Radius/Fillet gauge, feeler gauge, hole gauge

Objectives: At the end of this lesson you shall be able to
- **state what is radius and fillet gauge**
- **mention the sizes and uses of feeler gauge.**

Radius and fillet gauges: Components are machined to have curved formation on the edges or at the junction of two steps. Accordingly they are called radius and fillets. The size of the radius is normally provided on a drawing. The gauges used to check the radius formed on the edges of diameters are fillet and the gauges used to check the fillets are called fillet gauges.

They are made of hardened sheet metal each to a precise radius. They are used to check the radii by comparing the radius on a part with the radius of the gauges.

Fig 1 shows the application of radius gauge to check the radius formed externally. Fig 2 shows the application of a fillet gauge to check the fillet formed on a turned component. The other typical applications are:

Fig 1

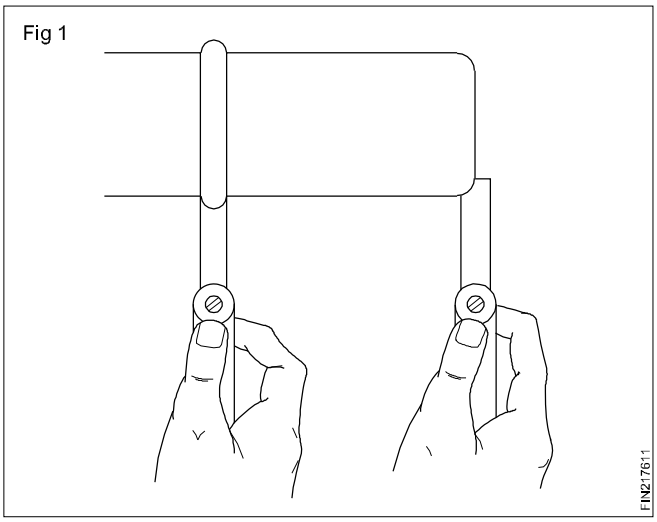

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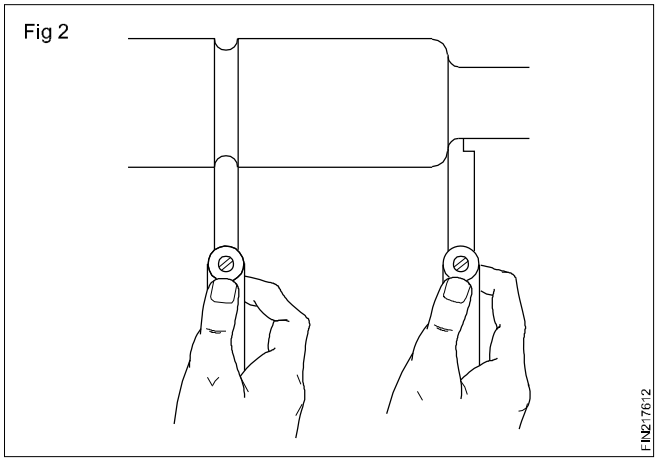
Fig 2



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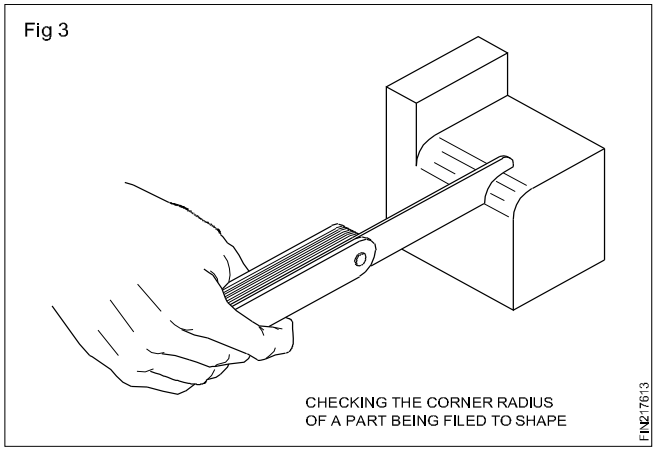
– Checking the corner radius of a part being filed to shape. (Fig 3)

Fig 3



CHECKING THE CORNER RADIUS OF A PART BEING FILED TO SHAPE

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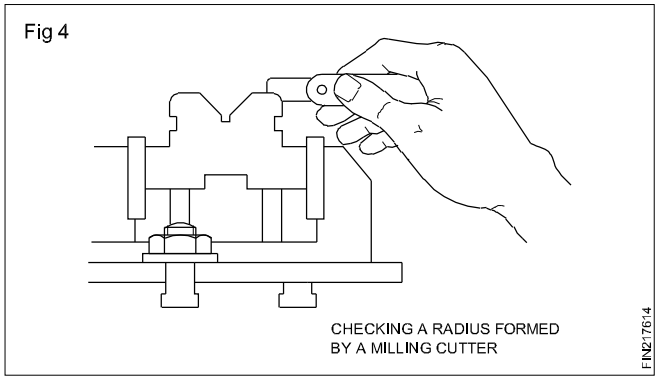
– Checking a radius formed by a milling cutter. (Fig 4)

Fig 4



CHECKING A RADIUS FORMED BY A MILLING CUTTER

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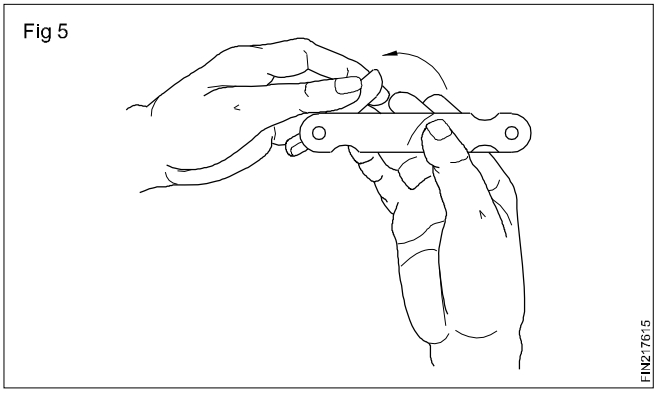
The radius and fillet gauges are available in sets of several blades which fold into a holder when not in use. (Fig 5)

Fig 5



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Some sets have provisions to check the radius and fillet on each blade. (Fig 6)

And some sets have separate sets of blades to check the radius and fillet. (Fig 7)

Fig 6

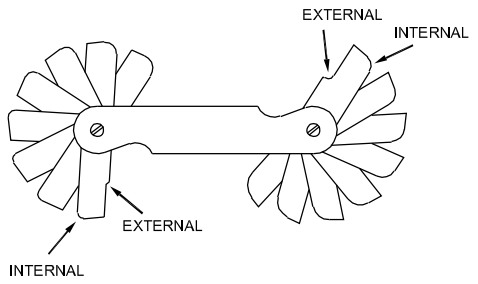
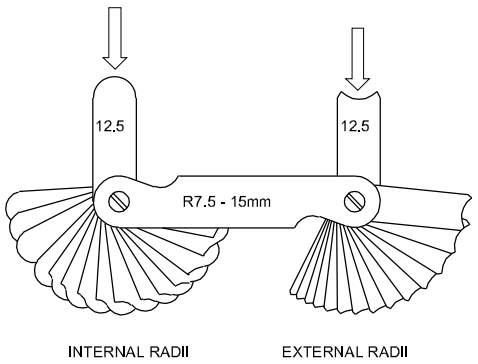
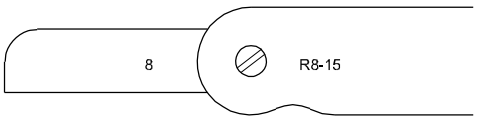


Fig 7



Each blade can be swung out of the holder separately, and has its size engraved on it. (Fig 8)

Fig 8



Fillet gauges are available in sets to check the radii and fillets from:

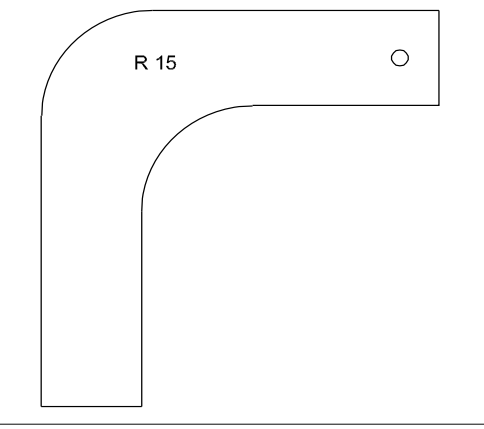
1 to 7 mm in steps of 0.5 mm

7.5 to 15 mm in steps of 0.5 mm

15.5 to 25 mm in steps 0.5 mm.

Individual gauges are also available. They usually have internal and external radii on each gauge and are made in sizes from 1 to 100 mm in steps of 1 mm. (Fig 9)

Fig 9



Before using the radius gauge, check that it is clean and undamaged.

Remove burrs from the workpiece.

Select the leaf of the gauge from the set corresponding to the radius to be checked.

Figure 10 shows that the radius of the fillet and that of the external radius are smaller than the gauge.

Try a smaller gauge to determine the radius dimension.

File or machine the workpiece if it has to be of the radius of the gauge.

Figure 11 shows that the radius of the fillet and that of the external radius are larger than the gauge.

Fig 10

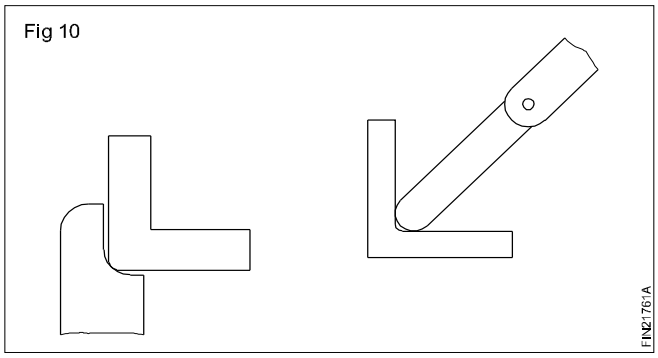
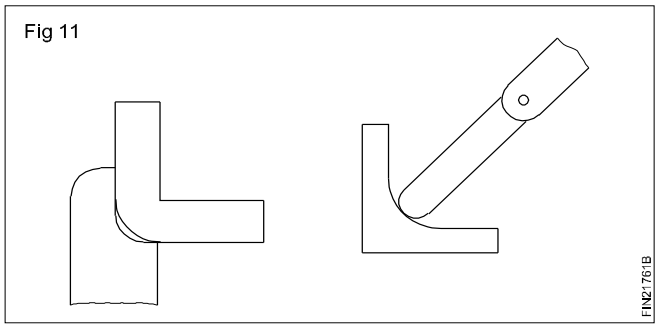


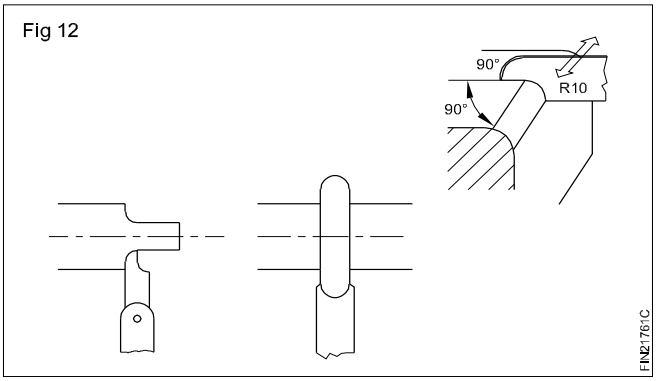
Fig 11



Try a larger gauge if you need to find the radius dimension.

Figure 12 shows the workpiece having the same radius as that of the gauge that is being used for checking.

Fig 12



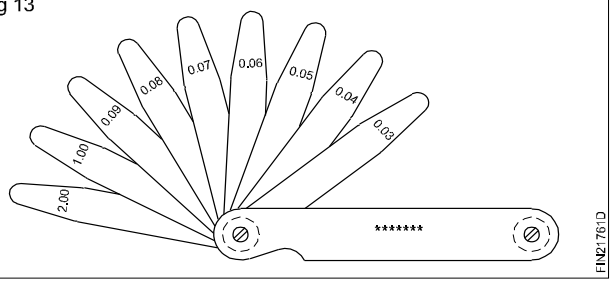
Feeler gauge and uses

Features: A feeler gauge consists of a number of hardened and tempered steel blades of various thicknesses mounted in a steel case. (Fig 13)

The thickness of individual leaves is marked on it. (Fig 13)

B.I.S. Set: 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 0.03 mm to 1 mm in steps of 0.01 mm). The length of the blade is usually 100 mm.

Fig 13



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, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50.

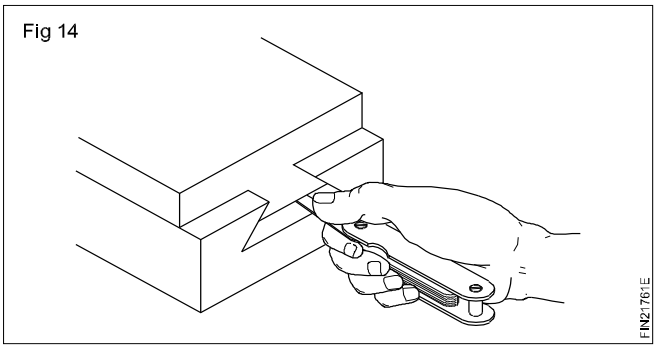
The sizes of the feeler gauges in a set are carefully chosen in order that a maximum number of dimensions can be formed by building up from a minimum number of leaves.

The dimension being tested is judged to be equal to the thickness of the leaves used, when a slight pull is felt while withdrawing them. Accuracy in using these gauge requires a good sense of feel.

Feeler gauges are used:

– To check the gap between the mating parts
– To check and set the spark plug gaps
– To set the clearance between the fixture (setting block) and the cutter/tool for machining the jobs
– To check and measure the bearing clearance, and for many other purposes where a specified clearance must be maintained. (Fig 14)

Fig 14



Telescopic gauge

Objectives : At the end of this lesson you shall be able to
- **name the parts of a telescopic gauge**
- **state the constructional features of telescopic gauges**
- **state the ranges of telescopic gauges.**

Telescopic gauges are popular for fine work as they are very rigid and have a better 'feel'.

Uses

Used for measuring the sizes of holes, slots and recesses.

Construction (Figs 1 & 2)

Telescopic gauges are 'T' shaped. They consist of a pair of telescopic legs or plungers connected to a handle. The plungers are spring-loaded to force them apart. After inserting the gauge in a hole or slot, it can be locked in position by turning the knurled handle. It may then be withdrawn from the hole and measured with a micrometer. (Fig 3)

Fig 1

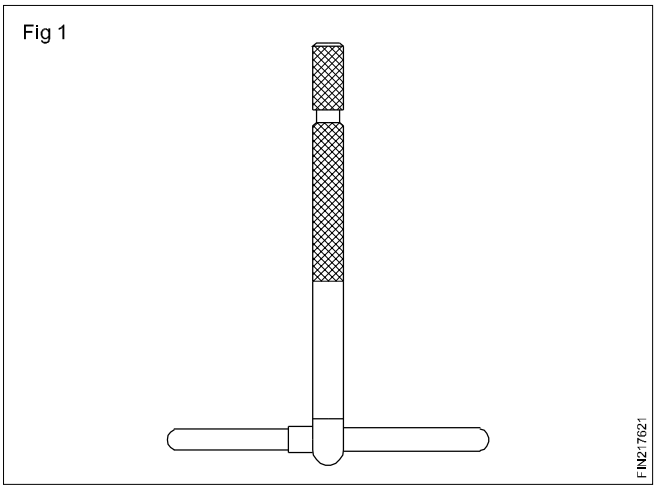


Fig 1

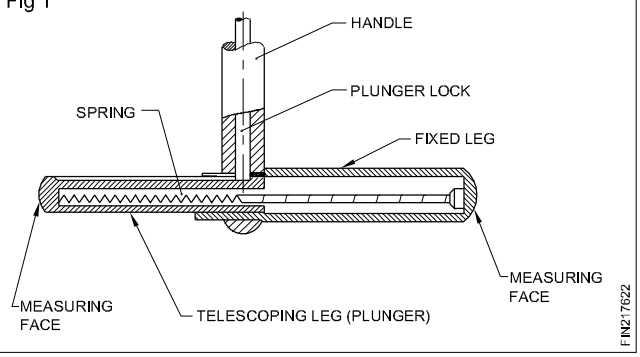
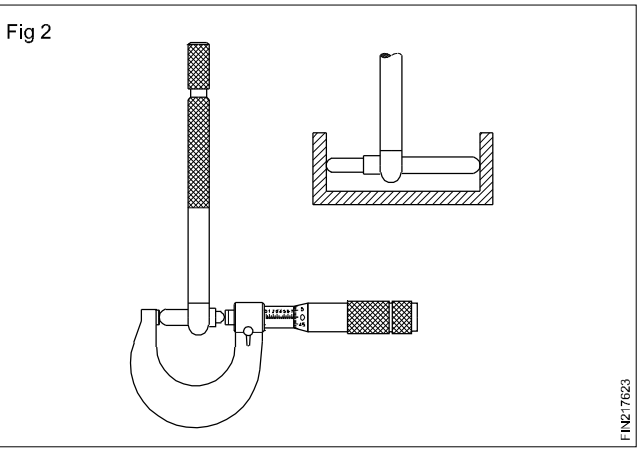


Fig 2



Telescopic gauges are available in a set of 6 nos, to measure holes from 8 mm to 150 mm. (as per MITUTOYO - Series 155)

No.1 8.0 mm to 12.7 mm

No.2 12.7 mm to 19.0 mm

No.3 19.0 mm to 32.0 mm

No.4 32.0 mm to 54.0 mm

No.5 54.0 mm to 90.0 mm

No. 6 90.0 mm to 150.0 mm

Small hole gauges

Objectives : At the end of this lesson you shall be able to
- **identify the parts of a small hole gauge**
- **state the construction of a small hole gauge**
- **state the ranges of small hole gauges.**

Telescopic gauges are not suitable for measuring holes below 9 mm. For measuring smaller holes and slots, small hole gauges are used.

Construction (Fig 1)

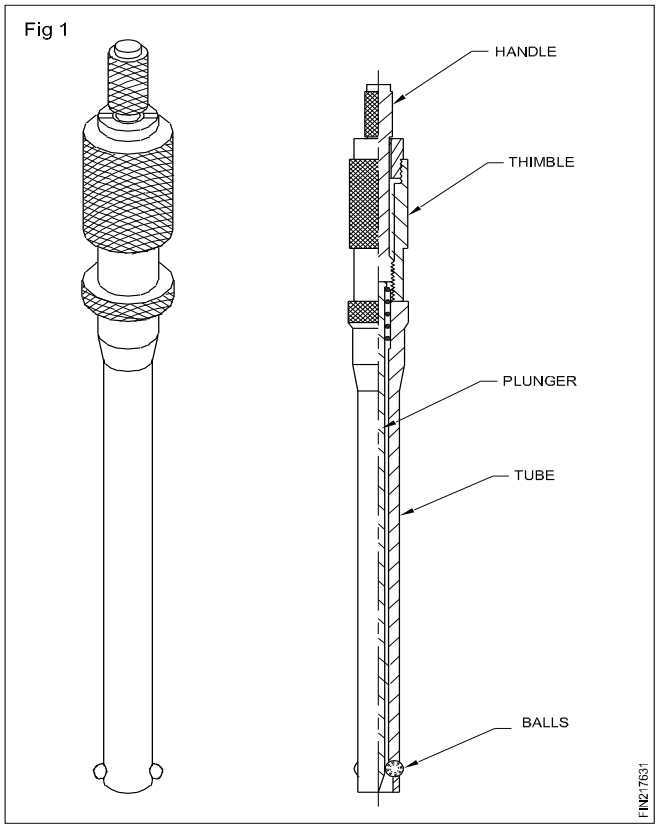
A small hole gauge consists of a tube having holes on the opposite sides at one end where hardened balls are fixed. The other end of the tube has an external thread. A screwed thimble is fixed with the threaded tube. A plunger with a tapered end, and spring-loaded, is inserted in the tube and tightened with the screwed thimble.

At the end of the thimble a knurled handle is fitted. While rotating the knurled handle in a clockwise direction the plunger moves forward up, and pushes the balls out to contact the surfaces.

A small hole gauge is an instrument used for indirect measurement, while a micrometer is usually used for measuring the sizes directly.

Small hole gauges are available in a set of 4 numbers to measure holes from 3 mm to 13 mm. (as per MITUTOYO - Series 154)

Fig 1



No.1 3 mm to 5 mm

No.2 5 mm to 7.5 mm

No.3 7.5 mm to 10 mm

No.4 10 mm to 13 mm

Care and Maintenance of Feeler, radius and hole gauges

Immediately after use, close funned out feeler gauge blades. This should be done by grouping smaller blades against the consecutively larger sizes for support. This will prevent the thinner blades bending when they are closed into the case.

Feeler gauges should be cleaned with an oily cloth before storage to prevent rust.

Wonkee Donkee recommends that you keep the blades closed at all times, other than when in actual use, to prevent damage. Open - Measure - Close. The blades should only be out for as long as it takes to measure or set the gap. Tighten the adjusting screw, if there is one, for additional security.

Radius gauges can be coverd in an oil-based spray as a preventive measure against rust during storage. If a radius gauge becomes rusty, the folding mechanism may seize up. Further problems include the compromised accuracy of the gauge's measurement. The once precisely machined radius may develop irregularities because of corrosion.

Close away blades into the case carefully after use. This ensures the blades do not become bent or misshapen when the gauge is not in use. Radius gauge blades with fine measuring surfaces are othen bought in assortmen to Be sure to use the plastic sleeve casing which allows neat and orderly storage.

Some types of small hole gauges have flattened ball ends to permit use in shallow holes and recesses.Be care. Observe the following practices for the care and upkeep of small hole gauges:

- Coat. metal parts of small hole gauges with a light film oil to prevent rust.
- Store gauges in separate containers.
- Keep graduation and markings clean and legible.
- Do not drop small hole gauges. Small nicks and scratches will result in inaccurate measurement

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