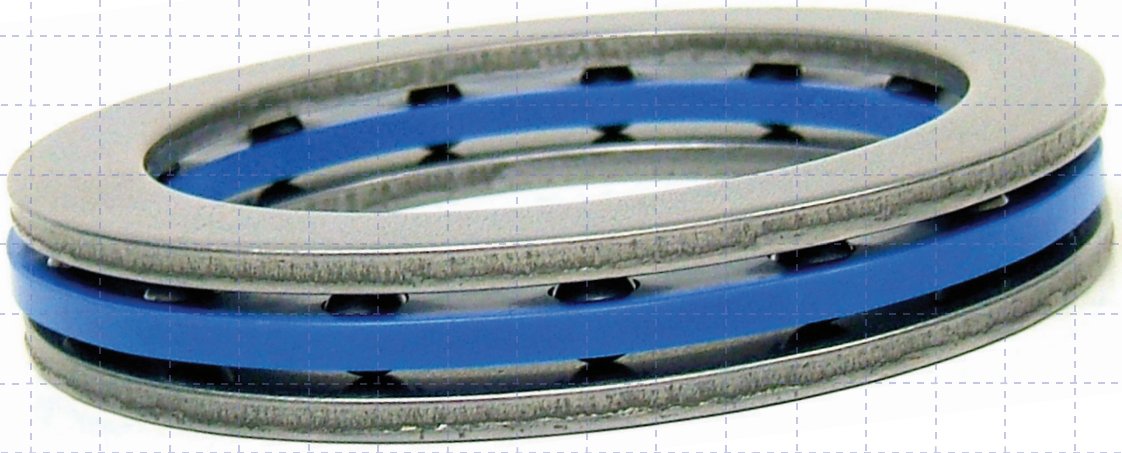
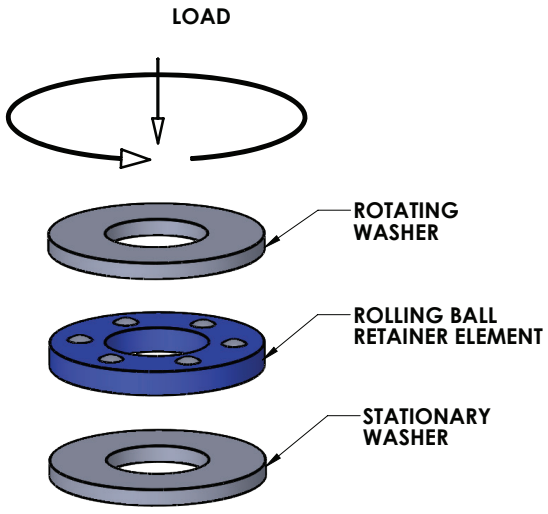
WHAT IS A THRUST BEARING

WHITE PAPER



Bearings literally make the world go round. They are called "bearings" because they "bear" the stress of an application's moving parts.

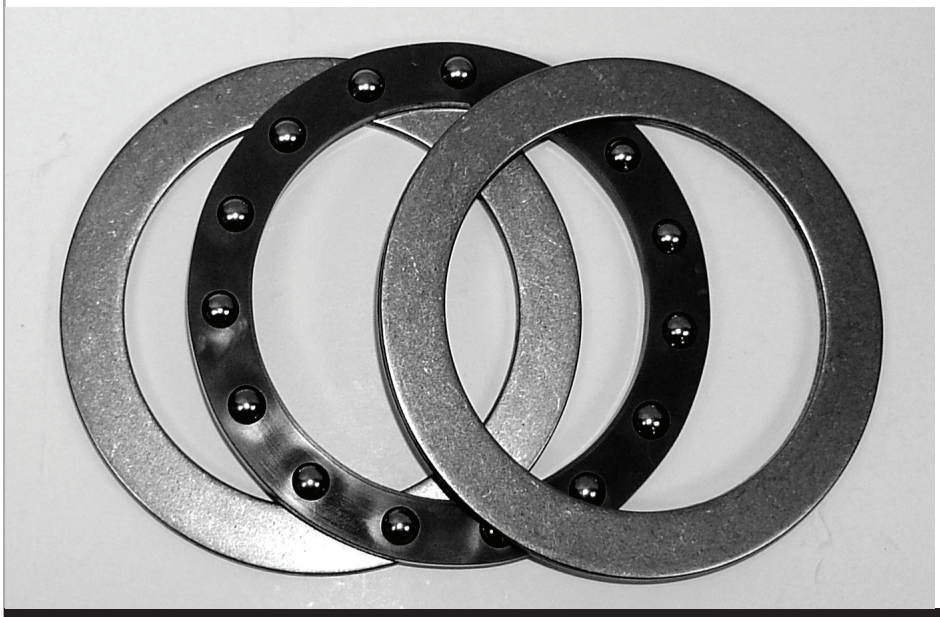
The two major bearing classifications are radial bearings and axial bearings. With radial bearings the force radiates out from the axis or is perpendicular to the axis. When axial bearings are in use the force is parallel to the line of the axis.

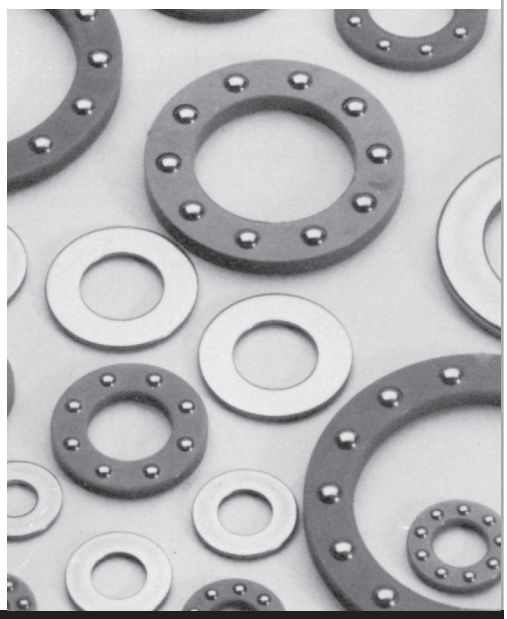


This paper is on Axial Bearings or Thrust Bearings. With Thrust bearings the force is parallel to the axis, meaning the force is pushing against the bearing. There are many thrust bearing applications but the primary application separates a rotating load from a non-rotating surface. Some examples would be: supporting a rotary table, absorbing the thrust of a boat's or airplane's propeller.

Types of Thrust Bearings:

- ***Ball thrust bearing:*** composed of bearing balls supported in a cage, can be used in multiple thrust applications with low to medium axial load.
- ***Cylindrical thrust roller bearings:*** consist of small cylindrical rollers arranged flat with their axes pointing to the axis of the bearing. They provide very good carrying capacity and are inexpensive but tend to wear due to the differences in radial speed and friction, which is higher than with ball bearings.
- ***Tapered roller thrust bearings:*** consist of small tapered rollers arranged so that their axes all converge on the bearing axis. The roller's length, the diameter of the wide and the narrow ends, and the angle of rollers need to be carefully calculated to provide the correct taper so each end of the roller rolls smoothly on the bearing face without skidding. A larger contact area can support greater thrust loads versus the ball type but are more expensive to manufacture.
- ***Spherical roller thrust bearing:*** use asymmetrical rollers of spherical shape, rolling inside a cage between two spherical-shaped raceway washers. They can accommodate combined radial and axial loads and also accommodate misalignment of the shafts. Spherical roller thrust bearings offer the highest load rating density of all thrust bearings.
- ***Fluid bearings:*** the axial thrust is supported by a thin layer of pressurized liquid, usually oil, and provides very low friction.
- ***Magnetic bearings:*** the axial thrust load is supported by a magnetic field. They are used where very high speeds and very low friction are required.
- ***Sliding thrust bearing:*** a non-rolling bearing with the thrust load taken up by low friction material such as: bronze, plastic, or even felt washers.



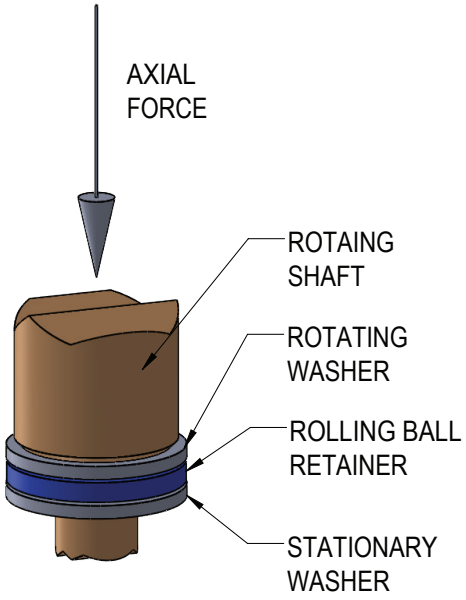


History of thrust bearings

The earliest recovered example of a rolling-element bearing is a wooden ball bearing supporting a rotating table from the remains of the Roman Nemi ships in Lake Nemi, Italy. The wrecks were dated to 40 BC. The first plain and rolling-element bearings were wood closely followed by bronze. Over their history, bearings have been made of ceramic, sapphire, glass, steel, bronze, other metals, and plastic. All of these variations are still used today.

How a thrust bearing works

An axial load is transferred from one bearing ring, through the rolling elements, to the other bearing ring.



Definition of load

An axial bearing load is a force that acts parallel to the axis of the shaft, sometimes referred to as a thrust load. Usually, you'll find an axial load directly in line with the shaft, like a drill. An axial load can be a reactive load offset from the shaft axis, like a bevel gear. Axial loads transfer force equally onto the rolling elements, thereby creating a balanced load distribution.

How to choose the correct thrust bearing

- ***Define the application:*** what is the design intended to do? This includes shaft dimensions or space dimension for the thrust bearing.
- ***Force or load against the bearing:*** What is the total pressure or load pressing on the thrust bearing?
- ***Thrust bearing preload:*** Bearing preload is a predetermined load applied to a bearing and is separate from application loads. Preload is a design consideration to increase rigidity, decrease vibration and sliding friction. Preload needs to be taken into consideration when evaluating total load.
- RPM of the application?
- Hours of operation or cycle time?
- Operating environment, does the operating environment require special consideration?

Once you have answered all the questions above you are ready to choose the proper bearing for your application. If you have a need for axial thrust bearings that are inexpensive, smooth, free-turning, and quiet please do not hesitate to give Torque Transmission a call at 440-352-8995.