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Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity)

Produits isolants thermiques destinés aux applications du bâtiment — Détermination de la stabilité dimensionnelle dans des conditions de laboratoire constantes et normales (23 °C/50 % d'humidité relative)

Reference number
ISO 29471:2008(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 29471 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

Introduction

This International Standard comprises the original EN 1603:1996 and EN 1603:1996/AC:1997 prepared by Technical Committee CEN/TC 88, *Thermal insulating materials and products*, which have been amended by ISO/TC 163/SC 1 with reference to conditioning and testing conditions in tropical countries.

This International Standard is one of a series of documents specifying test methods, based on existing European Standards, that are being adopted by ISO. This "package" of standards includes the following group of interrelated documents.

International Standard	Respective EN standard
ISO 29465, *Thermal insulating products for building applications — Determination of length and width*	EN 822
ISO 29466, *Thermal insulating products for building applications — Determination of thickness*	EN 823
ISO 29467, *Thermal insulating products for building applications — Determination of squareness*	EN 824
ISO 29468, *Thermal insulating products for building applications — Determination of flatness*	EN 825
ISO 29469, *Thermal insulating products for building applications — Determination of compression behaviour*	EN 826
ISO 29470, *Thermal insulating products for building applications — Determination of the apparent density*	EN 1602
ISO 29471, *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23°C/50 % relative humidity)*	EN 1603
ISO 29472, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*	EN 1604
ISO 29764, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*	EN 1605
ISO 29765, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*	EN 1607
ISO 29766, *Thermal insulating products for building applications — Determination of tensile strength parallel to faces*	EN 1608
ISO 29767, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*	EN 1609

ISO 29768, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*	EN 12085
ISO 29769, *Thermal insulating products for building applications — Determination of behaviour under point load*	EN 12430
ISO 29770, *Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products*	EN 12431
ISO 29771, *Thermal insulating materials for building applications — Determination of organic content*	EN 13820
ISO 29803, *Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)*	EN 13497
ISO 29804, *Thermal insulation products for building applications — Determination of the tensile bond strength of the adhesive and of the base coat to the thermal insulation material*	EN 13494
ISO 29805, *Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes*	EN 13496

Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity)

1 Scope

This International Standard specifies the equipment and procedures to evaluate irreversible dimensional changes of test specimens and full-size products with time under constant normal laboratory conditions. It is applicable to thermal insulating products.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 29465, *Thermal insulating products for building applications — Determination of length and width*

ISO 29468, *Thermal insulating products for building applications — Determination of flatness*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
length
l
long linear dimension of the major surface of the specimen parallel to the longer linear dimension of the original product

3.2
width
b
short linear dimension of the major surface of the specimen, measured at right angles to the length

3.3
deviation from flatness
S
the maximum distance between the product, placed on a flat surface with the convex side uppermost, and the flat surface

3.4
normal laboratory conditions
(23 ± 2) °C and (50 ± 5) % relative humidity

4 Principle

Measure length, width and deviation from flatness of the specimens at several time intervals under normal laboratory conditions until relative stability has been achieved.

Dimensional stability is determined using one or more of the following methods:

— method A: Determination of linear dimensions of full size products;

— method B: Determination of linear dimensions of products using specimens with dimensions smaller than those of the full-size products;

— method C: Determination of deviation from flatness of full-size products.

5 Apparatus

5.1 (for method A) **Measuring equipment**, as defined in ISO 29465.

5.2 (for method B) **Frame**, fixed on a flat reference surface with a dial gauge of 0,01 mm accuracy or any device (optical, electrical etc.) that has an accuracy of 0,1 mm/m (see examples in Figures 1 and 2) plus either the equipment described in 5.3 (for method B1) or the equipment described in 5.4 (for method B2).

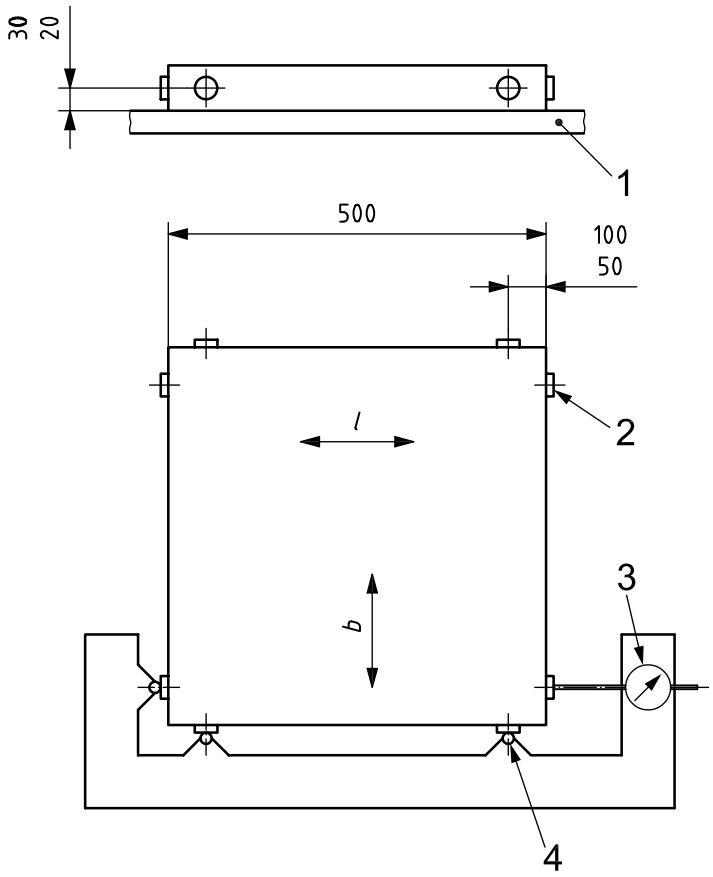
5.3 (for method B1) **Metal plates**, at least 20 mm in diameter (see Figure 1). The actual diameter is chosen so that the pressure exerted by the dial gauge is less than 2 kPa.

5.4 (for method B2) **Metal wire** (see Figure 2).

5.5 (for method C) **Measuring equipment**, as defined in ISO 29468.

Any test equipment that provides the same result to at least the same accuracy may be used.

Dimensions in millimetres

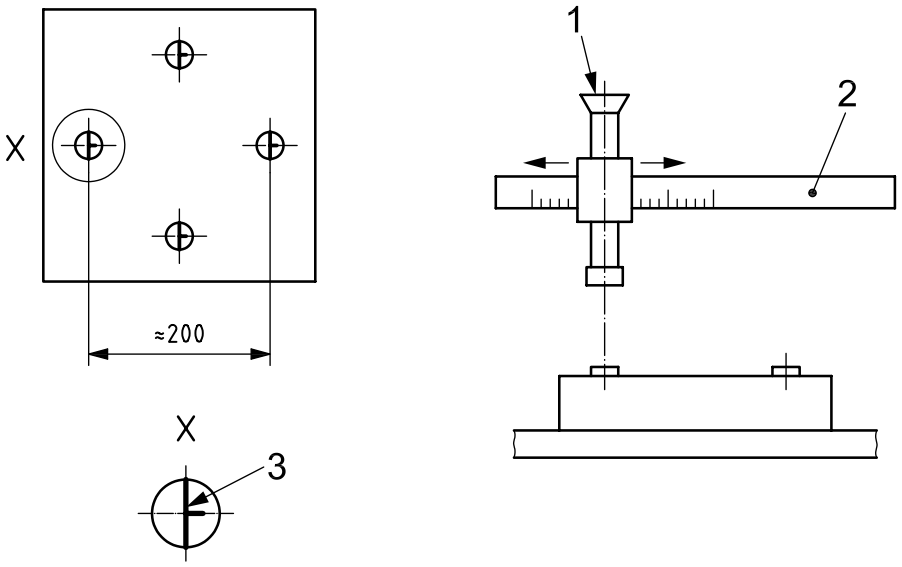


Key

1 flat reference surface
2 metal plate
3 dial gauge
4 metal bead

Figure 1 — Example of suitable equipment for method B1

Dimensions in millimetres



Key

1 optical or electrical device
2 rule
3 metal wire

Figure 2 — Example of suitable equipment for method B2

6 Test specimens

6.1 Dimensions of test specimens

The thickness of the specimens shall be equal to the original product thickness.

— For method A, the specimen shall be the full-size product.

— For method B1, 500 mm × 500 mm or, if less than 500 mm × 500 mm, as large as possible.

In every case, it shall be greater than 250 mm × 250 mm.

— For method B2, 250 mm × 250 mm.

— For method C, the specimen shall be the full-size product.

6.2 Number of test specimens

When testing full-size products, the number of specimens shall be as specified in the relevant product standard. If measurements are made on specimens taken from a full-size product, at least three specimens shall be tested. In the absence of a product standard or any other international or European technical specification, the number of specimens may be agreed between parties.

6.3 Preparation of test specimens

The specimens shall be cut by methods that do not change the structure from that of the original product.

If specimens are not the full-size products, the length and width directions shall be marked on them.

The method of selection of the specimens shall be as specified in the relevant product standard. In the absence of a product standard or any other international or European technical specification, the method of selection may be agreed between parties.

6.4 Conditioning of test specimens

The specimens shall be conditioned for at least 24 h at (23 ± 2) °C and (50 ± 5) % relative humidity.

In tropical countries, different conditioning and testing conditions can be relevant. In this case, the conditions shall be 27 °C and 65 % RH and be stated clearly in the test report.

7 Procedure

7.1 Test conditions

Testing shall be carried out at (23 ± 2) °C and (50 ± 5) % relative humidity.

The specimens shall be conditioned, either vertically or horizontally, with their major faces exposed to the test atmosphere (e.g. supported by wire mesh away from the chamber walls).

In tropical countries, different conditioning and testing conditions can be relevant. In this case, the conditions shall be 27 °C and 65 % RH and be stated clearly in the test report.

7.2 Test procedure

7.2.1 General

Measure dimensional stability using method A, B, or C. The choice shall be as specified in the relevant product standard. In the absence of a product standard or any other international or European technical specification, the method used may be agreed between parties.

Measure the length, the width and the deviation from flatness at the start of the test (l_0, b_0, S_0, respectively) and thereafter at time intervals of 28 days (l_t, b_t, S_t, respectively), with a minimum total test duration of 28 days.

If a more accurate deformation curve is required, measurements may additionally be performed at 1 day, 3 days, 7 days, and 14 days.

Continue measurements until the change in dimensions between the last two measurements is less then 10 % of the total change permitted. The total change permitted, $\Delta\varepsilon$, is normally specified in the relevant product standard. In the absence of such a specification, $\Delta\varepsilon$, may be agreed between parties.

The accuracy of the measuring equipment shall be equal to at least $\Delta\varepsilon/10$.

— Method A shall be used if $\Delta\varepsilon$ is 1 % or greater.

— Method B shall be used if $\Delta\varepsilon$ is less then 1 % but greater than 0,1 %.

— Method C requires an accuracy of 0,5 mm.

7.2.2 Method A

Measure the length and width of the full-size product in accordance with ISO 29465.

7.2.3 Method B1

Glue the metal plates to the edges of the specimen, as shown in Figure 1. Measure the dimensions and record to the nearest 0,01 mm.

7.2.4 Method B2

Glue the metal wires to the major faces of the specimen, as shown in Figure 2. Measure the dimensions and record to the nearest 0,005 mm.

7.2.5 Method C

Measure the deviation from flatness in accordance with ISO 29468.

8 Calculation and expression of results

Calculate the dimensional changes, $\Delta\varepsilon_l$ and $\Delta\varepsilon_b$, expressed as percentages, and $\Delta\varepsilon_S$, expressed in millimetres per metre, from the individual measurements, using Equations (1) to (3), respectively:

$$\Delta\varepsilon_l = 100 \times \frac{\Delta l}{l_0} \tag{1}$$

$$\Delta\varepsilon_b = 100 \times \frac{\Delta b}{b_0} \tag{2}$$

$$\Delta\varepsilon_S = 10^3 \times \frac{\Delta S}{l_0} \text{ or } \Delta\varepsilon_S = 10^3 \times \frac{\Delta S}{b_0} \tag{3}$$

where

Δl, Δb are the measured overall changes in length and width, expressed in millimetres;

ΔS is the measured overall change in flatness, expressed in millimetres;

l_0, b_0 are the measured initial length and width, expressed in millimetres.

Calculate the mean value of each dimensional change, $\Delta\varepsilon_l$, $\Delta\varepsilon_b$, and $\Delta\varepsilon_S$, from the individual test results.

The dimensional changes, $\Delta\varepsilon_l$ and $\Delta\varepsilon_b$, are given to the nearest 0,5 % for method A and to the nearest 0,1 % for method B. The change in deviation from flatness, $\Delta\varepsilon_S$, shall be given to the nearest millimetre per metre.

9 Accuracy of measurement

Following the experience from a “round robin test” where comparable test equipment and test specimen preparation were used, the accuracy for dimensional stability, $\Delta\varepsilon_l$ and $\Delta\varepsilon_b$, can be estimated as given below.

a) Repeatability limit, r, with a probability of 95 %: approximately 0,4 %;

b) Reproducibility limit, R, with a probability of 95 %: approximately 0,7 %.

The terms in a) and b) are applied as described in ISO 5725-2.

10 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) product identification:

- product name, factory, manufacturer, or supplier,
- production code number,
- type of product,
- packaging,
- form in which the product arrived at the laboratory,
- other information as appropriate (e.g. nominal thickness, nominal density);

c) test procedure:

- pre-test history and sampling (e.g. person taking the sample, place of sampling),
- conditioning,
- any deviation from Clauses 6 and 7,
- conditioning and testing conditions in tropical countries, if applicable,
- date of testing,
- general information relating to the test (test method used),
- events that can have affected the results;

d) results: all individual values and mean values.

NOTE It is expected that information about the apparatus and identity of the technician be available in the laboratory, but it is not necessary that it be recorded in the report.

ICS 91.100.60

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