

## 1.4 Terms in Measurement

### 1.4.1 Sensitivity

Sensitivity of the instrument is defined as the ratio of the magnitude of the output signal to the magnitude of the input signal.

- a. It denotes the smallest change in the measured variable to which the instruments respond.
- b. Sensitivity has no unique unit. It has wide range of the units which dependent up on the instrument or measuring system.

### 1.4.2 Readability

Readability is a word which is frequently used in the analog measurement. The readability is depending on the both the instruments and observer.

- a. Readability is defined as the closeness with which the scale of an analog instrument can be read.
- b. The susceptibility of a measuring instrument to having its indications converted to a meaningful number. It implies the ease with which observations can be made accurately.
- c. For getting better readability the instrument scale should be as high as possible.

### 1.4.3 Repeatability

Repeatability may be defined as the closeness of agreement among the number of consecutive measurements of the output for the same value of input under the same operating conditions. It may be specified in terms of units for a given period of time.

### 1.4.4 Reproducibility

Reproducibility may be defined as the closeness of agreement among the repeated measurements of the output for the same value of input under the same operating conditions over a period of time. Perfect reproducibility means that the instrument calibration does not gradually shift over a long period of time.

### 1.4.5 Calibration

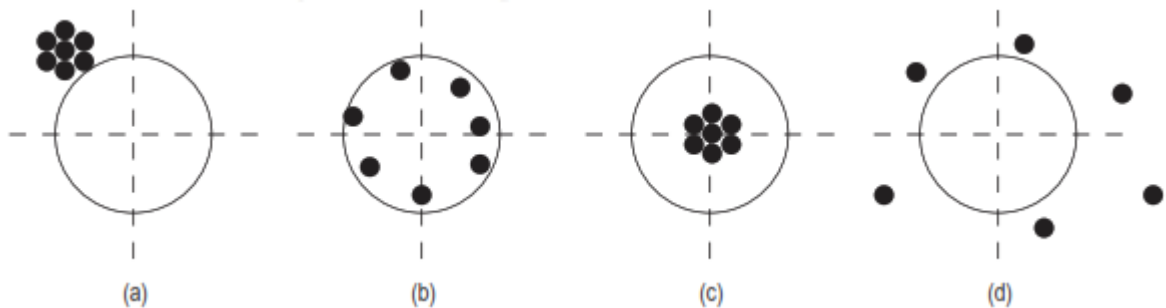
Calibration is essential that the equipment/instrument used to measure a given physical quantity is validated. The process of validation of the measurements to ascertain whether the given physical quantity conforms to the original/national standard of measurement is known as traceability of the standard.

Calibration is achieved by comparing the measuring instrument with the following:

- (a) a primary standard, (b) a known source of input, and (c) a secondary standard that possesses a higher accuracy than the instrument to be calibrated.

### 1.4.6 ACCURACY

Accuracy is the degree to which the measured value of the quality characteristic agrees with the true value. The difference between the true value and the measured value is known as error of measurement. It is practically difficult to measure exactly the true value and therefore a set of observations is made whose mean value is taken as the true value of the quality measured.



**Fig. 1.2 Accuracy and precision**

- (a) Precise but not accurate (b) Accurate but not precise (c) Precise and accurate (d) Not precise and not accurate

[source: “Engineering Metrology & Measurements”, N.V. Raghavendra., page-07]

### 1.4.7 PRECISION

The terms precision and accuracy are used in connection with the performance of the instrument. Precision is the repeatability of the measuring process. It refers to the group of measurements for the same characteristics taken under identical conditions.

It indicates to what extent the identically performed measurements agree with each other. If the instrument is not precise it will give different (widely varying) results for the same dimension when measured again and again. The set of observations will scatter about the mean. The scatter of these measurements is designated as  $\sigma$ , the standard deviation. It is used as an index of precision. The less the scattering more precise is the instrument. Thus, lower, the value of  $\sigma$ , the more precise is the instrument.

