



OIML BULLETIN

VOLUME LI • NUMBER 4

OCTOBER 2010

Quarterly Journal

Organisation Internationale de Métrologie Légale



ISSN 0473-2812

Winner of the 2009 OIML Award for Excellent Contribution
to Legal Metrology in Developing Countries:
Assignment Report



BULLETIN

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THE OIML BULLETIN IS THE
QUARTERLY JOURNAL OF THE
ORGANISATION INTERNATIONALE
DE MÉTROLOGIE LÉGALE

The Organisation Internationale de Métrologie Légale (OIML), established 12 October 1955, is an inter-governmental organization whose principal aim is to harmonize the regulations and metrological controls applied by the national metrology services of its Members.

EDITOR-IN-CHIEF: Jean-François Magaña

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2010 SUBSCRIPTION RATE

60 €

ISSN 0473-2812

PRINTED IN FRANCE

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10300 SAINTE SAVINE

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EBERHARD SEILER
OIML FACILITATOR ON
DEVELOPING COUNTRY MATTERS

One year has passed...

...since the OIML honoured Jordan's Legal Metrology Representative in the context of the Award for *Excellent Contributions from Developing Countries to Legal Metrology* during the 2009 CIML Meeting in Mombasa.

In addition to this official recognition is the hope that the Award might cause others to check whether their legal metrology services could benefit from the solutions and results achieved in Jordan (see the April 2009 OIML Bulletin).

Indeed, these expectations have become reality: the exchange of information has increased, and study visits to Jordan took place to observe the operation of the system in situ. Furthermore, Jordan was asked to support the development of legal metrology in Palestine; this request was realized with the financial support of the OIML as part of the Award, together with the generosity of the Jordan Institution for Standards and Metrology. Details of the assignment of the Head of Legal Metrology are published in this issue of the Bulletin.

In the meantime, the winner of the second Award was announced at the CIML Meeting in Orlando. Details will be published in due course in the Bulletin.

The foundation of legal metrology services generally mainly comprises activities with regard to fair trade and consumer protection. But legal metrology can contribute to ensuring correct measurements in other areas, too.

OIML TCs and SCs have elaborated more than 100 Recommendations which cover measuring instruments used in health care, environmental protection and human safety besides the traditional area of trade and commercial transactions. But as a matter of fact, only a few OIML Members have implemented Recommendations concerning the non-traditional areas, and indeed the importance of these new areas was stressed by the CIML's late President Knut Birkeland in 1998 in his expert report *Legal Metrology at the Dawn of the 21st Century*:

"The new areas are all characterised by the usual problems caused by inconsistent, fragmented and non-coherent legislation, with metrologically unrelated regulators, implementing bodies and users. It impedes the rational use of the global measurement system and cost-effective compatibility".

To change this situation and to stimulate the transposition of the relevant OIML Recommendations into national regulations is a major task facing not only developing countries but all of us. Successful activities in this regard would justify serious consideration for the OIML Award. ■

ANALOG - DIGITAL

Interpolation repeatability of analog scales

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Abstract

Reading the result of a measurement on an analog scale is not limited to integer points: it is also necessary to consider the fractional parts of the scale division. The accuracy of the measurement is therefore affected by reading the fraction. This paper reviews graduation mark specifications laid down for commonly used analog measures and concludes by suggesting the most appropriate fraction that can safely be adopted to minimize the reading error that may occur due to interpolation of the indicator between scale marks.

Analog indicators

An analog display has a series of line markings over which a pointer moves. The position of the tip of the needle on the line markings corresponds to the value of the measurement. The pointer can take various forms: it can be a needle, a line mark or a liquid column.

Although digital measurements are “accurate”, easy to perform and economical, the real world is analog, because analog measurements use a continuous phenomenon from where the digits are sampled at discrete intervals. Analog measurements have certain advantages over digital measurements, such as the possibility to assess a changing signal. A quick glance at the indicator will show whether the process is stable, or how close it is to the extreme limits and what the trend is. Analog meters are minimal loading devices with an input impedance usually 10 times lower than digital devices.

The application of analog scales is everywhere. Angular and length/displacement measurements by mechanical, optical or electronic devices are common. Autocollimators, theodolites, survey levels, transits, micrometers, dial gauges, calipers, steel/glass scales and reticules, invar tapes, voltmeters, ammeters, electrical energy meters, navigation instruments, thermometers, pipettes, burettes, and syringes all use graduated scales for measurements.

The use of graduated dial gauges is very common for measuring force in force measuring systems such as universal testing machines. The measurement of photometric quantities such as illumination and luminance also depended on subjective judgment by using the Weber-Fechner fraction. Further, such measurements use the $V\lambda$ filter which essentially represents the human eye response curve over the visible spectrum. Similarly, luminance measurement depends on the ability of an observer to match two juxtaposed stimuli. Disappearing filament thermometry or use of a pyrometer for high temperature measurement also depends on human judgment.

Review of standard specifications

In order to understand the effect on measurements of the characteristics of graduation marks, a survey of certain standard specifications was carried out. Instruments that are frequently used for making precision measurements in workshops, industrial work places in laboratories, or at market places are:

- Pressure gauges [1,2,3,4];
- Force proving devices [5,6,7];
- Linear displacement measuring devices such as dial gauges [8], micrometers [9,10,11], vernier calipers [12,13], line scales, steel/glass scales [14,15,16], tapes [17];
- Liquid-in-glass thermometers [18,19,20];
- Laboratory glassware such as volumetric glassware [21];
- Flasks [21], cylinders [21], pipettes [22] and burettes [23].

From analyzing these specifications, it was found that most of them recommend a line width from 0.10 mm to 0.30 mm and a line interval of 1.0 mm to 2.5 mm. However, in some high precision equipment the width may be as low as 80 μm .

Concepts in analog scale reading

In analog scale readings the pointer/indicator will lie either on an integer point or in between two adjacent integer points (i.e. two adjacent lines).

The error of measurement will depend on the accuracy with which the position of the pointer/indicator can be identified by the observer. In situations where the pointer/indicator falls on the integer point, the ideal position shall be the middle of the graduation to mark the exact value.

However, its location is a matter of judgment by the observer. This may be of minor consequence for most measurement types, but is important for instance where the detection of a meniscus is in question (such as pipettes).

In some instruments the indicators are marked with two lines separated by a distance almost equal to the thickness of the scale graduation. To read the value, the scale graduation needs to fall between the two lines of the pointer. Fine adjustment for exact coincidence is realized by a vernier type scale. However, in such cases, the readings are always made at integer points and not in between two lines and optical reticules are used for measuring the finer values.

Nonetheless, in all cases, the accuracy will be subjective, and is determined by correctly locating the position of the pointer/indicator. This estimation is either an absolute or a relative value [24].

For example, attempting to read the graduations of the main scale with a vernier scale or optical reticules or to a graduated scale line or to the space, leads to an 'absolute' estimation.

The reading is estimated as the measured value. For example, when the pointer falls a little away from the line marked as '2', one can read the value as '2.2'. On the other hand, when the estimate is made in relative terms by interpolation of the indicator position within the interval of adjacent graduations or on the line width, the value is expressed as a fraction of the interval or of the line interval or width. This is because the position of the pointer/indicator is judged with respect to both ends of the line(s) or the width. The two types of interpolation are distinguished as "reading" and "relative", respectively denoting absolute and fractional value.

Discussion on the optimum estimation of an analog scale reading

A reasonable estimation of the fraction to which a scale can be read can be worked out from the information provided by researchers and the standard specifications.

Research [25–29] conducted to determine the accuracy of interpolating the pointer position between scale marks as a function of spacing between divisions reveals five important points:

- (i) the relative error of interpolation decreases as the length of the graduation interval increases, up to approximately 12.5 mm;
- (ii) the absolute error of interpolation increases almost as a linear function of the length of the graduation interval;
- (iii) the error reduces with an increase in the line width;

(iv) The chances of locating a reading near the middle of the scale lines were highest when graduated at 10 mm intervals;

(v) The position of the pointer reading is repeatable.

Standard specifications on calibration of pressure gauges by DKD [4] and force proving devices [5,6,7] about how to interpolate the pointer position, are based on these research results. Both point out that:

- i) the thickness of the graduation marks on the scale shall be uniform and the width of the pointer shall be approximately equal to the width of a graduation mark;
- (ii) for 1/10 readability the line space shall not be less than 2.5 mm.

A clue from the dial gauge (in particular) and other graduated devices in general can be taken to relate line width and line spacing with the readability factor.

Accordingly, force measurement with a 0.01 dial gauge indicator that has a line space of 1 mm and a line width and pointer of 0.1 mm, an interpolation to 1:10 is possible. If the line width increases to 0.25 mm, only a 1:4 ratio can be read. To attain a 1:5 ratio, the line width should be 0.2 mm. The rule of 2.5 mm interline space for 1:10 readability is applicable for all other meters that have a line width larger than 0.1 mm. For pressure gauges, the line width and pointer tip width are specified to be $< 1/5$ of line spacing and interpolation is limited to between 1:4 and 1:10. Accordingly, considering this as a basis, an interpolation of 1:4 is possible with a line width of 0.2 mm and line spacing of 1 mm. For 1:2 the minimum spacing should be 2.0 mm. For 1/10, the minimum line spacing recommended is 2.5 mm which fits well in this scheme.

A similar rule will apply to the readability of other instruments. For example, if one uses a 25 mL burette with graduations every 0.1 mL, for reading the numbers on the graduated scale one will need to interpolate between the graduation marks. Since the burette is graduated to 0.1 mL, one can read the burette to 0.01 mL. The second decimal place is a comfortable estimate as the graduations are separated by 1 mm, 10 times the readability.

Conclusions

The readability of the line scale depends on two factors: the line width and the interline spacing. The survey of the specifications and research show that:

- (i) The limit of estimation is intimately related to these two aspects.

As a general rule, the fraction of interpolation as well as of the absolute reading can be formulated as:

$$\frac{\text{line width (x)}}{\text{scale interval (l)}} = \text{decimal fraction of interpolation (readability)}$$

(scale interval > line width)

Accordingly, the readability should be $l : x$.

- (ii) The interpolation (relative estimate) as well as the reading (absolute estimate) fit best at 1:4, 1:5, 1:2. However, 1:2 is most favorable for an absolute estimate, even if the l/x condition is violated.
- (iii) For 1:10, as a general rule, the line spacing should be 10 times the line width.
- (iv) The repeatability increases if a magnifier is used because the parallax is reduced. ■

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ROMANIA

Metrology and standardization: Infrastructure components of a modern society

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Introduction

Standardization is a component of the infrastructure of modern society which enables producers of goods and services to enter new segments of European and international markets, because the standards reflect a significant part of the requirements of these markets.

Using electrical power in Romania as an example, this article underlines the importance of collaboration between standardization and metrology specialists and manufacturers of measuring instruments in developing standards, taking into account the strong competition that exists both in the European and world markets. Involving specialists in standard development activities contributes to ensuring that producers of goods and services have access to correct and permanent information, and to adapting these activities to the marketplace.

1 Metrology and standardization

In a modern industrialized society, metrology is of great importance in several fields of our daily lives. Accurate measurements represent both the premise for high quality industrial production, and for the international trade of goods.

Measurements guarantee safety, protect the consumer and remove barriers to trade.

The quality of measurements is a requirement under the quality management system (see European Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*),

facilitates cooperation between testing / calibration laboratories as it helps to exchange information and experiences and to harmonize standards, procedures and other regulations used in measurements. A unified approach is a condition *sine-qua-non* of competitiveness.

Although making correct measurements is costly, incorrect measurements can have much larger implications in terms of cost, because their results affect the lives of every citizen. Developed nations spend large amounts on various measurement related activities.

Metrology, as part of the infrastructure of a modern society, ensures that measurements can be trusted in areas such as health, environmental protection, safety, etc. and a major ongoing concern is to effectively protect consumers against the harmful effects of inaccurate or false measurements.

A close interdependence between science and technical developments prompted the development of measurement techniques and related equipment. With scientific and technical progress, these measurement techniques are now current practice, and are characterized by a continuous increase in measurement performance, driven by ever higher requirements of industry.

The perfection of measurement techniques became increasingly necessary as a consequence of the development of society, and in view of these changes standardization is also a component of the infrastructure which makes it possible for industry to conquer new segments of the market since the standards cover an important portion of market demands. At present, standards are no longer of a mandatory nature, and the introduction of the concept of voluntary application (such as by governmental bodies or by commercial companies) represents a major step in the approach to this issue in different fields of activity.

Participation in the technical committees of standardization bodies allows those involved in this activity to keep up to date with news from the standardized field and with the tendencies in the respective fields.

Key objectives of the Romanian Standards Association (ASRO) for 2008–2010 include:

1. Promoting national consistency with the European standards;
2. Ensuring a commercial approach to national, European and international standards, together with an efficient marketing strategy;
3. Timely supply to clients of relevant products and services that meet their requirements;
4. Developing relationships between research, development, innovation and standardization;
5. Efficient development of relations with public authorities to promote and strengthen the role played

by standardization as a tool for supporting European policies and to simplify national legislation;

6. ASRO participation in European, national and international standardization activities to facilitate the process of consensus standard-setting and to ensure effective implementation of policies under the standardization system;
7. Improved communication in links to national and international standardization activities, and improvement of the supply of relevant information to interested parties.
8. Developing training and certification;
9. Developing relations between education and the standardization bodies.

Developing relationships between research, development, innovation and standardization aims to ensure a higher degree of participation in national technical committees having standardization activities (especially European), and leads to increased collaboration with the ASRO units and research teams from Romania through:

- the involvement of Romanian research in the development stages of European standards;
- conducting studies on the possibilities of implementing European standards in terms of technological development in the Romanian economy;
- generating proposals for European standards and original Romanian standards as a result of various fields of research topics.

Thus, in the field of metrology, ASRO collaborates closely with the Romanian Bureau of Legal Metrology (BRML) and with the National Institute of Metrology (INM), either on a joint basis or within the framework of various programs, in revising and updating Romanian standards, as well as in adopting specific international and European standards. INM is also committed to supporting specialized ASRO Technical Committees, in some cases as TC chair.

An example of this collaboration is the joint project "Adopting European Standards as Romanian standards in various electrotechnical fields", carried out by the BRML-INM and ASRO within the framework of the national CALIST program (Quality and Standardization).

Another example is ASRO TC 164, which deals with "Measuring equipment for electrical energy and load control" which is hosted and chaired by the INM and which is also actively involved in adopting specific European standards and norms as Romanian standards. 35 standards have so far been adopted within the framework of various programs financed by the Romanian Government.

Romanian companies are very eager to produce quality goods and services in accordance with European

standards and international requirements to ensure they remain competitive; to achieve this, it is vital to develop an efficient system of measurement and verification. Having competent staff is a determining factor in this process.

The objective of ensuring quality is to:

- increase economic production;
- increase the competitiveness of products, services, etc.;
- promote and improve products;
- extend products' lifespan;
- broaden the knowledge base;
- confirm the competitiveness and qualitative capacity of all those involved.

In an ideal economy, commercial exchanges would be facilitated if both sellers and buyers proposed their products and services according to the requirements of these standards.

The national legislation and the regulation activity are simplified and accelerated, when it is referred to those documents agreed at the European and international level.

2 Electrical power

Electrical power arrives on the market as a product from a manufacturer to the carrier and from the distributor to the consumer. It must be measured, both from a qualitative and a quantitative point of view.

The quality of the electrical power may be appreciated according to:

- the level of the voltage deviations with respect to the nominal voltage;
- the level of the frequency deviations with respect to the nominal frequency;
- the symmetry degree of the tri-phase system of voltages and currents;
- the purity of the voltage and current curves, which are intended to be of a sinusoidal form.

The quantity of electrical power may be determined through systems which have the following functions:

- measurement of the analogical (voltages, currents) and digital (state of the commutation and protection apparatus) data concerning problem zones of the electrical energy system where deforming conditions occur;
- digital processing of data, counting with a view to determining the energy parameters, the performance indexes concerning the quality of the electrical power;
- stocking, administrating and displaying the various

periods of consumption and events that create deviations in quality of the electrical power used;

- permanent monitoring of the energy parameters;
- identification and localization of defects;
- recording of normal and damage-related electrical events with a view to their subsequent analysis which may lead to measures pertaining to the qualitative and quantitative efficiency of the energy consumption;
- warning when the normal values for the quality indexes are surpassed.

At present, new problems occur, such as an increase in the number of electrical power suppliers, which determines the necessity for increased protection of the energy systems.

The liberalization and globalization of the electrical power market creates the necessity for the unification of geographically dispersed energy systems, management of the production, transport, and distribution as well as anticipating the electrical power consumption.

The liberalization of the electrical power market also has consequences on standardization in the field, because of the occurrence of new concerns such as:

- the increase in the technical quality of the electrical power imposed by increased consumer demand;
- identification of the factors that determine perturbations which may affect the quality of this “product”;
- the increase in the number of consumers, which creates the necessity to introduce new notions such as, for instance, remote metering;
- diversification of the means of producing electrical power: thermoelectric, hydroelectric, nuclear or environmental techniques such those based on converting solar energy, the energy of the sea or of the wind.

All these aspects impose that the standardization activity must continuously take account of developments in this field in order to take into account the demands of the electrical power market.

In this area there are a total of 31 Romanian standards in force at this time, which is the heritage of standards adopted in ASRO Technical Committee, TC 164, which specializes in equipment for the measurement of electrical power and load control.

The most recent Romanian standards adopted in the field of electrical energy measurement and load control are European standards:

- EN 50470-1:2006 – Electricity metering equipment (a.c.) – Part 1 – General requirements, tests and test conditions – Metering equipment (class indexes A, B and C);
- EN 50470-2:2006 – Electricity metering equipment

(a.c.) – Part 2 – Particular requirements – Electro-mechanical meters for active energy (class indexes A and B);

- EN 50470-3:2006 – Electricity metering equipment (a.c.) – Part 3 – Particular requirements – Static meters for active energy (class indexes A, B and C), which completes specialized publications on electricity.

These European Standards were prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and the scope of the standard covers:

- the essential requirements as given in Article 4(a) of the EC Directive 89/336/EEC; and
- all the relevant essential requirements as given in Annex I and Annex MI-003 of the EC Directive 2004/22/EC.

Directive 2004/22/EC on Measuring Instruments (MID) was adopted by the European Parliament and Council on 31 March 2004, for application by EU Member States from 30 October 2006. It takes precedence over national regulations in each Member State, and covers ten categories of measuring instruments. It is designed to harmonize the requirements for new measuring instruments placed on the market or put into use in Europe by eliminating the regulatory differences at national level which hinder trade.

This new-approach Directive allows manufacturers to choose between various conformity assessment procedures for their instruments. It reinforces European standards and OIML Recommendations, and introduces the notion of presumption of conformity to essential requirements.

Certificates of conformity to the MID Directive are valid throughout Europe, making it easier for manufacturers to market their controlled measuring instruments. How to develop a European standard and the role of national standardization is shown in Figure 1.

3 Objectives of the technical committees of standardization in the electricity field

ASRO as a national standardization body has reorganized its activity by alignment to the European and international standardization bodies CEN, CENELEC, ETSI, IEC and ISO.

Both nationally and at European level, standardization activity is carried out within technical committees since from the outset it was felt that the national interest would be in accordance with European and interna-

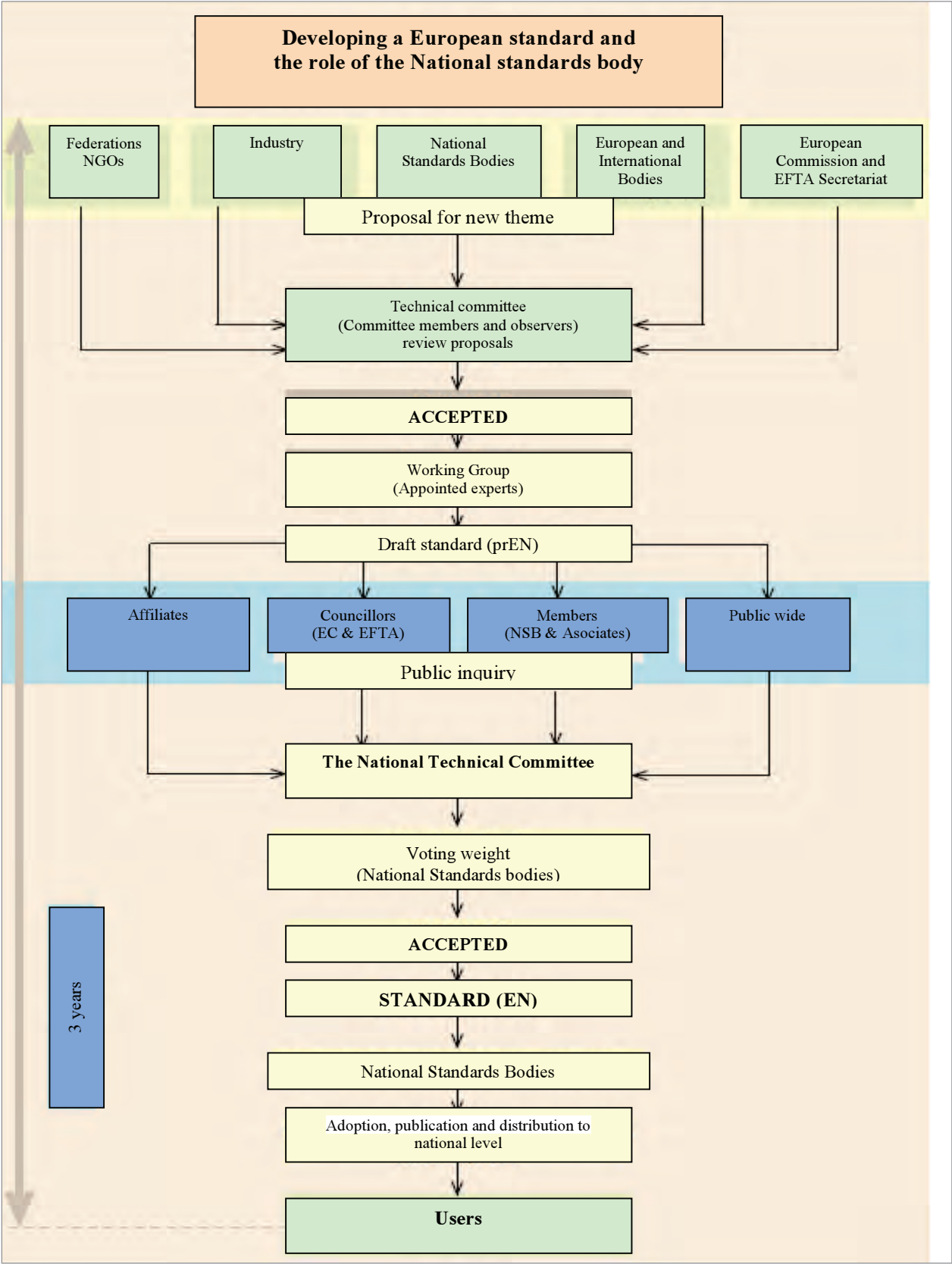


Figure 1 Development of a European standard and the role of the National standards body

tional interests so that each European and international technical committee in which Romania participated had a similar technical committee within ASRO.

However, one of the conditions fulfilled by ASRO in order to become a member with full rights in CEN and CENELEC was the existence of a similar technical committee. IEC/CENELEC TC 13 has its equivalent in ASRO, CT 164. The objectives of TC 13 are to develop standards which:

- allow the manufacture of measuring equipment which shall be used for the production, transport and distribution of electrical power in liberalized markets;
- allow the manufacture of measuring equipment that is adequate for environmental requirements;
- ensure an equitable starting point for a certain type of equipment, facilitating trade with measuring equipment;
- deliver a solid base for processing clients' demands and expectations with respect to the reliability of the equipment;
- prescribe a high level of security for the measuring equipment;
- anticipate that the equipment be capable of delivering secure and sufficient data to the beneficiaries about the measurements performed;
- provide instruments for the coordination of the entire system of measuring equipment, in all the aspects during its entire life.

CT 164, entitled "Equipment for the measurement of the electrical power and load control", participates in the adoption of European standards which, by translation or announcement, become Romanian standards. BRML-INM holds the presidency and the secretary of this TC.

ASRO, through standardization experts that are present in each TC coordinates, directs and controls the following activities:

- elaboration of Romanian national standards;
- adoption of European and international standards;
- assurance of the interface with the European and international standardization organizations;
- participation in the elaboration of European and/or international standards;
- periodical examination of the enforced patrimony of standards;
- annulment of conflicting standards;
- proposal of the national standardization strategy.

4 Conclusions

Especially since Romania joined the European Union in January 2007, its economy increasingly depends on specialist knowledge of the requirements and specifications laid down by the single European market. The government is set on ensuring that its products and services are of a high qualitative and technical standard in accordance with international and European standards.

Romanian manufacturers are increasingly involved in the activities of the technical committees, which allows them to better align their products with European and international standards, thus helping to reduce or even remove barriers to trade by increasing the competitiveness of Romanian products and services.

Having access to information right from the draft stages of these standards allows Romanian firms to adapt their activity to market requirements. They may propose the necessary changes both from a technical and organizational point of view, anticipate the corresponding costs, and consequently immediately become more competitive once the standard is approved.

By ensuring correct, permanent and timely information, producers of goods and services may consolidate their position on the market, acquire exclusivity for their products, increase their power of negotiation, and thus raise the level of profitability of their investments because they are in possession of the means to evaluate their results.

Becoming members of ASRO CT 164, interested parties may also become involved in the standardization activity of IEC/CENELEC TC 13. ■

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UKRAINE

Metrological activities between the TCs of the OIML and other International Organizations

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Abstract

The main scope of the activities of both international metrological and standardization organizations is described in this paper. The extent of the implementation in Ukraine of OIML Publications and ISO/IEC Standards relating to metrology is analyzed.

Introduction

Mutual exchange of experience and information in metrology is very important. The OIML was established in order to promote the global harmonization of legal metrology procedures and it 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 [1–5].

Ukraine has been an OIML Corresponding Member since January 1997 and as such it regularly receives OIML Documents, Recommendations and various other Publications with a view to harmonizing its national normative bases on metrology.

1 Main activity of international metrological organizations

1.1 OIML

International consensus in the legal metrology community is reached through Technical Committees (TCs) and Subcommittees (SCs), the composition of which includes representatives from OIML Member States, international standardization and technical organizations, manufacturers' associations and regional regulatory bodies.

The OIML develops model regulations, International Recommendations (OIML R) and International Documents (OIML D), which provide Members with an internationally agreed-upon basis for the establishment of national legislation on various categories of measuring instruments.

1.2 BIPM/Metre Convention

The Metre Convention is the treaty that created the BIPM, an intergovernmental organization under the authority of the CGPM and under the supervision of the CIPM. The BIPM acts in matters of world metrology, particularly concerning the demand for measurement standards of ever increasing accuracy, range and diversity, and the need to demonstrate equivalence between national measurement standards [6].

The CGPM receives the report of the CIPM on work accomplished; it discusses and examines the arrangements required to ensure the propagation and improvement of the International System of Units (SI); it endorses the results of new fundamental metrological determinations and various scientific resolutions of international scope; and it decides all major issues concerning the organization and development of the BIPM.

The CIPM MRA is a response to a growing need for an open, transparent and comprehensive scheme to give users reliable quantitative information on the comparability of national metrology services and to provide the technical basis for wider agreements negotiated for international trade, commerce and regulatory affairs.

The CIPM has set up a number of CCs, which bring together the world's experts in their specified fields as advisers on scientific and technical matters. Among the tasks of these CCs are the detailed considerations of advances in physics that directly influence metrology, the preparation of recommendations for discussion at the CIPM, the identification, planning and execution of key comparisons of national measurement standards,

and the provision of advice to the CIPM on the scientific work in the laboratories of the BIPM. Since the beginning of 2004 the reports of the CCs are only published electronically.

The *International System of Units* (SI) brochure [12] is the essential reference for all those who wish to use the SI correctly. It contains the official definitions of the base units of the SI, and all the decisions of the CIPM and CGPM related to the SI, its formalism and use. The brochure is periodically updated after detailed discussion by the CC for Units (CCU).

2 Main activities of International Organizations for Standardization in the field of metrology

2.1 ISO

The International Organization for Standardization (ISO) is a non-governmental organization and one of the world's foremost developers of voluntary technical standards. The ISO Central Secretariat manages an international standardization system, prepares, produces and disseminates international standards and standards-related documents. These services include coordination of the standards development program, administration of voting on draft standards, the final editing and publication of standards, and information, communication and public relations [7].

The Technical Management Board (TMB) is an ISO body which develops standards or guides on all matters concerning the organization, coordination, strategic planning, and programming of the technical work of ISO including the establishment and dissolution of technical committees (TCs), particularly in the field of metrology.

ISO standards are developed by TCs, SCs or project committees comprising experts from the industrial, technical and business sectors which have asked for the standards, and which subsequently put them to use. These experts may be joined by representatives of government agencies, testing laboratories, consumer associations, non-governmental organizations and academic circles. Each TC and SC has a secretariat assigned to an ISO member national body (for example, AFNOR, DIN, ANSI, etc.).

Stakeholders in international standardization comprise all those groups having an interest in international standardization because they are affected by it and wish therefore to contribute to the process of the development of international standards. Stakeholders participate in the technical work of ISO through national delegations appointed by the member national

bodies of ISO or, if they are organized in international or broadly-based organizations, through liaison organizations.

In addition to international standards, ISO can also offer other forms of normative agreements (e.g. ISO Guide, ISO Publicly Available Specification (PAS), ISO Technical Specification (TS), ISO Technical Report (TR) for situations where speedy publication is important, and has developed a schematic representation of the different types of agreements.

ISO engage in introducing international standards for quantities and units based on the SI – ISO 80000 (14 parts). The ISO 9000 series standards “Quality management systems”, and ISO 10012 “Measurement management systems” are important for National Metrological Institute (NMI). International standards ISO 3435 “Continuous mechanical handling equipment” and ISO 5725 “Accuracy (trueness and precision) of measurement methods and results” (six parts) are extensively used for handling measurement results. ISO Guide 30 “Terms and definitions used in connection with reference materials” and ISO Guide 35 “Reference materials – General and statistical principles for certification” are also used for metrological practice for reference materials.

ISO collaborates with its two sector based, international partners, the International Electrotechnical Commission (IEC) and the International Telecommunication Union (ITU), the United Nations Organization, as well as other specialized organizations, agencies and commissions. Cooperative agreements are established between the ISO and IEC and certain institutions, such as the BIPM and the OIML, the International Laboratory Accreditation Cooperation (ILAC), etc., with the objective of avoiding contradictory requirements; consequently, manufacturers and users of measuring instruments, test laboratories, etc. may simultaneously apply ISO and IEC publications and those of other institutions.

2.2 IEC

The IEC is the leading global organization that prepares and publishes international standards for all electrical, electronic and related technologies. These serve as a basis for national standardization and as references when drafting international tenders and contracts. The IEC charter embraces all electrotechnologies including electronics, magnetic and electromagnetic, electroacoustics, multimedia, telecommunication, and energy production and distribution, as well as associated general disciplines such as terminology and symbols, electromagnetic compatibility, measurement and performance, dependability, design and development, safety and the environment [8].

Designation of the OIML TC	Total publications	
	OIML (D/R/V)	DSTU OIML
TC 1 Terminology	0/0/1	-
TC 2 Units of measurement	1/0/0	1
TC 3 Metrological control	12/2/0	9
TC 4 Measurement standards and calibration and verification devices	4/0/0	3
TC 5 General requirements for measuring instruments	2/0/0	-
TC 6 Prepackaged products	0/3/0	-
TC 7 Measuring instruments for length and associated quantities	0/10/0	1
TC 8 Measurement of quantities of fluids	2/26/0	8
TC 9 Instruments for measuring mass and density	1/22/0	5
TC 10 Instruments for measuring pressure, force and associated quantities	0/7/1	1
TC 11 Instruments for measuring temperature and associated quantities	1/8/0	-
TC 12 Instruments for measuring electrical quantities	0/0/0	-
TC 13 Measuring instruments for acoustics and vibration	0/10/0	-
TC 14 Measuring instruments for used for optics	0/1/0	-
TC 15 Measuring instruments for ionizing radiations	1/3/0	-
TC 16 Instruments for measuring pollutants	1/10/0	-
TC 17 Instruments for physical-chemical measurements	1/11/0	-
TC 18 Medical measuring instruments	0/11/0	-
Total:	26/124/2	28

Table 1 Structure of OIML Publications developed by OIML TCs, and of National Standards of Ukraine in the field of metrology

The TCs and SCs, and many project teams/maintenance teams carry out the standards work of the IEC. These working groups (WG) are composed of people from all around the world who are experts in electrotechnology. The great majority of them come from industry, while others from commerce, government, test laboratories, research laboratories, academia, and consumer groups also contribute to the work.

ISO and IEC publications can be identified by their ISO or IEC number, through the International Classification for Standards (ICS) [9] system, or by the respective TC/SC responsible for that publication.

Ukraine has been an ISO and an IEC full member since 1993 and participates in its TC and SC projects for the preparation of international standards and other normative documents.

3 Joint activities of the Technical Committees of the OIML and other International Organizations in the field of metrology

A joint declaration was signed by the BIPM, the OIML and ILAC. In preparing it, the CIPM recognized that its MRA was complemented by similar Arrangements drawn up by the OIML and ILAC. Indeed all three are interlinked and all support the equivalence and acceptability of SI-traceable measurements world-wide. The aim of this international measurement system is to provide users with measurement results which can be accepted everywhere without the need for further measurements.

The BIPM works in close cooperation with several other international bodies concerned with metrology. Relations are also maintained through representation of the bodies on relevant CCs, and through the activities of the BIPM staff on external committees.

Name of ISO or IEC TC	Total no. of standards	
	ISO or IEC	DSTU ISO, DSTU IEC
ISO TCs		
TC 12 Quantities, units, symbols, conversion factors	14	1 (MOD)*
TC 30 Measurement of fluid flow in closed conduits	37	8
TC 48 Laboratory equipment	87	4
TC 69 Applications of statistical methods	23	6
TC 85 Nuclear energy	52	10
TC 108 Mechanical vibration, shock and condition monitoring	106	32
TC 113 Hydrometry	72	7
TC 158 Analysis of gases	23	8
TC 172 Optics and photonics	22	8
TC 213 Dimensional and geometrical product specifications and verification	105	15
Total:	541	99
IEC TCs		
TC 1 Terminology (for MI)	9	1
TC 13 Electrical energy measurement, tariff- and load control	15	4
TC 25 Quantities and units	11	1
TC 29 Electroacoustics	46	4
TC 38 Instrument transformers	8	2
TC 45 Nuclear instrumentation	25	2
TC 65 Industrial-process measurement, control and automation	11	3
TC 66 Safety of measuring, control and laboratory equipment	8	4
TC 85 Measuring equipment for electrical and electromagnetic quantities	41	13 3 (MOD)*
Total:	174	34

Table 2 Structure of ISO and IEC standards developed by ISO and IEC TCs, and of the national standards of Ukraine in the field of metrology

The OIML, BIPM, ISO and IEC participate in the Joint Committee for Guides in Metrology (JCGM), and the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS).

The JCGM has responsibility for the *Guide to the Expression of Uncertainty in Measurement* (GUM) [10] and the *International Vocabulary of Metrology – Basic and General Concepts and Associated Terms* (VIM) [11]. The JCGM-WG1 recently completed its first Supplement to the GUM, and JCGM-WG2 recently completed a revised edition of the VIM (VIM 3).

Developing and publishing joint international standards and guides are an important element of the activity of international organizations for standardization. International Standard ISO/IEC 17025 “General requirements for the competence of testing and calibration laboratories” and international Guide ISO/IEC Guide 43 “Proficiency testing by inter-

laboratory comparisons” (two parts), ISO/IEC Guide 2 “Standardization and related activities” establish requirements for quality systems, especially for NMIs, and requirements for the accreditation of independent laboratories, especially calibration laboratories.

4 Harmonization of Ukrainian National Standards with OIML Publications and ISO/IEC Standards and Guides

The general structure of OIML publications and the corresponding harmonization of national standards of Ukraine (DSTU OIML) is given in Table 1 [1–5].

The structure of the ISO and IEC standards developed by ISO and IEC TCs, and of the national standards of Ukraine (DSTU ISO or DSTU IEC) in the

field of metrology are given in Table 2 [1–8] by ICS code [9]: 01.060 “Quantities and units”; 17 “Metrology and measurement. Physical phenomena”; 25.040.40 “Industrial process measurement and control” and 71.040 “Analytical chemistry”. In total there are 541/174 ISO/IEC (respectively) standards in the field of metrology. DSTU ISO or DSTU IEC standards that were modified are marked as MOD (* in Table 2).

5 Conclusion and summary

The following are the conclusions obtained from the investigation:

- (1) An analysis of the activity of the TCs of the OIML and other international metrological organizations (or consultative committees) and of ISO and the IEC in the field of metrology (measurement and instrumentation) has shown that there are significant common interest and many shared objectives at various stages in the work.
- (2) Being a member of the OIML, ISO and the IEC enables legal metrology departments and NMIs to regularly receive international Documents, Recommendations and Standards and to use them to harmonize Ukrainian national standards in the field of metrology. ■

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TC/SC MEETING

OIML TC 8/SC 7

Gas metering

Sub committee and WG meetings

Verispect, Delft,
The Netherlands
29 June – 2 July 2010

GEORGE TEUNISSE
OIML TC 8/SC 7 Secretariat

RÉGINE GAUCHER
BIML Contact for TC 8/SC 7

- reference to national regulations in the OIML Recommendation;
- setting up maximum permissible errors depending on the hose length;
- inclusion of software requirements on the basis of OIML D 31 *General requirements for software controlled measuring instruments*;
- inclusion of requirements for dispensers powered by internal batteries;
- defining mandatory checking facilities;
- ambient temperature range to be defined as part of the rated operating conditions; and
- maintaining requirements and tests with constant flow.

Discussions at the meeting were based both on the critical comments identified when drawing up the synthesis of comments received on the 1 WD, and also on the responses to the questionnaire.

Discussions during the meeting were vivid and constructive and it was possible to reach a consensus on most of the points. Consequently, it should be possible to draw up a 1 CD and circulate it among TC 8/SC 7 members by the end of 2010.

The scope of the Recommendation will be clarified to strictly limit it to CNG dispensers.

OIML R 137-2 and the revision of OIML R 137-1

The 1 CD related to part 2 of OIML R 137 was drawn up as a combined draft with the 1 CD of the revision of OIML R 137-1 *Gas meters – Part 1: Metrological and technical requirements*.

The development of testing procedures highlighted the need to clarify various requirements, which is one reason why the revision of OIML R 137-1 was started at the same time. In addition, on the basis of the Draft Recommendation Format, it is recommended to publish parts 1 and 2 of OIML Recommendations together, since the approval procedures for these two parts are the same.

This 1 CD was circulated in October 2009 for comments among TC 8/SC 7 members with a deadline of 15 January 2010.

On the basis of the comments received, the TC 8/SC 7 Secretariat has started to draft a 2 CD which will be completed on the basis of the conclusions of the meeting.

The scope of the Recommendation will be clarified to include CNG meters in general, but to exclude CNG meters which are intended to be used in CNG dispensers. These meters will be covered by the revision of OIML R 139.

The TC 8/SC 7 meeting was held on 1 and 2 July, preceded on 29 and 30 June by a WG meeting, effectively resulting in two 2-day sessions.

The first session consisted of a meeting of the Working Group (set up within OIML TC 8/SC 7) for the revision of OIML R 139 *Compressed gaseous fuel measuring systems for vehicles*.

The second session was the TC 8/SC 7 meeting, mainly dealing with discussion of the critical comments received on the first Committee Draft (1 CD) drawn up for OIML R 137-1 & -2 which includes some modifications to OIML R 137-1:2006 *Gas meters. Part 1: Requirements*.

Revision of OIML R 139

A first Working Draft (1 WD) was circulated among WG members in December 2008 for comments, with a deadline of 1 April 2009.

In addition to this 1 WD, the TC 8/SC 7 Secretariat circulated a questionnaire to request members' points of view on specific topics, in particular:

References to energy will be removed. The measured quantities will be the volume at operating conditions (actual volume), the volume at base conditions, and the mass.

Built-in conversion devices are only covered by OIML R 137, external conversion devices being under the scope of OIML R 140 *Measuring systems for gaseous fuel*.

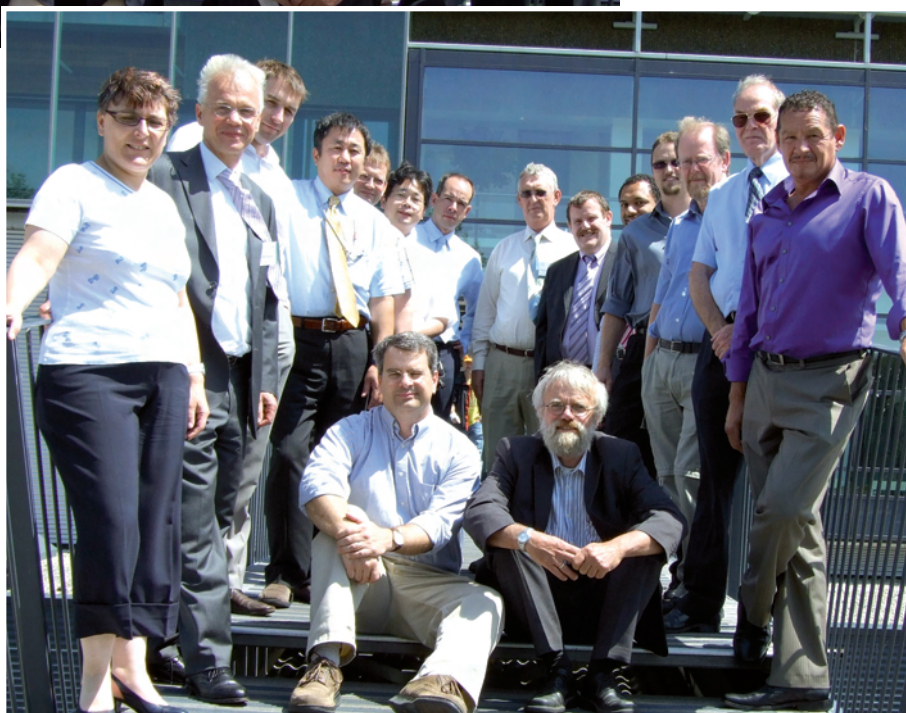
The Secretariat expects the 2 CD to be completed by

the end of August 2010, at which time it will be circulated for a three-month consultation of TC 8/SC 7 members for comments and votes by P-members.

If the 2 CD is accepted by TC 8/SC 7 P-members, the Draft Recommendation could be drawn up and submitted to the CIML for approval at its 46th Meeting in 2011. ■



TC 8/SC 7 meeting participants



TC 8/SC 7 Working Group meeting participants

JCGM

Joint Committee for Guides in Metrology (JCGM)

WILLEM KOOL
BIML

1 Introduction

The Joint Committee for Guides in Metrology is a cooperation between eight international organizations (BIPM, OIML, ISO, IEC, IUPAC, IUPAP, IFCC and ILAC)¹.

Its tasks are to maintain and promote the use of the *Guide to the Expression of Uncertainty in Measurement* (known as the GUM) and the *International Vocabulary of Metrology* (known as the VIM).

The JCGM is chaired by Prof. Andrew J. Wallard, Director of the BIPM. The BIPM also facilitates the work of the JCGM and its working groups by hosting meetings and providing secretarial support. Almost all meetings take place on the premises of the BIPM, at the historic site of the Pavillon de Breteuil (Photo 1).

The activities of the JCGM are governed by the JCGM Charter². The JCGM has two working groups: WG 1 for the GUM and WG 2 for the VIM.

This article aims to provide the OIML community with up-to-date information on the progress of the activities of the JCGM working groups. The previous update was published in the July 2007 OIML Bulletin³.

2 WG 1: The GUM and associated publications

The GUM was first published by ISO in 1993. A corrected version was published in 1995. The first edition of the GUM published under the terms of the JCGM Charter is from 2008, and is the 1995 edition with minor corrections. The 2008 edition (JCGM 100:2008) is

published by the OIML as OIML G 1-100 and is available for download from the OIML web site⁴.

An html version of the GUM is available on a dedicated JCGM portal on the internet hosted by ISO⁵.

Two other documents related to the GUM and prepared by WG 1 have meanwhile been adopted by the JCGM:

- JCGM 101:2008 *Evaluation of measurement data - Supplement 1 to the "Guide to the expression of uncertainty in measurement" - Propagation of distributions using a Monte Carlo method* published by the OIML as OIML G 1-101:2008, and
- JCGM 104:2009 *Evaluation of measurement data - An introduction to the "Guide to the expression of uncertainty in measurement" and related documents*, published by the OIML as OIML G 1-104:2009.

The following documents, in preparation by WG 1, are nearing completion and should be adopted by the JCGM within the next year:

- JCGM 102 *Evaluation of measurement data - Supplement 2 to the "Guide to the expression of uncertainty in measurement"- Extension to any number of output quantities*,
- JCGM 105 *Evaluation of measurement data - Concepts and basic principles*,
- JCGM 106 *Evaluation of measurement data - The role of measurement uncertainty in conformity assessment*.
- JCGM 106 is of particular importance to the OIML. OIML TC 3/SC 5 has a high priority project to develop a new OIML Document: *The role of measurement uncertainty in conformity assessment decisions in legal metrology*.

⁴ <http://www.oiml.org/publications/>

⁵ <http://www.iso.org/sites/JCGM/GUM-JCGM100.htm>



Photo 1: The 'Pavillon de Breteuil' in Sèvres, near Paris, France. This is where the BIPM is located and where most of the JCGM meetings take place.

¹ Information on the BIPM web site at:

<http://www.bipm.org/en/committees/jc/jcgm/>

² http://www.bipm.org/utis/en/pdf/JCGM_charter.pdf

³ http://www.oiml.org/bulletin/2007/07/oiml_bulletin_jul_2007.pdf

Another document that is currently being prepared by WG 1 is JCGM 103 *Evaluation of measurement data – Supplement 2 to the “Guide to the expression of uncertainty in measurement”- Modeling*.

Revision of the GUM

WG 1 has started considerations and consultations for a revision of the GUM. Although the GUM method is now well established as the way to express uncertainty in measurement, it also has some shortcomings. It basically only deals with cases with one variable, presupposes the existence of a measurement model and does not tell us how to construct a coverage region. These issues have since been (or will be) addressed in the GUM supplements, but should at least be mentioned in the main document.

Another issue is that the terminology used in the GUM is (no longer) in compliance with the VIM.

The consensus in WG 1 is that the GUM should stay as simple as possible and its structure should not change.

WG 1 membership

The members of WG 1 are (in square brackets the Member Organization they represent):

- Chairman: *Dr. Walter Bich* [ISO], from the ‘Istituto Nazionale di Ricerca Metrologica (INRIM)’ in Turin, Italy;
- BIPM contact: *Dr. Carine Michotte*, from the ‘Bureau International des Poids et Mesures (BIPM)’ in Sèvres, France;
- *Prof. Maurice Cox* [BIPM], from the ‘National Physical Laboratory (NPL)’ in Teddington, UK;
- *Dr. René Dybkær* [IUPAC], from the ‘Region H Frederiksberg Hospital, Department of Standardization in Laboratory Medicine’ in Frederiksberg, Denmark;
- *Dr. Charles D. Ehrlich* [OIML] from the ‘National Institute of Standards and Technology (NIST), Weights and Measures Division’ in Gaithersburg (MD), USA;
- *Dr. Clemens Elster* [IUPAP] from the ‘Physikalisch-Technische Bundesanstalt (PTB)’ in Braunschweig, Germany;
- *Dr. W. Tyler Estler* [BIPM], (retired);
- *Prof. Brynn Hibbert* [IUPAC], from the ‘School of Chemistry, University of New South Wales’ in Sydney, Australia;
- *Dr. Hidetaka Imai* [ILAC] from the ‘National Institute of Technology and Evaluation (NITE)’ in Tokyo, Japan;

- *Mr. Willem Kool* [OIML] from the ‘Bureau International de Métrologie Légale’ in Paris, France;
- *Dr. Lars Nielsen* [BIPM] from the ‘Danish Fundamental Metrology Ltd (DFM)’ in Lyngby, Denmark;
- *Prof. Leslie Pendrill* [ILAC] from the ‘Technical Research Institute of Sweden (SP)’ in Borås, Sweden;
- *Prof. Lorenzo Peretto* [IEC] from the ‘Department of Electrical Engineering, University of Bologna’ in Bologna, Italy;
- *Dr. Antonio Possolo* [IEC] from the ‘National Institute of Standards and Technology (NIST), Statistical Engineering Division’ in Gaithersburg (MD), USA;
- *Mr. Steve Sidney* [ILAC] from the ‘National Laboratory Association (NLA)’ in Pretoria, South Africa;
- *Dr. Adriaan van der Veen* [ISO] from the ‘Van Swinden Laboratory (VSL)’ in Delft, the Netherlands;
- *Prof. Graham H. White* [IFCC] from the ‘Department of Medical Biochemistry, Flinders Medical Centre’ in Bedford Park, Australia;
- *Dr. Wolfgang Wöger* [IUPAP] (retired).

3 WG 2: The VIM

In 2007, WG 2 completed the draft for the third edition of the VIM, now entitled *International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM)*. Under the terms of the JCGM Charter at that time, each Member Organization (MO) of the JCGM could use the draft to produce an MO-specific publication. ISO, the BIPM and the OIML then each published their own version of the VIM. Due to the usual necessity to make corrections during the editing process, the resulting three versions were, unfortunately, not identical. This, and some feedback that has been received from users of the VIM, prompted WG 2 to produce so-called corrigenda sheets for the three published versions of the third edition of the VIM.

The work on the corrigenda sheets was completed early this year. The OIML subsequently published a corrected version of the VIM (OIML V 2-200:2010) and the OIML-specific corrigenda sheet (OIML V 2-200-erratum:2010), so that users can see the changes that have been made.

The next step will be to produce one single version of the third edition of the VIM, which is to be used as the basis for the next edition.

The VIM is also available in html format on the JCGM portal hosted by ISO⁶.

⁶ <http://www.iso.org/sites/JCGM/VIM-JCGM200.htm>

Revision of the VIM

Even before finalizing the work on the third edition of the VIM, WG 2 has started to think about the fourth edition. It is anticipated that the revision process will take considerable time (ten years has been suggested). Comments on the third edition that have been and are being received from its users are collected in an electronic repository, accessible for members of WG 2 only. This repository serves as the basis for the revision of the VIM. WG 2 is also experimenting with web based tools, such as an electronic forum to exchange views, and is considering the use of Object Oriented Analysis in the process of structuring terminology.

One of the main issues in the revision is the expansion of the scope of the VIM to include concepts related to 'nominal properties'.

One issue that may need more urgent treatment, possibly in an addendum to the third edition of the VIM concerns entries surrounding the concept of 'error'. In the VIM, 'error' is treated as a value, whereas in WG 1, in particular in JCGM 106 on measurement uncertainty in conformity assessment, it is considered as a quantity.

WG 2 Membership

The members of WG 2 are (in square brackets the Member Organization they represent):

- Chairman: *Dr. Charles D. Ehrlich* [OIML] from the 'National Institute of Standards and Technology (NIST), Weights and Measures Division' in Gaithersburg (MD), USA;
- BIPM contact: *Dr. Claudine Thomas* from the 'Bureau International des Poids et Mesures (BIPM)' in Sèvres, France;
- *Dr. Jerzy Borzyminski* [OIML] from the 'Central Office of Measures (GUM)' in Warsaw, Poland;
- *Prof. Paul De Bièvre* [IUPAC], (retired);
- *Dr. René Dybkær* [IUPAC], from the 'Region H Frederiksberg Hospital, Department of Standardization in Laboratory Medicine' in Frederiksberg, Denmark;
- *Dr. Hidetaka Imai* [ILAC] from the 'National Institute of Technology and Evaluation (NITE)' in Tokyo, Japan;
- *Dr. Savely Karshenboim* [IUPAP] from the 'D.I. Mendeleyev Institute for Metrology (VNIIM)' in St. Petersburg, Russia;

- *Mr. Willem Kool* [OIML] from the 'Bureau International de Métrologie Légale' in Paris, France;
- *Prof. Luca Mari* [IEC] from the 'Università Cattaneo' in Castellanza (VA), Italy;
- *Dr. Françoise Pontet* [IFCC] from the 'Service de Biochimie, Hôpital Lariboisière' in Paris, France;
- *Mr. Marc Priel* [ISO] from the 'Laboratoire national de métrologie et d'essais (LNE)' in Paris, France;
- *Mr. Jean Schwob* [ISO] (retired);
- *Dr. Anders Thor* [IEC] from the 'Swedish Standards Institute (SIS)' in Stockholm, Sweden;
- *Dr. Stefanie Trapmann* [ISO], from the 'Institute for Reference Materials and Measurements (IRMM)' in Geel, Belgium;
- *Dr. Wolfgang Wöger* [IUPAP] (retired).

4 The JCGM publication procedure

The JCGM reviewed its procedure for the publication of JCGM documents by its Member Organizations.

The principle is that the eight Member Organizations collectively own the JCGM documents and, consequently, the copyright is shared by the MOs. The JCGM, however, does not publish any documents: JCGM documents are published by the MOs under their own banner and the copyright of these publications rests with the respective MOs.



Photo 2: Participants in the JCGM/WG 1 meeting (Paris, 25–28 May 2010): Clemens Elster, René Dybkær, Maurice Cox, Wolfgang Wöger, Adriaan van der Veen, Hidetaka Imai, Lars Nielsen, Willem Kool, Walter Bich, Tyler Estler, Antonio Possolo, Steve Sidney, Chuck Ehrlich, Graham White, Carine Michotte and Brynn Hibbert.

JCGM guidance documents are prepared in LaTeX or Word from which PDF versions can be readily produced. Maintaining the LaTeX or Word files is the responsibility of the JCGM working group that drafted the document. The final version, approved by the JCGM Member Organizations, is the 'official version' and is distributed to the MOs in PDF format. The publication by a Member Organization will be an exact reproduction of the 'official version' with the name and logo of the MO added on the cover page, or with a separate cover page.

Optionally, the following may be added:

- MO-specific information, copyright page and foreword;
- a table of correspondence between the bibliographic references in the official version and the publications of the MO. ■

Forthcoming meetings

Meetings of the JCGM and JCGM working groups have been scheduled for:

- JCGM: 1 December 2010;
- JCGM/WG 1: 23–26 November 2010 and 24–27 May 2011;
- JCGM/WG 2: 29–30 November 2010 and 18–20 May 2011.

For more information about the JCGM and its working groups, visit:

<http://www.bipm.org/en/committees/jc/jcgm/>



Photo 3: Participants in the JCGM/WG 2 meeting (Paris, 19–21 May 2010): Hidetaka Imai, Françoise Pontet, Marc Priel, Willem Kool, Anders Thor, Chuck Ehrlich, Wolfgang Wöger, Jean Schwob, René Dybkær, Claudine Thomas and Luca Mari.

ASSIGNMENT REPORT

Visit to the Palestinian Standards Institution (PSI)

3–13 May, 2010

Osama Melhem, Jordanian Institution for Standardization and Metrology

Winner of the 2009 OIML Award for *Excellent Contribution to Legal Metrology in Developing Countries*



1 Introduction

At the 44th CIML Meeting, I had the honor of being nominated as winner of the 2009 OIML Award for *Excellent Contribution to Legal Metrology in Developing Countries*.

As part of this Award, the OIML agreed to fund my assignment to share Jordan's metrological experience with Palestine, following an official request from the Palestinian Standards Institution (PSI) to the Jordan Institution for Standards and Metrology (JISM). The OIML covered all of my travel and accommodation expenses, and the PSI covered all local transportation within the Palestinian Territory.

From 3–13 May 2010, ten days of training and consultation were provided to PSI staff and testing and calibration laboratories, and more than 100 individuals benefited directly from this assignment.

2 Main achievements

The main achievements can be summarized as follows:

- 1 Conducting a two-day training course in the field of "Calculations of measurement uncertainty" at Al-Najah National University. 63 participants from about 25 accredited laboratories, universities, local industry and governmental institutions attended the course, which dealt with many of the obstacles facing Palestinian testing laboratories in the field of metrology.

The closing ceremony was attended by the PSI Director General, the Vice-President of Al-Najah National University and the President of Nablus Chamber of Commerce. The ceremony was covered by the media and I was awarded a trophy of the University by its Vice-President as an acknowledgment of my efforts in conducting this training course. See Figure 1.



Figure 1 Training course held at Al-Najah National University

- 2 Conducting a one-day seminar for PSI staff about the “Impact of legal metrology on the economy and society”. About 15 participants from PSI departments attended and the seminar was highly appreciated: it was proposed to repeat it in the future for PSI top management and stakeholders. The seminar covered the “History of metrology and the Metre Convention”, “the impact of metrology on the economy and society”, “Elements of quality infrastructure (QI)” and the “Jordanian metrology system”. See Figure 2.



Figure 2 Seminar at the PSI

- 3 General training on the following topics was given to PSI staff:

- Calibration and verification of volume measuring standards. See Figure 3;
- Calibration and verification of weighing instruments;
- Verification of clinical thermometers;
- Metrological cycles (type approval, conformity to type, initial verification, subsequent verification).



Figure 3 Training in calibration of volume measuring standards

- 4 Reviewing and discussing the Palestinian metrology regulations.
- 5 Discussing the proposal of establishing a one year diploma program in the field of metrology with the aid of Al-Najah National University. The details of this proposal are shown in Appendix 1 (Day 5, 2nd bullet).
- 6 Conducting three consultation visits to the following Palestinian testing laboratories and manufacturers:
- The testing laboratory at the Birzeit Pharmaceutical Company in Birzeit/Ramallah (see Figure 4);
 - The material testing laboratory in Ras Al-Jourah/ Hebron, named “Building Center-Consulting Material Testing, Engineering & Geotechnical Studies”. (see Figure 5);
 - The mass calibration laboratory at the Al-Taqqaddom Company, which is the biggest manufacturer of balances and weighing bridges in Palestine (See Figure 6). It was clearly noticed that the level of this company is advanced and that they are capable of manufacturing most kinds of class III balances. An in-depth discussion about OIML R 76, and Jordanian and Palestinian regulations took place during the meeting.



Figure 4 Birzeit Pharmaceutical Company



Figure 5 Building Center (Testing Laboratory)



Figure 6 Al-Taqaddom Manufacturing Company

At the final meeting, the Director General, the Director of the National Measurement Directorate, the Director of industrial metrology, the Director of legal metrology and the Director of national measurement standards evaluated the mission and expressed their deep gratitude to the OIML and to JISM for supporting Mr. Melhem's assignment; they hoped it could be repeated in the future. The Director General awarded Mr. Melhem with a PSI trophy as an acknowledgment of his efforts. See figure 7.

More details about the achievements are shown in Appendix 1.



Figure 7 Photos from the closing meeting

3 Meeting with PSI key persons

- Dr. Hazim Shounar, Director General of PSI;
- Eng. Jamal Swalha, Director of the National Measurement Directorate;
- Mr. Jalal Abu Baker, Director of industrial metrology department;
- Mr. Mohammad Sarhan, Director of legal metrology department;
- Eng. Ma'moun Sabah, Director of national measurement standards;
- Eng. Ahmad Al-Jalad, Director of accreditation directorate;
- Eng. Hidar Hejeh, Director of quality directorate.

Appendix 1

Details of Mr. Osama Melhem's visit to the Palestinian Standards Institution (PSI)

3–13 May, 2010

Day No.	Topic	Date
1	■ Meeting with the Director of the National Measurement Directorate and the Director of the Legal Metrology Department. ■ Review, modification and approval of the assignment agenda.	3 May
2	■ Meeting with the PSI Director General. ■ Discussion with the Director of the Accreditation Department and the Director of the National Measurement Directorate about cooperation between metrology and accreditation, as well as discussion of the Jordanian/German project concerning the "improvement of the services of the Jordanian medical laboratories" and how the Palestinians can benefit from it. ■ Starting the training of the calibration/verification of volume standards according to OIML Recommendations.	4 May
3	■ Continue the training on the calibration/verification of volume standards according to OIML Recommendations. ■ Theoretical training on the verification of clinical thermometers, based on OIML Recommendations.	5 May
4	■ Conducting a seminar for PSI staff about the impact and importance of legal metrology on the economy and society. About 15 participants from PSI departments attended; the seminar covered the following topics: ▷ History of metrology and the Metre Convention; ▷ Impact of metrology on the economy and society; ▷ Elements of a Quality Infrastructure (QI); ▷ Jordanian metrology system.	6 May
5	■ Starting the review of the legal metrology regulations and discussion about how to benefit from the Jordanian experience in this field and to adopt the Jordanian legal metrology regulations with some modifications. ■ Discussion of the idea of establishing a one year diploma program for metrology with the cooperation of Al-Najah National University. The proposed syllabus will include general mandatory topics, elective topics and a graduation project. The mandatory topics may include the following, each of which will count for two credit hours:	8 May

Day No.	Topic	Date
5	▷ Mathematics; ▷ Statistics; ▷ Physics; ▷ Computer skills; ▷ Quality control (ISO 9001, ISO 17025 and ISO 17020); ▷ Fundamentals of metrology (including metrological terminology, measurement units, regional and international metrology organizations, proficiency testing and inter-laboratory comparisons, etc.); ▷ Instrumentations (measuring instruments & control); ▷ National and international metrology systems and regulations; ▷ Calculations of measurement uncertainty. There will be additional specialized topics, from which students may choose six, each counting for two credit hours: ▷ Metrology of mass and related quantities (mass, force, pressure, volume, density, viscosity); ▷ Metrology of electricity and magnetism (DC, AC, HF, high current and high voltage); ▷ Metrology of length (wavelength and interferometry, dimensional metrology, angular measurement, forms, surface quality); ▷ Metrology of time and frequency; ▷ Metrology of thermometry (temperature measurement by contact, non-contact temperature measurement, humidity); ▷ Metrology of ionizing radiation and radioactivity (absorbed dose high level industrial products, absorbed dose medical products, radiation protection, radioactivity); ▷ Metrology of photometry and radiometry (optical radiometry, photometry, colorimetry, optical fibers); ▷ Metrology of flow (gas flow (volume), flow of water (volume, mass and energy), flow of liquids other than water), anemometry); ▷ Metrology of acoustics, ultrasonic and vibration (acoustic measurement in gases, accelerometry, acoustic measurement in liquids, ultrasound); ▷ Metrology of the amount of substance (environmental chemistry, clinical chemistry, material chemistry, food chemistry, biochemistry, micro biology, ph measurement). At the end of the year, each student shall conduct an applied project, which counts for three credit hours. This proposal will be discussed and finalized with the aid of the Al-Najah National University. In principal, the University will be the custodian of this program, while the PSI will provide the specialized trainers and practical training for the students.	8 May
6	■ Calibration of weighing bridges, based on OIML R 76. ■ Preparation for the training course "Calculations of measurement uncertainty".	9 May
7, 8	■ Conducting a training course on "Calculation of measurement uncertainty", based on the GUM. 63 participants from accredited laboratories, universities, industry and the PSI attended. ■ The training course covered the following topics: ▷ Introduction to metrology; ▷ Metrological terms and definitions; ▷ Measurement errors; ▷ Normal distribution and standard deviation;	10 & 11 May

Day No.	Topic	Date
7, 8	▷ Other types of distributions; ▷ Pooled standard deviation; ▷ Type A and Type B errors; ▷ Uncertainty calculations from repeatability; ▷ Uncertainty calculations for the average value; ▷ Uncertainty calculations from the measuring tools; ▷ Uncertainty calculations from repeatability and measuring tools; ▷ Uncertainty calculations from unlimited sources of uncertainty; ▷ Calculations of coverage factor based on the degrees of freedom; ▷ Results reporting; ▷ Results evaluations.	10 & 11 May
9	■ Site visits to the Palestinian laboratories and to industry were carried out for the sake of identifying their needs and providing some consultations. The visits included the following laboratory and manufacturers: 1- Birzeit Pharmaceutical Company in Birzeit/Ramallah 2- Building Center (Consulting Material Testing, Engineering & Geotechnical Studies) in Ras Al-Jourah/Hebron. 3- Al-Taqaddom Company (Manufacturer of balances and weighing bridges) in Hebron. The site visits focused on national metrological regulations, traceability of measuring instruments, and cooperation between the laboratories/manufacturers and PSI. The visits were very rewarding and highly appreciated by the top management of these laboratories/manufacturers.	12 May
10	■ Meeting with the staff of the Metrology Department and continuing the discussion regarding legal metrology regulations and future cooperation between PSI and JISM. ■ Closing meeting with the PSI Director General, the Director of the National Measurement Directorate, the Director of the Legal Metrology Department, the Director of the National Measurement Standards, the Director of Industrial Metrology and the Director of the Quality Department. As a result of the evaluation, the PSI Director General expressed his deep gratitude to the OIML and to JISM for supporting the metrology system and hoped that this kind of cooperation and support will continue in the future.	13 May

CAFMET

Third International Metrology Conference CAFMET 2010

Cairo, Egypt - 19-23 April 2010

REPORT BY CAFMET

With the organization of the Third International Conference of Metrology in Cairo, the African Committee of Metrology was able to develop its activity at a pace above and beyond its expectations: 117 scientific papers, 90 selected oral presentations (compared to 80 in 2008), 16 training workshops (compared to 8 in 2008), a variety of exhibitors, nearly 200 registered individuals from 50 different countries (compared to 25 countries represented in 2008). These factors guaranteed the success of this event.

Unexpectedly, three days before the opening of the conference, the Icelandic volcano Eyjafjallajökull started its activity on April 15, 2010. Due to the air traffic disruption in more than 100 airports in Northern Europe for nearly one week, we had to cope with a significant number of



missing speakers who were not able to reach Cairo. Each day we had to adjust the program of the conference according to the arrivals, delays and cancellations of the participants. Of the 16 training workshops initially scheduled, only six could be held.

The members of CAFMET are satisfied with the Cairo event, and in particular with the welcome

provided by the NIS team (National Institute of Standards), co-organizer of the event. We are also grateful to the PTB (German National Institute of Metrology) and UNIDO (United Nations Industrial Development Organization) for supporting a significant number of Africans to benefit from the metrological workshops.

The President of CAFMET announced the next host country for the 4th International Conference on Metrology CAFMET 2012: Morocco. Abdellah Nejjar, Director of Standardization and Quality Promotion from the Ministry of Industry, Trade and Upgrading of the Economy of Morocco, was one of our honored guests during the event. He closed the Third International Conference on Metrology CAFMET 2010 welcoming the good news and expressing the support from the Kingdom of Morocco.

The 4th International Conference of Metrology will take place in 2012 in Marrakech, Morocco

WELMEC**26th WELMEC
Committee Meeting****Bled, Slovenia
6–7 May 2010****GREGA KOVAČIČ**
WELMEC Secretary**Introduction**

The 26th WELMEC Committee meeting was opened by Ms. Nataša Mejak Vukovič (WELMEC Chairperson) who thanked Slovenia for its invitation to hold the meeting in Bled, Slovenia and presented Mr. Grega Kovačič as the new WELMEC Secretary.

On the occasion of the 20th Anniversary of WELMEC its first Chair Mr. Seton Bennett shared his memories of the early days of WELMEC. The first WELMEC meeting was held on 8 June 1990 in Bern, Switzerland when the Memorandum of Understanding

was signed by 13 WELMEC founder members and seven Working Groups were established.

The main topic of the meeting was the discussion and final approval of the WELMEC Strategy 2010 which replaced the strategy plan from 2003. Since 2003 WELMEC has encountered many new challenges which have now been reflected in the new strategy document. Following the enlargement of the EU, 12 Associate Members were accepted as new WELMEC Members. During the last four years the Measuring Instruments Directive (MID) has given WELMEC many new additional tasks and an expanded working program. WELMEC Working Groups have developed a number of Guides which are recognized by the European Commission as reference documents on the basis of a statement from the European Commission about cooperation with WELMEC in 2004. Right now WELMEC is heavily engaged in the preparation of proposals for a possible revision of the MID. In its future work WELMEC should take into account the implications of the New Legislative Framework and the Directive on Services in the Internal Market.

The Committee has identified WELMEC's vision which is to be the primary source for trusted advice on legal metrology issues. It was further agreed that WELMEC's mission is to develop and maintain mutual acceptance among its members and to maintain effective cooperation to achieve a harmonized and consistent approach to societies' needs for legal metrology and for the benefit of all stakeholders including consumers and businesses.



Picture 1: Delegates attending the 26th WELMEC Committee Meeting

The new WELMEC strategy document contains the goals, strategies and actions for its execution. Procedures for WELMEC activities and guidelines for WGs were also adopted. All the documents mentioned are published on the WELMEC web site.

Due to the result of the query on the possible continuation of the Type Approval Agreement (obsolete after the MID entered into force) it was decided to withdraw the WELMEC Type Approval Agreement for the time being. As a consequence it was agreed that WELMEC should focus on facilitating the application of Regulation 764/2008/EC on Mutual Recognition and to utilize the Type Approval Agreement where appropriate.

The Committee recognized the need to assist WELMEC Associate Members to develop additional competence in legal metrology as quickly as possible. Therefore it was agreed to draw up the Working Program in this respect in the near future, in accordance with the suggestions collected by the Associates.

The Committee elected Mr. Tuomo Valkeapää from Finland as a new WELMEC Vice-Chairperson for the next 3 years. Ms. Nataša Mejak Vuković thanked Ms. Corinne Lagauterie for her work as Vice-Chairperson during last 6 years.

The financial report for 2009 was approved and financial guidelines on travel expenses were adopted.

The following representatives of WELMEC Observers gave presentations on the key developments in their organizations last year:

- EURAMET presented by Prof. Leslie Pendrill, EURAMET Chair,
- OIML presented by Mr. J.F. Magaña, Director of BIML,
- European Commission, DG Enterprise and Industry presented by Mr. Daniel Hanekuyk,
- EA presented by Mr. Boštjan Godec from the Slovenian Accreditation Service,
- AFRIMETS presented by Mr. Katima Temba from National Regulator Compulsory Standards, South Africa,
- CEN-CENELEC presented by Luc van den Berge from the CEN-CENELEC Management Centre.

Working Group Reports

Working Group 2 (Directive Implementation (2009/23/EC))

Mr. Gulian Couvreur presented the report and working program. WG2 has provided an extensive contribution on the possible MID revision where the issue of the integration of Directive 2009/23/EC into the MID was

discussed intensively, with divided opinions. The revision of WELMEC Guide 2.8 will be ready for approval at the next WELMEC Committee meeting.

The Cross Reference Table 2004/22/EC vs. OIML R 51-1 which was prepared by WG2 was approved by the Committee.

Working Group 4 (General Aspects of Legal Metrology)

Mr. Knut Lindlov presented the report and working program. There has been no WG meeting since the last Committee meeting. The WG will continue to provide the WELMEC Secretariat with available information on the use of accuracy classes in regulations (to be done by the WG convener).

The Committee agreed to review the Terms of Reference of WG4 due to its envisaged commitment to analyze and respond to the challenges of legal metrology which was recently identified as one of the WELMEC strategy goals.

Working Group 5 (Metrological Supervision)

The report and working program was presented by Mr. Ian Turner. Work has begun on updating Guide 5.2 to reflect Regulation (EC) No. 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No. 339/93. The work accomplished will be presented at the Committee meeting in 2011. WG 5 continues to promote the role of the new WG5 website for the purpose of information exchange for market surveillance and aims at compiling the official Member States market surveillance plans on the website.

Working Group 6 (Prepackages)

Mr. Howard Burnett presented the report and working program. The Committee approved the revision of WELMEC Guide 6.0 *Introduction to WELMEC Documents on Pre-packages*, Issue 3. It was decided that WELMEC Guide 6.10 *Control on Pre-pecked Product* should be prepared with the information of all WELMEC members. Committee members confirmed their support for carrying out the importer's project and encouraged its members to participate in it.

Working Group 7 (Software)

Mr. Dieter Richter presented the report and work program. Committee agreed with WG7's proposal to act in order to improve a harmonized application of WELMEC Guide 7.2 on software. In this respect the proposed questionnaire to Notified Bodies was supported. Depending on the responses, a seminar for Notified Bodies could be an appropriate further step in order to improve knowledge of the software-related examination practice of Notified Bodies.

Concrete steps to support the better integration of the software-related essential requirements into harmonized standards were presented.

Working Group 8 (Measuring Instruments Directive)

The report and work program were presented by Ms. Corinne Lagauterie. The Committee approved the addendum to WELMEC Guide 8.4 and WELMEC Guide 8.9 *Common Application – Capacity Serving Measures*. Work on preparation of the Guide on statistics methods for module F and F1 is continuing and will be accomplished by the next Committee meeting.

The drafting of the proposals for the possible MID revision was the essential part of the work of WG8 in the period from the last Committee meeting. WG 8 has provided an extensive list of MID proposals.

Working Group 10 (Measuring Equipment for Liquids other than water)

The report and work program were presented by Ms. Anneke van Spronssen on behalf of Mr. Wim Volmer. The Committee decided not to have a separate Guide for test in situ for MI-005 instruments but to include the proposal in the future general Guide from WG10.

WG 10 has been heavily involved with drafting the list of proposals for the revision of the MID. As the membership of WG 10 consists of different stakeholders (Regulators, Notified Bodies and Manufacturer's Organizations), each having its own priorities, none of the presented proposals has unanimous WG support.

The e-mail voting procedure was agreed on for the Cross Reference Table 2004/22/EC vs. OIML R 117-1 which was prepared by WG10.

Working Group 11 (Utility Meters)

The report and work program were presented by Mr. Rainer Kramer. The Committee approved the revision of WELMEC Guide 11.1 Issue 4 and Guideline 11.2 on *Time depending consumption measurements for billing purposes (interval meter)*, both with some editorial modifications.

WG 11 has provided a valuable contribution to WELMEC proposals for the revision of the MID.

Ad hoc Working Group for Information Exchange

The report was presented by Mr. Harry Stolz. The Committee decided to close the Ad-Hoc WG for Information Exchange, and decided that the WELMEC Secretariat will take care of further checks and updates of the portal of the database for MID certificates. Therefore WG5 was asked to consider the proposal to have a dedicated user group to take care of any major questions concerning Information Exchange.

WELMEC & EURAMET MoU signed on the occasion of WELMEC Committee meeting on 6 May 2010 in Bled, Slovenia

EURAMET and WELMEC realize the importance of increased collaboration within the field of metrology in Europe. Both organizations have been strengthening their ties in recent years and this has been underlined by the signing of a Memorandum of Understanding between the two organizations. The MoU recognizes the role played by each organization in European metrology and the intention to collaborate closely in the future for the benefit of European metrology. ■



Picture 2: Ms. Nataša Mejak Vuković (WELMEC Chairperson) and Mr. Leslie Pendrill (EURAMET Chairperson) signing the MoU between WELMEC and EURAMET

Main decisions of the 26th WELMEC Committee meeting

- Accepted the Chairperson's Report,
- Took note about the finalized and open tasks from previous Committee meetings,
- Approved the financial reports for 2009 (after closing the Vienna account) with the additional reference to the external audit,
- Approved the subscriptions for 2011 to be the same as in 2010,
- Approved the financial guidelines on travel expenses in the amended version of the text established during the meeting,
- Elected Mr. Tuomo Valkeapää as the new Vice-Chair and thanked Ms. Corinne Lagauterie for her work as Vice-Chairperson during the last 6 years,
- Took note about the need to elect the new Chairperson in 2011,
- Approved the WELMEC Strategy Document in the amended version of the text established during the meeting,
- Asked the Chairperson to review the objectives of WELMEC within the coming year,
- Approved Procedures for WELMEC Activities in the amended version of the text established during the meeting,
- Approved Guidelines for Working Groups in the amended version of the text established during the meeting,
- Took note about the result of the query on Type Approval Agreement and agreed to withdraw the Type Approval Agreement for the time being,
- Took note of all WG Reports and Programs with a few modifications (WG2, WG5, WG11),
- Confirmed the Working Group 2 Terms of Reference without the reference to TAA,
- Approved the Correspondence Table OIML R 51/MID,
- Agreed to "put on hold" Working Group 4,
- Approved the revision of WELMEC Guide 6.0 *Introduction to WELMEC Documents on Prepackages*, Issue 3,
- Confirmed the support for carrying out the importer's project and encouraged members to participate in it,
- Decided that WELMEC Guide 6.10 *Controls on Prepacked Product* should be prepared with the information of all WELMEC Members,
- Supported the inquiry and proposal for the training for NB on software issues,
- Approved the addendum to WELMEC Guide 8.4,
- Approved the WELMEC Guide *Common Application – Capacity Serving Measures*,
- Decided not to have a separate Guide for test in situ for MI-005 Instruments but to include the proposal in the future general Guide from WG10,
- Decided to have an e-mail voting procedure on the Correspondence Table OIML R 117-1/MID,
- Approved the revision of WELMEC Guide 11.1 Issue 4 with editorial modifications,
- Approved the Guideline on *Time depending consumption measurements for billing purposes (interval meter)* with editorial modifications,
- Closed the Ad-Hoc WG *Information Exchange*,
- Decided that the WELMEC Secretariat takes care of further regular checks and updates of the portal of the database for MID certificates and asked WG5 to consider the proposal to have the dedicated user group take care of any major questions concerning Information Exchange.

OIML CERTIFICATE SYSTEM

List of OIML Issuing Authorities

The list of OIML Issuing Authorities is published in each issue of the OIML Bulletin. For more details, please refer to our web site: www.oiml.org/certificates. There are no changes since the last issue of the Bulletin.

	R 16	R 21	R 31	R 49	R 50	R 51	R 58	R 60	R 61	R 76	R 81	R 85	R 88	R 93	R 97	R 98	R 99	R 102	R 104	R 105	R 106	R 107	R 110	R 112	R 113	R 114	R 115	R 117/118	R 122	R 126	R 128	R 129	R 133	R 134	R 136
AT1	Bundesamt für Eich- und Vermessungswesen (BEV)																																		
AU1	National Measurement Institute (NMI)																																		
BE1	SPF Economie, PME, Classes Moyennes et Energie																																		
BG1	State Agency for Metrology and Technical Surveillance (SAMTS)																																		
BR1	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO)																																		
CH1	Office Fédéral de Métrologie (METAS)																																		
CN1	General Administration of Quality Supervision, Inspection and Quarantine of P. R. China (AQSIQ)																																		
CZ1	Czech Metrology Institute (CMI)																																		
DE1	Physikalisch-Technische Bundesanstalt (PTB)																																		
DK1	The Danish Accreditation and Metrology Fund (DANAK)																																		
DK2	FORCE Certification A/S																																		
DK3	Dansk Elektronik, Lys & Akustik (DELTA)																																		
ES1	Centro Español de Metrología (CEM)																																		
FI1	Inspecta Oy																																		
FR1	Ministère de l'Economie, de l'Industrie et de l'Emploi (MEIE)																																		
FR2	Laboratoire National de Métrologie et d'Essais (LNE)																																		
GB1	National Weights and Measures Laboratory (NWML)																																		
GB2	National Physical Laboratory (NPL)																																		
HU1	Hungarian Trade Licensing Office (MKEH)																																		
JP1	National Metrology Institute of Japan / National Institute of Advanced Industrial Science and Technology (NMIJ / AIST)																																		
KR1	Metrology and Measurement Division (KATS)																																		
NL1	NMI Certin B.V																																		
NO1	Norwegian Metrology Service (Justervesenet)																																		
NZ1	Measurement and Product Safety Service (MAPSS Wellington)																																		
PL1	Central Office of Measures (GUM)																																		
RO1	Bureau Roumain de Métrologie Légale (B.R.M.L.)																																		
RU1	Russian Research Institute for Metrological Service (VNIIMS)																																		
SE1	Swedish National Testing and Research Institute AB (S.P.)																																		
SI1	Metrology Institute of the Republic of Slovenia (MIRS)																																		
SK1	Slovak Legal Metrology																																		
US1	NIST																																		
VN1	Directorate for Standards and Quality (STAMEQ)																																		

All activities and responsibilities were transferred to FR2 in 2003

OIML Systems

Basic and MAA Certificates registered

2010.05–2010.08

Information: www.oiml.org section "OIML Systems"

The OIML Basic Certificate System

The *OIML Basic 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, which was initially called "OIML Certificate System", is now called the "OIML Basic Certificate System". The aim is for "OIML Basic Certificates of Conformity" to be clearly distinguished from "OIML MAA Certificates".

The System provides the possibility for manufacturers to obtain an OIML Basic Certificate and an OIML Basic Evaluation Report (called "Test Report" in the appropriate OIML Recommendations) indicating that a given instrument type complies with the requirements of the relevant OIML International Recommendation.

An OIML Recommendation can automatically be included within the System as soon as all the parts - including the Evaluation Report Format - have been published. Consequently, OIML Issuing Authorities may issue OIML Certificates for the relevant category from the date on which the Evaluation Report Format was published; this date is now given in the column entitled "Uploaded" on the Publications Page.

Other information on the System, particularly concerning the rules and conditions for the application, issue, and use of OIML Certificates, may be found in OIML Publication B 3 *OIML Certificate System for Measuring Instruments* (Edition 2003, ex. P 1) and its *Amendment* (2006) which may be downloaded from the Publications page.

The OIML MAA



In addition to the Basic System, the OIML has developed a *Mutual Acceptance Arrangement* (MAA) which is related to OIML Type Evaluations. This Arrangement - and its framework - are defined in OIML B 10-1 (Edition 2004) and its Amendment (2006), and B 10-2 (2004).

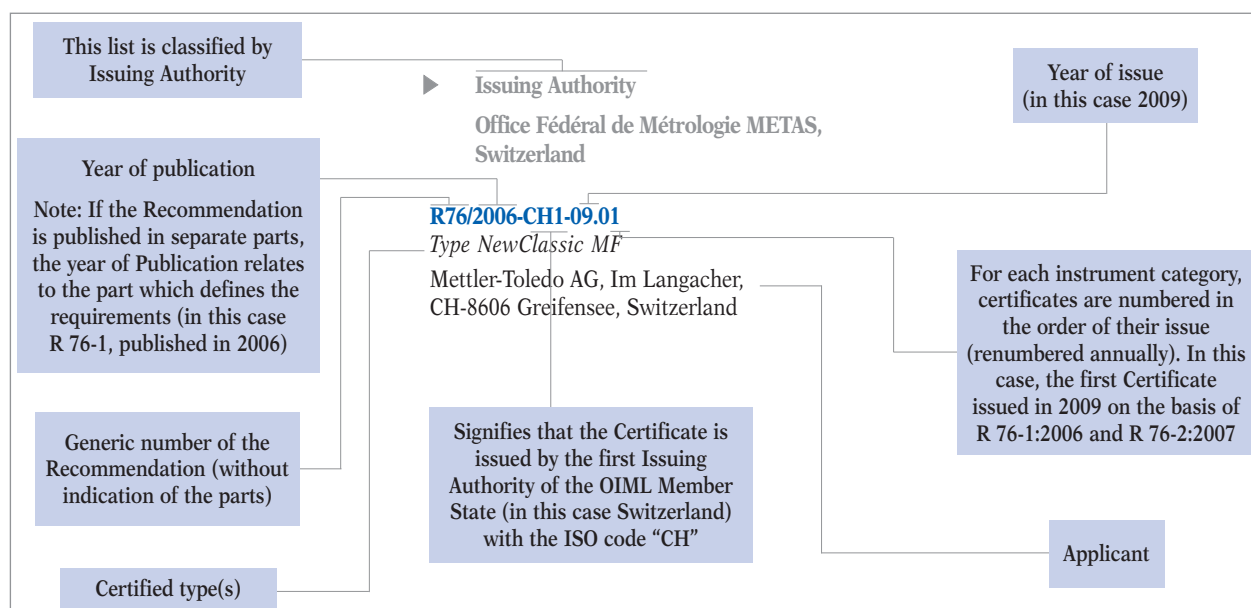
The OIML MAA is an additional tool to the OIML Basic Certificate System in particular to increase the existing mutual confidence through the System. It is still a voluntary system but with the following specific aspects:

- Increase in confidence by setting up an evaluation of the Testing Laboratories involved in type testing;
- Assistance to Member States who do not have their own test facilities;
- Possibility to take into account (in a Declaration of Mutual Confidence, or DoMC) additional national requirements (to those of the relevant OIML Recommendation).

The aim of the MAA is for the participants to accept and utilize MAA Evaluation Reports validated by an OIML MAA Certificate of Conformity. To this end, participants in the MAA are either Issuing Participants or Utilizing Participants.

For manufacturers, it avoids duplication of tests for type approval in different countries.

Participants (Issuing and Utilizing) declare their participation by signing a Declaration of Mutual Confidence (Signed DoMCs).



INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

**Water meters intended for the metering
of cold potable water**

R 49 (2006)

- Issuing Authority / *Autorité de délivrance*
Office Fédéral de Métrologie METAS, Switzerland

R049/2006-CH1-2007.04 Rev. 1

Concentric multi-jet impeller meter intended for the metering of cold and hot water (T30/T90) - Type: Messkapsel Vario S and Messkapsel Data

E. Wehrle GmbH, Obertalstrasse 8, DE-78120 Furtwangen, Germany

R049/2006-CH1-2007.05 Rev. 1

Concentric multi-jet impeller meter intended for the metering of cold and hot water (T30/T90) - Type: Messkapsel Vario S, Messkapsel Data, MTK-OZ IE, MTW-OZ IE, MTK-OZ MOE, MTW-OZ MOE, MTK-OZ MOC, MTW-OZ MOC, MTK-OZ MT, MTW-OZ MT, MTK-OZ SP, MTW-OZ SP, MTK-OZ AU, MTW-OZ AU

E. Wehrle GmbH, Obertalstrasse 8, DE-78120 Furtwangen, Germany

- Issuing Authority / *Autorité de délivrance*
FORCE Certification A/S,
Denmark

R049/2006-DK2-2010.01 (MAA)

Water meter, electro magnetic flowmeter - Type: MAG5100W DN50-150 with MAG8000CT

Siemens A/S Flow Instruments, Nordborgvej,
DK-6430 Nordborg, Denmark

- Issuing Authority / *Autorité de délivrance*
Laboratoire National de Métrologie et d'Essais,
Certification Instruments de Mesure, France

R049/2006-FR2-2010.03

*Electronic water meters CONTAZARA
Type CZTJ DN 50, 65, 80, 100, 125, 150, 200
CONTAZARA S.A, Carretera Castellon km 5.5,
ES-50720 Saragossa, Spain*

- Issuing Authority / *Autorité de délivrance*
National Weights and Measures Laboratory (NWML),
United Kingdom

R049/2006-GB1-2010.04 (MAA)

Family of cold water meters utilising a common, volumetric measuring element, with a nominal capacity of 5.5 revs/litre and having a rated permanent flowrate Q_3 of 10 m³/h.

Elster Metering Limited, Pondwicks Road, Luton LU1 3LJ,
Bedfordshire, United Kingdom

- Issuing Authority / *Autorité de délivrance*
NMI Certin B.V.,
The Netherlands

R049/2006-NL1-2010.01

Waterflux

Krohne Altometer, Kerkeplaat 12, NL-3313 LC Dordrecht,
The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic catchweighing instruments
*Instruments de pesage trieurs-étiqueteurs
à fonctionnement automatique*

R 51 (2006)

- Issuing Authority / *Autorité de délivrance*
NMI Certin B.V.,
The Netherlands

R051/2006-NL1-2010.02

Automatic catchweighing instrument - Type: MCW

Martini s.r.l. Processing & Packaging Machines, Via Borgo 21,
I-35015 Galliera Veneta Padova, Italy

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Metrological regulation for load cells
(applicable to analog and/or digital load cells)
Réglementation métrologique des cellules de pesée
(applicable aux cellules de pesée à affichage
analogique et/ou numérique)

R 60 (2000)

- Issuing Authority / Autorité de délivrance
 International Metrology Cooperation Office,
 National Metrology Institute of Japan
 (NMIJ) National Institute of Advanced Industrial Science
 and Technology (AIST), Japan

R060/2000-JP1-2010.01 Rev. 1 (MAA)

*Compression load cell - Type: DCC21-12T, DCC21-24T,
 DCC21-36T, DCC2-50T*

Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi,
 Japan

R060/2000-JP1-2010.06 (MAA)

*Load cells - Type: CC002-10T, CC002-20T, CC002-25T,
 CC002-30T, CC002-40T*

Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi,
 JP-251-8531 Kanagawa-ken, Japan

R060/2000-JP1-2010.08 (MAA)

*Load cells - Type: LB-XD-150L, LB-XD-300L, LB-XD-600L,
 LB-XD-1T, LB-XD-1,5T, LB-XD-2T, LB-XD-2,5T, LB-XD-4T,*

Kubota Corporation, 1-2-47 Shikitsu-higashi, Naniwa-ku,
 JP-556-8601 Osaka, Japan

R060/2000-JP1-2010.09 (MAA)

*Bending beam load cell - Type: UHB62-500, UHB63-500,
 UHB63-1T, UHB63-2T*

Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi,
 Japan

R060/2000-JP1-2010.10 (MAA)

*Compression load cell - ZR-5, ZR-10, ZR-20, ZR-20-KE,
 ZR-30, ZR-30-KE*

JFE Advantech Co. Ltd., 3-48 Takahata-cho, Nishinomiya,
 JP-663-8202 Hyogo, Japan

R060/2000-JP1-2010.11 (MAA)

*Bear (shear) load cell - Type: LB-XD-150L-EXM,
 LB-XD-300L-EXM, LB-XD-600L-EXM, LB-XD-1T-EXM,
 LB-XD-1,5T-EXM, LB-XD-2T-EXM, LB-XD-2,5T-EXM,
 LB-XD-4T-EXM, LB-XD-5T-EXM*

Kubota Corporation, 1-2-47 Shikitsu-higashi, Naniwa-ku,
 JP-556-8601 Osaka, Japan

R060/2000-JP1-2010.12 (MAA)

*Compression load cell - Type: CC1-H-10T, CC1-H-20T,
 CC1-H-25T, CC1-H-30T, CC1-H-40T, CC1-H-50T*

Kubota Corporation, 1-2-47 Shikitsu-higashi, Naniwa-ku,
 JP-556-8601 Osaka, Japan

R060/2000-JP1-2010.13 (MAA)

Beam (bending) load cell - Type: LBP-500L-FP1, LBP-1-FP1

A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku,
 JP-170-0013 Tokyo, Japan

- Issuing Authority / Autorité de délivrance
 National Weights and Measures Laboratory (NWML),
 United Kingdom

R060/2000-GB1-2005.06 Rev. 1

Stainless steel, compression load cell with digital output

Societa Cooperativa Bilanciai a.r.l, Via S. Ferrari N° 16,
 I-41011 Campogalliano, Modena, Italy

R060/2000-GB1-2005.07 Rev. 2

Stainless steel, compression strain gauge load cell

Societa Cooperativa Bilanciai a.r.l, Via S. Ferrari N° 16,
 I-41011 Campogalliano, Modena, Italy

R060/2000-GB1-2010.02 (MAA)

Beam Compression Load Cell Type B-XA

Jinan Jinzhong Electronic Scale Co. Ltd., N° 14, Yingxiongshan
 Road, Jinan, CN-250002 Shandong, P.R. China

R060/2000-GB1-2010.03

Stainless steel, compression strain gauge load cell

B & T Weighing System (Kunshan) Co. Ltd., Zhu Jia Wan Road,
 Zhou Shi Town, Kunshan, Jiangsu, P.R. China

- Issuing Authority / Autorité de délivrance
 NMi Certin B.V.,
 The Netherlands

R060/2000-NL1-2010.04 (MAA)

Compression load cell - Type: 116 and 116S

Tedea-Huntleigh or Vishay Transducers or Vishay Precision,
 8a Hazoran Street, New Industrial, IL-42506 Netanya, Israel

R060/2000-NL1-2010.05 (MAA)

A single point Load Cell - Type: LAD-A

Xiamen Loadcell Technology Co. Ltd., 5FL, No 20, Huli Park,
 Tongan Industry Central Zone, CN-361100 Xiamen, P.R. China

R060/2000-NL1-2010.06 (MAA)

A single point Load Cell - Type: LAE-A

Xiamen Loadcell Technology Co. Ltd., 5FL, No 20, Huli Park,
 Tongan Industry Central Zone, CN-361100 Xiamen, P.R. China



R060/2000-NL1-2010.07 (MAA)*A single point Load Cell - Type: LAB-B3*

Xiamen Loadcell Technology Co. Ltd., 5FL, No 20, Huli Park,
Tongan Industry Central Zone, CN-361100 Xiamen, P.R. China

- Issuing Authority / *Autorité de délivrance*
Physikalisch-Technische Bundesanstalt (PTB),
Germany

R060/2000-DE1-2009.09 Rev. 1*Strain Gauge bending beam load cell - Type: MP 79, MP 79T*

Sartorius Mechatronics T&H GmbH, Meiendorfer Strasse 205,
DE-22145 Hambourg, Germany

R060/2000-DE1-2009.11 Rev. 1*Strain gauge shear beam load cell - Type: FTP*

Laumas Elettronica S.r.l., Via 1 Maggio, 6, IT-43030 Basiicanova
Parma, Italy

R060/2000-DE1-2010.02*Strain gauge double bending beam load cell - Type: BM6G*

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC),
P.O. Box 2, CN-Hanzhong 723007, ShaanXi, P.R. China

R060/2000-DE1-2010.03*Strain gauge single point load cell - Type: PCB*

Flintec GmbH, Bemannsbruch 9, DE-74909 Meckesheim,
Germany

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments*Doseuses pondérales à fonctionnement automatique***R 61 (2004)**

- Issuing Authority / *Autorité de délivrance*
NMI Certin B.V.,
The Netherlands

R061/2004-NL1-2010.01*Automatic gravimetric filling instrument - Type: TE/-series*

Technipes S.r.l., Via Del Gelso, 12, I-47822 Santarcangelo di
Romagna, Italy

R061/2004-NL1-2010.01 Rev. 1*Non-automatic weighing instrument - Type: TE/-series*

Technipes S.r.l., Via Del Gelso, 12, I-47822 Santarcangelo di
Romagna, Italy

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments*Instruments de pesage à fonctionnement non automatique***R 76-1 (1992), R 76-2 (1993)**

- Issuing Authority / *Autorité de délivrance*
National Weights and Measures Laboratory (NWML),
United Kingdom

R076/1992-GB1-2007.03 Rev. 3*NCR 7878-2000 and 7874-5000 non-automatic weighing instruments*

NCR Corporation, 2651 Satellite Blvd, US-30096 Georgia,
Duluth, Georgia, United States

R076/1992-GB1-2010.01 Rev. 1*XM Series, Models XM 100, XM 200, XM 400 and XM 500 non-automatic weighing instruments*

Avery Berkel, Foundry Lane, Smethwick B66 2LP,
West Midlands, United Kingdom

R076/1992-GB1-2010.01 Rev. 2*XM Series, Models XM 100, XM 200, XM 400, XM 500, XM 601 and XM 603 non-automatic weighing instruments*

Avery Berkel, Foundry Lane, Smethwick B66 2LP,
West Midlands, United Kingdom

- Issuing Authority / *Autorité de délivrance*
NMI Certin B.V.,
The Netherlands

R076/1992-NL1-2010.01 Rev. 2*Non-automatic weighing instrument - Type: T32M... / T32XW... / T22M...*

Ohaus Corporation, 19A Chapin Road, US-NJ 07058 Pine Brook,
United States

R076/1992-NL1-2010.12 (MAA)*Non-automatic weighing instrument - Type: DS-685..*

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry
Developmental Zone, Jin Shan County, CN-201505 Shanghai,
P.R. China

R076/1992-NL1-2010.14*Non-automatic weighing instrument - Type: FM-62xB*

Fook Tin Technologies Ltd., 4/F Eastern Center,
1065 King's Road, Quarry Bay, HK-Hong Kong, Hong Kong

R076/1992-NL1-2010.15

Non-automatic weighing instrument - Type: CL5000-B, CL5000-P, CL5000-R, CL5000-H, CL5000-G, CL5000-S and CL5000-J-CB, CL5000-J-CP, CL5000-J-CR, CL5000-J-CH, CL5000-J-CS series

CAS Corporation, #19, Ganap-ri, Gwangjuk-Myoun, Yangju-Si, KR-482-841 Gyeonggi-Do, Korea (R.)

R076/1992-NL1-2010.15 Rev. 1

Non-automatic weighing instrument - Type: CL-5000-B, CL-5000-P, CL-5000-R, CL-5000-H, CL-5000-G, CL-5000-S and CL-5000J-CB, CL-5000J-CP, CL-5000J-CR, CL-5000J-CH, CL-5000J-CS Series

CAS Corporation, #19, Ganap-ri, Gwangjuk-Myoun, Yangju-Si, KR-482-841 Gyeonggi-Do, Korea (R.)

R076/1992-NL1-2010.16 (MAA)

Non-automatic weighing instrument - Type: FZ-i series

A&D Instruments Ltd., 24 Blacklands Way, Abingdon Business Park, Abingdon OX14 1DY, Oxfordshire, United Kingdom

R076/1992-NL1-2010.17 (MAA)

Non-automatic weighing instrument - Type: WB-260A or WB-260MA

Tanita Corporation, 14-2, 1-Chome, Maeno-cho, Itabashi-ku, JP-147-8630 Tokyo, Japan

R076/1992-NL1-2010.19

Non-automatic weighing instrument - Type: DS-500 and DS-502

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jin Shan County, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.20 (MAA)

Non-automatic weighing instrument - Type: DS-676

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jin Shan County, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.22 (MAA)

Non-automatic weighing instrument - Type: NTP-UNI

Ishida Co. Ltd., 44, Sanno-cho, Shogoin, Sakyo-ku, JP-606-8392 Kyoto, Japan

R076/1992-NL1-2010.24

Non-automatic weighing instrument - Type: AW4600...

Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Non-automatic weighing instruments

Instruments de pesage à fonctionnement non automatique

R 76-1 (2006), R 76-2 (2007)

- Issuing Authority / Autorité de délivrance
Office Fédéral de Métrologie METAS, Switzerland

R076/2006-CH1-2009.01 Rev. 1 (MAA)

Non-automatic weighing instrument - Newclassic MF
Mettler-Toledo AG, Im Langacher, CH-8606 Greifensee, Switzerland

- Issuing Authority / Autorité de délivrance
NMI Certin B.V.,
The Netherlands

R076/2006-NL1-2010.13

Non-automatic weighing instrument - Type: 830x / 840x (where x represents a number from 0 to 9)

Datalogic Scanning, Inc., 959 Terry Street, US-Oregon 97402-9150 Eugene, United States

R076/2006-NL1-2010.21 (MAA)

Non-automatic weighing instrument - Type: DI-990

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jin Shan County, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2010.26 (MAA)

Indicator, as a part of a non-automatic weighing instrument - Type: Flex

Penko Engineering BV, Schutterweg 35, NL-6718 XC Ede, The Netherlands

R076/2006-NL1-2010.27

Non-automatic weighing instrument - Type: DI-2500

Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jin Shan County, CN-201505 Shanghai, P.R. China

- Issuing Authority / Autorité de délivrance
Physikalisch-Technische Bundesanstalt (PTB),
Germany

R076/2006-DE1-2009.01 Rev. 1

Non-automatic electromechanical weighing instrument - Type: MSX

Sartorius A.G., Weender Landstrasse 94-108, DE-37075 Göttingen, Germany

**OIML Certificates,
Issuing Authorities,
Categories, Recipients:**

www.oiml.org

R076/2006-DE1-2010.01

Non-automatic weighing instrument for direct sales to the public - Type: SC II...

Bizerba GmbH & Co. KG, Wilhelm-Kraut-Strasse 65,
DE-72336 Balingen, Germany

► Issuing Authority / Autorité de délivrance

Russian Research Institute for Metrological Service
(VNIIMS)

R076/2006-RU1-2010.03

Axle truck scales "VA-P"

JSWMC "TENSO-M", 38, Vokzalnaya str, Kraskovo,
Ljuberezhskii district, RU-Moscow region 140050,
Russian Federation

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Fuel dispensers for motor vehicles

Distributeurs de carburant pour véhicules à moteur

R 117 (1995) + R 118 (1995)

► Issuing Authority / Autorité de délivrance

National Weights and Measures Laboratory (NWML),
United Kingdom

R117/1995-GB1-2010.01

Liquids other than water dispenser, designated Frontier - Accuracy class 0.5

Gilbarco Veeder Root, Crompton Close, Basildon SS14 3BA,
Essex, United Kingdom

R117/1995-GB1-2010.02

Liquids other than water dispenser, designation Sprint - Accuracy class 0.5

Gilbarco Veeder Root, Crompton Close, Basildon SS14 3BA,
Essex, United Kingdom

R117/1995-GB1-2010.03

Liquids other than water dispenser, designation Horizon

Gilbarco Veeder Root, Crompton Close, Basildon SS14 3BA,
Essex, United Kingdom

► Issuing Authority / Autorité de délivrance

Russian Research Institute for Metrological Service
(VNIIMS)

R117/1995-RU1-2010.01

GVR Fuel Dispensing Pump SPRINT series / Z-line series / Pace-Maker-IV series

Gilbarco Veeder Root India Private Ltd. (GVR),
10, Thakur Niwas, 173, J, Tata Road, Churchgate,
IN-400020 Mumbai, India

R117/1995-RU1-2010.02

GVR Extra Heavy Duty Pump-SPRINT Series

Gilbarco Veeder Root India Private Ltd. (GVR),
10, Thakur Niwas, 173, J, Tata Road, Churchgate,
IN-400020 Mumbai, India

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Evidential breath analyzers

éthylomètres

R 126 (1998)

► Issuing Authority / Autorité de délivrance

Centro Español de Metrologia, Spain

R126/1998-ES1-2009.02 Rev. 1

Evidential breath analyzers SAF'IR Evolution

ACS (Alcohol Countermeasures Systems), 60, International Blvd,
CA-Ontario M9W 6J2, Toronto, Canada

► Issuing Authority / Autorité de délivrance

Laboratoire National de Métrologie et d'Essais,
Certification Instruments de Mesure, France

R126/1998-FR2-2010.02

Evidential breath analyser DRAGER pattern 7110 MKIII

Drager Safety AG & Co. KGAA, Revalstrasse 1,
DE-23560 Lubeck, Germany

INSTRUMENT CATEGORY

CATÉGORIE D'INSTRUMENT

Multi-dimensional measuring instruments

Instruments de mesure multidimensionnels

R 129 (2000)

► Issuing Authority / Autorité de délivrance

NMi Certin B.V.,
The Netherlands

R129/2000-NL1-2010.01

Multi-dimensional measuring instrument - Type: SPK-1000

Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku,
JP-146-8580 Tokyo, Japan



8th International Symposium

Metrology 2011

Havana, Cuba, May 2011

The National Metrology Research Institute is pleased to invite you to the **8th International Symposium "Metrology 2011"**, to be held on 18–20 May 2011 in the Havana Conference Center as an expression of the strong ties that exist between Cuban metrologists and their international counterparts.

Metrology 2011 will provide an excellent framework for exchange among researchers, technologists and, in general, specialists in measurement in order to share updated knowledge and results through scientific discussion on metrology, which is a science of unquestionable importance to develop research, production and services in any country.

Metrology 2011 will make it possible to exchange experiences on a wide range of subjects including metrology and health, the pharmaceutical industry and biotechnology, agriculture, energy and the environment, as well as a number of topics such as road safety, prepacked goods, scientific metrology, management systems in metrology, development of human resources, and some innovations in international metrology.

Pre-conference training courses on General Metrology and Volume Measurements have also been planned.

We look forward to welcoming you in the spring of 2011.



For further information, please contact:
metrologia2011@ncnorma.cu

Ing. Antonio Alfredo López Maidique
Director
INIMET
Consulado 206, CP 10200,
Ciudad de La Habana,
Cuba
Tel (537) 8620536
Fax (537) 8676966

The OIML is pleased to welcome the following new

■ CIML Members

- **Israel:**
Mr. Yitzhak (Itzik) Kimchi
- **Slovenia:**
Mr. Mirko Stopar
- **Tunisia:**
Mr. Mourad Ben Hassine

www.oiml.org

Stay informed

■ OIML Meetings

TC 3/SC 5 Conformity assessment

4–5 October 2010 (Paris, France)

TC 6 Prepackaged products

11–15 April 2011 (Tokyo, Japan)

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Joint BIPM-BIML Web Portal

■ Committee Drafts

Received by the BIML, 2010.06 – 2010.08

Revision of R 79: Labelling requirements for prepackaged products	E	1 CD	TC 6	ZA
International system for the certification of prepackages as complying with requirements for the quantity of product and associated labeling (Provisional title)	E	2 CD	TC 6	ZA
International Vocabulary of Terms in Legal Metrology (VIML 2)	E	2 CD	TC 1	PL
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VOLUME LI • NUMBER 4
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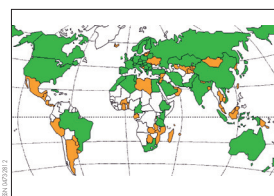


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VOLUME LI • NUMBER 3
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