

- Engineering Metrology and Measurements

TWO MARK QUESTION AND ANSWERS - UNIT 2

What are the considerations while manufacturing the slip gauges?

The following additional operations are carried out to obtain the necessary qualities in slip gauges during manufacture.

1. First the approximate size of slip gauges is done by preliminary operations.
2. The blocks are hardened and wear resistant by a special heat treatment process.
3. To stabilize the whole life of blocks, seasoning process is done.
4. The approximate required dimension is done by a final grinding process.

How do you calibrate the slip gauges?

Comparators are used to calibrate the slip gauges.

List the various linear measurements?

- (i) Length (ii) Heights and (iii) Thickness

What are the various types of linear measuring instruments?

The various devices used for measuring the linear measurements are

- i. Vernier calipers
- ii. Micrometers
- iii. Slip gauge or gauge blocks
- iv. Comparator

State 'Taylor principle' of gauge design.

It states that GO gauge is as maximum metal condition and NOGO gauge is as minimum metal condition.

List out any four angular measuring instrument used in metrology

- (i) Angle gauges
- (ii) Divided scales
- (iii) Sine bar with slip gauges

- (iv) Autocollimator
- (v) Angle dekkor

What is comparators?

Comparators are one form of linear measurement device which is quick and more convenient for checking large number of identical dimensions.

Classify the comparator according to the principles used for obtaining magnification.

The common types are:

- (i) Mechanical comparators.
- (ii) Electrical comparators.
- iii) Optical comparators.
- (iv) Pneumatic comparators.

How the mechanical comparator works?

The method of magnifying small movement of the indicator in all mechanical comparators are effected by means of levers, gear trains or a combination of these elements.

State the best example of a mechanical comparator.

A dial indicator or dial gauge is used as a mechanical comparator.

Define least count and mention the least count of a mechanical comparator.

Least count. - The least value that can be measured by using any measuring instrument known as least count. Least count of a mechanical comparator is 0.01 mm

How the mechanical comparator is used? State with any one example.

Let us assume that the required height of the component is 32.5mm. Initially, this height is built up with slip gauges. The slip gauge blocks are placed under the stem of the dial gauge. The pointer in the dial gauge is adjusted to zero. The slip gauges are removed- Now, the component to be checked is introduced under the stem of the dial gauge. If there is any deviation in the height of the component, it will be indicated by the pointer.

State any four advantages of reed type mechanical comparator.

- (i) It is usually robust, compact and easy to handle.
- (ii) There is no external supply such as electricity, air required
- (iii) It has very simple mechanism and is cheaper when compared to other types.
- (iv) It is suitable for ordinary workshop and also easily portable.

Mention any two disadvantages of reed type mechanical comparator.

- (i) Accuracy of the comparator mainly depends on the accuracy of the rack and pinion arrangement. Any slackness will reduce accuracy.
- (ii) It has more moving parts and hence friction is more and accuracy is less.

What are the major types of an electrical comparator?

An electrical comparator consists of the following three major parts such as

- (i) Transducer
- (ii) Display device as meter
- (iii) Amplifier

What basis the transducer works?

An iron armature is provided in between two coils held by a leaf spring at one end. The other end is supported against a plunger. The two coils act as two arms of an A.C. wheat stone bridge circuit.

How is the accuracy of an electrical comparator checked?

To check the accuracy of a given specimen or work, first a standard specimen is placed under the plunger. After this, the resistance of wheat stone bridge is adjusted that the scale reading shows zero. Then the specimen is removed. Now, the work is introduced under the plunger.

State the working principle of an electronic comparator.

In electronic comparator, transducer induction or the principle of application of frequency Modulation or radio oscillation is followed.

Mention the important parts of an electronic comparator.

- (i) Transducer
- (ii) Oscillator
- (iii) Amplifier
- (iv) Demodulator (v) Meter

Classify pneumatic comparators.

- (i) Flow or Velocity type.
- (ii) Back pressure type

What are the advantages of electrical and electronic comparator?

- (i) It has less number of moving parts.
- (ii) Magnification obtained is very high.
- (iii) Two or more magnifications are provided in the same instrument to use various ranges.
- (iv) The pointer is made very light so that it is more sensitive to vibration.

What are the disadvantages of electrical and electronic comparator?

- (i) External agency is required to measure for actuation.
- (ii) Variation of voltage or frequency may affect the accuracy of output.
- (iii) Due to heating coils, the accuracy decreases.
- (iv) It is more expensive than mechanical comparator.

List the various parts of an optical comparator

The optical comparator consists of the following parts such as

- (i) Pivoted lever. (ii) Objective lens (iii) Scale
- (iv) Plunger (v) Table and (vi) Base.

What are the advantages of pneumatic comparator?

- (i) The wear of measuring heads is avoided due to absence of direct contact.
- (ii) Friction is less due to less number of moving parts.

(iii) Work piece is cleaned by supplying of air during the measurement.

(iv) High magnification is possible.

(v) There is no interference of measuring head and indicating device because the measuring head is kept away from the indicating device.

(vi) It is a suitable method to check taperness of circular bore.

State the working principle of an electronic comparator.

In electronic comparator, transducer induction or the principle of application of frequency modulation or radio oscillation is followed.

Mention the important parts of an electronic comparator.

(i) Transducer

(ii) Oscillator

(iii) Amplifier

(iv) Demodulator

(v) Meter

What are the constructional requirements of good sine bar?

The rollers must be of equal diameter and true geometric cylinders.

The distance between the roller axes must be precise and known, and these axes must be mutually parallel.

The upper surface of the beam must be flat and parallel with the roller axes, and equidistant from each.

What is sine bar.

It is a precision measuring instrument and is an excellent example of combination of linear measurement and angular measurement when used in conjunction with gauge blocks (slip gauges). It consists of a bar carrying a suitable pair of rollers set a known centre distance. It is made of high carbon, high chromium corrosion resistant steel, suitably hardened, precision

ground and stabilised. Relief holes are provided for easy handling of sine bar and for reducing the weight of the sine bar. It should be used on a grade A surface plate.

What is interferometry.

Interferometry is a family of techniques in which waves, usually electromagnetic, are superimposed in order to extract information about the waves. Interferometry is an important investigative technique in the fields of astronomy, fiber optics, engineering metrology, optical metrology, oceanography, seismology, spectroscopy (and its applications to chemistry), quantum mechanics, nuclear and particle physics, plasma physics, remote sensing, bio molecular interactions, surface profiling, micro fluidics, mechanical stress/strain measurement, and velocimetry.

What are sine centers?

We have gained expertise in manufacturing and supplying a quality range of Sine Centres. The products offered by us are manufactured using optimum-grade material so that these are in compliance with international standards.

State the requirements of sine bar.

The rollers must be of equal diameter and true geometric cylinders. ii) The distance between the roller axes must be precise and known, and these axes must be mutually parallel. iii) The upper surface of the beam must be flat and parallel with the roller axes, and equidistant from each.

What are merits of mechanical comparators.

- Linear characteristics of scale
- High magnification
- Quick in results
- Versatility
- Minimum wear of contact point
- Free from backlash
- Quick insertion of work piece
- Provision for compensation from temperature effects

What is angle dekkor.

In this system, an illuminated scale is set in the focal plane of the collimating lens outside the field of view of a microscope eyepiece. It is then projected as a parallel beam and strikes a plane reflector below the instrument. It is reflected, and refocused by the lens so that its image is in the field of view of the eyepiece.

What is auto collimator.

If a point source of light O is placed at the principal focus of a collimating lens, it will be projected as a parallel beam of light. If this parallel beam now strikes a plane reflector which is normal to the optical axis, it will be reflected back along its own path and refocused at the source.

Mention the four precautions of slip gauges.

Base

Holder

Scriber

Measuring jaw

What are the chances of errors in sine bar.

Angles are measured using a sine bar with the help of gauge blocks and a dial gauge or a spirit level. The aim of a measurement is to measure the surface on which the dial gauge or spirit level is placed horizontal. For example, to measure the angle of a wedge, the wedge is placed on a horizontal table. The sine bar is placed over the inclined surface of the wedge. At this position, the top surface of the sine bar is inclined the same amount as the wedge. Using gauge blocks, the top surface is made horizontal. The sine of the angle of inclination of the wedge is the ratio of the height of the gauge blocks used and the distance between the centers of the cylinders.

What is meant by wringing slip gauges.

The slip gauges are wrung together by hand through a combined sliding and twisting motion. The air gap between the gauge faces is expelled out and the adhesion is caused partly by molecular attraction and partly by atmospheric pressure. The gap between the two wrung slip gauges is only of the order of 0.00635 m which is negligible.