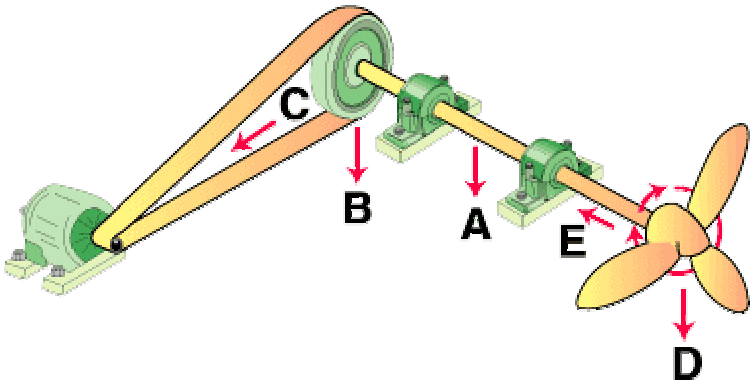
Rolling Element Bearings

Bearings enable designers to support shafts that are carrying loads of varying modes.



(picture borrowed from NTN Bearing Corporation's web site)

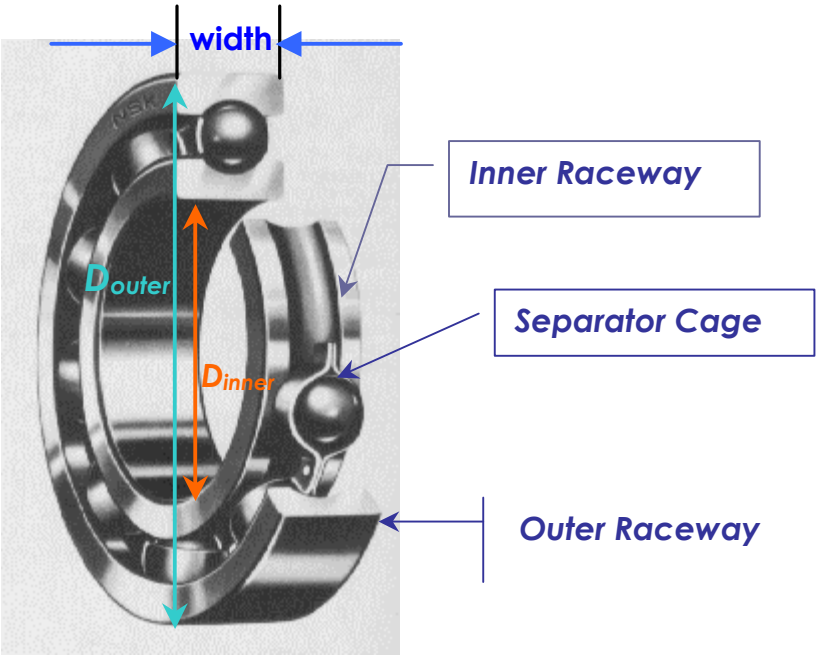
In the accompanying picture, the shaft is supported by bearings between the fan and the belt. The weight of the shaft and fan, the thrust created by the fan, the belt tension, along with the weight of the pulley must be considered when specifying an appropriate set of bearings for this application.

Our discussion of bearings will be limited to the rolling element bearings. More specifically, we will learn about ball bearings and roller bearings.

When an engineer orders a bearing from a vendor, he or she must provide the vendor with some basic information:

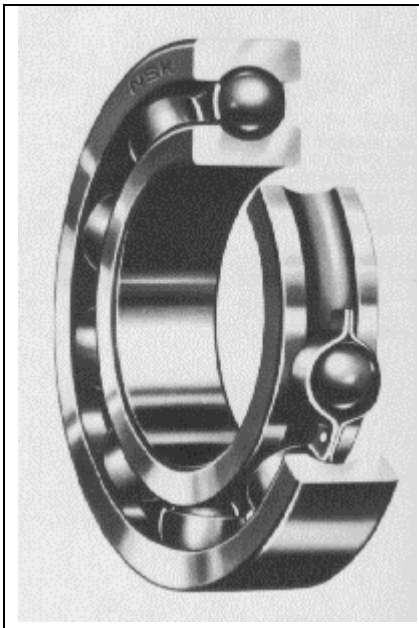
What width is needed?
What bore size is needed?
What static load must the bearing carry?
What dynamic load must the bearing carry?
What is the optimal speed that the bearing wil be subjected to?
What types of loads will be carried?

Features common to all rolling element bearings are labeled on the deep-grooved radial bearing shown below.



D_{inner} is often referred to as the **bore**.

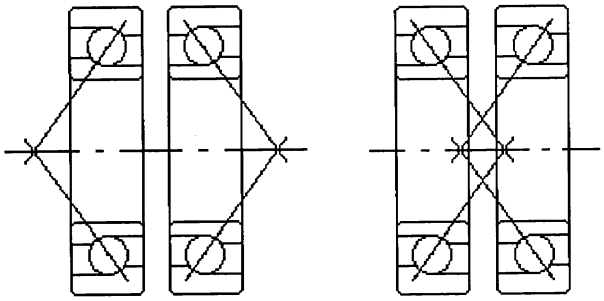
The decision as to which type of bearing is best to use is based on the types and magnitudes of loadings that the bearing has to handle. Some bearings handle purely radial loads, some handle purely axial loads, and some handle combinations of the two.

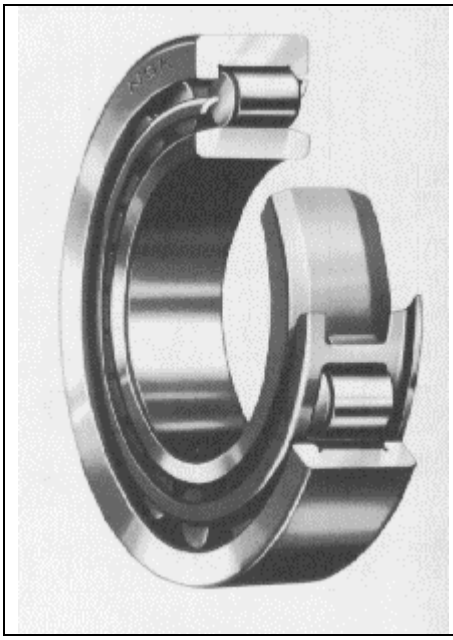
	This bearing is called a **deep grooved ball bearing**. It is composed of an outer raceway, an inner raceway, balls, and a separator. The deep grooved ball bearing is the most widely used of bearings. This bearing can handle radial loads as well as moderate axial loads. These bearings are also called Conrad bearings because of the way they are assembled

This bearing is called an **angular contact radial ball bearing**. These bearings are better at carrying thrust loads; they are designed to ride high on one of the raceways.

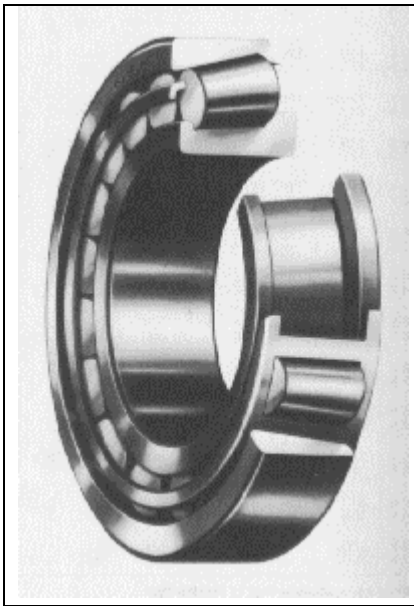
The angular contact radial ball bearing can handle moderate radial loads as well.

Angular contact bearings should be used in pairs.

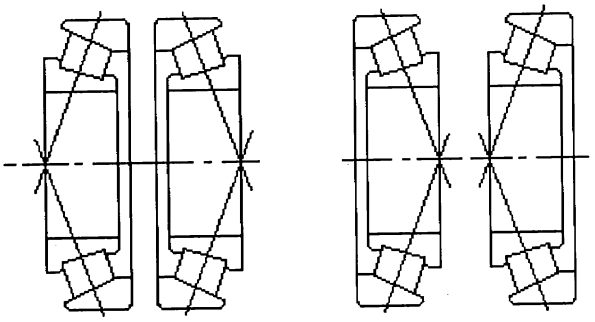




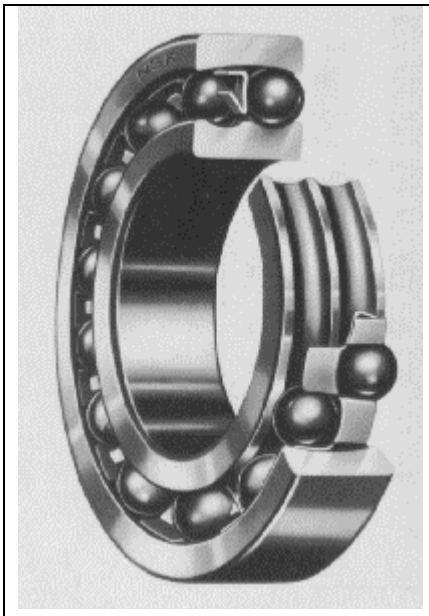
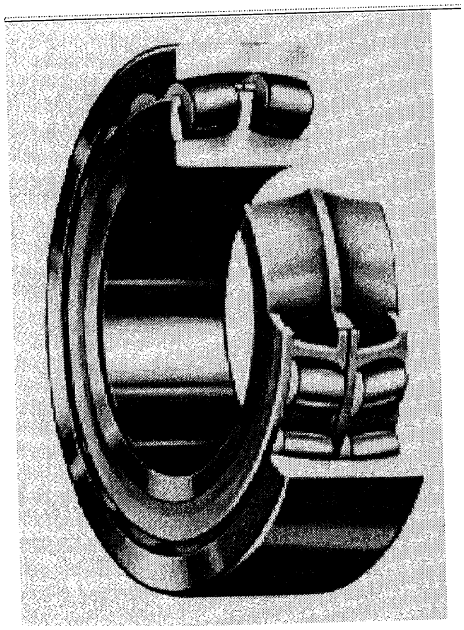
The bearing shown is a **cylindrical roller bearing**. Roller bearings can handle radial loads and some types of roller bearings can handle thrust loads as well. The load carrying capacity of cylindrical roller bearings is greater than that of roller bearings.



This bearing is called a **tapered roller bearing** it can handle radial loads as well as axial loads. Because of the taper on the rollers, radial loads will generate axial forces; tapered roller bearings are used in pair to counter the effect.



These bearings are called thrust bearings—they take the thrust load along a shaft's axis.

	This bearing is a self-aligning ball bearing. Self aligning-ball bearings are designed to allow for some misalignment of the shaft. The load carrying capacity of these bearings is very light and only small axial loads can be carried.
	Self-aligning spherical roller bearings are preferable for handling combined radial and axial loads while accommodating shaft misalignment.