Contents

1. Purpose

1.1 This document describes the ENAS requirements regarding the way calibration laboratories seeking ENAS accreditation have to carry out evaluation of their calibration and measurement capability (CMC), and the way it is expressed in the scopes of accreditation.

2. Scope

2.1 This document is applicable to all calibration laboratories seeking ENAS accreditation (applicants and accredited) as per the relevant requirements from ISO/IEC 17025 Standard.

3. Definitions

3.1 For the purpose of this document, the relevant terms and definitions given in the "International Vocabulary of Metrology – Basic and General Concepts and Associated Terms" (VIM) [3][5] and the following apply:

Calibration and Measurement Capability (CMC)

In the context of the CIPM MRA and ILAC Arrangement, and in compliance with the CIPM-ILAC Common Statement, the following definition is agreed upon:

A CMC is a calibration and measurement capability available to customers under normal conditions:

a) as described in the laboratory's scope of accreditation granted by a signatory to the ILAC Arrangement; or

b) as published in the BIPM key comparison database (KCDB) of the CIPM MRA.

4. ENAS requirements on CMC and Scopes of Accreditation for Calibration Laboratories

4.1 Scopes of accreditation of ENAS accredited calibration laboratories shall include the Calibration and Measurement Capability (CMC) expressed in terms of:

a) measurand or reference material;
b) calibration/measurement/procedure and edition/revision/version/date;
c) type of instrument/material/product to be calibrated/measured;
d) measurement range and additional parameters where applicable (e.g., frequency of applied voltage);
e) uncertainty of measurement.

4.2 Measurement ranges in scopes of accreditation shall be defined clearly and so that they are coherent with the type of measurand under consideration, e.g. it shall be seen that ranges starting from zero are not possible in some cases such as mass.

4.3 Uncertainty of measurement shall be estimated as per the requirements to measurement uncertainty of calibration in the ENAS document ETR 07.

4.4 There shall be no ambiguity on the expression of the CMC on the scopes of accreditation and, consequently, on the smallest uncertainty of measurement that can be expected to be achieved by a laboratory during a calibration or a measurement. Particular care shall be taken when the measurand covers a range of values. This is generally achieved through employing one or more of the following methods for expression of the uncertainty:

a) A single value, which is valid throughout the measurement range.

b) A range. In this case a calibration laboratory shall ensure that linear interpolation is appropriate in order to find the uncertainty at intermediate values.

c) An explicit function of the measurand or a parameter.

d) A matrix where the values of the uncertainty depend on the values of the measurand and additional parameters.

e) A graphical form, providing there is sufficient resolution on each axis to obtain at least two significant figures for the uncertainty.

f) Open intervals (example 1) “0 < U < x”, or (example 2) for a resistance interval of 1 to 100 ohms, the uncertainty stated as “less than 2 μΩ/Ω”) are incorrect in the expressions of CMCs.

4.5 The uncertainty covered by the CMC shall be expressed as the expanded uncertainty having a coverage probability of approximately 95 %. The unit of the uncertainty shall always be the same as that of the measurand or in a term relative to the measurand, e.g., percent, μV/V or part per 10^6. Because of the ambiguity of definitions, the use of terms “PPM” and “PPB” are not acceptable.

4.6 Calibration laboratories shall provide documented evidence that they can provide calibrations to customers so that measurement uncertainties equal those covered by the CMC showed in their scopes of accreditation. When determining the uncertainty of measurement to the CMC, the following shall be taken into consideration:

a) the measurement or calibration is performed according to a documented method/procedure under the management system of the laboratory which is used on a regular basis and is available to all customers in the scope of accreditation of the laboratory (see 4.1 b).

b) A reasonable amount of contribution to uncertainty from repeatability (Type A) shall be included and contributions due to reproducibility should be included in the CMC uncertainty component, when available. There should, on the other hand, be no significant contribution to the CMC uncertainty component attributable to physical effects that can be ascribed to imperfections of even the best existing device under calibration or measurement.

c) Contributions to the uncertainty which are caused by the device under calibration, and which can be separated from other contributions, should normally be excluded from the estimation. In the formulation of CMC, laboratories shall include a contribution for the performance of the “best existing device” which is understood as a device to be calibrated that is commercially or otherwise available for customers for a specific category of calibrations, even if it has a special performance (stability) or has a long history of calibration available.

d) Where laboratories provide services such as reference value provision, the uncertainty covered by the CMC should generally include factors related to the measurement procedure as it will be carried out on a sample, i.e., typical matrix effects, interferences, etc. shall be considered. The uncertainty covered by the CMC will not generally include contributions arising from the instability or inhomogeneity of the material. The CMC should be based on an analysis of the inherent performance of the method for typical stable and homogeneous samples.

Note 1: The uncertainty covered by the CMC for the reference value measurement is not identical with the uncertainty associated with a reference material provided by a reference materials producer. The expanded uncertainty of a certified reference material will in general be higher than the uncertainty covered by the CMC of the reference measurement on the reference material.

4.7 ENAS assessment team shall check the scope of accreditation is according to the requirements above and CMC values consistent with the corresponding uncertainties documented by the laboratory.

5. Reference

[1] ILAC-P14:09 – ILAC Policy for Measurement Uncertainty in Calibration.

[2] ENAS ETR 07 – ENAS Technical Requirement for Measurement Uncertainty.

[3] ISO/IEC Guide 99, International vocabulary of metrology - Basic and general concepts and associated terms (VIM).

[4] ISO 80000-1, Quantities and units - Part 1: General.

[5] JCGM 200, International vocabulary of metrology – Basic and general concepts and associated terms (Available from www.BIPM.org).

8. Change History

8.1 The following provides a summary of the changes made to this document:

Rev. No	Date	Changes
01	28.03.2021	1. Whole document is reviewed to incorporate ILAC P14:09/2020 requirement. 2. Year of publications removed from the reference standards given. 3. Word testing is removed from 4.1b & 4.1c 4. Sections 4.4b and 4.5 is reworded. Section 4.4 f is added.