SLOVENSKI STANDARD
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Toplotnoizolacijski proizvodi za uporabo v gradbeništvu - Ugotavljanje odpornosti sider s potegom za toplotnoizolacijske proizvode

Thermal insulation products for building applications - Determination of the pull-through resistance of anchors through thermal insulation products

Wärmedämmstoffe für das Bauwesen - Bestimmung des Durchzugwiderstandes von Dübeln durch Wärmedämmstoffe

Produits isolants thermiques pour le bâtiment - Détermination de la résistance au déboutonnage des chevilles de fixation dans les produits isolants thermiques

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91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials

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Thermal insulation products for building applications - Determination of the pull-through resistance of anchors through thermal insulation products

Produits isolants thermiques pour le bâtiment - Détermination de la résistance au déboutonnage des chevilles de fixation dans les produits isolants thermiques

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 16382:2012) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

1 Scope

This document specifies equipment and procedures for determining the pull-trough resistance of anchors through thermal insulation products.

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.

EN 206-1, *Concrete — Part 1: Specification, performance, production and conformity*

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

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

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

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

ISO 12491:1997, *Statistical methods for quality control of building materials and components*

3 Terms and definitions

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

3.1
external thermal insulation composite system (ETICS)
system of factory-made products, delivered as a kit from the manufacturer and applied on site

NOTE It is comprised of the following components, specifically designed for use with the substrate:

— an adhesive and/or mechanical fixing device;

— a thermal insulation product;

— one or more layers of base coat, where at least one layer contains a reinforcement;

— a finishing material.

4 Principle

The pull-through resistance of anchors through thermal insulation products is determined by a direct tensile load perpendicular to the surface of the thermal insulation product. The tensile load is applied by means of a tension plate glued to the test area of the thermal insulation products.

5 Apparatus

5.1 General

The anchor to be tested is pulled through the thermal insulation product. The edges of the thermal insulation product are fixed so by using a template with circular opening and clamps that they cannot get out of place and twist during pulling through of the anchor. The tension load is introduced to the thermal insulation product by a circular tension plate which fits into the circular opening of the template. The anchoring area of the anchor is fixed by a suitable device.

5.2 Glue

The glue shall be suitable for surfaces of the thermal insulation product and for timber (e. g. solvent-free epoxy adhesive or polyurethane adhesive). The glue shall not damage the thermal insulation material or the anchors and not influence the results.

5.3 Template

The square templates (see Key 2 in Figure 3) are to choose so that they do not influence the results by deformation. Suitable are e.g. glued wood plates of at least 20 mm thickness or steel plates of at least 7 mm thickness. The circular recess is to choose so that for the anchor plate and thermal insulation product thickness used the breakout cone is at each place at least 50 mm remote from the edge of the circular recess of the template.

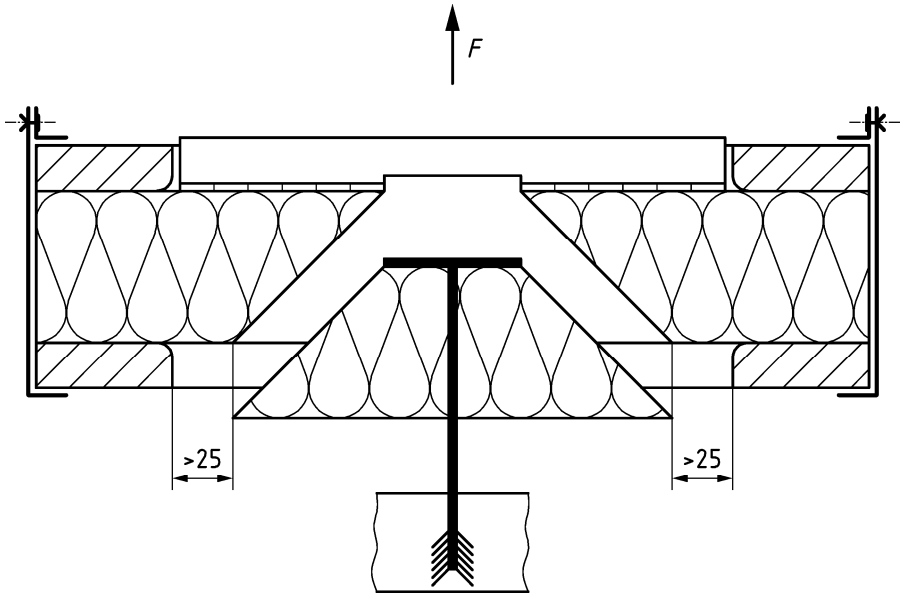
The distance of the circular recess from the edge of the template should be at least 25 mm.

The specimen of the thermal insulation product shall be at least as large as the outer dimensions of the template.

NOTE 1 The diameter of the circular recess in the template, d_S, can be calculated from the diameter of the anchor plate d_P, the thickness of the thermal insulation product t_I and the thermal insulation product variable m as follows: $d_S = d_P + m \times t_I$. The constant m is a value that depends on the breaking appearance of the thermal insulation product. Experience shows that the circular recess for anchor plates of 60 mm diameter and a thermal insulation product thickness of 60 mm should be at least 300 mm, and the outer dimensions of the template should be 350 mm.

NOTE 2 The dimension of m should be given by a minimum distance of 25 mm between the breaking cone and the circular recess of the template (see Figure 1).

Dimensions in millimetres



Key

F tensile load

NOTE This is one of possible modes of failure.

Figure 1 — Schematic presentation of the failure of the insulation product with a breaking cone

5.4 Clamping device

The clamping devices serve for the fixation of the thermal insulation product between the templates. For each edge of the template at least 2 clamps should be used so that shifting and twisting of the thermal insulation products at the edges are avoided.

5.5 Tension plate

The tension plate serves for the introduction of the load into the thermal insulation product (see Key 5 in Figure 3). The tension plate should be chosen and constructed so that the results are not influenced by deformation. Suitable are e.g. glued wood plates with a thickness of at least 20 mm or steel plates wit a thickness of at least 7 mm. The tension plate should be centrically provided with a device by which it is connected via a self- alignment device with the testing machine. The tension plate should have a diameter of $d_Z = d_S$ – 10 mm and an evenness with a maximum tolerance of ± 0,5 mm for 100 mm.

5.6 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 (20 ± 1) mm/min. It shall be capable of measuring the force with an error limit of a maximum of 1 % (see EN 1607).

6 Test specimens

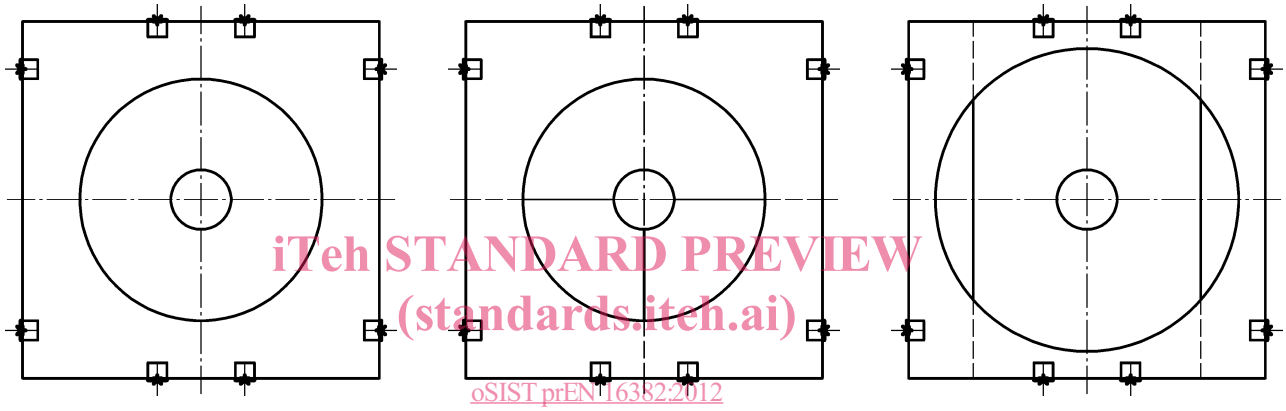
6.1 Thermal insulation product

The specimen of the thermal insulation product should be as large as the template described in 7.2.

For determination of the pull-through resistance of the anchor in the middle of the board a specimen without joint should be used as shown in Figure 2 a).

For determination of the pull-through resistance of the anchor on the T-joint between three boards the specimen should be designed as shown in Figure 2 b). This covers also an anchor between two insulation products.

To determine the pull-through resistance of the anchor in insulation products whereby the width of the board is smaller than the diameter d_S of the template (see Figure 3 or Figure 4), the tests should be performed as shown in Figure 2 c).



a) Test set up of the anchor in the middle of the board

b) Test set up of the anchor in the T-joint of three boards

c) Test set up of the anchor in the middle of the thermal insulation product with limited width

Figure 2 — Arrangement of the thermal insulation product in the test equipment

The thermal insulation product with the lowest thickness should be examined. With it also anchor pull-through values for greater thermal insulation product thicknesses will be reproduced.

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

6.2 Preparation of the test specimens

The anchor to be examined should be placed into the middle of the thermal insulation product specimen. In the case of specimens with T-joints the thermal insulation product parts are to be hold together e. g. with an adhesive tape going round them.

If the anchor should be examined in connection with the substrate, a concrete slab with a minimum strength corresponding to class C 20/25 according to EN 206-1 is to be used (see Figure 4). For this a spacer to the thermal insulation product should be used which has the thickness of the lower template plus the clamps. With it a pre-damage of the anchor assembly during the anchor mounting will be avoided, and the anchor can be placed in accordance with the mounting instruction of the manufacturer (e. g. nail anchors). The concrete slab should have at least such dimensions that the anchor can be placed and the tensile forces recorded during the test.

By using the template, the place on the specimen of the thermal insulation product should be marked on which the tension plate will be glued. The tension plate should be glued on this place by suitable glue. The tension plate should be glued so that it does not touch the edges of the upper template. A composite between anchor plate and the tension plate should be avoided by putting on an interlayer, e.g. a foil.

If the pull-through test of anchors should be carried out in combination with rendering and reinforcement, the base coat is applied after placing the anchor into the circular opening of the template in accordance with the instructions of the manufacturer (see Figure 5 and Figure 6). After curing and setting the tension plate is flat glued on as described above. A composite between anchor plate and render or base coat should avoided by putting on a interlayer, e.g. a foil.

The glue projecting at the sides of the tension plate should be removed.

After curing of the glue the specimen should be clamped between the templates so that the thermal insulation product should not be compressed.

The samples are to be conditioned at (23 ± 3) °C and (50 ± 10) % relative humidity at minimum for 24 h.

6.3 Number of test specimens

For the determination of the characteristic pull-through strength at least 5 test specimens are required.

7 Procedure

7.1 Test conditions

The test shall be carried out at (23 ± 3) °C and (50 ± 10) % relative humidity.

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 3 illustrates the attachment of the test specimen to the tensile testing machine.

The load should be transferred via a load cell centrically and perpendicularly to the plane of the plate.

The anchoring area of the anchor or, respectively, the anchoring substrate (e. g. concrete), shall be fixed by a suitable device (see Figure 3 and Figure 4). The rupture shall not occur at the interface between concrete and the anchor in configurations shown in Figures 4 and 6.

Following symbols are used in Figures 2 to 4:

d_S diameter of the circular recess in the template in millimetres ($d_S = d_P + m \times t_I$)

d_Z diameter of the tension plate in millimetres ($d_Z = d_S - 10$)

t_I thickness of the thermal insulation product in millimetres

d_P diameter of the anchor plate in millimetres

F tensile load in Kilonewton

b width of the square template in millimetres ($b \geq d_P + m \times t_I + 50 \geq 400$)