



The CIPM MRA

Demonstrating trust and confidence in the international measurement system

Critical national and international goals such as economic growth, innovation, energy and the environment, good health, and food security depend on accurate and trusted measurements of physical, chemical, and biological quantities. The CIPM MRA is a platform that provides the institutional and technical framework for National Metrology Institutes around the world to recognize each other's measurement standards and calibration certificates. Its supporting data, representation of measurement capabilities, and quality infrastructure are rigorously validated by NMIs and other participants in the international measurement system.

www.bipm.org

The benefits of the CIPM MRA and why your institute should become a signatory

The CIPM MRA provides a network for international engagement on measurement-related issues.

National Metrology Institutes join this international network grounded on common understanding of the SI, and a precise language for understanding measurement capabilities and utilizing those resources throughout the world. More than 250 institutes participate in the CIPM MRA, and participating countries cover approximately 98 % of the world's GDP.

Governments gain access to this network which constitutes a trusted and solid technical foundation for wider agreements related to international trade, commerce, and regulatory affairs. The interdependent world economy requires an open, transparent, and comprehensive scheme that demonstrates equivalence between national measurement services. The burden of negotiating and implementing multiple bilateral recognition arrangements is avoided.

Business, industry and manufacturers can be assured that products and services involving traceable measurements will be accepted in national and foreign markets. They can be assured that manufactured parts imported from foreign suppliers will meet national standards and be of dependable quality, reducing duplication of internal measurements. Parties requiring instrument calibration services or reference materials can choose the optimal source based on delivery time, cost, and level of uncertainty, regardless of whether the source is inside or outside the country.

Regulators can utilize the CIPM MRA as a “stamp of approval” to demonstrate compliance against documentary standards and requirements. They can rely on the technical knowledge of their NMI when implementing regulations. Decisions will be based on reliable and objective results.

Consumers can be confident that purchases of measured items in the marketplace (e.g., a litre of petrol, or a milligram of medicine) will be fair and safe.



The CIPM MRA affirms trust and confidence in the measurement capabilities of all participants.

How the quality of data is assured by the CIPM MRA

The heart of the CIPM MRA is the peer-reviewed data that supports the measurement capabilities of the signatories, metrological traceability to the SI of the measurement standards used by the NMIs, and the quality management systems of each signatory that assure a measurement result can be trusted every time it is performed. The signatories' capabilities are entered into a secure database, known as the KCDB, maintained by the BIPM, which is free and open for all to search and download. NMIs, the BIPM, Consultative Committees of the CIPM, and Regional Metrology Organizations cooperate together and all play key roles in the CIPM MRA. The CIPM MRA has four key components:

Measurement Comparisons provide the supporting evidence for the declared measurement capabilities, and demonstrate the equivalence of NMIs' national measurement standards. Measurement comparisons involve multiple NMIs measuring the same quantity over the same range, and a comparison of the results. Agreement in the results within declared uncertainties demonstrate the measurement capabilities of the NMIs, and helps validate their uncertainties and quality systems. All results are publicly available on the BIPM key comparison database (KCDB).

Calibration and Measurement Capabilities (CMCs) are the outcomes of the CIPM MRA, declared by the signatories to the CIPM MRA and validated mainly by the results of the Measurement Comparisons. CMCs are given in terms of a quantity (e.g., mass), a range, and a measurement uncertainty. CMCs are published in the KCDB only after they are reviewed and approved by both the Regional Metrology Organization (RMO) to which the NMI belongs, and by other RMOs. Once published in the KCDB, all CMCs are publicly available.

Metrological Traceability gives the parties confidence and assurance that the measurement results agree with national standards within the statement of uncertainty in measurement. The International Vocabulary of Basic and General Terms in Metrology (VIM) defines metrological traceability as:

“property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.”

As part of the CMC review process, NMIs must demonstrate traceability of their CMCs to measurement standards (at their own NMI or through another NMI which has CMCs in the KCDB).

The **Quality Management Systems (QMS)** of the CIPM MRA signatory ensures that every time the measurement is performed, it will meet the declared uncertainty. The QMS must cover all the declared CMCs, and is regularly reviewed and monitored by the RMO to which the signatory is a member. Signatories who are not a member of an RMO have other routes for approval of their QMS. The QMS must meet the requirements of ISO/IEC 17025:2017 for calibration and measurement services, and ISO 17034 for certified reference materials production. RMOs report to each other on the processes and outcomes of their reviews.

The structured processes of the CIPM MRA, along with the peer review of the comparison data and declared measurement capabilities, assure the quality of the data, giving confidence and trust in the results and underpin conformity assessment worldwide.

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Glossary of Acronyms

BIPM:	International Bureau of Weights and Measures
CIPM:	International Committee for Weights and Measures
CIPM MRA:	Mutual Recognition Arrangement of the CIPM
KCDB:	BIPM Key Comparison Database
NMI:	National Metrology Institute
QMS:	Quality Management System
RMO:	Regional Metrology Organization
SI:	International System of Units, also referred to as the metric system



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