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BSI Standards Publication

Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions

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National foreword

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

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Thermal insulating products for building applications - Determination of dimensional stability under specified temperature and humidity conditions

Produits isolants thermiques destinés aux applications du bâtiment - Détermination de la stabilité dimensionnelle dans des conditions de température et d'humidité spécifiées

Wärmedämmstoffe für das Bauwesen - Bestimmung der Dimensionsstabilität bei definierten Temperatur- und Feuchtebedingungen

This European Standard was approved by CEN on 15 December 2012.

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Foreword

This document (EN 1604:2013) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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

This document supersedes EN 1604:1996.

The revision of this standard contains no major changes, only minor corrections and clarifications of an editorial nature.

This European Standard is one of a series of standards which specify test methods for determining dimensions and properties of thermal insulating materials and products. It supports a series of product standards for thermal insulating materials and products which derive from the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products (Directive 89/106/EEC) through the consideration of the essential requirements.

This European Standard has been drafted for applications in buildings, but it may also be used in other areas where it is relevant.

This European test standard is one of the following group of interrelated standards on test methods for determining dimensions and properties of thermal insulation materials and products, all of which fall within the scope of CEN/TC 88:

— EN 822, *Thermal insulating products for building applications — Determination of length and width*

— EN 823, *Thermal insulating products for building applications — Determination of thickness*

— EN 824, *Thermal insulating products for building applications — Determination of squareness*

— EN 825, *Thermal insulating products for building applications — Determination of flatness*

— EN 826, *Thermal insulating products for building applications — Determination of compression behaviour*

— EN 1602, *Thermal insulating products for building applications — Determination of the apparent density*

— EN 1603, *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 °C/50 % relative humidity)*

— EN 1604, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*

— EN 1605, *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*

— EN 1606, *Thermal insulating products for building applications — Determination of compressive creep*

— EN 1607, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

— EN 1608, *Thermal insulating products for building applications — Determination of tensile strength parallel to faces*

— EN 1609, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*

— EN 12085, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*

— EN 12086, *Thermal insulating products for building applications — Determination of water vapour transmission properties*

— EN 12087, *Thermal insulating products for building applications — Determination of long-term water absorption by immersion*

— EN 12088, *Thermal insulating products for building applications — Determination of long-term water absorption by diffusion*

— EN 12089, *Thermal insulating products for building applications — Determination of bending behaviour*

— EN 12090, *Thermal insulating products for building applications — Determination of shear behaviour*

— EN 12091, *Thermal insulating products for building applications — Determination of freeze-thaw resistance*

— EN 12429, *Thermal insulating products for building applications — Conditioning to moisture equilibrium under specified temperature and humidity conditions*

— EN 12430, *Thermal insulating products for building applications — Determination of behaviour under point load*

— EN 12431, *Thermal insulating products for building applications — Determination of thickness for floating floor insulating products*

— EN 13793, *Thermal insulating products for building applications — Determination of behaviour under cyclic loading*

— EN 13820, *Thermal insulating materials for building applications — Determination of organic content*

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the equipment and procedures for evaluating dimensional changes of test specimens under specified conditions of temperature, relative humidity and duration of exposure. This European Standard proposes a range of conditions from which one or more desirable test conditions can be selected. It is applicable to thermal insulating products.

2 Normative references

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

EN 12085, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*

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
dimension of the test specimen parallel to the longer linear dimension of major surface of the original product

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

3.3
thickness
d
linear dimension measured perpendicularly to the length and width plane

4 Principle

The changes in linear dimensions are determined which occur when the test specimens have been conditioned, subjected to specified environments for a given period, and then reconditioned.

5 Apparatus

5.1 Temperature controlled or temperature and humidity controlled chamber, capable of maintaining the test specimens within the specified conditions and within the limits specified in 7.2.

5.2 Measuring instruments, capable of measuring linear dimensions of test specimens in accordance with EN 12085, to an accuracy of 0,1 mm.

6 Test specimens

6.1 Dimensions of test specimens

The thickness of test specimens shall be the original product thickness.

The test specimens shall be squarely cut and have a side length of (200 ± 1) mm. If larger dimensions are used, the accuracy shall be as given in 5.2.

6.2 Number of test specimens

The number of test specimens shall be as specified in the relevant product standard. If the number is not specified, then at least three test specimens shall be tested for each set of chosen conditions.

In the absence of a product standard or any other European Technical Specification, the number of test specimens may be agreed between parties.

6.3 Preparation of test specimens

The test specimens shall be cut so that they are representative of the full size product. Any surface skins, facings and/or coatings shall be retained. Length and width directions shall be marked on the test specimens.

6.4 Conditioning of test specimens

The test specimens shall be conditioned to equilibrium with an atmosphere at (23 ± 2) °C and (50 ± 5) % relative humidity. A test specimen is considered to be conditioned when changes in length and in width, measured according to 7.2, between two consecutive measurements at a time interval of two weeks, are less than 0,1 %.

Other time intervals may be defined in the relevant product standard or any other European Technical Specification.

7 Procedure

7.1 Test conditions

Condition the test specimens in accordance with 6.4.

7.2 Test procedure

In the same atmosphere as used for conditioning, determine the initial length and width of each test specimen (l_0 and b_0) by taking readings at three positions (l_{01}, l_{02}, l_{03} and b_{01}, b_{02}, b_{03}) and the initial thickness (d_0) at five positions (d_{01}, d_{02}, d_{03}, d_{04}, d_{05}) as shown in Figure 1, using the appropriate methods described in EN 12085, to an accuracy of 0,1 mm.

Expose a set of test specimens to each of the conditions specified in the relevant product standard.

In the absence of such a specification, test conditions may be agreed between parties chosen from the following:

For a specified temperature without a specified relative humidity:

— (−40 ± 3) °C

— (–30 ± 3) °C

— (+40 ± 2) °C

— (+60 ± 2) °C

For a specified temperature with a relative humidity specified in the range 30 % to 90 %, to an accuracy of ± 5 % relative humidity:

— (+20 ± 2) °C

— (+23 ± 2) °C

— (+60 ± 2) °C

— (+70 ± 2) °C

Other conditions may be used.

Lay the test specimens horizontally or place them vertically in the test chamber, not less than 25 mm apart, on a rigid wire mesh or perforated metal plate such that a substantial amount of free air is circulated around the test specimens.

The test specimens shall not be exposed to the direct radiation from any heating elements.

The preferred duration of exposure is (24 ± 1) h or (48 ± 1) h.

Other exposure times may be as specified in the relevant product standard or any other European Technical Specification or may be agreed between parties.

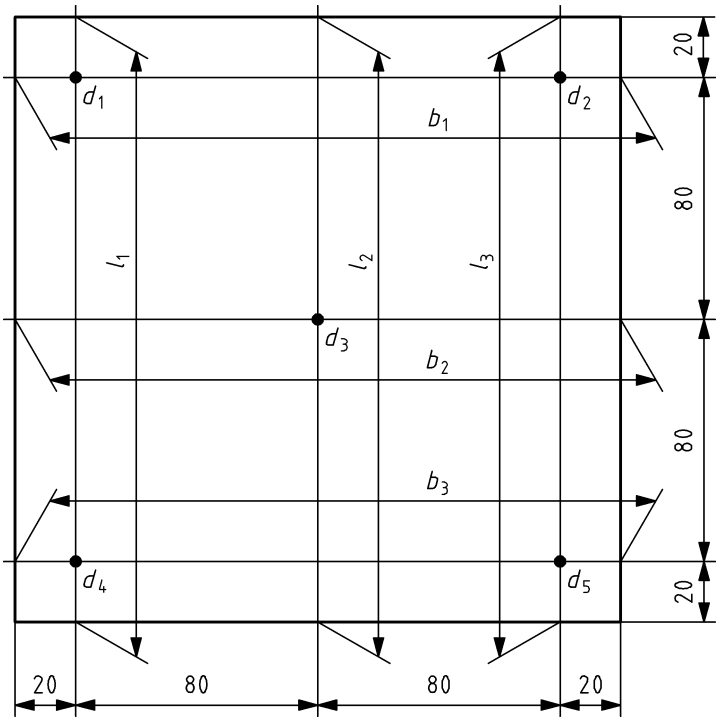
Remove the test specimens after exposure to the test atmosphere and expose them for a further (3 ± 1) h at (23 ± 2) °C and (50 ± 5) % relative humidity.

Determine the final length, width, and thickness of the test specimens (l_t and b_t and d_t) by taking readings (l_{t1}, l_{t2}, l_{t3} and b_{t1}, b_{t2}, b_{t3} and d_{t1}, d_{t2}, d_{t3}, d_{t4}, d_{t5f}) at the same positions as for the initial measurements (see Figure 1).

Examine the test specimens visually.

If requested in the relevant product standard or any other European Technical Specification, the test specimens may be re-exposed to the test conditions for periods of 7 days and the dimensions re-determined at the positions shown in Figure 1, at the end of the requested periods.

Dimensions in millimetres



d_1 stands for d_{01} and d_{t1} etc.

Figure 1 — Positions for measuring dimensions

8 Calculation and expression of results

Calculate the dimensional changes, $\Delta\varepsilon_l$, $\Delta\varepsilon_b$ and $\Delta\varepsilon_d$, in percentage, from the individual measurements, using Formulae (1) to (3):

$$\Delta\varepsilon_l = 100 \times \frac{l_t - l_0}{l_0} \quad (1)$$

$$\Delta\varepsilon_b = 100 \times \frac{b_t - b_0}{b_0} \quad (2)$$

$$\Delta\varepsilon_d = 100 \times \frac{d_t - d_0}{d_0} \quad (3)$$

where

l_0, b_0 and d_0 are the initial dimensions after conditioning, in millimetres;

l_t, b_t and d_t are the final dimensions after exposure, in millimetres.

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

The dimensional changes, $\Delta\varepsilon_l$, $\Delta\varepsilon_b$ and $\Delta\varepsilon_d$, shall be given to the nearest 0,1 %.

9 Precision of the method

An interlaboratory test was performed with nine laboratories. Three products were tested.

The result was analysed according to ISO 5725-2.

The results from the test are given in the Table 1.

Table 1 — Dimensional stability under specified conditions

Test conditions	Relative change in dimensions (in %)				
	Range of measured $\Delta\varepsilon_l$, $\Delta\varepsilon_b$, $\Delta\varepsilon_d$	**Estimate of repeatability variance** S_r	**95 % repeatability limit**	**Estimate of reproducibility variance** S_R	**95 % reproducibility limit**
Specified temperature	−1,0 to 2,1	0,1	0,4	0,2	0,7
Specified temperature and relative humidity	−0,7 to 2,5	0,2	0,6	0,3	1,0

All values given in the Table 1 are expressed in percentage of the test specimen dimension.

The above mentioned terms are applied as described in ISO 5725-2.

Bias cannot be determined in this test method as there is no accepted reference material for it.

NOTE The choice of products was selected to get a wide range of dimensional changes. The testing conditions were chosen to get a large variation in test results.

10 Test report

The test report shall include the following information:

a) reference to this European Standard;

b) product identification:

   1) trademark, factory, manufacturer, or supplier;

   2) production code number;

   3) type of product;

   4) packaging;

   5) the form in which the product arrived at the laboratory;

   6) other information as appropriate (e.g. nominal thickness, nominal density, skins, facings);

c) test procedure:

   1) pre-test history and sampling (e.g. who sampled and place of sampling);

2) conditioning;

3) deviations from Clauses 6 and 7, if any;

4) date of testing;

5) general information relating to the test (e.g. temperature, relative humidity, duration of test, dimensions of test specimens);

6) events which may have affected the results;

7) any observations made at the conclusion of the test. Information about the apparatus and identity of the person responsible for the test should be available in the laboratory, but it need not be recorded in the report;

d) results: all individual values and mean values.

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