800 | 15 500 | 2 800 | 4 000 |
| | 117.475 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 119 000 | 179 000 | 12 200 | 18 300 | 3 000 | 4 000 |
| | 120.000 | 32.545 | 32.545 | 26.195 | 3.5 | 3.3 | 152 000 | 225 000 | 15 500 | 22 900 | 3 000 | 4 000 |
| | 120.650 | 25.400 | 25.400 | 19.050 | 1.5 | 3.3 | 96 000 | 152 000 | 9 800 | 15 500 | 2 800 | 4 000 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 0.8 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 130.175 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 146.050 | 41.275 | 39.688 | 25.400 | 3.5 | 3.3 | 193 000 | 225 000 | 19 700 | 22 900 | 2 400 | 3 400 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 149.225 | 53.975 | 54.229 | 44.450 | 5.0 | 3.3 | 287 000 | 410 000 | 29 300 | 41 500 | 2 600 | 3 400 |
| | 150.089 | 44.450 | 46.672 | 36.512 | 3.5 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ▲ **JLM 710949** | ▲ **JLM 710910** | 77 | 71 | 96 | 101 | 3 | 1 | 23.7 | 0.45 | 1.3 | 0.73 | 0.526 | 0.237 |
| ▲ **JM 511946** | ▲ **JM 511910** | 78 | 72 | 99 | 105 | 3 | 2.5 | 24.5 | 0.40 | 1.5 | 0.82 | 0.72 | 0.342 |
| **478** | **472 A** | 77 | 73 | 106 | 114 | 2.3 | 3.3 | 24.3 | 0.38 | 1.6 | 0.86 | 0.942 | 0.466 |
| ▲ **JH 211749** | ▲ **JH 211710** | 80 | 74 | 107 | 114 | 3 | 2.5 | 27.9 | 0.34 | 1.8 | 0.98 | 1.25 | 0.625 |
| **6379** | **6320** | 84 | 77 | 117 | 126 | 3.5 | 3.3 | 35.0 | 0.32 | 1.8 | 1.0 | 2.25 | 1.39 |
| **H 715340** | **H 715311** | 88 | 82 | 118 | 132 | 3.5 | 3.3 | 37.1 | 0.47 | 1.3 | 0.70 | 2.4 | 0.961 |
| **395 A** | **394 A** | 73 | 73 | 101 | 104 | 0.8 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.528 | 0.263 |
| **395 S** | **394 A** | 79 | 73 | 101 | 104 | 3.5 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.524 | 0.263 |
| **3984** | **3920** | 80 | 74 | 99 | 106 | 3.5 | 3.2 | 25.5 | 0.40 | 1.5 | 0.82 | 0.712 | 0.454 |
| **3994** | **3920** | 84 | 74 | 99 | 106 | 5.5 | 3.2 | 25.5 | 0.40 | 1.5 | 0.82 | 0.706 | 0.454 |
| **39590** | **39521** | 80 | 74 | 103 | 107 | 3.5 | 0.8 | 23.5 | 0.34 | 1.8 | 0.97 | 0.822 | 0.365 |
| **39590** | **39520** | 80 | 74 | 101 | 107 | 3.5 | 3.3 | 23.5 | 0.34 | 1.8 | 0.97 | 0.822 | 0.359 |
| **33262** | **33462** | 81 | 75 | 104 | 112 | 3.5 | 3.3 | 26.8 | 0.44 | 1.4 | 0.76 | 0.911 | 0.442 |
| **560** | **553 X** | 81 | 75 | 108 | 115 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.14 | 0.692 |
| **HM 212049** | **HM 212010** | 82 | 75 | 110 | 116 | 3.5 | 1.5 | 26.9 | 0.34 | 1.8 | 0.98 | 1.25 | 0.604 |
| **HM 212049** | **HM 212011** | 81 | 74 | 108 | 116 | 3.5 | 3.3 | 26.9 | 0.34 | 1.8 | 0.98 | 1.25 | 0.598 |
| **560** | **552 A** | 81 | 75 | 109 | 116 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.14 | 0.764 |
| **H 715341** | **H 715311** | 89 | 83 | 118 | 132 | 3.5 | 3.3 | 37.1 | 0.47 | 1.3 | 0.70 | 2.34 | 0.961 |
| **399 A** | **394 A** | 78 | 74 | 101 | 104 | 2.3 | 1.3 | 20.9 | 0.40 | 1.5 | 0.82 | 0.497 | 0.263 |
| **480** | **472** | 83 | 76 | 106 | 113 | 3.5 | 2 | 25.1 | 0.38 | 1.6 | 0.86 | 0.862 | 0.493 |
| **560 S** | **553 X** | 83 | 76 | 108 | 115 | 3.5 | 3.3 | 28.8 | 0.35 | 1.7 | 0.95 | 1.09 | 0.692 |
| **570** | **563** | 83 | 77 | 112 | 120 | 3.5 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.32 | 0.655 |
| **H 414245** | **H 414210** | 86 | 82 | 121 | 129 | 3.5 | 3.3 | 30.6 | 0.36 | 1.7 | 0.92 | 1.95 | 0.796 |
| **H 715343** | **H 715311** | 90 | 84 | 118 | 132 | 3.5 | 3.3 | 37.1 | 0.47 | 1.3 | 0.70 | 2.28 | 0.961 |
| **9185** | **9121** | 94 | 81 | 130 | 145 | 3.5 | 3.3 | 44.3 | 0.66 | 0.92 | 0.50 | 2.53 | 1.21 |
| **LM 613449** | **LM 613410** | 78 | 76 | 104 | 107 | 1.5 | 0.8 | 22.1 | 0.42 | 1.4 | 0.79 | 0.562 | 0.238 |
| **29675** | **29620** | 80 | 77 | 101 | 109 | 1.5 | 3.3 | 26.3 | 0.49 | 1.2 | 0.68 | 0.695 | 0.273 |
| **33275** | **33462** | 84 | 77 | 104 | 112 | 3.5 | 3.3 | 26.8 | 0.44 | 1.4 | 0.76 | 0.83 | 0.442 |
| **47487** | **47420** | 84 | 78 | 107 | 114 | 3.5 | 3.3 | 26.0 | 0.36 | 1.7 | 0.92 | 1.02 | 0.477 |
| **29675** | **29630** | 79 | 78 | 105 | 113 | 1.5 | 3.3 | 26.3 | 0.49 | 1.2 | 0.68 | 0.695 | 0.489 |
| **566** | **563 X** | 85 | 78 | 114 | 120 | 3.5 | 0.8 | 28.3 | 0.36 | 1.6 | 0.91 | 1.27 | 0.658 |
| **643** | **633** | 86 | 80 | 116 | 124 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.56 | 0.712 |
| **H 913849** | **H 913810** | 95 | 82 | 124 | 138 | 3.5 | 3.3 | 44.4 | 0.78 | 0.77 | 0.42 | 1.95 | 0.898 |
| **655** | **653** | 88 | 82 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 2.35 | 0.891 |
| **6454** | **6420** | 94 | 85 | 129 | 140 | 5 | 3.3 | 39.0 | 0.36 | 1.7 | 0.91 | 2.95 | 1.63 |
| **745 A** | **742** | 88 | 82 | 134 | 142 | 3.5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.82 | 1.07 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

**Bore Diameter 70.000 – 76.200 mm**




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

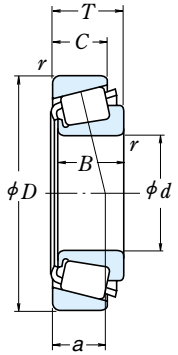
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

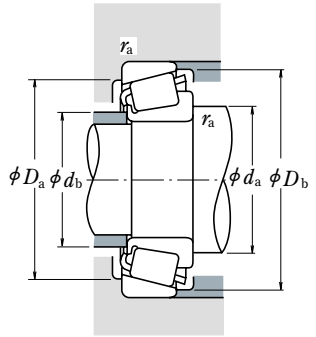
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **70.000** | 110.000 | 26.000 | 25.000 | 20.500 | 1.0 | 2.5 | 98 500 | 152 000 | 10 000 | 15 500 | 3 000 | 4 000 |
| | 115.000 | 29.000 | 29.000 | 23.000 | 3.0 | 2.5 | 126 000 | 177 000 | 12 900 | 18 100 | 3 000 | 4 000 |
| | 120.000 | 29.795 | 29.007 | 24.237 | 2.0 | 2.0 | 123 000 | 169 000 | 12 500 | 17 200 | 3 000 | 4 000 |
| **71.438** | 117.475 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 119 000 | 179 000 | 12 200 | 18 300 | 3 000 | 4 000 |
| | 120.000 | 32.545 | 32.545 | 26.195 | 3.5 | 3.3 | 152 000 | 225 000 | 15 500 | 22 900 | 3 000 | 4 000 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 6.4 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 130.175 | 41.275 | 41.275 | 31.750 | 6.4 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 136.525 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 195 000 | 263 000 | 19 800 | 26 800 | 2 800 | 3 800 |
| | 136.525 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 229 000 | 297 000 | 23 300 | 30 500 | 2 600 | 3 600 |
| | 136.525 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 233 000 | 370 000 | 23 800 | 37 500 | 2 600 | 3 400 |
| **73.025** | 112.712 | 25.400 | 25.400 | 19.050 | 3.5 | 3.3 | 96 000 | 152 000 | 9 800 | 15 500 | 2 800 | 4 000 |
| | 117.475 | 30.162 | 30.162 | 23.812 | 3.5 | 3.3 | 119 000 | 179 000 | 12 200 | 18 300 | 3 000 | 4 000 |
| | 127.000 | 36.512 | 36.170 | 28.575 | 3.5 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 149.225 | 53.975 | 54.229 | 44.450 | 3.5 | 3.3 | 287 000 | 410 000 | 29 300 | 41 500 | 2 600 | 3 400 |
| **73.817** | 127.000 | 36.512 | 36.170 | 28.575 | 0.8 | 3.3 | 166 000 | 234 000 | 16 900 | 23 900 | 2 800 | 3 800 |
| **74.612** | 150.000 | 41.275 | 41.275 | 31.750 | 3.5 | 3.0 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| **75.000** | 115.000 | 25.000 | 25.000 | 19.000 | 3.0 | 2.5 | 101 000 | 150 000 | 10 300 | 15 300 | 3 000 | 4 000 |
| | 120.000 | 31.000 | 29.500 | 25.000 | 3.0 | 2.5 | 129 000 | 198 000 | 13 100 | 20 200 | 2 800 | 3 800 |
| | 145.000 | 51.000 | 51.000 | 42.000 | 3.0 | 2.5 | 283 000 | 410 000 | 28 900 | 41 500 | 2 600 | 3 400 |
| **76.200** | 121.442 | 24.608 | 23.012 | 17.462 | 2.0 | 2.0 | 89 000 | 124 000 | 9 100 | 12 600 | 2 800 | 3 800 |
| | 127.000 | 30.162 | 31.000 | 22.225 | 3.5 | 3.3 | 134 000 | 195 000 | 13 700 | 19 900 | 2 800 | 3 800 |
| | 127.000 | 30.162 | 31.001 | 22.225 | 6.4 | 3.3 | 134 000 | 195 000 | 13 700 | 19 900 | 2 800 | 3 800 |
| | 133.350 | 33.338 | 33.338 | 26.195 | 0.8 | 3.3 | 154 000 | 237 000 | 15 700 | 24 200 | 2 600 | 3 600 |
| | 135.733 | 44.450 | 46.101 | 34.925 | 3.5 | 3.3 | 216 000 | 340 000 | 22 000 | 35 000 | 2 600 | 3 600 |
| | 136.525 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 136.525 | 30.162 | 29.769 | 22.225 | 6.4 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 139.992 | 36.512 | 36.098 | 28.575 | 3.5 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| | 149.225 | 53.975 | 54.229 | 44.450 | 3.5 | 3.3 | 287 000 | 410 000 | 29 300 | 41 500 | 2 600 | 3 400 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 152.400 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 161.925 | 49.212 | 46.038 | 31.750 | 3.5 | 3.3 | 248 000 | 290 000 | 25 300 | 29 600 | 2 200 | 3 000 |
| | 161.925 | 53.975 | 55.100 | 42.862 | 3.5 | 3.3 | 325 000 | 480 000 | 33 000 | 49 000 | 2 200 | 3 000 |
| | 161.925 | 53.975 | 55.100 | 42.862 | 6.4 | 3.3 | 325 000 | 480 000 | 33 000 | 49 000 | 2 200 | 3 000 |
| | 161.925 | 53.975 | 55.100 | 42.862 | 6.4 | 0.8 | 325 000 | 480 000 | 33 000 | 49 000 | 2 200 | 3 000 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ▲**JLM 813049** | ▲**JLM 813010** | 78 | 77 | 98 | 105 | 1 | 2.5 | 26.2 | 0.49 | 1.2 | 0.68 | 0.604 | 0.304 |
| ▲**JM 612949** | ▲**JM 612910** | 83 | 77 | 103 | 110 | 3 | 2.5 | 26.4 | 0.43 | 1.4 | 0.77 | 0.800 | 0.362 |
| **484** | **472** | 80 | 78 | 106 | 113 | 2 | 2 | 25.1 | 0.38 | 1.6 | 0.86 | 0.822 | 0.493 |
| **33281** | **33462** | 85 | 79 | 104 | 112 | 3.5 | 3.3 | 26.8 | 0.44 | 1.4 | 0.76 | 0.789 | 0.442 |
| **47490** | **47420** | 86 | 79 | 107 | 114 | 3.5 | 3.3 | 26.0 | 0.36 | 1.7 | 0.92 | 0.983 | 0.477 |
| **567 S** | **563** | 92 | 80 | 112 | 120 | 6.4 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.21 | 0.655 |
| **567 A** | **563** | 86 | 80 | 112 | 120 | 3.5 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.23 | 0.655 |
| **645** | **633** | 93 | 81 | 116 | 124 | 6.4 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.49 | 0.712 |
| **644** | **632** | 87 | 81 | 118 | 125 | 3.5 | 3.3 | 29.9 | 0.36 | 1.7 | 0.91 | 1.5 | 1.04 |
| **H 414249** | **H 414210** | 89 | 83 | 121 | 129 | 3.5 | 3.3 | 30.6 | 0.36 | 1.7 | 0.92 | 1.83 | 0.796 |
| **H 715345** | **H 715311** | 92 | 84 | 119 | 132 | 3.5 | 3.3 | 37.1 | 0.47 | 1.3 | 0.70 | 2.15 | 0.961 |
| **29685** | **29620** | 86 | 80 | 101 | 109 | 3.5 | 3.3 | 26.3 | 0.49 | 1.2 | 0.68 | 0.62 | 0.273 |
| **33287** | **33462** | 87 | 80 | 104 | 112 | 3.5 | 3.3 | 26.8 | 0.44 | 1.4 | 0.76 | 0.746 | 0.442 |
| **567** | **563** | 88 | 81 | 112 | 120 | 3.5 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.17 | 0.655 |
| **657** | **653** | 91 | 85 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 2.24 | 0.891 |
| **6460** | **6420** | 93 | 87 | 129 | 140 | 3.5 | 3.3 | 39.0 | 0.36 | 1.7 | 0.91 | 2.8 | 1.63 |
| **568** | **563** | 83 | 82 | 112 | 120 | 0.8 | 3.3 | 28.3 | 0.36 | 1.6 | 0.91 | 1.15 | 0.655 |
| **658** | **653 X** | 92 | 86 | 133 | 141 | 3.5 | 3 | 33.2 | 0.41 | 1.5 | 0.81 | 2.37 | 0.932 |
| ▲**JLM 714149** | ▲**JLM 714110** | 87 | 81 | 104 | 110 | 3 | 2.5 | 25.3 | 0.46 | 1.3 | 0.72 | 0.638 | 0.272 |
| ▲**JM 714249** | ▲**JM 714210** | 88 | 83 | 108 | 115 | 3 | 2.5 | 28.8 | 0.44 | 1.4 | 0.74 | 0.863 | 0.436 |
| ▲**JH 415647** | ▲**JH 415610** | 94 | 89 | 129 | 139 | 3 | 2.5 | 36.7 | 0.36 | 1.7 | 0.91 | 2.64 | 1.19 |
| **34300** | **34478** | 86 | 84 | 111 | 116 | 2 | 2 | 26.3 | 0.45 | 1.3 | 0.73 | 0.65 | 0.316 |
| **42687** | **42620** | 90 | 84 | 114 | 121 | 3.5 | 3.3 | 27.3 | 0.42 | 1.4 | 0.79 | 1.03 | 0.438 |
| **42688** | **42620** | 94 | 84 | 114 | 121 | 6.4 | 3.3 | 27.3 | 0.42 | 1.4 | 0.79 | 1.01 | 0.438 |
| **47680** | **47620** | 86 | 85 | 119 | 128 | 0.8 | 3.3 | 29.0 | 0.40 | 1.5 | 0.82 | 1.39 | 0.577 |
| **5760** | **5735** | 94 | 88 | 119 | 130 | 3.5 | 3.3 | 32.9 | 0.41 | 1.5 | 0.81 | 1.86 | 0.887 |
| **495 A** | **493** | 92 | 86 | 122 | 130 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.27 | 0.55 |
| **495 AX** | **493** | 98 | 86 | 122 | 130 | 6.4 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.26 | 0.55 |
| **575** | **572** | 92 | 86 | 125 | 133 | 3.5 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.61 | 0.788 |
| **6461** | **6420** | 96 | 89 | 129 | 140 | 3.5 | 3.3 | 39.0 | 0.36 | 1.7 | 0.91 | 2.64 | 1.63 |
| **590 A** | **592 A** | 95 | 89 | 135 | 145 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 2.2 | 1.06 |
| **659** | **652** | 93 | 87 | 134 | 141 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 2.11 | 1.26 |
| **9285** | **9220** | 103 | 90 | 138 | 153 | 3.5 | 3.3 | 49.8 | 0.71 | 0.85 | 0.47 | 2.82 | 1.4 |
| **6576** | **6535** | 99 | 92 | 141 | 154 | 3.5 | 3.3 | 40.7 | 0.40 | 1.5 | 0.82 | 3.74 | 1.67 |
| **6575** | **6535** | 104 | 92 | 141 | 154 | 6.4 | 3.3 | 40.7 | 0.40 | 1.5 | 0.82 | 3.73 | 1.67 |
| **6575** | **6536** | 104 | 92 | 144 | 154 | 6.4 | 0.8 | 40.7 | 0.40 | 1.5 | 0.82 | 3.73 | 1.68 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 76.200 – 83.345 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

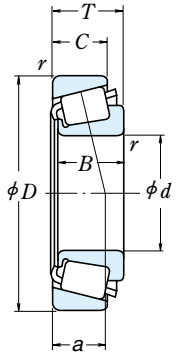
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

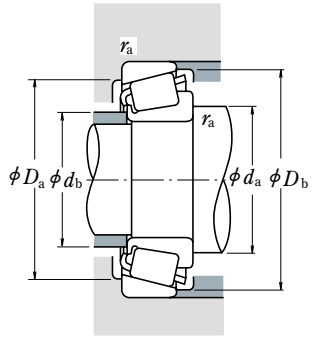
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **76.200** | 168.275 | 53.975 | 56.363 | 41.275 | 6.4 | 3.3 | 345 000 | 470 000 | 35 000 | 48 000 | 2 200 | 3 000 |
| | 168.275 | 53.975 | 56.363 | 41.275 | 0.8 | 3.3 | 345 000 | 470 000 | 35 000 | 48 000 | 2 200 | 3 000 |
| | 171.450 | 49.212 | 46.038 | 31.750 | 3.5 | 3.3 | 257 000 | 310 000 | 26 200 | 32 000 | 2 000 | 2 800 |
| | 177.800 | 55.562 | 50.800 | 34.925 | 3.5 | 3.3 | 257 000 | 310 000 | 26 200 | 32 000 | 2 000 | 2 800 |
| **77.788** | 121.442 | 24.608 | 23.012 | 17.462 | 3.5 | 2.0 | 89 000 | 124 000 | 9 100 | 12 600 | 2 800 | 3 800 |
| | 127.000 | 30.162 | 31.000 | 22.225 | 3.5 | 3.3 | 134 000 | 195 000 | 13 700 | 19 900 | 2 800 | 3 800 |
| | 135.733 | 44.450 | 46.101 | 34.925 | 3.5 | 3.3 | 216 000 | 340 000 | 22 000 | 35 000 | 2 600 | 3 600 |
| **79.375** | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 150.089 | 44.450 | 46.672 | 36.512 | 3.5 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |
| **80.000** | 130.000 | 35.000 | 34.000 | 28.500 | 3.0 | 2.5 | 166 000 | 251 000 | 17 000 | 25 600 | 2 600 | 3 600 |
| **80.962** | 136.525 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 139.700 | 36.512 | 36.098 | 28.575 | 3.5 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| | 139.992 | 36.512 | 36.098 | 28.575 | 3.5 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| **82.550** | 125.412 | 25.400 | 25.400 | 19.845 | 3.5 | 1.5 | 102 000 | 164 000 | 10 400 | 16 700 | 2 600 | 3 600 |
| | 133.350 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 133.350 | 33.338 | 33.338 | 26.195 | 3.5 | 3.3 | 154 000 | 237 000 | 15 700 | 24 200 | 2 600 | 3 600 |
| | 133.350 | 33.338 | 33.338 | 26.195 | 0.8 | 3.3 | 154 000 | 237 000 | 15 700 | 24 200 | 2 600 | 3 600 |
| | 133.350 | 33.338 | 33.338 | 26.195 | 6.8 | 3.3 | 154 000 | 237 000 | 15 700 | 24 200 | 2 600 | 3 600 |
| | 133.350 | 39.688 | 39.688 | 32.545 | 6.8 | 3.3 | 179 000 | 310 000 | 18 300 | 31 500 | 2 600 | 3 600 |
| | 136.525 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 139.700 | 36.512 | 36.098 | 28.575 | 3.5 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| | 139.992 | 36.512 | 36.098 | 28.575 | 3.5 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| | 139.992 | 36.512 | 36.098 | 28.575 | 6.8 | 3.3 | 175 000 | 260 000 | 17 800 | 26 500 | 2 600 | 3 400 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 150.000 | 44.455 | 46.672 | 35.000 | 3.5 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |
| | 150.089 | 44.450 | 46.672 | 36.512 | 3.5 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |
| | 152.400 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 161.925 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 161.925 | 53.975 | 55.100 | 42.862 | 3.5 | 3.3 | 325 000 | 480 000 | 33 000 | 49 000 | 2 200 | 3 000 |
| | 168.275 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 168.275 | 53.975 | 56.363 | 41.275 | 3.5 | 3.3 | 345 000 | 470 000 | 35 000 | 48 000 | 2 200 | 3 000 |
| **83.345** | 125.412 | 25.400 | 25.400 | 19.845 | 3.5 | 1.5 | 102 000 | 164 000 | 10 400 | 16 700 | 2 600 | 3 600 |
| | 125.412 | 25.400 | 25.400 | 19.845 | 0.8 | 1.5 | 102 000 | 164 000 | 10 400 | 16 700 | 2 600 | 3 600 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **843** | **832** | 101 | 89 | 149 | 155 | 6.4 | 3.3 | 35.2 | 0.30 | 2.0 | 1.1 | 4.11 | 1.74 |
| **837** | **832** | 90 | 89 | 149 | 155 | 0.8 | 3.3 | 35.2 | 0.30 | 2.0 | 1.1 | 4.13 | 1.74 |
| **9380** | **9321** | 105 | 98 | 147 | 164 | 3.5 | 3.3 | 54.1 | 0.76 | 0.79 | 0.43 | 3.47 | 1.51 |
| **9378** | **9320** | 105 | 98 | 148 | 164 | 3.5 | 3.3 | 57.3 | 0.76 | 0.79 | 0.43 | 3.71 | 2.24 |
| **34306** | **34478** | 90 | 84 | 110 | 116 | 3.5 | 2 | 26.3 | 0.45 | 1.3 | 0.73 | 0.612 | 0.316 |
| **42690** | **42620** | 91 | 85 | 114 | 121 | 3.5 | 3.3 | 27.3 | 0.42 | 1.4 | 0.79 | 0.976 | 0.438 |
| **5795** | **5735** | 96 | 89 | 119 | 130 | 3.5 | 3.3 | 32.9 | 0.41 | 1.5 | 0.81 | 1.79 | 0.887 |
| **661** | **653** | 96 | 90 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.99 | 0.891 |
| **750** | **742** | 96 | 90 | 134 | 142 | 3.5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.42 | 1.07 |
| ▲ **JM 515649** | ▲ **JM 515610** | 94 | 88 | 117 | 125 | 3 | 2.5 | 29.9 | 0.39 | 1.5 | 0.85 | 1.18 | 0.583 |
| **496** | **493** | 95 | 89 | 122 | 130 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.13 | 0.55 |
| **581** | **572 X** | 96 | 90 | 125 | 133 | 3.5 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.44 | 0.774 |
| **581** | **572** | 96 | 90 | 125 | 133 | 3.5 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.44 | 0.788 |
| **27687** | **27620** | 96 | 89 | 115 | 120 | 3.5 | 1.5 | 25.7 | 0.42 | 1.4 | 0.79 | 0.747 | 0.348 |
| **495** | **492 A** | 97 | 90 | 120 | 128 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.08 | 0.434 |
| **47686** | **47620** | 97 | 90 | 119 | 128 | 3.5 | 3.3 | 29.0 | 0.40 | 1.5 | 0.82 | 1.18 | 0.577 |
| **47685** | **47620** | 90 | 90 | 119 | 128 | 0.8 | 3.3 | 29.0 | 0.40 | 1.5 | 0.82 | 1.18 | 0.577 |
| **47687** | **47620** | 103 | 90 | 119 | 128 | 6.8 | 3.3 | 29.0 | 0.40 | 1.5 | 0.82 | 1.16 | 0.577 |
| **HM 516448** | **HM 516410** | 105 | 92 | 118 | 128 | 6.8 | 3.3 | 32.4 | 0.40 | 1.5 | 0.82 | 1.35 | 0.767 |
| **495** | **493** | 97 | 90 | 122 | 130 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.08 | 0.55 |
| **580** | **572 X** | 98 | 91 | 125 | 133 | 3.5 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.39 | 0.774 |
| **580** | **572** | 98 | 91 | 125 | 133 | 3.5 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.39 | 0.788 |
| **582** | **572** | 104 | 91 | 125 | 133 | 6.8 | 3.3 | 31.1 | 0.40 | 1.5 | 0.82 | 1.37 | 0.788 |
| **663** | **653** | 99 | 92 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.85 | 0.891 |
| **749 A** | **743** | 99 | 93 | 134 | 142 | 3.5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.26 | 1.04 |
| **749 A** | **742** | 98 | 93 | 135 | 143 | 3.5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.26 | 1.07 |
| **663** | **652** | 99 | 92 | 134 | 141 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.85 | 1.26 |
| **757** | **752** | 100 | 94 | 144 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.79 | 1.61 |
| **6559** | **6535** | 104 | 98 | 141 | 154 | 3.5 | 3.3 | 40.7 | 0.40 | 1.5 | 0.82 | 3.4 | 1.67 |
| **757** | **753** | 100 | 94 | 147 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.79 | 2.1 |
| **842** | **832** | 101 | 94 | 149 | 155 | 3.5 | 3.3 | 35.2 | 0.30 | 2.0 | 1.1 | 3.76 | 1.74 |
| **27690** | **27620** | 96 | 90 | 115 | 120 | 3.5 | 1.5 | 25.7 | 0.42 | 1.4 | 0.79 | 0.727 | 0.348 |
| **27689** | **27620** | 90 | 90 | 115 | 120 | 0.8 | 1.5 | 25.7 | 0.42 | 1.4 | 0.79 | 0.732 | 0.348 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 84.138 – 90.488 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **84.138** | 136.525 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 171.450 | 49.212 | 46.038 | 31.750 | 3.5 | 3.3 | 257 000 | 310 000 | 26 200 | 32 000 | 2 000 | 2 800 |
| **85.000** | 130.000 | 30.000 | 29.000 | 24.000 | 6.0 | 2.5 | 138 000 | 222 000 | 14 100 | 22 700 | 2 600 | 3 600 |
| | 130.000 | 30.000 | 29.000 | 24.000 | 3.0 | 2.5 | 138 000 | 222 000 | 14 100 | 22 700 | 2 600 | 3 600 |
| | 140.000 | 39.000 | 38.000 | 31.500 | 3.0 | 2.5 | 202 000 | 305 000 | 20 600 | 31 000 | 2 400 | 3 400 |
| | 150.000 | 46.000 | 46.000 | 38.000 | 3.0 | 2.5 | 275 000 | 390 000 | 28 000 | 40 000 | 2 400 | 3 200 |
| **85.026** | 150.089 | 44.450 | 46.672 | 36.512 | 3.5 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |
| | 150.089 | 44.450 | 46.672 | 36.512 | 5.0 | 3.3 | 265 000 | 370 000 | 27 000 | 37 500 | 2 400 | 3 200 |
| **85.725** | 133.350 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 136.525 | 30.162 | 29.769 | 22.225 | 3.5 | 3.3 | 130 000 | 192 000 | 13 300 | 19 600 | 2 600 | 3 400 |
| | 142.138 | 42.862 | 42.862 | 34.133 | 4.8 | 3.3 | 221 000 | 360 000 | 22 500 | 36 500 | 2 400 | 3 400 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 6.4 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 146.050 | 41.275 | 41.275 | 31.750 | 3.5 | 3.3 | 207 000 | 296 000 | 21 100 | 30 000 | 2 400 | 3 200 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 161.925 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 168.275 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 223 000 | 345 000 | 22 700 | 35 000 | 2 000 | 2 800 |
| **87.312** | 190.500 | 57.150 | 57.531 | 46.038 | 8.0 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| **88.900** | 149.225 | 31.750 | 28.971 | 24.608 | 3.0 | 3.3 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 152.400 | 39.688 | 39.688 | 30.162 | 6.4 | 3.3 | 253 000 | 365 000 | 25 800 | 37 500 | 2 200 | 3 200 |
| | 161.925 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 161.925 | 47.625 | 48.260 | 38.100 | 7.0 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 161.925 | 53.975 | 55.100 | 42.862 | 3.5 | 3.3 | 325 000 | 480 000 | 33 000 | 49 000 | 2 200 | 3 000 |
| | 168.275 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| | 168.275 | 53.975 | 56.363 | 41.275 | 3.5 | 3.3 | 345 000 | 470 000 | 35 000 | 48 000 | 2 200 | 3 000 |
| | 190.500 | 57.150 | 57.531 | 44.450 | 8.0 | 3.3 | 355 000 | 500 000 | 36 000 | 51 000 | 1 900 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 46.038 | 8.0 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| **90.000** | 145.000 | 35.000 | 34.000 | 27.000 | 3.0 | 2.5 | 190 000 | 285 000 | 19 400 | 29 000 | 2 400 | 3 200 |
| | 147.000 | 40.000 | 40.000 | 32.500 | 7.0 | 3.5 | 229 000 | 345 000 | 23 400 | 35 000 | 2 400 | 3 200 |
| | 155.000 | 44.000 | 44.000 | 35.500 | 3.0 | 2.5 | 274 000 | 395 000 | 28 000 | 40 000 | 2 200 | 3 000 |
| **90.488** | 161.925 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 274 000 | 390 000 | 28 000 | 40 000 | 2 200 | 3 000 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **498** | **493** | 98 | 91 | 122 | 130 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 1.04 | 0.55 |
| **664** | **653** | 99 | 93 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.79 | 0.891 |
| **9385** | **9321** | 111 | 98 | 147 | 164 | 3.5 | 3.3 | 54.1 | 0.76 | 0.79 | 0.43 | 3.11 | 1.51 |
| ▲ **JM 716648** | ▲ **JM 716610** | 104 | 92 | 117 | 125 | 6 | 2.5 | 29.5 | 0.44 | 1.4 | 0.74 | 0.931 | 0.461 |
| ▲ **JM 716649** | ▲ **JM 716610** | 98 | 92 | 117 | 125 | 3 | 2.5 | 29.5 | 0.44 | 1.4 | 0.74 | 0.943 | 0.461 |
| ▲ **JHM 516849** | ▲ **JHM 516810** | 100 | 94 | 125 | 134 | 3 | 2.5 | 33.3 | 0.41 | 1.5 | 0.81 | 1.55 | 0.768 |
| ▲ **JH 217249** | ▲ **JH 217210** | 101 | 95 | 134 | 142 | 3 | 2.5 | 33.9 | 0.33 | 1.8 | 0.99 | 2.29 | 1.09 |
| **749** | **742** | 101 | 95 | 134 | 142 | 3.5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.14 | 1.07 |
| **749 S** | **742** | 104 | 95 | 134 | 142 | 5 | 3.3 | 32.5 | 0.33 | 1.8 | 1.0 | 2.14 | 1.07 |
| **497** | **492 A** | 99 | 93 | 120 | 128 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 0.987 | 0.434 |
| **497** | **493** | 99 | 93 | 122 | 130 | 3.5 | 3.3 | 28.7 | 0.44 | 1.4 | 0.74 | 0.987 | 0.55 |
| **HM 617049** | **HM 617010** | 106 | 95 | 125 | 137 | 4.8 | 3.3 | 35.4 | 0.43 | 1.4 | 0.76 | 1.77 | 0.911 |
| **665 A** | **653** | 107 | 95 | 131 | 139 | 6.4 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.71 | 0.891 |
| **665** | **653** | 102 | 95 | 131 | 139 | 3.5 | 3.3 | 33.2 | 0.41 | 1.5 | 0.81 | 1.72 | 0.891 |
| **596** | **592 A** | 102 | 96 | 135 | 144 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.85 | 1.06 |
| **758** | **752** | 103 | 97 | 144 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.63 | 1.61 |
| **677** | **672** | 105 | 99 | 149 | 160 | 3.5 | 3.3 | 38.3 | 0.47 | 1.3 | 0.70 | 2.91 | 1.24 |
| **HH 221432** | **HH 221410** | 118 | 103 | 171 | 179 | 8 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 5.51 | 2.24 |
| **42350** | **42587** | 104 | 98 | 134 | 143 | 3 | 3.3 | 34.9 | 0.49 | 1.2 | 0.67 | 1.39 | 0.711 |
| **593** | **592 A** | 104 | 98 | 135 | 144 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.73 | 1.06 |
| **HM 518445** | **HM 518410** | 107 | 96 | 137 | 148 | 6.4 | 3.3 | 33.1 | 0.40 | 1.5 | 0.82 | 2.11 | 0.776 |
| **759** | **752** | 106 | 99 | 144 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.47 | 1.61 |
| **766** | **752** | 113 | 99 | 144 | 150 | 7 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.45 | 1.61 |
| **6580** | **6535** | 109 | 102 | 141 | 154 | 3.5 | 3.3 | 40.7 | 0.40 | 1.5 | 0.82 | 3.03 | 1.67 |
| **759** | **753** | 106 | 99 | 147 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.47 | 2.1 |
| **850** | **832** | 106 | 100 | 149 | 155 | 3.5 | 3.3 | 35.2 | 0.30 | 2.0 | 1.1 | 3.39 | 1.74 |
| **855** | **854** | 118 | 103 | 170 | 174 | 8 | 3.3 | 41.8 | 0.33 | 1.8 | 0.99 | 4.99 | 2.55 |
| **HH 221434** | **HH 221410** | 120 | 105 | 171 | 179 | 8 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 5.41 | 2.24 |
| ▲ **JM 718149** | ▲ **JM 718110** | 105 | 99 | 131 | 139 | 3 | 2.5 | 33.0 | 0.44 | 1.4 | 0.74 | 1.49 | 0.66 |
| ***HM 218248** | ****HM 218210** | 111 | 98 | 133 | 141 | 7 | 3.5 | 30.8 | 0.33 | 1.8 | 0.99 | 1.77 | 0.796 |
| ▲ **JHM 318448** | ▲ **JHM 318410** | 106 | 100 | 140 | 148 | 3 | 2.5 | 34.1 | 0.34 | 1.7 | 0.96 | 2.32 | 1.01 |
| **760** | **752** | 107 | 101 | 144 | 150 | 3.5 | 3.3 | 35.6 | 0.34 | 1.8 | 0.97 | 2.38 | 1.61 |

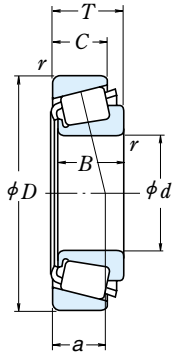
**Notes**

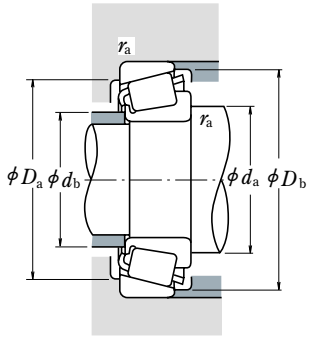
* The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

▲ The tolerances are listed in Tables **2, 3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 92.075 – 100.012 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

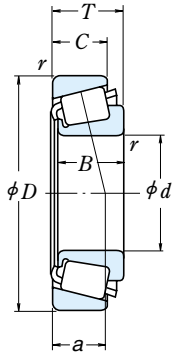
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

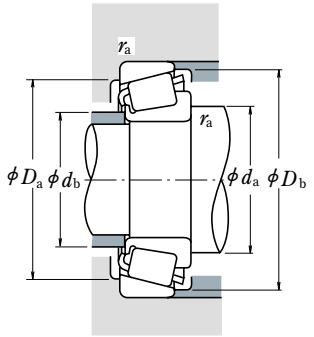
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | (kgf) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **92.075** | 146.050 | 33.338 | 34.925 | 26.195 | 3.5 | 3.3 | 169 000 | 280 000 | 17 300 | 28 500 | 2 400 | 3 200 |
| | 148.430 | 28.575 | 28.971 | 21.433 | 3.5 | 3.0 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 6.4 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 168.275 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 223 000 | 345 000 | 22 700 | 35 000 | 2 000 | 2 800 |
| | 190.500 | 57.150 | 57.531 | 44.450 | 8.0 | 3.3 | 355 000 | 500 000 | 36 000 | 51 000 | 1 900 | 2 600 |
| **93.662** | 148.430 | 28.575 | 28.971 | 21.433 | 3.0 | 3.0 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 149.225 | 31.750 | 28.971 | 24.608 | 3.0 | 3.3 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| **95.000** | 150.000 | 35.000 | 34.000 | 27.000 | 3.0 | 2.5 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| **95.250** | 146.050 | 33.338 | 34.925 | 26.195 | 3.5 | 3.3 | 169 000 | 280 000 | 17 300 | 28 500 | 2 400 | 3 200 |
| | 148.430 | 28.575 | 28.971 | 21.433 | 3.0 | 3.0 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 149.225 | 31.750 | 28.971 | 24.608 | 3.5 | 3.3 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 152.400 | 39.688 | 36.322 | 30.162 | 3.5 | 3.2 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 152.400 | 39.688 | 36.322 | 33.338 | 3.5 | 3.3 | 183 000 | 285 000 | 18 700 | 29 100 | 2 200 | 3 200 |
| | 168.275 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 223 000 | 345 000 | 22 700 | 35 000 | 2 000 | 2 800 |
| | 171.450 | 47.625 | 48.260 | 38.100 | 3.5 | 3.3 | 282 000 | 415 000 | 28 800 | 42 500 | 2 000 | 2 800 |
| | 180.975 | 47.625 | 48.006 | 38.100 | 3.5 | 3.3 | 258 000 | 375 000 | 26 300 | 38 500 | 2 000 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 44.450 | 8.0 | 3.3 | 355 000 | 500 000 | 36 000 | 51 000 | 1 900 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 46.038 | 8.0 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| **96.838** | 148.430 | 28.575 | 28.971 | 21.433 | 3.5 | 3.0 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| | 149.225 | 31.750 | 28.971 | 24.606 | 3.5 | 3.3 | 140 000 | 218 000 | 14 300 | 22 300 | 2 200 | 3 000 |
| **98.425** | 161.925 | 36.512 | 36.116 | 26.195 | 3.5 | 3.3 | 191 000 | 310 000 | 19 500 | 31 500 | 2 000 | 2 800 |
| | 168.275 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 223 000 | 345 000 | 22 700 | 35 000 | 2 000 | 2 800 |
| | 180.975 | 47.625 | 48.006 | 38.100 | 3.5 | 3.3 | 258 000 | 375 000 | 26 300 | 38 500 | 2 000 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 44.450 | 3.5 | 3.3 | 355 000 | 500 000 | 36 000 | 51 000 | 1 900 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 46.038 | 3.5 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| **99.982** | 190.500 | 57.150 | 57.531 | 46.038 | 6.4 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| **100.000** | 150.000 | 32.000 | 30.000 | 26.000 | 2.3 | 2.3 | 146 000 | 235 000 | 14 900 | 24 000 | 2 200 | 3 000 |
| | 155.000 | 36.000 | 35.000 | 28.000 | 3.0 | 2.5 | 191 000 | 325 000 | 19 500 | 33 000 | 2 000 | 2 800 |
| | 160.000 | 41.000 | 40.000 | 32.000 | 3.0 | 2.5 | 239 000 | 380 000 | 24 400 | 38 500 | 2 000 | 2 800 |
| **100.012** | 157.162 | 36.512 | 36.116 | 26.195 | 3.5 | 3.3 | 191 000 | 310 000 | 19 500 | 31 500 | 2 000 | 2 800 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **47890** | **47820** | 107 | 101 | 131 | 140 | 3.5 | 3.3 | 32.3 | 0.45 | 1.3 | 0.74 | 1.46 | 0.664 |
| **42362** | **42584** | 107 | 101 | 134 | 142 | 3.5 | 3 | 31.8 | 0.49 | 1.2 | 0.67 | 1.29 | 0.553 |
| **598** | **592 A** | 107 | 101 | 135 | 144 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.6 | 1.06 |
| **598 A** | **592 A** | 113 | 101 | 135 | 144 | 6.4 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.59 | 1.06 |
| **681** | **672** | 110 | 104 | 149 | 160 | 3.5 | 3.3 | 38.3 | 0.47 | 1.3 | 0.70 | 2.62 | 1.24 |
| **857** | **854** | 121 | 106 | 170 | 174 | 8 | 3.3 | 41.8 | 0.33 | 1.8 | 0.99 | 4.78 | 2.55 |
| **42368** | **42584** | 107 | 102 | 134 | 142 | 3 | 3 | 31.8 | 0.49 | 1.2 | 0.67 | 1.24 | 0.553 |
| **42368** | **42587** | 107 | 102 | 134 | 143 | 3 | 3.3 | 34.9 | 0.49 | 1.2 | 0.67 | 1.24 | 0.711 |
| **597** | **592 A** | 109 | 102 | 135 | 144 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.54 | 1.06 |
| ▲ **JM 719149** | ▲ **JM 719113** | 109 | 104 | 135 | 143 | 3 | 2.5 | 33.4 | 0.44 | 1.4 | 0.75 | 1.46 | 0.765 |
| **47896** | **47820** | 110 | 103 | 131 | 140 | 3.5 | 3.3 | 32.3 | 0.45 | 1.3 | 0.74 | 1.33 | 0.664 |
| **42375** | **42584** | 108 | 103 | 134 | 142 | 3 | 3 | 31.8 | 0.49 | 1.2 | 0.67 | 1.18 | 0.553 |
| **42376** | **42587** | 109 | 103 | 134 | 143 | 3.5 | 3.3 | 34.9 | 0.49 | 1.2 | 0.67 | 1.18 | 0.711 |
| **594** | **592 A** | 110 | 104 | 135 | 144 | 3.5 | 3.2 | 37.1 | 0.44 | 1.4 | 0.75 | 1.47 | 1.06 |
| **594** | **592** | 109 | 103 | 135 | 145 | 3.5 | 3.3 | 37.1 | 0.44 | 1.4 | 0.75 | 1.47 | 1.12 |
| **683** | **672** | 113 | 106 | 149 | 160 | 3.5 | 3.3 | 38.3 | 0.47 | 1.3 | 0.70 | 2.47 | 1.24 |
| **77375** | **77675** | 117 | 105 | 152 | 159 | 3.5 | 3.3 | 37.8 | 0.37 | 1.6 | 0.90 | 2.91 | 1.67 |
| **776** | **772** | 114 | 107 | 161 | 168 | 3.5 | 3.3 | 39.1 | 0.39 | 1.6 | 0.86 | 3.25 | 1.99 |
| **864** | **854** | 123 | 108 | 170 | 174 | 8 | 3.3 | 41.8 | 0.33 | 1.8 | 0.99 | 4.57 | 2.55 |
| **HH 221440** | **HH 221410** | 125 | 110 | 171 | 179 | 8 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 5.0 | 2.24 |
| **42381** | **42584** | 110 | 104 | 134 | 142 | 3.5 | 3 | 31.8 | 0.49 | 1.2 | 0.67 | 1.13 | 0.553 |
| **42381** | **42587** | 111 | 105 | 135 | 143 | 3.5 | 3.3 | 34.9 | 0.49 | 1.2 | 0.67 | 1.13 | 0.711 |
| **52387** | **52637** | 114 | 108 | 144 | 154 | 3.5 | 3.3 | 36.1 | 0.47 | 1.3 | 0.69 | 1.89 | 0.942 |
| **685** | **672** | 116 | 109 | 149 | 160 | 3.5 | 3.3 | 38.3 | 0.47 | 1.3 | 0.70 | 2.32 | 1.24 |
| **779** | **772** | 116 | 110 | 161 | 168 | 3.5 | 3.3 | 39.1 | 0.39 | 1.6 | 0.86 | 3.06 | 1.99 |
| **866** | **854** | 118 | 111 | 170 | 174 | 3.5 | 3.3 | 41.8 | 0.33 | 1.8 | 0.99 | 4.38 | 2.55 |
| **HH 221442** | **HH 221410** | 119 | 113 | 171 | 179 | 3.5 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 4.81 | 2.24 |
| **HH 221447** | **HH 221410** | 126 | 114 | 171 | 179 | 6.4 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 4.68 | 2.24 |
| ▲ **JLM 820048** | ▲ **JLM 820012** | 111 | 107 | 135 | 144 | 2.3 | 2.3 | 36.8 | 0.50 | 1.2 | 0.66 | 1.27 | 0.616 |
| ▲ **JM 720249** | ▲ **JM 720210** | 115 | 109 | 140 | 149 | 3 | 2.5 | 36.8 | 0.47 | 1.3 | 0.70 | 1.68 | 0.772 |
| ▲ **JHM 720249** | ▲ **JHM 720210** | 117 | 109 | 143 | 154 | 3 | 2.5 | 38.2 | 0.47 | 1.3 | 0.70 | 2.09 | 0.974 |
| **52393** | **52618** | 116 | 109 | 142 | 152 | 3.5 | 3.3 | 36.1 | 0.47 | 1.3 | 0.69 | 1.81 | 0.702 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 101.600 – 117.475 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

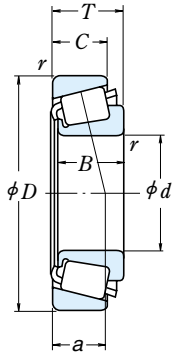
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | (kgf) | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **101.600** | 157.162 | 36.512 | 36.116 | 26.195 | 3.5 | 3.3 | 191 000 | 310 000 | 19 500 | 31 500 | 2 000 | 2 800 |
| | 161.925 | 36.512 | 36.116 | 26.195 | 3.5 | 3.3 | 191 000 | 310 000 | 19 500 | 31 500 | 2 000 | 2 800 |
| | 168.275 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 223 000 | 345 000 | 22 700 | 35 000 | 2 000 | 2 800 |
| | 180.975 | 47.625 | 48.006 | 38.100 | 3.5 | 3.3 | 258 000 | 375 000 | 26 300 | 38 500 | 2 000 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 44.450 | 8.0 | 3.3 | 355 000 | 500 000 | 36 000 | 51 000 | 1 900 | 2 600 |
| | 190.500 | 57.150 | 57.531 | 46.038 | 8.0 | 3.3 | 390 000 | 520 000 | 39 500 | 53 500 | 1 900 | 2 600 |
| | 212.725 | 66.675 | 66.675 | 53.975 | 7.0 | 3.3 | 570 000 | 810 000 | 58 000 | 82 500 | 1 700 | 2 200 |
| **104.775** | 180.975 | 47.625 | 48.006 | 38.100 | 7.0 | 3.3 | 258 000 | 375 000 | 26 300 | 38 500 | 2 000 | 2 600 |
| | 180.975 | 47.625 | 48.006 | 38.100 | 3.5 | 3.3 | 258 000 | 375 000 | 26 300 | 38 500 | 2 000 | 2 600 |
| | 190.500 | 47.625 | 49.212 | 34.925 | 3.5 | 3.3 | 296 000 | 465 000 | 30 000 | 47 000 | 1 800 | 2 400 |
| **106.362** | 165.100 | 36.512 | 36.512 | 26.988 | 3.5 | 3.3 | 195 000 | 320 000 | 19 800 | 33 000 | 2 000 | 2 600 |
| **107.950** | 158.750 | 23.020 | 21.438 | 15.875 | 3.5 | 3.3 | 102 000 | 165 000 | 10 400 | 16 800 | 2 000 | 2 800 |
| | 159.987 | 34.925 | 34.925 | 26.988 | 3.5 | 3.3 | 164 000 | 315 000 | 16 700 | 32 000 | 2 000 | 2 800 |
| | 161.925 | 34.925 | 34.925 | 26.988 | 3.5 | 3.3 | 164 000 | 280 000 | 16 800 | 28 600 | 2 000 | 2 800 |
| | 165.100 | 36.512 | 36.512 | 26.988 | 3.5 | 3.3 | 195 000 | 320 000 | 19 800 | 33 000 | 2 000 | 2 600 |
| | 190.500 | 47.625 | 49.212 | 34.925 | 3.5 | 3.3 | 296 000 | 465 000 | 30 000 | 47 000 | 1 800 | 2 400 |
| | 212.725 | 66.675 | 66.675 | 53.975 | 8.0 | 3.3 | 570 000 | 810 000 | 58 000 | 82 500 | 1 700 | 2 200 |
| **109.987** | 159.987 | 34.925 | 34.925 | 26.988 | 3.5 | 3.3 | 164 000 | 315 000 | 16 700 | 32 000 | 2 000 | 2 800 |
| | 159.987 | 34.925 | 34.925 | 26.988 | 8.0 | 3.3 | 164 000 | 315 000 | 16 700 | 32 000 | 2 000 | 2 800 |
| **109.992** | 177.800 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 232 000 | 375 000 | 23 700 | 38 000 | 1 800 | 2 600 |
| **110.000** | 165.000 | 35.000 | 35.000 | 26.500 | 3.0 | 2.5 | 195 000 | 320 000 | 19 800 | 33 000 | 2 000 | 2 600 |
| | 180.000 | 47.000 | 46.000 | 38.000 | 3.0 | 2.5 | 310 000 | 490 000 | 31 500 | 50 000 | 1 900 | 2 600 |
| **111.125** | 190.500 | 47.625 | 49.212 | 34.925 | 3.5 | 3.3 | 296 000 | 465 000 | 30 000 | 47 000 | 1 800 | 2 400 |
| **114.300** | 152.400 | 21.433 | 21.433 | 16.670 | 1.5 | 1.5 | 89 500 | 178 000 | 9 100 | 18 100 | 2 000 | 2 800 |
| | 177.800 | 41.275 | 41.275 | 30.162 | 3.5 | 3.3 | 232 000 | 375 000 | 23 700 | 38 000 | 1 800 | 2 600 |
| | 180.000 | 34.925 | 31.750 | 25.400 | 3.5 | 0.8 | 174 000 | 254 000 | 17 800 | 25 900 | 1 800 | 2 400 |
| | 190.500 | 47.625 | 49.212 | 34.925 | 3.5 | 3.3 | 296 000 | 465 000 | 30 000 | 47 000 | 1 800 | 2 400 |
| | 212.725 | 66.675 | 66.675 | 53.975 | 7.0 | 3.3 | 475 000 | 700 000 | 48 500 | 71 500 | 1 700 | 2 400 |
| | 212.725 | 66.675 | 66.675 | 53.975 | 7.0 | 3.3 | 570 000 | 810 000 | 58 000 | 82 500 | 1 700 | 2 200 |
| **115.087** | 190.500 | 47.625 | 49.212 | 34.925 | 3.5 | 3.3 | 296 000 | 465 000 | 30 000 | 47 000 | 1 800 | 2 400 |
| **117.475** | 180.975 | 34.925 | 31.750 | 25.400 | 3.5 | 3.3 | 174 000 | 254 000 | 17 800 | 25 900 | 1 800 | 2 400 |

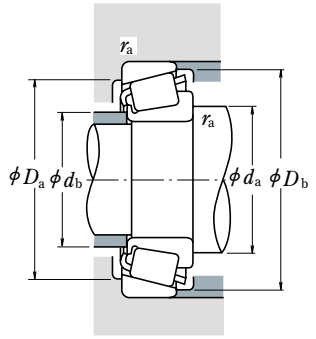
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| **52400** | **52618** | 117 | 111 | 142 | 152 | 3.5 | 3.3 | 36.1 | 0.47 | 1.3 | 0.69 | 1.75 | 0.702 |
| **52400** | **52637** | 117 | 111 | 144 | 154 | 3.5 | 3.3 | 36.1 | 0.47 | 1.3 | 0.69 | 1.75 | 0.942 |
| **687** | **672** | 118 | 112 | 149 | 160 | 3.5 | 3.3 | 38.3 | 0.47 | 1.3 | 0.70 | 2.15 | 1.24 |
| **780** | **772** | 119 | 113 | 161 | 168 | 3.5 | 3.3 | 39.1 | 0.39 | 1.6 | 0.86 | 2.88 | 1.99 |
| **861** | **854** | 129 | 114 | 170 | 174 | 8 | 3.3 | 41.8 | 0.33 | 1.8 | 0.99 | 4.13 | 2.55 |
| **HH 221449** | **HH 221410** | 131 | 116 | 171 | 179 | 8 | 3.3 | 42.3 | 0.33 | 1.8 | 0.99 | 4.55 | 2.24 |
| **HH 224335** | **HH 224310** | 132 | 121 | 192 | 202 | 7 | 3.3 | 47.3 | 0.33 | 1.8 | 1.0 | 8.14 | 3.06 |
| **787** | **772** | 129 | 116 | 161 | 168 | 7 | 3.3 | 39.1 | 0.39 | 1.6 | 0.86 | 2.66 | 1.99 |
| **782** | **772** | 122 | 116 | 161 | 168 | 3.5 | 3.3 | 39.1 | 0.39 | 1.6 | 0.86 | 2.68 | 1.99 |
| **71412** | **71750** | 124 | 118 | 171 | 181 | 3.5 | 3.3 | 40.1 | 0.42 | 1.4 | 0.79 | 4.0 | 1.71 |
| **56418** | **56650** | 122 | 116 | 149 | 159 | 3.5 | 3.3 | 38.6 | 0.50 | 1.2 | 0.66 | 1.87 | 0.861 |
| **37425** | **37625** | 122 | 115 | 143 | 152 | 3.5 | 3.3 | 37.0 | 0.61 | 0.99 | 0.54 | 0.886 | 0.488 |
| **LM 522546** | **LM 522510** | 122 | 116 | 146 | 154 | 3.5 | 3.3 | 33.7 | 0.40 | 1.5 | 0.82 | 1.65 | 0.784 |
| **48190** | **48120** | 122 | 116 | 146 | 156 | 3.5 | 3.3 | 38.7 | 0.51 | 1.2 | 0.65 | 1.59 | 0.83 |
| **56425** | **56650** | 123 | 117 | 149 | 159 | 3.5 | 3.3 | 38.6 | 0.50 | 1.2 | 0.66 | 1.8 | 0.861 |
| **71425** | **71750** | 126 | 120 | 171 | 181 | 3.5 | 3.3 | 40.1 | 0.42 | 1.4 | 0.79 | 3.79 | 1.71 |
| **HH 224340** | **HH 224310** | 139 | 126 | 192 | 202 | 8 | 3.3 | 47.3 | 0.33 | 1.8 | 1.0 | 7.58 | 3.06 |
| **LM 522549** | **LM 522510** | 124 | 118 | 146 | 154 | 3.5 | 3.3 | 33.7 | 0.40 | 1.5 | 0.82 | 1.55 | 0.784 |
| **LM 522548** | **LM 522510** | 133 | 118 | 146 | 154 | 8 | 3.3 | 33.7 | 0.40 | 1.5 | 0.82 | 1.53 | 0.784 |
| **64433** | **64700** | 128 | 121 | 160 | 172 | 3.5 | 3.3 | 42.4 | 0.52 | 1.2 | 0.64 | 2.64 | 1.11 |
| ▲ **JM 822049** | ▲ **JM 822010** | 124 | 119 | 149 | 159 | 3 | 2.5 | 38.3 | 0.50 | 1.2 | 0.66 | 1.64 | 0.842 |
| ▲ **JHM 522649** | ▲ **JHM 522610** | 127 | 122 | 162 | 172 | 3 | 2.5 | 40.9 | 0.41 | 1.5 | 0.81 | 3.12 | 1.51 |
| **71437** | **71750** | 129 | 123 | 171 | 181 | 3.5 | 3.3 | 40.1 | 0.42 | 1.4 | 0.79 | 3.58 | 1.71 |
| **L 623149** | **L 623110** | 123 | 121 | 143 | 148 | 1.5 | 1.5 | 27.4 | 0.41 | 1.5 | 0.80 | 0.725 | 0.344 |
| **64450** | **64700** | 131 | 125 | 160 | 172 | 3.5 | 3.3 | 42.4 | 0.52 | 1.2 | 0.64 | 2.39 | 1.11 |
| **68450** | ** **68709** | 130 | 123 | 165 | 172 | 3.5 | 0.8 | 40.0 | 0.50 | 1.2 | 0.66 | 1.95 | 1.0 |
| **71450** | **71750** | 132 | 125 | 171 | 181 | 3.5 | 3.3 | 40.1 | 0.42 | 1.4 | 0.79 | 3.37 | 1.71 |
| **938** | **932** | 141 | 128 | 187 | 193 | 7 | 3.3 | 46.9 | 0.33 | 1.8 | 1.0 | 6.01 | 4.11 |
| **HH 224346** | **HH 224310** | 143 | 131 | 192 | 202 | 7 | 3.3 | 47.3 | 0.33 | 1.8 | 1.0 | 7.01 | 3.06 |
| **71453** | **71750** | 133 | 126 | 171 | 181 | 3.5 | 3.3 | 40.1 | 0.42 | 1.4 | 0.79 | 3.31 | 1.71 |
| **68462** | **68712** | 132 | 125 | 163 | 172 | 3.5 | 3.3 | 40.0 | 0.50 | 1.2 | 0.66 | 1.73 | 1.05 |

**Notes** ** The maximum outside diameter is listed and its tolerance is negative (See Table **8.4.2** on Pages **A68** and **A69**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

**Bore Diameter 120.000 – 165.100 mm**




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

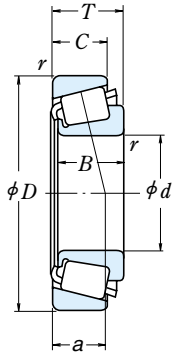
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | (kgf) | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **120.000** | 170.000 | 25.400 | 25.400 | 19.050 | 3.3 | 3.3 | 130 000 | 219 000 | 13 200 | 22 300 | 1 900 | 2 600 |
| | 174.625 | 35.720 | 36.512 | 27.783 | 3.5 | 1.5 | 212 000 | 385 000 | 21 600 | 39 000 | 1 900 | 2 600 |
| **120.650** | 182.562 | 39.688 | 38.100 | 33.338 | 3.5 | 3.3 | 228 000 | 445 000 | 23 200 | 45 000 | 1 800 | 2 400 |
| | 206.375 | 47.625 | 47.625 | 34.925 | 3.3 | 3.3 | 320 000 | 530 000 | 32 500 | 54 000 | 1 600 | 2 200 |
| **123.825** | 182.562 | 39.688 | 38.100 | 33.338 | 3.5 | 3.3 | 228 000 | 445 000 | 23 200 | 45 000 | 1 800 | 2 400 |
| **125.000** | 175.000 | 25.400 | 25.400 | 18.288 | 3.3 | 3.3 | 134 000 | 232 000 | 13 700 | 23 600 | 1 800 | 2 400 |
| **127.000** | 165.895 | 18.258 | 17.462 | 13.495 | 1.5 | 1.5 | 84 500 | 149 000 | 8 650 | 15 200 | 1 900 | 2 600 |
| | 182.562 | 39.688 | 38.100 | 33.338 | 3.5 | 3.3 | 228 000 | 445 000 | 23 200 | 45 000 | 1 800 | 2 400 |
| | 196.850 | 46.038 | 46.038 | 38.100 | 3.5 | 3.3 | 315 000 | 560 000 | 32 000 | 57 500 | 1 700 | 2 200 |
| | 215.900 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 287 000 | 495 000 | 29 300 | 50 000 | 1 500 | 2 000 |
| **128.588** | 206.375 | 47.625 | 47.625 | 34.925 | 3.3 | 3.3 | 320 000 | 530 000 | 32 500 | 54 000 | 1 600 | 2 200 |
| **130.000** | 206.375 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 320 000 | 530 000 | 32 500 | 54 000 | 1 600 | 2 200 |
| **130.175** | 203.200 | 46.038 | 46.038 | 38.100 | 3.5 | 3.3 | 315 000 | 560 000 | 32 000 | 57 500 | 1 700 | 2 200 |
| | 206.375 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 320 000 | 530 000 | 32 500 | 54 000 | 1 600 | 2 200 |
| **133.350** | 177.008 | 25.400 | 26.195 | 20.638 | 1.5 | 1.5 | 124 000 | 258 000 | 12 700 | 26 300 | 1 800 | 2 400 |
| | 190.500 | 39.688 | 39.688 | 33.338 | 3.5 | 3.3 | 240 000 | 485 000 | 24 500 | 49 500 | 1 700 | 2 200 |
| | 196.850 | 46.038 | 46.038 | 38.100 | 3.5 | 3.3 | 315 000 | 560 000 | 32 000 | 57 500 | 1 700 | 2 200 |
| | 215.900 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 287 000 | 495 000 | 29 300 | 50 000 | 1 500 | 2 000 |
| **136.525** | 190.500 | 39.688 | 39.688 | 33.338 | 3.5 | 3.3 | 240 000 | 485 000 | 24 500 | 49 500 | 1 700 | 2 200 |
| | 217.488 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 287 000 | 495 000 | 29 300 | 50 000 | 1 500 | 2 000 |
| **139.700** | 187.325 | 28.575 | 29.370 | 23.020 | 1.5 | 1.5 | 153 000 | 305 000 | 15 600 | 31 500 | 1 700 | 2 200 |
| | 215.900 | 47.625 | 47.625 | 34.925 | 3.5 | 3.3 | 287 000 | 495 000 | 29 300 | 50 000 | 1 500 | 2 000 |
| | 254.000 | 66.675 | 66.675 | 47.625 | 7.0 | 3.3 | 515 000 | 830 000 | 52 500 | 84 500 | 1 300 | 1 800 |
| **142.875** | 200.025 | 41.275 | 39.688 | 34.130 | 3.5 | 3.3 | 227 000 | 460 000 | 23 100 | 46 500 | 1 600 | 2 200 |
| **146.050** | 193.675 | 28.575 | 28.575 | 23.020 | 1.5 | 1.5 | 170 000 | 355 000 | 17 300 | 36 500 | 1 600 | 2 200 |
| | 236.538 | 57.150 | 56.642 | 44.450 | 3.5 | 3.3 | 455 000 | 720 000 | 46 000 | 73 500 | 1 400 | 1 900 |
| | 254.000 | 66.675 | 66.675 | 47.625 | 7.0 | 3.3 | 515 000 | 830 000 | 52 500 | 84 500 | 1 300 | 1 800 |
| **149.225** | 254.000 | 66.675 | 66.675 | 47.625 | 7.0 | 3.3 | 515 000 | 830 000 | 52 500 | 84 500 | 1 300 | 1 800 |
| **152.400** | 254.000 | 66.675 | 66.675 | 47.625 | 7.0 | 3.3 | 515 000 | 830 000 | 52 500 | 84 500 | 1 300 | 1 800 |
| **158.750** | 225.425 | 41.275 | 39.688 | 33.338 | 3.5 | 3.3 | 240 000 | 540 000 | 24 400 | 55 000 | 1 400 | 1 900 |
| **165.100** | 247.650 | 47.625 | 47.625 | 38.100 | 3.5 | 3.3 | 345 000 | 705 000 | 35 500 | 71 500 | 1 300 | 1 700 |

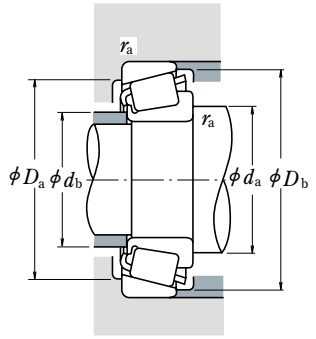
| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ▲ **JL 724348** | ▲ **JL 724314** | 132 | 127 | 156 | 163 | 3.3 | 3.3 | 32.9 | 0.46 | 1.3 | 0.72 | 1.08 | 0.591 |
| ✻ **M 224748** | **M 224710** | 135 | 129 | 163 | 168 | 3.5 | 1.5 | 32.2 | 0.33 | 1.8 | 0.99 | 1.9 | 0.866 |
| **48282** | **48220** | 136 | 133 | 168 | 176 | 3.5 | 3.3 | 34.2 | 0.31 | 2.0 | 1.1 | 2.56 | 1.14 |
| **795** | **792** | 139 | 134 | 186 | 198 | 3.3 | 3.3 | 45.7 | 0.46 | 1.3 | 0.72 | 4.44 | 1.9 |
| **48286** | **48220** | 139 | 133 | 168 | 176 | 3.5 | 3.3 | 34.2 | 0.31 | 2.0 | 1.1 | 2.37 | 1.14 |
| ▲ **JL 725346** | ▲ **JL 725316** | 138 | 133 | 161 | 168 | 3.3 | 3.3 | 34.3 | 0.48 | 1.3 | 0.69 | 1.19 | 0.573 |
| **LL 225749** | **LL 225710** | 135 | 132 | 158 | 160 | 1.5 | 1.5 | 24.2 | 0.33 | 1.8 | 0.99 | 0.647 | 0.288 |
| **48290** | **48220** | 141 | 135 | 168 | 176 | 3.5 | 3.3 | 34.2 | 0.31 | 2.0 | 1.1 | 2.19 | 1.14 |
| **67388** | **67322** | 144 | 138 | 180 | 189 | 3.5 | 3.3 | 39.7 | 0.34 | 1.7 | 0.96 | 3.74 | 1.46 |
| **74500** | **74850** | 148 | 141 | 196 | 208 | 3.5 | 3.3 | 48.4 | 0.49 | 1.2 | 0.68 | 4.92 | 1.99 |
| **799** | **792** | 146 | 140 | 186 | 198 | 3.3 | 3.3 | 45.7 | 0.46 | 1.3 | 0.72 | 3.86 | 1.9 |
| **797** | **792** | 148 | 141 | 186 | 198 | 3.5 | 3.3 | 45.7 | 0.46 | 1.3 | 0.72 | 3.76 | 1.9 |
| **67389** | **67320** | 146 | 141 | 183 | 191 | 3.5 | 3.3 | 39.7 | 0.34 | 1.7 | 0.96 | 3.51 | 2.06 |
| **799 A** | **792** | 148 | 142 | 186 | 198 | 3.5 | 3.3 | 45.7 | 0.46 | 1.3 | 0.72 | 3.74 | 1.9 |
| **L 327249** | **L 327210** | 143 | 141 | 167 | 171 | 1.5 | 1.5 | 29.5 | 0.35 | 1.7 | 0.95 | 1.18 | 0.55 |
| **48385** | **48320** | 148 | 142 | 177 | 184 | 3.5 | 3.3 | 35.9 | 0.32 | 1.9 | 1.0 | 2.58 | 1.16 |
| **67390** | **67322** | 149 | 143 | 180 | 189 | 3.5 | 3.3 | 39.7 | 0.34 | 1.7 | 0.96 | 3.27 | 1.46 |
| **74525** | **74850** | 152 | 146 | 196 | 208 | 3.5 | 3.3 | 48.4 | 0.49 | 1.2 | 0.68 | 4.44 | 1.99 |
| **48393** | **48320** | 151 | 144 | 177 | 184 | 3.5 | 3.3 | 35.9 | 0.32 | 1.9 | 1.0 | 2.37 | 1.16 |
| **74537** | **74856** | 155 | 148 | 197 | 210 | 3.5 | 3.3 | 48.4 | 0.49 | 1.2 | 0.68 | 4.19 | 2.13 |
| **LM 328448** | **LM 328410** | 149 | 147 | 176 | 182 | 1.5 | 1.5 | 31.7 | 0.36 | 1.7 | 0.93 | 1.59 | 0.67 |
| **74550** | **74850** | 158 | 151 | 196 | 208 | 3.5 | 3.3 | 48.4 | 0.49 | 1.2 | 0.68 | 3.93 | 1.99 |
| **99550** | **99100** | 170 | 156 | 227 | 238 | 7 | 3.3 | 55.3 | 0.41 | 1.5 | 0.81 | 9.99 | 3.83 |
| **48685** | **48620** | 158 | 151 | 185 | 193 | 3.5 | 3.3 | 37.6 | 0.34 | 1.8 | 0.98 | 2.63 | 1.19 |
| **36690** | **36620** | 155 | 154 | 182 | 188 | 1.5 | 1.5 | 33.5 | 0.37 | 1.6 | 0.90 | 1.64 | 0.725 |
| **HM 231140** | **HM 231110** | 164 | 160 | 217 | 224 | 3.5 | 3.3 | 45.9 | 0.32 | 1.9 | 1.0 | 6.07 | 2.93 |
| **99575** | **99100** | 175 | 162 | 227 | 238 | 7 | 3.3 | 55.3 | 0.41 | 1.5 | 0.81 | 9.24 | 3.83 |
| **99587** | **99100** | 178 | 165 | 227 | 238 | 7 | 3.3 | 55.3 | 0.41 | 1.5 | 0.81 | 8.86 | 3.83 |
| **99600** | **99100** | 181 | 167 | 227 | 238 | 7 | 3.3 | 55.3 | 0.41 | 1.5 | 0.81 | 8.46 | 3.83 |
| **46780** | **46720** | 176 | 169 | 209 | 218 | 3.5 | 3.3 | 44.3 | 0.38 | 1.6 | 0.86 | 3.69 | 1.66 |
| **67780** | **67720** | 185 | 179 | 229 | 240 | 3.5 | 3.3 | 52.4 | 0.44 | 1.4 | 0.75 | 5.83 | 2.33 |

**Notes** ✻ The maximum bore diameter is listed and its tolerance is negative (See Table **8.4.1** on Page **A68**).

▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 170.000 – 206.375 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | 0 | 0.4 | $Y_1$ |

**Static Equivalent Load**

$P_0 = 0.5F_r + Y_0F_a$

When $F_r > 0.5F_r + Y_0F_a$, use $P_0 = F_r$

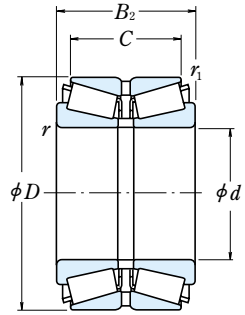
The values of $e$, $Y_1$, and $Y_0$ are given in the table below.

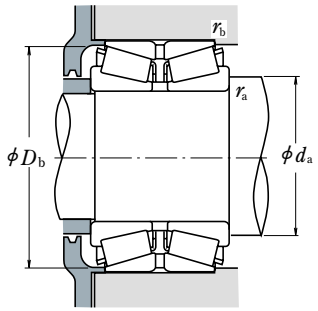
| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $B$ | $C$ | Cone $r$ min. | Cup $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **170.000** | 230.000 | 39.000 | 38.000 | 31.000 | 3.0 | 2.5 | 278 000 | 520 000 | 28 300 | 53 000 | 1 300 | 1 800 |
| | 240.000 | 46.000 | 44.500 | 37.000 | 3.0 | 2.5 | 380 000 | 720 000 | 39 000 | 73 000 | 1 300 | 1 800 |
| **174.625** | 247.650 | 47.625 | 47.625 | 38.100 | 3.5 | 3.3 | 345 000 | 705 000 | 35 500 | 71 500 | 1 300 | 1 700 |
| **177.800** | 227.012 | 30.162 | 30.162 | 23.020 | 1.5 | 1.5 | 181 000 | 415 000 | 18 500 | 42 000 | 1 300 | 1 800 |
| | 247.650 | 47.625 | 47.625 | 38.100 | 3.5 | 3.3 | 345 000 | 705 000 | 35 500 | 71 500 | 1 300 | 1 700 |
| | 260.350 | 53.975 | 53.975 | 41.275 | 3.5 | 3.3 | 455 000 | 835 000 | 46 500 | 85 000 | 1 200 | 1 700 |
| **190.000** | 260.000 | 46.000 | 44.000 | 36.500 | 3.0 | 2.5 | 370 000 | 730 000 | 38 000 | 74 500 | 1 100 | 1 600 |
| **190.500** | 266.700 | 47.625 | 46.833 | 38.100 | 3.5 | 3.3 | 345 000 | 720 000 | 35 000 | 73 000 | 1 100 | 1 500 |
| **200.000** | 300.000 | 65.000 | 62.000 | 51.000 | 3.5 | 2.5 | 615 000 | 1 130 000 | 62 500 | 116 000 | 1 000 | 1 400 |
| **203.200** | 282.575 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 365 000 | 800 000 | 37 500 | 81 500 | 1 000 | 1 400 |
| **206.375** | 282.575 | 46.038 | 46.038 | 36.512 | 3.5 | 3.3 | 365 000 | 800 000 | 37 500 | 81 500 | 1 000 | 1 400 |

| Bearing Numbers | | Abutment and Fillet Dimensions (mm) | | | | | | Eff. Load Centers (mm) | Constant | Axial Load Factors | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONE | CUP | $d_a$ | $d_b$ | $D_a$ | $D_b$ | Cone $r_a$ max. | Cup $r_a$ max. | $a$ | $e$ | $Y_1$ | $Y_0$ | approx. CONE | approx. CUP |
| ▲ **JHM 534149** | ▲ **JHM 534110** | 184 | 178 | 217 | 224 | 3 | 2.5 | 43.2 | 0.38 | 1.6 | 0.86 | 3.1 | 1.3 |
| ▲ **JM 734449** | ▲ **JM 734410** | 185 | 180 | 222 | 232 | 3 | 2.5 | 50.5 | 0.44 | 1.4 | 0.75 | 4.42 | 2.02 |
| **67787** | **67720** | 192 | 185 | 229 | 240 | 3.5 | 3.3 | 52.4 | 0.44 | 1.4 | 0.75 | 4.88 | 2.33 |
| **36990** | **36920** | 189 | 186 | 214 | 221 | 1.5 | 1.5 | 42.9 | 0.44 | 1.4 | 0.75 | 2.1 | 0.907 |
| **67790** | **67720** | 194 | 188 | 229 | 240 | 3.5 | 3.3 | 52.4 | 0.44 | 1.4 | 0.75 | 4.56 | 2.33 |
| **M 236849** | **M 236810** | 195 | 192 | 241 | 249 | 3.5 | 3.3 | 47.5 | 0.33 | 1.8 | 0.99 | 6.49 | 2.86 |
| ▲ **JM 738249** | ▲ **JM 738210** | 206 | 200 | 242 | 252 | 3 | 2.5 | 56.4 | 0.48 | 1.3 | 0.69 | 4.73 | 2.2 |
| **67885** | **67820** | 209 | 203 | 246 | 259 | 3.5 | 3.3 | 57.9 | 0.48 | 1.3 | 0.69 | 5.4 | 2.64 |
| ▲ **JHM 840449** | ▲ **JHM 840410** | 223 | 215 | 273 | 289 | 3.5 | 2.5 | 73.1 | 0.52 | 1.2 | 0.63 | 10.3 | 5.19 |
| **67983** | **67920** | 222 | 216 | 260 | 275 | 3.5 | 3.3 | 61.9 | 0.51 | 1.2 | 0.65 | 6.03 | 2.82 |
| **67985** | **67920** | 224 | 219 | 260 | 275 | 3.5 | 3.3 | 61.9 | 0.51 | 1.2 | 0.65 | 5.66 | 2.82 |

**Note** ▲ The tolerances are listed in Tables **2**, **3** and **4** on Pages **B113** and **B114**.

## Bore Diameter 40 – 90 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

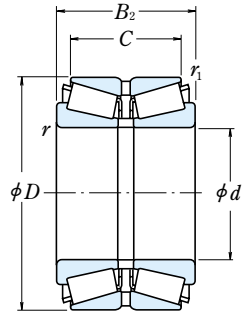
$P_0 = F_r + Y_0 F_a$

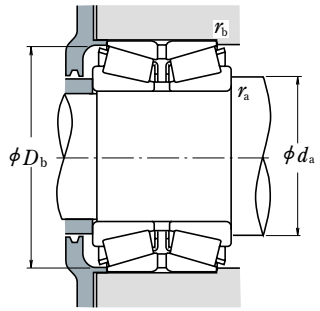
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Bearing Numbers | Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $d$ | $D$ | $B_2$ | $C$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | Grease | Oil | $d_a$ min. | $D_b$ min. | $r_a$ max. | $r_b$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **HR 40 KBE 42+L** | **40** | 80 | 45 | 37.5 | 1.5 | 0.6 | 109 000 | 140 000 | 3 700 | 5 100 | 51 | 75 | 1.5 | 0.6 | 0.37 | 2.7 | 1.8 | 1.8 | 0.97 |
| **HR 45 KBE 42+L** | **45** | 85 | 47 | 37.5 | 1.5 | 0.6 | 117 000 | 159 000 | 3 400 | 4 700 | 56 | 81 | 1.5 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 1.08 |
| **HR 45 KBE 52X+L** | | 85 | 55 | 43.5 | 1.5 | 0.6 | 143 000 | 204 000 | 3 400 | 4 700 | 56 | 81 | 1.5 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 1.31 |
| **HR 50 KBE 042+L** | **50** | 90 | 48 | 38.5 | 1.5 | 0.6 | 131 000 | 183 000 | 3 200 | 4 400 | 61 | 87 | 1.5 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 1.20 |
| **HR 50 KBE 42+L** | | 90 | 49 | 39.5 | 1.5 | 0.6 | 131 000 | 183 000 | 3 200 | 4 400 | 61 | 87 | 1.5 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 1.22 |
| **HR 50 KBE 52X+L** | | 90 | 55 | 43.5 | 1.5 | 0.6 | 150 000 | 218 000 | 3 200 | 4 400 | 61 | 87 | 1.5 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 1.39 |
| **HR 50 KBE 043+L** | | 110 | 64 | 51.5 | 2.5 | 0.6 | 224 000 | 297 000 | 2 700 | 3 700 | 65 | 104 | 2 | 0.6 | 0.35 | 2.9 | 2.0 | 1.9 | 2.77 |
| **HR 55 KBE 042+L** | **55** | 100 | 51 | 41.5 | 2 | 0.6 | 162 000 | 226 000 | 2 900 | 3 900 | 67 | 96 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 1.59 |
| **HR 55 KBE 1003+L** | | 100 | 52 | 42.5 | 2 | 0.6 | 162 000 | 226 000 | 2 900 | 3 900 | 67 | 96 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 1.63 |
| **HR 55 KBE 52X+L** | | 100 | 60 | 48.5 | 2 | 0.6 | 188 000 | 274 000 | 2 900 | 3 900 | 67 | 97 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 1.88 |
| **HR 55 KBE 43+L** | | 120 | 70 | 57 | 2.5 | 0.6 | 256 000 | 342 000 | 2 500 | 3 400 | 70 | 113 | 2 | 0.6 | 0.35 | 2.9 | 2.0 | 1.9 | 3.52 |
| **HR 60 KBE 042+L** | **60** | 110 | 53 | 43.5 | 2 | 0.6 | 178 000 | 246 000 | 2 700 | 3 600 | 72 | 105 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 2.03 |
| **HR 60 KBE 52X+L** | | 110 | 66 | 54.5 | 2 | 0.6 | 225 000 | 335 000 | 2 700 | 3 600 | 72 | 106 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 2.52 |
| **HR 60 KBE 43+L** | | 130 | 74 | 59 | 3 | 1 | 298 000 | 405 000 | 2 300 | 3 200 | 78 | 122 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 4.40 |
| **HR 65 KBE 42+L** | **65** | 120 | 56 | 46.5 | 2 | 0.6 | 210 000 | 300 000 | 2 400 | 3 200 | 77 | 115 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 2.58 |
| **HR 65 KBE 1202+L** | | 120 | 57 | 47.5 | 2 | 0.6 | 210 000 | 300 000 | 2 400 | 3 200 | 77 | 115 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 2.61 |
| **HR 65 KBE 52X+L** | | 120 | 73 | 61.5 | 2 | 0.6 | 269 000 | 405 000 | 2 400 | 3 300 | 77 | 117 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 3.35 |
| **HR 65 KBE 43+L** | | 140 | 79 | 63 | 3 | 1 | 340 000 | 465 000 | 2 100 | 2 900 | 83 | 132 | 2.5 | 1 | 0.55 | 2.9 | 2.0 | 1.9 | 5.42 |
| **HR 70 KBE 042+L** | **70** | 125 | 57 | 46.5 | 2 | 0.6 | 227 000 | 325 000 | 2 300 | 3 100 | 82 | 120 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 2.79 |
| **HR 70 KBE 42+L** | | 125 | 59 | 48.5 | 2 | 0.6 | 227 000 | 325 000 | 2 300 | 3 100 | 82 | 120 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 2.85 |
| **HR 70 KBE 52X+L** | | 125 | 74 | 61.5 | 2 | 0.6 | 270 000 | 410 000 | 2 300 | 3 100 | 82 | 121 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 3.58 |
| **HR 70 KBE 43+L** | | 150 | 83 | 67 | 3 | 1 | 390 000 | 535 000 | 2 000 | 2 700 | 88 | 142 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 6.45 |
| **HR 75 KBE 42+L** | **75** | 130 | 62 | 51.5 | 2 | 0.6 | 245 000 | 365 000 | 2 200 | 3 000 | 87 | 126 | 2 | 0.6 | 0.44 | 2.3 | 1.6 | 1.5 | 3.15 |
| **HR 75 KBE 52X+L** | | 130 | 74 | 61.5 | 2 | 0.6 | 283 000 | 440 000 | 2 200 | 3 000 | 87 | 127 | 2 | 0.6 | 0.44 | 2.3 | 1.6 | 1.5 | 3.73 |
| **HR 75 KBE 043+L** | | 160 | 87 | 69 | 3 | 1 | 435 000 | 600 000 | 1 900 | 2 500 | 93 | 151 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 7.66 |
| **HR 80 KBE 042+L** | **80** | 140 | 61 | 49 | 2.5 | 0.6 | 269 000 | 390 000 | 2 000 | 2 800 | 95 | 134 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 3.70 |
| **HR 80 KBE 42+L** | | 140 | 64 | 51.5 | 2.5 | 0.6 | 269 000 | 390 000 | 2 000 | 2 800 | 95 | 134 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 3.70 |
| **HR 80 KBE 52X+L** | | 140 | 78 | 63.5 | 2.5 | 0.6 | 330 000 | 505 000 | 2 000 | 2 800 | 95 | 136 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 4.59 |
| **HR 80 KBE 043+L** | | 170 | 92 | 73 | 3 | 1 | 475 000 | 655 000 | 1 700 | 2 400 | 98 | 161 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 9.02 |
| **HR 85 KBE 42+L** | **85** | 150 | 70 | 57 | 2.5 | 0.6 | 315 000 | 465 000 | 1 900 | 2 600 | 100 | 143 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 4.69 |
| **HR 85 KBE 52X+L** | | 150 | 86 | 69 | 2.5 | 0.6 | 360 000 | 555 000 | 1 900 | 2 600 | 100 | 144 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 5.70 |
| **HR 85 KBE 043+L** | | 180 | 98 | 77 | 4 | 1 | 530 000 | 745 000 | 1 600 | 2 200 | 106 | 169 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 10.8 |
| **HR 90 KBE 042+L** | **90** | 160 | 71 | 58 | 2.5 | 0.6 | 345 000 | 510 000 | 1 800 | 2 400 | 105 | 152 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 5.53 |
| **HR 90 KBE 42+L** | | 160 | 74 | 61 | 2.5 | 0.6 | 345 000 | 510 000 | 1 800 | 2 400 | 105 | 152 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 5.71 |
| **HR 90 KBE 52X+L** | | 160 | 94 | 77 | 2.5 | 0.6 | 440 000 | 700 000 | 1 800 | 2 400 | 105 | 154 | 2 | 0.6 | 0.42 | 2.4 | 1.6 | 1.6 | 7.26 |

**Remarks** For other double-row tapered roller bearings not listed above, please contact NSK.

## Bore Diameter 90 – 120 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

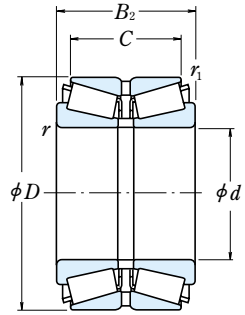
$P_0 = F_r + Y_0 F_a$

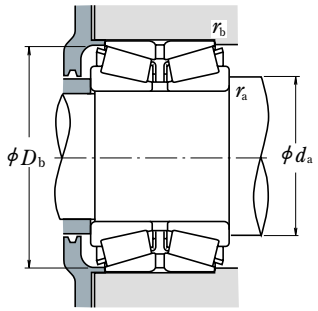
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Bearing Numbers | Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $d$ | $D$ | $B_2$ | $C$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | Grease | Oil | $d_a$ min. | $D_b$ min. | $r_a$ max. | $r_b$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **HR 90 KBE 043+L** | **90** | 190 | 102 | 81 | 4 | 1 | 595 000 | 845 000 | 1 600 | 2 100 | 111 | 178 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 12.7 |
| **HR 90 KBE 1901+L** | | 190 | 144 | 115 | 4 | 1 | 770 000 | 1 180 000 | 1 600 | 2 200 | 111 | 179 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 17.9 |
| **HR 95 KBE 42+L** | **95** | 170 | 78 | 63 | 3 | 1 | 385 000 | 570 000 | 1 700 | 2 300 | 113 | 161 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 6.75 |
| **HR 95 KBE 52+L** | | 170 | 100 | 83 | 3 | 1 | 495 000 | 800 000 | 1 700 | 2 300 | 113 | 163 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 8.60 |
| **HR 95 KBE 43+L** | | 200 | 108 | 85 | 4 | 1 | 640 000 | 910 000 | 1 500 | 2 000 | 116 | 187 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 14.7 |
| **100 KBE 31+L** | **100** | 165 | 52 | 46 | 2.5 | 0.6 | 222 000 | 340 000 | 1 700 | 2 300 | 115 | 156 | 2 | 0.6 | 0.33 | 3.0 | 2.0 | 2.0 | 4.04 |
| **HR100 KBE 1805+L** | | 180 | 81 | 64 | 3 | 1 | 435 000 | 665 000 | 1 600 | 2 200 | 118 | 170 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 8.16 |
| **HR100 KBE 042+L** | | 180 | 81 | 65 | 3 | 1 | 435 000 | 665 000 | 1 600 | 2 200 | 118 | 170 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 8.13 |
| **HR100 KBE 1801+L** | | 180 | 82 | 66 | 3 | 1 | 435 000 | 665 000 | 1 600 | 2 200 | 118 | 170 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 8.22 |
| **HR100 KBE 42+L** | | 180 | 83 | 67 | 3 | 1 | 435 000 | 665 000 | 1 600 | 2 200 | 118 | 170 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 8.7 |
| **HR100 KBE 1802+L** | | 180 | 105 | 85 | 3 | 1 | 555 000 | 905 000 | 1 600 | 2 200 | 118 | 173 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 10.6 |
| **HR100 KBE 52X+L** | | 180 | 107 | 87 | 3 | 1 | 555 000 | 905 000 | 1 600 | 2 200 | 118 | 173 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 10.7 |
| **HR100 KBE 1804+L** | | 180 | 110 | 90 | 3 | 1 | 555 000 | 905 000 | 1 600 | 2 200 | 118 | 173 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 11 |
| HR100 KBE 043+L | | 215 | 112 | 87 | 4 | 1 | 725 000 | 1 050 000 | 1 400 | 1 900 | 121 | 200 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 18.1 |
| **HR105 KBE 42X+L** | **105** | 190 | 88 | 70 | 3 | 1 | 480 000 | 735 000 | 1 500 | 2 000 | 123 | 179 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 9.76 |
| **HR105 KBE 1902+L** | | 190 | 117 | 96 | 3 | 1 | 620 000 | 1 020 000 | 1 500 | 2 000 | 123 | 182 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 13.4 |
| **HR105 KBE 52+L** | | 190 | 115 | 95 | 3 | 1 | 620 000 | 1 020 000 | 1 500 | 2 000 | 123 | 182 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 13.1 |
| HR105 KBE 043+L | | 225 | 116 | 91 | 4 | 1 | 780 000 | 1 130 000 | 1 300 | 1 800 | 126 | 209 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 20.4 |
| **110 KBE 31+L** | **110** | 180 | 56 | 50 | 2.5 | 0.6 | 264 000 | 400 000 | 1 500 | 2 000 | 125 | 172 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 5.11 |
| **110 KBE 031+L** | | 180 | 70 | 56 | 2.5 | 0.6 | 340 000 | 555 000 | 1 500 | 2 000 | 125 | 172 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 6.33 |
| **110 KBE 1802+L** | | 180 | 125 | 100 | 2.5 | 0.6 | 550 000 | 1 060 000 | 1 500 | 2 100 | 125 | 172 | 2 | 0.6 | 0.26 | 3.8 | 2.6 | 2.5 | 11.4 |
| **HR110 KBE 42+L** | | 200 | 90 | 72 | 3 | 1 | 540 000 | 840 000 | 1 400 | 1 900 | 128 | 190 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 11.2 |
| **HR110 KBE 42X+L** | | 200 | 92 | 74 | 3 | 1 | 540 000 | 840 000 | 1 400 | 1 900 | 128 | 190 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 11.5 |
| **HR110 KBE 2001+L** | | 200 | 120 | 100 | 3 | 1 | 685 000 | 1 130 000 | 1 400 | 1 900 | 128 | 193 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 15.4 |
| **HR110 KBE 52X+L** | | 200 | 121 | 101 | 3 | 1 | 685 000 | 1 130 000 | 1 400 | 1 900 | 128 | 193 | 2.5 | 1 | 0.42 | 2.4 | 1.6 | 1.6 | 15.2 |
| HR110 KBE 043+L | | 240 | 118 | 93 | 4 | 1.5 | 830 000 | 1 190 000 | 1 200 | 1 700 | 131 | 223 | 3 | 1.5 | 0.35 | 2.9 | 2.0 | 1.9 | 23.6 |
| **120 KBE 30+L** | **120** | 180 | 46 | 41 | 2.5 | 0.6 | 184 000 | 296 000 | 1 500 | 2 000 | 135 | 172 | 2 | 0.6 | 0.40 | 2.5 | 1.7 | 1.6 | 3.75 |
| **120 KBE 030+L** | | 180 | 58 | 46 | 2.5 | 0.6 | 260 000 | 450 000 | 1 500 | 2 000 | 135 | 172 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 4.64 |
| **120 KBE 31+L** | | 200 | 62 | 55 | 2.5 | 0.6 | 310 000 | 500 000 | 1 400 | 1 800 | 135 | 190 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 7.35 |
| **120 KBE 031+L** | | 200 | 78 | 62 | 2.5 | 0.6 | 415 000 | 690 000 | 1 400 | 1 900 | 135 | 190 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 8.97 |
| **120 KBE 2001+L** | | 200 | 100 | 84 | 2.5 | 0.6 | 515 000 | 885 000 | 1 400 | 1 800 | 135 | 193 | 2 | 0.6 | 0.37 | 2.7 | 1.8 | 1.8 | 11.3 |
| **HR120 KBE 42X+L** | | 215 | 97 | 78 | 3 | 1 | 575 000 | 900 000 | 1 300 | 1 800 | 138 | 204 | 2.5 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 13.7 |
| **HR120 KBE 52X+L** | | 215 | 132 | 109 | 3 | 1 | 750 000 | 1 270 000 | 1 300 | 1 800 | 138 | 207 | 2.5 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 18.8 |
| **HR120 KBE 43+L** | | 260 | 128 | 101 | 4 | 1 | 915 000 | 1 310 000 | 1 100 | 1 500 | 141 | 240 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 29.4 |
| **HR120 KBE 2601+L** | | 260 | 188 | 145 | 4 | 1 | 1 320 000 | 2 110 000 | 1 100 | 1 500 | 141 | 242 | 3 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 44.6 |

**Remarks** For other double-row tapered roller bearings not listed above, please contact NSK.

## Bore Diameter 125 – 150 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

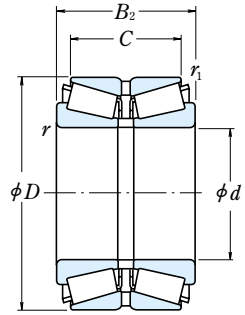
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

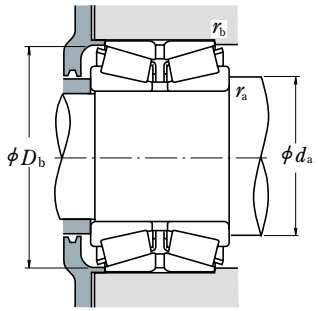
| Bearing Numbers | Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|
| | $d$ | $D$ | $B_2$ | $C$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | Grease | Oil |
| **125 KBE 2101+L** | **125** | 210 | 110 | 88 | 4 | 1 | 560 000 | 1 030 000 | 1 300 | 1 800 |
| **HR130 KBE 42+L** | **130** | 230 | 98 | 78.5 | 4 | 1 | 640 000 | 1 010 000 | 1 200 | 1 600 |
| **HR130 KBE 2301+L** | | 230 | 100 | 80.5 | 4 | 1 | 640 000 | 1 010 000 | 1 200 | 1 600 |
| **130 KBE 43+L** | | 280 | 137 | 107.5 | 5 | 1.5 | 940 000 | 1 350 000 | 1 000 | 1 400 |
| **HR130 KBE 2302+L** | | 230 | 145 | 115 | 4 | 1 | 905 000 | 1 580 000 | 1 200 | 1 700 |
| **HR130 KBE 52+L** | | 230 | 145 | 117.5 | 4 | 1 | 905 000 | 1 580 000 | 1 200 | 1 700 |
| **HR130 KBE 2303+L** | | 230 | 150 | 120 | 4 | 1 | 905 000 | 1 580 000 | 1 200 | 1 700 |
| **140 KBE 30+L** | **140** | 210 | 53 | 47 | 2.5 | 0.6 | 280 000 | 495 000 | 1 200 | 1 700 |
| **140 KBE 030+L** | | 210 | 66 | 53 | 2.5 | 1 | 305 000 | 530 000 | 1 200 | 1 700 |
| **140 KBE 2101+L** | | 210 | 106 | 94 | 2.5 | 0.6 | 555 000 | 1 200 000 | 1 300 | 1 700 |
| **140 KBE 31+L** | | 225 | 68 | 61 | 3 | 1 | 400 000 | 630 000 | 1 200 | 1 600 |
| **140 KBE 031+L** | | 225 | 84 | 68 | 3 | 1 | 490 000 | 850 000 | 1 200 | 1 600 |
| **140 KBE 2201+L** | | 225 | 85 | 68 | 3 | 1 | 490 000 | 850 000 | 1 200 | 1 600 |
| **140 KBE 2301+L** | | 230 | 120 | 94 | 3 | 1 | 685 000 | 1 270 000 | 1 200 | 1 600 |
| **140 KBE 2302+L** | | 230 | 140 | 110 | 3 | 1 | 820 000 | 1 550 000 | 1 200 | 1 600 |
| **140 KBE 2401+L** | | 240 | 132 | 106 | 4 | 1.5 | 685 000 | 1 360 000 | 1 100 | 1 500 |
| **HR140 KBE 42+L** | | 250 | 102 | 82.5 | 4 | 1 | 670 000 | 1 030 000 | 1 100 | 1 500 |
| **HR140 KBE 52X+L** | | 250 | 153 | 125.5 | 4 | 1 | 1 040 000 | 1 830 000 | 1 100 | 1 500 |
| **140 KBE 43+L** | | 300 | 145 | 115.5 | 5 | 1.5 | 1 030 000 | 1 480 000 | 1 000 | 1 300 |
| **150 KBE 30+L** | **150** | 225 | 56 | 50 | 3 | 1 | 300 000 | 545 000 | 1 200 | 1 600 |
| **150 KBE 030+L** | | 225 | 70 | 56 | 3 | 1 | 395 000 | 685 000 | 1 200 | 1 600 |
| **150 KBE 31+L** | | 250 | 80 | 71 | 3 | 1 | 510 000 | 810 000 | 1 100 | 1 400 |
| **150 KBE 031+L** | | 250 | 100 | 80 | 3 | 1 | 630 000 | 1 090 000 | 1 100 | 1 400 |
| **150 KBE 2502+L** | | 250 | 115 | 95 | 3 | 1 | 745 000 | 1 320 000 | 1 100 | 1 500 |
| **150 KBE 2601+L** | | 260 | 150 | 115 | 4 | 1 | 815 000 | 1 520 000 | 1 100 | 1 400 |
| **HR150 KBE 42+L** | | 270 | 109 | 87 | 4 | 1 | 830 000 | 1 330 000 | 1 000 | 1 400 |
| **HR150 KBE 52X+L** | | 270 | 164 | 130 | 4 | 1 | 1 210 000 | 2 150 000 | 1 000 | 1 400 |
| **HR150 KBE 2701+L** | | 270 | 174 | 140 | 4 | 1 | 1 210 000 | 2 150 000 | 1 000 | 1 400 |
| HR150 KBE 43+L | | 320 | 154 | 120 | 5 | 1.5 | 1 420 000 | 2 130 000 | 900 | 1 200 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | $d_a$ min. | $D_b$ min. | $r_a$ max. | $r_b$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **125 KBE 2101+L** | 146 | 201 | 3 | 1 | 0.43 | 2.3 | 1.6 | 1.5 | 14.5 |
| **HR130 KBE 42+L** | 151 | 220 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 15.8 |
| **HR130 KBE 2301+L** | 151 | 220 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 15.9 |
| **130 KBE 43+L** | 157 | 258 | 4 | 1.5 | 0.36 | 2.8 | 1.9 | 1.8 | 35 |
| **HR130 KBE 2302+L** | 151 | 221 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 24.1 |
| **HR130 KBE 52+L** | 151 | 222 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 23.8 |
| **HR130 KBE 2303+L** | 151 | 221 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 24.2 |
| **140 KBE 30+L** | 155 | 202 | 2 | 0.6 | 0.39 | 2.6 | 1.7 | 1.7 | 6.02 |
| **140 KBE 030+L** | 155 | 202 | 2 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 7.02 |
| **140 KBE 2101+L** | 155 | 202 | 2 | 0.6 | 0.33 | 3.0 | 2.0 | 2.0 | 12.3 |
| **140 KBE 31+L** | 158 | 216 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 9.31 |
| **140 KBE 031+L** | 158 | 215 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 11.6 |
| **140 KBE 2201+L** | 158 | 215 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 11.7 |
| **140 KBE 2301+L** | 158 | 220 | 2.5 | 1 | 0.33 | 3.0 | 2.0 | 2.0 | 17.6 |
| **140 KBE 2302+L** | 158 | 221 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 20.7 |
| **140 KBE 2401+L** | 161 | 227 | 3 | 1.5 | 0.44 | 2.3 | 1.5 | 1.5 | 22.7 |
| **HR140 KBE 42+L** | 161 | 237 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 18.9 |
| **HR140 KBE 52X+L** | 161 | 241 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 29.6 |
| **140 KBE 43+L** | 167 | 275 | 4 | 1.5 | 0.36 | 2.8 | 1.9 | 1.8 | 42.6 |
| **150 KBE 30+L** | 168 | 213 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 7.41 |
| **150 KBE 030+L** | 168 | 215 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 8.70 |
| **150 KBE 31+L** | 168 | 240 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 14.2 |
| **150 KBE 031+L** | 168 | 238 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 17.8 |
| **150 KBE 2502+L** | 168 | 238 | 2.5 | 1 | 0.37 | 2.7 | 1.8 | 1.8 | 20.9 |
| **150 KBE 2601+L** | 171 | 242 | 3 | 1 | 0.43 | 2.3 | 1.6 | 1.5 | 30.0 |
| **HR150 KBE 42+L** | 171 | 253 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 24.3 |
| **HR150 KBE 52X+L** | 171 | 257 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 37.3 |
| **HR150 KBE 2701+L** | 171 | 257 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 39.7 |
| HR150 KBE 43+L | 177 | 295 | 4 | 1.5 | 0.35 | 2.9 | 2.0 | 1.9 | 53.4 |

**Remarks** For other double-row tapered roller bearings not listed above, please contact NSK.

## Bore Diameter 160 – 200 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

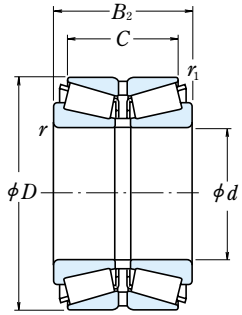
$P_0 = F_r + Y_0 F_a$

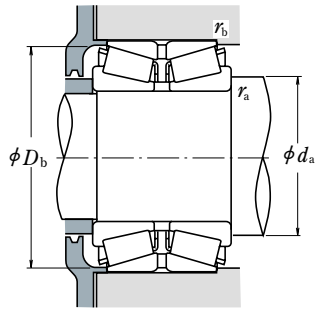
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Bearing Numbers | Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $d$ | $D$ | $B_2$ | $C$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | Grease | Oil | $d_a$ min. | $D_b$ min. | $r_a$ max. | $r_b$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **160 KBE 30+L** | **160** | 240 | 60 | 53 | 3 | 1 | 355 000 | 580 000 | 1 100 | 1 500 | 178 | 231 | 2.5 | 1 | 0.37 | 2.7 | 1.8 | 1.8 | 8.56 |
| **160 KBE 030+L** | | 240 | 75 | 60 | 3 | 1 | 395 000 | 710 000 | 1 100 | 1 500 | 178 | 230 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 10.5 |
| **160 KBE 2401+L** | | 240 | 110 | 90 | 3 | 1 | 650 000 | 1 290 000 | 1 100 | 1 500 | 178 | 232 | 2.5 | 1 | 0.38 | 2.6 | 1.8 | 1.7 | 16.2 |
| **160 KBE 31+L** | | 270 | 86 | 76 | 3 | 1 | 540 000 | 885 000 | 1 000 | 1 300 | 178 | 255 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 18.6 |
| **160 KBE 031+L** | | 270 | 108 | 86 | 3 | 1 | 775 000 | 1 380 000 | 1 000 | 1 300 | 178 | 256 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 23.1 |
| **160 KBE 2701+L** | | 270 | 140 | 120 | 3 | 1 | 990 000 | 1 880 000 | 1 000 | 1 300 | 178 | 261 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 30.6 |
| **160 KBE 2801+L** | | 280 | 150 | 125 | 4 | 1 | 1 100 000 | 2 020 000 | 1 000 | 1 300 | 181 | 266 | 3 | 1 | 0.32 | 3.2 | 2.1 | 2.1 | 35.9 |
| **160 KBE 42+L** | | 290 | 115 | 91 | 4 | 1 | 800 000 | 1 220 000 | 900 | 1 300 | 181 | 275 | 3 | 1 | 0.43 | 2.3 | 1.6 | 1.5 | 28.2 |
| **HR160 KBE 52X+L** | | 290 | 178 | 144 | 4 | 1 | 1 360 000 | 2 440 000 | 1 000 | 1 300 | 181 | 277 | 3 | 1 | 0.44 | 2.3 | 1.6 | 1.5 | 47.3 |
| **160 KBE 43+L** | | 340 | 160 | 126 | 5 | 1.5 | 1 310 000 | 1 920 000 | 800 | 1 100 | 187 | 314 | 4 | 1.5 | 0.36 | 2.8 | 1.9 | 1.8 | 60.4 |
| **165 KBE 2901+L** | **165** | 290 | 150 | 125 | 4 | 1 | 1 140 000 | 2 130 000 | 900 | 1 300 | 186 | 272 | 3 | 1 | 0.33 | 3.1 | 2.1 | 2.0 | 39.5 |
| **170 KBE 2501+L** | **170** | 250 | 85 | 65 | 3 | 1 | 435 000 | 845 000 | 1 000 | 1 400 | 188 | 241 | 2.5 | 1 | 0.44 | 2.3 | 1.5 | 1.5 | 12.3 |
| **170 KBE 30+L** | | 260 | 67 | 60 | 3 | 1 | 400 000 | 700 000 | 1 000 | 1 300 | 188 | 248 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 11.8 |
| **170 KBE 030+L** | | 260 | 84 | 67 | 3 | 1 | 575 000 | 1 030 000 | 1 000 | 1 300 | 188 | 249 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 14.4 |
| **170 KBE 31+L** | | 280 | 88 | 78 | 3 | 1 | 630 000 | 1 040 000 | 900 | 1 300 | 188 | 266 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 19.7 |
| **170 KBE 031+L** | | 280 | 110 | 88 | 3 | 1 | 820 000 | 1 450 000 | 900 | 1 300 | 188 | 268 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 24.2 |
| **170 KBE 2802+L** | | 280 | 150 | 130 | 3 | 1 | 1 110 000 | 2 160 000 | 1 000 | 1 300 | 188 | 269 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 34.6 |
| **HR170 KBE 52X+L** | | 310 | 192 | 152 | 5 | 1.5 | 1 590 000 | 2 910 000 | 900 | 1 200 | 197 | 297 | 4 | 1.5 | 0.44 | 2.3 | 1.6 | 1.5 | 57.3 |
| **180 KBE 30+L** | **180** | 280 | 74 | 66 | 3 | 1 | 455 000 | 810 000 | 900 | 1 300 | 198 | 265 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 15.4 |
| **180 KBE 030+L** | | 280 | 93 | 74 | 3 | 1 | 655 000 | 1 220 000 | 900 | 1 200 | 198 | 265 | 2.5 | 1 | 0.35 | 2.9 | 2.0 | 1.9 | 14.4 |
| **180 KBE 31+L** | | 300 | 96 | 85 | 4 | 1.5 | 725 000 | 1 210 000 | 900 | 1 200 | 201 | 284 | 3 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 24.8 |
| **180 KBE 031+L** | | 300 | 120 | 96 | 4 | 1.5 | 940 000 | 1 690 000 | 900 | 1 200 | 201 | 287 | 3 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 31.1 |
| **180 KBE 42+L** | | 320 | 127 | 99 | 5 | 1.5 | 895 000 | 1 390 000 | 800 | 1 200 | 207 | 300 | 4 | 1.5 | 0.44 | 2.3 | 1.5 | 1.5 | 36.5 |
| **HR180 KBE 52X+L** | | 320 | 192 | 152 | 5 | 1.5 | 1 640 000 | 3 050 000 | 900 | 1 200 | 207 | 308 | 4 | 1.5 | 0.45 | 2.2 | 1.5 | 1.5 | 59.2 |
| **180 KBE 3401+L** | | 340 | 180 | 140 | 5 | 1.5 | 1 410 000 | 2 510 000 | 800 | 1 100 | 207 | 305 | 4 | 1.5 | 0.43 | 2.3 | 1.6 | 1.5 | 68.1 |
| **190 KBE 30+L** | **190** | 290 | 75 | 67 | 3 | 1 | 490 000 | 845 000 | 900 | 1 200 | 208 | 279 | 2.5 | 1 | 0.39 | 2.6 | 1.7 | 1.7 | 16.2 |
| **190 KBE 030+L** | | 290 | 94 | 75 | 3 | 1 | 670 000 | 1 230 000 | 900 | 1 200 | 208 | 279 | 2.5 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 20.1 |
| **190 KBE 31+L** | | 320 | 104 | 92 | 4 | 1.5 | 800 000 | 1 380 000 | 800 | 1 100 | 211 | 301 | 3 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 30.9 |
| **190 KBE 031+L** | | 320 | 130 | 104 | 4 | 1.5 | 1 070 000 | 1 960 000 | 800 | 1 100 | 211 | 302 | 3 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 39.0 |
| **190 KBE 42+L** | | 340 | 133 | 105 | 5 | 1.5 | 990 000 | 1 580 000 | 800 | 1 100 | 217 | 320 | 4 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 43.9 |
| **HR190 KBE 52X+L** | | 340 | 204 | 160 | 5 | 1.5 | 1 910 000 | 3 550 000 | 800 | 1 100 | 217 | 327 | 4 | 1.5 | 0.44 | 2.3 | 1.6 | 1.5 | 70.8 |
| **HR200 KBE 3101+L** | **200** | 310 | 152 | 123 | 3 | 1 | 1 300 000 | 2 740 000 | 800 | 1 100 | 218 | 301 | 2.5 | 1 | 0.43 | 2.3 | 1.6 | 1.5 | 40.1 |
| **200 KBE 3201+L** | | 320 | 146 | 110 | 5 | 1.5 | 990 000 | 2 120 000 | 800 | 1 100 | 227 | 301 | 4 | 1.5 | 0.52 | 1.9 | 1.3 | 1.3 | 41.6 |
| **200 KBE 3301+L** | | 330 | 180 | 140 | 5 | 1.5 | 1 390 000 | 2 730 000 | 800 | 1 100 | 227 | 316 | 4 | 1.5 | 0.42 | 2.4 | 1.6 | 1.6 | 54.4 |
| **200 KBE 31+L** | | 340 | 112 | 100 | 4 | 1.5 | 940 000 | 1 670 000 | 800 | 1 000 | 221 | 321 | 3 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 38.8 |
| **200 KBE 031+L** | | 340 | 140 | 112 | 4 | 1.5 | 1 260 000 | 2 250 000 | 800 | 1 000 | 221 | 324 | 3 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 47.0 |
| **200 KBE 42+L** | | 360 | 142 | 110 | 5 | 1.5 | 1 100 000 | 1 780 000 | 700 | 1 000 | 227 | 338 | 4 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 52.6 |
| **HR200 KBE 52+L** | | 360 | 218 | 174 | 5 | 1.5 | 2 070 000 | 3 850 000 | 800 | 1 000 | 227 | 344 | 4 | 1.5 | 0.41 | 2.5 | 1.7 | 1.6 | 88.3 |

**Remarks** For other double-row tapered roller bearings not listed above, please contact NSK.

## Bore Diameter 206 – 260 mm




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Limiting Speeds (min$^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B_2$ | $C$ | $r$ min. | $r_1$ min. | $C_r$ | $C_{0r}$ | Grease | Oil |
| **206** | 283 | 102 | 83 | 4 | 1.5 | 580 000 | 1 430 000 | 900 | 1 200 |
| **210** | 355 | 116 | 103 | 4 | 1.5 | 905 000 | 1 520 000 | 700 | 1 000 |
| **220** | 300 | 110 | 88 | 3 | 1 | 730 000 | 1 710 000 | 800 | 1 100 |
| | 340 | 90 | 80 | 4 | 1.5 | 695 000 | 1 280 000 | 700 | 1 000 |
| | 340 | 113 | 90 | 4 | 1.5 | 920 000 | 1 830 000 | 700 | 1 000 |
| | 370 | 120 | 107 | 5 | 1.5 | 1 110 000 | 1 940 000 | 700 | 1 000 |
| | 370 | 150 | 120 | 5 | 1.5 | 1 460 000 | 2 760 000 | 700 | 1 000 |
| | 400 | 158 | 122 | 5 | 1.5 | 1 390 000 | 2 300 000 | 600 | 900 |
| **240** | 360 | 92 | 82 | 4 | 1.5 | 780 000 | 1 490 000 | 700 | 900 |
| | 360 | 115 | 92 | 4 | 1.5 | 1 020 000 | 2 040 000 | 700 | 900 |
| | 400 | 128 | 114 | 5 | 1.5 | 1 180 000 | 2 190 000 | 600 | 900 |
| | 400 | 160 | 128 | 5 | 1.5 | 1 620 000 | 3 050 000 | 600 | 900 |
| | 400 | 209 | 168 | 5 | 1.5 | 2 220 000 | 4 450 000 | 600 | 900 |
| **250** | 380 | 98 | 87 | 4 | 1 | 795 000 | 1 460 000 | 600 | 900 |
| **260** | 400 | 104 | 92 | 5 | 1.5 | 895 000 | 1 670 000 | 600 | 800 |
| | 400 | 130 | 104 | 5 | 1.5 | 1 210 000 | 2 460 000 | 600 | 800 |
| | 440 | 144 | 128 | 5 | 1.5 | 1 540 000 | 2 760 000 | 600 | 800 |
| | 440 | 172 | 145 | 5 | 1.5 | 1 870 000 | 3 500 000 | 600 | 800 |
| | 440 | 180 | 144 | 5 | 1.5 | 2 110 000 | 4 150 000 | 600 | 800 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | $d_a$ min. | $D_b$ min. | $r_a$ max. | $r_b$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **206 KBE 2801+L** | 227 | 275 | 3 | 1.5 | 0.51 | 2.0 | 1.3 | 1.3 | 18.1 |
| **210 KBE 31+L** | 231 | 338 | 3 | 1.5 | 0.46 | 2.2 | 1.5 | 1.4 | 41.7 |
| **220 KBE 3001+L** | 238 | 292 | 2.5 | 1 | 0.37 | 2.7 | 1.8 | 1.8 | 21.2 |
| **220 KBE 30+L** | 241 | 324 | 3 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 27.9 |
| **220 KBE 030+L** | 241 | 327 | 3 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 34.7 |
| **220 KBE 31+L** | 247 | 345 | 4 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 48.3 |
| **220 KBE 031+L** | 247 | 349 | 4 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 60.2 |
| **220 KBE 42+L** | 247 | 371 | 4 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 74.2 |
| **240 KBE 30+L** | 261 | 344 | 3 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 30.1 |
| **240 KBE 030+L** | 261 | 344 | 3 | 1.5 | 0.35 | 2.9 | 2.0 | 1.9 | 37.3 |
| **240 KBE 31+L** | 267 | 380 | 4 | 1.5 | 0.43 | 2.3 | 1.6 | 1.5 | 60.0 |
| **240 KBE 031+L** | 267 | 378 | 4 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 73.6 |
| **240 KBE 4003+L** | 267 | 384 | 4 | 1.5 | 0.33 | 3.0 | 2.0 | 2.0 | 96.4 |
| **250 KBE 3801+L** | 271 | 365 | 3 | 1 | 0.40 | 2.5 | 1.7 | 1.6 | 35.5 |
| **260 KBE 30+L** | 287 | 379 | 4 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 43.4 |
| **260 KBE 030+L** | 287 | 382 | 4 | 1.5 | 0.40 | 2.5 | 1.7 | 1.6 | 54.1 |
| **260 KBE 31+L** | 287 | 416 | 4 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 82.5 |
| **260 KBE 4401+L** | 287 | 414 | 4 | 1.5 | 0.38 | 2.6 | 1.8 | 1.7 | 98.1 |
| **260 KBE 031+L** | 287 | 416 | 4 | 1.5 | 0.39 | 2.6 | 1.7 | 1.7 | 104.0 |

**Remarks** For other double-row tapered roller bearings not listed above, please contact NSK.

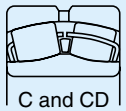
# SPHERICAL ROLLER BEARINGS

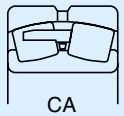
## SPHERICAL ROLLER BEARINGS

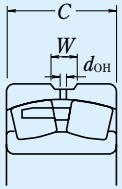
Cylindrical Bores, Tapered Bores
Bore Diameter 20 – 150mm ..... B184
Bore Diameter 160 – 560mm ..... B192
Bore Diameter 600 – 1400mm ..... B202

## DESIGN, TYPES, AND FEATURES

EA


C and CD


CA




Shown in the figures, types EA, C, CD, CA, which are designed for high load capacity, are available. Types EA, C and CD have pressed steel cages, and type CA has machined brass cages. The EA type bearings listed here are classified as HPS bearings, which offer particularly high load-carrying capacity, high limiting speeds, and are highly functional under high-temperature operating conditions of up to 200°C.

An oil groove and holes are provided in the outer ring to supply lubricant and the bearing numbers are suffixed with E4.

To use bearings with oil grooves and holes, it is recommended to provide an oil groove in the housing bore, since the depth of the groove in the bearing is limited. The number and dimensions of the oil groove and holes are shown in Tables 1 and 2.

When bearings with a hole for a locking pin to prevent outer ring rotation are required, please inform NSK.

**TOLERANCES AND RUNNING ACCURACY** ..... Table 8.2 (Pages A60 to A63)
**RECOMMENDED FITS** ..... Table 9.2 (Page A84)
Table 9.4 (Page A85)
**INTERNAL CLEARANCE** ..... Table 9.15 (Page A92)

## PERMISSIBLE MISALIGNMENT

The permissible misalignment of spherical roller bearings varies depending on the size and load, but it is approximately 0.018 to 0.045 radian (1° to 2.5°) with normal loads.

## LIMITING SPEEDS

The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A37 for detailed information.

**Table 1 Dimensions of Oil Grooves and Holes** Units : mm

| Nominal Outer Ring Width $C$ | | Oil Groove | Hole Diameter |
|---|---|---|---|
| over | incl | Width $W$ | $d_{OH}$ |
| 18 | 30 | 5 | 2.5 |
| 30 | 40 | 6 | 3 |
| 40 | 50 | 7 | 4 |
| 50 | 65 | 8 | 5 |
| 65 | 80 | 10 | 6 |
| 80 | 100 | 12 | 8 |
| 100 | 120 | 15 | 10 |
| 120 | 160 | 20 | 12 |
| 160 | 200 | 25 | 15 |
| 200 | 250 | 30 | 20 |
| 250 | 315 | 35 | 20 |
| 315 | 400 | 40 | 25 |
| 400 | — | 40 | 25 |

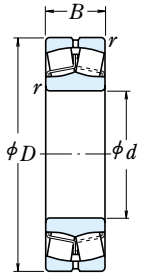
**Table 2 Number of Oil Holes**

| Nominal Outer Ring Dia $D$ (mm) | | Number of Holes |
|---|---|---|
| over | incl | |
| — | 180 | 4 |
| 180 | 250 | 6 |
| 250 | 315 | 6 |
| 315 | 400 | 6 |
| 400 | 500 | 6 |
| 500 | 630 | 8 |
| 630 | 800 | 8 |
| 800 | 1000 | 8 |
| 1000 | 1250 | 8 |
| 1250 | 1600 | 8 |
| 1600 | 2000 | 8 |

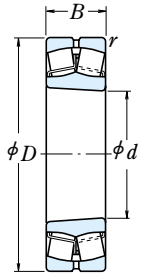
And if the load on spherical roller bearings becomes too small during operation or if the ratio of axial and radial loads is larger than the value of '$e$'(listed in the bearing tables), slippage occurs between the rollers and raceways, which may result in smearing. The higher the weight of the rollers and cage, the higher this tendency becomes, especially for large spherical roller bearings.

If very small bearing loads are expected, please contact NSK for selection of an appropriate bearing.

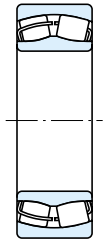
## Bore Diameter 20 – 55 mm



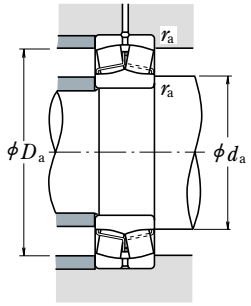

Cylindrical Bore




Tapered Bore



Without an Oil Groove or Holes




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

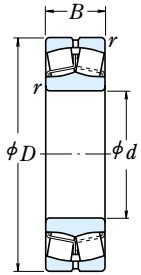
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **20** | 52 | 15 | 1.1 | 29 300 | 26 900 | 2 980 | 2 740 | 6 300 | 8 200 | **21304CDE4** |
| **25** | 52 | 18 | 1 | 37 500 | 37 000 | 3 850 | 3 800 | 7 100 | 9 000 | **22205CE4** |
| | 62 | 17 | 1.1 | 43 000 | 40 500 | 4 350 | 4 150 | 5 300 | 6 700 | **21305CDE4** |
| **30** | 62 | 20 | 1 | 50 000 | 50 000 | 5 100 | 5 100 | 6 000 | 7 500 | **22206CE4** |
| | 72 | 19 | 1.1 | 55 000 | 54 000 | 5 600 | 5 500 | 4 500 | 6 000 | **21306CDE4** |
| **35** | 72 | 23 | 1.1 | 69 000 | 71 000 | 7 050 | 7 200 | 5 300 | 6 700 | **22207CE4** |
| | 80 | 21 | 1.5 | 71 500 | 76 000 | 7 250 | 7 750 | 4 000 | 5 300 | **21307CDE4** |
| **40** | 80 | 23 | 1.1 | 113 000 | 99 500 | 11 500 | 10 100 | 6 700 | 8 500 | ***22208EAE4** |
| | 90 | 23 | 1.5 | 118 000 | 111 000 | 12 000 | 11 300 | 6 000 | 7 500 | ***21308EAE4** |
| | 90 | 33 | 1.5 | 170 000 | 153 000 | 17 300 | 15 600 | 5 300 | 6 700 | ***22308EAE4** |
| **45** | 85 | 23 | 1.1 | 118 000 | 111 000 | 12 000 | 11 300 | 6 000 | 7 500 | ***22209EAE4** |
| | 100 | 25 | 1.5 | 149 000 | 144 000 | 15 200 | 14 600 | 5 000 | 6 300 | ***21309EAE4** |
| | 100 | 36 | 1.5 | 207 000 | 195 000 | 21 100 | 19 900 | 4 500 | 5 600 | ***22309EAE4** |
| **50** | 90 | 23 | 1.1 | 124 000 | 119 000 | 12 600 | 12 100 | 5 600 | 7 100 | ***22210EAE4** |
| | 110 | 27 | 2 | 178 000 | 174 000 | 18 100 | 17 800 | 4 500 | 5 600 | ***21310EAE4** |
| | 110 | 40 | 2 | 246 000 | 234 000 | 25 100 | 23 900 | 4 300 | 5 300 | ***22310EAE4** |
| **55** | 100 | 25 | 1.5 | 149 000 | 144 000 | 15 200 | 14 600 | 5 300 | 6 700 | ***22211EAE4** |
| | 120 | 29 | 2 | 178 000 | 174 000 | 18 100 | 17 800 | 4 500 | 5 600 | ***21311EAE4** |
| | 120 | 43 | 2 | 292 000 | 292 000 | 29 800 | 29 800 | 3 800 | 4 800 | ***22311EAE4** |

| Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **21304CDKE4** | 27 | 28 | 45 | 42 | 1 | 0.31 | 3.2 | 2.1 | 2.1 | 0.17 |
| **22205CKE4** | 31 | 31 | 46 | 45 | 1 | 0.35 | 2.9 | 1.9 | 1.9 | 0.17 |
| **21305CDKE4** | 32 | 34 | 55 | 51 | 1 | 0.29 | 3.4 | 2.3 | 2.3 | 0.26 |
| **22206CKE4** | 36 | 37 | 56 | 54 | 1 | 0.33 | 3.1 | 2.1 | 2.0 | 0.27 |
| **21306CDKE4** | 37 | 40 | 65 | 59 | 1 | 0.28 | 3.6 | 2.4 | 2.3 | 0.39 |
| **22207CKE4** | 42 | 43 | 65 | 63 | 1 | 0.32 | 3.1 | 2.1 | 2.0 | 0.42 |
| **21307CDKE4** | 44 | 47 | 71 | 67 | 1.5 | 0.28 | 3.6 | 2.4 | 2.4 | 0.53 |
| ***22208EAKE4** | 47 | 49 | 73 | 70 | 1 | 0.28 | 3.6 | 2.4 | 2.4 | 0.50 |
| ***21308EAKE4** | 49 | 54 | 81 | 75 | 1.5 | 0.25 | 3.9 | 2.7 | 2.6 | 0.73 |
| ***22308EAKE4** | 49 | 52 | 81 | 77 | 1.5 | 0.35 | 2.8 | 1.9 | 1.9 | 0.98 |
| ***22209EAKE4** | 52 | 54 | 78 | 75 | 1 | 0.25 | 3.9 | 2.7 | 2.6 | 0.55 |
| ***21309EAKE4** | 54 | 65 | 91 | 89 | 1.5 | 0.23 | 4.3 | 2.9 | 2.8 | 0.96 |
| ***22309EAKE4** | 54 | 59 | 91 | 86 | 1.5 | 0.34 | 2.9 | 2.0 | 1.9 | 1.34 |
| ***22210EAKE4** | 57 | 60 | 83 | 81 | 1 | 0.24 | 4.3 | 2.9 | 2.8 | 0.61 |
| ***21310EAKE4** | 60 | 72 | 100 | 98 | 2 | 0.23 | 4.4 | 3.0 | 2.9 | 1.21 |
| ***22310EAKE4** | 60 | 64 | 100 | 93 | 2 | 0.35 | 2.8 | 1.9 | 1.9 | 1.78 |
| ***22211EAKE4** | 64 | 65 | 91 | 89 | 1.5 | 0.23 | 4.3 | 2.9 | 2.8 | 0.81 |
| ***21311EAKE4** | 65 | 72 | 110 | 98 | 2 | 0.23 | 4.4 | 3.0 | 2.9 | 1.58 |
| ***22311EAKE4** | 65 | 73 | 110 | 103 | 2 | 0.34 | 2.9 | 2.0 | 1.9 | 2.3 |

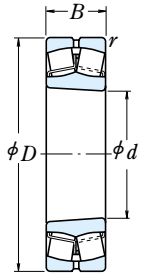
**Note** (1) The suffix K represents bearings with tapered bores (taper 1 : 12).

**Remarks**
1. The bearings denoted by an asterisk (*) are HPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A84 of the NSK Rolling Bearings catalog, in case of HPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B358** – **B359**, and **B366**.

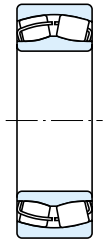
## Bore Diameter 60 – 85 mm



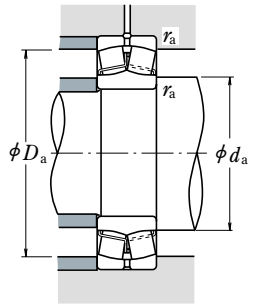

Cylindrical Bore




Tapered Bore



Without an Oil Groove or Holes




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

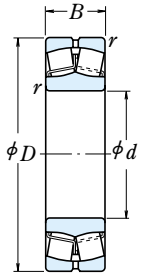
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore / Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **60** | 95 | 26 | 1.1 | 98 500 | 141 000 | 10 000 | 14 400 | 3 600 | 4 500 | **23012CE4** / **23012CKE4** | 67 | 68 | 88 | 85 | 1 | 0.26 | 3.9 | 2.6 | 2.5 | 0.68 |
| | 110 | 28 | 1.5 | 178 000 | 174 000 | 18 100 | 17 800 | 4 800 | 6 000 | ***22212EAE4** / ***22212EAKE4** | 69 | 72 | 101 | 98 | 1.5 | 0.23 | 4.4 | 3.0 | 2.9 | 1.1 |
| | 130 | 31 | 2.1 | 238 000 | 244 000 | 24 200 | 24 900 | 3 800 | 4 800 | ***21312EAE4** / ***21312EAKE4** | 72 | 87 | 118 | 117 | 2 | 0.22 | 4.5 | 3.0 | 3.0 | 1.98 |
| | 130 | 46 | 2.1 | 340 000 | 340 000 | 34 500 | 35 000 | 3 600 | 4 500 | ***22312EAE4** / ***22312EAKE4** | 72 | 79 | 118 | 111 | 2 | 0.34 | 3.0 | 2.0 | 1.9 | 2.89 |
| **65** | 120 | 31 | 1.5 | 221 000 | 230 000 | 22 500 | 23 500 | 4 300 | 5 300 | ***22213EAE4** / ***22213EAKE4** | 74 | 80 | 111 | 107 | 1.5 | 0.24 | 4.2 | 2.8 | 2.7 | 1.51 |
| | 140 | 33 | 2.1 | 264 000 | 275 000 | 27 000 | 28 000 | 3 600 | 4 500 | ***21313EAE4** / ***21313EAKE4** | 77 | 94 | 128 | 126 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 2.45 |
| | 140 | 48 | 2.1 | 375 000 | 380 000 | 38 000 | 38 500 | 3 200 | 4 000 | ***22313EAE4** / ***22313EAKE4** | 77 | 84 | 128 | 119 | 2 | 0.33 | 3.0 | 2.0 | 2.0 | 3.52 |
| **70** | 125 | 31 | 1.5 | 225 000 | 232 000 | 22 900 | 23 600 | 4 000 | 5 300 | ***22214EAE4** / ***22214EAKE4** | 79 | 84 | 116 | 111 | 1.5 | 0.23 | 4.3 | 2.9 | 2.8 | 1.58 |
| | 150 | 35 | 2.1 | 310 000 | 325 000 | 32 000 | 33 500 | 3 200 | 4 000 | ***21314EAE4** / ***21314EAKE4** | 82 | 101 | 138 | 135 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 3.0 |
| | 150 | 51 | 2.1 | 425 000 | 435 000 | 43 500 | 44 000 | 3 000 | 3 800 | ***22314EAE4** / ***22314EAKE4** | 82 | 91 | 138 | 129 | 2 | 0.33 | 3.0 | 2.0 | 2.0 | 4.28 |
| **75** | 130 | 31 | 1.5 | 238 000 | 244 000 | 24 200 | 24 900 | 4 000 | 5 000 | ***22215EAE4** / ***22215EAKE4** | 84 | 87 | 121 | 117 | 1.5 | 0.22 | 4.5 | 3.0 | 3.0 | 1.64 |
| | 160 | 37 | 2.1 | 310 000 | 325 000 | 32 000 | 33 500 | 3 200 | 4 000 | ***21315EAE4** / ***21315EAKE4** | 87 | 101 | 148 | 134 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 3.64 |
| | 160 | 55 | 2.1 | 485 000 | 505 000 | 49 500 | 51 500 | 2 800 | 3 600 | ***22315EAE4** / ***22315EAKE4** | 87 | 97 | 148 | 137 | 2 | 0.33 | 3.0 | 2.0 | 2.0 | 5.26 |
| **80** | 140 | 33 | 2 | 264 000 | 275 000 | 27 000 | 28 000 | 3 600 | 4 500 | ***22216EAE4** / ***22216EAKE4** | 90 | 94 | 130 | 126 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 2.01 |
| | 170 | 39 | 2.1 | 355 000 | 375 000 | 36 000 | 38 000 | 3 000 | 3 800 | ***21316EAE4** / ***21316EAKE4** | 92 | 109 | 158 | 146 | 2 | 0.23 | 4.4 | 3.0 | 2.9 | 4.32 |
| | 170 | 58 | 2.1 | 540 000 | 565 000 | 55 000 | 58 000 | 2 600 | 3 400 | ***22316EAE4** / ***22316EAKE4** | 92 | 103 | 158 | 145 | 2 | 0.33 | 3.0 | 2.0 | 2.0 | 6.23 |
| **85** | 150 | 36 | 2 | 310 000 | 325 000 | 32 000 | 33 500 | 3 400 | 4 300 | ***22217EAE4** / ***22217EAKE4** | 95 | 101 | 140 | 135 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 2.54 |
| | 180 | 41 | 3 | 360 000 | 395 000 | 37 000 | 40 000 | 3 000 | 4 000 | ***21317EAE4** / ***21317EAKE4** | 99 | 108 | 166 | 142 | 2.5 | 0.24 | 4.3 | 2.9 | 2.8 | 5.2 |
| | 180 | 60 | 3 | 600 000 | 630 000 | 61 000 | 64 000 | 2 400 | 3 200 | ***22317EAE4** / ***22317EAKE4** | 99 | 110 | 166 | 155 | 2.5 | 0.33 | 3.1 | 2.1 | 2.0 | 7.23 |

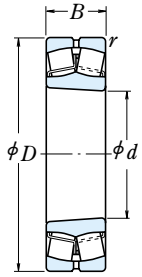
**Note** (1) The suffix K represents bearings with tapered bores (taper 1 : 12).

**Remarks**
1. The bearings denoted by an asterisk (*) are HPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A84 of the NSK Rolling Bearings catalog, in case of HPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B359** – **B361**, and **B366**.

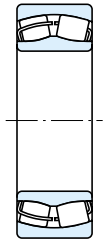
## Bore Diameter 90 – 110 mm



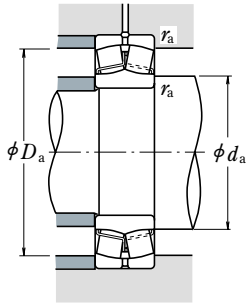

Cylindrical Bore




Tapered Bore



Without an Oil Groove or Holes




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

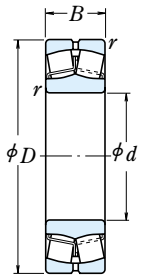
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **90** | 160 | 40 | 2 | 360 000 | 395 000 | 37 000 | 40 000 | 3 200 | 4 000 | ***22218EAE4** |
| | 160 | 52.4 | 2 | 340 000 | 490 000 | 34 500 | 50 000 | 1 800 | 2 400 | **23218CE4** |
| | 190 | 43 | 3 | 415 000 | 450 000 | 42 000 | 46 000 | 2 800 | 3 600 | ***21318EAE4** |
| | 190 | 64 | 3 | 665 000 | 705 000 | 68 000 | 72 000 | 2 400 | 3 000 | ***22318EAE4** |
| **95** | 170 | 43 | 2.1 | 415 000 | 450 000 | 42 000 | 46 000 | 3 000 | 3 800 | ***22219EAE4** |
| | 170 | 55.6 | 2.1 | 370 000 | 525 000 | 37 500 | 53 500 | 1 700 | 2 200 | **23219CAE4** |
| | 200 | 45 | 3 | 345 000 | 435 000 | 35 000 | 44 500 | 1 500 | 2 000 | **21319CE4** |
| | 200 | 67 | 3 | 735 000 | 780 000 | 75 000 | 79 500 | 2 200 | 2 800 | ***22319EAE4** |
| **100** | 150 | 37 | 1.5 | 212 000 | 335 000 | 21 600 | 34 500 | 2 200 | 2 800 | **23020CDE4** |
| | 150 | 50 | 1.5 | 276 000 | 470 000 | 28 100 | 48 000 | 1 800 | 2 400 | **24020CE4** |
| | 165 | 52 | 2 | 345 000 | 530 000 | 35 500 | 54 000 | 1 700 | 2 200 | **23120CE4** |
| | 165 | 65 | 2 | 345 000 | 535 000 | 35 000 | 55 000 | 1 700 | 2 200 | **24120CAE4** |
| | 180 | 46 | 2.1 | 455 000 | 490 000 | 46 500 | 50 000 | 2 800 | 3 600 | ***22220EAE4** |
| | 180 | 60.3 | 2.1 | 420 000 | 605 000 | 42 500 | 61 500 | 1 600 | 2 200 | **23220CE4** |
| | 215 | 47 | 3 | 395 000 | 485 000 | 40 500 | 49 500 | 1 400 | 1 900 | **21320CE4** |
| | 215 | 73 | 3 | 860 000 | 930 000 | 88 000 | 94 500 | 2 000 | 2 600 | ***22320EAE4** |
| **110** | 170 | 45 | 2 | 293 000 | 465 000 | 29 900 | 47 500 | 2 000 | 2 400 | **23022CDE4** |
| | 170 | 60 | 2 | 380 000 | 645 000 | 38 500 | 66 000 | 1 600 | 2 200 | **24022CE4** |
| | 180 | 56 | 2 | 385 000 | 630 000 | 39 500 | 64 000 | 1 600 | 2 000 | **23122CE4** |
| | 180 | 69 | 2 | 460 000 | 750 000 | 47 000 | 76 500 | 1 600 | 2 000 | **24122CE4** |
| | 200 | 53 | 2.1 | 605 000 | 645 000 | 61 500 | 66 000 | 2 600 | 3 200 | ***22222EAE4** |
| | 200 | 69.8 | 2.1 | 515 000 | 760 000 | 52 500 | 77 500 | 1 500 | 1 900 | **23222CE4** |
| | 240 | 50 | 3 | 450 000 | 545 000 | 46 000 | 55 500 | 1 300 | 1 700 | **21322CAE4** |
| | 240 | 80 | 3 | 1030 000 | 1 120 000 | 105 000 | 115 000 | 1 900 | 2 400 | ***22322EAE4** |

| Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| ***22218EAKE4** | 100 | 108 | 150 | 142 | 2 | 0.24 | 4.3 | 2.9 | 2.8 | 3.3 |
| **23218CKE4** | 100 | 105 | 150 | 138 | 2 | 0.32 | 3.2 | 2.1 | 2.1 | 4.51 |
| ***21318EAKE4** | 104 | 115 | 176 | 152 | 2.5 | 0.24 | 4.3 | 2.9 | 2.8 | 6.1 |
| ***22318EAKE4** | 104 | 115 | 176 | 163 | 2.5 | 0.33 | 3.1 | 2.1 | 2.0 | 8.56 |
| ***22219EAKE4** | 107 | 115 | 158 | 152 | 2 | 0.24 | 4.3 | 2.9 | 2.8 | 4.04 |
| **23219CAKE4** | 107 | — | 158 | 146 | 2 | 0.32 | 3.1 | 2.1 | 2.0 | 5.33 |
| **21319CKE4** | 109 | 127 | 186 | 172 | 2.5 | 0.22 | 4.6 | 3.1 | 3.0 | 6.92 |
| ***22319EAKE4** | 109 | 121 | 186 | 172 | 2.5 | 0.33 | 3.1 | 2.1 | 2.0 | 9.91 |
| **23020CDKE4** | 109 | 112 | 141 | 136 | 1.5 | 0.22 | 4.6 | 3.1 | 3.0 | 2.31 |
| **24020CK30E4** | 109 | 110 | 141 | 132 | 1.5 | 0.30 | 3.4 | 2.3 | 2.2 | 3.08 |
| **23120CKE4** | 110 | 113 | 155 | 144 | 2 | 0.30 | 3.4 | 2.3 | 2.2 | 4.38 |
| **24120CAK30E4** | 110 | — | 155 | 143 | 2 | 0.35 | 2.9 | 1.9 | 1.9 | 5.42 |
| ***22220EAKE4** | 112 | 119 | 168 | 160 | 2 | 0.24 | 4.3 | 2.9 | 2.8 | 4.84 |
| **23220CKE4** | 112 | 118 | 168 | 155 | 2 | 0.32 | 3.2 | 2.1 | 2.1 | 6.6 |
| **21320CKE4** | 114 | 133 | 201 | 184 | 2.5 | 0.21 | 4.7 | 3.2 | 3.1 | 8.46 |
| ***22320EAKE4** | 114 | 130 | 201 | 184 | 2.5 | 0.33 | 3.0 | 2.0 | 2.0 | 12.7 |
| **23022CDKE4** | 120 | 124 | 160 | 153 | 2 | 0.24 | 4.2 | 2.8 | 2.8 | 3.76 |
| **24022CK30E4** | 120 | 121 | 160 | 148 | 2 | 0.32 | 3.1 | 2.1 | 2.1 | 4.96 |
| **23122CKE4** | 120 | 127 | 170 | 158 | 2 | 0.28 | 3.5 | 2.4 | 2.3 | 5.7 |
| **24122CK30E4** | 120 | 123 | 170 | 154 | 2 | 0.36 | 2.8 | 1.9 | 1.8 | 6.84 |
| ***22222EAKE4** | 122 | 129 | 188 | 178 | 2 | 0.25 | 4.0 | 2.7 | 2.6 | 6.99 |
| **23222CKE4** | 122 | 130 | 188 | 170 | 2 | 0.34 | 3.0 | 2.0 | 1.9 | 9.54 |
| **21322CAKE4** | 124 | — | 226 | 206 | 2.5 | 0.22 | 4.6 | 3.1 | 3.0 | 11.2 |
| ***22322EAKE4** | 124 | 145 | 226 | 206 | 2.5 | 0.33 | 3.1 | 2.1 | 2.0 | 17.6 |

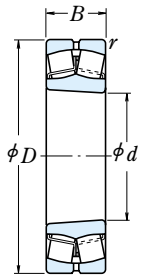
**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).

**Remarks**
1. The bearings denoted by an asterisk (*) are HPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A84 of the NSK Rolling Bearings catalog, in case of HPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B360** – **B361**, and **B366** – **B367**.

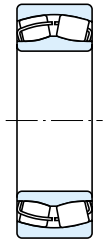
## Bore Diameter 120 – 150 mm



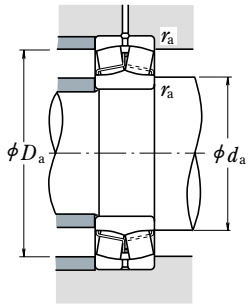

Cylindrical Bore




Tapered Bore



Without an Oil Groove or Holes




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

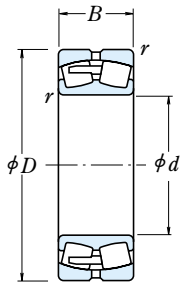
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing | Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore | Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **120** | 180 | 46 | 2 | 315 000 | 525 000 | 32 000 | 53 500 | 1 800 | 2 200 | **23024CDE4** | **23024CDKE4** | 130 | 134 | 170 | 163 | 2 | 0.22 | 4.5 | 3.0 | 2.9 | 4.11 |
| | 180 | 60 | 2 | 395 000 | 705 000 | 40 500 | 72 000 | 1 500 | 2 000 | **24024CE4** | **24024CK30E4** | 130 | 131 | 170 | 158 | 2 | 0.32 | 3.2 | 2.1 | 2.1 | 5.33 |
| | 200 | 62 | 2 | 465 000 | 720 000 | 47 500 | 73 500 | 1 400 | 1 800 | **23124CE4** | **23124CKE4** | 130 | 138 | 190 | 175 | 2 | 0.29 | 3.5 | 2.4 | 2.3 | 7.85 |
| | 200 | 80 | 2 | 575 000 | 950 000 | 58 500 | 96 500 | 1 400 | 1 800 | **24124CE4** | **24124CK30E4** | 130 | 136 | 190 | 171 | 2 | 0.37 | 2.7 | 1.8 | 1.8 | 10 |
| | 215 | 58 | 2.1 | 685 000 | 765 000 | 70 000 | 78 000 | 2 400 | 3 000 | ***22224EAE4** | ***22224EAKE4** | 132 | 142 | 203 | 190 | 2 | 0.25 | 3.9 | 2.7 | 2.6 | 8.8 |
| | 215 | 76 | 2.1 | 630 000 | 970 000 | 64 500 | 99 000 | 1 300 | 1 700 | **23224CE4** | **23224CKE4** | 132 | 140 | 203 | 182 | 2 | 0.34 | 2.9 | 2.0 | 1.9 | 12.1 |
| | 260 | 86 | 3 | 1190 000 | 1 320 000 | 122 000 | 134 000 | 1 700 | 2 200 | ***22324EAE4** | ***22324EAKE4** | 134 | 157 | 246 | 222 | 2.5 | 0.32 | 3.1 | 2.1 | 2.0 | 22.2 |
| **130** | 200 | 52 | 2 | 400 000 | 655 000 | 40 500 | 67 000 | 1 700 | 2 000 | **23026CDE4** | **23026CDKE4** | 140 | 147 | 190 | 180 | 2 | 0.23 | 4.3 | 2.9 | 2.8 | 5.98 |
| | 200 | 69 | 2 | 495 000 | 865 000 | 50 500 | 88 000 | 1 400 | 1 800 | **24026CE4** | **24026CK30E4** | 140 | 143 | 190 | 175 | 2 | 0.31 | 3.2 | 2.2 | 2.1 | 7.84 |
| | 210 | 64 | 2 | 505 000 | 825 000 | 51 500 | 84 500 | 1 300 | 1 700 | **23126CE4** | **23126CKE4** | 140 | 149 | 200 | 184 | 2 | 0.28 | 3.6 | 2.4 | 2.4 | 8.69 |
| | 210 | 80 | 2 | 590 000 | 1 010 000 | 60 000 | 103 000 | 1 300 | 1 700 | **24126CE4** | **24126CK30E4** | 140 | 146 | 200 | 180 | 2 | 0.35 | 2.9 | 1.9 | 1.9 | 10.7 |
| | 230 | 64 | 3 | 820 000 | 940 000 | 83 500 | 96 000 | 2 200 | 2 600 | ***22226EAE4** | ***22226EAKE4** | 144 | 152 | 216 | 204 | 2.5 | 0.26 | 3.8 | 2.6 | 2.5 | 11 |
| | 230 | 80 | 3 | 700 000 | 1 080 000 | 71 500 | 110 000 | 1 200 | 1 600 | **23226CE4** | **23226CKE4** | 144 | 150 | 216 | 196 | 2.5 | 0.34 | 2.9 | 2.0 | 1.9 | 14.3 |
| | 280 | 93 | 4 | 995 000 | 1 350 000 | 101 000 | 137 000 | 1 300 | 1 600 | **22326CE4** | **22326CKE4** | 148 | 166 | 262 | 236 | 3 | 0.34 | 2.9 | 2.0 | 1.9 | 28.1 |
| **140** | 210 | 53 | 2 | 420 000 | 715 000 | 43 000 | 73 000 | 1 600 | 1 900 | **23028CDE4** | **23028CDKE4** | 150 | 157 | 200 | 190 | 2 | 0.22 | 4.5 | 3.0 | 2.9 | 6.49 |
| | 210 | 69 | 2 | 525 000 | 945 000 | 53 500 | 96 500 | 1 300 | 1 700 | **24028CE4** | **24028CK30E4** | 150 | 154 | 200 | 186 | 2 | 0.29 | 3.4 | 2.3 | 2.2 | 8.37 |
| | 225 | 68 | 2.1 | 580 000 | 945 000 | 59 000 | 96 500 | 1 200 | 1 600 | **23128CE4** | **23128CKE4** | 152 | 158 | 213 | 198 | 2 | 0.28 | 3.6 | 2.4 | 2.3 | 10.5 |
| | 225 | 85 | 2.1 | 670 000 | 1 160 000 | 68 500 | 118 000 | 1 200 | 1 600 | **24128CE4** | **24128CK30E4** | 152 | 156 | 213 | 193 | 2 | 0.35 | 2.9 | 1.9 | 1.9 | 13 |
| | 250 | 68 | 3 | 645 000 | 930 000 | 65 500 | 95 000 | 1 400 | 1 700 | **22228CDE4** | **22228CDKE4** | 154 | 167 | 236 | 219 | 2.5 | 0.25 | 4.0 | 2.7 | 2.6 | 14.5 |
| | 250 | 88 | 3 | 835 000 | 1 300 000 | 85 000 | 133 000 | 1 100 | 1 500 | **23228CE4** | **23228CKE4** | 154 | 163 | 236 | 213 | 2.5 | 0.35 | 2.9 | 1.9 | 1.9 | 18.8 |
| | 300 | 102 | 4 | 1 160 000 | 1 590 000 | 118 000 | 162 000 | 1 200 | 1 500 | **22328CE4** | **22328CKE4** | 158 | 177 | 282 | 253 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 35.4 |
| **150** | 225 | 56 | 2.1 | 470 000 | 815 000 | 48 000 | 83 000 | 1 400 | 1 800 | **23030CDE4** | **23030CDKE4** | 162 | 168 | 213 | 203 | 2 | 0.22 | 4.6 | 3.1 | 3.0 | 7.9 |
| | 225 | 75 | 2.1 | 590 000 | 1 090 000 | 60 500 | 111 000 | 1 200 | 1 500 | **24030CE4** | **24030CK30E4** | 162 | 165 | 213 | 198 | 2 | 0.30 | 3.4 | 2.3 | 2.2 | 10.5 |
| | 250 | 80 | 2.1 | 725 000 | 1 180 000 | 74 000 | 121 000 | 1 100 | 1 400 | **23130CE4** | **23130CKE4** | 162 | 174 | 238 | 218 | 2 | 0.30 | 3.4 | 2.3 | 2.2 | 15.8 |
| | 250 | 100 | 2.1 | 890 000 | 1 530 000 | 91 000 | 156 000 | 1 100 | 1 400 | **24130CE4** | **24130CK30E4** | 162 | 169 | 238 | 212 | 2 | 0.38 | 2.6 | 1.8 | 1.7 | 19.8 |
| | 270 | 73 | 3 | 765 000 | 1 120 000 | 78 000 | 114 000 | 1 300 | 1 600 | **22230CDE4** | **22230CDKE4** | 164 | 179 | 256 | 236 | 2.5 | 0.26 | 3.9 | 2.6 | 2.5 | 18.4 |
| | 270 | 96 | 3 | 975 000 | 1 560 000 | 99 500 | 159 000 | 1 100 | 1 400 | **23230CE4** | **23230CKE4** | 164 | 176 | 256 | 230 | 2.5 | 0.35 | 2.9 | 1.9 | 1.9 | 24.2 |
| | 320 | 108 | 4 | 1 220 000 | 1 690 000 | 125 000 | 172 000 | 1 100 | 1 400 | **22330CAE4** | **22330CAKE4** | 168 | — | 302 | 270 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 41.5 |

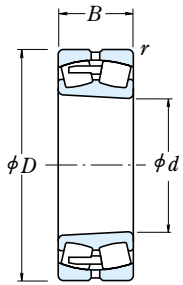
**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).

**Remarks**
1. The bearings denoted by an asterisk (*) are HPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A84 of the NSK Rolling Bearings catalog, in case of HPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B361** – **B362**, and **B367** – **B368**.

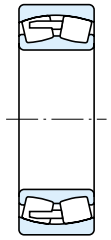
## Bore Diameter 160 – 190 mm



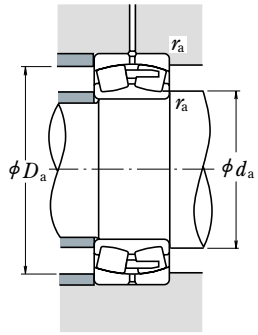

Cylindrical Bore




Tapered Bore



Without an Oil Groove and Holes




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

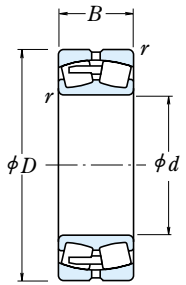
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing | Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore | Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **160** | 220 | 45 | 2 | 360 000 | 675 000 | 37 000 | 69 000 | 1 400 | 1 800 | **23932CAE4** | **23932CAKE4** | 170 | — | 210 | 203 | 2 | 0.18 | 5.6 | 3.8 | 3.7 | 4.97 |
| | 240 | 60 | 2.1 | 540 000 | 955 000 | 55 000 | 97 500 | 1 300 | 1 700 | **23032CDE4** | **23032CDKE4** | 172 | 179 | 228 | 216 | 2 | 0.22 | 4.5 | 3.0 | 2.9 | 9.66 |
| | 240 | 80 | 2.1 | 680 000 | 1 260 000 | 69 000 | 128 000 | 1 100 | 1 400 | **24032CE4** | **24032CK30E4** | 172 | 177 | 228 | 212 | 2 | 0.30 | 3.4 | 2.3 | 2.2 | 12.7 |
| | 270 | 86 | 2.1 | 855 000 | 1 400 000 | 87 000 | 143 000 | 1 000 | 1 300 | **23132CE4** | **23132CKE4** | 172 | 185 | 258 | 234 | 2 | 0.30 | 3.4 | 2.3 | 2.2 | 20.3 |
| | 270 | 109 | 2.1 | 1 040 000 | 1 760 000 | 106 000 | 179 000 | 1 000 | 1 300 | **24132CE4** | **24132CK30E4** | 172 | 179 | 258 | 229 | 2 | 0.39 | 2.6 | 1.7 | 1.7 | 25.4 |
| | 290 | 80 | 3 | 910 000 | 1 320 000 | 93 000 | 135 000 | 1 200 | 1 500 | **22232CDE4** | **22232CDKE4** | 174 | 190 | 276 | 255 | 2.5 | 0.26 | 3.8 | 2.6 | 2.5 | 23.1 |
| | 290 | 104 | 3 | 1 100 000 | 1 770 000 | 112 000 | 180 000 | 1 000 | 1 300 | **23232CE4** | **23232CKE4** | 174 | 189 | 276 | 245 | 2.5 | 0.34 | 2.9 | 2.0 | 1.9 | 30.5 |
| | 340 | 114 | 4 | 1 360 000 | 1 900 000 | 139 000 | 193 000 | 1 100 | 1 300 | **22332CAE4** | **22332CAKE4** | 178 | — | 322 | 287 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 49.3 |
| **170** | 230 | 45 | 2 | 350 000 | 660 000 | 35 500 | 67 500 | 1 400 | 1 800 | **23934BCAE4** | **23934BCAKE4** | 180 | — | 220 | 213 | 2 | 0.17 | 5.8 | 3.9 | 3.8 | 5.38 |
| | 260 | 67 | 2.1 | 640 000 | 1 090 000 | 65 000 | 112 000 | 1 200 | 1 600 | **23034CDE4** | **23034CDKE4** | 182 | 191 | 248 | 233 | 2 | 0.23 | 4.3 | 2.9 | 2.8 | 13 |
| | 260 | 90 | 2.1 | 825 000 | 1 520 000 | 84 000 | 155 000 | 1 000 | 1 300 | **24034CE4** | **24034CK30E4** | 182 | 188 | 248 | 228 | 2 | 0.31 | 3.2 | 2.2 | 2.1 | 17.3 |
| | 280 | 88 | 2.1 | 940 000 | 1 570 000 | 96 000 | 160 000 | 1 000 | 1 300 | **23134CE4** | **23134CKE4** | 182 | 194 | 268 | 245 | 2 | 0.29 | 3.5 | 2.3 | 2.3 | 21.8 |
| | 280 | 109 | 2.1 | 1 080 000 | 1 860 000 | 110 000 | 190 000 | 1 000 | 1 300 | **24134CE4** | **24134CK30E4** | 182 | 190 | 268 | 239 | 2 | 0.37 | 2.7 | 1.8 | 1.8 | 26.6 |
| | 310 | 86 | 4 | 990 000 | 1 500 000 | 101 000 | 153 000 | 1 100 | 1 400 | **22234CDE4** | **22234CDKE4** | 188 | 206 | 292 | 270 | 3 | 0.26 | 3.8 | 2.6 | 2.5 | 28.8 |
| | 310 | 110 | 4 | 1 200 000 | 1 910 000 | 122 000 | 195 000 | 900 | 1 200 | **23234CE4** | **23234CKE4** | 188 | 201 | 292 | 261 | 3 | 0.34 | 2.9 | 2.0 | 1.9 | 36.4 |
| | 360 | 120 | 4 | 1 580 000 | 2 110 000 | 161 000 | 215 000 | 1 000 | 1 200 | **22334CAE4** | **22334CAKE4** | 188 | — | 342 | 304 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 57.9 |
| **180** | 250 | 52 | 2 | 470 000 | 890 000 | 48 000 | 90 500 | 1 200 | 1 600 | **23936CAE4** | **23936CAKE4** | 190 | — | 240 | 230 | 2 | 0.18 | 5.5 | 3.7 | 3.6 | 7.64 |
| | 280 | 74 | 2.1 | 750 000 | 1 270 000 | 76 000 | 129 000 | 1 200 | 1 400 | **23036CDE4** | **23036CDKE4** | 192 | 202 | 268 | 249 | 2 | 0.24 | 4.2 | 2.8 | 2.8 | 17.1 |
| | 280 | 100 | 2.1 | 965 000 | 1 750 000 | 98 500 | 178 000 | 950 | 1 200 | **24036CE4** | **24036CK30E4** | 192 | 200 | 268 | 245 | 2 | 0.32 | 3.1 | 2.1 | 2.0 | 22.7 |
| | 300 | 96 | 3 | 1 050 000 | 1 760 000 | 108 000 | 180 000 | 900 | 1 200 | **23136CE4** | **23136CKE4** | 194 | 206 | 286 | 260 | 2.5 | 0.30 | 3.4 | 2.3 | 2.2 | 27.5 |
| | 300 | 118 | 3 | 1 190 000 | 2 040 000 | 121 000 | 208 000 | 900 | 1 200 | **24136CE4** | **24136CK30E4** | 194 | 202 | 286 | 255 | 2.5 | 0.37 | 2.7 | 1.8 | 1.8 | 33.1 |
| | 320 | 86 | 4 | 1 020 000 | 1 540 000 | 104 000 | 157 000 | 1 100 | 1 300 | **22236CDE4** | **22236CDKE4** | 198 | 212 | 302 | 278 | 3 | 0.26 | 3.9 | 2.6 | 2.6 | 30.2 |
| | 320 | 112 | 4 | 1 300 000 | 2 110 000 | 133 000 | 215 000 | 850 | 1 100 | **23236CE4** | **23236CKE4** | 198 | 211 | 302 | 274 | 3 | 0.33 | 3.0 | 2.0 | 2.0 | 38.9 |
| | 380 | 126 | 4 | 1 740 000 | 2 340 000 | 177 000 | 238 000 | 950 | 1 200 | **22336CAE4** | **22336CAKE4** | 198 | — | 362 | 322 | 3 | 0.34 | 2.9 | 2.0 | 1.9 | 67 |
| **190** | 260 | 52 | 2 | 460 000 | 875 000 | 47 000 | 89 500 | 1 200 | 1 500 | **23938CAE4** | **23938CAKE4** | 200 | — | 250 | 240 | 2 | 0.18 | 5.7 | 3.8 | 3.7 | 8.03 |
| | 290 | 75 | 2.1 | 775 000 | 1 350 000 | 79 000 | 138 000 | 1 100 | 1 400 | **23038CAE4** | **23038CAKE4** | 202 | — | 278 | 261 | 2 | 0.24 | 4.2 | 2.8 | 2.8 | 17.6 |
| | 290 | 100 | 2.1 | 975 000 | 1 840 000 | 99 500 | 188 000 | 900 | 1 200 | **24038CE4** | **24038CK30E4** | 202 | 210 | 278 | 253 | 2 | 0.31 | 3.2 | 2.2 | 2.1 | 24 |
| | 320 | 104 | 3 | 1 190 000 | 2 020 000 | 121 000 | 206 000 | 850 | 1 100 | **23138CE4** | **23138CKE4** | 204 | 219 | 306 | 276 | 2.5 | 0.31 | 3.3 | 2.2 | 2.2 | 34.5 |
| | 320 | 128 | 3 | 1 370 000 | 2 330 000 | 140 000 | 238 000 | 850 | 1 100 | **24138CE4** | **24138CK30E4** | 204 | 211 | 306 | 269 | 2.5 | 0.40 | 2.5 | 1.7 | 1.6 | 41.5 |
| | 340 | 92 | 4 | 1 140 000 | 1 730 000 | 116 000 | 176 000 | 1 000 | 1 200 | **22238CAE4** | **22238CAKE4** | 208 | — | 322 | 296 | 3 | 0.26 | 3.8 | 2.6 | 2.5 | 35.5 |
| | 340 | 120 | 4 | 1 440 000 | 2 350 000 | 147 000 | 240 000 | 800 | 1 100 | **23238CE4** | **23238CKE4** | 208 | 222 | 322 | 288 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 47.6 |
| | 400 | 132 | 5 | 1 890 000 | 2 590 000 | 193 000 | 264 000 | 900 | 1 100 | **22338CAE4** | **22338CAKE4** | 212 | — | 378 | 338 | 4 | 0.34 | 2.9 | 2.0 | 1.9 | 77.6 |

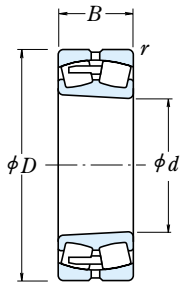
**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).

**Remarks** For the dimensions of adapters and withdrawal sleeves, refer to Pages **B362** and **B368**.

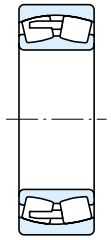
## Bore Diameter 200 – 260 mm




Cylindrical Bore



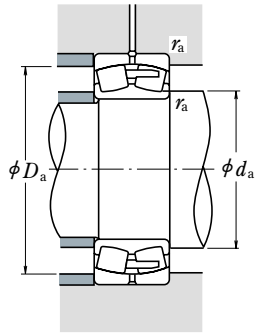

Tapered Bore



Without an Oil Groove and Holes

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **200** | 280 | 60 | 2.1 | 570 000 | 1 060 000 | 58 000 | 108 000 | 1 100 | 1 400 | **23940CAE4** |
| | 310 | 82 | 2.1 | 940 000 | 1 700 000 | 96 000 | 174 000 | 1 000 | 1 300 | **23040CAE4** |
| | 310 | 109 | 2.1 | 1 140 000 | 2 120 000 | 116 000 | 216 000 | 850 | 1 100 | **24040CE4** |
| | 340 | 112 | 3 | 1 360 000 | 2 330 000 | 139 000 | 238 000 | 800 | 1 000 | **23140CE4** |
| | 340 | 140 | 3 | 1 570 000 | 2 670 000 | 160 000 | 272 000 | 800 | 1 000 | **24140CE4** |
| | 360 | 98 | 4 | 1 300 000 | 2 010 000 | 133 000 | 204 000 | 950 | 1 200 | **22240CAE4** |
| | 360 | 128 | 4 | 1 660 000 | 2 750 000 | 169 000 | 281 000 | 750 | 1 000 | **23240CE4** |
| | 420 | 138 | 5 | 2 000 000 | 2 990 000 | 204 000 | 305 000 | 850 | 1 000 | **22340CAE4** |
| **220** | 300 | 60 | 2.1 | 625 000 | 1 240 000 | 64 000 | 126 000 | 1 000 | 1 300 | **23944CAE4** |
| | 340 | 90 | 3 | 1 090 000 | 1 980 000 | 111 000 | 202 000 | 950 | 1 200 | **23044CAE4** |
| | 340 | 118 | 3 | 1 360 000 | 2 600 000 | 138 000 | 265 000 | 750 | 1 000 | **24044CE4** |
| | 370 | 120 | 4 | 1 570 000 | 2 710 000 | 160 000 | 276 000 | 710 | 950 | **23144CE4** |
| | 370 | 150 | 4 | 1 800 000 | 3 200 000 | 183 000 | 325 000 | 710 | 950 | **24144CE4** |
| | 400 | 108 | 4 | 1 570 000 | 2 430 000 | 160 000 | 247 000 | 850 | 1 000 | **22244CAE4** |
| | 400 | 144 | 4 | 2 020 000 | 3 400 000 | 206 000 | 350 000 | 670 | 900 | **23244CE4** |
| | 460 | 145 | 5 | 2 350 000 | 3 400 000 | 240 000 | 345 000 | 750 | 950 | **22344CAE4** |
| **240** | 320 | 60 | 2.1 | 635 000 | 1 300 000 | 65 000 | 133 000 | 950 | 1 200 | **23948CAE4** |
| | 360 | 92 | 3 | 1 160 000 | 2 140 000 | 118 000 | 218 000 | 850 | 1 100 | **23048CAE4** |
| | 360 | 118 | 3 | 1 390 000 | 2 730 000 | 141 000 | 278 000 | 710 | 950 | **24048CE4** |
| | 400 | 128 | 4 | 1 790 000 | 3 100 000 | 182 000 | 320 000 | 670 | 850 | **23148CE4** |
| | 400 | 160 | 4 | 2 130 000 | 3 800 000 | 217 000 | 385 000 | 670 | 850 | **24148CE4** |
| | 440 | 120 | 4 | 1 870 000 | 2 890 000 | 191 000 | 294 000 | 750 | 950 | **22248CAE4** |
| | 440 | 160 | 4 | 2 440 000 | 4 050 000 | 249 000 | 415 000 | 630 | 800 | **23248CAE4** |
| | 500 | 155 | 5 | 2 600 000 | 3 800 000 | 265 000 | 385 000 | 670 | 850 | **22348CAE4** |
| **260** | 360 | 75 | 2.1 | 930 000 | 1 870 000 | 95 000 | 191 000 | 850 | 1 000 | **23952CAE4** |
| | 400 | 104 | 4 | 1 430 000 | 2 580 000 | 145 000 | 263 000 | 800 | 950 | **23052CAE4** |
| | 400 | 140 | 4 | 1 810 000 | 3 500 000 | 185 000 | 360 000 | 630 | 850 | **24052CAE4** |
| | 440 | 144 | 4 | 2 160 000 | 3 750 000 | 221 000 | 385 000 | 600 | 800 | **23152CAE4** |
| | 440 | 180 | 4 | 2 560 000 | 4 700 000 | 261 000 | 480 000 | 600 | 800 | **24152CAE4** |
| | 480 | 130 | 5 | 2 180 000 | 3 400 000 | 222 000 | 345 000 | 670 | 850 | **22252CAE4** |
| | 480 | 174 | 5 | 2 740 000 | 4 550 000 | 279 000 | 460 000 | 560 | 750 | **23252CAE4** |
| | 540 | 165 | 6 | 3 100 000 | 4 600 000 | 320 000 | 470 000 | 630 | 800 | **22352CAE4** |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

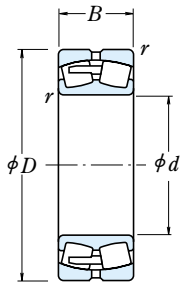
$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

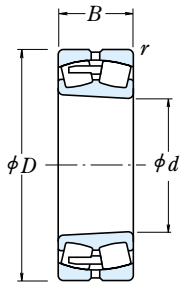
| Numbers | Abutment and Fillet Dimensions (mm) | | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $d_a$ max. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **23940CAKE4** | 212 | — | 268 | 258 | 2 | 0.20 | 5.1 | 3.4 | 3.3 | 11 |
| **23040CAKE4** | 212 | — | 298 | 279 | 2 | 0.25 | 4.0 | 2.7 | 2.6 | 22.6 |
| **24040CK30E4** | 212 | 223 | 298 | 271 | 2 | 0.32 | 3.1 | 2.1 | 2.0 | 30.4 |
| **23140CKE4** | 214 | 232 | 326 | 293 | 2.5 | 0.31 | 3.2 | 2.2 | 2.1 | 42.7 |
| **24140CK30E4** | 214 | 226 | 326 | 290 | 2.5 | 0.39 | 2.6 | 1.8 | 1.7 | 51.3 |
| **22240CAKE4** | 218 | — | 342 | 315 | 3 | 0.26 | 3.8 | 2.6 | 2.5 | 42.6 |
| **23240CKE4** | 218 | 237 | 342 | 307 | 3 | 0.34 | 2.9 | 2.0 | 1.9 | 57.1 |
| **22340CAKE4** | 222 | — | 398 | 352 | 4 | 0.34 | 2.9 | 2.0 | 1.9 | 92.6 |
| **23944CAKE4** | 232 | — | 288 | 278 | 2 | 0.18 | 5.7 | 3.8 | 3.7 | 12.2 |
| **23044CAKE4** | 234 | — | 326 | 302 | 2.5 | 0.24 | 4.1 | 2.8 | 2.7 | 29.7 |
| **24044CK30E4** | 234 | 244 | 326 | 296 | 2.5 | 0.31 | 3.2 | 2.1 | 2.1 | 40.5 |
| **23144CKE4** | 238 | 254 | 352 | 320 | 3 | 0.30 | 3.3 | 2.2 | 2.2 | 53 |
| **24144CK30E4** | 238 | 248 | 352 | 313 | 3 | 0.39 | 2.6 | 1.7 | 1.7 | 66.7 |
| **22244CAKE4** | 238 | — | 382 | 348 | 3 | 0.27 | 3.7 | 2.5 | 2.4 | 59 |
| **23244CKE4** | 238 | 260 | 382 | 337 | 3 | 0.35 | 2.9 | 1.9 | 1.9 | 80.4 |
| **22344CAKE4** | 242 | — | 438 | 391 | 4 | 0.33 | 3.0 | 2.0 | 2.0 | 116 |
| **23948CAKE4** | 252 | — | 308 | 298 | 2 | 0.17 | 6.0 | 4.0 | 3.9 | 13.3 |
| **23048CAKE4** | 254 | — | 346 | 324 | 2.5 | 0.24 | 4.2 | 2.8 | 2.7 | 32.6 |
| **24048CK30E4** | 254 | 265 | 346 | 317 | 2.5 | 0.29 | 3.4 | 2.3 | 2.2 | 43.4 |
| **23148CKE4** | 258 | 275 | 382 | 347 | 3 | 0.30 | 3.3 | 2.2 | 2.2 | 66.9 |
| **24148CK30E4** | 258 | 268 | 382 | 341 | 3 | 0.38 | 2.7 | 1.8 | 1.8 | 79.5 |
| **22248CAKE4** | 258 | — | 422 | 383 | 3 | 0.27 | 3.7 | 2.5 | 2.4 | 80.2 |
| **23248CAKE4** | 258 | — | 422 | 372 | 3 | 0.37 | 2.7 | 1.8 | 1.8 | 106 |
| **22348CAKE4** | 262 | — | 478 | 423 | 4 | 0.32 | 3.2 | 2.1 | 2.1 | 147 |
| **23952CAKE4** | 272 | — | 348 | 333 | 2 | 0.19 | 5.4 | 3.6 | 3.5 | 23 |
| **23052CAKE4** | 278 | — | 382 | 356 | 3 | 0.25 | 4.1 | 2.7 | 2.7 | 46.6 |
| **24052CAK30E4** | 278 | — | 382 | 348 | 3 | 0.32 | 3.1 | 2.1 | 2.1 | 62.6 |
| **23152CAKE4** | 278 | — | 422 | 380 | 3 | 0.32 | 3.2 | 2.1 | 2.1 | 88.2 |
| **24152CAK30E4** | 278 | — | 422 | 371 | 3 | 0.39 | 2.6 | 1.7 | 1.7 | 109 |
| **22252CAKE4** | 282 | — | 458 | 418 | 4 | 0.27 | 3.7 | 2.5 | 2.5 | 104 |
| **23252CAKE4** | 282 | — | 458 | 406 | 4 | 0.37 | 2.7 | 1.8 | 1.8 | 137 |
| **22352CAKE4** | 288 | — | 512 | 462 | 5 | 0.32 | 3.2 | 2.1 | 2.1 | 180 |

**Remarks** For the dimensions of adapters and withdrawal sleeves, refer to Pages **B363** and **B369**.

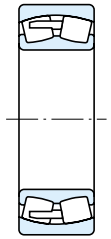
## Bore Diameter 280 – 340 mm




Cylindrical Bore



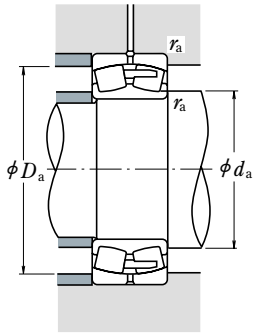

Tapered Bore



Without an Oil Groove and Holes

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **280** | 380 | 75 | 2.1 | 925 000 | 1 950 000 | 94 500 | 199 000 | 800 | 950 | **23956CAE4** |
| | 420 | 106 | 4 | 1 540 000 | 2 950 000 | 157 000 | 300 000 | 710 | 900 | **23056CAE4** |
| | 420 | 140 | 4 | 1 880 000 | 3 800 000 | 191 000 | 385 000 | 600 | 800 | **24056CAE4** |
| | 460 | 146 | 5 | 2 230 000 | 4 000 000 | 228 000 | 410 000 | 560 | 750 | **23156CAE4** |
| | 460 | 180 | 5 | 2 640 000 | 5 000 000 | 269 000 | 505 000 | 560 | 750 | **24156CAE4** |
| | 500 | 130 | 5 | 2 280 000 | 3 650 000 | 233 000 | 370 000 | 630 | 800 | **22256CAE4** |
| | 500 | 176 | 5 | 2 880 000 | 4 900 000 | 294 000 | 500 000 | 530 | 670 | **23256CAE4** |
| | 580 | 175 | 6 | 3 500 000 | 5 150 000 | 355 000 | 525 000 | 560 | 710 | **22356CAE4** |
| **300** | 420 | 90 | 3 | 1 230 000 | 2 490 000 | 125 000 | 254 000 | 710 | 900 | **23960CAE4** |
| | 460 | 118 | 4 | 1 920 000 | 3 700 000 | 196 000 | 375 000 | 670 | 850 | **23060CAE4** |
| | 460 | 160 | 4 | 2 310 000 | 4 600 000 | 235 000 | 470 000 | 530 | 710 | **24060CAE4** |
| | 500 | 160 | 5 | 2 670 000 | 4 800 000 | 273 000 | 490 000 | 500 | 670 | **23160CAE4** |
| | 500 | 200 | 5 | 3 100 000 | 5 800 000 | 315 000 | 595 000 | 500 | 670 | **24160CAE4** |
| | 540 | 140 | 5 | 2 610 000 | 4 250 000 | 266 000 | 430 000 | 600 | 750 | **22260CAE4** |
| | 540 | 192 | 5 | 3 400 000 | 5 900 000 | 350 000 | 600 000 | 480 | 630 | **23260CAE4** |
| **320** | 440 | 90 | 3 | 1 300 000 | 2 750 000 | 132 000 | 281 000 | 670 | 850 | **23964CAE4** |
| | 480 | 121 | 4 | 1 960 000 | 3 850 000 | 200 000 | 395 000 | 630 | 800 | **23064CAE4** |
| | 480 | 160 | 4 | 2 440 000 | 5 050 000 | 249 000 | 515 000 | 500 | 670 | **24064CAE4** |
| | 540 | 176 | 5 | 3 050 000 | 5 500 000 | 315 000 | 560 000 | 480 | 600 | **23164CAE4** |
| | 540 | 218 | 5 | 3 550 000 | 6 650 000 | 360 000 | 675 000 | 480 | 600 | **24164CAE4** |
| | 580 | 150 | 5 | 2 990 000 | 4 850 000 | 305 000 | 495 000 | 530 | 670 | **22264CAE4** |
| | 580 | 208 | 5 | 3 900 000 | 6 900 000 | 395 000 | 700 000 | 450 | 600 | **23264CAE4** |
| **340** | 460 | 90 | 3 | 1 330 000 | 2 840 000 | 136 000 | 289 000 | 630 | 800 | **23968CAE4** |
| | 520 | 133 | 5 | 2 280 000 | 4 400 000 | 232 000 | 445 000 | 560 | 710 | **23068CAE4** |
| | 520 | 180 | 5 | 2 920 000 | 6 050 000 | 298 000 | 615 000 | 480 | 600 | **24068CAE4** |
| | 580 | 190 | 5 | 3 600 000 | 6 600 000 | 370 000 | 670 000 | 430 | 560 | **23168CAE4** |
| | 580 | 243 | 5 | 4 250 000 | 7 900 000 | 430 000 | 810 000 | 430 | 560 | **24168CAE4** |
| | 620 | 224 | 6 | 4 400 000 | 7 800 000 | 450 000 | 795 000 | 400 | 530 | **23268CAE4** |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

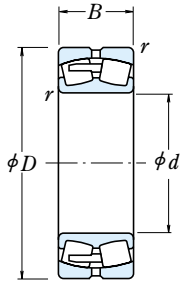
$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

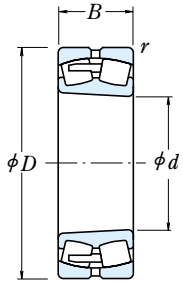
| Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **23956CAKE4** | 292 | 368 | 351 | 2 | 0.18 | 5.7 | 3.9 | 3.8 | 24.5 |
| **23056CAKE4** | 298 | 402 | 377 | 3 | 0.24 | 4.2 | 2.8 | 2.7 | 50.5 |
| **24056CAK30E4** | 298 | 402 | 369 | 3 | 0.31 | 3.3 | 2.2 | 2.2 | 66.4 |
| **23156CAKE4** | 302 | 438 | 400 | 4 | 0.30 | 3.3 | 2.2 | 2.2 | 94.3 |
| **24156CAK30E4** | 302 | 438 | 392 | 4 | 0.37 | 2.7 | 1.8 | 1.8 | 115 |
| **22256CAKE4** | 302 | 478 | 439 | 4 | 0.25 | 4.0 | 2.7 | 2.6 | 110 |
| **23256CAKE4** | 302 | 478 | 425 | 4 | 0.35 | 2.9 | 1.9 | 1.9 | 147 |
| **22356CAKE4** | 308 | 552 | 496 | 5 | 0.31 | 3.2 | 2.1 | 2.1 | 221 |
| **23960CAKE4** | 314 | 406 | 386 | 2.5 | 0.19 | 5.2 | 3.5 | 3.4 | 38.2 |
| **23060CAKE4** | 318 | 442 | 413 | 3 | 0.24 | 4.2 | 2.8 | 2.7 | 70.5 |
| **24060CAK30E4** | 318 | 442 | 400 | 3 | 0.32 | 3.1 | 2.1 | 2.0 | 93.6 |
| **23160CAKE4** | 322 | 478 | 433 | 4 | 0.31 | 3.3 | 2.2 | 2.2 | 125 |
| **24160CAK30E4** | 322 | 478 | 423 | 4 | 0.38 | 2.6 | 1.8 | 1.7 | 152 |
| **22260CAKE4** | 322 | 518 | 473 | 4 | 0.25 | 4.0 | 2.7 | 2.6 | 139 |
| **23260CAKE4** | 322 | 518 | 458 | 4 | 0.35 | 2.9 | 1.9 | 1.9 | 189 |
| **23964CAKE4** | 334 | 426 | 406 | 2.5 | 0.18 | 5.5 | 3.7 | 3.6 | 40.6 |
| **23064CAKE4** | 338 | 462 | 432 | 3 | 0.24 | 4.2 | 2.8 | 2.8 | 75.6 |
| **24064CAK30E4** | 338 | 462 | 422 | 3 | 0.31 | 3.3 | 2.2 | 2.2 | 99.7 |
| **23164CAKE4** | 342 | 518 | 466 | 4 | 0.31 | 3.2 | 2.1 | 2.1 | 162 |
| **24164CAK30E4** | 342 | 518 | 456 | 4 | 0.39 | 2.6 | 1.7 | 1.7 | 196 |
| **22264CAKE4** | 342 | 558 | 508 | 4 | 0.26 | 3.9 | 2.6 | 2.6 | 174 |
| **23264CAKE4** | 342 | 558 | 488 | 4 | 0.36 | 2.8 | 1.9 | 1.8 | 239 |
| **23968CAKE4** | 354 | 446 | 427 | 2.5 | 0.18 | 5.7 | 3.8 | 3.7 | 42.4 |
| **23068CAKE4** | 362 | 498 | 465 | 4 | 0.24 | 4.2 | 2.8 | 2.8 | 101 |
| **24068CAK30E4** | 362 | 498 | 454 | 4 | 0.32 | 3.2 | 2.1 | 2.1 | 135 |
| **23168CAKE4** | 362 | 558 | 499 | 4 | 0.31 | 3.2 | 2.1 | 2.1 | 206 |
| **24168CAK30E4** | 362 | 558 | 489 | 4 | 0.40 | 2.5 | 1.7 | 1.7 | 257 |
| **23268CAKE4** | 368 | 592 | 521 | 5 | 0.36 | 2.8 | 1.9 | 1.8 | 295 |

**Remarks** For the dimensions of adapters and withdrawal sleeves, refer to Pages **B363** – **B364**, and **B369** – **B370**.

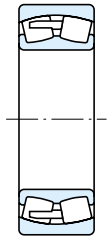
## Bore Diameter 360 – 440 mm




Cylindrical Bore



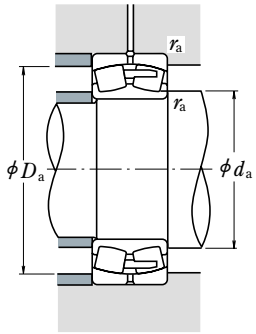

Tapered Bore



Without an Oil Groove and Holes

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **360** | 480 | 90 | 3 | 1 390 000 | 3 050 000 | 142 000 | 315 000 | 600 | 750 | **23972CAE4** |
| | 540 | 134 | 5 | 2 390 000 | 4 700 000 | 244 000 | 480 000 | 530 | 670 | **23072CAE4** |
| | 540 | 180 | 5 | 2 930 000 | 6 100 000 | 299 000 | 625 000 | 450 | 600 | **24072CAE4** |
| | 600 | 192 | 5 | 3 800 000 | 7 100 000 | 390 000 | 725 000 | 400 | 530 | **23172CAE4** |
| | 600 | 243 | 5 | 4 200 000 | 8 000 000 | 430 000 | 815 000 | 400 | 530 | **24172CAE4** |
| | 650 | 232 | 6 | 4 800 000 | 8 550 000 | 490 000 | 870 000 | 380 | 500 | **23272CAE4** |
| **380** | 520 | 106 | 4 | 1 870 000 | 4 100 000 | 190 000 | 420 000 | 530 | 670 | **23976CAE4** |
| | 560 | 135 | 5 | 2 500 000 | 5 100 000 | 255 000 | 520 000 | 530 | 630 | **23076CAE4** |
| | 560 | 180 | 5 | 3 050 000 | 6 600 000 | 315 000 | 670 000 | 430 | 560 | **24076CAE4** |
| | 620 | 194 | 5 | 4 000 000 | 7 600 000 | 405 000 | 775 000 | 400 | 500 | **23176CAE4** |
| | 620 | 243 | 5 | 4 350 000 | 8 450 000 | 440 000 | 865 000 | 400 | 500 | **24176CAE4** |
| | 680 | 240 | 6 | 5 150 000 | 9 200 000 | 525 000 | 940 000 | 360 | 480 | **23276CAE4** |
| **400** | 540 | 106 | 4 | 1 890 000 | 4 250 000 | 193 000 | 435 000 | 530 | 630 | **23980CAE4** |
| | 600 | 148 | 5 | 2 970 000 | 5 900 000 | 305 000 | 605 000 | 480 | 600 | **23080CAE4** |
| | 600 | 200 | 5 | 3 600 000 | 7 600 000 | 370 000 | 775 000 | 400 | 500 | **24080CAE4** |
| | 650 | 200 | 6 | 4 150 000 | 7 900 000 | 420 000 | 805 000 | 380 | 480 | **23180CAE4** |
| | 650 | 250 | 6 | 4 950 000 | 10 100 000 | 505 000 | 1 030 000 | 380 | 480 | **24180CAE4** |
| | 720 | 256 | 6 | 5 800 000 | 10 400 000 | 590 000 | 1 060 000 | 340 | 450 | **23280CAE4** |
| **420** | 560 | 106 | 4 | 1 870 000 | 4 250 000 | 191 000 | 430 000 | 500 | 600 | **23984CAE4** |
| | 620 | 150 | 5 | 2 910 000 | 5 850 000 | 297 000 | 595 000 | 450 | 560 | **23084CAE4** |
| | 620 | 200 | 5 | 3 750 000 | 8 100 000 | 380 000 | 825 000 | 380 | 480 | **24084CAE4** |
| | 700 | 224 | 6 | 5 000 000 | 9 400 000 | 510 000 | 960 000 | 340 | 450 | **23184CAE4** |
| | 700 | 280 | 6 | 6 000 000 | 12 000 000 | 610 000 | 1 220 000 | 340 | 450 | **24184CAE4** |
| | 760 | 272 | 7.5 | 6 450 000 | 11 700 000 | 660 000 | 1 190 000 | 320 | 430 | **23284CAE4** |
| **440** | 600 | 118 | 4 | 2 190 000 | 4 800 000 | 223 000 | 490 000 | 450 | 560 | **23988CAE4** |
| | 650 | 157 | 6 | 3 150 000 | 6 350 000 | 320 000 | 645 000 | 430 | 530 | **23088CAE4** |
| | 650 | 212 | 6 | 4 150 000 | 9 100 000 | 425 000 | 930 000 | 360 | 450 | **24088CAE4** |
| | 720 | 226 | 6 | 5 300 000 | 10 300 000 | 540 000 | 1 060 000 | 320 | 430 | **23188CAE4** |
| | 720 | 280 | 6 | 6 000 000 | 12 100 000 | 610 000 | 1 230 000 | 320 | 430 | **24188CAE4** |
| | 790 | 280 | 7.5 | 6 900 000 | 12 800 000 | 705 000 | 1 300 000 | 300 | 400 | **23288CAE4** |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

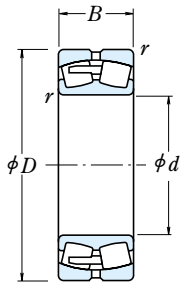
$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

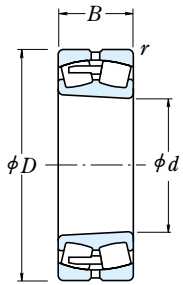
| Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **23972CAKE4** | 374 | 466 | 447 | 2.5 | 0.17 | 6.0 | 4.1 | 4.0 | 44.7 |
| **23072CAKE4** | 382 | 518 | 485 | 4 | 0.24 | 4.2 | 2.8 | 2.8 | 106 |
| **24072CAK30E4** | 382 | 518 | 476 | 4 | 0.32 | 3.2 | 2.1 | 2.1 | 139 |
| **23172CAKE4** | 382 | 578 | 520 | 4 | 0.31 | 3.2 | 2.2 | 2.1 | 217 |
| **24172CAK30E4** | 382 | 578 | 507 | 4 | 0.40 | 2.5 | 1.7 | 1.7 | 264 |
| **23272CAKE4** | 388 | 622 | 549 | 5 | 0.36 | 2.8 | 1.9 | 1.8 | 342 |
| **23976CAKE4** | 398 | 502 | 482 | 3 | 0.18 | 5.5 | 3.7 | 3.6 | 65.4 |
| **23076CAKE4** | 402 | 538 | 506 | 4 | 0.22 | 4.5 | 3.0 | 3.0 | 113 |
| **24076CAK30E4** | 402 | 538 | 496 | 4 | 0.29 | 3.4 | 2.3 | 2.3 | 148 |
| **23176CAKE4** | 402 | 598 | 540 | 4 | 0.30 | 3.3 | 2.2 | 2.2 | 229 |
| **24176CAK30E4** | 402 | 598 | 529 | 4 | 0.38 | 2.6 | 1.8 | 1.7 | 275 |
| **23276CAKE4** | 408 | 652 | 578 | 5 | 0.35 | 2.9 | 1.9 | 1.9 | 372 |
| **23980CAKE4** | 418 | 522 | 501 | 3 | 0.18 | 5.7 | 3.9 | 3.8 | 69.1 |
| **23080CAKE4** | 422 | 578 | 540 | 4 | 0.23 | 4.4 | 3.0 | 2.9 | 146 |
| **24080CAK30E4** | 422 | 578 | 527 | 4 | 0.31 | 3.3 | 2.2 | 2.2 | 193 |
| **23180CAKE4** | 428 | 622 | 569 | 5 | 0.29 | 3.4 | 2.3 | 2.3 | 257 |
| **24180CAK30E4** | 428 | 622 | 551 | 5 | 0.37 | 2.7 | 1.8 | 1.8 | 316 |
| **23280CAKE4** | 428 | 692 | 610 | 5 | 0.36 | 2.8 | 1.9 | 1.9 | 449 |
| **23984CAKE4** | 438 | 542 | 521 | 3 | 0.17 | 6.0 | 4.0 | 3.9 | 71.6 |
| **23084CAKE4** | 442 | 598 | 562 | 4 | 0.23 | 4.3 | 2.9 | 2.8 | 151 |
| **24084CAK30E4** | 442 | 598 | 549 | 4 | 0.31 | 3.2 | 2.2 | 2.1 | 199 |
| **23184CAKE4** | 448 | 672 | 607 | 5 | 0.31 | 3.3 | 2.2 | 2.2 | 341 |
| **24184CAK30E4** | 448 | 672 | 598 | 5 | 0.38 | 2.6 | 1.8 | 1.7 | 421 |
| **23284CAKE4** | 456 | 724 | 644 | 6 | 0.35 | 2.9 | 1.9 | 1.9 | 534 |
| **23988CAKE4** | 458 | 582 | 555 | 3 | 0.18 | 5.7 | 3.9 | 3.8 | 96.3 |
| **23088CAKE4** | 468 | 622 | 587 | 5 | 0.23 | 4.3 | 2.9 | 2.8 | 173 |
| **24088CAK30E4** | 468 | 622 | 576 | 5 | 0.31 | 3.2 | 2.1 | 2.1 | 237 |
| **23188CAKE4** | 468 | 692 | 627 | 5 | 0.3 | 3.3 | 2.2 | 2.2 | 360 |
| **24188CAK30E4** | 468 | 692 | 617 | 5 | 0.37 | 2.7 | 1.8 | 1.8 | 433 |
| **23288CAKE4** | 476 | 754 | 669 | 6 | 0.35 | 2.9 | 1.9 | 1.9 | 594 |

**Remarks** For the dimensions of adapters and withdrawal sleeves, refer to Pages **B364**, and **B370** – **B371**.

## Bore Diameter 460 – 560 mm




Cylindrical Bore

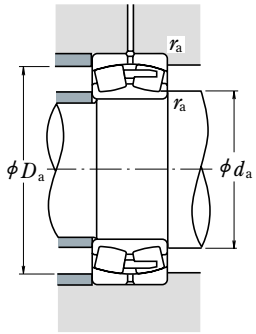



Tapered Bore

Without an Oil Groove and Holes

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **460** | 620 | 118 | 4 | 2 220 000 | 4 950 000 | 227 000 | 505 000 | 430 | 530 | **23992CAE4** |
| | 680 | 163 | 6 | 3 450 000 | 7 100 000 | 355 000 | 725 000 | 400 | 500 | **23092CAE4** |
| | 680 | 218 | 6 | 4 500 000 | 9 950 000 | 460 000 | 1 010 000 | 340 | 430 | **24092CAE4** |
| | 760 | 240 | 7.5 | 5 700 000 | 10 900 000 | 580 000 | 1 110 000 | 300 | 400 | **23192CAE4** |
| | 760 | 300 | 7.5 | 6 300 000 | 12 400 000 | 640 000 | 1 270 000 | 300 | 400 | **24192CAE4** |
| | 830 | 296 | 7.5 | 7 350 000 | 13 700 000 | 750 000 | 1 400 000 | 280 | 380 | **23292CAE4** |
| **480** | 650 | 128 | 5 | 2 580 000 | 5 850 000 | 263 000 | 595 000 | 400 | 500 | **23996CAE4** |
| | 700 | 165 | 6 | 3 800 000 | 7 950 000 | 385 000 | 810 000 | 400 | 480 | **23096CAE4** |
| | 700 | 218 | 6 | 4 600 000 | 10 200 000 | 470 000 | 1 040 000 | 320 | 430 | **24096CAE4** |
| | 790 | 248 | 7.5 | 6 050 000 | 11 700 000 | 620 000 | 1 200 000 | 300 | 380 | **23196CAE4** |
| | 790 | 308 | 7.5 | 7 150 000 | 14 600 000 | 730 000 | 1 490 000 | 300 | 380 | **24196CAE4** |
| | 870 | 310 | 7.5 | 7 850 000 | 14 400 000 | 805 000 | 1 470 000 | 260 | 360 | **23296CAE4** |
| **500** | 670 | 128 | 5 | 2 460 000 | 5 550 000 | 250 000 | 565 000 | 400 | 500 | **239/500CAE4** |
| | 720 | 167 | 6 | 3 750 000 | 8 100 000 | 385 000 | 825 000 | 380 | 480 | **230/500CAE4** |
| | 720 | 218 | 6 | 4 450 000 | 9 900 000 | 450 000 | 1 010 000 | 300 | 400 | **240/500CAE4** |
| | 830 | 264 | 7.5 | 6 850 000 | 13 400 000 | 700 000 | 1 360 000 | 280 | 360 | **231/500CAE4** |
| | 830 | 325 | 7.5 | 8 000 000 | 16 000 000 | 815 000 | 1 630 000 | 280 | 360 | **241/500CAE4** |
| | 920 | 336 | 7.5 | 9 000 000 | 16 600 000 | 915 000 | 1 690 000 | 260 | 320 | **232/500CAE4** |
| **530** | 710 | 136 | 5 | 2 930 000 | 6 800 000 | 299 000 | 695 000 | 360 | 450 | **239/530CAE4** |
| | 780 | 185 | 6 | 4 400 000 | 9 200 000 | 450 000 | 940 000 | 340 | 430 | **230/530CAE4** |
| | 780 | 250 | 6 | 5 400 000 | 11 800 000 | 550 000 | 1 210 000 | 280 | 360 | **240/530CAE4** |
| | 870 | 272 | 7.5 | 7 150 000 | 14 100 000 | 730 000 | 1 440 000 | 260 | 340 | **231/530CAE4** |
| | 870 | 335 | 7.5 | 8 500 000 | 17 500 000 | 870 000 | 1 790 000 | 260 | 340 | **241/530CAE4** |
| | 980 | 355 | 9.5 | 10 100 000 | 18 800 000 | 1 030 000 | 1 920 000 | 240 | 300 | **232/530CAE4** |
| **560** | 750 | 140 | 5 | 3 100 000 | 7 250 000 | 320 000 | 740 000 | 340 | 430 | **239/560CAE4** |
| | 820 | 195 | 6 | 5 000 000 | 10 700 000 | 510 000 | 1 090 000 | 320 | 400 | **230/560CAE4** |
| | 820 | 258 | 6 | 5 950 000 | 13 300 000 | 605 000 | 1 360 000 | 260 | 340 | **240/560CAE4** |
| | 920 | 280 | 7.5 | 7 850 000 | 15 500 000 | 800 000 | 1 580 000 | 240 | 320 | **231/560CAE4** |
| | 920 | 355 | 7.5 | 9 400 000 | 19 600 000 | 960 000 | 2 000 000 | 240 | 320 | **241/560CAE4** |
| | 1 030 | 365 | 9.5 | 10 900 000 | 20 500 000 | 1 110 000 | 2 090 000 | 220 | 280 | **232/560CAE4** |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

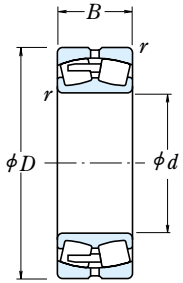
$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

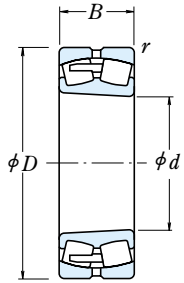
| Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **23992CAKE4** | 478 | 602 | 575 | 3 | 0.17 | 5.9 | 4.0 | 3.9 | 100 |
| **23092CAKE4** | 488 | 652 | 615 | 5 | 0.22 | 4.6 | 3.1 | 3.0 | 201 |
| **24092CAK30E4** | 488 | 652 | 604 | 5 | 0.29 | 3.4 | 2.3 | 2.3 | 266 |
| **23192CAKE4** | 496 | 724 | 661 | 6 | 0.31 | 3.3 | 2.2 | 2.2 | 423 |
| **24192CAK30E4** | 496 | 724 | 646 | 6 | 0.39 | 2.6 | 1.7 | 1.7 | 512 |
| **23292CAKE4** | 496 | 794 | 702 | 6 | 0.36 | 2.8 | 1.9 | 1.8 | 691 |
| **23996CAKE4** | 502 | 628 | 602 | 4 | 0.18 | 5.7 | 3.8 | 3.7 | 121 |
| **23096CAKE4** | 508 | 672 | 633 | 5 | 0.22 | 4.6 | 3.1 | 3.0 | 211 |
| **24096CAK30E4** | 508 | 672 | 625 | 5 | 0.30 | 3.4 | 2.3 | 2.2 | 270 |
| **23196CAKE4** | 516 | 754 | 688 | 6 | 0.31 | 3.3 | 2.2 | 2.2 | 475 |
| **24196CAK30E4** | 516 | 754 | 670 | 6 | 0.39 | 2.6 | 1.7 | 1.7 | 567 |
| **23296CAKE4** | 516 | 834 | 733 | 6 | 0.36 | 2.8 | 1.9 | 1.8 | 795 |
| **239/500CAKE4** | 522 | 648 | 622 | 4 | 0.17 | 6.0 | 4.0 | 3.9 | 124 |
| **230/500CAKE4** | 528 | 692 | 655 | 5 | 0.21 | 4.8 | 3.2 | 3.1 | 220 |
| **240/500CAK30E4** | 528 | 692 | 643 | 5 | 0.30 | 3.4 | 2.3 | 2.2 | 276 |
| **231/500CAKE4** | 536 | 794 | 720 | 6 | 0.31 | 3.2 | 2.2 | 2.1 | 567 |
| **241/500CAK30E4** | 536 | 794 | 703 | 6 | 0.39 | 2.6 | 1.7 | 1.7 | 666 |
| **232/500CAKE4** | 536 | 884 | 773 | 6 | 0.38 | 2.7 | 1.8 | 1.8 | 969 |
| **239/530CAKE4** | 552 | 688 | 659 | 4 | 0.17 | 6.0 | 4.0 | 3.9 | 149 |
| **230/530CAKE4** | 558 | 752 | 706 | 5 | 0.22 | 4.6 | 3.1 | 3.0 | 298 |
| **240/530CAK30E4** | 558 | 752 | 690 | 5 | 0.31 | 3.3 | 2.2 | 2.2 | 390 |
| **231/530CAKE4** | 566 | 834 | 758 | 6 | 0.30 | 3.3 | 2.2 | 2.2 | 628 |
| **241/530CAK30E4** | 566 | 834 | 740 | 6 | 0.38 | 2.6 | 1.8 | 1.7 | 773 |
| **232/530CAKE4** | 574 | 936 | 824 | 8 | 0.38 | 2.7 | 1.8 | 1.7 | 1 170 |
| **239/560CAKE4** | 582 | 728 | 697 | 4 | 0.16 | 6.1 | 4.1 | 4.0 | 172 |
| **230/560CAKE4** | 588 | 792 | 742 | 5 | 0.22 | 4.5 | 3.0 | 2.9 | 344 |
| **240/560CAK30E4** | 588 | 792 | 729 | 5 | 0.30 | 3.3 | 2.2 | 2.2 | 440 |
| **231/560CAKE4** | 596 | 884 | 804 | 6 | 0.30 | 3.4 | 2.3 | 2.2 | 727 |
| **241/560CAK30E4** | 596 | 884 | 782 | 6 | 0.39 | 2.6 | 1.8 | 1.7 | 886 |
| **232/560CAKE4** | 604 | 986 | 870 | 8 | 0.36 | 2.8 | 1.9 | 1.8 | 1 320 |

**Remarks** For the dimensions of adapters and withdrawal sleeves, refer to Pages **B365** and **B371**.

## Bore Diameter 600 – 800 mm



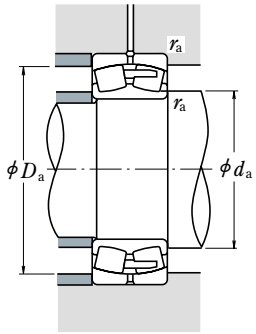

Cylindrical Bore




Tapered Bore

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore |
| **600** | 800 | 150 | 5 | 3 450 000 | 8 100 000 | 350 000 | 830 000 | 320 | 400 | **239/600CAE4** |
| | 870 | 200 | 6 | 5 450 000 | 12 200 000 | 555 000 | 1 240 000 | 300 | 360 | **230/600CAE4** |
| | 870 | 272 | 6 | 6 600 000 | 15 100 000 | 675 000 | 1 540 000 | 240 | 320 | **240/600CAE4** |
| | 980 | 300 | 7.5 | 8 750 000 | 17 500 000 | 895 000 | 1 790 000 | 220 | 280 | **231/600CAE4** |
| | 980 | 375 | 7.5 | 10 400 000 | 21 900 000 | 1 060 000 | 2 230 000 | 220 | 280 | **241/600CAE4** |
| | 1 090 | 388 | 9.5 | 12 700 000 | 24 900 000 | 1 300 000 | 2 540 000 | 200 | 260 | **232/600CAE4** |
| **630** | 850 | 165 | 6 | 4 000 000 | 9 350 000 | 405 000 | 950 000 | 300 | 360 | **239/630CAE4** |
| | 920 | 212 | 7.5 | 5 900 000 | 12 700 000 | 600 000 | 1 300 000 | 280 | 340 | **230/630CAE4** |
| | 920 | 290 | 7.5 | 7 550 000 | 17 700 000 | 770 000 | 1 810 000 | 220 | 300 | **240/630CAE4** |
| | 1 030 | 315 | 7.5 | 9 600 000 | 19 400 000 | 980 000 | 1 970 000 | 200 | 260 | 231/630CAE4 |
| | 1 030 | 400 | 7.5 | 11 300 000 | 23 900 000 | 1 160 000 | 2 440 000 | 200 | 260 | **241/630CAE4** |
| | 1 150 | 412 | 12 | 13 400 000 | 25 600 000 | 1 370 000 | 2 610 000 | 180 | 240 | **232/630CAE4** |
| **670** | 900 | 170 | 6 | 4 350 000 | 10 300 000 | 445 000 | 1 050 000 | 260 | 340 | **239/670CAE4** |
| | 980 | 230 | 7.5 | 6 850 000 | 15 000 000 | 700 000 | 1 530 000 | 240 | 320 | **230/670CAE4** |
| | 980 | 308 | 7.5 | 8 450 000 | 19 500 000 | 860 000 | 1 990 000 | 200 | 260 | **240/670CAE4** |
| | 1 090 | 336 | 7.5 | 10 600 000 | 21 600 000 | 1 080 000 | 2 200 000 | 190 | 240 | 231/670CAE4 |
| | 1 090 | 412 | 7.5 | 12 400 000 | 26 500 000 | 1 270 000 | 2 700 000 | 190 | 240 | **241/670CAE4** |
| | 1 220 | 438 | 12 | 14 900 000 | 28 700 000 | 1 520 000 | 2 920 000 | 170 | 220 | **232/670CAE4** |
| **710** | 950 | 180 | 6 | 4 800 000 | 11 700 000 | 490 000 | 1 200 000 | 240 | 300 | **239/710CAE4** |
| | 1 030 | 236 | 7.5 | 7 100 000 | 15 800 000 | 725 000 | 1 610 000 | 240 | 280 | **230/710CAE4** |
| | 1 030 | 315 | 7.5 | 8 850 000 | 20 700 000 | 905 000 | 2 110 000 | 190 | 240 | **240/710CAE4** |
| | 1 150 | 438 | 9.5 | 13 900 000 | 30 500 000 | 1 410 000 | 3 100 000 | 170 | 220 | **241/710CAE4** |
| | 1 280 | 450 | 12 | 15 700 000 | 30 500 000 | 1 600 000 | 3 100 000 | 160 | 200 | **232/710CAE4** |
| **750** | 1 000 | 185 | 6 | 5 250 000 | 12 800 000 | 535 000 | 1 310 000 | 220 | 280 | **239/750CAE4** |
| | 1 090 | 250 | 7.5 | 7 750 000 | 17 200 000 | 790 000 | 1 750 000 | 220 | 260 | **230/750CAE4** |
| | 1 090 | 335 | 7.5 | 10 100 000 | 24 000 000 | 1 030 000 | 2 450 000 | 180 | 220 | **240/750CAE4** |
| | 1 360 | 475 | 15 | 17 700 000 | 35 500 000 | 1 800 000 | 3 600 000 | 140 | 190 | **232/750CAE4** |
| **800** | 1 060 | 195 | 6 | 5 600 000 | 13 700 000 | 570 000 | 1 400 000 | 220 | 260 | **239/800CAE4** |
| | 1 150 | 258 | 7.5 | 8 350 000 | 19 100 000 | 850 000 | 1 950 000 | 200 | 240 | **230/800CAE4** |
| | 1 150 | 345 | 7.5 | 10 900 000 | 26 300 000 | 1 110 000 | 2 680 000 | 160 | 200 | **240/800CAE4** |
| | 1 280 | 375 | 9.5 | 13 800 000 | 29 200 000 | 1 410 000 | 2 970 000 | 150 | 190 | 231/800CAE4 |
| | 1 420 | 488 | 15 | 20 300 000 | 41 000 000 | 2 070 000 | 4 150 000 | 130 | 170 | **232/800CAE4** |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

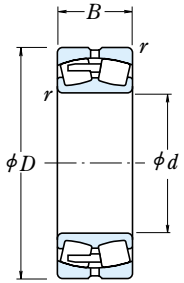
**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

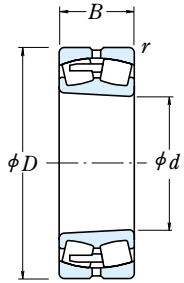
The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **239/600CAKE4** | 622 | 778 | 745 | 4 | 0.17 | 5.9 | 3.9 | 3.9 | 205 |
| **230/600CAKE4** | 628 | 842 | 794 | 5 | 0.21 | 4.8 | 3.3 | 3.2 | 389 |
| **240/600CAK30E4** | 628 | 842 | 772 | 5 | 0.30 | 3.3 | 2.2 | 2.2 | 529 |
| **231/600CAKE4** | 636 | 944 | 856 | 6 | 0.30 | 3.4 | 2.3 | 2.2 | 898 |
| **241/600CAK30E4** | 636 | 944 | 836 | 6 | 0.39 | 2.6 | 1.8 | 1.7 | 1 050 |
| **232/600CAKE4** | 644 | 1 046 | 923 | 8 | 0.36 | 2.8 | 1.9 | 1.8 | 1 590 |
| **239/630CAKE4** | 658 | 822 | 786 | 5 | 0.18 | 5.6 | 3.8 | 3.7 | 259 |
| **230/630CAKE4** | 666 | 884 | 835 | 6 | 0.22 | 4.7 | 3.1 | 3.1 | 468 |
| **240/630CAK30E4** | 666 | 884 | 815 | 6 | 0.30 | 3.3 | 2.2 | 2.2 | 637 |
| 231/630CAKE4 | 666 | 994 | 900 | 6 | 0.30 | 3.4 | 2.3 | 2.2 | 1 040 |
| **241/630CAK30E4** | 666 | 994 | 876 | 6 | 0.38 | 2.7 | 1.8 | 1.7 | 1 250 |
| **232/630CAKE4** | 684 | 1 096 | 970 | 10 | 0.36 | 2.8 | 1.9 | 1.8 | 1 850 |
| **239/670CAKE4** | 698 | 872 | 836 | 5 | 0.17 | 5.8 | 3.9 | 3.8 | 300 |
| **230/670CAKE4** | 706 | 944 | 891 | 6 | 0.22 | 4.7 | 3.1 | 3.1 | 571 |
| **240/670CAK30E4** | 706 | 944 | 868 | 6 | 0.30 | 3.3 | 2.2 | 2.2 | 773 |
| 231/670CAKE4 | 706 | 1 054 | 952 | 6 | 0.30 | 3.3 | 2.2 | 2.2 | 1 230 |
| **241/670CAK30E4** | 706 | 1 054 | 934 | 6 | 0.37 | 2.7 | 1.8 | 1.8 | 1 440 |
| **232/670CAKE4** | 724 | 1 166 | 1 024 | 10 | 0.37 | 2.7 | 1.8 | 1.8 | 2 210 |
| **239/710CAKE4** | 738 | 922 | 883 | 5 | 0.17 | 5.8 | 3.9 | 3.8 | 352 |
| **230/710CAKE4** | 746 | 994 | 936 | 6 | 0.22 | 4.6 | 3.1 | 3.0 | 647 |
| **240/710CAK30E4** | 746 | 994 | 916 | 6 | 0.29 | 3.4 | 2.3 | 2.2 | 861 |
| **241/710CAK30E4** | 754 | 1 106 | 981 | 8 | 0.38 | 2.6 | 1.8 | 1.7 | 1 730 |
| **232/710CAKE4** | 764 | 1 226 | 1 080 | 10 | 0.36 | 2.8 | 1.9 | 1.8 | 2 470 |
| **239/750CAKE4** | 778 | 972 | 931 | 5 | 0.17 | 6.0 | 4.1 | 4.0 | 398 |
| **230/750CAKE4** | 786 | 1 054 | 990 | 6 | 0.22 | 4.6 | 3.1 | 3.0 | 768 |
| **240/750CAK30E4** | 786 | 1 054 | 969 | 6 | 0.29 | 3.4 | 2.3 | 2.2 | 1 030 |
| **232/750CAKE4** | 814 | 1 296 | 1 148 | 12 | 0.36 | 2.8 | 1.9 | 1.8 | 2 980 |
| **239/800CAKE4** | 828 | 1 032 | 987 | 5 | 0.17 | 6.0 | 4.0 | 3.9 | 462 |
| **230/800CAKE4** | 836 | 1 114 | 1 045 | 6 | 0.21 | 4.7 | 3.2 | 3.1 | 870 |
| **240/800CAK30E4** | 836 | 1 114 | 1 029 | 6 | 0.27 | 3.7 | 2.5 | 2.5 | 1 130 |
| 231/800CAKE4 | 844 | 1 236 | 1 127 | 8 | 0.28 | 3.6 | 2.4 | 2.3 | 1870 |
| **232/800CAKE4** | 864 | 1 356 | 1 208 | 12 | 0.35 | 2.8 | 1.9 | 1.9 | 3 250 |

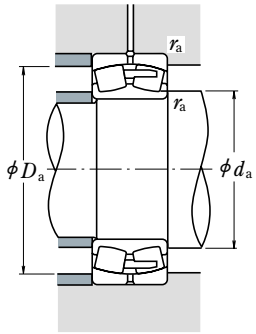
## Bore Diameter 850 – 1400 mm




Cylindrical Bore




Tapered Bore




**Dynamic Equivalent Load**

$P = XF_r + YF_a$

| $F_a/F_r \leqq e$ | | $F_a/F_r > e$ | |
|---|---|---|---|
| $X$ | $Y$ | $X$ | $Y$ |
| 1 | $Y_3$ | 0.67 | $Y_2$ |

**Static Equivalent Load**

$P_0 = F_r + Y_0 F_a$

The values of $e$, $Y_2$, $Y_3$, and $Y_0$ are given in the table below.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing | Numbers | Abutment and Fillet Dimensions (mm) | | | | Constant | Axial Load Factors | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Cylindrical Bore | Tapered Bore(1) | $d_a$ min. | $D_a$ max. | $D_a$ min. | $r_a$ max. | $e$ | $Y_2$ | $Y_3$ | $Y_0$ | approx. |
| **850** | 1 120 | 200 | 6 | 6 100 000 | 15 200 000 | 620 000 | 1 550 000 | 190 | 240 | **239/850CAE4** | **239/850CAKE4** | 878 | 1 092 | 1 046 | 5 | 0.16 | 6.2 | 4.2 | 4.1 | 523 |
| | 1 220 | 272 | 7.5 | 9 300 000 | 21 400 000 | 945 000 | 2 190 000 | 180 | 220 | **230/850CAE4** | **230/850CAKE4** | 886 | 1 184 | 1 109 | 6 | 0.21 | 4.8 | 3.2 | 3.1 | 1 020 |
| | 1 220 | 365 | 7.5 | 11 600 000 | 28 300 000 | 1 180 000 | 2 890 000 | 150 | 190 | **240/850CAE4** | **240/850CAK30E4** | 886 | 1 184 | 1 093 | 6 | 0.28 | 3.6 | 2.4 | 2.4 | 1 350 |
| | 1 500 | 515 | 15 | 22 300 000 | 45 500 000 | 2 270 000 | 4 650 000 | 120 | 160 | **232/850CAE4** | **232/850CAKE4** | 914 | 1 436 | 1 274 | 12 | 0.35 | 2.8 | 1.9 | 1.9 | 3 890 |
| **900** | 1 180 | 206 | 6 | 6 600 000 | 16 700 000 | 670 000 | 1 700 000 | 180 | 220 | **239/900CAE4** | **239/900CAKE4** | 928 | 1 152 | 1 103 | 5 | 0.16 | 6.4 | 4.3 | 4.2 | 591 |
| | 1 280 | 280 | 7.5 | 9 850 000 | 22 800 000 | 1 000 000 | 2 330 000 | 160 | 200 | 230/900CAE4 | 230/900CAKE4 | 936 | 1 244 | 1 169 | 6 | 0.20 | 4.9 | 3.3 | 3.2 | 1 160 |
| | 1 280 | 375 | 7.5 | 12 800 000 | 31 500 000 | 1 300 000 | 3 250 000 | 140 | 180 | **240/900CAE4** | **240/900CAK30E4** | 936 | 1 244 | 1 147 | 6 | 0.28 | 3.6 | 2.4 | 2.4 | 1 520 |
| | 1 580 | 515 | 15 | 23 400 000 | 47 500 000 | 2 380 000 | 4 850 000 | 110 | 140 | **232/900CAE4** | **232/900CAKE4** | 964 | 1 516 | 1 354 | 12 | 0.33 | 3.0 | 2.0 | 2.0 | 4 300 |
| **950** | 1 250 | 224 | 7.5 | 7 600 000 | 19 900 000 | 775 000 | 2 030 000 | 160 | 200 | **239/950CAE4** | **239/950CAKE4** | 986 | 1 214 | 1 169 | 6 | 0.16 | 6.3 | 4.2 | 4.1 | 732 |
| | 1 360 | 300 | 7.5 | 11 300 000 | 26 500 000 | 1 160 000 | 2 710 000 | 150 | 190 | **230/950CAE4** | **230/950CAKE4** | 986 | 1 324 | 1 241 | 6 | 0.21 | 4.8 | 3.2 | 3.2 | 1 400 |
| | 1 360 | 412 | 7.5 | 14 500 000 | 36 500 000 | 1 480 000 | 3 700 000 | 120 | 160 | **240/950CAE4** | **240/950CAK30E4** | 986 | 1 324 | 1 219 | 6 | 0.28 | 3.6 | 2.4 | 2.3 | 1 880 |
| | 1 660 | 530 | 15 | 24 700 000 | 50 500 000 | 2 520 000 | 5 150 000 | 100 | 130 | **232/950CAE4** | **232/950CAKE4** | 1 014 | 1 596 | 1 428 | 12 | 0.32 | 3.1 | 2.1 | 2.1 | 4 800 |
| **1 000** | 1 320 | 236 | 7.5 | 8 200 000 | 21 700 000 | 835 000 | 2 210 000 | 150 | 190 | 239/1000CAE4 | 239/1000CAKE4 | 1 036 | 1 284 | 1 229 | 6 | 0.16 | 6.4 | 4.3 | 4.2 | 881 |
| | 1 420 | 308 | 7.5 | 11 900 000 | 28 100 000 | 1 210 000 | 2 860 000 | 140 | 170 | 230/1000CAE4 | 230/1000CAKE4 | 1 036 | 1 384 | 1 298 | 6 | 0.20 | 4.9 | 3.3 | 3.2 | 1 560 |
| | 1 420 | 412 | 7.5 | 15 300 000 | 38 500 000 | 1 560 000 | 3 950 000 | 110 | 150 | **240/1000CAE4** | **240/1000CAK30E4** | 1 036 | 1 384 | 1 275 | 6 | 0.27 | 3.7 | 2.5 | 2.4 | 2 010 |
| **1 060** | 1 400 | 250 | 7.5 | 9 300 000 | 24 400 000 | 950 000 | 2 490 000 | 130 | 170 | **239/1060CAE4** | **239/1060CAKE4** | 1 096 | 1 364 | 1 302 | 6 | 0.16 | 6.1 | 4.1 | 4.0 | 1 030 |
| | 1 500 | 325 | 9.5 | 13 000 000 | 31 500 000 | 1 330 000 | 3 200 000 | 120 | 160 | **230/1060CAE4** | **230/1060CAKE4** | 1 104 | 1 456 | 1 368 | 8 | 0.21 | 4.9 | 3.3 | 3.2 | 1 790 |
| | 1 500 | 438 | 9.5 | 16 800 000 | 43 000 000 | 1 720 000 | 4 350 000 | 100 | 130 | 240/1060CAE4 | 240/1060CAK30E4 | 1 104 | 1 456 | 1 346 | 8 | 0.28 | 3.6 | 2.4 | 2.4 | 2 410 |
| **1 120** | 1 580 | 345 | 9.5 | 15 400 000 | 38 000 000 | 1 570 000 | 3 850 000 | 110 | 140 | 230/1120CAE4 | 230/1120CAKE4 | 1 164 | 1 536 | 1 444 | 8 | 0.20 | 5.0 | 3.4 | 3.3 | 2 120 |
| | 1 580 | 462 | 9.5 | 18 700 000 | 49 500 000 | 1 910 000 | 5 050 000 | 95 | 120 | **240/1120CAE4** | **240/1120CAK30E4** | 1 164 | 1 536 | 1 421 | 8 | 0.27 | 3.7 | 2.5 | 2.5 | 2 790 |
| **1 180** | 1 660 | 475 | 9.5 | 20 200 000 | 52 500 000 | 2 060 000 | 5 350 000 | 85 | 110 | 240/1180CAE4 | 240/1180CAK30E4 | 1 224 | 1 616 | 1 494 | 8 | 0.27 | 3.7 | 2.5 | 2.4 | 3 180 |
| **1 250** | 1 750 | 500 | 9.5 | 21 000 000 | 59 500 000 | 2 140 000 | 6 050 000 | 75 | 100 | **240/1250CAE4** | **240/1250CAK30E4** | 1 294 | 1 706 | 1 579 | 8 | 0.25 | 4.0 | 2.7 | 2.6 | 3 700 |
| **1 320** | 1 850 | 530 | 12 | 22 600 000 | 63 500 000 | 2 310 000 | 6 500 000 | 67 | 85 | **240/1320CAE4** | **240/1320CAK30E4** | 1 374 | 1 796 | 1 656 | 10 | 0.26 | 3.9 | 2.6 | 2.6 | 4 400 |
| **1 400** | 1 950 | 545 | 12 | 24 500 000 | 65 000 000 | 2 500 000 | 6 650 000 | 60 | 75 | **240/1400CAE4** | **240/1400CAK30E4** | 1 454 | 1 896 | 1 767 | 10 | 0.25 | 4.0 | 2.7 | 2.6 | 4 900 |

**Note** (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).

# THRUST BEARINGS

**SINGLE-DIRECTION THRUST BALL BEARINGS**

With Flat Seat, Aligning Seat, or Aligning Seat Washer — Bore Diameter 10 – 100mm ····· B210
Bore Diameter 110 – 360mm ····· B214

**DOUBLE-DIRECTION THRUST BALL BEARINGS**

With Flat Seat, Aligning Seat, or Aligning Seat Washer — Bore Diameter 10 – 190mm ····· B218

**THRUST CYLINDRICAL ROLLER BEARINGS** — Bore Diameter 35 – 320mm ····· B224

**THRUST SPHERICAL ROLLER BEARINGS** — Bore Diameter 60 – 500mm ····· B228

**Angular Contact Thrust Ball Bearings** are described on pages B234 to B243.

## DESIGN, TYPES, AND FEATURES

### THRUST BALL BEARINGS

Thrust ball bearings are classified into those with flat seats or aligning seats depending on the shape of the outer ring seat (housing washer). They can sustain axial loads but no radial loads.

The series of thrust ball bearings available are shown in Table 1.

For Single-Direction Thrust Ball Bearings, pressed steel cages and machined brass cages are usually used as shown in Table 2. The cages in Double-Direction Thrust Ball Bearings are the same as those in Single-Direction Thrust Ball Bearings of the same diameter series.

The basic load ratings listed in the bearing tables are based on the standard cage type shown in Table 2. If the type of cage is different for bearings with the same number, the number of balls may vary, in such a case, the load rating will differ from the one listed in the bearing tables.

**Table1 Series of Thrust Ball Bearings**

| | W/Flat Seat | W/Aligning Seat | W/Aligning Seat Washer |
|---|---|---|---|
| Single-Direction | 511 | — | — |
| | 512 | 532 | 532U |
| | 513 | 533 | 533U |
| | 514 | 534 | 534U |
| Double-Direction | 522 | 542 | 542U |
| | 523 | 543 | 543U |
| | 524 | 544 | 544U |

**Table 2 Standard Cages for Thrust Ball Bearings**

| Pressed Steel | Machined Brass |
|---|---|
| 51100 – 51152X | 51156X – 51172X |
| 51200 – 51236X | 51238X – 51272X |
| 51305 – 51336X | 51338X – 51340X |
| 51405 – 51418X | 51420X – 51436X |
| 53200 – 53236X | 53238X – 53272X |
| 53305 – 53336X | 53338X – 53340X |
| 53405 – 53418X | 53420X – 53436X |

### THRUST CYLINDRICAL ROLLER BEARINGS

These are thrust bearings containing cylindrical rollers. They can sustain only axial loads, but they are suitable for heavy loads and have high axial rigidity.

The cages are machined brass.

### THRUST SPHERICAL ROLLER BEARINGS

These are thrust bearings containing convex rollers. They have a self-aligning capability and are free of any influence of mounting error or shaft deflection. Besides the original type, the E type with pressed cages for high load capacity is also available. Their bearing numbers are suffixed by E.

For horizontal shaft or high speed application, machined brass cages are recommended. For details, contact NSK.

Since there are several places where lubrication is difficult, such as the area between the roller heads and inner ring rib, the sliding surfaces between cage and guide sleeve, etc., oil lubrication should be used even at low speed.

The cages in the original type are machined brass.

## TOLERANCES AND RUNNING ACCURACY

**THRUST BALL BEARINGS** ····· Table 8.6 (Pages A72 to A74)

**THRUST CYLINDRICAL ROLLER BEARINGS**
····· According to Table 8.2 (Pages A72 to A74)

**THRUST SPHERICAL ROLLER BEARINGS** ····· Table 8.7 (Pages A75)

## RECOMMENDED FITS

**THRUST BALL BEARINGS** ····· Table 9.3 (Pages A84)
Table 9.5 (Pages A85)

**THRUST CYLINDRICAL ROLLER BEARINGS** ····· Table 9.3 (Pages A84)
Table 9.5 (Pages A85)

**THRUST SPHERICAL ROLLER BEARINGS** ····· Table 9.3 (Pages A84)
Table 9.5 (Pages A85)





## DIMENSIONS RELATED TO MOUNTING

The dimensions related to mounting of thrust spherical roller bearings are listed in the Bearing Table.

If the bearing load is heavy, it is necessary to design the shaft shoulder with ample strength in order to provide sufficient support for the shaft washer.

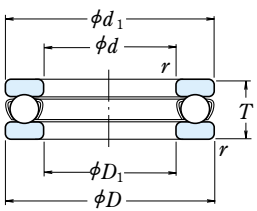
## PERMISSIBLE MISALIGNMENT

The permissible misalignment of thrust spherical roller bearings varies depending on the size, but it is approximately 0.018 to 0.036 radian (1° to 2°) with average loads.

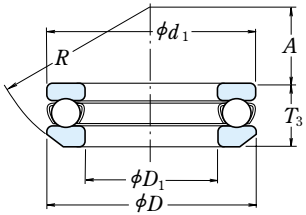
## MINIMUM AXIAL LOAD

It is necessary to apply some axial load to thrust bearings to prevent slippage between the rolling elements and raceways. For more details, please refer to Page A99.

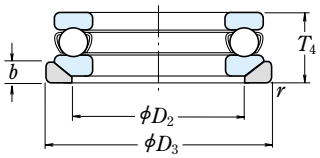
## Bore Diameter 10 – 50 mm



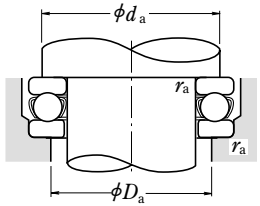

With Flat Seat

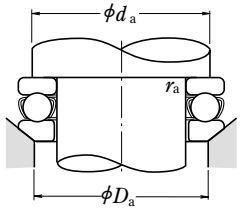


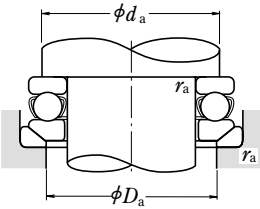

With Aligning Seat




With Aligning Seat Washer



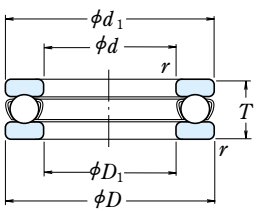



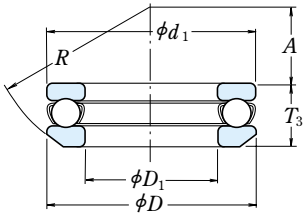

| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | With Flat Seat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $T_3$ | $T_4$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | |
| **10** | 24 | 9 | — | — | 0.3 | 10 100 | 14 000 | 1 030 | 1 420 | 6 700 | 10 000 | **51100** |
| | 26 | 11 | 11.6 | 13 | 0.6 | 12 800 | 17 100 | 1 300 | 1 740 | 6 000 | 9 000 | **51200** |
| **12** | 26 | 9 | — | — | 0.3 | 10 400 | 15 400 | 1 060 | 1 570 | 6 700 | 10 000 | **51101** |
| | 28 | 11 | 11.4 | 13 | 0.6 | 13 300 | 19 000 | 1 350 | 1 940 | 5 600 | 8 500 | **51201** |
| **15** | 28 | 9 | — | — | 0.3 | 10 600 | 16 800 | 1 080 | 1 710 | 6 300 | 9 500 | **51102** |
| | 32 | 12 | 13.3 | 15 | 0.6 | 16 700 | 24 800 | 1 710 | 2 530 | 5 000 | 7 500 | **51202** |
| **17** | 30 | 9 | — | — | 0.3 | 11 400 | 19 500 | 1 170 | 1 990 | 6 000 | 9 000 | **51103** |
| | 35 | 12 | 13.2 | 15 | 0.6 | 17 300 | 27 300 | 1 760 | 2 780 | 4 800 | 7 500 | **51203** |
| **20** | 35 | 10 | — | — | 0.3 | 15 100 | 26 600 | 1 540 | 2 710 | 5 300 | 8 000 | **51104** |
| | 40 | 14 | 14.7 | 17 | 0.6 | 22 500 | 37 500 | 2 290 | 3 850 | 4 300 | 6 300 | **51204** |
| **25** | 42 | 11 | — | — | 0.6 | 19 700 | 37 000 | 2 010 | 3 800 | 4 800 | 7 100 | **51105** |
| | 47 | 15 | 16.7 | 19 | 0.6 | 28 000 | 50 500 | 2 860 | 5 150 | 3 800 | 5 600 | **51205** |
| | 52 | 18 | 19.8 | 22 | 1 | 36 000 | 61 500 | 3 650 | 6 250 | 3 200 | 5 000 | **51305** |
| | 60 | 24 | 26.4 | 29 | 1 | 56 000 | 89 500 | 5 700 | 9 100 | 2 600 | 4 000 | **51405** |
| **30** | 47 | 11 | — | — | 0.6 | 20 600 | 42 000 | 2 100 | 4 300 | 4 300 | 6 700 | **51106** |
| | 52 | 16 | 17.8 | 20 | 0.6 | 29 500 | 58 000 | 3 000 | 5 950 | 3 400 | 5 300 | **51206** |
| | 60 | 21 | 22.6 | 25 | 1 | 43 000 | 78 500 | 4 400 | 8 000 | 2 800 | 4 300 | **51306** |
| | 70 | 28 | 30.1 | 33 | 1 | 73 000 | 126 000 | 7 450 | 12 800 | 2 200 | 3 400 | **51406** |
| **35** | 52 | 12 | — | — | 0.6 | 22 100 | 49 500 | 2 250 | 5 050 | 4 000 | 6 000 | **51107** |
| | 62 | 18 | 19.9 | 22 | 1 | 39 500 | 78 000 | 4 050 | 7 950 | 3 000 | 4 500 | **51207** |
| | 68 | 24 | 25.6 | 28 | 1 | 56 000 | 105 000 | 5 700 | 10 700 | 2 400 | 3 800 | **51307** |
| | 80 | 32 | 34 | 37 | 1.1 | 87 500 | 155 000 | 8 950 | 15 800 | 2 000 | 3 000 | **51407** |
| **40** | 60 | 13 | — | — | 0.6 | 27 100 | 63 000 | 2 770 | 6 400 | 3 600 | 5 300 | **51108** |
| | 68 | 19 | 20.3 | 23 | 1 | 47 500 | 98 500 | 4 850 | 10 000 | 2 800 | 4 300 | **51208** |
| | 78 | 26 | 28.5 | 31 | 1 | 70 000 | 135 000 | 7 100 | 13 700 | 2 200 | 3 400 | **51308** |
| | 90 | 36 | 38.2 | 42 | 1.1 | 103 000 | 188 000 | 10 500 | 19 100 | 1 700 | 2 600 | **51408** |
| **45** | 65 | 14 | — | — | 0.6 | 28 100 | 69 000 | 2 860 | 7 050 | 3 400 | 5 000 | **51109** |
| | 73 | 20 | 21.3 | 24 | 1 | 48 000 | 105 000 | 4 900 | 10 700 | 2 600 | 4 000 | **51209** |
| | 85 | 28 | 30.1 | 33 | 1 | 80 500 | 163 000 | 8 200 | 16 700 | 2 000 | 3 000 | **51309** |
| | 100 | 39 | 42.4 | 46 | 1.1 | 128 000 | 246 000 | 13 000 | 25 100 | 1 600 | 2 400 | **51409** |
| **50** | 70 | 14 | — | — | 0.6 | 29 000 | 75 500 | 2 960 | 7 700 | 3 200 | 4 800 | **51110** |
| | 78 | 22 | 23.5 | 26 | 1 | 49 000 | 111 000 | 5 000 | 11 400 | 2 400 | 3 600 | **51210** |
| | 95 | 31 | 34.3 | 37 | 1.1 | 97 500 | 202 000 | 9 950 | 20 600 | 1 800 | 2 800 | **51310** |
| | 110 | 43 | 45.6 | 50 | 1.5 | 147 000 | 288 000 | 15 000 | 29 400 | 1 400 | 2 200 | **51410** |

| Bearing Numbers | | Dimensions (mm) | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass(kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat | With Aligning Seat Washer | $d_1$ | $D_1$ | $D_2$ | $D_3$ | $b$ | $A$ | $R$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| — | — | 24 | 11 | — | — | — | — | — | 18 | 16 | 0.3 | 0.019 | — | — |
| **53200** | **53200 U** | 26 | 12 | 18 | 28 | 3.5 | 8.5 | 22 | 20 | 16 | 0.6 | 0.028 | 0.029 | 0.036 |
| — | — | 26 | 13 | — | — | — | — | — | 20 | 18 | 0.3 | 0.021 | — | — |
| **53201** | **53201 U** | 28 | 14 | 20 | 30 | 3.5 | 11.5 | 25 | 22 | 18 | 0.6 | 0.031 | 0.031 | 0.039 |
| — | — | 28 | 16 | — | — | — | — | — | 23 | 20 | 0.3 | 0.023 | — | — |
| **53202** | **53202 U** | 32 | 17 | 24 | 35 | 4 | 12 | 28 | 25 | 22 | 0.6 | 0.043 | 0.048 | 0.059 |
| — | — | 30 | 18 | — | — | — | — | — | 25 | 22 | 0.3 | 0.025 | — | — |
| **53203** | **53203 U** | 35 | 19 | 26 | 38 | 4 | 16 | 32 | 28 | 24 | 0.6 | 0.050 | 0.055 | 0.069 |
| — | — | 35 | 21 | — | — | — | — | — | 29 | 26 | 0.3 | 0.037 | — | — |
| **53204** | **53204 U** | 40 | 22 | 30 | 42 | 5 | 18 | 36 | 32 | 28 | 0.6 | 0.077 | 0.080 | 0.096 |
| — | — | 42 | 26 | — | — | — | — | — | 35 | 32 | 0.6 | 0.056 | — | — |
| **53205** | **53205 U** | 47 | 27 | 36 | 50 | 5.5 | 19 | 40 | 38 | 34 | 0.6 | 0.111 | 0.123 | 0.151 |
| **53305** | **53305 U** | 52 | 27 | 38 | 55 | 6 | 21 | 45 | 41 | 36 | 1 | 0.169 | 0.182 | 0.224 |
| **53405** | **53405 U** | 60 | 27 | 42 | 62 | 8 | 19 | 50 | 46 | 39 | 1 | 0.334 | 0.353 | 0.426 |
| — | — | 47 | 32 | — | — | — | — | — | 40 | 37 | 0.6 | 0.064 | — | — |
| **53206** | **53206 U** | 52 | 32 | 42 | 55 | 5.5 | 22 | 45 | 43 | 39 | 0.6 | 0.137 | 0.154 | 0.183 |
| **53306** | **53306 U** | 60 | 32 | 45 | 62 | 7 | 22 | 50 | 48 | 42 | 1 | 0.267 | 0.28 | 0.336 |
| **53406** | **53406 U** | 70 | 32 | 50 | 75 | 9 | 20 | 56 | 54 | 46 | 1 | 0.519 | 0.535 | 0.666 |
| — | — | 52 | 37 | — | — | — | — | — | 45 | 42 | 0.6 | 0.081 | — | — |
| **53207** | **53207 U** | 62 | 37 | 48 | 65 | 7 | 24 | 50 | 51 | 46 | 1 | 0.21 | 0.231 | 0.292 |
| **53307** | **53307 U** | 68 | 37 | 52 | 72 | 7.5 | 24 | 56 | 55 | 48 | 1 | 0.386 | 0.403 | 0.488 |
| **53407** | **53407 U** | 80 | 37 | 58 | 85 | 10 | 23 | 64 | 62 | 53 | 1 | 0.769 | 0.785 | 0.967 |
| — | — | 60 | 42 | — | — | — | — | — | 52 | 48 | 0.6 | 0.12 | — | — |
| **53208** | **53208 U** | 68 | 42 | 55 | 72 | 7 | 28.5 | 56 | 57 | 51 | 1 | 0.27 | 0.289 | 0.355 |
| **53308** | **53308 U** | 78 | 42 | 60 | 82 | 8.5 | 28 | 64 | 63 | 55 | 1 | 0.536 | 0.581 | 0.704 |
| **53408** | **53408 U** | 90 | 42 | 65 | 95 | 12 | 26 | 72 | 70 | 60 | 1 | 1.1 | 1.12 | 1.38 |
| — | — | 65 | 47 | — | — | — | — | — | 57 | 53 | 0.6 | 0.143 | — | — |
| **53209** | **53209 U** | 73 | 47 | 60 | 78 | 7.5 | 26 | 56 | 62 | 56 | 1 | 0.31 | 0.333 | 0.419 |
| **53309** | **53309 U** | 85 | 47 | 65 | 90 | 10 | 25 | 64 | 69 | 61 | 1 | 0.672 | 0.702 | 0.888 |
| **53409** | **53409 U** | 100 | 47 | 72 | 105 | 12.5 | 29 | 80 | 78 | 67 | 1 | 1.46 | 1.53 | 1.87 |
| — | — | 70 | 52 | — | — | — | — | — | 62 | 58 | 0.6 | 0.153 | — | — |
| **53210** | **53210 U** | 78 | 52 | 62 | 82 | 7.5 | 32.5 | 64 | 67 | 61 | 1 | 0.378 | 0.404 | 0.504 |
| **53310** | **53310 U** | 95 | 52 | 72 | 100 | 11 | 28 | 72 | 77 | 68 | 1 | 0.931 | 1.01 | 1.27 |
| **53410** | **53410 U** | 110 | 52 | 80 | 115 | 14 | 35 | 90 | 86 | 74 | 1.5 | 1.94 | 1.98 | 2.41 |

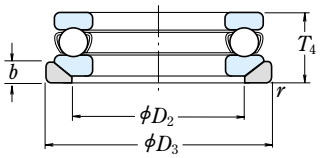
## Bore Diameter 55 – 100 mm



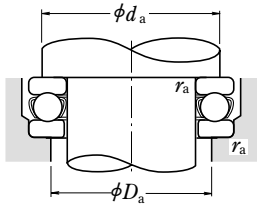

With Flat Seat

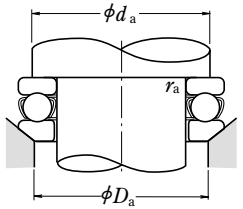


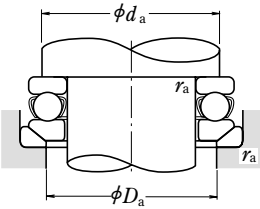

With Aligning Seat




With Aligning Seat Washer



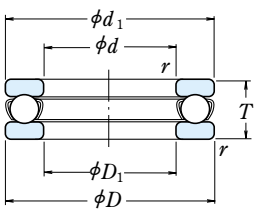




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | | With Flat Seat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $T_3$ | $T_4$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | |
| **55** | 78 | 16 | — | — | 0.6 | 35 000 | 93 000 | 3 600 | 9 500 | 2 800 | 4 300 | **51111** |
| | 90 | 25 | 27.3 | 30 | 1 | 70 000 | 159 000 | 7 150 | 16 200 | 2 200 | 3 200 | **51211** |
| | 105 | 35 | 39.3 | 42 | 1.1 | 115 000 | 244 000 | 11 800 | 24 900 | 1 600 | 2 400 | **51311** |
| | 120 | 48 | 50.5 | 55 | 1.5 | 181 000 | 350 000 | 18 500 | 35 500 | 1 300 | 1 900 | **51411** |
| **60** | 85 | 17 | — | — | 1 | 41 500 | 113 000 | 4 250 | 11 500 | 2 600 | 4 000 | **51112** |
| | 95 | 26 | 28 | 31 | 1 | 71 500 | 169 000 | 7 300 | 17 200 | 2 000 | 3 000 | **51212** |
| | 110 | 35 | 38.3 | 42 | 1.1 | 119 000 | 263 000 | 12 100 | 26 800 | 1 600 | 2 400 | **51312** |
| | 130 | 51 | 54 | 58 | 1.5 | 202 000 | 395 000 | 20 600 | 40 500 | 1 200 | 1 800 | **51412** |
| **65** | 90 | 18 | — | — | 1 | 42 000 | 117 000 | 4 300 | 12 000 | 2 400 | 3 800 | **51113** |
| | 100 | 27 | 28.7 | 32 | 1 | 75 500 | 189 000 | 7 700 | 19 200 | 1 900 | 2 800 | **51213** |
| | 115 | 36 | 39.4 | 43 | 1.1 | 123 000 | 282 000 | 12 500 | 28 700 | 1 500 | 2 400 | **51313** |
| | 140 | 56 | 60.2 | 65 | 2 | 234 000 | 495 000 | 23 800 | 50 500 | 1 100 | 1 700 | **51413** |
| **70** | 95 | 18 | — | — | 1 | 43 500 | 127 000 | 4 450 | 12 900 | 2 400 | 3 600 | **51114** |
| | 105 | 27 | 28.8 | 32 | 1 | 74 000 | 189 000 | 7 550 | 19 200 | 1 900 | 2 800 | **51214** |
| | 125 | 40 | 44.2 | 48 | 1.1 | 137 000 | 315 000 | 14 000 | 32 000 | 1 400 | 2 000 | **51314** |
| | 150 | 60 | 63.6 | 69 | 2 | 252 000 | 555 000 | 25 700 | 56 500 | 1 000 | 1 500 | **51414** |
| **75** | 100 | 19 | — | — | 1 | 43 500 | 131 000 | 4 450 | 13 400 | 2 200 | 3 400 | **51115** |
| | 110 | 27 | 28.3 | 32 | 1 | 78 000 | 209 000 | 7 950 | 21 300 | 1 800 | 2 800 | **51215** |
| | 135 | 44 | 48.1 | 52 | 1.5 | 159 000 | 365 000 | 16 200 | 37 500 | 1 300 | 1 900 | **51315** |
| | 160 | 65 | 69 | 75 | 2 | 254 000 | 560 000 | 25 900 | 57 000 | 950 | 1 400 | **51415** |
| **80** | 105 | 19 | — | — | 1 | 45 000 | 141 000 | 4 600 | 14 400 | 2 200 | 3 400 | **51116** |
| | 115 | 28 | 29.5 | 33 | 1 | 79 000 | 218 000 | 8 050 | 22 300 | 1 800 | 2 600 | **51216** |
| | 140 | 44 | 47.6 | 52 | 1.5 | 164 000 | 395 000 | 16 700 | 40 000 | 1 300 | 1 900 | **51316** |
| | 170 | 68 | 72.2 | 78 | 2.1 | 272 000 | 620 000 | 27 800 | 63 500 | 900 | 1 300 | **51416** |
| **85** | 110 | 19 | — | — | 1 | 46 500 | 150 000 | 4 700 | 15 300 | 2 200 | 3 200 | **51117** |
| | 125 | 31 | 33.1 | 37 | 1 | 96 000 | 264 000 | 9 800 | 26 900 | 1 600 | 2 400 | **51217** |
| | 150 | 49 | 53.1 | 58 | 1.5 | 207 000 | 490 000 | 21 100 | 50 000 | 1 100 | 1 700 | **51317** |
| | 180 | 72 | 77 | 83 | 2.1 | 310 000 | 755 000 | 31 500 | 77 000 | 850 | 1 300 | **51417 X** |
| **90** | 120 | 22 | — | — | 1 | 60 000 | 190 000 | 6 150 | 19 400 | 1 900 | 3 000 | **51118** |
| | 135 | 35 | 38.5 | 42 | 1.1 | 114 000 | 310 000 | 11 600 | 31 500 | 1 400 | 2 200 | **51218** |
| | 155 | 50 | 54.6 | 59 | 1.5 | 214 000 | 525 000 | 21 900 | 53 500 | 1 100 | 1 700 | **51318** |
| | 190 | 77 | 81.2 | 88 | 2.1 | 330 000 | 825 000 | 33 500 | 84 000 | 800 | 1 200 | **51418 X** |
| **100** | 135 | 25 | — | — | 1 | 86 000 | 268 000 | 8 750 | 27 300 | 1 700 | 2 600 | **51120** |
| | 150 | 38 | 40.9 | 45 | 1.1 | 135 000 | 375 000 | 13 700 | 38 500 | 1 300 | 2 000 | **51220** |
| | 170 | 55 | 59.2 | 64 | 1.5 | 239 000 | 595 000 | 24 300 | 61 000 | 1 000 | 1 500 | **51320** |
| | 210 | 85 | 90 | 98 | 3 | 370 000 | 985 000 | 38 000 | 100 000 | 710 | 1 100 | **51420 X** |

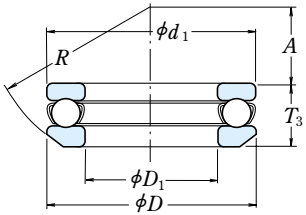
| Bearing Numbers[1] | | Dimensions (mm) | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat | With Aligning Seat Washer | $d_1$ | $D_1$ | $D_2$ | $D_3$ | $b$ | $A$ | $R$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| — | — | 78 | 57 | — | — | — | — | — | 69 | 64 | 0.6 | 0.227 | — | — |
| **53211** | **53211 U** | 90 | 57 | 72 | 95 | 9 | 35 | 72 | 76 | 69 | 1 | 0.599 | 0.656 | 0.819 |
| **53311** | **53311 U** | 105 | 57 | 80 | 110 | 11.5 | 30 | 80 | 85 | 75 | 1 | 1.31 | 1.45 | 1.78 |
| **53411** | **53411 U** | 120 | 57 | 88 | 125 | 15.5 | 28 | 90 | 94 | 81 | 1.5 | 2.58 | 2.59 | 3.16 |
| — | — | 85 | 62 | — | — | — | — | — | 75 | 70 | 1 | 0.281 | — | — |
| **53212** | **53212 U** | 95 | 62 | 78 | 100 | 9 | 32.5 | 72 | 81 | 74 | 1 | 0.673 | 0.731 | 0.897 |
| **53312** | **53312 U** | 110 | 62 | 85 | 115 | 11.5 | 41 | 90 | 90 | 80 | 1 | 1.4 | 1.51 | 1.83 |
| **53412** | **53412 U** | 130 | 62 | 95 | 135 | 16 | 34 | 100 | 102 | 88 | 1.5 | 3.16 | 3.2 | 3.91 |
| — | — | 90 | 67 | — | — | — | — | — | 80 | 75 | 1 | 0.324 | — | — |
| **53213** | **53213 U** | 100 | 67 | 82 | 105 | 9 | 40 | 80 | 86 | 79 | 1 | 0.756 | 0.812 | 0.989 |
| **53313** | **53313 U** | 115 | 67 | 90 | 120 | 12.5 | 38.5 | 90 | 95 | 85 | 1 | 1.54 | 1.67 | 2.04 |
| **53413** | **53413 U** | 140 | 68 | 100 | 145 | 17.5 | 40 | 112 | 110 | 95 | 2 | 4.1 | 4.22 | 5.13 |
| — | — | 95 | 72 | — | — | — | — | — | 85 | 80 | 1 | 0.346 | — | — |
| **53214** | **53214 U** | 105 | 72 | 88 | 110 | 9 | 38 | 80 | 91 | 84 | 1 | 0.793 | 0.866 | 1.05 |
| **53314** | **53314 U** | 125 | 72 | 98 | 130 | 13 | 43 | 100 | 103 | 92 | 1 | 2.0 | 2.2 | 2.64 |
| **53414** | **53414 U** | 150 | 73 | 110 | 155 | 19.5 | 34 | 112 | 118 | 102 | 2 | 5.05 | 5.12 | 6.21 |
| — | — | 100 | 77 | — | — | — | — | — | 90 | 85 | 1 | 0.389 | — | — |
| **53215** | **53215 U** | 110 | 77 | 92 | 115 | 9.5 | 49 | 90 | 96 | 89 | 1 | 0.845 | 1.27 | 1.11 |
| **53315** | **53315 U** | 135 | 77 | 105 | 140 | 15 | 37 | 100 | 111 | 99 | 1.5 | 2.6 | 2.8 | 3.42 |
| **53415** | **53415 U** | 160 | 78 | 115 | 165 | 21 | 42 | 125 | 125 | 110 | 2 | 6.15 | 6.23 | 7.58 |
| — | — | 105 | 82 | — | — | — | — | — | 95 | 90 | 1 | 0.417 | — | — |
| **53216** | **53216 U** | 115 | 82 | 98 | 120 | 10 | 46 | 90 | 101 | 94 | 1 | 0.931 | 1.01 | 1.23 |
| **53316** | **53316 U** | 140 | 82 | 110 | 145 | 15 | 50 | 112 | 116 | 104 | 1.5 | 2.74 | 2.94 | 3.55 |
| **53416** | **53416 U** | 170 | 83 | 125 | 175 | 22 | 36 | 125 | 133 | 117 | 2 | 7.21 | 7.33 | 8.9 |
| — | — | 110 | 87 | — | — | — | — | — | 100 | 95 | 1 | 0.44 | — | — |
| **53217** | **53217 U** | 125 | 88 | 105 | 130 | 11 | 52 | 100 | 109 | 101 | 1 | 1.22 | 1.35 | 1.63 |
| **53317** | **53317 U** | 150 | 88 | 115 | 155 | 17.5 | 43 | 112 | 124 | 111 | 1.5 | 3.57 | 3.78 | 4.67 |
| **53417 X** | **53417 XU** | 177 | 88 | 130 | 185 | 23 | 47 | 140 | 141 | 124 | 2 | 8.51 | 8.72 | 10.4 |
| — | — | 120 | 92 | — | — | — | — | — | 108 | 102 | 1 | 0.646 | — | — |
| **53218** | **53218 U** | 135 | 93 | 110 | 140 | 13.5 | 45 | 100 | 117 | 108 | 1 | 1.69 | 1.89 | 2.38 |
| **53318** | **53318 U** | 155 | 93 | 120 | 160 | 18 | 40 | 112 | 129 | 116 | 1.5 | 3.83 | 4.11 | 5.09 |
| **53418 X** | **53418 XU** | 187 | 93 | 140 | 195 | 25.5 | 40 | 140 | 149 | 131 | 2 | 10.2 | 10.3 | 12.4 |
| — | — | 135 | 102 | — | — | — | — | — | 121 | 114 | 1 | 0.96 | — | — |
| **53220** | **53220 U** | 150 | 103 | 125 | 155 | 14 | 52 | 112 | 130 | 120 | 1 | 2.25 | 2.49 | 3.03 |
| **53320** | **53320 U** | 170 | 103 | 135 | 175 | 18 | 46 | 125 | 142 | 128 | 1.5 | 4.98 | 5.31 | 6.37 |
| **53420 X** | **53420 XU** | 205 | 103 | 155 | 220 | 27 | 50 | 160 | 165 | 145 | 2.5 | 14.8 | 15 | 18.1 |

**Note** (1) The outside diameter $d_1$ of the shaft washers of all bearing numbers marked X is smaller than the outside diameter $D$ of the housing washers.

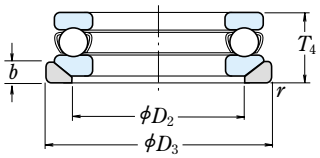
## Bore Diameter 110 – 190 mm



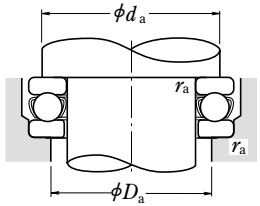

With Flat Seat

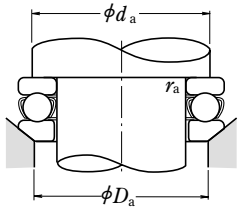


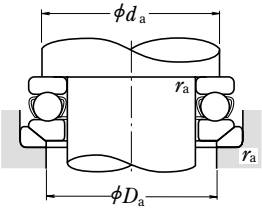

With Aligning Seat




With Aligning Seat Washer



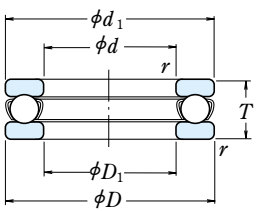




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | | With Flat Seat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $T_3$ | $T_4$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | |
| **110** | 145 | 25 | — | — | 1 | 88 000 | 288 000 | 8 950 | 29 400 | 1 700 | 2 400 | **51122** |
| | 160 | 38 | 40.2 | 45 | 1.1 | 136 000 | 395 000 | 13 900 | 40 000 | 1 300 | 1 900 | **51222** |
| | 190 | 63 | 67.2 | 72 | 2 | 282 000 | 755 000 | 28 800 | 77 000 | 900 | 1 300 | **51322 X** |
| | 230 | 95 | 99.7 | 109 | 3 | 415 000 | 1 150 000 | 42 000 | 118 000 | 630 | 950 | **51422 X** |
| **120** | 155 | 25 | — | — | 1 | 90 000 | 310 000 | 9 150 | 31 500 | 1 600 | 2 400 | **51124** |
| | 170 | 39 | 40.8 | 46 | 1.1 | 141 000 | 430 000 | 14 400 | 44 000 | 1 200 | 1 800 | **51224** |
| | 210 | 70 | 74.1 | 80 | 2.1 | 330 000 | 930 000 | 33 500 | 95 000 | 800 | 1 200 | **51324 X** |
| | 250 | 102 | 107.3 | 118 | 4 | 480 000 | 1 400 000 | 49 000 | 142 000 | 600 | 900 | **51424 X** |
| **130** | 170 | 30 | — | — | 1 | 105 000 | 350 000 | 10 700 | 36 000 | 1 400 | 2 000 | **51126** |
| | 190 | 45 | 47.9 | 53 | 1.5 | 183 000 | 550 000 | 18 700 | 56 000 | 1 100 | 1 600 | **51226 X** |
| | 225 | 75 | 80.3 | 86 | 2.1 | 350 000 | 1 030 000 | 35 500 | 105 000 | 750 | 1 100 | **51326 X** |
| | 270 | 110 | 115.2 | 128 | 4 | 525 000 | 1 590 000 | 53 500 | 162 000 | 530 | 800 | **51426 X** |
| **140** | 180 | 31 | — | — | 1 | 107 000 | 375 000 | 11 000 | 38 500 | 1 300 | 2 000 | **51128 X** |
| | 200 | 46 | 48.6 | 55 | 1.5 | 186 000 | 575 000 | 18 900 | 59 000 | 1 000 | 1 500 | **51228 X** |
| | 240 | 80 | 84.9 | 92 | 2.1 | 370 000 | 1 130 000 | 37 500 | 115 000 | 670 | 1 000 | **51328 X** |
| | 280 | 112 | 117 | 131 | 4 | 550 000 | 1 750 000 | 56 500 | 178 000 | 530 | 800 | **51428 X** |
| **150** | 190 | 31 | — | — | 1 | 110 000 | 400 000 | 11 200 | 41 000 | 1 300 | 1 900 | **51130 X** |
| | 215 | 50 | 53.3 | 60 | 1.5 | 238 000 | 735 000 | 24 300 | 75 000 | 950 | 1 400 | **51230 X** |
| | 250 | 80 | 83.7 | 92 | 2.1 | 380 000 | 1 200 000 | 39 000 | 123 000 | 670 | 1 000 | **51330 X** |
| | 300 | 120 | 125.9 | 140 | 4 | 620 000 | 2 010 000 | 63 000 | 205 000 | 480 | 710 | **51430 X** |
| **160** | 200 | 31 | — | — | 1 | 113 000 | 425 000 | 11 500 | 43 500 | 1 200 | 1 900 | **51132 X** |
| | 225 | 51 | 54.7 | 61 | 1.5 | 249 000 | 805 000 | 25 400 | 82 000 | 900 | 1 400 | **51232 X** |
| | 270 | 87 | 91.7 | 100 | 3 | 475 000 | 1 570 000 | 48 500 | 160 000 | 600 | 900 | **51332 X** |
| | 320 | 130 | 135.3 | 150 | 5 | 650 000 | 2 210 000 | 66 000 | 226 000 | 450 | 670 | **51432 X** |
| **170** | 215 | 34 | — | — | 1.1 | 135 000 | 510 000 | 13 800 | 52 000 | 1 100 | 1 700 | **51134 X** |
| | 240 | 55 | 58.7 | 65 | 1.5 | 280 000 | 915 000 | 28 500 | 93 000 | 850 | 1 300 | **51234 X** |
| | 280 | 87 | 91.3 | 100 | 3 | 465 000 | 1 570 000 | 47 500 | 160 000 | 600 | 900 | **51334 X** |
| | 340 | 135 | 141 | 156 | 5 | 715 000 | 2 480 000 | 73 000 | 253 000 | 430 | 630 | **51434 X** |
| **180** | 225 | 34 | — | — | 1.1 | 136 000 | 530 000 | 13 800 | 54 000 | 1 100 | 1 700 | **51136 X** |
| | 250 | 56 | 58.2 | 66 | 1.5 | 284 000 | 955 000 | 28 900 | 97 000 | 800 | 1 200 | **51236 X** |
| | 300 | 95 | 99.3 | 109 | 3 | 480 000 | 1 680 000 | 49 000 | 171 000 | 560 | 850 | **51336 X** |
| | 360 | 140 | 148.3 | 164 | 5 | 750 000 | 2 730 000 | 76 500 | 278 000 | 400 | 600 | **51436 X** |
| **190** | 240 | 37 | — | — | 1.1 | 172 000 | 655 000 | 17 500 | 67 000 | 1 000 | 1 600 | **51138 X** |
| | 270 | 62 | 65.7 | 73 | 2 | 320 000 | 1 110 000 | 32 500 | 113 000 | 750 | 1 100 | **51238 X** |
| | 320 | 105 | 111 | 121 | 4 | 550 000 | 1 960 000 | 56 000 | 199 000 | 500 | 750 | **51338 X** |

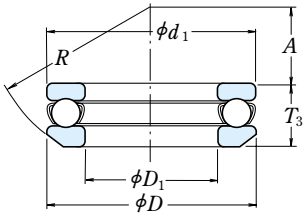
| Bearing Numbers(1) | | Dimensions (mm) | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat | With Aligning Seat Washer | $d_1$ | $D_1$ | $D_2$ | $D_3$ | $b$ | $A$ | $R$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| — | — | 145 | 112 | — | — | — | — | — | 131 | 124 | 1 | 1.04 | — | — |
| **53222** | **53222 U** | 160 | 113 | 135 | 165 | 14 | 65 | 125 | 140 | 130 | 1 | 2.42 | 2.65 | 3.2 |
| **53322 X** | **53322 XU** | 187 | 113 | 150 | 195 | 20.5 | 51 | 140 | 158 | 142 | 2 | 7.19 | 7.55 | 9.1 |
| **53422 X** | **53422 XU** | 225 | 113 | 170 | 240 | 29 | 59 | 180 | 181 | 159 | 2.5 | 20 | 20.5 | 24.3 |
| — | — | 155 | 122 | — | — | — | — | — | 141 | 134 | 1 | 1.12 | — | — |
| **53224** | **53224 U** | 170 | 123 | 145 | 175 | 15 | 61 | 125 | 150 | 140 | 1 | 2.7 | 2.94 | 3.58 |
| **53324 X** | **53324 XU** | 205 | 123 | 165 | 220 | 22 | 63 | 160 | 173 | 157 | 2 | 9.7 | 10.1 | 12.4 |
| **53424 X** | **53424 XU** | 245 | 123 | 185 | 260 | 32 | 70 | 200 | 196 | 174 | 3 | 26.2 | 26.5 | 31.3 |
| — | — | 170 | 132 | — | — | — | — | — | 154 | 146 | 1 | 1.68 | — | — |
| **53226 X** | **53226 XU** | 187 | 133 | 160 | 195 | 17 | 67 | 140 | 166 | 154 | 1.5 | 3.95 | 4.35 | 5.33 |
| **53326 X** | **53326 XU** | 220 | 134 | 177 | 235 | 26 | 53 | 160 | 186 | 169 | 2 | 12.1 | 12.7 | 15.8 |
| **53426 X** | **53426 XU** | 265 | 134 | 200 | 280 | 38 | 58 | 200 | 212 | 188 | 3 | 32.3 | 32.4 | 38.8 |
| — | — | 178 | 142 | — | — | — | — | — | 164 | 156 | 1 | 1.83 | — | — |
| **53228 X** | **53228 XU** | 197 | 143 | 170 | 210 | 17 | 87 | 160 | 176 | 164 | 1.5 | 4.3 | 4.74 | 5.89 |
| **53328 X** | **53328 XU** | 235 | 144 | 190 | 250 | 26 | 68 | 180 | 199 | 181 | 2 | 14.2 | 16.3 | 19.5 |
| **53428 X** | **53428 XU** | 275 | 144 | 206 | 290 | 38 | 83 | 225 | 222 | 198 | 3 | 34.7 | 34.8 | 41.4 |
| — | — | 188 | 152 | — | — | — | — | — | 174 | 166 | 1 | 1.95 | — | — |
| **53230 X** | **53230 XU** | 212 | 153 | 180 | 225 | 20.5 | 79 | 160 | 189 | 176 | 1.5 | 5.52 | 6.09 | 7.82 |
| **53330 X** | **53330 XU** | 245 | 154 | 200 | 260 | 26 | 89.5 | 200 | 209 | 191 | 2 | 15 | 17.3 | 20.5 |
| **53430 X** | **53430 XU** | 295 | 154 | 225 | 310 | 41 | 69 | 225 | 238 | 212 | 3 | 43.5 | 43.8 | 51.9 |
| — | — | 198 | 162 | — | — | — | — | — | 184 | 176 | 1 | 2.07 | — | — |
| **53232 X** | **53232 XU** | 222 | 163 | 190 | 235 | 21 | 74 | 160 | 199 | 186 | 1.5 | 6.04 | 6.78 | 8.7 |
| **53332 X** | **53332 XU** | 265 | 164 | 215 | 280 | 29 | 77 | 200 | 225 | 205 | 2.5 | 19.6 | 22.3 | 26.7 |
| **53432 X** | **53432 XU** | 315 | 164 | 240 | 330 | 41.5 | 84 | 250 | 254 | 226 | 4 | 52.7 | 52.9 | 62 |
| — | — | 213 | 172 | — | — | — | — | — | 197 | 188 | 1 | 2.72 | — | — |
| **53234 X** | **53234 XU** | 237 | 173 | 200 | 250 | 21.5 | 91 | 180 | 212 | 198 | 1.5 | 7.41 | 8.21 | 10.5 |
| **53334 X** | **53334 XU** | 275 | 174 | 220 | 290 | 29 | 105 | 225 | 235 | 215 | 2.5 | 20.3 | 23.2 | 28 |
| **53434 X** | **53434 XU** | 335 | 174 | 255 | 350 | 46 | 74 | 250 | 269 | 241 | 4 | 61.2 | 61.3 | 73 |
| — | — | 222 | 183 | — | — | — | — | — | 207 | 198 | 1 | 2.79 | — | — |
| **53236 X** | **53236 XU** | 247 | 183 | 210 | 260 | 21.5 | 112 | 200 | 222 | 208 | 1.5 | 7.94 | 8.57 | 10.8 |
| **53336 X** | **53336 XU** | 295 | 184 | 240 | 310 | 32 | 91 | 225 | 251 | 229 | 2.5 | 25.9 | 29.2 | 34.9 |
| **53436 X** | **53436 XU** | 355 | 184 | 270 | 370 | 46.5 | 97 | 280 | 285 | 255 | 4 | 70.5 | 72.1 | 84.9 |
| — | — | 237 | 193 | — | — | — | — | — | 220 | 210 | 1 | 3.6 | — | — |
| **53238 X** | **53238 XU** | 267 | 194 | 230 | 280 | 23 | 98 | 200 | 238 | 222 | 2 | 11.8 | 12.9 | 15.7 |
| **53338 X** | **53338 XU** | 315 | 195 | 255 | 330 | 33 | 104 | 250 | 266 | 244 | 3 | 36.5 | 38.1 | 44.7 |

**Note** (1) The outside diameter $d_1$ of the shaft washers of all bearing numbers marked X is smaller than the outside diameter $D$ of the housing washers.

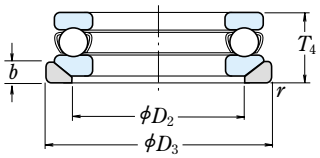
## Bore Diameter 200 – 360 mm



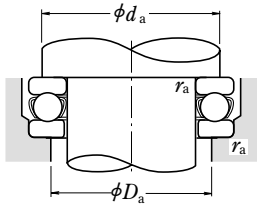

With Flat Seat

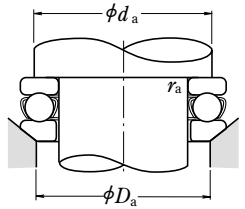


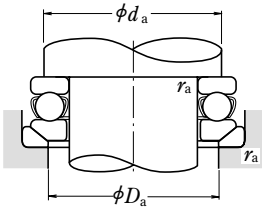

With Aligning Seat




With Aligning Seat Washer



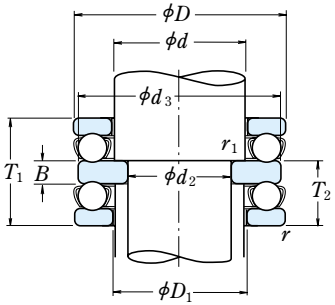




| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | With Flat Seat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $T_3$ | $T_4$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | |
| **200** | 250 | 37 | — | — | 1.1 | 173 000 | 675 000 | 17 600 | 69 000 | 1 000 | 1 500 | **51140 X** |
| | 280 | 62 | 65.3 | 74 | 2 | 315 000 | 1 110 000 | 32 500 | 113 000 | 710 | 1 100 | **51240 X** |
| | 340 | 110 | 118.4 | 130 | 4 | 600 000 | 2 220 000 | 61 500 | 227 000 | 480 | 710 | **51340 X** |
| **220** | 270 | 37 | — | — | 1.1 | 179 000 | 740 000 | 18 200 | 75 500 | 950 | 1 500 | **51144 X** |
| | 300 | 63 | 65.6 | 75 | 2 | 325 000 | 1 210 000 | 33 500 | 123 000 | 670 | 1 000 | **51244 X** |
| **240** | 300 | 45 | — | — | 1.5 | 229 000 | 935 000 | 23 400 | 95 000 | 850 | 1 200 | **51148 X** |
| | 340 | 78 | 81.6 | 92 | 2.1 | 420 000 | 1 650 000 | 43 000 | 168 000 | 560 | 850 | **51248 X** |
| **260** | 320 | 45 | — | — | 1.5 | 233 000 | 990 000 | 23 800 | 101 000 | 800 | 1 200 | **51152 X** |
| | 360 | 79 | 82.8 | 93 | 2.1 | 435 000 | 1 800 000 | 44 500 | 184 000 | 560 | 850 | **51252 X** |
| **280** | 350 | 53 | — | — | 1.5 | 315 000 | 1 310 000 | 32 000 | 134 000 | 710 | 1 000 | **51156 X** |
| | 380 | 80 | 85 | 94 | 2.1 | 450 000 | 1 950 000 | 46 000 | 199 000 | 530 | 800 | **51256 X** |
| **300** | 380 | 62 | — | — | 2 | 360 000 | 1 560 000 | 36 500 | 159 000 | 600 | 900 | **51160 X** |
| | 420 | 95 | 100.5 | 112 | 3 | 540 000 | 2 410 000 | 55 000 | 246 000 | 450 | 670 | **51260 X** |
| **320** | 400 | 63 | — | — | 2 | 365 000 | 1 660 000 | 37 500 | 169 000 | 600 | 900 | **51164 X** |
| | 440 | 95 | 100.5 | 112 | 3 | 585 000 | 2 680 000 | 59 500 | 273 000 | 450 | 670 | **51264 X** |
| **340** | 420 | 64 | — | — | 2 | 375 000 | 1 760 000 | 38 500 | 179 000 | 560 | 850 | **51168 X** |
| | 460 | 96 | 100.3 | 113 | 3 | 595 000 | 2 800 000 | 60 500 | 285 000 | 430 | 630 | **51268 X** |
| **360** | 440 | 65 | — | — | 2 | 385 000 | 1 860 000 | 39 000 | 190 000 | 560 | 800 | **51172 X** |
| | 500 | 110 | 116.7 | 130 | 4 | 705 000 | 3 500 000 | 72 000 | 355 000 | 380 | 560 | **51272 X** |

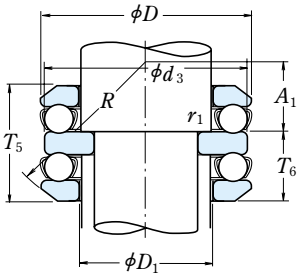
| Bearing Numbers(1) | | Dimensions (mm) | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat | With Aligning Seat Washer | $d_1$ | $D_1$ | $D_2$ | $D_3$ | $b$ | $A$ | $R$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| — | — | 247 | 203 | — | — | — | — | — | 230 | 220 | 1 | 3.75 | — | — |
| **53240 X** | **53240 XU** | 277 | 204 | 240 | 290 | 23 | 125 | 225 | 248 | 232 | 2 | 12.3 | 13.4 | 16.1 |
| **53340 X** | **53340 XU** | 335 | 205 | 270 | 350 | 38 | 92 | 250 | 282 | 258 | 3 | 43.6 | 46.2 | 54.8 |
| — | — | 267 | 223 | — | — | — | — | — | 250 | 240 | 1 | 4.09 | — | — |
| **53244 X** | **53244 XU** | 297 | 224 | 260 | 310 | 25 | 118 | 225 | 268 | 252 | 2 | 13.6 | 14.9 | 18 |
| — | — | 297 | 243 | — | — | — | — | — | 276 | 264 | 1.5 | 6.55 | — | — |
| **53248 X** | **53248 XU** | 335 | 244 | 290 | 350 | 30 | 122 | 250 | 299 | 281 | 2 | 23.7 | 25.6 | 30.7 |
| — | — | 317 | 263 | — | — | — | — | — | 296 | 284 | 1.5 | 7.01 | — | — |
| **53252 X** | **53252 XU** | 355 | 264 | 305 | 370 | 30 | 152 | 280 | 319 | 301 | 2 | 25.1 | 27.3 | 33.2 |
| — | — | 347 | 283 | — | — | — | — | — | 322 | 308 | 1.5 | 12 | — | — |
| **53256 X** | **53256 XU** | 375 | 284 | 325 | 390 | 31 | 143 | 280 | 339 | 321 | 2 | 27.1 | 30.3 | 37 |
| — | — | 376 | 304 | — | — | — | — | — | 348 | 332 | 2 | 17.2 | — | — |
| **53260 X** | **53260 XU** | 415 | 304 | 360 | 430 | 34 | 164 | 320 | 371 | 349 | 2.5 | 43.5 | 47.7 | 56.1 |
| — | — | 396 | 324 | — | — | — | — | — | 368 | 352 | 2 | 18.6 | — | — |
| **53264 X** | **53264 XU** | 435 | 325 | 380 | 450 | 36 | 157 | 320 | 391 | 369 | 2.5 | 45 | 49.9 | 59.4 |
| — | — | 416 | 344 | — | — | — | — | — | 388 | 372 | 2 | 19.9 | — | — |
| **53268 X** | **53268 XU** | 455 | 345 | 400 | 470 | 36 | 199 | 360 | 411 | 389 | 2.5 | 47.9 | 52.7 | 62 |
| — | — | 436 | 364 | — | — | — | — | — | 408 | 392 | 2 | 21.5 | — | — |
| **53272 X** | **53272 XU** | 495 | 365 | 430 | 510 | 43 | 172 | 360 | 442 | 418 | 3 | 68.8 | 76.3 | 90.9 |

**Note** (1) The outside diameter $d_1$ of the shaft washers of all bearing numbers marked X is smaller than the outside diameter $D$ of the housing washers.

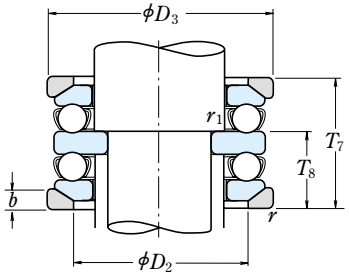
**Bore Diameter 10 – 55 mm**



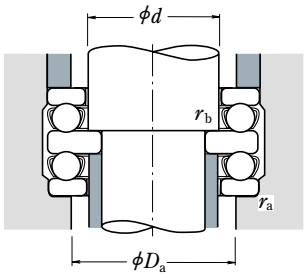

With Flat Seat

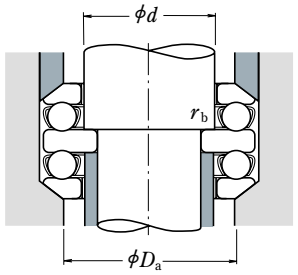


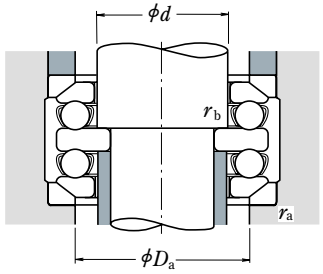

With Aligning Seat




With Aligning Seat Washer



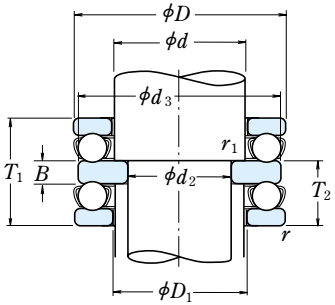



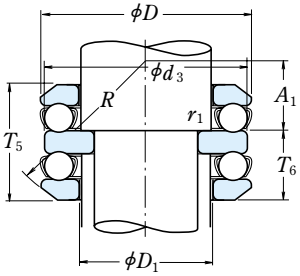

| Boundary Dimensions (mm) | | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Numbers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_2$ | $d$ | $D$ | $T_1$ | $T_5$ | $T_7$ | $r$ min. | $r_1$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | With Flat Seat | With Aligning Seat |
| **10** | 15 | 32 | 22 | 24.6 | 28 | 0.6 | 0.3 | 16 700 | 24 800 | 1 710 | 2 530 | 4 800 | 7 100 | **52202** | **54202** |
| **15** | 20 | 40 | 26 | 27.4 | 32 | 0.6 | 0.3 | 22 500 | 37 500 | 2 290 | 3 850 | 4 000 | 6 000 | **52204** | **54204** |
| | 25 | 60 | 45 | 49.8 | 55 | 1 | 0.6 | 56 000 | 89 500 | 5 700 | 9 100 | 2 400 | 3 600 | **52405** | **54405** |
| **20** | 25 | 47 | 28 | 31.4 | 36 | 0.6 | 0.3 | 28 000 | 50 500 | 2 860 | 5 150 | 3 400 | 5 300 | **52205** | **54205** |
| | 25 | 52 | 34 | 37.6 | 42 | 1 | 0.3 | 36 000 | 61 500 | 3 650 | 6 250 | 3 000 | 4 500 | **52305** | **54305** |
| | 30 | 70 | 52 | 56.2 | 62 | 1 | 0.6 | 73 000 | 126 000 | 7 450 | 12 800 | 2 200 | 3 200 | **52406** | **54406** |
| **25** | 30 | 52 | 29 | 32.6 | 37 | 0.6 | 0.3 | 29 500 | 58 000 | 3 000 | 5 950 | 3 200 | 5 000 | **52206** | **54206** |
| | 30 | 60 | 38 | 41.2 | 46 | 1 | 0.3 | 43 000 | 78 500 | 4 400 | 8 000 | 2 600 | 4 000 | **52306** | **54306** |
| | 35 | 80 | 59 | 63 | 69 | 1.1 | 0.6 | 87 500 | 155 000 | 8 950 | 15 800 | 1 800 | 2 800 | **52407** | **54407** |
| **30** | 35 | 62 | 34 | 37.8 | 42 | 1 | 0.3 | 39 500 | 78 000 | 4 050 | 7 950 | 2 800 | 4 300 | **52207** | **54207** |
| | 35 | 68 | 44 | 47.2 | 52 | 1 | 0.3 | 56 000 | 105 000 | 5 700 | 10 700 | 2 400 | 3 600 | **52307** | **54307** |
| | 40 | 68 | 36 | 38.6 | 44 | 1 | 0.6 | 47 500 | 98 500 | 4 850 | 10 000 | 2 600 | 3 800 | **52208** | **54208** |
| | 40 | 78 | 49 | 54 | 59 | 1 | 0.6 | 70 000 | 135 000 | 7 100 | 13 700 | 2 000 | 3 000 | **52308** | **54308** |
| | 40 | 90 | 65 | 69.4 | 77 | 1.1 | 0.6 | 103 000 | 188 000 | 10 500 | 19 100 | 1 700 | 2 400 | **52408** | **54408** |
| **35** | 45 | 73 | 37 | 39.6 | 45 | 1 | 0.6 | 48 000 | 105 000 | 4 900 | 10 700 | 2 400 | 3 600 | **52209** | **54209** |
| | 45 | 85 | 52 | 56.2 | 62 | 1 | 0.6 | 80 500 | 163 000 | 8 200 | 16 700 | 1 900 | 2 800 | **52309** | **54309** |
| | 45 | 100 | 72 | 78.8 | 86 | 1.1 | 0.6 | 128 000 | 246 000 | 13 000 | 25 100 | 1 500 | 2 200 | **52409** | **54409** |
| **40** | 50 | 78 | 39 | 42 | 47 | 1 | 0.6 | 49 000 | 111 000 | 5 000 | 11 400 | 2 400 | 3 400 | **52210** | **54210** |
| | 50 | 95 | 58 | 64.6 | 70 | 1.1 | 0.6 | 97 500 | 202 000 | 9 950 | 20 600 | 1 700 | 2 600 | **52310** | **54310** |
| | 50 | 110 | 78 | 83.2 | 92 | 1.5 | 0.6 | 147 000 | 288 000 | 15 000 | 29 400 | 1 400 | 2 000 | **52410** | **54410** |
| **45** | 55 | 90 | 45 | 49.6 | 55 | 1 | 0.6 | 70 000 | 159 000 | 7 150 | 16 200 | 2 000 | 3 000 | **52211** | **54211** |
| | 55 | 105 | 64 | 72.6 | 78 | 1.1 | 0.6 | 115 000 | 244 000 | 11 800 | 24 900 | 1 500 | 2 400 | **52311** | **54311** |
| | 55 | 120 | 87 | 92 | 101 | 1.5 | 0.6 | 181 000 | 350 000 | 18 500 | 35 500 | 1 200 | 1 800 | **52411** | **54411** |
| **50** | 60 | 95 | 46 | 50 | 56 | 1 | 0.6 | 71 500 | 169 000 | 7 300 | 17 200 | 1 900 | 3 000 | **52212** | **54212** |
| | 60 | 110 | 64 | 70.6 | 78 | 1.1 | 0.6 | 119 000 | 263 000 | 12 100 | 26 800 | 1 500 | 2 200 | **52312** | **54312** |
| | 60 | 130 | 93 | 99 | 107 | 1.5 | 0.6 | 202 000 | 395 000 | 20 600 | 40 500 | 1 100 | 1 700 | **52412** | **54412** |
| | 65 | 140 | 101 | 109.4 | 119 | 2 | 1 | 234 000 | 495 000 | 23 800 | 50 500 | 1 000 | 1 600 | **52413** | **54413** |
| **55** | 65 | 100 | 47 | 50.4 | 57 | 1 | 0.6 | 75 500 | 189 000 | 7 700 | 19 200 | 1 900 | 2 800 | **52213** | **54213** |
| | 65 | 115 | 65 | 71.8 | 79 | 1.1 | 0.6 | 123 000 | 282 000 | 12 500 | 28 700 | 1 500 | 2 200 | **52313** | **54313** |
| | 70 | 105 | 47 | 50.6 | 57 | 1 | 1 | 74 000 | 189 000 | 7 550 | 19 200 | 1 800 | 2 800 | **52214** | **54214** |
| | 70 | 125 | 72 | 80.4 | 88 | 1.1 | 1 | 137 000 | 315 000 | 14 000 | 32 000 | 1 300 | 2 000 | **52314** | **54314** |
| | 70 | 150 | 107 | 114.2 | 125 | 2 | 1 | 252 000 | 555 000 | 25 700 | 56 500 | 1 000 | 1 500 | **52414** | **54414** |

| With Aligning Seat Washer | Dimensions (mm) | | | | | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $d_3$ | $D_1$ | $D_2$ | $D_3$ | $T_2$ | $T_6$ | $T_8$ | $B$ | $b$ | $A_1$ | $R$ | $D_a$ max. | $r_a$ max. | $r_b$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| **54202 U** | 32 | 17 | 24 | 35 | 13.5 | 14.8 | 16.5 | 5 | 4 | 10.5 | 28 | 24 | 0.6 | 0.3 | 0.081 | 0.090 | 0.113 |
| **54204 U** | 40 | 22 | 30 | 42 | 16 | 16.7 | 19 | 6 | 5 | 16 | 36 | 30 | 0.6 | 0.3 | 0.148 | 0.151 | 0.185 |
| **54405 U** | 60 | 27 | 42 | 62 | 28 | 30.4 | 33 | 11 | 8 | 15 | 50 | 42 | 1 | 0.6 | 0.641 | 0.68 | 0.825 |
| **54205 U** | 47 | 27 | 36 | 50 | 17.5 | 19.2 | 21.5 | 7 | 5.5 | 16.5 | 40 | 36 | 0.6 | 0.3 | 0.213 | 0.236 | 0.293 |
| **54305 U** | 52 | 27 | 38 | 55 | 21 | 22.8 | 25 | 8 | 6 | 18 | 45 | 38 | 1 | 0.3 | 0.324 | 0.35 | 0.434 |
| **54406 U** | 70 | 32 | 50 | 75 | 32 | 34.1 | 37 | 12 | 9 | 16 | 56 | 50 | 1 | 0.6 | 0.978 | 1.01 | 1.27 |
| **54206 U** | 52 | 32 | 42 | 55 | 18 | 19.8 | 22 | 7 | 5.5 | 20 | 45 | 42 | 0.6 | 0.3 | 0.254 | 0.288 | 0.345 |
| **54306 U** | 60 | 32 | 45 | 62 | 23.5 | 25.1 | 27.5 | 9 | 7 | 19.5 | 50 | 45 | 1 | 0.3 | 0.483 | 0.511 | 0.621 |
| **54407 U** | 80 | 37 | 58 | 85 | 36.5 | 38.5 | 41.5 | 14 | 10 | 18.5 | 64 | 58 | 1 | 0.6 | 1.43 | 1.47 | 1.83 |
| **54207 U** | 62 | 37 | 48 | 65 | 21 | 22.9 | 25 | 8 | 7 | 21 | 50 | 48 | 1 | 0.3 | 0.406 | 0.447 | 0.57 |
| **54307 U** | 68 | 37 | 52 | 72 | 27 | 28.6 | 31 | 10 | 7.5 | 21 | 56 | 52 | 1 | 0.3 | 0.71 | 0.744 | 0.915 |
| **54208 U** | 68 | 42 | 55 | 72 | 22.5 | 23.8 | 26.5 | 9 | 7 | 25 | 56 | 55 | 1 | 0.6 | 0.543 | 0.581 | 0.713 |
| **54308 U** | 78 | 42 | 60 | 82 | 30.5 | 33 | 35.5 | 12 | 8.5 | 23.5 | 64 | 60 | 1 | 0.6 | 1.04 | 1.13 | 1.38 |
| **54408 U** | 90 | 42 | 65 | 95 | 40 | 42.2 | 46 | 15 | 12 | 22 | 72 | 65 | 1 | 0.6 | 1.98 | 2.02 | 2.54 |
| **54209 U** | 73 | 47 | 60 | 78 | 23 | 24.3 | 27 | 9 | 7.5 | 23 | 56 | 60 | 1 | 0.6 | 0.606 | 0.652 | 0.823 |
| **54309 U** | 85 | 47 | 65 | 90 | 32 | 34.1 | 37 | 12 | 10 | 21 | 64 | 65 | 1 | 0.6 | 1.28 | 1.34 | 1.71 |
| **54409 U** | 100 | 47 | 72 | 105 | 44.5 | 47.9 | 51.5 | 17 | 12.5 | 23.5 | 80 | 72 | 1 | 0.6 | 2.71 | 2.85 | 3.53 |
| **54210 U** | 78 | 52 | 62 | 82 | 24 | 25.5 | 28 | 9 | 7.5 | 30.5 | 64 | 62 | 1 | 0.6 | 0.697 | 0.75 | 0.949 |
| **54310 U** | 95 | 52 | 72 | 100 | 36 | 39.3 | 42 | 14 | 11 | 23 | 72 | 72 | 1 | 0.6 | 1.78 | 1.94 | 2.46 |
| **54410 U** | 110 | 52 | 80 | 115 | 48 | 50.6 | 55 | 18 | 14 | 30 | 90 | 80 | 1.5 | 0.6 | 3.51 | 3.59 | 4.45 |
| **54211 U** | 90 | 57 | 72 | 95 | 27.5 | 29.8 | 32.5 | 10 | 9 | 32.5 | 72 | 72 | 1 | 0.6 | 1.11 | 1.22 | 1.55 |
| **54311 U** | 105 | 57 | 80 | 110 | 39.5 | 43.8 | 46.5 | 15 | 11.5 | 25.5 | 80 | 80 | 1 | 0.6 | 2.43 | 2.7 | 3.35 |
| **54411 U** | 120 | 57 | 88 | 125 | 53.5 | 56 | 60.5 | 20 | 15.5 | 22.5 | 90 | 88 | 1.5 | 0.6 | 4.66 | 4.68 | 5.82 |
| **54212 U** | 95 | 62 | 78 | 100 | 28 | 30 | 33 | 10 | 9 | 30.5 | 72 | 78 | 1 | 0.6 | 1.22 | 1.33 | 1.66 |
| **54312 U** | 110 | 62 | 85 | 115 | 39.5 | 42.8 | 46.5 | 15 | 11.5 | 36.5 | 90 | 85 | 1 | 0.6 | 2.59 | 2.82 | 3.45 |
| **54412 U** | 130 | 62 | 95 | 135 | 57 | 60 | 64 | 21 | 16 | 28 | 100 | 95 | 1.5 | 0.6 | 5.74 | 5.82 | 7.24 |
| **54413 U** | 140 | 68 | 100 | 145 | 62 | 66.2 | 71 | 23 | 17.5 | 34 | 112 | 100 | 2 | 1 | 7.41 | 7.66 | 9.47 |
| **54213 U** | 100 | 67 | 82 | 105 | 28.5 | 30.2 | 33.5 | 10 | 9 | 38.5 | 80 | 82 | 1 | 0.6 | 1.34 | 1.45 | 1.81 |
| **54313 U** | 115 | 67 | 90 | 120 | 40 | 43.4 | 47 | 15 | 12.5 | 34.5 | 90 | 90 | 1 | 0.6 | 2.8 | 3.06 | 3.8 |
| **54214 U** | 105 | 72 | 88 | 110 | 28.5 | 30.3 | 33.5 | 10 | 9 | 36.5 | 80 | 88 | 1 | 1 | 1.44 | 1.59 | 1.95 |
| **54314 U** | 125 | 72 | 98 | 130 | 44 | 48.2 | 52 | 16 | 13 | 39 | 100 | 98 | 1 | 1 | 3.67 | 4.07 | 4.95 |
| **54414 U** | 150 | 73 | 110 | 155 | 65.5 | 69.1 | 74.5 | 24 | 19.5 | 28.5 | 112 | 110 | 2 | 1 | 8.99 | 9.12 | 11.3 |

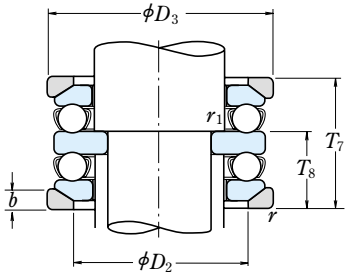
## Bore Diameter 60 – 130 mm



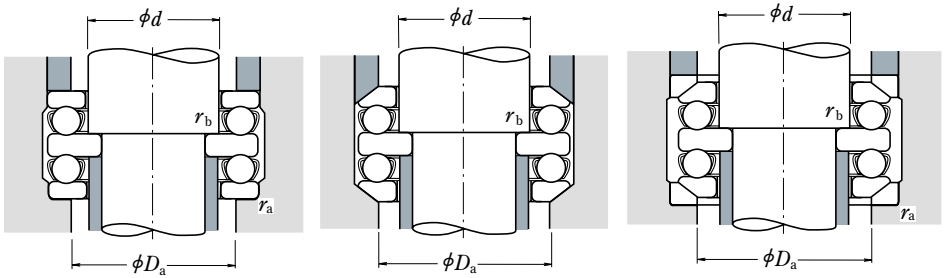

With Flat Seat




With Aligning Seat




With Aligning Seat Washer

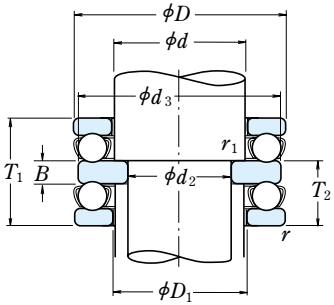



| Boundary Dimensions (mm) | | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_2$ | $d$ | $D$ | $T_1$ | $T_5$ | $T_7$ | $r$ min. | $r_1$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | With Flat Seat | With Aligning Seat |
| **60** | 75 | 110 | 47 | 49.6 | 57 | 1 | 1 | 78 000 | 209 000 | 7 950 | 21 300 | 1 800 | 2 600 | **52215** | **54215** |
| | 75 | 135 | 79 | 87.2 | 95 | 1.5 | 1 | 159 000 | 365 000 | 16 200 | 37 500 | 1 200 | 1 800 | **52315** | **54315** |
| | 75 | 160 | 115 | 123 | 135 | 2 | 1 | 254 000 | 560 000 | 25 900 | 57 000 | 900 | 1 400 | **52415** | **54415** |
| **65** | 80 | 115 | 48 | 51 | 58 | 1 | 1 | 79 000 | 218 000 | 8 050 | 22 300 | 1 700 | 2 600 | **52216** | **54216** |
| | 80 | 140 | 79 | 86.2 | 95 | 1.5 | 1 | 164 000 | 395 000 | 16 700 | 40 000 | 1 200 | 1 800 | **52316** | **54316** |
| | 80 | 170 | 120 | 128.4 | 140 | 2.1 | 1 | 272 000 | 620 000 | 27 800 | 63 500 | 850 | 1 300 | **52416** | **54416** |
| | 85 | 180 | 128 | 138 | 150 | 2.1 | 1.1 | 310 000 | 755 000 | 31 500 | 77 000 | 800 | 1 200 | **52417 X** | **54417 X** |
| **70** | 85 | 125 | 55 | 59.2 | 67 | 1 | 1 | 96 000 | 264 000 | 9 800 | 26 900 | 1 500 | 2 200 | **52217** | **54217** |
| | 85 | 150 | 87 | 95.2 | 105 | 1.5 | 1 | 207 000 | 490 000 | 21 100 | 50 000 | 1 100 | 1 600 | **52317** | **54317** |
| | 90 | 190 | 135 | 143.4 | 157 | 2.1 | 1.1 | 330 000 | 825 000 | 33 500 | 84 000 | 750 | 1 100 | **52418 X** | **54418 X** |
| **75** | 90 | 135 | 62 | 69 | 76 | 1.1 | 1 | 114 000 | 310 000 | 11 600 | 31 500 | 1 400 | 2 000 | **52218** | **54218** |
| | 90 | 155 | 88 | 97.2 | 106 | 1.5 | 1 | 214 000 | 525 000 | 21 900 | 53 500 | 1 100 | 1 600 | **52318** | **54318** |
| **80** | 100 | 210 | 150 | 160 | 176 | 3 | 1.1 | 370 000 | 985 000 | 38 000 | 100 000 | 670 | 1 000 | **52420 X** | **54420 X** |
| **85** | 100 | 150 | 67 | 72.8 | 81 | 1.1 | 1 | 135 000 | 375 000 | 13 700 | 38 500 | 1 300 | 1 900 | **52220** | **54220** |
| | 100 | 170 | 97 | 105.4 | 115 | 1.5 | 1 | 239 000 | 595 000 | 24 300 | 61 000 | 950 | 1 500 | **52320** | **54320** |
| **90** | 110 | 230 | 166 | — | — | 3 | 1.1 | 415 000 | 1 150 000 | 42 000 | 118 000 | 600 | 900 | **52422 X** | — |
| **95** | 110 | 160 | 67 | 71.4 | 81 | 1.1 | 1 | 136 000 | 395 000 | 13 900 | 40 000 | 1 200 | 1 800 | **52222** | **54222** |
| | 110 | 190 | 110 | 118.4 | 128 | 2 | 1 | 282 000 | 755 000 | 28 800 | 77 000 | 850 | 1 300 | **52322 X** | **54322 X** |
| | 120 | 250 | 177 | — | — | 4 | 1.5 | 515 000 | 1 540 000 | 52 500 | 157 000 | 560 | 850 | **52424 X** | — |
| **100** | 120 | 170 | 68 | 71.6 | 82 | 1.1 | 1.1 | 141 000 | 430 000 | 14 400 | 44 000 | 1 200 | 1 800 | **52224** | **54224** |
| | 120 | 210 | 123 | 131.2 | 143 | 2.1 | 1.1 | 330 000 | 930 000 | 33 500 | 95 000 | 750 | 1 100 | **52324 X** | **54324 X** |
| | 130 | 270 | 192 | — | — | 4 | 1.5 | 525 000 | 1 590 000 | 53 500 | 162 000 | 530 | 800 | **52426 X** | — |
| **110** | 130 | 190 | 80 | 85.8 | 96 | 1.5 | 1.1 | 183 000 | 550 000 | 18 700 | 56 000 | 1 000 | 1 500 | **52226 X** | **54226 X** |
| | 130 | 225 | 130 | — | — | 2.1 | 1.1 | 350 000 | 1 030 000 | 35 500 | 105 000 | 710 | 1 100 | **52326 X** | — |
| | 140 | 280 | 196 | — | — | 4 | 1.5 | 550 000 | 1 750 000 | 56 500 | 178 000 | 500 | 750 | **52428 X** | — |
| **120** | 140 | 200 | 81 | 86.2 | 99 | 1.5 | 1.1 | 186 000 | 575 000 | 18 900 | 59 000 | 1 000 | 1 500 | **52228 X** | **54228 X** |
| | 140 | 240 | 140 | — | — | 2.1 | 1.1 | 370 000 | 1 130 000 | 37 500 | 115 000 | 670 | 1 000 | **52328 X** | — |
| | 150 | 300 | 209 | — | — | 4 | 2 | 620 000 | 2 010 000 | 63 000 | 205 000 | 480 | 710 | **52430 X** | — |
| **130** | 150 | 215 | 89 | 95.6 | 109 | 1.5 | 1.1 | 238 000 | 735 000 | 24 300 | 75 000 | 900 | 1 300 | **52230 X** | **54230 X** |
| | 150 | 250 | 140 | — | — | 2.1 | 1.1 | 380 000 | 1 200 000 | 39 000 | 123 000 | 630 | 950 | **52330 X** | — |
| | 160 | 320 | 226 | — | — | 5 | 2 | 650 000 | 2 210 000 | 66 000 | 226 000 | 430 | 630 | **52432 X** | — |

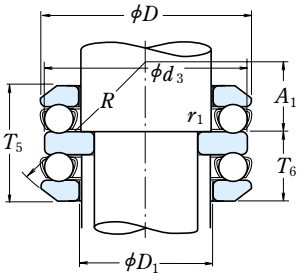
| Bearing Numbers | Dimensions (mm) | | | | | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat Washer | $d_3$ | $D_1$ | $D_2$ | $D_3$ | $T_2$ | $T_6$ | $T_8$ | $B$ | $b$ | $A_1$ | $R$ | $D_a$ max. | $r_a$ max. | $r_b$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| **54215 U** | 110 | 77 | 92 | 115 | 28.5 | 29.8 | 33.5 | 10 | 9.5 | 47.5 | 90 | 92 | 1 | 1 | 1.54 | 1.66 | 2.06 |
| **54315 U** | 135 | 77 | 105 | 140 | 48.5 | 52.6 | 56.5 | 18 | 15 | 32.5 | 100 | 105 | 1.5 | 1 | 4.74 | 5.14 | 6.38 |
| **54415 U** | 160 | 78 | 115 | 165 | 70.5 | 74.5 | 80.5 | 26 | 21 | 36.5 | 125 | 115 | 2 | 1 | 10.8 | 11 | 13.7 |
| **54216 U** | 115 | 82 | 98 | 120 | 29 | 30.5 | 34 | 10 | 10 | 45 | 90 | 98 | 1 | 1 | 1.66 | 1.78 | 2.21 |
| **54316 U** | 140 | 82 | 110 | 145 | 48.5 | 52.1 | 56.5 | 18 | 15 | 45.5 | 112 | 110 | 1.5 | 1 | 4.99 | 5.39 | 6.61 |
| **54416 U** | 170 | 83 | 125 | 175 | 73.5 | 77.7 | 83.5 | 27 | 22 | 30.5 | 125 | 125 | 2 | 1 | 12.6 | 12.8 | 16 |
| **54417 XU** | 179.5 | 88 | 130 | 185 | 78.5 | 83.5 | 89.5 | 29 | 23 | 40.5 | 140 | 130 | 2 | 1 | 15.4 | 15.8 | 19.5 |
| **54217 U** | 125 | 88 | 105 | 130 | 33.5 | 35.6 | 39.5 | 12 | 11 | 49.5 | 100 | 105 | 1 | 1 | 2.26 | 2.45 | 3.02 |
| **54317 U** | 150 | 88 | 115 | 155 | 53 | 57.1 | 62 | 19 | 17.5 | 39 | 112 | 115 | 1.5 | 1 | 6.38 | 6.8 | 10.5 |
| **54418 XU** | 189.5 | 93 | 140 | 195 | 82.5 | 86.7 | 93.5 | 30 | 25.5 | 34.5 | 140 | 140 | 2 | 1 | 17.5 | 18.1 | 22.5 |
| **54218 U** | 135 | 93 | 110 | 140 | 38 | 41.5 | 45 | 14 | 13.5 | 42 | 100 | 110 | 1 | 1 | 3.09 | 3.42 | 4.39 |
| **54318 U** | 155 | 93 | 120 | 160 | 53.5 | 58.1 | 62.5 | 19 | 18 | 36.5 | 112 | 120 | 1.5 | 1 | 6.79 | 7.33 | 9.29 |
| **54420 XU** | 209.5 | 103 | 155 | 220 | 91.5 | 96.5 | 104.5 | 33 | 27 | 43.5 | 160 | 155 | 2.5 | 1 | 26.8 | 27.2 | 33.4 |
| **54220 U** | 150 | 103 | 125 | 155 | 41 | 43.9 | 48 | 15 | 14 | 49 | 112 | 125 | 1 | 1 | 4.08 | 4.54 | 5.64 |
| **54320 U** | 170 | 103 | 135 | 175 | 59 | 63.2 | 68 | 21 | 18 | 42 | 125 | 135 | 1.5 | 1 | 8.82 | 9.47 | 11.6 |
| — | 229 | 113 | — | — | 101.5 | — | — | 37 | — | — | — | 159 | 2.5 | 1 | 35.6 | — | — |
| **54222 U** | 160 | 113 | 135 | 165 | 41 | 43.2 | 48 | 15 | 14 | 62 | 125 | 135 | 1 | 1 | 4.39 | 4.83 | 5.94 |
| **54322 XU** | 189.5 | 113 | 150 | 195 | 67 | 71.2 | 76 | 24 | 20.5 | 47 | 140 | 150 | 2 | 1 | 12.7 | 13.5 | 16.6 |
| — | 249 | 123 | — | — | 108.5 | — | — | 40 | — | — | — | 174 | 3 | 1.5 | 47.6 | — | — |
| **54224 U** | 170 | 123 | 145 | 175 | 41.5 | 43.3 | 48.5 | 15 | 15 | 58.5 | 125 | 145 | 1 | 1 | 4.92 | 5.4 | 6.68 |
| **54324 XU** | 209.5 | 123 | 165 | 220 | 75 | 79.1 | 85 | 27 | 22 | 58 | 160 | 165 | 2 | 1 | 17.6 | 16.4 | 22.9 |
| — | 269 | 134 | — | — | 117 | — | — | 42 | — | — | — | 188 | 3 | 1.5 | 57.8 | — | — |
| **54226 XU** | 189.5 | 133 | 160 | 195 | 49 | 51.9 | 57 | 18 | 17 | 63 | 140 | 160 | 1.5 | 1 | 7.43 | 8.24 | 10.2 |
| — | 224 | 134 | — | — | 80 | — | — | 30 | — | — | — | 169 | 2 | 1 | 21.5 | — | — |
| — | 279 | 144 | — | — | 120 | — | — | 44 | — | — | — | 198 | 3 | 1.5 | 62.4 | — | — |
| **54228 XU** | 199.5 | 143 | 170 | 210 | 49.5 | 52.1 | 58.5 | 18 | 17 | 83.5 | 160 | 170 | 1.5 | 1 | 8.01 | 8.87 | 11.2 |
| — | 239 | 144 | — | — | 85.5 | — | — | 31 | — | — | — | 181 | 2 | 1 | 24.8 | — | — |
| — | 299 | 153 | — | — | 127.5 | — | — | 46 | — | — | — | 212 | 3 | 2 | 77.8 | — | — |
| **54230 XU** | 214.5 | 153 | 180 | 225 | 54.5 | 57.8 | 64.5 | 20 | 20.5 | 74.5 | 160 | 180 | 1.5 | 1 | 10.4 | 11.5 | 15 |
| — | 249 | 154 | — | — | 85.5 | — | — | 31 | — | — | — | 191 | 2 | 1 | 30.3 | — | — |
| — | 319 | 164 | — | — | 138 | — | — | 50 | — | — | — | 226 | 4 | 2 | 93.6 | — | — |

**Note** (1) The outside diameter $d_3$ of the central washers of all bearing numbers marked X is smaller than the outside diameter $D$ of the housing washers.

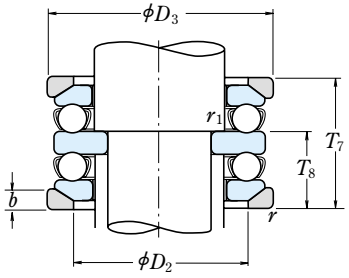
## Bore Diameter 135 – 190 mm



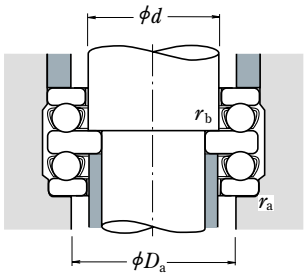

With Flat Seat

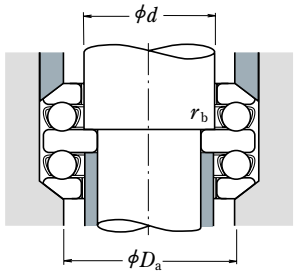


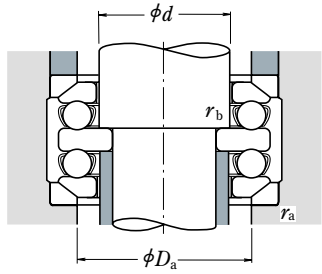

With Aligning Seat




With Aligning Seat Washer



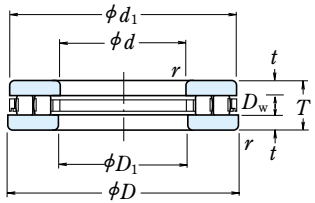



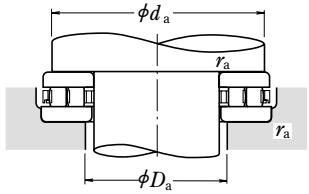

| Boundary Dimensions (mm) | | | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_2$ | $d$ | $D$ | $T_1$ | $T_5$ | $T_7$ | $r$ min. | $r_1$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil | With Flat Seat | With Aligning Seat |
| **135** | 170 | 340 | 236 | — | — | 5 | 2.1 | 715 000 | 2 480 000 | 73 000 | 253 000 | 400 | 600 | **52434 X** | — |
| **140** | 160 | 225 | 90 | 97.4 | 110 | 1.5 | 1.1 | 249 000 | 805 000 | 25 400 | 82 000 | 850 | 1 300 | **52232 X** | **54232 X** |
| | 160 | 270 | 153 | — | — | 3 | 1.1 | 475 000 | 1 570 000 | 48 500 | 160 000 | 600 | 900 | **52332 X** | — |
| | 180 | 360 | 245 | — | — | 5 | 3 | 750 000 | 2 730 000 | 76 500 | 278 000 | 380 | 560 | **52436 X** | — |
| **150** | 170 | 240 | 97 | 104.4 | 117 | 1.5 | 1.1 | 280 000 | 915 000 | 28 500 | 93 000 | 800 | 1 200 | **52234 X** | **54234 X** |
| | 170 | 280 | 153 | — | — | 3 | 1.1 | 465 000 | 1 570 000 | 47 500 | 160 000 | 560 | 850 | **52334 X** | — |
| | 180 | 250 | 98 | 102.4 | 118 | 1.5 | 2 | 284 000 | 955 000 | 28 900 | 97 000 | 800 | 1 200 | **52236 X** | **54236 X** |
| | 180 | 300 | 165 | — | — | 3 | 3 | 480 000 | 1 680 000 | 49 000 | 171 000 | 530 | 800 | **52336 X** | — |
| **160** | 190 | 270 | 109 | 116.4 | 131 | 2 | 2 | 320 000 | 1 110 000 | 32 500 | 113 000 | 710 | 1 100 | **52238 X** | **54238 X** |
| | 190 | 320 | 183 | — | — | 4 | 2 | 550 000 | 1 960 000 | 56 000 | 199 000 | 480 | 710 | **52338 X** | — |
| **170** | 200 | 280 | 109 | 115.6 | 133 | 2 | 2 | 315 000 | 1 110 000 | 32 500 | 113 000 | 710 | 1 000 | **52240 X** | **54240 X** |
| | 200 | 340 | 192 | — | — | 4 | 2 | 600 000 | 2 220 000 | 61 500 | 227 000 | 450 | 670 | **52340 X** | — |
| **190** | 220 | 300 | 110 | 115.2 | 134 | 2 | 2 | 325 000 | 1 210 000 | 33 500 | 123 000 | 670 | 1 000 | **52244 X** | **54244 X** |

| Dimensions (mm) | | | | | | | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| With Aligning Seat Washer | $d_3$ | $D_1$ | $D_2$ | $D_3$ | $T_2$ | $T_6$ | $T_8$ | $B$ | $b$ | $A_1$ | $R$ | $D_a$ max. | $r_a$ max. | $r_b$ max. | With Flat Seat | With Aligning Seat | With Aligning Seat Washer |
| — | 339 | 174 | — | — | 143 | — | — | 50 | — | — | — | 240 | 4 | 2 | 110 | — | — |
| **54232 XU** | 224.5 | 163 | 190 | 235 | 55 | 58.7 | 65 | 20 | 21 | 70 | 160 | 190 | 1.5 | 1 | 11.2 | 12.7 | 16.5 |
| — | 269 | 164 | — | — | 93 | — | — | 33 | — | — | — | 205 | 2.5 | 1 | 35.1 | — | — |
| — | 359 | 184 | — | — | 148.5 | — | — | 52 | — | — | — | 254 | 4 | 2.5 | 126 | — | — |
| **54234 XU** | 239.5 | 173 | 200 | 250 | 59 | 62.7 | 69 | 21 | 21.5 | 87 | 180 | 200 | 1.5 | 1 | 13.6 | 15.2 | 19.8 |
| — | 279 | 174 | — | — | 93 | — | — | 33 | — | — | — | 215 | 2.5 | 1 | 40.8 | — | — |
| **54236 XU** | 249 | 183 | 210 | 260 | 59.5 | 61.7 | 69.5 | 21 | 21.5 | 108.5 | 200 | 210 | 1.5 | 2 | 14.8 | 16.1 | 20.6 |
| — | 299 | 184 | — | — | 101 | — | — | 37 | — | — | — | 229 | 2.5 | 2.5 | 46.3 | — | — |
| **54238 XU** | 269 | 194 | 230 | 280 | 66.5 | 70.2 | 77.5 | 24 | 23 | 93.5 | 200 | 230 | 2 | 2 | 22.1 | 22.2 | 29.8 |
| — | 319 | 195 | — | — | 111.5 | — | — | 40 | — | — | — | 244 | 3 | 2 | 113 | — | — |
| **54240 XU** | 279 | 204 | 240 | 290 | 66.5 | 69.8 | 78.5 | 24 | 23 | 120.5 | 225 | 240 | 2 | 2 | 23.1 | 23.2 | 30.6 |
| — | 339 | 205 | — | — | 117 | — | — | 42 | — | — | — | 258 | 3 | 2 | 78.4 | — | — |
| **54244 XU** | 299 | 224 | 260 | 310 | 67 | 69.6 | 79 | 24 | 25 | 114 | 225 | 260 | 2 | 2 | 25.2 | 27.8 | 34.1 |

**Note** (1) The outside diameter $d_3$ of the central washers of all bearing numbers marked X is smaller than the outside diameter $D$ of the housing washers.

**Bore Diameter 35 – 130 mm**



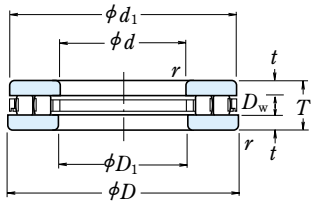



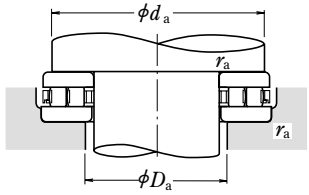

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $r$ min. | $C_a$ | $C_{0a}$ | Grease | Oil |
| **35** | 80 | 32 | 1.1 | 95 500 | 247 000 | 1 000 | 3 000 |
| **40** | 78 | 22 | 1 | 63 000 | 194 000 | 1 200 | 3 600 |
| **45** | 65 | 14 | 0.6 | 33 000 | 100 000 | 1 700 | 5 000 |
| | 85 | 24 | 1 | 71 000 | 233 000 | 1 100 | 3 400 |
| **50** | 110 | 27 | 1.1 | 139 000 | 470 000 | 900 | 2 800 |
| | 95 | 27 | 1.1 | 113 000 | 350 000 | 1 000 | 3 000 |
| **55** | 105 | 30 | 1.1 | 134 000 | 450 000 | 900 | 2 600 |
| **60** | 95 | 26 | 1 | 99 000 | 325 000 | 1 000 | 3 000 |
| | 110 | 30 | 1.1 | 139 000 | 480 000 | 850 | 2 600 |
| **65** | 100 | 27 | 1 | 110 000 | 325 000 | 950 | 2 800 |
| | 115 | 30 | 1.1 | 145 000 | 515 000 | 850 | 2 600 |
| **70** | 150 | 36 | 2 | 259 000 | 935 000 | 670 | 2 000 |
| | 125 | 34 | 1.1 | 191 000 | 635 000 | 750 | 2 200 |
| **75** | 100 | 19 | 1 | 63 500 | 221 000 | 1 100 | 3 400 |
| | 135 | 36 | 1.5 | 209 000 | 735 000 | 710 | 2 200 |
| **80** | 115 | 28 | 1 | 120 000 | 420 000 | 900 | 2 600 |
| | 140 | 36 | 1.5 | 208 000 | 740 000 | 710 | 2 000 |
| **85** | 110 | 19 | 1 | 75 000 | 298 000 | 1 100 | 3 200 |
| | 125 | 31 | 1 | 151 000 | 485 000 | 800 | 2 400 |
| | 150 | 39 | 1.5 | 257 000 | 995 000 | 630 | 1 900 |
| **90** | 120 | 22 | 1 | 96 000 | 370 000 | 950 | 3 000 |
| | 155 | 39 | 1.5 | 250 000 | 885 000 | 630 | 1 900 |
| **100** | 170 | 42 | 1.5 | 292 000 | 1 110 000 | 560 | 1 700 |
| **110** | 160 | 38 | 1.1 | 228 000 | 855 000 | 630 | 1 900 |
| | 190 | 48 | 2 | 390 000 | 1 490 000 | 500 | 1 500 |
| **120** | 170 | 39 | 1.1 | 233 000 | 895 000 | 600 | 1 800 |
| | 210 | 54 | 2.1 | 505 000 | 1 930 000 | 450 | 1 400 |
| **130** | 190 | 45 | 1.5 | 300 000 | 1 090 000 | 530 | 1 600 |
| | 225 | 58 | 2.1 | 585 000 | 2 370 000 | 430 | 1 300 |
| | 270 | 85 | 4 | 895 000 | 3 300 000 | 320 | 950 |

| Bearing Numbers | Dimensions (mm) | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|
| | $d_1$ | $D_1$ | $D_w$ | $t$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **35 TMP 14** | 80 | 37 | 12 | 10 | 71 | 46 | 1 | 0.97 |
| **40 TMP 93** | 78 | 42 | 8 | 7 | 71 | 48 | 1 | 0.525 |
| **45 TMP 11** | 65 | 47 | 6 | 4 | 60 | 49 | 0.6 | 0.144 |
| **45 TMP 93** | 85 | 47 | 8 | 8 | 78 | 53 | 1 | 0.665 |
| **50 TMP 74** | 109 | 52 | 11 | 8 | 100 | 61 | 1 | 1.52 |
| **50 TMP 93** | 93 | 52 | 11 | 8 | 89 | 57 | 1 | 0.94 |
| **55 TMP 93** | 105 | 55.2 | 11 | 9.5 | 98 | 63 | 1 | 1.28 |
| **60 TMP 12** | 95 | 62 | 10 | 8 | 88 | 67 | 1 | 0.735 |
| **60 TMP 93** | 110 | 62 | 11 | 9.5 | 103 | 68 | 1 | 1.36 |
| **65 TMP 12** | 100 | 67 | 12.5 | 7.25 | 93 | 71 | 1 | 0.805 |
| **65 TMP 93** | 115 | 65.2 | 11 | 9.5 | 108 | 73 | 1 | 1.44 |
| **70 TMP 74** | 149 | 72 | 15 | 10.5 | 137 | 84 | 2 | 3.8 |
| **70 TMP 93** | 125 | 72 | 14 | 10 | 117 | 78 | 1 | 1.95 |
| **75 TMP 11** | 100 | 77 | 8 | 5.5 | 96 | 79 | 1 | 0.41 |
| **75 TMP 93** | 135 | 77 | 14 | 11 | 125 | 84 | 1.5 | 2.42 |
| **80 TMP 12** | 115 | 82 | 11 | 8.5 | 109 | 86 | 1 | 1.02 |
| **80 TMP 93** | 138 | 82 | 14 | 11 | 130 | 91 | 1.5 | 2.54 |
| **85 TMP 11** | 110 | 87 | 7.5 | 5.75 | 105 | 89 | 1 | 0.46 |
| **85 TMP 12** | 125 | 88 | 14 | 8.5 | 118 | 92 | 1 | 1.36 |
| **85 TMP 93** | 148 | 87 | 14 | 12.5 | 140 | 95 | 1.5 | 3.2 |
| **90 TMP 11** | 119 | 91.5 | 9 | 6.5 | 114 | 95 | 1 | 0.725 |
| **90 TMP 93** | 155 | 90.2 | 16 | 11.5 | 144 | 101 | 1.5 | 3.3 |
| **100 TMP 93** | 170 | 103 | 16 | 13 | 159 | 110 | 1.5 | 4.25 |
| **110 TMP 12** | 160 | 113 | 15 | 11.5 | 150 | 119 | 1 | 2.66 |
| **110 TMP 93** | 190 | 113 | 19 | 14.5 | 179 | 120 | 2 | 6.15 |
| **120 TMP 12** | 170 | 123 | 15 | 12 | 160 | 129 | 1 | 2.93 |
| **120 TMP 93** | 210 | 123 | 22 | 16 | 199 | 129 | 2 | 8.55 |
| **130 TMP 12** | 187 | 133 | 19 | 13 | 177 | 142 | 1.5 | 4.5 |
| **130 TMP 93** | 225 | 133 | 22 | 18 | 214 | 140 | 2 | 10.4 |
| **130 TMP 94** | 270 | 133 | 32 | 26.5 | 254 | 150 | 3 | 26.2 |

**Remarks** For cylindrical roller thrust bearings not listed adove, please contact NSK.

**Bore Diameter 140 – 320 mm**



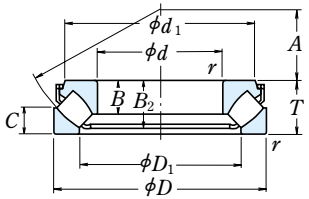



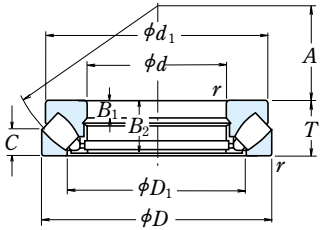

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $r$ min. | $C_a$ | $C_{0a}$ | Grease | Oil |
| **140** | 200 | 46 | 2 | 285 000 | 1 120 000 | 500 | 1 500 |
| | 240 | 60 | 2.1 | 610 000 | 2 360 000 | 400 | 1 200 |
| | 280 | 85 | 4 | 990 000 | 3 800 000 | 300 | 900 |
| **150** | 215 | 50 | 2 | 375 000 | 1 500 000 | 480 | 1 400 |
| | 250 | 60 | 2.1 | 635 000 | 2 510 000 | 400 | 1 200 |
| **160** | 200 | 31 | 1 | 173 000 | 815 000 | 630 | 1 900 |
| | 270 | 67 | 3 | 745 000 | 3 150 000 | 360 | 1 100 |
| **170** | 240 | 55 | 1.5 | 485 000 | 1 960 000 | 430 | 1 300 |
| | 280 | 67 | 3 | 800 000 | 3 500 000 | 340 | 1 000 |
| **180** | 300 | 73 | 3 | 1 000 000 | 4 000 000 | 320 | 950 |
| | 360 | 109 | 5 | 1 640 000 | 6 200 000 | 240 | 710 |
| **190** | 270 | 62 | 3 | 705 000 | 2 630 000 | 360 | 1 100 |
| | 320 | 78 | 4 | 1 080 000 | 4 500 000 | 300 | 900 |
| **200** | 250 | 37 | 1.1 | 365 000 | 1 690 000 | 500 | 1 500 |
| | 340 | 85 | 4 | 1 180 000 | 5 150 000 | 280 | 800 |
| **220** | 270 | 37 | 1.1 | 385 000 | 1 860 000 | 480 | 1 500 |
| | 300 | 63 | 2 | 770 000 | 3 100 000 | 340 | 1 000 |
| **240** | 300 | 45 | 1.5 | 435 000 | 2 160 000 | 400 | 1 200 |
| | 340 | 78 | 2.1 | 965 000 | 4 100 000 | 280 | 850 |
| **260** | 320 | 45 | 1.5 | 460 000 | 2 350 000 | 400 | 1 200 |
| | 360 | 79 | 2.1 | 995 000 | 4 350 000 | 280 | 850 |
| **280** | 350 | 53 | 1.5 | 545 000 | 2 800 000 | 340 | 1 000 |
| | 380 | 80 | 2.1 | 1 050 000 | 4 750 000 | 260 | 800 |
| **300** | 380 | 62 | 2 | 795 000 | 4 000 000 | 300 | 900 |
| | 420 | 95 | 3 | 1 390 000 | 6 250 000 | 220 | 670 |
| **320** | 400 | 63 | 2 | 820 000 | 4 250 000 | 300 | 900 |
| | 440 | 95 | 3 | 1 420 000 | 6 550 000 | 220 | 670 |

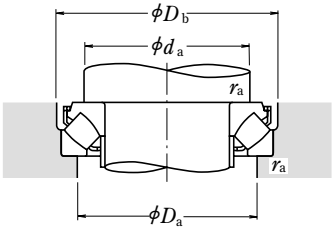
| Bearing Numbers | Dimensions (mm) | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|
| | $d_1$ | $D_1$ | $D_w$ | $t$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **140 TMP 12** | 197 | 143 | 17 | 14.5 | 188 | 153 | 2 | 4.85 |
| **140 TMP 93** | 240 | 143 | 25 | 17.5 | 226 | 154 | 2 | 12.2 |
| **140 TMP 94** | 280 | 143 | 32 | 26.5 | 262 | 158 | 3 | 27.5 |
| **150 TMP 12** | 215 | 153 | 19 | 15.5 | 202 | 163 | 2 | 6.15 |
| **150 TMP 93** | 250 | 153 | 25 | 17.5 | 236 | 165 | 2 | 12.8 |
| **160 TMP 11** | 200 | 162 | 11 | 10 | 191 | 168 | 1 | 2.21 |
| **160 TMP 93** | 265 | 164 | 25 | 21 | 255 | 173 | 2.5 | 16.9 |
| **170 TMP 12** | 237 | 173 | 22 | 16.5 | 227 | 182 | 1.5 | 8.2 |
| **170 TMP 93** | 280 | 173 | 25 | 21 | 265 | 183 | 2.5 | 17.7 |
| **180 TMP 93** | 300 | 185 | 32 | 20.5 | 284 | 194 | 2.5 | 22.5 |
| **180 TMP 94** | 354 | 189 | 45 | 32 | 335 | 205 | 4 | 58.2 |
| **190 TMP 12** | 266 | 195 | 30 | 16 | 255 | 200 | 2.5 | 11.8 |
| **190 TMP 93** | 320 | 195 | 32 | 23 | 303 | 205 | 3 | 27.6 |
| **200 TMP 11** | 247 | 203 | 17 | 10 | 242 | 207 | 1 | 4.1 |
| **200 TMP 93** | 340 | 205 | 32 | 26.5 | 322 | 218 | 3 | 34.5 |
| **220 TMP 11** | 267 | 223 | 17 | 10 | 262 | 227 | 1 | 4.5 |
| **220 TMP 12** | 297 | 224 | 30 | 16.5 | 287 | 232 | 2 | 13.5 |
| **240 TMP 11** | 297 | 243 | 18 | 13.5 | 288 | 251 | 1.5 | 7.2 |
| **240 TMP 12** | 335 | 244 | 32 | 23 | 322 | 258 | 2 | 23.3 |
| **260 TMP 11** | 317 | 263 | 18 | 13.5 | 308 | 272 | 1.5 | 7.75 |
| **260 TMP 12** | 355 | 264 | 32 | 23.5 | 342 | 276 | 2 | 25.2 |
| **280 TMP 11** | 347 | 283 | 20 | 16.5 | 335 | 294 | 1.5 | 11.6 |
| **280 TMP 12** | 375 | 284 | 32 | 24 | 362 | 296 | 2 | 27.2 |
| **300 TMP 11** | 376 | 304 | 25 | 18.5 | 365 | 315 | 2 | 16.7 |
| **300 TMP 12** | 415 | 304 | 38 | 28.5 | 398 | 322 | 2.5 | 42 |
| **320 TMP 11** | 396 | 324 | 25 | 19 | 385 | 335 | 2 | 18 |
| **320 TMP 12** | 435 | 325 | 38 | 28.5 | 418 | 340 | 2.5 | 44.5 |

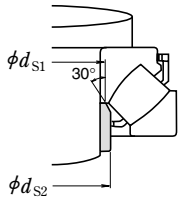
**Remarks** For cylindrical roller thrust bearings not listed adove, please contact NSK.

**Bore Diameter 60 – 200 mm**




**Dynamic Equivalent Load**

$P = 1.2F_r + F_a$

**Static Equivalent Load**

$P_0 = 2.8F_r + F_a$

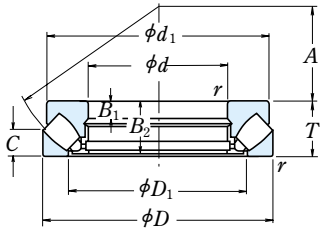
However, $F_r/F_a \leqq 0.55$ must be satisfied.

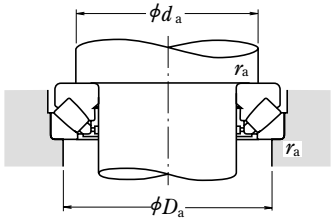
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) Oil | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | | |
| **60** | 130 | 42 | 1.5 | 330 000 | 885 000 | 33 500 | 90 000 | 2 600 | **29412 E** |
| **65** | 140 | 45 | 2 | 405 000 | 1 100 000 | 41 500 | 112 000 | 2 400 | **29413 E** |
| **70** | 150 | 48 | 2 | 450 000 | 1 240 000 | 46 000 | 126 000 | 2 400 | **29414 E** |
| **75** | 160 | 51 | 2 | 515 000 | 1 430 000 | 52 500 | 146 000 | 2 200 | **29415 E** |
| **80** | 170 | 54 | 2.1 | 575 000 | 1 600 000 | 58 500 | 163 000 | 2 000 | **29416 E** |
| **85** | 150 | 39 | 1.5 | 330 000 | 1 040 000 | 34 000 | 106 000 | 2 400 | **29317 E** |
| | 180 | 58 | 2.1 | 630 000 | 1 760 000 | 64 500 | 179 000 | 1 900 | **29417 E** |
| **90** | 155 | 39 | 1.5 | 350 000 | 1 080 000 | 35 500 | 110 000 | 2 200 | **29318 E** |
| | 190 | 60 | 2.1 | 695 000 | 1 950 000 | 70 500 | 199 000 | 1 800 | **29418 E** |
| **100** | 170 | 42 | 1.5 | 410 000 | 1 280 000 | 41 500 | 131 000 | 2 000 | **29320 E** |
| | 210 | 67 | 3 | 840 000 | 2 400 000 | 86 000 | 245 000 | 1 600 | **29420 E** |
| **110** | 190 | 48 | 2 | 530 000 | 1 710 000 | 54 000 | 174 000 | 1 800 | **29322 E** |
| | 230 | 73 | 3 | 1 010 000 | 2 930 000 | 103 000 | 299 000 | 1 500 | **29422 E** |
| **120** | 210 | 54 | 2.1 | 645 000 | 2 100 000 | 65 500 | 214 000 | 1 600 | **29324 E** |
| | 250 | 78 | 4 | 1 160 000 | 3 400 000 | 119 000 | 350 000 | 1 400 | **29424 E** |
| **130** | 225 | 58 | 2.1 | 740 000 | 2 450 000 | 75 500 | 250 000 | 1 500 | **29326 E** |
| | 270 | 85 | 4 | 1 330 000 | 3 900 000 | 135 000 | 400 000 | 1 200 | **29426 E** |
| **140** | 240 | 60 | 2.1 | 840 000 | 2 810 000 | 85 500 | 287 000 | 1 400 | **29328 E** |
| | 280 | 85 | 4 | 1 370 000 | 4 200 000 | 140 000 | 425 000 | 1 200 | **29428 E** |
| **150** | 250 | 60 | 2.1 | 870 000 | 2 900 000 | 89 000 | 296 000 | 1 400 | **29330 E** |
| | 300 | 90 | 4 | 1 580 000 | 4 900 000 | 162 000 | 500 000 | 1 100 | **29430 E** |
| **160** | 270 | 67 | 3 | 1 010 000 | 3 400 000 | 103 000 | 345 000 | 1 300 | **29332 E** |
| | 320 | 95 | 5 | 1 740 000 | 5 400 000 | 178 000 | 550 000 | 1 100 | **29432 E** |
| **170** | 280 | 67 | 3 | 1 050 000 | 3 500 000 | 107 000 | 355 000 | 1 200 | **29334 E** |
| | 340 | 103 | 5 | 1 680 000 | 5 800 000 | 171 000 | 595 000 | 1 000 | **29434** |
| **180** | 300 | 73 | 3 | 1 230 000 | 4 200 000 | 125 000 | 430 000 | 1 100 | **29336 E** |
| | 360 | 109 | 5 | 1 870 000 | 6 500 000 | 190 000 | 660 000 | 900 | **29436** |
| **190** | 320 | 78 | 4 | 1 370 000 | 4 700 000 | 140 000 | 480 000 | 1 100 | **29338 E** |
| | 380 | 115 | 5 | 2 100 000 | 7 450 000 | 215 000 | 760 000 | 850 | **29438** |
| **200** | 280 | 48 | 2 | 540 000 | 2 310 000 | 55 000 | 236 000 | 1 500 | **29240** |
| | 340 | 85 | 4 | 1 570 000 | 5 450 000 | 160 000 | 555 000 | 1 000 | **29340 E** |
| | 400 | 122 | 5 | 2 290 000 | 8 150 000 | 234 000 | 835 000 | 800 | **29440** |

| Dimensions (mm) | | | | | | Spacer Sleeve Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ | $D_1$ | $B, B_1$ | $B_2$ | $C$ | $A$ | $d_{S1}$ max. | $d_{S2}$ max. | $d_a$(1) min. | $D_a$ max. | $D_b$ min. | $r_a$ max. | approx. |
| 114.5 | 89 | 27 | 38 | 20 | 38 | 67 | 67 | 90 | 108 | 133 | 1.5 | 2.55 |
| 121.5 | 93 | 29.5 | 40.5 | 22 | 42 | 72 | 72 | 100 | 115 | 143 | 2 | 3.2 |
| 131.5 | 102 | 31 | 43 | 24 | 44 | 78 | 78 | 105 | 125 | 153 | 2 | 3.9 |
| 138 | 107 | 33.5 | 46 | 25 | 47 | 83 | 83 | 115 | 132 | 163 | 2 | 4.65 |
| 148 | 114.5 | 35 | 48.5 | 27 | 50 | 89 | 89 | 120 | 140 | 173 | 2 | 5.55 |
| 134.5 | 112 | 24.5 | 35.5 | 19 | 50 | 91 | 91 | 115 | 135 | 153 | 1.5 | 2.7 |
| 156.5 | 124 | 37 | 51.5 | 28 | 54 | 95 | 95 | 130 | 150 | 183 | 2 | 6.55 |
| 139.5 | 118 | 24.5 | 35 | 19 | 52 | 97 | 97 | 120 | 140 | 158 | 1.5 | 2.83 |
| 165.5 | 129.5 | 39 | 54.5 | 29 | 56 | 100 | 100 | 135 | 157 | 193 | 2 | 7.55 |
| 152 | 128 | 26.2 | 38 | 20.8 | 58 | 107 | 107 | 130 | 150 | 173 | 1.5 | 3.6 |
| 185 | 144 | 43 | 59.5 | 33 | 62 | 111 | 111 | 150 | 175 | 214 | 2.5 | 10.3 |
| 169.5 | 142.5 | 30.3 | 43.5 | 24 | 64 | 117 | 117 | 145 | 165 | 193 | 2 | 5.25 |
| 200 | 157 | 47 | 64.5 | 36 | 69 | 121 | 129 | 165 | 190 | 234 | 2.5 | 13.3 |
| 187.5 | 156.5 | 34 | 48.5 | 27 | 70 | 130 | 130 | 160 | 180 | 214 | 2 | 7.3 |
| 215 | 171 | 50.5 | 69.5 | 38 | 74 | 132 | 142 | 180 | 205 | 254 | 3 | 16.6 |
| 203.5 | 168.5 | 37 | 53.5 | 28 | 76 | 141 | 143 | 170 | 195 | 229 | 2 | 8.95 |
| 235 | 185 | 54 | 74.5 | 42 | 81 | 143 | 153 | 195 | 225 | 275 | 3 | 21.1 |
| 216.5 | 179 | 38.5 | 54 | 30 | 82 | 148 | 154 | 185 | 205 | 244 | 2 | 10.4 |
| 244.5 | 195.5 | 54 | 74.5 | 42 | 86 | 153 | 162 | 205 | 235 | 285 | 3 | 22.2 |
| 224 | 190 | 38 | 54.5 | 29 | 87 | 158 | 163 | 195 | 215 | 254 | 2 | 10.8 |
| 266 | 209 | 58 | 81 | 44 | 92 | 164 | 175 | 220 | 250 | 306 | 3 | 27.3 |
| 243 | 203 | 42 | 60 | 33 | 92 | 169 | 176 | 210 | 235 | 275 | 2.5 | 14.3 |
| 278 | 224.5 | 60.5 | 84.5 | 46 | 99 | 175 | 189 | 230 | 265 | 326 | 4 | 32.1 |
| 252 | 214.5 | 42.2 | 60.5 | 32 | 96 | 178 | 188 | 220 | 245 | 285 | 2.5 | 14.8 |
| 310 | 243 | 37 | 99 | 50 | 104 | — | — | 245 | 285 | — | 4 | 43.5 |
| 270 | 227 | 46 | 65.5 | 36 | 103 | 189 | 195 | 235 | 260 | 306 | 2.5 | 19 |
| 330 | 255 | 39 | 105 | 52 | 110 | — | — | 260 | 300 | — | 4 | 52 |
| 288.5 | 244 | 49 | 69 | 38 | 110 | 200 | 211 | 250 | 275 | 326 | 3 | 23 |
| 345 | 271 | 41 | 111 | 55 | 117 | — | — | 275 | 320 | — | 4 | 60 |
| 266 | 236 | 15 | 46 | 24 | 108 | — | — | 235 | 255 | — | 2 | 8.55 |
| 306.5 | 257 | 53.5 | 75 | 41 | 116 | 211 | 224 | 265 | 295 | 346 | 3 | 28.5 |
| 365 | 280 | 43 | 117 | 59 | 122 | — | — | 290 | 335 | — | 4 | 69 |

**Note** (1) For heavy load applications, a $d_a$ value should be chosen which is large enough to support the shaft washer rib.

## Bore Diameter 220 – 420 mm




**Dynamic Equivalent Load**

$P = 1.2F_r + F_a$

**Static Equivalent Load**

$P_0 = 2.8F_r + F_a$

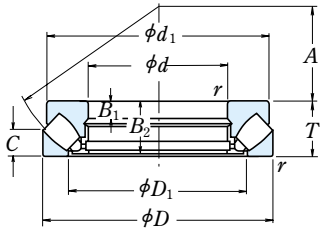
However, $F_r/F_a \leqq 0.55$ must be satisfied.

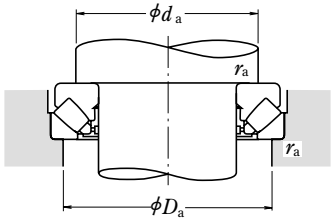
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) Oil | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | | |
| **220** | 300 | 48 | 2 | 560 000 | 2 500 000 | 57 000 | 255 000 | 1 400 | **29244** |
| | 360 | 85 | 4 | 1 340 000 | 5 200 000 | 137 000 | 530 000 | 950 | **29344** |
| | 420 | 122 | 6 | 2 350 000 | 8 650 000 | 240 000 | 880 000 | 800 | **29444** |
| **240** | 340 | 60 | 2.1 | 800 000 | 3 450 000 | 82 000 | 350 000 | 1 200 | **29248** |
| | 380 | 85 | 4 | 1 360 000 | 5 400 000 | 139 000 | 550 000 | 950 | **29348** |
| | 440 | 122 | 6 | 2 420 000 | 9 100 000 | 247 000 | 930 000 | 750 | **29448** |
| **260** | 360 | 60 | 2.1 | 855 000 | 3 850 000 | 87 500 | 395 000 | 1 200 | **29252** |
| | 420 | 95 | 5 | 1 700 000 | 6 800 000 | 173 000 | 695 000 | 800 | **29352** |
| | 480 | 132 | 6 | 2 820 000 | 10 700 000 | 287 000 | 1 090 000 | 710 | **29452** |
| **280** | 380 | 60 | 2.1 | 885 000 | 4 100 000 | 90 000 | 420 000 | 1 100 | **29256** |
| | 440 | 95 | 5 | 1 830 000 | 7 650 000 | 187 000 | 780 000 | 800 | **29356** |
| | 520 | 145 | 6 | 3 400 000 | 13 100 000 | 345 000 | 1 330 000 | 630 | **29456** |
| | 520 | 145 | 6 | 3 950 000 | 14 900 000 | 400 000 | 1 520 000 | 630 | **29456 EM** |
| **300** | 420 | 73 | 3 | 1 160 000 | 5 150 000 | 118 000 | 525 000 | 950 | **29260** |
| | 480 | 109 | 5 | 2 190 000 | 9 100 000 | 224 000 | 925 000 | 710 | **29360** |
| | 540 | 145 | 6 | 3 500 000 | 13 700 000 | 355 000 | 1 390 000 | 630 | **29460** |
| **320** | 440 | 73 | 3 | 1 190 000 | 5 450 000 | 122 000 | 555 000 | 950 | **29264** |
| | 500 | 109 | 5 | 2 230 000 | 9 400 000 | 227 000 | 960 000 | 670 | **29364** |
| | 580 | 155 | 7.5 | 3 650 000 | 14 600 000 | 370 000 | 1 490 000 | 560 | **29464** |
| **340** | 460 | 73 | 3 | 1 230 000 | 5 750 000 | 125 000 | 590 000 | 900 | **29268** |
| | 540 | 122 | 5 | 2 640 000 | 11 200 000 | 269 000 | 1 140 000 | 630 | **29368** |
| | 620 | 170 | 7.5 | 4 400 000 | 17 400 000 | 450 000 | 1 780 000 | 530 | **29468** |
| **360** | 500 | 85 | 4 | 1 550 000 | 7 300 000 | 158 000 | 745 000 | 800 | **29272** |
| | 560 | 122 | 5 | 2 670 000 | 11 500 000 | 272 000 | 1 180 000 | 600 | **29372** |
| | 640 | 170 | 7.5 | 4 200 000 | 17 200 000 | 430 000 | 1 750 000 | 500 | **29472** |
| | 640 | 170 | 7.5 | 5 450 000 | 20 400 000 | 555 000 | 2 800 000 | 500 | **29472 EM** |
| **380** | 520 | 85 | 4 | 1 620 000 | 7 800 000 | 165 000 | 795 000 | 800 | **29276** |
| | 600 | 132 | 6 | 3 300 000 | 14 500 000 | 335 000 | 1 480 000 | 560 | **29376** |
| | 670 | 175 | 7.5 | 4 800 000 | 19 500 000 | 490 000 | 1 990 000 | 480 | **29476** |
| **400** | 540 | 85 | 4 | 1 640 000 | 8 000 000 | 167 000 | 815 000 | 750 | **29280** |
| | 620 | 132 | 6 | 3 250 000 | 14 500 000 | 330 000 | 1 480 000 | 530 | **29380** |
| | 710 | 185 | 7.5 | 5 400 000 | 22 100 000 | 550 000 | 2 250 000 | 450 | **29480** |
| **420** | 580 | 95 | 5 | 2 010 000 | 9 800 000 | 205 000 | 1 000 000 | 670 | **29284** |
| | 650 | 140 | 6 | 3 500 000 | 15 700 000 | 355 000 | 1 600 000 | 500 | **29384** |
| | 730 | 185 | 7.5 | 5 650 000 | 23 500 000 | 575 000 | 2 400 000 | 450 | **29484** |

| Dimensions (mm) | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ | $D_1$ | $B_1$ | $B_2$ | $C$ | $A$ | $d_a$(1) min. | $D_a$ max. | $r_a$ max. | approx. |
| 285 | 254 | 15 | 46 | 24 | 117 | 260 | 275 | 2 | 9.2 |
| 335 | 280 | 29 | 81 | 41 | 125 | 285 | 315 | 3 | 33 |
| 385 | 308 | 43 | 117 | 58 | 132 | 310 | 355 | 5 | 74 |
| 325 | 283 | 19 | 57 | 30 | 130 | 285 | 305 | 2 | 16.5 |
| 355 | 300 | 29 | 81 | 41 | 135 | 300 | 330 | 3 | 35.5 |
| 405 | 326 | 43 | 117 | 59 | 142 | 330 | 375 | 5 | 79 |
| 345 | 302 | 19 | 57 | 30 | 139 | 305 | 325 | 2 | 18 |
| 390 | 329 | 32 | 91 | 45 | 148 | 330 | 365 | 4 | 48.5 |
| 445 | 357 | 48 | 127 | 64 | 154 | 360 | 405 | 5 | 105 |
| 365 | 323 | 19 | 57 | 30 | 150 | 325 | 345 | 2 | 19 |
| 410 | 348 | 32 | 91 | 46 | 158 | 350 | 390 | 4 | 52.5 |
| 480 | 384 | 52 | 140 | 68 | 166 | 390 | 440 | 5 | 132 |
| 480 | 380 | 52 | 140 | 70 | 166 | 410 | 445 | 5 | 134 |
| 400 | 353 | 21 | 69 | 38 | 162 | 355 | 380 | 2.5 | 30 |
| 450 | 379 | 37 | 105 | 50 | 168 | 380 | 420 | 4 | 74 |
| 500 | 402 | 52 | 140 | 70 | 175 | 410 | 460 | 5 | 140 |
| 420 | 372 | 21 | 69 | 38 | 172 | 375 | 400 | 2.5 | 32.5 |
| 470 | 399 | 37 | 105 | 53 | 180 | 400 | 440 | 4 | 77 |
| 555 | 436 | 55 | 149 | 75 | 191 | 435 | 495 | 6 | 175 |
| 440 | 395 | 21 | 69 | 37 | 183 | 395 | 420 | 2.5 | 33.5 |
| 510 | 428 | 41 | 117 | 59 | 192 | 430 | 470 | 4 | 103 |
| 590 | 462 | 61 | 164 | 82 | 201 | 465 | 530 | 6 | 218 |
| 480 | 423 | 25 | 81 | 44 | 194 | 420 | 455 | 3 | 51 |
| 525 | 448 | 41 | 117 | 59 | 202 | 450 | 495 | 4 | 107 |
| 610 | 480 | 61 | 164 | 82 | 210 | 485 | 550 | 6 | 228 |
| 580 | 474 | 61 | 164 | 83 | 210 | 495 | 550 | 6 | 220 |
| 496 | 441 | 27 | 81 | 42 | 202 | 440 | 475 | 3 | 52 |
| 568 | 477 | 44 | 127 | 63 | 216 | 480 | 525 | 5 | 140 |
| 640 | 504 | 63 | 168 | 85 | 230 | 510 | 575 | 6 | 254 |
| 517 | 460 | 27 | 81 | 42 | 212 | 460 | 490 | 3 | 55 |
| 590 | 494 | 44 | 127 | 64 | 225 | 500 | 550 | 5 | 150 |
| 680 | 536 | 67 | 178 | 89 | 236 | 540 | 610 | 6 | 306 |
| 553 | 489 | 30 | 91 | 46 | 225 | 490 | 525 | 4 | 72 |
| 620 | 520 | 48 | 135 | 68 | 235 | 525 | 575 | 5 | 170 |
| 700 | 556 | 67 | 178 | 89 | 244 | 560 | 630 | 6 | 323 |

**Note** (1) For heavy load applications, a $d_a$ value should be chosen which is large enough to support the shaft washer rib.

## Bore Diameter 440 – 500 mm




**Dynamic Equivalent Load**

$P = 1.2F_r + F_a$

**Static Equivalent Load**

$P_0 = 2.8F_r + F_a$

However, $F_r/F_a \leqq 0.55$ must be satisfied.

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) Oil | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $T$ | $r$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | | |
| **440** | 600 | 95 | 5 | 2 030 000 | 10 100 000 | 207 000 | 1 030 000 | 670 | **29288** |
| | 680 | 145 | 6 | 3 750 000 | 16 700 000 | 380 000 | 1 710 000 | 480 | **29388** |
| | 780 | 206 | 9.5 | 6 550 000 | 27 200 000 | 665 000 | 2 770 000 | 400 | **29488** |
| | 780 | 206 | 9.5 | 8 000 000 | 31 500 000 | 815 000 | 3 250 000 | 400 | **29488 EM** |
| **460** | 620 | 95 | 5 | 2 060 000 | 10 300 000 | 210 000 | 1 050 000 | 670 | **29292** |
| | 710 | 150 | 6 | 4 100 000 | 18 400 000 | 420 000 | 1 880 000 | 450 | **29392** |
| | 800 | 206 | 9.5 | 6 750 000 | 28 600 000 | 690 000 | 2 920 000 | 380 | **29492** |
| **480** | 650 | 103 | 5 | 2 370 000 | 12 100 000 | 241 000 | 1 240 000 | 600 | **29296** |
| | 730 | 150 | 6 | 4 150 000 | 19 000 000 | 425 000 | 1 940 000 | 450 | **29396** |
| | 850 | 224 | 9.5 | 7 200 000 | 31 000 000 | 730 000 | 3 150 000 | 360 | **29496** |
| **500** | 670 | 103 | 5 | 2 390 000 | 12 400 000 | 244 000 | 1 270 000 | 600 | **292/500** |
| | 750 | 150 | 6 | 4 350 000 | 20 400 000 | 445 000 | 2 080 000 | 450 | **293/500** |
| | 870 | 224 | 9.5 | 7 850 000 | 33 000 000 | 800 000 | 3 350 000 | 340 | **294/500** |

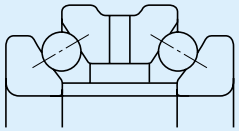
| Dimensions (mm) | | | | | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ | $D_1$ | $B_1$ | $B_2$ | $C$ | $A$ | $d_a$(1) min. | $D_a$ max. | $r_a$ max. | approx. |
| 575 | 508 | 30 | 91 | 49 | 235 | 510 | 545 | 4 | 77 |
| 645 | 548 | 49 | 140 | 70 | 245 | 550 | 600 | 5 | 190 |
| 745 | 588 | 74 | 199 | 100 | 260 | 595 | 670 | 8 | 407 |
| 710 | 577 | 74 | 199 | 101 | 257 | 605 | 675 | 8 | 402 |
| 592 | 530 | 30 | 91 | 46 | 245 | 530 | 570 | 4 | 80 |
| 666 | 567 | 51 | 144 | 72 | 257 | 575 | 630 | 5 | 210 |
| 765 | 608 | 74 | 199 | 100 | 272 | 615 | 690 | 8 | 420 |
| 624 | 556 | 33 | 99 | 55 | 259 | 555 | 595 | 4 | 97 |
| 690 | 590 | 51 | 144 | 72 | 270 | 595 | 650 | 5 | 215 |
| 810 | 638 | 81 | 216 | 108 | 280 | 645 | 730 | 8 | 545 |
| 645 | 574 | 33 | 99 | 55 | 268 | 575 | 615 | 4 | 100 |
| 715 | 611 | 51 | 144 | 74 | 280 | 615 | 670 | 5 | 220 |
| 830 | 661 | 81 | 216 | 107 | 290 | 670 | 750 | 8 | 560 |

**Note** (1) For heavy load applications, a $d_a$ value should be chosen which is large enough to support the shaft washer rib.

# ANGULAR CONTACT THRUST BALL BEARINGS

**DOUBLE-DIRECTION ANGULAR CONTACT THRUST BALL BEARINGS** Bore Diameter 35 – 280mm ..... B238
**ANGULAR CONTACT THRUST BALL BEARINGS FOR BALL SCREWS** Bore Diameter 15 – 60mm ..... B242

## DESIGN, TYPE, AND FEATURES



### DOUBLE-DIRECTION ANGULAR CONTACT THRUST BALL BEARINGS

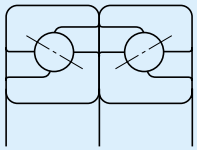
Double-Direction Angular Contact Thrust Ball Bearings are specially designed high precision bearings for the main spindles of machine tools.

Compared with the Thrust Ball Bearings in the 511 Series, this type contains more balls of smaller diameter and has a contact angle of 60°. Consequently, the influence of centrifugal force is less and they can withstand higher speed and have higher rigidity.

Bearings in Series 20 and 29 have the same inner and outer diameters as the double-row cylindrical roller bearings in Series NN30 and NN49 respectively, and they are both used for high axial loads.

Their cages are machined brass.

There are the BTR, BAR Series of highly rigid angular contact ball bearings suitable for high speed that can be easily replaced by these double- direction angular contact ball bearings. For more details, please contact NSK.



### ANGULAR CONTACT THRUST BALL BEARINGS FOR BALL SCREWS

Bearings of this type were specially designed to support NSK Precision Ball Screws. They are usually used in combinations of more than two bearings and with a preload. Their contact angle is 60°. For more details, please refer to Catalog **CAT. No. E1254 SUPER PRECISION BEARINGS.**

Their cages are molded polyamide.

## TOLERANCES AND RUNNING ACCURACY

**DOUBLE-DIRECTION ANGULAR CONTACT THRUST BALL BEARINGS** ..... Table 1
**ANGULAR CONTACT THRUST BALL BEARINGS FOR BALL SCREWS** ..... Table 2

The limiting chamfer dimensions of bearings of both types conform to Table 8.9.1 (Page A78).

**Table 1 Tolerances for Double-Direction Angular Contact Thrust Ball Bearings (Class 7 (1))**

**Table 1. 1 Tolerances for Bearing Bore and Height and Running Accuracy**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $\Delta_{Ts}$ | | $K_{ia}$ (or $K_{ea}$) | $S_d$ | $S_{ia}$ (or $S_{ea}$) |
|---|---|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | max | max | max |
| — | 30 | 0 | – 5 | 0 | – 300 | 5 | 4 | 3 |
| 30 | 50 | 0 | – 5 | 0 | – 400 | 5 | 4 | 3 |
| 50 | 80 | 0 | – 8 | 0 | – 500 | 6 | 5 | 5 |
| 80 | 120 | 0 | – 8 | 0 | – 600 | 6 | 5 | 5 |
| 120 | 180 | 0 | –10 | 0 | – 700 | 8 | 8 | 5 |
| 180 | 250 | 0 | –13 | 0 | – 800 | 8 | 8 | 6 |
| 250 | 315 | 0 | –15 | 0 | – 900 | 10 | 10 | 6 |
| 315 | 400 | 0 | –18 | 0 | –1200 | 10 | 12 | 7 |

**Note** (1) Class 7 is NSK Standard.

Symbols in the tables are described on Page A59.

**Table 1. 2 Tolerances for Housing Washer Outside Diameter**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Ds}$ | |
|---|---|---|---|
| over | incl | high | low |
| 30 | 50 | –25 | – 41 |
| 50 | 80 | –30 | – 49 |
| 80 | 120 | –36 | – 58 |
| 120 | 180 | –43 | – 68 |
| 180 | 250 | –50 | – 79 |
| 250 | 315 | –56 | – 88 |
| 315 | 400 | –62 | – 98 |
| 400 | 500 | –68 | –108 |
| 500 | 630 | –76 | –120 |

**Table 2 Tolerances and Running Accuracy of Angular Contact Thrust Ball Bearings for Ball Screws (Class 7A (1))**

**Table 2. 1 Tolerances and Limits for Shaft and Housing Washer**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | $\Delta_{dmp}$ | | $\Delta_{Bs}$ (or $\Delta_{Cs}$) | | $V_{Bs}$ (or $V_{Cs}$) | $K_{ia}$ | $S_d$ | $S_{ia}$ |
|---|---|---|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | max | max | max | max |
| 10 | 18 | 0 | – 4 | 0 | –120 | 1.5 | 2.5 | 4 | 2.5 |
| 18 | 30 | 0 | – 5 | 0 | –120 | 1.5 | 3 | 4 | 2.5 |
| 30 | 50 | 0 | – 6 | 0 | –120 | 1.5 | 4 | 4 | 2.5 |
| 50 | 80 | 0 | – 7 | 0 | –150 | 1.5 | 4 | 5 | 2.5 |

**Note** (1) Class 7A is NSK Standard.





## RECOMMENDED FITS

### DOUBLE-DIRECTION ANGULAR CONTACT THRUST BALL BEARINGS

The shaft washer and shaft should be in soft contact with neither interference nor clearance, and the housing washer and housing bore should be loosely fitted. For a bearing arrangement with a double-row cylindrical roller bearing, the tolerances for the outside diameter should be f6 to produce a loose fit.

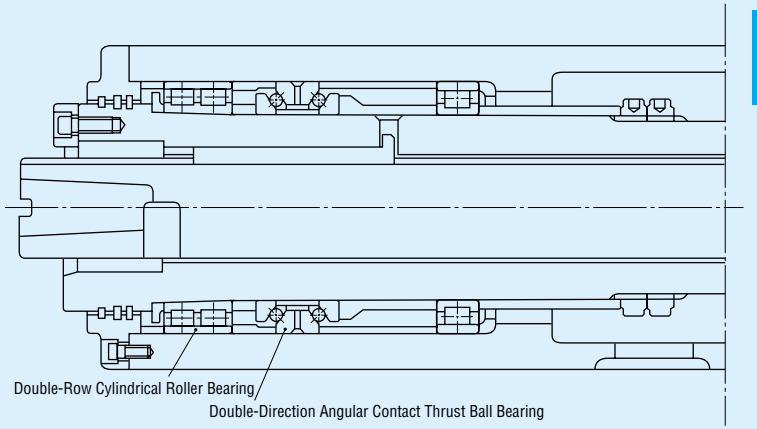
### ANGULAR CONTACT THRUST BALL BEARINGS FOR BALL SCREWS

A tolerance of h5 is recommended for shafts and H6 for housing bores.

## INTERNAL CLEARANCE AND PRELOAD

In order to produce an appropriate preload on bearings when they are mounted, the following axial internal clearances are recommended.

**DOUBLE-ROW ANGULAR CONTACT THRUST BALL BEARINGS** ..... Clearance C7
**ANGULAR CONTACT THRUST BALL BEARINGS FOR BALL SCREWS** ..... Clearance C10



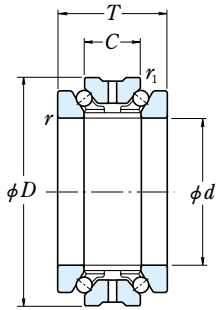

**Example of Application of Double-Direction Angular Contact Thrust Ball Bearing (Main Spindle of Machine Tool)**

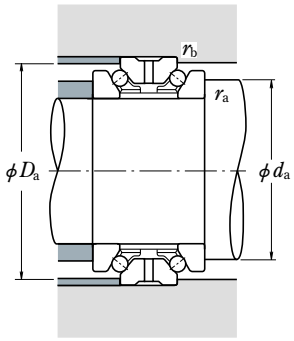
**Table 2. 2 Tolerances and Running Accuracy of Housing Washer**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | $\Delta_{Ds}$ | | $K_{ea}$ | $S_{ea}$ |
|---|---|---|---|---|---|
| over | incl | high | low | max | max |
| 30 | 50 | 0 | – 6 | 5 | 2.5 |
| 50 | 80 | 0 | – 7 | 5 | 2.5 |
| 80 | 120 | 0 | – 8 | 5 | 2.5 |

**Bore Diameter 35 – 150 mm**



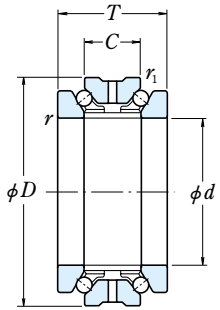

| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$(1) | $T$ | $C$ | $r$ min. | $r_1$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil |
| **35** | 62 | 34 | 17 | 1 | 0.6 | 22 800 | 53 500 | 2 330 | 5 450 | 10 000 | 11 000 |
| **40** | 68 | 36 | 18 | 1 | 0.6 | 23 600 | 59 000 | 2 410 | 6 050 | 9 000 | 10 000 |
| **45** | 75 | 38 | 19 | 1 | 0.6 | 26 300 | 67 500 | 2 680 | 6 900 | 8 000 | 9 000 |
| **50** | 80 | 38 | 19 | 1 | 0.6 | 27 200 | 74 000 | 2 780 | 7 550 | 7 000 | 8 000 |
| **55** | 90 | 44 | 22 | 1.1 | 0.6 | 33 500 | 94 000 | 3 450 | 9 550 | 6 300 | 6 900 |
| **60** | 95 | 44 | 22 | 1.1 | 0.6 | 35 000 | 102 000 | 3 550 | 10 400 | 5 900 | 6 500 |
| **65** | 100 | 44 | 22 | 1.1 | 0.6 | 36 000 | 110 000 | 3 700 | 11 300 | 5 500 | 6 100 |
| **70** | 110 | 48 | 24 | 1.1 | 0.6 | 49 500 | 146 000 | 5 050 | 14 900 | 5 000 | 5 600 |
| **75** | 115 | 48 | 24 | 1.1 | 0.6 | 50 000 | 152 000 | 5 100 | 15 500 | 4 800 | 5 300 |
| **80** | 125 | 54 | 27 | 1.1 | 0.6 | 59 000 | 181 000 | 6 000 | 18 500 | 4 400 | 4 900 |
| **85** | 130 | 54 | 27 | 1.1 | 0.6 | 59 500 | 189 000 | 6 050 | 19 300 | 4 200 | 4 700 |
| **90** | 140 | 60 | 30 | 1.5 | 1 | 78 500 | 246 000 | 8 000 | 25 100 | 4 000 | 4 400 |
| **95** | 145 | 60 | 30 | 1.5 | 1 | 79 500 | 256 000 | 8 100 | 26 100 | 3 800 | 4 200 |
| **100** | 140 | 48 | 24 | 1.1 | 0.6 | 55 000 | 196 000 | 5 600 | 20 000 | 3 800 | 4 200 |
| | 150 | 60 | 30 | 1.5 | 1 | 80 500 | 267 000 | 8 200 | 27 200 | 3 600 | 4 000 |
| **105** | 145 | 48 | 24 | 1.1 | 0.6 | 56 500 | 208 000 | 5 750 | 21 300 | 3 600 | 4 000 |
| | 160 | 66 | 33 | 2 | 1 | 91 500 | 305 000 | 9 350 | 31 000 | 3 400 | 3 800 |
| **110** | 150 | 48 | 24 | 1.1 | 0.6 | 57 000 | 215 000 | 5 800 | 21 900 | 3 500 | 3 900 |
| | 170 | 72 | 36 | 2 | 1 | 103 000 | 350 000 | 10 500 | 35 500 | 3 300 | 3 600 |
| **120** | 165 | 54 | 27 | 1.1 | 0.6 | 66 500 | 256 000 | 6 800 | 26 100 | 3 200 | 3 600 |
| | 180 | 72 | 36 | 2 | 1 | 106 000 | 375 000 | 10 800 | 38 000 | 3 000 | 3 400 |
| **130** | 180 | 60 | 30 | 1.5 | 1 | 79 500 | 315 000 | 8 100 | 32 500 | 3 000 | 3 300 |
| | 200 | 84 | 42 | 2 | 1 | 134 000 | 455 000 | 13 600 | 46 500 | 2 800 | 3 100 |
| **140** | 190 | 60 | 30 | 1.5 | 1 | 91 500 | 365 000 | 9 350 | 37 500 | 2 800 | 3 100 |
| | 210 | 84 | 42 | 2 | 1 | 145 000 | 525 000 | 14 800 | 53 500 | 2 600 | 2 900 |
| **150** | 210 | 72 | 36 | 2 | 1 | 116 000 | 465 000 | 11 800 | 47 500 | 2 500 | 2 800 |
| | 225 | 90 | 45 | 2.1 | 1.1 | 172 000 | 620 000 | 17 500 | 63 500 | 2 400 | 2 700 |

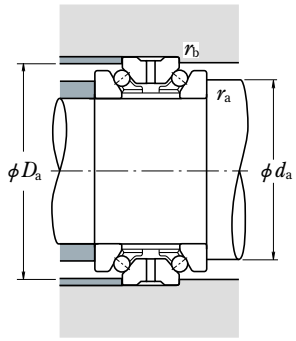
**Note** (1) Outside tolerance is f6.

| Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | Mass (kg) |
|---|---|---|---|---|---|
| | $d_a$ | $D_a$ | $r_a$ max. | $r_b$ max. | approx. |
| **35 TAC 20X+L** | 46 | 58 | 1 | 0.6 | 0.375 |
| **40 TAC 20X+L** | 51 | 63 | 1 | 0.6 | 0.460 |
| **45 TAC 20X+L** | 57 | 70 | 1 | 0.6 | 0.580 |
| **50 TAC 20X+L** | 62 | 75 | 1 | 0.6 | 0.625 |
| **55 TAC 20X+L** | 69 | 84 | 1 | 0.6 | 0.945 |
| **60 TAC 20X+L** | 74 | 89 | 1 | 0.6 | 1.000 |
| **65 TAC 20X+L** | 79 | 94 | 1 | 0.6 | 1.080 |
| **70 TAC 20X+L** | 87 | 104 | 1 | 0.6 | 1.460 |
| **75 TAC 20X+L** | 92 | 109 | 1 | 0.6 | 1.550 |
| **80 TAC 20X+L** | 99 | 117 | 1 | 0.6 | 2.110 |
| **85 TAC 20X+L** | 104 | 122 | 1 | 0.6 | 2.210 |
| **90 TAC 20X+L** | 110 | 131 | 1.5 | 1 | 2.930 |
| **95 TAC 20X+L** | 115 | 136 | 1.5 | 1 | 3.050 |
| **100 TAC 29X+L** | 117 | 134 | 1 | 0.6 | 1.950 |
| **100 TAC 20X+L** | 120 | 141 | 1.5 | 1 | 3.200 |
| **105 TAC 29X+L** | 122 | 139 | 1 | 0.6 | 2.040 |
| **105 TAC 20X+L** | 127 | 150 | 2 | 1 | 4.100 |
| **110 TAC 29X+L** | 127 | 144 | 1 | 0.6 | 2.120 |
| **110 TAC 20X+L** | 134 | 158 | 2 | 1 | 5.150 |
| **120 TAC 29X+L** | 139 | 157 | 1 | 0.6 | 2.940 |
| **120 TAC 20X+L** | 144 | 168 | 2 | 1 | 5.500 |
| **130 TAC 29X+L** | 150 | 170 | 1.5 | 1 | 3.950 |
| **130 TAC 20X+L** | 160 | 187 | 2 | 1 | 8.200 |
| **140 TAC 29D+L** | 158 | 182 | 1.5 | 1 | 4.200 |
| **140 TAC 20D+L** | 167 | 198 | 2 | 1 | 8.750 |
| **150 TAC 29D+L** | 172 | 200 | 2 | 1 | 6.600 |
| **150 TAC 20D+L** | 178 | 213 | 2 | 1 | 10.700 |

**Remarks** Nominal bearing bore and outside diameters for **20X · 20D** and **29X · 29D** bearing series are the same as those for the **NN30** and **NNU49 · NN49** bearing series respectively.

**Bore Diameter 160 – 280 mm**



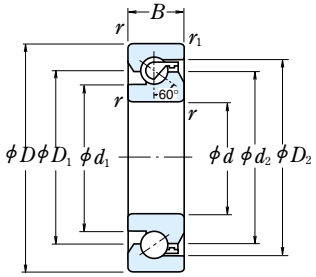

| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$(1) | $T$ | $C$ | $r$ min. | $r_1$ min. | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Grease | Oil |
| **160** | 220 | 72 | 36 | 2 | 1 | 118 000 | 490 000 | 12 100 | 50 000 | 2 400 | 2 700 |
| | 240 | 96 | 48 | 2.1 | 1.1 | 185 000 | 680 000 | 18 900 | 69 500 | 2 300 | 2 500 |
| **170** | 230 | 72 | 36 | 2 | 1 | 120 000 | 520 000 | 12 300 | 53 000 | 2 300 | 2 500 |
| | 260 | 108 | 54 | 2.1 | 1.1 | 218 000 | 810 000 | 22 200 | 82 500 | 2 100 | 2 400 |
| **180** | 250 | 84 | 42 | 2 | 1 | 158 000 | 655 000 | 16 100 | 67 000 | 2 100 | 2 400 |
| | 280 | 120 | 60 | 2.1 | 1.1 | 281 000 | 1 020 000 | 28 700 | 104 000 | 2 000 | 2 200 |
| **190** | 260 | 84 | 42 | 2 | 1 | 161 000 | 695 000 | 16 400 | 71 000 | 2 000 | 2 300 |
| | 290 | 120 | 60 | 2.1 | 1.1 | 285 000 | 1 060 000 | 29 000 | 108 000 | 1 900 | 2 100 |
| **200** | 280 | 96 | 48 | 2.1 | 1.1 | 204 000 | 855 000 | 20 800 | 87 000 | 1 900 | 2 100 |
| | 310 | 132 | 66 | 2.1 | 1.1 | 315 000 | 1 180 000 | 32 000 | 120 000 | 1 800 | 2 000 |
| **220** | 300 | 96 | 48 | 2.1 | 1.1 | 210 000 | 930 000 | 21 400 | 95 000 | 1 800 | 2 000 |
| **240** | 320 | 96 | 48 | 2.1 | 1.1 | 213 000 | 980 000 | 21 700 | 100 000 | 1 700 | 1 800 |
| **260** | 360 | 120 | 60 | 2.1 | 1.1 | 315 000 | 1 390 000 | 32 000 | 141 000 | 1 500 | 1 700 |
| **280** | 380 | 120 | 60 | 2.1 | 1.1 | 320 000 | 1 470 000 | 32 500 | 150 000 | 1 400 | 1 600 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | Mass (kg) |
|---|---|---|---|---|---|
| | $d_a$ | $D_a$ | $r_a$ max. | $r_b$ max. | approx. |
| **160 TAC 29D+L** | 182 | 210 | 2 | 1 | 7.000 |
| **160 TAC 20D+L** | 191 | 228 | 2 | 1 | 13.000 |
| **170 TAC 29D+L** | 192 | 219 | 2 | 1 | 7.350 |
| **170 TAC 20D+L** | 206 | 245 | 2 | 1 | 17.700 |
| **180 TAC 29D+L** | 207 | 238 | 2 | 1 | 10.700 |
| **180 TAC 20D+L** | 220 | 264 | 2 | 1 | 23.400 |
| **190 TAC 29D+L** | 217 | 247 | 2 | 1 | 11.200 |
| **190 TAC 20D+L** | 230 | 274 | 2 | 1 | 24.400 |
| **200 TAC 29D+L** | 230 | 267 | 2 | 1 | 15.700 |
| **200 TAC 20D+L** | 245 | 291 | 2 | 1 | 31.500 |
| **220 TAC 29D+L** | 250 | 287 | 2 | 1 | 17.000 |
| **240 TAC 29D+L** | 270 | 307 | 2 | 1 | 18.300 |
| **260 TAC 29D+L** | 300 | 344 | 2 | 1 | 31.500 |
| **280 TAC 29D+L** | 320 | 364 | 2 | 1 | 33.500 |

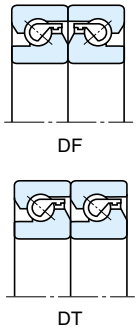
**Note** (1) Outside tolerance is f6.

**Remarks** Nominal bearing bore and outside diameters for **20X · 20D** and **29X · 29D** bearing series are the same as those for the **NN30** and **NNU49 · NN49** bearing series respectively.

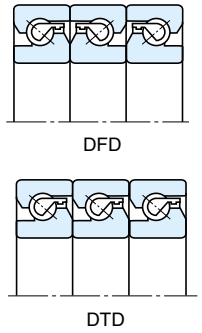
## Bore Diameter 15 – 60 mm



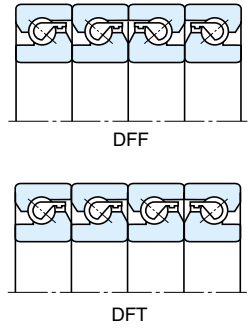

Double-Row Combination




Three-Row Combination




Four-Row Combination




**Dynamic Equivalent Load**

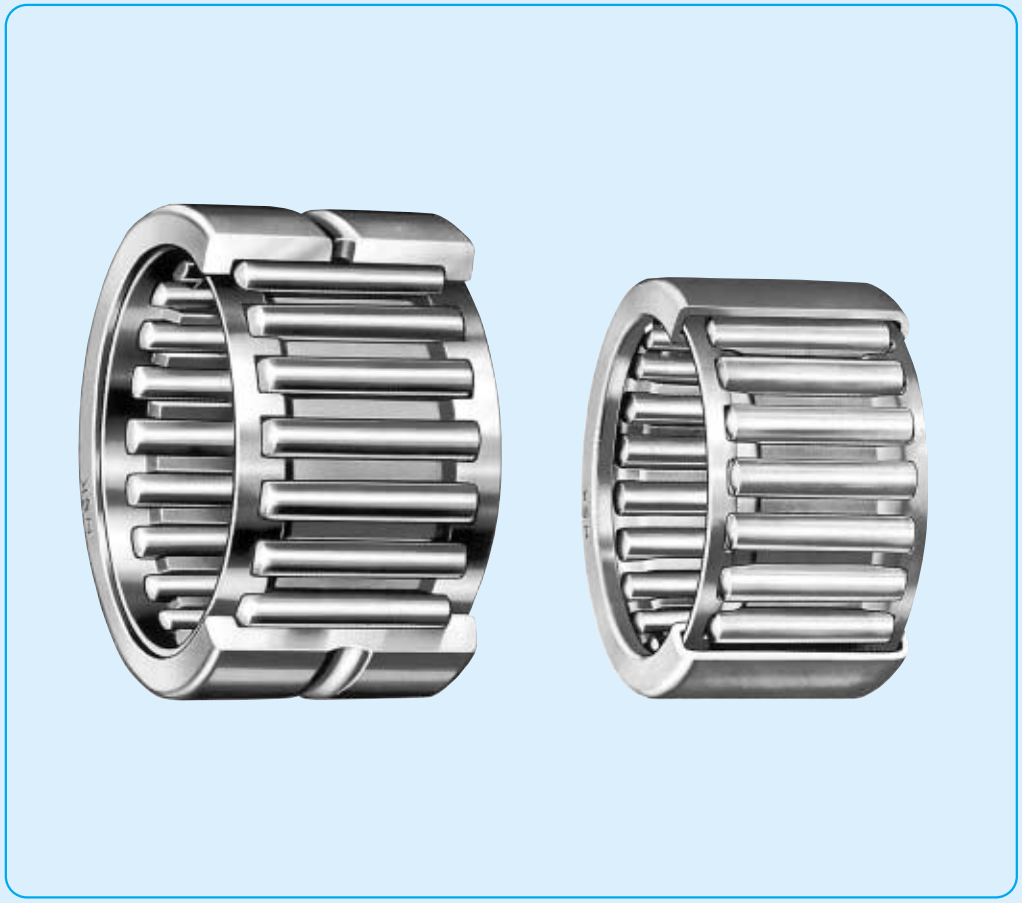
$P_a = XF_r + YF_a$

| Rows | | Two Rows | | Three Rows | | | Four Rows | | |
|---|---|---|---|---|---|---|---|---|---|
| Combination | | DF | DT | DFD | | DTD | DFT | DFF | DFT |
| Axial Load Sustained by / $e$=2.17 | | One Row | Two Rows | One Row | Two Rows | Three Rows | One Row | Two Rows | Three Rows |
| $F_a/F_r \leqq e$ | X | 1.9 | — | 1.43 | 2.33 | — | 1.17 | 2.33 | 2.53 |
| | Y | 0.55 | — | 0.77 | 0.35 | — | 0.89 | 0.35 | 0.26 |
| $F_a/F_r > e$ | X | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| | Y | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| Boundary Dimensions (mm) | | | | | Dimensions (mm) | | | | Limiting Speeds (1) ($min^{-1}$) | | Bearing Numbers | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $r_1$ min. | $d_1$ | $d_2$ | $D_1$ | $D_2$ | Grease | Oil | | approx. |
| **15** | 47 | 15 | 1 | 0.6 | 27.2 | 34 | 34 | 39.6 | 6 000 | 8 000 | **15 TAC 47B** | 0.144 |
| **17** | 47 | 15 | 1 | 0.6 | 27.2 | 34 | 34 | 39.6 | 6 000 | 8 000 | **17 TAC 47B** | 0.144 |
| **20** | 47 | 15 | 1 | 0.6 | 27.2 | 34 | 34 | 39.6 | 6 000 | 8 000 | **20 TAC 47B** | 0.135 |
| **25** | 62 | 15 | 1 | 0.6 | 37 | 45 | 45 | 50.7 | 4 500 | 6 000 | **25 TAC 62B** | 0.252 |
| **30** | 62 | 15 | 1 | 0.6 | 39.5 | 47 | 47 | 53.2 | 4 300 | 5 600 | **30 TAC 62B** | 0.224 |
| **35** | 72 | 15 | 1 | 0.6 | 47 | 55 | 55 | 60.7 | 3 600 | 5 000 | **35 TAC 72B** | 0.31 |
| **40** | 72 | 15 | 1 | 0.6 | 49 | 57 | 57 | 62.7 | 3 600 | 4 800 | **40 TAC 72B** | 0.275 |
| | 90 | 20 | 1 | 0.6 | 57 | 68 | 68 | 77.2 | 3 000 | 4 000 | **40 TAC 90B** | 0.674 |
| **45** | 75 | 15 | 1 | 0.6 | 54 | 62 | 62 | 67.7 | 3 200 | 4 300 | **45 TAC 75B** | 0.27 |
| | 100 | 20 | 1 | 0.6 | 64 | 75 | 75 | 84.2 | 2 600 | 3 600 | **45 TAC 100B** | 0.842 |
| **50** | 100 | 20 | 1 | 0.6 | 67.5 | 79 | 79 | 87.7 | 2 600 | 3 400 | **50 TAC 100B** | 0.778 |
| **55** | 100 | 20 | 1 | 0.6 | 67.5 | 79 | 79 | 87.7 | 2 600 | 3 400 | **55 TAC 100B** | 0.714 |
| | 120 | 20 | 1 | 0.6 | 82 | 93 | 93 | 102.2 | 2 200 | 3 000 | **55 TAC 120B** | 1.23 |
| **60** | 120 | 20 | 1 | 0.6 | 82 | 93 | 93 | 102.2 | 2 200 | 3 000 | **60 TAC 120B** | 1.16 |

| Basic Load Ratings $C_a$ | | | | | | Limiting Axial Load | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sustained by one row DF | | Sustained by two rows DT, DFD, DFF | | Sustained by three rows DTD, DFT | | Sustained by one row DF | | Sustained by two rows DT, DFD, DFF | | Sustained by three rows DTD, DFT | |
| (N) | {kgf} | (N) | {kgf} | (N) | {kgf} | (N) | {kgf} | (N) | {kgf} | (N) | {kgf} |
| 21 900 | 2 240 | 35 500 | 3 650 | 47 500 | 4 850 | 26 600 | 2 710 | 53 000 | 5 400 | 79 500 | 8 150 |
| 21 900 | 2 240 | 35 500 | 3 650 | 47 500 | 4 850 | 26 600 | 2 710 | 53 000 | 5 400 | 79 500 | 8 150 |
| 21 900 | 2 240 | 35 500 | 3 650 | 47 500 | 4 850 | 26 600 | 2 710 | 53 000 | 5 400 | 79 500 | 8 150 |
| 28 500 | 2 910 | 46 500 | 4 700 | 61 500 | 6 250 | 40 500 | 4 150 | 81 500 | 8 300 | 122 000 | 12 500 |
| 29 200 | 2 980 | 47 500 | 4 850 | 63 000 | 6 400 | 43 000 | 4 400 | 86 000 | 8 800 | 129 000 | 13 200 |
| 31 000 | 3 150 | 50 500 | 5 150 | 67 000 | 6 850 | 50 000 | 5 100 | 100 000 | 10 200 | 150 000 | 15 300 |
| 31 500 | 3 250 | 51 500 | 5 250 | 68 500 | 7 000 | 52 000 | 5 300 | 104 000 | 10 600 | 157 000 | 16 000 |
| 59 000 | 6 000 | 95 500 | 9 750 | 127 000 | 13 000 | 89 500 | 9 150 | 179 000 | 18 300 | 269 000 | 27 400 |
| 33 000 | 3 350 | 53 500 | 5 450 | 71 000 | 7 250 | 57 000 | 5 800 | 114 000 | 11 600 | 170 000 | 17 400 |
| 61 500 | 6 300 | 100 000 | 10 200 | 133 000 | 13 600 | 99 000 | 10 100 | 198 000 | 20 200 | 298 000 | 30 500 |
| 63 000 | 6 400 | 102 000 | 10 400 | 136 000 | 13 800 | 104 000 | 10 600 | 208 000 | 21 200 | 310 000 | 32 000 |
| 63 000 | 6 400 | 102 000 | 10 400 | 136 000 | 13 800 | 104 000 | 10 600 | 208 000 | 21 200 | 310 000 | 32 000 |
| 67 500 | 6 850 | 109 000 | 11 200 | 145 000 | 14 800 | 123 000 | 12 600 | 246 000 | 25 100 | 370 000 | 37 500 |
| 67 500 | 6 850 | 109 000 | 11 200 | 145 000 | 14 800 | 123 000 | 12 600 | 246 000 | 25 100 | 370 000 | 37 500 |

**Note** (1) These values apply when the standard preload (C10) is used.



# NEEDLE ROLLER BEARINGS


| | | |
|---|---|---|
| **CAGE & NEEDLE ROLLER ASSEMBLIES** | Inscribed Circle Diameter | 5 – 100mm .... B252 |
| Cage & Needle Roller Assemblies for Connecting Rod | Inscribed Circle Diameter | 12 – 30mm..... B256 |
| **DRAWN CUP NEEDLE ROLLER BEARINGS** | | |
| With Cage | Inscribed Circle Diameter | 4 – 55mm..... B258 |
| Full Complement Type | Inscribed Circle Diameter | 8 – 55mm..... B258 |
| **SOLID NEEDLE ROLLER BEARINGS** | Inscribed Circle Diameter | 9 – 390mm .... B264 |
| **THRUST NEEDLE ROLLER BEARINGS** | Bore Diameter | 10 – 100mm .... B274 |
| **CAM FOLLOWERS** | Outside Diameter | 16 – 90mm .... B276 |
| **ROLLER FOLLOWERS** | Bore Diameter | 5 – 50mm .... B278 |


## DESIGN AND TYPES

For needle roller bearings, there are many designs and types bearings.

Catalog

Specified catalog, NSK Needle Roller Bearings CAT.No.E1419 lists bearings shown in Table 1. Representative examples selected from them, are shown in this catalog. (shown with ■ in Table 1) For details, please refer individual specified catalog.

For bearing selection, please contact NSK.

**Table1 Types of Needle Roller Bearings**

| | |
|---|---|
| Cage & Needle Roller Assemblies | FWJ, FWF, WJ; FBN, FBNP, WJC, FWJC |
| Drawn Cup Needle Roller Bearings | FJ, FJH, J,JH; FJL; MFJ, MFJH, MJ, MJH; MFJL; F, FH, B, BH; MF, MFH, M, MH; Y, YH; FJT, FJTT, MFJT, FJLT, FJLTT, MFJLT; FJP, JP; FIR, IR |
| Solid Needle Roller Bearings | RNA 48, RNA 49, RNA 59, RNA 69, HJ; RLM; RNAF; RNA···TT; Cone |
| Thrust Needle Roller Bearings, Thurst raceway washers | FNTA, NTA; FB; FTRA, TRA; FTRB, TRB; FTRC, TRC; FTRD, TRD; FTRE, TRE |
| Needle Rollers | A Type (Pleas refer to B350 page); F Type; P Type; T Type; C Type; M Type |
| Cam Followers, Roller Followers | FCR, FCJ, CR; FCRS, FCJS, CRS; FYCR, FYCJ, YCR; FYCRS, FYCJS, YCRS |
| Needle Roller Bearings For Universal Joints | ZY; NSA |
| Drawn Cup Roller Clutches | RC; FC; RCB; FCB |

## DIMENSIONAL ACCURACY · RUNNING ACCURACY

### DRAWN CUP NEEDLE ROLLER BEARINGS

The correct form and dimensional accuracy of outer ring of drawn cup needle roller bearing is achieved only by press fitting into proper housing with appropriate interference. Therefore, roller inscribed circle diameter is measured after press fitted into a standard ring gauge.

The dimension of ring gauge and tolerance of roller inscribed circle diameter are shown in Tables 2 and 3.





Table 2 is applicable to standard drawn cup needle roller bearings (metric series), and Table 3 shows tolerance of roller inscribed circle diameter based on ISO Standards. For bearings assured by ISO Standards, please order by adding symbol of "-1" at the end of bearing number.

**Table 2 Inspection Gauge Dimensions (General Metric) of Drawn Cup Needle Roller Bearings.**
(FJ, FJH, MFJ, MFJH / F, FH, MF, MFH)

Units mm

| Nominal Roller Inscribed Circle Diameter, $F_w$ | Bore Diameter of Ring Gauge | Plug Gauge | |
|---|---|---|---|
| | | GO Gauge | NO-GO Gauge |
| 4 | 7. 996 | 4. 023 | 4. 048 |
| 5 | 8. 996 | 5. 023 | 5. 048 |
| 6 | 9. 996 | 6. 028 | 6. 053 |
| 7 | 10. 995 | 7. 031 | 7. 056 |
| 8 | 11. 995 | 8. 031 | 8. 056 |
| 9 | 12. 995 | 9. 031 | 9. 056 |
| 10 | 13. 995 | 10. 031 | 10. 056 |
| 12 | 15. 995 | 12. 031 | 12. 056 |
| FH 12 | 17. 995 | 12. 031 | 12. 056 |
| 13 | 18. 993 | 13. 034 | 13. 059 |
| 14 | 19. 993 | 14. 034 | 14. 059 |
| 15 | 20. 993 | 15. 034 | 15. 059 |
| 16 | 21. 993 | 16. 034 | 16. 059 |
| 17 | 22. 972 | 17. 013 | 17. 038 |
| 18 | 23. 972 | 18. 013 | 18. 038 |
| 20 | 25. 972 | 20. 013 | 20. 038 |
| 22 | 27. 972 | 22. 013 | 22. 038 |
| 25 | 31. 967 | 25. 013 | 25. 038 |
| 28 | 34. 967 | 28. 013 | 28. 038 |
| 30 | 36. 967 | 30. 013 | 30. 038 |
| 35 | 41. 967 | 35. 013 | 35. 043 |
| 40 | 46. 967 | 40. 013 | 40. 043 |
| 45 | 51. 961 | 45. 013 | 45. 043 |
| 50 | 57. 961 | 50. 013 | 50. 043 |
| 55 | 62. 961 | 55. 013 | 55. 043 |

**Remarks** This is the gauge dimension for Inspection of minimum diameter, $F_{wmin}$, of roller inscribed circle diameter.

**Table 3 Ring Gauge of Drawn Cup Needle Roller Bearings and Tolerance of Roller Inscribed Circle Diameter (ISO Standards)**
(FJ, FJH, MFJ and MFJH / F, FH, MF and MFH)

Units mm

| Nominal Roller Inscribed Circle Diameter, $F_w$ | Bore Diameter of Ring Gauge | Tolerance for Roller Inscribed Circle Diameter, $F_{wmin}$ (1) | |
|---|---|---|---|
| | | min. | max. |
| 4 | 7. 984 | 4. 010 | 4. 028 |
| 5 | 8. 984 | 5. 010 | 5. 028 |
| 6 | 9. 984 | 6. 010 | 6. 028 |
| 7 | 10. 980 | 7. 013 | 7. 031 |
| 8 | 11. 980 | 8. 013 | 8. 031 |
| H 8 | 13. 980 | 8. 013 | 8. 031 |
| 9 | 12. 980 | 9. 013 | 9. 031 |
| H 9 | 14. 980 | 9. 013 | 9. 031 |
| 10 | 13. 980 | 10. 013 | 10. 031 |
| H 10 | 15. 980 | 10. 013 | 10. 031 |
| 12 | 15. 980 | 12. 016 | 12. 034 |
| H 12 | 17. 980 | 12. 016 | 12. 034 |
| 13 | 18. 976 | 13. 016 | 13. 034 |
| 14 | 19. 976 | 14. 016 | 14. 034 |
| 15 | 20. 976 | 15. 016 | 15. 034 |
| 16 | 21. 976 | 16. 016 | 16. 034 |
| 17 | 22. 976 | 17. 016 | 17. 034 |
| 18 | 23. 976 | 18. 016 | 18. 034 |
| 20 | 25. 976 | 20. 020 | 20. 041 |
| 22 | 27. 976 | 22. 020 | 22. 041 |
| 25 | 31. 972 | 25. 020 | 25. 041 |
| 28 | 34. 972 | 28. 020 | 28. 041 |
| 30 | 36. 972 | 30. 020 | 30. 041 |
| 35 | 41. 972 | 35. 025 | 35. 050 |
| 40 | 46. 972 | 40. 025 | 40. 050 |
| 45 | 51. 967 | 45. 025 | 45. 050 |
| 50 | 57. 967 | 50. 025 | 50. 050 |
| 55 | 62. 967 | 55. 030 | 55. 060 |

**Note** (1) When using a cylinder instead of an inner ring, $F_{wmin}$ is the diameter of the cylinder at which the internal clearance is zero in at least one radial direction. ($F_{wmin}$ is the minimum diameter of each inscribed circle diameter where deviation is assumed.)

**Remarks** To measure the roller inscribed circle diameter, use the following plug gauges:

GO gauge: The same dimensions as the minimum tolerance of the roller inscribed circle diameter $F_{wmin}$.

NO-GO gauge: The dimensions should be the maximum tolerance of roller inscribed circle diameter, $F_{wmin}$, plus 0.002mm.

**SOLID NEEDLE ROLLER BEARINGS** ..... Table 8. 2 (A60-63 pages)

Tolerance of roller inscribed circle diameter for solid needle roller bearings without inner rings are shown in Table 4.

**Table 4 Inscribed Circle Diameter for Metric Solid Needle Roller Bearings** Units μm

| Nominal Inscribed Circle Diameter, $F_w$ (mm) | | Deviation (F6) of Minimum Diameter, $F_{wmin}$, of Roller Inscribed Circle Diameter $F_{wmin}$(1) $\Delta F_{wmin}$ | |
|---|---|---|---|
| over | incl | high | low |
| 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) When using a cylinder instead of an inner ring, $F_{wmin}$ is the diameter of the cylinder at which the internal clearance is zero in at least one radial direction. ($F_{wmin}$ is the minimum diameter of each inscribed circle diameter where deviation is assumed.)

**CAM FOLLOWERS · ROLLER FOLLOWERS** ..... Table 8. 2 (A60-63 pages)

The tolerance zone class of stud diameter $d$ of cam followers is h7, and the tolerance of assembled width of inner ring of roller followers is shown in bearing table.

These tolerances are applied to the bearings before surface treatment.

Cam Follower Dimensional Tolerences is always applited to the bearing before surface treatment.

## RECOMMENDED FITTING AND BEARING INTERNAL CLEARANCE

### CAGE & NEEDLE ROLLER ASSEMBLIES

Recommended fitting of cage & roller under typical operating condition is shown in Table 5. By combining cage & roller, shaft, and housing, appropriate radial internal clearance is obtained. However, the fitting and the radial internal clearance of cage & roller for connecting rod should be determined by the type of engine, characteristic, and driving condition etc.. For details, please refer to specified catalog.

**Table 5 Fitting Tolerances for Shafts and Housing Bores**

| Operating Conditions | Fitting Tolerance | | |
|---|---|---|---|
| | shaft | | housing bore |
| | $F_w \leqq 50$mm | $F_w > 50$mm | |
| High Accuracy, Oscillating Motion | js5 (j5) | h5 | G6 |
| Normal | h5 | g5 | |
| High Temperature, Large Shaft Deflection and Mounting Error of Bearings | f6 | | |





### DRAWN CUP NEEDLE ROLLER BEARINGS

For FJ, FJH, and MFJH types and F, FH, and MFH types, if tolerance of fitting such as shaft:h6, and housing bore:N7 (in case of thick steel housing), are applied under general operating condition, appropriate radial internal clearance is obtained. In case that outer ring rotation, the fitting of shaft : f6, housing bore : R7, and light alloy housing or steel housing of less than 6mm thickness, the housing bore should be smaller than N7 by 0.013 – 0.025mm.

### SOLID NEEDLE ROLLER BEARINGS

Recommended fitting for solid needle roller bearings with inner rings

Table 9. 2 (Page A84)

Table 9. 4 (Page A85)

Internal clearance of solid needle roller bearings with inner rings

Table 9. 14 (Page A91)

However, for needle roller bearing of wider bearing width, and with long needle rollers, bearings with CN clearance are not necessarily common, but large clearance is selected frequently. For the solid needle roller bearing without inner ring, it is possible to select radial internal clearance shown in Table 6 by selecting tolerance class of shaft, which is fitting to the bearing.

**Table 6 Fitting Tolerances and Radial Internal clearance of Shafts Assembled with Solid Needle Roller Bearings without Inner Rings**

| Nominal Roller Inscribed Circle Diameter $F_w$ (mm) | | C2 | CN | C3 | C4 |
|---|---|---|---|---|---|
| over | incl | | | | |
| 6 | 180 | k5 | g5 | f6 | e6 |
| 180 | 315 | j6 | f6 | e6 | d6 |
| 315 | 490 | h6 | e6 | d6 | c6 |

### THRUST NEEDLE ROLLER BEARINGS

Recommended Fitting of Thrust Needle Roller Bearings and Thrust Raceway are shown in Table 7.

**Table 7 Recommended Fitting of Thrust Needle Roller Bearings and Thrust Raceway**

Units mm

| Classification | Type | Cage or raceway guide | Tolerance class or dimension tolerance | |
|---|---|---|---|---|
| | | | Shaft | Housing bore |
| Thrust Needle Bearing Cage & Needle Roller Assemblies | FNTA | Bore | h8 | $D_c$ (1)+over 1.0 |
| | | Outside | — | H10 |
| Thrust Bearing Rings | FTRA to FTRE | Bore | h8 | $D_c$ (1)+over 1.0 |
| | | Outside | — | H10 |

**Note** (1) $D_c$ represents outside diameter of the cage.

**Remarks** If the cage is guided by outside diameter, to prevent the wear of housing bore, it is necessary to harden the surface at least.

## CAM FOLLOWERS · ROLLER FOLLOWERS

The recommended fittings for the mounting area of cam follower studs are shown in Table 8. Recommended shaft fittings of roller follower are shown in Table 9.

Since cam followers are used with cantilevered mounting, they should be fixed with little clearance of the fitting surface as much as possible.

Since a roller follower is generally used with outer ring rotation, the fitting with shaft is transition or loose fit. In case that heavy loads impose to the roller follower, it is recommended to use the shaft of quench hardening treatment, and with tight fit.

For the details, please refer to specified catalog.

**Table 8 Recommended Fitting for Stud Mounting Part of Cam Followers**

| Type | Fitting Tolerance of Mounting Hole |
|---|---|
| FCR, FCRS<br>FCJ, FCJS | JS7 (J7) |

**Table 9 Recommended Staft Fittings of Roller Followers**

| Load | Fitting Tolerance of Shaft |
|---|---|
| Light Load/Normal Load | g6 or h6 |
| Heavy Load | k6 |

## SHAFT AND HOUSING SPECIFICATIONS

The specification of shaft and housing for radial needle roller bearings, which are used under general operating condition, is shown in Table 10.

**Table 10 Shaft and housing Specifications of Radial Needle Roller Bearings (Cage & Needle Roller Assemblies/Drawn Cup Bearings/Solid Bearings)**

| Category | Shaft | | Housing Bore | |
|---|---|---|---|---|
| | Raceway Surface | Fitting Surface | Raceway Surface | Fitting Surface |
| Out-of-Roundness Tolerance | $\frac{IT3}{2}$ | $\frac{IT3}{2}$ to $\frac{IT4}{2}$ | $\frac{IT3}{2}$ | $\frac{IT4}{2}$ to $\frac{IT5}{2}$ |
| Cylindricity Tolerance | $\frac{IT3}{2}$ | $\frac{IT3}{2}$ to $\frac{IT4}{2}$ | $\frac{IT3}{2}$ | $\frac{IT4}{2}$ to $\frac{IT5}{2}$ |
| Roughness $R_a$ (μm) | 0.4 | 0.8 | 0.8 | 1.6 |
| Hardness | HRC58 to 64 Appropriate depth of hardening layer required | — | HRC58 to 64 Appropriate depth of hardening layer required | — |

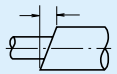
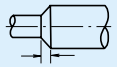
**Remarks** 1. For the specification of shaft and housing of cage & needle roller assembly for connecting rod, please refer to specified catalog.
2. These are general recommendation by radius method. For the value of standard tolerance (IT), please refer to Appendix 11 (page C22)





Specifications of Thrust Bearings Raceway Surface are shown in Table 11.

**Table 11 Specifications of Thrust Bearings Raceway Surface**

| | | |
|---|---|---|
| Squareness A | 0.5/1000 incl (mm/mm) |  |
| Squareness B | 1.0/1000 incl (mm/mm) |  |
| Roughness $R_a$ (μm) | 0.4 | — |
| Hardness | HRC58 to 64 (HRC60 to 64 is fovorable) | — |

## LIMITING INCLINATION ANGLES

The limiting inclination angle of radial needle roller bearing under general load condition is 0.001 radian (3.4') approximately. For the detail, please refer to specified catalog.,

**Table 12 Permissble Load Coefficient of Track**

| Hardness (HRC) | Coefficient |
|---|---|
| 20 | 0.4 |
| 25 | 0.5 |
| 30 | 0.6 |
| 35 | 0.8 |
| 40 | 1.0 |
| 45 | 1.4 |
| 50 | 1.9 |
| 55 | 2.6 |
| 58 | 3.2 |

## PERMISSBLE TRACK LOAD

The permissble load of the track is determined by compression strength or hardness. The permissble load of the track shown in the bearing table is value of a track made of steel with a hardness of HRC40. Table 12 indicates the permissible load coefficient of the track for each hardness.

The permissible load of the track for each hardness can be obtained by multiplying the permissible load coefficient of the track corresponding to each hardness.

## PRE-PACKED GREASE

The cam follower/roller follower with a seal is pre-lubricated with lithium soap-based grease. The range of operating temperature is –10 to +110°C. For the cam follower/roller follower without seal, please lubricate with suitable lubricant.

## MAXIMUM PERMISSIBLE LOAD AND MAXIMUM CLAMP TORQUE OF CAM FOLLOWERS.

The maximum radial Load that the cam follower can carry is determined by the bearing strengh and shear strengh of the stud rather than the Load rating for neele bearings. This value is given in the bearing table as the maximum permissible Load.

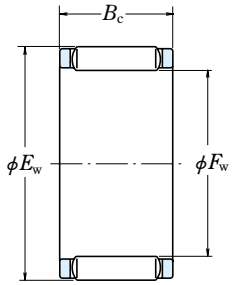
Since the stud of the cam follower receives bending stress and tensile stress from the bearing Load, the screw clamp torque should not exceed the value shown in the bearing table.

## LIMITING SPEED

The limiting speeds of bearings are shown in bearing tables. However, depending on load condition of the bearing, the limiting speeds are necessary to compensate. Also, improvement of lubrication method allows to take higher limiting speed. For the detail, please refer to A37 page.

## FWF • FWJ

**Inscribed Circle Diameter 5 – 22 mm**

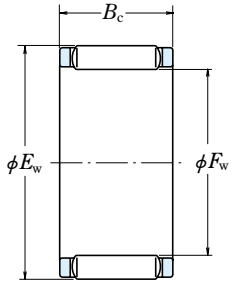



| Boundary Dimensions (mm) | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers | Mass (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $E_W$ | $B_C{}^{-0.2}_{-0.55}$ | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | | approx. |
| **5** | 8 | 8 | 2 330 | 1 860 | 237 | 189 | 60 000 | 95 000 | ✻ **FBNP-588** | 1.0 |
| **6** | 9 | 8 | 2 200 | 1 780 | 224 | 182 | 48 000 | 75 000 | ✻ **FBNP-698** | 1.2 |
| | 9 | 10 | 3 350 | 3 050 | 340 | 310 | 48 000 | 75 000 | ✻ **FBNP-6910** | 1.5 |
| **7** | 10 | 8 | 2 840 | 2 560 | 290 | 261 | 40 000 | 67 000 | ✻ **FBNP-7108** | 1.3 |
| | 10 | 10 | 3 650 | 3 550 | 375 | 360 | 40 000 | 67 000 | ✻ **FBNP-71010** | 1.6 |
| **8** | 11 | 10 | 3 950 | 4 000 | 400 | 410 | 34 000 | 56 000 | ✻ **FBNP-81110** | 1.8 |
| | 11 | 13 | 4 750 | 5 150 | 485 | 525 | 34 000 | 56 000 | ✻ **FBNP-81113** | 2.6 |
| **9** | 12 | 10 | 3 750 | 3 850 | 380 | 395 | 30 000 | 50 000 | ✻ **FBNP-91210** | 2.0 |
| | 12 | 13 | 5 100 | 5 750 | 520 | 585 | 30 000 | 50 000 | ✻ **FBNP-91213** | 2.6 |
| **10** | 13 | 10 | 3 950 | 4 300 | 405 | 435 | 28 000 | 45 000 | **FBN-101310** | 2.2 |
| | 13 | 13 | 5 400 | 6 350 | 550 | 650 | 28 000 | 45 000 | **FBN-101313** | 2.9 |
| | 14 | 13 | 6 500 | 6 750 | 660 | 690 | 28 000 | 45 000 | **FWF-101413** | 4.0 |
| **12** | 15 | 10 | 4 350 | 5 100 | 445 | 520 | 22 000 | 36 000 | **FBN-121510** | 2.6 |
| | 15 | 13 | 5 950 | 7 600 | 605 | 775 | 22 000 | 36 000 | **FBN-121513** | 3.4 |
| | 16 | 13 | 7 350 | 8 350 | 750 | 850 | 22 000 | 38 000 | **FWF-121613** | 4.6 |
| **14** | 18 | 10 | 6 750 | 7 750 | 690 | 790 | 19 000 | 32 000 | **FWF-141810** | 4.1 |
| | 18 | 13 | 8 050 | 9 750 | 820 | 995 | 19 000 | 32 000 | **FWF-141813** | 5.3 |
| | 20 | 17 | 13 400 | 14 600 | 1 370 | 1 490 | 20 000 | 32 000 | **FWF-142017** | 11 |
| **15** | 19 | 10 | 7 050 | 8 400 | 720 | 855 | 18 000 | 28 000 | **FWF-151910** | 4.3 |
| | 19 | 13 | 8 400 | 10 500 | 860 | 1 070 | 18 000 | 28 000 | **FWF-151913** | 5.6 |
| | 21 | 17 | 13 400 | 14 800 | 1 370 | 1 510 | 19 000 | 30 000 | **FWF-152117** | 12 |
| **16** | 20 | 10 | 7 350 | 9 000 | 750 | 920 | 17 000 | 26 000 | **FWF-162010** | 4.6 |
| | 20 | 13 | 8 800 | 11 300 | 895 | 1 150 | 17 000 | 26 000 | **FWF-162013** | 6.0 |
| | 22 | 17 | 14 700 | 16 900 | 1 500 | 1 720 | 17 000 | 28 000 | **FWF-162217** | 12 |
| **17** | 21 | 10 | 7 650 | 9 650 | 780 | 985 | 16 000 | 26 000 | **FWF-172110** | 4.8 |
| | 21 | 13 | 10 200 | 14 000 | 1 040 | 1 420 | 16 000 | 26 000 | **FWJ-172113** | 6.3 |
| | 23 | 17 | 15 100 | 17 800 | 1 540 | 1 810 | 16 000 | 26 000 | **FWF-172317** | 14 |
| **18** | 22 | 10 | 7 900 | 10 300 | 805 | 1 050 | 15 000 | 24 000 | **FWF-182210** | 5.1 |
| | 22 | 13 | 9 450 | 12 900 | 965 | 1 310 | 15 000 | 24 000 | **FWF-182213** | 6.6 |
| | 24 | 17 | 17 400 | 21 600 | 1 770 | 2 210 | 15 000 | 24 000 | **FWJ-182417** | 14 |
| **20** | 24 | 10 | 8 000 | 10 700 | 815 | 1 090 | 13 000 | 20 000 | **FWF-202410** | 5.6 |
| | 24 | 13 | 9 700 | 13 700 | 990 | 1 400 | 13 000 | 20 000 | **FWF-202413** | 7.3 |
| | 26 | 17 | 18 000 | 23 200 | 1 830 | 2 370 | 14 000 | 22 000 | **FWJ-202617** | 15 |
| **22** | 26 | 10 | 8 600 | 12 200 | 880 | 1 240 | 12 000 | 19 000 | **FWF-222610** | 6.1 |
| | 26 | 13 | 10 300 | 15 300 | 1 050 | 1 560 | 12 000 | 19 000 | **FWF-222613** | 7.9 |
| | 28 | 17 | 17 300 | 22 700 | 1 760 | 2 310 | 12 000 | 20 000 | **FWF-222817** | 16 |

**Note** (✻) These bearings have polyamide cages. The maximum permissible operating temperature for these bearings is 100 °C for continued operation and 120 °C for short periods.

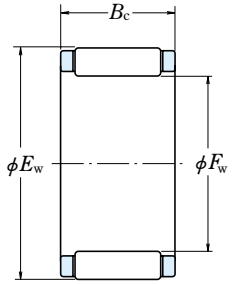
## FWF • FWJ

### Inscribed Circle Diameter 25 – 100 mm




| Boundary Dimensions (mm) | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | | Bearing Numbers | Mass (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $E_W$ | $B_C{}^{-0.2}_{-0.55}$ | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | | approx. |
| **25** | 29 | 10 | 9 350 | 14 100 | 950 | 1 440 | 10 000 | 17 000 | **FWF-252910** | 6.9 |
| | 29 | 13 | 11 300 | 18 000 | 1 150 | 1 830 | 10 000 | 17 000 | **FWF-252913** | 8.9 |
| | 31 | 17 | 19 200 | 26 800 | 1 950 | 2 740 | 10 000 | 17 000 | **FWF-253117** | 18 |
| **28** | 33 | 13 | 13 700 | 20 400 | 1 400 | 2 080 | 9 500 | 15 000 | **FWF-283313** | 13 |
| | 33 | 17 | 17 600 | 28 300 | 1 800 | 2 890 | 9 500 | 15 000 | **FWF-283317** | 16 |
| | 34 | 17 | 19 900 | 29 100 | 2 020 | 2 970 | 9 500 | 15 000 | **FWF-283417** | 20 |
| **30** | 35 | 13 | 14 000 | 21 600 | 1 430 | 2 200 | 8 500 | 14 000 | **FWF-303513** | 14 |
| | 35 | 17 | 18 700 | 31 500 | 1 910 | 3 200 | 8 500 | 14 000 | **FWF-303517A** | 18 |
| | 37 | 20 | 26 000 | 38 000 | 2 650 | 3 850 | 9 000 | 14 000 | **FWF-303720** | 30 |
| **32** | 37 | 13 | 15 100 | 24 400 | 1 540 | 2 480 | 8 000 | 13 000 | **FWF-323713** | 14 |
| | 37 | 17 | 18 500 | 31 500 | 1 880 | 3 200 | 8 000 | 13 000 | **FWJ-323717** | 19 |
| | 39 | 20 | 27 300 | 41 000 | 2 780 | 4 200 | 8 500 | 13 000 | **FWF-323920** | 32 |
| **35** | 40 | 13 | 14 900 | 24 600 | 1 520 | 2 500 | 7 500 | 12 000 | **FWF-354013** | 16 |
| | 40 | 17 | 20 500 | 37 000 | 2 090 | 3 750 | 7 500 | 12 000 | **FWF-354017** | 20 |
| | 42 | 20 | 30 000 | 47 500 | 3 050 | 4 850 | 7 500 | 12 000 | **FWJ-354220** | 34 |
| **40** | 45 | 17 | 21 000 | 40 000 | 2 150 | 4 050 | 6 300 | 10 000 | **FWF-404517A** | 23 |
| | 45 | 27 | 32 000 | 68 000 | 3 250 | 6 900 | 6 300 | 10 000 | **FWF-404527** | 36 |
| | 48 | 25 | 40 500 | 66 500 | 4 150 | 6 800 | 6 700 | 10 000 | **FWF-404825** | 56 |
| **45** | 50 | 17 | 21 600 | 43 000 | 2 200 | 4 350 | 5 600 | 9 000 | **FWF-455017** | 26 |
| | 50 | 27 | 34 000 | 77 500 | 3 500 | 7 900 | 5 600 | 9 000 | **FWF-455027** | 41 |
| | 53 | 25 | 44 000 | 77 000 | 4 500 | 7 850 | 5 600 | 9 500 | **FWF-455325** | 62 |
| **50** | 55 | 20 | 26 900 | 59 000 | 2 750 | 6 050 | 5 000 | 8 000 | **FWF-505520** | 37 |
| | 55 | 27 | 35 000 | 83 000 | 3 600 | 8 450 | 5 000 | 8 000 | **FWF-505527** | 50 |
| | 58 | 25 | 48 500 | 90 500 | 4 950 | 9 200 | 5 300 | 8 500 | **FWF-505825** | 77 |
| **55** | 61 | 20 | 31 000 | 64 000 | 3 150 | 6 500 | 4 500 | 7 500 | **FWF-556120** | 53 |
| | 61 | 30 | 47 000 | 109 000 | 4 750 | 11 100 | 4 500 | 7 500 | **FWF-556130** | 81 |
| | 63 | 25 | 50 000 | 97 500 | 5 100 | 9 950 | 4 800 | 7 500 | **FWF-556325** | 85 |
| **60** | 66 | 20 | 33 000 | 71 500 | 3 350 | 7 300 | 4 300 | 6 700 | **FWF-606620** | 57 |
| | 66 | 30 | 50 000 | 122 000 | 5 100 | 12 400 | 4 300 | 6 700 | **FWF-606630** | 87 |
| | 68 | 25 | 52 000 | 105 000 | 5 300 | 10 700 | 4 300 | 6 700 | **FWF-606825** | 91 |
| **65** | 73 | 30 | 61 000 | 132 000 | 6 200 | 13 400 | 4 000 | 6 300 | **FWF-657330** | 120 |
| **70** | 78 | 30 | 63 000 | 140 000 | 6 400 | 14 300 | 3 600 | 6 000 | **FWF-707830** | 125 |
| **75** | 83 | 30 | 65 000 | 151 000 | 6 650 | 15 400 | 3 400 | 5 600 | **FWF-758330** | 135 |
| **80** | 88 | 30 | 69 000 | 166 000 | 7 050 | 17 000 | 3 200 | 5 000 | **FWF-808830** | 145 |
| **85** | 93 | 30 | 71 000 | 176 000 | 7 250 | 17 900 | 3 000 | 4 800 | **FWF-859330** | 150 |
| **90** | 98 | 30 | 70 000 | 177 000 | 7 150 | 18 000 | 2 800 | 4 500 | **FWF-909830** | 160 |
| **95** | 103 | 30 | 69 500 | 177 000 | 7 100 | 18 100 | 2 600 | 4 300 | **FWF-9510330** | 175 |
| **100** | 108 | 30 | 75 500 | 201 000 | 7 700 | 20 500 | 2 400 | 4 000 | **FWF-10010830** | 185 |

## Cage & Needle Roller Assemblies for Large Ends of Connecting Rods
### Inscribed Circle Diameter 12 – 30 mm

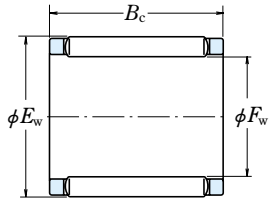



| Boundary Dimensions (mm) | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Bearing Numbers | Mass (g) |
|---|---|---|---|---|---|---|---|---|
| $F_W$ | $E_W$ | $B_C{}^{-0.2}_{-0.4}$ | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | | approx. |
| **12** | 16 | 10 | 6 100 | 6 500 | 620 | 665 | **FWF-121610-E** | 4.0 |
| **14** | 19 | 10 | 7 800 | 8 050 | 795 | 820 | **FWF-141910-E** | 6.2 |
| | 20 | 12 | 8 900 | 8 600 | 910 | 880 | **FWF-142012-E** | 8.3 |
| **15** | 19 | 9 | 5 650 | 6 250 | 575 | 640 | **FWF-15199-E** | 4.1 |
| | 20 | 10 | 7 300 | 7 600 | 745 | 775 | **FWF-152010-E** | 6.0 |
| | 21 | 10 | 7 950 | 7 500 | 810 | 765 | **FWF-152110-E** | 8.5 |
| **16** | 21 | 11 | 8 650 | 9 600 | 880 | 980 | **FWF-162111-E** | 7.5 |
| | 22 | 12 | 9 500 | 9 600 | 965 | 980 | **FWF-162212-E** | 9.5 |
| **18** | 23 | 14 | 11 800 | 14 800 | 1 200 | 1 510 | **FWF-182314-E** | 10 |
| | 24 | 12 | 10 000 | 10 600 | 1 020 | 1 080 | **FWF-182412-E** | 11 |
| **20** | 26 | 12 | 12 200 | 14 100 | 1 250 | 1 440 | **FWF-202612-E** | 13 |
| | 26 | 17 | 16 800 | 21 200 | 1 710 | 2 160 | **FWF-202617-E** | 17 |
| | 28 | 18 | 18 100 | 19 400 | 1 840 | 1 970 | **FWF-202818-E** | 25 |
| **22** | 28 | 14 | 13 900 | 17 100 | 1 420 | 1 740 | **FWF-222814-E** | 14 |
| | 29 | 15 | 16 300 | 19 000 | 1 660 | 1 930 | **FWF-222915-E** | 19 |
| | 32 | 16 | 19 700 | 19 400 | 2 010 | 1 970 | **FWF-223216-E** | 31 |
| **23** | 31 | 16 | 17 600 | 19 400 | 1 800 | 1 980 | **FWF-233116-E** | 23 |
| **24** | 30 | 15 | 15 600 | 20 300 | 1 590 | 2 070 | **FWF-243015-E** | 17 |
| | 30 | 17 | 17 900 | 24 300 | 1 830 | 2 480 | **FWF-243017-E** | 19 |
| | 31 | 20 | 21 600 | 27 800 | 2 200 | 2 840 | **FWF-243120-E** | 30 |
| **25** | 32 | 16 | 17 700 | 21 900 | 1 810 | 2 230 | **FWF-253216-E** | 24 |
| **28** | 35 | 16 | 18 400 | 23 700 | 1 880 | 2 410 | **FWF-283516-E** | 25 |
| **29.75** | 36.75 | 16.5 | 19 600 | 26 000 | 1 990 | 2 650 | **FWF-293616Z-E** | 28 |
| **30** | 37 | 16 | 21 900 | 30 500 | 2 230 | 3 100 | **FWF-303716-E** | 29 |
| | 38 | 18 | 25 500 | 34 000 | 2 600 | 3 450 | **FWF-303818-E** | 35 |



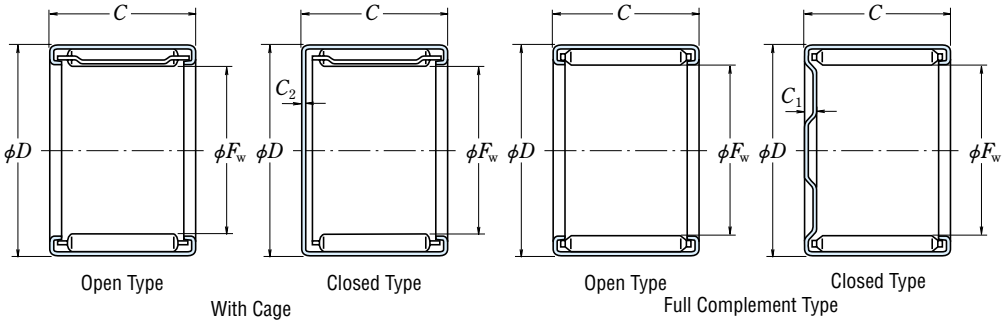


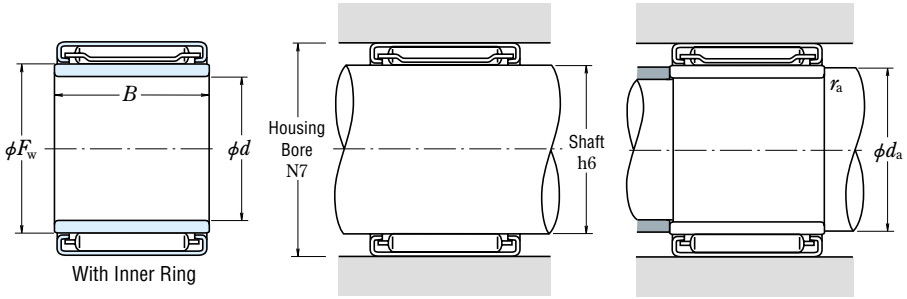
## Cage & Needle Roller Assemblies for Small Ends of Connecting Rods
### Inscribed Circle Diameter 9 – 19 mm




| Boundary Dimensions (mm) | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Bearing Numbers | Mass (g) |
|---|---|---|---|---|---|---|---|---|
| $F_W$ | $E_W$ | $B_C{}^{-0.2}_{-0.4}$ | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | | approx. |
| **9** | 12 | 11.5 | 4 300 | 4 650 | 440 | 475 | **FBN-91211Z-E** | 3.5 |
| **10** | 14 | 12.7 | 5 900 | 5 950 | 605 | 610 | **FBN-101412Z-E** | 5.0 |
| **12** | 15 | 14.3 | 6 400 | 8 400 | 655 | 855 | **FBN-121514Z-E** | 4.8 |
| | 16 | 13 | 7 250 | 8 200 | 740 | 835 | **FBN-121613-E** | 6.4 |
| | 16 | 15.5 | 8 500 | 10 000 | 865 | 1 020 | **FBN-121615Z-E** | 7.0 |
| | 16 | 16 | 8 500 | 10 000 | 865 | 1 020 | **FBN-121616-E** | 7.5 |
| **14** | 18 | 12 | 6 950 | 8 050 | 710 | 820 | **FBN-141812-E** | 6.5 |
| | 18 | 16.5 | 9 250 | 11 600 | 945 | 1 180 | **FBN-141816Z-E** | 8.5 |
| | 18 | 18 | 10 700 | 14 000 | 1 090 | 1 430 | **FBN-141818-E** | 11.5 |
| | 18 | 20 | 9 550 | 12 000 | 975 | 1 230 | **FBN-141820-E1** | 13 |
| **15** | 19 | 18 | 11 300 | 15 300 | 1 150 | 1 560 | **FBN-151918-E** | 11 |
| | 21 | 18 | 12 900 | 13 900 | 1 310 | 1 420 | **FBN-152118-E** | 13 |
| **16** | 20 | 22 | 13 700 | 20 000 | 1 400 | 2 040 | **FBN-162022-E** | 14 |
| | 20 | 23.5 | 14 900 | 22 300 | 1 520 | 2 280 | **FBN-162023Z-E** | 15 |
| | 21 | 20 | 14 200 | 18 100 | 1 450 | 1 840 | **FBN-162120-E** | 16 |
| **17** | 21 | 23 | 14 800 | 22 500 | 1 510 | 2 290 | **FBN-172123-E** | 16 |
| **18** | 22 | 17 | 11 500 | 16 500 | 1 170 | 1 680 | **FBN-182217-E** | 12 |
| | 22 | 22 | 14 200 | 21 600 | 1 440 | 2 200 | **FBN-182222-E** | 15 |
| | 22 | 23.6 | 15 400 | 24 100 | 1 570 | 2 460 | **FBN-182223Z-E** | 16 |
| **19** | 23 | 23.7 | 16 000 | 25 800 | 1 630 | 2 630 | **FBN-192323Z-E** | 17 |

## FJ • MFJ (With Cage)
## F • MF (Full Complement Type)
### Inscribed Circle Diameter 4 – 16 mm



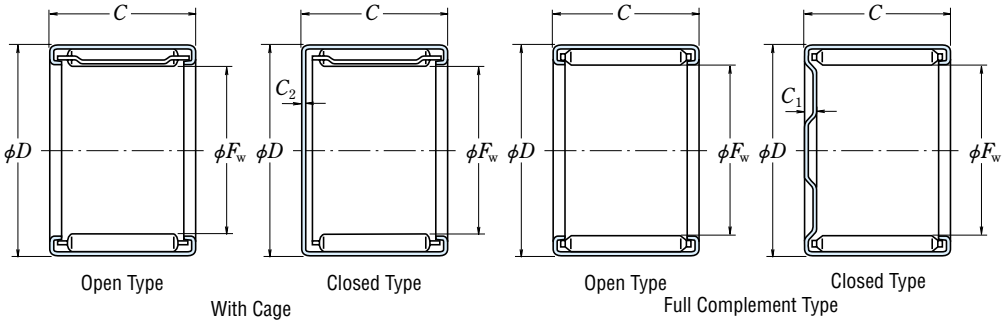



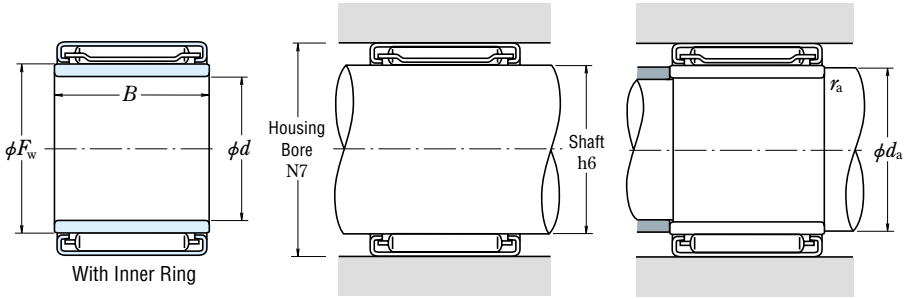

| Boundary Dimensions (mm) | | | | Basic Dynamic Load Ratings (N) | {kgf} | Limiting Loads (N) | {kgf} | Limiting Speeds (min⁻¹) | | Bearing With Cage | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C^{0}_{-0.25}$ | $C_1, C_2$ max. | $C_r$ | | $P_{max}$ | | Grease | Oil | Open | Closed |
| **4** | 8 | 8 | 0.8 | 1 720 | 175 | 675 | 69 | 45 000 | 75 000 | * **FJP-48** | — |
| **5** | 9 | 9 | 0.8 | 1 860 | 190 | 745 | 76 | 43 000 | 71 000 | **FJ-59** | **MFJ-59** |
| **6** | 10 | 9 | 0.8 | 2 320 | 237 | 985 | 101 | 36 000 | 56 000 | **FJ-69** | **MFJ-69** |
| **7** | 11 | 9 | 0.8 | 2 550 | 260 | 1 110 | 113 | 30 000 | 48 000 | **FJ-79** | **MFJ-79** |
| **8** | 12 | 10 | 0.8 | 2 840 | 289 | 1 270 | 130 | 26 000 | 43 000 | **FJ-810** | **MFJ-810** |
| | 14 | 10 | 1.0 | 4 300 | 435 | 1 770 | 180 | 28 000 | 45 000 | **FJH-810** | **MFJH-810** |
| | 14 | 10 | 1.9 | 5 550 | 565 | 2 980 | 305 | 6 300 | 10 000 | — | — |
| **9** | 13 | 10 | 0.8 | 3 300 | 335 | 1 600 | 163 | 22 000 | 36 000 | **FJ-910** | **MFJ-910** |
| | 15 | 10 | 1.0 | 4 550 | 465 | 1 910 | 194 | 24 000 | 40 000 | **FJH-910** | **MFJH-910** |
| | 15 | 10 | 1.8 | 6 100 | 625 | 3 350 | 340 | 6 000 | 10 000 | — | — |
| **10** | 14 | 10 | 0.8 | 3 500 | 360 | 1 760 | 179 | 20 000 | 32 000 | **FJ-1010** | **MFJ-1010** |
| | 16 | 10 | 1.0 | 4 900 | 500 | 2 100 | 214 | 22 000 | 34 000 | **FJH-1010** | **MFJH-1010** |
| | 16 | 10 | 1.9 | 6 650 | 680 | 3 700 | 375 | 5 600 | 9 000 | — | — |
| **12** | 16 | 10 | 0.8 | 4 150 | 420 | 2 210 | 225 | 17 000 | 26 000 | **FJ-1210** | **MFJ-1210** |
| | 18 | 12 | 1.0 | 6 450 | 655 | 3 050 | 310 | 17 000 | 28 000 | **FJH-1212** | **MFJH-1212** |
| | 18 | 12 | 1.9 | 9 000 | 920 | 5 700 | 580 | 4 500 | 7 500 | — | — |
| **13** | 19 | 12 | 1.0 | 6 950 | 710 | 3 400 | 345 | 16 000 | 26 000 | **FJ-1312** | **MFJ-1312** |
| | 19 | 12 | 1.9 | 9 550 | 975 | 6 100 | 625 | 4 300 | 7 100 | — | — |
| **14** | 20 | 12 | 1.0 | 6 500 | 665 | 3 250 | 335 | 15 000 | 24 000 | **FJ-1412** | **MFJ-1412** |
| | 20 | 12 | 2.2 | 9 450 | 965 | 6 350 | 645 | 3 800 | 6 000 | — | — |
| | 20 | 16 | 1.0 | 9 500 | 970 | 5 300 | 540 | 15 000 | 24 000 | **FJ-1416** | **MFJ-1416** |
| | 20 | 16 | 2.2 | 13 300 | 1 360 | 9 850 | 1 000 | 3 800 | 6 000 | — | — |
| **15** | 21 | 12 | 1.0 | 7 650 | 780 | 3 900 | 400 | 14 000 | 22 000 | **FJ-1512** | **MFJ-1512** |
| | 21 | 12 | 1.8 | 10 300 | 1 050 | 6 900 | 705 | 3 800 | 6 000 | — | — |
| | 21 | 14 | 1.8 | 12 400 | 1 270 | 8 800 | 895 | 3 800 | 6 000 | — | — |
| | 21 | 16 | 1.0 | 11 000 | 1 120 | 6 200 | 635 | 14 000 | 22 000 | **FJ-1516** | **MFJ-1516** |
| | 21 | 16 | 1.8 | 14 500 | 1 480 | 10 700 | 1 090 | 3 800 | 6 000 | — | — |
| **16** | 22 | 12 | 1.0 | 7 100 | 725 | 3 750 | 380 | 12 000 | 20 000 | **FJ-1612** | **MFJ-1612** |
| | 22 | 12 | 2.2 | 10 200 | 1 040 | 7 100 | 725 | 3 400 | 5 300 | — | — |
| | 22 | 16 | 1.0 | 10 400 | 1 060 | 6 050 | 620 | 12 000 | 20 000 | **FJ-1616** | **MFJ-1616** |
| | 22 | 16 | 2.2 | 14 400 | 1 460 | 11 100 | 1 130 | 3 400 | 5 300 | — | — |

| Numbers | | In case of inner ring is used | | | | | Mass Without Inner Ring (g) | |
|---|---|---|---|---|---|---|---|---|
| Full Complement Type | | Bearing Numbers of Inner Ring | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | approx. | |
| Open | Closed | | $d$ | $B$ | $d_a$(min.) | $r_a$(max.) | Open | Closed |
| — | — | — | — | — | — | — | 1.3 | — |
| — | — | — | — | — | — | — | 1.7 | 1.9 |
| — | — | — | — | — | — | — | 2.2 | 2.4 |
| — | — | — | — | — | — | — | 2.3 | 2.7 |
| — | — | — | — | — | — | — | 2.7 | 3.2 |
| — | — | — | — | — | — | — | 5.2 | 5.5 |
| **FH-810** | **MFH-810** | — | — | — | — | — | 6.0 | 6.3 |
| — | — | — | — | — | — | — | 3.2 | 3.6 |
| — | — | — | — | — | — | — | 5.7 | 6.1 |
| **FH-910** | **MFH-910** | — | — | — | — | — | 6.4 | 6.8 |
| — | — | **FIR-71010** | 7 | 10.5 | 9 | 0.3 | 3.6 | 4.1 |
| — | — | **FIR-71010** | 7 | 10.5 | 9 | 0.3 | 6.1 | 6.6 |
| **FH-1010** | **MFH-1010** | **FIR-71010** | 7 | 10.5 | 9 | 0.3 | 6.9 | 7.3 |
| — | — | **FIR-81210** | 8 | 10.5 | 10 | 0.3 | 4.1 | 4.5 |
| — | — | **FIR-81212** | 8 | 12.5 | 10 | 0.3 | 7.7 | 8.2 |
| **FH-1212** | **MFH-1212** | **FIR-81212** | 8 | 12.5 | 10 | 0.3 | 10 | 11 |
| — | — | **FIR-101312** | 10 | 12.5 | 12 | 0.3 | 8.6 | 9.5 |
| **F-1312** | **MF-1312** | **FIR-101312** | 10 | 12.5 | 12 | 0.3 | 11 | 12 |
| — | — | **FIR-101412** | 10 | 12.5 | 12 | 0.3 | 10 | 11 |
| **F-1412** | **MF-1412** | **FIR-101412** | 10 | 12.5 | 12 | 0.3 | 12 | 14 |
| — | — | **FIR-101416** | 10 | 16.5 | 12 | 0.3 | 13 | 14 |
| **F-1416** | **MF-1416** | **FIR-101416** | 10 | 16.5 | 12 | 0.3 | 18 | 19 |
| — | — | **FIR-121512** | 12 | 12.5 | 14 | 0.3 | 10 | 11 |
| **F-1512** | **MF-1512** | **FIR-121512** | 12 | 12.5 | 14 | 0.3 | 12 | 14 |
| **F-1514** | **MF-1514** | — | — | — | — | — | 15 | 16 |
| — | — | **FIR-121516** | 12 | 16.5 | 14 | 0.3 | 13 | 14 |
| **F-1516** | **MF-1516** | **FIR-121516** | 12 | 16.5 | 14 | 0.3 | 17 | 18 |
| — | — | **FIR-121612** | 12 | 12.5 | 14 | 0.3 | 11 | 12 |
| **F-1612** | **MF-1612** | **FIR-121612** | 12 | 12.5 | 14 | 0.3 | 14 | 15 |
| — | — | **FIR-121616** | 12 | 16.5 | 14 | 0.3 | 14 | 15 |
| **F-1616** | **MF-1616** | **FIR-121616** | 12 | 16.5 | 14 | 0.3 | 18 | 20 |

**Note** (*) These bearing have polyamide cages. The maximum permissible operating temperature for these bearings is 100 °C for continued operation and 120 °C for short periods.

## FJ • MFJ (With Cage)
## F • MF (Full Complement Type)
### Inscribed Circle Diameter 17 – 28 mm

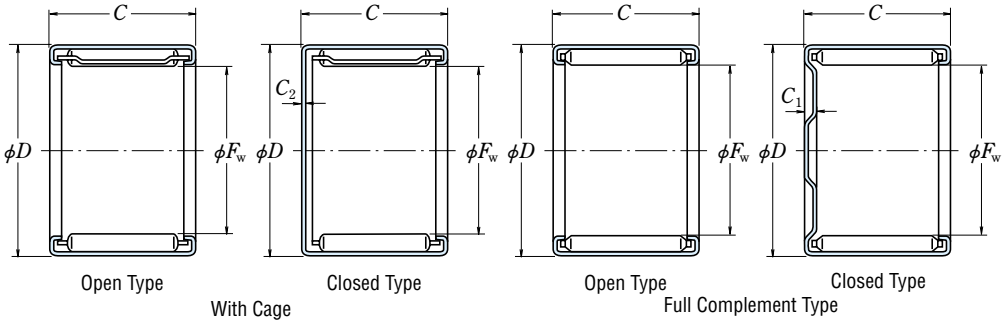


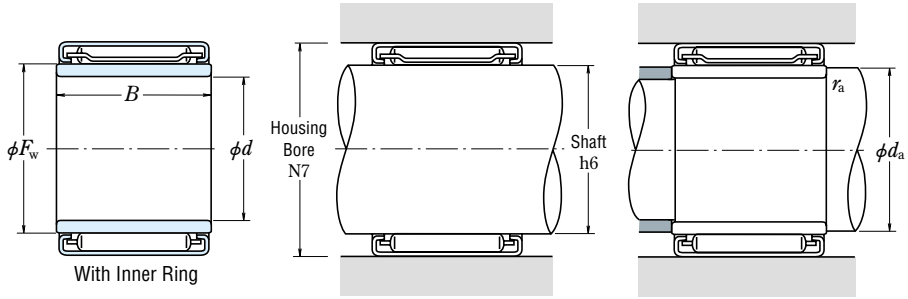




| Boundary Dimensions (mm) | | | | Basic Dynamic Load Ratings (N) | {kgf} | Limiting Loads (N) | {kgf} | Limiting Speeds (min⁻¹) | | Bearing Numbers With Cage | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C^{0}_{-0.25}$ | $C_1, C_2$ max. | $C_r$ | | $P_{max}$ | | Grease | Oil | Open | Closed |
| **17** | 23 | 12 | 1.0 | 8 450 | 860 | 4 450 | 455 | 12 000 | 19 000 | **FJ-1712** | **MFJ-1712** |
| | 23 | 12 | 1.8 | 11 300 | 1 150 | 7 750 | 790 | 3 400 | 5 600 | — | — |
| | 23 | 16 | 1.0 | 12 100 | 1 230 | 7 100 | 720 | 12 000 | 19 000 | **FJ-1716** | **MFJ-1716** |
| | 23 | 16 | 1.8 | 15 800 | 1 610 | 12 000 | 1 220 | 3 400 | 5 600 | — | — |
| **18** | 24 | 12 | 1.0 | 7 650 | 780 | 4 200 | 430 | 11 000 | 18 000 | **FJ-1812** | **MFJ-1812** |
| | 24 | 12 | 2.2 | 10 900 | 1 110 | 7 900 | 805 | 3 000 | 5 000 | — | — |
| | 24 | 16 | 1.0 | 11 200 | 1 140 | 6 800 | 695 | 11 000 | 18 000 | **FJ-1816** | **MFJ-1816** |
| | 24 | 16 | 2.2 | 15 300 | 1 560 | 12 300 | 1 250 | 3 000 | 5 000 | — | — |
| **20** | 26 | 12 | 1.0 | 8 150 | 835 | 4 650 | 475 | 10 000 | 16 000 | **FJ-2012** | **MFJ-2012** |
| | 26 | 12 | 2.2 | 11 500 | 1 170 | 8 700 | 885 | 2 800 | 4 500 | — | — |
| | 26 | 16 | 1.0 | 11 900 | 1 210 | 7 550 | 770 | 10 000 | 16 000 | **FJ-2016** | **MFJ-2016** |
| | 26 | 16 | 2.2 | 16 200 | 1 650 | 13 500 | 1 380 | 2 800 | 4 500 | — | — |
| | 26 | 20 | 1.0 | 15 300 | 1 560 | 10 500 | 1 070 | 10 000 | 16 000 | **FJ-2020** | **MFJ-2020** |
| | 26 | 20 | 2.2 | 20 500 | 2 090 | 18 300 | 1 870 | 2 800 | 4 500 | — | — |
| **22** | 28 | 12 | 1.0 | 8 650 | 880 | 5 150 | 525 | 9 000 | 14 000 | **FJ-2212** | **MFJ-2212** |
| | 28 | 12 | 2.2 | 12 100 | 1 230 | 9 500 | 970 | 2 400 | 4 000 | — | — |
| | 28 | 16 | 1.0 | 12 600 | 1 290 | 8 350 | 850 | 9 000 | 14 000 | **FJ-2216** | **MFJ-2216** |
| | 28 | 16 | 2.2 | 17 100 | 1 740 | 14 800 | 1 510 | 2 400 | 4 000 | — | — |
| | 28 | 20 | 1.0 | 16 200 | 1 660 | 11 500 | 1 180 | 9 000 | 14 000 | **FJ-2220** | **MFJ-2220** |
| | 28 | 20 | 2.2 | 21 600 | 2 200 | 20 000 | 2 040 | 2 400 | 4 000 | — | — |
| **25** | 32 | 16 | 1.0 | 15 200 | 1 550 | 9 350 | 955 | 8 000 | 13 000 | **FJ-2516** | **MFJ-2516** |
| | 32 | 16 | 2.5 | 20 200 | 2 060 | 16 200 | 1 650 | 2 800 | 4 500 | — | — |
| | 32 | 20 | 1.0 | 19 800 | 2 020 | 13 100 | 1 340 | 8 000 | 13 000 | **FJ-2520** | **MFJ-2520** |
| | 32 | 20 | 2.5 | 25 900 | 2 640 | 22 200 | 2 260 | 2 800 | 4 500 | — | — |
| | 32 | 26 | 1.0 | 26 200 | 2 670 | 18 800 | 1 920 | 8 000 | 13 000 | **FJ-2526** | **MFJ-2526** |
| | 32 | 26 | 2.5 | 34 000 | 3 450 | 31 500 | 3 200 | 2 800 | 4 500 | — | — |
| **28** | 35 | 16 | 1.0 | 15 600 | 1 590 | 9 950 | 1 020 | 7 100 | 11 000 | **FJ-2816** | **MFJ-2816** |
| | 35 | 16 | 2.5 | 21 300 | 2 170 | 17 900 | 1 820 | 2 400 | 4 000 | — | — |
| | 35 | 20 | 1.0 | 20 500 | 2 090 | 14 200 | 1 450 | 7 100 | 11 000 | **FJ-2820** | **MFJ-2820** |
| | 35 | 20 | 2.5 | 27 300 | 2 780 | 24 600 | 2 510 | 2 400 | 4 000 | — | — |
| | 35 | 26 | 1.0 | 26 900 | 2 750 | 20 200 | 2 060 | 7 100 | 11 000 | **FJ-2826** | **MFJ-2826** |
| | 35 | 26 | 2.5 | 35 500 | 3 650 | 34 500 | 3 550 | 2 400 | 4 000 | — | — |

| Numbers | | In case of inner ring is used | | | | | Mass Without Inner Ring (g) | |
|---|---|---|---|---|---|---|---|---|
| Full Complement Type | | Bearing Numbers of Inner Ring | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | approx. | |
| Open | Closed | | $d$ | $B$ | $d_{a(min.)}$ | $r_{a(max.)}$ | Open | Closed |
| — | — | — | — | — | — | — | 10 | 11 |
| **F-1712** | **MF-1712** | — | — | — | — | — | 14 | 15 |
| — | — | — | — | — | — | — | 14 | 16 |
| **F-1716** | **MF-1716** | — | — | — | — | — | 18 | 20 |
| — | — | **FIR-151812** | 15 | 12.5 | 17 | 0.3 | 12 | 14 |
| **F-1812** | **MF-1812** | **FIR-151812** | 15 | 12.5 | 17 | 0.3 | 14 | 16 |
| — | — | **FIR-151816** | 15 | 16.5 | 17 | 0.3 | 16 | 18 |
| **F-1816** | **MF-1816** | **FIR-151816** | 15 | 16.5 | 17 | 0.3 | 19 | 22 |
| — | — | **FIR-172012** | 17 | 12.5 | 19 | 0.3 | 13 | 15 |
| **F-2012** | **MF-2012** | **FIR-172012** | 17 | 12.5 | 19 | 0.3 | 17 | 19 |
| — | — | **FIR-172016** | 17 | 16.5 | 19 | 0.3 | 17 | 19 |
| **F-2016** | **MF-2016** | **FIR-172016** | 17 | 16.5 | 19 | 0.3 | 22 | 25 |
| — | — | **FIR-172020** | 17 | 20.5 | 19 | 0.3 | 22 | 24 |
| **F-2020** | **MF-2020** | **FIR-172020** | 17 | 20.5 | 19 | 0.3 | 28 | 30 |
| — | — | **FIR-172212** | 17 | 12.5 | 19 | 0.3 | 14 | 17 |
| **F-2212** | **MF-2212** | **FIR-172212** | 17 | 12.5 | 19 | 0.3 | 18 | 21 |
| — | — | **FIR-172216** | 17 | 16.5 | 19 | 0.3 | 19 | 22 |
| **F-2216** | **MF-2216** | **FIR-172216** | 17 | 16.5 | 19 | 0.3 | 24 | 27 |
| — | — | **FIR-172220** | 17 | 20.5 | 19 | 0.3 | 23 | 26 |
| **F-2220** | **MF-2220** | **FIR-172220** | 17 | 20.5 | 19 | 0.3 | 30 | 33 |
| — | — | **FIR-202516** | 20 | 16.5 | 22 | 0.3 | 24 | 27 |
| **F-2516** | **MF-2516** | **FIR-202516** | 20 | 16.5 | 22 | 0.3 | 31 | 35 |
| — | — | **FIR-202520** | 20 | 20.5 | 22 | 0.3 | 31 | 34 |
| **F-2520** | **MF-2520** | **FIR-202520** | 20 | 20.5 | 22 | 0.3 | 40 | 43 |
| — | — | **FIR-202526** | 20 | 26.5 | 22 | 0.3 | 40 | 43 |
| **F-2526** | **MF-2526** | **FIR-202526** | 20 | 26.5 | 22 | 0.3 | 52 | 55 |
| — | — | **FIR-222816** | 22 | 16.5 | 24 | 0.3 | 27 | 31 |
| **F-2816** | **MF-2816** | **FIR-222816** | 22 | 16.5 | 24 | 0.3 | 35 | 40 |
| — | — | **FIR-222820** | 22 | 20.5 | 24 | 0.3 | 34 | 38 |
| **F-2820** | **MF-2820** | **FIR-222820** | 22 | 20.5 | 24 | 0.3 | 44 | 48 |
| — | — | **FIR-222826** | 22 | 26.5 | 24 | 0.3 | 45 | 49 |
| **F-2826** | **MF-2826** | **FIR-222826** | 22 | 26.5 | 24 | 0.3 | 57 | 62 |

## FJ • MFJ (With Cage)
## F • MF (Full Complement Type)
### Inscribed Circle Diameter 30 – 55 mm



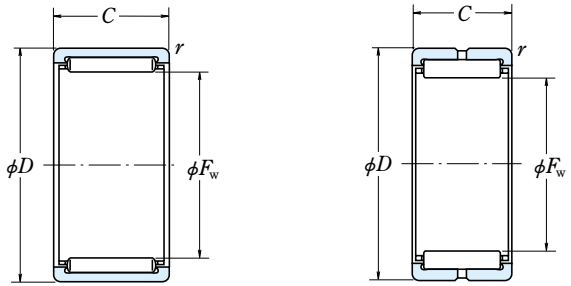




| Boundary Dimensions (mm) | | | | Basic Dynamic Load Ratings (N) | | Limiting Loads (N) | | Limiting Speeds (min⁻¹) | | Bearing Numbers | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C^{0}_{-0.25}$ | $C_1, C_2$ max. | $C_r$ | {kgf} | $P_{max}$ | {kgf} | Grease | Oil | With Cage Open | With Cage Closed |
| **30** | 37 | 16 | 1.0 | 15 600 | 1 590 | 10 100 | 1 030 | 6 700 | 10 000 | **FJ-3016L** | **MFJ-3016** |
| | 37 | 16 | 2.5 | 22 100 | 2 250 | 18 900 | 1 930 | 2 400 | 3 800 | — | — |
| | 37 | 20 | 1.0 | 19 400 | 1 970 | 13 300 | 1 360 | 6 700 | 10 000 | **FJ-3020** | **MFJ-3020** |
| | 37 | 20 | 2.5 | 28 400 | 2 900 | 26 200 | 2 670 | 2 400 | 3 800 | — | — |
| | 37 | 26 | 1.0 | 26 000 | 2 660 | 19 500 | 1 990 | 6 700 | 10 000 | **FJ-3026** | **MFJ-3026** |
| | 37 | 26 | 2.5 | 37 000 | 3 800 | 37 000 | 3 750 | 2 400 | 3 800 | — | — |
| **35** | 42 | 16 | 1.0 | 18 100 | 1 850 | 12 800 | 1 300 | 5 600 | 9 000 | **FJ-3516** | **MFJ-3516** |
| | 42 | 16 | 2.5 | 24 000 | 2 450 | 22 000 | 2 240 | 2 000 | 3 400 | — | — |
| | 42 | 20 | 1.0 | 23 600 | 2 410 | 17 900 | 1 830 | 5 600 | 9 000 | **FJ-3520** | **MFJ-3520** |
| | 42 | 20 | 2.5 | 31 000 | 3 150 | 30 000 | 3 100 | 2 000 | 3 400 | — | — |
| | 42 | 26 | 1.0 | 31 500 | 3 200 | 25 800 | 2 630 | 5 600 | 9 000 | **FJ-3526** | **MFJ-3526** |
| | 42 | 26 | 2.5 | 40 000 | 4 100 | 42 500 | 4 350 | 2 000 | 3 400 | — | — |
| **40** | 47 | 16 | 1.0 | 18 600 | 1 890 | 13 600 | 1 390 | 4 800 | 7 500 | **FJ-4016** | **MFJ-4016** |
| | 47 | 16 | 2.5 | 25 700 | 2 620 | 24 900 | 2 540 | 1 800 | 3 000 | — | — |
| | 47 | 20 | 1.0 | 23 500 | 2 400 | 18 500 | 1 890 | 4 800 | 7 500 | **FJ-4020** | **MFJ-4020** |
| | 47 | 20 | 2.5 | 32 500 | 3 350 | 34 000 | 3 450 | 1 800 | 3 000 | — | — |
| | 47 | 26 | 1.0 | 31 500 | 3 200 | 26 900 | 2 740 | 4 800 | 7 500 | **FJ-4026** | **MFJ-4026** |
| **45** | 52 | 16 | 1.0 | 19 900 | 2 030 | 15 400 | 1 570 | 4 300 | 6 700 | **FJ-4516** | **MFJ-4516** |
| | 52 | 16 | 2.5 | 27 300 | 2 790 | 27 800 | 2 840 | 1 600 | 2 600 | — | — |
| | 52 | 20 | 1.0 | 25 500 | 2 600 | 21 200 | 2 160 | 4 300 | 6 700 | **FJ-4520** | **MFJ-4520** |
| | 52 | 20 | 2.5 | 35 000 | 3 550 | 38 500 | 3 900 | 1 600 | 2 600 | — | — |
| **50** | 58 | 20 | 1.1 | 28 900 | 2 940 | 23 100 | 2 350 | 3 800 | 6 300 | **FJ-5020L** | **MFJ-5020** |
| | 58 | 20 | 2.8 | 39 500 | 4 050 | 41 500 | 4 250 | 1 700 | 2 800 | — | — |
| | 58 | 24 | 1.1 | 36 000 | 3 700 | 30 500 | 3 150 | 3 800 | 6 300 | **FJ-5024** | **MFJ-5024** |
| | 58 | 24 | 2.8 | 48 000 | 4 900 | 53 000 | 5 400 | 1 700 | 2 800 | — | — |
| **55** | 63 | 20 | 1.1 | 30 000 | 3 100 | 25 100 | 2 560 | 3 400 | 5 600 | **FJ-5520** | **MFJ-5520** |
| | 63 | 20 | 2.8 | 41 500 | 4 250 | 45 500 | 4 650 | 1 600 | 2 400 | — | — |
| | 63 | 24 | 1.1 | 37 500 | 3 850 | 33 500 | 3 400 | 3 400 | 5 600 | **FJ-5524** | **MFJ-5524** |
| | 63 | 24 | 2.8 | 50 500 | 5 150 | 58 000 | 5 950 | 1 600 | 2 400 | — | — |

| Numbers | | In case of inner ring is used | | | | | Mass Without Inner Ring (g) | |
|---|---|---|---|---|---|---|---|---|
| Full Complement Type | | Bearing Numbers of Inner Ring | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | |
| Open | Closed | | $d$ | $B$ | $d_a$(min.) | $r_a$(max.) | approx. Open | approx. Closed |
| — | — | — | — | — | — | — | 26 | 31 |
| **F-3016** | **MF-3016** | — | — | — | — | — | 35 | 40 |
| — | — | **FIR-253020** | 25 | 20.5 | 27 | 0.3 | 35 | 39 |
| **F-3020** | **MF-3020** | **FIR-253020** | 25 | 20.5 | 27 | 0.3 | 46 | 51 |
| — | — | **FIR-253026** | 25 | 26.5 | 27 | 0.3 | 46 | 50 |
| **F-3026** | **MF-3026** | **FIR-253026** | 25 | 26.5 | 27 | 0.3 | 61 | 66 |
| — | — | — | — | — | — | — | 32 | 38 |
| **F-3516** | **MF-3516** | — | — | — | — | — | 53 | 60 |
| — | — | **FIR-303520** | 30 | 20.5 | 34 | 0.6 | 41 | 45 |
| **F-3520** | **MF-3520** | **FIR-303520** | 30 | 20.5 | 34 | 0.6 | 42 | 49 |
| — | — | **FIR-303526** | 30 | 26.5 | 34 | 0.6 | 54 | 58 |
| **F-3526** | **MF-3526** | **FIR-303526** | 30 | 26.5 | 34 | 0.6 | 70 | 76 |
| — | — | — | — | — | — | — | 34 | 43 |
| **F-4016** | **MF-4016** | — | — | — | — | — | 48 | 56 |
| — | — | **FIR-354020** | 35 | 20.5 | 39 | 0.6 | 46 | 51 |
| **F-4020** | **MF-4020** | **FIR-354020** | 35 | 20.5 | 39 | 0.6 | 60 | 69 |
| — | — | **FIR-354026** | 35 | 26.5 | 39 | 0.6 | 60 | 65 |
| — | — | — | — | — | — | — | 39 | 50 |
| **F-4516** | **MF-4516** | — | — | — | — | — | 53 | 64 |
| — | — | **FIR-404520** | 40 | 20.5 | 44 | 0.6 | 53 | 59 |
| **F-4520** | **MF-4520** | **FIR-404520** | 40 | 20.5 | 44 | 0.6 | 67 | 78 |
| — | — | **FIR-455020** | 45 | 20.5 | 49 | 0.6 | 56 | 71 |
| **F-5020** | **MF-5020** | — | — | — | — | — | 81 | 95 |
| — | — | — | — | — | — | — | 69 | 84 |
| **F-5024** | **MF-5024** | — | — | — | — | — | 98 | 110 |
| — | — | — | — | — | — | — | 60 | 79 |
| **F-5520** | **MF-5520** | — | — | — | — | — | 88 | 105 |
| — | — | — | — | — | — | — | 72 | 90 |
| **F-5524** | **MF-5524** | — | — | — | — | — | 105 | 125 |

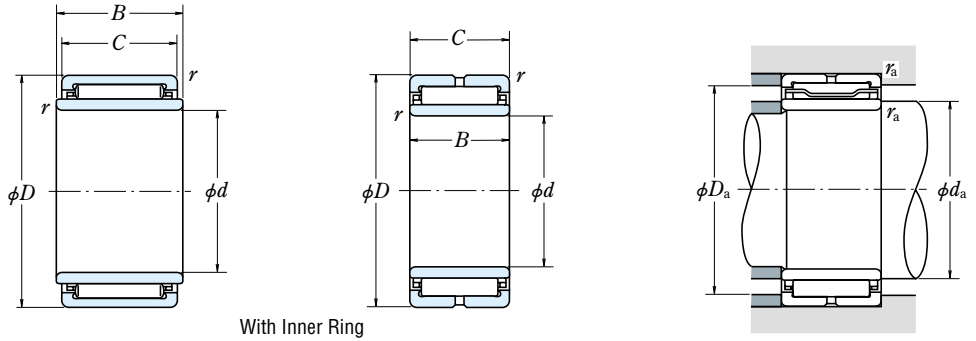
# RLM • LM
# RNA • NA

**Inscribed Circle Diameter 9 – 22 mm**




Without Inner Ring

RLM RNA




With Inner Ring

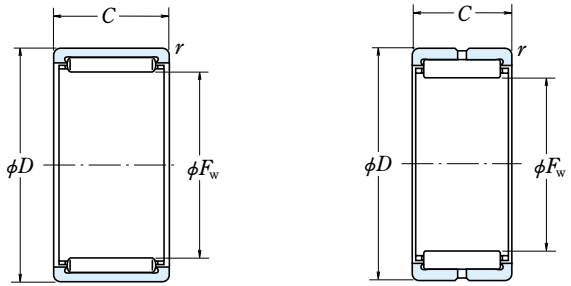
LM NA

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Without Inner Ring |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | |
| **9** | 16 | 12 | 0.3 | 6 150 | 5 400 | 625 | 550 | 24 000 | 40 000 | **RLM 912** |
| | 16 | 16 | 0.3 | 7 900 | 7 450 | 805 | 760 | 24 000 | 40 000 | **RLM 916** |
| **10** | 17 | 10 | 0.3 | 5 350 | 4 650 | 545 | 470 | 22 000 | 36 000 | **RLM 101710** |
| | 17 | 15 | 0.3 | 8 050 | 7 800 | 820 | 795 | 22 000 | 36 000 | **RLM 101715** |
| **12** | 17 | 12 | 0.3 | 6 150 | 7 650 | 625 | 780 | 18 000 | 30 000 | **RLM 1212** |
| | 19 | 12 | 0.3 | 7 300 | 7 150 | 745 | 730 | 18 000 | 30 000 | **RLM 121912** |
| **14** | 22 | 13 | 0.3 | 9 150 | 9 950 | 930 | 1 010 | 20 000 | 32 000 | — |
| | 22 | 16 | 0.3 | 12 100 | 12 700 | 1 230 | 1 300 | 15 000 | 24 000 | **RLM 1416** |
| | 22 | 20 | 0.3 | 15 500 | 17 500 | 1 580 | 1 790 | 15 000 | 24 000 | **RLM 1420** |
| **15** | 20 | 15 | 0.3 | 8 100 | 11 700 | 825 | 1 190 | 14 000 | 24 000 | **RLM 1515** |
| | 20 | 20 | 0.3 | 11 100 | 17 400 | 1 130 | 1 770 | 14 000 | 24 000 | **RLM 1520** |
| | 22 | 15 | 0.3 | 9 900 | 11 100 | 1 010 | 1 140 | 14 000 | 24 000 | **RLM 152215** |
| **16** | 24 | 13 | 0.3 | 10 100 | 11 700 | 1 030 | 1 190 | 17 000 | 28 000 | — |
| | 24 | 16 | 0.3 | 12 900 | 14 200 | 1 310 | 1 450 | 13 000 | 22 000 | **RLM 1616** |
| | 24 | 20 | 0.3 | 16 500 | 19 500 | 1 680 | 1 990 | 13 000 | 22 000 | **RLM 1620** |
| | 24 | 22 | 0.3 | 17 900 | 24 500 | 1 830 | 2 500 | 17 000 | 28 000 | — |
| **17** | 22 | 10 | 0.3 | 5 850 | 7 950 | 595 | 810 | 13 000 | 20 000 | **RLM 1710** |
| | 24 | 25 | 0.5 | 18 200 | 25 300 | 1 850 | 2 580 | 13 000 | 20 000 | **RLM 172425** |
| **18** | 25 | 15 | 0.5 | 11 500 | 14 300 | 1 170 | 1 450 | 12 000 | 20 000 | **RLM 1815** |
| | 25 | 20 | 0.5 | 15 800 | 21 500 | 1 610 | 2 190 | 12 000 | 20 000 | **RLM 1820** |
| **20** | 27 | 10 | 0.5 | 7 950 | 9 150 | 810 | 930 | 11 000 | 18 000 | **RLM 2010** |
| | 27 | 15 | 0.5 | 11 900 | 15 400 | 1 220 | 1 570 | 11 000 | 18 000 | **RLM 2015** |
| | 27 | 20 | 0.5 | 16 400 | 23 200 | 1 670 | 2 370 | 11 000 | 18 000 | **RLM 2020** |
| | 27 | 25 | 0.5 | 19 800 | 29 500 | 2 010 | 3 000 | 11 000 | 18 000 | **RLM 2025** |
| | 28 | 13 | 0.3 | 10 800 | 13 600 | 1 100 | 1 390 | 13 000 | 22 000 | — |
| | 28 | 18 | 0.3 | 15 700 | 21 900 | 1 600 | 2 240 | 13 000 | 22 000 | — |
| | 28 | 23 | 0.3 | 19 300 | 28 600 | 1 960 | 2 920 | 13 000 | 22 000 | — |
| **22** | 29 | 20 | 0.5 | 17 700 | 26 400 | 1 810 | 2 690 | 10 000 | 16 000 | **RLM 2220** |
| | 29 | 25 | 0.5 | 21 300 | 33 500 | 2 170 | 3 400 | 10 000 | 16 000 | **RLM 2225** |
| | 30 | 13 | 0.3 | 11 600 | 15 400 | 1 190 | 1 570 | 12 000 | 20 000 | — |
| | 30 | 18 | 0.3 | 16 800 | 24 800 | 1 720 | 2 530 | 12 000 | 20 000 | — |
| | 30 | 20 | 0.5 | 20 000 | 27 200 | 2 030 | 2 780 | 10 000 | 16 000 | **RLM 223020** |
| | 30 | 23 | 0.3 | 20 700 | 32 500 | 2 110 | 3 300 | 12 000 | 20 000 | — |

| Numbers | | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Without Inner Ring | With Inner Ring | $d$ | $B$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. Without Inner Ring | With Inner Ring |
| — | **LM 91612-1** | 6 | 12 | 8 | 14 | 0.3 | 0.009 | 0.013 |
| — | — | — | — | — | 14 | 0.3 | 0.011 | — |
| — | — | — | — | — | 15 | 0.3 | 0.008 | — |
| — | — | — | — | — | 15 | 0.3 | 0.012 | — |
| — | **LM 1212** | 8 | 12.2 | 10 | 15 | 0.3 | 0.007 | 0.013 |
| — | **LM 121912** | 8 | 12.2 | 10 | 17 | 0.3 | 0.011 | 0.017 |
| **RNA 4900** | **NA 4900** | 10 | 13 | 12 | 20 | 0.3 | 0.016 | 0.024 |
| — | **LM 1416** | 10 | 16.2 | 12 | 20 | 0.3 | 0.019 | 0.028 |
| — | **LM 1420** | 10 | 20.2 | 12 | 20 | 0.3 | 0.024 | 0.036 |
| — | **LM 1515** | 10 | 15.2 | 12 | 18 | 0.3 | 0.011 | 0.022 |
| — | **LM 1520** | 10 | 20.2 | 12 | 18 | 0.3 | 0.015 | 0.03 |
| — | **LM 152215** | 10 | 15.2 | 12 | 20 | 0.3 | 0.016 | 0.027 |
| **RNA 4901** | **NA 4901** | 12 | 13 | 14 | 22 | 0.3 | 0.018 | 0.027 |
| — | **LM 1616** | 12 | 16.2 | 14 | 22 | 0.3 | 0.021 | 0.032 |
| — | **LM 1620** | 12 | 20.2 | 14 | 22 | 0.3 | 0.027 | 0.041 |
| **RNA 6901** | **NA 6901** | 12 | 22 | 14 | 22 | 0.3 | 0.03 | 0.045 |
| — | **LM 1710** | 12 | 10.2 | 14 | 20 | 0.3 | 0.008 | 0.017 |
| — | **LM 172425** | 12 | 25.2 | 16 | 20 | 0.5 | 0.03 | 0.052 |
| — | **LM 1815** | 15 | 15.2 | 19 | 21 | 0.5 | 0.019 | 0.028 |
| — | **LM 1820** | 15 | 20.2 | 19 | 21 | 0.5 | 0.025 | 0.037 |
| — | **LM 2010** | 15 | 10.2 | 19 | 23 | 0.5 | 0.014 | 0.025 |
| — | **LM 2015** | 15 | 15.2 | 19 | 23 | 0.5 | 0.021 | 0.037 |
| — | **LM 2020** | 15 | 20.2 | 19 | 23 | 0.5 | 0.028 | 0.049 |
| — | **LM 2025** | 15 | 25.2 | 19 | 23 | 0.5 | 0.035 | 0.061 |
| **RNA 4902** | **NA 4902** | 15 | 13 | 17 | 26 | 0.3 | 0.021 | 0.035 |
| **RNA 5902** | **NA 5902** | 15 | 18 | 17 | 26 | 0.3 | 0.032 | 0.051 |
| **RNA 6902** | **NA 6902** | 15 | 23 | 17 | 26 | 0.3 | 0.039 | 0.064 |
| — | **LM 2220** | 17 | 20.2 | 21 | 25 | 0.5 | 0.03 | 0.054 |
| — | **LM 2225** | 17 | 25.2 | 21 | 25 | 0.5 | 0.038 | 0.068 |
| **RNA 4903** | **NA 4903** | 17 | 13 | 19 | 28 | 0.3 | 0.023 | 0.038 |
| **RNA 5903** | **NA 5903** | 17 | 18 | 19 | 28 | 0.3 | 0.034 | 0.055 |
| — | **LM 223020** | 17 | 20.2 | 21 | 26 | 0.5 | 0.035 | 0.06 |
| **RNA 6903** | **NA 6903** | 17 | 23 | 19 | 28 | 0.3 | 0.041 | 0.068 |

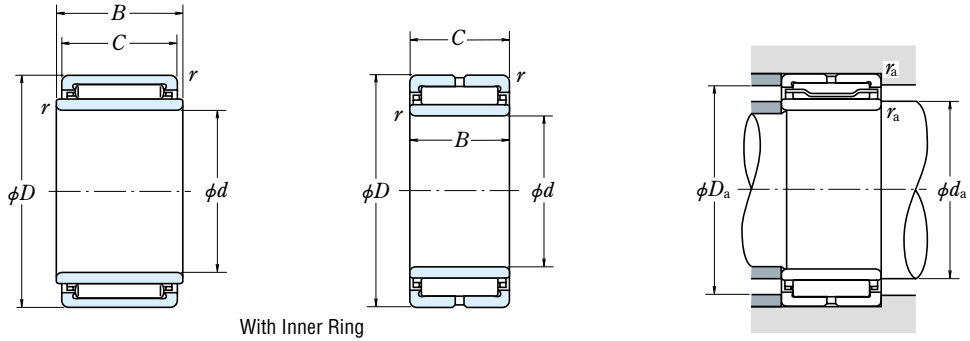
**Remarks** If a full complement roller bearing is required, please contact NSK.

## RLM • LM
## RNA • NA
### Inscribed Circle Diameter 25 – 35 mm




Without Inner Ring

RLM RNA




With Inner Ring

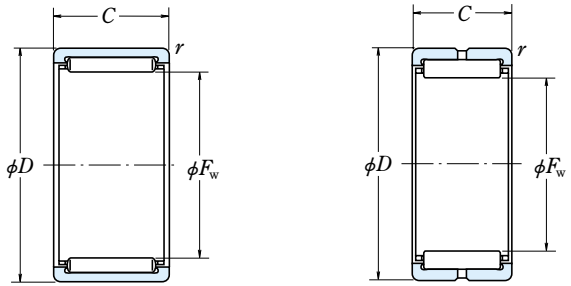
LM NA

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Numbers |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | Without Inner Ring |
| **25** | 32 | 12 | 0.5 | 10 300 | 13 700 | 1 050 | 1 400 | 8 500 | 14 000 | **RLM 2512** |
| | 32 | 20 | 0.5 | 18 800 | 29 700 | 1 920 | 3 050 | 8 500 | 14 000 | **RLM 2520** |
| | 32 | 25 | 0.5 | 22 700 | 37 500 | 2 310 | 3 850 | 8 500 | 14 000 | **RLM 2525** |
| | 37 | 17 | 0.3 | 19 700 | 22 900 | 2 010 | 2 340 | 11 000 | 18 000 | — |
| | 37 | 23 | 0.3 | 27 800 | 35 500 | 2 830 | 3 650 | 11 000 | 18 000 | — |
| | 37 | 30 | 0.3 | 36 500 | 50 500 | 3 700 | 5 150 | 11 000 | 18 000 | — |
| **28** | 35 | 20 | 0.5 | 19 900 | 33 000 | 2 030 | 3 350 | 7 500 | 12 000 | **RLM 2820** |
| | 35 | 25 | 0.5 | 23 900 | 42 000 | 2 440 | 4 250 | 7 500 | 12 000 | **RLM 2825** |
| | 37 | 30 | 0.5 | 34 000 | 52 500 | 3 450 | 5 350 | 7 500 | 12 000 | **RLM 283730** |
| | 39 | 17 | 0.3 | 22 400 | 30 500 | 2 290 | 3 150 | 9 500 | 15 000 | — |
| | 39 | 23 | 0.3 | 28 300 | 41 500 | 2 890 | 4 200 | 9 500 | 15 000 | — |
| | 39 | 30 | 0.3 | 37 000 | 58 500 | 3 800 | 6 000 | 9 500 | 15 000 | — |
| **30** | 37 | 25 | 0.5 | 24 500 | 44 000 | 2 490 | 4 500 | 7 100 | 12 000 | **RLM 3025** |
| | 40 | 20 | 0.5 | 25 000 | 36 000 | 2 550 | 3 650 | 7 100 | 12 000 | **RLM 304020** |
| | 40 | 30 | 0.5 | 35 000 | 56 000 | 3 600 | 5 700 | 7 100 | 12 000 | **RLM 304030** |
| | 42 | 17 | 0.3 | 21 400 | 26 800 | 2 180 | 2 740 | 9 000 | 14 000 | — |
| | 42 | 23 | 0.3 | 30 000 | 41 500 | 3 100 | 4 250 | 9 000 | 14 000 | — |
| | 42 | 30 | 0.3 | 39 500 | 59 000 | 4 050 | 6 050 | 9 000 | 14 000 | — |
| **32** | 42 | 20 | 0.5 | 25 800 | 38 000 | 2 630 | 3 900 | 6 700 | 11 000 | **RLM 3220** |
| | 42 | 30 | 0.5 | 36 500 | 59 000 | 3 700 | 6 050 | 6 700 | 11 000 | **RLM 3230** |
| | 45 | 17 | 0.3 | 22 200 | 28 700 | 2 270 | 2 930 | 8 500 | 13 000 | — |
| | 45 | 23 | 0.3 | 31 500 | 44 500 | 3 200 | 4 550 | 8 500 | 13 000 | — |
| | 45 | 30 | 0.3 | 41 000 | 63 500 | 4 200 | 6 450 | 8 500 | 13 000 | — |
| **35** | 42 | 20 | 0.5 | 22 300 | 41 000 | 2 270 | 4 200 | 6 300 | 10 000 | **RLM 3520** |
| | 42 | 30 | 0.5 | 31 000 | 63 500 | 3 200 | 6 450 | 6 300 | 10 000 | **RLM 3530** |
| | 45 | 20 | 0.5 | 27 500 | 42 500 | 2 800 | 4 350 | 6 300 | 10 000 | **RLM 354520** |
| | 45 | 25 | 0.5 | 33 000 | 54 500 | 3 400 | 5 550 | 6 300 | 10 000 | **RLM 354525** |
| | 45 | 30 | 0.5 | 38 500 | 66 000 | 3 950 | 6 750 | 6 300 | 10 000 | **RLM 354530** |
| | 47 | 17 | 0.3 | 23 900 | 32 500 | 2 430 | 3 300 | 7 500 | 12 000 | — |
| | 47 | 23 | 0.3 | 33 500 | 50 500 | 3 450 | 5 150 | 7 500 | 12 000 | — |
| | 47 | 30 | 0.3 | 44 000 | 71 500 | 4 500 | 7 300 | 7 500 | 12 000 | — |

| Numbers | | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Without Inner Ring | With Inner Ring | $d$ | $B$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. Without Inner Ring | With Inner Ring |
| — | **LM 2512** | 20 | 12.2 | 24 | 28 | 0.5 | 0.02 | 0.036 |
| — | **LM 2520** | 20 | 20.2 | 24 | 28 | 0.5 | 0.034 | 0.061 |
| — | **LM 2525** | 20 | 25.2 | 24 | 28 | 0.5 | 0.042 | 0.076 |
| **RNA 4904** | **NA 4904** | 20 | 17 | 22 | 35 | 0.3 | 0.055 | 0.077 |
| **RNA 5904** | **NA 5904** | 20 | 23 | 22 | 35 | 0.3 | 0.089 | 0.12 |
| **RNA 6904** | **NA 6904** | 20 | 30 | 22 | 35 | 0.3 | 0.098 | 0.14 |
| — | **LM 2820** | 22 | 20.2 | 26 | 31 | 0.5 | 0.038 | 0.062 |
| — | **LM 2825** | 22 | 25.2 | 26 | 31 | 0.5 | 0.047 | 0.092 |
| — | **LM 283730** | 22 | 30.2 | 26 | 33 | 0.5 | 0.075 | 0.13 |
| **RNA 49/22** | **NA 49/22** | 22 | 17 | 24 | 37 | 0.3 | 0.056 | 0.086 |
| **RNA 59/22** | **NA 59/22** | 22 | 23 | 24 | 37 | 0.3 | 0.091 | 0.135 |
| **RNA 69/22** | **NA 69/22** | 22 | 30 | 24 | 37 | 0.3 | 0.096 | 0.15 |
| — | **LM 3025** | 25 | 25.2 | 29 | 33 | 0.5 | 0.05 | 0.092 |
| — | **LM 304020** | 25 | 20.2 | 29 | 36 | 0.5 | 0.06 | 0.093 |
| — | **LM 304030** | 25 | 30.2 | 29 | 36 | 0.5 | 0.09 | 0.14 |
| **RNA 4905** | **NA 4905** | 25 | 17 | 27 | 40 | 0.3 | 0.063 | 0.091 |
| **RNA 5905** | **NA 5905** | 25 | 23 | 27 | 40 | 0.3 | 0.10 | 0.14 |
| **RNA 6905** | **NA 6905** | 25 | 30 | 27 | 40 | 0.3 | 0.11 | 0.16 |
| — | **LM 3220** | 28 | 20.2 | 32 | 38 | 0.5 | 0.064 | 0.09 |
| — | **LM 3230** | 28 | 30.2 | 32 | 38 | 0.5 | 0.096 | 0.14 |
| **RNA 49/28** | **NA 49/28** | 28 | 17 | 30 | 43 | 0.3 | 0.076 | 0.099 |
| **RNA 59/28** | **NA 59/28** | 28 | 23 | 30 | 43 | 0.3 | 0.11 | 0.145 |
| **RNA 69/28** | **NA 69/28** | 28 | 30 | 30 | 43 | 0.3 | 0.13 | 0.175 |
| — | **LM 3520** | 30 | 20.2 | 34 | 38 | 0.5 | 0.046 | 0.085 |
| — | **LM 3530** | 30 | 30.2 | 34 | 38 | 0.5 | 0.07 | 0.13 |
| — | **LM 354520** | 30 | 20.2 | 34 | 41 | 0.5 | 0.069 | 0.11 |
| — | **LM 354525** | 30 | 25.2 | 34 | 41 | 0.5 | 0.086 | 0.135 |
| — | **LM 354530** | 30 | 30.2 | 34 | 41 | 0.5 | 0.10 | 0.16 |
| **RNA 4906** | **NA 4906** | 30 | 17 | 32 | 45 | 0.3 | 0.072 | 0.105 |
| **RNA 5906** | **NA 5906** | 30 | 23 | 32 | 45 | 0.3 | 0.11 | 0.15 |
| **RNA 6906** | **NA 6906** | 30 | 30 | 32 | 45 | 0.3 | 0.13 | 0.19 |

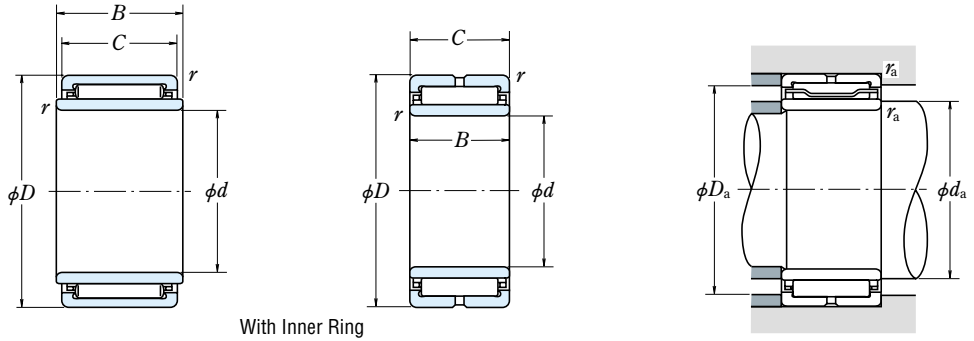
**Remarks** If a full complement roller bearing is required, please contact NSK.

# RLM • LM
# RNA • NA
## Inscribed Circle Diameter 37 – 58 mm




Without Inner Ring

RLM RNA




With Inner Ring

LM NA

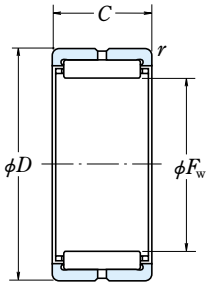
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Without Inner Ring |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | |
| **37** | 47 | 20 | 0.6 | 28 200 | 45 000 | 2 880 | 4 550 | 6 000 | 9 500 | **RLM 3720** |
| | 47 | 30 | 0.6 | 39 500 | 69 500 | 4 050 | 7 100 | 6 000 | 9 500 | **RLM 3730** |
| **38** | 48 | 20 | 0.6 | 29 000 | 47 000 | 2 960 | 4 800 | 5 600 | 9 000 | **RLM 3820** |
| | 48 | 30 | 0.6 | 41 000 | 73 000 | 4 150 | 7 450 | 5 600 | 9 000 | **RLM 3830** |
| **40** | 50 | 20 | 0.6 | 29 700 | 49 000 | 3 050 | 5 000 | 5 300 | 9 000 | **RLM 4020** |
| | 50 | 30 | 0.6 | 42 000 | 76 500 | 4 250 | 7 800 | 5 300 | 9 000 | **RLM 4030** |
| | 52 | 20 | 0.6 | 29 900 | 45 000 | 3 050 | 4 600 | 6 700 | 10 000 | — |
| | 52 | 27 | 0.6 | 40 500 | 66 000 | 4 100 | 6 750 | 6 700 | 10 000 | — |
| | 52 | 36 | 0.6 | 56 000 | 101 000 | 5 700 | 10 300 | 6 700 | 10 000 | — |
| **42** | 55 | 20 | 0.6 | 30 500 | 47 500 | 3 100 | 4 800 | 6 300 | 10 000 | — |
| | 55 | 27 | 0.6 | 41 500 | 69 500 | 4 200 | 7 100 | 6 300 | 10 000 | — |
| | 55 | 36 | 0.6 | 57 500 | 106 000 | 5 850 | 10 900 | 6 300 | 10 000 | — |
| **45** | 55 | 20 | 0.6 | 31 000 | 53 500 | 3 150 | 5 500 | 4 800 | 8 000 | **RLM 4520** |
| | 55 | 30 | 0.6 | 43 500 | 83 500 | 4 450 | 8 500 | 4 800 | 8 000 | **RLM 4530** |
| **48** | 62 | 22 | 0.6 | 39 000 | 61 500 | 3 950 | 6 300 | 5 600 | 9 000 | — |
| | 62 | 30 | 0.6 | 54 500 | 95 000 | 5 550 | 9 700 | 5 600 | 9 000 | — |
| | 62 | 40 | 0.6 | 72 000 | 137 000 | 7 350 | 13 900 | 5 600 | 9 000 | — |
| **50** | 62 | 20 | 0.6 | 35 500 | 60 500 | 3 600 | 6 150 | 4 300 | 7 100 | **RLM 506220** |
| | 62 | 25 | 0.6 | 43 000 | 77 500 | 4 400 | 7 900 | 4 300 | 7 100 | **RLM 506225** |
| **52** | 68 | 22 | 0.6 | 41 000 | 67 500 | 4 150 | 6 900 | 5 000 | 8 000 | — |
| | 68 | 30 | 0.6 | 57 000 | 104 000 | 5 800 | 10 600 | 5 000 | 8 000 | — |
| | 68 | 40 | 0.6 | 76 000 | 149 000 | 7 750 | 15 200 | 5 000 | 8 000 | — |
| **55** | 65 | 30 | 0.6 | 49 000 | 104 000 | 5 000 | 10 600 | 4 000 | 6 300 | **RLM 5530** |
| | 67 | 20 | 0.6 | 38 000 | 68 000 | 3 850 | 6 900 | 4 000 | 6 300 | **RLM 556720** |
| **58** | 72 | 22 | 0.6 | 42 500 | 73 500 | 4 350 | 7 500 | 4 500 | 7 100 | — |
| | 72 | 30 | 0.6 | 59 500 | 113 000 | 6 050 | 11 500 | 4 500 | 7 100 | — |
| | 72 | 40 | 0.6 | 79 000 | 163 000 | 8 050 | 16 600 | 4 500 | 7 100 | — |

| Numbers | | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Without Inner Ring | With Inner Ring | $d$ | $B$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. Without Inner Ring | With Inner Ring |
| — | **LM 3720** | 32 | 20.3 | 36 | 43 | 0.6 | 0.072 | 0.115 |
| — | **LM 3730** | 32 | 30.3 | 36 | 43 | 0.6 | 0.11 | 0.17 |
| — | **LM 3820** | 32 | 20.3 | 36 | 44 | 0.6 | 0.074 | 0.125 |
| — | **LM 3830** | 32 | 30.3 | 36 | 44 | 0.6 | 0.11 | 0.195 |
| — | **LM 4020** | 35 | 20.3 | 39 | 46 | 0.6 | 0.078 | 0.125 |
| — | **LM 4030** | 35 | 30.3 | 39 | 46 | 0.6 | 0.12 | 0.19 |
| **RNA 49/32** | **NA 49/32** | 32 | 20 | 36 | 48 | 0.6 | 0.092 | 0.16 |
| **RNA 59/32** | **NA 59/32** | 32 | 27 | 36 | 48 | 0.6 | 0.15 | 0.24 |
| **RNA 69/32** | **NA 69/32** | 32 | 36 | 36 | 48 | 0.6 | 0.17 | 0.29 |
| **RNA 4907** | **NA 4907** | 35 | 20 | 39 | 51 | 0.6 | 0.11 | 0.17 |
| **RNA 5907** | **NA 5907** | 35 | 27 | 39 | 51 | 0.6 | 0.175 | 0.25 |
| **RNA 6907** | **NA 6907** | 35 | 36 | 39 | 51 | 0.6 | 0.20 | 0.315 |
| — | **LM 4520** | 40 | 20.3 | 44 | 51 | 0.6 | 0.086 | 0.14 |
| — | **LM 4530** | 40 | 30.3 | 44 | 51 | 0.6 | 0.13 | 0.21 |
| **RNA 4908** | **NA 4908** | 40 | 22 | 44 | 58 | 0.6 | 0.15 | 0.24 |
| **RNA 5908** | **NA 5908** | 40 | 30 | 44 | 58 | 0.6 | 0.23 | 0.355 |
| **RNA 6908** | **NA 6908** | 40 | 40 | 44 | 58 | 0.6 | 0.265 | 0.435 |
| — | **LM 506220** | 42 | 20.3 | 46 | 58 | 0.6 | 0.12 | 0.21 |
| — | **LM 506225** | 42 | 25.3 | 46 | 58 | 0.6 | 0.155 | 0.265 |
| **RNA 4909** | **NA 4909** | 45 | 22 | 49 | 64 | 0.6 | 0.19 | 0.28 |
| **RNA 5909** | **NA 5909** | 45 | 30 | 49 | 64 | 0.6 | 0.27 | 0.39 |
| **RNA 6909** | **NA 6909** | 45 | 40 | 49 | 64 | 0.6 | 0.335 | 0.495 |
| — | **LM 5530** | 45 | 30.3 | 49 | 61 | 0.6 | 0.16 | 0.34 |
| — | **LM 556720** | 45 | 20.3 | 49 | 63 | 0.6 | 0.13 | 0.25 |
| **RNA 4910** | **NA 4910** | 50 | 22 | 54 | 68 | 0.6 | 0.18 | 0.295 |
| **RNA 5910** | **NA 5910** | 50 | 30 | 54 | 68 | 0.6 | 0.25 | 0.405 |
| **RNA 6910** | **NA 6910** | 50 | 40 | 54 | 68 | 0.6 | 0.32 | 0.53 |

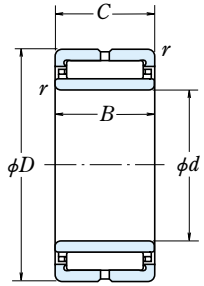
**Remarks** If a full complement roller bearing is required, please contact NSK.

## RNA • NA

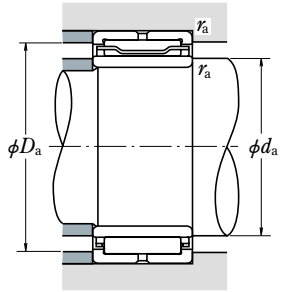
### Inscribed Circle Diameter 63 – 120 mm




Without Inner Ring
RNA




With Inner Ring
NA



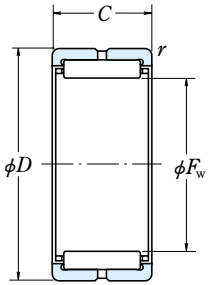

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Without Inner Ring |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | |
| **63** | 80 | 25 | 1 | 53 500 | 87 500 | 5 450 | 8 950 | 4 000 | 6 700 | **RNA 4911** |
| | 80 | 34 | 1 | 73 500 | 133 000 | 7 500 | 13 600 | 4 000 | 6 700 | **RNA 5911** |
| | 80 | 45 | 1 | 93 500 | 181 000 | 9 550 | 18 500 | 4 000 | 6 700 | **RNA 6911** |
| **68** | 85 | 25 | 1 | 56 000 | 95 500 | 5 700 | 9 750 | 3 800 | 6 300 | **RNA 4912** |
| | 85 | 34 | 1 | 77 500 | 145 000 | 7 900 | 14 800 | 3 800 | 6 300 | **RNA 5912** |
| | 85 | 45 | 1 | 98 000 | 197 000 | 10 000 | 20 100 | 3 800 | 6 300 | **RNA 6912** |
| **72** | 90 | 25 | 1 | 58 500 | 103 000 | 5 950 | 10 500 | 3 600 | 5 600 | **RNA 4913** |
| | 90 | 34 | 1 | 81 000 | 157 000 | 8 250 | 16 000 | 3 600 | 5 600 | **RNA 5913** |
| | 90 | 45 | 1 | 103 000 | 213 000 | 10 500 | 21 800 | 3 600 | 5 600 | **RNA 6913** |
| **80** | 100 | 30 | 1 | 80 500 | 143 000 | 8 200 | 14 600 | 3 200 | 5 300 | **RNA 4914** |
| | 100 | 40 | 1 | 107 000 | 206 000 | 10 900 | 21 000 | 3 200 | 5 300 | **RNA 5914** |
| | 100 | 54 | 1 | 143 000 | 298 000 | 14 500 | 30 500 | 3 200 | 5 300 | **RNA 6914** |
| **85** | 105 | 30 | 1 | 84 000 | 155 000 | 8 600 | 15 800 | 3 000 | 5 000 | **RNA 4915** |
| | 105 | 40 | 1 | 112 000 | 222 000 | 11 400 | 22 700 | 3 000 | 5 000 | **RNA 5915** |
| | 105 | 54 | 1 | 149 000 | 325 000 | 15 200 | 33 000 | 3 000 | 5 000 | **RNA 6915** |
| **90** | 110 | 30 | 1 | 87 500 | 166 000 | 8 950 | 17 000 | 2 800 | 4 500 | **RNA 4916** |
| | 110 | 40 | 1 | 116 000 | 239 000 | 11 900 | 24 400 | 2 800 | 4 500 | **RNA 5916** |
| | 110 | 54 | 1 | 157 000 | 350 000 | 16 000 | 36 000 | 2 800 | 4 500 | **RNA 6916** |
| **100** | 120 | 35 | 1.1 | 104 000 | 214 000 | 10 600 | 21 800 | 2 600 | 4 000 | **RNA 4917** |
| | 120 | 46 | 1.1 | 138 000 | 310 000 | 14 100 | 31 500 | 2 600 | 4 000 | **RNA 5917** |
| | 120 | 63 | 1.1 | 174 000 | 415 000 | 17 800 | 42 500 | 2 600 | 4 000 | **RNA 6917** |
| **105** | 125 | 35 | 1.1 | 108 000 | 228 000 | 11 000 | 23 300 | 2 400 | 4 000 | **RNA 4918** |
| | 125 | 46 | 1.1 | 143 000 | 330 000 | 14 600 | 33 500 | 2 400 | 4 000 | **RNA 5918** |
| | 125 | 63 | 1.1 | 181 000 | 445 000 | 18 400 | 45 000 | 2 400 | 4 000 | **RNA 6918** |
| **110** | 130 | 35 | 1.1 | 111 000 | 242 000 | 11 400 | 24 700 | 2 200 | 3 800 | **RNA 4919** |
| | 130 | 46 | 1.1 | 148 000 | 350 000 | 15 100 | 35 500 | 2 200 | 3 800 | **RNA 5919** |
| | 130 | 63 | 1.1 | 187 000 | 470 000 | 19 100 | 48 000 | 2 200 | 3 800 | **RNA 6919** |
| **115** | 140 | 40 | 1.1 | 144 000 | 295 000 | 14 700 | 30 000 | 2 200 | 3 600 | **RNA 4920** |
| | 140 | 54 | 1.1 | 193 000 | 430 000 | 19 700 | 43 500 | 2 200 | 3 600 | **RNA 5920** |
| **120** | 140 | 30 | 1 | 99 500 | 214 000 | 10 100 | 21 900 | 2 000 | 3 400 | **RNA 4822** |

| Numbers With Inner Ring | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) approx. | |
|---|---|---|---|---|---|---|---|
| | $d$ | $B$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | Without Inner Ring | With Inner Ring |
| **NA 4911** | 55 | 25 | 60 | 75 | 1 | 0.26 | 0.40 |
| **NA 5911** | 55 | 34 | 60 | 75 | 1 | 0.37 | 0.56 |
| **NA 6911** | 55 | 45 | 60 | 75 | 1 | 0.475 | 0.73 |
| **NA 4912** | 60 | 25 | 65 | 80 | 1 | 0.28 | 0.435 |
| **NA 5912** | 60 | 34 | 65 | 80 | 1 | 0.415 | 0.625 |
| **NA 6912** | 60 | 45 | 65 | 80 | 1 | 0.485 | 0.76 |
| **NA 4913** | 65 | 25 | 70 | 85 | 1 | 0.32 | 0.465 |
| **NA 5913** | 65 | 34 | 70 | 85 | 1 | 0.48 | 0.675 |
| **NA 6913** | 65 | 45 | 70 | 85 | 1 | 0.53 | 0.79 |
| **NA 4914** | 70 | 30 | 75 | 95 | 1 | 0.47 | 0.74 |
| **NA 5914** | 70 | 40 | 75 | 95 | 1 | 0.69 | 1.05 |
| **NA 6914** | 70 | 54 | 75 | 95 | 1 | 0.89 | 1.4 |
| **NA 4915** | 75 | 30 | 80 | 100 | 1 | 0.5 | 0.79 |
| **NA 5915** | 75 | 40 | 80 | 100 | 1 | 0.735 | 1.1 |
| **NA 6915** | 75 | 54 | 80 | 100 | 1 | 0.96 | 1.5 |
| **NA 4916** | 80 | 30 | 85 | 105 | 1 | 0.53 | 0.835 |
| **NA 5916** | 80 | 40 | 85 | 105 | 1 | 0.75 | 1.15 |
| **NA 6916** | 80 | 54 | 85 | 105 | 1 | 0.99 | 1.55 |
| **NA 4917** | 85 | 35 | 91.5 | 113.5 | 1 | 0.68 | 1.25 |
| **NA 5917** | 85 | 46 | 91.5 | 113.5 | 1 | 0.99 | 1.75 |
| **NA 6917** | 85 | 63 | 91.5 | 113.5 | 1 | 1.2 | 2.25 |
| **NA 4918** | 90 | 35 | 96.5 | 118.5 | 1 | 0.72 | 1.35 |
| **NA 5918** | 90 | 46 | 96.5 | 118.5 | 1 | 1.05 | 1.85 |
| **NA 6918** | 90 | 63 | 96.5 | 118.5 | 1 | 1.35 | 2.45 |
| **NA 4919** | 95 | 35 | 101.5 | 123.5 | 1 | 0.74 | 1.4 |
| **NA 5919** | 95 | 46 | 101.5 | 123.5 | 1 | 1.15 | 2.0 |
| **NA 6919** | 95 | 63 | 101.5 | 123.5 | 1 | 1.5 | 2.65 |
| **NA 4920** | 100 | 40 | 106.5 | 133.5 | 1 | 1.15 | 1.95 |
| **NA 5920** | 100 | 54 | 106.5 | 133.5 | 1 | 1.8 | 2.85 |
| **NA 4822** | 110 | 30 | 115 | 135 | 1 | 0.67 | 1.1 |

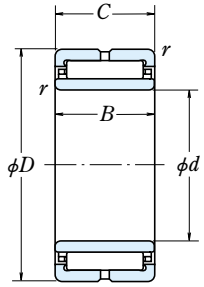
**Remarks** If a full complement roller bearing is required, please contact NSK.

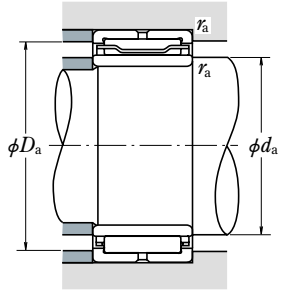
## RNA • NA

### Inscribed Circle Diameter 125 – 390 mm




Without Inner Ring
RNA




With Inner Ring
NA

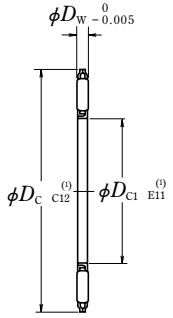
| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | | Limiting Speeds (min⁻¹) | | Bearing Without Inner Ring |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_W$ | $D$ | $C$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil | |
| **125** | 150 | 40 | 1.1 | 149 000 | 315 000 | 15 200 | 32 500 | 2 000 | 3 200 | **RNA 4922** |
| | 150 | 54 | 1.1 | 200 000 | 460 000 | 20 300 | 47 000 | 2 000 | 3 200 | **RNA 5922** |
| **130** | 150 | 30 | 1 | 105 000 | 238 000 | 10 700 | 24 300 | 1 900 | 3 200 | **RNA 4824** |
| **135** | 165 | 45 | 1.1 | 192 000 | 395 000 | 19 600 | 40 500 | 1 900 | 3 000 | **RNA 4924** |
| | 165 | 60 | 1.1 | 253 000 | 565 000 | 25 800 | 58 000 | 1 900 | 3 000 | **RNA 5924** |
| **145** | 165 | 35 | 1.1 | 127 000 | 315 000 | 12 900 | 32 000 | 1 700 | 2 800 | **RNA 4826** |
| **150** | 180 | 50 | 1.5 | 228 000 | 515 000 | 23 200 | 52 500 | 1 700 | 2 800 | **RNA 4926** |
| | 180 | 67 | 1.5 | 299 000 | 725 000 | 30 500 | 74 000 | 1 700 | 2 800 | **RNA 5926** |
| **155** | 175 | 35 | 1.1 | 133 000 | 340 000 | 13 600 | 35 000 | 1 600 | 2 600 | **RNA 4828** |
| **160** | 190 | 50 | 1.5 | 235 000 | 545 000 | 24 000 | 55 500 | 1 600 | 2 600 | **RNA 4928** |
| | 190 | 67 | 1.5 | 310 000 | 775 000 | 31 500 | 79 000 | 1 600 | 2 600 | **RNA 5928** |
| **165** | 190 | 40 | 1.1 | 180 000 | 440 000 | 18 300 | 45 000 | 1 500 | 2 400 | **RNA 4830** |
| **175** | 200 | 40 | 1.1 | 184 000 | 465 000 | 18 700 | 47 000 | 1 400 | 2 200 | **RNA 4832** |
| **185** | 215 | 45 | 1.1 | 224 000 | 540 000 | 22 900 | 55 000 | 1 400 | 2 200 | **RNA 4834** |
| **195** | 225 | 45 | 1.1 | 230 000 | 570 000 | 23 500 | 58 000 | 1 300 | 2 000 | **RNA 4836** |
| **210** | 240 | 50 | 1.5 | 268 000 | 705 000 | 27 300 | 72 000 | 1 200 | 1 900 | **RNA 4838** |
| **220** | 250 | 50 | 1.5 | 274 000 | 740 000 | 27 900 | 75 500 | 1 100 | 1 800 | **RNA 4840** |
| **240** | 270 | 50 | 1.5 | 286 000 | 805 000 | 29 100 | 82 000 | 1 000 | 1 700 | **RNA 4844** |
| **265** | 300 | 60 | 2 | 375 000 | 1 070 000 | 38 500 | 109 000 | 950 | 1 500 | **RNA 4848** |
| **285** | 320 | 60 | 2 | 395 000 | 1 160 000 | 40 000 | 118 000 | 900 | 1 400 | **RNA 4852** |
| **305** | 350 | 69 | 2 | 510 000 | 1 390 000 | 52 000 | 142 000 | 800 | 1 300 | **RNA 4856** |
| **330** | 380 | 80 | 2.1 | 660 000 | 1 810 000 | 67 500 | 185 000 | 750 | 1 200 | **RNA 4860** |
| **350** | 400 | 80 | 2.1 | 675 000 | 1 900 000 | 69 000 | 194 000 | 710 | 1 100 | **RNA 4864** |
| **370** | 420 | 80 | 2.1 | 690 000 | 1 990 000 | 70 500 | 203 000 | 670 | 1 100 | **RNA 4868** |
| **390** | 440 | 80 | 2.1 | 705 000 | 2 080 000 | 72 000 | 212 000 | 630 | 1 000 | **RNA 4872** |

| Numbers | Boundary Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) | |
|---|---|---|---|---|---|---|---|
| With Inner Ring | $d$ | $B$ | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. Without Inner Ring | With Inner Ring |
| **NA 4922** | 110 | 40 | 116.5 | 143.5 | 1 | 1.25 | 2.1 |
| **NA 5922** | 110 | 54 | 116.5 | 143.5 | 1 | 1.95 | 3.05 |
| **NA 4824** | 120 | 30 | 125 | 145 | 1 | 0.71 | 1.15 |
| **NA 4924** | 120 | 45 | 126.5 | 158.5 | 1 | 1.9 | 2.9 |
| **NA 5924** | 120 | 60 | 126.5 | 158.5 | 1 | 2.7 | 4.05 |
| **NA 4826** | 130 | 35 | 136.5 | 158.5 | 1 | 0.92 | 1.8 |
| **NA 4926** | 130 | 50 | 138 | 172 | 1.5 | 2.3 | 4.0 |
| **NA 5926** | 130 | 67 | 138 | 172 | 1.5 | 3.3 | 5.55 |
| **NA 4828** | 140 | 35 | 146.5 | 168.5 | 1 | 0.98 | 1.9 |
| **NA 4928** | 140 | 50 | 148 | 182 | 1.5 | 2.45 | 4.25 |
| **NA 5928** | 140 | 67 | 148 | 182 | 1.5 | 3.55 | 6.0 |
| **NA 4830** | 150 | 40 | 156.5 | 183.5 | 1 | 1.6 | 2.75 |
| **NA 4832** | 160 | 40 | 166.5 | 193.5 | 1 | 1.75 | 2.95 |
| **NA 4834** | 170 | 45 | 176.5 | 208.5 | 1 | 2.55 | 4.0 |
| **NA 4836** | 180 | 45 | 186.5 | 218.5 | 1 | 2.65 | 4.2 |
| **NA 4838** | 190 | 50 | 198 | 232 | 1.5 | 3.2 | 5.6 |
| **NA 4840** | 200 | 50 | 208 | 242 | 1.5 | 3.35 | 5.9 |
| **NA 4844** | 220 | 50 | 228 | 262 | 1.5 | 3.65 | 6.45 |
| **NA 4848** | 240 | 60 | 249 | 291 | 2 | 5.45 | 10 |
| **NA 4852** | 260 | 60 | 269 | 311 | 2 | 5.9 | 11 |
| **NA 4856** | 280 | 69 | 289 | 341 | 2 | 9.5 | 15.5 |
| **NA 4860** | 300 | 80 | 311 | 369 | 2 | 13 | 22 |
| **NA 4864** | 320 | 80 | 331 | 389 | 2 | 13.5 | 23.5 |
| **NA 4868** | 340 | 80 | 351 | 409 | 2 | 14 | 24.5 |
| **NA 4872** | 360 | 80 | 371 | 429 | 2 | 15 | 26 |

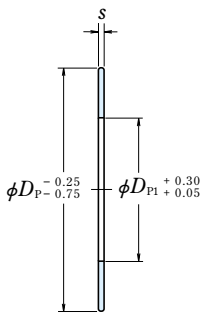
**Remarks** If a full complement roller bearing is required, please contact NSK.

## FNTA (Thrust Cage & Needle Roller Assemblies)

**Thrust raceway washers**
**FTRA** (s=1.0)
**FTRB** (s=1.5)
**FTRC** (s=2.0)
**FTRD** (s=2.5)
**FTRE** (s=3.0)
**Bore Diameter 10 – 100 mm**



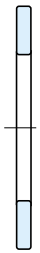
FNTA



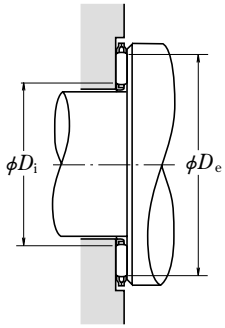
FTRA

FTRB

FTRC


FTRD

FTRE

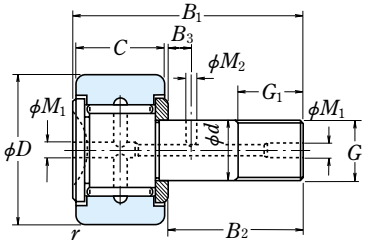



| Boundary Dimensions (mm) | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | Bearing Numbers | |
|---|---|---|---|---|---|---|---|---|---|
| $D_{c1}$,$D_{p1}$ | $D_c$,$D_p$ | $D_W$ | $C_a$ | $C_{0a}$ | $C_a$ | $C_{0a}$ | Oil | | $s$=1.0 $^{\pm 0.05}$ |
| **10** | 24 | 2 | 7 750 | 23 000 | 790 | 2 350 | 17 000 | **FNTA-1024** | ✻FTRA-1024 |
| **12** | 26 | 2 | 8 350 | 26 300 | 855 | 2 680 | 16 000 | **FNTA-1226** | FTRA-1226 |
| **15** | 28 | 2 | 7 950 | 25 800 | 810 | 2 630 | 15 000 | **FNTA-1528** | FTRA-1528 |
| **16** | 29 | 2 | 8 200 | 27 100 | 835 | 2 770 | 14 000 | **FNTA-1629** | FTRA-1629 |
| **17** | 30 | 2 | 8 400 | 28 400 | 855 | 2 900 | 14 000 | **FNTA-1730** | FTRA-1730 |
| **18** | 31 | 2 | 8 600 | 29 700 | 875 | 3 050 | 13 000 | **FNTA-1831** | FTRA-1831 |
| **20** | 35 | 2 | 11 900 | 47 000 | 1 220 | 4 800 | 12 000 | **FNTA-2035** | FTRA-2035 |
| **25** | 42 | 2 | 14 800 | 66 000 | 1 510 | 6 750 | 9 500 | **FNTA-2542** | FTRA-2542 |
| **30** | 47 | 2 | 16 500 | 79 000 | 1 680 | 8 100 | 8 500 | **FNTA-3047** | FTRA-3047 |
| **35** | 52 | 2 | 17 300 | 88 000 | 1 770 | 8 950 | 8 000 | **FNTA-3552** | FTRA-3552 |
| **40** | 60 | 3 | 26 900 | 122 000 | 2 740 | 12 400 | 6 700 | **FNTA-4060** | FTRA-4060 |
| **45** | 65 | 3 | 28 700 | 137 000 | 2 930 | 14 000 | 6 300 | **FNTA-4565** | FTRA-4565 |
| **50** | 70 | 3 | 30 500 | 152 000 | 3 100 | 15 500 | 5 600 | **FNTA-5070** | FTRA-5070 |
| **55** | 78 | 3 | 37 000 | 201 000 | 3 750 | 20 500 | 5 300 | **FNTA-5578** | FTRA-5578 |
| **60** | 85 | 3 | 43 000 | 252 000 | 4 400 | 25 700 | 4 800 | **FNTA-6085** | FTRA-6085 |
| **65** | 90 | 3 | 45 500 | 274 000 | 4 600 | 28 000 | 4 500 | **FNTA-6590** | FTRA-6590 |
| **70** | 95 | 4 | 59 000 | 320 000 | 6 000 | 33 000 | 4 300 | **FNTA-7095** | FTRA-7095 |
| **75** | 100 | 4 | 60 000 | 335 000 | 6 150 | 34 500 | 4 000 | **FNTA-75100** | FTRA-75100 |
| **80** | 105 | 4 | 63 000 | 365 000 | 6 450 | 37 500 | 3 800 | **FNTA-80105** | FTRA-80105 |
| **85** | 110 | 4 | 64 500 | 380 000 | 6 550 | 39 000 | 3 600 | **FNTA-85110** | FTRA-85110 |
| **90** | 120 | 4 | 80 000 | 515 000 | 8 150 | 52 500 | 3 400 | **FNTA-90120** | FTRA-90120 |
| **100** | 135 | 4 | 98 500 | 695 000 | 10 000 | 71 000 | 3 000 | **FNTA-100135** | FTRA-100135 |

| Bearing Numbers of Matching Bearing Rings | | | | Roller Contact Surfaces (mm) | | Mass (g) | |
|---|---|---|---|---|---|---|---|
| $s$=1.5 $^{0}_{-0.08}$ | $s$=2.0 $^{0}_{-0.08}$ | $s$=2.5 $^{0}_{-0.08}$ | $s$=3.0 $^{0}_{-0.08}$ | Outside Diameter $D_e$ min. | Bore Diameter $D_i$ max. | approx. FNTA | approx. FTRA |
| FTRB-1024 | FTRC-1024 | — | — | 22.0 | 11.5 | 2.3 | 2.9 |
| FTRB-1226 | FTRC-1226 | — | — | 24.0 | 13.5 | 3.4 | 3.3 |
| FTRB-1528 | FTRC-1528 | FTRD-1528 | FTRE-1528 | 26.0 | 16.5 | 3.5 | 3.5 |
| FTRB-1629 | FTRC-1629 | FTRD-1629 | FTRE-1629 | 27.0 | 17.5 | 3.7 | 3.6 |
| FTRB-1730 | FTRC-1730 | FTRD-1730 | FTRE-1730 | 28.0 | 18.5 | 3.8 | 3.8 |
| FTRB-1831 | FTRC-1831 | FTRD-1831 | FTRE-1831 | 29.0 | 19.5 | 4 | 3.9 |
| FTRB-2035 | FTRC-2035 | FTRD-2035 | FTRE-2035 | 33.0 | 21.5 | 5.4 | 5.1 |
| FTRB-2542 | FTRC-2542 | FTRD-2542 | FTRE-2542 | 40.0 | 26.5 | 7.7 | 7 |
| FTRB-3047 | FTRC-3047 | FTRD-3047 | FTRE-3047 | 45.0 | 31.5 | 8.9 | 7.9 |
| FTRB-3552 | FTRC-3552 | FTRD-3552 | FTRE-3552 | 50.5 | 36.5 | 9.7 | 9.1 |
| FTRB-4060 | FTRC-4060 | FTRD-4060 | FTRE-4060 | 57.0 | 42.0 | 18 | 12 |
| FTRB-4565 | FTRC-4565 | FTRD-4565 | FTRE-4565 | 62.0 | 47.0 | 20 | 13 |
| FTRB-5070 | FTRC-5070 | FTRD-5070 | FTRE-5070 | 67.0 | 51.5 | 22 | 15 |
| FTRB-5578 | FTRC-5578 | FTRD-5578 | FTRE-5578 | 75.0 | 57.0 | 29 | 19 |
| FTRB-6085 | FTRC-6085 | FTRD-6085 | FTRE-6085 | 82.0 | 61.5 | 35 | 22 |
| FTRB-6590 | FTRC-6590 | FTRD-6590 | FTRE-6590 | 87.5 | 66.5 | 38 | 24 |
| FTRB-7095 | FTRC-7095 | FTRD-7095 | FTRE-7095 | 92.5 | 71.5 | 52 | 25 |
| FTRB-75100 | FTRC-75100 | FTRD-75100 | FTRE-75100 | 97.5 | 76.5 | 54 | 27 |
| FTRB-80105 | FTRC-80105 | FTRD-80105 | FTRE-80105 | 102.5 | 81.5 | 58 | 28 |
| FTRB-85110 | FTRC-85110 | FTRD-85110 | FTRE-85110 | 107.5 | 86.5 | 63 | 30 |
| FTRB-90120 | FTRC-90120 | FTRD-90120 | FTRE-90120 | 117.5 | 91.5 | 80 | 38 |
| FTRB-100135 | FTRC-100135 | FTRD-100135 | FTRE-100135 | 132.5 | 101.5 | 105 | 50 |

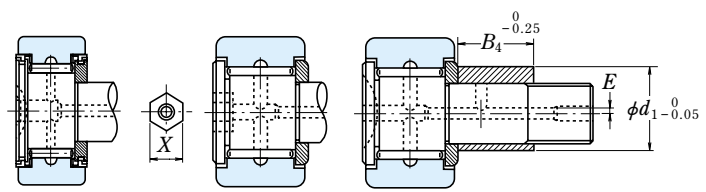
**Note** (1) For tolerance classes C12 and E11, please refer to ISO 286-1 and 286-2 (ISO system of limits and fits), respectively.
(✻) The tolerance of this bearing bore diameter is +0.025 to +0.175mm and outside diameter tolerance is −0.040 to −0.370mm

**FCR** (Full Complement)
**FCRS** [Full Complement, Sealed With Thrust Washer]
**FCJ** (With Cage)
**FCJS** [Sealed, with Cage and Thrust Washer]
**Outside Diameter 16 – 90 mm**




Full Complement

FCR




Full Complement, Sealed With Thrust Washer

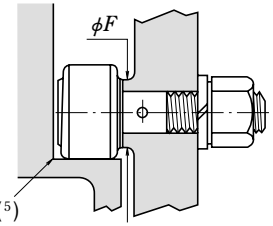
FCRS

Full Complement, With Hexagonal Socket

FCRB

Full Complement, With Eccentric Bush

FCRE




| Boundary Dimensions (mm) D | C | d | Dimensions (mm) Screw G | G1 | B1 | B2 | B3 | M2 | M1 | r min. | Bearing Numbers FCR FCJ | FCRS FCJS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16** | 11 | 6 | M 6×1 | 8 | 28 | 16 | — | — | 4(1) | 0.3 | **FCR-16** | **FCRS-16** |
| | 11 | 6 | M 6×1 | 8 | 28 | 16 | — | — | 4(1) | 0.3 | **FCJ-16** | **FCJS-16** |
| **19** | 11 | 8 | M 8×1.25 | 10 | 32 | 20 | — | — | 4(1) | 0.3 | **FCR-19** | **FCRS-19** |
| | 11 | 8 | M 8×1.25 | 10 | 32 | 20 | — | — | 4(1) | 0.3 | **FCJ-19** | **FCJS-19** |
| **22** | 12 | 10 | M10×1.25 | 12 | 36 | 23 | — | — | 4(1) | 0.3 | **FCR-22** | **FCRS-22** |
| | 12 | 10 | M10×1.25 | 12 | 36 | 23 | — | — | 4(1) | 0.3 | **FCJ-22** | **FCJS-22** |
| **26** | 12 | 10 | M10×1.25 | 12 | 36 | 23 | — | — | 4(1) | 0.3 | **FCR-26** | **FCRS-26** |
| | 12 | 10 | M10×1.25 | 12 | 36 | 23 | — | — | 4(1) | 0.3 | **FCJ-26** | **FCJS-26** |
| **30** | 14 | 12 | M12×1.5 | 13 | 40 | 25 | 6 | 3 | 6 | 0.6 | **FCR-30** | **FCRS-30** |
| | 14 | 12 | M12×1.5 | 13 | 40 | 25 | 6 | 3 | 6 | 0.6 | **FCJ-30** | **FCJS-30** |
| **32** | 14 | 12 | M12×1.5 | 13 | 40 | 25 | 6 | 3 | 6 | 0.6 | **FCR-32** | **FCRS-32** |
| | 14 | 12 | M12×1.5 | 13 | 40 | 25 | 6 | 3 | 6 | 0.6 | **FCJ-32** | **FCJS-32** |
| **35** | 18 | 16 | M16×1.5 | 17 | 52 | 32.5 | 8 | 3 | 6 | 0.6 | **FCR-35** | **FCRS-35** |
| | 18 | 16 | M16×1.5 | 17 | 52 | 32.5 | 8 | 3 | 6 | 0.6 | **FCJ-35** | **FCJS-35** |
| **40** | 20 | 18 | M18×1.5 | 19 | 58 | 36.5 | 8 | 3 | 6 | 1 | **FCR-40** | **FCRS-40** |
| | 20 | 18 | M18×1.5 | 19 | 58 | 36.5 | 8 | 3 | 6 | 1 | **FCJ-40** | **FCJS-40** |
| **47** | 24 | 20 | M20×1.5 | 21 | 66 | 40.5 | 9 | 4 | 8 | 1 | **FCR-47** | **FCRS-47** |
| | 24 | 20 | M20×1.5 | 21 | 66 | 40.5 | 9 | 4 | 8 | 1 | **FCJ-47** | **FCJS-47** |
| **52** | 24 | 20 | M20×1.5 | 21 | 66 | 40.5 | 9 | 4 | 8 | 1 | **FCR-52** | **FCRS-52** |
| | 24 | 20 | M20×1.5 | 21 | 66 | 40.5 | 9 | 4 | 8 | 1 | **FCJ-52** | **FCJS-52** |
| **62** | 29 | 24 | M24×1.5 | 25 | 80 | 49.5 | 11 | 4 | 8 | 1 | **FCR-62** | **FCRS-62** |
| | 29 | 24 | M24×1.5 | 25 | 80 | 49.5 | 11 | 4 | 8 | 1 | **FCJ-62** | **FCJS-62** |
| **72** | 29 | 24 | M24×1.5 | 25 | 80 | 49.5 | 11 | 4 | 8 | 1 | **FCR-72** | **FCRS-72** |
| | 29 | 24 | M24×1.5 | 25 | 80 | 49.5 | 11 | 4 | 8 | 1 | **FCJ-72** | **FCJS-72** |
| **80** | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCR-80** | **FCRS-80** |
| | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCJ-80** | **FCJS-80** |
| **85** | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCR-85** | **FCRS-85** |
| | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCJ-85** | **FCJS-85** |
| **90** | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCR-90** | **FCRS-90** |
| | 35 | 30 | M30×1.5 | 32 | 100 | 63 | 15 | 4 | 8 | 1 | **FCJ-90** | **FCJS-90** |

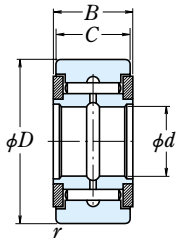
| Basic Dynamic Load Ratings (N) Cr | {kgf} | Limiting Loads (N) Pmax | {kgf} | Limiting Track Loads (N) | {kgf} | Mass (kg) approx. | Dimensions of Hexagonal Socket (2) (width across flats) (mm) X | Eccentric Bush Dimensions (3) (mm) B4 | d1 | E | Shoulder Dimensions (mm) F (min.) | Tightening Torque (4) (N·cm) (max.) | {kgf·cm} (max.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 800 | 590 | 2 360 | 240 | 3 350 | 340 | 0.020 | 4 | 8 | 9 | 0.5 | 11 | 226 | 23 |
| 2 830 | 288 | 2 360 | 240 | 3 350 | 340 | 0.018 | 4 | 8 | 9 | 0.5 | 11 | 226 | 23 |
| 6 600 | 670 | 4 200 | 425 | 4 150 | 425 | 0.031 | 4 | 10 | 11 | 0.5 | 13 | 550 | 56 |
| 3 450 | 355 | 4 200 | 425 | 4 150 | 425 | 0.030 | 4 | 10 | 11 | 0.5 | 13 | 550 | 56 |
| 8 550 | 875 | 6 550 | 665 | 5 300 | 540 | 0.047 | 5 | 11 | 13 | 0.5 | 15 | 1 060 | 108 |
| 4 350 | 445 | 6 550 | 665 | 5 300 | 540 | 0.045 | 5 | 11 | 13 | 0.5 | 15 | 1 060 | 108 |
| 8 550 | 875 | 6 550 | 665 | 6 000 | 610 | 0.060 | 5 | 11 | 13 | 0.5 | 15 | 1 060 | 108 |
| 4 350 | 445 | 6 550 | 665 | 6 000 | 610 | 0.058 | 5 | 11 | 13 | 0.5 | 15 | 1 060 | 108 |
| 12 500 | 1 280 | 9 250 | 945 | 7 800 | 795 | 0.088 | 6 | 12 | 17 | 1 | 20 | 1 450 | 148 |
| 7 200 | 735 | 9 250 | 945 | 7 800 | 795 | 0.086 | 6 | 12 | 17 | 1 | 20 | 1 450 | 148 |
| 12 500 | 1 280 | 9 250 | 945 | 8 050 | 820 | 0.099 | 6 | 12 | 17 | 1 | 20 | 1 450 | 148 |
| 7 200 | 735 | 9 250 | 945 | 8 050 | 820 | 0.096 | 6 | 12 | 17 | 1 | 20 | 1 450 | 148 |
| 18 600 | 1 900 | 17 000 | 1 740 | 11 800 | 1 200 | 0.17 | 10 | 15.5 | 22 | 1 | 24 | 4 000 | 410 |
| 9 700 | 990 | 17 000 | 1 740 | 11 800 | 1 200 | 0.165 | 10 | 15.5 | 22 | 1 | 24 | 4 000 | 410 |
| 20 500 | 2 090 | 21 700 | 2 220 | 14 300 | 1 460 | 0.25 | 10 | 17.5 | 24 | 1 | 26 | 5 950 | 605 |
| 10 300 | 1 050 | 21 700 | 2 220 | 14 300 | 1 460 | 0.24 | 10 | 17.5 | 24 | 1 | 26 | 5 950 | 605 |
| 28 200 | 2 880 | 26 400 | 2 690 | 20 800 | 2 120 | 0.39 | 12 | 19.5 | 27 | 1 | 31 | 8 450 | 860 |
| 19 200 | 1 950 | 26 400 | 2 690 | 20 800 | 2 120 | 0.38 | 12 | 19.5 | 27 | 1 | 31 | 8 450 | 860 |
| 28 200 | 2 880 | 26 400 | 2 690 | 22 900 | 2 340 | 0.47 | 12 | 19.5 | 27 | 1 | 31 | 8 450 | 860 |
| 19 200 | 1 950 | 26 400 | 2 690 | 22 900 | 2 340 | 0.455 | 12 | 19.5 | 27 | 1 | 31 | 8 450 | 860 |
| 40 000 | 4 100 | 38 500 | 3 950 | 34 000 | 3 450 | 0.80 | 14 | 24.5 | 34 | 1 | 45 | 15 200 | 1 550 |
| 24 900 | 2 540 | 38 500 | 3 950 | 34 000 | 3 450 | 0.79 | 14 | 24.5 | 34 | 1 | 45 | 15 200 | 1 550 |
| 40 000 | 4 100 | 38 500 | 3 950 | 38 000 | 3 860 | 1.05 | 14 | 24.5 | 34 | 1 | 45 | 15 200 | 1 550 |
| 24 900 | 2 540 | 38 500 | 3 950 | 38 000 | 3 860 | 1.05 | 14 | 24.5 | 34 | 1 | 45 | 15 200 | 1 550 |
| 60 500 | 6 200 | 61 000 | 6 200 | 52 000 | 5 300 | 1.55 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |
| 39 000 | 4 000 | 61 000 | 6 200 | 52 000 | 5 300 | 1.55 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |
| 60 500 | 6 200 | 61 000 | 6 200 | 55 500 | 5 650 | 1.75 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |
| 39 000 | 4 000 | 61 000 | 6 200 | 55 500 | 5 650 | 1.75 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |
| 60 500 | 6 200 | 61 000 | 6 200 | 59 000 | 6 000 | 1.95 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |
| 39 000 | 4 000 | 61 000 | 6 200 | 59 000 | 6 000 | 1.95 | 17 | 31 | 40 | 1.5 | 52 | 30 500 | 3 120 |

**Notes** (1) Only the head of the stud has on oil hole.
(2) Applicable to FCRB only.
**Remarks** Standard grease is packed in sealed cam followers, but not in cam followers without seals.

**Notes** (3) Applicable to FCRE only.
(4) These values are for when the screw is oiled ; they should be approximately doubled when the screw is dry.
(5) Should not be greater than $r$ (min).

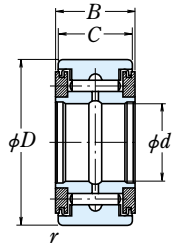
**FYCR** (Full Complement)
**FYCRS** [Full Complement, Sealed with Thrust Washer]
**FYCJ** (With Cage)
**FYCJS** [Sealed, with Cage and Thrust Washer]

**Bore Diameter 5 – 50 mm**



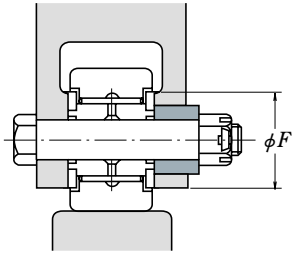

Full Complement

FYCR




Full Complement, Sealed with Thrust Washer

FYCRS




| Boundary Dimensions (mm) | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Track Loads (N) | Limiting Track Loads {kgf} |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $C$ | $B_{-0.38}^{0}$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | | |
| **5** | 16 | 11 | 12 | 0.3 | 5 800 | 8 000 | 590 | 815 | 3 350 | 340 |
| | 16 | 11 | 12 | 0.3 | 2 830 | 2 620 | 288 | 267 | 3 350 | 340 |
| **6** | 19 | 11 | 12 | 0.3 | 6 550 | 9 900 | 665 | 1 010 | 4 150 | 425 |
| | 19 | 11 | 12 | 0.3 | 3 450 | 3 600 | 355 | 365 | 4 150 | 425 |
| **8** | 24 | 14 | 15 | 0.3 | 10 100 | 15 000 | 1 030 | 1 530 | 6 500 | 665 |
| | 24 | 14 | 15 | 0.3 | 5 700 | 6 000 | 580 | 610 | 6 500 | 665 |
| **10** | 30 | 14 | 15 | 0.6 | 11 700 | 18 500 | 1 190 | 1 890 | 7 800 | 795 |
| | 30 | 14 | 15 | 0.6 | 6 950 | 8 200 | 705 | 835 | 7 800 | 795 |
| **12** | 32 | 14 | 15 | 0.6 | 12 600 | 21 000 | 1 280 | 2 140 | 8 050 | 820 |
| | 32 | 14 | 15 | 0.6 | 7 650 | 9 650 | 780 | 985 | 8 050 | 820 |
| **15** | 35 | 18 | 19 | 0.6 | 18 700 | 29 300 | 1 910 | 2 990 | 11 800 | 1 200 |
| | 35 | 18 | 19 | 0.6 | 12 200 | 14 100 | 1 250 | 1 440 | 11 800 | 1 200 |
| **17** | 40 | 20 | 21 | 0.6 | 21 100 | 35 000 | 2 160 | 3 600 | 14 300 | 1 460 |
| | 40 | 20 | 21 | 0.6 | 13 700 | 16 700 | 1 390 | 1 700 | 14 300 | 1 460 |
| **20** | 47 | 24 | 25 | 1 | 28 900 | 50 000 | 2 940 | 5 100 | 20 800 | 2 120 |
| | 47 | 24 | 25 | 1 | 18 200 | 22 600 | 1 850 | 2 310 | 20 800 | 2 120 |
| **25** | 52 | 24 | 25 | 1 | 32 500 | 60 000 | 3 300 | 6 100 | 22 900 | 2 340 |
| | 52 | 24 | 25 | 1 | 22 200 | 31 000 | 2 270 | 3 150 | 22 900 | 2 340 |
| **30** | 62 | 28 | 29 | 1 | 47 500 | 96 000 | 4 800 | 9 800 | 33 000 | 3 350 |
| | 62 | 28 | 29 | 1 | 31 500 | 47 000 | 3 200 | 4 800 | 33 000 | 3 350 |
| **35** | 72 | 28 | 29 | 1 | 49 500 | 106 000 | 5 050 | 10 800 | 36 500 | 3 700 |
| | 72 | 28 | 29 | 1 | 33 000 | 52 500 | 3 400 | 5 350 | 36 500 | 3 700 |
| **40** | 80 | 30 | 32 | 1 | 54 500 | 126 000 | 5 600 | 12 800 | 43 500 | 4 450 |
| | 80 | 30 | 32 | 1 | 38 500 | 67 500 | 3 950 | 6 900 | 43 500 | 4 450 |
| **45** | 85 | 30 | 32 | 1 | 57 500 | 139 000 | 5 850 | 14 100 | 46 500 | 4 750 |
| | 85 | 30 | 32 | 1 | 40 000 | 73 000 | 4 100 | 7 450 | 46 500 | 4 750 |
| **50** | 90 | 30 | 32 | 1 | 60 500 | 152 000 | 6 150 | 15 500 | 49 500 | 5 050 |
| | 90 | 30 | 32 | 1 | 41 500 | 78 000 | 4 200 | 7 950 | 49 500 | 5 050 |

| Bearing Numbers | | Mass (kg) | Shoulder Dimensions (mm) |
|---|---|---|---|
| FYCR FYCJ | FYCRS FYCJS | approx. | $F$ min. |
| **FYCR-5** | **FYCRS-5** | 0.016 | 10 |
| **FYCJ-5** | **FYCJS-5** | 0.014 | 10 |
| **FYCR-6** | **FYCRS-6** | 0.022 | 12 |
| **FYCJ-6** | **FYCJS-6** | 0.020 | 12 |
| **FYCR-8** | **FYCRS-8** | 0.044 | 14 |
| **FYCJ-8** | **FYCJS-8** | 0.042 | 14 |
| **FYCR-10** | **FYCRS-10** | 0.069 | 17 |
| **FYCJ-10** | **FYCJS-10** | 0.067 | 17 |
| **FYCR-12** | **FYCRS-12** | 0.076 | 19 |
| **FYCJ-12** | **FYCJS-12** | 0.074 | 19 |
| **FYCR-15** | **FYCRS-15** | 0.105 | 23 |
| **FYCJ-15** | **FYCJS-15** | 0.097 | 23 |
| **FYCR-17** | **FYCRS-17** | 0.145 | 25 |
| **FYCJ-17** | **FYCJS-17** | 0.14 | 25 |
| **FYCR-20** | **FYCRS-20** | 0.255 | 29 |
| **FYCJ-20** | **FYCJS-20** | 0.245 | 29 |
| **FYCR-25** | **FYCRS-25** | 0.285 | 34 |
| **FYCJ-25** | **FYCJS-25** | 0.275 | 34 |
| **FYCR-30** | **FYCRS-30** | 0.48 | 51 |
| **FYCJ-30** | **FYCJS-30** | 0.47 | 51 |
| **FYCR-35** | **FYCRS-35** | 0.64 | 58 |
| **FYCJ-35** | **FYCJS-35** | 0.635 | 58 |
| **FYCR-40** | **FYCRS-40** | 0.88 | 66 |
| **FYCJ-40** | **FYCJS-40** | 0.865 | 66 |
| **FYCR-45** | **FYCRS-45** | 0.93 | 72 |
| **FYCJ-45** | **FYCJS-45** | 0.91 | 72 |
| **FYCR-50** | **FYCRS-50** | 0.995 | 76 |
| **FYCJ-50** | **FYCJS-50** | 0.965 | 76 |

**Remarks** Standard grease is packed in sealed cam followers, but not in cam followers without seals.

# BALL BEARING UNITS

## SET SCREW TYPE PILLOW BLOCKS CAST HOUSING

UCP2 Shaft Diameter 12 – 90mm ..... B286
1/2 – 3 1/2 inch

## SET SCREW TYPE FLANGED UNITS CAST HOUSING

UCF2 Shaft Diameter 12 – 90mm ..... B292
1/2 – 3 1/2 inch
UCFL2 Shaft Diameter 12 – 90mm ..... B298
1/2 – 3 1/2 inch

# 1. CONSTRUCTION

The NSK bearing unit is a combination of a radial ball bearing, seal, and a housing of high-grade cast iron or pressed steel, which comes in various shapes.

The outer surface of the bearing and the internal surface of the housing are spherical, so that the unit is self-aligning.

The inside construction of the ball bearing for the unit is such that steel balls and retainers of the same type as in series 62 and 63 of the deep groove ball bearing are used. A duplex seal consisting of a combination of an oil-proof synthetic rubber seal and a slinger is provided on both sides.

Depending on the type, the following methods of fitting to the shaft are employed:

(1) The inner ring is fastened onto the shaft in two places by set screws.
(2) The inner ring has a tapered bore and is fitted to the shaft by means of an adapter.
(3) In the eccentric locking collar system the inns ring is fastened to the shaft by means of eccentrics grooves provided at the side of the inner ring and on the collar.

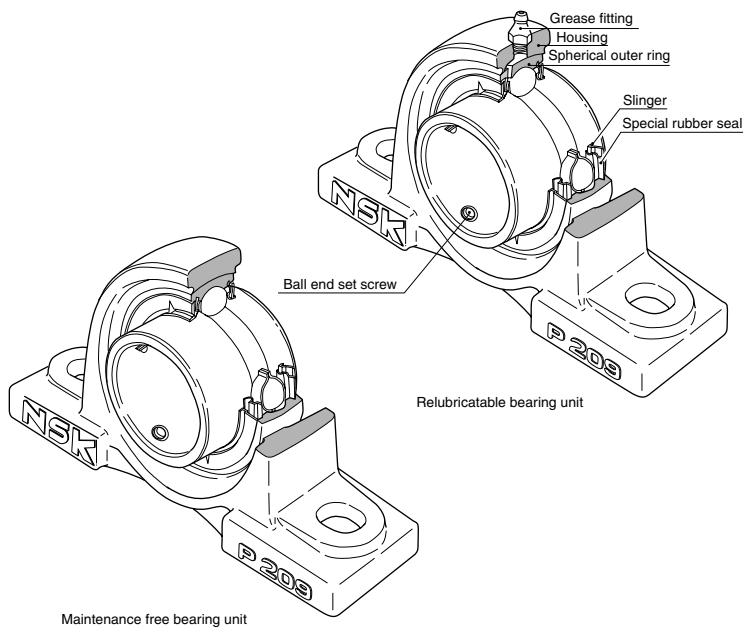



Fig.1.1





# 2. DESIGN FEATURES AND ADVANTAGES

## 2.1 MAINTENANCE FREE TYPE

The NSK Maintenance free bearing unit contains a high-grade lithium-based grease, good for use over a long period, which is ideally suited to sealed-type bearing. Also provided is an excellent sealing device, which prevents any leakage of grease or penetration of dust and water from outside.

It is designed so that the rotation of the shaft causes the sealed-in grease to circulate through the inside space, effectively providing maximum lubrication. The lubrication effect is maintained over a long period with no need for replenishment of grease.

To summarize the advantages of the NSK maintenance free bearing unit:

(1) As an adequate amount of good quality grease is sealed in at the time of manufacture, there is no need for replenishment. This means savings in terms of time and maintenance costs.
(2) Since there is no need for any regreasing facilities, such as piping, a more compact design is possible.
(3) The sealed-in design eliminates the possibility of grease leakage, which could lead to stained products.

## 2.2 RELUBRICATABLE TYPE

The NSK relubricatable type bearing unit has an advantage over other similar, units being so designed as to permit regreasing even in the case of misalignment of 2° to the right or left. The hole through which the grease fitting is mounted usually causes structural weakening of the housing.

However, as a result of extensive testing, in the NSK bearing unit the hole is positioned so as to minimize this adverse effect. In addition, the regreasing groove has been designed to minimize weakening of the housing.

While the NSK maintenance free type bearing unit is satisfactory for use under normal operating conditions in-doors, in the following circumstances it is necessary to use the relubricatable type bearing unit:

(1) Cases where the temperature of the bearing rises above 100°C, 212°F:
*-Normal temperature of up to 130°C, 266°F heat-resistant bearing units.
(2) Cases where there is excessive dust, but space does not permit using a bearing unit with a cover.
(3) Cases where the bearing unit is constantly exposed to splashes of water or any other liquid, but space does not permit using a bearing unit with a cover.
(4) Cases in which the humidity is very high, and the machine in which the bearing unit is used is run only intermittently.
(5) Cases involving a heavy load of which the Cr/Pr value is about 10 or below, and the speed is 10 $min^{-1}$ or below, or the movement is oscillatory.
(6) Cases where the number of revolutions is relatively high and the noise problem has to be considered; for example, when the bearing is used with the fan of an air conditioner.

## 2.3 SPECIAL SEALING FEATURE

### 2.3.1 STANDARD BEARING UNITS

The sealing device of the ball bearing for the NSK bearing unit is a combination of a heat-resistant and oil-proof synthetic rubber seal and a slinger of an exclusive design.

The seal, which is fixed in the outer ring, is steel-reinforced, and its lip, in contact with the inner ring, is designed to minimize frictional torque.

The slinger is fixed to the inner ring of the bearing with which it rotates. There is a small clearance between its periphery and the outer ring.

There are triangular protrusions on the outside face of the slinger and, as the bearing rotates, these protrusions on the slinger create a flow of air outward from the bearing. In this way, the slinger acts as a fan which-keeps dust and water away from the bearing.

These two types of seals on both sides of the bearing prevent grease leakage, and foreign matter is prevented from entering the bearing from outside.

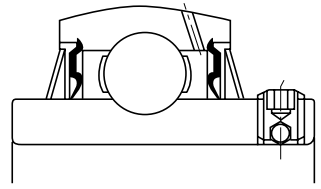


Fig.2.1

### 2.3.2 BEARING UNITS WITH COVERS

The NSK bearing unit with a cover consists of a standard bearing unit and an outside covering for extra protection against dust. Special consideration has been given to its design with respect to dust-proofing.

Sealing devices are provided in both the bearing and the housing, so that units of this type operate satisfactorily even in such adverse environments as flour mills, steel mills, foundries, galvanizing plants and chemical plants, where excessive dust is produced and/or liquids are used. They are also eminently suitable for outdoor environments where dust and rain are inevitable, and in heavy industrial machinery such as construction and transportation equipment.

The rubber seal of the cover contacts with the shaft by its two lips, as shown in Fig. 2.2 and 2.3. By filling the groove between the two lips with grease, an excellent sealing effect is obtained and, at the same time, the contacting portions of the lips are lubricated. Furthermore, the groove is so designed that when the shaft is inclined the rubber seal can move in the radial direction.

When bearing units are exposed to splashes of water rather than to dust, a drain hole (5 to 8 mm, 0.2 to 0.3 inches in diameter)is provided at the bottom of the cover, and grease should be applied to the side of the bearing itself instead of into the cover.

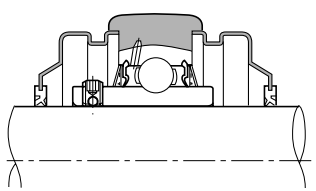


**Fig. 2.2 Pressed steel cover**

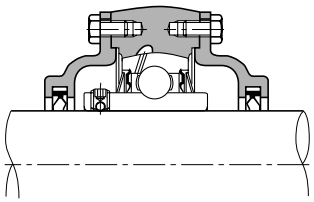


**Fig.2.3 Cast iron cover**

### 2.4 SECURE FITTING

Fastening the bearing to the shaft is effected by tightening the ball-end set screw, situated on the inner ring. This is a unique feature which prevents loosening, even if the bearing is subject to intense vibrations and shocks.

### 2.5 SELF-ALIGNING

With the NSK bearing unit, the outer surface of the ball bearing and the inner surface of the housing are spherical, thus this bearing unit has self-aligning characteristic. Any misalignment of axis that arise from poor workmanship on the shaft or errors in fitting will be properly adjusted.

### 2.6 HIGHER RATED LOAD CAPACITY

The bearing used in the unit is of the same internal construction as those in bearing series 62 and 63, and is capable of accommodating axial load as well as radial load, or composite load. The rated load capacity or this bearing is considerably higher than that of the corresponding self-aligning ball bearings used for standard plummer blocks

### 2.7 LIGHT WEIGHT YET STRONG HOUSING

Housings for NSK bearing units come in various shapes. They consist of either high-grade cast iron, one-piece casting, or of precision finished pressed steel, the latter being lighter in weight. In either case, they are practically designed to combine lightness with maximum strength.

### 2.8 EASY MOUNTING

The NSK bearing unit is an integrated unit consisting of a bearing and a housing.

As the bearing is prelubricated at manufacture with the correct amount of high-grade lithium base, it can be mounted on the shaft just as it is. It is sufficient to carry out a short test run after mounting.

### 2.9 ACCURATE FITTING OF THE HOUSING

In order to simplify the fitting of the pillow block and flange type bearing units, the housings are provided with a seat for a dowel pin, which may be utilized as needed.

### 2.10 BEARING REPLACEABILITY

The bearing used in the NSK bearing unit is replaceable. In the event of bearing failure, a new bearing can be fitted to the existing housing.





## 3. RECOMMENDED TORQUES FOR TIGTENING SET SCREWS

**Table 3.1 Recommended torques for tightening set screws**

A) Metric series, applied to metric bore size.

| Designation of the bearings of applicable units | | | Designation of set screws | Tightening torques N·m (max.) |
|---|---|---|---|---|
| UC201 to UC205 | — | — | M 5×0.8 × 7 | 3.9 |
| UC206 | — | UC305 to UC306 | M 6×0.75× 8 | 4.9 |
| UC207 | UCX05 | — | M 6×0.75× 8 | 5.8 |
| UC208 to UC210 | — | — | M 8×1 ×10 | 7.8 |
| UC211 | UCX06 to UCX08 | UC307 | M 8×1 ×10 | 9.8 |
| UC212 | UCX09 | — | M10×1.25×12 | 16.6 |
| UC213 to UC215 | — | UC308 to UC309 | M10×1.25×12 | 19.6 |
| UC216 | UCX10 | — | M10×1.25×12 | 22.5 |
| — | UCX11 to UCX12 | — | M10×1.25×12 | 24.5 |
| UC217 to UC218 | UCX13 to UCX15 | UC310 to UC314 | M12×1.5 ×13 | 29.4 |
| — | UCX16 to UCX17 | — | M12×1.5 ×13 | 34.3 |
| — | UCX18 | UC315 to UC316 | M14×1.5 ×15 | 34.3 |
| — | UCX20 | UC317 to UC319 | M16×1.5 ×18 | 53.9 |
| — | — | UC320 to UC324 | M18×1.5 ×20 | 58.8 |
| — | — | UC326 to UC328 | M20×1.5 ×25 | 78.4 |

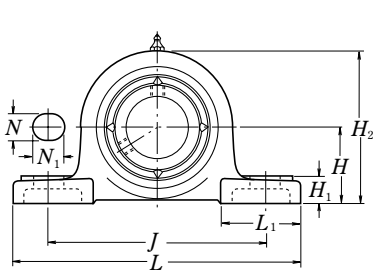
| Designation of the bearings of applicable units | Designation of set screws | Tightening torques N·m (max.) |
|---|---|---|
| AS201 to 205 | M5×0.8 × 7 | 3.4 |
| AS206 | M6×0.75× 8 | 4.4 |
| AS207 | M6×0.75× 8 | 4.9 |
| AS208 | M8×1 ×10 | 6.8 |

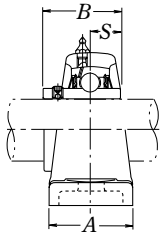
B) Inch series, applied to inch bore size.

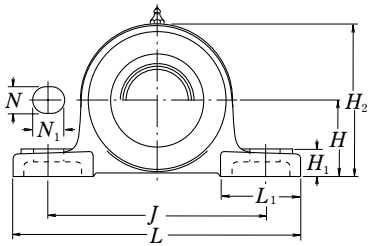
| Designation of the bearings for the unit to which torques given are applicable | | | Designation of set screws | Tightening torques lbf·inch (max.) |
|---|---|---|---|---|
| UC201 to UC205 | — | — | No.10 -32UNF | 34 |
| UC206 | — | UC305 to UC306 | 1/4 -28UNF | 43 |
| UC207 | UCX05 | — | 1/4 -28UNF | 52 |
| UC208 to UC210 | — | — | 5/16 -24UNF | 69 |
| UC211 | UCX06 to UCX08 | UC307 | 5/16 -24UNF | 86 |
| UC212 | UCX09 | — | 3/8 -24UNF | 147 |
| UC213 to UC215 | — | UC308 to UC309 | 3/8 -24UNF | 173 |
| UC216 | UCX10 | — | 3/8 -24UNF | 199 |
| — | UCX11 to UCX12 | — | 3/8 -24UNF | 216 |
| UC217 to UC218 | UCX13 to UCX15 | UC310 to UC314 | 1/2 -20UNF | 260 |
| — | UCX16 to UCX17 | — | 1/2 -20UNF | 303 |
| — | UCX18 | UC315 to UC316 | 9/16 -18UNF | 303 |
| — | UCX20 | UC317 to UC318 | 5/8 -18UNF | 477 |
| — | — | UC320 | 5/8 -18UNF | 520 |

| Designation of the bearings for the unit to which torques given are applicable | Designation of set screws | Tightening torques lbf·inch (max.) |
|---|---|---|
| AS201 to 205 | No 10-32UNF | 30 |
| AS206 | 1/4 -28UNF | 39 |
| AS207 | 1/4 -28UNF | 43 |
| AS208 | 5/16-24UNF | 60 |

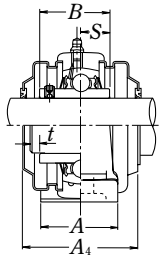
## Pillow blocks units cast housing
## Set screw type

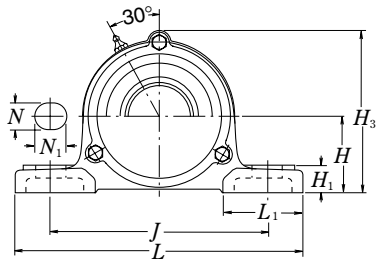


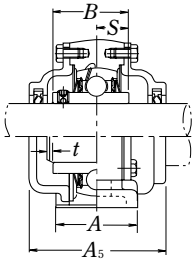




**Pressed steel dust cover type**
Open end **Z-UCP···D1**
Closed end **ZM-UCP···D1**



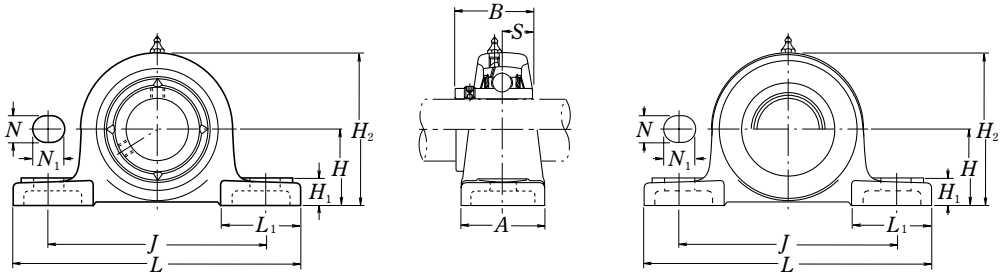

**Cast dust cover type**
Open end **C-UCP···D1**
Closed end **CM-UCP···D1**

| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm / inch H | L | J | A | N | $N_1$ | $H_1$ | $H_2$ | $L_1$ | B | S | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **UCP201D1** | 30.2 | 127 | 95 | 38 | 13 | 16 | 14 | 62 | 42 | 31 | 12.7 | M10 | UC201D1 |
| 1/2 | UCP201-008D1 | 1 3/16 | 5 | 3 3/4 | 1 1/2 | 1/2 | 5/8 | 9/16 | 2 7/16 | 1 21/32 | 1.2205 | 0.500 | 3/8 | UC201-008D1 |
| **15** | **UCP202D1** | 30.2 | 127 | 95 | 38 | 13 | 16 | 14 | 62 | 42 | 31 | 12.7 | M10 | UC202D1 |
| 9/16 | UCP202-009D1 | 1 3/16 | 5 | 3 3/4 | 1 1/2 | 1/2 | 5/8 | 9/16 | 2 7/16 | 1 21/32 | 1.2205 | 0.500 | 3/8 | UC202-009D1 |
| 5/8 | UCP202-010D1 | | | | | | | | | | | | | UC202-010D1 |
| **17** | **UCP203D1** | 30.2 | 127 | 95 | 38 | 13 | 16 | 14 | 62 | 42 | 31 | 12.7 | M10 | UC203D1 |
| 11/16 | UCP203-011D1 | 1 3/16 | 5 | 3 3/4 | 1 1/2 | 1/2 | 5/8 | 9/16 | 2 7/16 | 1 21/32 | 1.2205 | 0.500 | 3/8 | UC203-011D1 |
| **20** | **UCP204D1** | 33.3 | 127 | 95 | 38 | 13 | 16 | 14 | 65 | 42 | 31 | 12.7 | M10 | UC204D1 |
| 3/4 | UCP204-012D1 | 1 5/16 | 5 | 3 3/4 | 1 1/2 | 1/2 | 5/8 | 9/16 | 2 9/16 | 1 21/32 | 1.2205 | 0.500 | 3/8 | UC204-012D1 |
| **25** | **UCP205D1** | 36.5 | 140 | 105 | 38 | 13 | 16 | 15 | 71 | 42 | 34.1 | 14.3 | M10 | UC205D1 |
| 13/16 | UCP205-013D1 | | | | | | | | | | | | | UC205-013D1 |
| 7/8 | UCP205-014D1 | 1 7/16 | 5 1/2 | 4 1/8 | 1 1/2 | 1/2 | 5/8 | 19/32 | 2 25/32 | 1 21/32 | 1.3425 | 0.563 | 3/8 | UC205-014D1 |
| 15/16 | UCP205-015D1 | | | | | | | | | | | | | UC205-015D1 |
| 1 | UCP205-100D1 | | | | | | | | | | | | | UC205-100D1 |
| **30** | **UCP206D1** | 42.9 | 165 | 121 | 48 | 17 | 20 | 17 | 83 | 54 | 38.1 | 15.9 | M14 | UC206D1 |
| 11/16 | UCP206-101D1 | | | | | | | | | | | | | UC206-101D1 |
| 1 1/8 | UCP206-102D1 | 1 11/16 | 6 1/2 | 4 3/4 | 1 7/8 | 21/32 | 25/32 | 21/32 | 3 9/32 | 2 1/8 | 1.5000 | 0.626 | 1/2 | UC206-102D1 |
| 1 3/16 | UCP206-103D1 | | | | | | | | | | | | | UC206-103D1 |
| 1 1/4 | UCP206-104D1 | | | | | | | | | | | | | UC206-104D1 |
| **35** | **UCP207D1** | 47.6 | 167 | 127 | 48 | 17 | 20 | 18 | 93 | 54 | 42.9 | 17.5 | M14 | UC207D1 |
| 1 1/4 | UCP207-104D1 | | | | | | | | | | | | | UC207-104D1 |
| 15/16 | UCP207-105D1 | 1 7/8 | 6 9/16 | 5 | 1 7/8 | 21/32 | 25/32 | 23/32 | 3 21/32 | 2 1/8 | 1.6890 | 0.689 | 1/2 | UC207-105D1 |
| 1 3/8 | UCP207-106D1 | | | | | | | | | | | | | UC207-106D1 |
| 1 7/16 | UCP207-107D1 | | | | | | | | | | | | | UC207-107D1 |
| **40** | **UCP208D1** | 49.2 | 184 | 137 | 54 | 17 | 20 | 18 | 98 | 52 | 49.2 | 19 | M14 | UC208D1 |
| 1 1/2 | UCP208-108D1 | 1 15/16 | 7 1/4 | 5 13/32 | 2 1/8 | 21/32 | 25/32 | 23/32 | 3 27/32 | 2 1/16 | 1.9370 | 0.748 | 1/2 | UC208-108D1 |
| 1 9/16 | UCP208-109D1 | | | | | | | | | | | | | UC208-109D1 |

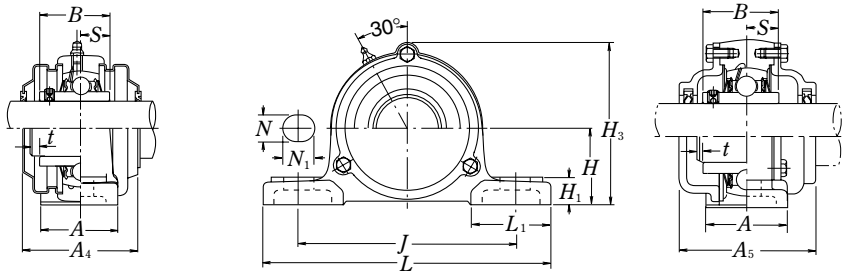
| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm / inch t max. | $A_4$ | $H_3$ | $A_5$ | Mass of unit kg / lb UCP | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|
| P203D1 | **Z(ZM)-UCP201D1** | **C(CM)-UCP201D1** | 2 | 45 | 67 | 62 | 0.7 | 0.7 | 1.0 |
| P203D1 | Z(ZM)-UCP201-008D1 | C(CM)-UCP201-008D1 | 5/64 | 1 25/32 | 2 5/8 | 2 7/16 | 1.5 | 1.5 | 2.2 |
| P203D1 | **Z(ZM)-UCP202D1** | **C(CM)-UCP202D1** | 2 | 45 | 67 | 62 | 0.7 | 0.7 | 1.0 |
| P203D1 | Z(ZM)-UCP202-009D1 | C(CM)-UCP202-009D1 | 5/64 | 1 25/32 | 2 5/8 | 2 7/16 | 1.5 | 1.5 | 2.2 |
| P203D1 | Z(ZM)-UCP202-010D1 | C(CM)-UCP202-010D1 | | | | | | | |
| P203D1 | **Z(ZM)-UCP203D1** | **C(CM)-UCP203D1** | 2 | 45 | 67 | 62 | 0.7 | 0.7 | 1.0 |
| P203D1 | Z(ZM)-UCP203-011D1 | C(CM)-UCP203-011D1 | 5/64 | 1 25/32 | 2 5/8 | 2 7/16 | 1.5 | 1.5 | 2.2 |
| P204D1 | **Z(ZM)-UCP204D1** | **C(CM)-UCP204D1** | 2 | 45 | 70 | 62 | 0.7 | 0.7 | 0.9 |
| P204D1 | Z(ZM)-UCP204-012D1 | C(CM)-UCP204-012D1 | 5/64 | 1 25/32 | 2 3/4 | 2 7/16 | 1.5 | 1.5 | 2.0 |
| P205D1 | **Z(ZM)-UCP205D1** | **C(CM)-UCP205D1** | 2 | 48 | 76 | 70 | 0.8 | 0.9 | 1.1 |
| P205D1 | Z(ZM)-UCP205-013D1 | C(CM)-UCP205-013D1 | | | | | | | |
| P205D1 | Z(ZM)-UCP205-014D1 | C(CM)-UCP205-014D1 | 5/64 | 1 29/32 | 3 | 2 3/4 | 1.8 | 2.0 | 2.4 |
| P205D1 | Z(ZM)-UCP205-015D1 | C(CM)-UCP205-015D1 | | | | | | | |
| P205D1 | Z(ZM)-UCP205-100D1 | C(CM)-UCP205-100D1 | | | | | | | |
| P206D1 | **Z(ZM)-UCP206D1** | **C(CM)-UCP206D1** | 2 | 53 | 88 | 75 | 1.4 | 1.4 | 1.7 |
| P206D1 | Z(ZM)-UCP206-101D1 | C(CM)-UCP206-101D1 | | | | | | | |
| P206D1 | Z(ZM)-UCP206-102D1 | C(CM)-UCP206-102D1 | 5/64 | 2 3/32 | 3 15/32 | 2 15/16 | 3.1 | 3.1 | 3.7 |
| P206D1 | Z(ZM)-UCP206-103D1 | C(CM)-UCP206-103D1 | | | | | | | |
| P206D1 | — | — | | | | | | | |
| P207D1 | **Z(ZM)-UCP207D1** | **C(CM)-UCP207D1** | 3 | 60 | 99 | 80 | 1.6 | 1.7 | 2.0 |
| P207D1 | Z(ZM)-UCP207-104D1 | C(CM)-UCP207-104D1 | | | | | | | |
| P207D1 | Z(ZM)-UCP207-105D1 | C(CM)-UCP207-105D1 | 1/8 | 2 3/8 | 3 29/32 | 3 5/32 | 3.5 | 3.7 | 4.4 |
| P207D1 | Z(ZM)-UCP207-106D1 | C(CM)-UCP207-106D1 | | | | | | | |
| P207D1 | — | — | | | | | | | |
| P208D1 | **Z(ZM)-UCP208D1** | **C(CM)-UCP208D1** | 3 | 69 | 105 | 90 | 1.9 | 2.1 | 2.7 |
| P208D1 | Z(ZM)-UCP208-108D1 | C(CM)-UCP208-108D1 | 1/8 | 2 23/32 | 4 1/8 | 3 17/32 | 4.2 | 4.6 | 6.0 |
| P208D1 | Z(ZM)-UCP208-109D1 | C(CM)-UCP208-109D1 | | | | | | | |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Pillow blocks units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCP···D1**
Closed end **ZM-UCP···D1**



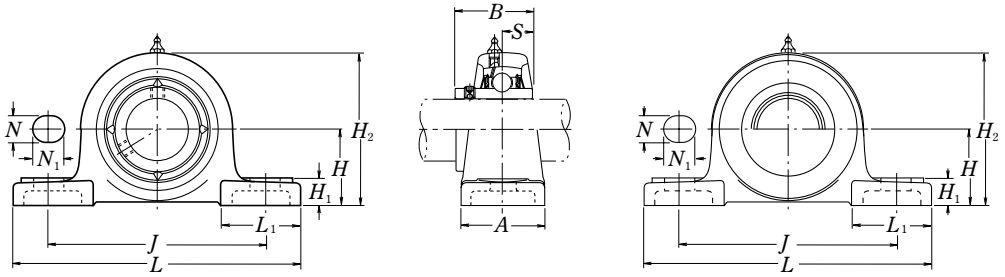

**Cast dust cover type**
Open end **C-UCP···D1**
Closed end **CM-UCP···D1**

| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm / inch H | L | J | A | N | $N_1$ | $H_1$ | $H_2$ | $L_1$ | B | S | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **45** | **UCP209D1** | 54 | 190 | 146 | 54 | 17 | 20 | 20 | 106 | 60 | 49.2 | 19 | M14 | UC209D1 |
| 15/8 | UCP209-110D1 | | | | | | | | | | | | | UC209-110D1 |
| 111/16 | UCP209-111D1 | 21/8 | 715/32 | 53/4 | 21/8 | 21/32 | 25/32 | 25/32 | 43/16 | 23/8 | 1.9370 | 0.748 | 1/2 | UC209-111D1 |
| 13/4 | UCP209-112D1 | | | | | | | | | | | | | UC209-112D1 |
| **50** | **UCP210D1** | 57.2 | 206 | 159 | 60 | 20 | 23 | 21 | 114 | 65 | 51.6 | 19 | M16 | UC210D1 |
| 113/16 | UCP210-113D1 | | | | | | | | | | | | | UC210-113D1 |
| 17/8 | UCP210-114D1 | 21/4 | 81/8 | 61/4 | 23/8 | 25/32 | 29/32 | 13/16 | 41/2 | 29/16 | 2.0315 | 0.748 | 5/8 | UC210-114D1 |
| 115/16 | UCP210-115D1 | | | | | | | | | | | | | UC210-115D1 |
| 2 | UCP210-200D1 | | | | | | | | | | | | | UC210-200D1 |
| **55** | **UCP211D1** | 63.5 | 219 | 171 | 60 | 20 | 23 | 23 | 126 | 65 | 55.6 | 22.2 | M16 | UC211D1 |
| 2 | UCP211-200D1 | | | | | | | | | | | | | UC211-200D1 |
| 21/16 | UCP211-201D1 | 21/2 | 85/8 | 623/32 | 23/8 | 25/32 | 29/32 | 29/32 | 431/32 | 29/16 | 2.1890 | 0.874 | 5/8 | UC211-201D1 |
| 21/8 | UCP211-202D1 | | | | | | | | | | | | | UC211-202D1 |
| 23/16 | UCP211-203D1 | | | | | | | | | | | | | UC211-203D1 |
| **60** | **UCP212D1** | 69.8 | 241 | 184 | 70 | 20 | 23 | 25 | 138 | 70 | 65.1 | 25.4 | M16 | UC212D1 |
| 21/4 | UCP212-204D1 | | | | | | | | | | | | | UC212-204D1 |
| 25/16 | UCP212-205D1 | 23/4 | 91/2 | 71/4 | 23/4 | 25/32 | 29/32 | 31/32 | 57/16 | 23/4 | 2.5630 | 1.000 | 5/8 | UC212-205D1 |
| 23/8 | UCP212-206D1 | | | | | | | | | | | | | UC212-206D1 |
| 27/16 | UCP212-207D1 | | | | | | | | | | | | | UC212-207D1 |
| **65** | **UCP213D1** | 76.2 | 265 | 203 | 70 | 25 | 28 | 27 | 151 | 77 | 65.1 | 25.4 | M20 | UC213D1 |
| 21/2 | UCP213-208D1 | 3 | 107/16 | 8 | 23/4 | 31/32 | 13/32 | 11/16 | 515/16 | 31/32 | 2.5630 | 1.000 | 3/4 | UC213-208D1 |
| 29/16 | UCP213-209D1 | | | | | | | | | | | | | UC213-209D1 |
| **70** | **UCP214D1** | 79.4 | 266 | 210 | 72 | 25 | 28 | 27 | 157 | 77 | 74.6 | 30.2 | M20 | UC214D1 |
| 25/8 | UCP214-210D1 | | | | | | | | | | | | | UC214-210D1 |
| 211/16 | UCP214-211D1 | 31/8 | 1015/32 | 89/32 | 227/32 | 31/32 | 13/32 | 11/16 | 63/16 | 31/32 | 2.9370 | 1.189 | 3/4 | UC214-211D1 |
| 23/4 | UCP214-212D1 | | | | | | | | | | | | | UC214-212D1 |

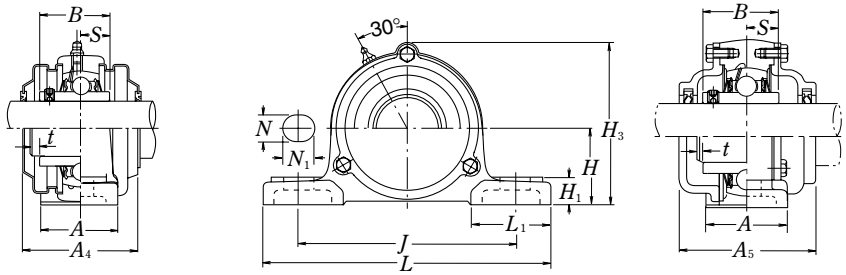
| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm / inch t max. | $A_4$ | $H_3$ | $A_5$ | Mass of unit kg / lb UCP | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|
| P209D1 | **Z(ZM)-UCP209D1** | **C(CM)-UCP209D1** | 3 | 69 | 113 | 95 | 2.2 | 2.4 | 3.1 |
| P209D1 | Z(ZM)-UCP209-110D1 | C(CM)-UCP209-110D1 | | | | | | | |
| P209D1 | Z(ZM)-UCP209-111D1 | C(CM)-UCP209-111D1 | 1/8 | 223/32 | 47/16 | 33/4 | 4.9 | 5.3 | 6.8 |
| P209D1 | Z(ZM)-UCP209-112D1 | C(CM)-UCP209-112D1 | | | | | | | |
| P210D1 | **Z(ZM)-UCP210D1** | **C(CM)-UCP210D1** | 3 | 76 | 119 | 100 | 2.7 | 2.8 | 3.6 |
| P210D1 | Z(ZM)-UCP210-113D1 | C(CM)-UCP210-113D1 | | | | | | | |
| P210D1 | Z(ZM)-UCP210-114D1 | C(CM)-UCP210-114D1 | 1/8 | 3 | 411/16 | 315/16 | 6.0 | 6.2 | 7.9 |
| P210D1 | Z(ZM)-UCP210-115D1 | C(CM)-UCP210-115D1 | | | | | | | |
| P210D1 | — | C(CM)-UCP210-200D1 | | | | | | | |
| P211D1 | **Z(ZM)-UCP211D1** | **C(CM)-UCP211D1** | 4 | 77 | 130 | 100 | 3.5 | 3.5 | 4.4 |
| P211D1 | Z(ZM)-UCP211-200D1 | C(CM)-UCP211-200D1 | | | | | | | |
| P211D1 | Z(ZM)-UCP211-201D1 | C(CM)-UCP211-201D1 | 5/32 | 31/32 | 51/8 | 315/16 | 7.7 | 7.7 | 9.7 |
| P211D1 | Z(ZM)-UCP211-202D1 | C(CM)-UCP211-202D1 | | | | | | | |
| P211D1 | Z(ZM)-UCP211-203D1 | C(CM)-UCP211-203D1 | | | | | | | |
| P212D1 | **Z(ZM)-UCP212D1** | **C(CM)-UCP212D1** | 4 | 89 | 143 | 115 | 4.7 | 5.0 | 6.0 |
| P212D1 | Z(ZM)-UCP212-204D1 | C(CM)-UCP212-204D1 | | | | | | | |
| P212D1 | Z(ZM)-UCP212-205D1 | C(CM)-UCP212-205D1 | 5/32 | 31/2 | 55/8 | 417/32 | 10 | 11 | 13 |
| P212D1 | Z(ZM)-UCP212-206D1 | C(CM)-UCP212-206D1 | | | | | | | |
| P212D1 | — | C(CM)-UCP212-207D1 | | | | | | | |
| P213D1 | **Z(ZM)-UCP213D1** | **C(CM)-UCP213D1** | 4 | 91 | 155 | 120 | 5.6 | 5.8 | 7.2 |
| P213D1 | Z(ZM)-UCP213-208D1 | C(CM)-UCP213-208D1 | 5/32 | 319/32 | 63/32 | 423/32 | 12 | 13 | 16 |
| P213D1 | Z(ZM)-UCP213-209D1 | C(CM)-UCP213-209D1 | | | | | | | |
| P214D1 | — | **C(CM)-UCP214D1** | 4 | — | 162 | 135 | 6.5 | — | 8.3 |
| P214D1 | | C(CM)-UCP214-210D1 | | | | | | | |
| P214D1 | — | C(CM)-UCP214-211D1 | 5/32 | — | 63/8 | 55/16 | 14 | — | 18 |
| P214D1 | | C(CM)-UCP214-212D1 | | | | | | | |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Pillow blocks units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCP···D1**
Closed end **ZM-UCP···D1**



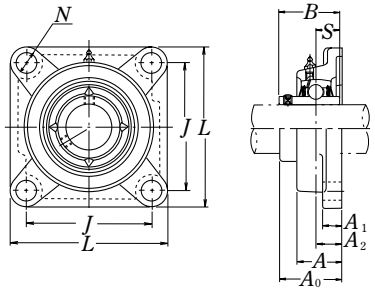

**Cast dust cover type**
Open end **C-UCP···D1**
Closed end **CM-UCP···D1**

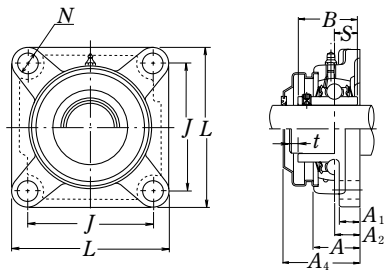
| Shaft dia. mm inch | Unit number(1) | Nominal dimensions mm inch H | L | J | A | N | $N_1$ | $H_1$ | $H_2$ | $L_1$ | B | S | Bolt size mm inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **75** | **UCP215D1** | 82.6 | 275 | 217 | 74 | 25 | 28 | 28 | 163 | 80 | 77.8 | 33.3 | M20 | UC215D1 |
| $2\,13/16$ | **UCP215-213D1** | | | | | | | | | | | | | UC215-213D1 |
| $2\,7/8$ | **UCP215-214D1** | $3\,1/4$ | $10\,13/16$ | $8\,17/32$ | $2\,29/32$ | $31/32$ | $1\,3/32$ | $1\,3/32$ | $6\,13/32$ | $3\,5/32$ | 3.0630 | 1.311 | $3/4$ | UC215-214D1 |
| $2\,15/16$ | **UCP215-215D1** | | | | | | | | | | | | | UC215-215D1 |
| 3 | **UCP215-300D1** | | | | | | | | | | | | | UC215-300D1 |
| **80** | **UCP216D1** | 88.9 | 292 | 232 | 78 | 25 | 28 | 30 | 175 | 85 | 82.6 | 33.3 | M20 | UC216D1 |
| $3\,1/16$ | **UCP216-301D1** | | | | | | | | | | | | | UC216-301D1 |
| $3\,1/8$ | **UCP216-302D1** | $3\,1/2$ | $11\,1/2$ | $9\,1/8$ | $3\,1/16$ | $31/32$ | $1\,3/32$ | $1\,3/16$ | $6\,7/8$ | $3\,11/32$ | 3.2520 | 1.311 | $3/4$ | UC216-302D1 |
| $3\,3/16$ | **UCP216-303D1** | | | | | | | | | | | | | UC216-303D1 |
| **85** | **UCP217D1** | 95.2 | 310 | 247 | 83 | 25 | 28 | 32 | 187 | 85 | 85.7 | 34.1 | M20 | UC217D1 |
| $3\,1/4$ | **UCP217-304D1** | | | | | | | | | | | | | UC217-304D1 |
| $3\,5/16$ | **UCP217-305D1** | $3\,3/4$ | $12\,7/32$ | $9\,23/32$ | $3\,9/32$ | $31/32$ | $1\,3/32$ | $1\,1/4$ | $7\,3/8$ | $3\,11/32$ | 3.3740 | 1.343 | $3/4$ | UC217-305D1 |
| $3\,7/16$ | **UCP217-307D1** | | | | | | | | | | | | | UC217-307D1 |
| **90** | **UCP218D1** | 101.6 | 327 | 262 | 88 | 27 | 30 | 33 | 200 | 90 | 96 | 39.7 | M22 | UC218D1 |
| $3\,1/2$ | **UCP218-308D1** | 4 | $12\,7/8$ | $10\,5/16$ | $3\,15/32$ | $1\,1/16$ | $1\,3/16$ | $1\,5/16$ | $7\,7/8$ | $3\,17/32$ | 3.7795 | 1.563 | $7/8$ | UC218-308D1 |

| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm inch t max. | $A_4$ | $H_3$ | $A_5$ | Mass of unit kg lb UCP | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|
| P215D1 | — | **C(CM)-UCP215D1** | 4 | — | 168 | 135 | 7.2 | — | 9.3 |
| P215D1 | | **C(CM)-UCP215-213D1** | | | | | | | |
| P215D1 | | **C(CM)-UCP215-214D1** | $5/32$ | — | $6\,5/8$ | $5\,5/16$ | 16 | — | 21 |
| P215D1 | — | **C(CM)-UCP215-215D1** | | | | | | | |
| P215D1 | | **C(CM)-UCP215-300D1** | | | | | | | |
| P216D1 | — | **C(CM)-UCP216D1** | 4 | — | 181 | 145 | 8.7 | — | 11 |
| P216D1 | | **C(CM)-UCP216-301D1** | | | | | | | |
| P216D1 | — | **C(CM)-UCP216-302D1** | $5/32$ | — | $7\,1/8$ | $5\,23/32$ | 19 | — | 24 |
| P216D1 | | **C(CM)-UCP216-303D1** | | | | | | | |
| P217D1 | — | **C(CM)-UCP217D1** | 5 | — | 191 | 155 | 11 | — | 13 |
| P217D1 | | **C(CM)-UCP217-304D1** | | | | | | | |
| P217D1 | — | **C(CM)-UCP217-305D1** | $13/64$ | — | $7\,17/32$ | $6\,3/32$ | 24 | — | 29 |
| P217D1 | | **C(CM)-UCP217-307D1** | | | | | | | |
| P218D1 | — | **C(CM)-UCP218D1** | 5 | — | 204 | 165 | 13 | — | 16 |
| P218D1 | — | **C(CM)-UCP218-308D1** | $13/64$ | — | $8\,1/32$ | $6\,1/2$ | 29 | — | 35 |

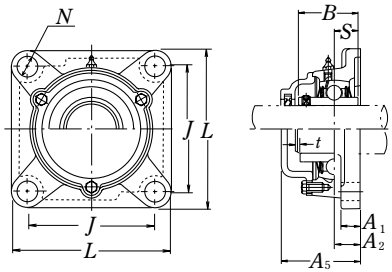
**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Square flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCF···D1**
Closed end **ZM-UCF···D1**



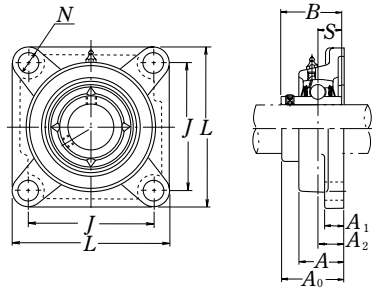

**Cast dust cover type**
Open end **C-UCF···D1**
Closed end **CM-UCF···D1**

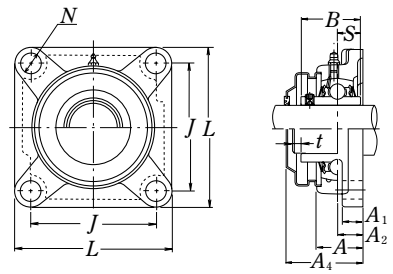
| Shaft dia. mm inch | Unit number(1) | Nominal dimensions mm inch $L$ | $J$ | $A_2$ | $A_1$ | $A$ | $N$ | $A_0$ | $B$ | $S$ | Bolt size mm inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **UCF201D1** | 86 | 64 | 15 | 11 | 25.5 | 12 | 33.3 | 31 | 12.7 | M10 | UC201D1 |
| 1/2 | UCF201-008D1 | 3 3/8 | 2 33/64 | 19/32 | 7/16 | 1 | 15/32 | 1 5/16 | 1.2205 | 0.500 | 3/8 | UC201-008D1 |
| **15** | **UCF202D1** | 86 | 64 | 15 | 11 | 25.5 | 12 | 33.3 | 31 | 12.7 | M10 | UC202D1 |
| 9/16 | UCF202-009D1 | 3 3/8 | 2 33/64 | 19/32 | 7/16 | 1 | 15/32 | 1 5/16 | 1.2205 | 0.500 | 3/8 | UC202-009D1 |
| 5/8 | UCF202-010D1 | | | | | | | | | | | UC202-010D1 |
| **17** | **UCF203D1** | 86 | 64 | 15 | 11 | 25.5 | 12 | 33.3 | 31 | 12.7 | M10 | UC203D1 |
| 11/16 | UCF203-011D1 | 3 3/8 | 2 33/64 | 19/32 | 7/16 | 1 | 15/32 | 1 5/16 | 1.2205 | 0.500 | 3/8 | UC203-011D1 |
| **20** | **UCF204D1** | 86 | 64 | 15 | 11 | 25.5 | 12 | 33.3 | 31 | 12.7 | M10 | UC204D1 |
| 3/4 | UCF204-012D1 | 3 3/8 | 2 33/64 | 19/32 | 7/16 | 1 | 15/32 | 1 5/16 | 1.2205 | 0.500 | 3/8 | UC204-012D1 |
| **25** | **UCF205D1** | 95 | 70 | 16 | 13 | 27 | 12 | 35.8 | 34.1 | 14.3 | M10 | UC205D1 |
| 13/16 | UCF205-013D1 | | | | | | | | | | | UC205-013D1 |
| 7/8 | UCF205-014D1 | 3 3/4 | 2 3/4 | 5/8 | 1/2 | 1 1/16 | 15/32 | 1 13/32 | 1.3425 | 0.563 | 3/8 | UC205-014D1 |
| 15/16 | UCF205-015D1 | | | | | | | | | | | UC205-015D1 |
| 1 | UCF205-100D1 | | | | | | | | | | | UC205-100D1 |
| **30** | **UCF206D1** | 108 | 83 | 18 | 13 | 31 | 12 | 40.2 | 38.1 | 15.9 | M10 | UC206D1 |
| 1 1/16 | UCF206-101D1 | | | | | | | | | | | UC206-101D1 |
| 1 1/8 | UCF206-102D1 | 4 1/4 | 3 17/64 | 45/64 | 1/2 | 17/32 | 15/32 | 1 37/64 | 1.5000 | 0.626 | 3/8 | UC206-102D1 |
| 1 3/16 | UCF206-103D1 | | | | | | | | | | | UC206-103D1 |
| 1 1/4 | UCF206-104D1 | | | | | | | | | | | UC206-104D1 |
| **35** | **UCF207D1** | 117 | 92 | 19 | 15 | 34 | 14 | 44.4 | 42.9 | 17.5 | M12 | UC207D1 |
| 1 1/4 | UCF207-104D1 | | | | | | | | | | | UC207-104D1 |
| 1 5/16 | UCF207-105D1 | 4 19/32 | 3 5/8 | 3/4 | 19/32 | 1 11/32 | 35/64 | 1 3/4 | 1.6890 | 0.689 | 7/16 | UC207-105D1 |
| 1 3/8 | UCF207-106D1 | | | | | | | | | | | UC207-106D1 |
| 1 7/16 | UCF207-107D1 | | | | | | | | | | | UC207-107D1 |
| **40** | **UCF208D1** | 130 | 102 | 21 | 15 | 36 | 16 | 51.2 | 49.2 | 19 | M14 | UC208D1 |
| 1 1/2 | UCF208-108D1 | 5 1/8 | 4 1/64 | 53/64 | 19/32 | 1 13/32 | 5/8 | 2 1/64 | 1.9370 | 0.748 | 1/2 | UC208-108D1 |
| 1 9/16 | UCF208-109D1 | | | | | | | | | | | UC208-109D1 |

| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm inch $t$ max. | $A_4$ | $A_5$ | Mass of unit kg lb UCP | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|
| F204D1 | **Z(ZM)-UCF201D1** | **C(CM)-UCF201D1** | 2 | 38 | 46 | 0.6 | 0.6 | 0.8 |
| F204D1 | Z(ZM)-UCF201-008D1 | C(CM)-UCF201-008D1 | 5/64 | 1 1/2 | 1 13/16 | 1.3 | 1.3 | 1.8 |
| F204D1 | **Z(ZM)-UCF202D1** | **C(CM)-UCF202D1** | 2 | 38 | 46 | 0.6 | 0.6 | 0.8 |
| F204D1 | Z(ZM)-UCF202-009D1 | C(CM)-UCF202-009D1 | | | | | | |
| F204D1 | Z(ZM)-UCF202-010D1 | C(CM)-UCF202-010D1 | 5/64 | 1 1/2 | 1 13/16 | 1.3 | 1.3 | 1.8 |
| F204D1 | **Z(ZM)-UCF203D1** | **C(CM)-UCF203D1** | 2 | 38 | 46 | 0.6 | 0.6 | 0.8 |
| F204D1 | Z(ZM)-UCF203-011D1 | C(CM)-UCF203-011D1 | 5/64 | 1 1/2 | 1 13/16 | 1.3 | 1.3 | 1.8 |
| F204D1 | **Z(ZM)-UCF204D1** | **C(CM)-UCF204D1** | 2 | 38 | 46 | 0.6 | 0.6 | 0.7 |
| F204D1 | Z(ZM)-UCF204-012D1 | C(CM)-UCF204-012D1 | 5/64 | 1 1/2 | 1 13/16 | 1.3 | 1.3 | 1.5 |
| F205D1 | **Z(ZM)-UCF205D1** | **C(CM)-UCF205D1** | 2 | 40 | 51 | 0.8 | 0.8 | 0.9 |
| F205D1 | Z(ZM)-UCF205-013D1 | C(CM)-UCF205-013D1 | | | | | | |
| F205D1 | Z(ZM)-UCF205-014D1 | C(CM)-UCF205-014D1 | | | | | | |
| F205D1 | Z(ZM)-UCF205-015D1 | C(CM)-UCF205-015D1 | 5/64 | 1 19/32 | 2 | 1.8 | 1.8 | 2.0 |
| F205D1 | Z(ZM)-UCF205-100D1 | C(CM)-UCF205-100D1 | | | | | | |
| F206D1 | **Z(ZM)-UCF206D1** | **C(CM)-UCF206D1** | 2 | 45 | 56 | 1.1 | 1.1 | 1.3 |
| F206D1 | Z(ZM)-UCF206-101D1 | C(CM)-UCF206-101D1 | | | | | | |
| F206D1 | Z(ZM)-UCF206-102D1 | C(CM)-UCF206-102D1 | | | | | | |
| F206D1 | Z(ZM)-UCF206-103D1 | C(CM)-UCF206-103D1 | 5/64 | 1 3/4 | 2 7/32 | 2.4 | 2.4 | 2.9 |
| F206D1 | — | C(CM)-UCF206-104D1 | | | | | | |
| F207D1 | **Z(ZM)-UCF207D1** | **C(CM)-UCF207D1** | 3 | 49 | 59 | 1.5 | 1.5 | 1.8 |
| F207D1 | Z(ZM)-UCF207-104D1 | C(CM)-UCF207-104D1 | | | | | | |
| F207D1 | Z(ZM)-UCF207-105D1 | C(CM)-UCF207-105D1 | | | | | | |
| F207D1 | Z(ZM)-UCF207-106D1 | C(CM)-UCF207-106D1 | 1/8 | 1 15/16 | 2 5/16 | 3.3 | 3.3 | 4.0 |
| F207D1 | — | C(CM)-UCF207-107D1 | | | | | | |
| F208D1 | **Z(ZM)-UCF208D1** | **C(CM)-UCF208D1** | 3 | 56 | 66 | 1.7 | 1.8 | 2.2 |
| F208D1 | Z(ZM)-UCF208-108D1 | C(CM)-UCF208-108D1 | | | | | | |
| F208D1 | Z(ZM)-UCF208-109D1 | C(CM)-UCF208-109D1 | 1/8 | 2 3/16 | 2 19/32 | 3.7 | 4.0 | 4.9 |

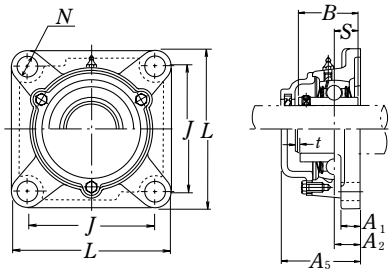
**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Square flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCF···D1**
Closed end **ZM-UCF···D1**



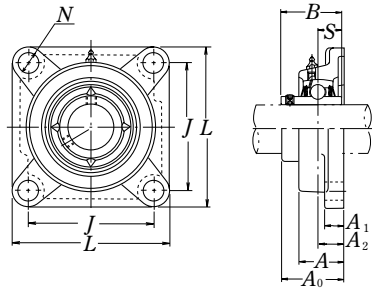

**Cast dust cover type**
Open end **C-UCF···D1**
Closed end **CM-UCF···D1**

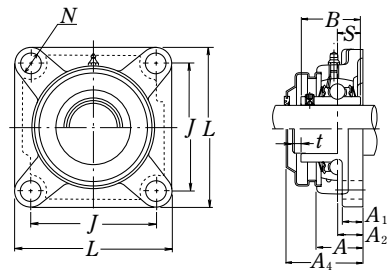
| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm inch: $L$ | $J$ | $A_2$ | $A_1$ | $A$ | $N$ | $A_0$ | $B$ | $S$ | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **45** | **UCF209D1** | 137 | 105 | 22 | 16 | 38 | 16 | 52.2 | 49.2 | 19 | M14 | UC209D1 |
| 1 5/8 | UCF209-110D1 | | | | | | | | | | | UC209-110D1 |
| 1 11/16 | UCF209-111D1 | 5 13/32 | 4 9/64 | 55/64 | 5/8 | 1 1/2 | 5/8 | 2 1/16 | 1.9370 | 0.748 | 1/2 | UC209-111D1 |
| 1 3/4 | UCF209-112D1 | | | | | | | | | | | UC209-112D1 |
| **50** | **UCF210D1** | 143 | 111 | 22 | 16 | 40 | 16 | 54.6 | 51.6 | 19 | M14 | UC210D1 |
| 1 13/16 | UCF210-113D1 | | | | | | | | | | | UC210-113D1 |
| 1 7/8 | UCF210-114D1 | 5 5/8 | 4 3/8 | 55/64 | 5/8 | 1 9/16 | 5/8 | 2 5/32 | 2.0315 | 0.748 | 1/2 | UC210-114D1 |
| 1 15/16 | UCF210-115D1 | | | | | | | | | | | UC210-115D1 |
| 2 | UCF210-200D1 | | | | | | | | | | | UC210-200D1 |
| **55** | **UCF211D1** | 162 | 130 | 25 | 18 | 43 | 19 | 58.4 | 55.6 | 22.2 | M16 | UC211D1 |
| 2 | UCF211-200D1 | | | | | | | | | | | UC211-200D1 |
| 2 1/16 | UCF211-201D1 | 6 3/8 | 5 1/8 | 63/64 | 23/32 | 1 11/16 | 3/4 | 2 19/64 | 2.1890 | 0.874 | 5/8 | UC211-201D1 |
| 2 1/8 | UCF211-202D1 | | | | | | | | | | | UC211-202D1 |
| 2 3/16 | UCF211-203D1 | | | | | | | | | | | UC211-203D1 |
| **60** | **UCF212D1** | 175 | 143 | 29 | 18 | 48 | 19 | 68.7 | 65.1 | 25.4 | M16 | UC212D1 |
| 2 1/4 | UCF212-204D1 | | | | | | | | | | | UC212-204D1 |
| 2 5/16 | UCF212-205D1 | 6 7/8 | 5 5/8 | 1 9/64 | 23/32 | 1 7/8 | 3/4 | 2 45/64 | 2.5630 | 1.000 | 5/8 | UC212-205D1 |
| 2 3/8 | UCF212-206D1 | | | | | | | | | | | UC212-206D1 |
| 2 7/16 | UCF212-207D1 | | | | | | | | | | | UC212-207D1 |
| **65** | **UCF213D1** | 187 | 149 | 30 | 22 | 50 | 19 | 69.7 | 65.1 | 25.4 | M16 | UC213D1 |
| 2 1/2 | UCF213-208D1 | 7 3/8 | 5 55/64 | 1 3/16 | 7/8 | 1 31/32 | 3/4 | 2 3/4 | 2.5630 | 1.000 | 5/8 | UC213-208D1 |
| 2 9/16 | UCF213-209D1 | | | | | | | | | | | UC213-209D1 |
| **70** | **UCF214D1** | 193 | 152 | 31 | 22 | 54 | 19 | 75.4 | 74.6 | 30.2 | M16 | UC214D1 |
| 2 5/8 | UCF214-210D1 | | | | | | | | | | | UC214-210D1 |
| 2 11/16 | UCF214-211D1 | 7 19/32 | 5 63/64 | 1 7/32 | 7/8 | 2 1/8 | 3/4 | 2 31/32 | 2.9370 | 1.189 | 5/8 | UC214-211D1 |
| 2 3/4 | UCF214-212D1 | | | | | | | | | | | UC214-212D1 |

| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm inch: $t$ max. | $A_4$ | $A_5$ | Mass of unit kg lb: UCF | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|
| F209D1 | **Z(ZM)-UCF209D1** | **C(CM)-UCF209D1** | 3 | 57 | 70 | 2.1 | 2.2 | 2.6 |
| F209D1 | Z(ZM)-UCF209-110D1 | C(CM)-UCF209-110D1 | | | | | | |
| F209D1 | Z(ZM)-UCF209-111D1 | C(CM)-UCF209-111D1 | 1/8 | 2 1/4 | 2 3/4 | 4.6 | 4.9 | 5.7 |
| F209D1 | Z(ZM)-UCF209-112D1 | C(CM)-UCF209-112D1 | | | | | | |
| F210D1 | **Z(ZM)-UCF210D1** | **C(CM)-UCF210D1** | 3 | 60 | 72 | 2.5 | 2.5 | 3.0 |
| F210D1 | Z(ZM)-UCF210-113D1 | C(CM)-UCF210-113D1 | | | | | | |
| F210D1 | Z(ZM)-UCF210-114D1 | C(CM)-UCF210-114D1 | 1/8 | 2 3/8 | 2 27/32 | 5.5 | 5.5 | 6.6 |
| F210D1 | Z(ZM)-UCF210-115D1 | C(CM)-UCF210-115D1 | | | | | | |
| F210D1 | — | C(CM)-UCF210-200D1 | | | | | | |
| F211D1 | **Z(ZM)-UCF211D1** | **C(CM)-UCF211D1** | 4 | 64 | 75 | 3.3 | 3.4 | 4.0 |
| F211D1 | Z(ZM)-UCF211-200D1 | C(CM)-UCF211-200D1 | | | | | | |
| F211D1 | Z(ZM)-UCF211-201D1 | C(CM)-UCF211-201D1 | 5/32 | 2 1/2 | 2 15/16 | 7.3 | 7.5 | 8.8 |
| F211D1 | Z(ZM)-UCF211-202D1 | C(CM)-UCF211-202D1 | | | | | | |
| F211D1 | Z(ZM)-UCF211-203D1 | C(CM)-UCF211-203D1 | | | | | | |
| F212D1 | **Z(ZM)-UCF212D1** | **C(CM)-UCF212D1** | 4 | 74 | 86 | 3.9 | 4.1 | 4.8 |
| F212D1 | Z(ZM)-UCF212-204D1 | C(CM)-UCF212-204D1 | | | | | | |
| F212D1 | Z(ZM)-UCF212-205D1 | C(CM)-UCF212-205D1 | 5/32 | 2 29/32 | 3 3/8 | 8.6 | 9.0 | 11 |
| F212D1 | Z(ZM)-UCF212-206D1 | C(CM)-UCF212-206D1 | | | | | | |
| F212D1 | — | C(CM)-UCF212-207D1 | | | | | | |
| F213D1 | **Z(ZM)-UCF213D1** | **C(CM)-UCF213D1** | 4 | 76 | 90 | 5.5 | 5.6 | 6.4 |
| F213D1 | Z(ZM)-UCF213-208D1 | C(CM)-UCF213-208D1 | 5/32 | 3 | 3 17/32 | 12 | 12 | 14 |
| F213D1 | Z(ZM)-UCF213-209D1 | C(CM)-UCF213-209D1 | | | | | | |
| F214D1 | — | **C(CM)-UCF214D1** | 4 | — | 98 | 6.3 | — | 7.4 |
| F214D1 | | C(CM)-UCF214-210D1 | | | | | | |
| F214D1 | — | C(CM)-UCF214-211D1 | 5/32 | — | 3 27/32 | 14 | — | 16 |
| F214D1 | | C(CM)-UCF214-212D1 | | | | | | |

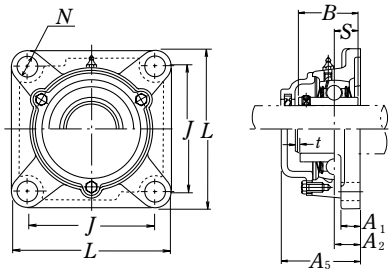
**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Square flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCF···D1**
Closed end **ZM-UCF···D1**



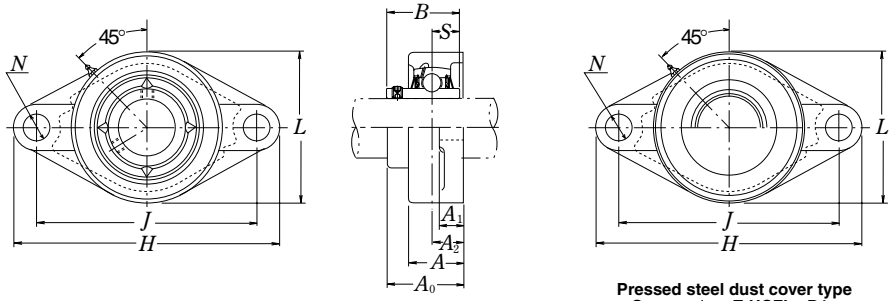

**Cast dust cover type**
Open end **C-UCF···D1**
Closed end **CM-UCF···D1**

| Shaft dia. mm inch | Unit number(1) | Nominal dimensions mm inch L | J | $A_2$ | $A_1$ | A | N | $A_0$ | B | S | Bolt size mm inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **75** | **UCF215D1** | 200 | 159 | 34 | 22 | 56 | 19 | 78.5 | 77.8 | 33.3 | M16 | UC215D1 |
| 2 13/16 | UCF215-213D1 | | | | | | | | | | | UC215-213D1 |
| 2 7/8 | UCF215-214D1 | 7 7/8 | 6 17/64 | 1 11/32 | 7/8 | 2 7/32 | 3/4 | 3 3/32 | 3.0630 | 1.311 | 5/8 | UC215-214D1 |
| 2 15/16 | UCF215-215D1 | | | | | | | | | | | UC215-215D1 |
| 3 | UCF215-300D1 | | | | | | | | | | | UC215-300D1 |
| **80** | **UCF216D1** | 208 | 165 | 34 | 22 | 58 | 23 | 83.3 | 82.6 | 33.3 | M20 | UC216D1 |
| 3 1/16 | UCF216-301D1 | | | | | | | | | | | UC216-301D1 |
| 3 1/8 | UCF216-302D1 | 8 3/16 | 6 1/2 | 1 11/32 | 7/8 | 2 9/32 | 29/32 | 3 9/32 | 3.2520 | 1.311 | 3/4 | UC216-302D1 |
| 3 3/16 | UCF216-303D1 | | | | | | | | | | | UC216-303D1 |
| **85** | **UCF217D1** | 220 | 175 | 36 | 24 | 63 | 23 | 87.6 | 85.7 | 34.1 | M20 | UC217D1 |
| 3 1/4 | UCF217-304D1 | | | | | | | | | | | UC217-304D1 |
| 3 5/16 | UCF217-305D1 | 8 21/32 | 6 57/64 | 1 27/64 | 15/16 | 2 15/32 | 29/32 | 3 29/64 | 3.3740 | 1.343 | 3/4 | UC217-305D1 |
| 3 7/16 | UCF217-307D1 | | | | | | | | | | | UC217-307D1 |
| **90** | **UCF218D1** | 235 | 187 | 40 | 24 | 68 | 23 | 96.3 | 96 | 39.7 | M20 | UC218D1 |
| 3 1/2 | UCF218-308D1 | 9 1/4 | 7 23/64 | 1 37/64 | 15/16 | 2 11/16 | 29/32 | 3 51/64 | 3.7795 | 1.563 | 3/4 | UC218-308D1 |

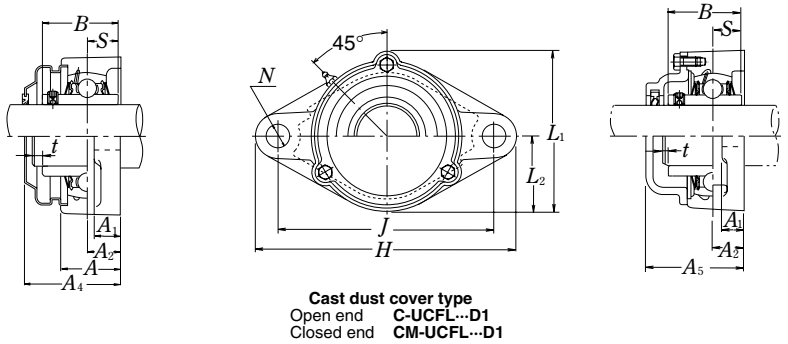
| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm inch t max. | $A_4$ | $A_5$ | Mass of unit kg lb UCF | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|
| F215D1 | — | **C(CM)-UCF215D1** | 4 | — | 102 | 6.6 | — | 7.9 |
| F215D1 | | **C(CM)-UCF215-213D1** | | | | | | |
| F215D1 | — | **C(CM)-UCF215-214D1** | 5/32 | — | 4 1/32 | 15 | — | 17 |
| F215D1 | | **C(CM)-UCF215-215D1** | | | | | | |
| F215D1 | | **C(CM)-UCF215-300D1** | | | | | | |
| F216D1 | — | **C(CM)-UCF216D1** | 4 | — | 106 | 7.9 | — | 9.3 |
| F216D1 | | **C(CM)-UCF216-301D1** | | | | | | |
| F216D1 | — | **C(CM)-UCF216-302D1** | 5/32 | — | 4 3/16 | 17 | — | 21 |
| F216D1 | | **C(CM)-UCF216-303D1** | | | | | | |
| F217D1 | — | **C(CM)-UCF217D1** | 5 | — | 114 | 9.8 | — | 12 |
| F217D1 | | **C(CM)-UCF217-304D1** | | | | | | |
| F217D1 | — | **C(CM)-UCF217-305D1** | 13/64 | — | 4 1/2 | 22 | — | 26 |
| F217D1 | | **C(CM)-UCF217-307D1** | | | | | | |
| F218D1 | — | **C(CM)-UCF218D1** | 5 | — | 122 | 12 | — | 13 |
| F218D1 | — | **C(CM)-UCF218-308D1** | 13/64 | — | 4 13/16 | 26 | — | 29 |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Rhombus flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCFL···D1**
Closed end **ZM-UCFL···D1**



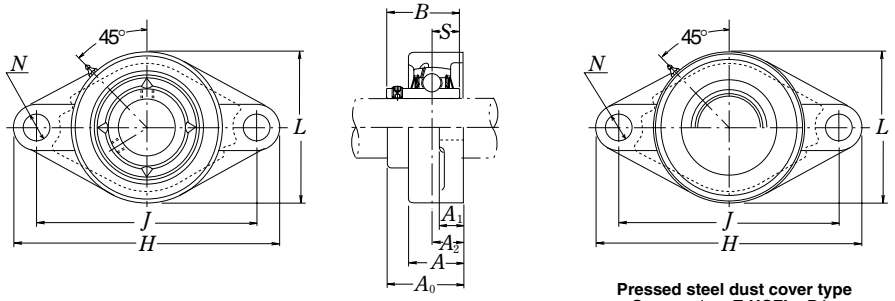

**Cast dust cover type**
Open end **C-UCFL···D1**
Closed end **CM-UCFL···D1**

| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm / inch H | J | $A_2$ | $A_1$ | A | N | L | $A_0$ | B | S | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **UCFL201D1** | 113 | 90 | 15 | 11 | 25.5 | 12 | 60 | 33.3 | 31 | 12.7 | M10 | UC201D1 |
| 1/2 | UCFL201-008D1 | 4 7/16 | 3 35/64 | 19/32 | 7/16 | 1 | 15/32 | 2 3/8 | 1 15/16 | 1.2205 | 0.500 | 3/8 | UC201-008D1 |
| **15** | **UCFL202D1** | 113 | 90 | 15 | 11 | 25.5 | 12 | 60 | 33.3 | 31 | 12.7 | M10 | UC202D1 |
| 9/16 | UCFL202-009D1 | 4 7/16 | 3 35/64 | 19/32 | 7/16 | 1 | 15/32 | 2 3/8 | 1 15/16 | 1.2205 | 0.500 | 3/8 | UC202-009D1 |
| 5/8 | UCFL202-010D1 | | | | | | | | | | | | UC202-010D1 |
| **17** | **UCFL203D1** | 113 | 90 | 15 | 11 | 25.5 | 12 | 60 | 33.3 | 31 | 12.7 | M10 | UC203D1 |
| 11/16 | UCFL203-011D1 | 4 7/16 | 3 35/64 | 19/32 | 7/16 | 1 | 15/32 | 2 3/8 | 1 15/16 | 1.2205 | 0.500 | 3/8 | UC203-011D1 |
| **20** | **UCFL204D1** | 113 | 90 | 15 | 11 | 25.5 | 12 | 60 | 33.3 | 31 | 12.7 | M10 | UC204D1 |
| 3/4 | UCFL204-012D1 | 4 7/16 | 3 35/64 | 19/32 | 7/16 | 1 | 15/32 | 2 3/8 | 1 15/16 | 1.2205 | 0.500 | 3/8 | UC204-012D1 |
| **25** | **UCFL205D1** | 130 | 99 | 16 | 13 | 27 | 16 | 68 | 35.8 | 34.1 | 14.3 | M14 | UC205D1 |
| 13/16 | UCFL205-013D1 | | | | | | | | | | | | UC205-013D1 |
| 7/8 | UCFL205-014D1 | 5 1/8 | 3 57/64 | 5/8 | 1/2 | 1 11/16 | 5/8 | 2 11/16 | 1 13/32 | 1.3425 | 0.563 | 1/2 | UC205-014D1 |
| 15/16 | UCFL205-015D1 | | | | | | | | | | | | UC205-015D1 |
| 1 | UCFL205-100D1 | | | | | | | | | | | | UC205-100D1 |
| **30** | **UCFL206D1** | 148 | 117 | 18 | 13 | 31 | 16 | 80 | 40.2 | 38.1 | 15.9 | M14 | UC206D1 |
| 11/16 | UCFL206-101D1 | | | | | | | | | | | | UC206-101D1 |
| 1 1/8 | UCFL206-102D1 | 5 13/16 | 4 39/64 | 45/64 | 1/2 | 1 7/32 | 5/8 | 3 5/32 | 1 37/64 | 1.5000 | 0.626 | 1/2 | UC206-102D1 |
| 1 3/16 | UCFL206-103D1 | | | | | | | | | | | | UC206-103D1 |
| 1 1/4 | UCFL206-104D1 | | | | | | | | | | | | UC206-104D1 |
| **35** | **UCFL207D1** | 161 | 130 | 19 | 15 | 34 | 16 | 90 | 44.4 | 42.9 | 17.5 | M14 | UC207D1 |
| 1 1/4 | UCFL207-104D1 | | | | | | | | | | | | UC207-104D1 |
| 1 5/16 | UCFL207-105D1 | 6 11/32 | 5 1/8 | 3/4 | 19/32 | 1 11/32 | 5/8 | 3 17/32 | 1 3/4 | 1.6890 | 0.689 | 1/2 | UC207-105D1 |
| 1 3/8 | UCFL207-106D1 | | | | | | | | | | | | UC207-106D1 |
| 1 7/16 | UCFL207-107D1 | | | | | | | | | | | | UC207-107D1 |
| **40** | **UCFL208D1** | 175 | 144 | 21 | 15 | 36 | 16 | 100 | 51.2 | 49.2 | 19 | M14 | UC208D1 |
| 1 1/2 | UCFL208-108D1 | 6 7/8 | 5 43/64 | 53/64 | 19/32 | 1 13/32 | 5/8 | 3 15/16 | 2 1/64 | 1.9370 | 0.748 | 1/2 | UC208-108D1 |
| 1 9/16 | UCFL208-109D1 | | | | | | | | | | | | UC208-109D1 |

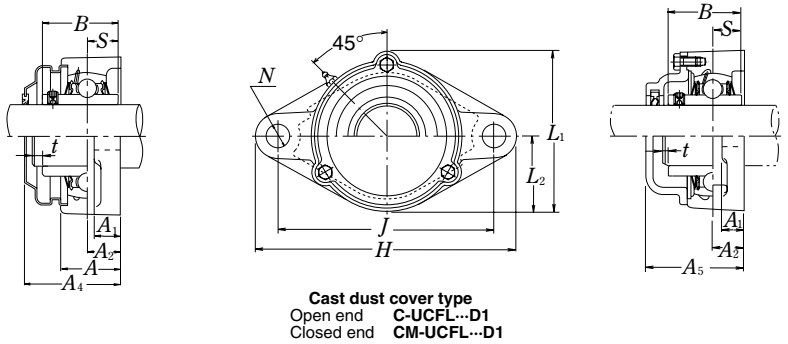
| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm / inch t max. | $A_4$ | $A_5$ | $L_1$ | $L_2$ | Mass of unit kg / lb UCFL | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|---|
| FL204D1 | **Z(ZM)-UCFL201D1** | **C(CM)-UCFL201D1** | 2 | 38 | 46 | 67 | 30 | 0.5 | 0.5 | 0.6 |
| FL204D1 | Z(ZM)-UCFL201-008D1 | C(CM)-UCFL201-008D1 | 5/64 | 1 1/2 | 1 13/16 | 2 5/8 | 1 3/16 | 1.1 | 1.1 | 1.3 |
| FL204D1 | **Z(ZM)-UCFL202D1** | **C(CM)-UCFL202D1** | 2 | 38 | 46 | 67 | 30 | 0.5 | 0.5 | 0.6 |
| FL204D1 | Z(ZM)-UCFL202-009D1 | C(CM)-UCFL202-009D1 | | | | | | | | |
| FL204D1 | Z(ZM)-UCFL202-010D1 | C(CM)-UCFL202-010D1 | 5/64 | 1 1/2 | 1 13/16 | 2 5/8 | 1 3/16 | 1.1 | 1.1 | 1.3 |
| FL204D1 | **Z(ZM)-UCFL203D1** | **C(CM)-UCFL203D1** | 2 | 38 | 46 | 67 | 30 | 0.5 | 0.5 | 0.6 |
| FL204D1 | Z(ZM)-UCFL203-011D1 | C(CM)-UCFL203-011D1 | 5/64 | 1 1/2 | 1 13/16 | 2 5/8 | 1 3/16 | 1.1 | 1.1 | 1.3 |
| FL204D1 | **Z(ZM)-UCFL204D1** | **C(CM)-UCFL204D1** | 2 | 38 | 46 | 67 | 30 | 0.4 | 0.4 | 0.6 |
| FL204D1 | Z(ZM)-UCFL204-012D1 | C(CM)-UCFL204-012D1 | 5/64 | 1 1/2 | 1 13/16 | 2 5/8 | 1 3/16 | 0.9 | 0.9 | 1.3 |
| FL205D1 | **Z(ZM)-UCFL205D1** | **C(CM)-UCFL205D1** | 2 | 40 | 51 | 74 | 34 | 0.6 | 0.6 | 0.8 |
| FL205D1 | Z(ZM)-UCFL205-013D1 | C(CM)-UCFL205-013D1 | | | | | | | | |
| FL205D1 | Z(ZM)-UCFL205-014D1 | C(CM)-UCFL205-014D1 | 5/64 | 1 19/32 | 2 | 2 29/32 | 1 11/32 | 1.3 | 1.3 | 1.8 |
| FL205D1 | Z(ZM)-UCFL205-015D1 | C(CM)-UCFL205-015D1 | | | | | | | | |
| FL205D1 | Z(ZM)-UCFL205-100D1 | C(CM)-UCFL205-100D1 | | | | | | | | |
| FL206D1 | **Z(ZM)-UCFL206D1** | **C(CM)-UCFL206D1** | 2 | 45 | 56 | 85 | 40 | 0.9 | 0.9 | 1.2 |
| FL206D1 | Z(ZM)-UCFL206-101D1 | C(CM)-UCFL206-101D1 | | | | | | | | |
| FL206D1 | Z(ZM)-UCFL206-102D1 | C(CM)-UCFL206-102D1 | 5/64 | 1 3/4 | 2 7/32 | 3 11/32 | 1 9/16 | 2.0 | 2.0 | 2.6 |
| FL206D1 | Z(ZM)-UCFL206-103D1 | C(CM)-UCFL206-103D1 | | | | | | | | |
| FL206D1 | — | — | | | | | | | | |
| FL207D1 | **Z(ZM)-UCFL207D1** | **C(CM)-UCFL207D1** | 3 | 49 | 59 | 97 | 45 | 1.2 | 1.2 | 1.4 |
| FL207D1 | Z(ZM)-UCFL207-104D1 | C(CM)-UCFL207-104D1 | | | | | | | | |
| FL207D1 | Z(ZM)-UCFL207-105D1 | C(CM)-UCFL207-105D1 | 1/8 | 1 15/16 | 2 5/16 | 3 13/16 | 1 25/32 | 2.6 | 2.6 | 3.1 |
| FL207D1 | Z(ZM)-UCFL207-106D1 | C(CM)-UCFL207-106D1 | | | | | | | | |
| FL207D1 | — | — | | | | | | | | |
| FL208D1 | **Z(ZM)-UCFL208D1** | **C(CM)-UCFL208D1** | 3 | 56 | 66 | 106 | 50 | 1.5 | 1.5 | 1.9 |
| FL208D1 | Z(ZM)-UCFL208-108D1 | C(CM)-UCFL208-108D1 | 1/8 | 2 3/16 | 2 19/32 | 4 3/16 | 1 31/32 | 3.3 | 3.3 | 4.2 |
| FL208D1 | Z(ZM)-UCFL208-109D1 | C(CM)-UCFL208-109D1 | | | | | | | | |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Rhombus flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCFL···D1**
Closed end **ZM-UCFL···D1**



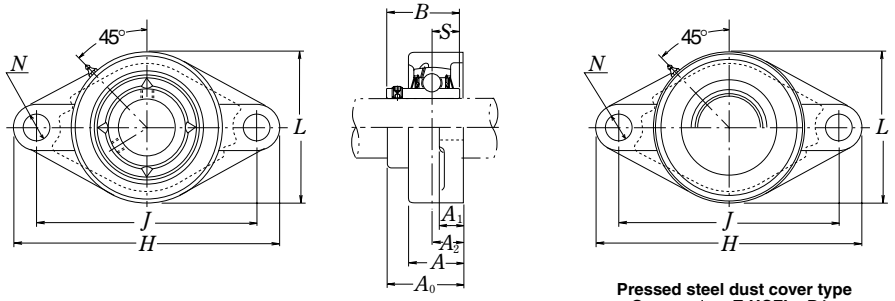

**Cast dust cover type**
Open end **C-UCFL···D1**
Closed end **CM-UCFL···D1**

| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm / inch H | J | $A_2$ | $A_1$ | A | N | L | $A_0$ | B | S | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **45** | **UCFL209D1** | 188 | 148 | 22 | 16 | 38 | 19 | 108 | 52.2 | 49.2 | 19 | M16 | UC209D1 |
| 1 5/8 | UCFL209-110D1 | | | | | | | | | | | | UC209-110D1 |
| 1 11/16 | UCFL209-111D1 | 7 13/32 | 5 53/64 | 55/64 | 5/8 | 1 1/2 | 3/4 | 4 1/4 | 2 1/16 | 1.9370 | 0.748 | 5/8 | UC209-111D1 |
| 1 3/4 | UCFL209-112D1 | | | | | | | | | | | | UC209-112D1 |
| **50** | **UCFL210D1** | 197 | 157 | 22 | 16 | 40 | 19 | 115 | 54.6 | 51.6 | 19 | M16 | UC210D1 |
| 1 13/16 | UCFL210-113D1 | | | | | | | | | | | | UC210-113D1 |
| 1 7/8 | UCFL210-114D1 | 7 3/4 | 6 3/16 | 55/64 | 5/8 | 1 9/16 | 3/4 | 4 17/32 | 2 5/32 | 2.0315 | 0.748 | 5/8 | UC210-114D1 |
| 1 15/16 | UCFL210-115D1 | | | | | | | | | | | | UC210-115D1 |
| 2 | UCFL210-200D1 | | | | | | | | | | | | UC210-200D1 |
| **55** | **UCFL211D1** | 224 | 184 | 25 | 18 | 43 | 19 | 130 | 58.4 | 55.6 | 22.2 | M16 | UC211D1 |
| 2 | UCFL211-200D1 | | | | | | | | | | | | UC211-200D1 |
| 2 1/16 | UCFL211-201D1 | 8 13/16 | 7 1/4 | 63/64 | 23/32 | 1 11/16 | 3/4 | 5 1/8 | 2 19/64 | 2.1890 | 0.874 | 5/8 | UC211-201D1 |
| 2 1/8 | UCFL211-202D1 | | | | | | | | | | | | UC211-202D1 |
| 2 3/16 | UCFL211-203D1 | | | | | | | | | | | | UC211-203D1 |
| **60** | **UCFL212D1** | 250 | 202 | 29 | 18 | 48 | 23 | 140 | 68.7 | 65.1 | 25.4 | M20 | UC212D1 |
| 2 1/4 | UCFL212-204D1 | | | | | | | | | | | | UC212-204D1 |
| 2 5/16 | UCFL212-205D1 | 9 27/32 | 7 61/64 | 1 9/64 | 23/32 | 1 7/8 | 29/32 | 5 1/2 | 2 45/64 | 2.5630 | 1.000 | 3/4 | UC212-205D1 |
| 2 3/8 | UCFL212-206D1 | | | | | | | | | | | | UC212-206D1 |
| 2 7/16 | UCFL212-207D1 | | | | | | | | | | | | UC212-207D1 |
| **65** | **UCFL213D1** | 258 | 210 | 30 | 22 | 50 | 23 | 155 | 69.7 | 65.1 | 25.4 | M20 | UC213D1 |
| 2 1/2 | UCFL213-208D1 | 10 5/32 | 8 17/64 | 1 3/16 | 7/8 | 1 31/32 | 29/32 | 6 3/32 | 2 3/4 | 2.5630 | 1.000 | 3/4 | UC213-208D1 |
| 2 9/16 | UCFL213-209D1 | | | | | | | | | | | | UC213-209D1 |
| **70** | **UCFL214D1** | 265 | 216 | 31 | 22 | 54 | 23 | 160 | 75.4 | 74.6 | 30.2 | M20 | UC214D1 |
| 2 5/8 | UCFL214-210D1 | | | | | | | | | | | | UC214-210D1 |
| 2 11/16 | UCFL214-211D1 | 10 7/16 | 8 1/2 | 1 7/32 | 7/8 | 2 1/8 | 29/32 | 6 5/16 | 2 31/32 | 2.9370 | 1.189 | 3/4 | UC214-211D1 |
| 2 3/4 | UCFL214-212D1 | | | | | | | | | | | | UC214-212D1 |

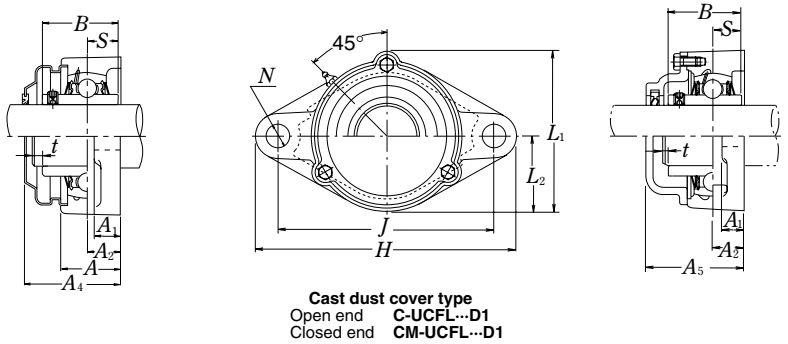
| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm / inch t max. | $A_4$ | $A_5$ | $L_1$ | $L_2$ | Mass of unit kg / lb UCFL | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|---|
| FL209D1 | **Z(ZM)-UCFL209D1** | **C(CM)-UCFL209D1** | 3 | 57 | 70 | 113 | 54 | 1.8 | 1.9 | 2.3 |
| FL209D1 | Z(ZM)-UCFL209-110D1 | C(CM)-UCFL209-110D1 | | | | | | | | |
| FL209D1 | Z(ZM)-UCFL209-111D1 | C(CM)-UCFL209-111D1 | 1/8 | 2 1/4 | 2 3/4 | 4 7/16 | 2 1/8 | 4.0 | 4.2 | 5.1 |
| FL209D1 | Z(ZM)-UCFL209-112D1 | C(CM)-UCFL209-112D1 | | | | | | | | |
| FL210D1 | **Z(ZM)-UCFL210D1** | **C(CM)-UCFL210D1** | 3 | 60 | 72 | 120 | 58 | 2.0 | 2.1 | 2.7 |
| FL210D1 | Z(ZM)-UCFL210-113D1 | C(CM)-UCFL210-113D1 | | | | | | | | |
| FL210D1 | Z(ZM)-UCFL210-114D1 | C(CM)-UCFL210-114D1 | 1/8 | 2 3/8 | 2 27/32 | 4 23/32 | 2 9/32 | 4.4 | 4.6 | 6.0 |
| FL210D1 | Z(ZM)-UCFL210-115D1 | C(CM)-UCFL210-115D1 | | | | | | | | |
| FL210D1 | — | C(CM)-UCFL210-200D1 | | | | | | | | |
| FL211D1 | **Z(ZM)-UCFL211D1** | **C(CM)-UCFL211D1** | 4 | 64 | 75 | 133 | 65 | 2.9 | 3.0 | 3.4 |
| FL211D1 | Z(ZM)-UCFL211-200D1 | C(CM)-UCFL211-200D1 | | | | | | | | |
| FL211D1 | Z(ZM)-UCFL211-201D1 | C(CM)-UCFL211-201D1 | 5/32 | 2 1/2 | 2 15/16 | 5 1/4 | 2 9/16 | 6.4 | 6.6 | 7.5 |
| FL211D1 | Z(ZM)-UCFL211-202D1 | C(CM)-UCFL211-202D1 | | | | | | | | |
| FL211D1 | Z(ZM)-UCFL211-203D1 | C(CM)-UCFL211-203D1 | | | | | | | | |
| FL212D1 | **Z(ZM)-UCFL212D1** | **C(CM)-UCFL212D1** | 4 | 74 | 86 | 144 | 70 | 3.8 | 4.0 | 4.6 |
| FL212D1 | Z(ZM)-UCFL212-204D1 | C(CM)-UCFL212-204D1 | | | | | | | | |
| FL212D1 | Z(ZM)-UCFL212-205D1 | C(CM)-UCFL212-205D1 | 5/32 | 2 29/32 | 3 3/8 | 5 21/32 | 2 3/4 | 8.4 | 8.9 | 10 |
| FL212D1 | Z(ZM)-UCFL212-206D1 | C(CM)-UCFL212-206D1 | | | | | | | | |
| FL212D1 | — | C(CM)-UCFL212-207D1 | | | | | | | | |
| FL213D1 | **Z(ZM)-UCFL213D1** | **C(CM)-UCFL213D1** | 4 | 76 | 90 | 157 | 78 | 4.8 | 4.9 | 5.8 |
| FL213D1 | Z(ZM)-UCFL213-208D1 | C(CM)-UCFL213-208D1 | 5/32 | 3 | 3 17/32 | 6 3/16 | 3 1/16 | 11 | 11 | 15 |
| FL213D1 | Z(ZM)-UCFL213-209D1 | C(CM)-UCFL213-209D1 | | | | | | | | |
| FL214D1 | — | **C(CM)-UCFL214D1** | 4 | — | 98 | 164 | 80 | 5.4 | — | 7.7 |
| FL214D1 | | C(CM)-UCFL214-210D1 | | | | | | | | |
| FL214D1 | — | C(CM)-UCFL214-211D1 | 5/32 | — | 3 27/32 | 6 15/32 | 3 5/32 | 12 | — | 17 |
| FL214D1 | | C(CM)-UCFL214-212D1 | | | | | | | | |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".

## Rhombus flanged units cast housing
## Set screw type




**Pressed steel dust cover type**
Open end **Z-UCFL···D1**
Closed end **ZM-UCFL···D1**

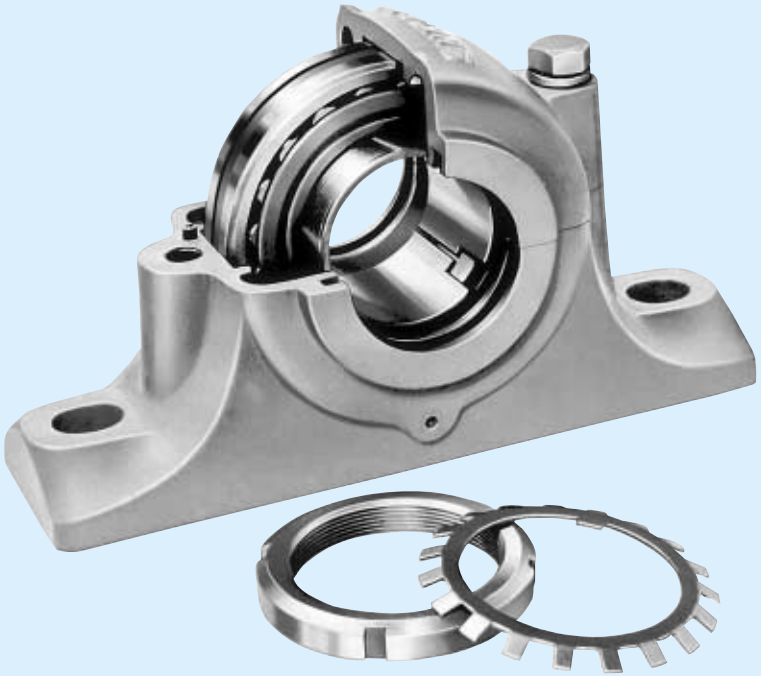



**Cast dust cover type**
Open end **C-UCFL···D1**
Closed end **CM-UCFL···D1**

| Shaft dia. mm / inch | Unit number(1) | Nominal dimensions mm / inch H | J | $A_2$ | $A_1$ | A | N | L | $A_0$ | B | S | Bolt size mm / inch | Bearing number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **75** | **UCFL215D1** | 275 | 225 | 34 | 22 | 56 | 23 | 165 | 78.5 | 77.8 | 33.3 | M20 | UC215D1 |
| 2 13/16 | UCFL215-213D1 | | | | | | | | | | | | UC215-213D1 |
| 2 7/8 | UCFL215-214D1 | 10 13/16 | 8 55/64 | 1 11/32 | 7/8 | 2 7/32 | 29/32 | 6 1/2 | 3 3/32 | 3.0630 | 1.311 | 3/4 | UC215-214D1 |
| 2 15/16 | UCFL215-215D1 | | | | | | | | | | | | UC215-215D1 |
| 3 | UCFL215-300D1 | | | | | | | | | | | | UC215-300D1 |
| **80** | **UCFL216D1** | 290 | 233 | 34 | 22 | 58 | 25 | 180 | 83.3 | 82.6 | 33.3 | M22 | UC216D1 |
| 3 1/16 | UCFL216-301D1 | | | | | | | | | | | | UC216-301D1 |
| 3 1/8 | UCFL216-302D1 | 11 13/32 | 9 11/64 | 1 11/32 | 7/8 | 2 9/32 | 63/64 | 7 3/32 | 3 9/32 | 3.2520 | 1.311 | 7/8 | UC216-302D1 |
| 3 3/16 | UCFL216-303D1 | | | | | | | | | | | | UC216-303D1 |
| **85** | **UCFL217D1** | 305 | 248 | 36 | 24 | 63 | 25 | 190 | 87.6 | 85.7 | 34.1 | M22 | UC217D1 |
| 3 1/4 | UCFL217-304D1 | | | | | | | | | | | | UC217-304D1 |
| 3 5/16 | UCFL217-305D1 | 12 | 9 49/64 | 1 27/64 | 15/16 | 2 15/32 | 63/64 | 7 15/32 | 3 29/64 | 3.3740 | 1.343 | 7/8 | UC217-305D1 |
| 3 7/16 | UCFL217-307D1 | | | | | | | | | | | | UC217-307D1 |
| **90** | **UCFL218D1** | 320 | 265 | 40 | 24 | 68 | 25 | 205 | 96.3 | 96 | 39.7 | M22 | UC218D1 |
| 3 1/2 | UCFL218-308D1 | 12 19/32 | 10 7/16 | 1 37/64 | 15/16 | 2 11/16 | 63/64 | 8 1/16 | 3 51/64 | 3.7795 | 1.563 | 7/8 | UC218-308D1 |

| Housing number | Unit number (1) pressed steel dust cover type | Unit number (1) cast dust cover type | Nominal dimensions mm / inch t max. | $A_4$ | $A_5$ | $L_1$ | $L_2$ | Mass of unit kg / lb UCFL | Z(ZM) | C(CM) |
|---|---|---|---|---|---|---|---|---|---|---|
| FL215D1 | — | **C(CM)-UCFL215D1** | 4 | — | 102 | 169 | 82 | 6.0 | — | 7.1 |
| FL215D1 | | **C(CM)-UCFL215-213D1** | | | | | | | | |
| FL215D1 | — | **C(CM)-UCFL215-214D1** | 5/32 | — | 4 1/32 | 6 21/32 | 3 7/32 | 13 | — | 16 |
| FL215D1 | | **C(CM)-UCFL215-215D1** | | | | | | | | |
| FL215D1 | | **C(CM)-UCFL215-300D1** | | | | | | | | |
| FL216D1 | — | **C(CM)-UCFL216D1** | 4 | — | 106 | 183 | 90 | 7.4 | — | 8.6 |
| FL216D1 | | **C(CM)-UCFL216-301D1** | | | | | | | | |
| FL216D1 | — | **C(CM)-UCFL216-302D1** | 5/32 | — | 4 3/16 | 7 7/32 | 3 17/32 | 16 | — | 19 |
| FL216D1 | | **C(CM)-UCFL216-303D1** | | | | | | | | |
| FL217D1 | — | **C(CM)-UCFL217D1** | 5 | — | 114 | 192 | 95 | 8.8 | — | 10 |
| FL217D1 | | **C(CM)-UCFL217-304D1** | | | | | | | | |
| FL217D1 | — | **C(CM)-UCFL217-305D1** | 13/64 | — | 4 1/2 | 7 9/16 | 3 3/4 | 19 | — | 22 |
| FL217D1 | | **C(CM)-UCFL217-307D1** | | | | | | | | |
| FL218D1 | — | **C(CM)-UCFL218D1** | 5 | — | 122 | 205 | 102 | 11 | — | 13 |
| FL218D1 | — | **C(CM)-UCFL218-308D1** | 13/64 | — | 4 13/16 | 8 1/16 | 4 1/32 | 24 | — | 29 |

**Note** (1) These numbers indicate relubricatable type. If maintenance free type is needed, please order without suffix "D1".



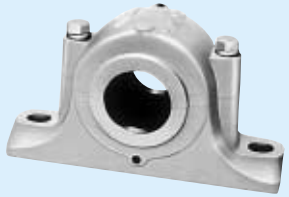
# PLUMMER BLOCKS


STANDARD TYPE PLUMMER BLOCKS ..... B306
LARGE PLUMMER BLOCKS ..... B312
DUSTPROOF PLUMMER BLOCKS ..... B316
STEPPED-SHAFT TYPE PLUMMER BLOCKS ..... B318


## DESIGN, TYPES AND FEATURES

There are numerous types and sizes of plummer blocks. In this catalog, only the types marked by ▭ are shown.

SN 5
SN 6
SN 30
SN 31
SN 2
SN 3
SN 2C
SN 3C



These are the most common type. Models SN30 and SN31 are for medium loads.

For types SN2C and SN3C, the bore diameters on the two sides are different.

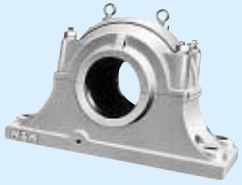
SN 5B
SN 6B
SN 30B
SN 31B
SN 2B
SN 3B
SN 2BC
SN 3BC

These have the same dimensions as those of types SN5 and SN6. To increase the bearing box strength, no material is removed from the top or bottom of the base, so mounting holes can be drilled anywhere.

SG 5

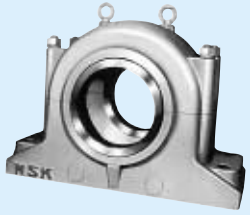
Dustproof plummer blocks have a combination of oil seals, labyrinth seals, and oil groove seals, therefore, they are suitable for environments with much dust and other foreign matter.

SD 30S
SD 31S
SD 5
SD 6
SD 2
SD 3
SD 2C
SD 3C



These are large and made for heavy loads. The standard ones have double seals and four mounting bolt holes. For types SD2C and SD3C, the bore diameters on the two sides are different.

SD31TS
SD32TS

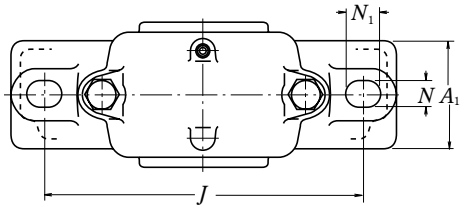


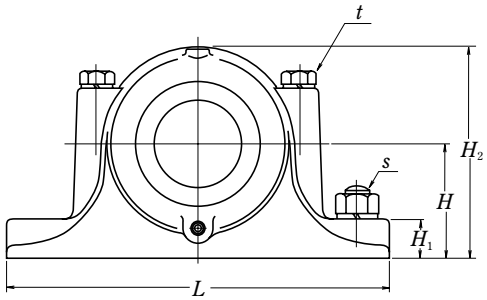
These are provided with labyrinth seals, so they are suitable for high speed applications.

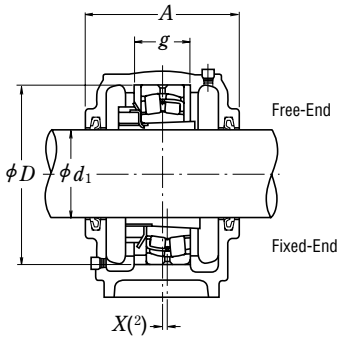
V · C

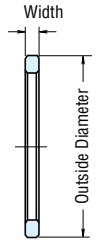
Single-piece plummer blocks (integrated type roller bearing unit)have higher rigidity and precision than split type plummer blocks.

## SN 5, SN 6 Types
## Shaft Diameter 20 – 55 mm




Locating Ring

| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **20** | **SN 505** | 52 | 40 | 130 | 15 | 20 | 67 | 165 | 46 | 22 | 75 | 25 | M 8 | M 12 | 1.1 |
| | **SN 605** | 62 | 50 | 150 | 15 | 20 | 80 | 185 | 52 | 22 | 90 | 34 | M 8 | M 12 | 1.6 |
| **25** | **SN 506** | 62 | 50 | 150 | 15 | 20 | 77 | 185 | 52 | 22 | 90 | 30 | M 8 | M 12 | 1.7 |
| | **SN 606** | 72 | 50 | 150 | 15 | 20 | 82 | 185 | 52 | 22 | 95 | 37 | M 10 | M 12 | 1.8 |
| **30** | **SN 507** | 72 | 50 | 150 | 15 | 20 | 82 | 185 | 52 | 22 | 95 | 33 | M 10 | M 12 | 1.9 |
| | **SN 607** | 80 | 60 | 170 | 15 | 20 | 90 | 205 | 60 | 25 | 110 | 41 | M 10 | M 12 | 2.6 |
| **35** | **SN 508** | 80 | 60 | 170 | 15 | 20 | 85 | 205 | 60 | 25 | 110 | 33 | M 10 | M 12 | 2.6 |
| | **SN 608** | 90 | 60 | 170 | 15 | 20 | 95 | 205 | 60 | 25 | 115 | 43 | M 10 | M 12 | 2.9 |
| **40** | **SN 509** | 85 | 60 | 170 | 15 | 20 | 85 | 205 | 60 | 25 | 112 | 31 | M 10 | M 12 | 2.8 |
| | **SN 609** | 100 | 70 | 210 | 18 | 23 | 105 | 255 | 70 | 28 | 130 | 46 | M 12 | M 16 | 4.1 |
| **45** | **SN 510** | 90 | 60 | 170 | 15 | 20 | 90 | 205 | 60 | 25 | 115 | 33 | M 10 | M 12 | 3.0 |
| | **SN 610** | 110 | 70 | 210 | 18 | 23 | 115 | 255 | 70 | 30 | 135 | 50 | M 12 | M 16 | 4.7 |
| **50** | **SN 511** | 100 | 70 | 210 | 18 | 23 | 95 | 255 | 70 | 28 | 130 | 33 | M 12 | M 16 | 4.5 |
| | **SN 611** | 120 | 80 | 230 | 18 | 23 | 120 | 275 | 80 | 30 | 150 | 53 | M 12 | M 16 | 5.8 |
| **55** | **SN 512** | 110 | 70 | 210 | 18 | 23 | 105 | 255 | 70 | 30 | 135 | 38 | M 12 | M 16 | 5.0 |
| | **SN 612** | 130 | 80 | 230 | 18 | 23 | 125 | 280 | 80 | 30 | 155 | 56 | M 12 | M 16 | 6.5 |

| Applicable Parts: Self-Aligning Ball Bearing Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Spherical Roller Bearing Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Adapter Numbers | Locating Rings Nominal (Outside Dia. × Width) | Q'ty | Oil Seals (3) |
|---|---|---|---|---|---|---|---|
| 1205 K | 12 200 | — | — | H 205X | SR 52× 5 | 2 | GS 5 |
| 2205 K | 12 400 | 22205 CKE4 | 37 500 | H 305X | SR 52× 7 | 1 | |
| 1305 K | 18 200 | 21305 CDKE4 | 43 000 | H 305X | SR 62× 8.5 | 2 | GS 5 |
| 2305 K | 24 900 | — | — | H 2305X | SR 62×10 | 1 | |
| 1206 K | 15 800 | — | — | H 206X | SR 62× 7 | 2 | GS 6 |
| 2206 K | 15 300 | 22206 CKE4 | 50 000 | H 306X | SR 62×10 | 1 | |
| 1306 K | 21 400 | 21306 CDKE4 | 55 000 | H 306X | SR 72× 9 | 2 | GS 6 |
| 2306 K | 32 000 | — | — | H 2306X | SR 72×10 | 1 | |
| 1207 K | 15 900 | — | — | H 207X | SR 72× 8 | 2 | GS 7 |
| 2207 K | 21 700 | 22207 CKE4 | 69 000 | H 307X | SR 72×10 | 1 | |
| 1307 K | 25 300 | 21307 CDKE4 | 71 500 | H 307X | SR 80×10 | 2 | GS 7 |
| 2307 K | 40 000 | — | — | H 2307X | SR 80×10 | 1 | |
| 1208 K | 19 300 | — | — | H 208X | SR 80× 7.5 | 2 | GS 8 |
| 2208 K | 22 400 | 22208 EAKE4 | 90 500 | H 308X | SR 80×10 | 1 | |
| 1308 K | 29 800 | 21308 EAKE4 | 94 500 | H 308X | SR 90×10 | 2 | GS 8 |
| 2308 K | 45 500 | 22308 EAKE4 | 136 000 | H 2308X | SR 90×10 | 1 | |
| 1209 K | 22 000 | — | — | H 209X | SR 85× 6 | 2 | GS 9 |
| 2209 K | 23 300 | 22209 EAKE4 | 94 500 | H 309X | SR 85× 8 | 1 | |
| 1309 K | 38 500 | 21309 EAKE4 | 119 000 | H 309X | SR 100×10.5 | 2 | GS 9 |
| 2309 K | 55 000 | 22309 EAKE4 | 166 000 | H 2309X | SR 100×10 | 1 | |
| 1210 K | 22 800 | — | — | H 210X | SR 90× 6.5 | 2 | GS10 |
| 2210 K | 23 400 | 22210 EAKE4 | 99 000 | H 310X | SR 90×10 | 1 | |
| 1310 K | 43 500 | 21310 EAKE4 | 142 000 | H 310X | SR 110×11.5 | 2 | GS10 |
| 2310 K | 65 000 | 22310 EAKE4 | 197 000 | H 2310X | SR 110×10 | 1 | |
| 1211 K | 26 900 | — | — | H 211X | SR 100× 6 | 2 | GS11 |
| 2211 K | 26 700 | 22211 EAKE4 | 119 000 | H 311X | SR 100× 8 | 1 | |
| 1311 K | 51 500 | 21311 EAKE4 | 142 000 | H 311X | SR 120×12 | 2 | GS11 |
| 2311 K | 76 500 | 22311 EAKE4 | 234 000 | H 2311X | SR 120×10 | 1 | |
| 1212 K | 30 500 | — | — | H 212X | SR 110× 8 | 2 | GS12 |
| 2212 K | 34 000 | 22212 EAKE4 | 142 000 | H 312X | SR 110×10 | 1 | |
| 1312 K | 57 500 | 21312 EAKE4 | 190 000 | H 312X | SR 130×12.5 | 2 | GS12 |
| 2312 K | 88 500 | 22312 EAKE4 | 271 000 | H 2312X | SR 130×10 | 1 | |

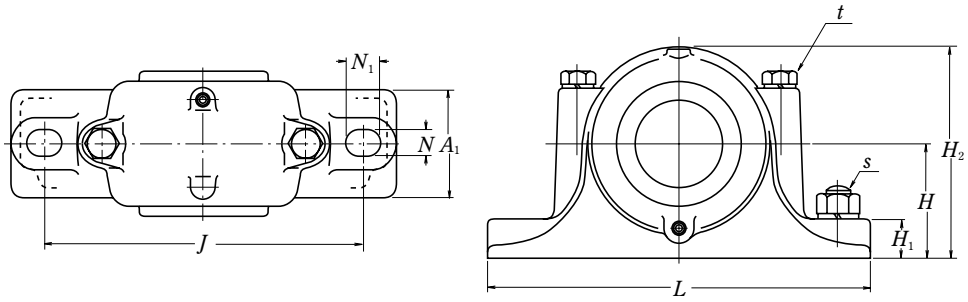
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter+locating ring".

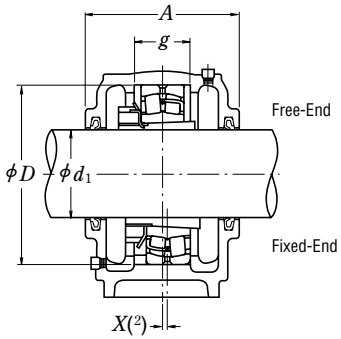
**Remarks** Threads for plugs are R 1/8.

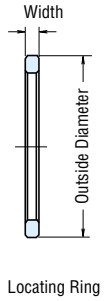
**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.

(3) Applicable to the ZF Type with the same number.

## SN 31, SN 5, SN 6 Types
## Shaft Diameter 60 – 100 mm




Locating Ring

| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **60** | **SN 513** | 120 | 80 | 230 | 18 | 23 | 110 | 275 | 80 | 30 | 150 | 43 | M 12 | M 16 | 5.6 |
| | **SN 613** | 140 | 95 | 260 | 22 | 27 | 130 | 315 | 90 | 32 | 175 | 58 | M 16 | M 20 | 8.7 |
| **65** | **SN 515** | 130 | 80 | 230 | 18 | 23 | 115 | 280 | 80 | 30 | 155 | 41 | M 12 | M 16 | 7.0 |
| | **SN 615** | 160 | 100 | 290 | 22 | 27 | 140 | 345 | 100 | 35 | 195 | 65 | M 16 | M 20 | 11.3 |
| **70** | **SN 516** | 140 | 95 | 260 | 22 | 27 | 120 | 315 | 90 | 32 | 175 | 43 | M 16 | M 20 | 9.0 |
| | **SN 616** | 170 | 112 | 290 | 22 | 27 | 145 | 345 | 100 | 35 | 212 | 68 | M 16 | M 20 | 12.6 |
| **75** | **SN 517** | 150 | 95 | 260 | 22 | 27 | 125 | 320 | 90 | 32 | 185 | 46 | M 16 | M 20 | 10 |
| | **SN 617** | 180 | 112 | 320 | 26 | 32 | 155 | 380 | 110 | 40 | 218 | 70 | M 20 | M 24 | 15 |
| **80** | **SN 518** | 160 | 100 | 290 | 22 | 27 | 145 | 345 | 100 | 35 | 195 | 62.4 | M 16 | M 20 | 13 |
| | **SN 618** | 190 | 112 | 320 | 26 | 32 | 160 | 380 | 110 | 40 | 225 | 74 | M 20 | M 24 | 19 |
| **85** | **SN 519** | 170 | 112 | 290 | 22 | 27 | 140 | 345 | 100 | 35 | 210 | 53 | M 16 | M 20 | 15 |
| | **SN 619** | 200 | 125 | 350 | 26 | 32 | 170 | 410 | 120 | 45 | 245 | 77 | M 20 | M 24 | 22 |
| **90** | **SN 520** | 180 | 112 | 320 | 26 | 32 | 160 | 380 | 110 | 40 | 218 | 70.3 | M 20 | M 24 | 18.5 |
| | **SN 620** | 215 | 140 | 350 | 26 | 32 | 175 | 410 | 120 | 45 | 270 | 83 | M 20 | M 24 | 25 |
| **100** | **SN 3122** | 180 | 112 | 320 | 26 | 32 | 155 | 380 | 110 | 40 | 218 | 66 | M 20 | M 24 | 18 |
| | **SN 522** | 200 | 125 | 350 | 26 | 32 | 175 | 410 | 120 | 45 | 240 | 80 | M 20 | M 24 | 20 |
| | **SN 622** | 240 | 150 | 390 | 28 | 36 | 190 | 450 | 130 | 50 | 300 | 90 | M 24 | M 24 | 32 |

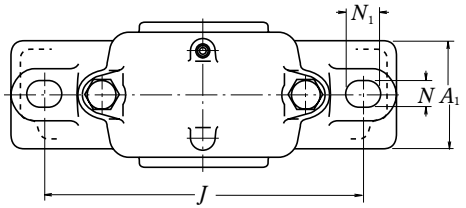
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter+locating ring".

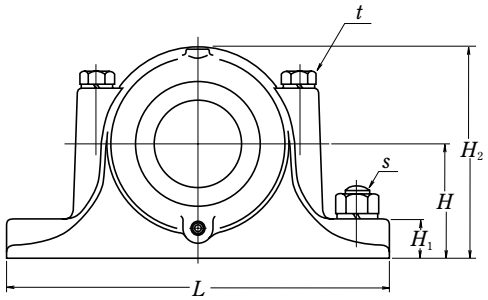
**Remarks** 1. The threads for plugs are R 1/8 for SN 616 and SN 519 or under and R 1/4 for SN 617, SN 520, SN 3122, and over.
2. SN 620 and SN 622 are provided with eye bolts.

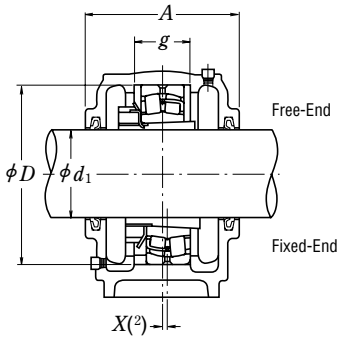
| Applicable Parts | | | | | | | Oil Seals (3) |
|---|---|---|---|---|---|---|---|
| Self-Aligning Ball Bearing | | Spherical Roller Bearing | | Adapter | Locating Rings | | |
| Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Numbers | Nominal (Outside Dia. ×Width) | Q'ty | |
| 1213 K | 31 000 | — | — | H 213X | SR 120×10 | 2 | GS13 |
| 2213 K | 43 500 | 22213 EAKE4 | 177 000 | H 313X | SR 120×12 | 1 | |
| 1313 K | 62 500 | 21313 EAKE4 | 212 000 | H 313X | SR 140×12.5 | 2 | GS13 |
| 2313 K | 97 000 | 22313 EAKE4 | 300 000 | H 2313X | SR 140×10 | 1 | |
| 1215 K | 39 000 | — | — | H 215X | SR 130× 8 | 2 | GS15 |
| 2215 K | 44 500 | 22215 EAKE4 | 190 000 | H 315X | SR 130×10 | 1 | |
| 1315 K | 80 000 | 21315 EAKE4 | 250 000 | H 315X | SR 160×14 | 2 | GS15 |
| 2315 K | 125 000 | 22315 EAKE4 | 390 000 | H 2315X | SR 160×10 | 1 | |
| 1216 K | 40 000 | — | — | H 216X | SR 140× 8.5 | 2 | GS16 |
| 2216 K | 49 000 | 22216 EAKE4 | 212 000 | H 316X | SR 140×10 | 1 | |
| 1316 K | 89 000 | 21316 EAKE4 | 284 000 | H 316X | SR 170×14.5 | 2 | GS16 |
| 2316 K | 130 000 | 22316 EAKE4 | 435 000 | H 2316X | SR 170×10 | 1 | |
| 1217 K | 49 500 | — | — | H 217X | SR 150× 9 | 2 | GS17 |
| 2217 K | 58 500 | 22217 EAKE4 | 250 000 | H 317X | SR 150×10 | 1 | |
| 1317 K | 98 500 | 21317 EAKE4 | 289 000 | H 317X | SR 180×14.5 | 2 | GS17 |
| 2317 K | 142 000 | 22317 EAKE4 | 480 000 | H 2317X | SR 180×10 | 1 | |
| 1218 K | 57 500 | — | — | H 218X | SR 160×16.2 | 2 | GS18 |
| 2218 K | 70 500 | 22218 EAKE4 | 289 000 | H 318X | SR 160×11.2 | 2 | |
| — | — | 23218 CKE4 | 340 000 | H 2318X | SR 160×10 | 1 | |
| 1318 K | 117 000 | 21318 EAKE4 | 330 000 | H 318X | SR 190×15.5 | 2 | GS18 |
| 2318 K | 154 000 | 22318 EAKE4 | 535 000 | H 2318X | SR 190×10 | 1 | |
| 1219 K | 64 000 | — | — | H 219X | SR 170×10.5 | 2 | GS19 |
| 2219 K | 84 000 | 22219 EAKE4 | 330 000 | H 319X | SR 170×10 | 1 | |
| 1319 K | 129 000 | 21319 CKE4 | 345 000 | H 319X | SR 200×16 | 2 | GS19 |
| 2319 K | 161 000 | 22319 EAKE4 | 590 000 | H 2319X | SR 200×10 | 1 | |
| 1220 K | 69 500 | — | — | H 220X | SR 180×18.1 | 2 | GS20 |
| 2220 K | 94 500 | 22220 EAKE4 | 365 000 | H 320X | SR 180×12.1 | 2 | |
| — | — | 23220 CKE4 | 420 000 | H 2320X | SR 180×10 | 1 | |
| 1320 K | 140 000 | 21320 CKE4 | 395 000 | H 320X | SR 215×18 | 2 | GS20 |
| 2320 K | 187 000 | 22320 EAKE4 | 690 000 | H 2320X | SR 215×10 | 1 | |
| — | — | 23122 CKE4 | 385 000 | H 3122X | SR 180×10 | 1 | GS22 |
| 1222 K | 87 000 | — | — | H 222X | SR 200×21 | 2 | GS22 |
| 2222 K | 122 000 | 22222 EAKE4 | 485 000 | H 322X | SR 200×13.5 | 2 | |
| — | — | 23222 CKE4 | 515 000 | H 2322X | SR 200×10 | 1 | |
| 1322 K | 161 000 | 21322 CAKE4 | 450 000 | H 322X | SR 240×20 | 2 | GS22 |
| 2322 K | 211 000 | 22322 EAKE4 | 825 000 | H 2322X | SR 240×10 | 1 | |

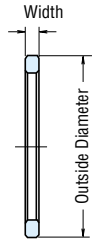
**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.
(3) Applicable to the ZF Type with the same number.

## SN 30, SN 31, SN 5, SN 6 Types
## Shaft Diameter 110 – 140 mm




Locating Ring

| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **110** | **SN 3024** | 180 | 112 | 320 | 26 | 32 | 150 | 380 | 110 | 40 | 218 | 56 | M 20 | M 24 | 16 |
| | **SN 3124** | 200 | 125 | 350 | 26 | 32 | 165 | 410 | 120 | 45 | 245 | 72 | M 20 | M 24 | 20 |
| | **SN 524** | 215 | 140 | 350 | 26 | 32 | 185 | 410 | 120 | 45 | 270 | 86 | M 20 | M 24 | 24.5 |
| | **SN 624** | 260 | 160 | 450 | 33 | 42 | 200 | 530 | 160 | 60 | 320 | 96 | M 24 | M 30 | 48 |
| **115** | **SN 3026** | 200 | 125 | 350 | 26 | 32 | 160 | 410 | 120 | 45 | 240 | 62 | M 20 | M 24 | 19 |
| | **SN 3126** | 210 | 140 | 350 | 26 | 32 | 170 | 410 | 120 | 45 | 270 | 74 | M 20 | M 24 | 26 |
| | **SN 526** | 230 | 150 | 380 | 28 | 36 | 190 | 445 | 130 | 50 | 290 | 90 | M 24 | M 24 | 30 |
| | **SN 626** | 280 | 170 | 470 | 33 | 42 | 210 | 550 | 160 | 60 | 340 | 103 | M 24 | M 30 | 56 |
| **125** | **SN 3028** | 210 | 140 | 350 | 26 | 32 | 170 | 410 | 120 | 45 | 270 | 63 | M 20 | M 24 | 25 |
| | **SN 3128** | 225 | 150 | 380 | 28 | 36 | 180 | 445 | 130 | 50 | 290 | 78 | M 24 | M 24 | 32 |
| | **SN 528** | 250 | 150 | 420 | 33 | 42 | 205 | 500 | 150 | 50 | 305 | 98 | M 24 | M 30 | 38 |
| | **SN 628** | 300 | 180 | 520 | 35 | 45 | 235 | 610 | 170 | 65 | 365 | 112 | M 30 | M 30 | 72 |
| **135** | **SN 3030** | 225 | 150 | 380 | 28 | 36 | 175 | 445 | 130 | 50 | 290 | 66 | M 24 | M 24 | 29 |
| | **SN 3130** | 250 | 150 | 420 | 33 | 42 | 200 | 500 | 150 | 50 | 305 | 90 | M 24 | M 30 | 38 |
| | **SN 530** | 270 | 160 | 450 | 33 | 42 | 220 | 530 | 160 | 60 | 325 | 106 | M 24 | M 30 | 46 |
| | **SN 630** | 320 | 190 | 560 | 35 | 45 | 245 | 650 | 180 | 65 | 385 | 118 | M 30 | M 30 | 98 |
| **140** | **SN 3032** | 240 | 150 | 390 | 28 | 36 | 190 | 450 | 130 | 50 | 300 | 70 | M 24 | M 24 | 32 |
| | **SN 3132** | 270 | 160 | 450 | 33 | 42 | 215 | 530 | 160 | 60 | 325 | 96 | M 24 | M 30 | 48 |
| | **SN 532** | 290 | 170 | 470 | 33 | 42 | 235 | 550 | 160 | 60 | 345 | 114 | M 24 | M 30 | 50 |
| | **SN 632** | 340 | 200 | 580 | 42 | 50 | 255 | 680 | 190 | 70 | 405 | 124 | M 30 | M 36 | 115 |

| Applicable Parts | | | | | | | Oil Seals (3) |
|---|---|---|---|---|---|---|---|
| Self-Aligning Ball Bearing | | Spherical Roller Bearing | | Adapter | Locating Rings | | |
| Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Numbers | Nominal ($\frac{\text{Outside Dia.}}{\text{Width}}$) | Q'ty | |
| — | — | 23024 CDKE4 | 315 000 | H 3024 | SR 180×10 | 1 | GS24 |
| — | — | 23124 CKE4 | 465 000 | H 3124 | SR 200×10 | 1 | GS24 |
| — | — | 22224 EAKE4 | 550 000 | H 3124 | SR 215×14 | 2 | GS24 |
| — | — | 23224 CKE4 | 630 000 | H 2324 | SR 215×10 | 1 | |
| — | — | 22324 EAKE4 | 955 000 | H 2324 | SR 260×10 | 1 | GS24 |
| — | — | 23026 CDKE4 | 400 000 | H 3026 | SR 200×10 | 1 | GS26 |
| — | — | 23126 CKE4 | 505 000 | H 3126 | SR 210×10 | 1 | GS26 |
| — | — | 22226 EAKE4 | 655 000 | H 3126 | SR 230×13 | 2 | GS26 |
| — | — | 23226 CKE4 | 700 000 | H 2326 | SR 230×10 | 1 | |
| — | — | 22326 CKE4 | 995 000 | H 2326 | SR 280×10 | 1 | GS26 |
| — | — | 23028 CDKE4 | 420 000 | H 3028 | SR 210×10 | 1 | GS28 |
| — | — | 23128 CKE4 | 580 000 | H 3128 | SR 225×10 | 1 | GS28 |
| — | — | 22228 CDKE4 | 645 000 | H 3128 | SR 250×15 | 2 | GS28 |
| — | — | 23228 CKE4 | 835 000 | H 2328 | SR 250×10 | 1 | |
| — | — | 22328 CKE4 | 1 160 000 | H 2328 | SR 300×10 | 1 | GS28 |
| — | — | 23030 CDKE4 | 470 000 | H 3030 | SR 225×10 | 1 | GS30 |
| — | — | 23130 CKE4 | 725 000 | H 3130 | SR 250×10 | 1 | GS30 |
| — | — | 22230 CDKE4 | 765 000 | H 3130 | SR 270×16.5 | 2 | GS30 |
| — | — | 23230 CKE4 | 975 000 | H 2330 | SR 270×10 | 1 | |
| — | — | 22330 CAKE4 | 1 220 000 | H 2330 | SR 320×10 | 1 | GS30 |
| — | — | 23032 CDKE4 | 540 000 | H 3032 | SR 240×10 | 1 | GS32 |
| — | — | 23132 CKE4 | 855 000 | H 3132 | SR 270×10 | 1 | GS32 |
| — | — | 22232 CDKE4 | 910 000 | H 3132 | SR 290×17 | 2 | GS32 |
| — | — | 23232 CKE4 | 1 100 000 | H 2332 | SR 290×10 | 1 | |
| — | — | 22332 CAKE4 | 1 360 000 | H 2332 | SR 340×10 | 1 | GS32 |

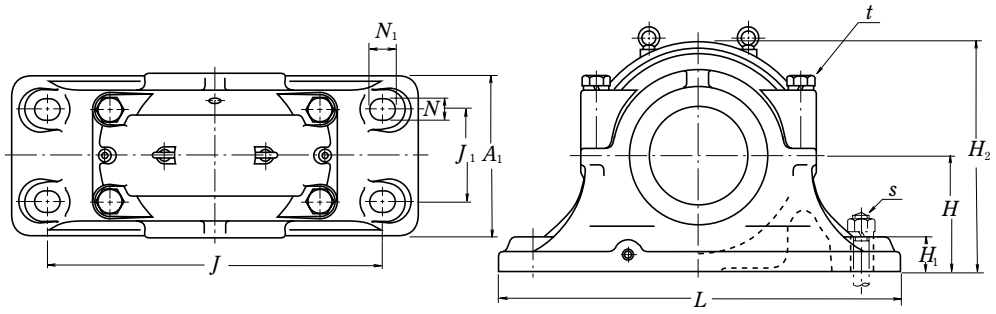
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter+locating ring".

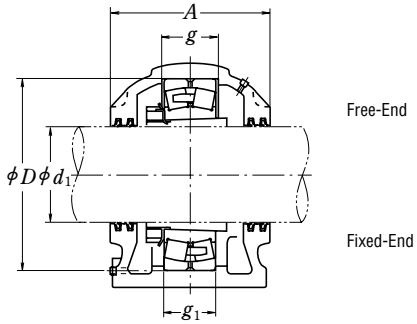
**Remarks** 1. The threads for plugs are R 1/4.
2. The bearing boxes for SN 524, SN 624, SN 3126, SN 3028, and over are provided with eye bolts.

**Notes** (2) The X dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.

(3) Applicable to the ZF Type with the same number.

## SD 30 S, SD 31 S, SD 5, SD 6 Types
## Shaft Diameter 150 – 260 mm




| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) Free-End | Fixed-End | Dimensions (mm) $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $J_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | SD 3034 S | SD 3034 SG | 260 | 160 | 450 | 36 | 46 | 230 | 540 | 200 | 50 | 315 | 110 |
| | SD 3134 S | SD 3134 SG | 280 | 170 | 470 | 36 | 46 | 250 | 560 | 220 | 50 | 335 | 120 |
| | SD 534 | SD 534 G | 310 | 180 | 510 | 36 | 46 | 270 | 620 | 250 | 60 | 360 | 140 |
| | SD 634 | SD 634 G | 360 | 210 | 610 | 36 | 46 | 300 | 740 | 290 | 65 | 420 | 170 |
| 160 | SD 3036 S | SD 3036 SG | 280 | 170 | 470 | 36 | 46 | 250 | 560 | 220 | 50 | 335 | 120 |
| | SD 3136 S | SD 3136 SG | 300 | 180 | 520 | 36 | 46 | 270 | 630 | 250 | 55 | 355 | 140 |
| | SD 536 | SD 536 G | 320 | 190 | 540 | 36 | 46 | 280 | 650 | 260 | 60 | 380 | 150 |
| | SD 636 | SD 636 G | 380 | 225 | 640 | 43 | 59 | 320 | 780 | 310 | 70 | 450 | 180 |
| 170 | SD 3038 S | SD 3038 SG | 290 | 170 | 470 | 36 | 46 | 250 | 560 | 220 | 50 | 340 | 120 |
| | SD 3138 S | SD 3138 SG | 320 | 190 | 560 | 36 | 46 | 290 | 680 | 270 | 55 | 385 | 140 |
| | SD 538 | SD 538 G | 340 | 200 | 570 | 36 | 46 | 290 | 700 | 280 | 65 | 400 | 160 |
| | SD 638 | SD 638 G | 400 | 240 | 680 | 43 | 59 | 330 | 820 | 320 | 70 | 475 | 190 |
| 180 | SD 3040 S | SD 3040 SG | 310 | 180 | 510 | 36 | 46 | 270 | 620 | 250 | 60 | 360 | 140 |
| | SD 3140 S | SD 3140 SG | 340 | 200 | 570 | 36 | 46 | 310 | 700 | 280 | 65 | 400 | 160 |
| | SD 540 | SD 540 G | 360 | 210 | 610 | 36 | 46 | 300 | 740 | 290 | 65 | 420 | 170 |
| | SD 640 | SD 640 G | 420 | 250 | 710 | 43 | 59 | 350 | 860 | 340 | 85 | 500 | 200 |
| 200 | SD 3044 S | SD 3044 SG | 340 | 200 | 570 | 36 | 46 | 290 | 700 | 280 | 65 | 400 | 160 |
| | SD 3144 S | SD 3144 SG | 370 | 225 | 640 | 43 | 59 | 320 | 780 | 310 | 70 | 445 | 180 |
| | SD 544 | SD 544 G | 400 | 240 | 680 | 43 | 59 | 330 | 820 | 320 | 70 | 475 | 190 |
| | SD 644 | SD 644 G | 460 | 280 | 770 | 43 | 59 | 360 | 920 | 350 | 85 | 550 | 210 |
| 220 | SD 3048 S | SD 3048 SG | 360 | 210 | 610 | 36 | 46 | 300 | 740 | 290 | 65 | 420 | 170 |
| | SD 3148 S | SD 3148 SG | 400 | 240 | 680 | 43 | 59 | 330 | 820 | 320 | 70 | 475 | 190 |
| | SD 548 | SD 548 G | 440 | 260 | 740 | 43 | 59 | 340 | 880 | 330 | 85 | 515 | 200 |
| | SD 648 | SD 648 G | 500 | 300 | 830 | 50 | 67 | 390 | 990 | 380 | 100 | 590 | 230 |
| 240 | SD 3052 S | SD 3052 SG | 400 | 240 | 680 | 43 | 59 | 340 | 820 | 320 | 70 | 475 | 190 |
| | SD 3152 S | SD 3152 SG | 440 | 260 | 740 | 43 | 59 | 360 | 880 | 350 | 85 | 515 | 200 |
| | SD 552 | SD 552 G | 480 | 280 | 790 | 43 | 59 | 370 | 940 | 360 | 85 | 560 | 210 |
| | SD 652 | SD 652 G | 540 | 325 | 890 | 50 | 67 | 410 | 1 060 | 400 | 100 | 640 | 250 |
| 260 | SD 3056 S | SD 3056 SG | 420 | 250 | 710 | 43 | 59 | 350 | 860 | 340 | 85 | 500 | 200 |
| | SD 3156 S | SD 3156 SG | 460 | 280 | 770 | 43 | 59 | 360 | 920 | 350 | 85 | 550 | 210 |
| | SD 556 | SD 556 G | 500 | 300 | 830 | 50 | 67 | 390 | 990 | 380 | 100 | 590 | 230 |
| | SD 656 | SD 656 G | 580 | 355 | 930 | 57 | 77 | 440 | 1 110 | 430 | 110 | 690 | 270 |

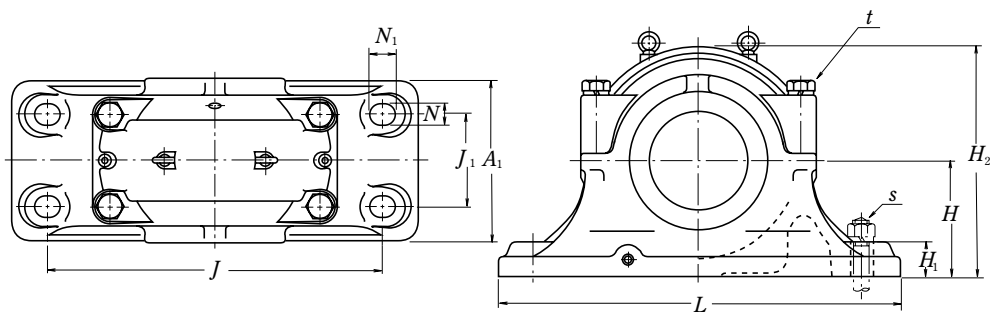
| $g$ H13 | $g_1$ H13 | $t$ nominal | $s$ nominal | Mass (kg) approx. | Applicable Parts Spherical Roller Bearing Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Adapter Numbers | Oil Seals (2) |
|---|---|---|---|---|---|---|---|---|
| 77 | 67 | M 24 | M 30 | 70 | 23034 CDKE4 | 640 000 | H 3034 | GS 34 |
| 98 | 88 | M 24 | M 30 | 75 | 23134 CKE4 | 940 000 | H 3134 | GS 34 |
| 96 | 86 | M 24 | M 30 | 100 | 22234 CDKE4 | 990 000 | H 3134 | GS 34 |
| 130 | 120 | M 30 | M 30 | 160 | 22334 CAKE4 | 1 580 000 | H 2334 | GS 34 |
| 84 | 74 | M 24 | M 30 | 79 | 23036 CDKE4 | 750 000 | H 3036 | GS 36 |
| 106 | 96 | M 24 | M 30 | 94 | 23136 CKE4 | 1 050 000 | H 3136 | GS 36 |
| 96 | 86 | M 24 | M 30 | 110 | 22236 CDKE4 | 1 020 000 | H 3136 | GS 36 |
| 136 | 126 | M 30 | M 36 | 195 | 22336 CAKE4 | 1 740 000 | H 2336 | GS 36 |
| 85 | 75 | M 24 | M 30 | 87 | 23038 CAKE4 | 775 000 | H 3038 | GS 38 |
| 114 | 104 | M 24 | M 30 | 110 | 23138 CKE4 | 1 190 000 | H 3138 | GS 38 |
| 102 | 92 | M 30 | M 30 | 130 | 22238 CAKE4 | 1 140 000 | H 3138 | GS 38 |
| 142 | 132 | M 30 | M 36 | 210 | 22338 CAKE4 | 1 890 000 | H 2338 | GS 38 |
| 92 | 82 | M 24 | M 30 | 100 | 23040 CAKE4 | 940 000 | H 3040 | GS 40 |
| 122 | 112 | M 30 | M 30 | 130 | 23140 CKE4 | 1 360 000 | H 3140 | GS 40 |
| 108 | 98 | M 30 | M 30 | 155 | 22240 CAKE4 | 1 300 000 | H 3140 | GS 40 |
| 148 | 138 | M 36 | M 36 | 240 | 22340 CAKE4 | 2 000 000 | H 2340 | GS 40 |
| 100 | 90 | M 30 | M 30 | 130 | 23044 CAKE4 | 1 090 000 | H 3044 | GS 44 |
| 130 | 120 | M 30 | M 36 | 180 | 23144 CKE4 | 1 570 000 | H 3144 | GS 44 |
| 118 | 108 | M 30 | M 36 | 205 | 22244 CAKE4 | 1 570 000 | H 3144 | GS 44 |
| 155 | 145 | M 36 | M 36 | 315 | 22344 CAKE4 | 2 350 000 | H 2344 | GS 44 |
| 102 | 92 | M 30 | M 30 | 160 | 23048 CAKE4 | 1 160 000 | H 3048 | GS 48 |
| 138 | 128 | M 30 | M 36 | 210 | 23148 CKE4 | 1 790 000 | H 3148 | GS 48 |
| 130 | 120 | M 36 | M 36 | 240 | 22248 CAKE4 | 1 870 000 | H 3148 | GS 48 |
| 165 | 155 | M 36 | M 42 | 405 | 22348 CAKE4 | 2 600 000 | H 2348 | GS 48 |
| 114 | 104 | M 30 | M 36 | 210 | 23052 CAKE4 | 1 430 000 | H 3052 | GS 52 |
| 154 | 144 | M 36 | M 36 | 240 | 23152 CAKE4 | 2 160 000 | H 3152 | GS 52 |
| 140 | 130 | M 36 | M 36 | 315 | 22252 CAKE4 | 2 180 000 | H 3152 | GS 52 |
| 175 | 165 | M 36 | M 42 | 480 | 22352 CAKE4 | 3 100 000 | H 2352 | GS 52 |
| 116 | 106 | M 36 | M 36 | 240 | 23056 CAKE4 | 1 540 000 | H 3056 | GS 56 |
| 156 | 146 | M 36 | M 36 | 315 | 23156 CAKE4 | 2 230 000 | H 3156 | GS 56 |
| 140 | 130 | M 36 | M 42 | 390 | 22256 CAKE4 | 2 280 000 | H 3156 | GS 56 |
| 185 | 175 | M 42 | M 48 | 610 | 22356 CAKE4 | 3 500 000 | H 2356 | GS 56 |

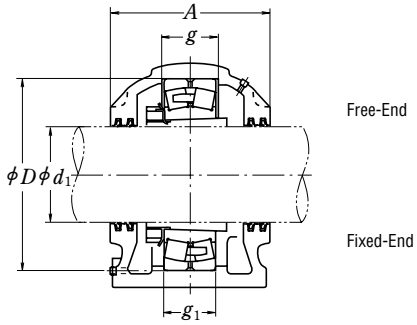
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter".

**Remarks** 1. The threads for oil replenishing hole plugs are R 1/4 and those for drain plugs are R 3/8.
2. The plummer block bearing boxes listed above are provided with eye bolts.

**Note** (2) Applicable to the ZF Type with the same number.

## SD 30 S, SD 31 S, SD 5 Types
## Shaft Diameter 280 – 450 mm




| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) Free-End | Fixed-End | Dimensions (mm) $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $J_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **280** | **SD 3060 S** | **SD 3060 SG** | 460 | 280 | 770 | 43 | 59 | 360 | 920 | 350 | 85 | 550 | 210 |
| | **SD 3160 S** | **SD 3160 SG** | 500 | 300 | 830 | 50 | 67 | 390 | 990 | 380 | 100 | 590 | 230 |
| | **SD 560** | **SD 560 G** | 540 | 325 | 890 | 50 | 67 | 410 | 1 060 | 400 | 100 | 640 | 250 |
| **300** | **SD 3064 S** | **SD 3064 SG** | 480 | 280 | 790 | 43 | 59 | 380 | 940 | 360 | 85 | 560 | 210 |
| | **SD 3164 S** | **SD 3164 SG** | 540 | 325 | 890 | 50 | 67 | 430 | 1 060 | 400 | 100 | 640 | 250 |
| | **SD 564** | **SD 564 G** | 580 | 355 | 930 | 57 | 77 | 440 | 1 110 | 430 | 110 | 690 | 270 |
| **320** | **SD 3068 S** | **SD 3068 SG** | 520 | 310 | 860 | 50 | 67 | 400 | 1 020 | 370 | 100 | 615 | 230 |
| | **SD 3168 S** | **SD 3168 SG** | 580 | 355 | 930 | 57 | 77 | 470 | 1 110 | 450 | 110 | 690 | 270 |
| **340** | **SD 3072 S** | **SD 3072 SG** | 540 | 325 | 890 | 50 | 67 | 410 | 1 060 | 390 | 100 | 640 | 250 |
| | **SD 3172 S** | **SD 3172 SG** | 600 | 365 | 960 | 57 | 77 | 470 | 1 140 | 460 | 120 | 710 | 310 |
| **360** | **SD 3076 S** | **SD 3076 SG** | 560 | 340 | 900 | 50 | 67 | 410 | 1 080 | 390 | 100 | 665 | 260 |
| | **SD 3176 S** | **SD 3176 SG** | 620 | 375 | 980 | 57 | 77 | 500 | 1 160 | 490 | 120 | 735 | 320 |
| **380** | **SD 3080 S** | **SD 3080 SG** | 600 | 365 | 960 | 57 | 77 | 430 | 1 140 | 420 | 120 | 710 | 270 |
| | **SD 3180 S** | **SD 3180 SG** | 650 | 390 | 1 040 | 57 | 77 | 520 | 1 220 | 510 | 125 | 765 | 340 |
| **400** | **SD 3084 S** | **SD 3084 SG** | 620 | 375 | 980 | 57 | 77 | 430 | 1 160 | 420 | 120 | 735 | 270 |
| | **SD 3184 S** | **SD 3184 SG** | 700 | 420 | 1 070 | 57 | 77 | 560 | 1 250 | 550 | 135 | 830 | 380 |
| **410** | **SD 3088 S** | **SD 3088 SG** | 650 | 390 | 1 040 | 57 | 77 | 460 | 1 220 | 450 | 125 | 765 | 280 |
| **430** | **SD 3092 S** | **SD 3092 SG** | 680 | 405 | 1 040 | 57 | 77 | 470 | 1 220 | 460 | 130 | 790 | 310 |
| **450** | **SD 3096 S** | **SD 3096 SG** | 700 | 415 | 1 100 | 57 | 77 | 485 | 1 280 | 470 | 130 | 820 | 320 |

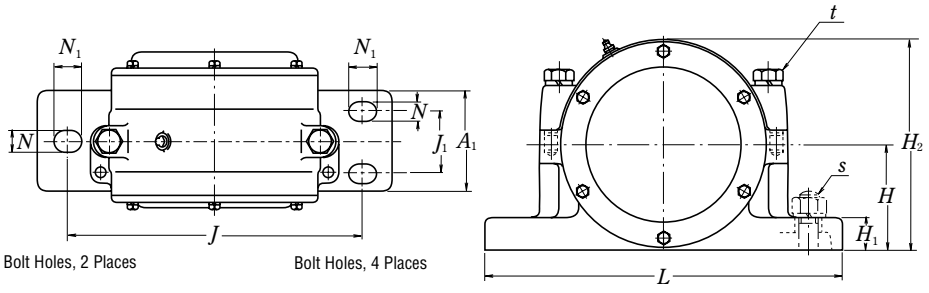
| $g$ H13 | $g_1$ H13 | $t$ nominal | $s$ nominal | Mass (kg) approx. | Applicable Parts Spherical Roller Bearing Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Adapter Numbers | Oil Seals (2) |
|---|---|---|---|---|---|---|---|---|
| 128 | 118 | M 36 | M 36 | 300 | 23060 CAKE4 | 1 920 000 | H 3060 | GS 60 |
| 170 | 160 | M 36 | M 42 | 405 | 23160 CAKE4 | 2 670 000 | H 3160 | GS 60 |
| 150 | 140 | M 36 | M 42 | 465 | 22260 CAKE4 | 2 610 000 | H 3160 | GS 60 |
| 131 | 121 | M 36 | M 36 | 320 | 23064 CAKE4 | 1 960 000 | H 3064 | GS 64 |
| 186 | 176 | M 36 | M 42 | 480 | 23164 CAKE4 | 3 050 000 | H 3164 | GS 64 |
| 160 | 150 | M 42 | M 48 | 595 | 22264 CAKE4 | 2 990 000 | H 3164 | GS 64 |
| 143 | 133 | M 36 | M 42 | 410 | 23068 CAKE4 | 2 280 000 | H 3068 | GS 68 |
| 200 | 190 | M 42 | M 48 | 650 | 23168 CAKE4 | 3 600 000 | H 3168 | GS 68 |
| 144 | 134 | M 36 | M 42 | 465 | 23072 CAKE4 | 2 390 000 | H 3072 | GS 72 |
| 202 | 192 | M 42 | M 48 | 700 | 23172 CAKE4 | 3 800 000 | H 3172 | GS 72 |
| 145 | 135 | M 36 | M 42 | 480 | 23076 CAKE4 | 2 500 000 | H 3076 | GS 76 |
| 204 | 194 | M 42 | M 48 | 940 | 23176 CAKE4 | 4 000 000 | H 3176 | GS 76 |
| 158 | 148 | M 42 | M 48 | 690 | 23080 CAKE4 | 2 970 000 | H 3080 | GS 80 |
| 210 | 200 | M 42 | M 48 | 1 040 | 23180 CAKE4 | 4 150 000 | H 3180 | GS 80 |
| 160 | 150 | M 42 | M 48 | 770 | 23084 CAKE4 | 2 910 000 | H 3084 | GS 84 |
| 234 | 224 | M 48 | M 48 | 1 150 | 23184 CAKE4 | 5 000 000 | H 3184 | GS 84 |
| 167 | 157 | M 42 | M 48 | 870 | 23088 CAKE4 | 3 150 000 | H 3088 | GS 88 |
| 173 | 163 | M 48 | M 48 | 940 | 23092 CAKE4 | 3 450 000 | H 3092 | GS 92 |
| 175 | 165 | M 48 | M 48 | 1 040 | 23096 CAKE4 | 3 800 000 | H 3096 | GS 96 |

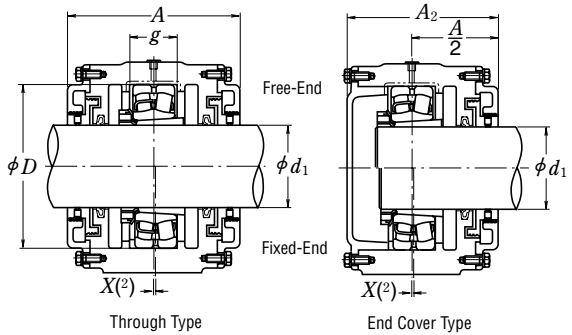
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter".

**Remarks** 1. The threads for oil replenishing hole plugs are R 1/4 and those for drain plugs are R 3/8.
2. The plummer block bearing boxes listed above are provided with eye bolts.

**Note** (2) Applicable to the ZF Type with the same number.

## SG 5, SG 5-0 Types
## Shaft Diameter 50 – 180 mm




| Shaft Diameter (mm) $d_1$ | Plummer Block Bearing Box Numbers (1) | | Dimensions (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Through Type | End Cover Type | $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $J_1$ | $A_2$ | $g$ H13 |
| **50** | **SG 511** | **SG 511-0** | 100 | 70 | 210 | 18 | 23 | 125 | 255 | 70 | 23 | 137 | — | 112.5 | 29 |
| **55** | **SG 512** | **SG 512-0** | 110 | 80 | 230 | 18 | 23 | 145 | 290 | 80 | 25 | 160 | — | 135 | 32 |
| **60** | **SG 513** | **SG 513-0** | 120 | 83 | 230 | 18 | 23 | 130 | 290 | 70 | 25 | 155 | — | 115 | 36 |
| **65** | **SG 515** | **SG 515-0** | 130 | 90 | 230 | 18 | 23 | 135 | 290 | 80 | 25 | 168 | — | 120 | 36 |
| **70** | **SG 516** | **SG 516-0** | 140 | 95 | 270 | 22 | 27 | 165 | 340 | 120 | 30 | 180 | 70 | 155 | 38 |
| **75** | **SG 517** | **SG 517-0** | 150 | 100 | 280 | 22 | 27 | 170 | 350 | 120 | 30 | 190 | 70 | 160 | 41 |
| **80** | **SG 518** | **SG 518-0** | 160 | 100 | 290 | 22 | 27 | 180 | 360 | 120 | 35 | 200 | 70 | 170 | 45 |
| **90** | **SG 520** | **SG 520-0** | 180 | 125 | 340 | 22 | 27 | 200 | 410 | 130 | 35 | 240 | 70 | 185 | 51 |
| **100** | **SG 522** | **SG 522-0** | 200 | 140 | 380 | 22 | 27 | 210 | 460 | 130 | 40 | 265 | 70 | 190 | 58 |
| **110** | **SG 524** | **SG 524-0** | 215 | 140 | 380 | 22 | 27 | 230 | 460 | 130 | 45 | 275 | 80 | 200 | 63 |
| **115** | **SG 526** | **SG 526-0** | 230 | 150 | 410 | 26 | 32 | 240 | 490 | 160 | 45 | 295 | 80 | 220 | 69 |
| **125** | **SG 528** | **SG 528-0** | 250 | 160 | 435 | 26 | 32 | 245 | 520 | 160 | 50 | 310 | 80 | 220 | 73 |
| **135** | **SG 530** | **SG 530-0** | 270 | 160 | 465 | 26 | 32 | 265 | 550 | 170 | 50 | 330 | 100 | 240 | 78 |
| **140** | **SG 532** | **SG 532-0** | 290 | 170 | 490 | 26 | 32 | 285 | 580 | 170 | 50 | 350 | 100 | 250 | 85 |
| **150** | **SG 534** | **SG 534-0** | 310 | 180 | 550 | 33 | 42 | 300 | 640 | 180 | 55 | 380 | 100 | 265 | 91 |
| **160** | **SG 536** | **SG 536-0** | 320 | 190 | 600 | 33 | 42 | 325 | 690 | 190 | 55 | 400 | 110 | 285 | 91 |
| **170** | **SG 538** | **SG 538-0** | 340 | 200 | 620 | 42 | 52 | 340 | 730 | 200 | 60 | 420 | 120 | 295 | 97 |
| **180** | **SG 540** | **SG 540-0** | 360 | 210 | 635 | 42 | 52 | 350 | 750 | 210 | 60 | 445 | 130 | 310 | 103 |

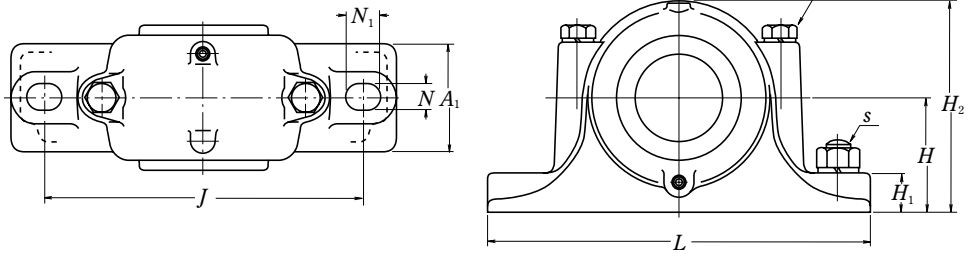
| $t$ nominal | $s$ nominal | Mass (kg) approx. Through Type | Mass (kg) approx. End Cover Type | Applicable Parts: Spherical Roller Bearing Numbers | Spherical Roller Bearing Basic Dynamic Load Ratings $C_r$ (N) | Adapter Numbers | Locating Ring Nominal (Outside Dia.×Width) | Locating Ring Q'ty | Oil Seals (3) |
|---|---|---|---|---|---|---|---|---|---|
| M 12 | M 16 | 8.5 | 7.5 | 22211 EAKE4 | 119 000 | H 311 X | SR 100×4 | 1 | GS 11 |
| M 16 | M 16 | 15 | 14 | 22212 EAKE4 | 142 000 | H 312 X | SR 110×4 | 1 | GS 12 |
| M 16 | M 16 | 9.5 | 8.5 | 22213 EAKE4 | 177 000 | H 313 X | SR 120×5 | 1 | GS 13 |
| M 16 | M 16 | 12.5 | 11 | 22215 EAKE4 | 190 000 | H 315 X | SR 130×5 | 1 | GS 15 |
| M 20 | M 20 | 18.5 | 17 | 22216 EAKE4 | 212 000 | H 316 X | SR 140×5 | 1 | GS 16 |
| M 20 | M 20 | 21 | 20 | 22217 EAKE4 | 250 000 | H 317 X | SR 150×5 | 1 | GS 17 |
| M 20 | M 20 | 25 | 23 | 22218 EAKE4 | 289 000 | H 318 X | SR 160×5 | 1 | GS 18 |
| M 20 | M 20 | 37 | 34 | 22220 EAKE4 | 365 000 | H 320 X | SR 180×5 | 1 | GS 20 |
| M 20 | M 20 | 50 | 45 | 22222 EAKE4 | 485 000 | H 322 X | SR 200×5 | 1 | GS 22 |
| M 20 | M 20 | 59 | 53 | 22224 EAKE4 | 550 000 | H 3124 | SR 215×5 | 1 | GS 24 |
| M 24 | M 24 | 67 | 62 | 22226 EAKE4 | 655 000 | H 3126 | SR 230×5 | 1 | GS 26 |
| M 24 | M 24 | 73 | 68 | 22228 CDKE4 | 645 000 | H 3128 | SR 250×5 | 1 | GS 28 |
| M 24 | M 24 | 90 | 80 | 22230 CDKE4 | 765 000 | H 3130 | SR 270×5 | 1 | GS 30 |
| M 24 | M 24 | 105 | 92 | 22232 CDKE4 | 910 000 | H 3132 | SR 290×5 | 1 | GS 32 |
| M 30 | M 30 | 130 | 115 | 22234 CDKE4 | 990 000 | H 3134 | SR 310×5 | 1 | GS 34 |
| M 30 | M 30 | 155 | 135 | 22236 CDKE4 | 1 020 000 | H 3136 | SR 320×5 | 1 | GS 36 |
| M 36 | M 36 | 175 | 155 | 22238 CAKE4 | 1 140 000 | H 3138 | SR 340×5 | 1 | GS 38 |
| M 36 | M 36 | 210 | 180 | 22240 CAKE4 | 1 300 000 | H 3140 | SR 360×5 | 1 | GS 40 |

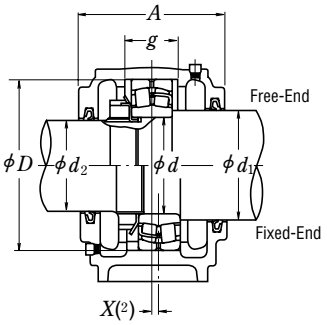
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+adapter+locating ring".

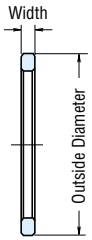
**Remarks** 1. The threads for grease nipples are R 1/8 for SG518 and under, and R 1/4 for SG520 and over.
2. Bearing boxes larger than SG520 are provided with eye bolts.

**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of plummer block bearing box, and it is 1/2 of the locating ring width.
(3) Applicable to the ZF Type with the same number.

## SN 2 C, SN 3 C Types
## Shaft Diameter 25 – 55 mm




Locating Ring

| Shaft Diameter (mm) $d$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $d_1$ | $d_2$ | $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **25** | **SN 205 C** | 30 | 20 | 52 | 40 | 130 | 15 | 20 | 67 | 165 | 46 | 22 | 75 | 25 | M 8 | M 12 |
| | **SN 305 C** | 30 | 20 | 62 | 50 | 150 | 15 | 20 | 80 | 185 | 52 | 22 | 90 | 34 | M 8 | M 12 |
| **30** | **SN 206 C** | 35 | 25 | 62 | 50 | 150 | 15 | 20 | 77 | 185 | 52 | 22 | 90 | 30 | M 8 | M 12 |
| | **SN 306 C** | 35 | 25 | 72 | 50 | 150 | 15 | 20 | 82 | 185 | 52 | 22 | 95 | 37 | M 10 | M 12 |
| **35** | **SN 207 C** | 45 | 30 | 72 | 50 | 150 | 15 | 20 | 82 | 185 | 52 | 22 | 95 | 33 | M 10 | M 12 |
| | **SN 307 C** | 45 | 30 | 80 | 60 | 170 | 15 | 20 | 90 | 205 | 60 | 25 | 110 | 41 | M 10 | M 12 |
| **40** | **SN 208 C** | 50 | 35 | 80 | 60 | 170 | 15 | 20 | 85 | 205 | 60 | 25 | 110 | 33 | M 10 | M 12 |
| | **SN 308 C** | 50 | 35 | 90 | 60 | 170 | 15 | 20 | 95 | 205 | 60 | 25 | 115 | 43 | M 10 | M 12 |
| **45** | **SN 209 C** | 55 | 40 | 85 | 60 | 170 | 15 | 20 | 85 | 205 | 60 | 25 | 112 | 31 | M 10 | M 12 |
| | **SN 309 C** | 55 | 40 | 100 | 70 | 210 | 18 | 23 | 105 | 255 | 70 | 28 | 130 | 46 | M 12 | M 16 |
| **50** | **SN 210 C** | 60 | 45 | 90 | 60 | 170 | 15 | 20 | 90 | 205 | 60 | 25 | 115 | 33 | M 10 | M 12 |
| | **SN 310 C** | 60 | 45 | 110 | 70 | 210 | 18 | 23 | 115 | 255 | 70 | 30 | 135 | 50 | M 12 | M 16 |
| **55** | **SN 211 C** | 65 | 50 | 100 | 70 | 210 | 18 | 23 | 95 | 255 | 70 | 28 | 130 | 33 | M 12 | M 16 |
| | **SN 311 C** | 65 | 50 | 120 | 80 | 230 | 18 | 23 | 120 | 275 | 80 | 30 | 150 | 53 | M 12 | M 16 |

| Mass (kg) approx. | Applicable Parts: Self-Aligning Ball Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Spherical Roller Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Nut Numbers | Washer Numbers | Locating Ring Nominal (Outside Dia.×Width) | Q'ty | Oil Seals (3) Side $d_1$ | Side $d_2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 | 1205 | 12 200 | — | — | AN 05 | AW 05X | SR 52× 5 | 2 | GS 7 | GS 5 |
| | 2205 | 12 400 | 22205 CE4 | 37 500 | AN 05 | AW 05X | SR 52× 7 | 1 | | |
| 1.6 | 1305 | 18 200 | 21305 CDE4 | 43 000 | AN 05 | AW 05X | SR 62× 8.5 | 2 | GS 7 | GS 5 |
| | 2305 | 24 900 | — | — | AN 05 | AW 05X | SR 62×10 | 1 | | |
| 1.7 | 1206 | 15 800 | — | — | AN 06 | AW 06X | SR 62× 7 | 2 | GS 8 | GS 6 |
| | 2206 | 15 300 | 22206 CE4 | 50 000 | AN 06 | AW 06X | SR 62×10 | 1 | | |
| 1.8 | 1306 | 21 400 | 21306 CDE4 | 55 000 | AN 06 | AW 06X | SR 72× 9 | 2 | GS 8 | GS 6 |
| | 2306 | 32 000 | — | — | AN 06 | AW 06X | SR 72×10 | 1 | | |
| 1.9 | 1207 | 15 900 | — | — | AN 07 | AW 07X | SR 72× 8 | 2 | GS 10 | GS 7 |
| | 2207 | 21 700 | 22207 CE4 | 69 000 | AN 07 | AW 07X | SR 72×10 | 1 | | |
| 2.6 | 1307 | 25 300 | 21307 CDE4 | 71 500 | AN 07 | AW 07X | SR 80×10 | 2 | GS 10 | GS 7 |
| | 2307 | 40 000 | — | — | AN 07 | AW 07X | SR 80×10 | 1 | | |
| 2.6 | 1208 | 19 300 | — | — | AN 08 | AW 08X | SR 80× 7.5 | 2 | GS 11 | GS 8 |
| | 2208 | 22 400 | 22208 EAE4 | 90 500 | AN 08 | AW 08X | SR 80×10 | 1 | | |
| 2.9 | 1308 | 29 800 | 21308 EAE4 | 94 500 | AN 08 | AW 08X | SR 90×10 | 2 | GS 11 | GS 8 |
| | 2308 | 45 500 | 22308 EAE4 | 136 000 | AN 08 | AW 08X | SR 90×10 | 1 | | |
| 2.8 | 1209 | 22 000 | — | — | AN 09 | AW 09X | SR 85× 6 | 2 | GS 12 | GS 9 |
| | 2209 | 23 300 | 22209 EAE4 | 94 500 | AN 09 | AW 09X | SR 85× 8 | 1 | | |
| 4.1 | 1309 | 38 500 | 21309 EAE4 | 119 000 | AN 09 | AW 09X | SR 100×10.5 | 2 | GS 12 | GS 9 |
| | 2309 | 55 000 | 22309 EAE4 | 166 000 | AN 09 | AW 09X | SR 100×10 | 1 | | |
| 3.0 | 1210 | 22 800 | — | — | AN 10 | AW 10X | SR 90× 6.5 | 2 | GS 13 | GS 10 |
| | 2210 | 23 400 | 22210 EAE4 | 99 000 | AN 10 | AW 10X | SR 90×10 | 1 | | |
| 4.7 | 1310 | 43 500 | 21310 EAE4 | 142 000 | AN 10 | AW 10X | SR 110×11.5 | 2 | GS 13 | GS 10 |
| | 2310 | 65 000 | 22310 EAE4 | 197 000 | AN 10 | AW 10X | SR 110×10 | 1 | | |
| 4.5 | 1211 | 26 900 | — | — | AN 11 | AW 11X | SR 100× 6 | 2 | GS 15 | GS 11 |
| | 2211 | 26 700 | 22211 EAE4 | 119 000 | AN 11 | AW 11X | SR 100× 8 | 1 | | |
| 5.8 | 1311 | 51 500 | 21311 EAE4 | 142 000 | AN 11 | AW 11X | SR 120×12 | 2 | GS 15 | GS 11 |
| | 2311 | 76 500 | 22311 EAE4 | 234 000 | AN 11 | AW 11X | SR 120×10 | 1 | | |

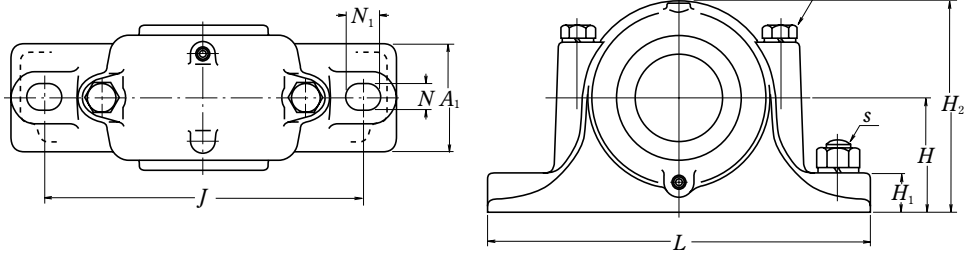
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+nut+washer+locating ring".

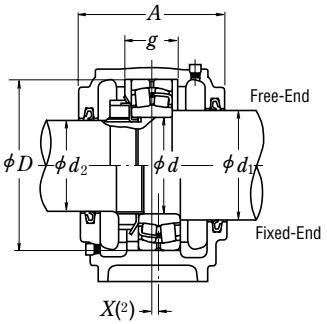
**Remarks** The threads for plugs are R 1/8.

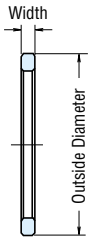
**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.

(3) Applicable to the ZF Type with the same number. (4) B. D. L. R. : Basic Dynamic Load Ratings

## SN 2 C, SN 3 C Types
## Shaft Diameter 60 – 90 mm




Locating Ring

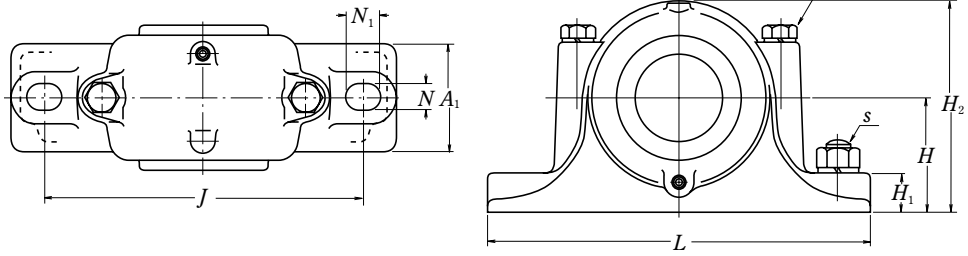
| Shaft Diameter (mm) $d$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $d_1$ | $d_2$ | $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **60** | **SN 212 C** | 70 | 55 | 110 | 70 | 210 | 18 | 23 | 105 | 255 | 70 | 30 | 135 | 38 | M 12 | M 16 |
| | **SN 312 C** | 70 | 55 | 130 | 80 | 230 | 18 | 23 | 125 | 280 | 80 | 30 | 155 | 56 | M 12 | M 16 |
| **65** | **SN 213 C** | 75 | 60 | 120 | 80 | 230 | 18 | 23 | 110 | 275 | 80 | 30 | 150 | 43 | M 12 | M 16 |
| | **SN 313 C** | 75 | 60 | 140 | 95 | 260 | 22 | 27 | 130 | 315 | 90 | 32 | 175 | 58 | M 16 | M 20 |
| **70** | **SN 214 C** | 80 | 65 | 125 | 80 | 230 | 18 | 23 | 115 | 275 | 80 | 30 | 155 | 44 | M 12 | M 16 |
| | **SN 314 C** | 80 | 65 | 150 | 95 | 260 | 22 | 27 | 130 | 320 | 90 | 32 | 185 | 61 | M 16 | M 20 |
| **75** | **SN 215 C** | 85 | 70 | 130 | 80 | 230 | 18 | 23 | 115 | 280 | 80 | 30 | 155 | 41 | M 12 | M 16 |
| | **SN 315 C** | 85 | 70 | 160 | 100 | 290 | 22 | 27 | 140 | 345 | 100 | 35 | 195 | 65 | M 16 | M 20 |
| **80** | **SN 216 C** | 90 | 75 | 140 | 95 | 260 | 22 | 27 | 120 | 315 | 90 | 32 | 175 | 43 | M 16 | M 20 |
| | **SN 316 C** | 90 | 75 | 170 | 112 | 290 | 22 | 27 | 145 | 345 | 100 | 35 | 212 | 68 | M 16 | M 20 |
| **85** | **SN 217 C** | 95 | 80 | 150 | 95 | 260 | 22 | 27 | 125 | 320 | 90 | 32 | 185 | 46 | M 16 | M 20 |
| | **SN 317 C** | 95 | 80 | 180 | 112 | 320 | 26 | 32 | 155 | 380 | 110 | 40 | 218 | 70 | M 20 | M 24 |
| **90** | **SN 218 C** | 100 | 85 | 160 | 100 | 290 | 22 | 27 | 145 | 345 | 100 | 35 | 195 | 62.4 | M 16 | M 20 |
| | **SN 318 C** | 105 | 85 | 190 | 112 | 320 | 26 | 32 | 160 | 380 | 110 | 40 | 225 | 74 | M 20 | M 24 |

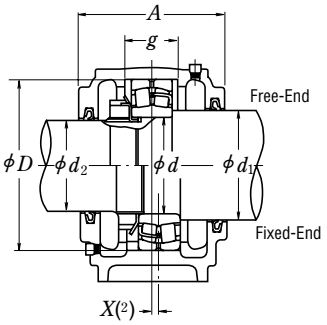
| Mass (kg) approx. | Applicable Parts: Self-Aligning Ball Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Spherical Roller Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Nut Numbers | Washer Numbers | Locating Ring Nominal (Outside Dia.×Width) | Q'ty | Oil Seals (3) Side $d_1$ | Side $d_2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 1212 | 30 500 | — | — | AN 12 | AW 12X | SR 110× 8 | 2 | GS 16 | GS 12 |
| | 2212 | 34 000 | 22212 EAE4 | 142 000 | AN 12 | AW 12X | SR 110×10 | 1 | | |
| 6.5 | 1312 | 57 500 | 21312 EAE4 | 190 000 | AN 12 | AW 12X | SR 130×12.5 | 2 | GS 16 | GS 12 |
| | 2312 | 88 500 | 22312 EAE4 | 271 000 | AN 12 | AW 12X | SR 130×10 | 1 | | |
| 5.6 | 1213 | 31 000 | — | — | AN 13 | AW 13X | SR 120×10 | 2 | GS 17 | GS 13 |
| | 2213 | 43 500 | 22213 EAE4 | 177 000 | AN 13 | AW 13X | SR 120×12 | 1 | | |
| 8.7 | 1313 | 62 500 | 21313 EAE4 | 212 000 | AN 13 | AW 13X | SR 140×12.5 | 2 | GS 17 | GS 13 |
| | 2313 | 97 000 | 22313 EAE4 | 300 000 | AN 13 | AW 13X | SR 140×10 | 1 | | |
| 6.2 | 1214 | 35 000 | — | — | AN 14 | AW 14X | SR 125×10 | 2 | GS 18 | GS 15 |
| | 2214 | 44 000 | 22214 EAE4 | 180 000 | AN 14 | AW 14X | SR 125×13 | 1 | | |
| 10 | 1314 | 65 000 | 21314 EAE4 | 250 000 | AN 14 | AW 14X | SR 150×13 | 2 | GS 18 | GS 15 |
| | 2314 | 111 000 | 22314 EAE4 | 340 000 | AN 14 | AW 14X | SR 150×10 | 1 | | |
| 7.0 | 1215 | 39 000 | — | — | AN 15 | AW 15X | SR 130× 8 | 2 | GS 19 | GS 16 |
| | 2215 | 44 500 | 22215 EAE4 | 190 000 | AN 15 | AW 15X | SR 130×10 | 1 | | |
| 11.3 | 1315 | 80 000 | 21315 EAE4 | 250 000 | AN 15 | AW 15X | SR 160×14 | 2 | GS 19 | GS 16 |
| | 2315 | 125 000 | 22315 EAE4 | 390 000 | AN 15 | AW 15X | SR 160×10 | 1 | | |
| 9.0 | 1216 | 40 000 | — | — | AN 16 | AW 16X | SR 140× 8.5 | 2 | GS 20 | GS 17 |
| | 2216 | 49 000 | 22216 EAE4 | 212 000 | AN 16 | AW 16X | SR 140×10 | 1 | | |
| 12.6 | 1316 | 89 000 | 21316 EAE4 | 284 000 | AN 16 | AW 16X | SR 170×14.5 | 2 | GS 20 | GS 17 |
| | 2316 | 130 000 | 22316 EAE4 | 435 000 | AN 16 | AW 16X | SR 170×10 | 1 | | |
| 10 | 1217 | 49 500 | — | — | AN 17 | AW 17X | SR 150× 9 | 2 | GS 21 | GS 18 |
| | 2217 | 58 500 | 22217 EAE4 | 250 000 | AN 17 | AW 17X | SR 150×10 | 1 | | |
| 15 | 1317 | 98 500 | 21317 EAE4 | 289 000 | AN 17 | AW 17X | SR 180×14.5 | 2 | GS 21 | GS 18 |
| | 2317 | 142 000 | 22317 EAE4 | 480 000 | AN 17 | AW 17X | SR 180×10 | 1 | | |
| 13 | 1218 | 57 500 | — | — | AN 18 | AW 18X | SR 160×16.2 | 2 | GS 22 | GS 19 |
| | 2218 | 70 500 | 22218 EAE4 | 289 000 | AN 18 | AW 18X | SR 160×11.2 | 2 | | |
| | — | — | 23218 CE4 | 340 000 | AN 18 | AW 18X | SR 160×10 | 1 | | |
| 19 | 1318 | 117 000 | 21318 EAE4 | 330 000 | AN 18 | AW 18X | SR 190×15.5 | 2 | GS 23 | GS 19 |
| | 2318 | 154 000 | 22318 EAE4 | 535 000 | AN 18 | AW 18X | SR 190×10 | 1 | | |

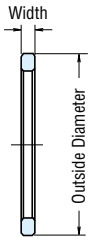
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+nut+washer+locating ring".
**Remarks** The threads for plugs are R 1/8 for SN316C, SN218C, and under and R 1/4 for SN317C and over.

**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.
(3) Applicable to the ZF Type with the same number. (4) B. D. L. R. : Basic Dynamic Load Ratings

## SN 2 C, SN 3 C Types
## Shaft Diameter 95 – 160 mm




Locating Ring

| Shaft Diameter (mm) $d$ | Plummer Block Bearing Box Numbers (1) | Dimensions (mm) $d_1$ | $d_2$ | $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $g$ H13 | $t$ nominal | $s$ nominal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **95** | **SN 219 C** | 110 | 90 | 170 | 112 | 290 | 22 | 27 | 140 | 345 | 100 | 35 | 210 | 53 | M 16 | M 20 |
| | **SN 319 C** | 110 | 90 | 200 | 125 | 350 | 26 | 32 | 170 | 410 | 120 | 45 | 245 | 77 | M 20 | M 24 |
| **100** | **SN 220 C** | 115 | 95 | 180 | 112 | 320 | 26 | 32 | 160 | 380 | 110 | 40 | 218 | 70.3 | M 20 | M 24 |
| | **SN 320 C** | 115 | 95 | 215 | 140 | 350 | 26 | 32 | 175 | 410 | 120 | 45 | 270 | 83 | M 20 | M 24 |
| **110** | **SN 222 C** | 125 | 105 | 200 | 125 | 350 | 26 | 32 | 175 | 410 | 120 | 45 | 240 | 80 | M 20 | M 24 |
| | **SN 322 C** | 125 | 105 | 240 | 150 | 390 | 28 | 36 | 190 | 450 | 130 | 50 | 300 | 90 | M 24 | M 24 |
| **120** | **SN 224 C** | 135 | 115 | 215 | 140 | 350 | 26 | 32 | 185 | 410 | 120 | 45 | 270 | 86 | M 20 | M 24 |
| | **SN 324 C** | 135 | 115 | 260 | 160 | 450 | 33 | 42 | 200 | 530 | 160 | 60 | 320 | 96 | M 24 | M 30 |
| **130** | **SN 226 C** | 145 | 125 | 230 | 150 | 380 | 28 | 36 | 190 | 445 | 130 | 50 | 290 | 90 | M 24 | M 24 |
| | **SN 326 C** | 150 | 125 | 280 | 170 | 470 | 33 | 42 | 210 | 550 | 160 | 60 | 340 | 103 | M 24 | M 30 |
| **140** | **SN 228 C** | 155 | 135 | 250 | 150 | 420 | 33 | 42 | 205 | 500 | 150 | 50 | 305 | 98 | M 24 | M 30 |
| | **SN 328 C** | 160 | 135 | 300 | 180 | 520 | 35 | 45 | 235 | 610 | 170 | 65 | 365 | 112 | M 30 | M 30 |
| **150** | **SN 230 C** | 165 | 145 | 270 | 160 | 450 | 33 | 42 | 220 | 530 | 160 | 60 | 325 | 106 | M 24 | M 30 |
| | **SN 330 C** | 170 | 145 | 320 | 190 | 560 | 35 | 45 | 245 | 650 | 180 | 65 | 385 | 118 | M 30 | M 30 |
| **160** | **SN 232 C** | 175 | 150 | 290 | 170 | 470 | 33 | 42 | 235 | 550 | 160 | 60 | 345 | 114 | M 24 | M 30 |
| | **SN 332 C** | 180 | 150 | 340 | 200 | 580 | 42 | 50 | 255 | 680 | 190 | 70 | 405 | 124 | M 30 | M 36 |

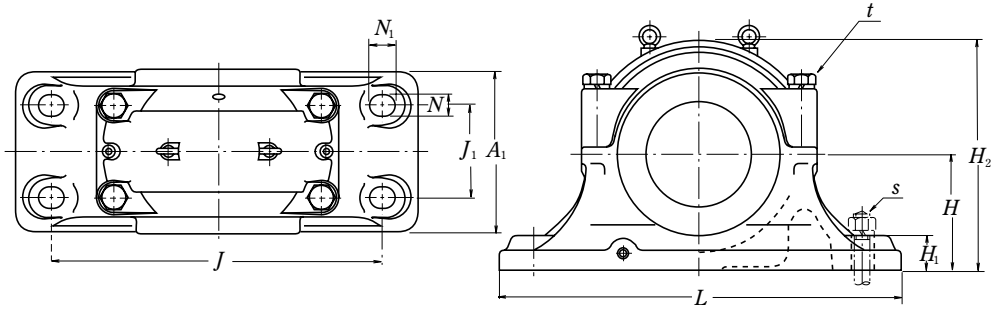
| Mass (kg) approx. | Applicable Parts: Self-Aligning Ball Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Spherical Roller Bearing Numbers | B. D. L. R. (4) $C_r$ (N) | Nut Numbers | Washer Numbers | Locating Ring Nominal (Outside Dia.×Width) | Q'ty | Oil Seals (3) Side $d_1$ | Side $d_2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1219 | 64 000 | — | — | AN 19 | AW 19X | SR 170×10.5 | 2 | GS 24 | GS 20 |
| | 2219 | 84 000 | 22219 EAE4 | 330 000 | AN 19 | AW 19X | SR 170×10 | 1 | | |
| 22 | 1319 | 129 000 | 21319 CE4 | 345 000 | AN 19 | AW 19X | SR 200×16 | 2 | GS 24 | GS 20 |
| | 2319 | 161 000 | 22319 EAE4 | 590 000 | AN 19 | AW 19X | SR 200×10 | 1 | | |
| 18.5 | 1220 | 69 500 | — | — | AN 20 | AW 20X | SR 180×18.1 | 2 | GS 26 | GS 21 |
| | 2220 | 94 500 | 22220 EAE4 | 365 000 | AN 20 | AW 20X | SR 180×12.1 | 2 | | |
| | — | — | 23220 CE4 | 420 000 | AN 20 | AW 20X | SR 180×10 | 1 | | |
| 25 | 1320 | 140 000 | 21320 CE4 | 395 000 | AN 20 | AW 20X | SR 215×18 | 2 | GS 26 | GS 21 |
| | 2320 | 187 000 | 22320 EAE4 | 690 000 | AN 20 | AW 20X | SR 215×10 | 1 | | |
| 20 | 1222 | 87 000 | — | — | AN 22 | AW 22X | SR 200×21 | 2 | GS 28 | GS 23 |
| | 2222 | 122 000 | 22222 EAE4 | 485 000 | AN 22 | AW 22X | SR 200×13.5 | 2 | | |
| | — | — | 23222 CE4 | 515 000 | AN 22 | AW 22X | SR 200×10 | 1 | | |
| 32 | 1322 | 161 000 | 21322 CAE4 | 395 000 | AN 22 | AW 22X | SR 240×20 | 2 | GS 28 | GS 23 |
| | 2322 | 211 000 | 22322 EAE4 | 825 000 | AN 22 | AW 22X | SR 240×10 | 1 | | |
| 24.5 | — | — | 22224 EAE4 | 550 000 | AN 24 | AW 24 | SR 215×14 | 2 | GS 30 | GS 26 |
| | — | — | 23224 CE4 | 630 000 | AN 24 | AW 24 | SR 215×10 | 1 | | |
| 48 | — | — | 22324 EAE4 | 955 000 | AN 24 | AW 24 | SR 260×10 | 1 | GS 30 | GS 26 |
| 30 | — | — | 22226 EAE4 | 655 000 | AN 26 | AW 26 | SR 230×13 | 2 | GS 33 | GS 28 |
| | — | — | 23226 CE4 | 700 000 | AN 26 | AW 26 | SR 230×10 | 1 | | |
| 56 | — | — | 22326 CE4 | 995 000 | AN 26 | AW 26 | SR 280×10 | 1 | GS 34 | GS 28 |
| 38 | — | — | 22228 CDE4 | 645 000 | AN 28 | AW 28 | SR 250×15 | 2 | GS 35 | GS 30 |
| | — | — | 23228 CE4 | 835 000 | AN 28 | AW 28 | SR 250×10 | 1 | | |
| 72 | — | — | 22328 CE4 | 1 160 000 | AN 28 | AW 28 | SR 300×10 | 1 | GS 36 | GS 30 |
| 46 | — | — | 22230 CDE4 | 765 000 | AN 30 | AW 30 | SR 270×16.5 | 2 | GS 37 | GS 33 |
| | — | — | 23230 CE4 | 975 000 | AN 30 | AW 30 | SR 270×10 | 1 | | |
| 98 | — | — | 22330 CAE4 | 1 220 000 | AN 30 | AW 30 | SR 320×10 | 1 | GS 38 | GS 33 |
| 50 | — | — | 22232 CDE4 | 910 000 | AN 32 | AW 32 | SR 290×17 | 2 | GS 39 | GS 34 |
| | — | — | 23232 CE4 | 1 100 000 | AN 32 | AW 32 | SR 290×10 | 1 | | |
| 115 | — | — | 22332 CAE4 | 1 360 000 | AN 32 | AW 32 | SR 340×10 | 1 | GS 40 | GS 34 |

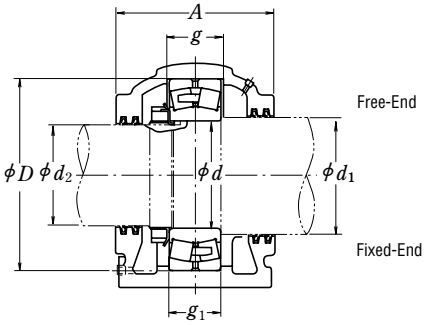
**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+nut+washer+locating ring".

**Remarks** 1. The threads for plugs are R 1/8 for SN219C, and R 1/4 for SN319C and SN220C and over.
2. Bearing boxes larger than SN320C and SN224C are provided with eye bolts.

**Notes** (2) The $X$ dimension indicates the offset of the bearing center from the center of the plummer block bearing box. When one locating ring is used, it is 1/2 of the locating ring width, and when two rings are used, it becomes 0.
(3) Applicable to the ZF Type with the same number. (4) B. D. L. R. : Basic Dynamic Load Ratings

## SD 2 C, SD 3 C Types
## Shaft Diameter 170 – 320 mm




| Shaft Diameter (mm) $d$ | Plummer Block Bearing Box Numbers (1) | | Dimensions (mm) | | | | | | | | | | | | Mass (kg) | Applicable Parts | | | | Oil Seals (2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Spherical Roller Bearing | | Nut | Washer or Stopper | | |
| | Free-End | Fixed-End | $d_1$ | $d_2$ | $D$ H8 | $H$ h13 | $J$ | $N$ | $N_1$ | $A$ | $L$ | $A_1$ | $H_1$ | $H_2$ | $J_1$ | $g$ H13 | $g_1$ H13 | $t$ nominal | $s$ nominal | approx. | Numbers | Basic Dynamic Load Ratings $C_r$ (N) | Numbers | Numbers | Side $d_1$ | Side $d_2$ |
| **170** | **SD 234 C** | **SD 234 CG** | 190 | 160 | 310 | 180 | 510 | 36 | 46 | 270 | 620 | 250 | 60 | 360 | 140 | 96 | 86 | M 24 | M 30 | 100 | 22234 CDE4 | 990 000 | AN 34 | AW 34 | GS 42 | GS 36 |
| | **SD 334 C** | **SD 334 CG** | 190 | 160 | 360 | 210 | 610 | 36 | 46 | 300 | 740 | 290 | 65 | 420 | 170 | 130 | 120 | M 30 | M 30 | 160 | 22334 CAE4 | 1 580 000 | AN 34 | AW 34 | GS 42 | GS 36 |
| **180** | **SD 236 C** | **SD 236 CG** | 200 | 170 | 320 | 190 | 540 | 36 | 46 | 280 | 650 | 260 | 60 | 380 | 150 | 96 | 86 | M 24 | M 30 | 110 | 22236 CDE4 | 1 020 000 | AN 36 | AW 36 | GS 44 | GS 38 |
| | **SD 336 C** | **SD 336 CG** | 200 | 170 | 380 | 225 | 640 | 43 | 59 | 320 | 780 | 310 | 70 | 450 | 180 | 136 | 126 | M 30 | M 36 | 195 | 22336 CAE4 | 1 740 000 | AN 36 | AW 36 | GS 44 | GS 38 |
| **190** | **SD 238 C** | **SD 238 CG** | 210 | 180 | 340 | 200 | 570 | 36 | 46 | 290 | 700 | 280 | 65 | 400 | 160 | 102 | 92 | M 30 | M 30 | 130 | 22238 CAE4 | 1 140 000 | AN 38 | AW 38 | GS 46 | GS 40 |
| | **SD 338 C** | **SD 338 CG** | 210 | 180 | 400 | 240 | 680 | 43 | 59 | 330 | 820 | 320 | 70 | 475 | 190 | 142 | 132 | M 30 | M 36 | 210 | 22338 CAE4 | 1 890 000 | AN 38 | AW 38 | GS 46 | GS 40 |
| **200** | **SD 240 C** | **SD 240 CG** | 220 | 190 | 360 | 210 | 610 | 36 | 46 | 300 | 740 | 290 | 65 | 420 | 170 | 108 | 98 | M 30 | M 30 | 155 | 22240 CAE4 | 1 300 000 | AN 40 | AW 40 | GS 48 | GS 42 |
| | **SD 340 C** | **SD 340 CG** | 220 | 190 | 420 | 250 | 710 | 43 | 59 | 350 | 860 | 340 | 85 | 500 | 200 | 148 | 138 | M 36 | M 36 | 240 | 22340 CAE4 | 2 000 000 | AN 40 | AW 40 | GS 48 | GS 42 |
| **220** | **SD 244 C** | **SD 244 CG** | 240 | 210 | 400 | 240 | 680 | 43 | 59 | 330 | 820 | 320 | 70 | 475 | 190 | 118 | 108 | M 30 | M 36 | 205 | 22244 CAE4 | 1 570 000 | AN 44 | AL 44 | GS 52 | GS 46 |
| | **SD 344 C** | **SD 344 CG** | 240 | 210 | 460 | 280 | 770 | 43 | 59 | 360 | 920 | 350 | 85 | 550 | 210 | 155 | 145 | M 36 | M 36 | 315 | 22344 CAE4 | 2 350 000 | AN 44 | AL 44 | GS 52 | GS 46 |
| **240** | **SD 248 C** | **SD 248 CG** | 260 | 230 | 440 | 260 | 740 | 43 | 59 | 340 | 880 | 330 | 85 | 515 | 200 | 130 | 120 | M 36 | M 36 | 240 | 22248 CAE4 | 1 870 000 | AN 48 | AL 44 | GS 56 | GS 50 |
| | **SD 348 C** | **SD 348 CG** | 260 | 230 | 500 | 300 | 830 | 50 | 67 | 390 | 990 | 380 | 100 | 590 | 230 | 165 | 155 | M 36 | M 42 | 405 | 22348 CAE4 | 2 600 000 | AN 48 | AL 44 | GS 56 | GS 50 |
| **260** | **SD 252 C** | **SD 252 CG** | 280 | 250 | 480 | 280 | 790 | 43 | 59 | 370 | 940 | 360 | 85 | 560 | 210 | 140 | 130 | M 36 | M 36 | 315 | 22252 CAE4 | 2 180 000 | AN 52 | AL 52 | GS 60 | GS 54 |
| | **SD 352 C** | **SD 352 CG** | 280 | 250 | 540 | 325 | 890 | 50 | 67 | 410 | 1 060 | 400 | 100 | 640 | 250 | 175 | 165 | M 36 | M 42 | 480 | 22352 CAE4 | 3 100 000 | AN 52 | AL 52 | GS 60 | GS 54 |
| **280** | **SD 256 C** | **SD 256 CG** | 300 | 260 | 500 | 300 | 830 | 50 | 67 | 390 | 990 | 380 | 100 | 590 | 230 | 140 | 130 | M 36 | M 42 | 390 | 22256 CAE4 | 2 280 000 | AN 56 | AL 52 | GS 64 | GS 56 |
| | **SD 356 C** | **SD 356 CG** | 300 | 260 | 580 | 355 | 930 | 57 | 77 | 440 | 1 110 | 430 | 110 | 690 | 270 | 185 | 175 | M 42 | M 48 | 610 | 22356 CAE4 | 3 500 000 | AN 56 | AL 52 | GS 64 | GS 56 |
| **300** | **SD 260 C** | **SD 260 CG** | 320 | 280 | 540 | 325 | 890 | 50 | 67 | 410 | 1 060 | 400 | 100 | 640 | 250 | 150 | 140 | M 36 | M 42 | 465 | 22260 CAE4 | 2 610 000 | AN 60 | AL 60 | GS 68 | GS 60 |
| **320** | **SD 264 C** | **SD 264 CG** | 340 | 300 | 580 | 355 | 930 | 57 | 77 | 440 | 1 110 | 430 | 110 | 690 | 270 | 160 | 150 | M 42 | M 48 | 595 | 22264 CAE4 | 2 990 000 | AN 64 | AL 64 | GS 72 | GS 64 |

**Note** (1) Including oil seal.
To place an order for a complete unit, please specify, "Plummer block bearing box+bearing+nut+washer or stopper".

**Remarks** 1. The threads for oil replenishing hole plugs are R 1/4 and those for drain plugs are R 3/8.
2. The plummer block bearing boxes listed above are provided with eye bolts.

**Note** (2) Applicable to the ZF Type with the same number.

# CYLINDRICAL ROLLER BEARINGS FOR SHEAVES

## CYLINDRICAL ROLLER BEARINGS FOR SHEAVES


Open Type — Bore Diameter 50 – 560mm ····· B328

Prelubricated Type — Bore Diameter 40 – 400mm ····· B332


## DESIGN, TYPES, AND FEATURES

Cylindrical Roller Bearings for sheaves are specially designed thin-walled, broad-width, full-complement type double-row cylindrical roller bearings, but they are widely used also for general industrial machines running at low speed and under heavy loads. There are several series as shown in Table 1.

**Table 1 Series of Cylindrical Roller Bearings for Sheaves**

| Bearing Type | | Fixed-End | Free-End |
|---|---|---|---|
| Open Type | Without Snap Ring | RS-48E4<br>RS-49E4 | RSF-48E4<br>RSF-49E4 |
| Shielded Type | Without Snap Ring | RS-50 | — |
| | With Snap Ring | RS-50NR | |

Since all are non-separable type bearings, the inner and outer rings cannot be separated, but the RSF type can be used as a free-end bearing. In this case, the permissible axial displacement is listed in the bearing tables.

Since cylindrical roller bearings for sheaves are a double-row, full-complement type, they can withstand heavy shock loads and moments and have sufficient axial load capacity for use in sheaves.

Since the shielded type is a kind of bearing unit, the number of parts surrounding the bearing can be reduced, so it allows for a simple compact design.

The surface of these bearings is treated for rust prevention.

## TOLERANCES AND RUNNING ACCURACY

····· Table 8.2 (Pages A60 to A63)

## RECOMMENDED FITS AND INTERNAL CLEARANGES

When used with outer ring rotation for sheaves or wheels, the fit and radial internal clearance should conform to Table 2.

**Table 2 Fits and Internal Clearances for Cylindrical Roller Bearings for Sheaves**

| Operating Conditions | | Fitting between Inner Ring and Shaft | Fitting between Outer Ring and Housing Bore | Recommended Internal Clearance |
|---|---|---|---|---|
| Outer Ring Rotation | Thin walled housings and heavy loads | g6 or h6 | P7 | C3 |
| | Normal to heavy loads | g6 or h6 | N7 | C3 |
| | Light or fluctuating loads | g6 or h6 | M7 | CN |

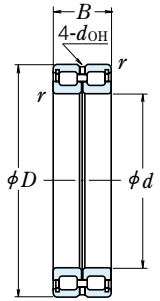
The fits listed in Tables 9.2 (Page A84) and 9.4 (Page A85) apply when they are used with inner ring rotation in general applications, and the internal clearance should conform to Table 3.

**Table 3**

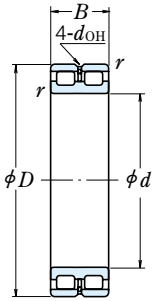
Units : μm

| Nominal Bore Dia. $d$ (mm) over | incl | Clearances CN min | CN max | C3 min | C3 max |
|---|---|---|---|---|---|
| **30** | **40** | 15 | 50 | 35 | 70 |
| **40** | **50** | 20 | 55 | 40 | 75 |
| **50** | **65** | 20 | 65 | 45 | 90 |
| **65** | **80** | 25 | 75 | 55 | 105 |
| **80** | **100** | 30 | 80 | 65 | 115 |
| **100** | **120** | 35 | 90 | 80 | 135 |
| **120** | **140** | 40 | 105 | 90 | 155 |
| **140** | **160** | 50 | 115 | 100 | 165 |
| **160** | **180** | 60 | 125 | 110 | 175 |
| **180** | **200** | 65 | 135 | 125 | 195 |
| **200** | **225** | 75 | 150 | 140 | 215 |
| **225** | **250** | 90 | 165 | 155 | 230 |
| **250** | **280** | 100 | 180 | 175 | 255 |
| **280** | **315** | 110 | 195 | 195 | 280 |
| **315** | **355** | 125 | 215 | 215 | 305 |
| **355** | **400** | 140 | 235 | 245 | 340 |
| **400** | **450** | 155 | 275 | 270 | 390 |
| **450** | **500** | 180 | 300 | 300 | 420 |

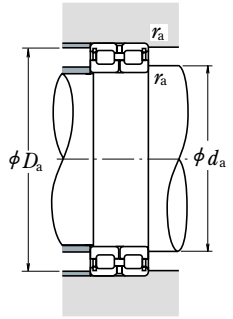
## RS-48 · RS-49 Types
## RSF-48 · RSF-49 Types
## Bore Diameter 50 – 220 mm




Fixed-End Bearing
RS




Free-End Bearing
RSF



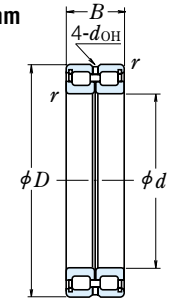

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **50** | 72 | 22 | 0.6 | 48 000 | 75 500 | 4 900 | 7 700 | 2 000 | 4 000 |
| **60** | 85 | 25 | 1 | 68 500 | 118 000 | 6 950 | 12 000 | 1 600 | 3 200 |
| **65** | 90 | 25 | 1 | 70 500 | 125 000 | 7 150 | 12 700 | 1 600 | 3 200 |
| **70** | 100 | 30 | 1 | 102 000 | 168 000 | 10 400 | 17 200 | 1 400 | 2 800 |
| **80** | 110 | 30 | 1 | 109 000 | 191 000 | 11 100 | 19 500 | 1 300 | 2 600 |
| **90** | 125 | 35 | 1.1 | 147 000 | 268 000 | 15 000 | 27 400 | 1 100 | 2 200 |
| **100** | 125 | 25 | 1 | 87 500 | 189 000 | 8 900 | 19 300 | 1 100 | 2 200 |
| | 140 | 40 | 1.1 | 194 000 | 400 000 | 19 800 | 41 000 | 1 000 | 2 000 |
| **105** | 130 | 25 | 1 | 89 000 | 196 000 | 9 100 | 19 900 | 1 000 | 2 000 |
| | 145 | 40 | 1.1 | 199 000 | 420 000 | 20 300 | 43 000 | 950 | 1 900 |
| **110** | 140 | 30 | 1 | 114 000 | 260 000 | 11 700 | 26 500 | 950 | 1 900 |
| | 150 | 40 | 1.1 | 202 000 | 430 000 | 20 600 | 44 000 | 900 | 1 800 |
| **120** | 150 | 30 | 1 | 119 000 | 283 000 | 12 200 | 28 900 | 900 | 1 800 |
| | 165 | 45 | 1.1 | 226 000 | 480 000 | 23 100 | 49 000 | 800 | 1 600 |
| **130** | 165 | 35 | 1.1 | 162 000 | 390 000 | 16 500 | 39 500 | 800 | 1 600 |
| | 180 | 50 | 1.5 | 262 000 | 555 000 | 26 700 | 56 500 | 750 | 1 500 |
| **140** | 175 | 35 | 1.1 | 167 000 | 415 000 | 17 000 | 42 500 | 750 | 1 500 |
| | 190 | 50 | 1.5 | 272 000 | 595 000 | 27 700 | 60 500 | 710 | 1 400 |
| **150** | 190 | 40 | 1.1 | 235 000 | 575 000 | 23 900 | 58 500 | 670 | 1 400 |
| | 210 | 60 | 2 | 390 000 | 865 000 | 40 000 | 88 500 | 670 | 1 300 |
| **160** | 200 | 40 | 1.1 | 243 000 | 615 000 | 24 800 | 63 000 | 630 | 1 300 |
| | 220 | 60 | 2 | 410 000 | 930 000 | 41 500 | 95 000 | 600 | 1 200 |
| **170** | 215 | 45 | 1.1 | 265 000 | 650 000 | 27 000 | 66 500 | 600 | 1 200 |
| | 230 | 60 | 2 | 415 000 | 975 000 | 42 500 | 99 500 | 600 | 1 200 |
| **180** | 225 | 45 | 1.1 | 272 000 | 685 000 | 27 800 | 70 000 | 560 | 1 100 |
| | 250 | 69 | 2 | 495 000 | 1 130 000 | 50 500 | 115 000 | 530 | 1 100 |
| **190** | 240 | 50 | 1.5 | 315 000 | 785 000 | 32 000 | 80 000 | 530 | 1 100 |
| | 260 | 69 | 2 | 510 000 | 1 180 000 | 52 000 | 120 000 | 500 | 1 000 |
| **200** | 250 | 50 | 1.5 | 320 000 | 825 000 | 33 000 | 84 000 | 500 | 1 000 |
| | 280 | 80 | 2.1 | 665 000 | 1 500 000 | 68 000 | 153 000 | 480 | 950 |
| **220** | 270 | 50 | 1.5 | 340 000 | 905 000 | 34 500 | 92 500 | 450 | 900 |
| | 300 | 80 | 2.1 | 695 000 | 1 620 000 | 70 500 | 165 000 | 430 | 850 |

**Remarks** Cylindrical roller bearings for sheaves are designed for specific applications, when using them, please contact NSK.

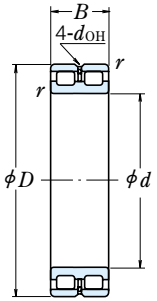
| Bearing Numbers[1] | | Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|
| Fixed-End Bearing | Free-End Bearing | $d_{OH}$[2] | Axial Disp.[3] | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **RS-4910E4** | **RSF-4910E4** | 2.5 | 1.5 | 54 | 68 | 0.6 | 0.30 |
| **RS-4912E4** | **RSF-4912E4** | 2.5 | 1.5 | 65 | 80 | 1 | 0.46 |
| **RS-4913E4** | **RSF-4913E4** | 2.5 | 2 | 70 | 85 | 1 | 0.50 |
| **RS-4914E4** | **RSF-4914E4** | 3 | 2 | 75 | 95 | 1 | 0.79 |
| **RS-4916E4** | **RSF-4916E4** | 3 | 2 | 85 | 105 | 1 | 0.89 |
| **RS-4918E4** | **RSF-4918E4** | 3 | 2 | 96.5 | 118.5 | 1 | 1.35 |
| **RS-4820E4** | **RSF-4820E4** | 2.5 | 1.5 | 105 | 120 | 1 | 0.74 |
| **RS-4920E4** | **RSF-4920E4** | 3 | 2 | 106.5 | 133.5 | 1 | 1.97 |
| **RS-4821E4** | **RSF-4821E4** | 2.5 | 1.5 | 110 | 125 | 1 | 0.77 |
| **RS-4921E4** | **RSF-4921E4** | 3 | 2 | 111.5 | 138.5 | 1 | 2.05 |
| **RS-4822E4** | **RSF-4822E4** | 3 | 2 | 115 | 135 | 1 | 1.09 |
| **RS-4922E4** | **RSF-4922E4** | 3 | 2 | 116.5 | 143.5 | 1 | 2.15 |
| **RS-4824E4** | **RSF-4824E4** | 3 | 2 | 125 | 145 | 1 | 1.28 |
| **RS-4924E4** | **RSF-4924E4** | 4 | 3 | 126.5 | 158.5 | 1 | 2.95 |
| **RS-4826E4** | **RSF-4826E4** | 3 | 2 | 136.5 | 158.5 | 1 | 1.9 |
| **RS-4926E4** | **RSF-4926E4** | 5 | 3.5 | 138 | 172 | 1.5 | 3.95 |
| **RS-4828E4** | **RSF-4828E4** | 3 | 2 | 146.5 | 168.5 | 1 | 2.03 |
| **RS-4928E4** | **RSF-4928E4** | 5 | 3.5 | 148 | 182 | 1.5 | 4.25 |
| **RS-4830E4** | **RSF-4830E4** | 3 | 2 | 156.5 | 183.5 | 1 | 2.85 |
| **RS-4930E4** | **RSF-4930E4** | 5 | 3.5 | 159 | 201 | 2 | 6.65 |
| **RS-4832E4** | **RSF-4832E4** | 3 | 2 | 166.5 | 193.5 | 1 | 3.05 |
| **RS-4932E4** | **RSF-4932E4** | 5 | 3.5 | 169 | 211 | 2 | 7.0 |
| **RS-4834E4** | **RSF-4834E4** | 4 | 3 | 176.5 | 208.5 | 1 | 4.1 |
| **RS-4934E4** | **RSF-4934E4** | 4 | 3.5 | 179 | 221 | 2 | 7.35 |
| **RS-4836E4** | **RSF-4836E4** | 4 | 3 | 186.5 | 218.5 | 1 | 4.3 |
| **RS-4936E4** | **RSF-4936E4** | 6 | 4.5 | 189 | 241 | 2 | 10.7 |
| **RS-4838E4** | **RSF-4838E4** | 5 | 3.5 | 198 | 232 | 1.5 | 5.65 |
| **RS-4938E4** | **RSF-4938E4** | 6 | 4.5 | 199 | 251 | 2 | 11.1 |
| **RS-4840E4** | **RSF-4840E4** | 5 | 3.5 | 208 | 242 | 1.5 | 5.95 |
| **RS-4940E4** | **RSF-4940E4** | 7 | 5 | 211 | 269 | 2 | 15.7 |
| **RS-4844E4** | **RSF-4844E4** | 5 | 3.5 | 228 | 262 | 1.5 | 6.45 |
| **RS-4944E4** | **RSF-4944E4** | 7 | 5 | 231 | 289 | 2 | 17 |

**Notes** (1) The suffix E4 indicates that the outer ring is provided with oil holes and oil groove.
(2) $d_{OH}$ represents the oil hole diameter in the outer ring.
(3) Permissible axial displacement for free-end bearings.

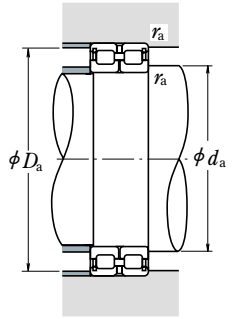
## RS-48 · RS-49 Types
## RSF-48 · RSF-49 Types
## Bore Diameter 240 – 560 mm




Fixed-End Bearing
RS




Free-End Bearing
RSF



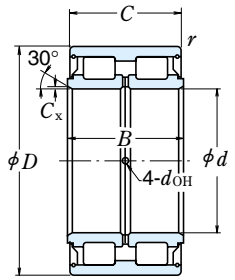

| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | Grease | Oil |
| **240** | 300 | 60 | 2 | 495 000 | 1 340 000 | 50 500 | 137 000 | 430 | 850 |
| | 320 | 80 | 2.1 | 725 000 | 1 770 000 | 74 000 | 181 000 | 400 | 800 |
| **260** | 320 | 60 | 2 | 515 000 | 1 450 000 | 52 500 | 148 000 | 380 | 750 |
| | 360 | 100 | 2.1 | 1 050 000 | 2 530 000 | 107 000 | 258 000 | 360 | 710 |
| **280** | 350 | 69 | 2 | 610 000 | 1 690 000 | 62 500 | 173 000 | 340 | 710 |
| | 380 | 100 | 2.1 | 1 090 000 | 2 720 000 | 111 000 | 277 000 | 340 | 670 |
| **300** | 380 | 80 | 2.1 | 805 000 | 2 160 000 | 82 000 | 220 000 | 320 | 630 |
| | 420 | 118 | 3 | 1 460 000 | 3 400 000 | 149 000 | 350 000 | 300 | 600 |
| **320** | 400 | 80 | 2.1 | 835 000 | 2 310 000 | 85 000 | 236 000 | 300 | 600 |
| | 440 | 118 | 3 | 1 500 000 | 3 600 000 | 153 000 | 365 000 | 280 | 560 |
| **340** | 420 | 80 | 2.1 | 855 000 | 2 430 000 | 87 500 | 248 000 | 280 | 560 |
| | 460 | 118 | 3 | 1 560 000 | 3 900 000 | 159 000 | 395 000 | 260 | 530 |
| **360** | 440 | 80 | 2.1 | 885 000 | 2 580 000 | 90 000 | 264 000 | 260 | 530 |
| | 480 | 118 | 3 | 1 600 000 | 4 050 000 | 163 000 | 415 000 | 260 | 500 |
| **380** | 480 | 100 | 2.1 | 1 260 000 | 3 600 000 | 128 000 | 365 000 | 240 | 500 |
| | 520 | 140 | 4 | 2 040 000 | 5 200 000 | 209 000 | 530 000 | 240 | 450 |
| **400** | 500 | 100 | 2.1 | 1 290 000 | 3 750 000 | 132 000 | 385 000 | 240 | 480 |
| | 540 | 140 | 4 | 2 100 000 | 5 450 000 | 214 000 | 555 000 | 220 | 450 |
| **420** | 520 | 100 | 2.1 | 1 320 000 | 3 950 000 | 135 000 | 405 000 | 220 | 450 |
| | 560 | 140 | 4 | 2 150 000 | 5 700 000 | 219 000 | 580 000 | 200 | 430 |
| **440** | 540 | 100 | 2.1 | 1 350 000 | 4 150 000 | 138 000 | 420 000 | 200 | 430 |
| | 600 | 160 | 4 | 2 840 000 | 7 350 000 | 289 000 | 750 000 | 190 | 380 |
| **460** | 580 | 118 | 3 | 1 730 000 | 5 150 000 | 177 000 | 525 000 | 190 | 380 |
| | 620 | 160 | 4 | 2 870 000 | 7 500 000 | 293 000 | 765 000 | 190 | 380 |
| **480** | 600 | 118 | 3 | 1 760 000 | 5 300 000 | 180 000 | 545 000 | 190 | 380 |
| | 650 | 170 | 5 | 3 200 000 | 8 500 000 | 325 000 | 865 000 | 180 | 360 |
| **500** | 620 | 118 | 3 | 1 810 000 | 5 600 000 | 184 000 | 570 000 | 180 | 360 |
| | 670 | 170 | 5 | 3 300 000 | 8 900 000 | 335 000 | 910 000 | 170 | 340 |
| **530** | 710 | 180 | 5 | 3 400 000 | 9 200 000 | 350 000 | 935 000 | 160 | 320 |
| **560** | 750 | 190 | 5 | 3 800 000 | 10 100 000 | 385 000 | 1 030 000 | 150 | 300 |

**Remarks** Cylindrical roller bearings for sheaves are designed for specific applications, when using them, please contact NSK.

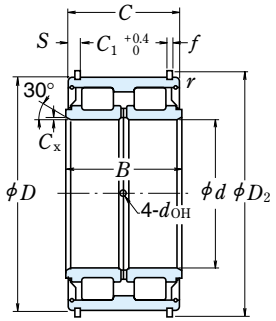
| Bearing Numbers[1] | | Dimensions (mm) | | Abutment and Fillet Dimensions (mm) | | | Mass (kg) |
|---|---|---|---|---|---|---|---|
| Fixed-End Bearing | Free-End Bearing | $d_{OH}$[2] | Axial Disp.[3] | $d_a$ min. | $D_a$ max. | $r_a$ max. | approx. |
| **RS-4848E4** | **RSF-4848E4** | 5 | 3.5 | 249 | 291 | 2 | 10.3 |
| **RS-4948E4** | **RSF-4948E4** | 7 | 5 | 251 | 309 | 2 | 18.4 |
| **RS-4852E4** | **RSF-4852E4** | 5 | 3.5 | 269 | 311 | 2 | 11 |
| **RS-4952E4** | **RSF-4952E4** | 8 | 6 | 271 | 349 | 2 | 32 |
| **RS-4856E4** | **RSF-4856E4** | 6 | 4.5 | 289 | 341 | 2 | 16 |
| **RS-4956E4** | **RSF-4956E4** | 8 | 6 | 291 | 369 | 2 | 34 |
| **RS-4860E4** | **RSF-4860E4** | 6 | 5 | 311 | 369 | 2 | 23 |
| **RS-4960E4** | **RSF-4960E4** | 9 | 7 | 313 | 407 | 2.5 | 52 |
| **RS-4864E4** | **RSF-4864E4** | 6 | 5 | 331 | 389 | 2 | 24.3 |
| **RS-4964E4** | **RSF-4964E4** | 9 | 7 | 333 | 427 | 2.5 | 55 |
| **RS-4868E4** | **RSF-4868E4** | 6 | 5 | 351 | 409 | 2 | 25.6 |
| **RS-4968E4** | **RSF-4968E4** | 9 | 7 | 353 | 447 | 2.5 | 58 |
| **RS-4872E4** | **RSF-4872E4** | 6 | 5 | 371 | 429 | 2 | 27 |
| **RS-4972E4** | **RSF-4972E4** | 9 | 7 | 373 | 467 | 2.5 | 61 |
| **RS-4876E4** | **RSF-4876E4** | 8 | 6 | 391 | 469 | 2 | 45.5 |
| **RS-4976E4** | **RSF-4976E4** | 11 | 8 | 396 | 504 | 3 | 90.5 |
| **RS-4880E4** | **RSF-4880E4** | 8 | 6 | 411 | 489 | 2 | 47.5 |
| **RS-4980E4** | **RSF-4980E4** | 11 | 8 | 416 | 524 | 3 | 94.5 |
| **RS-4884E4** | **RSF-4884E4** | 8 | 6 | 431 | 509 | 2 | 49.5 |
| **RS-4984E4** | **RSF-4984E4** | 11 | 8 | 436 | 544 | 3 | 98.5 |
| **RS-4888E4** | **RSF-4888E4** | 8 | 6 | 451 | 529 | 2 | 51.5 |
| **RS-4988E4** | **RSF-4988E4** | 11 | 8 | 456 | 584 | 3 | 136 |
| **RS-4892E4** | **RSF-4892E4** | 9 | 7 | 473 | 567 | 2.5 | 77.5 |
| **RS-4992E4** | **RSF-4992E4** | 11 | 8 | 476 | 604 | 3 | 142 |
| **RS-4896E4** | **RSF-4896E4** | 9 | 7 | 493 | 587 | 2.5 | 80.5 |
| **RS-4996E4** | **RSF-4996E4** | 12 | 9 | 500 | 630 | 4 | 167 |
| **RS-48/500E4** | **RSF-48/500E4** | 9 | 7 | 513 | 607 | 2.5 | 83.5 |
| **RS-49/500E4** | **RSF-49/500E4** | 12 | 9 | 520 | 650 | 4 | 173 |
| **RS-49/530E4** | **RSF-49/530E4** | 12 | 11 | 550 | 690 | 4 | 206 |
| **RS-49/560E4** | **RSF-49/560E4** | 12 | 11 | 580 | 730 | 4 | 231 |

**Notes** (1) The suffix E4 indicates that the outer ring is provided with oil holes and oil groove.
(2) $d_{OH}$ represents the oil hole diameter in the outer ring.
(3) Permissible axial displacement for free-end bearings.

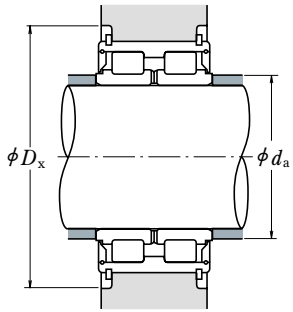
## RS-50 Type (Prelubricated)
## Bore Diameter 40 – 400 mm




Without Locating Ring




With Locating Ring



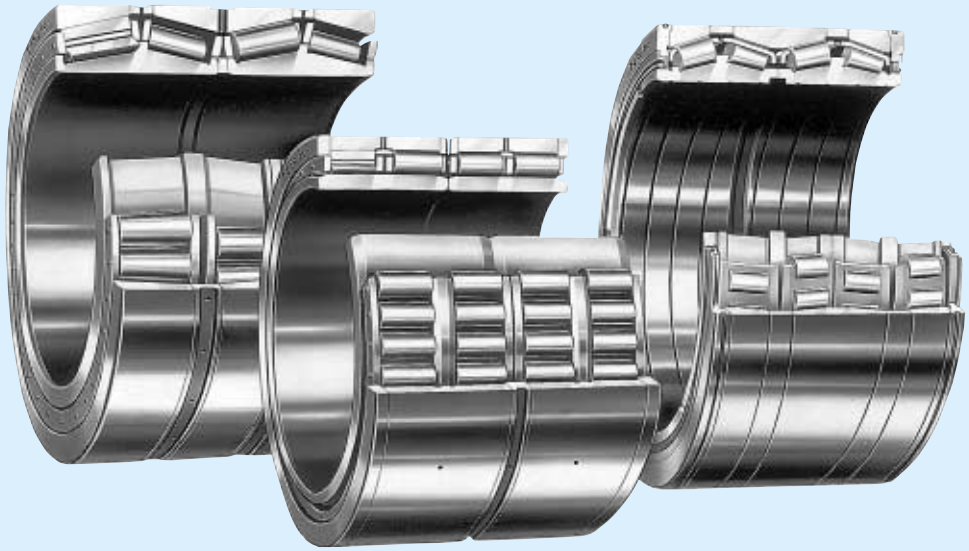

| Boundary Dimensions (mm) | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | | Limiting Speeds ($min^{-1}$) Grease |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$ | $C$ | $C_x$[1] min. | $r$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ | |
| **40** | 68 | 38 | 37 | 0.4 | 0.6 | 79 500 | 116 000 | 8 100 | 11 800 | 2 400 |
| **45** | 75 | 40 | 39 | 0.4 | 0.6 | 95 500 | 144 000 | 9 750 | 14 700 | 2 200 |
| **50** | 80 | 40 | 39 | 0.4 | 0.6 | 100 000 | 158 000 | 10 200 | 16 100 | 2 000 |
| **55** | 90 | 46 | 45 | 0.6 | 0.6 | 118 000 | 193 000 | 12 100 | 19 700 | 1 800 |
| **60** | 95 | 46 | 45 | 0.6 | 0.6 | 123 000 | 208 000 | 12 600 | 21 200 | 1 700 |
| **65** | 100 | 46 | 45 | 0.6 | 0.6 | 128 000 | 224 000 | 13 100 | 22 800 | 1 600 |
| **70** | 110 | 54 | 53 | 0.6 | 0.6 | 171 000 | 285 000 | 17 500 | 29 000 | 1 400 |
| **75** | 115 | 54 | 53 | 0.6 | 0.6 | 179 000 | 305 000 | 18 200 | 31 500 | 1 400 |
| **80** | 125 | 60 | 59 | 0.6 | 0.6 | 251 000 | 430 000 | 25 600 | 43 500 | 1 200 |
| **85** | 130 | 60 | 59 | 0.6 | 0.6 | 256 000 | 445 000 | 26 200 | 45 500 | 1 200 |
| **90** | 140 | 67 | 66 | 1 | 0.6 | 305 000 | 540 000 | 31 000 | 55 000 | 1 100 |
| **95** | 145 | 67 | 66 | 1 | 0.6 | 310 000 | 565 000 | 32 000 | 57 500 | 1 100 |
| **100** | 150 | 67 | 66 | 1 | 0.6 | 320 000 | 585 000 | 32 500 | 59 500 | 1 000 |
| **110** | 170 | 80 | 79 | 1.1 | 1 | 385 000 | 695 000 | 39 000 | 71 000 | 900 |
| **120** | 180 | 80 | 79 | 1.1 | 1 | 400 000 | 750 000 | 40 500 | 76 500 | 850 |
| **130** | 200 | 95 | 94 | 1.1 | 1 | 535 000 | 1 000 000 | 54 500 | 102 000 | 750 |
| **140** | 210 | 95 | 94 | 1.1 | 1 | 550 000 | 1 040 000 | 56 000 | 106 000 | 710 |
| **150** | 225 | 100 | 99 | 1.3 | 1 | 620 000 | 1 210 000 | 63 500 | 124 000 | 670 |
| **160** | 240 | 109 | 108 | 1.3 | 1.1 | 695 000 | 1 370 000 | 71 000 | 140 000 | 630 |
| **170** | 260 | 122 | 121 | 1.3 | 1.1 | 860 000 | 1 680 000 | 88 000 | 171 000 | 600 |
| **180** | 280 | 136 | 135 | 1.3 | 1.1 | 980 000 | 1 910 000 | 100 000 | 195 000 | 530 |
| **190** | 290 | 136 | 135 | 1.3 | 1.1 | 1 120 000 | 2 230 000 | 114 000 | 227 000 | 500 |
| **200** | 310 | 150 | 149 | 1.3 | 1.1 | 1 310 000 | 2 650 000 | 133 000 | 270 000 | 480 |
| **220** | 340 | 160 | 159 | 1.5 | 1.1 | 1 510 000 | 3 100 000 | 154 000 | 320 000 | 430 |
| **240** | 360 | 160 | 159 | 1.5 | 1.1 | 1 570 000 | 3 350 000 | 160 000 | 340 000 | 400 |
| **260** | 400 | 190 | 189 | 2 | 1.5 | 2 130 000 | 4 500 000 | 217 000 | 460 000 | 360 |
| **280** | 420 | 190 | 189 | 2 | 1.5 | 2 170 000 | 4 700 000 | 221 000 | 480 000 | 340 |
| **300** | 460 | 218 | 216 | 2 | 1.5 | 2 670 000 | 5 850 000 | 272 000 | 600 000 | 300 |
| **320** | 480 | 218 | 216 | 2 | 1.5 | 2 720 000 | 6 100 000 | 277 000 | 620 000 | 300 |
| **340** | 520 | 243 | 241 | 2.1 | 2 | 3 350 000 | 7 550 000 | 345 000 | 770 000 | 260 |
| **360** | 540 | 243 | 241 | 2.1 | 2 | 3 450 000 | 7 850 000 | 350 000 | 800 000 | 260 |
| **380** | 560 | 243 | 241 | 2.1 | 2 | 3 550 000 | 8 400 000 | 365 000 | 855 000 | 240 |
| **400** | 600 | 272 | 270 | 2.1 | 2 | 4 250 000 | 9 950 000 | 435 000 | 1 010 000 | 220 |

| Bearing Numbers | | Locating Ring Dimensions (mm) | | | | Oil Holes (mm) | Abutment and Fillet Dimensions (mm) | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Without Locating Ring | With Locating Ring | $C_1$ | $S$ | $D_2$ | $f$ | $d_{OH}$ | $d_a$ min. | $D_x$ min. | approx. |
| **RS-5008** | **RS-5008NR** | 28 | 4.5 | 71.8 | 2 | 2.5 | 43.5 | 77.5 | 0.56 |
| **RS-5009** | **RS-5009NR** | 30 | 4.5 | 78.8 | 2 | 2.5 | 48.5 | 84.5 | 0.70 |
| **RS-5010** | **RS-5010NR** | 30 | 4.5 | 83.8 | 2 | 2.5 | 53.5 | 89.5 | 0.76 |
| **RS-5011** | **RS-5011NR** | 34 | 5.5 | 94.8 | 2.5 | 3 | 60 | 101 | 1.17 |
| **RS-5012** | **RS-5012NR** | 34 | 5.5 | 99.8 | 2.5 | 3 | 65 | 106 | 1.25 |
| **RS-5013** | **RS-5013NR** | 34 | 5.5 | 104.8 | 2.5 | 3 | 70 | 111 | 1.32 |
| **RS-5014** | **RS-5014NR** | 42 | 5.5 | 114.5 | 2.5 | 3 | 75 | 121 | 1.87 |
| **RS-5015** | **RS-5015NR** | 42 | 5.5 | 119.5 | 2.5 | 3 | 80 | 126 | 2.0 |
| **RS-5016** | **RS-5016NR** | 48 | 5.5 | 129.5 | 2.5 | 3 | 85 | 136 | 2.65 |
| **RS-5017** | **RS-5017NR** | 48 | 5.5 | 134.5 | 2.5 | 3 | 90 | 141 | 2.75 |
| **RS-5018** | **RS-5018NR** | 54 | 6 | 145.4 | 2.5 | 4 | 96 | 153.5 | 3.75 |
| **RS-5019** | **RS-5019NR** | 54 | 6 | 150.4 | 2.5 | 4 | 101 | 158.5 | 3.95 |
| **RS-5020** | **RS-5020NR** | 54 | 6 | 155.4 | 2.5 | 4 | 106 | 163.5 | 4.05 |
| **RS-5022** | **RS-5022NR** | 65 | 7 | 175.4 | 2.5 | 5 | 116.5 | 183.5 | 6.1 |
| **RS-5024** | **RS-5024NR** | 65 | 7 | 188 | 3 | 5 | 126.5 | 197 | 7.0 |
| **RS-5026** | **RS-5026NR** | 77 | 8.5 | 207 | 3 | 5 | 136.5 | 217 | 10.6 |
| **RS-5028** | **RS-5028NR** | 77 | 8.5 | 217 | 3 | 5 | 146.5 | 227 | 11.3 |
| **RS-5030** | **RS-5030NR** | 81 | 9 | 232 | 3 | 6 | 157 | 242 | 13.7 |
| **RS-5032** | **RS-5032NR** | 89 | 9.5 | 247 | 3 | 6 | 167 | 257 | 16.8 |
| **RS-5034** | **RS-5034NR** | 99 | 11 | 270 | 4 | 6 | 177 | 285 | 22.2 |
| **RS-5036** | **RS-5036NR** | 110 | 12.5 | 294 | 5 | 6 | 187 | 318 | 30 |
| **RS-5038** | **RS-5038NR** | 110 | 12.5 | 304 | 5 | 6 | 197 | 328 | 32 |
| **RS-5040** | **RS-5040NR** | 120 | 14.5 | 324 | 5 | 6 | 207 | 352 | 41 |
| **RS-5044** | **RS-5044NR** | 130 | 14.5 | 356 | 6 | 7 | 228.5 | 382 | 53 |
| **RS-5048** | **RS-5048NR** | 130 | 14.5 | 376 | 6 | 7 | 248.5 | 402 | 57 |
| **RS-5052** | **RS-5052NR** | 154 | 17.5 | 416 | 7 | 8 | 270 | 444 | 86 |
| **RS-5056** | **RS-5056NR** | 154 | 17.5 | 436 | 7 | 8 | 290 | 472 | 92 |
| **RS-5060** | **RS-5060NR** | 178 | 19 | 476 | 7 | 8 | 310 | 512 | 130 |
| **RS-5064** | — | — | — | — | — | 8 | 330 | — | 135 |
| **RS-5068** | — | — | — | — | — | 10 | 352 | — | 185 |
| **RS-5072** | — | — | — | — | — | 10 | 372 | — | 192 |
| **RS-5076** | — | — | — | — | — | 10 | 392 | — | 196 |
| **RS-5080** | — | — | — | — | — | 10 | 412 | — | 280 |

**Note** (1) Chamfer dimension of inner ring in radial direction.

**Remarks** 1. Good quality grease is prepacked in bearings.
2. Grease can be supplied through oil holes in the inner rings.

**Remarks** 3. Cylindrical roller bearings for sheaves are designed for specific applications, when using them, please contact NSK.
4. For shield with outside diameter larger than 180mm, the above figure is different actual shape. For detail drawing, please contact NSK.







# ROLL-NECK BEARINGS

**FOUR-ROW TAPERED ROLLER BEARINGS**
Bore Diameter 100 – 939.800mm ..... B338

**FOUR-ROW CYLINDRICAL ROLLER BEARINGS**
Bore Diameter 100 – 920mm ..... B340

## DESIGN, TYPES, AND FEATURES

Four-row tapered roller bearings and four-row cylindrical roller bearings used for rolling-mill roll necks are easy to service and check, and are designed to have the highest load rating possible for the limited space around roll necks. Also, they are designed for high speed to satisfy the demand for fast rolling.

In addition to the open type (KV) four-row tapered roller bearings listed in this catalog, sealed-clean type four-row tapered roller bearings are also available. Please refer to "Large-Size Rolling Bearings" catalog (CAT. No. E125) or "Extra-Capacity Sealed-Clean™ Roll Neck Bearings" catalog (CAT. No. E1225) for more detailed information.

## TOLERANCES AND RUNNING ACCURACY

**METRIC DESIGN FOUR-ROW TAPERED ROLLER BEARINGS** ..... Table 8.3 (Pages A64 to A67)

**INCH DESIGN FOUR-ROW TAPERED ROLLER BEARINGS** ..... Table 8.4 (Pages A68 to A69)

**FOUR-ROW CYLINDRICAL ROLLER BEARINGS** ..... Table 8.2 (Pages A60 to A63)
(Not applicable to combined width)

## RECOMMENDED FITS

### FOUR-ROW TAPERED ROLLER BEARINGS (CYLINDRICAL BORES)

Tables 1 and 2 apply to metric series bearings and Tables 3 and 4 to inch design.

**Table 1 Fits of Metric Design Four-Row Tapered Roller Bearings with Roll Necks**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | Single Plane Mean Bore Dia. Deviation $\Delta_{dmp}$ | | Tolerance | | Clearance | | Wear Limits |
|---|---|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | min | max | Ref. |
| 80 | 120 | 0 | −20 | −120 | −150 | 100 | 150 | 300 |
| 120 | 180 | 0 | −25 | −150 | −175 | 125 | 175 | 350 |
| 180 | 250 | 0 | −30 | −175 | −200 | 145 | 200 | 400 |
| 250 | 315 | 0 | −35 | −210 | −250 | 175 | 250 | 500 |
| 315 | 400 | 0 | −40 | −240 | −300 | 200 | 300 | 600 |
| 400 | 500 | 0 | −45 | −245 | −300 | 200 | 300 | 600 |
| 500 | 630 | 0 | −50 | −250 | −300 | 200 | 300 | 600 |
| 630 | 800 | 0 | −75 | −325 | −400 | 250 | 400 | 800 |

**Table 2 Fits of Metric Design Four-Row Tapered Roller Bearings with Chock**

Units : μm

| Nominal Outside Diameter $D$ (mm) | | Single Plane Mean Outside Dia. Deviation $\Delta_{D_{mp}}$ | | Tolerance for Chock Bore Diameter | | Clearance | | Wear Limits of Chock |
|---|---|---|---|---|---|---|---|---|
| over | incl | high | low | high | low | min | max | Ref. |
| 120 | 150 | 0 | − 18 | + 57 | +25 | 25 | 75 | 150 |
| 150 | 180 | 0 | − 25 | +100 | +50 | 50 | 125 | 250 |
| 180 | 250 | 0 | − 30 | +120 | +50 | 50 | 150 | 300 |
| 250 | 315 | 0 | − 35 | +115 | +50 | 50 | 150 | 300 |
| 315 | 400 | 0 | − 40 | +110 | +50 | 50 | 150 | 300 |
| 400 | 500 | 0 | − 45 | +105 | +50 | 50 | 150 | 300 |
| 500 | 630 | 0 | − 50 | +100 | +50 | 50 | 150 | 300 |
| 630 | 800 | 0 | − 75 | +150 | +75 | 75 | 225 | 450 |
| 800 | 1 000 | 0 | −100 | +150 | +75 | 75 | 250 | 500 |

**Table 3 Fits of Inch Design Four-Row Tapered Roller Bearings with Roll Necks**

Units : μm

| Nominal Bore Diameter $d$ | | | | Bore Diameter Deviation $\Delta_{d_s}$ | | Tolerance for Roll Neck Diameter | | Clearance | | Wear Limits of Roll Neck |
|---|---|---|---|---|---|---|---|---|---|---|
| over | | incl | | | | | | | | |
| (mm) | 1/25.4 | (mm) | 1/25.4 | high | low | high | low | min | max | Ref. |
| 152.400 | 6.0000 | 203.200 | 8.0000 | + 25 | 0 | −150 | −175 | 150 | 200 | 400 |
| 203.200 | 8.0000 | 304.800 | 12.0000 | + 25 | 0 | −175 | −200 | 175 | 225 | 450 |
| 304.800 | 12.0000 | 609.600 | 24.0000 | + 51 | 0 | −200 | −250 | 200 | 301 | 600 |
| 609.600 | 24.0000 | 914.400 | 36.0000 | + 76 | 0 | −250 | −325 | 250 | 401 | 800 |
| 914.400 | 36.0000 | — | — | +102 | 0 | −300 | −400 | 300 | 502 | 1 000 |

**Table 4 Fits of Inch Design Four-Row Tapered Roller Bearings with Chocks**

Units : μm

| Nominal Outside Diameter $D$ | | | | Outside Dia. Deviation $\Delta_{D_s}$ | | Tolerance for Chock Bore Diameter | | Clearance | | Wear Limits of Chock |
|---|---|---|---|---|---|---|---|---|---|---|
| over | | incl | | | | | | | | |
| (mm) | 1/25.4 | (mm) | 1/25.4 | high | low | high | low | min | max | Ref. |
| — | — | 304.800 | 12.0000 | + 25 | 0 | + 75 | + 50 | 25 | 75 | 150 |
| 304.800 | 12.0000 | 609.600 | 24.0000 | + 51 | 0 | +150 | +100 | 49 | 150 | 300 |
| 609.600 | 24.0000 | 914.400 | 36.0000 | + 76 | 0 | +225 | +150 | 74 | 225 | 450 |
| 914.400 | 36.0000 | 1 219.200 | 48.0000 | +102 | 0 | +300 | +200 | 98 | 300 | 600 |
| 1 219.200 | 48.0000 | 1 524.000 | 60.0000 | +127 | 0 | +375 | +250 | 123 | 375 | 750 |





### FOUR-ROW CYLINDRICAL ROLLER BEARINGS (CYLINDRICAL BORES)

When they are used on backup rolls of four stage rolling mills, the tolerances for roll neck diameters are shown in Table 5. For the fitting between the bearing and chock bore, we recommend G7.

For the fitting of four-row cylindrical roller bearings on the roll necks of other rolling mills, Table 9.2 (Page A84) and Table 9.4 (Page A85) usually apply.

**Table 5 Recommended Backup Roll Neck Tolerances**

Units : μm

| Nominal Bore Diameter $d$ | | Tolerances for Roll Neck Diameter | |
|---|---|---|---|
| over | incl | high | low |
| 280 | 355 | +0.165 | +0.13 |
| 355 | 400 | +0.19 | +0.15 |
| 400 | 450 | +0.22 | +0.17 |
| 450 | 500 | +0.25 | +0.19 |
| 500 | 560 | +0.28 | +0.21 |
| 560 | 630 | +0.32 | +0.25 |
| 630 | 710 | +0.35 | +0.27 |
| 710 | 800 | +0.39 | +0.31 |
| 800 | 900 | +0.44 | +0.35 |
| 900 | 1 000 | +0.48 | +0.39 |

## INTERNAL CLEARANCES

### FOUR-ROW TAPERED ROLLER BEARINGS

The radial internal clearances in four-row tapered roller bearings (cylindrical bores) used on rolling mill roll necks with a loose fit are C2 or often smaller than C2. The NSK standard clearances for four-row tapered roller bearings for roll necks are shown in Table 6. Depending on the operating conditions, special radial clearance selection may become necessary, please contact NSK in such a case.

The internal clearance in four-row tapered roller bearings is peadjusted for individual bearing sets, therefore it is necessary to use each part of a given set by observing mating marks when assembling them.

### FOUR-ROW CYLINDRICAL ROLLER BEARINGS

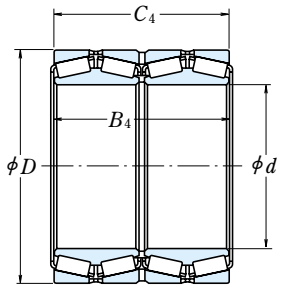
Please contact NSK regarding internal clearance.

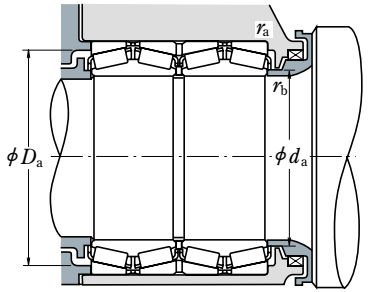
**Table 6 Standard Radial Internal Clearances in Four-Row Tapered Roller Bearings (Cylindrical Bores)**

Units : μm

| Nominal Bore Diameter $d$ (mm) | | Radial Internal Clearance | |
|---|---|---|---|
| over | incl | min | max |
| 80 | 120 | 25 | 45 |
| 120 | 180 | 30 | 50 |
| 180 | 250 | 40 | 60 |
| 250 | 315 | 50 | 70 |
| 315 | 400 | 60 | 80 |
| 400 | 500 | 70 | 90 |
| 500 | 630 | 80 | 100 |
| 630 | 800 | 100 | 120 |
| 800 | 1 000 | 120 | 140 |

**Bore Diameter 100 – 939.800 mm**




| Boundary Dimensions (mm) | | | | Basic Load Ratings (N) | | {kgf} | |
|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B_4$ | $C_4$ | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ |
| **100** | 140 | 104 | 104 | 320 000 | 765 000 | 32 500 | 78 000 |
| **120** | 170 | 124 | 124 | 475 000 | 1 080 000 | 48 000 | 110 000 |
| **135** | 180 | 160 | 160 | 455 000 | 1 280 000 | 46 500 | 130 000 |
| **150** | 212 | 155 | 155 | 750 000 | 1 880 000 | 76 500 | 192 000 |
| **165.100** | 225.425 | 165.100 | 168.275 | 705 000 | 2 160 000 | 72 000 | 220 000 |
| **177.800** | 247.650 | 192.088 | 192.088 | 950 000 | 2 570 000 | 97 000 | 262 000 |
| **190.500** | 266.700 | 187.325 | 188.912 | 1 010 000 | 2 870 000 | 103 000 | 293 000 |
| **206.375** | 282.575 | 190.500 | 190.500 | 995 000 | 2 870 000 | 101 000 | 292 000 |
| **228.600** | 400.050 | 296.875 | 296.875 | 2 570 000 | 5 450 000 | 262 000 | 555 000 |
| **240** | 338 | 248 | 248 | 1 960 000 | 5 300 000 | 199 000 | 540 000 |
| **244.475** | 327.025 | 193.675 | 193.675 | 1 300 000 | 3 700 000 | 132 000 | 375 000 |
| **254.000** | 358.775 | 269.875 | 269.875 | 2 230 000 | 6 150 000 | 227 000 | 630 000 |
| **266.700** | 355.600 | 230.188 | 228.600 | 1 810 000 | 5 050 000 | 185 000 | 515 000 |
| **279.400** | 393.700 | 269.875 | 269.875 | 2 010 000 | 5 450 000 | 205 000 | 555 000 |
| **304.648** | 438.048 | 280.990 | 279.400 | 2 600 000 | 6 750 000 | 265 000 | 685 000 |
| **343.052** | 457.098 | 254.000 | 254.000 | 2 520 000 | 7 250 000 | 256 000 | 740 000 |
| **368.300** | 523.875 | 382.588 | 382.588 | 5 050 000 | 14 900 000 | 515 000 | 1 520 000 |
| **384.175** | 546.100 | 400.050 | 400.050 | 5 750 000 | 16 600 000 | 585 000 | 1 700 000 |
| **406.400** | 546.100 | 288.925 | 288.925 | 2 960 000 | 8 550 000 | 300 000 | 875 000 |
| **415.925** | 590.550 | 434.975 | 434.975 | 6 450 000 | 19 500 000 | 655 000 | 1 990 000 |
| **457.200** | 596.900 | 276.225 | 279.400 | 3 300 000 | 10 000 000 | 335 000 | 1 020 000 |
| **479.425** | 679.450 | 495.300 | 495.300 | 8 200 000 | 25 500 000 | 840 000 | 2 600 000 |
| **482.600** | 615.950 | 330.200 | 330.200 | 4 100 000 | 13 800 000 | 415 000 | 1 410 000 |
| **500** | 705 | 515 | 515 | 8 350 000 | 26 600 000 | 850 000 | 2 710 000 |
| **509.948** | 654.924 | 377.000 | 379.000 | 4 700 000 | 16 100 000 | 480 000 | 1 640 000 |
| **558.800** | 736.600 | 409.575 | 409.575 | 6 050 000 | 19 400 000 | 620 000 | 1 980 000 |
| **571.500** | 812.800 | 593.725 | 593.725 | 11 700 000 | 37 000 000 | 1 200 000 | 3 800 000 |
| **609.600** | 787.400 | 361.950 | 361.950 | 5 750 000 | 18 700 000 | 585 000 | 1 910 000 |
| **635** | 900 | 660 | 660 | 13 300 000 | 43 500 000 | 1 350 000 | 4 400 000 |
| **685.800** | 876.300 | 352.425 | 355.600 | 6 350 000 | 22 200 000 | 645 000 | 2 270 000 |
| **711.200** | 914.400 | 317.500 | 317.500 | 5 500 000 | 19 300 000 | 560 000 | 1 970 000 |
| **749.300** | 990.600 | 605.000 | 605.000 | 13 000 000 | 47 000 000 | 1 330 000 | 4 800 000 |
| **762.000** | 1 066.800 | 723.900 | 736.600 | 18 000 000 | 59 500 000 | 1 840 000 | 6 050 000 |
| **840.000** | 1 170.000 | 840.000 | 840.000 | 22 200 000 | 76 000 000 | 2 260 000 | 7 750 000 |
| **939.800** | 1 333.500 | 952.500 | 952.500 | 26 900 000 | 92 000 000 | 2 740 000 | 9 400 000 |

| Bearing Numbers | Abutment and Fillet Dimensions (mm) | | | | Mass (kg) | Reference Numbers |
|---|---|---|---|---|---|---|
| | $d_a$ | $D_a$ | $r_a$ max. | $r_b$ max. | approx. | |
| **100 KV 895** | 109 | 130 | 2 | 1.5 | 4.9 | — |
| **120 KV 895** | 131 | 158 | 2 | 2 | 8.5 | — |
| **135 KV 1802** | 145 | 169 | 1.5 | 2 | 11.1 | — |
| **150 KV 895** | 162 | 196 | 2 | 2 | 17 | — |
| ***165 KV 2252** | 178 | 209 | 3.3 | 0.8 | 20.2 | 46791D -720-721D |
| ***177 KV 2452** | 192 | 228 | 3.3 | 1.5 | 27.9 | 67791D -720-721D |
| ***190 KV 2651** | 204 | 246 | 3.3 | 1.5 | 32.8 | 67885D -820-820D |
| ***206 KV 2854** | 218 | 261 | 3.3 | 0.8 | 35.2 | 67986D -920-921D |
| ***228 KV 4051** | 264 | 367 | 3.3 | 3.3 | 152 | EE 529091D -157-158XD |
| **240 KV 895** | 257 | 315 | 2.5 | 2.5 | 68.5 | — |
| ***244 KV 3251** | 260 | 306 | 3.3 | 1.5 | 44.6 | LM 247748D -710-710D |
| ***254 KV 3551** | 272 | 335 | 3.3 | 1.5 | 85.6 | M 249748DW -710-710D |
| ***266 KV 3552** | 281 | 335 | 3.3 | 1.5 | 60.6 | LM 451349D -310-310D |
| ***279 KV 3951** | 302 | 363 | 6.4 | 1.5 | 100 | EE 135111D -155-156XD |
| ***304 KV 4353** | 329 | 407 | 4.8 | 3.3 | 133 | M 757448DW -410-410D |
| ***343 KV 4555** | 362 | 430 | 3.3 | 1.5 | 114 | LM 761649DW -610-610D |
| ***368 KV 5251** | 396 | 487 | 6.4 | 3.3 | 274 | HM 265049D -010-010D |
| ***384 KV 5452** | 417 | 510 | 6.4 | 3.3 | 309 | HM 266449D -410-410D |
| ***406 KV 5455** | 430 | 512 | 6.4 | 1.5 | 186 | LM 767749DW -710-710D |
| ***415 KV 5951** | 451 | 550 | 6.4 | 3.3 | 395 | M 268749D -710-710D |
| ***457 KV 5952** | 487 | 566 | 3.3 | 1.5 | 201 | L 770849DW -810-810D |
| ***479 KV 6751** | 520 | 635 | 6.4 | 3.3 | 595 | M 272749DW -710-710D |
| ***482 KV 6152** | 508 | 582 | 6.4 | 3.3 | 242 | LM 272249DW -210-210D |
| **500 KV 895** | 544 | 657 | 5 | 5 | 654 | — |
| ***509 KV 6551** | 536 | 619 | 6.4 | 1.5 | 312 | — |
| ***558 KV 7352** | 588 | 697 | 6.4 | 3.3 | 457 | LM 377449DW -410-410D |
| ***571 KV 8151** | 622 | 755 | 6.4 | 3.3 | 1 020 | M 278749DW -710-710D |
| ***609 KV 7851 A** | 644 | 745 | 6.4 | 3.3 | 454 | EE 649241DW -310-311D |
| **635 KV 9001** | 695 | 840 | 5 | 4 | 1 380 | — |
| ***685 KV 8751** | 730 | 833 | 6.4 | 3.3 | 543 | EE 655271DW -345-346D |
| ***711 KV 9151** | 770 | 870 | 6.4 | 3.3 | 549 | EE 755281DW -360-361D |
| ***749 KV 9951** | 804 | 940 | 6.4 | 3.3 | 1 310 | LM 283649DW -610-610D |
| ***762 KV 1051** | 828 | 996 | 12.7 | 5 | 2 100 | — |
| ***840 KV 1151** | 910 | 1 095 | 7 | 7 | 2 900 | — |
| ***939 KV 1351** | 1 035 | 1 245 | 12.7 | 4.8 | 4 380 | LM 287849DW -810-810D |

**Note** (*) Bearings marked * are inch design.

**Remarks** 1. For four-row tapered roller bearings not listed above, please contact NSK.
2. Four-row tapered roller bearings are designed for specific applications, when using them, please contact NSK.

## Bore Diameter 100 – 330 mm

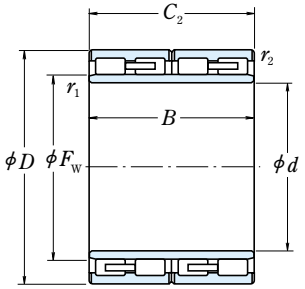



Figure 1

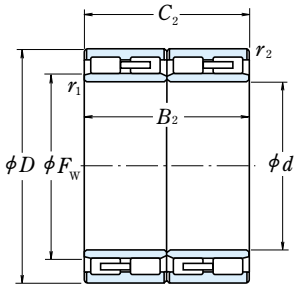



Figure 2

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | {kgf} | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B, B_2$ | $C_2$ | $F_w$ | $r_1$ min. | $r_2$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ |
| **100** | 140 | 104 | 104 | 111 | 1.5 | 1.1 | 345 000 | 820 000 | 35 000 | 84 000 |
| **145** | 225 | 156 | 156 | 169 | 2 | 2 | 835 000 | 1 820 000 | 85 000 | 185 000 |
| **150** | 220 | 150 | 150 | 168 | 2 | 2 | 770 000 | 1 700 000 | 78 500 | 174 000 |
| | 230 | 156 | 156 | 174 | 2 | 2 | 825 000 | 1 810 000 | 84 500 | 185 000 |
| **160** | 230 | 130 | 130 | 178 | 2 | 2 | 665 000 | 1 340 000 | 68 000 | 136 000 |
| | 230 | 168 | 168 | 180 | 2 | 2 | 895 000 | 2 200 000 | 91 500 | 225 000 |
| **170** | 250 | 168 | 168 | 192 | 2.1 | 2.1 | 1 040 000 | 2 320 000 | 106 000 | 237 000 |
| | 255 | 180 | 180 | 193 | 2.1 | 2.1 | 1 130 000 | 2 500 000 | 115 000 | 255 000 |
| **180** | 250 | 156 | 156 | 200 | 2 | 2 | 880 000 | 2 230 000 | 89 500 | 227 000 |
| | 260 | 168 | 168 | 202 | 2.1 | 2.1 | 990 000 | 2 300 000 | 101 000 | 235 000 |
| **190** | 260 | 168 | 168 | 212 | 2 | 2 | 980 000 | 2 600 000 | 100 000 | 265 000 |
| | 270 | 200 | 200 | 212 | 2.1 | 2.1 | 1 260 000 | 3 100 000 | 128 000 | 315 000 |
| **200** | 280 | 200 | 200 | 224 | 2.1 | 2.1 | 1 210 000 | 3 200 000 | 123 000 | 325 000 |
| | 290 | 192 | 192 | 226 | 2.1 | 2.1 | 1 220 000 | 3 000 000 | 124 000 | 305 000 |
| **220** | 310 | 192 | 192 | 247 | 2.1 | 2.1 | 1 320 000 | 3 450 000 | 134 000 | 350 000 |
| | 310 | 225 | 225 | 245 | 2.1 | 2.1 | 1 500 000 | 3 900 000 | 153 000 | 395 000 |
| | 320 | 210 | 210 | 248 | 2.1 | 2.1 | 1 530 000 | 3 650 000 | 156 000 | 375 000 |
| **230** | 330 | 206 | 206 | 260 | 2.1 | 2.1 | 1 510 000 | 3 900 000 | 154 000 | 395 000 |
| | 340 | 260 | 260 | 261 | 3 | 3 | 2 050 000 | 5 100 000 | 209 000 | 520 000 |
| **240** | 330 | 220 | 220 | 270 | 3 | 3 | 1 520 000 | 4 400 000 | 155 000 | 445 000 |
| **250** | 350 | 220 | 220 | 278 | 3 | 3 | 1 660 000 | 4 200 000 | 169 000 | 430 000 |
| **260** | 370 | 220 | 220 | 292 | 3 | 3 | 1 760 000 | 4 450 000 | 179 000 | 455 000 |
| | 380 | 280 | 280 | 294 | 3 | 3 | 2 420 000 | 6 250 000 | 247 000 | 635 000 |
| **270** | 380 | 230 | 230 | 298 | 2.1 | 2.1 | 2 000 000 | 5 050 000 | 204 000 | 515 000 |
| **280** | 390 | 220 | 220 | 312 | 3 | 3 | 1 820 000 | 4 800 000 | 186 000 | 490 000 |
| **300** | 400 | 300 | 300 | 328 | 2 | 2 | 2 330 000 | 6 900 000 | 238 000 | 700 000 |
| | 420 | 240 | 240 | 332 | 3 | 3 | 2 280 000 | 5 750 000 | 233 000 | 585 000 |
| **310** | 430 | 240 | 240 | 344.5 | 3 | 3 | 2 240 000 | 5 950 000 | 228 000 | 605 000 |
| **320** | 450 | 240 | 240 | 355 | 3 | 3 | 2 320 000 | 5 750 000 | 237 000 | 585 000 |
| **330** | 460 | 340 | 340 | 365 | 4 | 4 | 3 050 000 | 8 650 000 | 310 000 | 880 000 |

| Bearing Numbers | Mass (kg) approx. | Figures | Reference Bearing Numbers |
|---|---|---|---|
| **100 RV 1401** | 4 | 2 | — |
| **145 RV 2201** | 23 | 1 | 313924A |
| **150 RV 2201** | 20 | 1 | — |
| **150 RV 2302** | 23 | 1 | 313891A |
| **160 RV 2301** | 16 | 1 | — |
| **160 RV 2302** | 22 | 1 | — |
| **170 RV 2501** | 27 | 1 | — |
| **170 RV 2503** | 31 | 1 | — |
| **180 RV 2501** | 23 | 1 | — |
| **180 RV 2601** | 29 | 1 | 313812 |
| **190 RV 2601** | 26 | 1 | — |
| **190 RV 2701** | 36 | 1 | 314199B |
| **200 RV 2801** | 38 | 1 | — |
| **200 RV 2901** | 42 | 1 | 313811 |
| **220 RV 3101** | 46 | 1 | — |
| **220 RV 3102** | 52 | 1 | — |
| **220 RV 3201** | 56 | 1 | — |
| **230 RV 3301** | 58 | 1 | 313824 |
| **230 RV 3401** | 81 | 1 | — |
| **240 RV 3301** | 57 | 1 | 313921 |
| **250 RV 3501** | 64 | 1 | — |
| **260 RV 3701** | 76 | 1 | 313823 |
| **260 RV 3801** | 107 | 1 | — |
| **270 RV 3801** | 83 | 1 | — |
| **280 RV 3901** | 80 | 1 | 313822 |
| **300 RV 4021** | 103 | 2 | — |
| **300 RV 4201** | 101 | 1 | — |
| **310 RV 4301** | 107 | 1 | — |
| **320 RV 4502** | 116 | 1 | — |
| **330 RV 4601** | 174 | 1 | — |

**Remarks** 1. For four-row cylindrical roller bearings not listed above, please contact NSK.
2. Four-row cylindrical roller bearings are designed for specific applications, when using them, please contact NSK.

## Bore Diameter 370 – 920 mm

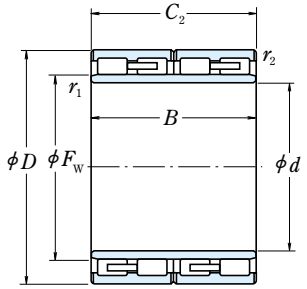



Figure 1

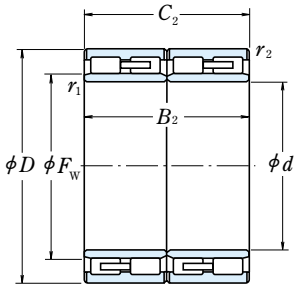



Figure 2

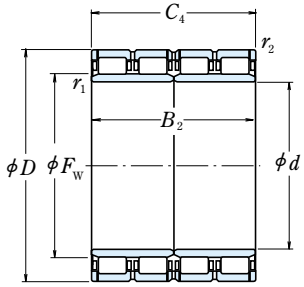



Figure 3

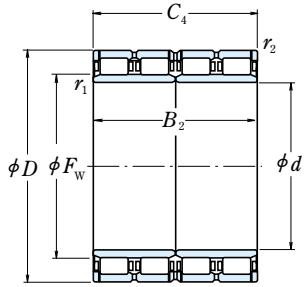


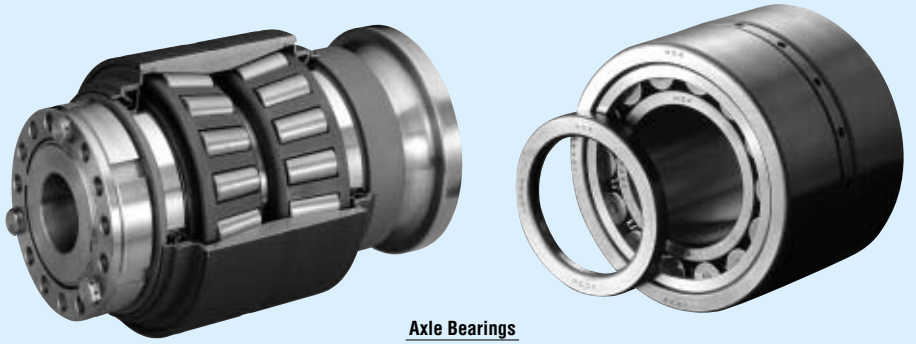

Figure 4

| Boundary Dimensions (mm) | | | | | | | Basic Load Ratings (N) | | Basic Load Ratings {kgf} | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | $D$ | $B$, $B_2$ | $C_2$ | $F_w$ | $r_1$ min. | $r_2$ min. | $C_r$ | $C_{0r}$ | $C_r$ | $C_{0r}$ |
| **370** | 540 | 400 | 400 | 415 | 4 | 4 | 4 500 000 | 12 000 000 | 460 000 | 1 230 000 |
| **380** | 540 | 400 | 400 | 424 | 5 | 5 | 4 300 000 | 12 000 000 | 440 000 | 1 220 000 |
| **390** | 550 | 400 | 400 | 434 | 5 | 5 | 4 400 000 | 12 400 000 | 450 000 | 1 260 000 |
| **400** | 560 | 410 | 410 | 445 | 5 | 2 | 5 600 000 | 16 500 000 | 575 000 | 1 680 000 |
| **430** | 591 | 420 | 420 | 476 | 4 | 4 | 4 450 000 | 13 400 000 | 455 000 | 1 370 000 |
| **440** | 620 | 450 | 450 | 490 | 4 | 4 | 6 350 000 | 19 000 000 | 650 000 | 1 940 000 |
| **450** | 630 | 450 | 450 | 500 | 4 | 4 | 5 950 000 | 17 500 000 | 605 000 | 1 780 000 |
| **460** | 670 | 500 | 500 | 522 | 6 | 6 | 7 650 000 | 22 700 000 | 780 000 | 2 320 000 |
| **480** | 680 | 500 | 500 | 534 | 5 | 5 | 7 700 000 | 23 100 000 | 785 000 | 2 360 000 |
| **500** | 690 | 510 | 510 | 552 | 5 | 5 | 7 750 000 | 24 600 000 | 790 000 | 2 500 000 |
| | 700 | 515 | 515 | 554 | 5 | 5 | 7 800 000 | 23 800 000 | 800 000 | 2 430 000 |
| | 720 | 530 | 530 | 560 | 6 | 6 | 8 550 000 | 25 300 000 | 870 000 | 2 580 000 |
| **520** | 735 | 535 | 535 | 574.5 | 5 | 5 | 8 900 000 | 26 300 000 | 910 000 | 2 680 000 |
| **530** | 780 | 570 | 570 | 601 | 6 | 6 | 10 100 000 | 29 200 000 | 1 030 000 | 2 980 000 |
| **570** | 815 | 594 | 594 | 628 | 6 | 6 | 11 700 000 | 33 500 000 | 1 190 000 | 3 450 000 |
| **610** | 870 | 660 | 660 | 680 | 6 | 6 | 13 200 000 | 41 500 000 | 1 340 000 | 4 250 000 |
| **650** | 920 | 690 | 690 | 723 | 7.5 | 7.5 | 14 200 000 | 45 000 000 | 1 450 000 | 4 600 000 |
| **690** | 980 | 715 | 715 | 767.5 | 7.5 | 7.5 | 15 300 000 | 48 000 000 | 1 560 000 | 4 900 000 |
| **700** | 930 | 620 | 620 | 763 | 6 | 6 | 11 100 000 | 38 000 000 | 1 130 000 | 3 900 000 |
| | 980 | 700 | 700 | 774 | 6 | 6 | 15 300 000 | 49 000 000 | 1 560 000 | 5 000 000 |
| **725** | 1 000 | 700 | 700 | 796 | 6 | 6 | 15 600 000 | 51 000 000 | 1 590 000 | 5 200 000 |
| **760** | 1 080 | 805 | 790 | 845 | 6 | 6 | 19 000 000 | 61 000 000 | 1 940 000 | 6 200 000 |
| **800** | 1 080 | 750 | 750 | 880 | 6 | 6 | 16 000 000 | 56 500 000 | 1 630 000 | 5 750 000 |
| **820** | 1 160 | 840 | 840 | 911 | 7.5 | 7.5 | 21 900 000 | 71 500 000 | 2 230 000 | 7 300 000 |
| | 1 100 | 745 | 720 | 892 | 6 | 3 | 16 900 000 | 58 500 000 | 1 720 000 | 6 000 000 |
| **850** | 1 180 | 850 | 850 | 940 | 7.5 | 7.5 | 21 100 000 | 72 000 000 | 2 150 000 | 7 350 000 |
| **860** | 1 130 | 670 | 670 | 934 | 6 | 6 | 15 700 000 | 56 500 000 | 1 600 000 | 5 800 000 |
| | 1 160 | 735 | 710 | 940 | 7.5 | 4 | 17 500 000 | 60 000 000 | 1 780 000 | 6 100 000 |
| **900** | 1 230 | 895 | 870 | 985 | 7.5 | 7.5 | 22 100 000 | 76 000 000 | 2 250 000 | 7 750 000 |
| **920** | 1 280 | 865 | 850 | 1 015 | 7.5 | 7.5 | 24 000 000 | 80 000 000 | 2 450 000 | 8 150 000 |

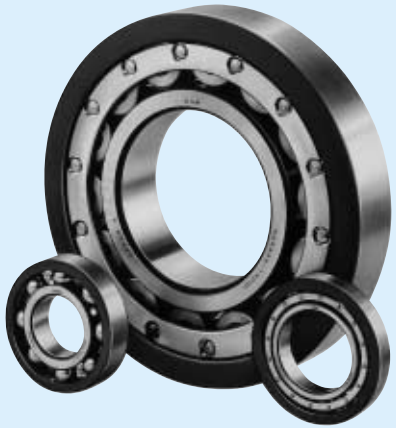
| Bearing Numbers | Mass (kg) approx. | Figures | Reference Bearing Numbers |
|---|---|---|---|
| **370 RV 5401** | 311 | 1 | — |
| **380 RV 5401** | 280 | 1(1) | — |
| **390 RV 5521** | 303 | 2(1) | — |
| **400 RV 5611** | 315 | 3 | 313015 |
| **430 RV 5921** | 347 | 2 | — |
| **440 RV 6221** | 430 | 2 | — |
| **450 RV 6321** | 440 | 2 | — |
| **460 RV 6721** | 596 | 2(1) | — |
| **480 RV 6811** | 610 | 3 | — |
| **500 RV 6921** | 580 | 2(1) | — |
| **500 RV 7021** | 622 | 2(1) | — |
| **500 RV 7211** | 782 | 3 | — |
| **520 RV 7331** | 750 | 4 | — |
| **530 RV 7811** | 960 | 3 | — |
| **570 RV 8111** | 960 | 3 | — |
| **610 RV 8711** | 1 330 | 3 | — |
| **650 RV 9211** | 1 520 | 3 | — |
| **690 RV 9831** | 1 790 | 4 | — |
| **700 RV 9311** | 1 200 | 3 | — |
| **700 RV 9821** | 1 720 | 2(1) | — |
| **725 RV 1011** | 1 670 | 3 | — |
| **760 RV 1032** | 2 430 | 4 | — |
| **800 RV 1032** | 2 050 | 4 | — |
| **820 RV 1121** | 2 900 | 2(1) | — |
| **820 RV 1132** | 2 000 | 4 | — |
| **850 RV 1111** | 2 850 | 3 | — |
| **860 RV 1132** | 1 780 | 4 | — |
| **860 RV 1133** | 2 200 | 4 | — |
| **900 RV 1211** | 3 200 | 3 | — |
| **920 RV 1211** | 3 510 | 3 | — |

**Remarks** 1. For four-row cylindrical roller bearings not listed above, please contact NSK.
2. Four-row cylindrical roller bearings are designed for specific applications, when using them, please contact NSK.

**Note** (1) Oil holes and oil grooves are provided at the center of outer rings.



Axle Bearings



Traction Motor Bearings

Gear Unit Bearings





# Railway Rolling Stock Bearings

Railway rolling stock bearings are important components of rolling stocks that require high reliability.
The main bearings consist of axle bearings that are mounted at both ends of axle and support the entire weight of the rolling stock. Additionally, there are railway traction motor bearings that are used for the motor that drives the axle; and gear unit bearings that transfer the power from the motor to the axle. NSK has designed and manufactured specific bearings for these very applications.

## Types and Features

### Axle Bearings

- Axle bearings consist of the following types of bearings to meet operator demands for high-speed capability of rolling stock, weight reductions, and minimal maintenance and inspection requirements:
  - ➢ Cylindrical roller bearings with a thrust collar (oil bath lubrication, grease lubrication)
  - ➢ Tapered roller bearings (oil bath lubrication)
  - ➢ RCC Bearings (sealed-clean rotating end cap cylindrical roller bearings) (grease lubrication)
  - ➢ RCT bearings (sealed-clean rotating end cap tapered roller bearings) (grease lubrication)
- NSK has been approved by AAR (Association of American Railroads).

### Traction Motor Bearings

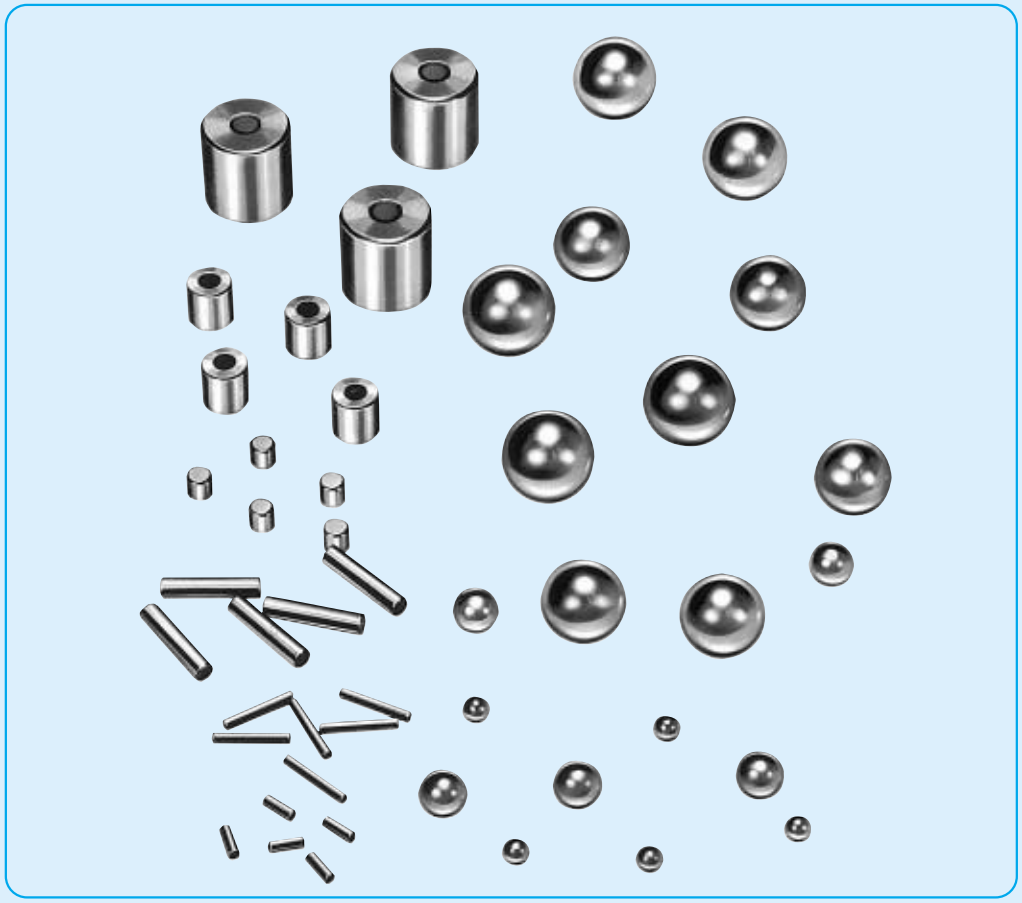
- Bearings for inverter controlled AC motors are speciality designed to meet high-speed specifications and requirements for ensuring dimensional stability. NSK recommends long-life grease for these bearings.
- NSK offers the following bearings as a measure against electric erosion, which occurs when electric current is allowed to flow through the motor bearings:
  - ➢ Ceramic-insulated bearings (ceramic-coated bearings) and PPS-insulated bearings
- High capacity bearings also available for locomotive-type large traction motors

### Gear Unit Bearings

- These bearings are designed to meet high-speed specifications and offer excellent seizure resistance.
- A reinforced cage has been adopted for these bearings.

## Specified catalogs

- Bearings for Railway Rolling Stock CAT. No. E1156
- Axle Bearings for Railway Rolling Stock (Cylindrical Roller Bearings) CAT. No. E1239
- Axle Bearings for Railway Rolling Stock (Spherical Roller Bearings) CAT. No. E1240
- Bearings for Traction Motors CAT. No. E1241



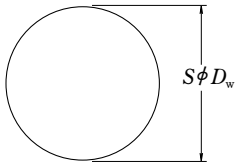
# STEEL BALLS AND ROLLERS


**STEEL BALLS FOR BALL BEARINGS** — Nominal Diameter 0.3 – 114.3mm ····· B348

**CYLINDRICAL ROLLERS FOR ROLLER BEARINGS** — Nominal Diameter 3 – 80mm ····· B350

**LONG CYLINDRICAL ROLLERS FOR ROLLER BEARINGS** — Nominal Diameter 5.5 – 15mm ····· B352

**NEEDLE ROLLERS FOR ROLLER BEARINGS** — Nominal Diameter 1 – 5mm ····· B354




## Nominal Size, Basic Diameters, and Mass

| Nominal Size | | Basic Diameter $D_w$ (mm) | Mass (kg) per 10000 pcs approx. | Nominal Size | | Basic Diameter $D_w$ (mm) | Mass (kg) per 1000 pcs approx. | Nominal Size | | Basic Diameter $D_w$ (mm) | Mass (kg) per 10 pcs approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | Inch | | | Metric | Inch | | | Metric | Inch | | |
| **0.3mm** | | 0.30000 | 0.0011 | | **3/8** | 9.52500 | 3.523 | **30mm** | | 30.00000 | 1.101 |
| **0.4mm** | | 0.40000 | 0.0026 | **10 mm** | | 10.00000 | 4.076 | | **1 3/16** | 30.16250 | 1.119 |
| **0.5mm** | | 0.50000 | 0.0051 | | **13/32** | 10.31875 | 4.479 | | **1 1/4** | 31.75000 | 1.305 |
| **0.6mm** | | 0.60000 | 0.0088 | **11 mm** | | 11.00000 | 5.425 | **32mm** | | 32.00000 | 1.336 |
| | **0.025** | 0.63500 | 0.0104 | | **7/16** | 11.11250 | 5.594 | | **1 5/16** | 33.33750 | 1.510 |
| **0.7mm** | | 0.70000 | 0.0140 | **11.5mm** | | 11.50000 | 6.199 | **34mm** | | 34.00000 | 1.602 |
| | **1/32** | 0.79375 | 0.0204 | | **15/32** | 11.90625 | 6.880 | | **1 3/8** | 34.92500 | 1.736 |
| **0.8mm** | | 0.80000 | 0.0209 | **12 mm** | | 12.00000 | 7.044 | **35mm** | | 35.00000 | 1.748 |
| **1 mm** | | 1.00000 | 0.0408 | | **1/2** | 12.70000 | 8.350 | **36mm** | | 36.00000 | 1.902 |
| | **3/64** | 1.19062 | 0.0688 | **13 mm** | | 13.00000 | 8.955 | | **1 7/16** | 36.51250 | 1.984 |
| **1.2mm** | | 1.20000 | 0.0704 | | **17/32** | 13.49375 | 10.02 | **38mm** | | 38.00000 | 2.237 |
| **1.5mm** | | 1.50000 | 0.1376 | **14 mm** | | 14.00000 | 11.19 | | **1 1/2** | 38.10000 | 2.254 |
| | **1/16** | 1.58750 | 0.1631 | | **9/16** | 14.28750 | 11.89 | | **1 9/16** | 39.68750 | 2.548 |
| | **5/64** | 1.98438 | 0.3185 | **15 mm** | | 15.00000 | 13.76 | **40mm** | | 40.00000 | 2.609 |
| **2 mm** | | 2.00000 | 0.3261 | | **19/32** | 15.08125 | 13.98 | | **1 5/8** | 41.27500 | 2.866 |
| | **3/32** | 2.38125 | 0.5504 | | **5/8** | 15.87500 | 16.31 | | **1 11/16** | 42.86250 | 3.210 |
| **2.5mm** | | 2.50000 | 0.6369 | **16 mm** | | 16.00000 | 16.70 | | **1 3/4** | 44.45000 | 3.580 |
| | **7/64** | 2.77812 | 0.8740 | | **21/32** | 16.66875 | 18.88 | **45mm** | | 45.00000 | 3.714 |
| **3 mm** | | 3.00000 | 1.101 | **17 mm** | | 17.00000 | 20.03 | | **1 13/16** | 46.03750 | 3.977 |
| | **1/8** | 3.17500 | 1.305 | | **11/16** | 17.46250 | 21.71 | | **1 7/8** | 47.62500 | 4.403 |
| **3.5mm** | | 3.50000 | 1.748 | **18 mm** | | 18.00000 | 23.77 | | **1 15/16** | 49.21250 | 4.858 |
| | **9/64** | 3.57188 | 1.858 | | **23/32** | 18.25625 | 24.80 | **50mm** | | 50.00000 | 5.095 |
| | **5/32** | 3.96875 | 2.548 | **19 mm** | | 19.00000 | 27.96 | | **2** | 50.80000 | 5.344 |
| **4 mm** | | 4.00000 | 2.609 | | **3/4** | 19.05000 | 28.18 | | **2 1/8** | 53.97500 | 6.410 |
| **4.5mm** | | 4.50000 | 3.714 | | **25/32** | 19.84375 | 31.85 | **55mm** | | 55.00000 | 6.782 |
| | **3/16** | 4.76250 | 4.403 | **20 mm** | | 20.00000 | 32.61 | | **2 1/4** | 57.15000 | 7.609 |
| **5 mm** | | 5.00000 | 5.095 | | **13/16** | 20.63750 | 35.83 | **60mm** | | 60.00000 | 8.805 |
| **5.5mm** | | 5.50000 | 6.782 | **21 mm** | | 21.00000 | 37.75 | | **2 3/8** | 60.32500 | 8.948 |
| | **7/32** | 5.55625 | 7.016 | | **27/32** | 21.43125 | 40.12 | | **2 1/2** | 63.50000 | 10.44 |
| | **15/64** | 5.95312 | 8.600 | **22 mm** | | 22.00000 | 43.40 | **65mm** | | 65.00000 | 11.19 |
| **6 mm** | | 6.00000 | 8.805 | | **7/8** | 22.22500 | 44.75 | | **2 5/8** | 66.67500 | 12.08 |
| | **1/4** | 6.35000 | 10.44 | **23 mm** | | 23.00000 | 49.60 | | **2 3/4** | 69.85000 | 13.89 |
| **6.5mm** | | 6.50000 | 11.19 | | **29/32** | 23.01875 | 49.72 | | **2 7/8** | 73.02500 | 15.87 |
| | **17/64** | 6.74688 | 12.52 | | **15/16** | 23.81250 | 55.04 | | **3** | 76.20000 | 18.04 |
| **7 mm** | | 7.00000 | 13.98 | **24 mm** | | 24.00000 | 56.35 | | **3 1/4** | 82.55000 | 22.93 |
| | **9/32** | 7.14375 | 14.86 | | **31/32** | 24.60625 | 60.73 | | **3 1/2** | 88.90000 | 28.64 |
| **7.5mm** | | 7.50000 | 17.20 | **25 mm** | | 25.00000 | 63.69 | | **3 3/4** | 95.25000 | 35.23 |
| | **5/16** | 7.93750 | 20.38 | | **1** | 25.40000 | 66.80 | | **4** | 101.60000 | 42.75 |
| **8 mm** | | 8.00000 | 20.87 | **26 mm** | | 26.00000 | 71.64 | | **4 1/4** | 107.95000 | 51.28 |
| **8.5mm** | | 8.50000 | 25.03 | | **1 1/16** | 26.98750 | 80.12 | | **4 1/2** | 114.30000 | 60.87 |
| | **11/32** | 8.73125 | 27.13 | **28 mm** | | 28.00000 | 89.48 | | | | |
| **9 mm** | | 9.00000 | 29.72 | | **1 1/8** | 28.57500 | 95.11 | | | | |





## Application, Nominal Size, Tolerances, Roughness, and Gauges

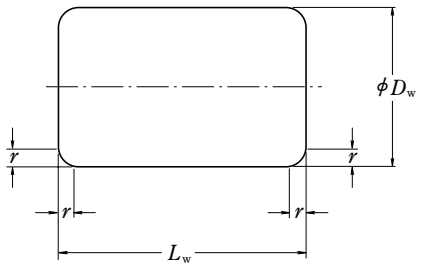
Units : μm

| Class | Nominal Size | | Tolerances | | | Gauges | | |
|---|---|---|---|---|---|---|---|---|
| | | | Variation in Dia. | Sphericity | Roughness $R_a$ | Diameter Difference per Lot | Gauge Interval | Gauge |
| | Metric (mm) | Inch | max. | max. | max. | max. | | |
| **3** | 0.3 to 12 | 0.025~ 1/2 | 0.08 | 0.08 | 0.012 | 0.13 | 0.5 | – 5, ·····, – 0.5, 0, + 0.5, ·····, + 5 |
| **5** | 0.3 to 12 | 0.025~ 1/2 | 0.13 | 0.13 | 0.02 | 0.25 | 1 | – 5, ·····, – 1 , 0, + 1 , ·····, + 5 |
| **10** | 0.3 to 25 | 0.025~1 | 0.25 | 0.25 | 0.025 | 0.5 | 1 | – 9, ·····, – 1 , 0, + 1 , ·····, + 9 |
| **16** | 0.3 to 25 | 0.025~1 | 0.4 | 0.4 | 0.032 | 0.8 | 2 | –10, ·····, – 2 , 0, + 2 , ·····, +10 |
| **20** | 0.3 to 38 | 0.025~1 1/2 | 0.5 | 0.5 | 0.04 | 1 | 2 | –10, ·····, – 2 , 0, + 2 , ·····, +10 |
| **28** | 0.3 to 38 | 0.025~1 1/2 | 0.7 | 0.7 | 0.05 | 1.4 | 2 | –12, ·····, – 2 , 0, + 2 , ·····, +12 |
| **40** | 0.3 to 50 | 0.025~2 | 1 | 1 | 0.08 | 2 | 4 | –16, ·····, – 4 , 0, + 4 , ·····, +16 |
| **60** | 0.3 to 65 | 0.025~3 | 1.5 | 1.5 | 0.095 | 3 | 5 | –25, ·····, – 5 , 0, + 5 , ·····, +25 |
| **100** | 0.3 to 65 | 0.025~4 1/2 | 2.5 | 2.5 | 0.125 | 5 | 10 | –40, ·····, –10 , 0, +10 , ·····, +40 |
| **200** | 0.3 to 65 | 0.025~4 1/2 | 5 | 5 | 0.2 | 10 | 15 | –60, ·····, –15 , 0, +15 , ·····, +60 |

## Hardness

| Nominal Size | | Hardness | |
|---|---|---|---|
| Metric (mm) | Inch | HV | HRC |
| 0.3 to 3 | 0.025 to 7/64 | 772 to 900 | (63 to 67)(1) |
| 3.5 to 30 | 1/8 to 1 1/8 | — | 62 to 67 |
| 32 to 65 | 1 3/16 to 4 1/2 | — | 61 to 67 |

**Note** (1) Values in ( ) are converted values for reference.




### Tolerances for Cylindrical Roller Chamfers

Units : mm

| min. | max. |
|---|---|
| 0.1 | 0.3 |
| 0.2 | 0.5 |
| 0.3 | 0.8 |
| 0.5 | 1.2 |
| 0.6 | 1.5 |
| 0.7 | 1.7 |
| 1 | 2.2(1) |
| 1.5 | 3.5 |
| 2 | 4 |

**Note** (1) If $D_w$ exceeds 40mm, $r$ (max.) is 2.7mm.

Units : mm

| Nominal Size | $D_w$ | $L_w$ | $r$ min. | Mass (kg) per 100 pcs approx. |
|---|---|---|---|---|
| **3 × 3** | 3 | 3 | 0.1 | 0.016 |
| **3 × 5** | 3 | 5 | 0.1 | 0.027 |
| **3.5× 5** | 3.5 | 5 | 0.2 | 0.037 |
| **4 × 4** | 4 | 4 | 0.2 | 0.039 |
| **4 × 6** | 4 | 6 | 0.2 | 0.058 |
| **4 × 8** | 4 | 8 | 0.2 | 0.078 |
| **4.5× 4.5** | 4.5 | 4.5 | 0.2 | 0.055 |
| **4.5× 6** | 4.5 | 6 | 0.2 | 0.073 |
| **5 × 5** | 5 | 5 | 0.2 | 0.075 |
| **5 × 8** | 5 | 8 | 0.2 | 0.121 |
| **5 ×10** | 5 | 10 | 0.2 | 0.152 |
| **5.5× 5.5** | 5.5 | 5.5 | 0.2 | 0.10 |
| **5.5× 8** | 5.5 | 8 | 0.2 | 0.146 |
| **6 × 6** | 6 | 6 | 0.2 | 0.13 |
| **6 × 8** | 6 | 8 | 0.2 | 0.178 |
| **6 ×12** | 6 | 12 | 0.2 | 0.261 |
| **6.5× 6.5** | 6.5 | 6.5 | 0.3 | 0.166 |
| **6.5× 9** | 6.5 | 9 | 0.3 | 0.23 |
| **7 × 7** | 7 | 7 | 0.3 | 0.206 |
| **7 ×10** | 7 | 10 | 0.3 | 0.296 |
| **7 ×14** | 7 | 14 | 0.3 | 0.415 |
| **7.5× 7.5** | 7.5 | 7.5 | 0.3 | 0.254 |
| **7.5×11** | 7.5 | 11 | 0.3 | 0.375 |
| **8 × 8** | 8 | 8 | 0.3 | 0.31 |
| **8 ×12** | 8 | 12 | 0.3 | 0.465 |
| **9 × 9** | 9 | 9 | 0.3 | 0.44 |
| **9 ×14** | 9 | 14 | 0.3 | 0.68 |
| **10 ×10** | 10 | 10 | 0.3 | 0.60 |
| **10 ×14** | 10 | 14 | 0.3 | 0.85 |
| **11 ×11** | 11 | 11 | 0.3 | 0.81 |
| **11 ×15** | 11 | 15 | 0.3 | 1.1 |
| **12 ×12** | 12 | 12 | 0.3 | 1.04 |
| **12 ×18** | 12 | 18 | 0.3 | 1.57 |
| **13 ×13** | 13 | 13 | 0.3 | 1.33 |
| **13 ×20** | 13 | 20 | 0.3 | 2.04 |
| **14 ×14** | 14 | 14 | 0.3 | 1.66 |
| **14 ×20** | 14 | 20 | 0.3 | 2.38 |

Units : mm

| Nominal Size | $D_w$ | $L_w$ | $r$ min. | Mass (kg) per 100 pcs approx. |
|---|---|---|---|---|
| **15 × 15** | 15 | 15 | 0.5 | 2.04 |
| **15 × 22** | 15 | 22 | 0.5 | 3.0 |
| **16 × 16** | 16 | 16 | 0.5 | 2.48 |
| **16 × 24** | 16 | 24 | 0.5 | 3.75 |
| **17 × 17** | 17 | 17 | 0.5 | 2.97 |
| **17 × 24** | 17 | 24 | 0.5 | 4.2 |
| **18 × 18** | 18 | 18 | 0.5 | 3.55 |
| **18 × 26** | 18 | 26 | 0.5 | 5.1 |
| **19 × 19** | 19 | 19 | 0.6 | 4.16 |
| **19 × 28** | 19 | 28 | 0.6 | 6.1 |
| **20 × 20** | 20 | 20 | 0.6 | 4.85 |
| **20 × 30** | 20 | 30 | 0.6 | 7.3 |
| **21 × 21** | 21 | 21 | 0.6 | 5.6 |
| **21 × 30** | 21 | 30 | 0.6 | 8.0 |
| **22 × 22** | 22 | 22 | 0.6 | 6.4 |
| **22 × 34** | 22 | 34 | 0.6 | 10 |
| **23 × 23** | 23 | 23 | 0.6 | 7.4 |
| **23 × 34** | 23 | 34 | 0.6 | 11.2 |
| **24 × 24** | 24 | 24 | 0.6 | 8.4 |
| **24 × 36** | 24 | 36 | 0.6 | 12.6 |
| **25 × 25** | 25 | 25 | 0.7 | 9.5 |
| **25 × 36** | 25 | 36 | 0.7 | 13.7 |
| **26 × 26** | 26 | 26 | 0.7 | 10.7 |
| **26 × 40** | 26 | 40 | 0.7 | 16.4 |
| **28 × 28** | 28 | 28 | 0.7 | 13.3 |
| **28 × 44** | 28 | 44 | 0.7 | 21 |
| **30 × 30** | 30 | 30 | 0.7 | 16.3 |
| **30 × 48** | 30 | 48 | 0.7 | 26.2 |
| **32 × 32** | 32 | 32 | 1 | 19.9 |
| **32 × 52** | 32 | 52 | 1 | 32.5 |
| **34 × 34** | 34 | 34 | 1 | 23.9 |
| **34 × 55** | 34 | 55 | 1 | 38.5 |
| **36 × 36** | 36 | 36 | 1 | 28.3 |
| **36 × 58** | 36 | 58 | 1 | 45.5 |
| **38 × 38** | 38 | 38 | 1 | 33.5 |
| **38 × 62** | 38 | 62 | 1 | 55 |
| **40 × 40** | 40 | 40 | 1 | 39 |
| **40 × 65** | 40 | 65 | 1 | 63 |

Units : mm

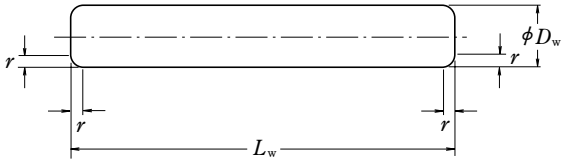
| Nominal Size | $D_w$ | $L_w$ | $r$ min. | Mass (kg) per 100 pcs approx. |
|---|---|---|---|---|
| **42 × 42** | 42 | 42 | 1 | 45 |
| **45 × 45** | 45 | 45 | 1 | 55.5 |
| **48 × 48** | 48 | 48 | 1 | 67 |
| **50 × 50** | 50 | 50 | 1 | 76 |
| **52 × 52** | 52 | 52 | 1.5 | 85 |
| **54 × 54** | 54 | 54 | 1.5 | 95.5 |
| **56 × 56** | 56 | 56 | 1.5 | 107 |
| **60 × 60** | 60 | 60 | 1.5 | 131 |
| **64 × 64** | 64 | 64 | 1.5 | 159 |
| **68 × 68** | 68 | 68 | 1.5 | 191 |
| **75 × 75** | 75 | 75 | 2 | 256 |
| **80 × 80** | 80 | 80 | 2 | 310 |

### Accuracy of Cylindrical Rollers

Units : μm

| Class | $D_w$ (mm) over | $D_w$ (mm) incl | Out-of-Roundness(1) $\Delta R$ max. | Single Plane Mean Roller Diameter Variation(2) $VD_{Wmp}$ max. | Roller Gauge Lot Diameter Variation(1) $VD_{WL}$ max. | Length Deviation(3) $\Delta L_{Ws}$ high | Length Deviation(3) $\Delta L_{Ws}$ low(4) | Roller Gauge Lot Length Variation $VL_{WL}$ max. | End Face Runout $S_w$ max. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 18 | 0.5 | 0.8 | 1 | +10 | – [ ( IT9) – 10] | 5 | 3 |
| 1A | 3 | 30 | 0.7 | 1 | 1.5 | +10 | – [ ( IT9) – 10] | 7 | 5 |
| 2 | 3 | 50 | 1 | 1.5 | 2 | +10 | – [ ( IT9) – 10] | 10 | 6 |
| 2A | 10 | 80 | 1.3 | 2 | 2.5 | +10 | – [ ( IT9) – 10] | 13 | 8 |
| 3 | 18 | 80 | 1.5 | 3 | 3 | +10 | – [ ( IT9) – 10] | 15 | 10 |
| 5 | 30 | 80 | 2.5 | 4 | 5 | +10 | – [ ( IT9) – 10] | 25 | 15 |

**Notes** (1) Applicable to roller center (length direction).
(2) Applicable to cylindrical outside surface.
(3) To find the IT9 standard tolerance according to the $L_w$ size classification, refer to the IT9 column of the Appendix Table 11 on Page C22.
(4) The value for low of length deviation is subtracted 10μm from the value of the standard tolerance for each roller length.




**Remarks** The figure shows an example of a flat-end long cylindrical roller.

Units : mm

| Nominal Size | $D_w$ | $L_w$ | $r$ (1) min. | Mass (kg) per 100 pcs approx. |
|---|---|---|---|---|
| **5.5×18** | 5.5 | 18 | 0.2 | 0.333 |
| **5.5×22.4** | 5.5 | 22.4 | 0.2 | 0.414 |
| **5.5×28** | 5.5 | 28 | 0.2 | 0.518 |
| **6 ×20** | 6 | 20 | 0.2 | 0.44 |
| **6 ×25** | 6 | 25 | 0.2 | 0.55 |
| **6 ×31.5** | 6 | 31.5 | 0.2 | 0.693 |
| **6 ×40** | 6 | 40 | 0.2 | 0.88 |
| **6 ×50** | 6 | 50 | 0.2 | 1.1 |
| **6.5×20** | 6.5 | 20 | 0.3 | 0.516 |
| **6.5×25** | 6.5 | 25 | 0.3 | 0.645 |
| **6.5×31.5** | 6.5 | 31.5 | 0.3 | 0.813 |
| **7 ×22.4** | 7 | 22.4 | 0.3 | 0.671 |
| **7 ×28** | 7 | 28 | 0.3 | 0.838 |
| **7 ×35.5** | 7 | 35.5 | 0.3 | 1.06 |
| **7 ×45** | 7 | 45 | 0.3 | 1.35 |
| **7 ×56** | 7 | 56 | 0.3 | 1.68 |
| **7.5×31.5** | 7.5 | 31.5 | 0.3 | 1.08 |
| **7.5×40** | 7.5 | 40 | 0.3 | 1.38 |

Units : mm

| Nominal Size | $D_w$ | $L_w$ | $r$ (1) min. | Mass (kg) per 100 pcs approx. |
|---|---|---|---|---|
| **8 ×25** | 8 | 25 | 0.3 | 0.978 |
| **8 ×31.5** | 8 | 31.5 | 0.3 | 1.23 |
| **8 ×40** | 8 | 40 | 0.3 | 1.56 |
| **8 ×50** | 8 | 50 | 0.3 | 1.96 |
| **8 ×63** | 8 | 63 | 0.3 | 2.46 |
| **9 ×28** | 9 | 28 | 0.3 | 1.39 |
| **9 ×35.5** | 9 | 35.5 | 0.3 | 1.76 |
| **9 ×45** | 9 | 45 | 0.3 | 2.23 |
| **9 ×56** | 9 | 56 | 0.3 | 2.77 |
| **10×31.5** | 10 | 31.5 | 0.3 | 1.93 |
| **10×40** | 10 | 40 | 0.3 | 2.44 |
| **10×50** | 10 | 50 | 0.3 | 3.06 |
| **10×63** | 10 | 63 | 0.3 | 3.85 |
| **12×40** | 12 | 40 | 0.3 | 3.52 |
| **12×50** | 12 | 50 | 0.3 | 4.4 |
| **12×63** | 12 | 63 | 0.3 | 5.54 |
| **15×45** | 15 | 45 | 0.5 | 6.16 |
| **15×56** | 15 | 56 | 0.5 | 7.68 |
| **15×71** | 15 | 71 | 0.5 | 9.74 |
| **15×90** | 15 | 90 | 0.5 | 12.4 |

**Note** (1) Only for flat-end rollers.

### Tolerances for Long Cylindrical Roller Chamfers

Units : mm

| min. | max. |
|---|---|
| 0.2 | 0.5 |
| 0.3 | 0.8 |
| 0.5 | 1.2 |

### Accuracy of Long Cylindrical Rollers

Units : μm

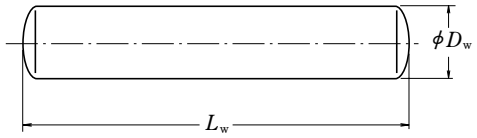
| Class | Out-of-Roundness (1) $\Delta R$ max. | Single Plane Mean Roller Diameter Variation (3) $VD_{Wmp}$ max. | Roller Gauge Lot Diameter Variation(1) $VD_{WL}$ max. | Length Deviation(2) $\Delta L_{Ws}$ |
|---|---|---|---|---|
| 3 | 1.5 | 3 | 3 | h12 |
| 5 | 2 | 5 | 5 | h12 |

**Notes** (1) Applicable to roller center (length direction).
(2) Classified by $L_w$. Refer to Tolerauce for Length Doviation.
(3) Applicable to cylindrical outside surface.

### Tolerance for Length Deviation

Units : mm

| Length | | h12 | | h13 | |
|---|---|---|---|---|---|
| over | incl | high | low | high | low |
| 3 | 6 | — | | 0 | – 0.18 |
| 6 | 10 | — | | 0 | – 0.22 |
| 10 | 18 | — | | 0 | – 0.27 |




Spherical-end Type

Units : mm

| Nominal Size | $D_w$ | $L_w$ | $r$ (1) min. | Mass (kg) per 1000 pcs approx. |
|---|---|---|---|---|
| **1 × 5.8** | 1 | 5.8 | 0.1 | 0.035 |
| **1 × 6.8** | 1 | 6.8 | 0.1 | 0.042 |
| **1 × 7.8** | 1 | 7.8 | 0.1 | 0.048 |
| **1 × 9.8** | 1 | 9.8 | 0.1 | 0.060 |
| **1.5× 5.8** | 1.5 | 5.8 | 0.1 | 0.080 |
| **1.5× 6.8** | 1.5 | 6.8 | 0.1 | 0.093 |
| **1.5× 7.8** | 1.5 | 7.8 | 0.1 | 0.105 |
| **1.5× 9.8** | 1.5 | 9.8 | 0.1 | 0.135 |
| **1.5×11.8** | 1.5 | 11.8 | 0.1 | 0.160 |
| **1.5×13.8** | 1.5 | 13.8 | 0.1 | 0.190 |
| **2 × 6.8** | 2 | 6.8 | 0.1 | 0.165 |
| **2 × 7.8** | 2 | 7.8 | 0.1 | 0.190 |
| **2 × 9.8** | 2 | 9.8 | 0.1 | 0.240 |
| **2 ×11.8** | 2 | 11.8 | 0.1 | 0.290 |
| **2 ×13.8** | 2 | 13.8 | 0.1 | 0.335 |
| **2 ×15.8** | 2 | 15.8 | 0.1 | 0.385 |
| **2 ×17.8** | 2 | 17.8 | 0.1 | 0.435 |
| **2 ×19.8** | 2 | 19.8 | 0.1 | 0.485 |
| **2.5× 7.8** | 2.5 | 7.8 | 0.1 | 0.300 |
| **2.5× 9.8** | 2.5 | 9.8 | 0.1 | 0.375 |
| **2.5×11.8** | 2.5 | 11.8 | 0.1 | 0.450 |
| **2.5×13.8** | 2.5 | 13.8 | 0.1 | 0.525 |
| **2.5×15.8** | 2.5 | 15.8 | 0.1 | 0.605 |
| **2.5×17.8** | 2.5 | 17.8 | 0.1 | 0.680 |
| **2.5×19.8** | 2.5 | 19.8 | 0.1 | 0.755 |
| **2.5×21.8** | 2.5 | 21.8 | 0.1 | 0.835 |
| **2.5×23.8** | 2.5 | 23.8 | 0.1 | 0.910 |
| **3 × 9.8** | 3 | 9.8 | 0.1 | 0.540 |
| **3 ×11.8** | 3 | 11.8 | 0.1 | 0.650 |
| **3 ×13.8** | 3 | 13.8 | 0.1 | 0.760 |
| **3 ×15.8** | 3 | 15.8 | 0.1 | 0.870 |
| **3 ×17.8** | 3 | 17.8 | 0.1 | 0.980 |
| **3 ×19.8** | 3 | 19.8 | 0.1 | 1.10 |
| **3 ×21.8** | 3 | 21.8 | 0.1 | 1.20 |
| **3 ×23.8** | 3 | 23.8 | 0.1 | 1.30 |
| **3 ×25.8** | 3 | 25.8 | 0.1 | 1.40 |
| **3 ×27.8** | 3 | 27.8 | 0.1 | 1.55 |
| **3 ×29.8** | 3 | 29.8 | 0.1 | 1.65 |
| **3.5×11.8** | 3.5 | 11.8 | 0.1 | 0.885 |
| **3.5×13.8** | 3.5 | 13.8 | 0.1 | 1.05 |
| **3.5×15.8** | 3.5 | 15.8 | 0.1 | 1.20 |
| **3.5×17.8** | 3.5 | 17.8 | 0.1 | 1.35 |

Units : mm

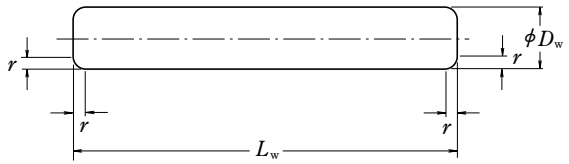
| Nominal Size | $D_w$ | $L_w$ | $r$ (1) min. | Mass (kg) per 1000 pcs approx. |
|---|---|---|---|---|
| **3.5×19.8** | 3.5 | 19.8 | 0.1 | 1.50 |
| **3.5×21.8** | 3.5 | 21.8 | 0.1 | 1.65 |
| **3.5×23.8** | 3.5 | 23.8 | 0.1 | 1.80 |
| **3.5×25.8** | 3.5 | 25.8 | 0.1 | 1.95 |
| **3.5×27.8** | 3.5 | 27.8 | 0.1 | 2.10 |
| **3.5×29.8** | 3.5 | 29.8 | 0.1 | 2.25 |
| **3.5×31.8** | 3.5 | 31.8 | 0.1 | 2.40 |
| **3.5×34.8** | 3.5 | 34.8 | 0.1 | 2.60 |
| **4 ×13.8** | 4 | 13.8 | 0.1 | 1.35 |
| **4 ×15.8** | 4 | 15.8 | 0.1 | 1.55 |
| **4 ×17.8** | 4 | 17.8 | 0.1 | 1.75 |
| **4 ×19.8** | 4 | 19.8 | 0.1 | 1.95 |
| **4 ×21.8** | 4 | 21.8 | 0.1 | 2.15 |
| **4 ×23.8** | 4 | 23.8 | 0.1 | 2.35 |
| **4 ×25.8** | 4 | 25.8 | 0.1 | 2.55 |
| **4 ×27.8** | 4 | 27.8 | 0.1 | 2.70 |
| **4 ×29.8** | 4 | 29.8 | 0.1 | 2.90 |
| **4 ×31.8** | 4 | 31.8 | 0.1 | 3.10 |
| **4 ×34.8** | 4 | 34.8 | 0.1 | 3.40 |
| **4 ×37.8** | 4 | 37.8 | 0.1 | 3.70 |
| **4 ×39.8** | 4 | 39.8 | 0.1 | 3.90 |
| **4.5×17.8** | 4.5 | 17.8 | 0.1 | 2.20 |
| **4.5×19.8** | 4.5 | 19.8 | 0.1 | 2.45 |
| **4.5×21.8** | 4.5 | 21.8 | 0.1 | 2.70 |
| **4.5×23.8** | 4.5 | 23.8 | 0.1 | 2.95 |
| **4.5×25.8** | 4.5 | 25.8 | 0.1 | 3.20 |
| **4.5×29.8** | 4.5 | 29.8 | 0.1 | 3.70 |
| **4.5×31.8** | 4.5 | 31.8 | 0.1 | 3.95 |
| **4.5×34.8** | 4.5 | 34.8 | 0.1 | 4.30 |
| **4.5×37.8** | 4.5 | 37.8 | 0.1 | 4.70 |
| **4.5×39.8** | 4.5 | 39.8 | 0.1 | 4.90 |
| **5 ×19.8** | 5 | 19.8 | 0.1 | 3.00 |
| **5 ×21.8** | 5 | 21.8 | 0.1 | 3.35 |
| **5 ×23.8** | 5 | 23.8 | 0.1 | 3.65 |
| **5 ×25.8** | 5 | 25.8 | 0.1 | 3.95 |
| **5 ×27.8** | 5 | 27.8 | 0.1 | 4.25 |
| **5 ×29.8** | 5 | 29.8 | 0.1 | 4.55 |
| **5 ×31.8** | 5 | 31.8 | 0.1 | 4.85 |
| **5 ×34.8** | 5 | 34.8 | 0.1 | 5.30 |
| **5 ×37.8** | 5 | 37.8 | 0.1 | 5.75 |
| **5 ×39.8** | 5 | 39.8 | 0.1 | 6.10 |
| **5 ×49.8** | 5 | 49.8 | 0.1 | 7.60 |

**Note** (1) Only for flat-end rollers.

**Remarks** 1. The figure shows a spherical-end type and a flat-end type.

2. The radius R of the spherical-end type is bounded by the following range:
   Minimum: $D_w/2$
   Maximum: $L_w/2$






Flat-end Type

## Tolerances for Needle Roller Chamfers

Units : mm

| $D_w$ over | $D_w$ incl | $r$ min. | $r$ max. |
|---|---|---|---|
| — | 1 | 0.1 | 0.4 |
| 1 | 3 | 0.1 | 0.6 |
| 3 | 5 | 0.1 | 0.9 |

**Remarks** Only for flat-end needle rollers.

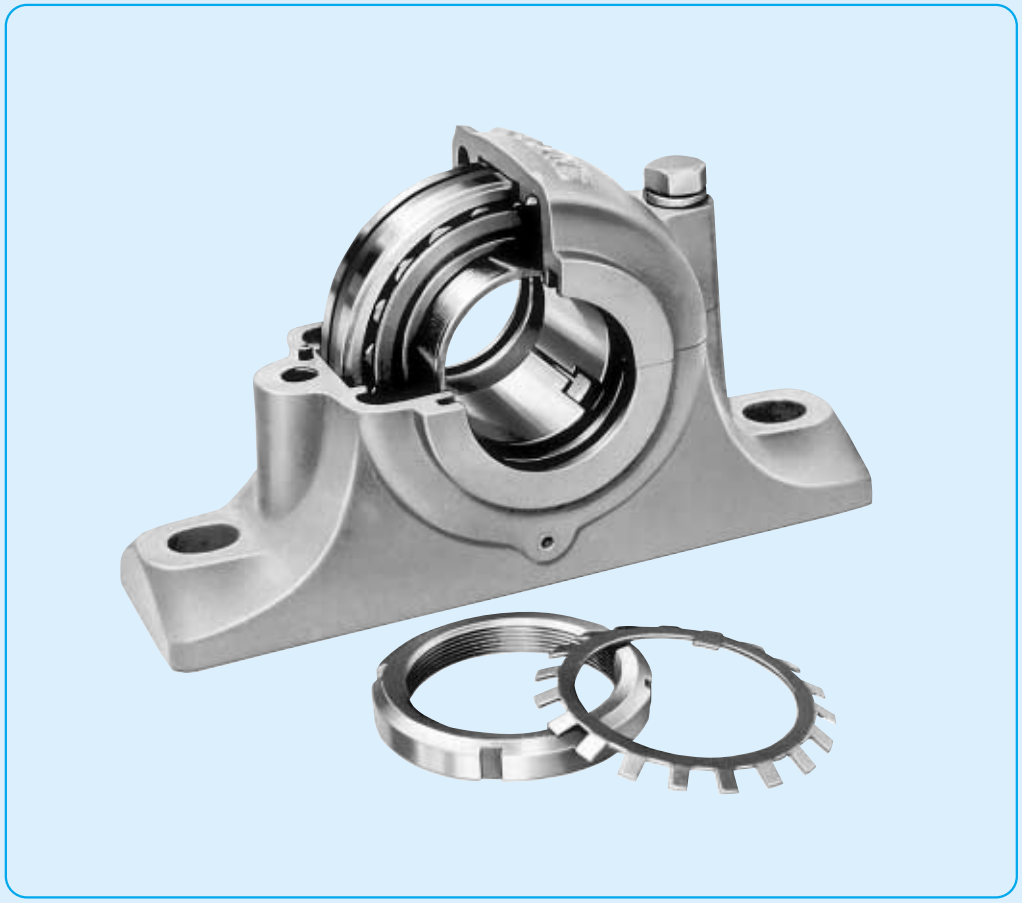
## Accuracy of Needle Rollers

Units : μm

| Class | Single Plane Mean Roller Diameter Variation (1) $VD_{WP}$ max. | Out-of-Roundness (1) $\Delta R$ max. | Roller Gauge Lot Diameter Variation(1) $VD_{WL}$ max. | Length Deviation(2) $\Delta L_{Ws}$ |
|---|---|---|---|---|
| 2 | 1 | 1 | 2 | h13 |
| 3 | 1.5 | 1.5 | 3 | h13 |
| 5 | 2 | 2.5 | 5 | h13 |

**Notes** (1) Applicable to roller center (length direction).
(2) Classified by $L_w$. Refer to Tolerance for Length Deviation in Page B349.

**Remarks** The actual diameter at any place along the entire length should not exceed the following figures compared to the actual maximum diameter at the roller center (length direction).
Class2: 0.5μm
Class3: 0.8μm
Class5: 1.0μm



# ACCESSORIES FOR ROLLING BEARINGS


**ADAPTERS FOR ROLLING BEARINGS** Shaft Diameter 17 – 470mm ..... B358

**WITHDRAWAL SLEEVES FOR ROLLING BEARINGS** Shaft Diameter 35 – 480mm ..... B366

**NUTS FOR ROLLING BEARINGS** ..... B372

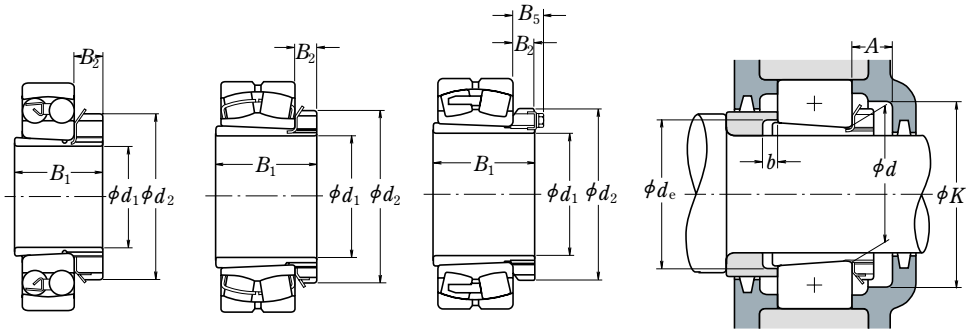
**STOPPERS FOR ROLLING BEARINGS** ..... B377

**WASHERS FOR ROLLING BEARINGS** ..... B378




NSK

## Shaft Diameter 17 – 40 mm



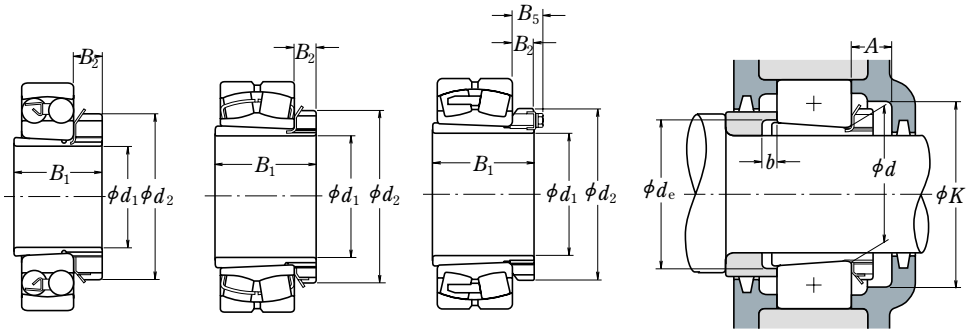

| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **17** | 20 | 1204K | + **H 204X** | 24 | 32 | 7 | — | A 204X | 14 | 39 | 23 | 5 | 0.045 |
| | 20 | 2204K | + **H 304X** | 28 | 32 | 7 | — | A 304X | 14 | 39 | 24 | 5 | 0.045 |
| | 20 | 1304K | + **H 304X** | 28 | 32 | 7 | — | A 304X | 14 | 39 | 24 | 8 | 0.045 |
| | 20 | 2304K | + **H2304X** | 31 | 32 | 7 | — | A2304X | 14 | 39 | 24 | 5 | 0.050 |
| **20** | 25 | 1205K | + **H 205X** | 26 | 38 | 8 | — | A 205X | 15 | 45 | 28 | 5 | 0.065 |
| | 25 | 2205K | + **H 305X** | 29 | 38 | 8 | — | A 305X | 15 | 45 | 29 | 5 | 0.075 |
| | 25 | 1305K | + **H 305X** | 29 | 38 | 8 | — | A 305X | 15 | 45 | 29 | 6 | 0.075 |
| | 25 | 21305C DKE4 | + **H 305X** | 29 | 38 | 8 | — | A 305X | 15 | 45 | 29 | 6 | 0.075 |
| | 25 | 2305K | + **H2305X** | 35 | 38 | 8 | — | A2305X | 15 | 45 | 29 | 5 | 0.090 |
| **25** | 30 | 1206K | + **H 206X** | 27 | 45 | 8 | — | A 206X | 15 | 50 | 33 | 5 | 0.10 |
| | 30 | 2206K | + **H 306X** | 31 | 45 | 8 | — | A 306X | 15 | 50 | 34 | 5 | 0.11 |
| | 30 | 1306K | + **H 306X** | 31 | 45 | 8 | — | A 306X | 15 | 50 | 34 | 6 | 0.11 |
| | 30 | 21306C DKE4 | + **H 306X** | 31 | 45 | 8 | — | A 306X | 15 | 50 | 34 | 6 | 0.11 |
| | 30 | 2306K | + **H2306X** | 38 | 45 | 8 | — | A2306X | 15 | 50 | 35 | 5 | 0.125 |
| **30** | 35 | 1207K | + **H 207X** | 29 | 52 | 9 | — | A 207X | 17 | 58 | 38 | 5 | 0.125 |
| | 35 | 2207K | + **H 307X** | 35 | 52 | 9 | — | A 307X | 17 | 58 | 39 | 5 | 0.145 |
| | 35 | 1307K | + **H 307X** | 35 | 52 | 9 | — | A 307X | 17 | 58 | 39 | 7 | 0.145 |
| | 35 | 21307C DKE4 | + **H 307X** | 35 | 52 | 9 | — | A 307X | 17 | 58 | 39 | 7 | 0.145 |
| | 35 | 2307K | + **H2307X** | 43 | 52 | 9 | — | A2307X | 17 | 58 | 40 | 5 | 0.16 |
| **35** | 40 | 1208K | + **H 208X** | 31 | 58 | 10 | — | A 208X | 17 | 65 | 44 | 5 | 0.175 |
| | 40 | 2208K | + **H 308X** | 36 | 58 | 10 | — | A 308X | 17 | 65 | 44 | 5 | 0.19 |
| | 40 | 1308K | + **H 308X** | 36 | 58 | 10 | — | A 308X | 17 | 65 | 44 | 5 | 0.19 |
| | 40 | 21308E AKE4 | + **H 308X** | 36 | 58 | 10 | — | A 308X | 17 | 65 | 44 | 5 | 0.19 |
| | 40 | 2308K | + **H2308X** | 46 | 58 | 10 | — | A2308X | 17 | 65 | 45 | 5 | 0.225 |
| | 40 | 22308E AKE4 | + **H2308X** | 46 | 58 | 10 | — | A2308X | 17 | 65 | 45 | 5 | 0.225 |
| **40** | 45 | 1209K | + **H 209X** | 33 | 65 | 11 | — | A 209X | 17 | 72 | 49 | 5 | 0.225 |
| | 45 | 2209K | + **H 309X** | 39 | 65 | 11 | — | A 309X | 17 | 72 | 49 | 8 | 0.26 |
| | 45 | 1309K | + **H 309X** | 39 | 65 | 11 | — | A 309X | 17 | 72 | 49 | 5 | 0.26 |
| | 45 | 21309E AKE4 | + **H 309X** | 39 | 65 | 11 | — | A 309X | 17 | 72 | 49 | 5 | 0.26 |
| | 45 | 2309K | + **H2309X** | 50 | 65 | 11 | — | A2309X | 17 | 72 | 50 | 5 | 0.30 |
| | 45 | 22309E AKE4 | + **H2309X** | 50 | 65 | 11 | — | A2309X | 17 | 72 | 50 | 5 | 0.30 |

**Remarks** The suffix X represents adapter sleeves having narrow slits, for which washers with straight tabs should be used.





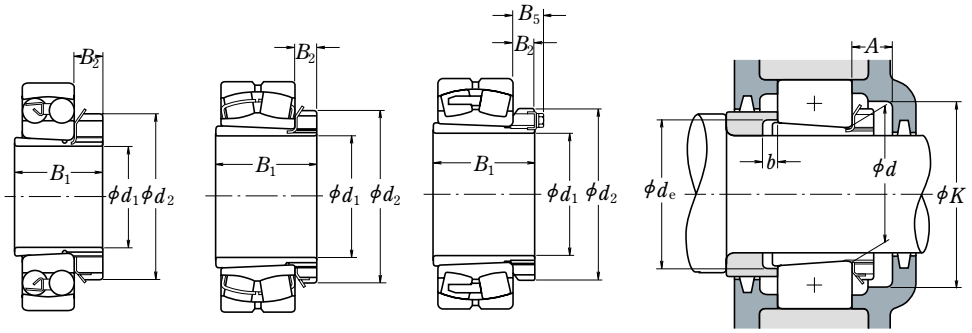
## Shaft Diameter 45 – 60 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **45** | 50 | 1210K | + **H 210X** | 35 | 70 | 12 | — | A 210X | 19 | 76 | 53 | 5 | 0.275 |
| | 50 | 2210K | + **H 310X** | 42 | 70 | 12 | — | A 310X | 19 | 76 | 54 | 10 | 0.30 |
| | 50 | 1310K | + **H 310X** | 42 | 70 | 12 | — | A 310X | 19 | 76 | 54 | 5 | 0.30 |
| | 50 | 21310E AKE4 | + **H 310X** | 42 | 70 | 12 | — | A 310X | 19 | 76 | 54 | 5 | 0.30 |
| | 50 | 2310K | + **H2310X** | 55 | 70 | 12 | — | A2310X | 19 | 76 | 56 | 5 | 0.35 |
| | 50 | 22310E AKE4 | + **H2310X** | 55 | 70 | 12 | — | A2310X | 19 | 76 | 56 | 5 | 0.35 |
| **50** | 55 | 1211K | + **H 211X** | 37 | 75 | 12 | — | A 211X | 19 | 85 | 60 | 6 | 0.305 |
| | 55 | 2211K | + **H 311X** | 45 | 75 | 12 | — | A 311X | 19 | 85 | 60 | 11 | 0.35 |
| | 55 | 22211E AKE4 | + **H 311X** | 45 | 75 | 12 | — | A 311X | 19 | 85 | 60 | 11 | 0.35 |
| | 55 | 1311K | + **H 311X** | 45 | 75 | 12 | — | A 311X | 19 | 85 | 60 | 6 | 0.35 |
| | 55 | 21311E AKE4 | + **H 311X** | 45 | 75 | 12 | — | A 311X | 19 | 85 | 60 | 6 | 0.35 |
| | 55 | 2311K | + **H2311X** | 59 | 75 | 12 | — | A2311X | 19 | 85 | 61 | 6 | 0.40 |
| | 55 | 22311E AKE4 | + **H2311X** | 59 | 75 | 12 | — | A2311X | 19 | 85 | 61 | 6 | 0.40 |
| **55** | 60 | 1212K | + **H 212X** | 38 | 80 | 13 | — | A 212X | 20 | 90 | 64 | 5 | 0.365 |
| | 60 | 2212K | + **H 312X** | 47 | 80 | 13 | — | A 312X | 20 | 90 | 65 | 9 | 0.40 |
| | 60 | 22212E AKE4 | + **H 312X** | 47 | 80 | 13 | — | A 312X | 20 | 90 | 65 | 9 | 0.40 |
| | 60 | 1312K | + **H 312X** | 47 | 80 | 13 | — | A 312X | 20 | 90 | 65 | 5 | 0.40 |
| | 60 | 21312E AKE4 | + **H 312X** | 47 | 80 | 13 | — | A 312X | 20 | 90 | 65 | 5 | 0.40 |
| | 60 | 2312K | + **H2312X** | 62 | 80 | 13 | — | A2312X | 20 | 90 | 66 | 5 | 0.45 |
| | 60 | 22312E AKE4 | + **H2312X** | 62 | 80 | 13 | — | A2312X | 20 | 90 | 66 | 5 | 0.45 |
| **60** | 65 | 1213K | + **H 213X** | 40 | 85 | 14 | — | A 213X | 21 | 96 | 70 | 5 | 0.40 |
| | 65 | 2213K | + **H 313X** | 50 | 85 | 14 | — | A 313X | 21 | 96 | 70 | 8 | 0.45 |
| | 65 | 22213E AKE4 | + **H 313X** | 50 | 85 | 14 | — | A 313X | 21 | 96 | 70 | 8 | 0.45 |
| | 65 | 1313K | + **H 313X** | 50 | 85 | 14 | — | A 313X | 21 | 96 | 70 | 5 | 0.45 |
| | 65 | 21313E AKE4 | + **H 313X** | 50 | 85 | 14 | — | A 313X | 21 | 96 | 70 | 5 | 0.45 |
| | 65 | 2313K | + **H2313X** | 65 | 85 | 14 | — | A2313X | 21 | 96 | 72 | 5 | 0.55 |
| | 65 | 22313E AKE4 | + **H2313X** | 65 | 85 | 14 | — | A2313X | 21 | 96 | 72 | 5 | 0.55 |
| | 70 | 22214E AKE4 | + **H 314X** | 52 | 92 | 14 | — | A 314X | 21 | 96 | 70 | 8 | 0.65 |
| | 70 | 21314E AKE4 | + **H 314X** | 52 | 92 | 14 | — | A 314X | 21 | 96 | 70 | 5 | 0.65 |
| | 70 | 22314E AKE4 | + **H2314X** | 68 | 92 | 14 | — | A2314X | 21 | 96 | 72 | 5 | 0.80 |

**Remarks** The suffix X represents adapter sleeves having narrow slits, for which washers with straight tabs should be used.

## Shaft Diameter 65 – 80 mm



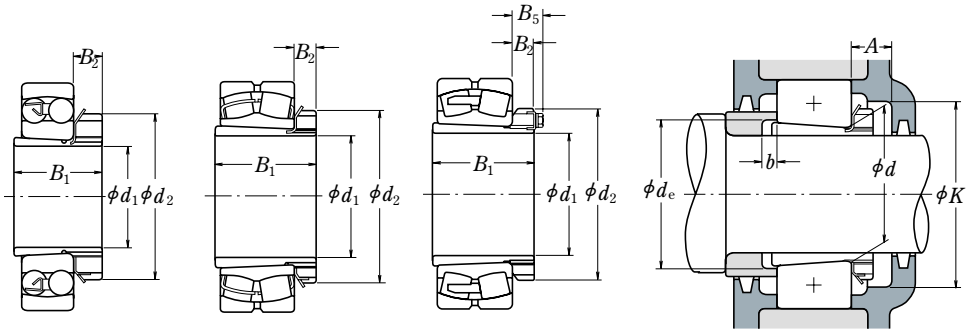

| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **65** | 75 | 1215K | + **H 215X** | 43 | 98 | 15 | — | A 215X | 23 | 110 | 80 | 5 | 0.70 |
| | 75 | 2215K | + **H 315X** | 55 | 98 | 15 | — | A 315X | 23 | 110 | 80 | 12 | 0.85 |
| | 75 | 22215E AKE4 | + **H 315X** | 55 | 98 | 15 | — | A 315X | 23 | 110 | 80 | 12 | 0.85 |
| | 75 | 1315K | + **H 315X** | 55 | 98 | 15 | — | A 315X | 23 | 110 | 80 | 5 | 0.85 |
| | 75 | 21315E AKE4 | + **H 315X** | 55 | 98 | 15 | — | A 315X | 23 | 110 | 80 | 5 | 0.85 |
| | 75 | 2315K | + **H2315X** | 73 | 98 | 15 | — | A2315X | 23 | 110 | 82 | 5 | 1.05 |
| | 75 | 22315E AKE4 | + **H2315X** | 73 | 98 | 15 | — | A2315X | 23 | 110 | 82 | 5 | 1.05 |
| **70** | 80 | 1216K | + **H 216X** | 46 | 105 | 17 | — | A 216X | 25 | 120 | 85 | 5 | 0.85 |
| | 80 | 2216K | + **H 316X** | 59 | 105 | 17 | — | A 316X | 25 | 120 | 86 | 12 | 1.05 |
| | 80 | 22216E AKE4 | + **H 316X** | 59 | 105 | 17 | — | A 316X | 25 | 120 | 86 | 12 | 1.05 |
| | 80 | 1316K | + **H 316X** | 59 | 105 | 17 | — | A 316X | 25 | 120 | 86 | 5 | 1.05 |
| | 80 | 21316E AKE4 | + **H 316X** | 59 | 105 | 17 | — | A 316X | 25 | 120 | 86 | 5 | 1.05 |
| | 80 | 2316K | + **H2316X** | 78 | 105 | 17 | — | A2316X | 25 | 120 | 87 | 5 | 1.3 |
| | 80 | 22316E AKE4 | + **H2316X** | 78 | 105 | 17 | — | A2316X | 25 | 120 | 87 | 5 | 1.3 |
| **75** | 85 | 1217K | + **H 217X** | 50 | 110 | 18 | — | A 217X | 27 | 128 | 90 | 6 | 1.0 |
| | 85 | 2217K | + **H 317X** | 63 | 110 | 18 | — | A 317X | 27 | 128 | 91 | 12 | 1.2 |
| | 85 | 22217E AKE4 | + **H 317X** | 63 | 110 | 18 | — | A 317X | 27 | 128 | 91 | 12 | 1.2 |
| | 85 | 1317K | + **H 317X** | 63 | 110 | 18 | — | A 317X | 27 | 128 | 91 | 6 | 1.2 |
| | 85 | 21317E AKE4 | + **H 317X** | 63 | 110 | 18 | — | A 317X | 27 | 128 | 91 | 6 | 1.2 |
| | 85 | 2317K | + **H2317X** | 82 | 110 | 18 | — | A2317X | 27 | 128 | 94 | 6 | 1.45 |
| | 85 | 22317E AKE4 | + **H2317X** | 82 | 110 | 18 | — | A2317X | 27 | 128 | 94 | 6 | 1.45 |
| **80** | 90 | 1218K | + **H 218X** | 52 | 120 | 18 | — | A 218X | 28 | 139 | 95 | 6 | 1.15 |
| | 90 | 2218K | + **H 318X** | 65 | 120 | 18 | — | A 318X | 28 | 139 | 96 | 10 | 1.4 |
| | 90 | 22218E AKE4 | + **H 318X** | 65 | 120 | 18 | — | A 318X | 28 | 139 | 96 | 10 | 1.4 |
| | 90 | 1318K | + **H 318X** | 65 | 120 | 18 | — | A 318X | 28 | 139 | 96 | 6 | 1.4 |
| | 90 | 21318E AKE4 | + **H 318X** | 65 | 120 | 18 | — | A 318X | 28 | 139 | 96 | 6 | 1.4 |
| | 90 | 2318K | + **H2318X** | 86 | 120 | 18 | — | A2318X | 28 | 139 | 99 | 6 | 1.7 |
| | 90 | 23218C KE4 | + **H2318X** | 86 | 120 | 18 | — | A2318X | 28 | 139 | 99 | 6 | 1.7 |
| | 90 | 22318E AKE4 | + **H2318X** | 86 | 120 | 18 | — | A2318X | 28 | 139 | 99 | 6 | 1.7 |

**Remarks** The suffix X represents adapter sleeves having narrow slits, for which washers with straight tabs should be used.





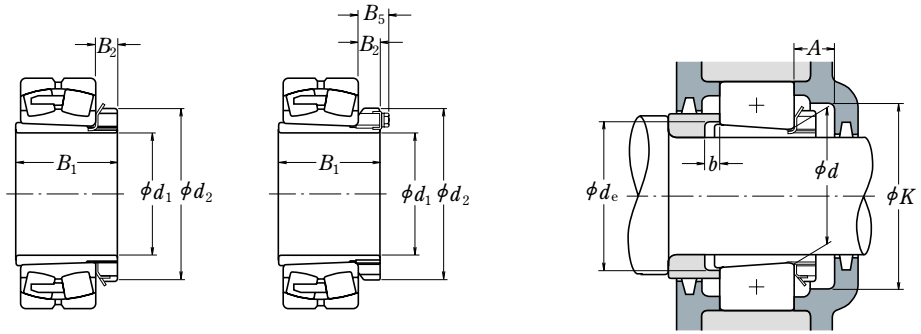
## Shaft Diameter 85 – 115 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **85** | 95 | 1219K | + **H 219X** | 55 | 125 | 19 | — | A 219X | 29 | 145 | 101 | 7 | 1.35 |
| | 95 | 2219K | + **H 319X** | 68 | 125 | 19 | — | A 319X | 29 | 145 | 102 | 9 | 1.55 |
| | 95 | 22219E AKE4 | + **H 319X** | 68 | 125 | 19 | — | A 319X | 29 | 145 | 102 | 9 | 1.55 |
| | 95 | 1319K | + **H 319X** | 68 | 125 | 19 | — | A 319X | 29 | 145 | 102 | 7 | 1.55 |
| | 95 | 21319C KE4 | + **H 319X** | 68 | 125 | 19 | — | A 319X | 29 | 145 | 102 | 7 | 1.55 |
| | 95 | 2319K | + **H2319X** | 90 | 125 | 19 | — | A2319X | 29 | 145 | 105 | 7 | 1.9 |
| | 95 | 22319E AKE4 | + **H2319X** | 90 | 125 | 19 | — | A2319X | 29 | 145 | 105 | 7 | 1.9 |
| **90** | 100 | 1220K | + **H 220X** | 58 | 130 | 20 | — | A 220X | 30 | 150 | 106 | 7 | 1.45 |
| | 100 | 2220K | + **H 320X** | 71 | 130 | 20 | — | A 320X | 30 | 150 | 107 | 8 | 1.7 |
| | 100 | 22220E AKE4 | + **H 320X** | 71 | 130 | 20 | — | A 320X | 30 | 150 | 107 | 8 | 1.7 |
| | 100 | 1320K | + **H 320X** | 71 | 130 | 20 | — | A 320X | 30 | 150 | 107 | 7 | 1.7 |
| | 100 | 21320C KE4 | + **H 320X** | 71 | 130 | 20 | — | A 320X | 30 | 150 | 107 | 7 | 1.7 |
| | 100 | 2320K | + **H2320X** | 97 | 130 | 20 | — | A2320X | 30 | 150 | 110 | 7 | 2.15 |
| | 100 | 23220C KE4 | + **H2320X** | 97 | 130 | 20 | — | A2320X | 30 | 150 | 110 | 7 | 2.15 |
| | 100 | 22320E AKE4 | + **H2320X** | 97 | 130 | 20 | — | A2320X | 30 | 150 | 110 | 7 | 2.15 |
| **100** | 110 | 23122C KE4 | + **H3122X** | 81 | 145 | 21 | — | A3122X | 32 | 170 | 117 | 7 | 2.25 |
| | 110 | 1222K | + **H 222X** | 63 | 145 | 21 | — | A 222X | 32 | 170 | 116 | 7 | 1.95 |
| | 110 | 2222K | + **H 322X** | 77 | 145 | 21 | — | A 322X | 32 | 170 | 117 | 6 | 2.3 |
| | 110 | 22222E AKE4 | + **H 322X** | 77 | 145 | 21 | — | A 322X | 32 | 170 | 117 | 6 | 2.3 |
| | 110 | 1322K | + **H 322X** | 77 | 145 | 21 | — | A 322X | 32 | 170 | 117 | 9 | 2.3 |
| | 110 | 2322K | + **H2322X** | 105 | 145 | 21 | — | A2322X | 32 | 170 | 121 | 7 | 2.75 |
| | 110 | 23222C KE4 | + **H2322X** | 105 | 145 | 21 | — | A2322X | 32 | 170 | 121 | 17 | 2.75 |
| | 110 | 22322E AKE4 | + **H2322X** | 105 | 145 | 21 | — | A2322X | 32 | 170 | 121 | 7 | 2.75 |
| **110** | 120 | 23024C DKE4 | + **H3024** | 72 | 145 | 22 | — | A 3024 | 33 | 180 | 127 | 7 | 1.95 |
| | 120 | 23124C KE4 | + **H3124** | 88 | 155 | 22 | — | A 3124 | 33 | 180 | 128 | 7 | 2.65 |
| | 120 | 22224E AKE4 | + **H3124** | 88 | 155 | 22 | — | A 3124 | 33 | 180 | 128 | 11 | 2.65 |
| | 120 | 23224C KE4 | + **H2324** | 112 | 155 | 22 | — | A 2324 | 33 | 180 | 131 | 17 | 3.2 |
| | 120 | 22324E AKE4 | + **H2324** | 112 | 155 | 22 | — | A 2324 | 33 | 180 | 131 | 7 | 3.2 |
| **115** | 130 | 23026C DKE4 | + **H3026** | 80 | 155 | 23 | — | A 3026 | 34 | 190 | 137 | 8 | 2.85 |
| | 130 | 23126C KE4 | + **H3126** | 92 | 165 | 23 | — | A 3126 | 34 | 190 | 138 | 8 | 3.65 |
| | 130 | 22226E AKE4 | + **H3126** | 92 | 165 | 23 | — | A 3126 | 34 | 190 | 138 | 8 | 3.65 |
| | 130 | 23226C KE4 | + **H2326** | 121 | 165 | 23 | — | A 2326 | 34 | 190 | 142 | 21 | 4.6 |
| | 130 | 22326C KE4 | + **H2326** | 121 | 165 | 23 | — | A 2326 | 34 | 190 | 142 | 8 | 4.6 |

**Remarks** The suffix X represents adapter sleeves having narrow slits, for which washers with straight tabs should be used.

## Shaft Diameter 125 – 170 mm

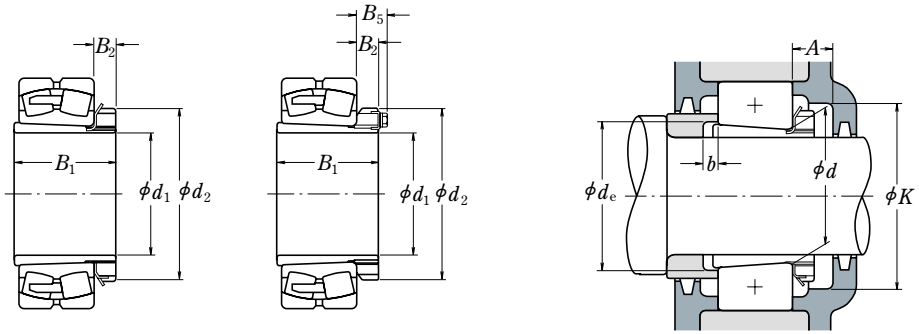



| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **125** | 140 | 23028C DKE4 + **H3028** | 82 | 165 | 24 | — | A 3028 | 36 | 205 | 147 | 8 | 3.15 |
| | 140 | 23128C KE4 + **H3128** | 97 | 180 | 24 | — | A 3128 | 36 | 205 | 149 | 8 | 4.35 |
| | 140 | 22228C DKE4 + **H3128** | 97 | 180 | 24 | — | A 3128 | 36 | 205 | 149 | 8 | 4.35 |
| | 140 | 23228C KE4 + **H2328** | 131 | 180 | 24 | — | A 2328 | 36 | 205 | 152 | 22 | 5.55 |
| | 140 | 22328C KE4 + **H2328** | 131 | 180 | 24 | — | A 2328 | 36 | 205 | 152 | 8 | 5.55 |
| **135** | 150 | 23030C DKE4 + **H3030** | 87 | 180 | 26 | — | A 3030 | 37 | 220 | 158 | 8 | 3.9 |
| | 150 | 23130C KE4 + **H3130** | 111 | 195 | 26 | — | A 3130 | 37 | 220 | 160 | 8 | 5.5 |
| | 150 | 22230C DKE4 + **H3130** | 111 | 195 | 26 | — | A 3130 | 37 | 220 | 160 | 15 | 5.5 |
| | 150 | 23230C KE4 + **H2330** | 139 | 195 | 26 | — | A 2330 | 37 | 220 | 163 | 20 | 6.6 |
| | 150 | 22330C AKE4 + **H2330** | 139 | 195 | 26 | — | A 2330 | 37 | 220 | 163 | 8 | 6.6 |
| **140** | 160 | 23932C AKE4 + **H3932** | 78 | 190 | 28 | — | A 3932 | 39 | 205 | 168 | 8 | 4.64 |
| | 160 | 23032C DKE4 + **H3032** | 93 | 190 | 28 | — | A 3032 | 39 | 230 | 168 | 8 | 5.2 |
| | 160 | 23132C KE4 + **H3132** | 119 | 210 | 28 | — | A 3132 | 39 | 230 | 170 | 8 | 7.65 |
| | 160 | 22232C DKE4 + **H3132** | 119 | 210 | 28 | — | A 3132 | 39 | 230 | 170 | 14 | 7.65 |
| | 160 | 23232C KE4 + **H2332** | 147 | 210 | 28 | — | A 2332 | 39 | 230 | 174 | 18 | 9.15 |
| | 160 | 22332C AKE4 + **H2332** | 147 | 210 | 28 | — | A 2332 | 39 | 230 | 174 | 8 | 9.15 |
| **150** | 170 | 23934B CAKE4 + **H3934** | 79 | 200 | 29 | — | A 3934 | 40 | 215 | 179 | 8 | 5.07 |
| | 170 | 23034C DKE4 + **H3034** | 101 | 200 | 29 | — | A 3034 | 40 | 250 | 179 | 8 | 6.0 |
| | 170 | 23134C KE4 + **H3134** | 122 | 220 | 29 | — | A 3134 | 40 | 250 | 180 | 8 | 8.4 |
| | 170 | 22234C DKE4 + **H3134** | 122 | 220 | 29 | — | A 3134 | 40 | 250 | 180 | 10 | 8.4 |
| | 170 | 23234C KE4 + **H2334** | 154 | 220 | 29 | — | A 2334 | 40 | 250 | 185 | 18 | 10 |
| | 170 | 22334C AKE4 + **H2334** | 154 | 220 | 29 | — | A 2334 | 40 | 250 | 185 | 8 | 10 |
| **160** | 180 | 23936C AKE4 + **H3936** | 87 | 210 | 30 | — | A 3936 | 41 | 230 | 189 | 8 | 5.87 |
| | 180 | 23036C DKE4 + **H3036** | 109 | 210 | 30 | — | A 3036 | 41 | 260 | 189 | 8 | 6.85 |
| | 180 | 23136C KE4 + **H3136** | 131 | 230 | 30 | — | A 3136 | 41 | 260 | 191 | 8 | 9.5 |
| | 180 | 22236C DKE4 + **H3136** | 131 | 230 | 30 | — | A 3136 | 41 | 260 | 191 | 18 | 9.5 |
| | 180 | 23236C KE4 + **H2336** | 161 | 230 | 30 | — | A 2336 | 41 | 260 | 195 | 22 | 11.5 |
| | 180 | 22336C AKE4 + **H2336** | 161 | 230 | 30 | — | A 2336 | 41 | 260 | 195 | 8 | 11.5 |
| **170** | 190 | 23938C AKE4 + **H3938** | 89 | 220 | 31 | — | A 3938 | 43 | 240 | 199 | 9 | 6.35 |
| | 190 | 23038C AKE4 + **H3038** | 112 | 220 | 31 | — | A 3038 | 43 | 270 | 199 | 9 | 7.45 |
| | 190 | 23138C KE4 + **H3138** | 141 | 240 | 31 | — | A 3138 | 43 | 270 | 202 | 9 | 11 |
| | 190 | 22238C AKE4 + **H3138** | 141 | 240 | 31 | — | A 3138 | 43 | 270 | 202 | 21 | 11 |
| | 190 | 23238C KE4 + **H2338** | 169 | 240 | 31 | — | A 2338 | 43 | 270 | 206 | 21 | 12.5 |
| | 190 | 22338C AKE4 + **H2338** | 169 | 240 | 31 | — | A 2338 | 43 | 270 | 206 | 9 | 12.5 |



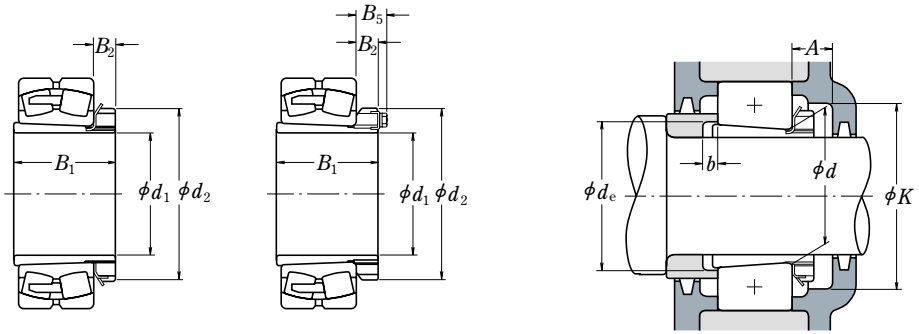


## Shaft Diameter 180 – 260 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **180** | 200 | 23940C AKE4 + **H3940** | 98 | 240 | 32 | — | A 3940 | 46 | 260 | 210 | 10 | 8.0 |
| | 200 | 23040C AKE4 + **H3040** | 120 | 240 | 32 | — | A 3040 | 46 | 280 | 210 | 10 | 9.2 |
| | 200 | 23140C KE4 + **H3140** | 150 | 250 | 32 | — | A 3140 | 46 | 280 | 212 | 10 | 12 |
| | 200 | 22240C AKE4 + **H3140** | 150 | 250 | 32 | — | A 3140 | 46 | 280 | 212 | 24 | 12 |
| | 200 | 23240C KE4 + **H2340** | 176 | 250 | 32 | — | A 2340 | 46 | 280 | 216 | 20 | 14 |
| | 200 | 22340C AKE4 + **H2340** | 176 | 250 | 32 | — | A 2340 | 46 | 280 | 216 | 10 | 14 |
| **200** | 220 | 23944C AKE4 + **H3944** | 96 | 260 | 30 | 41 | A 3944 | 55 | 280 | 231 | 10 | 8.32 |
| | 220 | 23044C AKE4 + **H3044** | 128 | 260 | 30 | 41 | A 3044 | 55 | 320 | 231 | 12 | 10.5 |
| | 220 | 23144C KE4 + **H3144** | 158 | 280 | 32 | 44 | A 3144 | 55 | 320 | 233 | 10 | 14.5 |
| | 220 | 22244C AKE4 + **H3144** | 158 | 280 | 32 | 44 | A 3144 | 55 | 320 | 233 | 22 | 14.5 |
| | 220 | 23244C KE4 + **H2344** | 183 | 280 | 32 | 44 | A 2344 | 55 | 320 | 236 | 11 | 16.5 |
| | 220 | 22344C AKE4 + **H2344** | 183 | 280 | 32 | 44 | A 2344 | 55 | 320 | 236 | 10 | 16.5 |
| **220** | 240 | 23948C AKE4 + **H3948** | 101 | 290 | 34 | 46 | A 3948 | 60 | 300 | 251 | 11 | 11.2 |
| | 240 | 23048C AKE4 + **H3048** | 133 | 290 | 34 | 46 | A 3048 | 60 | 340 | 251 | 11 | 13 |
| | 240 | 23148C KE4 + **H3148** | 169 | 300 | 34 | 46 | A 3148 | 60 | 340 | 254 | 11 | 17.5 |
| | 240 | 22248C AKE4 + **H3148** | 169 | 300 | 34 | 46 | A 3148 | 60 | 340 | 254 | 19 | 17.5 |
| | 240 | 23248C AKE4 + **H2348** | 196 | 300 | 34 | 46 | A 2348 | 60 | 340 | 257 | 6 | 19.5 |
| | 240 | 22348C AKE4 + **H2348** | 196 | 300 | 34 | 46 | A 2348 | 60 | 340 | 257 | 11 | 19.5 |
| **240** | 260 | 23952C AKE4 + **H3952** | 116 | 310 | 34 | 46 | A 3952 | 60 | 330 | 272 | 11 | 13.4 |
| | 260 | 23052C AKE4 + **H3052** | 147 | 310 | 34 | 46 | A 3052 | 60 | 370 | 272 | 13 | 15.5 |
| | 260 | 23152C AKE4 + **H3152** | 187 | 330 | 36 | 49 | A 3152 | 60 | 370 | 276 | 11 | 22 |
| | 260 | 22252C AKE4 + **H3152** | 187 | 330 | 36 | 49 | A 3152 | 60 | 370 | 276 | 25 | 22 |
| | 260 | 23252C AKE4 + **H2352** | 208 | 330 | 36 | 49 | A 2352 | 60 | 370 | 278 | 2 | 24 |
| | 260 | 22352C AKE4 + **H2352** | 208 | 330 | 36 | 49 | A 2352 | 60 | 370 | 278 | 11 | 24 |
| **260** | 280 | 23956C AKE4 + **H3956** | 121 | 330 | 38 | 50 | A 3956 | 65 | 350 | 292 | 12 | 15.5 |
| | 280 | 23056C AKE4 + **H3056** | 152 | 330 | 38 | 50 | A 3056 | 65 | 390 | 292 | 12 | 17.5 |
| | 280 | 23156C AKE4 + **H3156** | 192 | 350 | 38 | 51 | A 3156 | 65 | 390 | 296 | 12 | 24.5 |
| | 280 | 22256C AKE4 + **H3156** | 192 | 350 | 38 | 51 | A 3156 | 65 | 390 | 296 | 28 | 24.5 |
| | 280 | 23256C AKE4 + **H2356** | 221 | 350 | 38 | 51 | A 2356 | 65 | 390 | 299 | 11 | 28 |
| | 280 | 22356C AKE4 + **H2356** | 221 | 350 | 38 | 51 | A 2356 | 65 | 390 | 299 | 12 | 28 |

## Shaft Diameter 280 – 410 mm

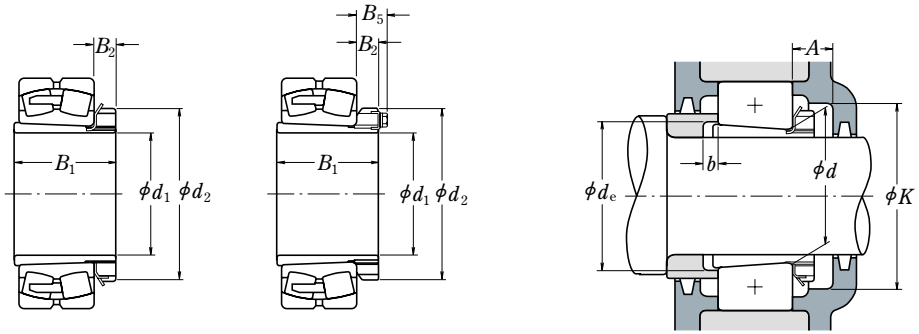



| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **280** | 300 | 23960C AKE4 + **H3960** | 140 | 360 | 42 | 54 | A3960 | 69 | 380 | 313 | 12 | 20.7 |
| | 300 | 23060C AKE4 + **H3060** | 168 | 360 | 42 | 54 | A3060 | 69 | 430 | 313 | 12 | 23 |
| | 300 | 23160C AKE4 + **H3160** | 208 | 380 | 40 | 53 | A3160 | 69 | 430 | 317 | 12 | 30 |
| | 300 | 22260C AKE4 + **H3160** | 208 | 380 | 40 | 53 | A3160 | 69 | 430 | 317 | 32 | 30 |
| | 300 | 23260C AKE4 + **H3260** | 240 | 380 | 40 | 53 | A3260 | 69 | 430 | 321 | 12 | 34 |
| **300** | 320 | 23964C AKE4 + **H3964** | 140 | 380 | 42 | 55 | A3964 | 72 | 400 | 334 | 13 | 21.8 |
| | 320 | 23064C AKE4 + **H3064** | 171 | 380 | 42 | 55 | A3064 | 72 | 450 | 334 | 13 | 24.5 |
| | 320 | 23164C AKE4 + **H3164** | 226 | 400 | 42 | 56 | A3164 | 72 | 450 | 339 | 13 | 35 |
| | 320 | 22264C AKE4 + **H3164** | 226 | 400 | 42 | 56 | A3164 | 72 | 450 | 339 | 39 | 35 |
| | 320 | 23264C AKE4 + **H3264** | 258 | 400 | 42 | 56 | A3264 | 72 | 450 | 343 | 13 | 39.5 |
| **320** | 340 | 23968C AKE4 + **H3968** | 144 | 400 | 45 | 58 | A3968 | 75 | 430 | 354 | 14 | 24.6 |
| | 340 | 23068C AKE4 + **H3068** | 187 | 400 | 45 | 58 | A3068 | 75 | 490 | 355 | 14 | 28.5 |
| | 340 | 23168C AKE4 + **H3168** | 254 | 440 | 55 | 72 | A3168 | 75 | 490 | 360 | 14 | 49.5 |
| | 340 | 23268C AKE4 + **H3268** | 288 | 440 | 55 | 72 | A3268 | 75 | 490 | 364 | 14 | 54.5 |
| **340** | 360 | 23972C AKE4 + **H3972** | 144 | 420 | 45 | 58 | A3972 | 75 | 450 | 374 | 14 | 25.7 |
| | 360 | 23072C AKE4 + **H3072** | 188 | 420 | 45 | 58 | A3072 | 75 | 510 | 375 | 14 | 30.5 |
| | 360 | 23172C AKE4 + **H3172** | 259 | 460 | 58 | 75 | A3172 | 75 | 510 | 380 | 14 | 54 |
| | 360 | 23272C AKE4 + **H3272** | 299 | 460 | 58 | 75 | A3272 | 75 | 510 | 385 | 14 | 60.5 |
| **360** | 380 | 23976C AKE4 + **H3976** | 164 | 450 | 48 | 62 | A3976 | 82 | 480 | 396 | 15 | 31.9 |
| | 380 | 23076C AKE4 + **H3076** | 193 | 450 | 48 | 62 | A3076 | 82 | 540 | 396 | 15 | 36 |
| | 380 | 23176C AKE4 + **H3176** | 264 | 490 | 60 | 77 | A3176 | 82 | 540 | 401 | 15 | 61.5 |
| | 380 | 23276C AKE4 + **H3276** | 310 | 490 | 60 | 77 | A3276 | 82 | 540 | 405 | 15 | 69.5 |
| **380** | 400 | 23980C AKE4 + **H3980** | 168 | 470 | 52 | 66 | A3980 | 86 | 500 | 417 | 15 | 35.2 |
| | 400 | 23080C AKE4 + **H3080** | 210 | 470 | 52 | 66 | A3080 | 86 | 580 | 417 | 15 | 41.5 |
| | 400 | 23180C AKE4 + **H3180** | 272 | 520 | 62 | 82 | A3180 | 86 | 580 | 421 | 15 | 70.5 |
| | 400 | 23280C AKE4 + **H3280** | 328 | 520 | 62 | 82 | A3280 | 86 | 580 | 427 | 15 | 81 |
| **400** | 420 | 23984C AKE4 + **H3984** | 168 | 490 | 52 | 66 | A3984 | 86 | 520 | 437 | 16 | 36.6 |
| | 420 | 23084C AKE4 + **H3084** | 212 | 490 | 52 | 66 | A3084 | 86 | 600 | 437 | 16 | 43.5 |
| | 420 | 23184C AKE4 + **H3184** | 304 | 540 | 70 | 90 | A3184 | 86 | 600 | 443 | 16 | 84 |
| | 420 | 23284C AKE4 + **H3284** | 352 | 540 | 70 | 90 | A3284 | 86 | 600 | 448 | 16 | 94 |
| **410** | 440 | 23988C AKE4 + **H3988** | 189 | 520 | 60 | 77 | A3988 | 99 | 550 | 458 | 17 | 58.6 |
| | 440 | 23088C AKE4 + **H3088** | 228 | 520 | 60 | 77 | A3088 | 99 | 620 | 458 | 17 | 65 |
| | 440 | 23188C AKE4 + **H3188** | 307 | 560 | 70 | 90 | A3188 | 99 | 620 | 464 | 17 | 104 |
| | 440 | 23288C AKE4 + **H3288** | 361 | 560 | 70 | 90 | A3288 | 99 | 620 | 469 | 17 | 118 |



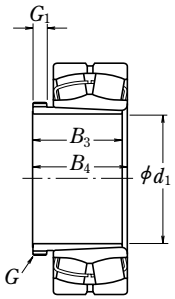


## Shaft Diameter 430 – 470 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Dimensions (mm) $B_1$ | $d_2$ | $B_2$ | $B_5$ | Adapter Sleeve Numbers | Abutment Dimensions (mm) $A$ min. | $K$ min. | $d_e$ min. | $b$ min. | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **430** | 460 | 23992C AKE4 + **H3992** | 189 | 540 | 60 | 77 | A3992 | 99 | 570 | 478 | 17 | 62 |
| | 460 | 23092C AKE4 + **H3092** | 234 | 540 | 60 | 77 | A3092 | 99 | 650 | 478 | 17 | 69.5 |
| | 460 | 23192C AKE4 + **H3192** | 326 | 580 | 75 | 95 | A3192 | 99 | 650 | 485 | 17 | 116 |
| | 460 | 23292C AKE4 + **H3292** | 382 | 580 | 75 | 95 | A3292 | 99 | 650 | 491 | 17 | 132 |
| **450** | 480 | 23996C AKE4 + **H3996** | 200 | 560 | 60 | 77 | A3996 | 99 | 600 | 499 | 18 | 67.5 |
| | 480 | 23096C AKE4 + **H3096** | 237 | 560 | 60 | 77 | A3096 | 99 | 690 | 499 | 18 | 73.5 |
| | 480 | 23196C AKE4 + **H3196** | 335 | 620 | 75 | 95 | A3196 | 99 | 690 | 505 | 18 | 133 |
| | 480 | 23296C AKE4 + **H3296** | 397 | 620 | 75 | 95 | A3296 | 99 | 690 | 512 | 18 | 152 |
| **470** | 500 | 239/500C AKE4 + **H39/500** | 208 | 580 | 68 | 85 | A39/500 | 109 | 620 | 519 | 18 | 74.6 |
| | 500 | 230/500C AKE4 + **H30/500** | 247 | 580 | 68 | 85 | A30/500 | 109 | 700 | 519 | 18 | 82 |
| | 500 | 231/500C AKE4 + **H31/500** | 356 | 630 | 80 | 100 | A31/500 | 109 | 700 | 527 | 18 | 143 |
| | 500 | 232/500C AKE4 + **H32/500** | 428 | 630 | 80 | 100 | A32/500 | 109 | 700 | 534 | 18 | 166 |

**Shaft Diameter 35 – 85 mm**

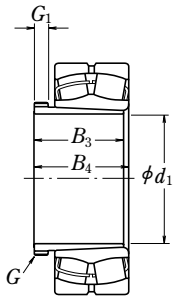



| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **35** | 40 | 21308EAKE4 + **AH 308** | M 45 × 1.5 | 29 | 6 | 32 | 0.09 |
| | 40 | 22308EAKE4 + **AH 2308** | M 45 × 1.5 | 40 | 7 | 43 | 0.13 |
| **40** | 45 | 21309EAKE4 + **AH 309** | M 50 × 1.5 | 31 | 6 | 34 | 0.11 |
| | 45 | 22309EAKE4 + **AH 2309** | M 50 × 1.5 | 44 | 7 | 47 | 0.165 |
| **45** | 50 | 21310EAKE4 + **AHX 310** | M 55 × 2 | 35 | 7 | 38 | 0.16 |
| | 50 | 22310EAKE4 + **AHX 2310** | M 55 × 2 | 50 | 9 | 53 | 0.235 |
| **50** | 55 | 22211EAKE4 + **AHX 311** | M 60 × 2 | 37 | 7 | 40 | 0.19 |
| | 55 | 21311EAKE4 + **AHX 311** | M 60 × 2 | 37 | 7 | 40 | 0.19 |
| | 55 | 22311EAKE4 + **AHX 2311** | M 60 × 2 | 54 | 10 | 57 | 0.285 |
| **55** | 60 | 22212EAKE4 + **AHX 312** | M 65 × 2 | 40 | 8 | 43 | 0.215 |
| | 60 | 21312EAKE4 + **AHX 312** | M 65 × 2 | 40 | 8 | 43 | 0.215 |
| | 60 | 22312EAKE4 + **AHX 2312** | M 65 × 2 | 58 | 11 | 61 | 0.34 |
| **60** | 65 | 22213EAKE4 + **AH 313** | M 75 × 2 | 42 | 8 | 45 | 0.255 |
| | 65 | 21313EAKE4 + **AH 313** | M 75 × 2 | 42 | 8 | 45 | 0.255 |
| | 65 | 22313EAKE4 + **AH 2313** | M 75 × 2 | 61 | 12 | 64 | 0.395 |
| **65** | 70 | 22214EAKE4 + **AH 314** | M 80 × 2 | 43 | 8 | 47 | 0.28 |
| | 70 | 21314EAKE4 + **AH 314** | M 80 × 2 | 43 | 8 | 47 | 0.28 |
| | 70 | 22314EAKE4 + **AHX 2314** | M 80 × 2 | 64 | 12 | 68 | 0.53 |
| **70** | 75 | 22215EAKE4 + **AH 315** | M 85 × 2 | 45 | 8 | 49 | 0.315 |
| | 75 | 21315EAKE4 + **AH 315** | M 85 × 2 | 45 | 8 | 49 | 0.315 |
| | 75 | 22315EAKE4 + **AHX 2315** | M 85 × 2 | 68 | 12 | 72 | 0.605 |
| **75** | 80 | 22216EAKE4 + **AH 316** | M 90 × 2 | 48 | 8 | 52 | 0.365 |
| | 80 | 21316EAKE4 + **AH 316** | M 90 × 2 | 48 | 8 | 52 | 0.365 |
| | 80 | 22316EAKE4 + **AHX 2316** | M 90 × 2 | 71 | 12 | 75 | 0.665 |
| **80** | 85 | 22217EAKE4 + **AHX 317** | M 95 × 2 | 52 | 9 | 56 | 0.48 |
| | 85 | 21317EAKE4 + **AHX 317** | M 95 × 2 | 52 | 9 | 56 | 0.48 |
| | 85 | 22317EAKE4 + **AHX 2317** | M 95 × 2 | 74 | 13 | 78 | 0.745 |
| **85** | 90 | 22218EAKE4 + **AHX 318** | M 100 × 2 | 53 | 9 | 57 | 0.52 |
| | 90 | 21318EAKE4 + **AHX 318** | M 100 × 2 | 53 | 9 | 57 | 0.52 |
| | 90 | 23218CKE4 + **AHX 3218** | M 100 × 2 | 63 | 10 | 67 | 0.58 |
| | 90 | 22318EAKE4 + **AHX 2318** | M 100 × 2 | 79 | 14 | 83 | 0.845 |



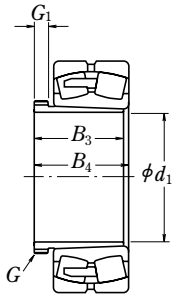


**Shaft Diameter 90 – 135 mm**




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **90** | 95 | 22219EAKE4 + **AHX 319** | M 105 × 2 | 57 | 10 | 61 | 0.595 |
| | 95 | 21319CKE4 + **AHX 319** | M 105 × 2 | 57 | 10 | 61 | 0.595 |
| | 95 | 22319EAKE4 + **AHX 2319** | M 105 × 2 | 85 | 16 | 89 | 0.89 |
| **95** | 100 | 21320CKE4 + **AHX 3120** | M 110 × 2 | 64 | 11 | 68 | 0.70 |
| | 100 | 22220EAKE4 + **AHX 320** | M 110 × 2 | 59 | 10 | 63 | 0.66 |
| | 100 | 21320CKE4 + **AHX 320** | M 110 × 2 | 59 | 10 | 63 | 0.66 |
| | 100 | 23220CKE4 + **AHX 3220** | M 110 × 2 | 73 | 11 | 77 | 0.77 |
| | 100 | 22320EAKE4 + **AHX 2320** | M 110 × 2 | 90 | 16 | 94 | 1.0 |
| **105** | 110 | 23122CKE4 + **AHX 3122** | M 120 × 2 | 68 | 11 | 72 | 0.76 |
| | 110 | 22222EAKE4 + **AHX 3122** | M 120 × 2 | 68 | 11 | 72 | 0.76 |
| | 110 | 24122CK30E4 + **AH 24122** | M 115 × 2 | 82 | 13 | 91 | 0.73 |
| | 110 | 23222CKE4 + **AHX 3222** | M 125 × 2 | 82 | 11 | 86 | 1.04 |
| | 110 | 22322EAKE4 + **AHX 2322** | M 125 × 2 | 98 | 16 | 102 | 1.35 |
| **115** | 120 | 23024CDKE4 + **AHX 3024** | M 130 × 2 | 60 | 13 | 64 | 0.75 |
| | 120 | 24024CK30E4 + **AH 24024** | M 125 × 2 | 73 | 13 | 82 | 0.70 |
| | 120 | 23124CKE4 + **AHX 3124** | M 130 × 2 | 75 | 12 | 79 | 0.95 |
| | 120 | 22224EAKE4 + **AHX 3124** | M 130 × 2 | 75 | 12 | 79 | 0.95 |
| | 120 | 24124CK30E4 + **AH 24124** | M 130 × 2 | 93 | 13 | 102 | 1.02 |
| | 120 | 23224CKE4 + **AHX 3224** | M 135 × 2 | 90 | 13 | 94 | 1.3 |
| | 120 | 22324EAKE4 + **AHX 2324** | M 135 × 2 | 105 | 17 | 109 | 1.6 |
| **125** | 130 | 23026CDKE4 + **AHX 3026** | M 140 × 2 | 67 | 14 | 71 | 0.95 |
| | 130 | 24026CK30E4 + **AH 24026** | M 135 × 2 | 83 | 14 | 93 | 0.89 |
| | 130 | 23126CKE4 + **AHX 3126** | M 140 × 2 | 78 | 12 | 82 | 1.08 |
| | 130 | 22226EAKE4 + **AHX 3126** | M 140 × 2 | 78 | 12 | 82 | 1.08 |
| | 130 | 24126CK30E4 + **AH 24126** | M 140 × 2 | 94 | 14 | 104 | 1.14 |
| | 130 | 23226CKE4 + **AHX 3226** | M 145 × 2 | 98 | 15 | 102 | 1.58 |
| | 130 | 22326CKE4 + **AHX 2326** | M 145 × 2 | 115 | 19 | 119 | 1.97 |
| **135** | 140 | 23028CDKE4 + **AHX 3028** | M 150 × 2 | 68 | 14 | 73 | 1.01 |
| | 140 | 24028CK30E4 + **AH 24028** | M 145 × 2 | 83 | 14 | 93 | 0.96 |
| | 140 | 23128CKE4 + **AHX 3128** | M 150 × 2 | 83 | 14 | 88 | 1.28 |
| | 140 | 22228CDKE4 + **AHX 3128** | M 150 × 2 | 83 | 14 | 88 | 1.28 |
| | 140 | 24128CK30E4 + **AH 24128** | M 150 × 2 | 99 | 14 | 109 | 1.3 |
| | 140 | 23228CKE4 + **AHX 3228** | M 155 × 3 | 104 | 15 | 109 | 1.84 |
| | 140 | 22328CKE4 + **AHX 2328** | M 155 × 3 | 125 | 20 | 130 | 2.33 |

## Shaft Diameter 145 – 180 mm

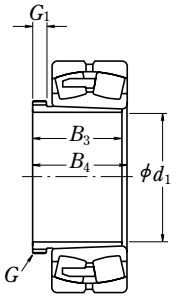



| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **145** | 150 | 23030CDKE4 + **AHX 3030** | M 160 × 3 | 72 | 15 | 77 | 1.15 |
| | 150 | 24030CK30E4 + **AH 24030** | M 155 × 3 | 90 | 15 | 101 | 1.11 |
| | 150 | 23130CKE4 + **AHX 3130** | M 165 × 3 | 96 | 15 | 101 | 1.79 |
| | 150 | 22230CDKE4 + **AHX 3130** | M 165 × 3 | 96 | 15 | 101 | 1.79 |
| | 150 | 24130CK30E4 + **AH 24130** | M 160 × 3 | 115 | 15 | 126 | 1.63 |
| | 150 | 23230CKE4 + **AHX 3230** | M 165 × 3 | 114 | 17 | 119 | 2.22 |
| | 150 | 22330CAKE4 + **AHX 2330** | M 165 × 3 | 135 | 24 | 140 | 2.82 |
| **150** | 160 | 23032CDKE4 + **AH 3032** | M 170 × 3 | 77 | 16 | 82 | 2.05 |
| | 160 | 24032CK30E4 + **AH 24032** | M 170 × 3 | 95 | 15 | 106 | 2.28 |
| | 160 | 23132CKE4 + **AH 3132** | M 180 × 3 | 103 | 16 | 108 | 3.2 |
| | 160 | 22232CDKE4 + **AH 3132** | M 180 × 3 | 103 | 16 | 108 | 3.2 |
| | 160 | 24132CK30E4 + **AH 24132** | M 170 × 3 | 124 | 15 | 135 | 3.03 |
| | 160 | 23232CKE4 + **AH 3232** | M 180 × 3 | 124 | 20 | 130 | 4.1 |
| | 160 | 22332CAKE4 + **AH 2332** | M 180 × 3 | 140 | 24 | 146 | 4.7 |
| **160** | 170 | 23034CDKE4 + **AH 3034** | M 180 × 3 | 85 | 17 | 90 | 2.45 |
| | 170 | 24034CK30E4 + **AH 24034** | M 180 × 3 | 106 | 16 | 117 | 2.74 |
| | 170 | 23134CKE4 + **AH 3134** | M 190 × 3 | 104 | 16 | 109 | 3.4 |
| | 170 | 22234CDKE4 + **AH 3134** | M 190 × 3 | 104 | 16 | 109 | 3.4 |
| | 170 | 24134CK30E4 + **AH 24134** | M 180 × 3 | 125 | 16 | 136 | 3.26 |
| | 170 | 23234CKE4 + **AH 3234** | M 190 × 3 | 134 | 24 | 140 | 4.8 |
| | 170 | 22334CAKE4 + **AH 2334** | M 190 × 3 | 146 | 24 | 152 | 5.25 |
| **170** | 180 | 23036CDKE4 + **AH 3036** | M 190 × 3 | 92 | 17 | 98 | 2.8 |
| | 180 | 24036CK30E4 + **AH 24036** | M 190 × 3 | 116 | 16 | 127 | 3.19 |
| | 180 | 23136CKE4 + **AH 3136** | M 200 × 3 | 116 | 19 | 122 | 4.2 |
| | 180 | 24136CK30E4 + **AH 24136** | M 190 × 3 | 134 | 16 | 145 | 3.74 |
| | 180 | 22236CDKE4 + **AH 2236** | M 200 × 3 | 105 | 17 | 110 | 3.75 |
| | 180 | 23236CKE4 + **AH 3236** | M 200 × 3 | 140 | 24 | 146 | 5.3 |
| | 180 | 22336CAKE4 + **AH 2336** | M 200 × 3 | 154 | 26 | 160 | 5.85 |
| **180** | 190 | 23038CAKE4 + **AH 3038** | Tr 205 × 4 | 96 | 18 | 102 | 3.35 |
| | 190 | 24038CK30E4 + **AH 24038** | M 200 × 3 | 118 | 18 | 131 | 3.47 |
| | 190 | 23138CKE4 + **AH 3138** | Tr 210 × 4 | 125 | 20 | 131 | 4.9 |
| | 190 | 24138CK30E4 + **AH 24138** | M 200 × 3 | 146 | 18 | 159 | 4.38 |
| | 190 | 22238CAKE4 + **AH 2238** | Tr 210 × 4 | 112 | 18 | 117 | 4.25 |
| | 190 | 23238CKE4 + **AH 3238** | Tr 210 × 4 | 145 | 25 | 152 | 5.9 |
| | 190 | 22338CAKE4 + **AH 2338** | Tr 210 × 4 | 160 | 26 | 167 | 6.65 |



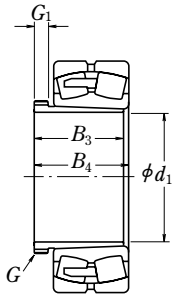


## Shaft Diameter 190 – 260 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **190** | 200 | 23040CAKE4 + **AH 3040** | Tr 215 × 4 | 102 | 19 | 108 | 3.8 |
| | 200 | 24040CK30E4 + **AH 24040** | Tr 210 × 4 | 127 | 18 | 140 | 3.92 |
| | 200 | 23140CKE4 + **AH 3140** | Tr 220 × 4 | 134 | 21 | 140 | 5.5 |
| | 200 | 24140CK30E4 + **AH 24140** | Tr 210 × 4 | 158 | 18 | 171 | 5.0 |
| | 200 | 22240CAKE4 + **AH 2240** | Tr 220 × 4 | 118 | 19 | 123 | 4.7 |
| | 200 | 23240CKE4 + **AH 3240** | Tr 220 × 4 | 153 | 25 | 160 | 6.7 |
| | 200 | 22340CAKE4 + **AH 2340** | Tr 220 × 4 | 170 | 30 | 177 | 7.55 |
| **200** | 220 | 23044CAKE4 + **AH 3044** | Tr 235 × 4 | 111 | 20 | 117 | 7.4 |
| | 220 | 24044CK30E4 + **AH 24044** | Tr 230 × 4 | 138 | 20 | 152 | 8.23 |
| | 220 | 23144CKE4 + **AH 3144** | Tr 240 × 4 | 145 | 23 | 151 | 10.5 |
| | 220 | 24144CK30E4 + **AH 24144** | Tr 230 × 4 | 170 | 20 | 184 | 10.3 |
| | 220 | 22244CAKE4 + **AH 2244** | Tr 240 × 4 | 130 | 20 | 136 | 9.1 |
| | 220 | 23244CKE4 + **AH 2344** | Tr 240 × 4 | 181 | 30 | 189 | 13.5 |
| | 220 | 22344CAKE4 + **AH 2344** | Tr 240 × 4 | 181 | 30 | 189 | 13.5 |
| **220** | 240 | 23048CAKE4 + **AH 3048** | Tr 260 × 4 | 116 | 21 | 123 | 8.75 |
| | 240 | 24048CK30E4 + **AH 24048** | Tr 250 × 4 | 138 | 20 | 153 | 9.0 |
| | 240 | 23148CKE4 + **AH 3148** | Tr 260 × 4 | 154 | 25 | 161 | 12 |
| | 240 | 24148CK30E4 + **AH 24148** | Tr 260 × 4 | 180 | 20 | 195 | 12.6 |
| | 240 | 22248CAKE4 + **AH 2248** | Tr 260 × 4 | 144 | 21 | 150 | 11 |
| | 240 | 23248CAKE4 + **AH 2348** | Tr 260 × 4 | 189 | 30 | 197 | 15.5 |
| | 240 | 22348CAKE4 + **AH 2348** | Tr 260 × 4 | 189 | 30 | 197 | 15.5 |
| **240** | 260 | 23052CAKE4 + **AH 3052** | Tr 280 × 4 | 128 | 23 | 135 | 10.5 |
| | 260 | 24052CAK30E4 + **AH 24052** | Tr 270 × 4 | 162 | 22 | 178 | 11.7 |
| | 260 | 23152CAKE4 + **AH 3152** | Tr 290 × 4 | 172 | 26 | 179 | 16 |
| | 260 | 24152CAK30E4 + **AH 24152** | Tr 280 × 4 | 202 | 22 | 218 | 15.5 |
| | 260 | 22252CAKE4 + **AH 2252** | Tr 290 × 4 | 155 | 23 | 161 | 14 |
| | 260 | 23252CAKE4 + **AH 2352** | Tr 290 × 4 | 205 | 30 | 213 | 19.5 |
| | 260 | 22352CAKE4 + **AH 2352** | Tr 290 × 4 | 205 | 30 | 213 | 19.5 |
| **260** | 280 | 23056CAKE4 + **AH 3056** | Tr 300 × 4 | 131 | 24 | 139 | 12 |
| | 280 | 24056CAK30E4 + **AH 24056** | Tr 290 × 4 | 162 | 22 | 179 | 12.6 |
| | 280 | 23156CAKE4 + **AH 3156** | Tr 310 × 5 | 175 | 28 | 183 | 17.5 |
| | 280 | 24156CAK30E4 + **AH 24156** | Tr 300 × 4 | 202 | 22 | 219 | 16.8 |
| | 280 | 22256CAKE4 + **AH 2256** | Tr 310 × 5 | 155 | 24 | 163 | 15 |
| | 280 | 23256CAKE4 + **AH 2356** | Tr 310 × 5 | 212 | 30 | 220 | 21.5 |
| | 280 | 22356CAKE4 + **AH 2356** | Tr 310 × 5 | 212 | 30 | 220 | 21.5 |

## Shaft Diameter 280 – 380 mm

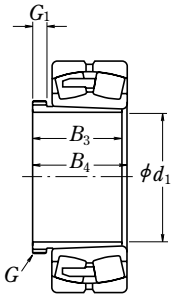



| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **280** | 300 | 23060CAKE4 + **AH 3060** | Tr 320 × 5 | 145 | 26 | 153 | 14.5 |
| | 300 | 24060CAK30E4 + **AH 24060** | Tr 310 × 5 | 184 | 24 | 202 | 15.5 |
| | 300 | 23160CAKE4 + **AH 3160** | Tr 330 × 5 | 192 | 30 | 200 | 21 |
| | 300 | 24160CAK30E4 + **AH 24160** | Tr 320 × 5 | 224 | 24 | 242 | 20.3 |
| | 300 | 22260CAKE4 + **AH 2260** | Tr 330 × 5 | 170 | 26 | 178 | 18 |
| | 300 | 23260CAKE4 + **AH 3260** | Tr 330 × 5 | 228 | 34 | 236 | 20 |
| **300** | 320 | 23064CAKE4 + **AH 3064** | Tr 345 × 5 | 149 | 27 | 157 | 16 |
| | 320 | 24064CAK30E4 + **AH 24064** | Tr 330 × 5 | 184 | 24 | 202 | 16.4 |
| | 320 | 23164CAKE4 + **AH 3164** | Tr 350 × 5 | 209 | 31 | 217 | 24.5 |
| | 320 | 24164CAK30E4 + **AH 24164** | Tr 340 × 5 | 242 | 24 | 260 | 23.5 |
| | 320 | 23264CAKE4 + **AH 3264** | Tr 350 × 5 | 246 | 36 | 254 | 25 |
| **320** | 340 | 23068CAKE4 + **AH 3068** | Tr 365 × 5 | 162 | 28 | 171 | 19.5 |
| | 340 | 24068CAK30E4 + **AH 24068** | Tr 360 × 5 | 206 | 26 | 225 | 21.2 |
| | 340 | 23168CAKE4 + **AH 3168** | Tr 370 × 5 | 225 | 33 | 234 | 29 |
| | 340 | 24168CAK30E4 + **AH 24168** | Tr 360 × 5 | 269 | 26 | 288 | 28.3 |
| | 340 | 23268CAKE4 + **AH 3268** | Tr 370 × 5 | 264 | 38 | 273 | 35.5 |
| **340** | 360 | 23072CAKE4 + **AH 3072** | Tr 385 × 5 | 167 | 30 | 176 | 21 |
| | 360 | 24072CAK30E4 + **AH 24072** | Tr 380 × 5 | 206 | 26 | 226 | 22.5 |
| | 360 | 23172CAKE4 + **AH 3172** | Tr 400 × 5 | 229 | 35 | 238 | 33 |
| | 360 | 24172CAK30E4 + **AH 24172** | Tr 380 × 5 | 269 | 26 | 289 | 30 |
| | 360 | 23272CAKE4 + **AH 3272** | Tr 400 × 5 | 274 | 40 | 283 | 41.5 |
| **360** | 380 | 23076CAKE4 + **AH 3076** | Tr 410 × 5 | 170 | 31 | 180 | 23.5 |
| | 380 | 24076CAK30E4 + **AH 24076** | Tr 400 × 5 | 208 | 28 | 228 | 24.1 |
| | 380 | 23176CAKE4 + **AH 3176** | Tr 420 × 5 | 232 | 36 | 242 | 35.5 |
| | 380 | 24176CAK30E4 + **AH 24176** | Tr 400 × 5 | 271 | 28 | 291 | 32.1 |
| | 380 | 23276CAKE4 + **AH 3276** | Tr 420 × 5 | 284 | 42 | 294 | 45.5 |
| **380** | 400 | 23080CAKE4 + **AH 3080** | Tr 430 × 5 | 183 | 33 | 193 | 27.5 |
| | 400 | 24080CAK30E4 + **AH 24080** | Tr 420 × 5 | 228 | 28 | 248 | 28 |
| | 400 | 23180CAKE4 + **AH 3180** | Tr 440 × 5 | 240 | 38 | 250 | 39.5 |
| | 400 | 24180CAK30E4 + **AH 24180** | Tr 420 × 5 | 278 | 28 | 298 | 34.8 |
| | 400 | 23280CAKE4 + **AH 3280** | Tr 440 × 5 | 302 | 44 | 312 | 51.5 |



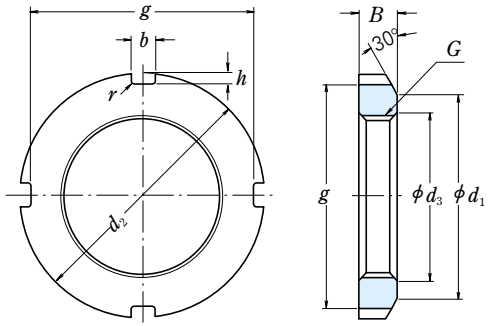


## Shaft Diameter 400 – 480 mm




| Shaft Diameter (mm) $d_1$ | Nominal Bearing Bore Dia. (mm) $d$ | Nominal Numbers Applicable Bearings | Screw Thread $G$ | Dimensions (mm) $B_3$ | $G_1$ | $B_4$ | Mass (kg) approx. |
|---|---|---|---|---|---|---|---|
| **400** | 420 | 23084CAKE4 + **AH 3084** | Tr 450 × 5 | 186 | 34 | 196 | 29 |
| | 420 | 24084CAK30E4 + **AH 24084** | Tr 440 × 5 | 230 | 30 | 252 | 29.8 |
| | 420 | 23184CAKE4 + **AH 3184** | Tr 460 × 5 | 266 | 40 | 276 | 46.5 |
| | 420 | 24184CAK30E4 + **AH 24184** | Tr 440 × 5 | 310 | 30 | 332 | 41.4 |
| | 420 | 23284CAKE4 + **AH 3284** | Tr 460 × 5 | 321 | 46 | 331 | 59 |
| **420** | 440 | 23088CAKE4 + **AHX 3088** | Tr 470 × 5 | 194 | 35 | 205 | 42 |
| | 440 | 24088CAK30E4 + **AH 24088** | Tr 460 × 5 | 242 | 30 | 264 | 33 |
| | 440 | 23188CAKE4 + **AHX 3188** | Tr 480 × 5 | 270 | 42 | 281 | 50 |
| | 440 | 24188CAK30E4 + **AH 24188** | Tr 460 × 5 | 310 | 30 | 332 | 43.5 |
| | 440 | 23288CAKE4 + **AHX 3288** | Tr 480 × 5 | 330 | 48 | 341 | 64 |
| **440** | 460 | 23092CAKE4 + **AHX 3092** | Tr 490 × 5 | 202 | 37 | 213 | 46 |
| | 460 | 24092CAK30E4 + **AH 24092** | Tr 480 × 5 | 250 | 32 | 273 | 35.9 |
| | 460 | 23192CAKE4 + **AHX 3192** | Tr 510 × 6 | 285 | 43 | 296 | 58 |
| | 460 | 24192CAK30E4 + **AH 24192** | Tr 480 × 5 | 332 | 32 | 355 | 49.7 |
| | 460 | 23292CAKE4 + **AHX 3292** | Tr 510 × 6 | 349 | 50 | 360 | 74.5 |
| **460** | 480 | 23096CAKE4 + **AHX 3096** | Tr 520 × 6 | 205 | 38 | 217 | 51 |
| | 480 | 24096CAK30E4 + **AH 24096** | Tr 500 × 5 | 250 | 32 | 273 | 37.5 |
| | 480 | 23196CAKE4 + **AHX 3196** | Tr 530 × 6 | 295 | 45 | 307 | 63 |
| | 480 | 24196CAK30E4 + **AH 24196** | Tr 500 × 5 | 340 | 32 | 363 | 53 |
| | 480 | 23296CAKE4 + **AHX 3296** | Tr 530 × 6 | 364 | 52 | 376 | 82 |
| **480** | 500 | 230/500CAKE4 + **AHX 30/500** | Tr 540 × 6 | 209 | 40 | 221 | 54.5 |
| | 500 | 240/500CAK30E4 + **AH 240/500** | Tr 530 × 6 | 253 | 35 | 276 | 41.9 |
| | 500 | 231/500CAKE4 + **AHX 31/500** | Tr 550 × 6 | 313 | 47 | 325 | 71 |
| | 500 | 241/500CAK30E4 + **AH 241/500** | Tr 530 × 6 | 360 | 35 | 383 | 61.2 |
| | 500 | 232/500CAKE4 + **AHX 32/500** | Tr 550 × 6 | 393 | 54 | 405 | 94.5 |

## (For Adapters and Shafts)



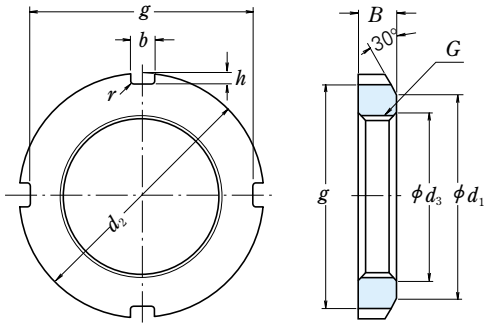

Nut with Washer

Units : mm

| Nominal Numbers | Nut Series AN | | | | | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screw Threads | Basic Dimensions | | | | | | | | Mass (kg) approx. | Adapter (1) Sleeve Bore Dia. Numbers | Washer Numbers | Shaft Dia. |
| | $G$ | $d_2$ | $d_1$ | $g$ | $b$ | $h$ | $d_3$ | $B$ | $r$ max. | | | | |
| **AN 02** | M 15×1 | 25 | 21 | 21 | 4 | 2 | 15.5 | 5 | 0.4 | 0.010 | — | **AW 02 X** | 15 |
| **AN 03** | M 17×1 | 28 | 24 | 24 | 4 | 2 | 17.5 | 5 | 0.4 | 0.013 | — | **AW 03 X** | 17 |
| **AN 04** | M 20×1 | 32 | 26 | 28 | 4 | 2 | 20.5 | 6 | 0.4 | 0.019 | 04 | **AW 04 X** | 20 |
| **AN 05** | M 25×1.5 | 38 | 32 | 34 | 5 | 2 | 25.8 | 7 | 0.4 | 0.025 | 05 | **AW 05 X** | 25 |
| **AN 06** | M 30×1.5 | 45 | 38 | 41 | 5 | 2 | 30.8 | 7 | 0.4 | 0.043 | 06 | **AW 06 X** | 30 |
| **AN 07** | M 35×1.5 | 52 | 44 | 48 | 5 | 2 | 35.8 | 8 | 0.4 | 0.053 | 07 | **AW 07 X** | 35 |
| **AN 08** | M 40×1.5 | 58 | 50 | 53 | 6 | 2.5 | 40.8 | 9 | 0.5 | 0.085 | 08 | **AW 08 X** | 40 |
| **AN 09** | M 45×1.5 | 65 | 56 | 60 | 6 | 2.5 | 45.8 | 10 | 0.5 | 0.119 | 09 | **AW 09 X** | 45 |
| **AN 10** | M 50×1.5 | 70 | 61 | 65 | 6 | 2.5 | 50.8 | 11 | 0.5 | 0.148 | 10 | **AW 10 X** | 50 |
| **AN 11** | M 55×2 | 75 | 67 | 69 | 7 | 3 | 56 | 11 | 0.5 | 0.158 | 11 | **AW 11 X** | 55 |
| **AN 12** | M 60×2 | 80 | 73 | 74 | 7 | 3 | 61 | 11 | 0.5 | 0.174 | 12 | **AW 12 X** | 60 |
| **AN 13** | M 65×2 | 85 | 79 | 79 | 7 | 3 | 66 | 12 | 0.5 | 0.203 | 13 | **AW 13 X** | 65 |
| **AN 14** | M 70×2 | 92 | 85 | 85 | 8 | 3.5 | 71 | 12 | 0.5 | 0.242 | 14 | **AW 14 X** | 70 |
| **AN 15** | M 75×2 | 98 | 90 | 91 | 8 | 3.5 | 76 | 13 | 0.5 | 0.287 | 15 | **AW 15 X** | 75 |
| **AN 16** | M 80×2 | 105 | 95 | 98 | 8 | 3.5 | 81 | 15 | 0.6 | 0.395 | 16 | **AW 16 X** | 80 |
| **AN 17** | M 85×2 | 110 | 102 | 103 | 8 | 3.5 | 86 | 16 | 0.6 | 0.45 | 17 | **AW 17 X** | 85 |
| **AN 18** | M 90×2 | 120 | 108 | 112 | 10 | 4 | 91 | 16 | 0.6 | 0.555 | 18 | **AW 18 X** | 90 |
| **AN 19** | M 95×2 | 125 | 113 | 117 | 10 | 4 | 96 | 17 | 0.6 | 0.66 | 19 | **AW 19 X** | 95 |
| **AN 20** | M 100×2 | 130 | 120 | 122 | 10 | 4 | 101 | 18 | 0.6 | 0.70 | 20 | **AW 20 X** | 100 |
| **AN 21** | M 105×2 | 140 | 126 | 130 | 12 | 5 | 106 | 18 | 0.7 | 0.845 | 21 | **AW 21 X** | 105 |
| **AN 22** | M 110×2 | 145 | 133 | 135 | 12 | 5 | 111 | 19 | 0.7 | 0.965 | 22 | **AW 22 X** | 110 |
| **AN 23** | M 115×2 | 150 | 137 | 140 | 12 | 5 | 116 | 19 | 0.7 | 1.01 | — | **AW 23** | 115 |
| **AN 24** | M 120×2 | 155 | 138 | 145 | 12 | 5 | 121 | 20 | 0.7 | 1.08 | 24 | **AW 24** | 120 |
| **AN 25** | M 125×2 | 160 | 148 | 150 | 12 | 5 | 126 | 21 | 0.7 | 1.19 | — | **AW 25** | 125 |

**Note** (1) Applicable to adapter sleeve Series A31, A2, A3, and A23.

**Remarks** The basic design and dimensions of screw threads are in accordance with JIS B 0205.




Nut with Washer

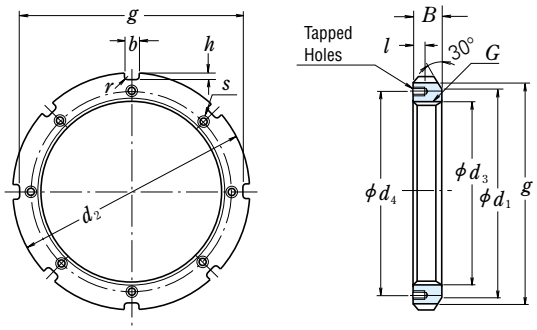
Units : mm

| Nominal Numbers | Nut Series AN | | | | | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screw Threads | Basic Dimensions | | | | | | | | Mass (kg) approx. | Adapter (1) Sleeve Bore Dia. Numbers | Washer Numbers | Shaft Dia. |
| | $G$ | $d_2$ | $d_1$ | $g$ | $b$ | $h$ | $d_3$ | $B$ | $r$ max. | | | | |
| **AN 26** | M 130×2 | 165 | 149 | 155 | 12 | 5 | 131 | 21 | 0.7 | 1.25 | 26 | **AW 26** | 130 |
| **AN 27** | M 135×2 | 175 | 160 | 163 | 14 | 6 | 136 | 22 | 0.7 | 1.55 | — | **AW 27** | 135 |
| **AN 28** | M 140×2 | 180 | 160 | 168 | 14 | 6 | 141 | 22 | 0.7 | 1.56 | 28 | **AW 28** | 140 |
| **AN 29** | M 145×2 | 190 | 172 | 178 | 14 | 6 | 146 | 24 | 0.7 | 2.0 | — | **AW 29** | 145 |
| **AN 30** | M 150×2 | 195 | 171 | 183 | 14 | 6 | 151 | 24 | 0.7 | 2.03 | 30 | **AW 30** | 150 |
| **AN 31** | M 155×3 | 200 | 182 | 186 | 16 | 7 | 156.5 | 25 | 0.7 | 2.21 | — | — | — |
| **AN 32** | M 160×3 | 210 | 182 | 196 | 16 | 7 | 161.5 | 25 | 0.7 | 2.59 | 32 | **AW 32** | 160 |
| **AN 33** | M 165×3 | 210 | 193 | 196 | 16 | 7 | 166.5 | 26 | 0.7 | 2.43 | — | — | — |
| **AN 34** | M 170×3 | 220 | 193 | 206 | 16 | 7 | 171.5 | 26 | 0.7 | 2.8 | 34 | **AW 34** | 170 |
| **AN 36** | M 180×3 | 230 | 203 | 214 | 18 | 8 | 181.5 | 27 | 0.7 | 3.05 | 36 | **AW 36** | 180 |
| **AN 38** | M 190×3 | 240 | 214 | 224 | 18 | 8 | 191.5 | 28 | 0.7 | 3.4 | 38 | **AW 38** | 190 |
| **AN 40** | M 200×3 | 250 | 226 | 234 | 18 | 8 | 201.5 | 29 | 0.7 | 3.7 | 40 | **AW 40** | 200 |
| | Nut Series ANL | | | | | | | | | | | | |
| **ANL 24** | M 120×2 | 145 | 133 | 135 | 12 | 5 | 121 | 20 | 0.7 | 0.78 | 24 | **AWL 24** | 120 |
| **ANL 26** | M 130×2 | 155 | 143 | 145 | 12 | 5 | 131 | 21 | 0.7 | 0.88 | 26 | **AWL 26** | 130 |
| **ANL 28** | M 140×2 | 165 | 151 | 153 | 14 | 6 | 141 | 22 | 0.7 | 0.99 | 28 | **AWL 28** | 140 |
| **ANL 30** | M 150×2 | 180 | 164 | 168 | 14 | 6 | 151 | 24 | 0.7 | 1.38 | 30 | **AWL 30** | 150 |
| **ANL 32** | M 160×3 | 190 | 174 | 176 | 16 | 7 | 161.5 | 25 | 0.7 | 1.56 | 32 | **AWL 32** | 160 |
| **ANL 34** | M 170×3 | 200 | 184 | 186 | 16 | 7 | 171.5 | 26 | 0.7 | 1.72 | 34 | **AWL 34** | 170 |
| **ANL 36** | M 180×3 | 210 | 192 | 194 | 18 | 8 | 181.5 | 27 | 0.7 | 1.95 | 36 | **AWL 36** | 180 |
| **ANL 38** | M 190×3 | 220 | 202 | 204 | 18 | 8 | 191.5 | 28 | 0.7 | 2.08 | 38 | **AWL 38** | 190 |
| **ANL 40** | M 200×3 | 240 | 218 | 224 | 18 | 8 | 201.5 | 29 | 0.7 | 2.98 | 40 | **AWL 40** | 200 |

**Note** (1) Series AN is applicable to adapter sleeve Series A31 and A23.
Series ANL is applicable to adapter sleeve Series A30.

**Remarks** The basic design and dimensions of screw threads are in accordance with JIS B 0205.

## (For Adapters and Shafts)




Nut with Stopper

Units : mm

| Nominal Numbers | Nut Series AN | | | | | | | | | | | | | | Reference | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screw Threads $G$ | Basic Dimensions $d_2$ | $d_1$ | $g$ | $b$ | $h$ | $d_3$ | $B$ | $r$ max. | Tapped Holes $l$ | Screw Threads ($S$) | $d_4$ | Mass (kg) approx. | Adapter (1) Sleeve Bore Dia. Numbers | Stopper Numbers | Shaft Dia. |
| **AN 44** | Tr 220×4 | 280 | 250 | 260 | 20 | 10 | 222 | 32 | 0.8 | 15 | M 8×1.25 | 238 | 5.2 | 44 | **AL 44** | 220 |
| **AN 48** | Tr 240×4 | 300 | 270 | 280 | 20 | 10 | 242 | 34 | 0.8 | 15 | M 8×1.25 | 258 | 5.95 | 48 | **AL 44** | 240 |
| **AN 52** | Tr 260×4 | 330 | 300 | 306 | 24 | 12 | 262 | 36 | 0.8 | 18 | M 10×1.5 | 281 | 8.05 | 52 | **AL 52** | 260 |
| **AN 56** | Tr 280×4 | 350 | 320 | 326 | 24 | 12 | 282 | 38 | 0.8 | 18 | M 10×1.5 | 301 | 9.05 | 56 | **AL 52** | 280 |
| **AN 60** | Tr 300×4 | 380 | 340 | 356 | 24 | 12 | 302 | 40 | 0.8 | 18 | M 10×1.5 | 326 | 11.8 | 60 | **AL 60** | 300 |
| **AN 64** | Tr 320×5 | 400 | 360 | 376 | 24 | 12 | 322.5 | 42 | 0.8 | 18 | M 10×1.5 | 345 | 13.1 | 64 | **AL 64** | 320 |
| **AN 68** | Tr 340×5 | 440 | 400 | 410 | 28 | 15 | 342.5 | 55 | 1 | 21 | M 12×1.75 | 372 | 23.1 | 68 | **AL 68** | 340 |
| **AN 72** | Tr 360×5 | 460 | 420 | 430 | 28 | 15 | 362.5 | 58 | 1 | 21 | M 12×1.75 | 392 | 25.1 | 72 | **AL 68** | 360 |
| **AN 76** | Tr 380×5 | 490 | 450 | 454 | 32 | 18 | 382.5 | 60 | 1 | 21 | M 12×1.75 | 414 | 31 | 76 | **AL 76** | 380 |
| **AN 80** | Tr 400×5 | 520 | 470 | 484 | 32 | 18 | 402.5 | 62 | 1 | 27 | M 16×2 | 439 | 37 | 80 | **AL 80** | 400 |
| **AN 84** | Tr 420×5 | 540 | 490 | 504 | 32 | 18 | 422.5 | 70 | 1 | 27 | M 16×2 | 459 | 43.5 | 84 | **AL 80** | 420 |
| **AN 88** | Tr 440×5 | 560 | 510 | 520 | 36 | 20 | 442.5 | 70 | 1 | 27 | M 16×2 | 477 | 45 | 88 | **AL 88** | 440 |
| **AN 92** | Tr 460×5 | 580 | 540 | 540 | 36 | 20 | 462.5 | 75 | 1 | 27 | M 16×2 | 497 | 50.5 | 92 | **AL 88** | 460 |
| **AN 96** | Tr 480×5 | 620 | 560 | 580 | 36 | 20 | 482.5 | 75 | 1 | 27 | M 16×2 | 527 | 62 | 96 | **AL 96** | 480 |
| **AN 100** | Tr 500×5 | 630 | 580 | 584 | 40 | 23 | 502.5 | 80 | 1 | 27 | M 16×2 | 539 | 63.5 | /500 | **AL 100** | 500 |
| | Nut Series ANL | | | | | | | | | | | | | | | |
| **ANL 44** | Tr 220×4 | 260 | 242 | 242 | 20 | 9 | 222 | 30 | 0.8 | 12 | M 6×1 | 229 | 3.1 | 44 | **ALL 44** | 220 |
| **ANL 48** | Tr 240×4 | 290 | 270 | 270 | 20 | 10 | 242 | 34 | 0.8 | 15 | M 8×1.25 | 253 | 5.15 | 48 | **ALL 48** | 240 |
| **ANL 52** | Tr 260×4 | 310 | 290 | 290 | 20 | 10 | 262 | 34 | 0.8 | 15 | M 8×1.25 | 273 | 5.65 | 52 | **ALL 48** | 260 |
| **ANL 56** | Tr 280×4 | 330 | 310 | 310 | 24 | 10 | 282 | 38 | 0.8 | 15 | M 8×1.25 | 293 | 6.8 | 56 | **ALL 56** | 280 |
| **ANL 60** | Tr 300×4 | 360 | 336 | 336 | 24 | 12 | 302 | 42 | 0.8 | 15 | M 8×1.25 | 316 | 9.6 | 60 | **ALL 60** | 300 |
| **ANL 64** | Tr 320×5 | 380 | 356 | 356 | 24 | 12 | 322.5 | 42 | 0.8 | 15 | M 8×1.25 | 335 | 9.95 | 64 | **ALL 64** | 320 |
| **ANL 68** | Tr 340×5 | 400 | 376 | 376 | 24 | 12 | 342.5 | 45 | 1 | 15 | M 8×1.25 | 355 | 11.7 | 68 | **ALL 64** | 340 |
| **ANL 72** | Tr 360×5 | 420 | 394 | 394 | 28 | 13 | 362.5 | 45 | 1 | 15 | M 8×1.25 | 374 | 12 | 72 | **ALL 72** | 360 |
| **ANL 76** | Tr 380×5 | 450 | 422 | 422 | 28 | 14 | 382.5 | 48 | 1 | 18 | M 10×1.5 | 398 | 14.9 | 76 | **ALL 76** | 380 |
| **ANL 80** | Tr 400×5 | 470 | 442 | 442 | 28 | 14 | 402.5 | 52 | 1 | 18 | M 10×1.5 | 418 | 16.9 | 80 | **ALL 76** | 400 |
| **ANL 84** | Tr 420×5 | 490 | 462 | 462 | 32 | 14 | 422.5 | 52 | 1 | 18 | M 10×1.5 | 438 | 17.4 | 84 | **ALL 84** | 420 |
| **ANL 88** | Tr 440×5 | 520 | 490 | 490 | 32 | 15 | 442.5 | 60 | 1 | 21 | M 12×1.75 | 462 | 26.2 | 88 | **ALL 88** | 440 |
| **ANL 92** | Tr 460×5 | 540 | 510 | 510 | 32 | 15 | 462.5 | 60 | 1 | 21 | M 12×1.75 | 482 | 28 | 92 | **ALL 88** | 460 |
| **ANL 96** | Tr 480×5 | 560 | 530 | 530 | 36 | 15 | 482.5 | 60 | 1 | 21 | M 12×1.75 | 502 | 29.5 | 96 | **ALL 96** | 480 |
| **ANL 100** | Tr 500×5 | 580 | 550 | 550 | 36 | 15 | 502.5 | 68 | 1 | 21 | M 12×1.75 | 522 | 33.5 | /500 | **ALL 96** | 500 |

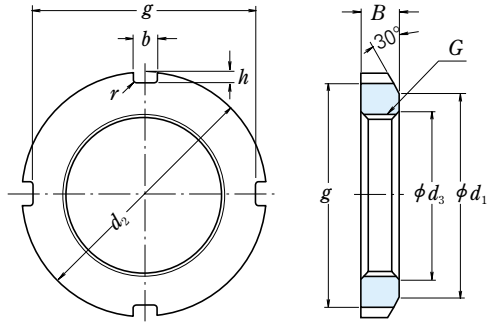
**Note** (1) Series AN is applicable to adapter sleeve Series A31, A32 and A23. Series ANL is applicable to adapter sleeve Series A30.

**Remarks** 1. The basic design and dimensions of screw threads are in accordance with JIS B 0216.
2. The basic design and dimensions of threads in tapped holes are in accordance with JIS B 0205.





## (For Withdrawal Sleeves)




Units : mm

| Nominal Numbers | Nut Series HN | | | | | | | | | | Reference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screw Threads $G$ | Basic Dimensions $d_2$ | $d_1$ | $g$ | $b$ | $h$ | $d_3$ | $B$ | $r$ max. | Mass (kg) approx. | Withdrawal Sleeve Numbers AH 31 | AH 22 | AH 32 | AH 23 |
| **HN 42** | Tr 210×4 | 270 | 238 | 250 | 20 | 10 | 212 | 30 | 0.8 | 4.75 | **AH 3138** | **AH 2238** | **AH 3238** | **AH 2338** |
| **HN 44** | Tr 220×4 | 280 | 250 | 260 | 20 | 10 | 222 | 32 | 0.8 | 5.35 | **AH 3140** | **AH 2240** | **AH 3240** | **AH 2340** |
| **HN 48** | Tr 240×4 | 300 | 270 | 280 | 20 | 10 | 242 | 34 | 0.8 | 6.2 | **AH 3144** | **AH 2244** | — | **AH 2344** |
| **HN 52** | Tr 260×4 | 330 | 300 | 306 | 24 | 12 | 262 | 36 | 0.8 | 8.55 | **AH 3148** | **AH 2248** | — | **AH 2348** |
| **HN 58** | Tr 290×4 | 370 | 330 | 346 | 24 | 12 | 292 | 40 | 0.8 | 11.8 | **AH 3152** | **AH 2252** | — | **AH 2352** |
| **HN 62** | Tr 310×5 | 390 | 350 | 366 | 24 | 12 | 312.5 | 42 | 0.8 | 13.4 | **AH 3156** | **AH 2256** | — | **AH 2356** |
| **HN 66** | Tr 330×5 | 420 | 380 | 390 | 28 | 15 | 332.5 | 52 | 1 | 20.4 | **AH 3160** | **AH 2260** | **AH 3260** | — |
| **HN 70** | Tr 350×5 | 450 | 410 | 420 | 28 | 15 | 352.5 | 55 | 1 | 25.2 | **AH 3164** | **AH 2264** | **AH 3264** | — |
| **HN 74** | Tr 370×5 | 470 | 430 | 440 | 28 | 15 | 372.5 | 58 | 1 | 28.2 | **AH 3168** | — | **AH 3268** | — |
| **HN 80** | Tr 400×5 | 520 | 470 | 484 | 32 | 18 | 402.5 | 62 | 1 | 40 | **AH 3172** | — | **AH 3272** | — |
| **HN 84** | Tr 420×5 | 540 | 490 | 504 | 32 | 18 | 422.5 | 70 | 1 | 46.9 | **AH 3176** | — | **AH 3276** | — |
| **HN 88** | Tr 440×5 | 560 | 510 | 520 | 36 | 20 | 442.5 | 70 | 1 | 48.5 | **AH 3180** | — | **AH 3280** | — |
| **HN 92** | Tr 460×5 | 580 | 540 | 540 | 36 | 20 | 462.5 | 75 | 1 | 55 | **AH 3184** | — | **AH 3284** | — |
| **HN 96** | Tr 480×5 | 620 | 560 | 580 | 36 | 20 | 482.5 | 75 | 1 | 67 | **AHX 3188** | — | **AHX 3288** | — |
| **HN 102** | Tr 510×6 | 650 | 590 | 604 | 40 | 23 | 513 | 80 | 1 | 75 | **AHX 3192** | — | **AHX 3292** | — |
| **HN 106** | Tr 530×6 | 670 | 610 | 624 | 40 | 23 | 533 | 80 | 1 | 78 | **AHX 3196** | — | **AHX 3296** | — |
| **HN 110** | Tr 550×6 | 700 | 640 | 654 | 40 | 23 | 553 | 80 | 1 | 92.5 | **AHX 31/500** | — | **AHX 32/500** | — |
| | Nut Series HNL | | | | | | | | | | AH 30 | AH 2 | | |
| **HNL 41** | Tr 205×4 | 250 | 232 | 234 | 18 | 8 | 207 | 30 | 0.8 | 3.45 | **AH 3038** | **AH 238** | | |
| **HNL 43** | Tr 215×4 | 260 | 242 | 242 | 20 | 9 | 217 | 30 | 0.8 | 3.7 | **AH 3040** | **AH 240** | | |
| **HNL 47** | Tr 235×4 | 280 | 262 | 262 | 20 | 9 | 237 | 34 | 0.8 | 4.6 | **AH 3044** | **AH 244** | | |
| **HNL 52** | Tr 260×4 | 310 | 290 | 290 | 20 | 10 | 262 | 34 | 0.8 | 5.8 | **AH 3048** | **AH 248** | | |
| **HNL 56** | Tr 280×4 | 330 | 310 | 310 | 24 | 10 | 282 | 38 | 0.8 | 6.7 | **AH 3052** | **AH 252** | | |
| **HNL 60** | Tr 300×4 | 360 | 336 | 336 | 24 | 12 | 302 | 42 | 0.8 | 9.6 | **AH 3056** | **AH 256** | | |
| **HNL 64** | Tr 320×5 | 380 | 356 | 356 | 24 | 12 | 322.5 | 42 | 1 | 10.3 | **AH 3060** | — | | |
| **HNL 69** | Tr 345×5 | 410 | 384 | 384 | 28 | 13 | 347.5 | 45 | 1 | 11.5 | **AH 3064** | — | | |
| **HNL 73** | Tr 365×5 | 430 | 404 | 404 | 28 | 13 | 367.5 | 48 | 1 | 14.2 | **AH 3068** | — | | |
| **HNL 77** | Tr 385×5 | 450 | 422 | 422 | 28 | 14 | 387.5 | 48 | 1 | 15 | **AH 3072** | — | | |
| **HNL 82** | Tr 410×5 | 480 | 452 | 452 | 32 | 14 | 412.5 | 52 | 1 | 19 | **AH 3076** | — | | |
| **HNL 86** | Tr 430×5 | 500 | 472 | 472 | 32 | 14 | 432.5 | 52 | 1 | 19.8 | **AH 3080** | — | | |
| **HNL 90** | Tr 450×5 | 520 | 490 | 490 | 32 | 15 | 452.5 | 60 | 1 | 23.8 | **AH 3084** | — | | |
| **HNL 94** | Tr 470×5 | 540 | 510 | 510 | 32 | 15 | 472.5 | 60 | 1 | 25 | **AHX 3088** | — | | |
| **HNL 98** | Tr 490×5 | 580 | 550 | 550 | 36 | 15 | 492.5 | 60 | 1 | 34 | **AHX 3092** | — | | |
| **HNL 104** | Tr 520×6 | 600 | 570 | 570 | 36 | 15 | 523 | 68 | 1 | 37 | **AHX 3096** | — | | |
| **HNL 108** | Tr 540×6 | 630 | 590 | 590 | 40 | 20 | 543 | 68 | 1 | 43.5 | **AHX 30/500** | | | |

**Remarks** 1. The basic design and dimensions of screw threads are in accordance with JIS B 0216.
2. The number of notches in the nut may be bigger than that shown in the above figure.

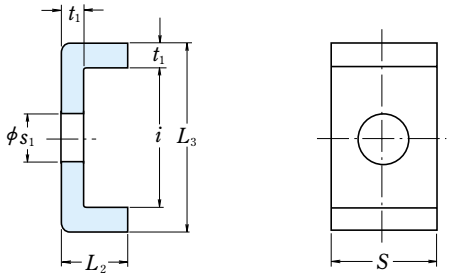
## (Combination of Withdrawal Sleeves and Nuts)

| Nominal Numbers | Reference | | | | | | |
|---|---|---|---|---|---|---|---|
| | Withdrawal Sleeve Numbers | | | | | | |
| | AH 30 | AH 31 | AH 2 | AH 22 | AH 32 | AH 3 | AH 23 |
| AN 09 | — | — | AH 208 | — | — | AH 308 | AH 2308 |
| AN 10 | — | — | AH 209 | — | — | AH 309 | AH 2309 |
| AN 11 | — | — | AH 210 | — | — | AHX 310 | AHX 2310 |
| AN 12 | — | — | AH 211 | — | — | AHX 311 | AHX 2311 |
| AN 13 | — | — | AH 212 | — | — | AHX 312 | AHX 2312 |
| AN 14 | — | — | — | — | — | — | — |
| AN 15 | — | — | AH 213 | — | — | AH 313 | AH 2313 |
| AN 16 | — | — | AH 214 | — | — | AH 314 | AHX 2314 |
| AN 17 | — | — | AH 215 | — | — | AH 315 | AHX 2315 |
| AN 18 | — | — | AH 216 | — | — | AH 316 | AHX 2316 |
| AN 19 | — | — | AH 217 | — | — | AHX 317 | AHX 2317 |
| AN 20 | — | — | AH 218 | — | AHX 3218 | AHX 318 | AHX 2318 |
| AN 21 | — | — | AH 219 | — | — | AHX 319 | AHX 2319 |
| AN 22 | — | — | AH 220 | — | AHX 3220 | AHX 320 | AHX 2320 |
| AN 23 | — | — | AH 221 | — | — | AHX 321 | — |
| AN 24 | — | AHX 3122 | AH 222 | — | — | AHX 322 | — |
| AN 25 | — | — | — | — | AHX 3222 | — | AHX 2322 |
| AN 26 | AHX 3024 | AHX 3124 | AH 224 | — | — | AHX 324 | — |
| AN 27 | — | — | — | — | AHX 3224 | — | AHX 2324 |
| AN 28 | AHX 3026 | AHX 3126 | AH 226 | — | — | AHX 326 | — |
| AN 29 | — | — | — | — | AHX 3226 | — | AHX 2326 |
| AN 30 | AHX 3028 | AHX 3128 | AH 228 | — | — | AHX 328 | — |
| AN 31 | — | — | — | — | AHX 3228 | — | AHX 2328 |
| AN 32 | AHX 3030 | — | AH 230 | — | — | — | — |
| AN 33 | — | AHX 3130 | — | — | AHX 3230 | AHX 330 | AHX 2330 |
| AN 34 | AH 3032 | — | AH 232 | — | — | — | — |
| AN 36 | AH 3034 | AH 3132 | AH 234 | — | AH 3232 | AH 332 | AH 2332 |
| AN 38 | AH 3036 | AH 3134 | AH 236 | — | AH 3234 | AH 334 | AH 2334 |
| AN 40 | — | AH 3136 | — | AH 2236 | AH 3236 | — | AH 2336 |



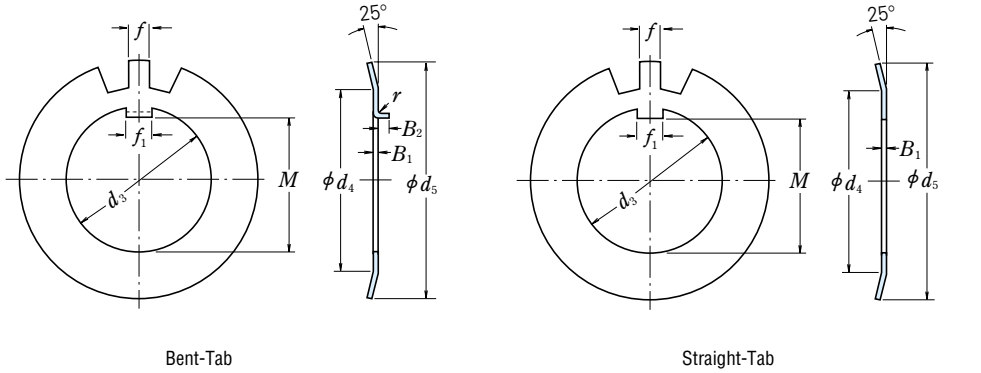







Units : mm

| Nominal Numbers | Stopper Series AL | | | | | | | Reference |
|---|---|---|---|---|---|---|---|---|
| | Basic Dimensions | | | | | | Mass (kg) per 100 pcs approx. | Nut Numbers |
| | $t_1$ | $S$ | $L_2$ | $s_1$ | $i$ | $L_3$ | | |
| AL 44 | 4 | 20 | 12 | 9 | 22.5 | 30.5 | 2.6 | AN 44, AN 48 |
| AL 52 | 4 | 24 | 12 | 12 | 25.5 | 33.5 | 3.4 | AN 52, AN 56 |
| AL 60 | 4 | 24 | 12 | 12 | 30.5 | 38.5 | 3.8 | AN 60 |
| AL 64 | 5 | 24 | 15 | 12 | 31 | 41 | 5.35 | AN 64 |
| AL 68 | 5 | 28 | 15 | 14 | 38 | 48 | 6.65 | AN 68, AN 72 |
| AL 76 | 5 | 32 | 15 | 14 | 40 | 50 | 7.95 | AN 76 |
| AL 80 | 5 | 32 | 15 | 18 | 45 | 55 | 8.2 | AN 80, AN 84 |
| AL 88 | 5 | 36 | 15 | 18 | 43 | 53 | 9.0 | AN 88, AN 92 |
| AL 96 | 5 | 36 | 15 | 18 | 53 | 63 | 10.4 | AN 96 |
| AL 100 | 5 | 40 | 15 | 18 | 45 | 55 | 10.5 | AN 100 |
| Stopper Series ALL | | | | | | | | |
| ALL 44 | 4 | 20 | 12 | 7 | 13.5 | 21.5 | 2.12 | ANL 44 |
| ALL 48 | 4 | 20 | 12 | 9 | 17.5 | 25.5 | 2.29 | ANL 48, ANL 52 |
| ALL 56 | 4 | 24 | 12 | 9 | 17.5 | 25.5 | 2.92 | ANL 56 |
| ALL 60 | 4 | 24 | 12 | 9 | 20.5 | 28.5 | 3.15 | ANL 60 |
| ALL 64 | 5 | 24 | 15 | 9 | 21 | 31 | 4.55 | ANL 64, ANL 68 |
| ALL 72 | 5 | 28 | 15 | 9 | 20 | 30 | 5.05 | ANL 72 |
| ALL 76 | 5 | 28 | 15 | 12 | 24 | 34 | 5.3 | ANL 76, ANL 80 |
| ALL 84 | 5 | 32 | 15 | 12 | 24 | 34 | 6.1 | ANL 84 |
| ALL 88 | 5 | 32 | 15 | 14 | 28 | 38 | 6.45 | ANL 88, ANL 92 |
| ALL 96 | 5 | 36 | 15 | 14 | 28 | 38 | 7.3 | ANL 96, ANL 100 |




Bent-Tab




Straight-Tab

Units : mm

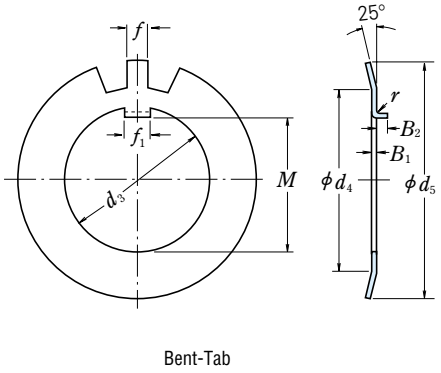
| Nominal Numbers | | Washer Series AW | | | | | | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Basic Dimensions | | | | | | | | | No. of Teeth | Mass (kg) per 100 pcs approx. | Adapter (1) Sleeve Bore Dia. Numbers | Nut Numbers | Shaft Dia. |
| Bent-Tab | Straight-Tab | $d_3$ | $M$ | $f_1$ | $B_1$ | $f$ | $d_4$ | $d_5$ | Bent-Tab $r$ | Bent-Tab $B_2$ | | | | | |
| **AW 02** | **AW 02 X** | 15 | 13.5 | 4 | 1 | 4 | 21 | 28 | 1 | 2.5 | 13 | 0.253 | — | **AN 02** | 15 |
| **AW 03** | **AW 03 X** | 17 | 15.5 | 4 | 1 | 4 | 24 | 32 | 1 | 2.5 | 13 | 0.315 | — | **AN 03** | 17 |
| **AW 04** | **AW 04 X** | 20 | 18.5 | 4 | 1 | 4 | 26 | 36 | 1 | 2.5 | 13 | 0.35 | 04 | **AN 04** | 20 |
| **AW 05** | **AW 05 X** | 25 | 23 | 5 | 1.2 | 5 | 32 | 42 | 1 | 2.5 | 13 | 0.64 | 05 | **AN 05** | 25 |
| **AW 06** | **AW 06 X** | 30 | 27.5 | 5 | 1.2 | 5 | 38 | 49 | 1 | 2.5 | 13 | 0.78 | 06 | **AN 06** | 30 |
| **AW 07** | **AW 07 X** | 35 | 32.5 | 6 | 1.2 | 5 | 44 | 57 | 1 | 2.5 | 15 | 1.04 | 07 | **AN 07** | 35 |
| **AW 08** | **AW 08 X** | 40 | 37.5 | 6 | 1.2 | 6 | 50 | 62 | 1 | 2.5 | 15 | 1.23 | 08 | **AN 08** | 40 |
| **AW 09** | **AW 09 X** | 45 | 42.5 | 6 | 1.2 | 6 | 56 | 69 | 1 | 2.5 | 17 | 1.52 | 09 | **AN 09** | 45 |
| **AW 10** | **AW 10 X** | 50 | 47.5 | 6 | 1.2 | 6 | 61 | 74 | 1 | 2.5 | 17 | 1.6 | 10 | **AN 10** | 50 |
| **AW 11** | **AW 11 X** | 55 | 52.5 | 8 | 1.2 | 7 | 67 | 81 | 1 | 4 | 17 | 1.96 | 11 | **AN 11** | 55 |
| **AW 12** | **AW 12 X** | 60 | 57.5 | 8 | 1.5 | 7 | 73 | 86 | 1.2 | 4 | 17 | 2.53 | 12 | **AN 12** | 60 |
| **AW 13** | **AW 13 X** | 65 | 62.5 | 8 | 1.5 | 7 | 79 | 92 | 1.2 | 4 | 19 | 2.9 | 13 | **AN 13** | 65 |
| **AW 14** | **AW 14 X** | 70 | 66.5 | 8 | 1.5 | 8 | 85 | 98 | 1.2 | 4 | 19 | 3.35 | 14 | **AN 14** | 70 |
| **AW 15** | **AW 15 X** | 75 | 71.5 | 8 | 1.5 | 8 | 90 | 104 | 1.2 | 4 | 19 | 3.55 | 15 | **AN 15** | 75 |
| **AW 16** | **AW 16 X** | 80 | 76.5 | 10 | 1.8 | 8 | 95 | 112 | 1.2 | 4 | 19 | 4.65 | 16 | **AN 16** | 80 |
| **AW 17** | **AW 17 X** | 85 | 81.5 | 10 | 1.8 | 8 | 102 | 119 | 1.2 | 4 | 19 | 5.25 | 17 | **AN 17** | 85 |
| **AW 18** | **AW 18 X** | 90 | 86.5 | 10 | 1.8 | 10 | 108 | 126 | 1.2 | 4 | 19 | 6.25 | 18 | **AN 18** | 90 |
| **AW 19** | **AW 19 X** | 95 | 91.5 | 10 | 1.8 | 10 | 113 | 133 | 1.2 | 4 | 19 | 6.7 | 19 | **AN 19** | 95 |
| **AW 20** | **AW 20 X** | 100 | 96.5 | 12 | 1.8 | 10 | 120 | 142 | 1.2 | 6 | 19 | 7.65 | 20 | **AN 20** | 100 |
| **AW 21** | **AW 21 X** | 105 | 100.5 | 12 | 1.8 | 12 | 126 | 145 | 1.2 | 6 | 19 | 8.25 | 21 | **AN 21** | 105 |
| **AW 22** | **AW 22 X** | 110 | 105.5 | 12 | 1.8 | 12 | 133 | 154 | 1.2 | 6 | 19 | 9.4 | 22 | **AN 22** | 110 |
| **AW 23** | **AW 23 X** | 115 | 110.5 | 12 | 2 | 12 | 137 | 159 | 1.5 | 6 | 19 | 10.8 | — | **AN 23** | 115 |
| **AW 24** | **AW 24 X** | 120 | 115 | 14 | 2 | 12 | 138 | 164 | 1.5 | 6 | 19 | 10.5 | 24 | **AN 24** | 120 |
| **AW 25** | **AW 25 X** | 125 | 120 | 14 | 2 | 12 | 148 | 170 | 1.5 | 6 | 19 | 11.8 | — | **AN 25** | 125 |

**Note** (1) Applicable to adapter sleeve Series A31, A2, A3, and A23.

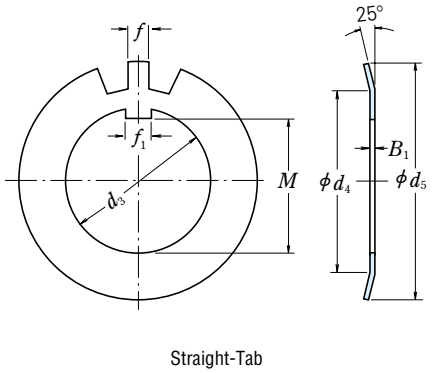
**Remarks** Washers with straight tabs shall be used with adapter sleeves having narrow slits, and for those having wide slits, either type of washer may be used.








Bent-Tab




Straight-Tab

Units : mm

| Nominal Numbers | | Washer Series AW | | | | | | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Basic Dimensions | | | | | | | | | No. of Teeth | Mass (kg) per 100 pcs approx. | Adapter (1) Sleeve Bore Dia. Numbers | Nut Numbers | Shaft Dia. |
| Bent-Tab | Straight-Tab | $d_3$ | $M$ | $f_1$ | $B_1$ | $f$ | $d_4$ | $d_5$ | Bent-Tab $r$ | Bent-Tab $B_2$ | | | | | |
| **AW 26** | **AW 26 X** | 130 | 125 | 14 | 2 | 12 | 149 | 175 | 1.5 | 6 | 19 | 11.3 | 26 | **AN 26** | 130 |
| **AW 27** | **AW 27 X** | 135 | 130 | 14 | 2 | 14 | 160 | 185 | 1.5 | 6 | 19 | 14.4 | — | **AN 27** | 135 |
| **AW 28** | **AW 28 X** | 140 | 135 | 16 | 2 | 14 | 160 | 192 | 1.5 | 8 | 19 | 14.2 | 28 | **AN 28** | 140 |
| **AW 29** | **AW 29 X** | 145 | 140 | 16 | 2 | 14 | 172 | 202 | 1.5 | 8 | 19 | 16.8 | — | **AN 29** | 145 |
| **AW 30** | **AW 30 X** | 150 | 145 | 16 | 2 | 14 | 171 | 205 | 1.5 | 8 | 19 | 15.9 | 30 | **AN 30** | 150 |
| **AW 31** | **AW 31 X** | 155 | 147.5 | 16 | 2.5 | 16 | 182 | 212 | 1.5 | 8 | 19 | 20.9 | — | **AN 31** | 155 |
| **AW 32** | **AW 32 X** | 160 | 154 | 18 | 2.5 | 16 | 182 | 217 | 1.5 | 8 | 19 | 22.2 | 32 | **AN 32** | 160 |
| **AW 33** | **AW 33 X** | 165 | 157.5 | 18 | 2.5 | 16 | 193 | 222 | 1.5 | 8 | 19 | 24.1 | — | **AN 33** | 165 |
| **AW 34** | **AW 34 X** | 170 | 164 | 18 | 2.5 | 16 | 193 | 232 | 1.5 | 8 | 19 | 24.7 | 34 | **AN 34** | 170 |
| **AW 36** | **AW 36 X** | 180 | 174 | 20 | 2.5 | 18 | 203 | 242 | 1.5 | 8 | 19 | 26.8 | 36 | **AN 36** | 180 |
| **AW 38** | **AW 38 X** | 190 | 184 | 20 | 2.5 | 18 | 214 | 252 | 1.5 | 8 | 19 | 27.8 | 38 | **AN 38** | 190 |
| **AW 40** | **AW 40 X** | 200 | 194 | 20 | 2.5 | 18 | 226 | 262 | 1.5 | 8 | 19 | 29.3 | 40 | **AN 40** | 200 |
| Washer Series AWL | | | | | | | | | | | | | | | |
| **AWL 24** | **AWL 24 X** | 120 | 115 | 14 | 2 | 12 | 133 | 155 | 1.5 | 6 | 19 | 7.7 | 24 | **ANL 24** | 120 |
| **AWL 26** | **AWL 26 X** | 130 | 125 | 14 | 2 | 12 | 143 | 165 | 1.5 | 6 | 19 | 8.7 | 26 | **ANL 26** | 130 |
| **AWL 28** | **AWL 28 X** | 140 | 135 | 16 | 2 | 14 | 151 | 175 | 1.5 | 8 | 19 | 10.9 | 28 | **ANL 28** | 140 |
| **AWL 30** | **AWL 30 X** | 150 | 145 | 16 | 2 | 14 | 164 | 190 | 1.5 | 8 | 19 | 11.3 | 30 | **ANL 30** | 150 |
| **AWL 32** | **AWL 32 X** | 160 | 154 | 18 | 2.5 | 16 | 174 | 200 | 1.5 | 8 | 19 | 16.2 | 32 | **ANL 32** | 160 |
| **AWL 34** | **AWL 34 X** | 170 | 164 | 18 | 2.5 | 16 | 184 | 210 | 1.5 | 8 | 19 | 19 | 34 | **ANL 34** | 170 |
| **AWL 36** | **AWL 36 X** | 180 | 174 | 20 | 2.5 | 18 | 192 | 220 | 1.5 | 8 | 19 | 18 | 36 | **ANL 36** | 180 |
| **AWL 38** | **AWL 38 X** | 190 | 184 | 20 | 2.5 | 18 | 202 | 230 | 1.5 | 8 | 19 | 20.5 | 38 | **ANL 38** | 190 |
| **AWL 40** | **AWL 40 X** | 200 | 194 | 20 | 2.5 | 18 | 218 | 250 | 1.5 | 8 | 19 | 21.4 | 40 | **ANL 40** | 200 |

**Note** (1) Series AW is applicable to adapter sleeve Series A31 and A23.
Series AWL is applicable to adapter sleeve Series A30.

**Remarks** Washers with straight tabs shall be used with adapter sleeves having narrow slits, and for those having wide slits, either type of washer may be used.

# INTRODUCTION OF NSK PRODUCTS · APPENDICES

## INTRODUCTION OF NSK PRODUCTS

Page

Photos of NSK Products ..... C 2

## APPENDICES

Appendix Table 1 Conversion from SI (International Units) System ..... C 8

Appendix Table 2 N–kgf Force Conversion Table ..... C10

Appendix Table 3 kg–lb Mass Conversion Table ..... C11

Appendix Table 4 °C–°F Temperature Conversion Table ..... C12

Appendix Table 5 Viscosity Conversion Table ..... C13

Appendix Table 6 inch–mm Dimension Conversion Table ..... C14

Appendix Table 7 Hardness Conversion Table ..... C16

Appendix Table 8 Physical and Mechanical Properties of Materials ..... C17

Appendix Table 9 Tolerances for Shaft Diameters ..... C18

Appendix Table 10 Tolerances for Housing Bore Diameters ..... C20

Appendix Table 11 Values of Standard Tolerance Grades IT ..... C22

Appendix Table 12 Speed Factor $f_n$ ..... C24

Appendix Table 13 Fatigue Life Factor $f_h$ and Fatigue Life $L \cdot L_h$ ..... C25

Appendix Table 14 Index of Inch Design Tapered Roller Bearings ..... C26

## AUTOMOTIVE PRODUCTS

Column Type Electric Power Steering
(CAT.No. E4102)

Pinion Type Electric Power Steering
(CAT.No. E4102)

Offeet Ball Screw Type Electric Power Steering
(CAT.No. E4102)

Long Life Water Pump Bearings
(CAT.No. E396, E4102)

Hub Unit Bearings
(CAT.No. E4201)

One-Way Clutch
(CAT.No. E4102)





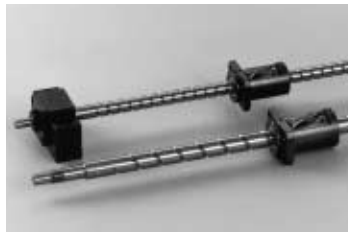
## PRECISION MACHINE COMPONENTS

### BALL SCREWS

Precision Ball Screws
(CAT.No. E3162)

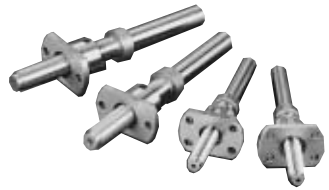
High-speed Low-noise
Ball Screws BSS Series
(CAT.No. E3229, E3162)

Ball Screw for standard
stock compact FA Series
(CAT.No. E3230, E3162)



Ball Screws for Standard
stock VFA Series
(CAT.No. E3162)

Ball Screws for High-Load
Drive HTF-SRC, HTF-SRD, HTF Series
(CAT.No. E3162, E3238)



Precision Miniature Ball
Screws
(CAT.No. E3162)

Precision Hollow Shaft
Ball Screws
(CAT.No. E3162)

NSK New Σ Series
ROBOTTE Ball Screws
with Spline
(CAT.No. E3162)

Ball Screws for transfer equipment
(CAT.No. E3162)

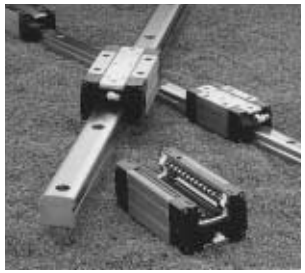
### MONOCARRIERS

Monocarriers
(CAT.No. E3419, E3162)

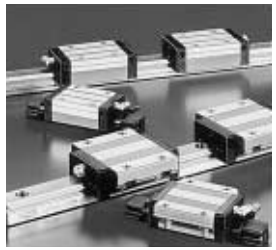
## PRECISION MACHINE COMPONENTS

### LINEAR BEARINGS

NSK Linear Guides and Ball Screws Equipped with "NSK K1™" Lubrication Unit (CAT.No. E3162)

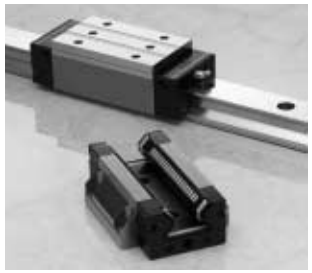


Translide™, New Type of Rolling Element Linear Motion Bearing (CAT.No. E3324, E3162)



NSK Linear Guides Self-aligning LH Series · LS Series (CAT.No. E3162)

NSK Linear Guides Miniature PU and PE Series (CAT.No. E3327, E3162)



NSK Linear Guides Roller Guide RA Series (CAT.No. E3328, E3162)

NSK S1™ Series Precision Linear Guides (CAT.No. E3320, E3162)

### ASSORTED SPINDLES

High Speed Integrated Motor Spindles

Precision Grinding Spindles (CAT.No. E2202)

Live Centers (CAT.No. E2202)

Oil/Air Lubricating Unit, Fine Lube (CAT.No. E1254/A1387)

Standard Type Precision Boring Heads (CAT.No. E2202)

Spindles for Electrical and Electric Equipment

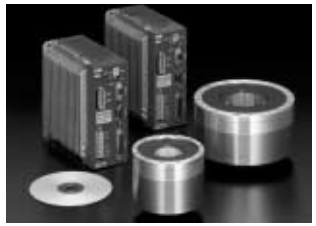


NSK

PRECISION MACHINE COMPONENTS

### MECHATRONIC ACTUATORS

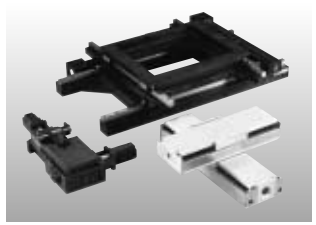
Megatorque Motor PS Series (CAT.No. E3510)



XY Modules

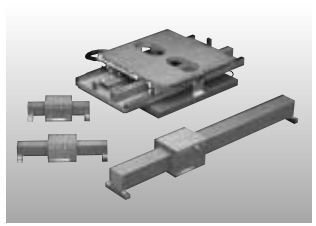
Megatorque Motor PN Series

XY Tables



Low Profile Megatorque Motor PN2012 (CAT. No. ESP-070724)

Air Bearing Slides



(CAT.No. E3156)

## AIR SPINDLES

Air-spindle

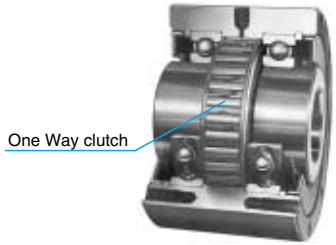
Air Cleaner Unit

DD Air-spindle

## Large Size Proximity Stepper RZ Series

## RELATED PRODUCT WITH BEARING

Bearing Induction Heater
(CAT.No. E398)




One Way clutch
(Package Type)

Extra Small Bearing Monitor
NB-4
(Bearing Abnormality Detector)
(CAT.No. E410)

## Appendix Table 1 Conversion Table from SI (International Units) System

### Comparison of SI, CGS, and Engineering Units

| Units / Unit System | Length | Mass | Time | Temp. | Acceleration | Force | Stress | Pressure | Energy | Power |
|---|---|---|---|---|---|---|---|---|---|---|
| SI | m | kg | s | K, °C | $m/s^2$ | N | Pa | Pa | J | W |
| CGS System | cm | g | s | °C | Gal | dyn | $dyn/cm^2$ | $dyn/cm^2$ | erg | erg/s |
| Engineering Unit System | m | $kgf \cdot s^2/m$ | s | °C | $m/s^2$ | kgf | $kgf/m^2$ | $kgf/m^2$ | $kgf \cdot m$ | $kgf \cdot m/s$ |

### Prefixes Used In SI System

| Multiples | Prefix | Symbols | Multiples | Prefix | Symbols |
|---|---|---|---|---|---|
| $10^{18}$ | Exa | E | $10^{-1}$ | Deci | d |
| $10^{15}$ | Peta | P | $10^{-2}$ | Centi | c |
| $10^{12}$ | Tera | T | $10^{-3}$ | Milli | m |
| $10^{9}$ | Giga | G | $10^{-6}$ | Micro | μ |
| $10^{6}$ | Mega | M | $10^{-9}$ | Nano | n |
| $10^{3}$ | Kilo | k | $10^{-12}$ | Pico | p |
| $10^{2}$ | Hecto | h | $10^{-15}$ | Femto | f |
| 10 | Deca | da | $10^{-18}$ | Ato | a |

### Conversion Factors from SI Units

| Parameter | SI Units | | Units other than SI | | Conversion Factors from SI Units |
|---|---|---|---|---|---|
| | Names of Units | Symbols | Name of Units | Symbols | |
| Angle | Radian | rad | Degree<br>Minute<br>Second | °<br>′<br>″ | $180/\pi$<br>$10\,800/\pi$<br>$648\,000/\pi$ |
| Length | Meter | m | Micron<br>Angstrom | μ<br>Å | $10^6$<br>$10^{10}$ |
| Area | Square meter | $m^2$ | Are<br>Hectare | a<br>ha | $10^{-2}$<br>$10^{-4}$ |
| Volume | Cubic meter | $m^3$ | Liter<br>Deciliter | l, L<br>dl, dL | $10^3$<br>$10^4$ |
| Time | Second | s | Minute<br>Hour<br>Day | min<br>h<br>d | 1/60<br>1/3 600<br>1/86 400 |
| Frequency | Hertz | Hz | Cycle | $s^{-1}$ | 1 |
| Speed of Rotation | Revolution per second | $s^{-1}$ | Revolution per miunte | rpm | 60 |
| Speed | Meter per second | m/s | Kilometer per hour<br>Knot | km/h<br>kn | 3 600/1 000<br>3 600/1 852 |
| Acceleration | Meter per second per second | $m/s^2$ | Gal<br>g | Gal<br>G | $10^2$<br>1/9.806 65 |
| Mass | Kilogram | kg | Ton | t | $10^{-3}$ |
| Force | Newton | N | Kilogram-force<br>Ton-force<br>Dyne | kgf<br>tf<br>dyn | 1/9.806 65<br>$1/(9.806\,65\times10^3)$<br>$10^5$ |
| Torque or Moment | Newton · meter | N · m | Kilogram-force meter | kgf · m | 1/9.806 65 |
| Stress | Pascal | Pa ($N/m^2$) | Kilogram-force per square centimeter<br>Kilogram-force per square millimeter | $kgf/cm^2$<br>$kgf/mm^2$ | $1/(9.806\,65\times10^4)$<br>$1/(9.806\,65\times10^6)$ |

### Conversion Factors from SI Units (Continued)

| Parameter | SI Units | | Units other than SI | | Conversion Factors from SI Units |
|---|---|---|---|---|---|
| | Names of Units | Symbols | Names of Units | Units | |
| Pressure | Pascal<br>(Newton per square meter) | Pa<br>($N/m^2$) | Kilogram-force per square meter<br>Water Column<br>Mercury Column<br>Torr<br>Bar<br>Atmosphere | $kgf/m^2$<br>$mH_2O$<br>mmHg<br>Torr<br>bar<br>atm | 1/9.806 65<br>$1/(9.806\,65\times10^3)$<br>$760/(1.013\,25\times10^5)$<br>$760/(1.013\,25\times10^5)$<br>$10^{-5}$<br>$1/(1.013\,25\times10^5)$ |
| Energy | Joule<br>(Newton · meter) | J<br>(N · m) | Erg<br>Calorie (International)<br>Kilogram-force meter<br>Kilowatt hour<br>French horse power hour | erg<br>$cal_{IT}$<br>$kgf \cdot m$<br>$kW \cdot h$<br>$PS \cdot h$ | $10^7$<br>1/4.186 8<br>1/9.806 65<br>$1/(3.6\times10^6)$<br>$\approx 3.776\,72\times10^{-7}$ |
| Work | Watt<br>(Joule per second) | W<br>(J/s) | Kilogram-force meter per second<br>Kilocalorie per hour<br>French horse power | $kgf \cdot m/s$<br>kcal/h<br>PS | 1/9.806 65<br>1/1.163<br>≈ 1/735.498 8 |
| Viscosity, Viscosity Index | Pascal second | $Pa \cdot s$ | Poise | P | 10 |
| Kinematic Viscosity, Kinematic Viscosity Index | Square meter per second | $m^2/s$ | Stokes<br>Centistokes | St<br>cSt | $10^4$<br>$10^6$ |
| Temperature | Kelvin, Degree celsius | K, °C | Degree | °C | (See note (1)) |
| Electric Current, Magnetomotive Force | Ampere | A | Ampere | A | 1 |
| Voltage, Electromotive Force | Volt | V | (Watts per ampere) | (W/A) | 1 |
| Magnetic Field Strength | Ampere per meter | A/m | Oersted | Oe | $4\pi/10^3$ |
| Magnetic Flux Density | Tesla | T | Gauss<br>Gamma | Gs<br>γ | $10^4$<br>$10^9$ |
| Electrical Resistance | Ohm | Ω | (Volts per ampere) | (V/A) | 1 |

**Note** (1) The conversion from $T$K into $\theta$°C is $\theta=T-273.15$ but for a temperature difference, it is $\Delta T=\Delta\theta$. However, $\Delta T$ and $\Delta\theta$ represent temperature differences measured using the Kelvin and Celsius scales respectively.

**Remarks** The names and symbols in ( ) are equivalent to those directly above them or on their left.
Example of conversion 1N=1/9.806 65kgf

## Appendix Table 2 N-kgf Conversion Table

**[Method of using this table]** For example, to convert 10N into kgf, read the figure in the right kgf column adjacent to the 10 in the center column in the 1st block. This means that 10N is 1.0197kgf. To convert 10kgf into N, read the figure in the left N column of the same row, which indicates that the answer is 98.066N.

1 N=0.1019716 kgf
1 kgf=9.80665 N

| N | | kgf | N | | kgf | N | | kgf |
|---|---|---|---|---|---|---|---|---|
| 9.8066 | **1** | 0.1020 | 333.43 | **34** | 3.4670 | 657.05 | **67** | 6.8321 |
| 19.613 | **2** | 0.2039 | 343.23 | **35** | 3.5690 | 666.85 | **68** | 6.9341 |
| 29.420 | **3** | 0.3059 | 353.04 | **36** | 3.6710 | 676.66 | **69** | 7.0360 |
| 39.227 | **4** | 0.4079 | 362.85 | **37** | 3.7729 | 686.47 | **70** | 7.1380 |
| 49.033 | **5** | 0.5099 | 372.65 | **38** | 3.8749 | 696.27 | **71** | 7.2400 |
| 58.840 | **6** | 0.6118 | 382.46 | **39** | 3.9769 | 706.08 | **72** | 7.3420 |
| 68.647 | **7** | 0.7138 | 392.27 | **40** | 4.0789 | 715.89 | **73** | 7.4439 |
| 78.453 | **8** | 0.8158 | 402.07 | **41** | 4.1808 | 725.69 | **74** | 7.5459 |
| 88.260 | **9** | 0.9177 | 411.88 | **42** | 4.2828 | 735.50 | **75** | 7.6479 |
| 98.066 | **10** | 1.0197 | 421.69 | **43** | 4.3848 | 745.31 | **76** | 7.7498 |
| 107.87 | **11** | 1.1217 | 431.49 | **44** | 4.4868 | 755.11 | **77** | 7.8518 |
| 117.68 | **12** | 1.2237 | 441.30 | **45** | 4.5887 | 764.92 | **78** | 7.9538 |
| 127.49 | **13** | 1.3256 | 451.11 | **46** | 4.6907 | 774.73 | **79** | 8.0558 |
| 137.29 | **14** | 1.4276 | 460.91 | **47** | 4.7927 | 784.53 | **80** | 8.1577 |
| 147.10 | **15** | 1.5296 | 470.72 | **48** | 4.8946 | 794.34 | **81** | 8.2597 |
| 156.91 | **16** | 1.6315 | 480.53 | **49** | 4.9966 | 804.15 | **82** | 8.3617 |
| 166.71 | **17** | 1.7335 | 490.33 | **50** | 5.0986 | 813.95 | **83** | 8.4636 |
| 176.52 | **18** | 1.8355 | 500.14 | **51** | 5.2006 | 823.76 | **84** | 8.5656 |
| 186.33 | **19** | 1.9375 | 509.95 | **52** | 5.3025 | 833.57 | **85** | 8.6676 |
| 196.13 | **20** | 2.0394 | 519.75 | **53** | 5.4045 | 843.37 | **86** | 8.7696 |
| 205.94 | **21** | 2.1414 | 529.56 | **54** | 5.5065 | 853.18 | **87** | 8.8715 |
| 215.75 | **22** | 2.2434 | 539.37 | **55** | 5.6084 | 862.99 | **88** | 8.9735 |
| 225.55 | **23** | 2.3453 | 549.17 | **56** | 5.7104 | 872.79 | **89** | 9.0755 |
| 235.36 | **24** | 2.4473 | 558.98 | **57** | 5.8124 | 882.60 | **90** | 9.1774 |
| 245.17 | **25** | 2.5493 | 568.79 | **58** | 5.9144 | 892.41 | **91** | 9.2794 |
| 254.97 | **26** | 2.6513 | 578.59 | **59** | 6.0163 | 902.21 | **92** | 9.3814 |
| 264.78 | **27** | 2.7532 | 588.40 | **60** | 6.1183 | 912.02 | **93** | 9.4834 |
| 274.59 | **28** | 2.8552 | 598.21 | **61** | 6.2203 | 921.83 | **94** | 9.5853 |
| 284.39 | **29** | 2.9572 | 608.01 | **62** | 6.3222 | 931.63 | **95** | 9.6873 |
| 294.20 | **30** | 3.0591 | 617.82 | **63** | 6.4242 | 941.44 | **96** | 9.7893 |
| 304.01 | **31** | 3.1611 | 627.63 | **64** | 6.5262 | 951.25 | **97** | 9.8912 |
| 313.81 | **32** | 3.2631 | 637.43 | **65** | 6.6282 | 961.05 | **98** | 9.9932 |
| 323.62 | **33** | 3.3651 | 647.24 | **66** | 6.7301 | 970.86 | **99** | 10.095 |

## Appendix Table 3 kg-lb Conversion Table

**[Method of using this table]** For example, to convert 10kg into lb, read the figure in the right lb column adjacent to the 10 in the center column in the 1st block. This means that 10kg is 22.046lb. To convert 10lb into kg, read the figure in the left kg column of the same row, which indicates that the answer is 4.536kg.

1 kg=2.2046226 lb
1 lb=0.45359237 kg

| kg | | lb | kg | | lb | kg | | lb |
|---|---|---|---|---|---|---|---|---|
| 0.454 | **1** | 2.205 | 15.422 | **34** | 74.957 | 30.391 | **67** | 147.71 |
| 0.907 | **2** | 4.409 | 15.876 | **35** | 77.162 | 30.844 | **68** | 149.91 |
| 1.361 | **3** | 6.614 | 16.329 | **36** | 79.366 | 31.298 | **69** | 152.12 |
| 1.814 | **4** | 8.818 | 16.783 | **37** | 81.571 | 31.751 | **70** | 154.32 |
| 2.268 | **5** | 11.023 | 17.237 | **38** | 83.776 | 32.205 | **71** | 156.53 |
| 2.722 | **6** | 13.228 | 17.690 | **39** | 85.980 | 32.659 | **72** | 158.73 |
| 3.175 | **7** | 15.432 | 18.144 | **40** | 88.185 | 33.112 | **73** | 160.94 |
| 3.629 | **8** | 17.637 | 18.597 | **41** | 90.390 | 33.566 | **74** | 163.14 |
| 4.082 | **9** | 19.842 | 19.051 | **42** | 92.594 | 34.019 | **75** | 165.35 |
| 4.536 | **10** | 22.046 | 19.504 | **43** | 94.799 | 34.473 | **76** | 167.55 |
| 4.990 | **11** | 24.251 | 19.958 | **44** | 97.003 | 34.927 | **77** | 169.76 |
| 5.443 | **12** | 26.455 | 20.412 | **45** | 99.208 | 35.380 | **78** | 171.96 |
| 5.897 | **13** | 28.660 | 20.865 | **46** | 101.41 | 35.834 | **79** | 174.17 |
| 6.350 | **14** | 30.865 | 21.319 | **47** | 103.62 | 36.287 | **80** | 176.37 |
| 6.804 | **15** | 33.069 | 21.772 | **48** | 105.82 | 36.741 | **81** | 178.57 |
| 7.257 | **16** | 35.274 | 22.226 | **49** | 108.03 | 37.195 | **82** | 180.78 |
| 7.711 | **17** | 37.479 | 22.680 | **50** | 110.23 | 37.648 | **83** | 182.98 |
| 8.165 | **18** | 39.683 | 23.133 | **51** | 112.44 | 38.102 | **84** | 185.19 |
| 8.618 | **19** | 41.888 | 23.587 | **52** | 114.64 | 38.555 | **85** | 187.39 |
| 9.072 | **20** | 44.092 | 24.040 | **53** | 116.84 | 39.009 | **86** | 189.60 |
| 9.525 | **21** | 46.297 | 24.494 | **54** | 119.05 | 39.463 | **87** | 191.80 |
| 9.979 | **22** | 48.502 | 24.948 | **55** | 121.25 | 39.916 | **88** | 194.01 |
| 10.433 | **23** | 50.706 | 25.401 | **56** | 123.46 | 40.370 | **89** | 196.21 |
| 10.886 | **24** | 52.911 | 25.855 | **57** | 125.66 | 40.823 | **90** | 198.42 |
| 11.340 | **25** | 55.116 | 26.308 | **58** | 127.87 | 41.277 | **91** | 200.62 |
| 11.793 | **26** | 57.320 | 26.762 | **59** | 130.07 | 41.730 | **92** | 202.83 |
| 12.247 | **27** | 59.525 | 27.216 | **60** | 132.28 | 42.184 | **93** | 205.03 |
| 12.701 | **28** | 61.729 | 27.669 | **61** | 134.48 | 42.638 | **94** | 207.23 |
| 13.154 | **29** | 63.934 | 28.123 | **62** | 136.69 | 43.091 | **95** | 209.44 |
| 13.608 | **30** | 66.139 | 28.576 | **63** | 138.89 | 43.545 | **96** | 211.64 |
| 14.061 | **31** | 68.343 | 29.030 | **64** | 141.10 | 43.998 | **97** | 213.85 |
| 14.515 | **32** | 70.548 | 29.484 | **65** | 143.30 | 44.452 | **98** | 216.05 |
| 14.969 | **33** | 72.753 | 29.937 | **66** | 145.51 | 44.906 | **99** | 218.26 |

## Appendix Table 4 °C-°F Conversion Table

**[Method of using this table]** For example, to convert 38°C into °F, read the figure in the right °F column adjacent to the 38 in the center column in the 2nd block. This means that 38°C is 100.4°F. To convert 38°F into°C, read the figure in the left °C column of the same row, which indicates that the answer is 3.3°C.

$$C=\frac{5}{9}(F-32)$$

$$F=32+\frac{9}{5}C$$

| °C | | °F | °C | | °F | °C | | °F | °C | | °F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| −73.3 | **−100** | −148.0 | 0.0 | **32** | 89.6 | 21.7 | **71** | 159.8 | 43.3 | **110** | 230 |
| −62.2 | **− 80** | −112.0 | 0.6 | **33** | 91.4 | 22.2 | **72** | 161.6 | 46.1 | **115** | 239 |
| −51.1 | **− 60** | − 76.0 | 1.1 | **34** | 93.2 | 22.8 | **73** | 163.4 | 48.9 | **120** | 248 |
| −40.0 | **− 40** | − 40.0 | 1.7 | **35** | 95.0 | 23.3 | **74** | 165.2 | 51.7 | **125** | 257 |
| −34.4 | **− 30** | − 22.0 | 2.2 | **36** | 96.8 | 23.9 | **75** | 167.0 | 54.4 | **130** | 266 |
| −28.9 | **− 20** | − 4.0 | 2.8 | **37** | 98.6 | 24.4 | **76** | 168.8 | 57.2 | **135** | 275 |
| −23.3 | **− 10** | 14.0 | 3.3 | **38** | 100.4 | 25.0 | **77** | 170.6 | 60.0 | **140** | 284 |
| −17.8 | **0** | 32.0 | 3.9 | **39** | 102.2 | 25.6 | **78** | 172.4 | 65.6 | **150** | 302 |
| −17.2 | **1** | 33.8 | 4.4 | **40** | 104.0 | 26.1 | **79** | 174.2 | 71.1 | **160** | 320 |
| −16.7 | **2** | 35.6 | 5.0 | **41** | 105.8 | 26.7 | **80** | 176.0 | 76.7 | **170** | 338 |
| −16.1 | **3** | 37.4 | 5.6 | **42** | 107.6 | 27.2 | **81** | 177.8 | 82.2 | **180** | 356 |
| −15.6 | **4** | 39.2 | 6.1 | **43** | 109.4 | 27.8 | **82** | 179.6 | 87.8 | **190** | 374 |
| −15.0 | **5** | 41.0 | 6.7 | **44** | 111.2 | 28.3 | **83** | 181.4 | 93.3 | **200** | 392 |
| −14.4 | **6** | 42.8 | 7.2 | **45** | 113.0 | 28.9 | **84** | 183.2 | 98.9 | **210** | 410 |
| −13.9 | **7** | 44.6 | 7.8 | **46** | 114.8 | 29.4 | **85** | 185.0 | 104.4 | **220** | 428 |
| −13.3 | **8** | 46.4 | 8.3 | **47** | 116.6 | 30.0 | **86** | 186.8 | 110.0 | **230** | 446 |
| −12.8 | **9** | 48.2 | 8.9 | **48** | 118.4 | 30.6 | **87** | 188.6 | 115.6 | **240** | 464 |
| −12.2 | **10** | 50.0 | 9.4 | **49** | 120.2 | 31.1 | **88** | 190.4 | 121.1 | **250** | 482 |
| −11.7 | **11** | 51.8 | 10.0 | **50** | 122.0 | 31.7 | **89** | 192.2 | 148.9 | **300** | 572 |
| −11.1 | **12** | 53.6 | 10.6 | **51** | 123.8 | 32.2 | **90** | 194.0 | 176.7 | **350** | 662 |
| −10.6 | **13** | 55.4 | 11.1 | **52** | 125.6 | 32.8 | **91** | 195.8 | 204 | **400** | 752 |
| −10.0 | **14** | 57.2 | 11.7 | **53** | 127.4 | 33.3 | **92** | 197.6 | 232 | **450** | 842 |
| − 9.4 | **15** | 59.0 | 12.2 | **54** | 129.2 | 33.9 | **93** | 199.4 | 260 | **500** | 932 |
| − 8.9 | **16** | 60.8 | 12.8 | **55** | 131.0 | 34.4 | **94** | 201.2 | 288 | **550** | 1022 |
| − 8.3 | **17** | 62.6 | 13.3 | **56** | 132.8 | 35.0 | **95** | 203.0 | 316 | **600** | 1112 |
| − 7.8 | **18** | 64.4 | 13.9 | **57** | 134.6 | 35.6 | **96** | 204.8 | 343 | **650** | 1202 |
| − 7.2 | **19** | 66.2 | 14.4 | **58** | 136.4 | 36.1 | **97** | 206.6 | 371 | **700** | 1292 |
| − 6.7 | **20** | 68.0 | 15.0 | **59** | 138.2 | 36.7 | **98** | 208.4 | 399 | **750** | 1382 |
| − 6.1 | **21** | 69.8 | 15.6 | **60** | 140.0 | 37.2 | **99** | 210.2 | 427 | **800** | 1472 |
| − 5.6 | **22** | 71.6 | 16.1 | **61** | 141.8 | 37.8 | **100** | 212.0 | 454 | **850** | 1562 |
| − 5.0 | **23** | 73.4 | 16.7 | **62** | 143.6 | 38.3 | **101** | 213.8 | 482 | **900** | 1652 |
| − 4.4 | **24** | 75.2 | 17.2 | **63** | 145.4 | 38.9 | **102** | 215.6 | 510 | **950** | 1742 |
| − 3.9 | **25** | 77.0 | 17.8 | **64** | 147.2 | 39.4 | **103** | 217.4 | 538 | **1000** | 1832 |
| − 3.3 | **26** | 78.8 | 18.3 | **65** | 149.0 | 40.0 | **104** | 219.2 | 593 | **1100** | 2012 |
| − 2.8 | **27** | 80.6 | 18.9 | **66** | 150.8 | 40.6 | **105** | 221.0 | 649 | **1200** | 2192 |
| − 2.2 | **28** | 82.4 | 19.4 | **67** | 152.6 | 41.1 | **106** | 222.8 | 704 | **1300** | 2372 |
| − 1.7 | **29** | 84.2 | 20.0 | **68** | 154.4 | 41.7 | **107** | 224.6 | 760 | **1400** | 2552 |
| − 1.1 | **30** | 86.0 | 20.6 | **69** | 156.2 | 42.2 | **108** | 226.4 | 816 | **1500** | 2732 |
| − 0.6 | **31** | 87.8 | 21.1 | **70** | 158.0 | 42.8 | **109** | 228.2 | 871 | **1600** | 2912 |

## Appendix Table 5 Viscosity Conversion Table

| Kinematic Viscosity $mm^2/s$ | Saybolt Universal SUS (sec) | | No.1 Type Redwood R (sec) | | Engler E (degree) |
|---|---|---|---|---|---|
| | 100°F | 210°F | 50°C | 100°C | |
| **2** | 32.6 | 32.8 | 30.8 | 31.2 | 1.14 |
| **3** | 36.0 | 36.3 | 33.3 | 33.7 | 1.22 |
| **4** | 39.1 | 39.4 | 35.9 | 36.5 | 1.31 |
| **5** | 42.3 | 42.6 | 38.5 | 39.1 | 1.40 |
| **6** | 45.5 | 45.8 | 41.1 | 41.7 | 1.48 |
| **7** | 48.7 | 49.0 | 43.7 | 44.3 | 1.56 |
| **8** | 52.0 | 52.4 | 46.3 | 47.0 | 1.65 |
| **9** | 55.4 | 55.8 | 49.1 | 50.0 | 1.75 |
| **10** | 58.8 | 59.2 | 52.1 | 52.9 | 1.84 |
| **11** | 62.3 | 62.7 | 55.1 | 56.0 | 1.93 |
| **12** | 65.9 | 66.4 | 58.2 | 59.1 | 2.02 |
| **13** | 69.6 | 70.1 | 61.4 | 62.3 | 2.12 |
| **14** | 73.4 | 73.9 | 64.7 | 65.6 | 2.22 |
| **15** | 77.2 | 77.7 | 68.0 | 69.1 | 2.32 |
| **16** | 81.1 | 81.7 | 71.5 | 72.6 | 2.43 |
| **17** | 85.1 | 85.7 | 75.0 | 76.1 | 2.54 |
| **18** | 89.2 | 89.8 | 78.6 | 79.7 | 2.64 |
| **19** | 93.3 | 94.0 | 82.1 | 83.6 | 2.76 |
| **20** | 97.5 | 98.2 | 85.8 | 87.4 | 2.87 |
| **21** | 102 | 102 | 89.5 | 91.3 | 2.98 |
| **22** | 106 | 107 | 93.3 | 95.1 | 3.10 |
| **23** | 110 | 111 | 97.1 | 98.9 | 3.22 |
| **24** | 115 | 115 | 101 | 103 | 3.34 |
| **25** | 119 | 120 | 105 | 107 | 3.46 |
| **26** | 123 | 124 | 109 | 111 | 3.58 |
| **27** | 128 | 129 | 112 | 115 | 3.70 |
| **28** | 132 | 133 | 116 | 119 | 3.82 |
| **29** | 137 | 138 | 120 | 123 | 3.95 |
| **30** | 141 | 142 | 124 | 127 | 4.07 |
| **31** | 145 | 146 | 128 | 131 | 4.20 |
| **32** | 150 | 150 | 132 | 135 | 4.32 |
| **33** | 154 | 155 | 136 | 139 | 4.45 |
| **34** | 159 | 160 | 140 | 143 | 4.57 |

| Kinematic Viscosity $mm^2/s$ | Saybolt Universal SUS (sec) | | No.1 Type Redwood R (sec) | | Engler E (degree) |
|---|---|---|---|---|---|
| | 100°F | 210°F | 50°C | 100°C | |
| **35** | 163 | 164 | 144 | 147 | 4.70 |
| **36** | 168 | 170 | 148 | 151 | 4.83 |
| **37** | 172 | 173 | 153 | 155 | 4.96 |
| **38** | 177 | 178 | 156 | 159 | 5.08 |
| **39** | 181 | 183 | 160 | 164 | 5.21 |
| **40** | 186 | 187 | 164 | 168 | 5.34 |
| **41** | 190 | 192 | 168 | 172 | 5.47 |
| **42** | 195 | 196 | 172 | 176 | 5.59 |
| **43** | 199 | 201 | 176 | 180 | 5.72 |
| **44** | 204 | 205 | 180 | 185 | 5.85 |
| **45** | 208 | 210 | 184 | 189 | 5.98 |
| **46** | 213 | 215 | 188 | 193 | 6.11 |
| **47** | 218 | 219 | 193 | 197 | 6.24 |
| **48** | 222 | 224 | 197 | 202 | 6.37 |
| **49** | 227 | 228 | 201 | 206 | 6.50 |
| **50** | 231 | 233 | 205 | 210 | 6.63 |
| **55** | 254 | 256 | 225 | 231 | 7.24 |
| **60** | 277 | 279 | 245 | 252 | 7.90 |
| **65** | 300 | 302 | 266 | 273 | 8.55 |
| **70** | 323 | 326 | 286 | 294 | 9.21 |
| **75** | 346 | 349 | 306 | 315 | 9.89 |
| **80** | 371 | 373 | 326 | 336 | 10.5 |
| **85** | 394 | 397 | 347 | 357 | 11.2 |
| **90** | 417 | 420 | 367 | 378 | 11.8 |
| **95** | 440 | 443 | 387 | 399 | 12.5 |
| **100** | 464 | 467 | 408 | 420 | 13.2 |
| **120** | 556 | 560 | 490 | 504 | 15.8 |
| **140** | 649 | 653 | 571 | 588 | 18.4 |
| **160** | 742 | 747 | 653 | 672 | 21.1 |
| **180** | 834 | 840 | 734 | 757 | 23.7 |
| **200** | 927 | 933 | 816 | 841 | 26.3 |
| **250** | 1 159 | 1 167 | 1 020 | 1 051 | 32.9 |
| **300** | 1 391 | 1 400 | 1 224 | 1 241 | 39.5 |

**Remarks** $1mm^2/s=1cSt$

## Appendix Table 6 inch - mm Conversion Table

1″=25.4mm

| inch | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fraction | Decimal | mm | | | | | | | | | | |
| **0** | **0.000000** | **0.000** | **25.400** | **50.800** | **76.200** | **101.600** | **127.000** | **152.400** | **177.800** | **203.200** | **228.600** | **254.000** |
| 1/64 | 0.015625 | 0.397 | 25.797 | 51.197 | 76.597 | 101.997 | 127.397 | 152.797 | 178.197 | 203.597 | 228.997 | 254.397 |
| 1/32 | 0.031250 | 0.794 | 26.194 | 51.594 | 76.994 | 102.394 | 127.794 | 153.194 | 178.594 | 203.994 | 229.394 | 254.794 |
| 3/64 | 0.046875 | 1.191 | 26.591 | 51.991 | 77.391 | 102.791 | 128.191 | 153.591 | 178.991 | 204.391 | 229.791 | 255.191 |
| **1/16** | **0.062500** | **1.588** | **26.988** | **52.388** | **77.788** | **103.188** | **128.588** | **153.988** | **179.388** | **204.788** | **230.188** | **255.588** |
| 5/64 | 0.078125 | 1.984 | 27.384 | 52.784 | 78.184 | 103.584 | 128.984 | 154.384 | 179.784 | 205.184 | 230.584 | 255.984 |
| 3/32 | 0.093750 | 2.381 | 27.781 | 53.181 | 78.581 | 103.981 | 129.381 | 154.781 | 180.181 | 205.581 | 230.981 | 256.381 |
| 7/64 | 0.109375 | 2.778 | 28.178 | 53.578 | 78.978 | 104.378 | 129.778 | 155.178 | 180.578 | 205.978 | 231.378 | 256.778 |
| **1/8** | **0.125000** | **3.175** | **28.575** | **53.975** | **79.375** | **104.775** | **130.175** | **155.575** | **180.975** | **206.375** | **231.775** | **257.175** |
| 9/64 | 0.140625 | 3.572 | 28.972 | 54.372 | 79.772 | 105.172 | 130.572 | 155.972 | 181.372 | 206.772 | 232.172 | 257.572 |
| 5/32 | 0.156250 | 3.969 | 29.369 | 54.769 | 80.169 | 105.569 | 130.969 | 156.369 | 181.769 | 207.169 | 232.569 | 257.969 |
| 11/64 | 0.171875 | 4.366 | 29.766 | 55.166 | 80.566 | 105.966 | 131.366 | 156.766 | 182.166 | 207.566 | 232.966 | 258.366 |
| **3/16** | **0.187500** | **4.762** | **30.162** | **55.562** | **80.962** | **106.362** | **131.762** | **157.162** | **182.562** | **207.962** | **233.362** | **258.762** |
| 13/64 | 0.203125 | 5.159 | 30.559 | 55.959 | 81.359 | 106.759 | 132.159 | 157.559 | 182.959 | 208.359 | 233.759 | 259.159 |
| 7/32 | 0.218750 | 5.556 | 30.956 | 56.356 | 81.756 | 107.156 | 132.556 | 157.956 | 183.356 | 208.756 | 234.156 | 259.556 |
| 15/64 | 0.234375 | 5.953 | 31.353 | 56.753 | 82.153 | 107.553 | 132.953 | 158.353 | 183.753 | 209.153 | 234.553 | 259.953 |
| **1/4** | **0.250000** | **6.350** | **31.750** | **57.150** | **82.550** | **107.950** | **133.350** | **158.750** | **184.150** | **209.550** | **234.950** | **260.350** |
| 17/64 | 0.265625 | 6.747 | 32.147 | 57.547 | 82.947 | 108.347 | 133.747 | 159.147 | 184.547 | 209.947 | 235.347 | 260.747 |
| 9/32 | 0.281250 | 7.144 | 32.544 | 57.944 | 83.344 | 108.744 | 134.144 | 159.544 | 184.944 | 210.344 | 235.744 | 261.144 |
| 19/64 | 0.296875 | 7.541 | 32.941 | 58.341 | 83.741 | 109.141 | 134.541 | 159.941 | 185.341 | 210.741 | 236.141 | 261.541 |
| **5/16** | **0.312500** | **7.938** | **33.338** | **58.738** | **84.138** | **109.538** | **134.938** | **160.338** | **185.738** | **211.138** | **236.538** | **261.938** |
| 21/64 | 0.328125 | 8.334 | 33.734 | 59.134 | 84.534 | 109.934 | 135.334 | 160.734 | 186.134 | 211.534 | 236.934 | 262.334 |
| 11/32 | 0.343750 | 8.731 | 34.131 | 59.531 | 84.931 | 110.331 | 135.731 | 161.131 | 186.531 | 211.931 | 237.331 | 262.731 |
| 23/64 | 0.359375 | 9.128 | 34.528 | 59.928 | 85.328 | 110.728 | 136.128 | 161.528 | 186.928 | 212.328 | 237.728 | 263.128 |
| **3/8** | **0.375000** | **9.525** | **34.925** | **60.325** | **85.725** | **111.125** | **136.525** | **161.925** | **187.325** | **212.725** | **238.125** | **263.525** |
| 25/64 | 0.390625 | 9.922 | 35.322 | 60.722 | 86.122 | 111.522 | 136.922 | 162.322 | 187.722 | 213.122 | 238.522 | 263.922 |
| 13/32 | 0.406250 | 10.319 | 35.719 | 61.119 | 86.519 | 111.919 | 137.319 | 162.719 | 188.119 | 213.519 | 238.919 | 264.319 |
| 27/64 | 0.421875 | 10.716 | 36.116 | 61.516 | 86.916 | 112.316 | 137.716 | 163.116 | 188.516 | 213.916 | 239.316 | 264.716 |
| **7/16** | **0.437500** | **11.112** | **36.512** | **61.912** | **87.312** | **112.712** | **138.112** | **163.512** | **188.912** | **214.312** | **239.712** | **265.112** |
| 29/64 | 0.453125 | 11.509 | 36.909 | 62.309 | 87.709 | 113.109 | 138.509 | 163.909 | 189.309 | 214.709 | 240.109 | 265.509 |
| 15/32 | 0.468750 | 11.906 | 37.306 | 62.706 | 88.106 | 113.506 | 138.906 | 164.306 | 189.706 | 215.106 | 240.506 | 265.906 |
| 31/64 | 0.484375 | 12.303 | 37.703 | 63.103 | 88.503 | 113.903 | 139.303 | 164.703 | 190.103 | 215.503 | 240.903 | 266.303 |
| **1/2** | **0.500000** | **12.700** | **38.100** | **63.500** | **88.900** | **114.300** | **139.700** | **165.100** | **190.500** | **215.900** | **241.300** | **266.700** |
| 33/64 | 0.515625 | 13.097 | 38.497 | 63.897 | 89.297 | 114.697 | 140.097 | 165.497 | 190.897 | 216.297 | 241.697 | 267.097 |
| 17/32 | 0.531250 | 13.494 | 38.894 | 64.294 | 89.694 | 115.094 | 140.494 | 165.894 | 191.294 | 216.694 | 242.094 | 267.494 |
| 35/64 | 0.546875 | 13.891 | 39.291 | 64.691 | 90.091 | 115.491 | 140.891 | 166.291 | 191.691 | 217.091 | 242.491 | 267.891 |
| **9/16** | **0.562500** | **14.288** | **39.688** | **65.088** | **90.488** | **115.888** | **141.288** | **166.688** | **192.088** | **217.488** | **242.888** | **268.288** |
| 37/64 | 0.578125 | 14.684 | 40.084 | 65.484 | 90.884 | 116.284 | 141.684 | 167.084 | 192.484 | 217.884 | 243.284 | 268.684 |
| 19/32 | 0.593750 | 15.081 | 40.481 | 65.881 | 91.281 | 116.681 | 142.081 | 167.481 | 192.881 | 218.281 | 243.681 | 269.081 |
| 39/64 | 0.609375 | 15.478 | 40.878 | 66.278 | 91.678 | 117.078 | 142.478 | 167.878 | 193.278 | 218.678 | 244.078 | 269.478 |
| **5/8** | **0.625000** | **15.875** | **41.275** | **66.675** | **92.075** | **117.475** | **142.875** | **168.275** | **193.675** | **219.075** | **244.475** | **269.875** |
| 41/64 | 0.640625 | 16.272 | 41.672 | 67.072 | 92.472 | 117.872 | 143.272 | 168.672 | 194.072 | 219.472 | 244.872 | 270.272 |
| 21/32 | 0.656250 | 16.669 | 42.069 | 67.469 | 92.869 | 118.269 | 143.669 | 169.069 | 194.469 | 219.869 | 245.269 | 270.669 |
| 43/64 | 0.671875 | 17.066 | 42.466 | 67.866 | 93.266 | 118.666 | 144.066 | 169.466 | 194.866 | 220.266 | 245.666 | 271.066 |
| **11/16** | **0.687500** | **17.462** | **42.862** | **68.262** | **93.662** | **119.062** | **144.462** | **169.862** | **195.262** | **220.662** | **246.062** | **271.462** |
| 45/64 | 0.703125 | 17.859 | 43.259 | 68.659 | 94.059 | 119.459 | 144.859 | 170.259 | 195.659 | 221.059 | 246.459 | 271.859 |
| 23/32 | 0.718750 | 18.256 | 43.656 | 69.056 | 94.456 | 119.856 | 145.256 | 170.656 | 196.056 | 221.456 | 246.856 | 272.256 |
| 47/64 | 0.734375 | 18.653 | 44.053 | 69.453 | 94.853 | 120.253 | 145.653 | 171.053 | 196.453 | 221.853 | 247.253 | 272.653 |
| **3/4** | **0.750000** | **19.050** | **44.450** | **69.850** | **95.250** | **120.650** | **146.050** | **171.450** | **196.850** | **222.250** | **247.650** | **273.050** |
| 49/64 | 0.765625 | 19.447 | 44.847 | 70.247 | 95.647 | 121.047 | 146.447 | 171.847 | 197.247 | 222.647 | 248.047 | 273.447 |
| 25/32 | 0.781250 | 19.844 | 45.244 | 70.644 | 96.044 | 121.444 | 146.844 | 172.244 | 197.644 | 223.044 | 248.444 | 273.844 |
| 51/64 | 0.796875 | 20.241 | 45.641 | 71.041 | 96.441 | 121.841 | 147.241 | 172.641 | 198.041 | 223.441 | 248.841 | 274.241 |
| **13/16** | **0.812500** | **20.638** | **46.038** | **71.438** | **96.838** | **122.238** | **147.638** | **173.038** | **198.438** | **223.838** | **249.238** | **274.638** |
| 53/64 | 0.828125 | 21.034 | 46.434 | 71.834 | 97.234 | 122.634 | 148.034 | 173.434 | 198.834 | 224.234 | 249.634 | 275.034 |
| 27/32 | 0.843750 | 21.431 | 46.831 | 72.231 | 97.631 | 123.031 | 148.431 | 173.831 | 199.231 | 224.631 | 250.031 | 275.431 |
| 55/64 | 0.859375 | 21.828 | 47.228 | 72.628 | 98.028 | 123.428 | 148.828 | 174.228 | 199.628 | 225.028 | 250.428 | 275.828 |
| **7/8** | **0.875000** | **22.225** | **47.625** | **73.025** | **98.425** | **123.825** | **149.225** | **174.625** | **200.025** | **225.425** | **250.825** | **276.225** |
| 57/64 | 0.890625 | 22.622 | 48.022 | 73.422 | 98.822 | 124.222 | 149.622 | 175.022 | 200.422 | 225.822 | 251.222 | 276.622 |
| 29/32 | 0.906250 | 23.019 | 48.419 | 73.819 | 99.219 | 124.619 | 150.019 | 175.419 | 200.819 | 226.219 | 251.619 | 277.019 |
| 59/64 | 0.921875 | 23.416 | 48.816 | 74.216 | 99.616 | 125.016 | 150.416 | 175.816 | 201.216 | 226.616 | 252.016 | 277.416 |
| **15/16** | **0.937500** | **23.812** | **49.212** | **74.612** | **100.012** | **125.412** | **150.812** | **176.212** | **201.612** | **227.012** | **252.412** | **277.812** |
| 61/64 | 0.953125 | 24.209 | 49.609 | 75.009 | 100.409 | 125.809 | 151.209 | 176.609 | 202.009 | 227.409 | 252.809 | 278.209 |
| 31/32 | 0.968750 | 24.606 | 50.006 | 75.406 | 100.806 | 126.206 | 151.606 | 177.006 | 202.406 | 227.806 | 253.206 | 278.606 |
| 63/64 | 0.984375 | 25.003 | 50.403 | 75.803 | 101.203 | 126.603 | 152.003 | 177.403 | 202.803 | 228.203 | 253.603 | 279.003 |



1″=25.4mm

| inch | | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fraction | Decimal | mm | | | | | | | | | |
| **0** | **0.0000** | **279.400** | **304.800** | **330.200** | **355.600** | **381.000** | **406.400** | **431.800** | **457.200** | **482.600** | **508.000** |
| 1/16 | 0.0625 | 280.988 | 306.388 | 331.788 | 357.188 | 382.588 | 407.988 | 433.388 | 458.788 | 484.188 | 509.588 |
| 1/8 | 0.1250 | 282.575 | 307.975 | 333.375 | 358.775 | 384.175 | 409.575 | 434.975 | 460.375 | 485.775 | 511.175 |
| 3/16 | 0.1875 | 284.162 | 309.562 | 334.962 | 360.362 | 385.762 | 411.162 | 436.562 | 461.962 | 487.362 | 512.762 |
| **1/4** | **0.2500** | **285.750** | **311.150** | **336.550** | **361.950** | **387.350** | **412.750** | **438.150** | **463.550** | **488.950** | **514.350** |
| 5/16 | 0.3125 | 287.338 | 312.738 | 338.138 | 363.538 | 388.938 | 414.338 | 439.738 | 465.138 | 490.538 | 515.938 |
| 3/8 | 0.3750 | 288.925 | 314.325 | 339.725 | 365.125 | 390.525 | 415.925 | 441.325 | 466.725 | 492.125 | 517.525 |
| 7/16 | 0.4375 | 290.512 | 315.912 | 341.312 | 366.712 | 392.112 | 417.512 | 442.912 | 468.312 | 493.712 | 519.112 |
| **1/2** | **0.5000** | **292.100** | **317.500** | **342.900** | **368.300** | **393.700** | **419.100** | **444.500** | **469.900** | **495.300** | **520.700** |
| 9/16 | 0.5625 | 293.688 | 319.088 | 344.488 | 369.888 | 395.288 | 420.688 | 446.088 | 471.488 | 496.888 | 522.288 |
| 5/8 | 0.6250 | 295.275 | 320.675 | 346.075 | 371.475 | 396.875 | 422.275 | 447.675 | 473.075 | 498.475 | 523.875 |
| 11/16 | 0.6875 | 296.862 | 322.262 | 347.662 | 373.062 | 398.462 | 423.862 | 449.262 | 474.662 | 500.062 | 525.462 |
| **3/4** | **0.7500** | **298.450** | **323.850** | **349.250** | **374.650** | **400.050** | **425.450** | **450.850** | **476.250** | **501.650** | **527.050** |
| 13/16 | 0.8125 | 300.038 | 325.438 | 350.838 | 376.238 | 401.638 | 427.038 | 452.438 | 477.838 | 503.238 | 528.638 |
| 7/8 | 0.8750 | 301.625 | 327.025 | 352.425 | 377.825 | 403.225 | 428.625 | 454.025 | 479.425 | 504.825 | 530.225 |
| 15/16 | 0.9375 | 303.212 | 328.612 | 354.012 | 379.412 | 404.812 | 430.212 | 455.612 | 481.012 | 506.412 | 531.812 |

1″=25.4mm

| inch | | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fraction | Decimal | mm | | | | | | | | | |
| **0** | **0.0000** | **533.400** | **558.800** | **584.200** | **609.600** | **635.000** | **660.400** | **685.800** | **711.200** | **736.600** | **762.000** |
| 1/16 | 0.0625 | 534.988 | 560.388 | 585.788 | 611.188 | 636.588 | 661.988 | 687.388 | 712.788 | 738.188 | 763.588 |
| 1/8 | 0.1250 | 536.575 | 561.975 | 587.375 | 612.775 | 638.175 | 663.575 | 688.975 | 714.375 | 739.775 | 765.175 |
| 3/16 | 0.1875 | 538.162 | 563.562 | 588.962 | 614.362 | 639.762 | 665.162 | 690.562 | 715.962 | 741.362 | 766.762 |
| **1/4** | **0.2500** | **539.750** | **565.150** | **590.550** | **615.950** | **641.350** | **666.750** | **692.150** | **717.550** | **742.950** | **768.350** |
| 5/16 | 0.3125 | 541.338 | 566.738 | 592.138 | 617.538 | 642.938 | 668.338 | 693.738 | 719.138 | 744.538 | 769.938 |
| 3/8 | 0.3750 | 542.925 | 568.325 | 593.725 | 619.125 | 644.525 | 669.925 | 695.325 | 720.725 | 746.125 | 771.525 |
| 7/16 | 0.4375 | 544.512 | 569.912 | 595.312 | 620.712 | 646.112 | 671.512 | 696.912 | 722.312 | 747.712 | 773.112 |
| **1/2** | **0.5000** | **546.100** | **571.500** | **596.900** | **622.300** | **647.700** | **673.100** | **698.500** | **723.900** | **749.300** | **774.700** |
| 9/16 | 0.5625 | 547.688 | 573.088 | 598.488 | 623.888 | 649.288 | 674.688 | 700.088 | 725.488 | 750.888 | 776.288 |
| 5/8 | 0.6250 | 549.275 | 574.675 | 600.075 | 625.475 | 650.875 | 676.275 | 701.675 | 727.075 | 752.475 | 777.875 |
| 11/16 | 0.6875 | 550.862 | 576.262 | 601.662 | 627.062 | 652.462 | 677.862 | 703.262 | 728.662 | 754.062 | 779.462 |
| **3/4** | **0.7500** | **552.450** | **577.850** | **603.250** | **628.650** | **654.050** | **679.450** | **704.850** | **730.250** | **755.650** | **781.050** |
| 13/16 | 0.8125 | 554.038 | 579.438 | 604.838 | 630.238 | 655.638 | 681.038 | 706.438 | 731.838 | 757.238 | 782.638 |
| 7/8 | 0.8750 | 555.625 | 581.025 | 606.425 | 631.825 | 657.225 | 682.625 | 708.025 | 733.425 | 758.825 | 784.225 |
| 15/16 | 0.9375 | 557.212 | 582.612 | 608.012 | 633.412 | 658.812 | 684.212 | 709.612 | 735.012 | 760.412 | 785.812 |

1″=25.4mm

| inch | | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fraction | Decimal | mm | | | | | | | | | |
| **0** | **0.0000** | **787.400** | **812.800** | **838.200** | **863.600** | **889.000** | **914.400** | **939.800** | **965.200** | **990.600** | **1016.000** |
| 1/16 | 0.0625 | 788.988 | 814.388 | 839.788 | 865.188 | 890.588 | 915.988 | 941.388 | 966.788 | 992.188 | 1017.588 |
| 1/8 | 0.1250 | 790.575 | 815.975 | 841.375 | 866.775 | 892.175 | 917.575 | 942.975 | 968.375 | 993.775 | 1019.175 |
| 3/16 | 0.1875 | 792.162 | 817.562 | 842.962 | 868.362 | 893.762 | 919.162 | 944.562 | 969.962 | 995.362 | 1020.762 |
| **1/4** | **0.2500** | **793.750** | **819.150** | **844.550** | **869.950** | **895.350** | **920.750** | **946.150** | **971.550** | **996.950** | **1022.350** |
| 5/16 | 0.3125 | 795.338 | 820.738 | 846.138 | 871.538 | 896.938 | 922.338 | 947.738 | 973.138 | 998.538 | 1023.938 |
| 3/8 | 0.3750 | 796.925 | 822.325 | 847.725 | 873.125 | 898.525 | 923.925 | 949.325 | 974.725 | 1000.125 | 1025.525 |
| 7/16 | 0.4375 | 798.512 | 823.912 | 849.312 | 874.712 | 900.112 | 925.512 | 950.912 | 976.312 | 1001.712 | 1027.112 |
| **1/2** | **0.5000** | **800.100** | **825.500** | **850.900** | **876.300** | **901.700** | **927.100** | **952.500** | **977.900** | **1003.300** | **1028.700** |
| 9/16 | 0.5625 | 801.688 | 827.088 | 852.488 | 877.888 | 903.288 | 928.688 | 954.088 | 979.488 | 1004.888 | 1030.288 |
| 5/8 | 0.6250 | 803.275 | 828.675 | 854.075 | 879.475 | 904.875 | 930.275 | 955.675 | 981.075 | 1006.475 | 1031.875 |
| 11/16 | 0.6875 | 804.862 | 830.262 | 855.662 | 881.062 | 906.462 | 931.862 | 957.262 | 982.662 | 1008.062 | 1033.462 |
| **3/4** | **0.7500** | **806.450** | **831.850** | **857.250** | **882.650** | **908.050** | **933.450** | **958.850** | **984.250** | **1009.650** | **1035.050** |
| 13/16 | 0.8125 | 808.038 | 833.438 | 858.838 | 884.238 | 909.638 | 935.038 | 960.438 | 985.838 | 1011.238 | 1036.638 |
| 7/8 | 0.8750 | 809.625 | 835.025 | 860.425 | 885.825 | 911.225 | 936.625 | 962.025 | 987.425 | 1012.825 | 1038.225 |
| 15/16 | 0.9375 | 811.212 | 836.612 | 862.012 | 887.412 | 912.812 | 938.212 | 963.621 | 989.012 | 1014.412 | 1039.812 |

## Appendix Table 7 Hardness Conversion Table (Reference)

| Rockwell C Scale Hardness (1 471N) {150kgf} | Vickers Hardness | Brinell Hardness: Standard Ball | Brinell Hardness: Tungsten Carbide Ball | Rockwell Hardness: A Scale Load 588.4N {60kgf} Brale Indenter | Rockwell Hardness: B Scale Load 980.7N {100kgf} 1.588mm (1/16in) Ball | Shore Hardness |
|---|---|---|---|---|---|---|
| **68** | 940 | — | — | 85.6 | — | 97 |
| **67** | 900 | — | — | 85.0 | — | 95 |
| **66** | 865 | — | — | 84.5 | — | 92 |
| **65** | 832 | — | 739 | 83.9 | — | 91 |
| **64** | 800 | — | 722 | 83.4 | — | 88 |
| **63** | 772 | — | 705 | 82.8 | — | 87 |
| **62** | 746 | — | 688 | 82.3 | — | 85 |
| **61** | 720 | — | 670 | 81.8 | — | 83 |
| **60** | 697 | — | 654 | 81.2 | — | 81 |
| **59** | 674 | — | 634 | 80.7 | — | 80 |
| **58** | 653 | — | 615 | 80.1 | — | 78 |
| **57** | 633 | — | 595 | 79.6 | — | 76 |
| **56** | 613 | — | 577 | 79.0 | — | 75 |
| **55** | 595 | — | 560 | 78.5 | — | 74 |
| **54** | 577 | — | 543 | 78.0 | — | 72 |
| **53** | 560 | — | 525 | 77.4 | — | 71 |
| **52** | 544 | 500 | 512 | 76.8 | — | 69 |
| **51** | 528 | 487 | 496 | 76.3 | — | 68 |
| **50** | 513 | 475 | 481 | 75.9 | — | 67 |
| **49** | 498 | 464 | 469 | 75.2 | — | 66 |
| **48** | 484 | 451 | 455 | 74.7 | — | 64 |
| **47** | 471 | 442 | 443 | 74.1 | — | 63 |
| **46** | 458 | 432 | 432 | 73.6 | — | 62 |
| **45** | 446 | 421 | 421 | 73.1 | — | 60 |
| **44** | 434 | 409 | 409 | 72.5 | — | 58 |
| **43** | 423 | 400 | 400 | 72.0 | — | 57 |
| **42** | 412 | 390 | 390 | 71.5 | — | 56 |
| **41** | 402 | 381 | 381 | 70.9 | — | 55 |
| **40** | 392 | 371 | 371 | 70.4 | — | 54 |
| **39** | 382 | 362 | 362 | 69.9 | — | 52 |
| **38** | 372 | 353 | 353 | 69.4 | — | 51 |
| **37** | 363 | 344 | 344 | 68.9 | — | 50 |
| **36** | 354 | 336 | 336 | 68.4 | (109.0) | 49 |
| **35** | 345 | 327 | 327 | 67.9 | (108.5) | 48 |
| **34** | 336 | 319 | 319 | 67.4 | (108.0) | 47 |
| **33** | 327 | 311 | 311 | 66.8 | (107.5) | 46 |
| **32** | 318 | 301 | 301 | 66.3 | (107.0) | 44 |
| **31** | 310 | 294 | 294 | 65.8 | (106.0) | 43 |
| **30** | 302 | 286 | 286 | 65.3 | (105.5) | 42 |
| **29** | 294 | 279 | 279 | 64.7 | (104.5) | 41 |
| **28** | 286 | 271 | 271 | 64.3 | (104.0) | 41 |
| **27** | 279 | 264 | 264 | 63.8 | (103.0) | 40 |
| **26** | 272 | 258 | 258 | 63.3 | (102.5) | 38 |
| **25** | 266 | 253 | 253 | 62.8 | (101.5) | 38 |
| **24** | 260 | 247 | 247 | 62.4 | (101.0) | 37 |
| **23** | 254 | 243 | 243 | 62.0 | 100.0 | 36 |
| **22** | 248 | 237 | 237 | 61.5 | 99.0 | 35 |
| **21** | 243 | 231 | 231 | 61.0 | 98.5 | 35 |
| **20** | 238 | 226 | 226 | 60.5 | 97.8 | 34 |
| (**18**) | 230 | 219 | 219 | — | 96.7 | 33 |
| (**16**) | 222 | 212 | 212 | — | 95.5 | 32 |
| (**14**) | 213 | 203 | 203 | — | 93.9 | 31 |
| (**12**) | 204 | 194 | 194 | — | 92.3 | 29 |
| (**10**) | 196 | 187 | 187 | — | 90.7 | 28 |
| (**8**) | 188 | 179 | 179 | — | 89.5 | 27 |
| (**6**) | 180 | 171 | 171 | — | 87.1 | 26 |
| (**4**) | 173 | 165 | 165 | — | 85.5 | 25 |
| (**2**) | 166 | 158 | 158 | — | 83.5 | 24 |
| (**0**) | 160 | 152 | 152 | — | 81.7 | 24 |

## Appendix Table 8 Physical and Mechanical Properties of Materials

| Materials | Specific Gravity | Coefficient of Linear Expansion (0°～100°C) ($K^{-1}$) | Hardness (Brinell) | Modulus of Linear Elasticity (MPa) {kgf/mm²} | Tensile Strength (MPa) {kgf/mm²} | Yield Point (MPa) {kgf/mm²} | Elongation (%) |
|---|---|---|---|---|---|---|---|
| Bearing Steel (hardened) | 7.83 | $12.5\times10^{-6}$ | 650 to 740 | 208 000 {21 200} | 1 570 to 1 960 {160 to 200} | — | — |
| Martensitic Stainless Steel SUS 440C | 7.68 | $10.1\times10^{-6}$ | 580 | 200 000 {20 400} | 1 960 {200} | 1 860 {190} | — |
| Mild Steel (C=0.12～0.20%) | 7.86 | $11.6\times10^{-6}$ | 100 to 130 | 206 000 {21 000} | 373 to 471 {38 to 48} | 216 to 294 {22 to 30} | 24 to 36 |
| Hard Steel (C=0.3～0.5%) | 7.84 | $11.3\times10^{-6}$ | 160 to 200 | 206 000 {21 000} | 539 to 686 {55 to 70} | 333 to 451 {34 to 46} | 14 to 26 |
| Austenitic Stainless Steel SUS 304 | 8.03 | $16.3\times10^{-6}$ | 150 | 193 000 {19 700} | 588 {60} | 245 {25} | 60 |
| Cast Iron — Gray Iron FC200 | 7.3 | $10.4\times10^{-6}$ | 223 | 98 100 {10 000} | More than 200 {20} | — | — |
| Cast Iron — Spheroidal graphite Iron FCD400 | 7.0 | $11.7\times10^{-6}$ | Less than 201 | 98 100 {10 000} | More than 400 {41} | — | More than 12 |
| Aluminum | 2.69 | $23.7\times10^{-6}$ | 15 to 26 | 70 600 {7 200} | 78 {8} | 34 {3.5} | 35 |
| Zinc | 7.14 | $31\times10^{-6}$ | 30 to 60 | 92 200 {9 400} | 147 {15} | — | 30 to 40 |
| Copper | 8.93 | $16.2\times10^{-6}$ | 50 | 123 000 {12 500} | 196 {20} | 69 {7} | 15 to 20 |
| Brass (Annealed) | 8.5 | $19.1\times10^{-6}$ | 45 | 103 000 {10 500} | 294 to 343 {30 to 35} | — | 65 to 75 |
| Brass (Machined) | 8.5 | $19.1\times10^{-6}$ | 85 to 130 | 103 000 {10 500} | 363 to 539 {37 to 55} | — | 15 to 50 |

**Remarks** The hardness of hardened bearing steel and martensitic stainless steel is usually expressed using the Rockwell C Scale, but for comparison, it is converted into Brinell hardness.

## Appendix Table 9 Tolerances for Shaft Diameters

Units : μm

| Diameter Classification (mm) over | incl | Single Plane Mean B.D. Deviation (Normal) $\Delta_{dmp}$ | d6 | e6 | f6 | g5 | g6 | h5 | h6 | h7 | h8 | h9 | h10 | js5 | js6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 6 | 0<br>− 8 | − 30<br>− 38 | − 20<br>− 28 | − 10<br>− 18 | − 4<br>− 9 | − 4<br>− 12 | 0<br>− 5 | 0<br>− 8 | 0<br>− 12 | 0<br>− 18 | 0<br>− 30 | 0<br>− 48 | ± 2.5 | ± 4 |
| 6 | 10 | 0<br>− 8 | − 40<br>− 49 | − 25<br>− 34 | − 13<br>− 22 | − 5<br>− 11 | − 5<br>− 14 | 0<br>− 6 | 0<br>− 9 | 0<br>− 15 | 0<br>− 22 | 0<br>− 36 | 0<br>− 58 | ± 3 | ± 4.5 |
| 10 | 18 | 0<br>− 8 | − 50<br>− 61 | − 32<br>− 43 | − 16<br>− 27 | − 6<br>− 14 | − 6<br>− 17 | 0<br>− 8 | 0<br>− 11 | 0<br>− 18 | 0<br>− 27 | 0<br>− 43 | 0<br>− 70 | ± 4 | ± 5.5 |
| 18 | 30 | 0<br>− 10 | − 65<br>− 78 | − 40<br>− 53 | − 20<br>− 33 | − 7<br>− 16 | − 7<br>− 20 | 0<br>− 9 | 0<br>− 13 | 0<br>− 21 | 0<br>− 33 | 0<br>− 52 | 0<br>− 84 | ± 4.5 | ± 6.5 |
| 30 | 50 | 0<br>− 12 | − 80<br>− 96 | − 50<br>− 66 | − 25<br>− 41 | − 9<br>− 20 | − 9<br>− 25 | 0<br>− 11 | 0<br>− 16 | 0<br>− 25 | 0<br>− 39 | 0<br>− 62 | 0<br>− 100 | ± 5.5 | ± 8 |
| 50 | 80 | 0<br>− 15 | − 100<br>− 119 | − 60<br>− 79 | − 30<br>− 49 | − 10<br>− 23 | − 10<br>− 29 | 0<br>− 13 | 0<br>− 19 | 0<br>− 30 | 0<br>− 46 | 0<br>− 74 | 0<br>− 120 | ± 6.5 | ± 9.5 |
| 80 | 120 | 0<br>− 20 | − 120<br>− 142 | − 72<br>− 94 | − 36<br>− 58 | − 12<br>− 27 | − 12<br>− 34 | 0<br>− 15 | 0<br>− 22 | 0<br>− 35 | 0<br>− 54 | 0<br>− 87 | 0<br>− 140 | ± 7.5 | ± 11 |
| 120 | 180 | 0<br>− 25 | − 145<br>− 170 | − 85<br>− 110 | − 43<br>− 68 | − 14<br>− 32 | − 14<br>− 39 | 0<br>− 18 | 0<br>− 25 | 0<br>− 40 | 0<br>− 63 | 0<br>− 100 | 0<br>− 160 | ± 9 | ± 12.5 |
| 180 | 250 | 0<br>− 30 | − 170<br>− 199 | − 100<br>− 129 | − 50<br>− 79 | − 15<br>− 35 | − 15<br>− 44 | 0<br>− 20 | 0<br>− 29 | 0<br>− 46 | 0<br>− 72 | 0<br>− 115 | 0<br>− 185 | ± 10 | ± 14.5 |
| 250 | 315 | 0<br>− 35 | − 190<br>− 222 | − 110<br>− 142 | − 56<br>− 88 | − 17<br>− 40 | − 17<br>− 49 | 0<br>− 23 | 0<br>− 32 | 0<br>− 52 | 0<br>− 81 | 0<br>− 130 | 0<br>− 210 | ± 11.5 | ± 16 |
| 315 | 400 | 0<br>− 40 | − 210<br>− 246 | − 125<br>− 161 | − 62<br>− 98 | − 18<br>− 43 | − 18<br>− 54 | 0<br>− 25 | 0<br>− 36 | 0<br>− 57 | 0<br>− 89 | 0<br>− 140 | 0<br>− 230 | ± 12.5 | ± 18 |
| 400 | 500 | 0<br>− 45 | − 230<br>− 270 | − 135<br>− 175 | − 68<br>− 108 | − 20<br>− 47 | − 20<br>− 60 | 0<br>− 27 | 0<br>− 40 | 0<br>− 63 | 0<br>− 97 | 0<br>− 155 | 0<br>− 250 | ± 13.5 | ± 20 |
| 500 | 630 | 0<br>− 50 | − 260<br>− 304 | − 145<br>− 189 | − 76<br>− 120 | — | − 22<br>− 66 | — | 0<br>− 44 | 0<br>− 70 | 0<br>− 110 | 0<br>− 175 | 0<br>− 280 | — | ± 22 |
| 630 | 800 | 0<br>− 75 | − 290<br>− 340 | − 160<br>− 210 | − 80<br>− 130 | — | − 24<br>− 74 | — | 0<br>− 50 | 0<br>− 80 | 0<br>− 125 | 0<br>− 200 | 0<br>− 320 | — | ± 25 |
| 800 | 1 000 | 0<br>− 100 | − 320<br>− 376 | − 170<br>− 226 | − 86<br>− 142 | — | − 26<br>− 82 | — | 0<br>− 56 | 0<br>− 90 | 0<br>− 140 | 0<br>− 230 | 0<br>− 360 | — | ± 28 |
| 1 000 | 1 250 | 0<br>− 125 | − 350<br>− 416 | − 195<br>− 261 | − 98<br>− 164 | — | − 28<br>− 94 | — | 0<br>− 66 | 0<br>− 105 | 0<br>− 165 | 0<br>− 260 | 0<br>− 420 | — | ± 33 |
| 1 250 | 1 600 | 0<br>− 160 | − 390<br>− 468 | − 220<br>− 298 | − 110<br>− 188 | — | − 30<br>− 108 | — | 0<br>− 78 | 0<br>− 125 | 0<br>− 195 | 0<br>− 310 | 0<br>− 500 | — | ± 39 |
| 1 600 | 2 000 | 0<br>− 200 | − 430<br>− 522 | − 240<br>− 332 | − 120<br>− 212 | — | − 32<br>− 124 | — | 0<br>− 92 | 0<br>− 150 | 0<br>− 230 | 0<br>− 370 | 0<br>− 600 | — | ± 46 |

| j5 | j6 | j7 | k5 | k6 | k7 | m5 | m6 | n6 | p6 | r6 | r7 | Diameter Classification (mm) over | incl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + 3<br>− 2 | + 6<br>− 2 | + 8<br>− 4 | + 6<br>+ 1 | + 9<br>+ 1 | + 13<br>+ 1 | + 9<br>+ 4 | + 12<br>+ 4 | + 16<br>+ 8 | + 20<br>+ 12 | + 23<br>+ 15 | + 27<br>+ 15 | 3 | 6 |
| + 4<br>− 2 | + 7<br>− 2 | + 10<br>− 5 | + 7<br>+ 1 | + 10<br>+ 1 | + 16<br>+ 1 | + 12<br>+ 6 | + 15<br>+ 6 | + 19<br>+ 10 | + 24<br>+ 15 | + 28<br>+ 19 | + 34<br>+ 19 | 6 | 10 |
| + 5<br>− 3 | + 8<br>− 3 | + 12<br>− 6 | + 9<br>+ 1 | + 12<br>+ 1 | + 19<br>+ 1 | + 15<br>+ 7 | + 18<br>+ 7 | + 23<br>+ 12 | + 29<br>+ 18 | + 34<br>+ 23 | + 41<br>+ 23 | 10 | 18 |
| + 5<br>− 4 | + 9<br>− 4 | + 13<br>− 8 | + 11<br>+ 2 | + 15<br>+ 2 | + 23<br>+ 2 | + 17<br>+ 8 | + 21<br>+ 8 | + 28<br>+ 15 | + 35<br>+ 22 | + 41<br>+ 28 | + 49<br>+ 28 | 18 | 30 |
| + 6<br>− 5 | + 11<br>− 5 | + 15<br>− 10 | + 13<br>+ 2 | + 18<br>+ 2 | + 27<br>+ 2 | + 20<br>+ 9 | + 25<br>+ 9 | + 33<br>+ 17 | + 42<br>+ 26 | + 50<br>+ 34 | + 59<br>+ 34 | 30 | 50 |
| + 6<br>− 7 | + 12<br>− 7 | + 18<br>− 12 | + 15<br>+ 2 | + 21<br>+ 2 | + 32<br>+ 2 | + 24<br>+ 11 | + 30<br>+ 11 | + 39<br>+ 20 | + 51<br>+ 32 | + 60<br>+ 41 | + 71<br>+ 41 | 50 | 65 |
| | | | | | | | | | | + 62<br>+ 43 | + 73<br>+ 43 | 65 | 80 |
| + 6<br>− 9 | + 13<br>− 9 | + 20<br>− 15 | + 18<br>+ 3 | + 25<br>+ 3 | + 38<br>+ 3 | + 28<br>+ 13 | + 35<br>+ 13 | + 45<br>+ 23 | + 59<br>+ 37 | + 73<br>+ 51 | + 86<br>+ 51 | 80 | 100 |
| | | | | | | | | | | + 76<br>+ 54 | + 89<br>+ 54 | 100 | 120 |
| + 7<br>− 11 | + 14<br>− 11 | + 22<br>− 18 | + 21<br>+ 3 | + 28<br>+ 3 | + 43<br>+ 3 | + 33<br>+ 15 | + 40<br>+ 15 | + 52<br>+ 27 | + 68<br>+ 43 | + 88<br>+ 63 | + 103<br>+ 63 | 120 | 140 |
| | | | | | | | | | | + 90<br>+ 65 | + 105<br>+ 65 | 140 | 160 |
| | | | | | | | | | | + 93<br>+ 68 | + 108<br>+ 68 | 160 | 180 |
| + 7<br>− 13 | + 16<br>− 13 | + 25<br>− 21 | + 24<br>+ 4 | + 33<br>+ 4 | + 50<br>+ 4 | + 37<br>+ 17 | + 46<br>+ 17 | + 60<br>+ 31 | + 79<br>+ 50 | + 106<br>+ 77 | + 123<br>+ 77 | 180 | 200 |
| | | | | | | | | | | + 109<br>+ 80 | + 126<br>+ 80 | 200 | 225 |
| | | | | | | | | | | + 113<br>+ 84 | + 130<br>+ 84 | 225 | 250 |
| + 7<br>− 16 | ± 16 | ± 26 | + 27<br>+ 4 | + 36<br>+ 4 | + 56<br>+ 4 | + 43<br>+ 20 | + 52<br>+ 20 | + 66<br>+ 34 | + 88<br>+ 56 | + 126<br>+ 94 | + 146<br>+ 94 | 250 | 280 |
| | | | | | | | | | | + 130<br>+ 98 | + 150<br>+ 98 | 280 | 315 |
| + 7<br>− 18 | ± 18 | + 29<br>− 28 | + 29<br>+ 4 | + 40<br>+ 4 | + 61<br>+ 4 | + 46<br>+ 21 | + 57<br>+ 21 | + 73<br>+ 37 | + 98<br>+ 62 | + 144<br>+ 108 | + 165<br>+ 108 | 315 | 355 |
| | | | | | | | | | | + 150<br>+ 114 | + 171<br>+ 114 | 355 | 400 |
| + 7<br>− 20 | ± 20 | + 31<br>− 32 | + 32<br>+ 5 | + 45<br>+ 5 | + 68<br>+ 5 | + 50<br>+ 23 | + 63<br>+ 23 | + 80<br>+ 40 | + 108<br>+ 68 | + 166<br>+ 126 | + 189<br>+ 126 | 400 | 450 |
| | | | | | | | | | | + 172<br>+ 132 | + 195<br>+ 132 | 450 | 500 |
| — | — | — | — | + 44<br>0 | + 70<br>0 | — | + 70<br>+ 26 | + 88<br>+ 44 | + 122<br>+ 78 | + 194<br>+ 150 | + 220<br>+ 150 | 500 | 560 |
| | | | | | | | | | | + 199<br>+ 155 | + 225<br>+ 155 | 560 | 630 |
| — | — | — | — | + 50<br>0 | + 80<br>0 | — | + 80<br>+ 30 | + 100<br>+ 50 | + 138<br>+ 88 | + 225<br>+ 175 | + 255<br>+ 175 | 630 | 710 |
| | | | | | | | | | | + 235<br>+ 185 | + 265<br>+ 185 | 710 | 800 |
| — | — | — | — | + 56<br>0 | + 90<br>0 | — | + 90<br>+ 34 | + 112<br>+ 56 | + 156<br>+ 100 | + 266<br>+ 210 | + 300<br>+ 210 | 800 | 900 |
| | | | | | | | | | | + 276<br>+ 220 | + 310<br>+ 220 | 900 | 1 000 |
| — | — | — | — | + 66<br>0 | + 105<br>0 | — | + 106<br>+ 40 | + 132<br>+ 66 | + 186<br>+ 120 | + 316<br>+ 250 | + 355<br>+ 250 | 1 000 | 1 120 |
| | | | | | | | | | | + 326<br>+ 260 | + 365<br>+ 260 | 1 120 | 1 250 |
| — | — | — | — | + 78<br>0 | + 125<br>0 | — | + 126<br>+ 48 | + 156<br>+ 78 | + 218<br>+ 140 | + 378<br>+ 300 | + 425<br>+ 300 | 1 250 | 1 400 |
| | | | | | | | | | | + 408<br>+ 330 | + 455<br>+ 330 | 1 400 | 1 600 |
| — | — | — | — | + 92<br>0 | + 150<br>0 | — | + 150<br>+ 58 | + 184<br>+ 92 | + 262<br>+ 170 | + 462<br>+ 370 | + 520<br>+ 370 | 1 600 | 1 800 |
| | | | | | | | | | | + 492<br>+ 400 | + 550<br>+ 400 | 1 800 | 2 000 |

## Appendix Table 10

### Tolerances for Housing Bore Diameters

Units : μm

| Diameter Classification (mm) over | incl | Single Plane Mean O.D. Deviation (Normal) $\Delta_{Dmp}$ | E6 | F6 | F7 | G6 | G7 | H6 | H7 | H8 | J6 | J7 | JS6 | JS7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 18 | 0<br>− 8 | + 43<br>+ 32 | + 27<br>+ 16 | + 34<br>+ 16 | + 17<br>+ 6 | + 24<br>+ 6 | + 11<br>0 | + 18<br>0 | + 27<br>0 | + 6<br>− 5 | + 10<br>− 8 | ± 5.5 | ± 9 |
| 18 | 30 | 0<br>− 9 | + 53<br>+ 40 | + 33<br>+ 20 | + 41<br>+ 20 | + 20<br>+ 7 | + 28<br>+ 7 | + 13<br>0 | + 21<br>0 | + 33<br>0 | + 8<br>− 5 | + 12<br>− 9 | ± 6.5 | ± 10.5 |
| 30 | 50 | 0<br>− 11 | + 66<br>+ 50 | + 41<br>+ 25 | + 50<br>+ 25 | + 25<br>+ 9 | + 34<br>+ 9 | + 16<br>0 | + 25<br>0 | + 39<br>0 | + 10<br>− 6 | + 14<br>− 11 | ± 8 | ± 12.5 |
| 50 | 80 | 0<br>− 13 | + 79<br>+ 60 | + 49<br>+ 30 | + 60<br>+ 30 | + 29<br>+ 10 | + 40<br>+ 10 | + 19<br>0 | + 30<br>0 | + 46<br>0 | + 13<br>− 6 | + 18<br>− 12 | ± 9.5 | ± 15 |
| 80 | 120 | 0<br>− 15 | + 94<br>+ 72 | + 58<br>+ 36 | + 71<br>+ 36 | + 34<br>+ 12 | + 47<br>+ 12 | + 22<br>0 | + 35<br>0 | + 54<br>0 | + 16<br>− 6 | + 22<br>− 13 | ± 11 | ± 17.5 |
| 120<br>150 | 150<br>180 | 0<br>− 18<br>0<br>− 25 | + 110<br>+ 85 | + 68<br>+ 43 | + 83<br>+ 43 | + 39<br>+ 14 | + 54<br>+ 14 | + 25<br>0 | + 40<br>0 | + 63<br>0 | + 18<br>− 7 | + 26<br>− 14 | ± 12.5 | ± 20 |
| 180 | 250 | 0<br>− 30 | + 129<br>+ 100 | + 79<br>+ 50 | + 96<br>+ 50 | + 44<br>+ 15 | + 61<br>+ 15 | + 29<br>0 | + 46<br>0 | + 72<br>0 | + 22<br>− 7 | + 30<br>− 16 | ± 14.5 | ± 23 |
| 250 | 315 | 0<br>− 35 | + 142<br>+ 110 | + 88<br>+ 56 | + 108<br>+ 56 | + 49<br>+ 17 | + 69<br>+ 17 | + 32<br>0 | + 52<br>0 | + 81<br>0 | + 25<br>− 7 | + 36<br>− 16 | ± 16 | ± 26 |
| 315 | 400 | 0<br>− 40 | + 161<br>+ 125 | + 98<br>+ 62 | + 119<br>+ 62 | + 54<br>+ 18 | + 75<br>+ 18 | + 36<br>0 | + 57<br>0 | + 89<br>0 | + 29<br>− 7 | + 39<br>− 18 | ± 18 | ± 28.5 |
| 400 | 500 | 0<br>− 45 | + 175<br>+ 135 | + 108<br>+ 68 | + 131<br>+ 68 | + 60<br>+ 20 | + 83<br>+ 20 | + 40<br>0 | + 63<br>0 | + 97<br>0 | + 33<br>− 7 | + 43<br>− 20 | ± 20 | ± 31.5 |
| 500 | 630 | 0<br>− 50 | + 189<br>+ 145 | + 120<br>+ 76 | + 146<br>+ 76 | + 66<br>+ 22 | + 92<br>+ 22 | + 44<br>0 | + 70<br>0 | + 110<br>0 | — | — | ± 22 | ± 35 |
| 630 | 800 | 0<br>− 75 | + 210<br>+ 160 | + 130<br>+ 80 | + 160<br>+ 80 | + 74<br>+ 24 | + 104<br>+ 24 | + 50<br>0 | + 80<br>0 | + 125<br>0 | — | — | ± 25 | ± 40 |
| 800 | 1 000 | 0<br>− 100 | + 226<br>+ 170 | + 142<br>+ 86 | + 176<br>+ 86 | + 82<br>+ 26 | + 116<br>+ 26 | + 56<br>0 | + 90<br>0 | + 140<br>0 | — | — | ± 28 | ± 45 |
| 1 000 | 1 250 | 0<br>− 125 | + 261<br>+ 195 | + 164<br>+ 98 | + 203<br>+ 98 | + 94<br>+ 28 | + 133<br>+ 28 | + 66<br>0 | + 105<br>0 | + 165<br>0 | — | — | ± 33 | ± 52.5 |
| 1 250 | 1 600 | 0<br>− 160 | + 298<br>+ 220 | + 188<br>+ 110 | + 235<br>+ 110 | + 108<br>+ 30 | + 155<br>+ 30 | + 78<br>0 | + 125<br>0 | + 195<br>0 | — | — | ± 39 | ± 62.5 |
| 1 600 | 2 000 | 0<br>− 200 | + 332<br>+ 240 | + 212<br>+ 120 | + 270<br>+ 120 | + 124<br>+ 32 | + 182<br>+ 32 | + 92<br>0 | + 150<br>0 | + 230<br>0 | — | — | ± 46 | ± 75 |
| 2 000 | 2 500 | 0<br>− 250 | + 370<br>+ 260 | + 240<br>+ 130 | + 305<br>+ 130 | + 144<br>+ 34 | + 209<br>+ 34 | + 110<br>0 | + 175<br>0 | + 280<br>0 | — | — | ± 55 | ± 87.5 |

| K5 | K6 | K7 | M5 | M6 | M7 | N5 | N6 | N7 | P6 | P7 | Diameter Classification (mm) over | incl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + 2<br>− 6 | + 2<br>− 9 | + 6<br>− 12 | − 4<br>−12 | − 4<br>− 15 | 0<br>− 18 | − 9<br>−17 | − 9<br>− 20 | − 5<br>− 23 | − 15<br>− 26 | − 11<br>− 29 | 10 | 18 |
| + 1<br>− 8 | + 2<br>− 11 | + 6<br>− 15 | − 5<br>−14 | − 4<br>− 17 | 0<br>− 21 | −12<br>−21 | − 11<br>− 24 | − 7<br>− 28 | − 18<br>− 31 | − 14<br>− 35 | 18 | 30 |
| + 2<br>− 9 | + 3<br>− 13 | + 7<br>− 18 | − 5<br>−16 | − 4<br>− 20 | 0<br>− 25 | −13<br>−24 | − 12<br>− 28 | − 8<br>− 33 | − 21<br>− 37 | − 17<br>− 42 | 30 | 50 |
| + 3<br>−10 | + 4<br>− 15 | + 9<br>− 21 | − 6<br>−19 | − 5<br>− 24 | 0<br>− 30 | −15<br>−28 | − 14<br>− 33 | − 9<br>− 39 | − 26<br>− 45 | − 21<br>− 51 | 50 | 80 |
| + 2<br>−13 | + 4<br>− 18 | + 10<br>− 25 | − 8<br>−23 | − 6<br>− 28 | 0<br>− 35 | −18<br>−33 | − 16<br>− 38 | − 10<br>− 45 | − 30<br>− 52 | − 24<br>− 59 | 80 | 120 |
| + 3<br>−15 | + 4<br>− 21 | + 12<br>− 28 | − 9<br>−27 | − 8<br>− 33 | 0<br>− 40 | −21<br>−39 | − 20<br>− 45 | − 12<br>− 52 | − 36<br>− 61 | − 28<br>− 68 | 120 | 180 |
| + 2<br>−18 | + 5<br>− 24 | + 13<br>− 33 | −11<br>−31 | − 8<br>− 37 | 0<br>− 46 | −25<br>−45 | − 22<br>− 51 | − 14<br>− 60 | − 41<br>− 70 | − 33<br>− 79 | 180 | 250 |
| + 3<br>−20 | + 5<br>− 27 | + 16<br>− 36 | −13<br>−36 | − 9<br>− 41 | 0<br>− 52 | −27<br>−50 | − 25<br>− 57 | − 14<br>− 66 | − 47<br>− 79 | − 36<br>− 88 | 250 | 315 |
| + 3<br>−22 | + 7<br>− 29 | + 17<br>− 40 | −14<br>−39 | − 10<br>− 46 | 0<br>− 57 | −30<br>−55 | − 26<br>− 62 | − 16<br>− 73 | − 51<br>− 87 | − 41<br>− 98 | 315 | 400 |
| + 2<br>−25 | + 8<br>− 32 | + 18<br>− 45 | −16<br>−43 | − 10<br>− 50 | 0<br>− 63 | −33<br>−60 | − 27<br>− 67 | − 17<br>− 80 | − 55<br>− 95 | − 45<br>−108 | 400 | 500 |
| — | 0<br>− 44 | 0<br>− 70 | — | − 26<br>− 70 | − 26<br>− 96 | — | − 44<br>− 88 | − 44<br>−114 | − 78<br>−122 | − 78<br>−148 | 500 | 630 |
| — | 0<br>− 50 | 0<br>− 80 | — | − 30<br>− 80 | − 30<br>−110 | — | − 50<br>−100 | − 50<br>−130 | − 88<br>−138 | − 88<br>−168 | 630 | 800 |
| — | 0<br>− 56 | 0<br>− 90 | — | − 34<br>− 90 | − 34<br>−124 | — | − 56<br>−112 | − 56<br>−146 | −100<br>−156 | −100<br>−190 | 800 | 1 000 |
| — | 0<br>− 66 | 0<br>−105 | — | − 40<br>−106 | − 40<br>−145 | — | − 66<br>−132 | − 66<br>−171 | −120<br>−186 | −120<br>−225 | 1 000 | 1 250 |
| — | 0<br>− 78 | 0<br>−125 | — | − 48<br>−126 | − 48<br>−173 | — | − 78<br>−156 | − 78<br>−203 | −140<br>−218 | −140<br>−265 | 1 250 | 1 600 |
| — | 0<br>− 92 | 0<br>−150 | — | − 58<br>−150 | − 58<br>−208 | — | − 92<br>−184 | − 92<br>−242 | −170<br>−262 | −170<br>−320 | 1 600 | 2 000 |
| — | 0<br>−110 | 0<br>−175 | — | − 68<br>−178 | − 68<br>−243 | — | −110<br>−220 | −110<br>−285 | −195<br>−305 | −195<br>−370 | 2 000 | 2 500 |

**Appendix Table 11 Values of Standard Tolerance Grades IT**

| Basic Size (mm) over | Basic Size (mm) incl | Standard Tolerances (μm) IT1 | IT2 | IT3 | IT4 | IT5 | IT6 | IT7 | IT8 | IT9 | IT10 | IT11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | 3 | 0.8 | 1.2 | 2 | 3 | 4 | 6 | 10 | 14 | 25 | 40 | 60 |
| 3 | 6 | 1 | 1.5 | 2.5 | 4 | 5 | 8 | 12 | 18 | 30 | 48 | 75 |
| 6 | 10 | 1 | 1.5 | 2.5 | 4 | 6 | 9 | 15 | 22 | 36 | 58 | 90 |
| 10 | 18 | 1.2 | 2 | 3 | 5 | 8 | 11 | 18 | 27 | 43 | 70 | 110 |
| 18 | 30 | 1.5 | 2.5 | 4 | 6 | 9 | 13 | 21 | 33 | 52 | 84 | 130 |
| 30 | 50 | 1.5 | 2.5 | 4 | 7 | 11 | 16 | 25 | 39 | 62 | 100 | 160 |
| 50 | 80 | 2 | 3 | 5 | 8 | 13 | 19 | 30 | 46 | 74 | 120 | 190 |
| 80 | 120 | 2.5 | 4 | 6 | 10 | 15 | 22 | 35 | 54 | 87 | 140 | 220 |
| 120 | 180 | 3.5 | 5 | 8 | 12 | 18 | 25 | 40 | 63 | 100 | 160 | 250 |
| 180 | 250 | 4.5 | 7 | 10 | 14 | 20 | 29 | 46 | 72 | 115 | 185 | 290 |
| 250 | 315 | 6 | 8 | 12 | 16 | 23 | 32 | 52 | 81 | 130 | 210 | 320 |
| 315 | 400 | 7 | 9 | 13 | 18 | 25 | 36 | 57 | 89 | 140 | 230 | 360 |
| 400 | 500 | 8 | 10 | 15 | 20 | 27 | 40 | 63 | 97 | 155 | 250 | 400 |
| 500 | 630 | 9 | 11 | 16 | 22 | 32 | 44 | 70 | 110 | 175 | 280 | 440 |
| 630 | 800 | 10 | 13 | 18 | 25 | 36 | 50 | 80 | 125 | 200 | 320 | 500 |
| 800 | 1 000 | 11 | 15 | 21 | 28 | 40 | 56 | 90 | 140 | 230 | 360 | 560 |
| 1 000 | 1 250 | 13 | 18 | 24 | 33 | 47 | 66 | 105 | 165 | 260 | 420 | 660 |
| 1 250 | 1 600 | 15 | 21 | 29 | 39 | 55 | 78 | 125 | 195 | 310 | 500 | 780 |
| 1 600 | 2 000 | 18 | 25 | 35 | 46 | 65 | 92 | 150 | 230 | 370 | 600 | 920 |
| 2 000 | 2 500 | 22 | 30 | 41 | 55 | 78 | 110 | 175 | 280 | 440 | 700 | 1 100 |
| 2 500 | 3 150 | 26 | 36 | 50 | 68 | 96 | 135 | 210 | 330 | 540 | 860 | 1 350 |

| Grades IT12 | IT13 | IT14 | IT15 | IT16 | IT17 | IT18 | Basic Size (mm) over | incl |
|---|---|---|---|---|---|---|---|---|
| Tolerances (mm) | | | | | | | | |
| 0.10 | 0.14 | 0.25 | 0.40 | 0.60 | 1.00 | 1.40 | — | 3 |
| 0.12 | 0.18 | 0.30 | 0.48 | 0.75 | 1.20 | 1.80 | 3 | 6 |
| 0.15 | 0.22 | 0.36 | 0.58 | 0.90 | 1.50 | 2.20 | 6 | 10 |
| 0.18 | 0.27 | 0.43 | 0.70 | 1.10 | 1.80 | 2.70 | 10 | 18 |
| 0.21 | 0.33 | 0.52 | 0.84 | 1.30 | 2.10 | 3.30 | 18 | 30 |
| 0.25 | 0.39 | 0.62 | 1.00 | 1.60 | 2.50 | 3.90 | 30 | 50 |
| 0.30 | 0.46 | 0.74 | 1.20 | 1.90 | 3.00 | 4.60 | 50 | 80 |
| 0.35 | 0.54 | 0.87 | 1.40 | 2.20 | 3.50 | 5.40 | 80 | 120 |
| 0.40 | 0.63 | 1.00 | 1.60 | 2.50 | 4.00 | 6.30 | 120 | 180 |
| 0.46 | 0.72 | 1.15 | 1.85 | 2.90 | 4.60 | 7.20 | 180 | 250 |
| 0.52 | 0.81 | 1.30 | 2.10 | 3.20 | 5.20 | 8.10 | 250 | 315 |
| 0.57 | 0.89 | 1.40 | 2.30 | 3.60 | 5.70 | 8.90 | 315 | 400 |
| 0.63 | 0.97 | 1.55 | 2.50 | 4.00 | 6.30 | 9.70 | 400 | 500 |
| 0.70 | 1.10 | 1.75 | 2.80 | 4.40 | 7.00 | 11.00 | 500 | 630 |
| 0.80 | 1.25 | 2.00 | 3.20 | 5.00 | 8.00 | 12.50 | 630 | 800 |
| 0.90 | 1.40 | 2.30 | 3.60 | 5.60 | 9.00 | 14.00 | 800 | 1 000 |
| 1.05 | 1.65 | 2.60 | 4.20 | 6.60 | 10.50 | 16.50 | 1 000 | 1 250 |
| 1.25 | 1.95 | 3.10 | 5.00 | 7.80 | 12.50 | 19.50 | 1 250 | 1 600 |
| 1.50 | 2.30 | 3.70 | 6.00 | 9.20 | 15.00 | 23.00 | 1 600 | 2 000 |
| 1.75 | 2.80 | 4.40 | 7.00 | 11.00 | 17.50 | 28.00 | 2 000 | 2 500 |
| 2.10 | 3.30 | 5.40 | 8.60 | 13.50 | 21.00 | 33.00 | 2 500 | 3 150 |

**Remarks** 1. Standard tolerance grades IT14 to IT18 shall not be used for basic sizes less than or equal to 1mm.
2. Values for standard tolerance grades IT1 to IT5 for basic sizes over 500mm are included for experimental use.

## Appedix Table 12 Speed Factor $f_n$

Ball Bearings $f_n = (0.03\ n)^{-1/3}$

Roller Bearings $f_n = (0.03\ n)^{-3/10}$

| Speed $n$ (min$^{-1}$) | Speed Factor $f_n$ | |
|---|---|---|
| | Ball Bearings | Roller Bearings |
| 10 | 1.49 | 1.44 |
| 11 | 1.45 | 1.39 |
| 12 | 1.41 | 1.36 |
| 13 | 1.37 | 1.33 |
| 14 | 1.34 | 1.30 |
| 15 | 1.30 | 1.27 |
| 16 | 1.28 | 1.25 |
| 17 | 1.25 | 1.22 |
| 18 | 1.23 | 1.20 |
| 19 | 1.21 | 1.18 |
| 20 | 1.19 | 1.17 |
| 21 | 1.17 | 1.15 |
| 22 | 1.15 | 1.13 |
| 23 | 1.13 | 1.12 |
| 24 | 1.12 | 1.10 |
| 25 | 1.10 | 1.09 |
| 26 | 1.09 | 1.08 |
| 27 | 1.07 | 1.07 |
| 28 | 1.06 | 1.05 |
| 29 | 1.05 | 1.04 |
| 30 | 1.04 | 1.03 |
| 31 | 1.02 | 1.02 |
| 32 | 1.01 | 1.01 |
| **33.3** | **1.00** | **1.00** |
| 34 | 0.993 | 0.994 |
| 36 | 0.975 | 0.977 |
| 38 | 0.957 | 0.961 |
| 40 | 0.941 | 0.947 |
| 42 | 0.926 | 0.933 |
| 44 | 0.912 | 0.920 |
| 46 | 0.898 | 0.908 |
| 48 | 0.886 | 0.896 |
| 50 | 0.874 | 0.885 |
| 55 | 0.846 | 0.861 |
| 60 | 0.822 | 0.838 |
| 65 | 0.800 | 0.818 |
| 70 | 0.781 | 0.800 |
| 75 | 0.763 | 0.784 |
| 80 | 0.747 | 0.769 |
| 85 | 0.732 | 0.755 |
| 90 | 0.718 | 0.742 |
| 95 | 0.705 | 0.730 |
| 100 | 0.693 | 0.719 |
| 110 | 0.672 | 0.699 |
| 120 | 0.652 | 0.681 |
| 130 | 0.635 | 0.665 |
| 140 | 0.620 | 0.650 |
| 150 | 0.606 | 0.637 |
| 160 | 0.593 | 0.625 |
| 170 | 0.581 | 0.613 |
| 180 | 0.570 | 0.603 |
| 190 | 0.560 | 0.593 |
| 200 | 0.550 | 0.584 |
| 220 | 0.533 | 0.568 |
| 240 | 0.518 | 0.553 |
| 260 | 0.504 | 0.540 |
| 280 | 0.492 | 0.528 |
| 300 | 0.481 | 0.517 |
| 320 | 0.471 | 0.507 |
| 340 | 0.461 | 0.498 |
| 360 | 0.452 | 0.490 |
| 380 | 0.444 | 0.482 |
| 400 | 0.437 | 0.475 |
| 420 | 0.430 | 0.468 |
| 440 | 0.423 | 0.461 |
| 460 | 0.417 | 0.455 |
| 480 | 0.411 | 0.449 |
| 500 | 0.405 | 0.444 |
| 550 | 0.393 | 0.431 |
| 600 | 0.382 | 0.420 |
| 650 | 0.372 | 0.410 |
| 700 | 0.362 | 0.401 |
| 750 | 0.354 | 0.393 |
| 800 | 0.347 | 0.385 |
| 850 | 0.340 | 0.378 |
| 900 | 0.333 | 0.372 |
| 950 | 0.327 | 0.366 |
| 1 000 | 0.322 | 0.360 |
| 1 050 | 0.317 | 0.355 |
| 1 100 | 0.312 | 0.350 |
| 1 150 | 0.307 | 0.346 |
| 1 200 | 0.303 | 0.341 |
| 1 250 | 0.299 | 0.337 |
| 1 300 | 0.295 | 0.333 |
| 1 400 | 0.288 | 0.326 |
| 1 500 | 0.281 | 0.319 |
| 1 600 | 0.275 | 0.313 |
| 1 700 | 0.270 | 0.307 |
| 1 800 | 0.265 | 0.302 |
| 1 900 | 0.260 | 0.297 |
| 2 000 | 0.255 | 0.293 |
| 2 100 | 0.251 | 0.289 |
| 2 200 | 0.247 | 0.285 |
| 2 300 | 0.244 | 0.281 |
| 2 400 | 0.240 | 0.277 |
| 2 500 | 0.237 | 0.274 |
| 2 600 | 0.234 | 0.271 |
| 2 700 | 0.231 | 0.268 |
| 2 800 | 0.228 | 0.265 |
| 2 900 | 0.226 | 0.262 |
| 3 000 | 0.223 | 0.259 |
| 3 200 | 0.218 | 0.254 |
| 3 400 | 0.214 | 0.250 |
| 3 600 | 0.210 | 0.245 |
| 3 800 | 0.206 | 0.242 |
| 4 000 | 0.203 | 0.238 |
| 4 200 | 0.199 | 0.234 |
| 4 400 | 0.196 | 0.231 |
| 4 600 | 0.194 | 0.228 |
| 4 800 | 0.191 | 0.225 |
| 5 000 | 0.188 | 0.222 |
| 5 200 | 0.186 | 0.220 |
| 5 400 | 0.183 | 0.217 |
| 5 600 | 0.181 | 0.215 |
| 5 800 | 0.179 | 0.213 |
| 6 000 | 0.177 | 0.211 |
| 6 200 | 0.175 | 0.209 |
| 6 400 | 0.173 | 0.207 |
| 6 600 | 0.172 | 0.205 |
| 6 800 | 0.170 | 0.203 |
| 7 000 | 0.168 | 0.201 |
| 7 200 | 0.167 | 0.199 |
| 7 400 | 0.165 | 0.198 |
| 7 600 | 0.164 | 0.196 |
| 7 800 | 0.162 | 0.195 |
| 8 000 | 0.161 | 0.193 |
| 8 500 | 0.158 | 0.190 |
| 9 000 | 0.155 | 0.186 |
| 9 500 | 0.152 | 0.183 |
| 10 000 | 0.149 | 0.181 |
| 11 000 | 0.145 | 0.176 |
| 12 000 | 0.141 | 0.171 |
| 13 000 | 0.137 | 0.167 |
| 14 000 | 0.134 | 0.163 |
| 15 000 | 0.130 | 0.160 |
| 16 000 | 0.128 | 0.157 |
| 17 000 | 0.125 | 0.154 |
| 18 000 | 0.123 | 0.151 |
| 19 000 | 0.121 | 0.149 |
| 20 000 | 0.119 | 0.147 |
| 22 000 | 0.115 | 0.143 |
| 24 000 | 0.112 | 0.139 |
| 26 000 | 0.109 | 0.136 |
| 28 000 | 0.106 | 0.133 |
| 30 000 | 0.104 | 0.130 |
| 32 000 | 0.101 | 0.127 |
| 34 000 | 0.099 | 0.125 |
| 36 000 | 0.097 | 0.123 |
| 38 000 | 0.096 | 0.121 |
| 40 000 | 0.094 | 0.119 |

## Appendix Table 13 Fatigue Life Factor $f_n$ and Fatigue Life $L \cdot L_h$

Ball Bearings $L=(C/P)^3$ $L_h=500\ f_h^3$

Roller Bearings $L=(C/P)^{10/3}$ $L_h=500\ f_h^{10/3}$

| $C/P$ or $f_h$ | Ball Bearing Life | | Roller Bearing Life | |
|---|---|---|---|---|
| | $L$ ($10^6$ rev) | $L_h$ (h) | $L$ ($10^6$ rev) | $L_h$ (h) |
| 0.70 | 0.34 | 172 | 0.30 | 152 |
| 0.75 | 0.42 | 211 | 0.38 | 192 |
| 0.80 | 0.51 | 256 | 0.48 | 238 |
| 0.85 | 0.61 | 307 | 0.58 | 291 |
| 0.90 | 0.73 | 365 | 0.70 | 352 |
| 0.95 | 0.86 | 429 | 0.84 | 421 |
| **1.00** | **1.00** | **500** | **1.00** | **500** |
| 1.05 | 1.16 | 579 | 1.18 | 588 |
| 1.10 | 1.33 | 665 | 1.37 | 687 |
| 1.15 | 1.52 | 760 | 1.59 | 797 |
| 1.20 | 1.73 | 864 | 1.84 | 918 |
| 1.25 | 1.95 | 977 | 2.10 | 1 050 |
| 1.30 | 2.20 | 1 100 | 2.40 | 1 200 |
| 1.35 | 2.46 | 1 230 | 2.72 | 1 360 |
| 1.40 | 2.74 | 1 370 | 3.07 | 1 530 |
| 1.45 | 3.05 | 1 520 | 3.45 | 1 730 |
| 1.50 | 3.38 | 1 690 | 3.86 | 1 930 |
| 1.55 | 3.72 | 1 860 | 4.31 | 2 150 |
| 1.60 | 4.10 | 2 050 | 4.79 | 2 400 |
| 1.65 | 4.49 | 2 250 | 5.31 | 2 650 |
| 1.70 | 4.91 | 2 460 | 5.86 | 2 930 |
| 1.75 | 5.36 | 2 680 | 6.46 | 3 230 |
| 1.80 | 5.83 | 2 920 | 7.09 | 3 550 |
| 1.85 | 6.33 | 3 170 | 7.77 | 3 890 |
| 1.90 | 6.86 | 3 430 | 8.50 | 4 250 |
| 1.95 | 7.41 | 3 710 | 9.26 | 4 630 |
| 2.00 | 8.00 | 4 000 | 10.1 | 5 040 |
| 2.05 | 8.62 | 4 310 | 10.9 | 5 470 |
| 2.10 | 9.26 | 4 630 | 11.9 | 5 930 |
| 2.15 | 9.94 | 4 970 | 12.8 | 6 410 |
| 2.20 | 10.6 | 5 320 | 13.8 | 6 920 |
| 2.25 | 11.4 | 5 700 | 14.9 | 7 460 |
| 2.30 | 12.2 | 6 080 | 16.1 | 8 030 |
| 2.35 | 13.0 | 6 490 | 17.3 | 8 630 |
| 2.40 | 13.8 | 6 910 | 18.5 | 9 250 |
| 2.45 | 14.7 | 7 350 | 19.8 | 9 910 |
| 2.50 | 15.6 | 7 810 | 21.2 | 10 600 |
| 2.55 | 16.6 | 8 290 | 22.7 | 11 300 |
| 2.60 | 17.6 | 8 790 | 24.2 | 12 100 |
| 2.65 | 18.6 | 9 300 | 25.8 | 12 900 |
| 2.70 | 19.7 | 9 840 | 27.4 | 13 700 |
| 2.75 | 20.8 | 10 400 | 29.1 | 14 600 |
| 2.80 | 22.0 | 11 000 | 30.9 | 15 500 |
| 2.85 | 23.1 | 11 600 | 32.8 | 16 400 |
| 2.90 | 24.4 | 12 200 | 34.8 | 17 400 |
| 2.95 | 25.7 | 12 800 | 36.8 | 18 400 |
| 3.00 | 27.0 | 13 500 | 38.9 | 19 500 |
| 3.05 | 28.4 | 14 200 | 41.1 | 20 600 |
| 3.10 | 29.8 | 14 900 | 43.4 | 21 700 |
| 3.15 | 31.3 | 15 600 | 45.8 | 22 900 |
| 3.20 | 32.8 | 16 400 | 48.3 | 24 100 |
| 3.25 | 34.3 | 17 200 | 50.8 | 25 400 |
| 3.30 | 35.9 | 18 000 | 53.5 | 26 800 |
| 3.35 | 37.6 | 18 800 | 56.3 | 28 100 |
| 3.40 | 39.3 | 19 700 | 59.1 | 29 600 |
| 3.45 | 41.1 | 20 500 | 62.0 | 31 000 |
| 3.50 | 42.9 | 21 400 | 65.1 | 32 500 |
| 3.55 | 44.7 | 22 400 | 68.2 | 34 100 |
| 3.60 | 46.7 | 23 300 | 71.5 | 35 800 |
| 3.65 | 48.6 | 24 300 | 74.9 | 37 400 |
| 3.70 | 50.7 | 25 300 | 78.3 | 39 200 |
| 3.75 | 52.7 | 26 400 | 81.9 | 41 000 |
| 3.80 | 54.9 | 27 400 | 85.6 | 42 800 |
| 3.85 | 57.1 | 28 500 | 89.4 | 44 700 |
| 3.90 | 59.3 | 29 700 | 93.4 | 46 700 |
| 3.95 | 61.6 | 30 800 | 97.4 | 48 700 |
| 4.00 | 64.0 | 32 000 | 102 | 50 800 |
| 4.05 | 66.4 | 33 200 | 106 | 52 900 |
| 4.10 | 68.9 | 34 500 | 110 | 55 200 |
| 4.15 | 71.5 | 35 700 | 115 | 57 400 |
| 4.20 | 74.1 | 37 000 | 120 | 59 800 |
| 4.25 | 76.8 | 38 400 | 124 | 62 200 |
| 4.30 | 79.5 | 39 800 | 129 | 64 600 |
| 4.35 | 82.3 | 41 200 | 134 | 67 200 |
| 4.40 | 85.2 | 42 600 | 140 | 69 800 |
| 4.45 | 88.1 | 44 100 | 145 | 72 500 |
| 4.50 | 91.1 | 45 600 | 150 | 75 200 |
| 4.55 | 94.2 | 47 100 | 156 | 78 000 |
| 4.60 | 97.3 | 48 700 | 162 | 80 900 |
| 4.65 | 101 | 50 300 | 168 | 83 900 |
| 4.70 | 104 | 51 900 | 174 | 87 000 |
| 4.75 | 107 | 53 600 | 180 | 90 100 |
| 4.80 | 111 | 55 300 | 187 | 93 300 |
| 4.85 | 114 | 57 000 | 193 | 96 600 |
| 4.90 | 118 | 58 800 | 200 | 99 900 |
| 4.95 | 121 | 60 600 | 207 | 103 000 |
| 5.00 | 125 | 62 500 | 214 | 107 000 |
| 5.10 | 133 | 66 300 | 228 | 114 000 |
| 5.20 | 141 | 70 300 | 244 | 122 000 |
| 5.30 | 149 | 74 400 | 260 | 130 000 |
| 5.40 | 157 | 78 700 | 276 | 138 000 |
| 5.50 | 166 | 83 200 | 294 | 147 000 |
| 5.60 | 176 | 87 800 | 312 | 156 000 |
| 5.70 | 185 | 92 600 | 331 | 165 000 |
| 5.80 | 195 | 97 600 | 351 | 175 000 |
| 5.90 | 205 | 103 000 | 371 | 186 000 |
| 6.00 | 216 | 108 000 | 392 | 196 000 |
| 6.50 | 275 | 137 000 | 513 | 256 000 |
| 7.00 | 343 | 172 000 | 656 | 328 000 |
| 7.50 | 422 | 211 000 | 826 | 413 000 |
| 8.00 | 512 | 256 000 | 1 020 | 512 000 |
| 8.50 | 614 | 307 000 | 1 250 | 627 000 |
| 9.00 | 729 | 365 000 | 1 520 | 758 000 |
| 9.50 | 857 | 429 000 | 1 820 | 908 000 |
| 10.0 | 1 000 | — | 2 150 | — |
| 11.0 | 1 330 | — | 2 960 | — |
| 12.0 | 1 730 | — | 3 960 | — |
| 13.0 | 2 200 | — | 5 170 | — |
| 14.0 | 2 740 | — | 6 610 | — |
| 15.0 | 3 380 | — | 8 320 | — |

## Appendix Table14 Index of Inch Design Tapered Roller Bearings

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **332** | *D* | 80.000 | B136,B140,B142 |
| **336** | *d* | 41.275 | B142 |
| **342** | *d* | 41.275 | B142 |
| **342 S** | *d* | 42.875 | B142 |
| **344** | *d* | 40.000 | B140 |
| **344 A** | *d* | 40.000 | B140 |
| **346** | *d* | 31.750 | B136 |
| **354 A** | *D* | 85.000 | B144 |
| **359 S** | *d* | 46.038 | B144 |
| **362 A** | *D* | 88.900 | B144,B146 |
| **366** | *d* | 50.000 | B146 |
| **368** | *d* | 50.800 | B146 |
| **368 A** | *d* | 50.800 | B146 |
| **369 A** | *d* | 47.625 | B144 |
| **372** | *D* | 100.000 | B146 |
| **374** | *D* | 93.264 | B144 |
| **376** | *d* | 45.000 | B144 |
| **377** | *d* | 52.388 | B146 |
| **382** | *D* | 98.425 | B148 |
| **382 A** | *D* | 96.838 | B148 |
| **382 S** | *D* | 96.838 | B148 |
| **385** | *d* | 55.000 | B148 |
| **387** | *d* | 57.150 | B148 |
| **387 A** | *d* | 57.150 | B148 |
| **388 A** | *d* | 57.531 | B148 |
| **390 A** | *d* | 63.500 | B150 |
| **394 A** | *D* | 110.000 | B150,B152 |
| **395** | *d* | 63.500 | B150 |
| **395 A** | *d* | 66.675 | B152 |
| **395 S** | *d* | 66.675 | B152 |
| **397** | *d* | 60.000 | B150 |
| **399 A** | *d* | 68.262 | B152 |
| **414** | *D* | 88.501 | B140 |
| **418** | *d* | 38.100 | B140 |
| **432** | *D* | 95.250 | B142 |
| **432 A** | *D* | 95.250 | B144 |
| **436** | *d* | 46.038 | B144 |
| **438** | *d* | 44.450 | B142 |
| **453 A** | *D* | 107.950 | B144 |
| **453 X** | *D* | 104.775 | B148 |
| **460** | *d* | 44.450 | B144 |
| **462** | *d* | 57.150 | B148 |
| **469** | *d* | 57.150 | B148 |
| **472** | *D* | 120.000 | B152,B154 |
| **472 A** | *D* | 120.000 | B152 |
| **478** | *d* | 65.000 | B152 |
| **480** | *d* | 68.262 | B152 |
| **484** | *d* | 70.000 | B154 |
| **492 A** | *D* | 133.350 | B156,B158 |
| **493** | *D* | 136.525 | B154,B156,B158 |
| **495** | *d* | 82.550 | B156 |
| **495 A** | *d* | 76.200 | B154 |
| **495 AX** | *d* | 76.200 | B154 |
| **496** | *d* | 80.962 | B156 |
| **497** | *d* | 85.725 | B158 |
| **498** | *d* | 84.138 | B158 |
| **522** | *D* | 101.600 | B144,B146 |
| **528** | *d* | 47.625 | B144 |
| **529** | *d* | 50.800 | B146 |
| **529 X** | *d* | 50.800 | B146 |
| **532 X** | *D* | 107.950 | B148 |
| **539** | *d* | 53.975 | B148 |
| **552 A** | *D* | 123.825 | B148,B150,B152 |
| **553 X** | *D* | 122.238 | B150,B152 |
| **555 S** | *d* | 57.150 | B148 |
| **557 S** | *d* | 53.975 | B148 |
| **558** | *d* | 60.325 | B150 |
| **559** | *d* | 63.500 | B150 |
| **560** | *d* | 66.675 | B152 |
| **560 S** | *d* | 68.262 | B152 |
| **563** | *D* | 127.000 | B150,B152,B154 |
| **563 X** | *D* | 127.000 | B152 |
| **565** | *d* | 63.500 | B150 |
| **566** | *d* | 69.850 | B152 |
| **567** | *d* | 73.025 | B154 |
| **567 A** | *d* | 71.438 | B154 |
| **567 S** | *d* | 71.438 | B154 |
| **568** | *d* | 73.817 | B154 |
| **569** | *d* | 64.963 | B150 |
| **570** | *d* | 68.262 | B152 |
| **572** | *D* | 139.992 | B154,B156 |
| **572 X** | *D* | 139.700 | B156 |
| **575** | *d* | 76.200 | B154 |
| **580** | *d* | 82.550 | B156 |
| **581** | *d* | 80.962 | B156 |
| **582** | *d* | 82.550 | B156 |
| **590 A** | *d* | 76.200 | B154 |
| **592** | *D* | 152.400 | B160 |
| **592 A** | *D* | 152.400 | B154,B158,B160 |
| **593** | *d* | 88.900 | B158 |
| **594** | *d* | 95.250 | B160 |
| **596** | *d* | 85.725 | B158 |
| **597** | *d* | 93.662 | B160 |
| **598** | *d* | 92.075 | B160 |
| **598 A** | *d* | 92.075 | B160 |
| **614 X** | *D* | 115.000 | B148 |
| **622 X** | *d* | 55.000 | B148 |
| **632** | *D* | 136.525 | B150,B154 |
| **633** | *D* | 130.175 | B150,B152,B154 |
| **637** | *d* | 60.325 | B150 |
| **639** | *d* | 63.500 | B150 |
| **643** | *d* | 69.850 | B152 |
| **644** | *d* | 71.438 | B154 |
| **645** | *d* | 71.438 | B154 |
| **652** | *D* | 152.400 | B154,B156 |
| **653** | *D* | 146.050 | B152,B154,B156,B158 |
| **653 X** | *D* | 150.000 | B154 |
| **655** | *d* | 69.850 | B152 |
| **657** | *d* | 73.025 | B154 |
| **658** | *d* | 74.612 | B154 |
| **659** | *d* | 76.200 | B154 |
| **661** | *d* | 79.375 | B156 |
| **663** | *d* | 82.550 | B156 |
| **664** | *d* | 84.138 | B158 |
| **665** | *d* | 85.725 | B158 |
| **665 A** | *d* | 85.725 | B158 |
| **672** | *D* | 168.275 | B158,B160,B162 |
| **677** | *d* | 85.725 | B158 |
| **681** | *d* | 92.075 | B160 |
| **683** | *d* | 95.250 | B160 |
| **685** | *d* | 98.425 | B160 |
| **687** | *d* | 101.600 | B162 |
| **742** | *D* | 150.089 | B152,B156,B158 |
| **743** | *D* | 150.000 | B156 |
| **745 A** | *d* | 69.850 | B152 |
| **749** | *d* | 85.026 | B158 |
| **749 A** | *d* | 82.550 | B156 |
| **749 S** | *d* | 85.026 | B158 |
| **750** | *d* | 79.375 | B156 |
| **752** | *D* | 161.925 | B156,B158 |
| **753** | *D* | 168.275 | B156,B158 |
| **757** | *d* | 82.550 | B156 |
| **758** | *d* | 85.725 | B158 |
| **759** | *d* | 88.900 | B158 |
| **760** | *d* | 90.488 | B158 |
| **766** | *d* | 88.900 | B158 |
| **772** | *D* | 180.975 | B160,B162 |
| **776** | *d* | 95.250 | B160 |
| **779** | *d* | 98.425 | B160 |
| **780** | *d* | 101.600 | B162 |
| **782** | *d* | 104.775 | B162 |
| **787** | *d* | 104.775 | B162 |
| **792** | *D* | 206.375 | B164 |
| **795** | *d* | 120.650 | B164 |
| **797** | *d* | 130.000 | B164 |
| **799** | *d* | 128.588 | B164 |
| **799 A** | *d* | 130.175 | B164 |
| **832** | *D* | 168.275 | B156,B158 |
| **837** | *d* | 76.200 | B156 |
| **842** | *d* | 82.550 | B156 |
| **843** | *d* | 76.200 | B156 |
| **850** | *d* | 88.900 | B158 |
| **854** | *D* | 190.500 | B158,B160,B162 |
| **855** | *d* | 88.900 | B158 |
| **857** | *d* | 92.075 | B160 |
| **861** | *d* | 101.600 | B162 |
| **864** | *d* | 95.250 | B160 |
| **866** | *d* | 98.425 | B160 |
| **932** | *D* | 212.725 | B162 |
| **938** | *d* | 114.300 | B162 |
| **1220** | *D* | 57.150 | B132 |
| **1280** | *d* | 22.225 | B132 |
| **1328** | *D* | 52.388 | B132 |
| **1329** | *D* | 53.975 | B132 |
| **1380** | *d* | 22.225 | B132 |
| **1620** | *D* | 66.675 | B138 |
| **1680** | *d* | 33.338 | B138 |
| **1729** | *D* | 56.896 | B132,B134 |
| **1755** | *d* | 22.225 | B132 |
| **1779** | *d* | 23.812 | B134 |
| **1922** | *D* | 57.150 | B134 |
| **1988** | *d* | 28.575 | B134 |
| **1997 X** | *d* | 26.988 | B134 |
| **A2047** | *d* | 12.000 | B132 |
| **A2126** | *D* | 31.991 | B132 |
| **2523** | *D* | 69.850 | B136,B138 |
| **2558** | *d* | 30.162 | B136 |
| **2559** | *d* | 30.162 | B136 |
| **2580** | *d* | 31.750 | B136 |
| **2582** | *d* | 31.750 | B136 |
| **2585** | *d* | 33.338 | B138 |
| **2631** | *D* | 66.421 | B136 |
| **2690** | *d* | 29.367 | B136 |
| **2720** | *D* | 76.200 | B140 |
| **2729** | *D* | 76.200 | B140 |
| **2735 X** | *D* | 73.025 | B140 |
| **2788** | *d* | 38.100 | B140 |
| **2789** | *d* | 39.688 | B140 |
| **2820** | *D* | 73.025 | B138 |
| **2877** | *d* | 34.925 | B138 |
| **2924** | *D* | 85.000 | B144 |
| **2984** | *d* | 46.038 | B144 |
| **3120** | *D* | 72.626 | B136,B138 |
| **3188** | *d* | 31.750 | B136 |
| **3197** | *d* | 33.338 | B138 |
| **3320** | *D* | 80.167 | B140 |
| **3386** | *d* | 39.688 | B140 |
| **3420** | *D* | 79.375 | B138,B140 |
| **3478** | *d* | 34.925 | B138 |
| **3479** | *d* | 36.512 | B140 |
| **3490** | *d* | 38.100 | B140 |
| **3525** | *D* | 87.312 | B142 |
| **3576** | *d* | 41.275 | B142 |
| **3578** | *d* | 44.450 | B142 |
| **3720** | *D* | 93.264 | B142 |
| **3730** | *D* | 93.264 | B146 |
| **3775** | *d* | 50.800 | B146 |
| **3780** | *d* | 50.800 | B146 |
| **3782** | *d* | 44.450 | B142 |
| **3820** | *D* | 85.725 | B142 |
| **3877** | *d* | 41.275 | B142 |
| **3920** | *D* | 112.712 | B150,B152 |
| **3926** | *D* | 112.712 | B148,B150 |
| **3981** | *d* | 58.738 | B148 |
| **3982** | *d* | 63.500 | B150 |
| **3984** | *d* | 66.675 | B152 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **3994** | *d* | 66.675 | B152 |
| **A4050** | *d* | 12.700 | B132 |
| **A4059** | *d* | 15.000 | B132 |
| **A4138** | *D* | 34.988 | B132 |
| **4335** | *D* | 90.488 | B142 |
| **4388** | *d* | 41.275 | B142 |
| **4535** | *D* | 104.775 | B148 |
| **4595** | *d* | 53.975 | B148 |
| **A5069** | *d* | 17.455 | B132 |
| **A5144** | *D* | 36.525 | B132 |
| **5335** | *D* | 103.188 | B144 |
| **5356** | *d* | 44.450 | B144 |
| **5535** | *D* | 122.238 | B148,B150 |
| **5566** | *d* | 55.562 | B148 |
| **5582** | *d* | 60.325 | B150 |
| **5584** | *d* | 63.500 | B150 |
| **5735** | *D* | 135.733 | B154,B156 |
| **5760** | *d* | 76.200 | B154 |
| **5795** | *d* | 77.788 | B156 |
| **A6062** | *d* | 15.875 | B132 |
| **A6067** | *d* | 16.993 | B132 |
| **A6075** | *d* | 19.050 | B132 |
| **A6157** | *D* | 39.992 | B132 |
| **6220** | *D* | 127.000 | B146,B148 |
| **6279** | *d* | 50.800 | B146 |
| **6280** | *d* | 53.975 | B148 |
| **6320** | *D* | 135.755 | B150,B152 |
| **6376** | *d* | 60.325 | B150 |
| **6379** | *d* | 65.088 | B152 |
| **6420** | *D* | 149.225 | B148,B152,B154 |
| **6454** | *d* | 69.850 | B152 |
| **6455** | *d* | 57.150 | B148 |
| **6460** | *d* | 73.025 | B154 |
| **6461** | *d* | 76.200 | B154 |
| **6535** | *D* | 161.925 | B154,B156,B158 |
| **6536** | *D* | 161.925 | B154 |
| **6559** | *d* | 82.550 | B156 |
| **6575** | *d* | 76.200 | B154 |
| **6576** | *d* | 76.200 | B154 |
| **6580** | *d* | 88.900 | B158 |
| **9121** | *D* | 152.400 | B150,B152 |
| **9180** | *d* | 61.912 | B150 |
| **9185** | *d* | 68.262 | B152 |
| **9220** | *D* | 161.925 | B154 |
| **9285** | *d* | 76.200 | B154 |
| **9320** | *D* | 177.800 | B156 |
| **9321** | *D* | 171.450 | B156,B158 |
| **9378** | *d* | 76.200 | B156 |
| **9380** | *d* | 76.200 | B156 |
| **9385** | *d* | 84.138 | B158 |
| **02420** | *D* | 68.262 | B134,B136 |
| **02473** | *d* | 25.400 | B134 |
| **02474** | *d* | 28.575 | B134 |
| **02475** | *d* | 31.750 | B136 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **02820** | *D* | 73.025 | B134,B138 |
| **02872** | *d* | 28.575 | B134 |
| **02878** | *d* | 34.925 | B138 |
| **03062** | *d* | 15.875 | B132 |
| **03162** | *D* | 41.275 | B132 |
| **05062** | *d* | 15.875 | B132 |
| **05068** | *d* | 17.462 | B132 |
| **05075** | *d* | 19.050 | B132 |
| **05079** | *d* | 19.990 | B132 |
| **05175** | *D* | 44.450 | B132 |
| **05185** | *D* | 47.000 | B132 |
| **07079** | *d* | 20.000 | B132 |
| **07087** | *d* | 22.225 | B132 |
| **07097** | *d* | 25.000 | B134 |
| **07098** | *d* | 24.981 | B134 |
| **07100** | *d* | 25.400 | B134 |
| **07100SA** | *d* | 25.400 | B134 |
| **07196** | *D* | 50.005 | B132,B134 |
| **07204** | *D* | 51.994 | B132,B134 |
| **07205** | *D* | 52.001 | B134 |
| **08118** | *d* | 30.162 | B136 |
| **08125** | *d* | 31.750 | B136 |
| **08231** | *D* | 58.738 | B136 |
| **09062** | *d* | 15.875 | B132 |
| **09067** | *d* | 19.050 | B132 |
| **09074** | *d* | 19.050 | B132 |
| **09078** | *d* | 19.050 | B132 |
| **09081** | *d* | 20.625 | B132 |
| **09194** | *D* | 49.225 | B132 |
| **09195** | *D* | 49.225 | B132 |
| **09196** | *D* | 49.225 | B132 |
| **11162** | *d* | 41.275 | B142 |
| **11300** | *D* | 76.200 | B142 |
| **11520** | *D* | 42.862 | B132 |
| **11590** | *d* | 15.875 | B132 |
| **LM11710** | *D* | 39.878 | B132 |
| **LM11749** | *d* | 17.462 | B132 |
| **LM11910** | *D* | 45.237 | B132 |
| **LM11949** | *d* | 19.050 | B132 |
| **12168** | *d* | 42.862 | B142 |
| **12303** | *D* | 76.992 | B142 |
| **12520** | *D* | 49.225 | B132 |
| **12580** | *d* | 20.638 | B132 |
| **M12610** | *D* | 50.005 | B132 |
| **M12648** | *d* | 22.225 | B132 |
| **M12649** | *d* | 21.430 | B132 |
| **LM12710** | *D* | 45.237 | B132 |
| **LM12711** | *D* | 45.975 | B132 |
| **LM12749** | *d* | 22.000 | B132 |
| **13175** | *d* | 44.450 | B142 |
| **13181** | *d* | 46.038 | B144 |
| **13318** | *D* | 80.962 | B142,B144 |
| **13620** | *D* | 69.012 | B140 |
| **13621** | *D* | 69.012 | B140 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **13685** | *d* | 38.100 | B140 |
| **13687** | *d* | 38.100 | B140 |
| **13830** | *D* | 63.500 | B140 |
| **13889** | *d* | 38.100 | B140 |
| **14123 A** | *d* | 31.750 | B136 |
| **14125 A** | *d* | 31.750 | B136 |
| **14130** | *d* | 33.338 | B138 |
| **14131** | *d* | 33.338 | B138 |
| **14137 A** | *d* | 34.925 | B138 |
| **14138 A** | *d* | 34.925 | B138 |
| **14139** | *d* | 34.976 | B138 |
| **14274** | *D* | 69.012 | B136,B138 |
| **14276** | *D* | 69.012 | B136,B138 |
| **14283** | *D* | 72.085 | B138 |
| **15100** | *d* | 25.400 | B134 |
| **15101** | *d* | 25.400 | B134 |
| **15106** | *d* | 26.988 | B134 |
| **15112** | *d* | 28.575 | B134 |
| **15113** | *d* | 28.575 | B134 |
| **15116** | *d* | 30.112 | B136 |
| **15117** | *d* | 30.000 | B136 |
| **15118** | *d* | 30.213 | B136 |
| **15119** | *d* | 30.213 | B136 |
| **15120** | *d* | 30.213 | B136 |
| **15123** | *d* | 31.750 | B136 |
| **15125** | *d* | 31.750 | B136 |
| **15126** | *d* | 31.750 | B136 |
| **15245** | *D* | 62.000 | B134,B136 |
| **15250** | *D* | 63.500 | B136 |
| **15250 X** | *D* | 63.500 | B134 |
| **15520** | *D* | 57.150 | B134 |
| **15523** | *D* | 60.325 | B134 |
| **15578** | *d* | 25.400 | B134 |
| **15580** | *d* | 26.988 | B134 |
| **16150** | *d* | 38.100 | B140 |
| **16284** | *D* | 72.238 | B140 |
| **16929** | *D* | 74.988 | B142 |
| **16986** | *d* | 43.000 | B142 |
| **17098** | *d* | 24.981 | B134 |
| **17118** | *d* | 30.000 | B136 |
| **17244** | *D* | 62.000 | B134,B136 |
| **17520** | *D* | 42.862 | B132 |
| **17580** | *d* | 15.875 | B132 |
| **17831** | *D* | 79.985 | B144 |
| **17887** | *d* | 45.230 | B144 |
| **18200** | *d* | 50.800 | B146 |
| **18337** | *D* | 85.725 | B146 |
| **18520** | *D* | 73.025 | B140 |
| **18590** | *d* | 41.275 | B140 |
| **18620** | *D* | 79.375 | B144 |
| **18690** | *d* | 46.038 | B144 |
| **18720** | *D* | 85.000 | B146 |
| **18790** | *d* | 50.800 | B146 |
| **19138** | *d* | 34.976 | B138 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **19150** | *d* | 38.100 | B140 |
| **19268** | *D* | 68.262 | B138,B140 |
| **21075** | *d* | 19.050 | B132 |
| **21212** | *D* | 53.975 | B132 |
| **L21511** | *D* | 34.988 | B132 |
| **L21549** | *d* | 15.875 | B132 |
| **22168** | *d* | 42.862 | B142 |
| **22325** | *D* | 82.550 | B142 |
| **23100** | *d* | 25.400 | B134 |
| **23256** | *D* | 65.088 | B134 |
| **23621** | *D* | 73.025 | B138 |
| **23691** | *d* | 35.000 | B138 |
| **24720** | *D* | 76.200 | B142 |
| **24721** | *D* | 76.200 | B142 |
| **24780** | *d* | 41.275 | B142 |
| **25520** | *D* | 82.931 | B142,B144 |
| **25521** | *D* | 83.058 | B142 |
| **25523** | *D* | 82.931 | B142,B144 |
| **25577** | *d* | 42.875 | B142 |
| **25578** | *d* | 42.862 | B142 |
| **25580** | *d* | 44.450 | B142 |
| **25584** | *d* | 44.983 | B144 |
| **25590** | *d* | 45.618 | B144 |
| **25820** | *D* | 73.025 | B138 |
| **25821** | *D* | 73.025 | B138,B140 |
| **25877** | *d* | 34.925 | B138 |
| **25878** | *d* | 34.925 | B138 |
| **25880** | *d* | 36.487 | B140 |
| **26118** | *d* | 30.000 | B136 |
| **26131** | *d* | 33.338 | B138 |
| **26283** | *D* | 72.000 | B136,B138 |
| **26820** | *D* | 80.167 | B142 |
| **26822** | *D* | 79.375 | B142 |
| **26823** | *D* | 76.200 | B142 |
| **26882** | *d* | 41.275 | B142 |
| **26884** | *d* | 42.875 | B142 |
| **27620** | *D* | 125.412 | B156 |
| **27687** | *d* | 82.550 | B156 |
| **27689** | *d* | 83.345 | B156 |
| **27690** | *d* | 83.345 | B156 |
| **27820** | *D* | 80.035 | B140 |
| **27880** | *d* | 38.100 | B140 |
| **28138** | *d* | 34.976 | B138 |
| **28315** | *D* | 80.000 | B138 |
| **28521** | *D* | 92.075 | B146 |
| **28580** | *d* | 50.800 | B146 |
| **28584** | *d* | 52.388 | B146 |
| **28622** | *D* | 97.630 | B148 |
| **28680** | *d* | 55.562 | B148 |
| **28920** | *D* | 101.600 | B150 |
| **28921** | *D* | 100.000 | B150 |
| **28985** | *d* | 60.325 | B150 |
| **29520** | *D* | 107.950 | B150 |
| **29586** | *d* | 63.500 | B150 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **29620** | *D* | 112.712 | B152,B154 |
| **29630** | *D* | 120.650 | B152 |
| **29675** | *d* | 69.850 | B152 |
| **29685** | *d* | 73.025 | B154 |
| **LM29710** | *D* | 65.088 | B140 |
| **LM29711** | *D* | 65.088 | B140 |
| **LM29748** | *d* | 38.100 | B140 |
| **LM29749** | *d* | 38.100 | B140 |
| **31520** | *D* | 76.200 | B138 |
| **31594** | *d* | 34.925 | B138 |
| **33262** | *d* | 66.675 | B152 |
| **33275** | *d* | 69.850 | B152 |
| **33281** | *d* | 71.438 | B154 |
| **33287** | *d* | 73.025 | B154 |
| **JHM33410** | *D* | 55.000 | B134 |
| **JHM33449** | *d* | 24.000 | B134 |
| **33462** | *D* | 117.475 | B152,B154 |
| **33821** | *D* | 95.250 | B146 |
| **33889** | *d* | 50.800 | B146 |
| **34300** | *d* | 76.200 | B154 |
| **34306** | *d* | 77.788 | B156 |
| **34478** | *D* | 121.442 | B154,B156 |
| **36620** | *D* | 193.675 | B164 |
| **36690** | *d* | 146.050 | B164 |
| **36920** | *D* | 227.012 | B166 |
| **36990** | *d* | 177.800 | B166 |
| **37425** | *d* | 107.950 | B162 |
| **37625** | *D* | 158.750 | B162 |
| **M38510** | *D* | 66.675 | B138 |
| **M38511** | *D* | 65.987 | B138 |
| **M38547** | *d* | 35.000 | B138 |
| **M38549** | *d* | 34.925 | B138 |
| **39236** | *d* | 60.000 | B150 |
| **39250** | *d* | 63.500 | B150 |
| **39412** | *D* | 104.775 | B150 |
| **39520** | *D* | 112.712 | B150,B152 |
| **39521** | *D* | 112.712 | B152 |
| **39585** | *d* | 63.500 | B150 |
| **39590** | *d* | 66.675 | B152 |
| **41100** | *d* | 25.400 | B134 |
| **41125** | *d* | 28.575 | B134 |
| **41126** | *d* | 28.575 | B134 |
| **41286** | *D* | 72.626 | B134 |
| **42350** | *d* | 88.900 | B158 |
| **42362** | *d* | 92.075 | B160 |
| **42368** | *d* | 93.662 | B160 |
| **42375** | *d* | 95.250 | B160 |
| **42376** | *d* | 95.250 | B160 |
| **42381** | *d* | 96.838 | B160 |
| **42584** | *D* | 148.430 | B160 |
| **42587** | *D* | 149.225 | B158,B160 |
| **42620** | *D* | 127.000 | B154,B156 |
| **42687** | *d* | 76.200 | B154 |
| **42688** | *d* | 76.200 | B154 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **42690** | *d* | 77.788 | B156 |
| **43118** | *d* | 30.162 | B136 |
| **43131** | *d* | 33.338 | B138 |
| **43300** | *D* | 76.200 | B136 |
| **43312** | *D* | 79.375 | B138 |
| **44143** | *d* | 36.512 | B140 |
| **44150** | *d* | 38.100 | B140 |
| **44157** | *d* | 40.000 | B140 |
| **44162** | *d* | 41.275 | B142 |
| **44348** | *D* | 88.501 | B140,B142 |
| **L44610** | *D* | 50.292 | B134 |
| **L44640** | *d* | 23.812 | B134 |
| **L44643** | *d* | 25.400 | B134 |
| **L44649** | *d* | 26.988 | B134 |
| **45220** | *D* | 104.775 | B148 |
| **45221** | *D* | 104.775 | B148 |
| **45289** | *d* | 57.150 | B148 |
| **L45410** | *D* | 50.292 | B136 |
| **L45449** | *d* | 29.000 | B136 |
| **46143** | *d* | 36.512 | B140 |
| **46162** | *d* | 41.275 | B142 |
| **46176** | *d* | 44.450 | B142 |
| **46368** | *D* | 93.662 | B140,B142 |
| **46720** | *D* | 225.425 | B164 |
| **46780** | *d* | 158.750 | B164 |
| **47420** | *D* | 120.000 | B152,B154 |
| **47487** | *d* | 69.850 | B152 |
| **47490** | *d* | 71.438 | B154 |
| **47620** | *D* | 133.350 | B154,B156 |
| **47680** | *d* | 76.200 | B154 |
| **47685** | *d* | 82.550 | B156 |
| **47686** | *d* | 82.550 | B156 |
| **47687** | *d* | 82.550 | B156 |
| **47820** | *D* | 146.050 | B160 |
| **47890** | *d* | 92.075 | B160 |
| **47896** | *d* | 95.250 | B160 |
| **48120** | *D* | 161.925 | B162 |
| **48190** | *d* | 107.950 | B162 |
| **48220** | *D* | 182.562 | B164 |
| **48282** | *d* | 120.650 | B164 |
| **48286** | *d* | 123.825 | B164 |
| **48290** | *d* | 127.000 | B164 |
| **48320** | *D* | 190.500 | B164 |
| **48385** | *d* | 133.350 | B164 |
| **48393** | *d* | 136.525 | B164 |
| **LM48510** | *D* | 65.088 | B138 |
| **LM48511** | *D* | 65.088 | B138 |
| **LM48548** | *d* | 34.925 | B138 |
| **48620** | *D* | 200.025 | B164 |
| **48685** | *d* | 142.875 | B164 |
| **49175** | *d* | 44.450 | B142 |
| **49176** | *d* | 44.450 | B142 |
| **49368** | *D* | 93.662 | B142 |
| **49520** | *D* | 101.600 | B146 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **49585** | *d* | 50.800 | B146 |
| **52387** | *d* | 98.425 | B160 |
| **52393** | *d* | 100.012 | B160 |
| **52400** | *d* | 101.600 | B162 |
| **52618** | *D* | 157.162 | B160,B162 |
| **52637** | *D* | 161.925 | B160,B162 |
| **53150** | *d* | 38.100 | B140 |
| **53162** | *d* | 41.275 | B142 |
| **53176** | *d* | 44.450 | B144 |
| **53177** | *d* | 44.450 | B144 |
| **53178** | *d* | 44.450 | B144 |
| **53375** | *D* | 95.250 | B140,B144 |
| **53387** | *D* | 98.425 | B142,B144 |
| **55175** | *d* | 44.450 | B144 |
| **55187** | *d* | 47.625 | B144 |
| **55200** | *d* | 50.800 | B146 |
| **55200C** | *d* | 50.800 | B146 |
| **55206** | *d* | 52.388 | B146 |
| **55437** | *D* | 111.125 | B144,B146 |
| **55443** | *D* | 112.712 | B144 |
| **56418** | *d* | 106.362 | B162 |
| **56425** | *d* | 107.950 | B162 |
| **56650** | *D* | 165.100 | B162 |
| **59200** | *d* | 50.800 | B146 |
| **59429** | *D* | 108.966 | B146 |
| **64433** | *d* | 109.992 | B162 |
| **64450** | *d* | 114.300 | B162 |
| **64700** | *D* | 177.800 | B162 |
| **65200** | *d* | 50.800 | B146 |
| **65212** | *d* | 53.975 | B148 |
| **65237** | *d* | 60.325 | B150 |
| **65320** | *D* | 114.300 | B144 |
| **65385** | *d* | 44.450 | B144 |
| **65500** | *D* | 127.000 | B146,B148,B150 |
| **66187** | *d* | 47.625 | B144 |
| **66462** | *D* | 117.475 | B144 |
| **66520** | *D* | 122.238 | B148,B150 |
| **66584** | *d* | 53.975 | B148 |
| **66585** | *d* | 60.000 | B150 |
| **66587** | *d* | 57.150 | B148 |
| **LM67010** | *D* | 59.131 | B134,B136 |
| **LM67043** | *d* | 28.575 | B134 |
| **LM67048** | *d* | 31.750 | B136 |
| **67320** | *D* | 203.200 | B164 |
| **67322** | *D* | 196.850 | B164 |
| **67388** | *d* | 127.000 | B164 |
| **67389** | *d* | 130.175 | B164 |
| **67390** | *d* | 133.350 | B164 |
| **67720** | *D* | 247.650 | B164,B166 |
| **67780** | *d* | 165.100 | B164 |
| **67787** | *d* | 174.625 | B166 |
| **67790** | *d* | 177.800 | B166 |
| **67820** | *D* | 266.700 | B166 |
| **67885** | *d* | 190.500 | B166 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **67920** | *D* | 282.575 | B166 |
| **67983** | *d* | 203.200 | B166 |
| **67985** | *d* | 206.375 | B166 |
| **L68110** | *D* | 59.131 | B138 |
| **L68111** | *D* | 59.975 | B138 |
| **L68149** | *d* | 35.000 | B138 |
| **68450** | *d* | 114.300 | B162 |
| **68462** | *d* | 117.475 | B162 |
| **68709** | *D* | 180.000 | B162 |
| **68712** | *D* | 180.975 | B162 |
| **JL69310** | *D* | 63.000 | B140 |
| **JL69349** | *d* | 38.000 | B140 |
| **71412** | *d* | 104.775 | B162 |
| **71425** | *d* | 107.950 | B162 |
| **71437** | *d* | 111.125 | B162 |
| **71450** | *d* | 114.300 | B162 |
| **71453** | *d* | 115.087 | B162 |
| **71750** | *D* | 190.500 | B162 |
| **72187** | *d* | 47.625 | B144 |
| **72200** | *d* | 50.800 | B146 |
| **72200C** | *d* | 50.800 | B146 |
| **72212** | *d* | 53.975 | B148 |
| **72212C** | *d* | 53.975 | B148 |
| **72218** | *d* | 55.562 | B148 |
| **72218C** | *d* | 55.562 | B148 |
| **72225C** | *d* | 57.150 | B148 |
| **72487** | *D* | 123.825 | B144,B146,B148 |
| **LM72810** | *D* | 47.000 | B134 |
| **LM72849** | *d* | 22.606 | B134 |
| **74500** | *d* | 127.000 | B164 |
| **74525** | *d* | 133.350 | B164 |
| **74537** | *d* | 136.525 | B164 |
| **74550** | *d* | 139.700 | B164 |
| **74850** | *D* | 215.900 | B164 |
| **74856** | *D* | 217.488 | B164 |
| **77375** | *d* | 95.250 | B160 |
| **77675** | *D* | 171.450 | B160 |
| **78225** | *d* | 57.150 | B148 |
| **78250** | *d* | 63.500 | B150 |
| **LM78310** | *D* | 62.000 | B138 |
| **LM78310A** | *D* | 62.000 | B138 |
| **LM78349** | *d* | 35.000 | B138 |
| **78537** | *D* | 136.525 | B150 |
| **78551** | *D* | 140.030 | B148,B150 |
| **78571** | *D* | 144.983 | B148 |
| **HM81610** | *D* | 47.000 | B132 |
| **HM81649** | *d* | 16.000 | B132 |
| **M84210** | *D* | 59.530 | B134 |
| **M84249** | *d* | 25.400 | B134 |
| **M84510** | *D* | 57.150 | B134 |
| **M84548** | *d* | 25.400 | B134 |
| **M86610** | *D* | 64.292 | B134,B136 |
| **M86643** | *d* | 25.400 | B134 |
| **M86647** | *d* | 28.575 | B134 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **M86648A** | *d* | 30.955 | B136 |
| **M86649** | *d* | 30.162 | B136 |
| **M88010** | *D* | 68.262 | B136,B138 |
| **M88043** | *d* | 30.162 | B136 |
| **M88046** | *d* | 31.750 | B136 |
| **M88048** | *d* | 33.338 | B138 |
| **HM88510** | *D* | 73.025 | B136,B138 |
| **HM88542** | *d* | 31.750 | B136 |
| **HM88547** | *d* | 33.338 | B138 |
| **HM88610** | *D* | 72.233 | B134,B136,B138,B140 |
| **HM88630** | *d* | 25.400 | B134 |
| **HM88638** | *d* | 32.000 | B136 |
| **HM88648** | *d* | 35.717 | B140 |
| **HM88649** | *d* | 34.925 | B138 |
| **HM89410** | *D* | 76.200 | B138,B140 |
| **HM89411** | *D* | 76.200 | B138 |
| **HM89443** | *d* | 33.338 | B138 |
| **HM89444** | *d* | 33.338 | B138 |
| **HM89446** | *d* | 34.925 | B138 |
| **HM89446A** | *d* | 34.925 | B138 |
| **HM89449** | *d* | 36.512 | B140 |
| **99100** | *D* | 254.000 | B164 |
| **99550** | *d* | 139.700 | B164 |
| **99575** | *d* | 146.050 | B164 |
| **99587** | *d* | 149.225 | B164 |
| **99600** | *d* | 152.400 | B164 |
| **LM102910** | *D* | 73.431 | B144 |
| **LM102949** | *d* | 45.242 | B144 |
| **JLM104910** | *D* | 82.000 | B146 |
| **LM104911** | *D* | 82.550 | B146 |
| **LM104911A** | *D* | 82.550 | B146 |
| **LM104912** | *D* | 82.931 | B146 |
| **LM104947A** | *d* | 50.000 | B146 |
| **JLM104948** | *d* | 50.000 | B146 |
| **LM104949** | *d* | 50.800 | B146 |
| **M201011** | *D* | 73.025 | B140 |
| **M201047** | *d* | 39.688 | B140 |
| **JM205110** | *D* | 90.000 | B146 |
| **JM205149** | *d* | 50.000 | B146 |
| **JM207010** | *D* | 95.000 | B148 |
| **JM207049** | *d* | 55.000 | B148 |
| **JH211710** | *D* | 120.000 | B152 |
| **JH211749** | *d* | 65.000 | B152 |
| **HM212010** | *D* | 122.238 | B150,B152 |
| **HM212011** | *D* | 122.238 | B150,B152 |
| **HM212044** | *d* | 60.325 | B150 |
| **HM212046** | *d* | 63.500 | B150 |
| **HM212047** | *d* | 63.500 | B150 |
| **HM212049** | *d* | 66.675 | B152 |
| **JH217210** | *D* | 150.000 | B158 |
| **JH217249** | *d* | 85.000 | B158 |
| **HM218210** | *D* | 147.000 | B158 |
| **HM218248** | *d* | 90.000 | B158 |
| **HH221410** | *D* | 190.500 | B158,B160,B162 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **HH221432** | *d* | 87.312 | B158 |
| **HH221434** | *d* | 88.900 | B158 |
| **HH221440** | *d* | 95.250 | B160 |
| **HH221442** | *d* | 98.425 | B160 |
| **HH221447** | *d* | 99.982 | B160 |
| **HH221449** | *d* | 101.600 | B162 |
| **HH224310** | *D* | 212.725 | B162 |
| **HH224335** | *d* | 101.600 | B162 |
| **HH224340** | *d* | 107.950 | B162 |
| **HH224346** | *d* | 114.300 | B162 |
| **M224710** | *D* | 174.625 | B164 |
| **M224748** | *d* | 120.000 | B164 |
| **LL225710** | *D* | 165.895 | B164 |
| **LL225749** | *d* | 127.000 | B164 |
| **HM231110** | *D* | 236.538 | B164 |
| **HM231140** | *d* | 146.050 | B164 |
| **M236810** | *D* | 260.350 | B166 |
| **M236849** | *d* | 177.800 | B166 |
| **LM300811** | *D* | 68.000 | B140 |
| **LM300849** | *d* | 41.000 | B140 |
| **L305610** | *D* | 80.962 | B146 |
| **L305649** | *d* | 50.800 | B146 |
| **JH307710** | *D* | 110.000 | B148 |
| **JH307749** | *d* | 55.000 | B148 |
| **JHM318410** | *D* | 155.000 | B158 |
| **JHM318448** | *d* | 90.000 | B158 |
| **L327210** | *D* | 177.008 | B164 |
| **L327249** | *d* | 133.350 | B164 |
| **LM328410** | *D* | 187.325 | B164 |
| **LM328448** | *d* | 139.700 | B164 |
| **H414210** | *D* | 136.525 | B152,B154 |
| **H414245** | *d* | 68.262 | B152 |
| **H414249** | *d* | 71.438 | B154 |
| **JH415610** | *D* | 145.000 | B154 |
| **JH415647** | *d* | 75.000 | B154 |
| **LM501310** | *D* | 73.431 | B140 |
| **LM501314** | *D* | 73.431 | B140 |
| **LM501349** | *d* | 41.275 | B140 |
| **LM503310** | *D* | 75.000 | B144 |
| **LM503349** | *d* | 46.000 | B144 |
| **HH506310** | *D* | 114.300 | B146 |
| **HH506348** | *d* | 49.212 | B146 |
| **JLM506810** | *D* | 90.000 | B148 |
| **JLM506849** | *d* | 55.000 | B148 |
| **JLM508710** | *D* | 95.000 | B150 |
| **JLM508748** | *d* | 60.000 | B150 |
| **JM511910** | *D* | 110.000 | B152 |
| **JM511946** | *d* | 65.000 | B152 |
| **JM515610** | *D* | 130.000 | B156 |
| **JM515649** | *d* | 80.000 | B156 |
| **HM516410** | *D* | 133.350 | B156 |
| **HM516448** | *d* | 82.550 | B156 |
| **JHM516810** | *D* | 140.000 | B158 |
| **JHM516849** | *d* | 85.000 | B158 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **HM518410** | *D* | 152.400 | B158 |
| **HM518445** | *d* | 88.900 | B158 |
| **LM522510** | *D* | 159.987 | B162 |
| **LM522546** | *d* | 107.950 | B162 |
| **LM522548** | *d* | 109.987 | B162 |
| **LM522549** | *d* | 109.987 | B162 |
| **JHM522610** | *D* | 180.000 | B162 |
| **JHM522649** | *d* | 110.000 | B162 |
| **JHM534110** | *D* | 230.000 | B166 |
| **JHM534149** | *d* | 170.000 | B166 |
| **LM603011** | *D* | 77.788 | B144 |
| **LM603012** | *D* | 77.788 | B144 |
| **LM603049** | *d* | 45.242 | B144 |
| **L610510** | *D* | 94.458 | B150 |
| **L610549** | *d* | 63.500 | B150 |
| **JM612910** | *D* | 115.000 | B154 |
| **JM612949** | *d* | 70.000 | B154 |
| **LM613410** | *D* | 112.712 | B152 |
| **LM613449** | *d* | 69.850 | B152 |
| **HM617010** | *D* | 142.138 | B158 |
| **HM617049** | *d* | 85.725 | B158 |
| **L623110** | *D* | 152.400 | B162 |
| **L623149** | *d* | 114.300 | B162 |
| **JLM710910** | *D* | 105.000 | B152 |
| **JLM710949** | *d* | 65.000 | B152 |
| **JLM714110** | *D* | 115.000 | B154 |
| **JLM714149** | *d* | 75.000 | B154 |
| **JM714210** | *D* | 120.000 | B154 |
| **JM714249** | *d* | 75.000 | B154 |
| **H715311** | *D* | 136.525 | B150,B152,B154 |
| **H715334** | *d* | 61.912 | B150 |
| **H715340** | *d* | 65.088 | B152 |
| **H715341** | *d* | 66.675 | B152 |
| **H715343** | *d* | 68.262 | B152 |
| **H715345** | *d* | 71.438 | B154 |
| **JM716610** | *D* | 130.000 | B158 |
| **JM716648** | *d* | 85.000 | B158 |
| **JM716649** | *d* | 85.000 | B158 |
| **JM718110** | *D* | 145.000 | B158 |
| **JM718149** | *d* | 90.000 | B158 |
| **JM719113** | *D* | 150.000 | B160 |
| **JM719149** | *d* | 95.000 | B160 |
| **JM720210** | *D* | 155.000 | B160 |
| **JHM720210** | *D* | 160.000 | B160 |
| **JM720249** | *d* | 100.000 | B160 |
| **JHM720249** | *d* | 100.000 | B160 |
| **JL724314** | *D* | 170.000 | B164 |
| **JL724348** | *d* | 120.000 | B164 |
| **JL725316** | *D* | 175.000 | B164 |
| **JL725346** | *d* | 125.000 | B164 |
| **JM734410** | *D* | 240.000 | B166 |
| **JM734449** | *d* | 170.000 | B166 |
| **JM738210** | *D* | 260.000 | B166 |
| **JM738249** | *d* | 190.000 | B166 |

| Bearing No. CONE, CUP | Nominal Dimension (mm) *d*:CONE (Bore Dia.) *D*:CUP (Outside Dia.) | | Pages |
|---|---|---|---|
| **HM801310** | *D* | 82.550 | B140 |
| **HM801346** | *d* | 38.100 | B140 |
| **M802011** | *D* | 82.550 | B142 |
| **M802048** | *d* | 41.275 | B142 |
| **HM803110** | *D* | 88.900 | B142 |
| **HM803145** | *d* | 41.275 | B142 |
| **HM803146** | *d* | 41.275 | B142 |
| **HM803149** | *d* | 44.450 | B142 |
| **M804010** | *D* | 88.900 | B144 |
| **M804049** | *d* | 47.625 | B144 |
| **HM804810** | *D* | 95.250 | B142,B144,B146 |
| **HM804840** | *d* | 41.275 | B142 |
| **HM804843** | *d* | 44.450 | B144 |
| **HM804846** | *d* | 47.625 | B144 |
| **HM804848** | *d* | 48.412 | B146 |
| **HM804849** | *d* | 48.412 | B146 |
| **HM807010** | *D* | 104.775 | B144,B146 |
| **HM807011** | *D* | 104.775 | B146 |
| **JHM807012** | *D* | 105.000 | B146 |
| **HM807040** | *d* | 44.450 | B144 |
| **HM807044** | *d* | 49.212 | B146 |
| **JHM807045** | *d* | 50.000 | B146 |
| **HM807046** | *d* | 50.800 | B146 |
| **JLM813010** | *D* | 110.000 | B154 |
| **JLM813049** | *d* | 70.000 | B154 |
| **JLM820012** | *D* | 150.000 | B160 |
| **JLM820048** | *d* | 100.000 | B160 |
| **JM822010** | *D* | 165.000 | B162 |
| **JM822049** | *d* | 110.000 | B162 |
| **JHM840410** | *D* | 300.000 | B166 |
| **JHM840449** | *d* | 200.000 | B166 |
| **HM903210** | *D* | 95.250 | B144 |
| **HM903247** | *d* | 44.450 | B144 |
| **HM903249** | *d* | 44.450 | B144 |
| **HM911210** | *D* | 130.175 | B148 |
| **HM911242** | *d* | 53.975 | B148 |
| **H913810** | *D* | 146.050 | B150,B152 |
| **H913842** | *d* | 61.912 | B150 |
| **H913849** | *d* | 69.850 | B152 |

# Worldwide Sales Offices and Manufacturing Plants

P: Phone F: Fax C: Country Code Printed in Japan

## NSK LTD.-HEADQUARTERS, TOKYO, JAPAN

**www.nsk.com**

Nissei Bldg., 1-6-3 Ohsaki, Shinagawa-ku, Tokyo 141-8560, Japan

INDUSTRIAL MACHINERY BUSINESS DIVISION-HEADQUARTERS
P: 03-3779-7227 F: 03-3779-7644 C: 81

GLOBAL AFTERMARKET DEPARTMENT
P: 03-3779-7253 F: 03-3779-7644 C: 81

PRECISION MACHINERY DEPARTMENT
P: 03-3779-7163 F: 03-3779-7644 C: 81

MECHATRONICS BUSINESS DEPARTMENT
P: 0466-21-3027 F: 0466-21-3206 C: 81

AUTOMOTIVE BUSINESS DIVISION-HEADQUARTERS
P: 03-3779-7189 F: 03-3779-7917 C: 81

## ●Africa

**South Africa:**

**NSK SOUTH AFRICA (PTY) LTD.**

JOHANNESBURG 25 Galaxy Avenue, Linbro Business Park, Sandton, Gauteng, P.O. Box 1157, Kelvin, 2054, South Africa
P: 011-458-3600 F: 011-458-3608 C: 27

## ●Asia and Oceania

**Australia:**

**NSK AUSTRALIA PTY. LTD. www.au.nsk.com**

MELBOURNE 11 Dalmore Drive, Scoresby, Victoria 3179, Australia
P: 03-9764-8302 F: 03-9764-8304 C: 61

SYDNEY 24-28 River Road West, Parramatta, New South Wales 2150, Australia
P: 02-8843-8100 F: 02-9893-8406 C: 61

BRISBANE 1/69 Selhurst Street, Coopers Plains, Queensland 4108, Australia
P: 07-3347-2600 F: 07-3345-5376 C: 61

PERTH Unit 1, 71 Tacoma Circuit, Canning Vale, Western Australia 6155, Australia
P: 08-9256-5000 F: 08-9256-1044 C: 61

**China:**

**NSK HONG KONG LTD.**

HONG KONG Suite 814, World Commerce Centre, Harbour City, T.S.T, KLN, Hong Kong
P: 2739-9933 F: 2739-9323 C: 852

SHENZHEN Room 8B08-09, Jueshi Tower, Jiabing Road, Luohu, Shenzhen, China (518001)
P: 0755-25904886 F: 0755-25904883 C: 86

**KUNSHAN NSK CO., LTD.**

OFFICE/PLANT 258 South Huang Pu Jiang Rd., Kunshan Economic & Technical Development Zone, Jiang Su, China (215335)
P: 0512-5771-5654 F: 0512-5771-5689 C: 86

**CHANGSHU NSK NEEDLE BEARING CO., LTD.**

OFFICE/PLANT No. 66 Dongnan Road, Changshu Southeast Economic Development Zone, Changshu City, Jiangsu, China (215500)
P: 0512-5230-1111 F: 0512-5230-6011 C: 86

**NSK STEERING SYSTEMS DONGGUAN CO., LTD.**

OFFICE/PLANT High-tech Park, Shilong Road, Guanlong Section, Dongguan, Guangdong, China (523119)
P: 0769-2262-0960 F: 0769-2316-2867 C: 86

**ZHANGJIAGANG NSK PRECISION MACHINERY CO., LTD.**

OFFICE/PLANT No. 34 Zhenxing Road, Zhangjiagang Economic Development Zone, Zhangjiagang City, Jiangsu Province, China (215600)
P: 0512-5867-6496 F: 0512-5818-0970 C: 86

**SUZHOU NSK BEARINGS CO., LTD.**

OFFICE/PLANT No. 22 Taishan Road, Suzhou New District, Jiangsu, China (215129)
P: 0512-6665-5666 F: 0512-6665-9138 C: 86

**NSK (CHINA) RESEARCH & DEVELOPMENT CO., LTD.**

JIANGSU No.8 NSK Rd., Huaqiao Economic Development Zone, Kunshan, Jiangsu, China
P: 0512-5796-3000 F: 0512-5796-3300 C: 86

**NSK (SHANGHAI) TRADING CO., LTD.**

JIANGSU No.8 NSK Rd., Huaqiao Economic Development Zone, Kunshan, Jiangsu, China
P: 0512-5796-3000 F: 0512-5796-3300 C: 86

**NSK (CHINA) INVESTMENT CO., LTD. www.nsk.com.cn**

HEAD OFFICE No.8 NSK Rd., Huaqiao Economic Development Zone, Kunshan, Jiangsu, China
P: 0512-5796-3000 F: 0512-5796-3300 C: 86

BEIJING Room 2116, Beijing Fortune Bldg., 5 Dong San Huan Bei Lu, Chao Yang District, Beijing, China (100004)
P: 010-6590-8161 F: 010-6590-8166 C: 86

GUANGZHOU Room 3101/3102/3106A, Guangdong Telecom Plaza, 18 Zhongshan Er Road, Guangzhou, Guangdong, China (510080)
P: 020-3786-4833 F: 020-3786-4501 C: 86

CHENGDU Room1901, Green Land Hotel, No.99 Zhonglieci Xi Street, Chengdu,Sichuan Province, China (610016)
P: 028-8661-4200 F: 028-8661-4343 C: 86

**NSK CHINA SALES CO., LTD.**

SHANGHAI Room 01-03, Tower B 27F, Far East International Plaza, No.317 Xianxia Road, Shanghai, China (200051)
P: 021-6235-0198 F: 021-6235-1858 C: 86

CHANGCHUN Room 1001, Building A, Zhongyin Building, 727 Xi'an Road, Changchun, Jilin Province, China (130061)
P: 0431-8898-8682 F: 0431-8898-8670 C: 86

TIAN JIN Room 06, 09F The Exchange Tower 2, No. 189 NanJing Road, Heping District, Tianjin, China (300050)
P: 022-8319-5030 F: 022-8319-5033 C: 86

NANJING A1 22F, Golden Eagle International Plaza, No.89 Hanzhong Road, Nanjing, Jiangsu Province, China (210029)
P:025-8472-6671 F:025-8472-6687 C:86

CHONGQING Room 2306, Unit B, No.137, Keyuan 2nd Road, Jiulongpo District, Chonqing, China (400039)
P:023-6806-5310 F:023-6806-5292 C:86

**NSK-WARNER (SHANGHAI) CO., LTD.**

PLANT No. 2518 Huancheng Road (West) Fengxian District, Shanghai,China (201401)
P: 021-3365-5757 F: 021-3365-5262 C: 86

**AKS PRECISION BALL (HANGZHOU) CO., LTD.**

PLANT No. 189 Hongda Road, Xiaoshan Area of Economic & Technological Development Zone, Hangzhou, Zhejiang, China (311231)
P: 0571-2280-1288 F: 0571-2280-1268 C: 86

**NSK-YAGI PRECISION FORGING (ZHANGJIAGANG) CO., LTD.**

PLANT No. 34 Zhenxing Road, Zhangjiagang Economic Development Zone, Zhangjiagang City, Jiangsu Province, China (215600)
P:0512-5867-6496 F:0512-5818-0970 C:86

**NSK-WANDA ELECTRIC POWER ASSISTED STEERING SYSTEMS CO.,LTD.**

OFFICE/PLANT 1833 Yatai Road, Wenyan Town, Xiaoshan, Hangzhou, Zhejiang, China (311258)
P:0571-8230-2735 F:0571-8230-2692 C:86

**India:**

**RANE NSK STEERING SYSTEMS LTD.**

CHENNAI 14, Rajagopalan Salai, Vallancherry, Guduvancherry, Tamil Nadu-603 202, India
P:044-474-06017 F:044-274-66001 C:91

BAWAL Plot No.28A, Sector 6, HSIIDC Growth Centre Bawal, District Rewari, Haryana -123 501, India
P:01284-264281 F:01284-264280 C:91

**NSK INDIA SALES CO.PVT.LTD.**

CHENNAI New No.7, Old No.5, Boat Club Road, Chennai-600 028, India
P:044-2433-1161 F:044-2433-1160 C:91

GURGAON 311, JMD Pacific Square, Sector 15 (II), 32nd Milestone, National Highway-8, Gurgaon, Haryana-122 001, India
P:0124-4104-530 F:0124-4104-532 C:91

KOLKATA 502, Trinity Towers, 83, Topsia Road, Kolkata-700 046, India
P:033-4001-2062 F:033-4001-2064 C:91

MUMBAI 321, A Wing, Ahura Centre, 82, Mahakali Caves Road, Andheri East, Mumbai -400 093, India
P:022-2838-7787 F:022-2838-5191 C:91

**NSK-ABC BEARINGS LTD.**

OFFICE/PLANT Plot No.A2, SIPCOT Growth Centre, Oragadam, Mathur Village, Sriperumbudur Taluk, Kancheepuram District, Tamil Nadu-602 105, India
P:044-2714-3000 F:044-2714-3099 C:91

**Indonesia:**

**PT. NSK BEARINGS MANUFACTURING INDONESIA**

JAKARTA PLANT Blok M4, Kawasan Berikat MM2100 Industrial Town Cikarang Barat, Bekasi 17520, Indonesia
P: 021-898-0155 F: 021-898-0156 C: 62

**PT. NSK INDONESIA www.id.nsk.com**

JAKARTA Summitmas II, 6th Floor, Jl. Jend Sudirman Kav. 61-62, Jakarta 12190, Indonesia
P: 021-252-3458 F: 021-252-3223 C: 62

**PT. NSK-WARNER INDONESIA**

BEKASI MM2100 Industrial Town, Cikarang Barat, Bekasi 17520, Indonesia
P: 021-8998-3216 F: 021-8998-3218 C: 62

**Korea:**

**NSK KOREA CO., LTD. www.kr.nsk.com**

SEOUL Posco Center (West Wing) 9F, 892, Daechi-4Dong, Kangnam-Ku, Seoul, 135-777, Korea
P: 02-3287-0300 F: 02-3287-0345 C: 82

CHANGWON 60, Seongsan-Dong, Changwon, Kyungsangnam-Do, 641-315, Korea
PLANT P: 055-287-6001 F: 055-285-9982 C: 82

**Malaysia:**

**NSK BEARINGS (MALAYSIA) SDN. BHD. www.my.nsk.com**

HEAD OFFICE No. 2, Jalan Pemaju, U1/15, Seksyen U1, Hicom Glenmarie Industrial Park, 40150 Shah Alam, Selangor, Malaysia
P: 03-7803-8859 F: 03-7806-5982 C: 60

PRAI No.36, Jalan kikik, Taman Inderawasih, 13600 Prai, Penang, Malaysia
P: 04-3902275 F: 04-3991830 C: 60

JOHOR BAHRU 88 Jalan Ros Merah 2/17, Taman Johor Jaya, 81100 Johor Bahru, Johor, Malaysia
P: 07-3546290 F: 07-3546291 C: 60

KOTA KINABALU Lot 10, Lrg Kurma 4, Likas Ind. Centre, 5/12 Miles Jln Tuaran, 88450 Inanam, Sabah, Malaysia
P: 088-421260 F: 088-421261 C: 60

IPOH Gr. Floor, 89 Jalan Bendahara, 31650 Ipoh, Perak, Malaysia
P: 05-2555000 F: 05-2553373 C: 60

**NSK MICRO PRECISION (M) SDN. BHD. www.my.nsk.com**

MALAYSIA PLANT No.43 Jalan Taming Dua,Taman Taming Jaya 43300 Balakong, Selangor Darul Ehsan, Malaysia
P: 03-8961-3960 F: 03-8961-3968 C: 60

**New Zealand:**

**NSK NEW ZEALAND LTD. www.nsk-rhp.co.nz**

AUCKLAND 3 Te Apunga Place, Mt. Wellington, Auckland, New Zealand
P: 09-276-4992 F: 09-276-4082 C: 64

**Philippines:**

**NSK REPRESENTATIVE OFFICE**

MANILA 8th Floor The Salcedo Towers 169 H.V. dela Costa St., Salcedo Village Makati City, Philippines 1227
P: 02-893-9543 F: 02-893-9173 C: 63

**Singapore:**

**NSK INTERNATIONAL (SINGAPORE) PTE LTD.**

SINGAPORE 238A, Thomson Road, #24-01/05, Novena Square Tower A, Singapore 307684
P: 6496-8000 F: 6250-5845 C: 65

**NSK SINGAPORE (PRIVATE) LTD. www.nsk-singapore.com.sg**

SINGAPORE 238A, Thomson Road, #24-01/05, Novena Square Tower A, Singapore 307684
P: 6496-8000 F: 6250-5845 C: 65

**Taiwan:**

**TAIWAN NSK PRECISION CO., LTD.**

TAIPEI 11F., No.87, Song Jiang Rd., Jhongshan District, Taipei City 104, Taiwan R.O.C.
P: 02-2509-3305 F: 02-2509-1393 C: 886

TAICHUNG 107-7, Sec. 3, Wen Xing Rd., Taichung City 407, Taiwan R.O.C.
P: 04-2311-7978 F: 04-2311-2627 C: 886

TAINAN No.8 Daye 1st Rd., Southern Taiwan Science Park, Tainan County 741, Taiwan R.O.C.
P: 06-505-5861 F: 06-505-5061 C: 886

NSK Ltd. has a basic policy not to export any products or technology designated as controlled items by export-related laws. When exporting the products in this brochure, the laws of the exporting country must be observed. Specifications are subject to change without notice and without any obligation on the part of the manufacturer. Every care has been taken to ensure the accuracy of the data contained in this brochure, but no liability can be accepted for any loss or damage suffered through errors or omissions. We will gratefully acknowledge any additions or corrections.

# Worldwide Sales Offices and Manufacturing Plants

P: Phone F: Fax C: Country Code Printed in Japan

**TAIWAN NSK TECHNOLOGY CO., LTD.**

TAIPEI 11F., No. 87, Songjiang Rd., Jhongshan District, Taipei City 104, Taiwan R.O.C.
P: 02-2509-3305 F: 02-2509-1393 C: 886

**Thailand:**

**NSK BEARINGS (THAILAND) CO.,LTD.**

BANGKOK 26 Soi On-Nuch 55/1 Pravet District, Bangkok 10250, Thailand
P: 02320-2555 F: 02320-2826 C: 66

**NSK BEARINGS MANUFACTURING (THAILAND) CO., LTD.**

OFFICE/PLANT 700/430 Moo 7, Amata Nakorn Industrial Estate, T.Donhualor, A.Muangchonburi, Chonburi 20000, Thailand
P: 038-454-010 F: 038-454-017 C: 66

**SIAM NSK STEERING SYSTEMS CO., LTD.**

OFFICE/PLANT 90 Moo 9, Wellgrow Industrial Estate, Km.36 Bangna-Trad Rd., Bangwao, Bangpakong, Chachoengsao 24180, Thailand
P: 038-522-343 F: 038-522-351 C: 66

**NSK ASIA PACIFIC TECHNOLOGY CENTRE (THAILAND) CO., LTD.**

CHONBURI 700/430 Moo 7, Amata Nakorn Industrial Estate, T.Donhualor, A.Muangchonburi, Chonburi 20000, Thailand
P: 038-454-631 F: 038-454-634 C: 66

**Vietnam:**

**NSK VIETNAM CO., LTD.**

HEAD OFFICE Techno Center, Room 204-205, Thang Long Industrial Park, Dong Anh District, Hanoi, Vietnam
P: 04-3955-0159 F: 04-3955-0158 C: 84

**NSK REPRESENTATIVE OFFICE**

HO CHI MINH CITY Suite 307, Metropolitan Building, 235 Dong Khoi Street, District 1,HCMC, Vietnam
P: 08-3822-7907 F: 08-3822-7910 C: 84

## ●Europe

**NSK EUROPE LTD. (EUROPEAN HEADQUARTERS) www.eu.nsk.com**

MAIDENHEAD Belmont Place, Belmont Road, Maidenhead, Berkshire SL6 6TB, U.K.
P: 01628-509-800 F: 01628-509-808 C: 44

**France:**

**NSK FRANCE S.A.S.**

PARIS Quartier de l' Europe, 2 Rue Georges Guynemer, 78283 Guyancourt, France
P: 01-30-57-39-39 F: 01-30-57-00-01 C: 33

**Germany:**

**NSK DEUTSCHLAND GMBH**

HEAD OFFICE Harkortsrasse 15, D-40880 Ratingen, Germany
P: 02102-4810 F: 02102-4812-290 C: 49

STUTTGART Liebknechtstrasse 33, DE-70565 Stuttgart-Vahingen, Germany
P: 0711-79082-0 F: 0711-79082-289 C: 49

WOLFSBURG Heinrich-Nordhoff-Strasse 101, D-38440 Wolfsburg, Germany
P: 05361-27647-10 F: 05361-27647-70 C: 49

INGOLDSTADT Ingoldstadt, D-85055 Ingoldstadt, Germany
P: 0841-901-4640 F: 0841-901-4642 C: 49

**NSK PRECISION EUROPE GMBH**

DÜSSELDORF Harkortsrasse 15, D-40880 Ratingen, Germany
P: 02102-4810 F: 02102-4812-290 C: 49

**NEUWEG FERTIGUNG GMBH**

OFFICE/PLANT Ehinger Strasse 5, D-89597 Munderkingen, Germany
P: 07393-540 F: 07393-5414 C: 49

**Italy:**

**NSK ITALIA S.P.A.**

MILANO Via Garibaldi 215, Garbagnate Milanese (Milano) 20024, Italy
P: 0299-5191 F: 0299-028373 C: 39

**INDUSTRIA CUSCINETTI S.P.A.**

TORINO PLANT Via Giotto 4, I-10080, S. Benigno C. se (Torino), Italy
P: 011-982-4811 F: 011-988-0284 C: 39

**Netherlands:**

**NSK EUROPEAN DISTRIBUTION CENTRE B.V.**

De Kroonstraat 38, 5048 AP Tilburg, Netherlands
P: 013-4647647 F: 013-4647648 C: 31

**Poland:**

**NSK EUROPE LTD. REPRESENTATIVE OFFICE**

WARSAW Ul. Migdalowa 4/73, 02-796, Warsaw, Poland
P: 022-645-1525 F: 022-645-1529 C: 48

**NSK BEARINGS POLSKA S.A.**

OFFICE/PLANT Ul. Jagiellonska 109, 25-734 Kielce, Poland
P: 041-366-5001 F: 041-367-0500 C: 48

**NSK EUROPEAN TECHNOLOGY CENTER, POLAND OFFICE**

Ul. Jagiellonska 109, 25-734 Kielce, Poland
P: 041-366-5812 F: 041-366-5206 C: 48

**NSK STEERING SYSTEMS EUROPE (POLSKA) SP.ZO.O.**

CORPORATE Ul. Mariana Jachimowicza 17, 58-306 Walbrzych, Poland
OFFICE/PLANT P: 074-664-4101 F: 074-664-4104 C: 48

**NSK NEEDLE BEARING POLAND SP.ZO.O.**

OFFICE/PLANT UL. Jagiellonska 109, 25-734 Kielce, Poland
P: 041-345-2469 F: 041-345-0361 C: 48

**NSK POLSKA SP.ZO.O.**

KIELCE Ul. Karczowkowska 41, 25-711 Kielce, Poland
P: 041-347-5110 F: 041-347-5101 C: 48

**Spain:**

**NSK SPAIN S.A.**

BARCELONA C/Tarragona 161, 2ª Planta, 08014, Barcelona, Spain
P: 093-433-5775 F: 093-433-5776 C: 34

**Turkey:**

**NSK RULMANLARI ORTA DOGU TIC. LTD. STI.**

ISTANBUL 19 Mayis Mah. Ataturk Cad. Ulya Engin Is Merkezi No. 68 Kat. 6, Kozyatagi 34734, Istanbul, Turkey
P: 0216-355-0398 F: 0216-355-0399 C: 90

**United Kingdom:**

**NSK BEARINGS EUROPE LTD.**

PETERLEE 3 Brindley Road, South West Industrial Estate, Peterlee, Co. Durham SR8 2JD, U.K.
PLANT P: 0191-586-6111 F: 0191-586-3482 C: 44
NEWARK Northern Road, Newark, Nottinghamshire NG24 2JF, U.K.
PLANT P: 01636-605-123 F: 01636-605-000 C: 44

**NSK EUROPEAN TECHNOLOGY CENTRE**

NEWARK Northern Road, Newark, Nottinghamshire NG24 2JF, U.K.
P: 01636-605-123 F: 01636-643-241 C: 44

**NSK UK LTD.**

NEWARK Northern Road, Newark, Nottinghamshire NG24 2JF, U.K.
P: 01636-605-123 F: 01636-605-000 C: 44

**NSK PRECISION UK LTD.**

PLANT Northern Road, Newark, Nottinghamshire NG24 2JF, U.K.
P: 01636-605-123 F: 01636-605-000 C: 44

**NSK STEERING SYSTEMS EUROPE LTD.**

HEAD OFFICE Belmont Place, Belmont Road, Maidenhead, Berkshire SL6 6TB, U.K.
P: 01628-509-800 F: 01628-509-808 C: 44

PETERLEE 6/7 Doxford Drive, South West Industrial Estate, Peterlee, Co. Durham SR8 2PP, U.K.
PLANT P: 0191-518-6400 F: 0191-518-6421 C: 44

## ●North and South America

**NSK AMERICAS, INC. (AMERICAN HEADQUARTERS)**

ANN ARBOR 4200 Goss Road, Ann Arbor, Michigan 48105, U.S.A.
P: 734-913-7500 F: 734-913-7511 C: 1

**Argentina:**

**NSK ARGENTINA SRL**

BUENOS AIRES Garcia del Rio 2477 Piso 7 Oficina "A" (1429) Buenos Aires-Argentina
P: 11-4704-5100 F: 11-4704-0033 C: 54

**Brazil:**

**NSK BRASIL LTDA. www.br.nsk.com**

HEAD OFFICE Rua 13 de Maio, 1633-14th Andar-Bela Vista-CEP 01327-905 São Paulo, SP, Brazil
P: 011-3269-4786 F: 011-3269-4720 C: 55

SUZANO PLANT Av. Vereador Joao Batista Fitipaldi, 66, CEP 08685-000, Vila Maluf, Suzano, SP, Brazil
P: 011-4744-2527 F: 011-4744-2529 C: 55

BELO HORIZONTE Rua Ceara 1431-4th andar-sala 405-Funcionarios Belo Horizonte-MG, Brazil 30150-311
P: 031-3274-2591 F: 031-3273-4408 C: 55

JOINVILLE Rua Blumenau, 178-sala 910-Centro Joinville-SC, Brazil 89204-250
P: 047-3422-5445 F: 047-3422-2817 C: 55

PORTO ALEGRE Av. Cristovão Colombo, 1694-sala 202-Floresta Porto Alegre-RS, Brazil 90560 001
P: 051-3222-1324 F: 051-3222-2599 C: 55

RECIFE Av. Conselheiro Aguiar, 2738-6th andar-conj. 604-Boa Viagem Recife-PE, Brazil 51020-020
P: 081-3326-3781 F: 081-3326-5047 C: 55

**Canada:**

**NSK CANADA INC. www.ca.nsk.com**

HEAD OFFICE 5585 McAdam Road, Mississauga, Ontario, Canada L4Z 1N4
P: 905-890-0740 F: 800-800-2788 C: 1

TORONTO 5585 McAdam Road, Mississauga, Ontario, Canada L4Z 1N4
P: 877-994-6675 F: 800-800-2788 C: 1

MONTREAL 2150-32E Avenue, Lachine, Quebec, Canada H8T 3H7
P: 514-633-1220 F: 800-800-2788 C: 1

VANCOUVER 3353 Wayburne Drive, Burnaby, British Columbia, Canada V5G 4L4
P: 877-994-6675 F: 800-800-2788 C: 1

**Mexico:**

**NSK RODAMIENTOS MEXICANA, S.A. DE C.V. www.mx.nsk.com**

MEXICO CITY Av. Presidente Juarez No.2007 Lote 5, Col. San Jeronimo Tepetlacalco, Tlalnepantla, Estado de Mexico, Mexico, C.P.54090
P: 55-3682-2900 F: 55-3682-2937 C: 52

**United States of America:**

**NSK CORPORATION www.us.nsk.com**

HEAD OFFICE 4200 Goss Road, Ann Arbor, Michigan 48105, U.S.A.
P: 734-913-7500 F: 734-913-7511 C: 1

NSK AMERICAN TECHNOLOGY CENTER 4200 Goss Road, Ann Arbor, Michigan 48105, U.S.A.
P: 734-913-7500 F: 734-913-7511 C: 1

CLARINDA PLANT 1100 N. First Street, Clarinda, Iowa 51632, U.S.A.
P: 712-542-5121 F: 712-542-4905 C: 1

FRANKLIN PLANT 3400 Bearing Drive, Franklin, Indiana 46131, U.S.A.
P: 317-738-5000 F: 317-738-5050 C: 1

LIBERTY PLANT 1112 East Kitchel Road, Liberty, Indiana 47353, U.S.A.
P: 765-458-5000 F: 765-458-7832 C: 1

**NSK PRECISION AMERICA, INC. www.npa.nsk.com**

OFFICE/PLANT 3450 Bearing Drive, Franklin, Indiana 46131, U.S.A.
P: 317-738-5000 F: 317-738-5050 C: 1

SAN JOSE 780 Montague Expressway, Suite 508, San Jose, California 95131, U.S.A.
P: 408-944-9400 F: 408-944-9405 C: 1

**NSK STEERING SYSTEMS AMERICA, INC. www.nssa.nsk.com**

OFFICE/PLANT 110 Shields Drive, Bennington, Vermont 05201, U.S.A.
P: 802-442-5448 F: 802-442-2253 C: 1

ANN ARBOR 4200 Goss Road, Ann Arbor, Michigan 48105, U.S.A.
P: 734-913-7500 F: 734-913-7102 C: 1

**NSK-WARNER U.S.A., INC.**

TROY 3001 West Big Beaver Road, Suite 701, Troy, Michigan 48084, U.S.A.
P: 248-822-8888 F: 248-822-1111 C: 1

**NSK LATIN AMERICA, INC. www.la.nsk.com**

MIAMI 2500 NW 107th Avenue, Suite 300, Miami, Florida 33172, U.S.A.
P: 305-477-0605 F: 305-477-0377 C: 1

<As of July 2009>

For the latest information, please refer to the NSK website.

NSK Ltd. has a basic policy not to export any products or technology designated as controlled items by export-related laws. When exporting the products in this brochure, the laws of the exporting country must be observed. Specifications are subject to change without notice and without any obligation on the part of the manufacturer. Every care has been taken to ensure the accuracy of the data contained in this brochure, but no liability can be accepted for any loss or damage suffered through errors or omissions. We will gratefully acknowledge any additions or corrections.

NSK used environmentally friendly paper and printing methods for this publication.

CAT. No. E1102g 2009 E-10 Printed in Japan ©NSK Ltd. 2005