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Online traffic surveillance:
How safe are the data transmission systems?

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Editorial

Jean-François Magaña
BIML Director

Preparing for Berlin

As you are receiving this Bulletin, Member States, Corresponding Members and Liaison Institutions are preparing their documents to leave for the OIML Meetings in Berlin.

The meetings which will take place are of strategic importance for our Organization. The OIML Conference will decide on the budget of the OIML for the period 2005–2008 and on the major orientations of the Organization, the International Committee will elect a President and a First Vice-President, important decisions will be made concerning the *OIML Certificate System* and the implementation of the *Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations* (MAA), and the setup for supporting Developing Countries will be reviewed. A Forum on Developing Countries will be held in order to allow donors and beneficiaries of technical assistance to express both their offers and their needs, and to initiate discussion.

All these issues should result in a better service rendered by the OIML to Members and, more generally, to all countries. The Bureau will continue its best efforts to continuously improve this service, and we are encouraged in this by the large number of countries who approach us with the intention of becoming OIML Corresponding Members or Member States. ■

Préparations pour Berlin

Alors que vous recevez ce Bulletin, les États Membres, les Membres Correspondants et les Institutions en Liaison sont en train de préparer leurs documents pour aller assister aux réunions de l'OIML à Berlin.

Les réunions qui se tiendront sont d'une importance stratégique pour notre Organisation. La Conférence de l'OIML décidera du budget de l'OIML pour la période 2005–2008 et des orientations majeures de l'Organisation, le Comité International élira un Président et un Premier Vice-Président, d'importantes décisions seront prises concernant le *Système de Certificats OIML* et la mise en œuvre du document cadre pour un *Arrangement d'Acceptation Mutuelle des évaluations OIML de type* (MAA), et l'organisation actuellement en place pour le soutien aux Pays en Développement sera revue. Un Forum sur les Pays en Développement se tiendra afin de permettre aux fournisseurs et aux bénéficiaires d'assistance technique d'exprimer leurs offres et leurs besoins et de commencer à en discuter.

Tous ces sujets auront pour résultat d'améliorer le service rendu par l'OIML aux Membres et, plus généralement, à tous les pays. Le Bureau continuera à s'efforcer d'améliorer sans cesse ce service, et nous sommes encouragés en cela par le nombre important de pays qui nous contactent en vue de devenir Membres Correspondants ou États Membres de l'OIML. ■

OIML R 117: APPLICATION

Liquid flow measuring systems on pipelines

Dr. Detlev Mencke

Foreword

A measuring system on a pipeline for crude oil is a complex system. The measured quantities are very large, the liquid contains different types of hydrocarbons (from light liquefied petroleum gas to heavy bitumen), the measurements cannot be repeated, and the flow cannot easily be interrupted. In addition, nearly all types of measurement signals (analog and digital) and processing devices are used, and testing the measuring instruments is not easy.

On the basis of such a measuring system, the author wishes to present some of his ideas concerning construction and testing, measurement signals and checking facilities, and the holistic and atomistic principles of liquid flow measuring systems.

1 Liquid flow measuring system

1.1 Types of liquid flow measuring systems

For a long time, in the English language the "system" of a liquid meter together with gas elimination device, filter, pump, and valves, was called a "measuring assembly", a translation of the French term "ensemble de mesurage".

During a meeting of the responsible OIML Subcommittee (formerly SP5D/SR1, now TC 8/SC 3) in April 1989, the English-speaking members of the Subcommittee decided that in the future the term "measuring system" would be used.

According to OIML R 117 "Measuring systems for liquids other than water" [1] there exist many different types of "liquid flow measuring systems", for instance:

- Fuel dispensers intended for refueling motor vehicles;
- Measuring systems for loading trucks;
- Measuring systems on a road tanker;
- Measuring systems on a pipeline for crude oil; and
- Measuring systems for loading and unloading ships, etc.

OIML R 117 is under revision; a new version will likely be available during 2005. Because some definitions in the existing version dated 1995 are not as clear as desired, the following definitions are taken from the 2nd Committee Draft version of R 117-1 [2] (partial quotations):

T.1.1 The *measuring system* is a system which comprises a meter for quantities (volume or mass) of liquids and its ancillary devices and additional devices.

T.1.2 The *meter for quantities of liquids* is an instrument intended to measure continuously and display the quantity of liquid passing through the measuring device at metering conditions.

T.1.3 The *measuring device* is a part of the meter converting the flow, the volume or the mass of the liquid to be measured into signals, representing volume or mass, aimed for the calculator. It consists of a meter *sensor* and a *transducer*.

T.1.4 The *calculator* is a part of the meter that receives the output signals from the measuring device(s) and, possibly, from associated measuring devices, processes them and, if appropriate, stores in memory the results until they are used. In addition, the calculator may be capable of communicating both ways with ancillary devices.

T.1.5 The *indicating device* is a part of the meter which displays continuously the measurement results.

T.1.6 Examples of *ancillary devices* are a printing device and conversion device.

T.1.7 Examples of *additional devices* are a gas elimination device, filter, pump, and valves.

1.2 Measuring system on a pipeline for crude oil

This example of a measuring system is installed at the end of a long pipeline from Marseille (France) to Karlsruhe (Germany) with a length of about 760 km, a nominal diameter of 600 mm and a maximum flowrate of 6000 m^3/h. The system consists of:

- Two measuring devices (parts of turbine meters in parallel);
- One associated measuring device for the temperature;
- One associated measuring device for the density;

- One associated measuring device for the pressure; and
- Two associated measuring devices for the viscosity.

In order to minimize the influence of the flow disturbances each turbine measuring device is installed between a straightener and a straight pipe with a length of twelve times the diameter upstream and a straight pipe with a length of five times the diameter downstream of the device. All associated measuring devices are installed in a special controlled bypass downstream of the meters branch.

Figure 1 shows the installation of these devices installed outdoors at the end of the pipeline. The compartment with the associated measuring devices is shown on the right. Figure 2 shows the interior of this compartment.

The tasks of the electronic calculator are as follows:

- Checking of all signals emanating from the measuring devices;
- Control of the equilibrium of the flowrates passing through the two turbines;
- Correction of the volume values depending on the flowrate and the viscosity;
- Conversion of the volume at metering conditions to the volume at base conditions (15 °C) and to the mass depending on the density and pressure;
- Checking of the functioning of all these calculation procedures;
- Transfer of the results to a video monitor as indicating device and to two printers; and
- Storage of all relevant values of the last deliveries.

These tasks are performed several times during the delivery. For instance, each time after a volume difference (at metering conditions) of 10 m^3, the temperature, density and pressure are measured. Then the differences of the volume at base conditions and of the mass are calculated depending on the measured values, and added to the previous values.

The large quantities to be measured are divided into batches, which belong to different customers. Each time a new batch begins, the valves to the large storage tanks are automatically closed and respectively opened, the last values are stored in a memory and printed, and the counting devices are set to zero. On the video monitor the following values together with their designation (for example "Volume at 15 °C"), the unit and the decimal sign are indicated:

- Actual date and time;
- Time since the last setting to zero;
- Name of the customer;

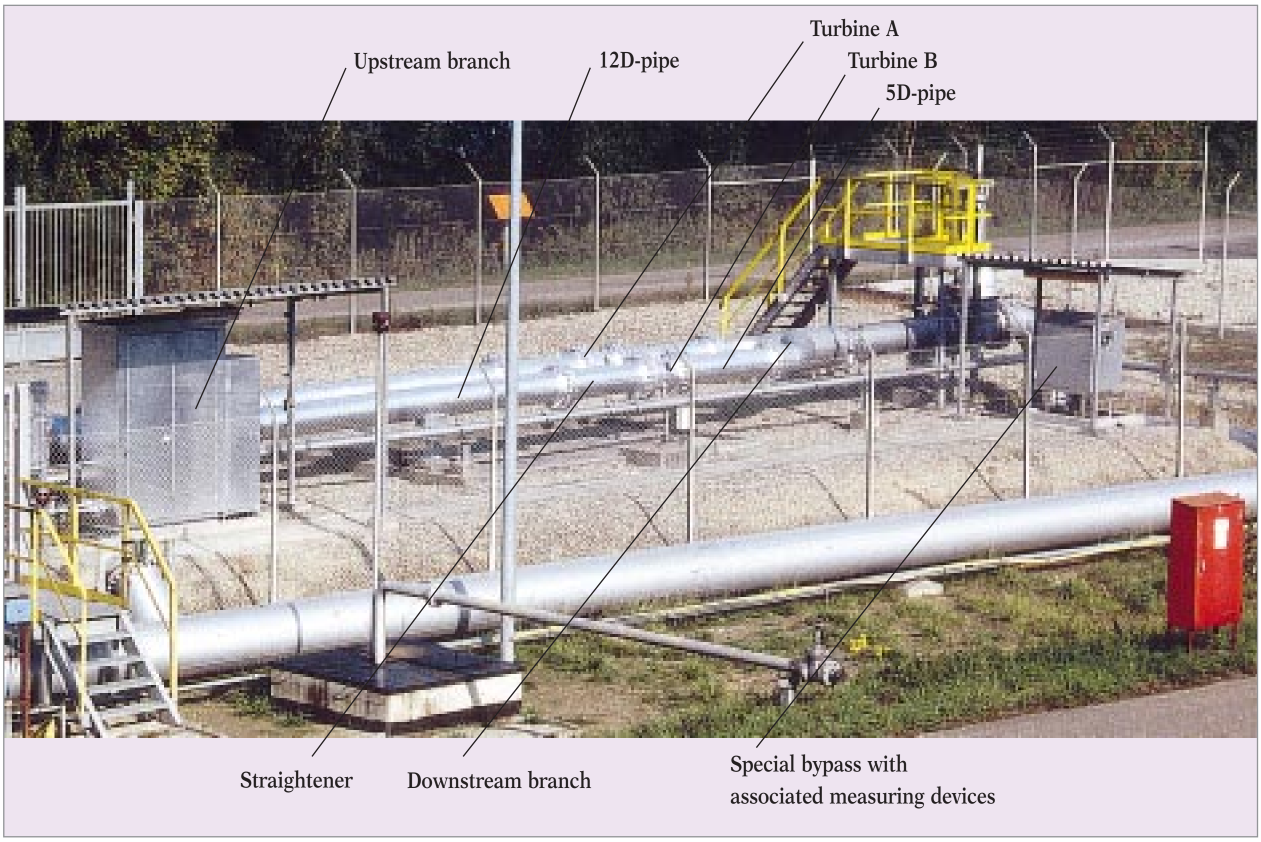

Fig. 1 Installation of the pipeline measuring system

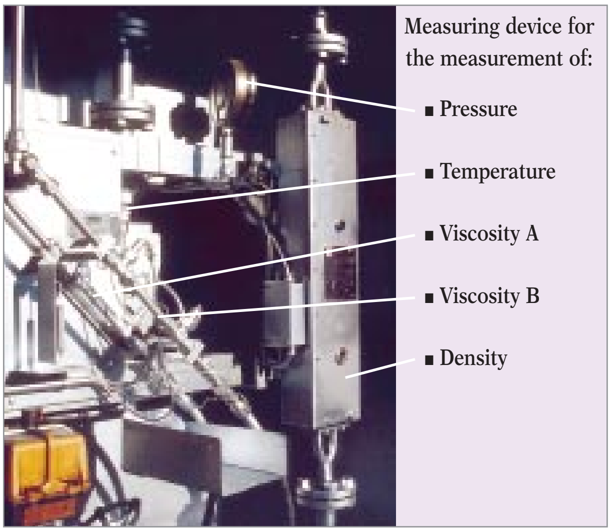

Fig. 2 Interior of the compartment with the associated measuring devices

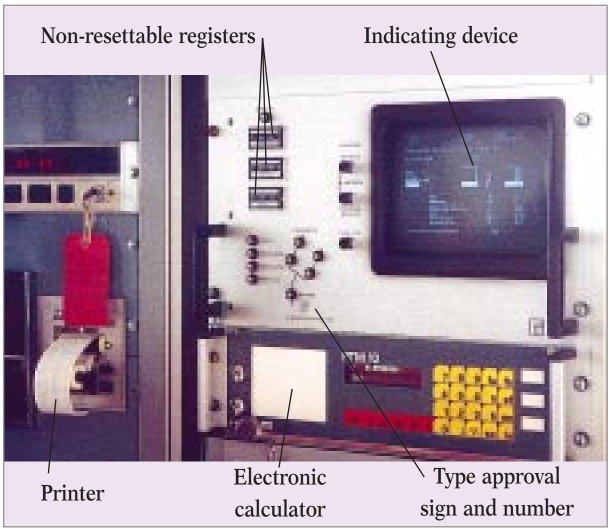

Fig. 3 Calculator, indicating device and ancillary devices

- Total volume at metering conditions;
- Total volume at 15 °C;
- Total mass;
- Total weight in air;
- Actual volume flowrate;
- Actual temperature;
- Actual pressure;
- Actual density at metering conditions;
- Actual density at 15 °C;
- Actual dynamic viscosity;
- Actual kinematic viscosity.

Figure 3 shows the calculator, the video monitor and the printer. In addition to the indicating device, non-resettable mechanical registers are used to verify the measured quantities in case of a power failure.

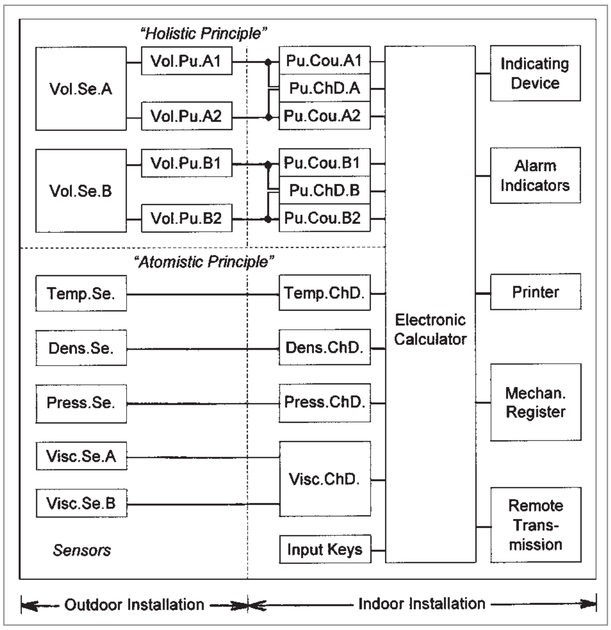

Fig. 4 Structure of the pipeline measuring system

The structure of this pipeline measuring system is shown in Fig. 4. From left to right, first the sensors are described, followed by the transducers, the calculator, and the indicating devices. The function of the so-called checking devices and the vertical partition in "holistic principle" and "atomistic principle" will be discussed later.

Abbrev.	Element of the system	Technical realization
Vol.Se.A.	Volume sensor A	Turbine meter wheel
Temp.Se.	Temperature sensor	Platinum resistance
Dens.Se.	Density sensor	Vibrating tube instrument
Press.Se.	Pressure sensor	Piezoelectric sensor
Visc.Se.A	Viscosity sensor A	Falling ball viscosimeter
Vol.Pu.A1	Volume pulser A1	Electronic pulser
Pu.Cou.A1	Pulse counter A1	Part of the calculator
Pu.ChD.A	Pulse checking device A	Checking of pulse conformity
Temp.ChD.	Temp. checking device	Checking of electr. resistance
Dens.ChD.	Density checking device	Checking of frequency
Press.ChD.	Pressure checking device	Checking of current
Visc.ChD.	Viscosity checking device	Checking of time interval

1.3 Testing of the measuring system

The way of testing a measuring system of this size is different from the test procedure of smaller systems. For instance a fuel dispenser intended for the refueling of motor vehicles is usually tested by filling a standard capacity measure of 10 litres using the nozzle of the dispenser, and at the end of the test the indicated volume at the dispenser (dynamic measurement) will be compared with the level indication of the measure (static measurement).

In the case of pipeline measuring systems, OIML R 117 allows the separate verification of the meters used on a control test station. The whole measuring system shall be subjected to a qualitative function check and its installation in situ. From the author's knowledge the test described here was performed only once and is the sole realistic test of a pipeline measuring system (in the same way as fuel dispensers) on the occasion of a type approval procedure.

First, the two turbine meters were tested with five different petroleum products on the test bench at Fos-sur-Mer near Marseille, France. In addition, each associated measuring device was tested with at least two different liquids.

Experts from the German Verification Office in the Federal State Rhineland-Palatinate (and under the author's responsibility) tested the measuring system on a pipeline for crude oil in the following way. The test measure was a large storage tank with a floating roof and with a diameter ca. 68 m, as shown in Fig. 5. The difference in height between the start and the end of the test was about 4.05 m. All measurements of the gauging and immersion of the roof were made manually using graduated tapes. Figure 6 shows the measurement of the liquid level with a graduated tape. Because the atmosphere above the roof of the tank is hazardous depending on the gaseous parts of the crude oil, breathing apparatus had to be used when measuring the immersion of the roof, as shown in Fig. 7. During the test several samples of the liquid were taken and tested later in the laboratory.

Fig. 5 View of the large storage tank used as test measure

Fig. 6 Manual measurement of the liquid level using graduated tape

Fig. 7 Manual measurement of the immersion of the roof

1.4 Results of the measurement

At the start of the test and after a measuring time of about 4.5 h the following values were indicated on the video monitor:

	Start	End
Time	10:49 h	15:21 h
Volume at meter. cond.	0	14744 m^3
Mass	0	12420 t
Flowrate	0	3400 m^3/h
Temperature	16.1 °C	16.2 °C
Density at 15 °C	843.7 kg/m^3	843.1 kg/m^3
Pressure	2.9 bar	3.1 bar
Kinematic viscosity	6.0 mm^2/s	6.0 mm^2/s

As can be seen, the values of the temperature, density, pressure and viscosity remain very stable during the whole measurement operation.

The "true value" for this special measurement was calculated from the manually measured values of the large storage tank (including the displacement of the floating roof) and from the values for temperature and density of the samples taken together with all necessary corrections.

The "measured value" was the total mass indicated on the video monitor.

The real "overall deviation", i.e. the "measured value" minus the "true value" divided by the "true value", was 0.051 %. This is an excellent value, but it is a random deviation which is only valid for this unique measurement. It is very small in relation to the MPE (maximum permissible error) of 0.3 % valid for measuring systems on pipelines as laid down in OIML R 117 for accuracy class 0.3. But it is not an "error of measurement", because no uncertainties were taken into consideration.

On the other hand, the accuracy class 0.3 valid for measuring systems on pipelines seems to be a realistic value, which can be accomplished in practice.

2 Measurement signals and checking facilities

2.1 Correct and incorrect states of a measuring instrument

In the field of industrial measurements with a measuring instrument and in the field of related data processing, there exist five different states as follows:

1 The measuring instrument is working correctly; all measured values are within the MPE
Permissible state

2 The measuring instrument has a complete failure and does not indicate any value
Unwanted, but permissible state *)

3 The measuring instrument detects a significant fault (using a checking facility):

3a *Either:* The indication of the measured value is inhibited and the measurement interrupted, if possible (stopping the flow)
Permissible state for interruptible measuring system

3b *Or:* The displayed value is clearly indicated as being wrong (visible or audible alarm for the attention of the operator)
Permissible state for non-interruptible measuring system

4 The measuring instrument does not detect the fault, but the indication cannot be interpreted, memorized or transmitted as a measurement result
Permissible state

5 Neither the measuring instrument nor the operator detects a significant fault; a wrong value (outside of MPE) is indicated and leads to a falsification of the measured data
Non-permissible state

*) That is the author's opinion, but valid only for industrial measurements. If no measurement can be made, then no error is made in the sense of MPE.

For example, interruptible measuring systems are fuel dispensers and measuring systems for the loading of trucks, and non-interruptible measuring systems are measuring systems on a pipeline for crude oil.

In the sense of legal metrology, state 5 is a non-permissible state and must be transformed into one of the other permissible states.

In the common understanding of "reliability" all states except state 1 are non-permissible states. If a measuring instrument does not indicate any value (state 2), makes an alarm (state 3) or shows a wrong value (states 4 or 5), it is called an "unreliable instrument".

2.2 Types of measurement signals

The measurement signals between parts of the measuring instruments, related data processing devices and ancillary devices can be divided into the following five groups:

Group A Voltages, currents, resistances
Group B Frequencies
Group C Times and time intervals
Group D Incremental pulses
Group E Coded signals

Measurement signal	direct and alternating voltage/current		pulses, binary and ternary signals		
Signal parameter	amplitude	frequency	interval	count of pulses	code
Symbol	***I, U, R***	***f***	***t***, τ	***i***	***n***
Type of signal	analog	analog	analog	incremental	coded
Group	**A**	**B**	**C**	**D**	**E**

Voltage, current, and resistance are generally *analog* measurement signals; the signal parameter is the amplitude.

In the classification of analog and digital, the frequency has a special (hybrid) position. It is in continuous relationship with the density ρ of the liquid, it is produced as an analog measured signal. It can be checked in an analog way and be determined by means of the inductive reactance ωL. Generally, however, its value is determined by counting the zero passages within a specified time interval; thus it assumes an apparently digital function.

The behavior of the pulses and binary and ternary signals can be explained with the aid of Fig. 8. The term "ternary signal" designates a signal for which the two

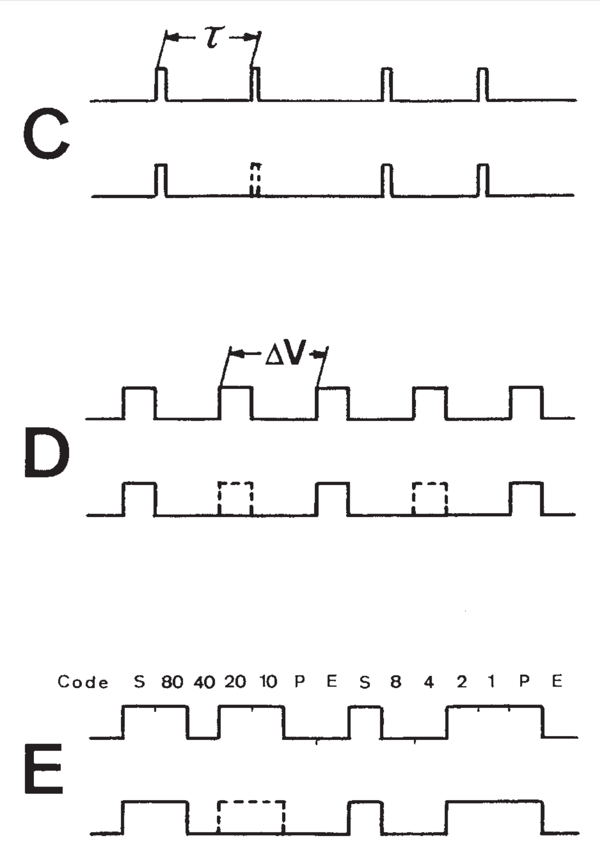

Fig. 8 Pulses, binary and ternary signals

logical states "yes" and "no" are represented by signals differing from zero, e.g. + 24 V and – 24 V so that the value 0 V can be used for fault detection (breaking of cables).

In Fig. 8 each of the signal types identified by the letters C to E (in conformity with the table above) is represented twice:

- In the *upper* line as an *undisturbed* signal; and
- In the *lower* line as a signal *disturbed* by lacking pulses.

For signal C, the time interval τ between the first and the second pulse (in relation to the time interval between the first and the third pulse) represents the *analog* signal parameter. With this type of signal, difficulties arise when one pulse is lost. Therefore either the time intervals must be determined several times or a trouble free transmission must be aimed at.

Signals D and E are referred to as *digital* signals; with respect to the errors resulting from troubles, they are divided in this paper into *incremental* signals D and *coded* signals E.

Signal D is the mostly used form of transmission of pulses in lines between the measuring device of a liquid meter and the coupled calculator and indicating device. Each pulse represents a constant increment ΔV of volume. To determine the total volume V, these pulses must be counted during the measuring operation.

Loss of individual pulses during measurement and transmission will lead to an error of the measurement result, which is in a *certain relation* to the MPE of the liquid meter.

Signal E is the usual type of transmission of *digital* data between two electrical devices such as calculator and printer. In Fig. 8 the example of the transmission pattern of a simple sequence of binary signals is used (only with the logical states "yes" and "no", the so-called BCD "binary coded decimal number"):

S - 80 - 40 - 20 - 10 - P - E - S - 8 - 4 - 2 - 1 - P - E

with S start bit (always "yes");
P parity bit (for odd parity);
E stop bit (always "no").

Loss of individual pulses during measurement and transmission will in this case lead to an error of the measurement result which is *not* in a certain relation to the MPE of the liquid meter; *any error* is possible (maximum 50 %).

2.3 Operational fault perceptibility

Nearly 40 years ago, the author introduced the term "operational fault perceptibility" (in German "Funktionsfehler-Erkennbarkeit") as a principle valid for type approvals of liquid meters with electronic devices. At this time the first positive displacement meter with an electronic pulser came on the market. The pulser was connected with a so-called remote counter, which counted the pulses and indicated the total value at a central place. The author's idea was that the measuring system including the remote counter should *"perceive"* malfunctions or *"faults"* during the *"operation"* of the system (generation and transportation of the pulses), and sound an alarm in the case of a malfunction.

Special requirements for pulse driven remote counters were laid down in Germany at that time, based on comprehensive tests made with piston meters and oval gear meters. An example of such a realistic test is shown in Fig. 9, which shows the diagram of pulse sequences determined on the PTB's test bench. The manual operation of the main valve of the test bench enabled a transition time during the opening and closing procedure of about 1/10 second.

The test was made with an oval gear meter with a magnetic clutch between the measuring chamber (wet room) and the gear (dry room). The pulser was not equipped with an anti-backlash clutch.

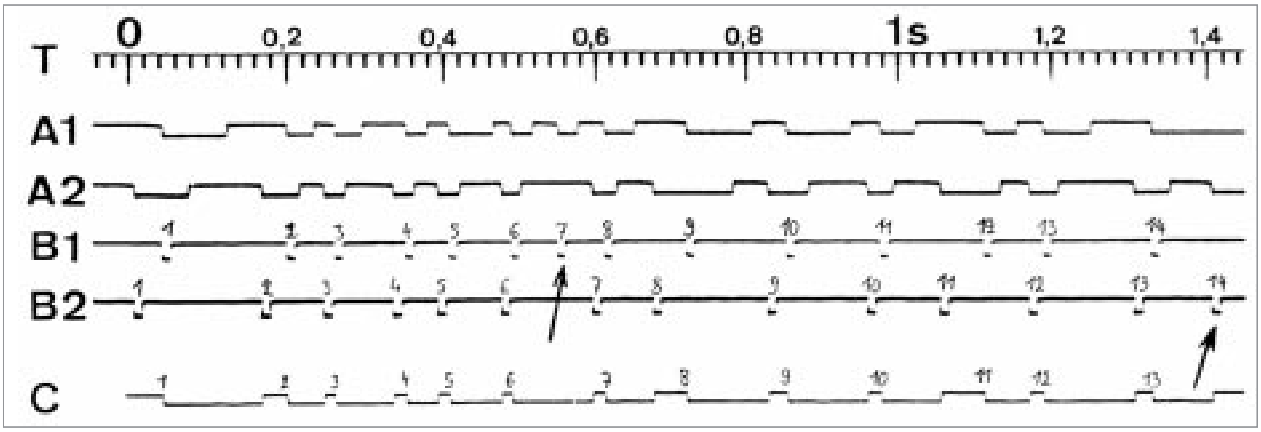

Fig. 9 Recording of pulses from an oval gear meter

T	Time scale (0 to 1.4 seconds);
A1	Original pulses from pulse generator 1;
A2	Original pulses from pulse generator 2 (pulse shift 90º);
B1	Transformed pulses 1 (edges of original pulses 1);
B2	Transformed pulses 2 (edges of original pulses 2);
C	Pulses to be counted (one pulse equals one litre).

At place 7 a wrong pulse was created in line 1 and detected by the checking device, because the axis of the disk of the pulser was moving backwards (swinging backwards and forwards of the built-in magnetic clutch) for a very short time.

At place 14 a wrong pulse was created in line 2 (not in line 1) for the same reason and was again detected by the checking device.

The real volume passing through the volume sensor was 13 litres and not 14 litres!

Many additional trials and tests were made to *simulate* the generation of pulses, particularly for the combination of a piston meter (for fuel dispensers) with an optical-mechanical pulser. These trials did not lead to a sufficient possibility of simulation in order to clearly define the "interface" between the output of the pulser and the input of the calculator. So for many years the pulser with two pulse systems, with a pulse shift of 90º and with a mechanical backlash clutch was (and sometimes is until today) the "state of the art".

The requirements valid in Germany based on the principle of "operational fault perceptibility" were at first laid down in special type approvals given to European manufacturers. After ten years of experience the author published (world-wide for the first time) some of these requirements in the journal "PTB-Mitteilungen" [3], available also in English and French. The German requirements were later taken over by the responsible authorities of The Netherlands, Belgium, France, Switzerland, and Austria. An important requirement was that for the generation and transmission of pulses, defined as follows:

"For the recognition of faults in pulse generation and transmission, a pulse control circuit must be provided after the input part. If two pulses occur in succession in the one channel, without an intermediate pulse in the other channel, then the excess pulse must be detected. It is insignificant in which channel a superfluous pulse occurs, i.e. an excess pulse in one channel should not be made ineffective by an excess pulse in the other channel."

In 1981 the author presented these requirements, in the meantime on a more general basis, in a lecture [4] held during an OIML Seminar in Borås, Sweden. That seminar for the first time dealt with "electronic devices" as parts of measuring instruments (the outset of OIML Document D 11).

Because many people wanted a written version of this lecture, the author collected all relevant information about liquid and gas meters equipped with electronic devices in a special PTB Report [5]. This report included many detailed requirements depending on the type of measurement signal and the distance between the electronic devices.

The measuring system on a pipeline for crude oil, which is used here as a typical example of a complex system, was approved by the PTB in March 1982 with later amendments in 1985, 1992, and 1999. In the type approval certificate, the requirements for the measurement signals were laid down as shown in the following table; they were fully in line with the published requirements [5].

Measurand	Sensor	Measurement signal	Signal requirement
Volume	Turbine wheel	Count of pulses	1
Temperature	Platinum resistance Pt100	Electric resistance	2
Density	Vibrating tube instrument	Frequency	3
Pressure	Piezoelectric sensor	Electric current	4
Viscosity	Falling ball viscosimeter	Time interval	5

Signal requirement:

1 Two identical pulse transmission systems with a time phase shift between both pulse series of about 90º, and checking of the conformity of both pulse series after signal transmission.
2 Resistance with four-wire transmission.
3 Checking of the frequency range after signal transmission with a filter network.
4 Current within the standard range 4 mA to 20 mA with suppressed zero.
5 Use of closed-loop current.

2.4 Electronic devices with checking facilities

The above-mentioned "signal requirements" are based on the principle of "operational fault perceptibility". During the discussions in the responsible OIML Subcommittee about requirements valid for "electronic devices" as parts of liquid measuring systems, these "signal requirements" were the basis of the requirements laid down in the first drafts of OIML R 117.

Because many people did not understand the term "operational fault perceptibility" and its philosophy, another term was introduced in OIML R 117, the "*checking facility*" as part of the "electronic devices" of the measuring system. This term was connected with the supplements *automatic* and *nonautomatic* on the one hand, and *permanent* and *intermittent* on the other hand.

In the new draft [2], the permanent automatic checking facility is defined as follows:

T.5.1 The *checking facility* is a facility incorporated in a measuring system which checks for the presence of a necessary device, and which enables incorrectness in the generation, transmission, processing and/or indication of a measurement data to be detected and acted upon.

T.5.2 The *automatic* checking facility is a checking facility operating without the intervention of an operator.

T.5.3 The *permanent* automatic checking facility is an automatic checking facility operating during the entire measurement operation.

In the same draft [2] the *necessity for checking facilities* is laid down in general as follows and in detail in 4.3.2 to 4.3.6 (not cited here):

4.1.1 *Electronic measuring systems* shall be designed and manufactured such that their metrological functions are *safeguarded* and their errors do not exceed the maximum permissible errors as defined in 2.5 under rated operating conditions.

In the existing version R 117 [1] one can find some examples of solutions for the requirements:

4.3.2.1 When the signals generated by the flow sensor are in the form of pulses, each pulse representing an elementary volume, at least security level B defined by ISO 6551 (Cabled transmission of electric and/or electronic pulsed data) is required.

4.3.6 ...Examples: four wire transmission for resistive sensors - frequency filters for density meters - control of the driving current for 4–20 mA pressure sensors.

These examples are fully in line with the solutions given by the manufacturer of the discussed measuring system on a pipeline for crude oil (see column "Technical realization" in Fig. 4), and they are again fully in line with the published requirements in the PTB Report [5].

3 Holistic and atomistic principle of measuring systems

3.1 Roots in Greek philosophy

In ancient Greek philosophy there existed two main points of view concerning "systems of parts", the "holistic principle" and the "atomistic principle". Hereby the Greek word SYSTEMA means originally only "putting together".

The "holistic principle" favors the totality, the thinking in overlapping continuities, the integration of diversities, and the unit in the varieties. The word "holistic" derives from the Greek word OLOS and means the whole or entirety. The "holistic principle" was represented by *Plato* (427–347 B.C.) and later by *Plotinus* (A.D. 205–270) [6].

The "atomistic principle" favors the priority of the parts, the analysis of the compound, and the reduction to the simplest elements. The word "atomistic" derives from the Greek word ATOMO and means the smallest indivisible unit or quantity. The "atomistic principle" was represented by *Empedocles* (490–430 B.C.) and *Democritus* (460–370 B.C.) [6].

These considerations, which are nearly 2500 years old, have their justification until today. And also the famous sentence is still valid, which *Aristotle* (384–322 B.C.), a student of *Plato*, defined as "The whole is more than the sum of all its parts".

3.2 General systems theory

In the last 30 years, a new interdisciplinary scientific field became a high importance, the so-called "general systems theory". For instance Prof. Günter Ropohl presents this in his publication (in German) "General systems theory as research program" [7].

The old philosophies of the holistic and atomistic principles are nowadays taken up in the discussions about "general systems". There exist scientists in favor of one principle, and others who are in favor of the opposite principle. The following description of the problems and solutions with liquid flow measuring systems shows both their validity and boundaries.

In his publication G. Ropohl explains that there exist three different conceptions regarding the point of view of a system. The first conception is the "*structural conception*", that means that the "system" consists of several "elements", each having inputs and outputs, and each standing in "relationship" to the other. This conception interprets the general and special requirements of legal metrology in the best way. Therefore hereafter only the "*structural conception*" will be used.

The second conception is the "*functional conception*", that means that the "system" is regarded as a "black box", and there is no interest in acquiring knowledge about the technical workings of the inner parts of the system. This conception does not fulfill many requirements valid for liquid measuring systems and will not be used here.

The third conception is the "*hierarchical conception*", that means that the "system" is a part of a "super-system", and includes several "sub-systems". This conception is a more theoretical conception and will not be used, because such a partition does not exist here.

In addition to these conceptions G. Ropohl explained in his publication [7] the "holistic axiom of totality and parts" as follows:

> *"The properties and behaviors of higher levels are not understandable from the sum of the properties and behaviors of their parts so long as they are observed insularly. If we know the ensemble of the parts and the relationships between them, then the properties and behaviors of the higher levels are derivable from those of the parts."*
> *"That means that the whole is the sum of all its parts* and *the sum of the relationships between the parts"* (quotations from [7]).

Following the "*structural conception*" as said before, this measuring system on a pipeline for crude oil consists of several "elements", each having inputs and outputs, and each standing in relationship to the other. The "elements" are the *sensors* and *transducers* of the volume measuring devices and of the associated measuring devices, in addition the electronic *calculator*, the *indicating device*, and the *printers*. The "relationships" are given by the measurement signals between these devices via the so-called interfaces.

3.3 Holistic principle valid for the measurement of liquid quantities

In the first edition of the VIM [8] the following terms are defined:

- The *static measurement* is the measurement of a quantity whose value can be considered constant for the duration of the measurement.
- The *dynamic measurement* is the determination of the instantaneous value of a quantity and, where appropriate, its variation with time.

Notes (in the VIM): The qualifiers "static" and "dynamic" apply to the measurand and not to the method of measurement.

Although these definitions are deleted in the second edition of the VIM [9], they are useful for the following interpretation.

Coming back to the question whether the "holistic principle" or the "atomistic principle" should be used, the combination "turbine measuring device - pulser - electronic calculator" is a typical example of the "holistic principle". The consideration of the measurement signals between these "elements" (interfaces) during a short time interval ("time window") says nothing about the behavior of the signals over a long period of time.

As was shown in 2.3, many trials and tests were made to *simulate* the generation of pulses, but without success. The trials did not lead to a sufficient possibility of simulation in order to clearly define the "interface" between the output of the pulser and the input of the calculator. When one cannot define this "interface", the "atomistic principle" is not permissible. That means that only the "holistic principle" is permissible for the generation, transportation and addition of pulses, each pulse representing an elementary volume.

The same "holistic principle" applies, if one uses other types of liquid meters with pulsers, for instance to piston meters or oval gear meters. It also applies in the case when the measurement signal is an electric voltage, current or phase shift, which represents the *flowrate* passing through the measuring device, for example electromagnetic meters or Coriolis mass flowmeters.

Summing up, in all cases when one uses:

- *Totalizing measuring instruments* (VIM [9] point 4.8) or
- *Integrating measuring instruments* (VIM point 4.9)

as liquid meters (the so-called *dynamic* measurement), the "holistic principle" applies and the "atomistic principle" is not permissible.

For the time being, OIML R 117 [1] is based on the "holistic principle". The MPEs given in 2.5 [1] are the ranges of the "overall errors" valid for all types of quantity indications. For example, if the system measures the volume at metering condition with a volume meter and the density at metering condition (belonging to that volume) with a density meter, and calculates the mass as a product of volume and density, the MPEs given in 2.5 [1] are also valid for that mass indication compared with the indication of a weighing instrument.

If the volume measuring device consists of a meter sensor (part of a turbine meter) and a transducer (pulser), one cannot partition the "overall error" E_o for the whole meter into the error E_s created by the sensor and the error E_t created by the transducer. In the sense of the "holistic principle" this partition is not permissible.

Of course there is one exception from the holistic principle in R 117 saying that one can test the volume meter alone (as a part of the measuring system) using the MPEs of line B in Table 2 [1]. But this is only a preliminary test (first stage of the initial verification) to show that the meter is good enough for future use. The final test (second stage of the initial verification) must be done with the complete measuring system.

3.4 Atomistic principle valid for the measurement of temperature, density, etc.

As the opposite to the measurement of quantities of liquids, the "atomistic principle" can be used in the case of the measurement of temperature, density, pressure, and viscosity. These values can normally be considered to be constant for the duration of the measurement.

As stated above, the atomistic principle requires the analysis of the compound. For example, in the case where one has different parts necessary for the temperature measurement (platinum resistance Pt100 as "sensor", and amplifier, etc. as "transducer") one may use the atomistic principle, but then one has to lay down the relation between the errors caused by these parts.

Because the errors created by the two parts (sensor and transducer) are fully independent from each other, the following square-law equation can be used (instead of a linear equation, which is sometimes in use):

$$(E_o)^2 = (E_s)^2 + (E_t)^2 \qquad (1)$$

with E_o the "over-all-error";
E_s the error created by the sensor; and
E_t the error created by the transducer.

This is in analogy to the equation in 2.7.4 of the existing OIML R 117 [1].

The maximum permissible errors MPE_o for E_o as "overall error" for the measurement of temperature, pressure and density are laid down in 2.7.2 of [1] and are taken over in the draft [2].

If MPE_s is the maximum permissible error for E_s (as error created by the *sensor*) and MPE_t that for E_t (as error created by the *transducer*), the following equations are valid:

$$MPE_s = k_s \times MPE_o \qquad (2)$$

$$MPE_t = k_t \times MPE_o \qquad (3)$$

k_s and k_t are the factors which express the "relationship" between the "elements" sensor and transducer. In analogy to equation 1 the following equation is valid:

$$(k_s)^2 + (k_t)^2 = 1 \qquad (4)$$

For the time being the proposal in the draft [2] is:

$$k_s = 0.8 \text{ and } k_t = 0.6 \qquad (5)$$

In the case of the measurement of temperature, density, pressure, and viscosity, as mentioned before, separate tests of the sensors and of the transducers are possible.

Summing up, in all cases when one uses:

- *Displaying measuring instruments* (VIM [9] 4.6) or
- *Recording measuring instruments* (VIM 4.7)

as instruments to measure temperature, density, pressure, and viscosity (the so-called *static* measurement), the "atomistic principle" *or* the "holistic principle" is permissible.

But if one combines "elements" following the "holistic principle" (see Fig. 4, upper section) and "elements" following the "atomistic principle" (see Fig. 4, lower section), only the "holistic principle" applies to the whole "system" consisting of these "elements". The discussed measuring system on a pipeline for crude oil has to be tested (and verified) as a whole system under the aspect of the "holistic principle". ■

References

[1] OIML International Recommendation R 117 "Measuring Systems for Liquids other than Water", Edition 1995

[2] 2nd Committee Draft of revised OIML International Recommendation R 117-1 "Measuring Systems for Liquids other than Water", dated 2 April 2004

[3] Mencke, D., Eberle, J., and Bluschke, H.: "Bauartanforderungen an elektrische Zählwerke und elektrische Zusatzeinrichtungen für Flüssigkeitszähler" (Requirements for the type approval of liquid meters with respect to the electrical registers and electrical ancillary devices), PTB-Mitteilungen, 84th year, volume 1, February 1974

[4] Mencke, D.: "Pattern approval of liquid and gas meters equipped with electronic devices", Lecture OIML Seminar in Borås, Sweden, September 1981

[5] Mencke, D.: "Elektronische Einrichtungen als Teile von Messgeräten zur Mengenmessung von Fluiden" (Electronic devices as components of instruments measuring the quantity of fluids), PTB-Report Me-40, December 1982

[6] "The New Encyclopædia Britannica", 15th Edition, Chicago 1989

[7] Ropohl, G., and Lenk, H.: "Systemtheorie als Wissenschaftsprogramm" (General systems theory as research program), Athenäum Verlag, Königstein/Taunus 1978

[8] "International vocabulary of basic and general terms in metrology" (VIM), first edition, 1984

[9] "International vocabulary of basic and general terms in metrology" (VIM), second edition, 1993

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ROAD SAFETY

Online traffic surveillance

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Abstract

Today, pictures of road traffic violation are recorded on site onto film or video together with the corresponding measurement data. Future surveillance systems will digitalize these pictures and transmit them together with the measurement data to an evaluation center. How safe are these systems? Is it possible to manipulate the data? In order to ensure the reliable transmission of legally binding measurement values, attention has to be paid to the criteria illustrated in the report.

This article was originally published in [1] and has since been revised and translated.

1 Introduction: Digital cameras in road traffic

With today's traffic surveillance, measurement readings and documentary photographs are generally recorded and stored on site by the police or by a measuring system. The data is usually stored on film or disk and can serve at a later date as evidence for prosecution. This data is reliable and therefore also legally binding because the capture, storage and safeguarding all occur only within the "protected" area of the police. The measurement value initially produced, visualized and stored (in whatever form) is regarded as original. However, each subsequent processing and even the transmitting of this measurement constitute a copy.

The introduction of digital cameras in the field of road traffic, the possibility to digitalize analogue recorded measurements and to transmit both picture and measurements together as one record to an evaluation center, places new demands on such measuring systems in ensuring the reliability of the measurements made [2]. The recording of the measurement values and the visualization of the binding measurements are now performed in separate locations.

Measuring systems of this type comprise sensors, data transmission equipment and a computer for the evaluation. The combination of the various measurement data (speed) and parameters (speed limits, time of day) into one integral record, and the transmitting and evaluation require new assessment criteria; hence the approval and verification processes (see Fig. 1) must be evaluated individually and defined correspondingly [3].

The present report deals with the problematic nature of establishing and transmitting measurement values in the field of road traffic. Several of the criteria described, however, are also applicable in other areas [4].

2 Criteria for the capturing and processing of data

If the binding data is stored on film or video, one can be confident that these measurements are unaltered on the original film or tape. This confidence is based on experience, is not founded on the technical characteristics of the documentation and does not yet exist in the new electronic form of documentation of measurements and visual data. The general public still regards this technology with skepticism, due to reports of data manipulation.

In Switzerland, the aim of METAS is to dispel this doubt by using transparent technical procedures. This calls for the procedures employed to be comprehensible at all times for those involved, including the law courts. The criteria below illustrate how digitally transmitted measurements can be secured.

Fig. 1 Speed measuring instruments are compared with the METAS reference installation under realistic traffic conditions (Photo: METAS)

Figure 2 Red light and speed surveillance with on site double image on wet film (Photo: METAS)

2.1 Secure classification of measurement readings

With traffic surveillance, the traffic situation at the time of the violation and the relevant measurement values are causally inter-connected. They therefore have to be documented together in order to be credible. If measurements are recorded in an analogue format, then they immediately have to be recorded on film or video; this guarantees that the measurement readings do really belong to the photographic or video recording.

When simultaneously monitoring a vehicle jumping a red traffic light and the speed of the vehicle, the current status of the traffic light is superimposed on the photo (see Fig. 2). Two photographs, which are taken consecutively at a pre-determined interval of time, also unequivocally verify the speed at which the vehicle was moving at the time of the offence.

However, if measurement values (speed) are provisionally stored digitally and combined with time-related data such as speed limits, the time of day, and digital photographic recordings of the traffic situation stemming from different systems and possibly also from different origins, the case becomes considerably more complex. In cases of traffic light violation, it is a matter of combining this causally related data electronically and transmitting it to an evaluation center [3].

A typical example of this is the documentation of a speeding violation within variable speed limits that are regulated by a traffic control system: the measuring instrument which registers the vehicle's speed must, at all times, receive information on the correct authorized speed limits, transmitted to it by the traffic control system. This value is stored in the system in digital form. Parallel to this, a digital camera records the traffic situation. These three occurrences - speed of the vehicle, imposed speed limit and traffic situation - belong together time wise and are to be verified in a case of traffic violation (see Fig. 3).

The correct incorporation of different measurements, data and photographic documentation from various locations to form one record can be solved technically, yet it is a costly and complex operation to demonstrate this and make it comprehensible to those involved. An initial attempt is to provide each measurement with a fixed time stamp at the time of registration. The superimposition in of a clock and the authorized speed limit is a confidence-building measure.

Figure 3 Scheme showing the principle of a traffic surveillance system with a variable speed limit controlled by a traffic regulation system. The measurement values are transmitted to a center for evaluation, where they are stored (Illustration: METAS)

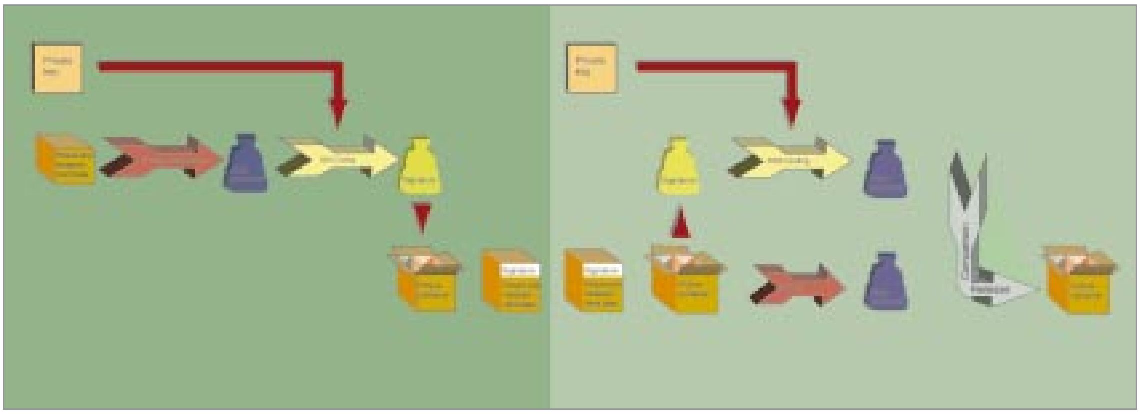

Figure 4 Functioning of the digital signature: the scheme on the left illustrates the creation of the digital signature, and the one on the right the verification after transmission (Illustration: METAS)

2.2 Data compression/data format

Once a traffic violation has occurred and the data record is complete, it can then be transmitted to another location for evaluation, though if the data record includes high-resolution photographs, this results in large quantities of data, which can cause capacity problems during digital transmission. A solution to this problem lies in the compression of the data.

There is no danger of losing data with loss-free compression methods. These processes are, however, inefficient for digitally recorded photographs. For this reason, irreversible compression processes are generally applied, which results in parts of the data record being irreversibly lost during compression. The authorized compression level for metrological applications, which still guarantees reliable data, cannot be established generally but can only be empirically determined, due to the different varying compression algorithms used [5].

A further aspect of digital data reports is the data format. Should publicly accessible or proprietary data formats be used? Proprietary formats increase protection against unauthorized access, although it is essential here that the manufacturer's software is also stored. As digital data can be modified at any time with the aid of a trivial editor, the integrity of the data is not increased by proprietary formats.

2.3 Intactness/integrity

Data records must be protected against unidentifiable alteration along the path of transmission. In order to ensure this, so-called digital signatures are employed. The digital signature of a data record is a "fingerprint" of the data that includes the sender's private key. The recipient examines the intactness of the data record by de-coding the enclosed "fingerprint" using the sender's public key, and comparing this with the new "fingerprint" created on arrival of the data record (see Fig. 4).

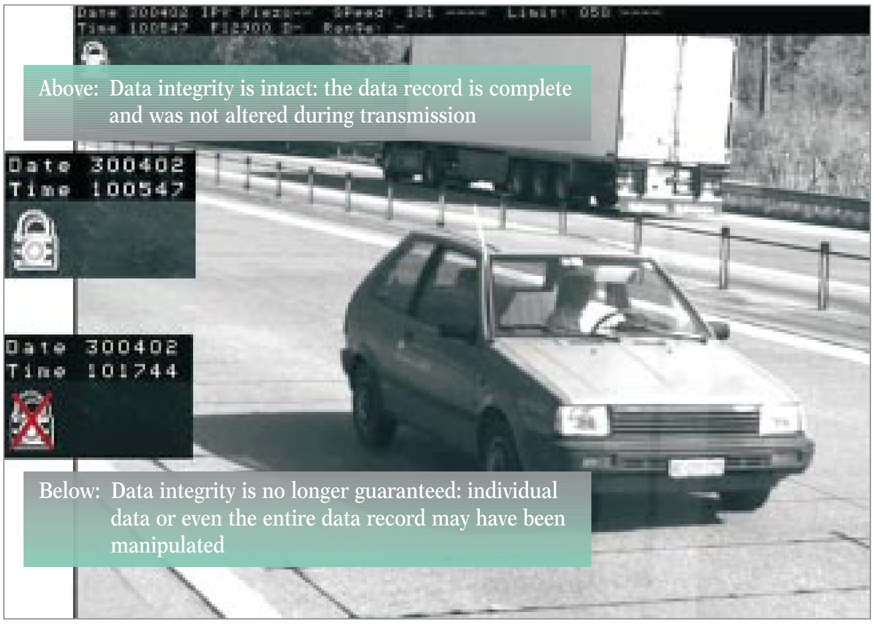

Figure 5 The padlock blended into the picture reveals the data integrity (Photo: METAS)

Although a digital signature cannot prevent manipulation of the data record, it enables the recipient to ascertain without doubt whether the transmitted data is intact or not. The digital signature guarantees the integrity of a data record. Furthermore, it is impossible for the recipient to alter the contents of the data record unidentifiably at a later date.

The two keys (private and public) are created individually in each separate camera. The private key remains in the camera, and only the public key is transmitted to the place of evaluation. Each measurement system has only one pair of keys. The digital signature enables both the person in the evaluation center and the prosecuting authorities to confirm that the data integrity is guaranteed (see Fig. 5).

2.4 Authenticity

Authenticity is an important factor of data transmission. Authenticity means assured identity, assured origin or assured genuineness of data. In data transmission, authenticity is guaranteed by certification of the digital signature. Such a signature is provided with a key certificate emanating from a certification body.

When establishing measurements, the authenticity is provided by the on site photographic documentation of the situation details; it is visible to those involved. The person in the evaluation center can therefore unmistakably locate where the data was registered, although electronic access to the sender's private key is not permitted.

2.5 Confidentiality or data coding

Data records should not be readable by unauthorized persons. Data protection is, in terms of confidentiality, not an essential element for the approval authorities, although if (due to an unprotected data transmission path) there is a danger that information may be gained that may stimulate manipulation of the data record, then coding in accordance with a technically recognized and equivalent process is necessary.

From a technical standpoint, symmetrical or asymmetrical coding or even hybrid forms may be chosen. Which coding algorithms one decides upon depends on the size of the data record that is to be processed, and on the level of security of the transmission path which is to be protected. Data protection regulations are effective for procedures in road traffic surveillance.

2.6 Access protection/remote maintenance

This criterion is of importance to maintenance and verification. The protection of the autonomous, decentralized measuring installation is endangered not only physically, but also by electronic access. It can also be assumed that the data records are stored at least temporarily on site. In the past, there was a risk of destruction or theft of autonomous measurement systems; in such cases, no reporting of drivers was possible since the film was no longer available.

However, if the measurements are registered digitally and transmitted to a center to be evaluated, it is possible to manipulate this data flow, either consciously or unconsciously. A hacker might gain access to the system on site, or an unintentional error (possibly unobserved) may be committed during remote maintenance of the software by the manufacturer, which could after a certain period of time lead to false reporting. It could, under circumstances, even be indiscernible to the prosecuting authorities that such data records can no longer be considered as valid evidence [3].

The measuring equipment on site must be protected in such a way that prevents unauthorized persons from gaining access to the functional components, without the use of force. Each kind of access to these systems is to be documented in a log file. Due to the innovation of the system and the lack of confidence in measurements registered using this method, METAS has decided that no remote maintenance work is to be performed. Access authorization on the administration level is only possible via the terminal on site.

With these systems, only data transfer is possible using the data transmission path, and no programming. According to Swiss instructions, both maintenance work on hardware components and the replacement of software require a new verification to be performed. Verified measurement systems of this type are to be sealed on site.

In order to guarantee the long-term security of such measurement systems on initial verification, the contents of the files relevant to the awarding of access rights, the most important code data of the system and the test evaluations are registered and deposited at METAS. This master data serves as reference values for regular subsequent verifications, and helps - together with the contents of the log file recordings - to determine if and when access offences have taken place.

2.7 Secure storage of legally-binding data records

Data records are to remain available until conclusion of the legal proceedings. In order to protect the integrity of these data records, they are to be stored together with the relevant public key. In cases of proprietary formats, the relevant software is also to be stored. This can lead to a considerable amount of work for the evaluation center.

Work will also increase for legal experts as, unlike previously, not only the relevant film is to be examined, but additional details have to be considered and must be available, such as the public key and usually also the processing software with the access license and password. These disadvantages are considerably compensated for by the elimination of film changing, by the simplified automation of data evaluation and by the opportunity to automatically identify number plates. This facilitates the correct location of the corresponding vehicle owner.

The integrity of the data records plays a subordinate role, and more common archive formats may be employed without difficulty.

3 Promoting confidence in data transmission

In future, there is to be an increased application of measurement systems which transmit the measured data to a center for evaluation. Through this, the possibility to digitalize analogue recorded measurement values and to transmit these digitally as a complete data record (photographic and measurement data) will gain significance. The legally binding measurement values are to be documented only in the evaluation center [3], [4].

Automatic traffic surveillance is an important field of application. Other areas will follow: where, in trade and transport, the public comes into contact with measurements, digital transmission will become the standard procedure, for example with energy and water meters. In time, confidence will grow in digitally recorded and transmitted measurements. The criteria described here for methods of confidence building are recognized and must be applied.

Road-users still regard automatic speed measurement using digital transmission with skepticism. A false conviction for speeding due to incorrectly recorded measurements has unpleasant and sometimes dramatic consequences for the person involved. For this reason, METAS places strict requirements on the approval of such measurement systems. The security procedures employed when recording the measurement values have to be reliable and trustworthy for the prosecuting authorities as well.

The work of the verification laboratories will prove more demanding and complex compared to conventional measuring systems: the new systems with on site measuring facilities, digital transmission and evaluation, are to be regarded and examined as a single unit. This is essential in order to guarantee that they can function reliably both autonomously and for the required number of years, 24 hours a day. In the future, a driver involved in a case of traffic violation should still be confident that a report filed against him is correct and that, in case of doubt, the facts of the case can be reconstructed. ■

References

[1] Fasel, W. (2002): Verkehrsüberwachung online. metINFO Vol. 9, No. 3, pp. 13–16.

[2] Kochsiek, M. (2003): Wie entwickelt sich das gesetzliche Messwesen international?, wdm wägen dosieren mischen Vol. 34, No. 3, pp. 19–21.

[3] Richter, D. (2002): Software in der Metrologie – Chancen und Risiken, PTB-Mitteilungen Vol. 112, No. 2, pp. 99–113.

[4] Grottker, U. and Roman Schwartz (2003): Software in Legal Metrology, OIML Bulletin Vol. 44, No. 2, pp. 24–31.

[5] Systeme für die automatische Verkehrskontrolle mit digitaler Bildtechnik; Studie im Auftrtag des Bundesamts für Strassen ASTRA, erarbeitet durch Rapp Ingenieure + Planer, September 2002.

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FROM THE BIPM

Metrology and traceability

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Metrology is the science of measurement, embracing both experimental and theoretical determinations at any level of uncertainty in any field of science and technology.

Measurement science is not, however, purely the preserve of scientists. It is something of vital importance to us all. The intricate but invisible network of services, suppliers and communications upon which we are all dependent rely on metrology for their efficient and reliable operation. For example:

- the economic success of nations depends upon the ability to manufacture and trade precisely made and tested products and components;
- satellite navigation systems and international time correlation make accurate location possible – allowing the networking of computer systems around the world, and permitting aircraft to land in poor visibility;
- human health depends critically on the ability to make accurate diagnosis, and in which reliable measurement is increasingly important;
- consumers have to trust the amount of petrol delivered by a pump.

All forms of physical and chemical measurement affect the quality of the world in which we live.

Traceability

Metrology is thus of fundamental importance in industry and trade - not only from the point of view of the consumer but also for those involved in manufacturing. Both groups must have confidence in the accuracy and reliability of the measurements upon which they depend. Within the manufacturing process, to ensure the accuracy of measuring instruments, it is essential that they should be periodically calibrated against more accurate measurement standards, which in turn should have their calibration traceable to even more accurate national measurement standards at the national level and, eventually, the international level. When these various levels of calibration have been documented, a chain of traceable calibrations is created.

Traceability means that the result of a measurement, no matter where it is made, can be related to a national or international measurement standard, and that this relationship is documented. In addition, the measuring instrument must be calibrated by a measurement standard that is itself traceable. Traceability is thus defined as the property of the result of a measurement or the value of a measurement standard whereby it can be related to stated references, usually national or international, through an unbroken chain of comparisons all having stated uncertainties. The concept of traceability is important because it makes possible the comparison of the accuracy of measurements worldwide according to a standardized procedure for estimating measurement uncertainty.

Within a chain of traceability, the units of measurement with the highest accuracy are realized by international measurement standards. The value of the international standard is usually determined by comparison of national standards of the highest quality, or in the case of the kilogram by the mass of the International Prototype. National measurement standards, maintained in a national metrology institute or NMI (for example, the NPL in the UK, the NIST in the USA or the NMIJ in Japan) must be compared with these international standards. The result of such comparisons, together with the precision and uncertainty of the national standard will be stated and available on, for example, the internet (see the BIPM key comparison database, www.bipm.org/kcdb/). Then the national measurement standard serves as a reference for calibration of standards of lower precision. Reference standards are kept in a national metrology institute or in an accredited calibration laboratory for calibrations not requiring the highest accuracy. Again, the result and the uncertainty will be stated.

At each stage in such a chain of traceability, one loses a certain degree of precision (see Figure). Thus the highest level standards are the international standards, known with the greatest level of precision, and the lower level standards will have been determined to a lower level of precision. This lower level of precision will be one which is acceptable or appropriate for the use of that particular standard.

Standards

In measurement science, the word 'standard' is used with two different meanings: first, as a widely adopted specification, technical recommendation or similar document; and, second, as a measurement standard. This note deals with measurement standards, which can be a physical measure, measuring instrument, reference material or measuring system intended to define, realize, conserve or reproduce a unit or one or more values of a quantity to serve as a reference. For example, the unit of the quantity 'mass' is given its physical form by a cylindrical piece of metal of one kilogram, which represents the international standard, and gauge blocks represent certain values of the quantity 'length'.

The hierarchy of measurement standards (see Figure) starts from the international standard at the apex, which is known with the highest precision and goes all the way down to working standards. International measurement standards are standards recognized by an international agreement to serve internationally as the basis for assigning values to other standards of the quantity concerned. The oldest standard in use today is the International Prototype of the Kilogram, kept at the Bureau International des Poids et Mesures (BIPM) in Sèvres. The role of the BIPM is to ensure the international consistency of the highest level measuring standards in each of the signatories of the international treaty known as the Metre Convention.

A national measurement standard is a standard, often a primary standard, recognized by national law to serve in a country as the basis for assigning values to other standards of the quantity concerned. The custodian of national measurement standards in, for example, the USA is the NIST and in the Netherlands it is the NMi.

A primary standard is a standard that is designated or widely acknowledged as having the highest metrological qualities and whose value is accepted without reference to other standards of the same quantity. Primary standards are, for example, Josephson devices for the realization of the quantity 'volt', or stabilized lasers used in conjunction with interferometers for the realization of the quantity 'length.' The devices are used as national standards.

Secondary standards are standards whose value is assigned by comparison to a primary standard of the same quantity. Primary standards are usually used to calibrate secondary standards. A working standard is a standard that is used routinely to calibrate or check material measures, measuring instruments or reference materials. A working standard is usually calibrated with reference to a secondary standard, and may be used to ensure that routine measurements are being carried out correctly - a check standard.

A reference standard is a standard generally having the highest metrological quality available at a given location or in a given organization from which the measurements made at that location are derived. Calibration laboratories maintain reference standards for calibrating their working standards.

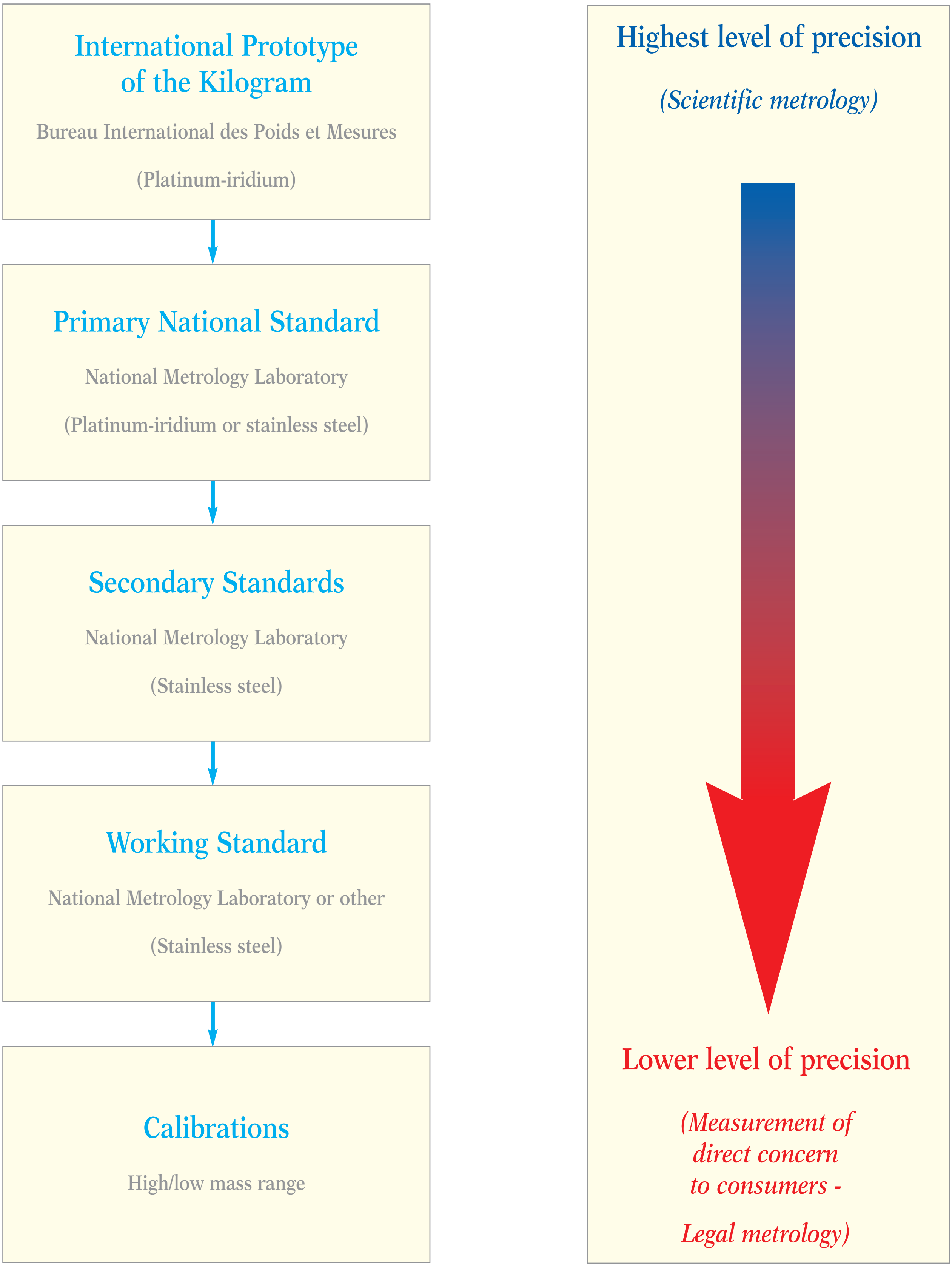
Metrology and Legal Metrology

Perhaps the best way to understand the difference between metrology and legal metrology is to consider the various stages in the process of traceability. The overall process is certainly measurement science, but legal metrology is metrology which ensures the quality and credibility of measurements that are used directly in regulation and in areas of commerce. It deals with traceability, but also with risks of misuse of the instruments, of tampering and of accidental influences on the measuring instruments. In many cases, laws or regulations govern the accuracy of these measurements as well as the conformity of the measuring instruments against national or international specifications.

The accuracy of the mass measurements made by, for example, the weighing scales in a local supermarket are ultimately calibrated through the national traceability systems against standard weights kept at a national metrology laboratory and these national weights are calibrated against an international standard. One thus has a chain of calibrations, which allows the measurements in the supermarket to be traced to an internationally accepted set of standards. The consumer can therefore have confidence in the accuracy of local systems of weights and measures. In addition, we can ensure the consistency of measurements worldwide, because all measurements can either be traced to a single, highly accurate international reference because national standards may be compared with each other.

While the primary focus of legal metrology concerns measurements that directly affect consumers, metrology as a whole is of importance to all those engaged in the various chains of measurement and calibration. So while the physicists who maintain the International Prototype of the kilogram (the last physical artefact which defines a base unit and against which all other measuring systems in the world are calibrated) at the BIPM, Sèvres, can be thought of as scientific metrologists, they are not directly connected with the concerns of legal metrology in their daily work. On the other hand, the technicians who calibrate weighing scales in shops and markets are directly concerned with legal metrology, and are of course also metrologists.

Legal metrology, as represented by the work of the International Organization of Legal Metrology (OIML) is concerned with the chain of measurement traceability that directly affects consumers, and has the backing of national laws which protect the consumer from, for example, shopkeepers whose weighing or other measuring devices may not calibrated correctly. This means that Recommendations (being models for technical regulations) issued by the OIML are often incorporated directly into national and international laws and regulations concerned with consumer protection. Such OIML



Schematic representation of the various types of standard that exist in a particular area of metrology, and how the level of precision decreases along the chain of traceability

Recommendations are therefore used directly by regulators and law makers and may have the force of law.

Metrologists in NMIs are, however, concerned with metrology in a somewhat broader context. At the highest or most scientifically-oriented level, they ensure the consistency of the International System of Units (SI). In most cases, this implies research into the base definitions of the units and on the fundamental constants of science; for example, the speed of light and properties of atoms.

Each NMI may construct equipment to realize the definitions of the base units of the SI, and so maintain national representation of units such as the metre, second or the volt, which are used as reference measurements in that country. NMI metrologists also compare their national references so as to ensure that they are equivalent and that there is a worldwide consistency in SI measurements at all levels of accuracy.

Consider length measurement. Physicists working at the forefront of metrology are concerned that the base unit of length (the metre) is defined so as to meet the up-to-date needs of science, industry, commerce and society. When combined with SI traceability this means that length measurements are nationally and internationally consistent. Legal metrology steps in when there are length measurements used in regulation; and the OIML is concerned that, for example, measuring tapes used by builders and surveyors are accurate and that the construction industry is giving the customer what it is being contracted to give them. The difference between metrology and legal metrology is therefore often one of scale of precision, although traceability and the accreditation of technical competence of the scientists and technicians are common to both.

The metre is currently defined with respect to laser radiation and may be measured by metrologists to one part in 10^{12}, whereas in consumer protection terms (i.e. legal metrology) one is more concerned that a building which is supposed to be several metres in length is as close as possible to this in terms of the precision of building materials – very far from one part in 10^{12}. However, because accuracy is lost during the different stages of calibration in the chain of traceability between one set of standards and another set, measurements at the highest level of precision must be made to give interested parties confidence in precision at those levels where the consumer is directly concerned by the measurements. Thus, although there is extreme precision in the experiments that realize the metre, this degree of precision is lost to some extent as one moves down the chain of traceability to routine industrial measurements (see Figure). However, these losses are inevitable, and to have the appropriate level of precision required by industry, one needs the extreme precision of the measurements made by scientific metrologists.

However much metrology and legal metrology are concerned with very different levels of precision, both deal with related problems. Both are essential in ensuring that as wide a constituency as possible is involved in and concerned with measurements and measurement science. Both metrology and legal metrology are essential in ensuring consistent national measurement systems, traceable to international standards; thereby establishing that there are no significant differences in measurements and tests made in different countries. Regulators and legislators who need to have confidence in various systems of national measurements, can therefore have confidence that measurements made in one country will be accepted in other countries, which helps reduce or eliminate the possibility that lack of acceptance of calibration and tests could be used as a technical barrier to trade. ■

The BIPM, established in 1875 by the Metre Convention (a diplomatic treaty between 51 nations), ensures worldwide uniformity of measurements and their traceability to the International System of Units (SI).

Bureau International des Poids et Mesures,
Pavillon du Breteuil, 92312 Sèvres, France
www.bipm.org

BIPM

The OIML, established in 1955, is an intergovernmental organization whose principal aim is to harmonize the regulations and metrological controls applied by the national metrology services of its national members.

Organisation Internationale de Métrologie Légale,
11 rue Turgot, 75009 Paris, France
www.oiml.org

OIML

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METROLOGICAL STRUCTURES

Modernization of legal metrology in Germany

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1 The importance of legal metrology

For Germany as a highly industrialized country, the fundamental importance of legal metrology is confirmed by an OIML estimate according to which goods and energy amounting up to 10 % of the gross national product of a country are exchanged and charged for on the basis of measurement results. Official measurements such as, for example, in road traffic and for the determination of taxes and duties also play a role which should not be under-estimated.

The *Verification Act* established consumer protection and competition as essential objectives of national legal metrology. Corresponding protection goals not only exist in Germany but - with different focal areas - also in other countries in Europe and throughout the world. International harmonization of these requirements is regulated in approximately 120 OIML International Recommendations which in many countries have been transposed into national law. Also the European Directive for Non-automatic Weighing Instruments and the Measuring Instruments Directive (MID) have laid down the technical requirements for measuring instruments and test procedures from OIML Recommendations.

2 State and Development

2.1 State in Germany

The Federal Republic of Germany consists of 16 Federal States of very different sizes and populations. The Federal Government has the exclusive legislative power for weights and measures, and has enacted relevant laws and ordinances so that uniformity of legal metrology is guaranteed at the federal level. As the operative tasks in the legal regulations have been assigned in part to the Federal Government, but predominantly to the Federal States, these regulations require the consent of the Bundesrat (Federal Council).

The PTB realizes the legal units, disseminates them and ensures uniformity. It grants type approvals for measuring instruments, releases test specifications and renders consultancy services to the Federal States and the state-approved test centers. Approvals subject to charges (as tests and certification in legal metrology) require approximately 40 years of expert services. In this sector, another 40 years of expert services are used for research and development in this field, including work with organizations for national and international harmonization.

The Federal States enforce the verification law with approximately 1500 employees in over 80 verification offices. These tasks cover verifications, surveillance measures (for example in the case of test centers, prepackages and repairers), recognition of test centers and prosecution of administrative offences. Each year, approximately two million verifications are performed. The state-approved test centers verify measuring instruments for electricity, gas, water and heat. With about 1500 employees, they annually perform approximately 18 million verifications in about 380 test centers, including sampling procedures.

For many years, legal metrology has been successfully applied and has been an example to many other countries. However, every system reaches its limits and has to be adapted when the basic requirements change. These changes comprise technical development, further globalization of the economy and political targets.

2.2 Technical development

Under the influence of information technology, modern measuring instruments have become increasingly complex open systems with stationary and sometimes exchangeable components which are networked together. As the software defines essential metrological characteristics, the requirements for the software (and its checking) have become increasingly important. On the one hand, this higher complexity requires a larger scope of the tests; on the other hand, more extensive tests are economically not justifiable.

Due to the shorter innovation cycles, manufacturers of measuring instruments are working to high-pressure deadlines in a global competition environment, meaning that efficient test procedures for both type approval and verification must be developed.

Another challenge is the case of measuring systems in which remote displays and data transmissions are not recognizable by the consumer. Due to the liberalization of the electricity market, devices are increasingly used which, by means of load profile memories, generate new values from those measured which are not, however, always recognizable by the customer but which are used as the basis for a utility bill. This is why in future, for the processing of data relevant to the bill, not only the individual measuring instrument but the whole measuring system must be covered by the range of application of the verification law. It must be ensured that only those measurement values will be used as a basis for the bill which have been determined by verified or suitably monitored components of the measuring system. The software used in the system for processing these measured values must, therefore, be tested. The new tasks related to this test also require new (and sometimes higher) qualifications of the employees in legal metrology.

3 Modernization measures

One motive for amending legal metrology regulations is the transposition of the MID into national law. This measure shall be used at the same time to modernize those national requirements that have not been harmonized to be able to also allow for political, economic and technical developments.

3.1 Test procedures

An example of national specifications is the requirements for measuring instruments after placing on the market. Both nationally approved measuring instruments and those with European approval must also in future be subjected to subsequent verification. Today, extensive technical tests are performed on individual measuring instruments. The changing economic marginal conditions do not allow extensive technical tests to be performed on individual devices but suggest to carry out sample tests on equivalent devices. Performance of such cost-saving tests on measuring instruments to prolong the period of validity of the verification has proved its worth in practice. It should, therefore, be checked whether similar sampling procedures could also be applied to other measuring instruments. Practical experience of private bodies should be taken into account.

In addition, to prepare itself for new technologies, the PTB is developing within the scope of the existing cooperation at European level (WELMEC) common requirements and test procedures for measuring systems with integrated software-controlled functions for the transfer, storage and conversion of measurement data and their monitoring. Such systems imply considerable manipulation hazards which must also be checked *in situ* so that the verification authorities are to be included in the development.

3.2 National transposition of the European Measuring Instruments Directive (MID)

According to the principle of subsidiarity, the scope of the Directive is limited to regulation until the placing on the market or first putting into operation of measuring instruments, and the obligation of the member states to monitor the correct application of the Directive. In addition, the member states continue to decide (under their own responsibility) which application - and thus which measuring instrument categories - will be subject to legal control and which competent certification bodies will take over (as notified bodies) the role of approval bodies which the state has so far assumed.

As concerns the regulations, until first placing on the market it has to be checked whether the number of measuring instruments which are today subject to national legal control may be reduced. In future, consumer protection must look more closely at the economic consequences of the measurements made. This is why corresponding criteria of definition are required, the aim being to concentrate legal regulations on those measuring instruments where there exists a risk of errors which could result in prejudice to the consumer or in unfair competition.

For the transposition of the MID into national law in Germany, it can be assumed that the conformity assessment procedures specified in the MID will also be adopted for those measuring instruments which are not covered by the MID, and which are still subject to national legal control. As a consequence, it will become possible to include private bodies for all measuring instrument categories (with the exception of those instruments that are regulated in accordance with the old concept). A distinction must be made between the period before the measuring instruments are first placed on the market and the surveillance of instruments already in circulation, as different concepts for the future definition are applicable to the two periods.

The conformity assessment procedures are structured according to different modules from which the manufacturer can freely choose. The procedure according to modules B and F comprises type examination (module B) and the test of all series devices (module F). This procedure basically corresponds to the combination of type approval and initial verification applied up to present.

In the case of module combination B+D, the manufacturer can partly dispense with the expensive and time-consuming product test of all series devices by a notified body, by having his quality assurance in production approved and surveyed by a body notified for module D. This way of proceeding is in compliance with the procedure stated in the NAWI Directive.

Instead of the above module combinations, the manufacturer may also choose the procedure according to module H1, in the case of which a design examination on the basis of measurement results of the manufacturer as well as approval and surveillance of the quality system (also covering the development) is performed. This procedure is particularly attractive for manufacturers that develop and manufacture many type variants of one type series of measuring instruments on the basis of a quality system already certified in accordance with ISO 9001.

The notified bodies to be included in the conformity assessment procedures have to meet the criteria for independence, competence and integrity stated in the Directive. In addition to their metrological and technical competence, they also have to furnish proof of their ability to assess quality systems. These bodies are notified to the European Commission by the Federal Government. To ensure a high protection level in legal metrology it is planned to introduce strong requirements as concerns the notified bodies. Due to the requirement for independence and impartiality, only third-party bodies can become notified bodies. The Federal States will be included in the selection and surveillance of these bodies.

3.3 Consequences for the PTB

In coordination with the Federal Government, the measuring instrument manufacturers and the verification authorities, the PTB will act as a notified body for modules B, D and H1. In preparation for this task, especially for the approval of manufacturers' quality systems, the PTB has already taken measures which will also allow for the constantly increasing importance of cross-sectoral aspects in legal metrology. Approval criteria and test procedures have to be developed which are compatible with those of other notified bodies within the context of European harmonization since the PTB will in future compete with governmental and private European organizations. One measure taken with a view to these future tasks is the establishment of the certification body for measuring instruments at the PTB.

Within the scope of standardization, the PTB plans a consequent separation of testing and certification in such a way that the test laboratories for type examination will work in the PTB divisions and a central certification body will be established in a cross-sectoral division. This ensures that there is a clear distinction between testing and certification as far as both staff and the organizational structure are concerned. An essential task of this certification body is the assessment of test reports within the scope of type examinations and the evaluation of audits at the manufacturers' with respect to their compliance with the requirements stated in the Directives.

3.4 Metrological surveillance

Metrological surveillance is the overall surveillance activity after measuring instruments have been placed on the market. In this context, a distinction is made between market surveillance and the surveillance of measuring instruments used (surveillance of measuring instrument users).

Market surveillance serves to determine whether the manufacturer has only placed measuring instruments on the market which meet the legal requirements. Here, those requirements that are currently in force are decisive when the instruments are placed on the market. An exception is the activity of the notified body which controls the manufacturer before the instruments are placed on the market, for example by sample inspections of products before they are marketed.

A distinction must be made between market surveillance targeted at the manufacturer and the surveillance of measuring instruments used. The latter is targeted at the user of a measuring instrument who is responsible for its installation and maintenance, the processing of measurement values, handling and the ongoing compliance with the properties fixed for its use. Suitable measures are verifications and sampling procedures for prolongation of the period of validity of the verification.

Globalization and liberalization of the markets, in particular the energy markets, have led to severe competition with sometimes tighter profit margins, which can increase the risk that the manufacturer places non-conforming instruments on the market. Moreover, the temptation for the manufacturer to manipulate the instruments is higher and renders more severe surveillance measures necessary. This surveillance cannot exclusively be performed within the scope of subsequent verification, which is why verification must now concentrate on other activities. The increasing complexity of measuring instruments and systems requires considerably more advanced technical competence on the part of the monitoring bodies which - due to limited resources - cannot be accomplished nationwide, in particular in the smaller Federal States.

The verification authorities should elaborate suitable measures for market surveillance and instrument manufacturer surveillance with the assistance of the PTB. Depending on the potential hazards and the number of unusual observations in the case of specific measuring instruments, they should carry out selective surveillance actions. This requires criteria which seem to suggest a cross-national surveillance action. In this context it is to be checked whether the effectiveness of such selective actions can be improved by the assignment of specialized nationwide operating working groups of the verification authorities. For these surveillance measures, cross-national enforcement centers for all measuring instrument categories would be helpful to allow selective actions to be performed with due regard to practice.

In this context, the PTB renders advisory services as a metrological competence center. The way of proceeding when technical aspects of non-conformity, manipulation of measuring instruments and complaints are concerned has meanwhile been regulated at national level between the PTB and the verification authorities. Contacts with overseas organizations (for example manufacturers, notified bodies or authorities) are established by the PTB or the Federal Ministry. As further regulation is required in the European context, WELMEC has founded a working group and is currently aiming at obtaining support from the EU Commission.

4 Opening of private test centers

Over 100 years ago, electrical test offices were founded to ensure the correctness of electricity meters. These test offices (later renamed state-approved test centers) have obviously proved their worth as the system was extended to cover gas, water and heat measuring instruments. This decision was based on economic reasons as it was more cost-effective for the state to use the existing public utility industry facilities than to develop technical and personnel resources of its own. Recognition and surveillance of these test centers have, however, remained the task of the state.

Another step towards privatization was taken approximately 10 years ago when manufacturers were allowed dispense with initial verification which was, up to then, carried out by the verification authorities and to perform the tests within the scope of their quality systems. In this context, the PTB has also felt the European competition, as manufacturers no longer depend on type approval in Germany but can equally obtain it from other notified bodies in Europe.

The implementation of the MID at national level now represents another step towards privatization which is to be supplemented nationally by the application of the MID conformity assessment procedures to all measuring instrument categories subject to legal control in Germany so that manufacturers operating a quality system will no longer have to make use of initial verification.

Moreover, the Bundesrat has decided that private bodies shall also perform technical inspection tasks after the instruments have been placed on the market, i.e. subsequent verification. The authorities shall, however, remain responsible for recognition and surveillance of these private bodies.

On the basis of the experience gained so far with privatization in legal metrology, this political mandate is comprehensible. Due to the loss of fees charged for subsequent verification, such a concept can, however, not be implemented in the short term but has to take the fiscal particularities of the individual Federal States into account. From this point of view it is understandable that the latter make different uses of the privatization possibilities. It is intended to establish an experimental clause to gradually gain experience.

To achieve uniformity in legal metrology, the PTB makes all possible efforts to raise the level of the requirements to be met by the private bodies responsible for subsequent verification to that of the notified bodies in order to maintain an equivalent protection level for both new instruments and instruments already on the market as far as independence and competence are concerned. In view of the requirement for independence in the sense of a third-party body, manufactures are not allowed to perform subsequent verification on their own measuring instruments.

In this context it must also be checked whether the periods of validity of verification so far applicable are still appropriate. Former investigations performed at the PTB have shown that the period of validity of the verification for fuel dispensers and weighing instruments could be considerably prolonged for technical reasons alone. An argument for the retention of the periods was based on the previous link-up of subsequent verification with metrological surveillance measures, in particular for the surveillance of the instrument users. In the case of the planned separation of technical and surveillance tasks it would be left to the verification authorities to formulate the surveillance intervals independent of today’s period of verification validity so that it would be sufficient to perform technical tests by private bodies after considerably longer intervals. The users of measuring instruments would be the beneficiaries of this regulation with lower total costs for subsequent verification.

5 Summary

Germany has an efficient, internationally recognized legal metrology system at its disposal to which PTB, the verification authorities and the state-approved test centers have made essential contributions. The test and surveillance activities performed so far have proved their worth in the past, but European harmonization and technical progress, faster innovation as well as the increasing shortage of resources call for ongoing and permanent modernization.

The protective goals applicable so far shall also be reached in future with the aid of the verification law. Consumer protection should, however, be more strongly geared to the economic consequences of the measurements. Legal regulations will concentrate on measuring instruments for which errors can lead to considerable material damage for the consumer or to clear unfair competition. A corresponding amendment of the legal regulations is under preparation.

In Germany, the application of legal metrology will in future be organized on the basis of division of labor. The PTB will continue to realize and disseminate the legal units, carry out tests and conformity assessments and render advisory services to the regional authorities and test centers. To ensure federal uniformity, it is important for the PTB that competence and independence of the private bodies are guaranteed.

The increasing importance of the surveillance of instruments which are already on the market cannot be regulated exclusively at national level; this would contradict the EC Directives. For these tasks, a cross border exchange of information is required. The PTB therefore aims at a close cooperation, both at national and European levels, with the verification authorities which for this purpose have to overcome the limitations of federalism to be able to represent a uniform legal metrology system. ■

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OIML Certificate System:

Certificates registered 2004.05–2004.07

Up to date information (including B 3): www.oiml.org

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

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

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

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

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

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

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

OIML Recommendation applicable within the System / Year of publication

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

Certified pattern(s)

Modèle(s) certifié(s)

► Issuing Authority / *Autorité de délivrance*

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

R60/2000-NL1-02.02
Type 0765 (Class C)
Mettler-Toledo Inc., 150 Accurate Way,
Inman, SC 29349, USA

The code (ISO) of the Member State in which the certificate was issued, with the Issuing Authority's serial number in that Member State.

Le code (ISO) indicatif de l'État Membre ayant délivré le certificat, avec le numéro de série de l'Autorité de Délivrance dans cet État Membre.

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

Pour chaque catégorie d'instrument, les certificats sont numérotés par ordre de délivrance (cette numérotation est annuelle).

Year of issue

Année de délivrance

Applicant

Demandeur

Système de Certificats OIML:

Certificats enregistrés 2004.05–2004.07

Informations à jour (y compris le B 3): www.oiml.org

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

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

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

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

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

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 51 (1996)

▶ Issuing Authority / *Autorité de délivrance*

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

R051/1996-FR2-2004.03
CP 90 for accuracy class X(1)
VARPE CONTROL DE PESO, S.A., Osona, 21 - Poligono Industrial Can Casablancas, 08192 Sant Quirze del Vallés, Barcelona, Spain

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R051/1996-GB1-2004.01
ECLIPSE CS Series for accuracy class X(1)
Cintex Ltd., Trindent Industrial Estate, Blackhorne Road, Colnbrook SL3 OAX, Slough, Berkshire, United Kingdom

▶ Issuing Authority / *Autorité de délivrance*

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

R051/1996-NL1-2004.01 Rev. 1
AW-3600 … - … for class Y(a)
Teraoka Seiko Co., Ltd., 13-12 Kugahara, 5-Chome, Ohta-ku, 146-8580, Tokyo, Japan

R051/1996-NL1-2004.03
CSG..L and CMG..L with controller CE2000, CSG..LW and CMG..LW with controller CE2000 for accuracy class X(1)
Yamato Scale GmbH, Hanns-Martin-Schleyer Straße 13, D-47877 Willich, Germany

▶ Issuing Authority / *Autorité de délivrance*

Norwegian Metrology Service, Norway

R051/1996-NO1-2003.01
Mettler Toledo JagXtreme Expressweigh for accuracy class Y(a)
Cargoscan AS, Grenseveien 65/67, N-0663 Oslo, Norway

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R051/1996-DE1-1999.05 Rev. 3
L2-PTLs (Classes Y(a) and Y(b))
Mettler-Toledo (Albstadt) GmbH, Unter dem Malesfelden 34, D-72458 Albstadt, Germany

R051/1996-DE1-2004.01
BW B… for accuracy class Y(a)
Caljan ApS, Ved Milepaelen 6-8, DK-8361 Hasselager-Aarhus, Denmark

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*

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

R060/2000-FR2-2004.01
SCAIME single point load cell, bending beam load cell, with strain gauge (Class C)
Scaime S.A., Z.I. de Juvigny, B.P. 501, F-74105 Annemasse Cedex, France

▶ Issuing Authority / *Autorité de délivrance*

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

R060/2000-NL1-2004.07
TLC, HLC and THC for accuracy classes C and D

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

R060/2000-NL1-2004.08
PW18C... and PW18C...H1 for accuracy class C

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

R060/2000-NL1-2004.10
MBF for accuracy class C

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

▶ Issuing Authority / *Autorité de délivrance*

DANAK The Danish Accreditation and Metrology Fund, Denmark

R060/2000-DK1-2004.01
HSC (Class C)

ESIT Electronics Ltd., Nisantepe Mahallesi, Alemdar Umraniye, TR-34775 Istanbul, Turkey

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Automatic gravimetric filling instruments
Doseuses pondérales à fonctionnement automatique

R 61 (1996)

▶ Issuing Authority / *Autorité de délivrance*

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

R061/1996-NL1-2004.01
*ADW-*XX****/***/*** for accuracy class X(1)*

Yamato Scale GmbH, Hanns-Martin-Schleyer Straße 13, D-47877 Willich, Germany

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R061/1996-DE1-2004.03
SIWAREX FTA-... for accuracy class Ref (0.2)

Siemens AG, Östliche Rheinbrücken straße 50, D-76187 Karlsruhe, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Nonautomatic weighing instruments
Instruments de pesage à fonctionnement non automatique

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

▶ Issuing Authority / *Autorité de délivrance*

Inspecta Oy, Finland

R076/1992-FI1-2003.01 Rev. 1
MCS5 PLUS Crane scale (Class III)

Tamtron Oy, Vehnämyllynkatu 18, FIN-33700 Tampere, Finland

▶ 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-JP1-2003.01 Rev. 1
Type UW (Classes I and II)

Shimadzu Corporation, 1, Nishinokyo-Kuwabaracho, Nakagyo-ku 604, Kyoto, Japan

▶ Issuing Authority / *Autorité de délivrance*

National Weights and Measures Laboratory (NWML), United Kingdom

R076/1992-GB1-2004.01 Rev. 1
520 indicating device (Class III)

Rice Lake Weighing Systems, 230 West Coleman Street, 54868 Wisconsin, Rice Lake, Wisconsin, United States

R076/1992-GB1-2004.02
920i (Class III)
Rice Lake Weighing Systems, 230 West Coleman Street, 54868 Wisconsin, Rice Lake, Wisconsin, United States

▶ Issuing Authority / *Autorité de délivrance*

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

R076/1992-NL1-2004.09
AB-S, GB-S, PB-S, JB-C and JB-G (Classes I, II and III)
Mettler-Toledo A.G., Im Langacher, CH-8606 Greifensee, Switzerland

R076/1992-NL1-2004.10
Azplus.. / AM.. (Class III)
ADAM Equipment Co. Ltd., Bond Avenue, Denbigh East Industrial Estate, Milton Keynes MK1 1SW, United Kingdom

R076/1992-NL1-2004.11 Rev. 2
DS-700.. (Class III)
Shanghai Teraoka Electronic Co., Ltd., Tinglin Industry Developmental Zone, Jinshan District, Shanghai 201505, China

R076/1992-NL1-2004.12
FD series (Class III)
Ohaus Corporation, 19A Chapin Road, 07058 New Jersey, Pine Brook, New Jersey, United States

▶ Issuing Authority / *Autorité de délivrance*

Physikalisch-Technische Bundesanstalt (PTB), Germany

R076/1992-DE1-2001.08 Rev. 2
Types BC BL 100, BD BL 100, BD BL 200, BF BL 500 (Classes I, II and III)
Sartorius A.G., Weender Landstraße 94-108, D-37075 Göttingen, Germany

R076/1992-DE1-2002.04 Rev. 1
Types CE... (Class III)
Bizerba GmbH & Co. KG, Wilhelm-Kraut-Straße 65, D-72336 Balingen, Germany

R076/1992-DE1-2003.01 Rev. 1
Types 635x1, 635x2, 645x1, 645x2, 665x1, 665x2, 675x1, 675x2, 685x1, 685x2 (Class III)
Seca Meß- und Wiegetechnik or Vogel & Halke GmbH & Co., Hammer Steindamm 9-25, D-22089 Hamburg, Germany

▶ Issuing Authority / *Autorité de délivrance*

Russian Research Institute for Metrological Service (VNIIMS) of Gosstandart of Russian Federation, Russian Federation

R076/1992-RU1-2003.03
Net scale "NOTOK" (Class III)
JSWMC "TENSO-M", 38, Vokzalnaya str, Kraskovo, Lyuberetskii district, Moscow region, 140050, Russian Federation

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 85 (1998)

▶ Issuing Authority / *Autorité de délivrance*

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

R085/1998-NL1-2004.01
Model 970 with antenna F08 and DC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.02
Model 970 with antenna F08 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.03
Model 970 with antenna S06 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.04
Model 970 with antenna S08 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.05
Model 970 with antenna S10 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.06
Model 970 with antenna S12 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

R085/1998-NL1-2004.07
Model 970 with antenna W06 and AC power supply (accuracy class 2)
Enraf B.V., Delftechpark 39, NL-2628 XJ Delft, The Netherlands

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 107 (1997)

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

R107/1997-GB1-2004.01
Computabulk Mk4 for accuracy class 0.2
Chronos Richardson Ltd, Arnside Road, Bestwood Estate, Nottingham NG5 5HD, United Kingdom

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

R107/1997-DE1-2004.01
Minipond 25/ SWW 2000 M for accuracy class 0.2; 0.5; 1 or 2
B+L Industrial Measurements GmbH, Hans-Bunte-Straße 8-10, D-69123 Heidelberg, Germany, Germany

R107/1997-DE1-2004.02
SIWAREX FTA-... for accuracy class 0.2, 0.5, 1 or 2
Siemens AG, Östliche Rheinbrücken straße 50, D-76187 Karlsruhe, Germany

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

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

R 117 (1995) + R 118 (1995)

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

R117/1995-NL1-2004.02
DPX-A light for accuracy class 0,5
Dresser Wayne Pignone, Via Roma 32, I-23018 Talamona (SO), Italy

R117/1995-NL1-2004.03
IXION for accuracy class 0,5
Dresser Wayne Pignone, Via Roma 32, I-23018 Talamona (SO), Italy

INSTRUMENT CATEGORY
CATÉGORIE D'INSTRUMENT

Multi-dimensional measuring instruments
Instruments de mesure multidimensionnels

R 129 (2000)

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

R129/2000-NL1-2004.01
VMS 520
SICK AG., Nimburger Strasse 11, D-79276 Reute, Germany

Issuing Authority / *Autorité de délivrance*

Norwegian Metrology Service, Norway

R129/2000-NO1-2002.01

Cargoscanner CS5200 Beam Family

Cargoscan AS, Grenseveien 65/67,
N-0663 Oslo, Norway

R129/2000-NO1-2002.02

Cargoscanner CS900

Cargoscan AS, Grenseveien 65/67,
N-0663 Oslo, Norway

R129/2000-NO1-2003.01

Cargoscanner CS5200 Beam family

Cargoscan AS, Grenseveien 65/67,
N-0663 Oslo, Norway

R129/2000-NO1-2003.02

Cargoscanner CS5200 Beam family

Cargoscan AS, Grenseveien 65/67,
N-0663 Oslo, Norway

CECIP

54ème Assemblée Générale

Barcelone, Espagne

21 mai 2004

MICHEL TURPAIN
Secrétaire Permanent

Le CECIP, Comité Européen des Constructeurs d'Instruments de Pesage, vient de tenir sa 54ème Assemblée Générale à Barcelone en Espagne, à l'invitation de l'AECIP, Association Espagnole de Coordination de l'Industrie du Pesage.

Notre Assemblée Générale s'est tenue dans les salons de l'Hôtel Barcelo Sants. De nombreux invités et membres du CECIP sont intervenus dans des domaines très variés intéressant notre activité:

- M. Josep Isern Sitja, Directeur Général de l'Industrie de la Généralité de Catalogne, nous a fait l'honneur d'ouvrir cette journée,
- M. Josep Maria Catalan, Président de l'AECIP, a prononcé un discours de bienvenue à l'ensemble des invités et des délégués,
- M. David Castle, Président du CECIP, a ouvert officiellement la 54ème Assemblée Générale du CECIP,
- M. José Angel Robles Carbonell, du Centre de Métrologie Espagnol, nous a présenté la surveillance des instruments de pesage en service,
- Prof. Dr. Manfred Kochsiek, Président par Intérim de l'OIML, nous a donné les dernières nouvelles de l'OIML et de la mise en place de l'Accord de Reconnaissance Mutuelle sur les capteurs et les instruments de pesage à fonctionnement non automatique,
- Mme Susanne Höke de la Direction Générale Entreprise de la Commission Européenne, nous a présenté la Directive sur les Instruments de Mesure (MID), signée quelques semaines auparavant, après quatorze ans de travaux,
- M. Nicola Campanella, de la société Bravosolution, nous a présenté les achats aux enchères en ligne, comme une chance pour les fournisseurs,
- M. Raül Adroher, de l'Association Espagnole des Constructeurs d'Instruments de Pesage, nous a présenté un projet de salon du pesage en Espagne,
- M. Michel Turpain, Secrétaire Permanent du CECIP, a présenté une synthèse de la vérification des instruments de pesage en service dans les pays membres du CECIP.

Après l'arrivée de trois nouvelles Fédérations au sein du CECIP en 2003, le CECIP est composé aujourd'hui de 15 Fédérations venant des pays suivants:

Allemagne	Espagne
Finlande	France
Hongrie	Italie
Pays-Bas	Pologne
République Slovaque	République Tchèque
Roumanie	Royaume-Uni
Fédération Russe	Suisse
Ukraine	

Chaque Fédération a présenté la situation de l'industrie du pesage en 2003 dans son pays, résumée dans un tableau récapitulatif détaillant la production d'instruments de pesage en Europe et montrant une baisse de la production par rapport à 2002 en Espagne, en Italie et en France (avec la fermeture de l'usine Testut en 2003) et une hausse légère en Allemagne et plus marquée en Finlande, au Royaume-Uni et en République Tchèque.

Les exportations sont en baisse en général sauf au Royaume-Uni et en République Tchèque. Les importations sont en hausse en Espagne, en Finlande et au Royaume-Uni, et en baisse en Allemagne, en France, en Italie, en République Tchèque et en Suisse.

La partie statutaire s'est déroulée l'après-midi avec le programme habituel ci-dessous.

Rapports d'activité des Groupes de Travail

- Le groupe Métrologie Légale qui poursuit sa tâche de propositions et d'examens:
  - Des documents de l'OIML, en particulier la révision des Recommandations touchant les instruments de pesage à fonctionnement automatique qui accompagneront la MID,
  - Des documents de la Commission Européenne, en particulier en 2003 la finalisation de la MID,
  - Des documents du WELMEC, European Cooperation in Legal Metrology, en particulier les guides d'harmonisation.
- Le Bureau, qui assure la gestion quotidienne du Comité et son développement, en apportant notre expérience aux jeunes Fédérations des pays qui frappent à la porte de l'Union Européenne, en prenant contact avec les Fédérations de constructeurs d'instruments de pesage à travers le monde, amenant de nouveaux membres au CECIP, comme la Pologne, la

Roumanie et la Russie en 2003, en créant des liens avec les Fédérations de Chine, des États-Unis d'Amérique ou du Japon.

Nos amis Espagnols avaient parfaitement organisé cette Assemblée Générale dans la superbe ville de Barcelone. Cette journée de travail fut suivie d'une journée touristique dans les environs de Barcelone à la découverte du grandiose Monastère de Poblet, ensemble cistercien fondé en 1153, panthéon des Rois de Catalogne et d'Aragon, inscrit au patrimoine mondial de l'UNESCO. Puis le déjeuner fut suivi de la visite des caves prestigieuses de la famille Torrès.

Merci à nos amis Espagnols, M. Josep Maria Catalan, Président de l'AECIP, Lidia Sebastian, Raül Adroher et tous les membres de l'AECIP pour leur chaleureux accueil. A l'année prochaine en Pologne ! ■

CECIP

54th General Assembly

Barcelona, Spain

21 May 2004

MICHEL TURPAIN
Permanent Secretary

CECIP, the European Committee of Weighing Instrument Manufacturers, held its 54th General Assembly in Barcelona, Spain, at the invitation of AECIP, the Spanish Association of Coordination of the Weighing Industry.

The General Assembly was held in the Barcelo Sants Hotel. A number of guests and members of CECIP gave presentations on a wide range of topics related to our activity:

- Mr. Josep Isern Sitja, Director General for Industry of the Catalonia Region, honored us by opening up the proceedings,
- Mr. Josep Maria Catalan, President of AECIP, gave a welcome speech to all guests and delegates,
- Mr. David Castle, President of CECIP, officially opened the 54th CECIP General Assembly,
- Mr. José Angel Robles Carbonell, of the Spanish Centro Español de Metrología (CEM), presented the surveillance of weighing instruments in service,
- Prof. Dr. Manfred Kochsiek, OIML Acting President, gave the latest OIML news and notably the setting up of the OIML Mutual Recognition Arrangement on load cells and on nonautomatic weighing instruments,
- Mrs. Susanne Höke from the Enterprise Directorate-General of the European Commission gave a presentation about the Measuring Instruments Directive (MID), which had been signed some weeks previously following fourteen years of work,
- Mr. Nicola Campanella, from the Company Bravosolution, gave a presentation on online auctions as being an opportunity for suppliers,
- Mr. Raül Adroher, of the Spanish Association of Weighing Instrument Manufacturers, presented a project to hold a weighing salon in Spain,

- Mr. Michel Turpain, Permanent CECIP Secretary, gave a summary of in service weighing instrument verification in CECIP member countries.

Following the accession as CECIP members of three new Federations in 2003, CECIP now comprises 15 Federations from the following countries:

Czech Republic	Finland
France	Germany
Hungary	Italy
Poland	Romania
Russian Federation	Slovakia
Spain	Switzerland
The Netherlands	Ukraine
United Kingdom	

Each Federation then presented the situation of the weighing industry in its country. The table summarizes weighing instrument production in Europe and indicates a decrease in production compared to 2002 in Spain, Italy and France (with the closure of the Testut factory in 2003), a slight increase in Germany, and a more marked increase in Finland, the United Kingdom and the Czech Republic.

Exports showed a general decline except in the United Kingdom and in the Czech Republic. Imports rose in Spain, Finland and in the United Kingdom but declined in Germany, France, Italy, the Czech Republic and Switzerland.

During the afternoon the statutory part included, as in previous years, the usual program as described below.

Activity reports for each Working Group

- The Legal Metrology Group, which is continuing with its task of coming up with proposals and examinations:
  - Of OIML documents, especially the revision of Recommendations dealing with automatic weighing instruments which will accompany the MID,
  - Of European Commission documents, especially in 2003 the finalization of the MID,
  - Of WELMEC (European Cooperation in Legal Metrology) documents, especially harmonization Guides.
- The Bureau, which takes care of the day-to-day management of the Committee and of its development by passing on experience acquired to the younger Federations of those countries that come knocking at the European Union's door, and by making contacts with the Federations of weighing instrument manufacturers around the world, bringing on board new CECIP members, such as Poland, Romania and Russia in 2003, and by creating ties with the Chinese, American, and Japanese Federations.

Our Spanish friends made an excellent job of organizing this General Assembly in the superb town of Barcelona. The work session was followed by a sightseeing day in the Barcelona area during which delegates visited the magnificent Cistercian Monastery in Poblet founded in 1153, burial place of the kings of Catalonia and Aragon and listed among the UNESCO World Heritage Sites. After lunch, delegates enjoyed a visit to the prestigious Torrès wine cellars.

We extend our thanks to our Spanish friends, to Mr. Josep Maria Catalan, AECIP President, Lidia Sebastian, Raül Adroher and all the members of AECIP for their warm welcome. See you next year in Poland!

Statistiques - Industrie du Pesage *Année 2003* Results - Weighing Industry *Year 2003*

Pays / **Country**	**Production**		**Variation**	**Export**	**Import**
	Hors taxe Monnaie locale Local currency	Hors taxe Without tax Million Euro	2003 / 2002	Variation/2002 Million Euro	Variation/2002 Million Euro
ALLEMAGNE *GERMANY*		667,9	+ 0,9 %	443,3 – 3,4 %	184,4 – 18,1 %
ESPAGNE *SPAIN*		60,4	– 17,6 %	17,5 – 30,5 %	6,7 + 6,3 %
FINLANDE *FINLAND*		28,5	+ 2,9 %	5,89 – 28 %	10,7 + 8,7 %
FRANCE *FRANCE*		164,7	– 4,9 %	74,8 – 20,6 %	127,6 – 1,4 %
HONGRIE *HUNGARY*					
ITALIE *ITALY*		159,1	– 13,2 %	23,3 – 4,1 %	35,4 – 4,1 %
PAYS-BAS *NETHERLANDS*					
POLOGNE *POLAND*					
REPUBLIQUE SLOVAQUE *SLOVAK REPUBLIC*					
REPUBLIQUE TCHEQUE *CZECH REPUBLIC*		12,5	+ 5,9 %	1,95 + 30,1 %	9,72 – 20,3 %
ROUMANIE *ROMANIA*					
ROYAUME-UNI *United Kingdom*		192,9	+ 4 %	137,7 + 11,38 %	131,78 + 15,10 %
FEDERATION RUSSE *RUSSIAN FEDERATION*					
SUISSE *SWITZERLAND*				114,2 – 13,5 %	40,9 – 1,2 %
UKRAINE *UKRAINE*					

RLMO NEWS

20th WELMEC Committee Meeting

Časta Papiernička, Slovakia

13–14 May 2004

GABRIELE WESSELY, WELMEC Secretary

The 20th WELMEC Committee Meeting was held in Časta Papiernička (Slovakia) on 13–14 May 2004. The meeting was opened by Mr. Ivan Mikulecký, Director of the Department of Metrology of the Slovak Office of Standards, Metrology and Testing and Prof. Matej Bilý, General Director of the Slovak Institute of Metrology (SMU).

Mr. Dusan Gàbris, Director of the SMU Metrology and Quality Department, gave a presentation about recent developments in the Slovak metrology system and Mr. Freistetter (WELMEC Chairman) informed the Committee that on 14 May two European Commission representatives, Mr. Brekelmans and Mr. Hanekuyk, would give their views on further cooperation between the EC and WELMEC.

Mr. Freistetter then welcomed Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia as new Full Members; representatives of these countries would proceed to sign the Memorandum of Understanding (MoU) before the gala diner. Estonia, who could unfortunately not attend the meeting, would sign the MoU by post.

On this occasion the Czech Republic, Hungary and Poland also signed the WELMEC Type Approval Agreement (TAA), and Cyprus, Malta and Slovenia would sign it by post. The Committee also agreed to include the new OIML R 134-1 *Automatic instruments for weighing road vehicles in motion. Total vehicle weighing* in the WELMEC TAA, which would be modified accordingly.

Mrs. Corinne Lagauterie (France) was then elected as new Committee Vice-chairperson. Mr. Freistetter welcomed her and thanked Mr. Schulz for his successful 10 years as Vice-Chairperson. The composition of the Chairman's Group was also changed: it now consisted of Mrs. Lagauterie, Mrs. Todorova, Mr. Schulz, Mr. Klenovský and Mr. Lindlov.

Next year it would be necessary to elect a new Chairperson, so the Secretariat would send out a call for candidates in 2004.

Since in 2003 the Committee had agreed to create two new Working Groups and the Convenors had been chosen and confirmed, the latter were introduced: Dr. Kramer for the Utility Meters WG and Dr. Burghart for the ad hoc WG for Information Exchange. The ToR of the Working Groups were endorsed and are all published on the WELMEC web site.

In the course of the discussion the question of the creation of new WGs was again raised and it was agreed to ask for proposals for the creation of WGs for

Taximeters, Exhaust Gas Analyzers, Material Measures and Dimensional Measuring Instruments.

At the European level the Measuring Instruments Directive (MID) was finalized and published in the Official Journal on 30 April 2004. Member States now have until 30 April 2006 at the latest to transpose it into national law. The MID will enter into force in all the Member States and the EEA at the same time on 30 October 2006.

The idea to hold various seminars was also discussed. It was agreed to first hold seminars on the implementation of the MID at the level of the national authorities, and as a second step for industry; the seminars would be organized by WG 8 as soon as possible. It additionally transpired to be necessary for the Secretariat to create a platform for frequently asked questions ("FAQ") concerning the MID (the first of which would be to identify who is responsible for the MID implementation in the different countries). This would also be detailed on the WELMEC web site.

A European Commission statement brought to the meeting by Mr. Brekelmans and Mr. Hanekuyk was distributed and then presented by Mr. Brekelmans. The statement was very encouraging and proposed close cooperation between the Commission and WELMEC in the following areas:

- Market surveillance;
- Cooperation regarding conformity assessment, including the operation of Notified Bodies;
- Identification of relevant OIML publications;
- Development of guidance documents;
- The wider area of administrative cooperation.

The proposal for cooperation was endorsed by WELMEC and was now the basis for such further cooperation.

Mr. Hanekuyk also gave information concerning prepackages. In December 2004 there would be a meeting of the national authorities, as the EC needs information from the new members. A proposal concerning the deregulation of package sizes was formulated in July 2004 and then passed on to the Commission.

The Commission's participation was warmly welcomed for the discussion it generated and the clarifications emanating from it.

Reports by Working Groups

WG 2 Weighing Instruments

The WG 2 report was presented by Mr. Birdseye, who also commented the revised version of WELMEC Guide 2 *Non Automatic Weighing Instruments* for acceptance. The amendment to the Guide was adopted and is now available on the WELMEC web site. A new area for WG 2 was now the field of Automatic Weighing Instruments, covered by the MID.

WG 4 General Aspects of Legal Metrology

Mr. Lindlov, WG 4 Chairman, gave a presentation of the WG 4 ToR and the three main aspects this WG's tasks, which would eventually be set out in one document. The discussion about accuracy classes and uses of measuring instruments led to the conclusion that there was no reason to enlarge the range of accuracy classes and uses of measuring instruments beyond the existing situation in the Member States when transposing the MID into national law.

WG 5 Metrological Supervision

Mr. Björkqvist was confirmed as the new Co-Convenor of WG 5 and he presented this WG's report. The ToR of WG 5 were adopted with minor changes.

He also presented WELMEC Guide 5.2 *Market Surveillance for Non-Automatic Weighing Instruments* to the Committee for acceptance.

A discussion ensued in which the EC representatives also participated, about when Market Surveillance actually starts and when one can say that a product has actually been "put on the market". It was agreed that Market Surveillance at a manufacturer's premises is only possible when there is strong suspicion that something is wrong with an instrument.

It was agreed to adopt the new Guide 5.2 in its current state; if industry or Market Surveillance Authorities had problems in interpreting the text, amendments could be considered. Guide 5.2 was adopted and is now available on the WELMEC web site.

WG 6 Prepackages

The WG 6 report was presented by Mr. Burnett from LACORS. He informed the Committee that as Guide 6.0 had been drawn up prior to the extension of the EU, it was now necessary to update it and to include Cyprus and Malta. The Committee decided not to produce a new issue after its publication, but rather to amend it prior to publication. The new WG 6 ToR were adopted with minor amendments and the revised Guide 6.0 is available on the WELMEC web site.

WG 7 Software

Mr. Schulz presented the WG 7 report on behalf of Mr. Schwartz from the PTB. He explained that software in legal metrology was very important when considering the risk of influencing the performance of measuring instruments itself. Under the EU Growth Program there was an EU-funded project concerning software in legal metrology. The results of these projects would be considered as a very valuable basis for a WELMEC Guide in this field.

WG 8 Measuring Instruments Directive

Mrs. Lagauterie gave the WG 8 report on behalf of Mr. Lagauterie, who was confirmed as WG 8 Convenor. The WG 8 ToR were adopted, including taking into account the MID and OIML definitions, and taking on the task of organizing workshops on the implementation of the MID.

The working program would be set up and meetings held starting in September 2004.

WG 10 Measuring Equipment for Liquids Other Than Water

Mrs. van Spronssen presented the WG 10 report and Mr. Johansen commented that there had been long discussions concerning information technology equipment to ascertain which tests were necessary and how to use existing test procedures without having to develop new ones. OIML R 117 and R 118 could be used, but they were costly for the manufacturer.

WG 10 had already included the corresponding MID Annex in its working package.

WG 11 Utility Meters

Mr. Kramer presented the new WG 11 ToR. As the Committee considered these to be too extensive they were reformulated and then presented again - and accepted. They were published on the WELMEC web site and the Secretariat sent out a call for members.

Ad hoc Group for Information Exchange

This Working Group was responsible for the preparation of the information exchange laid down by the MID. Such information concerned, for example, Type Approval Certificates, Approvals of Quality Management Systems, and market surveillance activities. A common basis and shared information should be available all over Europe.

The ToR of this new Ad hoc WG were endorsed and Mr. Burghart would put out a call for members.

The EMeTAS report was given by Mr. Birdseye; he remarked that there were currently 4 400 documents on the server and that the UK was one of the main users of the database. A recent letter to WELMEC by EMeTAS was distributed, in which Mr. Gainsford expressed the hope that WELMEC would continue to endorse EMeTAS and that it was important to have a meeting of WELMEC and EMeTAS representatives. The Ad hoc Working Group would consider this offer.

Other reports

As usual at the end of the Committee Meeting, reports were presented by Observer Organizations. Mr. Weidlich (SNAS) gave an update on recent developments in the EA, which was followed by an extensive discussion about impartiality requirements in ISO 17011. Mr. Weidlich also mentioned cross-border accreditation development in the EA. Both issues were leading to the very sensitive question of compatibility with the EU legal framework concerning the free movement of services.

Then Mr. Szilvássy gave a presentation on recent developments within the OIML, especially concerning the OIML MAA and its forthcoming implementation. Among key issues for 2004, he mentioned the BIML initiative for increased cooperation with CEN/CENELEC, WELMEC and the European Commission on issues related to the implementation of the MID.

Mr. Klenovský gave a short presentation on EUROMET. The next EUROMET General Assembly would be held in June in Bled, there Mr. Bennett was presented as the new EUROMET President. He informed the Committee that the transition CEMPA MRA had ended in December 2003 and that about 10 000 CMCs were currently administered by EUROMET. The IMERA Project was a new project started with support from the EC, the basic aim being to instigate coordinated research in certain areas. He also informed the Committee about ongoing differences in opinion between the EA and EUROMET concerning the lack of detachment in the field of accreditation in some countries.

Future Committee Meetings

The WELMEC Committee was invited by Mr. Llewellyn to hold its 21st Meeting in the UK in 2005, by Mrs.

Todorova to hold its 22nd Meeting in Bulgaria, and by Mr. Iacobescu to hold its 23rd Meeting in Romania. The Committee expressed its gratitude for these invitations.

Main decisions

The WELMEC Committee:

- Approved the Minutes of the 19th Committee Meeting in Madrid;
- Accepted the Chairman's Report for 2003;
- Approved the report concerning the budget for 2003;
- Approved the subscriptions for 2005 to be the same as 2004;
- Welcomed Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia in changing their status from Associate Members and with EU membership to WELMEC Membership (new issue for WELMEC 1);
- Elected Mrs. Corinne Lagauterie as new Vice-Chairperson;
- Thanked Mr. Wilfried Schulz for his work as WELMEC Vice-Chairman;
- Took note of the new composition of the Chairman's Group;
- Thanked Mr. Cartaxo-Reis for his work in the WELMEC Chairman's Group;
- Agreed to hold an MID Implementation/ Enforcement Workshop for WELMEC in 2004;
- Agreed to hold Workshops/Seminars for industry and notified bodies in 2005/2006;
- Agreed to provide a platform for questions/answers concerning the MID;
- Welcomed Cyprus, the Czech Republic, Hungary, Poland and Slovenia as new members in the Type Approval Agreement (new issue for the WELMEC TAA);
- Agreed to add OIML R 134-1 to the scope of the WELMEC TAA;
- Approved all Working Group Reports;
- Approved WELMEC Documents 2, 5.2 and 6.2;
- Took note of the development of three documents in WG 4 concerning uncertainty in legal metrology, the use of accuracy classes and failure rate;
- Adopted the ToR for WG 5, WG 6, WG 8, WG 11 and the Ad hoc WG;
- Decided to introduce the results of the EU Growth Projects into the relevant WELMEC WG as a basis for WELMEC Documents;
- Endorsed the Commission Statement about cooperation between WELMEC and the European Commission;
- Thanked the SMU for hosting the 20th Committee Meeting;
- Accepted the invitation to hold the 21st Committee Meeting on 11–12 May 2005 (confirmed) in Edinburgh (UK).

TC/SC NEWS

OIML TC 17/SC 8 Working Group Meeting

Sydney, Australia

31 May – 1 June 2004

GRAHAME HARVEY
NMI Australia

Members were invited to attend the first meeting of TC 17/SC 8 in Sydney from 31 May to 1 June 2004. However, only three P-members indicated their willingness to travel all the way to Australia. Rather than defer the meeting, it was decided to meet as a Working Group with the specific task of drawing up a Draft Recommendation for measuring instruments used for protein determination in grain. To ensure that the Working Group had access to broad practical experience, delegates were invited from the Australian Wheat Board, Queensland trade measurement and GrainCorp (a major grain receival company and user of protein measuring instruments in Australia).

While grain protein measurements are important to many economies, the Secretariat knows of only two countries that have published standards for these instruments. Prior to the meeting an outline draft was circulated to Subcommittee members and comments sought. During the meeting a number of critical issues were identified such as the types of grain to be covered, the moisture basis of the measurements and, of course, maximum permissible errors. Very good progress was made in addressing these issues and incorporating changes based on comments received and the experience of Working Group members.

Following the meeting a Working Draft was drawn up and circulated to WG members for approval prior to its intended circulation to the Subcommittee by 31 August 2004. It is also intended hold a meeting of the Subcommittee later in the year, possibly in a less remote location and preferably linked to other meetings, when comments on the Working Draft can be considered. ■

TC/SC NEWS

OIML TC 12

Copenhagen, Denmark
30 March – 1 April 2004

Stefan Svensson

TC 12 Secretary

The Working Group for the revision of the International Recommendation on *Electricity meters* (OIML R 46), held a meeting in Copenhagen, Denmark from 30 March to 1 April 2004.

Thirty-one delegates from seventeen countries attended the meeting, which was kindly hosted by the DEFU of Denmark.

A good sign of the sustained level of interest in this subject was that before the meeting more than 160 comments had been collected. Many pertinent suggestions as to how best to answer and fulfil as many as possible of the different requests were made both before and during the meeting.

Much effort was put into finalizing the "Requirements" and "Testing" sections, the main aim being to make the requirements as robust as possible while not unnecessarily disqualifying any technology.

Also, efforts were made to use standardized tests as much as possible, preferably from OIML D 11 *General requirements for electronic measuring instruments*.

At the end of the meeting, the draft had matured such that the meeting could decide that it would reach 1 CD stage after some further editing work was carried out; this work was assigned to the Secretariat. It was also decided that the draft should be split up into three sections: "Requirements", "Tests" and "Test report" in order to render integration into national regulations easier. This would also allow the Secretariat to be able to postpone writing the "Test report" section until later.

The deadline for comments on the 1 CD is now set to October 31, 2004. The date and venue of the next meeting is not yet set, but it is expected to be held in the second half of November, 2004. ■

The OIML is pleased to welcome the following new

CIML Members

Australia

Mr. Grahame Harvey

The Netherlands

Mr. Cees J. van Mullem

OIML Meetings

5 October 2004 - Paris, France
(Exact venue to be confirmed later)
TC 8/SC 5 Water meters

11 October 2004 - Dordrecht, The Netherlands
(Exact venue to be confirmed later)
TC 8/SC 8 Gas meters

25–29 October 2004 - Berlin, Germany
Development Council Meeting
39th CIML Meeting
12th International Conference on Legal Metrology

2–3 December 2004 - Vienna
TC 8/SC 1 Static volume measurement

Committee Drafts

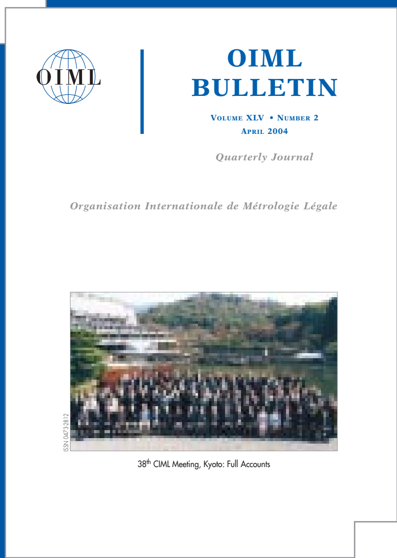
Received by the BIML, 2004.05 – 2004.07

Revision R 56 "Standard solutions reproducing the electrolytic conductivity"	E	2 CD	TC 17/SC 4	RU
Revision of "International Vocabulary of Basic and General Terms in Metrology"	E	Draft from JCGM WG 2	TC 1	PL
Revision R 46: Electricity Meters	E	1 CD	TC 12	DE
R 75-3: Heat Meters Part 3: Test Report Format	E	1 CD	TC 11	DE
Extension of the period of validity of verification of utility meters on the basis of sampling inspections	E	1 CD	TC 3/SC 4	DE
Gas meters (Combined revision of R 6, R 31 and R 32)	E	1 CD	TC 8/SC 8	NL

Call for papers

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

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



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- the paper originals of any relevant photos, illustrations, diagrams, etc.;
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