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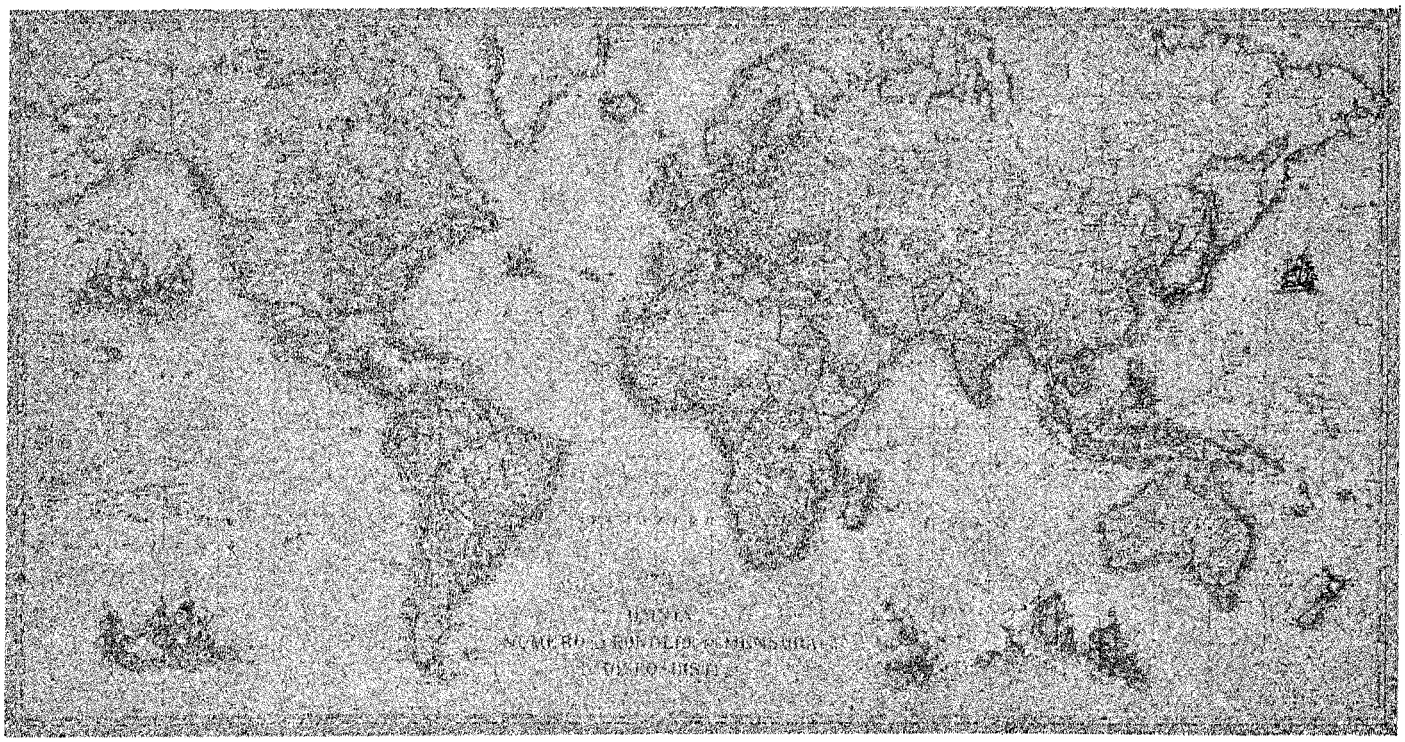

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REPUBLIQUE DEMOCRATIQUE ALLEMANDE

MUTUAL RECOGNITION of TESTING of MEASURING INSTRUMENTS in the CMEA COUNTRIES

by **H. DAMM, H. DULLMANN, R. WIEDEMANN**

Amt für Standardisierung, Messwesen und Warenprüfung

The article below is an English translation of a paper published in Metrologische Abhandlungen 2 (1982) N° 1 of ASMW.

The agreement mentioned in the article was signed on 4 July 1982 between the representatives of Bulgaria, Hungary, Viet-nam, G.D.R., Cuba, Mongolia, Poland, Czechoslovakia and U.S.S.R.

L'article ci-dessous est une traduction en anglais d'un article publié dans Metrologische Abhandlungen 2 (1982) N° 1 de l'ASMW.

L'accord mentionné dans l'article portant sur la reconnaissance mutuelle d'approbations de modèle et vérifications a été signé le 4 juillet 1982 entre la Bulgarie, la Hongrie, le Viet-nam, la R.D.A., Cuba, la Mongolie, la Pologne, la Tchécoslovaquie et l'U.R.S.S.

The expansion of work distribution is gaining importance not only from the national, but in an increasing degree from the international point of view. In the « Comprehensive Programme for the Further Deepening and Improvement of the Cooperation and Development of the Socialist Economic Integration of the Member Countries of the Council for Mutual Economic Aid (CMEA) » it was therefore laid down to develop and improve the cooperation of the interested CMEA countries in the field of metrology, in order to ensure the uniformity of measurements in the national economy and in the exchange of goods when evaluating the quality and quantity of raw materials, materials and finished products. For this reason and for the purpose of the mutual recognition of the results of pattern approval and testing of measuring instruments in the various CMEA countries it is required to unify the necessary normative-technical documentation for their pattern approval and testing [1].

The inter-governmental International Organization of Legal Metrology (Organisation Internationale de Métrologie Légale - OIML), to which more than forty states are affiliated, is also aiming at the far-reaching unification of state influence on measuring instruments and measurements within the framework of legal metrology through international recommendations for technical parameters and test specifications [2], [3], [4].

The necessity of such measures is being emphasized by the statement in the Final Act of the Conference on Security and Cooperation in Europe, that the development of the international harmonization of standards and technical regulations as

well as the international cooperation in the field of test methods is an important means in order to overcome technical barriers in international trade and industrial cooperation, and thus to facilitate its development and to increase productivity. Here, it is also expressed the readiness to promote international agreements and other appropriate arrangements on the recognition of certifications and test documents on the conformity with standards and technical regulations [5].

Status of mutual recognition of testing within the CMEA countries

The state testing is being directed by legal provisions in the countries. It generally comprises the test of the pattern (test of pattern approval) and the test of the individual measuring instruments (verification). Besides the already mentioned advantages, international unification and recognition of these activities also allow use of the technological facilities of production for the testing, thus avoiding double work. Consequently, besides the elimination of barriers to international trade, there follow further efficiency profits being immediately effective in the national economy. Thus, an assessment of the ASMW shows that, for example, the so far concluded bilateral agreement with the USSR has brought an economic benefit of 1.5 million marks for the GDR due to the saving of test charges for pattern approvals in the USSR, the abolition of costs for the provision of patterns for the test in the partner-country and the saving of expenses for pattern approvals of measuring instruments of the USSR in the GDR. The USSR states a benefit of 2 million roubles. An indirect, but no less efficient advantage lies in the avoidance of delays in export as well as in the immediate application of the measuring instruments in the importing country.

Table 1 gives, arranged according to measured quantities, a survey of the measuring instruments, for which the state pattern approval and the verification are being mutually recognized by the ASMW and the state institution of the partner-country on the basis of concluded agreements. The measuring instruments (classes or patterns) are given in the respective agreements.

TABLE 1

INSTITUTION/COUNTRY	MEASURING INSTRUMENT FOR MEASURED QUANTITY
GUS/ People's Republic of Bulgaria	Mass, length, angle, force and hardness, pressure, volume, temperature
UNM/ Czechoslovak Socialist Republic	Mass, force, pressure, viscosity, volume, temperature, electricity
CEN/ Republic of Cuba	Mass, force and hardness, volume, temperature, electricity, acoustics
PKNMiJ/ Polish People's Republic	Mass, volume, temperature, electricity, pressure
GOSSTANDART/ USSR	Pressure, length, angle, volume, temperature, electricity, acoustics, moisture
OMH/ Hungarian People's Republic	Mass, volume, temperature, electricity

The present experience of the ASMW gained with these bilateral agreements has shown the advantage of the principles, given in Table 2.

TABLE 2

APPROVED PRINCIPLES FOR THE BILATERAL RECOGNITION
OF THE STATE PATTERN APPROVAL AND THE VERIFICATION OF MEASURING INSTRUMENTS

1. Basis for the technical requirements and test methods are CMEA standards, coordinated national standards or other normative-technical documents of international organizations.
2. As a result of the state pattern approval and verification, the state body of the exporting country being competent for metrology certifies that the agreed normative-technical documents are being adhered to.
3. Recognizing the results of the state pattern approval and verification, the importing country renounces to execute own pattern approval and verifications as precondition for the approval of the import and use of the measuring instruments to be imported.
4. In accordance with the legal provisions of their countries, the partners take measures to ensure that the respective export delivery contracts base on the agreed standards or other coordinated normative-technical documentations for the measuring instruments.
5. The measuring instruments, that these agreements shall be applied to, are determined in cooperation between the responsible foreign trade, financial and central state administrations, being competent for metrology.
6. Changes of the provisions in the coordinated normative-technical documentations as well as the withdrawal of the agreed recognition are possible in mutual agreement.
7. The provisions on the regulations of after-sales service, liability to recourse, service, spare parts supply and so on in the foreign trade agreements, resulting from the general terms of delivery, are not altered by the bi- and multilateral agreements on the mutual recognition of the results of the state pattern approval and verification.

A multilateral solution is being prepared within the framework of the section of metrology of the Standing Commission of CMEA for cooperation in the field of standardization. The section of metrology made a proposal in October 1981, that the ST RGW (CMEA Standard) 1707-79 of the present CMEA standards [6], which settle the problems of pattern approval and their mutual recognition in general, shall be replaced by an inter-governmental agreement of almost the same content, and ST RGW 1708-79 shall be adjusted to these facts. These provisions require CMEA standards for measuring instruments which comprise the entire width of the state demands on the test methods, too. Here, such groups of measuring instruments have to be put in the centre which are conducive to the metrological assurance of the long-term goal programmes of cooperation of the CMEA member countries. An acceleration of this work is required. Explicitly, it has also to be pointed out that such regulations themselves must not cause disturbances in trade.

Thus, the mutual recognition, for example, should not be made dependent on unilateral measures. It is also not possible that the inclusion of a measuring instrument into the nomenclature of the patterns to be mutually recognized shall be necessary precondition for the conclusion of commercial contracts. The general introduction of the CMEA pattern approval and the CMEA verification (including uniform marks for this) would most essentially contribute to the rationalization of the whole procedure. Within the framework of the section of metrology it is intended to provide work in this direction in the period 1981-1985.

On the basis of governmental agreements on scientific and technological cooperation such arrangements are in principle also possible beyond the framework of the CMEA. They will bring along considerable facilities in the mutual deliveries of goods, and help to eliminate impediments in connexion with export plans, caused by the conditions of testing and acceptance of the very different organizations.

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INDE

A METHOD for CALIBRATING LOW DENSITY HYDROMETERS USING a STANDARD HYDROMETER CALIBRATED for HIGHER DENSITIES

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SUMMARY — The authors describe a method using a metallic ring of known mass and density which is slipped onto the hydrometer under test so that it can be compared to a standard hydrometer in less volatile liquids.

RESUME — La méthode décrite par les auteurs utilise une bague de masse et masse volumique connues, qui est enfilée sur la tige de l'aréomètre à étalonner de façon à permettre sa comparaison à un aréomètre étalon dans des liquides moins volatiles.

Introduction

Density hydrometers are commonly used for determination of density of liquids by various scientific and industrial laboratories. To ensure the reliability of these determinations hydrometers are calibrated. The direct comparison method is mostly used for their calibration. In this method the hydrometer under test and a standard hydrometer of the same range are floated side by side in a liquid of appropriate density and the reading indicated by the under test hydrometer is compared against that shown by the standard. After applying necessary corrections on account of temperature, surface tension and the scale error of the standard, the correct density indication is found out and the correction to be added to the observed scale reading of the under test hydrometer is calculated. The method requires : (i) liquids of proper surface tension and having density corresponding to the scale graduation under calibration and (ii) a standard hydrometer of the same density indications as the hydrometer under calibration.

On many occasions either one or both the conditions are not met. Low density liquids like petroleum ether particularly in the density range from 0.600 to 0.650 g/cm^3 even if available may not give the required density after long storage due to the loss of its highly volatile low density fraction. The low density liquids are not only difficult to procure and store but also pose problems at ambient temperature during summer seasons in tropical countries. Due to high volatility, the liquid near the top of the hydrometer jar remains in an agitated condition which does not allow a steady reading. Therefore, a method has been worked out by which calibration of hydrometers meant for lower density liquids can be carried out against standard hydrometers and liquids of higher density.

The ring method

In this method a metallic ring of suitable material and dimensions is chosen so that when it is slipped on to the hydrometer under test the latter sinks up to the specified graduation. The ring remains always submerged in the liquid. Let the graduation indicate the density R and the available liquid be of density d (d being greater than R).

The equilibrium equation in this case can be written :

$$M + m\left(1 - \frac{d}{\Delta}\right) + \frac{\pi D \gamma_1}{g} = Vd + v\rho_1 \qquad (1)$$

where m = mass of ring

Δ = density of the ring and

M = mass of the hydrometer

The mass M when calculated by weighing the hydrometer in air of density ρ_2 by direct comparison against the mass standards of density Δ_1 and mass value W, is related to these parameters as :

$$M = W\ (1 - \rho_2/\Delta_1) + V\rho_2 + v\rho_2 \qquad (2)$$

The density ρ_2 of the liquid, in which the hydrometer alone floats upto the specified graduation R is governed by the equation :

$$M + \frac{\pi D \gamma_2}{g} = V\rho_L + v\rho_3 \qquad (3)$$

In the above equations :

g = acceleration due to gravity ;

D = diameter of the stem of the hydrometer ;

γ_1, γ_2 = surface tensions of the liquids of density d and ρ_L respectively ;

V = the volume of the immersed portion of the hydrometer ;

v = the volume of the hydrometer stem above the plane of the level surface of the liquid : and

ρ_1, ρ_2 and ρ_3 = the densities of air at the temperature of measurements.

The terms $v\rho_1$, $v\rho_2$ and $v\rho_3$ are due to air buoyancy acting on the emergent portion of the hydrometer. These quantities are small and hence their variation due to change in air density, especially in a laboratory, may be neglected.

Elimination of M, V and $v\rho_1$, $v\rho_2$ or $v\rho_3$ *gives :*

$$\rho_L = \frac{(d - \rho_2)\left[\frac{\pi D \gamma_2}{g} + W\ (1 - \rho_2/\Delta_1)\right]}{\left[m\left(1 - \frac{d}{\Delta}\right) + \frac{\pi D \gamma_1}{g} + W\ (1 - \rho_2/\Delta_1)\right]} + \rho_2 \qquad (4)$$

As R is the reading on the scale when the hydrometer was immersed with the ring on, then :

$$C = \rho_L - R$$

is the necessary correction to be added at the point R.

The density d, of the liquid is determined with a standard hydrometer simultaneously when the hydrometer under test with the ring slipped on it was floating upto the graduation R. If the observations are taken at a temperature other than that for which the hydrometers have been standardised then small corrections due to the change in effective volumes of the hydrometers are also applied.

Choice of the mass of the ring

The mass of the ring, required to float the hydrometer upto the upper most graduation in the available liquid of density d, would depend upon scale range, volume of bulb and

the value of the density corresponding to its lowest graduation. The mass of the ring, therefore, will be different for different types of hydrometers. To make a ring of the calculated mass, for each and every hydrometer so that it floats upto the specified graduation in the liquid of density d is not only difficult but rather impracticable. In finding out the mass of the ring, the value of d, for 0.600 g/cm^3 mark, was arbitrarily chosen as 0.700 g/cm^3, the calculated mass of the ring, then, was approximated to nearest gram. Hence with the knowledge of prior calculations, four rings of masses 8, 5, 3 and 2 g have been chosen with a view to find out as to which ring will suit to largest number of hydrometers. The densities of the liquids required to cover the lowest and uppermost graduations of the scale have been calculated for the minimum and maximum permissible bulb volumes for each type of hydrometer. The results have been tabulated in Table I. The designation of the hydrometers used are those specified by International Organisation for Standardization, which fortunately tallies with those used by Indian and British Standards Institutions. The hydrometers have been grouped according to the length and range of their scale, giving rise to designations like L-20, L-50, M-50, M-100 and S-50. Here the alphabet indicates the length of the scale i.e. L for long, M for medium and S for short, while numerals indicate the range of the scale, for example 50 means that the difference between the density values of the lowest and uppermost graduations is 0.050 g/cm^3 or 50 kg/m^3.

From the last columns V and VI of Table 1, it may be seen that the ring of mass 5 g may be used for all types of hydrometers in the density range 0.600 to 0.700 g/cm^3, except of an odd case of L-50, 0.600 - 0.650 g/cm^3 hydrometer when it has the maximum permissible bulb volume. For this ring, liquids of densities in between 0.700 to 0.950 g/cm^3 are required. These liquids are commonly available, easy to store and also otherwise needed for the calibration of the hydrometers used for higher density liquids.

The most commonly used petroleum liquids from 0.6 g/cm^3 to 1.0 g/cm^3 have the surface tension in between 15 to 35 mN/m. The value of the surface tension, therefore, should be known for precise calibration of the hydrometers of lower density range against those of the higher density liquids. However, it has been seen that if in calculations, the value of the surface tension differs by 5 mN/m then the error would not be more than one-fifth of the smallest graduation of the hydrometer under calibration, which for practical purposes may be ignored.

TABLE 1

I	II	III	IV	V	VI
DESIGNATION OF HYDROMETER	LOWEST VALUE OF THE DENSITY g/cm^3	VOLUME OF THE BULB cm^3	MASS OF RING g	DENSITY OF LIQUIDS FOR LOWEST MARK	DENSITY OF LIQUIDS FOR HIGHEST MARK
L-50	0.600	50	8	0.735	0.795
		65	8	0.704	0.762
		50	5	0.685	0.742
		65	5	0.666	0.721
	0.650	50	8	0.785	0.844
		65	8	0.747	0.804
		50	5	0.735	0.790
		65	5	0.709	0.763
M-50	0.600	30	8	0.822	0.889
		45	8	0.755	0.811
		30	5	0.741	0.802
		45	5	0.695	0.752
		30	3	0.686	0.742
		45	3	0.657	0.712
	0.650	30	8	0.872	0.937
		45	8	0.800	0.860
		30	5	0.791	0.850
		45	5	0.745	0.801
		30	3	0.727	0.792
		45	3	0.702	0.762
		30	2	0.708	0.762
		45	2	0.689	0.742
M-100	0.600	18	8	0.968	1.147
		26	8	0.838	0.972
		18	5	0.816	0.947
		26	5	0.751	0.873
		18	3	0.732	0.851
		26	3	0.692	0.805
S-50	0.600	18	8	0.963	1.039
		26	8	0.855	0.924
		18	5	0.832	0.899
		26	5	0.762	0.824
		18	3	0.742	0.802
		26	3	0.699	0.756
		18	2	0.696	0.753
		26	2	0.667	0.722
	0.650	18	8	1.012	1.086
		26	8	0.905	0.972
		18	5	0.863	0.947
		26	5	0.812	0.873
		18	3	0.791	0.851
		26	3	0.749	0.806
		18	2	0.746	0.802
		26	2	0.717	0.771

Experimental Conclusion

One hydrometer calibrated by the National Physical Laboratory Teddington (U.K.) of the range 0.600 to 0.650 g/cm³ was examined by this method using a ring of platinum wire and having the mass 7.160 g approximately. The liquids used were of density range 0.68 to 0.73 g/cm³. The density of the liquid was determined simultaneously with the help of a more accurately calibrated hydrometer. The scale of the hydrometer was tested at four points and the corresponding corrections were calculated.

A typical set of experimental results has been indicated in Table 2. The corrections as reported in the calibration certificate of the hydrometer under test and those calculated by the aforesaid method have been, respectively, given in Columns VII and VIII, the other necessary data has also been shown in columns I to VI of the same table.

TABLE 2

I	II	III	IV	V	VI	VII	VIII
SCALE READING OF UNDER TEST HYDROMETER	DENSITY OF LIQUID	DENSITY OF AIR	SURFACE TENSION OF LIQUID USED	SURFACE TENSION FOR WHICH UNDER TEST HYDROMETER IS CALIBRATED	CALCULATED VALUE OF DENSITY INDICATION OF UNDER TEST HYDROMETER	CORRECTION TO BE APPLIED AS CALCULATED BY THE METHOD	CORRECTION AS REPORTED IN THE TEST CERTIFICATE
g/cm³	g/cm³	g/cm³	mN/m	mN/m	g/cm³	g/cm³	g/cm³
R	d	ρ_2	γ_1	γ_2	ρ_L	C *	
0.600	0.67688	0.001107	19	15	0.59991	— 0.000 10	— 0.000 05
0.620	0.69938	0.001106	20	16	0.61993	— 0.000 05	— 0.000 10
0.640	0.72186	0.001104	21	17	0.63993	— 0.000 05	— 0.000 05
0.650	0.73300	0.001104	22	18	0.64985	— 0.000 15	— 0.000 05

* Values are rounded to the nearest 0.000 05 g/cm³. The other determined parameters are $W = 53.994$ g ; $D = 0.737$ cm ; $\Delta = 21.5$ g/cm³.

It may be seen that the differences in two corrections are insignificant as the value of the smallest graduation is 0.000 5 g/cm³ and the required accuracy for such hydrometers is 0.0001 g/cm³. The closeness of the two corrections demonstrate amply the suitability of the method. The method reported in the paper is, therefore, being used regularly for the hydrometers having the lower and upper density values of 0.600 and 0.650 g/cm³ respectively.

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PAYS-BAS

METHODS of QUANTITY CONTROL of PREPACKAGES *

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SUMMARY — The author reviews practical test methods used for net content measurement of prepackages, including processing of results and use of automated means for filling control and recording of data. The various methods applied for density measurement of products labelled by volume are also described and their merits are evaluated.

RESUME — L'auteur passe en revue les méthodes pratiques utilisées pour le mesurage du contenu des préemballages ainsi que les procédés de traitement des résultats et les moyens automatisés pour le contrôle du remplissage et l'enregistrement des données. Les différentes méthodes de détermination de la masse volumique des produits étiquetés en volume sont également décrites et leurs mérites sont évalués.

1. Introduction

The goal of the quantity control of prepackages is to obtain a more efficient filling process. At the same time, the legal requirements must be complied with. Especially for productions which have a more continuous character, so large numbers of prepackages are involved, an efficient control system can produce great savings in product costs. In addition, the recording of the measured and calculated results is very important. The packer has a view of the filled batches, from which he can deduce whether his instructions have been carried out properly and whether all legal requirements are satisfied. Whenever there are any complaints of underfilling, the packer is able to defend himself with the recorded data or trace its cause and if necessary take measures to avoid underfilling in the future.

The authorities can also use the recorded results for judging whether the legal requirements have been met.

Automation can be the solution in those cases in which quantity control involves much expensive labour. There are many ways of automation which of course go with different levels of investment. In the Netherlands these investments vary from circa $ 3 500 to circa $ 180 000 per system.

2. Checks by means of « measurement »

The most simple way of control is « measurement » : every prepackage is being filled by hand up to the right quantity, which is measured by means of a (legal) measuring-instrument, with a certain (required) accuracy. This way of filling, is normally in use for small batches and large prepackages.

* This paper was presented at the OIML seminar on prepackages in Berne, Switzerland, 6-8 June 1983.

There are two possibilities :

1 products indicated by volume : the packages are filled with the aid of a measuring-glass ;

2 products indicated by weight : the packages are filled with the aid of a non-automatic weighing machine.

For such a filling-system we would not require any registration, because every individual package will be filled with the right quantity (minimum principle).

The filling of a volume indicated prepackage by means of a non-automatic weighing machine will not be regarded as « measurement », because the quantity cannot be measured directly. First a density measurement will have to be carried out, in order to be able to convert the volume into a filling-weight. In such a case the packer will have to keep records of the density and the calculations concerned.

The advantages of « measurement » are its simplicity and the absence of the need for registration.

A disadvantage of this method is that it takes much labour. In practice sometimes errors are made because of non-accurate handling. We then advice to perform an overall-check.

3. Checks by means of « sampling »

When « measurement » is not possible the checking will have to be done by drawing samples.

The sampling plan should be organised in such a manner, that with a minimum of samples, a representative picture of the production can be obtained. Instructions will have to be available for the correction of deviations of the filling-process. When a deviation exceeds a certain predetermined limit a batch will have to be rejected.

In practice many packers find it very difficult to set up a statistical accountable control-system. We give the packers as much information as possible and in some cases advice is given, how to set up the system. There are also engineering agencies who design control-systems.

It is important to supervise the introduction of the control-system in the factory carefully. The personnel must learn how to deal with the new situation and and they will have to be motivated to do the job correctly. It should be made clear that the purpose is to gain a more efficient filling-process. We have met situations in which the importance of this aspect was underestimated. The personnel did not understand the meaning of it and they did not apply it correctly. On the other hand there is a packer who had an instruction film made for the operators at the filling machines, in order to explain everything they need to know.

It also appears to be rather difficult to interprete the sample-results correctly. Some basic statistical knowledge is desirable for the effective application in order to come to an efficacious production.

Systematical checking by means of sampling has resulted, in many cases, into a better knowledge of the filling-process and in some situations unknown disturbing influences were discovered and technical improvements of the filling-process were initiated.

When checking by means of sampling one has to realise that there are certain risks of making wrong conclusions. The important thing is to design the control system in such a manner that these risks are reduced to an acceptable level. Example : by coincidence a relatively large number of slightly underfilled prepackages could be taken as samples ; the filling machine would be adjusted upwards, according to the instructions, whilst the real mean of the batch was within the specifications.

3.1 **Sample drawing by hand**

Depending on the filling-machine and the organisation of the packaging department it can be favourable to collect the samples by hand. The prepackages are usually collected, just after being closed, directly from the filling line. In principle these samples must be drawn at random, but when for example, the filling machine has 4 filling units it may be advisable to draw samples per filling unit or to draw series of 4 samples in which every filling unit is equally represented.

3.2 **Automatic sample drawing**

The action of taking the prepackage out of the filling line and placing it on a non-automatic weighing machine, is done automatically. This can be done by creating a by-pass, which is controlled by a valve or a pusher. The package is placed on the non-automatic weighing machine and will have to stay there until a correct weighing is performed ; the weighing process is discontinuous. After weighing the prepackage must be put back in an open space left in the filling line.

It may be difficult to build a system like this into an existing filling line, but when designing a packaging line, integration may well be possible. In practice we saw very little application of this method, because of the earlier mentioned reason.

3.3 **Measuring the net contents**

The net contents (quantity) of the prepackage can be measured by means of a non-automatic weighing machine, a measuring glass or a templet in combination with Measuring Container Bottles (MCB's).

WEIGHING

— net weighing : the product has not yet been packed or it can easily be taken out of the package ;

— gross weighing minus individual tare : the net weight will be obtained by subtracting the individual tare from the prepackage in question, which can be measured before or after (destructive) the gross weighing ;

— gross weighing minus mean tare : this method can by used only when the variation in the tare weight is within certain chosen limits.

  The mean tare weight can be determined by drawing samples out of every batch of packaging material. When using a double scale- or an electronic weighing machine a package which is very close to the mean can be used as the tare weight.

From volume declared prepackages, measured by weighing the net contents must be calculated by means of the density, measured at the desired reference temperature. The weighing can be performed at any available temperature. Density-measurements will be discussed in par. 3.5.

The advantages of weighing are the high accuracy which can easily be reached, the possibility of automation and, for volume declared prepackages, the independence of temperature.

MEASURING GLASS

Moreover the volume declared prepackages can be measured by volume by means of a measuring glass. The measuring glass must have a certain accuracy and tolerances will have to be stated for the temperature interval for which it can be used (in relation to the product). It is also possible to measure at different temperatures if a temperature correction table is available for every product. Such a correction table should be determined in accordance with a prescribed method.

The advantage is the direct measurement of the quantity without the need for density measurement. Products which are not homogeneous can also be measured. The disadvantages of this method are :

— the error of the measuring glass causes a systematic error which cannot be adjusted. If necessary this problem can be solved by calibrating the measuring glass and correcting the measured values accordingly ;

— the package must be emptied and later, when bacterological, health and other considerations are allowed for, filled again ; if these allowances have not been made, the test would be destructive ! Besides this method takes more labour than weighing and

— it has no possibility of automation.

TEMPLET

Especially when bottles are used as packaging material, the dispersion in tare weight is usually so wide that the method of using the mean tare weight is very often impossible to apply. This is regrettable, because it takes much labour to weigh and mark every bottle of a sample before filling and then take them out of the filling line for weighing again afterwards. This is a lot of work not only for the inspector but also for the packer in his own checking procedure. So for the control of prepackaged products in bottles a different system has been developed. The basis of this method is that the bottles themselves can serve as measures for checking the contents. Therefore the bottles must be produced in such a way that they satisfy a number of specifications concerning their shape and regularity. There is an EEC directive dealing with these bottles. In the Netherlands this directive has been integrated into the national law. This means that the Service of Weights and Measures checks the production of such bottles, MCB's, on their specifications, by means of sampling.

Here in the same way as with the control system on the prepackages it is important that the producer has his own (evaluated or recognised) control-system. The MCB's are marked with a special EEC mark, a mirrored epsilon, and an officially approved trademark. The MCB's, which have a constant form, may be used as a means of checking but only in combination with a height measurement instrument. A templet is such a device. It is made in accordance with the shape of the bottle to which it belongs. In the Netherlands these templets are measured and designed by the Service of Weights and Measures. Each individual templet must be stamped. It is obvious that the reading of templets must be done by visual observation. There is (not yet) any possibility to perform the read out of the height automatically.

3.4 **Processing the results**

The results can be processed on a control-chart. Many packers use a mean standard deviation chart or a median-range chart. On the control-chart control-limits and/or action-limits can be stated. If the control limits are exceeded the filling machine will have to be adjusted accordingly. Whenever action-limits are exceeded the batch concerned will have to be rejected. With the aid of this chart and additional instructions for the personnel, one is able to control the filled quantity. An example of such an instruction is : drawing an extra large sample, in case of exeeding the action-limit, in order to judge with a higher accuracy whether the batch should be rejected or not. Such a chart should also contain information about the product, batchcode, machine number, date, tare weight, density, etc...

The measurements, calculations and interpretation of the results can be automised. The most simple way of automation is to put the results by hand in a calculating device, which calculates the mean and the standard deviation. The calculated results would still have to be interpretated by the operator. The above mentioned control-chart can assist him for this purpose. This kind of « automation » can be realised with a pocket calculator from circa $ 20 or more, which of course is very cheap. In practice very few packers apply this method. A relatively much applied level of automation is checking by means of an electronic weighing machine connected to a calculating unit. The measured values are directly transmitted to the calculating unit and calculation, interpretation, messages and printout of the

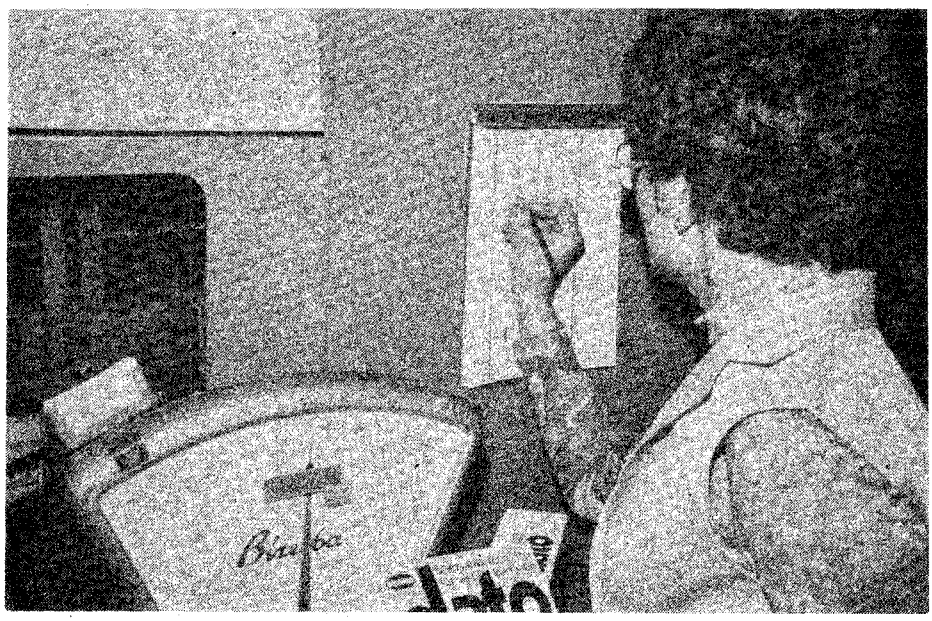

Fig. 1

Processing of the results on a control-chart

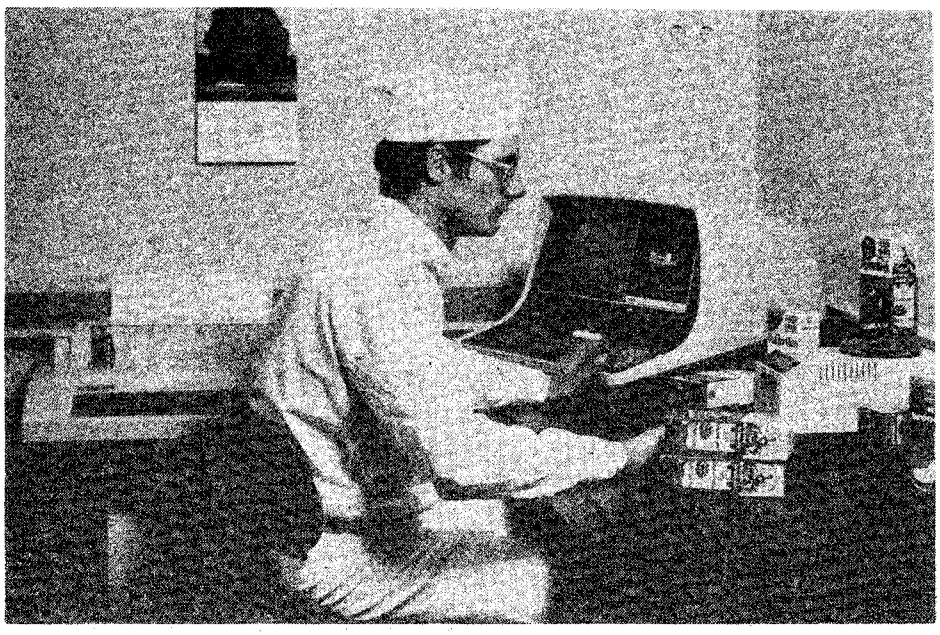

Fig. 2

Processing of the results using a micro-computer
connected to an electronic weighing machine and a printer

results can be performed automatically. The kind and the amount of calculations and other functions that can be performed depend on the options with regard to the restrictions of the equipment, the inventiveness of its designers and the imagination of the programmer.

At the processing of the measured results one can restrict oneself to calculate the sample result or go further to arrange surveys of the production of a day, shift, week, month, year or whatever is desired. Processing by hand can be very time consuming and errors can easily be made. Automatic data processing is time saving and can be very accurate. Moreover automation becomes useful when applied in combination with the interpretation of the results, control-limits, messages for the operator and feed-back to the filling machine and other aspects like quality control can be processed with the same device. The errors will be reduced to the level of wrong sample drawing or placing the wrong type of package on the electronic non-automatic weighing machine.

The nature of this kind of equipment may vary from a « stand alone » system, one electronic weighing machine connected to one calculating device, to a multiple input system, which may consist of several weigh terminals, (in most cases not more than 6 to 10) connected to a central micro-computer. In a few cases even a mini-computer is used, for this purpose, in combination with approximately 20 weigh terminals.

A weigh terminal may consist of an « intelligent » electronic weighing machine or an electronic weighing machine with a terminal on which information can be put in and read out.

A « stand alone » system can be applied for a group of filling lines or per filling line. The operator will have put in some information to identify the product and the filling line before starting with the sample drawing. Directly after drawing the sample the operator will receive back information about actions to be taken or whether the filling process is under control. These systems vary in costs from circa $ 7 000 to circa $ 14 000.

A « multiple input » system consists of a central micro-computer with possible options like a printer, extended memory, data recording on tape or flexible disc, monitor, etc., connected to weigh terminals, which are stationed near every filling line. The operator has to do the same as with the before described system. The advantages of a central computer instead of several separate ones are that the costs per weigh terminal will be lower and that general surveys can be made automatically. These systems will cost, depending the number of weigh terminals and the options, from circa $ 15 000 to circa $ 30 000.

Both with the « stand alone » - and the « multi input » system registration of the quantity control can be performed automatically either on paper, which is still done in most cases and which sometimes results into large piles of paper containing so much information that it might become difficult to survey, or on a data recording system like tape or (flexible) disc. When the recording takes place on such a data recording system, provisions should be made so that any wanted information, can be retrieved at any time.

Generally speaking, small packers will tend to use a « stand alone » system and the large packers, who have many filling lines, will tend to use a « multiple input » system. Especially where expensive products or very large batch sizes (continuous production) are concerned the packers will be pressed economically to gain a more efficient filling process. Costly investments can be recovered from within a few months to not more than a few years.

When more options and more weighing terminals are desired a mini-computer can be applied. The mini-computer can operate faster and can contain more information. Of course the amount of money concerned will be high and it will only be profitable for very large packers who can save much on product costs and efficiency. This type of automation system will need an investment of up to circa $ 180 000, about half of which is accounted for by software.

The EEC has a directive for prepackages, which prescribes a control system, recognised by the authorities. In the Netherlands we apply this for automised control systems too. The equipment must be approved and stamped. The software must be approved as well because we need to know the software in order to be able to judge whether applying such equipment can give any guarantee that the prepackages will meet the legal requirements of the directive. The requirements we demand are :

— the correct statistical formulas must be used ;

— control limits and correction instructions must not lead to underfilling within a certain period of time ;

— there must be a clear identification of the product, machine number, date, tare weight and density ;

— possibilities for mistakes, errors and fraudulent actions must be avoided as much as possible.

3.5 **Density**

When checking volumetrically indicated prepackages by weighing, the weight must be transformed into a volume, by means of the actual density. For this purpose we use the following methods for measuring the density :

GLASS PYKNOMETER

Suited for easy flowing liquids, not containing CO_2. An accuracy of circa 0.01 % can be reached.

METAL PYKNOMETER

Suited for more or less pasty fluids, for instance yoghurt, or fluids with small solid particles ; an accuracy of circa 0.1 % can be reached.

AREOMETER

Suited for easy flowing liquids, not containing CO_2. Areometers are very vulnerable and their measuring range is small. Calibrating has to be done with the aid of reference fluids the density of which is known. Measurement with fluids which have different surface-tensions causes errors. An accuracy of 0.1 % to 0.01 % can be reached.

PLUNGE BODY (GAMMA SPHERE)

Suited for easy flowing liquids, not containing CO_2. A body with a known volume, which is fixed on a frame, is plunged into a glass with the liquid, which has to be measured. The glass is placed on a balance. The plunger body will meet with an upward power, corresponding to the amount of displaced fluid, which is measured by the balance. This method is also depending on the surface-tension of the liquids. When the surface-tension is known a correction can easily be made.

ELECTRONIC DENSITY METER

By means of a hypodermic syringe 2 ml of liquid is injected in the U-shaped tube, which starts vibrating at its natural frequency, depending on the density of the liquid. The density can be read out directly. All kinds of liquids can be measured, from easy-flowing liquids to thick ones. Even aerosols are not excluded, as long as a special adapter is used. One must always have the right solvent at hand, because the narrow and costly (circa $ 1 400) tube must be cleaned after measurement. Calibration is easily done by injecting destilled water and air. The device itself maintains the desired temperature ; also an external measuring -cell, which can be connected with a temperature controlled water bath can be applied. This device costs circa $ 3 600 and can be supplied with a BCD output connection.

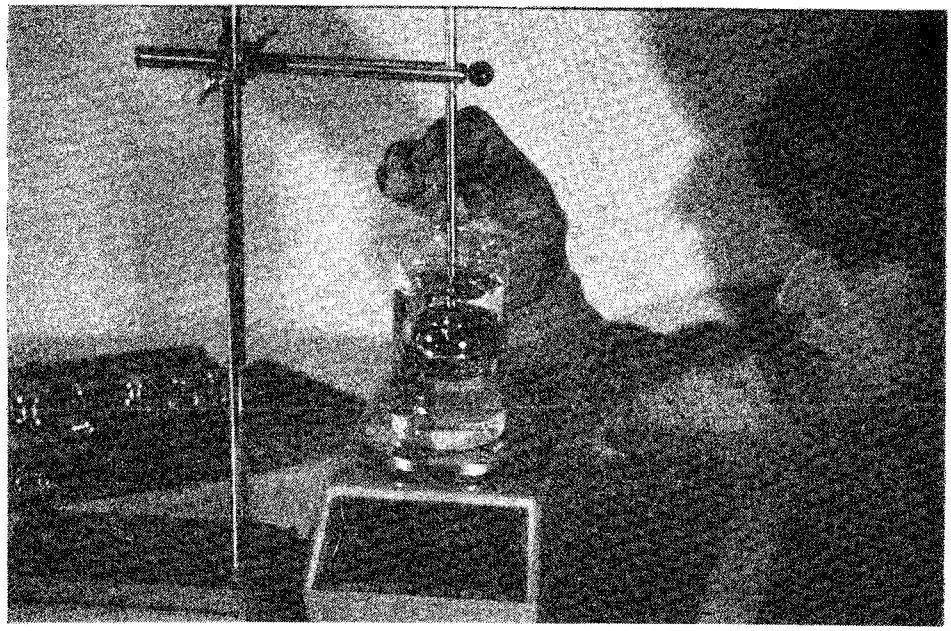

Fig. 3

Density measurement using a plunge body which is dipped into the fluid until the mark on the rod

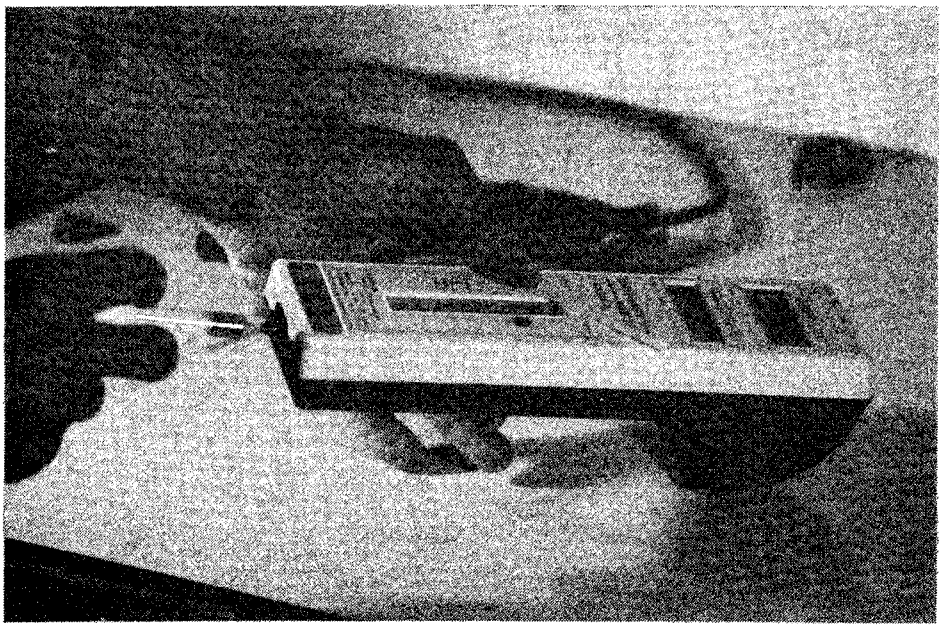

Fig. 4

Portable electronic density meter

PORTABLE ELECTRONIC DENSITY METER

This is in principle the same device as the above mentioned, but without temperature control, and aerosols cannot be measured. The allowed pressure is limited. A connection with other apparatus is not possible either. The accuracy will be circa 0.1 %.

HYDROSTATIC WEIGHING

This method is known to be used for measuring the density of a fluid : a body with a known volume is hanged in the fluid to be measured and the upward force of the displaced fluid is measured by the weighing machine. It is similar with the « plunge body » method. This method also can be applied for measuring the density of very thick paste-like products : a small amount of the product is placed on a small metal plate. The empty plate is weighed in air and when hanging in distilled water. Then the plate with the paste is weighed in air and when hanging in distilled water.

The weight of the amount of product can be calculated from the difference between the weight of the empty and the « filled » plate. The volume of the product can be calculated from the difference in weight of the empty and the « filled » plate hanging in distilled water and the density of the distilled water at the specific temperature. When the product dissolves in water a different fluid will have to be used. The volume and the weight are known, so the density can be calculated. An accuracy of circa 0.1 % can be reached.

BRIX MEASUREMENT

The angle of refraction is being measured. For many liquids it is a measure of the density. When the relation between the angle of refraction and the density is known from previous reference measurements, the Brix measurement can be applied. This method causes errors when the product contains components which affect the angle of refraction independently of the density or the other way around. An example of such a component is citric acid.

Normally an accuracy of 0.1 % can easily be reached but an accuracy of up to 0.01 % is possible, depending on the product. We are still doing research in order to gain more knowledge in this field. Now even an automatic Brix measurement device is available : it is built into the filling line and the measurement takes place continuously.

HEIGHT MARKED BOTTLE

The filled bottle is to be marked at the surface level of the liquid and weighed. The empty bottle and the bottle filled until the level mark with distilled water, are also weighed. The density of water is known so therefore the density of the product can be calculated. This method can be used for liquids containing CO_2. An accuracy of 0.1 % can be reached.

BOTTLE AS PYCNOMETER

The filled bottle is weighed with the product and then completed up to brim with distilled water and weighed again. Then the bottle is emptied, weighed and filled to the brim with distilled water and weighed again. Now all aspects are known and the density of the product can be calculated. Filling to the brim can be carried out with the aid of a transparent plate with a small hole in it, which is to be placed on top of the bottle. This method can be used for all kinds of liquids in bottles. The accuracy of this method can reach 0.1 %.

4. Checkweigher

Checkweighers are built into the filling line and they can check every pre-package or take samples from the production. There can also be optional functions like registration, calculations, feed-back to filling machine and of course a reject mechanism. The advantage of a checkweigher is that, if feed-back is applied, the adjustments of the filling machine and the registration can be performed automatically. The only human actions left are starting up the process and watching at regular intervals to see if everything is still operating correctly.

4.1 Checkweigher with counters

This is the conventionel checkweigher, simple in construction, usually supplied with one or more set points and corresponding counters. With the numbers on the counters, an estimation of the mean and the standard deviation can be made by means of a special calculation. This calculation is rather cumbersome and the accuracy of the result depends on the number of observations, the number of classes and the class width. The results will still have to be interpretated by the operator. There are only a few manufacturers, who are still producing this kind of check-weighers. The advantage of course is that their price is relatively low : around $ 3 500 or somewhat more.

4.2 Electronic checkweigher

Electronic checkweighers are becoming very important for the checking of filling lines. Progress is being made in the application of these advanced micro-processor controlled devices. Printers are often supplied in the standard versions. Calculations and interpretations of the results as mentioned before (processing the results) can be performed. The latest models are built of separate units like electronic weigh cells, micro-processors, printers, monitors and keyboards. These components have just been put together and the software has been designed for it. Such a checkweigher should produce records of a day, shift or whichever interval is desired and of course the feed-back and reject options are regularly available. These checkweighers cost circa $ 20 000 to circa $ 50 000. Only one checkweigher can be operating at one filling line at a time. The price of the electronic components will become cheaper and cheaper, so we expect the overall price to drop accordingly. As more functions can be done by this device human actions become more and more superfluous. The packer can thus save on the cost of labour.

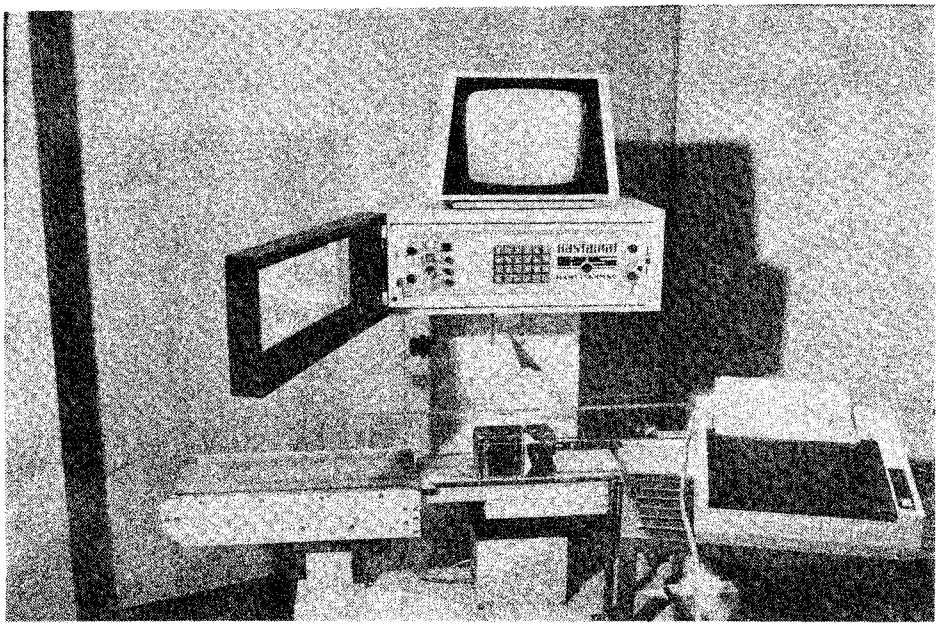

Fig. 5

A modern electronic checkweigher, consisting of a weigh cell, micro-computer, monitor and printer

4.3 Checkweigher connected to the automatic gravimetric filling machine

The latest development in the field of checkweiging is connecting the micro-processor or micro-computer to the electronic weigh cells of the gravimetric filling machines. At the end of chosen intervals the signal of a selected number of weighings is collected from every weigh cell and transmitted to the central computer or micro-processor. Many weigh cells can be connected to one central computer. The costs per weighing unit are relatively low compared with the other type of checkweighers because no extra weigh cells are needed and only one computer is necessary to control all the gravimetric filling machines. In many cases a feedback option can also be applied.

For the checkweighers the same procedures are followed as for the other automatic control systems ; they will have to be approved, stamped and the software must also be approved, when used for the EEC directive of prepackages.

5. Quantity control by the authorities

Our criteria are the Dutch law, « Hoeveelheidsaanduidingen besluit (Warenwet) », in which the EEC directives 106 and 211 are incorporated and the Weights and Measures law. The checks are carried out on the packer's or importer's premises. As much as possible the checks will take place on the filling-lines. Also the records which the packer has to keep, the control equipment used by the packer and the application of the packers control-system will be inspected.

The authorities concerned are supplied with a micro-computer which is connected with an electronic non-automatic weighing machine. Two types of computers and several types of weighing machines are used. The software has been designed at the Service of Weights and Measures and is used by all authorities concerned. At the end of every year the tapes with the program and the sample results are gathered and read out on the central computer. It is possible to have a view, of all samples taken in the Netherlands, available within a few hours.

On their visits to the packers the inspectors are equipped with a small trolley in which all necessary equipment is stored. They can deal with all kinds of samples to be taken. At the start of every sample a reference weighing with the mass standards is performed in order to eliminate measuring errors. Our own equipment is calibrated every year or if necessary, more frequently.

6. Conclusion

We do not think automation should be compulsory or is an absolute necessity, but in every situation one should evaluate its advantages, profits, costs and disadvantages. If the decision has been taken in favour of automation of quantity control, one should realise that at the introduction of such a system, the personnel will have to be carefully instructed. They are the ones to work with the equipment and if they are not convinced of its usefulness, motivation will be lacking and the equipment will not be used to its fullest extend.

When automation is done at a more sophisticated level a higher checking frequency is possible and the control of the quantity can be efficient enough for the filling machine to reach production near the legal limits. When using a less sophisticated system one will have to build-in a margin by means of a slight over-fill.

In practice we evaluate the control systems of the packers carrying out the EEC directives 211 and 106 with reference to the statistic principles. What we feel needed, however, is agreement on acceptable producers' and consumers' risks. We would like to draw attention to this particular point for future elaboration of OIML Recommendations in the field of prepackage control.

The LOCAL VALUE of g

by **S.A. THULIN**
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The following notes attempt to inform practical metrologists on the accuracy which may be expected from the use of gravity formulas and on some related problems.

Measuring instruments depending on g

For many instruments which are based on the measurement of force it is necessary to know the value of the acceleration due to gravity at the instrument site. This is in particular the case for liquid column manometers and barometers, for piston manometers and to a less extent for viscometers of the capillary or falling ball type, certain materials testing machines etc. Calibration of force measuring devices by use of dead-weights requires the knowledge of the value of g with a rather high accuracy.

Most types of electronic balances using elastic deformation (load cells) or electromagnetic compensation are also affected by the value of g if they are not adjusted (calibrated) with weights at their exact place of use. Although this is the usual practice for high accuracy balances, other electronic weighing machines used for trade are frequently adjusted at the place of manufacture and may require different adjustments depending on the geographical zone where they are intended to be used [1].

Only a few types of electronic balances have special compensation systems making them basically insensitive to reasonable variations in g; this is also the case for most mechanical balances with the exception of spring balances.

Tidal variations of g

At a given fixed location the value of g varies by a small amount due to the variations in attraction of the sun and the moon. The maximum combined effect amounts during maximum tides to $0.16 \cdot 10^{-6}$ in relative value [2]. These variations can usually be neglected by the practical metrologists but have to be taken into account in geophysical prospecting when using gravimeters.

Variations with latitude, gravity formulas

The effective value of g at sea level varies with latitude due to the action of the centrifugal force produced by the rotation of the earth. If the earth were a perfect sphere, g would diminish from the poles to the equator by an amount proportional to the square of the cosine of the angle of latitude.

Since the earth is flattended the mathematical expression becomes slightly more complicated and various formulas are given in the literature. The most common form is the so-called international gravity formula adopted by the International Association of Geodesy in 1930 :

$$\gamma = \gamma_E (1 + \beta \sin^2 \varphi + \beta_2 \sin^2 2\varphi) \quad (1)$$

where γ = theoretical value of acceleration due to gravity at mean sea level
γ_E = acceleration due to gravity at the equator and mean sea level
φ = latitude
β = coefficient of principal latitude term
β_2 = coefficient of small latitude term

The Geodetic Reference System adopted by the International Union of Geodesy and Geophysics in 1967 is based on a slightly different formula which represents a better approximation of the geoid [3] and which we may write as

$$\gamma = A (1 + B \sin^2\varphi + C \sin^4\varphi) \quad (2)$$

Though less accurate, the first formula can however still be used for comparison purposes provided the values of the coefficients are changed.

The values of the coefficients thus adopted are for formula (1) :

$\gamma_E = 9.78\,031\,8$ m/s^2 ($\gamma_{E1930} = 9.78\,049\,0$ m/s^2)
$\beta = 0.00\,530\,24$ ($\beta_{1930} = 0.00\,528\,84$)
$\beta_2 = -0.00\,000\,59$

and for formula (2) :

$A = 9.78\,031\,85$ m/s^2
$B = 0.00\,527\,889\,5$
$C = 0.00\,002\,346\,2$

It is important to point out that the γ-values are mainly used as a conventional reference by geophysicists for studies of the earth's gravity field. Unfortunately the word « normal gravity » is in geophysical literature often used to designate γ-values. However the same expression is used by metrologists to designate the constant g_n (see below).

Although the coefficients adopted in 1967 represent an improvement with respect to the form of the geoid and take into account the results of some absolute determinations of g using free fall, it is not appropriate to determine local values of g by use of these formulas whenever a relative accuracy better than 10^{-4} is required. The reason is mainly the uncertainty in estimating altitude corrections and the influence of local gravity disturbances.

Variations due to altitude

The theoretical variations of gravity with altitude are of two kinds [2] :

— free air variation basically valid in the air above sea level (subject to Faye correction by geophysicists) ;
— variation inside a plate of the earth's crust located above sea level (subject to Bouguer correction by geophysicists).

The free air correction is easy to develop mathematically as it simply depends on an increase of the effective earth radius with altitude. It results in a theoretical decrease of g with altitude which is $3.086 \cdot 10^{-6}$ m/s^2 per meter (for altitude variations up to a few thousand meters).

At the surface of a very large plateau without surrounding mountains the resulting altitude correction must take into account the attraction of the layer of the crust located above sea level (the so-called Bouguer plate). The latter effect depends on the mean density of the earth itself and on the mean density of the material

in the plateau. The combined effect of the attraction of the plateau and the decrease in free air results in an effective decrease of g compared to sea level which is roughly $2 \cdot 10^{-6}$ m/s^2 per meter altitude.

As many applications in metrology take place near the ground surface, altitude corrections have generally to be calculated using this latter figure rather than that for free air.

Variations due local shape of the terrain

The value of g is also largely affected by the surrounding terrain. Thus in a deep valley or on a high mountain the effective value may be different by up to 0.001 m/s^2 from that obtained using simply altitude corrections.

Determination of g by physical measurements

Whenever it is necessary to know the value of g with an accuracy better than 0.001 m/s^2 or 10^{-4} in relative value, one has to rely upon gravity values which have been determined for gravity stations close to the site where the g-value is needed.

If the distance to the gravity station does not exceed a few hundred kilometers, if the terrain around both sites is relatively flat and if the difference in altitude does not exceed a few hundred meters one may estimate the local g-value from the difference formula :

$$g_L = g_s + K_1 (\sin^2 \varphi_L - \sin^2 \varphi_s) - K_2 (H_L - H_s) \quad (3)$$

where g_L = estimated local value of the acceleration due to gravity m/s^2

g_s = absolute value at the gravity station in m/s^2 (most recent value in the new world gravity network or comprising a correction with respect to the previously used Potsdam system)

φ_L = latitude of the local site

φ_s = latitude of the absolute gravity station

K_1 = $\gamma_E \cdot \beta =$ 0.05 185 9 m/s^2

K_2 = $2 \cdot 10^{-6}$ m/s^2 per m in the earth's crust ($3 \cdot 10^{-6}$ m/s^2 per m in free air)

H_L = altitude of local site in m

H_s = altitude of gravity station in m

Even when remaining within the above mentioned geographical limits it cannot be expected that g_L can be estimated by formula (3) to an accuracy better than $2 \cdot 10^{-4}$ m/s^2 which corresponds to $2 \cdot 10^{-5}$ in relative value.

When the surrounding terrain is not flat and in highland areas it is preferable to use a gravimeter of the suspended-mass type to determine the local g-value on the site by interpolation between two different gravity stations. Such procedures, currently used in geophysical prospecting, practically reduce the uncertainty of the local value of g to the same amount as that of the gravity stations.

More recently, portable instruments based on free fall have been constructed which allow absolute determinations of g directly on the site [4]. The new world gravity network which is being built up is fully based on a number of absolute determinations of g using free fall. Accuracies of the order of 10^{-8} in relative value have been obtained with such instrumentation and are thus far beyond the needs of practical metrology.

The value of g_n

Finally a few words about the role and history of g_n sometimes called « standard » or « normal » gravity. Its value, 9.80 665 m/s² should in all cases be stated without rounding off, as it is a **conventional value** adopted by the 3ème Conférence Générale des Poids et Mesures in 1901.

It is mainly intended to be used as a means for reducing deadweight and liquid column measurements of force and pressure. (It was also used in the definitions of the now abandonned unit kilogram-force).

Thus for example a piston manometer using deadweights, or a mercury barometer, may be calibrated at one location where the local value is known with sufficient accuracy. The calibrating laboratory then transforms the measured values using the factor g_n/g_c where g_c is the acceleration at the site of calibration. In practice this means that the certified values for the deadweight piston manometer, or the mercury barometer, will be correct at a hypothetical location where $g = g_n = 9.80\,665$ m/s².

In order to use this manometer, or barometer, at any location where the acceleration due to gravity is g_L, all the certified values of pressure have to be multiplied by g_L/g_n.

In this way the value of g_n is cancelled in final measurement results which thus only depend on the factor g_L/g_c.

Historically the value of $g_n = 9.80\,665$ m/s² was meant to represent the value of the acceleration due to gravity at 45° latitude and mean sea level. It was based on pendulum measurements made in 1888 at the Pavillon de Breteuil (BIPM), Sèvres, by Defforges and Lubinski.

The result of reversable pendulum measurements made in 1905 at the Geodätisches Institut in Potsdam by Kühnen and Furtwängler and which constituted the reference for the world gravity network up to 1967, indicated that the true value at sea level was probably considerably lower than g_n. However, as this fact was of no practical consequence for metrologists the 5ème Conférence Générale des Poids et Mesures in 1913 reconfirmed the value of g_n adopted in 1901. We know to-day that it is higher by about 47 parts in 10^6 with respect to the value for 45° latitude calculated from the 1967 version of the international gravity formula.

We may conclude by stating that the value $g_n = 9.80\,665$ m/s² will most probably continue for long to be used in force and pressure reductions as a convenient intermedium rather than a true physical constant.

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Vol. 18 Number 3, 1982 p. 139-152

Vol. 18 Number 4, 1982 p. 221-229

Vol. 19 Number 2, 1983 p. 49-55

The original work of A. SAKUMA at BIPM is expected to be published in Metrologia in 1984.

LABORATORY NOTE

SEALS for MANOMETER TEST BENCHES

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In hydraulic and pneumatic installations pressure seals are used which have the form of rings or perforated disks. Rubber-elastic materials are mostly utilized for low pressures. For medium pressures seals consisting of vulcanized fibre or similar materials are customary. Metallic gaskets are often used for high pressures.

Hydraulic or pneumatic installations that have to be disassembled very often, as this is the case with manometer test benches, need a replacement of gaskets more frequently, since soft gaskets are easily damaged, while metallic gaskets are growing hard. Moreover traditional gaskets for high pressures require very strong torques for tightening and loosening, which demands considerable physical efforts from the operating staff during the whole day. Traditional gaskets need further tightening after the leakage test, since then mostly the experience is made that one or another gasket is leaking on the test bench. This is very onerous and prolongs the times of setting up. More than 10 years ago, in the Bundesamt, gaskets have been developed to avoid these troubles, which are in the technical sense absolutely leak-proof within the range from technical vacuum up to excess pressures of 100 MPa.

As can be derived from the illustrations the seals are composed of a cylindrical supporting body made from metal, e.g. steel, into each end face of which a circular groove has been machined, where an O-ring may be placed. O-rings are torus-shaped components of rubber-elastic material and are produced by numerous manufacturers in different sizes. These manufacturers are furnishing tables indicating the dimensions of the grooves for the various diameters.

Since O-rings are very light-weight they can easily be dispatched by mail.

These gaskets have still further advantages :

— Almost unlimited re-use (in case of damage only the O-rings have to be renewed, the supporting body can only be damaged by brute force) ;
— the gaskets can easily be produced on a simple lathe ;
— suitable dimensions can also be used in small cap nuts ;
— no leakage will even occur when the surfaces of the shanks of the manometers are not perfectly smooth ;
— good seal in both directions ;
— only small torque necessary for tightening and detaching ;
— corrosion-resistant if suitable materials are choosen for the O-rings and for the supporting body.

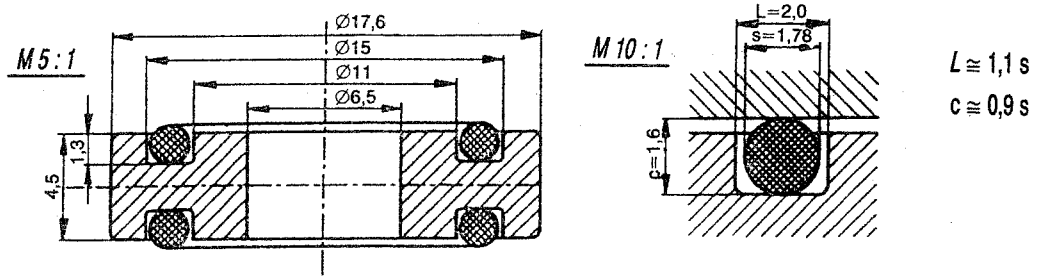

Fig. 1
DIMENSIONS OF A SEAL FOR A USUAL MANOMETER CONNECTION
Generally the depth c of the groove may be executed with 0,9 s, and length L with 1,1 s but in any case the assembling recommendations of the makers of the O-rings are binding.

BIML

TRAVAUX des SECRÉTARIATS OIML en 1983 et 1984

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 1983 et les prévisions pour 1984. Il est basé sur les rapports annuels et autres informations disponibles.

SP 1 - Terminologie

Le deuxième projet du Vocabulaire International de Métrologie (VIM) a fait l'objet de discussions lors de la réunion à Paris en février 1983 du groupe mixte de travail (BIPM-CEI-ISO-OIML). Les commentaires reçus ont été examinés par les responsables de ce groupe et le texte définitif des versions française et anglaise a été terminé fin septembre 1983 pour impression.

Le projet de révision du Vocabulaire de Métrologie Légale (VML), qui a été préparé par le secrétariat-rapporteur Sr 1, a été envoyé aux membres du CIML pour vote par correspondance ; la date limite est fin février 1984.

SP 2 - Métrologie légale. Généralités

Sr 2 prépare une révision du Document International « Unités de mesure légales » qui tiendra compte des décisions de la 17ème Conférence Générale des Poids et Mesures.

Lors de sa 19ème réunion en mai 1983, le CIML a décidé de réactiver le secrétariat-rapporteur Sr 4 et chargé le BIML, responsable de ce secrétariat, de continuer à étudier des systèmes de certification en se concentrant sur des accords bilatéraux ou multilatéraux existants. Le BIML a préparé des documents de travail pour une réunion à Paris en mars 1984.

Sr 6 a préparé un 2ème avant-projet « Dispositifs électroniques incorporés ou associés aux instruments de mesure » et un 1er avant-projet « Procédures d'essai de dispositifs électroniques ». Les deux avant-projets ont fait l'objet de discussions pendant une réunion à Alexandria, Etats-Unis, en septembre 1983. Suite à cette réunion le secrétariat-rapporteur a préparé un 3ème avant-projet contenant, en annexe, les procédures d'essai ; cet avant-projet sera distribué début 1984 pour discussion en juin lors d'une réunion à Amsterdam.

Le secrétariat-rapporteur compte pouvoir présenter le 4ème avant-projet avant fin octobre 1984.

SP 4 - Mesure des longueurs, surfaces, angles

Sr 1 prépare un 1er avant-projet sur les mesures de précision à traits.

La révision de la RI 35 préparée par Sr 2 et le projet de RI sur les instruments mesureurs de longueurs, préparé par Sr 3, ont été diffusés aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale.

Le 2ème projet de Document International « Schéma de hiérarchie des instruments de mesure des longueurs » a été envoyé par Sr 4 à ses collaborateurs.

Sr 6 a préparé un 1er avant-projet sur les appareils de mesure de la surface des peaux, qui sera envoyé pour commentaires aux pays collaborateurs en 1984.

Sr 7 a élaboré un 1er avant-projet de terminologie en métrologie géométrique ; cet avant-projet a été soumis à un groupe de travail mixte ISO-OIML et un 2ème avant-projet sera préparé en 1984 en tenant compte des observations reçues.

SP 5 - Mesure des volumes de liquides

Suite à la réunion à Tokyo en mars 1983, le secrétariat-rapporteur Sr 2 a préparé un 2ème avant-projet sur les schémas de hiérarchie, qui sera diffusé pour commentaires au début 1984.

Sr 3 qui s'était également réuni à Tokyo en mars 1983 a, comme suite aux discussions lors de cette réunion, préparé les avant-projets suivants :

4ème avant-projet « Pipettes à un trait »

2ème avant-projet « Pipettes graduées ».

Ces avant-projets seront envoyés début 1984 et feront l'objet d'une réunion prévue pour fin 1984.

Sr 4 collabore activement avec ISO/TC 84/SC 1 sur le sujet des seringues hypodermiques non-réutilisables. Un 3ème avant-projet contenant des références aux normes ISO sera préparé en 1984.

Sr 5 prépare un 2ème avant-projet sur les bouteilles récipients-mesures en tenant compte des observations reçues.

Le projet de RI « Réservoirs de stockage » préparé par Sr 8 a été envoyé aux membres du CIML pour vote par correspondance avant d'être soumis pour sanction à la 7ème Conférence Internationale. La prochaine réunion du Sr 8 est prévue pour juin 1984 en liaison avec Sr 9, Sr 10 et Sr 11.

Sr 9 « Camions et wagons citernes » a préparé le 5ème avant-projet qui sera discuté à la réunion en juin 1984. On prévoit de pouvoir ainsi terminer la rédaction et soumettre la prochaine version au secrétariat-pilote.

Sr 10 « Péniches et navires citernes » a effectué une enquête concernant l'intérêt des pays-membres pour ce sujet. Les résultats de cette enquête feront l'objet de discussions lors de la réunion en juin.

Sr 11 a terminé le 1er et le 2ème avant-projets sur les mesures de niveaux de liquides. Le 2ème avant-projet diffusé pour commentaires en novembre 1983 fera l'objet de discussions pendant la réunion de juin 1984.

Le projet de RI « Ensembles de mesure - contrôles métrologiques », préparé par Sr 13, a été diffusé pour vote par correspondance avant soumission pour sanction Dispositions particulières » soumis au secrétariat-pilote a été retourné au Sr 13 pour à la 7ème Conférence Internationale. L'avant-projet de RI « Ensembles de mesure - études supplémentaires. Le 1er avant-projet sur les compteurs turbines a été diffusé aux collaborateurs pour commentaires. En tenant compte de ces commentaires, Sr 13 prépare un 2ème avant-projet sur les compteurs turbines et en même temps le 1er avant-projet sur les ensembles de mesure pour pipe-lines. Les deux avant-projets feront l'objet de discussions lors d'une réunion prévue pour le deuxième semestre 1984.

Sr 15 a préparé le 1er avant-projet « Compteurs et ensembles de mesure pour liquides cryogéniques » qui a été discuté lors d'une réunion à Paris en décembre 1983. Le 2ème avant-projet sera préparé par le secrétariat-rapporteur et diffusé pour commentaires en 1984.

Le projet de RI « Compteurs d'eau chaude » terminé par le Sr 16 a été approuvé par le secrétariat-pilote et diffusé pour vote par correspondance auprès des membres du CIML avant soumission pour sanction à la 7ème Conférence Internationale. Le projet de DI sur l'évaluation des étalons de débit et dispositifs utilisés pour l'essai des compteurs d'eau a été adopté par le CIML et sera imprimé en tant que DI 7. La prochaine réunion du Sr 16 est prévue se tenir en liaison avec ISO/TC 30/SC 7 et OIML SP 5-Sr 3 à la fin 1984.

Sr 17 a envoyé son dernier avant-projet pour vote par ses collaborateurs et a l'intention de le soumettre ensuite au secrétariat-pilote pour approbation.

Le projet de RI « Tables de mesure du pétrole » préparé par Sr 18 a été approuvé par le secrétariat-pilote et diffusé aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale.

Sr 20 a tenu une réunion à Tokyo en mars 1983 en liaison avec Sr 2 et Sr 3. Le 3ème avant-projet sur les méthodes et dispositifs pour la vérification des ensembles de mesure est en préparation.

SP 6 - Mesure des gaz

Sr 1 prépare un projet de révision de la RI 31 et étudie également, en coopération avec Sr 2, les problèmes concernant la révision de la RI 6.

Sr 3 prépare le 5ème avant-projet sur les voludéprimomètres, qui fera l'objet de discussions à une réunion à Paris prévue pour le deuxième semestre 1984.

Sr 4 prépare un nouvel avant-projet de Document International sur la mesure des hydrocarbures gazeux distribués par pipe-line, qui sera envoyé aux collaborateurs avant la fin 1984.

Sr 5 et Sr 6 ont l'intention d'élaborer des avant-projets de Documents Internationaux sur l'étalonnage et la vérification de compteurs de gaz et de les distribuer avant la fin 1984.

Sr 7, Sr 9, Sr 10 et Sr 11 ont commencé leurs travaux sur les 1ers avant-projets.

Sr 12 continue ses travaux sur les calorimètres à gaz automatiques ainsi que sur leur vérification.

SP 7 - Mesure des masses

Sr 2 a élaboré un 3ème avant-projet sur les instruments électroniques de pesage. Cet avant-projet a fait l'objet de discussions lors de la réunion à Alexandria, Etats-Unis, en septembre 1983. Le 4ème avant-projet est en cours de préparation en vue d'une réunion à Amsterdam en juin 1984 en liaison avec SP 2-Sr 6.

Le projet de révision de la RI 3 a été terminé par Sr 4 et a été diffusé aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale. Sr 4 se réunira à Bergen en juin 1984 pour discuter des méthodes d'essais de certains types d'instruments de pesage.

Sr 5 continue le travail sur les 1ers avant-projets sur les instruments de pesage totalisateurs discontinus à fonctionnement automatique et sur les installations de pesage en mouvement de wagons de chemins de fer. Ces avant-projets sont pré-

parés en vue d'une réunion pour fin 1984 ou début 1985. Le projet de RI « Doseuses pondérales » a été diffusé aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale.

Ceci est également le cas pour le projet de RI « Réglementation métrologique des cellules de pesée » élaboré par Sr 8.

SP 8 - Poids

Sr 1 a élaboré un avant-projet intitulé « Spécifications métrologiques pour poids » qui englobe les prescriptions actuellement incorporées dans les RI 1, 2, 20, 25 et 52. Cet avant-projet sera soumis au secrétariat-pilote pour approbation début 1984.

SP 9 - Mesure des masses volumiques

Sr 2 a préparé un projet de révision de la RI 44 « Alcoomètres et aréomètres pour alcool ». Ce projet a fait l'objet d'un vote par correspondance et sera soumis pour sanction à la 7ème Conférence Internationale.

Sr 3 a diffusé le 3ème avant-projet « Aréomètres pour usages spécifiques » et un 4ème avant-projet, en tenant compte des commentaires reçus, sera diffusé aux collaborateurs avant fin 1984.

Sr 4 propose que le travail sur la tension superficielle des liquides soit arrêté.

Sr 7 a été dissout par décision du CIML à sa 19ème réunion en mai 1983.

Sr 9 prévoit de diffuser le 1er projet de terminologie en 1984.

SP 10 - Instruments de mesure pour véhicules

Sr 3 prévoit d'élaborer le 1er avant-projet sur les taximètres électroniques.

SP 11 - Mesure des pressions

Le secrétariat-pilote a continué ses travaux sur la terminologie des mesures de pression ; il est prévu de terminer le 1er avant-projet au début 1984.

Sr 2 a élaboré une nouvelle version de l'avant-projet sur les schémas de hiérarchie qui sera diffusé pour commentaires début 1984.

Le 4ème avant-projet du Sr 3 sur les manomètres à piston a fait l'objet de discussions lors d'une réunion à Bratislava en novembre 1983. Le 5ème avant-projet contenant les décisions de cette réunion sera soumis au secrétariat-pilote pour approbation au début 1984.

Sr 4 a terminé des avant-projets sur les méthodes de vérification des manomètres indicateurs et enregistreurs. Les deux avant-projets seront envoyés aux collaborateurs pour commentaires en 1984.

Sr 5 continue d'étudier les commentaires reçus à la suite de son enquête sur les manomètres pour la tension artérielle et préparera ensuite un projet de révision de la RI 16.

Sr 7 a reçu un grand nombre de commentaires sur son 3ème avant-projet sur les baromètres et prépare le 4ème avant-projet.

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

Sr 1 prépare le 1er avant-projet de terminologie relative aux mesures de températures qu'il compte diffuser en 1984.

Sr 3 a terminé le projet de RI sur les thermomètres électriques à résistance et a l'intention de le soumettre au secrétariat-pilote en 1984.

Sr 5 termine le 1er avant-projet sur les thermocouples en tenant compte des travaux du CEI/CE 65B.

Sr 6 a terminé le projet de révision de la RI 18 sur les pyromètres optiques et soumettra ce projet au secrétariat-pilote pour approbation. Les 2èmes avant-projets sur la classification des pyromètres à radiation et sur les pyromètres à radiation totale ont été élaborés et feront l'objet d'une réunion à Léningrad en avril 1984.

Sr 7 a diffusé le 2ème avant-projet sur les thermomètres médicaux électriques et projette une réunion pour le deuxième semestre 1984.

Le 2ème avant-projet de RI « Compteurs d'énergie thermique » préparé par Sr 8 a été discuté et approuvé lors d'une réunion à Berlin en juin 1983. Il a ensuite été soumis au secrétariat-pilote pour approbation en tenant compte d'une prochaine modification en ce qui concerne les dispositifs électroniques.

Le 4ème avant-projet « Méthodes de vérification des couples thermo-électriques » préparé par Sr 9 sera soumis au secrétariat-pilote pour approbation en 1984.

SP 13 - Mesure des grandeurs électriques et magnétiques

Le CIML a chargé le BIML d'étudier, en liaison avec les Etats-membres concernés, l'étendue des activités de ce secrétariat par rapport aux activités similaires de la CEI.

Sr 1 considère que la compatibilité internationale des étalons primaires ne doit pas être traitée par l'OIML et suggère la suppression de ce secrétariat.

Sr 2 considère que les travaux de l'OIML sur les wattmètres doivent être arrêtés.

Sr 4 a préparé le 5ème avant-projet de RI sur les transformateurs électriques de mesure, qui a été diffusé aux collaborateurs pour commentaires.

Sr 5 et Sr 7 ont élaboré les 2èmes projets :

« Appareils de mesure électriques de tension, courant et fréquence »

et « Terminologie relative à la mesure des grandeurs électriques et magnétiques ».

SP 14 - Acoustique et vibrations

Le projet « Sonomètres » préparé par Sr 1 a été adopté à titre provisoire par le CIML et publié comme RI 58 mais doit être soumis à la sanction de la 7ème Conférence Internationale.

Sr 2 collabore activement avec ISO/TC 43 et CEI/CE 29. La révision de la publication CEI 645 « Audiomètres » a été entreprise avec une attention particulière aux besoins de la métrologie légale de façon à permettre son utilisation ultérieure dans une Recommandation de l'OIML.

SP 15 - Optique

Sr 1 a terminé un projet sur les dioptrimètres. Ce projet a été envoyé directement aux membres du CIML pour vote par correspondance, avant soumission pour sanction de la 7ème Conférence Internationale.

SP 16 - Rayonnements ionisants

Sr 1 a attendu la publication de la norme CEI 731 en vue de son utilisation comme base technique pour une Recommandation de l'OIML. Cette norme est maintenant parue et le travail du Sr 1 peut reprendre.

Le 2ème avant-projet sur les laboratoires secondaires de dosimétrie préparé par Sr 2 a fait l'objet d'une réunion à Budapest en avril 1983. L'avant-projet modifié lors de la réunion a été soumis au secrétariat-pilote pour approbation.

SP 17 - Mesure des pollutions

Le secrétariat-pilote et ses secrétariats-rapporteurs tiendront des réunions à Paris en mai 1984.

Sr 1 a élaboré un 1er avant-projet de RI sur les instruments de mesure de CO dans les gaz d'échappement de véhicules automobiles.

Sr 2 prépare un avant-projet sur l'utilisation des chromatographes en phase gazeuse/spectromètres de masse pour la surveillance de la pollution de l'eau.

Sr 3 prépare un avant-projet sur les chromatographes utilisés pour la surveillance de la pollution due aux pesticides et aux substances toxiques.

Ces avant-projets seront diffusés aux collaborateurs début 1984.

SP 18 - Mesure des caractéristiques des produits alimentaires

Le projet de RI « Humidimètres pour grains de céréales et graines oléagineuses » a été adopté à titre provisoire par le CIML et sera soumis à la sanction de la 7ème Conférence Internationale.

Sr 5 a été supprimé par décision du CIML lors de sa réunion en mai 1983.

Sr 7 a l'intention de diffuser en 1984 le 1er avant-projet sur les réfractomètres pour la mesure de la teneur du sucre dans les jus de fruits.

SP 19 - Mesure des caractéristiques des matériaux

Sr 1 a fait savoir que des comparaisons internationales de force ont lieu dans le cadre des institutions internationales (BIPM, IMEKO) et suggère d'arrêter les travaux de l'OIML dans ce domaine.

Le secrétariat-pilote et Sr 2 ont tenu des réunions à Paris en juin 1983. Les décisions prises ont permis au Sr 2 de terminer le projet de RI « Prescriptions générales sur les machines d'essai » et « Prescriptions pour les machines d'essai en tension et en compression ». Ces projets ont été envoyés aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale. Sr 2 continue son travail sur le 4ème avant-projet concernant les instruments de mesure de force utilisés pour vérifier les machines d'essai des matériaux.

Sr 3 envisage une révision des RI 9 à 12 concernant les blocs de référence de dureté mais attend les résultats des activités de l'ISO dans ce domaine.

Sr 4 a terminé la première étape de l'intercomparaison des échelles de référence nationale de dureté Rockwell C et Vickers HV 30. La deuxième étape, sous la responsabilité du Japon, est prévue pour 1984.

Le projet de RI « Caractéristiques des extensomètres électriques à résistance » préparé par Sr 5 a été diffusé aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale.

Sr 6 a préparé le 3ème avant-projet de DI « Terminologie des essais de dureté ». Cet avant-projet a reçu l'accord des collaborateurs et sera soumis au secrétariat-pilote pour approbation.

SP 20 - Produits préemballés

Le secrétariat-pilote et ses secrétariats-rapporteurs se sont réunis à Berne en juin 1983. Le 1er avant-projet « Contenu informatif de l'étiquetage » préparé par Sr 1 et le document « Principes concernant l'échantillonnage des produits préemballés » préparé par Sr 2 ont été discutés. Les secrétariats-rapporteurs ont préparé des nouvelles versions de ces documents en vue d'une nouvelle réunion à Berne en juin 1984. Un nouveau plan d'échantillonnage, préparé par Sr 2, fera également l'objet de délibérations.

SP 21 - Normalisation des caractéristiques métrologiques des instruments de mesure

Sr 1 et Sr 2 ont terminé les projets de DI « Caractéristiques générales des instruments de mesure » et « Caractéristiques dynamiques des instruments de mesure » ainsi que l'Appendice « Notice informative ». Les deux projets ont été envoyés aux membres du CIML pour approbation.

Sr 4 a terminé les études préliminaires sur les systèmes de mesure et prépare le 1er avant-projet.

Sr 5 prépare le 3ème avant-projet sur les méthodes de contrôle des caractéristiques métrologiques des instruments de mesure.

Sr 6 a terminé le 1er avant-projet « Détermination expérimentale des caractéristiques métrologiques des systèmes de mesure ».

SP 22 - Principes du contrôle métrologique

Le secrétariat-pilote et ses secrétariats-rapporteurs tiendront une réunion à Coblence en avril 1984.

Sr 1 a préparé le 4ème avant-projet de DI « Domaines d'utilisation des instruments de mesure assujettis à la vérification ».

Sr 2 a terminé l'avant-projet « Principes du choix des caractéristiques pour l'examen des instruments de mesure usuels ». Cet avant-projet sera soumis au secrétariat-pilote pour approbation à la réunion en avril.

Sr 3 concernant les principes d'approbation de modèle, Sr 4 concernant les principes de la vérification et Sr 6 s'occupant de l'assurance métrologique, ont développé des avant-projets sur ces sujets qui seront diffusés aux collaborateurs pour commentaires et qui seront également discutés à la réunion en avril.

Sr 5 a élaboré un projet de DI « Principes de la surveillance métrologique ». Ce projet a été approuvé par le secrétariat-pilote et a été adopté par le CIML. Il sera publié en tant que DI 9.

SP 23 - Méthodes et moyens d'attestation des dispositifs de vérification

Sr 2 a terminé le projet de DI « Principes du choix et de la reconnaissance officielle des étalons, de leur utilisation et conservation ». Ce projet a été adopté par le CIML et sera publié en tant que DI 8.

Le projet de DI « Documentation pour les étalons et les dispositifs d'étalonnage » élaboré par Sr 3 et adopté par le CIML a été publié en 1983 en tant que DI 6.

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

Sr 1, Sr 2 et Sr 3 ont effectué une consultation par correspondance et ont l'intention de préparer des projets de RI en 1984, comme suit :

Sr 1 « Instruments pour la numération des globules sanguins »

Sr 2 « Pipettes pour mélanger le sang »

Sr 3 « Pipettes Westergren pour mesurer la vitesse de sédimentation du sang »

Sr 4 a élaboré des projets de RI sur les électrocardiographes et les électroencéphalographes et les a soumis au secrétariat-pilote pour approbation. Le secrétariat a aussi préparé un 2ème avant-projet de DI « Instruments de mesure des grandeurs bioélectriques. Caractéristiques métrologiques à normaliser et méthodes de leur représentation ».

Sr 5 a l'intention de commencer son travail dans le domaine de l'hématologie en 1984.

SP 27 - Matériaux de référence

Sr 1 examinera la possibilité d'inclure les termes et les définitions concernant les matériaux de référence certifiés dans le Vocabulaire de l'OIML.

Sr 3, Sr 4 et Sr 5 ont examiné les commentaires reçus et, selon la proposition du BIML, décidé de combiner ces avant-projets dans un seul document intitulé « Principes généraux pour l'utilisation des matériaux de référence certifiés dans les mesures ».

Sr 6 a décidé de suspendre le travail sur le contenu des certificats pour les matériaux de référence. Ce secrétariat coopère à la révision du Guide 31 de l'ISO/REMCO.

Sr 7 a l'intention de reconsidérer le besoin de travail de l'OIML sur les procédures et méthodes de comparaison des matériaux de référence.

SP 30 - Mesures physico-chimiques

Le secrétariat-pilote et Sr 2, Sr 9 et Sr 10 ont tenu des réunions à Tbilissi à la fin mai 1983.

Sr 1 a effectué une intercomparaison des étalons nationaux de pH et pense éventuellement préparer un avant-projet sur la vérification des pH-mètres.

Le projet de RI « Méthode d'étalonnage des cellules de conductivité » préparé par Sr 2 a été approuvé par le secrétariat-pilote et a été diffusé aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale. Le secrétariat a aussi l'intention de préparer un avant-projet sur la mesure de la conductivité des électrolytes.

Sr 3 a l'intention de préparer de nouveaux avant-projets en tenant compte des commentaires reçus comme suit :

5ème avant-projet « Echelle pratique de l'humidité relative de l'air »

et 4ème avant-projet « Tables psychrométriques internationales ».

Le projet de RI « Humidimètres pour le bois » a été préparé par Sr 4, a été approuvé par le secrétariat-pilote et a été diffusé pour vote par correspondance auprès des membres du CIML avant soumission pour sanction à la 7ème Conférence Internationale. Le secrétariat-rapporteur a l'intention d'élaborer en 1984 un avant-projet sur la vérification des humidimètres pour le bois.

Sr 6 prépare le 4ème avant-projet « Shéma de hiérarchie pour les instruments de mesure de l'humidité des gaz » qui sera examiné pendant une réunion prévue pour la fin 1984. Le secrétariat a aussi l'intention de préparer un 2ème avant-projet sur les méthodes d'essai des psychromètres.

Sr 9 a terminé un projet de RI sur les viscosimètres capillaires en verre ; le projet a été approuvé par le secrétariat-pilote et a été diffusé pour vote par correspondance auprès des membres du CIML avant soumission pour sanction à la 7ème Conférence Internationale. Le projet de DI sur le schéma de hiérarchie des instruments de mesure de viscosité des liquides a été aussi approuvé par le secrétariat-pilote et sera soumis au CIML pour adoption en 1984. Le secrétariat a aussi l'intention d'élaborer un 1er avant-projet sur les liquides étalons utilisés pour l'étalonnage et la vérification des viscosimètres.

Sr 10 a terminé les projets suivants :

« Prescriptions pour les gaz purs CO, CO_2, CH_4, H_2, O_2 et N_2 destinés à la préparation des mélanges de référence »

et « Méthode pour la détermination des erreurs de base et d'hystérésis des analyseurs de gaz durant leur vérification ».

Les deux projets ont été approuvés par le secrétariat-pilote et ont été diffusés aux membres du CIML pour vote par correspondance avant soumission pour sanction à la 7ème Conférence Internationale. Le secrétariat-rapporteur a l'intention de préparer de nouveaux avant-projets en tenant compte des commentaires reçus concernant les méthodes et moyens de vérification des instruments automatiques pour la mesure de la concentration dans l'atmosphère de SO_2 et CO, respectivement.

Sr 12 continue ses études sur les explosimètres en tenant compte du travail de CENELEC/SC 31/9.

SP 31 - Enseignement de la métrologie

Le secrétariat-pilote et ses secrétariats-rapporteurs Sr 1 et Sr 2 tiendront des réunions à Paris en avril 1984.

Sr 1 a terminé le projet de DI « Qualifications recommandées des ingénieurs métrologues ». Ce projet a été approuvé par le secrétariat-pilote et a été soumis au CIML pour adoption. Ce secrétariat-rapporteur a aussi élaboré les 1ers avant-projets, pour discussions en avril, comme suit :

« Programme-type des cours de base en métrologie pour ingénieurs » et

« Vocabulaire des termes et définitions dans le domaine de l'enseignement et de la formation des métrologistes ».

Sr 2 a élaboré les 2èmes avant-projets de DI concernant la formation des techniciens. Les nouveaux avant-projets ont pour titre :

« Formation initiale des techniciens de la métrologie légale » et

« Qualification exigée des techniciens de métrologie légale ».

The WORK of OIML SECRETARIATS 1983 - 1984

As in previous years an account of the work of OIML pilot and reporting secretariats is given stating the progress of work in 1983 and the forecast for 1984. It is based on annual reports and other information available.

SP 1 - Terminology

The second draft of the International Vocabulary of Metrology (VIM) was discussed by the BIPM-IEC-ISO-OIML Joint Working Group during a meeting in Paris, February 1983, and was then sent out for consultation to all parties concerned. The comments received were considered by the Task Group and the definitive text of the French and English versions was finalized for printing end of September 1983.

The draft revision of the Vocabulary of Legal Metrology (VML) which was prepared by the reporting secretariat SP 1-Sr 1 was submitted to a postal vote of the International Committee ; the limit date of the voting is the last day of February 1984.

SP 2 - Legal metrology. General

Sr 2 is preparing a revision of the International Document « Legal units of measurement » taking into account the decisions of the 17th General Conference of Weights and Measures.

During its 19th meeting in May 1983, the International Committee has decided to reactivate the reporting secretariat Sr 4 and instructed the BIML, responsible for it, to continue with the study of certification systems, focussing the work on existing bilateral and multilateral agreements. BIML has prepared working documents for a meeting in Paris, March 1984.

Sr 6 has prepared the 2nd pre-draft « Electronic devices incorporated in or associated with measuring instruments » and the 1st pre-draft « Test procedures for electronic measuring instruments ». Both pre-drafts were discussed during a meeting in Alexandria USA, September 1983. Following this meeting a 3rd pre-draft, including an Annex on the test procedures, was prepared by the secretariat ; it will be distributed beginning 1984 and is to be discussed during a meeting in Amsterdam, June 1984. The secretariat intends to have the 4th pre-draft ready before end of October 1984.

SP 4 - Measurement of length, area, angle

Sr 1 is preparing a 1st pre-draft International Recommendation for high-accuracy line measures of length.

The revision of RI 35 prepared by Sr 2 and the draft RI for length measuring instruments prepared by Sr 3 were sent out for a postal vote by CIML members before submission to the 7th International Conference for sanction.

A 2nd draft DI « Hierarchy scheme for length measuring instruments » prepared by Sr 4 was distributed for comment to the collaborating countries.

Sr 6 has prepared a 1st pre-draft for instruments measuring the area of hides ; this draft will be sent to the collaborating countries for comment during 1984.

Sr 7 has elaborated a 1st pre-draft on terminology used in dimensional metrology ; this draft was submitted for comment to the ISO-OIML Joint Working Group and taking into account the comments received the secretariat will prepare the 2nd pre-draft in 1984.

SP 5 - Measurement of volume of liquids

Following a meeting in Tokyo, March 1983, the reporting secretariat Sr 2 has prepared a 2nd pre-draft on hierarchy schemes ; it will be distributed for comment beginning of 1984.

Sr 3 also held a meeting in Tokyo, March 1983, and taking into account the decisions taken, the secretariat has prepared the following pre-drafts :

4th pre-draft « One mark pipettes » and

2nd pre-draft « Graduated pipettes ».

These pre-drafts will be distributed for comment beginning of 1984 and will be discussed during the next meeting provisionally set for the end of 1984.

Sr 4 is collaborating with ISO/TC 84/SC 1 on the subject of hypodermic syringes for single use and a 3rd pre-draft, with references to the relevant ISO document, will be prepared during 1984.

Sr 5 « Measuring container bottles » is preparing a 2nd pre-draft taking into consideration the comments received.

The draft RI « Storage tanks », prepared by Sr 8, was sent to CIML members for postal vote before submission to the 7th International Conference for sanction. The next meeting of Sr 8 is planned for June 1984 in conjunction with Sr 9, Sr 10 and Sr 11.

Sr 9 « Road and rail tanks » has prepared the 5th pre-draft which will be discussed at the meeting in June 1984. It is intended to finalize the text and to submit the next version as a draft to the pilot secretariat.

Sr 10 « Barge and ship tanks » has carried out an enquiry concerning the interest within OIML on this subject. The results of this enquiry and the comments received will be discussed during the meeting in June.

Sr 11 has completed the first and second pre-drafts on liquid level measurements during 1983. The 2nd pre-draft was distributed for comment November 1983 and will be discussed during the meeting in June 1984.

The draft RI « Measuring assemblies - metrological controls », prepared by the Sr 13, was sent out for a postal vote before submission to the 7th International Conference for sanction. The pre-draft RI « Measuring assemblies - special requirements », submitted to the pilot secretariat was returned to the reporting secretariat for further study. The 1st pre-draft concerning turbine meters was distributed to the collaborating members for comment. Taking account of the comments received, Sr 13 is preparing a 2nd pre-draft for turbine meters and at the same time a 1st pre-draft for pipe-line measuring assemblies. Both these pre-drafts will be discussed during a meeting planned for the second half of 1984.

Sr 15 has developed a 1st pre-draft « Meters and measuring systems for cryogenic liquids » which was discussed at a meeting in Paris, December 1983. The 2nd pre-draft will be prepared by the reporting secretariat and distributed for comment during 1984.

The draft RI « Hot-water meters », finalized by Sr 16, was approved by the pilot secretariat and was sent out for a postal vote of the CIML members before submission to the 7th International Conference for sanction. The draft DI on the evaluation of standards and facilities used for testing water meters was adopted by the International Committee and is being prepared for printing as DI 7. The next meeting of Sr 16 is planned in conjunction with ISO/TC 30/SC 7 and OIML SP 5-Sr 3 for the end of 1984.

Sr 17 has submitted the last pre-draft to a vote by its collaborators and intends to submit the draft for approval to the pilot secretariat.

The draft RI « Petroleum measurement tables », prepared by Sr 18, was approved by the pilot secretariat and was circulated to the CIML members for a postal vote before submission to the 7th International Conference for sanction.

Sr 20 has held a meeting in Tokyo, March 1983, in conjunction with Sr 2 and Sr 3. A 3rd pre-draft on methods and means for verifying measuring assemblies is being elaborated by the reporting secretariat.

SP 6 - Measurement of gas

Sr 1 is preparing a draft revision of RI 31 and is also studying, in cooperation with Sr 2, the problems concerning a revision of RI 6.

Sr 3 is preparing the 5th pre-draft « Differential pressure gas meters » for discussion during a meeting in Paris, second half of 1984.

Sr 4 is preparing a pre-draft International Document on the measurement of hydrocarbon gases distributed by pipe-line for circulation to the collaborating members before end of 1984.

Sr 5 and Sr 6 intend to elaborate pre-draft International Documents on calibration and verification of gas meters and to circulate them before end of 1984.

Sr 7, Sr 9, Sr 10 and Sr 11 have started work on the 1st pre-drafts.

Sr 12 is continuing its studies on automatic gas calorimeters and their verification.

SP 7 - Measurement of mass

Sr 2 has developed a 3rd pre-draft on electronic weighing instruments. This pre-draft was discussed during the meeting in Alexandria, USA September 1983 and a 4th pre-draft is being prepared for a meeting in Amsterdam June 1984, in conjunction with SP 2-Sr 6.

The draft revision of RI 3 was finalized by Sr 4 and was sent out to the CIML members for voting before submission to the 7th International Conference for sanction. Sr 4 is meeting in Bergen, June 1984, to consider harmonized test methods for certain types of weighing machines.

Sr 5 is continuing its work on the preparation of pre-drafts on discontinuous totalizing automatic weighing machines and on weighing-in-motion railway weigh-bridges ; the pre-drafts are being prepared for a meeting late 1984 or early 1985.

The draft RI « Automatic gravimetric filling machines » was sent out for a postal vote to CIML members before submission to the 7th International Conference for sanction.

This was also done with the draft RI « Regulations for load cells », elaborated by Sr 8.

SP 8 - Weights

Sr 1 has developed a pre-draft « Metrological specifications for weights » which consolidates the requirements now contained in RI 1, 2, 20, 25 and 52. It will be circulated to members of SP 8 for approval, early 1984.

SP 9 - Measurement of density

Sr 2 has prepared a draft revision of RI 44 « Alcoholometers and alcohol hydrometers ». This draft was the subject of a postal vote by the CIML members and will be submitted to the 7th International Conference for sanction.

Sr 3 has circulated a 3rd pre-draft « Hydrometers for specific purposes » and taking into account the comments received a 4th pre-draft will be prepared and sent out for consultation before the end of 1984.

Sr 4 proposes that work on the subject of surface tension of liquids should be discontinued.

Sr 7 is dissolved by CIML decision, 19th meeting May 1983.

Sr 9 is developing the 1st pre-draft which should be ready for circulation and comment during 1984.

SP 10 - Measuring instruments for vehicles

Sr 3 will elaborate the 1st pre-draft for electronic taximeters.

SP 11 - Measurement of pressure

The pilot secretariat has continued its work on a glossary of terms used in pressure measurement ; the 1st pre-draft is expected to be ready, beginning of 1984.

Sr 2 has elaborated a new version of the pre-draft « Hierarchy schemes » ; this draft will be circulated for comment during 1984.

The 4th pre-draft on piston pressure gauges, prepared by Sr 3, was discussed during a meeting in Bratislava, November 1983. The 5th pre-draft incorporating the decisions of this meeting will be submitted to the pilot secretariat for approval, early 1984.

Sr 4 completed the pre-drafts on the verification methods for indicating and recording pressure gauges. Both pre-drafts will be distributed to the collaborating members for comment during 1984.

Sr 5 is continuing its study of the comments received following a general enquiry on manometers for blood pressure and will then elaborate a revision of RI 16.

Sr 7 has received a number of comments on the 3rd pre-draft on barometers and is now preparing the 4th pre-draft.

SP 12 - Measurement of temperature and heat

Sr 1 preparing the 1st pre-draft of a vocabulary relating to temperature measurement for circulation during 1984.

Sr 3 has finalized the draft RI on electrical resistance thermometers and intends to submit it to the pilot secretariat during 1984.

Sr 5 is finalizing the 1st pre-draft on thermocouples taking into account the work of IEC/TC 65B. It is expected to be ready for distribution to the collaborating members in 1984.

Sr 6 finalized the draft revision of RI 18 on optical pyrometers and will submit the draft to the pilot secretariat for approval. The 2nd pre-drafts on classification of radiation pyrometers and on total radiation pyrometers were elaborated and will be discussed during a meeting in Leningrad, April 1984.

Sr 7 has circulated the 2nd pre-draft on clinical electrical thermometers to the collaborating members for comment and is planning a meeting for the second half of 1984.

The 2nd pre-draft RI « Thermal energy meters » prepared by Sr 8 was discussed and agreed during a meeting in Berlin, June 1983. It was then submitted to the pilot secretariat for approval subject to an early revision concerning electronic devices.

The 4th pre-draft « Verification methods for thermocouples » was elaborated by Sr 9 and will be submitted for approval to the pilot secretariat during 1984.

SP 13 - Measurement of electrical and magnetic quantities

The CIML has instructed the Bureau to study, in liaison with the Member States concerned, the range of subjects covered by the pilot secretariat with reference to the IEC activities.

Sr 1 considers that international compatibility of primary standards is not an OIML activity and has suggested that work on this subject be discontinued.

Sr 2 considers that OIML work on wattmeters should be discontinued.

Sr 4 has prepared the 5th pre-draft RI « Electrical measuring instrument transformers » which has been distributed to the collaborators for comment.

Sr 5 and Sr 7 are elaborating the 2nd drafts :

« Electrical measuring instruments indicating voltage, current and frequency »

and « Terminology relating to the measurement of magnetic and electrical quantities ».

SP 14 - Acoustics and vibration

The draft « Sound level meters » prepared by Sr 1 was provisionally adopted by the International Committee and was published as RI 58 ; it will be submitted to the 7th International Conference for sanction.

Sr 2 is cooperating closely with ISO/TC 43 and IEC/TC 29. A revision of IEC 645 « Audiometers » is being undertaken with special reference to requirements of legal metrology and later use of the final document as an OIML Recommendation.

SP 15 - Optics

Sr 1 has finalized a draft RI on dioptrometers. This draft was sent directly to the CIML members for a postal vote before submission to the 7th International Conference for sanction.

SP 16 - Ionizing radiation

Sr 1 has been awaiting the publication of IEC 731 on the assumption that this document could form the technical basis of an OIML Recommendation. This standard is now available and the work of Sr 1 is expected to proceed.

The 2nd pre-draft for secondary standard dosimetry laboratories, prepared by Sr 2 was discussed during a meeting in Budapest, April 1983. The draft, with some modifications, was accepted and submitted to the pilot secretariat for approval.

SP 17 - Measurement of pollution

The pilot secretariat and its reporting secretariats will meet in Paris, May 1984.

Sr 1 has developed the 1st pre-draft RI for instruments measuring the content of CO in exhaust gases from motor vehicles.

Sr 2 is preparing a pre-draft on gas chromatograph mass spectrometers used in monitoring water pollution.

Sr 3 is preparing a pre-draft on chromatographs used in monitoring pesticide and toxic substance pollution.

These pre-drafts will be circulated for comment to collaborating members, early 1984.

SP 18 - Measurement of characteristics of food products

The draft RI « Moisture meters for cereal grains and oil seeds » was provisionally adopted by the International Committee and was published as RI 59 ; it will be submitted to the 7th International Conference for sanction.

Sr 5 was dissolved by CIML decision at the 19th meeting, May 1983.

Sr 7 intends to distribute the 1st pre-draft on refractometers for measuring the sugar content in fruit juices to the collaborating members during 1984.

SP 19 - Measurement of characteristics of materials

Sr 1 has stated that international force comparisons are proceeding within the framework of other international institution (BIPM, IMEKO) and therefore suggests that within OIML, work on this subject be discontinued.

The pilot secretariat and Sr 2 have met in Paris, June 1983. Taking into account the decisions of that meeting the reporting secretariat has finalized the draft RI's « Material testing machines - general » and « Materials testing machines - tension and compression » ; the drafts were sent out for a postal vote to CIML members before submission to the 7th International Conference for sanction. Sr 2 continues its preparations of the 4th pre-draft for instruments for verifying the force indication of materials testing machines.

Sr 3 is considering a revision of RI's 9 to 12 on hardness blocks and is at present awaiting the outcome of relevant ISO activities.

Sr 4 has completed the 1st stage of the intercomparison of national hardness reference scales, Rockwell-C and Vickers HV 30 ; the 2nd stage under the responsibility of Japan is planned for 1984.

The draft RI « Performance characteristics of metallic resistance strain gauges », prepared by Sr 5 was sent out for a postal vote to the CIML members before submission to the 7th International Conference for sanction.

Sr 6 has prepared the 3rd pre-draft DI « Terminology of hardness testing » ; the pre-draft was agreed by the collaborating members and will be submitted to the pilot secretariat for approval.

SP 20 - Prepackaged products

The pilot secretariat and its reporting secretariats held meetings in Berne, June 1983. The 1st pre-draft « Information on package labels » prepared by Sr 1 and the document « Guiding principles concerning sampling of prepackaged products » prepared by Sr 2 were discussed. The reporting secretariats have developed the 2nd editions of these documents for consideration during the next meeting also in Berne, June 1984. A new reference sampling scheme elaborated by Sr 2 will be submitted for discussion.

SP 21 - Standardization of metrological characteristics of measuring instruments

Sr 1 and Sr 2 have finalized the draft DI's « General characteristics of measuring instruments » and « Dynamic characteristics of measuring instruments » respectively, as well as the Appendix « Informative material ». Both drafts were sent out to CIML members for adoption.

Sr 4 has completed its study on the metrological characteristics of measuring systems and is elaborating the 1st pre-draft.

Sr 5 is continuing its work on the preparation of the 3rd pre-draft « Requirements for methods of control of metrological characteristics of measuring instruments ».

Sr 6 has completed the 1st pre-draft « Experimental determination of metrological characteristics of measuring systems. Basic principles ».

SP 22 - Principles of metrological control

The pilot secretariat and its reporting secretariats will meet in Koblenz, April 1984.

Sr 1 has prepared the 4th pre-draft DI « Fields of use of measuring instruments subject to metrological control ».

Sr 2 has finalized a pre-draft « Principles for the selection of characteristics for the examination of ordinary measuring instruments » ; this draft will be submitted to the pilot secretariat for approval at the meeting in April.

Sr 3 dealing with principles of pattern evaluation, Sr 4 dealing with principles of initial and subsequent verification, and Sr 6 dealing with metrological assurance have developed pre-drafts on these subjects, which were distributed for comment to the collaborating members and will be discussed during the meeting in April.

Sr 5 has elaborated a draft DI « Principles of metrological supervision ». This draft was approved by the pilot secretariat and was adopted by the International Committee ; it will be published as DI 9.

SP 23 - Methods and means used for certification of verification devices

Sr 2 has finalized the draft DI « Principles concerning choice, official recognition, use and conservation of measurement standards ». This draft was adopted by the International Committee and will be published as DI 8.

The draft DI « Documentation for measurement standards and calibration devices » elaborated by Sr 3 and adopted by the International Committee was published during 1983 as DI 6.

SP 26 - Measuring instruments used in the field of health

Sr 1, Sr 2 and Sr 3 have carried out a consultation by correspondence and during 1984 intend to develop draft RI's as follows :

Sr 1 — « Instruments for counting blood cells »

Sr 2 — « Pipettes for mixing blood samples »

Sr 3 — « Westergren tubes for measuring the sedimentation rate of blood ».

Sr 4 has elaborated draft RI's on electrocardiographs and electroencephalographs, and submitted them to the pilot secretariat for approval. The secretariat also prepared a 2nd pre-draft DI « Instruments for measuring bio-electrical quantities. Metrological characteristics subject to standardization and methods of their representation ».

Sr 5 intends to start its work in the field of hematology in 1984.

SP 27 - Reference materials

Sr 1 will investigate the possibility of including the terms and definitions concerning certified reference materials in the OIML Vocabulary.

Sr 3, Sr 4 and Sr 5 have considered the comments received and following the BIML proposal decided to combine their pre-drafts into one document « General principles for the use of certified reference materials in measurement ».

Sr 6 has decided to defer the work on the contents of certificates for reference materials ; the secretariat is cooperating in the revision of the ISO/REMCO Guide 31.

Sr 7 intends to re-evaluate the need for OIML work on the procedures and practice of comparison of reference materials.

SP 30 - Physico-chemical measurements

The pilot secretariat and Sr 2, Sr 9 and Sr 10 held meetings in Tbilissi, end of May 1983.

Sr 1 contemplates to carry out an intercomparison of national standards of pH units and consideration is being given to the preparation of a pre-draft on the verification of pH meters.

The draft RI « Calibration method for conductivity cells » prepared by Sr 2 was approved by the pilot secretariat and was sent out for a postal vote to the CIML members before submission to the 7th International Conference for sanction. The secretariat intends to develop a pre-draft on the measurement of conductivity of electrolytic solutions.

Sr 3 intends to prepare new pre-drafts, taking into account the comments received, as follows :

5th pre-draft « Practical scale for relative humidity of air »

and 4th pre-draft « International psychrometric tables ».

The draft RI « Wood moisture meters » prepared by Sr 4 was approved by the pilot secretariat and was sent out for a postal vote before submission to the 7th International Conference for sanction. During 1984 the secretariat intends to elaborate a pre-draft on the verification of moisture meters.

Sr 6 is preparing the 4th pre-draft « Hierarchy scheme for instruments measuring the humidity of gases » to be discussed during a meeting planned for the end of 1984. The secretariat also intends to prepare a 2nd predraft « Test methods for psychrometers ».

Sr 9 has finalized the draft RI « Glass capillary viscometers for the measurement of kinematic viscosity. Verification method » ; the draft was approved by the pilot secretariat and was sent out for postal voting before submission to the 7th International Conference for sanction. The draft DI on the hierarchy scheme for instruments measuring the viscosity of liquids was also approved by the pilot secretariat and will be submitted to the International Committee for adoption in 1984. In addition, the secretariat intends to elaborate a 1st pre-draft on standard liquids used for the calibration and verification of viscometers.

Sr 10 has finalized the following two drafts :

« Requirements concerning CO, CO_2, CH_4, H_2, O_2 and N_2 pure gases intended for the preparation of reference gas mixtures »

and « Method for the determination of intrinsic and hysteresis errors of gas analyzers during verification ».

Both drafts were approved by the pilot secretariat and were sent out for a postal vote before submission to the 7th International Conference for sanction. Taking into account the comments received the secretariat intends to prepare two new pre-drafts concerning the methods and devices for the verification of automatic instruments measuring the concentration in the atmosphere of SO_2 and CO, respectively.

Sr 12 is continuing the study of explosimeters with reference to the work of CENELEC/SC 31/9.

SP 31 - Teaching of metrology

The pilot secretariat and its reporting secretariats Sr 1 and Sr 2 will meet in Paris, April 1984.

Sr 1 has finalized the draft DI « Recommended qualifications of metrology engineers » ; this draft was approved by the pilot secretariat and was submitted to the International Committee for adoption. The reporting secretariat has also developed the 1st pre-drafts, for discussion in April, as follows :

« Typical programme of the basic metrology course for engineers » and

« Glossary of terms and definitions in the field of training and upgrading of metrologists ».

Sr 2 has elaborated the 2nd pre-drafts for DI's concerning training of technicians. The new pre-drafts have the following titles :

« Qualifications demanded of legal metrology technicians » and

« Basic training of legal metrology technicians ».

INFORMATIONS

NOUVELLES ADHESIONS

Le début de l'année 1984 a été marqué par l'adhésion à l'OIML de deux Etats, tous deux du continent Sud-Américain :

au titre d'Etat Membre : le BRESIL,

au titre de Membre Correspondant : le PEROU.

Ces nouvelles adhésions portent à 71 le nombre des Etats Membres et Correspondants de l'OIML.

MEMBRES DU COMITE

Nous avons été informés de la nomination de Monsieur Anthony McGRATH en tant que nouveau représentant de l'IRLANDE en remplacement de Monsieur M. FAHY.

Par ailleurs, le Membre du Comité représentant le BRESIL, nouvel Etat Membre, sera désigné ultérieurement.

INDEX DU BULLETIN

Nous signalons qu'il existe un index des articles du Bulletin de l'OIML du N° 1 (1960) au N° 89 (1982).

Cet index se compose de deux parties :

— la première énumérant les sujets et indiquant pays, auteurs, N° du Bulletin, mots-clefs des titres, langues et années,

— la deuxième reprenant la série des numéros des Bulletins et indiquant les titres complets des articles.

Des exemplaires en nombre limité peuvent être obtenus en s'adressant au BIML.

IMEKO

CONFERENCE TC 3 : Récents progrès dans la technologie du pesage et dans le mesurage des forces.

Cette Conférence à Kobe, Japon, du 11 au 14 septembre 1984 est prévue sous les auspices du Comité Technique TC-3 de l'IMEKO : Mesurage des forces et des masses, et est organisée par la « Society of Instrument and Control Engineers of Japan ».

Les demandes de renseignements peuvent être adrssées à IMEKO TC-3, Kobe Conference/84 Secretariat, Attn Mr M. Namiki, The Society of Instrument and Control Engineers, 35-28-303, Hongo 1-chome, Bunkyo-ku, Tokyo, 113 Japon.

SYMPOSIUM IMEKO : Le mesurage de la température dans l'industrie et les sciences.

En coopération avec le comité national IMEKO de la R.D.A., WGMA (Scientific-Technical Society for Measurement Technology and Automation in the KDT Chamber of Technology), le Comité Technique TC 12 organisera son second Symposium sur le mesurage de la température dans l'industrie et les sciences en République Démocratique Allemande, du 16 au 18 octobre 1984, à Suhl.

Les demandes de renseignements concernant l'organisation de ce Symposium et les participations provisoires peuvent être adressées à : Kammer der Technik, Dipl.-Ing. U. Hartung, Thälmannplatz 4, DDR-6000 Suhl.

INFORMATION

NEW ADHESIONS

The beginning of the year 1984 was marked by the accession to OIML of two States, both from the South-American continent :

BRAZIL as a Member State,

PERU as a Corresponding Member.

These new accessions bring the number of OIML Member States and Corresponding Members to 71.

COMMITTEE MEMBERS

We have been informed of the nomination of Mr Anthony McGRATH as the new representative for IRELAND, replacing Mr M. FAHY.

The Committee Member to represent BRAZIL, the new Member State, will be nominated shortly.

BULLETIN INDEX

We would like to point out that BIML has prepared an index of the articles in the OIML Bulletins from No 1 (1960) to No 89 (1982).

This index comprises two parts :

— the first part arranged by subject and indicating country, author, No of Bulletin, key words of the head line, language and year,

— the second part arranged according to the numbers of the Bulletin and indicating complete head lines of the articles.

A limited number of copies can be obtained by writing to the Bureau.

IMEKO

CONFERENCE TC-3 : Recent Advances in Weighing Technology and Force Measurement

This conference at Kobe, Japan on 11-14 September 1984 is sponsored by the IMEKO Technical Committee TC-3 on Measurement of Force and Mass and organised by the Society of Instrument and Control Engineers of Japan.

Inquiries should be directed to : IMEKO TC-3 Kobe Conference/84 Secretariat, Attn Mr M. Namiki, The Society of Instrument and Control Engineers, 35-28-303, Hongo 1-chome, Bunkyo-ku, Tokyo, 113 Japan.

IMEKO SYMPOSIUM : Temperature Measurement in Industry and Science

The TC-12 will organise, in co-operation with the national IMEKO member organisation of the GDR, the WGMA (Scientific-Technical Society for Measurement Technology and Automation) in the KDT (Chamber of Technology), its 2nd Symposium Temperature Measurement in Industry and Science in the German Democratic Republic. It will take place from 16-18 October 1984 in Suhl.

Inquiries concerning the organisation of the symposium, and provisional application, should be directed to : Kammer der Technik, Dipl.-Ing. U. Hartung, Thälmannplatz 4, DDR-6000 Suhl.

REUNIONS

	Groupes de travail	Dates	Lieux
SP 2 - Sr 4	Reconnaissance internationale des contrôles et des marques de vérification	29-30 mars 1984	PARIS, BIML
SP 31	Enseignement de la métrologie	2-3 avril 1984	PARIS FRANCE
SP 12 - Sr 6	Pyromètres optiques	4-6 avril 1984	LENINGRAD U.R.S.S.
SP 22 et ses	Secrétariats-rapporteurs Principes du contrôle métrologique	9-13 avril 1984	COBLENCE R.F. d'ALLEMAGNE
SP 5 - Sr 8	Réservoirs de stockage	4-9 juin 1984	CONSTANTZA ROUMANIE
SP 5 - Sr 9	Camions et wagons citernes		
SP 5 - Sr 10	Péniches et navires citernes		
SP 5 - Sr 11	Dispositifs de repérage des niveaux de liquides dans les réservoirs		
SP 20	Produits préemballés	5-8 juin 1984	BERNE SUISSE
SP 20 - Sr 1	Contenu informatif de l'étiquetage		
SP 20 - Sr 2	Vérification des quantités contenues dans les emballages		
SP 7 - Sr 4	Instruments de pesage à fonctionnement non automatique	13-15 juin 1984	BERGEN NORVEGE
SP 2 - Sr 6	Instruments électroniques.	18-20 juin 1984	AMSTERDAM PAYS-BAS
SP 7 - Sr 2	Instruments de pesage. Dispositifs électroniques	21-22 juin 1984	AMSTERDAM PAYS-BAS
SP 17 et ses	Secrétariats-rapporteurs Mesure des pollutions	25-29 juin 1984	PARIS, BIML
SP 5 - Sr 13	Compteurs et ensembles de mesure de liquides autres que l'eau à chambres mesureuses ou à turbine	automne 1984 *(provisoire)*	PARIS FRANCE
SP 6 - Sr 3	Voludéprimomètres pour gaz		
SP 5 - Sr 3	Mesures de volume pour laboratoires	4ème trimestre 1984 *(provisoire)*	ROYAUME-UNI
SP 5 - Sr 16	Compteurs d'eau		
SP 7 - Sr 5	Instruments de pesage à fonctionnement automatique	fin 1984 ou début 1985 *(provisoire)*	ROYAUME-UNI
SP 30 - Sr 6	Hygrométrie de l'air et des gaz	fin 1984 *(provisoire)*	TCHECOSLOVAQUIE

Conseil de Développement	5-6 avril 1984	PARIS, BIML
Septième Conférence Internationale de Métrologie Légale	1-5 oct. 1984	HELSINKI FINLANDE
Vingtième Réunion du Comité International de Métrologie Légale		

CENTRE DE DOCUMENTATION

Documents reçus au cours du 1er trimestre 1984

BUREAU INTERNATIONAL DES POIDS ET MESURES — BIPM

Comité consultatif de photométrie et radiométrie
10ème Session - 28-30 sept. 1982

ORGANISATION INTERNATIONALE DE NORMALISATION — ISO

Rapport d'Activité 1982-1983 (fr. et ang.)

ORGANISATION DES NATIONS UNIES POUR L'EDUCATION, LA SCIENCE ET LA CULTURE — UNESCO

Comptes rendus des débats de la quatrième session extraordinaire de la Conférence Générale, Vol. 3 - Paris, 1982

CONFERENCE DES NATIONS UNIES SUR LE COMMERCE ET LE DEVELOPPEMENT — CNUCED

Manuel de statistiques du commerce international et du développement, 1983

COMMONWEALTH SCIENCE COUNCIL — CSC

CSC Technical Publication Serie N° 136 : Asia/Pacific Metrology Programme - Report of the fifth Steering Committee Meeting, 12-14 sept. 1983 : Beijing, China (CSC (83) MS-22)

CONSEIL D'ASSISTANCE MUTUELLE ECONOMIQUE — SEV

Ukazatel' Standartov SEV, 1983

AFRIQUE DU SUD

Council for Mineral Technology
Special Publication N° 4 : A manual of analytical methods used at Mintech (by H. Stoch and K. Dixon, 1983)

REPUBLIQUE FEDERALE D'ALLEMAGNE

Physikalisch- Technische Bundesanstalt
Eichordnung : Fünfte Verordnung zur Änderung vom 15-12-1982
PTB-Publications : translations of metrological literature (Juni 1983)
PTB-Prüfregeln Band 2 : Termometros de vidrio con liquidos (traduction en espagnol, 1983)
PTB-Prüfregeln Band 6 + Anhang : Electricity Meters (traduction en anglais, 1983)
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PTB-Prüfregeln Band 15 : Manometros Hidraulicos (traduction en espagnol, 1983)

Friedr. Vieweg & Sohn
Grundbegriffe des Mass- und Eichwesens
(E. Seiler, 1983)

AUSTRALIE

National Standards Commission
Regulation 9 + General Certificate of approval N° 9/0/A (8-1983) : Vehicle tanks of capacities 0.5 to 100 kilolitres
Document 113 (Dec. 1983) : Procedures for the submission and testing of weighing-in-motion systems
Document 117 (Dec. 1983) : Design rules for weighing-in-motion systems for trade use

AUTRICHE

Bundesamt für Eich- und Vermessungswesen

Amtsblatt für das Eichwesen Nr 5-8/1983

Beglaubigungsvorschriften für Normalgewichtsstücke der Genauigkeitsklassen N und NN vom 10-8-1983

Vergütungen für Beglaubigungen vom 28-9-1983

Vergütungen im Physikalisch-technischen Prüfungsdienst vom 28-9-1983

ETATS-UNIS D'AMERIQUE

National Bureau of Standards

NBS Handbook 44 (1984) : Specifications Tolerances, and other Technical Requirements for Weighing and Measuring Devices

NBS Handbook 130 (1984) : Uniform Laws and Regulations

National Academy of Sciences/National Research Council

Research concerning Metrology and Fundamental Constants, 1983

American National Standards Institute

ANSI Reporter, published biweekly
depuis le Vol. 17, N° 25 (Déc. 1983)

FINLANDE

Teknillinen Tarkastuslaitos

Mittauspaikkakalenteri (Directory of Measurement Services in Finland), Helsinki 1983

FRANCE

Réglementation Métrologique

Décret n° 83-567 du 26-7-1983 : Ressort territorial des Services extérieurs

Décret n° 83-568 du 27-6-1983 : Directions régionales de l'Industrie et de la Recherche

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Dienst van het IJkwezen

IJkwetgeving I : Aanvulling Nr. 32 (Jan. 1984)

IJkwetgeving IIa : Aanvulling Nr. 4 (Dec. 1983)

POLOGNE

Polski Komitet Normalizacji, Miar i Jakosci

Katalog Polskich norm 1982, Dodatek

Katalog Norm Branzowych 1983, Tom 1, 2

PORTUGAL

Direcçao-Geral da Qualidade

Décret-loi N° 165/83 du 27-4-1983 : Organisation du système national de gestion de la qualité (en français)

ROYAUME-UNI DE GRANDE-BRETAGNE ET D'IRLANDE DU NORD

National Weights and Measures Laboratory

Statutory Instruments 1983 N° 1653 : Weights and Measures - The Weights and Measures (Local and Working Standard Weights and Testing Equipment) Regulations 1983

SI 1983 N° 1654 : Weights and Measures - The Weights and Measures (Local and Working Standard Capacity Measures) Regulations 1983

SI 1983 N° 1655 : Weights and Measures - The Capacity Measures (Intoxicating liquor) Regulations 1983

SI 1983 N° 1656 : Weights and Measures - The Measuring Equipment (Intoxicating liquor) Regulations 1983

Doc 7110 (Dec. 1983) : Specification for Local standards of mass (supersedes SWM 255 (R), Sept. 1969)

Doc 7120 (Dec. 1983) : Specification for working standard weights and test weights (supersedes in part WM 244 Dec. 1970)

Doc 7310 (Dec. 1983) : Specification for Local standards of capacity - Glass delivery Measures (Automatic Pipettes) (supersedes SWM 251, Dec. 1963)

Doc 7320 (Dec. 1983) : Specification for working standards of capacity - Glass volumetric flasks (supersedes SWM 259, July 1965 ; SWM 265, Jan. 1971 ; SWM 269, Feb. 1980)

SUISSE

Mettler Instruments AG

Dictionnary of Weighing Terms (A practical guide to the terminology of weighing), 1983

URSS

Gosudarstvennyi Komitet SSSR po Standartam

(Traductions en russe) :

Mode de travail des Secrétariats de l'OIML
Liste des Secrétariats de l'OIML
D.I. N° 1 : Loi de métrologie
D.I. N° 3 : Qualification légale des instruments de mesurage

RECOMMANDATIONS INTERNATIONALES

R.I. N°

— Vocabulaire de métrologie légale (termes fondamentaux)
Vocabulary of legal metrology (fundamental terms)

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 machines

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)

8 — Voir RI 59
See RI 59

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 (instruments usuels)
Indicating pressure gauges, vacuum gauges and pressure-vacuum gauges (ordinary instruments)

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

19 — Manomètres, vacuomètres, manovacuomètres enregistreurs (instruments usuels)
Recording pressure gauges, vacuum gauges, and pressure-vacuum gauges (ordinary instruments)

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 (système 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
Alcoholometers and alcohol hydrometers

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

* Projet adopté par le CIML - mai 1983.
A sanctionner par la Septième Conférence - octobre 1984.
Draft adopted by the CIML - May 1983.
To be sanctioned by the Seventh Conference - October 1984.

DOCUMENTS INTERNATIONAUX

D.I. 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

Note — Recommandations internationales et Documents internationaux peuvent être acquis au *International Recommendations and International Documents may be purchased from* Bureau International de Métrologie Légale, 11, rue Turgot, 75009 PARIS.

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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 excepted 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.

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