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World Metrology Day 2012:
We measure for your safety

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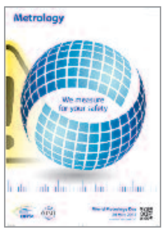

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Editorial

Chris Pulham
Editor/Webmaster, BIML

2012 World Metrology Day

Again this year, the BIPM and the OIML formed a Team to plan and coordinate World Metrology Day on May 20 (the anniversary of the Signing of the Metre Convention in 1875 by 17 Nations).

The 2012 theme was "We measure for your safety", a topic that was deliberately left as broad as possible in order to encourage a wide range of initiatives on the part of the participating national metrology institutes. To illustrate this theme, the PTB once again provided the design for the poster.

As in 2011 when the theme was "Chemical measurements for our life, our future" we were impressed by the number of different events that were organized across the world and by their very wide scope: poster sessions, conferences, exhibitions, open days and lectures to name but some. Fifteen countries informed the WMD Team of events they had organized and details of these are published in this edition of the Bulletin.

The BIML and BIPM Directors underlined the importance of metrology and safety in their first joint message (see page 23): being capable of obtaining reliable measurement results in the field of safety is vital in all walks of life, even though the general public is often largely unaware of the key role played by metrology in ensuring our safety.

The web site statistics again go to show how popular the event was: in the space of just three months, www.worldmetrologyday.org had some 10 000 visits, 22 000 pages were viewed and a total of about 13 Gb of bandwidth was utilized, the majority of which was in the month of May itself.

A warm thank you to all those that participated. We look forward to planning the 2013 event and will be publishing details of the theme as soon as it is fixed. See you next year for WMD 2013! ■

Journée Mondiale de la Métrologie 2012

A nouveau cette année, le BIPM et l'OIML ont constitué une Equipe pour planifier et coordonner une Journée Mondiale de la Métrologie le 20 mai (anniversaire de la Signature de la Convention du Mètre en 1875 par 17 Nations).

Le thème 2012 était "Nos mesures pour votre sécurité", un sujet laissé délibérément aussi vaste que possible afin d'encourager une large gamme d'initiatives de la part des Instituts nationaux de métrologie participants. Pour illustrer ce thème, le PTB cette année encore a fourni la conception graphique du poster.

Tout comme en 2011, lorsque le thème était "Les mesures en chimie au service de notre vie, notre avenir", nous avons été impressionnés par le nombre d'initiatives différentes qui ont été organisées à travers le monde et par leur très grande variété : posters, conférences, expositions, journées portes ouvertes et présentations, pour n'en citer que quelques-unes. Quinze pays ont informé l'Equipe WMD des événements qu'ils ont organisés et nous en publions les détails dans ce numéro du Bulletin.

Les Directeurs du BIML et du BIPM ont souligné l'importance de la métrologie et de la sécurité dans leur premier message conjoint (voir la page 23) : être capable d'obtenir des résultats de mesurage fiables dans le domaine de la sécurité est primordial dans tous les domaines de la vie, même si le grand public n'est souvent pas informé du rôle clé que joue la métrologie dans l'assurance de notre sécurité.

Les statistiques en provenance du site web démontrent une fois de plus à quel point cette manifestation est populaire : en l'espace de seulement trois mois, www.worldmetrologyday.org a reçu quelque 10 000 visites, 22 000 pages ont été visionnées et un total d'environ 13 Go de bande passante utilisé, dont la majorité pendant le seul mois de mai.

Un grand merci à tous les participants. Nous attendons avec confiance l'organisation de la manifestation 2013, et publierons les détails du prochain thème dès que celui-ci sera fixé. Alors… à l'année prochaine pour WMD 2013 ! ■

DATA SECURITY

The computer infrastructure grid: prospects for applications in metrology

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Abstract

A global computer infrastructure system called the "grid", created in response to challenges resulting from the increasing complexity of experimental physical assemblies and information systems, is presented in this paper as an optimal IT platform for metrology tasks, i.e. the assurance of metrological traceability (often in geographically remote regions) and measurement data protection in global networks.

The emphasis is placed on the use of a new component of the grid, the instrument element (IE), which is intended to ensure secure, remote, joint team work when monitoring and managing instruments and data generated and stored on distributed scientific measuring equipment using conventional grid resources.

The article describes the variety of all possible IE applications within the available grid technology for those metrology tasks where IT support is required. The IE grid becomes an optimal environment which can be used to effectively perform measurement tasks which have the highest level of measurement data transfer, storage and processing safety, revealing new opportunities to track measurement results and ensure a high level of reliability of these results.

1 Introduction

International metrology organizations, including the OIML, play an important role in coordinating metrological activity in the globalized world [1]. This activity is primarily intended to ensure metrological traceability, often though not always in geographically remote regions, as well as to achieve a high level of confidence in measurements.

The coordination and management of measurement processes often separated by long distances should be supported by state-of-the-art information technology. It is believed that this support could be based on the internet. However, this system provides no possibility to control the measurement and computation processes, and the data transferred are under constant threat of being falsified or even irretrievably lost.

The problems of interaction between remote devices as well as of measurement data protection in the global networks are being overcome [2,3,4,5], but the solutions are always partial, problem-dependent and take a lot of special effort.

Is there any way out? The answer is yes. Based on the same hardware (i.e. the same telecommunication elements as used by the internet) a *brand new* system of globally distributed computations can exist which ensures the highest possible level of safety for today which excludes even such troublesome phenomena as viruses and hacker attacks.

This system appears to meet the challenges of qualitative complexity of experimental physical assemblies and information systems which require new monitoring, management and operating approaches. The new paradigm of distributed computations is named the "grid".

There are many implementations of this concept in the USA and in the European Union. However, the most wide-spread implementation of the grid concept in recent years is the gLite middleware. The gLite is used to support the most difficult physical installations created by mankind, the Large Hadron Collider (LHC). The development of this middleware is closely connected with the *Conseil Européen pour la Recherche Nucléaire* (CERN) experiments [13–16]. The most sophisticated measuring systems are now accumulated there and the problem encountered was the lack of computing resources to process the huge amount of information obtained during LHC experiments that were generated there for the first time.

Despite the historical roots of the European DataGrid (EDG) project, and then the LHC Computing Grid (LCG), the gLite middleware was developed as a *general platform* for constructing a distributed computing network [10,11,16]. With financial support from the European Union, the European scientific community

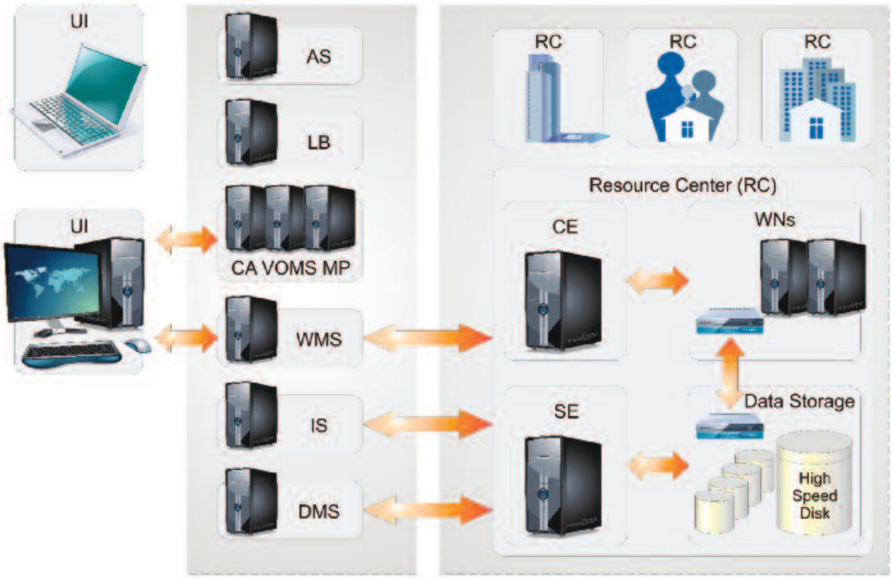

Figure 1 Grid system flowchart

launched the Enabling Grids for the E-sciencE (EGEE) project within which the gLite middleware was created.

Remote control and data acquisition are part of the existing grid concept. However, grid developments are more often focused on the sharing of computational and storage resources. In fact, these resources are much needed for most applications and users.

2 Classical grid structure

A classical grid is composed of the following basic structural elements (see Figure 1): a set of computational nodes (PC) with installed Worker Nodes (WNs); a set of Resource Centers (RC) comprising the Computing Element (CE) and the Storage Element (SE); and a set of basic Grid Services (the gLite middleware) with User Interfaces (UI) for access to Grid.

The gLite package is a complete solution for the grid including both the basic low-level programs and a number of high-level services. It accumulates the components of the best projects existing today such as the Condor and Globus, as well as the components developed within the LCG project [16]. The gLite is compatible with such task planners as PBS [10], Condor and LSF, and contains the basic services that facilitate the creation of grid applications for any applied area.

The Globus Toolkit developed by American scientists has actually become a world standard. It particularly includes a special HTTP-protocol for the use of the Grid Resource Allocation Management (GRAM); an extended version of the Grid File Transfer Protocol (GridFTP); the Grid Security Infrastructure (GSI); distributed data access based on the Lightweight Directory Access Protocol (LDAP); and remote data access via GASS (Globus Access to Secondary Storage) interface.

A resource center is composed of two types of resources [10,11]: computing resources controlled via the Computing Element (CE), and data storage resources accessible via the Storage Element (SE) which makes it possible to store and transport data between similar resources or between a resource and a grid user.

Basic grid services ensure the operation of the entire grid system and are divided into the following parts:

- Workload Management System (WMS);
- Data Management System (DMS) consisting of a file directory service and a metadata directory service;
- information and monitoring system (IS) which solves the problem of collecting and managing data on the status of the grid infrastructure;
- Grid Security Infrastructure (GSI) consisting of Certificate Authority (CA) issuing and supporting certificates;
- Virtual Organization Membership Service (VOMS);
- MyProxy Service (MP), the task of which is to provide the authentication and authorization between various grid system components;
- Logging and Bookkeeping (LB) System tracking task realization processes; and
- Accounting Subsystem (AS) designed to register the use of computing resources.

Thanks to gLite, the geographically distributed set of resources is represented as a single resource for users. The gLite middleware plays the role of a personal computer operating system in the grid.

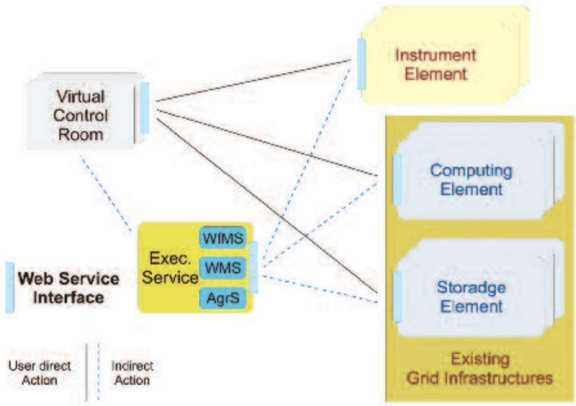

Figure 2 Interaction between the Instrument Element (IE) and other grid components

3 Security in the grid

Security is at the heart of the grid. Its components are both special secure file transfer protocols such as GSIFTP, Secure RFIO, Gsidcap, and an authorization system which, in turn, is layered and deeply separates the grid resource access rights.

GSIFTP provides the functionality of the FTP protocol, but with the support of the Grid Security Infrastructure (GSI). GSI ensures the security in insecure public data networks by providing such services as authentication, file transfer confidentiality and unified grid logon. GSI uses X.509 digital certificates as user and resource identifiers. This protocol offers fast, safe and efficient file transfer and makes it possible to control file transfer between two storage elements separated from the user (third-party transfers), as well as to transfer data in several parallel flows.

What is new is the use of the Virtual Organization Membership Service (VOMS) which stores information on the affiliation of users to certain groups and virtual organizations and their role within them. User rights can be set depending on user affiliation to a particular virtual organization, group or role (with VOMS).

Thus, the grid security system possesses all known cryptography tools and offers a harmonious authorization and access rights system based on electronic certificates.

4 Instrument element

There are more and more cases today where in addition to resource distribution, close interaction between the instruments and the grid users must be ensured. Remote access is often necessary from any grid site.

The Grid Enabled Remote Instrumentation with Distributed Control and Computation (GridCC) project [18] was launched to meet these challenges. The project aims to use grid capabilities for secure, remote, joint team work when monitoring and managing instruments and data generated and stored on distributed scientific equipment using conventional grid resources.

The Instrument Element (IE) was developed within this project and has been successfully used in various scientific collaborations for remote interaction with devices in the grid environment.

The IE consists of a linked service collection ensuring the functionality for configuring, managing and monitoring of measuring instruments outside the IE interface which allows their interaction with the rest of the grid. Figure 2 illustrates the interaction between the IE and its users and other grid components [17].

The key IE characteristics are described below [17]. The IE complies with the following functional requirements:

- uniform model of an instrument;
- standard grid access to the instruments;
- capability to communicate between different instruments belonging to different institutes and Virtual Organizations (VOs).

Remark: An IE user is not only a human being but also any application with certain rights specified in an electronic grid certificate.

An IE user can have one of the following roles shown in Figure 3 [17]:

1 Observer – can monitor the instrument;
2 Operator – can have access to an instrument configuration, as well as the right to control and monitor the instrument;
3 Administrator – can create an instrument configuration which then becomes accessible for 1 and 2.

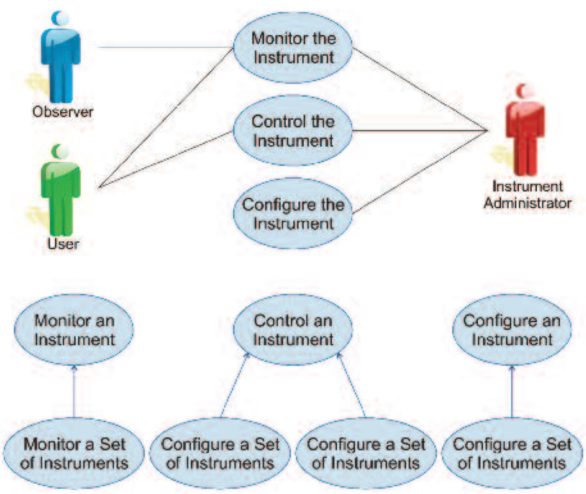

Figure 3 Instrument Element (IE) use cases

Table 1 Nonfunctional requirements

Nonfunctional requirements	Type
The nodes/instrument must be controlled and monitored	Scalability
The nodes/instrument should be accessed through the web	Remote access
The nodes/instrument should be accessed in a homogeneous way	Standardization
Round-trip time to reach all the nodes must be in the order of human reaction time	Quality of service
Online diagnostics and possible error recovery	Autonomic

At any moment there may be many observers and administrators, but only one operator which uses (i.e. controls) the instrument.

If the instrument is complex and has independent modules (as is the case for the LHC CMS detector [12,13]) then several operators may each use a separate module.

The IE was developed based on the functional (see above) and technical requirements (see Table 1) [17].

An instrument or a set of instruments can be both very simple and very complex. Therefore, the following instrument categories were introduced when creating an abstract model of the instrument:

- dummy instrument;
- smart instrument;
- smart instrument in an ad hoc network.

Figure 4 shows a uniform model of instrument control [17].

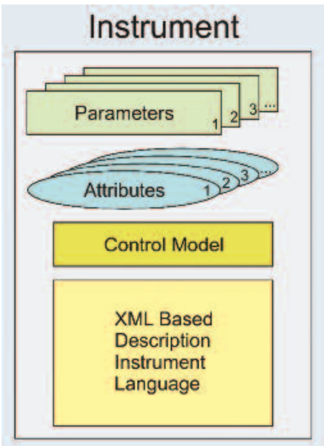

Figure 4 Uniform model of instrument control

Figure 5 shows a flowchart describing the instrument integration within the grid [17].

5 The grid and some metrology tasks

Those areas of metrology where the application of the grid could significantly improve the efficiency of the metrological activity are described below.

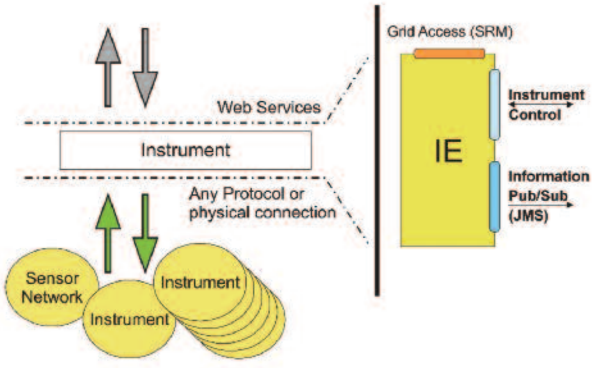

Figure 5 Instrument integration within the grid

5.1 Commercial transactions with consumers

Electricity meters, gas meters, heat meters, and water meters are constituent elements of the system of commercial transactions with end consumers and, in general, are in the legal metrology domain.

The authors expect that the grid, as a global distributed computing system in which security issues have systematically been solved to the highest level of modern information technology, will also be introduced in the banking sector, and commercial transactions with end customers will be integrated into this system.

5.2 Long-term storage and transfer of measurement data

The OIML specifies the legal metrology requirements for the long-term storage and transfer of measurement data, as well as for the uploading of new software versions for measuring instruments [8] in its Document OIML D 31:2008 *General requirements for software controlled measuring instruments*.

The grid has specifically been designed to solve similar tasks. It is known that the data hypothetically demonstrating the existence of the Higgs boson in the LHC experiments are a negligible part in the whole array (~ 10^{15} bytes per year of collision results [10,11]). Therefore, when developing the grid instrumentation, the objective was set to prevent any distortion or loss of experiment data.

Thus, the use of the grid and its Instrument Element component automatically solve the legal metrology problems specified in OIML D 31.

5.3 Remote comparisons of measurement standards, measurement reference standards and devices

In many cases modern computer technology allows for remote comparisons of measuring instruments [4, 5].

There are international programs in clock synchronization, navigation and other areas within which remote comparisons are carried out.

The grid can move these approaches to an absolutely new level both qualitatively and quantitatively, providing better processing efficiency and simultaneous data security.

5.4 Key comparisons of primary measurement standards

These comparisons are often time-consuming and expensive. Compared to the traditional internet, the grid can provide more effective tools to carry out remote comparisons of measurement standards, uniform calculations, and safe data transfer. Most operations, sometimes even all of them, can be made remotely.

5.5 Linux OS embedded instruments

The software contained in measuring instruments is becoming more and more complex. Linux OS embedded instruments are becoming more widely used, and as measuring instruments the software component is under legal metrological control. The issues involved in testing such systems and ensuring the security of measurement data are crucial. The above mentioned requirements in OIML D 31 should be met, and although this is a new and challenging task [6], it is one which is already familiar to grid developers.

Today, LHC is the most complex measuring instrument in the history of our civilization where similar and many other tasks are solved using the grid. The tools the grid provides as well as the newly developed IE provide many opportunities to effectively and safely use measuring instruments with embedded Linux OS.

The authors propose to use the 'thin client' concept as another approach to solve measuring tasks with complex software. In other words, instruments should have minimum software integrating them into the grid, and the complex processing of raw data should be performed in the grid environment.

The choice of an approach is up to measuring instrument developers.

5.6 "Reference" software

One of the main methods to study measuring instrument software is to compare it with "reference" software. However, the term "reference" software is not sufficiently defined. Besides, the comparison can be made based on both the results of code execution and the literal code matching.

In the future, the grid will be able to assign a clear meaning to the "reference" software concept and make the comparison on a new, higher level. In the authors' opinion, leading metrological organizations could set and complete the task of creating a metrological reference software repository as one of the grid resources, similar to the gLite middleware repositories [10]. In the authors' opinion, this is the very software to be used in key comparisons of measurement standards.

A relatively small group of highly skilled metrologists, mathematicians, and programmers would be quite sufficient to create a "reference" program resource.

5.7 "Reference" test data

Besides the issue in section 5.6 there is also a problem to create a grid resource for "reference" test data [9] or, in a broader meaning, test tasks. Such tasks have been used for many years to test clusters within the computer experiment assurance system at the LHC based on the grid [12–15].

5.8 Smart electrical grid

Recently, much attention has been paid to so-called "smart meters" that allow energy savings to be made. It is stated in [7] that one of the major goals of the European Metrology Research Programme (EMRP) is "to develop a metrological measurement infrastructure in Europe to support successful implementation of a Smart Electrical Grid".

Remark: Within the "Smart Electrical Grid" concept the term "grid" means mains electrical power, which differs from the meaning of "grid" as *an information computer network* that is discussed in this paper.

EMRP specifies the following research areas in Smart Electrical Grid [7]:

"a) Measurement framework for monitoring stability of smart grids via application of reliable and accurate Phasor Measurement units;

b) Traceable on-site energy measurement systems (smart meters) for ensuring fair energy trade;

c) Remote on-site measurement of power quality and efficiency; and
d) Modelling, simulation and network analysis of the system state of smart grids".

The available grid concept realization - the gLite middleware - together with the Instrument Element provide a complete set of tools to create applications for solving the above-mentioned problems in this area [20, 21].

Taking into account the conceptuality and integrity of the computing resources management system and the information security system, as well as the genericity of the instrument model (see above) in the IE, the development of grid-independent applications duplicating the solutions for these problems seems inexpedient to the authors, both with regard to time, financial, and manpower costs and to the quality of solving the problems.

6 Summary

A number of crucial metrological problems need to be adequately addressed by modern computer technologies. The authors are convinced that the grid is one such technology that meets today's global challenges. The creation of the Instrument Element as a grid component makes this system an optimal environment for effective monitoring, management and servicing of measuring resources which has the highest level of measurement data transfer, storage and processing security and which reveals new opportunities to track measurement procedures and assure a high level of confidence to these measurements.

In addition to the communities already using the grid [18,19]:

- earthquake community,
- environment community,
- experimental science community,

metrologists can obtain an extremely powerful tool to realize their goals in the

- metrology community. ■

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GAS METERS

Assessment of domestic diaphragm gas meter service lifetime

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Abstract

This paper presents the experimental results of exhaustive metrological analysis aimed at correlating the percentage measurement errors for G4 diaphragm domestic gas meters and their in-service time period (*service lifetime*). The results refer to diaphragm gas meters with synthetic membrane (rubber-on-cloth) that are used for domestic metering (for cooking use only, or for both heating and cooking). The assessment of the average errors allows useful inter-relations and indications to be obtained in order to determine the "Operating Mean Lifetime" (OML) of this type of gas meter.

1 Introduction

In general, the metrological performance of any measuring instrument changes with time (*performance degradation*), under the influence of many factors such as:

- the environmental parameters to which the meter is exposed (for example ambient temperature/pressure/humidity),
- potential impurities (contamination, pollution, etc.) during the metering process,
- the range conditions (values of the measurand inside the measurement range or possible overload),
- the operating conditions: measurand constant with the time (steady conditions) or quickly chancing; thermophysical or thermodynamic properties of the measurand,
- wear and tear (especially for dynamic meters),
- improper use (wrong or incorrect installation).

The accuracy of the measuring instrument must therefore be checked from time to time (*periodical verification*) by means of calibration according to the conditions of use, or to certain quality assurance requirements. The calibration procedure is based on the comparison, for the same quantity (*measurand*), of the metering value provided by the meter under test and the value provided by a suitable (traceable) measurement standard.

In particular, diaphragm gas meters are the most popular and widespread type of gas meters, and are still used almost exclusively for measuring gas consumptions of individual customers, both in households (domestic or residential applications) and commercial businesses [1]. The basic idea of such meters was established between 1820 and 1830, so diaphragm gas meters have proved themselves to be reliable for well over 100 years. Initially, in the early 1800's the oldest commercial positive displacement gas meters were the so-called "liquid sealed drum meters". The inherent difficulties with the liquid sealed meters (such as changes in liquid level and freezing) were overcome in the 1840's with the development of the *dry* diaphragm-type positive displacement meter.

Diaphragm gas meters belong to the "positive displacement meter" group of flowmeters, historically the oldest technology for measuring gas consumption by means of a volumetric measurement technique. In this type of meter the measurement is made by internally passing an isolated volume of gas that successively fills compartments (metering chambers) with a fixed quantity of gas (basic cyclic volume). The compartment subsequently empties.

This filling and emptying process is controlled by suitable valves and is translated into rotary motion to operate a register or index that indicates the total volume of gas passed through the meter.

Main advantages of diaphragm gas meters:

- well known and accepted measurement technology,
- full standardization [2–4],
- worldwide experience in their use,
- mechanical measurement principle: no power source is required,
- production cost adequate for the target market segment.

Main limitations of diaphragm gas meters:

- dynamic metering principle: moving parts are subject to wear and tear,
- the volumetric measurement technique requires compensation in temperature and pressure,
- the use with natural gases of different compositions and origins may affect the elastic behavior of the crucial measurement component: the membrane which limits the metering chamber.

Diaphragm gas meters typically show satisfactory accuracy (in accordance with the fixed Maximum Permissible Errors) and wide turndown (the ratio between the maximum flowrate Q_{max} and the minimum flowrate Q_{min}), in the order of 150:1 [5].

Deterioration of the diaphragm gas meter's metrological performance during the years of service is due to fatigue, wear, moisture or dirt present in the gas.

The *Operating Mean Lifetime* (or *mean service life*) of a gas meter for custody transfer application is the time interval during which the meter performs in accordance with the metrological requirements determined by the relevant legislation [5]. The error tolerances for custody transfer applications are called Maximum Permissible Errors (MPE), or Limits of Permissible Errors (LPE), and are defined as follows: *"extreme values of an error permitted by specification, regulation, etc. for a given measuring instrument"*.

According to the different standards, the current MPE limits are shown in Table 1.

According to the specifications introduced by national regulations for metrology, the *Operating Mean Lifetime* of a domestic gas meter varies, ranging from 10 years (in the Czech Republic, for example), to 15 years (recently introduced in Italy) or 20 years (in France, for example) [1]. In general, the *Operating Mean Lifetime* is an indicative parameter, which should be validated by means of periodical verifications (re-calibrations), carried out on a sample, by a statistical method at fixed intervals (typically 4–5–8 years). The *Operating Mean Lifetime* is not stated by the national regulations in all countries, and again conformity assessment is not determined by means of periodical verifications at fixed time intervals in all countries either.

The aim of this paper is to analyze the results of a wide and exhaustive campaign of calibrations carried out on diaphragm gas meters of different ages, in order to suggest, on a statistical basis, the *Operating Mean Lifetime* of a domestic gas diaphragm meter.

2 Description of the analysis method

The analysis of the metrological behavior was carried out on G4 domestic diaphragm gas meters installed in a geographical region characterized by the same climatic conditions (and also by a homogeneous kind of natural gas supply). In such a geographical area, the population of the user's installed gas meters was characterized by means of a *"user record"*, containing the following information:

- address of the user,
- ID number of the meter installed,
- type of meter (metrological classification, Q_{max}, p_{max}, etc.),
- year of construction/installation,
- manufacturer (of the meter),
- type of gas use (only cooking, or both cooking and heating).

In this way it was possible to create a suitable database and, consequently, to define relatively homogeneous lots (clusters) of gas meters (the same year of construction, the same manufacturer, the same gas use, the same geographical area) on which to focus the metrological analysis. Firstly, the sampling procedure used is in accordance with the *lot inspection* approach (or *sampling inspection*). The choice of the sampling plan was: "s"-method acceptance sampling plan (general inspection level III, reduced-type) [ISO 3951-1:2005].

In order to limit the population of the meters involved and to determine gas meter samples of an appropriate size, the investigation referred to the following *"4 reference-years"*:

- diaphragm gas meters with 16 years lifetime service (sample size: 215 meters divided into three lots of different meter manufacturers),
- diaphragm gas meters with 11 years lifetime service (sample size: 270 meters divided into four lots of different meter manufacturers),
- diaphragm gas meters with 6 years lifetime service (sample size: 169 meters divided into two lots of different meter manufacturers),
- diaphragm gas meters with 1 year lifetime service (sample size: 243 meters divided into two lots of different meter manufacturers).

Table 1: Maximum Permissible Errors for custody transfer applications

Flow range	OIML R 31 – OIML R137-1 (Q_t = 0.1 Q_{max}) [3]			UNI EN 1359 (Q_t = 0.1 Q_{max}) [4]	Directive MID 2004/22/EC [5]		EEC 71/318 (Q_t=2Q_{min})
	accuracy class				*accuracy class*		
	0.5	*1.0*	*1.5*		*1.0*	*1.5*	
$Q_{min} \leq Q < Q_t$	±1 %	±2 %	±3 %	±3 %	±2 %	±3 %	±3 %
$Q_t \leq Q \leq Q_{max}$	±0.5 %	±1 %	±1.5 %	±1.5 %	±1 %	±1.5 %	±2 %

3 Calibration procedure

The gas meters in the samples described above were selected by a random extraction technique, which identified the meter selected by means of the ID number in the appropriate database.

The gas meters identified were removed from the user's installation, carefully boxed up and dispatched to a metrological laboratory with appropriate reliability and traceability (compliance with the requirements of ISO 17025, [6]).

Each single gas meter was tested by means of a *secondary calibration* test facility, i.e. by means of a *master-slave calibration* system. The master-meters employed were two accurate positive displacement meters, depending on the value of the testing flowrate (one master meter for the lowest flowrate, Q_{min}, and the other for higher flowrates).

The ambient conditions during the calibrations were monitored and controlled (T_{amb} =21 °C ± 1 °C and RH = 65 % ± 10 %).

The gas meters were tested at four flowrates: Q_{min}, 0.2 Q_{max}, 0.5 Q_{max}, and Q_{max}. At each flowrate, three measurements were carried out.

The *Calibration and Measurement Capabilities* (CMC) of the metrological laboratory are (for a coverage factor k = 2):

- CMC = 0.45 % for the flowrates 0.2 Q_{max}, 0.5 Q_{max}, Q_{max},
- CMC = 0.72 % for the flowrate Q_{min}.

The calibrations were carried out according to the requirements of OIML R 137 and OIML R 31.

For each calibration point (i.e. each flowrate value) the percentage error was determined [7]:

$$e_{\%} = \frac{(V_{slave} - V_{master})}{V_{master}} \cdot 100$$

where:

V_{master} is the gas volume measured by the master meter (*reference value*, or *conventional true value*),

V_{slave} is the gas volume measured by meter under test.

For the three repetitions (at any flowrate value) the mean percentage error was calculated:

$$\bar{e}_{\%} = \frac{1}{3}\sum_{k=1}^{3} e_{\%,k}$$

For each sample of gas meters (for each flowrate value) the mean or average percentage errors ($E_{\%}$) were calculated:

$$\bar{E}_{\%} = \frac{1}{N}\sum_{k=1}^{N} \bar{e}_{\%,} \qquad (1)$$

where N is the total number of sample gas meters.

The experimental standard deviation (s) of the mean percentage errors was determined:

$$s(\bar{e}_{\%}) = \sqrt{\frac{1}{N-1}\sum_{k=1}^{N}\left(\bar{e}_{\%} - \bar{E}_{\%}\right)^2} \qquad (2)$$

Low values of (s) mean that the meters of the sample show a percentage error ($\bar{e}_{\%,k}$) quite close to their mean value ($\bar{E}_{\%}$); on the other hand, high values of (s) signify poor performance among the experimental results performed by the meters.

In other words, for each flowrate test value, the experimental standard deviation "s" expresses the *degree of coherence* (or *congruity*) of the experimental results. Therefore, in order to make the conformity assessment of a sample by means of a statistical method it is necessary to consider both the parameters "$\bar{E}_{\%}$" (relationship 1) and "s" (relationship 2); the single condition $\bar{E}_{\%}$ included within the MPE limits may be not sufficient to fully describe the metrological behavior of the sample.

A high concordance of the experimental data implies a good *degree of coherence* (low values of s): such a condition validates the meaning of the "average error" parameter; on the other hand, experimental data with a high spread (i.e. high values of s), render the concept of average error less meaningful.

4 Experimental results

In Figures 1 to 4 the calibration results are reported for the samples of the tested gas meters with different lifetime services.

In all the figures, the following are reported:

- the mean error values ($\bar{E}_{\%}$), as defined by equation (1), are represented by a circular point;
- the experimental standard deviation (s), defined by equation (2), is represented by means of a vertical segment, symmetrically positioned with respect to the mean/average error.

In order to give an indication of the *conformity* [8–9] (i.e. when the meter behavior complies with the MPE error limits) of the sample gas meters, it is useful to introduce the following cases (see Figure 5):

A = *full conformity*: in this case the average error is within the MPE limits and also the magnitude of the standard deviation is within MPE limits (s ≤ MPE);

B = *satisfactory conformity*: in this case the average error is within the MPE limits, the magnitude of the standard deviation is within the MPE limits (s ≤ MPE) but a vertical segment slightly intersects the PME line;

C = *poor conformity*: in this case the average error is within the MPE limits, but both the vertical segments of the standard deviation intersect and extend beyond the MPE lines (s > MPE);

D = *non conformity*: in this case the average error is out of the MPE limits, and the magnitude of s is less than the MPE limits (s ≤ MPE);

E = *full non conformity*: in this case the average error is out of the MPE limits and the standard deviation is greater than the MPE limits (s > MPE).

The calibration results show that at the minimum flowrate (Q_{min}) the diaphragm gas meters manifest very poor stability and consequently they show a low *degree of coherence* (high values of the standard deviation s).

5 Discussion and conclusions

This paper has presented a comprehensive study of the measurement errors encountered in diaphragm gas meters at different time intervals of service.

A very large number (897) of G4 gas meters with synthetic membrane were calibrated.

The instability effects at the lowest flowrate (Q_{min}) affect the measurement repeatability.

The conformity of a sample of gas meters can be determined when at the three flowrates in the upper zone (0.2 Q_{max}, 0.5 Q_{max} and Q_{max}) the errors determined are of type A or B (see Figure 5).

As it is possible to infer from Figure 1, meters with 16 years of service show poor conformity (type C), since the average errors are within the MPE limits but the repeatability is unsatisfactory (s > MPE limits).

On the other hand, those gas meters with less than 16 years of service are characterized by a good or satisfactory conformity (type A and B).

Therefore, it is possible to summarize that the O*perating Mean Life* (OML) for G4 diaphragm gas meters should be comprised between 11 and 16 years (11 < OML < 16). ■

6 References

[1] World gas meter report, 6th edition, 2007, ABS Energy Research, London.

[2] OIML R 31:1995: *Diaphragm gas meters*.

[3] OIML R 137-1:2006: *Gas meters – Part 1: Requirements*.

[4] UNI EN1359:2006: *Gas meters – Diaphragm meters*.

[5] Directive 2004/22/EC of The European Parliament and of the Council of 31 March 2004 on Measuring Instruments (*Measuring Instruments Directive*).

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[7] OIML V 1:2000: *International Vocabulary of Terms in Legal Metrology*: VIML 2.13.

[8] WELMEC Guide 8.1 (Issue 1): *Guide on terms and definitions in the MID and their relation to terms defined in other international metrologically relevant documents*, June 2006.

[9] WELMEC Guide 11.1 (Issue 3): *Measuring Instruments Directive 2004/22/EC – Common Application for utility meters*, May 2009.

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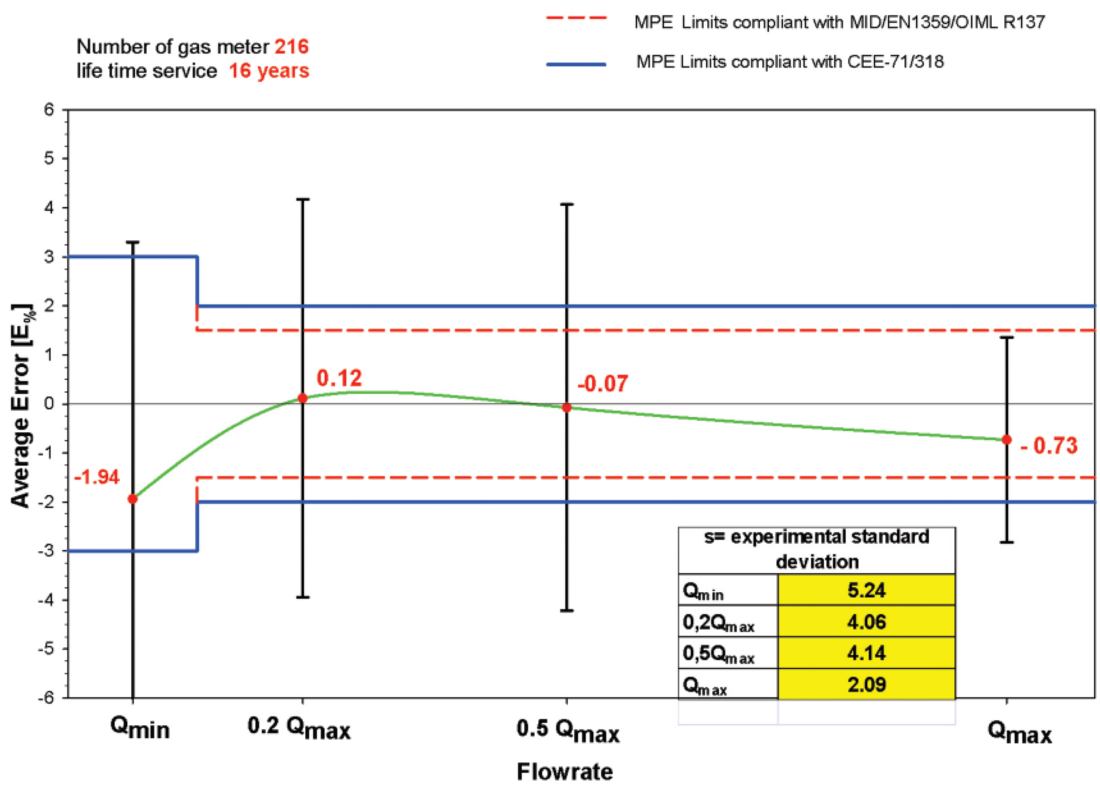


Figure 1 Calibration results of diaphragm gas meters with 16 years lifetime service

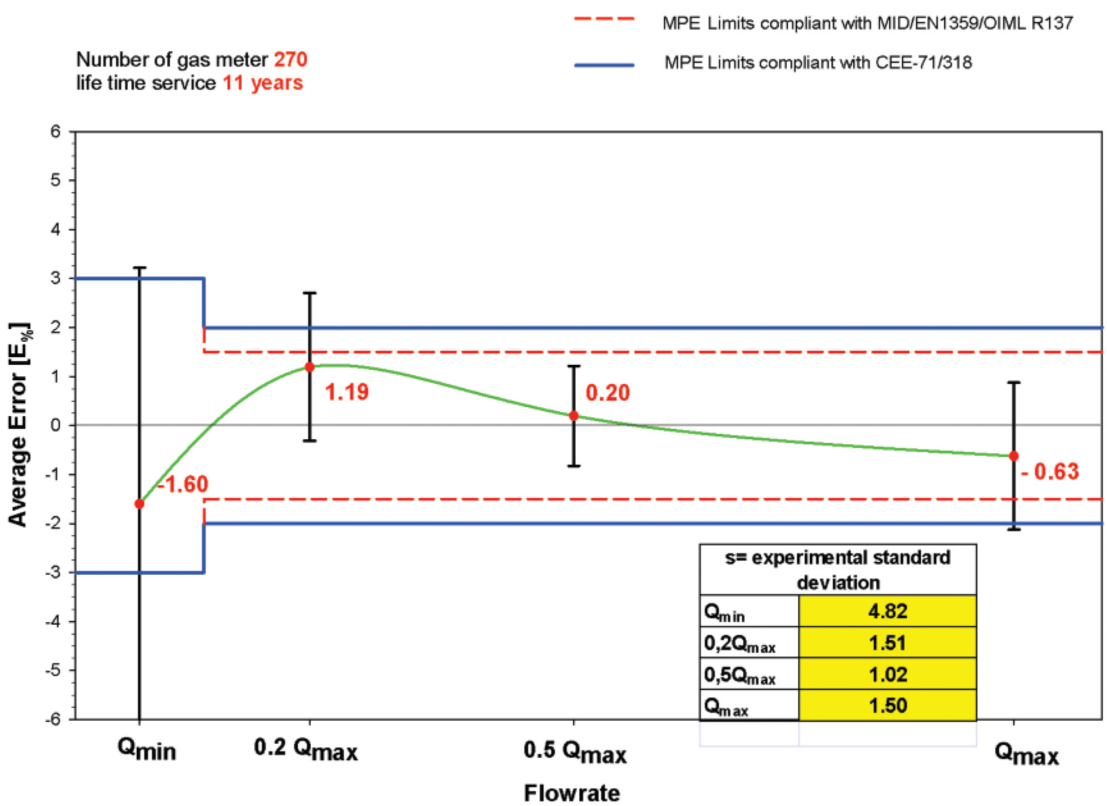


Figure 2 Calibration results of diaphragm gas meters with 11 years lifetime service

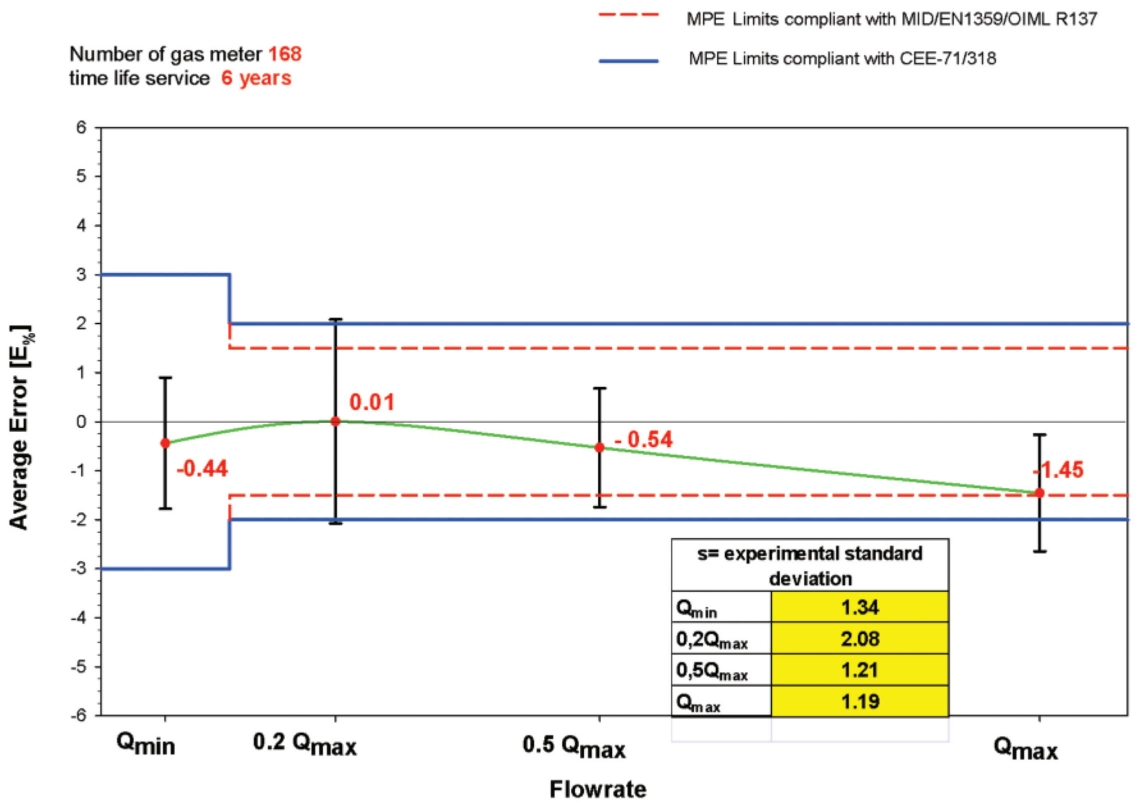


Figure 3 Calibration results of diaphragm gas meters with 6 years lifetime service

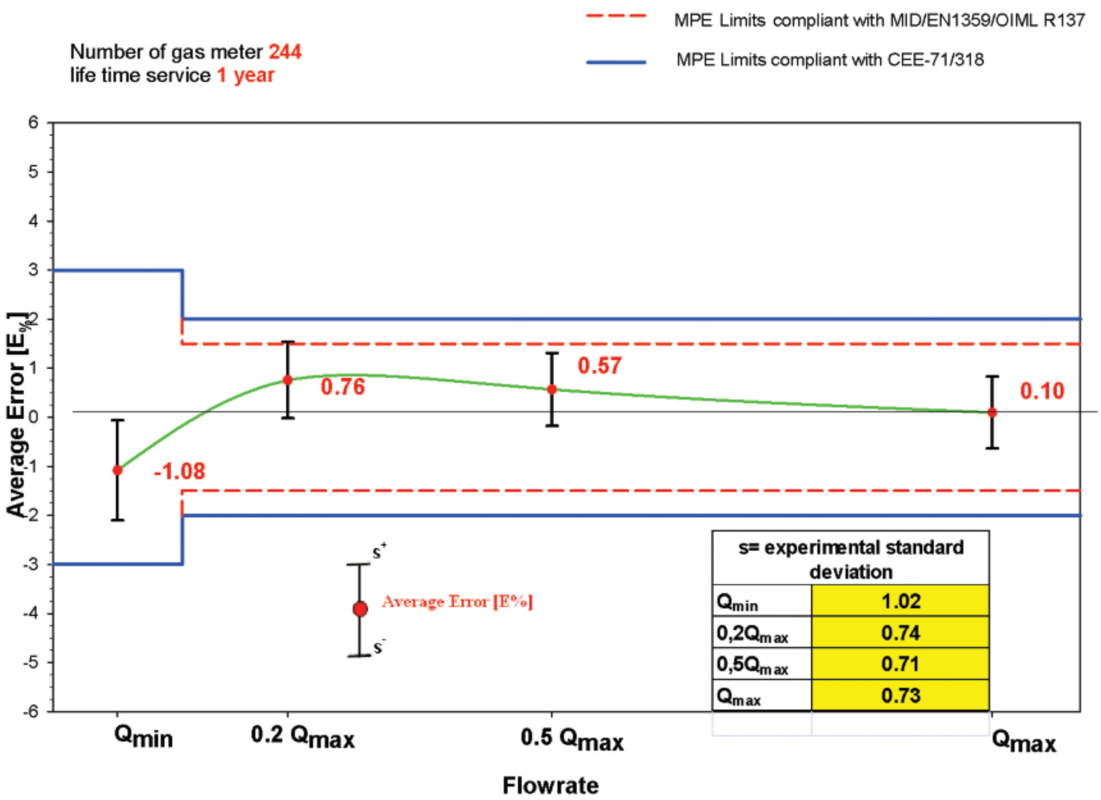


Figure 4 Calibration results of diaphragm gas meters with 1 year lifetime service

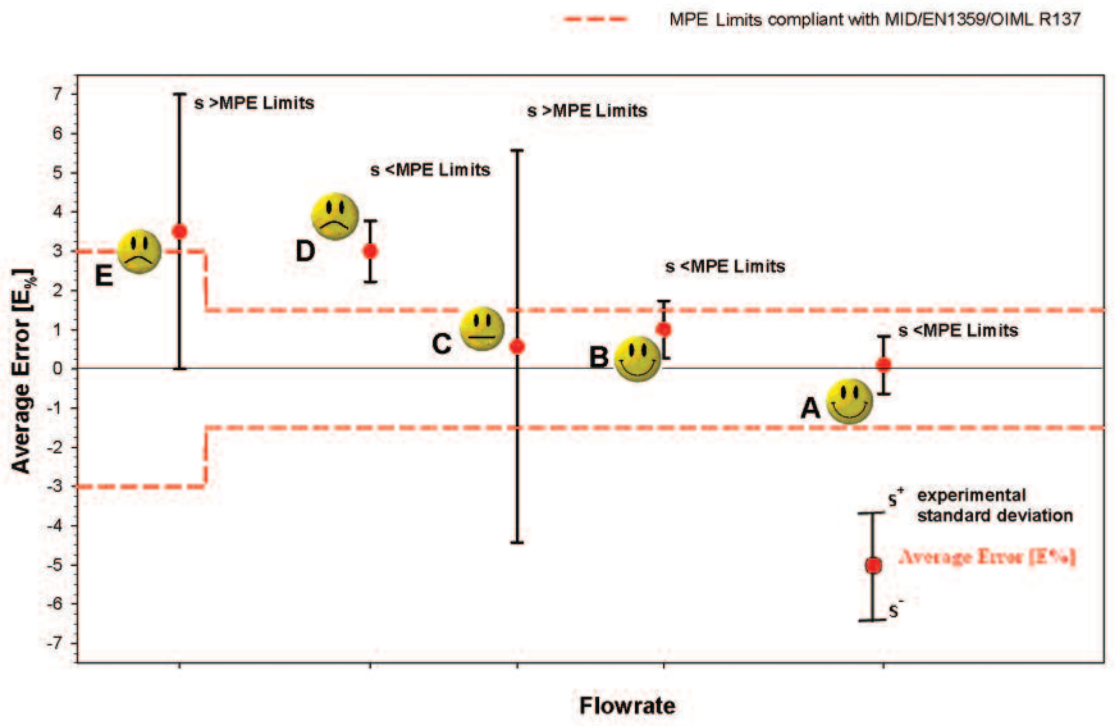


Figure 5 Conformity assessment classification

HISTORY OF SCALES

Part 1: Weights, scales and weighing in the course of time

ING. WOLFGANG EULER, Hennef/Sieg and
HEINZ WEISSER, Balingen

This series of short articles under the theme "History of scales" is intended to offer readers – and especially young people who might still be in training and who will undertake responsibilities in the future – a chance to broaden their knowledge of the scales which are used in enterprise and in trade transactions.

Weights and measures are a matter of course for the manufacturer of scales as this subject is all that he is concerned with. But when was the scale invented? Why does such a measuring device exist at all? These are only a few of the many questions which will be answered in this multipart series of the *History of scales*.

The origin of weighing scales

How unimaginably vast is time and space. Our earth is at least three and a half billion years old. A grain of dust in the universe circling around the sun, along with the other planets that go to make up our solar system. And this sun in turn is only one of about fifty billion fixed stars which fill the Milky Way system.

The beginnings of life likewise lie billions of years in the past. However only two million years ago the so-called "primates" had developed, creatures who walked in an upright position. "Homo sapiens", the first human beings, still had to develop from them.

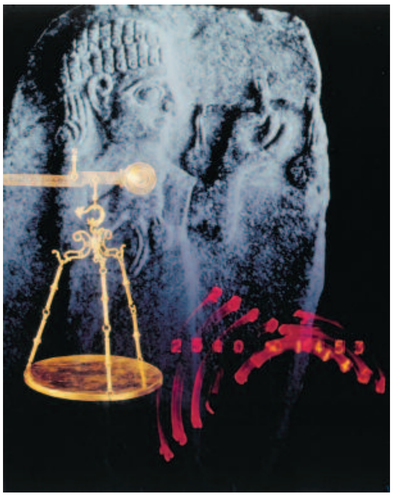
As a newborn infant, the human being is the most feeble and helpless of all creatures. But behind the low and bulging brow glows the divine spark of the mind, in his slumbering soul shines the presentiment of a higher mission. And thus the future lord of the earth begins along a path which, with sacrifice and struggle, leads to the enlightened gate of culture and onward to the bright path of history.

The Neanderthals traveled over the world for many millennia. They were hunters and gatherers and lived, as the saying goes, "from hand to mouth".

Approximately 10 000 years ago, sometime and somewhere, the first peasants had developed in the early dawn of human history. At other places a band of wandering nomads settled down along the shores of a lake and were dedicated to fishing. And with the changes in the way of living, they also created the first successful tools.

Step by step they conquered the plant kingdom, cultivated the first field crops and planted cereals such as barley and einkorn wheat. The origins of the first agricultural cultivations presumably go back to former Mesopotamia.

The humans who had led an existence as hunting and gathering nomads until then eventually settled down. And with this significant jump in development, mankind began to measure for the first time, because people needed to determine the quantity of types of grains and calculate the size of plots of land, property, and surfaces. Measurements were also essential for the daily barter transactions.



Editor's Note

A series of articles on the history of scales is being published in the next few issues of the OIML Bulletin. Today s weighing machines are all equipped with electronics and software, and have necessarily become more complex over time. It is hard for consumers and "simple" citizens to fully grasp how the mass (weight) is determined directly – indeed, even measuring instrument experts encounter more and more problems in understanding advanced technical specifications. It was therefore a matter of particular concern to Manfred Kochsiek (former Vice-President of PTB and former CIML Acting President) to show the development of scales right through to today's high-tech products. Mr. Kochsiek called on the expertise of Mr. Euler and Mr. Weisser, both of whom are competent experts in the field of (non-)automatic weighing instruments. As authors of this article they have done an excellent job in compiling this history of scales in a simple but very comprehensible way. The Authors will be presented in the October edition of the Bulletin, in which the next two parts of this series will be published.

Coconut, food or wooden sticks: simple but effective means to measure quantities and lengths

The first measuring implements

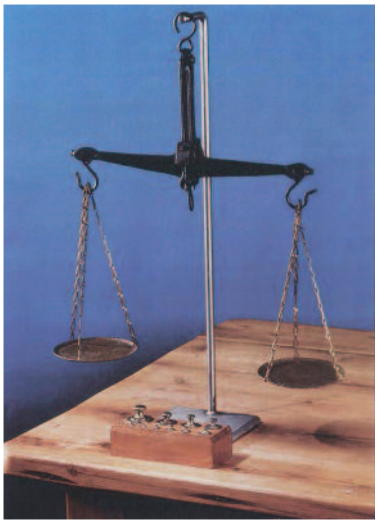
Hollow and simple linear rulers are probably the oldest measuring instruments mankind invented. Weighing scales, as suspected, came immediately thereafter. Containers of similar size were initially employed for determining quantity, for example a hollowed-out coconut. And a wood stick or forearm helped to determine lengths, distances, surfaces, and goods. This simple but effective method only presupposes that two or more individuals accept the measure. And the ensuing measurements were nevertheless so beneficial that we in part still know and use them:

Carrier

Yoke employed by coolies

- *Bushels*: German measure of capacity for bulk solid bodies (e.g. cereals) used until 1872;
- *Yard*: a measure of length;
- *Foot*: common in the Anglo-American region (then as now);
- *Liter*: today our most common measure of capacity.

"The human is the measure of all things" – this idiom applies also to the development of scales. With arms outstretched to the side, the human torso forms the scales beam and the accompanying weighing pans with his hollowed hands. The barter transactions of original people were probably concluded in this way to compare weights.



Equal-armed balance

The origin of the scales – the symbol for equality, truth and justice – extends back to the oldest ancient cultures. In the Neolithic period (10 000 B.C.), the first mechanization and cultivation of human life began. Stone weights (around 7 000 B.C.) were found in Egypt – historical testimony which speaks for the fact that scales must have existed in this ancient culture.

Around the world today, primarily in Asia, the yoke used by coolies or the bearing yoke to carry water, milk, cheese, or similar loads used in many countries soon gave primitive people the idea of balancing two loads. The pivoting point of the beam soon migrated from the human shoulder to a stone or wooden column, and for smaller scale beams to a middle bearing eye, and in later times to a middle cutting edge. The basic form of the equal armed beam balance was thus invented, probably in different places around the same time. Where precisely scales were developed in ancient times can still not be determined to this day.

The oldest conserved equal armed beam balance was found in a prehistoric tomb in Egypt and is dated at around 5 000 B.C. Its scale beam consists of reddish limestone and is pierced in the center and at both ends, and is furnished with strings which guaranteed free play and great sensitivity. Origins of measuring devices are to be sought especially in lands of the Babylonians between the Euphrates and Tigris (today Iraq) as well as in the valley of the Egyptian Nile. The first known measurement and weight system, which was trend-setting for the metrological development in antiquity, was located in the ancient Babylonian city of Ur northwest of Basra (Iraq) around 2 600 B.C.

Both the Bible and the Koran insist on balance. Below are some examples of quotations indicating the importance of scales and units of measure:

Bible, Old Testament:

- Leviticus 19, 35: *Do not use dishonest standards when measuring length, weight or quantity*.
- Leviticus 19, 36: *Use honest scales and honest weights, an honest ephah and an honest hin*.

Koran:

- Verse 86, 7th Sure: Therefore keep measures and weights fair and honest / and do not reduce the property of the people / and do not damage the land once it has healed.

Part 2: Weights, scales and weighing through the ages

The Roman steelyard

The Roman steelyard with its sliding weight is a further development of the *equal armed beam scale*, around 500 B.C. It has been proven that the sliding weight beam scale had its origins in Egypt in about 1 400 BC. For the ancient Romans, this scale was an important basis for their trade empire. This is how sliding weight scales gradually became known as the "Roman scale" over the course of time. The various terms used here all refer to the same type of scale.

The platform scale works on the principle of the equal armed beam scale

Sliding weight scales consist of a beam with a scale and two unequal lever arms. On one arm there is a balance weight and on the other arm there is a hook to suspend the item to be weighed. Many sliding weight scales even had two hooks for hanging the load. This provided two weighing ranges. The distance between the lever arms can be changed by moving the sliding weight until the suspended object comes into balance. The sliding weights normally had geometric shapes or were reproductions of commodities such as fruit, animals or human busts.

The invention of the Roman sliding weight scale of course had an immense significance in trade since it offered enormous advantages over the equal armed scale. It is much quicker and easier to weigh using a sliding weight that is several times lighter than the load depending on the relative distance between the lever arms. The same operation is much more difficult using an equal armed scale with its many weight units. But it must be clearly pointed out that the steelyard can only be used if no high demands are placed on accuracy. In fact, the Roman steelyard can be very imprecise when determining weight.

Remains of this scale or its rests have been found in all countries conquered by Rome. The scale still renders good service today, and the Roman steelyard scale is still the main scale used in Mediterranean countries.

Market, mass and weight in the Middle Ages

Mass and weight have been linked to the right to hold markets from time immemorial, as quoted by Pippin (744): "... that all towns shall apply, maintain in proper order and keep statutory markets and mass units". In the cultural history of mankind, a market provides the opportunity to exchange goods in large settlements and towns. The market privileges bestowed upon local rulers normally went hand in hand with the right to mint coins, the right to levy customs duties and the right to organize public markets. These privileges also included the standardization of mass units and weights for supervising the market. Without this, a public market would not be possible.

Remark: Weights and weighing still determine the flow of money and goods today to a great extent. Without scales it would also be impossible to maintain a properly functioning economy.

The platform scale and the equal armed beam scale (from 1669)

Platform scales belong to the group of mechanical scales and operate on the principle of the equal armed beam scale. They are normally made for weighing ranges of up to 10 kg. During the weighing operation, the platform scale compares the mass of a known object, e.g. a commercial weight (standard weight) with that of goods weighed. The weight of the goods weighed matches that of the commercial weight when equilibrium is attained. On a platform scale, this is recognizable when the two tongues in the middle are aligned along the same line. The platform scale was invented in 1669.

The analogue signal and the equal armed beam scale

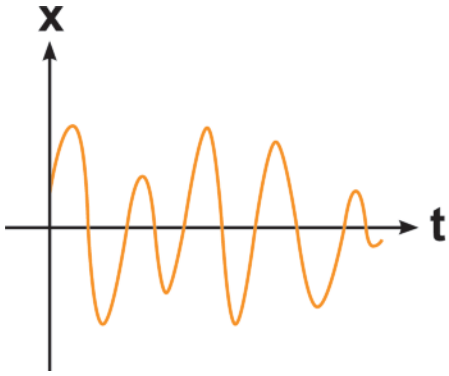
Before we deal with the invention of the binary number system, let us again explain the term "analogue". In the meantime, this term has become lost for most people, which is often noticeable in seminars. Simple explanations are not easy to obtain.

Analogue (Greek) means proportionate, ratio, account. Freely translated, analogue means something like "similar".

A signal is referred to as analogue when its parameters bearing the information, e.g. momentary value, can assume continuously any variable value between a minimum and a maximum. This relates to almost all real processes or states.

Examples for analogue conditions: The tacho generator voltage proportional to the rotational speed or the speed of a dynamo on a bicycle (low speed = less light, high speed = bright light) is an analogue function. An office door is open slightly, open slightly more, half open or fully open (but it is either open or closed = digital). The voltage of a strain gauge load cell proportional to force is also an analogue signal.

Equal armed beam scales operate on the analogue principle: a proportionally greater or smaller pointer deflection results from a rising or falling weight load.



Continuous-value and continuous-time

The binary number system and the equal armed beam scale

Gottfried Wilhelm Leibniz deduced the method of calculating with the two digits 0 and 1 by dividing the weights on the analogue equal armed beam scale. As a result, he developed the binary number system that is still in use today and that is indispensable for the computer industry. He wrote about this far-reaching discovery in his New Year's letter to Duke Rudolf August in Wolfenbüttel in 1697.

8	4	2	1		
2^3	2^2	2^1	2^0		
				Binär	Dezimal
0	0	0	1	= 1	= 1
1	0	0	0	= 8	= 8
0	1	1	0	= 4 + 2	= 6
0	1	1	0	= 4 + 2	= 6
0	0	0	1	= 1	= 1
1	0	0	0	= 8	= 8
1	0	0	0	= 8	= 8
0	0	1	1	= 2 + 1	= 3
0	1	0	0	= 4	= 4
0	1	1	1	= 7	= 7
0	0	1	1	= 2 + 1	= 3

Examples of converting binary to decimal figures

Outlook

In Part 3 we will again consider Gottfried Wilhelm Leibniz and the binary number system. 1764 is the next milestone in the history of the scale. For this we go to the Swabian Alb, to Philipp Matthäus Hahn in Albstadt-Onstmettingen. He is regarded as the founder of all scale technology and manufacture in the entire region of the Zollernalb. In addition, it is thanks to his work that a new and major star arose in the scale heavens with the company Bizerba in 1866. ■

Metrology

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20 May 2012

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Message from the Directors of the BIPM and the BIML

WORLD METROLOGY DAY 2012

Michael Kühne
Director of the BIPM

Stephen Patoray
Director of the BIML

Paris, March 2012

Dear Colleagues,

May 20, the anniversary of the signing of the Metre Convention in 1875, is the day on which the world metrology community celebrates *World Metrology Day*. As Directors of the two world metrology Organizations (the BIPM and the BIML), our aim in marking the anniversary is to join together and work with you to raise awareness of the important, if often unnoticed, role that metrology plays in all of our lives. And so we take this opportunity to address the stakeholders in the metrology arena and to invite you to join us in the activities to commemorate this important date.

This year we have chosen the theme *Metrology for safety*, reflecting the importance of obtaining reliable measurement results to ensure we are safe whether at work, rest or play. Just like "metrology", the term "safety" covers a very wide spectrum of topics but many people are unaware of the vital role played by our worldwide metrology community. Safety is crucially dependent on good metrology. It is our collective responsibility as metrologists to ensure that we have trustworthy measurement results whether to help ensure the reliability of the planes people fly in, the impact resistance of cars, or even the radiation therapy we or others will someday need.

This is the message we must put across to the public, who use and trust in the measurements we make. Across the world, National Metrology Institutes and the National Legal Metrology organizations strive to provide the communities they serve with the expert metrological knowledge that allows our modern high technology world to function reliably and safely.

Let us consider road safety as an example. Some 1.5 million people are killed on the world's roads each year, an alarming figure which has prompted the UN to declare the *Decade of Action for Road Safety* (2011–2020). A number of OIML Recommendations are particularly relevant to the field of road safety, as they give guidance on a range of instruments which may be subject to legal controls. Some examples are tire pressure gauges, speedometers, radar equipment for the measurement of the speed of vehicles, evidential breath analyzers and automatic instruments for weighing road vehicles.

Taking another example, few members of the public are aware that the BIPM provides comparison and calibration services in the field of ionizing radiation to its Member States' National Metrology Institutes and Designated Institutes, as well as to the World Health Organization / International Atomic Energy Agency (WHO/IAEA) program. Worldwide these BIPM services help to underpin the accuracy of the annual treatment of some seven million patients undergoing radiotherapy, a further 33 million being diagnosed by nuclear medicine, and over 360 million being diagnosed by x-ray. In addition, some 11 million people are monitored for their personal radiation dose because they work with ionizing radiation.

These are just a few examples. Whatever people do, whichever way they turn, although they may not know it, their safety depends on us, the metrology community, doing our job, and doing it well. As the slogan says, our message to the world at large is "We measure for your safety".

So join us in celebrating World Metrology Day, and help people recognize the contribution of the intergovernmental and national organizations that work throughout the year on their behalf. ■

Events

Around the world, events were organized to celebrate World Metrology Day 2012. These included talks, presentations, open days, exhibitions and seminars.

The BIPM and the BIML jointly managed the World Metrology Day web site (www.worldmetrologyday.org) and uploaded details of the events as they were communicated to us. We are grateful to all those who supported the event and are pleased to publish below excerpts of the "Events" page of the WMD web site.

Australia

As part of the WMD commemorations, on 22 May NMI invited Dr Adi Paterson, CEO of the Australian Nuclear Science and Technology Organisation (ANSTO) and Mr Martin Dwyer of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) to give a presentation on the work of their respective organisations. NMI's Dr Valérie Villière also gave a short talk. The seminar was opened with a short address by Dr Barry Inglis, the President of the International Committee for Weights and Measures (CIPM). For more information, please visit: www.measurement.gov.au/Pages/NMISymposium.aspx

Bangladesh

The Bangladesh Standards and Testing Institution (BSTI) decided to observe World Metrology Day 2012. On this occasion, a discussion meeting was held on 20 May 2012 in the BSTI auditorium. The Honorable Minister, Ministry of Industries of the Government of Bangladesh remained present as Chief Guest during the discussion meeting. A number of well-renowned scientists, academics and press and media personalities also attended, and a PowerPoint presentation marking the importance of World Metrology Day and this year's theme was given by NML-BSTI officials. National radio/television and newspapers also broadcast and published the World Metrology Day program.

Belgium

Le mardi 15 mai 2012, le Service de métrologie du SPF Economie (Belgique) a organisé une série de présentations sur le thème "Métrology for Safety", suivi d'une visite guidée des laboratoires. Lors de cette journée internationale de la métrologie l'atelier s'est déroulé en français, en néerlandais et en anglais. Pour de plus amples renseignements, visitez ce site web : http://economie.fgov.be/fr/modules/activity/activite_1/20120515_world_metrology_day_2012.jsp

Botswana

This year WMD was celebrated in Gaborone under the theme 'Metrology for safety' which highlighted the importance of correct measurements to ensure safety in all walks of life. The focus for this year's theme was on road safety and to demonstrate its significance the Botswana Bureau of Standards (BOBS) partnered with the Motor Vehicle Accident Fund, the Department of Road Transport and Safety and the Botswana Police Service to spread road safety awareness across the country. For a full report, visit: http://www.worldmetrologyday.org/events.html#botswana

Brazil

The Brazilian National Institute of Metrology, Quality and Technology (Inmetro) held its third annual celebration of World Metrology Day on Tuesday, May 22, 2012. On this one-day event several presentations and other related activities approached the WMD proposed theme Metrology for Safety. The location was Inmetro facilities, Xerém, Duque de Caxias/RJ – Brazil ; for more information please contact Mr. Silvio F Santos (sfsantos@inmetro.gov.br)

Bulgaria

The Bulgarian Institute of Metrology, together with the Union of Metrologists in Bulgaria, the State Agency for Metrological and Technical Surveillance and the Federation of the Scientific Engineering Unions organized the X-th National Scientific-Practical Conference “Metrology 2012” on 18 May 2012. This year’s event was devoted to World Metrology Day, 20 May, with the motto “We measure for your safety”. The Conference was under the patronage of Mr. Delyan Dobrev, Minister of Economy, Energy and Tourism. Themes of the Conference: measurements - a prerequisite for safety, legal metrology for public protection, current international and national documents on metrology, European framework for marketing of measuring instruments, accreditation in support of safety and standardization and safety. The Bulgarian Institute of Standardization, the Bulgarian Accreditation Service, the Bulgarian Academy of Science, the Technical University of Sofia, the University of Chemical Technology and Metallurgy - Sofia, former colleagues involved in metrology activities, producers of measuring instruments and other interested parties were invited to take part in the Conference. More information: www.bim.government.bg

Costa Rica

In celebration of World Metrology Day, LACOMET organized a series of activities from 21–30 May 2012 which were expected to have an impact on a wide range of audiences including secondary metrology laboratories, universities, and the general public. Certain designated LACOMET laboratories also participated, including the Variable Electrical Metrology Laboratory ICE, the National Metrology Laboratory, RECOPE, and the National Laboratory of Force Lanamme UCR. Activities included an Open Day at LACOMET laboratories for users of metrology; a video conference with the participation of Luis Mussio (OIML): “Metrology and security” for metrologists of LACOMET bodies and officials of the National System for Quality (accreditation, regulation and standardization); advanced level exchanges between LACOMET, LMVE-ICE, LNM LANAMME RECOPE and UCR aimed at secondary laboratories, clients and the general public; a Metrology Awareness Seminar for SMEs, METRON project, aimed at companies in the metalworking sector, food, chambers of commerce; talks on Radiation Safety and CICANUM by the University of Costa Rica, led by health officials, universities and general users; and lastly a discussion and video conference entitled “Importance of Metrology” for high school students by LACOMET.

Ireland

To mark World Metrology Day 2012, NSAI NML arranged for 3rd level students from Dublin City University to visit the NML premises in Glasnevin on 24 May. The students, who were in their third year studying science and engineering, were given a tour of the NML laboratories and shown practical usage of the equipment used in calibration. More information: www.nsai.ie/our-services/measurement/calibration-services/world-metrology-day-2012.aspx

Republic of Korea

KRISS celebrated World Metrology Day by organizing a symposium on May 21, 2012. It took place at the campus of KRISS, Daejeon, Korea. The theme of the symposium was "We measure for your safety" and presentations and discussions covered significant issues such as public and industrial safety, radioactivity and food safety, nanomaterials, etc. Speakers were all from the R&D divisions of KRISS. The symposium was also connected with a workshop with regard to the world class laboratories in KRISS. The Symposium Program comprised: 1. "Advanced measurement technology for public and industrial safety" - Dr. Dong-Jin Yoon, Head, Center for Safety Measurements, KRISS; 2. "The Fukushima nuclear accident and radiation safety" - Dr. LEE, Sang Han, Center for Ionizing Radiation, KRISS; 3. "Measurement for medical healthcare" - Dr. Yong Tae KIM, Center for Fluid Flow and Acoustics, KRISS; and 4. "Nano EHS research activities in KRISS" - Dr. Song, Nam Woong, Center for Nano-bio Convergence, KRISS.

México

To celebrate World Metrology Day 2012, the Centro Nacional de Metrología, México proposed a public open day to show the big picture of how we all benefit from metrology in our daily lives. The theme of World Metrology Day 2012 was underpinned by the slogan "We measure for your safety". To mark this celebration, the third one of its kind, CENAM opened its doors and offered guided tours of its measurement laboratories and also other places of interest within the facility such as the Newton tree, display patterns and various meters for conducting experiments. There were lectures, video projections showing the institution, access to the library, poster displays, and more. The laboratories and lectures were oriented towards the general public, beginning at minimum high school grade level or equivalent. The thematic areas considered during group visits to laboratories were: Safety and Health, Energy and Environment, Metrology for Industry, and the International System of Units (SI). For more details please visit: www.cenam.mx/pabiertas

Saudi Arabia

"It is my pleasure to share with you the WMD event organized by the Saudi Quality Council. This is the third event since we began in 2010; we organized a symposium on Sunday 20 May 2012 to raise the awareness of the importance of metrology in all aspects of our lives. In line with this year's slogan we selected different topics for the lectures. Every year, we organize a symposium to cover the application of metrology in different disciplines: mainly, the basic metrology concept, the NMI, medical, testing to protect customer rights, and compliance with specifications. The program of the event was posted on our web site together with the invitation. The event this year was sponsored by the well known manufacturer of calibration equipment Fluke, and their representative in the Kingdom of Saudi Arabia Mejdaf Group. The Saudi TV channel covered the event. The SI poster was offered to the audience as gift of the day. The PowerPoint files of the lectures are available, the message from the Directors of the BIPM and the BIML was translated into Arabic and pictures from the event are also available." – Eng. Waleed Al-Faris, Member of the Executive Committee of the SQC.

Tunisia

A cette occasion, un World Café sur le thème « Métrologie & Sécurité » a été organisé par l'Agence Nationale de Métrologie (ANM), le mardi 22 mai 2012 à l'hôtel Golden Tulip à Tunis, avec le concours du CNSTN1, de l'ANCSEP2, du CTAA3 et de l'Observatoire National de la Sécurité Routière. L'objectif de ce World Café était d'explorer les sujets en question afin d'identifier les problématiques y afférents et de faire des recommandations pour le développement de la métrologie dans ce domaine au niveau national. A ce titre, les 3 sujets suivants ont été traités : la sécurité pour le bien-être ; la sécurité routière ;et la sécurité sanitaire. Aussi, un workshop sur le contrôle métrologique des préemballages a été animé, en fin de journée, par un expert européen, et ce, dans le cadre du projet de jumelage institutionnel entre la Tunisie (ANM) et un consortium européen composé de l'Institut Néerlandais de Métrologie (VSL) et de l'institut Portugais de la Qualité (IPQ). Ce Workshop avait pour thème : « Métrologie et produits préemballés : les exigences européennes ».

Turkey

World Metrology Day was celebrated in Turkey on 21 May, 2012 from 09.30–16:00 at the Bilkent Hotel, Ankara, hosted by the Ministry of Science, Industry and Technology General Directorate of Metrology and Standardization. During the event Prof Dr Naci EKEM, a member of Eski ehir Osmangazi University, gave a talk on metrology, Dr Muhsin MAZMAN, Senior Researcher from TÜB TAK, gave a talk on science, and prizes were awarded to the secondary education students painting contest winners entitled “What would happen to our safety if we could not measure correctly?”. Prizes were also awarded for running and table tennis sports activities performed in TÜB TAK Gebze Campus. It was possible to view the Painting Contest exhibition and the TÜB TAK UME Measurement Park. State institutions and organizations, industrial firms and universities especially involved in metrology-related academic activities and a group of 30 secondary education students were invited to the celebration and it was estimated that there were a total of about 300 participants. For more information: www.sanayi.gov.tr/AnnouncementDetails.aspx?annID=1073&lng=tr and www.ume.tubitak.gov.tr/toplumda_metroloji/dunya_metroloji_gunu.php?f=1

United States

The range of the National Institute of Standards and Technology’s measurement work devoted to safety is vast, and this work affects millions of measuring instruments both in the USA and around the world. NIST celebrated World Metrology Day on Monday May 21, 2012, with a Colloquium highlighting a large number of NIST programs dedicated to creating a safer world. This World Metrology Day, thought was given to how important accurate measurement is to our lives and our civilized, industrial society. To find out more about the Colloquium, please visit the following NIST page: www.nist.gov/pml/improving-safety-measures-and-measures-of-safety-for-world-metrology-day-2012.cfm

Uruguay

LATU commemorated WMD with a seminar for the presentation of new services for the calibration of instruments used to ensure road safety. En conmemoración del Día Mundial de la Metrologia, el Laboratorio Tecnológico del Uruguay y la Unidad Nacional de Seguridad Vial - Presidencia de la República, tienen el agrado de invitar a usted a la presentación del nuevo Servicio de Calibración de Instrumentos relacionado con la Seguridad Vial. Miércoles 23 de mayo a la hora 10:00 - Sala de Actos - LATU. ■

www.worldmetrologyday.org

ENGAGING WITH CONSUMERS

Report of the 34th ISO COPOLCO Plenary meeting and workshop

15–17 May 2012

Nadi, Fiji

John Birch AM, CIML Honorary Member

Traditionally, consumer protection was the major rationale for weights and measures systems, and informed consumers performed an important role in market surveillance. However technological change, the expanding scope of legal metrology, regulatory reform and changing expenditure patterns have contributed to a decline in consumer interest in metrology and currently there is no direct consumer input into the technical work of the OIML.

Thirty five years ago studies on the economics of the measurement system at NBS (USA) noted that most studies were conducted from the perspective of the physical scientist. An alternative approach would be to focus on the user and in particular consumers which would make it easier to explore the secondary impacts of costs and benefits of measurement for the society as a whole.

In 1978 ISO established a Committee on Consumer Policy (COPOLCO) to support consumer participation in standards development and to channel consumer views into both current standards projects and proposals for new areas of interest to consumers. COPLOCO membership includes some 105 national standards bodies. The International Electrotechnical Committee is also represented and Consumers International, the OECD and (since 2012) the OIML also have liaison status. Delegates are typically representatives from the national standards bodies and consumer organisations in the member countries.

Whilst COPOLCO itself does not develop standards, it does produce guides, policy statements and information publications on issues of importance to consumers. To assist consumers to contribute to standards development COPOLCO has developed a distance learning module *Consumers and standards: partnership for a better world*.

COPOLCO has eleven working groups that progress their program. These include working groups on consumer participation, product safety, consumer protection in the global market place and training which focuses particularly on the needs of developing countries. In addition each year COPOLCO organises a workshop in conjunction with its plenary meeting to explore a different theme of consumer interest and determine possible recommendations for ISO policy directions or potential future technical work. In 2011 the workshop theme was *Homes for Tomorrow-Building through Standards* and two areas that were identified for further consideration were standards for housing insulation and smart meters.

COPOLCO held its 34th Plenary meeting in Nadi, Fiji on 16–17 May this year. The Plenary was preceded by a workshop on 15 May on the theme *How do consumers know what they are getting*. John Birch represented the OIML at the Plenary and Workshop.

A consultation identified counterfeit goods and legal metrology as the focus for the 2012 workshop, examining both market surveillance and legal metrology as tools for consumer protection. Areas of concern in legal metrology identified in the consultation included electricity metering, particularly smart meters, prepacking quantity compliance and deceptive packing.

The workshop attracted 150 participants from twenty two national standards organisations and was opened by Hon. Alyan Sayed-Khalyum, the Fiji Attorney-General and Minister for Industry and Trade. Whilst the prime focus of the workshop was on counterfeit goods with presentations by Fiji Customs, Underwriters Laboratories and Canadian Standards Association there was interest in Mr. Birch's presentation on the *role and impact of legal metrology for consumer protection*. Other presentations in this session were *Credible claims and consumer protection – why effective conformity assessment is the missing link* by Olivier Peyrat past chair of ISO/CASCO and Director General AFNOR and *Non compliant and counterfeit products – a global response from market surveillance authorities* by Graeme Drake of GED Advisory.

In his presentation Mr. Birch mentioned that the change from mechanical to electronic measuring instruments had resulted in reduced transparency for consumers with a reduction in trust in some measurements and the possibility of fraud. He detailed the rapid growth of global trade in prepacked goods and the challenges in controlling net quantity, and the deregulation in some countries which had reduced consumer protection provided by standard pack sizes and deceptive packing requirements. The control of the quantity of goods in the market place is being replaced by control and certification at the packer using quality systems and accreditation. The "e" mark system in the European Community is one response to this problem.

The deregulation of the electricity and gas industries is having a significant impact on consumers.The introduction of time of usage tariffs and smart meters provides the opportunity for consumers to adjust their usage to take account of market prices. However, this will be dependent on effective in-house meter displays and programs that inform and engage consumers. Legal metrology will generally have responsibility for approving smart meters and (sometimes) the time measurement and associated software but not the mechanisms for alerting consumers to tariff changes.

Following the presentations the participants considered a number of case studies from Fiji, Indonesia, Brazil and Argentina and the European consumer perspective which was presented by Arnold Pindar, President of ANEC.

Following on from the Workshop discussions, delegates expressed strong support for increased market surveillance and consumer compensation for fraud but expressed limited support for accreditation and certification systems.

The COPOLCO Plenary was opened by the Prime Minister of Fiji Josaia Bainimarama and by the ISO Vice-President (policy) Sadao Takeda. The two day meeting considered reports from working groups on a wide range of topics including:

- consumer participation group where the development of a brochure involving consumers was considered: *Why and how – Practical guidance for standards development bodies*;
- Training group where there was significant interest from developing countries in conformity assessment;
- Consumer protection in the global market place group, which proposed the production of an international Standard Guideline for the assessment and improvement of energy services to users;
- Product safety group, which is considering linkages between nanotechnology and sustainable development;
- Developing countries group which met in association with the COPOLCO meeting, and which considered the creation of a secure and reliable "Chat Forum";
- Report from the Asian Network on Consumer Participation (ANCO) which is developing a information sharing system on product safety funded by the APEC Support Fund;
- Reports were also received from IEC and OECD and Mr. Birch presented the OIML report.

The OIML report included current work by TCs on prepackages and utility meters. Mr. Birch stressed that OIML Recommendations when adopted are expected to be legislated for by OIML Member States to the extent possible. The role of Regional Legal Metrology Organisations was also described as well as the OIML's interest in the economic and social benefits of legal metrology. There was a range of questions arising from the presentation including telephone metering, smart meters and economic and social benefits of metrology.

The 2013 COPOLCO plenary meeting will be held in Malta and hosted by Mr. Farrugia who is also the CIML Member for Malta.

Consumers are a major stakeholder of legal metrology but are little involved in the OIML work program. The liaison with COPOLCO provides an opportunity to explore how consumer concerns could be incorporated into the OIML work plan. ■

John Birch discusses metrology with Hon. Alyan Sayed-Khalyum, Fiji Attorney-General and Minister for Industry and Trade

LIAISONS

SADCMEL Report on the 26th meeting

Lilongwe, Malawi 20 March 2012

Brian Beard, SADCMEL Secretariat

1 General

The 26th SADCMEL annual meeting was held in Lilongwe, Malawi on 20 March 2012. It was attended by 13 of the 14 member states of the Southern African Development Community (SADC), two associate members and several observers including representatives of the BIML and PTB. The meeting was preceded by a technical committee meeting dealing with requirements for prepackages.

2 Current Membership and office bearers

SADCMEL permanent members are made up of the 14 SADC member states. It has 4 associate members who represent the legal metrology organizations of Ethiopia, Ghana, Kenya and Uganda. SADCMEL is a member of AFRIMETS which is the Pan African Metrology Organization and participates in its activities with a view to strengthening legal metrology activities in the region. At the 26th SADCMEL meeting Namibia was elected to chair SADCMEL for the next two years and the nominated chairperson is Dr. Eino Mvula. South Africa was reconfirmed as the Secretariat for a further three years with the Regional coordinator being Mr. K. Temba.

3 SADCMEL Technical Committee 1 meeting – 18 March 2012

In an effort to harmonize technical regulations in the region the requirements in OIML Recommendations are used wherever possible. Where OIML requirements are not entirely suitable regional requirements are developed. Comprehensive requirements have therefore been developed for prepackages, namely SADCMEL Document 1 “Labelling requirements for prepackaged products and general requirements for the sale of goods” (based on OIML R 79) and SADCMEL Document 4 “Tolerances permitted for the accuracy of measurement made in terms of legal metrology legislation including the measurement of goods when prepackaged or when measured at the time of sale or in pursuance of sale, and requirements for inspection of prepackages”. Proposals for the amendment of SADCMEL Document 1 were discussed and agreed to at the TC meeting. These amendments concerned clarification of the product description for “pasta products” and inclusion of additional regulated pack sizes for vinegar.

4 2012 Annual meeting – 20 March 2012

The following is a summary of important agenda items addressed at the 26th SADCMEL meeting:

4.1 SADCMEL Annual Report

The Annual Report summarized the activities undertaken during the previous twelve months which included representation at the meeting of Regional Legal Metrology Organizations (RLMOs) at the time of the 46th CIML Meeting in Prague and at the ARFIMETS General Assembly in Nairobi. The report concluded that although activities were undertaken as planned it was disappointing that no capacity building had taken place.

4.2 Member country and associated institution reports

Members presented a report of activities over the previous 12 months. Many members are in the process of upgrading outdated legislation to be in line with OIML Recommendations and SADCMEL harmonized requirements. In several cases the scope of enabling Acts is being broadened to cover health, safety and environmental measurements. A general problem is the lack of infrastructure and equipment suitable for verifying instruments according to latest requirements. Several members are in the process of purchasing new equipment. A number of members celebrated World Metrology Day 2011 by hosting events in one form or another.

4.3 AFRIMETS Report

The report gave information on meetings held and activities in progress which included meetings with the African Union Commission to discuss the recognition of AFRIMETS as the African body dealing with metrology and the finalization of the AFRIMETS Roadmap.

4.4 Report by the BIML

Mr. Ian Dunmill, Assistant Director at the BIML reported on recent activities and OIML membership changes. He noted that several West African countries have joined as Corresponding Members and that applications have been received from Malawi and Namibia. He encouraged other SADCMEL members to become at least Corresponding Members and outlined the simple procedure for joining.

Other items of feedback included:

- Intentions of the BIML to work with the PTB to assist developing countries.
- Information on the OIML *Award for excellent contributions to legal metrology in developing countries*.
- Information on the 2012 World Metrology Day poster.

4.5 Discussion on activities under the COMESA/EAC/SADC Tripartite Annex

4.5.1 Report on Expert Group meeting

The Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC) and Southern African Development Community (SADC) have signed a “Memorandum of Understanding on Inter Regional Cooperation and Integration” (Tripartite MOU). In terms of the MOU various agreements are being negotiated. One of these is an agreement establishing a Free Trade Area (FTA) which has an annex dealing with cooperation in the fields of Standardization, Metrology, Conformity Assessment and Accreditation (SMCA Annex).

In anticipation of the finalization of the SMCA Annex a meeting of Experts from the three Regional Economic Communities (RECs) was called in October 2012 to establish a working programme for the various SMCA fields including legal metrology.

The meeting consisted of a one day opening plenary, two day parallel sessions for the various SMCA fields and a closing plenary on the final day where reports back were given.

The meeting was attended by 59 persons (varied slightly per day). SADCMEL was represented by Mr. Brian Beard (Secretariat) and Messrs S. Chilembo and K. Kapembwa (Zambia).

As there were several experts representing both legal and scientific metrology it was decided to hold a single meeting covering both legal and scientific metrology. The outcome of discussions on the way forward included the following decisions:

a) Each REC should establish suitable structures to cover cooperation between member countries in legal and scientific metrology. These structures should participate in AFRIMETS. SADCMEL will represent the SADC Region.
b) A Tripartite Legal Metrology Coordinating Committee should be established to oversee the work programme. Each REC will be represented by three members.
c) Awareness sessions on the role of Legal Metrology in trade facilitation should be arranged by the Coordinating Committee for presentation to political decision makers. These sessions will be conducted in any country requesting them.
d) A survey on priority training and equipment needs should be conducted within each REC and submitted for collation into a tripartite needs analysis so that donor funding for capacity building can be motivated.
e) Countries should strive to update legislation to cover latest requirements for at least measuring instruments used in trade, by 2016. The requirements in OIML Recommendations should be used as far as possible.

4.5.2 Discussions on implications for SADCMEL

SADCMEL members are basically compliant with the decisions taken at the Tripartite Expert Group meeting and SADCMEL only needs to nominate experts for the Tripartite Legal Metrology Coordinating Committee and submit a list of most important needs with regard to training, equipment and awareness.

It was agreed that Ms. S. Kahwa of Tanzania, Mr. O. Muke of Botswana and Mr. K. Temba, the SADCMEL Regional Coordinator, would be nominated to represent SADCMEL on the Tripartite Legal Metrology Coordinating Committee.

4.6 SADCMEL Website

The new SADCMEL website which is hosted by the National Regulator for Compulsory Specifications (NRCS) of South Africa is operational although there are various technical glitches to be sorted out. The address is www.sadcmel.org.

4.7 Support from the PTB

The PTB representative, Ms. K. Wunderlich, indicated that there were funds available for assisting with "Regional integration" in the SADC Region and in deserving cases individual countries could be assisted with legal metrology projects towards regional integration. The PTB was thanked for their attendance of the meeting and support offered.

5 Conclusion

It was encouraging that almost all member countries were able to attend the meeting which is an indication of government support for SADCMEL activities. All arrangements were excellent thanks to our hosts, the Government of Malawi and the Malawi Bureau of Standards. Activities within SADCMEL, including infrastructure development and training have slowed down due to a lack of funding. ■

OIML CERTIFICATE SYSTEM

List of OIML Issuing Authorities

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

		R 16	R 21	R 31	R 49	R 50	R 51	R 58	R 60	R 61	R 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
AT1	Bundesamt für Eich- und Vermessungswesen (BEV)					■	■	■		■		■		■	■		■	■		■	■		■	■	■			■	■	■							
AU1	National Measurement Institute (NMI)				■	■	■		■			■		■									■	■						■		■		■			
BE1	SPF Economie, PME, Classes Moyennes et Energie											■					■	■																			
BG1	State Agency for Metrology and Technical Surveillance (SAMTS)											■						■																			
BR1	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO)											■																									
CH1	Office Fédéral de Métrologie (METAS)	■		■	■	■	■		■	■		■					■	■				■	■	■						■						■	
CN1	General Administration of Quality Supervision, Inspection and Quarantine of P. R. China (AQSIQ)			■		■	■		■	■		■					■	■						■						■						■	
CZ1	Czech Metrology Institute (CMI)				■							■	■	■								■								■						■	
DE1	Physikalisch-Technische Bundesanstalt (PTB)	■		■	■	■	■	■	■	■		■		■	■		■	■	■	■	■	■	■	■	■			■	■	■		■	■	■	■		■
DK1	The Danish Accreditation and Metrology Fund (DANAK)					■	■		■	■		■						■				■	■	■						■				■		■	
DK2	FORCE Certification A/S				■																																
DK3	Dansk Elektronik, Lys & Akustik (DELTA)					■	■		■	■		■											■	■										■		■	
ES1	Centro Español de Metrología (CEM)				■		■		■	■		■					■	■														■					
FI1	Inspecta Oy					■	■		■	■		■		■									■	■						■							
FR1	Ministère de l'Economie, de l'Industrie et de l'Emploi (MEIE)	*All activities and responsibilities were transferred to FR2 in 2003*																																			
FR2	Laboratoire National de Métrologie et d'Essais (LNE)		■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■		■	■	■	■			■	■	■		■		■		■	
GB1	National Measurement Office (NMO) - Formerly NWML		■		■	■	■		■	■	■	■		■				■				■	■	■						■				■		■	
GB2	National Physical Laboratory (NPL)																■																				
HU1	Hungarian Trade Licensing Office (MKEH)											■																									
JP1	National Metrology Institute of Japan / National Institute of Advanced Industrial Science and Technology (NMIJ / AIST)								■			■																	■	■							
KR1	Metrology and Measurement Division (KATS)											■																									
NL1	NMi Certin B.V.		■	■	■	■	■		■	■		■	■	■			■		■			■	■	■						■		■	■	■		■	
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	Swedish National Testing and Research Institute AB (S.P.)					■	■		■	■		■		■				■					■	■						■							
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 2012.04–2012.06

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

The OIML Basic Certificate System

The *OIML Basic Certificate System for Measuring Instruments* was introduced in 1991 to facilitate administrative procedures and lower the costs associated with the international trade of measuring instruments subject to legal requirements. The System, which was initially called "OIML Certificate System", is now called the "OIML Basic Certificate System". The aim is for "OIML Basic Certificates of Conformity" to be clearly distinguished from "OIML MAA Certificates".

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

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

Other information on the System, particularly concerning the rules and conditions for the application, issue, and use of OIML Certificates, may be found in OIML Publication B 3 *OIML Basic Certificate System for OIML Type Evaluation of Measuring Instruments* (Edition 2011) which may be downloaded from the Publications page of the OIML web site. ■

The OIML MAA

In addition to the Basic System, the OIML has developed a *Mutual Acceptance Arrangement* (MAA) which is related to OIML Type Evaluations. This Arrangement - and its framework - are defined in OIML B 10 (Edition 2011) *Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations*.

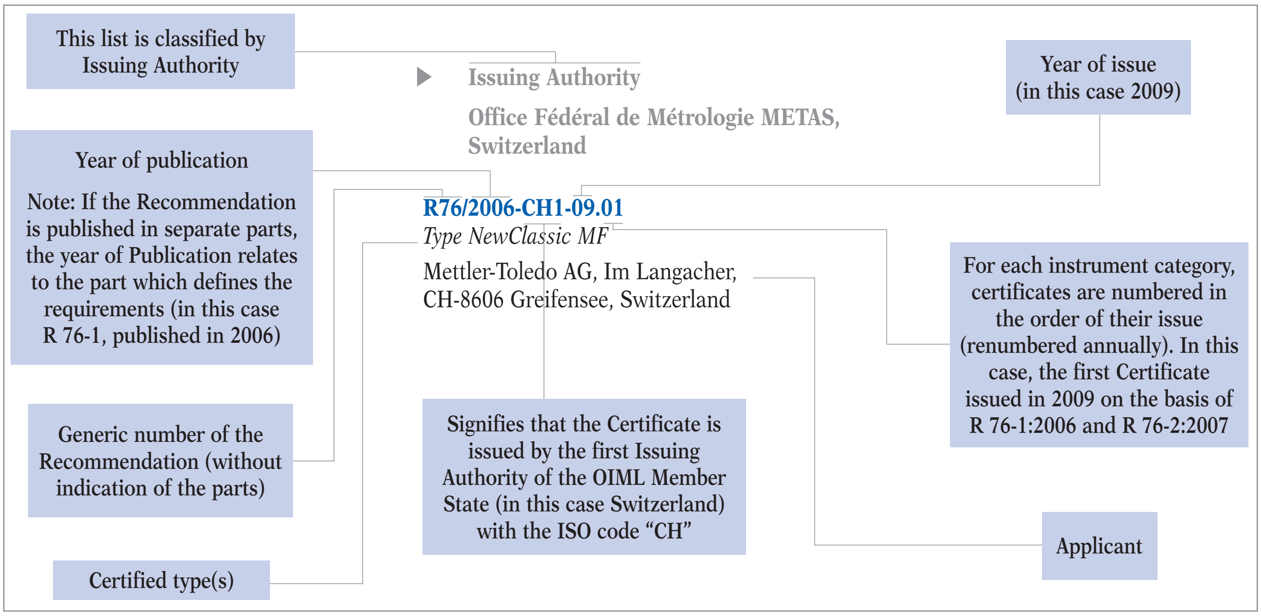
The OIML MAA is an additional tool to the OIML Basic Certificate System in particular to increase the existing mutual confidence through the System. It is still a voluntary system but with the following specific aspects:

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

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

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

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



INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Taximeters
Taximètres

R 21 (2007)

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R021/2007-NL1-2011.01
Electronic taximeter - Type : MDT – Taximeter (Force One)
Italtax S.r.l., Via dell'Industria, 16, IT-62017 Porto Recanati (MC), Italy

R021/2007-NL1-2012.03
MDT - Taximeter X-One
Italtax S.r.l., Via dell'Industria, 16, IT-62017 Porto Recanati (MC), Italy

INSTRUMENT CATEGORY:
R 49 (2006)

Water meters intended for the metering of cold potable water

▶ Issuing Authority / *Autorité de délivrance*

Czech Metrology Institute (CMI), Czech Republic

R049/2006-CZ1-2012.01
Ultrasound Water Meter - Type: FLOMIC FL5024 and FLOMIC FL5044
ELIS PLEZN, Lucni 15, P.O. BOX 126, CZ-304 25 Plzen, Czech Republic

R049/2006-CZ1-2012.02
Single Jet Water Meter - Type: SJ-LFC and SJ-WDC
Ningbo Water Meter Co. Ltd., N° 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

R049/2006-CZ1-2012.03
Single Jet Water Meter - Type: SJ-SDC
Ningbo Water Meter Co. Ltd., N° 99, Lane 268, Beihai Road, CN-315033 Ningbo, P.R. China

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R049/2006-NL1-2011.01
WATERFLUX 3070
Krohne Altometer, Kerkeplaat 12, NL-3313 LC Dordrecht, The Netherlands

R049/2006-NL1-2012.01
Water meter intended for the metering of cold potable water and hot water, model "WATERFLUX 3070", class 1 and 2
Krohne Altometer, Kerkeplaat 12, NL-3313 LC Dordrecht, The Netherlands

R049/2006-NL1-2012.02
Water meter intended for the metering of cold potable water and hot water, model "Sharpflow SWB7 + CWB7", class 1 and 2
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 (1996)

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R051/1996-DE1-2003.07 Rev. 1
Checkweigher - Type: Ventocheck
FL Smidth Ventomatic SpA, Via G. Marconi, IT-24030 Valbrembo (BG), Italy

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-NL1-2011.02
Automatic catchweighing instrument - Type : LS-4000, CW-4000 or GW-4000
Dibal S.A., Astintze Kalea 24, Pol. Ind. Neinver, ES-48160 Derio - Vizcaya, Spain

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*

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

R060/2000-FR2-2012.01 (MAA)
S-type tension load-cell, ZAP series, with strain gauges, tested as part of a weighing instrument.
ARPEGE MASTER-K, 38 Avenue des Frères Montgolfier, BP 186, FR-69686 Chassieu Cedex, France

▶ Issuing Authority / *Autorité de délivrance*

International Metrology Cooperation Office, National Metrology Institute of Japan (NMIJ) National Institute of Advanced Industrial Science and Technology (AIST), Japan

R060/2000-JP1-2011.05 Rev. 1 (MAA)
Beam (shear) load cell - Type: LCM19K500,LCM19T001,LCM19T1.5,LCM19T002
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

R060/2000-JP1-2011.09 Rev. 1 (MAA)
Compression load cell - Type: HR II-20, HR II-30, HR II-50, HR II-100, HR III-50, HR III-80, IR-20, IR-30
JFE Advantech Co. Ltd., 3-48 Takahata-cho, Nishinomiya, JP-663-8202 Hyogo, Japan

R060/2000-JP1-2012.02 (MAA)
Tension load cell - Type: LC1205-T001A, LC1205-T002, LC1205-T005
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

R060/2000-JP1-2012.03 (MAA)
Beam (shear) load cell - Type: LB-XD-1T-HCS, LB-XD-3T-HCS, LB-XD-5T-HCS
Kubota Corporation, 1-2-47 Shikitsu-higashi, Naniwa-ku, JP-556-8601 Osaka, Japan

R060/2000-JP1-2012.04 (MAA)
Compression load cell - Type: CC010-10T, CC10-20T, CC10-30T, CC10-50T
Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R060/2000-NL1-2010.12 (MAA)
"S"-beam load cell - Type: RSC Type C - Fraction:0.7
Hottinger Baldwin Messtechnik GmbH, Im Tiefen See 45, DE-64293 Darmstadt, Germany

R060/2000-NL1-2010.18 (MAA)
Single point Load Cell - Type: BM6A-xx-xx-xxx-XX - Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.19 (MAA)
Compression load cell, canister type - Type: BM14P-xx-xx-xxxx-XX-Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.20 (MAA)
Single point Load Cell - Type: L6E3-xx-xxx-xxx-XX- Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.21 (MAA)
L6E3-xx-xxx-xxx-XX - R1 Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.22 (MAA)
L6E-xx-xx-xxx-XX - Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.23 (MAA)
Single point Load Cell - Type: L6H5-xx-xxx-xxx-XX - Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.24 (MAA)
L6J2-xx-xxx-xxx-XX - Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.25 (MAA)
Single point Load Cell - Type: L6D-xx-xx-xx x - R1 Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.26 (MAA)
Single point, bending beam load cell - Type: 1022, 1022P and LPS
Vishay Precision or Tedea-Huntleigh, 8A Hazoran Street, IL-42506 Natanya, Israel

R060/2000-NL1-2010.27 (MAA)
Double ended beam shear beam Load Cell - Type: 102BH
Anyload Transducer Co. Ltd., 7228 Winston Street, #18, BC V5A 2G9 Burnaby, Canada

R060/2000-NL1-2010.28 (MAA)
Single point Load Cell - Type: PN...,PMB...
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

R060/2000-NL1-2010.29 (MAA)
Compression Load Cell - Type: BM24R-xx-xxx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.30 (MAA)
Tension or Compresion Load Cell - Type: H3G-xx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.31 (MAA)
Single point Load Cell - Type: B6F-xx-xxx-x x x-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.32 (MAA)
Single point load cell - Type: BM6A-xx-xx-xxx-xx-Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.33 (MAA)
Single point Load Cell- Type: L6E3-xx-xxx-xxx-xx-R1 Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.34 (MAA)
Single point Load Cell - Type: L6E3-xx-xxx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.35 (MAA)
Single point Load Cell - Type: L6D-xx-xxx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2010.36 (MAA)
Bending beam Load Cell- Type: BM8D-xx-xxx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.06 (MAA)
Shear beam Load Cell - Type: SQBMC
Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2011.07
Bending beam Load Cell - Type: 1242
Vishay Israel Ltd. Transducers, 2 Haofan St., 58814 Holon, Israel

R060/2000-NL1-2011.08 (MAA)
Bending beam Load Cell - Type: CB063
Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

R060/2000-NL1-2011.09 (MAA)
Single point Load Cell - Type: MA...,MB...,MC...,MD...
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

R060/2000-NL1-2011.12 (MAA)
Single point Load Cell - Type: C2D1
Minebea Co. Ltd. 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

R060/2000-NL1-2011.13 (MAA)
Shear beam Load Cell - Type: LL-34
G&P Liden Weighing AB, Bilgatan 15, S-442 40 Kungälv, Sweden

R060/2000-NL1-2011.14 (MAA)
Shear beam Load Cell - Type: 102TH
Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2011.15 (MAA)
Compression Load Cell - Type:102DH
Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2011.17
Shear beam Load Cell - Type: SQBB
Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2011.18
Bending beam Load Cell - Type: 1242
Vishay Israel Ltd. Transducers, 2 Haofan St., 58814 Holon, Israel

R060/2000-NL1-2011.19 (MAA)
Single point, bending beam Load Cell - Type: 1022,1022P and LPS
Vishay Israel Ltd. Transducers, 2 Haofan St., 58814 Holon, Israel

R060/2000-NL1-2011.20 (MAA)
Single point Load Cell - Type: BM11-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.21 (MAA)
Compression Load Cell - Type: BM24R-xx-xxx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.22 (MAA)
Single point Load Cell - Type: L6Q-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.23
Compression Load Cell - Type: TRS 1100

S.C. SWS International S.R.L., Str. Cpt. Juverdeanu Nr. 18, Sector 2, 023105 Bucarest, Romania

R060/2000-NL1-2011.24 (MAA)
Shear beam Load Cell - Type: MQ-S

S.C. SWS International S.R.L., Str. Cpt. Juverdeanu Nr. 18, Sector 2, 023105 Bucarest, Romania

R060/2000-NL1-2011.25
Shear beam Load Cell - Type: MD-A

S.C. SWS International S.R.L., Str. Cpt. Juverdeanu Nr. 18, Sector 2, 023105 Bucarest, Romania

R060/2000-NL1-2011.26
Compression Load Cell - Type: TR 1100

S.C. SWS International S.R.L., Str. Cpt. Juverdeanu Nr. 18, Sector 2, 023105 Bucarest, Romania

R060/2000-NL1-2011.27 (MAA)
Single point Load Cell - Type: B6N-xx-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.28 (MAA)
Bending beam Load Cell - Type: B8D-xx-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.29 (MAA)
Single point Load Cell - Type: BM6G-xx-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.30 (MAA)
Bending beam or shear beam Load Cell - Type: H8C-xx-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.31 (MAA)
Double ended shear beam Load Cell - Type: H9D-xx-xxx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.32 (MAA)
Single point Load Cell - Type: CB004S

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

R060/2000-NL1-2011.33 (MAA)
Bending beam or shear beam Load Cell - Type: BM8D-xx-xx-xxx-xx Series

Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2011.34 (MAA)
Shear beam Load Cell - Type: 563YH

Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2011.35 (MAA)
Universal Load Cell - Type: PWSE

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

R060/2000-NL1-2011.37 (MAA)
Single point Load Cell equipped with electronics - Type : SLP330D, SLP331D, SLP332D

Mettler-Toledo AG, Heuwinkelstrasse, CH-8606, Nanikon, Switzerland

R060/2000-NL1-2012.02 (MAA)
Shear beam Load Cell - Type : SB210

SEWHACNM Co. Ltd., 301~302, 102 Dong, Ssangyong 3rd Bucheon Techno Park, 36-1 Samjeon-dong, Ojeong-gu, 153-801 Bucheon City Gyeonggi-do, Korea (R.)

R060/2000-NL1-2012.03 (MAA)
Bending beam Load Cell - Type: AMI

Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2012.05 (MAA)
Bending beam load cell - Type: SBIC-SS, SBICG-SS, SBICF-SS,SBICK-SS and SB-SS

Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2012.06 (MAA)
Shear beam Load Cell - Type: SBO
Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2012.07 (MAA)
Shear beam Load Cell - Type: SQB
Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2012.08 (MAA)
Compression Load Cell - Type: ZSKB, ZSKBB, ZSKBC
Keli Electric Manufacturing (Ningbo) Co. Ltd., N° 199 Changxing Road, Jiangbei District, CN-315033 Ningbo, P.R. China

R060/2000-NL1-2012.09 (MAA)
Double ended shear beam Load Cell - Type : DSB1
CAS Corporation, #19, Ganap-Ri, Gwangjuk-Myoun, Yangju-Si, KR-482-841 Kyunggi-Do, Korea (R.)

R060/2000-NL1-2012.10 (MAA)
Single point load Cell - Type: LOC SS
Vishay Israel Ltd. Transducers, 2 Haofan St., 58814 Holon, Israel

R060/2000-NL1-2012.11 (MAA)
Bending beam or shear beam load cell - Type: BM8D-xx-xx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2012.12 (MAA)
Bending beam or shear beam load cell - Type: H8C -xx-xx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2012.13 (MAA)
S-beam compression load cell- Type: HM3Q-Cx-xt-xx x-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2012.14 (MAA)
Shear beam load cell - Type: HM8-Cx-xt-xx x-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2012.15 (MAA)
Shear beam load cell - Type:BM8H-Cx-xx-xx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000, Hanzhong- ShaanXi, P.R. China

R060/2000-NL1-2012.16 (MAA)
Single point load cell - Type: CBE1
Minebea Co. Ltd. 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

Issuing Authority / *Autorité de délivrance*

National Measurement Office (NMO), United Kingdom

R060/2000-GB1-2012.01 (MAA)
AW685 stainless steel compression load cell
Vehicle Weighing Solutions Ltd., South View Park, Marsack Street, Caversham RG4 5AF Reading, United Kingdom

R060/2000-GB1-2012.02 (MAA)
AW685 stainless steel compression load cell
Applied Weighing International Ltd., Unit 5, Southview Park, Marsack Street, Caversham RG4 5AF, Reading, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R061/1996-DE1-2001.01 Rev. 1
Automatic gravimetric filling instrument - Type: EWU-010
FLSmidth Ventomatic SpA, Via G. Marconi, IT-24030 Valbrembo (BG), Italy

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments
Instruments de pesage à fonctionnement non automatique

R 76-1 (1992), R 76-2 (1993)

▶ Issuing Authority / *Autorité de délivrance*

Dansk Elektronik, Lys & Akustik (DELTA), Denmark

R076/1992-DK3-2012.01
Non-automatic weighing instrument - Type TPS / TPSS / TPT Truck Pallet Scale
TScale Electronics Mfg (Kunshan). Co. Ltd., No. 268 Zhujiawan Road, Zhoushi Town, Kunshan City, CN-215300 Suzhou, Jiangsu Province, 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

R076/1992-JP1-2012.01 (MAA)
Non-automatic weighing instruments - Type: SC/SE series
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V., The Netherlands

R076/1992-NL1-2008.45 Rev. 1
Non-automatic weighing machine - Type: WX-Series
Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee, Switzerland

R076/1992-NL1-2008.45 Rev. 2
Non-automatic weighing instrument - Type: WX-series
Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee, Switzerland

R076/1992-NL1-2009.27 Rev. 1
Non-automatic weighing machine - Type: SC-240MA
Tanita Corporation, 14-2, 1-Chome, Maeno-cho, Itabashi-ku, JP-174-8630 Tokyo, Japan

R076/1992-NL1-2010.18 Rev. 1 (MAA)
Non-automatic weighing instrument: MC-980A or MC-980MA
Tanita Corporation, 14-2, 1-Chome, Maeno-cho, Itabashi-ku, JP-174-8630 Tokyo, Japan

R076/1992-NL1-2010.18 Rev. 2 (MAA)
Non-automatic weighing instrument - Type: MC-980A or MC-980MA
Tanita Corporation, 14-2, 1-Chome, Maeno-cho, Itabashi-ku, JP-174-8630 Tokyo, Japan

R076/1992-NL1-2010.41
Non-automatic weighing instrument - Type: RM5800II
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.42
Non-automatic weighing instrument
CAS Corporation, #19, Ganap-Ri, Gwangjuk-Myoun, Yangju-Si, KR-482-841 Kyunggi-Do, Korea (R.)

R076/1992-NL1-2010.44 (MAA)
Non-automatic weighing instrument - Type: DS-685
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.45
Non-automatic weighing instrument - Type: DS-866..,DS-867
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.47
Non-automatic weighing instrument - Type: DS-700
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2010.51
Non-automatic weighing instrument - Type: FM-630 / FMM-T370.../TPRO2...0
Fook Tin Technologies Ltd., 4/F Eastern Center, 1065 King's Road, Quarry Bay, HK-Hong Kong

R076/1992-NL1-2011.07 (MAA)
Non-automatic weighing instrument - Type: PCA320, PCA 220 Series
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/1992-NL1-2011.10
Non-automatic weighing instrument - Type: PS-130
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

R076/1992-NL1-2011.14 (MAA)
Non-automatic weighing instrument - Type: PCS
Grupo Epelsa S.L., c/Punto Net, 3, Polígono Industrial TECNOALCALÁ, ES-28805 Alcalá de Henares (Madrid), Spain

R076/1992-NL1-2011.17 (MAA)
Non-automatic weighing instrument - Type: ATX.../ATY...
Shimadzu Corporation, 1, Nishinokyo-Kuwabara-cho, Nakagyo-ku, JP-604-8511 Kyoto, Japan

R076/1992-NL1-2011.19 (MAA)
Non-automatic weighing instrument - Type: BJ165 Series
Precisa Gravimetrics A.G., Moosmattstrasse 32, CH-8953 Dietikon, Switzerland

R076/1992-NL1-2011.22 (MAA)
Non-automatic weighing instrument - Type: DS-805
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

R076/1992-NL1-2011.23 (MAA)
Non-automatic weighing instrument - Type: DS-800
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

R076/1992-NL1-2011.24 (MAA)
Non automatic weighing instrument - Type: DS-686
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/1992-NL1-2011.26
Non-automatic weighing instrument - Type: C2000 or Isolette 8000
Drager Medical Systems Inc., 3135 Quarry Road, Telford, PA 18969 Pennsylvania, United States

R076/1992-NL1-2011.28 Rev. 1
Non-automatic weighing instrument - Type: Postal vision - 110 / 1600
Hytech International B.V., Meesterstraat 44-46, NL-Nootdorp, Netherlands

R076/1992-NL1-2012.05 (MAA)
Non-automatic weighing instrument - Type: TW-V / TX-V series
Shimadzu Corporation, 1, Nishinokyo-Kuwabara-cho, Nakagyo-ku, JP-604-8511 Kyoto, Japan

R076/1992-NL1-2012.13
Non-automatic weighing instrument - Type: RLP-xxM and RLP-xxSM (xx indicates the capacity)
Rice Lake Weighing Systems, 230 West Coleman Street, 54868 Wisconsin, Rice Lake, United States

R076/1992-NL1-2012.15 (MAA)
Non automatic weighing instrument - Type: SJ Series
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

R076/1992-NL1-2012.15 Rev. 1 (MAA)
Non-automatic weighing instrument - Type: SJ Series
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

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

SP Technical Research Institute of Sweden, Sweden

R076/1992-SE1-2012.01 (MAA)
Graduated, self-indicating, electronic, single or multi-interval weighing instrument.
Ishida Co. Ltd., 44, Sanno-cho, Shogoin, Sakyo-ku, JP-606-8392 Kyoto, Japan

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Non-automatic weighing instruments
Instruments de pesage à fonctionnement non automatique

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

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

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

R076/2006-FR2-2012.01 Rev. 0 (MAA)
Indicateur type IDL pour instrument de pesage à fonctionnement non automatique
ARPEGE MASTER-K, 38 Avenue des Frères Montgolfier, BP 186, FR-69686 Chassieu Cedex, France

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

NMi Certin B.V., The Netherlands

R076/2006-NL1-2010.25 (MAA)
Analog data processing device - Type: DigiCell
Mettler-Toledo (Albstadt) GmbH, Unter dem Malesfelden 34, DE-72458 Albstadt, Germany

R076/2006-NL1-2010.43 (MAA)
Non-automatic weighing instrument - Type: ICS.
Mettler-Toledo (Albstadt) GmbH, Unter dem Malesfelden 34, DE-72458 Albstadt, Germany

R076/2006-NL1-2010.46 (MAA)
Indicator, as part of a Non-automatic weighing instrument - Type: 500
Dibal S.A., Astintze Kalea 24, Pol. Ind. Neinver, ES-48160 Derio - Vizcaya, Spain

R076/2006-NL1-2010.49 (MAA)
Indicator - Type: ED640
Elettrondata S.r.l., Via del Canaletto 77/79, IT-41042 Spezzano di Fiorano (Modena), Italy

R076/2006-NL1-2011.08 (MAA)
Analog data processing device (ADPD) - Type: AD Module 1
Xiamen Pinnacle Electrical Co. Ltd., 4F, Guangxia Building, North High-Tech Zone, Xiamen, CN-Fujian, P.R. China

R076/2006-NL1-2011.09 (MAA)
Non automatic weighing instrument - Type: EX...Series
Ohaus Corporation, 7, Campus Drive, Suite 310, NJ 07054 Parsippany, United States

R076/2006-NL1-2011.12 (MAA)
Non-automatic weighing machine - Type: IND245/IND246
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2011.13 (MAA)
Indicator, as part of a Non-automatic weighing instrument - Type: 500
Dibal S.A., Astintze Kalea 24, Pol. Ind. Neinver, ES-48160 Derio - Vizcaya, Spain

R076/2006-NL1-2011.15 (MAA)
Non-automatic weighing instrument - Type: Navigator NV Series
Ohaus Corporation, 7, Campus Drive, Suite 310, NJ 07054 Parsippany, United States

R076/2006-NL1-2011.16 (MAA)
Indicator, as a part of a non-automatic weighing instrument - Type: Flex 2100
Penko Engineering BV, Schutterweg 35, NL-6718 XC Ede, Netherlands

R076/2006-NL1-2011.20 Rev. 1 (MAA)
Non-automatic weighing instrument
Teraoka Weigh-System PTE Ltd., 4 Leng Kee Road, #05-03/04/05 & 11, SIS Building, SG-159088 Republic of Singapore

R076/2006-NL1-2011.21 (MAA)
Non-automatic weighing instrument - Type: BBA242 / BBA212
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2011.25 (MAA)
Indicator as part of a weighing instrument - Type: XK315A1-10,: XK315A1-11,: XK315A1-12,: XK315A1-13.
Shanghai Caisun Electronic Technology Co. Ltd., No. 25, 369 Datuanzhen Sandun Sanxuan Road, Nanhui, CN-201312 Shanghai, P.R. China

R076/2006-NL1-2011.27 (MAA)
Non-automatic weighing instrument - Type: DS-166SS S-GE
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2011.29
Non-automatic weighing instrument - Type: DS-708
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2011.37 Rev. 1 (MAA)
Weighing module - Type: PBD655
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2012.01
Non-automatic weighing instrument - Type : DS-781, DS-781SS, DS-782
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.02 (MAA)
Indicator - Type: LP7510A and LP7510B
Locosc Ningbo Precision Technology Co. Ltd., No. 137 Zhenyong Road, Yongjing, CN-315021 Ningbo, P.R. China

R076/2006-NL1-2012.03 (MAA)
*Weighing module - Brand name OneForAll MFR with digicell board MFR - Type : ..MBA....., ..MPD....., ..MMA.....**
Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee, Switzerland

R076/2006-NL1-2012.06 (MAA)
Non-automatic weighing instrument - Type : ICS
Mettler-Toledo (Albstadt) GmbH, Unter dem Malesfelden 34, DE-72458 Albstadt, Germany

R076/2006-NL1-2012.07
Non-automatic weighing instrument - Type : DS-700.
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.07 Rev. 1
Non-automatic weighing instrument - Type : DS-700.
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.12
Non-automatic weighing instrument - Type: InBody 230 or InBody J30
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.14 (MAA)
Non-automatic weighing instrument - Type: DI-166 / DI-166SS
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.16 (MAA)
Non-automatic weighing instrument - Type: DS-686
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.17 (MAA)
Non-automatic weighing instrument - Type: W50C/Z2 or W50C/D100
Marelec Construct NV, Redanweg 15, BE-8620 Nieuwpoort, Belgium

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

R076/2006-DE1-2008.05 Rev. 1
Nonautomatic price-computing weighing instrument for direct sales to the public - Type: K...
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Strasse 65, DE-72336 Balingen, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic level gauges for measuring the level of liquid in fixed storage tanks
Jaugeurs automatiques pour le mesurage des niveaux de liquide dans les réservoirs de stockage fixes

R 85 (1998)

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

R085/1998-NL1-2011.01
Automatic level gauge for measuring the level of liquid in storage tanks, model 854ATG.
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, Netherlands

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-CZ1-2012.01
Automatic level gauge - Type: OptiLevel HLS 6010 (probe) / OptiLevel Supply (console/I.S. barrier)
Hectronic GmbH, Allmendstrasse 15, DE-79848 Bonndorf, Germany

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*
NMi Certin B.V., The Netherlands

R117/1995-NL1-2005.04 Rev. 1
Fuel Dispenser for Motor Vehicles - Type : Global Vista
Dresser Wayne Pignone, DEG Italia S.r.l, Via Roma 32, IT-23018 Talamona (SO), Italy

R117/1995-NL1-2011.01 Rev. 0
*Fuel Dispenser for Motor Vehicles - Type : Quantium Q120T; Quantium Q220T; Quantium Q320T; Quantium Q420T; Quantium Q520T; Quantium XXXX**
Tokheim Group S.A.S., Paris-Nord 2, 5 rue des Chardonnerets, BP 67040 Tremblay en France, FR-95971 Roissy Ch de Gaulle Cedex, France

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Evidential breath analyzers
Éthylomètres

R 126 (1998)

▶ Issuing Authority / *Autorité de délivrance*
Centro Español de Metrologia, Spain

R126/1998-ES1-2009.02 Rev. 2
Evidential breath analyzers - SAF'IR Evolution
ACS (Alcohol Countermeasures Systems), 60, International Blvd, CA-Ontario M9W 6J2, Toronto, Canada

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

R126/1998-FR2-2012.01
Evidential breath analyser: ALCOTEST 9510
Drager Safety AG & Co. KGAA, Revalstrasse 1, DE-23560 Lubeck, Germany

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Corresponding Member

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TC 6 (Prepackaged products)
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13–15 November 2012 (Paris, France)

Committee Drafts

Received by the BIML, 2012.04 – 2012.06

Test report format to R 46: Active electricity energy meters	E	1 CD	TC 12	AU
Revision of R 139: Compressed gaseous fuel measuring systems for vehicles. Part 1: Metrological and technical requirements Part 2: Metrological controls and performance tests	E	1 CD	TC 8/SC 7	NL
Blackbody radiators for calibration of radiation thermometers. Calibration and verification procedure	E	4 CD	TC 11/SC 3	RU
Revision of OIML R 49-1, -2, -3: Water meters intended for the metering of cold potable water and hot water - Part 1: Metrological and technical requirements - Part 2: Test methods - Part 3: Test report format	E	3 CD	TC 8/SC5	UK

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Syed Fakhra Azam Saleheen

It is with deep regret that we inform our readers of the recent passing away of Mr. Syed Fakhra Azam Saleheen, who died in March 2012 at the age of 76.

Mr. Saleheen was instrumental in introducing the International System of Units into Bangladesh in the 1980s. He had worked at the Bangladesh Standard and Testing Institution since August 1963 and retired as Director General in December 1992.

He played a key role in ensuring that the necessary changes were made from the local units of measure to the SI, and was supported in this role by the active participation of the OIML.

Mr. Saleheen was also very active with ISO, and Bangladesh is an ISO Member as well as being a long-standing OIML Corresponding Member.

He will be dearly missed by his family, colleagues and friends and will be remembered as an active participant in the development of metrication in Bangladesh. ■

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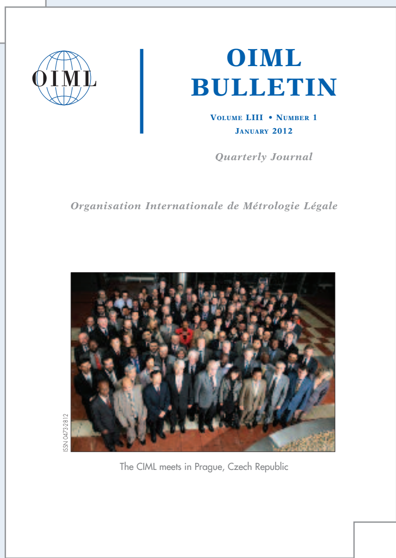

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