



# Ball Bearing Specialty Products

An Online Continuing Education Course for Engineers

**Course Number: M-1042**

**Credit: 1 Hour / 1 PDH / 1 CPD**

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## Introduction

Ball bearings are precision engineering components that are used primarily to support rotating shafts in mechanical equipment. They can be found in everything from personal computers to passenger cars. They are of simple design and can be manufactured in mass production quantities. They can support heavy loads over a wide speed range and do it virtually friction free. They come in many different sizes and shapes, are relatively inexpensive, and require little or no maintenance. They have predictable design lives and operating characteristics and are truly a valuable asset to today's rotating equipment industry.

Since ball bearings are of simple design and can support loads from multiple directions, they can be put to good use in a number of different shapes and sizes in both domestic and industrial products. This course will first discuss basic ball bearing design and characteristics. That will be followed by a review of some of the many variations of ball bearings that are used in today's products including some of the applications and advantages of each.

## Ball Bearing Description

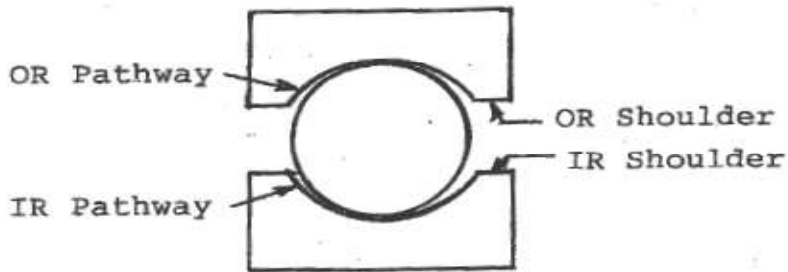
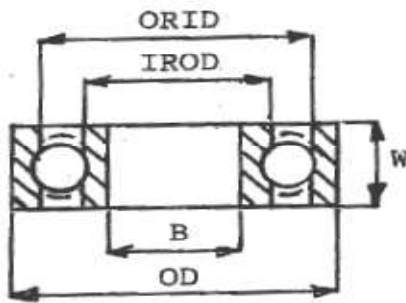
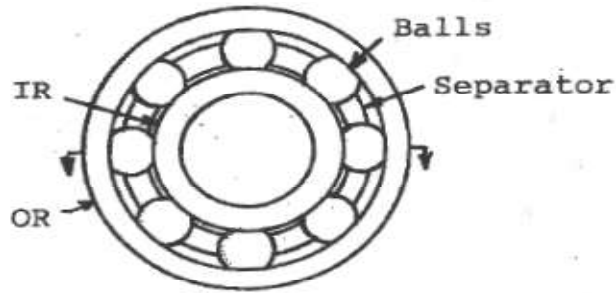
A ball bearing consists of an inner ring, an outer ring, a complement of balls, and a separator. (See Figure 1.) The inner ring outside diameter (IROD) and the outer ring inside diameter (ORID) have a groove in which the balls revolve around. This groove is commonly called the pathway. The raised surface on each side of the pathway is called the shoulder. The balls are held equally spaced around the annulus of the bearing by the separator. The basic dimensions of the bearing are the inner ring inside diameter or bore (B), the outer ring outside diameter (OD), and the width (W). The basic or standard ball bearing is called the “radial” ball bearing. It is assembled according to the “Conrad” method as shown on Figure 2. In order to accomplish this method of assembly; a limited number of balls can be designed into the bearing. This makes radial ball bearings able to support less load than ball bearings with a full complement of balls (discussed later).

Radial ball bearings support both radial and thrust loads. Radial loads act perpendicular to the bearing axis of rotation while thrust loads act parallel to the bearing axis of rotation. (See Figure 3.) This is a major advantage of using radial ball bearings over cylindrical roller bearings in that cylindrical roller bearings can support high radial loads but are restricted in the amount of thrust load they can support. Cylindrical roller bearings, as the name suggests, have rollers that are the shape of cylinders. The roller flat ends do not support thrust loads as efficiently as do the spherical balls in ball bearings. (See Figure 4.)

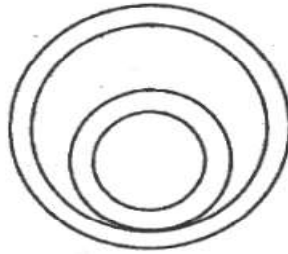
Most ball bearings fall into three different series based on their cross-sectional area with the larger sizes being able to support heavier loads. (See Figure 5.) Commonly used radial ball bearings come in a very large size range starting with a bearing having a 4 millimeter (mm) bore (.1575 inch), 16 mm OD (.6299 inch), and 5 mm width (.1969 inch) to a bearing with a 180 mm bore (7.0866 inch), 280 mm OD (11.0236 inch), and 46 mm width (1.8110 inch). Although most bearings are manufactured to metric dimensions; bearings made to inch dimensions are also available. (See Figure 6.)

Figure 1

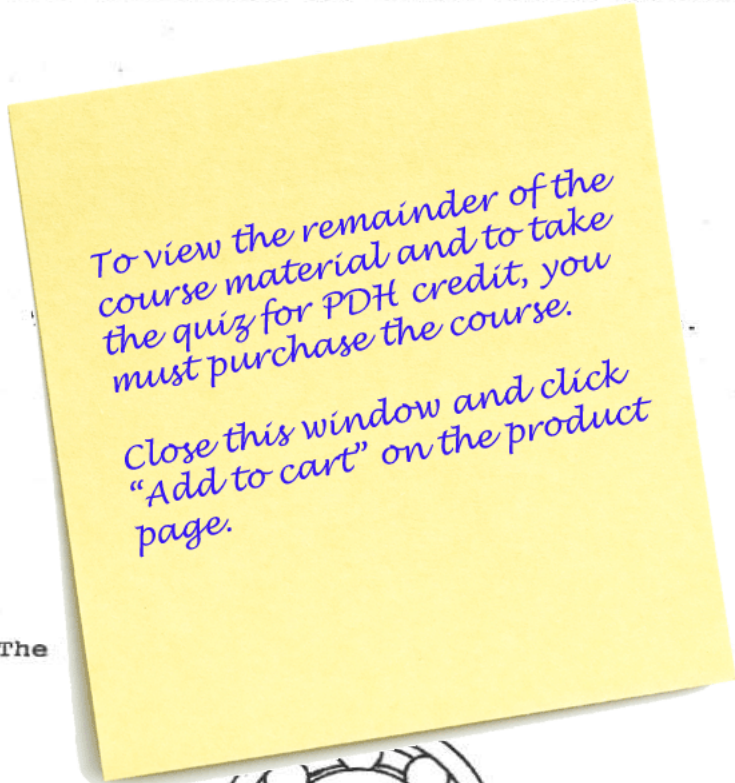
Radial Ball Bearing



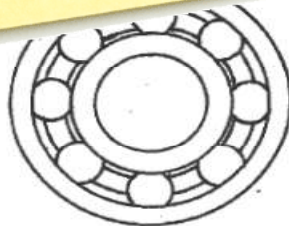
(Enlarged Section)



The IR is placed off-center inside the OR.



The



The separator is installed.

**Figure 2**  
**Conrad Assembly**