



International Working Group: OIML TC 3 *Metrological Control*

Maison de la Chimie, Paris, 1–3 June 1999

Secretariat: United States of America

Chairman: Sam Chappell

Participation: Forty delegates representing nineteen OIML Member States, one Corresponding Member, the OIML Development Council, one liaison organization and the BIML, as detailed below

P-members: Australia, Belgium, Bulgaria, P.R. of China, Czech Republic, Denmark, France, Germany, Japan, Netherlands, Norway, Poland, Russia, Sweden, United Kingdom, USA

O-members: Finland, Slovakia, Switzerland

OIML Corresponding Member: Albania

Liaison institution: CECIP

OIML Development Council: Tunisia

Objective:

To discuss the fourth draft OIML Document *Mutual Acceptance Agreement on OIML Pattern Evaluation* and to provide a status report on the work of OIML TC 3 *Metrological Control*

Discussion topics reported on:

- 1 TC 3/SC 5 *Conformity Assessment*
- 2 Fourth Draft OIML Document *Mutual Acceptance Agreement on OIML Pattern Evaluation*
- 3 *Expression of Uncertainty in Measurement*
- 4 *Reports on the Status of Work*
- 5 *Resolutions of the Meeting*



Forty delegates attended the OIML TC 3 meeting in Paris, chaired by Sam Chappell (OIML Vice-President)

1 TC 3/SC 5 Conformity Assessment

Prior to the meeting, the Secretariat distributed a ballot to P-members for comment and vote on the establishment of a new subcommittee TC 3/SC 5 *Conformity Assessment*, whose objective would be to establish rules and procedures for fostering mutual confidence in the results of testing measuring instruments under legal metrology control among OIML Member States. The USA and the BIML were proposed to hold the joint Secretariat for TC 3/SC 5.

The results of the ballot were as follows: 22 out of the 24 ballots were returned (missing: Austria and France) with 20 “Yes” votes and 2 abstentions (Germany and Norway). Written comments on the ballot were received from Australia, Germany and the United Kingdom. Of those who responded, 18 Member States registered to become P-members and 7 as O-members. It was declared that TC 3/SC 5 could be established subject to CIML approval.

During the meeting, the following projects were identified as to be maintained:

- Document on the *OIML Certificate System for Measuring Instruments*;
- Draft Document on *Mutual Acceptance Agreement on OIML Pattern Evaluation*; and
- Working Draft Document on the *Expression of Uncertainty in Measurement in Legal Metrology Applications*.

2 Fourth Draft OIML Document *Mutual Acceptance Agreement on OIML Pattern Evaluation*

The fourth draft Document was reviewed clause by clause and the following principal changes were agreed upon:

- the requirements for participation should be clearly expressed in the Scope and elsewhere where appropriate;
- provision should be made for OIML Member States to indicate that they would accept certificates of conformance issued under the Agreement;
- both the evaluation body and the certification body should be assessed for competence;
- accreditation or peer review could be used to assess competence for the purpose of establishing mutual confidence;
- requirements for establishing competence should be equivalent for either process;

- assessment teams should be made up of experts for testing the category of instruments addressed and at least one quality systems expert; and
- the *Questionnaire on National Capabilities*, Annex C in the Draft Document, should be made generic.

It was agreed that supplementary Documents needed to be developed for assessing the competence of participants. Such Documents should be based on existing or draft ISO/IEC Guides and Standards in which the relevant legal metrology applications would be addressed. The following were identified:

- ISO DIS 17025 *General Requirements for the Competence of Testing and Calibration Laboratories*. G. Lagauterie provided a complementary text for interpreting the requirements as applied to pattern evaluation in legal metrology;
- ISO/IEC Guide 65 *General Requirements for Bodies Operating Product Certification Systems*. John Birch, assisted by the secretariat, will investigate the status of this Guide and recommend how an interpretation document should be developed as applied to certifying bodies issuing certificates under the agreement; and
- ISO/IEC Guide 68 *Considerations on Entering into Mutual Recognition Agreements and EA-2/02 EA Policy and Procedures for the Multilateral Agreement* (November 1998). G. Engler agreed to seek permission from his management to develop criteria for assessment teams that would evaluate participants in the Agreement.

3 Expression of Uncertainty in Measurement

A second Working Draft Document on the *Guide for Considering Measurement Uncertainty in Legal Metrology* by G. Lagauterie had been distributed together with comments by the USA prior to the meeting. The topic of uncertainty was discussed in presentations as follows:

- K. D. Sommer gave a presentation on *Uncertainty in Measurement* in which he addressed the approach for expressing uncertainty separately for “calibrated” and “verified” measuring instruments (see **technique**);
- S. Chappell gave a presentation on “Traceability in Measurement” and its importance in establishing confidence in measurement at international level and its influence on the definition of uncertainty for legal metrology applications; and
- G. Lagauterie presented a paper with examples for fluid measuring instruments to supplement the approach taken in the working draft. The title of the paper was *Origins of measurement uncertainties when calibrating or verifying a measuring instrument*.

It was agreed to continue the work in developing an OIML Document on the *Expression of Measurement Uncertainty in Legal Metrology Applications*. A task group with representatives from France, Germany and the USA was identified to continue the effort. Others having an interest were invited to participate and should identify themselves.

4 Reports on the Status of Work

Written reports were provided by the Secretariats on the status of the work of the following subcommittees:

- TC 3/SC 1 *Pattern Approval and Verification* (USA);
- TC 3/SC 2 *Metrological Supervision* (Czech Republic);
- TC 3/SC 3 *Reference Materials* (Russian Federation); and
- TC 3/SC 4 *Statistical Methods* (Germany)*.

Time did not permit a discussion of these reports, but copies may be obtained from the BIML on request.

5 Resolutions of the Meeting

1. According to the response to the ballot of P-members, TC 3/SC 5 *Conformity Assessment* was approved by TC 3 to be established with the co-Secretariat of the USA and the BIML.
2. The minutes of the meeting to record the major points of the discussions will be prepared by the Secretariat and distributed to all participants within one month.
3. Written comments by participants on the 4th draft OIML Document *Mutual Acceptance Agreement on OIML Pattern Evaluation* should be submitted to the Secretariat by no later than July 15, 1999.
4. On the basis of the discussions held at the meeting and the written comments received, the Secretariat will prepare a 5th draft OIML Document for distribu-

tion to collaborators in the work of OIML TC 3/SC 5 by August 15, 1999.

5. At its October meeting, the CIML will be provided with a report on the proposal to establish OIML TC 3/SC 5 and its objectives, scope and work program. The CIML will be requested to endorse the work.
6. An interpretation Document shall be developed by a task group on the application of the ISO DIS 17025 to laboratories performing "pattern approval tests" in legal metrology. Comments on the initial draft on this subject should be submitted to Mr. Lagauterie and the Secretariat by no later than July 15, 1999.
7. An interpretation Document shall be developed by a task group on the application of the ISO/IEC Guide 65: 1996 *General Requirements of Bodies Operating Quality Product Certification Systems* to national responsible bodies performing pattern evaluation and/or issuing "certificates of pattern approval" in legal metrology.
8. A task group consisting of representatives from France, Germany and the USA was requested to develop a new draft on the "expression of uncertainty" as applicable in legal metrology based on the discussions held at the meeting. ■



Sam Chappell

* Since TC 3/SC 4 is to restart its activities under the responsibility of Germany, a full report is printed overleaf



Status Report: **TC 3/SC 4 Application of statistical methods for measuring instruments**

1 Preliminary remarks

At the 33rd CIML Meeting in Seoul Prof. Kochsiek agreed that Germany should take on the chairmanship of TC 3/SC 4 *Application of statistical methods*.

Statistical control methods in legal metrology are urgently needed (and indeed already widely discussed) in connection with a number of International Recommendations; below are some suggestions as to how this subject could be dealt with in the future.

2 Statistical control methods in legal metrology

Statistical sampling methods are a compromise between the (reduced) accuracy of an estimation and the whole entity of a test as would be necessary for a complete or individual test. Statistical control methods may also be considered as quality assurance measures taken in differing cases, i.e.:

- preventive assessment with a view to future use;
- follow-up assessment on whether the given characteristics were actually met.

A different case is the assessment of measuring devices already in use, for example electricity meters. In this case it is possible to examine by sampling inspection whether, after several years of operation, the electricity meters still give measurement results which are so good that the meters may remain part of the electricity supply system for a further time period. In its modified form the sampling plan may provide information about the state of a measuring instrument batch already in use.

As there are a large number of differing applications of statistical methods, a uniform control level should not be assumed. Experience gained from a large variety of measuring instruments has shown that it is more expedient to define individual problems with their own statistical conditions.

For example, where measuring instruments are manufactured in highly automated processes significant statements on measurement parameters may already be made on the basis of internal quality checks. However, where they are manufactured in manual processes other marginal conditions apply which will also have to be taken into consideration by the statistical control methods.

3 Level of protection (essential for the sampling plan)

Similar to a modern production line that is managed using a quality system, quality objectives also have to be initially defined in the legal metrology field.

The concept of a sampling plan aimed at either acceptance or rejection will always be oriented to such quality objectives, i.e. the level of requirements. For example, where measuring instruments subject to legal control do not meet the relevant requirements, economic disadvantages for the supplier or the consumer, health risks or safety problems may arise.

These shortcomings have to be weighted according to their significance and are to be taken into consideration in the testing procedure. Wherever the highest level is to be achieved the individual control of each measuring instrument with the corresponding workload involved will be necessary. However, in many cases it will be expedient to specify the control level in accordance with the application of the unit under test in order to optimize the cost-benefit ratio - meaning to adapt the scope of control to the metrological needs. Hence, statistical tests at a statistically calculated protection level will generally be possible and will make sense. On the other hand this will mean that the measuring instrument manufacturer will have to orientate his quality system to the protection level required by legal metrology.

4 Fundamental assessment situations

Statistical tests at a corresponding protection level are conceivable as follows:

- A batch of new measuring instruments is to be used for the first time in the legal sphere.

Statistical assessment considers the new state of the instruments, which have to comply with a given pattern and which are assessed according to the characteristics of the pattern. The sampling plan will take into account which batch qualities will imply definite acceptance and which will imply definite rejection. The acceptance and rejection characteristics have to be clearly and basically defined; rejection of the batch will (in the worst case) lead to a marketing prohibition which may, however, be repealed if the instruments are repaired.

- A batch of instruments has been in use for a longer period of time. Within the framework of a market surveillance it is to be assessed whether the batch does in fact fulfil the requirements to be met for the application, or the batch condition is to be analyzed.

In such a case it will be necessary to apply a satisfactory separation method on the basis of an appropriate sampling plan to achieve an effective separation of good and bad batches. Due to the fact that the instruments are already in use, the whole sampling procedure becomes more complicated since the application conditions as well as the operational influences will be taken into account by the procedure.

- If it becomes obvious during such a procedure that the batch does not meet the legal requirements, this might have the consequence that the batch may no longer be used. By further analysis such statistical controls may provide suitable results on the duration period of a batch in use and on a sensible scope of error limits.
- On the basis of a sample it is to be checked whether legal requirements are met or not. In the latter case the result will lead to measures such as warnings or fines being imposed on the responsible person, for which the assumption of an offence has to be reliable (statistical reliability e.g. $\geq 95\%$).

A test result produced on the basis of statistics can result in legal action being taken only after it has been corrected by the statistical uncertainty. Besides, the rejection of such a batch may lead to a marketing or use prohibition.

5 Possible action to be taken in TC 3/SC 4

It has to be assumed that the various OIML Member States have differing ideas on the effect of sampling procedures. Here, even further-reaching methods than those mentioned above are conceivable.

Therefore it has to be one of the predominant tasks in determining the scope of TC 3/SC 4 to define the subject in such a way that the participating countries' ideas on the system will be taken into consideration. In this connection the definition of the framework conditions to be taken into account in the drawing up of such plans is more important than the establishment of specific sampling plans. Here, guidelines for the protection level to be considered for the various fields in legal metrology have to be particularly mentioned. Questions to be asked in this context are:

- Which percentage of a batch to be used may exceed the maximum permissible errors (mpe) on verification or in service respectively, and which percentage may be tolerated or not in case of component failures?
- Which percentage of a batch may exceed the mpe on testing at the end of an application period?
- What statistical reliability (99.5 %, 99 %, 95 %) has to be prescribed for which measuring instruments and for which applications?
- What rejection rate may not be exceeded by the manufacturer of certain measuring instruments within the framework of his quality assurance measures?

If such requirements are satisfactorily defined, principles for the establishment of sampling plans may be derived. Undoubtedly, individual testing plans will have to be developed for individual categories of measuring instruments which should, however, be oriented towards the fundamental guidelines.

6 Further action

Once TC 3/SC 4 has elaborated the principles for statistical control methods, the testing plans appropriate for the relevant categories of measuring instruments and their intended use should be further developed within the same subcommittee.

In fact, TC 12 is currently revising OIML R 46 on electricity meters. However, the statistical control plans elaborated here will also apply to the other line-bound household meters (water, heat, gas), since with the same protection level the same mathematical principles (and formulae) will be applicable. Some experience was already gained in this matter at international level so that TC 3/SC 4 might elaborate the general guidelines and prepare the control plans specific for the use of utility meters.

TC 6 is dealing with prepackages, i.e. the revision of R 87 *Net content in packages*. TC 6 might be the appropriate body to elaborate the statistical methods for the control of net filling quantities, so this will not be a subject to be dealt with under TC 3/SC 4. However, Germany is prepared to cooperate with TC 6.

In order to be able to start work this year, a questionnaire was distributed to OIML Members to ascertain which Member States are willing to participate in TC 3/SC 4 as permanent, active members or observers. ■