



# SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)



## Department of Mechanical Engineering

### CAD/CAM and Automation

#### Unit – II

#### CMM- TYPES OF PROBES



<https://tinyurl.com/y934hzdw>



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# TYPES OF PROBES



Two general categories

1. Contact (see figure)
  - Touch-trigger probe
  - Analog scanning probe

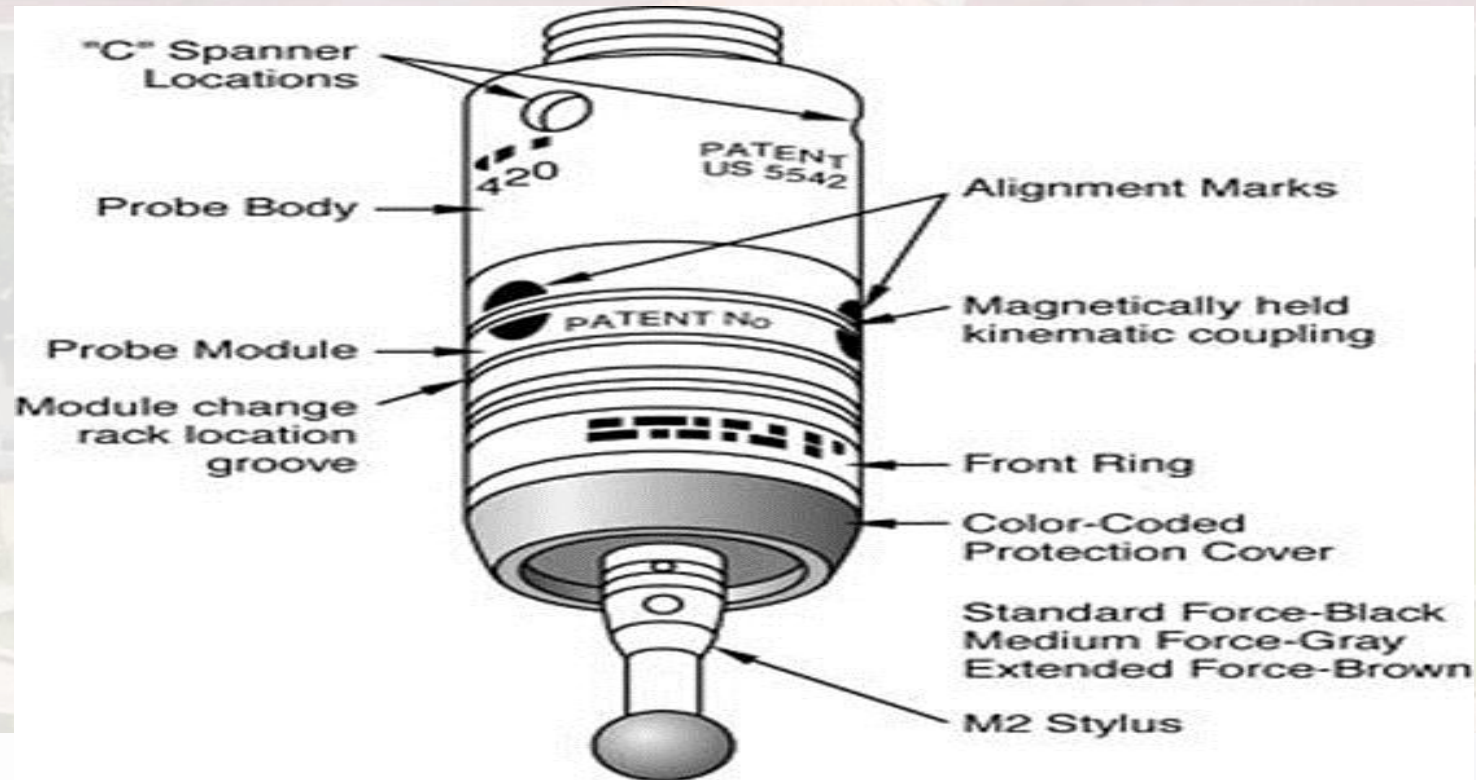
2. Noncontact

For inspection of printed circuit board, measuring a clay or wax model, when the object being measured would be deformed by the force of stylus

- laser probes
- video probes



# Measuring using CMM



<https://tinyurl.com/y72dl4g>



# Contact probes

## 1. Touch trigger probe

- As the sensor makes contact with the part, the difference in contact resistance indicates that the probe has been deflected
- The computer records this contact point coordinate space
- An LED light and an audible signal usually indicate contact
- Touch probe assemblies consist of three components; probe head, probe and stylus

## 2. Analog scanning probe

- Use to measure contour surfaces, complex, irregular  
Remains in contact with the surface of the part as it moves
- Improve the speed and accuracy



# Non-contact probe



## 1. Laser scanning probe

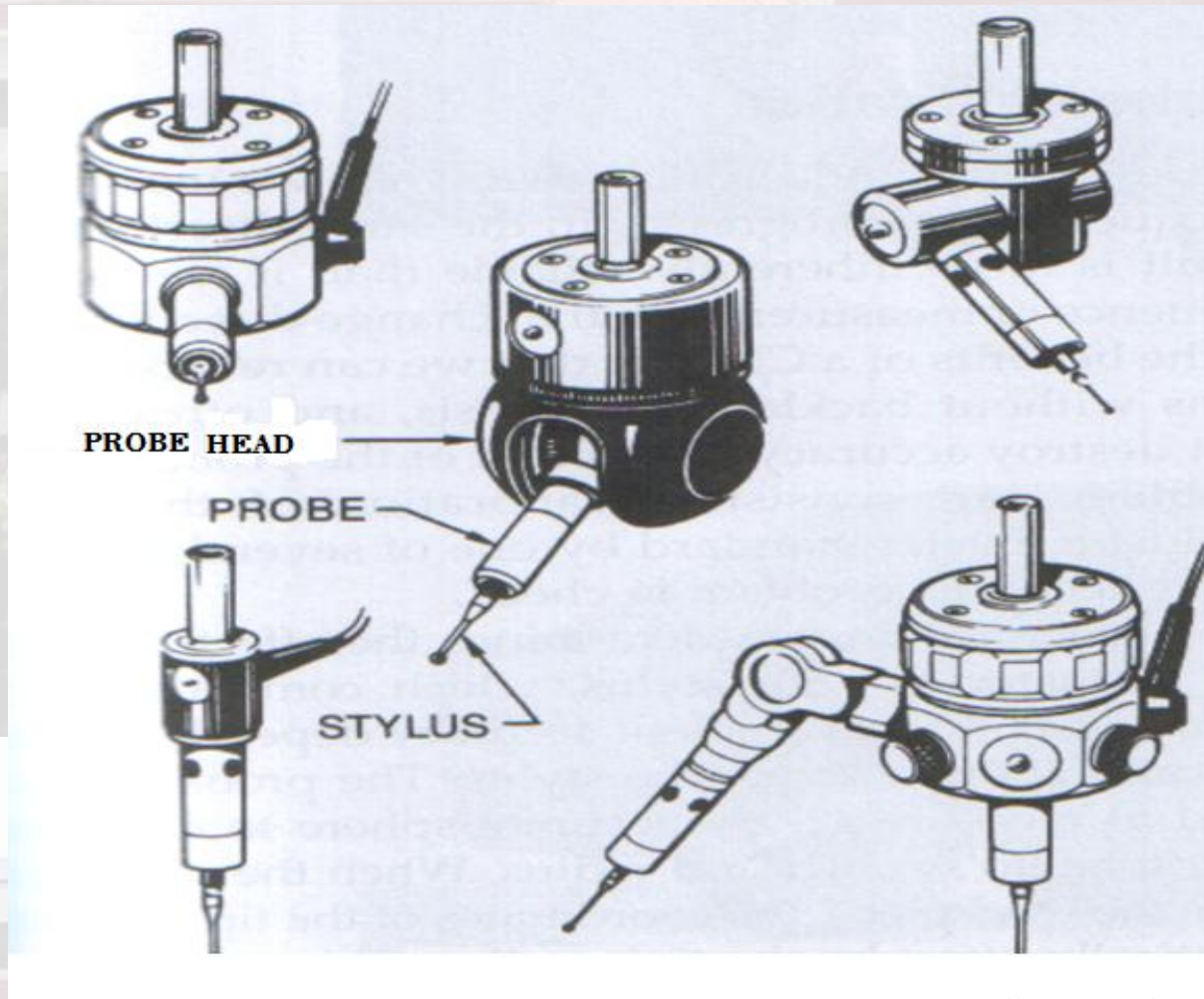
- Laser probes project a light beam onto the surface of a part
- When the light beam is triggered, the position of beam is read by triangulation through a lens in the probe receptor
- Laser tool have a high degree of speed and accuracy

## 2. Video probe

- The feature are measured by computer 'count' of the pixels of the electronic image
- The camera is capable of generating multitude of measurements points within a single video frame



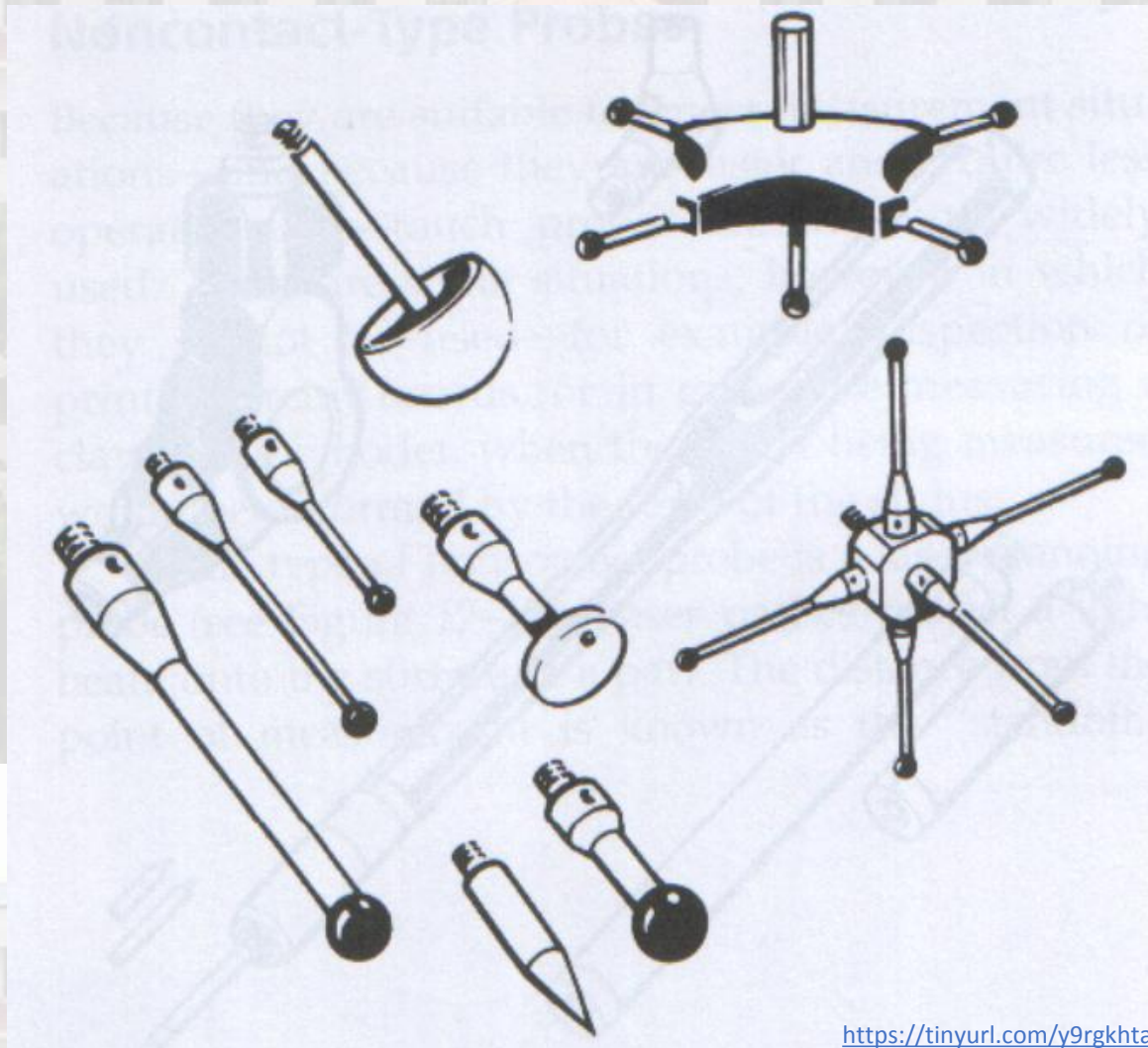
# Probe head, probes and stylus



<https://tinyurl.com/y9rgkhta>



# Multiple shapes of sylvus





# CMM software



- The programming of the machine or the software of the system enables the CMM to reach its full potential for accuracy, precision and speed
- Contour programs allow the CMM to quickly define detailed, complex non-geometric shapes such as gear, cams, and injection molds
- These programs also can be used to compare the measurement data with a computer assisted drafting (CAD) model



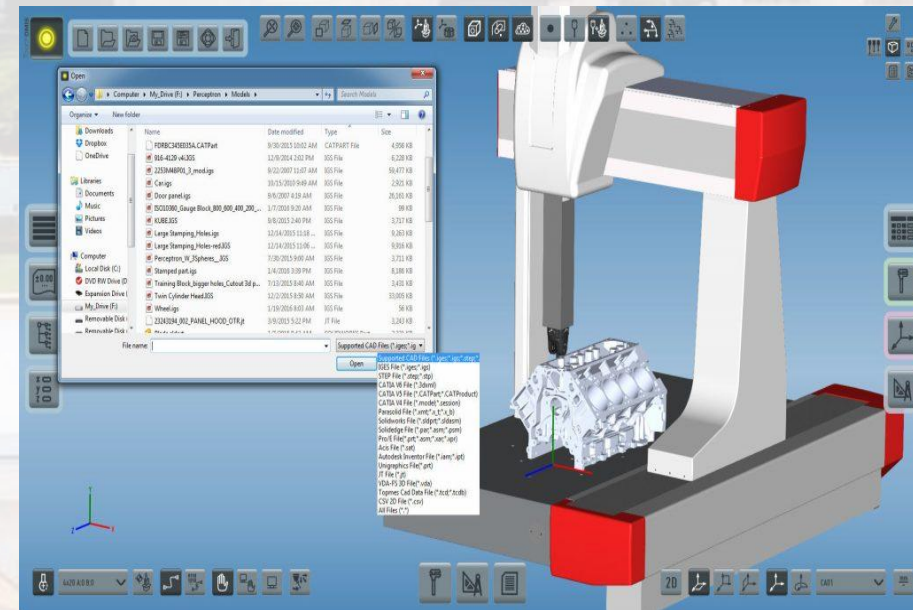


# CMM software (Cont..)



Generally software packages contains some or all of the following capabilities:

- Resolution selection
- Conversion between SI and English (mm and inch)
- Conversion of rectangular coordinates to polar coordinates
- Axis scaling
- Datum selection and reset
- Circle center and diameter solution
- Bolt-circle center and diameter
- Save and recall previous datum
- Nominal and tolerance entry
- Out-of tolerance computation



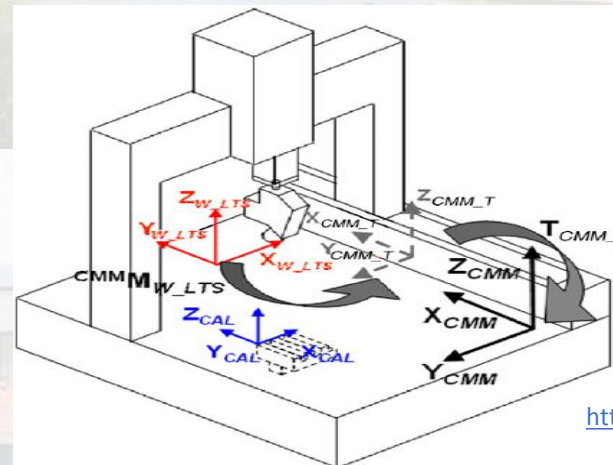
<https://tinyurl.com/yb64kz9s>



# Coordinate System



- A coordinate allows the CMM to locate features on a workpiece relative to other features
- The coordinate system is similar to a three-dimensional map, providing direction and location
- Each machine has a 'home' position (an origin) and x, y and z axes identify location that represents the machine coordinate system (MCS)
- A manufactured part can also have a part coordinate system (PCS)



<https://tinyurl.com/y9rz3pom>

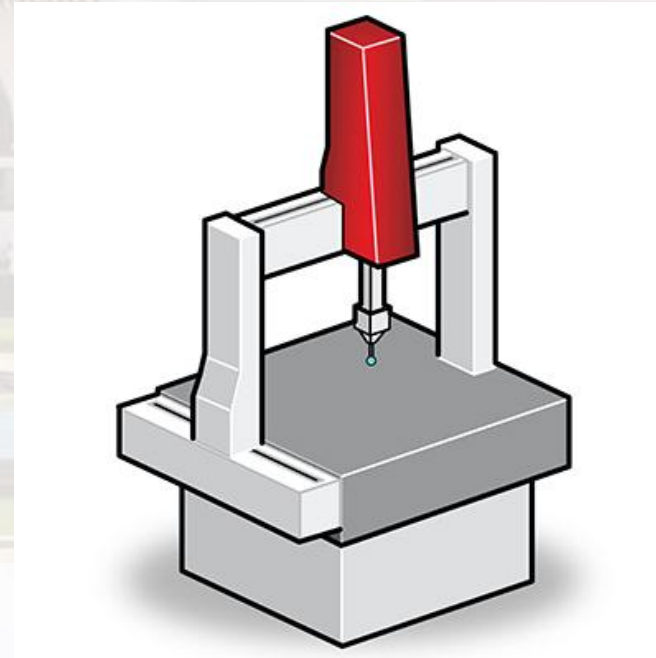


# The Role of Coordinate Measuring Machines



CMMs are particularly suited for the following conditions:

- Short runs
- Multiple features
- Flexibility
- High unit cost
- Production interruption



<https://tinyurl.com/y8dao88p>



# The Role of Coordinate Measuring Machines



- **Short runs**

We may be producing hundreds or even thousands of part, but the production run is not sufficient to justify the cost of production inspection tooling

- **Multiple features**

When we have a number of features- both dimensional and geometric- to control, CMM is the instrument that makes control easy and economical



# The Role of Coordinate Measuring Machines (Cont..)



- **Flexibility**

Because we can choose the application of the CMM system, we can also do short runs and measure multiple features

- **High unit cost**

Because reworking or scrapping is costly, CMM systems significantly increase the production of acceptable parts



# The Role of Coordinate Measuring Machines (Cont..)



- **Production interruption**

Whenever you have to inspect and pass one part before you can start machining on the next part, a machining center may actually be able to help a manufacturer save more money by reducing downtime than would be save by inspection



# Assessment Questions



1. Distinguish between absolute and incremental coordinate system.
2. What precise movement does CMM have?
  - a) Precise movement in x coordinate
  - b) Precise movement in x and y coordinates
  - c) Precise movement in y and z coordinates
  - d) Precise movement in x, y and z coordinates**
3. Which of the following is true for trigger type probe system used in computer controlled CMM?
  - a) Bucking mechanism is a 2 point bearing
  - b) Current coordinate position stored when circuit is close
  - c) Contacts of point bearing arranged at 90 degree
  - d) Contacts of point bearing act as electrical micro switches**

<https://tinyurl.com/v8gbqs7x>



THANK YOU