OIML BULLETIN

VOLUME LXIV • NUMBER 4
OCTOBER 2023

Quarterly Journal

Organisation Internationale de Métrologie Légale

Photo: Succo, Pixabay

ISSN 0473-2812

Legal metrology compliance and enforcement

BULLETIN

VOLUME LXIV • NUMBER 3

OCTOBER 2023

THE OIML BULLETIN IS THE JOURNAL OF THE ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

The Organisation Internationale de Métrologie Légale (OIML), established 12 October 1955, is an intergovernmental organization whose principal aim is to harmonize the regulations and metrological controls applied by the national metrology services of its Members.

EDITOR-IN-CHIEF: Anthony Donnellan
EDITOR: Chris Pulham

THE OIML BULLETIN IS FREE OF CHARGE

PUBLISHED ONLINE BY THE BIML

OIML SECRETARIAT

BUREAU INTERNATIONAL DE MÉTROLOGIE LÉGALE (BIML)

11 RUE TURGOT – 75009 PARIS – FRANCE
TEL: 33 (0)1 4878 1282
FAX: 33 (0)1 4282 1727
INTERNET: www.oiml.org or www.oiml.int
www.metrologyinfo.org

BIML STAFF

DIRECTOR
Anthony Donnellan (anthony.donnellan@oiml.org)

ASSISTANT DIRECTORS
Paul Dixon (paul.dixon@oiml.org)
Ian Dunmill (ian.dunmill@oiml.org)

STAFF MEMBERS (IN ALPHABETICAL ORDER)
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Florence Martinie: Administrator, Finance (florence.martinie@oiml.org)

Luis Mussio: Engineer (luis.mussio@oiml.org)

Chris Pulham: Editor/Webmaster (chris.pulham@oiml.org)

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COMPLIANCE AND ENFORCEMENT

Editorial

KERYNNE BIRCH
Manager, Legal Metrology Branch,
Programs and Governance
National Measurement Institute, Australia
(NMIA)

Legal metrology: Regulatory compliance and enforcement

Cost of living pressures are a global issue affecting both consumers and business. Now, more than ever, the work programs of legal metrology regulators are critical to building up trust and facilitating trade in OIML member economies. While regulation of legal metrology is typically an activity that takes place "behind the scenes", it is nevertheless of vital importance and is generally accepted as automatically occurring in the background by consumers because consumers "assume" – rightly so – that they are getting value for money and that the transactions they engage in represent fair value for money.

Instantaneous access to information is globally prevalent, which goes hand-in-hand with community expectations about government regulators delivering effective outcomes. Modern regulators have responsibilities associated with timely and accurate access to information about their regulatory program outputs. The options available for reaching communities are vast, particularly options relating to engagement via social media. Legal metrology regulators must monitor available options to ensure maximum reach and timeliness when sharing information.

Fit-for-purpose engagement with regulated entities carries significant importance and is a common expectation of modern regulators. In addition to engaging with the community, we must also find the right "fit" for the *type* of engagement to ensure success. Expectations about the outcomes of the engagement must be clear and coupled with a fitting engagement mechanism. Such engagements can have positive impacts in increasing industry compliance via raising awareness about legislative responsibilities and practical ways to comply. Online mechanisms to engage, inform, consult and educate have flourished and can be balanced with face-to-face meetings.

Regulatory approaches of governments across the globe can vary widely. From self-regulation and education to strong financial penalty deterrents, or prescriptive vs outcome-focused approaches, regulators today have a myriad of choice when designing their regulatory approach. Legal metrology regulators must select appropriate regulatory approaches that balance government priorities, the consumer, and business expectations, while identifying and allowing for risks. Modern regulatory approaches must also evolve with technological developments, which are occurring at a rapid rate. Regulators of legal metrology face many challenges associated with new technologies for emerging renewable fuel markets and net zero priorities, to name but two. Keeping pace with technological advancements will ensure regulations are effective and fit for purpose, reduce barriers to trade, and maintain trust.

This edition of the OIML Bulletin, mentored by the National Measurement Institute Australia (NMIA) presents a number of case studies and practical thoughts on various legal metrology regulatory approaches, and describes challenges facing OIML Members. We hope you enjoy reading it, and invite you to share your own compliance and enforcement challenges – and how you resolved them – with the readers of the Bulletin. ■

Kerynne Birch

Manager, Division Métrologie Légale,
Programmes et Gouvernance
Institut National de la Mesure, Australie
(NMIA)

Métrologie légale : Conformité réglementaire et application de la loi

Les pressions liées au coût de la vie sont un problème mondial qui affecte à la fois les consommateurs et les entreprises. Aujourd'hui, plus que jamais, les programmes de travail des organismes de réglementation de la métrologie légale sont essentiels pour instaurer la confiance et faciliter les échanges dans les économies membres de l'OIML. Bien que la réglementation de la métrologie légale soit généralement une activité qui se déroule « en coulisses », elle est néanmoins d'une importance vitale et est généralement acceptée comme se produisant automatiquement en arrière-plan par les consommateurs parce que ceux-ci « supposent » – à juste titre – qu'ils en ont pour leur argent et que les transactions qu'ils effectuent représentent un juste rapport qualité/prix.

L'accès instantané à l'information est monnaie courante dans le monde entier, ce qui va de pair avec les attentes de la communauté à l'égard des régulateurs gouvernementaux pour qu'ils fournissent des résultats efficaces. Les régulateurs modernes ont des responsabilités liées à l'accès opportun et précis à l'information sur les résultats de leur programme de réglementation. Les options disponibles pour atteindre les communautés sont vastes, en particulier les options relatives à l'engagement via les médias sociaux. Les organismes de réglementation de la métrologie légale doivent surveiller les options disponibles afin de garantir une portée maximale et un partage de l'information en temps opportun.

Un engagement adapté aux objectifs avec les entités réglementées revêt une grande importance et constitue une attente commune des régulateurs modernes. Outre l'engagement avec la communauté, nous devons également trouver le bon « ajustement » pour le *type* d'engagement afin d'en assurer le succès. Les attentes concernant les résultats de l'engagement doivent être claires et associées à un mécanisme d'engagement approprié. De tels engagements peuvent avoir un impact positif sur la conformité de l'industrie en la sensibilisant aux responsabilités législatives et aux moyens pratiques de s'y conformer. Les mécanismes en ligne d'engagement, d'information, de consultation et d'éducation ont prospéré et peuvent être équilibrés par des réunions en face à face.

Les approches réglementaires des gouvernements du monde entier varient considérablement. De l'autorégulation et de l'éducation à des sanctions financières dissuasives, en passant par des approches prescriptives ou axées sur les résultats, les régulateurs disposent aujourd'hui d'une myriade de choix pour concevoir leur approche réglementaire. Les autorités de réglementation de la métrologie légale doivent choisir des approches réglementaires appropriées qui concilient les priorités gouvernementales, les attentes des consommateurs et des entreprises, tout en identifiant et en prenant en compte les risques. Les approches réglementaires modernes doivent également évoluer avec les développements technologiques, qui se produisent à un rythme rapide. Les régulateurs de la métrologie légale sont confrontés à de nombreux défis liés aux nouvelles technologies pour les marchés émergents des carburants renouvelables et les priorités « net zéro », pour n'en citer que deux. En suivant le rythme des avancées technologiques, les réglementations seront efficaces et adaptées à leur objectif, elles réduiront les obstacles au commerce, et maintiendront la confiance.

Cette édition du Bulletin de l'OIML, parrainée par le National Measurement Institute Australia (NMIA), présente un certain nombre d'études de cas et de réflexions pratiques sur diverses approches réglementaires en matière de métrologie légale, et décrit les défis auxquels sont confrontés les Membres de l'OIML. Nous vous souhaitons une bonne lecture et vous invitons à partager avec les lecteurs du Bulletin vos propres défis en matière de conformité et d'application de la réglementation, ainsi que la manière dont vous les avez résolus. ■

CONFORMITY

Propagation of conformity statements in weighing procedures for law enforcement

Gisa Foyer[1], Katy Klauenberg[2], John Greenwood[3]

[1] Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany

[2] Physikalisch-Technische Bundesanstalt, Abbestr. 2-12, 10587 Berlin, Germany

[3] United Kingdom Accreditation Service (UKAS), 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, United Kingdom

1 Abstract

In some practical cases direct weighing is not feasible and weights have to be calculated from several weighing results. For most legal purposes, a risk-based evaluation of the non-conformance is still necessary. This paper focuses on the use of decision rules to derive conformity statements and technical rules that comply with ISO 17025 in these cases.

2 Introduction

The main aim of legal metrology is to ensure trust and fairness in measurements covering consumer protection, health, safety, and other areas [1]. One of the cornerstones of reaching this aim is a general acceptability of measurement results, which can, among other things, be established by statements of conformity. Such statements are made according to ISO/IEC 17025:2017 [2] and are based on measurement uncertainty and risk evaluation as described in JCGM 106:2012 [3].

Some use cases require the combination of several measurement results, each with limited conformity information, to come to an overall measurement result, as well as a statement of conformity about this. Reference [4] gives an overview of the propagation of conformity statements in accordance with [2], [3], [6] when linearly combining quantities. For instance, it is argued and demonstrated in [4] that simply combining specification limits might lead, in the worst case scenario, to the wrong acceptance of the combined measurement results. The guidance provided and the decision rules developed in [4] enable the risk of the non-conformance of linearly combined quantities to be calculated.

This summary paper gives an overview of the results found in [4] and focusses on their practical application in developing technical rules for legally regulated measuring instruments. Conformity statements in legal metrology generally include a minimum amount of information, without additional information on the measurement uncertainty and the corresponding probability distribution, complicating their dissemination. This is discussed in [4] with reference among others to OIML G 19:2017 [5]. The example of weighing long trucks for law enforcement purposes as taken from [4] clarifies these conditions. Weighing procedures for long trucks and rules for the propagation of conformity statements are developed on a national level and are influenced by national laws and regulations. The main question to be answered in this summary paper is whether guidance provided in [4] on new decision rules is sufficient to determine the acceptance of a linearly combined measurement result in advance of the execution of each input measurement. Moreover, can such guidance be considered in the decision-making process for new technical rules?

3 Summary of options to propagate conformity

In [4] the topic of propagating conformity statements is discussed. In particular, statements of conformity are investigated for linear combinations of quantities for which, in turn, conformity statements are available. In [4] the development of decision rules on how to propagate conformity statements is performed in two steps:

i) classifying the scenario based on the amount and quality of the knowledge on the input statements of conformity, and

ii) mathematically deriving the risk of non-conformance for common scenarios.

Let us summarise both steps in the following.

Knowledge on input statements of conformity can vary greatly. This might range from the complete measurement results including probability distributions on all inputs to just conformity to specification statements. In [4] four main cases are distinguished, resulting in different approaches. A brief overview of the four cases and general guidance on risk calculation is summarised in Table 1.

Table 1: Four main cases (G,C, S, and M) of risk calculation for the propagation of conformity statements and a summary of the methods to calculate the risk of non-conformance (based on [4])

Case	Calculation of risk based on
G – GUM	GUM documents ([3], [6], [7]) are applicable
C – Conservative approaches	GUM with conservative approach is used
S – Simplified rules	Tables [4] and software [8] can be used
M – Minimum information available	Adding input risks

Cases S and M are the prevailing ones in the use of measuring instruments in legal metrology. Reference [4] gives general guidance for stating conformity in the cases of G, C, S and M. It also provides two sets of examples, one of which is presented and discussed in more detail in the following section.

4 Example of weighing for law enforcement purposes

The propagation of statements of conformity may in general be avoided by directly using measurement results for which a statement of conformity is available. One such instance might be the reading on a conformity-assessed weighing instrument. However, in some cases this is not possible practically, for example, when weighing very long trucks especially for law enforcement purposes. Trucks may be too long to fit on a single weighbridge (e.g. due to having loaded long logs) or no suitable weighing instrument may be available. The issue of non-compatibility between the weighing instrument and the object to be weighed is neither new nor specific to a single nation. Furthermore, instructions for different weighing procedures exist worldwide, for example in Germany [9], Australia [10], and the United Kingdom [11]. In the German document, the specification that the truck weight is said to conform to is the sum of the specifications for each input measurement e.g. the maximum permissible error (MPE) in service. The other two documents do not give any specifications that the sum of the input measurements must conform to. The risk of non-conformance is not quantified in any of the documents even though [2] requires risk-based statements.

In the following, the risk of the calculated truck weight not conforming to the sum of the in-service specifications for each input measurement is calculated for different weighing procedures, which are shown in Figure 1. It should be noted that this paper focuses solely on the impact of the propagation of conformity statements and not on any metrological effects the described procedures might be involved with, e.g. shifting of loads during moving of the vehicle or influences of the alignment of the weighing instruments.

First of all, procedures a)-d) have to be classified into one of the cases of G, C, S, or M from [4]. Therefore, the amount and quality of knowledge on the weighing instruments has to be analysed. For all four procedures, it is assumed that weighing instruments are used that

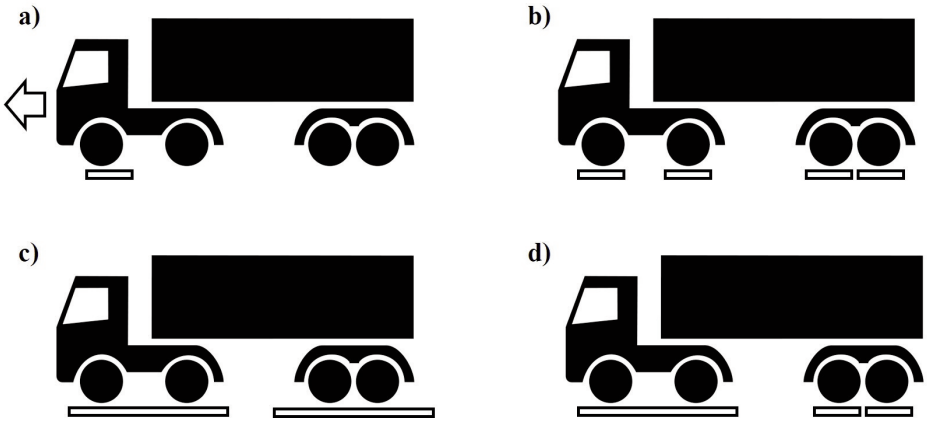

Figure 1: Different weighing procedures for weighing a long vehicle. a) Sequential weighing on the same instrument. b) Simultaneous weighing on different instruments of the same type (axle weighers). c) Simultaneous weighing on different instruments of the same type (short bridge). d) Simultaneous weighing on different instruments of different types

Table 2: Resulting risk of non-conformance for the linear combination in different weighing procedures

Procedure (Figure 1)	Case [4]	Assumptions	Method	Risk of non-conformance
Single weighing	S0	$n = 1$, $m \leq 12$	[8]	0.033
a)	M1	$n = 4$	Adding input risk ($4 \cdot 0.033$)	0.132
b)	S1	Independence, $n = 2$, $m \leq 12$	Table 2 [4]	0.00174
c)	S1	Independence, $n = 4$, $m \leq 12$	Table 2 [4]	0.00000603
d)	S2	Independence, $n = 3$, $m \leq 12$, $MPE_1/MPE_2 = 0.4$	Figure B1 [4]	0.00015

are conformity assessed in line with OIML Recommendation R 76 [12]. The relevant metrological specification for the displayed weight during initial or subsequent verification is given in the form of an MPE, and the conformity is established using weights with expanded uncertainty ($k = 2$), being smaller than or equal to 1/3 of the MPE. For procedures b)-d), a sufficient degree of independence can be assumed between the input measurements, thus allowing the application of the decision rules of case S. In contrast, procedure a) requires the classification of the decision rules in case M as the input measurement values are clearly correlated (cf. [4] for details).

Within case S, several scenarios permit a particularly simple evaluation of the risk of non-conformance, two of which are important for the example: scenario S1 when the MPEs for all measurement inputs are identical, and scenario S2 when MPEs for all but one measurement are identical. Assuming an evenly distributed weight on the trucks in Figure 1, procedures b) and c) can be classified as S1 and procedure d), as S2. For cases S1 and S2, the relation m between the standard uncertainty of the weights that were used to establish conformity and the in-service MPEs is needed. As the relation between the initial and the in-service MPE is 2, $m \leq 12$ (cf. [4] for details). Additionally, for case S2, the ratio between the MPE of the different instruments (short bridge and axle weigher) is needed. This is assumed to be 0.4.

Table 1 summarises the appropriate cases and assumptions for all the procedures shown in Figure 1 to give the resulting risk of non-conformance for in-service MPEs. For comparison, the results of a single weighing on a suitable weighbridge are given as well using case S0. For this case, the assumptions of case S apply, and an online app [8] was used to calculate the risk of non-conformance based on distributional assumptions taking into account MPE and measurement uncertainty information (see Theorem 1 in [4]).

The results in Table 1 show large differences in the risks of non-conformance between the four scenarios. Case M1 stands out in particular because the input risks accumulate. The resulting risk thus increases with the number of input quantities, which is not expected for the other cases. However, case M1 is the only one applicable for correlated input quantities whose correlation is unknown. The assumption of independence needed for the scenarios in case S is thus a vital one and should be valid.

5 Application of results in developing technical rules

Knowledge on the risk of non-conformance can be used for developing technical rules in several ways. These include evaluating existing rules and determining the most suitable procedures, as well as more detailed requirements. One common approach for propagating conformity statements for all cases and measurement scenarios is however not possible as this depends on the measurement procedure and the purpose of the measurement, as well as legal or technical restrictions.

In the following, a few examples of the requirements needed for technical rules when weighing very long trucks are given along with further details.

- Procedure a) with the highest risk of non-conformance might be considered for very specific purposes, such as weighing clearly heavily overloaded and dangerous vehicles. The risk of harm to others may outweigh the risk of wrongly accusing someone of overloading in this case. Therefore, a description of the measurement scenario, the protection goal and the mathematical methods used for the risk analysis should be included in the decision for a technical rule.

- A technical rule might restrict the number of input values for procedure a) to limit the increase in the risk of non-conformance.
- A technical rule might comprise conditions for procedures b)-d) as regards the input values. This might be a recorded assessment or even proof of the independence of the input values.
- A technical rule for any procedure should require a statement on the risk of non-conformance for each output value similar to what is required in [2].

All these are only options and are hypothetical, but they clearly show the benefit of risk calculations when developing technical rules, as well as laws, and regulations for statements of conformity on linear combinations of quantities.

6 Summary and outlook

The research presented in [4] has been summarised. It gives an overview of approaches to assess the conformity of linear combinations of quantities, for which conformity statements with different kinds of information are available. The guidelines provided and the decision rules developed enable a risk calculation for the non-conformance of linear combined quantities. These can be used to enable risk-based decisions on which measurement procedures fulfil legal and technical requirements and on where additional knowledge is needed to safely use measuring instruments. With the help of the online app [8], which is also supplied in [4], further scenarios are easy to calculate.

This paper demonstrated that the guidance given in [4] is sufficient to allow very concrete technical rules. The example also shows that assumptions that are made in the process of risk calculations have to be checked for their validity as they can have a large effect on the result. This applies especially to the independence of the input values.

Even though this summary, as well as the original paper [4], focusses on examples from weighing, it is expected that the research results can be used for other measuring scenarios as well. Such scenarios include electrical metering, where not all sources and rates of consumption are measured separately. ■

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COMPLIANCE

Legal metrology compliance and enforcement in Australia

KERYNNE BIRCH
Manager, Legal Metrology Branch,
Programs and Governance
National Measurement Institute, Australia (NMIA)

Abstract

This article describes how legal metrology compliance and enforcement is administered in Australia, with a focus on the benefits of enforceable undertakings as an enforcement tool. It also presents how the National Measurement Institute, Australia (NMIA) is making a once in a generation change to the legislation that administers legal metrology.

1 Introduction

The NMIA is a Division of the Department of Industry, Science and Resources and is the top-level body responsible for maintaining Australia's measurement system through administration of the *National Measurement Act 1960*. NMIA administers the measurement legislation and undertakes various activities to support a vision of trusted measurement for Australia. As a national authority on measurement, NMIA plays a fundamental role in underpinning the Australian economy by:

- maintaining and regulating Australia's measurement system;
- developing and maintaining national measurement standards;
- delivering world-class measurement products and client services; and
- ensuring that Australian consumers and industry can rely on trusted measurements for fair trade in goods and services.

More than $1 trillion worth of goods, services and utilities are estimated to be traded each year in Australia based on measurement. Reliable representations of measurements help consumers and businesses to make informed purchasing decisions, which more broadly, support the efficient operation of the markets.

In planning and undertaking our regulatory responsibilities, NMIA recognises that reducing regulatory burden on industry can lower costs to businesses and facilitate innovation. We also note the importance of ensuring that the regulatory environment strikes the right balance between efficient markets and community expectations.

2 Regulation of legal metrology in Australia

2.1 Trade measurement inspectors

NMIA employs a workforce of highly skilled trade measurement inspectors located in most capital cities in Australia and some regional locations (see Figure 1, page 10). A presence in both metropolitan and regional locations is essential to manage unique risks associated with different locations. Even with an expansive coverage of officers, challenges still exist relating to coverage of some regional and remote areas. This is primarily due to the size of the Australian continent which, for example, is several times the size of Europe. Inspection programmes in regional and remote locations require significant planning to ensure success.

Trade measurement inspectors spend up to 18 months undertaking specialised training before being appointed under the *National Measurement Act 1960*. Once appointed, their role is to ensure that traders comply with the legislation and adopt correct trading practices by checking that:

- measuring instruments (for example, weighing instruments, fuel dispensers and weighbridges) are accurate;
- pre-packaged goods contain the correct amount of product;
- trader practices do not disadvantage consumers (i.e. taring practices); and
- authorised third parties conduct their business in accordance with legislative requirements.

NMIA's trade measurement inspectors provide advice and guidance to businesses on better measurement practice, and they enforce legislative requirements. They also undertake targeted audits as part of market surveillance activity to monitor traders' and licensees' compliance with their obligations under the legislation.

2.2 Measuring instruments

The *National Measurement Act 1960* regulates measuring instruments used for trade purposes. This framework is consistent with international best practice. Key components of this framework are pattern approval and instrument verification.

Image 1: A trade measurement inspector testing a retail weighing instrument used for trade

2.2.a Pattern approval

Measuring instruments must be manufactured according to an approved pattern (design). The pattern approval process determines whether a measuring instrument is suitable for its intended uses. It also ensures that the instruments will operate within the prescribed allowable limits of error over a range of environmental and usage conditions.

2.2.b Instrument verification

The pattern-approved instrument must be tested by a licensed third-party organisation (service licensee). NMI licenses more than 300 external third party organisations which employ more than 1 200 verifiers. These verifiers on average verify between 85 000 and 110 000 measuring instruments per year.

3 Compliance and enforcement approach

NMIA's compliance and enforcement approach is supported by the best practice principles of proportionality, consistency, and transparency. Observing these principles is coupled with a risk-based approach that aims to minimise harm, while at the same time avoiding creating unnecessary compliance costs or burdens for business.

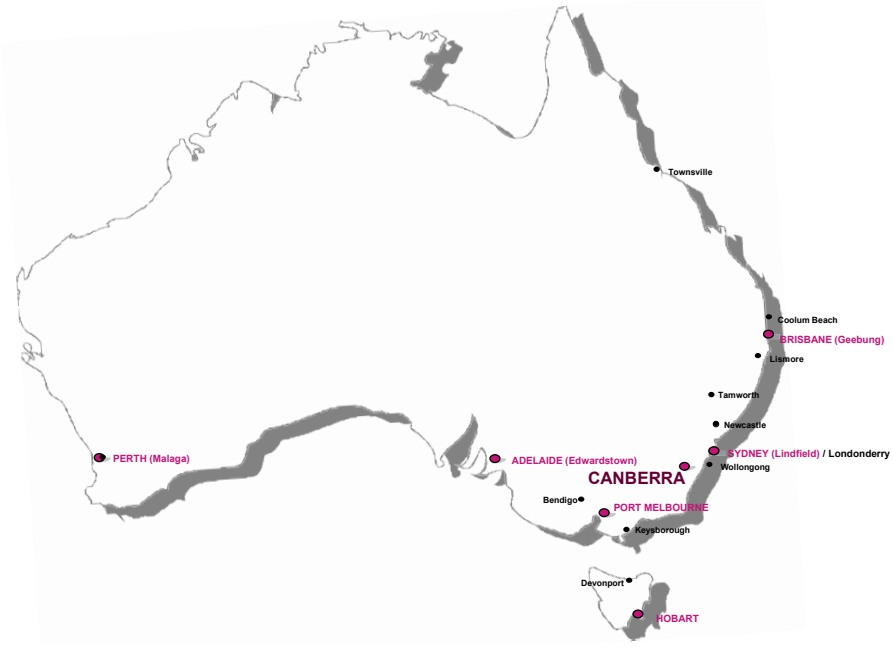

Figure 1: NMIA office locations

NMIA measures risk in terms of the harm and likelihood of regulatory non-compliance. Some of the factors used to determine harm include:

- impact on confidence in the measurement system;
- extent of financial detriment to consumers or industry;
- impact on maintaining a level playing field for business competition; and
- ability of consumers to make informed purchasing decisions.

In assessing risk, we consider the impact of any single instance and/or the cumulative effect of many individual instances of non-compliance. We use a risk-based approach when:

- prioritising the development and maintenance of the legal metrology infrastructure (for example, pattern approval standards, National Instrument Test Procedures, and appointment of authorised third parties);
- targeting compliance activities; and
- determining the appropriate and proportionate regulatory response where non-compliance is identified.

3.1 Program-driven compliance

NMIA combines market intelligence, consumer complaints and stakeholder feedback with compliance history to plan and implement national annual and targeted inspection programs. Trade measurement inspectors use program plans to inform inspection planning as well as responding to complaints or in-field intelligence. NMIA may also work closely with traders who require specialist advice or support to meet their measurement regulation responsibilities. These requests may inform future inspection effort within the program planning period.

Annual programs occur throughout the financial year period, whilst targeted programs occur within one-week timeframes. Targeted programs involve all trade measurement inspectors across Australia to focus on one trader type during the program week.

3.2 Authorising framework and compliance response

3.2.a Authorised third parties

NMIA has developed a package of assessment products for verifiers and weighbridge operators to ensure individuals operating under licences issued by NMIA are able to competently discharge their regulatory responsibilities. NMIA is registered by the Australian Skills Quality Authority under the Australian Quality Training Framework, so participants who meet all the requirements of a relevant assessment are awarded a nationally recognised statement of attainment. Verifiers employed by Servicing Licensees are required to hold statements of attainment for each of the subclasses of measuring instruments they verify. It is a condition on all Public Weighbridge Licensees that at least one registered public weighbridge operator must hold a statement of attainment for weighbridge operations.

Servicing licensees are required to maintain a quality management system (QMS) that outlines appropriate processes, procedures, equipment and competency documentation needed to correctly verify measuring instruments. QMS documents must be submitted with an application for issue or renewal of a servicing licence. They can also be subject to an on-site audit by a trade measurement inspector. As a condition of their appointment, Verifying, Certifying and Approving Authorities and Utility Meter Verifiers must demonstrate their competence to perform specific types of testing, inspection, calibration, and other related activities. This is usually through appropriate accreditation from the National Association of Testing Authorities (NATA).

3.2.b Compliance response

Where non-compliance results in a low level of harm and there is minimal likelihood of continued non-compliance, a trade measurement inspector will issue a non-compliance notice and may provide education if appropriate. A follow-up visit will check that any issues identified have been corrected. This is the most common enforcement action. In addition to non-compliance notices, where follow-up inspections identify continued non-compliance or the level of non-compliance detected in initial audits results in more significant harm, possible enforcement options include:

- letters of warning; and/or
- infringement notices (which currently include a fine of AUD1 565 per offence).

Where non-compliance and infringement notices have not deterred traders or licensees from breaching measurement legislation or where monitoring activities detect more serious issues, further enforcement options include:

- NMIA entering into an enforceable undertaking with the trader; and/or
- referring matters to the Commonwealth Director of Public Prosecutions for consideration of injunction or prosecution.

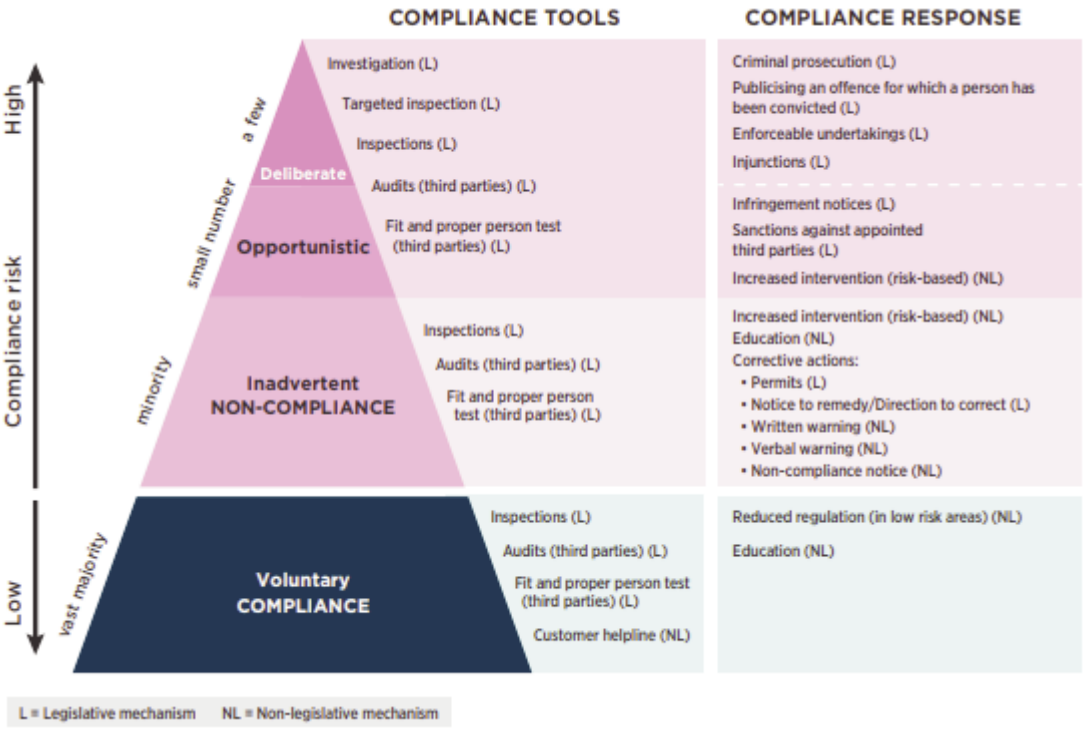

Figure 2: NMIA compliance response commensurate to risk

Additional disciplinary action can also be taken against servicing and public weighbridge licensees and utility meter verifiers, including:

- varying the conditions of their licence/appointment;
- suspending their licence/appointment for up to 12 months; and/or
- cancelling their licence/appointment.

Continued non-compliance may also warrant increased intervention via programmed inspection activities by trade measurement inspectors.

The NMIA processes enforcement actions via a central team to ensure a consistent approach. This central team is engaged from the time at which the non-compliance is identified. Each instance of non-compliance that may warrant escalated enforcement action is moderated for consistency.

Figure 2 demonstrates the range of compliance options currently available to NMIA and how they relate to the risk of the identified non-compliance.

3.2.c Enforceable undertakings

Enforceable undertakings are an effective tool used to work collaboratively with the organisation, via agreement, to achieve compliance. Enforceable undertakings are given in person to NMIA in connection with a matter relating to compliance under the *National Measurement Act 1960*. Following identification of non-compliance, NMIA works with the trader on requirements to achieve compliance. Such requirements may include:

- ensuring all instruments under control of the trader are tested and verified;
- development and implementation of internal audit programs;
- update to or improvement of internal quality management systems;
- staff training relating to legislative requirements;
- reporting requirements to ensure compliance; and
- monitoring requirements.

By entering an enforceable undertaking with the organisation, NMIA can affect meaningful outcomes that are often organisation-wide, rather than outcomes limited to an individual trader. This often has a broad geographical impact if the organisation has multiple sites in different locations. Enforceable undertaking requirements also set the foundation for sustained compliance, resulting in the potential for reduced repeat non-compliance.

Between 2017 and 2018, NMIA undertook targeted inspections of major supermarket chains in Australia which resulted in high levels of minor non-compliance. The NMIA accepted two formal enforceable undertakings which included requirements to:

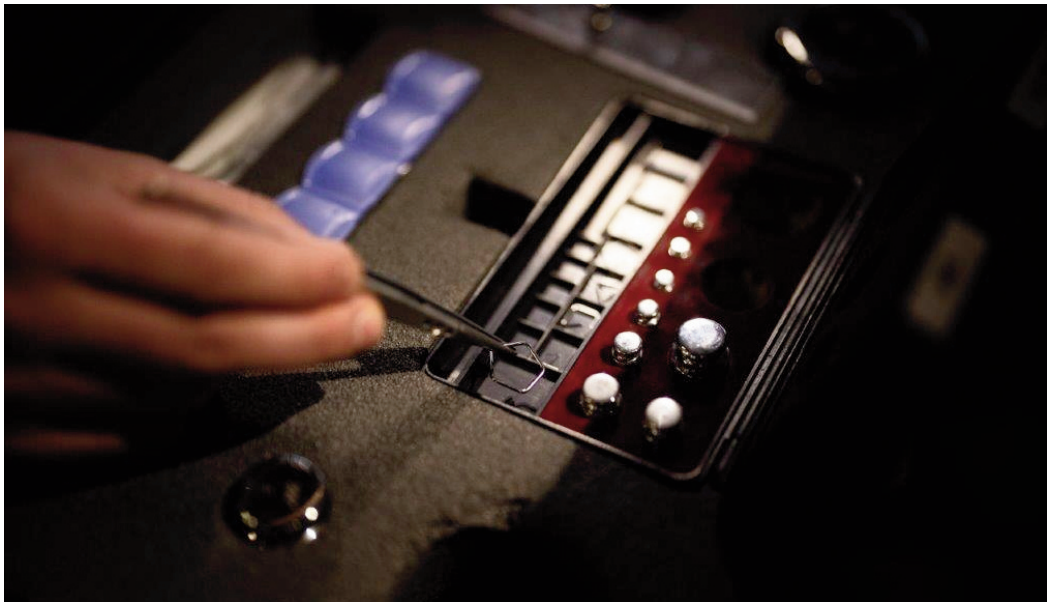

Image 2: Use of micro-weights to assess compliance

- introduce quality assurance processes to test accuracy;
- verify the status and cleanliness of non-automatic weighing instruments;
- train staff relating to tare allowances and trading practices and improved quality assurance checks on pre-packaged and bakery goods.

During a targeted program in December 2020, the inspection pass rate increased by up to 42 %, with improvements in compliance across four inspection types, indicating that the enforceable undertakings resulted in organisation-wide improvements.

4 Australian Measurement Law reform

Australia's current measurement legislation supports consumer confidence in our measurement system; however, it is prescriptive, lacks flexibility, and does not support the adoption of new technology.

NMIA is reforming Australia's measurement legislation to help our country keep pace with changing business practices as well as evolving measurement needs. Following reform, Australia's measurement legislation aims to:

- be more principles-based and flexible;
- boost industry investment confidence;
- increase the speed to market for new technologies;
- provide enhanced confidence that consumers and business obtain what they pay for; and
- continue providing a platform for businesses to operate on a level playing field.

The legislative reforms will modernise the approach to compliance and enforcement by expanding the current compliance and enforcement tools. This will better target different degrees of non-compliance. Options currently under consideration include:

- civil penalty provisions;
- tailored infringement notices with scalable penalties;
- the introduction of additional permits and corrective notices (for example, improvement notices and prohibition notices);
- the ability to publish details of non-compliance (the legislation currently prohibits this);
- court orders, for example, adverse publicity orders and non-punitive orders;
- mechanisms to enable enforceable industry codes of conduct;
- recalls of measuring instruments and packaged products; and
- a defence for businesses that have exercised due diligence to prevent a contravention. ■

Australian Government
Department of Industry, Science and Resources
National Measurement Institute

CONFIDENCE

Fostering confidence in legal metrology

Veronica Scotti, Lawyer and contract professor at Politecnico di Milano, Member of the Committee of Metrology of the Order of Engineers in Milan

Massimo Mai, Secretary of the Committee of Metrology of the Order of Engineers in Milan, Member of LMG of CECIP, Metrology teacher for the Italian association Comufficio

Abstract

Legal metrology has established various regulations, especially in the context of international agreements, to provide a set of rules and specifications. This ensures fair and equitable conditions, which may sometimes be disregarded in technical standards because standards may sometimes not take the legal (or ethical) aspects into full account.

However, the mission of legal metrology may be at risk if the established rules provide recommendations aimed only at regulating the placing on the market of an instrument, without considering how to ensure that its performance is maintained over time. While initial compliance with requirements is declared by the manufacturers that assure instruments' reliability, based on certification bodies' initial verifications, homogeneous and compulsory rules are needed to periodically evaluate whether performance is maintained over time.

OIML Guides and Recommendations on testing measuring instruments during their operative life should represent the basis for the advancement of legal metrology, aiming at ensuring fair treatment globally in order to instill a new confidence in measurements and avoid conflicts.

1 Introduction

The need to measure is inherent to human beings, who from the very beginning have sought to understand everything that surrounds them, including themselves, through measurement. In ancient times, measurement units were predominantly based on parts of the human body and aimed at meeting basic needs within small communities settled in limited territories.

Subsequently, with the development of civilization which led to the intensification of commercial exchanges, the need arose to establish more complex systems of measurement. Initially, these systems were devised by individuals engaged in trade, but they soon became the subject of legal regulations.

Kings and rulers soon realized how important is was to regulate measurements, which played a very significant role on two levels:

- they allowed the determination of taxes to be applied to goods;
- they prevented conflicts between parties related to quantitative differences (or, in some cases, an opportunity to resolve conflicts).

For a long time the standardization of measurements has been, and to some extent still is, a complex issue because it involves elements that are strongly influenced by territorial communities, almost like a component of the identity of a particular population. It is easy to imagine the reluctance of countries conquered by the Romans to substitute their own measurement units in favor of those imposed by the conquerors, just as we cannot forget the challenges faced after the French Revolution and during the 18th century Industrial Revolution, which aimed at promoting the standardization of weights and measures. Even today, we observe the use of legal measurements in official documents together with different measurement units applied in practice in specific areas, which may not be consistent with regulations. Additionally, we cannot forget the coexistence (legally authorized) of the SI and the Imperial System.

On the international stage, significant progress has certainly been made towards the standardization of weights and measures through the conclusion of treaties and the establishment of permanent organizations aimed at ensuring uniformity in measurement systems; however, there are still aspects that require further development.

2 Legal metrology today

Today's legal metrology faces modern challenges, partly stemming from the complexity and sophistication of measuring instruments, which are more susceptible to wear and tear compared to ancient instruments (constructed with obviously different materials and technologies), which were less accurate in their

measurements but more robust; for this reason, the performance requirements of measuring instruments should not only be defined by binding regulations that specify the performance they must comply with to be placed on the market, but also verified through universally applicable methods and mandatory periodic assessments.

An important development has occurred in the European context, where specific measures have been taken in order to ensure that minimum requirements are met for certain measuring instruments, especially for widely used instruments such as scales, electricity and gas meters, and other instruments.

Manufacturers and certification bodies are responsible for evaluating and certifying the conformity of the products manufactured in accordance with these requirements. The best-known regulations are *Directive 2014/31/EU of the European Parliament and of the Council* of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments, and *Directive 2014/32/EU of the European Parliament and of the Council* of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments, which establish obligations for manufacturers and other similar entities such as authorized representatives and agents, as well as additional obligations for importers and distributors of the products. These steps can be summarized as follows:

- Produce products that comply with the Directives while adhering to and satisfying the defined requirements.
- Submit the products to the appropriate procedures for conformity assessment.
- Prepare the EU Declaration of Conformity for the product (mandatory for manufacturers).
- Maintain documentation related to measuring instruments for at least 10 years (e.g. declarations of conformity or user manuals, etc.).
- Cooperate with the authorities of each Member State in case the product poses risks.

The European Union utilizes the well-established mechanism of the New Approach Directives in regulating measuring instruments. This approach aims at moving away from the traditional "command and control" model, with the perspective of providing greater freedom to manufacturers in terms of product design. However, manufacturers are still required to fulfill specific obligations while ensuring that they meet the minimum performance and safety requirements established for the various products involved. The evaluation procedure is entrusted to certification bodies that are integrated into the European system through specific notification by the Member State in which they are based. This ensures that the conformity assessment is carried out according to the typical scheme used for voluntary certifications, but still remains subject to supervision by the public administration. In this field, technical standards play a significant role as they serve as the foundation for manufacturers when designing and selecting the most suitable technical solutions to meet the requirements prescribed by the legislator.

The Directives, in this regard, establish a reference framework consisting of essential requirements, which are mandatory and non-negotiable elements. These essential requirements can be met through the application of harmonized technical standards or normative technical documents prepared by the OIML[1]. Ultimately, manufacturers may also choose to implement their own technical solutions to meet these requirements, provided that they are themselves capable of demonstrating the suitability of these solutions. The legal metrology framework outlined by the European Directives primarily emphasizes the initial requirements that measuring instruments must adhere to when they are placed on the market, first distributed and put into service (making available on the market, placing on the market and putting into use), regardless of the subsequent product life cycle. The main issue, here, is that the EU Directives cover only the initial technical specifications, which, although they should include durability as determined by the manufacturer based on the characteristics of the produced instrument, are not subject to subsequent controls aimed at verifying that the expected performance is maintained over time, up to the declared durability (which is, in this case, also experimentally assessed). The subsequent metrological verifications on measuring instruments are not at all covered by the Directives, as any regulation on this matter is left to the discretion of the Member States. This means that the Member States are free to define or not define the criteria, periodicity, and methods for periodic verifications.

3 Differences in periodic verifications

This regulatory gap does not allow the European Union to verify the preservation of the characteristics of the measuring instruments used in each Member State, nor does it enable the initiation of infringement procedures

[1] This is explicitly specified in Directive 2014/32/EU where a normative document is defined as a document containing technical specifications adopted by the OIML.

against a Member State, as this is an area that is devoid of specific regulations. The potential consequences of such a scenario are easily foreseeable: the periodic verification of instruments in service, which varies in terms of periodicity and methods in each EU Country[2], could lead to different and potentially discriminatory treatment, undermining the equality and harmonization that the European Union painstakingly promotes.

From a legal perspective, in order to achieve better effectiveness, supplementary legislation to the metrological Directives that addresses subsequent controls would also be necessary. However, given the current situation, where there are still some minor discrepancies in some national transpositions of the Directives, such a prospect appears somewhat far from being applicable.

Despite the gaps left by the European legislator, a suitable remedy could indeed be provided by technical standards, both those issued by standardization bodies and normative documents issued by international organizations such as the OIML. These standards could fill the gap by including specific technical requirements that also encompass a basic regulation for subsequent checks on instruments in service.

A similar path for standards can be a challenge because such standards, before being recognized as being useful for ensuring the compliance of measuring instruments with the established regulations, must pass through the scrutiny of European institutions. This is explicitly stated in the relevant legislation:

1. *Measuring instruments which are in conformity with **harmonized standards** or parts thereof, the references of which have been published in the **Official Journal of the European Union** shall be presumed to be in conformity with the essential requirements set out in Annex I and in the relevant instrument-specific Annexes covered by those standards or parts thereof.*
2. *Measuring instruments which are in conformity with parts of **normative documents**, the list of which has been published in the **Official Journal of the European Union**, shall be presumed to be in conformity with the essential requirements set out in Annex I and in the relevant instrument-specific Annexes covered by those parts of normative documents* [Directive 2014/32/EU).

Furthermore, it is worth noting that manufacturers may still choose alternative solutions to ensure their product's compliance with the essential requirements set forth in the metrological Directives. This circumstance might seemingly undermine attempts to integrate legal regulations by the entities responsible for drafting technical standards or normative documents. However, it is crucial not to underestimate the strength that the legislator attributes to explicitly referenced standards. In fact, when a manufacturer applies harmonized standards or OIML normative documents, they benefit from a presumption of conformity. This advantage granted to the application of standards and normative documents is crucial in the selection of technical solutions, since it exempts the manufacturer from having to provide evidence of conformity of their products because, in the case of a dispute, the party challenging conformity of the products must prove its case, while the manufacturer can simply declare conformity based on the relevant standards or normative documents for that type of measuring instrument. This implies that manufacturers are unlikely to adopt technical solutions that are different from those offered by the standards already issued for that product. As a result, either standards or normative documents become the preferred option. This gives them additional strength beyond what has already been granted by the European legislators, primarily due to their widespread use and acceptance.

Now, while the *de facto* application of these standards does not elevate them to the status of legally binding rules, it does provide a pathway to embark on a more comprehensive approach to measuring instruments. This approach can encompass not only initial performance but also in-service performance, ensuring the long-term maintenance of the metrological characteristics of the instrument.

Clearly, defining at least the fundamental aspects of periodic verifications on instruments in service would indeed help to restore users' confidence in legal metrology, which has sometimes seen its credibility diminished due to misbehavior or errors resulting from a lack of oversight by institutions.

Furthermore, the introduction of common provisions for periodic verifications could also help overcome inconsistent national regulations issued in this regard. If faithfully applied, such regulations could risk generating inequities, as seen with a national Italian regulation that governs subsequent metrological verifications on instruments in service.

In particular, in 2017, Italy issued Decree No. 93/2017, which not only established methods and timeframes for periodic verifications but also introduced a different type of control, namely random control or control at the request of a party involved in the verification. The distinction between the two categories of controls, while conceptually sensible, appears to have an anomalous regulation because "the maximum permissible errors in random or requested controls are

[2] For instance, in France periodic verification of energy meters is performed every 10 years while in Italy it is every 15 years.

more than 50 percent higher than those established for periodic verification". It is clear that the application of such a provision, besides being entirely illogical, often leads to inequitable treatments; in light of this, all controls other than periodic verifications are effectively preemptively excluded, as users are discouraged from making such requests due to the risk of having an instrument confirmed to meet tolerance levels when, if subjected to a periodic verification rather than a random check, it might have been declared non conform and, consequently, taken out of service.

4 Conclusion

A definitive solution to these kinds of situations would indeed require legislative intervention. However, until that happens, it is essential for organizations operating in the field of legal metrology and standardization bodies to take a proactive role by including aspects related to in-service verifications in their documents. They can suggest manufacturers to consider, in addition to the overall life of the instrument, an interval for performing verifications. This proactive approach can help to address some of the challenges and inconsistencies in the absence of comprehensive legal regulations. Such provisions could indeed encourage manufacturers to include those clarifications in the documentation accompanying measuring instruments. Consequently, in EU Member States, it would no longer be possible to impose different or more stringent controls than those indicated by the manufacturers, as any adopted national regulations would be in conflict with the European provisions, which always hold superior legal authority compared to national ones when they are in contradiction with European Directives.

In this way, legal metrology could potentially regain its role in guaranteeing public trust and fairness in transactions, which is currently threatened by divergent national measures that are detached from the European legal framework aimed at harmonization.

The alignment of standards and documentation across EU Member States could contribute to a more consistent and reliable system of legal metrology throughout the European Union. ■

FORGED PLATE

International cooperation to detect forged information plates and approval marks

ANSELM GITTENS
Metrology Department
Saint Lucia Bureau of Standards (SLBS)

Background

Saint Lucia is a Small Island Developing State located in the Caribbean region of the Americas with an area of 616 km^2. The Saint Lucia Bureau of Standards (SLBS) was established in 1991 and is the national metrology institute, national legal metrology institute, and national standards body of Saint Lucia. The Metrology Department of the SLBS was a recipient of the OIML CEEMS Award in 2015 and Saint Lucia is a Corresponding Member of the OIML.

The SLBS has always confirmed that a weighing instrument has a valid type/pattern approval before we proceed with an initial or in-service verification. We search for proof of type approval by downloading online U.S. NTEP, Measurement Canada, NMI Australia or EC Type Examination certificates of conformity, and check that the instrument has a valid OIML certificate of conformity with the applicable OIML Recommendation(s). This article, which is based on an incident that occurred in June 2018, demonstrates the effectiveness of the use of online type approval databases and international cooperation among national legal metrology institutes to achieve legal metrology compliance.

Determination of pattern approval status and detection of a forged information plate

Legal metrology personnel from the SLBS visited a packaging business in Saint Lucia in June 2018 to conduct a verification of a digital non-automatic weighing instrument. The legal metrology inspectors observed that this weighing instrument displayed its model number as being **HW**-200KGL, manufactured in Australia, and it had an information plate with a Measurement Canada AM-5404 approval mark. However, when SLBS downloaded the AM-5404 Notice of Approval we realized that the approval was issued for a model **HV**-200KGL and not for the **HW**-200KGL model. Oddly, the information plate bore the name of a manufacturer which did not match the name of the manufacturer on the Canadian type approval certificate. The information plate also had an Industry Canada initial examination mark so at this point we reached out to our counterparts at Measurement Canada since we were concerned that an unknown entity had fabricated a forged information plate.

An official from Measurement Canada provided a prompt response with the following comments:

- "This device's model is truly a **HW**-200KGL and it was not approved in Canada. The main reason for not being approved is that class III devices in Canada are limited to 10 000 intervals. With this device, when used with metric units, there are, as you mentioned, 11 000 intervals. That is above the maximum that is legally allowed."
- "The scale is truly an A&D scale. The manufacturer, on the information plate, is Mettler-Toledo. This would be a non-compliance if found like this, in the field, in Canada. On computing scales, metallic information plates are typically riveted to the device. This one is not."
- "The Industry Canada sticker on the information plate is what we call an initial examination mark. Normally, there is rigorous control on these Industry Canada stickers. Only Measurement Canada inspectors have them and they affix one of them on a device when it is successfully examined for the first time. Unfortunately, the serial number on the sticker (25076) is not traceable for us."
- "Pacific Industrial Scale Co. Ltd. used to be one of our Authorized Service Providers who had the ability to perform initial examination of scales in Canada. In this particular case, we do not have a trace that an initial examination was performed by Measurement Canada or by any Authorized Service Provider on this scale (serial number M7300479). In other words, according to our national database, this scale does not exist."
- "The fact that the device is manufactured in Australia is very odd. In Canada, we mostly get devices manufactured in the US or in Europe."

The Measurement Canada official theorised that the weighing instrument, manufactured in Australia, was

sold in Canada via the Internet. The Canadian who bought it tried to have it examined for trade but could not do so because it is not approved for trade. At that point, he/she was stuck with a scale that could not be certified for trade in Canada, so, he/she put it back on the Internet for sale and sold it to a customer in Saint Lucia with a forged information plate to make it look like it was approved for trade in Canada. The Industry Canada initial examination mark was probably taken off another scale, in Canada, and put on this Mettler Toledo plate. Lastly, even though the scale has a sticker from Pacific Industrial Scale, it is impossible to say whether the scale was sold by them.

The Canadian official thought that this was an isolated case since in Canada they already have many monitoring activities to ensure that such an altered scale does not last in the Canadian market. Unfortunately, Canada cannot control scales outside its borders but was appreciative of the time the SLBS spent in bringing this potential fraud scheme to their attention.

Conclusion

The forged information plate was removed from the weighing instrument and is stored in the Metrology Department of the SLBS as an exhibit.

This incident highlights how conformity assessment procedures and international cooperation among national legal metrology bodies, which utilize publications from the OIML, can thwart potential fraud schemes in the use of weighing instruments for commercial transactions. ■

Disclaimer:
Any information about, or mention of a manufacturer or service provider in this article does not imply endorsement by the SLBS or Measurement Canada of the products or services of the manufacturers or service providers.

Picture of a forged information plate

ENFORCEMENT

Legal metrology in Saudi Arabia: Taqyees Program and compliance enforcement

NAWAF ALSHAMMARI
Legal Metrology Program, SASO,
Kingdom of Saudi Arabia

Abstract

Legal metrology is a cornerstone in ensuring equitable trade practices and safeguarding public safety, spanning various sectors. This article thoroughly explores the legal metrology landscape in the Kingdom of Saudi Arabia, with a particular focus on the transformative "Taqyees" Program, a key initiative integrated into the National Transformation Program 2020.

Spearheaded by Saudi Standards, Metrology and Quality Organization (SASO), the Taqyees Program represents a pivotal stride toward bolstering consumer trust, streamlining international trade, and validating the accuracy of diverse measuring instruments. In addition, this article provides in-depth insights into the broader framework of legal metrology compliance and enforcement mechanisms within Saudi Arabia. It underscores the critical significance of stringent standards, rigorous type approval processes, and robust consumer protection measures. These measures serve not only to protect the interests of consumers but also to fortify the overall integrity of the marketplace.

This article also aims to shed light on the multifaceted aspects of legal metrology in Saudi Arabia, emphasizing the proactive measures taken by SASO to foster a conducive environment for trade and commerce. By delving into Taqyees Program and the broader compliance framework, this article contributes to a more profound understanding of the pivotal role played by legal metrology in promoting fairness, accuracy, and trust in the Saudi Arabia marketplace. Ultimately, these efforts advance the nation's economic goals and underscore its commitment to public safety.

1 Introduction

Legal metrology encompasses regulations and standards that govern measurements and measuring instruments, ensuring their accuracy, fairness, and consumer protection in commercial transactions. In Saudi Arabia, the Taqyees Program is a significant initiative under the National Transformation Program 2020, administered by the Saudi Standards, Metrology, and Quality Organization (SASO). It aims to promote faire trade by focusing on verifying the correctness of measuring instruments such as fuel dispensers, non-automatic weighing instruments, electricity meters, and water meters.

1.1 Overview of the Taqyees "Legal Metrology Program"

The Taqyees Program, also known as the "Legal Metrology Program", is one of the initiatives of SASO which aims to ensure that legal measuring instruments conform to a set of standard specifications to ensure the correctness of the amounts of product sold by conducting technical checks and field verification. It stands as the vanguard of legal metrology in Saudi Arabia, addressing various aspects of daily life such as commerce, economics, industry, environment, and health, by ensuring accurate measurements.

1.2 Legal metrology framework in Saudi Arabia

The services provided by Taqyees are listed below:

- National type approval: This crucial phase involves the evaluation and approval of measuring instruments to ensure they meet established standards and specifications. Instruments that successfully undergo national type approval are deemed fit for use in commercial transactions.
- Initial verification: Before entering the market, measuring instruments undergo initial verification to confirm their accuracy and compliance with legal metrology regulations. This step acts as a safeguard to prevent inaccurate measurements that could harm consumers or impede fair trade.
- Periodic verification: Regular reassessment of measuring instruments is essential to maintain their accuracy over time. Periodic verification helps identify any deviations from standards and ensures ongoing accuracy in commercial transactions.

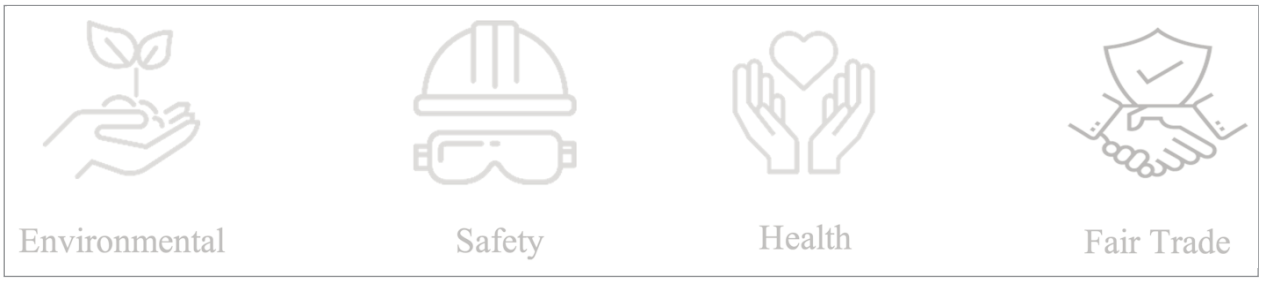

Figure 1: The traditional areas covered by legal metrology

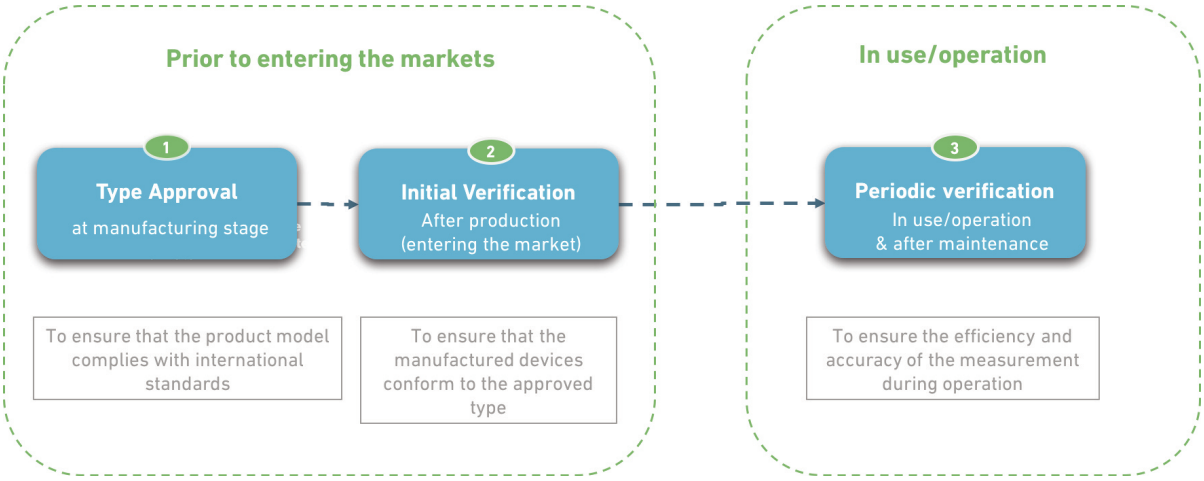

Figure 2: Sequence of legal metrology activities

- After-maintenance verification: Measuring instruments often require maintenance or repairs. After any servicing operation, these instruments must undergo verification to confirm that their accuracy has been restored and that they continue to meet legal metrology requirements.
- Market surveillance: To maintain the integrity of the marketplace, the Taqyees Program conducts market surveillance activities to monitor the use of measuring instruments in the field. This includes inspecting instruments in use at various businesses to ensure compliance with established standards.
- Qualification of the verification body: The Program also oversees the qualification of the verification bodies that are responsible for conducting inspections and verifications. This ensures that only competent bodies are entrusted with these critical tasks.
- Qualification of the maintenance body: maintenance bodies must meet specific qualifications to carry out maintenance and repair work on measuring instruments. This ensures that instruments are serviced by professionals who understand legal metrology requirements.

1.3 Import controls

SASO implements robust import controls to ensure that only measuring instruments that comply with Saudi Arabia legal metrology standards enter the domestic market. This control mechanism is crucial in preventing the influx of non-compliant devices that could compromise the accuracy and fairness of trade within the Kingdom.

By monitoring imports of measuring instruments, SASO effectively creates a level playing field for businesses operating in Saudi Arabia. These controls protect domestic industries and bolster consumer confidence in the products available in the local market.

2 Workshops, awareness and training

Taqyees also conducts workshops for manufacturers, importers, and establishment owners to educate them about the importance of type approval, initial verifica-

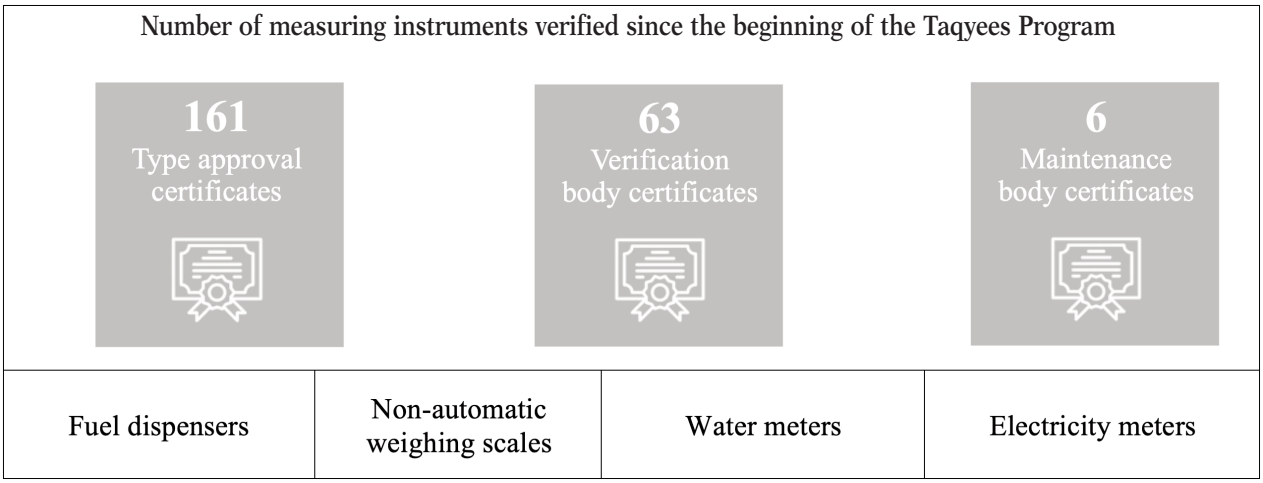

Figure 3: Services offered by the Taqyees Program

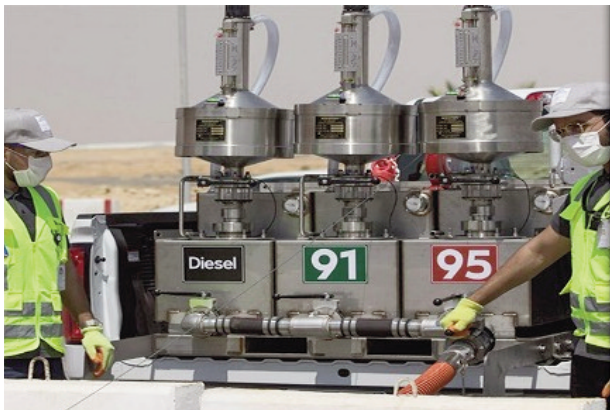

Figure 4: Field verifications conducted by the Taqyees Program to verify the accuracy of measuring instruments

tion, and periodic verification. These efforts aim to ensure compliance with Saudi standards and environmental conditions.

2.1 Awareness and training

Awareness and training programs are pivotal in cultivating a culture of compliance with legal metrology standards among manufacturers, traders, and regulators. These programs serve as a bridge to ensure that all stakeholders possess the requisite knowledge and skills to navigate the complex landscape of measurement regulations.

Awareness initiatives offer comprehensive guidance on compliance requirements and verification procedures. They empower individuals and organizations to understand and meet legal metrology standards effectively. Additionally, ongoing training programs ensure stakeholders stay updated with evolving regulations and emerging technologies, reinforcing the commitment to transparency and consumer protection in the marketplace.

SASO recognizes the importance of education and capacity-building in promoting legal metrology standards and requirements. To achieve this, SASO regularly conducts workshops and training programs to educate various stakeholders, including manufacturers, importers, retailers, and regulatory authorities.

By enhancing stakeholders' understanding of legal metrology, SASO creates a more transparent and equitable marketplace in Saudi Arabia. These workshops and training programs are instrumental in fostering a culture of compliance and quality in the measuring industry within the Kingdom.

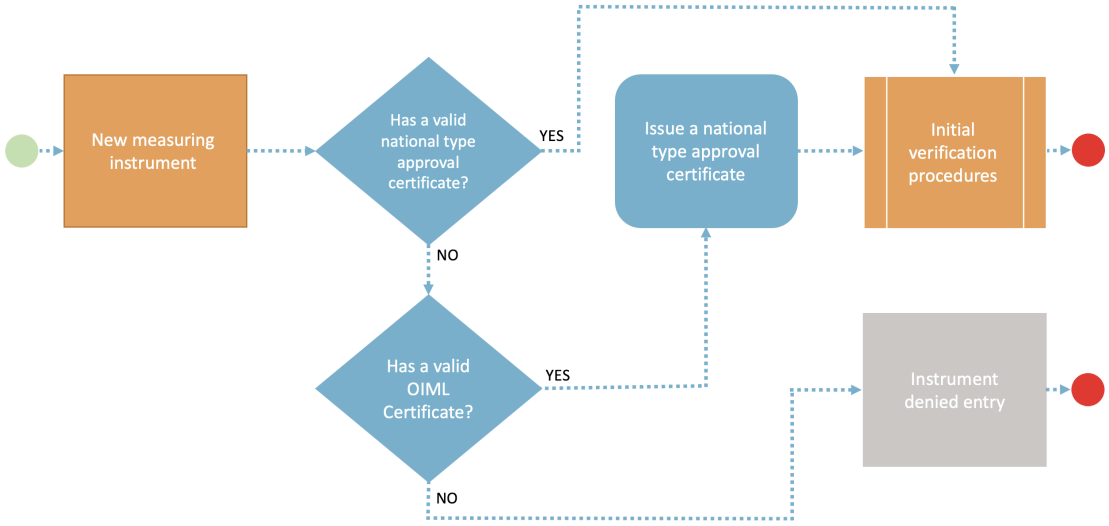

Figure 5: Process for approving measuring instruments to enter the Kingdom's markets

2.2 Taqyees workshops

Taqyees has also played a significant role in promoting compliance with legal metrology standards in Saudi Arabia. The Program has conducted 19 workshops to educate manufacturers and importers about the prerequisites for acquiring a national type approval certificate and the necessary steps for initiating the verification process for measuring instruments via the Taqyees website. This process mandates that the measuring instruments possess both a national type approval certificate and an initial verification label. It aligns with the Saudi standard specifications, ensuring the instrument's functionality in local environmental conditions and compliance with all requirements, affirming its reliability and performance.

Taqyees has also organized 12 workshops for business owners who are under the obligation to acquire an acceptable label. They achieve this by submitting an annual request for the periodic verification of the measuring instruments they employ. This practice ensures the accuracy and precision of their measuring instruments, which is crucial for commercial transactions.

By combining the efforts of SASO and Taqyees, Saudi Arabia is actively working to educate and empower stakeholders in the measuring industry, thereby contributing to a more transparent, reliable, and compliant marketplace.

2.3 Advertising and awareness campaigns

In its pursuit of promoting legal metrology standards, SASO recognizes the importance of effective communication. Beyond workshops, advertising and awareness campaigns are pivotal in reaching a broader audience. These campaigns are strategically designed to educate manufacturers, importers, business owners and consumers about the significance of legal metrology in their daily lives. Through various media channels including television, radio, and digital platforms, SASO spreads the message of precision, fairness, and consumer protection. Eye-catching advertisements and

Figure 6: Some publications launched by the Taqyees Program to raise awareness of consumers, manufacturers and importers

Figure 7: Steps for submitting a consumer complaint and field visits for verification

informative content are disseminated to ensure that individuals are well-informed about their rights and the standards they can expect when engaging in commercial transactions.

By leveraging advertising and awareness campaigns, the legal metrology Taqyees Program strives to create a public awareness and accountability culture. These efforts empower consumers to make informed choices and motivate businesses to adhere to the highest measurement standards. As a result, advertising campaigns connect the regulatory framework with the hearts and minds of the people, reinforcing the overarching goal of enhancing trust and fairness in the Saudi marketplace.

3 Legal metrology compliance and enforcement in Saudi Arabia

This introduces the concept of advertising and awareness campaigns within legal metrology and emphasizes their role in educating and engaging the public. It connects seamlessly with the subsequent section, which delves deeper into legal metrology compliance and enforcement in Saudi Arabia.

SASO is the primary regulatory body in Saudi Arabia responsible for legal metrology compliance and enforcement. SASO, represented by the Taqyees Program, ensures accuracy in measurements, fairness in trade, and consumer protection through various measures, including type approval, types of verifications, and awareness campaigns.

Legal metrology compliance and enforcement are essential components of maintaining a transparent marketplace and protecting consumers. This section outlines key elements of compliance.

3.1 Compliance assessment

Compliance assessment is a fundamental aspect of legal metrology, serving as the cornerstone for maintaining the integrity of measurement standards and regulations. Regulatory bodies play a pivotal role in overseeing these standards. Manufacturers, importers, and measuring device users are responsible for ensuring compliance with a complex framework of rules and specifications.

To achieve this compliance, various processes are employed such as type approval, initial verifications, and periodic verification. Type approval is a pivotal stage wherein manufacturers must meticulously demonstrate that their measuring instruments meet the stringent accuracy and quality standards stipulated by the regulatory authorities. This rigorous assessment ensures that only devices that meet the exacting criteria are permitted entry into the market.

3.2 Consumer protection

In trade, legal metrology is intricately linked to protecting consumers' rights and interests. At its core, it guarantees that consumers receive accurate quantities of goods or services during commercial transactions. Price transparency and fair trade are also integral to consumer protection within the legal metrology framework.

Legal metrology fosters consumer trust by ensuring that measuring instruments are accurate and reliable, promoting fair and equitable transactions. It empowers consumers by preventing fraudulent practices and deceptive pricing, ultimately contributing to a more transparent marketplace.

At its core, Saudi Arabia's legal metrology regulations are designed to protect consumers. By ensuring the accuracy of measurements during purchases, these regulations empower consumers to make informed decisions and trust the fairness of trade transactions. Consumers can have confidence that the products they purchase meet the highest standards of quality and accuracy. This commitment to consumer protection is a central pillar of SASO's mission, reflecting the organization's dedication to fostering a marketplace where consumers' interests are prioritized and upheld.

To safeguard consumers, several communication channels have been established to enable them to report any instances of encountering a measuring instrument during a commercial transaction that lacks a valid and

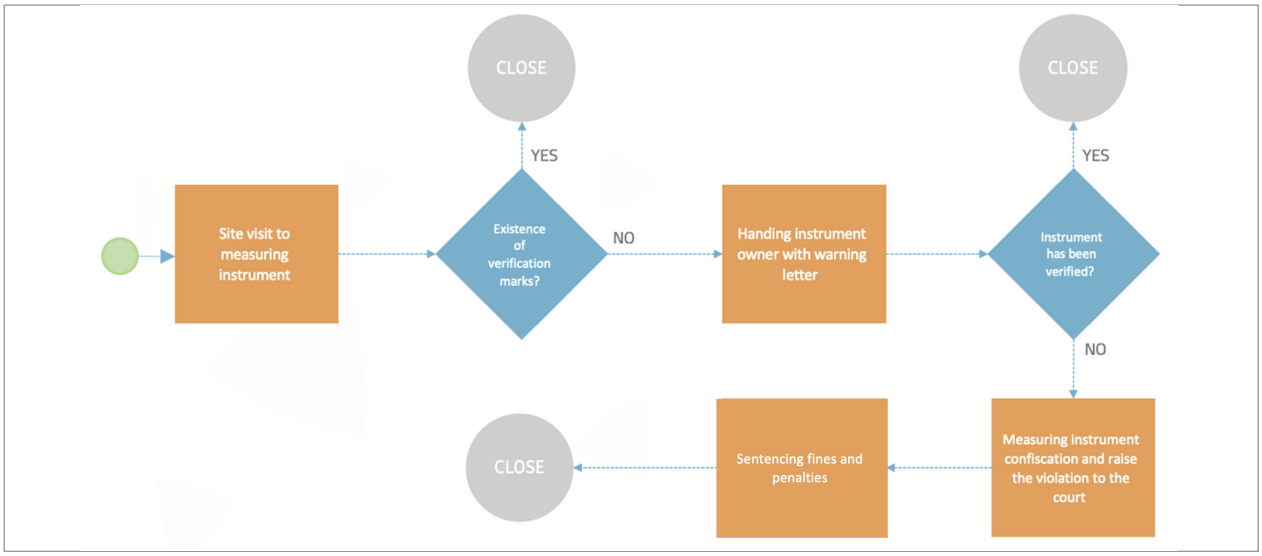

Figure 8: Verification flowchart "Case 1": In Case 1, when a measuring instrument has not been verified previously, it undergoes the sequence as shown.

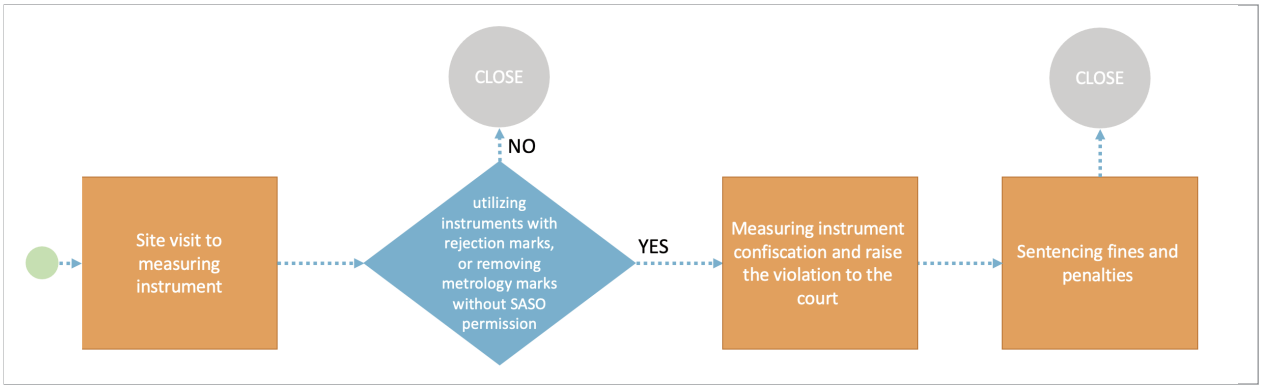

Figure 9: Verification flowchart "Case 2": In Case 2, Taqyees focuses on measuring instruments that are being used with expired verification marks, utilizing instruments with rejection marks, or removing metrology marks without SASO permission. In response to these violations, the action taken involves confiscating the measuring instruments and escalating the violation to the court, which can result in fines.

acceptable verification label or does not function accurately. Upon receiving a consumer's report, Taqyees initiates a field visit and conducts an immediate verification process to ensure that the measuring instrument possesses a valid verification label and that it operates accurately.

3.3 Enforcement actions

In the event of violations of legal metrology regulations, regulatory authorities have the power to initiate enforcement actions. These actions are pivotal in maintaining the efficacy of the legal metrology system and deterring potential wrongdoers.

Enforcement actions can take various forms, including imposing fines on non-compliant entities, confiscating measuring devices that fail to meet standards, revoking licenses or permits, and even pursuing legal action against those who persistently violate legal metrology regulations. This multifaceted approach ensures that compliance remains a paramount concern for all stakeholders in the marketplace.

This enforcement framework underscores SASO's commitment to maintaining the integrity of legal metrology in Saudi Arabia. It is a deterrent, discouraging businesses from flouting regulations while safeguarding consumers from potential harm or deception.

3.4 Enforcement framework

Taqyees has various methods to target non-conforming measuring instruments. Firstly, data utilization from the Taqyees platform, which displays measuring instruments that have not been verified. Secondly, conducting market visits with legal inspectors to identify non-compliant instruments. Lastly, the Program relies on complaints raised by consumers to identify potential issues.

In terms of the enforcement framework, there are two cases to consider, which are shown in Figures 8 and 9.

4 Conclusions

Legal metrology plays a pivotal role in preserving the integrity of commercial transactions, fostering equitable competition, and safeguarding public welfare. This cornerstone of modern commerce is exemplified in Saudi Arabia through the Taqyees Program and the unwavering regulatory endeavors of the Saudi Standards, Metrology and Quality Organization (SASO). These initiatives stand as a testament to the Kingdom's commitment to accuracy, consumer protection, and the facilitation of international trade.

In an era where trust and reliability are paramount in the global marketplace, Saudi Arabia's dedication to rigorous legal metrology standards and regulations is a beacon of transparency. The accurate measurement of goods and services, supported by robust regulations, instils confidence in buyers and sellers and bolsters the nation's credibility on the international stage. Through steadfast compliance, Saudi Arabia cultivates an environment where business transactions are conducted with integrity and fairness, ensuring consumers receive what they pay for. Businesses compete on a level playing field. By proactively engaging with this information and detailed guidance on legal metrology practices, standards, and regulations, we can collectively contribute to the continued growth of a transparent, accountable, and reliable marketplace in Saudi Arabia and beyond. As exemplified by the Taqyees Program and SASO's efforts, legal metrology stands as an enduring pillar supporting the Kingdom's economic progress and global engagement. ■

SUPERVISION

Internal metrological supervision - an effective way to ensure compliance with metrological requirements

Ruth Genkina, Lev Isaev, Alexander Kuzin, Alexey Kroshkin

VNIIMS, Russian Federation

Abstract

This article considers the general principles of the organization of state metrological supervision as it is carried out in the Russian Federation. It demonstrates that despite recent changes in the federal legislation and improvements made to the general approach and the liberalization of some mandatory requirements, the overall efficiency of state supervision remains low. At the same time, the functionality of the state supervision can be significantly supplemented and expanded by so-called *internal* metrological supervision, which is carried out on a voluntary basis by the metrological services (metrological departments) of the enterprises themselves. The basic principles of the organization of internal metrological supervision at the enterprises are considered.

Keywords

State metrological supervision, internal metrological supervision, legal metrology, metrological requirements, risk-oriented approach

Introduction: State supervision in the Russian Federation

State supervision is an important part of any state's activity both to protect the interests of the state itself and to observe the constitutional rights of its citizens.

State supervision in the Russian Federation comprises the activities of supervisory authorities aimed at preventing, detecting and suppressing violations of mandatory requirements, eliminating their consequences, and restoring the legal situation that existed before the occurrence of such violations. In the Russian Federation in different types of state supervision the terms "supervision" and "control" are used, which are almost identical in their semantic meaning. However, for better perception of information we will only use the term "supervision" in this article.

The Federal Law [1] (hereinafter - the Law), which came into force on July 1, 2021, was intended to eliminate the shortcomings of the current legal regulation of state supervision, including non-systematic provisions and gaps in regulations, insufficient prevention of violations of mandatory requirements, as well as unjustified emphasis on inspections of the business entities and enterprises. The specific objectives of the Law were as follows:

- reduction of excessive administrative pressure on business entities and citizens;
- ensuring compliance of business entities and citizens with mandatory requirements;
- concentration of the efforts of the supervisory authorities on those entities that pose the greatest risk of causing harm (damage) to legally protected wealth; and
- increasing the efficiency of the use of material, financial and other resources allocated to ensure the supervisory activities of the state.

The essence of the new approach to the organization of state supervision is the transition from inspections and penalties to monitoring and prevention. For the first time, the law introduced the concept of preventive measures, among which we can highlight informing, generalization of law enforcement practice, announcement of warnings, self-inspection, and preventive visits. The Law also proclaimed a risk-oriented approach to the organization of supervision, which implies that supervision should be based on the management of the risks of causing damage to legally protected values, namely the interests of the state and its citizens. At the same time, preventive measures aimed at reducing the risk of harm should be prioritized over supervisory measures.

State metrological supervision

On the basis of the Law, which defines the basic principles of organization of all types of state supervision in the Russian Federation, in 2021 the Regulation on State Metrological Supervision [2]

(hereinafter - the Regulation) was developed, regulating supervisory activities in the field of legal metrology. This document specified the provisions of the Law in relation to the supervision of the business entities (enterprises), the duties of which includes compliance with mandatory metrological requirements.

The Regulation provides for the supervisory authorities to conduct traditional supervisory activities, such as monitoring purchases, inspection visits, raid inspections, field inspections, etc. However, such activities are strictly regulated on the basis of the damage risk management system. The priority direction of the state metrological supervision is now preventive measures, in particular self-inspection. Such an event is carried out by the business entities on a voluntary basis. In the course of self-inspection, the business entity independently assesses compliance with mandatory metrological requirements at its services and facilities according to a special program.

In the event of positive results of such self-inspection, the enterprise has the right to issue a Declaration, which is registered by the authorized state body - the Federal Agency for Technical Regulating and Metrology (Rosstandart). Business entities that have issued a Declaration based on the results of self-inspection have a higher degree of confidence on the part of supervisory authorities, and such enterprises are less subject to traditional types of supervisory activities.

Despite the progressive changes in the organization of state metrological supervision and, as a consequence, the increased efficiency of such supervision, it is not able to fully implement the tasks assigned to it, namely guaranteed compliance with mandatory metrological requirements and minimization of the risk of causing damage to the legally protected interests of the state and its citizens, for a number of reasons:

1. The area of responsibility of state metrological supervision is limited to the sphere of legal metrology. At the same time, a large number of measurements are carried out outside this sphere, for example, in many types of production, including food production, in scientific research and development, in education, information technologies, nanotechnologies, quality management, etc. Inaccurate results of such measurements also carry an essential risk of causing damage.
2. State metrological supervision has limited resources. At present there are just over 300 inspectors involved in the structure of the relevant executive authorities, which is clearly quite insufficient for a country such as the Russian Federation. The real degree of coverage of business entities performing measurements in the sphere of legal metrology is less than 1 %. Funds received from administrative penalties (fines) can provide neither prevention nor elimination of the consequences of violations of mandatory metrological requirements.
3. Even if ideally organized, state metrological supervision cannot fully ensure a risk-oriented approach due to the fact that employees of supervisory authorities are not experts in a particular area of economic activity and, accordingly, cannot reliably determine the damage value and manage the risk of its occurrence for each business entity.

Internal metrological supervision

For the above reasons, in addition to the state metrological supervision, the so-called internal metrological supervision is actively developing in the Russian Federation, which is carried out on a voluntary basis by the metrological services (departments) of the enterprises themselves.

Internal metrological supervision is not defined within the framework of modern metrological legislation, although at the turn of 2012–2015 a number of standards and recommendations on its organization and implementation were developed [3-5].

On the basis of the National Institute of Legal Metrology (VNIIMS) the System of Metrological Supervision (in Russian abbreviation – SMN) [6] was created and successfully operates; it unites the enterprises which, on a voluntary basis, have introduced internal metrological supervision in practice and carry it out on a permanent basis. Participation in this system helps enterprises to acquire and confirm their competence in the organization and implementation of internal metrological supervision on the basis of common principles, rules and norms accepted in the SMN. The members of the SMN are both separate production enterprises and large vertically integrated companies and holdings. Membership in the SMN helps enterprises to increase the degree of confidence on the part of customers in the quality of their products or services.

Let us consider the main principles and approaches on which internal metrological supervision is based. The three-level scheme of supervision organization is recommended to SMN members to ensure maximum coverage of all objects of metrological supervision (hereinafter - OMS) and minimum risk of damage caused by their non-compliance with metrological requirements (see Figure 1).

When organizing internal metrological supervision at the enterprise, the first thing to do is to identify all the OMS's that may cause potential damage, and to assess the risk of damage for each OMS, i.e. the probability of non-compliance of the OMS with metrological requirements. It is recommended to draw up two separate lists

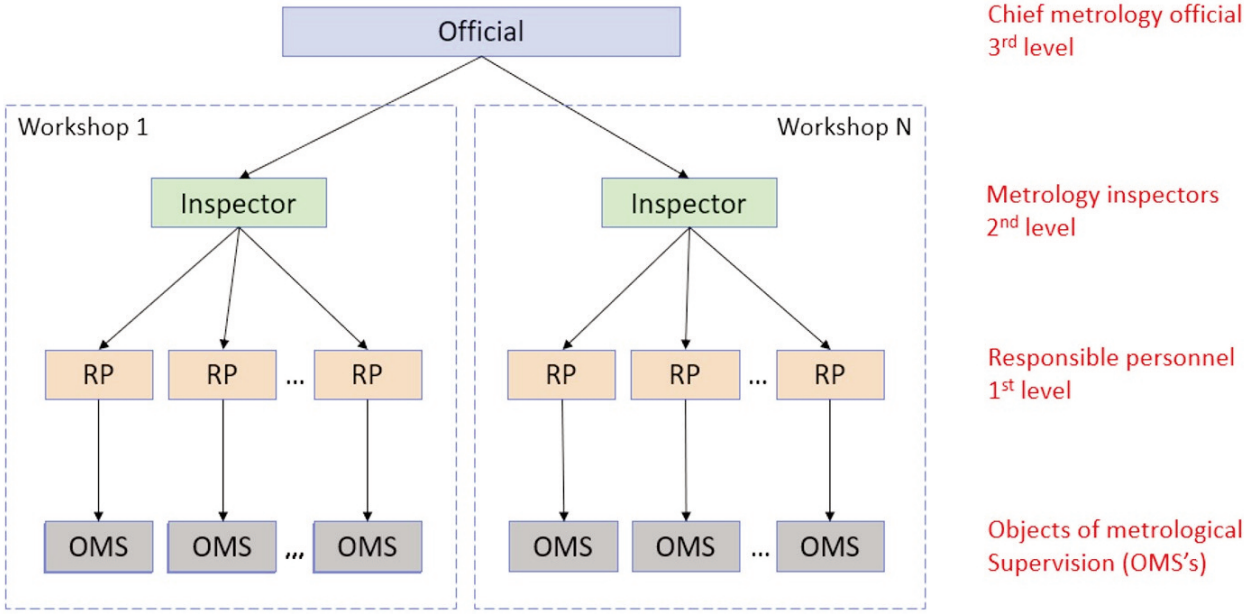

Figure 1: Three-level scheme of internal metrological supervision

for OMS's applied within and outside the sphere of legal metrology. Objects within the sphere of legal metrology may also be objects for state metrological supervision, while those outside this sphere may be objects for internal metrological supervision only. The objects of metrological supervision may be not only measuring instruments, measurement standards and reference materials, but also measurement (calibration, verification, etc.) procedures, measurement results, measurement units, methods of determination and expression of uncertainty, and other objects to which metrological requirements are applicable. All identified and listed OMS's are subject to continuous periodic monitoring (control).

The frequency and content of monitoring is determined by expert judgement on a case-by-case basis, based on the damage value and the probability of its occurrence. Monitoring of OMS's is carried out by those responsible for the state and use of OMS's. As a rule, these are regular operating personnel in charge of the facilities which contain OMS's. If necessary, these personnel undergo additional briefings and trainings on compliance with metrological requirements. The results of OMS's monitoring are recorded in specially designed logbooks. Such activities on the organization and conduct of regular monitoring constitute the first (main) level of internal metrological supervision.

The second level of internal metrological supervision is organized within the structural subdivision of the enterprise (workshop, division, technological complex, production line, etc.). A special metrology inspector is in charge of supervision at this level. The inspector's main task is to control the monitoring performed by those responsible at the first level. Such control can be carried out in different ways depending on the specifics of the enterprise, including checking the completion of monitoring logbooks, spot checks of OMS's, etc. The inspector also collects statistics and analyses the effectiveness of the OMS's monitoring, eliminates minor deficiencies, and adjusts, if necessary, the frequency and content of monitoring. Depending on the specifics of the enterprise, an inspector may manage from one or two to several dozen persons responsible for the state and application of the OMS's, which carry out first-level monitoring.

Metrology inspectors of the second level report to the representative of the enterprise management, who is responsible for the general management of internal metrological supervision. Depending on the internal organizational structure, this may be the chief metrologist, quality manager or other official responsible for the general state of metrological support at the enterprise. The duties of this official include general management of internal supervision, development of supervisory guidance documents (enterprise standards, regulations, manuals, etc.) and instructions for all participants of supervisory activities, summarizing reports from structural subdivisions, management of nonconformities, development of control and corrective actions, preparation of certificates and reports for the

management of the enterprise. Such an official represents the third, upper level of internal metrological supervision at the enterprise.

In the case where an enterprise is part of a large holding, industrial group or vertically integrated company, an additional corporate level of supervision management may be organized at the level of the holding, whose tasks include the establishment of the general procedure and rules for the organization of supervision activities among the enterprises of the group.

The above approach to the organization of internal metrological supervision, which has been accepted by the participants of the SMN system, has been tested by many years of practice and has proved its effectiveness. The main features of internal metrological supervision compared to state metrological supervision are identified below:

1. Internal supervision potentially provides coverage of 100 % of OMS's used both within and outside the sphere of legal metrology.
2. Internal supervision is conducted on a regular basis, the frequency and content of internal supervision is not determined by regulatory documents, but by expert judgement based on a risk-oriented approach.
3. Internal supervision is carried out by motivated personnel directly involved in production activities and interested in the final result: the quality of products manufactured or services rendered.

Due to the above-mentioned features, internal metrological supervision has a preventive character and is aimed not at fixing, but at preventing violations. If properly organized, internal supervision provides guarantees of compliance with metrological requirements and, accordingly, minimizes the risk of damage to legally protected wealth. In addition, properly organized internal (interior) supervision practically guarantees the absence of claims from the state supervisory authorities in the event that the enterprise is subjected to inspection under the state metrological supervision.

Conclusion

Thus, the state metrological supervision is an important function of the state, designed to ensure compliance with mandatory metrological requirements by subjects carrying out activities in the sphere of legal metrology, thereby ensuring the protection of both citizens and the state from the negative consequences of unreliable measurement results.

However, despite a number of progressive changes in recent years in legislation and in the practice of state metrological supervision, it cannot fully ensure guaranteed compliance with metrological requirements by all subjects of economic activity. This is a consequence of its limited scope of application (only in the sphere of legal metrology), low coverage of objects of metrological supervision (less than 1 %), limited resources of supervisory authorities, impossibility to fully implement in practice a preventive approach, and a number of other factors.

The shortcomings of the state metrological supervision can be significantly compensated by internal metrological supervision organized and carried out voluntarily by metrological services of the enterprises themselves. The system of metrological supervision (SMN), functioning on the basis of VNIIMS, helps enterprises to achieve competence in terms of the organization of internal metrological supervision. Competently organized and conscientiously carried out internal metrological supervision provides almost 100 % coverage of the objects of supervision, guaranteed compliance with metrological requirements and, as a consequence, minimization of risks of damage to legally protected values. ■

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ENFORCEMENT CHALLENGES

Non-metrological challenges in legal metrology

Robert Wynands[1], Frank Märtens

Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany

Abstract

Enforcement of legal metrology rules is essential to maintain trust of its stakeholders in the basic promise of legal metrology: Correct measurement results. This is particularly important when legal metrology is applied in the enforcement of other rules, as we discuss here for the case of traffic rule enforcement in Germany.

1 Introduction

Every year, more than 1.25 million people are killed in traffic on the world's roads [1, 2]. Legal metrology can play an important role in reducing that death toll, by providing trusted measurement results to document and sanction unsafe behavior such as speeding, tail-gating, or running red lights. Trust in those measurement results, however, relies on trust in the correct functioning of the measurement devices deployed. It is here where enforcement of legal metrology rules comes into play: to ensure that the devices in actual use function correctly.

Speed enforcement is a prime example of the necessity and usefulness of legal metrology. Because the measurement of a particular vehicle's speed cannot be repeated and in general cannot be checked independently with comparable accuracy afterwards, the checking is shifted from the individual measurement to the device itself: The device is tested thoroughly, to ensure that its measurement results can be trusted.

But it is not enough that all the metrological rules are followed. In addition, all stakeholders must be convinced that this is, indeed, the case. This includes the trust that legal metrology rules are enforced. In particular, the judges presiding over court trials for traffic violations must be convinced that metrological rules and their enforcement work as intended. In the following, we describe some of the approaches used to strengthen the trust in devices covered by legal metrology rules, including their enforcement, within the German legal system for enforcing traffic rules.

2 Traffic and speed in Germany

Not everybody obeys speed limits, sometimes violating them willingly or at least knowingly, and sometimes due to negligence. With inappropriate or excessive speed being a major cause of traffic fatalities [1, 3], it is a public duty to enforce speed limits to save lives. In Germany, speed measuring instruments have been helping in this effort since 1958 [4], by objectively detecting and documenting speed violations and therefore superseding previous, less objective methods of speed assessment [5].

Statistics for speed violations in Germany are hard to obtain because not only the police in each of the 16 federal states but also local communities can be authorized to enforce the limits. A rough estimate is about 30 million speeding tickets per year. Most ticketed drivers pay the fines, but a small minority contest the ticket all the way to court. Every year, 350 000 trials for traffic violations are held in Germany [6], although it is not known what percentage of these is for speeding and what percentage is for parking or other offences. Even when assuming that all the trials were for speeding, one finds that only 1 % of all ticketed drivers go to court. Or in other words, 99 % of them trust the measurement – and therefore the quality control mechanisms of legal metrology.

Of those 350 000 trials, only about 2 % end in an acquittal (mostly due to formal reasons not connected to the measurement itself) [6]. However, until recently, about 21 % were discontinued without a verdict, i.e., with the driver neither formally acquitted nor convicted (Figure 1). Part of the reason for this high rate could be that the judges were not convinced about the reliability of the measurement result and therefore could not decide either way. In the mid-2010's we therefore started, together with other actors from the police and the legal system, to work on improving knowledge of legal metrology in the legal system, with the goal of increasing trust in the measurement results. As seen in Figure 1, this effort has contributed to a 25 % decrease

[1] ORCID number (https://orcid.org): 0000-0002-4518-9703

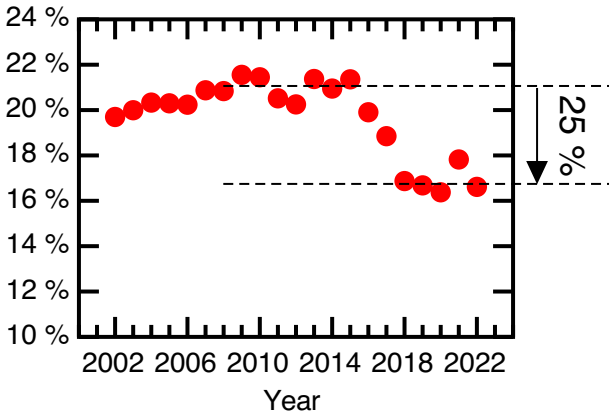

Figure 1: Percentage of all trials for traffic violations (not just speeding) that were discontinued without a decision. The rate of acquittals remained constant at only 2 % over the whole period.

in trials that were discontinued without a verdict. This corresponds to an additional 90 000 drivers caught speeding at check points (typically at accident hotspots or near schools, retirement homes, and other sensitive areas) who are effectively admonished by society to respect life and limb of their fellow citizens.

3 Increasing trust and understanding of legal metrology mechanisms

In the following we present some of the activities we started or intensified to reach the goal of deeper trust in measurement results. These actions were supported by our technical competence and our authority as Germany's national metrology institute, i.e., as a neutral agent without commercial interests.

3.1 Special website

A special website was set up to distribute general knowledge about legal metrology [7]. The website collects essays on the principles of legal metrology and its quality control, as well as answers and explanations to frequently encountered technical questions in court proceedings. Everything is presented in a language intended to be understood by people without a technical background. We make use of analogies from everyday life, put in explanatory graphics, and avoid the use of equations as much as possible.

Figure 2: The "calling card" that links to the special website for technical experts and judges

Within a few months of starting this website, there were hundreds of downloads of those essays per month. In part, this may be due to the promotion in the form of a "calling card" that can be distributed during meetings and events (Figure 2). But it also shows that those publicly available essays written by the national metrology institute as a neutral agent fill a need that was not filled before.

Of particular importance for the acceptance of our essays is that each of them can be traced by an individual, fixed digital object identifier (DOI), linking it to a permanent document repository. When one of the essays is updated, both the previous and the new version are archived and cross-linked with each other. A court citing one of those essays in its verdict can be assured that the document and the link to it will remain accessible and valid permanently.

We consider it a huge success that nowadays in the legal literature the content of the essays on our special website is considered as "obvious facts". This means that they can be used in trials freely, without having to justify their use, and that they can be treated as proven, without having to question or check their validity.

3.2 Workshops with judges

Another useful tool is the organization of workshops with the judges responsible for traffic cases. In this format, the lower-court judges of the precinct of a Court of Appeal meet for a one-day event with a PTB expert. A PTB presentation on legal metrology in the traffic measurement context opens the program, followed by talks about specific technical subjects that are of current interest in everyday court practice. Examples include:

- the security of the cryptographic signatures attached to the electronic evidence files produced by the speed measuring device;

- the role of measurement uncertainty and the resulting practice of subtracting the permissible error limit from the measured value, to obtain the speed value that the driver is charged with;
- the effect of opaque or reflecting objects or of moving vegetation in the field of view of different speed measuring devices: radar, lidar, etc.;
- the working principle of new device types that have come into use recently; and
- many other specialized subjects, on request by the audience.

This format is highly successful because the direct interaction makes it possible to bridge the language gap between us – as scientists and engineers with a technical mindset – and the judges with their legal training. A typical result is that the judges gain a much better understanding about (and usually also more trust in) the quality control measures built into legal metrology:

1 Testing of the prototype by the manufacturer during the development of the device;
2 Testing of the type specimen by the conformity assessment body;
3 Testing of each individual device during conformity assessment (previously the initial verification);
4 Periodic re-verification of each individual device;
5 Enforcement by market surveillance authorities; and
6 Inspection testing in case of a suspected device malfunction.

In our experience, it comes as a surprise to the audience that there are so many levels of testing and enforcement, and that the type testing comprises many thousands of real-life speed measurements under different (including unfavorable) conditions. Electromagnetic compatibility testing, dust and water spray testing, temperature tests, software testing including parts of the source code, etc. [8, 9] – the large array of testing performed before a device is allowed in traffic enforcement is not normally known, either.

In addition, we ourselves profit from these workshops. We come into direct contact with our "customers" in the legal system, i.e., the target group of our website essays (see section 3.1) and the recipients of our official expert statements (see section 3.7 below), and obtain feedback about whether these are considered helpful in their scope, depth and level of technical language or where they could be improved in principle.

3.3 Publications in legal journals

To further the reach of our essays (see section 3.1) we have published adapted versions of some of them as articles in a traffic law journal. That this strategy was successful can be seen by the fact that higher courts of law have quoted them in their verdicts. It is a very special feeling to see one's work as a physicist or engineer published in a law journal!

3.4 Publicizing the technical competence for type approval

Much of the trust in a speed measurement is based on the trust that the type approval was performed thoroughly and carefully. In our communications with the legal system, we therefore emphasize the various levels of quality control that a national metrology institute makes use of: Working according to IEC/ISO 17025, yearly audits by the International Meter Convention, peer visits from other national metrology institutes, etc.

Moreover, we have formally published the technical evidence for our competence. This includes a refereed publication on the national standard for road vehicle speed that PTB operates, including a detailed documentation of its measurement uncertainty [10]. Another publication describes the speed measurement comparisons with our colleagues in the national metrology institutes of Switzerland and Austria [11]. Both publications serve as proof of metrological traceability of our standard.

Emphasizing our technical competence is important because in a typical court case the speeding driver hires a private technical expert to check the measurement; there are no formal requirements to call oneself a "technical expert" and offer technical services to ticketed drivers. The opinion of the driver's private expert often stands against the facts presented by the national metrology institute. It is therefore important that the court can form an idea of the relative technical competences of privately hired experts on the one hand and the experts at the national metrology institute on the other hand. This can help the court decide which arguments to base its verdict on.

3.5 Improving technical recommendations

The OIML community is well acquainted with the concept of technical Recommendations, for instance R 91 for speed measuring devices [8]. In Germany, there are national documents that are similar in content to R 91 but in many details even stricter, the so-called "PTB-Anforderungen" (PTB-A) [12]. In recent years, we have fully revised all of them and split them into individual documents for each type of traffic measurement device. For instance, PTB-A 12.04 is for Doppler radar

devices, PTB-A 12.05 for laser scanner devices, and PTB-A 12.13 for section control (average speed) devices. The modernized versions are structured to facilitate an easy one-on-one matching of legal requirements, as specified in Germany's Ordinance on legal metrology, with the resulting technical specifications, as detailed in the PTB-A documents. In addition, the new PTB-A documents carry a digital object identifier (DOI) so that they can be found in the permanent document repository.

Because for older device types the PTB-A document to apply is the version that was valid at the time of the original type approval, there is an interest in those older PTB-A versions. These have been assembled in a web archive [12] for easy public access.

The development of a PTB-A document follows a strict consensus principle. A PTB-led working group comprising all relevant stakeholders (PTB, conformity assessment bodies for type approval, verification offices, enforcement bodies for legal metrology, police, judges, technical experts) discusses new or updated PTB-A drafts and passes them unanimously.

In a second step, the new or updated PTB-A document is submitted to the so-called Rule Determination Committee (REA), a body formed by Germany's Measures and Verifications Act, the basic law governing legal metrology. Its members comprise representatives from all branches of society that have a stake in legal metrology, including consumer associations. As in the previous step, decisions are taken unanimously. The task of REA is to identify existing technical rules and standards, such as the PTB-A documents, and to declare them as state of the art. Devices that meet those standards are considered to be compliant with the legal requirements.

The two steps for each PTB-A document mean that its content is based on a broad public consensus. This is meant to foster their acceptance by all parts of society.

In the present context the importance of the PTB-A documents lies in the orientation they give to manufacturers, users, and judges about the level of technical sophistication of the devices and about the technical rules that must be followed to obtain correct measurement results.

3.6 Improving user manuals and measurement documentation

Although modern traffic measurement devices are built to high technical standards and can avoid many possible sources of errors automatically, there are still operational procedures that must be followed by the user. For instance, a Doppler radar device must be set up in the correct angle to the driving direction, or else the displayed speed might be incorrect. There can be other operational constraints depending on the device type.

Any such constraints must be specified in the user manual. The German legal practice requires that a device is type-approved and verified and that it is operated by competent personnel according to the instructions in the manual (so-called standardized measurement procedure). It is then assumed that the device will produce equivalent results under equivalent conditions, so that its measurement results can be trusted without having to check each one of them individually for sources of error. It is only by relying on the standardized measurement procedure that the 350 000 trials per year can be carried out.

An important ingredient is that the user manual is complete in the following sense: When a user follows all the instructions in the manual it is ensured that the device measures correctly. Recently, the trade association covering traffic measurement devices [13] issued a reference structure for a user manual to its members, based on an international standard for user manuals (DIN EN IEC/IEEE 82079-1:2021-09).

In addition, a recommendation was developed about what the written documentation of a measurement run should contain, so that a judge might find all the information needed to confirm that the device was verified and was operated according to the instructions. This minimum set of information is included as a requirement in the PTB-A documents.

3.7 Providing technical advice

In cases where the questions of a judge are not covered by the essays on the special PTB website [7], PTB is sometimes asked directly to provide official expert statements (usually in writing) for the specific court case at hand. This happens about 200 times per year, corresponding to less than half of what the workload was before introduction of the website (Figure 3).

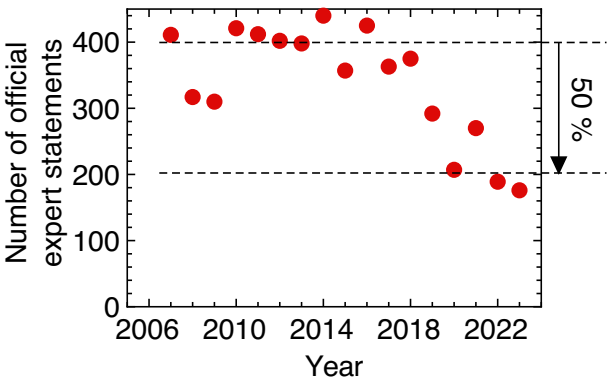

Figure 3: Number of PTB official expert statements given in connection with individual court cases for traffic violations

4 Conclusion

All the activities described above to increase trust in legal metrology results can only be successful if this trust also extends to the enforcement of the rules of legal metrology. It is therefore important to maintain a useful level of metrological control, including effective enforcement of those rules and effective communication of the rules and their enforcement mechanisms.

5 Acknowledgement

We thank J. Rohde for a critical reading of the manuscript.

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COMPLIANCE

Legal metrology in India: Compliance and enforcement

Dr Mukesh Kumar
Deputy Controller
Legal Metrology, Department of Legal Metrology
Government of Uttar Pradesh, India

Legal metrology may have originated from the very first civilizations, but the oldest references are from Egypt relating to building requirements and the periodic calibration of the cubit – but of course legal metrology now has a much wider scope, especially over recent decades. The main objective of a modern legal metrology regime is to protect citizens from the negative consequences of incorrect measurements. All over the world, governments lay down requirements in legislation for measuring instruments, measurement and testing methods, and prepackaged products insofar as they are necessary to achieve these objectives.

Legal metrology is the technical regulation side of metrology. Whereas scientific and industrial metrology provides society with accurate and trustworthy measurements over a broad spectrum, legal metrology is specifically concerned with the accuracy of measurements where these have an influence on the transparency of economic transactions, health and safety, and law enforcement. Thus, preventive as well as repressive measures are applied. Preventive measures include type/pattern/model approval of measuring equipment before it may be manufactured and used. It includes the calibration and verification of such instruments before they are put into operation, as well as their recalibration and reverification after a specified period whereas repressive measures include market surveillance to reveal any illegal usage of measuring instruments or non-compliance with prepackaged product requirements.

Those who use measuring instruments covered by legal metrology regulations are not metrological experts, and hence the authorities must take responsibility for the credibility of such measurements. Therefore, measuring instruments that fall under the scope of legal metrology should, under working conditions and throughout the whole period of use, guarantee that measurement results are correct and within specified permissible errors. Such measuring instruments are type-approved to ensure their fitness for purpose. It should be quite obvious that legal metrology measures can become major barriers to trade. For example, differences in the requirements for prepackaged products will hinder cross-border trade in prepackaged goods. Countries are therefore urged to harmonise their legal metrology measures with international standards and the global measurement system for global acceptance.

The OIML was established in 1955 specifically to promote the global harmonisation of legal metrology requirements for measuring instruments, and publishes many guidelines and model regulations that OIML Members use as the basis for their national legal metrology legislation. Measurements covered by legal metrology are very much influenced by the society in which they are designed to protect consumer' interests. Evaluation of the country's legal metrology regime is therefore heavily dependent on its level of development and the needs of its society at large.

Product labelling compliance plays a significant role in the product sale, distribution and delivery. The risk associated with non-compliance may affect the business and lead to loss of brand reputation, regulatory fines, or penalties. Not having validated systems and processes in place might significantly impact any business. The uniform mandatory declaration on every prepackaged product fulfils the objective of a uniform measurement system worldwide to protect the interests of consumers across the world.

The scope of metrology is very broad and can be termed "Cradle to Grave" since there are many things that can be measured, many different ways in which measurements can be carried out, and even different ways in which measurement results can be expressed. *"If you can't measure it, you can't make it"*.

The application of metrology underpins quality in manufactured goods and processes through accurate and reliable measurement. Metrology plays a key role in the adoption of scientific and technological innovations, the design and efficient manufacture of products that comply with the needs of the marketplace, and the detection and avoidance of non-conformities. It provides fundamental support for health and safety testing, environmental monitoring, and food processing. It also provides the basis for fair trading in a domestic economy and international trading in the global market place. Legal metrology has a particular role to play when there is a societal need to protect both the buyer and seller in a commercial exchange of a commodity or a service provided, or where measurements are used to apply a sanction, and virtually all countries provide such protections through their legal systems.

Law and legal requirements interact with metrology in two different ways and this is reflected in the definition of legal metrology included in the International Vocabulary of Terms in Legal Metrology (VIML) [2] which describes legal metrology as *the practice and the process of applying regulatory structure and enforcement to metrology*. "Legal metrology" is taken to comprise all the activities for which legal requirements are prescribed on measurement. It thus includes prescribed units of measurement, requirements on the use of measuring instruments or systems and methods of measurement, and activities performed by or on behalf of governmental authorities, in order to ensure an appropriate level of confidence in measurement results in the national regulatory environment.

Legal metrology makes use of all developments in metrology to obtain appropriate references, metrological traceability, and treatment of measurement uncertainty. It may apply to any quantity addressed by metrology. This aspect of legal metrology applies not only to trading parties, but also to the protection of individuals and society as a whole in the form of legal metrology regulations. Hence accurate measurement is a basic right of every consumer, and they must feel that *"they get what they pay for"*.

The legal metrology officers in India:

- ensure the implementation of the Law on Metrology through interactions with individual businesses;
- identify contraventions of the Law on Metrology and carry out prosecutions, as well as directing and implementing the legal control of the instruments; and
- conduct surveillance inspections and verifications on the sale of goods including prepackages and instruments, or supervise these functions when carried out by designated or licensed bodies to ensure compliance with the Law on Metrology and regulations promulgated by the Central Government and State Government. They accept them for use, and mark such measuring instruments that are found to be correct, or reject and order those that are found to be incorrect to be corrected, replaced, or removed.

With respect to the need for compatibility between national and international metrological requirements, each country has its own historical perspective on the development of metrological requirements. However, the Technical Barriers to Trade (TBT) Agreement (Article 2.4) [10], implemented within the World Trade Organization (WTO), provides for countries to base their national technical regulations on international documentary standards (norms) so as to harmonise the national requirements. It also requires signatories to take account of, and participate in, international systems of conformity assessment and mutual recognition agreements (Article 6).

The international community has adopted a system of units, measurement standards and requirements for measuring instruments and prepackages through treaties (i.e. the "Metre Convention" and the "Convention establishing an International Organization of Legal Metrology"). The international organisations have also developed systems of mutual recognition or acceptance of the equivalence of measurement standards, of national measurement capabilities, of competences of calibration laboratories and of legal metrology type approval test certificates. The mission of the OIML is to enable economies to put in place effective legal metrology infrastructures that are mutually compatible and internationally recognised, for all areas for which governments take responsibility, such as those which facilitate trade, establish mutual confidence, and harmonise the level of consumer protection worldwide. (OIML B 15:2011 *OIML Strategy* [14]).

In fulfilling its mission, the OIML:

- develops model regulations, Recommendations ("standards") and related documents for use by legal metrology authorities and industry;
- provides mutual recognition systems which reduce trade barriers and costs in a global market;
- represents the interests of the legal metrology community within international organisations and forums concerned with metrology, standardisation, testing, certification and accreditation;
- promotes and facilitates the exchange of knowledge and competencies within the legal metrological system;
- helps in developing a legal metrology structure in developing nations as well as LDCs;
- coordinates with other metrology bodies (NMIs, RLMOs) to raise awareness of the contribution that a sound legal relationship makes between international and national legal metrology authorities to promote a globally uniform measurement system; and
- recently, develops the Digital Transformation of Legal Metrology to bring the legal metrology system under one umbrella.

The Department of Legal Metrology, Ministry of Consumer Affairs, Government of India regulates the Legal Metrology Act and associated regulations through State Governments to ensure a public guarantee is in place from the point of view of the security and accuracy of the weighings and measurements for consumer protection and trade purposes, with the objective of achieving the above legal metrology principles by coordinating the adoption and implementation of OIML Recommendations, Documents, Guides and other publications as below.

The Legal Metrology Act, 2009

The Act received the assent of the President of India on the 13 January, 2010 and came into force with effect from 1 April, 2011. The Department of Consumer Affairs is the nodal agency for the implementation of the Act. The Act is a single Act covering the provisions of the Standards of Weights and Measures Act, 1976 and Standards of Weights and Measures (Enforcement) Act, 1985.The Act only comprises 57 Sections.

1. Legal Metrology (General) Rules, 2011:

Specifications for weighing and measuring instruments are prescribed in the Legal Metrology (General) Rules, 2011 which include around 40 types of weighing and measuring instruments such as electronic weighing instruments, weighbridges, petrol pumps, water meters, sphygmomanometers, clinical thermometers, etc. These weighing and measuring instruments are used by industry, traders, hospitals and various government and non-government organisations for weighing and measuring, and the end results are directly for the benefit of citizens. These weighing and measuring instruments are periodically verified by the State Government officers using the Standard Weights and Measures and the procedure prescribed in the Rules.

2. Legal Metrology (Packaged Commodities) Rules, 2011:

- 'Pre-packaged commodity' is defined under the Act as 'a commodity which without the purchaser being present is placed in a package of whatever nature, whether sealed or not, so that the product contained therein has a pre-determined quantity'.
- As per the Legal Metrology (Packaged Commodities) Rules, 2011 certain mandatory declarations have to be made on every package to enforce and implement OIML R 79 and R 87.
- Besides the above, the Government has made it mandatory to pack 19 commodities in the prescribed sizes in the interest of the consumer.

3. Legal Metrology (Approval of Models) Rules, 2011:

Manufacturers/importers of weighing and measuring equipment which are prescribed under the Legal Metrology Act, 2009 and the rules made thereunder, are required to acquire the approval of the Government of India before manufacturing/import.

4. Legal Metrology (National Standards) Rules, 2011:

- Under the Rules there is a provision that the national prototypes/various standards are kept at National Physical Laboratory (NMI), New Delhi.
- Reference standards of weights and measures are kept at the Regional Reference Standard Laboratory.
- Reference standards are used for the verification of secondary standard weights and measures which are part of state government laboratories.
- The working standard weights and measures are available at the district level which are used for the verification of any weights and measures that are used by traders and manufacturers for transaction or protection purposes. The working standard weights and measures are verified by the secondary standard weights and measures.

5. Legal Metrology (Numeration) Rules, 2011:

Under these rules provision is made for making numeration and the manner in which numbers shall be written.

6. Indian Institute of Legal Metrology Rules, 2011:

The Indian Institute of Legal Metrology, Ranchi is the training institute which provides training in the field of legal metrology to the Legal Metrology Officers of States/UTs/Union of India.

7. Legal Metrology (Government Approved Test Centre) Rules, 2013:

The Government Approved Test Centre (GATC) Rules are framed for the approval of GATCs established by private individuals for the verification of certain weights and measures, in addition to verification carried out by the State Government Officers.

The work performed by the legal metrology authorities is therefore vital for the public interest. The Directorate of Legal Metrology is a statutory authority with powers and responsibilities prescribed under the Legal Metrology Act, 2009 relating to inter-state trade and commerce of weights and measures including pre-packaged commodities. It is also responsible for establishing standards of legal metrology and maintaining traceability of standards relating to legal metrology. Its primary responsibilities are regulation, enforcement and research, regulation and enforcement functions to undertake technical field inspections, searches, seizures, registration of offices and launching prosecutions.

The enforcement of legal metrology laws is carried out by the 28 State Governments and eight Union Territories through Controllers of Legal Metrology and other Legal Metrology Officers as per the provisions of the Legal Metrology Act.

Non-compliance can take many forms:

- inappropriate measurement practices which can include the use of non-standard weights and measures and the use of unverified weights and measures for counter transactions;
- measurement labels that do not meet regulatory requirements and use of non-standard units to express dimensions, mass, volume or numbers;
- short measure packaged goods; and
- using measuring instruments that are unapproved or inaccurate.

Regular inspections and enforcement serve to check that any issues identified have been corrected. This is the most common enforcement action. However, even minor measurement errors can have a significant impact on competition and can be detrimental to consumers when considered in aggregate.

Summary of the compliance activity and outcomes: A case study of Uttar Pradesh

Uttar Pradesh is the most populous and largest state in India, having 75 districts with 151 working standard laboratories, and 10 secondary standard laboratories to enforce compliance of the Legal Metrology Act. The population of Uttar Pradesh is also considered as being the largest consumer base in the country with around 200 million people. It has the third largest economy with a state of the art infrastructure and promotes exemplary citizenship as well as a business-oriented model of e-governance. Among the huge number of measuring instrument users and consumers, compliance with the Legal Metrology Act and Rules is very well enforced and implemented.

Inspections of traders

In 2021–22, Legal Metrology Officers/inspectors undertook 566 618 inspections of business premises, manufacturing (packaging) units, fuel dispensing pumps, LPG, weighbridges, bullion traders, sugar mill shops selling prepacked commodities, shopping malls and other retail business outlets etc., using weights and measures.

In the period 2022–23, 640 253 traders were inspected. If any violations of the Act & Rules are found, actions were taken against the offender as par the Legal Metrology Act. This action concerns not only traditional business market transactions but also involves ensuring strict compliance with the Legal Metrology Act on e-commerce market platforms as well direct selling business models.

In its mission to enforce strict compliance with Uttar Pradesh's legal metrology enforcement rule, 2011, the Department carried out verifications of 3 461 537 and 3 281 118 measuring instrument inspections in the periods 2021–22 and 2022–23 respectively. Regular inspections and verifications of measuring instruments, including electronic weighing instruments, not only encouraged the uniform standard use of weights and measures but also protected the interests of consumer transactions. These actions are carried out in compliance with the respective OIML Recommendations.

Effective enforcement is carried out to ensure compliance with the Legal Metrology (Prepackaged Commodity) Rules, 2011 in accordance with OIML R 87 for prepacked commodities, which ensures the correct mandatory declaration is present on every packet as well as the quantity declared. Following OIML R 79 to monitor the net content becomes more transparent and easier with respect to the relevant MPEs. Ensuring compliance and enforcement of prepacked commodities significantly reduces violations of the appropriate legislation, resulting in correct and lawful mandatory declarations as well as accurate prepackage quantities.

Effective control mechanisms for service licensing include manufacturers, and dealers and repairers of measuring instruments. They are responsible for manufacturing measuring instruments as per the type approval granted by the Government of India, the sale and repair (cleaning, adjusting and repairing in the presence of the legal metrology officers performing the verification and stamping) of measuring instruments under License issued by the Controller of Legal Metrology of the respective state.

Enforcement actions

Inspectors issue non-compliance notices whenever any violations of the Legal Metrology Act are identified during trader inspections. Available enforcement actions include infringement notices with associated fines and referral for potential prosecution to the competent court of law. The average amount of fines associated with infringement notices in 2021–22 and 2022–23 was INR 3211.00 and INR 3080.00 per offence.

EoDB (Ease of Doing Business)

Under its EoDB guidelines, the Department of Legal Metrology provides the following online service on a single window system and also on the process of complete digital transformation of legal metrology to overcome barriers to innovation set up by regulations, better coordinate legal processes, and reduce costs and time. The objective is to exploit data-driven possibilities, together with concepts for digital platforms, for the benefit of all stakeholders in legal metrology.

Online services for third party measuring instrument manufacturers/dealers/repairers and packer registration

Users can apply online for verification of measuring instruments, then a fee is charged online and finally the verification is recorded. The service flow charts may be consulted at www.legalmetrology-up.gov.in

(A) Licences and Registrations

- Issue new licences for manufacturers, dealers and repairers.
- Auto renewal of licenses for manufacturers, dealers and repairers.
- Registration of manufacturers/packers of packaged commodities.
- Intimation of the director's nomination.
- Process flow charts, check lists, procedures and lists of documents required to obtain licences and registrations.

(B) Online verification application and fee submission

(C) Verification and re-verification of measuring instruments

- Verification and reverification of petrol/diesel fuel dispensing pumps, CNG/LPG dispensers, storage tanks, auto Rikshaw/taxi fare meters.
- Process flow, check lists and procedures for new verification and reverification.
- Online verification certificate.

Best practices followed by the Legal Metrology Department:

- Every legal metrology officer is trained with a four-month basic training course from the Indian Institute of Legal Metrology, Ranchi, India.
- Equipped with laptops and high-speed internet supported by MIS on the Department's portal.
- Regular webinars and refresher courses to upgrade new technology in weighing systems as well as new rules and regulations. Online webinars provide the opportunity to interact with LMOs and LM stakeholders across the world.
- Training programs by the Government of India in new and developing areas of metrology provide opportunities to model best practice in areas such as the coordination of measurement machines and nano technologies.
- Establish the IT cell to provide technical support to LMOs and weights and measures users.
- Integrated grievance redressal system of the State Government as well as a national consumer helpline.

Conclusion

A sound legal metrology system such as that developed in India establishes confidence and trust for consumers, businesses and government, and ensures that any non-compliances are sanctioned by the application of appropriate penalties. A more citizen-friendly approach has been adopted and the human interface has been minimised in order to promote the application, importance and benefits of legal metrology to society at large. ■

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QI IN SAUDI ARABIA

Legal metrology applications and National Quality Infrastructure, and its crucial role in Saudi Vision 2030

Ass. Prof. Khaled M. Ahmed
SASO, Saudi Arabia

Eng. Fahad Almuhlaki
SASO-NMCC, Saudi Arabia

1 Introduction

The technical regulatory aspect of metrology, i.e. the process and practice of applying legislative and regulatory frameworks, as well as their enforcement, to metrology is known as legal metrology (OIML, 2015a). A comprehensive understanding of legal metrology encompasses regulation in numerous spheres of human existence, such as commerce, public health, the environment, and safety. Scientific and industrial metrology provides society with reliable and accurate measurements across a wide range. Although the necessity for fair commerce led to the development of legal metrology, its use has expanded significantly in recent years.

A modern legal metrology regime's primary goal is to protect the public from the detrimental effects of inaccurate measurements in areas including work settings, business transactions, law enforcement, and health and safety systems. Governments all around the world enact laws defining specifications for prepackaged products, measurement and testing procedures, and measuring devices as needed to achieve this goal. Both repressive and preventive actions are employed.

One of the preventive measures is to require type approval for measuring equipment before it can be sold. Before these instruments are used, they must be calibrated and verified. They also need to be recalibrated and verified after a predetermined length of time. Market surveillance is one of the repressive techniques used to uncover any illicit use of measurement tools or violation of prepackaging regulations.

Since those utilizing measuring devices are not specialists in metrology, it is the government's duty to ensure that the measurements are reliable. Consequently, measuring devices that fall under the scope of legal metrology must ensure accurate measurement outcomes under operational circumstances, throughout the duration of their use, and within permissible error limits. These measuring devices have received type approval to guarantee their suitability for use.

The potential for legal metrology measures to become significant trade obstacles should be very apparent. For instance, commerce in prepackaged products will be hampered by discrepancies in prepackaging standards. As a result, countries are pushed to align their legal metrology policies with global standards and shared markets. These are usually implemented as top-down regional laws, such as the European Union's (EU) Measurements Instrument Directive (MID).

The OIML was established in 1955 with the express goal of advancing the harmonization of legal metrology standards worldwide. It publishes a number of model regulations and guidelines that Member States are under the moral obligation to utilize as the foundation for their own national legal metrology laws.

The society that legal metrology aims to safeguard has a significant influence on what is measured. For example, requesting metered taxis might be considered as illogical given that in some countries taxi fares are typically negotiated between drivers and passengers. Furthermore, when measuring equipment is imported with a type testing certificate from an accredited laboratory, it makes little sense to set up expensive laboratories to conduct type testing. Therefore, it is critical to distinguish between the legal metrology requirements of a least developed nation and those of a fully industrialized, wealthy nation that might also be a part of a developed common market.

Therefore, the demands of society as a whole and the nation's stage of development play a major role in determining to what degree the legal metrology regime is evaluated. Therefore, without knowledge of the actual needs of society and authorities as well as the ability of industry and suppliers to implement the regime, it is incomplete.

Table 1 enumerates the fundamental components of the legal metrology regime that pertain to the four pillars.

2 Trade measurement and non-compliance

When commodities and services are bought and sold and their value is established by means of a measurement, this is referred to as a trade measurement.

Table 1: Building blocks and pillars of the legal metrology regime (Source: Section 11. Legal Metrology, World Bank Report)

	BUILDING BLOCK	
PILLAR	NO.	DESCRIPTION
1: Legal and institutional framework	1	Legal metrology strategy
	2	Legal entity
	3	Governance
	4	Financial sustainability
2: Administration and infrastructure	5	Director
	6	Organizational structure
	7	Management and personnel
	8	Premises
	9	Equipment
	10	Quality management system documentation
3: Service delivery and technical competency	11	Legal metrology technical staff
	12	Type approval of measuring instruments
	13	Calibration and verification services
	14	Market surveillance
	15	Training system
4: External relations and recognition	16	Liaison with regional organizations
	17	Liaison with international organizations
	18	Coordination within the QI
	19	Designated organizations
	20	Consultative forum

Note: QI = quality infrastructure.

According to studies conducted in Australia, the United States, and Canada, measurement-related commercial transactions (such as prepackaged goods and utility metering) account for at least 50 % of the gross national income. About 25 % of this total comes from retail transactions, with business-to-business transactions making up the other three-quarters. These figures indicate that around USD 970 billion worth of trade transactions include measuring in Australia annually.

Open and equitable competition is supported by measurements that are consistent and definite. By guaranteeing that all market participants, regardless of their size or financial strength, adhere to the same rules and have an equal opportunity to compete, it creates a level playing field for business. Accurate depictions of measures facilitate well-informed decision-making for organizations and customers alike. In a broader sense, they facilitate the market's smooth functioning.

The expected role of the Saudi Arabian National Metrology Institute (NMI) is to enforce the National Measurement Act and related regulations and thus to guarantee the following for trade purposes:

- appropriateness of measuring instruments;
- accuracy of measurements; and
- suitability of measures for trade purposes.

For example in Australia, the NMIA's trade measurement inspectors assist firms in adhering to legal requirements by:

- testing measuring devices;
- inspecting packaged goods and reviewing business operations;
- offering guidance on fulfilling compliance duties; and
- taking enforcement action where required.

When focusing on compliance efforts and choosing the proper and proportionate regulatory action when non-compliance is found, NMIs employ a risk-based methodology.

Risk is quantified by considering both the potential for harm and the chance of breaking regulations (non-compliance) based on the risk-based approach taken by NMIs. Several variables are taken into consideration when assessing harm, such as the following:

- the effect on consumer or industry confidence in the measuring system;
- the degree of financial injury to customers or the industry;
- the effect on preserving fair competition among businesses; and
- the capacity of consumers to make well-informed judgments about what to buy.

A variety of behaviors can be considered as non-compliance, such as short measuring prepackaged products, using unapproved or inaccurate measuring instruments, and improper measurement practices (such as not adjusting shop scales to account for the weight of packaging in over-the-counter transactions). Not every incidence of non-compliance has an impact on the integrity of measurement-based transactions. Measurement errors are uncommon and are often rather small when they do occur.

An inspector will give a non-compliance notice and, if necessary, offer guidance when non-compliance is judged to be causing little harm and to have little chance of continuing. A follow-up appointment will verify that any problems found have been fixed. When taken as a whole, though, even small measurement inaccuracies might negatively affect consumers and the level of competition.

Moreover, manufacturers of instruments can take advantage of the legal metrology system, which offers information on conformity with the applicable OIML Recommendations in the state in question, even in the absence of explicit national regulations. The system supports the production, promotion, and use of measuring equipment that are not yet governed by law. Manufacturers can, for instance, demonstrate to their clients the traceability of the measuring tools used in product packaging, therefore advancing their marketing.

3 Examples of enforcement actions

Serious enforcement action is carried out in the following cases:

- persistent non-compliance discovered after a previous notice has been given;
- a particularly serious breach found after an initial audit; and
- violations that have a significant impact on the public.

The following are examples of possible enforcement actions:

- warning letters;
- violation notices with accompanying fines;
- enforceable commitments; and
- injunction or possible prosecution.

4 National Quality Infrastructure (NQI) in Saudi Arabia

Any country's total progress is dependent on its National Quality Infrastructure (NQI). Any country's quality infrastructure (QI) is made up of globally accepted methodology, standards, accreditation, conformity assessment, and market surveillance. UNIDO defines the QI as: "the system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the quality, safety and environmental soundness of goods, services, and processes. The quality infrastructure is required for the effective operation of domestic markets, and its international recognition is important to enable access to foreign markets. It is a critical element in promoting and sustaining economic development, as well as environmental and social well-being. It relies on metrology, standardization, accreditation, conformity assessment, and market surveillance." Elements of NQI are shown in Figure 1.

It is a rudimentary system of empowerment that offers certification, testing, calibration, and inspection.

Figure 1: Elements of National Quality Infrastructure (Source: Rui Sun et al., National Quality Infrastructure System and Its Application Progress in Photovoltaic Industry, Electronics 2022, 11(3), 426; https://doi.org/10.3390/electronics11030426)

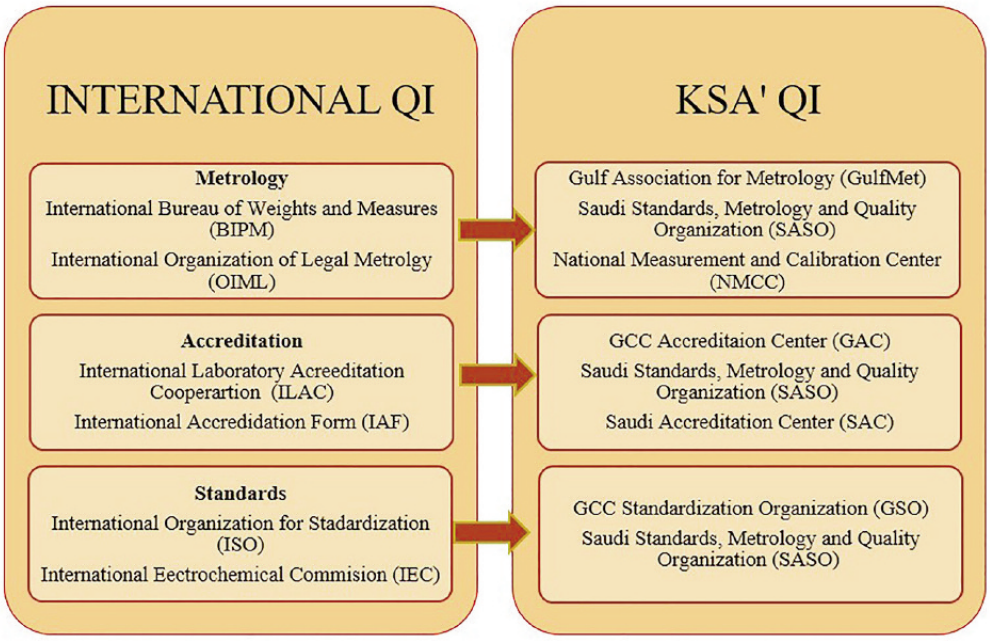

Figure 2: Building blocks and pillars of the legal metrology regime (Source: V. Kumar et al., MAPAN-Journal of Metrology Society of India (March 2022) 37(1):97–106)

Universities, R&D labs, science and technology organizations, civil societies, businesses, and government are all connected by the QI. Any country's ability to thrive economically and maintain a high standard of living depends on these units.

The overall measurable capacities of international equivalency available with apex QI institutions and the mechanism for disseminating the availability of QI facilities to all stakeholders across the nation are the main factors determining the effectiveness of the national QI system. Figure 2 summarizes the QI organizations in the Kingdom of Saudi Arabia (KSA) and around the world. By properly establishing each of the QI's constituent parts in the KSA, an internationally acclaimed QI has been created.

Quality infrastructure, with its four components: standards, conformity assessment, accreditation, and metrology (measurement and calibration), plays a vital role in enabling countries to achieve sustainability strategies in industrial and agricultural growth and human resources development, in addition to its effective contribution to increasing exports, protecting the environment, supporting health and safety, and ensuring consumer rights and monitoring sources of climate pollution.

4.1 National Quality Strategy (NQS) of Saudi Arabia

NQS is the overarching framework that is in line with the Kingdom's Vision 2030 and encompasses a broad understanding of quality and institutional excellence across a number of sectors in the KSA. Raising the standard of national goods and services will increase their competitiveness in the global market, grow all business sectors precisely and rationally with higher added value, and have a favorable effect on GDP and GNP. The NQS was created to support the government's goal of increasing service provision to all KSA residents, highlighting their vital role in the country, and making it easier for them to access the services they need. The relationship between the three elements of NQI is summarized in Figure 3.

For instance, among the steps SASO has taken to guarantee product quality are:

1. The Saudi Program for Product Safety (Saleem), which is in charge of guaranteeing product safety and making sure defects do not exist in the products.
2. The unification of legal tests of measures based on the international standard is the responsibility of the national program for legal calibration (Taqyees). Furthermore, of note are the 30 389 standard items that SASO has authorized and its membership of 293 international bodies since its founding.

4.2 Standards (documentary)

A standard is a document drawn up by general agreement between all stakeholders, and approved by an official body, that includes general rules, guidelines, or characteristics related to activities of general and

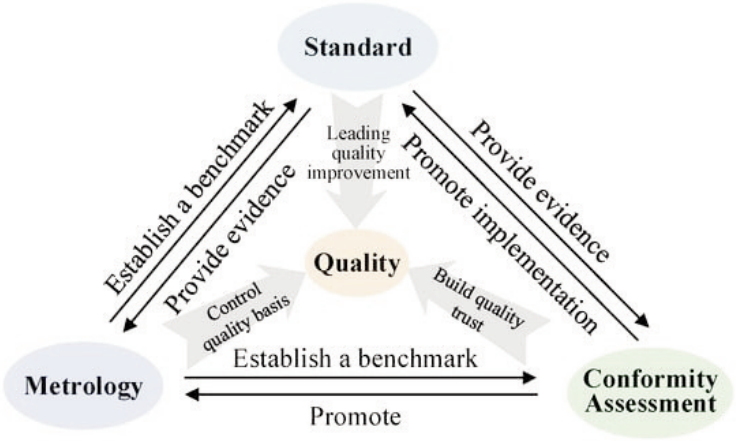

Figure 3: The relationship between the three elements of NQI (Source: Rui Sun et al., National Quality Infrastructure System and its Application Progress in the Photovoltaic Industry, Electronics 2022, 11(3), 426; https://doi.org/10.3390/electronics11030426)

recurring use or their results, with the aim of achieving the optimal degree of order and arrangement within a specific context. Technical regulations specify the detailed characteristics of products or processes and methods. Production for which compliance is mandatory – whenever the consumer's health, safety or quality of life is concerned.

The importance of standards

The standards and standardization system is the space that enables all stakeholders to participate in enhancing the competitiveness of the national economy through:

- determining the standards, specifications and technical requirements for goods, products and services for the purpose of achieving acceptable levels of quality to preserve the health, safety, environment and general security of the consumer;
- raising the quality of local services and products in a way that contributes to ensuring their competitiveness and promoting them at the local and international levels;
- reducing the cost of manufacturing and increasing the competitiveness of national companies and factories compared to their foreign competitors;
- facilitating intra-trade exchange with partner countries by removing technical obstacles for local exporters.

4.3 Saudi Accreditation Center (SAC)

The national body in charge of offering accreditation services to conformity assessment bodies in the KSA is the Saudi Accreditation Center (SAC). It consists of inspection bodies, certification bodies, Halal certification bodies, and testing and calibration laboratories in all disciplines (such as electrical, chemical, construction and building materials, measurement and calibration, etc.). The goal of the SAC is to improve consumer protection while contributing to the growth of the national economy by increasing the technical proficiency of national CABs.

Saudi Arabia signed an international accreditation agreement in 2011 that allowed for the recognition of Saudi standards in numerous fields. The national center's laboratories' quality system is built upon the requirements of international standards (ISO/IEC 17025, ISO 17034, and ISO 17043). The quality system was assessed (peer reviewed) in 11 fields between December 2019 and January 2020 under the direction of GULFMET, and the system was certified and accredited in accordance with ISO/IEC 17025, among other standards.

The importance of accreditation

Accreditation activity is considered essential to facilitate the flow of goods to and from global markets as it contributes to raising the level of quality and creating a culture of discipline in the local market and protecting the consumer through the certificates and reports issued by accredited bodies.

- It ensures technical and administrative validity and reliability at the level of the various components of the economic system, especially those related to bodies that evaluate the conformity of products and services.
- It supports government agencies in reducing cases of confusion and ambiguity when making decisions related to health, public health, and the environment based on reports and certificates related to the quality of products and services.

- It contributes to reducing production defects and the possibility of non-conformity of products, which leads to enhancing levels of consumer satisfaction and raising the levels of general confidence of consumers in the goods and services available in the market.
- It enhances confidence in the quality of services and products by facilitating the circulation of goods and services that meet the relevant quality and safety specifications.

The SAC is the only official national body authorized to accredit conformity assessment bodies within the Kingdom, including testing and calibration laboratories, certification bodies, and inspection bodies, in addition to bodies granting halal certificates.

Saudi participation in regional and international organizations

- Full membership in the International Laboratory Accreditation Organization (ILAC). Following its signing of the International Recognition Agreement in the field of accreditation of inspection, testing and calibration laboratories and inspection bodies (ILAC-MRA).
- Full membership in the Arab Accreditation Center (ARAC) and a signatory to the ARAC-MRA Mutual Recognition Agreement.
- Full membership in the Asia-Pacific Accreditation Organization (APAC).
- Full membership in the Accreditation Committee of the Islamic Organization for Standardization and Metrology (SMIIC-AC).
- Full membership in the International Halal Accreditation Organization (IHAF).

4.4 Conformity assessment

Conformity assessment attests proof that specific requirements related to a product, process, system, person, or entity have been met. Conformity assessment services are testing, inspection, calibration, inspection and certification services for management systems, people and products.

The importance of conformity assessment

Conformity assessment activity is considered a pivotal activity in the national economic system as it is the basic mechanism that:

- verifies the conformity of products and services in accordance with national and international requirements, standards and requirements, especially the requirements of the World Trade Organization, and helps protect the national economy from random supply or non-conformity with national regulations and specifications;
- ensures the provision of a high level of protection to the consumer from various types of risks that may result from the use of products or commercial fraud, including verification of weights and measures;
- contributes to boosting exports by enacting rules and mechanisms that ensure the liberalization of intra-trade with the rest of the world in accordance with technical requirements and standards for the quality of products and services; and
- strengthens environmental, health and public security oversight systems by implementing mechanisms for monitoring environmental pollution indicators.

Conformity assessment bodies in the Kingdom are divided into governmental and private bodies active in the fields of testing, calibration, certification and inspection, approximately 400 of which are accredited either by the SAC or by international accreditation bodies.

4.5 National Measurement and Calibration Center (NMI of Saudi Arabia)

The National Measurement and Calibration Center (NMCC) was established in the KSA in 1406 AH (1986 AD). Its primary duties include developing and maintaining national measurement standards, calibrating measuring devices and standards, conducting metrology research, and taking part in significant regional and global interlaboratory comparisons. It offers services to support industrial, legal, and scientific metrology in both the public and private spheres. Additionally, it guarantees metrological traceability of measurement results to the SI units.

The NMCC, which is divided into five departments, houses twenty-two specialized national laboratories that provide industrial, legal, and scientific metrology services to both the public and commercial sectors. NMCC also includes a Quality and Technical Assistance department for maintaining the quality system and technical assistance to customers among other tasks for customer satisfaction and technical support to NMCC laboratories. It also comprises a Proficiency Testing Unit (PT Unit) that takes responsibility for organizing PT programs and schemes to support different sectors in the Saudi society. Figure 4 depicts the NMCC organization chart.

- Since 2011, the Kingdom is a signatory to the *Metre Convention* and the *Mutual Recognition Arrangement*

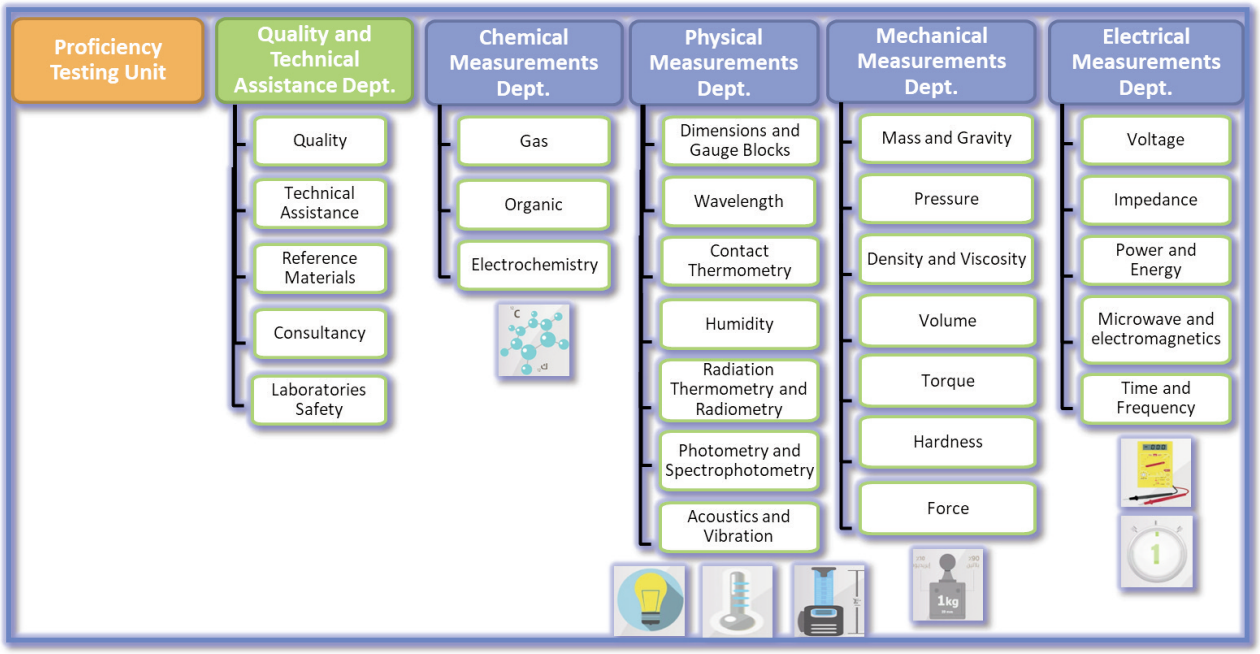

Figure 4: Organization Structure of the National Measurement and Calibration Center (NMCC)

(CIPM MRA, Mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes) The National Measurement and Calibration Center achieved outstanding results during its participation in more than 30 international comparisons organized under the auspices of the BIPM and regional metrology organizations such as EURAMET, GULFMET, APMP and COOMET, published on the BIPM KCDB website.

- The NMCC'S laboratories passed the peer evaluation conducted by the RMOs and submitted to the JCRB through the Asian Regional Metrology Organization (APMP).
- CMCs: Many entries/Calibration and measurement Capabilities (CMCs) have been published in a variety of fields, e.g. the field of length measurement and electrical measurements, and the fields of force, pressure, mass, time and frequency are under deployment procedures. The process in this regard (CMCs publishing) is steadily growing with a prominent yet practical strategy.

5 Conclusion

Legal metrology offers many advantages to society, such as:

- support of civil society;
- technological education;
- reduction in the number of deaths and injuries from accidents;
- improvement in the natural environment; and
- improved health from standardization of measurement and testing, among others.

The quality infrastructure is required for the effective operation of domestic markets, and its international recognition is important to enable access to foreign markets. It is a critical element in promoting and sustaining economic development, as well as environmental and social wellbeing. The Quality Infrastructure is "The system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the quality, safety and environmental soundness of goods, services and processes". It relies on metrology, standardization, accreditation, conformity assessment, and market surveillance.

In the KSA, it is necessary to take into account a number of recommendations for the future, such as expanding SASO's apex capabilities and introducing new system standards, in order to boost the KSA's quality assurance. It is also necessary to expand SASO's measurement and calibration capabilities into the fields of energy, biomedical, environmental monitoring, and quantum standards. New primary/national standards

should also be established, and efforts should be made to improve the coordination of the three QI pillars: metrology, standards, and accreditation. Moreover, the development of robust cooperation between the four helices (government, academia, S&T institutions, civil society & media, and enterprises) fortifies the legal framework and encourages the widespread adoption of legal metrology.

It is necessary to construct more research centers and to implement a strong culture of research and development. Enhancing competitiveness across priority industries, strengthening the industrial standard enforcement mechanism, and encouraging the private sector to engage in public infrastructure projects are also critical. It is important to raise awareness of the quality improvement.

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OIML TRAINING EVENT (OTE)

Prepackaged goods according to OIML R 79 and OIML R 87

3–7 July 2023

Deutsche Akademie für Metrologie (DAM), Bad Reichenhall, Germany

IAN DUNMILL, BIML Assistant Director

After the lifting of travel restrictions, the OIML was able to organise its first in-person training event since the COVID-19 pandemic at the Deutsche Akademie für Metrologie (DAM) in Germany.

The topic of prepacked goods was chosen due to the demand from different regions for training in this widely-regulated field, which is not only important from a metrological point of view, but also critical for consumer protection. Putting into place legal metrology controls on prepackaged products enables not only domestic products to be checked in local factories, but imported prepackaged products to be checked at their importers. This four-day event covered theoretical and practical aspects of two OIML Recommendations:

- R 79:2015 *Labelling requirements for prepackages*, and
- R 87:2016 *Quantity of product in prepackages*

The training event was attended by 19 participants, from 17 economies, and was mainly aimed at those from Countries and Economies with Emerging Metrology Systems (CEEMS). Most participants were self-funded, but five were funded by the PTB (Germany) and three by the United Nations Industrial Development Organisation (UNIDO).

The two lecturers for the course were also from CEEMS economies – Mr Jaco Marneweck (South Africa) led the sessions on R 79, and Mr Pedro Pérez Vargas (Colombia) covered those on R 87. Both are pictured below during the training session.

The programme of the OTE was as shown in the table on the next page. Over the four days, there was a mixture of classroom sessions and practical sessions. The classroom sessions were all presented in a way that enabled a high degree of interaction between the lecturers and the participants, which was highly appreciated by all.

OIML Training Event

Prepackaged goods according to OIML R 79 and OIML R 87

3 to 7 July 2023, DAM in Bad Reichenhall (Bavaria), Germany

Training programme

	Monday 3 July 2023	Tuesday 4 July 2023	Wednesday 5 July 2023	Thursday 6 July 2023	Friday 7 July 2023
Session 1 **09:00 to 10:30**		OPENING SESSION • Opening and welcome • Purpose of OTE • Introductions • Group photo	TRAINING ON OIML R 79 - *Labelling requirements for prepackages* • Type size of letters and symbols	TRAINING ON OIML R 87 – *Quantity of product in prepackages* • Terminology	TRAINING ON OIML R 87 – *Practical: Verification of prepackaged products expressed in volume*
Morning break – 10:30 to 11:00					
Session 2 **11:00 to 12:30**		TRAINING ON OIML R 79 - *Labelling requirements for prepackages* • Terminology • Identity of the product • Declaration of responsibility for a prepackage	TRAINING ON OIML R 79 - *Labelling requirements for prepackages* • Revision	TRAINING ON OIML R 87 – *Quantity of product in prepackages* • Metrological requirements for prepackages	TRAINING ON OIML R 87 - *Quantity of product in prepackages* • OIML G 14 *Density Measurement*
Lunch break – 12:30 to 14:00 [for the account of each participant]					
Session 3 **14:00 to 15:15**		TRAINING ON OIML R 79 - *Labelling requirements for prepackages* • Quantity declarations • Suggested methods of indicating the quantity on prepackages	SITE VISIT **Südwestdeutsche Salzwerke AG** Reichenbachstrasse 4	TRAINING ON OIML R 87 *Practical: Verification of prepackaged products with constant nominal content, expressed in mass*	TRAINING ON OIML R 87 - *Practical: Verification of drained products packed in liquid medium*
Afternoon break – 15:15 to 15:45					
Session 4 **15:45 to 17:00**	**Registration of participants** DAM Wittelsbacherstrasse 14	TRAINING ON OIML R 79 - *Labelling requirements for prepackages* • Misleading practices • Units of measurements and symbols	SITE VISIT (Continued)	TRAINING ON OIML R 87 – *Quantity of product in prepackages* • Tare procedures	TRAINING ON OIML R 87 - *Quantity of product in prepackages* • Actual quantity in glazed and frozen products CLOSING SESSION • Vote of thanks • Closing of OTE
Sessions close at 17:00	**Welcoming event at DAM** (sponsored by DAM)		**Social event** Gasthaus Heimgarten Am Einfang 10 (sponsored by the OIML)		Participants depart

Participants also visited a local salt factory to see prepackaged product control in practice. A local newspaper reported on the visit and on the training course being held in Bad Reichenhall.

For the part of the training event on R 79, participants were asked to bring along labels from prepackaged products found in their countries, which they were then able to discuss and consider whether they complied with the requirements in the OIML Recommendation.

For the practical training on the methods used to check that products met the requirements of R 87, three tests were covered (see pictures, below):

- Net weight (plastic containers of salt);
- Net volume (bottles of fruit juice); and
- Drained weight (cans of peaches).

In all cases, the equipment and process were demonstrated and explained, and then participants had the opportunity to conduct the necessary testing themselves.

Following the practical testing, all participants also made use of a spreadsheet to analyse the results and consider whether the products were in conformity with the requirements. They were also able to adjust the results to see the effect that non-conforming packages had on the overall batch results.

Feedback obtained from participants at the end of the course indicated a wide appreciation for the trainers, training facilities and location, and training programme. The opportunity for such an informal exchange of views and questions was highly welcomed. Some participants expressed a wish for consideration of testing on more complicated products, and these could be covered in a later or longer course.

The OIML will be considering the possibilities for holding future OTEs as part of its work programme in support of CEEMS. ■

Von der Schönheit der Kurstadt begeistert

Landesamt für Gewichte holt internationale Veranstaltung nach Bad Reichenhall

Bad Reichenhall. Die Deutsche Akademie für Metrologie beim Bayerischen Landesamt für Maß und Gewicht hat in Zusammenarbeit mit der Organisation Internationale de Métrologie Légale (OIML) und der Physikalisch-Technischen Bundesanstalt (PTB) erstmals eine internationale Veranstaltung in Bad Reichenhall durchgeführt. „Derartige OIML Training Events (OTE) haben seit 2016 schon in China und auf Kuba stattgefunden. Das diesjährige Event war das erste seiner Art auf europäischem Boden", berichtet der Chef der Deutschen Akademie für Metrologie, Cord Müller, der Heimatzeitung.

Zielgruppe der OTE sind Länder und Wirtschaftsräume mit emergenter metrologischer Infrastruktur, das heißt sich noch entwickelnden Vorschriften und Regeln des richtigen Messens, wie sie in Deutschland durch das Mess- und Eichrecht bereits seit langer Zeit existieren, wie Müller erklärt. Vom 3. bis 7. Juli waren also 22 Teilnehmer und Dozenten aus 20 verschiedenen Ländern und fünf Kontinenten, von Albanien bis Uganda im Alphabet, in der Kurstadt zu Gast.

Zentrales Thema des Workshops war laut Müller die metrologische Kontrolle von Fertigpackungen, das heißt von Waren, die in Abwesenheit der Endverbraucher verschlossen und dann zum Beispiel in Supermärkten zum Kauf angeboten werden.

Führung in der Saline gehörte zum Programm

Um einen Eindruck davon zu vermitteln, mit welcher Sorgfalt seitens der herstellenden Industrie hierzulande gearbeitet wird, damit Fertigpackungen die angegebene Füllmenge auch enthalten, wurde für die Teilnehmer des Events eine Werksführung in der Neuen Saline organisiert. Im nachfolgenden Workshop, der in den Räumen der DAM in der Wittelsbacher Straße stattfand, konnten sich die Teilnehmer mittels Waage und Rechenprogramm davon überzeugen, dass die der Produktion entnommene Stichprobe alle internationalen Empfehlungen der OIML einhält und damit dem Export des Reichenhaller Tafelsalzes auch nach Übersee metrologisch nichts im Wege steht. Nach der Behördenverlagerung des Landesamtes für Maß und Gewicht aus München nach Bad Reichenhall freut sich das Team der Deutschen Akademie für Metrologie ganz besonders, neben den seit 2020 regelmäßig stattfindenden Lehrgängen und Seminaren für das eichtechnische Personal der deutschen Eichbehörden und Prüfstellen nun auch wieder internationale Aktivitäten anbieten zu können. Die Teilnehmer des OTE waren samt und sonders begeistert von der Schönheit und Gastlichkeit Bad Reichenhalls, so dass man seitens der Akademie guter Dinge ist, auch in den Folgejahren internationale Gäste der DAM in der Alpenstadt begrüßen zu können. – red

Um einen Eindruck davon zu vermitteln, mit welcher Sorgfalt die Industrie hierzulande arbeitet, wurde für die Teilnehmer eine Werksführung in der Neuen Saline organisiert. – Foto: Deutschen Akademie für Metrologie

OIML TC 9/SC 2/P 10

Revision of OIML R 51:2006 *Automatic catchweighing instruments*

6–9 November 2023 Online

MORAYO AWOSOLA CEng MIET (UNITED KINGDOM)
Secretariat, OIML TC 9/SC 2 *Automatic weighing instruments*
Convener, OIML TC 9/SC 2/p 10 Revision of OIML R 51:2006 *Automatic catchweighing instruments*

1 Introduction

The fifth online meeting of the OIML Project Group TC 9/SC 2/p10 "Revision of OIML R 51:2006 *Automatic catchweighing instruments*" took place in November 2023. This was a four-day meeting with 31 participants representing 19 countries, liaisons, and manufacturers. The meeting addressed the Project Group comments received on the OIML R 51 Working Drafts, and in addition reviewed the work of the various subgroups (SGs) that were tasked with investigating technical issues relating to specific OIML R 51 requirements. The BIML provided Zoom online support.

2 What is an automatic catchweighing instrument (catchweigher)?

According to OIML R 51:2006, an automatic catchweighing instrument (catchweigher) is an automatic weighing instrument that weighs pre-assembled discrete loads or single loads of loose material. OIML R 51:2006 defines the following six groups of catchweigher instruments:

i) **Checkweigher** - Instrument that sub-divides prepackages of different mass into two or more subgroups according to the value of the difference between their mass and the nominal set point.

ii) **Grading instrument** - Instrument which assigns a weighing result to a predetermined range of mass to determine a tariff or toll, e.g. postal scales.

iii) **Weigh labeller** - Instrument that labels individual pre-assembled discrete loads (e.g. prepackages) with the weight value.

iv) **Weigh-price labeller** - Instrument that calculates the price to pay on the basis of the indicated mass and the unit price and labels individual pre-assembled discrete loads (e.g. prepackages with the weight value, unit price and price to pay).

v) **Vehicle mounted instrument** - Complete instrument that is firmly mounted on a vehicle, and that is designed for that specific purpose.

vi) **Vehicle incorporated instrument** - Instrument where components of the vehicle which are also components of the weighing instrument, i.e. parts of the vehicle (levers, joints and/or force transmission), are used for the instrument.

3 TC/SC enquiry stage

A periodic review of OIML R 51:2006 was conducted in TC 9/SC 2 between 19 November 2014 and 21 February 2015, with the following results:

- 10 votes to "Revise" OIML R 51, and
- 1 vote to "Reconfirm" OIML R 51.

The required 2/3 majority of P-Members was therefore reached to recommend to the 53rd CIML meeting that OIML R 51:2006 should be revised. The reasons provided for a revision of OIML R 51:2006 were:

- to analyse the available new technologies in the field of legal metrology for digital displays, cloud storage systems, communication systems, remote monitoring, etc.;

- to review the minimum number of consecutive test weighings used to determine the mean error and the standard deviation of the error to ascertain whether fewer than 60 test weighings are feasible without compromising on the confidence;
- to update the software requirements to OIML D 31 *General requirements for software-controlled measuring instruments*;
- to update the performance tests to OIML D 11 *General requirements for measuring instruments - Environmental conditions*;
- to explore modern physical and digital display devices for weighing applications, and visibility/clarity of the instrument descriptive markings; and
- to review the tests for initial and subsequent verification, including the number of consecutive tests weighings.

4 CIML decision stage

CIML Resolution 2018/23 "Proposal for a new project on the revision of OIML R 51 *Automatic catchweighing instruments*" was passed unanimously at the 53rd CIML Meeting which took place between 9–12 October 2018 in Hamburg, Germany. There were no abstentions. The proposed conveners were Mr Morayo Awosola (United Kingdom), and Mr B.N. Dixit (India).

5 TC 9/SC 2/p 10 project meetings

Five meetings were held online, with Zoom support provided by the BIML. The dates and approximate participation are as below:

1st online meeting (18/19 May 2021)
47 participants representing 22 OIML countries, liaisons, and manufacturers

2nd online meeting (20/21 April 2022)
44 participants representing 19 OIML countries, liaisons, and manufacturers

3rd online meeting (23/24 November 2022)
30 participants representing over 17 OIML countries, liaisons, and manufacturers

4th online PG meeting (28/29 June 2023)
26 participants representing over 15 OIML countries, liaisons, and manufacturers

5th online meeting (6 to 9 November 2023)
31 participants representing 19 countries, liaisons, and manufacturers

6 TC 9/SC 2/p 10 main technical discussions and creation of subgroups

6.1 Minimum number of consecutive test weighings used to determine the mean error and the standard deviation of the error

For category X instruments with a load less than or equal to 1 kg, the current R 51:2006 requires 60 test weighings. Note: In R 51, category X applies only to checkweighers used to check prepacked products that are subject to the requirements of OIML R 87. The measurement error is determined for each package, and its mean value and standard deviation computed. These values are then compared against the maximum permissible mean error (MPME) and maximum permissible standard deviation (MPSD), respectively. If neither exceeds these limits, the decision is "pass", or otherwise "fail". This basic principle is independent of instrument parameters such as the verification scale interval or the min/max capacity and can be evaluated and investigated using mathematical/statistical methods.

TC 9/SC 2/p 10 set up a subgroup for this activity under the leadership of a statistics expert to look at various statistical models with the aim of developing a new test method that reduces the average number of test weighings from 60 to 30 without compromising on confidence. Presentations on this model given by the expert at the TC 9/SC 2/p 10 meetings indicated that the model will require no change to the current evaluation procedure, needs only half the resources, and the main risk for consumers and users is that a non-conforming instrument is used for products being released onto the market. It was shown that the risk increase for a reduction from 60 to 30 test weighings compared to the old method is around 0.1 percent points. The main risk for manufacturers is that a conforming instrument must be reworked. The proposed model was published in the April 2023 OIML Bulletin.

The expert also explained that while the model was validated in different ways, some are still ongoing, and there is potential for a research project to conduct such an investigation. The results could be used in the next revision of R 51.

A proposal of the model to be included in the R 51 revision was uploaded to the OIML R 51 workspace and the November 2023 TC 9/SC 2/p 10 meeting agreed to include the proposal in an OIML R 51 annex as an option to the status quo.

6.2 Tests at initial verification, type approval and inspection

TC 9/SC 2/p 10 discussed the OIML R 51 metrological and performance test requirements at initial verification, type approval and inspection. It was decided that a subgroup was needed to provide a list of the tests and requirements specific to initial verification, type approval and inspection for OIML R 51 instruments. The work of the subgroup is still ongoing and will also look at instruments such as wheel loaders and provide answers to open questions regarding the testing of these types of instruments.

6.3 Stable equilibrium requirements for R 51 instruments

Stable equilibrium is defined in R 51-1 as the "condition of the instrument such that the printed or stored weighing values show no more than two adjacent values with one of them being the final weight value". A subgroup for this activity identified that the OIML R 51 requirements for stable equilibrium do not cover all automatic static weighing modes of OIML R 51 instruments, including the Start Stop Mode with a constant fixed dwell time. The subgroup suggested that an additional requirement of "stability criteria" is needed as was previously used in the OIML R 51:1996 edition.

TC 9/SC 2/p 10 agreed to the subgroup's proposal to define "stability criteria" requirements for type examination in the next OIML R 51 Working Draft.

6.4 Physical display: What application/type of indication is useful and required?

TC 9/SC 2/p 10 discussed the requirements for a physical display and it was generally accepted that in principle, every OIML R 51 automatic weighing instrument needs a good and easy-to-read primary indication. An indication is needed for the purpose of setting up the instrument, and for metrological control, so that a measurement result is available during verification, re-verification, or inspection, and during this the software identification, and the contents of the audit trail can be obtained and checked. This is necessary to verify conformity to type.

Some TC 9/SC 2/p 10 members agreed that it is not necessary to display the measurement result during normal operation of checkweighers, weight labellers and weight price labellers, as the weight value is marked on the package for checkweighers, weight labellers and weight price labellers. They also believe that the indication can be displayed or printed, with the possibility for the measurement result to additionally be provided in alternative forms, such as touching, provided they are not confusing or misleading.

The work of the subgroup established to investigate the requirements for display and indication of measurement results is still ongoing, with the aim of ensuring that a new definition of display types will not add additional requirements or add exceptions to the requirements.

6.5 Sorting devices

Some TC 9/SC 2/p 10 members believed that the sorting device defined in R 51 is interpreted differently by manufacturers and by some approval authorities. Some interpret the "sorting device" as a logical function (allocation) into sub-groups and the result of which can be, for example, a count value or a signal output, and others, including approval authorities from the European Union, interpret the "sorting device" as a mandatory physical sorting device, an integral part of the checkweigher, which must operate fully automatically and which is the responsibility of the manufacturer of the weighing instrument. This obliges the manufacturer to assess the sorting device on the production line, especially when placing the checkweigher on the market. Potential legal disputes can arise when a sorting device not manufactured or approved by the manufacturer of the weighing instrument is used by the user of the weighing instrument.

It is the view of some TC 9/SC 2/p 10 members that test requirements for a physical sorting device should be specified in R 51 to ensure that:

a) only the logical function, but not the physical sorting, is tested during the type approval test;
b) in the type approval no restriction is made on the type of physical sorting device, in order to give the weighing instrument manufacturer as much flexibility as possible;
c) when an automatic weighing instrument is put into use (moment of initial verification) it needs a (physical) sorting device, but it may use (or share) already existing physical sorting devices of other equipment; and
d) during initial verification, subsequent verification (periodic or after repair) and in-service inspection the sorting device shall be formally checked for its presence, suitability for the intended purpose (for the type of package to be sorted), and correct function in the installation environment.

A subgroup was set up to investigate whether physical sorting devices of checkweighers are mandatory and/or an integral part of the instrument. The subgroup submitted a report which proposed modifications to R 51 to include new definitions and requirements for the sorting facility, sorting function, and sorting device. It was recommended that a future revision of R 51 should consider the questions raised such as whether the sorting device is:

a) an integral part of the automatic checkweigher;
b) a logical function (e.g. counter value, signal output); or
c) a physical separation of the produced prepackages.

6.6 Software

A software subgroup was set up to examine the software requirements and evaluation in OIML R 51. The subgroup work is still ongoing and had met several times and reviewed various software publications such as the VIML *International vocabulary of terms in legal metrology*, VIM *International Vocabulary of Metrology*, WELMEC Guide 7.2 *Software Guide Version 2022*, and OIML D 31 *General requirements for software-controlled measuring instruments*. The subgroup held discussions on:

- analysis of the documentation and evaluation of the design (subject to legal control);
- verification by functional testing of the software and metrological functions;
- protection of software by an audit trail of any intervention;
- whether any changes to the legally relevant software automatically prevent operation, or an alarm, or error record is generated;
- remote verification during the in-service inspection, checking for type conformity using the software identification and the software seal for evidence of an intervention;
- web-based applications where it may not be possible or practical to carry out an on-site check; and
- AI (Artificial intelligence) possibilities for problem solving, data analysis, etc.

7 Future TC 9/SC 2/p 10 activities

1) Some TC 9/SC 2/p 10 subgroups will continue their work and report to the convener(s) when available.
2) A sixth meeting of TC 9/SC 2/p 10 is scheduled for April/May 2024.
3) A sixth Working Draft of OIML R 51 Parts 1 and 2 will be circulated once TC 9/SC 2/p 10 has had the opportunity to discuss and unanimously accept the subgroup reports, and once all the fifth Working Draft comments have been unanimously resolved. ■

LIAISON ACTIVITIES

IAF-ILAC Annual Meetings

Montreal, Canada
6-15 November 2023

PAUL DIXON, BIML Assistant Director

Mr Paul Dixon, BIML Assistant Director, represented the OIML at the IAF-ILAC Annual Meetings held in Montreal, Canada. He participated in a number of technical meetings, including the ILAC Accreditation Committee (AIC), the AIC Metrology Working Group, and the ILAC Inspection Committee (IC) meetings. Mr Dixon gave presentations at both of the AIC and the IC meetings, providing members of those committees with an update on OIML activities.

In addition, Mr Dixon attended the IAF Technical Committee meeting and the IAF MLA Committee meeting. Attending these meetings provided an excellent opportunity to discuss with relevant IAF colleagues the OIML application for a scope extension of the IAF MLA to include the OIML-CS.

Accreditation plays an important role in the operation of the OIML Certification System (OIML-CS) where it is used by OIML Issuing Authorities and Test Laboratories to demonstrate compliance with the relevant international standards. Mr Dixon has worked closely with both organisations to ensure that the accreditation requirements of the OIML-CS are fulfilled, notably through the development and publication of Joint Assessment Procedures to support accreditation assessments under the OIML-CS, and the identification of experts to participate in accreditation and peer assessments.

Participating in the meetings provided an excellent opportunity to progress the renewal of the IAF-ILAC-OIML MoU, and to discuss with IAF and ILAC colleagues future Work Programmes and accreditation issues associated with the OIML-CS. ■

IC meeting - Mr Paul Dixon


AIC meeting


IC meeting

LIAISON ACTIVITIES

IECEx Management Committee Meeting

Edinburgh, United Kingdom
21-22 September 2023

PAUL DIXON, BIML Assistant Director

Mr Paul Dixon, BIML Assistant Director, represented the OIML at the IECEx Management Committee meeting held in Edinburgh, United Kingdom. He gave a presentation at the meeting to provide an update on OIML activities, notably those associated with the OIML Certification System (OIML-CS).

The OIML has a long-standing relationship with the IEC and the MoU between the two organisations was recently renewed (see article on page [xx]). A Joint OIML-IECEx Working Group (JWG) was established to explore synergies and areas where the two organisations may be able to cooperate with the aim of making use of existing systems and practices in order to reduce cost and time to market for manufacturers of Ex equipment covered by both IECEx and OIML-CS schemes.

In support of the renewed MoU the IECEx Management Committee agreed that the JWG should be reactivated. This was supported by the CIML at the recent CIML meeting, where the CIML also agreed that Dr Bobjoseph Mathew will replace Dr Roman Schwartz as one of the OIML representatives on the JWG.

Mr Dixon will work with Mr Chris Agius, IECEx Executive Secretary to progress the activities of the JWG, and to ensure the continued excellent cooperation between the two organisations. ■

L to R: Mr Mark Amos (Business Manager, IECEx Secretariat) and Mr Paul Meanwell (IECEx Chair)

MOU

2023 Renewal of the OIML-IEC MoU

BIML

On 14 November 2023 at the International Electrotechnical Commission (IEC) Secretariat in Geneva, Switzerland, a renewed MoU between the IEC and the OIML was signed by Mr Philippe Metzger (General Secretary and CEO of the IEC) and Dr Bobjoseph Mathew (CIML President).

The renewed MoU supersedes the MoU signed in October 2018 and it is intended to build on and enhance the long-standing relationships and excellent cooperation between the IEC and the OIML by aligning the MoU with the latest standards development and conformity assessment activities of both organisations.

The MoU contains a number of Articles aimed at improving cooperation between the two organisations:

- each organisation will extend a standing invitation to the other to attend and report to their respective annual meetings;
- the two organisations may agree to explore opportunities to jointly develop and/or operate conformity assessment system(s), and that in this respect the two organisations shall endeavour to find and initiate situations for cooperation, such as pilot projects;
- recognition of the intellectual property (IP) generated by both organisations, and the use and acknowledgement of each organisation's IP; and
- the Liaison Officers of each organisation shall be responsible for drawing up a joint work programme.

The OIML looks forward to continuing the excellent cooperation with the IEC, and to building on existing initiatives such as the creation of a Joint IECEx-OIML Working Group which is aimed at making use of existing systems and practices in order to reduce cost and time to market for manufacturers of Ex equipment covered by both IECEx and OIML Certification System schemes. ■

Signing of the renewed MoU in Geneva on 14 November 2023

Left: Dr Bobjoseph Mathew (CIML President)
Right: Mr Philippe Metzger (General Secretary and CEO of the IEC)

LIAISON ACTIVITIES

Expert Group Meetings on Global Quality Tools

14 – 17 November 2023

UNIDO Headquarters, Vienna (Austria)

IAN DUNMILL, BIML Assistant Director

Context

Between 14–17 November 2023, the United Nations Industrial Development Organization (UNIDO) organised a series of Expert Group Meetings (EGMs) to discuss and validate its global tools on quality infrastructure for sustainable development (particularly the QI4SD Index) and digital maturity for national standardisation. Prior to the EGMs discussing the specifics of the two subjects, UNIDO gathered a group of technical experts to discuss the more general contribution of Quality Infrastructure to Sustainable Development. The discussion centred on the following questions:

- *The future of industry and trade must be sustainable*. How can quality and standards contribute to foster sustainable and responsible business practices, incorporating human rights and environmental considerations in companies' operations?
- *Climate change remains the most urgent challenge for humanity*. What role can quality infrastructure play to support climate action? How can QI actively contribute to climate resilience and what is needed to foster that role in the future?
- *Industry is a major source of greenhouse gas (GHG) emissions, but at the same time can provide environmentally friendly business solutions*. What role can quality and standards play in supporting industry to both adapt to and help mitigate climate change? How can they contribute to fostering the role of industry as it seeks innovative solutions?

EGM on the Quality Infrastructure for Sustainable Development Index

Background

The Quality Infrastructure for Sustainable Development (QI4SD) Index aims to provide a framework of indicators that summarises the overall state of development of a country's and/or region's Quality Infrastructure (QI) and its readiness to support the Sustainable Development Goals (SDGs). The QI4SD Index analyses QI in five dimensions – standardisation, metrology, accreditation, conformity assessment and policy – and maps out indicators for each. It then links these indicators to the three pillars of sustainable development, namely people, prosperity, and planet (the three Ps).

The data for the indicators was provided from INetQI members' official information, and from a joint ISO-UNIDO survey in the case of the policy indicator, considering the period from February to June 2022. The Index allows for a rapid assessment of the QI system in a country and/or region by means of a score. The first edition of the Index was launched in June 2022. Following feedback received from international and national QI experts after the Index's launch, and the interest in updating the Index on a regular basis (perhaps every two years), there is a need to review the methodology used, explore areas for improvement, and following this, initiate a new phase of data collection (from February to June 2024) in order to be able to launch the second edition of the Index by November 2024.

Objectives of the Expert Group Meeting (EGM)

The EGM had four main objectives:

1 To provide an overview of the methodology of the QI4SD Index. This will ensure an understanding of the method of data collection, the calculations and mathematics behind the indicators (the indicators for each QI dimension, and for each of the three Ps), the rationale behind the selection of the indicators, and the relevance of the indicators.

2 To obtain feedback on the methodology, data selection and data gathering to enhance the Index robustness and inform the design of its second edition. This discussion included maintenance of the current indicators, and the identification of new ones if applicable.

3 To share experiences of the QI4SD Index workshop conducted in Saudi Arabia.

4 To present the QI4SD Index Africa Report as a tool for strategy development, whilst highlighting the value and the use of the Index.

The outputs of the EGM were as follows:

- Expert feedback was obtained on the QI4SD Index Methodology, which validated its approach, but which also identified a number of minor areas for improvement which could be incorporated into the next edition of the Index.
- Some areas for improvement and fine-tuning of the QI4SD Index were identified. These areas include data collection, methodology, a redefinition of some indicators, and the inclusion of QI dimensions not adequately addressed in the first iteration of the Index, such as market surveillance.
- The EGM importantly enabled broader UNIDO engagement with INetQI and Member States' technical counterparts.
- The EGM also encouraged broader dissemination and recognition of the value of the QI4SD index by UNIDO, INetQI, and Member States.

The EGM was attended by participants from the INetQI organisations who were involved in bilateral meetings and discussions during the development of the first iteration of the QI4SD Index:

- International Organization for Standardisation (ISO)
- International Electrotechnical Commission (IEC)
- International Telecommunications Union (ITU)
- International Bureau of Weights and Measures (BIPM)
- International Organization of Legal Metrology (OIML)
- International Accreditation Forum (IAF)
- United Nations Economic Commission for Europe (UNECE)
- The International Certification Network (IQNet)

EGM on Digital Transformation of National Standards Bodies (NSBs)

Background

Digital Transformation is described as a process that leverages digital technologies to foster organisational changes in areas such as strategy, business models, processes, leadership, and culture, all with the goal of adding value to society. On the other hand, digitisation is primarily about using technology to enhance efficiency, reduce costs, and optimise operations within an organisation. UNIDO is conscious of the relevance of standardisation as one of the pillars of quality infrastructure, and developed a methodology for undertaking a Digital Maturity Assessment, as a more precise and secure first stage of the digital transformation journey for national standards bodies.

Objectives of the Expert Group Meeting (EGM)

The EGM had three main objectives:

1 Presentation of the UNIDO methodology on the Digital Transformation of NSBs and its application in different countries, followed by presentations of the different approaches to digitalisation.

2 Validation of the underlying methodology.

3 Identification of recommendations and feedback for its improvement.

The outputs of the EGM were as follows:

- Expert feedback was obtained on the NSB digital transformation methodology, with clear areas for improvement and potential expansion to include other quality infrastructure (QI) institutions and services (metrology, accreditation, conformity assessment etc.).
- The common methodology was validated.
- The implementation of the practical results achieved by more mature projects was explained and discussed.

A key follow-up action following the EGM will be the development of a document outline setting out the entire methodology, together with the process and steps towards developing a roadmap for the digitalisation of NSBs. ■

OIML Certification System (OIML-CS)

Introduction

The OIML-CS is a system for issuing, registering and using OIML Certificates and their associated OIML type evaluation reports for types of measuring instruments (including families of measuring instruments, modules, or families of modules), based on the requirements of OIML Recommendations.

The OIML-CS comprises two Schemes: Scheme A and Scheme B. Competence of the OIML Issuing Authorities and their Test Laboratories is demonstrated through self-declaration under Scheme B and accreditation or peer assessment under Scheme A.

The aim of the OIML-CS is to facilitate, accelerate and harmonize the work of national and regional bodies that are responsible for type evaluation and approval of measuring instruments subject to legal metrological control. In the same way, instrument manufacturers, who are required to obtain type approval in some countries in which they wish to sell their products, should benefit from the OIML-CS as it will provide evidence that their instrument type complies with the requirements of the relevant OIML Recommendation(s).

It is a voluntary system and OIML Member States and Corresponding Members are free to participate. Participating in the OIML-CS commits, in principle, the signatories to abide by the rules of the OIML-CS that are established in OIML B 18:2022 *Framework for the OIML Certification System (OIML-CS)*. Signatories voluntarily accept and utilize OIML type evaluation and test reports, when associated with an OIML Certificate issued by an OIML Issuing Authority, for type approval or recognition in their national or regional metrological controls.

The OIML-CS was launched on 1 January 2018 and has replaced the former OIML Basic Certificate System and the OIML Mutual Acceptance Arrangement (MAA).

OIML certificates

OIML certificates issued under Scheme A and Scheme B can be downloaded from the database on the OIML website at https://www.oiml.org/en/oiml-cs/certificat_view.

The database also includes certificates issued under the former OIML Basic Certificate System and the MAA. Although these two systems are no longer in operation, the certificates remain valid.

OIML Issuing Authorities, Utilizers and Associates

A summary of the approved OIML Issuing Authorities is published on the next page, followed by a summary of those Utilizers and Associates that have declared that they will accept OIML certificates and/or OIML type evaluation reports as the basis for a national or regional approval.

OIML-CS scope

OIML R 111:2004 *Weights of classes* E_1, E_2, F_1, F_2, M_1, M_{1-2}, M_2, M_{2-3} *and* M_3 is now included in the scope of the OIML-CS in Scheme B, with a transition to Scheme A after two years.

Upcoming OIML-CS events

The Ninth OIML-CS Management Committee Meeting will be held in New Delhi, India on 6–7 March 2024. Meetings of the Review Committee, Maintenance Group, and various Working Groups will also be held on the preceding day.

More information

For enquiries regarding the OIML-CS, please contact the OIML-CS Executive Secretary Mr Paul Dixon (executive.secretary@oiml.org). Visit the OIML website:

https://www.oiml.org/en/oiml-cs

OIML Certification System (OIML-CS)

List of OIML Issuing Authorities and their scopes

Updated: 2023-11-22

The list of OIML Issuing Authorities is published in each issue of the OIML Bulletin and can be downloaded at www.oiml.org/oiml-cs/oiml-issuing-authorities

		R 21:2007	R 35:2007	R 46:2012	R 49:2006	R 49:2013	R 50:2014	R 51:2006	R 60:2000	R 60:2017	R 60:2021	R 61:2004	R 61:2017	R 75:2002	R 76:1992	R 76:2006	R 85:2008	R 99:2008	R 106:2011	R 107:2007	R 117:1995	R 117:2007	R 117:2019	R 126:1998	R 126:2021	R 129:2000	R 134:2006	R 137:2012	R 139:2014	R 139:2018
AU1	National Measurement Institute Australia (NMIA)						■								■	■														
CH1	Federal Institute of Metrology (METAS)								■							■			■								■			
CN2	National Institute of Metrology, China (NIM)							■	■	■		■	■		■	■														
CZ1	Czech Metrology Institute (CMI)					■		■					■			■	■					■	■				■	■		■
DE1	Physikalisch-Technische Bundesanstalt (PTB)					■		■	■	■	■	■	■	■		■														
DK2	FORCE Certification A/S					■	■	■	■	■		■	■			■			■	■						■	■	■	■	■
FR2	Laboratoire National de Métrologie et d'Essais (LNE)				■	■		■	■	■						■								■	■					
GB1	Office for Product Safety and Standards (OPSS) (formerly NMO)					■		■	■	■					■	■						■	■							
IN1	Legal Metrology Division, Department of Consumer Affairs (LMD, DoCA)		■		■	■									■	■					■	■	■							
JP1	NMIJ/AIST								■	■	■				■	■					■	■	■							
NL1	NMi Certin B.V.	■		■	■	■	■	■	■	■		■	■		■	■	■	■	■	■	■	■	■		■	■	■	■	■	■
SE1	Research Institutes of Sweden (RISE)							■	■	■		■	■			■	■				■	■	■							
SK1	Slovak Legal Metrology (SLM)				■	■										■														

OIML Certification System (OIML-CS)

List of Utilizers, Associates and their scopes

Updated: 2023-11-22

The list of Utilizer and Associate scopes is published in each issue of the OIML Bulletin and can be downloaded at www.oiml.org/oiml-cs/utilizers-and-associates

1 = Scheme A only **5 = Scheme B only**
2 = Scheme A and MAA
3 = Scheme A and B
4 = Scheme A, B and MAA

		R 21:2007	R 35:2007	R 46:2012	R 49:2006	R 49:2013	R 50:2014	R 51:2006	R 58:1998	R 59:2016	R 60:2000	R 60:2017	R 60:2021	R 61:2004	R 61:2017	R 75:2002	R 76:1992	R 76:2006	R 81:1998	R 85:2008	R 88:1998	R 93:1999	R 99:2008	R 102:1992	R 104:1993
AE	Ministry of Industry and Advanced Technology (MoIAT)	1	1	1	1	1	1	1	1		1	1	1			1	1	1					1		
AU	National Measurement Institute, Australia (NMIA)				1	1	1				1	1						1							
BE	Federal Public Service Economy	3		3		3	3	3			1			3		3		1		3			3		
CA	Measurement Canada										2	1				1		2							
CH	Federal Institute of Metrology (METAS)			1	2	2	1	1			2			1		1		2							
CN	State Administration for Market Regulation (SAMR)							1			2	1		1	1		2	2							
CO	Superintendencia de Industria y Comercio (SIC)	3		3	4	4	3	3			2			3		3	2	2		3			3		
CU	Oficina Nacional de Normalizacion (NC)	3	3	1		1	3	1	3	3	1	1		3	3	3		1	3	3	3	3	3	3	3
CZ	Czech Metrology Institute (CMI)					1		1							1			1		1					
DE	Physikalisch-Technische Bundesanstalt (PTB)	3	3	3	3	4	3	3			2	1	1	3	3	3		2					3		
DK	FORCE Certification A/S				2	2	1	1			2	1		1	1			2							
FR	Laboratoire National de Métrologie et d'Essais (LNE)	1		1	1	1	1	1			1		1	1		1	1	1		1			1		
GB	Office for Product Safety and Standards (OPSS) (formerly NMO)	3				4	3	3			2	1		3			1	1		3					
IN	Legal Metrology Division, Department of Consumer Affairs	3		3		4	3	3			2			3		3		2		3					
IR	Iran National Standards Organization (INSO)				4	4					2	1					2	2							
IT	Tifernogas																								
JP	NMIJ/AIST										2	1	1				2	2							
KE	Weights and Measures Department		3	3	4	4		3			4	4		3	3		4	4		3					
KH	National Metrology Centre (NMC)	3		3	3	3	3	3			1			3		3	1	1		3			3		
KI	Ministry of Commerce, Industry and Cooperatives	5	5	5	1	1	5	1		5	1	1		5	5	5	1	1	5	5					
KR	Korea Testing Certification (KTC)																2	2							
LV	LNMC Ltd. Metrology Bureau																								
NA	Namibian Standards Institution			3	4	4	3	3			2			3			2	2		3					
NL	NMi Certin B.V.	3		3	3	4	3	3			2	1		3	3	3	1	2		3			3		
NZ	Trading Standards (Ministry of Business, Innovation and Employment) (MBIE)				4	4	3	3			2						2	2		3					
PH	National Metrology Laboratory	3	3	3		3				3								3		3			3		
RU	VNIIMS																								
RW	Rwanda Standards Board	3	3	3	3	3		3	3	3	1	1		3	3		1	1					3	3	3
SA	SASO (Saudi Standards, Metrology and Quality Organization)			3		1						1						1							
SE	RISE Research Institutes of Sweden AB							3			2	1		3				2		3					
SK	Slovak Legal Metrology (SLM)				2	2												2							
TN	National Agency of Metrology (ANM)	3		3	2	2	3	3			2			3				2		3			3		
UG	Uganda National Bureau of Standards (UNBS)			3	1	3					1	1					1	1							
US	National Conference on Weights and Measures (NCWM)										2														
ZA	NRCS: Legal Metrology				3	3		3			1						1	1		3					
ZM	Zambia Metrology Agency	3	3	3	3	3	3	3	3				3		3			3		3					

OIML Certification System (OIML-CS)

List of Utilizers, Associates and their scopes (Cont'd)

Updated: 2023-11-22

The list of Utilizer and Associate scopes is published in each issue of the OIML Bulletin and can be downloaded at www.oiml.org/oiml-cs/utilizers-and-associates

1 = Scheme A only **5 = Scheme B only**
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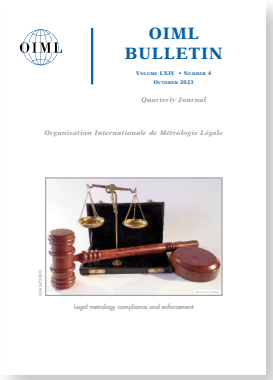
		R 106:2011	R 107:2007	R 110:1994	R 117:1995	R 117:2007	R 117:2019	R 122:1996	R 126:1998	R 126:2021	R 128:2000	R 129:2000	R 129:2020	R 133:2002	R 134:2006	R 136:2004	R 137:2012	R 139:2014	R 139:2018	R 143:2009	R 144:2013	R 145:2015	R 146:2016	R 148:2020	R 149:2020	R 150:2020
AE	Ministry of Industry and Advanced Technology (MoIAT)	1	1		1	1	1							1	1		1			1	1			1	1	1
AU	National Measurement Institute, Australia (NMIA)																									
BE	Federal Public Service Economy	3	3			3						3					3	3								
CA	Measurement Canada																									
CH	Federal Institute of Metrology (METAS)	1	1						1			1			1		1									
CN	State Administration for Market Regulation (SAMR)																									
CO	Superintendencia de Industria y Comercio (SIC)	3	3		3	3			3			3			3		3	3								
CU	Oficina Nacional de Normalizacion (NC)	3	3	3		3		3	3		3	3		3	3	3	3	3	3	3	3	3	3			
CZ	Czech Metrology Institute (CMI)					1	1								1		1		1							
DE	Physikalisch-Technische Bundesanstalt (PTB)	3	3			3	3					3	3			3	3									
DK	FORCE Certification A/S	1	1			1	1					1	1		3		1	1	1							
FR	Laboratoire National de Métrologie et d'Essais (LNE)	1	1			1			1	1		1			1		1	1								
GB	Office for Product Safety and Standards (OPSS) (formerly NMO)	3	3		3	3	3					3			3											
IN	Legal Metrology Division, Department of Consumer Affairs	1	3			3						3			1		3	3								
IR	Iran National Standards Organization (INSO)																									
IT	Tifernogas																1									
JP	NMIJ/AIST				1	1	1																			
KE	Weights and Measures Department	3			3	3			3						3	3	3	3	3							
KH	National Metrology Centre (NMC)	3	3		3	3			3			3			3		3	3								
KI	Ministry of Commerce, Industry and Cooperatives	5		5	1	1								5	5		5	5	5							
KR	Korea Testing Certification (KTC)																									
LV	LNMC Ltd. Metrology Bureau								3						3											
NA	Namibian Standards Institution	3	3		3	3			3			3			3											
NL	NMi Certin B.V.	3	3		3	3	1		3	1		3			3		3	3	3							
NZ	Trading Standards (Ministry of Business, Innovation and Employment) (MBIE)	3	3		3	3						3			3											
PH	National Metrology Laboratory	3					3			3					3									3	3	
RU	VNIIMS				3	3																				
RW	Rwanda Standards Board	3		3	3	3		3	3			3		3	3		3			3	3		3			
SA	SASO (Saudi Standards, Metrology and Quality Organization)					3																				
SE	RISE Research Institutes of Sweden AB				3	3																				
SK	Slovak Legal Metrology (SLM)																									
TN	National Agency of Metrology (ANM)	3	3		3	3			3			3			3		3	3								
UG	Uganda National Bureau of Standards				1	1	1								3		3									
US	National Conference on Weights and Measures (NCWM)																									
ZA	NRCS: Legal Metrology	3	3		3	3			3			3			3		3	3								
ZM	Zambia Metrology Agency	3	3				3			3			3	3	3		3		3					3	3	3

Promotion of the OIML Bulletin: Become a Mentor



The OIML Bulletin is one, if not the only, international publication dedicated to legal metrology topics.

In accordance with CIML Resolutions 2019/30 and 2020/21, there is a clear desire amongst OIML Members for the Bulletin to continue to be an attractive publication for legal metrology worldwide, and for it to be an excellent advertisement for our Organisation.

This has been achieved through long-term planning of the future editions and identification of key topics of high interest, for instance, legal control of measuring instruments in the fields of energy, health and the environment, where important aspects such as new technology, legal requirements, or test/verification procedures will be addressed.

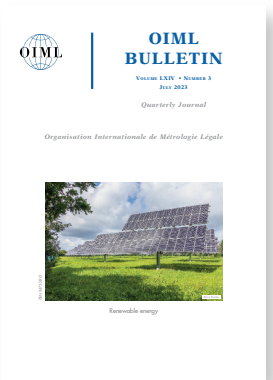
In addition, support has been sought from CIML Members and Corresponding Member Representatives who have taken on the responsibility of acting as "Mentors" for future editions, certain key topics, or specific technical articles. The role of "Mentors" is to support the Editor of the Bulletin by coordinating the development of articles for a key topic through the identification of authors / experts. It is not necessarily expected that articles are written by the "Mentors" themselves, but by experts that a "Mentor" has identified and contacted.

In order to identify key topics of significant interest for future editions and "Mentors" to lead them, the BIML prepares, and makes available on the OIML website (www.oiml.org/en/publications/bulletin/future-editions), a plan for the upcoming four to six editions of the Bulletin.

The table on the following page is intended to be "dynamic", i.e. proposed key topics may be moved to other editions depending on available "Mentors" and authors for technical articles.

All CIML Members and Corresponding Member Representatives are encouraged to support the OIML Bulletin, to share their legal metrology experiences with the legal metrology community worldwide, and to take responsibility either as a "Mentor" for one of the next editions of the Bulletin, or by promoting it at TC/SC/Project Group meetings, RLMO meetings, CEEMS AG meetings, and other opportunities.

CIML Members and Corresponding Member Representatives who would like to be a "Mentor" for a specific edition / key topic, or who would like to suggest that a new key topic be added to the list, are asked to contact the BIML (chris.pulham@oiml.org).



Edition	General key topic	Mentor	Proposed article submissions
January 2024	58th CIML Meeting, OIML Seminar *The future of the OIML in the digital era*, and the NEXT initiative	BIML	▪ Meetings reports, speeches, key points, future direction
April 2024	International and Regional Legal Metrology Systems	To be identified	▪ Update on the targeted amendment of the European MID ▪ European, American and Asia-Pacific approaches to metrology systems ▪ OIML D 1 and its relevance to national legal metrology legislation; OIML-BIPM joint D 1 project
July 2024	Sustainability	Dr Bobjoseph Mathew, CIML President	▪ Legal metrology and sustainability, World Metrology Day 2024
October 2024	Volumetric measurement	Mr Wim Volmer, Authority for Digital Infrastructure (RDI), Netherlands	
January 2025	59th CIML Meeting and OIML Seminar	BIML	▪ Meetings reports, speeches, key points, future direction
	Weighing	To be identified	▪ NAWIs, belt weighers, weighbridges, automatic weighing instruments, etc. ▪ Revisions of Recommendations, e.g. R 51, R 76, etc. Contributions from CECIP / Specific problems encountered by CEEMS
	Intellectual property		▪ Role of patents in legal metrology

2023-11-28

info

The OIML is pleased to welcome the following new

Member State

Montenegro
(Previously an OIML Corresponding Member)

OIML meeting

6-7 March 2024
Ninth OIML-CS Management Committee meeting
New Delhi, India

CIML Members

- **Brazil:** Mr Antonio Lourenço Pancieri
- **Colombia:** Mr Pedro Perez
- **Republic of Korea:** Dr Yonghyun Lee
- **P.R. China:** Mr Liu Hongbin
- **Italy:** Sig. Gianfrancesco Romeo
- **South Africa:** Mr Trevor Tshepo Modiba

Committee Drafts

Received by the BIML, 2023.08 – 2023.11

Revision of OIML R 142:2008: Automated refractometers - Parts 1 and 2	2 CD	TC 17/SC 2/p 4	IR	2023-09-18
Revision of OIML R 91:1990: Radar equipment for the measurement of the speed of vehicles	2 CD	TC 7/SC 4/p 3	SI + CH	2023-11-14

In memory of Prof. Pavel Neyezhmakov (1961–2023)

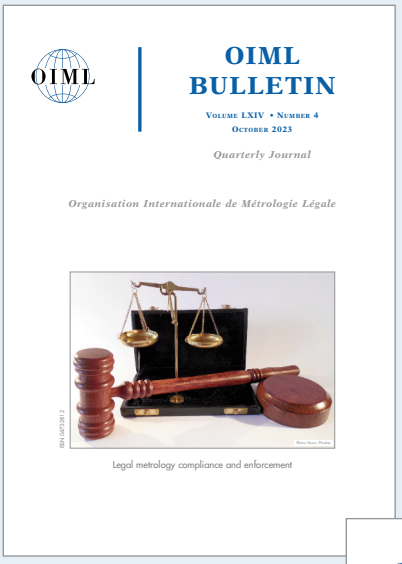
The BIML regrets to inform you of the sad passing on 16 October 2023 of Prof. Pavel Neyezhmakov, General Director of the NSC "Institute of Metrology" (Kharkiv, Ukraine), member of the International Committee of Weights and Measures (CIPM), Doctor of Technical Sciences, and Professor.

Prof. Neyezhmakov devoted forty years of his life to working at the NSC, where he earned much esteem due to his high level of professionalism, purposefulness, fairness and leadership qualities.

He was a highly qualified specialist who imparted his knowledge and skills in his work, helping his colleagues to make progress by sharing his extensive professional experience with them.

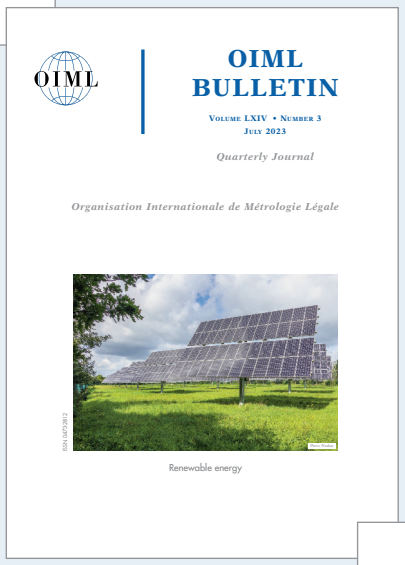
Prof. Neyezhmakov managed to successfully combine his fruitful scientific work with educational and international activities, for which he received the highest recognition at the international level.

The memory of Prof. Neyezhmakov will remain forever in the hearts of his colleagues and friends, and the OIML extends our sincerest condolences to his family, friends and colleagues.



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.

Technical articles 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:

The Editor, OIML Bulletin
BIML, 11 Rue Turgot, F-75009 Paris, France
(chris.pulham@oiml.org)