

International Legal Metrology Organizational Primer

By S. Wayne Stiefel

1. Measurement

1.1 The International Bureau of Weights and Measures

The International Bureau of Weights and Measures, formally known by its French name, Bureau International des Poids et Mesures (BIPM) in Paris, is responsible for the definition of the International System of Units (SI) and promoting worldwide consistency of physical measurements. It is the institute that coordinates many international metrology activities, and performs metrology research. The BIPM operates under the supervision of the International Committee for Weights and Measures (CIPM). The CIPM suggests modifications to the SI to the General Conference on Weights and Measures (CGPM) for formal adoption. The CGPM is the primary intergovernmental treaty organization¹ responsible for the SI, representing nearly 50 countries. Both the BIPM and the CIPM were established by the Meter Convention, which was signed in Paris in 1875 by representatives of seventeen nations, including the United States. Refinement of the SI is an ongoing process aided by the work of BIPM's Consultative Committees: Electricity and Magnetism, Photometry and Radiometry, Thermometry, Length, Time and Frequency, Units, Mass and related quantities, and Amount of substance.

1.2 National Metrology Institutes

Within countries, measurements are made consistent/comparable through traceability to their primary standards maintained by the National Metrology Institutes (NMIs); the United States NMI is the National Institute of Standards and Technology (NIST). Each NMI is responsible for maintaining the primary standards, usually recognized by national law, that serve in its country as the basis for assigning values to other standards of the quantity concerned.

1.3 Regional Metrology Organizations (RMOs)

NIST is the U.S. member of the Inter-American Metrology System (SIM). All RMOs have as their objectives:

- Information exchange on measurement standards and capabilities
- Provision of international credibility for measurement traceability and competence as a basis for a global Mutual Recognition Arrangement (MRA) for metrology standards and calibration certificates issued by National Metrology Institutes
- Training of personnel to upgrade measurement capability within the region
- Facilitation of traceability of measurement through calibration and comparison of national standards, and
- Collaboration with BIPM, including the key comparison database, and also with other counterpart regional bodies.

Other RMOs with similar objectives include the:

- Asia Pacific Metrology Program (APMP)
- Euro-Asian Cooperation of National Metrological Institutions (COOMET)

- European Association of National Metrology Institutes (EURAMET), and the
- Southern African Community Cooperation in Measurement Traceability (SADCMET).

1.4 Accreditation

Accreditation of calibration and testing laboratories serves the objectives of the government and the private sector (industry, consumers, and other stakeholders) by fostering and promoting a uniformly acceptable base of professional and technical competence in the laboratory community, and facilitating and promoting acceptance of calibration and test results among countries to avoid barriers to trade. Testing and calibration laboratory accreditations underpin an infrastructure of competent measurement laboratories supporting domestic and international trade and conformity assessment activities. Accreditation programs provide an unbiased third-party evaluation and recognition of capability and performance, as well as expert technical guidance to upgrade laboratory performance.

1.4.1 International Accreditation Organizations

The International Laboratory Accreditation Cooperation (ILAC) has the aim of developing international cooperation for facilitating trade by promotion of the acceptance of accredited test and calibration results. ILAC membership is open to laboratory accreditation organizations that have been accepted as signatories to the ILAC Mutual Recognition Arrangement. Each accreditation body that is a signatory to the Arrangement agrees to abide by its terms and conditions and by the ILAC evaluation procedures. To do this, the signatory must:

- Maintain conformance with ISO/IEC 17011 Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies, related ILAC guidance documents, and a few, but important, supplementary requirements;
- Ensure that all its accredited laboratories comply with ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories and related ILAC guidance documents.

These signatories have, in turn, been peer-reviewed and shown to meet ILAC's criteria for competence.

The International Accreditation Forum, Inc. (IAF) is the world association of Conformity Assessment Accreditation Bodies and other bodies interested in conformity assessment in the fields of management systems, products, services, personnel and other similar programs of conformity assessment. The purpose of the IAF is to ensure that its accreditation body members accredit only competent bodies and to establish mutual recognition arrangements, known as Multilateral Recognition Arrangements (MLA), among its members. Accreditation body membership in IAF is open to organizations that accredit bodies for certification/registration of management systems, products, services, personnel or similar programs of conformity assessment.

1.4.2 Regional Laboratory Accreditation Organizations (RLAO's)

RLAO's that cooperate with members in their region and with ILAC and/or IAF to foster accreditation activities include:

- Asia Pacific Laboratory Accreditation Cooperation (APLAC)
- Central Asian Cooperation on Metrology Accreditation and Quality (CAC-MAS-Q)
- European Cooperation for Accreditation (EA)
- Inter-American Accreditation Cooperation (IAAC)
- Pacific Accreditation Cooperation (PAC), and
- Southern African Development Community in Accreditation (SADCA).

RLAO activities that support mutual recognition and acceptance of accredited services and results include: meetings for exchange of information and to promote discussion, such as common interpretation of standards; management of peer evaluations; organization of proficiency testing; development and promotion of mutual recognition arrangements among Members, and cooperation with other national, regional and international bodies with similar or complementary objectives. Accreditors domiciled in the United States seeking mutual recognition work through the APLAC.

2. Documentary Standards

2.1 The International Organization of Legal Metrology (OIML)

OIML is the international organization for developing documentary standards related to regulated and legally mandated measurements. OIML is an inter-governmental treaty organization established in 1955 by the Convention (the treaty), which has an objective of harmonization of national regulations and metrological controls (e.g., type approval, verification, etc) applied by legal metrology authorities. There are 59 Member States (voting) and 56 Corresponding Members (nonvoting). The oversight body of OIML is the International Committee of Legal Metrology (CIML), which meets annually. Each Member State has one CIML Member. A meeting of the OIML Conference is held every four years to establish general policy, vote on the budget and confirm the decisions of the CIML. The United States ratified the Convention and joined OIML in 1972.

The OIML utilizes Technical Committees (TCs) and Subcommittees (SCs) comprised of representatives from member countries to develop model regulations and standards. The standards are referred to in OIML as Recommendations. International consensus in the legal metrology community is reached through TC and SC activities. The composition of the TCs and SCs includes representatives from Member States and liaison representation from international standardization and technical organizations, manufacturers associations and regional regulatory bodies. Under the coordination of a Secretariat, experts establish international technical guidelines for the metrological performance and testing procedures of measuring instruments subject to legal controls. The TCs are organized by general measurement discipline and the SCs are assigned specific types of measuring instruments or areas for standards development. During development, Recommendations go through successive incomplete drafts designated as 1 WD (Working Draft), 2 WD, etc. When a TC or SC addresses all necessary elements in a Recommendation the designation shifts from a WD to a Committee Draft (CD) with successive drafts numbered 1CD, 2 CD, etc. Following a successful TC or SC ballot and approval a CD is designated as a Draft Document (DD) or a Draft Recommendation (DR) and sent to the International Bureau of Legal Metrology (BIML) for approval by the CIML. The BIML provides the administrative, technical and editorial staffing function for the OIML. Following CIML approval, the BIML publishes and provides for free distribution of the Documents and Recommendations through the OIML website.

The OIML has developed a Certificate System for measuring instruments that comply with the Recommendations to promote global regulatory-body acceptance of test reports, thereby avoiding duplicative type evaluation testing requirements. Manufacturers may submit instruments to testing facilities authorized by national Issuing Authorities, which are designated by their CIML Members. The OIML web site database lists the Issuing Authorities and the OIML Certificates of Conformity (CC) submitted by the various national Issuing Authorities for registration by the BIML.

The OIML has developed a Mutual Acceptance Arrangement (MAA) that is related to the OIML Certification system used for Type Evaluations. The goal of the MAA is for the participants to accept and utilize Test Reports validated by an OIML MAA Certificate of Conformity. The scheme designates Participants in the MAA as either Issuing Participants (IPs) or Utilizing Participants (UPs). Issuing Authorities that will issue and use OIML MAA Certificates of Conformity are designated as IPs. Tests reports associated with these OIML MAA Certificates will also be accepted and utilized by UPs

to issue, for example, national type approvals. To foster confidence, the MAA includes an evaluation of the competence and testing capabilities of the Testing Laboratories of OIML Issuing Authorities applying to be an IP, according to the international standard ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories. This evaluation may be carried out either by accreditation or by peer assessment. The Committee on Participation Review (CPR), comprised of experts from participating countries, studies the application files of potential participants and decides on the need to conduct peer assessments, considering the accreditation of the Testing Laboratories and the scope of these accreditations. Evaluation reports are distributed to the participants, and when all participants agree on the acceptability of the IP applicants, the IP applicants are allowed to sign the Declaration of Mutual Confidence (DoMC). The initial MAA implementation covers OIML R 60 (Load cells) and OIML R 76 (Nonautomatic weighing instruments), for which a large number of OIML Certificates have been issued. The first two Declarations of Mutual Confidence were published by the BIML in September 2006. The National Conference on Weights and Measures (NCWM) signed the DoMC (as a Utilizing Participant) for R60. Consequently, the U.S. National Type Evaluation Program (NTEP) will accept test data on load cells that are tested according to the requirements in OIML R60 (and additional, agreed-upon requirements), from Issuing Participants under the DoMC, to use as the basis of issuing NTEP Certificates. A DoMC for OIML R49 (Water meters) was begun in 2007.

2.2 Other International Standards Organizations

To avoid conflicting requirements for measuring instruments, the OIML establishes liaisons with international and regional institutions concerning activities in metrology, standardization and related fields including: the International Bureau of Weights and Measures (BIPM), the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Federation of Clinical Chemistry (IFCC), and the International Union of Pure and Applied Physics (IUPAP). The complete list is on the OIML liaison website. These organizations develop standards for related aspects of measuring instruments, such as safety; interoperability, and performance requirements not necessarily directly related to legal metrology.

2.3 Regional Legal Metrology Organizations (RLMOs)

The RLMOs provide a forum for sharing information on legal metrology in member countries and economies to promote a harmonized and consistent approach to legal metrology requirements in the region. RLMOs also facilitate communications and shared training opportunities. Shared specific objectives include supporting an integrated measurement infrastructure in the region, promoting equity in the market place, improving the quality of life and facilitating international trade.

For the United States, NIST is a member of both the Inter-American Metrology System - Legal Metrology Working Group (SIM -LMWG), and the Asia-Pacific Legal Metrology Forum (APLMF). Other regional legal metrology organizations with similar roles include the:

- Euro-Asian Cooperation of National Metrological Institutions (COOMET)
- Euro-Mediterranean Legal Metrology Forum (EMLMF), and
- European Cooperation in Legal Metrology (WELMEC)

3. Laws and Regulations

National, state and local governments determine through the legislative process how to ensure that equity in the marketplace, and the safety and health of the public are maintained. Measurements play a crucial role and are tied to laws and regulations that govern the accuracy of measuring instruments and their conformity to national or

recognized international specifications. Legal metrology involves not only the facilitation of traceability, but also means for detecting fraud (tampering), accidental misuse, and inaccuracy caused by influence factors which disrupt the measurement process. Instruments are controlled through a system of type approval, initial verification and marketplace surveillance.

4. Economic Promotion Organizations

Several global and regional organizations are focused on promoting international trade and fostering development necessary for free trade. An essential element for trade recognized by these organizations is legal metrology. The following organizations have supported developing such infrastructure in developing countries around the world.

The World Trade Organization (WTO) deals with the rules of trade among nations at a global or near-global level. It is an organization for liberalizing trade. It is a forum for governments to negotiate global trade agreements. It is a place for them to settle trade disputes. It operates on a system of rules covering global trade and associated aspects.

The Organization of American States (OAS) has dual roles in promoting development. On a political level, it fosters dialogue and consensus on ways to combat poverty and improve the level of development in the region. The OAS also mobilizes funds so member states can carry out projects in priority areas.

The United Nations Industrial Development Organization's (UNIDO) objective is to reduce poverty in countries with developing and transition economies through: sustainable industrial growth with emphasis on productive economic activities; trade capacity building; and promotion of energy efficiency, renewable energy and environmental sustainability.

The World Bank is a vital source of financial and technical assistance to developing countries around the world to support its mission of reducing global poverty and improving living standards. The World Bank is made up of two unique development institutions owned by 185 member countries: the International Bank for Reconstruction and Development focuses on middle income and creditworthy poor countries, while the International Development Association focuses on the poorest countries in the world. Together they provide low-interest loans, interest-free credit and grants to developing countries for education, health, infrastructure, communications and many other purposes.

The United States Agency for International Development (USAID) is an independent U.S. federal government agency that receives overall foreign policy guidance from the Secretary of State. USAID supports long-term economic growth, agriculture and trade in countries recovering from disaster, trying to escape poverty and engaging in democratic reforms.

GLOSSARY OF ACRONYMS

(Acronyms in Blue are cross-linked to web sites)

APLAC	Asia Pacific Laboratory Accreditation Cooperation
APLMF	Asia-Pacific Legal Metrology Forum
APMP	Asia Pacific Metrology Program
BIML	International Bureau of Legal Metrology
BIPM	International Bureau of Weights and Measures
CAC-MAS-Q	Central Asian Cooperation on Metrology Accreditation and Quality
CC	Certificate of Conformity
CD	Committee Draft
CGPM	General Conference on Weights and Measures
CIPM	International Committee for Weights and Measures
COOMET	Euro-Asian Cooperation of National Metrological Institutions
CPR	Committee on Participation Review
DD	Draft Document
DoMC	Declaration of Mutual Confidence
DR	Draft Recommendation
EA	European Cooperation for Accreditation
EMLMF	Euro-Mediterranean Legal Metrology Forum
EUROMET	European Collaboration in Measurement Standards
IAAC	Inter-American Accreditation Cooperation
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IFCC	International Federation of Clinical Chemistry
ILAC	International Laboratory Accreditation Cooperation
ISO	International Organization for Standardization
IUPAP	International Union of Pure and Applied Physics
MAA	Mutual Acceptance Agreement
MLA	Multilateral Recognition Arrangements
MRA	Mutual Recognition Arrangements

NCWM	National Conference on Weights and Measures
NIST	National Institute of Standards and Technology
NMIs	National Metrology Institutes
NTEP	National Type Evaluation Program
OAS	Organization of American States
OIML	International Organization of Legal Metrology
PAC	Pacific Accreditation Cooperation
R	Recommendation
RLAOs	Regional Laboratory Accreditation Organizations
RLMOs	Regional Legal Metrology Organizations
RMOs	Regional Metrology Organizations
SADCA	Southern African Development Community in Accreditation
SADCMEL	Southern African Community Cooperation in Measurement Traceability
SC	Technical Subcommittee
SI	International System of Units
SIM	Inter-American Metrology System
SIM-LMWG	Inter-American Metrology System - Legal Metrology Working Group
TC	Technical Committee
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WD	Working Draft
WELMEC	European Cooperation in Legal Metrology
WTO	World Trade Organization

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