



# SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING



## SENSORS AND INSTRUMENTATION



Guess Today's Topic????





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



Linear measurement applies to measurement of lengths, diameter, heights and thickness including external and internal measurements. The line measuring instruments have series of accurately spaced lines marked on them e.g., Scale. The dimensions to be measured are aligned with the graduations of the scale.

Linear measuring instruments are designed either for line measurements or end measurements. In end measuring instruments, the measurement is taken between two end surfaces in micrometres, slip gauges etc. The instruments used for linear measurements can be classified as:

- a. Direct measuring instruments
- b. Indirect measuring instruments





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



Both direct and indirect linear measuring instruments conform to these established standards of length and provide convenient means for making accurate and precise linear measurements. Vernier calliper and vernier micrometer are the most widely used linear measuring instruments in machine shops and tool rooms. Measuring instruments are designed either for line measurements (e.g., steel rule or vernier calliper) or for end measurements in order to measure the distance between two surfaces using an instrument (e.g., screw gauge). Callipers and dividers, which are also linear measurement devices, are basically dimension transfer instruments. They will not directly provide the measurement of length on a scale. Quality of measurement not only depends on the accuracy of these instruments, but also calls for application of certain simple principles to be followed during measurements. Illustrations are given throughout this chapter, especially on the latter issue, to highlight that care should be exercised for the proper use of linear measuring instruments.





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



Most people's first contact with linear measurement is with a steel rule or a tape measure. today's engineer has a choice of a wide range of instruments—from purely mechanically operated instruments to digital electronics instruments. One has to consider only the nature of application and cost of measurement to decide which instrument is the best for an application. However, many of these instruments, such as depth gauge and height gauge, need to be used with a datum to ensure accuracy of measurements. The foundation for all dimensional measurements is the 'datum plane', the most important ones being the surface plate and the V-block.





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



## SURFACE PLATE

we understood that every linear measurement starts at a reference point and end at a measured point. This is true when our basic interest is in measuring a single dimension, length in this case. However, the foundation for all dimensional measurements is the 'datum plane', the most important one being the surface plate. A surface plate is a hard, solid, and horizontal flat plate, which is used as the reference plane for precision inspection, marking out, and precision tooling set-up. Since a surface plate is used as the datum for all measurements on a job, it should be finished to a high degree of accuracy. It should also be robust to withstand repeated contacts with metallic workpieces and not be vulnerable to wear and tear.





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



- **SCALED INSTRUMENTS** Rules are useful for many shop floor measurements. However, measurements of certain components require some mechanical means to either hold the measuring device steadily against the component being measured or capture the reading, which can be read at leisure. Another important advantage of a scaled instrument is that the least count of measurement can be improved greatly compared to an ordinary steel rule. Most of the modern scaled instruments provide digital display, which comes with a high degree of magnification. Measurements can be made up to micron accuracy. This section presents three scaled instruments, namely depth gauge, combination set, and callipers, which are necessary accessories in a modern metrology laboratory.





# LINEAR AND ANGULAR DISPLACEMENT MEASUREMENT



Angular measurement is another important element in measuring. It involves the measurement of angles of tapers and similar surfaces.

In angular measurements, two types of angle measuring devices are used. They are angle gauges corresponding to slip gauges and divided scales corresponding to line standards. The most common instrument is sine bar.

The main difference between linear and angular measurement is that no absolute standard is required for angular measurement.





*Thank  
you*

