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# A STUDY ON THE CONTRIBUTION OF THE INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY IN THE WORLDWIDE STANDARDS OF WEIGHTS AND MEASUREMENTS

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**ABSTRACT**
*The accurate measurement has always been a vital factor for the growth of the commerce, trade and society at large. For this universally acceptable standards can only meet with the purpose. The International Organization for Legal Metrology (OIML) has worked bringing acceptability and stability in laying down the standards for the weights and measurements internationally. This paper tried to put light on the contribution of the OIML in the field of legal metrology and way ahead in future of legal metrology.*

## INTRODUCTION

Legal Metrology is the name by which the law relating to weights and measures is known in international parlance. Legal Metrology is very vital for scientific, technological and industrial progress of any country. The establishment of national standards of weights and measures an their proper enforcement aim at ensuring accuracy of measurements and measuring instruments and thus legal metrology strengthens the national economy in a broader sense besides being a potential instrument of consumer protection. The scope of legal metrology according to international practice extends to three broad fields of human activities, namely, commercial transactions, industrial measurements and measurements needed to ensure public health and human safety. The coverage of legal metrology varies from country to country. In some, almost all practical measurements are brought under the purview of legal metrology, whereas in other countries legal metrology finds restricted application in a few quantities like mass, length and volume used in trade and commerce. In most of the countries, however, legal metrology encompasses measurements which have a bearing on the protection of individuals from the financial and environmental points of view.

Legal metrology can be defined as that part of metrology which deals with units of measurement, methods of measurement and measuring instruments in so far as they concern statutory, technical and legal requirements which have the ultimate object of assuring public guarantee from the point of view of security and of appropriate accuracy of measurements.

## INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY (OIML)

The International Organization of Legal Metrology (OIML) is an intergovernmental treaty organization whose membership includes Member States, countries which participate actively in technical activities, and Corresponding Members, countries which join the OIML as observers. It was established in 1955 in order to promote the global harmonization of legal metrology procedures. Since that time, the OIML has developed a worldwide technical structure that provides its Members with metrological guidelines for the elaboration of national and regional requirements concerning the manufacture and use of measuring instruments for legal metrology applications.

According to OIML legal Metrology is the entirety of the legislative, administrative and technical procedures established by, or by reference to public authorities, and implemented on their behalf in order to specify and to ensure, in a regulatory or contractual manner, the appropriate quality and credibility of measurements related to official controls, trade, health, safety and the environment.

The OIML develops model regulations, International Recommendations, which provide Members with an internationally agreed-upon basis for the establishment of national

legislation on various categories of measuring instruments. Given the increasing national implementation of OIML guidelines, more and more manufacturers are referring to OIML International and Recommendations to ensure that their products meet international specifications for metrological performance and testing.

Metrology also has three basic subfields, all of which make use of the three basic activities, though in varying proportions:

1. Scientific or fundamental metrology
2. Applied, technical or industrial metrology
3. Legal metrology

**SCIENTIFIC OR FUNDAMENTAL METROLOGY**

Scientific or fundamental metrology concerns the establishment of quantity systems, unit systems, units of measurement, the development of new measurement methods, realisation of measurement standards and the transfer of traceability from these standards to users in society. The BIPM maintains a database of the metrological calibration and measurement capabilities of various institutes around the world. These institutes, whose activities are peer-reviewed, provide the top-level reference points for metrological traceability. In the area of measurement the BIPM has identified nine metrology areas including length, mass and time.

**APPLIED, TECHNICAL OR INDUSTRIAL METROLOGY**

Applied, technical or industrial metrology concerns the application of measurement science to manufacturing and other processes and their use in society, ensuring the suitability of measurement instruments, their calibration and quality control of measurements. Although the emphasis in this area of metrology is on the measurements themselves, traceability of the calibration of the measurement devices is necessary to ensure confidence in the measurements.

**LEGAL METROLOGY**

Legal metrology "concerns activities which result from statutory requirements and concern measurement, units of measurement, measuring instruments and methods of measurement and which are performed by competent bodies." Such statutory requirements might arise from, amongst others, the needs for protection of health, public safety, the environment, enabling taxation, protection of consumers and fair trade. The OIML was set up to assist in harmonizing such regulations across national boundaries to ensure that legal requirements do not inhibit trade. In Europe WELMEC was established to promote cooperation on the field of legal metrology.

**APPLIED METROLOGY**

Metrology laboratories are places where both metrology and calibration work are performed. Calibration laboratories generally specialize in calibration work only. Both metrology and calibration laboratories must isolate the work performed from influences that might affect the work. Temperature, humidity, vibration, electrical power supply, radiated energy and other influences are often controlled. Generally, it is the rate of change or instability that is more detrimental than whatever value prevails. Calibration technicians execute calibration work. In large organizations, the work is further divided into three groups:

GROUP DEFINITION

Set-up people arrange the equipment needed for calibration and verify that it works correctly.

Operators execute the calibration procedures and collect data.

Tear-down people dismantle set-ups, check the components for damage and then put the components into a stored state. This is the entry-level position for people who didn't start in the equipment warehouse or transportation functions. Alternatively, the technicians can be divided by major discipline areas: physical, dimensional, electrical, RF, microwave and so on. But the principles are the same regardless of the equipment.

Metrology technicians perform investigation work in addition to calibrations. They also apply proven principles to known situations and evaluate unexpected or contradictory results. Specific education in metrology was formerly limited to sub-professional work. Most of the branches of the US Military train 'enlisted-grade' technicians to meet their specific needs. Large industrial organizations also develop people who demonstrate aptitude in testing functions. When this is combined with an engineering degree, it qualifies the person as a metrology engineer. Over the last 15 years, universities such as the University of North Carolina at Charlotte have created a specific curriculum in metrology engineering. In England, metrology was part of the fifth year of some undergraduate engineering programs. Metrologists are people who perform metrology work at and above the technician levels. The metrology and calibration work

described above is always accompanied by documentation. The documentation can be divided into two types: one related to the task, and the other related the administrative program. Task documentation includes calibration procedures and the collected data. Administrative program documentation includes equipment identification data, 'calibration certificates', and calibration time interval information and 'as-found' or 'out-of-tolerance' notifications. Administrative programs provide standardization of the metrology and calibration work and make it possible to independently verify that the work was performed. Generally, the administrative program is specific to the organization performing the work and addresses customer requirements. General administrative program specifications created by industry groups, such as the ANS (ANSI) Z540 series, may also be covered in the administrative program. Other specifications created by the US Food and Drug Administration, US Federal Aviation Administration or other agencies would supplement or replace ANS Z540 for work performed in their domains. Often administrative programs can be as complicated and detailed as the measurement work itself.

**INDUSTRY-SPECIFIC STANDARDS**

In addition to standards created by national and international standards organizations, many large and small industrial companies also define metrology standards and procedures to meet their particular needs for technically and economically competitive manufacturing. These standards and procedures, while drawing in part upon the national and international standards, also address the issues of what specific instrument technology will be used to measure each quantity, how often each quantity will be measured, and which definition of each quantity will be used as the basis for accomplishing the process control that their manufacturing and product specifications require. Industrial metrology standards include dynamic control plans, also known as "dimensional control plans", or "DCPs", for their products.

In industrial metrology, several issues beyond accuracy constrain the usability of metrology methods. These include:

1. The speed with which measurements can be accomplished on parts or surfaces in the process of manufacturing, which must match the taken time of the production line.
2. The completeness with which the manufactured part can be measured such as described in high-definition metrology.
3. The ability of the measurement mechanism to operate reliably in a manufacturing plant environment considering temperature, vibration, dust, and a host of other potential hostile factors.
4. The ability of the measurement results, as they are presented, to be assimilated by the manufacturing operators or automation in time to effectively control the manufacturing process variables.
5. The total financial cost of measuring each part.

**OIML CERTIFICATE SYSTEM FOR MEASURING INSTRUMENTS**

The OIML Certificate System for Measuring Instruments was introduced in 1991 to facilitate administrative procedures and lower the costs associated with the international trade of measuring instruments subject to legal requirements. The System provides the possibility for a manufacturer to obtain an OIML Certificate and a Test Report indicating that a given instrument type (pattern) complies with the requirements of the relevant OIML International Recommendations. Certificates are delivered by OIML Member States that have established one or several Issuing Authorities responsible for processing applications by manufacturers wishing to have their instrument types (patterns) certified. Certificates issued by OIML are accepted by national metrology services on a voluntary basis, and as the climate for mutual confidence and recognition of test results develops between OIML Members, the System serves to simplify the type (pattern) approval process for manufacturers and metrology authorities by eliminating costly duplication of application and test procedures.

**CONCLUSION**

The contribution of OIML has been tremendous in the field of legal metrology. The majority of the contribution has been the result of the various technical committees of the OIML. The same is summarized herein below. The technical work of the OIML is carried out by technical committees (TC), each committee having responsibility for a different aspect of legal metrology. In some cases the technical committee is broken up into one or more subcommittees (SC). The running of each subcommittee is the responsibility of various national laboratories around the world. As of 4 February 2013 there were 18 technical

committees and 45 subcommittees. The technical committees were:

1. TC 1 Terminology
2. TC 2 Units of measurement
3. TC 3 Metrological control (5 SCs)
4. TC 4 Measurement standards and calibration and verification devices
5. TC 5 General requirements for measuring instruments (2 SCs)
6. TC 6 Prepackaged products
7. TC 7 Measuring instruments for length and associated quantities (4 SCs)
8. TC 8 Measurement of quantities of fluids (5 SCs)
9. TC 9 Instruments for measuring mass and density (4 SCs)
10. TC 10 Instruments for measuring pressure, force and associated quantities (5 SCs)
11. TC 11 Instruments for measuring temperature and associated quantities (3 SCs)
12. TC 12 Instruments for measuring electrical quantities
13. TC 13 Measuring instruments for acoustics and vibration
14. TC 14 Measuring instruments used for optics
15. TC 15 Measuring instruments for ionizing radiations (2 SCs)
16. TC 16 Instruments for measuring pollutants (4 SCs)
17. TC 17 Instruments for physico-chemical measurements (8 SCs)
18. TC 18 Medical measuring instruments (3 SCs)

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