BS EN 1605:2013

BSI Standards Publication

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

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1605:2013. It supersedes BS EN 1605:1997, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/540, Energy performance of materials components and buildings.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2013.

ISBN 978 0 580 78044 8

ICS 91.100.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2013.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1605

March 2013

ICS 91.100.60

Supersedes EN 1605:1996

English Version

Thermal insulating products for building applications - Determination of deformation under specified compressive load and temperature conditions

Produits isolants thermiques destinés aux applications du bâtiment - Détermination de la déformation sous charge en compression et conditions de température spécifiées

Wärmedämmstoffe für das Bauwesen - Bestimmung der Verformung bei definierter Druck- und Temperaturbeanspruchung

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

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 1605:2013) 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 1605:1996.

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 building, 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 determining the deformation occurring under specified conditions of compressive load, temperature and time. 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 term and definition applies.

3.1
relative deformation
ε
reduction in thickness of a test specimen under specified compressive load, expressed as a percentage of its initial thickness, measured in the direction of compressive loading

4 Principle

A specified compressive load is applied to a test specimen and the relative deformation is measured in two steps each with a different temperature and time condition.

5 Apparatus

5.1 Instruments, capable of measuring linear dimensions of test specimens in accordance with EN 12085 to an accuracy of 0,5 % for length and width and 0,1 mm for thickness.

5.2 Oven, with thermostat and forced air circulation, capable of maintaining the required temperature to within $\pm$ 1 K.

5.3 Loading device, consisting of two flat plates, one of which shall be movable, so arranged that they compress the test specimen in a vertical direction.

The movable plate shall be guided in such a manner as to be self-aligning. The plates shall be capable of being loaded smoothly and without distortion so that, during the test, the static stress does not change by more than $\pm$ 5 % (see Figure 1 and Table 1).

The two flat plates should be finely ground/polished. The distance between the upper plate and the reading device should be as short as possible. The zero setting of the deformation measurement should be done using a calibrated steel block approximately of the same thickness as the product to be tested.

6 Test specimens

6.1 Dimensions of test specimens

The thickness of the test specimens shall be the original product thickness, provided that the thickness is at least 20 mm.

The test specimens shall be squarely cut and have sides with the following recommended dimensions:

50 mm x 50 mm or

100 mm x 100 mm or

150 mm x 150 mm or

200 mm x 200 mm or

300 mm x 300 mm.

The side length shall be equal to or greater than the thickness.

Dimensions used shall be as specified in the relevant product standard.

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

The tolerance on parallelism between the two faces of the test specimen shall not be greater than 0,5 % of its side length, with a maximum of 0,5 mm.

If the test specimen is not flat, it shall be ground flat or an adequate coating shall be applied to prepare the surface for the test. Where it is coated, no significant deformation should occur in the coating or it shall be taken into account by deducting the deformation of the coating.

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 used for each selected set of 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 the direction of loading applied to the product will correspond to the direction in which the compressive forces are applied to the product in use.

Natural surface skins and any facings and/or coatings that form an integral part of the product shall be retained.

Special methods of preparation, when needed, are given in the relevant product standard or any other European Technical Specification.

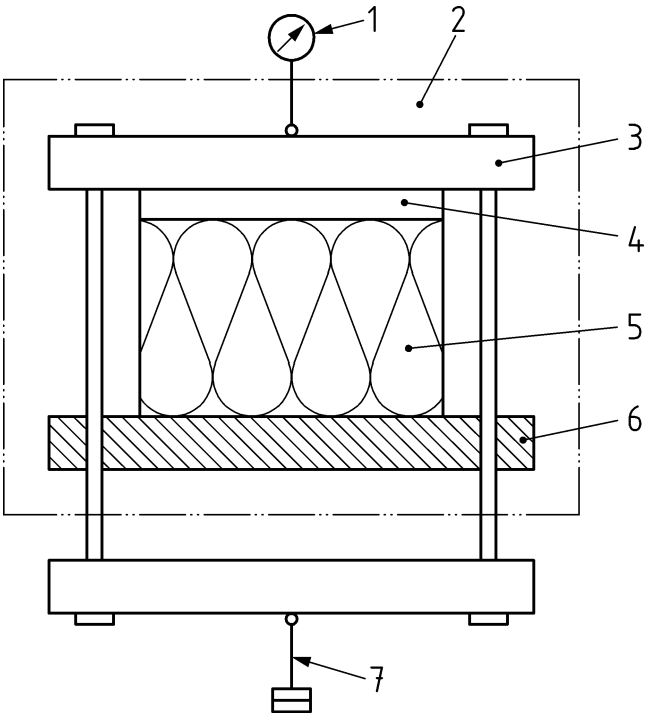

Figure 1 a)

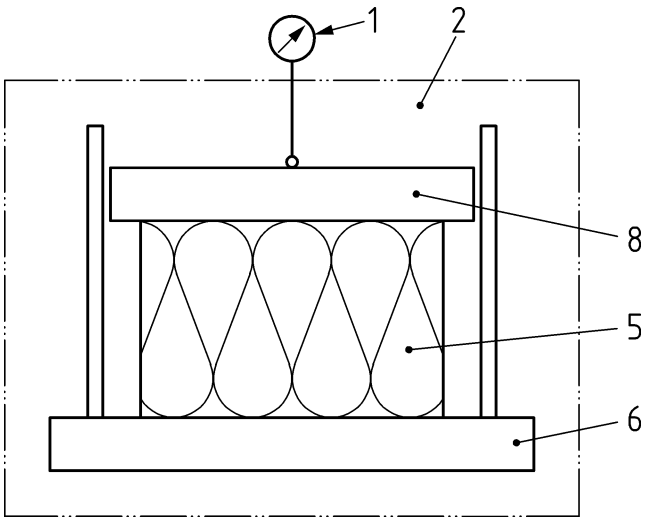

Figure 1 b)

Key
1 dial gauge
2 oven
3 loading bridge
4 load distribution plate (movable, self-aligning)
5 test specimen
6 crosshead
7 loading by weights
8 load

Figure 1 — Examples of test apparatus

6.4 Conditioning of test specimens

The test specimens shall be conditioned for at least 6 h at (23 ± 5) °C. In case of dispute, they shall be conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity for the time specified in the relevant product standard.

7 Procedure

7.1 Test conditions

The test conditions shall be as specified in Table 1.

7.2 Test procedure

Measure the length and width of each test specimen to an accuracy of 0,5 %, in accordance with EN 12085. These dimensions are used for calculating the initial area of the cross section of the test specimen for determining the load.

The test shall be carried out with one of the three different sets of conditions (1, 2 or 3) as shown in Table 1. The set to be used shall be as specified in the relevant product standard or any other European Technical Specification.

Measure the thickness of each test specimen, d_s, after conditioning in accordance with EN 12085, to an accuracy of 0,1 mm.

The test is to be made in two steps, A and B, using the following procedure.

7.2.1 Step A

Load the test specimen at a temperature of (23 ± 5) °C for (48 ± 1) h with a load corresponding to the set of conditions (1, 2 or 3) selected from Table 1.

Determine the thickness of the test specimen, d_1, after (48 ± 1) h under load, to the nearest 0,1 mm.

7.2.2 Step B

Expose the loaded test specimen to the temperature for the time indicated, in accordance with the selected set of conditions (1, 2 or 3).

Determine the thickness of the test specimen, d_2, after the selected time at the test temperature under the load, to the nearest 0,1 mm.

Table 1 — Test conditions

Set of conditions	**Stress,** in kPa	**Step A**		**Step B**	
		Temperature, in °C	Time, in h	Temperature, in °C	Time, in h
1	20	(23 ± 5)	(48 ± 1)	(80 ± 1)	(48 ± 1)
2	40	(23 ± 5)	(48 ± 1)	(70 ± 1)	(168 ± 1)
3	80	(23 ± 5)	(48 ± 1)	(60 ± 1)	(168 ± 1)

8 Calculation and expression of results

The results are the mean values from the measurements, which shall be expressed to three significant figures.

NOTE Results obtained with test specimens of different thicknesses can be different.

Calculate the relative deformation after step A of the test, as a percentage, using Formula (1):

$$\varepsilon = \frac{d_s - d_1}{d_s} \times 100 \quad (1)$$

where

d_s is the thickness of the test specimen (in accordance with 7.2) before applying the selected load, in millimetres;

d_1 is the thickness of the test specimen after applying the selected load (in accordance with 7.2.1), in millimetres.

Calculate the total relative deformation after step B of the test, ε_2, as a percentage, using Formula (2):

$$\varepsilon_2 = \frac{d_s - d_2}{d_s} \times 100 \quad (2)$$

where

d_s is the thickness of the test specimen (in accordance with 7.2) before applying the selected load, in millimetres;

d_2 is the thickness of the test specimen after applying the selected load and temperature condition (in accordance with 7.2.2), in millimetres.

9 Accuracy of measurement

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

The results were analysed according to ISO 5725-2.

The results from the test are given in Tables 2 and 3:

Table 2 – Percentage deformation under specified conditions (stress 20 kPa, temperature 23 °C, time 48 h) in percent %

Test conditions	Relative deformations after step A of the test: ε(d1)				
	Range of measured ε_1	Estimate of repeatability variance S_r	95 % repeatability limit	Estimate of reproducibility variance S_R	95 % reproducibility limit
Stress 20kPa temperature 23°C time 48 h	- 0,2 to 2,9	0,2	0,5	0,4	1,2

Table 3 – Percentage deformation under specified conditions (stress 20 kPa, temperature 80 °C, time 48 h) in percent %

Test conditions	Relative deformations after step B of the test: ε(d2)				
	Range of measured ε_2	Estimate of repeatability variance S_r	95 % repeatability limit	Estimate of reproducibility variance S_R	95 % reproducibility limit
Stress 20kPa temperature 80°C time 48 h	- 0,3 to 7,5	0,3	0,8	0,8	2,0

All values given in Tables 1 and 2 are expressed in percentage deformation.

For all other test conditions the accuracy is expected to be the same.

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

Bias cannot be determined in this test method as there is not any 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) product name, 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 dimensions, nominal density);

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, including the dimensions of test specimens and the chosen set of conditions;

6) any events which may have affected the results. 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 for steps A and B.

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™