VICE DIRECTORATE OF PHYSICAL METROLOGY

Course: Small Volume Metrology

Intended for:

The course is designed for professionals and technicians whose activities are related to magnitude of volume.

Identification:

Course name	Small Volume Metrology	Course duration	24 hours
Minimum # of slots	Four (4) people	Maximum # of slots	Eight (8) people
Place	The courses are taught in the Instituto Nacional de Metrología, located on Avenida Carrera (AK) 50 No. 26-55, Int 2 (CAN), Bogotá D.C.	Cost	Resolution & current rates
For information & registration: www.inm.gov.co link http://www.inm.gov.co/index.php/serviciosinm/capacitacion Tel. (571) 254 22 22 extensions 1417 & 1428			

Course Objectives:

GENERAL OBJECTIVE: provide theoretical and practical tools for the calibration of Glass Volumetric Material and Piston Pipettes using the gravimetric calibration method.

1. Present basic concepts such as Volume, Capacity, Calibration, uncertainty, error indication, Adjustment, and others, so that the participants understand the foundation of calibration methods for this magnitude.
2. Describe the most common volumetric tools in the industry and in laboratories, emphasizing their operational use (contain-supply) to be able to choose the most appropriate calibration method.
3. Present the calibration methodology used for glass volumetric material (gravimetric method), based on ISO 4787:2010.
4. Provide the elements that allow for course participants to perform uncertainty estimates of the gravimetric method, using as a reference ISO/TR 20461:2000(E).
5. Present the calibration methodology (gravimetric method) used for piston-operated/positive-displacement pipettes (micro-pipettes), based on the set of norms ISO 8655-2:2002 and ISO 8655-6:2002.
6. Propose an uncertainty budget for the calibration of micro-pipettes.
7. Provide the elements that allow for course participants to prepare calibration certificates in the magnitude of volume and, at the same time, give metrological compliance to the volumetric containers according to their specific requirements.

Course Content:

Day One

1. Basic metrological concepts applicable to volume, such as Volume, Capacity, Fluid, Calibration, Adjustment, units that correspond to the magnitude, and concepts related to the Archimedes Principal (fluid, density, thrust, etc.)
2. Description of glass instruments for the measurement of volume (instruments that contain and supply)
3. Meniscal volume analysis
4. Verifying weighing instruments
5. Gravimetric Method for the calibration of glass material according to ISO 4787:2010, operational sequence and recommendations

Practices:

6. Verification and handling of weighing instruments
7. Calibrating calibrated instruments: calibrated balls, meniscal readings
8. Calibrating pycnometers and convex meniscal readings
9. Calibrating graduated glass volumetric instruments (glass pipettes) in three points

Day Two

1. Calculating water density (Tanaka Equation) and air density (OIML Equation R 111-1 Edition 2004 (E))
2. Calculating the capacity of glass instruments to measure volume (instruments to contain and supply)
3. Operational principals and description of piston-operated instruments: operational classification and sequence ISO 8655-2:2002 and ISO 8655-6:2002
4. Recommendations for use of piston-operated pipette and quality assurance of their results

Practices:

- Determining water and air density by means of real measurements of calibration conditions (environmental conditions and working fluid)
- Measuring the capacity of piston-operated pipettes: sequence of calibration operations ISO 8655-2 and 6

Day Three

1. Calculating the capacity of piston pipettes and the density of water and liquid
2. Estimating the uncertainty of the gravimetric method based on ISO/TR 20461:2000(E) and

EURAMET recommendations cg-19 Version 2.1 (03/2012)

3. Uncertainty budget for the gravimetric method of calibrating piston-operated/positive-displacement pipettes ISO/TR 20461:2000(E) and Recommendation D.K.D 8.1 Edition 12/2011
4. Preparing calibration certificates for the magnitude of volume

Requirements

Participants should:

1. Have taken the Basic Metrology Course
2. Have taken the Measurement Uncertainty Course
3. Have basic knowledge of differential calculus, algebra and basic statistics
4. Have access to a laptop comuputer for the course's practical exercises

Important Information

In the event of partial attendance (missing more than 20% of the course) on the part of the participant, the INM will not award an "Attendance Certificate" or refund money from the course payment.

The courses are taught in the Instituto Nacional de Metrología located on Avenida Carrera (AK) 50 No. 26-55, Int 2 (CAN), Bogotá D.C., from 8:15 to 17:00 hours.

Users should consult about the availability of space before depositing payment: Tel. (571) 254 22 22 extensions 1417 & 1428.