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Bearings

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The use of bearings, simplistic as they may have been then, dates back to at least the ancient Egyptians, and perhaps even predated the invention of the wheel. Today bearings can be found wherever there is relative motion between two surfaces, which includes virtually everything from household appliances to industrial machinery.

WHAT IS A BEARING?

Bearings are **tribological components** that carry a load while in contact with and moving relative to another part. The movement may be sliding or rotating. There are basically two different types of bearings: plain bearings and roller bearings. Other types include fluid bearings that support their loads on a thin layer of gas or liquid; magnetic bearings that use magnetic fields to carry their loads; hinge-like flexure bearings in which the load is supported by a bending element; and jewel bearings used in watches and clocks.

PLAIN BEARING TYPES

Plain bearings, also referred to as bushes, bushings or sleeve bearings, are usually

cylindrical in shape and contain no moving parts.

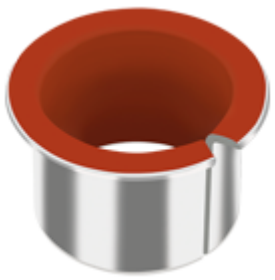
Standard configurations include cylindrical bearings for radial loads, flanged bearings for radial and light axial loads, thrust washers and flanged thrust washers for heavy axial loads and sliding plates of various shapes. They also can be made to custom designs, including special shapes, features (grooves, holes, notches, tabs, etc.) and dimensions.

Plain bearings are used for sliding, rotating, oscillating or reciprocating motion. In sliding applications they serve as slide bearings, bearing strips and wear plates. In these applications the sliding surfaces are usually flat, but can also be cylindrical, and movement is always linear rather than rotating. Rotating applications involve cylindrical surfaces and one or two directions of travel. Oscillating and reciprocating applications involve flat or cylindrical surfaces, but bi-directional travel.

Plain bearing construction may be solid or with a split joint (wrapped bearings) for easier installation. It is important to match the bearing to the application. High loads call for bearings with increased contact area and high load bearing capacity. Bearings with solid lubricants are designed to operate at higher temperatures than those lubricated with oil or grease. And high speed applications call for special lubricants to minimize heat build-up and friction.

Plain bearings are manufactured with different constructions and product selection depends on the operating conditions of the application and performance requirements.

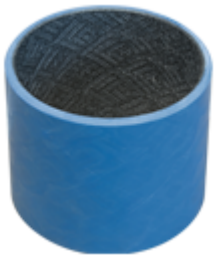
A VARIETY OF LOW FRICTION BEARING MATERIALS



Metal-polymer plain bearings consist of a metal backing, usually steel or bronze,

onto which is sintered a porous bronze layer that is then impregnated with PTFE and additives to obtain a running surface that offers anti-friction and wear resistant bearing properties. These bearings can operate dry or with external lubrication.

Plain bearings also may be made of **engineered plastics**, which provide excellent wear resistance and low friction in both dry and lubricated operating conditions. Being injection molded, they can be designed to almost any shape and produced from a variety of resins compounded with reinforcing fibers and solid lubricant. These bearings exhibit excellent dimensional stability, low coefficients of friction and good thermal conductivity.



Fiber reinforced composite bearings are another form of plain bearing that consists of a filament-wound, fiberglass-impregnated, epoxy backing with a variety of low-friction, wear-resistant bearing linings. This structure enables the bearings to support high static and dynamic loads, while their inert nature makes them suitable for corrosive environments.

Monometallic, bimetallic and sintered bronze plain bearings are designed for use in both land-based and submerged industrial applications under high load with slow speed movements. **Solid bronze bearings** impregnated with lubricant provide maintenance-free performance in high temperature applications, whereas monometallic and bimetallic bearings are designed for lubricated applications.

ROLLER BEARINGS

Rolling-element bearings utilize balls (ball bearings) or cylindrical rollers (roller or “needle” bearings). These elements are contained with bearing rings or “races”, where they facilitate motion with little resistance to sliding. Ball bearings, the most common type, can accommodate both radial and axial loads.

However, rolling element bearings are subject to failure modes such as brinelling, when the race is deformed by the rolling element due to load or the balls deform if

they are overloaded, false brinelling, due to repeated loads under static conditions, as well as wear due to insufficient lubrication with oscillatory movements. Designed for heavier loads, cylindrical roller bearings have greater contact with the races, spreading the load over a larger area. However, they are not well suited for applications involving thrust loads.

PLAIN BEARINGS VERSUS ROLLER AND NEEDLE BEARINGS

There are significant **differences between plain bearings and roller bearings** preventing them from being used interchangeably

- Because of their complex, multi-component design, precision construction and exacting installation, rolling-element bearings tend to be considerably more expensive than plain bearings
- Rolling-element bearings are better suited to applications requiring precise shaft location and/or extremely low friction
- Because of their greater contact area and conformability, plain bearings provide higher load capacity and resistance to high shock loads and edge loading
- Plain bearings compensate misalignment better than certain rolling-element bearings to reduce the impact from edge loading
- The slim, one-piece design of plain bearings enable to reduce housing size for substantial **space and weight savings**
- Plain bearings offer greater resistance to damage from oscillatory movements for **improved bearing life**
- Plain bearings are not subject to wear damage resulting from the skidding of the rolling-elements when operating at high speed and too low load and exhibit superior damping properties
- The absence of internal moving parts in plain bearings results in **quieter operation** and almost unlimited speed ratings under properly lubricated systems than rolling-element bearings
- Straightforward **installation of plain bearings** into simple machined housings virtually eliminates fitting damage compared with rolling-element bearings
- Non metallic plain bearings offer **improved corrosion resistance** compared

to standard rolling-element bearings
- Plain bearings can operate dry **eliminating the additional cost of lubricant systems**, lubricant and equipment downtime during maintenance
- Plain bearings can operate dry at high temperatures and with the presence of contaminants

Related links:

- **Wikipedia**: to learn more about the different uses of mechanical bearings

What are Plain Bearings?

Need advice?

Our experts are ready to help you find the right solution for your specific application.

Contact us