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Principles of metrological supervision

Principes de la surveillance métrologique

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ORGANISATION INTERNATIONALE
DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION
OF LEGAL METROLOGY

Foreword

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States.

The two main categories of OIML publications are:

- **International Recommendations (OIML R)**, which are model regulations that establish the metrological characteristics required of certain measuring instruments and which specify methods and equipment for checking their conformity; the OIML Member States shall implement these Recommendations to the greatest possible extent;
- **International Documents (OIML D)**, which are informative in nature and intended to improve the work of the metrological services.

OIML Draft Recommendations and Documents are developed by technical committees or subcommittees which are formed by the Member States. Certain international and regional institutions also participate on a consultation basis.

Cooperative agreements are established between OIML and certain institutions, such as ISO and IEC, with the objective of avoiding contradictory requirements; consequently, manufacturers and users of measuring instruments, test laboratories, etc. may apply simultaneously OIML publications and those of other institutions.

International Recommendations and International Documents are published in French (F) and English (E) and are subject to periodic revision.

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PRINCIPLES of METROLOGICAL SUPERVISION

This International Document contains a survey of principles applied in the exercise of metrological supervision. In every country, metrological supervision must conform to the pertinent laws, regulations, decrees and decisions of competent authorities which, however, differ between individual countries. The aim of this Document is the creation of a basis for the harmonization of this activity at an international level. The concrete forms of metrological supervision in any one country must take into account the economic system of that country, the organization of its legal system, its territorial organization, and also its other features and specific conditions.

The operations outlined in this International Document form a long and comprehensive list. It is by no means suggested that in any one country or case all of them should be followed. In each instance, the most suitable operations must be chosen.

1. Aims and elements of metrological supervision

1.1. Metrological supervision is a technical and administrative activity of competent persons and authorities, the aim of which is to control the observance of metrology laws and regulations.

1.2. Purpose of metrological supervision

Metrological supervision applies generally to:

- units of measurement,
- means of measurement,
- methods of measurement,
- results of measurement,
- measurement personnel,
- other obligations related to metrology determined by laws or regulations (for example: obligation to declare and record, obligation to carry out the controls, to comply with technical standards relating to the measurements and measuring means, etc.).

In relation to measuring instruments, one distinguishes the metrological supervision of:

- measuring instruments subject to verification with or without pattern approval,
- measuring instruments not subject to verification but subject to pattern approval,
- measuring instruments subject to neither verification nor pattern approval,
- standards and testing devices.

A significant and complex part of metrological supervision concerning the results of measurements is the control of prepacked or graded products bearing indications of quantity in units of mass, volume, length, or area or as a number.

1.3. Fields of application of metrological supervision

- manufacture of measuring instruments,
- testing, calibration and verification of measuring instruments,
- correct use and application of measuring instruments,
- maintenance and repair of measuring instruments,
- production, inventory and sale of prepacked or graded products,
- importation of measuring instruments and of prepacked products.

1.4. The metrological supervision may be initiated by:

- administrative actions under laws or regulations (for example: work programme of the organization or person in charge of the supervision, etc.),
- exceptional circumstances (for example : on request, in response to a complaint, because of suspicion or doubt, on instruction).

Once initiated, the supervision activity in relation to a given subject may be:

- continuous,
- periodic,
- irregular or occasional,
- once only.

1.5. External administrative examination with reference to metrological supervision includes a series of operations properly chosen for each case or situation. As an aid to their selection, it is possible to use the following comprehensive list of operations, subdivided into three groups (A, B, C) for better guidance.

A. Legal units, prescribed names and symbols, prescribed markings

Check that:

- A.1. the legal units and their prescribed or authorized multiples or submultiples are used,
- A.2. the correct names of units and the correct prefixes of their multiples and sub-multiples are used,
- A.3. the correct symbols of units, of their multiples and submultiples are used,
- A.4. the accuracy is indicated in the prescribed form, completely, and in the proper place (manufacturer's markings on measuring instruments, tolerances for prepacked products, measurement results, etc.),
- A.5. the names and symbols of the quantities are correct,
- A.6. the name of the measuring instrument is correct,
- A.7. the mandatory information on prepacked products is visible, readable and printed in large enough characters,
- A.8. the mandatory information is in the correct place on the package,
- A.9. the ratio between the contents and the volume of the package is adequate (to avoid «deceptive packages »).

B. Measuring instruments during tests and in use

Check :

- B.1. the legal qualification of the measuring instrument (whether the measuring instrument is or is not subject to mandatory verification),
- B.2. that the measuring instrument conforms to an approved pattern, if applicable,
- B.3. in the case of an imported measuring instrument, that the importation was authorized in conformity with existing legal metrology regulations,
- B.4. that the ordinary measuring instrument was tested or verified (according to its legal qualification) or that the standard was calibrated and has a certificate. Check that, according to the marks and documentation, the verification or calibration is still valid and that it was done in compliance with existing regulations,
- B.5. the presence and completeness of the required verification marks, principal verification mark and protective marks,
- B.6. that the measuring instrument suffered no accidental damage or excessive wear and tear during its use,
- B.7. that the measuring instrument shows no evidence of misuse or deliberate damage likely to influence its metrological qualities,
- B.8. that the measuring instrument is installed in a suitable environment and that the external influence quantities are within the permissible limits (temperature, humidity of the environment, pressure and cleanliness of the environment, vibrations, etc.),
- B.9. that the measuring instrument has been correctly installed and assembled,
- B.10. that the measuring instrument has been adjusted correctly,
- B.11. the completeness and the correctness of the prescribed accessories,
- B.12. the completeness and validity of the documentation prescribed for the measuring instrument,
- B.13. that the measuring instrument is correctly used and/or tested (when being verified or calibrated) (for example : connections, supply, handling, observance of measuring range limits, etc.),
- B.14. the knowledge of the personnel and its qualifications, when prescribed. Also check the authorization of the persons carrying out tests, verifications, and calibrations of the measuring instruments,
- B.15. that the prescribed maintenance is carried out and, when prescribed, also check the qualifications of the maintenance personnel,
- B.16. the manner of conservation or transport of measuring instruments which are not in constant use,
- B.17. that the measuring instrument, its location, and its installation comply with the general technical and safety regulations and with the requirements concerning the protection of the environment.

C. Other operations relating to metrological guarantee

Check :

- C.1. that verified or calibrated measuring instruments are used wherever prescribed by law or regulations,
 - C.2. the observance of requirements concerning possession of standards and testing equipment (verification and calibration devices and facilities, etc.),
 - C.3. the completion of tests and examinations prescribed by law and compliance with the instructions to manufacturers, repairers, importers, and users of measuring instruments,
 - C.4. the observance of prescribed or recommended (at national or international level) measurement methods and procedures and ways of evaluating the measurements,
 - C.5. the observance of the hierarchy of measuring instruments and the traceability of measurement results, where prescribed.
- 1.6. The metrological examination of measuring instruments during metrological supervision includes mainly the following operations:
- D.1. determine, when not otherwise specified, the number of measuring instruments to be examined (for example: all instruments in a lot, or the size of a representative sample); choose an appropriate sampling plan,
 - D.2. determine the manner of examination (in situ, without dismantling and/or at a verification station, after dismantling), specify the method, range, and procedure by which the test must be carried out as well as the testing device to be used,
 - D.3. check the measuring instrument by comparing one or several indications with those of the control measuring instrument, or the standard, or
 - D.4. check the measuring instrument by means of a prescribed, recommended or chosen verification method i.e. a complete, simplified, subsequent or exceptional verification ^(*),
 - D.5. carry out a detailed examination and control of the measuring instrument (quality of the manufacture, conformity with the approved pattern, condition, wear, unauthorized tampering, etc.),
 - D.6. evaluate the results of the metrological examination and formulate a conclusion.

2. Manufacture, repair, and importation of measuring instruments

- 2.1. The general task of the supervision in this field is to verify that manufacturers, repairers, and importers fulfill their obligations under law and regulations. That means, especially:

^(*) Note: certain general requirements concerning verification of measuring instruments are treated by OIML Secretariat SP 22- Sr 2 « Principles of the choice of parameters and characteristics to be verified ».

- the obligation, for the manufacturer, the repairer or the importer to be registered with the competent legal metrology organization, sometimes also to possess an official authorization for this activity,
- the prohibition to manufacture or to import measuring instruments other than of an approved (or authorized) pattern the quality of which corresponds to the prescribed technical and metrological characteristics,
- to carry out the prescribed tests on the manufactured, repaired, or imported measuring instruments and, in consequence, to possess the necessary standards, calibration stations, and documentation (regulations, testing instructions, etc.),
- to provide the measuring instruments with marks, seals, and indications, as well as with all kinds of protection (for transport, storage, use, etc.) and with prescribed documentation,
- to submit for verification the measuring instruments subject to mandatory verification, possibly to take steps to prevent forbidden uses of unverified measuring instruments.

2.2. The activity of supervising organizations in relation to the manufacturer, the repairer, or the importer concerns:

- the technical documentation and, if necessary, the documents of an official, administrative, economic, financial, etc. character,
- the manufactured, repaired, or imported measuring instruments,
- the standards, testing devices and test locations of the manufacturer or the repairer, the level of tests carried out, and the qualification (capability) of the personnel carrying out the tests and controls;

This activity may sometimes involve:

- the control of raw materials, semi-finished products, technological procedures, and construction parts, in order to ensure the uniformity and the necessary stability of the metrological characteristics of measuring instruments,
- the control of the distribution of errors of the verified measuring instruments with the aim of eliminating the biased use of the error limits, i.e. to take unfair advantage of the negative or positive maximum permissible errors,
- the control of the number and nature of the users' complaints concerning the measuring instruments.

2.3. The control of manufactured, repaired, or imported measuring instruments may be carried out before or after their verification (or calibration). In both cases, it may consist in an external administrative examination and/or a metrological examination.

2.4. The operations of the external administrative examination of manufactured, repaired, or imported measuring instruments after their verification (or calibration) are shown in the Table on page 12^(*).

^(*) Note: in administrative examination before initial verification or calibration, some operations are omitted.

2.5. The operations of the metrological control of manufactured, repaired, or imported measuring instruments are given in point 1.6.

3. Users of measuring instruments

3.1. The aim of metrological supervision at the premises of the users of measuring instruments is to control, especially:

- the use of legal measuring instruments, where prescribed, and the submission of instruments to subsequent verification,
- the correctness of the installation, maintenance, or storage of measuring instruments,
- the fulfillment of obligations concerning the control and tests of the ordinary measuring instruments and the provision by the users of necessary standards and calibration devices,
- the compliance with prescribed methods and procedures in making measurements and obtaining measurement results,
- the use of legal units not only in connection with measurements, but also in the technical and official administrative documentation.

3.2. The operations of the external administrative examination of measuring instruments at the users' premises are shown in the Table on page 12, separately for measuring instruments submitted to verification, for measuring instruments not submitted to verification, and for standards and calibration devices.

3.3. The operations of the metrological examination of measuring instruments applied by way of supervision of users of measuring instruments are the following: D.1, D.2, D.3 or D.4 and D.6 - according to point 1.6.

4. Testing, verification and calibration of measuring instruments

4.1. The aim of metrological supervision concerning testing, verification, and calibration of measuring instruments is to check that the following are complied with:

- general requirements determined by law and regulations (qualifications, authorization, obligations, reports, maintenance of registers, etc.),
- technical and metrological regulations determining the procedures used in testing, the characteristics of standards and testing devices, and the qualifications of the personnel,
- all the other requirements necessary to ensure the accuracy and reliability of the test, verification, or calibration results.

The supervision includes both external administrative examinations and metrological examinations.

4.2. The operations of administrative control and external administrative examination of measuring instruments (standards and ordinary measuring instruments) and of testing devices are shown in the Table on page 12.

4.3. The operations of metrological examination according to point 1.6. refer to the tested, verified, or calibrated measuring instruments as well as to the standards and the testing devices used.

5. Prepacked or graded products

5.1. The aim of metrological supervision in this field is to control that the quantity declared on the prepacked product corresponds to the actual contents, within of the permissible errors limits. The quantity in prepacked products is usually expressed y mass, volume, length, area, or as a number. The product itself can be packed (solid and granular materials), filled (liquids) or graded (for example eggs) - automatically, semi-automatically, or manually.

5.2. Supervision of prepacked or graded products is carried out by one or more of the following methods:

- control of samples of the product taken from the production line, stock, or the place of sale,
- control of filling, check grading machines, and other devices used for preparing prepacked and graded products,
- control of measuring instruments and standards used by the manufacturer to check the quantitative results of his package filling process or, possibly, to check the adjustment of the machines.

5.3. Control of the product includes:

- taking of samples,
- administrative examination according to point 1.5., operations A.1 to A.5 and A.7 to A.9, or the control of other data indicated on the label or on the product ^(*),
- measurement of individual pieces of the sample,
- evaluation of the result of control and determination of actions to be taken.

The sample size, the manner, place, and time of sampling and the methods of evaluation of the result of control are determined by national regulations and international recommendations, often in the form of reference methods and model procedures. The selection of a procedure and of a method of evaluation can depend on the aim and object of the control and on specific conditions ^(**).

^(*) Note: the requirements concerning information contained on package labels are treated by OIML Secretariat SP 20-Sr 1 « Information on package labels ».

^(**) Note: in the field of the OIML activities these methods and reference procedures are treated by the Secretariat SP 2-Sr 5 « Control by sampling » and the Secretariat SP 20-Sr 2 «Verification of net content in packages ».

- 5.4. The control of measuring instruments and standards used by the manufacturer to check the accuracy of his package filling or checking process includes:
- initial and subsequent verification of measuring instruments and standards,
 - periodic check of the method and accuracy of their use,
 - inspection of manufacturer's records of their use.

6. Principal legal and administrative aspects of metrological supervision

- 6.1. The authority to carry out metrological supervision, as defined in point 1.1, which is invested in a given supervising body, derives from:
- law and regulations according to the function performed by the supervising body,
 - delegation by a competent institution. This delegation can be permanent, limited in time, or for a single operation.

As stated above, metrological supervising bodies belong, especially to organizations of:

- national metrology,
- competent metrology services,
- centers of industrial metrological services,
- other legally authorized institutions.

- 6.2. Successful performance of metrological supervision requires that supervising bodies are competent and have the necessary means. It is important to assure that the supervising bodies have:

- access to the measuring instruments,
- access to the results of the measurements, including sampling of prepacked products,
- access to the necessary documents and information,
- all facilities necessary to enable performance of tests on selected measuring instruments, etc.

If the competence derived from law and regulations is insufficient, the supervising body must be provided with exceptional and specific authority.

6.3. Metrological supervision includes various administrative activities, for example:

- planning of the operations of metrological supervision,
- preparing and approval of depositions or reports,
- updating of records of the operations carried out and evaluation of metrological supervision, etc.

6.4. Deficiencies noted during a given operation of metrological supervision lead, depending on importance and extent, to the following measures:

- instructions to the person responsible,
- reprimand of the person responsible,
- informing the superior organization or responsible individuals of the deficiencies, requiring that they be eliminated and that consequently, steps be taken with respect to the persons responsible for these deficiencies,
- cancellation of the validity of the verification (or calibration) and prohibition of the use of the measuring instrument, measuring device, etc.
- prohibition of the sale of prepacked products which do not conform to the requirements of regulations,
- decision concerning the confiscation or the destruction of the defective measuring instrument,
- punitive sanctions against the responsible person or organization according to law or regulations.

As appropriate, two or more of these measures may be applied simultaneously.

Operations of the external administrative examination in the different fields of activity of a supervising body (point 1.5.)

Field of application of supervision	CATEGORY OF MEASURING INSTRUMENTS			Standards and testing devices III
	Ordinary measuring instruments	subject to verification II	subject to verification I	
1 MANUFACTURE	not subject to verification I (A1 to A6) B1, B4, B6, B7, B10, B11, B12, B14 C2, C3	B1, B2, B5, B7, B10, B11, B12, B14 C2, C3	(A1 to A3) (B2), (B11), (B12), (B14) C2, C3	
2 REPAIR	(A1 to A6) B1, B4, B6, B7, B10, B11, B12, B14 C2, C3	B1, B2, B3, B5, B6, B7, B10, B11, B12, B14 C2, C3	(A1 to A3) (B2), (B11), (B12), (B14) C2, C3	
3 IMPORTATION	(A1 to A6) B1, B4, B7, B10, B11, B12 C3	B3, B4, (B5), B7, B10, B11, B12 C3	(A1 to A3) B3, (B4), (B5), B7, B10, B11, B12 C2, C3	
USE 4 MAINTENANCE CONSERVATION	(A1 to A6) B1, B4, B6 to B15, B17 C2, C3, C4	B1, B4 to B15, B17 C1, C2, C3, C4	(A1 to A3) B1, B4, (B5), B6 to B17 C1, C2, C3, C5	
TESTS 5 VERIFICATION CALIBRATION	(A1 to A6) B1, B7 to B14 —	A1 to A6 B1 to B14 —	(A1 to A6) B1, B4, (B5), B6 to B17 C1, C4, C5	

() = does not always apply

Contents

<i>Foreword</i>	2
1. Aims and elements of metrological supervision.....	3
2. Manufacture, repair and importation of measuring instruments.....	6
3. Users of measuring instruments.....	8
4. Testing, verification and calibration of measuring instruments.....	8
5. Prepacked or graded products.....	9
6. Principal legal and administrative aspects of metrological supervision.....	10