Geometric &Dimensional Tolerance

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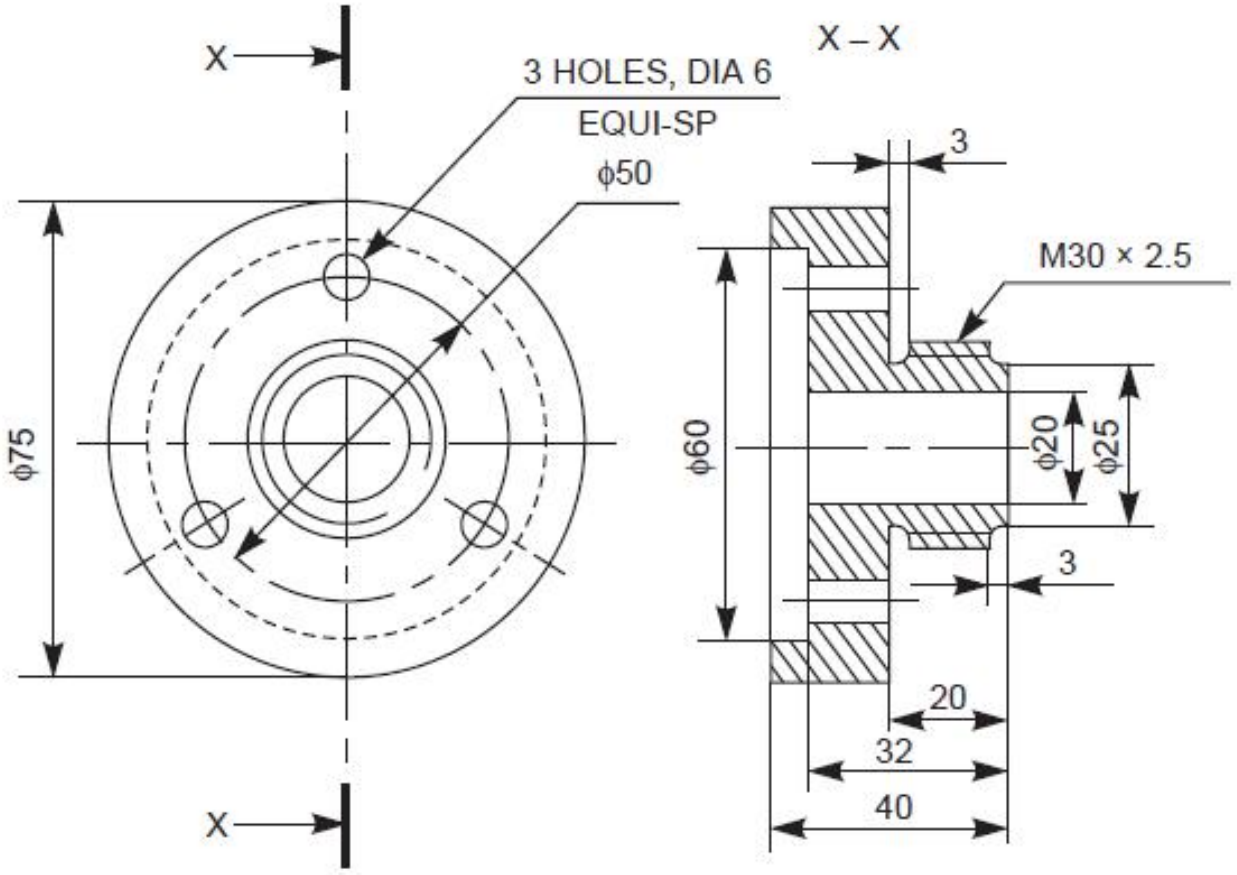
Production Drawing

Before actual manufacturing of any product . The design engineer prepare a PRODUCT DRAWING .

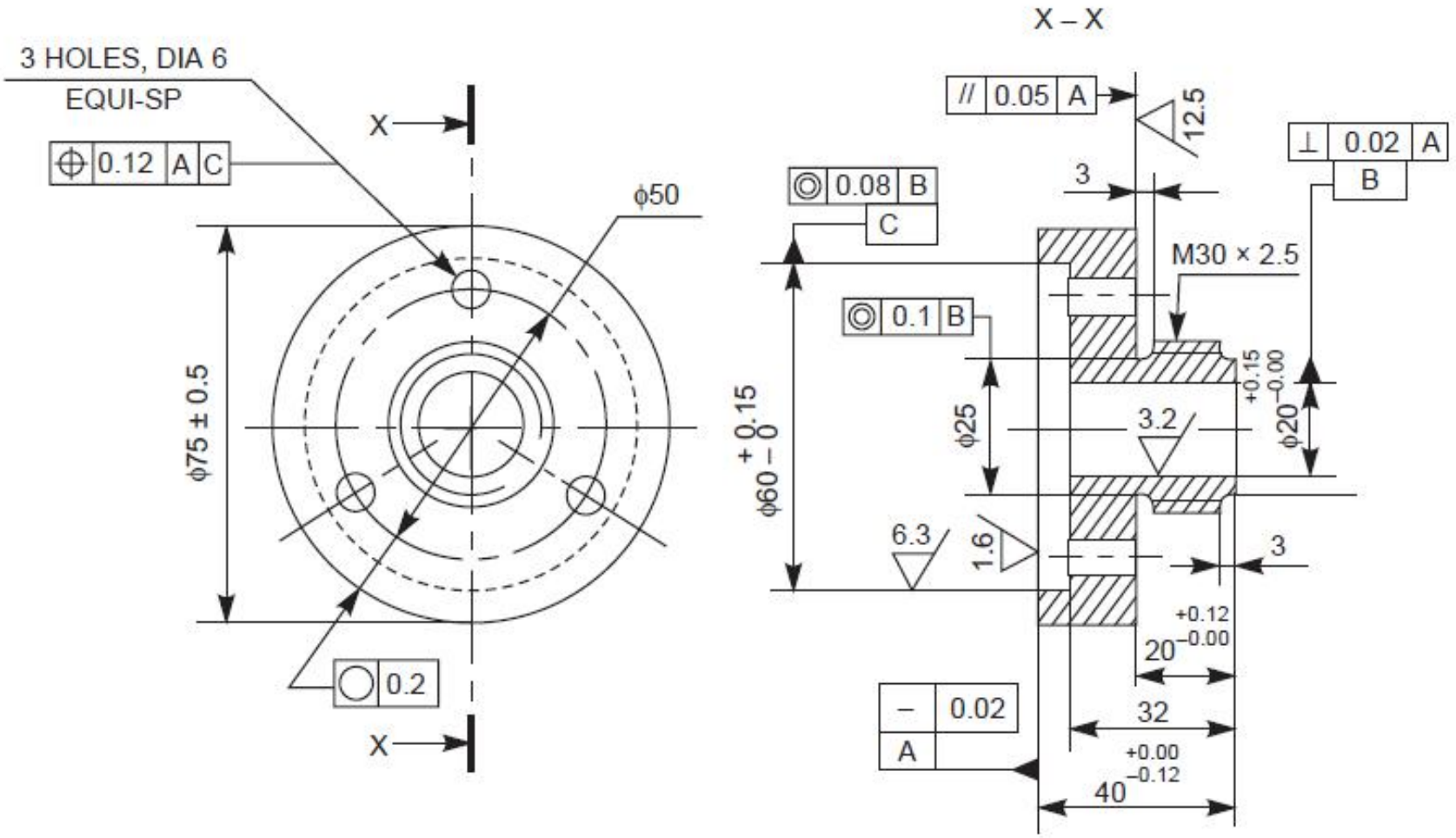
This PRODUCT DRAWING contains ,

- **Geometric Tolerance**
- **Dimensional Tolerance**
- **Quantity**
- **Material type , kind , size .**
- **Manufacturing method**
- **Surface roughness**
- **National standards .**

Machine Drawing



Production Drawing



Why we require GDT ?

No parts can be manufactured perfectly according to design due to various parameters and error in production method .

But part must be close to Pre defined Size and shape . The permissiblele variation in Size & Shape is known as Tolerance .

It is necessary for achieving Interchangeability in Mass production – so any parts can be fit while assembling .

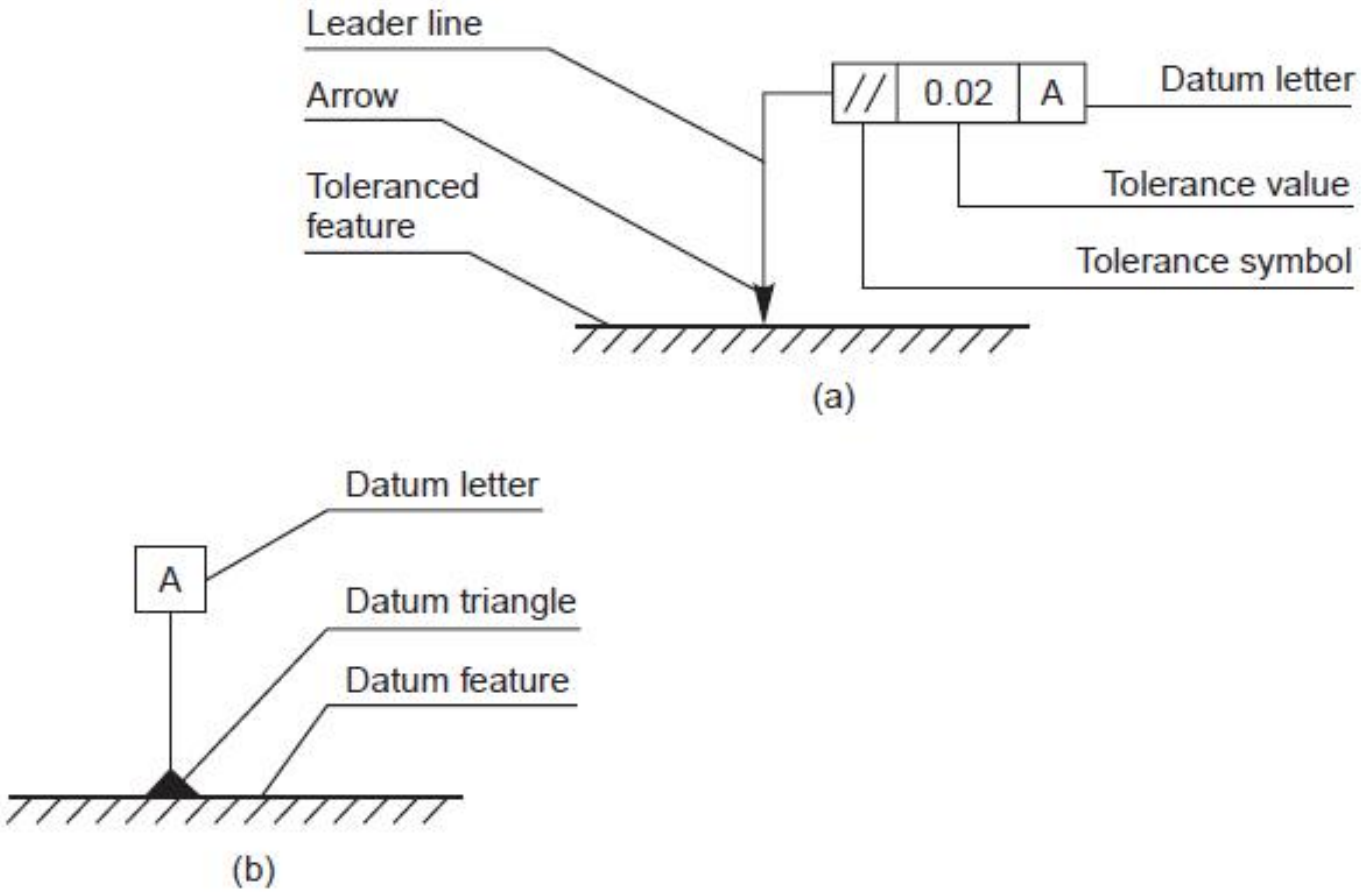
Geometric tolerance

Shape of machine parts – cylinders, prisms, cones, spheres.

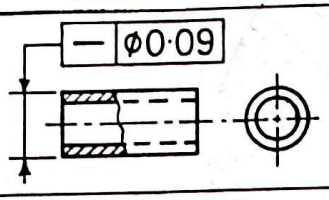
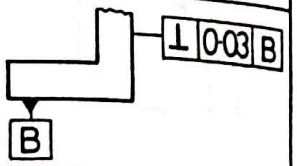
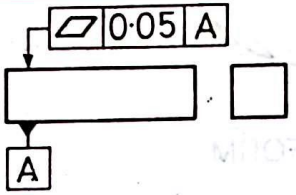
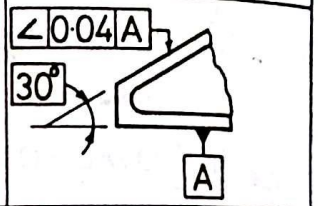
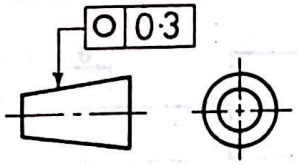
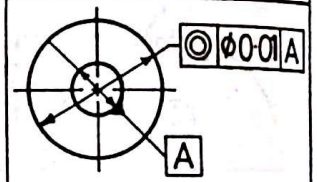
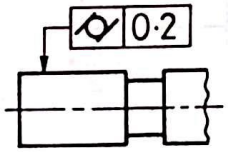
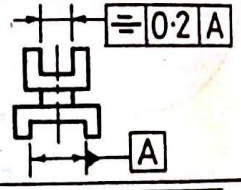
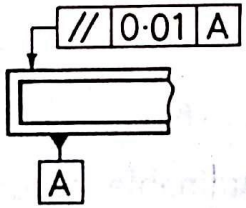
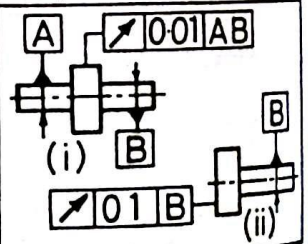
Geometrical Deviation in parts

- **Form tolerance**
  - **Flat surface**
    - **straightness**
    - **flatness**
  - **Cylindrical Surface**
    - **Barrel , Bow , taper , oval , lobed .**
- **Position Tolerance**
  - **Radial run out**
  - **Axial run out**
  - **Miss alignment**

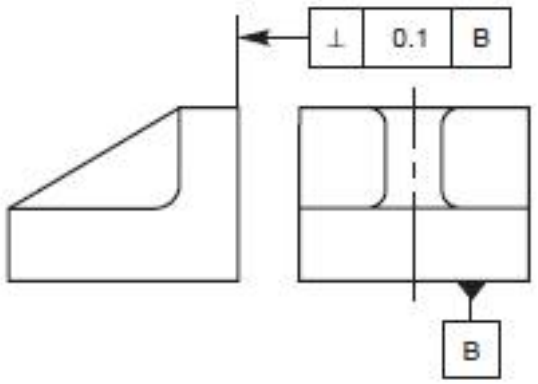
Geometric tolerance representation in drawing



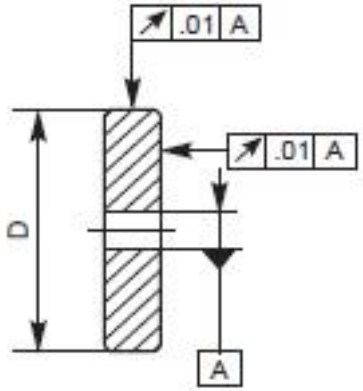
Geometric tolerance representation in drawing

CHARACTERISTICS TO BE TOLERANCED	SYMBOL	ILLUSTRATION	CHARACTERISTICS TO BE TOLERANCED	SYMBOL	ILLUSTRATION
STRAIGHTNESS	—		PERPENDICULARITY	⊥	
FLATNESS	▱		ANGULARITY	∠	
CIRCULARITY	○		CONCENTRICITY AND COAXIALITY	◎	
CYLINDRICITY	⌭		SYMMETRY	⌯	
PARALLELISM	//		RUN-OUT (i) RADIAL RUNOUT (ii) AXIAL RUNOUT	↗	

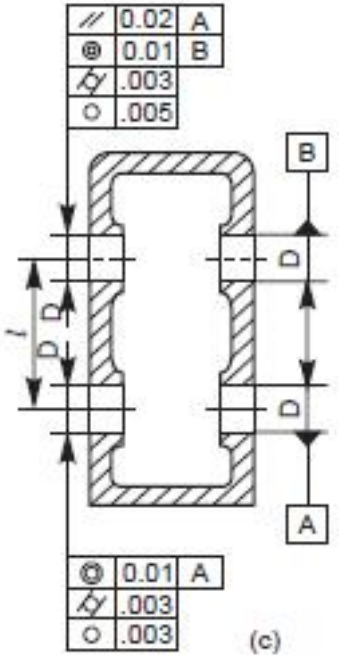
Geometric tolerance representation in drawing



(a)

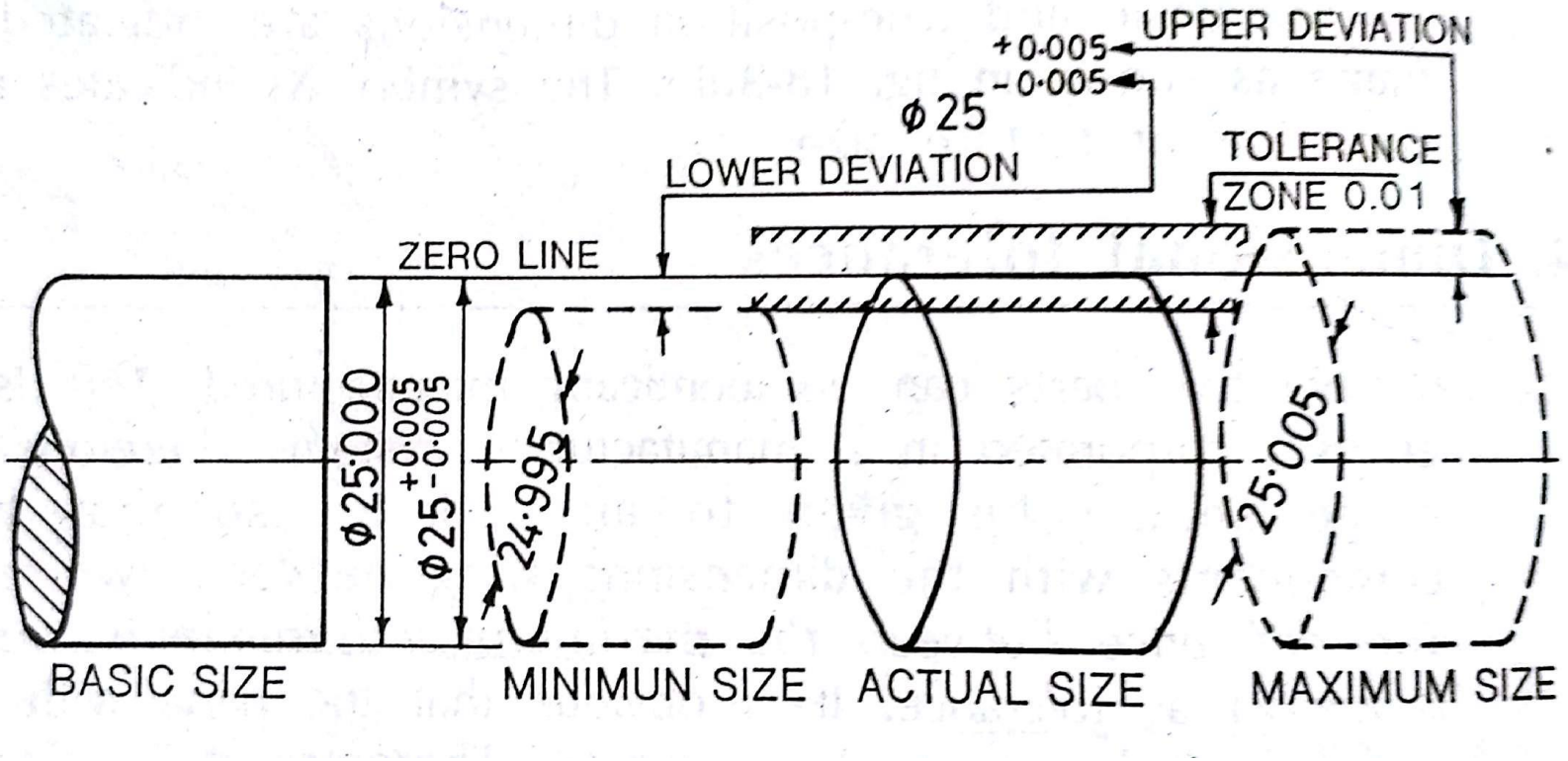


(b)

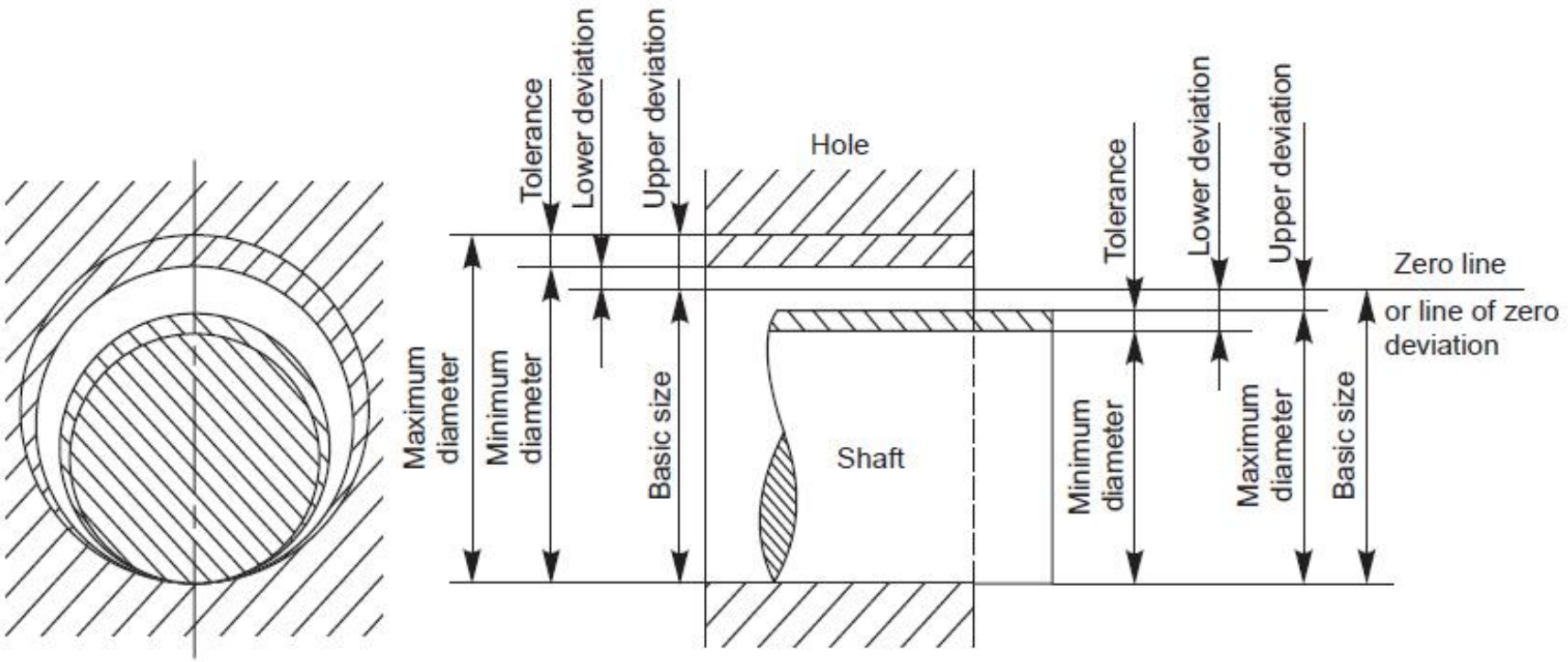


(c)

Dimensional tolerance



Dimensional tolerance



Dimensional tolerance

Basic Dimension : Dimension obtained by design calculations

Upper Deviation : Algebraic difference between max and basic

Lower deviation : Algebraic difference between min and basic

Tolerance zone : Difference between Max and min

Zero line : passes through basic size

Unilateral limits , Bilateral limits : limits on same side & both side

Types of Fits- clearance fit

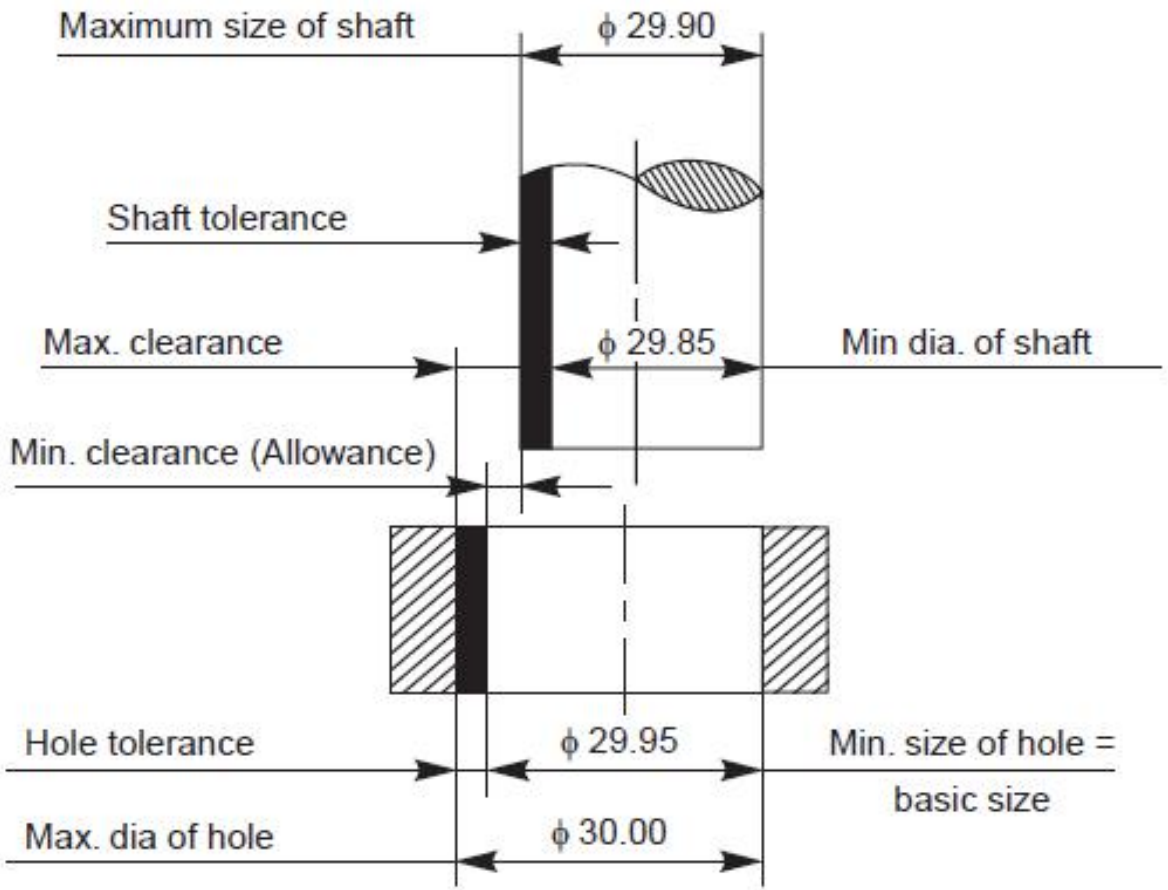


Fig. 15.10 Clearance fit

Types of Fits- Transition

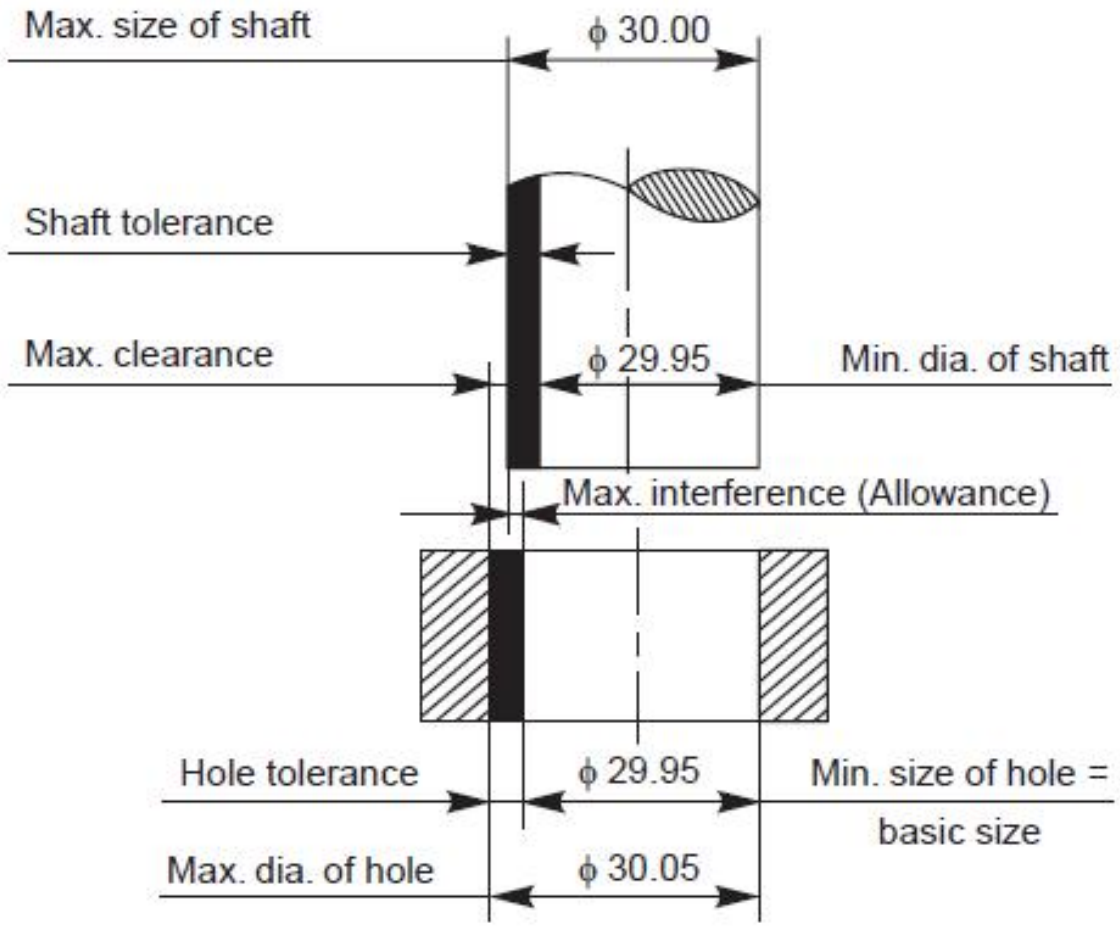


Fig. 15.11 Transition fit

Types of Fits- Interference fit

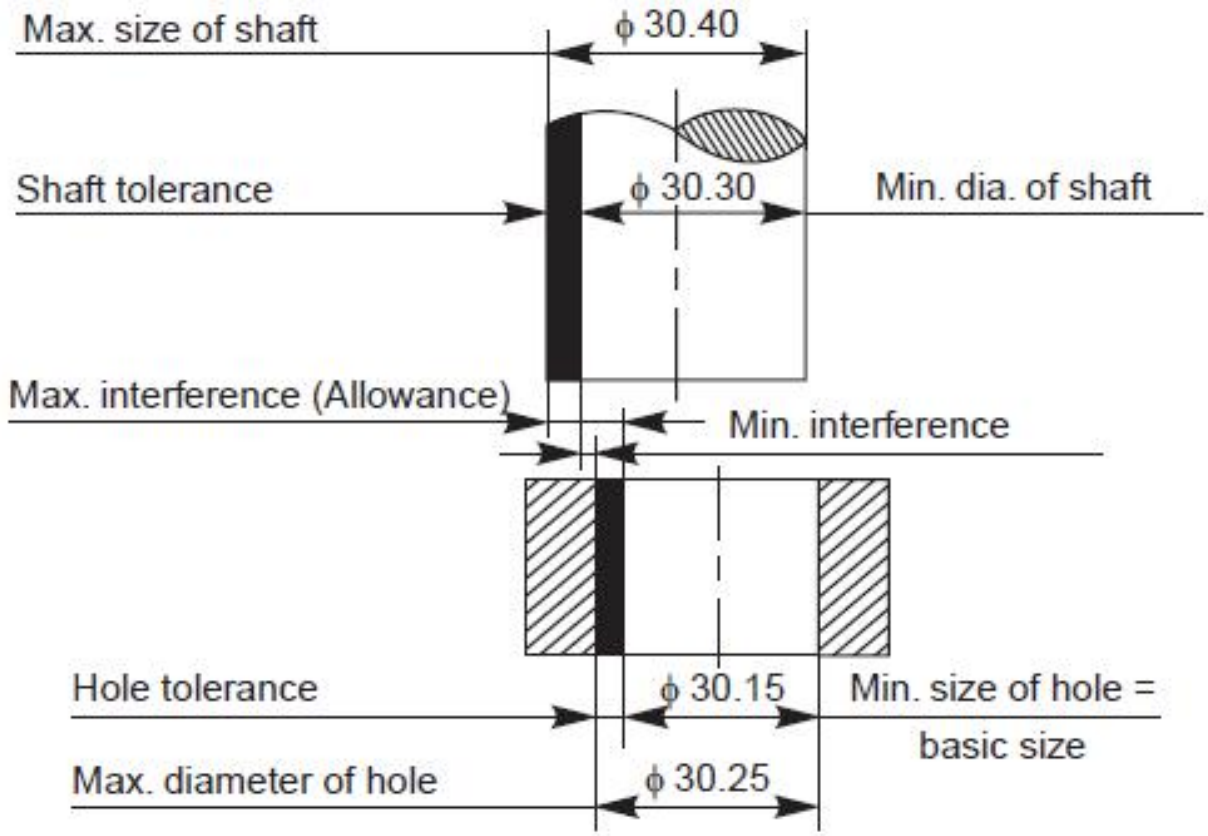
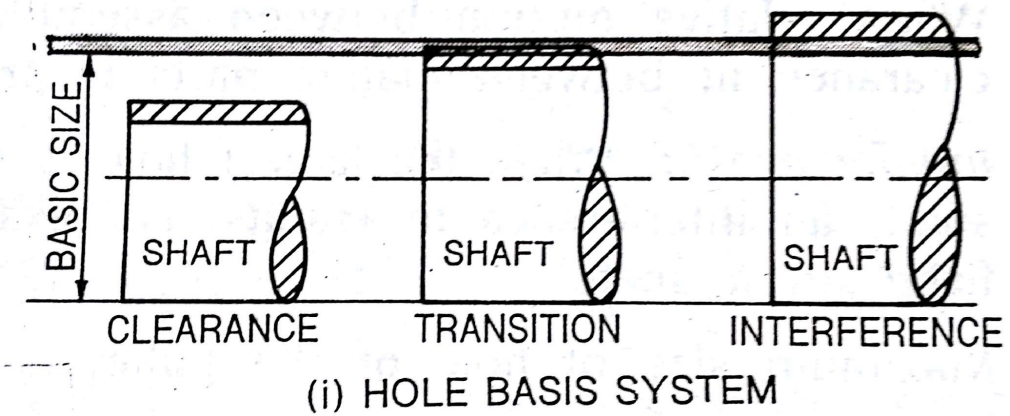


Fig. 15.12 Interference fit

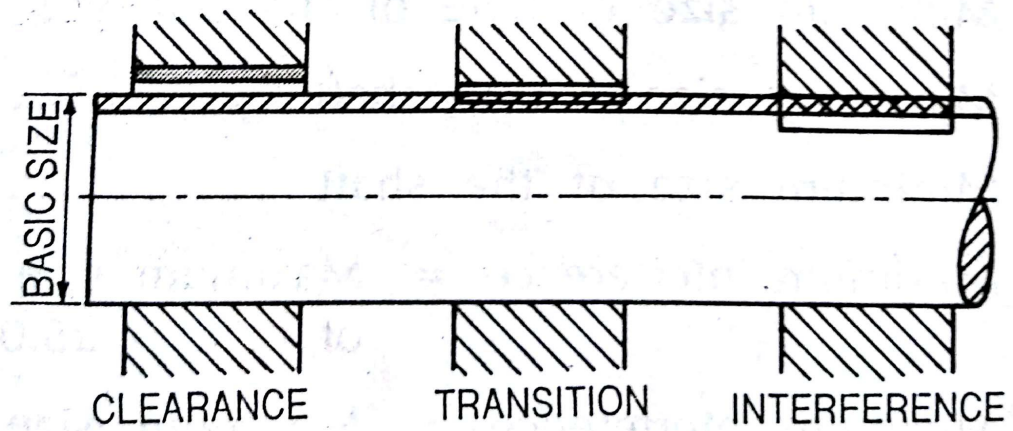
Dimensional tolerance

Basic hole :
Hole whose lower deviation is zero



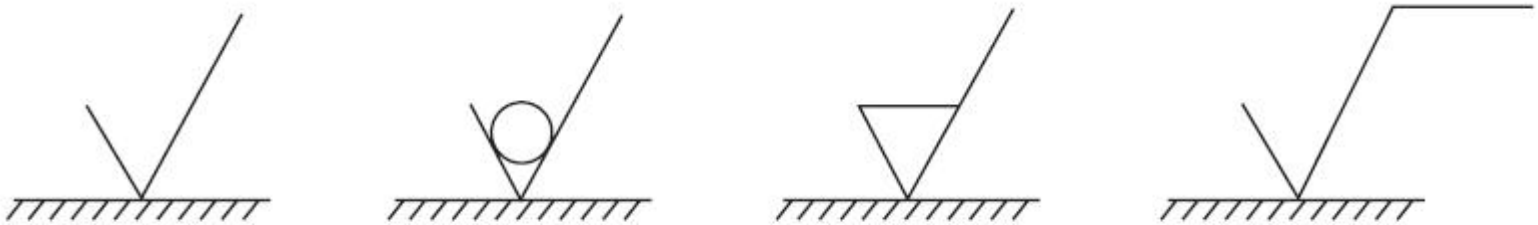
(i) HOLE BASIS SYSTEM

Basic shaft:
Shaft whose Upper deviation is zero



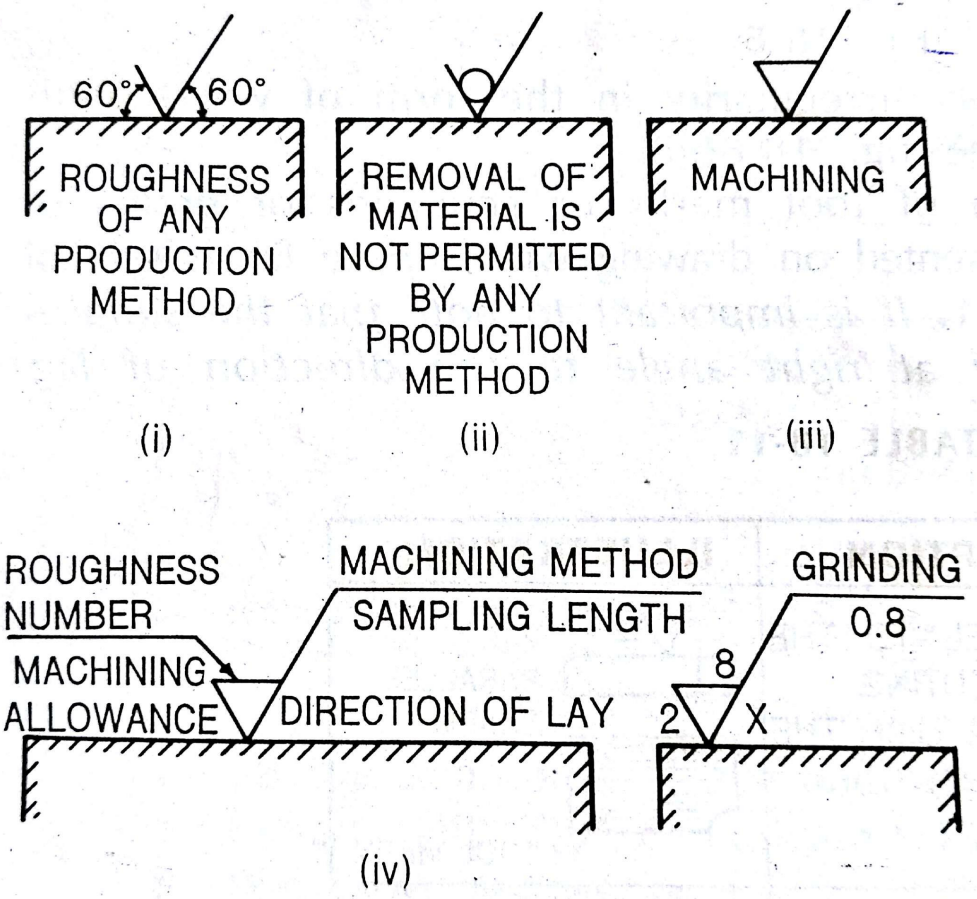
(ii) SHAFT BASIS SYSTEM

Surface roughness & Representation



Surface roughness & Representation

Surface roughness : Peaks and valleys observed on machine surface .



Surface roughness & Representation

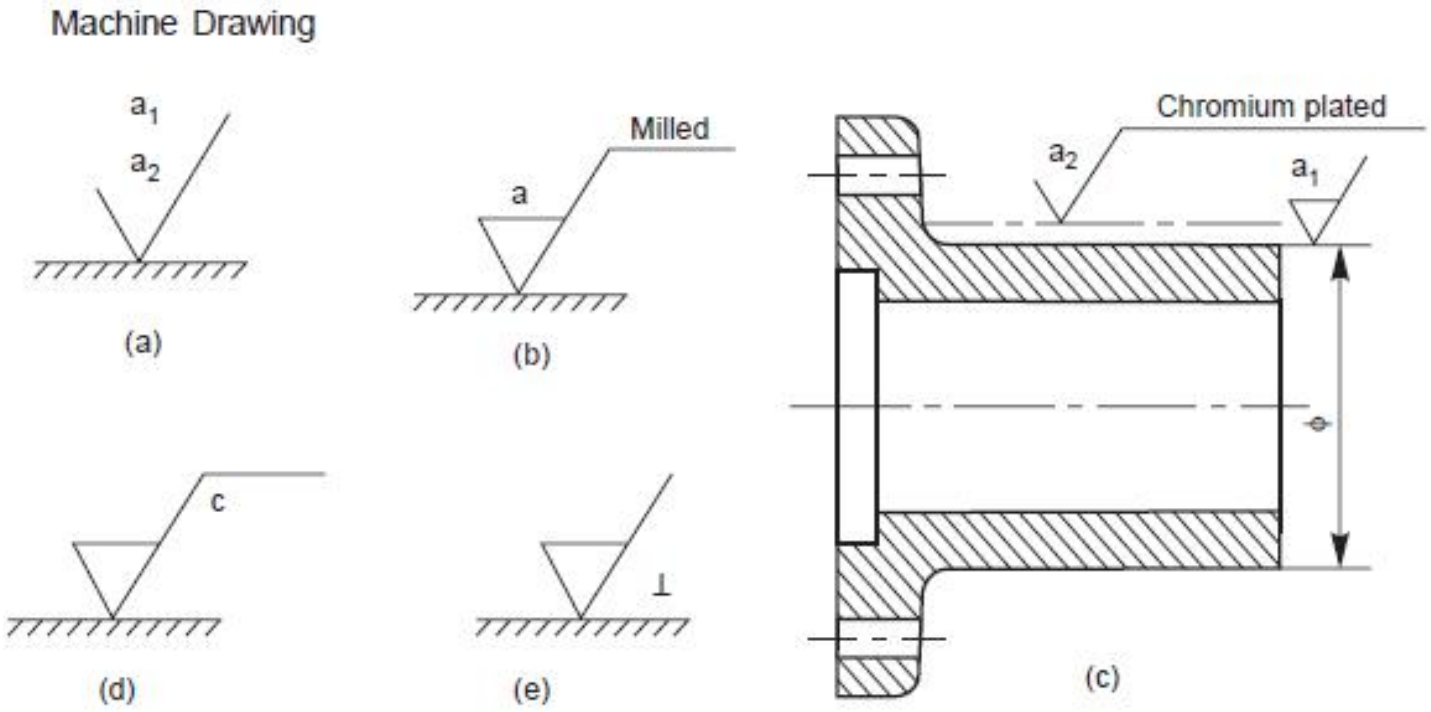


Fig. 16.4