

LIMITS & FITS

LIMITS--- High limit

Low limit

FITS--- Clearance fit

Interference fit

Transition fit

LIMITS & FITS

LIMITS:- These are two extreme permissible sizes of dimension between which actual size of dimension is contained. The greater of these two is called high limit and the smaller low limit

LIMITS & FITS

FITS:-

- It is the relationship existing between two mating parts wrt amount of play or interference which is present when they are assembled together.
- It is the degree of tightness or looseness between two mating parts to perform a definite function

Terms used in limits & fits:-

- Shaft
- Hole
- Basic size
- Actual size
- Limits of size– HL & LL
- Tolerance = HL-LL
- Allowance = Difference between MMC of mating parts

Deviation---

- Upper deviation
- Lower deviation
- Mean deviation

Zero Line

Fundamental Deviation

FITS

TYPES OF FITS-

- Clearance fit– Min & Max clearance
- Interference, Press or Force fit– Min & Max interference
- Transition fit

LIMITS & FITS

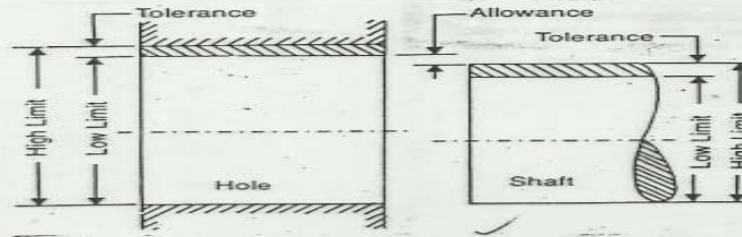


Fig. 9.2. Limits and Tolerance.

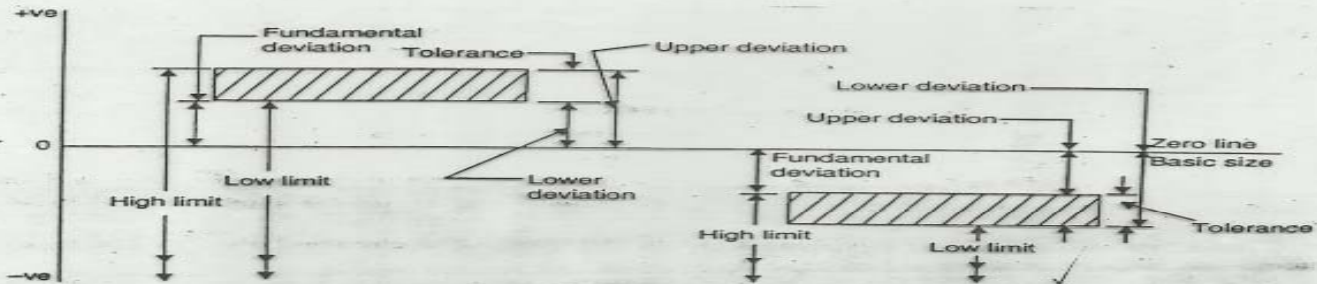


Fig. 9.3. Deviations.

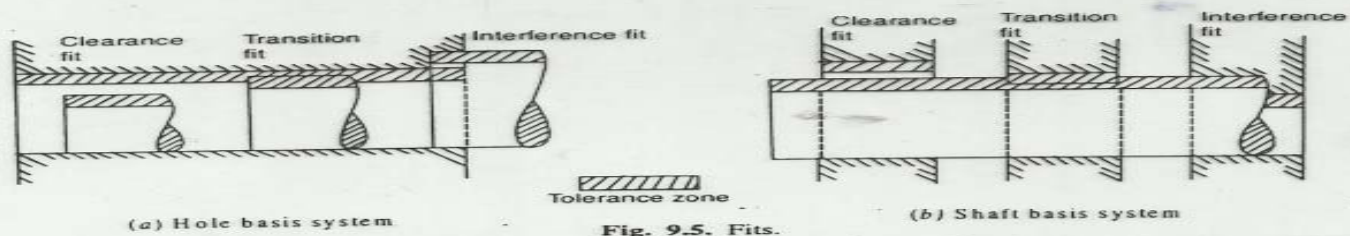


Fig. 9.5. Fits.

HOLE/SHAFT BASIS SYSTEM

Various allowances for different fits may be

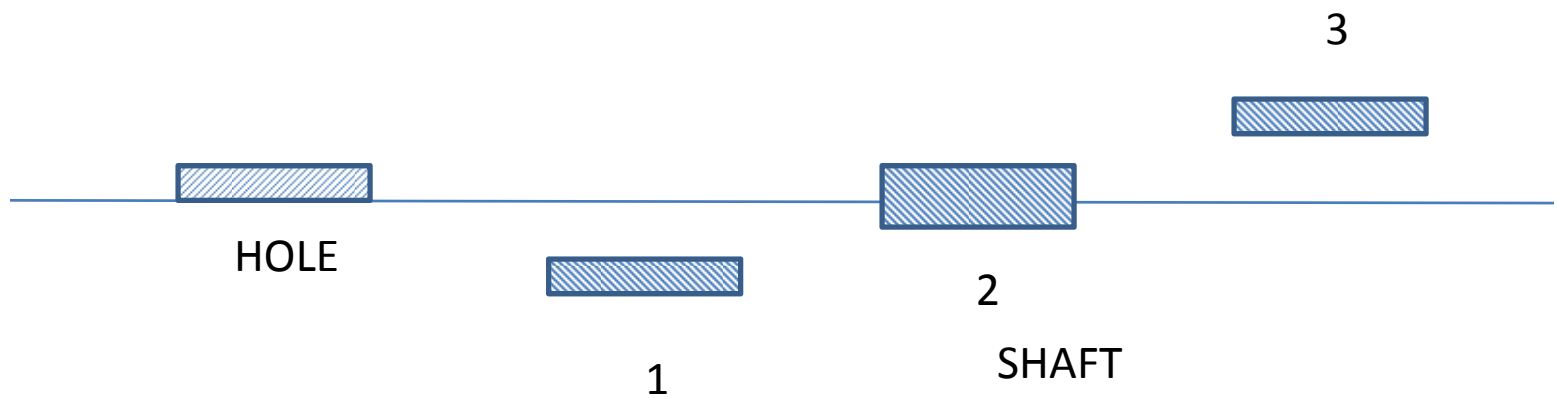
obtained in two ways:-

- Hole base system
- Shaft base system

HOLE BASIS SYSTEM

- HOLE SIZE IS KEPT CONSTANT AND SHAFT IS VARIED TO GIVE VARIOUS TYPES OF FIT.
- BASIC SIZE TAKEN IS LOW LIMIT OF HOLE
- HIGH LIMIT OF HOLE & TWO LIMITS (HL&LL) GIVE THE DESIRED FIT

HOLE BASIS SYSTEM



1 --- Clearance fit

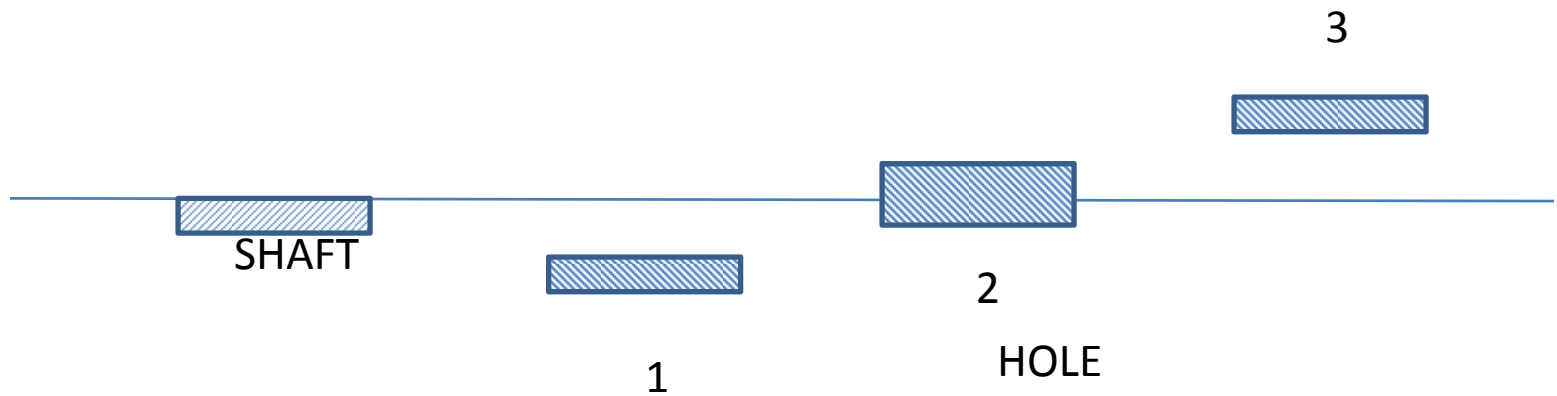
2—Transition fit

3 Interference fit

SHAFT BASIS SYSTEM

- SHAFT SIZE IS KEPT CONSTANT & HOLE SIZE IS VARIED TO GIVE VARIOUS FITS.
- BASIC SIZE IS TAKEN AS MAX LIMIT SIZE OF SHAFT.
- LL OF SHAFT AND TWO LIMITS (HL & LL) OF HOLE GIVE THE DESIRED FIT.
- METHOD NOT PREFERRED IN LARGE PRODUCTION

SHAFT BASIS SYSTEM



1 --- Interference fit

2—Transition fit

3 --Clearance fit

TOLERANCE

- Permissible variation in size or dimension is called tolerance.
- Amount by which a job is allowed to go away from accuracy without any functional trouble

25 ± 0.005 cm

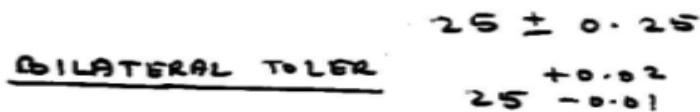
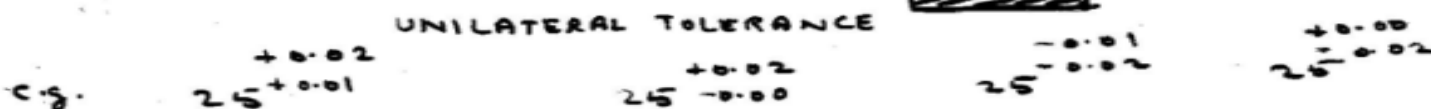
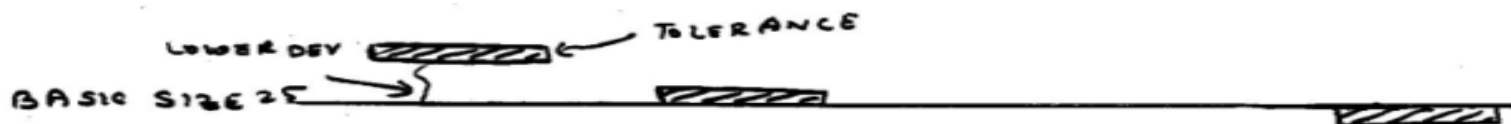
TOLERANCE

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PERMISSIBLE VARIATION IN SIZE OR DIMENSION IS CALLED TOLERANCE

- UNILATERAL TOLERANCE

- BILATERAL TOLERANCE



ISO SYSTEM OF Limits & fits

- Covers holes and shafts upto 3150 mm
- For any basic size there are 28 different holes progressively oversize and undersize.
- 28 holes are --

A,B,C,CD,D,E,EF,F,FG,G,H,J,JS,K,M,N,P,R,S,T,U,V,

X,Y,Z,ZA,ZB,& ZC

- Each hole has a choice of 18 grades of tolerance i.e. IT01,IT0,IT1 to IT16 (Similarly for shafts)
- Tolerance grades decide the accuracy of manufacture

VALUES OF TOLERANCES

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VALUES OF TOLERANCE FOR TOLERANCE GRADES

IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
10i	16i	25i	40i	63i	100i	160i	250i	400i	630i	1000i

IT1	IT2	IT3	IT4	IT5
2i	2.7i	3.5i	5i	7i

} GEOMETRIC PROGRESSION

IT01, TOLERANCE = $0.3 + 0.008 D$

IT0 " = $0.5 + 0.012 D$

IT1 " = $0.8 + 0.02 D$

IT01 TO IT5 APPLICABLE TO SIZE UPTO 500mm.

FOR SIZES ABOVE 500mm, $L = 0.004D + 2.1$

TOLERANCE GRADE

UPTO 500mm: $L = \text{TOLERANCE UNIT} = 0.45 \sqrt[3]{D} + 0.001 D$
in microns

$D = \text{geometric mean dia} = \sqrt{d_1 d_2}$

$d_1, d_2 = \text{DIAMETRAL STEPS i.e.}$
1-3, 3-6, 6-10, 10-14 mm ETC.

FOR SIZES > 500mm.

$L = 0.004D + 2.1$

ARRANGEMENT OF HOLES & SHAFTS

