SCANNING PROBES

- In analogue sensing, **a scanning probe is used that is installed** on a **CMM or CNC machine**.
- When scanning, **the probe stylus tip contacts** the feature and then **moves continuously** along the surface, gathering data as it moves.
- The scanning speed in analogue sensing is up to **three times faster** than in point-to-point sensing.

A milling machine with scanning probe

CONTACT – ADVANTAGES & DISADVANTAGES

Advantages:

- High accuracy.
- Low costs.
- Ability to measure deep slots and pockets.
- Insensitivity to color or transparency.

Disadvantages:

- Slow data collection.
- Distortion of soft objects by the probe.

COORDINATE MEASURING MACHINE (CMM)

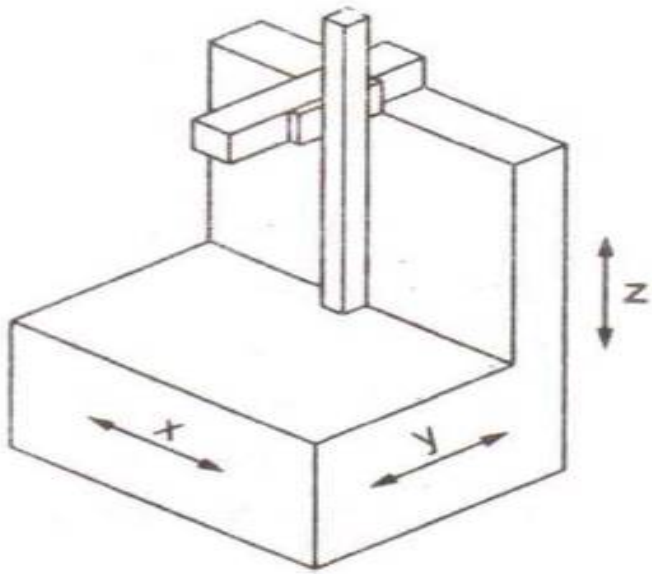
- A coordinate measuring machine (CMM) is a device that measures the geometry of physical objects by sensing points on the surface of the object with a probe.
- Various **types of probes are used in CMMs, including mechanical, optical, laser, and white light.**
- Depending on the machine, the probe position may be **manually controlled by an operator** or it may be computer controlled.

Types of CMM

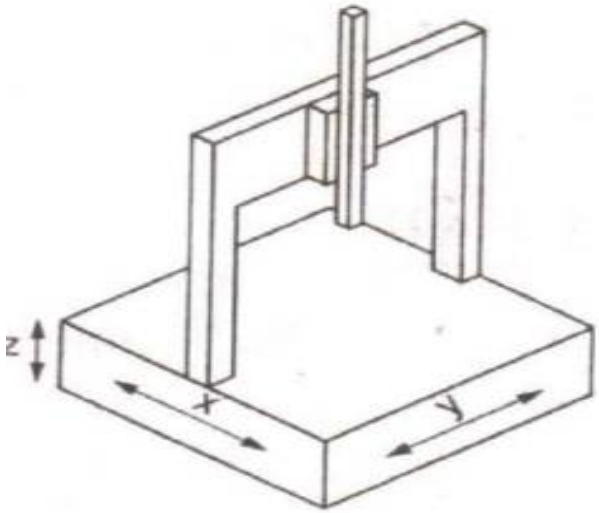
1. Cantilever Type
2. Bridge Type
3. Column Type
4. Gantry Type
5. Horizontal Arm Type

Cantilever type

- A vertical probe moves in the z-axis
- Carried by a cantilevered arm that moves in the y-axis
- This arm also moves laterally through the x-axis
- Advantage- a fixed table allows good accessibility to the work piece
- Disadvantage- the bending caused by the cantilever design
- The cantilever design offers a long table with relatively small measuring ranges in the other two axis.
- Suitable for measuring long, thin part



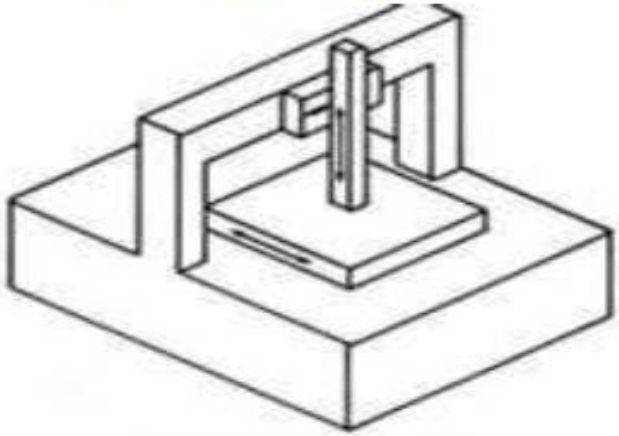
Moving bridge type



- Most widely used
- Has stationary table to support work piece to be measured and a moving bridge
- Advantage- reduce bending effect
- Disadvantage- with this design, the phenomenon of yawing (sometimes called walking) can occur- affect the accuracy

Fixed bridge type

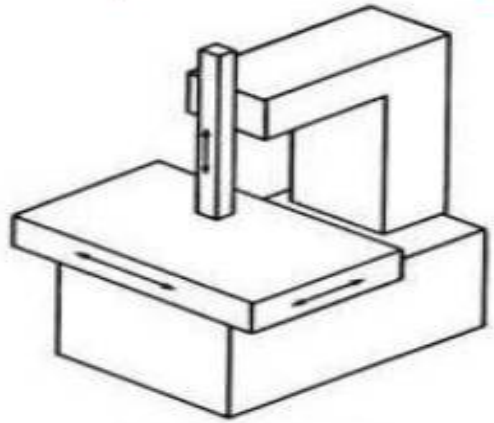
- In the fixed bridge configuration, the bridge is rigidly attached to the machine bed
- This design eliminates the phenomenon of walking and provides high rigidity



FIXED BRIDGE TYPE

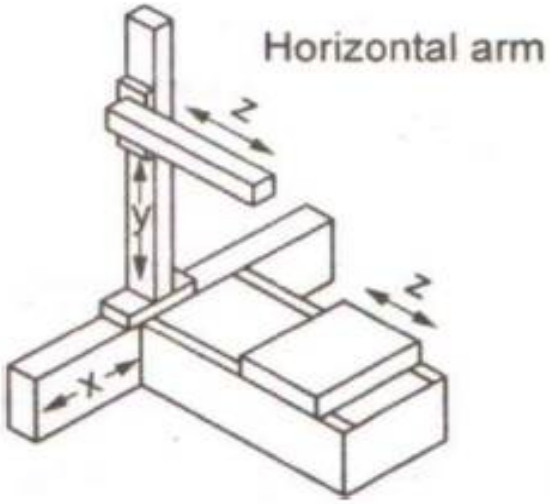
Column type

- Often referred to as universal measuring machine instead of CMM
- The column type CMM construction provides exceptional rigidity and accuracy
- These machines are usually reserved for gauge rooms rather than inspection



C. COLUMN TYPE

Horizontal arm type



D. MOVING RAM HORIZONTAL ARM TYPE

- Unlike the previous machines, the basic horizontal arm-type CMM
- Also referred to as layout machine
- Has a moving arm, and the probe is carried along the y-axis
- Advantage- provides a large area, unobstructed work area
- Ideal configuration for measurement of automobile parts

APPLICATIONS

- Co-ordinate measuring machines find applications in automobile, machine tool, electronics, space and many other large companies.
- These machines are best suited for the test and inspection of test equipment, gauges and tools.
- For aircraft & space vehicles, hundred percent inspections is carried out by using CMM.
- CMM can be used for determining dimensional accuracy of the components.
- These are ideal for determination of shape and position, maximum metal condition, linkage of results etc. which cannot do in conventional machines.
- CMM can also be used for sorting tasks to achieve optimum pairing of components within tolerance limits.

ADVANTAGES

- The inspection rate is increased.
- Accuracy is more.
- Operators error can be minimized.
- Skill requirements of the operator is reduced.
- Reduced inspection fix Turing and maintenance cost.
- Reduction in calculating and recording time.
- Reduction in set up time.
- No need of separate go / no go gauges for each feature.
- Reduction of scrap and good part rejection.
- Reduction in off line analysis time.