

# Vernier Callipers

Presented by  
Department of BSHU (Physics)  
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## Vernier Callipers

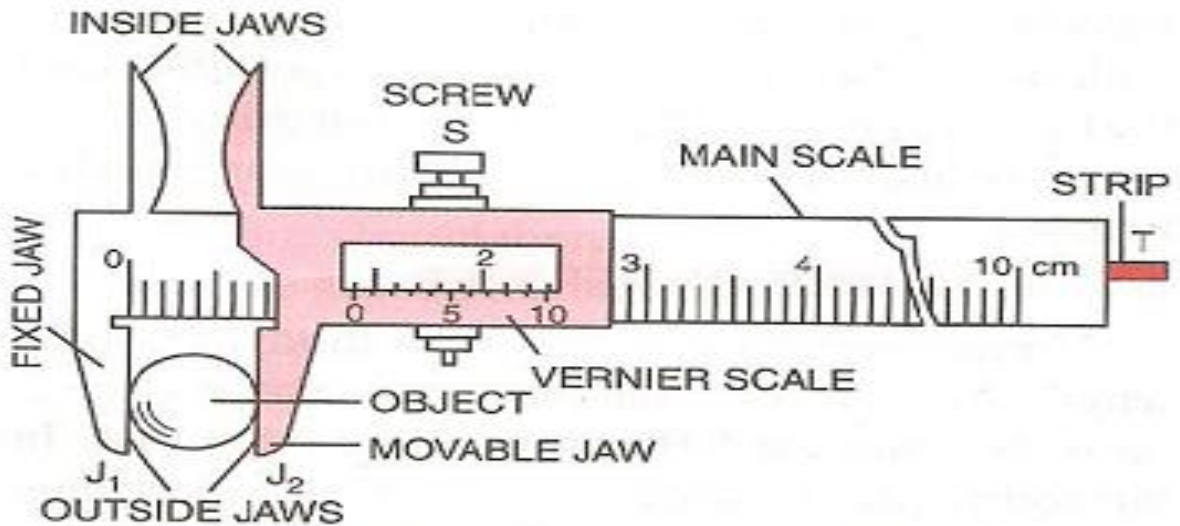


### What is vernier callipers ?

- Vernier calliper is the basic instrument of measurement consist of main scale, vernier scale, measuring jaws and depth measuring bar. The vernier scale can slide along the main scale.
- Invented by a French mathematician named Pierre Vernier.
- Used for measuring height, diameter and depth based on the principle of “difference between two scales”. It can be measure up to .001 cm.
- If there are  $n$  division of vernier scale, then coincident main scale division is  $(n-1)$ . For example, 10 division of vernier scale coincide with 9 division of main scale.
- The main use of the vernier callipers is to measure the internal and external diameter of a round objects like cylinder, because the measuring jaws can be secured on either side of the circumference.

## Vernier Callipers

### DIAGRAM OF VARIOUS PARTS OF THE VERNIER CALLIPERSE



### WHAT IS VERNIER CONSTANT

Vernier constant is defined as the difference between the value of one main scale division and one vernier scale division, also known as the least count of vernier calliper, i.e. the minimum length that can be measured accurately using the instrument.

# Vernier Callipers

## HOW TO FIND VERNIER CONSTANT OR LEAST COUNT

Least count (L.C.)

= 1 main scale division – 1 Vernier scale division

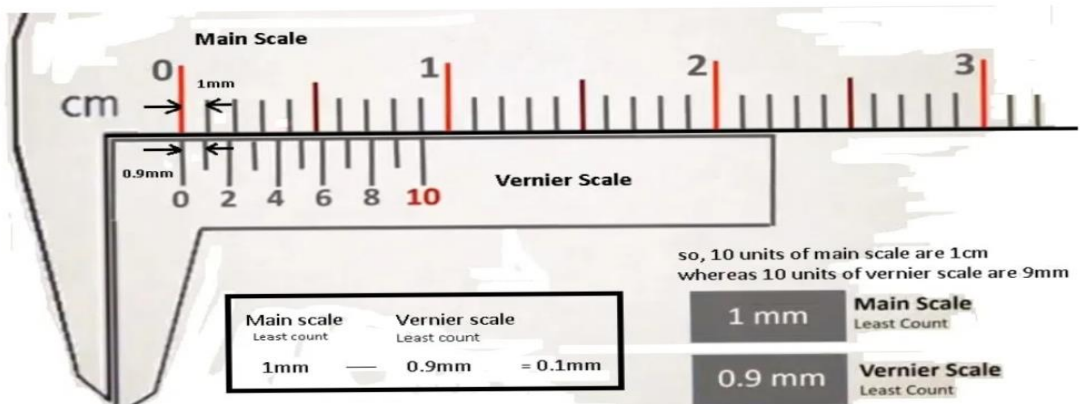
= 1 mm – 0.09 mm = 0.1mm = 0.01 cm

Or,

Least count (L.C.)

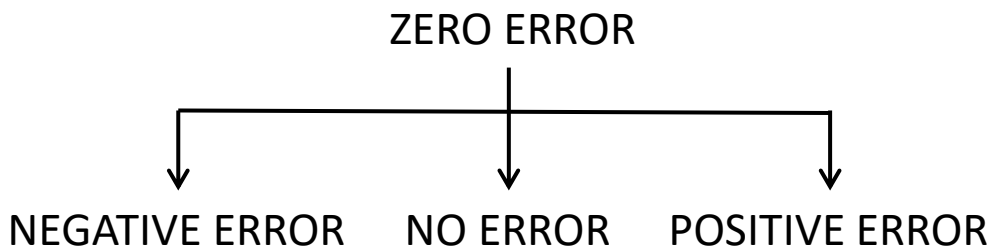
= value of the smallest division on main scale / total  
no. of divisions on vernier scale

= 1mm / 10 = 0.1mm = 0.01cm



## VERNIER CALLIPER ZERO ERROR

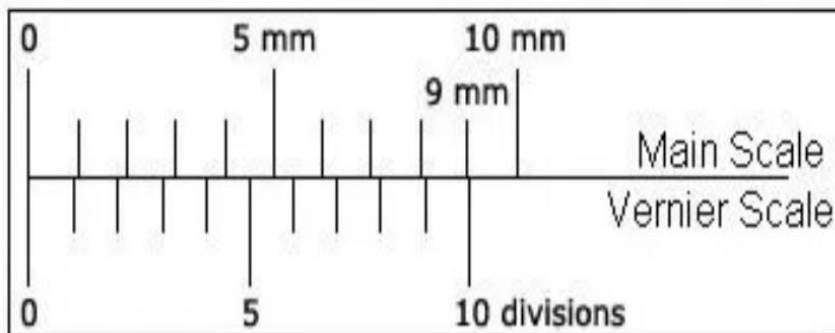
- Zero error in the vernier callipers is a mathematical error due to which, the zero of the vernier scale does not coincide with the zero of the main scale.
- In other words, if zero mark on the vernier scale doesn't coincide with the zero mark on the main scale, then the error that occurs is called zero error.
- There are three types of zero error in the vernier callipers.



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## WHAT IS NO ZERO ERROR

In no zero error, when we bring two jaws together you will see zero of the main scale is coinciding with the zero of the vernier scale. They are exactly in a straight line. So the vernier calliper is free from zero error or you can say there is no zero error in this vernier calliper.



**No Zero Error**      Zero error = 0

# Vernier Callipers

## WHAT IS POSITIVE ERROR

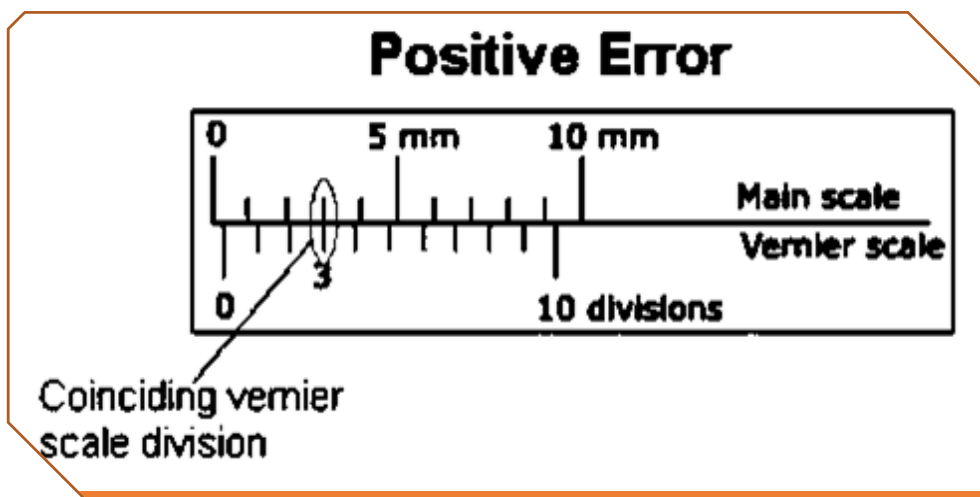
In positive zero error, let's bring the two jaws of vernier calliper together. You will see, the zero of vernier scale is ahead of main scale zero. Or you can say zero of the vernier scale is at the right side of main scale Zero.

### Calculation of positive error

Coinciding vernier scale division = 3

$$\begin{aligned}\text{Zero error} &= \text{coinciding V.S.D.} \times \text{Least count} \\ &= 3 \times 0.01 \text{ cm} = + 0.03 \text{ cm}\end{aligned}$$

Thus it is positive error which will be indicated with “ + ” sign.



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## WHAT IS NEGATIVE ERROR

In negative zero error, we will bring the two jaws together. Here you can see zero of vernier scale is the back side of Main scale zero. Or to the left of main scale zero.

### Calculation of negative error

Coinciding V.S.D. = 8;

Difference = Total V.S.D. – Coinciding V.S.D. =  $10 - 8 = 2$

Now, Zero error = Difference  $\times$  Least count  
 $= 2 \times 0.01 \text{ cm} = - 0.02 \text{ cm}$

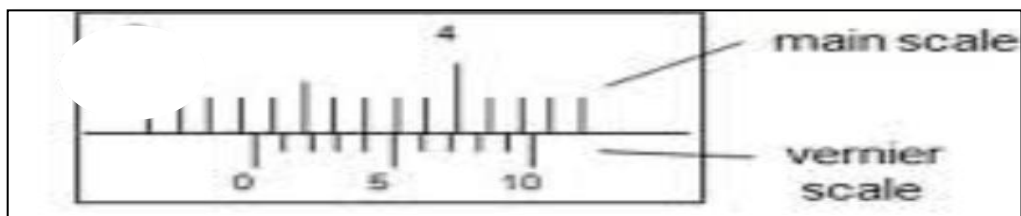
The minus sign indicate the negative error in vernier calliper.



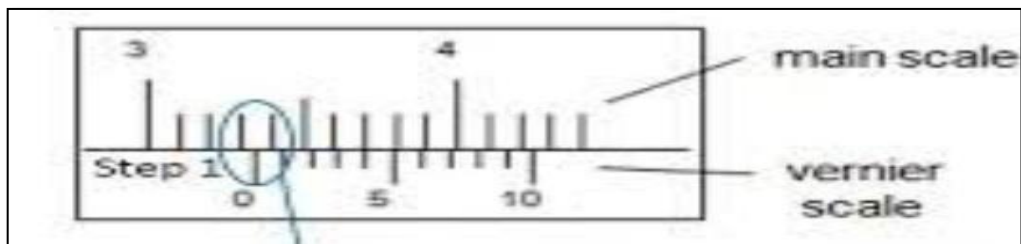
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## HOW TO TAKE READING USING A VERNIER CALLIPERSE

1. The zero vernier scale is between 3.3 and 3.4, So reading is 3.3 cm



2. Next look out for where the main scale intercept.  
The marking appear as straight line from vernier to main scale.



3. For point of intercept is at the 4th marking. Hence total reading =  $3.3 + (4 \times 0.01) = 3.34\text{cm}$ .

