

INTRODUCTION

In the modern era, gauges and precision instruments are needed in manufacturing various parts of a machine and to measure their dimensions. Gauge is an instrument that provides a fixed measurement of material, while precision instruments can measure any part of the machine with more accuracy.

1 GAUGES

Nowadays, in order to produce machine parts with good accuracy and to maintain the flow of mass-production, it is essential to build gauges with the required tolerance as per the given blueprints. Often, instruments like micrometers, vernier calipers or other measuring instruments are used to measure the dimensions of various parts of a machine. The process of opening and adjusting the measuring instruments again and again, to measure the machine part is quite time-consuming. Also, the unskilled laborers face issues in reading such precise measuring instruments and hence, gauges were invented as a solution to such issues.

Gauge is a fixed measuring instrument, and it is used to check the manufactured machine parts. The usage of gauges saves time and boosts production. A gauge checks the specific size for which it is manufactured; hence, the size of the gauge is not adjustable. Commonly, the gauge tool is composed of steel and is hard, tempered and ground, while the gauges which are used very often are made up of chromium steel, vanadium steel in order to protect them from wearing out.

1.1 Advantages of Gauges

The following are the advantages of using a gauge:

1. Taking measurements using gauges is time saving.
2. Products made after checking by the gauge are inexpensive.
3. It reduces the cost of production, if manufacturing rate increases.
4. Even the unskilled labourers can measure using gauges.
5. There is a very less requirement for the quality check inspectors.

1.2 Gauge Manufacturing Method

A specific machining process is used to develop the gauges of the required shape and size. This is followed by hardening and artificial seasoning. The gauges are then subjected to low temperature, followed by high temperature and then boiling water, to help them withstand the effects of the weather. The gauge is then ground to obtain an accurate shape and size. This is followed by the finishing process where lapping is used. The surface of the gauge is electroplated to make it abrasion resistant.

2 TYPES OF GAUGES

2.1 Radius Gauge or Fillet Gauge

The radius gauge is used to check the external and internal radius of the job. The blades in the gauge are made of high quality steel which are fixed in a holder and made

available as a set. The size of the radius that can be measured is marked on every blade.

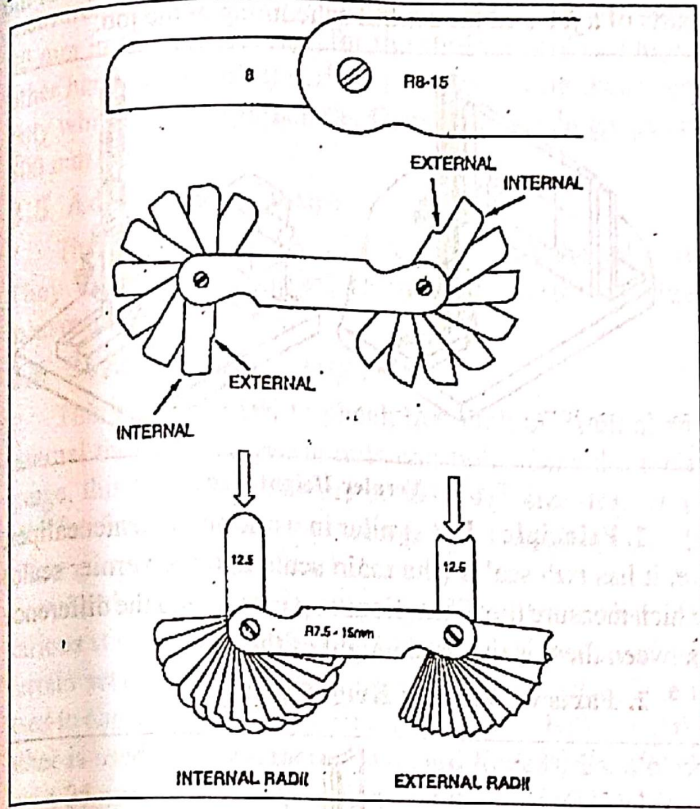


Fig. 1 : Radius Gauge

In special circumstances, a single gauge with many radii is used.

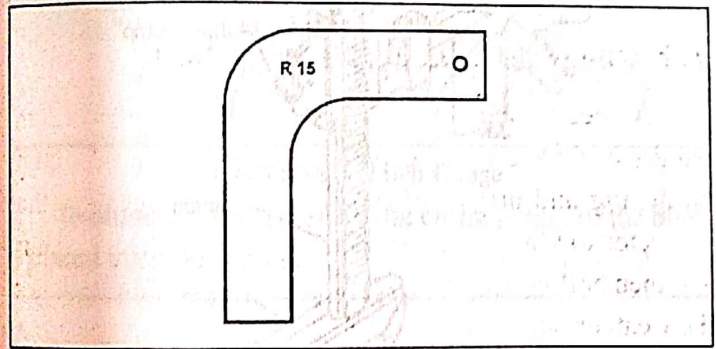


Fig. 2 : Radius Gauge with Single Blade

In a fillet weld gauge, the convex side is used for measuring the leg, while the concave one measures the throat.

2.2 Feeler Gauge

Also known as thickness gauge, a feeler gauge is used to measure the gap between two parts. It is available as a set of hardened and tempered strips of varying thickness which are clamped onto a holder with a screw. The thickness of a feeler gauge is 12 mm, while the value of length varies from 12 mm to 75 mm. The thickness of each strip is marked on the strip itself. Four sets of feeler gauge are formed according to the thickness of the strips.

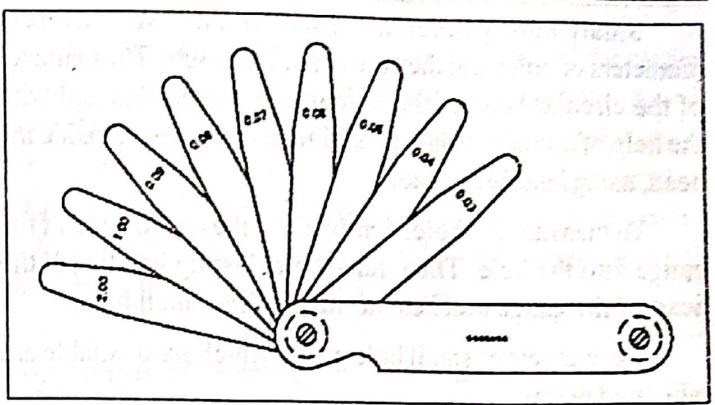


Fig. 3 : Feeler Gauge

Applications of Feeler Gauge

1. For checking the gap between the two adjoining parts.
2. For the inspection of tappet clearance of the engine.
3. For checking the gap in the spark plug.
4. For checking the bearing clearance and other types of clearance.
5. For setting the gap between the fixture (setting block) and the machine cutter tool.

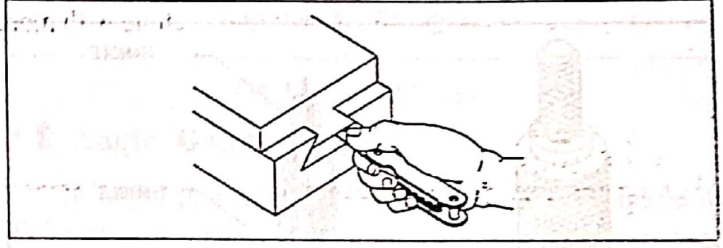


Fig. 4 : Application of Feeler Gauge

Table 1 : Thickness of Blades of Feeler Gauge

Set No.	No. of Blades	Thickness of Blades
1.	8	0.03,0.04,0.05,0.06,0.07,0.08,0.09,0.10
2.	9	0.03,0.04,0.05,0.06,0.07,0.08,0.09
3.	16	0.03,0.04,0.05,0.06,0.07,0.08,0.09,0.1, 0.15,0.20,0.25,0.30,0.35,0.40,0.45,0.50
4.	13	0.03,0.04,0.05,0.06,0.07,0.08,0.09,0.1, 0.15,0.2,0.30,0.4,0.5

2.3 Hole Gauge

A hole gauge or a drill gauge is a measuring tool used to check the diameter or size of straight shank twist drill. This gauge has a round expandable head, which is used along with an outside micrometer. The gauge is used to measure the internal size of small holes, like in valve guide which has very small holes.

Small hole gauges are used to estimate different diameters of holes and they are available in sets. The diameter of the circular head of the hole gauge can be changed with the help of a small wedge, by sliding it up or down, inside the head, using handle adjuster.

To measure the hole, firmly place the round head of the gauge into the hole. Then, turn the adjusting handle till the head of the gauge touches the sides of the small hole.

Various sets of small hole gauge which are available are tabulated below.

Table 2 : Sets of Small Hole Gauge

Set No.	Diameter
Number 1	3.2 mm to 3.8 mm
Number 2	3.8 mm to 4.5 mm
Number 3	4.5 mm to 5.1mm
Number 4	5.1 mm to 6.4 mm
Number 5	6.4 mm to 6.8 mm
Number 6	6.8 mm to 9.6 mm
Number 7	9.6 mm to 12.7 mm

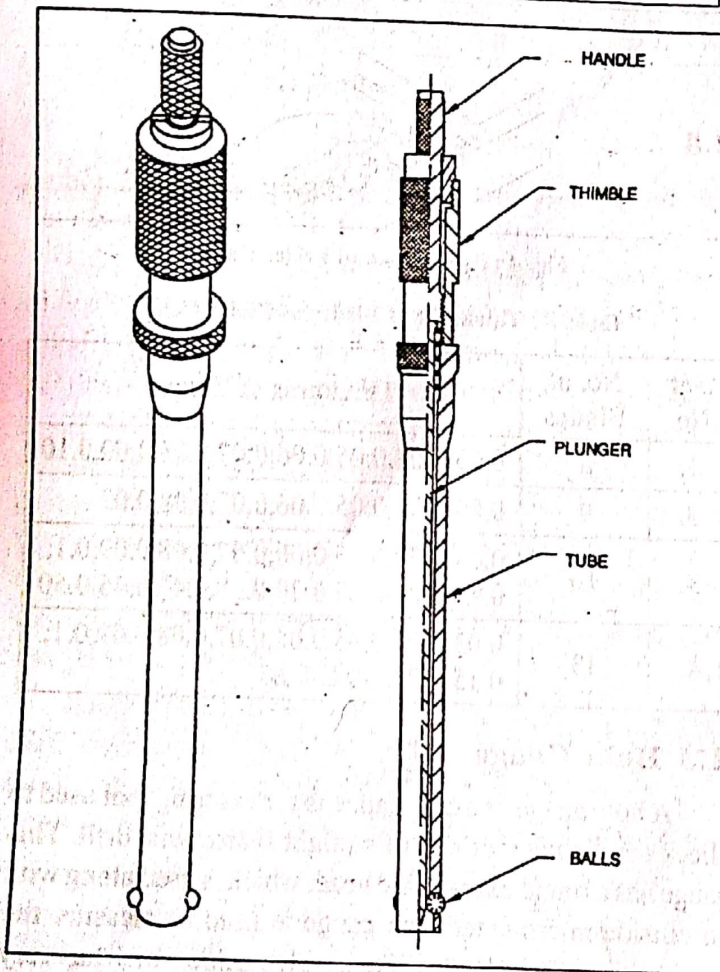


Fig. 5 : Small Hole Gauge

2.4 Vernier Height Gauge

It is a gauge which helps in measuring the height of parts of a job and for central scheduling of the job.

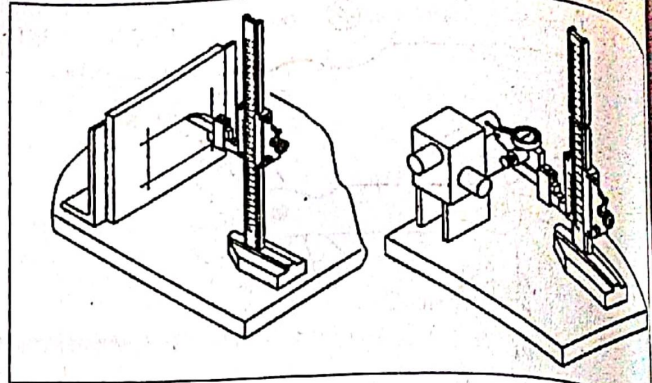


Fig. 6 : Vernier Height Gauge

1. Principle : It is similar in working to vernier caliper, i.e. it has two scales (the main scale and the vernier scale) which measure the dimensions separately, and the difference between them is the final height of the job.

2. Parts of Vernier Height Gauge

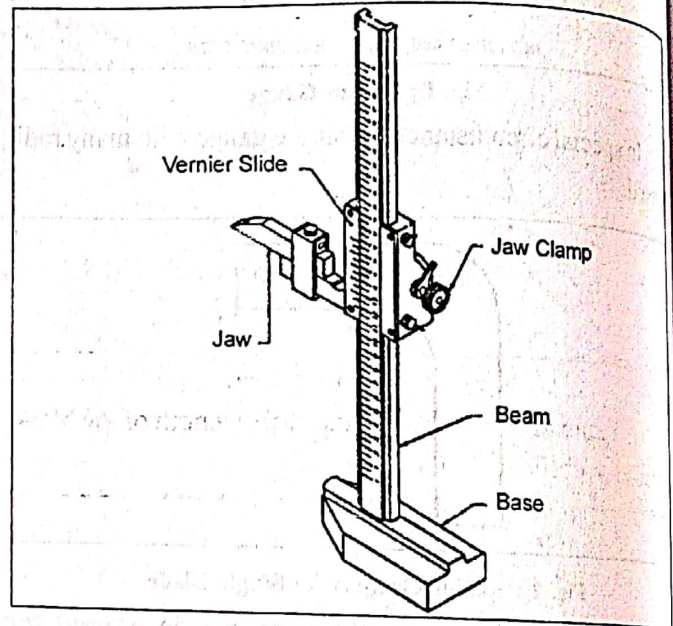


Fig. 7 : Different Parts of Vernier Height Gauge

(i) **Base :** It has a hard base which is lapped and abraded. The base provides datum and with its reference measurements are taken.

(ii) **Beam :** It is very similar to the beam scale of the vernier caliper. It is graduated in nature and is attached vertically to the base.

(iii) **Vernier Slide :** Both straight and offset scribers are attached to the vernier slide. There is a jaw along with the main scale on which the clamp is fitted. The scriber of the vernier height gauge is adjusted in the clamp.

The zero setting of the straight scribe reads 30 mm, therefore, while measuring any height using this scribe user must add 30 mm to the original reading to prevent erroneous measurement. Hence, a zero setting block which measures 30 mm in size is necessary for the straight scribe. On the other hand, in the offset scribe the zero setting reads zero only which is easier to handle. Generally, height gauges of 300 mm are used.

2.5 Adjustable Gauge

These gauges can be adjusted to check the job size. They are generally used to measure external size/ measurement.

2.6 Screw Pitch Gauge

This gauge is used to check the pitch of external and internal threads on screws, nuts and bolts. Like the feeler gauge, this too is fitted in the holder. The size or pitch of each hardened strip made of spring steel is marked on it. In a few gauges, the depth of the cut of the thread is also mentioned in the screw pitch gauge. These are available in various standards according to the angles of the threads. In certain sets of screw pitch gauges, one end of the blade is used to check British Standard Threads (BSF, BSW) and the other is used to check metric standard threads. Each blade has a 25 mm to 30 mm thread cut on it.

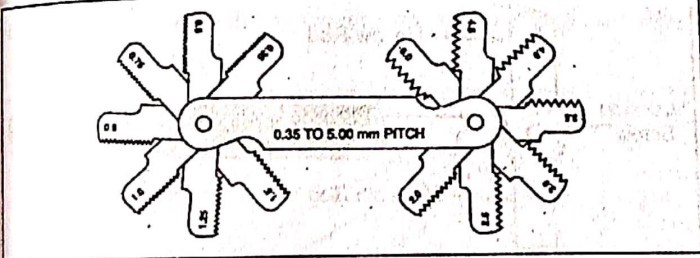


Fig. 8 : Screw Pitch Gauge

To obtain accurate results, the entire length of the blade is placed over the thread.

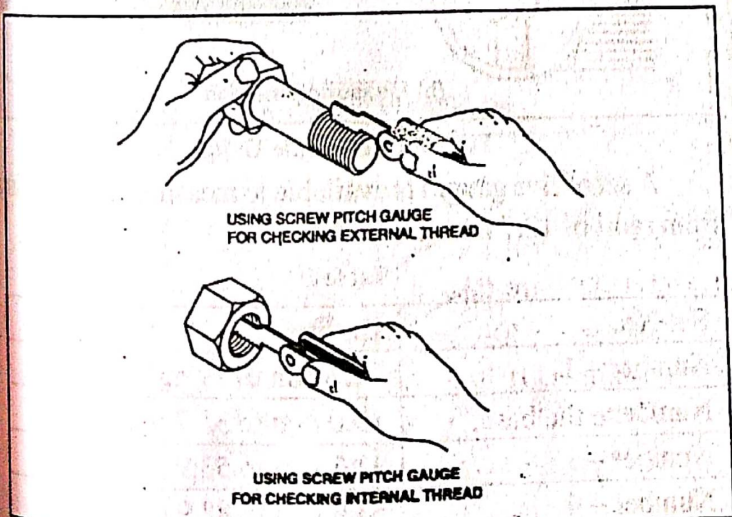


Fig. 9 : Application of Screw Pitch Gauge

2.7 Centre Gauge

This gauge is used to check the tool point of the cutting tool of the lathe machine, which is used to cut the threads while grinding. It is also used to set the tool perpendicular to the lathe machine. This is made of 3 mm thick high steel strip. This is a "V" groove made at different angles according to the various screw thread standards. These days the metric threads with an angle of 60° are often used.

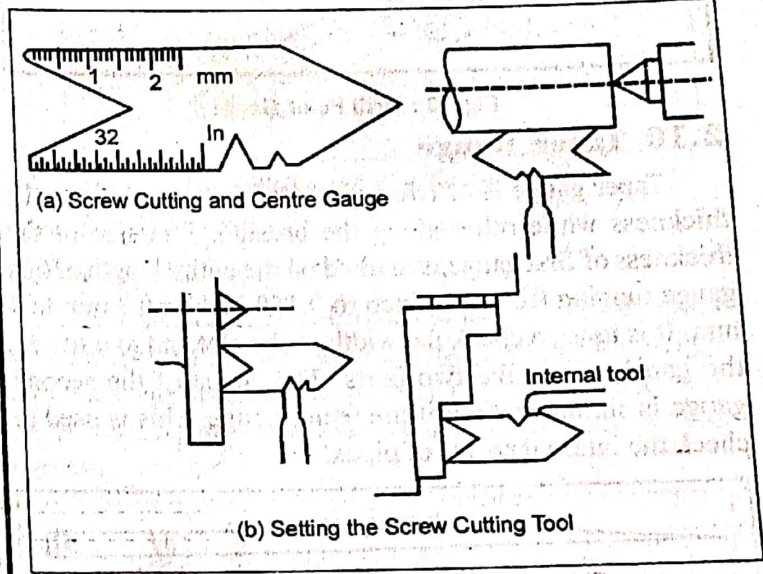


Fig. 10 : Centre Gauge

2.8 Angle Gauge

In angle gauge, there is a group of strips made at different angles and tightened in a holder with a screw or rivet. They are made of spring steel that is tempered. The size of each strip is marked on it. They are made at various angles such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 14½, 15, 20, 25, 30, 35, 40 degrees and are used to check angled grooves.

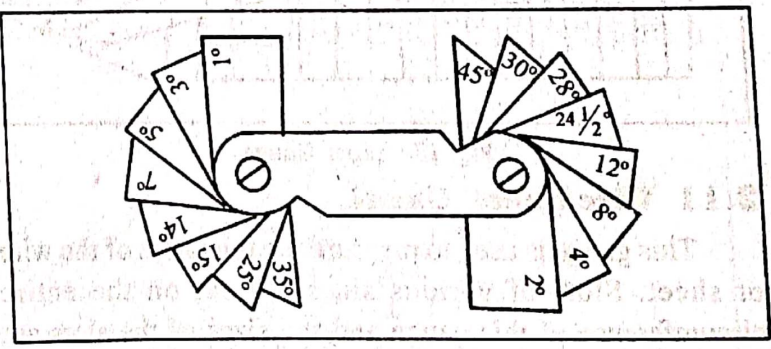


Fig. 11 : Angle Gauge

2.9 Drill Point Gauge

The cutting angle of the drill is checked with this gauge. Using this, we can check whether the two lips of the drill are equal or not. The angle of this drill is 59°.