Editorial

MAA 9CD

The OIML Mutual Acceptance Arrangement (MAA) continues to make good progress thanks to the contributions of OIML TC 3/SC 5 Members, and especially as a result of the considerable amount of work that has been done by the US Secretariat of this SC. A Ninth Committee Draft (9CD) for the MAA has now been sent to the SC Members and is likely to be presented for postal voting by CIML Members before the 37th CIML Meeting later this year in Saint Jean de Luz.

It is both the BIML's and the Subcommittee's expectation that the MAA can be adopted in Saint Jean; indeed, it is now of crucial importance for this to happen in order for the OIML to be able to continue its work. We must now develop our experience of implementing declarations of mutual confidence for different categories of instruments in order to be able to revise and improve this MAA in the future and to start working on the other issues that have been identified in the OIML Action Plan.

Conformity to type is certainly the most important issue that we have to address. It has been strongly recommended that a high level of priority be allocated to this topic by a number of individuals and groups: representatives of industry, the Eleventh OIML Conference in London (in particular), several RLMOs and most developing countries all agree that this area is a key one for the future.

Fundamental ideas are now emerging on this issue, but to start such work requires that the OIML Certificate System be highly consistent throughout all the Member States, which is the intended outcome of implementing the MAA.

When the technical aspects of conformity to type have been agreed on, we shall be able to develop and extend the OIML Certificate System to include certification of individual measuring instruments. This must be our goal in order to contribute to the free circulation of measuring instruments and to support developing countries in exerting tighter control of the instruments placed on their markets.

We look forward to seeing this first step completed, to seeing the MAA adopted and implemented, and to witnessing first hand the commencing of further work in this field. ■

BIML

VERIFICATION / WEIGHING

A combinatorial technique for weighbridge verification

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Abstract

A general technique for the calibration of metric instruments developed at the Measurement Standards Laboratory of New Zealand is applied to the verification of vehicle weighbridges. The technique, called the combinatorial technique, is used to determine both the errors in the weighbridge scale over the verification range and the associated measurement uncertainty. Using suitable equipment, the measurements can be carried out in a time comparable to that of current techniques. The technique has the advantage that the total mass of the standard weights used can be between 5 % and 50 % of the capacity of the weighbridge. Although reducing the proportion of standard weights increases the uncertainty in calculated scale errors, the technique has sufficient statistical rigor to allow a determination of the degree of confidence in any compliance/non-compliance decision. Examples of the verification of road weighbridges, up to 40 t, using the technique are given.

Keywords: Mass, Weighbridge, Verification

1 Introduction

Ongoing verification of road and rail weighbridges for market surveillance requires regular maintenance, transportation and use of standard weights of large nominal values, typically between 0.1 t and 1 t. A weighbridge can have a capacity of up to 120 t or more, so that verification requires the use of specialized lifting and transportation equipment. Recent developments [1,2] have focused on designing such equipment to minimize the number of personnel required to carry out verification and to improve the efficiency of the verification. Such equipment consists of a truck/trailer system that can transport the standard weights required as well as a forklift and hydraulic hoist for manipulating the weights.

Often it is not possible, practical or legal to transport standard weights that reach the capacity of the weighbridge, in which case verification is achieved by using substitution material [3] instead of standard weights. In general the truck/trailer unit itself is designed to be of sufficient mass to be used as a substitution weight. For example the Rhineland-Palatinate vehicle [2] is a self-contained verification system consisting of a 12.5 t tractor, 15 t trailer, and 27.5 t of standard weights, allowing verification of weighbridges of up to 55 t. Often vehicles or material present at the weighbridge site at the time of the verification are also used as substitution material.

OIML R 76-1 [3] allows the quantity of standard weights required for use in the substitution technique to be as small as 20 % of the capacity of the weighbridge. The use of the substitution technique can therefore be of considerable advantage to a Verification Authority with limited resources. However, as the quantity of standard weights used is reduced, the cumulative effect of errors due to measurement reproducibility increases. Tight constraints are therefore placed on the allowable limits for repeatability error [3], so that the use of the substitution technique in accordance with OIML R 76-1 is often not possible.

In this paper the authors describe the application of a relatively new technique in which the total mass of standard weights required can be reduced to 5 % of the capacity of the weighbridge, while at the same time providing a rigorous analysis of uncertainties in the verification to allow an assessment of the risk arising from using a smaller total mass of standard weights. This technique, called the combinatorial technique, was originally developed for the calibration of resistance bridges used in thermometry [4], but its application to metric instruments in general soon became apparent [5]. The combinatorial technique has practical advantages in large mass and balance calibration [6], and these advantages, with particular regard to weighbridge verification, are discussed here.

In Section 2 of this paper the authors describe the principle of the combinatorial technique. In Section 3 they illustrate the use of the technique with three examples and compare the results of measurements on weighbridges using the combinatorial technique and the substitution technique. In Sections 4 and 5 the practical and theoretical aspects of the technique are considered, and conclusions are given in Section 6.

In this paper the term "reproducibility" rather than "repeatability" is used to describe apparent random variations in measurements. Repeatability, in relation to weighbridges, is defined in OIML R 76-1 as the "ability of an instrument to provide results that agree one with the other when the same load is deposited several times and in a practically identical way on the load receptor under reasonably constant test conditions". This definition is based on that given in the *Guide to the expression of uncertainty of measurement* [7]. However, in the combinatorial technique, the loads used are loaded in different positions and sequences, so that measurement variability is influenced by instrument repeatability as well as eccentric loading and discrimination. These factors combined influence what is referred to here as reproducibility. Also, in this paper the authors use "mass" to mean "conventional value of mass" [8].

2 Description of the technique

The combinatorial technique involves placing m distinct loads in all possible combinations onto the weighbridge. Only one of these loads need consist entirely of standard weights, and the remaining loads are made up with suitable material and vehicles that are available on-site. This gives a total of 2^m possible loading combinations, including the weighbridge zero where no load is used. The masses of the loads are chosen so that the range of combinations covers the operating range of the weighbridge. If *Max* is the maximum capacity of the weighbridge, then a binary sequence of loads having masses of approximately 0.5 *Max*, 0.25 *Max*, 0.125 *Max*, ... gives a uniform coverage of the scale range. In practice 5 loads are usually sufficient, ranging in mass from approximately 0.05 *Max* to 0.5 *Max*. Although the binary sequence is ideal, any sequence of loads that gives a suitable distribution of measurements over the required range is sufficient to give a rigorous assessment of errors over the range of the weighbridge scale.

The basis of the combinatorial technique is that a comparison of scale indications for different combinations of loads can give information on the non-linearity of the scale without the need for standard weights. As an illustration, consider the following measurements carried out on a weighbridge with scale interval $d = 20$ kg. A load of approximate mass 20 t gave a reading of

$$r_1 = 20358 \text{ kg} \qquad (1)$$

and a load of approximate mass 10 t gave a reading of

$$r_2 = 10082 \text{ kg} \qquad (2)$$

A third measurement using these two loads in combination gave a reading of

$$r_{1+2} = 30426 \text{ kg} \qquad (3)$$

so that

$$r_{1+2} - (r_1 + r_2) = -14 \text{ kg} \qquad (4)$$

Note that each reading has been corrected using the method described in [3] in which weights of mass 0.1 d are applied to determine the value at which the indication changes. If the scale response was linear one would expect (4) to equal zero. The observation that this is not the case demonstrates these three measurements provide information about the non-linearity of the weighbridge scale. Analysis of readings for all 16 possible combinations of 4 loads, nominally 20 t, 10 t, 5 t and 2.5 t, using least-squares estimation, gives information on the non-linearity of the scale over its entire range up to 40 t. If one of the loads consists of standard weights of known mass, scale errors with corresponding uncertainties of measurement can be determined [5,6]. Note that the non-zero result of Equation (4) may also include components due to instrument repeatability, discrimination and eccentricity errors. However, with the large number of different measurements involved in the combinatorial technique, the effect of these components is "randomized" to some extent, and consequently these components are accounted for in an evaluation of measurement reproducibility from the residuals of the least-squares estimation.

In the combinatorial technique, the dependence of the scale error $E(r)$ on the scale indication r is modeled by a polynomial equation, normally a cubic polynomial of the form

$$E(r) = Ar + Br^2 + Cr^3 \qquad (5)$$

where A, B and C are constants that are calculated in the least-squares analysis. Figure 1 illustrates the form of results obtained with the combinatorial technique. The solid curve is the calculated cubic polynomial $E(r)$, and the dashed curves (with light shading between) represent the confidence interval associated with the expanded uncertainty $U(r)$ [7], normally calculated for a 95 % level of confidence. The bold solid lines are specified values of maximum permissible error (MPE) for the device. In the unshaded region of Figure 1, the envelope $E(r) \pm U(r)$ of probable error values lies entirely within the MPE, so that compliance to the MPE can be asserted with a high degree of confidence. Conversely, in the heavily shaded region on the right hand side of Figure 1, the envelope of probable error values lies entirely outside the MPE, so that non-compliance can be asserted with a high degree of confidence. In the shaded region in between, a decision on compliance or non-compliance can only be made with a lesser degree of confidence. However, it is not within the scope of this paper to discuss the assessment of the risk associated with such decisions. The important point to note is that the combinatorial technique gives sufficient statistical information to allow an evaluation of the risk associated with any compliance/non-compliance decision, particularly in situations where the total mass of standard weights available is much less than the capacity of the weighbridge.

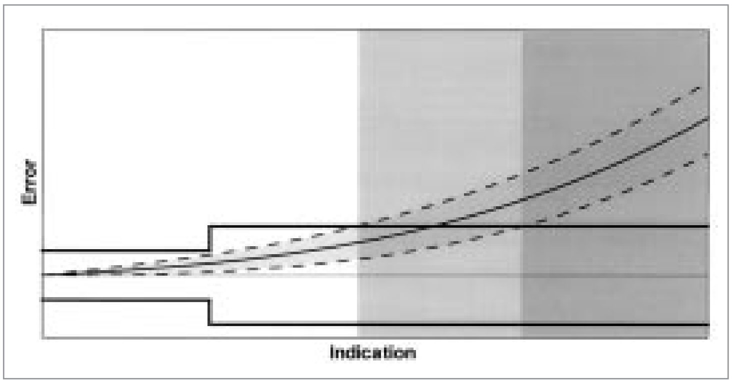

Figure 1 Schematic illustration of the form of results obtained using the combinatorial technique, showing calculated error (solid curve) with associated expanded uncertainties (dashed curves, generally for a 95 % level of confidence). The bold solid lines are the relevant values of MPE.

3 Examples

The three examples presented here describe measurements done during verifications of three different truck weighbridges, each having a scale interval d = 20 kg. In each example, MPE values shown are for a Class III device on subsequent verification, as described in [3]. All weighbridges were verified up to 40 t, which is currently the legal limit for road usage in New Zealand. Also, for each example, measurements using the substitution technique were carried out on the same day, in order to demonstrate the validity of the combinatorial technique. For both techniques, all readings were corrected using the method described in [3], in which weights, of mass 0.1 d, are applied to determine the value at which the indication changes.

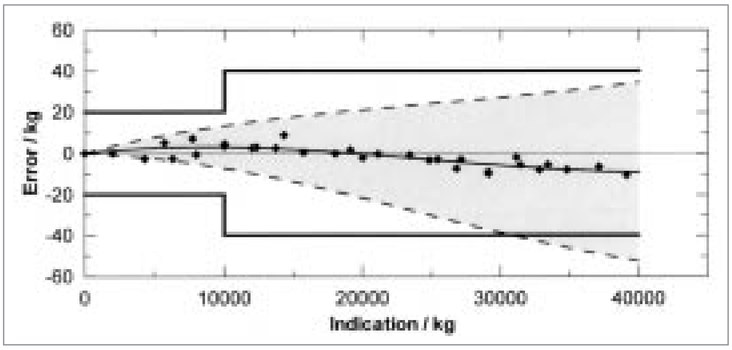

Figure 3 Results of measurements using the combinatorial technique as described in Example 1, using 2 t of standard weights. The data points indicate the variation of the data about the calculated error (solid curve). The dashed curves are the expanded uncertainty in the calculated error, for a 95 % level of confidence. The solid bold lines are the relevant values of MPE.

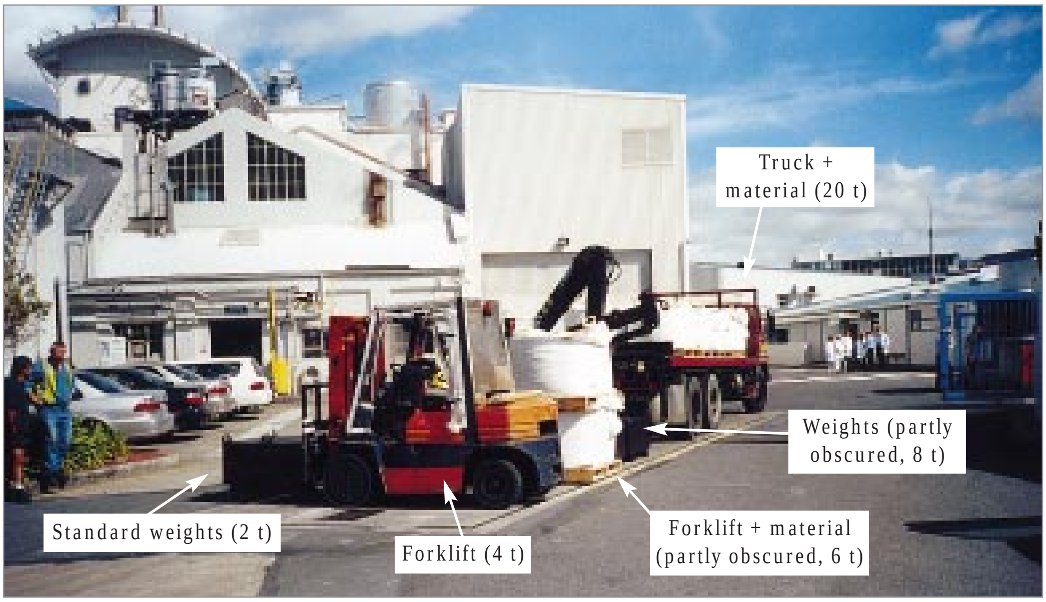

Figure 2 Loads used in the measurements in Example 1.

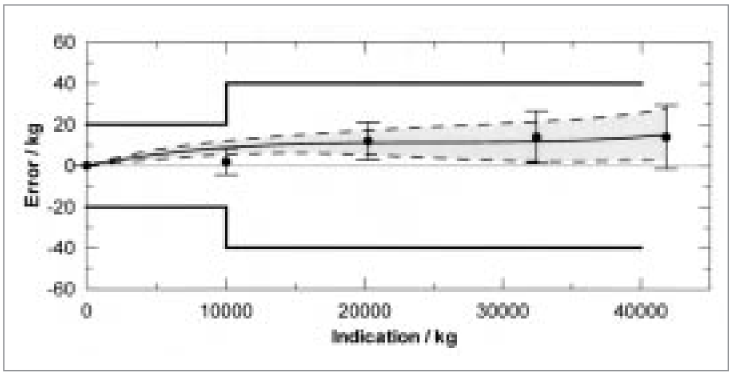

Figure 4 Re-calculated error (solid curve) for the measurements in Example 1, based on 8 t of standard weights, and associated uncertainty (dashed curves). The data points with uncertainty bars are the errors calculated using the substitution technique. All uncertainties are expanded uncertainties for a 95 % level of confidence. The solid bold lines are the relevant values of MPE.

3.1 Example 1

For this weighbridge, of capacity 60 t, measurements were carried out using the combinatorial technique up to 40 t with $m = 5$ loads, made up from vehicles and material available on site, as well as standard weights. Apart from the standard weights, the masses of the loads only need to be known approximately in order to ensure that the combinations are suitable. The only other requirement of the loads is that they be stable over the period of measurements. The loads used in this example were: truck + material (approximate mass 20 t), spare weights (8 t), forklift + material (6 t), 2nd forklift (4 t) and standard weights (2 t). These are shown in Figure 2. Figure 3 shows the results using the combinatorial technique, based on the known mass of the 2 t load of standard weights only. In Figure 3 the solid curve is the least-squares estimate (the calculated error $E(r)$). The data points indicate the variations in the data about $E(r)$ (the "residuals" of the least squares estimation), and these variations are used to determine the reproducibility of the measurements [5,6]. For these measurements, the reproducibility, calculated as a standard uncertainty [7], is u_R = 3.1 kg. The reproducibility and the uncertainty in the combination of standard weights are incorporated into the least-squares analysis to calculate uncertainties in the calculated errors $E(r)$ [6]. All other possible uncertainty contributions are negligible, and in the three examples in this paper the uncertainty is dominated by the reproducibility component. This is not entirely obvious from Figure 1, particularly at higher values of scale indication where the variation in the data about the least-squares estimate is small compared to the expanded uncertainty (dashed lines in Figure 3). An inherent characteristic of the combinatorial technique is that the uncertainty in the calculated scale error at a given scale indication is proportional to the product of the reproducibility and the ratio of the indication to the mass of standard weights (see Equation (6) later).

Clearly, from Figure 3, one can assert to a high level of confidence that the errors in the weighbridge indication are within the specified values of MPE. This is a remarkable result, given that the mass of the standard weights used corresponds to 5 % of the capacity of the weighbridge. To demonstrate the dependence of results

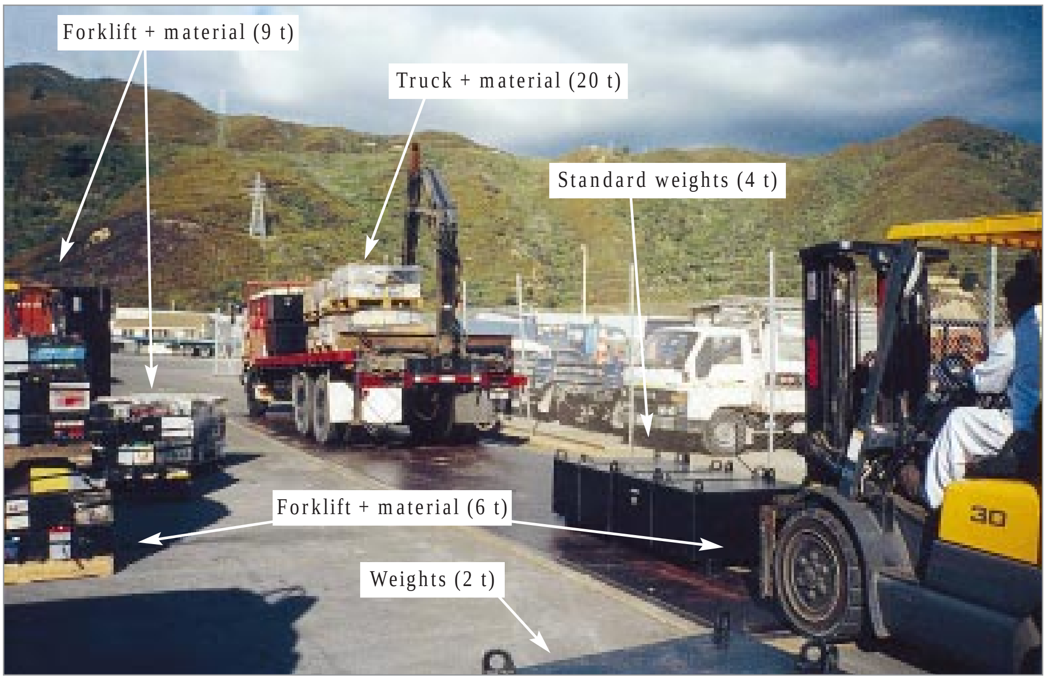

Figure 5 Loads used in the measurements in Example 2.

on the total mass of standard weights, the data was re-analyzed based on the 8 t combination of standard weights, and the results are shown in Figure 4 (data points have been omitted for clarity). Comparing Figures 3 and 4, the uncertainty has been reduced by a factor of four through using 8 t rather that 2 t of standard weights, and the two results show excellent agreement within the calculated uncertainties. Figure 4 also compares the results for the combinatorial technique with those for measurements carried out using the substitution technique. For the substitution technique, 10 t of standard weights were used in 4 substitutions, and the uncertainty limits shown are calculated from the reproducibility determined by the combinatorial technique (see reference [6]). There is excellent agreement between the two techniques. However, it is important to realize that without the estimate of the reproducibility obtained from the combinatorial technique, a proper comparison of the two techniques would not be possible.

3.2 Example 2

For this weighbridge, of capacity 60 t, measurements were carried out using the combinatorial technique up to 40 t with m = 5 loads, made up from vehicles and material available on site, as well as standard weights. The loads were: truck + material (approximate mass 20 t), forklift + material (9 t), 2nd forklift + material (6 t), standard weights (4 t) and spare weights (2 t). These are shown in Figure 5. This verification was based on the 4 t load of standard weights, and although measurements were hindered by windy conditions at the time, the reproducibility was good (u_R = 4.2 kg). Results are shown in Figure 6, along with the results from the substitution technique using 10 t of standard weights. Based on the results of the combinatorial technique, one can assert with a high degree of confidence that the weighbridge complies with the specified MPE. This is confirmed by the excellent agreement with the results of measurements using the substitution technique.

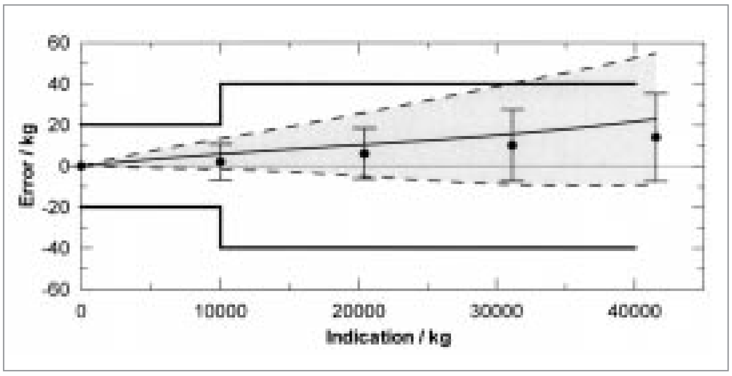

Figure 6 Results of measurements using the combinatorial technique as described in Example 2, using 4 t of standard weights, showing the calculated error (solid curve) and associated uncertainty (dashed curves). The solid bold lines are the relevant values of MPE, and the data points with uncertainty bars are results of measurements using the substitution technique. All uncertainties are expanded uncertainties for a 95 % level of confidence.

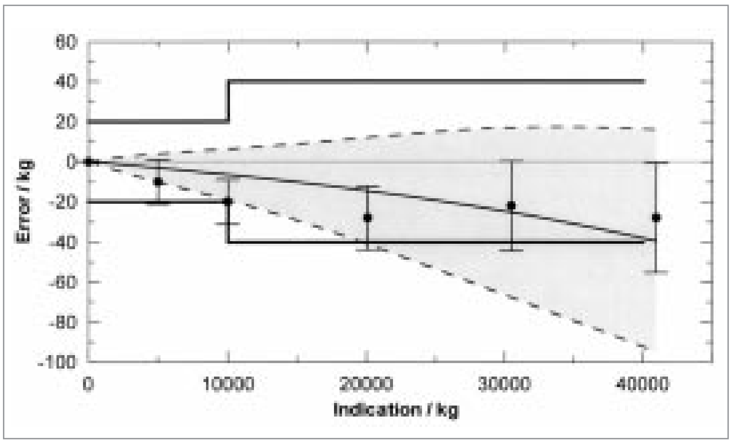

Figure 7 Results of measurements using the combinatorial technique as described in Example 3, using 4 t of standard weights, showing the calculated error (solid curve) and associated uncertainty (dashed curves). The solid bold lines are the relevant values of MPE, and the data points with uncertainty bars are results of measurements using the substitution technique. All uncertainties are expanded uncertainties for a 95 % level of confidence.

3.3 Example 3

For this weighbridge, of capacity 60 t, measurements were carried out using the combinatorial technique up to 40 t with m = 4 loads, made up from vehicles and material available on site, as well as standard weights. The loads were: truck + material (approximate mass 20 t), 2nd truck (10 t), forklift + material (6 t), and standard weights (4 t). Results are shown in Figure 7, along with the results from the substitution technique. The calculated reproducibility was u_R = 4.9 kg. In this example, for the results obtained using the combinatorial technique, the uncertainty is much larger compared with the earlier examples, exceeding the MPE at larger load. This is largely due to the fewer number of combinations used and also the poorer reproducibility. Based on these results, one can only assert that the weighbridge complies with the specified MPE up to around 20 t. As in the previous examples, there is good agreement with the results obtained using the substitution technique.

4 Practical aspects

4.1 Calculations

The least-squares analysis required in the combinatorial technique uses matrix algebra for calculation of scale errors and corresponding uncertainties [6]. These calculations can easily be implemented in computer spreadsheet software such as Microsoft Excel. The calculations for the examples presented here were done using a spreadsheet that is set up so that, once all data are entered into the appropriate cells, the scale errors are automatically calculated. This implementation has the advantage that the operator does not need to fully understand the details of the calculation.

An important advantage of the combinatorial technique is that the reproducibility is assessed from a large number of different combinations of loads. This gives a reliable estimate of the weighbridge reproducibility, as it includes variations that occur due to such effects as repeatability, discrimination and eccentric loading.

4.2 Loading sequences

Table 1 shows the sequence of measurements in Example 2, in the order in which they were carried out. This order was designed to reduce the amount of time and manipulation of loads required. For convenience, the sequence was divided into sub-sequences involving 3 or 4 loadings. The strategy was to keep the larger loads in place while going through the combinations of smaller loads. For example, for the first 4 sub-sequences the truck was left in position on the weighbridge while the other loads were moved on and off and measurements made.

4.3 Resources required

A critical aspect in assessing the practicality of the combinatorial technique is the resources required, in particular time, equipment and number of personnel. In the case where the total mass of standard weights available is less than 10 % of the capacity of the weighbridge, the combinatorial technique requires a similar number and similar types of loadings as the substitution technique [6]. In general, the efficiency of the combinatorial technique is greatly increased if "rolling" loads are used. For example, the use of two forklifts (with skilled drivers) and a truck in examples 1 and 2 allowed efficient manipulation and interchanging of loads. The ideal requirements for a weighbridge verification using the combinatorial technique are given in Table 2. With such equipment available, measurements on a weighbridge using the substitution technique followed by the combinatorial technique were completed within half a day, including the time taken to organize suitable vehicles and material for the loads required. With suitable equipment, measurements using the combinatorial technique can be carried out in a similar time to other current techniques.

5 Theoretical aspects

Although the least-squares analysis will always produce uncertainties for a given set of measurements, it is useful to know in advance what uncertainties can be achieved in a given situation. This can be achieved using the following equation, which gives an approximation for the standard uncertainty $u(r)$ in the calculated error $E(r)$ at a given indication r,

$$u(r) \approx \frac{r}{M} \sqrt{3.6 \frac{u_R^2}{2^m} + u_M^2} \quad (6)$$

where u_M is the standard uncertainty in the mass M of standard weights. This equation was derived empirically by numerical analysis, and is a slightly better approximation than that given in [6]; it gives values of uncertainty that are within 10 % of those calculated by least-squares analysis, provided that the load of standard weights is either of the two smallest loads used.

Equation (6) can be simplified with the following considerations. It is usually best to use $m = 5$ loads, and the uncertainty u_M in the standard weights is generally small enough to be disregarded. For a properly installed and serviced weighbridge, based on the results presented here, one would expect that $u_R = 0.25\ d$ in the worst case. Equation (6) then becomes, for $m = 5$,

$$u(r) \approx 0.084 \frac{rd}{M} \quad (7)$$

or as an expanded uncertainty (for $m = 5$),

$$U(r) \approx 0.17 \frac{rd}{M} \quad (8)$$

A common criterion used in designing measurements for determining compliance or non-compliance is that $U(r)$ should be less than or equal to one-third of the

Table 1 The sequence of loading combinations used in Example 2, and corresponding indications and mass "Delta" of extra weights required to change each indication (all in kg).

Weights used	1	2	3	4	5
Identifiers	20truck	9fork	6fork	4stds	2stds

Loadings	Indication	Delta	Corrected
20truck+9fork+6fork	35000	16	34994
20truck+9fork+6fork+2stds	36980	12	36978
20truck+9fork+6fork+4stds	38980	10	38980
20truck+9fork+6fork+4stds+2stds	40980	12	40978
20truck+9fork	28800	4	28806
20truck+9fork+2stds	30800	2	30808
20truck+9fork+4stds	32820	18	32812
20truck+9fork+4stds+2stds	34820	16	34814
20truck+6fork	25960	8	25962
20truck+6fork+2stds	27960	6	27964
20truck+6fork+4stds	29960	4	29966
20truck+6fork+4stds+2stds	31960	4	31966
20truck	19800	20	19790
20truck+2stds	21800	18	21792
20truck+4stds	23800	18	23792
20truck+4stds+2stds	25800	20	25790
9fork+6fork	15180	8	15182
9fork+6fork+2stds	17180	8	17182
9fork+6fork+4stds	19180	4	19186
9fork+6fork+4stds+2stds	21180	2	21188
9fork	9020	10	9020
9fork+2stds	11020	10	11020
9fork+4stds	13020	10	13020
9fork+4stds+2stds	15020	6	15024
6fork	6180	16	6174
6fork+2stds	8180	18	8172
6fork+4stds	10180	14	10176
6fork+4stds+2stds	12180	14	12176
2stds	2000	10	2000
4stds	4000	8	4002
4stds+2stds	6000	6	6004

Table 2 Ideal requirements for the verification of a weighbridge, up to 40 t, using the combinatorial technique (see Examples 1 and 2).

Equipment	10 t truck 2 forklifts 15–20 t of material to make up loads 2–8 t standard weights
Personnel	2 forklift/truck drivers 1 verifying officer

MPE. Considering the case where $r = Max$, for which MPE = 2 d (for subsequent verification), then this criterion would be met for $M > 0.25\ Max$. That is, based on the assumptions given here, this criterion would be satisfied for a total mass of standard weights that is as small as 25 % of the weighbridge capacity.

6 Conclusions

This paper describes the application of the combinatorial technique to the verification of truck weighbridges. The combinatorial technique can be used in any weighbridge verification, and is particularly suited to situations where it is not feasible to have standard weights that cover the full range of the weighbridge scale. This technique enables a rigorous determination both of the errors in the weighbridge scale and also of the associated uncertainties, and can be easily and efficiently implemented with the use of "rolling" loads. Comparisons of the results of the combinatorial technique with those of the substitution technique, made possible through use of the reproducibility data obtained from the combinatorial technique, demonstrate the validity of the combinatorial technique. The combinatorial technique provides sufficient information to allow a quantitative assessment of the risk associated in making a compliance/non-compliance decision, particularly when the total mass of standard weights used is much less that the capacity of the weighbridge.

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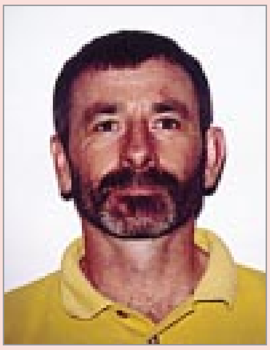

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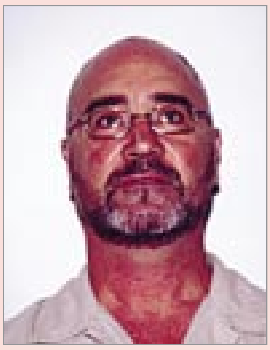

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WEIGHING

Verification of weighing instruments from a statistical point of view

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1 Introduction

This paper deals with the verification of nonautomatic, single interval weighing instruments from a statistical point of view.

On the basis of the verification test results obtained for weighing instruments, the verification officer makes the decision as to whether or not an instrument can be verified.

The test results are estimates, i.e. their values are associated with uncertainties and due to them the officer may make incorrect decisions.

The aim of this paper is to investigate these decisions and to make suggestions about how to avoid them. A formula is given for the uncertainty of the errors in the indication of the instrument observed in the weighing test (R 76-1, A.4.4.1). It is used in the study of incorrect decisions and also to judge some of the requirements laid down for verification.

In Section 2 a short note on the verification tests is given. Sections 3 and 4 deal with incorrect decisions. In Section 5 a formula for the uncertainty associated with the results of the weighing test is presented.

2 Notes on verification tests

The flow chart at the bottom of this page shows some of the verification tests and checks for the instruments.

1)	2)	3)
Checks before the tests, e.g. leveling, connection to the power supply and temperature stability	Weighing test where the indications are compared with the values of the test loads (standard weights) - the "true" values of the indications	Repeatability and eccentricity tests where differences between the results of several weighings of the same load are investigated

The test results in 2) must be within the MPEs, *the maximum permissible errors on initial verification* (R 76-1, 3.5), and the differences between the results of the weighings in 3) must meet the permissible differences (R 76-1, 3.6).

3 Uncertainty and a "quality" indicator for verification

3.1 "True" E

For a certain load let E be the error of the instrument obtained in the weighing test and U the value of the uncertainty of that error. The interval E ± U covers the "true" value of E with a "high" confidence level. The "true" value of E is here called the "true" E.

According to the requirements of R 76-1, 3.5 the absolute value of the error E must satisfy the condition

$$|E| \le |MPE|$$

for all the loads. The question is, what is the probability that

$$|\text{“true” } E| \le |MPE|$$

is true when

$$|E| \le |MPE|$$

is met and U takes on different values?

3.2 Probability that |"true" E| ≤ |MPE| is true *)

Case 1: U ≤ 1/3 × |MPE|

If $|E| \le 2/3 \times |MPE|$ and $U \le 1/3 \times |MPE|$, then substituting these values for E and U in E ± U (which includes the "true" E) it is easy to see that $|\text{“true” } E| \le |MPE|$ is true.

*) A similar discussion of this subject is given in the author's paper "Calibration of Weighing Instruments and Uncertainty of Calibration", OIML Bulletin, October 2001.

In general, if $|E| \leq |MPE|$ and $U \leq 1/3 \times |MPE|$, the probability P that $|\text{"true" } E| \leq |MPE|$ is true is approximated by the fraction

$$|MPE| / (|MPE| + 1/3 \times |MPE|).$$

Now $|MPE|$ is half the length of the interval where the "true" E should be and

$$|MPE| + 1/3 \times |MPE|$$

that where it is. If $U < 1/3 \times |MPE|$, P is greater than the fraction and if $U = 1/3 \times |MPE|$, P equals the fraction. So:

$$P \geq |MPE| / (|MPE| + 1/3 \times |MPE|) =$$
$$= |MPE| / (4/3 \times |MPE|) = 75\ \%$$

Case 2: $U < |MPE|$

$U = k \times |MPE|$ ($k < 1$). In a similar way as in Case 1 the probability P that $|\text{"true" } E| \leq |MPE|$ is true is:

$$P = |MPE| / (|MPE| + k \times |MPE|) =$$
$$= 1 / (1 + k) > 50\ \%\ (k < 1)$$

Example:

Let the observed E be

$$E = +\ 0.4 \times |MPE|.$$

If k = 0.9, then the "true" E is in the interval

$$E \pm 0.9 \times |MPE|\ \text{(its length is } 1.8 \times |MPE|).$$

In order for the condition

$$|\text{"true" } E| \leq |MPE|$$

to be true, the "true" E should be in the interval

$$\text{from } -0.5 \times |MPE| \text{ to } |MPE|$$

the length of which is $1.5 \times |MPE|$. Thus $P = 1.5 \times |MPE| / (1.8 \times |MPE|) \approx 83\ \%$.

Case 3: $U \geq |MPE|$

$U = k \times |MPE|$ ($k \geq 1$). The probability P that $|\text{"true" } E| \leq$ MPE is true is:

$$P = |MPE| / (|MPE| + k \times |MPE|) =$$
$$= 1 / (1 + k) \leq 50\ \%\ (k \geq 1)$$

On the basis of the previous cases one can draw the conclusion that the smaller the value U assumes, the better the chances are that $|\text{"true" } E| \leq |MPE|$ is true when $|E| \leq |MPE|$.

3.3 "Quality" indicator U

If $U < |MPE|$ ($P > 50\ \%$), the quality of the verification is here regarded as good enough. Obviously values of

$$U \leq 1/3 \times |MPE|\ (P \geq 75\ \%)$$

are ideal but may sometimes be difficult to achieve. Practical conditions for $U < |MPE|$ are given in 5.3.2 and for $U \leq 1/3 \times |MPE|$ in 5.3.3.

If $U \geq |MPE|$ ($P \leq 50\ \%$), the values of U should be reduced by having the instrument serviced and adjusted. As stated in 5.3.2 the adjustment should primarily aim to reduce the eccentric errors and the repeatability error, if possible. The intention is: $U < |MPE|$.

4 Type I and II errors and OC-curves

4.1 Type I and II errors

Consider "Type I" in Figure 1 where the observed E (3.1) is E > +MPE. If the "true" E in the interval E ± U is "true" E < +MPE, it complies with the requirements (a "good" result). However, the observed E is E > +MPE and does not comply with the requirements. Because E is the basis for decision, a Type I error is committed (the "good" result cannot accepted).

Consider "Type II" in Figure 1 where E < +MPE. If the "true" E in the interval E ± U is "true" E > +MPE, it does not comply with the requirements (a "poor" result). However, the observed E is E < +MPE and complies with the requirements. Because E is the basis for decision, a Type II error is committed (the "poor" result is accepted).

Type I and II errors can also be brought about by some defects in the tests (Section 2). For example:

A) If in the eccentricity test the variations in the zero point are not taken into account accurately enough before the test load is applied to the different positions on the load receptor, then the results of the test may be misleading and the decisions made on their basis may be incorrect.

B) Suppose that the errors of the indications obtained in the weighing test vary in a non-linear way and that they are within the MPEs. However, the errors of the net values may exceed the MPEs. If in this case the errors of the net values are not investigated as they should be, an instrument not complying with the requirements might be verified and a Type II error is committed.

4.2 OC-curves

In the following the effect of Type I and II errors is illustrated with the aid of OC-curves (see textbooks dealing with statistical quality control) showing the probability that the instrument is verified.

4.2.1 Ideal OC-curve

Let us deal with an imaginary case where E is within the MPEs but U equals zero. Thus the observed E equals the "true" E. It is thus possible to perform the verification without the effect of Type I and II errors. This is illustrated by the ideal OC-curve in Figure 2.

4.2.2 Actual OC-curve

In real situations the uncertainty associated with the observed E differs from zero. When this E is used to investigate whether or not the condition |E| ≤ |MPE| (3.1) is met, incorrect decisions can be made due to Type I and II errors as explained in 4.1.

Consider Figure 3 where two example OC-curves are shown. Their ordinates show the probability P that the instrument is verified. Now let a Type I error mean that a "good" instrument (all the "true" E values are within the MPEs) is not verified and a Type II error that a "poor" instrument (all the "true" E values are not within the MPEs) is verified.

In order to avoid these errors P should be as large as possible when |"true" E | ≤ |MPE| and as small as possible when |"true" E | > |MPE|.

Curve a) in Figure 3

Type I errors may be committed because P < 1 for the values of |"true" E | which are just below |MPE |. So "good" instruments may sometimes not be verified. If the |"true" E | is "small" or near zero, then P ≈ 1 and Type I errors can very likely be avoided.

Type II errors can be committed because P > 0 for the values of |"true" E | which are slightly greater than |MPE |. So a "poor" instrument may be verified, although in this case quite rarely. P decreases as |"true" E | increases and assumes zero if |"true" E | is great enough. So the chances of Type II errors gradually decrease as |"true" E |increases.

Curve a) is considered to be a good fit to the step curve (the ideal OC-curve). The fit is better the smaller the values U assumes. On the other hand, the better the fit the more unlikely Type I and Type II errors are.

Curve b) in Figure 3

For the values of | "true" E | which are slightly smaller than |MPE |, P assumes values zero. So Type I errors are very likely and "good" instruments are in practice not verified. However, if | "true" E | is near zero, P ≈ 1 and the very "good" instruments (|"true" E |≈ 0) can be verified.

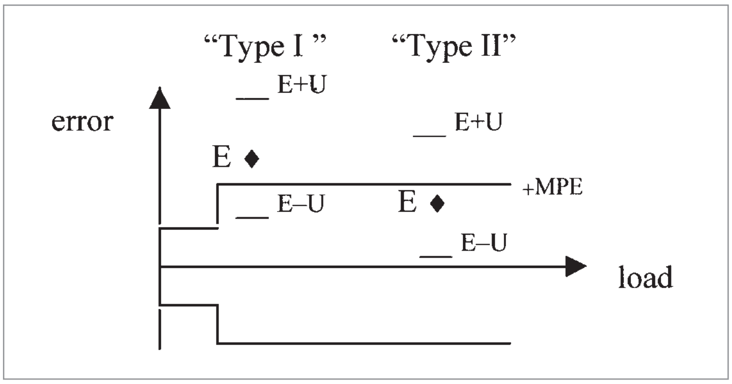

Figure 1

"Type I": Let the "true" E be < +MPE. Decisions are made according to the observed E which is E > +MPE. So a Type I error is committed.

"Type II": Let the "true" E be > +MPE. Decisions are made according to the observed error E which is E < +MPE. So a Type II error is committed.

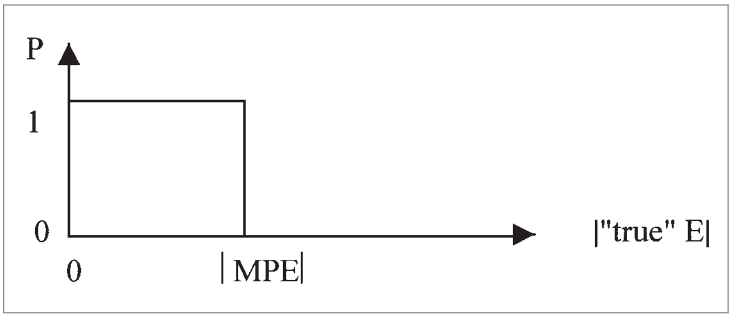

Figure 2

If |"true" E| ≤ | MPE | (U = 0), the probability P that the instrument is verified is 1.

If |"true" E| > | MPE|, the probability is 0.

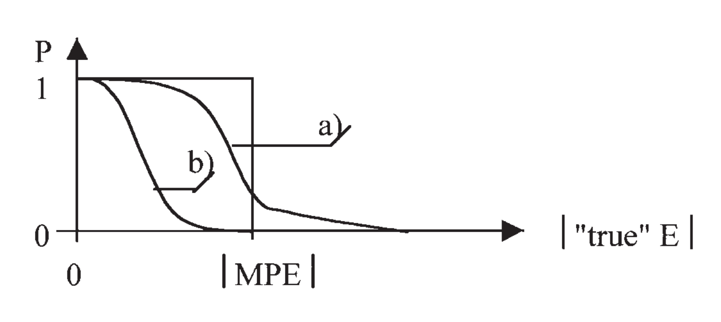

Figure 3

If |"true" E| ≤ | MPE| (U > 0), the probability P (curve a) that the instrument is verified is ≤ 1. Only if the values of |"true" E| are near zero, then P = 1.

If |"true" E| > | MPE|, P (curve a) is > 0 and cannot be 0 until the values of |"true" E| are great enough. The fit of curve a) to the step curve (the ideal OC-curve) is quite good but that of curve b) is not.

Type II errors are practically impossible and "poor" instruments are not likely to be verified at all. This is achieved at the expense of committing Type I errors.

Curve b) could represent a situation where instead of |E| ≤ |MPE| the requirement |E ± U| ≤ |MPE| is applied to verification. The fit of curve b) to the step curve is considered to be very poor.

5 Practical evaluation of the uncertainty and requirements

5.1 Formula for U

The uncertainty U associated with the errors E (3.1) obtained in the weighing test is evaluated here with the aid of the following formula for U:

$$U = 2r\,[(k_n\,R)^2 + u^2 + (0.4\,\Delta)^2]^{1/2}$$

Where: *)

R is the repeatability, i.e., the difference between the largest and the smallest results in the repeatability test. The test load is the largest load used in the test. Frequently, it is near Max (R 76-1. A.4.10).

k_n R is the standard deviation of the results of the repeatability test. k_n assumes the following values according to the number n (n ≥ 3) of results in the test:
k_3 = 0.591, k_4 = 0.486, k_5 = 0.430, k_6 = 0.395,
k_7 = 0.370, k_8 = 0.350, k_9 = 0.337, k_{10} = 0.325.

u is the standard deviation of the errors of the verified weights used. u = 0.4 × (the sum of the |mpe|s of the weights for the load which corresponds to the load used in the repeatability test).

Δ is the greatest eccentric error noted in the eccentricity test (R 76-1, A.4.7). Frequently, the test load is 1/3 × |MPE| of the instrument. If Δ is less than or equal to the smaller of |Δ| < |MPE| or |Δ| < e for the load used in the test, set Δ = 0 in U. In this case the errors in the weighing test can be regarded as independent of the positions of the weights on the load receptor. Otherwise, Δ ≠ 0 and 0.4|Δ| is the standard deviation of the errors brought about by the eccentric positions of the weights on the load receptor during the weighing test.

r is a coefficient and assumes the values 0.3, 0.4, 0.7 and 1 which are associated with the values of the MPEs of the instrument as given in Table 1. r is used to evaluate U for the loads where the MPEs take on the different values ± 0.5 e, ± 1 e and ± 1.5 e **or** ± 0.5 e and ± 1 e **or** only ± 0.5 e.

The formula for U can be used if:

A) digital rounding errors included in digital indications are eliminated (R 76-1, 3.5.3.2),

B) readings of the indications are unambiguous (R 76-1, 4.2.1),

C) the verification is performed at a steady ambient temperature (R 76-1, A.4.1.2),

D) verified weights are used in the verification, and

E) the buoyancy effect of the air density on weights does not need to be taken into account (note that this effect should also be considered on the load measuring device (load cell) and the load receptor).

5.2 Determination of U

The values of k_n R, u and Δ are determined as mentioned in 5.1 and are inserted in the formula for U. Thereafter, according to r (Table 1) the values of U are sequentially evaluated for the loads where the MPEs take on the different values.

*) Explanations of k_n R, u, Δ and r are presented in the author's paper "Calibration of Weighing Instruments and Uncertainty of Calibration", OIML Bulletin, October 2001.

For example, let the instrument be of class III and Max/e = n = 2000. Thus the MPEs assume the values ± 0.5 e and ± 1 e. U is as follows:

$$U = 2 \times 0.4 \times [(k_n\ R)^2 + u^2 + (0.4\ \Delta)^2]^{1/2}$$

for the loads where

$$MPE = \pm 0.5\ e\ (r = 0.4)$$

$U = 2 \times [(k_n\ R)^2 + u^2 + (0.4\ \Delta)^2]^{1/2}$ for the loads where

$$MPE = \pm 1\ e\ (r = 1).$$

5.3 Requirements and values of U

5.3.1 Values of U expressed in terms of e

Let us deal with instruments with MPEs which take on the values ± 0.5 e and ± 1 e.

According to the requirements of R 76-1 the values of R, u and Δ could be as follows:

- R can be at most e, if the test load is near Max. The number of weighings is supposed to be six. So $k_6 = 0.395$ and $k_6\ R \approx 0.4\ e$ (R 76-1, 3.6.1 and 8.3.3).
- In order to obtain u, calculate the sum of the |mpe|s of the weights Σ|mpe| for the test load used for R. So according to u in 5.1 and R 76-1, 3.7.1, $u = 0.4 \times \Sigma|mpe| \le 0.4 \times 1/3 \times |MPE| = 0.4 \times 1/3\ e$ because |MPE| = e of the instrument for the load in question.
- The value of |Δ| can be at most e (R 76-1, 3.6.2).

Table 1 Coefficient r

The values of r associated with the values of the MPEs for the instrument.			
MPE:	±0.5 e	± 1 e	± 1.5 e
r:	0.3	0.7	1
r:	0.4	1	-
r:	1	-	-

Insert these greatest values for k_n R, u and Δ in U. Thus, the value of U for the loads for which MPE = ± 0.5 e (r = 0.4) is:

$$U = 2r[(k_n\ R)^2 + u^2 + (0.4\ \Delta)^2]^{1/2} =$$
$$= 2 \times 0.4 \times [(0.4\ e)^2 + (0.4 \times 1/3\ e)^2 + (0.4\ e)^2]^{1/2} =$$
$$= 2 \times 0.4 \times 0.58\ e \approx 0.46\ e\ (U \approx |MPE|)$$

The value of U for the loads for which MPE = ±1 e (r = 1) is:

$$U = 2r[(k_n\ R)^2 + u^2 + (0.4\ \Delta)^2]^{1/2} =$$
$$= 2 \times [(0.4\ e)^2 + (0.4 \times 1/3\ e)^2 + (0.4\ e)^2]^{1/2}$$
$$= 2 \times 0.58\ e \approx 1.2\ e\ (U > |MPE|)$$

In a similar way the values of U can be approximated if the MPEs of the instrument assume the values ± 0.5 e, ± 1 e and ± 1.5 e or only ± 0.5 e.

5.3.2 Conditions for U < |MPE| and suggestions for R, Δ and errors of the weights

In order to arrive at values of U which are smaller than |MPE| (see 3.2 and 3.3), the following values are suggested for R, Δ and the errors of the weights:

- R should be R < |MPE| or R < e for the applied test load, whichever is smaller. The number n of weighings in the repeatability test should be n ≥ 5 (the values of k_n (5.1) are quite stable for these values of n and thus the information from the test could be good enough).
- |Δ| should be |Δ| < |MPE| or |Δ| < e for the applied test load, whichever is smaller. In this case set Δ = 0 in U.
- The weights for the weighing test should, if possible, be selected so that their errors are not greater than 1/5 (instead of 1/3) of the |MPE| of the instrument for the applied load.

5.3.3 Conditions for U ≤ 1/3 × |MPE|

If U should be U ≤ 1/3 × |MPE| and the MPEs assume the values ± 0.5 e and ± 1 e, then R should be R ≤ 0.35 e for the applied test load while Δ is as given in 5.3.2. The weights should preferably be selected so that their errors are at most 1/5 (instead of 1/3) of the |MPE| for the applied load.

If U should be U ≤ 1/3 × |MPE| and the MPEs take on the values ± 0.5 e, ± 1 e and ± 1.5 e, R should be R < 0.55 for the applied test load, Δ is as given in 5.3.2 and 1/5 should be used in the selection of the weights. However, if the weights are selected using 1/3, R should be R < 0.4 e for the applied test load while Δ is as given in 5.3.2. ■

References

OIML Recommendation R 76-1: *Non-automatic weighing instruments. Part 1: Metrological and technical requirements - Tests* (1992)

Guide to the Expression of Uncertainty in Measurement, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML (1995 corrected and reprinted edition)

UNCERTAINTY

Role of measurement uncertainty in deciding conformance in legal metrology(*)

Klaus-Dieter Sommer and Manfred Kochsiek

Abstract

The method used to decide whether an instrument conforms with the requirements for legal metrology has an important impact on the accuracy that can be subsequently achieved. There are two approaches to deciding on conformity, the classical approach that does not take uncertainty directly into account, and a more modern approach that is consistent with the industrial decision rules for proving conformity with specifications.

On the basis of a consistent mathematical treatment, the consequences of using the different approaches are demonstrated, along with their influence on the uncertainty contribution of verified instruments that are being used.

Introduction

The accuracy of measuring instruments must be consistent with their intended use. ISO 9001: 2000 and ISO / IEC 17025: 2000 standards [1] [2], require that traceability of measuring and test results to national or international standards must be given in order to allow the necessary statements about their metrological quality. The most important methodologies used to ensure that measuring instruments are giving the correct indication are:

- In industrial metrology: regular calibration of the measuring instruments according to the quality system in use; and
- In legal metrology: type testing and periodic verifications of the measuring instruments according to legal regulations.

(*) This article was first published in the Proceedings of the *10th International Metrology Congress* held in Saint Louis, France, from 22–25 October 2001. Reprinted with permission.

Both methodologies are closely related and are based substantially on the same measuring procedures. Over the years, however, they have become established with separate rules and metrological infrastructures, and they aim at different areas of application.

Legal verification of the conformity of measuring instruments is a method of testing covered by legal regulations. It is part of a process of legal metrological control that in many economies requires type evaluation and approval of some types of instruments as a first step.

However, the use of legally verified instruments within the framework of quality management sometimes presents problems, since only the maximum permissible errors (MPE) for the instruments are stated, without the measurement uncertainties being explicitly given. The relationship of legally prescribed error limits and measurement uncertainty is insufficiently understood. The most important concern for the instrument user therefore is the equivalence and relationship of measurement results which have been obtained from verified and from calibrated instruments.

In order to answer this concern, the understanding of the role of measurement uncertainty in deciding conformity plays a central role, along with the estimation of the uncertainty contributions of verified or conformity tested instruments when they are being used.

Verification and measurement uncertainty

Constituents of legal conformity verification

The constituents are:

- Qualitative tests, predominantly for the state of the instrument and the applicable safety requirements;
- Quantitative tests which are consistent with the definition of calibration (see VIM 6.11 [3]);
- Evaluation of the results of the qualitative and quantitative tests to ensure that the legal requirements are being met; and
- If the evaluation leads to the instrument being accepted: placing a verification mark on the instrument, and, on request, issuing a certificate.

Measurement uncertainty associated with the results of the quantitative tests

The aim of the quantitative tests is to determine the instrumental errors together with the associated uncertainty of measurement at prescribed testing values. The tests are carried out according to well-established and standardized testing procedures. These procedures are mostly identical to those which are used for calibration in industrial metrology. Following the definition of calibration (see VIM 6.11 [3]), a quantitative test may be considered a calibration. Comparison methods are predominantly used for these tests.

Figure 1 shows the block diagram of a typical comparison of an instrument under test and a standard which, in the given example, is a material measure [3]. The standard reproduces or supplies known values of the measurand X_S.

From the block diagram, the measurement error ΔX of the instrument under test may be described by the equation:

$$\Delta X = X_{INDX} - X_S - \delta X_{CS} - \delta X_P \qquad (1)$$

δX_{CS} is the unknown error of the standard due to an imperfect calibration of the standard itself;

X_{INDX} is the indication of the instrument under test;

δX_P may be the combination of all other unknown measurement errors due to imperfections of the measuring procedure and of the instrument under test.

$$\delta X_P = \delta X_{DS} + \delta X_{PS} + \delta X_{CPL} + \delta X_{PX} + \delta X_{INDX} \qquad (2)$$

Where:

δX_{DS} is the unknown error of the standard due to drift effects;

δX_{PS} is the unknown error of the standard due to its susceptibility to the (incompletely known) environmental conditions;

δX_{CPL} is the unknown error due to the imperfect coupling of the measurand with the instrument under test, e.g. caused by temperature difference, pressure loss, electrical mismatch, etc.;

δX_{PX} is the unknown error due to the imperfection of the instrument under test and its susceptibility to the (incompletely known) environmental conditions;

δX_{INDX} is the unknown error due to the digital resolution or the need to estimate an analogue reading.

The expectation of the measurement error $E[\Delta X] = \Delta x$ is:

$$\Delta x = E[X_{INDX}] - E[X_S] - E[\delta X_{CS}] - E[\delta X_P] \qquad (3)$$

where the capital E symbolizes the expectation value of the respective quantity in brackets.

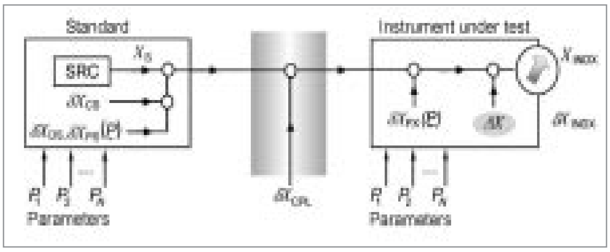

Fig. 1 Comparison method for quantitative testing and calibration using a material measure [3] as a standard. SRC - source of the quantity X_S; other quantities - see text

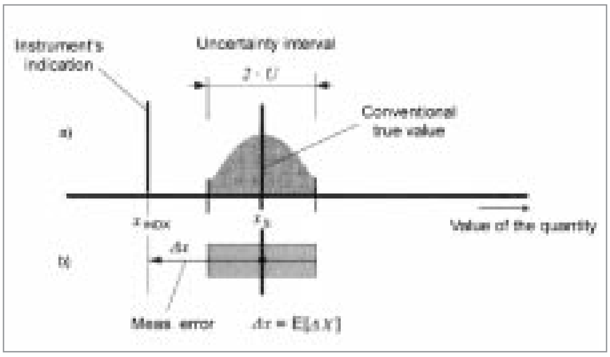

Fig. 2 Calibration result: Illustration of the relationship between the expected value of the measurement error, Δx, and the associated (expanded) uncertainty, U, $U = k \cdot u(\Delta x)$ [5]

a) when stating the conventional true value together with the indicated value,

b) when stating the conventional true value or the indicated value together with the error Δx.

Assuming that all quantities are independent, the square of the standard uncertainty associated with the expectation value of the measurement error can be calculated by:

$$u^2(\Delta x) = u^2(\delta x_{CS}) + u^2(\delta x_{DS}) + u^2(\delta x_{PS}) + u^2(\delta x_{CPL}) + u^2(\delta x_{PX}) + u^2(\delta x_{INDX}) \qquad (4)$$

The uncertainty contribution $u(\delta x_{CS})$ can be derived from the uncertainty statement given on the calibration certificate of the standard, and the contribution $u(\delta x_{DS})$ from the existing knowledge about its long-term stability. All other contributions can be estimated from the knowledge about the quantitative test or calibration.

Figure 2 illustrates the relationship between the expected value of the measurement error and the associated (expanded) uncertainty of measurement U when presenting a (single) calibration result.

Equation (4) demonstrates the key problems associated with calibrations:

- The result is valid only for the moment of calibration.
- The result is valid only for the specific calibration conditions.

- The result and, therefore, the quality of dissemination of a physical unit, depend on the performance of the individual instrument under test.

It must be accepted that instruments are often used in environments that are different from the calibration or test conditions.

Therefore, the measurement uncertainty that has been evaluated for laboratory conditions will often be exceeded if the instrument is susceptible to environmental influences. A problem can also arise if the instrument's performance degrades with prolonged use. The instrument user must, therefore, consider all these problems on the basis of his technical knowledge.

Assessment of compliance in legal metrology

Specification limits and uncertainty of measurement

If an instrument is tested for conformity with a given specification or to check that it meets a requirement with regard to error limits, this test consists of comparisons of the calibration results, that give the measurement errors, with the specified values and limits respectively. The uncertainty of measurement associated with the calibration result (see Fig. 2 and equation (4)) inevitably then becomes an uncertainty of the conformity decision. Measurement results affected by measurement errors lying close to prescribed error limits, MPE_- and MPE_+, cannot definitely be regarded as being, or not being, in conformance with the given tolerance requirement. Figure 3 (taken from the standard ISO 14253-1 [4]) makes this problem quite clear: apparently, between the conformance zone and the upper and lower

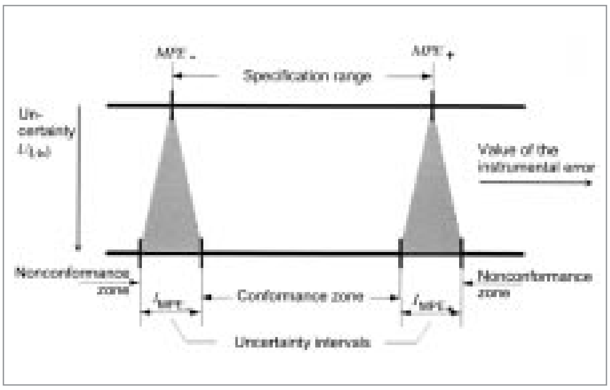

Fig. 3 Specification and measurement uncertainty, $U(\Delta x)$, which is associated with the value of the measurement error, Δx, according to ISO 14253-1 [4].

I_{MPE-} and I_{MPE+} are the lower / upper uncertainty intervals (see text)

nonconformance zones there are uncertainty intervals that are also called zones of ambiguity. The uncertainty intervals are defined by:

$I_{MPE-} = [MPE_- - U; MPE_- + U]$ and

$I_{MPE+} = [MPE_+ - U; MPE_+ + U]$.

According to the explanation of the expanded uncertainty of measurement given in the *Guide to the expression of uncertainty in measurement* (GUM) [5], it can be expected that values lying outside the uncertainty intervals, can be assigned with a high probability, either to the conformance or to the nonconformance zones. When instruments are bought and sold, this conclusion forms the basis for demonstrating conformity or nonconformity.

Decision criteria

Classical approach of legal metrology

The classical approach of legal verification does not take measurement uncertainty directly into consideration. Measuring instruments are normally considered to comply with the MPE requirement if they meet the following criteria:

(a) The value of the instrumental error of the instrument under test is found to be equal to or less than the value of the prescribed maximum permissible error on verification (MPE):

$$|\Delta x| \le MPE \qquad (5)$$

(b) The expanded uncertainty of measurement associated with the value of the measurement error, for a coverage probability of 95 %, is small compared with the legally prescribed error limits.

In verification, the expanded uncertainty of measurement U_{95} is usually considered to be small enough if it does not exceed 1/3 of the value of the respective error limit:

$$U_{95} \le U_{max} = 1/3 \cdot MPE \qquad (6)$$

where U_{max} is the maximum acceptable value of the expanded uncertainty of measurement associated with the value of the measurement error.

On type testing, the maximum acceptable value of the expanded uncertainty of measurement is reduced to:

$$U_{95type} \le U_{maxtype} = 1/5 \cdot MPE \qquad (6a)$$

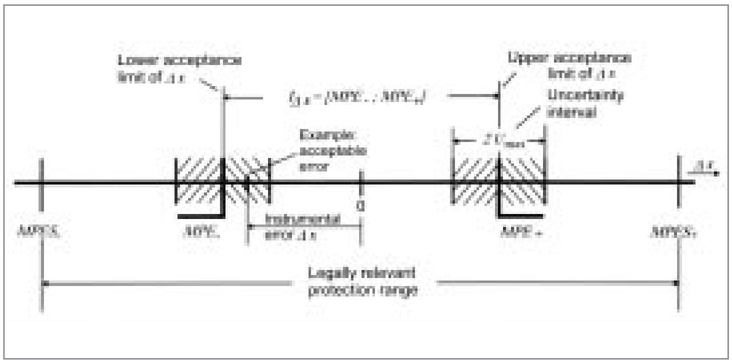

Fig. 4 Illustration of the decision criteria according to the classical verification approach.
MPE_- and MPE_+ are the lower / upper maximum permissible errors on verification;
$MPES_-$ and $MPES_+$ are the lower / upper maximum permissible errors in service;
Δx value of the instrumental error;
$I_{\Delta x}$ error acceptance interval;
U_{max} see equation (6)

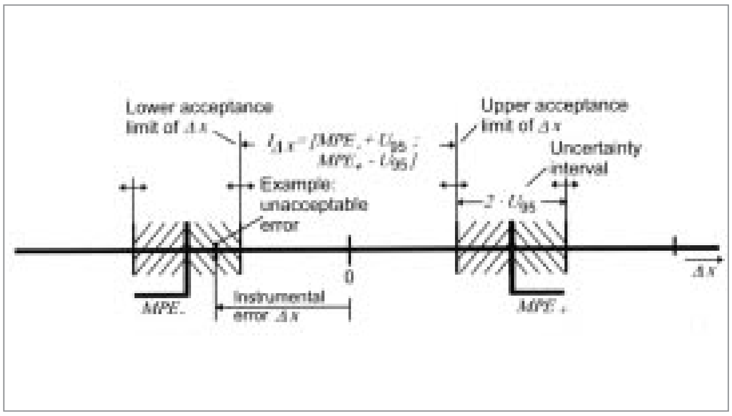

Fig. 5 Illustration of the decision criteria according to the modern approach of evaluating conformity.
MPE_- and MPE_+ are the lower / upper maximum permissible errors on verification;
Δx value of the instrumental error;
$I_{\Delta x}$ error acceptance interval;
U_{95} actual expanded uncertainty of measurement associated with Δx

The decision criteria for verification are illustrated in Fig. 4. The legally prescribed error limits, MPE_- and MPE_+, are equal to the acceptance limits of the instrumental error Δx.

Because of the associated uncertainty, which may extend up to the value U_{max}, it can be expected that, in the worst case, the given error limits on verification will be exceeded by the value of U_{max}, i.e. by 33 % (see equation (6)).

It should be noted that in many economies with developed legal metrology systems, a second kind of error limits has been defined: the maximum permissible errors in service (MPES). These are normally twice the maximum permissible errors on verification. For the instrument user, the maximum permissible errors in service are the error limits that are legally relevant [6]. Therefore, there is only a negligible risk in the sense that no measured value under verification, even if the measurement uncertainty is taken into account, will be outside the tolerance band which is given by the error limits in service (see Fig. 4).

Modern approach to deciding on conformity

In today's metrology, another approach is widely used too. In the regulated area, it is applied to testing of working standards, e.g. weights [7]. This approach is consistent with the prescribed procedures for statements of conformance of calibration results in industrial metrology [8] and with the decision rules given to ISO 14253-1 [4].

Here, instruments are considered to comply with a given specification or with the legal requirements for error limits if they meet the following criteria:

(a) The value of the instrumental error Δx of the instrument under test is found to be equal to or less than the difference between the value of the prescribed error limits, MPE, and the actual expanded uncertainty of measurement, U_{95}:

$$|\Delta x| \leq MPE - U_{95} \qquad (7)$$

where U_{95} is the actual expanded uncertainty of measurement associated with the value of the instrumental error Δx.

(b) The expanded uncertainty of measurement associated with the value of the instrumental error, for a coverage probability of 95 %, is small compared with the prescribed error limits.

When verifying weights [7], the expanded uncertainty of measurement, U_{95}, is usually considered to be small enough if it does not exceed 1/3 of the respective error limit. Therefore, equation (6) also applies.

In practice, this means that with respect to measurement errors, Δx, an acceptance interval is defined that is significantly reduced when compared with the range between the prescribed error limits. The magnitude of this interval may be defined by:

$$[MPE_- + U_{95};\ MPE_+ - U_{95}].$$

This approach is illustrated in Fig. 5.

This approach ensures that there is a high probability that the prescribed error limits are hardly ever exceeded. But, when compared with the classical approach of legal metrology, its practical result is a reduction in the given error limits. Due to the commercial impact of such a *de-facto* reduction, common use in legal metrology seems to be unlikely.

Furthermore, it should be noted that, according to equation (7), the acceptance limits of the error value Δx depend on the value obtained for the expanded uncertainty U_{95} by the performing laboratory. This means that the acceptance limits are not constant, but may vary depending on the competence of the laboratory.

Use of legally verified instruments

In practice, it is often necessary or desirable to determine the uncertainty of measurements that are carried out using legally verified instruments.

The uncertainty of measurement attributed to the measurand is to be estimated according to the GUM [5]. Figure 6 shows the block diagram of a typical direct measurement for which the following equation can be derived:

$$Y = X_{IND} - \delta X_M - X_{Delta} \tag{8}$$

Where:

- Y is the measurand, X_{IND} the indication of the measuring instrument;
- δX_M represents a combined unknown measurement error that comprises all unknown measurement errors due to the imperfection of the measurement procedure and of the measuring instrument in use; and
- X_{Delta} is the output quantity either from the instrument's verification or from a calibration.

As an aid to understanding, the uncertainty contribution of a calibrated instrument may first be evaluated. In this case, the output quantity X_{Delta} of the previous calibration of the instrument is the measurement error, and equation (8) becomes:

$$Y = X_{IND} - \delta X_M - \Delta X \tag{8a}$$

δX_M comprises the result of at least the following error sources (see Fig. 6):

- δX_{PM} the susceptibility of the instrument to environmental conditions and incomplete knowledge of the actual operating conditions;
- δX_{DM} instrument drift;
- δX_{CPLY} imperfect coupling of the measurand to the instrument; and
- δX_{INDM} digital resolution or errors in reading the indication.

From equation (8a), the expectation value of the measurand becomes:

$$y = \mathrm{E}[Y] = \mathrm{E}[X_{INDM}] - \mathrm{E}[\Delta X] - \mathrm{E}[\delta X_M] \tag{9}$$

The following standard uncertainty may be attributed to the value of the measurand:

$$u(y) = \sqrt{u^2(\delta x_M) + u^2(\Delta x)} \tag{10}$$

Both contributions can be assumed to be independent of each other. The contribution $u(\Delta x)$ and the value Δx are known from the result of the previous calibration. The contribution $u(\delta x_M)$ must be estimated on the basis of existing knowledge about the measurement.

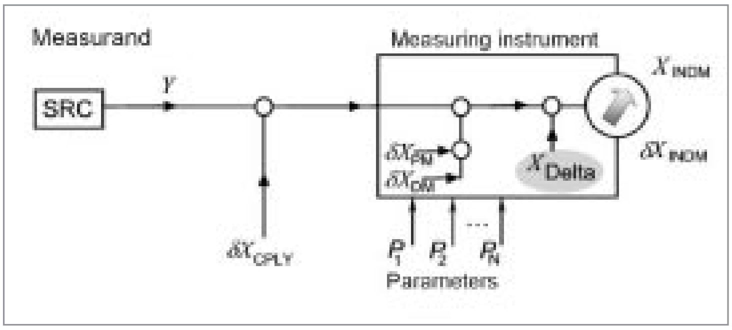

Fig. 6 Direct measurement of the quantity Y (measurand).
SRC is the source of the measurand; other quantities - see text

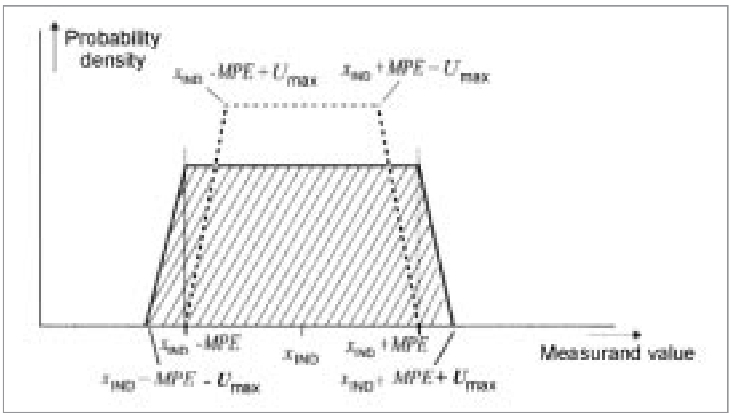

Fig. 7 Suggested probability distributions for evaluating the standard uncertainty contributions of verified measuring instruments.

Plot a: for the classical verification approach;
Plot b: for the modern approach.

MPE value of the maximum permissible errors;
x_{IND} indicated value;
U_{max} see equation (6).

In the case of a verified or conformity tested instrument, only the positive statement of conformity, the legally prescribed error limits and the decision criteria are known. With regard to the quantity X_{Delta} (see equation (8)), the following is known:

- Classical verification approach to deciding on conformity:

  $|\Delta x| \leq MPE$ and $U_{max} = MPE / 3$

- Modern approach to deciding on conformity:

  $|\Delta x| \leq MPE - U_{95}$ and $U_{max} = MPE / 3$

In both cases, the quantity X_{Delta} (see equation (8)) may be understood as an unknown measurement error, δX_{Delta}, inside the above given limits.

For verified instruments, equation (10) becomes:

$$u(y) = \sqrt{u^2(\delta x_M) + u^2(\delta x_{Delta})} \qquad (10a)$$

The contribution $u(\delta x_M)$ must be estimated in the same way as for calibrated instruments.

$u(\delta x_{Delta})$ can be estimated on the basis of the following knowledge:

- Indications in the ranges of values

  $[y - MPE; y + MPE]$, for the classical approach,

or

  $[y - MPE + U_{max}; y + MPE - U_{max}]$, for the modern approach, can be assumed to be equally probable.

- The probability of indications beyond these intervals declines in proportion to the increase in distance from these limits. Indications outside the intervals $[y - MPE - U_{max}; y + MPE + U_{max}]$, for the classical approach, and $[y - MPE; y + MPE]$, for the new approach, are unlikely.

This knowledge corresponds more or less to a trapezoidal probability distribution as shown in Fig. 7.

Therefore, the uncertainty contribution of newly verified measuring instruments may be estimated by

$$u(\delta x_{Delta}) = a \cdot \sqrt{(1 + \beta^2) / 6} \qquad [5] \qquad (11)$$

Where:

for the classical approach,
$a = U_{max} + MPE; \beta = 0.7\overline{5}$, and,

for the modern approach,
$a = MPE; \beta = 0.60 \ldots 0.80$.

As a result we obtain $u(\delta x_{Delta}) \approx 0.7 \cdot MPE$ (classical approach) and $\approx 0.5 \cdot MPE$ (modern approach).

It should be emphasized that in comparison with calibration results, simplicity and confidence in conformity statements which are provided to the instrument user must be "bought" by keeping a considerable "error reserve". This "error reserve" corresponds to the ratio of maximum permissible errors to the maximum acceptable expanded uncertainty. It also depends on the methodology used to consider the measurement uncertainty.

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Acknowledgement: *The authors wish to thank Charles D. Ehrlich (NIST, USA) for useful discussions.*

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CUBA

Regulations for the metrological control of measuring instruments in the Republic of Cuba

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This paper was presented at the 13th International Fair of Medical Techniques "Health For All" held in Havana, Cuba, on April 23–27, 2001.

Although still considered a developing economy, Cuba is recognized by many countries as being an authority in the medical domain on account of a number of factors:

- Its success with the educational program for training medical, paramedical and electro-medical service personnel;
- The progress made in creating teaching and health-care units;
- The introduction of free national medical and hospital care; and
- The existence of health indicators which are comparable to (and in some cases better than) those of developed countries.

The concept of *medical authority* includes not only the above elements, but also the assurance that both imported and domestic equipment used within the national health system operate in a safe and reliable way.

Medical equipment, many of which are in fact measuring instruments, plays an important role within the national health system since many of the parameters used as supports for clinical diagnosis are obtained as a result of measuring processes. It is not hard to imagine the negative impact of a measurement result intended to be used for a diagnosis or a therapy treatment if the instrument fails to operate correctly. Just by way of example one could mention:

- A lack of accuracy in radiotherapy equipment may lead to harmful radiation emissions or may cause negative effects on a tumor;
- A sphygmomanometer registering unequal figures of maximum and minimum blood pressure values, or showing an error that is outside the maximum permissible values established, has a negative influence on the determination of a patient's blood pressure pattern;
- If the electrical impulse for cardiac muscle stimulation is not properly quantified, an energy value lower or higher than the correct one is likely to be applied, thus paving the way for alterations in the impulse and irreversible damage being done to the patient.

In brief, the essence of safety and reliability in the use of medical equipment lies in the assurance of its correct performance and the accuracy of its measurements, aspects contained within the object of study of the metrological science and, particularly, of the activities related to metrological control.

Each country takes care of the coordinated development of these aspects depending on its own (state or non-state) metrological activity. In this regard, the Cuban government is responsible for ensuring the correct operation of the said metrological infrastructure to protect the population, but the factors that contribute to the design, development, manufacture, import, marketing and ultimate use of measuring instruments - in the present case medical instruments - are also involved.

Cuba's level of development in medical equipment production and the fact that the majority of this equipment is currently imported triggered the decision to create and develop a methodological, organizational and scientific-technical infrastructure which allows the trueness of the technical, metrological and safety-related characteristics stated by the manufacturers to be assessed.

Testing also provides information about:

- The technical level of the equipment according to modern-day technological developments;
- The behavior with regards to external influence quantities;
- The possibility to carry out metrological control of the equipment; and
- The facilities for the maintenance and repair activities, among others.

The main objective is clearly to ensure the highest possible level of product quality and to this end the OIML, with its 107 Members (among which Cuba, one of the founders) attempts to guarantee a proper credibility level concerning test results and thus facilitate international harmonization of regulations and metrological controls applied by national metrology services, promote international cooperation and contribute to the elimination of technical barriers to trade. A significant role is played therein by OIML D 19

Pattern Evaluation and Pattern Approval, adopted by Cuba and discussed in further detail later on.

Decree-Law 183 on Metrology, which came into force in Cuba as of July 2, 1998, contains two chapters directly linked to our object of study:

Chapter VI: On metrological control; and

Chapter VII: On the manufacture, repair and sale of measuring instruments.

Metrological control

Metrological control addresses measuring instruments and methods as well as the conditions under which the results are obtained, expressed and used. Measuring instruments in use or to be used in specified regulatory measurements are subject to metrological control, including:

- Standard instruments used in the verification and calibration of measuring instruments;
- Instruments used in public health;
- Commercial transactions;
- Environmental protection;
- Technical safety;
- Official registers;
- Instruments used in consumer-related activities; and
- Others of public interest.

Only those measuring instruments that have been submitted to metrological control with satisfactory results can be used.

Any measuring instrument submitted to metrological control that fails to meet the regulatory requirements will be declared unfit for use or sale until it does. If the instrument cannot be conditioned to meet the requirements of this Decree-Law, its provisions will be withdrawn or confiscated, as applicable.

The metrological control of measuring instruments is a group of activities comprising:

- Pattern approval;
- Initial and subsequent verification; and
- Supervision of use.

For the moment, pattern approval and supervision of use (metrological supervision) will be dealt with.

Pattern approval

Pattern approval is regulated in Cuba according to the provisions laid down in:

- NC OIML D 19 (1994) *Pattern Evaluation and Approval*, and
- Joint Resolution 1-95 of the Ministry of Economics and Planning and the Ministry of Foreign Trade on *Procedure for Measuring Instrument Pattern Evaluation and Approval*, published in the Official Gazette of the Republic of Cuba, June 28, 1995.

The Normative Document NC OIML D 19 is a general document that contains:

- Introduction;
- Definitions;
- Instruments submitted for pattern approval;
- Procedures for pattern approval;
- Pattern evaluation plan and examination; and
- Pattern approval decision.

The procedure for measuring instrument pattern evaluation and approval is laid down in a separate document with a view to the nationwide implementation of NC OIML D 19, and it contains:

- Evaluation and approval bodies;
- Responsibilities for pattern approval;
- Procedure for pattern approval and evaluation;
- Annex 1: Content of the pattern approval certificate; and
- Annex 2: List of measuring instruments submitted for pattern approval.

In the case of medical science, the list given in Annex 2 includes measuring instruments the legal nature of which refers to measuring the characteristics of human beings and animals, therapy uses, instruments used in chemical, biological and biochemical analyses, identification of biological and chemical substances and species, and definition of contents, concentrations, etc.

This document is mandatory for all state and private entities operating in the country in the development, production, importation, marketing and use of measuring instruments comprised within their scope.

Likewise, it is mandatory for state and private investment entities that import into the country any measuring instruments covered by this procedure. The procedure establishes that:

- Assessment bodies and testing laboratories must meet the requirements laid down in NC ISO 9002 on "Quality management and assurance" and NC ISO/IEC 17025 on "General requirements for the competence of testing and calibration laboratories".
- The assessment bodies are the laboratories located in entities that belong to the system of the National Bureau of Standards, namely the National Metrology Research Institute and the Territorial Metrology Centers. Other laboratories outside the system of the

National Bureau of Standards may be used provided they meet the above-mentioned requirements.

- The pattern approval body is the National Bureau of Standards, which has put the National Metrology Research Institute in charge of approving, registering and issuing the certificates.
- The approval body can accept pattern approvals issued by any other country(ies) as long as there are bilateral or regional agreements signed to this end. It can also accept pattern approvals emanating from other competent bodies, after a case-by-case discussion with the applicant.
- Measuring instruments imported before both NC OIML D 19 (1994) and the *Procedure for Measuring Instrument Pattern Evaluation and Approval* came into effect, and put into use in places of strategic economic importance or where a very stringent safety level is required, must remain under the metrological control of the National Bureau of Standards, and their importation is prohibited until they are evaluated and approved.

So far the OIML Technical Committee for Medical Instruments (TC 18), together with other TCs, have issued twelve International Recommendations which are very useful for the evaluation of various types of medical measuring instruments, among which electrocardiographs, electroencephalographs, sphygmomanometers, audiometry equipment, dosimeters, ergometers and clinical thermometers.

Metrological supervision

State inspectors carry out metrological supervision on:

- Production, testing, calibration and verification of measuring instruments;
- Proper use and application of measuring instruments;
- Maintenance, reparation or modification of measuring instruments;
- Production, control and sale of prepacked and prepackaged products; and
- Importation of measuring instruments and prepacked and prepackaged products.

Manufacture, repair and sale of measuring instruments

Decree-Law 183 on Metrology establishes, among others, the following provisions:

- Any measuring instrument importer shall provide, as applicable and together with the final user and other relevant parties, the necessary means for the assembling, use, maintenance and repair of the instruments.

It also points out that:

- Any manufacturer, importer, renter, trader or user of measuring instruments of a new pattern shall ensure that they are included in the block diagram of the corresponding hierarchy. Otherwise, they are responsible for guaranteeing their traceability through the National Metrology Research Institute or the Territorial Metrology Centers.

It is important to underline the fact that Chapter X of this Decree-Law includes the means available for dealing with offences.

Decree-Law 271 of the Executive Committee of the Council of Ministers on “Contravention of regulations established on Metrology, January 10, 2001”, will come into force in the country ninety days after its publication in the Official Gazette of the Republic of Cuba.

Any offences concerning the above regulations will lead to administrative sanctions being taken, in addition to any civil, legal or other liabilities which may arise.

In the event that any of the above offences are imputable to a physical person, he/she will be partially or totally, temporarily or definitively banned from carrying out the specific activity he/she had been authorized to carry out, as applicable. The incumbent will be personally liable in accordance with the relevant contravention.

Finally, as additional information on the level of performance of Cuban metrological control activity regarding pattern evaluation with a view to approval, it can be stated that the Testing Laboratory of the National Metrology Institute ranks among the entities that have offered this service by assessing various types of medical measuring instruments, such as:

- Line of electrocardiographs;
- System for cardiac rhythm recording and processing;
- Baby scales;
- Dosimeter readers;
- Blood pressure monitor; and
- Bone density measurer. ■

OIML technical activities

- **2001 Review**
- **2002 Forecasts**

Activités techniques de l'OIML

- **Rapport 2001**
- **Prévisions 2002**

The information given on pages 30–36 is based on 2001 annual reports submitted by OIML secretariats. Work projects are listed for each **active** technical committee and sub-committee that produced and/or circulated a WD or CD during 2001, together with the state of progress at the end of 2001 and projections for 2002, where appropriate.

Les informations données en pages 30–36 sont basées sur les rapports annuels de 2001, fournis par les secrétariats OIML. Les thèmes de travail sont donnés pour chaque comité technique ou sous-comité **actif** qui a produit et/ou distribué un WD ou un CD pendant 2001, avec l'état d'avancement à la fin de 2001 et les prévisions pour 2002, si approprié.

KEY TO ABBREVIATIONS USED

WD — Working draft (Preparatory stage)
Projet de travail (Stade de préparation)

CD — Committee draft (Committee stage)
Projet de comité (Stade de comité)

DR/DD/DV — Draft Recommendation/Document/Vocabulary (Approval stage)
Projet de Recommandation/Document/Vocabulaire (Stade d'approbation)

Vote — CIML postal vote on the draft
Vote postal CIML sur le projet

Approval — Approval or submission to CIML/Conference for approval
Approbation ou présentation pour approbation par CIML/Conférence

R/D/V — International Recommendation/Document/Vocabulary (Publication stage)
For availability: see list of publications
Recommandation/Document/Vocabulaire International (Stade de publication)
Pour disponibilité: voir liste des publications

Postponed — Development of project suspended pending completion of relevant document by other international organization(s)
Développement du projet suspendu en attendant l'achèvement d'un document correspondant par une (d')autre(s) organisation(s) internationale(s)

OIML TECHNICAL ACTIVITIES	2001	2002
TC 2 Units of measurement		
• Amendment* D 2: Legal units of measurement *(harmonized with resolution of 22nd CGPM (Paris, 1999)	WD	1 CD
TC 3 Metrological control		
• Revision D 1: Law on metrology	WD	1 CD
TC 3/SC 1 Pattern approval and verification		
• Initial verification of measuring instruments utilizing the manufacturer's quality system (D 27)	D	-
TC 3/SC 2 Metrological supervision		
• Revision D 9: Principles of metrological supervision	2 CD	3 CD/DD
TC 3/SC 3 Reference materials		
• Revision D 18: General principle of the use of certified reference materials in measurements	Vote	D
TC 3/SC 4 Application of statistical methods		
• Applications of statistical methods for measuring instruments in legal metrology	WD	1 CD
TC 3/SC 5 Conformity assessment		
• Mutual acceptance arrangement on OIML type evaluations	8 CD	DD
• Expression of uncertainty in measurement in legal metrology applications	WD	1 CD
• OIML Certificate System for Measuring Instruments	2 CD	DD/Vote
• OIML procedures for peer review of laboratories to enable mutual acceptance of test results and OIML certificates of conformity	WD	1 CD
• Checklists for issuing authorities and testing laboratories carrying out OIML type evaluations	2 CD	DD
TC 4 Measurement standards and calibration and verification devices		
• Revision D 5: Principles for establishment of hierarchy systems for measuring instruments	1 CD (Questionnaire on revision)	2 CD/DD
• Revision D 6 + D 8: Measurement standards. Requirements and documentation	2 CD	DD/Vote

OIML TECHNICAL ACTIVITIES	2001	2002
• Revision D 10: Guidelines for the determination of calibration intervals of measuring equipment	DD (Developed by ILAC)	DD/Vote
• Principles for selection and expression of metrological characteristics of standards and devices used for calibration and verification	WD	1 CD
TC 5/SC 1 Electronic instruments		
• Revision D 11: General requirements for electronic measuring instruments	WD	1 CD
TC 5/SC 2 Software		
• Software in legal metrology	WD	WD/1 CD
TC 6 Prepackaged products		
• Revision R 87: Net content in packages	2 CD	3 CD/DR
TC 7 Measuring instruments for length and associated quantities		
• Revision R 35: Material measures for length for general use	WD	1 CD
TC 7/SC 1 Measuring instruments for length		
• Revision R 30: End standards of length (gauge blocks)	WD	1 CD
TC 7/SC 3 Measurement of areas		
• Instruments for measuring the areas of leather		WD/1 CD
TC 7/SC 4 Measuring instruments for road traffic		
• Electronic taximeters	WD	1 CD
TC 8 Measurement of quantities of fluids		
• Vessels for public use (Combined revision of: R 4: Volumetric flasks (one mark) in glass; R 29: Capacity serving measures; R 45: Casks and barrels; and R 96: Measuring container bottles)	WD	WD/1 CD

OIML TECHNICAL ACTIVITIES	2001	2002
TC 8/SC 2 Static mass measurement		
• Annex to R 125: Test report format for evaluation of mass measuring systems for liquids in tanks		WD
TC 8/SC 3 Dynamic volume measurement (liquids other than water)		
• Revision R 86: Drum meters for alcohol and their supplementary devices		WD
• Revision R 118: Testing procedures and test report format for pattern evaluation of fuel dispensers for motor vehicles	2 CD	3 CD
• Revision R 117: Measuring systems for liquids other than water (combined with revision R 105)	WD	1 CD
TC 8/SC 4 Dynamic mass measurement (liquids other than water)		
• Revision R 105: Direct mass flow measuring systems for quantities of liquids (with the intention of incorporating R 105 into R 117)	WD	1 CD
TC 8/SC 5 Water meters		
• Water meters intended for the metering of cold water (including requirements for electronic devices) (R 49-1)	-	Amended R 49-1 to be published
• R 49-2: Test procedures	Approval	R
• R 49-3: Test report format	WD	1 CD/2 CD
TC 8/SC 6 Measurement of cryogenic liquids		
• Annex D to R 81: Test report format	R (Publishing delayed)	R
TC 8/SC 7 Gas metering		
• Metering systems for gaseous fuel	2CD	3 CD/DR
• Compressed gaseous fuel measuring systems for vehicles	2 CD	3 CD/DR
TC 8/SC 8 Gas meters		
• Combined revision of R 6, R 31 and R 32	WD	1 CD
TC 9 Instruments for measuring mass and density		
• Revision R 74: Electronic weighing instruments	1 CD	2 CD (Depending on progress of revision D 11)

OIML TECHNICAL ACTIVITIES	2001	2002
TC 9/SC 1 Nonautomatic weighing instruments		
• Amendment to or revision R 76: Nonautomatic weighing instruments		WD
TC 9/SC 2 Automatic weighing instruments		
• Automatic instruments for weighing road vehicles in motion Part A - Total vehicle weighing	Vote	Approval
• Part A - Annex C: Test report format	1 CD	2 CD/DR
• Automatic instruments for weighing road vehicles in motion Part B - Axle weighing	1 CD	2 CD/DR
• Part B - Annex C: Test report format		WD
• Revision R 51: Automatic catchweighing instruments	2 CD	DR/Vote
• Revision R 61: Automatic gravimetric filling instruments	WD	1 CD
TC 9/SC 3 Weights		
• Revision R 111: Weights of accuracy classes E_1, E_2, F_1, F_2, M_1, M_2, M_3 plus test procedures and test report format (including requirements of R 47: Standard weights for testing high capacity weighing machines)	2 CD	DR/vote
• Revision R 33: Conventional value of the result of weighing in air	1 CD	2 CD
TC 9/SC 4 Densities		
• Hierarchy scheme for density measuring instruments	1 CD	2 CD/DR
TC 10/SC 1 Pressure balances		
• Pressure transducers with uniform output signal	2 CD	3 CD/DR
TC 10/SC 2 Pressure gauges with elastic sensing elements		
• Pressure transmitters with elastic sensing elements	1 CD	2 CD
• Revision R 101: Indicating and recording pressure gauges, vacuum gauges and pressure vacuum gauges with elastic sensing elements (ordinary instruments)	2 CD	3 CD
• Revision R 109: Pressure gauges and vacuum gauges with elastic sensing elements (standard instruments)	2 CD	3 CD
TC 10/SC 4 Material testing machines		
• Requirements for force measuring instruments for verifying material testing machines	WD	WD/1 CD

OIML TECHNICAL ACTIVITIES	2001	2002
TC 10/SC 5 Hardness standardized blocks and hardness testing machines		
• Rockwell hardness testing machines (combined revision R 11; R 12; R 36 and R 39)		WD/1 CD
TC 11 Instruments for measuring temperature and associated quantities		
• Revision R 75: Heat meters (Part 1: General requirements; Part 2: Type approval and initial verification tests)	Approval	R
• R 75-3: Heat meters. Test report format		1 CD
TC 11/SC 1 Resistance thermometers		
• Revision R 84: Resistance-thermometer sensors made of platinum, copper or nickel (for industrial and commercial use)	DR	Vote/Approval
TC 11/SC 2 Contact thermometers		
• R 133: Liquid-in-glass thermometers	Approval	R
TC 11/SC 3 Radiation thermometers		
• Revision R 48: Tungsten ribbon lamps for calibration of optical pyrometers	2 CD	DR
• Standard black-body radiator for the temperature range from – 50 °C to 3000 °C	WD	1 CD
TC 12 Instruments for measuring electrical quantities		
• Revision R 46: Active electrical energy meters for direct connection of class 2	WD	WD/1 CD
TC 13 Measuring instruments for acoustics and vibration ***(Secretariat of TC 13 vacant)***		
• Octave-band and fractional octave-band filters (R 130)	R	-
• Revision R 58 and R 88	Waiting for IEC progress	Waiting for IEC progress

OIML TECHNICAL ACTIVITIES	2001	2002
TC 15/SC 2 Measuring instruments for ionizing radiations used in industrial processing		
• Polymethylmethacrylate (PMMA) dosimetry system for measuring ionizing radiations absorbed dose in materials and products (R 131)	R	-
• Alanine (EPR) dosimetry system for measuring ionizing radiations absorbed dose in materials and products (R 132)	R	-
TC 16/SC 1 Air pollution		
• Annex to ISO 3930/OIML R 99: Test report format for the evaluation of instruments for measuring vehicle exhaust emissions	1 CD	2 CD
• Continuous measuring instruments for NO_x emissions	WD	1 CD
• Continuous measuring instruments for SO_2 emissions	WD	1 CD
• Continuous measuring instruments for CO emissions	WD	1 CD
TC 16/SC 2 Water pollution		
• Revision R 100: Atomic absorption spectrometers for measuring metal pollutants in water	WD	1 CD
• Revision R 83: Gas chromatograph/mass spectrometer/data system for analysis of organic pollutants in water	WD	1 CD
• Revision R 116: Inductively coupled plasma atomic emission spectrometers for measurement of metal pollutants in water	WD	1 CD
TC 16/SC 3 Pesticides and other pollutant toxic substances		
• Revision R 82: Gas chromatographs for measuring pollution from pesticides and other toxic substances	1 CD	2 CD
TC 16/SC 4 Field measurements of hazardous (toxic) pollutants		
• Fourier transform infrared spectrometers for measurement of air pollutants	1 CD	2 CD
TC 17/SC 1 Humidity		
• Revision R 59: Moisture meters for cereal grains and oilseeds	WD	1 CD
TC 17/SC 4 Conductometry		
• Revision R 56: Standard solutions reproducing the conductivity of electrolytes	WD	1 CD
• Revision R 68: Calibration method for conductivity cells	WD	1 CD
• Methods of measurement of the conductivity of electrolytic solutions	WD	1 CD

OIML TECHNICAL ACTIVITIES	2001	2002
TC 17/SC 5 Viscometry		
• Reference standard liquids (newtonian viscosity standard for the calibration and verification of viscometers)	WD	1 CD
TC 17/SC 6 Gas analysis		
• Procedures for calibration of mine methanometers	WD	1 CD
• Procedures for calibration of alarms of combustible gases and vapors	WD	1 CD
TC 18/SC 1 Blood pressure instruments		
• Revision R 16: Manometers for instruments for measuring blood pressure (sphygmomanometers) (including Test report format)	Approval	R
Note: 2 draft Recommendations developed and approved: R 16-1: Noninvasive mechanical sphygmomanometers R 16-2: Noninvasive automated sphygmomanometers		
TC 18/SC 2 Medical thermometers		
• Revision R 7: Clinical thermometers, mercury-in-glass with maximum device	WD	1 CD
TC 18/SC 4 Bio-electrical measurements		
• Annex to R 90: Test report format for the evaluation of recording electrocardiographs	3 CD	(BIML proposes to revise R 90)
• Digital electrocardiographs and electrocardioscopes	WD	1 CD
TC 18/SC 5 Measuring instruments for medical laboratories		
• Light absorption spectrometers for medical laboratories	2 CD	3 CD/DR

OIML Certificate System:

Certificates registered 2001.11–2002.01

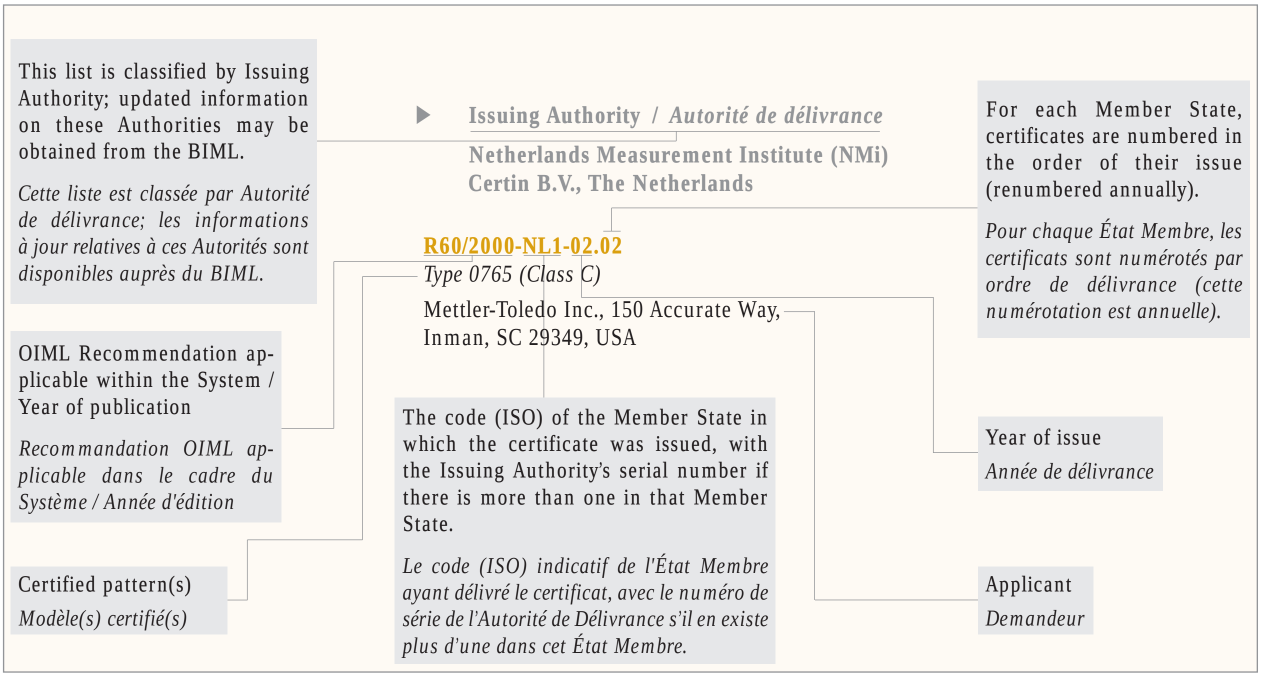
For up to date information: www.oiml.org

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:

Certificats enregistrés 2001.11–2002.01

Pour des informations à jour: www.oiml.org

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. ■

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-98.08 Rev. 1

Dialog 165 and Dialog 165 B with terminal type Dialog 165 V or Dialog 165 G (Class Y(a) or Y(b))

Weber-Waagenbau u. Wägeelektronik GmbH, Boschstraße 7, D-68753 Waghäusel 1, Germany

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R51/1996-GB1-01.01 Rev. 1

Type 8060 (Classes X(1) and Y(a))

Pelcombe Ltd, Main Road, Dovercourt, Harwich, Essex CO12 4LP, United Kingdom

R51/1996-GB1-01.03

Type LM9000 for accuracy classes Y(a) and Y(b)

RDS Technology Ltd, Cirencester Road, Minchinhampton, Stroud, Glous. GL6 9BH, United Kingdom

▶ Issuing Authority / *Autorité de délivrance*

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

R51/1996-NL1-01.01

Type G2200/GS900/G1000 for accuracy classes X(1) and Y(a)

Pelcombe Ltd, Main Road, Dovercourt, Harwich, Essex CO12 4LP, United Kingdom

R51/1996-NL1-02.01

Type DBW for accuracy classes Y(a) and Y(b)

MBS Maschinenfbau Systemtechnik GmbH, Hervester Strasse 58, D-46286 Dorsten, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 60 (2000)

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R60/2000-DE-01.05

MP 40 for accuracy classes D1, C3 and C3 MR

Global Weighing Technologies GmbH, Meiendorfer Str. 205, D-22145 Hamburg, Germany

▶ Issuing Authority / *Autorité de délivrance*

Danish Agency for Development of Trade and Industry, Division of Metrology, Denmark

R60/2000-DK-01.04

Type FLS (Class C)

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

▶ Issuing Authority / *Autorité de délivrance*

Laboratoire National d'Essais
Service Certification et Conformité Technique
Certification Instruments de Mesure, France

R60/2000-FR2-01.01

Types AQ...C.SH5e, AQ...C.SH10e (Class C)

Scaime S.A., Z.I. de Juvigny, B.P. 501, F-74105 Annemasse cedex, France

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R60/2000-GB1-01.02

Single Ended Beam (bending) strain gauge load cell, model G4-TBSP-100 / 250 / 500 / 750 / 1000 (Class C3)

Group Four Transducers Inc., 22 Dear Park Drive, East Longmeadow, MA 01028, USA

Issuing Authority / *Autorité de délivrance*

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

R60/2000-NL1-01.20

Type BCA (Class C)

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

R60/2000-NL1-01.21

Type HBS (Class C)

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

R60/2000-NL1-02.01

Type 3410 (Class C)

Tedea Huntleigh International Ltd., 5a Hatzoran St., Netanya 42506, Israël

R60/2000-NL1-02.02

Type 0765 (Class C)

Mettler-Toledo Inc., 150 Accurate Way, Inman, SC 29349, USA

R60/2000-NL1-02.03

Type 3530 (Class C)

Tedea Huntleigh Europe Ltd., 37 Portmanmoor Road, Cardiff CF24 5HE, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R61/1996-DE-98.01 Rev. 2

Dialog 165 and Dialog 165 B with terminal type Dialog 165 V or Dialog 165 G, accuracy class Ref (0.2)

Weber-Waagenbau u. Wägeelektronik GmbH, Boschstraße 7, D-68753 Waghäusel 1, Germany

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*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R76/1992-DE-00.09 Rev. 3

iso-TEST (Classes I, II, III and IIII)

Sartorius A.G., Weender Landstraße 94-108, D-37075 Göttingen, Germany

R76/1992-DE-01.08

Types BC BL 100, BD BL 200 (Classes I and II)

Sartorius A.G., Weender Landstraße 94-108, D-37075 Göttingen, Germany

Issuing Authority / *Autorité de délivrance*

Danish Agency for Development of Trade and Industry, Division of Metrology, Denmark

R76/1992-DK-01.03

8564 / ScanWIC 8544 / ScanWI 8526 (Class III)

Scanvaegt International A/S, P.O. Pedersens Vej 18, DK-8200 Aarhus N, Denmark

R76/1992-DK-01.04

Type 777 / 778 (Classes III and IIII)

Cardinal Scale Manufacturing Co., 203 East Daugherty St., Webb City, Missouri 64870, USA

Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R76/1992-GB1-01.01

RDS Loadmaster 9000 (Class IIII)

RDS Technology Ltd, Cirencester Road, Minchinhampton, Stroud, Glous. GL6 9BH, United Kingdom

Issuing Authority / *Autorité de délivrance*

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

R76/1992-NL1-01.36
DS-788.. (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.39
Type ASTRA-XT (Class III)
Descom Co., Ltd., 4-12 Wonmi Dong, Wonmi-Ku, Buchon-City, Kyungki-Do 420-110, Rep. of Korea

R76/1992-NL1-01.40
Types TLC-030A, TLC-060(M)A, TLC-120(M)A, TL-150MA (Class III)
Tanita Corporation (Brand names: Tanita, Rhewa, Wunder), 14-2, 1-Chome, Maeno-cho, Itabashi-ku, Tokyo 147-8630, Japan

R76/1992-NL1-01.41
Type ASTRA-XT single-interval and multi-interval (Class III)
Descom Co., Ltd., 4-12 Wonmi Dong, Wonmi-Ku, Buchon-City, Kyungki-Do 420-110, Rep. of Korea

R76/1992-NL1-01.42
Type ASTRA (Class III)
Descom Co., Ltd., 4-12 Wonmi Dong, Wonmi-Ku, Buchon-City, Kyungki-Do 420-110, Rep. of Korea

R76/1992-NL1-01.43
Type DS-788.. (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.44
SM-200... (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.45
Type SM-300... (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.46
Type SM-500... (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.47
PS7.. (Class II)
Mettler-Toledo (Albstadt) GmbH, Unter dem Malesfelden 34, D-72458 Albstadt, Germany

R76/1992-NL1-01.48
DS-520 (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-01.49
K-serie (Class III)
DIBAL S.A., c/ Astintze Kalea, 24, Poligono Industrial Neinver, E-48016 Derio (Bilbao-Vizcaya), Spain

R76/1992-NL1-01.50
Hytech-6200 (Class III)
Hytech Europe BV, Bramenberg 9-a, 3755 BT EEMNES, The Netherlands

R76/1992-NL1-01.51
AMP-series (Class III)
Universal Weight Enterprise Co. Ltd., 2-5 Fl., No. 39 Pao Shing Road, Hsin Tien City, Taipei Hsien 231, Taiwan

R76/1992-NL1-01.52
ASTRA-XT (Class III)
Descom Co., Ltd., 4-12 Wonmi Dong, Wonmi-Ku, Buchon-City, Kyungki-Do 420-110, Rep. of Korea

R76/1992-NL1-01.53
SM-710 (Class III)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, Tokyo 146-8580, Japan

R76/1992-NL1-02.01
ECO (Class III)
Grupo Epelsa, S.L. or EXA, Ctra. Sta. Cruz de Calafell, 35 km. 9,400, E-08830 Sant Boi de Llobregat, Barcelona, Spain

R76/1992-NL1-02.02
HRS (Class III)
Epelsa S.L., C/. Albasanz, 6-8, E-28037 Madrid, Spain

R76/1992-NL1-02.03
6200 , 1500 (Class III)
Hytech Europe BV, Bramenberg 9-a, 3755 BT EEMNES, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 85 (1998)

▸ Issuing Authority / *Autorité de délivrance*

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

R85/1998-NL1-01.12

Model 873 with antenna F08 (accuracy class 2)

Enraf B.V., Röntgenweg 1, 2624 BD Delft, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Discontinuous totalizing automatic weighing instruments (Totalizing hopper weighers)
Instruments de pesage totalisateurs discontinus à fonctionnement automatique (Peseuses totalisatrices à trémie)

R 107 (1997)

▸ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R107/1997-DE-98.01 Rev. 2

Discontinuous totalizing automatic weighing instrument type Dialog 165 (Class 0.2)

Weber-Waagenbau u. Wägeelektronik GmbH, Boschstraße 7, D-68753 Waghäusel 1, Germany

▸ Issuing Authority / *Autorité de délivrance*

Danish Agency for Development of Trade and Industry, Division of Metrology, Denmark

R107/1997-DK-01.01

Type WI 130 DTI for accuracy class 0.2

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

Updated information on OIML certificates:

www.oiml.org

RLMO MEETING ACCOUNTS

- 8th APLMF Meeting
- Meeting of the Regional Groups

12–16 November 2001
Auckland (New Zealand)

Ayako Taniguchi, APLMF Secretariat

Eighth Meeting of the Asia-Pacific Legal Metrology Forum (APLMF)

November 13 to 15, 2001

The Eighth Asia-Pacific Legal Metrology Forum (APLMF) and Working Group (WG) meetings were held in the Hyatt Regency Hotel, Auckland, New Zealand, from November 13 to 15, 2001, hosted by the Ministry of Consumer Affairs, New Zealand. A total of 76 delegates and observers attended the meetings.

Delegates from the following nineteen APLMF economies were present: Australia, Brunei Darussalam, Cambodia, Canada, PR China, Hong Kong China, Indonesia, Japan, Republic of Korea, Laos PDR, Malaysia, New Zealand, Papua New Guinea, Russia, Singapore, Chinese Taipei, Thailand, USA and Vietnam.

The following five international and regional organizations attended as observers: the Asia-Pacific Laboratory Accreditation Cooperation (APLAC), the Association of South East Asian Nations (ASEAN) secretariat, the BIML, the Cooperation for Metrology (COOMET), and the Southern African Development Community Cooperation in Legal Metrology (SADCMEL).

Representatives from the PTB and officials from the following six Pacific Island Economies also attended: Cook Islands, Fiji, Kiribati, Western Samoa, Solomon Islands and Tonga.

Mr. Keith Manch, General Manager, Ministry of Consumer Affairs, officially opened the meeting on behalf of Hon. Jim Anderton, Deputy Prime Minister of New Zealand. He spoke on the importance of legal metrology, which can provide standards by which society can ensure a fair environment for trade, justice and the social well being of its citizens and on the need for a strong infrastructure to support innovation and enterprise. He highlighted the pace and increase of globalization and the role of the APLMF in contributing to the sharing of knowledge, skills and techniques, and the promotion of consumer confidence.

Mr. John Birch, President of the APLMF, reported on the progress of programs and activities of the APLMF, and highlighted the following achievements:

- The train-the-trainer course on Verification of Petroleum and LPG Fuel Dispensers held in May 2001 in Beijing was successfully presented and organized by the National Standards Commission, Australia, and the China State General Administration of Quality Supervision & Inspection & Quarantine (AQSIQ).
- NSC obtained funding from the Department of Industry, Tourism and Resources, Australia, to conduct the train-the-trainer course on Verification of Non-Automatic Weighing Instruments based on OIML R 76 in April 2002 in Hanoi, Vietnam.
- The WG on Rice Moisture Measurement obtained funding from APEC TILF to carry out its project, a study tour to Japan on metrological control of rice moisture measurements. This was the first stage of the project and was successfully conducted in October 2001 in Japan. The WG also obtained funding from APEC TILF for the second stage of this project to be conducted in 2003 in Thailand.

APLMF Work Program for 2002–2003

The Working Group on Goods Packed by Measure seeks to:

- Follow up on the recent survey of APLMF economies seeking to establish the contact for goods packed by measure within each economy.
- Prepare and publish a register of officials who are the contacts in each economy for goods packed by measure.
- Prepare any required submission of comments on the redraft of R 87 or the proposed IQ Mark to TC 6 when required by the President.
- Keep the Secretariat informed of all correspondence with the Working Groups.
- Maintain relationships with other regional legal metrology organizations such as WELMEC WG 6.
- Prepare a report for the Ninth APLMF meeting on issues relating to Goods Packed by Measure including regulating prescribed sizes and unit pricing.

The Working Group on Training seeks to:

- Conduct the Train-the-Trainer courses for verifying Non-Automatic Weighing Instruments (NAWIs) in Hanoi from April 8 to 13, 2002.
- Consolidate training courses based on existing packages either as Train-the-Trainer courses or as one-day courses.
- Complete and distribute the Train-the-Trainer Module, based on OIML R 117 for verifying Fuel Dispensers.
- Investigate training in utility meters.

The Working Group on Utility Meters seeks to:

- Prepare a survey to identify and prioritize the specific needs of APLMF members with regard to utility meters and distribute the finalized survey to all APLMF members.
- Have Australia prepare an information sheet on electricity meter standards and concerns about the IEC's unacceptably high allowable accuracies.

The Working Group on Rice Moisture Measurement seeks to:

- Compile reports made by the participants and publish the finalized document by March 2002.
- Implement the second stage of the project funded by APEC TILF, which involves training in certifying and calibrating several types of rice moisture meters and establishing a suitable inspection system for APEC economies.

The Working Group on Intercomparison Calibration and Testing seeks to:

- Consider conducting another intercomparison test of non-automatic weighing instruments provided there is sufficient interest in participation from members.
- Commence intercomparison testing of mass standards.
- Have members participating in the intercomparison testing of load cells submit their reports to the Coordinator of the project, Australia, by December 2001, and circulate the finalized report to the members.
- Publish the report on Intercomparison Calibration and Testing of Non-Automatic Weighing Instruments in the OIML Bulletin.

The Working Group on Mutual Recognition Arrangements seeks to:

- Consider the involvement of other members of the MAA since the proposed MAA was based on the issuing of test reports by Issuing Authorities that participate in the OIML Certificate System (with the acknowledgement of their participating CIML Member).
- Continue to support the OIML work and not develop a regional MAA.

The Working Group on Medical Measurements seeks to:

- Present progress in the work on sphygmomanometers.
- Consider inviting a speaker to address the next APLMF meeting on the metrological control of sphygmomanometers.

The APLMF Members seek to:

- Develop a project on economic analysis of legal metrology with the aim of setting priorities based on economic and social impacts.
- Support the work of TC 3/SC 5 in developing the Mutual Acceptance Arrangements (MAA) on Test Reports.
- Complete the survey of members on establishing a Working Group on Application of weighing bulk commodity shipping to replace the draft survey.
- Prepare a calendar of activities in member economies and circulate this information to members on the activities of the region.
- Prepare the third edition of the Directory of Legal Metrology in the Asia-Pacific Region.
- Have Japan circulate any information on opportunities for training in legal metrology to members.
- Have China provide information on the C mark system to members.
- Attend OIML and CIML meetings and provide reports on the Forum meetings to the OIML Bulletin.
- Provide reports to APEC SCSC and attend at least one meeting a year.
- Exchange information with other specialist regional bodies and attend the annual meetings where appropriate.
- Exchange information with other regional legal metrology organizations (RLMOs) and attend coordinating meetings with RLMOs.

- Consider organizing a conference on "The Future of Legal Metrology."
- Consider organizing training courses in support of international trade on:
  - High-capacity weighing;
  - High-capacity flow measurements;
  - Goods packed by measure; and
  - Measurement uncertainty in legal metrology.
- Consider organizing a seminar/workshop for training providers in legal metrology throughout the region.
- Support OIML's development of:
  - Recommendation on Statistical Sampling;
  - Taximeters, and
  - The revision of D 1 Law on Metrology.
- Maintain contact with the WTO on TBT issues.
- Upgrade and update the APLMF web pages.
- Continue to encourage the participation of DPR Korea in APLMF activities and invite a representative from East Timor to participate in the next Forum meeting as an observer.
- Strengthen the policy focus of the Forum meetings.
- Support the organization of the Ninth Forum meeting.

Working Group meetings

On November 13, 2001, Working Group meetings were held on mutual recognition arrangements, training, utility meters, goods packed by measure, rice moisture measurements, and intercomparison calibration and testing.

Topic for discussion

Ms. Lesley Harwood, advisor on consumer representation, Ministry of Consumer Affairs, New Zealand, was invited to the meeting and spoke on "Consumer involvement in legal metrology."

Major issues

New President and Secretariat for the APLMF

APLMF members were informed that effective January 1, 2002, the APLMF Presidency and Secretariat would be transferred from the National Standards Commission (NSC), Australia, to the National Metrology Institute of Japan (NMIJ) in the National Institute of Advanced Industrial Science and Technology (AIST), Japan.

The new APLMF President and Secretariat members are:

- Dr. Akira Ooiwa, APLMF President, Director, Mechanical Metrology Division, NMIJ AIST.
- Mr. Kazuo Neda, APLMF Executive Secretary, Director, Legal Weighing Metrology Division, NMIJ AIST.
- Ayako Taniguchi, APLMF Secretary, International Metrology Cooperation Office, International Affairs Department, NMIJ AIST.

APLMF Honorary Member

APLMF members thanked Mr. John Birch, immediate past President of the APLMF, and Mrs. Loon Khoo, the former Secretary, for their contributions and commitment to the development and work of the APLMF. They also agreed to appoint Mr. Birch an Honorary Member of the APLMF in recognition of his outstanding service as a President from 1994 to 2001.

APLMF Executive Committee Members

APLMF Executive Committee members introduced were Canada, Japan (APLMF President and Secretariat), New Zealand (host economy for 2001), Vietnam (host economy for 2002), and Mr. John Birch AM (former APLMF President).

Ninth and Tenth APLMF meetings

Mr. Bui Quy Long, delegate from Vietnam, proposed on behalf of the Vietnamese delegation that the APLMF members hold the Ninth APLMF and WG meetings in November 2002 in Ho Chi Minh City. This is in association with the APMP General Assembly and the meeting of the ASEAN Working Group on Legal Metrology.

Dr. Akira Ooiwa, the new APLMF President, also proposed to the members that Japan would like to host the Tenth APLMF and WG meetings in 2003 in Kyoto, Japan, in association with the CIML Meeting.

Meetings of the Regional Groups

ASEAN Working Group on Legal Metrology (WGLM)

On November 12, 2001, the ASEAN Working Group on Legal Metrology held its first meeting prior to the

Eighth APLMF and WG meetings in Auckland, New Zealand. Officials attended from Brunei Darussalum, Cambodia, Indonesia, Lao PDR, Malaysia, Singapore, Thailand, and Vietnam and a representative from the ASEAN secretariat and observers from Australia and New Zealand also attended. They discussed the terms of reference of the Working Group and proposed a work program for consideration at the next ACCSQ meeting in 2002.

South Pacific Legal Metrology Forum (SPLMF)

The second meeting of the South Pacific Legal Metrology Forum (SPLMF) was held from November 15 to 16, 2001 in Auckland, New Zealand, to discuss regional cooperation in trade measurement and legal metrology in the South Pacific region. Officials attended it from Cook Islands, Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands and Tonga. Representatives from Australia and New Zealand also attended. The SPLMF members agreed that it would be necessary to establish a regional cooperation program in the South Pacific on trade measurement and legal metrology. Such a program would promote the efficient development of national systems, harmonize requirements, ensure consistency of measurement in the region, and support regional and international trade. ■

Ayako Taniguchi – APLMF Secretariat
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Center for International Measurement Standards
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563 Japan
Tel: +81-298-61-4362
Fax: +81-298-61-4393
E-mail: sec@aplmf.org
www.aplmf.org

A Communiqué concerning the SPLMF
is published on the following pages

COMMUNIQUÉ

Meeting of the South Pacific Legal Metrology Forum (SPLMF)

15–16 November 2001

Officials from trade measurement and legal metrology authorities in Cook Islands, Kiribati, Fiji, Papua New Guinea, Samoa, Solomon Islands and Tonga met together on 15 and 16 November 2001 to discuss regional cooperation in trade measurement and legal metrology in the Pacific Region.

The officials had attended the 8th Meeting of the Asia Pacific Legal Metrology Forum (APLMF) held in Auckland on 13–15 November which had discussed harmonization of legal metrology requirements in the Asia Pacific region in support of the APEC free trade agenda.

Officials noted that most Pacific nations have established trade measurement (weights and measures) systems that focus on consumer protection, however an effective trade measurement system can provide significant economic benefits and greatly assist the efficient operation of markets. Benefits would include:

- Consumer protection;
- Provision of a "level playing field" for commercial transactions;
- Reduced disputation and transaction costs;
- Effective stock control;
- Full national benefit is obtained for commodity exports; and
- Full collection of government excise and taxes based on measurement.

There was a need to develop their systems to support a wider range of trade transactions including international trade and government excise collection.

In addition, there was a need for the legal metrology system to support a wider range of government regulatory measurements particularly those used for:

- Environmental control to ensure sustainability of logging and fishing operations, and monitoring the impact of global warming; and
- Health and safety, e.g. radar speed devices, breath analyzers, occupational noise level measurements.

Officials noted that APEC had established a subcommittee on standards and conformance to harmonize technical requirements on the region in support of free trade. The Asia Pacific Legal Metrology Forum, comprising twenty-three Pacific Rim economies, has been harmonizing legal metrology requirements in the region in support of the APEC Leader's Agreement.

Officials agreed there would be value in establishing a regional cooperation program in the South Pacific on trade measurement and legal metrology which would assist the efficient development of the national systems, harmonies requirements, ensure consistency of measurement in the region and support regional and international trade.

Areas of cooperation would include:

- Harmonization of metrology legislation requirements, including the completion of the introduction of the metric (SI) system of measurement;
- Development of specialized test and measurement facilities;
- Development of a regional training program in trade and legal metrology for government officials and industry; and
- Development of policy capability to respond to the challenges arising from new technologies, expanding scope of metrology, changing role of government and globalization.

It was agreed that before deciding on a detailed program of regional cooperation a sectoral and institutional analysis and needs assessment should be undertaken and to seek funding for such a study from Australia and New Zealand.

The purpose of the study is to prioritize the development of the national and regional systems to maximize economic and social benefits. In this regard the Papua New Guinea official noted that in his country:

- "Mineral products constitute 70 % of PNG export income and 17 % of government revenue;
- PNG has recently changed its taxes on alcohol and tobacco from an *ad valorem* tax to taxes based on weight and volume; and
- There is a proposal to develop the PNG natural gas deposits and export the gas to Australia by a high pressure gas pipeline.

All of these sources of government revenue and national income rely on accurate and consistent measurement".

To support the development of regional cooperation the meeting requested that the Cook Islands should act as the interim coordinator, Samoa to provide Secretariat support and Tonga to act as interim regional training coordinator. The meeting further requested that, when this is confirmed, advice be forwarded to regional (APLMF) and international (OIML) organizations.

Officials attending

Economy	Official	Organisation
Cook Islands	Mr. David A Greig	Director for Labor & Consumer Services
Fiji	Mr. Satish Lal	Ministry of Commerce, Business Development & Investment
Kiribati	Mr. Takabea Barantarawa	Ministry of Commerce, Industry and Tourism
Papua New Guinea	Mr. Kialou M Angat	Director General, National Institute of Standards & Industrial Technology (NISIT)
Samoa	Ms. lulia Petelo	Assistant Secretary, Department of Trade, Commerce & Industry
Solomon Islands	Mr. Oliver Bikimoro Jino	Principal Consumer Officer, Ministry of Commerce & Primary Industries
Tonga	Mr. Sione Vuna Fa'otusia	Legal Officer and Acting Director of Consumer Affairs, Ministry of Labor, Commerce & Industries

WORKSHOP

Metrology and testing systems - Catalysts for economic and social development

4–6 December 2001 Ouagadougou (Burkina Faso)

ULRICH DIEKMANN, PTB

Introduction

This workshop was organized and funded by the Physikalisch-Technische Bundesanstalt (PTB) with organizational assistance from the West African Economic and Monetary Union (UEMOA) and support from the local office of the German Development Cooperation (GTZ). It took place at the headquarters of UEMOA in Ouagadougou, Burkina Faso and was part of the regional project “Encouragement of metrology and testing systems in West African Countries” financed by the German Federal Ministry for Economic Cooperation and Development (BMZ). This project aims to encourage metrology and testing activities so as to contribute to the removal of technical barriers to trade in recipient countries.

The workshop

The objective of the workshop was to identify national and regional priorities and to facilitate the planning of initial activities for the project. The participants were representatives of national metrology services and relevant government departments from Benin, Burkina Faso, Ghana, Guinea, Ivory Coast, Mali, Niger, Senegal and Togo. UNIDO and the OIML were also invited to participate.

A total of 26 people participated in the workshop some of whom had considerable metrology and testing experience, others having hardly any.

The way in which participants worked during the workshop showed a high degree of mutual respect and an atmosphere of partnership which allowed everyone the possibility of expressing themselves openly. For most of those present, the participative style of work was new and they found it very positive and effective. Both the group work and the plenary discussions were conducted in a very relaxed atmosphere which enabled the group to achieve concrete results.

The workshop consisted of two parts: an information day followed by two planning days.

Analysis of the current situation

The first day provided an opportunity for an exchange of information on West African metrology and testing systems and was devoted to the analysis of the current situation in the region. Countries worked in groups of two or three to assess the strong and weak points of their systems. This analysis showed that whilst the metrology and testing systems which are in place throughout the region are at considerably different levels, countries nevertheless have a number of problems in common with each other. The main needs which came out of this examination and the subsequent discussion were:

- Training (both initial and continuing) for personnel;
- Equipment;
- Information on international and regional developments, and therefore a need for regular exchange of information.

Planning

The second and third days permitted the development of strategies for the improvement of the situation in the metrology and testing sector. Again working groups were used to consider the following questions concerning individual countries and/or the region:

- What conditions/restrictions prevent the establishment of a metrology and testing system?
- What is necessary to improve the metrology and testing situation?
- How should the target groups and political decision makers be informed and made aware of metrology and testing, and how should the information be made generally accessible?
- What are the assistance/advice and training needs in the metrology and testing sector?

Plenary discussion of the proposals made by the working groups identified possible actions to be considered in the short term, as well as specific local interests and a contact person for each country so that a network may be established.

Action plan

The following action plan was agreed:

- A questionnaire concerning the current situation and the needs would be developed by the PTB in January 2002;
- This questionnaire would be circulated directly to the contact persons that had been identified within each country;
- These questionnaires would be returned during February 2002;
- A second workshop would be organized, concentrating on the development of the participants' skills;
- This workshop will take place in April/May 2002 in the Ivory Coast.

ATELIER PTB

Le système de métrologie et d'essais - Un catalyseur pour le développement économique et social

4–6 décembre 2001 Ouagadougou (Burkina Faso)

ULRICH DIEKMANN, PTB

Introduction

L'atelier a été organisé et financé par le Physikalisch-Technische Bundesanstalt (PTB) avec une participation de l'Union Économique et Monétaire de l'Afrique de l'Ouest (UEMAO) pour l'organisation, et le soutien du bureau local de la Coopération Allemande de Développement (GTZ). Il s'est tenu au siège de l'UEMAO à Ouagadougou, Burkina Faso, dans le cadre du projet régional "Encouragement aux systèmes de métrologie et d'essais dans les pays d'Afrique de l'Ouest" financé par le Ministère Fédéral Allemand de Développement et de Coopération Économique (BMZ). Ce projet vise à encourager les activités de métrologie et d'essais afin de contribuer à l'élimination des barrières techniques au commerce dans les pays qui en bénéficient.

L'atelier

L'objectif de l'atelier a été d'identifier les priorités nationales et régionales et de faciliter la planification des travaux de démarrage du projet. Les participants étaient des représentants des services nationaux de métrologie et départements gouvernementaux concernés du Bénin, Burkina Faso, Côte d'Ivoire, Ghana, Guinée, Mali, Niger, Sénégal et Togo. L'ONUDI et l'OIML ont également été invitées à participer.

Au total, 26 personnes ont participé à l'atelier; certaines avaient déjà une expérience considérable en matière de métrologie et d'essais, d'autres pratiquement pas.

La manière dont les participants ont travaillé pendant l'atelier a montré un haut degré de respect mutuel et une atmosphère de coopération qui ont permis a chacun de s'exprimer ouvertement. Pour la plupart des présents, le style de travail participatif était quelque chose de nouveau qui a été trouvé très positif et efficace. Aussi bien le travail en groupe que les sessions plénières ont été conduits dans une atmosphère très décontractée qui a permis au groupe d'aboutir à des résultats concrets.

L'atelier a été divisé en deux parties: une journée d'information suivie de deux journées de planification.

Analyse de la situation en cours

La première journée a donné l'occasion d'un échange d'information sur la métrologie et les essais en Afrique de l'Ouest et a été consacrée à l'analyse de la situation en cours dans la région. Les pays ont travaillé par groupes de deux ou trois afin d'évaluer les points forts et les points faibles de leurs systèmes. Cette analyse a montré que si les systèmes de métrologie et d'essais qui existent dans la région sont à des niveaux considérablement différents, les pays rencontrent néanmoins un certain nombre de problèmes communs. Les principaux besoins qui sont ressortis de cette étude et des discussions ultérieures sont:

- La formation (à la fois initiale et continue) du personnel;
- L'équipement;
- L'information sur les développements internationaux et régionaux et donc le besoin d'échanges réguliers d'information.

Planification

La deuxième et la troisième journées ont permis le développement de stratégies visant à améliorer le secteur de la métrologie et des essais. À nouveau il a été fait appel à des groupes de travail pour examiner les questions suivantes dans l'optique des pays individuels et/ou de la région:

- Quelles conditions/restrictions empêchent l'établissement d'un système de métrologie et d'essais?
- Qu'est-ce qui est nécessaire à l'amélioration de la situation de la métrologie et des essais?
- Comment informer et sensibiliser à la métrologie et aux essais les groupes cibles et les preneurs de décisions politiques et comment rendre l'information généralement accessible?
- Quels sont les besoins en matière d'aides/conseils et de formation dans le secteur de la métrologie et des essais?

Les discussions en session plénière des propositions des groupes de travail ont identifié des actions à considérer à court terme, ainsi que des intérêts locaux spécifiques et, pour chaque pays, une personne de contact a été désignée en vue de l'établissement d'un réseau.

Plan d'action

Le plan d'action suivant a été accepté:

- Un questionnaire sur la situation en cours et les besoins sera élaboré par le PTB en janvier 2002;
- Ce questionnaire sera envoyé directement aux personnes de contact identifiées dans chaque pays;
- Les réponses au questionnaire seront retournées en février 2002;
- Un deuxième atelier sera organisé, pour se concentrer sur le perfectionnement des participants;
- Ce deuxième atelier se tiendra en avril/mai 2002 en Côte d'Ivoire. ■

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ISO CASCO

17th Plenary Meeting

29–30 November 2001 (Geneva)

In opening the meeting, Dr. Eicher, ISO Secretary-General, recalled that conformity assessment had been an important topic in the 2001 ISO General Assembly. CASCO's future role would be more influential and would need to be strengthened: one of the challenges was the integrity of conformity assessment operations, since these have a direct impact on the image of ISO.

Key points on the agenda which are relevant to current OIML work included the following:

WG 11: Mutual recognition agreements

Draft ISO/IEC Guide 68 *Arrangements for the recognition and acceptance of conformity assessment results* would be circulated early in 2002.

WG 12: Use of marks of conformity

The consultation on ISO/IEC CD 17030 *Third-party marks of conformity and their use* has started. This is being prepared as an international standard, but its possible conversion to a Guide will be considered.

WG 14: Fundamentals of product certification

The clauses of ISO/IEC CD Guide 67 *Fundamentals of product certification* which cover basic components of product certification and elements and types of product certification systems, will be published as ISO/IEC CD2 Guide 67 after including the comments received. Clauses 7–8 may be better included in a future revision of Guide 65:1996.

A revision of ISO/IEC Guide 28:1982 *General rules for a model third-party certification system for products* which currently covers only one model for a third-party product certification system will be proposed.

WG 17: Certification of persons

Voting on Draft International Standard (DIS) ISO/IEC 17024 *General requirements for bodies operating certification of persons* will start shortly.

WG 18: Assessment and accreditation

Consultation on ISO/IEC CD2 17011 *General requirements for bodies providing assessment and accreditation of conformity assessment bodies* has begun.

WG 19: Peer assessment

Consultation on ISO/IEC CD 17040 *General requirements for peer assessment of conformity assessment bodies* has begun.

WG 20: Standards and conformity assessment

Most of the provisions of ISO/IEC Guide 7:1994 *Guidelines for drafting of standards suitable for use for conformity assessment* are now included in the ISO/IEC Directives, and the CASCO Advisory Group on Standards and Conformity Assessment now exists to advise TCs with specific concerns. However, WG 20 will continue with a revision of Guide 7 for "external" users.

WG 22: Code of good practice for conformity assessment

A second WD revision of ISO/IEC Guide 60 *Code of good practice for conformity assessment* will be ready by mid 2002 and the WTO TBT Committee will be kept informed of WG 22's progress to improve coordination.

WG 24: Supplier's declaration of conformity and its supporting documentation

Work has begun on converting ISO/IEC Guide 22:1996 into ISO/IEC 17050 *Supplier's Declaration of Conformity* and on developing ISO/IEC 17051 *Supporting Documentation for Supplier's Declaration of Conformity*. Opinions differ over the scope of these projects and the WG will send a proposed scope and rationale to CASCO.

Report from the OIML

Ian Dunmill briefly summarized relevant OIML activities, referring participants to the printed report which had been distributed. The Chairman encouraged CASCO members to become more familiar with the OIML system. He also welcomed the OIML as an A-liaison organisation, recognizing that these liaison arrangements should operate in both directions and suggesting that opportunities for effective participation of CASCO representatives in the relevant work of organizations having A-liaison status should be explored.

DEVCO

The DEVCO Secretary, Anwar El-Tawil, reported that a joint advisory DEVCO–CASCO Group on Conformity Assessment Strategies and chat room had been set up.

The next CASCO plenary meeting will provisionally be held in Geneva on 7–8 November 2002. ■

WORKSHOP REPORT

Interamerican Workshop on Packaging and Labeling

9–10 December 2001
Miami

Technical Standards Activities Program (TSAP)

Interamerican Metrology System (SIM)

NIST's Technical Standards Activities Program (TSAP), Office of Weights and Measures, and its Global Standards and Information Program worked with Mr. Cesar Luis da Silva, Chairman of the Legal Metrology Working Group (LMWG) of SIM to present a two-day Interamerican Workshop on Packaging and Labeling in Miami on December 9–10, 2001. More than 50 participants from the Americas and Europe attended the Workshop and shared a wide variety of information on labeling requirements and packaging experiences.

One of the projects the three offices cooperated on for the Workshop was a Survey of Labeling Requirements of the SIM member states. Among the information collected were the various requirements of the member states for declaring the net quantity, identity, and responsibility on packages intended for consumers. The first draft of the survey was discussed at the meeting and additional efforts will be made to ensure all of the information is up to date and complete so that the survey results can be posted on the SIM web site.

One of the significant issues discussed at the meeting involved the use of the comma and the period as decimal markers in net quantity declarations. Some countries (including the USA) want to permit either to be used so that manufacturers do not have to maintain different packaging for each market, but many countries want to permit only the comma to be used as the decimal marker. The pros and cons of each approach were exhaustively discussed but no agreement could be obtained. One position was that the comma is specified as the decimal marker in SI; therefore, it was not necessary to discuss this point since the LMWG recommends that the SI system of measurement be used. Another comment was that a recent discussion at the BIPM indicated that the decimal point might be recognized there as the preferred decimal marker symbol (for English language publications). A further comment reported that both the comma and the period are in use and should be allowed, since to reject package labels on this one point would disrupt trade. One participant suggested that the LMWG could not recognize both the comma and the period because it would be inconsistent with the recommendation to use SI. BIML Director Jean-François Magaña reported that Europe encourages the use of SI, but understands that flexibility is needed. He stated that the BIPM suggest that both the comma and the period be accepted as decimal markers. Further efforts to resolve this issue will be made at future meetings of the LMWG.

The SIM Legal Metrology Working Group held a meeting immediately following the Workshop and issued the following resolutions and decisions:

Packaging and labeling

The LMWG agreed to:

- Encourage each OIML Member State to adopt OIML International Recommendations R 79 and R 87 and collaborate in their revision. The LMWG encouraged the OIML to consider procedures for small lot sizes and packages with low counts.
- Recommend that information required on package labels be in the language of the country in which the product is sold.
- Simplify the net content statement on packages. For example, only the measurement units that are relevant to the consuming market need to be translated into that country's language.
- Encourage exclusive use of the SI System for package labeling.
- Ask SIM for financial support to develop and provide training programs on labeling subjects (e.g., metrication, net content testing procedures and labeling requirements of OIML R 87 and OIML R 79).
- Recommend that a project be undertaken to identify and suggest standardization of reference temperatures used to determine the net quantity of contents of liquids in the Americas.
- Request that SIM create a database containing each country's legal metrology regulations (e.g., labeling, net contents testing, contact information, etc.) and that it be made available on the Internet.
- Solicit, update, correct and complete the P&L survey responses of each country in their region so the survey can be posted on the SIM web site. This work should be finalized by March 1, 2002.

Other Items

The LMWG also agreed to:

- Request that SIM create a list server for discussion of issues on the SIM web site for the LMWG to exchange information, establish priorities for harmonization, and other purposes.
- Establish an ongoing forum for industry to bring labeling issues and problems to the SIM LMWG for discussion and possible resolution (e.g., harmonization of requirements or ensuring full disclosure). SIM LMWG representatives will coordinate through e-mail or personal contacts to develop the issues and bring the information to the Group for further discussion and resolution. It was also agreed that the sub regions of SIM implement the above resolutions on a local basis.

Technical Standards Activities Program

US participation in OIML activities is coordinated by Dr. Charles Ehrlich, Chief of the Technical Standards Activities Program (TSAP) at NIST.

If you would like to learn more about these activities, please visit the TSAP web site at http://ts.nist.gov/oiml

Dr. Ehrlich can be contacted at charles.ehrlich@nist.gov or by telephone at 301-917-4834 or by Fax at 301-975-5414.

WORKSHOP REPORT

Initiation Workshop for National Metrology Institutes

13–14 December 2001 Rotterdam (The Netherlands)

ATTILA SZILVÁSSY, BIML

Solving practical problems when implementing a Quality System based on ISO/IEC 17025

I The EUROMET Quality System Forum (QS-Forum) and Initiation Project

The CIPM Mutual Recognition Arrangement (MRA) implies for national metrology institutes (NMIs) the participation in key comparisons and an operational quality system (QS). In Europe NMIs have adopted ISO/IEC 17025 as a standard for their quality system.

As a result of the project *Implementation of CIPM's MRA for EUROMET Member Countries* a Quality System Forum was proposed and established providing for discussion and review of QS-implementation in NMIs.

To ensure that there is a common understanding in Europe of the requirements of ISO/IEC 17025 as they apply to NMIs, the 2-year Initiation Project started November 2000 with partial funding from the European Commission. The Initiation Project is facilitating the European program to review quality systems through a process aimed at:

- Discussing how organizations do things, especially in relation to ISO/IEC 17025;
- Sharing and recommending best practice for ISO/IEC 17025 implementation;
- Providing comment and feedback to members and NMIs;
- Providing comment and feedback to regional metrology organizations elsewhere; and
- Presentation (in Euromet's QS-Forum) by European NMIs of their quality systems before the end of 2002.

During the project close bilateral links are established with, for example, non-European countries and organizations to arrive at a global uniform manner of interpreting and implementing the new ISO/IEC 17025.

II The Initiation Workshop

The Workshop, preceded by a QS-Forum meeting, was organized by the NMi (The Netherlands) on behalf of the ten members of the Initiation Project: BEV (Austria), CMI (Czech Republic), BNM-LNE (France), OMH (Hungary), IMGC (Italy), JV (Norway), IPQ (Portugal), SMU (Slovakia), MIRS (Slovenia) and NMi VSL (The Netherlands).

The Workshop was attended by some eighty participants from 27 European countries and from six countries of the Asia-Pacific and the SIM region.

After the five plenary lectures (including lectures on the situation of the CIPM MRA, on the status of NMIs Quality Systems in the APMP and in the SIM regions) parallel sessions on the following three sub-themes were organized:

a) High level (measurement) standards and ISO/IEC 17025

In addition to mini-lectures on the relation of high level measurement standards and their maintenance to the ISO/IEC standard, mini-lectures on assuring the quality of test and calibration results and development of new methods were presented and discussed.

b) Validation

As well as the mini-lectures on validation of calibration methods and software applications, mini-lectures on approaches for the determination of uncertainty were presented and discussed.

c) Internal vs. external aspects

In this section, aspects such as consumer needs, preventive actions and value-added effectiveness of internal audits were dealt with.

Recommendations and conclusions

During the Workshop closing session conclusions were drawn and some recommendations (e.g. to accreditation bodies and the JCGM) were formulated, such as:

- The CIPM MRA has enhanced the introduction of QMS in NMIs and the implementation of ISO/IEC 17025 and resulted in a rapid development during the last two years;
- NMIs can choose between third party assessment and self-declaration of their quality system;
- A clearer understanding and definition of self declaration is necessary;
- ISO/IEC 17025 is very suitable for standards laboratories if processes are fully described and if they are customer oriented. There is an interest of NMIs for a more flexible scope of the standard;
- Alignment (but not too many changes or corrections) of ISO/IEC 17025 (1999) to ISO 9001 (2000) is necessary;
- Validation of calibration methods has to be part of QS and all software applications have to be validated; and
- JCGM WG 1 is to be encouraged to identify examples where use of the "mainstream GUM" leads to difficulties and to publish supplements to the GUM.

Based on the presentations and discussions during the Workshop, the following conclusions for the OIML MAA and related activities and for the national legal metrology services of OIML Members can be drawn:

- Introduction of QS in national Legal Metrology Services and proof of competence by accreditation or by other means for (type approval) testing laboratories seems to be inevitable in the near future and the OIML MAA will give an impetus for developments in this direction;
- It will be necessary to include requirements for validation of (type approval) test methods and uncertainty statement/estimation for the tests in OIML Recommendations;
- As in the CIPM MRA, in addition to third party accreditation other means of proving competence such as self declaration is to be allowed for in the OIML MAA;
- It will inevitably be necessary for at least one assessor with special knowledge in the field of legal metrology to be involved in the accreditation of type testing laboratories;
- Experience gained by the NMIs in implementing ISO 9001 for their Quality Systems and in implementing ISO/IEC 17025 as part of their QS and the EUROMET experience in implementing the CIPM MRA can be used by the OIML in preparing its own procedures for mutual acceptance of (type approval) test results. Thus, duplication of work can be avoided and further connecting elements between different task fields of metrology can be clearly identified. ■

More information can be found at:

www.initiation.nl and www.euromet.ch

MEETING REPORT

Presidential Council

25–26 February 2002 (BIML)

Jean-François Magaña

Financial matters

- The contributory class of certain Member States was discussed, as were the decisions taken in the past for countries with payment arrears.
- The BIML will prepare the transition towards the application of a standardized general accountancy scheme, which is more appropriate than the system currently used for taking into account depreciation of equipment, etc. The adoption of the new scheme will be discussed at the 12th Conference.

Staff of the Bureau

- A number of points concerning the BIML Staff Regulations were discussed including probationary period, notice period, family allowances, death grant and staff evaluation. The revised document will be submitted to the CIML for approval.
- Mr. Faber outlined Mr. Athané's responsibilities as Consultant up to the end of 2002, which include formalizing the existing BIML procedures that form the *Quality System* of the Bureau. These procedures will in particular allow the references of decisions relating to the different issues of the life of the Organization to be more readily retrieved. Mr. Athané will also be charged with preparing and chairing the seminar *What Will Legal Metrology Be In The year 2020*.

Technical work

- Pr. Kochsiek informed participants that the PTB proposes to take on responsibility for the currently vacant TC 13 Secretariat.
- On the occasion of the revision of the *Directives for the Technical Work*, a procedure should be studied to take actions when the work of a Secretariat does not progress, and if necessary in order to change the responsibility of the TC/SC secretariats.
- The 9th draft MAA should be submitted for voting within the Subcommittee (3 months' delay) then could be submitted for voting and comments by CIML Members (a further 3 months) in order to be presented at the 37th CIML Meeting.

Internet and electronic documentation

- The Council agreed on the need to recruit a specialist to work on the OIML web site, database, and computer equipment.
- The Council gave its backing to the proposed developments relating to the use of the Internet and it was agreed that this is the right way to evolve.
- The Bureau will prepare a presentation on these Internet developments for the 37th CIML Meeting, also covering the Development Council web site.

Braunschweig Seminar and the World Bank

- Contacts must be maintained and followed with the World Bank, and the Seminar envisaged at the World Bank premises should be coupled with the Second Seminar which is planned at NIST in line with the last Braunschweig Seminar.

Policy on formalized relations with other organizations

- The BIML Director will prepare a second draft document to be presented at the CIML Meeting. This policy will make a distinction between three categories of bodies:
  - general liaisons such as WTO, UNIDO, BIPM, etc.;
  - standard setting organizations and their technical committees or subcommittees; and
  - organizations representing manufacturers of instruments, users, consumers, etc.
- The possibility to accept not only international and regional organizations, but also national organizations will be studied.
- The BIML Director will initiate discussions with CEN and CENELEC in order to take into account the comments received and to make these agreements more symmetrical when required. The outcome of the discussions will be presented to the Presidential Council in order to submit them to the CIML.

Horizontal Documents

- The document presented by the Bureau will be completed to present the way in which horizontal documents should be included step by step in the OIML publications system and what the consequence of these steps would be on the existing Recommendations and Documents. This paper will be submitted to TC 3 before being presented to the CIML.

IQ Mark and individual conformity marking of instruments

- The Presidential Council took note of a presentation by The BIML Director on the assessment of conformity to type and on the assessment of the accuracy of instruments and prepackages. The Seminar *What Will Legal Metrology Be In The Year 2020* will probably provide elements to support this issue.

RLMOs

- The Bureau will prepare a policy paper concerning the setting up and the Terms of Reference of a "Council for the Cooperation with the RLMOs", advisory to the President of the CIML, and which will complete the future advisory infrastructure:
  - Presidential Council;
  - Development Council in its future configuration; and
  - Council for cooperation with the RLMOs.
- This policy paper will be discussed by correspondence with the members of the Presidential Council, and will then be presented to the CIML at its 37th Meeting.
- There will not be a meeting of the OIML with the RLMOs in September, a decision on the establishment of this new Council shall be awaited first.

Development Council

- On the basis of the present paper, the Bureau will prepare a policy paper for the 37th CIML Meeting, presenting the situation, the long term orientations and the questions to be solved. This paper should make provisions to set up transitional mechanisms (task force mentioned below) with a view to a final restructuring of the Development Council by the Conference in 2004.
- A task force consisting of 9 individuals will be appointed by the CIML President to start working on these issues and to prepare the Development Council meetings. This task force will anticipate the proposed future configuration of the Council.
- The first ideas on an action plan for the Development Council will be studied after having adopted this policy and set up the task force. The Action Plan studied by the Development Council should become a part of the general OIML Action Plan.

37th CIML Meeting

- The schedule will be the following:
  - Monday a.m.: Presidential Council meeting,
  - Monday p.m.: Development Council Task Force,
  - Tuesday a.m.: Development Council (plenary),
  - Tuesday p.m. to Friday a.m. (except Wednesday p.m.): CIML Meeting.

Seminar *What Will Legal Metrology Be In The Year 2020*

- The BIML Director will contact the lecturers to draw their attention to the need to focus their presentations on the long term evolutions of legal metrology and not on the present state of legal metrology.
- The Seminar will be chaired by Bernard Athané.

Joint OIML/BIPM/ILAC meeting (BIPM, 27 Feb.)

- The OIML was represented in this meeting by Messrs. Faber, Kochsiek, Issaev, Ehrlich and Magaña. ■

SEMINAR REPORT

WTO/TBT Agreement and Standards Matters for Caribbean Countries

19–21 February 2002 Castries, Saint Lucia

IAN DUNMILL, BIML

The Seminar on the WTO/TBT Agreement and Standards Matters for Caribbean Countries took place as part of the WTO's technical assistance activities linked to the Technical Barriers to Trade (TBT) Agreement. It was the result of requests from the secretariats of the Caribbean Community (CARICOM) and the Organization of Eastern Caribbean States (OECS).

Forty-six participants took part, representing Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago. Seven people were also present from CARICOM and the OECS.

The Seminar was opened by the Minister of Commerce, Tourism, Investment and Consumer Affairs of Saint Lucia. Three officials from the Trade and Environment and Technical Cooperation Divisions of the WTO, together with experts from ISO, the IEC and the OIML gave presentations on the WTO TBT Agreement and on international standards and legal metrology matters.

The program for the Seminar was as follows:

First day

- Introduction to the WTO
- Introduction to the TBT Agreement - its basic principles
- International Standards and their role in promoting trade
- TBT Agreement and international standards
- Participation of developing countries in international standardization

Second day

- Q&A as well as experience-sharing among participating countries on the use of and participation in the preparation of international standards
- Transparency provisions of the TBT Agreement
- Standards information and its role in economic development
- Q&A and experience-sharing among participating countries concerning the TBT transparency provisions and standards information
- International guides for conformity assessment
- Conformity assessment and the TBT Agreement

Third day

- Regional and international systems for conformity assessment
- Q&A and experience-sharing among participating countries on international guides for conformity assessment as well as regional and international systems for conformity assessment
- Statements on the implementation and administration of the Agreement as well as experience-sharing among participating countries in the implementation of the TBT Agreement
- The TBT Agreement - consultation and dispute settlement
- Benefiting from the TBT Agreement
- The TBT-related Technical Cooperation Program - Identification and prioritization of technical assistance needs by participating countries
- Q&A on TBT technical assistance issues
- Possible solutions at the national, regional and international levels

26 September – 4 October 2002

OIML Meetings

Saint Jean de Luz, France

- **Seminar,**
  "What will Legal Metrology Be In The Year 2020"
- **37th CIML Meeting**
- **Development Council Meeting**

Saint Jean de Luz is a small, attractive seaside town situated about 15 km south of Biarritz on the French Atlantic coast.

The Seminar will take place in the Olano Business Center (several kilometers north of the town), and the other meetings will be held in the Hélianthal Hotel on the seafront.

Delegates will be staying in hotels in the town and the area boasts beautiful walks, sites and tourist attractions. ■

The OIML is pleased to welcome the following new

Member State

Albania

CIML Member

Democratic People's Republic of Korea
Mr. Jon In Chol

OIML Meetings

2002.09.26–27 (Saint Jean de Luz, France)

SEMINAR:
What will legal metrology be in the year 2020?

2002.09.30 – 2002.10.04 (Saint Jean de Luz, France)

Development Council Meeting
37th CIML Meeting

Committee Drafts

received by the BIML, 2001.11.01 – 2002.01.31

Revision of R 48: Tungsten ribbon lamps for the calibration of radiation thermometers	E	2 CD	TC 11/SC 3	Russian Federation
Revision of R 51-1: Automatic catchweighing instruments. Part 1: Metrological and technical requirements - Tests	E	2 CD	TC 9/SC 2	United Kingdom
Revision of R 51-2: Automatic catchweighing instruments. Part 2: Test report format	E	2 CD	TC 9/SC 2	United Kingdom