



## 1. PURPOSE

This Guidance describes the technical policy established by NBE for the estimation of the uncertainty of measurements made by calibration laboratories in the context of calibration services, and the use of estimates of uncertainty of measurement in the statement of measurement results. Applicable provisions of this Guidance shall also apply to internal calibration.

## 2. SCOPE

This Guidance covers calibration activities undertaken by NBE-Accredited Conformity Assessment Bodies that fulfil the requirements of relevant international standards.

## 3. RELEVANT DOCUMENTS

- a) ISO/IEC 17025 Standard for testing and calibration laboratories,
- b) ISO/IEC 17020 Standard for inspection bodies,
- c) ISO 15189 Standard for medical laboratories,
- d) ISO/IEC 17043 Standard for proficiency testing providers,
- e) ISO/IEC Guide 98-3:2008 - Uncertainty of measurement - Part 3, Guide to the expression of uncertainty in measurement (GUM:1995).
- f) ILAC P14:01/2013 ILAC Policy for Uncertainty in Calibration

## 4. POLICIES AND PRINCIPLES

- 4.1 Accredited calibration laboratories must estimate the relevant uncertainty of measurement to enable the interpretation of all calibration results they provide.
- 4.2 Uncertainty of measurement must in general be estimated and reported in accordance with the method published in the international document titled "ISO/IEC Guide 98-3 Guide to the Expression of Uncertainty in Measurement (GUM)" by BIPM, IEC, IFCC, ILAC, ISO, IUPAC, IUPAP and OIML documents making references to the aforesaid document.
- 4.3 The estimate for uncertainty made by calculation must be documented and supported by evidence.
- 4.4 Calibration laboratories which apply for accreditation must indicate the "Calibration and Measurement Capability" for calibration works included in their accreditation scope. The expression "Calibration and Measurement Capability" and the expression "Best Measurement Capability" as used previously in the accreditation system have the same meaning; and this definition is provided in ILAC P14:01/2013 "ILAC Policy for Uncertainty in Calibration".



- 4.5 The difficulty of mathematical modelling used in the estimation of measurement uncertainty must be commensurate with the accuracy required.
- 4.6 The following information as a minimum must be included in the submission of the measurement results:
- a) A clear description of the measurand;
  - b) Value arrived by measurement;
  - c) Expanded uncertainty at a confidence level of 95%;
  - d) Coverage factor (k); and
  - e) Measurement unit of the measurement result and expanded uncertainty.
- 4.7 Uncertainties estimated by a calibration laboratory must be linked with the measurement results obtained during the calibration.
- 4.8 Expanded uncertainties must be reported by two significant digits. Where it is necessary to know the value of uncertainty in order to make further calculations, it may be useful to retain the rounded numbers to reduce errors that may arise from rounding. Where it is necessary to report in such number of significant digits other than two (three significant digits etc.), the technical justification for the said case shall be retained.
- The obtained and reported estimated value of the measurand must be rounded to have such number of digits equal to that of the associated uncertainty estimate. For example, if the value of the measurand is estimated 7.08758 as a result of measurement and the uncertainty is found as 0.016; the obtained estimated of the measurand must be rounded to 7.088. GUM chapter 7 provides guidelines on how to round.
- 4.9 Calibration certificates issued by the accredited calibration laboratories must include values for measurement uncertainty and such values must not be smaller than “Calibration and Measurement Capability” indicated in their accreditation certificates.