

MOTION & CONTROL™

NSK



NSK has always strived to uncover and respond to society's needs, offering new motion that no one has ever imagined. Today, NSK's Motion & Control™ can be found almost everywhere: from cars and planes to homes and high-tech factories — from massive construction machines to tiny medical instruments. NSK products are broadly split into the categories of bearings, automotive products, and precision machinery products (e.g. ball screws, linear guides, and Megatorque Motors™).

NSK products and solutions are vital to ensuring the reliable and efficient operation of machinery used around the world and for meeting environmental requirements, advancing automation, and implementing smart technologies.

Rolling bearings

Needle Roller Bearings, Thrust Roller Bearings, Spherical Roller Bearings, Tapered Roller Bearings, and Cylindrical Roller Bearings.



Product type

- Cylindrical Roller Bearings
- Tapered Roller Bearings
- Spherical Roller Bearings
- Thrust Roller Bearings
- Needle Roller Bearings

❖ 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.

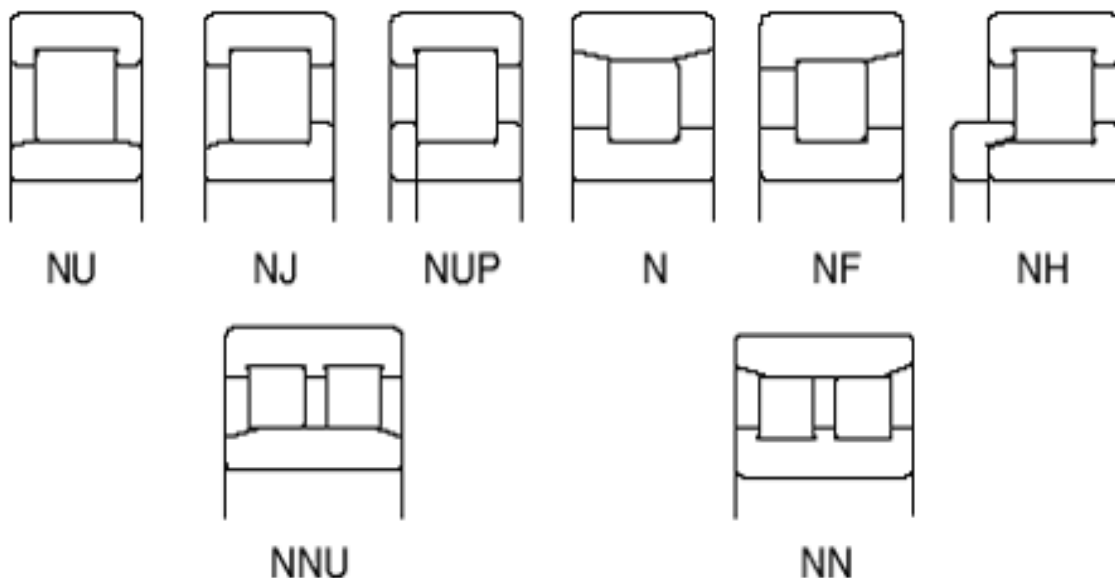
There are different types designated as NU, NJ, NUP, N, NF (for single-row bearings), NNU, and NN (for double-row bearings) depending on the design or absence of side ribs).

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.

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.

The inner ring loose rib of an NUP-type cylindrical roller bearing should be mounted so that the marked side is on the outside.

❖ 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 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; normal angle, medium angle, and steep angle.

Double-row and four-row tapered roller bearings are also available. Pressed steel cages are generally used.



❖ Thrust Roller Bearings

Available with cylindrical or spherical rollers, NSK's thrust roller bearings sustain only axial loads, but they are suitable for heavy loads and have high axial rigidity. Spherical thrust roller bearings contain convex rollers and have a self-aligning capability and are free of any influence of mounting error or shaft deflection. Standard cages are machined brass, where the E-type offers a pressed cage for high load capacity.

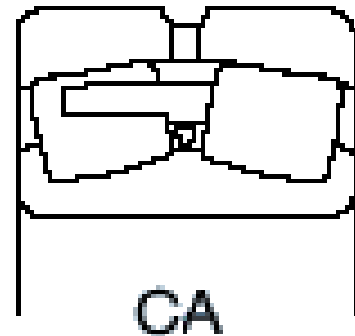
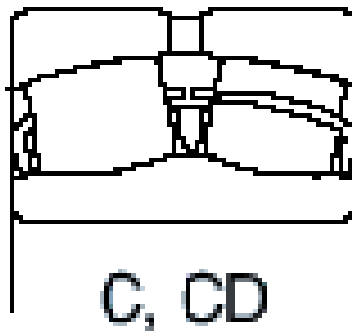
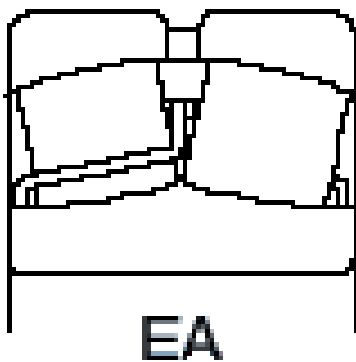


❖ Spherical Roller Bearings

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. Type EA has especially high load capacity, features low torque, and has a high-strength cage.

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.



❖ Needle Roller Bearings

Needle roller bearings are a bearing that is classified as either radial or thrust depending on the direction of the load being supported. Needle roller bearings include bearings whose rollers slightly exceed the size range of needle rollers as stipulated by ISO. Needle roller bearings include drawn cup and solid radial bearings, as well as application-specific cam followers, and roller followers. Thrust bearings include thrust needle bearings.



Ball bearings

Deep Groove Ball Bearings, Angular Contact Ball Bearings, Self-Aligning Ball Bearings, Thrust Ball Bearings, and N Series Thin-Section Ball Bearings Metric and Inch Designs.



Product type

- Deep Groove Ball Bearings
- Angular Contact Ball Bearings
- Self-Aligning Ball Bearings
- Thrust Ball Bearings
- N Series Thin-Section Ball Bearings Metric and Inch Designs

❖ Deep Groove Ball Bearings

NSK manufacture a full range of deep groove ball bearings. These bearings are the most common type and are used in a wide variety of applications.

NSK

NSK

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 (°)	-10 to +110°C	-10 to +110°C	-10 to +100°C

Note (†) 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.



Open Type



With Snap Ring



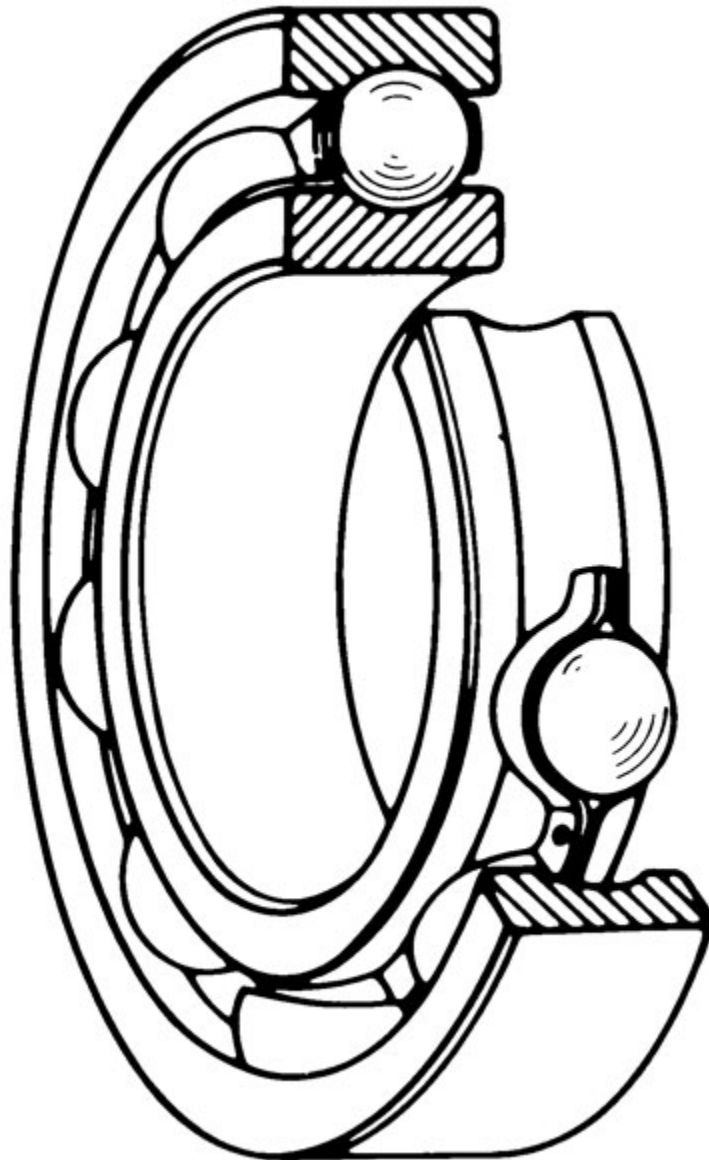
Shielded Type
(ZZ Type)



Non-Contact
Rubber Sealed
Type (VV Type)



Contact
Rubber Sealed
Type (DDU Type)



Single-Row Deep Groove Ball Bearings

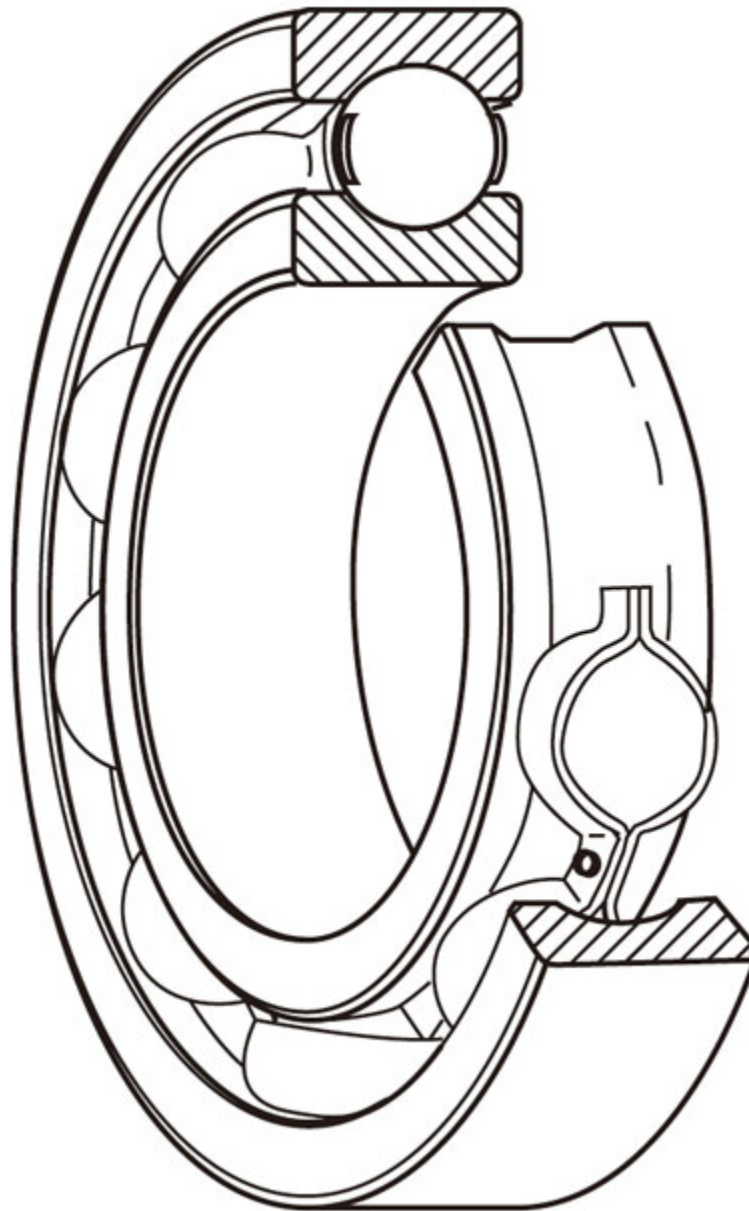
Pressed Steel Cages

Single-row deep groove ball bearings are the most common type of rolling bearings. Their use is very widespread.

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.

For big deep groove ball bearings, machined brass cages are used.

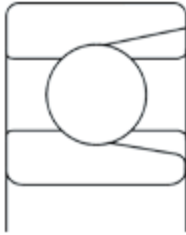
Machined cages are also used for high speed applications.



Extra Small Ball Bearings and Miniature Ball Bearings

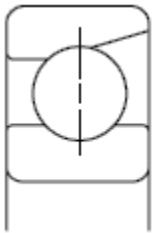
Miniature and instrument ball bearings can be divided into two basic types, deep groove and angular contact. The first (deep groove) can be further divided into the following five classes depending on their design details:

- Standard type
- Flanged outer ring
- Extended inner ring
- Expanded type in which one ring has a radial thickness that is larger than normal compared with the bearing width.
- Thin section type in which both rings are extra thin in the radial direction. They can also be classified as: open, shielded, or sealed.



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 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.

Deep groove ball bearings are the most widely used bearing type and are particularly versatile. They have low friction and are optimized for low noise and

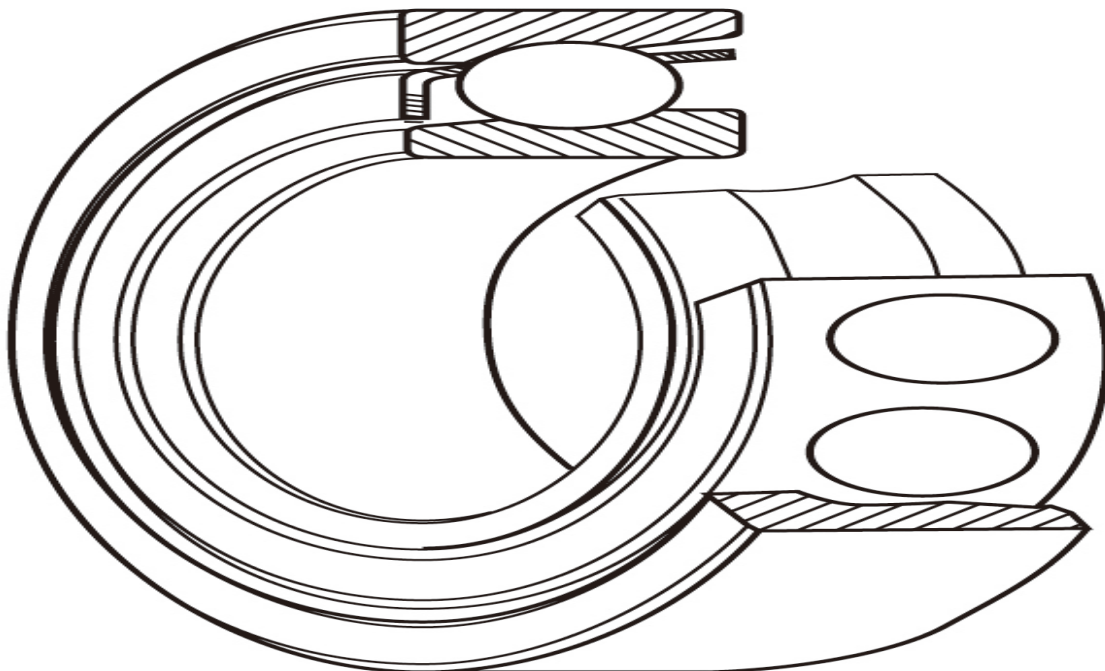
low vibration which enables high rotational speeds. They accommodate radial and axial loads in both directions, are easy to mount, and require less maintenance than other bearing types.

❖ Angular Contact Ball Bearings

The NSK range of angular contact ball bearings has been designed to meet the increasingly demanding requirements of original equipment manufacturers. These bearings have a contact angle so that they can sustain significant axial loads in one direction together with radial loads. Furthermore, since an axial component is generated when a radial load is applied, these bearings are generally used in pairs, triplex sets, quadruplex sets, or multiplex sets. NSK offers one of the most comprehensive ranges of angular contact ball bearings available.



Product List



Single-Row Angular Contact Ball Bearings (Pressed Steel Cages & Machined Brass Cages)

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.

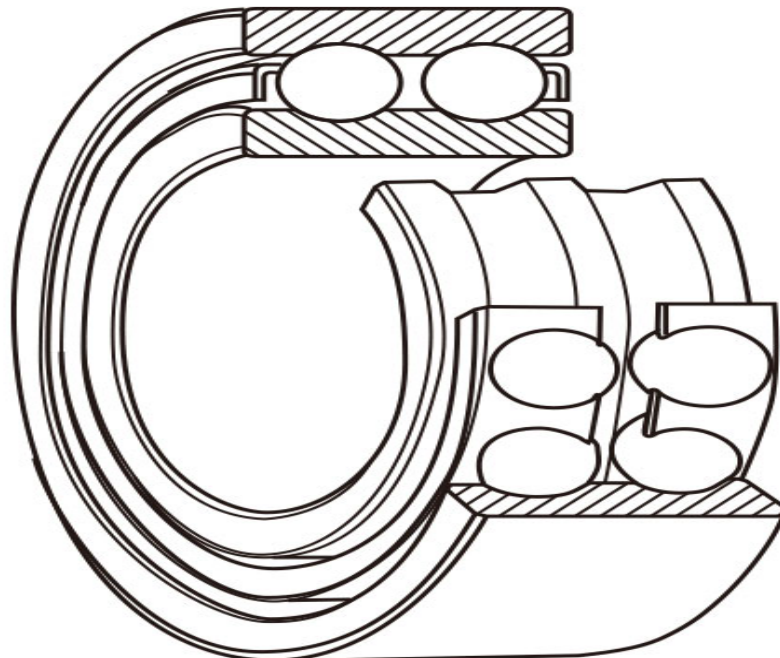
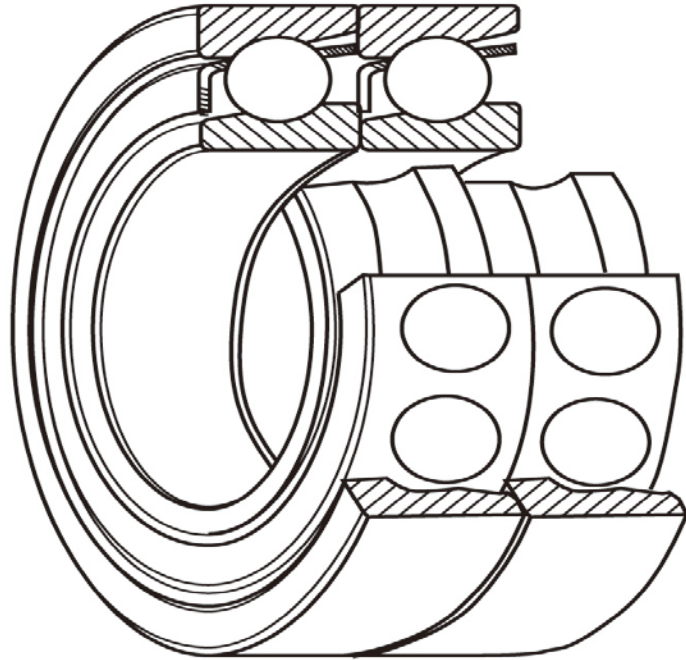
Since the rigidity of single-row angular contact ball bearings can be increased by preloading, they are often used in the main spindles of machine tools, for which high running accuracy is required.

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.

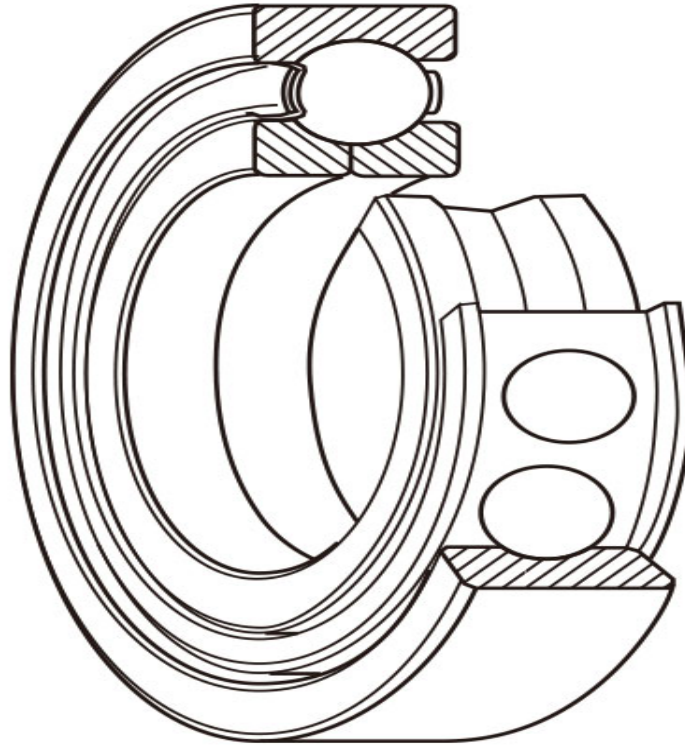
Matched Angular Contact Ball Bearings

The types and features of matched angular Contact Ball bearings are shown in Table 2



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.

❖ Self-Aligning Ball Bearings



This type of ball bearing is recommended when alignment of the shaft and housing is difficult and the shaft may flex. 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. Pressed steel cages are usually used. Since the contact angle is small, the axial load capacity is low. The permissible dynamic misalignment is approximately 0.07 to 0.12 radian (4 to 7 degrees) under normal loads. However, depending on the surrounding structure, such an angle may not be possible.

❖ Thrust Ball Bearings

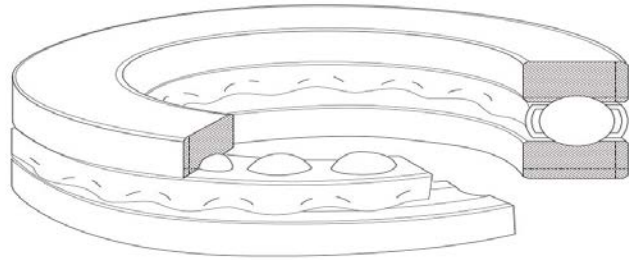
Thrust ball bearings are classified into those with flat seats or aligning seats depending on the shape of the outer ring seat (housing washer). They can sustain axial loads but no radial loads. For Single-Direction Thrust Ball Bearings, pressed steel cages and machined brass cages are usually used. The cages in Double-Direction Thrust Ball Bearings are the same as those in Single-Direction Thrust Ball Bearings of the same diameter series.



Product List

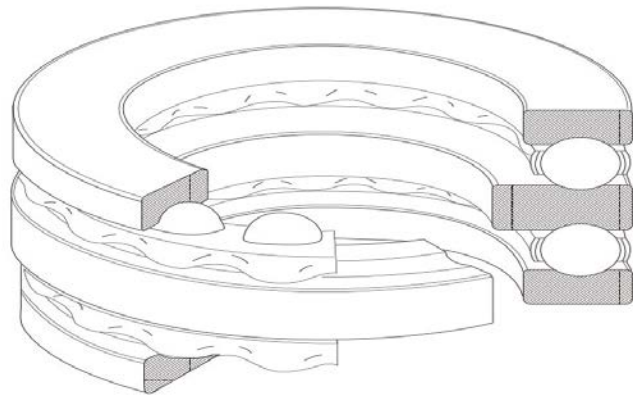
Single-Direction Thrust Ball Bearings

Axial loads in one direction can be sustained.



Double-Direction Thrust Ball Bearings

Axial loads in both directions can be sustained by shaft sleeve.

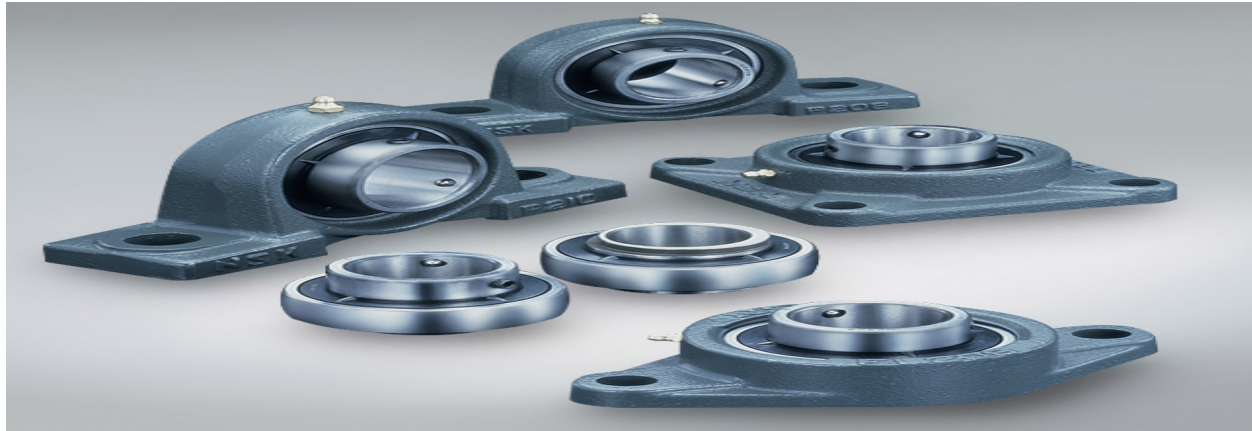


❖ N Series Thin-Section Ball Bearings Metric and Inch Designs



Extremely thin-section ball bearings and roller bearings contributing to downsizing, weight saving, and reduction of torque loss of robots, construction equipments, and industrial machinery.

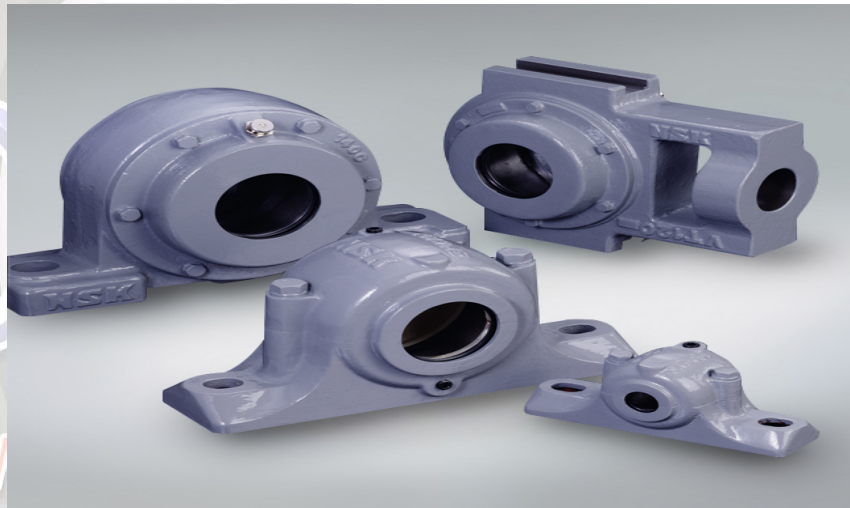
Bearing Units



Plummer Blocks

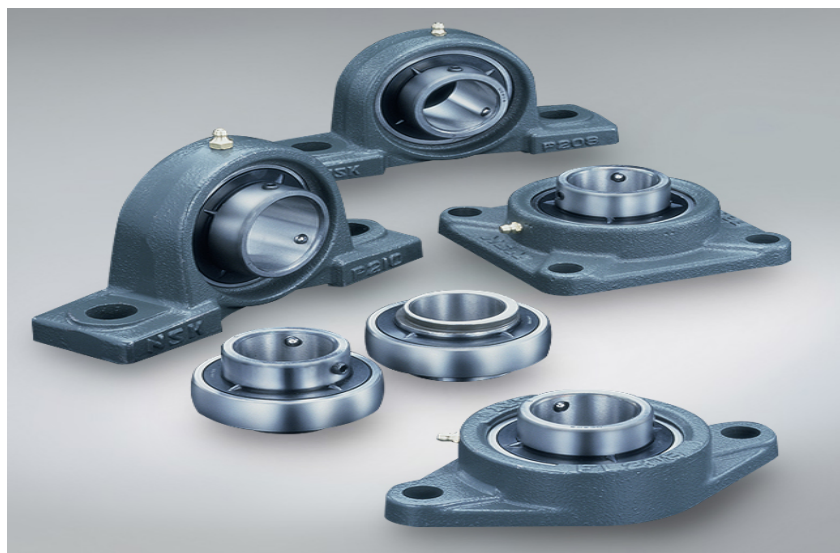
To ensure effective sealing, plummer blocks are available with a variety of special sealing options and end covers. Benefits include a facility for easy mounting and dismantling of pre-assembled shafts.

Plummer block housings can be used with high-capacity spherical roller bearings or self-aligning ball bearings. They are manufactured from high-strength cast iron as standard but are also available in cast steel or spheroidal graphite cast iron. The housings have a re-lubrication facility and can be used with either oil or grease lubrication.



Ball Bearing Units

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.

NSK



Darwish Oil Seal Center