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World Metrology Day 2017:
Measurements for transport

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■ Editorial

ROMAN SCHWARTZ
CIML FIRST VICE-PRESIDENT

OIML Certification System (OIML-CS)

For over 25 years, the OIML has operated certificate systems for the benefit of the various stakeholders in the legal metrology community. The Basic Certificate System was implemented in 1991 and was supplemented in 2005 by the introduction of the Mutual Acceptance Arrangement (MAA). The MAA was aimed at providing greater confidence and increased acceptance of OIML Certificates and their associated type evaluation reports through the peer evaluation of the Issuing Participants and the signing of Declarations of Mutual Confidence.

Following a seminar in 2013 to discuss the MAA and how it could be improved, significant work has taken place resulting in the development and approval of a *Framework* for a new OIML Certification System (OIML-CS), subsequently published as OIML B 18:2016.

The new OIML-CS will come into operation on 1 January 2018 and will replace the existing Basic and MAA systems. It will provide significant global benefits:

- manufacturers will benefit from a system that will provide increased confidence in OIML certificates and associated type evaluation reports, resulting in wider acceptance and reduced time to market;
- OIML Issuing Authorities will benefit from being able to demonstrate their competence, increased acceptance of the OIML certificates and associated type evaluation reports that they issue and from a level playing field when offering certification services to manufacturers;
- Utilizers and Associates will benefit from increased confidence in the OIML certificates and associated type evaluation reports, thus enabling them to implement or develop their national type approval systems without the need to invest in test facilities;
- lastly, the OIML itself will benefit from having a new system with a clearly defined management structure tasked with ensuring the effective implementation and operation of the system.

As Peter Mason's article on page 25 points out, certification of measuring instruments is an important part of the broader Quality Infrastructure landscape. Further work is ongoing to implement the new OIML-CS (see page 28) in readiness for 1 January 2018 and various activities are being planned to promote its benefits. The first key event is a Seminar to be held in Shanghai on 15 June 2017. I would encourage anyone to attend who has an interest in the benefits that OIML certification can bring. ■

CALIBRATION OF WEIGHTS

Uncertainty contribution due to eccentricity

Pablo Canalejo Cabrera, Internacional de Bienes, Servicios e Ingeniería S.A. de C.V. (IBSEI)

Augusto Maury Toledo, MESS Servicios Metrológicos, S. de R.L de C.V.

Abstract

This paper discusses the formula C.6.4.3 recommended by Annex C of OIML R 111 to estimate the contribution to uncertainty due to eccentricity loading when weights are manually placed on the load receptor and manually exchanged. The discussion is based on the assumption that the use of such a formula leads to an underestimation of the uncertainty. A calibration of an M_1 20 kg rectangular weight is used as example. In order to improve the formula and avoid any underestimation, amendments are proposed.

1 Introduction

Most accredited laboratories for the calibration of weights in Mexico define their uncertainty budgets in accordance with the national calibration guideline [1] which is based on OIML R 111-1 [2].

Annex C of OIML R 111-1 provides the formulae to calculate each relevant contribution to the uncertainty of a calibrated weight, which can be used depending on the accuracy class of the weight under test, type and number of weighing cycles, weights exchange, and other calibration situations.

This paper focuses on the uncertainty contribution due to eccentric loading (u_E) when the calibration involves the manual exchange of weights. According to R 111, to calculate this contribution, formula C.6.4.3 should be used.

After many years of practice in calibrating weights and calculating errors and uncertainties according to R 111, the authors have noticed that formula C.6.4.3 may lead to an underestimation of the uncertainty. Thus, they believe it should be improved. A discussion of the formula is presented in this paper and some amendments are proposed to avoid any underestimation.

2 Uncertainty due to eccentricity

According to R 111, the acceptable solution for the calculation of the uncertainty due to eccentricity, where the exchange of weights has to be done manually, is to use the following formula:

$$u_E = \frac{\frac{d_1}{d_2}D}{2\sqrt{3}} \qquad (1)$$

Formula (1) is the above-mentioned formula described in Annex C.6.4.3 of R 111, where:

D is the difference between the maximum and minimum values from the eccentricity test performed according to OIML R 76-2 [3];

d_1 is the estimated distance between the centers of the weights under comparison; and

d_2 is the distance from the center of the load receptor to one of the corners.

In those cases where the eccentricity effect is not covered by the uncertainty of the weighing process, this contribution has to be calculated using formula (1) and has to be considered in the uncertainty budget.

2.1 Distance d_1

During calibration, the weight under test (T) and the reference weight (R) should be placed in the same position, usually by matching the geometric center of their respective bases with the geometrical center of the load receptor of the mass comparator.

Scales with devices designed to achieve manual centering of the weights are available on the market (see Figure 1).

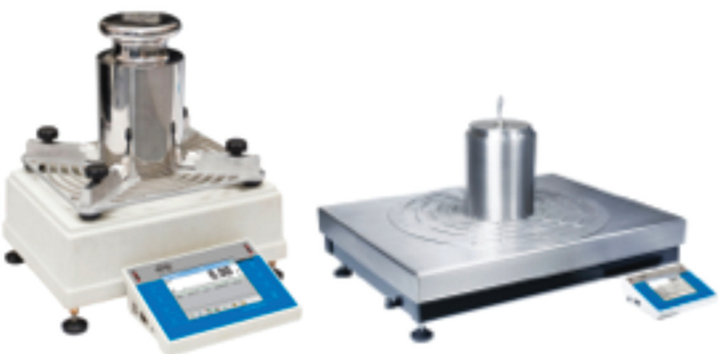

Figure 1 Scales with centering devices

Where such scales are not available, it is common to mark the load receptors in some convenient way that does not affect the measurement process.

The eccentric loading effect is manifested when the geometric centers of the bases of the weights being compared are placed in different positions on the load receptor. The difference between the positions of the geometric centers of the bases of both weights on the load receptor is the distance d_1.

Figure 2 shows the distance d_1 when a parallelepiped weight (T) with a rectangular shaped base is compared with a cylindrical weight of circular base (R), a typical example of a calibration of 5 kg, 10 kg and 20 kg M_1 weights.

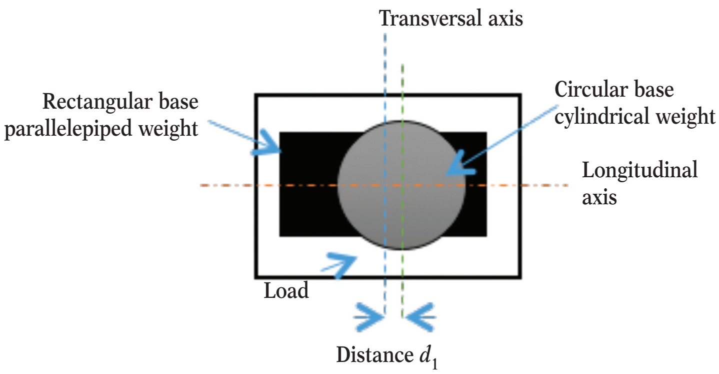

Figure 2 Distance d_1

Distance d_1 could be different when several comparisons are carried out by the same operator or by different operators. Variability in the value of d_1 depends on the skills of the operators, even their mood and physical capacities during calibrations.

To measure and record the value of d_1 at each calibration is not practical. It is much more convenient to estimate the greater obtainable value for d_1 by carrying out measurements with each operator, scale and nominal value of weights that a laboratory is able to calibrate. Measurements must be repeated at certain intervals for confirmation purposes.

For the calibration situation shown in Fig. 2 a practical procedure to determine d_1 could be the following:

- measure the diameter of the cylindrical base of R, (ϕ),
- measure the longer length at the rectangular base of T (L_M),
- place T as centered as possible, with the longer side along the longitudinal axis of the load receptor,
- measure the distance between the right edge of T and the right edge of the load receptor along the longitudinal axle, (L_B),
- withdraw T and place R instead, as centered as possible,
- measure the distance between the right edge of R and the right edge of the load receptor along the longitudinal axis, (L_A).

The distance d_1 can then be estimated by the following equation:

$$d_1 = \left|\left(L_B + \frac{L_M}{2}\right) - \left(L_A + \frac{\phi}{2}\right)\right| \quad (2)$$

Table 1 shows the results obtained at IBSEI in one of the experiments carried out to determine the distance d_1 for M_1 20 kg weights, with three different operators. The values are expressed in mm and uncertainties are not included, as this is not relevant.

Table 1 Measuring distance d_1 (mm)

Diameter of the circular base of R (ϕ)				128
Longer length at the rectangular base of T (L_M)				230
Operator	Measurement	L_A	L_B	d_1
1	1	123	55	17
	2	105	69	15
	3	112	72	11
	4	122	60	11
	5	130	67	12
	6	110	74	15
2	1	130	63	16
	2	110	73	14
	3	120	54	15
	4	122	55	16
	5	125	60	14
	6	130	68	11
3	1	110	40	19
	2	109	45	13
	3	112	41	20
	4	108	72	15
	5	120	55	14
	6	106	48	7
Greater value for distance d_1				20

2.2 Distance d_2

OIML R 111 defines d_2 as the distance from the center to one of the corners of the load receptor.

For scales with circular load receptors the authors consider that such a definition is not quite appropriate. In that case it would be more appropriate to define d_2 as the radius of the load receptor, as there are no corners in circular load receptors.

The eccentric loading effect is quantified by the value *D* and, as mentioned before, it is defined as the difference between maximum and minimum values obtained when the eccentricity test of the scales is performed according to OIML R 76-2.

Where the *D* value is obtained from the measurement results at two adjacent points on the load receptor (i.e. zones 2 and 3 in Fig. 3), it could be reasonable to define d_2 as the distance between those two adjacent points, represented by d'_2 instead of d_2.

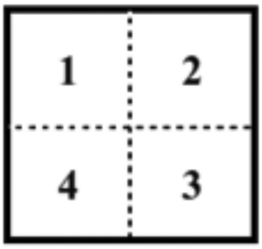

Figure 3 Weighing zones for the eccentricity test according to OIML R 76

The numbers in Figure 3 identify the center points of the load zones defined to the eccentric load test performed according to OIML R 76.

Figure 4 shows the distances d_2 and d'_2 for a square load receptor, d_2 being the current definition specified in OIML R 111 and d'_2 the distance between two adjacent points where the load is placed when the eccentricity test is performed.

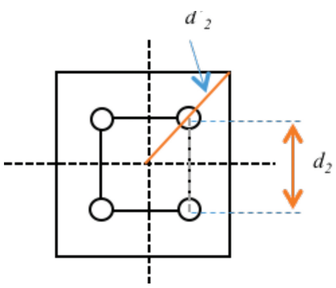

Figure 4 Distances d_2 and d'_2 for a square load receptor

From simple calculations for the square and rectangular load receptors d'_2 can be estimated as √2 times lower than d_2. For rectangular load receptors d'_2 can be obtained as a half of the shorter side of the load receptor.

For instance, in a circular load receptor having a diameter of 20 cm, d_2 would be the radius = 10 cm and d'_2 is 10/√2 ≈ 7 cm. Thus, $d'_2 / d_2 \approx 0.7$ or $d'_2 \approx d_2 / \sqrt{2}$.

Using d'_2 instead of d_2, formula C.6.4.3 gives an incremented result, which confirms the hypothesis of an underestimation.

If *D* would be defined in a different way, d_2 could also be defined in a different way, but in all cases the distance d_2 seems to be shorter than that from the center to the edge of the load receptor. For instance, defining *D* as the absolute value of the maximum indication error obtained at any of the load zones, the maximum value of d_2 could be, for a square load receptor, the distance between the center of the load receptor and the center of any of the load zones.

An overestimation of d_2 leads to an underestimation of u_E.

2.3 Difference *D*

As mentioned above, *D* is defined as the difference between the maximum and minimum values from the eccentricity test performed in accordance with OIML R 76-2.

Since the eccentricity test in subclause 3.1 of OIML R 76-2 refers to corrected errors (E_c) compared with the maximum permissible errors specified in OIML R 76-1 [4], in the authors' opinion the definition of *D* is limited and confusing.

According to R 76, the maximum and minimum values are corrected errors calculated as follows:

$$E_c = E - E_0 \quad (3)$$

where:

E = $I + ½\,e - \Delta L - L$, is the corrected error for the eccentricity test load,

I the corresponding balance indication,

e the verification scale,

ΔL the additional load added to the load receptor in steps of 1/10 e to obtain a change from I to I + e,

L the eccentricity test load, and

E_0 the corrected error calculated at zero or a load close to zero (e.g. 10 e).

One of the limits for the definition of *D* given in OIML R 111 is that corrected errors can only be obtained in scales with $d \geq 1$ mg. Many calibration weight laboratories use balances with $d < 1$ mg. Another limit is that the difference between the corrected errors may be zero even if there is an eccentric loading error with respect to the center of the load receptor. According to R 76, the load is not located at the center of the load receptor.

Thus, in the authors' opinion D should be redefined as the absolute value of the maximum difference between the indications obtained at the off center load zones with respect to the center of the load receptor as specified in Euramet cg 18 [5].

On the other hand, D is evaluated using a test load close to 1/3 of Max, but eccentricity is a load dependent effect.

Formula C.6.4.3 (Eq. 1) does not take into account such load dependence effect, thus, assuming linearity, in the authors' opinion the following correction factor should be added:

$$f = \frac{V_n}{L_T} \tag{4}$$

Where:

V_n is the nominal value of T, and
L_T is the test load used to perform the eccentric loading test.

The omission of the factor in formula C.6.4.3 confirms the hypothesis of an underestimation of the uncertainty.

3 Amendments to the formula

From 2.2 and 2.3 above, formula C.6.4.3 (see Eq. 1) could be rewritten as:

$$u_{\mathrm{E}} = \frac{f \dfrac{d_1}{d'_2} D}{2\sqrt{3}} \tag{5}$$

The difference between Eq. 1 and Eq. 5 could be significant, depending on the scope of calibration of each laboratory.

In the event that D remains as defined in OIML R 111, and $d'_2 \approx d_2 / \sqrt{2}$, Table 2 shows the difference between the values obtained using Eq. 1 and Eq. 5 for a 20 kg M_1 weight calibrated with a 20 kg × 0.1 g comparator with $d_1 = 20$ mm, $d_2 = 130$ mm and $D = 0.3$ g whose eccentric loading effect was evaluated using a 10 kg test load.

Similar calculations could be made using different definitions for D and d'_2 as mentioned in 2.2 and 2.3 above.

As can be seen, it is very important for the mass comparator to have a D value as close to 0 as possible. Currently, because of the use of R 111 formula in C.6.4.3, the eccentric loading uncertainty contribution is negligible even when D is as large as 3 d.

Table 2 Difference between Eq. 1 and Eq. 5

	Eq. 1	Eq. 5	Difference	Increment
u_E/g	0.013	0.038	0.025	290 %

4 Conclusions and future discussion

In those cases where the eccentricity effect is not covered by the uncertainty of the weighing process, in the authors' opinion the current acceptable solution (OIML R 111, Annex C, formula C.6.4.3) to estimate the uncertainty due to eccentric loading when manual exchange is used, leads to an underestimation of the uncertainty of the conventional mass of the calibrated weight.

The causes of such an underestimation are the inconsistent definitions of d_2 and D and the omission of a convenient factor to take the load dependence of the eccentric load into account.

To avoid this underestimation, the use of a new formula is proposed by the authors (Eq. 5).

The authors are interested in exchanging and in continuing such discussions with a view to a possible future review of Annex C of OIML R 111 and encourage feedback to this paper and ideas from other legal metrology professionals. ■

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[3] OIML R 76-2:2007 *Non-automatic weighing instruments. Part 2: Test report format*.

[4] OIML R 76-1:2006 *Non-automatic weighing instruments. Part 1: Metrological and technical requirements. Tests.*

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INFRASTRUCTURES

Metrological support of gas flowrate measurement in the Russian Federation

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1 Introduction

The Russian Federation is one of the leading exporters of natural gas. Metrological issues related to natural gas flowrate measurement are directly associated with the economical and industrial well-being of the country. Figure 1 shows the main global natural gas trade movements in 2015.

However, resolving these issues is not only a national task, it is the result of a consolidated interaction of the international metrological community. This article details the basic principles of metrological support for gas flowrate measurements in the Russian Federation in order to increase the effectiveness of cooperation between the international community and the Russian Federation in this field. The article comprises four main sections:

- federal laws of the Russian Federation directly or indirectly related to metrology;
- traceability of measurement results: this section contains issues related to the standards used in the Russian Federation in the field of gas flowrate measurement and the national standard specifying the state measurement chain for gas flowrate measuring instruments;
- a series of national and interstate standards specifying general issues arising during the performance of gas flowrate measurements; and
- recognition by the international metrological community: this section describes the cooperation of the leading gas flowrate measurement research institute (FGUP VNIIR) within the framework of Regional Metrology Organizations (RMOs) and the participation of FGUP VNIIR in global metrological projects.

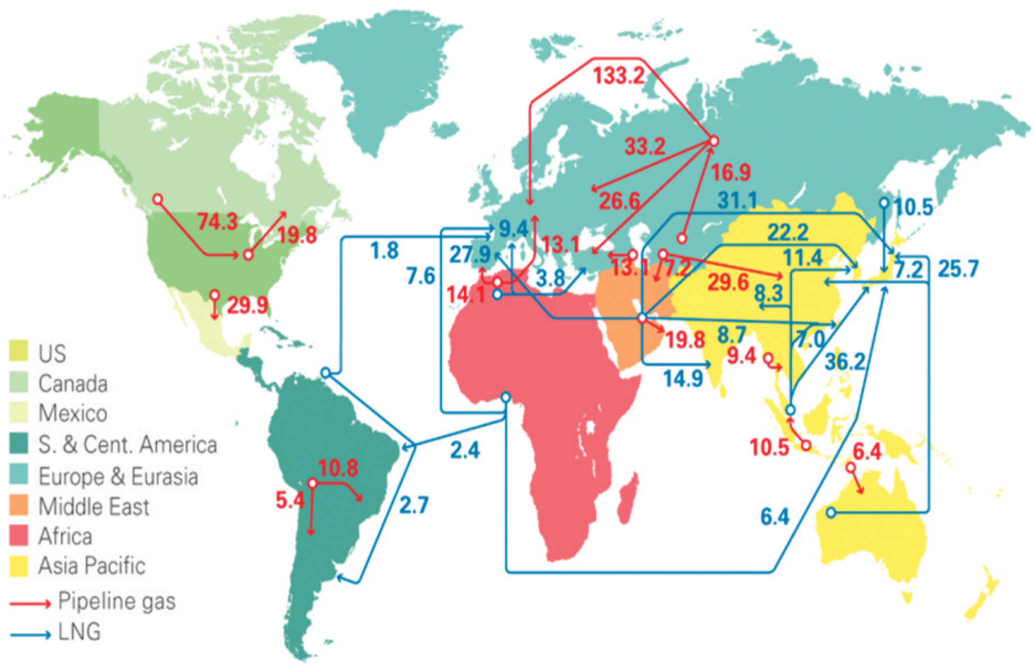

Figure 1: Natural gas trade movements in 2015 – trade flows worldwide (billion m^3)
(source: Includes FGE MENAgas service, GIIGNL, IHS, IHS Waterborne, PIRA Energy Group and Wood Mackenzie) [1]

2 Laws on metrology

Today, legislation in the Russian Federation contains a broad range of legal and normative regulations, adherence to which is aimed at ensuring the uniformity and accuracy of measurements. The legal framework of Russian metrology is presently determined at the highest possible level.

2.1 Constitutional provisions in the field of metrology

According to the Constitution of the Russian Federation (Article 71, r), standards, reference standards, the use of the SI and time measurement are under the jurisdiction of the Russian Federation. Thus, these provisions establish the centralized management of the general issues of legal metrology. These constitutional provisions were developed by the adoption of laws “Ensuring the uniformity of measurements” and “Technical regulation”, Decrees of the Russian Government on individual issues of metrological activity, and regulatory documents of the Rosstandart: technical guidelines, national, interstate and international standards, as well as the recommendations of the state metrological research institutes of the Rosstandart which specify the fundamental principles of metrological activity.

2.2 Law “On technical regulation”

This law was adopted in order to reduce the administrative and economic pressure exerted on manufacturers, to eliminate technical barriers in trade, to increase the effectiveness of market protection against hazardous products, and to facilitate the country’s accession to the WTO and the rapprochement of Russian codes in the field of technical regulations with international rules and regulations. This Federal Law establishes relations during the development, adoption, application and fulfilment of product requirements. It is aimed at eliminating redundancy in the mandatory requirements of standards, the removal of unreasonable barriers to business development, and at providing an acceptable level of product safety.

2.3 Law “On ensuring the uniformity of measurements”

The law of the Russian Federation “Ensuring the uniformity of measurements” establishes the legal framework for ensuring the uniformity of measurements; it also regulates the relations between the state authorities and legal bodies and individuals regarding the manufacturing, issuing, operation, repair and import of measuring instruments. It is aimed at protecting the rights and legal interests of citizens, establishing public order, protecting the economy, and avoiding the negative consequences of inaccurate measurement results. It promotes progress on the basis of the creation and application of state standards of physical units and harmonization of the Russian measurement system with universally accepted practice. It also establishes the State system for ensuring the uniformity of measurements (hereafter “GSI”) and determines mandatory metrological requirements for measurements performed in this field. For instance, the GSI field comprises:

- performance of activities in the field of health care;
- performance of environmental protection activities;
- trading and the performance of prepackaging;
- performance of activities in the field of national defense and safety; and
- other types of activities with a total of 19 items.

The law establishes the mandatory requirement that measurements made according to GSI must be performed using certified measurement procedures and measuring instruments of an approved type that have passed the verification process. In order to fulfil the requirements of this Federal Law the following orders have been issued by the Ministry for Industry and Trade:

- No. 4091 dated 15 December, 2015 “Establishment of the Order of certification of primary reference measurement procedures (methods), reference measurement procedures (methods) and their application”;
- No. 1081 dated 30 November, 2009 “Procedure for standard sampling or measuring instrument type approval testing and the procedure for issuing type approval certificates for standard samples or measuring instruments, setting or change of the validity term for the said certificates, verification intervals for the measuring instruments, and requirements for standard sample and measuring instruments type approval marks and the procedure of their application”; and
- No. 1815 dated 2 July, 2015 “Approval of the procedure for verification of measuring instruments, requirements for verification marks and contents of the verification certificate”.

These procedures are applied during the approval, testing and verification of measuring instruments.

2.3 Technical regulations

Technical regulations (TR) are adopted in order to protect individuals, legal bodies, state and municipal property and the environment. They also serve to prevent actions which may mislead consumers, they control the efficiency of the provision of energy and the efficient use of resources. The following TRs from the field of liquid and gaseous hydrocarbons transport are presently undergoing the acceptance procedure within the Eurasian Economic Union (EEU):

- EEU technical regulation “Safety of combustible natural gas prepared for transportation and (or) use”;
- EEU technical regulation “Requirements for liquefied hydrocarbon gases intended for use as fuel”; and
- EEU technical regulation “Requirements for main pipelines for transportation of liquid and gaseous hydrocarbons”.

3 State verification schedule and standards of the Russian Federation for gas flowrate measuring instruments

In accordance with the law of the Russian Federation “Ensuring the uniformity of measurements”, unit standards and measuring instruments used in the territory of the Russian Federation should be traceable to the national primary standards of the corresponding units. In order to implement the provisions of the law, state verification schedules of the corresponding measurement units approved in accordance with an established procedure in the form of a regulatory document are currently being developed. The verification schedule for volumetric and mass flowrate measuring instruments is regulated by GOST R 8.618-2014 “State verification schedule for means measuring volume and mass flow of gas”.

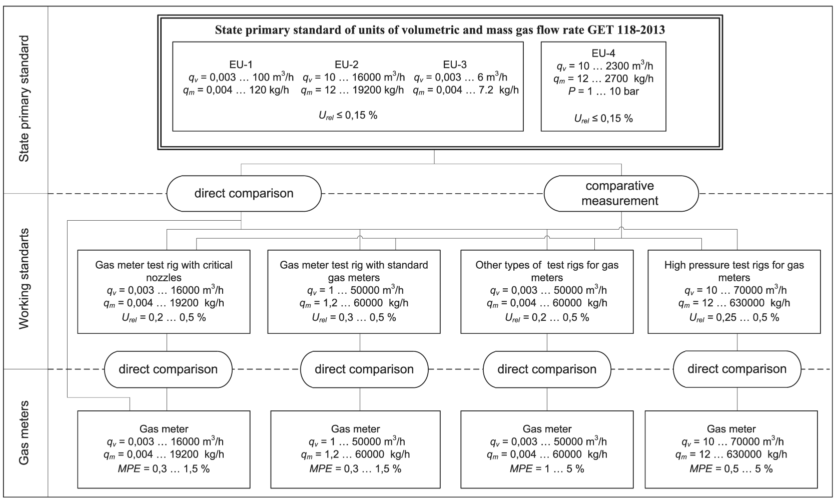

Figure 2: Verification schedule

At the top of the state verification hierarchy is the state primary standard of units of volumetric and mass flowrate of gas GET 118-2013. This standard is designed for maintaining and disseminating units of volumetric and mass gas flowrate within the range of $3 \cdot 10^{-3}$ to 16000 m^3/h, transfer of unit sizes to working standards and working measuring instruments in order to provide uniformity of volumetric and mass gas flowrate measurements. The standard is represented by a complex of facilities reproducing a measurement unit with the highest accuracy in the Russian Federation. The standard comprises three facilities operating with air at atmospheric pressure and a single facility working on air at pressure up to 1 MPa.

Transfer of a volumetric flowrate unit from the state primary standard to working standards in accordance with the state verification schedule can be performed by means of a direct comparison or transferred with the use of a comparison standard. Critical nozzles are traceable to GET 118-2013 are particularly used as an integral part of first step of working standards. Rotary and turbine gas meters with special configurations of various standard sizes demonstrating high repeatability and stability of metrological characteristics are used as comparison standards. Besides, these comparison standards can be used during international comparisons.

The Ural regional metrological center (URMTs) was established for testing and verifying gas flowmeters in working conditions on the basis of the Dolgoderevenskaya gas metering station (working medium: natural gas, pressure up to 7.5 MPa). Its functional capabilities and metrological characteristics are similar to those of the best foreign metrological centers, having a best measurement capability of 0.3 % for flowrate and volume. Together with FGUP VNIIR the center performs testing of domestic and foreign measuring instruments to confirm their metrological characteristics and prepare recommendations on their possible use at the facilities of PJSC Gazprom.

The construction of the third section of URMTs is a highly promising project. It will allow a fully functional metrological center to be established for testing flow meters and gas meters of all standard sizes within the gas pressure range of 0.6 to 7.5 MPa. In the future this center will accommodate primary gas flowrate standards working on natural gas and pressure, and develop testing facilities for the generation of various gas flows for research purposes.

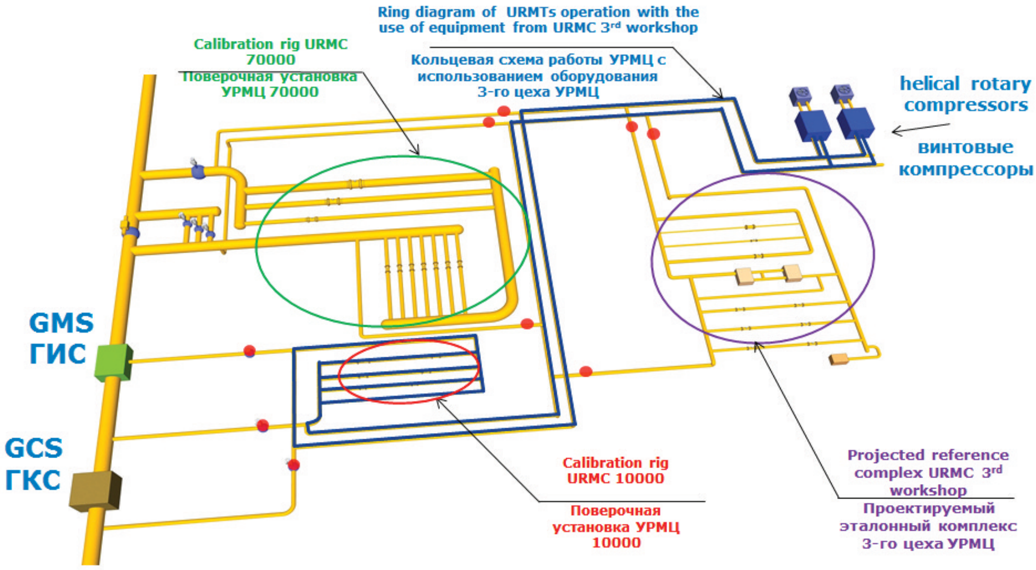

Figure 3: Ural metrological center

The reference standard of the currently designed third shop is designed for the use of a Gas Oil Piston Prover - GOPP. The verification gas of the reference standard is combustible natural gas. The uncertainty of the reference standard according to the design project amounts to 0.07 % within the flowrate range of 5 to 120 m^3/h at a gas pressure up to 7.5 MPa. An IRPP rotary piston prover is planned to be used at the next level of the hierarchy of measurement unit transfer. The IRPP prover has a modular structure composed of 10 IRM-Duo rotary gas meters with gas flowrate ranges under working conditions from 5 to 400 m^3/h each with uncertainty of 0.13–0.15 % within the flowrate range from 5 to 4000 m^3/h at gas pressures up to 7.5 MPa.

4 Standards used for natural gas flowrate measurements in the Russian Federation

4.1 General provisions

An essential requirement in order to increase measurement accuracy is the modernization of regulatory documentation. The majority of issues related to the organization of metrological support in the field of natural gas metering have been thoroughly developed and solved in accordance with the requirements of effective regulatory documents (RD). Below is a brief summary of the regulatory documentation that establishes general metrological and technical requirements for gas flowrate measurements:

- GOST 8.417-2002 “State system for ensuring the uniformity of measurements. Units of quantities”. This standard establishes units of physical quantities used in the territory of the country: names, designations, definitions and rules of their application;
- GOST 2939-63 “Gases. Conditions for the determination of volume”. This standard is related to gases and specifies the conditions for determining their volume in the process of mutual payments with consumers. In the Russian Federation the standard conditions for gas are: temperature 20 ° , pressure 0.101325 MPa and relative humidity 0 %.
- GOST R 8.563-2009 “State system for ensuring the uniformity of measurements. Procedures of measurements”. This standard covers measurement techniques and procedures including the procedures of quantitative chemical analysis, and establishes general provisions and requirements related to the development, certification, standardization and application of measurement procedures, as well as to the corresponding metrological supervision;
- GOST R 8.596-2002 “State system for ensuring the uniformity of measurements. Metrological assurance for measuring systems. Main principles”. This standard establishes general provisions for the metrological support of measurement systems (MS)

at the development (design), manufacturing and operation stages of their life cycle;

- GOST R 8.733 – 2011 "State system for ensuring the uniformity of measurements. Systems for measuring the quantity and parameters of free oil gas. General metrological and technical requirements". This standard is related to systems for the measurement of the quantity and parameters of free oil gas and specifies the general metrological and technical requirements; and
- GOST R 8.741-2011 "State system for ensuring the uniformity of measurements. Volume of natural gas. General requirements for measurement procedures". This standard concerns procedures for the measurement of the volume of natural gas reduced to standard conditions and establishes general requirements for natural gas volume measurement procedures. It is used during the development of procedures for the measurement of volume of gas transferred to consumers or transported by main pipelines.

4.2 Standard measurement procedures

The standard measurement procedures used in the Russian Federation are classified into groups on the basis of the primary flowrate transducers utilized:

- GOST R 8.740-2011 "State system for ensuring the uniformity of measurements. Flow rate and quantity of gas. Procedure of measurements by turbine, rotary and vortex meters";
- GOST R 8.611-2013 "State system for ensuring the uniformity of measurements. Flow rate and quantity of gas. Procedure for measurements of by ultrasonic meters";
- GOST 8.586.1,5-2005 (ISO 5167-1,5:2003) "Measurement of liquids and gases flow rate and quantity by means of orifice instruments".

These standards establish generally accepted procedures for the measurement of volumetric flowrate and volume of natural, commercial oil and other single and multicomponent gases reduced to standard conditions with the use of various measuring techniques.

4.3 Properties of natural gas

Concerning the determination of the properties and the quality of measured gas, the majority of the Russian Federation's standards are harmonized with the corresponding ISO standards:

- GOST 30319.2 "Natural gas. Methods of calculation of physical properties. Definition of compressibility coefficient". This standard specifies four methods for defining the compressibility coefficient of natural gas: whose composition is not completely known (two methods NX19 and GERG-91) and with a known composition of natural gas (AGA8-92 DC and VNIC SMV methods). The standard specifies the preferred application fields for each method in accordance with the parameters measured (pressure, temperature, density of natural gas at standard conditions and composition of natural gas), however it does not prohibit the use of any of these methods in other fields; and
- GOST R 8.662-2009, ISO 20765-1:2005 "State system for ensuring the uniformity of measurements. Natural gas. Gas phase thermodynamic properties. Methods of calculation for transmission and distribution applications on base of the AGA8 fundamental equation of state". Harmonized with ISO 20765-1:2005;
- GOST R 8.769-2011, ISO 12213-3:2006 "State system for ensuring the uniformity of measurements. Natural gas. Compression factor of gas phase. Method of calculation based on gas physical properties". Harmonized with ISO 12213-3:2006.
- GOST R 8.662-2009, ISO 20765-1:2005 and GOST R 8.769-2011, ISO 12213-3:2006 are standards which specify the method for calculating the compressibility factor of natural gas prepared for transmission and distribution over gas transmission pipelines, on condition that it is only in the gas phase. The standard concerns gases prepared for transportation over gas pipelines in the pressure "p" and temperature "t" ranges, in which the transmission and distribution of gases in performed in practice.

4.4 Sampling and gas properties

- GOST 31370-2008, ISO 10715:1997 "Natural gas. Sampling guidelines". The standard specifies requirements for the sampling, preparation and handling of representative samples of main gas which has been subjected to processing. It also features requirements for sampling methodology, the location of the sampling probe and the structure of the auxiliary equipment for sampling and sample handling. The standard concerns spot, direct and sequential sampling. Special attention is paid in the standard to such components of natural gas as oxygen, hydrogen sulphide, air, nitrogen and carbon dioxide. The standard does not concern sampling of liquid or multiphase flows. Harmonized with ISO 10715:1997;

- GOST 31369-2008, ISO 6976:1995 "Natural gas. Calculation of calorific values, density, relative density and Wobbe index from composition". This standard concerns physicochemical quality indicators and specifies algorithms for the calculation of the high heating value, the low heating value, the density, the relative density and the Wobbe index of natural gases, natural gas simulators and other combustible gaseous fuels on the basis of the known composition at standard measurement conditions. The calculation of physicochemical quality indicators of natural gas requires the use of various physical values of pure components specified in the standard. This standard features methods of accuracy assessment of the calculated values of the main quality indicators of natural gas. The calculation methods of the quality indicator values on the basis of the molar fraction or the mass concentration are applicable for any composition of natural gas, natural gas simulator or any other combustible fuel which is generally in a gaseous state. For the calculation of the quality indicator values of a gas, whose composition is known in volume ratios, these methods are only applicable for gases generally composed of methane (molar ratio of methane not less than 0.5). Harmonized with ISO 6976:1995.

4.5 Compositional analysis of gas

- GOST 31371-2008, ISO 6974:2000 "Natural gas. Determination of composition with defined uncertainty by gas chromatography". Composed of 7 parts. GOST 31371.7 features a procedure for measurements of the molar ratio of components of combustible dried natural gas by gas chromatography in the ranges specified in the standard. The procedure is designed for application in analytical (testing) laboratories and at metering stations that monitor the physicochemical quality indicators of combustible dried natural gas. The procedure can represent a basis for the performance of commercial accounting of combustible dried natural gas. Harmonized with ISO 6974:2000.

4.6 Analysis of sulphur compounds in gas

- GOST 22387.2-2014 "Combustible natural gases. Methods for determination of hydrogen sulphide and mercaptan sulphur". This standard concerns combustible natural gases and specifies methods for the determination of hydrogen sulphide and mercaptan sulphur:
  - photocolorimetric, with a mass concentration of hydrogen sulphide in the range from 1.0×10^{-3} to 5.0×10^{-2} g/m^3 and mercaptan sulphur in the range from 1.0×10^{-3} to 2.5×10^{-1} g/m^3;
  - potentiometric, with a mass concentration of hydrogen sulphide and mercaptan sulphur in the range from 1.0×10^{-3} to 0.5 g/m^3;
  - iodimetric, with a mass concentration of hydrogen sulphide in the range from 1.0×10^{-2} to 150.0 g/m^3 and mercaptan sulphur in the range from $1.0{*}10^{-2}$ to 1.0 g/m^3.
- GOST R 53367-2009 "Combustible natural gas. Determination of sulphur-containing components using the chromatographic method". The standard concerns combustible natural gases transmitted over gas transmission pipelines, designed for industrial and utility applications, and features a chromatographic method of determining the sulphur-containing components: hydrogen sulphide, mercaptans and carbonyl sulphide. The standard is used for determining sulphur-containing compounds in methane, combustible natural gas and natural gas simulators.

4.7 Moisture content analysis

- GOST R 53762-2009 "Natural combustible gases. Determination of hydrocarbon dew-point temperature". This standard specifies the requirements for the measurement of hydrocarbon dew-point temperature by visual and automatic condensing methods in natural combustible gases supplied from field gas treatment facilities, underground gas storage facilities and gas processing plants to main gas pipelines, transported over them and supplied to consumers.
- GOST R 53763-2009 "Natural combustible gases. Determination of water dew-point temperature". This standard specifies the requirements for the measurement of water dew-point temperature by visual and automatic condensing and sorption (dielkometric, coulometric, piezoelectric, interferometric) methods in natural combustible gases supplied from field gas treatment facilities, underground gas storage facilities and gas processing plants to main gas pipelines, transported over them and supplied to consumers, and used as fuel for internal combustion engines.

5 Interaction with the international metrological community

The national Russian Federation standard GET 118-2013 participates in international comparisons:

COOMET projects No. 219/Sk-00 and No. 412/UA/07 have been completed. As a result of the comparisons, FGUP VNIIR Calibration and Measurement Capabilities (CMCs) have been registered in the BIPM CMC Database in the gas flowrate range from 0.12 to 800 m^3/h, and the institute has received an approval to use the CIPM MRA logo.

Bilateral comparisons of national standards from China and the Russian Federation are currently performed within the framework of COOMET project No. 679/RU/16. By mutual agreement with NIM, critical nozzles with a nominal flowrate from 4.5 to 50 m^3/h have been selected as transfer standards. The PTB (Germany) also participates in this work, and after the publication of the comparison results this comparison can be reclassified as a supplementary comparison within COOMET. The experimental part of the work was completed in the summer of 2016.

In 2016 a new project was registered in COOMET – topic No. 680/RU/16 on the performance of comparisons in the gas flowrate range from 20 to 6500 m^3/h. We invite all members of the metrological community to consider participating in this comparison.

6 Conclusion

This article reflects the general features of metrological support for gas flowrate measurements in the Russian Federation. The established vertical hierarchy of metrological support facilitates effective interaction with metrological institutes from other countries. FGUP VNIIR has received recognition from the international metrological community and the right to use the CIPM MRA logo. The availability of this logo on calibration certificates implies that:

- VNIIR has signed the CIPM Mutual Recognition Agreement (as one of the Rosstandart institutes) and has therefore assumed an obligation to follow the regulations, rules and principles of ensuring the uniformity of measurements established by the international metrological community;
- VNIIR fulfils these obligations by stating and confirming its measurement capabilities (CMC) published in an open international database managed and continuously updated by the BIPM;
- VNIIR is an active participant of international key comparisons of standards allowing the accuracy level of Russian state standards to be determined and confirmed, from which unit sizes are, in turn, transferred to working standards and other measuring instruments using approved measurement chains;
- certificates will be accepted and have legal force abroad;
- VNIIR has the right to perform calibrations of measuring instruments for foreign customers.

It does not seem possible to describe all the peculiarities of metrological support even for an individual group of measurements, therefore please contact the authors of the article using the contact information provided below for any additional information. All members of the metrological community are invited to cooperate both within regional metrological organizations and in the form of direct bilateral contacts regarding issues of ensuring the uniformity of gas flowrate measurements. ■

References

[1] BP Global, Natural gas trade movements http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/natural-gas/natural-gas-trade-movements.html

All Federal laws, subordinate act, technical regulations, interstate and national standards are available online at the following addresses:

http://fundmetrology.ru/default.aspx
http://www.gost.ru/wps/portal/
www.eurasiancommission.org

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OIML D 1

First experiences with national metrology legislation – a benchmark test to OIML D 1:2012 *Considerations for a Law on Metrology*

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1 Introduction

On the occasion of the 10th OIML Conference and associated events in 2008 in Sydney, an ad-hoc group consisting of four persons was established under OIML TC 3 *Metrological control*. Its task was to draft a revision of OIML Document D 1:2004 *Elements for a Law on Metrology*, taking into account all the recent developments in metrology with a special focus on issues of legal metrology such as globalization, conformity assessment procedures, traceability, market surveillance, etc.

Step by step, information and proposals were collected from CIML Members and discussions were held with international and regional organizations. Inputs were also received from the International Bureau of Weights and Measures (BIPM), the International Organization for Standardization (ISO), the International Laboratory Accreditation Cooperation (ILAC), several regional metrology organizations, and regional manufacturers' organizations (e.g. the European Association for National Trade Organisations representing European weighing instrument manufacturers – CECIP, and the Committee of European Manufacturers of Petroleum Measuring and Distributing Equipment – CECOD).

A final draft was proposed in 2011 which was approved by the 47th CIML Meeting 2012 in Bucharest. The revised OIML Document D 1 was published in 2012 under the title *Considerations for a Law on Metrology* [1].

Developed in liaison with the above organizations, the revised D 1 provides advice on the issues to be considered when drawing up national laws related to metrology. The need for this is reinforced by the increasing participation of states in trans-national, regional and international agreements following the globalization of trade and services in which such laws provide the basis for dealing with the appropriate national measurement-based requirements.

The legislation for which this Document provides advice may either be one general law covering all legal aspects of metrology or separate laws, each related to a specific aspect of metrology. Considerations may also be found in other laws or binding regulations, such as a regulation on legal units of measurement, legislation on traceability, on measuring equipment (weights and measures act), etc., or provisions related to metrology and measurements in more general legislation such as a law on consumer protection or conformity assessment.

The bodies responsible for drawing up such laws are invited to select the appropriate Elements from this Document (36 Elements are formulated), examine their relevance and, if necessary, adapt them to their needs.

It should be noted that in different countries, different terms are in use for binding regulations in legislation, e.g. "by-law", "circular", "decision", "decree", etc.

2 Structure of OIML D 1

2.1 Presentation of OIML D 1

OIML D 1 is presented in six parts:

- Part 1 Introduction;
- Part 2 Rationale, providing elements which justify the need for setting up legal provisions related to metrology and to metrological infrastructures;
- Part 3 Guidelines for setting up structures in metrology and proposed articles for the law;
- Part 4 Proposal for regulations;
- Part 5 Proposal for the structure of a Law on Metrology; and
- Part 6 References.

All the parts should be considered, selected and adapted by each country according to specific needs, then incorporated into laws, government acts, ministerial acts, etc., according to the constitution and regulatory practice of the country.

For decision makers, especially helpful information is given in Part 2.

While the intention is to address the regulated sector, many of these provisions also relate, and are applicable to, best internationally accepted metrology practice in the non-regulated sector.

2.2 What is metrology?

Metrology is the science of measurement and its application. Metrology includes all theoretical and practical aspects of measurement, whatever the measurement uncertainty and field of application. See also VIM [2], VIML [3].

2.3 Why a Law on Metrology?

Metrology is very broad, since there are many things that can be measured, many different ways that measurements can be carried out, and even different ways that measurement results can be expressed. Many applications of metrology have a legal aspect, such as when there is a societal need to protect both the buyer and the seller in a commercial exchange of a commodity or a service provided, or where measurements are used to apply a sanction.

A country's Law on Metrology should nonetheless be as compact and as simple as possible, providing enough detail to address the country's policies involving measurement, while providing sufficient flexibility to allow for changes and innovations in technologies and measurement procedures without having to change the law itself, leaving such details to decrees, regulations and other legal instruments.

2.4 Examples of the value/benefit of metrology

- Metrology encompasses measurement science and technology embedded in an infrastructure of measurement standards, dissemination of units, and science-based policy advice.
- Metrology facilitates fair trade through harmonized written standards, consistent measurement standards and internationally accepted certificates.
- Metrology drives innovation: measurement science at the technological frontiers enables and drives industrial innovation in advanced production and instrumentation.
- Metrology supports regulation by providing measurement references for policy advice, directives, conformity assessment, and verification.
- Metrology advances the protection of people, for instance through reliable measurements of radioactivity or medical measurements.
- Metrology helps meet societal goals, such as increased energy efficiency and reduced consumption of resources.

2.5 What is a national quality infrastructure?

The concept of "Quality Infrastructure", QI, refers here to all aspects of metrology, standardization, testing and quality management including certification and accreditation. This includes both public and private institutions and the regulatory framework within which they operate.

2.6 What is legal metrology?

Legal metrology is the practice and the process of applying regulatory structure and enforcement to metrology. It comprises all activities for which legal requirements are prescribed on measurement, units of measurement, measuring instruments or systems and methods of measurement. Such activities are performed by or on behalf of governmental authorities, in order to ensure an appropriate level of confidence in measurement results in the national regulatory environment. Legal metrology makes use of developments in metrology to obtain appropriate references and traceability, and may apply to any quantity addressed by metrology.

Legal metrology includes four main activities:

- setting up legal requirements;
- control/conformity assessment of regulated products and regulated activities;
- supervision of regulated products and of regulated activities; and
- providing the necessary infrastructure for correct measurements.

2.7 Why is a metrological infrastructure necessary?

No quantity can be correctly and consistently measured without metrology and without a metrological infrastructure.

2.8 What is the role of the government?

The role of the government in metrology is to provide society with the necessary means to establish confidence in measurement results.

2.9 Need for compatibility between national and international metrological requirements

Each nation has its own historical perspective on the development of metrological requirements.

The Technical Barriers to Trade (TBT) Agreement (Article 2.4) [4], implemented within the World Trade Organization (WTO), makes it an obligation for countries to base their national technical regulations on international documentary standards (norms) so as to harmonize national requirements. It also requires signatories to take account of, and participate in, international systems of conformity assessment and mutual recognition agreements (TBT Article 6).

3 Guidelines for setting up structures in metrology

This section provides guidelines on the issues that should be considered when elaborating a Law on Metrology. These issues may be addressed in a single law covering all aspects, or, when such other legislation already exists, when adapting legislation on accreditation, on conformity assessment or on consumer protection, in which case the Law on Metrology will only include the specific issues that are not covered by this other legislation and will refer to them when necessary.

The essential contents of the issues to be considered in the legislation on metrology are summarized in OIML D 1, Part 3, as "Elements" (36 Elements are defined). They should be taken into account not only for the legislation but also for the whole metrology infrastructure.

Starting with the definitions, only those terms should be mentioned that provide for a better understanding of the Law on Metrology. Refer to the VIM [2] or the VIML [3] directly for the most up to date definitions of terms included in this Document. It is generally recommended to mention "traceability", "calibration", "verification", "market surveillance".

3.1 National metrology policy

The policy for metrology should be a policy of the whole Government, aiming at providing the country with a metrology infrastructure that is able to ensure fair trade, foster economic development and efficiency, ensure the technological and scientific progress of the country, protect health and the environment, and protect citizens and consumers. This policy should be clearly expressed so that all concerned parties can understand its goals and it should commit all the ministries and all the local authorities.

The national metrology infrastructure should comprise:

- an authority in the government in charge of the national metrology policy, and in charge of coordinating the actions of other departments related to metrological issues;
- a legal corpus, including the laws and regulations that have provisions related to metrology;
- a system of national measurement standards and dissemination of legal units;
- a (voluntary) system for accrediting calibration laboratories and, if required, testing laboratories, inspection bodies and certification bodies;
- structures for disseminating knowledge and competencies in metrology (e.g. training, education, etc.); and
- services to industry and to the economy in the field of metrology.

3.2 National institutes/authorities

Two types of national institutes should be established, which may either be independent organizations or parts of one organization:

- a National Metrology Institute (NMI), consisting of one or more standards laboratories, which can also be part of (for instance) a university or other scientific institute; in general, due to the expanding scope of metrology, many countries traditionally distribute responsibility for different quantities/units among different institutes coordinated either by a principal institute or by an agency. Such an organizational structure may be considered by small or developing countries, in order to make use of the existing competencies and capabilities;
- generally one national legal metrology institute (NLMI) in charge of studying technical specifications for legal metrology, issuing type approvals, and providing technical coordination and support to other legal metrology bodies; this may also be distributed among several institutes specializing in different fields under an appropriate coordination.

3.2.1 Structures

These institutes may have various possible structures:

- a public institute owning and running its own laboratories;
- a private institute owning and running its own laboratories under the authority of the government, taking into account unfair competition and national security; or
- a public agency coordinating public or private institutes.

3.2.2 Central Metrology Authority (CMA)

All the issues concerning the national metrology policy at the central level (e.g. scientific, industrial and legal) should be managed or coordinated by one single central authority, the Central Metrology Authority (CMA).

3.2.3 Local Metrology Authorities (LMAs)

Implementation at local level will be the responsibility of LMAs, which can be

- local offices of the ministries, or
- services of states in a federal organization, organizations or services depending on regional (provincial) or local authorities.

3.2.4 Metrology Advisory Board

The government shall set up an advisory board/council for metrology to address, as a minimum, legal metrology. Its members should comprise representatives of interested stakeholders, e.g. government, CMA, LMA, NLMI, NMI, industry, instrument users, universities, etc.

3.3 Regulations on measurements

Regulations may be made

- to define measurement units to be used in legal transactions for various methods of sale,
- to prescribe that certain measurements are to be used as the basis of transactions or law enforcement activities,
- to define the list of measurements subject to legal metrological requirements, and
- on prepackages.

3.4 Application of the law

The enforcement of the regulations adopted in application of the law on metrology shall be placed under the responsibility of the Central Metrology Authority and should be carried out:

- for actions at national level, by the CMA;
- for actions at local level, by the Local Metrology Authorities if appropriate (when the size of the country allows this, it may be decided that the CMA will carry out all enforcement activities).

The main topics are:

- various kinds of surveillance;
- power of official agents; and
- offences.

4 Proposal for regulations on metrology

After defining the national strategy for the metrology system it must be decided whether the law on metrology should cover all areas of metrology with the establishment of a calibration service, etc., or only legal metrology with a nationwide system of verification/ conformity assessment bodies.

The revisions of a law on metrology and mandatory requirements (decrees, binding regulations) should reflect the new developments of

- globalization of trade and services,
- technical developments, e.g. use of measurement systems instead of instruments,
- use of various conformity assessment procedures for verification, and
- supervision of the metrology system on a regional or international basis.

Nevertheless, a law on metrology is always a national affair. In Europe even with binding European Directives for the member countries, the individual national laws on metrology are still all different! This is because each law should reflect

- the culture and history of the country,
- the political system (e.g. central or federal),
- the needs of the national economy, and
- the involvement of private bodies or not, etc.

Other laws such as a law on accreditation, a law on standardization, etc. have to be taken into account. The organization of a national metrological infrastructure should contain

- a law on metrology, a law on accreditation, etc.,
- legal documents such as decrees, by-laws, etc.,
- binding regulations, and
- voluntary written standards.

5 Proposal for the structure of a law on metrology

A law on metrology should take into account other national laws such as the law on consumer protection, the law on accreditation, the law on standardization, etc. and international treaties such as the WTO TBT Agreement, the WTO SPS Agreement, the Metre Convention, the OIML Convention, etc.

The government is responsible for

- protecting its citizens,
- guaranteeing free trade with fair measurements, and
- supporting industry and services with a metrological infrastructure.

The Elements defined in OIML D 1 [1], Part 3, should be (re)worded taking into consideration the legislative drafting practice of the country, its needs, its culture, etc., whilst maintaining their simplicity and clarity. Based on these Elements, Part 5 of OIML D 1 gives concrete guidance on how a law on metrology should be structured and which are the minimum points which should be included in a law on metrology. An example law comprising 28 Articles is proposed.

6 Benchmark procedure

6.1 Starting phase

It has been mentioned that no two laws on metrology in different countries are the same. Therefore it is interesting to assess the existing laws to determine their agreement with the provisions of OIML D 1.

The aim of the assessments was not to present a "cooking recipe" on how to write the national law on metrology, but rather to unveil the present status of the metrological legislation of the country concerned, and to trigger a discussion – internally by responsible persons of that country, and externally with experts from international organizations – on how the legislation might be improved.

The authors of this report gained experience in providing consultancy to decision makers and in support of the metrological infrastructure and legislation from about 30 countries in several regions of the world.

Some of these countries requested that the authors assess their existing or newly developed laws on metrology. In 2012 the authors started to compare those laws with OIML D 1:2012, focusing on how far the requirements of OIML D 1 are fulfilled by the law on metrology (or by another national law or sub-law regulation, where applicable).

After having performed such examinations for several single countries the authors were asked to do the same work in a regional context.

The first survey was carried out for the ten ASEAN Member States (Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam) in 2014. The eight states of the SAARC region (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka) followed at the beginning of 2016, and the member countries of COOMET (Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Bulgaria, China, Cuba, Germany, Georgia, Korea (DPR), Kazakhstan, Lithuania, Moldova, Romania, Russia, Slovakia, Tajikistan, Turkey, Ukraine, Uzbekistan) expressed an interest in continuing the work with their laws on metrology, although not all of these countries participate in this benchmarking. This was also started in 2016 and should be finished in 2017; so far, results are available for five countries (February 2017).

6.2 Method used

Generally, the assessment is restricted to the uppermost level of legislation, i.e. to the law on metrology. Some

(Country) < xxx > The Law on Ensuring Uniformity of Measurements (2000 + Amendments ...)

				Article relates to Element no.:	1	2	3	4	5	6	7	8	9	...	36
				Considering all Articles of the Law:	1	2	2	1	2	3	2	2	...	...	...
Article no.:	*Content*	*Marking (see below)*		*Comment to the Article*											
	Chapter 1. General Provisions														
1	The basic concepts used in the present Law	1	3	point 1: accreditation should apply to physical bodies as well. point 12: the term *attestion* should not be used for measuring instruments; correct: *certification*. See general remarks below.											
2	The Legislation of the Republic of <xxx> on Ensuring the uniformity of measurement	2		OK		x									
3	The Sphere of Action of the Present Law	2		OK											
4	The Purposes of Ensuring uniformity of measurement	1	3	missing: meeting the requirements of international trade; otherwise ok.											
5	The Government Management on Ensuring the uniformity of measurement	1	3	It is not mentioned which body of the Government (Parliament, Council of Ministers, a governmental department, a Ministry) authorises the "authorized body". Besides legislative tasks the authorized body performs many executive tasks as well. These should better transfered, e.g., to an NMI.	x										
	Chapter 2. The State System of Ensuring the uniformity of measurement														
6	Structure of the State System of Ensuring uniformity of measurement	2		OK							x	x			
...	...														

Figure 1

Legend:	
0	Not acceptable.
1	Acceptable, but recommended to change.
2	Acceptable, no need to change.
3	Not (or not satisfactorily) regulated in the law; inclusion into legislation (or correction) is recommended.
4	Contained in the law but violating international agreements or best practice.
5	Contained in the law but not in complete agreement with D1 or other international recommendations or best practice.
6	
7	Acceptable if regulated on the sub-law level; that should be mentioned in the law.
8	Not or not completely regulated in the law but reference is made to sub-law level.
9	It is recommended to treat the details of this Article/Element not in the law on metrology but on the sub-law level, or in another law.
10	Completely in agreement with international requirements and best practice.
n	These D1-Elements are of special importance for international trade and cooperation.

Figure 2

countries in the three regions and some countries in other parts of the world do not really have a law on metrology. Instead, metrology is dealt with in other laws, e.g. in a law on consumer protection, or in a regulation on the sub-law level. In such cases only the metrology related articles have been evaluated.

The authors checked each article of the law against the relevant Element of OIML D 1 as a benchmark (see Fig. 1). Each row of the table is dedicated to an article; each column in the right hand part refers to one of the 36 Elements. If a relationship exists between the contents of the article and the Element then an "x" shows that congruency.

According to the degree of fulfillment of each Element, a colored mark (0 – *not acceptable* through 2 – *no need to change*) was assigned to the respective article which is related to that Element; the same color was given to the "x" field. One or more explanation numbers (3 through 10) and/or a verbal comment was allocated to certain articles – see Fig. 2.

Additionally, a second table was set up that has a row for each Element showing the article(s) related to it – see Fig. 3. Sometimes an Element contains more than one issue, or the Element is only partially considered by the law; in such cases the row is split into two or more sub-rows (e.g. Elements 3 and 6 in Fig. 3). The blue color in the first column marks those Elements which seem to the authors to be the most important ones for enabling free trade and international acceptance and cooperation. In the fourth column giving the acceptance level, the colored marks are the same as before; additionally the mark 3 (in yellow) appears which means that the law contains no articles related to that Element.

Finally, a summary was given for each country containing a narrative assessment – sometimes with recommendations as to what should be changed in the law – and a copy of the first table as described above but compressed to the "blue" Elements – See Fig. 4.

OIML-D1 Element #	Topic of this Element	Article # to this Element	Aceptance level	Explanation note	Country <xxx> Comments
1	Gov designates the gov.dept. in charge of national metrology policy	4	2		<xxx-Authority> is the head of the State Metrology Service
2	Gov defines measurements and MIs that are subject to legal control	17	2		
3	Gov designates the institute(s) ... (NMI)	4	1	3	No NMI defined
	Designation depending on evaluation (peer assessment or accreditation)		3		
4	Set up of a system of Nat. Meas. Standards that provides traceability to SI	6	1		incomplete: no traceabilty to SI; only reference to <xxx-Authority>
5	Implemeting bodies for certain tasks should be accredited	18-1	1	5	not all activities should be included into mandatory accreditation (e.g., calibration)
6	Funding of NMI		3		
	No unfair competition		3		
7	Gov designates a CMA	9, 10, 11	2		
8	Gov designates LMAs (if applicable)				
9	Gov shall designate an Advisory board		3		*Advisory body* not defined
10	Measurements, pre-packages & MIs are required to be traceable to SI, either national or by standards of other countries		3		
...					
36	Organisation of the national metrological infrastructure and legislation				

Legend:	
0	Not acceptable.
1	Acceptable, but recommended to change.
2	Acceptable, no need to change.
3	Not (or not satisfactorily) regulated in the law; inclusion into legislation (or correction) is recommended.
4	Contained in the law but violating international agreements or best practice.
5	Contained in the law but not in complete agreement with D1 or other international recommendations or best practice.
6	
7	Acceptable if regulated on the sub-law level; that should be mentioned in the law.
8	Not or not completely regulated in the law but reference is made to sub-law level.
9	It is recommended to treat the details of this Article/Element not in the law on metrology but on the sub-law level, or in another law.
10	Completely in agreement with international requirements and best practice.
n	These D1-Elements are of special importance for international trade and cooperation.

Figure 3

6.3 Comparison of all countries in the three regions

Figure 5 shows the benchmarks of 23 countries. It turned out that there are major differences in the implementation of the various metrology laws. Comparing the markings of the three regions, it is obvious that there are fewer green fields in the SAARC area than in ASEAN and COOMET; it is a fact that all regions have to combat certain legislative deficiencies,

(Country) < xxx > *The Law on Ensuring Uniformity of Measurements (2000 + Amendments ...)*

Summary:
The presented Law considers most of the needs for a contemporary legal metrology infrastructure. Some issues which are important for international cooperation and trade are missing in the Law however. The organization and structure of the metrology bodies needs some improvement. The responsibilty of the Authorized Body for tasks at both legislative and executive level may lead to conflicts of interest.

The benchmark was performed ...

The following Elements of the document OIML-D1:2012 which are especially important for regional or international activities, recognition or acceptance, have not (or not satisfactorily) been considered in the presented law:

1	4	6	11	15	16	18	19	20	34

			Article relates to OIML-D1 Element no.:	1	2	3	4	5	6	10	11	13	15	16	18	19	20	34
			Considering all Sections of the Law:	1	2	2	1	2	3	2	3	2	3	1	1	1	3	3
Article no.:	*Content*	*Marking (see below)*	*Comment to the Section*															
	Chapter 1. General Provisions																	
1	The basic concepts used in the present Law	*1*	point 1: accreditation should apply to physical bodies as well. point 12: the term *attestion* should not be used for measuring instruments; correct: *certification*. See general remarks below.															
2	The Legislation of the Republic of <xxx> on Ensuring the uniformity of measurement	*2*	OK		*x*													
...																		

Figure 4

usually more so than the industrialized countries in the western hemisphere. On the other hand it should be mentioned that

- there is no obligation for any country to consider all the Elements in its legislation; also well industrialized countries do not do so, and
- many countries consider the Elements not only in their law on metrology but also in their sub-law legislation. Sub-laws in English or Russian were not available to the authors in most cases, and were therefore only rarely included in the assessment.

6.4 Most frequent deviations/deficiencies found in the existing laws

Issues not dealt with or not dealt with in a satisfactorily manner, e.g.:

- scope of the law to ensure confidence in measurements and their results;
- ensuring international comparability of measurements, acceptance/recognition of certificates;
- establishment of institutional/organizational structures (NMI, CMA, LMA, accreditation bodies, calibration service, advisory council, market surveillance, pre-package regulations), and definition of their tasks, competence, responsibility, power, etc.;
- sources of funding;
- definition of regulated/non-regulated areas of metrology;
- conformity assessment (CA): requirements for CA bodies, proof of competence by accreditation;
- traceability to SI for all measurement standards (including and especially for national standards);
- definition of *accuracy* according to international practice: measurement uncertainty, accuracy classes, maximum permissible error;
- definition of basic terms according to international practice; specific custom-made definitions or similar should not be invented which are contrary to common use;
- transparent availability of measurement results.

Sometimes too many details are regulated in the law which should be regulated at the sub-law level, e.g.:

- what are the fines/punishments for specific offences;
- technical details (e.g. how to execute specific verification/testing procedures, how to fix markings, etc.).
- Law-makers should keep in mind that the process of changing the law (e.g. due to new technical developments or requirements or due to currency exchange rates) is always a lengthy procedure. In contrast, in most cases it is an easy matter to change a mandatory technical regulation.

D1-Element no.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Country: (ASEAN)																																				
1		3	3	1	3	3				3	3	2	2		3	3		1	3	3			2	2	2	1				1	1			3		
2		3	2	0	3	3				3	3	2	2		3	1		3	1	3														3		1
3		1	1	1	3	3				3	3	2	2		3	3		1	0	3			1	1	1	2	2	3	2	3				3		
4		1	2	2	2	3	2	2	2	2	3		3		3	1	1	1	2	2	2					2	2	2	2	2	2	2		2		1
5		3	2	2	3	2			2	1	3		2		3	3		3	3	3														3		
6	3	2	2	2	3	3	3	3	2	2	3	2	2		3	2	2	2	2	2	1		1	2	2	1		1				1		2	2	
7	1	1	1	3	1	2	3	1	1	1	1	2	2	1	3	3		1	2	3														1		
7a	2	1	2	3	2	2		2	1	3	3		3	1	3	3		2	2	3														1		
8			3	3	3	3	3			3	3	3	3		3	3		3	3	3				2	1			1						3		
8a		1	2	1	3	3	3			3	3	1	1		3	3		2	1	1			2	2	2	2		1		2	2		2	3	2	
9	1	0	3	1	3	3	1	2		3	3	1	1		3	3		1	(0)	(0)	1		1											3		
10	2	2	3	2	3	2	1	1		2	3	2	2	2	3	2	2	2	2	1	2				2	2						2		3	2	
Country: (SAARC)																																				
1	3	3	3	3	3	3				3	3		3		3	3		3	3	3														3		
2	2	3	3	3	3	3				3	3		3		3	1		3	3	3														2		
3	3	3	3	1	1	3	3	3	2	3	3	3	1	3	3	3	0	1	3	3	3	2	1	2	2	1	1	1	1	1	1	3	2	1	1	3
4	3	3	3	3	3	3				3	3		3		3	3		2	2	3														3		
5	3	3	3	1	1	3	1	3	3	3	1	2	1	3	3	3	3	2	3	1	3	3	3	3	2	1	1	1	1	1	1	3	3	3	3	3
6	3	3	1	1	0	3	3	3	3	3	3	2	1	3	3	3	3	1	1	3	3	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3
7	3	3	3	3	1	3	3	3	3	3	3	3	3	3	3	3	0	1	3	3	3	2	1	2	2	1	1	1	1	1	1	3	2	3	3	3
8	3	3	2	3	3	3	3	3	3	3	3	2	2	3	3	3	3	2	3	1	1	3	3	2	2	1	3	3	3	3	1	3	1	3	2	1
Country: (COOMET)																																				
1	2	2	1	2	2	2	2	2	3	2	1	2	2	2	1	2	2	3	1	1	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	2
2	1	2	2	1	2	3	2	2	3	2	3	2	2	3	3	1	3	1	1	3	1	1	1	1	1	3	3	3	3	3	3	3	3	3	2	3
3	2	2	3	1	1	3				3	3		3		3	3		1	1	1														3		
4	1	2	3	2	2	3	3	3	3	2	3	2	2	1	3	1	1	1	3	1	1	3	1	3	1	3	3	3	3	3	3	3	3	3	3	3
5	1	2	2	2	2	1	2	2	1	2	2	2	1	2	2	2	1	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2

(6 - 13 will follow by end 2017)

Legend:	
(0)	Not acceptable in the present shape; probably acceptable in the forthcoming new law.
0	Revision for clarification is urgently recommended.
1	Acceptable, but recommended to change.
2	Acceptable, no need to change.
3	Not (or not satisfactorily) regulated in the law; inclusion into legislation (or correction) is recommended.
n	These D1-Elements are of special importance for international trade and cooperation.

Figure 5

6.5 Important consequences

The benchmark shows that:

- mutual recognition of test results by countries is required and should be stipulated in the legislation. This refers especially to conformity declarations and type approval certificates. The forthcoming elaboration of a new OIML Certification System may foster and support such ambitions;
- confidence-building measures are necessary to resolve this issue. For this, peer reviews and third-party accreditation are the best solutions to be considered;
- type approval is not carried out in many countries of the regions. In some countries this is not required. How to deal with this point as a priority issue has to be decided very carefully.

The following items must be considered in the legislation:

- scope/aim/subject of the law;
- national strategy and policy;
- organization of the metrological infrastructure;
- Central Metrology Authority (CMA), National Metrology Institute (NMI), and Local Metrology Authorities (LMA);
- metrology advisory board;
- transparent availability of measurement results;
- regulated area (legal metrology) and non-regulated area;
- calibration/testing service;
- legal units of measurement;
- traceability of measurement results;
- conformity assessment of measuring instruments.

Regulation on measurements:

- categories of instruments under legal metrology:
  - utility meters (electricity, gas, water, heat);
  - weighing instruments;
  - flow meters (e.g. petrol pumps);
  - taximeters;
  - etc.;
- regulations on prepackages;

- international agreements;
- enforcements;
- fees, financial provisions;
- offences/fines/penalties;
- transition period;
- inspection/supervision/surveillance for placing measuring instruments on the market.

7 Summary and required action

During the authors' assessments, they not only checked and compared the available documents; they also held many discussions with decision makers and metrologists in numerous countries. As an outcome of their benchmark and the various discussions, the following points can be summarized:

- many countries, especially from ASEAN and COOMET, have already applied this benchmark to revise their legislation. Some of them have finished that process, others are at the parliamentary stage;
- to explain to the appropriate decision makers the benefits of metrology and legal metrology for a country, especially in order to ensure fair trade and services, OIML D 1 proved to be very helpful;
- for the exchange of goods and services in the globalized world new procedures are required, e.g.:
  - consideration of conformity assessment procedures instead of type approval and verification;
  - new technical developments such as software-controlled measuring instruments; provisions should be included in legislation;
- a positive statement is that OIML D 1 is in line with WTO TBT requirements and mandatory regional regulations, e.g. EU directives, ASEAN ATIGA requirements;
- it turned out from discussions with developing countries that many OIML Documents and Recommendations are too complicated. This point has already been recognized by OIML activities in favor of CEEMS countries (Countries and Economies with Emerging Metrology Systems) [5];
- other discussions have shown that the use of two different certificate systems is too difficult to understand, especially the handling of the MAA system. From the authors' point of view it was a good decision by the CIML (in October 2016) to start using a single OIML Certification System from 2018.

Further, the authors recommend that the OIML should start discussions about:

- the influence of "Industry 4.0" on legal metrology;
- the revision of OIML D 1:2012 in 2018. ■

8 References

[1] OIML Document D 1:2012 *Considerations for a Law on Metrology*

[2] OIML Vocabulary V 2-200:2012 *International Vocabulary of Metrology – Basic and General Concepts and Associated Terms* (VIM)

[3] OIML Vocabulary V 1:2013 *International vocabulary of terms in legal metrology* (VIML)

[4] World Trade Organization – Agreement on Technical Barriers to Trade (WTO TBT, 1995)

[5] Seminar *Metrology in Daily Life*, Chengdu, P.R. China, 2014

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QUALITY INFRASTRUCTURE

The place of Legal Metrology in a National Quality Infrastructure

Peter Mason, CIML President

This article is based on a presentation given by the Author to the Conference "Shaping Business Environments for Global Growth and Prosperity" at Lancaster House, London, 11 to 13 October 2016.

The concept of a National Quality Infrastructure is something which has generated growing interest in recent years. The links between standardisation, metrology and accreditation, and the conformity assessment activities which are an integral part of all those areas, have long been promoted by the PTB in their various development activities and it is the unifying element of the DCMAS Network, the secretariat of which the OIML took over last year.

Those links are also at the heart of many programmes aimed at modernising and diversifying economies – consider the prominent role, for instance of the Abu Dhabi Quality and Conformity Council in that part of the world. More recently the World Bank Group has identified this as one of their priority areas, and only two years ago the four main bodies concerned with standardisation, accreditation, scientific metrology and legal metrology in the UK came together to found UKQI – the UK Quality Infrastructure.

Metrology frequently plays an important role in QI programmes and it is an explicit part of every definition of Quality Infrastructure that has been attempted. But I sometimes suspect that people not familiar with the area must sometimes ask themselves the questions "What is Measurement doing in this picture?" and "Isn't it a little narrow and specialised alongside broad fields like standards and conformity assessment?" The purpose of this article is to answer those questions and to show that metrology, and in particular legal metrology, not only belongs in the definition but also can play a very important part in QI programmes wherever they are undertaken.

First, however, it is necessary to explore in a little more detail what is meant by Quality Infrastructure. The easy part of the concept is *Infrastructure*, which I think we can view as a mix of

- physical facilities and equipment,
- written procedures and specifications,
- institutional structures, and
- skilled people.

Being clear what is meant by *Quality* is a little more difficult. Originally it seems to have been used as a kind of shorthand to capture the fields of standardisation, metrology and accreditation. Subsequently, conformity assessment was added to the picture, with some definitions highlighting different types of conformity assessment – testing, measurement, inspection, certification, etc. And the World Bank definition of Quality Infrastructure also includes "market surveillance". The problem with the various ways in which these building blocks of Quality Infrastructure are described is that it can make it difficult to see how all these components fit together. This is a particular problem for metrology, where, if we are not careful, it can end up appearing only in a small "test & measurement" box.

The fundamental reason for this is that Standardisation, Accreditation and Metrology are not separate and similarly shaped areas. They are linked, and they interact, in several different ways. And this in turn means that it can be a challenge to describe what we mean by Quality Infrastructure to anyone outside the field.

One good way of making sense of this is to look at the issue from an institutional point of view. After all, Standardisation Bodies, Accreditation Bodies and Metrology Institutes are usually distinct entities. And this is reflected in the structures which are well established at the international level. Moreover, the various forms of conformity assessment – inspection, testing, calibration, certification – are usually easy to distinguish, even if they may sometimes be carried out by the same bodies. Figure 1 provides a good example of what a National Quality Infrastructure landscape looks like when viewed from this institutional perspective.

However, even this representation does not provide a clear picture of where metrology fits in. Some-one unfamiliar with the subject may conclude that the role of metrology in this landscape is confined to the activities of the National Metrology Institutes in defining measurement standards and calibration laboratories in providing calibration certificates. Those of us who operate in the world of metrology know there is a lot more to our contribution than that, but how do we bring this out more clearly?

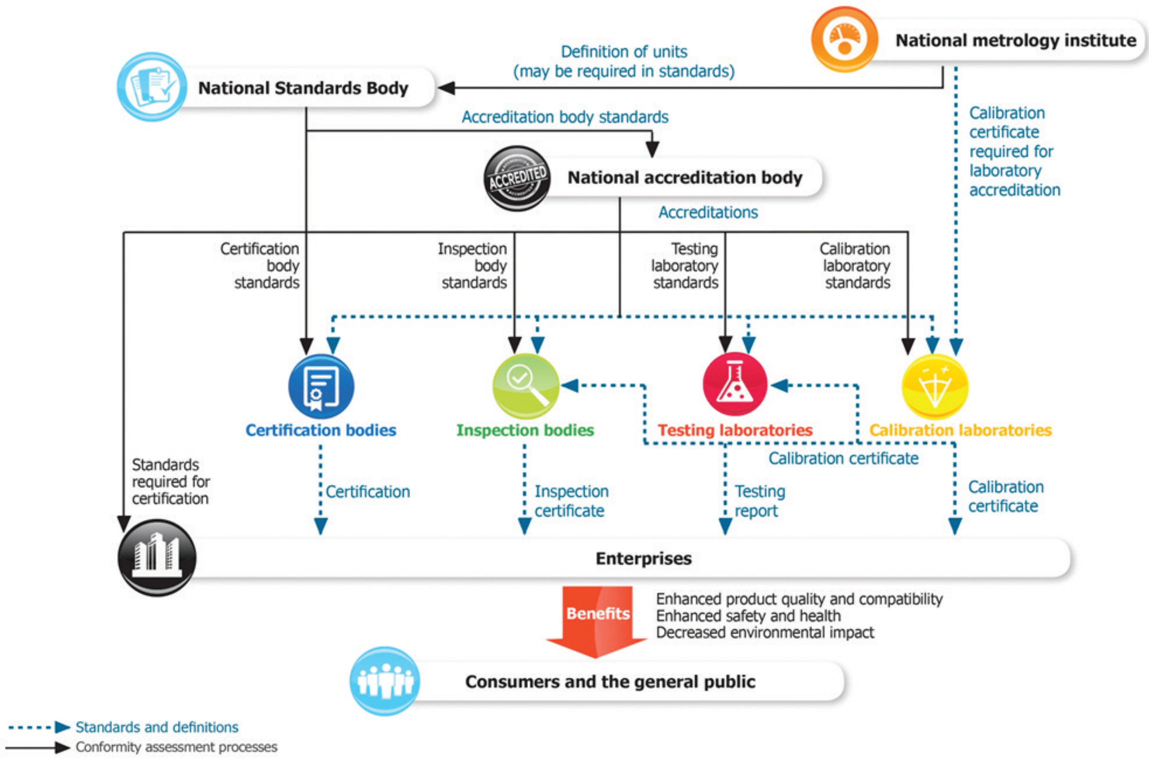

Figure 1: National Quality Infrastructure landscape viewed from an institutional perspective. Source: J. Luis Guasch & Colleagues, *Quality Systems and Standards for a Competitive Edge*, World Bank, 2007. Reproduced with permission.

The way I have found to make sense of this landscape is to go back to a simpler vertical model which separates out Standards (in the widest sense) and Conformity Assessment (see Figure 2). This allows us to see that physical standards, traced back to the SI, and documentary standards, represented both by “voluntary” Standards and mandatory Technical Regulations, are the twin sources of everything in the Quality Infrastructure landscape. But it also makes it clearer where the work of the OIML fits in when we produce, through our Recommendations, documentary standards for measuring instruments.

At the conformity assessment stage, we also need to make it clear that metrology, and in particular legal metrology, is involved in testing activities (e.g. testing of measuring instruments), inspection activities (which arguably should include verification for these purposes) and the type approval process (which often relies on certification).

This vertical way of looking at things also provides us with a clearer picture of how the accreditation process operates – essentially it is a means of distinguishing between those conformity assessment bodies which have been shown independently to meet the standards which apply to such activities.

Finally, the model gives us a better understanding of why market surveillance activities are sometimes included in the definition of a National Quality Infrastructure – market surveillance, after all, is essentially the application of inspection and testing to identifying products in the distribution chain which do not conform to legally required standards.

This way of looking at the Quality Infrastructure landscape, especially if it is combined with the institutional picture given in Figure 1, now gives us a firmer basis for considering what metrology can contribute to initiatives intended to improve a country’s Quality Infrastructure.

Some of those contributions arise from the historical importance of metrology. The first “standards” were physical measurement standards. Regulation of weights and measures was one of the first areas of consumer protection. Weights and measures inspectors were the forerunners of much of the enforcement community we see today. Metrology provided, in the form of the BIPM, one of the first examples of an Intergovernmental Treaty Organisation.

This historical importance still has practical significance today. In many economies the metrology bodies stand apart from the rest of the standards and conformity assessment machinery. And in the least developed economies, improved metrology is one of the first places policy makers may look to make improvements. This is true of industrial metrology, where testing

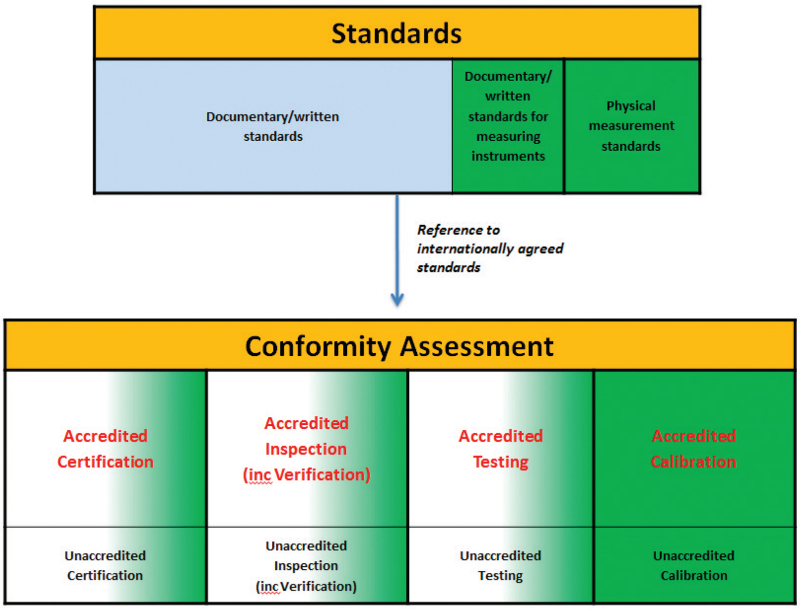

Figure 2: Separating out Standards and Conformity Assessment.
Activities with a metrology component are shaded in green.

and measurement is essential for industrial production that is going to be accepted as part of a globalised economy. But it also applies to legal metrology, where reliable weights and measures may be one of the first areas of consumer protection to be introduced into what are often largely unregulated markets. For all these reasons, a country's metrology system can be an attractive place to start when Governments begin to look for initiatives that will improve the systems on which a modern economy relies.

In addition, there are some very practical advantages in ensuring metrology plays a prominent role in developing a Quality Infrastructure. As we have seen, there are many points of contact between metrology (and metrologists) and the rest of the Quality Infrastructure. Metrology is not just about physical standards. Legal metrology is heavily dependent on regulation of measuring instruments through written standards and specifications which are developed in a manner very similar to other standards. And then the rest of metrology offers numerous examples of the different types of conformity assessment. Indeed it has often been at the forefront of new and more efficient techniques – type approval, a co-regulation approach to standards, guaranteeing consistency of manufacture through auditing of management systems, use of non-state bodies to carry out conformity assessment for regulatory purposes. So by starting off with metrology we can gain an insight into many aspects of a Quality Infrastructure.

This is important because a well-functioning Quality Infrastructure can bring many benefits to a modern economy:

- Facilitating leading edge scientific discoveries;
- Supporting innovation – the application of new technology and ideas;
- Improving industrial production – facilitating exchange of goods and services as part of globalisation;
- Delivering confidence to customers and consumers through voluntary **standards** and widely-recognised marking schemes which may avoid the need for formal regulation;
- Providing, where formal **technical regulation** is required, regulators with an evidence base for good practice and indeed sometimes providing the opportunity to transfer the standards directly into regulations;
- Providing, in more mature systems, the possibility of co-regulation – generally expressed requirements where recognised standards are a guaranteed way of demonstrating compliance, which in turn provides greater flexibility for innovative firms;
- And finally, when a flourishing conformity assessment sector is introduced, backed by internationally accepted accreditation, providing regulators with a variety of modern compliance tools, such as type approval, audited management systems, third party certification and verification, which can reduce reliance on traditional and expensive inspection based models.

And as I hope I have demonstrated, metrology can play a really valuable role in securing these benefits. ■

OIML-CS

Update on the OIML Certification System (OIML-CS)

Paul Dixon, BIML

Introduction

The article in the January 2017 edition of the OIML Bulletin on the new OIML Certification System (OIML-CS) provided an overview of the development of the *Framework* for the OIML-CS, the principles and objectives of the OIML-CS and information on the OIML-CS scope and structure. This article describes recent developments relating to the implementation of the OIML-CS, including the outcomes of the first provisional Management Committee (prMC) meeting, as well as information on a proposed OIML-CS Seminar that will be held in Shanghai, P.R. China on 15 June 2017.

Provisional Management Committee (prMC)

With the *Framework* approved and subsequently published as OIML B 18:2016, the CIML created a provisional Management Committee (prMC) under CIML Resolution 2016/17. The prMC, chaired by the CIML First Vice-President, was requested by the CIML to take all appropriate actions so that the new OIML-CS may become effective from 1 January 2018.

Resolution 2016/17 also specified that the prMC has the authority to act as the Management Committee for the purposes of approving OIML-CS Operational and Procedural Documents, Guidance Documents, Templates and Forms.

The prMC has been established with representatives from 18 OIML Member States and two Organizations in Liaison and it held its first meeting on 14–16 February 2017 at the PTB, Berlin, Germany. Representatives from 11 OIML Member States (Australia, France, Germany, India, Japan, Korea (R.), Netherlands, P.R. China, Russian Federation, Slovakia and United States) and one Organization in Liaison (CECIP) participated in the meeting.

The primary aims of the first prMC meeting were to

a) agree responses to the comments that had been received from prMC members on the Working Drafts of the Operational and Procedural Documents,

b) develop proposals to improve and amend OIML B 18:2016 for approval at the 2017 CIML Meeting,

Participants in the first prMC Meeting at the PTB in Berlin, Germany

c) discuss proposals for an OIML-CS website and logo,
d) develop proposals for promotion and awareness raising,
e) consider the process for the identification and approval of experts to participate in peer assessments and accreditation assessments, and
f) develop the transitional arrangements from the current OIML Basic Certificate System and OIML Mutual Acceptance Arrangement (MAA) to the new OIML-CS.

Key outcomes from the first prMC meeting

At its meeting the prMC made a number of decisions and agreed on a set of actions to progress with the implementation of the OIML-CS. Some of the key outcomes from the meeting were to

a) amend the OIML-CS structure to replace the Advisory Panel with a Review Committee which will be a sub-committee of the Management Committee (see below),
b) finalize the Working Drafts of the Operational and Procedural Documents to reflect the agreed responses to the comments raised by prMC Members,
c) finalize the necessary templates and forms to support the operation of the OIML-CS,
d) develop a 'temporary' area on the OIML website to provide information on the implementation of the OIML-CS while the full OIML-CS website is being developed,
e) develop detailed proposals for the transitional arrangements from the current Certificate Systems to the OIML-CS, including a proposal for a two-year transition period for existing OIML Issuing Participants under the MAA to demonstrate compliance with ISO/IEC 17065 through accreditation or peer assessment, and
f) undertake various promotion and awareness-raising activities relating to the OIML-CS, including a Seminar (see below).

Proposal for a new OIML-CS structure

As mentioned above, one of the key outcomes from the first prMC Meeting was a proposal to move responsibility for reviewing applications for potential Issuing Authorities and legal metrology experts from the Advisory Panel (AP) to a "Review Committee" which will be a sub-committee of the Management Committee. This change was agreed due to concerns over the potential for additional bureaucracy created by having an AP and the potential difficulties in finding suitable AP members; it was felt that suitable candidates to participate in the AP would either be members of the MC or legal metrology experts. This change will entail the deletion of the AP from the structure, with consequential changes to the documentation including a revision of OIML B 18:2016. Figure 1 shows the proposed new OIML-CS structure.

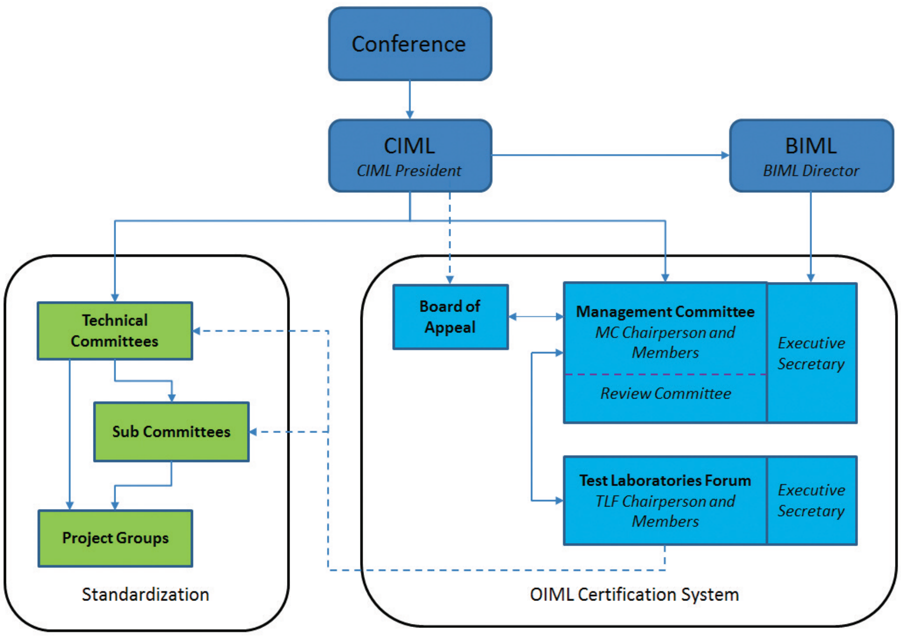

Figure 1: Proposed new OIML-CS Structure

Seminar on the OIML-CS (Shanghai, P.R. China, 15 June 2017)

The prMC agreed that it is essential to promote the OIML-CS and raise awareness with key stakeholders. To support this key requirement it was decided that a Seminar on the OIML-CS should be held to provide the key stakeholders with information on the implementation of the OIML-CS and the actions that potential Issuing Authorities and Utilizers will need to take to enable them to participate in the OIML-CS.

With close support from the Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), P.R. China, a Seminar on the OIML-CS will be held in Shanghai, P.R. China, on 15 June 2017. The Seminar is open to representatives of OIML member countries, representatives from RLMOs, members of the OIML-CS prMC, CIML Presidential Council Members, manufacturer representatives and others who are interested in the OIML-CS.

An outline agenda for the Seminar has been developed and it is proposed that the event will cover four key themes:

a) Introduction and General Information on the OIML-CS;
b) Stakeholder Perspectives;
c) Preparing for the new OIML-CS;
d) What will happen after implementation?

This is an important event which is intended to support the successful implementation of the OIML-CS and which will help to ensure that all key stakeholders are aware of the requirements for participation in the OIML-CS. Further information on the Seminar, including information on registration, can be found on the OIML website at:

https://www.oiml.org/en/events/oiml-seminars

Next steps

The prMC will continue to take steps to ensure that the new OIML-CS will become operational on 1 January 2018, with a number of Working Groups established to address the actions that were raised at the first prMC Meeting. The BIML will work on the development of the proposed OIML-CS website, and members of the prMC and BIML staff will identify opportunities to promote and raise awareness of the OIML-CS amongst key stakeholders such as potential Issuing Authorities, Utilizers and manufacturers.

A second prMC meeting is scheduled to take place on 13–14 June 2017 in conjunction with the Seminar on the OIML-CS. It is anticipated that at the second prMC meeting a revised version of OIML B 18 will be finalized for approval at the 52nd CIML Meeting in October 2017, and the Working Drafts of the Operational and Procedural Documents will be finalized and approved by the prMC.

A final meeting of the OIML MAA Committee on Participation Review (CPR) will also be held on 16 June 2017 to support the transition of existing Issuing Participants under the OIML MAA to the OIML-CS.

The prMC will provide a report on its activities at the 52nd CIML Meeting in 2017, with a view to the OIML-CS becoming effective on 1 January 2018. ■

COOMET: EURO-ASIAN METROLOGY COOPERATION

Report on the COOMET Seminar on the *Status Quo of Legal Metrology in COOMET Member Countries*

27–28 September 2016, Tashkent, Uzbekistan

PETER ULBIG, Chairperson of COOMET TC 2 *Legal Metrology*

In conjunction with the annual meeting of COOMET TC 2 *Legal Metrology*, a seminar on the status quo of legal metrology in COOMET member countries was held from 27 to 28 September 2016 in Tashkent, Uzbekistan. It was supported by Uzstandard.

27 persons from 13 countries participated in the seminar: Azerbaijan, Belarus, Cuba, Germany, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Slovakia, Ukraine, Tajikistan, and Uzbekistan.

The objective was to carry out a comparison of the laws of the COOMET member countries in the field of legal metrology. To achieve this, Prof. Manfred Kochsiek (former CIML Acting President and PTB Consultant) had been asked to undertake a comparison of the national metrology laws on the basis of OIML D 1 *Considerations for a Law on Metrology*. The various national metrology laws were therefore made available by the members in Russian and were analyzed in accordance with OIML D 1.

Although this work has not yet been completed, Prof. Kochsiek was able to present the preliminary results. His presentation was followed by an intensive discussion on the situation in the individual countries.

In the second part of the seminar, two different subjects were dealt with. Firstly, Dr. Stephan Mieke (PTB Consultant) reported on the legal regulations in the European Union concerning medical products with a measurement function. This subject had been requested by a large number of members because medical products with a measurement function play an increasingly important role in most countries; they cover many different fields and vary greatly in complexity (e.g. from sphygmomanometers to computer tomographs). Due to the high importance of such measuring instruments for medical diagnoses, medication and therapies, the participants declared themselves in favor of introducing suitable metrological monitoring which would create sufficient confidence in the measurement technology on the part of both patients and users of such instruments.

Another topic which was discussed was the legal treatment of measuring instruments in test laboratories. For this purpose, Dr. Peter Ulbig (Chairperson of COOMET TC 2) presented a survey of the current regulations in the international accreditation system for test laboratory measuring instruments and compared them with potential national legal regulations. ■

World Metrology Day 2017: Measurements for transport

May 20 is World Metrology Day, commemorating the anniversary of the signing of the Metre Convention in 1875. This treaty provides the basis for a coherent measurement system worldwide that underpins scientific discovery and innovation, industrial manufacturing and international trade, as well as the improvement of the quality of life and the protection of the global environment.

The theme for World Metrology Day 2017 is **Measurements for transport**. This theme was chosen because transport plays such a key role in the modern world. We not only move ourselves, but also the food we eat, the clothes we wear, the goods we use and rely on, not forgetting the raw materials they are made from. Doing so safely, efficiently and with minimal environmental impact requires an astonishing range of measurements.

Across the world, national metrology institutes continually advance measurement science by developing and validating new measurement techniques at whatever level of sophistication is needed. These advances are playing a crucial role in bringing new solutions to the transport sector, innovations such as hydrogen fuel cells, electric vehicles, or the new generation of fuel efficient passenger jets. The national metrology institutes participate in comparisons coordinated by the Bureau International des Poids et Mesures (BIPM) to ensure the reliability of measurement results worldwide. The BIPM also provides a forum for its Member States to address new measurement challenges. The International Organization of Legal Metrology (OIML) develops International Recommendations, the aim of which is to align and harmonize requirements worldwide in many fields, including transport.

World Metrology Day recognizes and celebrates the contribution of all the people that work in intergovernmental and national organizations throughout the year on behalf of all. ■

Directors' messages

Stephen Patoray

Director of the BIML

Judging by the succession of themes and articles related to World Metrology Day over the recent years, it is quite evident that legal metrology is very much a part of our everyday lives. In many ways transport also plays a significant role in the lives of every one of us, every day:

- water, gas, and electricity must be transported from their source to their point of use, such as our homes or businesses;
- petrol and diesel must also be transported from their source through the refinery to the storage tanks and finally to our automobiles and trucks;
- much of the produce, vegetables, meat and other staples need to be transported from their source to the local market.

Road, rail, air, water, cable and pipe all provide a medium for the transport of people and/or goods. Many products such as our smartphones, computers or televisions are manufactured in one location and must then be transported to their respective retail outlets. Even water must often be transported over great distances to meet agricultural and urban demands.

Some 30 different OIML Recommendations relate to some form of transport and provide standards for the equipment used to measure various aspects of the transportation chain. These Recommendations provide solutions to a number of issues; a few of these are:

- R 99 Instruments for measuring vehicle exhaust emissions
- R 126 Evidential breath analyzers
- R 80 Road and rail tankers with level gauging
- R 106 Automatic rail-weighbridges
- R 134 Automatic instruments for weighing road vehicles in motion and measuring axle loads
- R 50 Continuous totalizing automatic weighing instruments (belt weighers)
- R 59 Moisture meters for cereal grains and oilseeds

Being able to safely, economically and accurately transport various items has become a vital part of the daily life of people in much of the world. Whether it is trading with our neighbors, the next town or locations half way around the world, we are all either recipients or providers of transport.

We hope you enjoy celebrating World Metrology Day with us again this year and look forward to once again marking the importance that metrology has in our world. ■

Martin Milton

Director of the BIPM

Business and citizens around the world depend on access to safe and reliable transport. It is one of the factors that is most important in enabling a successful modern society.

Whilst the needs for new and improved means of transport are clear, it is also important that they meet increasing requirements for economy and environmental performance. Every type of transport, from bicycles to container ships, from cars to space craft are required to meet appropriate standards. They are needed as the basis for national and international regulation. They can specify requirements for every aspect of performance from safety and economy, to emissions.

The implementation of standards depends on measurement technology and measurement standards. Some of the most demanding that are underpinned by the work of national metrology institutes include:

- accurate and rapid weighing of shipping containers to ensure the safe loading of container ships;
- characterisation of low friction surfaces and aerodynamic shapes of aircraft to minimize fuel consumption;
- valid measurements of the chemical composition of vehicle emissions to support regulators and city authorities in controlling pollution levels.

As the demands for accessible and efficient transport increase, so demands like these for measurements and standards to underpin them will too. Some of these demands will ultimately be met by new technologies such as driverless cars and zero-emission vehicles, which in turn will generate new measurement challenges. ■

www.worldmetrologyday.org

- Directors' messages

- Posters

- Events

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
There are no changes since the last issue of the Bulletin.

		R 16	R 21	R 31	R 35	R 46	R 49	R 50	R 51	R 58	R 60	R 61	R 75	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	R 137	R 139
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	Institut 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							■	■		■	■		■		■									■	■						■									
FR2	Laboratoire National de Métrologie et d'Essais (LNE)		■	■			■	■	■	■	■	■		■	■	■	■		■	■	■	■		■	■	■	■			■	■	■		■		■		■		■	■
GB1	NMRO Certification Services (NMRO)		■		■		■	■	■		■	■	■	■		■				■				■	■	■						■				■		■			
HU1	Hungarian Trade Licensing Office (MKEH)													■																											
IT1	Ministero dello sviluppo economico - Direzione generale mercato, concorrenza, consumatori, vigilanza e normativa tecnica						■																																		
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.		■	■		■	■	■	■		■	■		■	■	■			■		■			■	■	■						■		■	■	■		■		■	■
NL2	KIWA Nederland 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	RISE Research Institutes of Sweden AB							■	■		■	■		■		■				■					■	■						■									
SI1	Metrology Institute of the Republic of Slovenia (MIRS)													■																											
SK1	Slovak Legal Metrology						■							■																		■									
US1	NCWM, Inc.										■			■																											
VN1	Directorate for Standards and Quality (STAMEQ)													■																											

OIML SYSTEMS

Basic and MAA Certificates registered

2017.01–2017.02

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Taximeters
Taximètres

R 21 (2007)

Issuing Authority / *Autorité de délivrance*

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

R021/2007-FR2-2017.01
Taximeter ATA Primus-RS-01

Automatismes et Techniques Avancées SA, 30 impasse du Nid, ZA du Verdalai, FR-13790 Peynier, France

R021/2007-FR2-2017.02
Taximeter ATA Primus-S-01

Automatismes et Techniques Avancées SA, 30 impasse du Nid, ZA du Verdalai, FR-13790 Peynier, France

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Water meters for cold potable water and hot water
Compteurs d'eau potable froide et d'eau chaude

R 49 (2013)

Issuing Authority / *Autorité de délivrance*

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

R049/2013-FR2-2016.02
Water meters - Type: TU1 40F, TU1 50, TU1 65, TU1 80 and TU1 100.

Itron France, 11 Boulevard Pasteur, FR-67500 Haguenau, France

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-NL1-2016.04
Automatic catchweighing instrument - Type: CSJ/CMJ - series

Yamato Scale GmbH, Hanns-Martin-Schleyer Straße 13, DE-47877 Willich, Germany

Issuing Authority / *Autorité de délivrance*

NMRO Certification Services (NMRO), United Kingdom

R051/2006-GB1-2008.01 Rev. 2
CW Checkweigher

Loma Systems Group and ITW Group, Southwood, Farnborough GU14 0NY, United Kingdom

R051/2006-GB1-2017.01
Type: 420 Series

Sparc Systems Ltd., Merebrook Industrial Estate, Hanley Road, Malvern WR13 6NP, United Kingdom

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*

State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R060/2000-CN1-2016.01 (MAA)
Load cell - Type: SLB615D

Mettler-Toledo (Changzhou) Precision Instruments Ltd., 5 Middle HuaShan Road, Xinbei District, CN-213022 ChangZhou, Jiangsu, P.R. China

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R060/2000-NL1-2016.11 (MAA)
Single point load cell, with strain gauges - Type: 108xA
Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2016.34 (MAA)
Bending beam load cell, with strain gauges - Type: SP4M. . .
Hottinger Baldwin Messtechnik GmbH, Im Tiefen See 45, DE-64293 Darmstadt, Germany

R060/2000-NL1-2016.35 (MAA)
Compression load cell, with strain gauges - Type: CC1, CC1-T
Flintec GmbH, Bemannsbruch 9, DE-74909 Meckesheim, Germany

R060/2000-NL1-2016.38
Compression load cell, with strain gauges, equipped with electronics - Type: DC 285, CPFN-A, CPFN-B
Arpege Master K, 15 rue de Dauphine, Bat 6 CS40216, FR-69808 Saint-Priest Cedex, France

R060/2000-NL1-2016.40 (MAA)
Bending beam load cell with strain gauges - Type: F3833
Tecsis Shenzhen Sensors Co. Ltd., 102 Block B, Hytera Science and Technology Park, No. 3 Baolong 4th Road, Longgang Dist., 518116 Shenzhen, P.R. China

R060/2000-NL1-2016.42 (MAA)
Compression load cell, with strain gauges, equipped with electronics - Type: TBDLC
Toledo do Brasil Industria de Balancas Ltda., Manoel Cremonesi, 1, Sao Bernardo do Campo, SP 09851-900 Brazil

R060/2000-NL1-2016.42 Rev. 1 (MAA)
Compression load cell, with strain gauges, equipped with electronics - Type: TBDLC
Toledo do Brasil Industria de Balancas Ltda., Manoel Cremonesi, 1, Sao Bernardo do Campo, SP 09851-900 Brazil

R060/2000-NL1-2016.45 (MAA)
Double ended shear beam load cell, with strain gauges - Type: QSC-A
Keli Sensing Technology (Ningbo) Co. Ltd., 199 Changxing Rd., Jiangbei district, Ningbo, P.R. China

R060/2000-NL1-2016.46 (MAA)
Shear beam load cell, with strain gauges - Type: SBPB-A
Keli Sensing Technology (Ningbo) Co. Ltd., 199 Changxing Rd., Jiangbei district, Ningbo, P.R. China

R060/2000-NL1-2016.47 (MAA)
Compression load cell, with strain gauges - Type: WL506A
Acecells Instruments Co. Ltd, 61 Pread Street, Dept 400, London W2 1NS, United Kingdom

R060/2000-NL1-2017.02 (MAA)
Single point load cell, with strain gauges - Type: M050 or PR57
Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

R060/2000-NL1-2017.03 Rev. 1 (MAA)
Compression load cell, with strain gauges - Type: RL5416
Rice Lake Weighing Systems Europe B.V., Weiland 11, NL-6666 MH Heteren, The Netherlands

▶ Issuing Authority / *Autorité de délivrance*

NMRO Certification Services (NMRO),
United Kingdom

R060/2000-GB1-2012.07 Rev. 2 (MAA)
SB6 stainless steel load cell
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-NL1-2017.01
Automatic gravimetric filling instrument - Type: ADW-A. . ., ADW-E. . .
Yamato Scale Co. Ltd., 5-22 Saenba-cho, JP-673-8688 Akashi, Hyogo, Japan

Database of all OIML Certificates:

www.oiml.org/en/certificates/registered-certificates

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***

Dansk Elektronik, Lys & Akustik (DELTA), Denmark

R076/2006-DK3-2017.01
Non-automatic weighing instrument - Type: FT-10 / FT-10Fill / FT-10Flow

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

▶ **Issuing Authority /** ***Autorité de délivrance***

State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R076/2006-CN1-2016.01 (MAA)
Terminal, as part of a non-automatic weighing instrument - Type: ICS429, ICS439, ICS449, ICS469, ICS489

Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111 West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-CN1-2016.02 (MAA)
Terminal, as part of a non-automatic weighing instrument - Type: ICS425, ICS435, ICS445, ICS465, ICS485

Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111 West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-CN1-2016.03 (MAA)
Electronic truck scale - Type: SCS-100t, SCS-150t

Chongqing Data Control Technology Co. Ltd., 2 Fengxi Road, Caijiagang Town, Beibei District, CN-400707 Chongqing, P.R. China

▶ **Issuing Authority /** ***Autorité de délivrance***

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

R076/2006-FR2-2017.01 Rev. 0 (MAA)
Indicator - Type: P1405-B

Precia SA, BP 106, FR-07001 Privas Cedex, France

▶ **Issuing Authority /** ***Autorité de délivrance***

NMi Certin B.V., The Netherlands

R076/2006-NL1-2015.44 (MAA)
Indicator - Type: Container Weighing System

Bison Group Ltd., Unit 2, 11 Wharf Street, 9016 Dunedin, New Zealand

R076/2006-NL1-2016.31 (MAA)
Non-automatic weighing instrument - Type: Sara Plus, Sara 3000, Bolero, Calypso

ArjoHuntleigh AB, Hans Michelsensgatan 10, SE-211 20 Malmö, Sweden

R076/2006-NL1-2016.52 (MAA)
Indicator - Type: WTX120

Hottinger Baldwin Messtechnik GmbH, Im Tiefen See 45, DE-64293 Darmstadt, Germany

R076/2006-NL1-2016.59 (MAA)
Non-automatic weighing instrument - Type: Maxi Twin, Minstrel, Tenor, Maxi 500, Maxi Sky 1000, Maxi Sky 2, Maxi Sky 600, Maxi Sky 440

ArjoHuntleigh AB, Hans Michelsensgatan 10, SE-211 20 Malmö, Sweden

R076/2006-NL1-2016.60 (MAA)
Non-automatic weighing instrument - Type: Alenti, Miranti

ArjoHuntleigh AB, Hans Michelsensgatan 10, SE-211 20 Malmö, Sweden

R076/2006-NL1-2016.63 (MAA)
Non-automatic weighing instrument - Type: MS-2xxx, MS-3sss, MS-4xxx, MS-5xxx, MS-6xxx, MBF-5xxx, MBF-6xxx, MS21-NEOxx

Charder Electronic Co. Ltd., 103 Guozhong Road, Dali Dist 412, Taichung, Chinese Taipei

R076/2006-NL1-2016.63 Rev. 1 (MAA)
Non-automatic weighing instrument - Type: MS-2xxx, MS-3sss, MS-4xxx, MS-5xxx, MS-6xxx, MBF-5xxx, MBF-6xxx, MS21-NEOxx

Charder Electronic Co. Ltd., 103 Guozhong Road, Dali Dist 412, Taichung, Chinese Taipei

R076/2006-NL1-2017.01 (MAA)
Automatic Weighing Instrument - Type: AP Series

Shimadzu Corporation, 1 Nishinokyo-Kuwabara-cho, Nakagyo-ku, JP-604-8511 Kyoto, Japan

R076/2006-NL1-2017.03 (MAA)
Non-automatic weighing instrument - Type: Fresh Base. . . / FB . . .

Mettler-Toledo GmbH, Im Langacher 44, CH-8606 Greifensee, Switzerland

R076/2006-NL1-2017.04 (MAA)
Non-automatic weighing instrument -
Type: Rider 8000 R81 . . .
Ohaus Corporation, 7 Campus Drive, Suite 310, 07054 Parsippany - NJ, United States

▶ Issuing Authority / *Autorité de délivrance*
NMRO Certification Services (NMRO), United Kingdom

R076/2006-GB1-2015.02 Rev. 1 (MAA)
Type: XS Series
Avery Berkel, Foundry Lane, Smethwick B66 2LP, United Kingdom

R076/2006-GB1-2016.02 Rev. 2 (MAA)
Type: SWII and PRII
CAS Corporation, #262 Geurugogae-ro, Gwangjeok-myeon, Yangju-si, Gyenonggi-do, Korea (R.)

R076/2006-GB1-2016.13 (MAA)
PMA
Sartorius Lab Instruments GmbH & Co. KG, Otto-Brenner-Str. 20, DE-37079 Gottingen, Germany

R076/2006-GB1-2017.01 (MAA)
Type: CI-2001 Series
CAS Corporation, #262 Geurugogae-ro, Gwangjeok-myeon, Yangju-si, Gyenonggi-do, Korea (R.)

R076/2006-GB1-2017.02 (MAA)
Type: ZK830
Avery Weigh-Tronix, Foundry Lane, Smethwick B66 2LP, United Kingdom

R076/2006-GB1-2017.03 (MAA)
Type: 4800MLF / 4800XLF
SR Instruments Inc., 600 Young Street, Tonawanda, 14150 New York, United States

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

R076/2006-DE1-2016.02 (MAA)
Non-automatic electromechanical weighing instrument with or without lever system -
Type: BL-A, BL-B, BL-C, BL-D
Sartorius Lab Instruments GmbH & Co. KG, Otto-Brenner-Str. 20, DE-37079 Gottingen, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic level gauges for fixed storage tanks
Jaugeurs automatiques pour les réservoirs de stockage fixes

R 85 (2008)

▶ Issuing Authority / *Autorité de délivrance*
Czech Metrology Institute (CMI), Czech Republic

R085/2008-CZ1-2012.05 Rev. 1
Magnetostrictive level gauge - Type: SiteSentinel Integra 100/500 (controler) -/924B (probe) - Vsmart (probe sensor controller)/7100V - XMT-SI-485 or XMT (probe)
OPW Fuel Management Systems, 6900 Santa Fe Drive, IL60525 Hodgkins, Illinois, United States

R085/2008-CZ1-2014.04 Rev. 1
Magnetostrictive level gauge - Type: 924B (probe) / SiteSentinel Nano (console); XMT-SI-485 or XMT (probe) / SiteSentinel Nano (console)
OPW Fuel Management Systems, 6900 Santa Fe Drive, IL60525 Hodgkins, Illinois, United States

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*
Russian Research Institute for Metrological Service (VNIIMS)

R117/1995-RU1-2017.01
Tatsuno Fuel Dispensing Units Sunny XE Series Suction type and Remote type
Tatsuno India Private Limited, B-31 and B-32 MIDC Industrial Area, Taloja, District Raigad, 410208 Maharashtra, India

R117/1995-RU1-2017.01 Rev. 1
Tatsuno fuel dispensing units - Type: Sunny XE Series Suction type and Remote type
Tatsuno India Private Limited, B-31 and B-32 MIDC Industrial Area, Taloja, District Raigad, 410208 Maharashtra, India

▸ Issuing Authority / *Autorité de délivrance*

State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R117/1995-CN1-2016.01
Fuel dispenser - Type: JSK-50E1121B, JSK-50E2242B, JSK-50E1121Q, JSK-50E2242Q,

Sesai Jialijia (Beijing) Petro Chemical Equipment Co. Ltd., RM C2016 No. 10 Zhong Xing Road, Sci-Tech Park, Changping Disitrict, 102206 Beijing, P.R. China

▸ 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

R117/1995-JP1-2016.01
Fuel dispenser for motor vehicles, Tatsuno Sunny-GL series

Tatsuno Corporation, 3-2-6 Mita, Minato-ku, 108-8520 Tokyo, Japan

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Dynamic measuring systems for liquids other than water
Ensembles de mesurage dynamique de liquides autres que l'eau

R 117 (2007) + R 118 (1995)

▸ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R117/2007-NL1-2015.01 Rev. 3
Density sensor (a sensor as a part of a densitometer) - Type: CDM100M; CDM100P

Emerson Process Management Micro Motion Inc., 7070 Winchester Circle, CO80301 Boulder, Colorado, United States

R117/2007-NL1-2016.05
Measurement transducer - Type: Promass Q 300 DNxxx

Endress + Hauser Flowtec AG, Kagenstrasse 7, CH-4153 Reinach BL 1, Switzerland

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Gas meters
Compteurs de gaz

R 137 (2012)

▸ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R137/2012-NL1-2016.10
Thermal mass meter - Type: x485xxx

MeteRsit, Viale dell'Industria 31, IT-35129 Padova, Italy

R137/2012-NL1-2016.13
Ultrasonic gas meter - Type: UIM-4F

Gas Souzan Ind. & Mfg. Co., Industrial Zone, Najafabad, Isfahan, Iran

R137/2012-NL1-2016.14
Ultrasonic gas meter - Type: FMU

Flow Meter Group B.V., Menisstraat 5c, NL-7091 ZZ Dinxperlo, The Netherlands

R137/2012-NL1-2016.17
Diaphragm gas meter - Type: EM-G1.6, EM-G2.5 and EM-64

Elektrometal S.A., ul. Stawowa 71, PL-43-400 Cieszyn, Poland

R137/2012-NL1-2016.18
Ultrasonic gas meter - Type: UIM-4F

Transus Instruments B.V., Duikerweg 37, NL-3897 LM Zeewolde, The Netherlands

R137/2012-NL1-2016.19
Diaphragm gas meter - Type: EM-G1.6, EM-G2.5 and EM-64

Elektrometal S.A., ul. Stawowa 71, PL-43-400 Cieszyn, Poland

R137/2012-NL1-2016.19 Rev. 1
Diaphragm gas meter - Type: EM-G1.6, EM-G2.5 and EM-G4

Elektrometal S.A., ul. Stawowa 71, PL-43-400 Cieszyn, Poland

info

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■ Corresponding Member

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■ CIML Members

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Mr Raimundo Alves de Rezende

■ Thailand:
Mrs. Nuntawan Sakuntanaga

■ Norway:
Mr. Geir Samuelsen

■ Croatia:
Mrs Brankica Novosel

■ Sweden:
Mrs. Renée Hansson

■ OIML meeting

October 2017

52nd CIML Meeting and Associated Events
9–13 October 2017
Carthagena, Colombia

■ Committee Drafts

Received by the BIML, 2017.01 – 2017.03

- None -

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- the paper originals of any relevant photos, illustrations, diagrams, etc.;
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