Bulletin OIML n° 98
Mars 1985

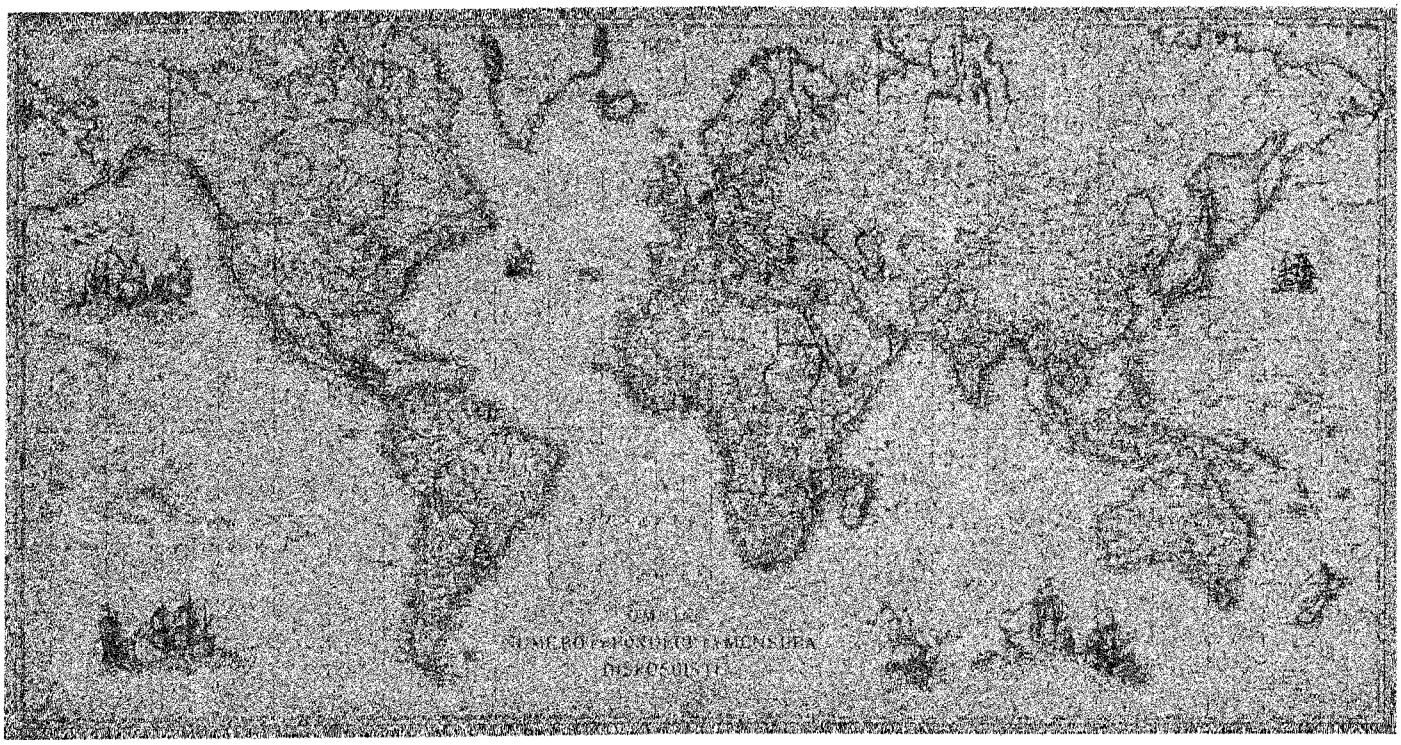
ISSN 0473-2812

BULLETIN

DE

L'ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

Organe de Liaison entre les Etats membres



BUREAU INTERNATIONAL DE METROLOGIE LEGALE
11, Rue Turgot — 75009 PARIS — France

Bulletin OIML n° 98
26e Année — Mars 1985
Trimestriel
ISSN 0473-2812

BULLETIN
de
l'ORGANISATION INTERNATIONALE de MÉTROLOGIE LÉGALE

SOMMAIRE

Abonnement pour 1985 : Europe : 100 F-français
Autres pays : 120 F-français
Chèques postaux : Paris 8 046-24 X
Banque de France : B.P. 140-01 - 75049 Paris Cedex 01
Comptes Courants, Banques Etrangères, Cpte n° 5051-7

BUREAU INTERNATIONAL DE METROLOGIE LEGALE
11, Rue Turgot — 75009 Paris — France
Tél. 878-12-82 et 285-27-11 Le Directeur : Mr B. ATHANÉ
TELEX : SVPSV 660870 F ATTN OIML

REPUBLIQUE FEDERALE D'ALLEMAGNE

NEW EQUIPMENT and PROCEDURES for TESTING GASOLINE PUMPS

by **W. GÖGGE**

Eichdirektion Rheinland-Pfalz, Bad Kreuznach

SUMMARY — The author reviews the metrological requirements for gasoline pumps as applied in the Federal Republic of Germany and describes the new equipment used in Rheinland-Pfalz for on-site verification. For flowrates below 100 L/min a small cart containing the test flasks has been constructed. A special prover truck is used for higher flow-rates.

RESUME — L'auteur passe en revue les exigences métrologiques pour les pompes d'hydrocarbures en République Fédérale d'Allemagne et décrit le nouvel équipement utilisé dans le Rheinland-Pfalz pour la vérification sur le lieu d'installation. Un petit chariot mobile a été construit pour des débits inférieurs à 100 L/min. Un camion contenant des étalons de volume de plus forte capacité est utilisé pour des débits plus importants.

1. Gasoline Pump Equipment

Fuel for motor vehicles has always been expensive enough to warrant the use of measuring instruments for its sale. In the early days of motor traffic, the few automobilists bought their fuel in pharmacies ; simple volume measuring equipment was used to measure the desired quantities. With increasing motor traffic, special facilities were established for storage and distribution of fuel as well as for maintenance and repair of motor vehicles : Gasoline or service stations. Gasoline was no longer sold in bottles or similar vessels, but was stored in underground or surface storage containers and manually pumped into volume measuring instruments. Those first gasoline pumps were equipped with two such instruments : while one chamber was being filled, the other one could be emptied into the vehicle's fuel tank. Electric pumps soon replaced the manually operated pumps and so-called displacement meters, for example piston pump counters, took the place of measuring containers, allowing continuous measuring and fuelling. Filters, gas separators and valves completed this equipment to ensure clean and bubble-free refuelling. The initially used analogue displays were replaced by digital displays. Mechanical price calculators were installed for computation of the final amount to be paid by the customer based on the respective unit price.

This equipment again was replaced by so-called all-electric fuelling systems. The volume measuring unit -still used with modern equipment- is now connected to a pulse generator instead of a mechanical calculator. This avoids possible unwanted feedback from the mechanical price calculator to the volume measuring instrument and increases the accuracy at all rates of flow. The measured values - together with the base price - are electronically processed and digitally displayed on the indicator of the gasoline pump and are transmitted to the cashing facility where printers, cash registers and credit systems can be connected. The values can also serve as basis for internal operational control functions, such as control of contents of the storage containers, accumulation of fuel sales, etc. or for market analysis.

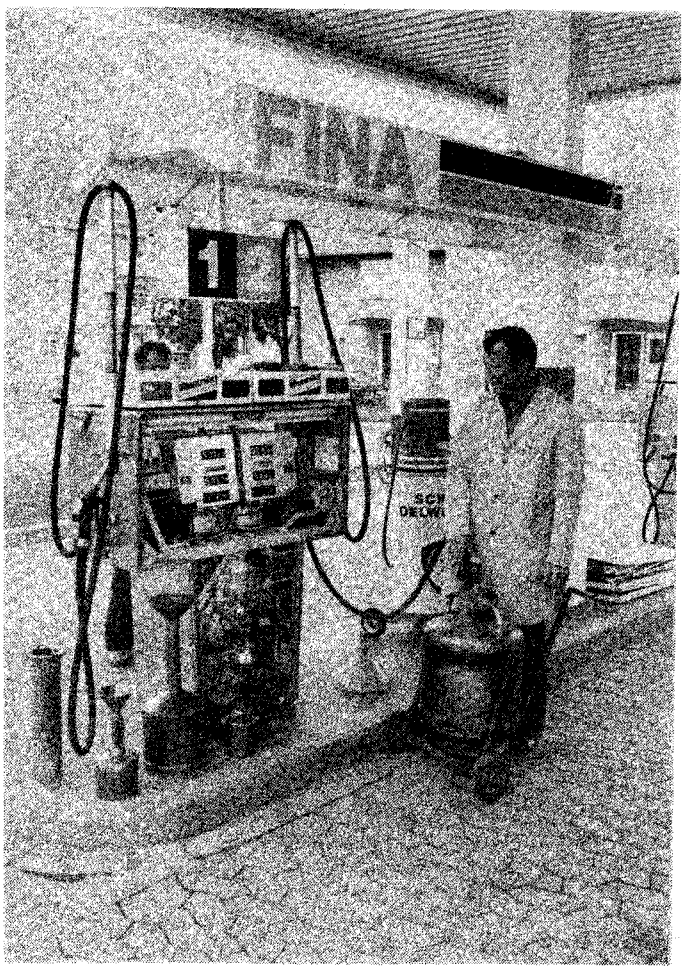


Fig. 1
Testing of gasoline pumps with individual separate provers

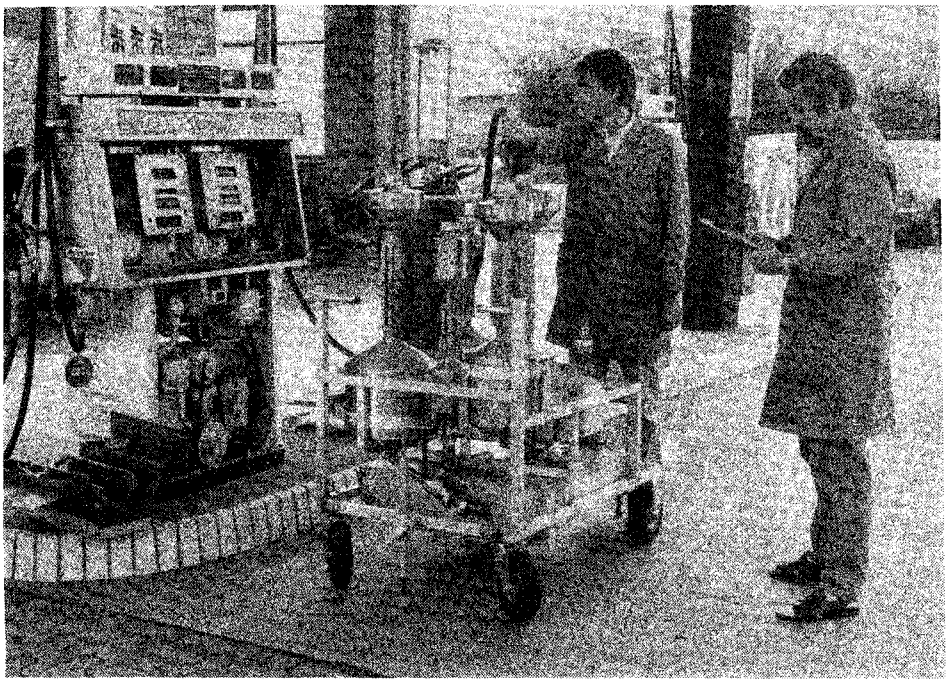


Fig. 2
Testing of gasoline pumps with the new test equipment

Auxilliary devices to dispense fuel against credits cards can also be attached. Self-service is facilitated by such equipment as coin and paper money acceptance systems (automatic tellers), quantity pre-setting units, and equipment for easy handling, like special fuel hoses and nozzles as well as overhead installation of fuel hoses.

2. Gasoline Pumps in the Framework of Legal Metrology

Commercially used gasoline pumps are subject to verification in many states. This means, pumps must be checked and stamped by the responsible verification authority on a regularly or irregularly recurring basis. In Germany, the period between regular verifications is two years.

However, owners of gasoline pumps have them more frequently adjusted, since they want to keep the error rate as nearly to zero as possible. After such adjustments, subsequent verification is required to restore compliance with legal requirements.

Measuring instruments subject to verification must comply with legal requirements and guidelines. In Germany, the provisions of the « Eichordnung » (Verification Ordinance), Appendix 5, govern the verification of gasoline pumps. All pertinent directives of the European Economic Community (EEC) have been incorporated into the Eichordnung ; it contains construction and identification requirements for gasoline pumps as well as maximum permissible errors, which are of importance for manufacturers and owners of gasoline pumps as well as for customers.

The maximum permissible errors in the Federal Republic of Germany for a measured volume of 2 L or more are

0.5 % at the time of verification (initial or subsequent)

1.0 % during daily operation (supervision)

As a general rule, new gasoline pumps, constituting complete compact measuring systems are verified in the factory. Individual components, for example all electronic attachments, must be pre-tested prior to final assembly with the end product. The pre-test and the external administrative examination can be more easily performed on the premises of the manufacturer because here the verification officer has all special test equipment at his disposal and he can determine, how and from which parts the measuring instrument has been manufactured. Maximum permissible errors during the pre-tests are much stricter than during verifications of the complete instruments. Example : For the volume measuring component they are for 2 L and above 0.3 % of the measured volume.

In addition to the initial verification of gasoline pumps in the factory, there are a number of instances, where the measuring system at the place of installation must undergo complete verification under conditions of initial verification. This is especially so if the seals or sealing devices are damaged because of maintenance and/or repair or if spare parts are used for repair, which were not pre-tested.

3. Verification of Gasoline Pumps on the Site

The equipment for more effective inspection and verification of gasoline pumps as described below is designed for initial and subsequent verification at the place of final installation.

Metrological principles for testing of volume measuring instruments are very simple : A certain quantity is filled into a measuring container whose volume is exactly defined and known. The quantity of fuel filled into this container, the so-called prover, is then compared with the indication on the display of the pump. Both values must coincide within maximum permissible errors.

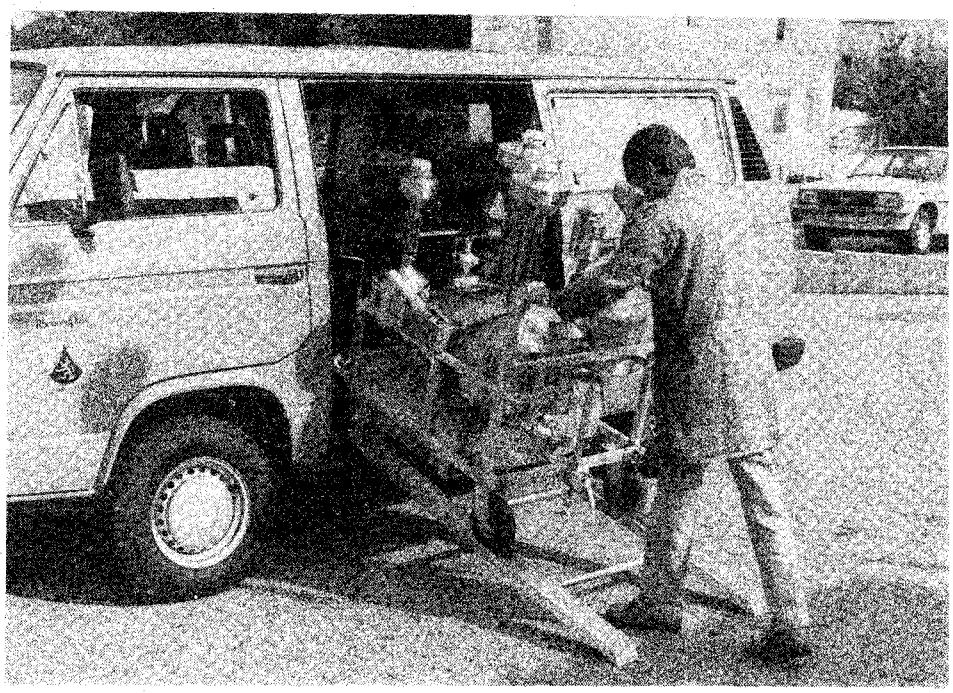


Fig. 3
Handling and loading of new test equipment

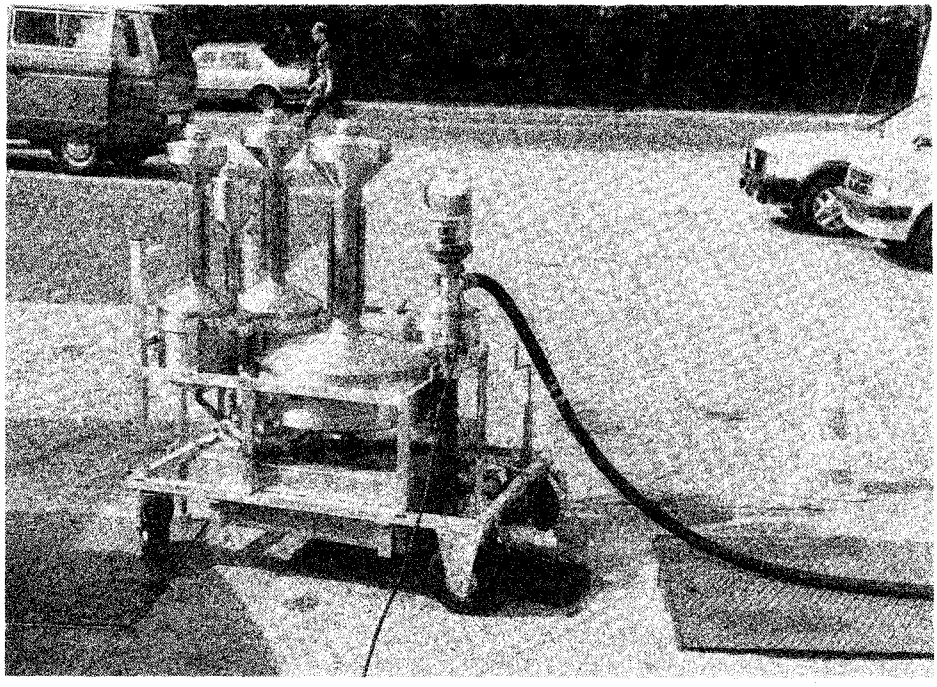


Fig. 4
Pumping fuel out of test equipment

The characteristic of the maximum permissible error requires tests at different flow rates. Normally, tests at three different flow rates are sufficient : at lowest, highest and at medium value. For each gasoline pump the minimum delivery is determined (for example 2 L). This means, that no quantity of less than 2 liters may be sold by this pump, because the possible inaccuracy might otherwise become excessive. The test quantity at minimum flow must be at least equal to the minimum delivery. In case of higher flow rates, larger volumes will have to be accomodated by a prover since for a test time of not less than 20 s a volume of up to 50 L is required. At medium flow this leads to test volumes somewhere in the middle between both values. In addition to that, gasoline pumps with widely varying flow rates are in operation, therefore, provers of different volumes must be available during the test. Consequently, the inspector has to bring provers of different volumes to the test location. In the past, these provers were put into a car (without special holding devices) and carried to the test site. They were filled during the test, carried to the storage containers of the service station and then the fuel was poured back into these storage containers (Fig. 1).

For many years, since service stations existed, the tests were performed that way. We felt it was about time for modern, more effective test procedures. It became evident that flow meters cannot replace provers because their accuracy and measuring stability is not adequate. Therefore, the provers, which we continue to use, are mounted in a specially constructed frame on a little cart (Fig. 2).

The test equipment comprises 5 brass provers of 2 L, 5 L, 10 L, 20 L and 50 L volume. The provers were manufactured by Messrs. Ludwig Brenner, Maschinen- und Apparatebau, Mühldorfstraße 8, 8000 München 80, while the cart with mountings and accessories was designed and manufactured in the Rheinland-Pfalz Verification Authority's own work shop. The total cost of the entire test equipment amounted to approx DM 11 000.

The frame of the test equipment consists of aluminium, one person can easily move it about as well as out of and back into the car (Fig. 3). In comparison to

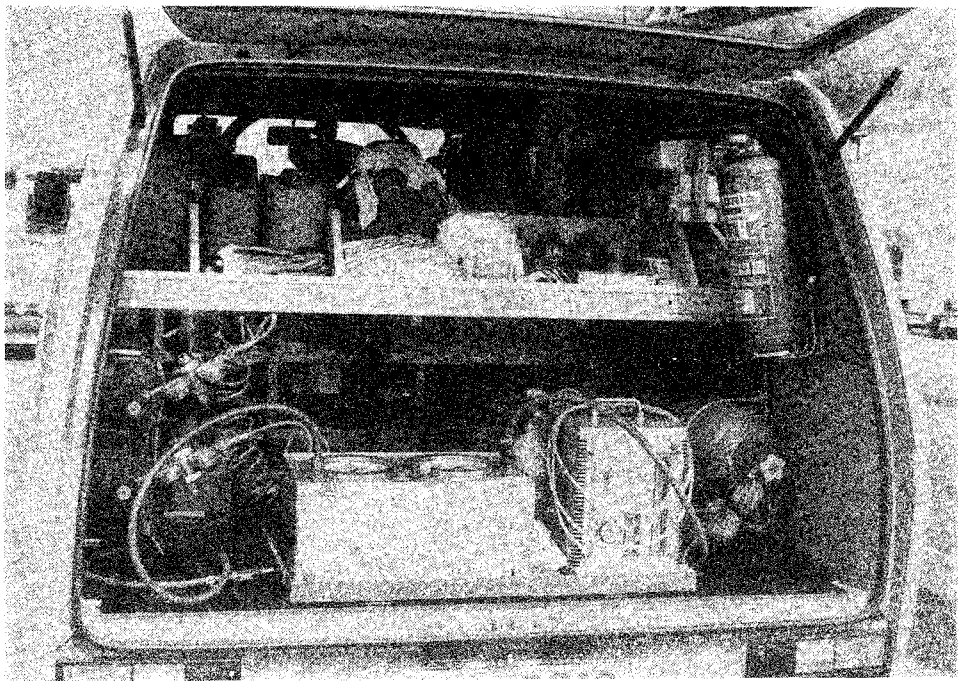


Fig. 5

Further test instruments installed in the inspectors car :
bottom right for CO measuring instruments, bottom left for tire pressure measuring instruments

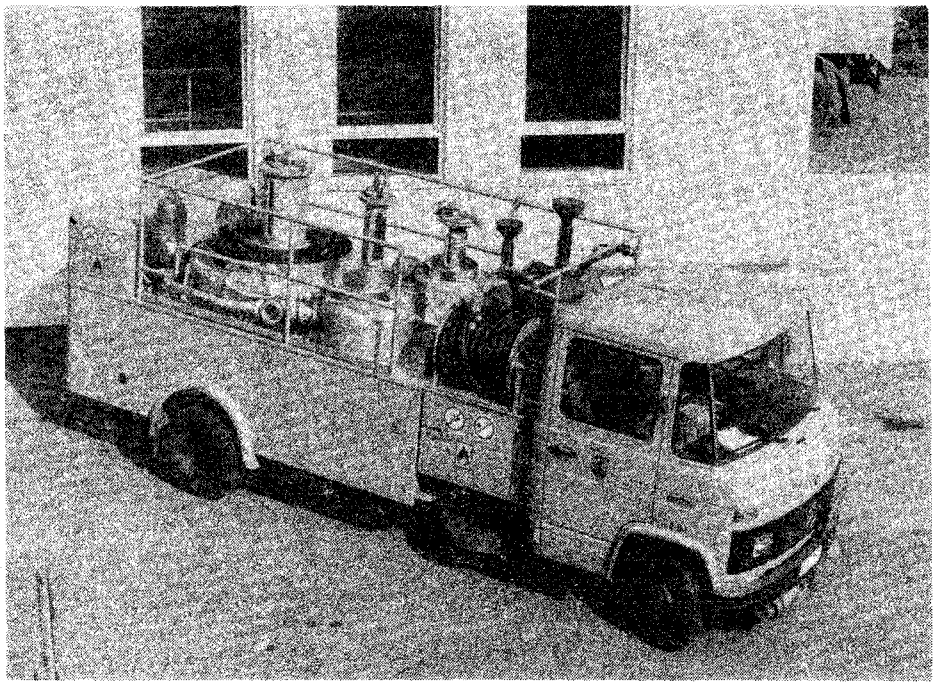


Fig. 6

Truck with built-in provers with capacities of 20, 50, 100, 200 and 1 000 L

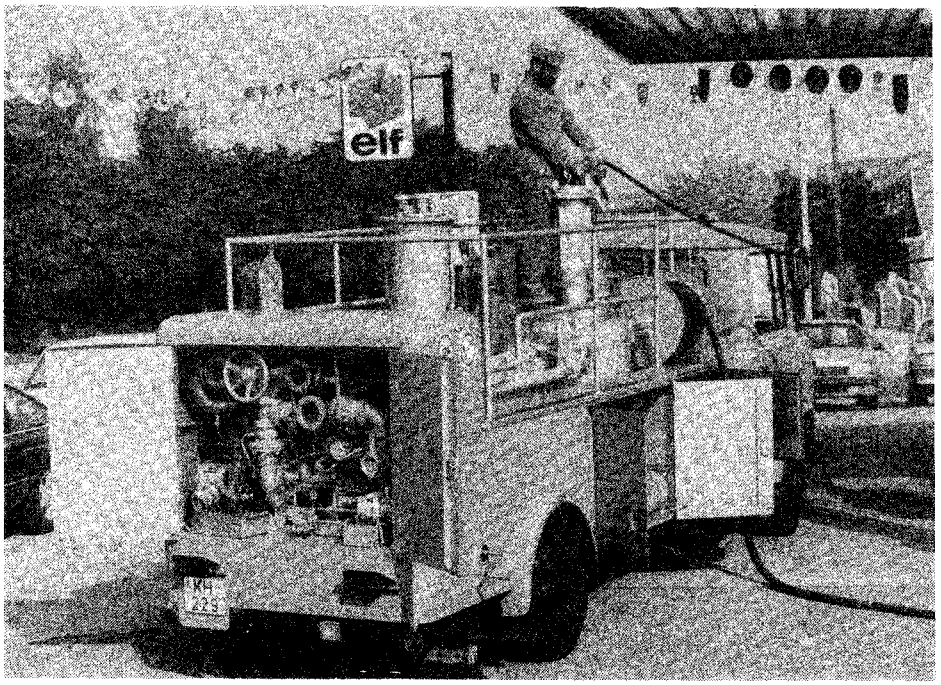


Fig. 7

Truck with built-in provers testing gasoline pumps

the old method, the provers are much better protected against indentation, a very important aspect of the new test equipment. The provers are connected to a collection tank by a system of pipes, viewing glasses and valves. After use, the provers are emptied into a collection tank with a capacity of 75 L and are available for further tests. After completion of the inspection, the cart is moved over to the storage container of the service station and emptied by means of a hose.

If the storage containers of a service station are installed on or above ground level, the test fuel can be pumped out of the provers or the collection tank into the storage container (Fig. 4).

The inspector's car is equipped for all types of verifications that might occur at a service station (Fig. 5). On the lower right, the test equipment for CO exhaust gas measuring instruments is installed, and on the lower left, the test equipment for tire pressure measuring instruments.

For testing of gasoline pumps with higher flow rates of approx 100 to 150 L/min the so called prover-truck (Eichkolben-Fahrzeug) of the Verification Authority Rheinland-Pfalz can also be used (Fig. 6). This truck is equipped with 5 firmly installed provers of 20, 50, 100, 200 and 1 000 L volume.

After the verification, the provers are emptied by means of a system of pumps and hoses (Fig. 7). This truck however, has not been specifically designed for the verification of gasoline stations, but is mainly used for verification of the measuring equipment of road tank cars. The operational cost for this truck is much higher than for the test equipment described before.

In concluding this article, two more advantages of firmly installed provers as compared to loose ones should be mentioned. The inspectors are better protected against fuel vapors, since the provers must no longer be emptied by hand. Furthermore, the image of the inspectors and consequently the confidence of the public in the quality of measurements is improved when effective test equipment is used. These points of view should not be neglected when planning and developing new test equipment.

REPUBLIQUE DEMOCRATIQUE ALLEMANDE

TESTING of CONVEYOR-BELT SCALES *

by **H.M. HUMPERT**
Amt für Standardisierung, Meßwesen und Warenprüfung

Introduction

As effective means to determine the mass of bulk materials conveyor-belt scales are extensively used in industrial plants. The different types of these scales which have been adapted to the special conditions of use cover mass flows ranging from several kilograms per hour to several 1 000 t/h with a permissible measurement inaccuracy of 0.5 % to 2 %.

Because of the variability of use, specialists often have vague ideas of the effect of influence factors on the weighing error. In references [1], [2], [3], [4] selected parameters which have been found to be significant are discussed in terms of their effect on the weighing error. From these references it follows that the metrological characteristics of conveyor-belt scales - besides the technical data reached by the producer - are particularly determined by the conditions existing at the place of operation. As far as metrological testing is concerned, this means that only such measuring procedures are applicable, which fully cover all parameter effects occuring at the time of testing. In the passages below possible measuring procedures will be compared.

Discussions will be confined to conveyor-belt scales which operate on the basis of the gravimetric measuring principle. That what will be pointed out is not applicable to radiometric conveyor-belt scales since other influence factors determine the weighing error because of the differing measuring principle.

1. Measuring Principle

Conveyor-belt scales cover two quantities in terms of metrology :

— the conveying speed v through the speed of the belt ;

— the belt load p through a force measurement.

One or several carrying idler stations of the belt conveyor are replaced by weigh idler stations. Fig. 1 shows the transfer characteristics of two types of weigh bridges in a schematic form. The finite section x of an ideal, equally distributed belt load p exercises a force of $p \cdot \Delta x \cdot g$ (g = gravitational acceleration) on the belt section concerned. However, the force effect on the weigh bridge by the discrete loads depends on the point of loading in the interval between the weigh idler stations and the carrying idler stations adjoining the weigh bridge. For the one-idler weigh bridge it therefore applies :

$$F = p \cdot \Delta x \cdot g \cdot \frac{2x}{B} \quad \text{for } 0 \leqslant x \leqslant \frac{B}{2} \tag{1}$$

$$F = p \cdot \Delta x \cdot g \left(2 - \frac{2x}{B} \right) \quad \text{for } \frac{B}{2} \leqslant x \leqslant B \tag{2}$$

* This paper is an English translation of a paper published in German in Metrologische Abhandlungen des ASMW Heft 4, 1981.

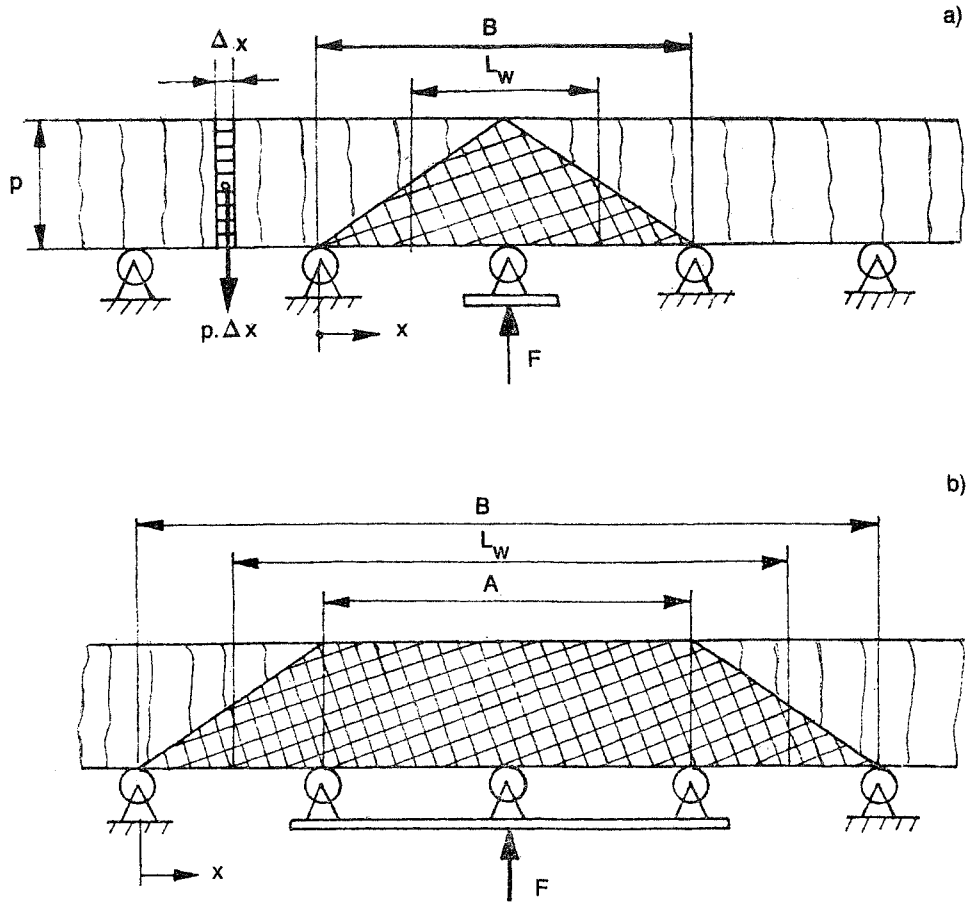


Fig. 1

Transfer behaviour of weighbridges

a) One-idler weighbridge

b) Multi (3)-idler weighbridge

The complete joining of discrete loads $p \cdot \Delta x \cdot g$ effects the total load on the weigh bridge

$$F = 2 \int_{o}^{B/2} p \cdot g \cdot \frac{2x}{B} \cdot dx, \text{ if } \Delta x \rightarrow dx \tag{3}$$

$$F = p \cdot g \cdot \frac{B}{2} \tag{4}$$

The value F is equal to the cross-hatched triangular surface in fig. 1. This triangle can be transformed into a rectangle of equal area with the edge length L_w. In weighing engineering L_w is called the bridge length.

For the multi-idler bridge the force effects of discrete loads are comparable with those of the one idler weigh bridge only in the interval

$$0 \leqslant x \leqslant \frac{B - A}{2}$$

and

$$\frac{B + A}{2} \leqslant x \leqslant B$$

In the interval of the weigh bridge $\left(\frac{B - A}{2} \leqslant x \leqslant \frac{B + A}{2} \right)$ the load effect is independent of the point of loading, a fact resulting in an advantage in terms of metrology. The total force effect of a load, equally distributed on the belt, on the weigh bridge therefore is :

$$F = 2 \int_{0}^{\frac{B-A}{2}} p \cdot g \cdot \frac{2}{B - A} \cdot x \cdot dx + \int_{\frac{B-A}{2}}^{\frac{B+A}{2}} pg dx \qquad (5)$$

$$F = p \cdot g \cdot \frac{B + A}{2} \qquad (6)$$

$$\text{with } L_w = \frac{A + B}{2} \qquad (7)$$

According to the formation of measuring results, there exist two types of conveyor-belt scales :

1. integrating conveyor-belt scales with which the instantaneous values of the belt load $p(t)$ and conveying speed represented by the weigh bridge loading $F(t)$ and the belt speed $v(t)$ are measured and integrated :

$$m = \int_{0}^{t} \frac{F(t)}{L_w \cdot g} \cdot v(t) \cdot dt \qquad (8)$$

2. adding conveyor-belt scales with which the mass of the material to be weighed is determined at the instant T after it has passed a bridge length. The individual results are added :

$$m = \sum_{i=1}^{n} \frac{F(t)}{g}, \text{ if } (v(t))^{-1} \cdot L_w = T \qquad (9)$$

The general problems of testing of conveyor-belt scales are independent of the functional principle (integrating or adding) or of the principle of the acquisition and processing of measured values (mechanical or electro-mechanical) so that this differentiation need not to be made in the following passages.

2. Test Procedure

The errors of individual components as well as the parameter effects are reflected in the weighing error of conveyor-belt scales. The user of measuring means is usually only interested to know the total error of scales which may be deduced from the difference of the indication of conveyor-belt scales and the actually conveyed mass of material to be weighed. Without adequate technological preparations, the metrological determination of a larger mass of material to be weighed with the necessary uncertainty, however, involves considerable difficulties. The amount of

activities required in testing grows with the increase of mass flow. For this reason it has often been demanded to develop a test procedure in which a simulation of the loading of the weigh bridge by weights, chains or other variants is applied. Is it possible to make a definite comment on the measuring error of conveyor-belt scales as a result of this « testing without weighing material » ?

2.1. **Testing without Weighing Material**

Fig. 2 shows possible loading variants of a weigh bridge in a schematic form.

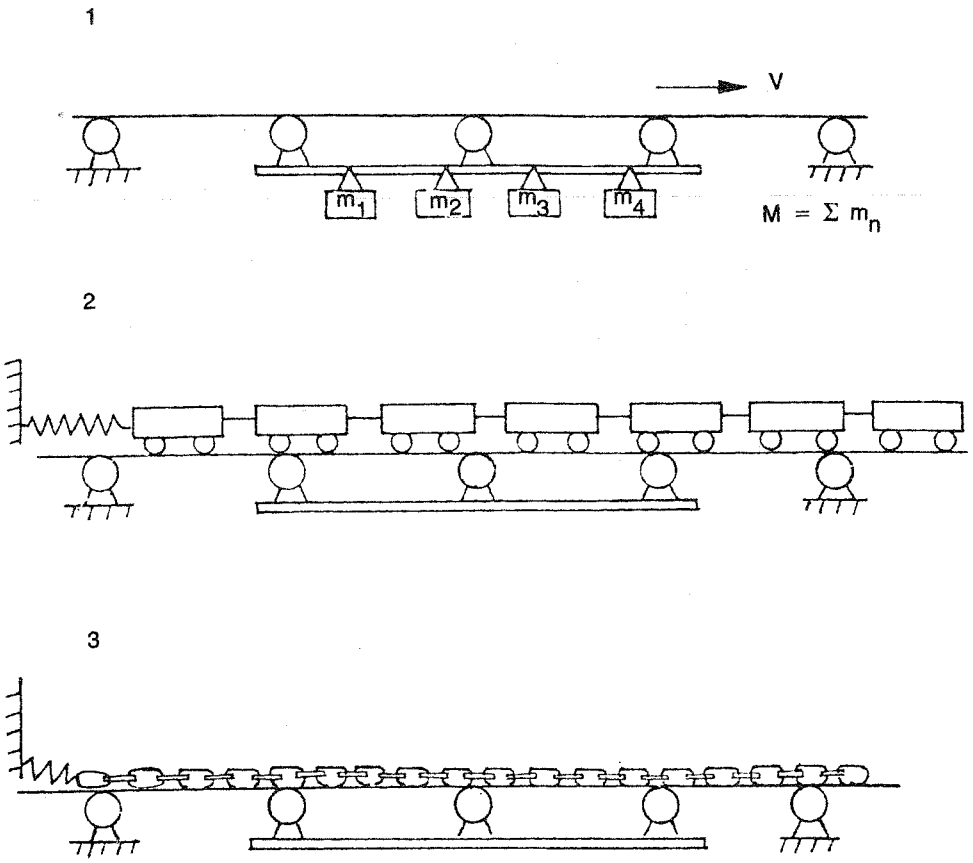


Fig. 2

Possible loading variants of the weighbridge

1 — Weights
2 — Load carpet (e.g. chained, joined individual loads)
3 — Chains

Depending on the bridge length, in many cases considerable loads have to be applied to ensure a loading of the weigh bridge up to the maximum load. For example, conveyor-belt scales with a weigh bridge of 10 m in length and a maximum load of 2 000 kg are known to be used in power-stations. Loading the belt with chains or « load carpets » is expected to result in a test which simulates real loading conditions. It is necessary to fix a set value m_n to be able to calculate the weighing error f of the test performed under these conditions. This value is compared with the change of indication m_w of the scales over a testing period t :

$$f = \frac{m_w - m_n}{m_n} \cdot 100\ \% \qquad (10)$$

The calculation of the target value is based on idealized conditions. The mass of weighing material conveyed by the conveyor-belt scales thus is :

$$m = p.v.t \tag{11}$$

In case of loading the weigh bridge with weights of a total mass M we have :

$$p = \frac{M}{L_w} \tag{12}$$

If loading of the belt is performed with a strip or surface load (chains or load carpet) we have :

$$p = \frac{M}{l_T} \tag{13}$$

M — mass of simulated loading

l_T — effective length of simulated loading

From that follows for the target value of the indication of mass m_n after the end of a fixed testing period t :

$$m_n = \frac{M}{L_w}.v.t \quad \text{or} \quad m_n = \frac{M}{l_T}.v.t \tag{14}$$

This test procedure was applied to adjust electro-mechanical integrating conveyor-belt scales, with the weigh bridge being loaded with weights. After that a control check was performed by loading the conveyor-belt scales with a defined mass of weighing material. The results are shown in fig. 3.

In this example testing of the conveyor-belt scales with a simulated loading yielded a systematic error of 0.75 %. What are the causes of it ?

2.1.1. Systematic Error of the Target Value

When performing the metrological determination of the values necessary for the calculation, systematic errors cannot be avoided to occur under the special conditions of use of the conveyor-belt scales. The systematic error is determined by (14) :

$$\frac{\Delta m_n}{m_n} = \frac{\Delta M}{M} - \frac{\Delta L_w}{L_w} + \frac{\Delta v}{v} + \frac{\Delta t}{t} \tag{15}$$

or

$$\frac{\Delta m_n}{m_n} = \frac{\Delta M}{M} - \frac{\Delta l_T}{l_T} + \frac{\Delta v}{v} + \frac{\Delta t}{t} \tag{16}$$

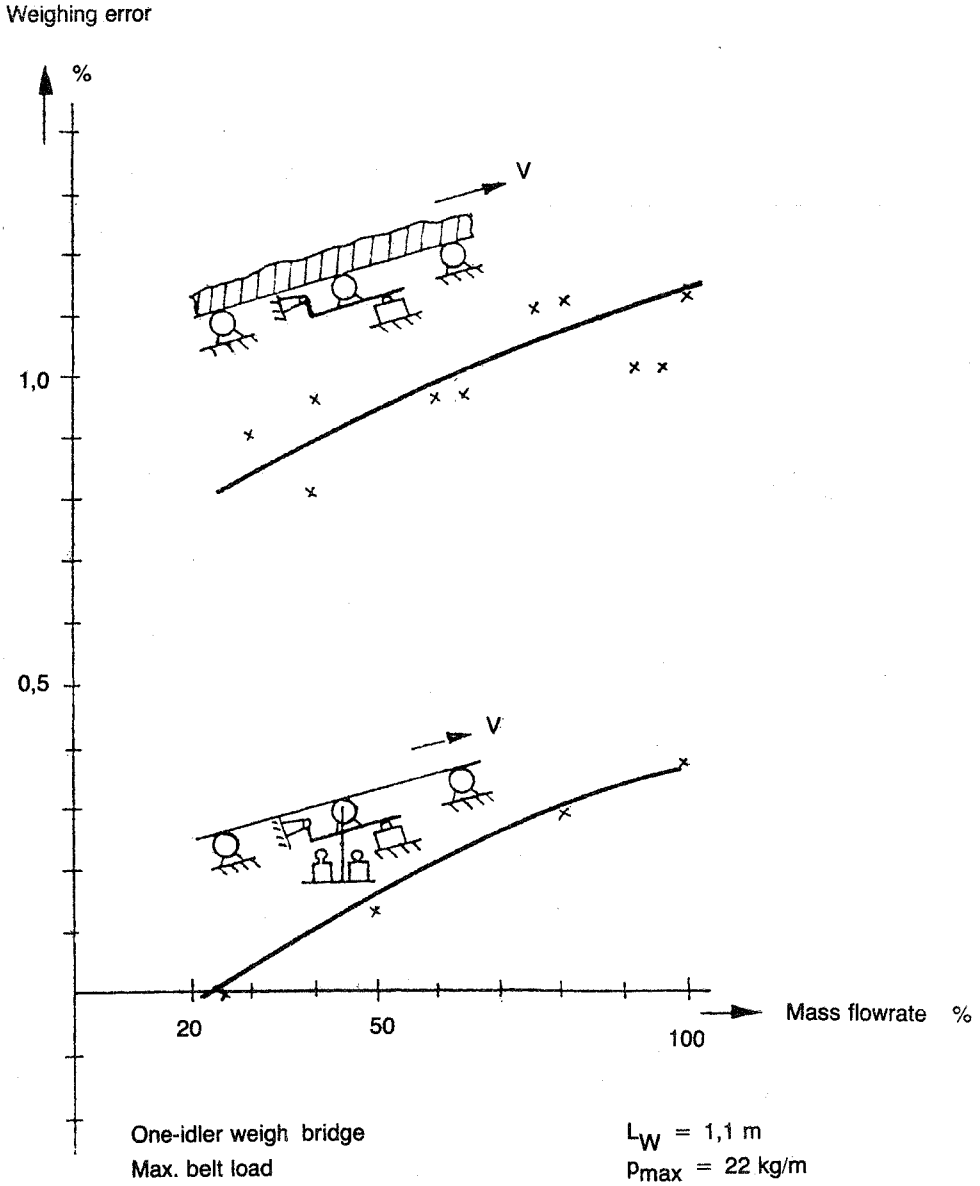
If, for example, a conveyor-belt scale with a permissible error of ± 1 % is to be tested, the component of the error caused by the means of reference or the measuring procedure shall be $\frac{\Delta m_n}{m_n} \leqslant 0.3$ %.

2.1.2. Parasitic Force Effects on the Weigh Bridge

The weigh bridge deforms under load (fig. 4). Therefore a misalignment (y) depending on the measured length y_M and the load by the belt and the weighing material always has to be expected inspite of a careful adjustment of the weigh idler station(s) with a lifted conveyor-belt (y_o) in relation to the adjoining carrying idler stations :

$$y = y_o - y_M \cdot \frac{p_o + p}{p_o + p_{max}}$$

p_o — belt mass/meter
p — mass of material/meter
p_{max} — max. mass of material/meter



One-idler weigh bridge	L_W = 1,1 m
Max. belt load	p_{max} = 22 kg/m
Conveying speed	v = 1,65 m/s
Angle of ascent	α = 12°
Variation of longitudinal force of the belt	$\Delta F_B \approx$ 600 N
Measured path	y_M = 0,2 mm

Fig. 3

Difference between testing procedures with and without weighing material (example)

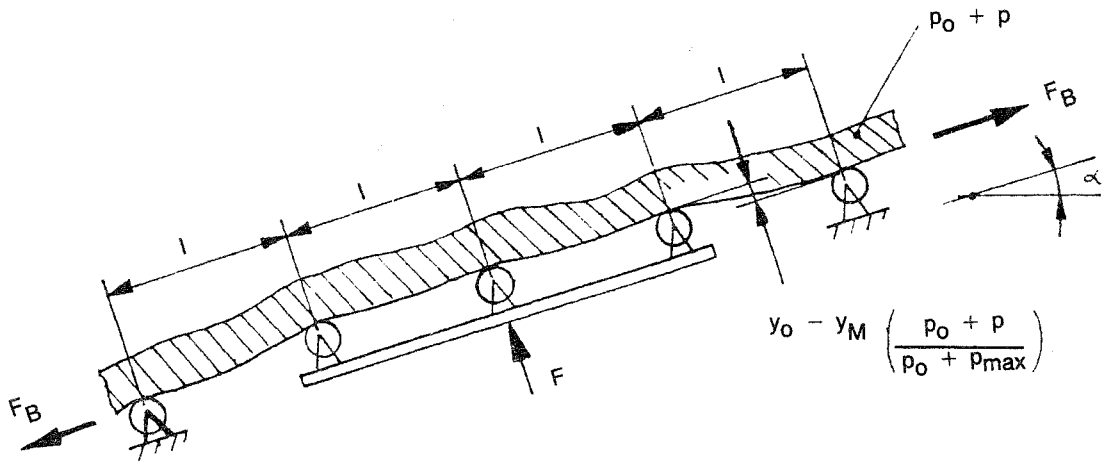


Fig. 4
Influence factors effecting force measurement

This misalignment combined with the longitudinal force of the belt F_B and the lack of flexibility of the conveyor-belt results in a parasitic force effect which is only partly compensated by the adjustment of the scales in idle running (zero setting). The longitudinal force of the belt increases with the growing load on the conveyor-belt under normal conditions of use of the belt-conveyor (ΔF_B).

However, in case of a simulated loading this longitudinal force of the belt remains constant or varies only insignificantly.

This is reflected by two systematic components of the error which may be expressed with sufficient approximation as follows :

$$- \Delta f = - 1.6 \cdot y_M \cdot \frac{\Delta F_B}{i \cdot p_{max} \cdot l^2 \cdot g} \cdot 100 \ \%$$

$$- \delta f = - 2 \cdot y_o \cdot \frac{\Delta F_B}{i \cdot p_{max} \cdot l^2 \cdot g} \cdot 100 \ \%$$

where

Δf — linearity error (difference of the weighing error between 0.2 p_{max} and p_{max})

δf — constant error in the measuring range (parallel displacement of the weighing error characteristic)

i — number of weigh idler stations of the weigh bridge

The concrete data of the belt-conveyor or weigh bridge (fig. 3) can be used to estimate the following components of the error :

$$- \Delta f = - 0.1 \ \%$$
$$- \delta f \ (y_o = 1 \text{ mm}) = - 0.45 \ \%$$

Hence it follows that the estimated characteristic is parallely displaced by — 0.45 % and deviates in its inclination by — 0.1 % from the real characteristic if no allowance is made of the misalignment of the weigh bridge of $y_o = 1$ mm for a simulated loading.

2.1.3. Loading

The one-idler weigh bridge is very sensitive to loading differences between simulation load and real load. For ascending conveyor-belts the necessary identity of the point of loading between the loading variants cannot be guaranteed in case of a loading with weights (fig. 5).

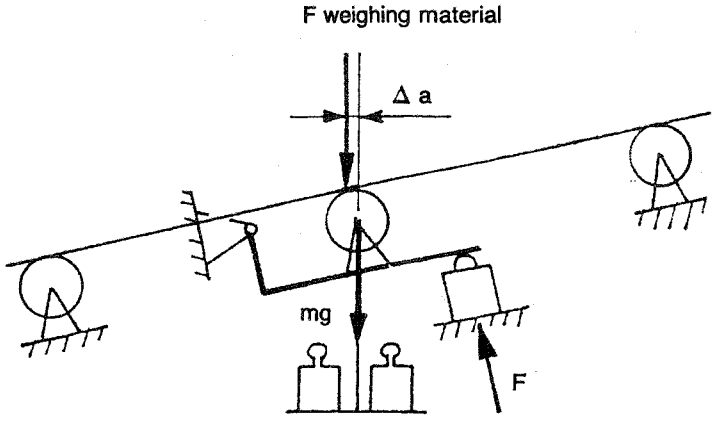


Fig. 5

Local differences of force transfer

A locally very homogeneous mass distribution is absolutely necessary in case of strip or surface loads chained over the weigh bridge since local mass differences take on a different significance (depending on the distance to the weigh idler station) due to the transfer behaviour (fig. 1).

As compared to that, the multi-idler weigh bridge is almost insensitive to local mass differences in the interval of weigh idler stations, as has already been mentioned in section 1.

2.1.4. Effect of Belt Speed

In order to reduce the reading error of the indication of mass after the end of the testing time t to a minimum, it is necessary to fix the indication. A test counter which is controlled by the belt speed transducer is generally used to eliminate subjective factors. The product of belt speed and testing time is equal to a constant preprogrammed value, which is chosen so that complete belt turns are achieved.

However, the value of the product also remains constant in case of a slip existing between the belt and the belt speed gauge. The result of the simulation testing involves an error which is equal to the value of the error of speed measurement $\frac{\Delta v}{v}$.

Possible relative motion between material and belt are consequently not covered by this testing method.

This brief summary, which is also incomplete as far as possible error effects are concerned, may suffice to outline the problems of « testing without weighing material » and explain the inadequacy of this testing procedure. Conclusions drawn from metrological investigations involving various variants of load carpets and chain loads as well as loading of weigh bridges with weights may be summarized as follows :

— In general, parameter effects occurring during testing without weighing material cannot be controlled and determined with the necessary accuracy.

— Testing with a simulated loading cannot be recommended as the only testing procedure for the adjustment and control of the metrological characteristics of conveyor-belt scales.

— In principle, there exist advantages of the loading of the belt with load carpets in the extended range of the weigh bridge, as compared with a loading with weights, since it better meets the requirements of the conditions of practical use.

Against this there exist a number of disadvantages :

— non-reproducibility of measured results due to a non-repeatable distribution of mass,
— difficult manipulation, particularly with large maximum loads of the weigh bridge,
— very high costs of purchase, maintenance and testing.

2.2. **Testing with Weighing Material**

Testing with a known mass of weighing material has proven to be the most suitable testing procedure for determining the weighing error since all influence factors effecting the weighing result are covered. As compared with testing without weighing material, this procedure, for example, makes allowance for the slip of the speed transducer as well as variations in misalignment of the weigh idler station, without accounting for them. Expenditure of labour and equipment involved in testing can be considerably reduced as compared to that of the past, if aspects of the testing of measuring devices are taken into account as early as in the design stage of the conveying plant into which the conveyor-belt scales are integrated at a later stage. The most essential principles of design for the operation of conveyor-belt scales have been outlined in reference [5]. Whereas the comments on the siting of the control scales are fully applicable to this procedure, a number of modifications which have been allowed for in reference [6] have to be observed when defining the minimum test mass, i.e. the smallest mass of weighing material, which may pass the conveyor-belt scales to comply with the error limits. It should be the aim to test with a smallest possible mass of weighing material since this involves economic benefits in terms of equipment and testing costs. Criteria which have an effect on the value of the minimum check mass are [6] :

— the class of accuracy of the conveyor-belt scales (0.5 % or 1 %),
— the mass scale interval of the conveyor-belt scales and control scales (the latter are in general non-automatic scales of accuracy class III, according to calibration specification ASMW-VM 160 and OIML Recommendation No. 3),
— the maximum mass flow,
— the belt length of the conveying installation.

In industrial plants an upper limit of belt length to values ranging from 60 to 100 m have proven to be an optimum to achieve short times of testing.

3. Summary

Starting from an outline of the measuring principle, two testing procedures for conveyor-belt scales have been compared in terms of possible error effects on testing results. Testing procedures involving a simulation of quantities to be measured (referred to as « testing without weighing material ») are not suitable to be applied as the only procedures for the adjustment and metrological testing of conveyor-belt scales. Possible causes of differing results among the testing procedures have been outlined in the light of an example. The aim of repeated efforts to develop testing procedures involving no weighing material so as to reduce the expenditure of labour and equipment involved in testing, can be achieved at lower costs by making sufficient allowance of aspects of the metrological testing of the scales already in the design stage of the conveying plant.

References

[1] Colijn : Effect of belt-conveyor parameters on belt-scale accuracy, Annual ISA Conference, Sept. 9-12, 1963, Chicago.

[2] Michelin : Les erreurs de pesée sur bande en pesage continu. Mesucora, 1967.

[3] Hasche/Humpert/Muras : Einige Probleme der Bestimmung der meßtechnischen Eigenschaften von elektromechanischen Förderbandwaagen, Vortrag auf der 5. internationalen Tagung des Tech. Komitees « Kraftmessung und Wägung » der IMEKO, Szeged, 1974.

[4] Humpert : Dynamische Parametereinflüsse auf den Wägefehler von Förderbandwaagen, Vortrag auf dem 6. Wägetechnischen Kolloquium, Szeged, 1978.

[5] Trommer/Muras : Projektieren und Anwenden eichfähiger Bandwaagen in Fördergurtanlagen. Hebezeuge und Fördermittel, Heft 6 und 7, 1976.

[6] Eichvorschrift Förderbandwaagen ASMW - VM 166, Mai 1977.

PAYS-BAS

TEST INSTALLATION for GAS METERS with a MAXIMUM CAPACITY of 12 000 m^3/h *

by **J. HEERES**
Flow measurement division, Dienst van het IJkwezen Dordrecht

Introduction

The test installation of the Service of Legal Metrology at Dordrecht can measure errors of gas meters between flow rates from 40 to 12 000 m^3/h. The installation is situated in a fully airconditioned laboratory (20 × 12 × 7 m), has a main pipe line with a diameter of 0.5 m and is controlled by means of a desktop computer. The installation has seven reference gas meters. Air at nearly atmospheric conditions is used as testmedium. A schematic drawing of the installation is given in figure 1. A bell prover with a nominal volume of 4 m^3 is the standard with which the seven reference gas meters are calibrated. Subsequently the following aspects will be dealt with :

— construction and functioning of the bell prover.
— construction and functioning of the main test installation.
— calibration method of the test installation.
— the error calculation method.
— the method of measurement and control by means of the desktop computer.

Construction and functioning of the bell prover

The bell prover consists of a stainless steel cylinder (bell) with a closed top and an open base, vertically moving in an open vessel filled with oil. A blower can pump air into the bell through a pipe, running through the middle of the vessel. The oil in the vessel acts as a seal. There is a heat exchanger between the blower and the bell prover. The top of the bell is connected to a steel belt that runs over a wheel and is fixed at one point at the wheel's circumference.

The maximum pressure in the bell is mainly determined by the weight of the bell and is about 2.4 kPa. This pressure may be varied by the use of counter weights. In order to maintain a constant pressure in the bell over the whole measuring range, the balancing, the suspension, the conduction of the belt and the compensation of the variable upthrust on the bell in the oil, must meet very high standards. The compensation of the upthrust is effected by a weight, suspended from a strip that runs over the outer edge of a cam wheel.

The nominal volume of the bell is 4 m^3. The volume flowed from or into the bell may be read from a scale attached to it. The smallest scale division is 0.2 dm^3. It is possible to connect a gas meter under test directly to the outlet of the bell prover (see figure 1).

---

* This paper is an English translation of a paper published in Metrovisie Vol. 22, N° 2, April 1983.

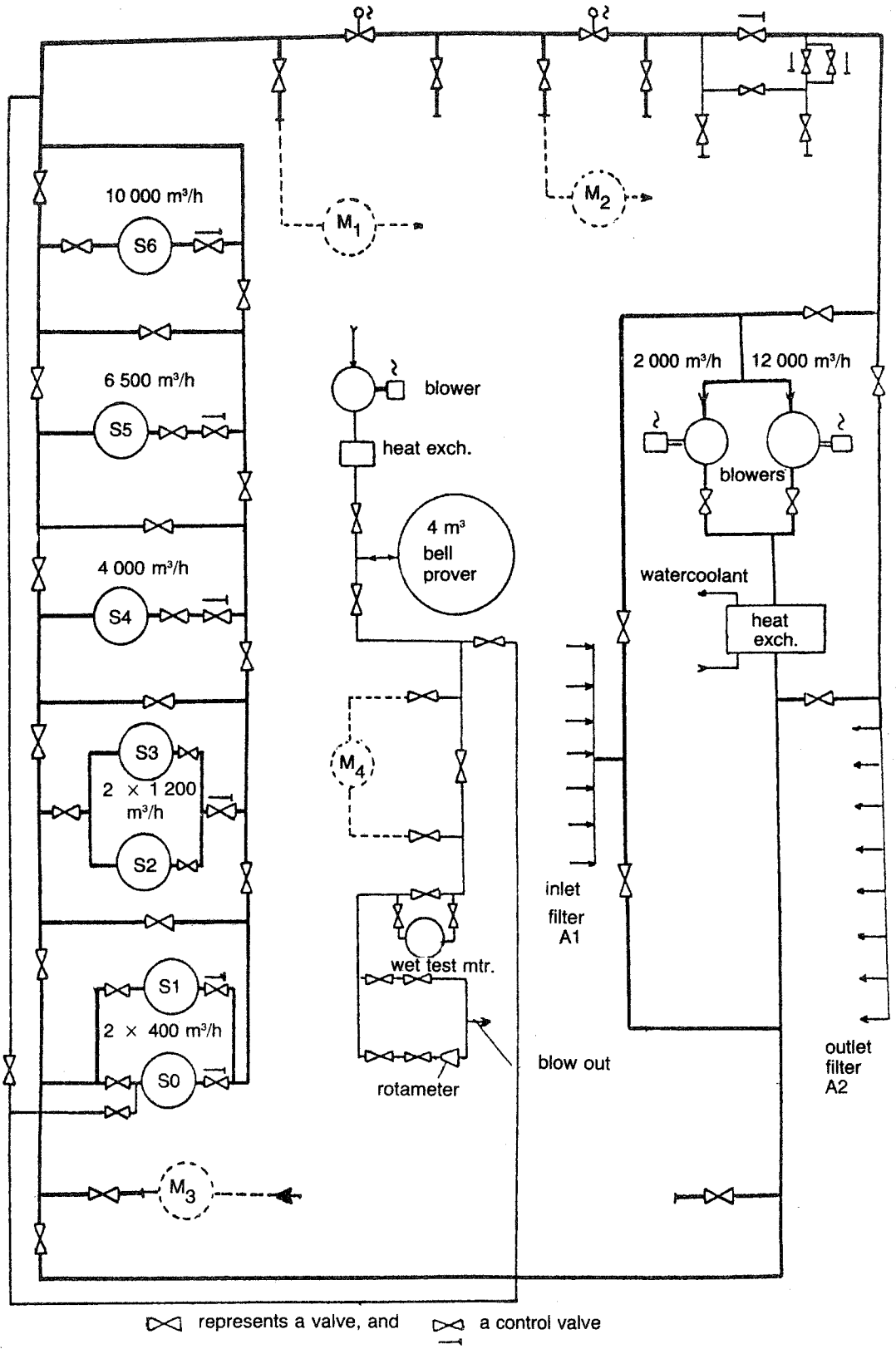


Fig. 1

Diagram of the large test installation. S0 to S6 are reference meters ; M_1 and M_2 are positions for meters to be tested in pressure mode, M_3 in vacuum mode and M_4 directly on 4 m³ bell prover.

At a fixed flow rate (minimum 0.4 m^3/h and maximum 400 m^3/h) it is possible to test rotary piston gas meters as well as diaphragm gas meters accurately with the tests started and stopped at a standstill. It is necessary that the duration of the tests is arranged so as to ensure that the effect of the meter's acceleration and deceleration will be negligible.

Another method is to test the meters during a certain time interval in which the flowrate remains constant (flying start/stop method). At approximately 5 mm from the scale there is a photoelectric cell that reacts to reflected light, produced by a light source fitted at a certain angle. This assembly is mounted so that it produces a signal when a black strip fitted to the scale passes the sensor. There are five black strips dividing the scale in four sections of 500.0 dm^3. The sensor is connected to an electronic counter with preset that measures the time interval for the preset number of impulses. Before starting the test the counter is reset and put into the starting position by hand.

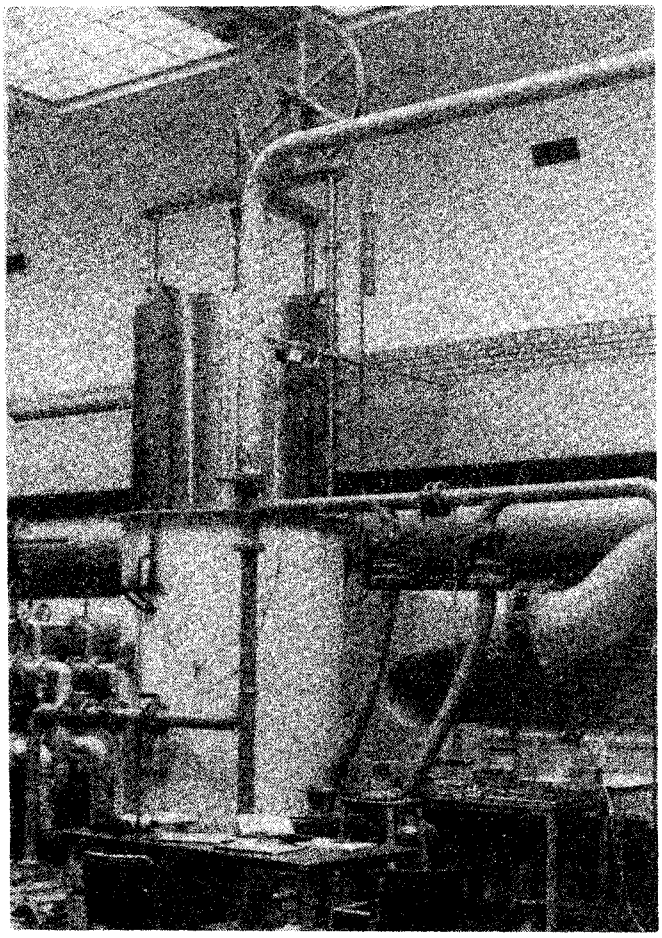


Fig. 2
Bell prover

The strip giving the start signal passes the sensor when approximately 1 m^3 air has flowed out of the bell. This ensures that the meter under test has ample opportunity to stabilize the flow rate. The counter is stopped when the preset number of impulses has passed the sensor. The actual volume, flowing out of the bell prover between the starting and stopping signals, is determined by means of a robot camera operated by the same signals. The camera takes a photo of the scale at the switching moments.

A sensor is also connected to the meter under test. A fixed relation exists between the impulse value from this sensor and a unit volume indicated by the meter. The sensor of the meter under test is connected to a second electronic counter. This counter measures also the time interval for a preset number of impulses. The preset value of both counters is equal. The counters are started at approximately the same moment. The error of the meter can be calculated from the difference in time required for X m^3 volume out of the bell prover and X m^3 volume indicated by the meter under test. In this calculation corrections have to be made for pressure and temperature differences between the bell prover and the meter.

Pressure is measured with a micromanometer and temperature is measured with thermistors (a resistor with a negative temperature coefficient). The temperature sensors have been placed in the upper part of the bell, near the outlet of the bell and near the outlet of the meter. Meters with a maximum flow rate up to 400 m^3/h can be tested with the bell prover.

It is also possible to fill the bell with natural gas. The bell prover can be directly connected with the main test installation by opening and closing a number of valves. (see figure 1).

Construction and functioning of the test installation

The test installation consists mainly of two blowers in parallel, a heat exchanger, four reference rotary piston gas meters, three reference turbine gas meters, three places to connect the meter under test and a computerized measuring unit. The testmedium is air at nearly atmospheric conditions. At the connecting places M_1 and M_2 (see figure 1) meters can be tested with gauge pressure and at connecting place M_3 meters can be tested with vacuum. Flow straighteners are used just before the inlet of the meter under test.

The air used for the tests is drawn from the laboratory and is returned to it. Depending on the desired flow rate one or the other of the blowers is used. These blowers have been installed in a separate room. The capacities are 2 000 m^3/h (maximum pressure 2.5 kPa) and 12 000 m^3/h (maximum pressure 7.0 kPa). Each blower is driven by an electromotor that operates at a frequency, regulated by means of a static frequency transformer. The frequency is controlled in the laboratory by hand or automatically.

A heat exchanger has been installed at the outlet of the blowers (pipe diameter 0.5 m). The cooling medium is water. The air temperature is regulated in such a way that the outlet temperature of the heat exchanger is equal to the ambient temperature of the laboratory.

The installation has seven reference meters with different capacities. These meters can be used either separately or switched in series or in parallel. The maximum flowrates of the reference meters are :

— 2 × 400 m^3/h and 2 × 1 200 m^3/h (rotor gas meter)

— 4 000 m^3/h, 6 500 m^3/h and 10 000 m^3/h (turbine meters)

The maximum flowrate of the installation is 12 000 m^3/h.

Each reference meter has two sensors producing impulses proportional to the indicated volume. These volume signals are measured by countercards placed in a data aquisition unit controlled by a desktop computer. Each reference meter is provided with two temperature sensors : a glass thermometer and a platinum resistance thermometer connected with a multiplexer in the data aquisition unit. The pressure of each reference meter is measured by means of a manometer or, via magnetically operated valves, by means of two pressure transmitters placed in parallel. The valves and the transmitters are controlled by the data aquisition unit. The meter under test is provided with the same instrumentation. When the meter under test does not have a sensor for measuring volume impulses, a so called shaft encoder is used.

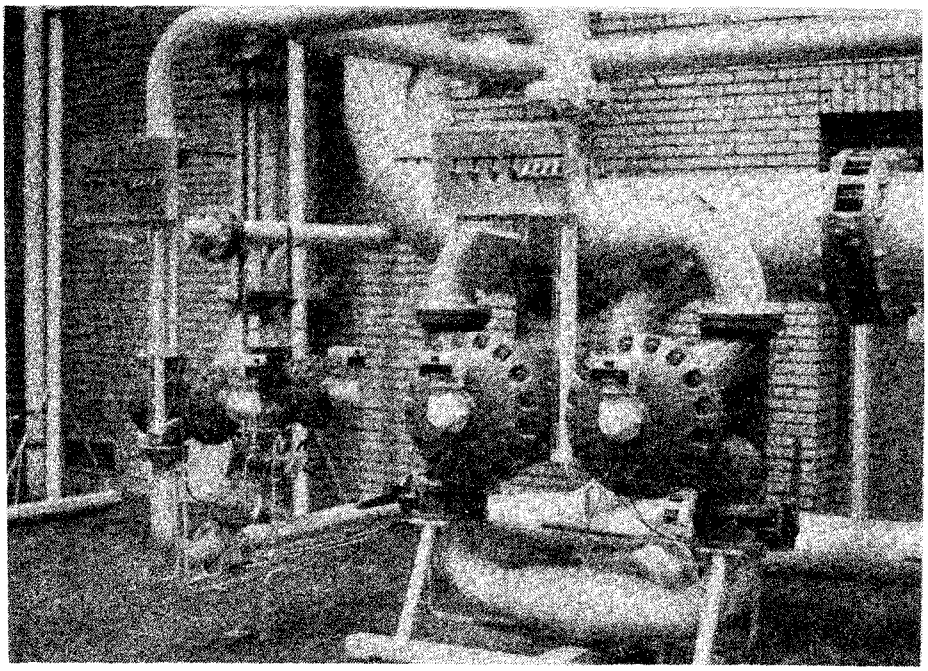


Fig. 3

Four reference rotary piston gas meters
(2 × 400 m^3/h and 2 × 1 200 m^3/h)

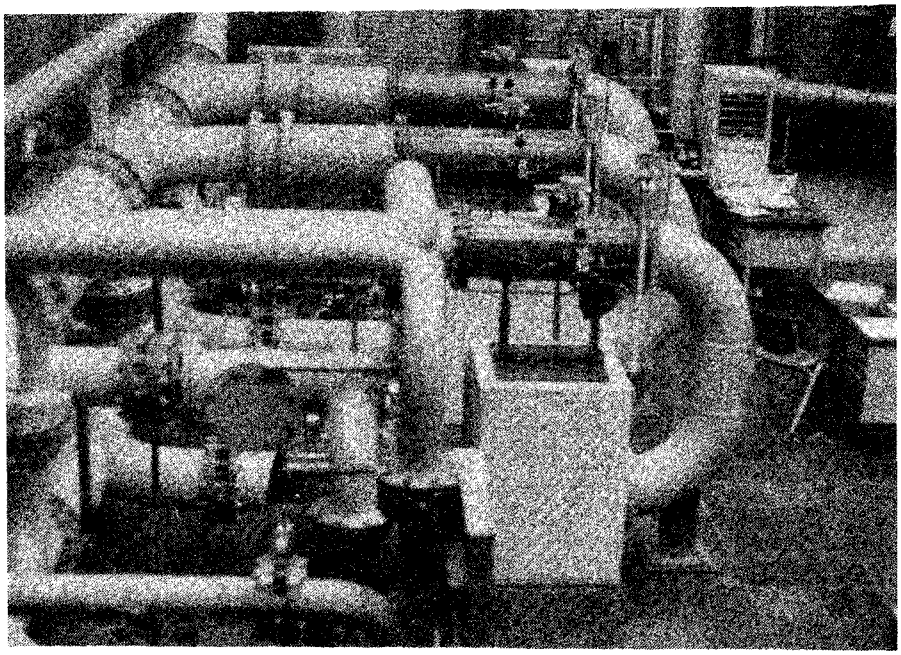


Fig. 4

Three reference turbine gas meters
(4 000, 6 500 and 10 000 m^3/h)

The calibration method of the main test installation

The bell prover is calibrated with a liquid sealed test gas meter. The error of the liquid sealed test gas meter is determined with the primary volumetric standard of the Service of Legal Metrology in the Netherlands (volume displacement installation). The absolute uncertainty in the sytematic error of the bell prover does not exceed 0.10 %. The two reference rotor gasmeters with maximum capacities of 400 m^3/h (referred to as S0 and S1) can be connected in situ with the bell prover for calibration purposes.

With the meters S0 and S1 in parallel, the reference meters S2 and S3 thus are calibrated up to 800 m^3/h. With S2 and S3 in parallel the error of reference turbine meter S4 is determined up to 1 600 m^3/h. Subsequently, reference meter S4 may be used to calibrate S2 and S3 up to 1 200 m^3/h. This method is applied until the error of reference turbine meter S6 is known at 10 000 m^3/h (see table 1). The absolute uncertainty in the calibration of this installation does not exceed 0.20 %.

TABLE 1

Reference meter // = parallel with	Calibration of reference meter number	Calibration up to (m^3/h)
bell prover	S0 and S1	400 (Qmax)
S0 // S1	S2 and S3	800
S2 // S3	S4	1 200
S4	S2 and S3	1 200 (Qmax)
S2 // S3	S4	2 400
S2 // S3 // S4	S5	4 000
S5	S4	4 000 (Qmax)
S4 // S5	S6	6 500
S6	S5	6 500 (Qmax)
S4 // S5	S6	10 000 (Qmax)

The error calculation method

When testing a gas meter against a reference the following parameters should be measured, both for the meter under test (index m) and for the volumetric reference (index s).

P_s, P_m = the absolute reference pressure (Pa)

T_s, T_m = the absolute reference temperature (K)

V_{as}, V_{am} = the indicated volume at equal time (m^3)

$\tau_s = \tau_m$ = the time for V_{as} or V_{am} (s)

The error of the used reference meter(s) (F_s %) is known as a function of the indicated flowrate (Q_{as} m^3/s).

The error of a (reference) gas meter is by definition :

$$F = \frac{V_a - V_d}{V_d} \times 100\ \% \qquad (1)$$

in which V_d is the volume in m^3 that actually flows through the meter. In accordance with (1) the volume flowing through the reference meter (V_{ds} m^3) is :

$$V_{ds} = \frac{V_{as}}{1 + F/100} \qquad (2)$$

The actual volumetric flowrate of the meter under test and of the reference meter are respectively :

$$Q_{dm} = V_{dm}/\tau_m \qquad (3)$$

and

$$Q_{ds} = V_{ds}/\tau_s \qquad (4)$$

For a gas meter calibrated with one volumetric standard we have provided V_{dm} and V_{ds} are measured during equal periods ($\tau_s = \tau_m$) :

$$\frac{P_m \times V_{dm}}{Z_m \times T_m} = \frac{P_s \times V_{ds}}{Z_s \times T_s} \qquad (5)$$

In this equation Z_s and Z_m represent the compressibility factors for air of pressure P and temperature T. Since Z_s and Z_m virtually equal each other (low pressure difference) they are assumed to be « 1 » (effect = 0.02 % per bar pressure variation). Using (4) and (5), (3) may be written :

$$Q_{dm} = \frac{P_s}{P_m} \times \frac{T_m}{T_s} \times Q_{ds} \qquad (6)$$

When more then one reference meter is used in parallel :

$$Q_{dm} = \frac{T_m}{P_m} \times \left[\frac{P_{s1} \times Q_{ds1}}{T_{s1}} + \ldots + \frac{P_{sn} \times Q_{dsn}}{T_{sn}} \right] \qquad (7)$$

The error of the meter under test may also be calculated from the volumetric flowrate :

$$F_m = \frac{Q_{am} - Q_{dm}}{Q_{dm}} \times 100\ \% \qquad (8)$$

Substituting (6) in (8) the error can be calculated :

$$F_m = \left[\frac{Q_{am}}{Q_{ds}} \cdot \frac{P_m}{P_s} \cdot \frac{T_s}{T_m} - 1 \right] \times 100\ \% \qquad (9)$$

Or with (2) up to (4) :

$$F_m = \left[\frac{V_{am}}{V_{as}} \cdot \frac{\tau_s}{\tau_m} \cdot \frac{P_m}{P_s} \cdot \frac{T_s}{T_m} \cdot \left(1 + \frac{F_s}{100} \right) - 1 \right] \times 100\ \% \qquad (10)$$

The parameters shown in the formula (10) can be determined at once or are known. For tests whereby the volume counters of both the meter under test and

the reference meter are read when the meters have been stopped at the beginning and the end of the measurement, it appears :

$$\tau_s = \tau_m$$

For tests in whereby the time is measured for V_a m³ volume of the meter and the reference meter, it appears :

$$V_{as} = V_{am}$$

The error curve of the reference meters may be fitted in an equation. An equation shown to be satisfactory is :

$$F = K_0 + K_1 \times Q_a^m + K_2 \times Q_a^n + K_3 \times Q_a^i \ (\%)$$

In which :

Q_a = indicated volume flowrate (m³/s) or (m³/h)
$K_0 .. K_3$ = coefficients
m, n, i = exponents.

Exponents usually used are :

m = —0.2 ; n = 0.33 ; i = —2
m = —1 ; n = 1 ; i = 2
m = 1 ; n = 2 ; i = 3

Using the above formulas the error of a gas meter can be calculated simply by and. Calculation may be carried out more quickly using a programmable calculator.

The method of measuring and control by means of the desktop computer

The control and measuring unit consists of a data aquisition unit with an extender, a printer, a plotter and a desktop computer. The data aquisition unit consists of a main frame for connection to the computer, in which the user may place cards by his own choice, such as a multimeter, a counter, a multiplexer, etc.

The computer is of the make Hewlett and Packard, type 9835. The programming language is Basic, provided with a few extensions related to other program languages. The memory capacity is 256k. The screen provides 26 lines of 80 characters each. The computer has a built-in tape drive for the use of cassettes, in which program and data may be stored. The computer is connected to the other instruments via a IEEE 488 (HP-IB) interface. The data aquisition unit holds the measuring and control instruments. These are :

— eight counter cards for measuring the double impulse signal from the reference meters (max. three parallel) and the meter under test.
— A mA output card (4 to 20 mA) for controlling the number of revolutions of the blower.
— A multimeter card with a built-in current source for measuring the voltages produced by the pressure transmitters and the platinum resistance sensors.
— A 20 channel scanner card for connecting the nine temperature sensors with the multimeter (four wire = two channels for one sensor). Two channels are used for checking the multimeter continuously by means of a reference resistor.
— Two 16 channel relay cards for controlling the magnetic valves used for pressure measurement.
— A 8 channel relay card for switching the blowers on and off and various other accessories.
— A digital interrupt card for various alarm signals and for detecting the volume start- and stop signal.

The control, measurement and calculation program is entirely stored in the computer memory. Before starting the tests identification data of the meter under test must be put into the computer by hand. Subsequently, the connecting place, the used reference meters and the used temperature sensors must also be put into the computer. After setting of the flowrate (either by hand or automatically) the various relevant temperatures are projected on the screen.

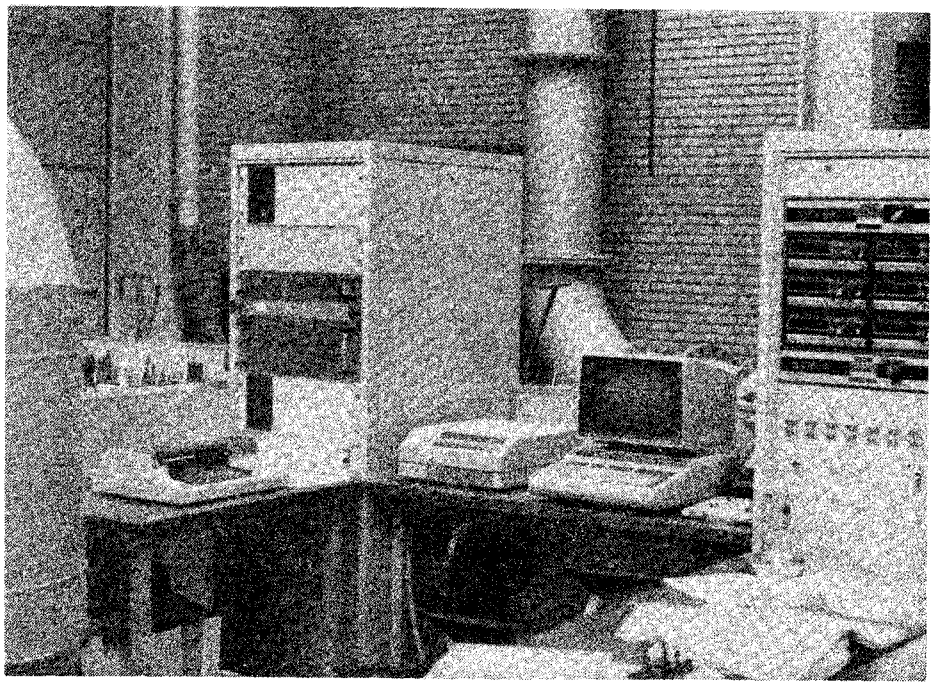


Fig. 5

Computer, plotter, printer and data aquisition unit

The testing may be started when temperature is sufficiently stable.

Each measurement consists of :

— The counting of at least 10 000 impulses for each meter with a measurement time not less than 30 seconds.
— Checking the pulse transmission.
— Measuring all relevant temperatures at least three times.
— Measuring the required pressures at least twice with two pressure transmitters placed in parallel.
— Checking the flowrate before and after the test.
— Printing the test results in a test report.

When the measurements have been completed, the error is calculated automatically. After the complete test procedure a certificate is printed and the error curve is plotted.

The task of the operator during the measurements consists of carrying out one measurement by hand to check the computer, the choice of the flowrates and to decide whether or not a test is acceptable.

This automatic measuring system allows very reliable results to be obtained in a short time.

BIML

TRAVAUX des SECRETARIATS OIML en 1984 et 1985

Comme pour les années précédentes, nous donnons ci-dessous un aperçu des travaux des secrétariats pilotes et rapporteurs de l'OIML, en indiquant leur avancement en 1984 et les prévisions pour 1985. Il est basé sur les rapports annuels et autres informations disponibles.

SP 1 - Terminologie

Le Vocabulaire International des termes fondamentaux et généraux de Métrologie (VIM), qui a été préparé conjointement par BIPM, CEI, ISO et OIML, a été publié en mai 1984. Le Bureau a effectué une étude comparant le VIM avec l'édition bilingue du Vocabulaire de Métrologie Légale ; cette étude a été envoyée à tous les Etats Membres et Membres Correspondants de l'OIML au début de 1985.

Sr 1 a étudié les nombreux commentaires accompagnant le vote sur la révision du Vocabulaire de Métrologie Légale (VML) et préparera un autre projet en 1985.

Sr 2 a étudié le projet sur la terminologie concernant les mesures électriques et magnétiques, préparé par SP 13-Sr 7 et a envoyé ses commentaires au Secrétariat-rapporteur.

Sr 3 continue de passer en revue tous les projets de l'OIML. Selon les directives de la dernière version du « Mode de travail des Secrétariats de l'OIML », le Bureau envoie maintenant systématiquement une copie au SP 1-Sr 3 quand les projets de Recommandations et Documents sont soumis au Comité pour vote par correspondance.

SP 2 - Métrologie légale. Généralités

Sr 1 a préparé une brochure pour les pays en développement ayant pour titre « Guidelines for the Establishment of Simplified Metrology Regulations ».

Sr 2 continue son étude sur la révision du DI 2 « Unités de mesure légales ».

Sr 3 — pas d'activité ; il est proposé de dissoudre ce Secrétariat puisque son activité est couverte par SP 22.

Sr 4 — Le Groupe de Travail International a tenu une réunion du 29 au 30 mars 1984 à Paris. A la demande du CIML le Secrétariat a décidé de continuer ses études. Le BIML a préparé et distribué pour commentaires le 1er avant-projet de DI « Directives régissant l'arrangement d'accords bi- ou multilatéraux de reconnaissance des résultats d'essais d'approbation de modèle et de vérification ».

Le 2ème avant-projet sera préparé en 1985 en tenant compte des commentaires reçus.

Simultanément, le BIML prépare pour soumission aux Membres du CIML des rapports concernant :

— la compilation des informations relatives aux systèmes de reconnaissance existants

— l'échange d'informations sur les essais d'approbation de modèle

— la référence aux RI de l'OIML dans les décisions d'approbation de modèle

— les attestations de conformité d'instruments aux RI de l'OIML.

Sr 6 — Le Groupe de Travail International a discuté le 3ème avant-projet de DI « Exigences générales pour les instruments de mesure électroniques » pendant une réunion à Amsterdam en juin 1984. Le Secrétariat a préparé un 4ème avant-projet pour une réunion à Copenhague du 10 au 12 juin 1985.

SP 4 - Mesure des longueurs, surfaces, angles

Sr 1 a distribué pour commentaires le 1er avant-projet de RI sur les mesures à traits de précision.

Sr 2 — La révision de la RI 35 a été sanctionnée par la 7ème Conférence.

Sr 3 — Le projet sur les « Instruments mesureurs de longueur » a été sanctionné par la 7ème Conférence et sera publié en tant que RI 66.

Sr 4 a étudié les commentaires reçus sur le 2ème projet de DI « Schéma de hiérarchie des instruments de mesurage des longueurs » et a l'intention de préparer un 3ème projet en 1985.

Sr 5 a envoyé les projets de DI « Schéma de hiérarchie des instruments de mesurage des angles » et « Méthodes de reproduction des unités d'angle plan » au Secrétariat-Pilote pour suite à donner.

Sr 6 a continué ses études sur le 1er avant-projet de RI sur les « Instruments de mesure de l'aire des peaux ».

Sr 7 a développé un 2ème avant-projet de RI « Terminologie utilisée en métrologie dimensionnelle ». Ce projet a été envoyé aux membres du Groupe de Travail Mixte ISO-OIML pour commentaires.

SP 5S - Mesure statique des volumes de liquides

Sr 1 prépare un 1er avant-projet de DI : Terminologie, 1ère partie — Mesurage des produits pétroliers.

Sr 2 a préparé un 2ème avant-projet de DI : Schémas de hiérarchie pour le mesurage des volumes de liquides.

Sr 3 a préparé un 1er avant-projet de RI sur les étalons de volume automatiques pour étude par le Groupe de Travail International en 1985.

Sr 8 — Le Groupe de Travail International a tenu une réunion à Constanta en juin 1984 et a terminé le projet de RI sur les réservoirs de stockage fixes qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 71. Ce Secrétariat coopère étroitement avec ISO/TC 28 sur les différentes méthodes de jaugeage des réservoirs.

Sr 9 a mis au point le projet de RI sur les camions et wagons citernes pendant une réunion à Constanta. Ce projet sera soumis au Secrétariat-Pilote pour approbation.

Sr 10 continue ses travaux sur les péniches et navires citernes. Le 2ème avant-projet a été discuté à Constanta et le 3ème avant-projet sera distribué pour commentaires en 1985.

Sr 11 a discuté le 2ème avant-projet sur le mesurage de niveaux de liquides pendant la réunion à Constanta. Le Secrétariat élabore un 3ème avant-projet qui sera soumis au Secrétariat-Pilote pour approbation en 1985.

SP 5D - Mesure dynamique des volumes de liquides

Sr 1 (ex Sr 13) a terminé le projet de RI « Ensembles de mesurage — Contrôles métrologiques » qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 67. Le projet de RI « Ensembles de mesurage — Dispositions particulières » a été modifié.

Le Secrétariat prépare un 2ème avant-projet sur les compteurs à turbine et un 1er avant-projet sur les ensembles de mesure pour pipe-line.

Sr 2 (ex Sr 15) a élaboré un 2ème avant-projet de RI « Compteurs et ensembles de mesurage pour liquides cryogéniques ». Cet avant-projet a été discuté pendant une réunion du Groupe de Travail International à Paris en mai 1984. Le Secrétariat prépare un 3ème avant-projet pour une réunion qui aura lieu au BIML du 17 au 19 avril 1985.

Sr 3 (ex Sr 16) a terminé le projet « Compteurs d'eau chaude » qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 72. Les points suivants ont été discutés lors d'une réunion à Londres en novembre 1984 :

1. dispositifs électroniques d'affichage pour compteurs d'eau
2. vérification des compteurs d'eau par échantillonnage
3. révision de la RI 49 (en liaison avec ISO).

Le Secrétariat prépare des projets pour la prochaine réunion.

Sr 4 (ex Sr 17) a soumis au Secrétariat-Pilote, pour approbation, un projet de RI sur les compteurs à tambour pour alcool.

Sr 5 (ex Sr 18) a préparé un projet de RI « Tables de mesure du pétrole » qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 63.

Sr 6 (ex Sr 19) continue l'élaboration d'un avant-projet de RI sur les « Dispositifs électroniques appliqués à la mesure des volumes », qui sera distribué aux collaborateurs pour commentaires avant fin 1985. On propose une réunion pour 1986.

SP 6 - Mesure des gaz

Sr 1 a l'intention de distribuer, pour commentaires, un projet de révision de la RI 31 « Compteurs de volume de gaz à parois déformables ».

Sr 4 poursuit ses études sur un 2ème avant-projet de DI sur la mesure des hydrocarbures gazeux distribués par pipe-line.

Sr 5 et Sr 6 ont continué leurs travaux sur les avant-projets concernant l'étalonnage et la vérification des compteurs de gaz et ont l'intention de distribuer ces textes pour commentaires avant la fin 1985.

Sr 9 a préparé un avant-projet sur les correcteurs de gaz, qui sera soumis au Groupe de Travail International.

Sr 11 élabore un 1er avant-projet de RI sur les calculateurs incorporés dans les systèmes de mesure du gaz.

Sr 12 a l'intention de développer un 1er avant-projet sur les calorimètres à gaz et leur vérification.

SP 7 - Mesure des masses

Sr 2 a tenu une réunion sur les instruments de pesage électroniques à Amsterdam en juin 1984. Comme suite, le Secrétariat a élaboré un 5ème avant-projet qui sera diffusé pour commentaires début 1985 et qui sera examiné pendant une réunion à Copenhague en juin 1985.

Sr 4 — Le projet de révision de la RI 3 a été sanctionné par la 7ème Conférence. Le Groupe de Travail International a tenu une réunion à Bergen en juin 1984 et a commencé son travail sur des méthodes d'essai pour l'approbation de modèle d'instruments de pesage non automatiques et sur une révision de la RI 28. La prochaine réunion est prévue pour l'automne 1985 à Boras.

Sr 5 a élaboré un projet de RI sur les doseuses pondérales, qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 61.

Les 1ers avant-projets de RI sur les instruments de pesage à totalisateurs discontinus et sur les ponts-bascules automatiques de chemin-de-fer ont été complétés et diffusés pour commentaires. Ces deux avant-projets seront discutés pendant une réunion à Londres du 29 avril au 3 mai 1985.

Sr 8 a terminé le projet de RI sur les cellules de pesée, qui a été sanctionné par la 7ème Conférence et publié en tant que RI 60.

SP 8 - Poids

Sr 1 a développé, en consultation avec Sr 2, Sr 5 et Sr 6, un avant-projet reprenant toutes les exigences pour les poids, qui sont contenues dans les RI 1, 2, 20, 25 et 52. Cet avant-projet de RI sera distribué pour commentaires en 1985.

SP 9 - Mesure des masses volumiques

Sr 2 a préparé une révision de la RI 44 qui a été sanctionnée par la 7ème Conférence.

Sr 3 est en train de modifier le 3ème avant-projet sur les aréomètres pour usages spécifiques, pour tenir compte des commentaires reçus.

Sr 4 a été supprimé à la 20ème réunion du CIML en 1984.

Sr 9 distribuera en 1985 le 1er avant-projet sur la terminologie.

SP 10 - Instruments de mesure pour véhicules

Sr 1 attend l'achèvement des travaux du SP 2-Sr 6 sur l'électronique avant de modifier son projet sur les cinémomètres radar.

Sr 3 distribuera en 1985 le 1er avant-projet sur les taximètres électroniques.

SP 11 - Mesure des pressions

Le Secrétariat-Pilote a préparé un avant-projet sur la terminologie, qui sera distribué pour commentaires.

Sr 2 a préparé un 2ème avant-projet de DI sur les schémas de hiérarchie.

Sr 3 a envoyé à ses collaborateurs son 5ème avant-projet sur les manomètres à piston.

Sr 4 a élaboré un 3ème avant-projet sur les méthodes de vérification des manomètres, vacuomètres, manovacuomètres à éléments récepteurs élastiques à indications directes par aiguille et échelle graduée, et un 2ème avant-projet sur les méthodes de vérification des manomètres, vacuomètres et manovacuomètres enregistreurs à éléments récepteurs élastiques.

Le Secrétariat a l'intention de tenir une réunion à Lvov en mai 1985.

Sr 5 a l'intention d'informer ses collaborateurs sur le résultat de l'enquête concernant les manomètres de mesure de la tension artérielle et commencera son travail sur la révision de la RI 16.

Sr 7 a terminé le 4ème avant-projet sur les baromètres, qui sera envoyé aux collaborateurs début 1985, pour commentaires.

SP 12 - Mesure des températures et de l'énergie calorifique

Sr 3 a diffusé pour commentaires un nouveau projet de RI sur les thermomètres électriques à résistance qui a été mis en conformité avec la Publication 751 de la CEI.

Sr 5 a élaboré le 1er avant-projet de RI sur les tables de tolérances des thermocouples étalons, basé sur le travail du TC 65B de la CEI, et a l'intention de le distribuer pendant le deuxième semestre 1985.

Sr 6 — Le Groupe de Travail International a tenu une réunion à Léningrad en avril 1984 ; comme suite le Secrétariat élabore actuellement les 3èmes avant-projets de RI « Classification des pyromètres à radiation » et « Pyromètres à radiation totale ».

La révision de la RI 18, qui a été approuvée par le Secrétariat-Pilote, a été envoyée aux Membres du CIML pour vote.

Sr 7 prépare une réunion sur les thermomètres médicaux, à Trier en septembre 1985.

Sr 8 a terminé le projet de RI « Compteurs d'énergie thermique » qui a été approuvé par le Secrétariat-Pilote et envoyé aux Membres du CIML pour vote.

Sr 9 a terminé le 4ème avant-projet « Méthodes de vérification des couples thermo-électriques » qui, après quelques modifications d'ordre rédactionnel, sera soumis au Secrétariat-Pilote.

SP 13 - Mesure des grandeurs électriques et magnétiques

Sr 1 a été supprimé par le CIML lors de sa 20ème réunion en 1984.

Sr 4 a l'intention d'élaborer le 6ème avant-projet sur les transformateurs de mesure électriques pour tenir compte des commentaires reçus, et espère pouvoir le soumettre au Secrétariat-Pilote en 1985.

Sr 5 a distribué pour commentaires le 2ème avant-projet sur les appareils mesureurs indicateurs pour courant, tension et fréquence.

Sr 7 a distribué pour commentaires le 2ème avant-projet sur la terminologie relative au mesurage des grandeurs électriques et magnétiques et a aussi élaboré une liste de termes à harmoniser avec la CEI.

SP 14 - Acoustique et vibrations

Sr 1 a l'intention de préparer un projet, pour adoption par l'OIML, basé sur la publication CEI « Sonomètres intégrateurs ».

Le projet de RI 58 « Sonomètres » a été sanctionné par la 7ème Conférence et a été publié en tant que RI 58.

SP 15 - Optique

Sr 1 coopère avec l'ISO pour préparer un projet de RI sur les dioptrimètres. Une réunion commune s'est tenue à Berlin en septembre 1984.

SP 16 - Rayonnements ionisants

Sr 1 suit les travaux de la CEI sur les dosimètres. Un amendement a la Publication CEI 731 de 1983 est en voie d'approbation par la CEI et le Secrétariat décidera ensuite s'il est opportun d'élaborer un projet correspondant aux besoins de l'OIML.

Sr 2 a élaboré un projet de DI « Laboratoires secondaires d'étalonnage en dosimétrie pour l'étalonnage des dosimètres utilisés en radiothérapie ». Ce projet a été soumis au Secrétariat-Pilote pour approbation.

SP 17 - Mesure des pollutions

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs ont tenu une réunion à Paris en juin 1984. La prochaine réunion est prévue pour mai 1985 à Washington.

Sr 1 a élaboré et distribué pour commentaires un 1er avant-projet de RI sur les instruments destinés à mesurer le monoxyde de carbone dans les gaz d'échappement.

Sr 2 a préparé un 2ème avant-projet « Chromatographes des gaz à spectromètres de masse. Système de données pour l'analyse des polluants organiques de l'eau » qui sera discuté lors de la réunion à Washington.

Le Secrétariat a l'intention de commencer à travailler sur un avant-projet de RI concernant les spectromètres à absorption atomique (AA) utilisés pour la surveillance de la pollution de l'eau.

Sr 4 a préparé un 2ème avant-projet de RI sur les chromatographes des gaz pour la mesure de la pollution due aux pesticides et substances toxiques, qui sera discuté pendant la réunion à Washington.

Le Secrétariat prépare aussi un avant-projet sur des chromatographes à phase liquide utilisés pour la surveillance de la pollution due aux pesticides et subsances toxiques.

SP 18 - Mesure des caractéristiques des produits alimentaires

Sr 1 — Le projet de RI « Humidimètres pour grains de céréales et graines oléagineuses » a été sanctionné par la 7ème Conférence et a été publié en tant que RI 59.

SP 19 - Mesure des caractéristiques des matériaux

Sr 1 a été supprimé par le CIML lors de sa 20ème réunion.

Sr 2 a terminé les projets de RI « Exigences générales pour les machines d'essai des matériaux » et « Exigences pour les machines d'essai des matériaux en traction et en compression ». Ces projets ont été sanctionnés par la 7ème Conférence et seront publiés en tant que RI 64 et RI 65.

Le Secrétariat a aussi préparé et diffusé pour commentaires le 4ème avant-projet sur les instruments de vérification de force des machines d'essai.

Sr 3 attend l'achèvement des travaux de l'ISO avant d'entreprendre la révision des RI 9 à 12.

Sr 4 a publié un rapport sur le résultat de la première phase de l'intercomparaison internationale des blocs de référence de dureté.

Sr 5 a terminé un projet de RI sur les caractéristiques des extensomètres métalliques à résistance, qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 62.

Sr 6 a élaboré un 3ème avant-projet sur la terminologie des essais de dureté et a l'intention de diffuser cet avant-projet pour commentaires en 1985.

SP 20 - Produits préemballés

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs ont tenu une réunion à Berne en juin 1984. La prochaine réunion est prévue pour juin 1985.

Sr 1 a préparé un 3ème avant-projet « Contenu informatif de l'étiquetage » en tenant compte des décisions prises pendant la réunion à Berne ; cet avant-projet a été soumis au Secrétariat-Pilote pour approbation.

Sr 2 préparera un nouvel avant-projet sur la vérification de la quantité nette des préemballages.

SP 21 - Normalisation des caractéristiques métrologiques des instruments de mesure

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs tiendront une réunion à Lvov en mai 1985.

Sr 1 et Sr 2 ont préparé des projets de DI « Caractéristiques métrologiques générales des instruments de mesurage » et « Caractéristiques métrologiques des propriétés dynamiques des instruments de mesurage », qui ont été adoptés par le Comité et sont en cours de publication.

Sr 1 prépare un avant-projet sur les caractéristiques normalisées d'un type donné d'instruments de mesure ; la structure de cet avant-projet et son contenu feront l'objet de discussions lors de la réunion à Lvov.

Sr 2 prépare un avant-projet sur le principe de détermination des caractéristiques dynamiques des instruments de mesure ; la structure et le contenu feront aussi l'objet de discussions à la réunion de Lvov.

Sr 4 a complété le projet de DI sur les principes de spécification des caractéristiques métrologiques des systèmes de mesurage ; ce projet sera soumis au Secrétariat-Pilote pour approbation.

Sr 5 continue son travail sur l'avant-projet de DI « Méthodes du contrôle des caractéristiques métrologiques des instruments de mesurage ».

Sr 6 a préparé un 2ème avant-projet de DI « Détermination expérimentale des caractéristiques métrologiques des systèmes de mesurage. Principes de base ». Cet avant-projet sera discuté lors de la réunion de Lvov.

SP 22 - Principes du contrôle métrologique

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs ont tenu une réunion à Coblence en avril 1984.

Sr 1 a terminé le projet de DI « Domaines d'utilisation des instruments de mesure assujettis à la vérification » ; ce projet a été soumis au Comité pour adoption.

Sr 2 a terminé le projet de DI « Principes du choix des caractéristiques pour l'examen des instruments de mesure usuels » ; ce projet a aussi été soumis au Comité pour adoption.

Sr 3 et Sr 4, qui s'occupent des principes d'essai de modèle et de vérification d'instruments de mesure respectivement, ont préparé d'autres avant-projets en tenant compte des commentaires du Groupe de Travail International. Les deux projets seront soumis au Comité pour approbation par correspondance.

Sr 5 — Le projet « Principes de la surveillance métrologique » adopté par le CIML a été publié en tant que DI 9.

Sr 6 a terminé le projet de DI « Principes permettant d'assurer l'efficacité du contrôle métrologique » ; ce projet a été soumis au CIML pour adoption.

SP 26 - Instruments de mesure utilisés dans le domaine de la santé

Sr 2 a soumis le 1er projet « Pipettes hémocytométriques à dilution » au Secrétariat-Pilote pour approbation.

Sr 3 a soumis le 1er Projet de RI « Pipettes Westergren pour mesurer la vitesse de sédimentation du sang » au Secrétariat-Pilote pour approbation.

Sr 4 a élaboré les 2èmes avant-projets de RI sur les électrocardiographes et les électroencéphalographes ; les deux projets ont été présentés à nouveau au Secrétariat-Pilote pour approbation. Le secrétariat continue son travail sur l'avant-projet de DI « Instruments de mesure des grandeurs bioélectriques. Caractéristiques métrologiques à normaliser et moyens de leur représentation ».

Sr 5 a l'intention de commencer son travail sur les matériaux de référence certifiés relatifs à l'hématologie cellulaire quantitative.

SP 27 - Principes généraux de l'utilisation des matériaux de référence en métrologie légale

Le Secrétariat-Pilote a diffusé à ses collaborateurs un projet de programme de travail et un questionnaire concernant la participation dans les activités du SP 27.

Le Secrétariat-Pilote a l'intention de tenir une réunion avec ses Secrétariats-rapporteurs en 1985.

Sr 2 — L'activité est en suspens en attendant l'achèvement des travaux de classification dans le cadre de l'ISO/REMCO.

Sr 3, Sr 4 et Sr 5 ont repris leur projets et diffusé pour commentaires un 1er projet commun de DI « Principes généraux d'utilisation des matériaux de référence certifiés légaux ». Un 2ème projet a été préparé en tenant compte des commentaires reçus et sera soumis au Groupe de Travail International pour approbation.

Sr 7 continue ses études sur les méthodes de comparaison des matériaux de référence.

SP 30 - Mesures Physico-chimiques

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs Sr 2, Sr 4, Sr 9 et Sr 10 ont l'intention de tenir une réunion à Batoumi en septembre 1985.

Sr 1 a diffusé le programme d'intercomparaison de pH-mètres à ses collaborateurs ;

Sr 2 a terminé le projet de RI « Méthode d'étalonnage des cellules de conductivité » ; ce projet a été sanctionné par la 7ème Conférence et sera publié en tant que RI 68. Le Secrétariat prépare maintenant un 2ème avant-projet sur la mesure de conductivité des solutions électrolytiques pour la réunion de Batoumi.

Sr 3 a élaboré un 5ème avant-projet sur l'échelle pratique de l'humidité relative de l'air utilisant des solutions de sel saturées ; ce projet sera distribué pour commentaires en 1985. Le Secrétariat a l'intention de soumettre le 3ème avant-projet révisé sur les tables psychrométriques internationales à ses collaborateurs, pour approbation.

Sr 4 va réétudier le projet de RI « Humidimètres pour le bois. Méthodes de vérification » à la lumière des commentaires reçus des Membres du CIML à la suite du vote par correspondance et préparera un nouveau projet. La vérification des humidimètres par thermogravimétrie a fait l'objet d'une enquête parmi les collaborateurs et les réponses sont en train d'être analysées.

Sr 6 a préparé d'autres avant-projets de DI « Schéma de hiérarchie des instruments de mesure de l'humidité des gaz » et « Méthodes d'essai des psychromètres » ; ces avant-projets seront diffusés pour commentaires en 1985.

Sr 9 a terminé le projet de RI « Viscosimètres à capillaire, en verre, pour la mesure de la viscosité cinématique » qui a été sanctionné par la 7ème Conférence et sera publié en tant que RI 69. Le projet de DI « Schéma de hiérarchie des instruments de mesure de la viscosité des liquides » a été adopté par le CIML et est en cours de publication. Le Secrétariat prépare un avant-projet sur les liquides étalons utilisés pour l'étalonnage des viscosimètres, pour la réunion de Batoumi.

Sr 10 a terminé les projets de RI suivants : « Méthode pour la détermination des erreurs de base et de reversibilité des analyseurs de gaz » et « Prescriptions pour les gaz purs CO, CO_2, CH_4, H_2, O_2, N_2 et Ar destinés à la préparation des mélanges de référence ». Ces projets ont été sanctionnés par la 7ème Conférence et seront publiés en tant que RI 70 et RI 73 respectivement. Le Secrétariat continue la préparation des avant-projets concernant les méthodes et moyens de vérification d'instruments automatiques pour la mesure de la concentration de SO_2 et CO dans l'atmosphère.

SP 31 - Enseignement de la métrologie

Le Secrétariat-Pilote et ses Secrétariats-rapporteurs ont tenu une réunion à Paris en avril 1984.

Sr 1 et Sr 2 ont préparé des projets de DI « Qualifications pour les Ingénieurs-métrologues » et « Formation des techniciens en métrologie » respectivement. Les deux projets ont été soumis au Comité pour adoption.

Sr 1 prépare actuellement des projets de DI « Programme-type de cours de métrologie de base pour ingénieurs » et « Glossaire des termes et définitions dans le domaine de la formation et du perfectionnement des métrologues ». Le Secrétariat travaille également sur la structure d'un annuaire international des institutions fournissant une formation spécialisée en métrologie.

Sr 2 a distribué en janvier 1985 son 3ème avant-projet concernant le programme de formation des techniciens de métrologie légale.

BIML

The WORK of OIML SECRETARIATS 1984 - 1985

As in previous years an account of the work of OIML pilot and reporting secretariats is given stating the progress of work in 1984 and the forecasts for 1985. It is based on annual reports and other information available.

SP 1 - Terminology

The International Vocabulary of basic and general terms in Metrology (VIM), which was prepared jointly by BIPM, IEC, ISO and OIML, was published in May 1984. The Bureau has carried out a study comparing the VIM with the bilingual edition of the Vocabulary of Legal Metrology ; this study was distributed to all OIML Members and Corresponding Members beginning of 1985.

Sr 1 studied the many comments received with the postal vote on the draft revision of the Vocabulary of Legal Metrology (VML) and will prepare a further draft in 1985.

Sr 2 studied the draft on the terminology relating to the measurement of electrical and magnetic quantities, prepared by SP 13-Sr 7, and has sent its comments to the Reporting Secretariat.

Sr 3 continues the reviews of all the OIML drafts. Following the directives of the last version of the « Working Method of OIML Secretariats » the Bureau now systematically sends a separate copy to SP 1-Sr 3 when the draft Recommendations and Documents are submitted to the Committee for voting.

SP 2 - Legal metrology. General

Sr 1 has prepared a brochure for developing countries under the title « Guidelines for the Establishment of Simplified Metrology Regulations ».

Sr 2 is continuing its study on the revision of DI 2 « Legal units of measurement ».

Sr 3 — No activity ; it is proposed to disband this Secretariat since its terms of reference are covered by SP 22.

Sr 4 — The International Working Group held a meeting in Paris, 29-30 March 1984. At the request of CIML the Secretariat will continue its study. The BIML has prepared and distributed for comment the 1st pre-draft DI « Guidelines governing the arrangement of bi- and multilateral agreements on the recognition of test results of pattern approval and verification ».

The 2nd pre-draft will be prepared during 1985 taking into account the comments received.

In parallel, BIML is preparing, for submission to the CIML, reports concerning :

— collection of information on existing systems of recognition,

— exchange of information on pattern approval tests,

— reference to OIML International Recommendations in pattern approvals,

— certificates of conformity of instruments with OIML International Recommendations.

Sr 6 — The IWG has discussed the 3rd pre-draft DI « General requirements for electronic instruments » during its meeting in Amsterdam, June 1984. The Secretariat has prepared a 4th pre-draft for consideration by its IWG in Copenhagen, 10-12 June 1985.

SP 4 - Measurement of length, area, angle

Sr 1 distributed for comment the 1st pre-draft RI for high-accuracy line measures of length.

Sr 2 — The revision of RI 35 was sanctioned by the 7th Conference.

Sr 3 — The draft RI for length measuring instruments was sanctioned by the 7th Conference and will be published as RI 66.

Sr 4 studied the comments received on the draft DI « Hierarchy scheme for length measuring instruments » and intends to prepare a 3rd draft in 1985.

Sr 5 has sent the final draft DI's « Hierarchy scheme for angle measuring instruments » and « Methods for reproduction of plane angle units » to the Pilot Secretariat for further action.

Sr 6 continued its studies on the 1st pre-draft RI for instruments measuring the area of hides.

Sr 7 developed the 2nd pre-draft RI « Terminology used in dimensional metrology » ; the draft was sent to members of the ISO-OIML Joint Working Group for comment.

SP 5S - Static measurement of volume of liquids

Sr 1 is preparing the 1st pre-draft DI Terminology, Part I — Measurement of petroleum products.

Sr 2 prepared the 2nd pre-draft DI Hierarchy schemes for measurement of volume of liquids.

Sr 3 has developed the 1st pre-draft RI for automatic volume standards for consideration by the IWG in 1985.

Sr 8 — The IWG held a meeting in Constanta, June 1984, and finalized the draft RI for storage tanks ; the draft was sanctioned by the 7th Conference and will be published as RI 71. The Secretariat cooperates closely with ISO/TC 28 on the various methods of tank calibration.

Sr 9 has finalized the draft RI « Road and rail tankers » during the meeting in Constanta ; the draft will be submitted to the Pilot Secretariat for approval.

Sr 10 continues with its work on barge and ship tanks ; the 2nd pre-draft was discussed in Constanta and a 3rd pre-draft will be distributed in 1985, for comment.

Sr 11 — The 2nd pre-draft on liquid level measurements was discussed during the meeting in Constanta. The Secretariat is developing the 3rd pre-draft to be submitted to the Pilot Secretariat for approval, in 1985.

SP 5D - Dynamic measurement of volume of liquids

Sr 1 (ex Sr 13) finalized the draft RI « Measuring assemblies — Metrological controls » which was sanctioned by the 7th Conference and will be published as RI 67. The draft RI « Measuring assemblies — Special requirements » is being modified. The secretariat is preparing a 2nd pre-draft on turbine meters and a 1st pre-draft on measuring assemblies in pipe lines.

Sr 2 (ex Sr 15) developed a 2nd pre-draft RI « Meters and measuring systems for cryogenic liquids » which was discussed during a meeting of the IWG in Paris, May 1984. The secretariat has prepared a 3rd pre-draft and the next meeting of the IWG will take place at BIML, 17-19 April 1985.

Sr 3 (ex Sr 16) finalized the draft RI « Hot-water meters » ; the draft was sanctioned by the 7th Conference and will be published as RI 72. During a meeting of the IWG in London, November 1984, the following subjects were discussed :

1. electronic indicating devices for water meters,
2. statistical testing of water meters,
3. revision of RI 49 (in liaison with ISO).

The secretariat will prepare drafts for the next IWG meeting.

Sr 4 (ex Sr 17) submitted the draft RI « Drummeters for alcohol and their supplementary devices » to the Pilot Secretariat for approval.

Sr 5 (ex Sr 18) prepared a draft RI « Petroleum measurement tables » which was sanctioned by the 7th Conference and will be published as RI 63.

Sr 6 (ex Sr 19) continued the elaboration of a pre-draft RI on electronic devices applied to the measurement of volume of liquids and intends to distribute the 1st pre-draft to collaborating countries for comment before the end of 1985 ; a meeting of the IWG is proposed for 1986.

SP 6 - Measurement of gas

Sr 1 intends to distribute a draft revision of RI 31 « Diaphragm gas meters » to the IWG members for comment.

Sr 4 continued its work on the preparation of a pre-draft DI on the measurement of hydrocarbon gazes distributed by pipe line.

Sr 5 and Sr 6 continued their work on the pre-drafts on calibration and verification of gas meters and intend to distribute the documents for comment before the end of 1985.

Sr 9 has prepared a pre-draft on gas correctors which will be submitted to the IWG.

Sr 11 is elaborating a 1st pre-draft International Recommendation on calculators integrated in gas measuring systems.

Sr 12 intends to develop a 1st pre-draft dealing with automatic gas calorimeters and their verification.

SP 7 - Measurement of mass

Sr 2 held a meeting on electronic weighing instruments in Amsterdam, June 1984. Following this, the Secretariat has developed the 5th pre-draft which will be circulated for comment early 1985 and will be discussed during a meeting in Copenhagen, June 1985.

Sr 4 — The draft revision of RI 3 was sanctioned by the 7th Conference. The IWG held a meeting in Bergen, June 1984, and initiated work on pattern approval test procedures for non-automatic weighing instruments and on a revision of RI 28. The next meeting is planned for the autumn of 1985, in Boras.

Sr 5 finalized the draft RI for gravimetric filling machines ; it was sanctioned by the 7th Conference and will be published as RI 61. The 1st pre-draft RI's for discontinuous totalizing weighing machines and for automatic rail-weighbridges were completed and distributed for comment ; both pre-drafts will be discussed during a meeting in London, 29 April - 3 May 1985.

Sr 8 finalized the draft RI for load cells which was sanctioned by the 7th Conference and has been published as RI 60.

SP 8 - Weights

Sr 1 has developed in consultation with Sr 2, Sr 5 and Sr 6 a pre-draft RI which consolidates all the requirements for weights now contained in the RI's No's 1, 2, 20, 25 and 52. The draft will be circulated for comment and approval during 1985.

SP 9 - Measurement of density

Sr 2 has prepared a revision of RI 44 which was sanctioned by the 7th Conference.

Sr 3 is revising the 3rd pre-draft « Hydrometers for specific purposes » taking into account the comments received.

Sr 4 was abolished by the CIML at its 20th meeting in 1984.

Sr 9 will distribute for comment the 1st pre-draft on terminology during 1985.

SP 10 - Measuring instruments for vehicles

Sr 1 is awaiting completion of the SP 2-Sr 6 work on electronics before modifying the draft on radar speed meters.

Sr 3 will circulate the 1st pre-draft on electronic taximeters during 1985.

SP 11 - Measurement of pressure

The Pilot Secretariat prepared a pre-draft on terminology which was circulated for comment.

Sr 2 prepared a 2nd pre-draft DI on hierarchy schemes.

Sr 3 distributed to its IWG the 5th pre-draft on piston pressure gauges for comment and approval.

Sr 4 developed the 3rd and 2nd pre-draft RI's on verification methods for indicating and recording pressure gauges respectively. The Secretariat intends to hold a meeting of its IWG in Lvov, May 1985.

Sr 5 will inform its collaborators on the results of the enquiries concerning manometers for blood pressure and will then start work on a revision of RI 16.

Sr 7 has completed the 4th pre-draft on barometers which will be submitted to the IWG for comment and approval, early 1985.

SP 12 - Measurement of temperature and heat

Sr 3 has distributed for comment a new draft RI on electrical resistance thermometers which is now harmonized with IEC Publication 751.

Sr 5 developed a 1st pre-draft RI on tables and tolerances of standard thermocouples, based on work by IEC/TC 65B and intends to send it out for comment during the 2nd quarter of 1985.

Sr 6 IWG held a meeting in Leningrad, April 1984. Following this the Secretariat is elaborating the 3rd pre-draft RI's « Classification of radiation pyrometers » and « Total radiation pyrometers ».

The draft revision of RI 18, approved by the Pilot Secretariat, was sent to CIML Members for voting.

Sr 7 is preparing for a meeting on clinical thermometers in Trier, September 1985.

Sr 8 has finalized the draft RI « Heat meters » ; the draft was approved by the Pilot Secretariat and was sent to CIML Members for voting.

Sr 9 has finalized the 4th pre-draft « Verification methods for thermocouples » ; after some editorial amendments the draft will be submitted to the Pilot Secretariat.

SP 13 - Measurement of electrical and magnetic quantities

Sr 1 was abolished by the CIML at its 20th meeting in 1984.

Sr 4 intends to elaborate the 6th pre-draft on instrument transformers taking into account the comments received and hopes to submit it to the Pilot Secretariat in 1985.

Sr 5 and 7 have distributed for comment the 2nd pre-drafts on measuring instruments indicating voltage, current and frequency and on terminology (electricity) respectively. A list of terms to be harmonized with IEC has been prepared.

SP 14 - Acoustics and vibration

Sr 1 intends to prepare a draft for adoption by OIML based on the IEC Publication on « Integrating sound level meters ». The Draft « Sound level meters » was sanctioned by the 7th Conference and has been published as RI 58.

SP 15 - Optics

Sr 1 cooperates with ISO in preparing a draft RI on dioptrometers ; a joint meeting was held in Berlin, September 1984.

SP 16 - Ionizing radiation

Sr 1 is following the work of IEC on dosemeters. An amendment to the IEC Publication 731 of 1983 is expected to be approved and the Secretariat will then consider the suitability of proposing a draft relevant to OIML interests.

Sr 2 has finalized the draft DI « Secondary standard dosimetry laboratories for the calibration of dosemeters used in radiotherapy » ; the draft was submitted to the Pilot Secretariat for approval.

SP 17 - Mesurement of pollution

The Pilot Secretariat and its Reporting Secretariats met in Paris, June 1984 : the next meeting is planned for May 1985, in Washington.

Sr 1 has developed and distributed for comment a 1st pre-draft RI on exhaust carbon monoxide meters.

Sr 2 has prepared a 2nd pre-draft RI « Gas chromatographs/mass spectrometer data system (GC/MS) for analyzis of organic pollutants in water », to be discussed during the meeting in Washington.

The Secretariat intends to start work on a pre-draft RI dealing with atomic absorption spectrometers (AA) used in monitoring water pollution.

Sr 4 has prepared the 2nd pre-draft RI on « Gas chromatographs (GC) for measuring pesticide and toxic substance pollution » which will be discussed during the meeting in Washington. The Secretariat is also developing a predraft on high performance liquid chromatographs (HPLC) used in monitoring pesticide and toxic substance pollution.

SP 18 - Measurement of characteristics of food products

Sr 1 — The draft « Moisture meters for cereal grains and oilseeds » was sanctioned by the 7th Conference and has been published as RI 59.

SP 19 - Measurement of characteristics of materials

Sr 1 was dissolved by the CIML at its 20th meeting.

Sr 2 completed the draft RI's « General requirements for materials testing machines » and « Requirements for machines for tension and compression testing of materials » ; the drafts were sanctioned by the 7th Conference and will be published as RI 64 and RI 65 respectively.

The Secretariat also prepared and distributed for comment the 4th pre-draft for instruments verifying the force indication of materials testing machines.

Sr 3 is awaiting completion of ISO work before starting a revision of RI's 9 to 12.

Sr 4 has published a report on the results of the 1st stage of the international hardness test blocks intercomparison.

Sr 5 finalized the draft RI « Performance characteristics of metallic strain gauges » which was sanctioned by the 7th Conference and will be published as RI 62.

Sr 6 has elaborated a 3rd pre-draft on terminology of hardness testing and intends to circulate the draft for comment during 1985.

SP 20 - Prepackaged products

The Pilot Secretariat and its Reporting Secretariats held a meeting in Berne, June 1984. The next meeting is planned for June 1985.

Sr 1 has prepared a 3rd pre-draft « Information on package labels » taking into account the decisions taken during the meeting in Berne ; the draft was submitted to the Pilot Secretariat for approval.

Sr 2 will prepare a new pre-draft on the verification of net quantity of prepackages.

SP 21 - Standardization of the metrological characteristics of measuring instruments

The Pilot Secretariat and its Reporting Secretariats will hold a meeting in Lvov, May 1985.

Sr 1 and Sr 2 developed draft DI's « General characteristics of measuring instruments » and « Dynamic characteristics of measuring instruments » which were adopted by the Committee and are being prepared for publication.

Sr 1 is developing a pre-draft on the standardized characteristics of a given pattern of measuring instrument ; the structure and contents will be discussed at the meeting in Lvov.

Sr 2 is preparing a pre-draft on the principles of determination of dynamic characteristics of measuring instruments ; the structure and contents will be discussed at the meeting in Lvov.

Sr 4 completed a draft DI on the principles of prescribing the metrological characteristics of measuring systems ; the draft is being submitted to the Pilot Secretariat for approval.

Sr 5 continues its work on the pre-draft DI « Requirements for methods of control of metrological characteristics of measuring instruments ».

Sr 6 developed a 2nd pre-draft DI « Experimental determination of metrological characteristics of measuring systems. Basic principles » ; the draft will be discussed at the meeting in Lvov.

SP 22 - Principles of metrological control

The Pilot Secretariat and its Reporting Secretariats met in Koblenz, April 1984.

Sr 1 finalized the draft DI « Fields of use of measuring instruments subject to verification » ; the draft was submitted to the Committee for adoption.

Sr 2 finalized the draft DI « Principles for the selection of characteristics for the examination of ordinary measuring instruments » ; the draft was submitted to the Committee for adoption.

Sr 3 and Sr 4 dealing with pattern evaluation and verification of measuring instruments respectively have prepared further pre-drafts taking into account the comments of the IWG. Both drafts will be submitted to the CIML for approval by mail.

Sr 5 — The draft DI « Principles of metrological supervision » adopted by CIML was published as DI 9.

Sr 6 has finalized the draft DI « Principles of assurance of metrological control ». The draft was submitted to the CIML for adoption.

SP 26 - Measuring instruments used in the field of health

Sr 2 submitted the 1st draft RI « Haemocytometer dilution pipettes » to the Pilot Secretariat for approval.

Sr 3 submitted the 1st draft RI « Westergren tubes for measurement of erythrocyte sedimentation rate » to the Pilot Secretariat for approval.

Sr 4 developed 2nd draft RI's for electrocardiographs and electroencephalographs ; both drafts were re-submitted to the Pilot Secretariat. The Secretariat is continuing its work on a pre-draft DI « Instruments measuring bioelectrical quantities. Metrological characteristics subject to standardization and methods of their presentation ».

Sr 5 intends to deal initially with certified reference materials related to quantitative cellular hematology.

SP 27 - General principles for the use of reference materials in legal metrology

The Pilot Secretariat has circulated to the collaborating member states a draft work program and a questionnaire concerning participation in SP 27 activities.

The Pilot Secretariat intends to hold a meeting with its Reporting Secretariats during 1985.

Sr 2 — no activity pending completion of the classification work in ISO REMCO.

Sr 3, Sr 4 and Sr 5 have consolidated their pre-drafts and have circulated for comment the 1st joint draft DI « Certified reference materials. General principles for application in measurement ». A 2nd draft will be prepared taking into account the comments received and will be submitted to the IWG for approval.

Sr 7 continues its studies on the procedure and practice of comparison of reference materials.

SP 30 - Physico-chemical measurements

The Pilot Secretariat and the Reporting Secretariats Sr 2, Sr 4, Sr 9 and Sr 10 intend to hold a meeting in Batumi, September 1985.

Sr 1 circulated a program on the intercomparison of pH-meters to the collaborating countries.

Sr 2 finalized the draft RI « Calibration method for conductivity cells » ; the draft was sanctioned by the 7th Conference and will be published as RI 68. The Secretariat is now preparing a 2nd pre-draft on the measurement of conductivity of electrolytic solutions for the meeting in Batumi.

Sr 3 developed the 5th pre-draft on a relative humidity scale using saturated salt solutions which will be distributed for comment in 1985. The Secretariat intends to submit the revised 3rd pre-draft on psychrometric tables to the collaborating member states for approval.

Sr 4 will reconsider the draft RI « Wood moisture meters — Methods of verification » in the light of comments received from the CIML members as result of the postal vote and is preparing a new draft. The verification of moisture meters by thermogravimetry has been subject to an enquiry among the collaborators and the replies are being analyzed.

Sr 6 has prepared further pre-draft DI's « Hierarchy scheme for instruments measuring the humidity of gases » and « Test methods for psychrometers » ; these drafts will be distributed for comment in 1985.

Sr 9 finalized the draft RI « Glass capillary viscometers for the measurement of kinematic viscosity » which was sanctioned by the 7th Conference and will be published as RI 69. The draft DI « Hierarchy scheme for instruments measuring the viscosity of liquids » was adopted by CIML and is being prepared for publication. The Secretariat is preparing a pre-draft « Standard liquids used for the calibration of viscometers » for the meeting in Batumi.

Sr 10 has finalized the draft RI's « Method for the determination of intrinsic and hysteresis errors of gas analysers » and « Requirements concerning CO, CO_2, CH_4, H_2, O_2, N_2 and Ar pure gases intended for the preparation of reference gas mixtures ». The drafts were sanctioned by the 7th Conference and will be published as RI 70 and RI 73 respectively. The Secretariat continues the preparation of pre-drafts dealing with methods and devices for the verification of automatic instruments measuring the concentration in the atmosphere of SO_2 and CO.

SP 31 - Teaching of metrology

The Pilot Secretariat and its Reporting Secretariats held a meeting in Paris, April 1984.

Sr 1 and Sr 2 have prepared draft DI's « Recommended qualifications for metrology engineers » and « Training of metrology technicians » respectively. Both drafts were submitted to the Committee for adoption.

Sr 1 is at present preparing draft DI's « Typical program of a basic metrology course for engineers » and « Glossary of terms and definitions in the field of training and upgrading of metrologists ». The Secretariat is also working on a structure of an international directory of institutions providing specialized training in metrology.

Sr 2 has distributed in January 1985 the 3rd pre-draft concerning the study program for the training of legal metrology technicians.

INFORMATIONS

MEMBRES DU COMITE

La composition du Comité International de Métrologie Légale est modifiée ainsi qu'il suit :

PAYS-BAS — Monsieur A.C. BIJLOO a quitté ses fonctions de Directeur Général Adjoint du Service Néerlandais de Métrologie et a cessé de représenter son pays au Comité International de Métrologie Légale. Son successeur au Comité est Monsieur J. NIEUWLAND, Chef de la Section des Affaires Légales et autres Affaires Juridiques au même Service.

ROYAUME-UNI — Monsieur G. SOUCH, Directeur du National Weights and Measures Laboratory et Membre du CIML, a pris sa retraite. Il a été remplacé par Monsieur P.B. CLAPHAM qui représentera également son Pays au CIML.

Nous adressons nos meilleures salutations de bienvenue aux nouveaux Membres du Comité et nous exprimons nos vifs remerciements à Monsieur BIJLOO et à Monsieur SOUCH pour leur précieuse participation aux travaux de l'Organisation.

MEMBRE CORRESPONDANT

Monsieur le Président du CIML vient d'accueillir l'ISLANDE en qualité de nouveau Membre Correspondant de l'Organisation. Cette nouvelle adhésion porte à 74 le nombre des Etats Membres et Membres Correspondants de notre Institution.

REP. FED. D'ALLEMAGNE

Les associations allemandes d'ingénieurs VDI et VDE organisent en coopération avec IMEKO TC 5 un symposium intitulé « Mesures de dureté en théorie et pratique », qui aura lieu dans la Schwabenlandhalle à Fellbach les 10 et 11 mars 1986. Pour tous renseignements, s'adresser à :

VDI/VDE — Gesellschaft für Mess- und Regelungstechnik (GMR)
Postfach 11 39
D-4000 Düsseldorf 1

FRANCE

Des stages de spécialisation dans le domaine de la métrologie mécanique auront lieu encore cette année du 3 au 7 juin : « Connaissances des machines à mesurer tridimensionnelles » et du 18 au 20 novembre : « Organisation de la métrologie dans les entreprises ». Pour tous renseignements, s'adresser au

Laboratoire National d'Essais
Département Métrologie et Instruments de Mesure
1, rue Gaston Boissier
75015 Paris

HONGRIE

Un colloque et une exposition d'instruments de pesage ont eu lieu à Szeged du 28 au 31 août 1984. Cette manifestation était la huitième du genre organisée par la Société METROPOND. Le colloque comportait plus de 28 exposés en hongrois et en allemand dont un nombre important furent prononcés par des conférenciers étrangers.

INFORMATION

COMMITTEE MEMBERS

The composition of the International Committee of Legal Metrology has changed as follows :

NETHERLANDS — Mr A.C. BIJLOO has relinquished his position as Assistant Director General of the Metrology Service of the Netherlands and has ceased to be a Member of the CIML. His successor as Representative of his country on the Committee is Mr J. NIEUWLAND, Chief, Legislation and other Juridical Affairs Division of the same Service.

UNITED KINGDOM — Mr G. SOUCH, Director of the National Weights and Measures Laboratory and CIML Member has taken early retirement and has been replaced by Mr P.B. CLAPHAM who will represent his country on the CIML.

We express our best wishes of welcome to the new Committee Members, and warmly thank Mr BIJLOO and Mr SOUCH for their valuable participation in our activities.

CORRESPONDING MEMBER

The President of the CIML has admitted ICELAND as new OIML Corresponding Member. This accession brings to 74 the number of Member States and Corresponding Members of our Institution.

FED. REP. of GERMANY

The German associations of engineers VDI and VDE organise in cooperation with IMEKO TC 5 a symposium with the title « Hardness Testing in Theory and Practice » which will take place in the Schwabenlandhalle at Fellbach from 10 to 11 March 1986. For all information contact :

VDI/VDE — Gesellschaft für Mess- und Regelungstechnik (GMR)
Postfach 11 39
D-4000 Düsseldorf 1

FRANCE

Training courses in engineering metrology with emphasis on threedimensional measuring machines will take place also this year, from 3 to 7 June : « Connaissances des machines à mesurer tridimensionnelles » and from 18 to 20 November 1985 : « Organisation de la métrologie dans les entreprises ». For all information contact :

Laboratoire National d'Essais
Département Métrologie et Instruments de Mesure
1, rue Gaston Boissier
75015 Paris

HUNGARY

A conference on weighing and an exhibition of weighing instruments took place at Szeged from 28 to 31 August 1984. This event which was organized for the eighth time by the company METROPOND comprised more than 28 papers in Hungarian and German whereof a large number were presented by foreign participants.

REUNIONS

	Groupes de travail	Dates	Lieux
SP 5D - Sr 2 (ancien SP 5 - Sr 15)	Compteurs et ensembles de mesure de liquides cryogéniques	17-19 avril 1985	PARIS, BIML
SP 27	Principes généraux de l'utilisation des matériaux de référence en métrologie légale	23-25 avril 1985	MOSCOU U.R.S.S.
SP 7 - Sr 5	Instruments de pesage à fonctionnement automatique	29 avril-3 mai 1985	LONDRES ROYAUME-UNI
SP 17 et ses secrétariats-rapporteurs	Mesure des pollutions	20-24 mai 1985	WASHINGTON U.S.A.
SP 21 et ses secrétariats-rapporteurs	Normalisation des caractéristiques métrologiques	20-22 mai 1985	LVOV U.R.S.S.
SP 11 - Sr 4	Manomètres à éléments récepteurs élastiques	23-25 mai 1985	LVOV U.R.S.S.
SP 20 - Sr 1	Contenu informatif de l'étiquetage des produits préemballés	4-7 juin 1985	LOCARNO SUISSE
SP 20 - Sr 2	Vérification des quantités contenues dans les emballages		
SP 2 - Sr 6	Instruments électroniques	10-12 juin 1985	COPENHAGUE DANEMARK
SP 7 - Sr 2	Mesure des masses. Dispositifs électroniques	13-14 juin 1985	
SP 30 et ses secrétariats-rapporteurs	Mesures physico-chimiques	9-14 sept. 1985	BATOUMI U.R.S.S.
SP 12 - Sr 7	Thermomètres médicaux	24-26 sept. 1985	TRIER R.F. D'ALLEMAGNE
SP 7 - Sr 4	Instruments de pesage à fonctionnement non automatique	10-12 sept. 1985	BORÅS SUEDE
Séminaire OIML sur le contrôle des installations de pesage en vrac		22-25 avril 1985	PARIS FRANCE
Conseil de la Présidence		23-24 sept. 1985 *(provisoire)*	BRAUNSCHWEIG R.F. D'ALLEMAGNE

CENTRE DE DOCUMENTATION

La liste de documents reçus au Centre de documentation ne sera dorénavant plus publiée dans le Bulletin mais sera remplacée par des répertoires plus complets qui seront disponibles sur demande au BIML par pays et sujet.

Nous continuerons cependant à signaler à l'avenir sous la rubrique « Littérature » les publications reçues, autres que les normes, qui présentent un intérêt particulier pour la métrologie y compris son enseignement ainsi que pour l'activité de l'OIML en général.

DOCUMENTATION CENTRE

The list of documents received by the Documentation Centre will from this issue not be published in the Bulletin but will be replaced by more complete repertories which can be obtained from BIML on request according to country and subject.

We will however continue in future to advise under the title « Literature » about received publications, other than standards, which present special interest in the field of metrology including training as well as for the activity of OIML as a whole.

PUBLICATIONS

— Vocabulaire de métrologie légale
Vocabulary of legal metrology

— Vocabulaire international des termes fondamentaux et généraux de métrologie
International vocabulary of basic and general terms in metrology

RECOMMANDATIONS INTERNATIONALES

INTERNATIONAL RECOMMENDATIONS

RI N°

1 — Poids cylindriques de 1 g à 10 kg (de la classe de précision moyenne)
Cylindrical weights from 1 g to 10 kg (medium accuracy class)

2 — Poids parallélépipédiques de 5 à 50 kg (de la classe de précision moyenne)
Rectangular bar weights from 5 to 50 kg (medium accuracy class)

3 — Réglementation métrologique des instruments de pesage à fonctionnement non automatique
Metrological regulations for non automatic weighing instruments

4 — Fioles jaugées (à un trait) en verre
Volumetric flasks (one mark) in glass

5 — Compteurs de liquides autres que l'eau à chambres mesureuses
Meters for liquids other than water with measuring chambers

6 — Prescriptions générales pour les compteurs de volume de gaz
General specifications for volumetric gas meters

7 — Thermomètres médicaux (à mercure, en verre, avec dispositif à maximum)
Clinical thermometers (mercury-in-glass, with maximum device)

9 — Vérification et étalonnage des blocs de référence de dureté Brinell
Verification and calibration of Brinell hardness standardized blocks

10 — Vérification et étalonnage des blocs de référence de dureté Vickers
Verification and calibration of Vickers hardness standardized blocks

11 — Vérification et étalonnage des blocs de référence de dureté Rockwell B
Verification and calibration of Rockwell B hardness standardized blocks

12 — Vérification et étalonnage des blocs de référence de dureté Rockwell C
Verification and calibration of Rockwell C hardness standardized blocks

14 — Saccharimètres polarimétriques
Polarimetric saccharimeters

15 — Instruments de mesure de la masse à l'hectolitre des céréales
Instruments for measuring the hectolitre mass of cereals

16 — Manomètres des instruments de mesure de la tension artérielle (sphygmo-manomètres)
Manometers for instruments for measuring blood pressure (sphygmomanometers)

17 — Manomètres, vacuomètres, manovacuomètres indicateurs
Indicating pressure gauges, vacuum gauges and pressure-vacuum gauges

18 — Pyromètres optiques à filament disparaissant
Optical pyrometers of the disappearing filament type

19 — Manomètres, vacuomètres, manovacuomètres enregistreurs
Recording pressure gauges, vacuum gauges, and pressure-vacuum gauges

20 — Poids des classes de précision E_1 E_2 F_1 F_2 M_1 de 50 kg à 1 mg
Weights of accuracy classes E_1 E_2 F_1 F_2 M_1 from 50 kg to 1 mg

21 — Taximètres
Taximeters

22 — Tables alcoométriques internationales
International alcoholometric tables

23 — Manomètres pour pneumatiques de véhicules automobiles
Tyre pressure gauges for motor vehicles

24 — Mètre étalon rigide pour agents de vérification
Standard one metre bar for verification officers

25 — Poids étalons pour agents de vérification
Standard weights for verification officers

26 — Seringues médicales
Medical syringes

27 — Compteurs de volume de liquides (autres que l'eau). Dispositifs complémentaires
Volume meters for liquids (other than water). Ancillary equipment

28 — Réglementation technique des instruments de pesage à fonctionnement non-automatique
Technical regulations for non-automatic weighing machines

29 — Mesures de capacité de service
Capacity serving measures

30 — Mesures de longueur à bouts plans (calibres à bouts plans ou cales-étalons)
End standards of length (gauge blocks)

31 — Compteurs de volume de gaz à parois déformables
Diaphragm gas meters

32 — Compteurs de volume de gaz à pistons rotatifs et compteurs de volume de gaz à turbine
Rotary piston gas meters and turbine gas meters

33 — Valeur conventionnelle du résultat des pesées dans l'air
Conventional value of the result of weighing in air

34 — Classes de précision des instruments de mesurage
Accuracy classes of measuring instruments

35 — Mesures matérialisées de longueur pour usages généraux
Material measures of length for general use

36 — Vérification des pénétrateurs des machines d'essai de dureté
Verification of indenters for hardness testing machines

37 — Vérification des machines d'essai de dureté (système Brinell)
Verification of hardness testing machines (Brinell system)

38 — Vérification des machines d'essai de dureté (système Vickers)
Verification of hardness testing machines (Vickers system)

39 — Vérification des machines d'essai de dureté (systèmes Rockwell B, F, T - C, A, N)
Verification of hardness testing machines (Rockwell systems B, F, T - C, A, N)

40 — Pipettes graduées étalons pour agents de vérification
Standard graduated pipettes for verification officers

41 — Burettes étalons pour agents de vérification
Standard burettes for verification officers

42 — Poinçons de métal pour agents de vérification
Metal stamps for verification officers

43 — Fioles étalons graduées en verre pour agents de vérification
Standard graduated glass flasks for verification officers

44 — Alcoomètres et aréomètres pour alcool et thermomètres utilisés en alcoométrie
Alcoholometers and alcohol hydrometers and thermometers for use in alcoholometry

45 — Tonneaux et futailles
Casks and barrels

46 — Compteurs d'énergie électrique active à branchement direct (de la classe 2)
Active electrical energy meters for direct connection (class 2)

47 — Poids étalons pour le contrôle des instruments de pesage de portée élevée
Standard weights for testing of high capacity weighing machines

48 — Lampes à ruban de tungstène pour l'étalonnage des pyromètres optiques
Tungsten ribbon lamps for calibration of optical pyrometers

49 — Compteurs d'eau (destinés au mesurage de l'eau froide)
Water meters (intended for the metering of cold water)

50 — Instruments de pesage totalisateurs continus à fonctionnement automatique
Continuous totalising automatic weighing machines

51 — Trieuses pondérales de contrôle et trieuses pondérales de classement
Checkweighing and weight grading machines

52 — Poids hexagonaux. Classe de précision ordinaire de 100 g à 50 kg
Hexagonal weights. Ordinary accuracy class, from 100 g to 50 kg

53 — Caractéristiques métrologiques des éléments récepteurs élastiques utilisés pour le mesurage de la pression. Méthodes de leur détermination
Metrological characteristics of elastic sensing elements used for measurement of pressure. Determination methods

54 — Echelle de pH des solutions aqueuses
pH scale for aqueous solutions

55 — Compteurs de vitesse, compteurs mécaniques de distances et chronotachygraphes des véhicules automobiles - Réglementation métrologique
Speedometers, mechanical odometers and chronotachographs for motor vehicles. Metrological regulations

56 — Solutions-étalons reproduisant la conductivité des électrolytes
Standard solutions reproducing the conductivity of electrolytes

57 — Ensembles de mesurage de liquides autres que l'eau équipés de compteurs de volumes. Dispositions générales
Measuring assemblies for liquids other than water fitted with volume meters. General provisions.

58 — Sonomètres
Sound level meters

59 — Humidimètres pour grains de céréales et graines oléagineuses
Moisture meters for cereal grains and oilseeds

60 — Réglementation métrologique des cellules de pesée
Metrological regulations for load cells

61 — Doseuses pondérales à fonctionnement automatique
Automatic gravimetric filling machines

62 — Caractéristiques des extensomètres métalliques à résistance
Performance characteristics of metallic resistance strain gages

63 — Tables de mesure du pétrole
Petroleum measurement tables

64 — Exigences générales pour les machines d'essai des matériaux
General requirements for materials testing machines

65 — Exigences pour les machines d'essai des matériaux en traction et en compression
Requirements for machines for tension and compression testing of materials

66 — Instruments mesureurs de longueurs
Length measuring instruments

67 — Ensembles de mesurage de liquides autres que l'eau équipés de compteurs de volumes. Contrôles métrologiques
Measuring assemblies for liquids other than water fitted with volume meters. Metrological controls

68 — Méthode d'étalonnage des cellules de conductivité
Calibration method for conductivity cells

69 — Viscosimètres à capillaire, en verre, pour la mesure de la viscosité cinématique
Glass capillary viscometers for the measurement of kinematic viscosity.

70 — Méthode pour la détermination des erreurs de base et de reversibilité des analyseurs de gaz
Method for the determination of intrinsic and hysteresis errors of gas analysers

71 — Réservoirs de stockage fixes à pression atmosphérique ou sous pression. Prescriptions générales
Fixed storage tanks at atmospheric pressure or under pressure. General requirements

72 — Compteurs d'eau destinés au mesurage de l'eau chaude
Hot-water meters

73 — Prescriptions pour les gaz purs CO, CO_2, CH_4, H_2, O_2, N_2 et Ar destinés à la préparation des mélanges de référence
Requirements concerning CO, CO_2, CH_4, H_2, O_2, N_2 and Ar pure gases intended for the preparation of reference gas mixtures

DOCUMENTS INTERNATIONAUX

INTERNATIONAL DOCUMENTS

DI N°

1 — Loi de métrologie
Law on metrology

2 — Unités de mesure légales
Legal units of measurement

3 — Qualification légale des instruments de mesurage
Legal qualification of measuring instruments

4 — Conditions d'installation et de stockage des compteurs d'eau froide
Installation and storage conditions for cold water meters

5 — Principes pour l'établissement des schémas de hiérarchie des instruments de mesure
Principles for the establishment of hierarchy schemes for measuring instruments

6 — Documentation pour les étalons et les dispositifs d'étalonnage
Documentation for measurement standards and calibration devices

7 — Evaluation des étalons de débitmétrie et des dispositifs utilisés pour l'essai des compteurs d'eau
The evaluation of flow standards and facilities used for testing water meters

8 — Principes concernant le choix, la reconnaissance officielle, l'utilisation et la conservation des étalons
Principles concerning choice, official recognition, use and conservation of measurement standards

9 — Principes de la surveillance métrologique
Principles of metrological supervision

10 — Conseils pour la détermination des intervalles de réétalonnage des équipements de mesure utilisés dans les laboratoires d'essais
Guidelines for the determination of recalibration intervals of measuring equipment used in testing laboratories

Note — Ces publications peuvent être acquises au / *These publications may be purchased from* Bureau International de Métrologie Légale, 11, rue Turgot, 75009 PARIS.

Les Recommandations Internationales 62 à 73 sont en cours d'impression.
The International Recommendations 62 to 73 are being printed.

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

ETATS MEMBRES

ALGERIE
REP. FEDERALE D'ALLEMAGNE
REP. DEMOCRATIQUE ALLEMANDE
AUSTRALIE
AUTRICHE
BELGIQUE
BRESIL
BULGARIE
CAMEROUN
CANADA
CHYPRE
REP. DE COREE
REP. POP. DEM. DE COREE
CUBA
DANEMARK
EGYPTE
ESPAGNE
ETATS-UNIS D'AMERIQUE
ETHIOPIE
FINLANDE
FRANCE
GRECE
GUINEE
HONGRIE
INDE
INDONESIE
IRLANDE
ISRAEL
ITALIE
JAPON
KENYA
LIBAN
MAROC
MONACO
NORVEGE
PAKISTAN
PAYS-BAS
POLOGNE
ROUMANIE
ROYAUME-UNI DE GRANDE-BRETAGNE ET D'IRLANDE DU NORD
SRI LANKA
SUEDE
SUISSE
TANZANIE
TCHECOSLOVAQUIE
TUNISIE
U.R.S.S.
VENEZUELA
YOUGOSLAVIE

MEMBRES CORRESPONDANTS

Albanie - Bahrein - Botswana - Burkina Faso - Colombie - Equateur - Fidji - Hong Kong - Irak - Islande - Jamaïque - Jordanie - Koweit - Luxembourg - Mali - Maurice - Népal - Nouvelle-Zélande - Panama - Pérou - Philippines - Portugal - Syrie - Trinité et Tobago - Turquie

MEMBRES

du

COMITE INTERNATIONAL de METROLOGIE LEGALE

ALGERIE

Membre à désigner par son Gouvernement
Correspondance adressée à
Mr M. ALBANE
Directeur des Services industriels
Sous-direction de la Métrologie
Ministère des Industries Légères
Rue Ahmed Bey
Immeuble Colisée
ALGER

REPUBLIQUE FEDERALE D'ALLEMAGNE

Mr W. MÜHE
Chef des Bureaux Technico-Scientifiques,
Physikalisch-Technische Bundesanstalt,
Bundesallee 100
3300 BRAUNSCHWEIG.
TP 49-531-5920
TX 9-52 822 PTB
TG Bundesphysik Braunschweig

REPUBLIQUE DEMOCRATIQUE ALLEMANDE

Mr H.W. LIERS
Directeur de la Métrologie Légale,
Amt für Standardisierung, Messwesen
und Warenprüfung,
Fürstenwalder Damm 388
1162 BERLIN.
TP 37-2-65 260
TX 112630 asmw

AUSTRALIE

Mr T.J. PETRY
Executive Director
National Standards Commission,
P.O. Box 282
NORTH RYDE, N.S.W. 2113.
TP 61-2-888 39 22
TX AA 23144
TG NATSTANCOM Sydney

AUTRICHE

Mr R. LEWISCH
Director of the Metrology Service
Bundesamt für Eich- und Vermessungswesen
Arltgasse 35
A-1163 WIEN.
TP 43-222-92 16 27
TX 115 468 bevwn

BELGIQUE

Madame M.L. HENRION
Inspecteur Général
Service de la Métrologie
24-26, rue J.A. De Mot
B-1040 BRUXELLES
TP 32-2-233 61 11

BRESIL

Mr W. dos SANTOS
Président, INMETRO
Rod. Washington Luiz, km 101,5
Xerèm - D. Caxias
25400 RIO DE JANEIRO
TP 55-21-779 1407
TX 2130672 IMNQ BR

BULGARIE

Mr P. ZLATAREV
Directeur Général du Centre National
de Métrologie
Comité d'Etat pour la Science et le
Progrès Technique
Département à la Normalisation
21, rue du 6 Septembre
1000 SOFIA
TP — 8591
TX 22 570 DKS
TG techprogress

CAMEROUN

Mr E. NDOUGOU
Chef du Service des Poids et Mesures
Ministère du Commerce et de l'Industrie
Direction des Prix et des Poids et Mesures
YAOUNDE
TP 237-22-35-69
TX 82-68 à Yaoundé

CANADA

Mr R.G. KNAPP
Director, Legal Metrology Branch
Consumer and Corporate Affairs
Tunney's Pasture
Avenue Holland
Standards Building
OTTAWA, Ontario K1A OC9
TP 1-613-992 38 19
TX 053 3694

CHYPRE

Mr M. EROTOKRITOS
Chief Industrial Officer
Ministry of Commerce and Industry
NICOSIA.
TP 357-21-40 34 41
TX 2283 MIN COMIND
TG mincommind Nicosia

REPUBLIQUE DE COREE

Mr KIM SUNG HWAN
Director of Metrology Division
Bureau of Standards
Industrial Advancement Administration
2, Chung-ang-dong,
KWACH'ON, KYONGGI-DO 171-11
TP 82-2-590-8990
TG KORIAA.

REPUBLIQUE POP. DEM. DE COREE

Mr KIM HI SANG
Directeur de l'Institut Central de Métrologie
du Comité Métrologique auprès du Comité
National de la Science et de la Technologie
Arrondissement de Sadong
PYONGYANG
TG standard

CUBA

Mr J. GOMEZ ROSELL
Director INIMET
c/o Mr Acosta Alemany
Comite Estatal de Normalizacion
Calle 12 N° 314 entre 3A y 5A, Miramar
HABANA
TX 511422 CINAN
TP 53-7-67901
TG CEN HAVANA

DANEMARK

Mr Ove E. PETERSEN
Senior Executive Engineer
Secretariat for Metrology
National Agency of Technology
Tagensvej 135
DK-2200 COPENHAGEN N
TP 45 1 85 10 66
TX 15768 techno DK

EGYPTE

Mr F.A. SOBHY
Président,
Egyptian Organization for Standardization
and Quality Control
2 Latin America Street, Garden City
CAIRO.
TP 20-2-26 355 et 29 720
TX 93 296 EOS
TG TAWHID

ESPAGNE

Mr M. CADARSO
Vice-Président
Comision Nacional de Metrologia y Metrotecnia
c/General Ibanez de Ibero, 3
28003 MADRID
TP 34-1-233 38 00

ETATS-UNIS D'AMERIQUE

Mr D.E. EDGERLY
Manager, Standards Management Program
Office of Product Standards Policy
National Bureau of Standards
Building 101, Room A 625
GAITHERSBURG, Maryland 20899
TP 1-301-921 32 87
TX 898 493 GARG

ETHIOPIE

Mr Yohannes AFEWORK
Head of Technical Service
Ethiopian Standards Institution
P.O. Box 2310
ADDIS ABABA.
TP — 15 04 00 et 15 04 25
TG ETHIOSTAN

FINLANDE

Madame U. LÄHTEENMÄKI
Director of the Metrology Department
Technical Inspection Centre
Box 204
SF 00181 HELSINKI 18
TP 358-0-61 671
TG TEKTARTOS HKI

FRANCE

Mr Ph. BERTRAN
Chef du Service de la Métrologie
D.Q.S.I. Ministère du Redéploiement Industriel
et du Commerce Extérieur
30-32, rue Guersant
75840 PARIS Cedex 17
TP 33 (1) 572-85-85
TX DIRSIM 649917 F

GRECE

Madame M. GITZENI
Fonctionnaire technique
Direction des Poids et Mesures
Direction Générale Technique
Ministère du Commerce
ATHENES

GUINEE

Mr B. CONDE
Directeur du Service National
de Métrologie Légale,
Ministère du Commerce Intérieur
CONAKRY.
TP — 42 403 et 41 720

HONGRIE

Mr M. GACSI
Président, Orszâgos Mérésügyi Hivatal,
P.O. Box 19
H-1531 BUDAPEST
TP 36-1-85 05 99 et 85 13 28
TX 22-4865 OMH
TG HUNGMETER Budapest

INDE

Mr S. HAQUE
Director, Weights & Measures
Ministry of Food and Civil Supplies
Directorate of Weights and Measures
12-A, Jam Nagar House
NEW DELHI 110 011
TP — 38 53 44
TX 31-3711 COOP IN
TG POORTISAHAKAR

INDONESIE

Mr R. HAROEN
Direktur Metrologi,
Departemen Perdagangan
Jalan Pasteur 27
40171 BANDUNG.
TP 62-22-50 597 et 50 695
TX 28 176 DITMET BD

IRLANDE

Mr A. McGRATH
Principal Officer, Legal Metrology Section
Department of Industry, Trade, Commerce and Tourism
Frederick Building, Setanta Centre,
South Frederick Street,
DUBLIN 2.
TP 353-1-71 08 33
TX 24 651
TG TRADCOM Dublin

ISRAEL

Mr A. RONEN
Controller of Weights, Measures and Standards
Ministry of Industry and Trade
P.O.B. 299
JERUSALEM 94190.
TP 972-2-27 241
TG MEMISCOM Jerusalem

ITALIE

Mr C. AMODEO
Capo dell'Ufficio Centrale Metrico.
Via Antonio Bosio, 15
00161 ROMA.
TP 39-6-348 78 34

JAPON

Mr K. IIZUKA
Director General
National Research Laboratory of Metrology
1-4, 1-Chome, Umezono, Sakura-Mura, Niihari-Gun
IBARAKI 305.
TP 81-298-54 41 49
TX 3652570 AIST
TG KEIRYOKEN TSUCHIURA

KENYA

Mr P.A. AYATA
Superintendent of Weights and Measures
Weights and Measures Department
Ministry of Commerce
P.O. Box 41071
NAIROBI
TP 254-2-33 51 55 et 33 51 11
TG ASSIZERS, Nairobi

LIBAN

Membre à désigner par son Gouvernement
Correspondance à adresser à
Service des Poids et Mesures,
Ministère de l'Economie et du Commerce.
Rue Al-Sourati, imm. Assaf
RAS-BEYROUTH.
TP — 34 40 60

MAROC

Mr M. BENKIRANE
Chef de la Division de la Métrologie Légale
Direction du Commerce Intérieur,
Ministère du Commerce et de l'Industrie
RABAT.
TP 2112-7-51 792

MONACO

Mr A. VATRICAN
Secrétaire Général,
Centre Scientifique de Monaco
16, Boulevard de Suisse
MC MONTE CARLO.
TP 33-93-30 33 71

NORVEGE

Mr K. BIRKELAND
Directeur, Det norske justervesen
Postbox 6832 St. Olavs Plass
0130 OSLO 1
TP 47-2-20 02 26

PAKISTAN

Membre à désigner par son Gouvernement
Correspondance adressée à
Pakistan Standards Institution
39-Garden Road, Saddar
KARACHI-3.
TP — 73 088
TG PEYASAI

PAYS-BAS

Mr J. NIEUWLAND
Chef
Section des Affaires Légales
Dienst van het IJkwezen
Hoofddirectie
Postbus 654
2600 AR DELFT.
TP 31-15-56 92 71
TX 38 373 IJKWZ

POLOGNE

Mr T. PODGORSKI
Président Adjoint,
Polski Komitet Normalizacji, Miar i Jakosci
ul. Elektoralna 2
00-139 WARSZAWA.
TP 48-22-20 54 34
TX 813 642 PKN
TG PEKANIM

ROUMANIE

Mr I. ISCRULESCU
Directeur, Institutul National de Metrologie,
Sos Vitan-Birzesti nr. 11
BUCAREST 4.
TP — 83 35 20
TX 11 871

ROYAUME-UNI

Mr P.B. CLAPHAM
Director,
National Weights and Measures Laboratory,
Department of Trade and Industry
26, Chapter Street
LONDON SW1P 4NS.
TP 44-1-211 30 00
TX 88 11 074 DTHQ

SRI LANKA

Mr H.L.R.W. MADANAYAKE
Deputy Commissioner of Internal Trade
Measurement Standards and Services Division
Department of Internal Trade
101, Park Road
COLOMBO 5.
TP — 83 261

SUEDE

Mr R. OHLON
Ingénieur en Chef, Statens Provningsanstalt.
P.O. BOX 857
S-501 15 BORÅS.
TP 46-33-16 50 00
TX 362.52
TG TESTING B BORAS

SUISSE

Mr P. KOCH
Vice-Directeur, Office Fédéral de Métrologie,
Lindenweg 50
3084 WABERN/BE.
TP 41-31-54 10 61
TX 33 385 LATOP
TG OFMET

TANZANIE

Mr M. KABALO
Principal Inspector, Weights & Measures
Weights and Measures Bureau
P.O. Box 313
DAR ES SALAAM.
TP — 63 639
TG WEIGHING Dar es Salaam

TCHECOSLOVAQUIE

Mr T. HILL
Président, Urad pro normalizaci a mereni,
Vàclavské nàmesti c.19
113 47 PRAHA 1 — NOVE MESTO.
TP 42-2-26 22 51
TX 121 948 UNM
TG normalizace

TUNISIE

Mr Ali BEN GAID
Président Directeur Général
Institut National de la Normalisation
et de la Propriété Industrielle
Boîte Postale 23
1012 TUNIS BELVEDERE
TP 216-1-785 922
TX 13 602 INORPI

U.R.S.S.

Mr L.K. ISSAEV
Chef du Département de Métrologie,
Gosstandart,
Leninsky Prospect 9
117049 MOSCOU.
TP — 236 40 44
TX 411 378 GOST
TG Moskva-Standart

VENEZUELA

Mr H. REYES CABRERA
Directeur,
Servicio Nacional de Metrologia
Ministerio de Fomento,
Av. Javier Ustariz, Edif. Parque Residencial
Urb. San Bernardino
CARACAS.
TP 58-2-52 14 09
TX 22 753 MINFO
TG METROLOGIA Caracas

YOUGOSLAVIE

Mr N. BEVK
Sous-Directeur,
Bureau Fédéral des Mesures et Métaux Précieux
Mike Alasa 14
11000 BEOGRAD.
TP 38-11-18 37 36
TX 11 020 YUZMBG

TP = telephone

Les numéros sont en général indiqués pour le régime automatique international à l'exception des numéros qui sont précédés d'un trait.

The call numbers are generally indicated for international automatic dialling except where the local number is preceded by a dash.

TG = telegramme TX = telex

Pour tout télex ou télégramme, il est nécessaire d'indiquer le nom de la personne et sa qualité.

For all telex or telegrams it is necessary to indicate name of person and occupation.

PRESIDENCE

Président ..... K. BIRKELAND, Norvège
1er Vice-Président ... L.K. ISSAEV, U.R.S.S.
2e Vice-Président ... W. MÜHE, Rép. Féd. d'Allemagne

CONSEIL DE LA PRESIDENCE

K. BIRKELAND, Norvège, Président
L.K. ISSAEV, U.R.S.S., V/Président
H.W. LIERS, Rép. Dém. Allemande
Ph. BERTRAN, France
Madame M.L. HENRION, Belgique
W. MÜHE, Rép. Féd. d'Allemagne, V/Président
D.E. EDGERLY, Etats-Unis d'Amérique
P.B. CLAPHAM, Royaume-Uni
Le Directeur du Bureau International de Métrologie Légale

BUREAU INTERNATIONAL DE METROLOGIE LEGALE

Directeur	B. ATHANE
Adjoint au Directeur	S.A. THULIN
Adjoint au Directeur	F. PETIK
Ingénieur Consultant	A.B. TURSKI
Administrateur	Ph. LECLERCQ

MEMBRES D'HONNEUR

J. STULLA-GOTZ, Autriche — Président du Comité
H. KONIG, Suisse — Vice-Président du Comité
H. MOSER, Rép. Féd. d'Allemagne — Membre du Conseil de la Présidence
F. VIAUD, France — Membre du Conseil de la Présidence
M.D.V. COSTAMAGNA — Premier Directeur du Bureau
V. ERMAKOV, U.R.S.S. — Vice-Président du Comité
A.J. van MALE, Pays-Bas — Président du Comité
A. PERLSTAIN, Suisse — Membre du Conseil de la Présidence

ADRESSES DES SERVICES DES MEMBRES CORRESPONDANTS

ALBANIE

Drejtoria e Kontrollit te Mjeteve Matese
prane Keshillit te Ministrave
TIRANA

BAHREIN

The Responsible of Metrology
Standards and Metrology Section
Ministry of Commerce and Agriculture
P.O. Box 5479
MANAMA

BOTSWANA

The Permanent Secretary
Division of Weights and Measures
Ministry of Commerce and Industry
Private Bag 48
GABORONE

BURKINA FASO

Direction Générale des Prix
Ministère du Commerce
et de l'Approvisionnement du Peuple
B.P. 19
OUAGADOUGOU

COLOMBIE

Superintendencia de Industria y Comercio
Centro de Control de Calidad y Metrologia
Cra. 37 No 52-95, 4° piso
BOGOTA D.E.

EQUATEUR

The Director General
Instituto Ecuatoriano de Normalizacion
Calle Baquerizo Moreno No 454
entre 6 de Diciembre y Almagro
Casilla No 3999
QUITO

FIDJI

The Chief Inspector of Weights and Measures
C/o Ministry of Economic Planning
and Development
P.O. Box 2118
SUVA

HONG-KONG

The Director of Industry
(Attn : Principal Industry Officer, Weights
and Measures)
Industry Department
Ocean Centre, 14/F
5, Canton Road
KOWLOON

IRAK

Planning Board
Central Organization for Standardization
and Quality Control
P.O.B. 13032
Al Jadiria
BAGHDAD

ISLANDE

The Director
Icelandic Office of Metrology
Löggildingarstofan
Sioumuli 13
105 REYKJAVIK

JAMAIQUE

The Director
Jamaican Bureau of Standards
6 Winchester Road
KINGSTON 10

JORDANIE

Directorate of Standards
Ministry of Industry and Trade
P.O. Box 2019
AMMAN

KOWEIT

The Under Secretary
Ministry of Commerce and Industry
Department of Standards and Metrology
Post Box No 2944
KUWAIT

LUXEMBOURG

Le Préposé du Service de Métrologie
Administration des Contributions
Rue des Scillas
2529 HOWALD

MALI

Le Directeur Général des Affaires Economiques
(Service des Poids et Mesures)
B.P. 201
BAMAKO

MAURICE

The Director
Mauritius Standards Bureau
Ministry of Commerce and Industry
REDUIT

NEPAL

The Chief Inspector
Mint, Weights and Measures Department
Ministry of Finance
His Majesty's Government
Bhimsenstambha
KATHMANDU

NOUVELLE-ZELANDE

The Chief Inspector of Weights and Measures
Department of Labour
Head Office
Private Bag
WELLINGTON 1

PANAMA

Le Directeur
Comision Panamena de Normas Industriales
y Tecnicas
Ministerio de Comercio e Industrias
Apartado 9658
PANAMA 4

PEROU

The Director General
ITINTEC Instituto de Investigacion Tecnologica
Industrial y de Normas Tecnicas
Apartado 145
LIMA 100

PHILIPPINES

The Director
Product Standards Agency
Ministry of Trade and Industry
Trade & Industry Building
361 Sen. Gil J. Puyat Avenue
Makati, Metro Manila
PHILIPPINES 3117

PORTUGAL

Director-Geral da Qualidade
Ministerio da Industria e Energia
Rue José Estevâo, 83-A
1199 LISBOA Codex

SYRIE

The General Director
The Syrian Arab Organization
for Standardization and Metrology
P.O. Box 11836
DAMASCUS

TRINITE ET TOBAGO

The Director
Trinidad and Tobago Bureau of Standards
P.O. Box 467
PORT OF SPAIN

TURQUIE

Le Directeur du Service des Poids et Mesures
Ticaret Bakanligi, Olçüler ve Ayarlar
Müdür Vekili - Bakanliklar
ANKARA

Grande Imprimerie de Troyes, 130, rue Général-de-Gaulle, 10000 TROYES
Dépôt légal n° 7231 - Mars 1985