Calibration of Instruments / Equipments used in Air Quality Monitoring & Analysis

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Calibration

The comparison of a measurement system of unknown accuracy to another measurement system with a known accuracy to detect, correlate, report or eliminate by adjustment, any variation from the required performance limits of the unverified measurement system

The device with the known or assigned correctness is called the standard. The second device is the unit under test (UUT) or test instrument (TI)

Calibration as per ISO 17025

Option I

- NABL accredited laboratories can perform In house calibration for sampling and analytical instruments using standard device traceable to national standards

Option II

- Calibration by any NABL accredited calibration laboratory

What to Calibrate

Sampling Equipment (Flow calibration)

- Flowmeter / Manometer
- Rotameter

Analytical Instruments/Equipments

- Analytical Balance
- Spectrophotometer
- Volumetric Glass wares

Calibration of Sampling Equipment (HVS) Flowmeter/Manometer

Why to Calibrate

- Calibration of HVS is necessary to establish traceability of field measurement to a primary standard via flow rate transfer standard
- The most common flow rate transfer standard used for calibration of flow of HVS is orifice method

When to Calibrate

- Single point Calibration

  Once in a month

- Multi point Calibration
  - When sampler is first installed
  - Every six months
  - After major repair work
  - When a one point calibration check deviates by more than ±7% from the calibration curve

Transfer Standard

- A transportable device or apparatus that is capable of accurately measuring air flow used to calibrate samplers in the field.

- The precision and accuracy of these types of instruments must be characterized through a certification process

Calibration Equipments for HVS

Primary

- Standard Positive displacement meter (Roots Meter)

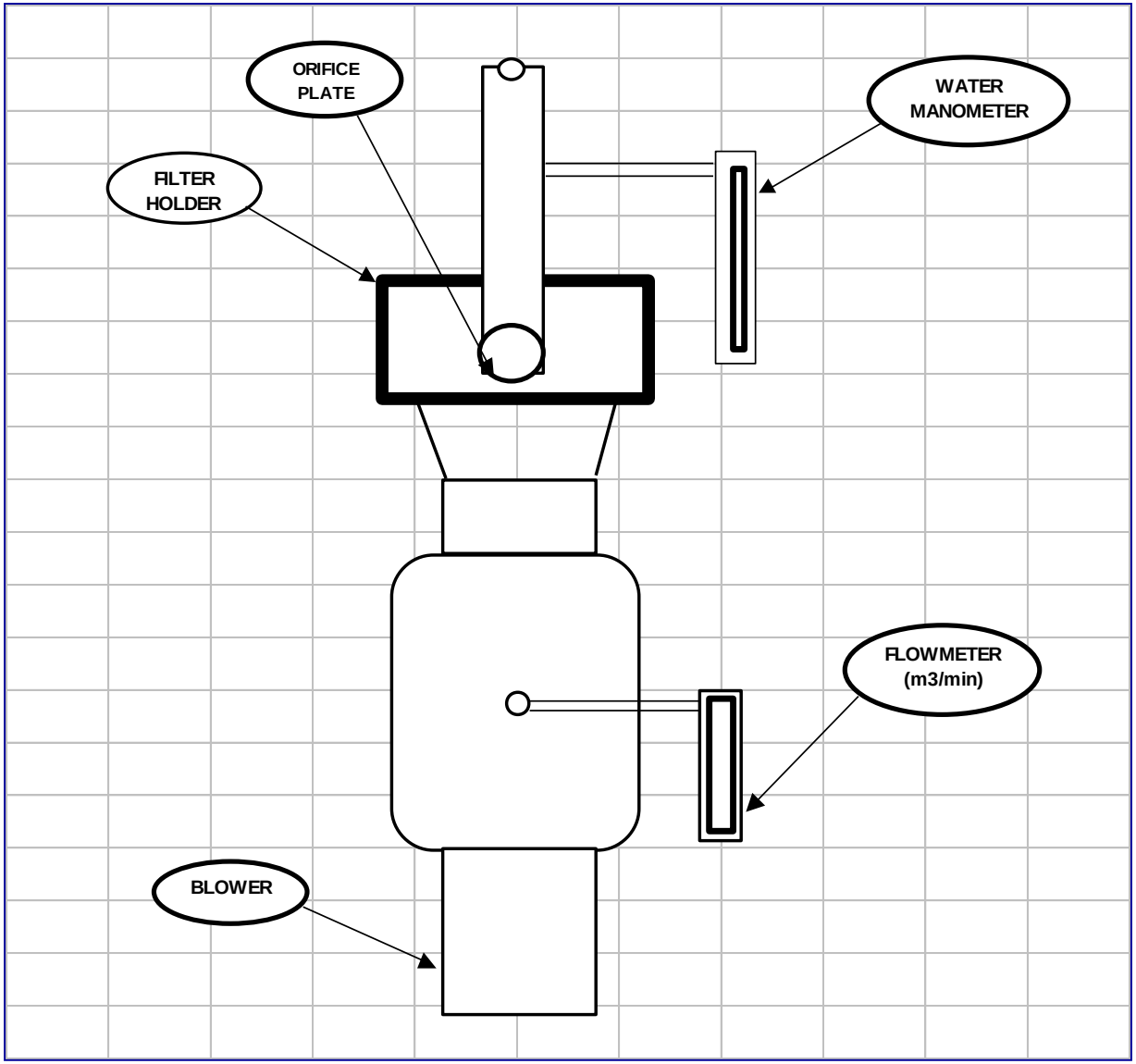
  (must be traceable to international / national testing laboratory and checked biennially against a similar device)

Secondary

- Top loading Orifice Calibration Unit

  (Field Calibration Unit / Transportable device)

Flow Diagram of calibration of HVS

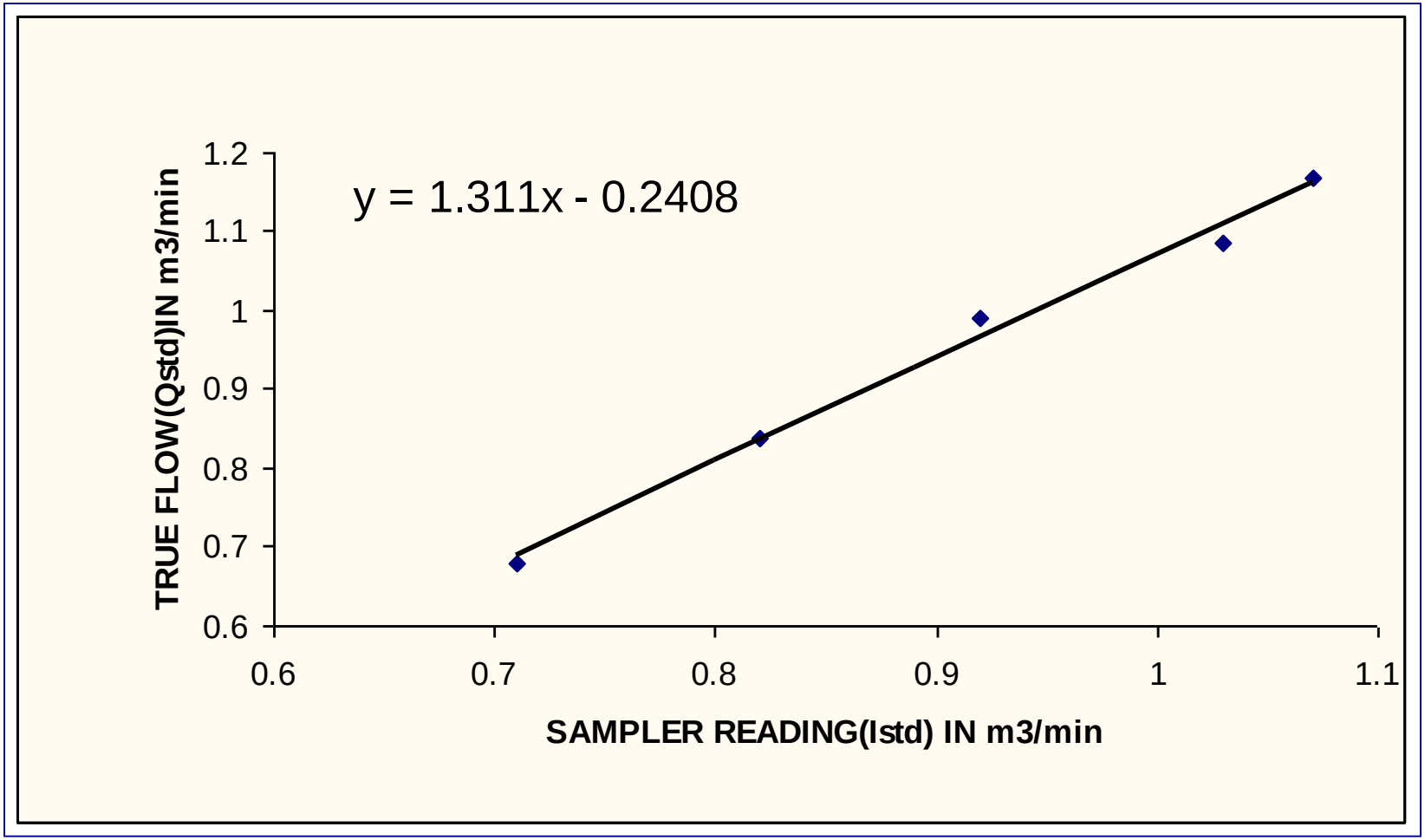


Calibration Graph

- Plot a Calibration curve (linear regression) using the indicated (Istd) on X axis and actual flow (Qstd) on Y axis
- Use this standard graph for the correction of flow of HVS

±

Calibration Graph for HVS



Calibration of Rotameter (Soap Bubble Method)

The basic principle used in soap bubble method is to make soap bubble travel through a graduated glass column for a range of volume of air from one point to another in a given period of time under influence of suction.

Flow meters available for flow calibration of Rotameters

- Conventional Soap bubble meter consists of a graduated and calibrated glass column and a calibrated stopwatch
- Digital Film Flow Meter
- Digital Flow meter operating on Graphite Piston technology

Flow does not have direct traceability to any national standard

The flow is traceable through volume, time, temperature, pressure etc. which are directly traceable to national standards

Calibration of Analytical Instruments

Analytical Balance

- Calibration using standard weights confirming to OIML accuracy class which has traceability to national/international standards
- Calibrations performed for

  Repeatability, Linearity & Eccentricity

Spectrophotometer

- Calibration for transmittance and wavelength using standard filters traceable to national standards
- Chemical calibration for linearity and wavelength

Volumetric Glass wares

- Use A Grade certified glass wares
- Calibrate the volume by gravimetric method (Refer BIS method)
- Do not oven dry the volumetric glass wares during calibration, only air drying is permitted

In House Calibration in CPCB

- Calibration of Manometer/Flowmeter of HVS by Top Loading Orifice Calibrator
- Calibration of Rotameter by Digital Flow Meter
- Calibration of Balance by Certified Standard Weights
- Calibration of Spectrophotometer by Certified standard filters / chemical calibration by NIST traceable primary standard

Thank You