CONCEPT

Calibration Management and Industrial Metrology: Traceability, Uncertainty and Intervals

31 October – 4 November 2027
Riyadh - KAFD district five-star



Calibration Management and Industrial Metrology: Traceability, Uncertainty and Intervals

Ref: 371_15745 **Date:** 31 October – 4 November 2027 **Location:** Riyadh - KAFD district five-star **Fees:** 20000 SAR

Introduction:

Calibration management fails quietly: instruments drift between overdue calibrations, certificates are filed without anyone checking the reported uncertainty, and an out-of-tolerance result rarely triggers a review of product already released. This Core Concept course gives technicians, QA/QC staff and supervisors the industrial metrology needed to run a site calibration programme: VIM vocabulary and the SI, traceability chains, GUM uncertainty budgets, discipline-specific calibration procedures, interval setting, out-of-tolerance impact assessment and decision rules. Participants build a Calibration Programme and Uncertainty Workbook for instruments from their own site.

Course Objectives:

- Apply VIM terminology and SI traceability to classify site measuring equipment and document each instrument's traceability chain
- Build GUM-based measurement uncertainty budgets for calibrations performed in the workshop or in the field
- Calibrate pressure, temperature, flow, dimensional and electrical instruments to a written procedure and record as-found and as-left data
- Set and adjust calibration intervals from as-found history and reliability targets
- Evaluate out-of-tolerance findings and assess their impact on product, process and earlier measurements
- Apply decision rules and guard bands when issuing or accepting statements of conformity

Target Audience:

- Technicians who calibrate and maintain pressure, temperature, flow and electrical instruments
- QA/QC staff responsible for measuring equipment control and product release decisions
- Supervisors who run in-house calibration workshops or site metrology laboratories
- Maintenance supervisors who plan calibration schedules and manage external calibration suppliers
- Inspection staff who use dimensional gauges and must defend measurement results

Course Outline:

Day 1: Metrology Foundations, the SI and Traceability Chains

- VIM Terminology: Measurand, Error, Accuracy, Precision, Resolution and Tolerance
- SI Base Units and Their Redefinition from Fixed Physical Constants
- Scientific, Industrial and Legal Metrology: Roles of National Metrology Institutes and Calibration Laboratories
- Traceability Pyramid: Unbroken Chain from Reference Standards to Plant Instruments
- Measuring Equipment Register and Criticality Ranking Current-State Review

Day 2: Measurement Uncertainty with the GUM Approach

- Measurement Model and Input Quantities under JCGM 100:2008
- Type A Evaluation from Repeated Readings and Type B Evaluation from Specifications
- Combined Standard Uncertainty, Coverage Factor and Expanded Uncertainty
- Uncertainty Budget Spreadsheet: Reference Standard, Resolution, Drift and Environment
- Calibration Certificate Review: Reported Uncertainty, Traceability and Conformity Statements

Day 3: Instrument Calibration Procedures by Measurement Discipline

- Pressure Calibration: Deadweight Testers, Pressure Comparators and Hysteresis Checks
- Temperature Calibration: Dry-Block Calibrators, Liquid Baths and Reference PRTs
- Flow Instrument Verification: Master Meter Comparison and In-Situ Checks
- Dimensional and Electrical Calibration: Gauge Blocks, Micrometers and Multifunction Calibrators
- Calibration Procedure Template: Test Points, Test Uncertainty Ratio, As-Found and As-Left Data

Day 4: Calibration Intervals, Out-of-Tolerance Events and Conformity Decisions

- Initial Interval Setting and Adjustment Methods from ILAC-G24:2022
- Reliability Targets and As-Found Trend Analysis for Interval Extension or Reduction
- Out-of-Tolerance Evaluation: Product Impact Assessment, Recall Scope and Corrective Action
- Decision Rules and Guard Bands under ILAC-G8:09/2019 and JCGM 106:2012
- Calibration Management Software: Equipment Records, Recall Scheduling and Audit Trails

Day 5: Calibration Programme Modelling Build

- Case: Pressure Transmitter Uncertainty Budget and Pass or Fail Call with Guard Band
- Case: Temperature Sensor Out-of-Tolerance Impact Assessment on Released Product
- Interval Review Exercise from Multi-Cycle As-Found History
- Calibration Programme Indicators: Overdue Rate, Out-of-Tolerance Rate and Schedule Adherence
- Calibration Programme and Uncertainty Workbook Build and Peer Review

Skills You Will Gain:

- Metrological Traceability Mapping
- Uncertainty Budgeting
- Pressure and Temperature Calibration
- Calibration Certificate Evaluation
- Recalibration Interval Analysis
- Out-of-Tolerance Impact Assessment
- Guard Band Setting
- Calibration Records Management

Why Attend This Course:

- Leave with a Calibration Programme and Uncertainty Workbook built on instruments from your own site
- Defend pass or fail calls to auditors and customers with an uncertainty budget and a stated decision rule
- Replace habit-based calibration intervals with intervals justified by as-found data
- Compare calibration practice with peers from oil and gas, pharmaceuticals, food, power and manufacturing

Conclusion:

A calibration programme is only as sound as its weakest link: an untraceable reference, an unchecked certificate, an interval nobody reviews or an out-of-tolerance result that never reaches the product it affected. The course moves from VIM vocabulary, the SI and traceability through GUM uncertainty budgets and discipline-specific calibration procedures to interval adjustment, out-of-tolerance impact assessment, decision rules and calibration software. The final day produces a Calibration Programme and Uncertainty Workbook ready for the next equipment review.