Telescope gauge

Objectives: At the end of this lesson you shall be able to
- **name the parts of telescope gauge**
- **Measuring technique how to telescope gauge reading on outside micrometer**

Telescopic Gauge (Fig 1) **:** This is an instrument used for measuring the inside size of slots or holes. It consists of a handle and two plungers, one of which telescopes into the other. Both the plungers are kept under spring tension. In order to lock the plungers in position, a knurled screw at the end of the handle is tightened. If the diameter of a hole is to be measured, the plungers are first compressed and then locked. The plunger end is put into the hole and the end is allowed to expand so that the plungers touch the opposite edges.

Then the plungers are locked in position and taken out of the hole. The diameter is measured with the help of an outside micrometer. The telescopic gauge does not have graduations of its own.

The precaution to be taken in the telescopic gauge in that they should be inserted squarely on to the bore and centralised properly.

Measuring Technique

(a) Compress the fixed and telescopic legs and lock them by locking screw.

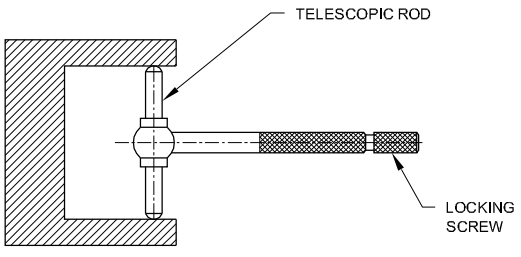
(b) Insert the gauge ends into the hole to be measured.

(c) Unlock the legs by unscrewing the locking screw for expanding the legs to the inner diameter of the hole.

(d) Measure with feel and lock the legs in position.

(e) Transfer the measurement to an outside micrometer for reading.

Fig 1



TELESCOPIC GAUGE

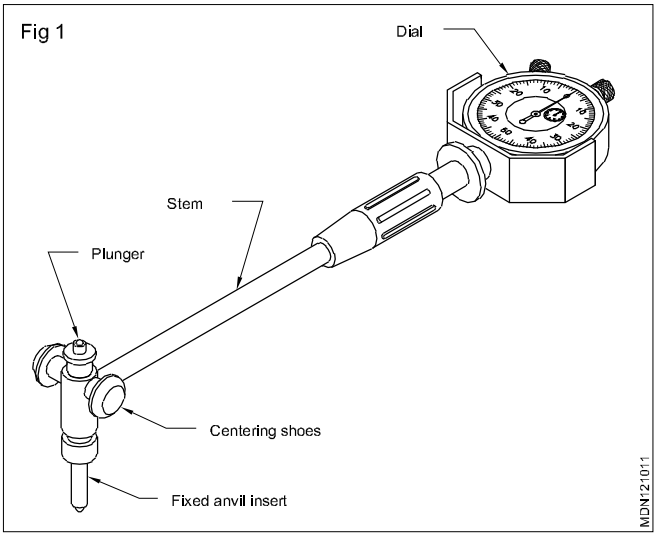
Dial bore gauge

- **name the parts of a bore dial gauge**
- **state the features of a bore dial gauge**
- **read the measurement using a graduated dial.**

This is a precision measuring instrument used for measuring the internal dimensions. The dial bore gauge is normally available as a two-point, self-cantering type

Dial bore gauge (Fig 1) **:**

Fig 1



Stem

This holds all the components together and contains the mechanism for transmitting the plunger motion to the dial.

Fixed anvil/inserts

These anvils are interchangeable. The selection of the anvil is made depending on the diameter of the bore to be measured. For certain types of bore dial gauges, extension rings/washers are provided for extending the range of measurement.

Sliding plunger

This actuates the movement of the dial for reading the measurement.

Centering shoes/spherical supports

Certain types of bore dial gauges are provided with a pair of ground discs. (Fig 2)

This maintains the alignment of the measuring faces in the centre of the bore. For some types, two spherical supports which are spring-loaded are provided.

Dial Indicator (Fig 3)

This has graduations marked on the dial. The graduations has marked in clockwise and anticlockwise directions.

Bore dial gauges are available in various sizes with different measuring ranges. These are interchangeable measuring rods (external rods or combination washers) for measuring different sizes. (Fig 4)

Fig 2

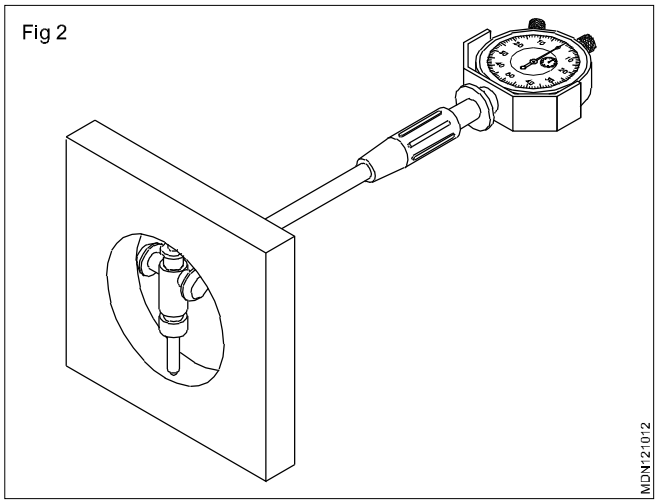


Fig 3

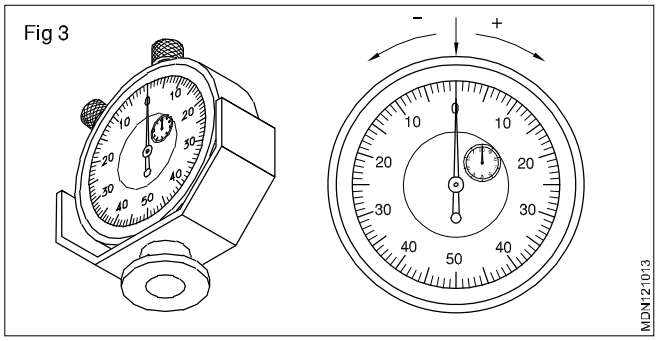
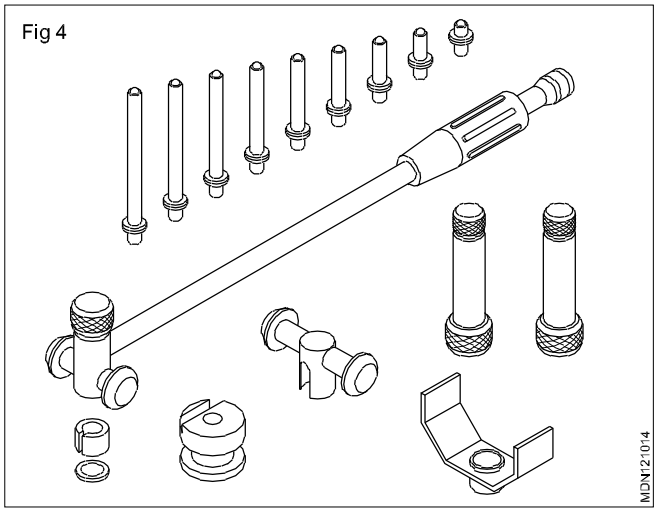


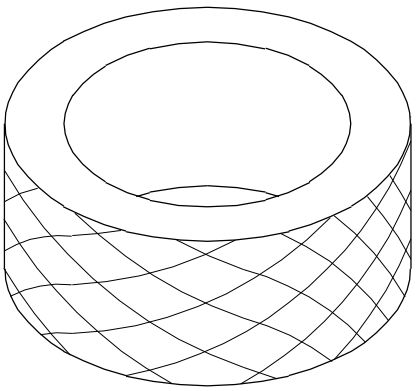
Fig 4



The accuracy of the instrument depends on the type of graduations on the dial. The most frequently used instruments have accuracies of 0.001 mm and 0.01 mm.

The dial gauge should be set to zero before taking measurement. Setting rings are available for zero setting. (Fig 5)

Fig 5



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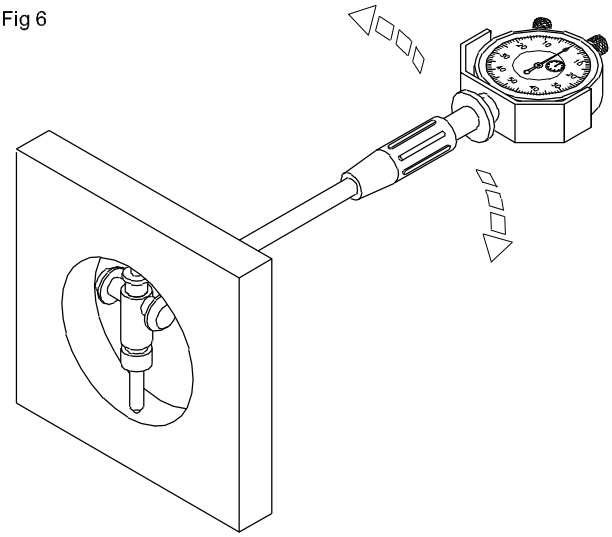
While taking measurements press the spring-loaded end (plunger) as it enters into the setting device or in the bore being measured. Slightly rock and steady the device for keeping the measuring faces in position. (Fig 6)

Fig 6



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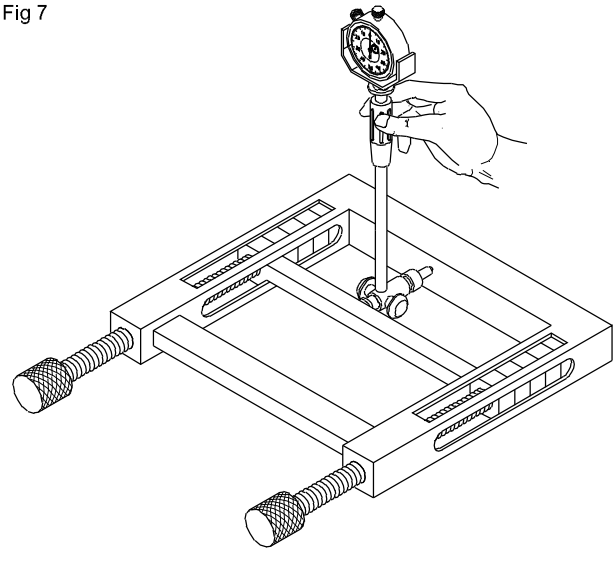
Slip gauges fixed in a setting fixture can also be used for zero setting. (Fig 7)

Fig 7



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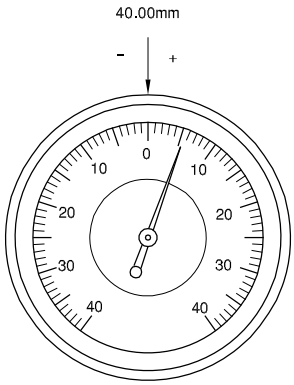
Reading the dial indicator (Fig 8)

When taking the reading, first check the measuring range and the subdivisions of the scale. The indicator in the figure has a range of 0.8 mm and is graduated 0-40 in both directions. Thus the value of each division is 0.01 mm.

The indicator shows positive deviations in the clockwise direction and negative deviations in the anticlockwise direction.

Fig 8



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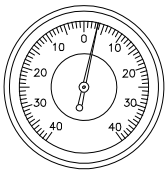
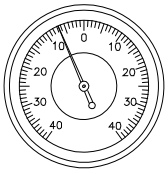
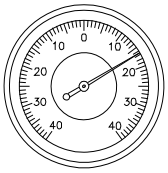
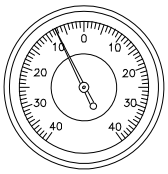
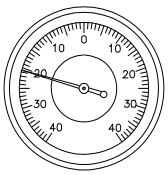
Classroom assignment

Basic measurement		Value measured	
30.0 mm		29.97 - 29.98	☐
		30.02 - 30.03	☐
		30.03 - 30.04	☐
		30.04 - 30.05	☐
23.0 mm		22.92 - 22.93	☐
		22.93 - 22.94	☐
		22.94 - 22.95	☐
		22.96 - 22.97	☐
47.8 mm		47.86 - 47.87	☐
		47.88 - 47.89	☐
		47.92 - 47.93	☐
		47.96 - 47.97	☐
53.0 mm		52.92 - 52.93	☐
		52.93 - 52.94	☐
		53.96 - 53.97	☐
		53.97 - 53.98	☐
65.0 mm		64.75 - 64.76	☐
		64.79 - 64.80	☐
		64.83 - 64.84	☐
		64.87 - 64.88	☐

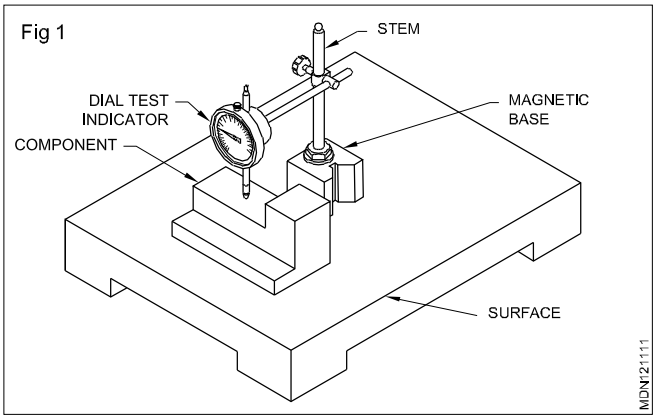
Dial test indicators

Objectives: At the end of this lesson you shall be able to
- **state the principle of a dial test indicator**
- **state the types of dial test indicator**
- **identify the parts of a dial test indicator**
- **state the important features of a dial test indicator**
- **state the functions of a dial test indicator**
- **identify the different types of stands.**
- **state the important of straight edge**

Dial test indicators

Dial test indicators are instruments of high precision, used for comparing and determining the variation in the sizes of a component. These instruments cannot give the direct reading of the sizes like micrometers and vernier calipers. A dial test indicator magnifies small variations in sizes by means of a pointer on a graduated dial. This indirect reading of the deviations gives an accurate picture of the conditions of the parts being tested. (Fig 1)

Fig 1



Principle of working

The magnification of the small movement of the plunger or stylus is converted into a rotary motion of the pointer on a circular scale.

Types

Two types of dial test indicator4s are in use.

They are the

- Plunger type (Fig 2)
- Lever type. (Fig 3,4 & 5)

The plunger type dial test indicator

The external parts and features of a dial test indicator are as shown in the (Fig 2).

Pointer (A)

Rotatable bezel (B)

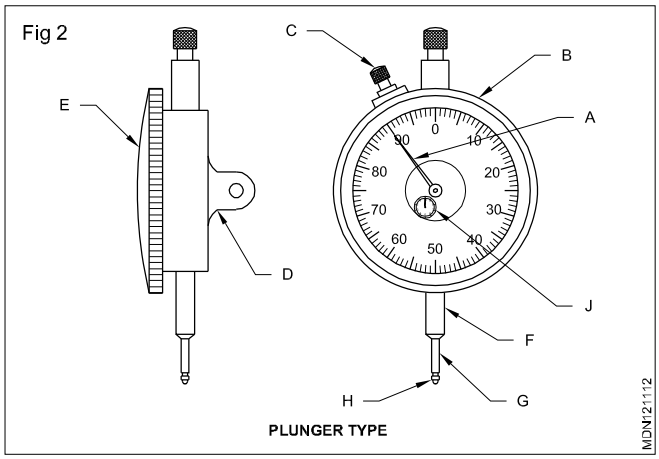
Bezel clamp (C)

Back lug (D)
Transparent dial cover (E)
Stem (F)
Plunger (G)
Anvil (H)

Revolution counter (J)

For converting the linear motion of the plunger, a rack and pinion mechanism is used.

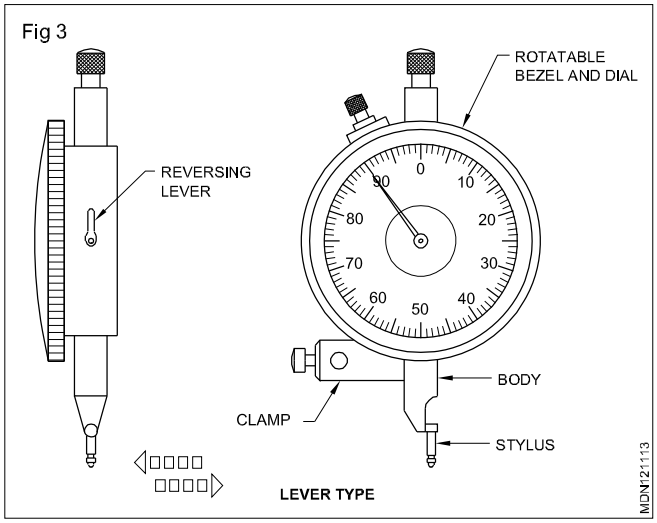
Fig 2



The lever type dial test indicator (Fig 3,4,5)

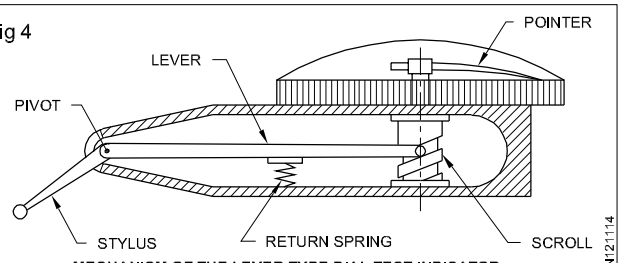
In the case of this type of dial test indicators, the magnification of the movement is obtained by the mechanism of the lever and scroll.

Fig 3



It has a stylus with a ball-type contact, and it has an oscillating movement as against the reciprocating movement in the plunger type indicator.

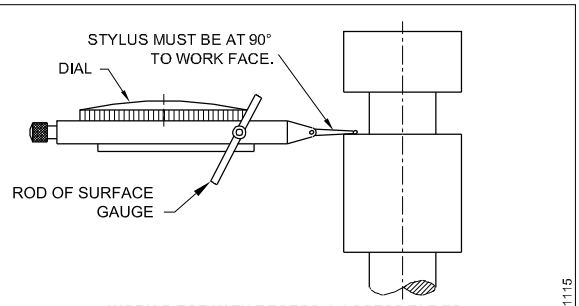
Fig 4



MECHANISM OF THE LEVER TYPE DIAL TEST INDICATOR

This can be conveniently mounted on a surface gauge stand, and can be used in places where the plunger type dial test indicator application is difficult.

Fig 5



WORK PIECE WITH RECESS INACCESSIBLE TO PLUNGER TYPE DIAL INDICATOR

Important features of dial test indicators

An important feature of the dial test indicator is that the dial can be rotated by a ring bezel, enabling the zero to be get in any position.

Many dial test indicators read plus in the clockwise direction from zero, and minus in the anticlockwise direction so as to give plus and minus indications.

Uses

- To compare the dimensions of workpiece against a known standard, eg. Slip gauges.
- To check plane surfaces for parallelism and flatness.
- To check straightness of shafts and bars.
- To check concentricity of holes and shafts.

Indicator stands (Fig 6 & 7)

Dial test indicators are used in conjunction with stands for holding them so that the stand itself may be placed on a datum surface or machine tool.

The different types of stands are:

- Magnetic stand with universal clamp
- Magnetic stand with flexible post
- General purpose holder with cast iron base.

Fig 6

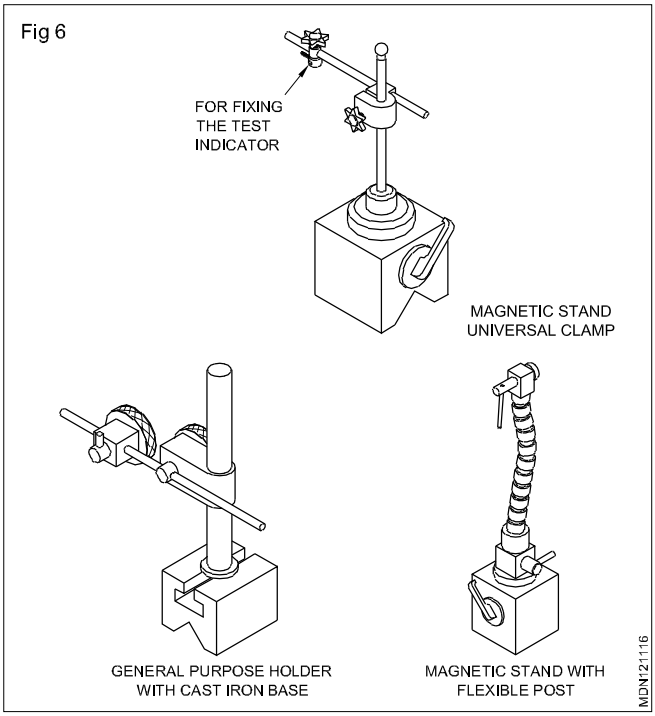
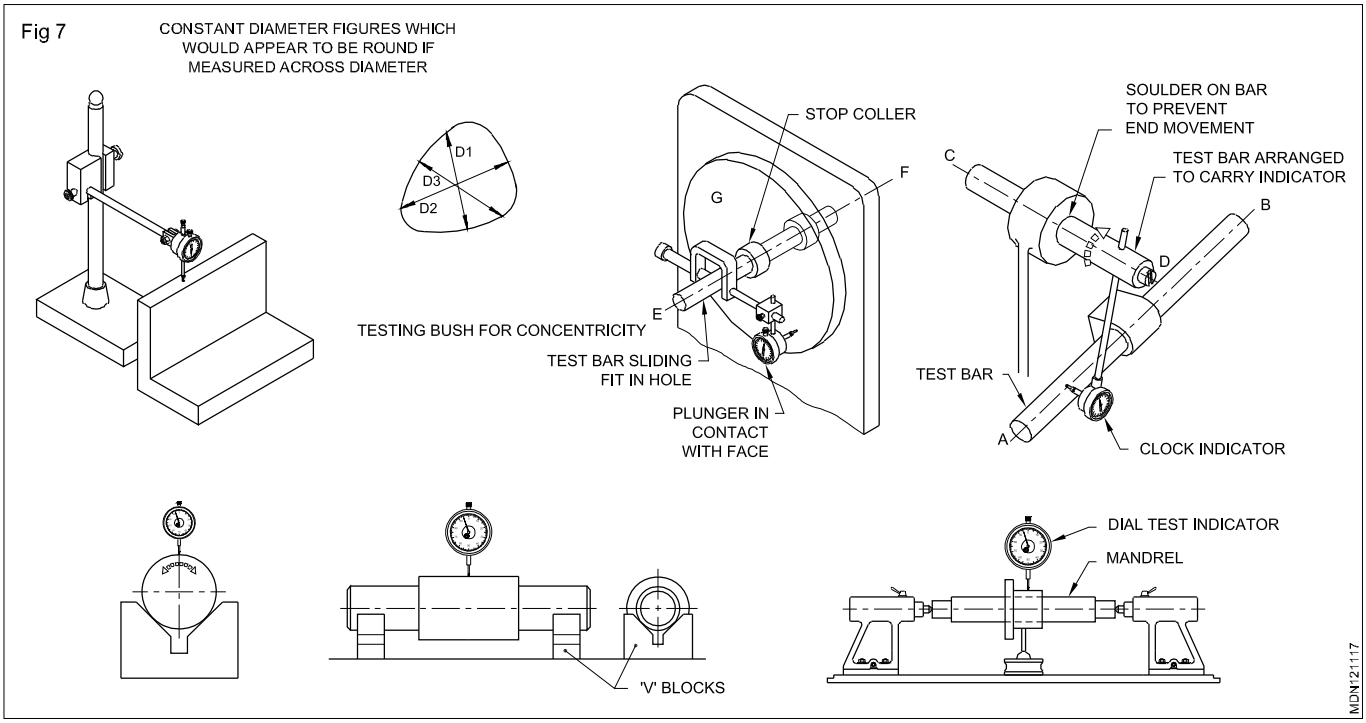


Fig 7



Straight edges

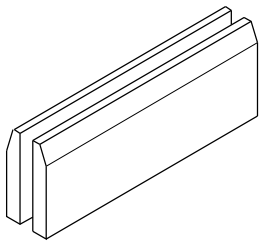
Objectives: At the end of this lesson you shall be able to
- **name the different types of straight**
- **state the straight edge uses edge**
- **state the different method of testing straightness.**

For testing straightness and to use a guide for marking long straight lines. Straight edges made of steel or cast iron are used.

Steel straight edges.

These are usually available up to 2 meters in length and may be rectangular in cross-section or have one edge beveled (Fig 1)

Fig 1



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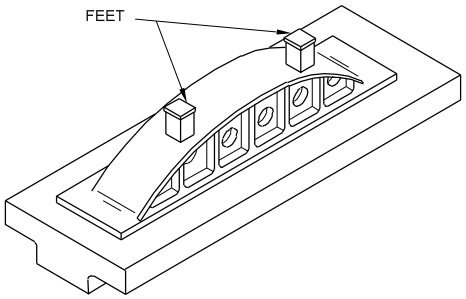
Cast iron straight edges (Fig 2)

These are made from close- grained, grey, cast iron and can be considered as narrow surface plates. They are available up to 3 meters length and are used for testing machine tool sideways, cast iron straight edges have ribs, and bow-shaped tops to prevent distortion. These straight edges are-shaped tops to prevent distortion. These straight edges are provided with feet to prevent distortion under their own weight.

Fig 2



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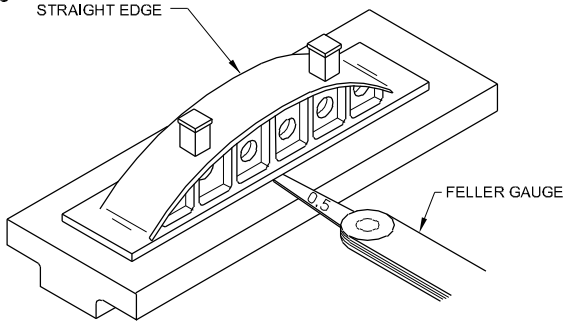
Use of straight edges

Checking with feeler gauges

In certain situations when the gap between the surface and the straight edge is more. a feeler gauge can be used (Fig 3) to determine the extent of deviation.

Fig 3



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USE OF STRAIGHT EDGE -FELLER GAUGE

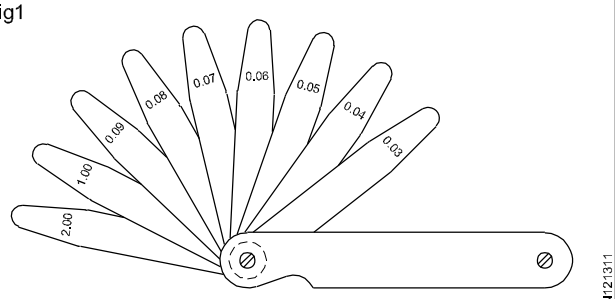
Feeler gauge & uses

Objectives: At the end of this lesson you shall be able to
- **state the constructional features of a feeler gauge**
- **state the method of indicating different ranges of**
- **state the method of setting a feeler gauge**
- **state the different uses of feeler gauges.**

Features

A feeler gauge consists of a number of hardened and tempered steel blades of various thicknesses mounted in a steel case.

Fig1



The thickness of individual leaves is marked on it. (Fig 1)

The sizes of the feeler gauges in a set are carefully chosen in order that a maximum number of dimensions can be formed by building up from a minimum number of leaves.

The dimension being tested is judged to be equal to the thickness of the leaves used. When a slight pull is felt while with drawing them. Accuracy in using these gauges requires a good sense of feel.

B.I.S

The Indian standard establishes four sets of feeler gauges Nos.1,2,3 and 4 which differ by the number of blades in each and by the range of thickness(minimum) is 0.03mm

Example

Set No.4 of Indian standard consists of 13 blades of different thicknesses.

0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.010, 0.015, 0.20, 0.30, 0.040, 0.50.

USES

Feeler gauges are used:

- to check the gap between the mating parts
- to check and set the spark plug gaps and tappet clearance in an engine etc.
- to set the clearance between the fixture (setting block) and the cutter/tool for machining the jobs. (Fig 2,3)
- to check and measure the bearing clearance, and for many other purposes where a specified clearance must be maintained.

Fig 2

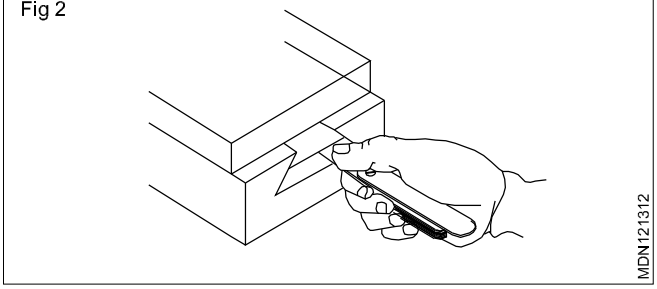
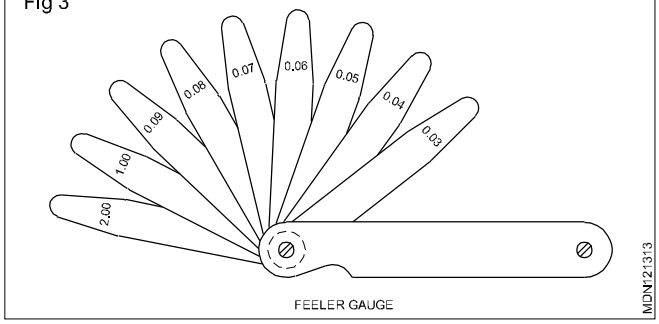


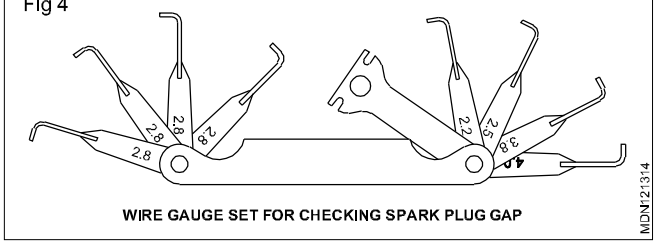
Fig 3



FEELER GAUGE

Wire gauge (Fig 4): The plug wire gauge is a thickness gauges using wires of varying diameter instead of thin flat strips of steel. It is used fir checking spark plug gap.

Fig 4



WIRE GAUGE SET FOR CHECKING SPARK PLUG GAP

Types of feeler gauge.

1 universal master gauge

2 standard feeler gauge

3 ignition and wire gauge

Classification of feeler gauge

- Universal master gauge containing 25 leaves
- Standard feeler gauge containing 10 leaves
- Go and No Go type feeler gauge containing 15 step-grand leaves
- Overhead valve feeler gauge containing 16 offset blades
- Ignition feeler gauge containing 12 leaves
- Piston gauge containing and leaves
- Spark plug wire gauge containing are electrode bender 8 wire gauge

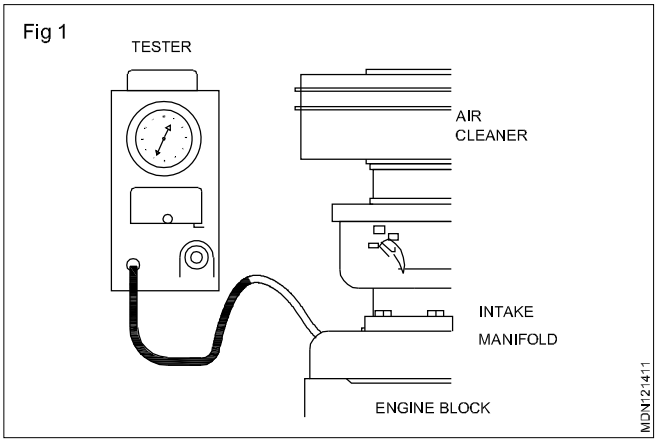
Vacuum gauge

Objectives: At the end of this lesson you shall be able to
- **state the purpose of vacuum gauge**
- **state the vacuum gauge attachment in an engine.**

A vacuum gauge (Fig 1) is a useful diagnostic and time-up tool.

It is used to detect vacuum leaks at idle speed, sticking valves, worn rings, clogged exhaust, incorrect timing and positive crank case ventilation (PCV)

Fig 1



Attaching Vacuum Gauge

At normal operating temperature connect the vacuum gauge to the intake manifold. Some manifolds incorporated a plug that may be removed so that vacuum line adopter may be installed.

- A relative study high vacuum reading indicate an absence vacuum leak in the system (i.e) values and rings are in good sealing.
- Fairly study vacuum reading indicate vacuum leak in the system (i.e) value and rings are not in good sealing.
- Vacuum reading indicate uneven, valve are burned or sticky and damaged piston or blown gasket.

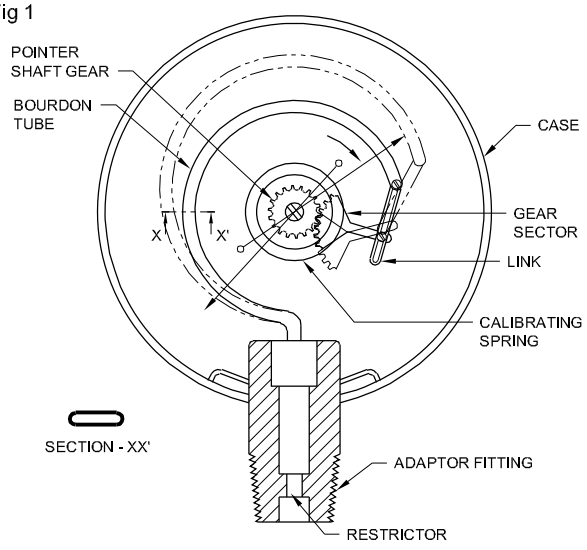
Tyre pressure gauge

Objectives: At the end of this lesson you shall be able to
- **state the construction and features of tyre pressure gauge**
- **use a tyre pressure gauge to check & set tyre pressure.**

Pressure gauge

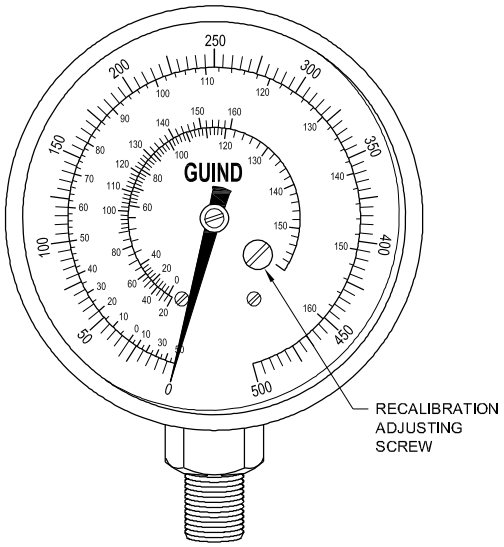
It is used to check the pressure of tyre unit. Bourdon tube pressure gauges (Fig 2) made by stainless steel. A Pressure rise in bourdon tube makes it tend to straighten. This movement will pull on the link which will turn the gear sector counter clockwise. The pointer shaft with then turn clockwise to move needle on a graduated scale to indicate pressure. (Fig 1)

Fig 1



INTERNAL CONSTRUCTION OF PRESSURE GAUGE

Fig 2



PRESSURE GAUGE

Special features

- Excellent load-cycle stability and shock resistance.
- All stainless steel construction
- Positive pressure ranges 0-200 P.S.I (Fig 3)

The pressure gauge hose has a adapter, which depresses the valve pin of tyre and compressed air get into the tube of the gauge. The pressure is indicated in the dial. Compare the pressure to the recommended pressure by the manufacturer. If it is less, refill the tyre with compressed air by operating the trigger (Fig 3). When the required pressure is shown in the gauge stop filling.

Fig 3