

# FACTFILE: GCE TECHNOLOGY & DESIGN

## 1.47 BEARINGS



### Bearings

#### Learning outcomes

Students should be able to demonstrate knowledge and understanding of:

bearings to include:

- plain, rolling element, self-aligning, thrust, taper and bearing housing.

#### Course Content

Students need to know about bearings. They should have knowledge and understanding of why bearings might be used in machines and have an understanding of the consequences of not using bearings in mechanical industrial situations. They should have knowledge of different types of bearings and be able to outline and justify what types of bearings are used in an engineering application.

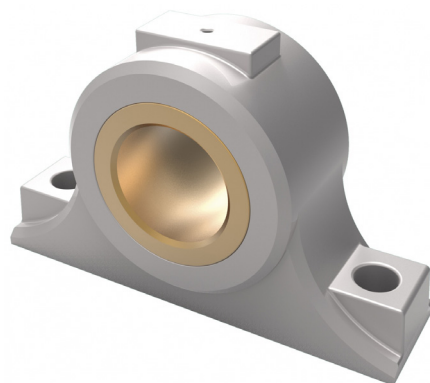
#### What do bearings do?

Machines have moving parts. Parts or components that revolve on a machine, such as a shaft on a lathe or a drive shaft in a motor vehicle need to be supported as they are revolving. A bearing enables a component to rotate and be supported whilst reducing friction.

#### Plain bearing

If a rotating shaft is supported then heat at the point of support is created in the form of friction. If the friction is allowed to continue, then the components will get very hot and in time the components around the support might fail. A bearing, positioned at the support can help to reduce friction, reducing the heat generated and reducing the wear that might occur.

The simplest type of bearing is the “plain” bearing. A plain bearing is where a rotating shaft is positioned in a hole and the shaft is allowed to rotate in that hole. In order to reduce the friction and consequently wear, a bearing material is put, in the form of a sleeve between the rotating shaft and the hole. The bearing material has a low coefficient of friction, thus allowing the shaft to rotate easily. That material might be bronze or nylon. Plain bearings have advantages and disadvantages. They are relatively cheap. They are compact and lightweight and can take quite high loadings, do not need to be lubricated and can be replaced reasonably easily.



Plain bearing

## Rolling element (or rolling) bearings

Plain bearings use a bearing material to help reduce friction and allow a shaft to rotate in a hole. Rolling element bearings use rollers or balls that rotate to reduce friction. The rollers or balls are held in a holder called a “race” where they are held in position but allowed to rotate. The race is placed between bearing rings. This allows the inner ring to spin freely within the outer ring with very little friction or resistance. The outer ring is attached to the support and the inner to the rotating shaft.



Ball Bearing

## Self-aligning bearings

Self-aligning bearings take into account small amounts of misalignments between the rotating shaft and any support that may be required. Self-aligning bearings have two rows of rollers and a single race. Having two rows of balls allow the bearing to take into account any small variations in misalignment. These types of bearings can be useful when as load is applied, the misalignment increases.



Self-aligning bearings

The illustration clearly shows the two sets of rollers in the self-aligning bearing and demonstrates how small amounts of misalignment can be taken into consideration with such a bearing.

## Thrust and Taper Bearings

A thrust bearing is a type of roller bearing. As with all bearings, the idea is that a shaft is able to rotate with reduced friction within the bearings. With a thrust bearing they are designed specifically to deal with what is referred to as “Axial Load”. The Axial Load is the thrust that is applied along the axis of the shaft as it is rotating. The axial thrust is taken by hardened steel balls, supported by a cage, and moving in circular grooves ground in hardened steel plates

Tapered thrust bearings consist of a series of small tapered rollers that are arranged so that if a line were drawn along the centre line of each roller they would meet at a point on the axis of the bearing. Thrust bearings are commonly used in vehicles stub axles for example, to support the wheels.



Thrust bearing



Bearing housings come in a range of shapes and sizes and depend on the type of job for which the bearing is required.

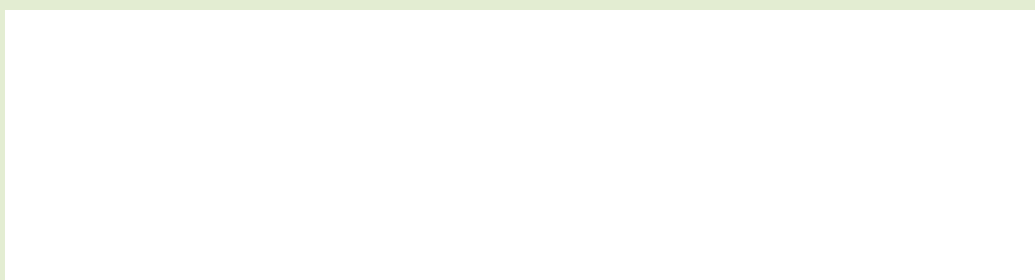
Each bearing type possesses a different housing depending on the load and speed of revolution. Material selection and method of lubrication are important factors to be considered when selecting a bearing.

## ? Revision Questions

- 1** Discuss the advantages and disadvantages of using plain bearings in an industrial situation. State two types of bearing material that could be used in a plain bearing.

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- 2** Draw a sectional sketch of a roller bearing supporting a horizontal rotating drive shaft. Indicate using arrowheads the directional forces that this bearing is designed to support.



- 3** Explain and justify the uses of thrust bearings in the drive system of a motor vehicle.

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