Linear Measurement Comparators

Electronic comparators

Principle of operation

The work to be measured is placed under the plunger of the electronic comparator. Both work and comparator are made to rest on the surface plate. The linear movement of the plunger is converted into electrical signal by a suitable transducer. Then it sent to an oscillator to modulate the electrical signal by adding carrier frequency of wave. After that the amplified signal is sent to demodulator in which the carrier waves are cut off. Finally, the demodulated signal is passed to the meter to convert the probe tip movement into linear measurement as an output signal. A separate electrical supply of D.C. is already given to actuate the meter.

Linear Measurement Comparators

Electronic comparators

Advantages of Electrical and Electronic comparator

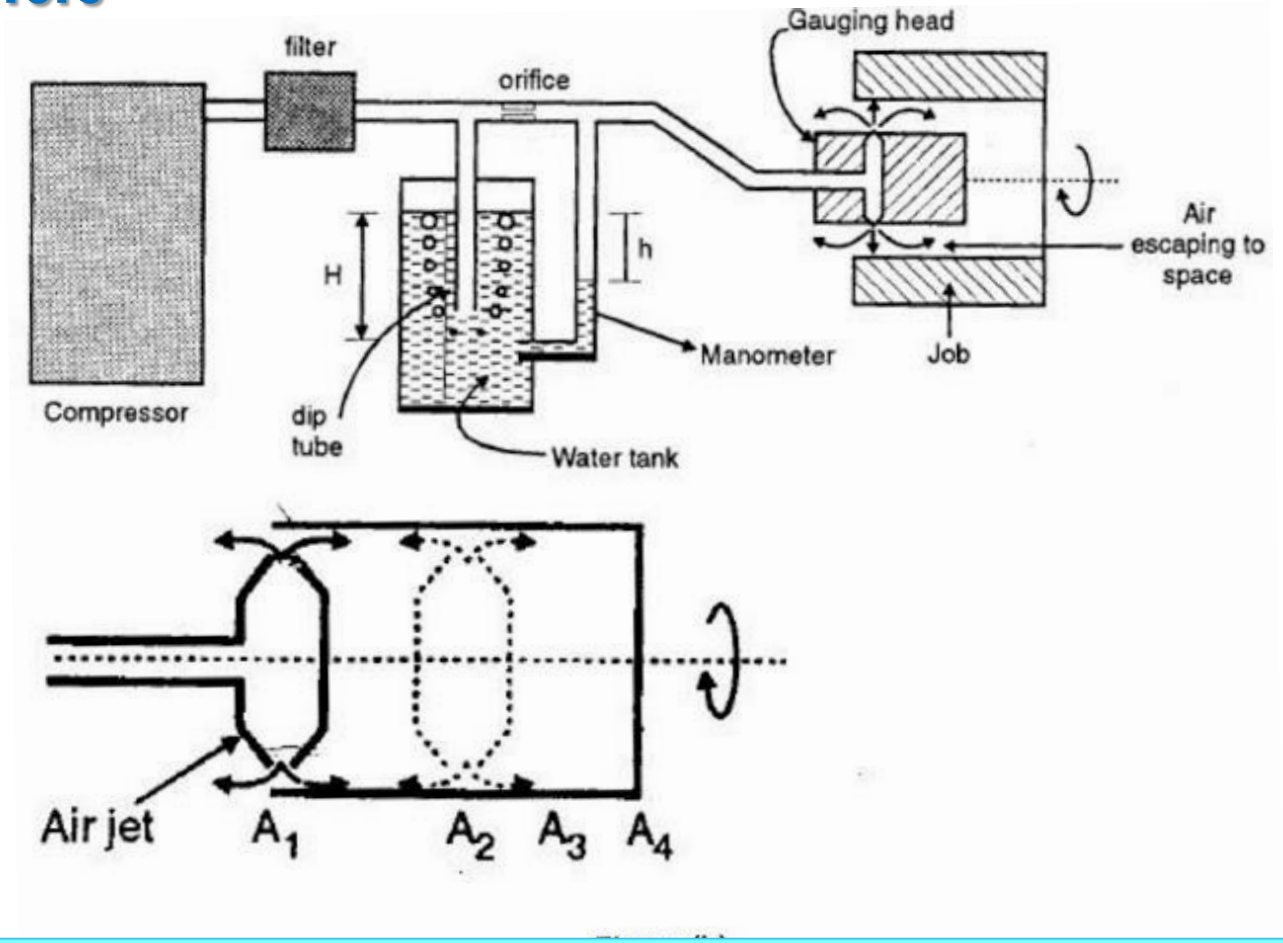
1. It has less number of moving parts.
2. Magnification obtained is very high.
3. Two or more magnifications are provided in the same instrument to use various ranges.
4. The pointer is made very light so that it is more sensitive to vibration.
5. The instrument is very compact.

Disadvantages of Electrical and Electronic comparator

1. External agency is required to meter for actuation.
2. Variation of voltage or frequency may affect the accuracy of output.
3. Due to heating coils, the accuracy decreases.
4. It is more expensive than mechanical comparator.

Linear Measurement Comparators

Pneumatic comparators



Linear Measurement Comparators

Pneumatic comparators

Advantages:

1. It is cheaper, simple to operate and the cost is low.
2. It is free from mechanical hysteresis and wear.
3. The magnification can be obtained as high as 10,000 X.
4. The gauging member is not in direct contact with the work.
5. Indicating and measuring is done at two different places.
6. Tapers can be easily detected.
7. The method is self cleaning due to continuous flow of air through the jets and this makes the method ideal to be used on shop floor for online controls.

Linear Measurement Comparators

Pneumatic comparators

Disadvantages:

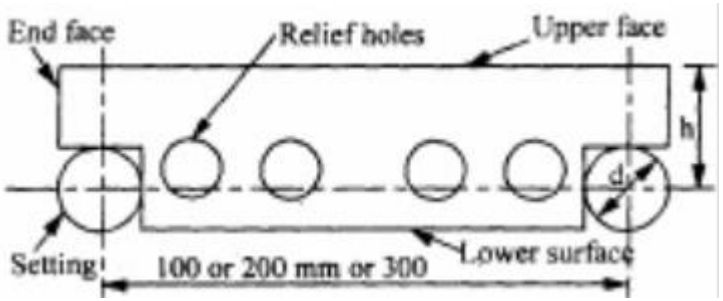
1. They are very sensitive to temperature and humidity changes.
2. The accuracy may be influenced by the surface roughness of the component being checked.
3. Different gauging heads are needed for different jobs.
4. Auxiliary equipments such as air filters, pressure gauges and regulators are needed.
5. Non-uniformity of scale is a peculiar aspect of air gauging as the variation of back pressure is linear, over only a small range of the orifice size variation.

Angle Measurements

Sine bar

Sine bars are always used along with slip gauges as a device for the measurement of angles very precisely. They are used to

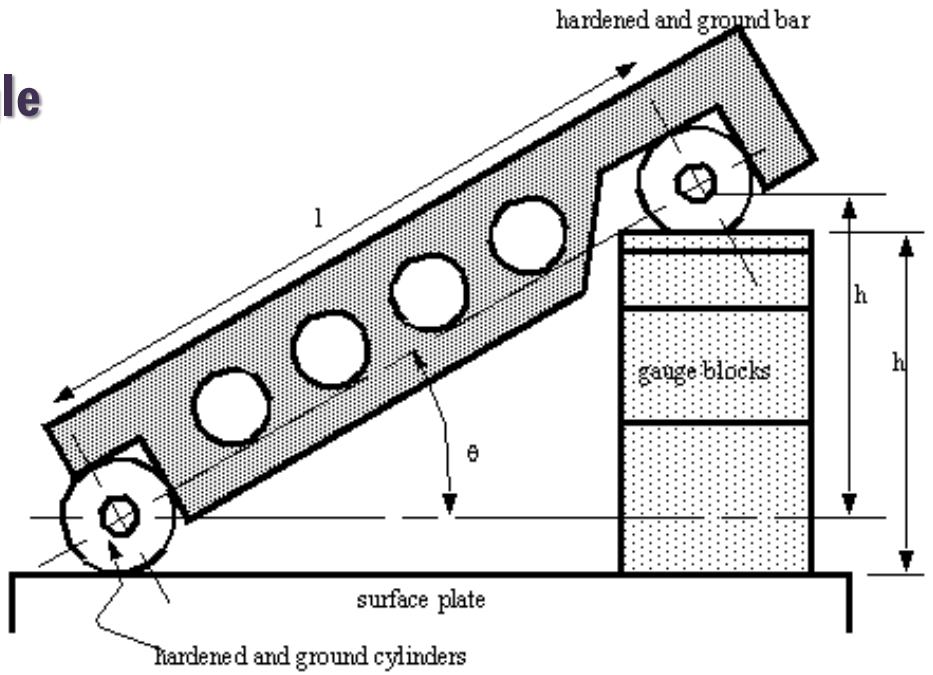
1. Measure angles very accurately.
2. Locate the work piece to a given angle with very high precision.



Angle Measurements

Sine bar

Locating any' work to a given angle



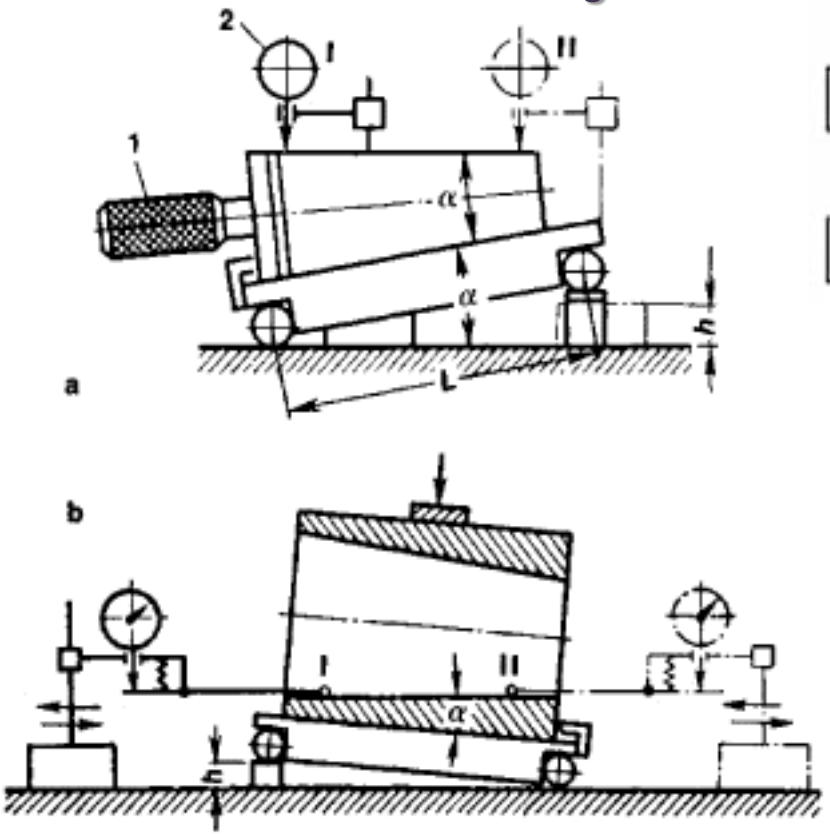
l = distance between centres of ground cylinders (typically 5" or 10")
h = height of the gauge blocks
θ = the angle of the plate

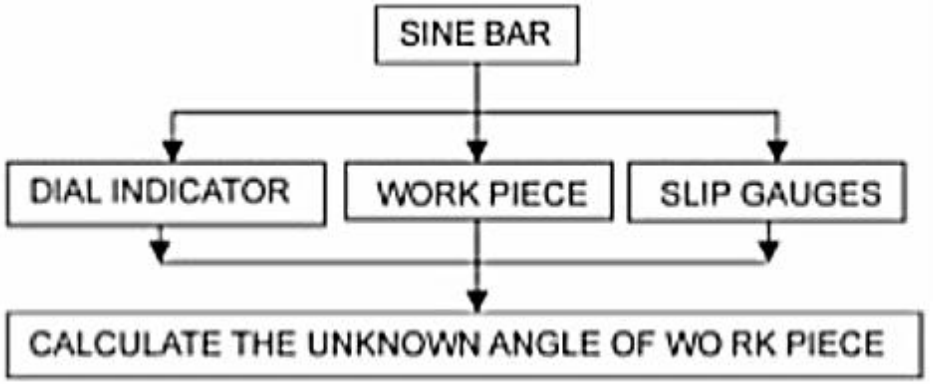
$$\theta = \operatorname{asin}\left(\frac{h}{l}\right)$$

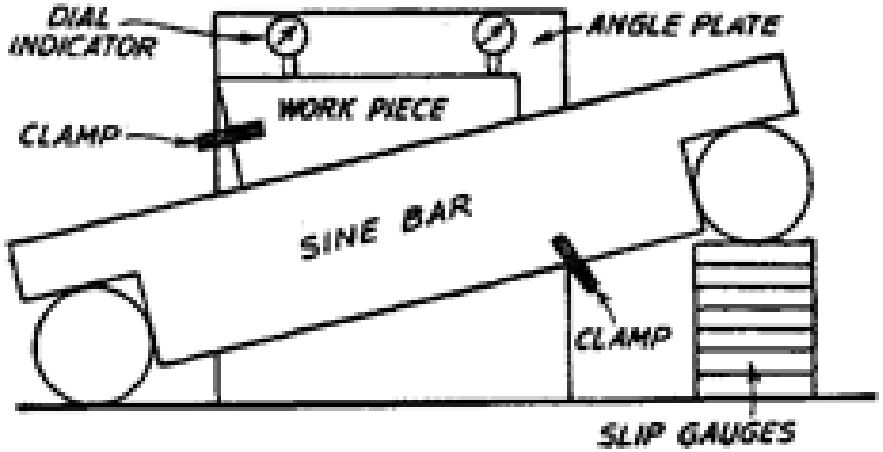
Angle Measurements

Sine bar

To Measure unknown angle







Angle Measurements

Sine bar

Limitations of sine bars

1. Sine bars are fairly reliable for angles than 15°.
2. It is physically difficult to hold in position.
3. Slight errors in sine bar cause larger angular errors.
4. A difference of deformation occurs at the point of roller contact with the surface plate and to the gauge blocks.
5. The size of parts to be inspected by sine bar is limited.

Sources of error in sine bars

1. Error in distance between roller centers.
2. Error in slip gauge combination.
3. Error in checking of parallelism.
4. Error in parallelism of roller axes with each other.
5. Error in flatness of the upper surface of sine bar.

Angle Measurements

Bevel protractors

Bevel protractors are nothing but angular measuring instruments.

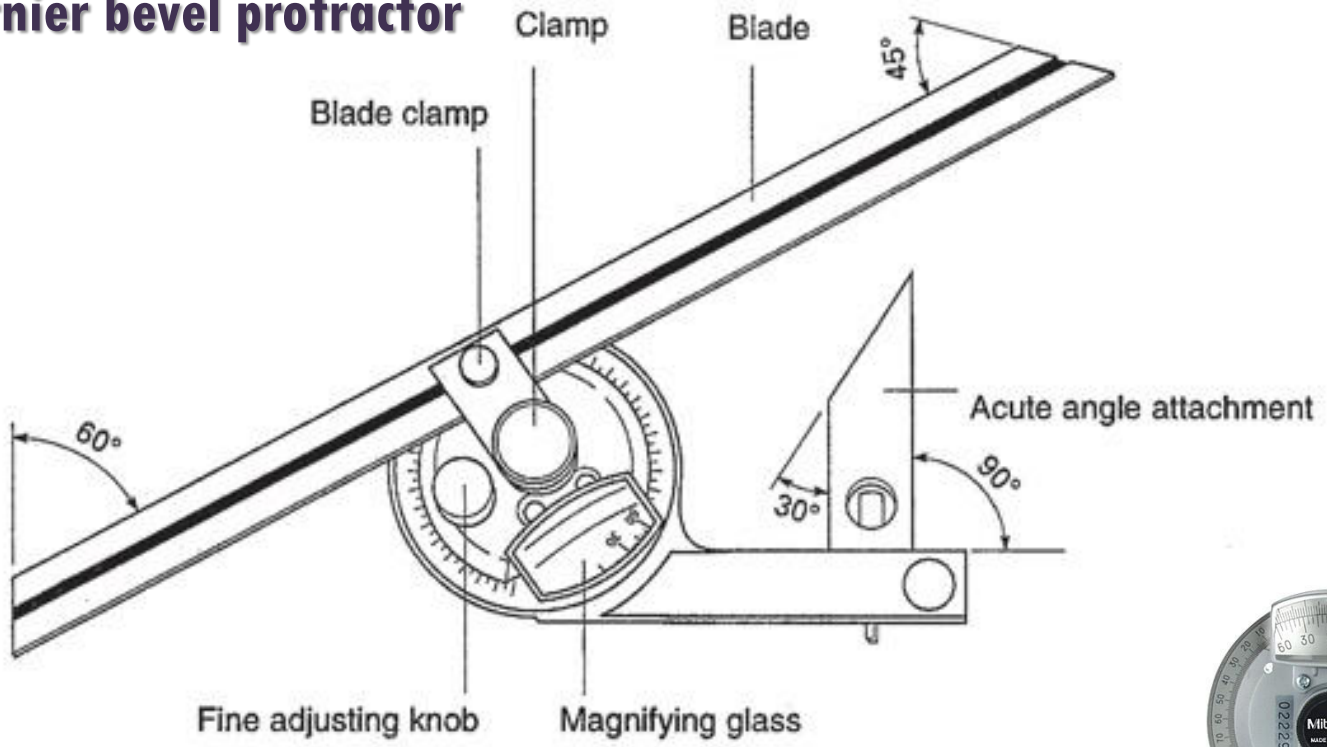
Types of bevel protractors:

1. **Vernier bevel protractor**
2. **Universal protractor**
3. **Optical protractor**

Angle Measurements

Bevel protractors

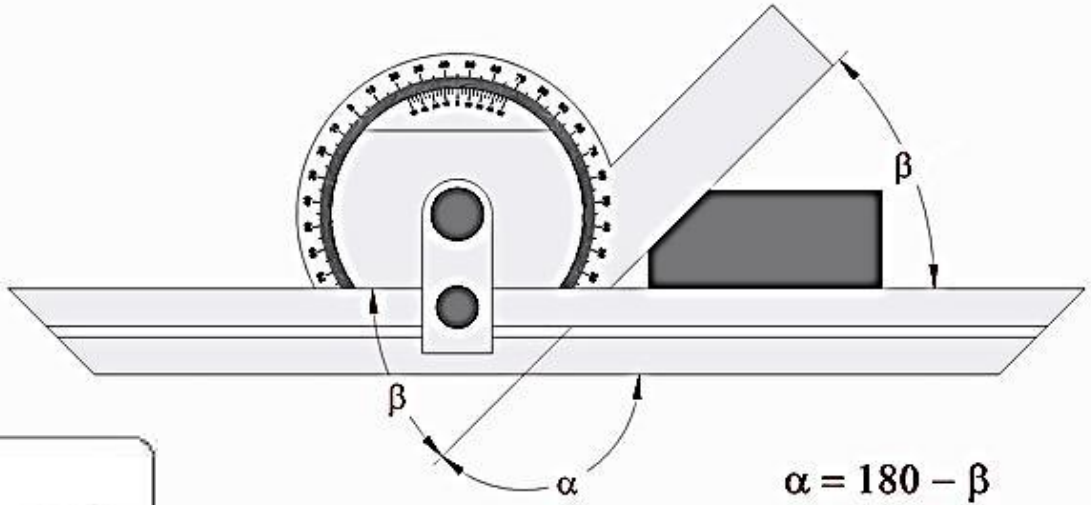
Vernier bevel protractor

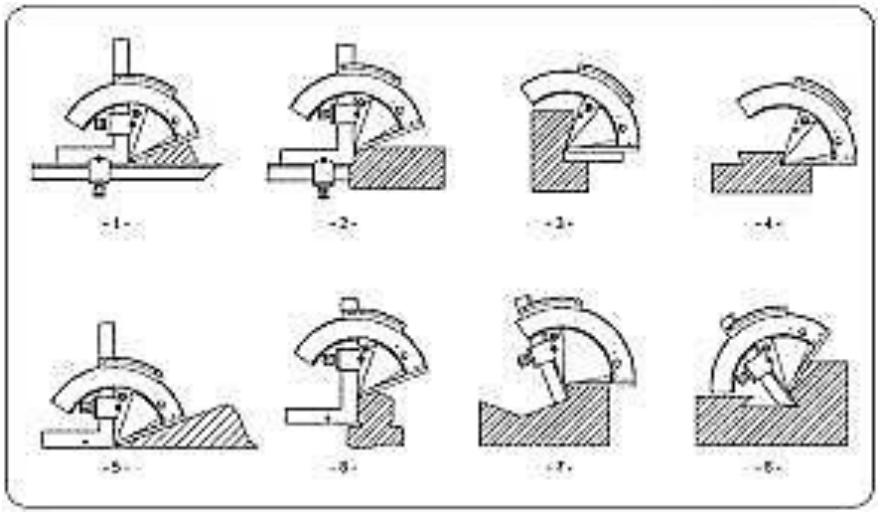


Angle Measurements

Bevel protractors

Vernier bevel protractor






Thank You