



Rolling Contact Bearing Guide

An Online Continuing Education Course for Engineers

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Introduction

A bearing is a component that is used in machines to support rotating shafts with a minimum of friction. There are two types of bearings: rolling contact bearings and journal bearings. Rolling contact bearings use balls or rollers that rotate between inner and outer rings to allow shaft rotation. Journal bearings are one-piece static sleeves that mount in housings and fit closely to shafts to allow rotational movement. Both have many applications in today's industrial products. For instance, in the automotive industry, rolling contact bearings are used in transmissions while journal bearings are used in engines. This course deals with rolling contact bearings. It teaches all their important aspects from the basics to machine applications.

Types of Rolling Contact Bearings

There are two types of rolling contact bearings: ball bearings and roller bearings. Ball bearings, as the name suggests, use balls as the rolling element while roller bearings use rollers.

Ball bearings can be divided into two groups: radial ball bearings and angular contact ball bearings. (See Figures 1&2) Radial ball bearings support primarily radial loads which act perpendicular to the bearing axis. Angular contact ball bearings support both radial and thrust loads which act parallel to the bearing axis.

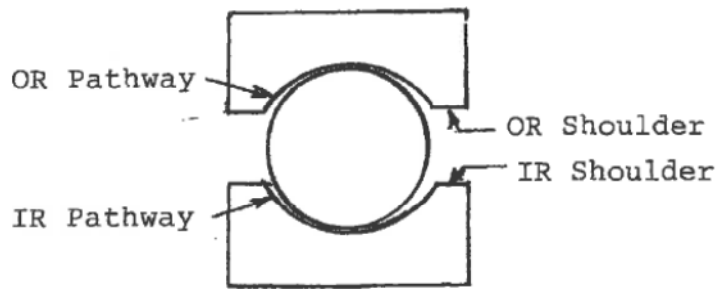
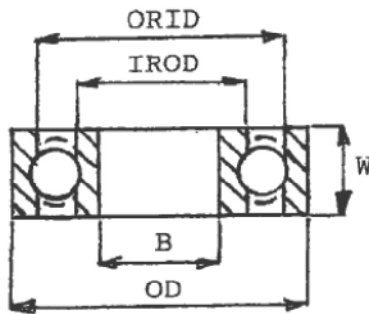
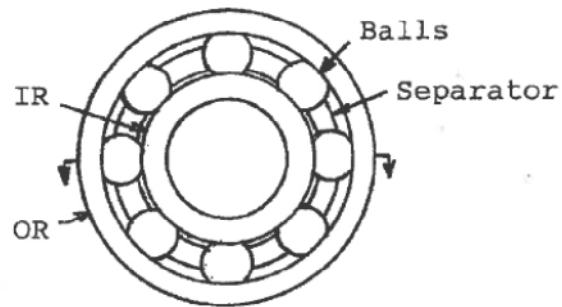
It can be seen from Figure 3 how radial loads act perpendicular to the bearing axis while thrust loads act parallel to the bearing axis. In some instances there are two radial loads acting on a bearing. The Pythagorean Theorem is used to calculate the resultant radial load. The radial load may be located between the two bearings as shown on Figure 3. Simple beam formula can be used to calculate the individual load on each bearing. It can be shown that the bearing located closer to the load supports the greater portion of the load. The load may also be located overhanging the two bearings. In this case, beam formula will show that the bearing located closer to the load actually supports more than the load itself.

Radial ball bearings are assembled by a method called *Conrad Assembly*. It starts by placing the inner ring off-center inside the outer ring, loading a limited number of balls in the crescent space, centering the balls, and installing the separator. (See Figure 4) Adding a loading groove to one or both rings allows the assembly of more balls. (Shown later) Radial ball bearings are non-separable. Angular contact bearings have separable rings and can be assembled with a full complement of balls increasing their capacity to support more load than radial ball bearings.

Roller bearings can be divided into two groups: cylindrical roller bearings and tapered roller bearings. (See Figures 5 & 6) Cylindrical roller bearings support primarily radial loads while tapered roller bearings support both radial and thrust loads. Cylindrical roller bearings and tapered roller bearings can be assembled with a full complement of rollers maximizing their capacity to support loads.

Figure 1

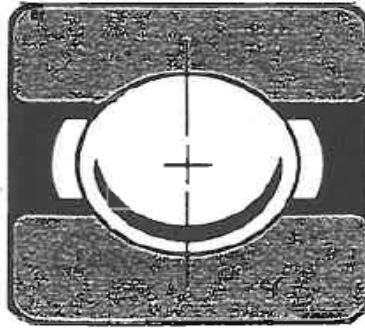
Ball Bearing Terminology



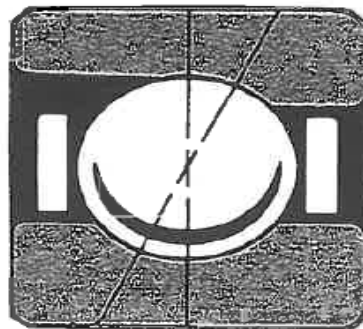
(Exaggerated View)

Figure 2

Ball Bearing Types



Radial Ball Bearing



Angular Contact Ball Bearing

Figure 3

Forces Acting on Bearings

