

1 Structures, Classification and Characteristics of rolling bearings

1.1 Structure

Rolling bearings (hereafter referred to as bearings) are general standard parts widely used in different kinds of mechanical equipments. Thanks to the low friction coefficient, only 1/10 of that of plain bearings, furthermore they are simple in structure, and easy to use and maintain, therefore, they have substituted for plain bearings in many fields such as machinery. The cost is reduced by specialized mass production, and international universal standards have been formulated. Generally a bearing consists of two rings (inner ring and outer ring), rolling element and cage. In addition, recently some professionals have pointed out that the lubricant is also a part of the bearing. (Figure 1.1)

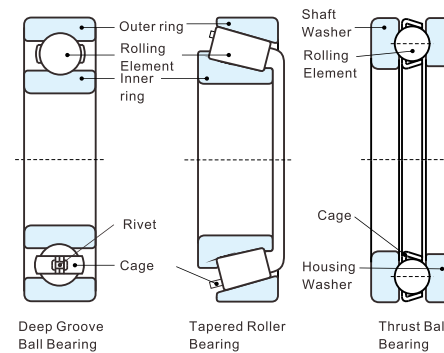


Fig. 1.1 Nomenclature for Bearing Parts

Many rolling elements are arranged between the inner ring and the outer ring, among which some intervals are kept by the cage to avoid contact and collision, thereby to run smoothly.

1) rings (Inner ring, Outer ring)

The part on the rings where the rolling element rolls is called raceway. The raceway of the ball bearing is also called groove. In general, the inner diameter of inner rings and the outer diameter of outer rings should fit the shaft and housing respectively while being mounted. The inner and outer rings for thrust bearing are called shaft washer and housing washer respectively.

2) Rolling Element

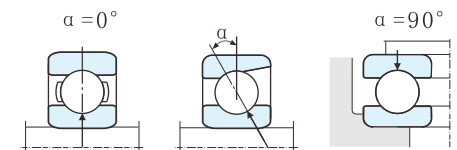
Rolling elements falls into balls and rollers. Rollers are subdivided into cylindrical rollers, tapered rollers, spherical rollers and needle rollers, etc. according to their shapes.

3) Cage

The cage envelops rolling elements to make them keep some intervals in the circumferential direction. Cages fall into pressed, machined, molded and pin cages in accordance with different processes. According to different materials, they are divided into steel, copper nylon, and phenolic resin cages.

1.2 Classification

Contact angle is expressed by α . The angle between common normal(the contact point between the rolling element and the raceway or the midpoint of the contact line) and the bearing Radial plane is called contact angle.



According to different contact angles, bearings fall into two kinds: Radial bearing ($0^\circ \leq \alpha \leq 45^\circ$) Thrust bearing ($45^\circ < \alpha \leq 90^\circ$).

According to the shapes of the rolling elements, bearings fall into: ball bearing and roller bearing. According to the structures of the rings, ball bearings fall into: deep groove ball bearing, angular contact ball bearing, thrust ball bearing, etc. According to the shapes of the rollers, roller bearings fall into: cylindrical roller bearing, needle roller bearing, tapered roller bearing, spherical roller bearing, etc. In a word, general bearings are classified as the following fig. 1.2 (a).