Shaft: The term shaft refers not only to diameter of a circular shaft to any external dimension on a component.

Hole: This term refers not only to the diameter of a circular hole but to any internal dimension on a component

Basics of Fit

A fit or limit system consists of a series of tolerances arranged to suit a specific range of sizes and functions, so that limits of size may. Be selected and given to mating components to ensure specific classes of fit. This system may be arranged on the following basis:

1. Hole basis system
2. Shaft basis system.

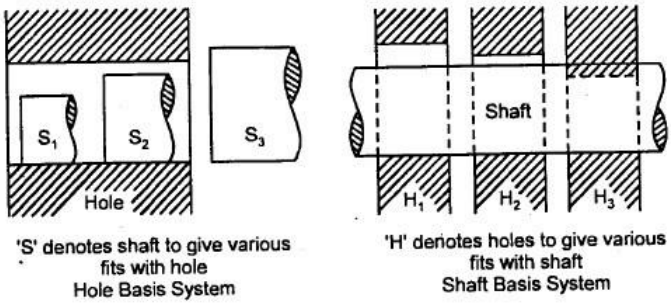

Fig 1.6 Nominal & Basic Dimension

Hole basis system:

'Hole basis system' is one in which the limits on the hole are kept constant and the variations necessary to obtain the classes of fit are arranged by varying those on the shaft.

Shaft basis system:

'Shaft basis system' is one in which the limits on the shaft are kept constant and the variations necessary to obtain the classes of fit are arranged by varying the limits on

the holes. In present day industrial practice hole basis system is used because a great many holes are produced by standard tooling, for example, reamers drills, etc., whose size is not adjustable. Subsequently the shaft sizes are more readily variable about the basic size by means of turning or grinding operations. Thus the hole basis system results in considerable reduction in reamers and other precision tools as compared to a shaft basis system because in shaft basis system due to non-adjustable nature of reamers, drills etc. great variety (of sizes) of these tools are required for producing different classes of holes for one class of shaft for obtaining different fits.

Systems of Specifying Tolerances

The tolerance or the error permitted in manufacturing a particular dimension may be allowed to vary either on one side of the basic size or on either side of the basic size. Accordingly two systems of specifying tolerances exit.

3. Unilateral system
4. Bilateral system.

In the unilateral system, tolerance is applied only in one direction.

	+ 0.04		-0.02
Examples:	40.0	or	40.0
	+ 0.02		-0.04

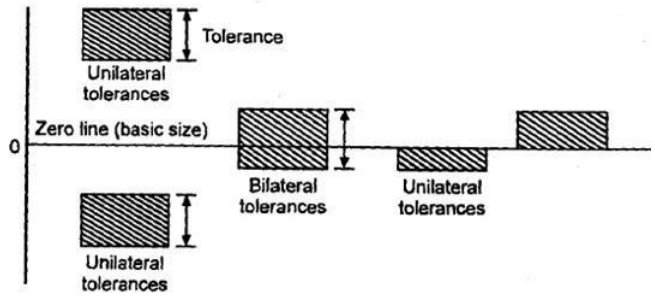

Fig 1.7 Types of Tolerances

In the bilateral system of writing tolerances, a dimension is permitted to vary in two directions.

$^{+ 0.02}$
Examples: $40.0^{- 0.04}$

INTERCHANGEABILITY

It is the principle employed to mating parts or components. The parts are picked at random, complying with the stipulated specifications and functional requirements of the assembly. When only a few assemblies are to be made, the correct fits between parts arc made by controlling the sizes while machining the parts, by matching them with their mating parts. The actual sizes of the parts may vary from assembly to assembly to such an extent that a given part can fit only in its own assembly. Such a method of manufacture takes more time and will therefore increase the cost. There will also be problems when parts arc needed to be replaced. Modern production is based on the concept of interchangeability. When one component assembles properly with any mating component, both being chosen at random, then this is interchangeable manufacture. It is the uniformity of size of the components produced which ensures interchangeability.

The advantages of interchangeability are as follows:

5. The assembly of mating parts is easier. Since any component picked up from its lot will assemble with any other mating part from another lot without additional fitting and machining.
6. It enhances the production rate.
7. The standardization of machine parts and manufacturing methods is decided.
8. It brings down the assembling cost drastically.
9. Repairing of existing machines or products is simplified because

component parts can be easily replaced.

10. Replacement of worn out parts is easy.