

Basic Knowledge of Bearings

Here, we provide basic information on bearings.

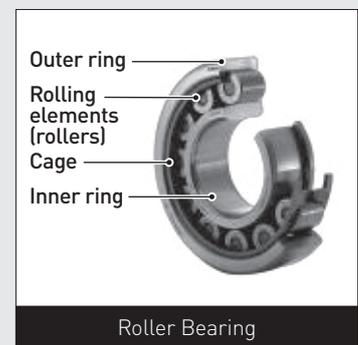
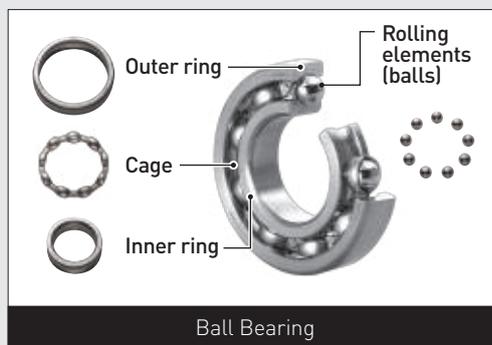
Structure and Function

Bearings—the staple of industry. A surprisingly large number of them can be found all around us. Bearings are used in all kinds of machinery, such as automobiles, airplanes, washing machines, refrigerators, air conditioners, vacuum cleaners, photocopy machines, computers and even in satellites far away in outer space. Bearings enhance the functionality of machinery and help to save energy. Around 100 bearings are used in the average household and 100 to 150 or more are in an automobile. They play an active role in making our lives smoother everywhere in the world, from everyday life to offices, factories and cutting-edge science laboratories. Bearings are utilized in tough environments and in hidden places, such as inside machinery, so we do not usually get the opportunity to see them. Nevertheless, bearings are crucial for the stable operation of machinery and for ensuring top performance.

The term *bearing* incorporates the meaning of “to bear,” in the sense of “to support,” and “to carry a burden.” This refers to the fact that bearings support and carry the burden of revolving axles.

Structure

The ball bearings and roller bearings pictured to the right represent two typical types of the most basic category of bearings, known as rolling bearings. Rolling bearings are made up of four elements—an outer ring, an inner ring, a cage as well as rolling elements—and have an extremely simple basic structure.



Function

The basic function of bearings is principally to reduce mechanical friction. Reducing friction means:

1. Machinery will run more efficiently
2. There will be less frictional wear, extending the operating life of the machinery
3. Preventing abrasion burn and avoiding mechanical breakdown

Bearings also contribute to lower energy consumption by reducing friction and allowing the efficient transmission of power. This is just one way in which bearings are environmentally friendly.

Types of Bearings

A brief overview of typical bearings is presented as follows.

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|--|---|---|--|
| <p>1 Deep groove ball bearing</p>  <p>This is the most widely used bearing in the world.</p> | <p>2 Angular contact thrust ball bearing</p>  <p>In this type, the rolling element meets the inner and outer ring raceways at a contact angle. This bearing can carry radial and axial loads.</p> | <p>3 Thrust ball bearing</p>  <p>Thrust ball bearings are capable of handling loads in the axial direction (axial loads). They can support heavy loads.</p> | <p>4 Cylindrical roller bearing</p>  <p>The rolling elements are the cylindrical roller type.</p> |
| <p>5 Tapered roller bearing</p>  <p>The rolling elements are of the tapered roller type. Because the rollers are tapered, this bearing is able to carry combined axial and radial loads.</p> | <p>6 Self-aligning roller bearing</p>  <p>This bearing has an automatic aligning function to compensate for minute misalignments between the inner and outer rings during operation.</p> | <p>7 Thrust needle bearing</p>  <p>This bearing is used in parts such as compressors that deliver the air in automobile air-conditioning units.</p> | <p>8 Cage and roller</p>  <p>This is one of several kinds of bearings used in vehicles' manual transmissions. It is required to be highly durable.</p> |



Did you know? —the Amazing World of Bearings

Playing a role in severe ultra-high and ultra-low temperature environments

High temperature

Medical CT scanners have become an essential part of keeping us healthy. High-performance bearings are used inside the CT scanner vacuum tubes that generate X-rays and are working in high-temperature environments reaching 300 to 500°C.



Low temperature

NSK bearings work in ultra-low temperature environments of -162°C in LNG (liquefied natural gas) pumps. Moreover, some bearings are used in environments of -250°C within the liquid fuel pumps of space rockets.



Ranging in size from an outer diameter of 6 m down to 2 mm

Largest

The Eurotunnel, which links England and France under the Strait of Dover, was dug using a tunnel boring machine that employed an extra large size bearing weighing 15 tons and having an outer diameter of 6 m.



Smallest

Miniature bearings are used in cooling fans and extra small motors, for example. The smallest bearings made by NSK have a bore diameter of 0.6 mm, an outer diameter of 2.0 mm and a thickness of 0.8 mm.



Astounding rotation speed of 400,000 times per minute

High-speed rotation

Dental handpieces used by dentists rotate at an astounding speed of 400,000 times per minute (6,600 times per second). The high-accuracy, low-vibration bearings used in these devices help reduce pain during medical treatment.



The balls that are the closest to being perfect spheres on Earth

Sphericity

With a sphericity of less than 0.05 micrometers, the balls that are closest to being perfect spheres on Earth are the balls used in bearings. If a 10-mm diameter ball were enlarged to the size of the Earth, any bumps would only be about the size of the Great Buddha of Kamakura, Japan (11 m).



Bearings used in different environments

Artificial satellites

With its vacuum, microgravity, severe temperature differences and cosmic radiation, the special environment of space differs from the environment of Earth. Even so, bearings must perform flawlessly here. NSK bearings also are used in the flywheels for artificial satellite attitude control.



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Wind turbines

Wind turbine generators are increasingly used as a source of renewable energy. The locations in which these are installed have expanded from coastlands and mountains to the ocean and are required to be maintenance-free under severe environmental conditions. Extra large size bearings, which can reach 2 m in size, are now required to provide greater reliability and durability than before.



Food processing machinery

Food processing machinery's greatest priority is the consideration of health and safety. Naturally, bearings must not contain any toxic substances for humans but must be resistant to water and dust, be able to withstand antiseptic chemicals and be unlikely to rust. Therefore bearings for special environments which meet these needs are also used.



SPACEA™ Series bearings for special environments