Manfred Kochsiek

Editorial

Ghaïet-El-Mouna Annabi

Un nouveau départ pour le Conseil de Développement de l'OIML

La fin des années quatre-vingt-dix voit le redémarrage des activités de l'OIML en faveur du développement, grâce aux efforts de Manfred Kochsiek qui a assuré la présidence du Conseil de Développement en 1997 et 1998, et de Mme Ghaïet-El-Mouna Annabi qui en a été élue Présidente en octobre 1998.

L'OIML n'a pas pour rôle de fournir les moyens financiers et humains propres à résoudre les problèmes des pays en développement en matière de métrologie légale, mais d'agir comme catalyseur permettant, par son expertise et ses relations, d'identifier les besoins et d'indiquer aux agences spécialisées dans l'aide au développement et aux pays industrialisés désireux de contribuer à cette aide, les directions à prendre et les moyens de répondre aux besoins.

C'est dans cet état d'esprit que s'élabore actuellement le programme de travail du Conseil de Développement qui sera discuté en octobre prochain à Tunis. Sur la base des résultats du Séminaire International tenu à Braunschweig en juin 1998 et des propositions du Rapport Birkeland, les grandes lignes en sont:

- développement de la coopération avec l'ONUDI et les autres organisations internationales (OMC, ISO, etc.) et régionales (APLMF, CE, SADCMEL, SIM, etc.) et les pays industrialisés susceptibles d'apporter leur contribution;
- coopération étroite avec le BIPM en vue d'une approche intégrée des problèmes métrologiques auxquels les pays en développement ont à faire face;
- implication accrue du Conseil de la Présidence dans les activités de développement, en particulier pour les problèmes de stratégie et de politique à long terme;
- coopération accrue avec les organisations régionales de métrologie légale.

Ainsi les pays en développement membres de l'OIML (qui représentent environ la moitié des 105 États Membres et Membres Correspondants de l'OIML), mais également, par le biais de la coopération régionale, de nombreux autres pays, pourront-ils bénéficier d'une action OIML que l'on espère plus efficace et mieux insérée dans un contexte de globalisation. ■

The OIML Development Council takes a new direction

The end of the Nineties will be marked by the rekindling of OIML activities in the field of development thanks to the efforts of Manfred Kochsiek (who chaired the Development Council in 1997 and 1998) and Mrs. Ghaïet-El-Mouna Annabi (who was elected Chairperson in October 1998).

The role of the OIML is not to provide the financial and human resources that are required to solve developing countries' legal metrology problems; it is rather to act as a permanent catalyst by providing expertise and a network of contacts. The OIML also identifies these countries' needs, suggests the best way forward and highlights the means required to satisfy these needs, both to agencies specialized in granting development aid and to industrialized countries wishing to contribute to such aid.

It is along these lines that the Development Council work program, which will be discussed this October in Tunis, is currently being drawn up. Based on the outcome of the International Seminar held in Braunschweig in June 1998 and on the proposals put forward in the Birkeland Report, the main elements of this work program are:

- development of cooperation with UNIDO and other international (WTO, ISO, etc.) and regional (APLMF, EC, SADCMEL, SIM, etc.) organizations, and also with those industrialized countries that might be in a position to make a contribution;
- close cooperation with the BIPM with a view to adopting an integrated approach to metrological problems faced by developing countries;
- increased involvement of the Presidential Council in development activities, especially concerning strategy issues and long-term policy;
- increased cooperation with regional legal metrology organizations.

In this way not only developing countries that are members of the OIML (which represent about half of the 105 OIML Member States and Corresponding Members) but additionally, through regional cooperation, a number of other countries will be able to draw benefit from OIML action which it is hoped will be more effective and better integrated into a context of globalization. ■

BIML

LOAD CELLS

Type testing facilities for load cells in The Netherlands

KEES VAN WILLENSWAARD and GEP ENGLER, NMi Certin B.V., The Netherlands

1 Introduction

NMi B.V. is the sole private enterprise laboratory in The Netherlands that carries out type testing in the field of legal metrology, and has been appointed as a "Notified Body" by the Dutch Government. Many OIML test certificates have been issued by NMi Certin, and the C-TM department (*Certin Type Approval Measuring Instruments*) has been active in type testing load cells since the late 1960's. Initially tests were based on national requirements, but since the publication of OIML R 60 *Metrological regulation for load cells* (1991), this Recommendation has been fully adopted. 95 out of the 173 OIML certificates for load cells have been issued by NMi Certin (as at March 15, 1999).

As a permanent member of OIML TC 9 *Instruments for measuring mass and density* (and also of the previous SP7-SR8) NMi was actively involved in the first drafts of OIML R 60 as well as in subsequent revisions.

NMi has laboratories in Delft and Dordrecht in the Western part of The Netherlands. The Type Approval Measuring Instruments department, where the load cells are tested, is located in Delft.

This article gives a brief tour of the load cell type-testing facilities, which mainly consist of:

- a 2.5/25 t dead weight/lever machine;
- a 550 kg dead weight machine;
- facilities (weights, load receptors, frames, etc.) to test smaller load cells manually;
- a hydraulic machine for minimum dead load output return test;
- a facility for barometric pressure tests;
- various temperature and climate test facilities;
- load cell indicators;
- thermometers, barometers, etc.

Several fully-automated tests are carried out and the technology used in processing is continuously updated (both dead weight machines are already on their third generation of control system).

All equipment (masses, thermometers, barometers, load cell indicators, etc.) is directly traceable to national standards, maintained by the National Standards Laboratory NMi VSL B.V., a sister company of NMi Certin B.V.

NMi facilities are also available to industry and to scientific laboratories for prototype testing, calibration, etc.

2 Facilities

All the mass standards and both the force generating machines are calibrated in kg (mass) rather than in newtons (force). If the equipment is used for calibration (in newtons), the acceleration of gravity and the effect of air buoyancy have to be taken into account.

2.1 Force generating facilities

2.1.1 Facilities for small capacity load cells

Load cells for small capacities (up to about 50 kg) are tested manually by mounting them onto (or under) a frame and the first load step is normally one of the load platforms. Platforms are available with calibrated masses of 0.5 kg, 1 kg, 2 kg, 5 kg and 10 kg; these platforms are adjusted within the tolerances of accuracy class M_1. A wide choice of standard weights is available in all accuracy classes.

For temperature tests, this setup can be mounted in the temperature chamber, described in 2.4 below.

2.1.2 The 550 kg dead weight machine

The NMi 550 kg dead weight machine mainly consists of built-in weights, a frame, a semi-fixed "table" and a

The 550 kg dead weight machine *(see 2.1.2)*

"cradle" in which the weights can be applied by means of electric motors, controlled by a computer.

The machine contains 110 weights of 5 kg each, made of stainless steel and adjusted to within 1×10^{-5}. As the masses are applied in pairs, the load increments can be any multiple of 10 kg.

The load cell is mounted between the table and the cradle in tension or compression.

The load is applied to the load cell via a loading pad for compression or an arrangement of rods, bearings, etc. for tension, depending on the type of load cell.

The construction of the machine might seem such that the mass of the cradle (ca. 70 kg) plus the loading pad, etc. would cause a relatively large dead load on the load cell. This dead load is, however, compensated by means of a lever situated at the top of the machine. This lever is provided with a counterweight that can be slid along it in order to adjust the pre-load. In practice, the system is always adjusted in such a way that there is a small constant pre-load (the specified minimum dead load) on the load cell.

It is clear that the lever has to be in the horizontal position before a reading is taken. This is achieved by a feedback system consisting of an extension to the lever with sensors, controlling a motor which drives four spindles which in turn move the semi-fixed point (the table) up or down until the lever is horizontal. Then the reading can be taken (after a pre-determined time interval).

The weights are always applied progressively and in pairs, starting with the lower ones. This ensures that the center of gravity is as low as possible and remains along the vertical axis of the machine.

The design of the machine provides for enough space above the table (for compression) as well as under it (for tension) for a temperature chamber, described in 2.4. The machine and the temperature generating system are both controlled by a computer in such a way that a complete temperature test can be performed without the need for operator supervision.

The operator can preset the following data:

- maximum load;
- size of the increments;
- time intervals;
- number of cycles;
- in the case of a temperature test: the temperatures and the time interval after a change in temperature;
- the "exercise" of the load cell.

If the maximum load is not a multiple of the chosen increment, then the last step is the smaller one, in order to complete the selected maximum load.

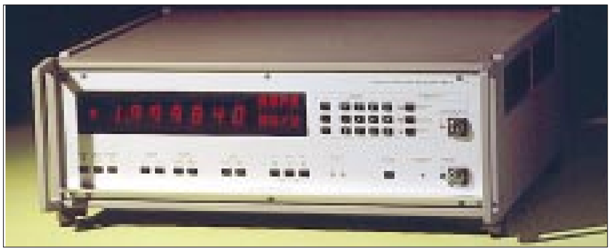
Furthermore, since the publication of OIML R 60 the machine has been provided with a double hydraulic ram which can lift or drop the cradle with the applied weights. This makes it possible to smoothly apply or remove the maximum (or any other) load and enables NMi to comply with the minimum dead load output return test as prescribed in subclause 7.2 of this Recommendation.

Without this facility, the time needed for the incremental application or removal of the masses and the leveling of the lever between the load steps would (especially in case of larger loads) by far exceed the time prescribed in OIML R 60, subclause 6.3.

2.1.3 The 2.5/25 t dead weight/lever machine

The primary (dead weight) part of the 2.5/25 t machine is basically similar to the 550 kg machine, described in

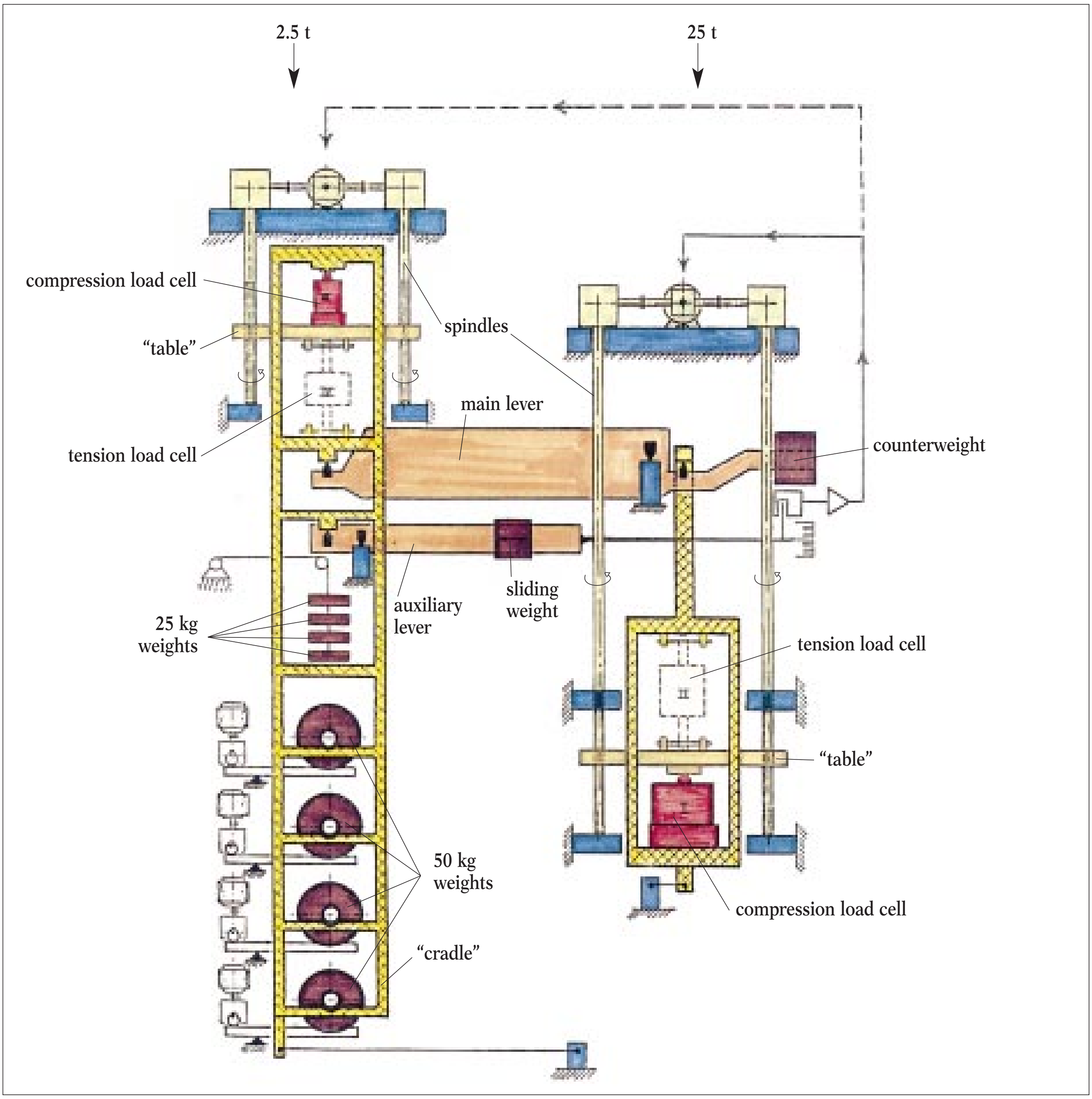
The 2.5/25 t dead weight/lever machine *(see 2.1.3)*



The HBM DMP 39 load cell indicator *(see 2.2)*

2.1.2 above. This machine contains 48 weights of 50 kg each plus four weights of 25 kg made of mild steel and protected with a special non-evaporating black varnish. The weights are adjusted to within 1×10^{-5}. As the masses of 50 kg are applied in pairs and those of 25 kg individually, the load increments can be any multiple of 25 kg for the 2.5 t side and of 250 kg for the 25 t side. This machine also has a lever system, but in this case the lever does more than merely compensate the unwanted dead load on the load cell under test. The lever has a ratio of 10:1 and this allows for the possibility to generate loads up to 25 t in the secondary part of the machine. In this case, the lever reverses the direction of the load.

The design of the machine is such that on the 2.5 t side there is sufficient space at both load cell positions (compression and tension) to place a temperature cham-



Schematic diagram of the 2.5/25 t dead weight/lever machine *(see 2.1.3 and photo, bottom of page 6)*

The 25 t press *(see 2.3.3)* with cubic temperature chamber *(see 2.4)*

ber around the load cell under test. This is also the case at the position for a compression type of load cell on the high capacity side of the machine.

The leveling system is provided with an auxiliary lever which amplifies the deflection of the main lever by a factor of 8. This leveling system is an important contribution to the specified accuracy which was confirmed by international intercomparisons.

The auxiliary lever has a sliding weight which enables the application of a defined dead load of up to 60 kg in the primary part, and hence 600 kg on the secondary part.

Due to the working principle of the machine (applying the weights and subsequently leveling) the total application of larger loads is somewhat slow. To give an extreme figure, it can take up to 2.5 minutes to apply 25 t on a load cell (included leveling). This is far slower than the time prescribed in OIML R 60, subclause 6.3.

The operation of the computer-based control panel of this machine is very similar to the 550 kg machine described above, including the interface to the temperature generating system.

2.2 Load cell indicators

For the tests according to OIML R 60, NMi Certin uses type DMP 39 load cell indicators, manufactured by the German company HBM.

Since it was introduced in the late 1980's, this type of instrument is very common in the field of testing load cells. The DMP 39 is widely used by many sister-organizations as well as by manufacturers of load cells. It is an AC-system: the supply voltage for the load cells can be selected in steps of 1 V from 1 V to 15 V, 225 Hz. The input impedance of the instrument is > 100 MΩ and the input impedance of the load cell(s) connected can vary from 40 Ω to 3000 Ω (depending on the supply voltage). The resolution is 1.000.000 digits (it is possible to select lower resolutions) with an input (i.e. the output signal of the load cells) ranging from 2.5 mV/V to 250 mV/V. The linearity is specified to be within 0.0004 % of the span. The previously used "Servo Balans" DC indicator is still available, though in practice that instrument is nowadays only used on rare occasions for special projects.

2.3 Facilities for zero return tests

2.3.1 Small capacity load cells

Small capacity load cells (max < 50 kg) are tested manually. For these capacities the minimum dead load output return test, the creep test and the temperature test are normally combined.

2.3.2 550 kg dead weight machine

The 550 kg dead weight machine is provided with a double hydraulic ram which can lift or drop the cradle with the applied weights. This makes it possible to apply or remove the maximum (or any other) load smoothly and enables NMi to comply with the minimum dead load output return test as prescribed in subclause 7.2 of OIML R 60. Without this facility, the time needed for the incremental application or removal of the masses and the leveling of the lever between the load steps would (especially in the case of larger loads) by far exceed the time prescribed in OIML R 60, subclause 6.3.

2.3.3 25 t press

As it is impossible to carry out suitable creep or zero return tests on the 2.5/25 t machine and a modification for this purpose was not possible at a reasonable cost, a simple hydraulic workshop press has been modified. However as the load is neither exactly defined nor entirely stable, this press is not suitable for a creep test though it does perform very well for the zero return test, allowing NMi to apply and remove a load in accordance with OIML R 60.

Within the frame, there is enough room to mount the same temperature chambers used in the force generating machines; hence it is possible to perform the zero return test at temperatures in the entire range from – 10 °C to + 40 °C. This facility has been designed to supplement the 25 t machine, so the press can achieve the same maximum load (25 t in compression).

The cylindrical temperature chamber *(see 2.4)*

2.4 Facilities for temperature tests

For temperature tests in either of the two force standard machines or for zero return tests under temperature-controlled conditions in the hydraulic press, two cylindrical and two cubic temperature chambers are available. The basic design of all these chambers is the same: a metal chamber is lined with a layer of polyurethane foam, within which runs a coiled copper pipe. This pipe is connected by a flexible and thermally insulated tube with a Cryostat, which cools or heats the circulating antifreeze liquid.

An important precaution to prevent thermal gradients is the thermally insulated floor of the chamber as well as the thermal insulation in the loading pad. The insulating material is “Celoron” (Novotext-ferrozell) which is a cloth-reinforced resin; this combines good thermal insulation with high resistance against compression forces.

Both cylindrical chambers have a divisible lid with a hole for the loading pad. The cubic ones have a door in the front, which allows far better access to the load cell under test and the auxiliary equipment in the temperature chamber.

There are three water-cooled cryostats, located outside the laboratory. One is connected to the 550 kg machine, the second is used for the 2.5/25 t machine and the third for the hydraulic press.

A permanent system of thermally insulated pipes and valves makes it easy to switch cryostats in case one of them ceases to function.

The relation between the temperature of the liquid and the final air temperature in the chamber has been established empirically: air temperatures of – 10 °C and + 40 °C require the liquid to be about – 20 °C and + 50 °C respectively. The exact values mainly depend on the chamber in use and on the length of the tube.

2.5 Facilities for humidity tests

Among other facilities, the Type Approval Measuring Instruments department has several fully-programmable climate chambers. Temperature (– 20 °C/+ 100 °C) as well as humidity (20 %/98 % relative humidity at temperatures from + 5 °C to + 95 °C) are controlled by microprocessor. NMi uses these chambers, among others, for humidity tests on non-hermetically sealed load cells as prescribed in IEC 68-2-30 (test Db: 6 cycles + 25 °C/+ 40 °C at 95 % humidity). It is also very suitable for tests on the temperature behavior of unloaded load cells.

2.6 Facility for barometric pressure test

The simple prototype of the facility to test the influence of changes in barometric pressure on the zero output of load cells consisted of just a plastic washing-up bowl, a bucket, a flowerpot and two tubes. After this prototype had successfully been used for some time, the more convenient setup shown below was constructed.

The pressure in the chamber can easily be increased by a small hand-pump or by adding a small amount of water in the outer bowl.

The barometric pressure chamber *(see 2.6)*

3 Data processing

In order to standardize the processing of test data, NMi Certin developed MEAS R 60 (Measurement Administration System). This program is based on a spreadsheet program using Quattro Pro 5.0.

NMi operates with a LAN network by which the DMP 39 load cell indicator is connected to a laptop computer. When all the tests have been completed, the various calculations are performed automatically and the project engineer can print the OIML test report from his or her office.

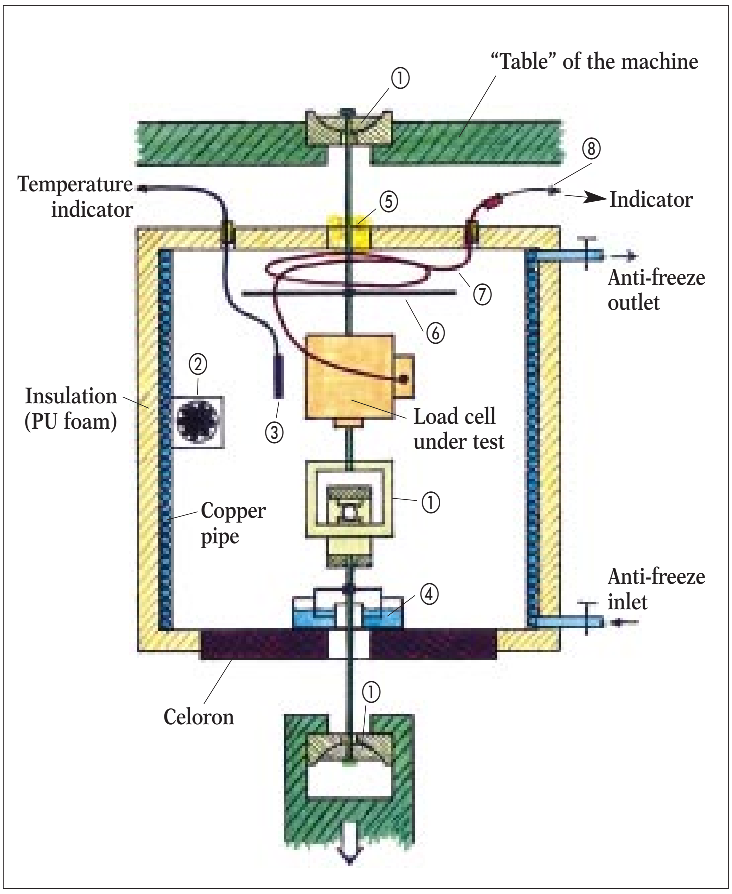
4 OIML R 60 and the NMi Certin B.V. test facilities

The facilities described in this paper allow NMi Certin B.V. to carry out all the tests on load cells up to 25 t that are prescribed in OIML R 60. For larger capacity load cells, in many cases it is possible to also carry out the tests in cooperation with laboratories of sister organizations.

5 Precautions during temperature tests

A typical example of a tension type load cell temperature test in the cubic temperature chamber is illustrated below.

In this setup, the load cell is mounted between bearings (1) to prevent side-loads. The 220 V fan (2) runs at 110 V in order to keep the dissipation low as well as to minimize unwanted forces due to the "wind" caused by the fan. The ambient temperature is measured (3) rather than the temperature of the load cell under test itself, as it is obvious that it is the environmental temperature that is relevant. The feed-through of the lower tension rod is a glycol-filled labyrinth (4) which prevents cold air from "falling" out of the gap. This cold air might not only cause a temperature gradient to occur, but can also lead to the risk of a layer of ice building up at temperatures in the chamber below zero.



Tension type load cell temperature test in the cubic temperature chamber
(schematic representation; numbers refer to paragraph 5)

The gap (5) in the top is simply closed with tissue paper as the influence of side forces at this spot is negligible. To prevent a temperature gradient caused by heat conduction through the upper tension rod, there is an aluminium or copper disk (6) which acts as a heat-sink to ensure that the rod is at ambient temperature. The cable (7) of the load cell (usually a four-wire system) is in the temperature chamber, and only a few centimeters and the plug to the extension cable (8) are located on the outside. This extension cable to the indicator is a six-wire system. The bottom of the chamber is made of Celoron for the test of compression-type load cells.

6 Not only type testing

The formal owner of the majority of the hardware described in this paper (including both the force generating machines) is NMi VSL B.V. (Van Swinden Laboratorium), the National Measurement Institute of The Netherlands. This is a sister-company of NMi Certin B.V., located in the same premises, so it is clear that traceability is ensured directly to the national standards of The Netherlands.

The Mechanics Department of NMi VSL B.V. carries out calibration of load cells and complete force measuring equipment, among others.

If, in case of force measuring machines, calibration has to be carried out in “round” newton values, this is achieved by applying additional weights manually.

These calibrations and other related tests are carried out commercially for various customers, for example scientific organizations, test laboratories, R&D departments of load cell manufacturers, etc.

For loads exceeding the capacity of the 250 kN machine, calibrations can be carried out up to 5 MN with a relative uncertainty ranging from 2.10^{-4} to 5.10^{-4} by means of transfer standards.

Incidentally, a related facility is the calibration facility for torque transducers - a topical subject due for the most part to changes in legislation concerning the maximum power transferred by the shaft to the propeller of fishing vessels. For this purpose, which also falls under the umbrella of legal metrology, a unique facility is available in The Netherlands for torques up to 400 kN·m.

At the moment, this equipment is just being transferred from Delft Technical University to NMi VSL B.V.

In this torque-generating machine, the torque is generated hydraulically and measured from 3.2 kN·m up to 32 kN·m with weights of 2 kN each and from 32 kN·m to 400 kN·m by means of force transducers connected to two arms of known length. The ranges of the transducers are +/– 100 kN·m and +/– 400 kN·m. For each range one pair of transducers is available.

The relative uncertainty of this facility is 2.10^{-3} in normal mode with the force transducers and 5.10^{-4} with the weights.

References

OIML R 60 (1991)	Metrological regulation for load cells*
EN 10.002-2 (1991)	Metallic materials - Tensile testing - Part 2: Verification of the force measuring system of the tensile testing machines
EN 10.002-3 (1994)	Metallic materials - Tensile test. Part 3: Calibration of force proving instruments used for the verification of uniaxial testing machines

**Note:* At the time of drafting this paper, R 60 (1991) is under revision. The new draft of R 60 has been approved by the members of OIML TC 9 and this version will be presented for approval by the CIML at its 34th Meeting in October 1999 (Tunis).

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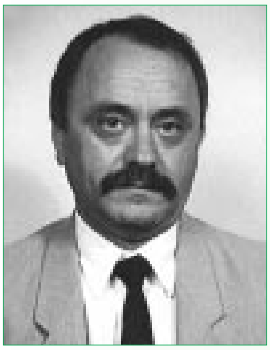

UNCERTAINTY

Qualifying measuring instruments based on the quadratic approach of the *Guide to the Expression of Uncertainty in Measurement*

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Abstract

Qualifying a measuring instrument involves both a comparison and a decision:

- *Comparison of the metrological parameter(s) of the instrument as determined by (or evaluated based on) the results of the calibration and the required (or supposed) values of these parameters derived from technological or safety requirements (or tolerance in the general sense) or the manufacturer's specification of the instrument. This comparison usually results in a decision to accept or reject the instrument for use;*
- *The decision is influenced both by the first order (α-type or type I)* and the second order (β-type or type II)* errors of the decision and also by the uncertainty of the value measured or reproduced by the standard. A quadratic evaluation of the measured deviations reduces the risk of the incorrect decisions being made in both cases.*

Introduction

The qualification of a measuring instrument is based on the d_i deviations between the measured y_i values provided by the measuring instrument to be qualified and the respective z_i reference (or conventional) values of the measurand reproduced by or measured with the standard:

$$d_i = y_i - z_i \qquad (1)$$

D is a random variable since both Y and Z are random variables and Y can itself be considered as the sum of the two random variables.

The first variable is the expected value of the results deviating in a random manner from the true or definitive value of the measurand in the range of the measurements (these deviations are called *systematic errors* and are estimated with the biases).

The second variable is the classical random error (or deviation), i.e. the deviation of the measured values from the expected value or from the average of many results in practice.

The metrologist's task is either to characterize the measuring instrument with an s(Y) standard deviation (or a multiple thereof) or to judge if the estimated standard deviation is less (but not more) than a value that is (or ought to be) specified for the measuring instrument to be qualified.

Note: The instrument's specification does not usually define the term *accuracy* itself, so the user should consider it either as a multiple of a standard deviation or as certain limits for the maximum permissible error (mpe).

The s(Y) standard deviation has to be calculated or estimated from the results of the calibration and from the specification of the measurement standard.

As the variance of D is equal to the sum of the variances of Y and Z, the variance of Y is the difference of the variances D and Z respectively. The variance of D can be estimated from the results of the calibration by eq. (12) according to the so-called or noted type A estimation of the standard deviation (or uncertainty) on the basis of the experimental or relative frequency-based concept of the probability. In this case:

$$s(Y) = \sqrt{s^2(D) - s^2(Z)} \qquad (2)$$

To use this approach the s(Z) standard deviation of Z has to be estimated from the calibration certificate of the measurement standard used for the calibration.

* *Note:* Throughout the text, the uniform denominations "α-type" and "β-type" are used.

$s(Z)$ is known this way, at least in principle. Attributing probability distribution functions to Y and Z, the probability distribution function of D can be derived and the probability of the event of:

$$P[|d| > k \cdot s(Y)] = p \qquad (3)$$

can be calculated for any value of d. If the value d_b is found to be out of the limits of the mpe with a low probability of $p(d_b)$ then one might reject even an acceptable instrument. This is the so-called α-type error (concluding a hypothesis H_1 when H_0 is true). And as the absolute values of a few measured deviations can easily be less (or not more) than the critical value for d one can obtain acceptable values for d even in the case of measuring instruments having greater errors or standard deviation than the allowed value. Accepting an "unacceptable" instrument, i.e. accepting the H_0 hypothesis when another value of H_1 is true is called the β-type error.

For an acceptable instrument, a measured deviation can fall outside the tolerance limits because of a large (but rare) random error **or** because of the unknown (and therefore not considered) error of the measurement standard, **or both**. Similarly a measured deviation can fall within the acceptable range even for an unacceptable instrument because of the random nature of the errors **or** because of the influence of the unknown error of the measurement standard, or both. To consider or to reduce the chances of incorrect decisions being made, at least three different principles or rules of qualification are applied and one additional principle is suggested below.

1 Spreading the risk of an incorrect qualification

A traditional qualification method is to compare all the measured deviations with the limits of the mpe's derived from the accuracy specification of the instrument:

$$d_l \leq d_i \leq d_u \qquad (4)$$

where:

- d_l is the lower mpe limit (usually negative and may be a function of the measured value);
- d_u is the upper mpe limit (usually positive and may be a function of the measured value); and
- d_i is the i^{th} measured deviation.

The measuring instrument will be accepted or qualified as being "acceptable" if the condition in eq. (4) is met for all the d_i values. The decision might however be the subject of both an α-type or a β-type error, since a measured deviation can fall outside the tolerance limits even for an acceptable instrument because of the occurrence of a large but rare random error or because of the unknown (and therefore not considered) error of the measurement standard, or both.

On the other hand several consecutive measured deviations can fall within the acceptable range even for an unacceptable instrument because of the random nature of the errors and the influence of the unknown error of the measurement standard, or both. The probabilities of these two incorrect decisions being made are often considered to be equal or at least similar in value and neglected for this reason. This practice is often used in legal metrology although the owner and user of incorrectly rejected and incorrectly accepted instruments is not necessarily one and the same.

Furthermore, since alternative H_1 hypotheses to describe the behavior of unacceptable instruments are usually not proved, the probability of accepting an unacceptable instrument can hardly be ascertained. Having proved hypotheses for the probabilities of the D deviations, the probability of α-type errors can be calculated:

$$P(\alpha) \approx 1 - \int_{d_l}^{d_u} \varphi(D) \cdot d(D) \qquad (5)$$

where $\varphi(D)$ is the probability density function of the deviations with the estimation $s^2(D)$ for the variance. Chebisev's equation can be used in cases where no proved hypothesis is available (i.e. when the distribution of the sample deviates significantly from the supposed one). The original form of the equation is:

$$P[|D - M(D)| > \varepsilon] = \frac{\mathrm{var}D}{\varepsilon^2} \qquad (6)$$

where:

- $M(D)$ is the expected value of D, which is zero in the present case; and
- ε is a small positive number.

Let $|d_l| = d_u \cong k \cdot s(D) = \varepsilon$ where k can be the well-known and widely used coverage factor. In this case:

$$P[|D| \geq k \cdot s(D)] \leq \frac{1}{k^2} \qquad (7)$$

The uncertainty of the z_i reference values contributes generally to the chance of the incorrect decision being made, but this contribution can often be neglected after reducing it to below one tenth of the $|d_l| = d_u$ values.

2 Qualification for maximum confidence of operation

Another traditional qualification method is to compare all the measured deviations with the "tightened" mpe limits:

$$d_l + U_z \leq d_i \leq d_u - U_z \tag{8}$$

where:

- d_l is the lower mpe limit;
- d_u is the upper mpe limit;
- d_i is the i^{th} measured deviation; and
- $U_z = k \cdot s(Z)$ is the uncertainty of the reproduction or measurement of the reference or conventional value of the measurand.

The measuring instrument will now be accepted or qualified as being "good" if the condition in eq. (8) is met for all the d_i values. An unacceptable instrument (i.e. one that failed to meet the specifications) will hardly be qualified as "good" in this way.

This decision might however more often be the subject of an α-type error than in the case of the "shared risk", since a measured deviation can fall outside the tightened tolerance limits with somewhat more probability even for an acceptable instrument. The reason for this can be the occurrence of a large and less rare random error or because of the unknown (and therefore not considered) error of the measurement standard, or both. Accepting $\varphi(D)$ for the probability density function of the differences with the estimation $s^2(D)$ for the variance, the probability of the α-type error is:

$$P(\alpha) = 1 - \int_{d_l + U_z}^{d_u - U_z} \varphi(D) \cdot d(D) \tag{9}$$

and the formula in eq. (10) can be used if no suitable $\varphi(D)$ probability density function is available for the differences:

$$P\left[|d| > k \cdot s(d) - U_z\right] \leq \frac{s^2(D)}{(k \cdot s(D) - U_z)^2} \tag{10}$$

3 Avoiding the rejection of an instrument that meets the specifications

One more traditional qualification method is to compare all the measured deviations with the extended limits of the mpe's:

$$d_l - U_z \leq d_i \leq d_u + U_z \tag{11}$$

where:

- d_l is the lower mpe limit;
- d_u is the upper mpe limit;
- is the i^{th} measured deviation; and
- $U_z = k \cdot s(Z)$ is the uncertainty of the reproduction or measurement of the reference or conventional value of the measurand.

The measuring instrument will now be accepted or qualified as being "good" if the condition in eq. (11) is met for all the d_i values. Practically all of the "good" instruments will be accepted but the chance of unacceptable instruments being accepted (i.e. those that fail to meet the specifications) will be increased this way.

This decision might more often be the subject of a β-type error than in the case of the "shared risk", since a measured deviation can fall within the extended tolerance limits with somewhat more probability even for an unacceptable instrument because of the occurrence of a few consecutive small and (unlikely but possible) random errors or because of the unknown (and therefore not considered) error of the measurement standard, or both.

4 A quadratic approach

Reducing the probability of unacceptable instruments being accepted by tightening the limits increases the probability of good instruments being rejected; reducing the probability of good instruments being rejected by extending the limits of acceptance increases the probability of unacceptable instruments being accepted. The probability of making incorrect decisions can be reduced:

- using measurement standards with low measurement uncertainty or reproduction when U_s is not more than 1/10 of the mpe (this is expensive and affects only one of the incorrect decision sources);
- using higher values for the coverage factor than $k = 2$ (though the demand for higher confidence does not aid in intuitive thinking but allows only likely tendencies or facts to be stated or recognized); or
- using the quadratic estimation of the *Guide* for the qualification as well.

Perhaps the accuracy or the uncertainty of the measuring instrument can be characterized either with the s(Y) standard deviation or with a multiple thereof. For this the experimental standard deviation of the results of the calibration shall first be calculated according to the so-called A type evaluation of the results:

$$s(D) = \sqrt{\frac{\sum_{i=1}^{n} d_i^2}{n}} \tag{12}$$

Substituting in eq. (2) the value of s(D) as calculated in eq. 12, one can compute a standard deviation which characterizes the measuring instrument with an experimentally determined expanded uncertainty that conforms to the *Guide*:

$$U = 2\sqrt{\frac{\sum_{i=1}^{n} d_i^2}{n} - s^2(Z)} \tag{13}$$

This can be used directly for uncertainty calculations, is not sensitive to any large individual deviation which can itself decide the qualification of the instrument, and is not affected by the limited accuracy of the measurement standard used for the calibration.

Extended tests have shown that above a certain low limit in the number of measured deviations, this second moment or non-central variance based on the s(Y) parameter can well describe the performance of the measuring instrument to be qualified and this s(Y) parameter can be interpreted according to existing international metrological normative documents.

Summary and conclusion

Traditional linear principles of qualification cannot exclude the possibility of incorrect decisions being made. The probabilities of this occurring can be reduced by applying the quadratic evaluation of the deviations and by considering the standard deviation of the reproduction or measurement of the reference value. This approach was presented to the 49th General Assembly of CECIP (*Comité European des Constructeurs d'Instruments de Pesage*) for further consideration. ■

Bibliography

[1] *International Vocabulary of Basic and General Terms in Metrology*, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1993.

[2] *Guide to the Expression of Uncertainty in Measurement*, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, Corrected and reprinted, 1995.

[3] P. Bölöni: *Connections between various interpretations of measurement uncertainty*, OIML Bulletin, Vol. XXXVIII No. 4, October 1997, pp. 21–23.

[4] W.H. Emerson: *The new VIM (Vocabulary for metrologists)*, OIML Bulletin Vol. XXV, No. 2, April 1994, pp. 30–34 and *Personal reflections about the VIM*, pages 35–37.

Note: At the time of going to press, the OIML TC 3 *Metrological control* meeting (1–3 June, Paris) has not yet taken place; one of the topics to be discussed at this meeting is measurement uncertainty in legal metrology. Information on the outputs of the meeting will be given in the October 1999 issue of the Bulletin.

TECHNOLOGICAL DEVELOPMENTS

Security of computerized instruments

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Introduction

The objective of legal metrology is to ensure a sufficient level of confidence in measurement results. Measuring instruments must have well-suited metrological characteristics (i.e. accuracy, reliability, sensitivity and durability) such that they give exact measurement results during their life-cycle. In addition, they must either not be affected by external influences which may distort these results, or be protected against such influences, or even clearly indicate those factors which might alter the measurements.

The influences to be considered may depend on:

- the instrument's conditions of installation (horizontality of a weighing machine or of a water meter, straight lengths of pipes, etc.);
- the instrument's environment (very few factors were actually found to influence the correct operation of mechanical instruments, though these factors did tend to affect durability);
- the actions of the user (bad handling or attempts to engage in fraudulent use: mechanical instruments only allowed very simple operations to be performed. Handling errors also needed to be reduced).

When instruments were purely mechanical, the risk factors (and the consequences thereof) were simple, there were not very many of them and they could virtually all be analyzed.

Fraudulent handling was rendered impossible by simple methods:

- either such attempts were subsequently clearly visible,
- or fraudulent handling was made impossible by physical access protection (sealing) of the instrument's critical elements.

At this time and up until the middle of the 1970's, the legal metrology profession called for competence mainly in the fields of mechanics and fluid mechanics, and perhaps also to a certain extent in thermodynamics. Since then, the general and constant trend within the civil service has been to reduce staff, which has put the brakes on staff renewal and the recruitment of new skills.

Meanwhile, the use not only of electronics but especially of computer technology in measuring instruments has acutely disrupted the "state of the art".

The technological electronic evolution

Electronics has considerably developed instruments' performance, though at the expense of increased sensitivity to their external environment (temperature, humidity, electrical and electromagnetic disturbances, etc.). The reliability and durability of these instruments have become critical subjects, which Document OIML D 11 goes some way to addressing. Techniques have developed, but in a way which has allowed legal metrology staff to adequately keep pace with these new technologies.

A difficulty nevertheless began to appear: the extreme rapidity with which electronic components have developed, which raised the problem of conformity of the instruments to the approved pattern. This problem was not completely new, since even for mechanical instruments, the quality of the steel used and the quality of the processing of the surface of certain metallic parts,

La version originale française de cet article ("Sécurité des instruments informatisés") a été publiée dans le Bulletin d'avril 1999 the composition of plastics, or even the packaging of plastic granules before injection were all essential criteria, though of course difficult (if not impossible) to check on the finished product. Conformity assurance of electronic instruments was therefore dealt with in the same way as that of mechanical instruments, which has in fact given satisfactory results. Conformity falls under the responsibility of the manufacturer and is presumed to exist unless the contrary is proved. On the initiative of the manufacturer or of the checking authorities, instruments or parts of instruments selected at random from a production batch can be submitted to some or all pattern approval tests. This "black box" type examination provides sufficient confidence as to the conformity of electronic instruments.

Computerization

Computerization, on the other hand, has radically changed the legal metrology profession. Whilst a computerized instrument can on the surface look like an electronic instrument and may seem to be only a development of it, this is in fact misleading. What beneficial effect does computerization actually have on instruments?

- It does not inherently improve rough measurement results. The key element for the metrological performance of an instrument is the sensor. Whilst the reliability and reproducibility of sensors have increased, this progress owes nothing to computerization. Computerization allows the behavior of a sensor to be modeled and allows complex procedures (that could be applied at calibration laboratory level) to automatically be applied to the processing of its output.
- It allows more complex calculation and processing operations to be carried out. This power of calculation allows pressure, temperature and density corrections to be made to a flow measurement with a high sampling rate. It allows the non-linear sensor response curves to be rectified, and permits analog-digital conversions to be traced to a sole standard component instead of several.
- It allows for considerably more functions, which are more complex and sometimes outside the scope of legal metrology. For example, a gasoline service station terminal manages not only the fuel pumps, but also handles the accounting side of credit card transactions, calculates the remaining stock volume of fuel in the tanks, and also takes care of the shop sales transactions.
- It allows different instruments to function in a network: for example in a sugar beet warehouse, computers link together in a network the identification badge readers, the "in" and "out" weighbridges, the various sample-weighing machines, and the analysis laboratory saccharimeters.
- But it also introduces new vulnerability, much more complex and this time invisible. Computerization offers the possibility for instruments to communicate with their users and to receive orders, even basic ones. However, any possibility of giving orders to a computerized system or to provide it with parameters or data may also provide an ideal opportunity to hack its normal operation.

The techniques of legal metrology are consequently much more fundamentally modified by the introduction of computerization than by electronics. Whereas electronics simply required a parallel development of personnel skills which could be accomplished by providing ongoing training, computerization introduces a radical break from this concept. The required techniques now relate to the security of computerized systems and can only be acquired by in-depth training.

The study carried out in France

The *Sous-direction de la Métrologie* conducted a study by security experts in computerized systems of:

- current requirements of regulations (transcribed from the most recent OIML Recommendations);
- methods and procedures for type/pattern approval (harmonized in Europe by the various WELMEC Guides and Draft Guides);
- the instruction of certain pattern approval dossiers; and
- the state of the art as regards computer security

among a number of French measuring instrument manufacturers. This study, of which some extracts are given in the annex to this article, shows how questions of legal metrology are tackled by computer security professionals and what the necessary skills are, respectively, for:

- specifying the statutory requirements as regards the computer security of measuring instruments;
- approving instrument models with a view to their security certification being delivered by a specialized body; and
- dealing entirely with an approval dossier, including computer security.

This study also addresses the problem of modifications to models of instruments after their approval and the taking into account of these modifications in the regulations. This extremely important question is not, however, the subject of the present article.

Instruments and fraudulent use

One of the main questions brought up in this report on the security of measuring instrument software is whether there is a risk of fraudulent use: this has always been possible in the case of mechanical instruments, even by merely removing the seal and replacing it with a counterfeit or stolen seal. The difference brought about by computer technology is that fraud now tends to be more widespread: whilst fraud on mechanical instruments remained localized and was limited by the availability of tools and the necessary know-how (for example a false stamp), a means of defrauding a computerized instrument may instantly be communicated to numerous potential defrauders, or even broadcast on the Internet. Furthermore, defrauding a computerized instrument may be subtle and not visible when the instrument is checked.

Another characteristic of fraud is that it depends on the confidentiality of information held by the manufacturers and by repair engineers. The codes authorizing access to protected parameters and zones of an instrument are intangible (e.g. password, coded message, etc.). Even if the instrument knows how to "defend itself" against intrusion attempts, a certain vulnerability remains if there is a risk that certain staff of the manufacturer or of the repairer are likely to disclose these keys. If such disclosure by a dishonest employee does not necessarily harm the manufacturer, limited legal means are available to repress such deeds and the penal sanctions of legal metrology regulations are not adapted to these new crimes. Complicity of fraud can be put forward, but the fraud will for its major part be potential and not actually witnessed.

The temptation to defraud

All categories of instruments do not, however, suffer from the same degree of risk: certain users are reliable (the police force for example), and certain frauds are not profitable. One recommendation of the study should be rapidly followed: to define a risk scale for various categories of instruments as regards the temptation to defraud, which can be evaluated by counterbalancing two types of considerations:

- the gains anticipated by the fraudsters, depending on the number of instruments being used, on the cost of products or the services measured by the instruments;
- the risk that the fraud is discovered without any particular anti-fraud measures being incorporated in instruments (denunciation, cross-checking between several independent measurements, risks of leaks due to the number of people involved, etc.).

One can therefore define a scale of initial risk of fraud (before this risk is reduced by the security measures required by the regulations). The level of resistance of the security mechanisms in the instruments will then be determined in view of this initial risk.

Taking into account the risk of fraud

Another question raised by this study is to decide what measures to take if an inherent weakness in the system becomes known to the public (a password for example). Three cases are possible:

- either the risk of fraud is accepted as such;
- or it is possible to reconfigure the security mechanisms or to bring into operation counter-measures which reduce this vulnerability (reconfiguration or reprogramming) on instruments in service; or
- the instrument must be withdrawn from service.

This problem arose for a scrambled TV channel when the circuit diagrams for its first decoder were published in a magazine. The TV channel set about designing a new generation of decoders, which completely replaced the previous generation. In this case their decision was made on economic and business grounds, but in legal metrology if such a decision has to be made by the statutory authorities then various complex problems arise, notably as regards the onus of responsibility.

No computer system is completely risk-free as far as its vulnerability is concerned: a certain degree of inherent risk is acceptable during pattern approval, but can become unacceptable when this risk element becomes a real threat, even though the instrument is strictly identical. This raises the difficult problem of the onus of responsibility. A manufacturer takes responsibility for any defects that arise in the instruments he produces, however when a residual risk has been identified and accepted (even implicitly) by the pattern approval authority, if this risk subsequently becomes a reality then only the authority's responsibility should be questioned. Can a known risk be legally considered as a hidden defect once it appears? Can the pattern approval body be held responsible for the consequences of this risk? These questions are legally complex, but must be dealt with.

The skills of legal metrology experts

The study report also suggests a description of the skills required to carry out the activity of regulation and pattern approval, as well as a training plan to this end. Three levels are defined, in line with the following objectives:

Level 1:

To know how to set out statutory requirements (in the electronics and computerization fields);

Level 2:

To know how to read and understand an assessment report of the computerized security aspects of an instrument;

Level 3:

To know how to evaluate the computerized security of an instrument.

One only needs to read this part of the report, which describes the basic pre-requisites and the training plans corresponding to these three levels, to realize that legal metrology is really a new profession.

Each person in charge of a legal metrology technical unit will be able to judge what proportion of its personnel meets the necessary requirements and is therefore capable of following the training described. This report will often be worrying for those bodies that did not experience a rapid and recent turnover of their personnel with a recruitment profile such as that proposed in the report.

Some may feel that the author of the report has voluntarily set very demanding objectives in his recommendations in order to increase the value of those organisms specializing in computer security. But this is not the perception of the experts at the *Sous-direction de la Métrologie*, who have worked together with that expert on the practical analysis of approval files, and who are convinced that these recommendations are indeed relevant.

Experts at the *Sous-direction de la Métrologie* regularly carry out pattern approval of computerized instruments and apply the "state of the art" as accepted in Europe, which represents some of the methods presented in this report. The recommended in-depth analysis does therefore appear necessary to the specialists of the *Sous-direction de la Métrologie* in order to better master the subject, and provides both an approach and tools which are more complete and more coherent.

Conclusion

A final piece of advice for those in charge of legal metrology bodies who perhaps are not convinced of the need to radically update skills would be that they compare the evolution of the age-structure (and types of training) between:

- the designers of measuring instruments in the majority of companies; and
- specialists in legal metrology services.

Without detracting from any of the credit that is due to our elders, and whose experience and judgment is still of great value, the above comparison is self-explanatory. ■

Excerpts of the CR2A-DI report on the security of computerized instruments

2.3 Fraudulent use of measuring instruments

The level of examination of the security of computer programs that are subject to legal control can be adapted in line with the degree of risk of fraud that is associated with the category of measuring instruments of which such programs are an integral part. This risk factor can be determined according to various parameters, for example:

- the potential gain of tampering with a computer program, which is to be compared with that which might result from the instrument itself being fraudulently manipulated whilst actually in use: in some cases it is perhaps neither necessary nor justified to excessively protect the software components of a measuring instrument that can in fact easily be manipulated during use;
- the penalty incurred, which is to be weighed up against the potential gain;
- the probability of whether the fraud might be detected within a reasonable time period;
- the number of people who must be involved in the fraud;
- the number of measuring instruments manufactured, since no criminal will ever invest more time and money in trying to cheat an instrument than the amount he hopes to gain from such an activity. The development of anti-fraud mechanisms (for example, "clocking" taximeters) may require several months

of study, design and development. It is more profitable for the criminal who is looking for a return on his investment to concentrate on measuring instruments manufactured by the thousand rather than in small quantities, and so consequently the size of the criminal's potential market is directly proportional to the number of measuring instruments on the market;
- the type of customers using the measuring instruments in question to make transactions: industrials have more means at their disposal to cross-check and verify information than retail sellers, for example. One is therefore more likely to see dishonest practices in the retail sector rather than in the industrial sector;
- the category of users (such as police officers, postal workers, bailiffs, experts, garage owners, truck drivers, retailers, etc.).

When the stakes are particularly important, it can be necessary to require that the metrological part of the measuring instrument be the subject of an assessment according to ITSEC criteria, in which case the level of assessment must be determined as early on as possible, since taking into account certain assessment criteria has an influence on the development process and on manufacturers' internal organization. For an assessment according to ITSEC criteria to be successful, these criteria must be respected before development even begins. The case of pattern approval of a measuring instrument that is the subject of an assessment according to ITSEC criteria is dealt with in more detail later on in this document.

2.4 Security objectives

The security objectives stated below are of a generic nature so that they may be adapted to any category of measuring instrument. They are expressed independently of any notion of assessment according to ITSEC criteria:

- to give advance warning of attempts to defraud using commercially available tools (such as text editors);
- to prevent unintentional misuse;
- to guarantee that the measuring instrument does not comprise any hidden functions which would allow its metrological behavior to be modified. Such hidden functions may either exist without the knowledge of the manufacturer (design defect or vulnerability of one of the instrument's components), or be voluntarily added to the metrological program by the development team, in order to negotiate their illicit use;
- to guarantee the exactness (i.e. the integrity) of the metrological data throughout the measurement operation, during their transmission, printing and/or display and possibly even throughout the duration of their storage. Anyone in possession of a measuring instrument must not be able to modify such data;
- to guarantee the availability of the metrological data throughout the whole measurement, and possibly throughout the duration of their storage;
- to guarantee the origin of the metrological data during their transmission;
- to guarantee the inviolability of the critical security mechanisms;
- to guarantee that no design, implementation or applicational defect is present;
- to guarantee that each category of user (owner, repair engineer, etc.) only has access to those functions that are authorized for him;
- to guarantee that the various user modes allow the user's identity to be confirmed (ID check);
- to guarantee that any malfunction of the metrological part of the program is detected and that the measurement is not able to be carried out;
- to guarantee the exactness of the identification of the program (version and serial numbers, etc.);
- to guarantee the permanent operation of the security functions and mechanisms;
- to guarantee the presence of certain mandatory devices, where appropriate;
- to guarantee the preservation of security in the case where the instrument malfunctions or in the event of a power failure;
- to guarantee, if necessary, the protection of the confidentiality, integrity and availability of secret elements (codes, passwords, etc.), including cases of malfunctioning;
- in the case where this option is applicable, to ensure the imputability of any actions executed on the instrument that have a bearing on the metrological part (calibration, tariff entry, etc.) by keeping a log of these actions.

Measuring instruments undergo laboratory tests which serve to ensure their continuity of operation despite any electrical, electromagnetic or atmospheric (hygrometry, temperature) disturbances. Any malfunction that occurs due to this type of disturbance is therefore outside the scope of this study and does not call for any security objectives to be detailed.

3.1 Determination of the level of assessment for a category of measuring instruments

The cost of an ITSEC assessment depends on the size of the assessment target and on the level of assessment. The ITSEC criteria lay down the requirements for conformity and efficiency assurance.

The requirements for conformity assurance can be summed up as follows:

- *level E1:* at this level, a security target and an informal description of the general conception of the assessment target must exist. The functional tests must indicate that the assessment target complies with its security target;
- *level E2:* apart from the requirements of level E1, an informal description of the detailed conception must exist and elements of proof of the functional tests must be evaluated. There must also be a configuration management system and an approved distribution process;
- *level E3:* in addition to the requirements of level E2, the source code and/or the descriptive diagrams of the equipment corresponding to the security mechanisms must be evaluated. The elements of proof of the mechanism tests must be evaluated;
- *level E4:* in addition to the requirements of level E3, a "formal underlying pattern of security policy supporting the assess-

ment target" must exist. This formal pattern is an abstract presentation of the important security principles that an assessment target should cause to be respected. It is a model of security requirements which absolutely has to be realized in a formal language and accompanied by an informal interpretation from the angle of the security target. The functions dedicated to security, plus the general and detailed conception must be specified in a semi-formal style;

- *level E5:* in addition to the requirements of level E4, a close conformity must exist between the detailed conception and the source code and/or the descriptive diagrams of the equipment;
- *level E6:* in addition to the requirements of level E5, the functions dedicated to security as well as the general conception must be specified in a formal style and in a coherent way with the underlying formal pattern of security policy.

The meaning of the quotation of the resistance of the mechanisms is as follows:

- in order for the minimum resistance of a critical mechanism to be quoted as being "elementary", it must be evident that it provides sufficient protection against random accidental subversion, even though it is likely to be overridden by competent criminals;
- in order for the minimum resistance of a critical mechanism to be quoted as being "average", it must be evident that it provides sufficient protection against criminals who only have limited opportunities or competence;
- in order for the minimum resistance of a critical mechanism to be quoted as being "high", it must be evident that it can only be overridden by criminals who are highly competent, and who have the necessary skills and resources - however a successful attack is normally deemed as not being feasible.

Within the framework of programs, criminals can use means of attack such as password dictionaries (available on the Internet) which allow them to discover passwords and thus gain access to privileged modes of use such as system administrator access rights. Criminals may also make use of retro-engineering tools which allow them to piece together the source code from the executable code. It then becomes easy to modify the code in order to introduce complementary functions or modify its existing functions.

The level of assessment must mainly be chosen both in line with the risk of fraud for the category of measuring instrument and in line with the stakes associated with the fraud. For example, if it is really necessary to ensure that there are no hidden functions in the metrological program, then it is preferable that the source code be examined by the assessors. In this case, only assessment from level E3 up caters for this.

Likewise, if the stakes associated with the fraud are so potentially high that there is a quasi-certain risk of large-scale attempts being made to bypass the security mechanisms protecting the metrological parts of programs, possibly even at international level (as is already the case on the Internet where whole sites are devoted to hacking), then it will be necessary to increase these mechanisms as much as possible.

Note: The preceding statement about Internet leads to a first recommendation: it is becoming increasingly necessary for legal metrology authorities to monitor and regularly search for sites or forums on the Internet whose intent is to propagate piracy of measuring instruments that are subject to legal control. In order to remain anonymous during these searches, it is preferable to set up a separate Internet access and to use a pseudonym. It is clear that for example an address like X.Y@industry.gov.country is too conspicuous and might cause the surveillance to fail.

4.1 Typical elements of the pattern approval program

One of the objectives of this study is to determine the typical elements of the program to be requested of manufacturers with a view to pattern approval. These typical elements are those which allow all or part of the following to be ensured:

- the integrity of the metrological part of the program is regularly checked, at time-intervals to be defined according to the category of the measuring instrument (e.g. before each measurement, on each power-up, every hour, etc.);
- a measurement cannot be made if the result of the integrity check of the metrological part of the program reveals the existence of a problem, in which case a specific error message must be displayed;
- the integrity of the main indications (i.e. quantities whose values are subject to state control) is maintained and regularly checked;
- during the measurement operation it is impossible to modify those main indications that are not intended to be measured during that operation (e.g. the unit price);
- if the measuring instrument comprises a programming/consulting mode which allows the user to enter data (e.g. unit price, nature of the marketed products, etc.) or to consult management data stored in the memory (e.g. total sales, total mileage covered, etc.) then it must be impossible to make a measurement when the measuring instrument is in programming/consulting mode;
- access to programming, repair and calibration functions intended for use only by approved bodies is protected by a security mechanism (e.g. by a password), the resistance of which is sufficient to counter the risk of fraud of the measuring instrument;
- the integrity of the metrological data is checked throughout the measurement by a security mechanism whose resistance is proportional to the risk of fraud of the category of measuring instrument (CRC, encryption, etc.). A specific error message is displayed if a problem arises and if possible the measurement is stopped;
- the integrity of the data stored in the memory is preserved and regularly checked;
- the data are stored in the memory together with the date of the transaction in order to allow them to be kept over a predefined period;
- data stored in the memory cannot be erased before the end of this predefined period;
- if the data storage media become saturated, transactions are blocked or a special process of data deletion is activated. In both cases, a specific error message must be displayed. The special process of memorized data deletion must only take place after explicit agreement has been obtained and in accordance with an exceptional procedure;

- the interfaces of the metrological part of the program protect it with regard to the outside;
- the communication protocols used guarantee that the integrity of information flow is checked;
- the program does not comprise any hidden functions, i.e. the set of visible commands is exhaustive;
- the data display times and the transition from user mode to data programming/consulting mode are compatible with the type of measuring instrument. These display times serve to avoid any confusion between the amount due and (for example) a totaling up of the management data memorized;
- the confidentiality of non-transferable information, if it exists, is maintained;
- it is possible to identify the version number of the program and to prove that it is really the version number which is displayed;
- it is possible to ensure that the same program that actually underwent pattern approval is in fact installed in the measuring instrument;
- the metrological part of the program has been the subject of functional tests according to a scenario of predefined tests. The scope of the tests leads to a reasonable assurance that the security of the program is determined in line with the resistance it must put up to attempts to defraud.

The elements of proof which enable the officer to carry out the necessary checks can take the form of a descriptive documentation of the instrument's functioning, conception documents (specification of needs, general conception, detailed conception, analysis file, logic diagram, source code, etc.), technical specifications of components, tests reports, etc. These elements of proof currently vary in content.

5.1 Core syllabus training

5.1.1 Pre-requisites

The examination of the security of programs or of electronic transmissions requires certain knowledge both of computerization/electronics and of information systems security. The latter is dealt with in section 5.1.2 *Security awareness*.

The objective of this section is to list the skills required in the fields of computerization and electronics. Given the wide scope of the subjects in question, it will doubtless prove necessary to divide up the skills amongst several individuals who will act in a complementary manner.

Note: Dividing the skills up in this manner may have an influence on the future organization of the pattern approval body. In the future it might perhaps be necessary to share out the examination of pattern approval files between the recorders by fields of competence, in line with the internal structure of the measuring instrument rather than by categories of measuring instruments, as is the case now.

The required knowledge in the field of computerization is as follows:

- good general knowledge of microcomputing: knowledge of the internal structure and of the functioning of PC's and of different peripheral devices;
- good practical knowledge of standard operating systems (Windows 3.X/95/98/NT, Unix, etc.);
- good general knowledge of basic computerization skills including knowing what an operating system is and what programming languages, compilers, linkers, communication protocols and so on are;
- good knowledge of standard protocols (TCP/IP, etc.) and OSI layers;
- practical knowledge of Internet.

The required knowledge in the field of electronics is as follows:

- good knowledge of cabling (twisted pairs, coaxial cables, optical fibers) and of different types of network mapping and of their consequences;
- good general knowledge of components likely to be incorporated in measuring instruments (RAM, ROM, EPROM, network cards, microprocessors, etc.) and of their use;
- necessary knowledge for the examination of the appropriateness of an electronic circuit diagram;
- good general knowledge of electricity.

5.1.2 Security awareness

Recorders' awareness of the security of information systems is a necessary prerequisite to more advanced training on security. The organization of the awareness session may comprise two parts:

- general security aspects;
- personalized aspects.

The general security aspects may follow the following plan:

- generic description of an information system, which consists of physical resources (computers, networks, peripherals, etc.) and logical resources (software packages, applications, data);
- definition of the main concepts used in security (security objectives, threats, parries, availability, integrity, privacy, authentication, identification, access control, attack, vulnerability, etc.) and explanations on vocabulary that is specific to the security of information systems;
- illustration of some cases of damage caused to computers due to piracy, for example unauthorized changes made to Internet sites, etc.);
- general description of the tools which could be used to carry out such piracy (password dictionaries, etc.);
- general description of some known weaknesses (usurpation of administrator rights);
- description of the main security functions used (access control, audit, etc.) and of their implementation (use of the functionalities of the operating system, presentation of the main sets of tools used in the trade such as firewalls, etc.);
- introduction to network security;
- succinct presentation of the ITSEC assessment criteria and of the actors and roles associated with these (SCSSI, CESTI, assessor, manufacturer, etc.);
- succinct presentation of the documents produced in association with the ITSEC assessment criteria (security target,

efficiency and conformity, RTE, etc.), as well as notions of the assessment target, security function, etc.;
- summary of the regulations associated with the security of information systems (legal protection of confidential information, encoding, etc.);
- presentation of the main French methods of assessing the security of information systems: MELISA, MARION, MASSIA.

Note: MELISA, MARION and MASSIA are methods which allow on-site audits to be carried out in order to estimate the degree of vulnerability of an information system. Although these methods are not directly exploitable within the framework of legal metrology, consulting them may prove fruitful since they provide useful information as to the global vulnerabilities and threats that can exist, as well as the countermeasures to be implemented to efficiently combat them.

5.2 Level 1 training

The objective of level 1 training is to be in a position to formulate statutory requirements in terms of program and electronic transmissions security. The aim is to use these requirements as specifications when drawing up security targets for those measuring instruments that must be assessed according to ITSEC criteria. They must be adapted to the applicational context of the measuring instruments, to the risk of fraud which is associated with them as well as to the technologies used. It is advisable to gain an in-depth knowledge of information systems security in order to have a global overview of the subject.

The degree of skill aimed at must be equivalent to that of a computer/electronics engineer with 2–5 years' experience, including significant experience in security.

The aspects to be examined are:

- good knowledge of regulations relating to the security of information systems;
- good knowledge of ITSEC assessment criteria;
- good general knowledge of security solutions: this knowledge must allow the requirements to be dimensioned in accordance with the category of measuring instrument concerned;
- good knowledge of network security;
- practical knowledge of the EBIOS method.

Note: The EBIOS method aims to express needs and identify security objectives. Although this method is not directly exploitable within the framework of legal metrology, it does give rise to a methodological framework which is appreciable when determining security objectives and which proves to be particularly useful when it is necessary to draw up a security target.

5.3 Level 2 training

The objective of level 2 training is to be in a position to understand the documents available when a product has been assessed according to ITSEC criteria and which are accessible to the pattern approval authority. These documents are: the security target, the certificate, the certification report and the product documentation. Actually, the assessment supplies are confidential, as are the assessors' end of task reports, as well as the RTE. The level 2 training complements the level 1 training.

The degree of skill aimed at must be equivalent to that of a computer/electronics engineer with 2–5 years' experience, including significant experience in security.

The aspects to be examined are:

- practical knowledge of the ITSEC assessment criteria and of the ITSEM manual;
- good knowledge of security solutions: this knowledge must be adequate to determine whether a security function is sufficient to ensure that security objectives are achieved;
- notions of encoding.

5.4 Level 3 training

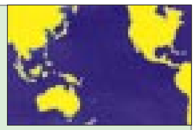
The objective of level 3 training is to be in a position to carry out the equivalent of the profession of assessor. The level 3 training complements the level 2 training.

The degree of skill aimed at must be equivalent to that of a computer/electronics engineer with 5–10 years' experience, specialized in security. As stated before, the necessary skills should be spread out between several individuals.

The skills to be acquired are as follows:

- technological monitoring, in particular on the Internet, to stay informed of technological evolutions and to watch out for potential weaknesses and means of attack;
- in-depth knowledge of the ITSEC assessment criteria and of the ITSEM manual;
- in-depth knowledge of programming and assembler languages;
- in-depth knowledge of operating systems;
- in-depth knowledge of network architecture;
- in-depth knowledge of communication protocols (to know how to interpret data packets circulating on a network);
- in-depth knowledge of technologies such as micro chips, firewalls, encoding, etc.;
- in-depth knowledge of development platforms (workshops for program engineering and for computer-assisted design, etc.);
- in-depth knowledge of test techniques (data flow analysis, static and dynamic tests, analysis of test coverage, etc.);
- practical knowledge of attack tools (oscilloscopes, spectrum analyzers, deciphering machines, protocol analyzers, sniffers, password dictionaries, retro-engineering tools, source code analysis tools, etc.);
- if necessary, training in formal methods (in the event of assessment from level E4 upwards).
- knowledge of on-site audit techniques.

TRAINING



A legal metrology training program in the Asia-Pacific Region

KERRY MARSTON, Regional Training Coordinator, APLMF

Introduction

At its inaugural meeting in Sydney just four years ago the Asia-Pacific Legal Metrology Forum (APLMF) identified training of legal metrology staff as a major consideration. Of particular concern was the need to establish regionally consistent training to provide highly competent staff and harmonized legal metrology within the region; this greatly assists in the establishment of mutual recognition agreements within the regions.

Training policy

As a result the APLMF quickly developed a comprehensive training policy and has an ongoing training program for the region, in which the need for training at four different levels has been identified as outlined below:

Level one: Develop political awareness and commitment from senior administrators to enable the development of appropriate legislative and administrative structures, and financial support;

Level two: Develop the necessary knowledge and skills to put in place operational infrastructures through legislation, regulation and coordinated administration;

Level three: Train technical staff to develop a mutual understanding of OIML Recommendations so that these can be best implemented and train technical staff to enable them to monitor regulations, calibration and testing.

Level four: Raise the awareness of users and consumers.

Addressing training at each of these levels will ensure that an appropriate legislative and administrative structure is in place to provide the technical infrastructure to support the work of technical staff. Training at each level will use suitable and well-researched training techniques in order to achieve the identified outcomes for the target audience.

Training program

An ongoing training program has been developed in line with this policy and to meet the needs identified in a comprehensive needs analysis conducted throughout the Region during 1996. Over the last two years this program has included:

- a workshop/seminar on legislation and administration held in Tsukuba, Japan. Some thirty delegates from thirteen member economies attended and presentations were given by experts from Australia, Norway, Canada, and Japan. As a result of this workshop a resource document on modernization of legislative and administrative structures is being finalized.
- two introductory workshops on high capacity flowmeters and high capacity weighing.
  - The first workshop on flowmeters was held in Tsukuba, Japan and was attended by twenty-four delegates from thirteen member economies, with experts from Australia and Canada jointly presenting the workshop.
  - The second workshop on weighing was jointly organized and presented by the China State Bureau of Quality and Technical Supervision (CSBTS) and the National Standards Commission (NSC), Australia and was based on OIML R 50, R 106 and R 107. Some twenty-four delegates from fifteen member economies attended this workshop held in Shanghai; a site visit is pictured in Figs. 1 and 2.

- a train-the-trainer course on the pattern approval of nonautomatic weighing instruments based on OIML R 76. This course was initially trialed in Tsukuba in 1997 and a full course was held in Shanghai in 1998, jointly developed and presented by CSBTS and NSC. It was attended by some thirty delegates from sixteen member economies (see Figs. 3 and 4). The development of the train-the-trainer module is the result of a two-year cooperative project between China and Australia.

Future plans

Following the successful development of the first train-the-trainer module launched in Shanghai it is planned to develop two further modules over the next two years using the same model.

The first is on the verification of nonautomatic weighing instruments according to OIML R 76 and the second is to be on the pattern approval and verification of drive-way petroleum and LPG dispensers based on OIML R 117 and OIML R 118.

The development of these modules is being funded by the Australian Agency for International Development (AusAID). The first module is close to completion, with the first train the trainer course to be held in Indonesia in August, 1999. It is planned to have the second module available early in 2000.

Competency-based training approach used to develop the training modules

The train-the-trainer modules are designed as competency-based training (CBT), which is an approach designed to ensure that the student acquires the understanding and skills to the appropriate level specified by a recognized set of standards which are commonly called the “competency standards”.

This approach then requires the establishment of these “competency standards”, i.e. the specification of the knowledge and skill, and their application to the standard of performance required in employment. For these training courses the standards are determined by the specification of the knowledge and skills defined in the appropriate OIML Recommendations and Documents.

The only effective way to establish the application of the specified knowledge and skills is by direct, formal consultation with industry itself and with persons currently performing the task in a highly competent way. The direct result of this consultation is documented as the competencies and learning outcomes within the curriculum. This is the framework on which the training courses and modules are based.

Fig. 1 Automatic belt weighing conveyor at a major steel manufacturing plant in Shanghai (1998)

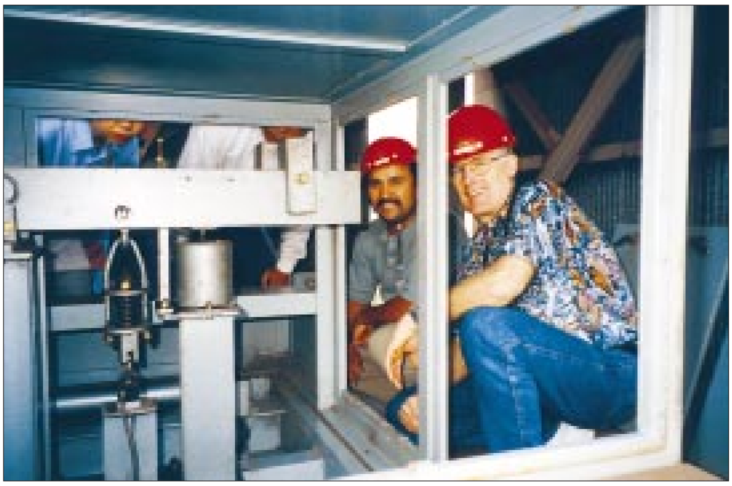


Fig. 2 Participants inspecting the weighing mechanism of the automatic conveyor belt weighing facility shown in Fig. 1

In this way a competency-based training approach focuses any training program on the transfer of skills and understanding from experienced members of staff to less experienced staff. In the same way it can be used to transfer and develop similar skills and understanding throughout the Region, building confidence in the measurement systems between member economies and thus assisting in the development of harmonization and mutual recognition agreements.

Developing the training materials

Once the curriculum framework is established (as detailed above) the development of the training module or materials can begin. These are designed to provide

Fig. 3 Workshop participants (Shanghai, September 1998)

Fig. 4 Participants in the Training Room during the OIML R 76 Train-the-trainer course (Shanghai, September 1998)

the teaching strategies, resources and ideas to ensure that the successful student will be able achieve the learning outcomes that have been set out in the curriculum.

For example, the training module on the implementation of OIML R 76 consists of:

- a trainer's manual that contains the curriculum, trainer's guide which provides step-by-step instructions on how to organize and run a training course, overhead projection slide masters, information and practical exercises to include in a student's workbook and a set of answers to the practical exercises;
- a procedure manual which contains an easy to follow procedure for each test required for pattern approval;
- a training video which visually demonstrates a number of the test procedures and which is now available in seven different languages including English;
- an sample student's workbook to be used as a guide to develop a student's workbook designed specifically for each training course;
- a computer program (as an optional extra) containing the evaluation reports based on OIML R 76-2 used by NSC.

The resources chosen to support the curriculum were carefully selected to be within the technologies readily available and within the budget of the majority of member economies within the Region. Other resources will be added as other technologies become more readily available and prove to be of genuine assistance in the training process. It is planned to develop the other modules in a similar way. A set of APLMF training modules to assist in the implementation of OIML Recommendations throughout the Region will thus be developed.

Flexibility

The completed module on pattern approval has already proved to be very flexible. It was readily and easily adapted earlier this year in Australia (by NSC) to organize and run an industry training course on the requirements for pattern approval of nonautomatic weighing instruments. This involved modifying the student's workbook, changing the depth to which the testing procedures where treated and adding a section on the application requirements to submit an instrument for pattern approval.

Training network

Successful training is a very interactive process involving the sharing of ideas, experiences (good and bad) and resources. The initial presentation of the training module at a workshop to potential trainers is only the first step, albeit a major one; the next most important step is for these new trainers to have enough support to use the module in organizing and running their own training courses within their own economy.

To help provide this support a contact network has been established among the whole group. This can offer advice, encouragement, assistance and most importantly the sharing of ideas, some of which can be used in the longer term to improve the module itself and to inform of the development of future modules.

The APLMF training program is very ambitious in what it has set out to achieve throughout the Region. In the same way to assist in its success, and to provide continuing support throughout the Region, a regional training network is now being established. This will provide the APLMF with a training contact in every member economy, a overview of the training currently taking place, as well as a list of all the training centers and colleges currently offering training in metrology. This information can then be shared throughout the Region.

International network and accreditation

A great deal of effort, time and money is going into developing the APLMF training modules and to ensure they are internationally harmonized with OIML Recommendations. Could they be used successfully in other regions? If so, how do other regional organizations find out about them? Can other regional bodies who want to make use of them be confident that they truly reflect the criteria and test procedures set out in the OIML Recommendations and Documents? Perhaps they reflect regional and/or individual countries' interpretations and peculiarities?

These questions and problems were raised by the APLMF at the recent OIML Development Council Meeting. As a result of the discussion is was proposed that OIML consider international OIML accreditation of legal metrology training courses. This would ensure the quality of the product and an appropriate alignment to OIML criteria and Recommendations.

To do this would require the establishment of criteria setting out clearly what the minimum requirements would be for a training course to be considered for accreditation, the establishment of an assessment committee, one that is committed to the importance of the task so that the turn-around time is short, that appropriate training courses can be quickly accredited and out in the training rooms being used.

The selection of committee members is also very important, so that the courses that are accredited are educationally sound, technically correct and very practical. To ensure an appropriate balance would require expert input from a technical educator with experience in developing training packages and courses in metrology and preferably with experience in developing countries, expert input from a member of the technical committee that is responsible for developing the OIML Recommendation so that the interpretation is correct and expert input from a technical person who is currently implementing the Recommendation in the field.

Accredited training courses would then be put into an OIML register of training programs or modules to ensure members know about and have access to them. The register could be regularly published in the OIML Bulletin.

Effective training is more than a register of accredited courses, it is an interaction of ideas and experiences. In an interactive environment it will grow, develop and improve to meet ever-changing needs and demands. One way of encouraging this interaction is to establish an international training network, with regular reports and articles from members and regional organizations on training programs, on what is being used and/or achieved, what worked, what didn't work, etc. Again the OIML Bulletin could be used as the forum for the exchange of this sort of information, with a regular page for the OIML international training network. ■

To share ideas, discussion or concerns about this idea, contact:

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METROLOGICAL INFRASTRUCTURES

75 Years of Trade Metrology in South Africa

STUART CARSTENS, Deputy Director, Trade Metrology, SABS, South Africa

Introduction

Legal, or Trade Metrology as it is known in South Africa, was established as a Central Government function on 1 May 1923 with the promulgation of the Weights & Measures Act (Act 32 of 1922). May 1998 therefore heralded in 75 years of service to South Africa. The culminating highlights of our celebratory year were a seminar on the latest developments in South African Trade Metrology and a banquet for staff and other dignitaries.

History

1652–1922

The first European settlers arrived in Southern Africa to establish a provisioning station for the Dutch East India Company in 1652. The first reference to any matters metrological was the "Statuten van India 1681", which demanded the verification and reverification of scales every two years.

Owing to the alternating occupation of the Cape Colony by the Netherlands and the British Empire, a mixture of the two systems of measurement, used by the occupiers, was adopted.

As the pioneers migrated, the Dutch system of measures was established wherever settlements were established. In 1850 Dutch measurement systems were in use in Transvaal, Orange Free State and Natal. As scales were difficult to transport during the Great Trek, measures such as the bucket or schepel were used. Distance was measured by "an hour on horseback".

A need for statutory control was sorely needed and after 1850 various laws were passed by the different colonies. It is not known to what extent control was exercised, as there is no record of the employment of trained assizers until 1902, when the municipality of Johannesburg appointed one.

1923–1998

A need for uniform control was advocated by commerce but was not effected until the Union Government passed the Weights & Measures Act in 1922.

The Assize division was established on 1 May 1923 in the Ministry of Mines and Industry, with 27 staff members. There were offices in Cape Town, Johannesburg, Port Elizabeth, Bloemfontein and Pretoria. The equipment used by the major Municipalities was transferred to the National Department.

Owing to the vast areas that need to be covered in South Africa, verification itineraries initially took up to 6 weeks. The first itineraries were done by train with an Assize station being held in the town hall or a garage or at the local police station.

With the advent of more mechanical instruments and later of electronic instruments, Assize stations were discontinued and instruments were verified in situ.

The Assize Division grew through the years to fifteen regional offices and changed its name to Weights & Measures and eventually to the Trade Metrology Department.

In 1991 the Trade Metrology function was transferred to the South African Bureau of Standards (SABS) but remained as a Central Government function supported by the Department of Trade and Industry and ultimately reporting to the Minister of Trade and Industry. The move came with a drastic reduction in staff, since the modus operandi was to change to make way for privatization of the verification function.

As already mentioned, the verification and reverification function has been privatized by means of an accreditation scheme utilizing Code of Practice SABS 0259, which is based on ISO Guide 25. There are presently ± 110 accredited verification laboratories in the mass and volume fields.

The Trade Metrology Department is once again in the process of re-evaluating its function, responsibilities, staffing, funding and commitment by Government.

There is a position plan presently at the Department of Trade and Industry for submission to the Minister; this plan sketches various scenarios to elevate the service and control to levels found in developed countries and takes account of the South African Constitution which gives greater powers to Provincial Governments.

South African legislation

Trade Metrology legislation in South Africa developed along British lines through the colonial era and has generally kept pace with international trends. Although regulatory requirements were amended to cater for electronic instruments, this area of legislation has not kept pace with the latest technology over the last ten years and we are in the process of replacing it with OIML Recommendations. Currently legislation only covers trade use instruments and it is our intention to expand into the full spectrum of legal metrology in due course. Regulations dealing with the labeling and sale of goods are also presently under review as part of a Southern African Development Community initiative to remove technical barriers to trade. It has, however, proved difficult to find a model which is completely acceptable internationally.

Functions

The Trade Metrology Department controls the full ambit of trade metrology, from type approval of instruments to packaging and sale of goods.

Type approval of instruments used in trade

The type approval of instruments used in trade is regarded as an integral part of the Trade Metrology function and great emphasis is placed on accomplishing this task to the best of our ability. We have the capability of conducting most tests prescribed in OIML Recommendations; our most noticeable deficiency is a test facility for conducting tests on load cells according to OIML Recommendation R 60. We have of late changed our modus operandi in that we will accept OIML approval certificates for instruments where our legal requirements are in line with OIML Recommendations. For instruments where our national regulations are not yet in line with OIML Recommendations, we will only conduct outstanding tests after evaluation of the OIML test results submitted.

Local, regional and international liaisons

The Department is involved in meetings with local industry regarding creation of specifications, amendments to the Act, etc. On the regional level we are actively involved in SADCMEL (Southern African Development Community Cooperation in Legal Metrology). Mr. Brian Beard (Director of Trade Metrology) is presently the Chairman of SADCMEL. We are also members of IOLMF (Indian Ocean Legal Metrology Forum).

On the international front we are members of OIML. We are also busy building up contacts with the Legal Metrology Community wherever we are afforded the chance.

Inspection of goods (reactive)

At present inspections of prepacked goods are primarily carried out on a reactive basis. There are moves afoot to revert to proactive inspections, because control in the market place has been eroded by lack of inspection.

The Department is also presently in the final stages of having specifications published for “Measuring Container Bottles” (SABS 1840) and “Control of the quantity of contents in prepacked packages within the legal prescriptions of the Trade Metrology Act and Regulations” (SABS 1841). Both of these documents are based on the OIML and European models.

Inspection of measuring instruments used in trade (reactive)

The inspection of instruments used in trade is also carried out on a reactive basis, which has led to a situation where reverification of instruments is not being done as required. Of necessity we are becoming more proactive in this area.

Creation and maintenance of legislation

It is the role of the Department to ensure that National Legislation at all times meets the national requirements, but that is also in line with international norms and aligned to regional interests. To ensure this we are presently involved in the harmonization of legislation within the SADC region. We also intend to adopt OIML Recommendations where these are available.

Training

Trade metrologists in South Africa are required to have a National Diploma in Electrical Engineering (light current). Before being appointed under the Act, training on the Act and Regulations is given in-house for a period of one year. Refresher courses are given when required. We are currently assisting with the establishment of a Southern African Resource center for Metrology Education and it is envisaged that in future our courses will be offered through this institution.

Accreditation of verification laboratories

The verification of instruments used in trade is undertaken in large by verification laboratories which are accredited by the Department. Laboratories are accredited against the SABS 0259 Code of Practice, which is based on ISO Guide 25, and audits are done twice per annum. The accreditation covers both initial and re-verification.

Verification of measuring instruments used in trade

The Department has the capability of verifying all instruments falling under the Act and it is responsible for verifying instruments where this service is not supplied by accredited laboratories. These are mostly instruments for which it is not financially viable to become accredited or provide a service.

75th Year celebrations: 1 May 1998 – 31 April 1999

One of the major events in our 75th year of service was the accession of South Africa to the OIML in August 1998.

To culminate our celebratory year a seminar, as well as a banquet, was arranged.

On 2 February 1999 a one-day seminar was held which was attended by 150 delegates representative of the Government, Industry and the international fraternity. The international guests who attended were Mr. G. Faber (CIML President), Mr. B. Athané (BIML Director), Prof. Dr. M. Kochsiek (CIML Vice-President and PTB Vice-President) and Mr. J. Birch (Executive Director of NSC Australia and APLMF Convenor). Papers covering the following topics were presented by members of Industry, the Trade Metrology Department and Mr. Birch:

- 75 Years of Trade Metrology;
- Importance of Legal Metrology for the economy of the country and foreseen developments into the 21st century;
- Accreditation of verification laboratories - A weighing industry perspective;
- SADCMEL/OIML - Harmonization on marking requirements of prepacked goods;
- SADCMEL/OIML - Harmonization on requirements for measuring instruments;
- Prescribed packaging patterns for prepacked goods - Deregulation or not;
- Specification SABS 1841 - Control of the quantity of contents in prepacked packages within the legal

Left to right: J. van den Heever, F. Hengstberger, A. Stoltz, B. Beard, E. Tarnow, S. Carstens, B. May, J. Birch, L. Heekes, T. Mothapo and Z. Fourie

prescriptions of the Trade Metrology Act and Regulations - An industry perspective;
- Specification SABS 1840 - Manufacture of measuring container bottles;
- National Measurement Standards - An overview;
- Type Approval - Procedure for approval and acceptance of OIML documentation;
- SADC Resource Center of Metrology Education (SRCME) - An overview;
- Proposed future of Trade Metrology in South Africa.

A plaque was unveiled at the Trade Metrology Department's Offices by Dr. Henri Van Rensburg, General Manager of Standards at the SABS, on 3 February 1999. The banquet was held on the same evening and the Guest Speaker was Mr. Faber. Excerpts from his speech are printed on pages 32–33.

Mr. Beard presented Messrs. Faber, Kochsiek and Birch with a commemorative gift and Prof. Kochsiek in turn handed over a gift from the PTB, which is now displayed in the entrance hall of the Trade Metrology Building.

Conclusion

Over the last 75 years Trade Metrology in South Africa has provided an adequate service to meet the demands of consumers and industry alike. The stage has now been reached where the function must be reassessed to enable us to meet international, regional and local needs for the new millennium. We appreciate the support received from the international legal metrology fraternity over the past few years and look forward to continued interaction in the future. Having become a full OIML Member State we intend giving the Organization our full support.

L to R: Messrs. B. Athané, J. Birch, S. Carstens, B. Beard, G. Faber and Prof. Dr. M. Kochsiek (International Guests with Director and Deputy Director)

L to R: Dr. Henri van Rensburg (General Manager Standards SBU) and Mr. Brian Beard (at the unveiling of the plaque)

L to R: Mr. G. Faber, Prof. Dr. M. Kochsiek and Mr. B. Beard

Excerpts from the speech given at the banquet by Mr. G. Faber, CIML President

Ladies and Gentlemen,

It is a great pleasure for me to visit South Africa, it is my first time and it will certainly not be my last trip to this wonderful country.

As you know, I am from the Netherlands, so my mother tongue is Dutch. However experts told me that English is spoken by almost everybody in this country, so I speak to you in English which, by the way, is not the official language of the OIML - that is French - but more and more the working language.

There are at least two reasons to congratulate you tonight, Ladies and Gentlemen. The first reason is of course the seventy-fifth anniversary of Trade Metrology in your country, I will come back to that later. And the second reason is that now, since a couple of months, South Africa has entered the OIML as a full Member. This was really a big step, not only for you, but also for all other members of the legal metrology family.

Mr. Faber went on to introduce the OIML before speaking about the role of legal metrology in today's society.

So what is the importance of legal metrology in today's society?

One can say that legal metrology remains the most efficient tool to protect individuals and society as a whole whenever incorrect measurement results may affect their economic or social status or when conflicting interests are associated with measurement results.

Owing to the importance of metrology in the social and economic development of our societies, governments have a responsibility in ensuring that the basis for correct and credible measurements exists in all countries. This governmental interest mainly covers matters such as the establishment and maintenance of national primary measurement standards, the traceability schemes which enable the dissemination of measurements units, information and education, research, etc., and of course legal metrology.

Legal metrology mainly applies in fields connected with trade, health, safety, the environment and official controls.

However, in most countries, these various fields of application of legal metrology are not the responsibility of a single public service. In fact, several ministries are concerned with these matters and there is therefore a need for coordination at national level in order to ensure that every public body responsible for controlling part of the global legal metrology field carries out its tasks in line with sound metrological guidelines.

Here appears the concept of a national metrology system which has been the subject of thorough discussions during a Seminar last year held in Braunschweig, Germany.

It is on similar concepts that the OIML is redefining its strategy and long-term policy.

The globalization of exchanges and the multiple interactions between the various elements of our society lead us in the direction of a deeper integration of the activities carried out at international level.

In fact, in the same way that metrology systems must exist at national level, there is a need for a kind of global, worldwide measurement system to which all measurements will be related.

It is on the basis of these general ideas that the OIML is developing its new strategy. I have entrusted Knut Birkeland, my predecessor as CIML President, with a study of what the OIML strategy should be. This study was presented to the Committee in 1998 and it is expected that the Committee will take decisions about its implementation during the next Committee meeting, this year in Tunis.

May I now offer you some views concerning the possible future trends of legal metrology both at national, regional and international levels.

By definition legal metrology is a governmental matter. However, this does not mean that governments must directly enforce all national legal metrology tasks.

It may be quite acceptable in many countries that a large part of these tasks, especially those connected with the testing and verification of measuring instruments, be allocated to non-public bodies, including private laboratories and even the manufacturers themselves. This, in my opinion, is a trend which will become more and more effective in most countries and which will contribute to giving legal metrology controls the maximum of efficiency and flexibility.

Of course, the development of regulations and final decisions must remain under the public authorities' control.

Now, concerning the scope of legal metrology and its developments, I would like to advise responsible bodies to be cautious.

We are now living in a period of deregulation, which means that any unnecessary regulation should be eliminated. What about legal metrology regulations? Owing to the importance of metrology and legal metrology in the economic and social development of any countries, such regulations should not disappear. However, legal metrology authorities should not try to over-regulate. There are many metrological activities which may be carried out, many measuring instruments which may be used without regulations. Therefore, such regulations must strictly be limited to the fields where they are necessary. It is with this in mind that the OIML work program is reviewed at regular intervals in order to eliminate any unnecessary work.

Regionalization is also a characteristic of the present day in many human activities, including legal metrology.

There are many actions which are far easier to carry out at regional rather than at international level: intercomparisons, cooperative training, technical assistance, and of course establishment of common regional resources.

A decisive trend for the next ten years will therefore be the development of regional cooperation in legal metrology, the OIML having the essential responsibility of ensuring the necessary coordination among the various regions.

If I now consider the international level, I believe that the most important challenge we are facing will be the establishment of a real climate of confidence among countries concerning measurement results in general and, as a first step, confidence in test results.

Several strategies may be adopted: accreditation of testing laboratories, peer assessment, intercomparisons, transparency concerning laboratory capabilities, etc.

The OIML has an important responsibility in this field and has already started working on certain of these aspects.

However, the globalization of our economy is such that one organization alone cannot be successful. The OIML must closely work in coordination with a number of other international bodies, the Meter Convention in all fields of metrology, also ILAC and IAF for matters connected with accreditation, worldwide standardization bodies such as ISO and IEC, trade and economic organizations - in particular the WTO with which the OIML has now observer status - and many other organizations.

Now, finally let me come back to the anniversary of trade metrology in South Africa. I would like to make two comments to that.

Firstly, the fact that SABS is organizing such an important seminar and also this magnificent banquet is a recognition of the importance of metrology, and especially legal metrology, in our modern societies. Metrology is a basic tool for improving the quality of life, products and services. Personally, I always have been very happy and proud to work for metrology and I am sure the same goes for you.

And secondly the term “trade metrology” draws my attention. On one hand this term is very limited, because, as I explained, metrology has also responsibilities in fields such as health, safety and the environment. On the other hand, trade metrology comprises more than only legal metrology and that is right because the ultimate goal of metrology in trade is to obtain nationwide and international credibility in measurement results. Well, to reach that goal, one needs a lot of things: good measurement standards, good measuring instruments and good measuring procedures. And that is, by the way, exactly the reason why I am very much in favor of a good cooperation between the OIML, BIPM and ILAC.

Ladies and Gentlemen, that is what I wanted to say to you tonight. Let me again say that I am very happy that South Africa is now a Member of our world metrology family, so that we can profit from 75 years of metrological experience.

Thank you for your attention. ■

meetings OIML réunions

OIML TC 13 Instruments de mesure pour l'acoustique et les vibrations

Francfort, 5 mars 1999

Secrétariat: Vacant *(voir texte)*

Président: Dr. K. Brinkmann

Participation: 19 personnes représentant 12 État Membres de l'OIML (Allemagne, Autriche, Canada, R.P. de Chine, Danemark, États Unis, France, Japon, Pologne, Royaume Uni, Suisse et la République Tchèque); deux institutions internationales (CEI et ISO); le BIML

Lieu: Locaux du VDE/DKE, Comité de Normalisation Allemand (membre de la CEI)

Points principaux

Un certain nombre de questions techniques ont été examinées et résolues par les participants:

- L'annexe C (format du rapport d'essai) à la Recommandation OIML R 122 *Appareils pour l'audiométrie vocale*, approuvée par correspondance par les Membres du CIML, sera prochainement envoyée au BIML pour publication après mise au point définitive par le Dr. K. Brinkmann, actuel Président du TC 13.
- Le projet sur les filtres d'octave et tiers d'octave a été approuvé par les membres-P du TC 13 et l'Allemagne a été chargée de mettre au point le texte avant de l'envoyer au BIML pour soumission par correspondance aux Membres du CIML.
- La révision des Recommandations 102 *Calibreurs acoustiques* et 103 *Appareillage de mesure pour la réponse des individus aux vibrations* est retardée dans l'attente des progrès des travaux correspondants au sein de la CEI et de l'ISO.

Par ailleurs, des questions administratives ou de politique générale ont été portées à l'attention des participants:

- Pour des raisons de réorganisation interne, la PTB n'est plus en mesure d'assurer le secrétariat et la présidence du TC 13; le BIML a été chargé de rechercher un pays volontaire. Cependant, il a été constaté que les groupes de travail pourraient continuer leur activité même en l'absence d'un secrétariat du TC 13 et l'Allemagne a indiqué qu'elle mènerait à bien les travaux en cours sous sa responsabilité directe.
- La coopération entre OIML TC 13 et CEI TC 29 est excellente mais pourrait être améliorée par la création de groupes de travail mixtes et le développement de publications conjointes. Le Président de OIML TC 13 a été chargé de présenter une proposition dans ce sens à CEI TC 29 qui se réunissait au même endroit quelques jours plus tard. La proposition ayant été bien reçue, le BIML a contacté officiellement le Bureau Central de la CEI qui a exprimé son accord. Les modalités pratiques de cette coopération restent à être définies et pourraient s'appliquer à la révision simultanée des Normes CEI et Recommandations OIML (R 58 et R 88) sur les sonomètres. Une approche similaire pourrait être proposée à l'ISO afin d'améliorer la coopération entre OIML TC 13 et ISO TC 108 dans le domaine des vibrations. ■

OIML TC 13 Measuring instruments for acoustics and vibration

Frankfurt, 5 March 1999

Secretariat: Vacant *(see text)*

Chairman: Dr. K. Brinkmann

Participation: 19 delegates representing 12 OIML Member States (Austria, Canada, P.R. China, Czech Republic, Denmark, France, Germany, Japan, Poland, Switzerland, United Kingdom and the United States); two international institutions (IEC and ISO); BIML

Venue: VDE/DKE, the German Standardization Committee (member of IEC)

Main points

A number of technical questions were addressed and resolved by the participants:

- Annex C (test report format) to Recommendation OIML R 122 *Equipment for speech audiometry*, which was approved by postal vote by CIML Members, will shortly be sent off for publication by the BIML after finalization by Dr. K. Brinkmann, the current TC 13 Chairman.
- The draft on octave band filters and one-third octave band filters has been approved by the P-members of TC 13 and Germany has been charged with finalizing the text before it is sent to the BIML and submitted by post to CIML Members.
- The revision of Recommendations 102 *Sound calibrators* and R 103 *Measuring instrumentation for human response to vibration* has been delayed until more progress has been made in the corresponding IEC and ISO work.

Additional questions of an administrative or general policy nature were brought to the attention of participants:

- For internal reorganization reasons, the PTB is no longer in a position to hold the secretariat and chair of TC 13; le BIML has been asked to find a volunteer country. It was however noted that the TC 13 working groups may pursue their work during the hand-over period and Germany has indicated that it is willing to see ongoing work through to the end under its continued direct responsibility.
- Cooperation between OIML TC 13 and IEC TC 29 is excellent but could be improved by creating mixed working groups and by developing joint publications. The Chairman of OIML TC 13 was charged with making a proposal on this subject to IEC TC 29, which was due to meet at the same venue a few days later. This proposal was positively received and so the BIML officially contacted the IEC Head Office, which duly expressed its agreement. The practicalities of this cooperation remain to be defined, and could apply to the simultaneous revision of IEC Standards and OIML Recommendations (R 58 and R 88) on sound meters. A similar approach could be suggested to ISO in order to improve cooperation between OIML TC 13 and ISO TC 108 in the field of vibrations. ■

liaison activities
OIML
activités de liaison

Ninth UN/ECE Working Party Session

18–20 May 1999, Geneva

The Ninth Session of the UN/ECE Working Party on *Technical Harmonization and Standardization Policies*, which was organized together with a Workshop on *The implementation and use of international standards* at the Palais des Nations, Geneva, was attended by over seventy representatives from thirty-five countries, including delegates from CEN, CENELEC, EFTA, EOTC, EU, IEC, ISO, UNCTAD, WTO and the BIML.

Among other points on the agenda, the following topics were discussed:

- coordination of standardization activities - ECE Standardization List;
- progress report on standardization reforms in transition economies;
- review of developments in standardization activities, regulatory cooperation and conformity assessment at international, regional and national levels and problems experienced by economies in transition towards a market economy;
- a draft guide on standardization of measurement procedures which will be sent to interested international (ISO, IEC, OIML) and regional (CEN, CENELEC, COOMET, EA, EUROMET) organizations for comments; and
- a draft international agreement among UN/ECE Member States on technical and harmonization issues.

During the Workshop organized in conjunction with the Session, thirteen presentations were given by representatives of international and regional standardization organizations, regional and national regulatory bodies and from industry, giving an insight into the situation and problems of national implementation of international standards in the field of electrical safety, measuring instruments and medical devices.

The presentation given by the BIML representative included a review of the situation and degree of implementation of OIML Recommendations in Member States and within the framework of the OIML Certificate System.

As a conclusion to the Workshop, the Working Party suggested that the international standardization organizations should be encouraged to report via regular surveys (as is already the case for the OIML) or other mechanisms regarding national implementation of standards, and also report on the impact of those standards on international trade.

Such organizations should continue to accelerate their efforts aimed at decreasing the lead-time required to draw up standards. ■

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COOMET	Introduction Objectives 9th Committee Meeting President's report	*Presented by Mr. V. Belotserkovsky* *COOMET President* Gosstandart of Russia Leninsky Prospect, 9, 117049 Moscow Russian Federation Tel.: +7-095-236 82 18 - Fax: +7-095-236 62 31 E-mail: coomet@gost.ru

Introduction to COOMET

Established in Warsaw in June 1991, COOMET (from *Coopération Métrologique*) is an organization made up of the national metrological institutions of a number of Central and Eastern European States, including CIS countries (presently Bulgaria, Belarus, Germany, Kazakhstan, Cuba, Lithuania, Moldavia, Poland, Romania, Russia, Slovakia and Ukraine). It is open to the national metrological institutions of countries of other regions, which may join as Associate Members.

The basis for COOMET was its Members' declared intention to cooperate in the fields of measurement standards, legal metrology and calibration services. COOMET offers a forum for discussing cooperative projects in these fields.

Two main metrological tasks at international level are:

- to establish a world-wide system of measurement standards based on the SI, sufficiently complete and generally recognized; and
- to assure traceability to this system of all measuring instruments used everywhere to determine various physical quantities to a known degree of accuracy.

International metrology organizations such as the Metre Convention and the OIML contribute directly to accomplishing these tasks and stimulate and coordinate the activities of the national metrology institutes and of calibration and verification laboratories throughout the world. The scope of this task is immense.

Regional metrology organizations such as COOMET bring together the national metrology institutions of states located in a particular region and which cooperate in their economic activities. Over a relatively short period of existence these regional organizations have proved to be useful partners of international and national bodies in ensuring the uniformity of measurements. Many problems defined by international organizations can be solved more easily within smaller groups of states acting in harmony after an internationally agreed distribution of tasks.

COOMET's objectives

- to contribute to effective problem solving concerning the uniformity of measurements and the required accuracy of same;
- to encourage closer cooperation between national economies and the elimination of technical barriers to international trade; and
- to establish closer interaction between the activities of the metrology services of Central and Eastern European States and the activities of corresponding services in Western Europe and in particular to cooperate with EUROMET, EA and WELMEC in as far as both sides are interested in such cooperation.

The principles of collaboration within COOMET are similar to those developed in Western European organizations. The Memorandum of Understanding expresses in principle the same ideas as EUROMET's Memorandum, and the Rules of Procedure are practically a replica of the Western original. It has been assumed that the analogy of principles and forms may facilitate possible common actions, bring the partners from the two European regions closer together and contribute to the desired integration. The formal difference is that COOMET's field of activity also includes some areas handled in Western Europe by WELMEC and EA.

The COOMET Committee consists of the Directors of the national metrological institutions (members of COOMET); it is responsible for organizing and supporting mutual cooperation. The Committee meets at least annually and its President is elected for a three-year period with the possibility of only one additional consecutive term of office. The Secretariat is provided by the Institution of the President.

In their respective countries, Committee Members appoint Contact Persons for the specified subject fields. In each subject field the Contact Persons propose candidates for Rapporteur, which the Committee then appoints.

A collaborative project may be placed in one of the following subject fields:

- Mass;
- Force and pressure;
- Electricity;
- Length and angle;
- Time and frequency;
- Thermometry and calorimetry;
- Ionizing radiation and radioactivity;
- Photometry and radiometry;
- Flow measurements;
- Acoustics and vibration;
- Physical chemistry; and
- Reference materials.

General metrology, Legal metrology and Calibration procedures are included in a unique subject field.

Most of COOMET's projects concern comparisons of measurement standards, the establishing of new standards and an improvement of the mechanisms for the dissemination of the units realized by the standards to the field instruments.

COOMET is prepared to conduct some key comparisons indicated in the BIPM program and is a member of the Joint Committee of the Regional Metrology Organizations and the BIPM. COOMET maintains liaisons with OIML, as outlined in the Agreement signed with the BIML in 1993, and since 1992 has enjoyed the status of an Observer in WELMEC, which EUROMET considers as its "sister organization".

Recently, some COOMET members also became associated members of EUROMET, WELMEC or EA. Such multiple cooperative ties will contribute to mutual understanding and to confidence in the opinions formulated by the partners.

COOMET Committee meetings are conducted in English and Russian; the same applies to documents received and sent out by the Secretariat. COOMET has no financial means of its own. ■

Program (agenda) of the 9th COOMET Committee Meeting

1 Opening of the meeting, approval of the agenda
2 Approval of the Protocol of the 8th COOMET Committee Meeting
3 Information on COOMET Member Organizations (new members, changes in Committee membership)
4 COOMET activity in the period between meetings and its work on increasing the efficiency of cooperation
5 Information on COOMET Member Organizations (current problems encountered in the metrological activity in their countries)
6 Results of the analysis on *The COOMET 1999 Work Program* (objective of the work, meetings, information measures, etc.)
7 Reports of COOMET Rapporteurs on work accomplished (taking into account the results of the analysis on COOMET carried out by its Secretariat)
8 Reports of the representatives of the international and regional organizations (CIPM, OIML, EUROMET, WELMEC, MGS, APLMF, etc.)
9 Information on COOMET's relations with other international and regional organizations (COOMET Committee President's report, Committee Members' and Rapporteurs' reports)
10 Draft of UN/ECE *Procedures of Measurements* Guide
11 International and national metrological developments in 1999 of interest to COOMET
12 Participation of COOMET Member Organizations in key comparisons
13 Coordination of the principles of the quotation of COOMET Members' fees for maintaining the International Secretariat
14 Information about work on the preparation of the COOMET Booklet
15 Date and place of the next Committee Meeting
16 Visits to VNIIMS, VNIIOFI and VNIIFTRI laboratories

9th COOMET Committee Meeting 12–13 May 1999, Moscow

COOMET *(Cooperation in Metrology of the Countries of Central and Eastern Europe and of the Community of Independent States (CIS))* held its Ninth Committee Meeting on 12–13th May, 1999 in Moscow under the presidency of Dr. Belotserkovsky, Russia.

The meeting was opened by Prof. G. Voronin, Gosstandart of Russia President. Almost 40 people attended, representing Belarus, Bulgaria, Germany, Kazakhstan, Lithuania, Moldova, Poland, Russia, Slovakia and Ukraine.

A new member of the COOMET Committee was introduced to participants: Dr. A. Orynbasarov, representing the Gosstandart of the Republic of Kazakhstan (which was admitted to COOMET at the end of 1998).

Then COOMET President Dr. V. Belotserkovsky made his report (see below), presenting the main immediate tasks of this regional metrological organization (RMO). The Committee Members approved these targets and exchanged information on current metrological activities in their countries.

COOMET Secretary Dr. B. Gorshkov (Gosstandart of Russia) presented the results of the analysis on the subject of COOMET and the 1999 Work Program activities. He also described the Plan of Arrangements directed at increasing the efficiency of COOMET's activity. In its work the COOMET Secretariat will be using the PCBIRS database management system, developed by Dr. V. Bugaev (Gosstandart of Russia) and which was demonstrated to participants, who found it of great interest.

Following the accounts of COOMET Rapporteurs, several reports were given on behalf of international and regional organizations in liaison.

On behalf of the OIML, Prof. M. Kochsiek (PTB) set out the main objectives of regional and national metrological organizations and gave information on the latest outcomes of cooperation in the framework of EUROMET.

Prof. L. Issaev (Gosstandart of Russia) as CIPM Member reported on BIPM/RMO collaboration and Dr. N. Zhagora (Gosstandart of the Republic of Belarus) spoke about the results of metrological cooperation between CIS countries.

Dr. B. Zemskov (Gosstandart of Russia) gave details on the activities of the Working Party on Technical Harmonization and Standardization Policies (UN/ECE Trade Division) and about the Draft of the *Procedures of Measurements* Guide.

COOMET Committee Members agreed that in 1999 the questions of the quotation of fees for maintaining the COOMET Secretariat should be settled. They appreciated the PTB's initiative to publish the COOMET Booklet in September, 1999.

The Committee approved the suggestion of representatives of the Gosstandart of Russia to organize various concrete actions in COOMET countries in honor of the 125th anniversary of the Metre Convention and to ask the BIPM and the OIML to consider the possibility of establishing an *International Metrological Day* on 20th May.

Participants had the opportunity to visit VNIIOFI, VNIIMS and VNIIFTRI laboratories and to familiarize themselves with these laboratories' research activities.

It was decided to hold the 10th COOMET Committee Meeting in May 2000 in Kazakhstan on the invitation of the Gosstandart of the Republic Kazakhstan. ■

COOMET activity in the period between meetings and tasks relating to the increase in the effectiveness of cooperation

(Report by the COOMET President)

Dear Colleagues,

Allow me to begin by informing you about the work that we have accomplished together with the Secretariat since I was elected as President of the COOMET Committee exactly one year ago.

First of all, we have received the archives of the COOMET basic documents and foregoing correspondence from the Secretariat in Bratislava. After accepting these documents, practical work has begun on drawing up a status report for each ongoing project and updating the Work Program. As of July 1, 1998 the Secretariat has registered 168 ongoing projects. It was necessary to understand:

- in which projects cooperation is continuing and therefore whether it is justified to retain them in the Work Program;

- which projects are on the list in our catalogue but for which no work is being carried out, for whatever reason;
- which projects are finished and how their results are being implemented;
- simultaneously we had to attend to some routine questions (acquisition of missing cards relating to projects, more precise definition of project numbers, etc.). Now this work is practically completed and the Secretariat will report on its results.

At the same time as drawing up status reports, work has been carried out to form a database according to COOMET's fields of interest using the PCBIRS analytical information retrieval system developed at VNIIFTRI. This software allows simultaneous operation with large data arrays both with structured and full-text databases, information analysis and data retrieval for inclusion in the decision-making processes; this system will be shown to you today.

In 1998 the Secretariat carried out a project entitled *The analysis of the results of international cooperation in the field of metrology and development of measures aimed at increasing its effectiveness*. Committee Members have made proposals as far as the increase in the effectiveness of COOMET activity is concerned and it is planned to complete and approve these proposals, taking into account their comments.

During this period a new COOMET Member was accepted: the Gosstandart of the Republic of Kazakhstan, which attaches great importance to international cooperation, being a member of the Interstate Council on standardization, metrology and certification of the CIS countries and of the OIML.

As you already know, the Minutes of the 8th COOMET Committee meeting were prepared with the active assistance of our Belarussian colleagues.

The Secretariat was created and the meeting schedule of the COOMET authorities and working bodies, as well as the information index of measures to be taken at international and national levels in the metrology field, were compiled and submitted to Committee Members.

During the period under review COOMET's relations with international and regional metrological bodies have become closer. Our representatives took part in some important meetings organized by the BIPM and the OIML (such as the second meeting of the Joint Committee of Regional Metrological Organizations and the BIPM). The Secretariat and the Rapporteur in the field of General and Legal Metrology Dr. Apel has acquainted the bodies concerned with a number of draft documents and it is planned to consider some of them at this meeting.

Information received regularly from EUROMET made it possible for the COOMET metrological centers concerned to join forces with the managers of some Western European projects.

Before considering the main tasks facing us in connection with the increase in effectiveness of COOMET cooperation, it is appropriate to go into detail concerning certain prerequisites we have, namely:

1 Close economic relations between countries which are geographically close to each other to predefine the necessity for metrological assurance, and improve mutual commodity exchange and scientific-technical cooperation. This is typical for any regional organization.

2 Lately the international metrological organizations - the BIPM and the OIML - have undertaken effective measures aimed at increasing the role of regional metrological organizations, drawn their attention to a number of important tasks and actively facilitated their accomplishment. For example, the Mutual Recognition Agreement developed under the aegis of the BIPM states that a national metrological institute wishing to take part in work within this Agreement should be a member of some regional metrological organization. Of course, it is insufficient to take part in a regional metrological organization formally since information about the best measurement capabilities of each participating agreement is introduced into the BIPM database and is made available to the whole world. Each country should become a participant of the above Agreement if it does not want to be left outside the international metrological community.

3 For most countries' legal metrology services that cooperate within COOMET, transition to a market economy is a characteristic process. This calls for infrastructural harmonization of these services and implementation of new documents of the international metrological organizations. For this purpose as well as for different measurement standard comparisons, considerable funds are needed, but the budget allotted for these purposes is generally insufficient. Cooperation within regional organizations allows such objectives to be achieved at a lower cost to each partner.

4 Most COOMET partners take an active part in the other regional metrological organizations: Germany, Poland and Slovakia are involved in EUROMET and in other Western European metrological organizations; Belarus, Kazakhstan, Moldova, Russia and the Ukraine are involved in the Interstate Council on standardization, metrology and certification of the CIS countries. Besides, Russia is a member of the Asia-Pacific Legal Metrology Forum. This brings together partners from different regions, permits the positive experience of other regional metrological organizations to be put to good use and favors an effective increase in cooperation.

5 COOMET integrates 12 countries having different levels of economic development and varying metrological potential. As a result, besides having common objectives each COOMET member has its own objectives and seeks to draw advantage from multilateral cooperation. Some of them pursue market expansion of their metrological services as an objective, others want to achieve quick recognition of their national measurement system and standards by the world community and others try to market their countries' production to foreign markets and so forth. In the third case (according to the information on our State Register of approved measuring instrument types) some partners of Russia have achieved a certain success. For instance, over many years Germany has become the main supplier of measuring instruments; this is hardly surprising, but the

fact that Belarus took the third place among countries exporting measuring equipment is worth noting. It is doubtful whether this would have been possible without the active cooperation of Belarussian metrologists with COOMET and the CIS Interstate Council.

Now I would like to try to formulate the main immediate tasks of our cooperation:

1 In the current year it is important to continue updating the COOMET Work Program. The efforts of Correspondents, Rapporteurs, Committee Members, the Secretariat and the President should concentrate on including projects that are feasible and practically significant for COOMET's partners. At the last Committee meeting in Minsk some people expressed their concern that there was no cooperation in such important fields as flow measurement, acoustics and vibration, ionizing radiation and radioactivity, general metrology, legal metrology and calibration services. Now the first encouraging signs have appeared in these fields (a number of interesting new projects were announced or are now being registered). It is necessary to support development of cooperation in these fields.

2 Within the next few years great attention should be paid to solving problems raised by the BIPM and the OIML concerning regional metrological organizations (which I shall not enumerate since at this meeting a number of relevant presentations will be made). The acquaintance with last draft documents prepared by these organizations confirms that the range of these problems is extremely wide, and solving them will require great efforts by all our partners over several years. The successful solution will be accomplished by realizing projects connected with an analysis of the state of measurement standard bases belonging to the COOMET members within different measurement fields such as 170/UA/98 (electricity), 174/RU/98 (photometry and radiometry), 174/RU/99 (time and frequency) and 75/RU/99 (ionizing radiation and radioactivity). The idea of such projects emanates from our Ukrainian colleague Prof. Ju. Pavlenko.

3 A very important key point is intensifying COOMET cooperation with other regional metrological organizations and using their experience. The experience of Western European countries as far as the approach to developing cooperation is concerned is especially useful for us; first of all, I refer to EUROMET experience. Unfortunately, for the time being our proposal about realizing joint projects was not yet supported by the EUROMET President though, for instance, it is logical to consider the EUROMET project now in force (the initiators of which are Finland, a EUROMET member, Poland, a COOMET and EUROMET member and Russia, a COOMET member) as a joint project. But this is not a question of principle. Mainly, it is important that COOMET Members taking part in the projects of other regional metrological organizations should inform our organization about results achieved.

For the time being COOMET develops very few documents on metrology. One of the reasons for this is that too much attention is paid to the determination of the document category. It is not taken into account that most international documents are of an informative nature and their categories are not of great importance. The volume of the documents developed can essentially be increased if documents of the other regional metrological organizations, including the CIS Interstate Council, are used. For instance, CIS-GOST Standard 8.563.2-97 *Measurement of liquids and gases flow rate and quantity by differential pressure method. Measurement procedure by orifice instruments* may be of interest to a COOMET country that obtains gas, oil and oil-based products from CIS countries.

4 An effective increase in our cooperation is impossible without improving the information provision based on the use of modern computer technology and new software products. Information exchange should be carried out mainly by using e-mail. It should be taken into account that the information exchange should be expanded not only within COOMET but also with international and regional organizations as well as with the metrological services of those countries that are interested in cooperating with COOMET. It is also necessary to speed up the publishing of the COOMET Booklet and launch our Internet site.

5 It seems that it is appropriate to take a number of organizational measures aimed at increasing the effectiveness of COOMET's activity. The Secretariat has prepared the appropriate proposals which, after being finalized according to comments received by and approved by the Committee, will begin to be implemented.

In concluding, I have tried to formulate only the basic tasks of COOMET for the short-term future. It is obvious that in the course of this meeting the range of these tasks will be widened. The Secretariat will include these proposals in the Minutes and will take them into account in other documents of our organization.

Thank you for your attention and may I wish you a successful meeting. ■

DAM Workshop on *Checking the net content in prepackages*

April 22–30, 1999
Munich, Germany

Nineteen participants from Bangladesh, Brazil, Bulgaria, Cuba, Czech Republic, Estonia, Lithuania, Macedonia, New Zealand, Romania, Slovenia and Thailand utilized the opportunity to gather comprehensive information on *Checking the net content in prepackages* during this Workshop organized by the German Academy of Metrology (DAM).

The training program consisted of a balanced mixture of theory and practical training in small groups for the application of the prepackaging directives.

The opportunity to discuss general and specific problems was welcomed and thoroughly utilized by the participants.

A final evaluation by the participants showed excellent results with regard to the content and organization of the workshop and also the quality of the teachers. In particular, the practical part was judged very helpful for their future work.

Theory

- **Legal Metrology in Germany and Europe**
  (Motives for the introduction of regulations regarding prepackages, prepackages as part of our legal system, infrastructure of legal metrology in Germany, enforcement)
- **Basic statistics**
  (Statistical distributions, mean value, standard deviation, confidence interval, basic requirements for statistical tests)
- **OIML**
  (Introduction to the tasks of the OIML, relevant OIML Recommendations, Members, documents)
- **Prepackages - basis, definitions**
  (Legal basis in Germany and in the rest of the EC, OIML Recommendations)
- **Labeling of prepackages**
  (Net content, basic price, information by the manufacturer, e-marking, differences between German regulations, EC directives and OIML Recommendations)
- **Requirements for net content**
  (Length, base, number of pieces, mass, volume, varying nominal quantity)
- **Test methods, sampling schemes**
  (Operating characteristics, single sampling scheme/ double sampling scheme)
- **Prepackage control by public authorities**
  (Checking of prepackages in trade)
- **Measuring containers/test by templates**
- **Determination of density**
- **Internal controls by the manufacturer**

Practice

- **Determination of density**
  (Displacement method for lacquers, bottles used as pycnometers, metal pycnometers, glass pycnometers, densimeters, DMA (flexural mode method), determination of density of aerosols)
- **Prepackage control at a manufacturing plant**
- **Prepackage control at the Munich Verification Office**
  (test of commodities:
  - bottles filled with wine, beer or mineral water
  - sour canned goods)
- **Presentation of weighing instruments and software for prepackage control with practical training**

On demand, the DAM will organize workshops and courses dealing with specific national themes of legal metrology. At present, workshops relating to weighing instruments, flow meters and calibration of storage tanks are in preparation.

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certificate system
OIML
système de certificats

In this Bulletin: OIML certificates registered

Dans ce Bulletin: certificats OIML enregistrés

1999.02 – 1999.04

OIML Certificate System

The OIML *Certificate System for Measuring Instruments* was introduced in 1991 to facilitate administrative procedures and lower costs associated with the international trade of measuring instruments subject to legal requirements.

The System provides the possibility for a manufacturer to obtain an OIML certificate and a test report indicating that a given instrument pattern complies with the requirements of relevant OIML International Recommendations.

Certificates are delivered by OIML Member States that have established one or several Issuing Authorities responsible for processing applications by manufacturers wishing to have their instrument patterns certified.

OIML certificates are accepted by national metrology services on a voluntary basis, and as the climate for mutual confidence and recognition of test results develops between OIML Members, the OIML Certificate System serves to simplify the pattern approval process for manufacturers and metrology authorities by eliminating costly duplication of application and test procedures.

Système de Certificats OIML

Le *Système de Certificats OIML pour les Instruments de Mesure* a été introduit en 1991 afin de faciliter les procédures administratives et d'abaisser les coûts liés au commerce international des instruments de mesure soumis aux exigences légales.

Le Système permet à un constructeur d'obtenir un certificat OIML et un rapport d'essai indiquant qu'un modèle d'instrument satisfait aux exigences des Recommandations OIML applicables.

Les certificats sont délivrés par les États Membres de l'OIML, qui ont établi une ou plusieurs autorités de délivrance responsables du traitement des demandes présentées par des constructeurs souhaitant voir certifier leurs modèles d'instruments.

Les services nationaux de métrologie légale peuvent accepter les certificats sur une base volontaire; avec le développement entre Membres OIML d'un climat de confiance mutuelle et de reconnaissance des résultats d'essais, le Système simplifie les processus d'approbation de modèle pour les constructeurs et les autorités métrologiques par l'élimination des répétitions coûteuses dans les procédures de demande et d'essai.

This list is classified by Issuing Authority; updated information on these Authorities may be obtained from the BIML.

Cette liste est classée par Autorité de délivrance; les informations à jour relatives à ces Autorités sont disponibles auprès du BIML.

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R51/1996 - DE - 98.03
Type GS ... (Classes X(1) and Y(a))
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

For each Member State, certificates are numbered in the order of their issue (renumbered annually).

Pour chaque État Membre, les certificats sont numérotés par ordre de délivrance (cette numérotation est annuelle).

OIML Recommendation applicable within the System / Year of publication

Recommandation OIML applicable dans le cadre du Système / Année d'édition

Year of issue

Année de délivrance

The code (ISO) of the Member State in which the certificate was issued.

Le code (ISO) indicatif de l'État Membre ayant délivré le certificat.

Certified pattern(s)

Modèle(s) certifié(s)

Applicant

Demandeur

For up to date information on OIML certificates:

Pour des informations à jour sur les certificats OIML:

http://www.oiml.org

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Diaphragm gas meters
Compteurs de gaz à parois déformables

R 31 (1995)

Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R31/1995-NL-99.01
Diaphragm gas meter, models GR25M-NL, GR25M-NR, GR25M-FL, GR25M-TL, GR25M-TWL, GR25M-LL, GR25M-LR
Ricoh Elemex Corporation, 3/Fl. Nagoya Center Bldg., 2-2-13, Nishiki, Naka-ku, Nagoya-shi, Japan

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

R51/1996-DE-99.01
Types DIDO 2000-16 (Class Y(b))
Ferdinand Friedlein GmbH, Industriestraße 10, 79787 Lauchingen, Germany

Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R51/1996-GB-99.01
Type 7000 (Classes X(1) and Y(a))
Pelcombe Ltd., Main Road, Dovercourt, Harwich, Essex CO12 4LP, United Kingdom

Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R51/1996-NL-99.02
Type Orion (Class Y(b))
Wray-TECH Instruments Inc., 555 Lordship Boulevard, Stratford CT 06615, USA

R51/1996-NL-99.03 Rev. 1
Type Precifill (Class X(1))
Stork BP&L, Lissenveld 41, 4941 VL Raamsdonksveer, The Netherlands

R51/1996-NL-99.04
Types LI-3600E and MI-3600 (Classes Y(a) and Y(b))
Digi Europe Limited, Digi House, Rookwood Way, Haverhill, Suffolk CB9 8DG, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Load cells
Cellules de pesée

R 60 (1991), Annex A (1993)

Issuing Authority / *Autorité de délivrance*

Ministère des Affaires Économiques, Service de la Métrologie, Belgium

R60/1991-BE-99.01
Cellule de pesée à jauges de contrainte Sensy type 202L/2022 (Classe C)
Sensy, Allée Centrale, 6040 Jumet, Belgium

Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R60/1991-GB-99.01
Load Cell Model No. Global MP 49 (Class C3)
GLOBAL Weighing Technologies GmbH, Meiendorfer Str. 205, D-22145 Hamburg, Germany

R60/1991-GB-99.04
Strain Gauge Compression Load Cell Type T103 (Class C6)
Avery Berkel Weighing, Foundry Lane, Smethwick, Warley, West Midlands B66 2LP, United Kingdom

R60/1991-GB-99.05
Strain Gauge Compression Load Cell Type T109 (Class C3)
Avery Berkel Weighing, Foundry Lane, Smethwick, Warley, West Midlands B66 2LP, United Kingdom

Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R60/1991-NL-99.02
Type MT-1022 (Class C)

Mettler-Toledo Changzhou Scale Ltd., 111 Changxi Road, Changzhou, Jiangsu 213001, PR China

R60/1991-NL-99.03
Type W-DLC/01 (Classes C and D)

Welvaarts Weegsystemen, De Tweeling 4, 5215 MC's-Hertogenbosch, The Netherlands

R60/1991-NL-99.04
Type HBS (Class C)

CAS Corporation, CAS Factory # 19 Kanap-ri, Kwangjeok-myon, Yangju-kun, Kyungki-do, South Korea

R60/1991-NL-99.05
Type PW24../.. (Classes C and D)

Hottinger Baldwin Messtechnic Wägetechnik GmbH, Im Tiefen See 45, D-64293 Darmstadt, Germany

R60/1991-NL-99.06
Type 220 / 230 (Class C)

Tedea Huntleigh Europe Ltd., 37 Portmanmoor Road, Cardiff CF2 2HB, United Kingdom

R60/1991-NL-99.07
Type BSS (Class C)

CAS Corporation, CAS Factory #19 Kanap-ri, Kwangjeok-myon, Yangju-kun, Kyungki-do, South Korea

R60/1991-NL-99.08
Type Spider 13 (Class C)

Mettler-Toledo GmbH, Heuwinkelstraße, CH-8606 Nänikon, Switzerland

R60/1991-NL-99.09
Type P (Class C)

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

R60/1991-NL-99.10
Type 1242 (Class C)

Tedea Huntleigh International Ltd., 10 Hatzoran street, Netanya 42506, Israel

R60/1991-NL-99.11
Type MV (Class C)

Epel Industrial S.A., Ctra. Sta. Cruz de Calafell, 35 km. 9,400, 08830 Sant Boi de Llobregat, Barcelona, Spain

Issuing Authority / *Autorité de délivrance*

National Institute of Standards and Technology, United States of America

R60/1991-US-99.01
Load Cell Model 745A (Class C)

Mettler-Toledo Inc., 1150 Dearborn Drive, Worthington, OH 43085-6712, USA

R60/1991-US-99.02
Load Cell Model 9363 (Class C)

Revere Transducers, Incorporated, 14192 Franklin Avenue, Tustin, California 92680, USA

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R61/1996-NL-99.01 Rev. 1
Type Precifill (Class X(1))

Stork BP&L, Lissenveld 41, 4941 VL Raamsdonksveer, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments
Instruments de pesage à fonctionnement non automatique

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

Issuing Authority / *Autorité de délivrance*

National Standards Commission, Australia

R76/1992-AU-99.01
Actronic Model AS675 Weighing Instrument (Class III)

Actronic Ltd., 8 Walls Road, Penrose, New Zealand

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R76/1992-DE-99.01
Types EC (Class III)
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

R76/1992-DE-99.03
Nonautomatic electromechanical weighing instrument, types SC... (Class III)
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R76/1992-GB-99.01
Avery Berkel MO 1xx series (Class III)
GEC Avery Limited, Foundry Lane, Smethwick, Warley, West Midlands B66 2LP, United Kingdom

▶ Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R76/1992-NL-98.06 Rev. 1
Type DC-688.. (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL-98.07 Rev. 1
Type DS-688.. (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL-98.09 Rev. 1
Type BW (Class III)
CAS Corporation, CAS Factory #19 Kanap-ri, Kwangjeok-myon, Yangju-kun, Kyungki-do, South Korea

R76/1992-NL-99.02
n <= 5000 div, Max <= 10 kg, e >= 2 g, Min = 5 e (Class III)
Epelsa, S.L., C/. Albasanz, 6-8, 28037 Madrid, Spain

R76/1992-NL-99.03
Type Activa (Class III)
Mobba S.C.C.L., Colón 6, E-08912 Badalona, Barcelona, Spain

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic rail-weighbridges
Ponts-bascules ferroviaires à fonctionnement automatique

R 106 (1997)

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R106/1997-GB-98.01
Railweight MS 3000 (Class 0.5 for coupled wagon - Class 0.2 for total train)
Railweight, Hurstfield Industrial Estate, Hurst Street, Reddish, Cheshire, Stockport SK5 7BB, United Kingdom

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*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R117/1995-DE-98.01
Model Global Hydraulic Module (GMH) (Class 0.5)
Wayne Germany, Dresser Europe S.A., Grimsehlstraße 44, 37574 Einbeck, Germany

▶ Issuing Authority / *Autorité de délivrance*

Netherlands Measurement Institute (NMi) Certin B.V., The Netherlands

R117/1995-NL-98.01 Rev. 1
Model Euro Premier (Class 0.5)
Tokheim Europe B.V., Reaal 5C, 2353 TK Leiderdorp, The Netherlands

R117/1995-NL-98.02 Rev. 1
Model Euro Premier (Class 0.5) with Bennet EPZ 75 combined pump, Tokheim Sofitan MA 26-5 meter and Eltomatic 01-08 pulser
Tokheim Europe B.V., Reaal 5C, 2353 TK Leiderdorp, The Netherlands

R117/1995-NL-99.01
Quantium (Class 0.5)
Tokheim, Koppens Automatic Fabrieken B.V. Industrieweg 5, 5531 AD Bladel, The Netherlands

Bureau International de Métrologie Légale

11, rue Turgot, 75009 Paris, France
TEL: 33 (0)1 48 78 12 82 or 33 (0)1 42 85 27 11
FAX: 33 (0)1 42 82 17 27
E-MAIL: biml@oiml.org
INTERNET: www.oiml.org

Assessment of OIML Activities for 1998

Contents

Assessment of OIML Activities for 1998

1 OIML Member States and Corresponding Members

Member States:	56	(+1)	South Africa
Corresponding Members:	46	(+2)	Guatemala; Madagascar
		(- 2)	Benin; Ghana
Total:	**102**	**(+ 1)**	

2 New and revised OIML Recommendations, Documents and other Publications issued

New Recommendations issued:	2	R 125, R 126
Revised Recommendations issued:	5	R 58, R 81, R 85, R 88, R 99
Total:	**7**	

Total number of Recommendations:

+ 1.7 %

1997	1998
117	119

Revised Document issued:	1	D 2
Other Publications issued:	3	OIML Development Council: *Main Issues, 1968–1998*; Presidential Council, International Committee of Legal Metrology, International Conference of Legal Metrology: *Main Issues Discussed, 1994–1998*; *Legal Metrology at the Dawn of the 21st Century: The Role and Responsibilities of the OIML* (Knut Birkeland)

Total number of Documents and other Publications:

+ 7.1 %

1997	1998
42	45

3 OIML Technical Committees and Subcommittees: Meetings and degree of participation of OIML Members

TC 8/SC 7	26–28 January 1998	Brussels	11	P-members present out of 16
TC 9/SC 3	19–22 May 1998	Gaithersburg	8	P-members present out of 21
TC 8/SC 5	16–17 November 1998	Paris	13	P-members present out of 24
TC 1	26–27 November 1998	Warsaw	6	P-members present out of 15

Note: BIML representative(s) participated in all the above meetings with the exception of TC 8/SC 7.

4 Liaisons with other international and regional bodies

BIML representatives participated in the following meetings in 1998:

ARSO	26 January	Nairobi	*General Assembly*
BIPM/ILAC/OIML	26 February	Paris	*Strategic Planning*
WELMEC	23–24 April	Douai	*Enforcement Seminar*
WELMEC WG 6	14 May	Paris	*Meeting*
JCGM WG 2	30 April	Geneva	*Meeting on the VIM*
	7 September	Sèvres	¨
	18–19 November	¨	¨
UN-ECE	18–20 May	Geneva	*8th UN-ECE Working Party Session*
ISO	7–8 May	Geneva	*Workshop on MRA's*
IEC TC 62	18 May	Toronto	*Meeting*
SIM	3–5 June	Gaithersburg	*Technical Seminar*
BIPM/IMEKO/PTB/OIML	16–19 June	Braunschweig	*International Seminar on The Role of Metrology in Economic and Social Develeopment*
ISO/DEVCO	14–15 September	Geneva	*32nd Meeting*
WTO TBT Committee	1 July	Geneva	*Meeting*
	14–15 September	¨	¨
	19–20 November	¨	¨
APLMF	25–27 October	Seoul	*5th Meeting*
WELMEC	30 October	Seoul	*Committee Meeting*
Plus other contacts with:	UNIDO, UNCTAD/DITE, ANSI, CECIP, ITC		

In addition, the CIML President, Immediate Past President, Vice-Presidents and certain Members have represented the OIML at meetings of:

COOMET Committee - EUROMET Committee - SADCMEL - APLMF - SIM - NPL (India) - CENAM (Mexico)

Concerning various technical activities of ISO, IEC, CEN, CENELEC and the European Commission, OIML experts participated in meetings and/or reports were given for the following fields:

- Instruments for measuring vehicle exhaust emissions;
- Water meters;
- Draft European Directive on measuring instruments (MID);
- Thermometers;
- Acoustic measurements.

5 Implementation of OIML Recommendations by OIML Members

An inquiry on the implementation of OIML Recommendations was carried out in 1996. In comparison with the previous inquiry (1992), there was a significant increase in the number of countries implementing individual Recommendations and in the degree of implementation (see the *Assessment* published in the July 1998 OIML Bulletin).

6 Categories of measuring instruments covered by the OIML Certificate System

Twenty-five categories of measuring instruments are covered by the following OIML Recommendations: R's 31, 50, 51, 58, 60, 61, 76, 85, 88, 97, 98, 102, 104, 105, 106, 107, 110, 112, 113, 114, 115, 116, 117/118, 123 & 126.

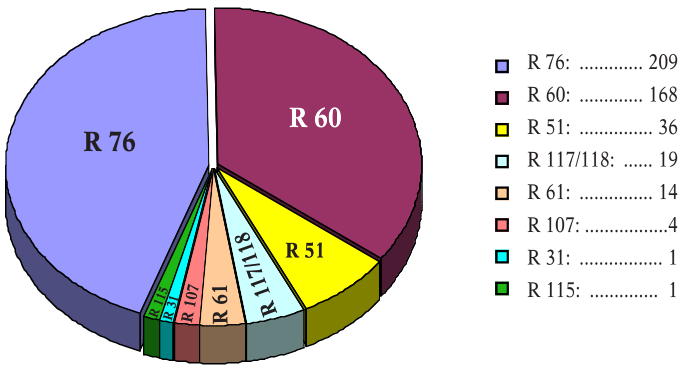
Total number of categories	1995	1996	1997	1998
	14	16	21	25
	+ 14 %	+ 31 %	+ 19 %	

7 Cumulative number of registered OIML certificates in 1998

Category:		
	Automatic catchweighing instruments (R 51):	36
	Load cells (R 60):	168
	Automatic gravimetric filling instruments (R 61):	14
	Nonautomatic weighing instruments (R 76):	209
	Clinical electrical thermometers (R 115):	1
	Fuel dispensers for motor vehicles (Rs 117/118):	19
	Gas meters (R 31)	1
	Automatic weighing instruments (R 107)	4
	Cumulative total, as at the end of 1998:	**452**

Cumulative number of registered certificates

1995	1996	1997	1998
158	226	318	452
+ 43 %	+ 40 %	+ 42 %	



OIML certificates by category

8 Degree of acceptance of OIML certificates by OIML Members

Inquiries were carried out by the BIML in 1997 and 1998; sixty-seven countries (39 Member States and 28 Corresponding Members) sent responses; their results are summarized as follows:

- More than 200 (*120 in 1997*) certificates were taken into consideration and/or accepted to facilitate the process of national type evaluation and approval;
- Certificates were accepted by 7 countries *(5 in 1997)*;
- Certificates were taken into consideration by 22 countries *(16 in 1997)*;
- 93 applicants and manufacturers of measuring instruments from 24 countries were granted OIML certificates.

9 Subscribers to the OIML Bulletin and purchasers of OIML Publications

OIML Bulletin	1995		1996		1997		1998
Total number of Bulletins distributed quarterly	1063		1045		1039		1039
		– 1.7 %		– 0.6 %		=	
Of which Bulletin subscribers	187		180		172		170
		– 3.7 %		– 4.4 %		– 1.1 %	

Sales of publications (FRF)	1995		1996		1997		1998
	114 405		173 943		195 668		160 930
		+ 52 %		+ 12 %		– 18 %	

10 Connections to the OIML Internet site (http://www.oiml.org)

In 1998, the BIML recorded an average of about 400–500 connections per month. At the time of going to press (May 1999) this figure has risen to about 1000 connections per month and the site is constantly being developed: more features have been included, including a news page and the possibility for Member States to download a number of OIML Publications directly.

11 Activities in support of development

Main activities:

- Co-organization and participation in the International Seminar on *The Role of Metrology in Economic and Social Development*, Braunschweig, June 1998;
- Contacts with international organizations (UNIDO, ISO/DEVCO, UN-ECE, IMEKO, WTO TBT Committee), regional organizations (APLMF, SADCMEL, SIM) with a view to development activities and visits/contacts with national legal metrology institutes of developing countries (Algeria, Kenya, Mongolia, Tunisia, Vietnam);
- Preparation of two surveys on OIML Development Council activities and resolutions (see point 2 in this Assessment);
- OIML Development Council Meeting (28 October 1998, Seoul) with 61 participants. Election of the new Chairperson of the Council.

New OIML Publication

Nouvelle Publication OIML

R 127 **Radiochromic film dosimetry system for ionizing radiation processing of materials and products**

R 127 **Systèmes de dosimétrie par film radiochromique pour le traitement par rayonnement ionisant de matériaux et de produits**

With the publication of OIML Recommendation R 127 *Radiochromic film dosimetry system for ionizing radiation processing of materials and products*, this new category of measuring instruments is now covered by the **OIML Certificate System**.

Avec la publication de la Recommandation OIML R 127 *Systèmes de dosimétrie par film radiochromique pour le traitement par rayonnement ionisant de matériaux et de produits*, cette nouvelle catégorie d'instruments de mesure est à présent couverte par le **Système de Certificats OIML**.

Committee drafts received by the BIML, 1999.03.01 – 1999.05.31

Title	Language	CD n°	TC/SC	Country
Revision of R 111: Weights of classes E_1, E_2, F_1, F_2, M_1, M_2 and M_3	E	1 CD	TC 9/SC 3	USA
International Vocabulary of Terms in Legal Metrology (VIML)	E	4 CD	TC 1	Poland
Automatic instruments for weighing road vehicles in motion. Part A - Total vehicle weighing	E	3 CD	TC 9/SC 2	UK

International Conference on Metrology - Trends and Applications in Calibration and Testing Laboratories

16–18 May 2000, Jerusalem, Israel

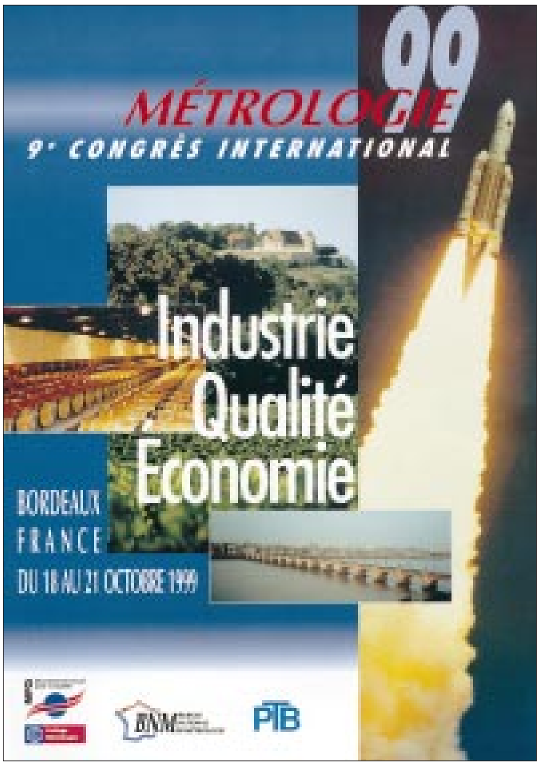
The Forum is being organized by the National Conference of Standard Laboratories (NCSL), the Cooperation International for Traceability in Analytical Chemistry (CITAC) and the Israeli Metrological Society.

Topics to be covered:

- Metrology as a science and as an integral part of business in industry and trade;
- Legal metrology;
- Regional metrological organization;
- Measurement methods and their validation;
- Instruments and their qualification;
- Measurement standards and reference materials;
- Interlaboratory comparisons;
- Proficiency testing;
- Uncertainty in measurement and analysis;
- Traceability;
- Laboratory information management systems;
- Accreditation of calibration and testing (analytical) laboratories;
- Ethical problems in metrology; and
- Education in the third millennium.

For more information please contact:

Dr. Henry Horwitz
Conference Secretariat
ISAS-International Seminars
PO Box 34001
Jerusalem 91340
Israel
Tel.: +972-2-652 0574
Fax: +972-2-652 0558
E-mail: isas@netvision.net.il



Métrologie 99 (18–21 October 1999) is organized by the Collège Métrologie of the Mouvement Français pour la Qualité under the aegis of the BNM and with the scientific participation of the PTB.

The aim of the Congress is to highlight new techniques of measurement and calibration that have been or are being developed to answer industry's needs.

Secretariat:

Sandrine Gazal
Maison de l'Entreprise
429 Rue de l'Industrie
34966 Montpellier Cedex 2
France
Tel.: +33 (0)4 67 91 33 42
Fax: +33 (0)4 67 91 33 43
E-mail: sandrine.gazal@wanadoo.fr

Agenda

11–15 October 1999

Meeting: **21st Conférence Générale des Poids et Mesures (CGPM)** **Paris**

Open to Members of the Convention du Mètre.

E-mail: info@bipm.fr

18–19 October 1999

Meeting: **ILAC '99 General Assembly** **Rio de Janeiro**

Open to ILAC Members, Associate Members and representatives of Liaison Organizations.

18–21 October 1999

Conference: **Métrologie 99** **Bordeaux**

Please refer to the announcement in this Bulletin.

E-mail: sandrine.gazal@wanadoo.fr

28–30 March 2000

Symposium: **Metrology 2000, Cuba (postponed from October 1999)** **Havana**

Sponsored by the National Bureau of Standards of the Republic of Cuba, MACNOR S.A. and other prestigious national, international and regional bodies, Metrology 2000 will draw the attention of many Latin American, Caribbean, European and Far Eastern countries.

E-mail: ncnorma@ceniai.inf.cu

16–18 May 2000

Meeting: **International Conference on Metrology** **Jerusalem**

Please refer to the announcement in this Bulletin.

E-mail: isas@netvision.net.il

OIML meetings / réunions

September 1999

30 Sept–1 Oct	Seminar on Software	PARIS, FRANCE

October 1999

5	OIML Development Council Meeting	TUNIS, TUNISIA
6–8	34th CIML Meeting	

November 1999

4–5	TC 8/SC 5 (Water meters)	GAITHERSBURG, USA

October 2000

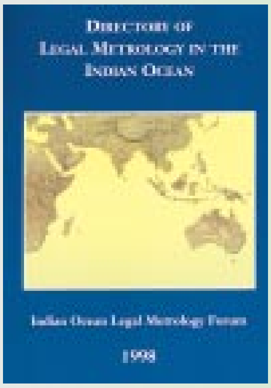
9–13	11th International Conference of Legal Metrology	LONDON, UK
	35th CIML Meeting	

The OIML is pleased to welcome the following new CIML Members for:

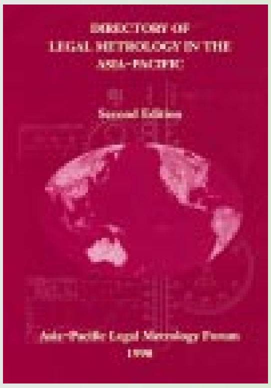
Ireland	**Mr. Farragher**
Kazakshtan	**Mr. Turspekov**
Romania	**Mr. Ocneanu**

info

Directories



Since the establishment of the APLMF in 1994, priority was given to publishing the *Directory,* which comprises information provided by legal metrology authorities in Asia-Pacific Economic Co-operation (APEC) economies on the legislation, institutional and operational aspects of legal metrology. This second edition (1998) of the *Directory* includes entries for all twenty-two APLMF Member Economies.



The National Standards Commission (NSC) Australia proposed the formation of the IOLMF in February 1997. This *Directory of Legal Metrology in the Indian Ocean* will greatly enhance the mutual understanding of legal metrology in the region and contribute to greater confidence in measurement and test results.

Both of the above *Directories* are available c/o NSC Australia:

Tel. +61-2-9888 3922
Fax +61-2-9888 3033