INTERNATIONAL

RECOMMENDATION

OIML R 66

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Length measuring instruments

Instruments mesureurs de longueurs

OIML R 66 Edition 1985 (E)

ORGANISATION INTERNATIONALE
DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION
OF LEGAL METROLOGY

Foreword

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LENGTH MEASURING INSTRUMENTS

1. General

1.1. Scope

This Recommendation applies to length measuring instruments (hereinafter called « instruments ») that is to say instruments (other than length measures) which determine the length of a line, wire, cable, tape, piece of cloth, strip, sheet or any other developable piece.

This Recommendation does not apply to measuring devices fitted on motor vehicles nor to instruments which can be fitted on motor vehicles for the verification of taximeters or chronotachographs (see International Recommendation No. 55), but it applies to manual instruments for measuring the length of tracks or roads (road measuring wheels).

1.2. Types of instruments

This Recommendation applies to the two following types of instruments :

— continuous measuring instruments, the indications of which are proportional to the rotation of a wheel or a roller,

— discontinuous measuring instruments, the indications of which are multiples of a given reference length.

1.3. Accuracy classes and maximum permissible errors

The instruments are divided into 3 accuracy classes.

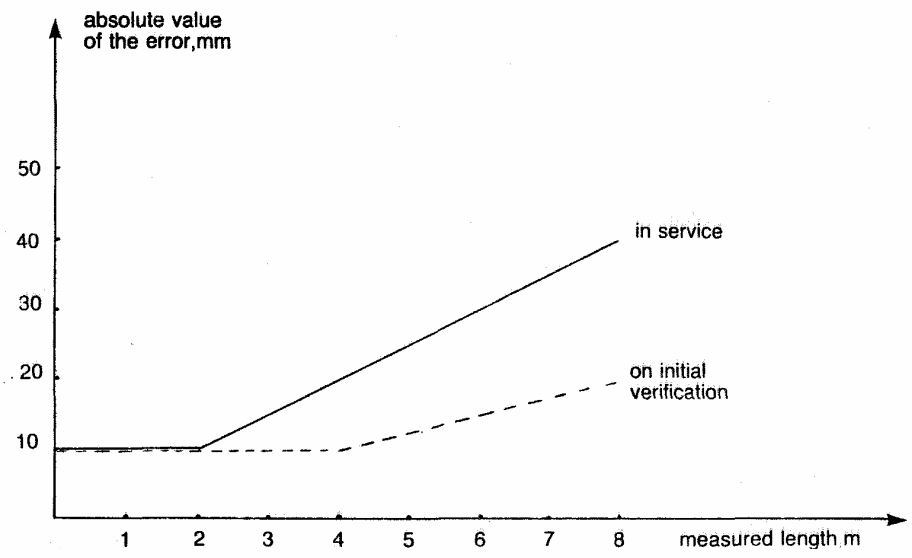
The corresponding maximum permissible errors, on initial verification and in service, are indicated in the Table below, in per cent of the measured length.

Accuracy class	Maximum permissible errors, positive or negative, in per cent of the measured length	
	on initial verification	in service
I	0.125	0.25
II	0.25	0.5
III	0.5	1

However, the absolute values of the maximum permissible errors may not be less than the values given below :

in class I : 0.005 L_m,
in class II : 0.01 L_m,
in class III : 0.02 L_m,

where L_m is the minimum measurable length, that is to say, the smallest length which is legally authorized to be measured by the instrument. This minimum measurable length is determined, for each pattern of instruments, during pattern approval, taking account of the accuracy class of the instrument, its metrological and technical characteristics (scale interval, play between the movable parts, etc.) and possibly the nature of the product to be measured (see note to point 1.1 in Appendix I, for the determination of L_m).



Example of limit curves of errors, for a class II
instrument having a minimum measurable length of 1 m

1.4. Composition

The instruments include :

— a measuring device,

— one or several indicating devices graduated in legal units of length.

The instruments may comprise other devices which may be part of the measuring chain, such as : feeding devices, discharging devices, devices for adjusting tension, etc.

1.5. Conditions of use and reference conditions

Unless otherwise specified, the instruments shall be used normally under the following conditions of the environment :

— temperature : – 10 °C to + 40 °C,

— relative humidity : 65 % ± 10 %,

— electrical power supply (where appropriate) : – 15 % to + 10 % of nominal voltage and ± 2 % of nominal frequency.

In addition, for some products, the reference conditions may be specified under which the instruments shall give the length of the product to be measured.

The normal requirements for conditioning and testing of textiles are specified in the International Standard ISO 139 as follows :

— temperature : 20 °C ± 2°C,

— relative humidity : 65 % ± 2 %.

Also for textiles, the instrument shall give the length which the piece of cloth would have, at the time of measurement, if it was :

— in relaxed state and not crumpled,

— lying flat on a smooth horizontal surface, with no tension applied.

2. Construction

2.1. Strength

The instruments shall be strongly built and made of materials having adequate stability and strength to withstand, without operational defect, the normal conditions of use and environment to which they are submitted.

2.2. Measuring device

2.2.1. Composition

The measuring device includes :

— in case of continuous instruments, one or several wheels, or one or several rollers in contact, either directly with the product to be measured or indirectly by means of one or several belts,

— in case of discontinuous instruments, one or several reference lengths.

Other well defined systems which can be used as length measuring devices are acceptable.

2.2.2. Special provisions for wheel-type or roller-type measuring devices

Wheels or rollers shall be made of materials which do not deteriorate and practically do not wear under normal conditions of use. They can incorporate a coating integral with the wheel or roller, made of rubber, textile, felt or similar material.

If these wheels or rollers are in direct contact with the product to be measured, this contact may be either tangential, or in the form of a partial wrap. In no case may slip occur between the product to be measured and the measuring device.

The instruments shall show, clearly visible :

— either one index acting as initial and final mark for the measured length,

— or two separate indices, one acting as the initial mark and the other as the final mark ; the distance between these two indices shall not exceed one metre, and shall be an integer multiple of the scale interval of indication.

2.3. Indicating device

2.3.1. General provisions

The indicating device shall give a direct, safe, easy and non-ambiguous indication of the measured length. However, it may be acceptable that the length between the initial mark index and final mark index be added to the measurement result, provided the calculation can be carried out easily.

These indications are obtained by :

— identifying the position of one or more pointers on one or more dials, or

— identifying the position of the end of the product opposite a scale mark, or

— reading aligned figures appearing horizontally in display windows, or

— a combination of these methods.

The coupling between the indicating device and the measuring device shall have no play or slip.

The indicating device of a wheel-type or roller-type measuring instrument shall be coupled to the wheels or rollers in such a way that the device indicates the decreasing length if, intentionally or following an incorrect operation, the operator displaces the product backwards or the instrument is used in the direction opposite to the normal direction of use.

2.3.2. Pointer-type indicating device

Pointer-type indicating devices shall comply with the following requirements :

— the direction of rotation of all pointers shall be the same,

— the scale interval of a scale shall be equal to the capacity of the scale immediately below it.

2.3.3. Digital or semi-digital indicating device

Where the indicating device incorporates figures appearing in display windows, or on any surface, these figures shall be aligned side by side to allow reading by simple juxtaposition.

The symbol of the unit of measurement used shall be printed or projected on the right of the numerical indication.

Where the indication of the measured length includes an integer part and a decimal part, a clearly visible comma (or decimal point) shall separate the integer part from the decimal part.

If display windows are used, the dimension of each window, taken in the direction of the displacement of figures, shall be slightly greater than the distance between the axes of two consecutive figures.

2.4. Scale interval

The scale interval shall be in the form 1.10^n, 2.10^n or 5.10^n metres, n being a positive or negative whole number or zero, and shall be compatible with the accuracy class of the instrument.

Irrespective of the type of indicating device used, the smallest scale spacing shall not be less than 1 mm.

In the case of discontinuous instruments, the scale interval shall have the same value as the reference length, but the indicator may be fitted with a device for the identification of a fraction of the reference length, on completion of a measurement.

2.5. Zero-setting device (or resetting to a known initial length)

The zero-setting device resets the indicator to zero, either under manual control or using an automatic system.

Zero-setting shall be total and it shall not be possible to indicate a new measurement result unless zero-setting has been completed.

In some cases, the zero-setting device may be replaced by a device for resetting to a known initial length.

Zero-setting or resetting to a known initial length shall, under no circumstances, cause an error exceeding the maximum permissible error for the minimum measurable length.

2.6. Repeating indicating devices

The instruments may be equipped with repeating indicating devices. These devices shall comply with the same requirements as the indicating devices and may incorporate devices for zero-setting or resetting to a known initial length.

The difference between the length displayed on the indicating device, and the lengths displayed on the repeating indicating devices shall not exceed one scale interval.

2.7. Totalizing devices

The instruments may be equipped with one or more totalizers indicating the total value of the different lengths measured.

Totalizers shall not incorporate zero-setting devices.

Totalizers shall comply with the same requirements as the indicating devices.

2.8. Printing devices

Printing devices shall comply with the following requirements :

— the scale interval of printing shall be equal to the scale interval of the indicating device,

— in case of digital indicating devices, the indicated and printed lengths shall be identical,

— in case of analogue indicating devices, the difference between the printed length and the indicated length shall not be greater than the smaller of the two following values :

— half of the scale interval,

— maximum permissible error on the indicated length.

2.9. Pre-setting devices

A pre-setting device is a device which automatically interrupts the functioning of the instrument, and the displacement of the measured product, when a preselected length of this product has been measured.

The indications of a pre-setting device shall not be used in place of those of the indicating or printing device.

2.10. Complementary devices

The instruments may be fitted with complementary devices used for folding or unfolding, tightening or relaxing, winding or unwinding the products to be measured, marking the measured portions, etc. They may also incorporate devices used for examining the products, detecting their defects and carrying out the measurements of extensible products, without tension.

These devices shall not affect the accuracy of the measurement process.

3. Identification plate

The identification plate shall be fixed on a non-detachable part of the instrument. It shall bear the following information in a legible and visible manner :

1. name or trade name and mark of the manufacturer,
2. pattern designation, serial number and year of manufacture,
3. accuracy class,
4. number of the approval decision, where this is mandatory,
5. nature and characteristics of the product(s) for the measurement of which the instrument may be used,
6. scale interval of indication,
7. minimum measurable length,
8. maximum measuring speed,
9. tension to which the pieces of cloth shall be submitted during measurement, if applicable.

When the use of the instrument requires special precautions, the necessary instructions shall be indicated, in a clearly visible manner, in the immediate vicinity of the indicating device.

4. Sealing

The instruments shall be built so that they can be sealed, according to national regulations, by means of seals or protection and guarantee marks, on the following parts :

- the indicating device,
- the coupling between the measuring device and the indicating device for wheel-type or roller-type instruments,
- adjusting devices, if provided,
- the identification plate, where appropriate.

APPENDIX I

METROLOGICAL CONTROLS

1. Pattern approval

1.1. General provisions

When required by national regulations, each pattern of length measuring instrument shall be the subject to pattern approval.

Pattern approval relates to the instrument itself taking into account, where appropriate, the particularities of the complete measuring assembly in which it is incorporated and which is likely to influence the measurement results in one way or another.

The approval decision shall include a complete description of the instrument itself (measuring device, indicating device and, where appropriate the product feed and discharging devices). It shall determine the minimum measurable length [(*)] and the maximum measuring speed as well as, where appropriate, the tension (generally zero or almost zero) which must be applied to the product when its length is being measured. It shall indicate the nature of the product(s), the length of which is measured by the instrument and shall specify the place and contents of the identification and stamping plates, and the nature and location of the sealing devices.

In the case of instruments measuring the length of cloth, the normal path of the cloth shall be clearly indicated by means of a diagram.

1.2. Approval tests

The number and nature of the approval tests shall be prescribed by the National Service of Legal Metrology.

The tests are carried out on one prototype only and the maximum permissible errors for these tests are those fixed in point 1.3 of this Recommendation.

2. Initial verification

When required by national regulations, each new or repaired instrument is submitted to initial verification.

2.1. Initial verification tests

The initial verification tests shall make it possible to check that the instruments comply with all the requirements of this Recommendation.

2.2. Initial verification in two stages

Initial verification is conducted in two stages when a preliminary inspection of some component parts of an instrument is provided for by the approval decision. In general, the first stage (partial initial verification) is carried out in the workshop of the manufacturer, and the second stage (final initial verification) at the place of use of the instrument.

(*) The minimum measurable length may be defined as equal to 100 times one of the following values :

a) reading error of the analogue indicating device,
b) rounding error of the digital indicating device or of the printing device,
c) the greater of the two preceding values when an analogue indicating device and a digital indicating device or a printing device are provided.

2.3. Confirmation of initial verification

Initial verification is confirmed by apposition of the initial verification mark, in places stipulated by the approval decision.

In the case of initial verification in two stages, the first of these two stages is confirmed by the apposition of the partial initial verification mark, in places stipulated by the approval decision.

3. Periodic verification

When required by national regulations, the instruments are submitted to periodic verification.

The periodic verification is always carried out at the place of use of the instrument.

The verification officer in charge of this verification checks that the instrument bears the initial verification marks and that it complies with the in-service accuracy requirements specified in point 1.3 of this Recommendation.

APPENDIX II

SPECIAL PROVISIONS FOR THE VERIFICATION OF CLOTH MEASURING INSTRUMENTS

Verification should, as far as possible, be carried out as follows :

1) determination of the length of a piece of cloth, using a material measure of length,

2) at least two successive determinations of the length of the same piece of cloth, using the instrument to be verified,

3) repeat determination of the length of the piece of cloth, using the material measure of length.

The error of the instrument is equal to the difference between the mean values obtained.

The material measure of length used to determine the length of the piece of cloth shall comply with the requirements of the International Recommendation No. 35 « Material measures of length for general use », accuracy classes II or III, depending on the accuracy class of the instrument to be verified.

The pieces of cloth used to verify the instrument shall have a minimum length of 10 m, in conformity with the use of the instrument, and shall be measured under the reference conditions specified in point 1.5 of this Recommendation. The length of the pieces shall, be measured by consecutive lengths of at least 3 m on a smooth and horizontal table which is at least 3.5 m long.

Note : a description of the manual method of measurement of a piece of cloth, using a material measure of length, may be found in the International Standard ISO 3933.

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