1. Application

1.1 This accreditation regulation applies to DANAK's accreditation of calibration laboratories.

1.2 When evaluating uncertainty of measurement, reporting of this in calibration certificates and determining measurement capability, the accredited calibration laboratories shall meet the criteria in ILAC's (International Laboratory Accreditation Cooperation) document ILAC-P14:09/2020 *ILAC Policy for Uncertainty in Calibration.* Requirements in ILAC-P14 are included in this accreditation regulation.

1.3 Evaluation of measurement uncertainty

1.3.1 Evaluation of uncertainty must meet the requirements of JCGM 100: 2008, *GUM 1995 with minor corrections, Evaluation of measurement data: Guide to the expression of uncertainty in measurement* or documents in compliance with the guide. This is met in EA 4/02 M: 2013 Evaluation *of the Uncertainty of Measurement in Calibration* and these parts appear in annex 1 which is used in the practical evaluation of uncertainties.

1.4 Measurement capability

Measurement capability of a laboratory (Calibration and Measurement Capability, CMC) is determined from the following:

i. Area of calibration
ii. material/measurement equipment
iii. Quantity
iv. Measurement range and secondary parameters where applicable; e.g. frequency at AC voltage measurements;
v. Expanded uncertainty of measurement.
vi. Statement of used method

The CMC of the laboratory is stated in the CMC form of the accredited calibration laboratory and is published at www.danak.dk.

1.4.2 The uncertainty of measurement covered by the CMC shall be expressed as the expanded uncertainty of measurement U(CMC) having a specific coverage probability of approximately 95 %. For one-dimensional quantities the measurement range is expressed with U(CMC) as roughly being linear and monotonous in the areas. The unit of the uncertainty of measurement shall always be the same as that of the measurand or in a term relative to the measurand, e.g. percentage.

1.4.3 Calibration laboratories must through laboratory comparisons (see DANAK accreditation regulation 3) be able to document their ability to deliver calibrations to customers, with uncertainties of measurement equal to the uncertainties of measurement covered by the CMC. When determining the measurement capability, the laboratory shall be aware of including the instrument contribution from an ideal existing material/measurement equipment.

The term "ideally existing device/measurement equipment" is understood as a device-/measurement equipment to be calibrated that is commercially or otherwise available for customers, even if it has a special performance (stability) or has a long history of calibration.

A reasonable amount of contribution to uncertainty from repeatability shall be included. If contributions from the reproducibility are available, they shall be included in the uncertainty comprised by the CMC.

1.4.4 There are instances where an ideal device/measurement equipment does not exist, and/or where contributions to the uncertainty from the devise/measurement equipment significantly affect the uncertainty. It is possible to exclude the contributions from the devise/measurement equipment when determining the CMC, if the contributions to the uncertainty from the device/measurement equipment can be separated from other contributions. In such cases it shall be noted in the CMC form that contributions from the device/measurement equipment are not included.

1.4.5 Where calibration laboratories provide services such as reference value provision for reference materials the uncertainty covered by the CMC, shall generally include factors related to the measurement procedure as it will be carried out on a sample. I.e. typical matrix effects and interferences shall be taken under consideration. The uncertainty covered by the CMC will not generally include contributions arising from the instability or inhomogeneity of the reference material.

Note: The uncertainty covered by the CMC for the reference value measurement is not necessarily identical with the uncertainty associated with a reference material provided by a reference materials producer.

1.5 The reporting of measurement uncertainty in calibration certificates.

Accredited calibration laboratories must report measurement uncertainty in compliance with following item 1.5.1 through 1.5.4:

1.5.1 In calibration certificates the measurement result shall be reported as $y \pm U$, associated with the related units of the size of measurement y and the expanding uncertainty U, . Tabular presentation of the measurement result may be used and the relative expanding uncertainty $U/|y|$ may also be provided if appropriate. The coverage factor k and the coverage probability shall be stated on the calibration certificate. To this an explanatory note shall be added, which may have the following content:

"The reported expanding uncertainty of measurement is stated as the standard uncertainty of the measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %:"

Note: For asymmetrical uncertainties other presentations than y ± U may be needed. This concerns also cases when uncertainty is determined by Monte Carlo simulations (propagation of distributions) or with logarithmic units.

1.5.2 The numerical value of the expanding uncertainty shall be given to, at most two significant figures. Further the following applies:

a) The numeric value of the measurement result shall in the final statement be rounded to the least significant figure in the value of the expanded uncertainty assigned to the measurement result.

b) If the expanding uncertainty is stated with one significant figure it shall be rounded up (for example 0,32 to 0,4). The normal rules for rounding are applied, if two significant figures are stated.

1.5.3 Contributions to the uncertainty stated on the calibration certificate shall include relevant short-term contributions during calibration and other contributions that can reasonable be attributed to the customer's device.
Where applicable the uncertainty shall cover the same contributions to uncertainty that were included when determining the uncertainty covered by the CMC. Except that uncertainty components evaluated for the ideal measuring equipment shall be replaced with those of the customer's device. As a consequence, the reported uncertainties will often be higher than the uncertainty covered by the CMC.

Random contributions, like for example contributions to uncertainty from transport, not known to the laboratory, should not normally be included in the reporting of uncertainty. If the laboratory expect that such contributions will have a significant influence on the uncertainties that the laboratory estimates for the calibration the customer should be informed in accordance with the general sections concerning tenders and review of contracts in DS/EN ISO/IEC 17025: 2017 *General requirements for the competence of testing and calibration laboratories*.

1.5.4 Accredited laboratories may not, as implied in the definition of the CMC, report a less expanded uncertainty than the uncertainty comprised by the CMC to which the laboratory is accredited.

Annex 1: Evaluation of measurement uncertainty

The accreditation regulation comes into force 15 January 2021. Any differences between the Danish and the English version of this document are not intended, but in case of doubt with respect to the correctness the version in Danish should be consulted.

Annex 1

Evaluation of uncertainty of measurement

Purpose

This annex is based on EA 4/02 M:2013 which back in time was elaborated by EAL on the basis of WECC Doc. 19-1990. The purpose of this document is to harmonize the evaluation of uncertainty of measurement.
This document is in accordance with JCGM 100:2008, *GUM 1995 with minor corrections, Evaluation of measurement data* – Guide to the Expression of Uncertainty in Measurement (GUM), which was published by 8 international organisations occupied with standardisation and metrology.

For reading the rest of this document see **EA-4/02**.