

## **'V' - Blocks, scribing block, straight edge**

**Objectives:** At the end of this lesson you shall be able to

- state the constructional features of 'V' blocks
- identify the types of 'V' blocks and state their uses
- specify 'V' blocks as per the standards recommended by B.I.S.

### **Constructional features**

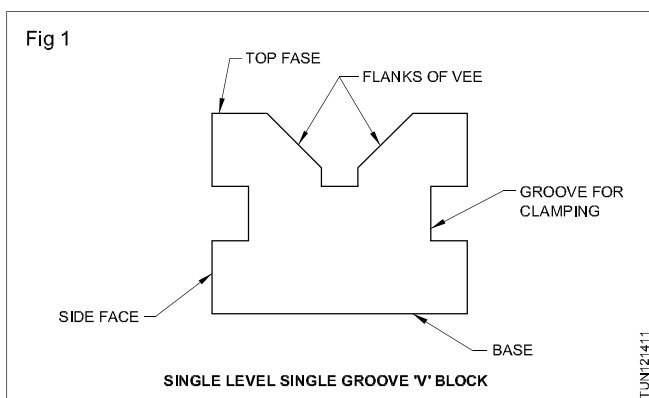
'V' blocks are devices used for marking and setting up work on machines. The features of a common type of 'V' blocks are as given in Fig 1.

The included angle of the VEE is 90° in all cases. 'V' blocks are finished to a high accuracy in respect of dimension, flatness and squareness.

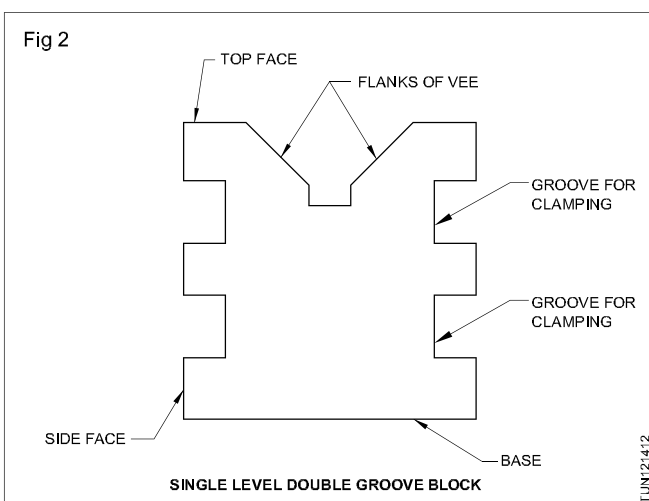
### **Types**

'V' blocks of different types are available. As per B.I.S. they are:

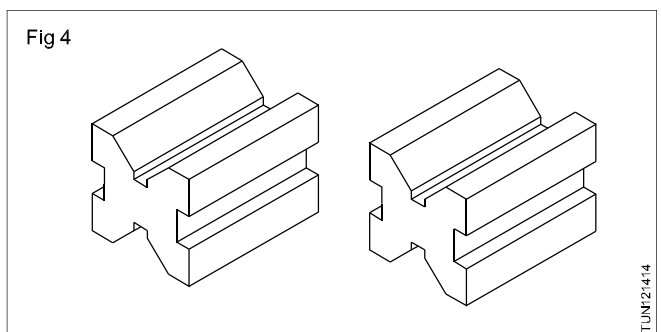
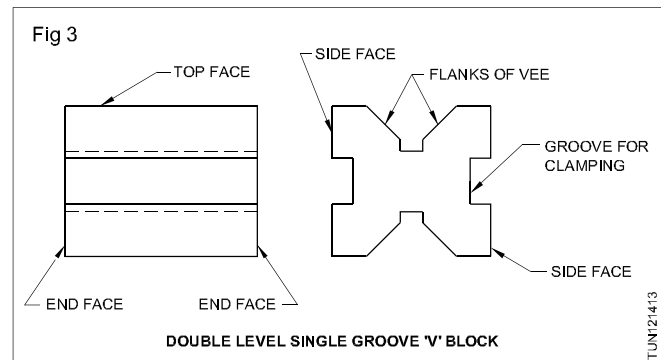
- single level, single groove 'V' block (Fig 1)



- single level, double groove 'V' block (Fig 2)



- double level, single groove 'V' Block (Fig 3)
- matched pair 'V' block. (Fig 4)



### **Single level, single groove 'V' block (Fig 1)**

This type has only one 'V' groove and has single square slots cut on both the sides.

This slot on both the sides, accommodates the work-holding clamps.

### **Single level, double groove 'V' block (Fig 2)**

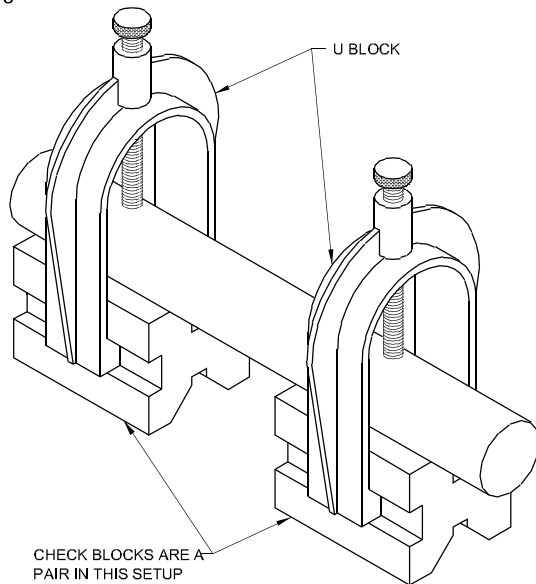
In this case, the 'V' block will have two slots on both sides. This permits for positioning the clamps depending on the diameter of the jobs.

### **Matched pair 'V' block (Figs 4 and 5)**

These blocks are available in pairs which have the same size and same grade of accuracy. They are identified by the number or the letter given by the manufacturer. These sets of blocks are used for supporting long shafts parallel to the marking off or machine tables.

'V' blocks are made in pairs of exactly the same size and shape. They are ground parallel and square on all their sides, and have the 'Vee' groove cut in the centre, symmetrical to the centre line.

Fig 5

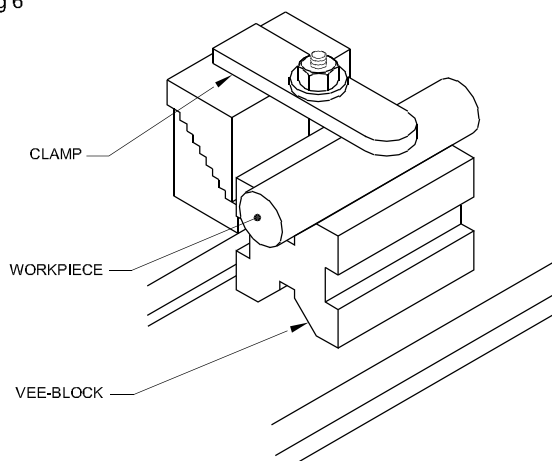


'V' BLOCKS SUPPORTING A SHAFT FOR MARKING OUT AND DRILLING

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'V' blocks are used to support and clamp round workpieces. (Fig 6)

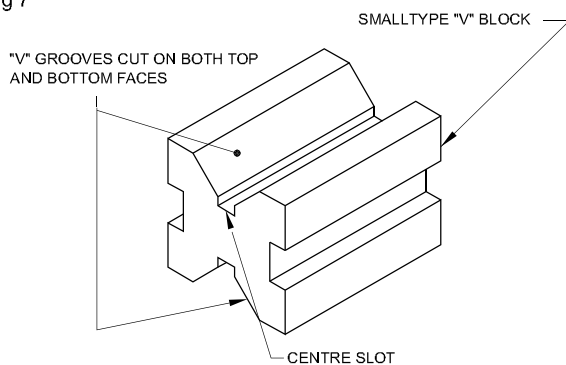
Fig 6



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Smaller type 'V' blocks have the 'V' grooves cut both on the top and bottom faces. (Fig 7)

Fig 7

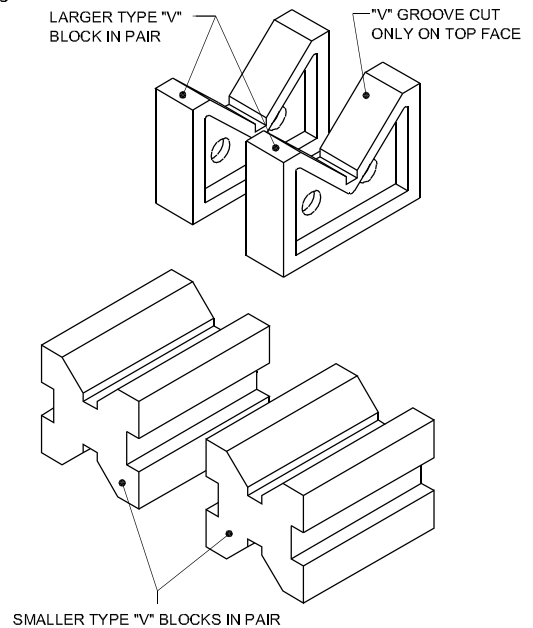


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The narrow slots at the apex of the 'V' grooves provide clearance for the drill during drilling operations, and also provide space for chips to flow away during the machining operations.

Small sizes of 'V' blocks are made of hardened steel, and larger sizes are made of cast iron. The larger sizes do not have slots on the side faces. (Fig 8)

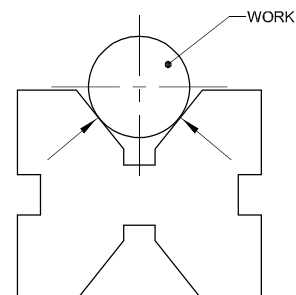
Fig 8



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When selecting a 'V' Block to support a round workpiece, the size of the 'V' block selected should be such that the workpiece touches the flanks of the 'V' groove at about the centre. (Fig 9)

Fig 9



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## Designation

'V' blocks are designated by the nominal size (length), the minimum and maximum diameters of the workpiece capable of being clamped and the grade and the number of the corresponding B.I.S. standard.

In the case of matched pairs it should be indicated by the letter 'M'.

For 'V' blocks with clamps it should be indicated as 'with clamps'.

## Example

- 1 A 50 mm long (nominal size) 'V' block capable of clamping workpieces between 5 to 40 mm in diameter and Grade A will be designated as - 'V' block 50/5-40 A - B.I.S. 2949.
- 2 In the case of a matched pair, it will be designated as 'V' block M50/5-40 A B.I.S. 2949.

- 3 For 'V' blocks supplied with clamps, the designation will be 'V' block with clamp 50/5-40 A B.I.S.2949.

### Grades and materials

'V' blocks are available in Grade 'A' and Grade 'B'.

#### Grade A

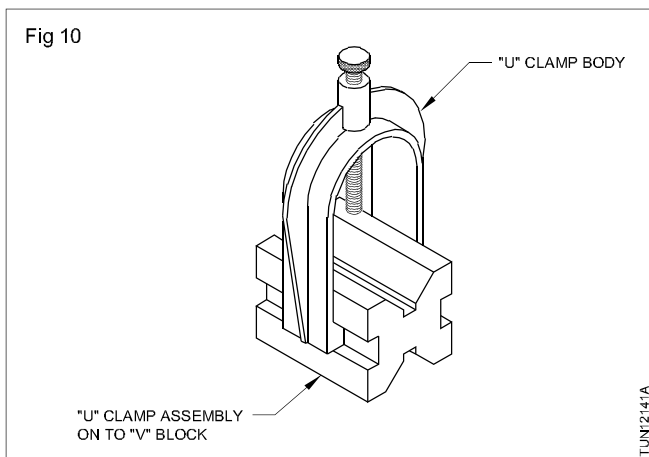
A grade 'V' blocks are more accurate and are available only up to 100 mm length. These are made of high quality steel.

#### Grade B

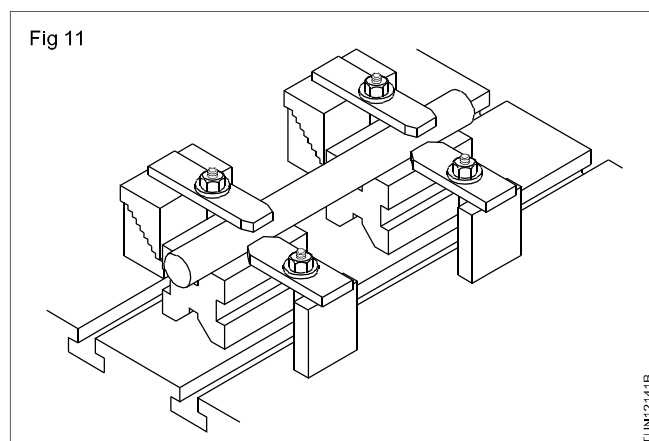
B grade 'V' blocks are not as accurate as A grade 'V' blocks and these are useful for general machine shop work. These 'V' blocks are available up to 300 mm length. Grade B 'V' blocks are made of closely grained cast iron.

### Clamping devices for 'V' blocks

For holding cylindrical jobs firmly on V blocks, U clamps are provided (Fig 10)

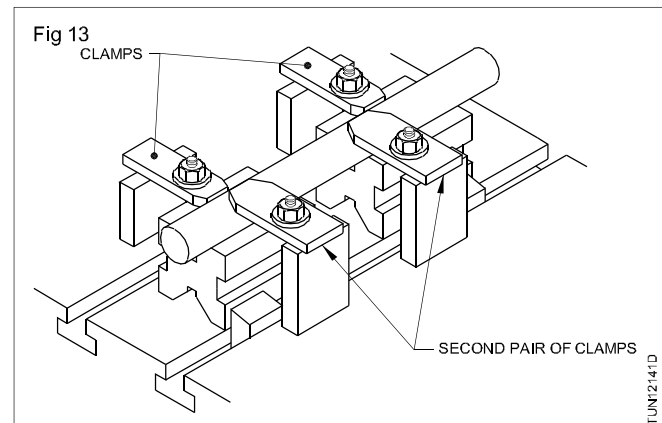
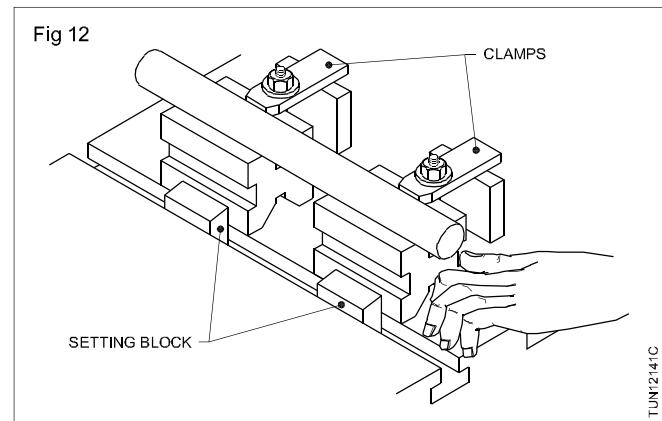


Because 'V' blocks are supplied in pairs of the same size and shape, it is possible to support long workpieces so that they are parallel to the surface upon which the blocks rest, such as on a machine, worktable or a surface table. (Fig 11)

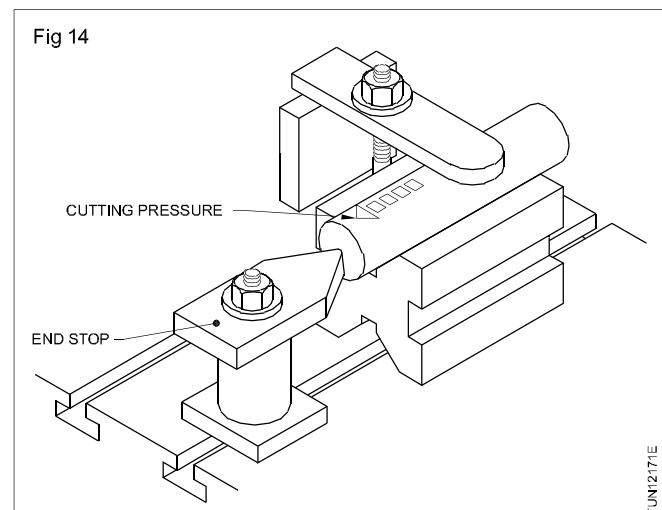


When round workpieces have to be clamped parallel to the edge of a machine worktable, one or two 'V' blocks are first set up parallel on the worktable, using clamps and setting blocks. (Fig 12)

Then a second clamp or pair of clamps is used to clamp the workpiece in the 'V' block(s). (Fig 13)



When machining operations are likely to push the workpiece out of position, an end stop can be used to prevent movement of the workpiece. The end stop is clamped to the machine work table as shown in Fig 14.



'V' blocks Grade 'A' will have a hardness of 650 to 700 HV (60 to 63 HRC)

'V' blocks Grade 'B' will have a hardness of 180 to 220 HB. 'V' blocks of both grades should be suitably stabilized.

Grade 'B' 'V' blocks are made from suitable quality closely grained cast iron.

In B.I.S. standard (IS: 2949-1974) a table is provided to indicate the dimensions of the 'V' blocks, together with the maximum and minimum diameters of the workpiece that can be accommodated on the 'V' block.

# Straight edges

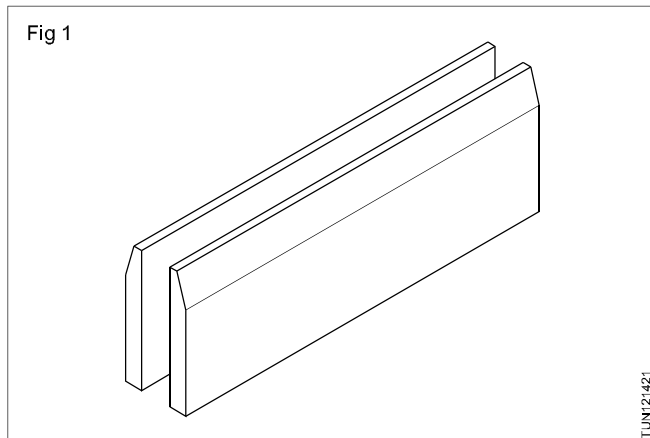
**Objectives:** At the end of this lesson you shall be able to

- name the different types of straight edges
- state the features and uses of each type of straight edge
- state the different methods of testing straightness.

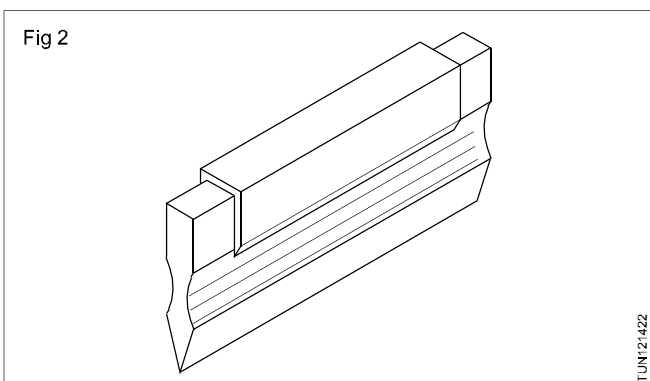
For testing straightness and to use a guide for marking long straight lines, straight edges made of steel or cast iron are used.

## Steel straight edges

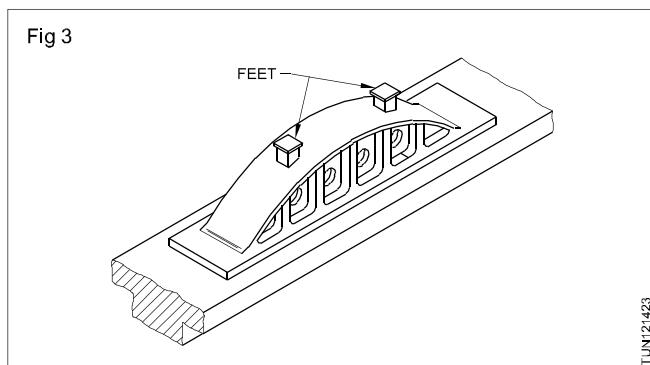
These are usually available up to 2 metres in length and may be rectangular in cross-section or have one edge bevelled. (Fig 1)



Toolmaker's steel straight edges are available in smaller lengths with bevelled edge. Some of these straight edges will have an acute angle of 60° for checking internal angles. (Fig 2)



## Cast iron straight edges (Fig 3)



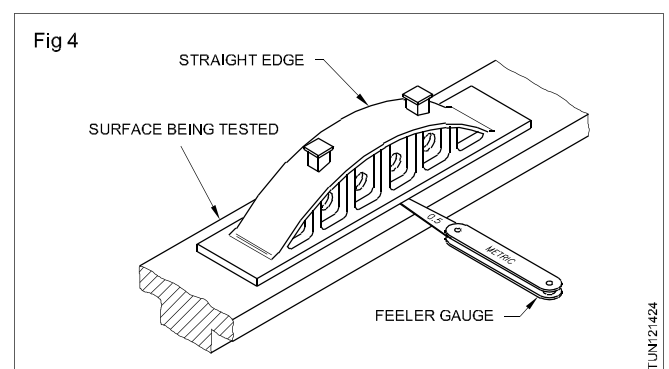
These are made from close-grained, grey, cast iron and can be considered as narrow surface plates. They are

available up to 3 metres length and are used for testing machine tool slideways. Cast iron straight edges have ribs, and bow-shaped tops to prevent distortion. These straight edges are provided with feet to prevent distortion under their own weight.

## Use of straight edges

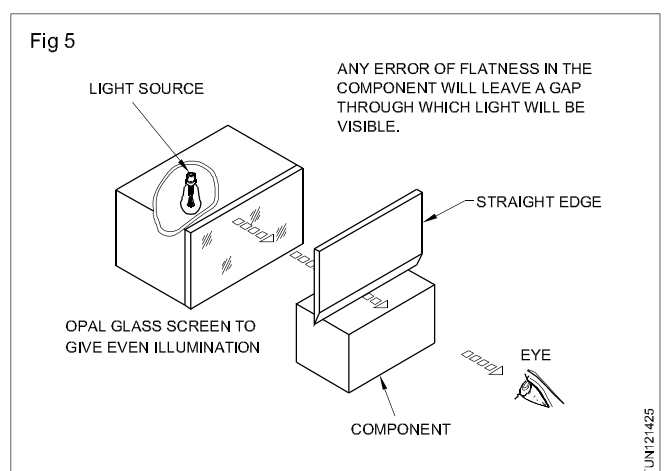
### Checking with feeler gauges

In certain situations when the gap between the surface and the straight edge is more, a feeler gauge can be used (Fig 4) to determine the extent of deviation.



## Use of light box

Where precision straight edges (toolmaker's) are used, a light box which can provide uniform illumination will be of advantage. Through the gap between the straight edge and the component a strip of light will be visible. (Fig 5) By practice the quality of surface can be determined by the amount of light passing through the non-contact surfaces.



**From practice it is said that if the gap is more than 0.002 mm, white light will be seen, and if it is less than 0.002 mm, it will be tinted light.**

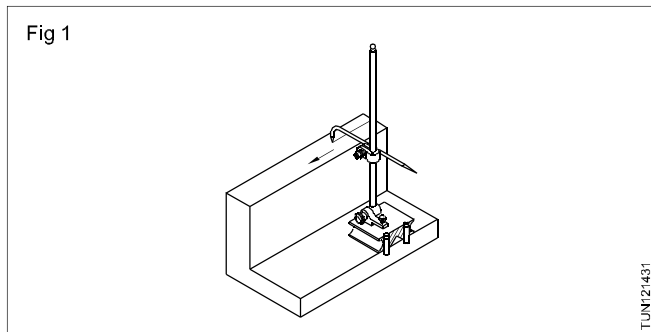
To make this judgement about the amount of deviation, one needs a great deal of practice. The same is applicable in the case of a try-square.

## Surface gauges (or) Scribing block

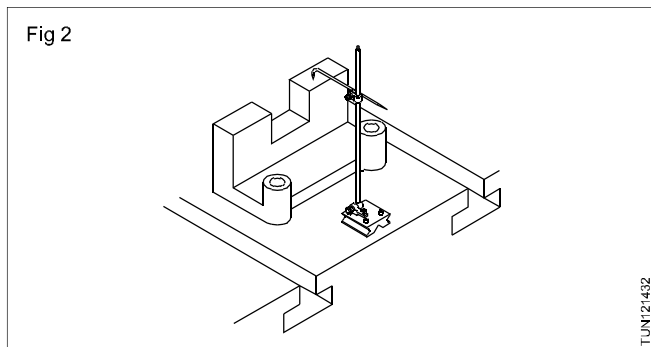
**Objectives:** At the end of this lesson you shall be able to

- state the constructional features of surface gauges
- name the types of surface gauges
- state the uses of surface gauges
- state the advantages of universal surface gauges.

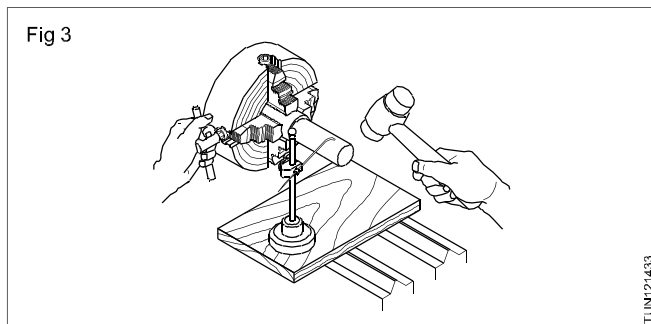
The surface gauge is one of the most common marking tools used for scribing lines parallel to a datum surface. (Fig 1)



Setting jobs on machines parallel to a datum surface. (Fig 2)



Checking the height and parallelism of jobs, setting jobs concentric to the machine spindle. (Fig 3)



### Types of surface gauges

Surface gauges/ scribing blocks are of two types, fixed and universal.

#### Surface gauge - fixed type (Fig 4)

The fixed type of surface gauge consists of a heavy flat base and a spindle fixed upright, to which a scriber is attached with a snug and a clamp nut.

#### Universal surface gauge (Fig 5)

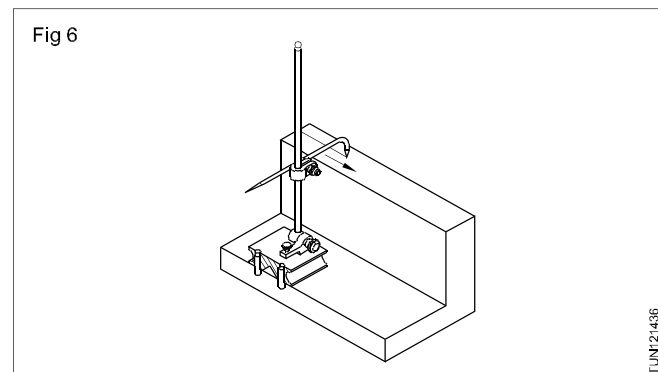
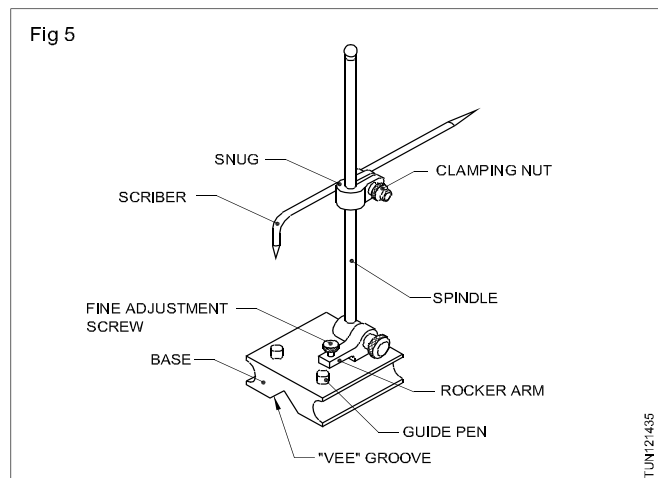
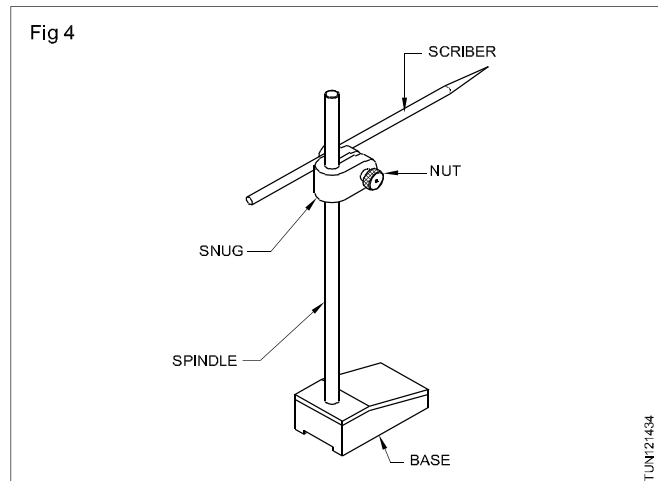
This has the following additional features.

The spindle can be set to any position.

Fine adjustments can be made quickly.

Can also be used on cylindrical surfaces.

Parallel lines can be scribed from any datum edge with the help of guide pins. (Fig 6)



### Parts and functions of a universal surface gauge

#### Base

The base is made of steel or cast iron with a V groove at the bottom. The 'V' groove helps to seat on circular work. The

guide-pins, fitted in the base are helpful for scribing lines from any datum edge.

### Rocker arm

The rocker arm is attached to the base along with a spring and a fine adjustment screw. This is used for fine adjustments.

### Spindle

the spindle is attached to the rocker arm.

### Scriber

The scriber can be clamped in any position on the spindle with the help of a snug and a clamping nut.

## Identification of tools and equipments

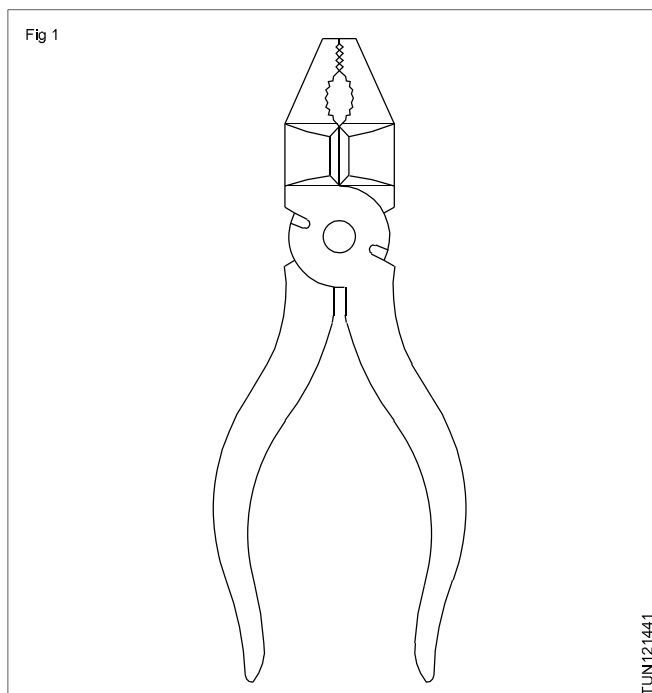
**Objectives:** At the end of this lesson you shall be able to

- list the type of identification of tools
- state the different types of tools
- state how tools are specified.

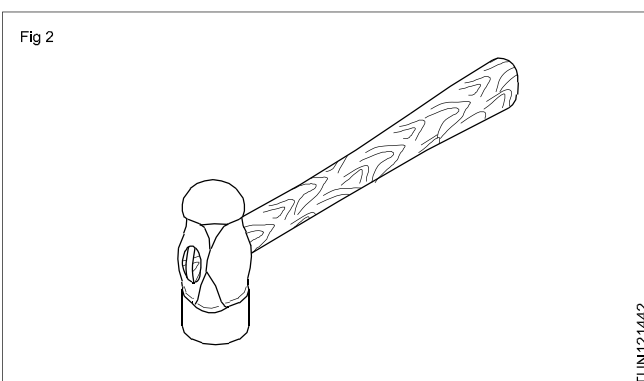
- 1 Hand tools
- 2 Fitting tools
- 3 Measuring tools

### 1 Hand tools

- a Cutting plier** specified according to their length (150mm). (Fig 1)

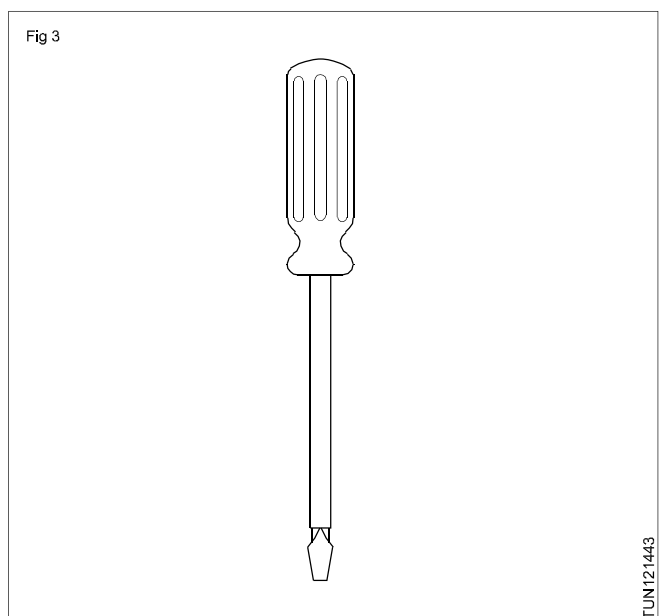


- b Hammer** specified by their weight and shape of pein. (Fig 2)

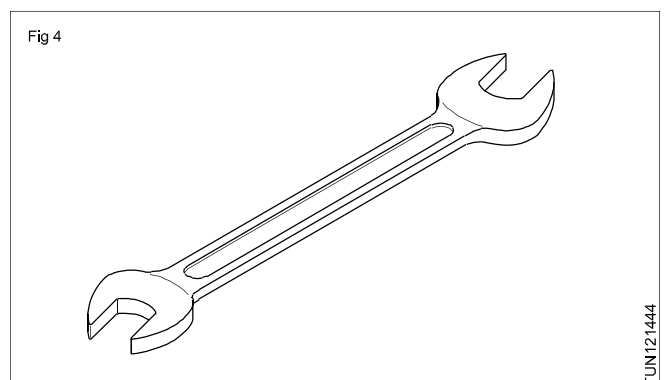


- c Screw driver** specified according to the

- length of the blade
- width of the tip (Fig 3)



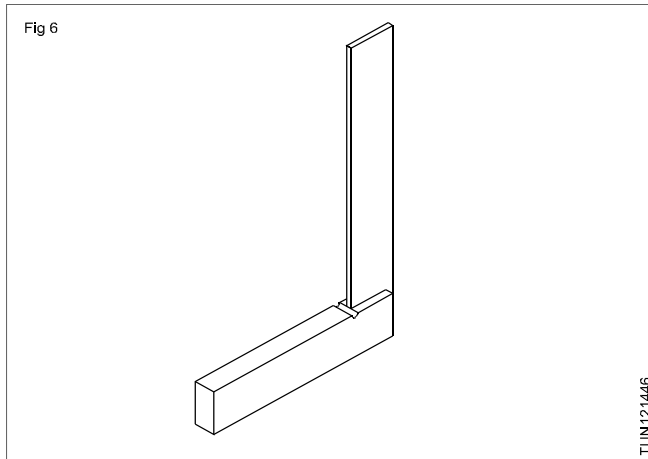
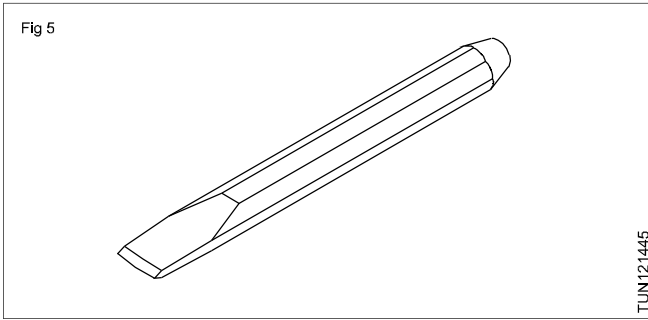
- d Spanner** specified by across to the flat 12mm to 13mm. (Fig 4)



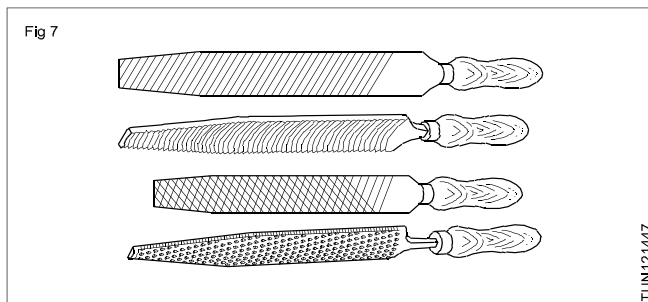
- e Chisel** are specified according to their length, width of cutting edge, type, cross section of the body. (Fig 5)

### 2 Fitting tools

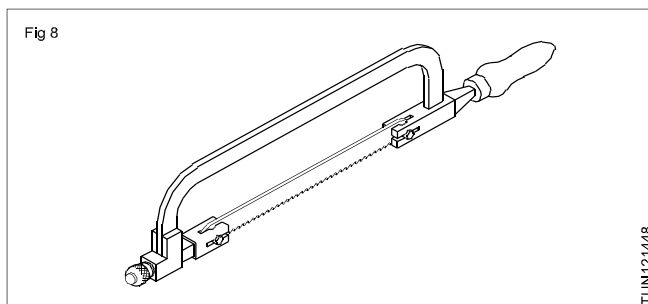
- a Try square** specified according to the length of the blade. (Fig 6)



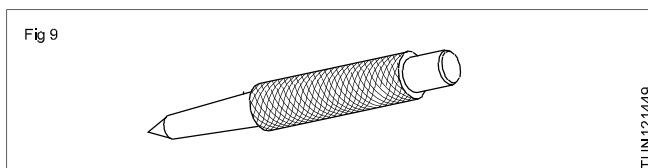
**b File** specified according to their length, grade, cut and shape. (Fig 7)



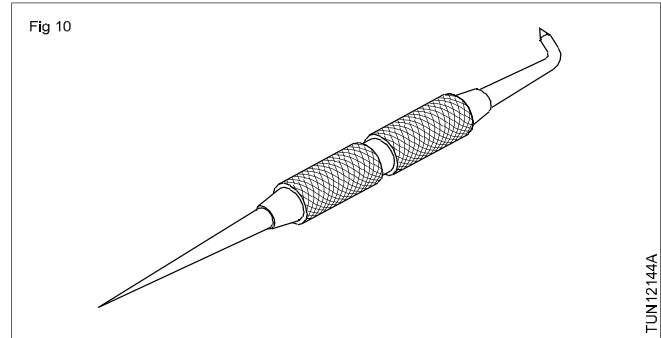
**c Hacksaw** frame specified by types. (Fig 8)



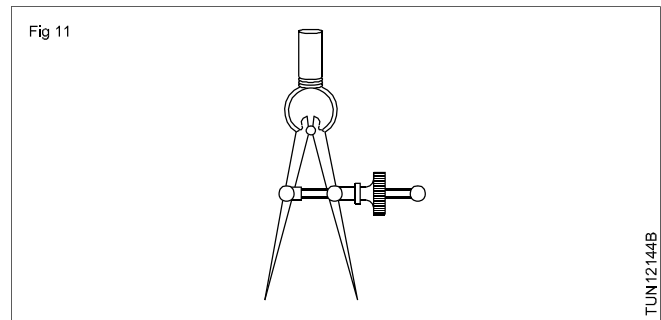
**d Punch** specified by types. (Fig 9)



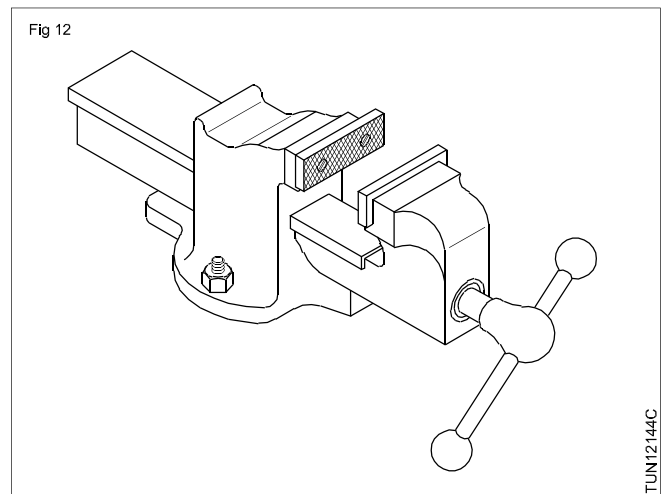
**e Scriber** specified by different shape and sizes. (Fig 10)



**f Divider spring joint** specified by its length. (Fig 11)

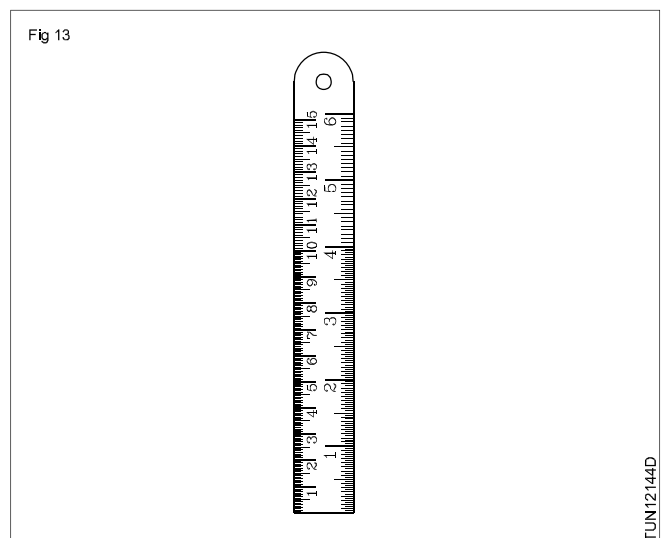


**g Bench vice** specified with & jaw. (Fig 12)

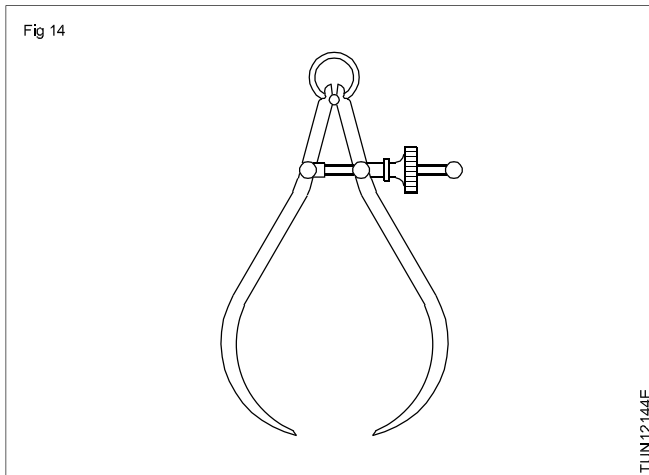


### 3 Measuring tools

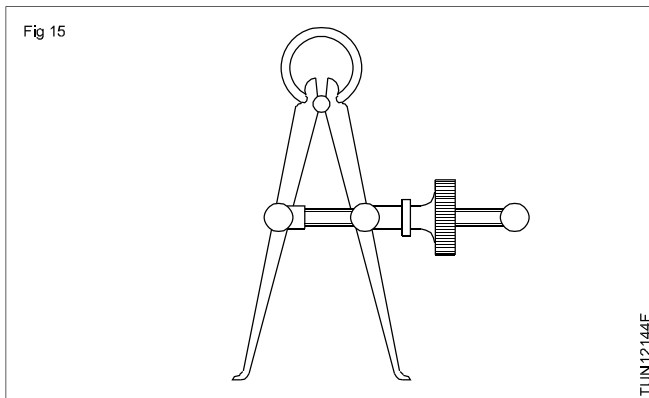
**a Steel rule** specified by length. (Fig 13)



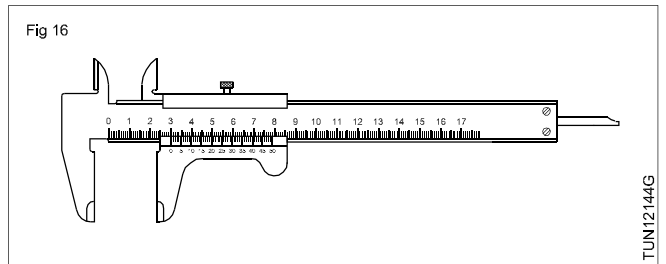
**b Outside caliper spring joint** specified by its length.  
(Fig 14)



**c Inside caliper spring joint** specified by its length.  
(Fig 15)



**d Vernier caliper** specified by its length. (Fig 16)



**e Outside micro meter** specified by ranges of 0 to 25mm, 25 to 50 mm etc (Fig 17)

