ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

24ME403 - METROLOGY & MEASUREMENTS

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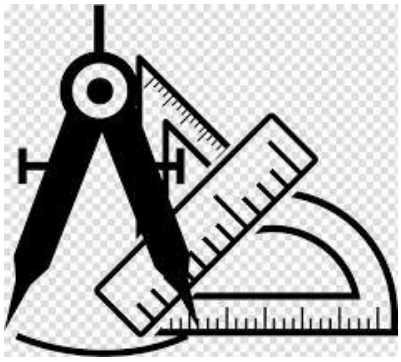


UNIT II: MEASUREMENT OF LINEAR AND ANGULAR DIMENSIONS

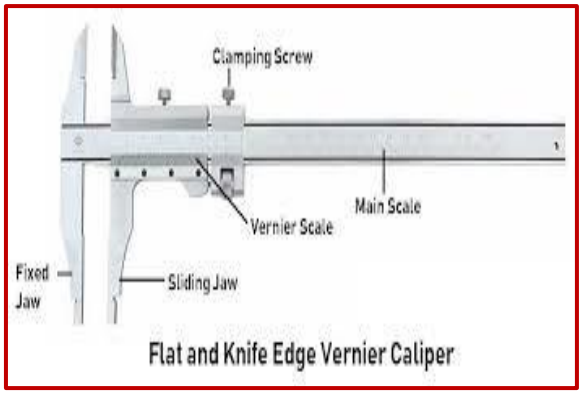
CO2: To make use of the principle; applications of linear and angular measuring instruments in the assembly and transmission elements.

Vernier Caliper

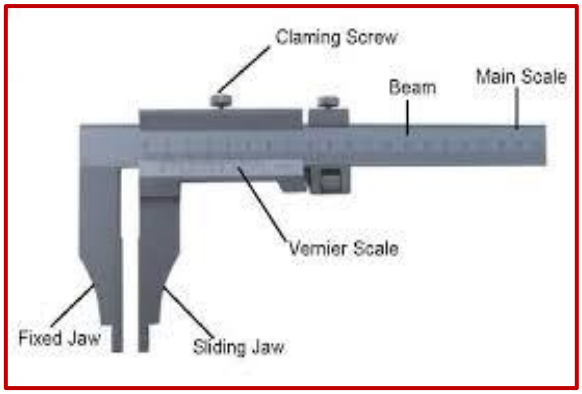
- A vernier caliper consists of two main parts: the main scale engraved on a solid L-shaped frame and the vernier scale that can slide along the main scale.
- The sliding nature of the vernier has given it another name – sliding caliper.
- The main scale is graduated in mm, up to a least count of 1mm.
- The vernier also has engraved graduations.
- The vernier caliper is made of either stainless steel or tool steel, depending on the nature and severity of application.

Types of Vernier Caliper:

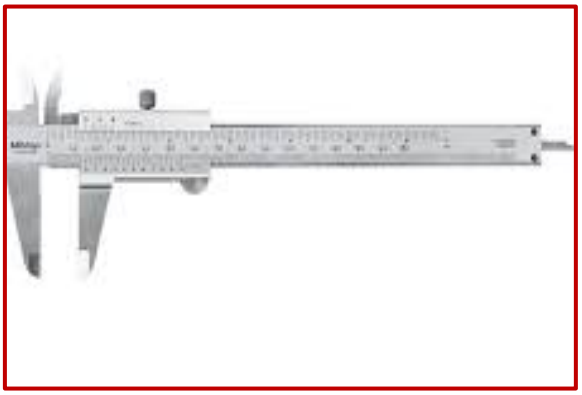
- Type A Vernier Caliper: Has jaws on both sides for external and internal measurements, with a depth bar attached to the main scale.
- Type B Vernier Caliper: Features jaws on one side only, typically used for either external or internal measurements, but not both.
- Type C Vernier Caliper: Is a specialized tool with a movable jaw and a fixed point, often used for measuring grooves, recesses, and other hard-to-reach dimensions.



Type A

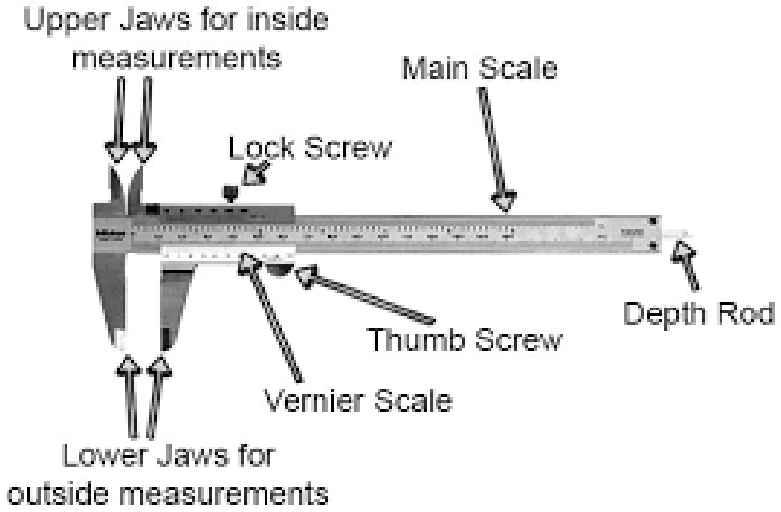


Type B



Type C

Parts of a Vernier Caliper:



1) **Main scale**: A fixed, graduated metal ruler that provides the primary measurement in mm or inches.
2) **Vernier scale**: A smaller, sliding scale that subdivides the smallest division of the main scale for precise fractional readings.

3) **External** jaws: The large, lower jaws used to measure the outside dimensions of an object, like its width or diameter.
4) **Internal jaws**: The smaller, upper jaws used to measure the inside dimensions of an object, like the diameter of a hole.
5) Depth rod / bar: A thin, retractable rod that extends from the end of the caliper to measure the depth of holes or steps.
6) **Locking screw / thumbscrew**: A screw or lever used to clamp and lock the sliding jaw in place to secure a reading.
7) **Slider / thumb roller**: The movable part that the user slides to adjust the jaws; it houses the vernier scale.
8) **Frame**: The main body of the caliper that holds all components together and provides rigidity.

Measurement procedure:

- Close the fixed and movable jaws gently. The main scale and vernier scale should align at zero. If they do not, note the zero error and apply the correction during measurement.
- Open the movable jaw and position the workpiece between the appropriate measuring jaws (external, internal, or depth rod).
- Slide the movable jaw assembly until the measuring tips just make contact with the surface of the part.
- Turn the fine adjustment screw to obtain precise and controlled contact with the workpiece. Adjust until the correct measuring feel is achieved by firm contact without excessive pressure.
- Tighten the fine-adjustment clamp/locking screw to hold the position.
- Read the value on the main scale and add the vernier scale coincidence.
- Calculate the vernier scale reading, and determine the total reading (final measurement).

  Vernier Scale Reading (VSR) = Vernier Scale Coincidence (VSC) × Least Count (LC)

  Total Reading (TR) = Main Scale Reading (MSR) + Vernier Scale Reading (VSR)
- Note the final value in the observation manual, applying zero-error correction if required, and determine the length of the given workpiece.