Egyptian Accreditation Council
EGAC

Guidelines for Laboratories in Calibration Metrology

PB15L

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Table of Modification

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2.1/Aug 2016	Quality Department	All	No changes, just revision for all procedure

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Calibration Metrology

1. PURPOSE AND SCOPE

The purpose of this document is to define the specific technical guidelines that should be followed by the laboratories seeking accreditation in the specific fields as applicable. EGAC's policy in this regard is to use the national and international expert organizations in this field, e.g., BIPM, OIML, EURAMET, … This Publication shall replace the EGAC publication:

- PB08L (Guiding Criteria for Laboratory Accreditation in the Field of Dimensional Metrology)
- PB09L (Guiding Criteria for Laboratory Accreditation in the Field of Pressure Metrology)
- PB10L (Guiding Criteria for Laboratory Accreditation in the Field of Temperature Metrology)
- PB11L (Guiding Criteria for Laboratory Accreditation in the Field of Electrical Metrology)

2. REFERENCES

Technical publication from:

- ISO organization (International Organization for Standards)
- BIPM organization (International Bureau for Weights and Measures)
- OIML organization (International Organization for Legal Metrology)
- EURAMET organization (European Association of National Metrology Institutes)
- EOS organization (Egyptian Organization for Standards and Quality Control)
- NIST organization (American National Institute for Standards and Technology)
- NPL organization (United Kingdom National Physical Laboratory)
- A2LA Accreditation Body (American Association for Laboratory Accreditation)
- UKAS Accreditation Body (United Kingdom Accreditation Services)
- DKD Accreditation Body (German Accreditation Body)

3. APPLICABLE GUIDELINES

An accredited laboratory working in the Calibration field should endeavor to use the following international standards as applicable in the specific field:

General Metrology Publications

- **From OIML organization site** (http://www.oiml.org/publications)
  - Evaluation of measurement data – *Guide to the expression of uncertainty in measurement* (OIML G 1-100) which is the same as (ISO GUM-*Guide to the expression of uncertainty in measurement*)
  - Evaluation of measurement data - Supplement 1 to the "Guide to the expression of uncertainty in measurement" - Propagation of distributions using a Monte Carlo method (OIML G 1-101)
  - International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) (OIML V 2 – 200) same as (ISO VIM).
- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
- **Or from EA (European co-operation for Accreditation)** (http://www.european-accreditation.org/content/publications/pub.htm)
  - Traceability of Measuring and Test Equipment to National Standards (EAL-G12)

- Expression of the Uncertainty of Measurement in Calibration (EA-4/02)

- **From NIST organization site** (http://physics.nist.gov/cuu/Uncertainty/basic.html) (http://physics.nist.gov/cuu/Units/index.html)
  - Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results (NIST Technical Note 1297)
  - The Use of the International System of Units (SI)
- **From NPL organization site** (http://publications.npl.co.uk/npl_web/pdf/mgpg11.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg8.pdf)
  - A beginner's guide to uncertainty in measurement (Guide No. 11)
  - Human factors in measurement and calibrations (Guide No. 8)
- **From A2LA Accreditation Body site** (http://www.a2la.org/guidance/est_mu_testing.pdf)
  - Estimation of Measurement Uncertainty in Testing (A2LA G104)

Publications in the field of Dimensional Metrology:

- **From EOS organization site** (http://www.eos.org.eg/Public/ar-eg/Egyptian+Standards)
  - ISO Geometrical Product Specifications (GPS) - Acceptance and re-verification tests for coordinate measuring machines (CMM) (ISO 10360-1 to 6)
- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Coordinate Measuring Machine Calibration (EAL-G17)
  - Calibration of Gauge Block Comparators (EURAMET/cg-02)
  - Extent of Calibration for Cylindrical Diameter Standards (EURAMET/cg-06)
  - Determination of Pitch Diameter of Parallel Thread Gauges by Mechanical Probing (EURAMET/cg-10)
  - Calibration of Stylus Instruments for Measuring Surface Roughness (EAL-G20)
- **From NPL organization site** (http://publications.npl.co.uk/npl_web/pdf/mgpg43.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg42.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg41.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg40.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg39.pdf)
  - CMM probing (Guide No. 43)
  - CMM verification (Guide No. 42)
  - CMM measurement strategies (Guide No. 41)
  - Calipers and micrometers (Guide No. 40)
  - Dimensional measurement using vision systems (Guide No. 39)
- **From the UKAS Accreditation Body site** (http://www.ukas.com/library/Technical-Information/Pubs-Technical-Articles/Pubs-List/LAB36%20Edition%203.pdf)
  - Laboratory Accommodation and Environment in the Measurement of Length, Angle and Form (UKAS-LAB 36)

Publications in the field of Temperature Metrology:

- **From BIPM organization site** (www.bipm.org)
  - Supplementary information for the international temperature scale 1990 (ITS-90)
- **From OIML organization site** (http://www.oiml.org/publications)
  - Liquid-in-glass thermometers, (OIML R 133)
  - Tungsten ribbon lamps for the calibration of radiation thermometers, (OIML R 48)
  - Glass capillary viscometers for the measurement of kinematic viscosity - Verification method, (OIML R 69)
- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Calibration of Thermocouples (EURAMET/cg-08)
  - Guidelines on the calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement (EURAMET/cg-11)
  - Calibration of Temperature Block Calibrators (EURAMET/cg-13)
  - Calibration of Thermocouples (EAL-G31)
- **From NIST organization site** (http://ts.nist.gov/MeasurementServices/Calibrations)
  - The Calibration of Thermocouple and Thermocouple Materials, NIST Spec. Publ. 250-35
  - Liquid-in-Glass Thermometer Calibration Service , NIST Spec. Publ. 250-23
  - Platinum Resistance Thermometer Calibrations , NIST Spec. Publ. 250-22
  - Radiance Temperature Calibrations, NIST Spec. Publ. 250-43
- **From DKD Accreditation Body site** (http://www.dkd.eu/inhalt.php?id=28) **(choose English language)**
  - Calibration of Resistance Thermometers (DKD-R 5-1)

Publications in the field of Pressure Metrology:

- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Guidelines on the Calibration of Electromechanical Manometers (EURAMET/cg-17)
  - Calibration of Pressure Balances (EA-4/17)
- **From OIML organization site** (http://www.oiml.org/publications)
  - Barometers (OIML R97)
  - Indicating and recording Pressure Gauges, Vacuum Gauges and Pressure-Vacuum Gauges with Elastic Sensing Elements (Ordinary Instruments) (OIML R101)
  - Pressure Gauges and Vacuum Gauges with Elastic Sensing Elements (Standard Instruments) (OIML R109)
- **From DKD Accreditation Body site** (http://www.dkd.eu/inhalt.php?id=28) **(choose English language)**
  - Calibration of Pressure Gauges (DKD-R 6-1)
  - Calibration of Measuring Devices for Vacuum (DKD-R 6-2 part1 to 5)

Publications in the field of Force Metrology:

- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Guidelines on the Calibration of Static Torque Measuring Devices (EURAMET/cg-14)
  - Guidelines on the Estimation of Uncertainty in Hardness Measurements (EURAMET/cg-16)
  - Guidelines on the Calibration of Non-automatic Weighing Instruments (EURAMET/cg-18)
  - Uncertainty of Calibration Results in Force Measurements (EAL-G22)
- **From NPL organization site** (http://publications.npl.co.uk/npl_web/pdf/mgpg71.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg20.pdf) (http://publications.npl.co.uk/npl_web/pdf/mgpg107.pdf)
  - The measurement of mass and weight (Guide No. 71)
  - Mechanical testing of hard metals (Guide No. 20)
  - Guide to the calibration and testing of torque transducers (Guide No. 107)

Publications in the field of Electrical Metrology (DC & Low Frequency):

- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Measurement and Generation of Small AC Voltages with Inductive Voltage Dividers (EURAMET/cg-09)
  - Guidelines on the Calibration of Digital Multimeters (EURAMET/cg-15)
  - Calibration of Oscilloscopes (EAL-G30)

Publications in the field of Electrical Metrology (Microwave & High Frequency):

- **From EURAMET organization site** (http://www.euramet.org/index.php?id=calibration-guides)
  - Guidelines on the Evaluation of Vector Network Analysers (VNA) (EURAMET/cg-12)
- **From NPL organization site** (http://publications.npl.co.uk/npl_web/pdf/mgpg68.pdf)
  - Phase Noise measurement (Guide No. 68)