



ACCURACY/PRECISION

Course : Metrology and Measurements



BULLS EYE





ACCURACY VS PRECISION



1

Accurate
Precise



2

Not Accurate
Precise



3

Accurate
Not Precise



4

Not Accurate
Not Precise



ACCURACY

Accuracy

- **Closeness of measured value with true value**
- Can be determined by single reading
- For example, if in lab you obtain a weight measurement of 3.2 kg for a given substance, but the actual or known weight is 10 kg, then your measurement is not accurate. In this case, your measurement is not close to the known value.
- Eg. A job having dimension **25mm and instrument** showing reading **24.98mm**





PRECISION

Precision

- Defined as ***repeatability of measuring instrument i.e. how close the measured values are to each other..***

- Can not be determined by single reading i.e. for describing precision a set of readings required.

- *E.g. reading obtained from measuring instrument*

- True reading – 25mm

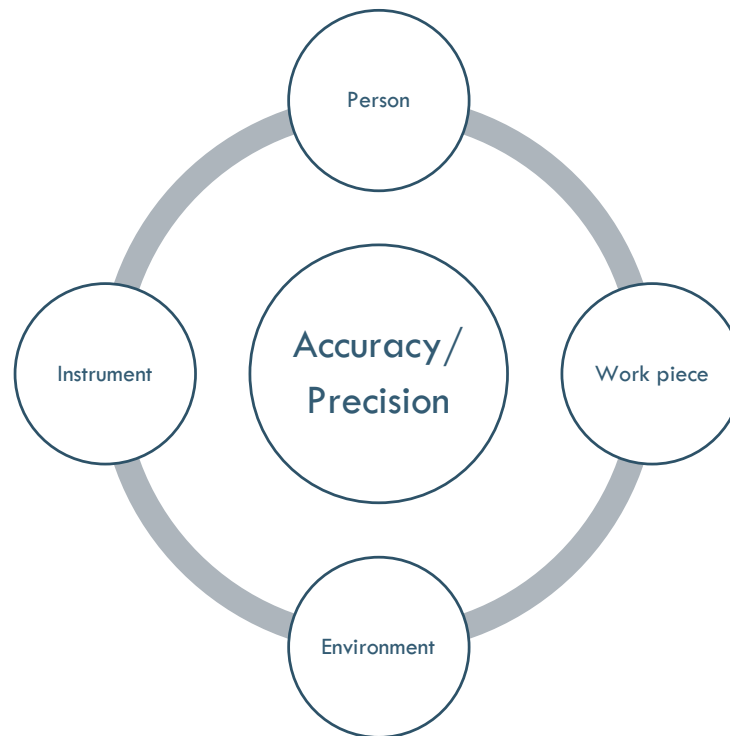
- 24.7 , 25.31, 24.69, 24.89, 25.02 - Set 1

- 24.98, 25.02, 25.01, 25.00, 25.00 – Set 2





EFFECTS OF ELEMENTS OF METROLOGY ON PRECISION AND ACCURACY





STANDARD OF MEASUREMENT

Factors affecting the standard of measurement

- Coefficient of thermal expansion
- Elastic properties of a material
- Stability with time
- Calibration interval
- Geometric compatibility

Factors ?



WORK PIECE TO BE MEASURED

- Coefficient of thermal expansion of material
- Elastic properties of a material
- Cleanliness, surface finish, surface defects such as scratches, waviness etc.,
- Adequate datum on the work piece
- Thermal equalization





FACTORS AFFECTING THE CHARACTERISTICS OF AN INSTRUMENT

- Scale error
- Repeatability and readability
- Calibration errors
- Effect of friction, zero drift, backlash etc.,
- Inadequate amplification
- Deformation when heavy work pieces are measured
- Constant geometry for both workpiece and standard.





• FACTORS AFFECTING PERSON & ENVIRONMENT

• Factors affecting Person

Training/skill

- Ability to select the measuring instruments and standard
- attitude towards accuracy
- Planning measurement techniques for minimum cost, consistent with precision requirements etc.



Factors affecting environment

- Temperature, humidity, atmosphere, pressure etc.,
- Clean surrounding and minimum vibration enhance precision
- Temperature equalization between standard, workpiece and instrument.
- Thermal expansion effects due to heat radiation from lights, heating elements, sunlight and people.
- Manual handling may also introduce thermal expansion.

