BRITISH STANDARD

BS EN
13486:2002

Temperature recorders and thermometers for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream — Periodic verification

The European Standard EN 13486:2002 has the status of a British Standard

ICS 27.200; 97.130.20

National foreword

This British Standard is the official English language version of EN 13486:2001.

The UK participation in its preparation was entrusted by Technical Committee RHE/19, Commercial refrigerated food cabinets (cold room and display cases), to Subcommittee RHE/19/-/6, Temperature recorders, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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English version

Temperature recorders and thermometers for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream — Periodic verification

Enregistreurs de température et thermomètres pour le transport, l'entreposage et la distribution des denrées alimentaires réfrigérées, congelées et surgelées et des crèmes glacées — Vérification périodique

Temperaturregistriergeräte und Thermometer für den Transport, die Lagerung und die Verteilung von gekühlten, gefrorenen, tiefgefrorenen Lebensmitteln und Eiskrem — Regelmäßige Prüfungen

This European Standard was approved by CEN on 28 September 2001.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 141, Pressure gauges — Thermometers — Means of measuring and/or recording temperature in the cold chain, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

The Annexes A and B are informative.

This standard contains a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

The present document sets the verification procedure for temperature recorders and thermometers for measuring the air and the products intended to equip the means used for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream and which comply with standards EN 12830 and EN 13485 (measurement classes and ranges).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12830, *Temperature recorders for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream — Tests, performance, suitability*.

EN 13485, *Thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream — Tests, performance, suitability*.

EN 30012-1, *Quality assurance requirements for measuring equipment — Part 1: Metrological confirmation system for measuring equipment (ISO 10012-1:1992).*

EN ISO 9000, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2000)*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions of EN 12830, EN 13485, EN ISO 9000 and the following terms and definitions apply.

3.1
verification[1)]
confirmation and provision of evidence that the specified requirements have been fulfilled

NOTE 1 In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

NOTE 2 The result of verification leads to a decision either to restore to service, or to perform adjustments, or to repair, or to downgrade, or to declare obsolete. A written trace of the verification performed is kept on the measuring instrument's individual record.

3.2
maximum permissible errors; limits of permissible error (of a measuring instrument)[2)]
extreme values of an error permitted by specifications, regulations etc., for a given measuring instrument

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1) Definition of EN ISO 9000.

2) Definition of VIM.

3.3
working standard[2)]
standard that is used routinely to calibrate or check material measures, measuring instruments or reference materials

NOTE 1 A working standard is usually calibrated against a reference standard.

NOTE 2 A working standard used routinely to ensure that measurements are being carried out correctly is called **a check standard**.

4 Frequency of verification

The frequency of the checks depends on the requirements of the user, taking account of the manufacturer's specifications.

If the temperature measuring instrument is mounted on a vehicle which is subjected to an annual or periodic maintenance inspection in an agreed vehicle test station, then the verification of these measuring instruments shall be done at the same time.

NOTE 1 Nevertheless it is recommended that a check be carried out every year by the manufacturer or workshops which are authorized by him or authorized verification services, when the temperature recorders and thermometers have been used over this period.

NOTE 2 It is recommended to have a systematic verification following a period of non-use exceeding the period adopted by the user or when an operating incident or a deterioration is noted or supposed, or during an intervention such as the introduction of a new sensor, except when permitted by the manufacturer.

5 Method of verification of temperature measurement

5.1 General

The method used is the measurement by direct comparison of the instrument under test and the working standard thermometer.

5.2 Environmental conditions

It shall be ascertained that the environmental conditions for the tests are compatible with the apparatus to be verified and with the measuring instruments used (disturbances caused by, for example welding unit, inverters, high voltage cables).

5.3 Working standard

Table 1 gives the maximum calibration uncertainty for the verification measurement range, with a one-year calibration interval.

Table 1 — Criterion for selection of working standard

Values in degrees Celsius

Class	0,5	1	2
Maximum calibration uncertainty of the working standard thermometer	± 0,1	± 0,2	± 0,5

5.4 Additional equipment

Climatic container or thermostatic bath or any suitable equipment for one-site verification.

The choice shall be in accordance with the requirements in Table 2.

Table 2 — Criterion for selection of additional equipment

Values in degrees Celsius

Class	0,5	1	2
Maximum uncertainty of the verification	± 0,3	± 0,5	± 1

5.5 Procedure

5.5.1 General

A detailed procedure of the operating method shall be drawn up, indicating the operating sequence and complying with the verification operations according to EN 30012-1.

5.5.2 Preliminary operations

If necessary:

— cleaning of the thermometer or the temperature recorder and the sensor(s);

— verification of the display or recorder (self-test) and connector(s);

— possible change of battery or its recharge;

— verification of the electrical connections.

Then:

— stabilization of the temperature of the sensors (pay attention to the response time, temperature delay, heat radiation, etc.);

— for recorders, verify the proper functioning of the clock or of the diagram recording system according to manufacturers' specifications.

5.5.3 Verification measurement(s)

The verification operation shall be conducted at a temperature within ±5 °C of the temperature at which the equipment is most frequently used, unless otherwise specified by the manufacturer, without exceeding the nominal measuring range of the equipment.

Climatic container or thermostatic bath as referred to in 5.4 shall be used when praticable.

If the verification is conducted on site, suitable equipment for the verification proposed by the manufacturer, if any, shall be used; if not, an appropriate measurement method shall be applied to comply with the following requirements:

— maximum thermal coupling between the sensors;

— minimum drift of the measured temperature;

— sufficient time for the reading to become stable.

5.6 Condition of acceptance

This operation consists of comparing the results of measurements and calculating errors noted, taking into account the measurement uncertainty of the working standard thermometer presented in Table 1 to verify if these measurements comply with the relevant specification of limit of permissible error as given in the standards. This specification shall be at least class 2 of the standards on temperature recorders (EN 12830) and thermometers (EN 13485:2001) irrespective of the original class of the appliance.

6 Method of verification of duration of temperature recordings

6.1 General

The purpose of this verification is to ensure that the duration of recordings is within specification.

6.2 Verification of recording duration by making a test recording

For this test the recorder may be set to its fastest chart speed or shortest recording interval. The actual time for a test recording is measured with a suitable clock with a relative error $\leq 0{,}02$ % and this is compared with the time measured on the recorder.

6.2.1 The recorder is put into operation and allowed to run for sufficient time to take up any mechanical play if applicable.

6.2.2 A sudden and repeatable change is made to the recorded temperature and at the same time the clock is started. The recorded temperature is then allowed to return to normal.

NOTE The recorded temperature may be changed by any suitable means, such as immersing the sensor in ice and water or simulating a temperature change with special equipment.

6.2.3 The recording is left to run for sufficient time to verify that the recording duration is within specification.

NOTE An estimate of the number of minutes needed is given by the following formula:

$$\frac{100\ t}{e}$$

where

t is the shortest measurable time interval in minutes on the recording;

e is the maximum permissible relative error.

6.2.4 The procedure of 6.2.2 is repeated and the clock is stopped at the same point where it was started in 6.2.2.

6.2.5 The recording duration is measured on the recorder between the points marked in steps 6.2.2 and 6.2.4. The percentage error is given by the following formula:

$$\frac{(t_{\mathrm{c}} - t_{\mathrm{r}})}{t_{\mathrm{c}}}$$

where

t_{c} is the duration measured on clock;

t_{r} is the duration measured on recorder.

6.3 Verification of recording duration by other means

If the manufacturer of the recorder has provided a means of determining the percentage error of the recording duration by some special test facility or procedure, then this may be used instead of the method defined in 6.2. The manufacturer's instructions shall be followed, and shall be referred to in the verification report.

6.4 Conditions of acceptance of duration

The relative error of recording duration shall be less than or equal to the maximum permissible relative error given in the standard EN 12830.

7 Expression of results

The results shall be presented as shown in Table 3.

Table 3 — Example for the presentation of results

Value measured by the working standard (A)	**Value measured by the equipment under test** (B)	**Difference** B - A
—	—	—

If the difference B - A is higher than the maximum permissible error: refusal or new calibration.

A verification report shall be completed for each verification including all the items appearing in the example in Annex A.

NOTE The life cycle sheet is recommended to ensure the traceability of the equipment. A model of a life cycle sheet appears in Annex B. If all the verifications of the report are retained, they can be considered to be the equivalent of the life cycle sheet.

Annex A
(informative)

Example of verification report

Identification of the body	**Verification report**
responsible for verification	**No.: .....**
Completed at or by:	
Designation of the equipment verified:	
Manufacturer:	
Type:	
Serial no.:	
	Verification date: .....
	Performed by: .....
	Name: .....
	Signature: .....
	Approved by: .....
	Name: .....
	Signature: .....

Verification report no.: ..... **Page 2/“.....”**

Measurement methods used: ....
Verification equipment used: ....
Measurement conditions: ....
List of parameters checked: ....
Uncertainties of measurement: ....

Expression of results

Value measured by the working standard (A)	**Value measured by the equipment under test** (B)	**Difference** B – A
—	—	—

Conclusion:

The verified equipment satisfies the conditions of acceptance defined in the procedure.

Yes ☐ No ☐

Remarks:

Figure A.1 — Example of verification report

Annex B
(informative)

Life cycle sheet

QUALITY ASSURANCE	EQUIPMENT LIFE CYCLE SHEET	Model of: March 8 1995

Identification no.:	Serial no.:
Type of equipment:	
Supplier:	
Reception date:	Start-up date:
Calibration and verification Permissible limit:	Frequency of verification:

Location	Probe Identification code	Intervention date	Calibration/Verification			Result and decision S: In service A: Adjustment R: Repair	Name and signature of person verifying
			Work calibration (A)	Apparatus to be verified (B)	Difference B - A		

Figure B.1 — Life cycle sheet

Bibliography

[1] International vocabulary of basic and general terms in metrology (VIM). BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 2nd Edition 1993.

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