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Editorial

Stephen Patoray
Director, BIML

Budgetary considerations

This fourth and last edition for 2012 of the OIML Bulletin is somewhat of a landmark; read on to discover why.

At the time of writing this Editorial the BIML staff have just returned from Bucharest, Romania, where the 47th CIML Meeting and 14th OIML Conference took place in the week of 1–5 October. The meetings were extremely successful, and many strategic Resolutions (www.oiml.org/download) were passed which will guide the Organization in its activities over the next four-year budgetary period.

Due to the cost-cutting actions and tight financial management measures that were implemented over the past two years, we are pleased to report that the financial situation of the OIML is very healthy. The 2013–2016 OIML Budget was approved and adopted by the 47th CIML and 14th Conference; this will result in a net reduction in Member States' contributions to the OIML.

Member States and Corresponding Members currently receive the Bulletin as part of their Membership, but manufacturers, libraries and other institutions pay a small subscription which has remained unchanged for decades. Based on the decision taken some years ago to render OIML Publications free of charge and the success this decision met with, the decision was taken in Bucharest as part of the 2013–2016 budget to also render the Bulletin free of charge.

The Bulletin has been available in electronic format since 1999. From the January 2013 edition onwards, the electronic version of the OIML Bulletin will be free of charge to all without any password. However, only the Institutions of OIML Members will continue to receive hard copies. We hope you understand the cost-benefit reasoning behind this decision, our aim being to allow everyone to continue to receive the Bulletin.

We also take this opportunity to renew our call for papers for the Bulletin – any articles on legal metrology-related subjects are always welcome, so do not hesitate to contact the Editor to submit articles you feel are suitable for publishing.

We hope you enjoy this edition of the Bulletin. ■

GAS METERS

A comparison among the new residential smart static gas meters

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MARCO VACCHINA, Italgas, Turin, Italy

Abstract

This paper presents a comprehensive survey of the new emerging smart static gas measurement technologies that are available on the market today. New generations of thermal mass gas meters and ultrasonic gas meters for residential applications have been studied and calibrated, by means of a traceable and accredited metrological laboratory. The main results of an experimental intercomparison among three different static gas meters are illustrated.

1 Gas metering technologies

Gas meters for residential applications can be divided into two groups:

- *conventional meters*: historically, the oldest measurement technology is the volumetric one; volumetric meters, also called *Positive Displacement meters* (PD-meters), measure by internally passing isolated volumes of gas that successively fill and empty compartments with a fixed quantity of gas. For the residential and commercial sectors, the predominant meter is the so-called *diaphragm gas meter*.
- *innovative meters*: these are based on non-traditional measurement techniques, possibly fully electronic meters (also called *smart meters*) and operating with a static metering principle (with no moving mechanical parts). In the last 10–15 years, the smart static gas meters for residential applications available on the market can be classified into two main measurement technologies: the thermal mass flowmeters and the ultrasonic flowmeters.

Recently, in addition to their main metrological purpose, gas meters for residential applications should have additional functionalities (suitable for so-called *added value services*):

- suitable for remote reading (AMR) of the meter (i.e. equipped with an electronic module for communication),
- suitable for the thermo-compensation of the volumetric gas measurement (i.e. equipped with a temperature sensor for the compensation of the volumetric measurement);
- suitable for safety purposes (i.e. equipped with a shutoff valve for interrupting the gas flow in case of emergency).

Diaphragm gas meters have been used in residential applications for more than 150 years. Today, new emerging (static) gas metering technologies are available and these innovative, smart gas meters (thermal and ultrasonic technologies) open up a *new age* for residential/commercial gas metering, matching metrological reliability with remote meter reading and safety functionalities.

2 Thermal mass flowmeters

Thermal mass flowmeters have been successfully employed for gas flow detection since the 1990's. R&D carried out in recent years in thermal mass-flow sensor technology has made possible the production of on-chip sensors with good performances for applications in natural gas.

The new generation micro-thermal mass flow sensors (such as CMOS: Complementary Metal-Oxide Semiconductor, or MEMS: micro-thermal calorimeters) are based on the cooling of a heated object (micro heater) placed in the flow. The measurement arrangement is composed of three basic elements: two temperature sensors and a central micro heater; both the temperature sensors and the micro heater are controlled by a suitable electronic module.

In order to reduce the power consumption of the micro heater and to achieve a large measurement range, the thermal mass flowmeter for residential gas application utilizes a special design type called *"bypass capillary"*. A bypass capillary type mass flowmeter is composed of four main elements (see Figure 1):

- a bypass circuit,
- a flow sensor mounted in the bypass circuit, in which the basic elements of Figure 2 are miniaturized, thus realizing a measurement "chip",
- an electronic circuit (microcontroller),
- a pressure dropper (laminar element), placed in the main pipe.

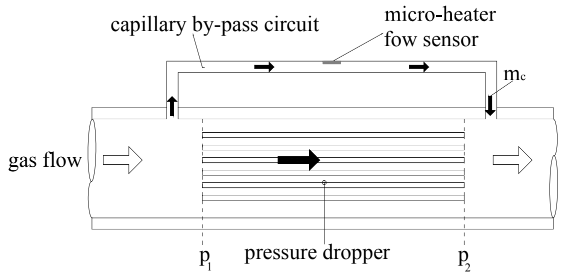

Figure 1 Basic elements of a by-pass capillary thermal mass flowmeter

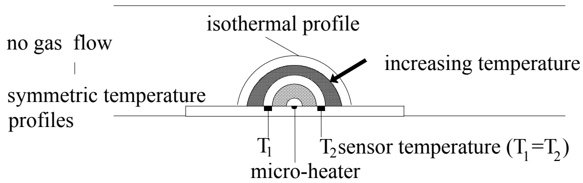

Figure 2a Temperature profiles in a by-pass capillary thermal mass flowmeter, without flow

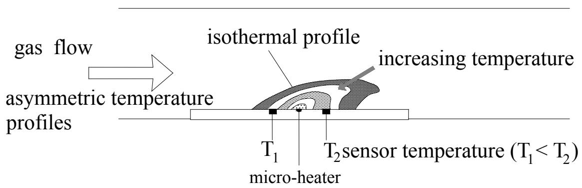

Figure 2b Temperature profiles in a by-pass capillary thermal mass flowmeter, with flow

Gas enters the meter and is divided into two flow paths; in both the laminar flow regime is ensured: in the bypass capillary tube the laminar flow regime is ensured by the very small diameter of the capillary, and in the main tube by the pressure dropper/laminar flow element. Most of the flow goes through the main pipe with pressure dropper: the pressure drop ($p_1 - p_2$) forces a small fraction of flow through the bypass capillary tube.

At the maximum flowrate, the pressure dropper placed in the main gas flow generates a pressure drop typically < 2 mbar. Less than 1 % (a very small amount) of the gas stream, i.e. the mass flow rate in the capillary circuit m_c, is thereby forced to flow through the bypass capillary tube and over the sensor.

In the micro-thermal mass flow sensor, the temperature difference between two temperature sensors placed symmetrically upstream and downstream of the micro heater (see Figure 2) detects the passage of gas flow. If no gas is flowing over the sensor, the two thermo-elements measure the same rise in temperature (see Figure 2a); if gas stream flows through the micro heater the temperature symmetry is disturbed, and the asymmetry can be expressed as a temperature difference between the two temperature sensors (see Figure 2b). This temperature difference signal, which exists in the form of a voltage difference (thermopile), is processed in the analogue part of the sensor chip and then digitalized in the digital part. This measurement signal (voltage difference) is proportional to the mass flowrate of the gas flowed over the sensor-chip.

Basically, the micro-thermal mass flow sensor uses the thermal properties of the gas to directly measure the mass flowrate (considering the electric power supply, Q_{el}, provided to the micro heater as being equal to the thermal power, Q_{th}, generated by the Joule effect $(R \cdot I)^2$ and lost to the gas flow by means of forced convective heat transfer):

$$Q_{el} = (R \cdot I)^2 = Q_{th} = m_c c_p \Delta T \qquad (1)$$

where:

Q is the heat power produced (and measured in terms of electrical power) by the micro heater lost to the gas flow [W]

R is electrical resistance [Ω]

I is current intensity [A]

m_c is the mass flow rate in the capillary bypass [kg/s]

c_p is the specific heat for a constant pressure [J/(kg K)]

$\Delta T = T_2 - T_1$ is the net difference in gas temperature [K]

T_1 is the temperature detected by the upstream sensor [K]

T_2 is the temperature detected by the downstream sensor [K]

The sensor chip detects the mass flow rate in the capillary tube (m_c): if the flow regime is laminar in both the circuit (the capillary one and the main one) there is a relationship between the mass flow rate in the capillary circuit and the mass flow rate in the main pipe.

The sensor uses the basic principle that each gas molecule has the specific ability to pick up heat (forced convective heat transfer). This property, called the *specific heat for a constant pressure* (c_p), directly relates to the mass and physical structure of the molecule and can be determined experimentally. The physical structure of molecules varies widely from gas to gas, as does the specific heat, c_p, which varies depending on the gas composition and temperature (for a gas with a "real" behavior, not ideal gas). Changes in c_p also imply changes in the thermal conductivity λ of the gas, since the thermal diffusivity of the gas is $\alpha = \lambda / (c_p \cdot \rho)$, where ρ is the gas density.

Therefore, the *gas sensitivity* (or *gas identification*) represents the main potential measurement limit, since the micro-electro-thermal procedure inevitably entails such dependence, and finally the measurement reliability. Additional parameters can be implicitly measured at the same time by the semiconductor sensor, in order to achieve sufficient identification of the gas composition (which is quite variable in natural gas) and to make possible an electronic correction applicable to all current natural gas compositions.

For most of the time, both the microcontroller and the sensor are in low power (or sleep) mode, only a timer and the LCD driver in the microcontroller being active. The internal timer signals the start of a measurement procedure and *"wakes"* the microcontroller from the sleep mode. There are three different measurement sequences:

(1) monitor measurement: in this case measurements with reduced resolution are performed only to see whether the flow rate changes; if a flow change is detected an accurate measurement sequence is activated;

(2) accurate measurement: in this case a full resolution measurement is carried out, taking the previous monitor measurement as a reference;

(3) thermal conductivity measurement: in this case the microcontroller begins a procedure to evaluate the actual thermal conductivity (λ) of the metering gas, and therefore its specific heat at constant pressure (c_p).

In order to reduce energy consumption, only one in 10 measurements (every 20 seconds) is carried out with full resolution (accurate mode).

In order to avoid energy-intensive precision measurements at constant flowrates, monitoring (low-resolution check) measurements are carried out; if a monitoring measurement detects a change in flow (or if after a specified number of measurements no further change in the flow is detected), an accurate measurement is carried out. In addition, the thermal conductivity (l) of the metering gas can be checked periodically (monitoring other physical parameters by the sensor chip), and a correction for the particular gas can be introduced.

Another, secondary, measurement limit consists in the fact that the gas flowing over the sensor chip in long term run "contaminates" the micro elements of the chip, changing the meter response. A suitable scrubber (or cyclone filter) can be used before the inlet of the capillary bypass conduit, in order to avoid the effect of the fine powder materials.

3 Smart ultrasonic gas meters

About 15 years ago some of the main manufacturing companies started to develop *smart ultrasonic gas meters* for residential applications, and to introduce these onto the market. These devices use the same measurement principle (*time of flight* or *transit time*) as the standard industrial ultrasonic meters, but early production costs and some initial technical problems delayed their acceptance in the residential market sector.

From 2003, new concept generations of compact, smart ultrasonic residential gas meters were implemented, tested and progressively introduced onto the market, with the following characteristics:

- good accuracy (including at low flow rates),
- bi-directional measurement (reverse gas flow detection),
- no mechanical moving parts to wear or stop,
- compact and lightweight,
- temperature compensation capability,
- built-in shut-off valve (for remote disconnection, leak detection, advanced safety function, pre-payment capability),
- digital communication functions, with interfaces for AMR (Automatic Meter Reading) or AMI (Advanced Metering Infrastructure): for example widespread standard digital interface is M-Bus type (wired or wireless).

The new generation meters are more compact in comparison with traditional diaphragm meters: for a G4 meter size, the dimensions and weight of an ultrasonic meter are reduced by 1/3 and 1/2 respectively. This means that they are easier to install.

The principal components of the meter include:

- the flow measurement cell, with a pair of ultrasonic sensors,
- batteries (lithium type),
- controller module,
- shutoff valve (unusual gas flows, low pressure, gas leak detection),
- pressure sensor,
- seismic sensor, for safety functions (for example in the event of earthquakes).

The shutoff valve automatically interrupts the gas flow when it detects an abnormal gas flow rate, typically twice the maximum flow rate, (for example due to a pipe break), or in the event of an abnormal drop in gas supply pressure, or in the case of a strong earthquake.

Another improvement compared to traditional diaphragm meters is that the last generation ultrasonic gas meters are able to identify small leaks (in a shorter time), by utilizing the instantaneous flow rate and the pressure sensor.

Experimental tests have proven that the behavior of these last generation ultrasonic gas flowmeters is quite independent of the gas type (for example air vs. city gas) and gas temperature (for example from –25 °C to 60 °C).

The measurement principle is based on the classic "*time-of-flight*" or "*transit time*" arrangement (see Figure 3): two ultrasonic piezoelectric sensors face each other across the gas flow path. Ultrasonic waves are sent in dual mode: *downstream mode* and *upstream mode*.

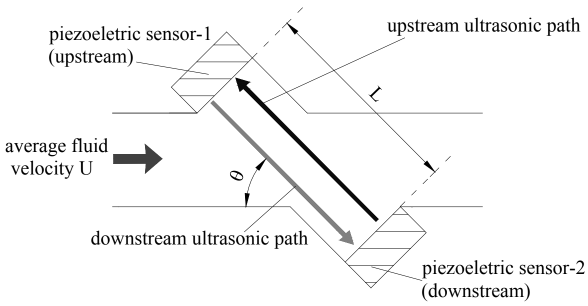

Figure 3 Measurement principle of a *time-of-flight* ultrasonic flowmeter

In the *downstream mode*, the ultrasonic waves travel across the fluid from the upstream sensor to the downstream sensor; in this case the ultrasonic velocity across the fluid C is implemented by the average fluid velocity (U) and consequently the transit time taken (t_{dw}) by the wave from sensor 1 to sensor 2 is:

$$t_{dw} = \frac{L}{(C + U \cos\theta)} \tag{2}$$

where L is the ultrasonic path and θ is the angle between the ultrasonic wave and the flow axis.

In the *upstream mode* (from sensor 2 towards sensor 1), the ultrasonic waves travel across the fluid in the opposition direction (i.e. from the downstream sensor to the upstream sensor) and therefore the transit time t_{up} is now greater than in the previous case ($t_{up} > t_{dw}$):

$$t_{up} = \frac{L}{(C - U \cos\theta)} \tag{3}$$

The average fluid velocity of the gas flow (U) can be obtained from the difference between the two times (or better the frequencies: $f_{dw}=1/t_{dw}$, $f_{up}=1/t_{up}$) taken by the ultrasonic waves to arrive:

$$U \approx \frac{L}{2\cos\theta}\left(\frac{1}{t_{dw}} - \frac{1}{t_{up}}\right) \tag{4}$$

In designing the meters, it is important in particular to optimize and set L (the length of the ultrasonic path) and θ (the angle between the conduit axis and the ultrasonic path) appropriately.

There are two possible "path configurations": (a) the "*direct mode*" (also called "*Z-type*"), in which the ultrasonic waves are transmitted directly from the two sensors (see Figure 4a) the *reflection mode* (also called "*V-type*"), in which the ultrasonic sensors are placed on the same side of the flow cell (see Figure 4b).

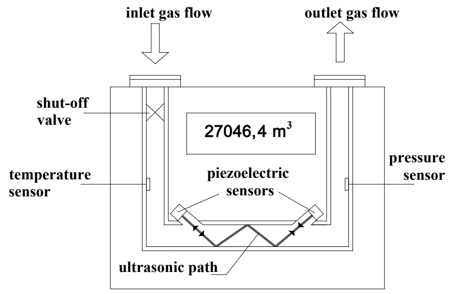

Figure 4a Ultrasonic gas flowmeter path configuration: *direct mode*

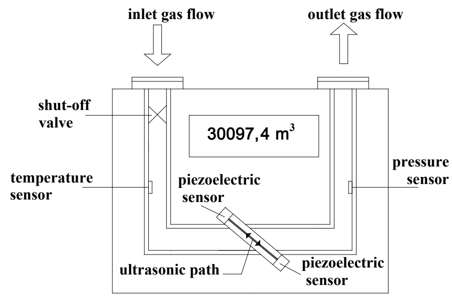

Figure 4b Ultrasonic gas flowmeter path configuration: *reflection mode*

Both the above transducer arrangements should be studied and improved for application in residential gas metering, since the flow and the pipe diameter of the flow tube are quite small.

Since the fluid velocity U is an average flow velocity on the transmission path of the ultrasonic wave (inclination of the θ angle), in order to obtain the volumetric flow rate Q it is necessary to introduce a *flow coefficient* c to convert the flow velocity U into the average flow velocity of the passage cross section (S):

$$Q = U \times c \times S \tag{5}$$

The difference between the flow coefficient c for air and for city gas is extremely small (the two flow coefficients tend almost to overlap each other). For this reason, calibration of ultrasonic gas meters may be performed using the air at only one or two flow rate points, and the verification tolerance in city gas can be satisfied using the determined flow coefficient as it is.

4 Experimental results

In this paper the first calibration results are presented of tests carried out on three new static gas meters:

a) an ultrasonic flowmeter, operating in "*direct mode*" (indicated as US_A in the following),
b) an ultrasonic flowmeter, operating in "*reflection mode*" (indicated as US_B in the following),
c) a thermal mass flowmeter (indicated as TMF in the following).

Each type of the above new static smart gas meters is made by a different manufacturer. The type a) meters tested (US_A) are characterized by Q_{min} = 0.12 m^3/h and Q_{max} = 6.0 m^3/h.

Type b) (US_B) and type c) (TMF) meters, instead, are classified as G4 gas meter (Q_{min} = 0.040 m^3/h; Q_{max} = 6.0 m^3/h).

Ultrasonic flowmeters (both type a and type b) were tested by means of a bell prover (primary calibration). In this case the *Best Calibration Uncertainty* (also called *Minimum Laboratory Uncertainty*) is equal to 0.30 % (with a coverage factor k = 2).

The thermal mass flowmeter was calibrated by means of a *master-slave configuration* (secondary calibration), in which an accurate rotary piston meter was used as *master*. In this case the *Best Calibration Uncertainty* is equal to 0.50 % (with a coverage factor k = 2).

Figure 5 shows the calibration results of five new meters of the same manufacturer of type a ultrasonic flowmeter (US_A). For each tested flow rate, the measurements were repeated three times: therefore the results in Figure 5 represent the "*average percentage error*", *e* (%):

$$e(\%) = \frac{V_{\text{read}} - V_{\text{ref}}}{V_{\text{ref}}} \cdot 100 \qquad (6)$$

where:

V_{read} is the gas volume measured by the meter under test (the difference between two meter readings at the beginning and at the end of the test),

V_{ref} is the reference gas volume provided by a traceable standard (*bell prover* or *master meter*).

Similarly, Figures 6 and 7 show respectively the calibration results of five type b ultrasonic flowmeters (US_B) and of five thermal mass flowmeters (TMF).

It is worth pointing out that the master-slave calibration rig (used to test the thermal mass flowmeters) does not allow calibrations to be performed in the lower flow range zone, i.e. between the minimum flow rate (Q_{min}) and the transitional flow rate (Q_t).

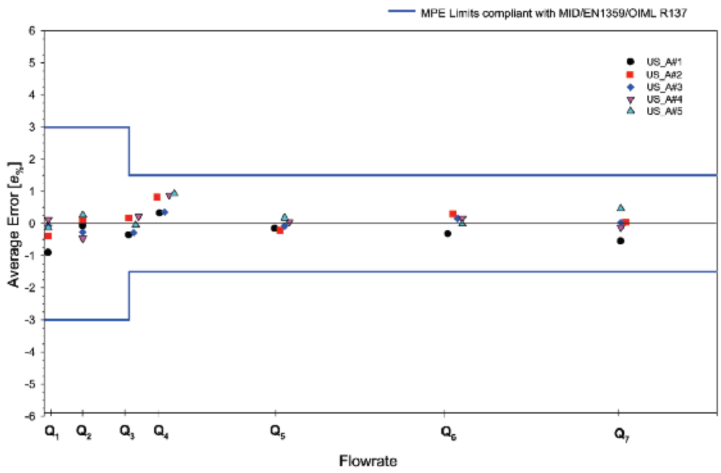

Figure 5 Experimental results of the calibration carried out on 5 different (new) ultrasonic meters operating in *direct mode* (type US_A)

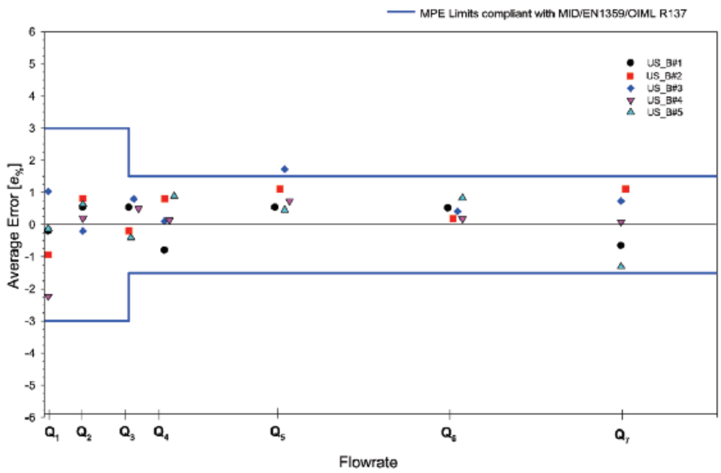

Figure 6 Experimental results of the calibration carried out on 5 different (new) ultrasonic meters operating in *reflection mode* (type US_B)

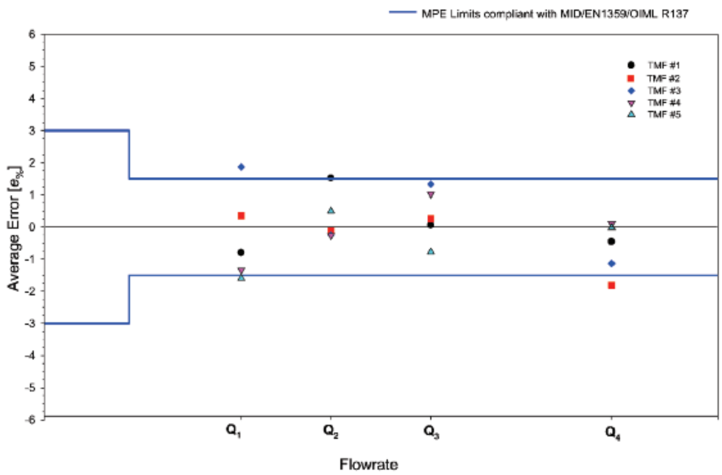

Figure 7 Experimental results of the calibration carried out on 5 different (new) thermal mass flowmeters

5 Conclusions

- The new static smart meters tested show a satisfactory comprehensive metrological behavior.
- For both the static measurement technologies, not enough information about the long-term reliability (durability) is available.
- Ultrasonic smart metering technology appears more advanced (studied, tested and produced) with respect to thermal mass technology: for example for the ultrasonic gas meters a specific reference standard (EN 14236:2007 "*Ultrasonic domestic gas meters*") is already available.
- Ultrasonic flowmeters are practically unaffected by the gas composition; on the contrary, micro-thermal mass flowmeter performances are affected by gas composition (since this changes the gas conductivity): the item "gas recognition techniques" (or *gas composition identification*) is a matter still in progress around the world.
- In ultrasonic flowmeters the average fluid velocity is calculated along the ultrasonic path, while in thermal mass flowmeters the flowrate is measured in the capillary tube and then processed and referred to the main pipe.
- Thermal mass flowmeters seem to be more affected by contaminants in the gas stream with respect to ultrasonic flowmeters: for example dust or dirt may cause (partial) blockage of the bypass circuit and/or the pressure dropper, increasing the pressure loss of the meter (pressure absorption); also, dust and moisture (humidity) in the gas stream can modify the sensor chip behavior (response).
- Low flow sensitivity: ultrasonic smart meters seem able to measure and register very low flow rates (about 3 L/h), while for micro-thermal mass flowmeters this parameter is not known or stated by the manufacturer.
- The range of ultrasonic flowmeters appears larger (more than three times) than that of thermal mass flowmeters.
- It is reasonable to expect that, in the near future, further models of improved static gas meters will appear on the market; in such new implemented meters some of the above limits will probably be overcome.

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HISTORY OF SCALES

Part 3: Weights, scales and weighing through the ages

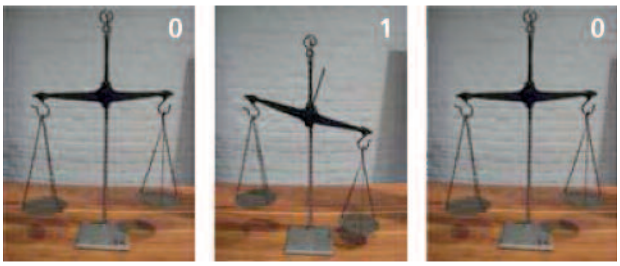
ING. WOLFGANG EULER, Hennef/Sieg and
HEINZ WEISSER, Balingen

In Part 2 we stated (among other points) that the equal armed beam scale also works on the analogue principle. A greater or lesser weight on the scale results in a proportionally larger or smaller movement of the pointer.

From Gottfried Wilhelm Leibniz and the center beam balance (known for thousands of years) to the latest digital technology

Gottfried Wilhelm Leibniz (born 1 July 1646 in Leipzig, died 14 November 1716 in Hanover aged 70) deduced a system of calculation that uses just two numbers, 0 and 1, from the division of weights on the analogue, center beam scale. A brilliant idea – or perhaps not? But how did Gottfried Wilhelm Leibniz, who lived in Wolfenbüttel near Brunswick, discover the binary system with just 0 and 1 which is still in widespread use today and which forms the very foundation of computer technology?

Let's take a closer look at the center beam scale without any weights on it: the pointer clearly points to 0.



If any weight is placed on the center beam scale, the pointer shows "just one position", and that is the number 1. If the weight is removed from the scale, the pointer returns to the position 0. This is an incredible achievement, which Leibniz was able to work out from looking at the center beam scale. In the authors' opinion there is no doubt that Leibniz really changed the world with his discovery and that this is one of the greatest inventions of the modern era. Today not only computers, scales and satellite navigation systems work using the binary system, but also almost anything and everything that has to do with data. And of course all the current weighing scales and data systems.

Leibniz died lonely and was buried in the graveyard of St. Johannis Church in the Neustadt district. It may be that a similar fate befell other researchers and engineers from the Swabian mountains, because their outstanding work remained largely unknown to the inhabitants of their home region and the surrounding areas. But this will all be revealed in future research.

Philipp Matthäus Hahn and the pendulum scales

Philipp Matthäus Hahn came to Onstmettingen for the first time in 1756. There he became friends with Philipp-Gottfried Schaudt, who was the same age. Both were exceptionally curious about natural sciences and were enthusiastic about technology.

The brilliant leadership of Hahn, together with the active assistance provided by Schaudt and the Sauter brothers resulted in clocks, calculating machines and pendulum scales. Let's take a closer look at the first pendulum scales designed and built as a simple household scale by this team.

So how did the development work begin on these pendulum scales, which are so different from the center beam scales in terms of their physical properties? The center beam scale shows the result of the measurement when the beam is in a horizontal position and the pointer in vertical position. This type of scale therefore has one single point of equilibrium. The off-center pendulum scale, by contrast, reaches a new equilibrium each time depending on the weight that is placed on it. The pendulum scale therefore has an infinite number of points of equilibrium. In other words: "In contrast to the center beam scale the pendulum scale measures mass not by means of compensation with another mass, but via the deflection, which can be read off a scale. The pendulum scale therefore calculates the result itself, automatically".

This principle of Hahn's pendulum scales was used 161 years later in the first German pendulum scale with sliding reference weights, which was manufactured by Bizerba in Balingen/Zollernalbkreis in 1924.

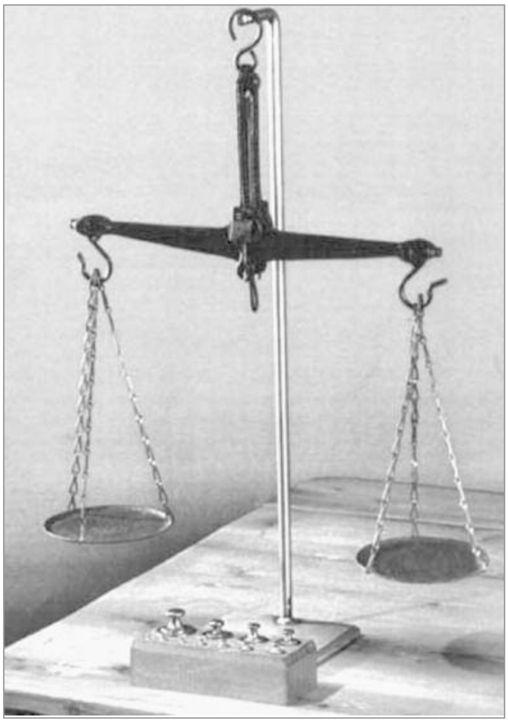


Fig. 2 Center-beam balance

Philipp Matthäus Hahn
Born 25.11.1739 –
Died 02.05.1790

Philip Gottfried Schaudt
Born 11.10.1739 –
Died 21.06.1809

Andreas Bizer: The pioneer of the early years and the great expansion!

In 1866 Bizer became involved in the ongoing history of weighing scale development. This was the year in which he established a workshop in Ebingen to manufacture and repair scales. In 1868 he moved the workshop to Balingen. In this section we highlight the main milestones from this simple engineering workshop for scales to the modern, high-tech company of today.

After setting up his company Bizer concentrated mainly on producing counter scales of the Roberval Balance type. During this period he gained considerable experience in non-self-indicating scales. These are scales which require the operator to manipulate weights or poises during the weighing process. In 1871 Andreas Bizer was appointed a master calibrator in conjunction with the introduction of the metric system of weights and measures.

Of course Bizer was aware of the invention of the pendulum scales by Hahn in 1763. This was the beginning of an unprecedented development of a small scale-maker. The pendulum scales were the cornerstone and the catalyst for Bizerba's success.

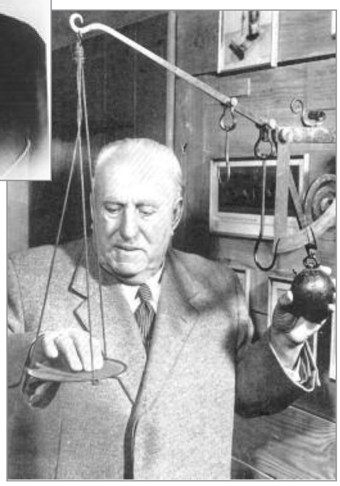
The middle photograph shows Prof. Wilhelm Kraut with the original of Hahn's pendulum balance scales, the principle of which was incorporated into the world famous pendulum scales first produced by Bizerba in 1924.

The roll-out of the first off-center beam counter scales in Germany

Figure 4 shows the historic development of the first off-center beam balances, which were produced successfully for many years. In 1924 the prototype of the off-center beam balance with variable reference weights was built with a wooden casing. In the same year these Bizerba scales were given component-type approval for verification for the first time in Germany. The scale at the back is an early mass production model. On the left is the highly successful model of the off-center beam balance with sliding poise developed in 1954 (see below). By 1928 Bizerba had become the largest manufacturer of weighing scales in Germany.

Andreas Bizer
Born 07.09.1839 –
Died 07.12.1914

Note:
"Bizerba" originates from
"Bizer" and "Balingen"



Prof. Wilhelm Kraut (Sen.)
Born 09.05.1875 –
Died 26.09.1957

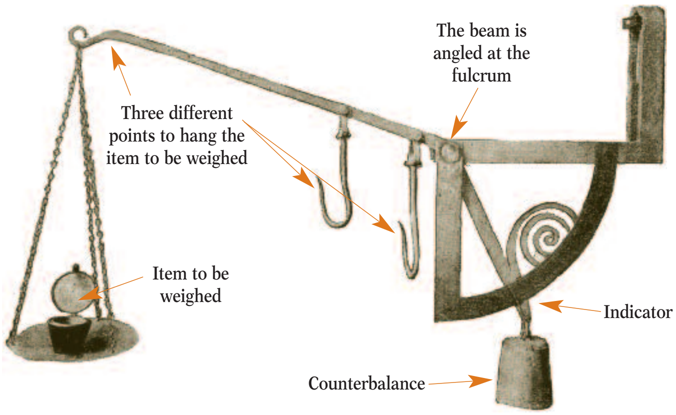


Fig. 3 Hahn's pendulum scale with 3 weighing points and an incremental scale. First invented in 1763 by Philipp Matthäus Hahn

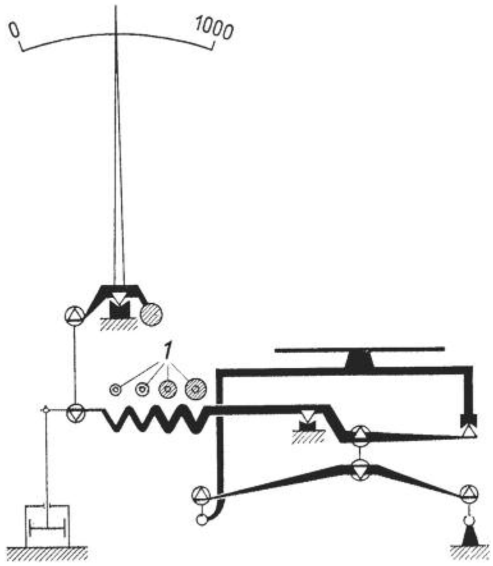


Fig. 5 Principle of the off-center beam balance with variable reference weights

Fig. 4 The first family of Bizerba off-center beam balances

From the pendulum scale with variable weights to the optical price-indicating scales

The later versions of pendulum scales with variable poise weights enabled the operator to read the weight and the corresponding price from a chart. This process required from the operator a precise reading of the weight and price data as the chart consisted of a large number of figures and combinations.

Therefore, the designers set about developing scales with an optical price indicator, brought to market in 1952. The great advantage of these counter scales was that they showed the price and the weight directly beneath one another. It became much faster and easier for the operator to determine the correct price.

Fig. 6a Pendulum scales with variable weights and price indicating scale

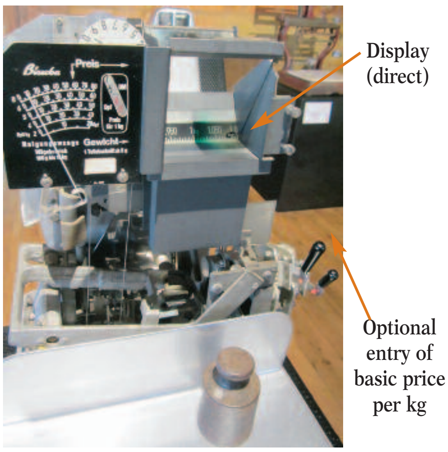


Fig. 6b Double pendulum scales with optical price

Fig. 6c Optical price scales in operation

This marked the end of the first chapter in the history of Bizerba, which continued with the development of electronic weighing scales. But to keep things in right order we will first take a look at the Chronos scale in 1883, the first automatic weighing scale in the world.

The town of Balingen owes the genesis of the Museum for Scales and Weights in the Zollern castle to Prof. Wilhelm Kraut and his passion for collecting. In 1943 he made his entire private collection available to the museum, and since then the collection has been extended considerably.

We conclude Part 3 with the words of the Spanish cultural philosopher Jose Ortega y Gasset:

Progress does not consist of destroying the past, but of preserving its essence, which had the power to create a better today."

To which we could add: "The future has a past!" This is particularly important because scales regulate and control the flow of money and goods, as they did thousands of years ago. They must therefore permanently be kept up to date with the latest technology. Without scales it would be impossible to organize an orderly economy, even in our computer-driven age. Scales are also a guarantee for consumer protection everywhere in the world. And ultimately we are all consumers. ■

About the authors

Wolfgang Euler is an engineer, adviser and consultant for international statutory measuring and calibration as well as for scales technology, and was the former chairman for automatic scales in the European metrology association CECIP and Group Legal Metrology Manager for Chronos in Hennef. He worked 48 years for this company world-wide in the fields of design, service, training & legal metrology. Wolfgang Euler has been in close contact with the technical development of Bizerba GmbH & Co. KG for over 10 years and has kindly declared himself willing to write this series for our Bizerba News. Mr. Heinz Weisser is an electronics technician. He has been working at BIZERBA headquarters for over 40 years, including nearly 20 years in technical education and training during which he has been head of product training and project manager in the field of industrial weighing and data technology.

Part 4: The evolution of weights, scales and weighing

The first automatic scales

New developments in the 1880's concerned not only the Bizerba scales, but also the Chronos scales, which originated some 400 km north of Balingen in Hennef an der Sieg (Cologne/Bonn region). Weighing history was being written here as well, as the first automatic weighing scales were soon to be manufactured following intensive research and development work.

The real trailblazers were Carl Reuther and Eduard Reisert

Eduard Reisert attended professional training schools in Aschaffenburg and Würzburg. In 1866 he found employment as a young engineer in Augsburg. From there Reisert moved on to Cologne. In 1876 he founded the company Munnem & Reisert with the manufacturer Munnem from Cologne. Reisert was fascinated by the idea of using the forces of nature to do work, so he applied the gravity that pulled on the item to be weighed as a source of power to fill and empty a weighing container shaped like a drum. The groundbreaking idea of an automatic flow measurement device for loose and bulk goods was born.

In 1877 Reisert manufactured a measuring device similar to a weighing scale known as No. 66 under the name of Munnem & Reisert in Cologne.

However, there was still a long way to go from the bulk flow measurement device to the approval and calibration of an automatic mechanical weighing scale. Around this time Reisert met the innovative, dynamic entrepreneur Carl Reuther.

Reuther had run an engineering workshop from 1859–1869 and later founded a factory in Hennef. There he built a variety of agricultural machines, and also the familiar decimal weighing scales, but not in an automatic version. The products he offered for sale were of a very high quality, which soon secured his commercial success.

But where did Carl Reuther acquire the knowledge he would have needed?

After qualifying as a metalworker in Bonn, Reuther travelled as a journeyman through Germany, Belgium and France. In particular during his time working in Liège in Belgium he gained a vast amount of professional know-how. At that time mechanical engineering was in its heyday in Liège and so for the mechanic and engineer from Hennef there was a great deal to learn. Reuther was also particularly skilled and knowledgeable in mathematics and physics.

Eduard Reisert.
Born 16.02.1847
in Alzenau/ Lower Franconia –
Died 20.01.1914
in Cologne

Carl Reuther.
Born 17.08.1834
in Hennef –
Died 09.02.1902 (ibid)

Company nameplate

Reuther's knowledge of weighing scales and Reisert's know-how relating to the forces of gravity acting on bulk goods led them to establish the machine factory C. Reuther & Reisert on 1 July 1881 in Hennef, the predecessor of the Chronos factory. This was the birthplace and the continuation of the brilliant evolution of automatic weighing scales.

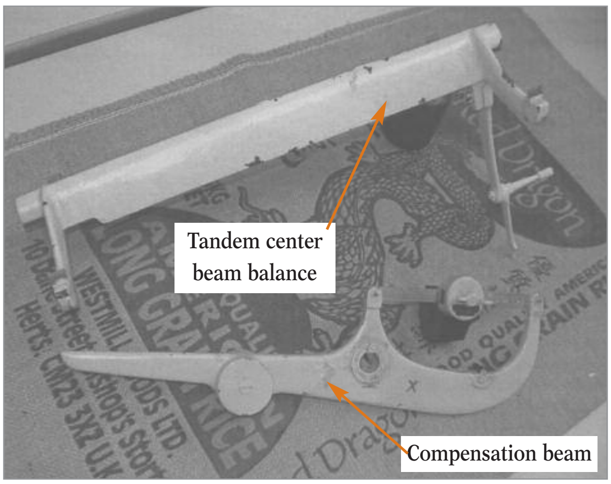
Former company logo
Center beam balance

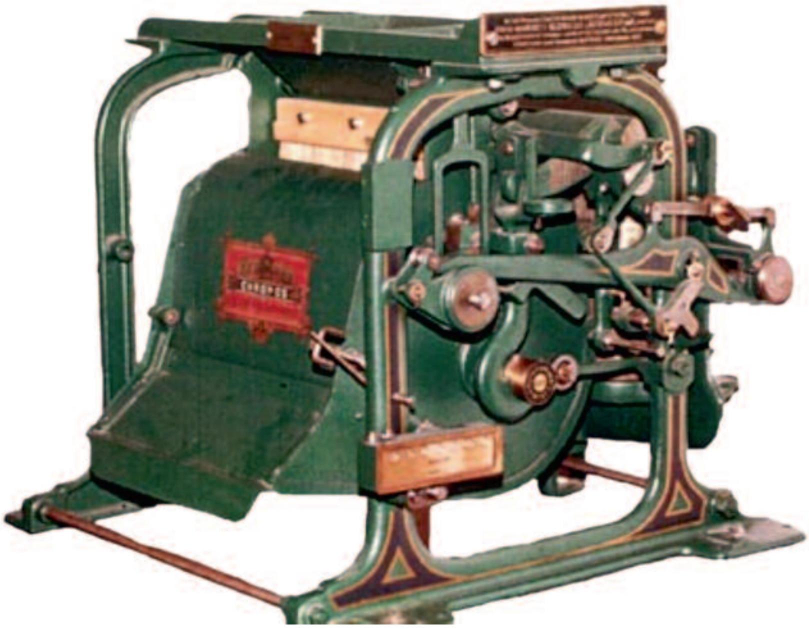
Exactly 128 years ago Reuther and Reisert invented the Chronos scales, the first calibratable automatic weighing scales in the world. This pioneering act put an end to a 10 000 year old tradition of weighing by hand – the era of automatic weighing had begun.

Approved for calibration as a measuring device with the seal of the *"Imperial Standard Calibration Commission"* on 12 April 1883 in Berlin, the invention of the Chronos scales revolutionized weighing and measuring worldwide. It is particularly remarkable that the Chronos scales functioned fully automatically according to the principle of the center beam balance which had been known for millennia (and which was formerly used as the company logo), for both fast and fine flows and including an after-flow regulator by using the earth's gravity. This meant that the Chronos scales required no own energy input to carry out the precise weighing process.

In principle, the Chronos weighing scale is a center beam balance. However, a "normal" center beam balance could not be used, as neither the large hoppers for the produce nor the large pans to hold the weights could be attached to it. This spurred the development of the heart of the Chronos weighing scale, the tandem beam balance. Setting the Chronos scale for various types of goods with different flow densities and flow properties was not a problem and could be done easily.

The Chronos weighing scale from Hennef an der Sieg was approved for calibration as a measuring device on 12 April 1883 in Berlin.





A worldwide hit! The successful automatic Chronos scale from 1883, here for 10 kg weights. The Chronos scale was the first calibratable automatic scale in the world and was approved for calibration as a measuring device on 12 April 1883 in Berlin. It was made for weighing fixed weights between 200 g and 3 000 kg.

Shared success: The foundation of the Carl Reuther Berufsschule 1897 in Hennef

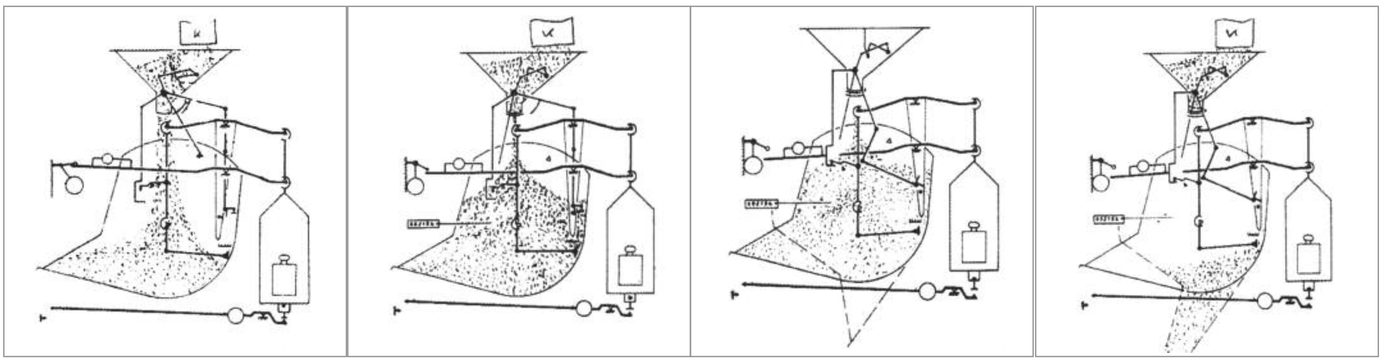
Carl Reuther founded this vocational training school in 1897 with the motto *"This institution was founded to help build a better world. May its work join hand to hand, may it bind land to land, heart to heart"* and endowed it with considerable funds. It was the first professional training school in the Sieg district (Cologne/Bonn) and the surrounding area. In memory of this foundation the present-day vocational training institution of the Rhine-Sieg district in Hennef has been known as the Carl Reuther Berufskolleg since 2 February 2010.

Generally speaking, weighing scales control and regulate flows of goods and funds today as they did millennia ago. Without scales it would not be possible to organize an orderly economy, even in our computer-driven age. Scales are also a guarantee of consumer protection everywhere in the world. And ultimately we are all consumers.

As we reach the end of Part 4 we are particularly happy to note that both Bizerba in Balingen and the Chronos scales in Hennef brought profound and far-reaching changes to the world of weighing. Thanks to the invention of the parson P.M. Hahn and P.G. Schaudt in Albstadt-Onstmettingen, Bizerba brought the pendulum scales with variable weights to market for the first time. This made it easier and safer to operate the scales, which also saved time and enabled a more precise result to be displayed. These pendulum scales were mainly used in the food retailing business by butchers, bakers and grocers.

The term and the balance symbol Chronos (Greek for time) were chosen as the name for the scales and subsequently as the company name because they represented time and accuracy. The explanation is simple: for around 10 000 years bulk goods were weighed by hand with manual scales. The invention of the automatic mechanical Chronos scales drastically reduced the time needed to weigh bulk goods. This also made the weighing process much more accurate, precise and tamper-proof. Today's modern industrial and computer-controlled weighing technology would be unthinkable without automatic mechanical scales, which will be one of the topics of our next article. The term Chronos, in

The phases of the automatic Chronos scales



Filling with fast flow

Switch to fine flow before desired weight is reached

After-flow regulator and emptying

Repeated filling with fast flow

combination with the center beam balance of the same name, therefore has a common significance for the scales developed at Bizerba and for the Chronos scales. In their day, both companies were world leaders in the production of weighing scales. The authors cannot help but wonder whether there was any contact between the two manufacturers in 1859, 1866, 1877 and 1881.

Extracts from a letter by Carl Reuther and Eduard Reisert dated May 1896

"When some 20 years ago (in 1876) we began to build and commercialize our own invention, an automatic weighing scale for grain, etc., this endeavor might have been considered to be quite bold, because all attempts in this direction undertaken hitherto by others had failed and served only to confirm the general opinion at the time that the manufacture of a useful automatic weighing scale was completely impossible. Today however, nobody can deny that we solved the task we set ourselves with the utmost success.

"Our automatic scales are well known and in operation at all the relevant major industrial sites at home and around the world, whether they be grain warehouses, mills, breweries, oil factories or cement works.

"They meet the needs of rational manufacturing, which abhors the interruption of mechanical conveyance for manual weighing, to such a degree that they have become practically indispensable. Since our automatic weighing scales were approved for calibration and for customs and excise purposes in Germany and almost all other countries around the globe they have completely supplanted the old, non-automatic weighing devices at all the pertinent larger factories". ■

PREPACKAGES

Legal metrology in prepackages – The difference between declared quantity and actual quantity

Jeroen Rommerts, NMi, The Netherlands

Metrology becomes legal metrology when fair competition and the interests of consumers are at risk in the absence of government intervention. Government must lay down the rules for prepackages in legislation and take care of the enforcement of the rules, which must cover:

- the quantity declaration,
- the way the actual quantity is measured, and
- the tolerances for the difference.

To make sense, there must also be consistent definitions in line with other legislation.

This article explores the main definitions around "prepackage". Some amendments and additions to the definitions in OIML R 87 *Quantity of product in prepackages* are proposed.

Why government must intervene

Protection of consumers

For a consumer it is not possible to check the quantity of product in a prepackage without destroying the packing material: the trade transaction cannot be checked or repeated without destroying the evidence. Consumer organization awareness of metrology is low and they do not intervene.

As a result, consumers rely on their government to balance the asymmetry between packers and consumers.

Fair competition between packers

Competitors of packers have more options than consumers to check the quantity of product in prepackages, but cannot construct the evidence needed to take legal action. Trade associations may set rules, but cannot enforce them.

Again, it is the government that needs to ensure a level playing field between packers.

The metrological rules for prepackages

Where to legislate metrology for prepackages

Because metrology covers aspects that are common to all prepacked products, it is appropriate to lay down these metrological rules for prepackages in horizontal legislation. This is the focus of OIML R 79 *Labeling requirements for prepackaged products* and R 87 *Quantity of product in prepackages*.

Rules that are not applicable, different or more detailed for some types of products can be embedded in product-specific (vertical) legislation; some examples of this are:

- Aerosols: 'nominal quantity' refers to the product together with the propellant,
- Fertilizer: very detailed measuring procedures.

In this way, all the aspects of metrology are taken care of in an 'umbrella' or 'backup' piece of legislation with the opportunity for the 'specialists' to pick and choose, overrule or supplement these aspects with product-specific aspects of metrology.

Rules that apply to all prepackages

The graphical representation in Figure 1 shows the aspects that concern metrology for prepackages.

Terminology

There are two purposes of defining terminology:

1 to make clear to which part of a prepackage a quantity claim on the label applies, and
2 to cross-reference 'non-metrology' legislation and standards that use other terms for the same part of a prepackage.

Terms should preferably not be in use already, to avoid confusion with terms that are used elsewhere.

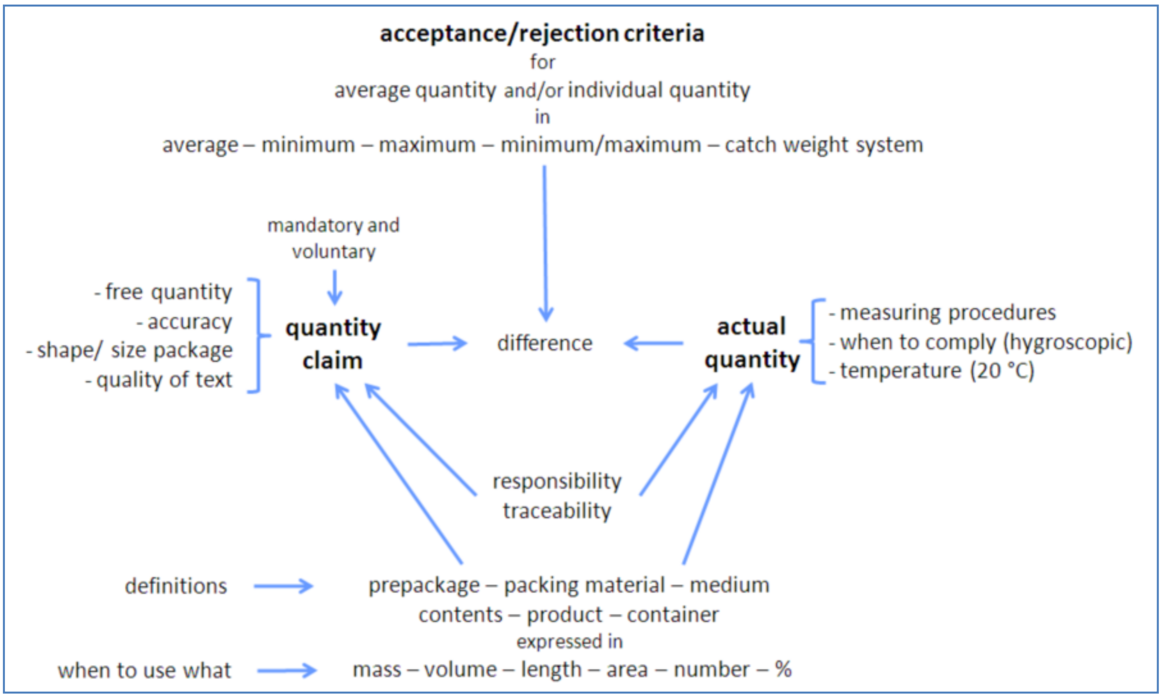


Figure 1 Aspects that concern metrology for prepackages

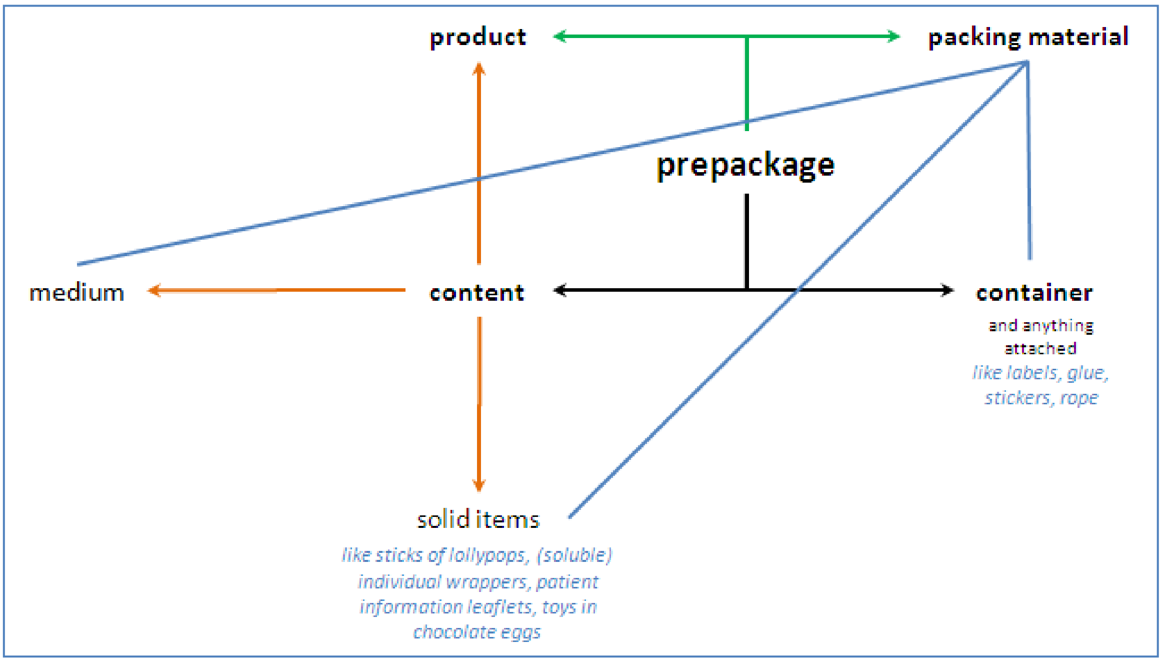


Figure 2 'Parts' of a prepackage

Figure 2 shows how the 'parts' of a prepackage relate to each other. This relation is achieved by defining three basic terms (prepackage, packing material and medium). The rest of the terms (product, content and container) are derived from the basic terms.

Basic term 1: Prepackage

OIML R 87 contains a definition of 'prepacked product' and of 'prepackage'. Both can be combined into one definition of prepackage:

Prepackage – combination of a product and the packing material in which it was put,

- without the purchaser present at the time the quantity of product was determined, and
- whether the nominal quantity of product has a predetermined value or not, and
- whether the packing material encloses the product completely or only partially, but in any case in such a way that the actual quantity of product cannot be altered without the packing material either being opened or undergoing a perceptible modification.

This definition excludes product weighed and packed in front of the consumer. It includes prepackages with a quantity declaration that is predetermined, and also prepackages with a quantity declaration that is measured (also called random packs or catch-weight prepackages).

Authorities must be able to see from the label whether the nominal quantity is predetermined or measured to make sure that the proper tolerances are used when checking the actual quantity.

The definition ensures that the claim remains relevant over time by ensuring the integrity of the packing material. The actual quantity of products that suffer from moisture loss can change over time, usually under the influence of environmental conditions. According to this definition, these products cannot be prepacked unless the quantity of product is compensated for the moisture loss.

Basic term 2: Packing material

OIML R 87 contains a definition of packing material. For clarification, a few notes could be added.

Packing material – everything of the prepackage that is intended to be left over after use of the product, except for items naturally in the product. Use includes consumption or subjecting to a treatment.

Note: packing material also includes:

- the container, and
- solid items that were put in the prepackage together with the product and the medium, such as (soluble) wrappers, sticks of lollypops, wax around cheese, and
- a medium that was put in the prepackage together with the product and that is intended to be left over after use of the product.

Note: packing material is sometimes referred to as individual package, tare, packaging, packaging material or liquid packing medium.

Note: Packing material is generally used to contain, protect, handle, deliver, preserve, transport, inform about and serve as an aid (e.g. food serving tray) while using the product it contains.

For food packed in a liquid medium, the Codex standard defines mediums that are intended to be left over after use.

This definition separates the product from the packing material, which includes:

- containers such as cans, jars, bottles, bags, vessels, etc.,
- sticks of lollypops, immediate wrappers, wax around cheese, labels, etc.,
- liquid or gaseous mediums packed with the product.

Sometimes it is not evident which part of the prepackage is intended to be left over after use. This is the case when parts might or might not be used, for instance fruits in sweetened fruit juice, meat in fat or fish in edible oil. The description of the product, or a recipe on the label might help to decide.

The packer can also decide to declare two products on the label.


International Recommendation
OIML R 87
Edition 2004 (E)
Quantity of product in prepackages
Quantité des préemballages
OIML
Organisation Internationale de Métrologie Légale
International Organization of Legal Metrology
OIML R 87 Edition 2004 (E)

Basic term 3: Medium

For foods packed in a liquid medium, the Codex standard defines a liquid medium as water, aqueous solutions of sugar and salt, fruit and vegetable juices in canned fruits and vegetables only, or vinegar, either singly or in combination.

All mediums can be defined as below:

Medium –

- a fluid or a mixture of fluids, either liquid, semi-liquid of frozen, or
- a gas or a mixture of gasses, whether under positive, negative or no pressure, or
- or a combination of both,

that was put in the prepackage with the product, whether separated from, in or surrounding the product, that is intended to be left over after use of the product, except for items naturally in the product. Use includes consumption or subjecting to a treatment.

Note: a liquid medium is sometimes also referred to as 'liquid packing medium'.

Note: a fluid can be separated from the product and other solid items that were put in the prepackage by measuring procedures described in WELMEC 6.8.

Note: medium also includes:

- the liquid mediums as specified in chapter 4.3.3 of the CODEX STAN 1-1985 'Labelling of Prepackaged Foods', and
- the ice-glaze as specified in CODEX standards on ice-glazed foods.

This definition also includes gaseous mediums in which foods are packed and liquid or gaseous mediums in which non-food products are packed.

This definition separates the product from the medium. The medium can be located in the product, vice versa, or both.

Examples of mediums are:

- liquids as defined in the Codex standard,
- crushed ice for fresh fish or ice-glaze covering frozen fish,
- oil that prevents nails from rusting,
- pressurized air or nitrogen in bags of potato chips,
- vacuumed air for coffee powder,
- pressurized gas for coffee powder,
- added carbon dioxide in the head-space of bottles of soft drinks or beer,
- air trapped in hair gel or paint,
- gel, fat, gelatin.

Derived term 1: Product

What product is becomes apparent via the definitions of prepackage and packing material.

Product – everything of the prepackage that is not packing material.

Note: the product is the content net of the medium.

Note: the quantity of 'product' is equivalent to:

- the 'drained weight of the food', for food packed in a liquid medium as specified in chapter 4.3.3 of the CODEX STAN 1-1985 'Labelling of Prepackaged Foods, and to
- the 'net contents of the food ... exclusive of the glaze' as specified in CODEX standards on ice-glazed foods.

Note: product includes fluids or gasses that were put in the prepackage together with the product and that are not intended to be left over after use of the product (e.g. air in chocolate mousse).

Note: product includes fluids or gasses that were not put in the prepackage with the product and that are intended to be left over after use of the product (e.g. mozzarella cheese, carbon dioxide in beer, air in hair gel).

Note: product includes fluids of gases that were not put in the prepackage with the product and that are not intended to be left over after use of the product (e.g. curdling of yoghurt or honey or clotting of paint).

The product is what is left of a 'food packed in a liquid medium'[1] after drainage of the liquid medium.

The propellant used to expel the content from the bi-compartmented aerosol dispenser shall not be regarded as part of the product[2].

Another way of expressing this is that the product is everything of the content that is not packing material.

The product can include mediums that are not intended to be left over after use, such as oil in canned fish, air trapped in chocolate mousse or ice-cream, carbon dioxide in soft drinks or beer.

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[1] Labelling of Prepackaged Foods (CODEX STAN 1-1985), chapter 2 Definition of terms

[2] FEA 224 - Product volume and nominal capacity of the outer container in bi-compartmented aerosol dispensers

Derived term 2: Container

This definition of container separates the medium from the packing material.

Container – everything of the packing material that is not the medium or solid items that were put in the prepackage together with the product and the medium, such as (soluble) wrappers, sticks of lollypops, wax around cheese.

Note: the container also includes labels, glue, ties, prizes, gifts, coupons, or decorations that remain after separation of the content.

Note: this definition also includes:

- that which is defined in chapter 2 *Definition of terms* of CODEX STAN 1-1985 'Labelling of Prepackaged Foods'.
- 'packaging material' as defined in *Quality assurance of pharmaceuticals - A compendium of guidelines and related materials* - Volume 2, 2nd updated edition of the WHO.

The container is everything of the prepackage that is intended to be left over after use of the product, that is not the medium.

The container includes:

- cans, jars, bottles, bags, vessels, etc.,
- sticks of lollypops, immediate wrappers, wax around cheese, labels, etc.

ISO 90 specifies definitions and methods for the determination of the dimensions and capacities of containers.

Derived term 3: Content

Content – everything of the prepackage that is not the container.

Note: content includes:

- the product, and
- a medium, and
- items that were put in the prepackage together with the product and the medium, such as wrappers and sticks of lollypops.

Note: content is referred to as 'net contents' in CODEX STAN 1-1985 'Labelling of Prepackaged Foods'. Content is referred to as 'net quantity' in EU food labelling legislation. ■

About the Author

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OIML CERTIFICATE SYSTEM

List of OIML Issuing Authorities

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		R 16	R 21	R 31	R 49	R 50	R 51	R 58	R 60	R 61	R 75	R 76	R 81	R 85	R 88	R 93	R 97	R 98	R 99	R 102	R 104	R 105	R 106	R 107	R 110	R 112	R 113	R 114	R 115	R 117/118	R 122	R 126	R 128	R 129	R 133	R 134	R 136
AT1	Bundesamt für Eich- und Vermessungswesen (BEV)					■	■	■		■		■		■	■		■	■		■	■		■	■	■			■	■	■							
AU1	National Measurement Institute (NMI)				■	■	■		■			■		■									■	■						■		■		■			
BE1	SPF Economie, PME, Classes Moyennes et Energie											■					■	■																			
BG1	State Agency for Metrology and Technical Surveillance (SAMTS)											■						■																			
BR1	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO)											■																									
CH1	Office Fédéral de Métrologie (METAS)	■		■	■	■	■		■	■		■					■	■				■	■	■						■						■	
CN1	General Administration of Quality Supervision, Inspection and Quarantine of P. R. China (AQSIQ)			■		■	■		■	■		■					■	■						■						■						■	
CZ1	Czech Metrology Institute (CMI)				■							■	■	■								■								■						■	
DE1	Physikalisch-Technische Bundesanstalt (PTB)	■		■	■	■	■	■	■	■		■		■	■		■	■	■	■	■	■	■	■	■			■	■	■		■	■	■	■		■
DK1	The Danish Accreditation and Metrology Fund (DANAK)					■	■		■	■		■						■				■	■	■						■				■		■	
DK2	FORCE Certification A/S				■																																
DK3	Dansk Elektronik, Lys & Akustik (DELTA)					■	■		■	■		■											■	■										■		■	
ES1	Centro Español de Metrología (CEM)				■		■		■	■		■					■	■														■					
FI1	Inspecta Oy					■	■		■	■		■		■									■	■						■							
FR1	Ministère de l'Economie, de l'Industrie et de l'Emploi (MEIE)	*All activities and responsibilities were transferred to FR2 in 2003*																																			
FR2	Laboratoire National de Métrologie et d'Essais (LNE)		■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■		■	■	■	■			■	■	■		■		■		■	
GB1	National Measurement Office (NMO) - Formerly NWML		■		■	■	■		■	■	■	■		■				■				■	■	■						■				■		■	
GB2	National Physical Laboratory (NPL)																■																				
HU1	Hungarian Trade Licensing Office (MKEH)											■																									
JP1	National Metrology Institute of Japan / National Institute of Advanced Industrial Science and Technology (NMIJ / AIST)								■			■																	■	■							
KR1	Metrology and Measurement Division (KATS)											■																									
NL1	NMi Certin B.V.		■	■	■	■	■		■	■		■	■	■			■		■			■	■	■						■		■	■	■		■	
NL2	KIWA Nederland B.V.				■																																
NO1	Norwegian Metrology Service (Justervesenet)					■	■			■		■										■	■	■						■				■			
NZ1	Measurement and Product Safety Service (MAPSS Wellington)											■																									
PL1	Central Office of Measures (GUM)											■						■		■																	
RO1	Bureau Roumain de Métrologie Légale (B.R.M.L.)																■	■							■			■	■								
RU1	Russian Research Institute for Metrological Service (VNIIMS)			■	■	■	■	■	■	■		■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
SE1	Swedish National Testing and Research Institute AB (S.P.)					■	■		■	■		■		■				■					■	■						■							
SI1	Metrology Institute of the Republic of Slovenia (MIRS)											■																									
SK1	Slovak Legal Metrology				■							■																		■							
US1	NCWM, Inc.								■			■																									
VN1	Directorate for Standards and Quality (STAMEQ)											■																									

OIML Systems

Basic and MAA Certificates registered 2012.07–2012.08

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

The OIML Basic Certificate System

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

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

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

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

The OIML MAA

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

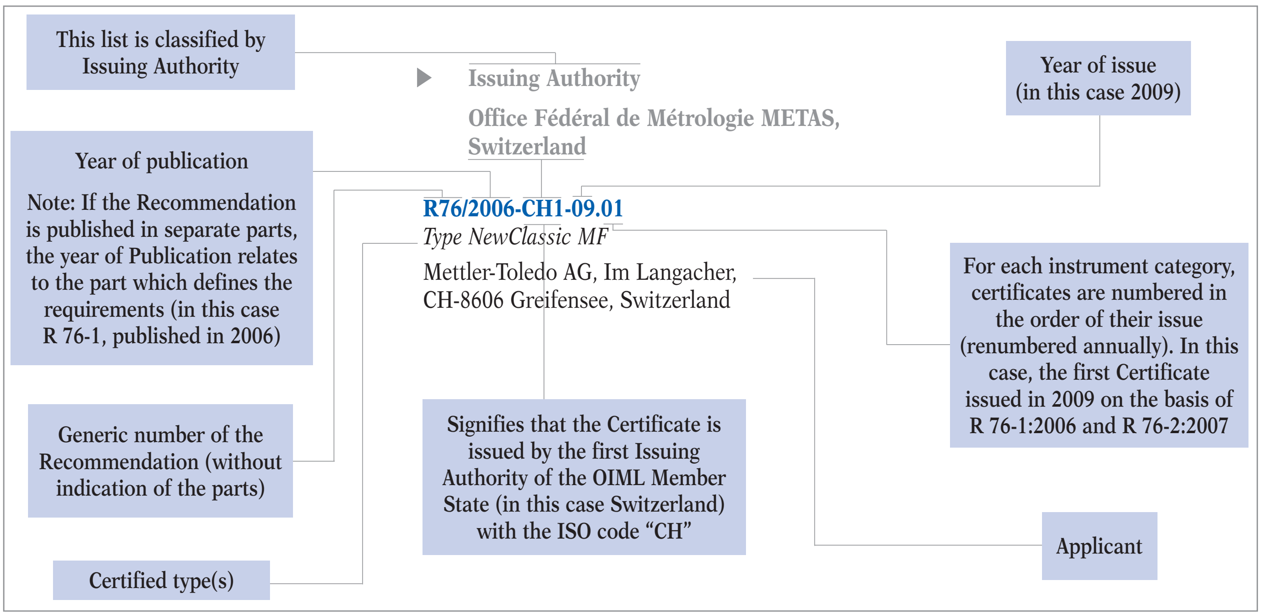
The OIML MAA is an additional tool to the OIML Basic Certificate System in particular to increase the existing mutual confidence through the System. It is still a voluntary system but with the following specific aspects:

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

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

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

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



INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Diaphragm gas meters
Compteurs de gaz à parois déformables

R 31 (1995)

Issuing Authority / *Autorité de délivrance*
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R031/1995-CN1-2011.01
Diaphragm gas meter - Type: J2.5C H
Dandong Gas Meter Co. Ltd., No. 66 Gucheng Road, Yuanbao District, Dandong, CN-118003 Liaoning, P.R. China

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

R031/1995-FR2-2005.06 Rev. 1
Compteur de gaz ITRON - Type: Gallus 2000 G2,5
ITRON France, 1 rue Chretien de Troyes, FR-51061 Reims, France

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

R031/1995-NL1-1998.01 Rev. 1
Diaphragm gas meter
Yazaki Energy System Corporation, 23 Minamikajima, Futamata-chou, Tenryu-ku, Mamatsu-shi, JP-431-3393 Shizouka-Pref, Japan

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Water meters intended for the metering of cold potable water
Compteurs d'eau destinés au mesurage de l'eau potable froide

R 49 (2003)

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

R049/2003-NL1-2006.01 Rev. 1
Water meter intended for the metering of cold potable water, model "OPTIFLUX x300C; OPTIFLUX x000F + IFC300y", class 1 and 2 (With x being 1,2,4,5 or 6 and with y being F or W)
Krohne Altometer, Kerkeplaat 12, NL-3313 LC Dordrecht, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Water meters intended for the metering of cold potable water and hot water
Compteurs d'eau destinés au mesurage de l'eau potable froide et de l'eau chaude

R 49 (2006)

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

R049/2006-DE1-2008.02 Rev. 4
Water meter for cold potable water - Type: SM100, SM100E, SM100P or SM001, SM001E, SM001P - SM150, SM150E, SM150P - SM250, SM250E, SM250P - SM700, SM700E, SM700P
Elster Metering Ltd., 130 Camford Way, Sundon Park, GB-LU3 3AN Luton, Bedfordshire, United Kingdom

R049/2006-DE1-2012.01
Water meter intended for the metering of cold potable water. Rotating piston meter with mechanical register - Type: RTKD-S
Zenner International GmbH & Co. KG, Römerstadt 4, DE-66121 Saarbrücken, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic catchweighing instruments
Instruments de pesage trieurs-étiqueteurs à fonctionnement automatique

R 51 (1996)

Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R051/1996-NL1-2012.02
Automatic catchweighing instrument - Type: LI-4600
Teraoka Seiko Co. Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, JP-146-8580 Tokyo, Japan

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 60 (2000)

Issuing Authority / *Autorité de délivrance*
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R060/2000-CN1-2011.01 (MAA)
Load Cell - Type: EX501A
Shenzhen Exact Sensor Instrument Co. Ltd., No. 23 Chuang Ye'r Road, ZhangBei Industrial Zone, Ailian LongGang, CN-215009 Shenzhen, P.R. China

Issuing Authority / *Autorité de délivrance*

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

R060/2000-JP1-2011.03 Rev. 1 (MAA)
Beam (bending) load cell - C2B1B-200K-C3, C2B1B-250K-C3, C2B1B-500K-C3, C2B1B-550K-C3, C2B1B-1T-C3, C2B1B-1.1T-C3, C2B1B-1.76-C3, C2B1B-2T-C3, C2B1B-2.2T-C3
Minebea Co. Ltd., 1-1-1 Katase Fujisawa-shi, JP-251-8531 Kanagawa-ken, Japan

R060/2000-JP1-2012.05 (MAA)
Beam (shear) load cell - Type: LCM17K500E,LCM17T001E, LCM17T002E
A&D Company Ltd., 3-23-14 Higashi-Ikebukuro, Toshima-Ku, JP-170-0013 Tokyo, Japan

Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R060/2000-NL1-2012.11 Rev. 1 (MAA)
Bending beam or shear beam load cell - Type: BM8D-xx-xx-xxx-xx Series
Zhonghang Electronic Measuring Instruments Co. Ltd. (ZEMIC), Xinyuan Road, The north zone of EDZ, Hanzhong, P.O. Box 2, CN-723000 Hanzhong-ShaanXi, P.R. China

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

R060/2000-NL1-2012.17 (MAA)
Single point load cell equipped with electronics - Type: SLP330D, SLP331D, SLP332D
Mettler-Toledo AG, Heuwinkelstrasse, CH-8606 Nanikon, Switzerland

R060/2000-NL1-2012.18
Double ended shear beam load cell - Type: SAL100A
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.19
Compression load cell - Type: SAL300A, SAL301A
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.20
Compression load cell - Type: SAL300S,SAL301S
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.21
Shear beam load cell - Type: SAL500A
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.22 (MAA)
Shear beam load cell - Type: SAL500S
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.23 (MAA)
Shear beam load cell - Type: SAL201S,SAL202S,SAL203S,SAL204S,SAL205S,
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.24
Shear beam load cell - Type: SAL200A
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.25 (MAA)
Single point load cell - Type: SAL401
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.26 (MAA)
Single point load cell - Type: SAL402
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.27 (MAA)
Single point load cell - Type: SAL404
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.28 (MAA)
Single point load cell
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.29 (MAA)
Single point load cell - Type: SAL406
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.30 (MAA)
Compression load cell - Type: SAL302A, SAL303A
Satis Co. Limited, Flat B07, Floor 23, Hover Industrial Building, No. 26-38 Kwai Cheong Road, N.T., Hong Kong

R060/2000-NL1-2012.31
Shear beam load cell - Type: CISA-I and CISA-A
ARPEGE MASTER-K, 38 Avenue des Frères Montgolfier, BP 186, FR-69686 Chassieu Cedex, France

R060/2000-NL1-2012.32 (MAA)
Shear beam load cell - Type: LP7110
Locosc Ningbo Precision Technology Co. Ltd., No. 137 Zhenyong Road, Yongjing, CN-315021 Ningbo, P.R. China

R060/2000-NL1-2012.34 (MAA)
Tension load cell - Type: 110xx
Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2012.35 (MAA)
Single point load cell - Type: PW29
Hottinger Baldwin Messtechnik GmbH, Im Tiefen See 45, DE-64293 Darmstadt, Germany

R060/2000-NL1-2012.36 (MAA)
Shear beam load cell - Type: 102TH, 102RH
Anyload Transducer Co. Ltd., 6994 Greenwood Street, Unit 102, V5A 1X8 Burnaby, BC, Canada

R060/2000-NL1-2012.37 (MAA)
Bending beam or shear beam load cell, with strain gauges - Type: T206
Avery Weigh-Tronix, Foundry Lane, Smethwick, West Midlands GB-B66 2LP, United Kingdom

R060/2000-NL1-2012.38 (MAA)
Shear beam load cell - Type: PS-3315
Vishay Israel Ltd. Transducers, 2 Haofan St., 58814 Holon, Israel

R060/2000-NL1-2012.39 (MAA)
S-beam compression load cell - Type: ST-XX-CA
Griffith Elder and Company Ltd., 1 Oaklands Park, Bury St Edmunds, Suffolk GB-IP33 2RE, United Kingdom

R060/2000-NL1-2012.39 Rev. 1 (MAA)
S-beam compression load cell - Type: ST-XX-CA
Griffith Elder and Company Ltd., 1 Oaklands Park, Bury St Edmunds, Suffolk GB-IP33 2RE, United Kingdom

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments
Instruments de pesage à fonctionnement non automatique

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

Issuing Authority / *Autorité de délivrance*

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

R076/1992-JP1-2012.02 (MAA)
Non-automatic weighing instruments - Type: F701-s
Unipulse Corporation, 9-11 Nihonbashi Hisamatsucho, Chuo-ku, JP 103-0005 Tokyo, Japan

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R076/1992-NL1-2012.21
Non-automatic weighing instrument - Type: SM-100, SM-5100
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

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

▶ Issuing Authority / *Autorité de délivrance*

Dansk Elektronik, Lys & Akustik (DELTA), Denmark

R076/2006-DK3-2012.02
Non-automatic weighing instrument - Type: DG-WB 1 / DG-WB 1D / DG-WB 2 / DG-WB 3 / DG-WB 5 / DG-WB 5D / DG-WB 6 / DG-WB 6D
Dinamica Generale s.r.l, Via Mondadori 15, IT-46025 Poggio Rusco, Italy

▶ Issuing Authority / *Autorité de délivrance*

State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R076/2006-CN1-2011.01 (MAA)
Price Labelling Scale - type: BCS-100PEA
Shang Hai Digital Balance Electronic Co. Ltd., #788 Song Xiu RD, CN-201703 District of Shanghai, P.R. China

▶ Issuing Authority / *Autorité de délivrance*

NMi Certin B.V.,
The Netherlands

R076/2006-NL1-2012.04 (MAA)
Indicator - Type: AD4408A
A&D Instruments Ltd., 24 Blacklands Way, Abingdon Business Park, Abingdon, Oxfordshire GB-OX14 1DY, United Kingdom

R076/2006-NL1-2012.08
Non-automatic weighing instrument - Type: bTwin (AMI & New AMI) / bTwin H2 (New AMI)
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2012.09
Non-automatic weighing instrument - Type: BI-10000 Helios and BI-10000 Atoll
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2012.10
Non-automatic weighing instrument - Type: Eole
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2012.11
Non-automatic weighing instrument - Type: bPro../bC-.../RL20-...
Mettler-Toledo (Changzhou) Measurement Technology Ltd., N° 111, West TaiHu Road, ChangZhou XinBei District, CN-213125 Jiangsu, P.R. China

R076/2006-NL1-2012.16 Rev. 1 (MAA)
Non-automatic weighing instrument
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.18 (MAA)
An indicator as part of a non-automatic weighing instrument - Type: X3AM, X3M, X5M, X1M
Hiweigh Technologies Ltd., No. 2278, Zhaotal Road, Puijang Town, Minhang District, CN 201112 Shanghai, P.R. China

R076/2006-NL1-2012.20
Non-automatic weighing instrument - Type: RM-40 II
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.22
Non-automatic weighing instrument - Type: DC-782 & DMC-782
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.24 (MAA)
Non-automatic weighing instrument - Type: Flex
Penko Engineering BV, Schutterweg 35, NL-6718 XC Ede, The Netherlands

R076/2006-NL1-2012.25
Non-automatic weighing instrument - Type: DS-688.
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.26
Non-automatic weighing instrument - Type: DS-673(SS)
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.27 (MAA)
Non-automatic weighing instrument - Type: WB-150
Tanita Corporation, 14-2, 1-Chome, Maeno-cho, Itabashi-ku, JP-174-8630 Tokyo, Japan

R076/2006-NL1-2012.28 (MAA)
Non-automatic weighing instrument - Type: PS1X.. Series
Xiamen Pinnacle Electrical Co. Ltd., 4F Chambridge Building, Torch High, Zone Xiamen, CN-361006 Fujian, P.R. China

R076/2006-NL1-2012.28 Rev. 1 (MAA)
Non automatic weighing instrument - Type: PS1X.. Series
Xiamen Pinnacle Electrical Co. Ltd., 4F Chambridge Building, Torch High, Zone Xiamen, CN-361006 Fujian, P.R. China

R076/2006-NL1-2012.30 (MAA)
Indicator, as part of a non-automatic weighing instrument - Type: 500 or 500-SW series
Dibal S.A., Astintze Kalea 24, Pol. Ind. Neinver, ES-48160 Derio - Vizcaya, Spain

R076/2006-NL1-2012.31 (MAA)
Non-automatic weighing instrument - Type: DS-685
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

R076/2006-NL1-2012.31 Rev. 1 (MAA)
Non-automatic weighing instrument - Type: DS-685
Shanghai Teraoka Electronic Co. Ltd., Tinglin Industry Developmental Zone, Jinshan District, CN-201505 Shanghai, P.R. China

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

Physikalisch-Technische Bundesanstalt (PTB), Germany

R076/2006-DE1-2012.01
Non-automatic electromechanical weighing instrument for persons - Type: BCA01A-C
Seca GmbH & Co. kg., Hammer Steindamm 9-25, DE-22089 Hamburg, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic level gauges for fixed storage tanks
Jaugeurs automatiques pour les réservoirs de stockage fixes

R 85 (2008)

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

Czech Metrology Institute (CMI), Czech Republic

R085/2008-CZ1-2012.02
Magnetostrictive level gauge - Type: VISY-Stick Advanced
Fafnir GmbH, Bahrenfelder strasse 19, DE-22795 Hamburg, Germany

R085/2008-CZ1-2012.03
Magnetostrictive level gauge - Type: VISY-Stick
Fafnir GmbH, Bahrenfelder strasse 19, DE-22795 Hamburg, Germany

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

NMi Certin B.V., The Netherlands

R085/2008-NL1-2012.01
Automatic level gauge for measuring the level of liquid in storage tanks, model 854ATG
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/2008-NL1-2012.02
Automatic level gauge for measuring the level of liquid in storage tanks, model 854ATG
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Instruments for measuring vehicle exhaust emissions
Instruments de mesure des gaz d'échappement des véhicules

R 99 (2008)

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

NMi Certin B.V., The Netherlands

R099/2008-NL1-2012.01
Exhaust gas analyzer - Type: OPUS400
OPUS Prodox AB, Backerstengatan 11C, Molndal, Sweden

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 117 (1995) + R 118 (1995)

▶ **Issuing Authority /** ***Autorité de délivrance***
State General Administration for Quality Supervision and Inspection and Quarantine (AQSIQ), China

R117/1995-CN1-2011.01
Fuel dispenser - Type: SKN1111, SKBF2221, SKBF1111, SKNF2221
Henghe Jiajua Tech Co. Ltd, Sanjian Piea Oubel, Yongjia, CN 325102 Zhejiang, P.R. China

REPORT

Colombian study mission to the international metrology and quality institutions

21–24 August 2012 France and Germany

Germán Sanz
Ministry of Commerce, Industry and Tourism

A mission took place from 21 to 24 August 2012 to study the role the various international metrology organizations play and their relations with Colombia. The delegation consisted of representatives of the leading Colombian National Quality Subsystem institutions.

The "Regulation Department" of Colombia, with the support of the "Assistance to Trade Technical Project" financed by the European Union, has been working hard to strengthen the Colombian Quality Subsystem. The goal is to achieve international recognition of the entities that are part of the Colombian Quality Infrastructure and to increase confidence in the measurements, certifications and accreditations that these entities perform in the country.

With the aid of the EU Project the Colombian government created the National Metrology Institute, the activities of which are currently focused on strengthening its institutional and technical structures. Technical support is also given to the National Accreditation Agency with the objective of achieving international recognition; support was also provided to the Superintendency of Industry and Commerce to strengthen the department responsible for legal metrology.

At the same time the national government, under the leadership of the Ministry of Commerce, Industry and Tourism, has been promoting the next steps that will be necessary to ensure international recognition of the Colombian Quality System. On December 15, 2011 the Colombian Congress approved a law by means of which Colombia will apply both to adhere to the Metre Convention and also to ratify the Convention of the International Organization of Legal Metrology to

INFORME

Misión colombiana de estudio a las instituciones internacionales de metrología y calidad

21–24 de Agosto de 2012 Francia y Alemania

Germán Sanz
Ministerio de Comercio, Industria y Turismo

Del 21 al 24 de Agosto de 2012 se llevó a cabo una misión de estudio del rol de entidades que conforman el sistema internacional de metrología y su relación con Colombia. La delegación estuvo conformada por representantes de las instituciones que lideran en Colombia el Subsistema Nacional de Calidad.

La Dirección de Regulación de Colombia, con apoyo del Proyecto Asistencia Técnica al Comercio que financia la Unión Europea, ha venido trabajando muy decididamente en el fortalecimiento del Subsistema Colombiano de Calidad. La metaes lograr el reconocimiento internacional de las entidades que hacen parte de la infraestructura de la calidad colombiana e incrementar la confianza en las mediciones, certificaciones y acreditaciones que dichas entidades realizan en el país.

Con el apoyo del del Proyecto el Gobierno Colombiano creó el Instituto Nacional de Metrología y se viene trabajando en su fortalecimiento técnico e institucional. Así mismo se está acompañando técnicamente al Organismo Nacional de Acreditación para lograr su reconocimiento Internacional, y se ha apoyado a la Superintendencia de Industria y Comercio en fortalecer el área encargada de velar por la metrología legal.

Simultáneamente el Gobierno Nacional bajo el liderazgo del Ministerio de Comercio, Industria y Turismo viene adelantando otros pasos necesarios para el reconocimiento internacional del sistema de calidad Colombiano. El pasado 15 de Diciembre de 2011 se aprobó mediante ley en el Congreso de la República por la cual Colombia podrá adherir a la Convención del Metro y también ratificar la Convención de la become a Member State, thus creating the necessary international links for the entities that are part of the Colombian Quality infrastructure in the field of metrology.

Given these developments and in anticipation of the next steps to adhere to these International Conventions, the EU project supported the Regulation Department's visit to the BIPM and the BIML in France. The other aim of the mission was to exchange experiences with countries that have the best quality infrastructure systems, oriented to cover the demands of the productive sector. The delegation also visited various entities that are part of the German quality infrastructure: PTB, DIN, BAM, and the Ministry of Economy, among others.

The delegation comprised the following officials of the Colombian entities that are part of the National Quality Subsystem:

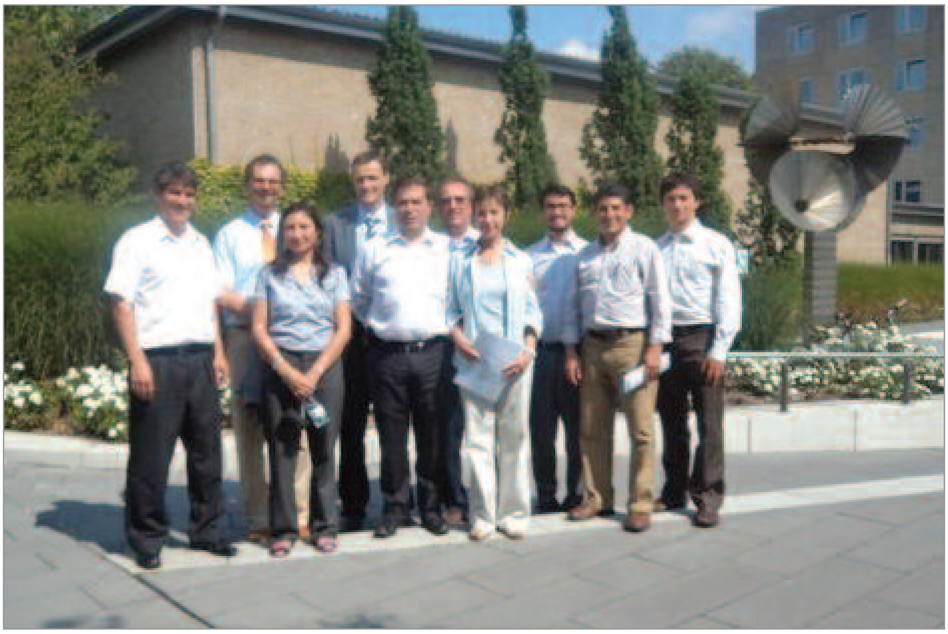
- Luis Felipe Torres – Director of Economic Regulation, Ministry of Commerce, Industry and Tourism
- Alejandro Giraldo – Superintendent in charge of the surveillance of Legal Metrology, Superintendency of Industry and Tourism
- Hernán Alzate – Director of the National Metrology Institute
- Ana Paola Gomez – Deputy Director of Business Development, National Planning Department

Organización Internacional de Metrología Legal para ser un Estado Miembro, creando los vínculos internacionales necesarios para las entidades que hacen parte de la infraestructura de la calidad colombiana.

Ante estos avances y anticipando los próximos pasos para adherir a estas Convenciones Internacionales, el Proyecto de la Unión Europea apoyó a la Dirección de Regulación con la realización de una visita a las sedes en Francia del Buro Internacional de Pesas y Medidas - BIPM y a la Organización Internacional de Metrología Legal - OIML, instituciones que hacen parte del Sistema Internacional de Metrología Así mismo con el objetivo también de intercambiar experiencias con países que tienen los mejores sistemas de infraestructura de la calidad orientadas hacia la demandas del sector productivo, se realizaron también visitas a las diversas entidades que hacen parte del sistema de calidad de Alemania (PTB, DIN, BAM, Ministerio de Economía entre otros).

Participaron en la misión los siguientes funcionarios de las entidades colombianas que hacen parte del Subsistema Nacional de Calidad:

- Luis Felipe Torres – Director de Regulación Económica Ministerio de Comercio, Industria y Turismo
- Alejandro Giraldo – Superintendente Delegado para la vigilancia de la Metrología Legal de la Superintendencia de Industria y Turismo
- Hernán Alzate – Director del Instituto Nacional de Metrología
- Ana Paola Gomez – Subdirectora de Desarrollo Empresarial del Departamento Nacional de Planeación.



Industry meets Science

The 3 day conference in the heart of Paris offers the opportunity to understand the latest technical developments in measurement, explore industrial challenges and develop solutions that will enhance innovation and performance through:

- A varied conference programme, featuring 180 presentations attended by over 1000 measurement professionals
- Poster sessions demonstrating latest technical developments with an opportunity to meet the specialists
- An exhibition showcasing innovations and solutions
- A range of technical site visits exploring industrial best practice

AIMS OF THE EVENT

- Explore the evolution of measurement techniques and their implications for Industry, R&D and society
- The added value of measurement as a tool for quality of products and processes
- The participation in the development of innovative technologies

PARTICIPANTS

More than 1,000 specialists from 50 different countries

- Users of measurement technology in industry, research and academia
- Manufacturers of measurement equipment and instrumentation
- Quality managers and decision makers
- Academics and researchers

THEMES

CONTROL OF MEASUREMENT, ANALYSIS AND TESTING PROCESSES
measurement uncertainties, traceability, interlaboratory comparisons, calibration, verification, accreditation, training and qualification of staff, cost optimisation, certification, modelling and numerical methods, organisation of the metrology function, standardisation

PHYSICAL AND CHEMICAL MEASUREMENTS
mass, force, flow, pressure, dimensional, electricity-magnetism, time-frequency, temperature, hygrometry, optics and photonics, chemical metrology, materials, ionising radiation, acoustics, gravimetry.

REGULATION, LEGAL METROLOGY, INTERNATIONAL RECOGNITION

NEW METROLOGY AND NEW SECTORS
biotechnology, environment, nanotechnology, health and medicine, sensory metrology, expectation and perception.

ROUND TABLES

- Metrology challenges for nanotechnologies
- The metrological requirements specific to high-tech trades (automotive, aerospace, medical)
- Medical biology and accreditation
- The importance of metrology in food processing
- Risk management in assessing the product conformity
- How measurement supports the development of low carbon technologies

For more information and to submit a paper:
www.metrologie2013.com

RLMO NEWS

Sixth AFRIMETS General Assembly

Ian Dunmill, BIML

The Sixth AFRIMETS General Assembly and associated meetings took place from 10–14 September 2012 at the Bénin Marina Hotel in Cotonou, Bénin.

The first day consisted of a number of parallel sessions including workshops on temperature and mass and related quantities, as well as a legal metrology working group, which were open to all delegates and to other stakeholders and invited guests from industry.

The AFRIMETS working groups on legal metrology, temperature and mass and related quantities met on the second day of the series of meetings, and there was also a meeting of the AFRIMETS Excom (Executive Committee).

The General Assembly met for two days, the first of which was taken up with keynote presentations from the OIML, BIPM and UNIDO, as well as updates from the sub-regional metrology organisations which comprise AFRIMETS: CEMACMET, EAMET, MAGMET, NEWMET, SADCMET/MEL and SOAMET. There was also feedback from the working groups which had met earlier in the week, and information on the programmes of NEPAD (the New Partenership for Africa's Development), in particular a planned workshop presenting the pillars of quality infrastructure.

On the second day, the General Assembly discussed the AFRIEMTS work programme for the coming year, both for legal metrology and scientific and industrial metrology. One of the main items for discussion was the AFRIMETS Legal Metrology School which is planned to be held in September 2013.

This School is intended to build on the success of the 2011 AFRIMETS Metrology School held in Nairobi, Kenya (see the April 2011 OIML Bulletin). Although plans are at an early stage, it is likely to be held in Tunis. An organising committee has been established, consisting of representatives of the BIML (lead), UNIDO (coordinator), PTB and the previous hosts, Kenya, as well as the AFRIMETS secretariat and the chairperson of the AFRIMETS legal metrology working group. It is hoped that a number of subjects included in the current and previous AFRIMETS legal metrology working group can be taken into consideration in the planning of the School. Further information will be provided in a later OIML Bulletin.

Other items discussed during the meeting and covered by its Resolutions included:

Membership fees

There will be an annual discussion on this matter, since currently no fees are paid, but AFRIMETS sees a need to move towards a more self-supporting and sustainable model in the future.

Financial strategy

The strategy in the existing AFRIMETS roadmap is to be reviewed in consultation with the subregional metrology bodies.

Survey of current status and needs in legal metrology

An "environmental scan and questionnaire" which was circulated last year, but to which a poor response was received is to be redistributed. Complete information from this survey is seen as being of paramount importance to the successful planning of the Legal Metrology School.

Legal metrology working group chairperson

A new chairman was appointed: Mr. Boubacar Issa (representing SOAMET).

Encouragement of upcoming national bodies

In both scientific and legal metrology, the importance of inter-subregional metrology body collaboration and coaching was highlighted, and the leading national bodies were reminded to keep the needs of least developed countries in mind.

New Ordinary Member of AFRIMETS

Gambia was accepted as an Ordinary Member, and will be invited to sign the AFRIMETS Memorandum of Understanding.

Use of the French language

The importance of translating official AFRIMETS documentation into French was noted, and a volunteer was found to translate the meeting's minutes and other relevant documents.

Next meeting

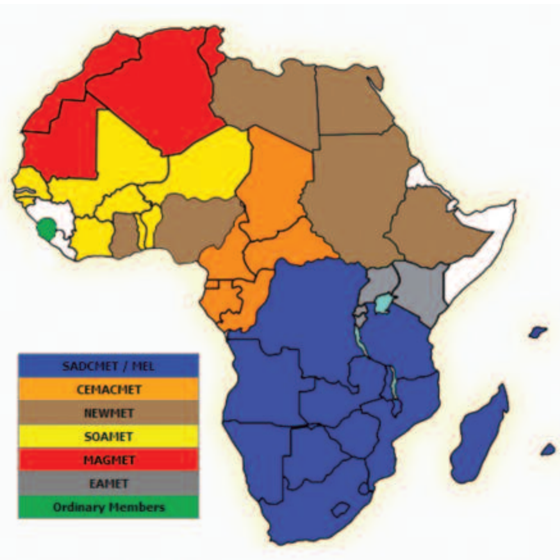
It was decided to hold the next AFRIMETS General Assembly in July 2013 in Botswana. ■

Principal Members of AFRIMETS:

SADCMET/MEL:	Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe
SOAMET:	Bénin, Burkina Faso, Guinea Bissau, Mali, Niger, Senegal, Togo, Côte d'Ivoire
CEMACMET:	Cameroon, Central African Republic, Chad, Congo Brazzaville, Equitorial Guinea, Gabon
EAMET:	Kenya, Uganda, Rwanda, Burundi
MAGMET:	Morocco, Algeria, Tunisia, Mauritania
NEWMET:	Egypt, Nigeria, Ethiopia, Ghana (+ Libya and Sudan which have not yet signed the MoU)

Ordinary Members:

Sierra Leone (+ Gambia which was accepted at the 2012 General Assembly)



Delegates attending the Sixth AFRIMETS General Assembly

The OIML is pleased to welcome the following new

CIML Members

- **Austria**
  Mr. Robert Edelmaier
- **Belarus**
  Dr. Victor Vladimirovich Nazarenko
- **Saudi Arabia**
  Dr. Saad Al-Kasabi
- **Slovak Republic**
  Prof. Ing. Jozef Mihok

Corresponding Member

- **Namibia**

OIML Meetings

47th CIML Meeting, 14th Conference & Associated Events
1–5 October 2012 (Bucharest, Romania)

TC 6 (Prepackaged products)
22–26 October 2012 (Tokyo, Japan)

TC 18/SC 1/p 1 (Blood pressure instruments)
22–26 October 2012 (PTB, Berlin, Germany)

TC 8/SC 3 (Dynamic volume and mass measurement - liquids other than water)
13–15 November 2012 (Paris, France)

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Stay informed

Committee Draft

Received by the BIML, 2012.07 – 2012.09

Revision of OIML R 60-1 and -2: Metrological regulation for load cells Part 1: Metrological and technical requirements Part 2: Metrological controls and performance tests	E	1 CD	TC 9	US


OIML BULLETIN

Volume LIII • Number 4
October 2012

Quarterly Journal

Organisation Internationale de Métrologie Légale

History of scales: Parts 3 and 4

Call for papers

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


OIML BULLETIN

Volume LIII • Number 3
July 2012

Quarterly Journal

Organisation Internationale de Métrologie Légale

World Metrology Day 2012:
A resounding success!

- 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:

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(chris.pulham@oiml.org)


OIML BULLETIN

Volume LIII • Number 2
April 2012

Quarterly Journal

Organisation Internationale de Métrologie Légale

Theme: Evolving Concepts in Metrology


OIML BULLETIN

Volume LIII • Number 1
January 2012

Quarterly Journal

Organisation Internationale de Métrologie Légale

The CIML meets in Prague, Czech Republic