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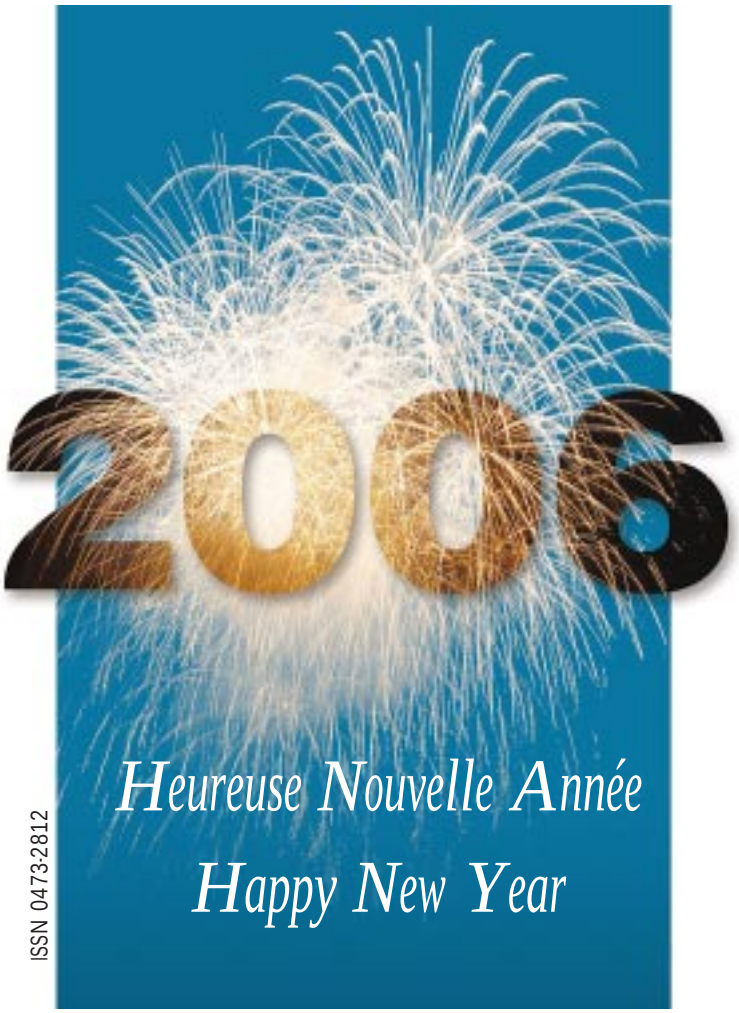

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Wishing all our Members and Readers a
Happy and Prosperous New Year

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Editorial

Alan Johnston
CIML President

Happy New Year to all our Members and Readers!

The end of 2005 brings to a close the OIML's Fiftieth Anniversary celebrations. But although the celebrations are over, our important work continues and I am certain that the next fifty years will bring yet more positive changes to the world of legal metrology.

Looking back, the OIML has grown from only a handful of Member States and Corresponding Members to its present total of 60 and 53 respectively. We have made great strides in terms of our presence in the international community and continue to spread the word throughout the world, bringing on board more and more countries as the years go by.

Significant challenges still exist for legal metrology. The globalization of economies and international trade continues to put increasing pressure on Member States to find new and innovate ways of ensuring the accuracy of measurements; individuals are calling for better protection against measurement fraud; businesses are demanding the removal of barriers to international trade; and measurement technologies are rapidly evolving and becoming increasingly complex.

Now, more than ever, international collaboration and cooperation in the development of model standards are paramount. The OIML's Mutual Acceptance Arrangement will become increasingly useful as participating organizations begin to take advantage of its benefits, in order to maximize their own efficiency.

Looking forward to the next fifty years, I am certain that the OIML will have an increased presence in the global marketplace - with more new Member States and Corresponding Members. The international community's response to the challenges facing legal metrology, and the way these responses are instituted in domestic rules and requirements, will influence business and consumer confidence for the coming decades.

The year 2005 was also exciting for me personally as I assumed my responsibilities as CIML President. I have thoroughly enjoyed the experience so far, particularly in relation to the people I have met and the organizations I have visited.

I was pleased to be invited to China earlier in the year to learn more about their metrological systems, and met with representatives from the Administration of Quality Supervision, Inspection and Quarantine of China, and the National Institute of Metrology as well as making a number of other visits within the country. I also recently participated in the Asia-Pacific Legal Metrology Forum held in Kuala Lumpur, Malaysia and would like to take this opportunity to extend my sincere thanks to my Chinese and Malaysian colleagues for their generous hospitality. These trips give me the opportunity to see first-hand how legal metrology shapes the global economy and it is encouraging for me to see the level of dedication and interest in the field of legal metrology, and witness the practical work of the OIML worldwide.

The year 2006 is sure to bring about some new challenges which I look forward to discussing with you throughout the year and at our meeting in Cape Town in October.

Best wishes for a healthy and prosperous New Year! ■

Alan E. Johnston

UNCERTAINTY

Uncertainty in type approval and verification

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Abstract

This paper investigates how to introduce the concept of uncertainty in the criteria of conformity in type approval and verification. The following are the results obtained from this study:

(1) The uncertainty in type approval is different from that obtained in the actual performance of measuring instruments.

(2) In type approval, if the uncertainty is equal to or less than one-third of the maximum permissible error (MPE), then the uncertainty should be included in the criteria of the conformity. If the measurement results, including the uncertainty, are within the MPE, then the instrument is deemed to conform; if it is outside the MPE, it is deemed to be non-conforming.

1 Introduction

In Japan, measuring instruments for commercial transactions and certification are regulated by the Measurement Law and are termed "specified measuring instruments". The legal regulatory system demands that they pass type approval tests and be subject to verification before they are placed on the market. In this paper, the criteria for deciding conformity of measuring instruments at the type approval stage and on verification will be discussed.

In the current type approval tests and verification, the evaluation is only based on whether or not the test results fall within the MPE specified by the Measurement Law, and the uncertainty in measurement is not considered at all. The current criteria for deciding conformity is not wholly reliable because of the uncertainty of measurement results of tests. To improve the reliability, the uncertainty in measurement needs to be taken into account. Research institutes in several countries have begun to consider how to introduce the concept of uncertainty in measurement into the criteria for deciding conformity [1, 8].

The purpose of this paper is to study methods of calculating the uncertainty in measurement based on the statistical interpretation of type approval tests and verification specified by the Measurement Law, and then propose criteria, including the uncertainty in measurement, for deciding conformity to legal metrology requirements.

As a specific example, type approval tests on non-automatic weighing instruments (NAWIs) will be discussed, since the number of applications submitted for type approval under this category is the largest among all specified measuring instruments.

2 Uncertainty in type approval tests and in verification

2.1 Test requirements of type approval and verification for weighing instruments

The test requirements for type approval and verification of NAWIs, as stipulated in the current Measurement Law, are shown in Table 1.

The MPE is specified for each test. If the measurement errors are within the specified MPE in every test, then the test result is deemed to conform. If the errors exceed the MPE, then it is decided as non-conforming. Thus, only a NAWI that passes all the tests will be accepted, and one that fails to pass any one of the tests will be rejected.

2.2 Definition of type approval and verification

In this paper, type approval and verification will be defined respectively and the uncertainty in measurement will be discussed based on these definitions.

In type approval tests, the design of a new type of specified measuring instrument is examined in order to ascertain its conformity with the technical requirements. Type approval tests consist of tests on the characteristics that solely depend on the design.

Table 1 Test requirements of type approval and verification

Type approval	Verification
Instrumental error test	Instrumental error test
Eccentricity test	Eccentricity test
Tilting error test	Discrimination test
Temperature characteristics test	Zero error test just after switching on
Zero error test just after switching on	Repeatability test with series of loading
Span stability test just after switching on	(about 5 items)
Repeatability test with series of loading	
Indication limit test	
Creep characteristics	(about 30 items)

Therefore, one or several samples of a measuring instrument are submitted to type approval tests. When type approval is obtained, the design of this type of instrument shall meet the requirements laid down by the relevant legal regulation and it shall perform adequately under the conditions of practical specified use.

Verification is carried out in order to ascertain the conformity of individual items of a type-approved specified measuring instrument to the requirements for performance. Verification tests consist of the tests on those characteristics that depend on each item. If each item gives rise to a major instrumental error, some of the tests performed in type approval could be applicable to verification as well. Actually, the test results of type approval can be substituted in verification.

2.3 Uncertainty in type approval tests and verification

There are various methods for estimating uncertainty in measurement [9, 14]. This paper shows two ways of estimating the uncertainty in measurement as follows:

(i) Uncertainty of performance of NAWIs (see Equation(1))
(ii) Uncertainty in type approval tests on NAWIs (see Equation(2))

$$u = \sqrt{Vr + Vd + Vs + (Ve + Vt) \times W^2} \qquad \text{Equation (1)}$$

$$u = \sqrt{Vd + Vs} \qquad \text{Equation (2)}$$

where:

u = standard uncertainty in each test
Vr = variance of repeatability
Vd = variance of rounding error
Vs = variance of the test load of the weight
Ve = relative variance by eccentric load
Vt = relative variance by temperature characteristic
W = load on a receptor

Regarding (i) above, each term in Equation (1) is chosen from major factors of the uncertainty in measurement in type approval tests. This information is what users will need as well as the satisfactory performance of NAWIs.

In type approval tests, each factor of the errors related to the performance of NAWIs is tested one by one. Other factors are small enough to be ignored when estimating the total uncertainty under standard conditions. As shown in Equation (2), error factors of the uncertainty of NAWIs are the variance of rounding errors and that of the test load of the weights.

The reason why the variance of the rounding errors should be considered as a factor of the uncertainty in measurement is as follows: If six measurements gave the same values, each value might fall under one scale interval but be spread over the interval. Therefore, the variance within one scale interval should be considered. In this respect, the variance of the rounding errors should be included in the factors of the uncertainty of the type approval test. However, if all the values measured six times are totally different, rounding errors are naturally included and they do not need to be included in the uncertainty of the type approval test. Here, assuming that all the values are almost equivalent, rounding errors should be included in the factors of uncertainty of the type approval test.

Regarding the specified measuring instruments whose conformity is decided based on the average of measurement results or standard deviation, the variance of repeatability is included in the factors of the uncertainty. But concerning NAWIs, it is not included due to the following reason: Regarding repeatability test on NAWIs, a series of six measurements is taken and the results of each measurement are assessed separately. In other words, if one of the six measurement result fails to pass the test despite the other five passing, the instrument will be rejected as a non-conforming item. Thus the average or standard deviation of the measurement results is not used for the assessment of NAWIs. This is

why the variance of repeatability is not included as a factor of the uncertainty in measurement here.

Type approval tests and verification are basic rules provided by the Japanese Measurement Law and related regulation. If the enforcement of requirements is tightened, this will increase production costs and retail prices of the specified measuring instruments, which would finally act against the public interests [15, 16]. Setting stricter standards should be left to the voluntary control of the manufacturing industry, since their requirements in general are stricter than those of national regulations. If the national law is tightened, they will make their standards stricter than ever. This situation could increase the cost considerably and never benefit the public.

The uncertainty of verification can also be evaluated in the following way:

(1) Estimate the uncertainty by the same way as at type approval.

(2) Not consider the uncertainty because the main purpose of verification is to ensure that the structure of each instrument conforms to the design.

(3) Not consider the uncertainty in view of time, cost and public interests.

3 Criteria of conformity in type approval

3.1 Criteria of conformity in type approval and verification

Figure 1 shows an example of the relationship between measurement result, uncertainty, MPE and conformity criteria.

Case 1: Both the measurement result and the uncertainty lie within the MPE. In this case, the result is obviously conforming.

Case 2: The measurement result lies within the MPE but a part of the uncertainty lies outside the MPE. Under current legislation, the result is conforming, since the conformity is decided only by the measurement value. If the uncertainty in measurement is considered, however, the result can be deemed to be non-conforming.

Case 3: The measurement result lies outside the MPE and the result is non-conforming under current legislation. But if the uncertainty in measurement is considered, a part of the uncertainty lies within the MPE, and it is deemed to be conforming.

Case 4: Both the measurement result and the uncertainty lie outside the MPE. In this case, the result is obviously non-conforming.

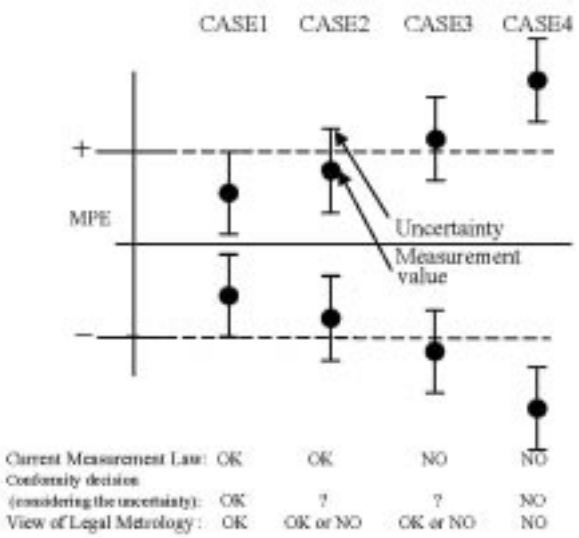

Figure 1 Relationship between measurement value, uncertainty, maximum permissible error and criteria for deciding conformity

Regarding Cases 2 and 3, the question would arise of how to decide the conformity considering the uncertainty in measurement.

In ISO 14253-1 [17], the criteria for deciding conformity of measurement results, including the uncertainty in measurement, is provided as follows: First, discuss how to consider the uncertainty in measurement and achieve a consensus about the standard of acceptance among the parties involved. If a consensus cannot be achieved, accept only Case 1 as conforming for consumer protection. In type approval and verification, the relevant parties are the government (or organizations designated by the government) and private companies that apply for type approval. Their relationship is not equal, as the position of the applying customer tends to be weaker. Since it should be difficult to reach a consensus through discussion between them, only Case 1 will be accepted according to ISO 14253-1.

The MPE is a concept which was introduced at the time when the uncertainty in measurement had not been considered. To introduce the concept of uncertainty in measurement, the MPE should also be reviewed. It is possible to extend the range of the MPE in accordance with the uncertainty in measurement. Nevertheless, the uncertainty in measurement will be reduced by the development of technology in the future. It is not a worthwhile idea to extend the range of the MPE periodically in accordance with the uncertainty in measurement. In this paper, discussion is based on the premise that the MPE should not be changed.

Market surveillance was carried out focusing on the performance of NAWIs which are in daily use, not on the needs of users.

Classes of NAWIs are shown in Table 2. The accuracy is classified from class 1 to class 4. A NAWI of class 1 has the narrowest range of MPE, whereas one of class 4 has the largest. As to NAWIs of classes 3 and 4, the range of MPE is larger, while the uncertainty in measurement is quite small. Therefore, the uncertainty in measurement does not affect the conformity decision on the instruments of classes 3 and 4. The uncertainty in measurement will greatly affect the conformity decision on NAWIs of class 1. Incidentally, a scale interval of a NAWI of class 1 is specified to be equal to or more than 0.01 g in Japan while that in some of EU countries is 0.001 g. Therefore, the uncertainty in measurement will significantly affect NAWIs of class 1 in those countries.

In Japan, there are several manufactures of NAWIs of class 1. Through voluntary cooperation between three companies, the instrumental error tests in type approval were carried out on the NAWIs of class 1 of some of EU countries and the NAWIs of classes 1 and 2 of Japan. The relationship between the measurement results, uncertainty in measurement and the MPE is shown in Figures 2-7.

On the horizontal axis of each figure, the mass of the weights loaded on the NAWIs is shown, and on the vertical axis, the deviation between the indication of the NAWIs and the mass of a weight. The dashed line in each figure shows the range of the MPE. If the deviation is within the dashed line range, the instruments will be deemed to be conforming.

In the case of Figure 2, weights of 50 g, 100 g, 150 g and 200 g were loaded. When a weight of 50 g was loaded, the indication was 50.000 g and when 100 g was loaded, it was 100.001 g, with a deviation of 0.001 g.

It was confirmed that the test result of domestic NAWIs of classes 1 and 2 lay well within the range of MPE, even inclusive of the uncertainty in measurement (Figures 2-5). The test results of NAWIs of class 1 of some EU countries also lay within the range of MPE, inclusive of the uncertainty, whereas one of them gave a little larger degree of uncertainty (Figures 6 and 7). In fact, for these manufacturers, it is acceptable that the uncertainty in measurement is introduced into the conformity decision in type approval and verification.

Accordingly, this paper proposes that only Case 1 should be accepted in type approval tests for NAWIs.

As Case 2 is also accepted under current legislation, the downside of rejecting Case 2 shall be discussed. The downside would be as follows: an increase in the proportion of defective items at the manufacturer's before shipping, an increase in the time needed for inspection and an increase in the retail price. If these downsides exceed the advantage of an improvement in performance, then the revision of the Measurement Law would not be preferable. Conversely, the revision would be desirable when the advantage exceeds the downside.

Table 2 Relationship between accuracy class of domestic NAWIs and uncertainty

Accuracy class	Scale intervals	Number of scale interval (scale interval/ maximum capacity)	Example: Indication value of NAWI with maximum capacity 500 g	Degree of influence of uncertainty
1	0.01 g ≦ e	50,000 ≦ n	0.00 g 0.01 g 0.02 g ... 500.00 g	large
2	0.01 g ≦ e ≦ 0.05 g	100 ≦ n ≦ 100,000	0.00 g 0.05 g 0.10 g ... 500.00 g	
	0.1 g ≦ e	5,000 ≦ n ≦ 100,000	0.0 g 0.1 g 0.2 g ... 500.0 g	
3	0.1 g ≦ e ≦ 2 g	100 ≦ n ≦ 10,000	0 g 2 g 4 g 500 g	
	5 g ≦ e	500 ≦ n ≦ 10,000	0 g 5 g 10 g 500 g	
4	5 g ≦ e	100 ≦ n ≦ 1,000	0 g 10 g 20 g 500 g	small

However, in the case of NAWIs, the above downside would be impossible. This will not occur because manufacturers have improved the designs and quality of products and realized automatic/unmanned inspection in-house. Even if Case 1 became the only case that would be accepted in type approval tests, no problem would arise due to the advances in manufacturing technology.

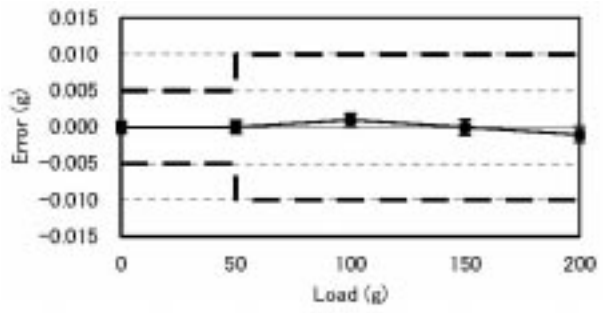

Figure 2 Domestic NAWI of class 2: Relationship between measurement results, measurement uncertainty and MPE(1) (maximum capacity 220 g, scale interval 0.01 g, complementary scale interval 0.001 g)

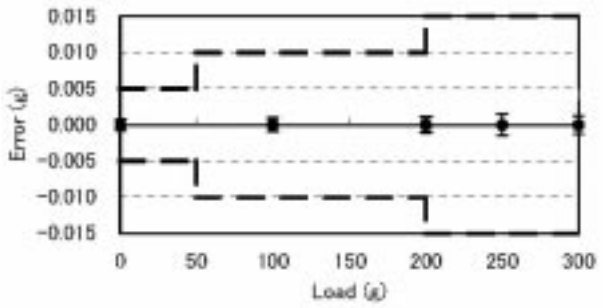

Figure 3 Domestic NAWI of class 2: Relationship between measurement results, measurement uncertainty and MPE(2)

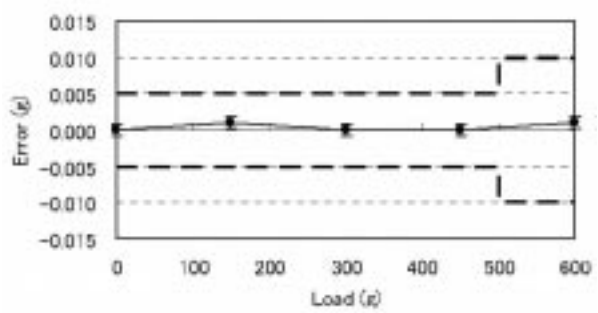

Figure 4 Domestic NAWI of class 1: Relationship between measurement results, measurement uncertainty and MPE(1) (maximum capacity 620 g, scale interval 0.01 g, complementary scale interval 0.001 g)

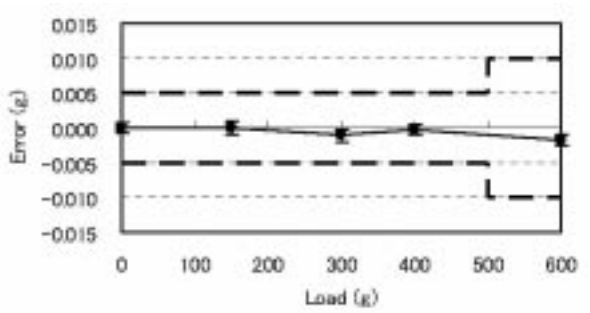

Figure 5 Domestic NAWI of class 1: Relationship between measurement results, measurement uncertainty and MPE(2) (maximum capacity 620 g, scale interval 0.01 g, complementary scale interval 0.001 g)

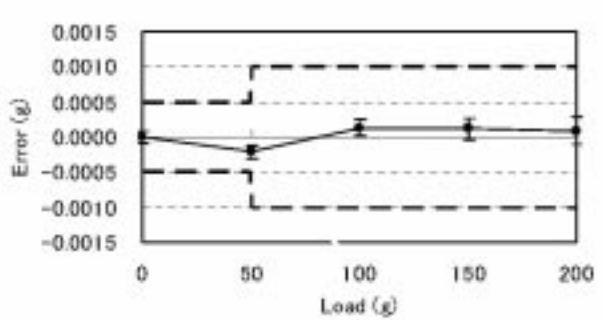

Figure 6 NAWI of class 1 in certain EU countries: Relationship of measurement results, measurement uncertainty and MPE(1) (maximum capacity 220 g, scale interval 0.001 g, complementary scale interval 0.0001 g)

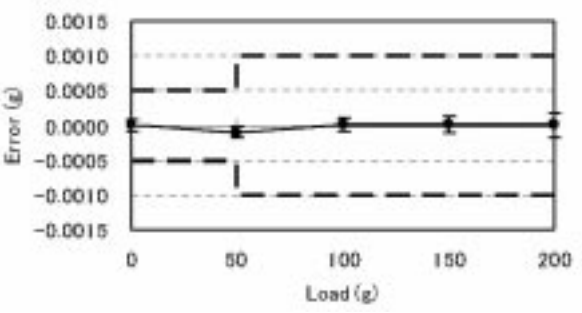

Figure 7 NAWI of class 1 in certain EU countries: Relationship between measurement results, measurement uncertainty and MPE (2) (maximum capacity 220 g, scale interval 0.001 g, complementary scale interval 0.0001 g)

3.2 Criteria for deciding conformity of the specified measuring instruments other than NAWIs in type approval tests

For NAWIs, even if Case 1 became the only case that would be accepted in type approval tests, no problem would occur. But this is not applicable to other categories of specified measuring instruments.

3.2.1 Uncertainty > MPE

Some categories of specified measuring instruments have an uncertainty in measurement larger than the MPE. No result could pass type approval tests if Case 1 became the only case of conforming. Type approval tests have no meaning for them. In this case, the uncertainty in measurement should not be considered in the conformity decision. First of all, the uncertainty in measurement should be reduced.

3.2.2 Uncertainty ≤ MPE

Other categories of specified measuring instruments have an uncertainty in measurement smaller than the MPE. If the proportion of the uncertainty to the MPE is large, requirements would be much more severe by making Case 1 the only case of conforming compared to current legislation in which the uncertainty in measurement is not considered. For example, if the proportion of the uncertainty in measurement rises up to 90 % of the MPE, the MPE will virtually become one-tenth compared with that of the current legislation. This means a high probability of being decided as non-conforming. Accordingly, this paper proposes that the uncertainty in measurement should not be considered in a conformity decision if the proportion of the uncertainty in measurement to the MPE exceeds one-third. For these categories of specified measuring instrument as well, the uncertainty in measurement should be reduced first.

This paper proposes that the uncertainty in measurement should be considered in a conformity decision if the proportion of the uncertainty in measurement to the MPE is less than one-third. This value of one-third is based on long-standing experiences in industry and this would be accepted by manufacturers. In any case, the consensus among manufacturers is indispensable to avoid confusion.

4 Conclusion and summary

The following are the conclusions obtained from the investigation:

(1) The uncertainty in measurement in the type approval tests is different from that in the performance of nonautomatic weighing instruments (NAWIs). The factors of the uncertainty in measurement in type approval tests are the variance of the rounding error and the variance of the test load of the weights.

(2) If the conformity decision in type approval tests is based on the average or standard deviation of the measurement values, the variance of repeatability should also be evaluated as one of the factors of the uncertainty in measurement.

(3) In type approval tests, if the uncertainty in measurement is equal to or less than one-third of the MPE, the uncertainty in measurement should be considered in the conformity decision. In this case, if the measurement results including the uncertainty in measurement lie within the MPE, it should be decided as conforming, and the rest as non-conforming. Before applying these criteria, consensus among the manufacturers of each instrument shall be achieved.

(4) In type approval tests, if the uncertainty in measurement exceeds one-third of the MPE, the uncertainty in measurement should not be considered in the conformity decision. Efforts should be made to reduce the uncertainty in measurement.

(5) As to the uncertainty in measurement in verification, there are several ways of approaching this such as the way applied to type approval tests, or the way in which the uncertainty in measurement is not considered at all, etc. ■

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SECOND CHINA METROLOGY FORUM

Basic requirements for legal metrology in Developing economies

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Abstract

Measurement is a part of our everyday economic life. The ordering of society must therefore involve metrology. Some sectors, particularly trade, need to be regulated by legislation, so we have "legal metrology" which involves the disciplines of metrology, law and practical organization.

This paper introduces the roles of metrology in the economy and considers the choices of what to regulate. It examines the benefits for trade in the context of developing economies and the potential for more general economic and social benefits.

The practical methods of metrological control are considered in the context of a developing economy; dealing firstly with control of measuring instruments - through certification, verification and inspection, and then with other methods e.g. control of packaged goods and prescribed quantities. Some parts of the system can be more easily realized by direct involvement with the institutions of the developed world but every national and local economy has its own special needs and processes which call for unique local solutions.

The necessary institutional elements of a legal metrology system comprise a framework of legislation, physical metrological standards, and an organizational structure with expert people to operate it. The paper proposes practical ways to meet these needs, e.g. by outlining the minimum specifications for metrological standards. It affirms the need for a supporting infrastructure. This comprises the support of the government administration and access to the other essential technical services which encompass standards, quality assurance and accreditation.

When established in this way, legal metrology becomes an important component of a functioning society, part of the fabric of the nation and indeed a part of the rapidly developing global network that links all peoples together.

1 Introduction

Metrology is an essential part of infrastructure for economic development. Countries and regions that are developing rapidly or which need to develop from a low economic base need to put in place the basic components of national metrology systems that will be at least adequate for local needs and enable participation in the global economy. This paper reviews the necessary elements and support systems for legal metrology in a developing economy, and looks at how they may be achieved by reference to local needs and international progress. It will review the necessary decisions on scope and control mechanisms, outline the essential system components and look at how the systems may be developed and supported.

Metrology is the science of measurement; it includes the theory of measurement, units of measurement and their physical realization, measurement processes and measuring instruments. Legal metrology stems from governmental care for global and national economic activity, fair-trading, quality control, consumer protection, safety, health and environmental concerns. It requires regulations to be implemented on the use of units, measures, weights and measuring instruments. Legal metrology must include the separate disciplines of both metrology and legislation but its practical implementation requires other, more human elements. These are the organizational structure and the responsible, trained staff to operate it.

2 Scope

In deciding on the necessary scope of a national legal metrology system it is necessary to examine the role of metrology in the economy and decide what needs to be controlled and what can be done by voluntary standards and good practice. It is also necessary to consider the costs, how to pay for it and what the benefits are for the economy and society.

2.1 Roles of metrology in the economy

The key areas to consider for a developing economy are consumer protection and fair trading, quality and

efficiency of industrial processes, and removal of barriers to trade.

Every trader and individual expects equity and fairness in the market place. The use of a uniform system of units of measurement and trust in measuring instruments and systems are necessities to ensure that fairness and protection are achieved.

Quality and efficiency for many aspects of industrial processes and operations depend on the metrological integrity of instruments or systems. Compliance with quality system certification often requires test and inspection equipment to have international traceability. Trade barriers are reduced as the confidence in traceability of measurement is enhanced. Much legislation and de facto regulatory requirements exists due to product specifications or requirements established by different legal authorities or industries. The use of a uniform system of measurement and traceability to internationally accepted standards enables the exchange of test results and certificates, thus reducing the burden on business operators.

Metrology is also important for environmental control, health and safety, medicine, law enforcement and taxation, but not all of these require legal control of measurement. It is essential to examine the real needs of the national economy and, if there are current deficits in the national systems, to prioritize development to meet the most urgent basic requirements.

2.2 The choice of what to regulate

In general we suggest that for developing economies it is best to minimize the scope of formal legislation, and to focus on trade. Why should we focus on trade when bad measurement in other fields, e.g. in medicine or environmental control could have life-threatening effects on countless individuals? The answer is that metrology legislation is not actually required to control measurement, but *people*. Clearly, even the most complex measuring instruments cannot in themselves bear any responsibility - only people can be responsible.

So we have to ask: where do we need legislation to enforce good measurement, and where is there any incentive for people to make bad measurements? We know from experience that those involved in measurement (or any technical work) that affects public safety, will generally do their best to get it exactly right. We still need metrological standards in these fields but we probably do not need legislation to ensure that the measurements are accurate and traceable. There are other laws to deal with negligence in these areas. But for trade measurement there may unfortunately be a disincentive for accuracy. This is not to say that traders are dishonest - they are probably no more or less honest than anybody else - but trade depends on fairness and confidence, i.e. in this case, confidence in measured quantities.

There are two aspects to this. Firstly, where consumers do not have the means to check quantities themselves, they need to be protected from unfair trading. This is even more important if it is not afterwards possible to repeat the measurements; such as when fuel is delivered into a vehicle tank - this is a prime example of a need for consumer protection. Secondly, we can say that thriving trade depends on fair competition. If traders cannot be confident that all of their suppliers and competitors are not taking advantage of any uncertainty in the measurements, then they cannot easily stay in business.

2.3 Benefits for trade in developing economies

Developing economies may often operate at three distinct levels. First there may be subsistence agriculture which contributes wealth to the community or nation but which may not be the most efficient and does not depend on trade or require any measurement.

On the other hand there may be industrial scale cash crops or other commodities, generally for export. In this case there will be very rigorous control of quantity and quality and so measurement is vital. But this kind of business is capital intensive (usually foreign capital) and the companies protect themselves without any government intervention. Indeed, it may be that the problem is for the local government to keep control of the measurements to protect themselves and their citizens.

However, between the subsistence and export sectors there is the all-important sector of the economy which depends on local trade. It is often the case that this sector is underdeveloped, but local prosperity and economic independence requires that local business can thrive. What is needed for this is stability and confidence - the confidence that enables relatively small business to invest in production and bring goods to market. Fair competition, supported by legal metrological control, is vital to this sector.

2.4 Other benefits

Moreover, the benefits are not only economic. Accurate measurement, fairly applied, provides the security for fair trading. The alternative is that traders may think that small scale cheating is routinely necessary to protect themselves. However, an environment where everyone must cheat a little to stay in business is

corrosive of civil society. Thus we believe that legal metrology applied to trade is not only an economic necessity but it also has a role in protecting and supporting the social fabric of a nation.

It is interesting to note that an accurate measurement is a kind of physical link, or at least a slightly more direct contact, between a producer and a consumer, even if they do not meet each other. It is fair to say that where this principle is universally applied it must bring more overall strength to a community.

2.5 Local needs

The decision on legal control for branches of metrology other than domestic trade must depend on local needs. It depends on the type of economy and its state of development. There may for example be a dependence on taxation of commodity exports for government revenue, in which case it would be essential to enforce their accurate measurement. If there are industrial companies, perhaps with no long-term stake in the economy, which could cause environmental damage, then it may be necessary to enforce accurate measurement of emissions to air or groundwater environment. For other areas of law enforcement, e.g. vehicle weight limits or motor speed limits, traceable measurements may be essential for successful prosecution of offenders.

In principle, all these areas need to be examined and prioritized but in general, legal control of measurement should be applied only where it is essential for local needs.

3 Control mechanisms

3.1 Measuring instruments

Most legal metrology is done by control of measuring instruments. While it is true that ultimately it is not instruments but people who are responsible, nevertheless it is in the instruments (in their hardware and software) that the capability and to some extent the intention of the measurements are defined. So the measuring instruments are like hard evidence. They can be checked by a trader every morning, e.g. by putting a weight on a scale in a shop, and an enforcement official could come anytime with his own more accurate weight-piece. With several weights he could test more of the capabilities and performance of the scale. He could see if it has design features such as seals to inhibit fraudulent measurements.

However, even weighing scales can be fairly complex industrial products and most measuring instrument types are far more complex, so the more efficient two-stage system has been evolved, whereby certification and approval of the measuring instrument design is followed by verification of all the individual instruments. This is achieved through assessment relative to specified metrological and technical requirements as defined, for example, by international standards and OIML Recommendations. More recently the development of quality management systems has enabled manufacturers to take more of the responsibility for the conformity of the measuring instruments, eliminating the need for independent verification and in some cases the need for type approval testing. This gives rise to a range of control procedures which may be applied as appropriate to the measuring instrument type and application. However, these systems depend on certification and audit of organizations by accredited certification bodies. It is also generally still necessary to ensure ongoing compliance by inspection or periodic re-verification.

3.2 Instrument control procedures

Type approval: This is the formal checking of a single piece of equipment, often a prototype, against the full set of standards relating to it. The result is a certificate that permits the equipment, subject to verification, to be used for trade transaction.

Verification: This is the checking of individual pieces of equipment often on site or at the premises of the manufacturer to ascertain compliance with the type approval certificate and ensure the individual accuracy of the item under test. The result is “stamping” and an approval for the equipment to be used for trade transactions.

Inspection: This is the continuing process of checking throughout the life of an individual piece of equipment to ensure that it has not been altered or adjusted to permit some type of fraud, or that the components have not become worn or damaged so as to indicate incorrectly. For maximum effectiveness this can be conducted in collaboration with local trade inspectors.

Market surveillance: This is the procedure operated by national metrology services to ensure that equipment put onto the market complies in all relevant respects with metrological legislation. It establishes that manufacturers, verification and enforcement bodies are fulfilling their roles under the legislation.

3.3 Legal metrology cooperation

Developments in legal metrology have been led by advanced countries with the resources for national type approval laboratories and adequate verification and enforcement services. Bilateral and regional agreements have reduced type approval costs for manufacturers. Less developed countries do not have the resources to fully participate in these systems. Since individual instrument types may have a globally dispersed population, there are very good reasons for international cooperation.

Decisions to recognize other national type approvals are a practical way forward but the most effective implementation is still dependent on adequate information from the certification process and it can be enhanced by information from in-service inspection and market surveillance in the developed countries. There is now a strong movement towards open access to information and full participation wherever possible. In the newly agreed OIML Mutual Acceptance Arrangement (MAA) for type approval test results, the countries which participate only in the category of accepting instrument test certificates will have the same status as regards access to information and management of the agreement as those which issue the test certificates. It is also significant that there is now free access via the Internet to download OIML Recommendations and Documents. This is a very welcome development which could be followed eventually by the international standards bodies.

In Europe there is an obligation to share certification information among member states. The systems to do this efficiently and to communicate market surveillance information are currently being developed in the context of the new Measuring Instruments Directive (MID). Open access to this information wherever possible would benefit authorities in developing countries who may rely on the European type approvals as the basis for their own de-facto or formal national approvals. All parties, including manufacturers will ultimately benefit from the knowledge of how to identify and verify conforming products. The same policy could be followed by other manufacturing economies, so that both developed and developing countries can most efficiently control measuring instruments.

3.4 Other control methods

As economies develop, more and more goods are prepackaged, e.g. food products prepared for sale in an urban environment. The optimum control mechanism is then quite different. It is not really appropriate or necessary to control the supplier's measuring instruments because the packages themselves can be checked by a sampling method. Practical sampling procedures are well documented, for example OIML R 87 *Net Contents in Prepackages* specifies the procedures for determining whether a production lot meets the regulatory requirements.

Consideration should be given to legal prescription of units of measurement in trade use, prescribed quantities, the use of measuring container bottles, and the labeling requirements of pre-packaged products. OIML Recommendations can be a valuable information resource for the development and maintenance of these national legal requirements. All of these systems are of use for protecting domestic consumers and for exports. National systems should therefore be developed to ensure the implementation and effectiveness of these legal control procedures.

4 Structures

In practice an operational legal metrology system must include the following basic dimensions or elements:

1. A framework of legislation;
2. Measurement standards and traceability; and
3. An organizational structure with trained people to operate it.

Most developing economies will have some form of national legal metrology structure, developed in response to local trade requirements or in cooperation with a regional legal metrology organization. The OIML Document D 1 *Elements for a Law on Metrology* gives general principles and recommendations for organizational and legal structures, including the governance of a national metrology system and the interfaces to the systems of international metrology. The structures of the basic elements are examined in more detail below.

4.1 Legislation

Setting up and operating a legal metrology service has to be based on legislation. However there is clearly a need for knowledge of metrology principles and procedure in drafting the legislation. Chapter V of OIML D 1 is configured in the form of draft primary legislation which would enable regulations to be made for measurements, pre-packages and measuring instruments. The relevant parameters to be controlled are

listed with specifications for the responsible authorities, and the means of enforcement (by defining offences, liabilities, conformity assessment organizations and responsibilities and powers) and financial provisions.

4.2 Measurement standards and traceability

4.2.1 Legal units of measurement

Today, key measurement units are defined by quantum physical processes rather than by a physical artifact such as the original meter bar. Legal units of measurement are based on the International System of Units (SI) to which most measures are related. The only one of these that still has a physical artifact is the kilogram, which is the mass of the international prototype in the form of a platinum-iridium cylinder kept at the BIPM (Sèvres, France).

Of the seven base units it is Mass and Length that are of most interest in legal metrology. Electric Current, Time and Temperature may also be important. By focusing on trade measurements we generally require to control only a short list of basic and derived measurements: Mass, Length, Volume (by capacity), Volume (by flow) and Electrical Energy.

4.2.2 Standards

Standards are the basis of measurement. The *International vocabulary of basic and general terms in metrology* (VIM) defines a measurement standard as: a material measure, measuring instrument, reference material or measuring system intended to define, realize, conserve or reproduce a unit or one or more values of a quantity to serve as a *reference*.

National measurement standards are created, located, kept and maintained in accordance with the national metrology provisions.

4.2.3 Traceability of measurement standards

Ensuring that measurements are traceable to national and international standards is most important for trade, especially overseas trade, and is essential to quality management as required by the quality standard ISO 9001. Traceability of national measurements is delivered through a national measurement system (NMS), by calibration of equipment through test and calibration laboratories accredited to ISO/IEC 17025 or direct from a national standards laboratory or a national metrology institute. However, providing that traceability is assured, the necessary limits of uncertainty for standards used in legal metrology should simply be appropriate to the application. The requirements of scientific and much engineering metrology would be economically unjustifiable for most trade metrology. Confidence depends on measurements that are known to be good enough. Table 1 is a review of what may generally be needed in developed and developing economies.

4.3 Organizational structure

The configuration of a national or regional service will be dependent on the local economic, cultural, demographic and legislative environment; it will take account of the prevailing structures of government and it must be compatible with and linked to international systems. Legal metrology is perhaps unique in this respect, having a depth of scope ranging from internationally agreed globally consistent systems, to the concerns of every citizen. OIML Document D 1 provides useful guidance for the structure of a national metrology service.

4.3.1 Central and distributed roles

The organizational structure must provide for maintenance and dissemination of measurement standards, certification of instruments and organizations, verification and inspection of instruments, enforcement of bulk and packaged quantities and input to the legislative process when required. Some of these roles require to be centralized while others are naturally distributed as a local service. The centralized roles are mainly primary activities such as legislation, type approval of instruments and maintenance of standards; while the distributed roles (secondary activities) are verification, inspection and enforcement work. On the other hand the dissemination of standards (by a calibration service) and the dissemination of information (e.g. on instrument certification and market surveillance) provide the necessary links from the center to the distributed functions. So the outcome will be a radial network.

4.3.2 Priorities for Developing economies

Usually the most urgent and prime requirement in Developing economies is to have an efficient verification and inspection service. Most of the participants should

Table 1: Examples of traceability of measurement standards in trade use

Standard	Specifications	Classification/units	Typical maintenance level	Typical trade applications	Typical country application
Mass	Weights are divided into OIML classes of E_1, E_2, F_1, F_2, M_1, M_{1-2}, M_2, M_{2-3} and M_3. (OIML R111, Edition 2004 (E)).	OIML Class E_1	National primary standard to ensure international traceability and calibration of weights of E_2 or lower.	Laboratory scientific applications only.	Developed economies
		OIML Class E_2	National secondary standard for calibrating F_1 weights. Maintained by national standards laboratories and national metrology institutes.	For calibration of F weights only.	Developed economies
		OIML Class F_1	Reference standard for calibrating F_2 weights. Maintained by national standards laboratories, national metrology institutes, calibration laboratories and trading standards.	High precision analytical measurement applications and weighing instruments of special accuracy class I and high accuracy class II.	Developed economies
		OIML Class F_2	Reference standard for calibrating M_1 and M_2 weights. Maintained by national standards laboratories, national metrology institutes, calibration laboratories and trading standards.	High precision analytical measurement applications and weighing instruments of accuracy class II.	Developed and Developing economies
		OIML Class M_1 and M_2	Industrial and commercial working standard. Maintained by national metrology institutes and calibration laboratories.	For daily trade applications and weighing instruments of accuracy class III.	Developed and Developing economies
		OIML Class M_3	Industrial and commercial working standard. Maintained by national metrology institutes and calibration laboratories.	For daily trade applications and weighing instruments of accuracy class IIII.	
		OIML Class M_{1-2} and M_{2-3}	Commercial working standard of lower accuracy from 50 kg to 5000 kg.	For daily trade applications and weighing instruments of medium accuracy class III.	Developed and Developing economies
Length	SI Unit Realization of the metre.	Specific types of stabilized laser, with internationally agreed frequencies and wavelengths.	National primary standards laboratories maintain these “realizations” at primary standard level to ensure international traceability.	Laboratory scientific applications only.	Developed economies
	Interferometer. Master gauge blocks and length bars.	Nanometre Millimetre	National secondary standards for calibration of secondary standards. Held by national standards laboratories.	High precision analytical laboratory calibration applications only.	Developed economies
	Gauge blocks and length bars.	Millimetre	Reference standards and working standards maintained by national metrology institutes, calibration laboratories and trading standards.	Trade and industry applications (e.g. glassware to large proving tanks).	Developed and Developing economies
Volume	Volume - traceable to the primary standards of mass and density.	Cubic metre or centimetre	Accredited Laboratory Standards for trade use.	Trade and industry calibration applications (e.g. flowmeters).	Developed and Developing economies
Flow	Liquid and gas flow - traceable to primary standards of length, mass and time.	Cubic metre per second. Kilogram per cubic metre	Accredited Laboratory Standards for trade use.	Trade and industry calibration applications.	Developed and Developing economies

be employed in this role, providing the human interface from the legal and standards infrastructure to the traders, consumers and other citizens who will benefit from the service.

The other roles are essential parts of the system but they consume fewer resources overall and can be provided in various alternative ways.

Good communications systems can ensure that the maintenance and to some extent the dissemination of standards can be shared on a regional basis. Metrology legislation cannot be done without application of metrological expertise but the bulk of this work is of a transient nature. Also, it is often neither necessary nor practical to run a national standards or type approval laboratory in a developing country. Most manufactured products, including measuring instruments, appear as a global population for which the design is already examined and approved in the developed countries. Such instruments can be formally approved or just accepted. The OIML MAA will provide a very effective route to issuing valid national approvals at very low cost. The exception will be for unique or specialist instruments, e.g. as employed in bulk commodity exports, which will require to be tested and approved by competent independent examiners.

4.3.3 National or local management

The employment of verification officials could be organized on a very local basis (as in the UK which is a densely populated and highly developed economy) or it could be organized as a national service. There is some advantage in linking local services to local government but generally for developing countries it may be cost-effective and more efficient to run a national service. The verification officials will be relatively few in number, but they should be professional people, having status and remuneration consistent with an enforcement role.

A similar question to be resolved is the scope of authority and additional operational roles of the verification officials. It may be efficient for metrology officials to have responsibilities in other aspects of consumer protection, environmental control, food safety, human and animal health and so on. However, in a new system for a Developing economy there is a risk of dispersal of expertise as some specialization is essential in a knowledge-based profession - and also a risk of dispersal of authority. Effective enforcement depends on a clear public perception of the role of the enforcement official. In general the best starting point is to employ highly professional officials, specializing in metrological verification and enforcement, operating with the authority of a national, provincial or regional service.

5 Supporting structures

A legal metrology service needs to be integrated with a supporting infrastructure which encompasses standardization, testing, quality assurance and accreditation. The arrangements cannot be specified exactly because there are so many variable circumstances and aspirations, but some features and functions can be specified in general terms.

5.1 Quality system certification

Quality management systems are increasingly important to metrological authorities and to the organizations that they may control, e.g. in respect of the manufacture or use of measuring instruments, storage and supply of bulk commodities and packaged goods. Accredited certification bodies should therefore be available in the economy.

5.2 Accreditation

Confidence in the certification of organizations and, in the case of a metrology service, in the certification of measuring instruments and calibration services, is greatly enhanced if these certification services are accredited by an independent organization. Accreditation services are relatively mobile and so do not have to be resourced locally. In any case they should be subject to peer review at international level through the International Accreditation Forum (IAF) or International Laboratory Accreditation Cooperation (ILAC).

5.3 Central organization - the NMI

OIML D 1 identifies a Central Metrology Authority (CMA) to be responsible for all the aspects of metrology policy, including scientific research and industrial metrology. The concept may be less important in a Developing economy where the organization is relatively small and naturally focused on legal metrology and maintenance of standards, but the principle of central coordination must still be applied and understood by the administration.

In practice a National Metrology Institute (NMI) generally forms the operational center of the legal metrology structure and is established by metrology law. Responsible trained personnel carry out the tasks of ensuring that nationally, measurement is accurate, fair

and legal. The NMI will have the lead responsibility for policy on measurement and provide the focus for control of legal weights and measures within the country. It will also cooperate with other national metrology institutes to ensure traceability and knowledge of latest developments in legal metrology. Whereas in a developed country the NMI may exist as a large organization with many projects and services, it can still function in a Developing economy by the collective knowledge and assigned objectives of a very small number of expert staff. The key features will be continuity and responsibility.

5.4 International support

At an international level activities are geared to achieve harmonization of requirements and unambiguous interpretations. The international comparability of measurement standards is established by an intensive cooperation in various international organizations:

- The International Bureau of Weights and Measures (BIPM) ensures worldwide uniformity of measurements and their traceability to the International System of Units (SI).

- The International Organization of Legal Metrology (OIML) aims at a global harmonization of requirements through the development of international "Recommendations" for the legal control of various types of measuring instruments.

- The United Nations Industrial Development Organization (UNIDO) is a specialized agency of the United Nations with responsibility for promoting industrialization throughout the developing world. It is represented in 35 Developing Countries. This representation and a number of specialized field offices, for investment, technology promotion and other specific aspects of its work, give UNIDO an active presence in the legal metrology field.

- Exemplary at a regional level is the Asia-Pacific Legal Metrology Forum (APLMF), a grouping of legal metrology authorities in the Asia-Pacific Economic Cooperation (APEC) economies and other economies on the Pacific Rim. Its objective is the development of legal metrology and the promotion of free and open trade in the region through the harmonization and removal of technical or administrative barriers to trade in the field of legal metrology.

5.5 Funding the national legal metrology service

A legal metrology service will primarily be funded through Government support and initiatives. The provision of metrological services (e.g. type approval, verification, calibration, etc.) may generate some fees to offset costs. In principle this implies that some aspects can be undertaken in the private sector while statutory roles must remain within government. However, any subcontracting or outsourcing must be subject to the requirement that the integrity, authority and expertise of the whole system must be maintained.

Setting up and development of metrological services may be achieved through cooperation with other national and international metrology organizations. Developing economies may thus benefit from provision of technical training, materials and equipment. The OIML has an increasing role in facilitating this process, in addition to providing information through its Recommendations and Documents. As part of the fundamental infrastructure for a stable and economically independent economy, metrological services merit support from the multilateral development organizations, preferably as part of integrated programs for broad based development.

5.6 Government administration

Regardless of how they are resourced and organized, metrology services are basic infrastructures and therefore they are the responsibility of government. The responsible senior officials of an administration cannot be expected to have a detailed knowledge of metrology, but unless they understand the basic principles and the dependence of the whole economy on metrology services, it is unlikely that these services will be adequately or consistently financed. This simple fact should be recognized by all concerned. The solution is fairly easy. A one or two-day training course or strategic briefing can provide all the necessary high level information and perspective of the role of metrology in the economy.

6 Conclusions

Legal metrology is vital for economic and social development. Part of the fight against hunger and poverty is the establishment of an efficient economic system and its integration into the world economy. This will, however, only be successful by implementation of a basic technical infrastructure for metrology, standard-

ization, testing, quality assurance and accreditation. In focusing on local and national requirements for legal metrology, this paper has attempted to provide guidance on where to start and what level of service to consider.

In prioritizing development, the systems for participation in trade with developed countries may be considered less urgent than basic local infrastructure for a thriving domestic economy, which is perhaps more important for establishing independence and self sufficiency.

Although there are different problems and different starting points in the developed and less developed countries, in fact *all* economies are developing and changing. All of them are connected in some way with the rest of the world but at the same time legal metrology is something that reaches down to touch the lives of ordinary people. So it is a profoundly important strand in the fabric of society. Providing the means to develop it in a globally consistent system is one of the essential tasks of world development. ■

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CERTIFICATION

Perspectives on assurance of conformity to type

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Certain weaknesses may be identified in the current OIML Certificate System for Measuring Instruments, and these are discussed in this paper:

- Type approvals may be based upon testing of design prototype "golden instrument" and not production instrument qualification.
- There is no continuous monitoring of current production.
- There is no requirement on maintenance of a design change file as well as software version control.
- There is no assessment of manufacturers' ability to continue to produce the approved type of instrument.

Historically, one of the important initial verification responsibilities was to verify that the production instrument was of the approved type. The advent of electronic devices precludes the complete determination of type approval requirement compliance by solely field verification (particularly for influence factors).

The discussions on mutual acceptance of OIML Test Reports have highlighted some of these weaknesses regardless of whether other nations' testing abilities can be accepted. For many years a product certification system has been employed to meet critical safety, health or environmental requirements and thus permitting the certification of individual devices. The conformity assessment options used to gain confidence in current production meeting type requirements generally use a combination of assessment and auditing of quality systems coupled with inspection and testing. While product conformity assessment can be carried out in many ways, it is in the interests of harmonization and mutual acceptance that a common approach to implementation within a category of instruments should be discussed and implemented in the OIML.

The implementation of a production meets type program in the OIML could mean the evolution of the OIML Certificate System to an OIML Certification Program, or that both systems could exist in parallel. A Certification Program would entail higher costs for the manufacturer but by demonstrating increased confidence in conformity, suppliers may more effectively achieve market access and acceptance of their products internationally. A similar process to the OIML Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations could be the basis of an OIML Certification Program.

A production meets type program should be compatible with ISO/IEC Guides 67 "*Conformity Assessment - Fundamentals of Product Certification*" and 28 "*Conformity assessment - Guidance on a Third-Party Certification System for Products*" to the extent necessary for legal metrology purposes. OIML D 27 "*Initial verification of measuring instruments utilizing the manufacturer's quality management system*" also specifically addresses a manufacturer's production quality system as a tool to ensure and demonstrate that production meets type requirements.

Currently the OIML Certificate System is a product certification system of 1b (see table from ISO/IEC Guide 67) that is initial type testing without production surveillance. A full-fledged system with production surveillance options such as (5) could be instituted to give the confidence necessary for a successful MAA, which would also be consistent with conformity assessment options present in European New Approach Directives such as the Measuring Instrument Directive (MID). Successful implementation of a product certification scheme implies a continuing relationship of a manufacturer with the Issuing Authority and could permit OIML conformity assessment marking of individual instruments.

Product surveillance options:

a) Testing or inspection of samples from the open market, (difficult but can be done at the distributor level),
b) Testing or inspection of samples from the factory (testing may be carried out by the issuing authority or witnessed),
c) Quality system audits combined with random tests or inspections (Issuing Authority may require a subset of type approval tests to ascertain if product is still the approved type),
d) Assessment of the production process or service.

These product surveillance options are conformity assessment tools at the Issuing Authorities' discretion and need not be applied continuously other than the assessment and surveillance of a manufacturer's quality system. The manufacturer's quality system indicated here may be an adjunct of their existing ISO 9000 or certification or not, but is specifically focused to cover performance requirements developed to address legal metrology concerns (see OIML D 27). Due to the differ-

Elements [a] of a Product Certification System	Product certification systems [b,c,d]							
	1a	1b	2	3	4	5	6	*N* [e]
1) Sampling (selection) f, as applicable	×	×	×	×	×	×		
2) Determination of characteristics, as applicable, by:	×	×	×	×	×	×	×	
a) testing (ISO/IEC 17025)								
b) inspection (ISO/IEC 17020)								
c) design appraisal								
d) assessment of services								
3) Evaluation (review) [f]	×	×	×	×	×	×	×	
4) Decision on certification (attestation) [f] Granting, maintaining, extending, suspending, withdrawing certification	×	×	×	×	×	×	×	
5) Licensing Granting, maintaining, extending, suspending, withdrawing the right to use certificates or marks		×	×	×	×	×		
6) Surveillance, as applicable by:								
a) testing or inspection of samples from the open market			×		×	×		
b) testing or inspection of samples from the factory				×	×	×		
c) quality system audits combined with random tests or inspections						×	×	
d) assessment of the production process or service				×	×	×	×	

[a] Where applicable, the elements can be coupled with initial assessment and surveillance of the applicant's quality system (an example is given in ISO/IEC Guide 53) or initial assessment of the production process. The order in which the assessments are performed may vary.

[b] A product certification system should include at least the elements 2), 3) and 4).

[c] An often used and well-tried model for a product certification system is described in ISO/IEC Guide 28; it is a product certification system corresponding to system 5.

[d] For product certification systems related to specific products, the term "scheme" is used (see Note 2 to 3.2).

[e] The ISO/IEC Publication (1992): *Certification and related activities: Assessment and verification of conformity to standard and technical specifications* mentions system 7 (batch testing) and system 8 (100 % testing). These may be considered product certification systems if at least the elements of system 1a are included.

[f] New terms used in ISO/IEC 17000.

ences between instrument categories, specific general requirements cannot be developed to apply across all instrument sectors, but should be harmonized and elaborated by the appropriate experts.

The manufacturer may apply product surveillance option (b) on a statistical basis or the manufacturer could employ product surveillance option (c) for periodic recertification of influence factor requirements as well. It is important to allow flexibility of compliance options for the Issuing Authority and for there to be harmonization in requirements for a manufacturer's focused quality system and additional production qualification testing for a category of instruments.

It is important that the manufacturer maintain technical design change documentation consistent with their quality system for the approved type for both hardware and software modifications. This would document production design changes with engineering modeling of the proposed design change leading to a decision by the manufacturer of whether the design change is major or minor for the approved type of instrument. Minor changes may be implemented with the additional requirement of testing by the manufacturer sufficient to support that the instrument continues to meet the type requirements. Major design changes would require consultation with the Issuing Authority as to whether more extensive testing is required. This process would apply to software changes as well as hardware changes and the Issuing Authority would audit the technical design change documentation. ■

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DTMQ

Development of Metrological Devices for Transferring Measured Quantities (DTMQ) associated to bottom loading measuring systems in France

BRUNO DEBORD
Laboratoire National de Métrologie et d'Essais (LNE), France

1 Origins of DTMQ

To prevent and/or reduce atmospheric pollution, in December 1994 the European Community adopted the European Directive no. 94/63/EC concerning the control of volatile organic compound (VOC) emissions resulting from the storage of petrol, and its distribution from storage terminals to service stations.

Major changes in equipment used for loading and unloading petroleum resulted from the application of this Directive. Technical equipment in refineries, terminals and transportation vehicles (trucks) needed to be adapted to respect the requirements of the Directive and attain the objective of reducing petroleum evaporation, notably:

- In refineries during loading operations from the measuring systems to the transportation vehicle, additional equipment was needed to return the petroleum vapor from the truck back to the refinery;
- In service stations during unloading operations from the truck to the service station tanks, additional equipment was needed to transfer petroleum vapors from the top of the tank back to the truck's tank.
- Equipment on the transportation vehicle itself needed to be adapted:
  - The opening of the inspection lids on each compartment of the truck was prohibited;
  - Required presence of a vapor collector.

In the service station before the unloading operation takes place, the transaction used to be based on the manual measurement of the level of petroleum contained in each compartment of the truck by a manual operation using an instrument called a manual gauging system. This manual operation required each inspection lid of the truck to be opened in order to measure the quantity of petroleum delivered which caused the evaporation of petrol, but this procedure is now prohibited by the Directive. As a result of applying this requirement of the Directive, manual gauging systems may no longer be used and therefore other solutions had to be found either without opening each inspection lid (such as an endoscope, magnetic gauge or other measuring system on each truck), or securing the transportation of the quantity previously measured in the refinery on its journey from the refinery to the service station without again having to measure the quantities in the service station, combined with securing the various pieces of electronic equipment on the truck.

And thus was born the concept of "DTMQ". This paper aims to present specifically how DTMQ was developed in France.

In 1996, a working group managed by the French Legal Metrology Authority (*Sous-direction de la Métrologie*, recently renamed *Bureau de la Métrologie*) in association with all those involved in the French petroleum industry such as petroleum producers, petroleum equipment producers and truck producers for the transportation of petrol, together established a document defining the possible solution, as below.

Loading procedure:

- Transferring the quantities of petroleum (volume) measured from the measuring system(s) in the refinery to one or any compartments of the truck;
- Using a communication interface to transfer the metrological data of the quantities measured from the measuring system to a memory device installed on the truck.

Transportation procedure:

- Securing the transportation of the quantities using a mechanical and/or electronic sealing device on the truck from the refinery to the service station.

Unloading procedure:

- Transferring the quantity measured from the truck to the service station in a secured way.

In 1998, M100 (a French Committee for Standardization of the *Bureau de Normalisation du Pétrole, BNPé)*, in association with AFNOR (*Association Française de*

Normalisation), the *Sous-Direction de la Métrologie* and all those involved in the French petroleum industry decided to write a standard defining the means to ensure adequate and accurate communication of this measurement information from the measuring system in the refinery to the truck, and from the truck to the service station.

Hard-wired solutions were discussed, but in the end solutions using a smart card to transfer metrological data were recommended in 2000. This norm FD M 87-110 "*Petroleum industry – Road tankers for liquid petroleum products*" called "*Guide d'interopérabilité du dispositif des quantités mesurées (DTQM) par cartes à puces*" was published by AFNOR in August 2003; a new version was published in March 2005. In the very near future, the European Committee for Standardization (CEN) should publish a standard developed on the basis of this French document.

In 2002, WELMEC published the "*Guide to Metrological Devices For Transferring Measured Quantities (DTMQ) associated to bottom loading measuring systems*" using all the work done since 1996 defining the essential requirements and the use of the smart card as a technical means of communication. This Guide also presents requirements for unattended delivery and for securing returns from the service station to the refinery in the event of refused or incomplete deliveries.

In October 2003, the French legal metrology authorities translated the requirements into a draft law (under the reference circular No. 03.00.510.001.1) which allowed the French designed body, the *Laboratoire National de Métrologie et d'Essais* (LNE) to begin French type approval for DTMQ.

2 What exactly is DTMQ?

The main objective of DTMQ is not to measure, but rather to ensure the secure transfer of the metrological data and the quantity of liquid. DTMQ is to be used in conjunction with a measuring system located in the depot (loading location). The functions of DTMQ are the following:

- In the refinery or the depot, the bottom loading of the measured quantity of petroleum from the measuring system into the compartments of the truck;
- The secure transfer of liquid by mechanical or electronic sealing devices from the depot to the unloading location (in principle the service station);

Photo 1

- The complete and correct unloading of the quantity from the compartments of the truck to the tanks of the service station;
- The secure transfer of liquid by mechanical or electronic sealing devices from the service station to the depot in the event of refused or incomplete deliveries; and
- The measuring of the quantity returned to the depot, and the transfer in the depot of this returned quantity, to one or any compartments of the truck.

In order to make the French type approval procedure easier, DTMQ was divided into four main parts:

i) Part 1, located in the depot, called "part in the depot: DTMQ/LR" (LR for Loading Rack) and used for the loading operation. The measuring system may or may not be part of the DTMQ/LR;

ii) Part 2, located on the truck, called "part on the truck: DTMQ/TR" (TR for Truck);

iii) Part 3, located in the depot, called "part for the return: DTMQ/RE" (RE for Return) and used only to transfer the quantity returned from the service station to the depot in the event of refused or incomplete deliveries; and

iv) Part 4, located in the service station, called "part in the service station: DTMQ/SS" (SS for Service Station) used for unattended deliveries.

For more details please refer to the Annex (at the end of this paper) which gives the detailed functions of each part of DTMQ. A DTMQ can be composed of:

- One DTMQ/LR (see photo 1);
- One DTMQ/TR (see photos 2 and 3);
- If necessary, one DTMQ/RE; and
- If necessary, one DTMQ/SS.

These main parts were also divided into "secondary parts" (See Table 1 on page 26).

The French legal metrology authority and the other parties decided that each main part (composed of all the secondary parts described above) or secondary parts as described above could be French type approved.

A flowchart is given in Figure 1 (page 27).

3 Legal requirements in France and in Europe

Table 2 shows the official documents to be applied in France and in Europe concerning the various legal requirements in force.

Table 2

Official documents to be applied	France	Europe
WELMEC Guide 10.2, September 2001	×	×
OIML R 117, Edition 1995	×	×
Circular no. 03.00.510.001.1	×	
The document "FD M 87-100", March 2005, gives presumption of conformity concerning the compatibility between each part		

Photo 2

Photo 3

4 Procedure for French type approval

The first French type approval certificates for main parts DTMQ/TR, DTMQ/RE and DTMQ/LR or secondary parts were delivered at the end of 2003. Readers interested may consult these certificates on the internet: www.lne.fr.

Table 1

Part	Secondary part	Reference of the secondary part	Description of the secondary part	Localization
DTMQ/LR	Terminal in depot	TD	Electronic device composed of a smart card reader and connected to the measuring system	On the loading site in the refinery
	Coupling device on loading pipe	C	Standard loading pipe equipped with sensors for the data of connection/disconnection to the truck during the loading operation	At the extremity of the loading arm on the loading site in the refinery
DTMQ/TR	Terminal onto the truck	TC	Electronic device composed of a smart card reader installed on the truck. The card is associated with the TC	On board the truck
	Loading pipe on the truck	A	Standard loading pipe conforms to the norm NF EN 13083 equipped with:	Onto each outlet of each compartment of the truck
			• Sensors for the data of connection/disconnection of the loading pipe to the truck during the loading operation,	
			• (DSA) a means of prevent- the unauthorized, accidental or fraudulent liquid withdrawal from the pipe on the truck (A)	
	Means of securing liquid withdrawal from the outlets of the truck	DSA	Means of securing the unauthorized, accidental or fraudulent liquid withdrawal from the pipe on the truck (A)	Equip each fixture on the truck (A)
	Means of securing the inspection lids or upper ports of the truck	DSOS	Equip each inspection lid or upper port of the truck to avoid fraud from the top	On the top of each compartment
	Automatic foot valve	OIS	To order the closing or opening of each compartment during the unloading operation for DTMQ	At the bottom of each compartment
DTMQ/TR or DTMQ/RE	Sensor for detecting emptiness for DTMQ/TR or DTMQ/RE	DTV	Ensure detection of the emptiness of the compartment	Close to the automatic foot valve
DTMQ/RE	Terminal for return	TRE	Electronic device composed of a smart card reader and connected to the measuring system	At the refinery
	Measuring system(s) in association with a pump	MS	Measuring system(s) for liquids other than water	At the refinery

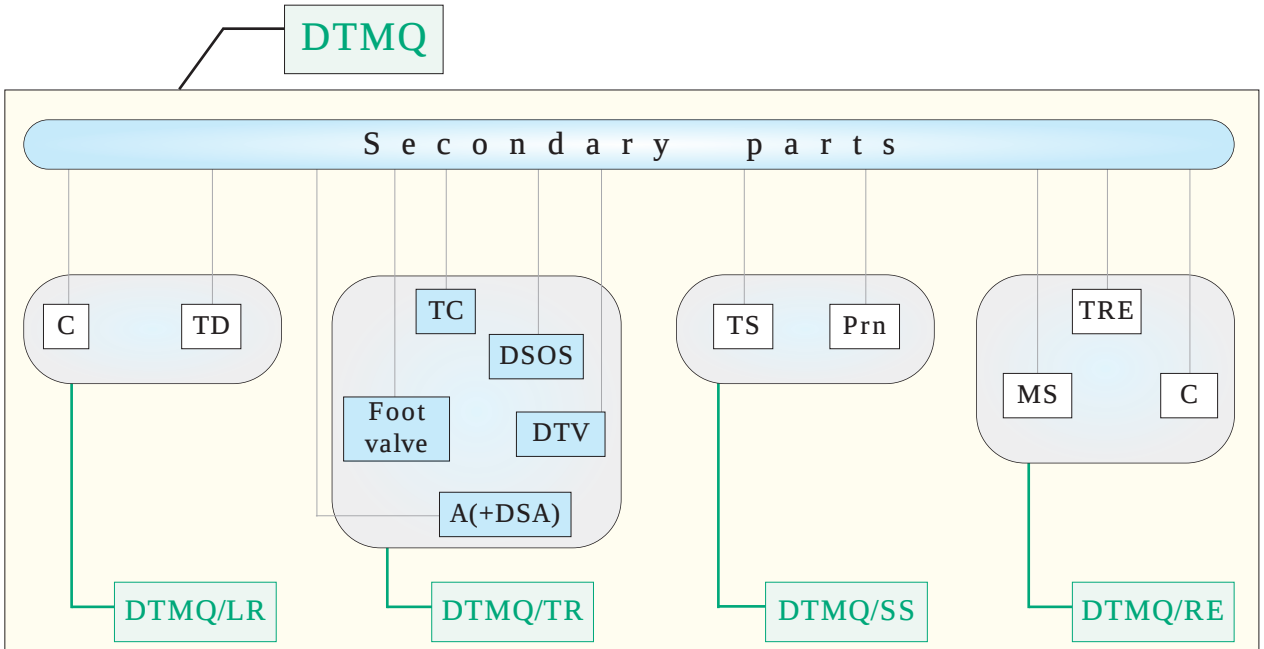

Figure 1

Table 3

Secondary part	Reference of the secondary part	Tests on influence factors - Annex A	Tests on disturbances - Annex A	Endurance tests
Terminal in depot	TD	×	×	
Coupling device on loading pipe	C	×	×	
Terminal onto the truck	TC	×	×	
Loading pipe on the truck	A	×	×	×*
Means of securing liquid withdrawal from the outlets of the truck	DSA	×	×	
Means of securing the inspection lids or upper ports of the truck	DSOS	×	×	
Automatic foot valve	OIS	×	×	
Sensor for detecting emptiness for DTMQ/TR or DTMQ/RE	DTV	×	×	
Terminal for return	TRE	×	×	

* Endurance tests for pipe onto truck (A) aims to validate the capacity of the pipe to continue to detect opening and closing operations without a significant leak of product after a number of cycles equivalent to one year of use.

The French type approval certificates were delivered (as is standard practice) based on the following procedure:

- A complete documentation describing the instrument (part or secondary part);
- A complete description of the software used;
- Functional tests: conformity of the instrument to French legal requirements;
- Performance tests: influence factors and disturbances as described in paragraph 5.8.2 of WELMEC Guide 10.2, September 2001;
- If necessary, endurance tests were applied only for secondary parts, especially for the securing devices of the pipe on truck.

Details of these tests and other criteria can be found in Table 3.

One practical particularity was encountered for DTMQ/LR: the question of the transmission of metrological data between the measuring systems in the depot and the DTMQ/LR. For industrial reasons, DTMQ/LR aims to be connected to an existing measuring system in the depot whose calculator outlet (in the case of electronic measuring systems) or mechanical indicating device outlet (in the case of mechanical measuring systems) is usually not type approved. Under these conditions, how can one ensure accurate transmission of metrological data between the measuring system and the DTMQ/LR?

- Case of a mechanical measuring system: a pulser has to be installed into the mechanical system of the mechanical indicating device to acquire electronic data to be exploited by the TD of the DTMQ/LR. This pulser should be tested for influence factors and disturbances in association with the TD and fixed in the type approval certificate of the DTMQ/LR.
- Case of an electronic measuring system: all calculators installed on existing measuring systems in the depot have an electronic outlet for sending measurement data to the TD. Nevertheless, even if the measuring system is type approved usually the calculator outlet has never been tested for influence factors or disturbances. Under these conditions, how can one ensure accurate transmission of metrological data from the measuring system calculator to the TD? This problem has been solved:
  - Checking the good transmission of data by accuracy tests at ambient temperature;
  - Official commitment of the industrials to the fact that the calculators installed will work under influence factors and disturbances;
  - For new calculators installed on measuring systems, a test under influence factors and disturbances for the metrological outlet should be carried out.

Table 4

Operation	Meanings/tools - description
Examination of conformity, especially conformity with the respective types and the software version	Documentary
Examination of installation and configuration	Functional tests
Loading test checking the good transfer of the liquid and data, activation of securing devices, and general good work of the DTMQ/TR	Using a DTMQ/LR already approved for hydraulic transfer or an equivalent and appropriate meaning of test using hydraulic system if necessary
Opening tests on DSA checking that an alarm appears on the TC and that less than 1 liter of liquid in 6 minutes can escape	Manual operation on each pipe on the truck (A) of the compartment, with liquid of destination or just water
Tests on the sensors installed on the pipe on the truck (A) checking good connection / disconnection during loading operation	Functional tests
If necessary, tests of correct functioning of the sensors used in the secondary parts of the DTMQ/TR (DTV, OIS, DSOS)	Functional tests

5 Initial verification for new DTMQ instruments

The procedure for initial verification was described in the type approval certificate, depending on each part or secondary part concerned.

For DTMQ/TR, the initial verification procedure was defined as follows:

The procedure is realized on the main DTMQ/TR installed on the truck (See Table 4).

In the case of secondary parts of DTMQ/TR which are already type approved (A,TC, DSOS, etc.), these procedures for initial verification can be partly reduced depending on what has been described for the initial verification procedure of the secondary part. Compatibility between the secondary parts has to be checked.

For DTMQ/LR:

The initial verification procedure for DTMQ/LR uses a DTMQ/TR which has already been approved, or an

equivalent and appropriate means of testing which has been validated by the type approval body.

The initial verification procedure for DTMQ/LR consists in:

- Examination of conformity, especially conformity with the respective types and the software version;
- Examination of the installation and configuration;
- Loading test checking the correct transfer of the liquid and data and general correct functioning of the DTMQ/LR.

In the case of the secondary parts of the DTMQ/LR which are already type approved (TD, C), these procedures for initial verification can be partly reduced depending on what has been described for the initial verification procedure of the secondary part. Compatibility between the secondary parts has to be checked.

For DTMQ/SS and DTMQ/RE:

The initial verification procedure consists in:

- Examination of conformity, especially conformity with the respective types and the software version;
- Examination of the installation and configuration;
- All functional tests to check the correct functioning of the part;
- For DTMQ/RE, when transferring a quantity of liquid from one compartment to another of the truck, all the requirements for DTMQ/LR have to be applied.

6 Periodic or subsequent verification

Operations of periodic or subsequent verification are based on those of the initial verification procedure as described above and in the type approval certificate. The French agreed body in charge of the periodic verification should particularly check the sealing devices (electronic and mechanical), sensors and secondary parts which are subject to mechanical wear.

7 Specific aspects of the French market and others developments in Europe

For the next few years the French market could be considered as a test for the development for DTMQ. Manufacturers of DTMQ, manufacturers of trucks, the French authorities and equipment designers have worked together over many years to create a final system, but all these people and entities know that the development of DTMQ is dependent on the final user, especially petroleum companies. The final user will decide on the technology he will use to conform to the requirements of the Directive.

The CEN Technical Committee TC 296 has drawn up a European Standard on the basis of the French document published by AFNOR, the final draft of which (PR EN 15208 *Tanks for transport of dangerous goods - Sealed parcel delivery systems - Working principles and interface specifications)* is currently being circulated for public inquiry. It should be published in 2006.

Last but not least, manufacturers will have to adapt DTMQ to specific national or regional situations. Other countries in Europe do not necessarily experience the same problems of fraud as the French market and so most certainly, DTMQ will have to adapt itself to these different circumstances. ■

Abbreviations

AFNOR ..... Association Française de Normalisation
BNPé ..... Bureau de Normalisation du Pétrole
CEN ..... European Committee for Standardization
DTMQ ..... Metrological Devices for Transferring Measured Quantities
LNE ..... Laboratoire National de Métrologie et d'Essais
VOC ..... Volatile Organic Compounds
WELMEC ... European Cooperation in Legal Metrology

Bibliography

- Circulaire n° 03.00.510.001.1 relative au contrôle métrologique des dispositifs de transfert des quantités mesurées (DTQM), associés à des ensembles de mesurage de chargement en source (www.industrie.gouv.fr/metro).
- European Directive No. 94/63 dated 20 December 1994.
- Guide to Metrological Devices For Transferring Measured Quantities (DTMQ) associated to bottom loading measuring systems, WELMEC 10.2, September 2001 (www.welmec.org).
- Guide d'interopérabilité du dispositif des quantités mesurées (DTQM) par cartes à puces, AFNOR, March 2005 (www.afnor.fr).

Acknowledgement

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Annex
Details of the functioning of each part of a DTMQ

Part DTMQ/LR

DTMQ/LR can include or not the measuring instrument. DTMQ/LR consists in:

- Transferring the liquid from the measuring instrument to the DTMQ/TR in a secured way;
- Reading data from the DTMQ/TR;
- Noting and memorizing data of the loading operation; and
- Transferring metrological data from the DTMQ/LR to the DTMQ/TR.

Part DTMQ/TR

This part includes all the secondary parts and consists in:

- Reading and securing data from the DTMQ/LR;
- Noting and memorizing data of the loading operation;
- Affecting data from the DTMQ/LR to the respective compartments of the DTMQ/TR;
- Memorizing and indicating or printing the measurement data;
- Transferring the liquid during loading or unloading in a secured way;
- Securing the transportation of the liquid;
- Securing the return of the liquid;
- If necessary, transferring data from the DTMQ/SS; and
- If necessary, identifying the service station or the service station storage tank.

Part DTMQ/SS

This part consists in:

- Memorizing and indicating or printing the measurement data in the service station; and
- Checking the secured unloading operation.

Part DTMQ/RE

This part include a measuring system and consists in:

- Transferring the liquid returned to the depot and contained in one of the compartments to another or several other compartment(s) of the same truck in a secured way.

OIML Certificate System:
Certificates registered 2005.08–2005.10
Up to date information (including B 3): www.oiml.org

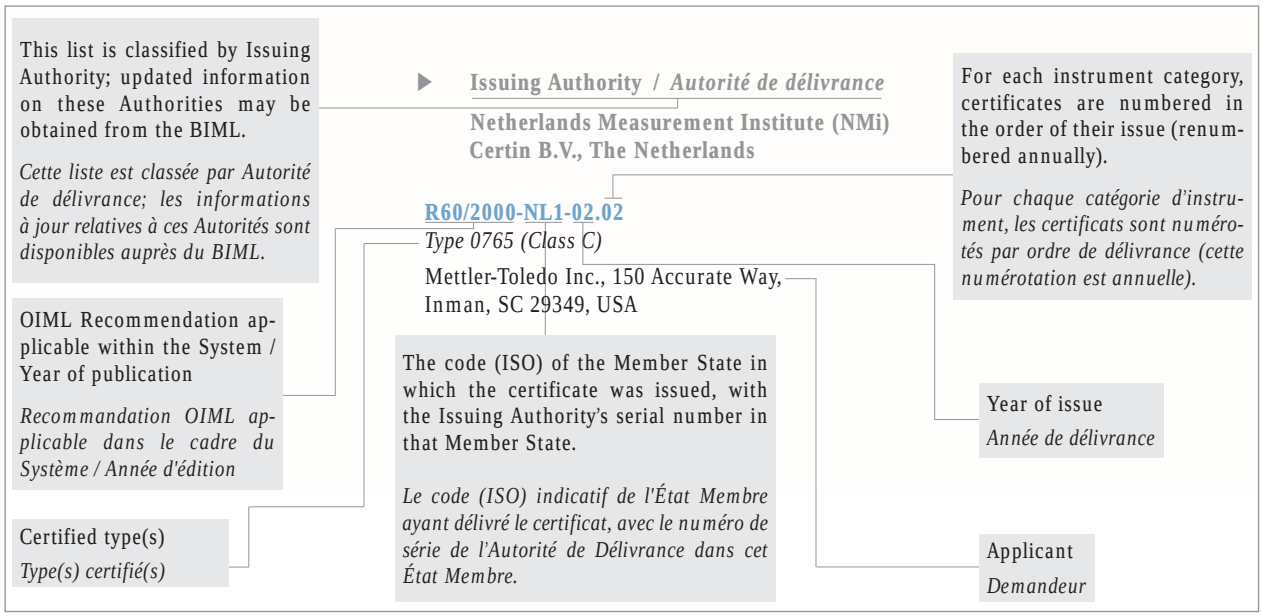
The *OIML Certificate System for Measuring Instruments* was introduced in 1991 to facilitate administrative procedures and lower costs associated with the international trade of measuring instruments subject to legal requirements.

The System provides the possibility for a manufacturer to obtain an OIML Certificate and a test report indicating that a given instrument type 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 types certified.

The rules and conditions for the application, issuing and use of OIML Certificates are included in the 2003 edition of OIML B 3 *OIML Certificate System for Measuring Instruments*.

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 type approval process for manufacturers and metrology authorities by eliminating costly duplication of application and test procedures. ■



Système de Certificats OIML:
Certificats enregistrés 2005.08–2005.10
Informations à jour (y compris le B 3): 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 type 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 types d'instruments.

Les règles et conditions pour la demande, la délivrance et l'utilisation de Certificats OIML sont définies dans l'édition 2003 de la Publication B 3 *Système de Certificats OIML pour les Instruments de Mesure*.

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 type 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***

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

R051/1996-NL1-2005.01 Rev. 1
Type: SV series
Anritsu Industrial Solutions Co. Ltd., 1800 Onna, Atsugi-shi 243, Kanagawa-Prefecture, Japan

R051/1996-NL1-2005.02
*Type: DACS-W-***-**, DACVS-W-***-**N, BC-W-***-** and DACS-H-***-***
Ishida Co., Ltd., 959-1 Shimomagari, Kurita-Gun, Ritto-cho, 520-3026 Shiga, Japan

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

Physikalisch-Technische Bundesanstalt (PTB), Germany

R051/1996-DE1-2005.04
Automatic Weigh Price Labelling Instrument. Type: CPS
Kuchler Electronics GmbH. S.A.M. Headquarters, Klatteweg 4-6, A-9010 Klagenfurt, Austria

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***

National Weights and Measures Laboratory (NWML), United Kingdom

R060/2000-GB1-2004.03 Rev. 1
Stainless steel strain gauge compression load cell
Avery Weigh-Tronix, Foundry Lane, Smethwick B66 2LP, West Midlands, United Kingdom

R060/2000-GB1-2005.06
Stainless steel, compression load cell with digital output
Weightron Bilanciai Ltd., Bridge Way (off Broombank Road), Chesterfield Trading Estate, Chesterfield S41 9QJ, United Kingdom

R060/2000-GB1-2005.07
Stainless steel, compression strain gauge load cell
Weightron Bilanciai Ltd., Bridge Way (off Broombank Road), Chesterfield Trading Estate, Chesterfield S41 9QJ, United Kingdom

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

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

R060/2000-NL1-2005.08
Type: HOC
Vishay Transducers Celtron/Technologies Inc., Binguan Nan Dao Youyi Road, Hexi District, Tianjin, China

R060/2000-NL1-2005.09
Type: SBC\1R
Mettler-Toledo (Changzhou) Precision Instruments Ltd., 5 HuaShanZhong Lu, ChangZhou, JiangSu, China

R060/2000-NL1-2005.10
Type: SK...
Scaime S.A., Z.I. de Juvigny, B.P. 501, F-74105 Annemasse Cedex, France

R060/2000-NL1-2005.11
Type: SBK...
Scaime S.A., Z.I. de Juvigny, B.P. 501,
F-74105 Annemasse Cedex, France

R060/2000-NL1-2005.12
Type: CSI...
Precia Molen, BP 106, F-07001 Privas Cedex, France

R060/2000-NL1-2005.13
Type: SWRC...
Scaime S.A., Z.I. de Juvigny, B.P. 501,
F-74105 Annemasse Cedex, France

R060/2000-NL1-2005.14
Type: PW10
Hottinger Baldwin Messtechnik GmbH,
Im Tiefen See 45, D-64293 Darmstadt, Germany

R060/2000-NL1-2005.15
Type: SSP1260
Mettler-Toledo (Changzhou) Scale & System Ltd.,
111 Changxi Road, Changzhou, Jiangsu 213001, China

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

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

R061/2004-DE1-2005.02
Automatic Gravimetric Filling Instrument Type: Bagging Controller Chrotec
CHROTECH GmbH, Joseph-Dietzgen-Strasse 12,
D-5773 Hennef, Germany

R061/2004-DE1-2005.03
Automatic Gravimetric Filling Instrument. Type: Bagging Controller BMT
BMT GmbH, Schäferstrasse 34a, D-59174 Kamen,
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***
Korean Agency for Technology and Standards, (KATS), Republic of Korea

R076/1992-KR1-2005.01
Type: INBODY 720
BIOSPACE Co., Ltd., #823, Yeoksam 1-dong,
Gangnam-gu, 135-784 Seoul, Korea (R.)

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

R076/1992-GB1-2005.01
E1150, and E1250
Avery Weigh-Tronix, Foundry Lane,
Smethwick B66 2LP, West Midlands, United Kingdom

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

R076/1992-NL1-2005.20
Type: CL5000 Series
CAS Corporation, CAS Building #440.1 Sungnae-Dong,
Kangdong-KU, Seoul, Korea (R.)

R076/1992-NL1-2005.21
Type: DC-788
Shanghai Teraoka Electronic Co., Ltd., Tinglin Industry Developmental Zone, Jinshan District,
Shanghai 201505, China

R076/1992-NL1-2005.22
Type: ECO
Grupo Epelsa, S.L. or EXA, Ctra. Sta. Cruz de Calafell,
35 km. 9,400, Sant Boi de Llobregat,
E-08830 Sant Boi de Llobregat, Barcelona, Spain

R076/1992-NL1-2005.23
Type: IPC, IPC-WP, JC or JC-WP

Ishida Co., Ltd., 959-1 Shimomagari, Kurita-Gun, Ritto-cho, 520-3026 Shiga, Japan

R076/1992-NL1-2005.24
Type: ULIS

Siraga SA, ZI Les Hervaux, BP 14, F-36500 Buzancais, France

R076/1992-NL1-2005.25
Type: D-POS

DIBAL S.A., c/ Astintze Kalea, 24, Poligono Industrial Neinver, E-48016 Derio (Bilbao-Vizcaya), Spain

R076/1992-NL1-2005.26
Types: WB-100...MA; WB-110...MA; DC-320MA (STMA)

Tanita Corporation (Brand names: Tanita, Rhewa, Wunder), 14-2, 1-Chome, Maeno-cho, Itabashi-ku, 147-8630 Tokyo, Japan

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

Physikalisch-Technische Bundesanstalt (PTB), Germany

R076/1992-DE1-2005.04
Non-automatic electromechanical baby weighing instruments. Types: M375x1 (multi-interval instrument) / M376x1 (multiple range

Seca GmbH & Co. KG., Hammer Steindamm 9-25, D-22089 Hamburg, Germany

R076/1992-DE1-2005.05
Nonautomatic electromechanical weighing instrument. Types: EC 100, EC 100 E, EC 200 F

Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

R076/1992-DE1-2005.06
Nonautomatic electromechanical weighing instrument. Types: SC(-H) 100, SC(-H) 200,SC(-H) 400, SC(-H) 500, SC(-H) 800, SC-C

Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 85 (1998)

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

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

R085/1998-NL1-2005.10
Automatic level gauge for measuring the level of liquid in fixed storage tanks, model 971 with antenna F08, H04, S06, S08, S10,

Enraf B.V., Delftechpark 39, NL-2628 XJ 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***

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

R107/1997-FR2-2005.01
Instruments de pesage totalisateurs discontinus à fonctionnement automatique (peseuses totalisatrices à trémie) type Executive+

Janodet SA, 34 rue Debordeaux, F-02200 Soissons, France

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

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

R107/1997-NL1-2005.01
Type: DisCon

Penko Engineering B.V., Wageningselaan 52-54, NL-3903 La Veenendaal, The Netherlands

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R107/1997-DE1-2005.01
Discontinuous Totalizing Automatic Weighing Instrument Type: Bulk Controller CHROTEC

Chrotech GmbH, Joseph-Dietzgen-Strasse 12, D-5773 Hennef, Germany

R107/1997-DE1-2005.02
Discontinuous Totalizing Automatic Weighing Instrument. Type: Bulk Controller BMT

BMT GmbH, Schäferstrasse 34a, D-59174 Kamen, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Fuel dispensers for motor vehicles
Distributeurs de carburant pour véhicules à moteur

R 117 (1995) + R 118 (1995)

▶ Issuing Authority / *Autorité de délivrance*

Czech Metrology Institute (CMI), Czech Republic

R117/1995-CZ1-2005.01
Fuel Dispenser for motor vehicles Type: SHARK BMP 5xx.S, 2xxx.S

Tatsuno-Benc Europe a.s., Prazska 68, 67801 Blansko, Czech Republic

▶ Issuing Authority / *Autorité de délivrance*

Russian Research Institute for Metrological Service (VNIIMS)

R117/1995-RU1-2003.01 Rev. 2
MIDCO Fuel Dispensing Pump (MEB SERIES/MPD SERIES/MMS SERIES)

Mercantile & Industrial Development Company Ltd., 39/44 Scheme 6, Road 2, Sion (East), 400022 Mumbai, India

R117/1995-RU1-2003.02 Rev. 2
MIDCO Flow meter for Fuel Dispensing Pump

Mercantile & Industrial Development Company Ltd., 39/44 Scheme 6, Road 2, Sion (East), 400022 Mumbai, India

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Multi-dimensional measuring instruments
Instruments de mesure multidimensionnels

R 129 (2000)

▶ Issuing Authority / *Autorité de délivrance*

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

R129/2000-NL1-2004.03 Rev. 1
Multi-dimensional measuring instrument for measuring dynamical, rectangular, non-irregular shaped and non-reflective boxes.

Accu-Sort Europe GmbH, Ruhlsdorfer Strasse 95, D-14532 Stahnsdorf, Germany

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R129/2000-DE1-2005.01
Type: Volumec HS2

Vitronic Dr.-Ing. Stein Bildverarbeitungssysteme GmbH, Hasengartenstrasse 14, D-65189 Wiesbaden, Germany

Lists and PDF files of OIML Certificates:

www.oiml.org

CONFORMITY ASSESSMENT

Current thoughts from the National Conference on Weights and Measures (NCWM) and the National Type Evaluation Program (NTEP)

STEPHEN PATORAY
NTEP Director

The United States is unique in many ways, and legal metrology is no exception. Unlike most industrialized countries in the world, the United States does not have a federalized legal metrology system. The individual states, via the Weights and Measures Laws adopted by and in force in each state, govern the regulation of weighing and measuring devices used in commerce. However, like many other countries around the world, the US does have a similar approach to legal metrology control. This includes type evaluation/certification, initial verification and subsequent verification. (Note: in the US the term "device" can currently refer to a weighing or measuring main element, a system or a measuring instrument).

The concept of pattern approval *or type evaluation*, as it is better known in the US, is not a new idea. Back in the late 1960s, the National Bureau of Standards (as it was called then) began issuing "Reports of Test". At this same time, many states had set up laboratories and required measuring instruments to be evaluated and certified before they could be placed in service within that state. In some cases, states would recognize the Certificates issued by other states. In all, there were at least 18 different possible Certificates that a company might be required to obtain before it could install a measuring instrument in all the various states in the US. In the mid-1970s work began to create a National Type Evaluation Program (NTEP). NTEP became operational in October 1984. Gradually, states began recognizing NTEP Certificates of Conformance that were at that time issued by the National Institute of Standards and Technology (NIST). This could be considered a Mutual Acceptance Arrangement agreed to by the states in the US.

The following is a quotation from the Scale Manufacturer's Association Metrology Control Plan (SMA MCP), 1999:

> "Type evaluation was put forward and has been supported by the scale industry on the basis of three principles: (1) to give manufacturers assurance that the engineering and operational features of a prototype device would be acceptable in advance of a hard tooling production decision; (2) to provide device manufacturers with a single approval process which would be recognized by all jurisdictions; and (3) to shelter the subsequent verification subsystem from excessive failure incidents. At no time was it suggested by industry that type evaluation should assume any exceptional responsibility for or supersede the subsequent verification role in field enforcement. The initial verification function serves as the first line of defense with respect to production meeting type. Field failures further along the life cycle line can be expected to be more related to field variables than conformance to type. However, production changes relatively late in a product's life cycle can still affect performance and compliance. These events should be evident from field data failure reports."

The concepts put forward in the SMA MCP (1999) include a Product Life Cycle. This life cycle is described as follows:

> "A product is conceived by a Manufacturer and is designed to the standards of the Manufacturer and within the requirements set forth by the NCWM (NIST Handbook 44). Once the product has reached a certain level of development, a prototype or pre-production sample of the product is submitted for type evaluation to an NTEP-assigned Testing Laboratory, which evaluates the product to the standards developed by the NCWM. Once the product is shown to meet these requirements, the Manufacturer begins to place the product in applications, which are considered "Legal for Trade." As each unit is "placed in service" an initial verification test is performed by an official having statutory authority (state or local W&M Jurisdiction). From this point forward the product may experience a variety of changes or interruption in its service life. These changes involve such things as adding additional hardware with the intent of enhancing the process, to using the product for an operation which was not known when originally installed and may be performed by the end user without the original Manufacturer's knowledge or consent. An interruption may be the result of a product failure and may be corrected by the Manufacturer, User, or Third Party capable of

performing the necessary service, but in all cases will be subjected to subsequent verification."

The author of this article has presented this background information to show that during the concept stages of NTEP, the roles of type evaluation and initial verification were very closely linked. Each significant part of the product life cycle is under the control of a different responsible party. The concept and design phase is the responsibility of the Manufacturer. The type evaluation is the responsibility of NTEP (Issuing Authority). The initial and subsequent verification is the responsibility of the state or local weights and measures jurisdiction. The reporting of metrologically significant changes to the device is the responsibility of the Manufacturer. And the cycle continues.

> "As with any process which is intended to produce measured results, the sharing of data collected, at all stages of the process, is the key to its success. This data may be the result of testing performed by the Manufacturer during the product's design and initial field tests; from the laboratory testing for pattern approval (by NTEP) and both the initial and subsequent verification testing (by the states). If we look at each of the responsible parties, each one plays a major role in the checking and balancing of the process." (SMA MCP 1999)

The author feels that this background provides some useful information on the role of NTEP and type evaluation. From his perspective, NTEP has proven to be a most useful tool in the US for the states, the device owner and the Manufacturer to ensure a device type has the capability of meeting the requirements set forth in NIST Handbook 44. Type evaluation under NTEP also reduces excessive failures in the initial and subsequent verification of a device. However, initial verification continues to be a significant factor in the overall scheme of a Metrology Control Plan or surveillance in the US. But even with initial verification, there are still some factors that cannot be evaluated in the field. With this information, let us take a closer look at Conformity Assessment as discussed at the recent NCWM Annual meeting.

Question: Why do we (the US) need Conformity Assessment?

Answer: We need Conformity Assessment to ensure that devices produced *after* the device has been type evaluated and certified by NTEP continue to meet the same requirements.

Question: How can this be accomplished?

Answer: The states can best accomplish this for most devices and requirements through initial verification. This information from the states would be collected in a database to be used by NTEP to ensure that devices continued to meet type.

Question: What is initial verification?

Answer: Initial verification is conducted on a new installation of a legal for trade device by the state or local jurisdiction within the first 30 days after the device is put in service. The time is limited to the first 30 days due to the fact that during this time, according to NIST Handbook 44, the device is required to meet acceptance tolerance; after 30 days, maintenance tolerances are required. This verification has two parts, inspection and performance testing. The inspection verifies suitability, installation, and traceability to NTEP CC (s) that apply to the system. The performance test verifies that the system meets the applicable accuracy or tolerance requirements.

Question: What about influence factors, such as T.N.8. in the NIST Handbook 44 scales code?

Answer: Influence factors cannot be evaluated in the field. They must be evaluated under controlled conditions. This indicates the need for an additional aspect in any Conformity Assessment Program to ensure manufacturers continue to produce devices to meet the requirements for influence factors.

Over the course of several years, several working groups have been charged with coming up with a program that will meet the needs for a practical yet valuable conformity assessment program. The results of these various working groups yielded three main elements to the basic Conformity Assessment Program. The following summary and commentary provide some detail on this great amount of work.

The main elements of the NTEP Conformity Assessment Program are:

- Initial Verification;
- Administrative Review of Certificates of Conformance; and
- Verified Conformity Assessment Program (VCAP).

Initial verification

Initial verification was discussed earlier as one of the major components of the SMA Metrology Control Plan. It is key to fulfilling the need to know that subsequently produced devices are "the same" as the device that was evaluated. In simple terms, it provides surveillance. The

author believes it is fair to say that just about everyone agrees initial verification by the regulatory official is the most practical and cost effective method to ensure production devices continue to meet the same standards as the one(s) that was/were initially certified.

Initial verification occurs in most states and local jurisdictions in the US right now. In many jurisdictions, the law requires inspectors to accomplish this within a set period of time. However, thoroughness of initial verification can vary greatly among the many jurisdictions. To overcome these variations and also to identify other areas needing improvement, a pilot program has been initiated focusing on one device type, Price Computing Scales. Several states have volunteered to participate in this pilot program. With this small controlled group of inspectors, the details of gathering, presenting and analyzing data can more easily be managed. From this core group, the program begins controlled growth into other states and other device types. These smaller steps will allow NTEP, the states and the CC holders to gain understanding and confidence in the initial verification process and its expanded role as a surveillance tool of NTEP. It will also allow for controlled growth of the database needed to handle the potentially large amount of data. This pilot program will provide NTEP an opportunity to review the benefits of gathering initial verification data. If there is no benefit shown, then Conformity Assessment could be modified. If, however, the benefit shown is great, more effort and resources can be channeled into this area to include more devices and more states. In this case, let the data tell us where we need to go. If problems are found with certain devices, it will be a joint effort of state jurisdictions, NTEP and the CC holder to resolve those problems. The more difficult questions to answer are when does a device not meet type and what are the trigger points? Or to put it into Statistical Process Control Language (SPC), has the process gone "out of control?" Currently the working group is still working on these issues.

Any data that is in the control of NTEP will always be treated as confidential. It would be considered part of the evaluation of the device and would not be shared with anyone other than the CC holder without written consent.

Administrative review of Certificates of Conformance

Perhaps the most important tool for the inspector when conducting initial verification is the Certificate of Conformance. Unfortunately, there is currently no detailed standard for the content of an NTEP CC. NTEP has been issuing Certificates of Conformance since 1985 and this has been an evolving process. Over that time, numerous people have drafted and reviewed NTEP CCs. Knowledge was gained and lost and gained again on what important information was needed on an NTEP CC. Requirements of NIST Handbook 44 have changed. The criteria in NCWM Publication14 have changed. New devices and a changing list of device types have made their way on to NTEP CCs. As a result, the consistency of information provided on Certificates is lacking.

NTEP recognizes the need for a standard format for NTEP CCs of each device type. The information should be clear, concise, consistent and readily understood. Currently a working group is in the process of developing basic criteria for the content of the NTEP CC based on the specific device type. This working group is also looking at the content and set up of other Certificates issued by various organizations throughout the world to gain insight on what makes a good Certificate. This group will focus their initial efforts on Price Computing Scales in harmony with the efforts of the Initial Verification Work Group as they proceed with their pilot program.

Verified Conformity Assessment Program (VCAP)

Many NTEP certified devices must meet NIST Handbook 44 requirements for influence factors. It is not possible to verify these requirements during the initial verification in the field. Therefore, the NTEP Conformity Assessment Program requires manufacturers of metrological devices (instruments) and/or components (modules) subject to influence factors, as defined in NIST Handbook 44, to have a Verified Conformity Assessment Program (VCAP) in place to ensure these metrological devices (instruments) and/or components (modules) are produced to perform at a level consistent with that of the device and/or component previously certified.

The Verified Conformity Assessment Program will be site-specific and will focus on the site that controls testing of the device. The main elements of VCAP are:

1) Documented Quality Management system governing the design and manufacture of the device.
   - Adequate control over subcontractors
   - Identification of metrologically significant components (MSCs)
     - Engineering change system
     - Document and data control system
     - Adequate identification and traceability of certified devices

2) Appropriate testing facilities and equipment necessary to verify influence factor compliance
3) An appropriate sampling plan, and acceptance criteria are in place and operating
4) A Nonconforming Material system to control non/conforming/non-compliant devices and components (either manufactured or purchased)
5) Appropriate Corrective Action system to deal with nonconforming /non-compliant devices
6) Documentation that personnel have been properly trained
7) The Certificate holder shall plan and implement a program of internal self-assessment

The self-assessment shall demonstrate effective and compliant operation of the manufacturer's own VCAP program

Summary

There is currently a great deal of interest in the topic of Conformity Assessment or Production to Type. A Conformity Assessment Program based on NTEP Certification, initial verification by the states and augmented by a Verified Conformity Assessment Program for devices subject to influence factor requirements is the direction in which the US is currently heading. There has been discussion on an international level on this topic. It is hoped that a better understanding of programs that are currently in place as well as programs that are now being developed or planned will enable all of us to implement the necessary components for effective Conformity Assessment Programs. ■

Contact information

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TC/SC NEWS

OIML TC 17/SC 8 Agricultural quality measurements

Berlin, Germany

27–28 June 2005

GRAHAME HARVEY
NSC, Australia
TC 17/SC 8 Secretariat

The second meeting of OIML TC 17/SC 8 was hosted by the PTB in Berlin on 27 and 28 June 2005 following the 12th International Metrology Congress and 40th CIML Meeting. The first project of this Subcommittee is the development of an OIML Recommendation on grain protein measuring instruments.

Delegates from Germany, Japan, the USA and Australia attended the meeting, which identified and took into consideration a number of critical issues including:

- The scope of the Recommendation, both in terms of technologies and grain types;
- Maximum permissible errors for each type of grain included in the Recommendation;
- The moisture basis for each type of grain;
- Reference conditions;
- Reference methods; and
- Grain temperature.

One significant outcome was the agreement that the Recommendation would need to include both Dumas and Kjeldahl reference methods and that, for any inter-jurisdictional transactions, the reference method would need to be stated in order to accommodate the resulting small differences in the measured grain protein concentration.

The Subcommittee spent a considerable amount of time reviewing the comments that had been received on the First Working Draft (1 WD) of the Recommendation. Several economies agreed to provide the Secretariat with additional information for the next draft and most of that information has now been received. ■

CONFORMITY TO TYPE

Report: Working Group on Conformity to Type

Lyon, France

17 June 2005

GRAHAME HARVEY
NSC, Australia

At its meeting in March 2005, the Presidential Council established a Working Group to establish whether there was a need for a proposal on conformity of production instruments to the approved type.

Because of the relatively short time frame between the formation of the WG and its first meeting, specific CIML Members who had expressed an interest in the topic were invited to attend. It is intended to distribute the minutes of the first meeting to all CIML Members and invite those with an interest to participate in the next meeting in South Africa in 2006.

The WG met for the first time in June 2005 in Lyon; the meeting considered the well-known "gold-plated" instrument syndrome that has been spoken of in OIML circles for decades. It also considered the likely impact of the MAA on developing economies to reduce their capacity to detect non-conforming instruments. Finally, Working Group members described the experiences in their economies and the programs (or lack thereof) that they had in place to detect non-conformances. It was noted that several economies had detected the same non-conformances independently.

The Working Group resolved to develop a proposal on conformity to type, including:

- International (OIML) coordination;
- Mutual sharing of information on non-conformities through an "alarm" database;
- Better information on the latest revisions of OIML Recommendations and Documents; and
- An OIML certification database.

It was agreed that the next step was for the Chair to develop a policy/discussion paper for consideration by WG members prior to the next meeting. Ultimately, the paper will be presented to the CIML for adoption. ■

INTERNATIONAL EVENTS

2nd China Metrology Forum

9–10 July 2005

Kunming, China

Adapted and edited from a report in the China Inspection and Quarantine Times, 12 July 2005, Original Article By Ju Xuan

The 2nd China Metrology Forum, organized by the General Administration of Quality Supervision, was opened on 9 July 2005 in Kunming in the Province of Yunnan, China. The main topic was *Economic globalization and supervision of the market by metrology*.

Over 200 representatives participated in the event and on 8 July the Deputy Director of the General Administration of Quality Supervision, Mr. Pu Changcheng, received the CIML Vice-President, Prof. Dr. Manfred Kochsiek, together with other high-level representatives of the countries participating in the event.

Mr. Pu Changcheng introduced the development of metrology in China to delegates and commented on the state of international cooperation in the field of metrology. He pointed out that with the establishment of a socialist market economy, in view of the increasing tendency towards globalization of the world economy, and considering the rapid development of science and technology in the 21st century (especially in light of the establishment of the mutual recognition systems in international metrology), increased international exchange and cooperation had already led to the rapid technological development of numerous national economies and to the setting up of the metrology system in China.

The Forum offered an opportunity for the exchange of information between China and international experts in the field of metrology, and opened up the challenge to develop joint research projects with international metrology experts. On behalf of the General Administration of Quality Supervision, Mr. Pu Changcheng thanked the OIML for the special Award and Medal given to the Deputy Director Mr. Li Chuanqing for his service to the OIML. He expressed the hope that China's cooperation with the various international metrology organizations and with metrologists worldwide would thus be further strengthened.

Taking the floor, Manfred Kochsiek highly esteemed China's contribution to the development of international metrology. He said that China's metrology system had been developing very rapidly for more than twenty years and that China had now developed cooperation in the field of metrology with numerous countries worldwide.

He went on to say that this Forum offered an important international arena to further strengthen exchanges and cooperation in metrology, and on behalf of the international metrology organizations and all those present he congratulated the organizers of the Forum.

In a combined effort, all countries could now play a role in accelerating the reform and development of metrology. International metrology organizations and individual metrologists were now paying attention to the establishment and development of metrology, and how it could be used to supervise the market.

The key areas to consider were notably the use of metrological calibration and verification resources, the reorganization and optimization of laboratories and of the various technical bodies, operational models, traceability to international standards, fair competition through market surveillance, the functions and impact of the government in the supervision of metrological standards and of the market, the development of standards, and finally the impact of economic globalization.

In conclusion, this highly successful Forum was an opportunity for the representatives of international organizations, individual delegates and for representatives and experts from China to report on and discuss a wide range of topics concerning metrology, with the aim of increasing cooperation and learning from each others' experience. ■

RLMO NEWS

21st WELMEC Committee Meeting

Edinburgh, UK

11–12 May 2005

GABRIELE WESSELY
WELMEC Secretary

The 21st Committee meeting was held in Edinburgh (United Kingdom) on 11–12 May 2005. The meeting was opened by the Lord Provost, major of Edinburgh, following which Dr. J.W. Llewellyn, Chief Executive, NWML, gave a presentation of metrology in the UK and highlighted recent developments and changes in the Organization.

Mr. Freistetter (WELMEC Chairman) presented the Chairman's Report as well as the meeting notes of the EC Working Group *Measuring Instruments* from February 2005. The topics discussed in this EC Working Group would have a direct influence on the work of WELMEC in the coming years.

Next on the agenda was the election of the Chairperson. Since there had been no other nominees for chairmanship, Mr. Freistetter was reelected as Chairman of WELMEC for the next three years.

As Turkey had applied for membership, the representative from Turkey Mr. Cabbar gave a presentation about metrology in Turkey. In addition, Mr. Freistetter gave a short presentation on the relations between the European Union and Turkey. After a short discussion, Turkey was welcomed by the WELMEC Committee as a new Associate Member.

Mr. Schulz presented the paper he had prepared concerning WELMEC cooperation with the European Commission and the role of CEN/CENELEC and OIML on the basis of the discussions with the European Commission in February 2005. Whilst it was neither up to the OIML nor CEN/CENELEC to decide what work projects would be carried out within WELMEC, WELMEC work should nevertheless take into account all the work done by these Organizations. Mr. Brekelmans said that in principle everybody could interpret standards and if the standard was unclear then it should be objected to. The Chairman took note of the proposed procedure and would draw up clear working instructions in time for the next Committee meeting; the Convenors of the Working Groups (WGs) were instructed to analyze their work, taking into consideration the document prepared by Mr. Schulz.

As the Secretariat had not been informed of any problems implying the need to create new Working Groups, it was agreed to create contact points for taximeters in Bulgaria, for dimensional measuring instruments in Norway, and for exhaust gas analyzers and material measures for the WELMEC Secretariat. WELMEC members were invited to send their comments concerning the four categories listed above up to 31 October 2005 and if necessary the Chairman would set up additional WGs. Furthermore, it was agreed that WG 11 (Utility meters) would be one group with the opportunity to set up subgroups.

Mrs. Lagauterie (Vice-Chairperson of WELMEC) gave a short presentation on the 2004 Seminar which was held for WELMEC members to share their experiences concerning the implementation of the Measuring Instruments Directive of the EU (MID). The result was reassuring and Mr. Lagauterie (Convenor of WG 8) informed the audience about the plans for a Seminar on 17 November 2005 in Paris, where there would be about 120 participants including stake-holders, who would also be invited. Amongst others, topics would be: presentation of MID subassemblies, the role of WELMEC, H1 durability, market surveillance, exchange of information, the MID and software.

As the WELMEC Type Approval Agreement (TAA) was now nearly completely covered by the MID, the situation had to be reconsidered by the Chairman's Group for the next Committee meeting. Mrs. van Spronssen suggested that the WELMEC Secretariat should be informed as and when the need arose for new instruments to be added to the TAA.

Mr. Brekelmans informed members that the first meeting of the Commission Working Group on Measuring Instruments on 22 February 2005 had been very useful and important to explain the institutional setting and to inform the stakeholders about cooperation with WELMEC. It was agreed that after a review of the New Approach, sectoral Directives might have to be modified.

Concerning prepackages, Mr. Brekelmans informed the Committee about the latest developments concerning the deregulation of the sizes of prepackages at national and EU level. Following the survey of metrological requirements last year, no major changes were to be expected.

Dual labeling on packages had been extended up to 2009. Mrs. van Spronssen raised the question about the situation in the USA and Mr. Brekelmans informed the Committee that the USA would go metric; a lot of the States were already metric, but dual labeling was still permitted. If Europe was to forbid dual labeling this would cause a lot of problems, so the decision should be

left to the producers. The Chairman agreed that flexibility was important and if there were any problems with dual labeling, WELMEC would inform the EC about it. A European Directive extending again the period of dual labeling should be drawn up in due course.

A letter received from the EC (Mr. Brekelmans) to WELMEC (Mr. Freistetter) concerning the evaluation of OIML Recommendations was followed by lively discussion on how to approach the task. Some of the points were: format, distribution of work load, conformity and travel expenses. Mrs. Lagauterie presented a draft version of a paper that might serve as an example for further papers as required by the Commission. The different Working Groups of WELMEC were charged with analyzing OIML Recommendations in comparison to the requirements of the MID. Furthermore, it was agreed to create a harmonized procedure for the work.

Mr. Birdseye advised the Committee to bear in mind that some OIML Recommendations might not be ready by the time they were needed for the work of WELMEC. The Chairman stated that if no Recommendation existed (e.g. for taximeters) then WELMEC would not have to produce a document. Mr. Björkqvist asked if the documents given to the Commission should not be OIML Recommendations, since these were normative documents. The Chairman replied that indeed OIML Recommendations were normative documents, but that it would be WELMEC's task to identify parts of (or complete) normative documents which would lead to the presumption of conformity with the MID.

Reports by Working Groups

WG 2 Weighing Instruments

The WG 2 report was presented by Mr. Birdseye, who explained that WG 2 was a large and active group; industry was represented in it by CECIP, EUROPAMA and many other interested stakeholders. Guide 2 was published after approval during the Committee meeting, as was Guide 2.6. Guides 3.1 and 2.2 were currently under revision. WELMEC Guide 2.3 was approved.

There had been a European funded project for automatic weighing instruments. Results from the MID AWI Project would be used by WG 8 and the technical work would be taken on by WG 2.

There was, in addition, a proposal for issuing type approval certificates under the MID (transition period). The paper was presented by Mr. Birdseye and was given to WG 8 for further consideration.

WG 4 General Aspects of Legal Metrology

Mr. Lindlov, Chairman of WG 4, reported that the last meeting had taken place in January 2005; he presented the annex with information on the prescription of accuracy classes. He reported that a new WELMEC Guide covering uncertainty, failure rate and accuracy classes was under discussion.

WG 5 Metrological Supervision

Mrs. Lawrence (LACORS) presented the report of WG 5. It was agreed that the WG would be co-convened by Mr. Björkqvist and Mrs. Lawrence. The Guide on Market Surveillance would be revised in the course of the year. It was suggested to hold another WELMEC Enforcement Seminar in 2007 in the UK.

WG 6 Prepackages

The Report of WG 6 was presented by Mr. Burnett. WELMEC Guide 6.4 was approved after an extended discussion about the "Certificate of Recognition"; finally Mr. Johansen suggested accepting the Guide excluding the certificate and asking the Commission about a time schedule for a new Directive. Mr. Brekelmans responded that it was planned that a proposal for a Directive would be presented in 2006 and that the implementation at national level would take five years at least. Guide 6.4 was adopted and would be published on the WELMEC web site.

WG 7 Software

Mr. Schwartz, WG 7 Convenor, reported on the activities of this WG. Mr. Schulz requested clarification concerning the confusion about the difference between Guides 7.1 and 7.2. It was made clear that Guide 7.1 contained historical information and thus had to be renamed "Background information" and would be added as an Annex to Guide 7.2 after the next revision. In addition, Mr. Johansen suggested a minor change to Guide 7.2 concerning the Type P. The Guide was thus approved and would be published on the WELMEC web site.

WG 8 Measuring Instruments Directive

Mr. Lagauterie gave the report on WG 8. This WG worked in accordance with a priority list and was

prepared to share information any time via e-mail. The Terms of Reference of WG 8 were amended by the question of a harmonized approach towards taking into account national or EEC Type Approvals for MID purposes. In this WG many documents would be prepared to help the uniform application of the MID requirements in Europe. Most of the papers would be ready by next year.

WG 10 Measuring Equipment for Liquids Other Than Water

Mr. Volmer was confirmed as Convenor of WG 10. Mrs. van Spronssen informed the Committee about the recent activities of this WG and suggested voting via e-mail about the new Guide on Test Procedures for Flow Computers. WG 10 had also included work on MID relevant annexes.

WG 11 Utility Meters

Mr. Kramer presented the WG report and stressed that he felt no need to create sub-groups; he suggested establishing a procedure allowing WG 11 to contribute guidelines to the EC Working Group *Measuring Instruments* by a simplified approval procedure or on a preliminary basis.

Ad hoc Working Group on Information Exchange

Mr. Hahnewald was confirmed as the new Convenor and the Committee thanked Mr. Burghart for his work.

Mr. Birdseye gave the EMeTAS report and stated that the UK was the biggest user of EMeTAS by far. Additionally, Mr. Gainsford and Mr. Hacking presented the work and tasks of EMeTAS. They stressed the importance of cooperation between WELMEC and EMeTAS as a basis for the MID and their commercial interest in cooperation. This analysis, and the requirements for the exchange of information, was already covered and given to the Ad Hoc Group on Information Exchange.

Other reports

As usual at the end of the Committee Meeting, reports were presented by Observer Organizations. The report about the latest developments and achievements in the OIML was given by Mr. Johnston, CIML President, who especially talked about the OIML MAA and the expectations for this Arrangement, which had also been discussed on different levels within the various Organizations. The first measuring instruments covered by the MAA were nonautomatic weighing instruments according to OIML R 76 and load cells according to OIML R 60. He pointed out that in Europe these measuring instruments were covered by existing European Directives and therefore the impact on the WELMEC TAA was minimal.

Mr. Clark updated the Committee on the organizational structure of EUROMET. He also gave information concerning the European Project IMERA which was started with support from the EC. In the papers from the EC concerning the revision of the New Approach, the measurement infrastructure was explicitly mentioned. Therefore it could be expected that EUROMET would have a major role to play in the field of measurements all over Europe.

Future Committee Meetings

At the end of the Committee meeting Mrs. Todorova (Bulgaria) invited the Committee to hold its next meeting in Sofia on 4–5 May 2006. The Committee expressed its gratitude for this invitation.

For the meeting in 2007, Romania confirmed their invitation.

Main decisions

The WELMEC Committee:

- Approves the Minutes of the 20th Committee Meeting in Casta Papiernicka (amendment)
- Accepts the Chairman's Report for 2004
- Approves the Report concerning the Budget for 2004
- Approves the subscriptions for 2006 to be the same as 2005
- Re-elects as Chairman Mr. Gerald Freistetter
- Welcoms Turkey as an Associate Member (new issue WELMEC 1)
- Asks the Chairman to review the Member Policy (content of Agreements with the EU) and present the results at the 22nd Committee Meeting
- Asks the Convenors of the WGs to encourage participation of stakeholders in the working groups
- Agrees that at present there is no need for stakeholders' participation in Committee meetings and

therefore asks the Chairman to evaluate the possibilities of better information for stakeholders about decisions taken and ongoing discussions

- Agrees on the creation of contact points for Taximeters (Bulgaria) and Dimensional Measuring Instruments (Norway)
- Notes that comments concerning the following categories of measuring instruments are sent to the WELMEC Secretariat: Exhaust Gas Analyzers and Material Measures
- Notes that comments are to be sent to the contact point or to the Secretariat by 31 October 2005 at the latest
- Agrees to give information concerning dual labeling to the European Commission
- Endorses the Commission's letter concerning co-operation between WELMEC and the European Commission concerning the analysis of OIML Recommendations and the MID
- Approves all Working Group Reports
- Approves WELMEC Guide 2.3
- Takes note of the document concerning the use of accuracy classes in WELMEC member countries
- Amends TOR WG 5 (Information concerning non-conforming NAWI)
- Approves WELMEC Guide 6.4 (without certificate)
- Approves WELMEC Guide 7.1 (re-titled)
- Approves WELMEC Guide 7.2 (slight amendment)
- Confirms Ms. Karen Lawrence as Co-convenor of WG 5
- Confirms Mr. Roman Schwartz as Convenor of WG 7
- Confirms Mr. Wim Volmer as Convenor of WG 10
- Thanks Mr. Michael Harvey for his work as Co-convenor of WG 5
- Confirms Mr. Rainer Hahnewald as Convenor of the ad hoc group on Information Exchange
- Thanks Mr. Burghart for his work as Convenor of the ad hoc group on Information Exchange
- Takes note of the report of EMeTAS
- Agrees to remove the notified body information on the web site (replacing with link to nando-is data base)
- Thanks NWML for hosting the 21st Committee Meeting
- Accepts the invitation to hold the 22nd WELMEC Committee Meeting on 4–5 May 2006 in Bulgaria
- Accepts the invitation to hold the 23rd WELMEC Committee Meeting in Romania in 2007 (date to be confirmed)

MILESTONES IN METROLOGY

Information

Following the success of the first Milestones in Metrology Congress in 2003, NMi (The Netherlands) has decided to organize a second event which will take place on 14–17 May 2006 at the Martiniplaza in Groningen:

Leonard Springerlaan 2
PO Box 8010
9702 KA Groningen
The Netherlands

www.martiniplaza.nl

The official Congress language will be English, however groups of participants who require translation are invited to contact the congress management.

The Congress will be a platform to discuss the future of legal metrology between manufacturers, metrology institutes and regulators, and will follow on from the discussions in 2003.

Each day will have a different theme: "Global Market Access", "The Measuring Instruments Directive", and "Technique and the Future" and presentations will cover a wide range of topics such as:

- the need for a Global Certification System,
- the OIML Mutual Acceptance Arrangement,
- the North American NTEP Program,
- Worldwide Certification,
- The Implementation of the MID,
- Market Surveillance,
- Harmonized Standards and OIML Recommendations,
- Prepackaging.

Further details may be obtained on the following web site:

www.milestonesinmetrology.nl

Third Middle East Metrology Conference and Exhibition

29-31 May 2006

Bahrain International Exhibition Centre, Kingdom of Bahrain

Information

The Kingdom of Bahrain is set to host the Third Middle East Measurement, Instrumentation & Laboratory Equipment (MEMI) Conference from 29 to 31 May 2006 at the Bahrain International Exhibition Centre (BIEC).

MEMI 2006 will be held under the patronage of H.E. Dr. Hassan Abdulla Fakhro, Minister of Industry and Commerce, Kingdom of Bahrain and is a joint venture undertaken by the Bahrain Convention & Exhibition Bureau (BCEB) and the Bahrain Society of Engineers (BSE).

The event will provide solutions and latest technologies to the rapidly emerging market for Metrological and Laboratory Equipment in the Middle East. The main objective of organizing MEMI 2006 is a step towards realizing the government's aspiration of establishing the Kingdom of Bahrain as one of the region's leading business and industrial destinations.

MEMI 2006 will consist of an Exhibition, and a Conference accompanied by seminars and workshops. MEMI was previously held in 2002 and 2004. With the proven success record of the past two years and keen interest shown by participants, MEMI is now a recognized event in Bahrain's calendar.

This event is expected to attract more than 120 exhibitors from related companies and the conference will include around 60 experts who will present papers.

To register, please contact the Organizers at the address below, or consult the web site.

Middle East Measurement Instrumentation & Laboratory Equipment 2006 Exhibition Office

Bahrain Convention & Exhibition Bureau, P. O. Box 11644 Manama, Kingdom of Bahrain
Phone +973 - 17-558812 or 17-558810
Fax +973 - 17-555513
Email: info@bahrainexhibitions.com

www.middleeastmetrology2006.com

The OIML is pleased to welcome the following new

CIML Member

- **Tunisia:**
  Mr. Mohamed Laouini

OIML Meetings

9–10 March 2006 · BEV, Vienna, Austria (to be confirmed)

TC 8/SC 1 Static volume measurement
Drafts of revisions of R 71, R 80 and R 81
Note: Possible alternative dates are 11–12 May 2006 in Vienna

October 2006 · Sheraton Hotel, Cape Town, South Africa
(Date to be confirmed)

41st CIML Meeting and associated events

www.oiml.org
Stay informed

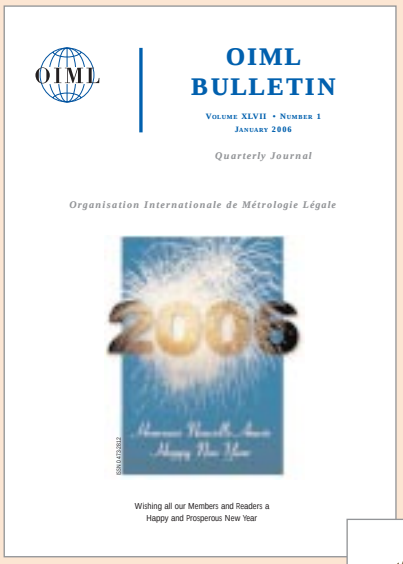
Committee Drafts

Received by the BIML, 2005.08 – 2005.11

Procedure for calibration and verification of the main characteristics of thermographic instruments	E	2 CD	TC 11/SC 3	RU
Combined revision R 6, R 31 and R 32: Gas meters	E	3 CD	TC 8/SC 8	NL
Automated refractometers. Methods and means of verification	E	1 CD	TC 17/SC 2	RU
Revision R 56: "Standard solutions reproducing the electrolytic conductivity"	E	3 CD	TC 17/SC 4	RU
Revision R 49-1: Water meters for metering cold potable water and hot water: Part 1: Metrological and technical requirements	E	3 CD	TC 8/SC 5	UK
Revision R 49-2: Water meters for metering cold potable water and hot water: Part 2: Test methods	E	3 CD	TC 8/SC 5	UK
Revision R 49-3: Water meters for metering cold potable water and hot water: Part 3: Test report format	E	2 CD	TC 8/SC 5	UK
Revision R 21: Taximeter systems	E	3 CD	TC 7/SC 4	UK

Call for papers

OIML Members
RLMOs
Liaison Institutions
Manufacturers' Associations
Consumers' & Users' Groups, etc.



- Technical articles on legal metrology related subjects
- Features on metrology in your country
- Accounts of Seminars, Meetings, Conferences
- Announcements of forthcoming events, etc.

The **OIML Bulletin** is a forum for the publication of technical papers and diverse articles addressing metrological advances in trade, health, the environment and safety - fields in which the credibility of measurement remains a challenging priority. The Editors of the Bulletin encourage the submission of articles covering topics such as national, regional and international activities in legal metrology and related fields, evaluation procedures, accreditation and certification, and measuring techniques and instrumentation. Authors are requested to submit:

- a titled, typed manuscript in Word or WordPerfect either on disk or (preferably) by e-mail;
- the paper originals of any relevant photos, illustrations, diagrams, etc.;
- a photograph of the author(s) suitable for publication together with full contact details: name, position, institution, address, telephone, fax and e-mail.

Note: Electronic images should be minimum 150 dpi, preferably 300 dpi.

Papers selected for publication will be remunerated at the rate of 23 € per printed page, provided that they have not already been published in other journals. The Editors reserve the right to edit contributions for style, space and linguistic reasons and author approval is always obtained prior to publication. The Editors decline responsibility for any claims made in articles, which are the sole responsibility of the authors concerned. Please send submissions to:

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