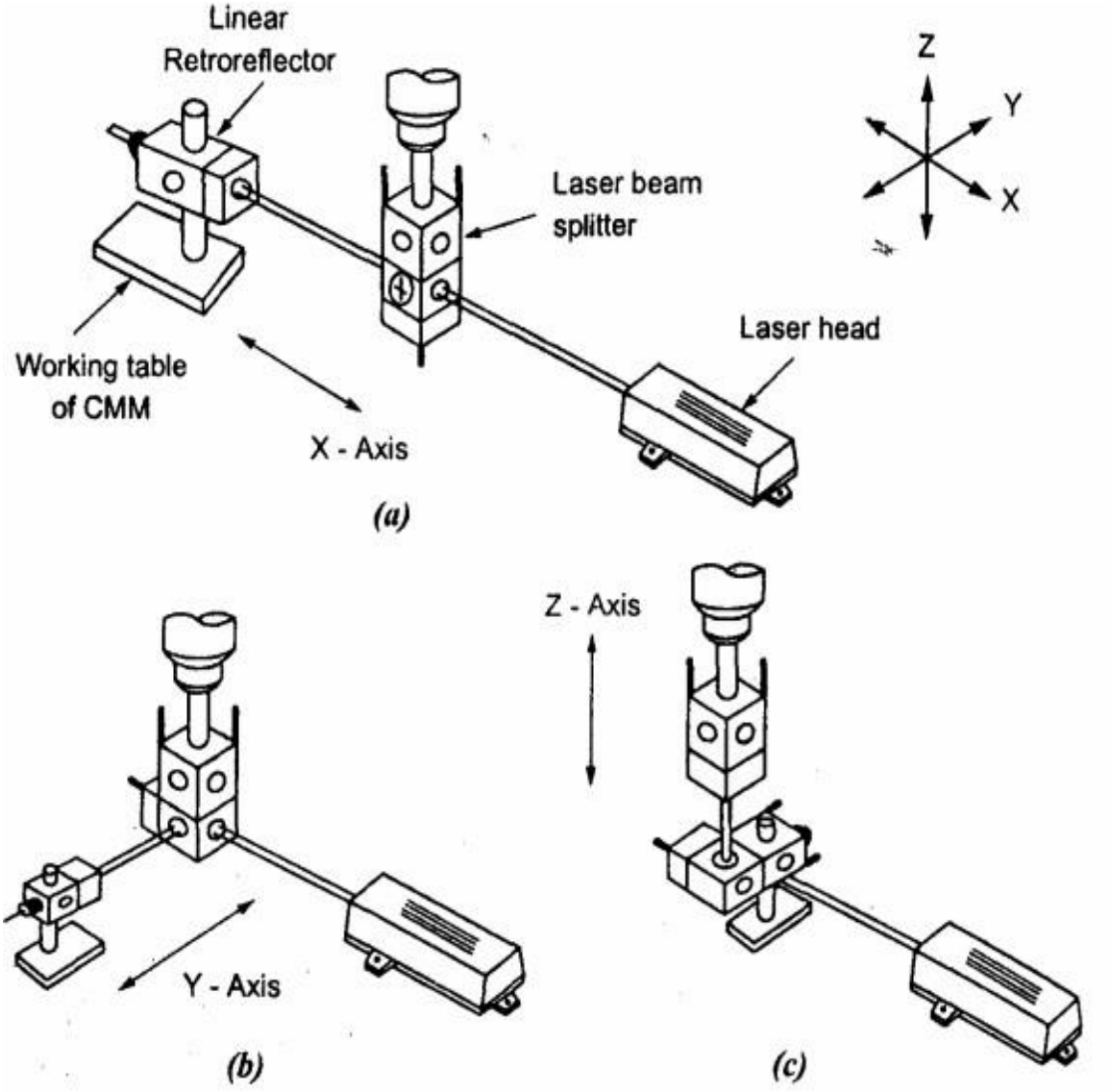
Calibration of Three Co-Ordinate MeasuringMachine



The laser head is mounted on the tripod stand and its height is adjusted corresponding to the working table of CMM. The interferometer contains a polarized beam splitter which reflects F1 component of the laser beam and the F2 Component parts

through. The retro reflector is a polished trihedral glass prism. It reflects the laser beam back along a line parallel to the original beam by twice the distance. For distance measurement the F1 and F2 beams that leave the laser head are aimed at the interferometer which splits F1 and F2 via polarizing beaming splitter. Component F1 becomes the fixed distance path and F2 is sent to a target which reflects it back to the interferometer. Relative motion between the interferometer and the remote retro reflector causes a Dopper shift in the returned frequency. Therefore the laser head sees a frequency difference given by F1-F2 ± ΔF2. The F1-F2 ± ΔF2 signal that is returned from the external interferometer is compared in the measurement display unit to the reference signal. The difference ΔF2 is related to the velocity. The longitudinal micrometer microscope of CMM is set at zero and the laser display unit is also set at zero. The CMM microscope is then set at the following points and the display units are noted.1 to 10mm, every mm and 10 to 200mm, in steps of 10mm. The accuracy of linear measurements is affected by changes in air temperature, pressure and humidity.

Performance ofCMM

- Geometrical accuracies such as positioning accuracy, Straightness andSquareness.
- Total measuring accuracy in terms of axial length measuring accuracy. Volumetric length measuring accuracy and length measuring repeatability. i.e., Coordinate measuring machine has to be tested as completesystem.
- Since environmental effects have great influence for the accuracy testing, including thermal parameters, vibrations and relative humidity arerequired.

APPLICATIONS

- Co-ordinate measuring machines find applications in automobile, machine tool, electronics, space and many other largecompanies.
- These machines are best suited for the test and inspection of test equipment, gauges and tools.
- For aircraft and space vehicles, hundred percent inspections is carried out by using CMM.
- CMM can be used for determining dimensional accuracy of thecomponents.
- These are ideal for determination of shape and position, maximum metal condition, linkage of results etc. which cannot do in conventionalmachines.
- CMM can also be used for sorting tasks to achieve optimum pairing of components within tolerancelimits.
- CMMs are also best for ensuring economic viability of NC machines by reducing their downtime for inspection results. They also help in reducing cost, rework cost at the appropriate time with a suitableCMM.

Advantages

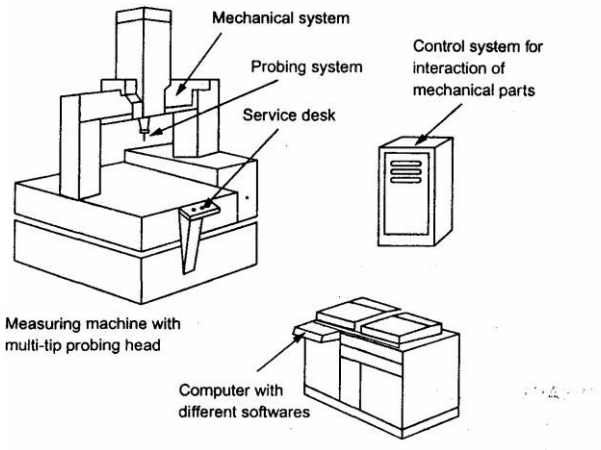
- The inspection rate isincreased.
- Accuracy ismore.
- Operators error can be minimized.
- Skill requirements of the operator is reduced.
- Reduced inspection fixturing and maintenancecost.
- Reduction in calculating and recordingtime.
- Reduction in set uptime.
- No need of separate go / no go gauges for eachfeature.
- Reduction of scrap and good partrejection.
- Reduction in off line analysistime.
- Simplification of inspection procedures, possibility of reduction of total inspection time through use of statistical and data analysistechniques.

Disadvantages

- The lable and probe may not be in perfectalignment.
- The probe may have runout.
- The probe moving in Z-axis may have some perpendicularerrors.
- Probe while moving in X and Y direction may not be square to eachother.
- There may be errors in digitalsystem.

COMPUTER CONTROLLED CO-ORDINATE MEASURINGMACHINE

- The measurements, inspection of parts for dimension form, surface characteristics and position of geometrical elements are done at the sametime.
- Mechanical system can be divided into four basic types. The selection will be depends on theapplication.
    1. Columntype.
    2. Bridgetype.
    3. Cantilevertype.
    4. Gantrytype.
    5. All these machines use probes which may be trigger type or measuring type. This is connected to the spindle in Z direction. The main features of this system are shown in figure
    6.



7. **Fig 4.15ColumnType**

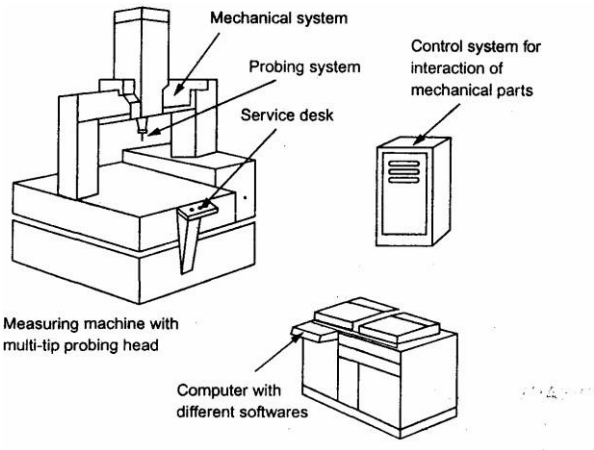
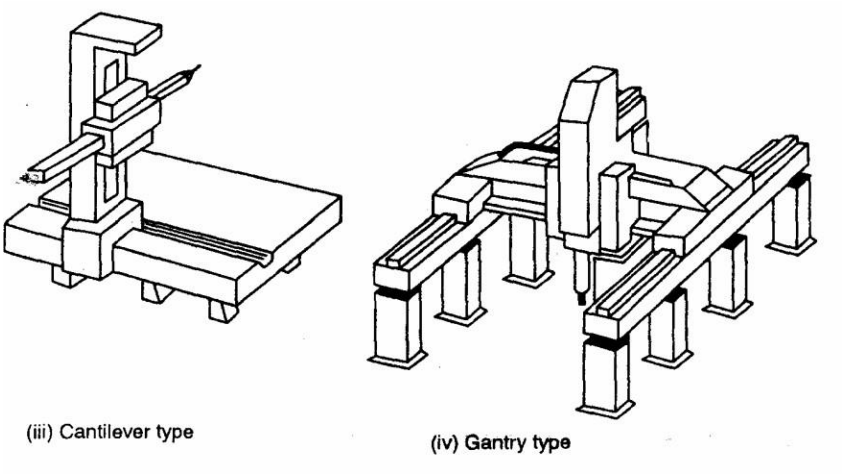


Fig 4.16 BridgeType



(iii) Cantilever type

(iv) Gantry type