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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

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

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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 29804 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

ISO 29804 is based on EN 13494:2002 prepared by Technical Committee CEN/TC 88 *Thermal insulating materials and products*. However,

— 6.3, preparation and number of test specimens,

— 7.1, test conditions, and

— Clause 10, test report

have been modified to reflect the conditions for tropical countries. Further, 5.2, 5.4, 6.1 and 8.2 have been modified.

This International Standard is based on EN 13494:2002 prepared by Technical Committee CEN/TC 88 *Thermal insulating materials and products*, which has 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	Title	Respective EN standard
12968	*Thermal insulation products for building applications — Determination of the pull-off resistance of external thermal insulation composite systems (ETICS) (foam block test)*	EN 13495
29465	*Thermal insulating products for building applications — Determination of length and width*	EN 822
29466	*Thermal insulating products for building applications — Determination of thickness*	EN 823
29467	*Thermal insulating products for building applications — Determination of squareness*	EN 824
29468	*Thermal insulating products for building applications — Determination of flatness*	EN 825
29469	*Thermal insulating products for building applications — Determination of compression behaviour*	EN 826
29470	*Thermal insulating products for building applications — Determination of the apparent density*	EN 1602
29471	*Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23°C/50 % relative humidity)*	EN 1603
29472	*Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*	EN 1604
29764	*Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions*	EN 1605
29765	*Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*	EN 1607
29766	*Thermal insulating products for building applications — Determination of tensile strength parallel to faces*	EN 1608
29767	*Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion*	EN 1609
29768	*Thermal insulating products for building applications — Determination of linear dimensions of test specimens*	EN 12085
29769	*Thermal insulating products for building applications — Determination of behaviour under point load*	EN 12430
29770	*Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products*	EN 12431
29771	*Thermal insulating materials for building applications — Determination of organic content*	EN 13820
29803	*Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)*	EN 13497
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
29805	*Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes*	EN 13496

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

1 Scope

This International 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

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 29466, *Thermal insulating products for building applications — Determination of thickness*

ISO 29470, *Thermal insulating products for building applications — Determination of the apparent density*

ISO 29765, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile matter content*

ISO 9229, *Thermal insulation — Vocabulary*

EN 13499, *Thermal insulation products for buildings — External thermal insulation composite systems (ETICS) based on expanded polystyrene — Specification*

ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods*

3 Terms and definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9229 and EN 13499 apply.

3.2 Symbols and units

Symbols used in this International Standard:

σ tensile bond strength, kPa;

F tensile load at failure, kN;

A 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 is 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, 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 shall not influence the results.

5.2 Rigid plates (e.g. plywood of thickness 20 mm or steel plates of thickness 5 mm), of the dimensions of (200 ± 2) mm × (200 ± 2) mm. The rigid plates with the dimensions of (50 ± 2) mm × (50 ± 2) mm may be used for direct measurements on the rig. 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 ±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, appropriate for the range of force and displacement involved, capable of having a constant crosshead speed adjusted to (10 ± 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 ISO 29765).

For measurements directly on the rig, portable devices may be used, with a precision of 10 %. In this case, the size of the test specimen shall be 50 mm × 50 mm for tractions higher than 50 kPa. For values lower than 20 kPa, direct measurement on the rig shall not be carried out. A precise traction machine shall be used (with a precision of 1 %) with samples of 200 mm × 200 mm.

6 Test specimens

6.1 Preparation of the samples

The adhesive, or base coat with the reinforcement, is applied in accordance with the manufacturer's instructions to the surface of the thermal insulation material having minimum dimensions of 500 mm × 1 000 mm × 10 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 can be agreed on between the 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 millimetre.

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 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 manufacturer's instructions.

In tropical countries, different conditioning and testing conditions might be relevant. In this case, the conditions shall be (27 ± 2) °C and (65 ± 5) % relative humidity and be stated clearly in the test report.

7 Procedure

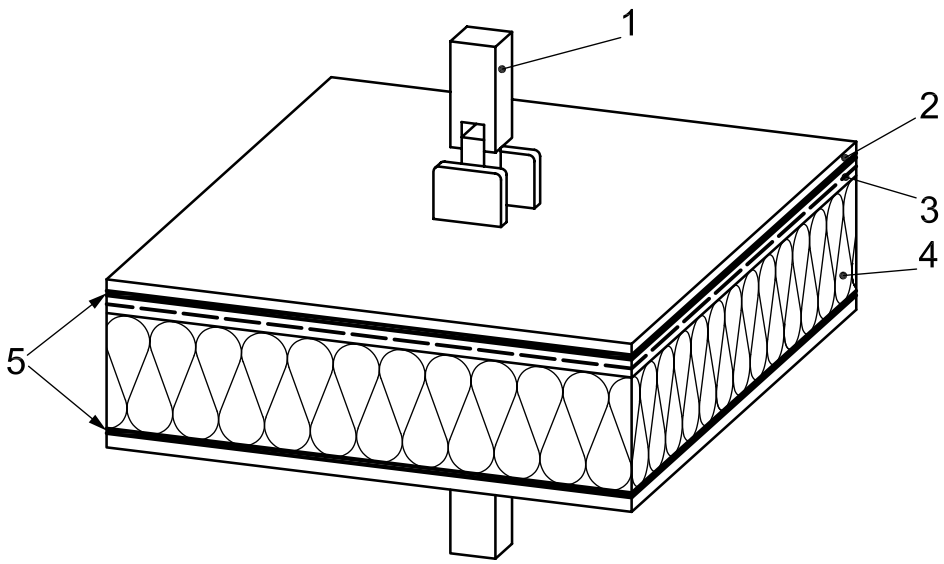
7.1 Test conditions

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

In tropical countries, different conditioning and testing conditions might be relevant. In this case, the conditions shall be (27 ± 2) °C and (65 ± 5) % relative humidity and be stated clearly in the test report.

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 ISO 29765 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 Additional information on the mode of failure can be made 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, σ, in kilopascal, using Equation (1):

$$\sigma = \frac{F}{A} \tag{1}$$

where

F is the tensile load at failure, in kilonewton;

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

σ is the tensile bond strength, in kilopascal.

The results shall be rounded to the nearest 1 kPa.

8.2 Mode of failure

Note which mode of failure occurs. Possible failures are:

— cohesive failure in the base coat or adhesive;

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

— cohesive failure in the thermal insulation material;

— adhesive failure between base coat and reinforcement.

9 Accuracy of measurement

NOTE It was not possible to include a statement on the accuracy of measurement at the time of publication of this International Standard, however it is intended to include such a statement in future editions of this International Standard.

10 Test report

The test report shall include the following information:

a) a reference to this International Standard, i.e. ISO 29804:2009;

b) the product identification given by the system manufacturer:

   1) for the ETICS:

      i) the product name, factory, manufacturer or supplier;

      ii) the batch numbers of the components;

   2) for the adhesive or base coat:

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

      ii) the packaging when the product arrived at the laboratory;

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

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

      v) the 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 ISO 3251, test conditions 3 h at 105 °C;

      vii) the thickness in millimetres or coverage in kilogram per square metre dry weight for cement-based mortars in bags and to the paste weight for organic renders in buckets;

   3) for the reinforcement:

      i) the type, product name and manufacturer;

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

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

   4) for the thermal insulating material:

      i) the type, product name and manufacturer;

      ii) the thickness in accordance with ISO 29466;

      iii) the declared density in accordance with ISO 29470;

      iv) the declared tensile strength perpendicular to faces in accordance with ISO 29765;

c) for the test procedure:

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

   2) the conditioning;

   3) the type and name of the glue used;

4) the material and dimensions of the rigid plates;

5) any deviation from Clauses 6 and 7;

6) the conditioning and testing conditions in tropical countries, if applicable;

7) the date of the test;

8) the number of test specimens;

9) the displacement or load speed;

10) any general information regarding the test;

11) the events which may have affected the results;

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

13) the results of the identification tests on finishing materials and base coats, carried out by the laboratory:

    i) the density;

    ii) the dry extract;

    iii) the ash content at 450 °C and 900 °C;

    iv) the particle size grading;

14) the thickness, in millimetres, or coverage in kilogram per square metre of the applied adhesive or base coat for each sample;

15) a description of the device used:

    i) the machine with a precision of 1 %, or

    ii) the portable device on the rig with a precision of 10 %;

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

d) for results:

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

2) a description of the mode of failures.

Bibliography

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

ICS 91.100.60

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