

# How to register calibration and measurement capabilities (CMCs)

## 1. A mechanism to allow international recognition of technical competence

An important step towards the reduction of technical barriers to trade is mutual recognition of the procedures and certificates that are used in conformity assessments to prove compliance with various technical regulations and standards. However, mutual recognition of conformity assessment procedures and certificates is impossible without a reliable technical basis, i.e. reliable and accepted measurements and analyses to demonstrate compliance. Internationally recognized metrological competence in a country is fundamental to guarantee reliable testing and analyses, and lays the foundation for international acceptance of the results. In 1999,

the International Committee for Weights and Measures (CIPM) addressed the need for a mechanism to allow international recognition of technical competence in calibrations and measurements by establishing the CIPM Mutual Recognition Arrangement (CIPM MRA): An arrangement for mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes (NMIs).

The recognition of these capabilities is based on a detailed and rigorous review process. The data on the capabilities is then published in a single, world-wide publicly available database maintained by the BIPM, known as the “key comparison database” (KCDB). For each specific calibration or



© PTB/Fotografie

measurement service, the entries in the key comparison database show the measurand, the range, the method and the measurement uncertainty that the national metrology institute provides to its customers. Only Members of the International Bureau of Weights and Measures (BIPM) or Associate of the General Conference on Weights and Measures (CGPM) whose national metrology institute has signed the CIPM-MRA can register their calibration and measurement capabilities.

This document describes how mutual recognition of metrological competence can be achieved and the conditions which must be met by a national metrology institute or designated institute in order to register its calibration and measurement capabilities in the KCDB.

## 2. Technical conditions for submitting calibration and measurement capabilities

A national metrology institute or designated institute that wants to register its calibration and measurement capabilities in the key comparison database of the BIPM has to fulfill the following technical conditions before submitting its calibration and measurement capabilities:

### 1. Establishing traceability to the International System of Units (SI)

A national metrology institute or a designated institute has two choices for establishing the traceability of its national standards to the International System of Units (SI):

- via a primary realization or representation of the unit concerned.

- via another national metrology institute or designated institute having relevant calibration and measurement capabilities with appropriate uncertainty published in the key comparison database.

Establishing traceability to the International System of Units via any accredited calibration laboratory that is not a national metrology institute or a designated institute is not sufficient within the CIPM MRA.

There are some cases where traceability to the International System of Units is not possible, e.g. in some areas of chemistry and biology. In these cases, it is the decision of the appropriate consultative committee to establish which paths of traceability are acceptable. For laboratory medicine the BIPM maintains a database of higher order reference materials and reference measurement procedures on behalf of the Joint Committee for Traceability in Laboratory Medicine. [www.bipm.org/en/committees/jc/jctlm/](http://www.bipm.org/en/committees/jc/jctlm/)



© PTB/Fotografie

### 2. Proven technical expertise in the field of the submitted calibration and measurement capabilities (CMCs)

Technical underpinning of the calibration and measurement capabilities concerned is achieved mainly through participation in comparisons. Comparisons are a series of measurements of the same artefact performed by different institutes to compare the performance of the participating institutes. In exceptional cases, for example where comparison results are not yet available or comparisons are not possible, other evidence demonstrating technical competence can be accepted. Typically, such evidence includes scientific publications, active participation in research projects of the respective regional metrology organization, or on-site peer-assessment reports.

Calibration and measurement capabilities can be underpinned by key or supplementary comparisons, initiated either

by the BIPM, a consultative committee, a responsible regional metrology organization or a national metrology institute. In all cases, registration of the comparison in the key comparison database is essential. Participation is generally limited to national metrology institutes and designated institutes and depends on the type of comparison.

### 3. Maintenance of a quality system

The CIPM MRA requires the participating national metrology institute and designated institute to establish and maintain a quality system. The quality system of a national metrology institute or designated institute should comply with ISO/IEC 17025 (ISO guide 34 for national metrology institutes that produce certified reference materials). All laboratories with declared calibration and measurement capabilities must demonstrate operation of an appropriate quality system.

Procedures for the review of quality systems vary slightly in detail between the different responsible regional metrology organizations. However, all the procedures follow general guidelines established by the International Committee for Weights and Measures and are considered equivalent.

### 3. Registration of calibration and measurement capabilities

Before the calibration and measurement capabilities can be published in the key comparison database, the competence

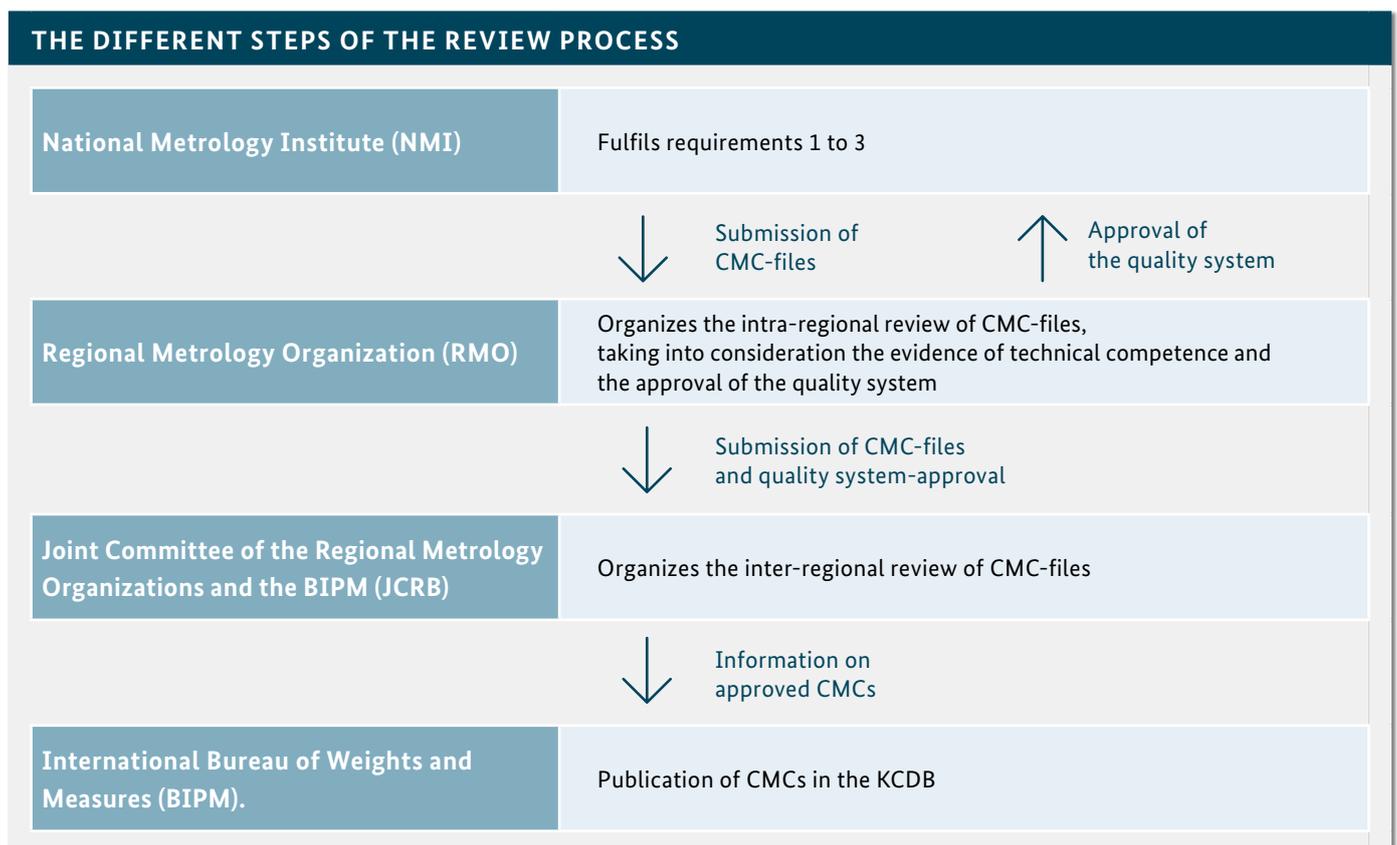
of a national metrology institute or designated institute is proven at different stages of a detailed and rigorous review process. This process is coordinated by the BIPM and the “Joint Committee of the Regional Metrology Organizations and BIPM” (JCRB).

#### 1. Submission of calibration and measurement capabilities (CMCs)

When mutual recognition is requested, the results of comparisons and other technical information are used to fill in a BIPM excel template (CMC-file) for each metrology area. The recognition of the calibration and measurement capability is not tied to achieving a specific level of measurement uncertainty: Each national metrology institute (and designated laboratory) declares the calibration and measurement capabilities – including the uncertainty – corresponding to its particular competence and equipment.

The scope of a submitted calibration and measurement capability does not have to correspond exactly to the comparison. A broad group of calibration and measurement capabilities can be underpinned by the same comparison if approved by the respective consultative committee. The calibration and measurement capabilities-file is submitted to the chairperson of the responsible regional metrology organisation technical committee for the area concerned.

#### 2. Intra-regional review of calibration and measurement capabilities (CMCs)



The claimed calibration and measurement capabilities undergo an intra-regional review, that is a review within the regional metrology organization to which the national metrology institute is affiliated. The procedure for intra-regional review is established by each responsible regional metrology organization following the guidelines of the Joint Committee of the Regional Metrology Organizations and the BIPM. Thus the practices may vary in the details but all achieve the same outcome. The objective is to ensure that the claimed calibration and measurement capabilities are justified and correspond to the technical expertise of the laboratory prior to their onward submission for review by the other regions.

### 3. Inter-regional review of calibration and measurement capabilities (CMCs)

When the calibration and measurement capabilities have been approved at a regional level, the chairperson of the respective technical committee of the responsible regional metrology organization submits a request for the inter-regional review to the Joint Committee of the Regional Metrology Organizations and the BIPM. The submission, including the excel-files, must be accompanied by a declaration by the chair of the responsible regional metrology organization's quality systems working group indicating that the quality system meets the requirements of ISO/IEC17025 and ISO guide 34 if appropriate.

The inter-regional review is conducted by technical committees (TC) or working groups (WG) of another regional metrology organization in the metrological area where mutual recognition is requested. The chairpersons of the technical committee/working group responsible for the review may involve representatives of other national metrology institutes if they are members of the technical committees/working groups. Participation in the review process is optional but at least one other regional metrology organization has to take part. Following submission, the technical committee/working group chairs from the different regional metrology organizations may comment on the submitted data. Based on the comments received a revision is submitted for approval by all regional metrology organizations participating in the review process.

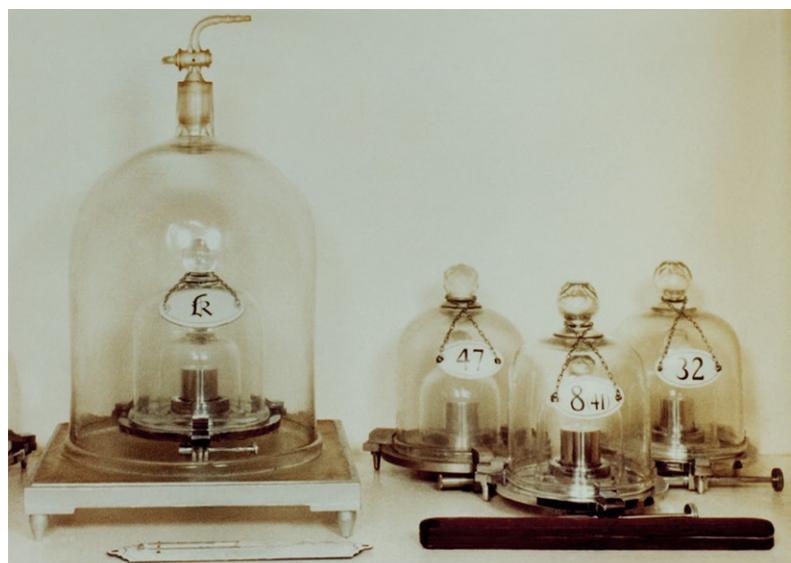
The entire review process is coordinated via an interactive website maintained by the BIPM and all information on the process is available to all participants in the CIPM MRA. This transparent process ensures that all national metrology institutes participating in the CIPM MRA have the opportunity to review the data before approval and publication.

### 4. Publication of the calibration and measurement capabilities (CMCs) in the key comparison database (KCDB)

Following successful inter-regional review and approval, the calibration and measurement capabilities are published by the BIPM in the key comparison database. This database is maintained by the key comparison database office at the BIPM and is available on the BIPM website. [kcdb.bipm.org](http://kcdb.bipm.org)

In cases where any requirements cease to be fulfilled, calibration and measurement capabilities entries are removed from the key comparison database.

The database is freely available for public access. It provides information on the calibration and measurement capabilities of national metrology institutes which are available to customers, thereby maximizing transparency concerning the capabilities of national metrology institutes.



© PTB/Fotografie