



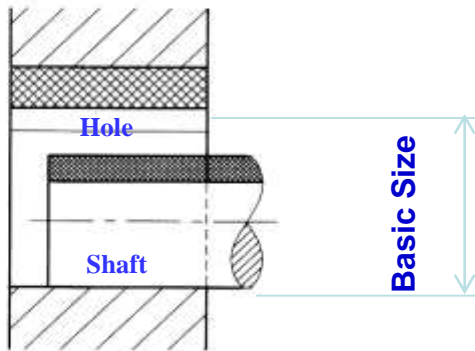
**Lesson No.
18**

**Week No.
08**

**Lesson Name
Limit, Fit, Tollerance**

LIMITS, FITS & TOLERANCE

- ❖ Terminology:- The terms related to limit system as per BIS are as below;

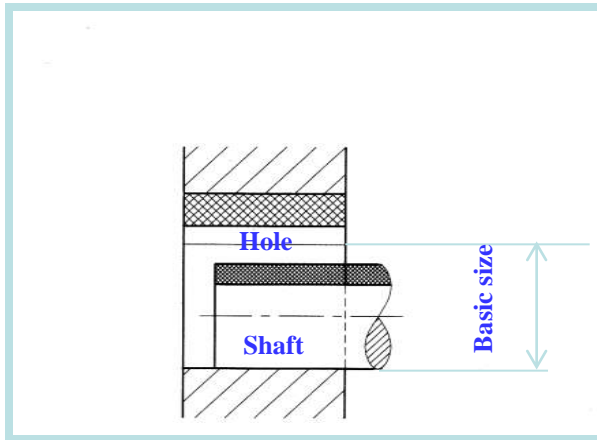


- ❖ Size:- It is a number expressed in a particular unit in the measurement of length.

- ❖ Basic Size:- It is the size based on which the dimensional deviations are given.

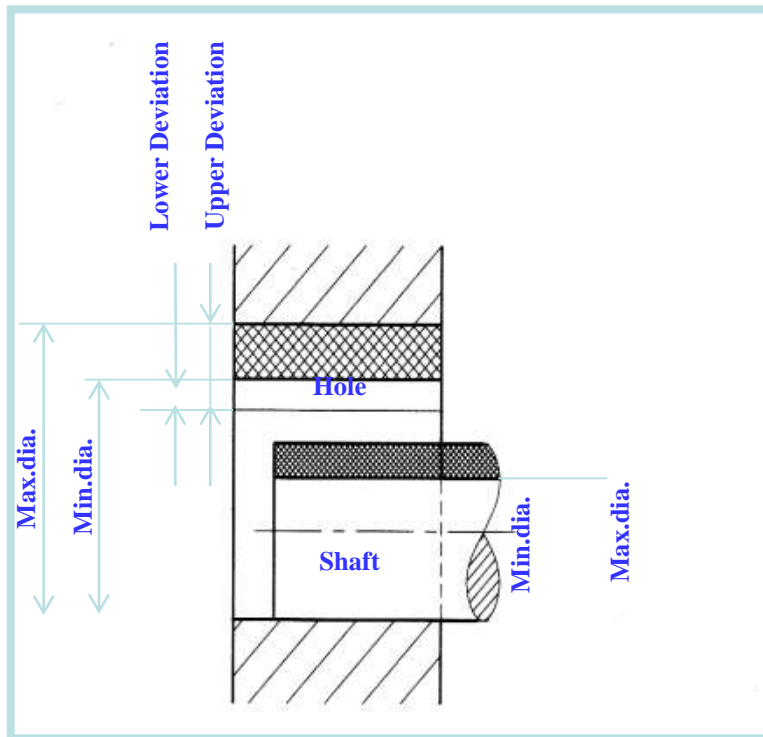
- ❖ Actual Size:- It is the size of the component by actual measurement after it is manufactured. It should lie between the two limits of size.

❖ Limits of size:- These are the extreme permissible sizes within which the operator is expected to make the component. Maximum limit of size is the greater of the two limit size, whereas the Minimum limit of size is the smaller of the two limit of size.



❖ Hole:- In the B.I.S. system of limits and fits, all internal features of a component including those which are not cylindrical are designated as 'Hole'.

❖ Shaft:- In the B.I.S. system of limits and fits, all external features of a component including those which are not cylindrical are designated as 'Shaft'.

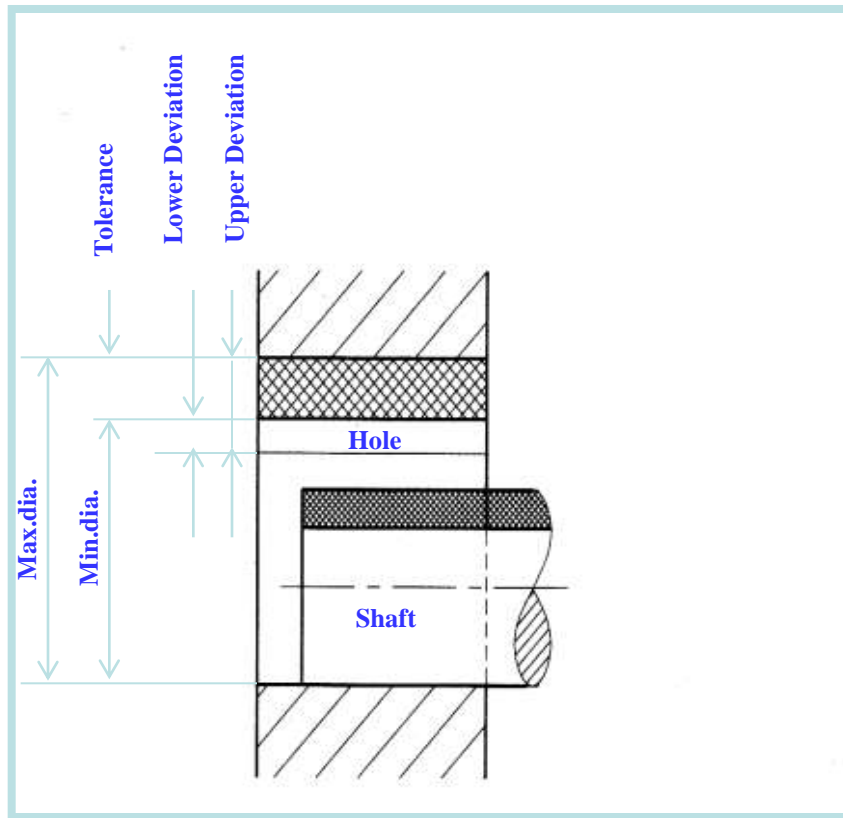


❖ Deviation:- It is the algebraic difference between a size, to its corresponding basic size. It may be positive, negative or zero.

❖ Upper Deviation:- It is the algebraic difference between maximum limit of size and its corresponding basic size.

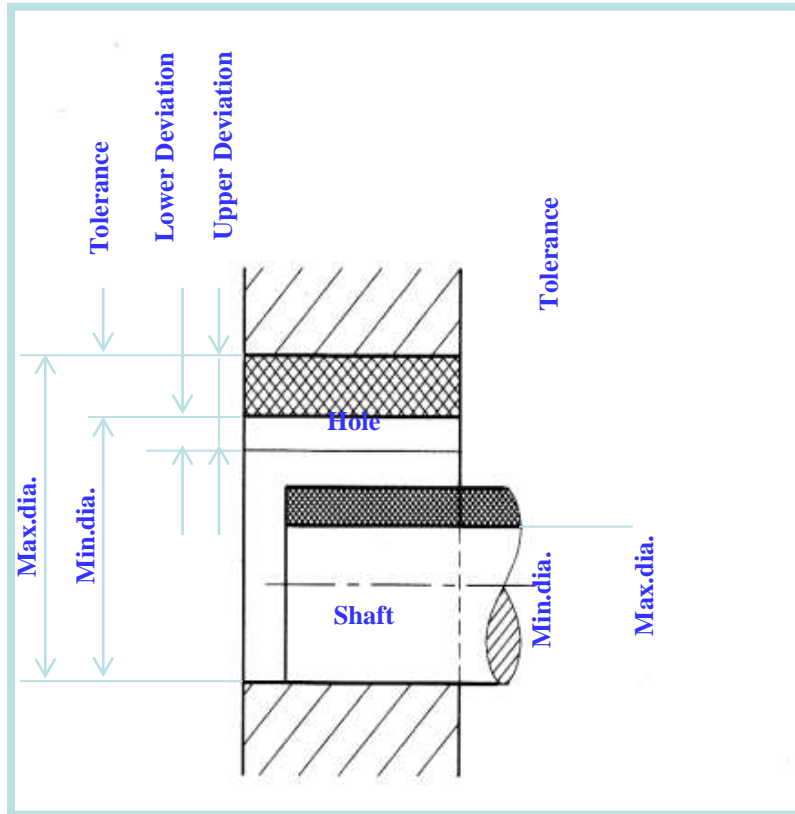
❖ Lower Deviation:- It is the algebraic difference between minimum limit of size and its corresponding basic size.

❖ Actual Deviation:- It is the algebraic difference between actual size and its corresponding basic size.



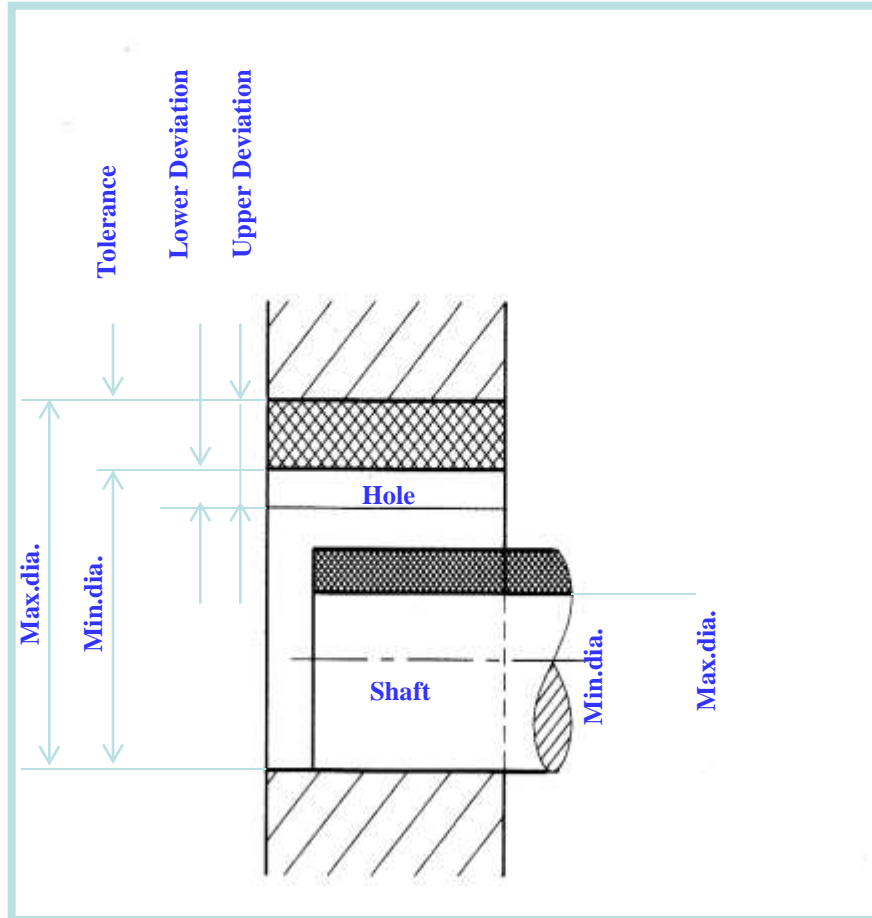
❖ Tolerance:- It is the difference between maximum limit of size and the minimum limit of size. It is always positive and is expressed only as a number without a sign.

❖ Zero line:- In graphical representation of the above terms, the zero line represents the basic size. This line is also called as the line of zero deviation.



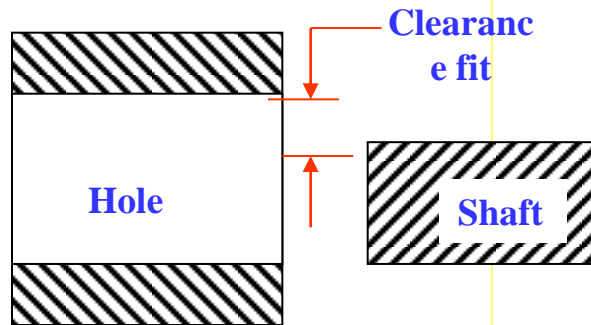
❖ Fundamental deviation:-

There are 25 fundamental deviations in the B.I.S. system represented by letter, symbols (Capital letters for Holes and small letters for Shaft) i.e. for Holes A,B,C,D...Z excluding I,L,O,Q and W. In addition to above, four sets of letters JS, ZA, ZB and ZC are included. For Shaft the same 25 letters & symbols but in small letter are used.

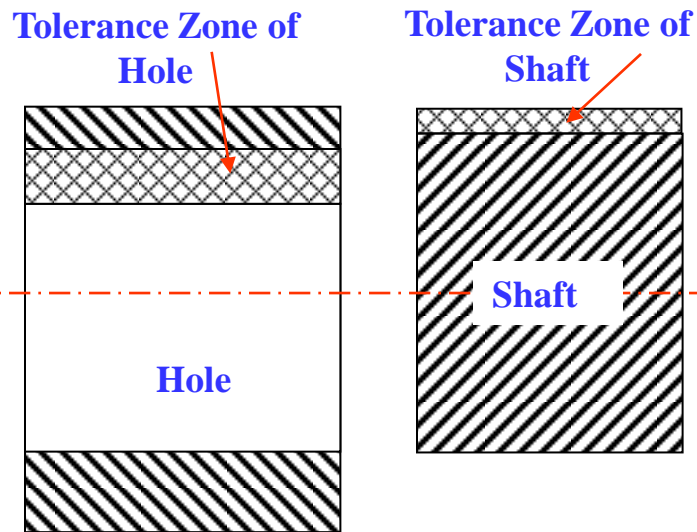


❖ **Fundamental Tolerance:-**
This is also called as ‘grade of tolerance’. In the Indian Standard System, there are 18 grades represented by number symbols, both for hole and shaft denoted as IT01, IT0, IT1, IT2.....IT16. A high number

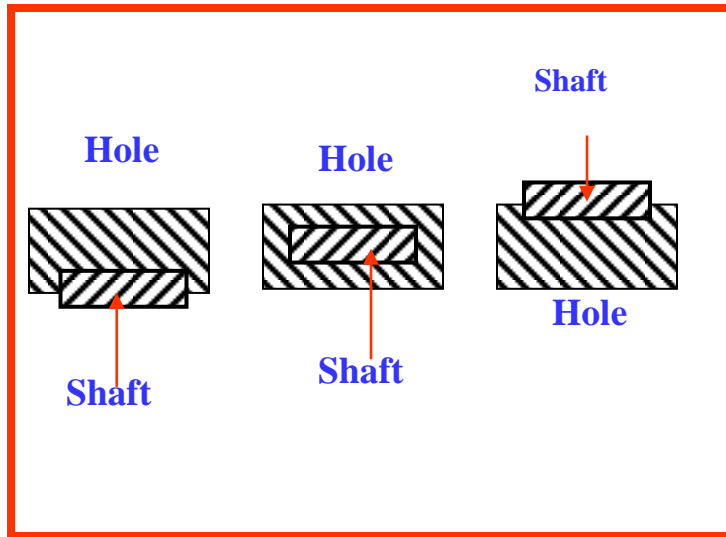
❖ **FIT:-** It is the relationship that exists between two mating parts, a hole and shaft with respect to their dimensional difference before assembly. Three types of fit are given hereunder;



❖ **Clearance fit:-** It is a fit which always provides clearance. Here the tolerance zone of the hole will be above the tolerance zone of the shaft. e.g. 20 H7/g6. Maximum clearance is the difference between the maximum hole and minimum shaft. Minimum clearance is the difference between the minimum hole and maximum shaft.



❖ **Interference fit:-** It is a fit which always provides interference. Here the tolerance zone of the hole will be below the tolerance zone of the shaft. e.g. 25 H7/p6. Maximum interference is the algebraic difference between the minimum hole and maximum shaft. Minimum interference is the algebraic difference between the maximum hole and minimum shaft.



❖ **Transition fit:-** It is a fit which may sometimes provides clearance and sometimes interference. When this class of fit is represented graphically, the tolerance zone of the hole and shaft will overlap each other. e.g. 75 H8/j7.

Mass Production :- Mass production means production of a unit, component or part in large numbers.



- ❖ **Advantages:-**
1. Time for the manufacture of components is reduced
 2. The cost of pieces is reduced.
 3. Spare parts can be quickly made available.

- Disadvantages:-**
1. Special purpose machines are necessary.
 2. Jigs and Fixtures are needed.
 3. Gauges are to be used instead of conventional precision instruments.
 4. Initial expenditure will be very high.

❖ Interchangeability:- When components are mass produced, unless they are interchangeable, the purpose of mass production is not fulfilled. By interchangeability, we mean that identical components, manufactured by different personnel under different environments, can be assembled and replaced without any further rectification during the assembly stage, without affecting the functioning of the component when assembled.

❖ Hole Basis System:- Where the size of the hole is kept constant and the size of the shaft is varied to get the different class of fits, then it is known as the hole basis system.



The diagram illustrates the Hole Basis System. It features a horizontal line representing the zero line. Above this line, the word "HOLE" is written in blue capital letters, and to its right, "ZERO LINE" is written in blue capital letters. Below the horizontal line, the words "BASIC HOLE" are written in blue capital letters.



❖ Shaft Basis System:- Where the size of the shaft is kept constant and the variations given to the hole to get the different class of fits, then it is known as the shaft basis system.

Basic Shaft System





QUESTIONS

- Define the following.

Basic Size

Hole

Shaft

Tolerance

Deviation

- What are the advantage & disadvantage of mass production?



CONCLUSTION

Thus we get the knowledge of Limit fit & Tolerance.