The main types of bearings

Bearings can be classified into the following types:

- Ball;
- Cylindrical roller bearings;
- Roller cone;
- Double-row self-aligning ball bearings;
- Needle bearings;
- Thrust Ball;
- Thrust roller.

Furthermore the ball bearings can be classified into:

- Radial - perceive mainly radial forces;
- Thrust-radial - perceive the radial and axial efforts;
- Thrust - perceive only the axial force;
- A four-point contact - axial load in both directions, or a combined radial load at simultaneous action of axial.

Ball bearings

Ball bearings are the most common type of bearings. They used ball rolling elements that roll in treadmills, made on the surfaces of outer rings (clips), and placed in stamped or machined or synthetic (polymeric) separator. With a point contact between the balls and running track at the moment of friction of this type of bearing is not great, so they can develop great speed.

Elements of ball bearings

<table>
<thead>
<tr>
<th>Outer ring</th>
<th>Inner ring</th>
<th>The bodies of rolling</th>
<th>Types of separators</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="outer_ring.png" alt="Image" /></td>
<td><img src="inner_ring.png" alt="Image" /></td>
<td><img src="rolling_bodies.png" alt="Image" /></td>
<td>polymeric</td>
</tr>
</tbody>
</table>

Some designs of ball radial bearings

a) Open standard single-row bearing design.  
b) Open single-row bearings with spherical outer ring.
c) Open single-row bearing with the thickened outer ring

d) Open double-row bearings standard design.

Some designs of ball radial thrust bearings

a) Single-row angular contact bearings standard design

b) Single-row bearing with a four-point contact.

c) Double-row angular contact bearing

d) Double-row angular contact bearing type HUB.
Application:
- Radial ball bearings - electric motors, household appliances, small high-speed motors, woodworking machines, medical equipment etc.;
- Angular contact ball bearings - machine spindles, motors, pumps etc.;
- A four-point contact – gearbox etc.

Cylindrical roller bearings

A distinctive feature of this type of bearing is used as a rolling element of cylindrical rollers, enclosed in cages made from different materials. Designed to carry the high radial loads in the absence of axial. Increased load capacity of cylindrical roller bearings (in 1.5-2 times higher than the same size ball bearings) is due to linear contact between the rollers and treadmills.

Elements of a cylindrical roller bearing

<table>
<thead>
<tr>
<th>Outdoor ring</th>
<th>Internal ring</th>
<th>The bodies of rolling</th>
<th>Types of separators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>polymeric</td>
</tr>
</tbody>
</table>

Cylindrical roller bearings can contain one or more rows of rolling bodies (in this capacity increases)

Some designs of cylindrical roller bearings

a) Single-row cylindrical roller bearing

b) Double-row cylindrical roller bearing

Application:
- Large motors;
- Axial wheels of railway transport;
- Guillotine;
• Powerful motors;
• Pumps;
• Spindles of machine tools etc.

**Roller tapered bearings**

Thanks to the use conical rollers arranged at an angle to the axis of rotation of the bearing, the type of bearings takes the combined load (the combined effect of radial and axial forces).

**Elements of a conical roller bearing**

<table>
<thead>
<tr>
<th>Outdoor ring</th>
<th>Internal ring</th>
<th>The bodies of rolling</th>
<th>Types of separator</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Depending on the application, tapered bearings are available with different designs. For example, to carry the large loads applied double-row tapered roller bearings, and to install a hub of cars - special units such as HUB, fully adjusted and lubricated.

**Some designs of roller tapered bearings**

a) Single-row cylindrical roller bearing.  

b) Double-row cylindrical roller bearing.

c) Double-row cylindrical roller bearing type HUB
Application:
- Helical, mechanical transmission;
- Axial wheels of railway transport;
- Hub for passenger and commercial vehicles etc.

Double-row self-aligning bearings

In these bearings the inner surface of the outer ring is made on the field, giving the ability to self-installing, which allows them to operate with considerable distortions of the inner ring on the outside, caused by a misalignment of seats, or shaft deflection from the action of loads. Double row rolling elements provides increased load capacity and offset the negative structural features.

These bearings are usually supplied with cages from:
- Steel - for use in the bearings of general application or when working at high temperatures;
- Plastics - for use in bearings of general application;
- Brass - to work in conditions of vibration.

Elements of double-row self-aligning bearings

<table>
<thead>
<tr>
<th>Outdoor ring</th>
<th>Internal ring</th>
<th>The bodies of rolling</th>
<th>Types of separator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>polymeric</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Steel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>brass</td>
</tr>
</tbody>
</table>

Available in two versions:
- Double-row ball - accept radial loads and operate at higher speeds;
- Double-row roller - perceive large radial and axial loads.
Some designs of double-row self-aligning bearings

a) Double-row self-aligning roller bearing  
b) Double-row self-aligning ball bearing

Application:
- Paper-making machines;
- Steel rolling mills;
- Big fans;
- Support wind power generators;
- Quarry machine etc.

Needle Bearings

The use of thin cylindrical rolling elements (needles) in the needle bearings can reduce the radial dimensions compared with conventional cylindrical roller bearings and to reduce costs, while maintaining approximately the same (or even more) the load carrying capacity but are limited by the speed of rotation.

Elements of needle bearings

<table>
<thead>
<tr>
<th>Outdoor ring</th>
<th>Internal ring</th>
<th>The bodies of rolling</th>
<th>Types of separator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>polymeric</td>
</tr>
</tbody>
</table>

Currently, needle bearings, being one of the most popular types of bearings (yielding only on the prevalence of ball bearings) are manufactured in various designs. For example, when the node are
several loads, use a combination of bearings, in which the needle bearing is combined with another type of bearing (or radial ball, or with angular contact ball or a hard-cylinder).

**Some designs of needle bearings**

* a) Single-row needle roller bearing.

* b) A combined needle bearing.

**Application:**

- Gearboxes;
- Internal combustion engines;
- Steering wheel system;
- Brake system;
- Bearing axes;
- Engines for motor boats;
- Power tool;
- Copiers;
- Fax machines;
- Units for moving a sheet of paper;
- Holders for paper towels;
- Fitness equipment etc.

**Thrust ball bearings**

These are a variety of ball bearings. Designed for perception only axial loads - radial load can not perceive.

**Elements of Thrust ball bearings**

<table>
<thead>
<tr>
<th>Outer ring</th>
<th>Inner ring</th>
<th>Body Rolling</th>
<th>Steel separator</th>
</tr>
</thead>
</table>
For the perception of axial load in one direction - apply single-row ball thrust bearings, in the case when the axial force bilateral efforts - double row ball thrust.

Some designs of thrust ball bearings

a) Single-row ball thrust bearing.  

b) Double row ball thrust bearing

Application:
- Vertical shafts;
- Rotate the center of machine tools,
- Jacks etc

Thrust roller bearings

These bearings are available in three forms:
- With cylindrical rollers - to work at high loads and low speeds;
- With conical rollers - to work in extremely high axial loads, the bumps and high speeds;
- With sphere conical rollers - have properties itself being installed and can carry large radial and axial loads.

Elements of thrust roller bearings.

<table>
<thead>
<tr>
<th>Outer ring</th>
<th>Inner ring</th>
<th>Body Rolling</th>
<th>Steel separator</th>
</tr>
</thead>
</table>

Some designs of thrust roller bearings

a) Hard spherical roller bearings.

b) Hard cylindrical roller bearings.

Application:
- Heavy duty vertical shafts;
- Thrust blocks piercing mills;
- Alternators;
- Extruders;
- Rotary units of metallurgical equipment etc.