

## MEASUREMENTS

The measurement of a given quantity is essentially an act or the result of comparison between the quantity (whose magnitude is unknown) & a predefined standard. Since two quantities are compared, the result is expressed in numerical values.

### Basic requirements of measurement

- 1) The standard used for comparison purposes must be accurately defined & should be commonly accepted
- 2) The apparatus used & the method adopted must be provable.

### Measuring instrument

It may be defined as a device for determining the value or magnitude of a quantity or variable.

### FUNCTIONAL ELEMENTS OF AN INSTRUMENT:

Most of the measurement systems contain three main functional elements.

They are:

- i) Primary sensing element
- ii) Variable conversion element &
- iii) Data presentation element.

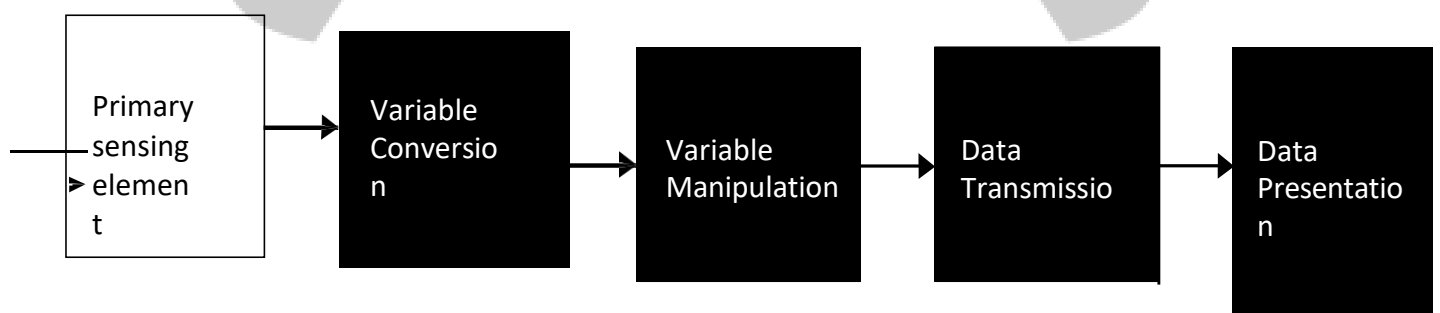


Fig 1.1 Functional Elements of an Instrument

**Primary sensing element:**

The quantity under measurement makes its first contact with the primary sensing element of a measurement system. i.e., the measured- (the unknown quantity which is to be measured) is first detected by primary sensor which gives the output in a different analogous form This output is then converted into an electrical signal by a transducer - (which converts energy from one form to another). The first stage of an measurement system is known as a detector transducer stage’.

**Variable conversion element:**

The output of the primary sensing element may be electrical signal of any form, it may be voltage, a frequency or some other electrical parameter. For the instrument to perform the desired function, it may be necessary to convert this output to some other suitable form.

**Variable manipulation element:**

The function of this element is to manipulate the signal presented to it preserving the original nature of the signal. It is not necessary that a variable manipulation element should follow the variable conversion element some non -linear processes like modulation, detection, sampling, filtering, chopping etc., are performed on the signal to bring it to the desired form to be accepted by the next stage of measurement system This process of conversion is called ‘signal conditioning’

The term signal conditioning includes many other functions in addition to Variable conversion & Variable manipulation In fact the element that follows the primary sensing element in any instrument or measurement system is called conditioning element’

NOTE: When the elements of an instrument are actually physically separated, it becomes necessary to transmit data from one to another. The element that performs this function is called a data transmission element’.

**Data presentation element:**

The information about the quantity under measurement has to be conveyed to the personnel handling the instrument or the system for monitoring, control, or analysis purposes. This function is done by data presentation element

In case data is to be monitored, visual display devices are needed these devices may be analog or digital indicating instruments like ammeters, voltmeters etc. In case data is to be recorded, recorders like magnetic tapes, high speed camera & TV equipment, CRT, printers may be used. For control & analysis is purpose microprocessor or computers may be used. The final stage in a measurement system is known as **terminating stage'**

