BRITISH STANDARD

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# 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

The European Standard EN 13494:2002 has the status of a British Standard

ICS 91.100.60

# National foreword

This British Standard is the official English language version of EN 13494:2002.

The UK participation in its preparation was entrusted by Technical Committee B/540, Energy performance of materials, components and buildings, to Subcommittee B/540/1, European standards for thermal insulation, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/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.

**Cross-references**

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This British Standard, having been prepared under the direction of the Building and Civil Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 28 October 2002

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EUROPEAN STANDARD

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# EN 13494

October 2002

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English version

# 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

Produits isolants thermiques destinés aux applications du bâtiment - Détermination de l'adhérence par traction de la colle et de la couche de base sur le matériau d'isolation thermique

Wärmedämmstoffe für das Bauwesen - Bestimmung der Haftzugfestigkeit zwischen Klebemasse/Klebemörtel und Wärmedämmstoff sowie zwischen Unterputz und Wärmedämmstoff

This European Standard was approved by CEN on 12 August 2002.

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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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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# Contents

page

Foreword ..... 3

1 Scope ..... 4

2 Normative references ..... 4

3 Terms and definitions, symbols and units ..... 4
3.1 Terms and definitions ..... 4
3.2 Symbols and units ..... 4

4 Principle ..... 5

5 Apparatus ..... 5
5.1 Glue ..... 5
5.2 Rigid plates ..... 5
5.3 Saw ..... 5
5.4 Tensile testing machine ..... 5

6 Test specimens ..... 5
6.1 Preparation of the samples ..... 5
6.2 Conditioning of the samples ..... 5
6.3 Preparation and number of test specimens ..... 5

7 Procedure ..... 6
7.1 Test conditions ..... 6
7.2 Attachment of the test specimens to the tensile testing machine ..... 6
7.3 Test procedure ..... 7

8 Calculation and expression of results ..... 7
8.1 Tensile bond strength ..... 7
8.2 Mode of failure ..... 8

9 Accuracy of measurement ..... 8

10 Test report ..... 8

## Foreword

This document (EN 13494:2002) 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 April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

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 may also be used in other areas where it is relevant.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

# 1 Scope

This European Standard specifies equipment and procedures for determining the tensile bond strength of the adhesive and of the base coat to the thermal insulation material.

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

EN 1015-1, *Methods of test for mortar for masonry — Part 1: Determination of particle size distribution (by sieve analysis).*

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

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

prEN ISO 3251, *Paints and varnishes and plastics — Determination of non-volatile matter content (ISO/DIS 3251:2000).*

prEN ISO 9229:1997, *Thermal insulation — Definitions of terms (ISO 9229:1997).*

prEN 13499:1999, *Thermal insulation products for buildings — External Thermal Insulation Composite Systems (ETICS) based on expanded polystyrene — Specification.*

EN ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods (ISO 3451-1:1997).*

# 3 Terms and definitions, symbols and units

## 3.1 Terms and definitions

For the purposes of this European Standard the terms and definitions given in prEN ISO 9229:1997 and prEN 13499:1999 apply.

## 3.2 Symbols and units

Symbols used in this standard:

is the tensile bond strength, kPa;

$F$ is the tensile load at failure, kN;

$A$ is the cross-sectional area of the plate, $m^2$.

# 4 Principle

The tensile bond strength of the adhesive and of the base coat to the thermal insulation material are determined by a direct load perpendicular to the surface of the adhesive or the base coat. The tensile load is applied by means of a rigid plate glued to the test area of the adhesive or base coat.

# 5 Apparatus

## 5.1 Glue

The glue shall be suitable for rough surfaces (render surface) and for timber (e.g. solvent free epoxy adhesive or polyurethane adhesive). The glue shall not damage the thermal insulation material, the base coat or the adhesive and not influence the results.

## 5.2 Rigid plates

The rigid plates (e.g. plywood of thickness 20 mm or steel plates of thickness 5 mm) shall have dimensions of (200 2) mm (200 2) mm. The mechanical stability or the rigid plates shall not influence the test results. They shall have a central fitting for the connection to the testing machine providing a self aligning attachment to avoid uneven distribution of tensile stress during the test. On the side to which the glue is to be applied, the plates shall be flat with a tolerance of $\pm$ 0,5 mm per 100 mm length.

## 5.3 Saw

Mechanical driven saw (e.g. circular saw or band saw) with guides for a rectangular cut. The saw shall be suitable for sawing test specimens from hardened adhesive or base coat with the reinforcement.

## 5.4 Tensile testing machine

The tensile testing machine, appropriate for the range of force and displacement involved, capable of having a constant crosshead speed adjusted to (10 $\pm$ 1) mm/min and suitable for testing specimens with the dimensions of 200 mm 200 mm. It shall be capable of measuring the force with an error limit of at least 1 % (see EN 1607).

# 6 Test specimens

## 6.1 Preparation of the samples

The adhesive, or base coat with the reinforcement, is applied in accordance with the manufacturers instructions on to the surface of thermal insulation material having minimum dimensions of 500 mm 1000 mm 60 mm. The samples shall not include mechanical fixings.

## 6.2 Conditioning of the samples

The conditioning of the samples shall be carried out as specified in the relevant ETICS product standard.

NOTE In the absence of a product standard for ETICS or any other European technical specification, the conditioning procedure may be agreed between parties.

## 6.3 Preparation and number of test specimens

Cut three square shaped test specimens of dimensions 200 mm 200 mm out of the samples. A minimum distance of 100 mm to the edges of the samples shall be maintained.

The thickness of the adhesive or of the base coat shall be measured visually and rounded to the nearest mm.

Apply a thin layer of glue to both surfaces of the test specimen in such a way that the glue forms a complete layer between the rigid plates and the test specimen. With slight pressure glue the rigid plate on to the test specimen

ensuring that the centre of the rigid plates coincides with the centre square shaped test specimen. Take care that the glue does not run down the sides of the test specimen. Allow the glue to harden in accordance with the manufacturers instructions.

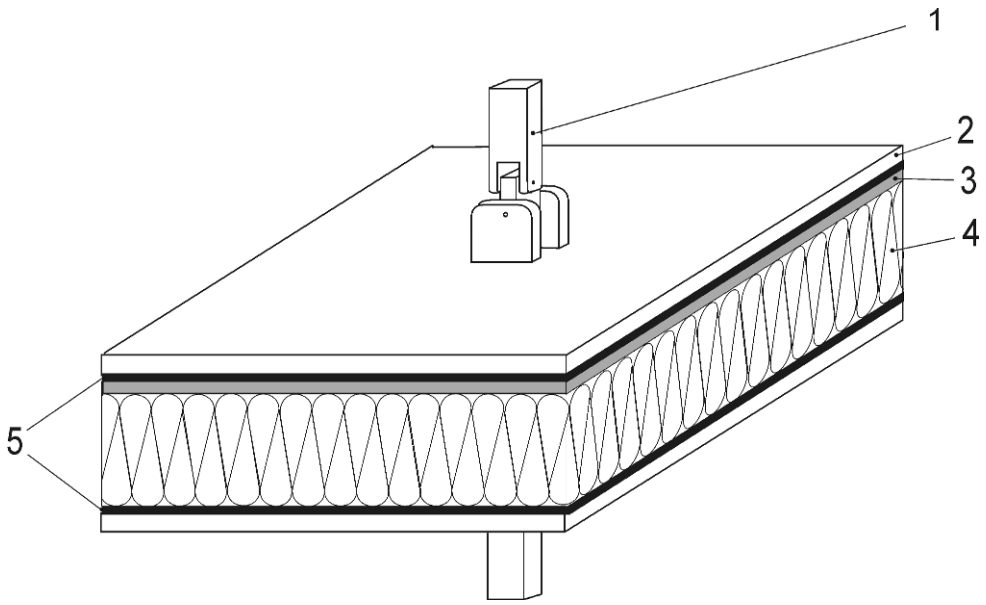
# 7 Procedure

## 7.1 Test conditions

The test shall be carried out at (23 $\pm$ 5) °C.

## 7.2 Attachment of the test specimens to the tensile testing machine

Attach the test specimen in the tensile testing machine by means of the central fitting of the rigid plates. Figure 1 illustrates the attachment of the test specimen to the tensile testing machine.




**Key**

1 Device for central fitting of the rigid plates
2 Rigid plates
3 Adhesive or base coat with reinforcement
4 Thermal insulation material to the testing machine
5 Glue

**Figure 1 — Attachment of the test specimen to the tensile testing machine**

### 7.3 Test procedure

Carry out the tensile bond strength measurement as described in EN 1607 until failure occurs. Apply the tensile load perpendicular to the test area through the rigid plates by means of the tensile testing machine.

Increase the load with a constant crosshead speed adjusted to (10 ± 1) mm/min.

Record the tensile force at failure. Reject any test where the mode of failure is a fracture at the glue layer between the test specimen and the rigid plates.

NOTE 1 For rigid or brittle thermal insulation materials it can be better to make the measurement with a load controlled speed of 100 N/s.

NOTE 2 More information of the mode of failure will be available, if the load/displacement curve is measured during the test.

## 8 Calculation and expression of results

### 8.1 Tensile bond strength

Calculate the tensile bond strength, , in kilopascal, using the equation:

$$= \frac{F}{A} \quad (1)$$

where

$F$ is the tensile load at failure, in kilonewton;

$A$ is the cross-sectional area of the plate, in square metre;

is the tensile bond strength, in kilopascal.

The results shall be rounded to the nearest 0,1 kPa.

### 8.2 Mode of failure

Note which mode of failure occurs. Possible failures are:

¾ adhesive failure between glue and base coat or adhesive;

¾ cohesive failure in the base coat or adhesive;

¾ adhesive failure between base coat or adhesive and the thermal insulation material;

¾ cohesive failure in the thermal insulation material.

## 9 Accuracy of measurement

NOTE It has not been possible to include a statement on the accuracy of measurement in this edition of the standard, but it is intended to include such a statement when the standard is next revised.

## 10 Test report

The test report shall include the following information:

a) reference to this European Standard;

b) product identification given by the system manufacturer

   1) ETICS

      i) product name, factory, manufacturer or supplier;

      ii) batch numbers of the components;

   2) Adhesive or base coat

      i) type of product (adhesive or base coat);

      ii) packaging when the product arrived at the laboratory;

      iii) the form of the product (paste or powder);

      iv) preparation of the product (with adding cement, water or other components, time and procedure for mixing the components before application);

      v) type of the main binders of the product (lime, cement, organic binder);

      vi) if the product is a paste, the non-volatile matter determined in accordance with prEN ISO 3251, test conditions 3 h at 105 °C;

      vii) if the main binder of the product is organic, ash content determined in accordance with EN ISO 3451-1, test conditions 2 h at 450 °C;

      viii) maximum grain size measured according EN 1015-1;

      ix) thickness of base coat;

3) Reinforcement

i) type, product name and manufacturer;

ii) mass per square metre of the reinforcement in gram per square metre;

iii) thread count in warp and weft per 100 mm or mesh dimensions of the reinforcement;

4) Thermal insulating material

i) type, product name and manufacturer;

ii) thickness according to EN 823;

iii) declared density according to EN 1602;

iv) declared tensile strength perpendicular to faces according to EN 1607;

c) test procedure

1) pre-test history and sampling, e.g. who sampled and where;

2) conditioning;

3) type and name of the glue used;

4) material and dimensions of the rigid plates;

5) deviation from clauses 6 and 7;

6) date of test;

7) number of test specimens;

8) displacement or load speed;

9) general information regarding the test;

10) events which may have affected the results;

11) number and type of test specimens which have been discarded and why;

NOTE Information about the apparatus and identity of the technician should be available in the laboratory, but it need not to be recorded in the report.

d) results

1) all individual values and the mean value of the tensile bond strength;

2) description of the mode of failures.

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