

PHOTOGRAPHS OF CHARTS ON METROLOGY

METROLOGY (M - 1) VERNIER CALIPER

The principle of vernier is that when two scales or divisions slightly different in size are used, the difference between them can be utilized to enhance the accuracy of measurement.

DIAL CALIPERS

METROLOGY (M - 2) VERNIER DEPTH GAUGE / HEIGHT GAUGE

VERNIER DEPTH GAUGE

VERNIER HEIGHT GAUGE

METROLOGY (M - 3) EXTERNAL MICROMETER

TO READ A MICROMETER

Actual Measurement = 11 mm on Barrel and 45 divisions on Thimble i.e. 0.45 mm
11 + 0.45 = 11.45 mm

TO READ A VERNIER MICROMETER

Actual Measurement = 15.54 mm

METROLOGY (M - 4) DEPTH MICROMETER / INSIDE MICROMETER

DEPTH MICROMETER

Micrometer depth gauges are used for measuring the depth of blind holes, slots, recesses, and projections. Each gauge consists of a flat base attached to a micrometer sleeve. An extension rod of the required length fits through the sleeve and protrudes through the base.

A micrometer depth gage and an extension rod. Measuring depth of a shoulder.

INSIDE MICROMETER

For internal measurements larger than 40 mm, inside micrometers are used. The inside micrometer set consists of a micrometer head, several extension rods of different lengths, which may be inserted in the head and spacing collar.

METROLOGY (M - 5) LIMIT GAUGES

HOLE GAUGES OR PLUG GAUGES

STANDARD PLUG GAUGE **PLATE GAUGE**

LIMIT PLUG GAUGE

GO NOT GO

GAUGES FOR SHAFTS OR RING GAUGES

Limit caliper gauge **Adjustable caliper gauge**

Snap gauge **Ring gauge**

Go NOT GO

METROLOGY (M - 6) ENGINEERING FITS

Shaft tolerance, Max. clearance, Min. clearance, Min. diameter of shaft, Maximum or design size of shaft, **CLEARANCE FIT**, Hole tolerance, Max. diameter of hole, Min. or design size of hole = Basic size.

Max. or design size of shaft, Shaft tolerance, Max. clearance, Max. interference (allowance), Min. diameter of shaft, **TRANSITION FIT**, Hole tolerance, Max. diameter of hole, Min. or design size of hole = Basic size.

Max. or design size of shaft, Shaft tolerance, Max. interference allowance, Min. diameter of shaft, **INTERFERENCE FIT**, Hole tolerance, Max. diameter of hole, Min. or design size of hole = Basic size.

METROLOGY (M - 7) TREAD MEASUREMENT

THREAD OR DIAMETER MEASURING MACHINE

TWO WIRE METHOD

Effective dia. $E = T + P$

Where, $T =$ Dimension under the wires
 $= M - 2d$

and $P = p/2 \cdot \cot^2 x/2 - d(\operatorname{Cosec} x/2 - 1)$

Where, $p =$ Pitch; $d =$ Diameter of wire; and $x =$ Thread angle.

THREE WIRE METHOD

If $M =$ Distance over wires,
 $E =$ Effective diameter;
 $d =$ Diameter of wires;
 $x =$ Angle of thread

Then, $M = E + d(1 + \operatorname{Cosec} x/2) - p/2 \cdot \cot^2 x/2$

From this equation, Effective dia. E can be calculated.

METROLOGY (M - 8) GEAR TOOTH VERNIER CALLIPER

Gear tooth vernier calliper is used for measuring the chordal thickness of a gear tooth at the pitch circle of a gear.

METROLOGY (M - 9) TOOL MAKER'S MICROSCOPE

THE OPTICAL SYSTEM

USES OF TOOL MAKER'S MICROSCOPE

Toolmaker's microscope is designed for measurements on parts of complex forms e.g. Profile of external threads, tools, templates and gauges, for measuring centre-to-centre distances of holes in any plane.