


## LAB 2: Title: To understand construction of outside micrometer and calculate its least count.

- Objectives:
- After studying this experiment you should be able to:
  - i. Understand the constructional parts of Micrometer,
  - ii. how to calculate least count of micrometer,
  - iii. To know how to use Micrometer.

# Principle of Micrometer:

Micrometers work on the principle of screw and nut. We know that when a screw is turned through one revolution, it advances by one pitch distance i.e. one rotation of screw corresponds to a linear movement of a distance equal to pitch of the thread.

- The description of main parts of an outside micrometer is given below:
  - (1) U shaped steel frame: The outside micrometer has “U” shaped or “C” shaped frame. It holds all the micrometer parts together. The gap of the frame permits the maximum diameter or length of the job to be measured.
  - (2) Anvil and spindle: The micrometer has a fixed anvil protruding 3 mm from the left hand side of the frame. Another movable anvil is provided on the front side of the spindle



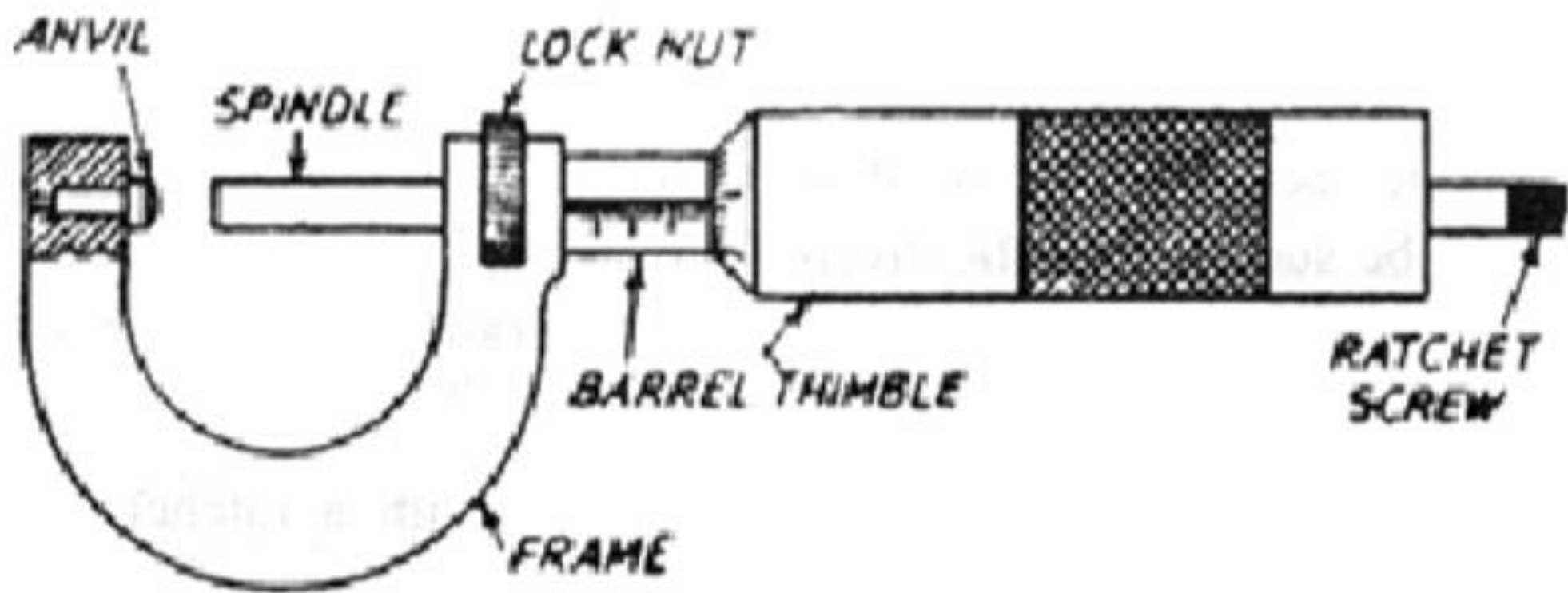
The anvils are accurately ground and lapped with its measuring faces flat and parallel to the spindle. These are also available with tungsten carbide faces. The spindle is the movable measuring face with the anvil on the front side. The spindle engages with the nut. It should run freely and smoothly throughout the length of its travel.

(3) Locknut: A lock nut is provided on the micrometer spindle to lock it when the micrometer is at its correct reading. (4) Sleeve or Barrel: The sleeve is accurately divided and clearly marked in 0.5 mm division along its length, which serves as a main scale. It is chrome plated and adjustable zero setting

(5) **Thimble:** The thimble can be moved over the barrel. It has 50 equal circular divisions around its circumference. Each division having a value of 0.01 mm.

(6) **Ratchet:** The ratchet is provided at the end of the thimble. It is used to assure accurate measurement and to prevent too much pressure being applied to the micrometer. When the spindle reaches near the work surface to be measured the operator uses the ratchet screw to tighten the thimble. The ratchet automatically slips when the correct uniform pressure is applied and prevents the application of too much pressure.

The micrometer usually has a maximum opening of 25mm. They are available in measuring ranges of 0 to 25mm, 25 to 50mm, 125mm to 150mm upto 575 to 600mm.



# Least count of Micrometer:

- Micrometer works on the principle of screw and nut. We know that when a screw is turned through nut by one revolution, it advances by one pitch distance i.e. one rotation of screw corresponds to a linear movement of a distance equal to pitch of the thread. If the circumference of the screw is divided into number of equal parts say “n”, its rotation through one division will cause the screw to advance through  $(\text{Pitch}/n)$  length.
- L.C. =  $\text{Pitch}/\text{minimum length that can be measured}$

□ Thus by reducing the pitch of the screw thread or by increasing the number of divisions on the circumference of screw, the length value of one circumferential division (L.C.) can be reduced and accuracy of measurement can be increased considerably. e.g. micrometer has a screw of 0.50 mm pitch; with a thimble graduated in 50 divisions to provide a direct reading of

□ L.C. of Micrometer = Pitch of spindle screw / No of divisions on thimble



## Observation Table:

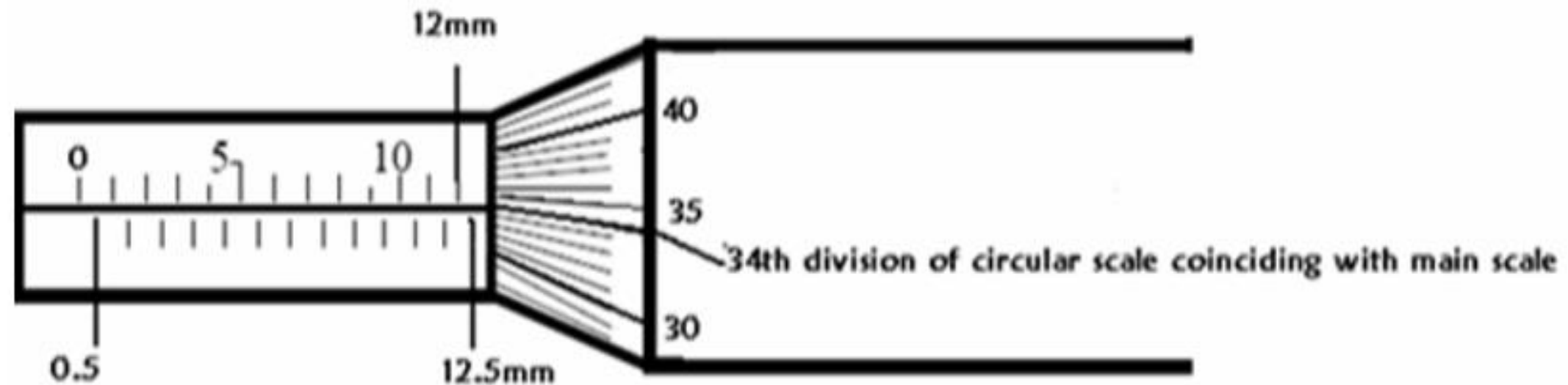
### Outside Micrometer

| S N | Range | Pitch of spindle screw | No. of divisions on thimble | Least count |
|-----|-------|------------------------|-----------------------------|-------------|
| 1   |       |                        |                             |             |
| 2   |       |                        |                             |             |
| 3   |       |                        |                             |             |

# Precautions to be taken while using micrometer:

- Clean the micrometer by wiping of oil dirt, dust etc before using it.
- 2. Clean the measuring faces of anvil and spindle with a clean piece of paper or cloth.
- 3. Set the zero reading of instrument before measuring.
- 4. Hold the workpiece whose dimensions to be measured and micrometer properly. Then turn the thimble with forefinger and thumb, till the measuring tip just touches workpiece. Fine adjustment should be made by ratchet so that uniform pressure is applied.
- 5. Handle and grip the instrument near the C- frame of micrometer.

## Reading the micrometer:



Formulae of calculating total reading with the help of outside micrometer is

**Total reading = (Main scale reading) + (Least count of Outside micrometer × Circular scale division exactly coinciding with any main scale division)**

**Total reading = M.S. reading + (L.C. of O.M. × Circular scale coinciding with M.S.)**

$$12.5 + (0.01 \times \text{circular scale division coinciding with main scale})$$

$$\begin{aligned} \text{Total reading} &= 12.5 + (0.01 \times 34) \\ &= 12.84 \text{ mm.} \end{aligned}$$

**Measurements with Micrometer:**

**Range:**

**Least count:**

**Make:**

| Sr.No | Main scale reading<br>A | No of circular division in<br>coincidence | Circular division X Least<br>count B | Total Reading<br>A + B mm |
|-------|-------------------------|---|--------------------------------------|---------------------------|
| 1     |                         |   |                                      |                           |
| 2     |                         |   |                                      |                           |
| 3     |                         |   |                                      |                           |

