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BSI Standards Publication

Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes as reinforcement for External Thermal Insulation Composite Systems with renders (ETICS)

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National foreword

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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.

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Thermal insulation products for building applications - Determination of the mechanical properties of glass fibre meshes as reinforcement for External Thermal Insulation Composite Systems with renders (ETICS)

Produits isolants thermiques pour le bâtiment - Détermination des caractéristiques mécaniques des treillis de fibres de verre servant à renforcer les systèmes composites d'isolation thermique par l'extérieur (ETICS) avec des enduits

Wärmedämmstoffe für das Bauwesen - Bestimmung der mechanischen Eigenschaften von Glasfasergewebe als Armierung für außenseitige Wärmedämm-Verbundsysteme mit Putz (WDVS)

This European Standard was approved by CEN on 31 August 2013.

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 13496:2013) 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of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

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 13496:2002.

The main changes with respect to the previous edition are listed below:

— addition of sampling in Clause 6;

— addition of Figure 1;

— amendment of the test evaluation in Clause 8.

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 equipment and procedures for determining the tensile strength and elongation of glass fibre meshes which are used for the reinforcement of the base coat in External Thermal Insulation Composite Systems (ETICS).

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

EN ISO 9229:2007, *Thermal insulation — Vocabulary (ISO 9229:2007)*

ISO 1887, *Textile glass — Determination of combustible-matter content*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229:2007 and the following apply.

3.1
tensile strength of glass fibre mesh
strength of the test specimen at failure relative to the width of the test specimen

4 Principle

The tensile strength of glass fibre meshes is determined at failure using a tensile testing machine.

5 Apparatus

5.1 Tensile testing machine, appropriate for the range of force and displacement involved, capable of having a constant crosshead speed adjusted to (50 ± 5) mm/min.

It shall be capable of measuring the force with an accuracy of 1 % in accordance with EN 1607.

5.2 Clamps of the tensile testing machine, which shall be coated with a material to ensure attachment without slippage of the test specimen, for example, rubber and shall fasten the test specimen across its whole width.

The clamps shall be sufficiently rigid to resist deformation during the test.

5.3 Container, which shall be wide and deep enough so that the test specimens can be immersed completely in an alkaline test solution.

This can be a cylindrical container, of volume (2,5 ± 0,5) l of height (48 ± 1) cm, of internal diameter (8 ± 0,5) cm, in which (2 ± 0,1) l of the alkaline test solution is introduced. The material of the container shall be resistant to the alkaline test solution (e.g. plastics or stainless steel).

6 Test specimens

6.1 Number of test specimens

Seven test specimens shall be used in warp direction, stored under normal conditions.

Seven test specimens shall be used in warp direction, stored in aggressive medium.

Seven test specimens shall be used in weft direction, stored under normal conditions.

Seven test specimens shall be used in weft direction, stored in aggressive medium.

6.2 Dimensions of the test specimens

The tensile strength of the meshes are tested in both the warp and the weft directions. The test specimen shall contain a minimum number of five threads within the width. The ratio of the length between the clamps to the width of the test specimen shall be 4 : 1 at minimum. The dimensions of the test specimens shall be a minimum of 300 mm $\times$ 45 mm.

6.3 Preparation of the test specimens

6.3.1 Sampling

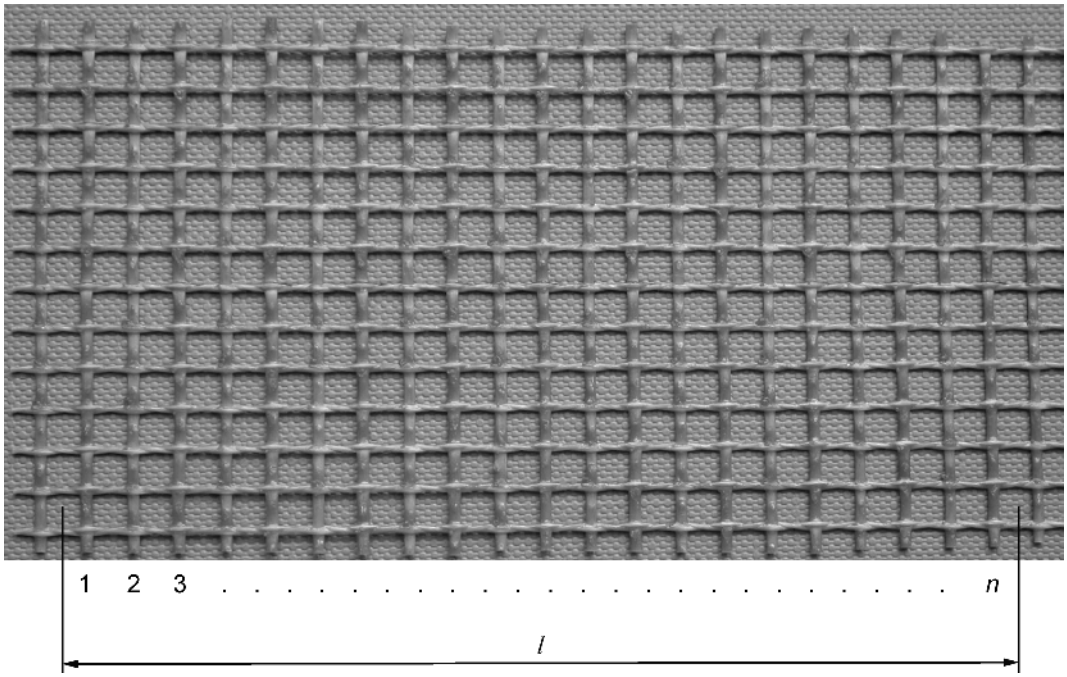
The test specimens shall be cut from the original packed product after removal of the first 5 m of the roll and at a distance of at least 100 mm from the edges. The test specimen shall be cut between the single warp or weft threads. The number of threads in the warp or in the weft direction shall be the same for the seven test specimens. The number of the threads shall be indicated in the test report. Test specimens shall not be bent or folded and shall be handled carefully during the whole test procedure.

6.3.2 Determination of the number of threads per 50 mm width of the specimen

The determination of the number of threads is specified each from middle of the mesh to middle of the mesh for the following measured distances.

Weft direction: total width of the roll, however about 1 m at maximum

Warp direction: about 1 m



Key
l measuring distance from middle of the mesh to middle of the mesh

Figure 1 — Determination of the number of threads

Within this measuring distance, l, as shown in Figure 1, the threads are counted, and the calculated number of threads n_{50} per 50 mm width of the specimen is calculated in accordance with Formula (1):

$$n_{50} = \frac{n}{l} \times 50 \quad (1)$$

where

n_{50} is the calculated number of threads per 50 mm width of the specimen, to the nearest 0,1;

n is the number of threads within the measuring distance l, to the nearest 1;

l is the measuring distance in millimetres, to the nearest 1 mm.

6.3.3 Determination of the number of threads per specimen to be tested

For the specification of the number of threads per specimen to be tested, n_{tested}, the value of n_{50} is determined as a whole number as follows:

— first place after the decimal point < 5: round down;

— first place after the decimal point ≥ 5: round up.

Cutting out of the number of threads to be tested, n_{tested}, always takes place in the middle of the mesh.

NOTE Because of the fact that cutting out takes place in the middle of the mesh, the total width of the mesh strips can differ by ± 5 mm from the nominal measure 50 mm.

6.4 Conditioning of the test specimens

6.4.1 Storage under normal conditions

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

6.4.2 Storage in aggressive medium

The test specimens shall be stored in the following alkaline test solution for 24 h at (60 ± 2) °C.

Add given amounts of substances to one litre of demineralised water:

$Ca(OH)_2$ 0,5 g at minimum purity of 96 % by mass;

NaOH 1 g at minimum purity of 97 % by mass;

KOH 4 g at minimum purity of 85 % by mass.

For the preparation of the alkaline test solution, the reagents shall be dissolved in distilled water in the given order above. For the storage of 30 g to 35 g glass fibre mesh, 1 l of the alkaline test solution is necessary.

If the glass mesh to be tested is only used in a base coat according to EN 15824, then it is also possible to use an aggressive medium consisting of a 20 % suspension of base coat in water at (60 ± 2) °C.

6.4.3 Wash and drying procedure

After storage in the aggressive medium, the test specimens shall be gently rinsed in running tap water at (20 ± 5) °C until the pH value at the surface of the specimens is less than 9, as measured with pH indicator paper. The test specimens shall be stored for 60 min in 0,5 % (by mass) hydrochloric acid. After this storage, the test specimens shall be gently rinsed in running tap water at (20 ± 5) °C, without significant mechanical movement until a pH value of 6 to 8 is stabilised, measured carefully with pH indicator paper. The test specimens shall be dried for 60 min at (60 ± 2) °C and afterwards stored for at least 24 h at (23 ± 2) °C and (50 ± 5) % relative humidity before testing.

7 Procedure

7.1 Test conditions

The test shall be carried out at (23 ± 2) °C.

7.2 Attachment of the test specimens in the tensile testing machine

The test specimens shall be attached between the two clamps, which are fastened in the tensile testing machine. A self-aligning attachment on the top clamp avoids uneven distribution of tensile stress during the test. The test specimen shall be located perpendicular to the clamps of the tensile testing machine.

The distance between the clamps shall be a minimum of 200 mm.

7.3 Test procedure

The test shall be carried out in the warp and the weft directions before and after storage of the test specimens in the aggressive medium.

Preload the test specimens at 5 mm/min until the load of 10 N is reached. Measure the resulting length, l_0, of the test specimen. Increase the load with a constant crosshead speed of (50 ± 5) mm/min until failure occurs. Record the force, F, in Newton and the corresponding length, l, in millimetres.

Discard the result of the test of any test specimen where the specimen is displaced within the clamp, or where the failure occurred at the clamp (majority of the threads break directly at the clamps).

8 Calculation and expression of results

The tensile strength per 50 mm width of the specimen is calculated in accordance with Formula (2) in each type of conditioning and direction of test.

$$R_{50} = \frac{F_{\max}}{n_{\text{tested}}} \times n_{50} \tag{2}$$

where

R_{50} is the tensile strength in Newton per 50 mm width of the specimen at the maximum load to the nearest 0,1 N per 50 mm for single values and to the nearest 1 N per 50 mm for the mean value;

$F_{\max}$ is the maximum load, in Newton, to the nearest 0,1 N;

n_{tested} tested number of threads per specimen to the nearest 1;

n_{50} is the calculated number of threads per 50 mm width of the specimen, to the nearest 0,1.

The elongation per 50 mm width of the specimen is calculated in accordance with Formula (3) in each type of conditioning and direction of test.

$$\varepsilon_{50} = \frac{l_{\text{Fmax}} - l_0}{l_0} \times 100 \tag{3}$$

where

ε_{50} is the elongation in percent per 50 mm width of the specimen to the nearest 1 % per 50 mm for single values and to the nearest 1 % per 50 mm for the mean value;

l_{Fmax} is the length, in millimetres, at the maximum load, to the nearest 1 mm;

l_0 is the length, in millimetres, after preload, to the nearest 1 mm.

The test result is the mean value of the elongation, ε_{50}, calculated from at least 5 single values.

9 Accuracy of measurement

NOTE It has not been possible to include a statement on the accuracy of the measurement in this document. Such a statement will be included however when a respective Round Robin Test (currently being carried out) provides the necessary data.

10 Test report

The test report shall include the following information:

a) a reference to this European Standard;

b) product identification given by the system manufacturer:

   1) product name, factory, manufacturer or supplier;

   2) batch number;

   3) type and construction 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;

   7) mass per unit area in grams per square metre;

   8) loss on ignition in percent in accordance with ISO 1887;

   9) mesh dimensions.

c) test procedure:

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

   2) conditioning, if a base coat is used for conditioning, type of this base coat;

   3) any deviation from Clauses 6 and 7;

   4) date of testing;

   5) number of test specimens;

   6) size of test specimen;

   7) number of tested and calculated threads per 50 mm width of test specimen in warp and weft direction;

   8) general information regarding the test;

   9) events which may have affected the results;

   10) number and type of test specimens which have been discarded and why.

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 for each type of conditioning and direction of test:

   1) individual values and mean value of the tensile strength, R_{50};

   2) individual values and mean value of the elongation, ε_{50}.

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BSI Group Headquarters

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