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Legal qualification of measuring instruments

Qualification légale des instruments de mesurage

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## 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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## PREAMBLE

This document deals with official actions which may be undertaken by a State for the purpose of attributing a « legal » quality to measuring instruments. Every effort has been made to consider all possible methods involved in these official actions.

The many possibilities offered should enable both States and the authors of International Recommendations, to select the solution or solutions to be adopted or recommended, according to the different types of instruments concerned, the methods used for their verification, use and maintenance, their reliability, administrative practices etc.

The actions considered cover:

a — attribution of « legal » quality (Chapter II) :

pattern approval : point 4 and annex A ;  
initial verification : point 5 and annex B ;  
calibration : point 5 and annex C ;

b — maintenance of this quality (Chapter III) :

subsequent verification : point 9 ;  
supervision : point 10 ;

the document then goes on to consider :

c — withdrawal of « legal » quality (Chapter IV) ;

d — reattribution of « legal » quality (Chapter V).

These principles can be applied in the context of « OIML Recommendations » taking account, where appropriate, of special methods specific to different instruments.

The document concludes with an appendix devoted to maximum permissible errors. Given the importance of this subject, it could be covered by a Recommendation or a special International Document.

BIML has quoted the provisions of certain regulations at different points in the text, and would take this opportunity of thanking the Organisations and National Services of Legal Metrology concerned.

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# LEGAL QUALIFICATIONS of MEASURING INSTRUMENTS

## — CHAPTER I —

### GENERAL

#### 1. Definition of legal measuring instrument.

« A measuring instrument which conforms to all the prescribed legal requirements » (Vocabulary of Legal Metrology).

#### 2. Types of statutory conditions (or requirements).

There are three types of statutory requirements:

- metrological requirements
- technical requirements
- administrative requirements.

##### 2.1. Metrological requirements.

Metrological requirements are intended to set the metrological qualities of instruments, and in particular the maximum permissible errors applicable, and the conditions under which the metrological qualities must be met.

##### 2.2. Technical requirements.

Technical requirements are intended to set the essential general design characteristics of instruments, without imposing any restriction on technical development, in order that:

- their metrological qualities are maintained in use <sup>(\*)</sup>,
- measurement results are certain, simple and non ambiguous,
- the risks of fraud are eliminated as far as possible.

##### 2.3. Administrative requirements.

Administrative requirements are intended:

- to set the characteristics of the instruments with respect to identification, external presentation, and utilization at the different stages of their working lives,
- to lay down methods for examination of instruments for the purpose of ascertaining that they comply with the metrological and technical provisions,
- to define criteria for the attribution, confirmation or withdrawal of the quality « legal measuring instrument ».

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<sup>(\*)</sup> See appendix for certain considerations concerning relations which may exist between maximum permissible errors on initial verification, and on subsequent verification or in service.

## ATTRIBUTION OF « LEGAL MEASURING INSTRUMENT » QUALITY

### 3. General.

Attribution of a « legal » character to measuring instruments is subject to due observance of metrological, technical and administrative requirements concerning the class of instrument in question.

Pattern approval for these instruments, and initial verification of instruments manufactured in accordance with the pattern, makes it possible to check that these requirements are met.

Nevertheless, certain types of instruments may be submitted directly for initial verification, without prior pattern approval, and certain instruments (or certain complementary or ancillary devices, or additions to these instruments) submitted for pattern approval may be exempted from initial verification.

### 4. Pattern approval.

#### 4.1. Definitions.

Pattern evaluation:

« The examination of one or more measuring instruments of the same pattern which are submitted by a manufacturer to the National Service of Legal Metrology; this examination includes the tests necessary for approval of the pattern » (Vocabulary of Legal Metrology).

Pattern approval:

« A decision taken by a competent State Authority, generally the National Service of Legal Metrology, recognizing that the pattern of a measuring instrument conforms to the mandatory requirements » (Vocabulary of Legal Metrology).

Preliminary examination is necessary as the first stage of attribution of a « legal » character, in the case of instruments of a new pattern constructed by a given manufacturer. A new pattern is characterized by a wholly or partly unknown composition, resulting from the application:

- of a new technique or measuring system
- of new materials
- of certain unknown component parts or auxiliary devices.

Pattern approval can concern the instruments themselves (which is most usual) or the main components or complementary or ancillary devices, or additions to these instruments (where the above influence or can influence the measuring results, or the statutory conditions for use of the instruments).

The pattern normally serves as a prototype for the manufacture of instruments likely to acquire the quality of « legal measuring instrument », following verification.

Under exceptional circumstances, the decision to grant pattern approval may confer this quality directly on instruments conforming with the pattern, without the need for verification (for example «where the organization of the sector of activity in which the measuring instruments are used, itself constitutes an adequate protection for the consumer, or where initial verification comes up against organizational difficulties, not in keeping with the guarantees which such verification would provide») <sup>(\*)</sup>.

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<sup>(\*)</sup> Preamble, Belgian Law.

Therefore any measuring instrument subject to statutory control, and subject to the exemptions provided for in point 4.4., must conform to an individually approved pattern.

Pattern examination relating to a prototype or to the first instruments produced, or possibly to drawings, is intended to determine whether the pattern, approval of which has been requested, is so constructed that it can be reasonably expected that instruments manufactured in accordance with this pattern will meet statutory requirements.

For example, the incidence of influence quantities can be studied systematically and the degree of importance of the resulting measurement variations can be evaluated.

Information drawn from pattern evaluation can be used, where appropriate, to set certain utilization and verification methods, and enforcement personnel of the National Service of Legal Metrology are thus frequently spared the task of executing delicate tests calling for very special qualifications and equipment.

#### 4.2. Pattern approval methods.

##### 4.2.1. General.

Pattern approval is granted by the competent Authority to any pattern of measuring instrument or auxiliary device which satisfies the relevant metrological and technical requirements.

Pattern approval is carried out in accordance with the provisions laid down in annex A, which specifies in particular :

- the procedure for registering an application and the list of accompanying documents,
- the method of carrying out the approval tests and the premises to be used for these tests,
- the nature of presentation of the pattern approval (instrument or drawings),
- the content of approval decision.

##### 4.2.2. Period of validity of pattern approval.

The period of validity of approval can be unlimited or not. Where this period is limited, a new decision is required if the application for approval is renewed when the period of validity of approval expires <sup>(\*)</sup>.

##### 4.2.3. Pattern approval with limited effect.

Pattern approval with limited effect can be granted in cases where normal approval cannot be granted (for example, «if the placing of certain instruments in service is an effective method of obtaining information likely to lead to a final decision concerning pattern approval»).

Pattern approval can therefore include any of the following restrictions:

- limitation of the period of validity,
- limitation of the number of instruments covered by the approval,
- an obligation to notify the competent authorities of the place of installation of each instrument,
- limitation of use.

Note: In certain cases, approval can be granted on a provisional basis to allow long-term exhaustive testing of a relatively large number of instruments to be carried out. In this case, the provisional period of approval is limited.

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<sup>(\*)</sup> The normal period of validity of pattern approval is set by national regulations (a period of 10 years is frequently stipulated, with the possibility of extension).

#### 4.3. Revocability of an approval decision.

Approval of a pattern can be revoked, depending on the national regulations:

- when it is found in practice that instruments manufactured in accordance with the pattern present faults of a general nature making these instruments unsuitable for their intended purpose,
- if instruments for which the pattern has been approved, do not conform to the said approved pattern <sup>(\*)</sup>, or do not comply with the provisions of the relevant regulations,
- where, following modification of applicable regulations, the instruments no longer meet the new provisions,
- where the manufacturer no longer complies regularly (or fully) with the various requirements stipulated in the approval decision.

Normally, the only effect of a decision revoking approval of a pattern is to prohibit, as from the date set by this decision, any initial verification of new instruments manufactured in accordance with the pattern concerned, or the placing of these instruments in service if no verification is required. Nevertheless, in certain cases, this decision can also prohibit the use of any instruments already manufactured, and impose their withdrawal from service.

#### 4.4. Exemption from pattern approval procedure.

Depending on the national regulations, instruments which meet the general and detailed specifications concerning technical construction and operation may be exempt from pattern approval (that is to say, categories of instruments for which all particularities of form and composition are set out in appropriate regulations, such as weights, certain measures of capacity and conventional measuring instruments).

These instruments are automatically accepted for initial verification. Instruments in a certain category, automatically accepted for initial verification, may be required to carry a special sign (annex A, point A.6.2.), placed on the instrument by the manufacturer, at his responsibility.

### 5. Initial verification and calibration.

#### 5.1. Definitions.

##### 5.1.1. Verification.

All the operations carried out by an organ of the National Service of Legal Metrology (or other legally authorized organisation) having the object of ascertaining and confirming that the measuring instrument entirely satisfies the requirements of regulations covering verification.

Verification includes both examination and stamping » (Vocabulary of Legal Metrology).

Verification results in selection of the instruments concerned:

- those which have successfully passed examination receive an acceptance stamp <sup>(\*\*)</sup>,
- others can receive a rejection stamp <sup>(\*\*)</sup>.

##### 5.1.2. Initial verification.

«The verification of a new measuring instrument, which has not been verified previously» (Vocabulary of Legal Metrology).

Note: By definition, initial verification only applies to new instruments, although national regulations may also require repaired or readjusted instruments to be submitted for verification on the lines of initial verification (see also point 9).

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<sup>(\*)</sup> and particularly in the case of instruments exempted from initial verification

<sup>(\*\*)</sup> in certain cases, the issue of an acceptance or rejection certificate can take the place of stamping.

### 5.1.3. Calibration of measuring containers.

The term « calibration » with respect to measuring containers, is used to describe all operations carried out for the purpose of determining the capacity of these measuring containers, corresponding to one or more filling levels. This procedure can be assimilated to initial verification.

Note: Containers used for storage, transport or delivery of a liquid, can be used for measuring this liquid, where these containers are specially adapted to the application for which they are intended, and possess the metrological qualities as required by regulation. These containers are then designated «measuring containers».

### 5.2. Instruments subject to initial verification and calibration.

Various criteria (varying according to national regulations) can be used to determine the instruments subject to initial verification or calibration ; initial verification (or calibration) can be applied, depending on the national regulations, to certain types of measuring instruments, to measuring instruments meant for certain uses, to instruments kept by certain kinds of users... etc...

Thus for a given type of instruments initial verification can be applied, except for cases of exemption:

- a) to all instruments of this type, irrespective of use and holder ;
- b) or only to those instruments of this type used for trade or in connection with health or public safety protection, or kept in certain premises such as stores, warehouses, depots or which are subject to special regulations in certain States (attribution of a character of « authenticity »).

Calibration concerns tanks, road, rail and sea tankers, and any type of storage tank which can be used as a measuring container.

### 5.3. Place of initial verification.

In the light of the following considerations:

- higher or lower degree of complexity of the instruments constituting independent assemblies,
- necessity for special installations,
- size of production batches (instruments manufactured in large batches are frequently verified at the place of manufacture),
- possibility of transporting the instruments (excessive fragility, size, etc...),
- extent of control equipment resources required,
- simplicity of control operations,
- extent of legal stipulations covering metrological controls,

initial verification can take place :

- at a place selected by the National Service of Legal Metrology,
- at the place of manufacture, (where certain control operations may be carried out during manufacture),
- at the place of installation,
- or partly at the place of manufacture and partly at the place of installation.

### 5.4. Submission for initial verification.

According to national regulations, submission for initial verification is the responsibility of:

- the manufacturer, or
- the holder or user, or
- the authorized representative of one or the other.

## 5.5. Initial verification.

Annex B specifies the conditions for initial verification with respect to: the verification Authority — possible stages of verification — places and methods of verification — application of verification marks.

### 5.5.1. Examination.

When an instrument is submitted for initial verification, the following are checked:

- a) that the instrument corresponds to the approved pattern, where covered by a pattern approval decision, or that the instrument corresponds to the requirements concerning the construction and operation laid down by regulation, if it is of a type exempted from pattern approval,
- b) that the instrument meets the special requirements of its category, with particular reference to :
  - metrological qualities (in particular maximum permissible errors),
  - where appropriate, its construction, insofar as such compliance is called for by the requirements (for example to guarantee a suitable degree of reliability for the instrument under normal use),
  - statutory description markings as well as positions for application of verification marks.

### 5.5.2. Instruments examined.

The submitted instruments may be either examined individually or, where covered by special regulations, verified by sampling: « verification of a batch of similar measuring instruments, based on the results of examination of one or more specimens taken from the batch » (Vocabulary of Legal Metrology).

In this case, it is not established that any one instrument of the batch conforms to all requirements. Conformity of the instruments can only be assumed with the degree of probability corresponding to the extent of the examination by sampling.

## 5.6. Calibration.

The preceding points may apply to the calibration of measuring containers.

Annex C contains certain specific provisions, normally applicable to measuring containers subject to calibration.

## MAINTENANCE of the « LEGAL » CHARACTER of MEASURING INSTRUMENTS

### 6. Period of validity of the « legal » character.

The « legal » character attributed to measuring instruments can have a limited or unlimited period of validity.

#### 6.1. Unlimited period of validity.

The period of validity is unlimited in cases where the competent Authorities decide that the instrument will not be subject to subsequent controls:

- for technical reasons : the construction of the instrument is such that any alteration in its metrological qualities make it unusable, or leads to its destruction ;
- for reasons of use : the construction of the instrument is such that accidental maladjustment or attempted fraud is negligible, or is easily tracable and simple to rectify ;
- for practical reasons : the composition of the instrument is such that possible changes of its metrological qualities, resulting from normal wear, are very limited, and the expense involved in carrying out the subsequent controls would not therefore be justified.

#### 6.2. Limited period of validity.

The period of validity is limited:

6.2.1. in cases where the competent Authorities in accordance with national regulations fix a given period of validity, at the end of which the instrument :

- must no longer be used (for any measurement, or for certain measurements only),
- cannot be maintained ready for use (in certain cases, it can even be required that the instrument be made unusable).
- must be withdrawn from all possible places of use.

6.2.2. in cases where the competent Authorities decide in accordance with national regulations that the instrument will be subject to subsequent controls, whether these controls must take place at given times or not.

The « legal » character of the instrument is only maintained if the results of these subsequent controls are satisfactory.

### 7. Control of maintenance of the « legal » character.

#### 7.1. Unlimited period of validity.

In principle no subsequent verification is provided for. Nevertheless, instruments may be subject to general supervision of use.

#### 7.2. Limited period of validity.

7.2.1. Where the « legal » character of the instrument has a given period of validity, no verification is normally provided for during this period. Nevertheless, instruments can be subject to general supervision of operation and use.

7.2.2. Where the instrument is required to undergo subsequent controls, these controls take place at the time of « subsequent verifications » and « metrological supervision ».

## 8. Subsequent controls.

Measuring instruments to which the quality of « legal measuring instrument » has been attributed (such instruments are generally in service) <sup>(\*)</sup>, may be subject to subsequent controls, according to national regulations, for the purpose of, among other objectives:

- a) checking the « legal » character of the instrument, and/or
- b) calling for readjustment or withdrawal from service of any instruments which no longer meet statutory conditions, and/or
- c) restoring the « legal » character, and/or
- d) supervision of correct use.

These controls are referred to as:

- subsequent verification of instruments ; such operations are frequently carried out following a summons or prior notice, at periodic or irregular intervals, and are intended to check points a and b in particular, and generally also point c in the case of periodic verification.
- inspection examination of instruments, which are generally carried out without prior notice at the place of use of the instrument concerned ; they are concerned in particular with points a and b above.

Supervision can also include supervision of correct use of the instruments (point d above) (See definition 10.1. below: « Metrological supervision »).

## 9. Subsequent verification.

Subsequent verification:

« Any verification of a measuring instrument which follows the initial verification:

- mandatory periodic verification,
- verification after repair <sup>(\*\*)</sup>, or
- verification before expiry of the period of validity of the periodical verification, made either :
- at the request of the user, or
- because for some reason the stamp is no longer valid for the remainder of this period of validity » (Vocabulary of Legal Metrology).

### 9.1. Purpose.

The subsequent verification of instruments (in principle instruments in service), is used to check the « legal » character of these instruments, to restore the « legal » character of an instrument, or to call for the readjustment or withdrawal from service of any instruments which no longer meet statutory conditions.

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<sup>(\*)</sup> The period of validity of the verification of a measuring instrument can be extended without further examination, in a case where the instrument has not been used since verification («verification renewal»: Vocabulary of Legal Metrology).

<sup>(\*\*)</sup> « Reconditioned » instruments may be subject to initial verification according to national regulations (see point 5.1.2.).

## 9.2. Methods.

Various different methods can be adopted for subsequent verification, depending on whether this verification concerns:

- an instrument in normal use: verification is generally carried out following a summons, periodically or at irregular intervals,
- an instrument overhauled systematically by the user, or
- an instrument which has undergone a non-scheduled repair <sup>(\*)</sup>, either at the initiative of the user or as imposed by the National Service of Legal Metrology.

Subsequent verification can cover all instruments of a given kind in service, or be carried out by sampling a certain number only of these instruments.

### 9.2.1. Periodic verification.

Periodic verification is the « subsequent verification of a measuring instrument, carried out periodically at intervals and according to the procedure laid down by the regulations » (Vocabulary of Legal Metrology).

The frequency of periodic verification can be based on given time intervals, or on a given number of measurement cycles carried out by the instrument, or after measurement of a given quantity of product.

### 9.2.2. Other subsequent verifications.

Non-periodic subsequent verifications can be carried out, for example, prior to expiry of the period of validity for periodic verification, where this is called for by regulation.

In general, non periodic subsequent verifications are carried out:  
at the request of the user, or  
if it is found that the stamping mark is no longer valid,  
or following repair <sup>(\*)</sup>.

Special decisions by the competent Authority may also call for the verification by sampling.

As for initial verification, sampling and application of statistical methods are admitted for subsequent verifications, whether periodic or non-periodic.

Non-periodic verification is carried out at the initiative of the competent Authorities.

## 9.3. Instruments concerned.

Certain of the criteria developed in point 5.2. (instruments concerned by initial verification), can be used where national regulations call for mandatory subsequent verification, particularly with respect to the different categories of instrument, but it should be noted however that the field of application of subsequent verification is necessarily more restricted than that for initial verification.

## 9.4. Submission of instruments.

The submission of an instrument for subsequent verification is necessarily the responsibility of its user, holder, or repairer.

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<sup>(\*)</sup> See footnote to point 9 on preceding page.

## 9.5. Stages and places of verification.

Verification can be carried out in one or more stages, and at different places, for example according to:

- the type of instrument concerned,
- the nature of the instruments (transportable, difficult to transport, fixed installation, etc...),
- the quality of the holder (sedentary or non-sedentary tradesmen, administrative authorities, factories, mines, etc...),
- the number of instruments.

## 9.6. Verification.

Verification involves examination of the instrument, and sanctioning of this examination.

### 9.6.1. Examination.

Examination is principally used to check the « legal » character of the instrument (namely that it meets the requirements for its category, with particular reference to adequate conservation of its metrological qualities).

### 9.6.2. Sanction.

An instrument which satisfactorily passes examination, receives the corresponding verification marks (in certain cases a certificate may take the place of the latter).

An instrument which fails to pass examination may receive a rejection mark (in certain cases obliteration of existing marks takes the place of a rejection mark).

Where an instrument has not passed examination, and if the holder wishes to continue its use, he is then obliged to repair the instrument within a given period, otherwise the instrument must be withdrawn from any possible place of use.

If an instrument shows defects liable to be seriously detrimental to the public interest, the instrument may be seized or sealed, so as to prevent its use (confiscation or destruction may even be called for).

On the other hand, if the defects observed are considered to be of little importance, it may be decided not to apply the rejection mark (and the instrument may therefore continue in use), provided the instrument is overhauled within a given period, followed, where appropriate, by fresh submission for verification. Such deferred acceptance can be indicated by a special mark.

## 9.7. Exemption from verification.

Instruments can be exempted from verification in service, either by general waiver concerning one or more categories of instrument, or by a decision specific to certain instruments.

# 10. Supervision of instruments in service.

## 10.1. Definitions.

Inspection examination :

« An examination of a measuring instrument with the object of checking that the stamp is valid, that the instrument has not been modified after verification, and that the errors do not exceed the tolerances permitted in service ».

Metrological supervision:

« Procedures for control exercised in respect of the manufacture, installation and repair of measuring instruments, or in respect of their use, to check that they are used correctly and honestly.

It extends also to control of correctness of the quantities indicated on prepacked articles ». (Vocabulary of Legal Metrology).

Supervision of instruments in service is therefore used to check that these instruments continue to meet legal requirements, that they are in good working condition, and that they are used correctly and honestly.

This supervision can also be assigned the task of preventing the contravention of laws and regulations, but in certain cases, it can also be considered that this supervision, generally employing limited resources, can be used as a rapid and relatively brief check of the operation of instruments in service, thus constituting a form of « simplified verification ».

## 10.2. Supervision.

Supervision of instruments in service is carried out by Officers of the National Service of Legal Metrology, or Officers of any other duly authorized Organisation, at the initiative of the competent authorities; it is generally unannounced and is carried out at the place of use of the instrument.

## LOSS of the « LEGAL » CHARACTER by MEASURING INSTRUMENTS

### 11. General.

#### 11.1. Definition.

Loss of validity of verification:

« The cancellation of the validity of the verification of a measuring instrument, when it no longer conforms to the requirements of the regulations ». (Vocabulary of Legal Metrology).

### 12. Loss of the « legal » character.

The loss of the «legal» character may result from general provisions applicable to a type of instrument, a decision specific to an instrument, and special cases.

12.1. General provisions may call for the loss of the « legal » character, by limitation of the period of validity of verification (initial or subsequent), for example to take account of the fact that instruments of the type concerned may show defects in use making them no longer suitable for their intended purpose.

In such cases, the « legal » character of the instrument can be extended by renewal of the period of validity of verification.

12.2. A special decision results from rejection of an instrument on verification or supervision, which no longer meets the relevant statutory requirements.

The loss of the «legal» character due to decisions of this type is normally annulled by the reconditioning of the instrument, except in special cases (12.3.1.).

12.3. Special cases.

The verification of an instrument may also lose its validity when :

12.3.1. a protective or verification mark is damaged, missing or obliterated ;

12.3.2. the instrument has undergone modifications, additions or adjustments of a nature to exert an influence on its technical measurement qualities, or which enlarge the field of its use ;

12.3.3. despite the continued presence of verification marks, the instrument is found to have become incorrect, or no longer meets statutory requirements in one way or another ;

12.3.4. requisite formalities have not been completed ;

12.3.5. the instrument is used in a non-statutory way (outside its intended field) ;

12.3.5.1. use outside the intended field, can lead to deterioration or changes in the instrument, resulting in a reduction in the accuracy of measurements subsequently made with the instrument, even within the intended field of use (for example, heavy overloading of the instrument). In this case, the verification of the instrument is no longer valid ;

12.3.5.2. on the other hand, use outside the intended field may have no effect on the metrological properties of the instrument (for example, use for measurements below a minimum prescribed value). For these measurements, the verification of the instrument is no longer effective and it is as though a non-verified instrument was used.

Note: The loss of the « legal » character is generally indicated by obliteration of verification marks, application of a rejection mark cancelling any existing verification marks, or entry on the stamping certificate, or cancellation of the latter.

## REATTRIBUTION of the « LEGAL » CHARACTER to MEASURING INSTRUMENTS

### 13. General.

Following rejection of a measuring instrument during verification or supervision, the instrument may reacquire the necessary and adequate statutory qualities, following repair, overhaul or readjustment, for the « legal » character to be reattributed.

### 14. Necessary and sufficient qualities for reattribution of the « legal » character.

According to the type of instrument concerned, national regulations may require, for reattribution of its « legal » character, that a reconditioned instrument must have reacquired:

- all initial qualities as laid down for a new instrument, or
- only those qualities which instruments in service must have retained, or
- certain intermediate qualities, specially defined for reattribution, between the two extreme levels of quality mentioned above.

This choice has certain consequences for establishing the conditions for reattribution of the « legal » character, principally insofar as maximum permissible errors are concerned, that means fixing the ratio between the maximum permissible errors for re-verification, and the maximum permissible errors in service (see Appendix).

### 15. Procedure for reattribution.

As appropriate, reattribution of the « legal » character is made by carrying out:

- a new initial verification of the instrument (see note in point 5.1.2.), or
- a subsequent verification, or
- even a simple examination, confirming that the repair called for, or addition of a device newly required has been carried out.

Verification or protective marks may require renewal following the above controls, particularly where these marks were obliterated at the time of rejection of the instrument, or if the marks have disappeared.

## — ANNEX A — PATTERN APPROVAL

### A.1. Application for pattern approval.

A.1.1. The application for approval includes the following information:

- name and address of the applicant <sup>(\*)</sup>,
- name and address of the manufacturer of the measuring instrument or his agent,
- type of the instrument,
- intended use,
- metrological characteristics,
- commercial designation, where applicable.

A. 1.2. The application is accompanied by documents necessary for examination of the application in particular:

A. 1.2.1. description including, in particular, details of the following:

- construction and operation of the instrument,
- safety devices guaranteeing correct operation,
- adjustment and setting devices,
- positions provided for:
  - verification marks,
  - seals (where appropriate).

A.1.2.2. general assembly drawings, and where necessary, drawings of important constructional details;

A.1.2.3. schematic diagrams and photographs, for use in connection with publication of the approval decision.

### A.2. Examination for pattern approval.

A.2.1. The nature, methods, and extent of pattern approval examination are set by regulations, specific to the different types of instruments.

A.2.2. The examination can cover:

A.2.2.1. either the technical study of a pattern, or of one or more of its component parts (of which the applicant <sup>(\*)</sup> is required to supply one or possibly more specimens) ;

A.2.2.2. or (in the case of bulky instruments, the basic cost of which is high or which are to be manufactured in very small quantities) prior study of documents supplied, sanctioned by temporary authorization for the manufacture of one specimen, on which technical studies are then carried out for the purpose of approval ;

A.2.2.3. or (in the case of instruments which are already sufficiently well known) only the study of documents supplied.

A.2.3. The technical study relates to the following, under normal (or special) conditions of use of the instrument:

its metrological properties, taking due account of the possible incidence of influence factors,

on its general characteristics (solid construction, reliability, and proof against fraudulent use).

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<sup>(\*)</sup> depending on national regulations, the applicant may either be any person, or the manufacturer only.

The study may include endurance tests.

A.2.4. The technical study can be carried out: in the laboratories of the National Service of Legal Metrology, in approved laboratories, at the place of manufacture, delivery or use, or at any other place agreed by the National Service of Legal Metrology.

A.2.4.1. If the study is carried out at the place of use, long-term exhaustive testing can be carried out on a relatively large number of instruments. The duration of this study is limited; it is carried out on a given number of instruments, and under pre-determined conditions of installation and use (see note in point 4.2.3.).

A.2.5. The National Service of Legal Metrology may require the applicant to provide standards, appropriate equipment and auxiliary personnel necessary for carrying out the pattern approval tests.

### **A.3. Depositing of specimen instrument.**

The applicant generally deposits one (in certain cases several) specimen instrument of the pattern which has received approval. In certain cases, and particularly in the case of bulky instruments, or those with a high basic cost or which are to be manufactured in very small quantities, parts, models, or drawings may be deposited instead of the specimen instrument.

The specimen instrument(s) remains lodged throughout the period during which measuring instruments of the pattern concerned are manufactured and, additionally for a fixed period (for example 5 years) after manufacture ceases.

### **A.4. Pattern approval decision and signs.**

A.4.1. The approval decision confirms the conclusions drawn from examination of the pattern, and sets the special conditions to be observed for the construction, verification, and use of instruments manufactured in accordance with the pattern.

A.4.1.1. Where pattern approval is granted for a complementary device, this approval indicates:

- those patterns of instrument to which the device may be added, or in which it may be included;
- general conditions for operation of all instruments, for which the device is approved.

A.4.2. Approval sign on specimen instrument.

A.4.2.1. The specimen instrument for the approved pattern, or in its absence, the documents relating to it, can receive a given pattern approval sign.

A.4.2.2. In the case of approval with limited effect, or provisional approval, this sign must be accompanied by a mark particular to each of the different kinds of approval.

A.4.3. Approval signs on instruments.

The person in whose name the pattern approval decision has been granted, is authorized, to the exclusion of all others, to apply the pattern approval signs mentioned in the preceding paragraphs on all instruments made according to the approved pattern.

These signs must be applied at the responsibility of the above mentioned person on every instrument presented for verification.

The signs and marks must be visible, legible and indelible.

If the placing of these presents technical difficulties, exceptions may be provided for in the pattern approval.

A.4.4. Instruments exempted from pattern approval (in accordance with point 4.4.), can be marked with a special sign.

#### **A.5. Publication of pattern approval.**

A.5.1. Pattern approvals must be officially announced for example by insertion in official publications of the National Service of Legal Metrology, or in special pamphlets

A.5.1.1. An approval decision is notified directly to the applicant.

A.5.2. Withdrawal of approval is announced by means of the procedure laid down in the preceding points.

#### **A.6. Examples of signs concerning pattern approval.**

A.6.1. Pattern approval sign.  
(to be decided following study).

A.6.1.1. Signs particular to each of the different types of approval with limited effect (to be decided following study).

A.6.2. Sign indicating exemption from pattern approval.  
(to be decided following study).

## INITIAL VERIFICATION

### B.1. Verification authorities.

B.1.1. Initial verification can be carried out:

- either directly by the National Service of Legal Metrology, or
- by a public, semi-public or private Organisation, duly authorized for this purpose, subject to possible supervision by the National Service of Legal Metrology.

### B.2. Stages and places of verification.

Initial verification can be carried out in one or more stages.

B.2.1. Subject to provisions laid down in the regulations specific to the different types of instrument:

B.2.1.1. Initial verification can be carried out in a single stage on instruments which are complete on leaving the factory, that is to say, those which can in principle be transferred and installed at their place of use without prior dismantling and without their metrological qualities being affected (subject to simple adjustment or setting).

B.2.1.2. Initial verification is carried out in two or several stages:

- for instruments whose correct operation depends on the conditions of installation or use ;
- for verifications needing too much time or when the essential verification equipment and apparatus are absent.

The complete verification consists of a first stage, then a second stage or several successive stages, the last stage at the place of use including necessary and sufficient controls for ensuring correct operation of the instrument;

- for complex instruments formed from a number of units each subject to individual controls, or produced in different manufacturing places.

The first stage of initial verification will comprise partial controls of the units, the final stage (at the place of assembly or use) will relate to the complete instrument.

B.2.2. The first stage of verification must make it possible to check the conformity of the instrument with the approved pattern or, in the case of instruments exempted from pattern approval, their conformity with requirements which apply to them.

In the case of complex instruments, formed from units which have to undergo individual controls, conformity is checked at all stages of manufacture where this is necessary.

B.2.3. If the specific regulations do not fix the place of verification, instruments which have to be verified in a single stage are verified in a place chosen by the National Service of Legal Metrology or Organisation concerned, for example at the office of the Service or the Organisation, at the manufacturers' premises, or any other place.

B.2.4. Instruments which have to be verified in two or several stages are verified under arrangements made by the National Service of Legal Metrology or Organisation entrusted with the verification.

### **B.3. Means of verification.**

B.3.1. Depending on the national regulations, and in particular when the verification does not take place in the Verification Office, the National Service of Legal Metrology or Organisation carrying out the verification can require the applicant to place at its disposal, wholly or partially, the suitable equipment and additional personnel needed to carry out the verification in accuracy conditions which are equivalent to those which could be obtained in the Office.

These national regulations can vary for different types of measuring instruments.

### **B.4. Verification marks.**

#### B.4.1. Marking.

Instruments which have successfully passed verification examination <sup>(\*)</sup> generally receive one or more initial verification marks, to confer on them the quality of « legal measuring instrument » <sup>(\*\*)</sup>,

In certain cases, an initial verification certificate may take the place of a verification mark.

#### B.4.2. Position and application of marks.

B.4.2.1. The verification mark or marks are applied to the instrument, and where necessary to the component parts of it, in positions reserved for this purpose on manufacture, and which provide for easy scrutiny of the marks and avoid the wear, obliteration, or displacement of them (these positions and corresponding devices are specially stipulated at the time of pattern approval, or laid down in general terms by regulations concerning instruments exempted from pattern approval).

B.4.2.2. The marks are applied for example by means of stamps, pincers, stickers, or engraving.

#### B.4.3. Examples of marks.

The characteristics of initial verification marks are laid down by national regulations, or by an International Recommendation.

Verification marks can include, for example:

- the arms or initials of the country, or a conventional symbol adopted by it,
- figures, letters or combinations of both, identifying the person which has carried out the verification,
- the date of verification, in particular the year (or the last two digits of the year), and where appropriate, the quarter or half year,

and/or any other information assisting recognition and guaranteeing authenticity.

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<sup>(\*)</sup> According to national regulations, instruments which do not pass the examination, can receive a rejection mark (or be covered by a rejection certificate).

<sup>(\*\*)</sup> Moreover, the competent National Service may authorize construction diagrams to be deposited with the instrument in service to facilitate subsequent controls (for example for measuring assemblies for liquids other than water).

— ANNEX C —

**CALIBRATION of MEASURING CONTAINERS <sup>(\*)</sup>**

(containers, road and rail tankers, tanks and ship's tanks)

- C.1. The constructional characteristics guaranteeing the functional accuracy of these measuring containers, methods for calibration, documents sanctioning these operations, etc., are laid down by national regulations.
- C.2. A measuring container which has been « calibrated », is equipped with a sealed identification plate, confirming this quality. In addition, mobile tankers are accompanied by currently valid documents, certifying the calibration.
- C.3. The results of the calibration are generally recorded on a calibration certificate.
- C.4. These documents can have limited validity (for example, 4 years for containers and road tankers, 10 years for rail tankers, storage tanks, and ship's tanks).

These documents also become invalid immediately the corresponding measuring container has been converted, repaired or deformed, or when its metrological characteristics have changed.

A new document can only be issued after re-calibration.

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<sup>(\*)</sup> See definition of « measuring containers » at 5.13.).

## MAXIMUM PERMISSIBLE ERRORS

### Ap.1. General.

Metrological provisions concerning the legal qualification of measuring instruments, are liable to vary according to the nature of the instruments concerned and the official operations directing qualification.

These metrological provisions define, in particular, maximum permissible errors at each stage of qualification, or numerical formulae covering the variation of indications in relation to the influence factors.

Various solutions can be adopted concerning these errors <sup>(\*)</sup>. For normal conditions of use, and for different classes of accuracy, the following can be specified:

a) an overall maximum permissible error (inaccuracy):

in principle, this error covers the sum of maximum values for all different errors which could appear on a single measurement, when using the instrument within a defined range of use, irrespective of the point in this range.

b) maximum permissible component errors:

each of these maximum permissible errors applies to one of the types of error which could appear when a single measurement is taken, irrespective of the point considered within a range of use specified for each of these errors.

c) a maximum permissible intrinsic error and laws for the variation of the indications :

- the maximum permissible intrinsic error is set under reference conditions or within a reference range for each influence factor <sup>(\*\*)</sup>,
- laws for the variation of the indications according to the influence factors are specified by means of numerical coefficients <sup>(\*\*\*)</sup>, within nominal ranges of use concerning each of these factors.

Note: The various errors thus specified are limiting errors, and the probability of these limits being exceeded during a measurement is negligible. For example, if the law of distribution for these errors is normal, a probability of 0.3 % can be taken as negligible (see Vocabulary of Legal Metrology 8.1.8.1.).

The Recommendation on classes of accuracy of measuring instruments indicates the different forms which these errors and variations can take, but the values of both errors and variations should be adapted to the various qualification operations for different measuring instruments.

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<sup>(\*)</sup> The various solutions are mentioned for guidance ; the new OIML Pilot Secretariats and in particular SP 21 « Standardization of metrological characteristics of measuring equipment », SP 22 « Principles of Metrological Control », and SP 23 « Methods and means used for certification of verification devices », will deal with the important aspects of these questions.

<sup>(\*\*)</sup> Within a reference range, the maximum permissible intrinsic error covers all errors which could appear, including those due to variations in the influence factors.

<sup>(\*\*\*)</sup> The numerical coefficients can be used for exact calculation of the variations, or the maximum value which the variations must not exceed.

## Ap.2. Different values of errors (according to stage of qualification).

In principle, the values of errors should be specified for each official operation.

Generally, however there are no values for pattern approval. Nevertheless, when carrying out tests for pattern approval, the maximum permissible errors on initial verification are generally taken as a basis <sup>(\*)</sup>.

Taking account of this restriction, the different errors to be considered are as follows:

- initial verification errors,
- subsequent verification errors,
- in-service errors,
- calibration errors of measuring containers.

### Ap.2.1. Ratios between different maximum permissible errors.

#### Ap.2.1.1. Error symmetry.

Maximum permissible errors are generally symmetrical. However, to take account of a systematic variation with time of the metrological qualities of certain instruments, asymmetrical limits can be applied at certain stages of qualification for these instruments.

#### Ap.2.1.2. General cases.

To facilitate international exchanges of instruments, and possible international recognition of verification procedures such as those sanctioned by a verification stamp, it seems appropriate to specify maximum permissible errors on the basis of those used for initial verification. For example the ratio between the maximum permissible error for initial verification and that for periodic verification could be 1 to 2. A State could also specify wider maximum permissible errors for supervision of instruments, for example three times the maximum permissible error for initial verification.

#### Ap.2.1.3. Special cases.

Ap.2.1.3.1. In certain cases, the same maximum permissible error values can be used for initial verification, during verification and supervision in service, and more rarely, during use of the instruments (for example in cases where maintenance of the instrument is assured either by its construction or by means of routine servicing).

Ap.2.1.3.2. Relative capacity errors indicated in documents accompanying measuring containers (Annex C) are normally specified once only according to the required degree of functional accuracy, taking account, where appropriate of any special calibration difficulties.

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<sup>(\*)</sup> In certain cases, it will be useful to fix for pattern approval, special values related to the maximum permitted errors. One can for example specify:

- the maximum difference to be allowed between the highest and the lowest points on the error curve,
- the maximum permissible errors valid after endurance tests.