CEN/TC 88/WG 18
External thermal insulation composite systems
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Secretariat: DIN

prEN 17237 Committee internal review document (pdf)

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Expected action Comment
Due Date 2019-10-18

Background

Dear WG18 members,

after some weeks of very intense work on a CPR conform prEN 17237, the Rewriting task group publishes the "WG18+"-Version as agreed at the 48th meeting of CEN/TC 88/WG 18 , 15th and 16th July 2019 in Berlin.

"WG18+" means, as also agreed at the 48th WG18 meeting, you are encouraged to share the document with other stakeholders who like to make comments to this document.

The "WG18 internal enquiry" will last 6 weeks, till Oct. 18th.

Please make comments either in the classic way by using the official commenting tables or by using the commenting function in the word document.

Therefore the Rewriting task group offers not only the pdf-file, but also the Word-document, which is included in the zip-file. The zip-file is necessary due to the pictures. You must put every file in the same directory to have all pictures in the Word-document ready.

Important note:
Please make sure the tracking is running while using the commenting function in the word-document. Please do **not** use any commenting functions within the PDF document.

Please send all your comments directly to Stephan.Wellendorf@din.de. He will collect the comments for the Rewriting task group.

Preferred is sumitting comments in the official commenting template.

What are the next steps?

The Rewriting task group will consider every comment to make the draft for the official enquiry. This takes some time, but after finishing the task the official process will be started by the WG18 secretary Stephan Wellendorf at DIN, without further consultation of WG18, as agreed in Berlin at the last WG18 meeting.

As from nature, the Rewriting task group will be confronted also with conflicting comments and will be forced to make decisions between them. To keep the process transparent, **all comments, which could not be considered** by the Rewriting task group due to conflicting situations or other reasons, **will be** kept and automatically **included in the comment list of the official enquiry.** That means, the discussion of conflicting comments within WG18 is postponed to the official enquiry only.

What is most important!

Most important are **comments of** a good or very **good quality**. The WG18 and the Rewriting task group, can only work on comments which includes proper proposals. And the best comments include proposals, which can be easily copied and pasted in the document. Comments without proposals will be very likely not considered at all, because from our experience it is too difficult to find out, what the commentator really means.

Thanks in advance for your comments,

Kind regards

Thomas Lohmann, Convenor, WG18 and Rewriting task group

CEN/TC 88

Date: 2019-09

prEN 17237:2019

CEN/TC 88

Secretariat: DIN

Thermal insulation products for buildings — External thermal insulation composite systems with renders (ETICS) — Specification

Wärmedämmstoffe für Gebäude — Außenseitige Wärmedämmverbundsysteme mit Putzoberfläche (WDVS) — Spezifikation

Produits isolants thermiques pour bâtiments — Systèmes d'isolation thermique extérieure par enduit sur isolant (ETICS) — Spécification

ICS:

Descriptors:

Document type: European Standard
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STD Version 2.9d

Contents

European foreword

This document (prEN 17237:2019) 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.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Construction Products Regulation (CPR).

For relationship with the EU CPR, see informative Annex ZA, which is an integral part of this document.

This European Standard is one of a series of standards for insulation products used in buildings, but can be used in other areas where appropriate.

Compared to EN 13499:2003 and EN 13500:2003, the following changes have been made:

a) the text is completely revised and both standards have been implemented in the approach of an ETIC_kit;

b) a new standard reference.

This European Standard contains the annexes:

— Annex A (normative) Limits of components used for ETIC_kits covered by the scope;

— Annex B (normative) Calculation of $Q_{PCS, ETIC\_kit}$ (formulae and example);

— Annex C (normative) Characteristic load resistance and characteristic plate stiffness of plastic anchors for ETICS;

— Annex D (normative) Point thermal transmittance of mechanical fixing devices;

— Annex E (normative) Test plan and conformity tables;

— Annex F (normative) Table for particle size distribution;

— Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No. 305/2011.

1 Scope

This European Standard specifies the characteristics for External Thermal Insulation Composite Systems with rendering systems (hereafter as: ETICS) to be used as thermal insulation for buildings, showing a thermal resistance ≥ 1 $m^2 \cdot K/W$.

In this European Standard ETICS is used on external walls, which are made either of masonry (bricks, blocks, stones, etc.) or concrete (cast on site or as prefabricated panels).

ETICS is a system comprising sets of components meant to be applied as external thermal insulation on walls of buildings. The ETICS components, sorted from the layers closest to the interior to more external layers, are:

- adhesive,
- thermal insulation,
- plastic anchors or load-bearing profiles (optional),
- base coat with reinforcement (glass fibre mesh or metal mesh) embedded into it,
- key coat (optional),
- finishing coat (excluding brick slips or tiles),
- decorative coat (optional).

The thermal insulation is fixed to the substrate using adhesive, mechanical fixing or their combination so that no air ventilation between the substrate and the insulation layer is allowed. The thermal insulation layer is faced with a rendering system consisting of one or more layers, one of which contains reinforcement. The rendering system is applied directly to the thermal insulation boards, without any air gap or a disconnecting layer.

An ETIC_kit is a kit comprising of the following components:

a) thermal insulation,

b) fixing system, either bonded-based, with adhesive (i.e. dry_mix adhesive, ready_to_use adhesive or adhesive_foam) or mechanically fixed, with devices (i.e. plate anchors, helix_type anchors, profiles and rails with collar anchors or anchored metal mesh), and

c) rendering system, which consists of base coat, reinforcement, finishing coat and, optionally, key coat and/or decorative coat.

ETIC_kits may vary in fixing systems related to adhesives and/or mechanical fixing devices, thermal insulations, base coats, reinforcements, finishing coats and, if included, also to key coats and/or decorative coats. Furthermore, ETIC_kits can vary also in

- adhesive bonded area
- adhesive coverage
- thermal insulation thickness
- anchor setting position
- anchor plate position perpendicular to substrate
- anchor number per unit area
- profiles and rails distance

- base coat thickness
- reinforcement overlap
- key coat coverage
- finishing coat thickness
- decorative coat coverage

With regard to the components, this European Standard covers ETIC_kits with:

a) adhesive, which is a ready_to_use, a dry_mix or a adhesive_foam, all as specified in Annex A.

b) thermal insulation, which is made of the following materials: mineral wool (MW), expanded polystyrene (EPS), extruded polystyrene foam (XPS), rigid polyurethane foam (PU), phenolic foam (PF), cellular glass (CG), expanded cork (ICB) or wood fibre (WF), all as specified in Annex A.

c) mechanical fixing device, which is a plate anchor, helix_type anchor, a collar anchor, a profile and rail with collar anchor or an anchor for an anchored metal mesh, all as specified in Annex A.

d) base coat, which is a ready_to_use or dry_mix, all as specified in Annex A.

e) reinforcement, which is a glass fibre mesh or a metal mesh, all as specified in Annex A

f) key coat, which is a very thin coating material, all as specified in Annex A

g) finishing coat, which is a ready_to_use or dry_mix, all as specified in Annex A.

h) decorative coat, which is a thin coating material, all as specified in Annex A.

With regard to the fixing methods, this European Standard covers ETIC_kits:

a) bonded with adhesive and additional supplementary plate anchors (I), which:

   1) bonded area is ≥ 40 %, and

   2) mass per unit area of the rendering system is ≤ 30 kg/m^2 and of the rendering system together with thermal insulation is ≤ 60 kg/m^2, and

   3) thickness of the thermal insulation is ≤ 400 mm.

b) bonded with adhesive (II), which:

   1) bonded area is ≥ 40 %, and

   2) mass per unit area of the rendering system is ≤ 30 kg/m^2 and of the rendering system together with thermal insulation is ≤ 60 kg/m^2, and

   3) thickness of the thermal insulation is ≤ 400 mm.

c) mechanically fixed with plate anchors and additional supplementary adhesive (III), which:

   1) mass per unit area of the rendering system is ≤ 40 kg/m^2 and of the rendering system together with thermal insulation is ≤ 65 kg/m^2, and

   2) bonded area is ≥ 40 %, and

3) minimum number of anchors per square meter is 4, and

4) thickness of the thermal insulation is ≤ 400 mm.

d) mechanically fixed with plate anchors and additional supplementary adhesive (III), which:

1) mass per unit area of the rendering system is ≤ 20 kg/m^2 and of the rendering system together with thermal insulation is ≤ 45 kg/m^2, and

2) bonded area is ≥ 20 %, and

3) minimum number of anchors per square meter is 4, and

4) thickness of the thermal insulation is ≤ 200 mm.

e) mechanically fixed with helix_type anchors countersunk and additional supplementary adhesive (IV), which:

1) mass per unit area of the rendering system is ≤ 40 kg/m^2 and of the rendering system together with thermal insulation is ≤ 65 kg/m^2, and

2) bonded area is ≥ 40 %, and

3) minimum number of anchors per square meter is 4, and

4) thickness of the thermal insulation is ≤ 400 mm.

f) mechanically fixed with plate anchors (V), which:

1) mass per unit area of the rendering system is ≤ 30 kg/m^2 and of the rendering system together with thermal insulation is ≤ 60 kg/m^2, and

2) minimum number of anchors per square meter is 4, and

3) thickness of the thermal insulation is ≤ 200 mm.

g) mechanically fixed with profiles and rails with and additional supplementary adhesive (VI), which:

1) mass per unit area of the rendering system is ≤ 30 kg/m^2 and of the rendering system together with thermal insulation is ≤ 60 kg/m^2, and

2) thickness of the thermal insulation is ≤ 200 mm.

h) mechanically fixed with profiles and rails (VII), which:

1) mass per unit area of the rendering system is ≤ 30 kg/m^2 and of the rendering system together with thermal insulation is ≤ 60 kg/m^2, and

2) thickness of the thermal insulation is ≤ 200 mm.

i) mechanically fixed by an anchored metal mesh (VIII), which:

1) thickness of the thermal insulation is ≤ 200 mm.

j) with a combination of fixing method and thermal insulation material according table 1, but foam adhesives with thermal insulation materials EPS and XPS only

Note to entry 1 All these values are specified for the intended end use conditions.

This European Standard specifies procedures for assessment and verification of constancy (AVCP) of performance of the ETIC_kit characteristics.

This European Standard does not cover:

— External insulation and finish systems (EIFS), according to ISO 17738

— Ceramic tiles in the rendering system

Table 1 — Fixing methods with required components and possible thermal insulation materials covered by this standard (X)

Fixing method / Components	ETIC_kit bonded with adhesive and additional supplementary plate anchors (I) see Figure 2	ETIC_kit bonded with adhesive (II) see Figure 3	ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive (III) see Figure 4	ETIC_kit mechanically fixed with helix_type anchors countersunk and additional supplementary adhesive (IV) See Figure 4	ETIC_kit mechanically fixed with plate anchors (V) see Figure 5	ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive (VI) see Figure 6	ETIC_kit mechanically fixed with profiles and rails (VII) see Figure 7	ETIC_kit mechanically fixed by an anchored metal mesh (VIII) see Figure 8
Adhesive	X	X	X	X	—	X	—	—
Thermal insulation MW-Board	—	—	X	X	X	X	X	X
Thermal insulation MW-Lamella	X	X	X	—	—	—	—	—
Thermal insulation EPS S	X	X	X	X	—	X	X	—
Thermal insulation EPS SD	X	X	X	X	—	—	—	—
Thermal insulation XPS	X	X	X	—	—	—	—	—
Thermal insulation PU	X	X	X	—	—	X	X	—
Thermal insulation PF	—	—	X	—	—	—	—	—
Thermal insulation CG	X	—	X	—	—	X	X	—
Thermal insulation ICB	—	—	X	—	—	—	—	—
Thermal insulation WF	—	—	X	—	—	—	—	—
Plate anchor	X	—	X	—	X	X	X	—
Helix_type anchor	—	—	—	X	—	—	—	—
Profiles and rails	—	—	—	—	—	X	X	—
Collar anchor	—	—	—	—	—	X	X	—
Base coat	X	X	X	X	X	X	X	X
Glass fibre mesh	X	X	X	X	X	X	X	—
Anchor for metal mesh	—	—	—	—	—	—	—	X

Metal mesh	—	—	—	—	—	—	—	X
Key coat (optional)	X	X	X	X	X	X	X	X
Finishing coat	X	X	X	X	X	X	X	X
Decorative coat (optional)	X	X	X	X	X	X	X	X

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 822:2013, *Thermal insulating products for building applications — Determination of length and width*

EN 823:2013, *Thermal insulating products for building applications — Determination of thickness*

EN 824:2013, *Thermal insulating products for building applications — Determination of squareness*

EN 825:2013, *Thermal insulating products for building applications — Determination of flatness*

EN 998-1:2016, *Specification for mortar for masonry — Part 1: Rendering and plastering mortar*

EN 1015-1:1998+A1:2006, *Methods of test for mortar for masonry — Part 1: Determination of particle size distribution (by sieve analysis)*

EN 1015-6:1998+A1:2006, *Methods of test for mortar for masonry — Part 6: Determination of bulk density of fresh mortar*

EN 1015-18:1998+A1:2006, *Methods of test for mortar for masonry — Part 18: Determination of water absorption coefficient due to capillary action of hardened mortar*

EN 1062-1:2004, *Paints and varnishes — Coating materials and coating systems for exterior masonry and concrete — Part 1: Classification*

EN 1062-3:2008, *Paints and varnishes — Coating materials and coating systems for exterior masonry and concrete — Part 3: Determination of liquid water permeability*

EN 1542:1999, *Products and systems for the protection and repair of concrete structures — Test methods — Measurement of bond strength by pull-off*

EN 1602:2013, *Thermal insulating products for building applications — Determination of the apparent density*

EN 1604:2013, *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions*

EN 1607:2013, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

EN 1609:2013, *Thermal insulating products for building applications — Determination of short term water absorption by partial immersion*

EN 1990:2002, *Eurocode: Basis of structural design*

EN 12086:2013, *Thermal insulating products for building applications — Determination of water vapour transmission properties*

EN 12087:2013, *Thermal insulating products for building applications — Determination of long term water absorption by immersion*

EN 12090:2013, *Thermal insulating products for building applications — Determination of shear behaviour*

EN 12524:2000, *Building materials and products — Hygrothermal properties — Tabulated design values*[1)]

EN 12667:2001, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance*

EN 13162:2012+A1:2015, *Thermal insulation products for buildings — Factory made mineral wool (MW) products — Specification*

EN 13163:2012+A2:2016, *Thermal insulation products for buildings — Factory made expanded polystyrene (EPS) products — Specification*

EN 13164:2012+A1:2015, *Thermal insulation products for buildings — Factory made extruded polystyrene foam (XPS) products — Specification*

EN 13165:2012+A2:2016, *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*

EN 13166:2012+A2:2016, *Thermal insulation products for buildings — Factory made phenolic foam (PF) products — Specification*

EN 13167:2012+A1:2015, *Thermal insulation products for buildings — Factory made cellular glass (CG) products — Specification*

EN 13170:2012+A1:2015, *Thermal insulation products for buildings — Factory made products of expanded cork (ICB) — Specification*

EN 13171:2012+A1:2015, *Thermal insulating products for buildings — Factory made wood fibre (WF) products — Specification*

EN 13238:2010, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

EN 13494:2019, *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 13495:2019, *Thermal insulation products for building applications — Determination of the pull-off resistance of external thermal insulation composite systems (ETICS)(foam block test)*

EN 13496:2013, *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)*

EN 13497:2018, *Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)*

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1) This standard has been withdrawn without replacement in 2007.

EN 13501-1:2018, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire test*

EN 13823:2010+A1:2014, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 15824:2017, *Specifications for external renders and internal plasters based on organic binders*

EN 16382:2016, *Thermal insulation products for building applications — Determination of the pull-through resistance of plate anchors through thermal insulation products*

EN 16383:2016, *Thermal insulation products for building applications — Determination of the hygrothermal behaviour of external thermal insulation composite systems with renders (ETICS)*

EN 16733:2016, *Reaction to fire tests for building products — Determination of a building product's propensity to undergo continuous smouldering*

EN 17101:2018, *Thermal insulation products for buildings — PU adhesive foam for External Thermal Insulation Composite Systems (ETICS)*

EN 29052-1:1991, *Acoustics — Determination of dynamic stiffness — Part 1: Materials used under floating floors in dwellings*

EN ISO 1716:2018, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716:2018)*

EN ISO 2811-1:2016, *Paints and varnishes — Determination of density — Part 1: Pycnometer method (ISO 2811-1:2016)*

EN ISO 3251:2019, *Paints, varnishes and plastics — Determination of non-volatile-matter content (ISO 3251:2019)*

EN ISO 3451-1:2019, *Plastics — Determination of ash — Part 1: General methods (ISO 3451-1:2019)*

EN ISO 6946:2017, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation methods (ISO 6946:2017)*

EN ISO 7783:2018, *Paints and varnishes — Determination of water-vapour transmission properties — Cup method (ISO 7783:2018)*

EN ISO 9053:2018, *Determination of airflow resistance — Part 1: Static airflow method (*ISO 9053:2018*)*

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

EN ISO 10211:2017, *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations (ISO 10211)*

EN ISO 10456:2007 + AC:2009, *Building materials and products — Hygrothermal properties —Tabulated design values and procedures for determining declared and design thermal values (ISO 10456)*

EN ISO 11925-2:2010, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
General terms

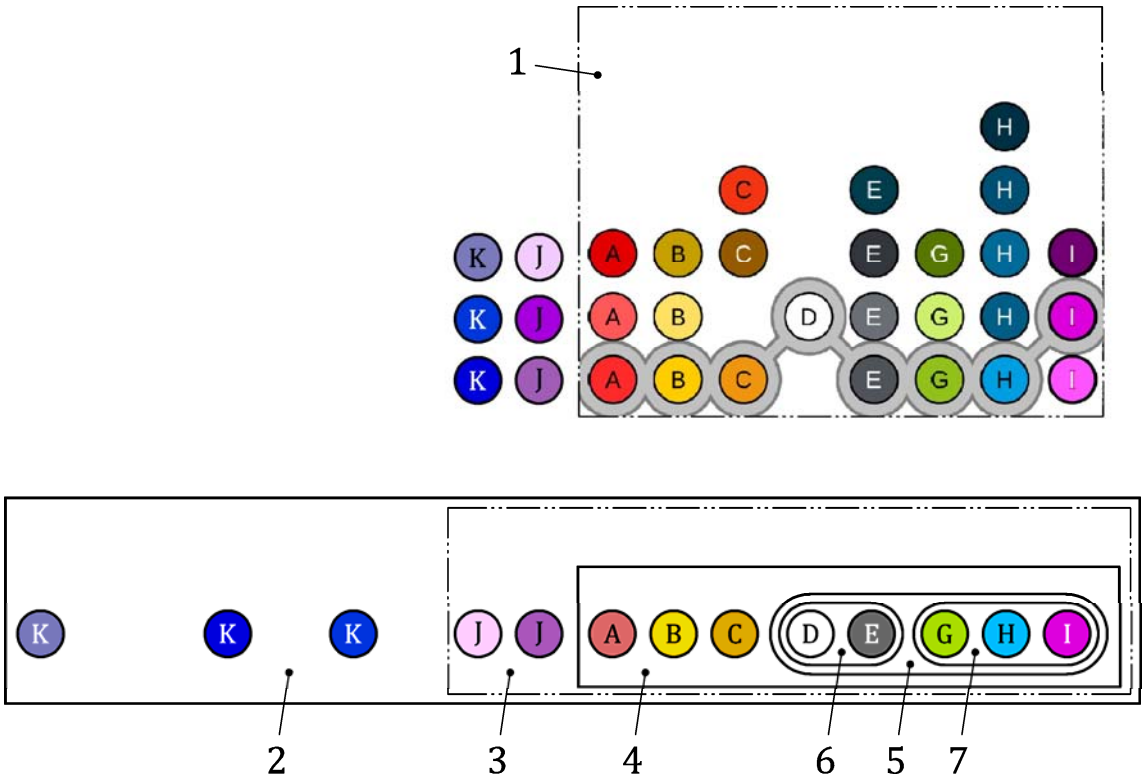
3.1.1
External Thermal Insulation Composite kit (ETIC_kit)
kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat and at least an adhesive or a mechanical fixing device, optionally a key coat and/or a decorative coat and/or further specification (adhesive bonded area; adhesive coverage; thermal insulation thickness; setting position, plate position perpendicular to substrate, number per unit area; profiles and rails distance; base coat thickness; reinforcement overlap; key coat coverage; finishing coat thickness; decorative coat coverage)

Note 1 to entry: The layer thickness of a key or decorative coat can be assessed according to EN 1062-1:2004:2004-08.

3.1.2
design external thermal insulation composite system (design ETICS)
set of ETIC_kits comprising the same base coat and thermal insulation components of the same material

Note 1 to entry: A design ETICS is defined by the description of every ETIC_kit comprised.

Note 2 to entry: Figure 1 shows an example and the relationship between an assembled ETIC_kit and construction works. Box 1 contains all components used for the whole set of ETIC_kits of a design ETICS. The ETIC_kit components of one of these ETIC_kits are marked with a grey background. This ETIC_kit is mechanically fixed with additional supplementary adhesive, also illustrated in Figure 4. It comprises eight components. Box 2 indicates construction works, box 3 the assembled ETIC_kit with ancillary products, box 4 the ETIC_kit components, box 5 the rendering system of the ETIC_kit, box 6 the reinforced basecoat of the ETIC_kit and box 7 the finishing layer of the ETIC_kit.



Key

1	design ETICS (Box 1)	A	adhesives
2	construction works (Box 2)	B	thermal insulation of the same material
3	assembled ETIC_kit (Box 3)	C	mechanical fixing devices
4	ETIC_kit (Box 4)	D	base coat
5	rendering system of ETIC_kit (Box 5)	E	reinforcements
6	reinforced base coat of ETIC_kit (Box 6)	G	key coats
7	finishing layer of ETIC_kit (Box 7)	H	finishing coats
		I	decorative coats
		J	ancillary products
		K	other construction products

Same characters indicate components of the same group. Different shades mean different components of the same group.

Figure 1 — Relationship between an assembled ETIC_kit and construction works

3.1.3
substrate
part of the wall or test assembly to which a ETIC_kit is fixed

3.1.4
reinforced base coat
base coat with embedded reinforcement

3.1.5
finishing layer
finishing coat with a key coat (optional) and/or a decorative coat (optional)

3.1.6
rendering system
reinforced base coat with finishing layer

3.1.7
gross heat of combustion
Q_{PCS}
heat of combustion of a substance when the combustion is complete and any produced water is entirely condensed under specified conditions

Note 1 to entry: The gross heat of combustion is expressed in mega joules per kilogram.

3.1.8
substantial components
component that constitutes a significant part of an ETIC_kit regarding reaction to fire, which is one layer with a mass per unit area ≥ 1,0 kg/m² or a thickness ≥ 1,0 mm, which can also consist of adjacent non-substantial layers exceeding at least one of the limits all together.

3.1.9
non-substantial components
component that does not constitute a significant part of an ETIC_kit regarding reaction to fire, which is a layer with a mass per unit area < 1,0 kg/m² and a thickness < 1,0 mm, which can also consist of adjacent non-substantial layers remaining under the limits all together.

3.1.10
organic content
total amount of organic substances as part of a component related to the mass in cured and dried conditions

Note 1 to entry: The organic content is expressed in percentage by mass in cured and dried condition.

Note 2 to entry: The adhesive, base coat, finishing coat, key coat and decorative coat include one or more binders out of a range from organic to inorganic. They may be grouped according to the binder used into inorganic (cement and/or lime, alkali silicate, etc.) and organic (acrylic or vinylic resin, siloxane resin, etc.) components.

3.1.11
variant
Group of ETIC_kits which represent significant differences in ETIC kits leading to different ways of assessment.

Note 1 to entry: Examples for common parameters of a variant are material of a component, organic content of a component, Euroclass of a component, absence of a key coat, fixing method, …

Note 2 to entry: The assessment for different variants can differ e.g. in the size of a test specimen, conditioning of test specimens, testing, direct field of application rules, …

3.1.12
production week
up to 5 production days in sequence in a maximum of 28 days

3.1.13
production month
up to 20 production days in sequence in a maximum of three months

3.1.14
FPC_result
Test result of a component_property evaluated for factory production control issues in a production line

3.1.15
FPC_mean_value
mean value of FPC_results of a component property, considering all FPC_results of the last 365 days in one production line

3.1.16
reference anchor
steel plate anchor for testing issues, made of steel with a nominal shank diameter of 8 mm and a plate with a diameter of 60^{+0}_{-1} mm, a nominal thickness of 6 mm and the radius of roundness 2 mm

Note 1 to entry: Details are given in Figure 2.

Dimensions in millimetres

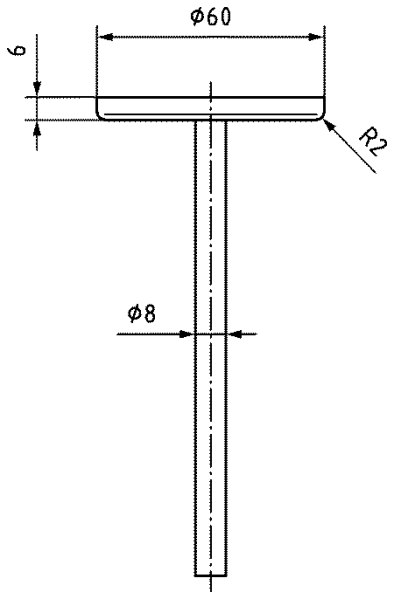


Figure 2 — Reference anchor for pull-through tests according to EN 16382:2016

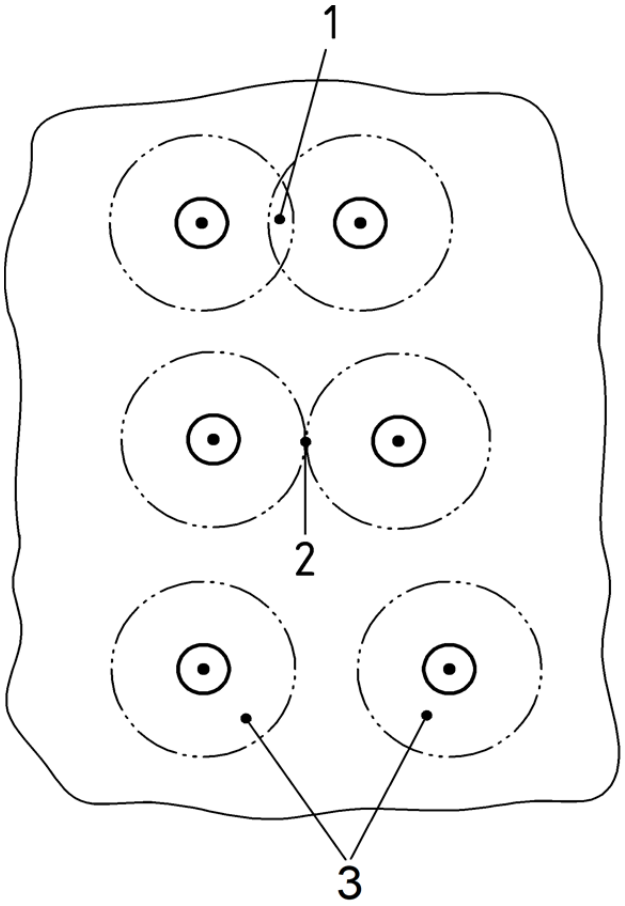
3.1.17
Superposition of plate anchors

Superposition of plate anchors, illustrated in Figure 3, is given, if two or more plate anchors influence each other regarding the fixing strength

Note to entry 1: No superposition of plate anchors is given, if they do not influence each other. The latter is assumed by maintaining a minimum distance between the centre of plate anchors and their sleeves respectively.

Note to entry 2: The minimum distance d_s to maintain no superposition shall be calculated by using the breaking cone $2 \cdot r_{tl}$ or the theoretical load cone $2 \cdot t_l + d_p$, whichever is the greatest.

Note to entry 3: If a measurement according to EN 16382:2016 lead to a tensile mode of failure, no breaking cone and no minimum distance to ensure no superposition can be estimated. This case is considered in the calculation of the minimum distance between anchor sleeves, 5.8.6.3.12.



Key

1 superposition, i.e. minimum distance between anchor sleeves, d_S, not ensured

2 no superposition, i.e. minimum distance between anchor sleeves, d_S, ensured

3 no superposition, i.e. distance between anchor sleeves greater than minimum distance

Note: The continuous line circles represent plate or helix_type anchors. The dash dotted line circles represent the areas which shall not overlap in order to ensure no superposition.

Figure 3 — Superposition of anchors

3.2
Components

3.2.1
adhesive
component used for bonding the thermal insulation to the substrate

Note 1 to entry: Adhesives are available as dry_mix, ready_to_use or adhesive_foam.

3.2.2
supplementary adhesive
component used to maintain the thermal insulation to the substrate prior to mechanical fixing

3.2.3
thermal insulation
component, thermal insulation material in its finished form, including any facings or coatings

3.2.4
mechanical fixing device
component used for fixing, based on mechanical friction of materials

3.2.4.1
rail
load bearing profiled continuous mechanical fixing device, form-locking fitting the insulation plate to the substrate by its geometric form

Note 1 to entry: Rails are commonly defined by material, cross section (drawing), thickness of the wings, bending strength perpendicular to the substrate, diameter of the holes for anchors and pull through value of the head of the collar anchor.

3.2.4.2
profile
profiled continuous mechanical fixing device, placed and/or fixed perpendicular to a rail, holding two adjacent insulation boards flush

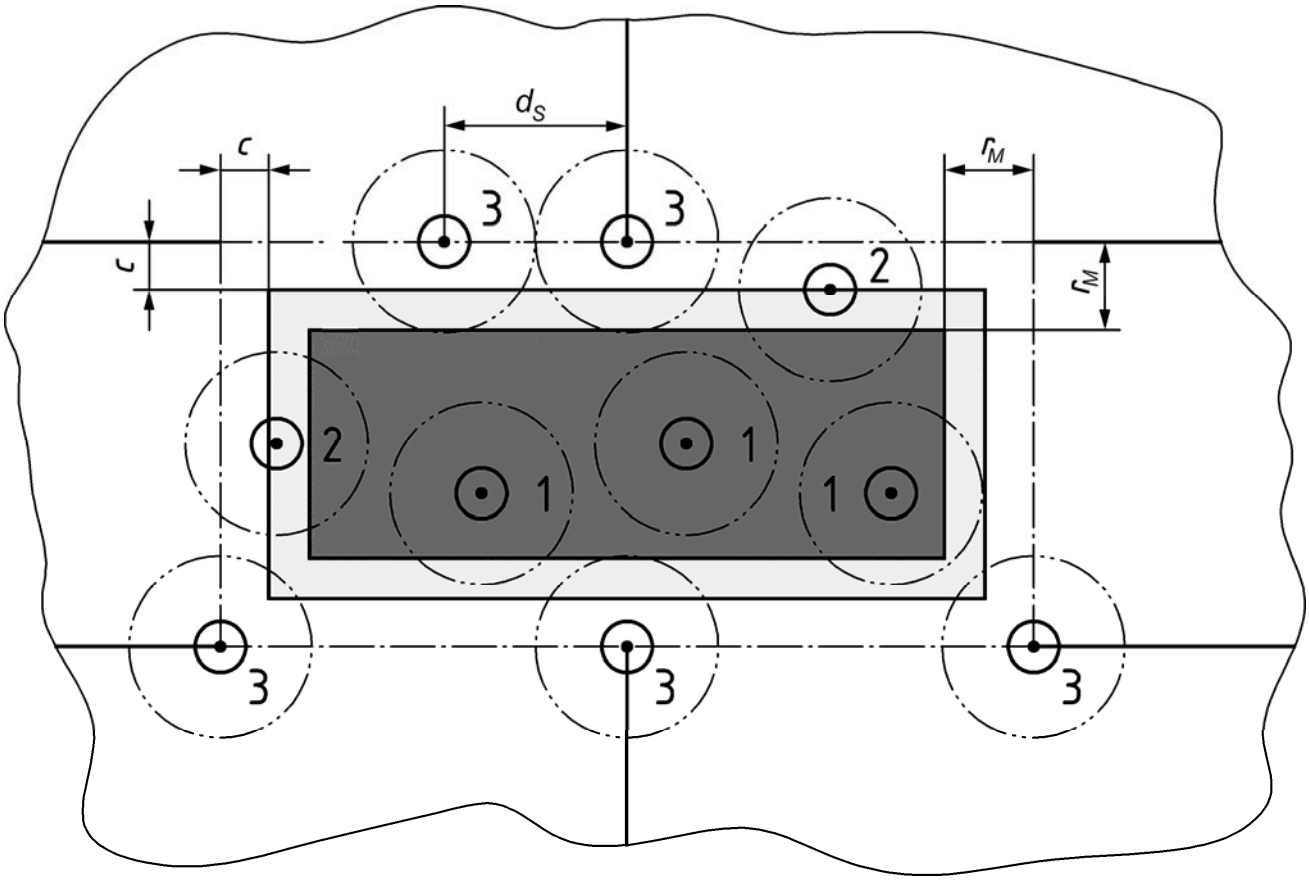
Note 1 to entry: Profiles are commonly defined by material, cross section (drawing), thickness and bending strength perpendicular to the substrate.

3.2.4.3
collar anchor
component for fixing rails to the substrate

3.2.4.4
plate anchor
component for fixing the thermal insulation and optionally the reinforced base coat to the substrate, consisting of a plate, a sleeve which passes through (or partially) the thermal insulation and a part which is embedded to the substrate

3.2.4.4.1
setting position
position of an anchor in a defined area in length and width direction of a thermal insulation board, in particular middle area position, edge/corner position and joint position

Note 1 to entry: See Figure 4.



Key

1	Middle area position examples
2	Edge/corner position examples
3	Joint position examples
r_M	Distance defining the middle area
d_S	minimum distance between anchor sleeves providing no superposition
c	Distance c determined according to EN 16382:2016
	Middle area **[[Change border line to a dashed one]]**
	Edge/corner area **[[Change border line to a dashed one]]**
	Joint area **[[Amend figure with a lightgrey joint area, also to highlight the thermal insulation board in the middle of the sketch]]**
—·—	Panel border **[[Change border line to a continues one and keep other lines between thermal insulation boards as continues lines]]**

Note: The continuous line circles represent the plate anchors. The dash dotted line circles represent the areas which shall not overlap in order to provide no superposition.

Figure 4 — Setting positions

3.2.4.4.1.1
middle area position
position of an anchor in the middle area of a thermal insulation board, defined by the distance of the centre of an anchor sleeve to the closest edge of the insulation board larger than the minimum distance r_M,

Note 1 to entry: See Figure 4.

3.2.4.4.1.2
edge/corner position
position of an anchor in the edge/corner area of a thermal insulation board, keeping a minimum distance c and a maximum distance r_M , see 5.8.6, to the border

Note 1 to entry: See Figure 4.

3.2.4.4.1.3
joint position
position of an anchor in the joint area of a thermal insulation board, keeping a maximum distance of c, see 5.8.6, to the border or set in joints

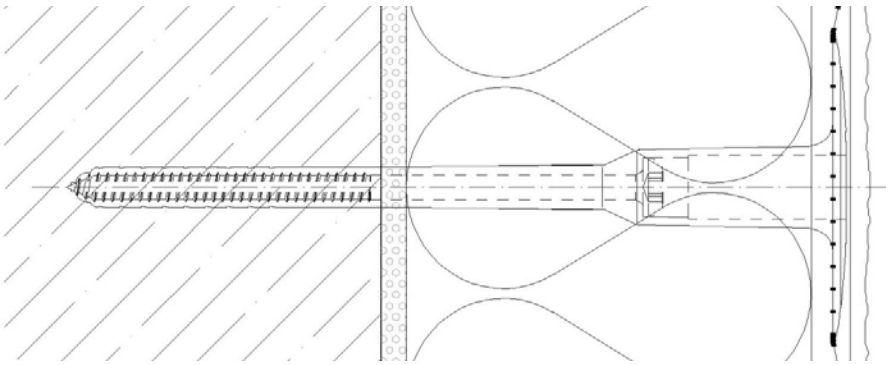
Note 1 to entry: See Figure 4.

3.2.4.4.2
position of plate anchor perpendicular to substrate
position of an anchor in thickness direction of a thermal insulation board, in particular above reinforcement, flush or countersunk

Note 1 to entry: See Figures 5 to 7.

3.2.4.4.2.1
plate anchor above reinforcement
Plate anchors above reinforcement are set within the base coat, in the part just above reinforcement

Note 1 to entry: See Figure 5.

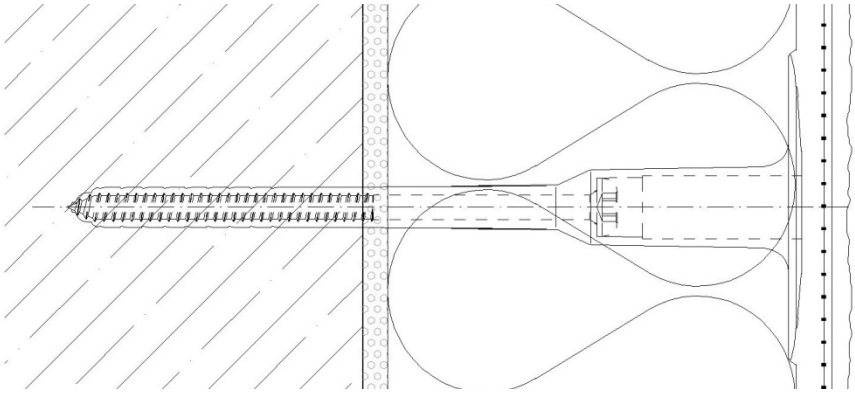


Key
1 Substrate
2 Adhesive
3 Thermal insulation
4 Plate anchor
5 Base coat
6 Reinforcement
7 Finishing layer

Figure 5 — plate anchor above reinforcement

3.2.4.4.2.2
plate anchor flush
Plate anchors set flush to the thermal insulation board, located under the reinforced base coat

Note 1 to entry: See Figure 6.

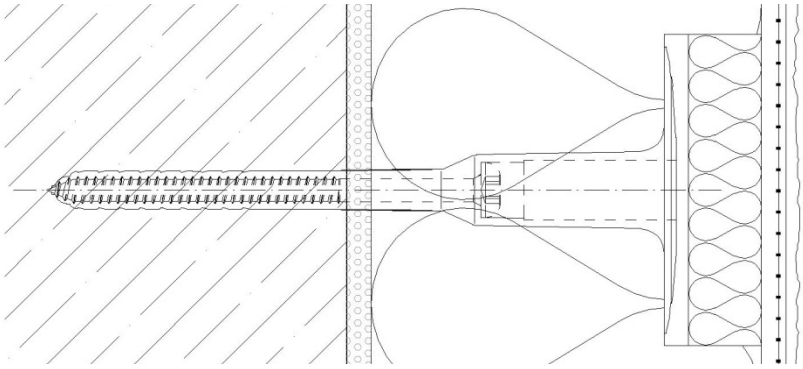


Key
1 Substrate
2 Adhesive
3 Thermal insulation
4 Plate anchor
5 Base coat
6 Reinforcement
7 Finishing layer

Figure 6 —Plate anchor flush

3.2.4.4.2.3
plate anchor countersunk
plate anchors countersunk are set deeper than flush and together with a thermal insulation plug on top of the plate

Note 1 to entry: See Figure 7.

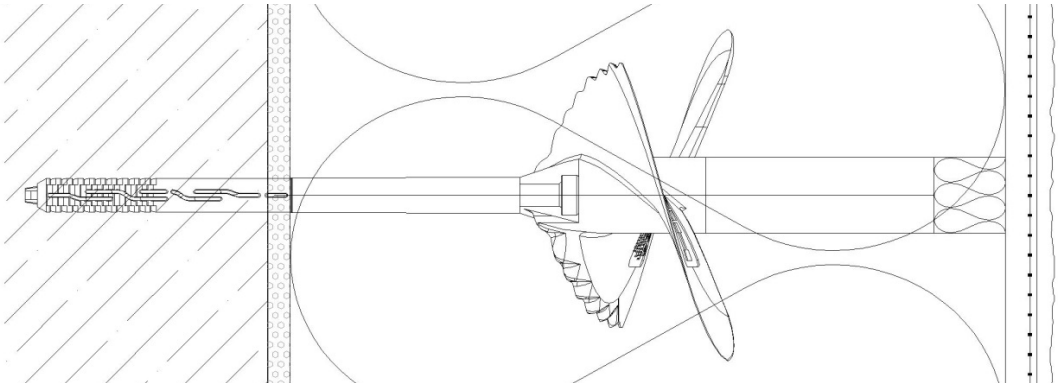


Key
1 Substrate
2 Adhesive
3 Thermal insulation
4 Plate anchor
5 Thermal insulation plug
6 Base coat
7 Reinforcement
8 Finishing layer

Figure 7 —Plate anchor countersunk

3.2.4.5
helix_type anchor
component for fixing the thermal insulation to the substrate, consisting of a helix/sleeve which passes through (or partially) the thermal insulation by screwing and a part which is embedded to the substrate

Note 1 to entry: See Figure 8.



Key
1 Substrate
2 Adhesive
3 Thermal insulation
4 Helix_type anchor
5 Thermal insulation plug
6 Base coat
7 Reinforcement
8 Finishing layer

Figure 8 — Helix_type anchor

3.2.4.6
supplementary plate anchor
component used to provide stability until the adhesive has cured and act as a temporary connection to avoid the risk of detachment of the thermal insulation

3.2.4.7
anchor for an anchored metal mesh
component for fixing a metal mesh, the reinforced base coat and the thermal insulation to the substrate.

3.2.5
base coat
component applied directly by rendering to the thermal insulation after fixing and/or bonding to the substrate

Note 1 to entry: The reinforcement is embedded into the base coat and provides most of the mechanical properties of the rendering system. A base coat is available as dry_mix or ready_to_use.

3.2.6
reinforcement
glass fibre mesh or metal mesh embedded in the base coat to reinforce the rendering system

Note 1 to entry: A second mesh layer can be used to improve the mechanical stability of an ETIC_kit.

3.2.6.1
glass fibre mesh
component consisting of continuous glass filament yarn in both the warp and the weft directions as reinforcement, intended for embedding in the base coat

3.2.6.2
metal mesh
component consisting of galvanised steel or stainless steel mesh as reinforcement, intended for embedding in the base coat

3.2.7
key coat
component applied to the base coat as a preparation for the application of the finishing coat

Note 1 to entry: A key coat is a very thin coating material which may be applied to the base coat as a preparation for the application of the finishing coat. It may also be used for aesthetic reasons.

3.2.8
finishing coat
component applied to the reinforced base coat with or without a key coat and with or without a decorative coat

Note 1 to entry: A finishing coat is available as dry_mix or ready_to_use. Finishing coats differing only in size of aggregates are different components.

3.2.8.1
aggregate sized coat
finishing coat applied in one layer where the maximum grain size of aggregates determines the thickness of the applied layer, which is slightly higher than the maximum grain size

3.2.8.2
felt coat
finishing coat applied in a layer thickness significantly higher than the maximum size of aggregates providing a smooth surface

Note 1 to entry: Typical aggregates used for felt coats have sizes less than 1 mm.

3.2.8.3
modelling coat
finishing coat applied in varying layer thicknesses above maximum size of aggregates providing a modelled surface after application, depending on appropriate application tools and techniques

Note 1 to entry: Typical aggregates used for modelling coats have sizes less than 1 mm.

3.2.8.4
scraped coat
finishing coat, scratched by a tool after being applied to achieve a rough surface, leading to a reduced layer thickness compared to the one initially applied.

Note 1 to entry: Some aggregates with a higher size of aggregates can be scratched out by the tool.

3.2.9
decorative coat
component which is applied to the finishing coat

Note 1 to entry: A decorative coat is a thin organically bound coating material, mainly used for aesthetic reasons.

3.3
Form
specific type of product regarding its physical state as-delivered and the method of processing on-site

3.3.1
dry_mix
powder blended at the factory that requires only mixing with a quantity of water specified by the manufacturer

3.3.2
dry_extra_binder
two component component, a powder requiring addition of quantity of extra binder specified by the manufacturer

3.3.3
ready_extra_cement
two component component, a paste requiring addition of quantity of cement specified by the manufacturer

3.3.4
ready_to_use
pastes, supplied in workable consistency to be processed directly, with a possible addition of small quantity of water to adjust consistency

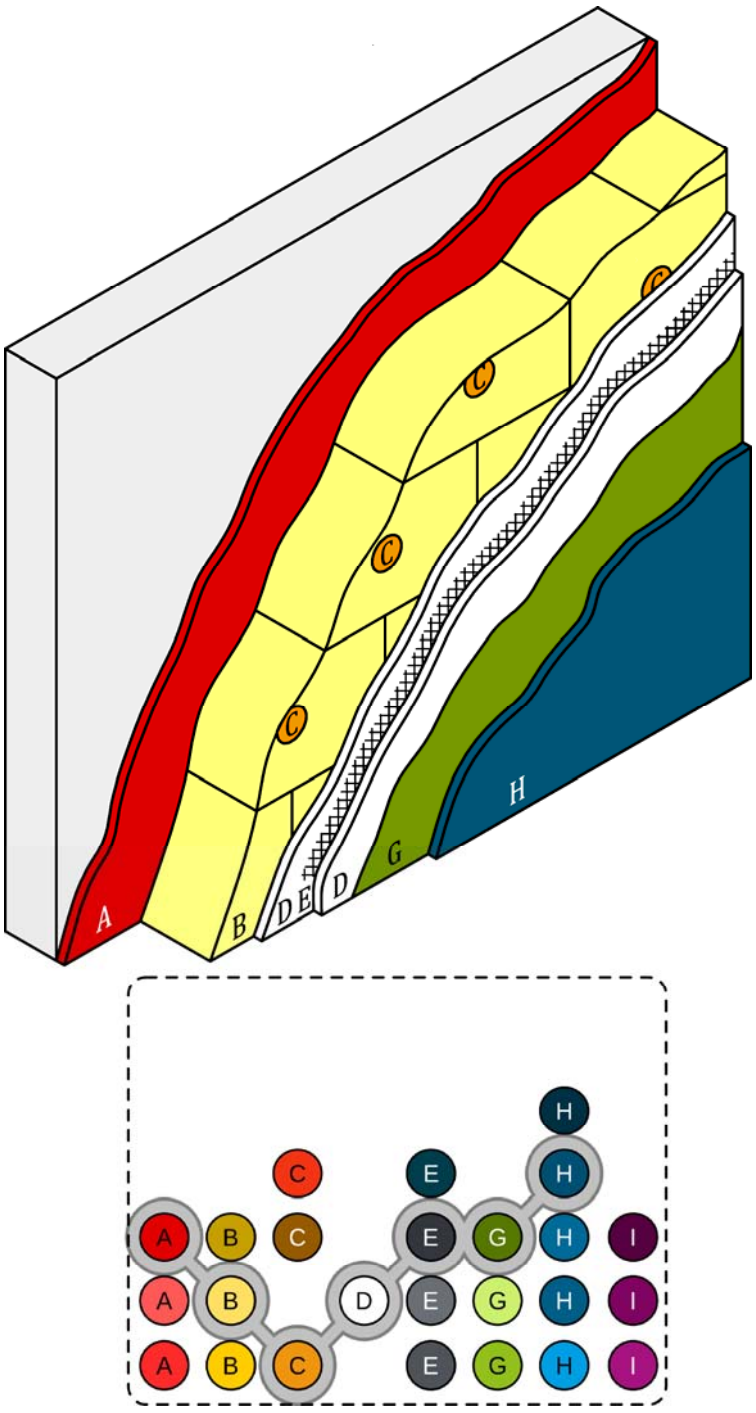
3.3.5
adhesive_foam
PU/PIR foam delivered in cans/containers to be sprayed

3.4
Fixing methods

3.4.1
ETIC_kit bonded with adhesive and additional supplementary plate anchors
ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, an adhesive, a plate anchor and optionally a key coat and/or a decorative coat

Note 1 to entry: The ETIC_kit is partially bonded in strips and/or dabs or fully bonded. The dead load is mainly transferred to the substrate by the adhesive. The supplementary plate anchors are mainly used to provide stability until the adhesive has cured and/or dried. They act as a temporary fixing to prevent detachment. The

adhesive minimizes convection behind thermal insulation, particularly in vertical direction. Figure 9 shows an example.



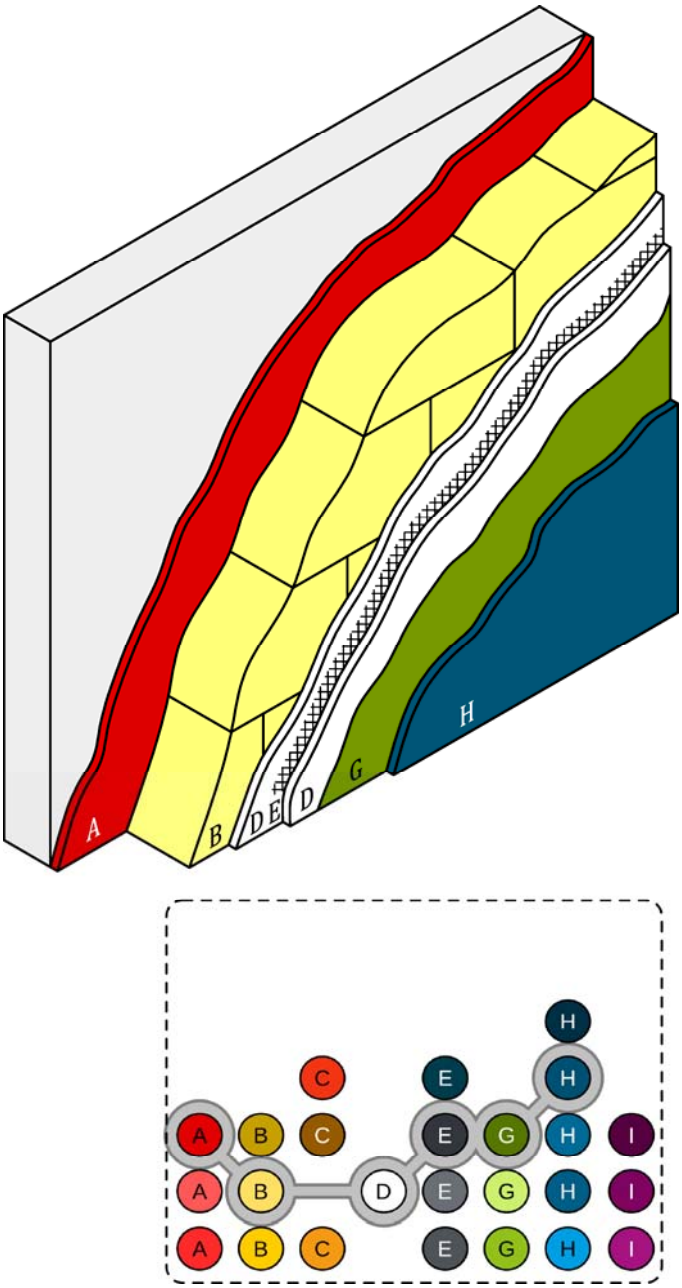
Key

A	adhesive	E	glas fibre mesh
B	thermal insulation	G	key coat
C	plate anchors	H	finishing coat
D	base coat		

Figure 9 — Example for an ETIC_kit bonded with adhesive and additional supplementary plate anchors

3.4.2
ETIC_kit bonded with adhesive
ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, an adhesive and optionally a key coat and/or a decorative coat

Note 1 to entry: The ETIC_kit is partially bonded in strips and/or dabs or fully bonded. The dead load is transferred to the substrate by the adhesive. The adhesive minimizes convection behind thermal insulation, particularly in vertical direction. Figure 10 shows an example.



Key

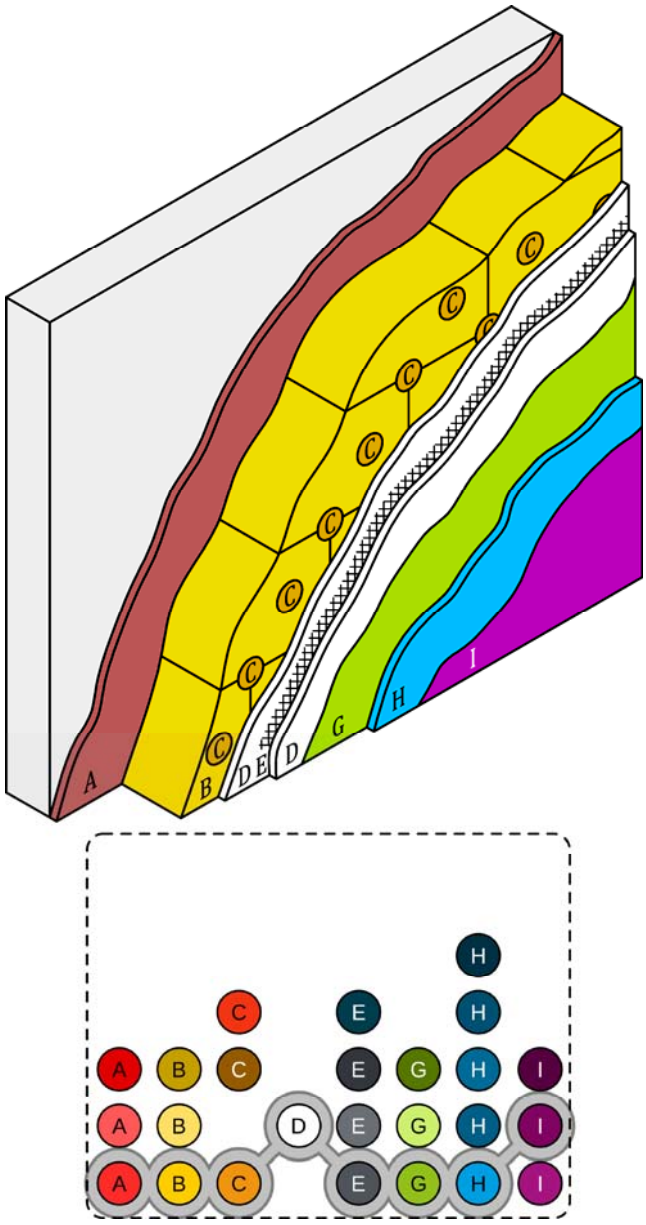
A	adhesive	E	glas fibre mesh
B	thermal insulation	G	key coat
D	base coat	H	finishing coat

Figure 10 — Example of an ETIC_kit bonded with adhesive

3.4.3
ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive

ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, an adhesive, a plate anchor and optionally a key coat and/or a decorative coat

Note 1 to entry: The wind load is considered to be transferred to the substrate by plate anchors. The dead load is considered to be transferred by the supplementary adhesive. The supplementary adhesive minimizes convection, particularly in vertical direction. Figure 11 shows an example.



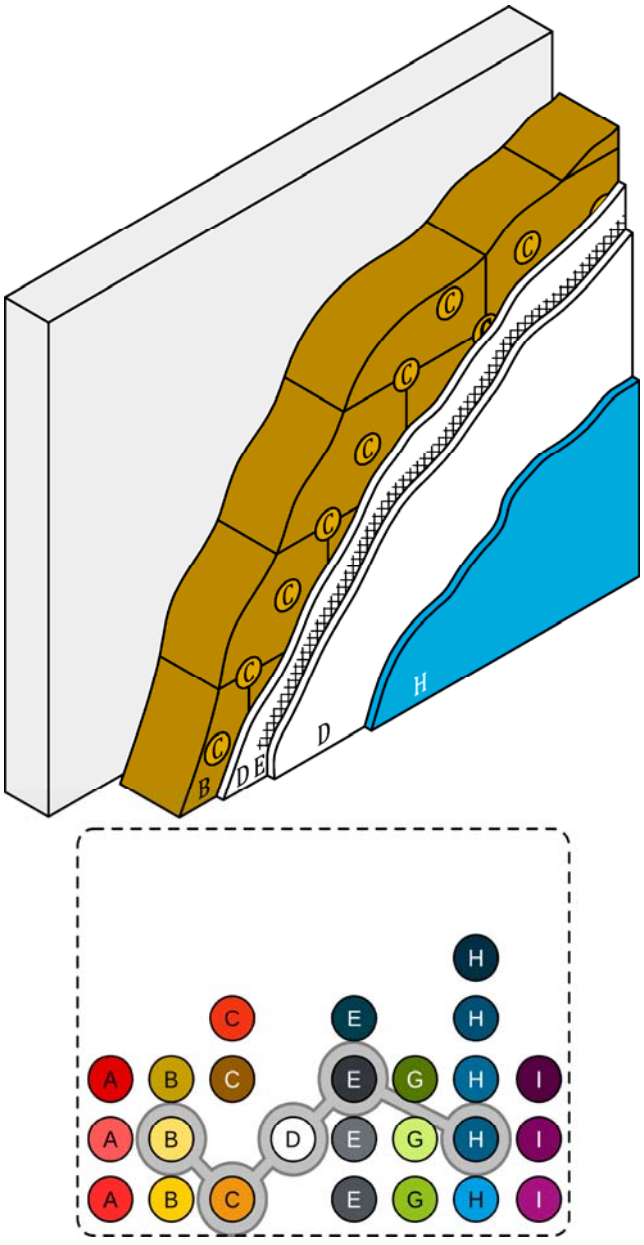
Key

A	adhesive	E	glas fibre mesh
B	thermal insulation	G	key coat
C	plate anchors	H	finishing coat
D	base coat	I	decorative coat

Figure 11 — Example of an ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive

3.4.4
ETIC_kit mechanically fixed with plate anchors
ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, a plate anchor and optionally a key coat and/or a decorative coat

Note 1 to entry: The wind load is considered to be transferred to the substrate by plate anchors. The dead load is considered to be transferred by the friction between the thermal insulation and the substrate. The close contact of the thermal insulation to the substrate minimizes convection, particularly in vertical direction. Figure 12 shows an example.



Key

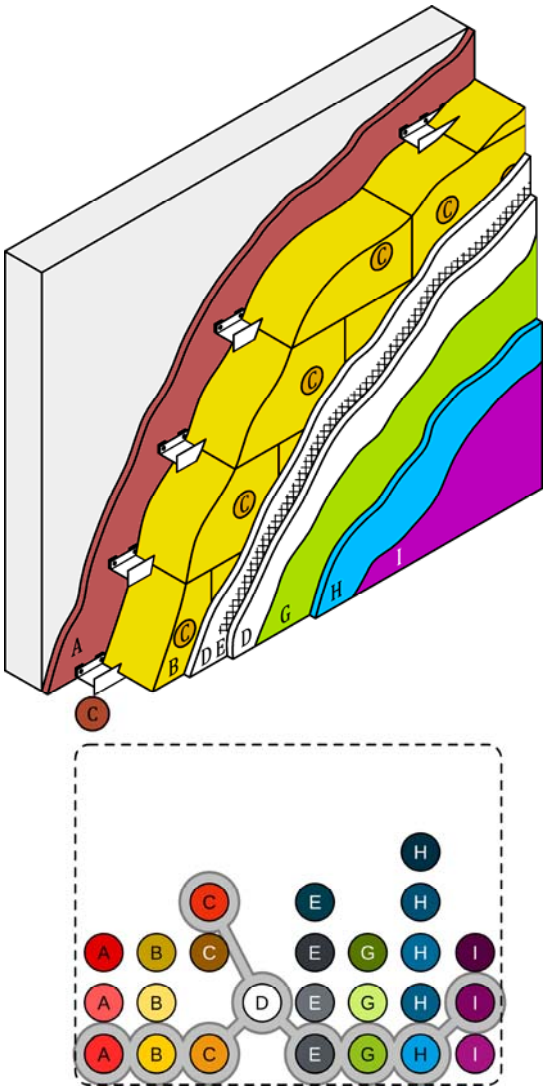
B	thermal insulation	E	glas fibre mesh
C	plate anchors	H	finishing coat
D	base coat		

Figure 12 — Example of an ETIC_kit mechanically fixed with plate anchors

3.4.5
ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive

ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, an adhesive, a collar anchor, a profile, a rail and optionally a plate anchor and/or a key coat and/or a decorative coat

Note 1 to entry: The wind load is considered to be transferred to the substrate by the profiles and rails, fixed with collar anchors to the substrate. Optional plate anchors support the fixing. The dead load is considered to be transferred by the profiles and rails, fixed with collar anchors to the substrate. The supplementary adhesive minimizes convection behind thermal insulation, particularly in vertical direction. Figure 13 shows an example.



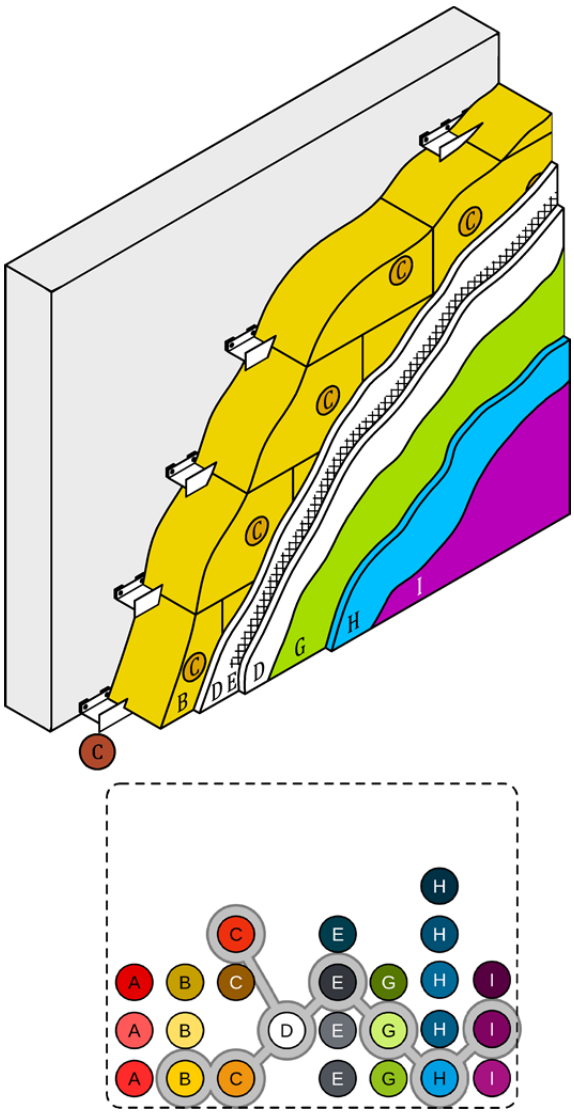
Key

A	localized dabs of adhesive located at least at anchor positions	E	glas fibre mesh
B	thermal insulation	G	key coat
C	profiles and rails, collar anchors	H	finishing coat
C	plate anchors	I	decorative coat
D	base coat		**[[Add profiles to vertical joints]]**

Figure 13 — Example of an ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive

3.4.6
ETIC_kit mechanically fixed with profiles and rails
ETIC_kit comprising a base coat, a thermal insulation, a reinforcement, a finishing coat, a collar anchor, a profile, a rail and optionally a key coat and/or a decorative coat

Note 1 to entry: The wind load is considered to be transferred to the substrate by the profiles and rails, fixed with collar anchors to the substrate. The dead load is considered to be transferred by the profiles and rails, fixed with collar anchors to the substrate. Figure 14 shows an example.



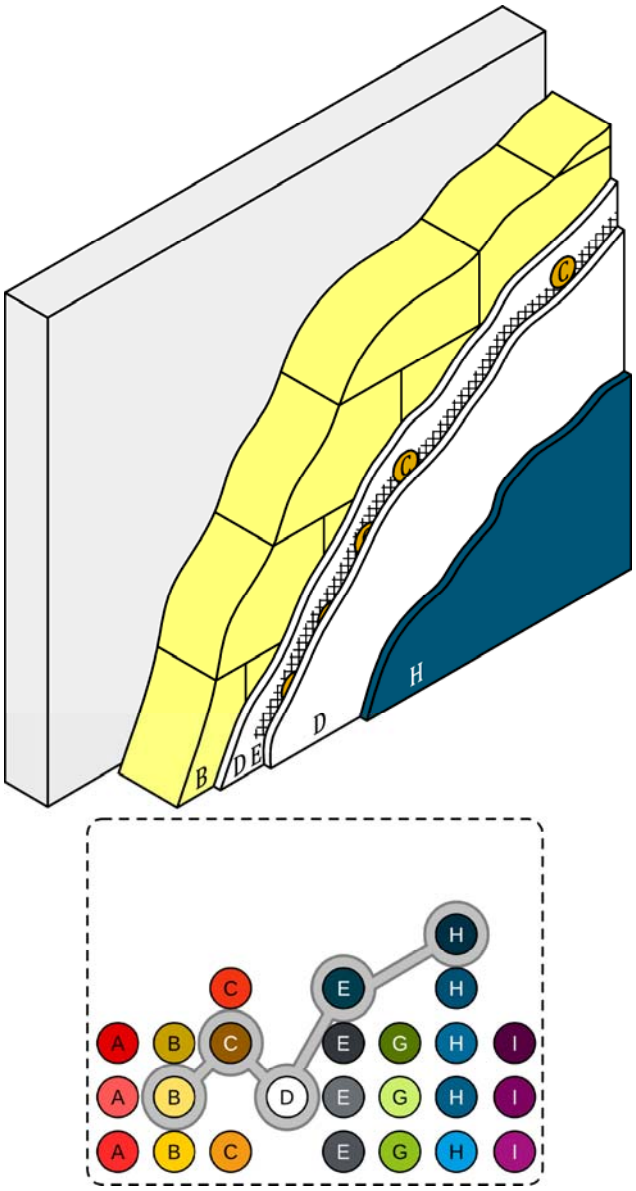
Key

B	thermal insulation	G	key coat
C	profiles and rails, collar anchors	H	finishing coat
C	plate anchors	I	decorative coat
D	base coat		**[[Add profiles to vertical joints]]**
E	glas fibre mesh		

Figure 14 — Example of an ETIC_kit mechanically fixed with profiles and rails

3.4.7
ETIC_kit mechanically fixed by an anchored metal mesh
ETIC_kit comprising a base coat, a thermal insulation, a metal mesh, a finishing coat, an anchor for the metal mesh and optionally a key coat and/or a decorative coat

Note 1 to entry: The wind load is considered to be transferred to the substrate by the anchored metal mesh. The dead load is considered to be transferred by the friction between the thermal insulation and the substrate. The close contact of the thermal insulation to the substrate, supported by the mass and stiffness of the rendering system, minimizes convection behind thermal insulation, particularly in vertical direction. Figure 15 shows an example.



Key

B	thermal insulation	E	metal mesh
C	anchors for the metal mesh	H	finishing coat
D	base coat		

Figure 15 — Example of an ETIC_kit mechanically fixed by an anchored metal mesh

4 Essential characteristics

4.1 Introduction

The determination of performance of an ETIC_kit is based on test results, calculations, direct field of application rules and classification without further testing according to clause 5.

5 Testing, assessment and test specimen, direct field of application rules

5.1 Introduction

Clause 5 contains the procedure for the assessment of essential and proxy characteristics in detail.

The assessment may vary according to different variants of ETIC_kits. They are numerous and cannot be covered in annex ZA. They are considered in clause 5. Variants can influence the kind of test specimens, direct field of application rules, calculations and more.

5.1.1 General rules for the assessment

The assessment of an ETIC_kit is performed by using either test results, evaluated on test specimens which are ETIC_kits or part of ETIC_kits, or by using test results together with direct field of application rules. In any case, the ETIC_kit to be assessed shall be defined by the incorporated components and specification according to the following list:

- adhesive bonded area
- adhesive coverage
- thermal insulation thickness
- anchor setting position
- anchor plate position perpendicular to substrate
- anchor number per unit area
- profiles and rails distances
- base coat thickness
- reinforcement overlap
- key coat coverage
- finishing coat thickness
- decorative coat coverage

Note to entry 1 The layer thickness of a key or decorative coat can be assessed according to EN 1062-1:2004:2004-08.

A test result is based on one or more test specimens. A test specimen is an ETIC_kit or part of an ETIC_kit. It can also be a single component. An assessment of an ETIC_kit with other components and/or specifications than tested is also possible by the use of direct field of application rules together with former test results.

Note to entry 1 As the direct field of application rules are conservative regarding other components and/or specifications, an ETIC_kit characteristic can be better or even much better than declared.

5.1.2 General rules for components used to prepare test specimens

Component_properties can have an influence on the characteristics of an ETIC_kit. As component_properties will be used for factory production control and test plans of ETIC_kit characteristics, some properties(s) of every component, used to build test specimen(s), shall be tested. The relevant component_properties(s) and respective tolerances are listed in Annex E with regard to

any specific ETIC_kit test/assessment. Any batch of a component, used to build one or more test specimens, shall be considered. The results shall be recorded according to the relevant test standards.

Note to entry 1: The outcome is needed for factory production control purposes of ETICS, see 6.

5.2 Reaction to fire

5.2.1 Reaction to fire of the adhesive_foam

5.2.1.1 Testing

The reaction to fire of a adhesive_foam shall be assessed according to EN 13501-1:2018.

5.2.1.2 Sampling

The sampling, the preparation of the test specimen and conditioning shall be done according to EN 13501-1:2018.

5.2.1.3 Direct field of application rules

No specific rules stated.

5.2.1.4 Expression of results

The result shall be expressed as the Euroclass achieved.

5.2.2 Reaction to fire of the thermal insulation

5.2.2.1 Testing

The reaction to fire of a thermal insulation shall be tested and assessed according to EN 13501-1:2018.

5.2.2.2 Sampling, Conditioning, test specimen

The sampling, the preparation of the test specimen and conditioning shall be done according to the standards EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.2.2.3 Direct field of application rules for thermal insulation

The rules of EN 13501-1:2018 and the respective EN apply.

5.2.2.4 Expression of results

The result shall be expressed as the Euroclass achieved.

5.2.3 Apparent density of thermal insulation

5.2.3.1 Variants

Thermal insulation

a) structure

    1) mono-density

2) dual-density

5.2.3.2 Testing

The apparent density of a thermal insulation shall be tested and assessed according to EN 1602:2013.

5.2.3.3 Sampling

The sampling, the preparation of the test specimen and conditioning shall be done according to the standards EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.2.3.4 Direct field of application rules for thermal insulation

For a mono-density thermal insulation, a test result is valid for the tested thermal insulation in any thickness.

For a dual-density thermal insulation, a test result is only valid for the tested thickness.

5.2.3.5 Expression of results

The result shall be expressed as the apparent density level of a thermal insulation in kg/m^3 rounded to two significant digits.

5.2.4 Organic content of the base and the finishing coat

5.2.4.1 Variants

Base and finishing coat

a) Euroclass according to EN 13501-1:2018

   1) A1, A2

   2) B, C, D, E or F

5.2.4.2 Testing

For base and finishing coats with Euroclass A1 or A2, the assessment of the organic content is relevant according to the following procedure:

a) Measure the mass of each initial base or finishing coat test specimen, used for the test, with a sufficient scale. The mass of an initial test specimen includes additives, e.g. tempering water.

b) Let the test specimen cure.

c) Dry the test specimen to mass constancy at 105 °C.

d) Measure the mass of the test specimen after curing and reaching the mass constancy with a sufficient scale.

5.2.4.3 Calculation

The organic content oc_{dry} shall be calculated in relation to end use condition dried at 105 °C to mass constancy.

$$oc_{dry} = \frac{oc_{initial} \times m_{initial}}{m_{dry}}$$

where

oc_{dry} is the organic content in percent, related to end use condition dried at 105 °C to mass constancy water

$oc_{initial}$ is the organic content in percent, related to the recipe including additives, e.g. tempering water

$m_{initial}$ is the mass of the initial test specimen including additives, e.g. tempering water

m_{dry} is the mass of the dried test specimen after curing and reaching the mass constancy

5.2.4.4 Sampling

-

5.2.4.5 Direct field of application rules

The result is valid for the considered base or finishing coat.

5.2.4.6 Expression of results

The result shall be expressed as the organic content level of a base coat or a finishing coat in % rounded to 0,1.

5.2.5 Mass per unit area of the reinforcement

5.2.5.1 Testing

The mass per unit area of a reinforcement shall be tested by measuring and weighing a one metre length of the mesh. For reinforcements in roll form, the width of the sample shall be the same as the roll width.

5.2.5.2 Sampling

Three samples has to be taken, each one with one metre length and the width of the roll of the mesh.

5.2.5.3 Direct field of application rules for reinforcement

The result is valid for the tested reinforcement.

5.2.5.4 Expression of results

The result is the average value of 3 measurements and shall be expressed as the mass per unit area level of a reinforcement in kg/m^2 rounded to 0,01.

5.2.6 Reaction to fire of the ETIC_kit according EN 13501-1:2018

5.2.6.1 Variants

ETIC_kit

a) Euroclass according to EN 13501-1:2018

1) A1 or A2
2) A1, A2, B, C or D
3) B, C, D, E or F

Substrate according to EN 13238:2010

a) Euroclass according to EN 13501-1:2018
   1) A1 or A2 s1,d0
   2) B, C, D

Adhesive, base coat and finishing coat

a) binder type
   1) inorganic (cement-calcium hydroxide, alkali silicate, etc.)
   2) organic (silicon resin, synthetic resin, etc.)
   3) PU/PIR (adhesive_foam)

b) organic content
   1) ≤ 5%
   2) > 5%
   3) ≤ 15%
   4) > 15%

c) flame retardant
   1) present
   2) absent

Thermal insulation

a) Euroclass according to EN 13501-1:2018
   1) A1 or A2
   2) B, C, D, E or F

b) material
   1) MW, EPS, XPS, CG, ICB
   2) PU, PF, WF

Fixing method

a) adhesive

   1) present

   2) absent

Mechanical fixing device

a) kind

   1) plate anchors

   2) profiles and rails

   3) anchored metal mesh

b) material

   1) plastic

   2) metal

Reinforcement

a) material

   1) glass fibre mesh

   2) metal mesh

Key coat and decorative coat

a) layer thickness in end use conditions ≤ 200 µm and organic content ≤ 5% or

b) layer thickness in end use conditions > 200 µm and/or organic content > 5%

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004:2004-08. The organic content shall be calculated according to 5.2.

5.2.6.2 Testing, assessment, test specimen and direct field of application rules

The reaction to fire of an ETIC_kit shall be assessed according to EN 13501-1:2018. The assessment is based on different sets of test results, evaluated by different test methods. Each test method is covered in the following in detail.

NOTE EN ISO 1182:2010 (Non-combustibility test) is not used for the assessment of the reaction to fire, as ETIC_kit test specimens cannot be representative prepared.

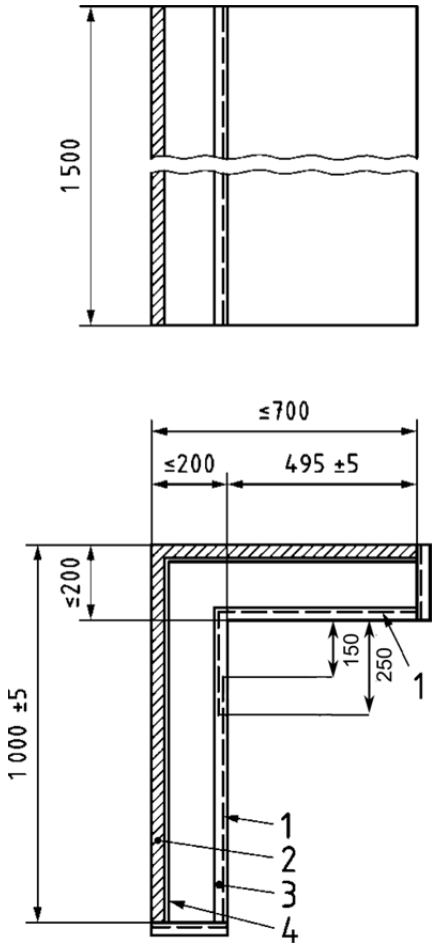
5.2.6.3 Testing according to EN 13823:2010+A1:2014 (Single burning item – SBI)

For ETIC_kits with Euroclass A1, A2, B, C or D, the testing according EN 13823:2010+A1:2014 is relevant.

5.2.6.3.1 Test specimen

A test specimen consists of a corner construction using the ETIC_kit components. The components shall be fixed to a standard substrate in accordance with EN 13238:2010. ETIC_kits with an adhesive present shall be fixed using an adhesive only. ETIC_kits with no adhesive present shall be fixed using mechanical fixing devices only. At the long wing of the SBI specimen a vertical joint of the reinforcement shall be installed. At a distance of 150 mm to 250 mm from the inner corner two layers of reinforcement shall overlap (see Figure 16). All edges shall be covered with the rendering system except the bottom side and the top side of the specimen (see Figure 16). After preparation, the test specimens shall be conditioned according to EN 13238:2010.

NOTE An aluminium foil is sometimes used on the bottom side of the test specimen to protect the test equipment.



Key

1 Reinforcement
2 Substrate
3 rendering system (base coat, key coat, finishing coat, decorative coat if necessary)
4 Adhesive
[a] Overlapping **[[Add a in sketch]]**

Figure 16 — Schematic drawing of the test specimen in the SBI-test according to EN 13823:2010+A1:2014

The variants

a) adhesive with an organic content > 15%,

b) thermal insulation of the material PU, PF or WF,

c) standard substrate of Euroclass B, C or D according to EN 13238:2010,

combined or not, require two test specimen designs instead of one with a different thickness of the thermal insulation.

Two variants shall be considered regarding base and finishing coats (two test specimen design). If the organic content of both the base coat and the finishing coat is ≤ 5 %, a test result is based on a one test specimen design. If the organic content of the base coat and/or the finishing coat is > 5 %, a test result is based on a two test specimen designs, differing in the layer thicknesses of the base and/or the finishing coat.

In case of the need of two or more test specimen designs, the test effort can be decreased by considering historical data and/or single measurements, showing a test result of less test specimen designs lead to a conservative test result.

If the layer thickness of a key coat or a decorative coat in end use conditions is ≤ 200 µm and the organic content is ≤ 5%, the test specimen can contain this coat(s) or not.

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004:2004-08.

5.2.6.3.2 Direct field of application rules for adhesive

For a standard substrate of Euroclass B, C or D according to EN 13238:2010, a thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, and an adhesive with an organic content > 5%, a test result of the test specimen design with the lower thickness of thermal insulation is valid for an organic content ≤, a flame retardant content ≥ and a coverage ≤ than tested and a test result of the test specimen design with the higher thickness of thermal insulation is valid for an adhesive with an organic content ≤, a flame retardant content ≥ and a coverage ≤ than tested.

For a standard substrate of Euroclass B, C or D according to EN 13238:2010, a thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, and an adhesive with an organic content ≤ 5%, a test result of the test specimen design with the lower thickness of thermal insulation is valid for an organic content ≤, a flame retardant content ≥ and a coverage ≥ than tested and a test result of the test specimen design with the higher thickness of thermal insulation is valid for an adhesive with an organic content ≤, a flame retardant content ≥ and a coverage ≤ than tested.

For all other variants:

In general, a test result is valid for adhesives with a coverage ≤ than tested.

For adhesives of binder type organic or inorganic, and with an organic content > 15%, a test result is valid for the tested adhesive only.

For adhesives of binder type organic or inorganic, and with an organic content ≤ 15%, a test result is valid for adhesives of binder type organic or inorganic with an organic content ≤ and a flame retardant content ≥ than tested.

For adhesives of binder type polyurethane, a test result is valid for the tested adhesive only.

5.2.6.3.3 Direct field of application rules for thermal insulation

In case of two test specimen designs, differing in the thickness of thermal insulation, a test result is valid for a thermal insulation thickness ≥ than the thinner and ≤ than the thicker one tested.

In case of one test specimen design, a test result is valid for a thermal insulation thickness ≤ than tested.

In general, if the thickness of a thermal insulation is limited by the maximum possible size of the test specimen and the maximum possible thickness is used, leading to a test specimen thickness (with substrate) ≥ 180 mm, a test result is also valid for a thickness of the thermal insulation > than tested.

For standard substrates of Euroclass A1 or A2 s1,d0 according to EN 13238:2010, and a thermal insulation of the material MW or CG with an Euroclass A1 or A2, a test result is valid for any thermal insulation of an Euroclass A1 or A2 and of the same material than tested, an organic content ≤ than tested and an Euroclass ≥ than tested.

For standard substrates of Euroclass B, C or D according to EN 13238:2010 and a thermal insulation of the material MW or CG with an Euroclass A1 or A2, a test result is valid for any thermal insulation of an Euroclass A1 or A2 and of the same material than tested, an organic content ≤ than tested and a Euroclass ≥ than tested. A test result is also valid for a standard substrate with an Euroclass A1 or A2 s1,d0.

For standard substrates of Euroclass A1 or A2 s1,d0 according to EN 13238:2010 and a thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, a test result is valid for any thermal insulation of an Euroclass B, C, D, E or F and of the same material with an apparent density ≤ than tested and a Euroclass ≥ than tested.

For standard substrates of Euroclass B, C or D according to EN 13238:2010 and a thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, a test result is valid for any thermal insulation of an Euroclass B, C, D, E or F and of the same material with an apparent density ≤ than tested and a Euroclass ≥ than tested. A test result is also valid for a standard substrate with an Euroclass A1 or A2 s1,d0.

For thermal insulation of the material PU, PF or WF, a test result is valid for the tested thermal insulation only.

5.2.6.3.4 Direct field of application rules for mechanical fixing device

When only adhesives are used for preparing the test specimen, a test result is valid also for the use of additional mechanical fixing devices.

In case a purely mechanical fixing is used for preparing the test specimen(s), a test result is valid for any mechanical fixing device of the same kind and material as the tested mechanical fixing device.

In case a purely mechanical fixing of the kind plate anchor or profiles and rails, and of the material plastic is used, a test result is valid for any mechanical fixing device of the same kind, and of the materials plastic and metal.

5.2.6.3.5 Direct field of application rules for base coat and finishing coat

For base coats and finishing coats, both with an organic content of ≤ 5%, a test result is valid for any base coat and finishing coat of the same binder type with an organic content ≤ than tested, a flame retardant content ≥ than tested, and a thickness ≥ than tested.

For base coats and finishing coats, at least one with an organic content of > 5%, a test result is valid for any base coat and finishing coat of the same binder type with an organic content ≤ than tested, a flame retardant content ≥ than tested, and a thickness ≥ the than the thinner and a thickness ≤ than the thicker layer thickness.

5.2.6.3.6 Direct field of application rules for reinforcement

A test result is valid for any reinforcement of the same type with a mass per unit area ≥ than tested and an overlap ≥ than tested.

5.2.6.3.7 Direct field of application rules for key coat and decorative coat

The direct field of application rules for a key coat and for a decorative coat are the same.

If the layer thickness of a coat in end use conditions is ≤ 200 µm, and the organic content is ≤ 5%, and the coat is used or not used to prepare the test specimen, a test result is valid for any coat with a layer thickness in end use conditions ≤ 200 µm and an organic content ≤ 5%.

For a layer thickness > 200 µm in end use conditions and/or an organic content > 5%, a test result is valid for any coat with an organic content ≤ than tested.

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004:2004-08.

5.2.6.3.8 Expression of results

The results shall be expressed according to EN 13823:2010+A1:2014.

5.2.6.4 Testing according to EN ISO 11925-2:2010 (Small flame test)

For ETIC_kits with Euroclass B, C, D or E, the testing and assessment according to EN ISO 11925-2:2010 is relevant.

5.2.6.4.1 Test specimen

For adhesives with an organic content > 15 %, six test specimens shall be prepared with all layers on a standard substrate and six test specimens shall be prepared showing substrate, adhesive and thermal insulation only. The test specimen shall be prepared with uncovered edges and without mechanical fixing devices.

For adhesives with an organic content ≤ 15 %, six test specimen shall be prepared without a substrate and without an adhesive. The test specimen shall be prepared with uncovered edges and without mechanical fixing devices.

Two variants shall be considered regarding base and finishing coats. If the organic content of both the base coat and the finishing coat is ≤ 5 %, a test result is based on a one test specimen design. If the organic content of the base coat and/or the finishing coat is > 5 %, a test result is based on a two test specimen design, differing in the layer thicknesses of the base and/or the finishing coat.

A test specimen shall show a thickness of 55 to 60 mm, the latter is the maximum thickness of the test specimen. Preparing a test specimen of maximum 60 mm thickness might not be possible with a given thermal insulation. In this case the thermal insulation shall be cut as such a 55 to 60 mm test specimen can be prepared.

In case of the need of two or more test specimen designs, the test effort can be decreased by considering historical data or single measurements, showing a test result of less test specimen designs lead to a conservative test result.

5.2.6.4.2 Testing

For adhesives with an organic content > 15 %, the measurements on the test specimens with a rendering system shall be performed with surface of the front side according to EN ISO 11925-2:2010, and the measurements on the test specimens without a rendering system shall be performed by edge flaming of the test specimen turned longitudinally by 90° according to EN ISO 11925-2:2010. The flame position shall be at the adhesive layer.

For adhesives with an organic content ≤ 15 %, the tests shall be performed with surface flaming of the front side according to EN ISO 11925-2:2010.

5.2.6.4.3 Direct field of application rules for adhesive

For adhesives with an organic content ≤ 15 %, a test result is valid for any adhesive.

For adhesives with an organic content > 15 %, a test result is valid for adhesives of the same binder type with an organic content ≤ than tested and with a coverage ≤ than tested.

5.2.6.4.4 Direct field of application rules for thermal insulation

A test result is valid for any thickness of the thermal insulation.

For standard substrates of Euroclass A1 or A2 s1,d0 according EN 13238:2010 and thermal insulation of the material MW or CG with an Euroclass A1 or A2, a test result is valid for any thermal insulation of an Euroclass A1 or A2 and of the same material than tested, an organic content ≤ than tested and an Euroclass ≥ than tested.

For standard substrates of Euroclass B, C, D according EN 13238:2010 and thermal insulation of the material MW or CG with an Euroclass A1 or A2, a test result is valid for any thermal insulation of an Euroclass A1 or A2 and of the same material than tested, an organic content ≤ than tested and a Euroclass ≥ than tested. A test result is also valid for a standard substrate with an Euroclass A1 or A2 s1,d0.

For standard substrates of Euroclass A1 or A2 s1,d0 according EN 13238:2010 and thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, a test result is valid for any thermal insulation of an Euroclass B, C, D, E or F and of the same material with an apparent density ≤ than tested and a Euroclass ≥ than tested.

For standard substrates of Euroclass B, C, D according EN 13238:2010 and thermal insulation of the material MW, EPS, XPS, CG or ICB with an Euroclass B, C, D, E or F, a test result is valid for any thermal insulation of an Euroclass B, C, D, E or F and of the same material with an apparent density ≤ than tested and a Euroclass ≥ than tested. A test result is also valid for a standard substrate with an Euroclass A1 or A2 s1,d0.

For thermal insulation of the material PU, PF or WF, a test result is valid for the tested thermal insulation only.

5.2.6.4.5 Direct field of application rules for base coat and finishing coat

For base coats and finishing coats of an organic content ≤ 5 %, a test result is valid for any base coat and finishing coat of the same binder type, with an organic content ≤ than tested, a flame retardant content ≥ than tested, and a thickness ≥ than tested.

For base coats and finishing coats of an organic content > 5 % of at least one of them, a test result is valid for any base coat and finishing coat of the same binder type, with an organic content ≤ than tested, a flame retardant content ≥ than tested, and a thickness ≥ than the thinner and a thickness ≤ than the thicker test specimen design.

Additionally, for base coats and finishing coats of binder type organic, a test result is also valid for base coats and finishing coats of binder type inorganic.

5.2.6.4.6 Direct field of application rules for reinforcement

A test result is valid for any reinforcement of the same material with a mass per unit area ≥ than tested.

5.2.6.4.7 Direct field of application rules for key coat and decorative coat

The direct field of application rules for a key coat and for a decorative coat are the same.

If the layer thickness of a coat in end use conditions is ≤ 200 µm, and the organic content is ≤ 5%, and the coat is used or not used to prepare the test specimen, a test result is valid for any coat with a layer thickness in end use conditions ≤ 200 µm and an organic content ≤ 5%.

For a layer thickness > 200 µm in end use conditions and/or an organic content > 5%, a test result is valid for any coat with an organic content ≤ than tested.

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004:2004-08.

5.2.6.4.8 Expression of results

The results shall be expressed according to EN ISO 11925-2:2010.

5.2.6.5 Testing according to EN ISO 1716:2018 (Heat of combustion, Q_{PCS}-Value)

For ETIC_kits with Euroclass A1 or A2, the Q_{PCS}-values shall be assessed. This test method shall be performed on every component of an ETIC_kit.

Components falling under EC decisions allowing classification without testing need not to be tested.

5.2.6.5.1 Test specimen

Test specimens shall be prepared according to EN ISO 1716:2018.

5.2.6.5.2 Direct field of application rules for adhesive

A test result is valid for the tested adhesive only.

5.2.6.5.3 Direct field of application rules for thermal insulation

A test result is valid for the tested thermal insulation only.

5.2.6.5.4 Direct field of application rules for base coat

A test result is valid for the tested base coat only.

5.2.6.5.5 Direct field of application rules for reinforcement

A test result is valid for the tested reinforcement only.

5.2.6.5.6 Direct field of application rules for key coat

A test result is valid for the tested key coat only.

5.2.6.5.7 Direct field of application rules for finishing coat

A test result is valid for any finishing coat differing only in size of aggregates than tested and an organic content ≤ than tested.

5.2.6.5.8 Direct field of application rules for decorative coat

A test result is valid for any decorative coat with an organic content ≤ than tested.

5.2.6.5.9 Calculation of the gross heat of combustion of an ETIC_kit $Q_{PCS, ETIC\_kit}$

The combination of components, layer thicknesses and/or coverages of an ETIC_kit leads to its specific gross heat of combustion.

5.2.6.5.10 Expression of results

The result shall be expressed as single values for any considered component of the ETIC_kit according to EN ISO 1716:2018 and as calculated according Annex B in MJ/kg rounded to 0,1 MJ/kg.

5.3 Propensity to undergo continues smouldering

5.3.1 Variants

Thermal insulation material:

a) MW, ICB or WF

b) EPS, XPS, CG, PU or PF

5.3.2 Assessment and testing

Only for a thermal insulation of the material MW, ICB or WF, the propensity to undergo continues smouldering shall be tested and assessed on the thermal insulation only according to EN 16733:2016.

5.3.3 Sampling, test specimen and conditioning

The sampling, the preparation of the test specimen and conditioning shall be done according to EN 13162:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.3.4 Direct field of application rules for thermal insulation

The direct field of application rules given in EN 13162:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material, shall be considered.

5.3.5 Expression of results

The result shall be expressed according to EN 16733:2016 by one of the codes “NoS”, “S” or “ANP”.

5.4 ETIC_kit water absorption

5.4.1 Variants

5.4.1.1 Thermal insulation

a) material

   1) MW board, MW lamella, PU, PF, CG, ICB and WF;

   2) EPS and XPS;

5.4.1.2 Base coat

a) organic content;

   1) ≤ 5%;

   2) > 5%.

b) thickness;

   1) > 7 mm;

   2) ≤ 7 mm.

5.4.1.3 Reinforcement

a) material

   1) glass fibre mesh;

   2) metal mesh.

5.4.1.4 Key coat

a) present;

b) absent.

5.4.1.5 Finishing coat

a) material;

   1) according to EN 15824:2017;

   2) felt/modelling coat according to EN 15824:2017;

   3) aggregate sized coat according to EN 998-1:2016;

   4) felt/modelling coat according to EN 998-1:2016;

5) scraped coat according to EN 998-1:2016;

6) other finishing coat;

a) component water absorption;

1) tested according to EN 1062-3:2008;

2) tested according to EN 1015-18:1998+A1:2006.

5.4.1.6 Decorative coat

a) present;

b) absent.

5.4.2 Test specimen

Two kinds of test specimen are used.

One kind of test specimen consists of the thermal insulation material and the reinforced base coat. The other kind consists of the thermal insulation material and the finishing layer, i.e. the reinforced base coat and the finishing coat. The finishing layer can also show a key coat and/or a decorative coat.

If a two test specimen design is desired, the test specimens differ in the thickness of the base coat. See 5.4.6.

The test specimens shall be prepared according to manufacturers instructions for end use application.

Preparation, sealing, storing, conditioning and measurement of the wiped test specimens shall be carried out according to EN 1062-3:2008:2013. The reverse side of the test specimen shall not be sealed

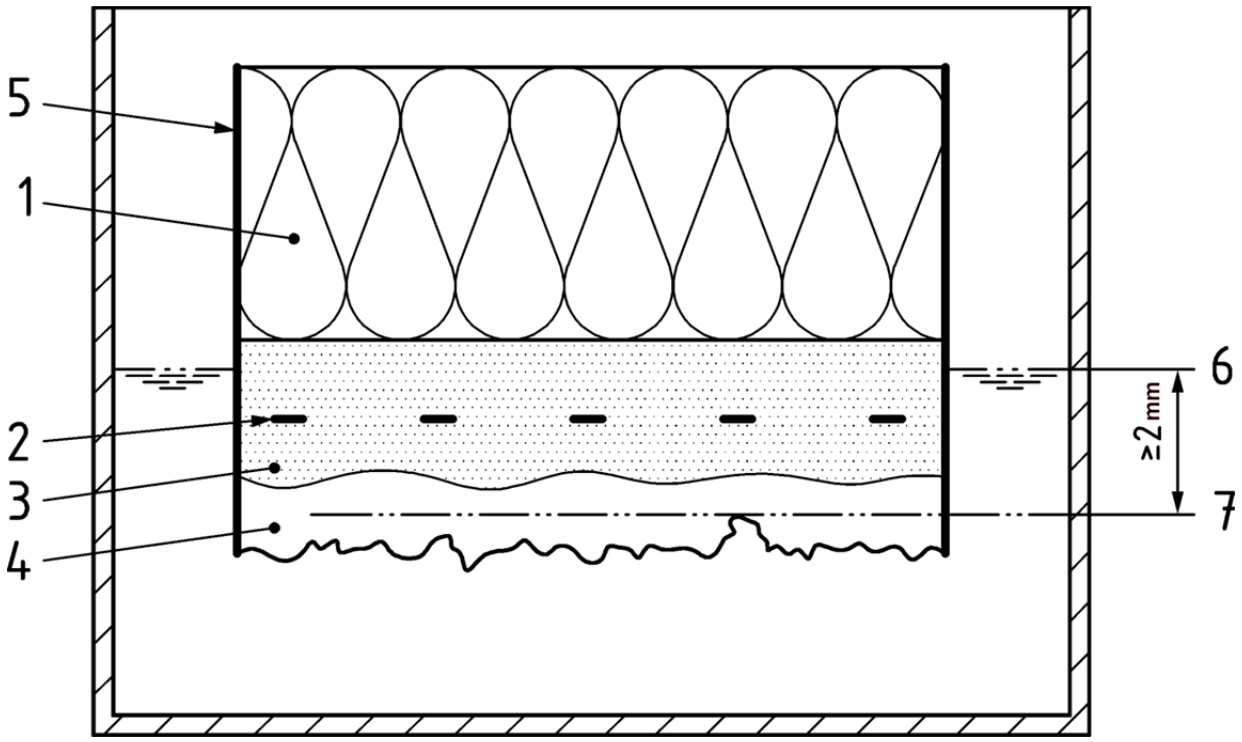
5.4.3 Testing

The ETIC_kit water absorption shall be tested and assessed according to EN 1609:2013 procedure B. Deviating from EN 1609:2013, the following procedure shall be carried out:

— the test specimen shall be dried to constant mass at (23 ± 2)°C and (50 ± 5) % r. H. (less than 0,3 *M* % difference within 24 h);

— both the dry mass of a test specimen and the mass after 3 min partial immersion $m_{3\,\mathrm{min}}$ shall be measured;

— the depth of submersion over the entire external surface shall be at least 2 mm that is, the distance between levels 6 and 7 in Figure 17.



Key

1 insulation component
2 reinforcement
3 base coat
4 finishing coat
5 sealing of the test specimen
6 surface of the water
7 level at which the minimum point of external surface of the finishing coat occurs

Figure 17 — Minimum depth of submersion of the test specimen for water absorption test

5.4.4 Calculation

A test result is calculated as follows:

$$W_p = \frac{m_{24\,\mathrm{h}} - m_{3\,\mathrm{min}}}{A_p}$$

where

W_p is short term water absorption in kg/m²;

$m_{24\,\mathrm{h}}$ is mass of the test specimen after 24 h of partial immersion in kg;

$m_{3\,\mathrm{min}}$ is mass of the test specimen after 3 min of partial immersion in kg;

A_p is bottom boundary area of the test specimen, amended according to EN 1609:2013, in m².

5.4.5 Direct field of application rules for thermal insulation

For a thermal insulation of the material MW board, MW lamella, PU, PF, CG, ICB and WF, a test result is valid for a thermal insulation of the same material with a component water absorption according to EN 1609:2013, method A, ≤ than tested.

For a thermal insulation or the material EPS and XPS, a test result is valid for a thermal insulation of the same material with a component water absorption according to EN 12087:2013, method 1A, ≤ than tested.

5.4.6 Direct field of application rules for base coat

For a two specimen design, differing in the thickness of the base coat, a test result is valid for the tested base coat with a thickness ≥ than the thinner and ≤ than the thicker one tested.

For a one specimen design with a base coat with an organic content ≤ 5%, a test result is valid for the tested base coat with a thickness ± 1,5 mm than tested, if the tested thickness is ≤ 7 mm, and with a thickness between 7,5 mm and the tested thickness, if the tested thickness is > 7 mm.

For a one specimen design with a base coat with an organic content > 5%, a test result is valid for the tested base coat with a thickness ± 1 mm than tested.

5.4.7 Direct field of application rules for reinforcement

A test result is valid for a reinforcement of the same material with a mass per unit area ≥ than tested.

5.4.8 Direct field of application rules for key coat

If a key coat is present in the test specimen, a test result is valid for any key coat with an organic content ≥ than tested and a thickness ≥ than tested.

Note to entry 1 The layer thickness of a key coat can be assessed according to EN 1062-1:2004:2004-08.

If a key coat is absent in the test specimen, a test result is valid for both, the use of any key coat and no use of a key coat.

5.4.9 Direct field of application rules for finishing coat

For aggregate sized coats according to EN 15824:2017, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption according to EN 1062-3:2008 ≤ than tested.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a component water absorption according EN 1062-3:2008 ≤ than tested and a thickness ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with the

same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.4.10 Direct field of application rules for decorative coat

If a decorative coat is present in the test specimen, a test result is valid for any decorative coat with a water permeation according to EN 1062-1:2004 ≤ than tested and a thickness ≥ than tested.

If a decorative coat is absent in the test specimen, a test result is valid for both, the use of any decorative coat and no use of a decorative coat.

5.4.11 Expression of results

A test result shall be expressed as the water absorption level of an ETIC_kit with rendering system in kg/m^2 rounded to 0,1.

5.5 Water tightness

5.5.1 Variants

5.5.1.1 Adhesive, base coat and finishing coat

a) binder type

   1) inorganic (cement-calcium hydroxide, alkali silicate, etc.)

   2) organic (silicon resin, synthetic resin, etc.)

   3) PU/PIR (adhesive_foam)

5.5.1.2 Thermal insulation

a) material

   1) MW board

   2) MW lamella

   3) EPS

   4) XPS

   5) PU

6) PF

7) CG

8) ICB

9) WF

5.5.1.3 Mechanical fixing device

a) kind

1) plate anchors

2) profiles and rails

3) anchored metal mesh

b) material

1) plastic

2) metal

5.5.1.4 Fixing method

a) adhesive

1) present

2) absent

5.5.1.5 Base coat

a) organic content

1) ≤ 5%

2) > 5%

b) thickness

1) > 7 mm

2) ≤ 7 mm

5.5.1.6 Reinforced base coat

Water absorption according to 5.4.

a) ≤ 0,5 kg/m^2

b) > 0,5 kg/m^2

5.5.1.7 Reinforcement material

a) glass fibre mesh

b) metal mesh

5.5.1.8 Key coat

a) present

b) absent

5.5.1.9 Finishing coat

a) material

1) aggregate sized coat according to EN 15824:2017

2) felt/modelling coat according to EN 15824:2017

3) aggregate sized coat according to EN 998-1:2016

4) felt/modelling coat according to EN 998-1:2016

5) scraped coat according to EN 998-1:2016

6) other finishing coat

5.5.1.10 Rendering system

a) water absorption according to 5.4.

1) ≤ 0,5 kg/m^2

2) > 0,5 kg/m^2

5.5.1.11 Decorative coat

a) present

b) absent

5.5.2 Testing

Water tightness shall be tested and assessed according to EN 16383:2016.

5.5.3 Assessment of water tightness

The assessment of water tightness is based on evaluation of different defects after hygrothermal conditioning according to EN 16383:2016. The following defects are considered:

— delamination, blistering or peeling of reinforced base coat or rendering system;

— failure or cracks associated with joints between insulation component;

— cracks with a width of more than 0,2 mm.

5.5.4 Test specimen

For thermal insulation of the material MW, EPS and CG, the thickness of the thermal insulation shall be ≥ 80 mm.

For purely mechanical fixing methods a two test specimen design, differing in the number of mechanical fixing devices per unit area, shall be used.

5.5.5 Direct field of application rules for adhesive

For a fixing method using an adhesive only, and an adhesive of the binder type organic or inorganic, and a thermal insulation of the material MW, EPS, PU, ICB and WF, a test result is valid for any adhesive of the binder type organic or inorganic.

For a fixing method using an adhesive only, a thermal insulation of the material XPS, and an adhesive of the binder type organic or polyurethane, a test result is valid for any adhesive of binder type organic or polyurethane.

For a fixing method using an adhesive only, a thermal insulation of the material XPS, PF and CG, and an adhesive of the binder type inorganic, a test result is valid for any adhesive of the same binder type, a shrinkage according to EN 2617-4:2002, procedure 6, annex 1.3 ≤ than tested and a thickness ≤ than tested.

For a fixing method using an adhesive and additional mechanical fixing devices, a test result is valid for any adhesive.

In general, a test result is valid for a bonded area ≥ than tested.

5.5.6 Direct field of application rules for thermal insulation

For a thermal insulation of the material MW board mono-density, MW board dual-density, MW lamella, EPS and CG, a test result is valid for any thermal insulation of the same material than tested, a tensile strength perpendicular to the surface ≥ than tested and any thermal insulation thickness.

In addition, for a thermal insulation of the material MW board mono-density, a test result is valid also for any thermal insulation of the material MW board mono-density and MW board dual-density with a tensile strength perpendicular to the surface ≥ than tested and any thickness of thermal insulation.

NOTE A MW board dual-density shows layers with different apparent densities.

For a thermal insulation of the material XPS, ICB and WF, a test result is valid for any thermal insulation of the same material than tested, a tensile strength perpendicular to the surface ≥ than tested and a thickness ≤ than tested.

For a thermal insulation of the material PU and PF, a test result is valid for the tested thermal insulation only with a thickness ≤ than tested.

5.5.7 Direct field of application rules for base coat

For a two specimen design, differing in the thickness of the base coat, a test result is valid for the tested base coat with a thickness ≥ than the thinner and ≤ than the thicker one tested.

For a one specimen design with a base coat of an organic content ≤ 5% and a thickness ≤ 7 mm, a test result is valid for the tested base coat with a thickness ± 1,5 mm than tested

For a one specimen design with a base coat of an organic content ≤ 5% and a thickness > 7 mm, a test result is valid for the tested base coat with a thickness between 7,5 mm and the tested thickness.

For a one specimen design with a base coat of an organic content > 5%, a test result is valid for the tested base coat with a thickness ± 1 mm than tested.

5.5.8 Direct field of application rules for reinforcement

For a reinforcement of the material glass fibre mesh, a test result is valid for any glass fibre mesh with a tensile strength after conditioning in aggressive medium according to EN 13496:2013 ≥ than tested, a mesh size ≤ than tested and the optional use of additional reinforcement layer(s) of the same material.

For a reinforcement of the material metal mesh, a test result is valid for the tested reinforcement only.

A test result is valid for a reinforcement with an overlap ≥ than tested.

5.5.9 Direct field of application rules for key coat

If a key coat is present in the test specimen, a test result is valid for any key coat with an organic content ≥ than tested and a thickness ≥ than tested.

Note to entry 1 The layer thickness of a key coat can be assessed according to EN 1062-1:2004:2004-08.

If a key coat is absent in the test specimen, a test result is valid for both, the use of any key coat and no use of a key coat.

5.5.10 Direct field of application rules for finishing coat

5.5.10.1 Reinforced base coats on a thermal insulation with a water absorption > 0,5 kg/m² according to 5.4

For reinforced base coats on a thermal insulation with a water absorption > 0,5 kg/m², the following rules apply:

For aggregate sized coats according to EN 15824:2017, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption according to EN 1062-3:2008 ≤ than tested.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a component water absorption according EN 1062-3:2008 ≤ than tested and a thickness ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.5.10.2 Finishing coats on a thermal insulation according to 5.4 with a water absorption > 0,5 kg/m²

For finishing coats on a thermal insulation according to 5.4 with a water absorption > 0,5 kg/m² the following rules apply:

For aggregate sized coats according to EN 15824:2017, a test result is valid for any coat of the same material with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a water absorption according to 5.4 ≤ than assessed and a thickness ≤ than tested.

For aggregate sized coats according to EN 998-1:2016, a test result is valid for any coat of the same material with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For felt/modelling coats and scraped coats according to EN 998-1:2016, a test result is valid for any coat of the same material with a water absorption according to 5.4 ≤ than assessed and a thickness ≤ than tested.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.5.10.3 Finishing coats on a thermal insulation according to 5.4 with a water absorption ≤ 0,5 kg/m²

For finishing coats on a thermal insulation according to 5.4 with a water absorption ≤ 0,5 kg/m², the following rules apply:

For aggregate sized and felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the material aggregate sized or felt/modelling coat, both according to EN 15824:2017, with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For aggregate sized and felt/modelling coats according to EN 998-1:2016, a test result is valid for any coat of the material aggregate sized or felt/modelling coat, both according to EN 998-1:2016, with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.5.11 Direct field of application rules for decorative coat

If a decorative coat is present in the test specimen, a test result is valid for any decorative coat with a water permeation according to EN 1062-1:2004 ≤ than tested and a thickness ≥ than tested.

Note to entry 1 The layer thickness of a decorative coat can be assessed according to EN 1062-1:2004:2004-08.

If a decorative coat is absent in the test specimen, a test result is valid for both, the use of any decorative coat and no use of a decorative coat.

5.5.12 Direct field of application rules for mechanical fixing device

When only adhesives are used for preparing the test specimen, a test result is valid for ETIC_kits bonded with adhesive and other fixing methods, using additional and/or supplementary mechanical fixing devices.

When adhesives and mechanical fixing devices are used for preparing the test specimen, a test result is valid for any mechanical fixing method with the same kind of mechanical fixing device.

For purely mechanical fixing methods a test result is valid for the tested mechanical fixing device and for mechanical fixing devices of the same kind and of the same material, with a number of mechanical fixing devices per unit area ≥ than the fewer and ≤ than the one more than tested.

In case a purely mechanical fixing of the kind plate anchor or profiles and rails, and of the material plastic is used, a test result is valid for any mechanical fixing device of the same kind, and of the material plastic and metal.

5.5.13 Direct field of application rules for test cycles according to EN 16383:2016

A test result according to EN 16383:2016 using the cycles hwcft is also valid for the cycles hwc and hw, a test result according to EN 16383:2016 using the cycles hwc is also valid for the cycles hw.

5.5.14 Expression of results

The test/assessment result shall be expressed by one of the codes “hw”, “hwc”, “hwcft” or "nhw".

— “hw” means, the heating and wetting cycles according to EN 16383:2016 did not lead to any defects according to 5.5.3.

— “hwc” means, the heating and wetting and the heating and cooling cycles according to EN 16383:2016 did not lead to any defects according to 5.5.3.

— “hwcft” means, the heating and wetting, the heating and cooling and the wetting, freezing and thawing cycles according to EN 16383:2016 did not lead to any defects according to 5.5.3.

— “nhw” means, that the assessment according to EN 16383:2016 lead to one or more defects according to 5.5.3.

5.6 Impact resistance

5.6.1 Variants

5.6.1.1 Base coat

a) binder type

1) inorganic (cement-calcium hydroxide, alkali silicate, etc.)

2) organic (silicon resin, synthetic resin, etc.)

5.6.1.2 Key coat

a) present

b) absent

5.6.1.3 Finishing coat

a) material

1) coat according to EN 15824:2017 or EN 998-1:2016

2) other finishing coat

5.6.1.4 Decorative coat

a) present

b) absent

5.6.2 Testing

The assessment of impact resistance is based on observation of the defects according to EN 13497:2018 at different levels of impact energy.

5.6.3 Test specimen

The test specimen shall be prepared according to EN 13497:2018 by using a thermal insulation and a rendering system. The use of a key and/or a decorative coat is optional.

5.6.4 Direct field of application rules for thermal insulation

A test result is valid for the tested thermal insulation with a thickness ≥ than tested.

5.6.5 Direct field of application rules for base coat

A test result is valid for the tested base coat with a thickness ≥ than tested.

5.6.6 Direct field of application rules for reinforcement

A test result is valid for the tested reinforcement only.

5.6.7 Direct field of application rules for key coat

If a key coat is present in the test specimen, a test result is valid for any key coat with a thickness ≥ than tested.

Note to entry 1 The layer thickness of a key coat can be assessed according to EN 1062-1:2004:2004-08.

If a key coat is absent in the test specimen, a test result is valid for both, the use of any key coat and no use of a key coat.

5.6.8 Direct field of application rules for finishing coat

For finishing coats according to EN 15824:2017 or EN 998-1:2016, a test result is valid for the tested finishing coat with a thickness ≥ than tested.

For other finishing coats, a test result is valid for the tested finishing coat with the tested thickness only.

5.6.9 Direct field of application rules for decorative coat

If a decorative coat is present in the test specimen, a test result is valid for any decorative coat with a thickness ≥ than tested.

If a decorative coat is absent in the test specimen, a test result is valid for both, the use of any decorative coat and no use of a decorative coat.

5.6.10 Expression of results

The impact resistance is the energy level which did not lead to any defects and no crack widths > 0,2 mm according to EN 13497:2018. The impact resistance shall be expressed by a code.

The first part of the code shows, if the evaluation considered only the surface or both, the surface and the backside of the rendering system of the test specimen. “S” means surface is considered only. “SB” means, surface and backside are considered.

The second part of the code shows the impact energy chosen according to EN 13497:2018

The third part shows the kind of conditioning according to EN 13497:2018, procedure 1, “hw” for heating and wetting, “hwc” for heating and wetting + heating and cooling and “hwcft” for heating and wetting + heating and cooling + wetting, freezing and thawing or procedure 2, “w” for wetting.

Note to entry 1: “S-10-w” and “SB-25-hwcft” are examples for sufficient codes.

5.7 Water vapour permeability

5.7.1 Variants

5.7.1.1 Base coat

a) material

   1) according to EN 15824:2017

   2) according to EN 998-1:2016

5.7.1.2 Finishing coat

a) Material

   1) according to EN 15824:2017

   2) according to EN 998-1:2016

   3) other finishing coat

5.7.2 Water vapour permeability of thermal insulation

5.7.2.1 Sampling, test specimen, conditioning and testing

The water vapour permeability of a thermal insulation shall be assessed according to EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.7.2.2 Direct field of application rules for thermal insulation

For a thermal insulation of the material MW, EPS, PU, PF, CG, ICB and WF, without surface facings, a result is valid for the tested thermal insulation in any thickness.

For a thermal insulation of the material XPS and of the material MW, EPS, PU, PF, CG, ICB and WF, with surface facings, a result is valid for the tested thermal insulation and thickness only.

5.7.2.3 Expression of results

Results shall be expressed as μ rounded to two significant digits.

5.7.3 Water vapour permeability of base coat

5.7.3.1 Sampling, test specimen, conditioning and testing

For base coats of a material according to EN 15824:2017, the water vapour permeability shall be assessed according to EN ISO 7783:2018.

For base coats of a material according to EN 998-1:2016, the water vapour permeability shall be assessed according to EN 1015-1:1998+A1:2006.

5.7.3.2 Direct field of application rules for base coat

For base coats according to EN 15824:2017, a test result is valid for the tested base coat and thickness only. If a two specimen design with two thicknesses is used, results shall be linear interpolated between the thicknesses.

For base coats according to EN 998-1:2016, a test result is valid for the tested base coat in any thickness.

5.7.3.3 Expression of results

For base coats of a material according to EN 15824:2017, the water vapour permeability shall be expressed as the diffusion-equivalent air layer thickness s_D in m rounded to 0,01.

For base coats of a material according to EN 998-1:2016, the water vapour permeability shall be expressed as μ rounded to two significant digits.

5.7.4 Water vapour permeability of finishing coat

5.7.4.1 Sampling, test specimen, conditioning and testing

For finishing coats according to EN 15824:2017, the water vapour permeability shall be assessed according to EN ISO 7783:2018.

For finishing coats according to EN 998-1:2016, the water vapour permeability shall be assessed according to EN 1015-1:1998+A1:2006.

For other finishing coats the water vapour permeability shall be assessed according to EN ISO 7783:2018.

5.7.4.2 Direct field of application rules for finishing coat

For finishing coats according to EN 15824:2017, a test result is valid for the tested finishing coat and thickness only. If a two specimen design with two thicknesses is used, results shall be linear interpolated between the thicknesses.

For finishing coats according to EN 998-1:2016, a test result is valid for the tested finishing coat in any thickness.

5.7.4.3 Expression of results

For finishing coats according to EN 15824:2017, the water vapour permeability shall be expressed as the diffusion-equivalent air layer thickness s_D in m rounded to 0,01.

For finishing coats according to EN 998-1:2016, the water vapour permeability shall be expressed as μ rounded to two significant digits.

For other finishing coats, the water vapour permeability shall be expressed as the diffusion-equivalent air layer thickness s_D in m rounded to 0,01.

5.7.5 Water vapour permeability of finishing coat with key and/or decorative coat

5.7.5.1 Sampling, test specimen, conditioning and testing

For finishing coats according to EN 15824:2017, the water vapour permeability shall be assessed according to EN ISO 7783:2018.

For finishing coats according to EN 998-1:2016, the water vapour permeability shall be assessed according to EN 1015-1:1998+A1:2006.

For other finishing coats the water vapour permeability shall be assessed according to EN ISO 7783:2018.

5.7.5.2 Direct field of application rules for key coat

A test result is valid for the tested key coat in any thickness.

Note to entry 1 The layer thickness of a key coat can be assessed according to EN 1062-1:2004:2004-08.

5.7.5.3 Direct field of application rules for finishing coat

For finishing coats according to EN 15824:2017, a test result is valid for the tested finishing coat and thickness only. If a two specimen design with two thicknesses is used, results shall be linear interpolated between the thicknesses.

5.7.5.4 Direct field of application rules for decorative coat

A test result is valid for the tested decorative coat in any thickness

5.7.5.5 Expression of results

For finishing coats according to EN 15824:2017, the water vapour permeability shall be expressed as the diffusion-equivalent air layer thickness s_D in m rounded to 0,01.

For finishing coats according to EN 998-1:2016, the water vapour permeability shall be expressed as μ rounded to two significant digits.

For other finishing coats, the water vapour permeability shall be expressed as the diffusion-equivalent air layer thickness s_D in m rounded to 0,01.

5.8 Bond strength / Fixing strength

5.8.1 General

The proxies of the characteristic bond strength/fixing strength depend on the variants regarding the

fixing methods

— ETIC_kit bonded with adhesive and supplementary plate anchors

— ETIC_kit bonded with adhesive

— ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive

— ETIC_kit mechanically fixed with helix_type anchors and additional supplementary adhesive

— ETIC_kit mechanically fixed with plate anchors

— ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive

— ETIC_kit mechanically fixed with profiles and rails

— ETIC_kit mechanically fixed by an anchored metal mesh

In table 2, the symbols X and A to F indicate the relevant proxies.

Table 2 — Relevant proxy characteristics of bond strength/fixing strength in relation to fixing methods

Fixing method / Proxy characteristic	ETIC_kit bonded with adhesive and additional supplementary plate anchors (I) see Figure 2	ETIC_kit bonded with adhesive (II) see Figure 3	ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive (III) see Figure 4	ETIC_kit mechanically fixed with helix_type anchors countersunk and additional supplementary adhesive (IV) see Figure 4	ETIC_kit mechanically fixed with plate anchors (V) see Figure 5	ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive (VI) see Figure 6	ETIC_kit mechanically fixed with profiles and rails (VII) see Figure 7	ETIC_kit mechanically fixed by an anchored metal mesh (VIII) see Figure 8
Proxy characteristics								
Bond strength of the adhesive to the thermal insulation, 5.8.2	X	X	X	X	—	X	—	—
Tensile strength of the thermal insulation, 5.8.3	X	X	X	X	X	X	X	X
Bond strength of the reinforced base coat to the thermal insulation, 5.8.4	X	X	X	X	X	X	X	X
Bond strength of the rendering system to the thermal insulation, 5.8.5	X	X	X	X	X	X	X	X
Pull through resistance of an anchor in the thermal insulation, 5.8.6.3	—	—	X*	X*	—	—	—	—
Characteristic plate stiffness and plate resistance of an anchor, 5.8.6.5	—	—	X	—	X	—	—	—
Detachment resistance (Load bearing capability) of profiles and rails fixed ETIC_kits, 5.8.6.4	—	—	—	—	—	X	X	—
Load bearing capability according to EN 13495:2019, method A, 5.8.6.4	—	—	X*	X*	—	—	—	—
Load bearing capability according to EN 13495:2019, method B, 5.8.6.4	X*	X*	X*	X*	X	X	X	X

X Relevant for all variants

X* Relevant for some variants, see 5.8.6.2

5.8.2 Bond strength of adhesive to the thermal insulation

5.8.2.1 Variants

Adhesive

a) binder type

   1) inorganic (cement-calcium hydroxide, alkali silicate, etc.)

   2) organic (silicon resin, synthetic resin, etc.)

   3) PU/PIR (adhesive_foam)

5.8.2.2 Adhesives of the binder type inorganic or organic

5.8.2.2.1 Assessment, test specimen, conditioning, testing, calculation

For adhesives of the binder type inorganic or organic, the bond strength to the insulation component shall be assessed in accordance with EN 13494:2019.

The test specimen shall be prepared according to EN 13494:2019.

The overall specimen shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The individual test specimens are cut from the overall specimen.

The test is performed according to EN 13494:2019 on the following samples (5 individual test specimens each):

— condition 1: without supplementary conditioning (dry condition);

— condition 2a: after preparation of the overall specimen, it shall be immersed in water for (48 ± 3) h. After taking the test specimen out of the water, it shall be conditioned at (23 ± 2) °C and (50 ± 5) % RH. 14 to 20 hours after taking the test specimen out of the water, the pull head plate shall be fixed and the test performed;

— condition 2b: after preparation of the overall specimen, it shall be immersed in water for (48 ± 3) h followed by (168 ± 5) h conditioning at (23 ± 2) °C and (50 ± 5) % RH before fixing the pull head plate.

5.8.2.2.2 Direct field of application rules for adhesives of the binder type inorganic or organic

5.8.2.2.2.1 Adhesives of the binder type inorganic or organic

For adhesives of the binder type inorganic or organic, a test result is valid for the tested adhesive in any thickness.

5.8.2.2.2.2 Thermal insulation

A test result is valid for any thermal insulation of the same material than tested, the same surface facing than tested, and a tensile strength ≥ than tested in any thickness.

5.8.2.2.3 Expression of results

The result of the assessment shall be expressed as the bond strength level of adhesive to thermal insulation in kPa rounded to three significant digits. All measurements and the mean value shall be given.

5.8.2.2.4 Reference to threshold levels

For ETIC_kits bonded with adhesive and additional supplementary plate anchors (I) and for ETIC_kits bonded with adhesive (II), a test result for bond strength of adhesive to thermal insulation after each conditioning shall be at least:

— condition 1:) 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than 60 kPa is admissible.

— condition 2a:) 30 kPa or cohesion fracture within the insulation material;

— condition 2b:) 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than 60 kPa is admissible.

5.8.2.3 Adhesives of the binder type polyurethane (adhesive_foam)

5.8.2.3.1 Assessment, test specimen, conditioning, testing, calculation

For adhesives of the binder type polyurethane, the bond strength to the insulation component shall be assessed in accordance to EN 17101:2018. The test specimen shall use the thermal insulation in question to perform the test, not EPS/XPS substrates as considered in EN 17101:2018 for testing adhesive_foam.

The overall specimen shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity.

The individual test specimens are cut from the overall specimen.

5.8.2.3.2 Direct field of application rules for adhesives of the binder type polyurethane (adhesive_foam)

5.8.2.3.2.1 Adhesives of the binder type polyurethane (adhesive_foam)

For adhesives of the binder type polyurethane (adhesive_foam), a test result is valid for the tested adhesive only, in any thickness.

5.8.2.3.2.2 Thermal insulation

A test result is valid for any thermal insulation of the same material than tested, the same surface facing than tested, and a tensile strength ≥ than tested in any thickness.

5.8.2.3.3 Expression of results

A test result shall be expressed as the bond strength level of adhesive to thermal insulation in kPa rounded to three significant digits. All measurements and the mean value shall be given.

5.8.2.3.4 Reference to threshold levels

For ETIC_kits bonded with adhesive and additional supplementary plate anchors (I) and for ETIC_kits bonded with adhesive (II), a test result for bond strength of adhesive to thermal insulation shall be ≥ 80 kPa; one measurement ≤ 80 kPa but ≥ 60 kPa is admissible.

5.8.3 Tensile strength perpendicular to the surface of the thermal insulation

5.8.3.1 Variants

Thermal insulation

a) material

1) MW board, EPS, XPS, PU, PF, CG, ICB and WF

2) MW lamella

5.8.3.2 Testing

The tensile strength perpendicular to the surface of the thermal insulation shall be tested according to EN 1607:2013.

5.8.3.3 Sampling

The sampling and the preparation of the test specimen shall be done according to the standards EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the thermal insulation material.

5.8.3.4 Conditioning

The test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity.

The test is performed after

- dry condition: without supplementary conditioning (dry condition);

For thermal insulation of the material MW, PF and WF, the test is performed additionally after

- wet condition: 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH in a climatic chamber followed by a drying period at (23 ± 2) °C and (50 ± 5) % RH until constant mass is achieved

5.8.3.5 Calculation

$\bar{F}_{\mathrm{dry}}$ is mean value in dry conditions

$\bar{F}_{\mathrm{wet}}$ is mean value in wet conditions

5.8.3.6 Direct field of application rules for thermal insulation

The result is valid for the tested thermal insulation in any thickness.

5.8.3.7 Expression of results

The result shall be expressed as the tensile strength level perpendicular to the surface of the thermal insulation for both conditions dry and wet in kPa rounded to 0,1.

5.8.4 Bond strength of the reinforced base coat to the thermal insulation

5.8.4.1 Variants

Reinforcement

a) material

    1) glass fibre mesh

    2) metal mesh

5.8.4.1.1 Assessment, test specimen, conditioning, testing, calculation

The bond strength of the reinforced base coat to the thermal insulation shall be determined in accordance with EN 13494:2019.

The test specimen shall be prepared according to EN 13494:2019.

The overall specimen shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The individual test specimens are cut from the overall specimen.

The test is performed according to EN 13494:2019 on the following samples (5 individual test specimens each) after conditioning of the overall test specimen:

— condition 1: without supplementary conditioning (dry condition);

— condition 2: with supplementary hygrothermal conditioning according to EN 16383:2016 followed by at least 7 days conditioning at (23 ± 2) °C and (50 ± 5) % RH.

NOTE The overall test specimen of the assessment of water tightness, 5.5, can be used.

5.8.4.2 Direct field of application rules for thermal insulation

The result is valid for any thermal insulation of the same material than tested, and the same surface facing than tested, and a tensile strength ≥ than tested in any thickness.

5.8.4.3 Direct field of application rules for base coat

The result is valid for the tested base coat only in any thickness.

5.8.4.4 Direct field of application rules for reinforcement

For a reinforcement of the material glass fibre mesh, a test result is valid a reinforcement of the same material with a tensile strength after conditioning in aggressive medium according to EN 13496:2013 ≥ than tested, a mesh size ≤ than tested and the optional use of additional reinforcement layer(s) of the same material.

For a reinforcement of the material metal mesh, a test result is valid for the tested reinforcement only.

5.8.4.5 Expression of results

The result shall be expressed as the bond strength level of base coat to thermal insulation in kPa rounded to 0,5. All measurements and the mean value shall be given.

5.8.4.6 Reference to thresholds

The bond strength of base coat to thermal insulation after each conditioning shall be at least 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than 60 kPa is admissible.

5.8.5 Bond strength of the rendering system to the thermal insulation

5.8.5.1 Variants

Reinforcement

a) material

    1) glass fibre mesh

    2) metal mesh

Reinforced base coat water absorption according to 5.4

a) ≤ 0,5 kg/m²

b) > 0,5 kg/m²

Finishing coat

a) material

    1) aggregate sized coat according to EN 15824:2017

    2) felt/modelling coat according to EN 15824:2017

    3) aggregate sized coat according to EN 998-1:2016

    4) felt/modelling coat according to EN 998-1:2016

    5) scraped coat according to EN 998-1:2016

    6) other finishing coat

Rendering system water absorption according to 5.4

a) ≤ 0,5 kg/m²

b) > 0,5 kg/m²

5.8.5.2 Assessment, test specimen, conditioning, testing, calculation

The bond strength of the rendering system to the thermal insulation shall be determined in accordance with EN 13494:2019.

The overall specimen shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The individual test specimens are cut from the overall specimen.

The test is performed according to EN 13494:2019 after supplementary hydrothermal conditioning according to EN 16383:2016 followed by at least 7 days conditioning at (23 ± 2) °C and (50 ± 5) % RH. The test is performed on 5 individual test specimens.

NOTE The overall test specimen of the assessment of water tightness, 5.5, can be used.

5.8.5.3 Direct field of application rules for thermal insulation

The result is valid for any thermal insulation of the same material than tested, the same surface facing than tested, and a tensile strength ≥ than tested in any thickness.

5.8.5.4 Direct field of application rules for base coat

The result is valid for the tested base coat only, in any thickness.

5.8.5.5 Direct field of application rules for reinforcement

For a reinforcement of the material glass fibre mesh, a test result is valid for any glass fibre mesh with a tensile strength after conditioning in aggressive medium according to EN 13496:2013 ≥ than tested, a mesh size ≤ than tested and the optional use of additional reinforcement layer(s) of the same material.

For a reinforcement of the material metal mesh, a test result is valid for the tested reinforcement only.

5.8.5.6 Direct field of application rules for key coat

If a key coat is present in the test specimen, a test result is valid for any key coat with an organic content ≥ than tested and a thickness ≥ than tested.

Note to entry 1 The layer thickness of a key coat can be assessed according to EN 1062-1:2004:2004-08.

If a key coat is absent in the test specimen, a test result is valid for both, the use of any key coat and no use of a key coat.

5.8.5.7 Direct field of application rules for finishing coat

5.8.5.7.1 Reinforced base coats on a thermal insulation according to 5.4 of a water absorption > 0,5 kg/m²

For reinforced base coats on a thermal insulation according to 5.4 of a water absorption > 0,5 kg/m² the following rules apply:

For aggregate sized coats according to EN 15824:2017, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption according to EN 1062-3:2008 ≤ than tested.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a component water absorption according EN 1062-3:2008 ≤ than tested and a thickness ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with the same

binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with the same binder (“same” to the effect of chemistry), an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a component water absorption ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1062-3:2008, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:1998+A1:2006, a test result is valid for any coat of the same material with a component water absorption ≤ than tested and a thickness ≤ than tested.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.8.5.7.2 Finishing coats on a thermal insulation according to 5.4 of a water absorption > 0,5 kg/m²

For finishing coats on a thermal insulation according to 5.4 of a water absorption > 0,5 kg/m² the following rules apply:

For aggregate sized coats according to EN 15824:2017, a test result is valid for any coat of the same material with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a water absorption according to 5.4 ≤ than assessed and a thickness ≤ than tested.

For aggregate sized coats according to EN 998-1:2016, a test result is valid for any coat of the same material with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For felt/modelling coats and scraped coats according to EN 998-1:2016, a test result is valid for any coat of the same material with a water absorption according to 5.4 ≤ than assessed and a thickness ≤ than tested.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.8.5.7.3 Finishing coats on a thermal insulation according to 5.4 of a water absorption ≤ 0,5 kg/m²

For finishing coats on a thermal insulation according to 5.4 of a water absorption ≤ 0,5 kg/m² the following rules apply:

For aggregate sized and felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the material aggregate sized or felt/modelling coat, both according to EN 15824:2017, with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For aggregate sized and felt/modelling coats according to EN 998-1:2016, a test result is valid for any coat of the material aggregate sized or felt/modelling coat, both according to EN 998-1:2016, with an aggregate size ≥ than 1 mm, ≥ (tested - 3 mm) and ≤ (tested + 2 mm) and a water absorption according to 5.4 ≤ than assessed.

For other finishing coats, a test result is valid for the tested finishing coat only with a thickness ≤ than tested.

5.8.5.8 Direct field of application rules for decorative coat

If a decorative coat is present in the test specimen, a test result is valid for any decorative coat with an organic content ≥ than tested and a thickness ≥ than tested.

Note to entry 1 The layer thickness of a decorative coat can be assessed according to EN 1062-1:2004:2004-08.

If a decorative coat is absent in the test specimen, a test result is valid for both, the use of any decorative coat and no use of a decorative coat.

5.8.5.9 Expression of results

The result shall be expressed as the bond strength level of base coat to thermal insulation in kPa rounded to 0,5.

The result shall also include the conditioning according to EN 16383:2016, expressed by one of the codes “hw”, “hwc”, “hwcft”.

— “hw” means, the heating and wetting cycles according to EN 16383:2016 are performed.

— “hwc” means, the heating and wetting and the heating and cooling cycles according to EN 16383:2016 are performed.

— “hwcft” means, the heating and wetting, the heating and cooling and the wetting, freezing and thawing cycles according to EN 16383:2016 are performed.

5.8.5.10 Reference to threshold levels

For ETIC_kits bonded with adhesive and additional supplementary plate anchors (I) and for ETIC_kits bonded with adhesive (II), a test result for rendering system to thermal insulation after each conditioning shall be at least 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than 60 kPa is admissible.

5.8.6 Fixing strength of mechanical fixing devices

5.8.6.1 Variants

5.8.6.1.1 Fixing method

a) ETIC_kit bonded with adhesive and supplementary plate anchors (I)

b) ETIC_kit bonded with adhesive (II)

c) ETIC_kit mechanically fixed with plate anchors and additional supplementary adhesive (III)

d) ETIC_kit mechanically fixed with helix_type anchors countersunk and additional supplementary adhesive (IV)

e) ETIC_kit mechanically fixed with plate anchors (V)

f) ETIC_kit mechanically fixed with profiles and rails and additional supplementary adhesive (VI)

g) ETIC_kit mechanically fixed with profiles and rails (VII)

h) ETIC_kit mechanically fixed by an anchored metal mesh (VIII)

5.8.6.1.2 Plate anchor

a) Plate diameter

   1) < 60 mm

   2) ≥ 60 mm

b) Plate stiffness

   1) < 0,6 kN/mm

   2) ≥ 0,6 kN/mm

c) Distance of plate anchor sleeve

   1) minimum distance of anchor sleeves undershot (superposition)

   2) minimum distance of anchor sleeves not undershot (no superposition)

d) Position of plate anchor perpendicular to substrate

   1) countersunk

   2) flush

   3) above reinforcement

5.8.6.1.3 Thermal insulation

a) material

   1) MW, ICB, WF

   2) EPS

   3) XPS, PU, PF, CG

b) Thickness

   1) ≤ 200 mm

   2) > 200 mm

3) ≤ 300 mm

4) > 300 mm

5.8.6.2 Relevant test and assessment methods for different fixing methods.

For fixing method I, II and III with thermal insulation of the material MW, ICB or WF with a thickness > 200 mm, or with a thermal insulation of the material EPS, XPS, PU, PF or CG with a thickness > 300 mm, EN 13495:2019, method B, is relevant.

For fixing method IV with thermal insulation of the material MW in any thickness, or with thermal insulation of the material EPS with a thickness > 300 mm, and no undershot of the minimum distance between anchor sleeves (no superposition), EN 16382:2016 and EN 13495:2019, method B, are relevant. Both tests shall be conducted.

For fixing method IV with thermal insulation of the material MW in any thickness, or with thermal insulation of the material EPS with a thickness > 300 mm, and an undershot of the minimum distance between anchor sleeves (superposition), EN 16382:2016 and EN 13495:2019, method A and B, are relevant. All three tests shall be conducted.

For fixing method IV with thermal insulation of the material EPS with a thickness ≤ 300 mm, EN 13495:2019, method A, is relevant.

For fixing method V, VI, VII and VIII, EN 13495:2019, method B, is relevant.

For fixing method III with thermal insulation of the material MW, ICB or WF with a thickness ≤ 200 mm, or with thermal insulation of the material EPS, XPS, PU, PF or CG with a thickness ≤ 300 mm, the following apply:

- For plate anchors above reinforcement, EN 13495:2019, method A, is relevant. This is also valid, if additional plate anchors are used flush and/or countersunk.
- For plate anchors countersunk, a thermal insulation of the material EPS and no undershot of the minimum distance between anchor sleeves (no superposition), EN 16382:2016 is relevant. This is also valid, if additional plate anchors are used flush.
- For plate anchors countersunk, a thermal insulation of the material EPS, and an undershot of the minimum distance between anchor sleeves (superposition), EN 13495:2019, method A, is relevant. This is also valid, if additional plate anchors are used flush.
- For plate anchors countersunk and a thermal insulation of the material MW, XPS, PU, PF, CG, ICB or WF, EN 16382:2016 and EN 13495:2019, method B, are relevant. This is also valid, if additional plate anchors are used flush.
- For plate anchors flush and no undershot of the minimum distance between anchor sleeves (no superposition), EN 16382:2016 is relevant.
- For plate anchors flush and an undershot of the minimum distance between anchor sleeves (superposition), EN 13495:2019, method A, is relevant.

For fixing methods III and V 5.8.6.5 is relevant.

5.8.6.3 Fixing strength of plate anchors according to EN 16382:2016

The fixing strength of a single plate anchor in a thermal insulation shall be assessed as the pull-through resistance according to EN 16382:2016

5.8.6.3.1 Test specimen, conditioning, testing, direct field of application rules and calculation

The fixing strength of a single plate anchor in a thermal insulation shall be assessed as the pull-through resistance according to EN 16382:2016

5.8.6.3.2 Direct field of application rules for thermal insulation

For plate anchors flush, a test result is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested and a thickness ≥ than tested.

For plate anchors countersunk in mono-density thermal insulation, a test result evaluated with plate anchors flush is valid when

- the resulting thickness of the thermal insulation below the anchor plate ≥ than the tested thermal insulation thickness, and
- the depth of a cut made by a setting tool leading to a resulting thickness of the thermal insulation below the cut ≥ than the tested thermal insulation thickness.

For plate anchors countersunk in dual-density thermal insulation, a test result evaluated with plate anchors flush is valid when

- the resulting thickness of the thermal insulation below the anchor plate ≥ than the tested thermal insulation thickness, and
- a depth of a cut made by a setting tool leading to a resulting thickness of the thermal insulation below the cut ≥ than the tested thermal insulation thickness, and
- a remaining undisturbed outer layer thickness ≥ than the tested thermal insulation thickness.

NOTE The outer layer of a dual-density thermal insulation, intended as the application service for the rendering system, provides commonly a higher density than the layer beneath.

5.8.6.3.3 Direct field of application rules for plate anchors

For plate anchors having a plate diameter $d_P \leq 60$ mm, a test result is valid for plate anchors in any length with a characteristic plate stiffness $k_P \geq$ than tested, a plate diameter $d_P \geq$ than tested and a characteristic load resistance $F_k \geq$ than tested.

For plate anchors having a plate diameter $d_P > 60$ mm, a test result is valid for the tested plate anchor only, in any length.

For plate anchors having the characteristics given in Table 3, a test result evaluated with a reference anchor is valid or not valid for the characteristic pull through resistance ranges given in Table 5.

Table 3 — Direct field of application rules for the application of pull-through test results gained with the reference anchor to plastic anchors

Test result is valid for plate anchors	Test result test with the reference anchor led to the following characteristic pull through resistance F_k		
	$F_k \leq 0{,}5$ kN	0,5 kN < $F_k \leq 0{,}75$ kN	$F_k > 0{,}75$ kN
flush or countersunk[a] with $d_P < 60$ mm	—	—	—
flush or countersunk[a] with $k_P < 0{,}6$ kN/mm $d_P \geq 60$ mm	X	—	—
flush or countersunk[a] with $k_P \geq 0{,}6$ kN/mm and $d_P \geq 60$ mm	X	X	—

[a] only valid for homogenous thermal insulation; only valid for a nominal thickness of the thermal insulation higher or equal the nominal thickness of the tested thermal insulation + the countersunk depth or the depth a setting tool cuts into a thermal insulation board, whichever is the greatest.

A test result is valid for any setting position ≥ than tested. The range for a setting position to consider is middle area position > edge/corner position > joint position.

5.8.6.3.4 Calculation of the characteristic pull-through resistance of a single plate anchor F_k:

The characteristic pull-through resistance F_k of a single plate anchor shall be calculated with a test results according to EN 16382:2016.

$$F_k = F_{5\,\%}$$

where

F_k is characteristic pull-through resistance of a single plate anchor in kN;

$F_{5\%}$ is 5 %-quantile of the pull-through resistance according to EN 16382:2016 in kN;

Related to the anchor setting positions:

$F_{k,a}$ is characteristic pull-through resistance of a single plate anchor in a middle area position of a thermal insulation board, in kN;

$F_{k,ec}$ is characteristic pull-through resistance of a single plate anchor at an edge/corner position of a thermal insulation board, in kN;

$F_{k,j}$ is characteristic pull-through resistance of a single plate anchor at a joint position (T-Joint or I-Joint) of a thermal insulation board, in kN.

5.8.6.3.5 Calculation of the minimum distance between anchor sleeves to avoid superposition

If no tensile mode of failure occurred during the test, the minimum distance d_S between anchor sleeves shall be calculated by using the breaking cone $2 \cdot r_{tl}$ according to EN 16382:2016 or the theoretical load cone $2 \cdot t_I + d_p$, whichever is the greatest:

$$d_S = \max\left(2 \times r_{tl} ; 2 \times t_I + d_p\right)$$

d_s is the minimum distance between anchor sleeves having no superposition;

r_{tl} is the mean breaking cone in mm according to EN 16382:2016;

t_I is the thickness of thermal insulation in mm;

d_p is the diameter of the anchor plate including additional plates, if used, in mm.

If tensile mode of failure occurred during the test, the minimum distance between anchor sleeves shall be at least the diameter of the tension plate used in the test according to EN 16382:2016.

5.8.6.3.6 Expression of results

The characteristic pull-through resistance F_k of a single plate anchor shall be expressed in kN rounded to 0,01 together with the anchor position concerned, e.g. “middle area countersunk 25 mm”, rounded to 1 mm. The minimum distance between anchor sleeves shall be expressed in mm rounded to 5 mm.

NOTE As the application of the direct field of application rules is conservative the actual pull through resistance might be higher than the characteristic pull through resistance indicated.

5.8.6.4 Fixing strength of helix_type anchors according to EN 16382:2016

The fixing strength of a single helix_type anchor in a thermal insulation shall be assessed as the pull-through resistance according to EN 16382:2016

5.8.6.4.1 Test specimen, conditioning, testing, direct field of application rules and calculation

The fixing strength of a single helix_type anchor in a thermal insulation shall be assessed as the pull-through resistance according to EN 16382:2016

5.8.6.4.2 Direct field of application rules for thermal insulation

For helix_type anchors, a test result evaluated is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested and a thickness ≥ than tested.

For helix_type anchors in multi-layer thermal insulation, a test result evaluated is valid for the tested type of insulation, a tensile strength of the layer the anchor is sitting in ≥ than tested.

5.8.6.4.3 Direct field of application rules for helix_type anchors

For helix_type anchors, a test result is valid for the tested anchor only, and for a distance between the substrate (wall) facing side of the thermal insulation and helix ≥ than tested.

A test result is valid for any setting position ≥ than tested. The range for a setting position to consider is middle area position > edge/corner position > joint position.

5.8.6.4.4 Calculation of the characteristic pull-through resistance of a single helix_type anchor F_k:

The characteristic pull-through resistance F_k of a single helix_type anchor shall be calculated with the test results according to EN 16382:2016.

$$F_k = F_{5\,\%}$$

where

F_k is characteristic pull-through resistance of a single helix_type anchor in kN;

$F_{5\%}$ is 5 %-quantile of the pull-through resistance according to EN 16382:2016 in kN;

Related to the anchor setting positions:

$F_{k,a}$ is characteristic pull-through resistance of a single helix_type anchor in a middle area position of a thermal insulation board, in kN;

$F_{k,ec}$ is characteristic pull-through resistance of a single helix_type anchor at an edge/corner position of a thermal insulation board, in kN;

$F_{k,j}$ is characteristic pull-through resistance of a single helix_type anchor at a joint position (T-Joint or I-Joint) of a thermal insulation board, in kN.

5.8.6.4.5 Calculation of the minimum distance between anchor sleeves to avoid superposition

If no tensile mode of failure occurred during the test, the minimum distance d_S between anchor sleeves shall be calculated by using the breaking cone $2 \cdot r_{tl}$ according to EN 16382:2016 or the theoretical load cone $2 \times t_{fix} + 2 \times r_{helix}$, whichever is the greatest:

$$d_S = \max(2 \times r_{tl}\,;\, 2 \times t_{fix} + 2 \times r_{helix})$$

d_s is the minimum distance between anchor sleeves having no superposition;

r_{tl} is the mean breaking cone in mm according to EN 16382:2016;

t_{fix} is the thickness of fixture, which is the distance of the upper part of the helix to the wall facing side of the thermal insulation;

r_{helix} is the maximum radius of the spiral of the helix_type anchor in mm.

If tensile mode of failure occurred during the test, the minimum distance between anchor sleeves shall be at least the diameter of the tension plate used in the test according to EN 16382:2016..

5.8.6.4.6 Expression of results

The characteristic pull-through resistance F_k of a single helix_type anchor shall be expressed in kN rounded to 0,01 together with the anchor position concerned, e.g. “middle area 80 mm from wall facing side of insulation”, rounded to 1 mm. The minimum distance between anchor sleeves shall be expressed in mm rounded to 5 mm.

NOTE As the application of the direct field of application rules is conservative, the actual pull through resistance might be higher than the characteristic pull through resistance indicated.

5.8.6.5 Load bearing capability according to EN 13495:2019, method A and B

5.8.6.5.1 Test specimen, conditioning, testing, direct field of application rules and calculation

The fixing strength shall be assessed as the load bearing capability according to EN 13495:2019, method A or B.

For ETIC_kits bonded with adhesive and supplementary plate anchors (I), a test specimen shows an adhesive, a thermal insulation and a reinforced base coat, but no anchor.

For ETIC_kits bonded with adhesive (II), a test specimen shows an adhesive, a thermal insulation and a reinforced base coat.

For ETIC_kits mechanically fixed with plate or helix_type anchors and additional supplementary adhesive (III and IV), a test specimen for method A shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. A test specimen for method B shows an adhesive, a thermal insulation, mechanical fixing devices and the reinforced base coat. A one or a two specimen design, differing in the number per unit area and/or setting positions of plate anchors, is possible for method A and B.

For ETIC_kits mechanically fixed with plate anchors (V), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A foil between substrate and thermal insulation is mandatory. A one or a two specimen design, differing in the number per unit area and/or setting positions of plate anchors.

For ETIC_kits mechanically fixed with profiles and rails and additional supplementary adhesive (VI), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. A foil between substrate and thermal insulation is mandatory. The test specimen shall have at least three parallel rails. A one or a two specimen design, differing in the distance between profiles and/or the distance between rails is possible. The outer rails shall be placed to the edge of the test specimen.

For ETIC_kits mechanically fixed with profiles and rails (VII), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A foil between substrate and thermal insulation is mandatory. The test specimen shall have at least three parallel rails. A one or a two specimen design, differing in the distance between profiles and/or the distance between rails is possible. The outer rails shall be placed to the edge of the test specimen.

For ETIC_kits mechanically fixed by an anchored metal mesh (VIII), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A foil between substrate and thermal insulation is mandatory. A one or a two specimen design, differing in the number per unit area of anchors, is possible.

5.8.6.5.2 Direct field of application rules for adhesive

A test result is valid for any adhesive with a bonded area ≥ than tested.

5.8.6.5.3 Direct field of application rules for thermal insulation

(I or II and method B) A test result is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested and a thickness ≤ than tested.

(IV and method A) A test result is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested and a thickness ≥ than tested.

(IV and method B) A test result is valid for any thermal insulation of the same material and type than tested, and a tensile strength ≥ than tested, and a shear strength ≥ than tested, and a thickness ≤ than tested.

(III or V and method A) For plate anchors flush, a test result is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested and a thickness ≥ than tested.

(III or V and method A) For plate anchors countersunk in mono-density thermal insulation, a test result evaluated with plate anchors flush is valid when

- the resulting thickness of the thermal insulation below the anchor plate ≥ than the tested thermal insulation thickness, and
- the depth of a cut made by a setting tool is leading to a resulting thickness of the thermal insulation below the cut ≥ than the tested thermal insulation thickness.

(III or V and method A) For plate anchors countersunk in dual-density insulation , a test result evaluated with plate anchors flush is valid when

- the resulting thickness of the thermal insulation below the anchor plate ≥ than the tested thermal insulation thickness, and
- a depth of a cut made by a setting tool is leading to a resulting thickness of the thermal insulation below the cut ≥ than tested,
- and a remaining undisturbed outer layer thickness ≥ than the tested thermal insulation thickness.

NOTE The outer layer of a dual-density thermal insulation , intended as the application service for the rendering system, provides commonly a higher density than the layer beneath

(IV) For helix_type anchors, a test result is valid for any mono-density thermal insulation of the same material and type as tested, a tensile strength ≥ than tested and a thickness ≤ than tested.

(IV) For helix_type anchors in dual-density insulation, a test result is valid for any thermal insulation of the same material and type as tested, and a tensile strength ≥ than tested, and a thickness ≤ than tested, if the helix is located in a thermal insulation layer with an apparent density ≥ than tested.

(III, IV, V, VI, VII or VIII and method B) A test result is valid for any thermal insulation of the same material and type than tested, a tensile strength ≥ than tested, and a shear strength ≥ than tested, and a thickness ≤ than tested.

5.8.6.5.4 Direct field of application rules for base coat

A test result is valid for the tested base coat in any thickness.

5.8.6.5.5 Direct field of application rules for reinforcement

For a reinforcement of the material glass fibre mesh, a test result is valid for any glass fibre mesh with a tensile strength after conditioning in aggressive medium according to EN 13496:2013 ≥ than tested, a mesh size ≤ than tested and the optional use of additional reinforcement layer(s) of the same material.

For a reinforcement of the material metal mesh, a test result is valid for the tested reinforcement only.

5.8.6.5.6 Direct field of application rules for plate anchors

For plate anchors having a plate diameter dP ≤ 60 mm, a test result is valid for plate anchors in any length with a characteristic plate stiffness kP ≥ than tested, a plate diameter dP ≥ than tested and a characteristic load resistance FP ≥ than tested.

For plate anchors having a plate diameter dP > 60 mm, a test result is valid for the tested plate anchor only, in any length.

For plate anchors having the characteristics given in Table 3, a test result evaluated with a reference anchor is valid or not valid for the characteristic pull through resistance ranges given in Table 5.

A test result is valid for any setting position ≥ than tested. The range for a setting position to consider is middle area position > edge/corner position > joint position.

A test result is valid for any plate position perpendicular to substrate ≥ than tested. The range for a plate position perpendicular to substrate to consider is above reinforcement > flush > countersunk.

For plate anchors countersunk, a test result is valid for a distance of plate to substrate faced side of thermal insulation ≥ than tested.

For plate anchors countersunk, a test result is valid for a distance of the setting tool cuts to substrate faced side of thermal insulation ≥ than tested.

5.8.6.5.7 Direct field of application rules for helix_type anchors

A test result is valid for the tested helix_type anchor only.

A test result is valid for a distance of the helix of the helix_type anchor to substrate faced side of thermal insulation ≥ than tested.

5.8.6.5.8 Direct field of application rules for profiles and rails

A test result is valid for the tested profile and rail only.

5.8.6.5.9 Direct field of application rules for collar anchors

A test result is valid for the tested collar anchor only.

5.8.6.5.10 Direct field of application rules for anchors of anchored metal meshes

A test result is valid for the tested anchor and metal mesh only.

5.8.6.5.11 Direct field of application rules for lateral load

For test results evaluated with EN 13495:2019, method B, a test result is valid for a lateral load per unit area ≤ than 0,5·tested.

NOTE The lateral load per unit area is calculated by the mass per unit area of the rendering system plus thermal insulation.

5.8.6.5.12 Calculation

The load bearing capacity $F_{k,block}$ shall be calculated with a test result reported in accordance with EN 13495:2019:

$$F_{\mathrm{k,block}} = F_{5\%}$$

where

$F_{\mathrm{k,block}}$ is load bearing capacity of an ETIC_kit tested according to EN 13495:2019 in kPa;

$F_{5\%}$ is the load bearing capacity of an ETIC_kit tested according to EN 13495:2019 in kPa

Calculation – Test specimen showing plate anchors in different setting positions.

For test specimens fixed with plate anchors without an adhesive, the load bearing capacity of ETIC_kits with another number of plate anchors per unit area than tested shall be calculated by the following algorithm.

The calculation is based on two test results 1 and 2 with different numbers of anchors per unit area. But the calculation is also possible, if only one test is performed. The result of the missing test is simply supposed to be $F_{k,block} = 0$ kPa with no anchors, $n_1 = 0$ and $n_{a,1} = 0$.

$F_{k,block,1}$ and $F_{k,block,2}$ are then graphed and linear interpolation used to determine the load bearing capacity for the desired number of anchors. The following rules apply:

The setting positions, e.g. middle area and joint, shall remain conservative in the calculation for every total number of anchors per unit area to ensure a safe outcome. If only middle area and joint positions are used in the test specimen(s), the minimum number of anchors in middle area position is calculated as follows:

$$n_{\mathrm{a}}(n) \geq \frac{(n_{\mathrm{a},2} - n_{\mathrm{a},1}) \times (n - n_1)}{(n_2 - n_1)} + n_{a,1}$$

where

n_{a} is the number of anchors in middle area position per unit area;

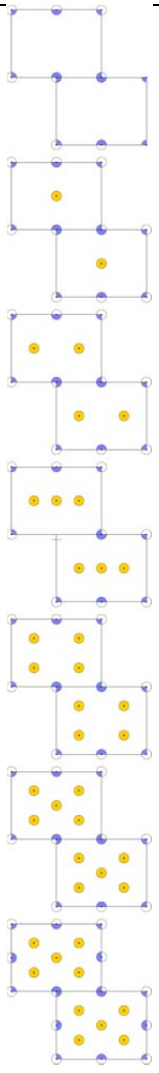
n is the total number of anchors per unit area;

1 Index 1: figures of the test with the lower total number of anchors per unit area;

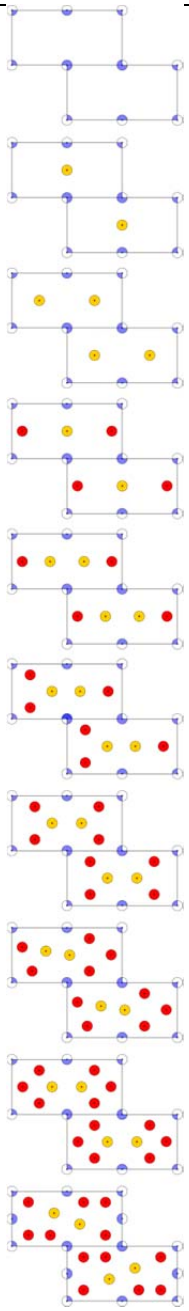
2 Index 2: figures of the test with the higher total number of anchors per unit area.

NOTE 1 The meaning of this formula is a linear interpolation of setting positions between the two test specimens.

EXAMPLE 1 Example for a conservative middle area to joint-position series with the test configuration 1 with 4 anchors in joint position per square meter and the test configuration 2 with 10 anchors in middle area and 6 anchors in joint position ($n_{a,1}$ = 0, $n_{j,1}$ = 4, $n_{a,2}$ = 10, $n_{j,2}$ = 6, n_1 = 4 and n_2 = 16). The real design example uses direct field of application rules, i.e. for some patterns anchors in middle area instead of edge/corner or joint position and edge/corner instead of joint position. $F_{k,block,1}$= 1,6 kN/m²and $F_{k,block,2}$ = 7,6 kN/m².

Number of anchors per square meter n	Calculation according the following equation $n_a(n) \geq \frac{(10-0)\times(n-4)}{(16-4)} + 0$	Minimum number of middle area to joint positions n_a:n_j	Chosen design	Chosen number of setting positions n_a:n_j	$F_{k,block,n_a:n_j} = \frac{F_{k,block,10:6} - F_{k,block,0:4}}{(16-4)} \times (n-4) + F_{k,block,0:4}$
4	$n_a \geq 0$	0:4		0:4	1,6 kN/m²
6	$n_a \geq 1{,}67$	2:4		2:4	2,6 kN/m²
8	$n_a \geq 3{,}33$	4:4		4:4	3,6 kN/m²
10	$n_a \geq 5$	5:5		6:4	4,6 kN/m²
12	$n_a \geq 6{,}67$	7:5		8:4	5,6 kN/m²
14	$n_a \geq 8{,}33$	9:5		10:4	6,6 kN/m²
16	$n_a \geq 10$	10:6		10:6	7,6 kN/m²

EXAMPLE 2 Example for a conservative middle area to joint-position and edge/corner to joint-position series with the test configuration 1 with 4 anchors in joint position per square meter and the test configuration 2 with 4 anchors in middle area, 12 anchors in edge/corner and 6 anchors in joint position per square meter ($n_{a,1}$ = 0, $n_{ec,1}$ = 0, $n_{j,1}$ = 6, $n_{a,2}$ = 4, $n_{ec,2}$ = 12, $n_{j,2}$ = 6, n_1 = 4 and n_2 = 22). The chosen design example uses direct field of application rules, i.e. for some patterns anchors in middle area instead of edge/corner or joint position and edge/corner instead of joint position. $F_{k,block,1}$= 1,6 kN/m²and $F_{k,block,2}$ = 9,8 kN/m².

Number of anchors per square meter n	Calculation according the following equation $n_a(n) \geq \frac{(10-0)\times(n-4)}{(16-4)} + 0$ $n_{ec}(n) \geq \frac{(10-0)\times(n-4)}{(16-4)} + 0$		Minimum number of middle area and edge/ corner positions n_a:n_{ec}:n_j	Chosen design	Chosen number of setting positions n_a: n_{ec}:n_j	$F_{k,block,n_a:n_{ec}:n_j} = \frac{F_{k,block,4:12:6} - F_{k,block,0:0:4}}{(22-4)} \times (n-4) + F_{k,block,0:0:4}$
4	$n_a \geq 0$	$n_{ec} \geq 0$	0:0:4		0:0:4	1,6 kN/m²
6	$n_a \geq 0{,}44$	$n_{ec} \geq 1{,}33$	1:1:4		2:0:4	2,5 kN/m²
8	$n_a \geq 0{,}89$	$n_{ec} \geq 2{,}67$	1:3:4		4:0:4	3,4 kN/m²
10	$n_a \geq 1{,}33$	$n_{ec} \geq 4$	2:4:4		2:4:4	4,3 kN/m²
12	$n_a \geq 1{,}78$	$n_{ec} \geq 5{,}33$	2:6:4		4:4:4	5,2 kN/m²
14	$n_a \geq 2{,}22$	$n_{ec} \geq 6{,}67$	3:6:5		4:6:4	6,2 kN/m²
16	$n_a \geq 2{,}67$	$n_{ec} \geq 8$	3:8:5		4:8:4	7,1 kN/m²
18	$n_a \geq 3{,}11$	$n_{ec} \geq 9{,}33$	4:9:5		4:10:4	8,0 kN/m²
20	$n_a \geq 3{,}56$	$n_{ec} \geq 10{,}67$	4:11:5		4:12:4	8,9 kN/m²
22	$n_a \geq 4$	$n_{ec} \geq 12$	4:12:6		4:12:6	9,8 kN/m²

Calculation – Test specimen showing plate anchors in middle area position only.

For test specimens fixed with plate anchors without an adhesive, the load bearing capacity of ETIC_kits with another number of plate anchors per unit area than tested shall be calculated by the following algorithm.

The calculation is based on two test results 1 and 2 with different numbers of anchors per unit area and the characteristic pull-through-resistances of the anchors in joint and in middle area position, $F_{k,j}$ and $F_{k,a}$. But the calculation is also possible, if only one test specimen design exist.. The result of the missing test is simply supposed to be $F_{k,block}$ = 0 kPa with no anchors.

For the calculation of the load bearing capacity of other setting positions and numbers of anchors per unit area than tested, the position factor is used. In case of joint-positions, the position factor is $F_{k,j}/F_{k,a}$.

Example 1: Test specimen with minimum number of anchors: 8 anchors per square meter in middle area position. Test specimen with maximum number of anchors: 12 anchors per square meter in middle area position.

Test results:

$F_{k,j}/F_{k,a}$ = 0,8 (derived from pull-through test results)

$F_{k,block}$, 8:0 = 5,0 kPa

$F_{k,block}$, 12:0 = 7,0 kPa

Calculated foam block resistances:

a) Linear Interpolation of middle area positions between foam block test results:

$F_{k,block}$, 8:0 = 5,0 kPa

$F_{k,block}$, 10:0 = 6,0 kPa

$F_{k,block}$, 12:0 = 7,0 kPa

b) Calculation of mixed joint and middle area positions

$$F_{k,block,na:nj} = n_a \times (F_{k,block,n:0} / n) + n_j \times (F_{k,block,n:0} / n) \times (F_{k,j}/F_{k,a})$$

or

$$F_{k,block,na:nj} = (F_{k,block,n:0} / n) \times (n_a + n_j \times (F_{k,j}/F_{k,a}))$$

with:

n_a is the number of anchors in middle area position per square meter

n_j is the number of anchors in joint position per square meter

n is the total number of anchors per square meter

$F_{k,block}$, 4:4 = (5,0 kPa / 8) × (4 + 4 × 0,8) = 4,5 kPa

$F_{k,block}$, 6:4 = (6,0 kPa / 10) × (6 + 4 × 0,8) = 5,5 kPa

$F_{k,block}$, 8:4 = (7,0 kPa / 12) × (8 + 4 × 0,8) = 6,5 kPa

rounded to 0,1 kPa.

Calculation – Minimum distance between anchor sleeves

The minimum distance between anchor sleeves is the minimal distance used in the test specimen with the larger number of plate anchors per unit area.

Calculation – Test specimen showing profiles and rails.

For test specimens fixed with profiles and rails, the load bearing capacity of ETIC_kits with another distance between profiles and/or another distance between rails than tested shall be calculated by the following algorithm.

The calculation is based on two test results 1 and 2 with a different distance between profiles and/or a different distance between rails.

$F_{k,block,1}$ and $F_{k,block,2}$ are then graphed and linear interpolation used to determine the foam block resistance for the required distance between profiles and/or between rails.

Calculation – Test specimen showing anchored metal mesh.

For test specimens fixed with an anchored metal mesh, the load bearing capacity of ETIC_kits with another number of anchors per unit area than tested shall be calculated by the following algorithm.

The calculation is based on two test results 1 and 2 with different numbers of anchors per unit area. But the calculation is also possible, if only one test is performed. The result of the missing test is simply supposed to be $F_{k,block}$ = 0 kPa with no anchors.

$F_{k,block,1}$ and $F_{k,block,2}$ are then graphed and linear interpolation used to determine the foam block resistance for the required number of anchors.

5.8.6.5.13 Expression of results

The load bearing capacity level shall be expressed as $F_{k,block}$ in kPa rounded to 0,05 together with the relevant information of the mechanical fixing, e. g. number of plate anchors per unit area of every specific setting position and every anchor plate position perpendicular to the substrate.

5.8.6.6 Characteristic load resistance and characteristic load stiffness of a plate anchor

The characteristic load resistance and characteristic load stiffness of a plate anchor shall be assessed according Annex C.

5.8.6.6.1 Expression of results

The characteristic load resistance of a plate anchor shall be expressed as F_p in kN rounded to 0,1. The characteristic plate stiffness of a plate anchor shall be expressed as k_p in kN/mm rounded to 0,1.

5.9 Airborne sound insulation

5.9.1 Dynamic stiffness

5.9.1.1 Testing, assessment

Dynamic stiffness shall be tested and assessed on the thermal insulation only according to EN 29052-1:1991.

5.9.2 Airflow resistance

5.9.2.1 Testing, assessment

Airflow resistance shall be tested and assessed on the thermal insulation only according to EN ISO 9053:2018

5.9.3 Weight of rendering system

5.9.3.1 Testing, assessment

Weight of the rendering system shall be tested and assessed according to EN 1015-1:1998+A1:2006

5.10 Thermal resistance

5.10.1 Thermal resistance of ETIC_kits without the influence of mechanical fixing devices

5.10.1.1 Testing

The thermal resistance of an ETIC_kit without the influence of mechanical fixing devices shall be assessed on the thermal insulation only according to the standards EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.10.1.2 Sampling

The sampling, the preparation of the test specimen and conditioning shall be done according to the standards EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material.

5.10.1.3 Calculation

The thermal resistance of an ETIC_kit shall be calculated considering the thickness of the thermal insulation by the following equation

$$R_{D,ETIC\ kit} = \frac{d_N}{\lambda_D}$$

with

R_D thermal resistance in $m^2 \cdot K/W$

d_N nominal thickness of the thermal insulation in m

λ_D thermal conductivity of the thermal insulation in W/(mK)

or the equation

$R_{D,ETIC\ kit} = R_D$

5.10.1.4 Expression of results

The result shall be expressed as the thermal resistance level of an ETIC_kit without the influence of anchors R in $m^2 \cdot K/W$ rounded to 0,05.

5.10.2 Thermal transmittance of anchors

5.10.2.1 Testing, assessment

Thermal transmittance of an anchor χ shall be tested and assessed according to Annex D.

5.10.2.2 Direct field of application rules

A result is valid for the tested anchor and a specified range of nominal thickness of thermal insulation according Annex D.

5.10.2.3 Expression of results

The result shall be expressed as the level of point thermal transmittance χ of an anchor in W/K rounded to 0,001.

5.10.3 Correction factor for u-value of profiles and rails

5.10.3.1 Testing, assessment

The correction factor for u-values of profiles and rails shall be assessed according to EN ISO 10211:2017.

5.10.3.2 Direct field of application rules

A result is valid for the assessed profiles and rails

5.10.3.3 Expression of results

The result shall be expressed as the correction factor for u-value in W/(mK) rounded to 0,001.

5.10.4 Correction factor for u-value of collar anchors and anchors for anchored metal mesh

5.10.4.1 Testing, assessment

The correction factor for u-values of collar anchors and anchors for anchored metal mesh shall be assessed according to EN ISO 10211:2017.

5.10.4.2 Direct field of application rules

A result is valid for the assessed anchor only.

5.10.4.3 Expression of results

The result shall be expressed as the correction factor for u-value of an anchor in W/K rounded to 0,001.

6 Assessment and verification of constancy of performance

6.1 General

The assessment and verification of constancy of performance (AVCP) of ETIC_kits shall be carried out using System 1.

It shall be done by

— assessing ETIC_kits according to 5.

— factory production control (FPC) of ETIC_kit components according to 6.

6.2 Assessment of ETIC_kits

The assessment of an ETIC_kit is performed by using either test results, evaluated on test specimens which are ETIC_kits or part of ETIC_kits, or by using test results together with direct field of application rules. In any case, the ETIC_kit to be assessed shall be defined by the incorporated components and further specification according the following list:

- adhesive bonded area
- adhesive coverage
- thermal insulation thickness
- anchor setting position
- anchor plate position perpendicular to substrate
- anchor number per unit area
- profiles and rails distances
- base coat thickness
- reinforcement overlap
- key coat coverage
- finishing coat thickness
- decorative coat coverage

Note to entry 1: The layer thickness of a key or decorative coat can be assessed according to EN 1062-1:2004:2004-08.

Note to entry 2: Test results based on ETAG004, made until this standard is cited in the OJEC of the EC, are acceptable.

6.3 Factory production control of ETIC_kit components

Note to entry 1: The factory production control and the comparison of factory production control results (FPC_results) with test results out of attestation of conformance (reference_values) is based on the same principles given in ETAG004:2013, pages 84 to 89. A list of control tests according ETAG004:2013 on ETIC_kit components is presented on page 88 in ETAG004:2013.

A test result of attestation of performance is based on one or more test specimen(s). A test specimen is an ETIC_kit or part of an ETIC_kit. It can also be a single component. For factory production control issues component_properties, which are used to make the test specimen(s), shall be _tested and documented. Every batch of every component, used to make test specimens out of it, shall be _tested. The same component_properties, considered during attestation of performance, shall be _tested for the factory production control of components.

The test results of _testing component_properties during attestation of performance are termed as “reference_values”. The test results of factory production control of components are termed as “FPC_results”.

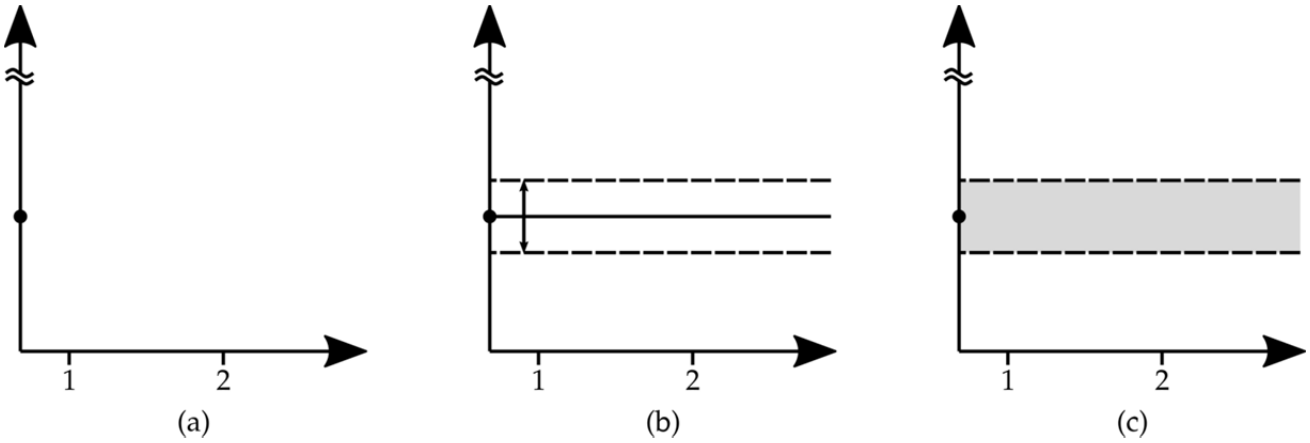
The FPC_results shall be compared with the reference_values. If the factory production control shows stable and comparable results regarding the desired characteristic, the conformity is stated. See 6.3.1 following.

An assessment of ETIC_kits with other components than tested is possible. In this case the assessment is based on direct field of application rules together with known test results. Hence no component_properties of other components are _tested and no reference_values of other components are available. Instead, the component_properties and reference_values of the component, which was part of the test specimen leading to the known test result, shall be used to be compared with FPC_results of the other components. The FPC_results shall be comparable to the reference_value.

In some cases comparability or stability of production is only used to approve conformity of a component, see Annex E.

Figure 18 to 29 show all steps and possibilities of the comparison of FPC_results with reference_values. Every graph shows the time in years at the x-axis and a property of a component at the y-axis.

6.3.1 Comparability with one reference_value



Key

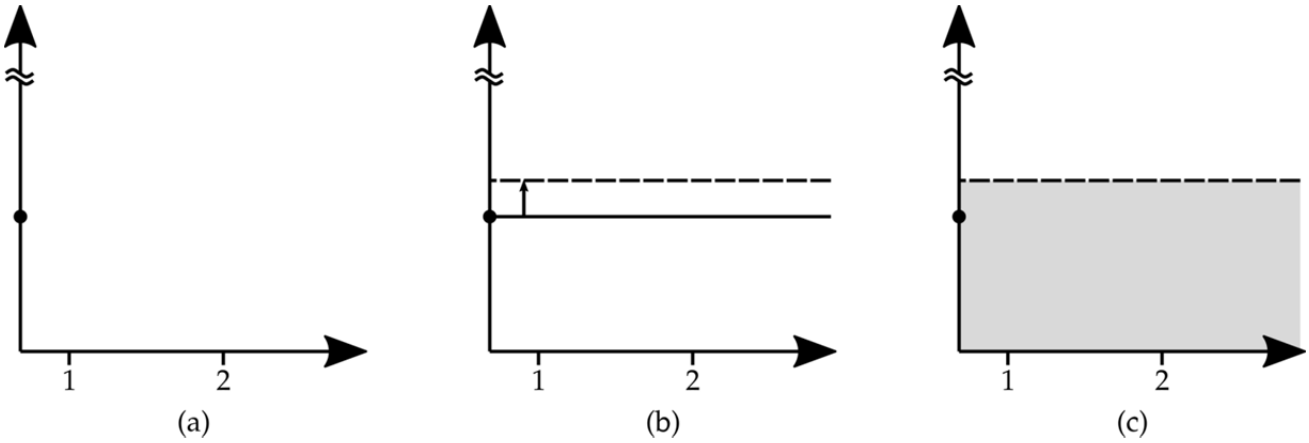
x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
black continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 18 — Comparability sector derived from one reference_value – upper and lower limit

The large dot in figure 18a represents a reference_value, _tested during the attestation of performance on the batch of the component used to make the test specimen for testing a specific ETIC_kit characteristic. The property can be e.g. the fresh mortar density of a dry_mix base coat or the mass per unit area of a glass fibre mesh.

Figure 18b added a continuous line over time representing the reference_value found during attestation of performance. The two small arrows indicate the allowed deviation of a FPC_result from the reference_value, to be comparable to the component used for test specimen(s). Figure 18b indicates a

two-sided situation with an upper and a lower limit. The limits are valid over time, shown by the two dashed lines. The allowed_deviation can be different for different component properties, see Annex E. Figure 18c now indicates the comparability_sector by a grey area, limited by the two dashed lines.

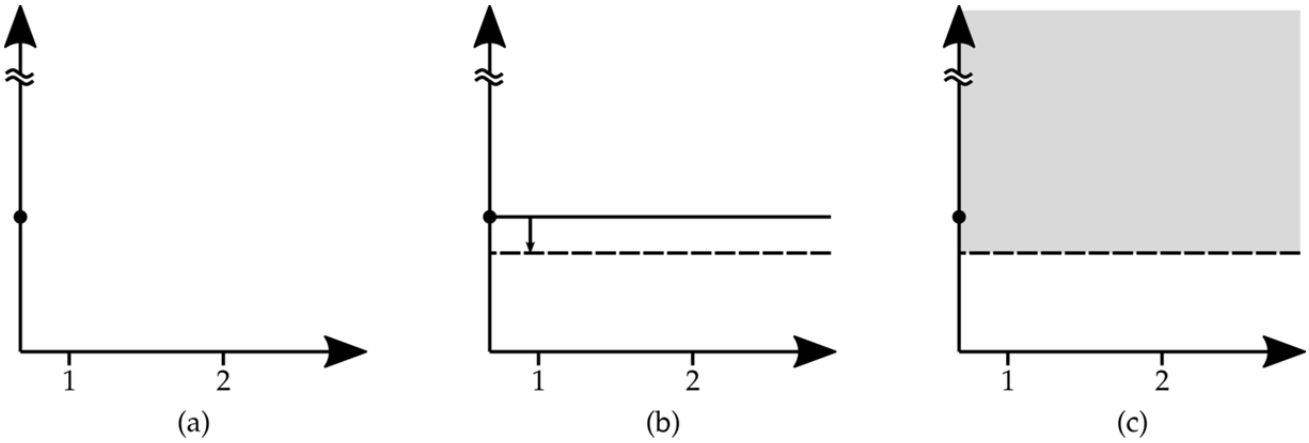


Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
black continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 19 — Comparability sector derived from one reference_value – upper limit

It is also possible to have one limit only. Figure 19b shows an upper limit, but not a lower one. Every FPC_result shall be ≤ to the upper limit to pass the surveillance, i.e. the comparability is stated. The upper limit is indicated by the dashed line. Figure 19c indicates the comparability_sector by a grey area.



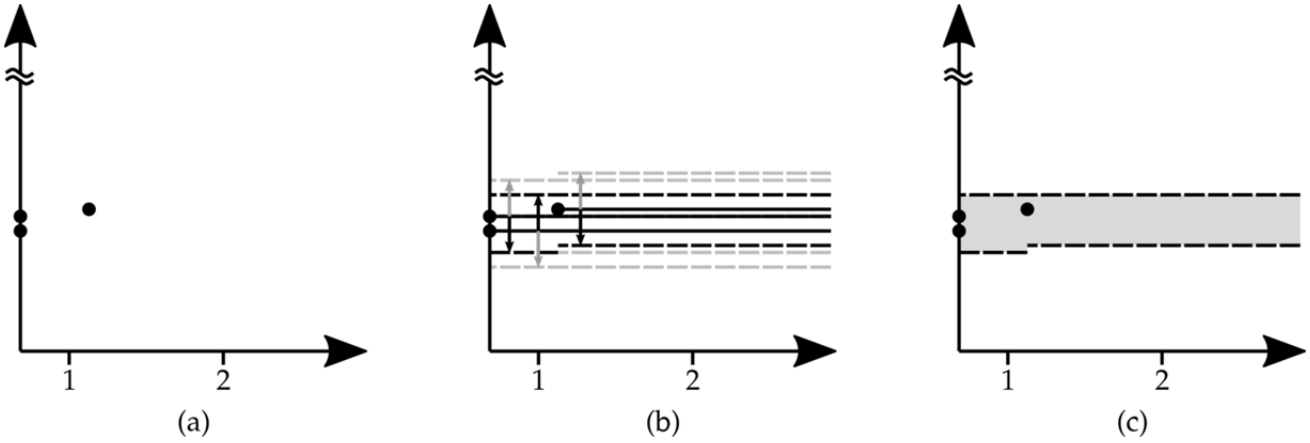
Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
black continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 20 — Comparability sector derived from one reference_value – lower limit

Figure 20b shows a lower limit, but not an upper one. Every FPC_result shall be ≥ to the lower limit to pass the surveillance, i.e. the comparability is stated. The lower limit is indicated by the dashed line. Figure 20c indicates the comparability_sector by a grey area.

6.3.2 Comparability with more than one reference_values



Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
black continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 21 — Comparability sector derived from multiple reference_values – upper and lower limit

Figure 21a shows three dots representing three different reference_values. Three different batches of one component are used to make test specimens. If a component, produced in one production line, is used for all kits, assessed by test specimens built with the three different batches, each single comparability_sector shall be matched by every FPC_result. Hence, the intersection of the three sectors is the remaining comparability_sector.

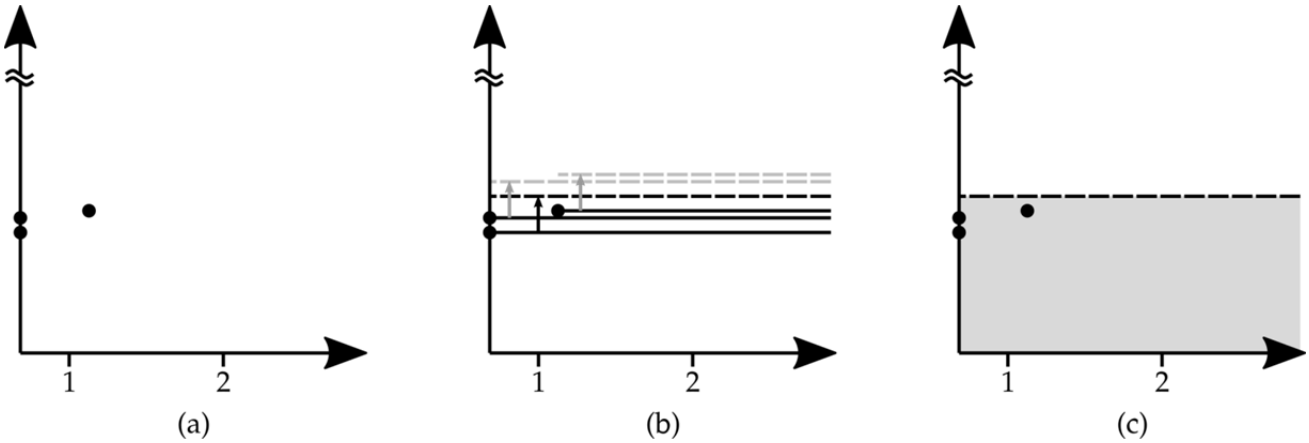
Instead of three different batches of one component, as an example, also three different, but similar components can be used for the assessment of performance. In this case also three similar reference_values are available, and the procedure to get the remaining comparability_sector is the same.

The dots in figure 21a are not all located at the same time. One test specimen was built later than the others with a new batch of the considered component. One comparability_sector starts later than the others though.

A reference_value can also be superseded by another. In this case the comparability sector of the previous reference_value ends and a new starts. It may also happen, that ETIC_kits are no longer on the market, which were connected to a specific reference_value. In this case the corresponding comparability_sector just ends.

In case of more than one reference_value, the current maximum reference_value defines the lower and the current minimum reference_value the higher limit of the comparability_sector, see the black dashed

lines in figure 21b. For every change of the set of reference_values over time, this procedure shall be repeated. Figure 21c shows the remaining comparability_sector by a grey area, limited by dashed lines.

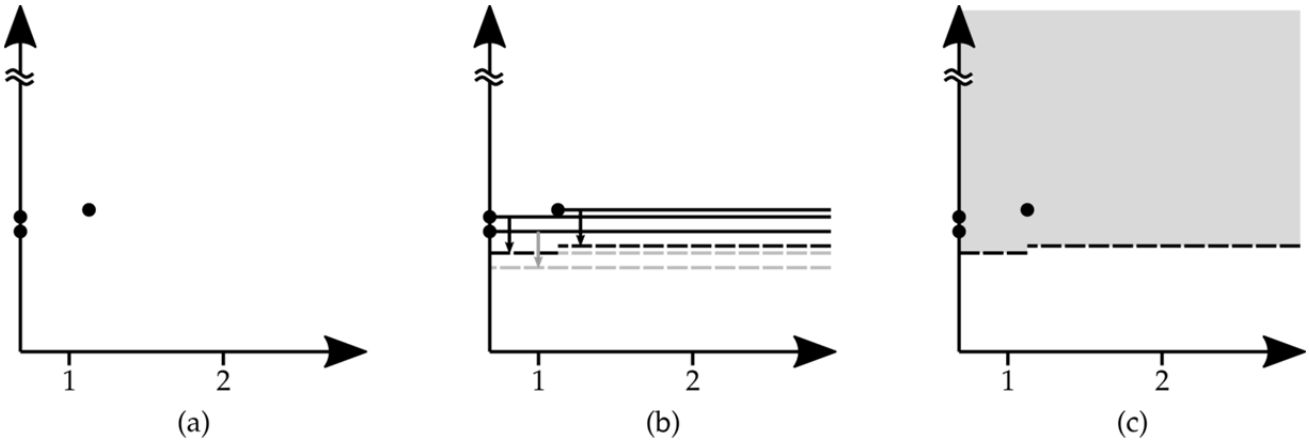


Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
black continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 22 — Comparability sector derived from multiple reference_values – upper limit

Figure 22b shows an upper limit, but not a lower one. Every FPC_result shall be ≤ to the upper limit to pass the surveillance, i.e. the comparability is stated. The upper limit is indicated by the black dashed line. Figure 22c indicates the comparability_sector by a grey area.



Key

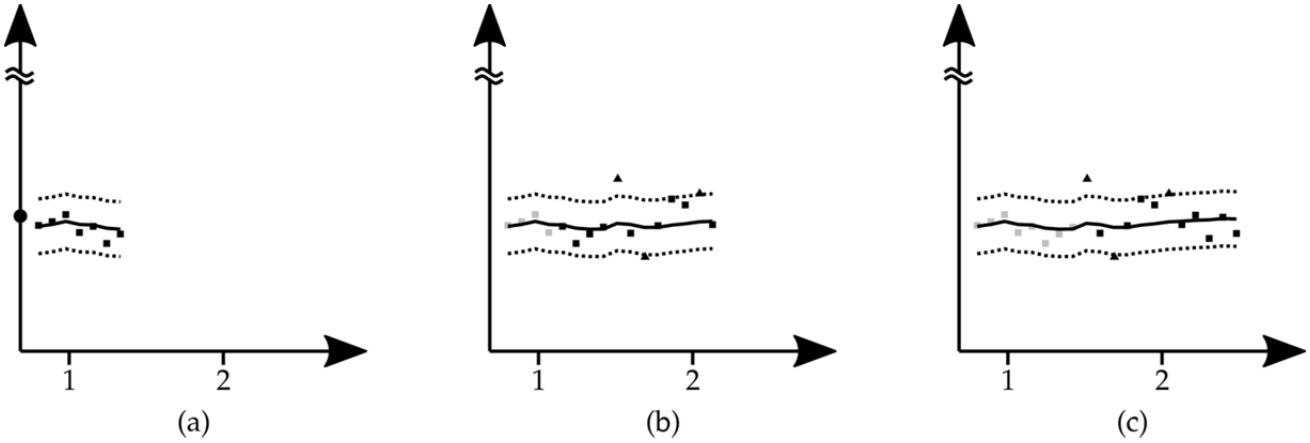
x-axis	Time in years
y-axis	Value of component_property
large dot	Reference_value
continues line	Reference_value over time
black dashed line	Limit for comparability
grey area	Comparability_sector

Figure 23 — Comparability sector derived from multiple reference_values – lower limit

Figure 23b shows a lower limit, but not an upper one. Every FPC_result shall be ≥ to the lower limit to pass the surveillance, i.e. the comparability is stated. The lower limit is indicated by the black dashed lines, providing a step. Figure 23c indicates the comparability_sector by a grey area.

6.3.3 Stability of production

The FPC_mean_value, which is the mean value of FPC_results of a component, taken over the last 365 days (one year), shall be calculated for every production day. Every FPC_result of the factory production control of a component shall be within a lower and upper limit, calculated by the mean value. See annex E for the calculation of the lower and upper limit.



Key

x-axis	Time in years
y-axis	Value of component_property
small black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
small grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production
small triangle	FPC_result not matching the criteria for a stable production
black dotted line	FPC_limit for a stable production

Figure 24 — Stability of production of one production line

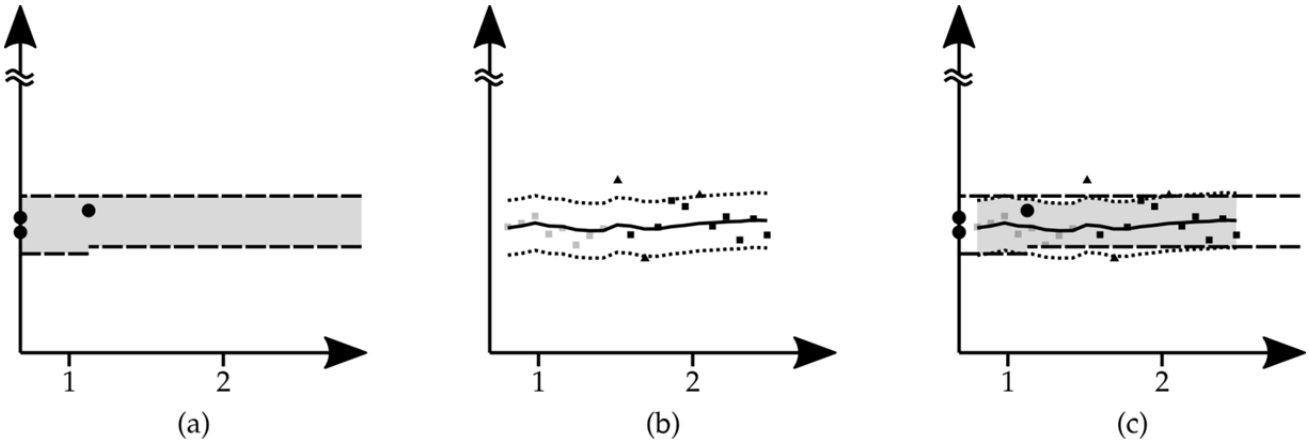
Figure 24a, b and c show an increasing number of FPC_results by time of one production line, starting production in the last quarter of year one. Every square or triangle represents a FPC_result. The mean value, recalculated with every new FPC_result, changes slightly as the continuous line shows. For the recalculation every FPC_result over the last 365 days shall be considered. In Figure 24a, b and c the black squares represent the FPC_results to consider. The grey symbols represent FPC_results older than one year and are no longer used to calculate the FPC_mean_value.

Figure 24a starts with less than 365 days and every FPC_result is considered. Figure 24b shows more than 365 days and some older FPC_results as grey squares or triangles. They are no longer considered for the calculation. In figure 24c even more older FPC_results are no longer considered for the calculation of the FPC_mean value.

The dotted lines indicate the lower and upper limit for a stable production. For a stable production every FPC_result shall match these limits. The limits depend on the relevant ETIC characteristic, group of components and the component_property, see Annex E.

6.3.4 Conformity of FPC_results with one production line

The conformity of FPC_results is given, if they match the criteria of comparability with reference_value(s) and stability of production.

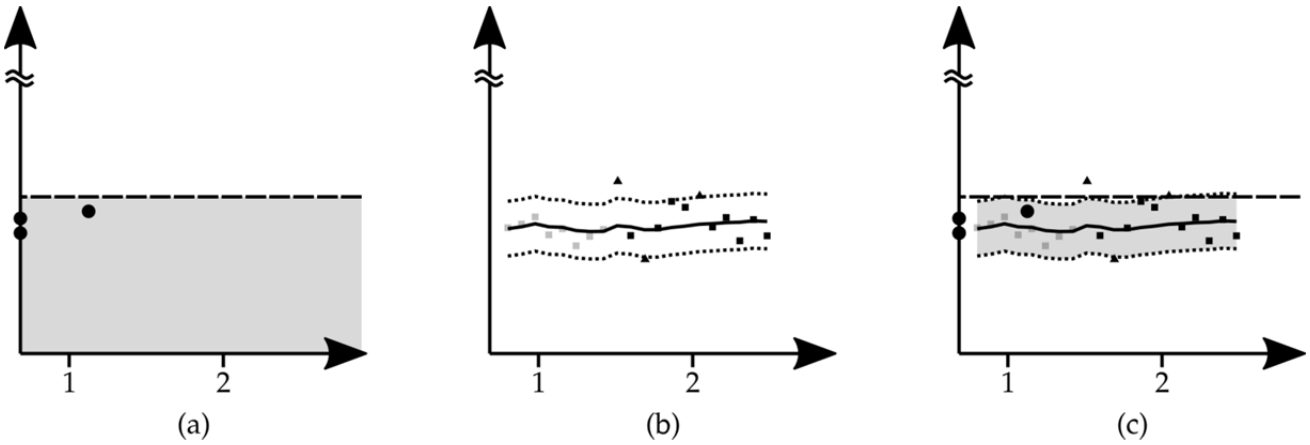


Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference value
small black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
small grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production in (b); FPC_result matching the criteria for conformity in (c)
small triangle	FPC_result not matching the criteria for a stable production (b); FPC_result not matching the criteria for conformity in (c)
black dotted line	FPC_limit for a stable production
black dashed line	Limit for comparability
grey area	Comparability_sector in (a); Comformity_sector in (c)

Figure 25 — Conformity_sector derived from multiple reference_values – upper and lower limit – and one production line

Figure 25c shows the intersection of comparability, figure 25a, and stability of one production line, figure 25b, leading to the conformity_sector in grey. FPC_results shown as squares in Figure 25c match the intersection and are conform, FPC_results shown as triangles are not conform.

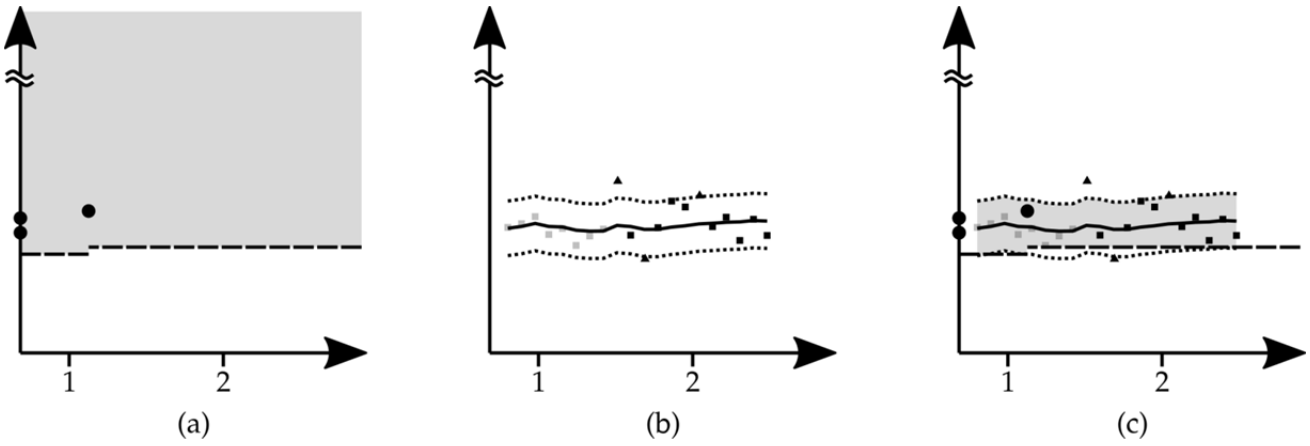


Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference value
small black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
small grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production in (b); FPC_result matching the criteria for conformity in (c)
small triangle	FPC_result not matching the criteria for a stable production (b); FPC_result not matching the criteria for conformity in (c)
black dotted line	FPC_limit for a stable production
black dashed line	Limit for comparability
grey area	Comparability_sector in (a); Comformity_sector in (c)

Figure 26 — Conformity sector derived from multiple reference_values – upper limit – and one production line

Figure 26c shows the intersection of an upper limit comparability_sector with one production line, figure 26a and b, and 27c shows the intersection of a lower limit comparability_sector with one production line, figure 27a and 27b. Consider the different conformity_sectors.



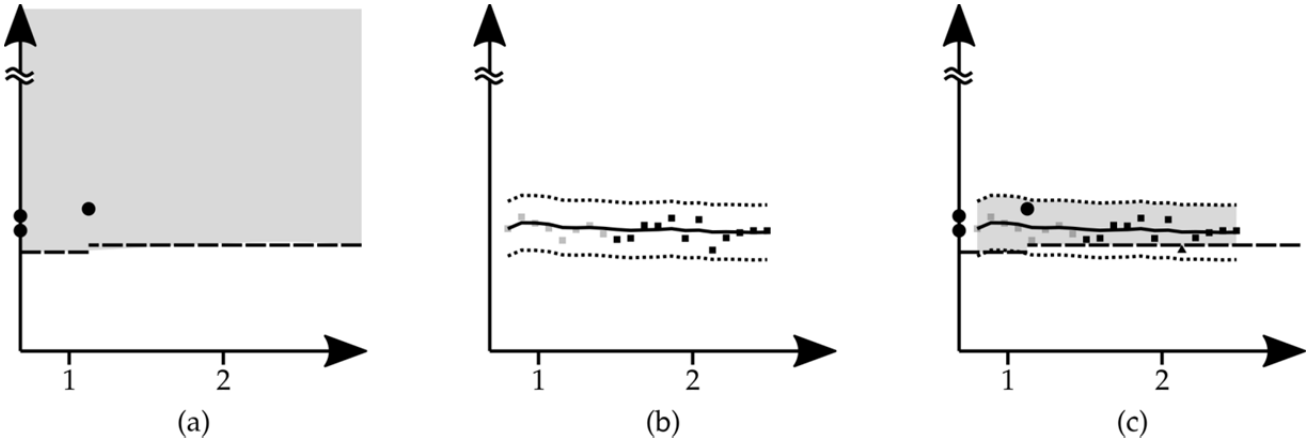
Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference value

black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production in (b); FPC_result matching the criteria for conformity in (c)
small triangle	FPC_result not matching the criteria for a stable production (b); FPC_result not matching the criteria for conformity in (c)
black dotted line	FPC_limit for a stable production
black dashed line	Limit for comparability
grey area	Comparability_sector in (a); Comformity_sector in (c)

Figure 27 — Conformity sector derived from multiple reference_values – upper limit – and one production line

6.3.5 Conformity of FPC_results with more than one production line



Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference value
black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production in (b); FPC_result matching the criteria for conformity in (c)
small triangle	FPC_result not matching the criteria for a stable production (b); FPC_result not matching the criteria for conformity in (c)
black dotted line	FPC_limit for a stable production
black dashed line	Limit for comparability
grey area	Comparability_sector in (a); Comformity_sector in (c)

Figure 28 — Conformity sector derived from multiple reference_values – lower limit – and another production line

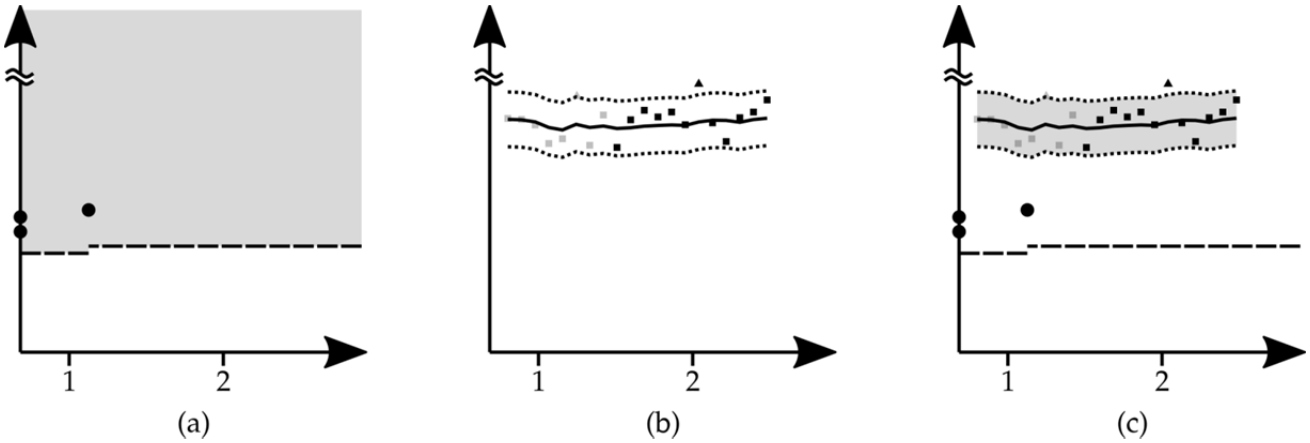
In case of more than one production line for one component, more than one comparison shall be made. Figure 28b shows the FPC_results of another production line than figure 27b, but the same component. The intersection with the relevant comparability_sector in figure 28a, which is the same as in figure 27a,

leads to a different conformity_sector. I.e., in case of more than one production line, the FPC_results of every production line shall be considered for its own.

6.3.6 Conformity of FPC_results of components not used for test specimens.

The assessment of an ETIC_kit can be based on direct field of application rules together with known test results. The ETIC_kit to be assessed can include a component, different from the component used to get the known test result. Therefore, no reference_value of the component is available.

The factory production control of such a component is not affected. The relevant comparability sector is the one of the component used to get the known test result.



Key

x-axis	Time in years
y-axis	Value of component_property
large dot	Reference value
small black symbol	FPC_result ≤ 365 days ago, to consider for FPC_mean_value
small grey symbol	FPC_result > 365 days ago, not to consider for FPC_mean_value
black continues line	FPC_mean_value
small square	FPC_result matching the criteria for a stable production in (a); FPC_result matching the criteria for conformity in (c)
small triangle	FPC_result not matching the criteria for a stable production (a); FPC_result not matching the criteria for conformity in (c)
black dotted line	FPC_limit for a stable production
black dashed line	Limit for comparability
grey area	Comparability_sector in (a); Comformity_sector in (c)

Figure 29 — Conformtity sector derived from multiple reference_values – lower limit – and one production line of a component not used for test specimens

Figure 29b shows the FPC_results of this component, which was never used for the test specimen. In this example,. its properties are quite different to the reference values, but because of a lower limit comparability_sector, the stability of production criteria, within the dotted lines in 29b, is the same as the conformity_sector in figure 29c.

6.4 Indirect testing of ETIC_kit components for FPC_results

Indirect testing is a means by which a given component_property may be assessed through tests on one or more other component_properties, with which a correlation has been established.

The correlation shall be established by suitable statistical means, e.g. regression analysis on the basis of adequate preliminary tests for each production line. It shall be re-examined at prescribed intervals and after changes or modifications, if these are likely to affect the correlation. The significance α of the correlation coefficient shall be $\alpha \leq 0{,}05$.

For each indirect testing procedure applied at the place of production the sampling plan and the conformity criteria, for the indirect component_property, shall be specified taking into account the relevant correlation between the corresponding component_properties.

In case of dispute the test method specified for the relevant component_property in the product standard shall be used.

Annex A
(normative)

Limits of components used for ETIC_kits covered by the scope

A.1 General

Components used for ETIC_kits which are covered by the scope are specified by the following limits.

A.1.1 Adhesive

Powder according to EN 998-1:2016 or ready_to_use according to EN 15824:2017 with

a) a bond strength of the adhesive to a smooth concrete slab of ≥ 250 kPa, tested in accordance with EN 1542:1999; one measurement lower than 250 kPa but higher than 200 kPa is admissible;

b) a bond strength of the adhesive to a smooth concrete slab after water exposure for 2 days followed by 2h to 18 h conditioning at (23 ± 2) °C and (50 ± 5) % RH (period within the application of the pull head plates and testing shall take place) of ≥ 80 kPa, tested in accordance with EN 1542:1999; one measurement lower than 80 kPa but higher than 60 kPa is admissible.

c) a bond strength of the adhesive to a smooth concrete slab after water exposure for 2 days followed by at least 7 days conditioning at (23 ± 2) °C and (50 ± 5) % RH of ≥ 250 kPa, tested in accordance with EN 1542:1999; one measurement lower than 250 kPa but higher than 200 kPa is admissible

The bond strength test shall be performed on a smooth concrete slab with a thickness of at least 40 mm. The water/cement ratio of the slab shall be of the order of 0,45 to 0,50. The tensile strength of the slab shall be ≥ 1,5 N/mm² perpendicular to the surface. The moisture content of the slab prior to the test shall be ≤ 3 % of the total mass.

The adhesive is applied onto the concrete slab with a thickness between 4 mm ± 1 mm. The adhesive shall cure and dry at (23 ± 2) °C and (50 ± 5) % RH for at least 28 days, before the test or conditioning begins. If the minimum nominal thickness of the adhesive is > 5 mm, the adhesive shall be applied with the given minimum nominal thickness.

The test is performed at a tensioning speed of (10 ± 1) mm/min or according to EN 1542:1999 on the following samples (5 test specimens each) using circular or square stamps. The mean failure resistance is calculated from the results of five measurements. The individual and mean values are recorded and the results are expressed in kPa.

Adhesive_foam with

a) tack free time ≥ 7 min according to EN 17101:2018, and

b) cohesion strength ≥ 80 kPa according to EN 17101:2018; one measurement lower than 80 kPa, but higher than 60 kPa is admissible.

A.1.2 Thermal insulation

MW, EPS, XPS, PU, PF, CG, ICB and WF according table A.1.

Table A.1 — Limits of thermal insulation used for ETIC_kits covered by the scope

	MW Lamella	MW Board	EPS S	EPS SD	XPS	PU	PF	CG	ICB	WF
Width tolerance according to EN 822:2013 [mm]	±2	±2	±2	±2	±2	±2	±2	±2	±3	±3
Thickness tolerance according to EN 823:2013 [mm]	±1	+3/-1	±1	±1	±1	±2 (bonded, <80 mm); ±3 (mechanically fixed, <80 mm); ±3 (bonded, ≥80 mm); ±4 (mechanically fixed, ≥80 mm thickness);	±2 (<140 mm thickness); -2/+5 (≥140 mm thickness)	±2	±1 mm (20-50 mm); ±2%, max. ±2 mm (>50 mm)	±1
Squareness according to EN 824:2013 [mm/m]	≤5	≤5	≤3	±2	±2	≤3	±2	±2	<2	≤3
Flatness tolerance per metre according to EN 825:2013 [mm]	≤4	≤4	≤3	≤3	≤3	≤3	≤5	≤2	≤2	≤3
Dimensional stability according to EN 1604:2013 at 70°C/90%, 48h [%]	±1	±1	≤2,0	±2,0	±2	≤2 (bonded, length and width); ≤2 (bonded, thickness); ≤3 (mechanically fixed, length and width); ≤4 (mechanically fixed, thickness)	±1,5	±0,5 (length and width); ±0,1 (thickness)	±1,0	±3
Tensile strength perpendicular to	≥80	≥5 (plate anchors and adhesive(III);	≥150 (profiles	≥80	≥100	≥80 (bonded);	≥80	≥100	≥50	≥7,5

the surface according to EN 1607:2013 [kPa]		≥15 (profiles and rails (VI and VII)); ≥5 (plate anchors only (V)); – (anchored metal mesh(VIII))	and rails); ≥80 (others)			≥50 (mechanically fixed)				
Shear strength according to EN 12090:2013 (50 or 60 mm specimens) [kPa]	≥20 (60 mm specimen)	-	≥30	≥20	≥100	≥30 (bonded); ≥20 (mechanically fixed)	≥30	≥50	≥50	–
Shear modulus according to EN 2090 [MPa]]	>1	-	≥1	≥0,3	≥3	≥1 (bonded); ≥0,35 (mechanically fixed)	≥0,35	≥1	≥1	–
Water absorption according to EN 609 [kg/m^2]	<1,0	<1,0	–	–	–	≤1	≤1,0	≤0,5	≤0,5	≤1,0
Water absorption according to EN 2087 [kg/m^2]	–	–	≤0,5 (Method 2)	≤0,5 (Method 2)	≤1,5 Vol% (Method 2A)	–	–	–	–	–

A.1.3 Mechanical fixing device

A.1.3.1 Plate anchor

A.1.3.1.1 Plate anchor applied by expansion of a plastic sleeve in a pre-drilled hole

Plastic anchor for the fixing of ETIC_kits in masonry or concrete substrate with

c) an anchoring in the substrate applied by expansion of a plastic sleeve with a diameter of ≥ 5 mm and

d) an expansion elements of the type “nailed-in” or of the type “screwed-in” and

e) an effective anchorage depth of ≥ 25 mm and

f) a plate diameter of ≥ 60 mm and

g) an anchor sleeve, plate and expansion zone made of

   1) polyethylene or

   2) polypropylene or

   3) polyamide 6 or

   4) polyamide 6.6 and

h) an expansion element made of

   1) galvanized steel or

2) stainless steel or

3) glass fiber reinforced plastic and

i) a chi-value equal or ≤ 0.002 W/K in case of galvanized carbon steel expansion element and

j) an axial plate stiffness of ≥ 0.3 kN/mm according Annex C and

k) an axial plate capacity of ≥ 1.0 kN according Annex C

A.1.3.1.2 Plate anchor with powder actuated steel fastener

Plastic anchor for the fixing of ETIC_kits in concrete substrate with

l) an effective anchorage depth in the concrete part of ≥ 20 mm and

m) a plate and body made of polyethylene and

n) a plate diameter of ≥ 30 mm and

o) a zinc flake coated nail made of tempered carbon steel with a diameter ranging from 3 mm to 5 mm and

p) an axial plate stiffness of ≥ 0.3 kN/mm according Annex C and

q) **an axial** plate capacity of ≥ 1.0 kN according Annex C

A.1.3.2 Helix_type anchor

Plastic anchor for the fixing of ETIC_kits in masonry or concrete substrate for countersunk installation in the insulation product utilizing a helix for fixing in the insulation with

a) an anchoring in the substrate applied by expansion of a plastic sleeve with a diameter of ≥ 5 mm and

b) an expansion elements of the type “screwed-in” and

c) an effective anchorage depth of ≥ 25 mm and

d) an anchor sleeve, plate and expansion zone made of

1) polyethylene or

2) polypropylene or

3) polyamide 6 or

4) polyamide 6.6 and

e) an expansion element made of

1) galvanized steel or

2) stainless steel or

3) glass fiber reinforced plastic and

f) a chi-value equal or ≤ 0,002 W/K in case of galvanized carbon steel expansion element

A.1.3.3 Collar anchor

Collar anchor of the type “nailed-in” or of the type “screwed-in” with

g) an anchoring in the substrate by expansion of a plastic sleeve with a diameter of ≥ 5 mm and

h) an effective anchorage depth of ≥ 25 mm and

i) an anchor sleeve, plate and expansion zone made of

1) polyethylene or

2) polypropylene or

3) polyamide 6 or

4) polyamide 6.6 and

j) an expansion element made of

1) galvanized steel or

2) stainless steel or

3) glass fiber reinforced plastic

A.1.3.4 Profile

Profiles made of polyvinylchloride or aluminium.

Note to entry 1 Profiles are assessed according to 5 not using direct fields of application rules

A.1.3.5 Rail

Rails made of polyvinylchloride or aluminium.

Note to entry 1 Rails are assessed according to 5 not using direct fields of application rules

A.1.3.6 Anchor for an anchored metal mesh

Anchors made of steel.

Note to entry 1 Anchors for anchored metal meshes are assessed according to 5 not using direct fields of application rules

A.1.4 Base coat

a) dry_mix according to EN 998-1:2016

b) ready_to_use according to EN 15824:2017

c) others.

A.1.5 Reinforcement

A.1.5.1 Glass fibre mesh

Glass fibre mesh with

a) tensile strength >= 40 N/mm under normal conditions according to EN 13496:2013; no measurement shall be < than 36 N/mm and the mean elongation ε50 shall be ≤ 5 and

b) tensile strength ≥ 20 N/mm after conditioning in aggressive medium according to EN 13496:2013; no measurement shall be < than 18 N/mm and the mean elongation ε50 shall be ≤ 5% and

c) a ratio of tensile strength under normal conditions according to EN 13496:2013 to tensile strength in aggressive medium according to EN 13496:2013 ≤ 2,0

A.1.5.1 Metal mesh

a) galvanized metal mesh with

   1) a galvanization after welding of the mesh and

   2) a zinc coat mass per unit area according to EN 10244-1 of 300 g/m² showing a minimum of every measurement of 250 g/m²

b) stainless steel mesh according to AISI 302 or 304

A.1.5.2 Overlapping

Reinforcement with an overlapping ≥ 100 mm.

A.1.6 Key coat

Very thin coating material.

A.1.7 Finishing coat

a) dry_mix according to EN 998-1:2016 or

b) ready_to_use according to EN 15824:2017

c) others.

A.1.8 Decorative coat

Thin organically bound coating material.

Annex B
(normative)

Calculation of $Q_{PCS, ETIC\_kit}$ (formulae and example)

B.1 General

The combination of ETIC_kit components, layer thicknesses and/or coverages leads to a specific gross heat of combustion of an ETIC_kit. The presented calculation is an example.

$$Q_{PCS,ETIC\_kit} = \frac{\sum_{i=1}^{n}(m_i \times Q_{PCS,i})}{\Sigma m_i}$$

Where

$Q_{PCS,i}$ is the the gross-heat of combustion of a component given in MJ/kg;

m_i is the dry mass per unit area of a component (see Table B.1) in kg/m² (mass in dried condition as in end use application).

EXAMPLE Calculation of $Q_{PCS, ETIC\_kit}$

Table B.1 — Data of the ETIC_kit components

Component *i*	$Q_{PCS,i}$ MJ/kg	**Mass per unit area** m_i kg/m²	$m_i \times Q_{PCS,i}$ MJ/m²
Adhesive	0,654	3,443	2,252
Thermal Insulation	1,430	27,726	39,648
Base coat	0,811	5,298	4,297
Glass fibre mesh	7,834	0,180	1,410
Key coat	4,519	0,210	0,949
Finishing coat	1,607	3,720	5,978
	Σ	**40,577**	**54,534**

B.2 Conversion

$$Q_{PCS,ETIC\_kit} = \frac{\Sigma Q_{PCS,i}\left[\frac{MJ}{m^2}\right]}{\Sigma m_i \left[\frac{kg}{m^2}\right]}$$

$$Q_{PCS,ETIC\_kit} = \frac{54{,}534\left[\frac{MJ}{m^2}\right]}{40{,}557\left[\frac{kg}{m^2}\right]}$$

$$Q_{PCS,ETIC\_kit} = 1{,}344\frac{MJ}{kg} \quad < 3{,}0\ \frac{MJ}{kg}$$

Annex C
(normative)

Characteristic load resistance and characteristic plate stiffness of plastic anchors for ETICS

C.1 General

The pull-through capacity and pull-off capacity of an ETIC_kit fixed by anchors is determined according to this standard and is particularly linked to the mechanical properties of the anchor plate.

These properties of the anchor plate are

a) the characteristic load resistance F_p and

b) the characteristic plate stiffness k_p

This annex covers tests for the determination of the characteristic load resistance of the anchor plate and the characteristic plate stiffness of plastic plate anchors for fixing of external thermal insulation composite systems with rendering. The test shall be carried out according to C.3.

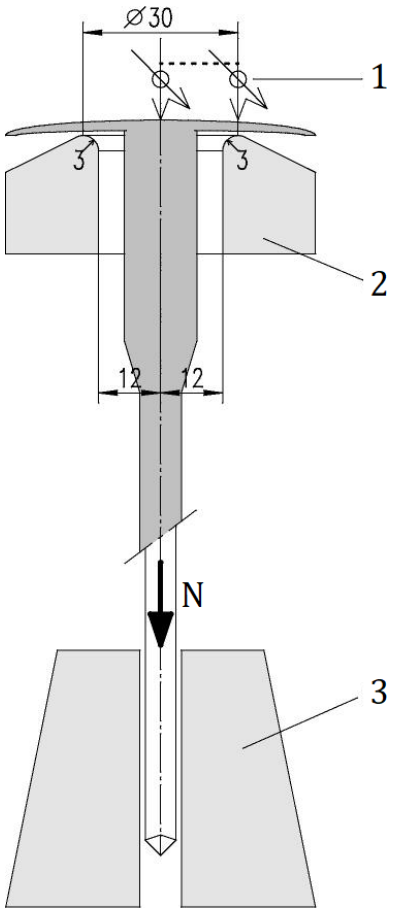
C.2 Description of the test method

At least 5 measurements shall be performed. During the measurements the anchor plate shall rest on a solid support ring with a diameter of 30 mm and a bevel radius of 3 mm and clear inner diameter of 24 mm, see Figure C.1. If the anchor plate is stiffened by ribs, recesses in the top of the supporting ring shall prevent a contact between the ribs and the supporting ring.

A test setup is shown in Figure C.1. The measurements shall be conducted at (23 ± 2) °C and (50 ± 5) % RH after conditioning of the test specimen for at least seven days at (23 ± 2) °C and (50 ± 5) % RH.

NOTE The mechanical properties of some plastics may vary due to different humidity conditions. The typical water content at (23 ± 2) °C and (50 ± 5) % RH of e.g. polyamide 6 is (3,0 ± 0,4) % and of polyamide 6.6 is (2,8 ±0,3) %.

Dimensions in mm



Key

1 displacement transducer

2 supporting ring

3 expansion element (clamping jaws)

Figure C.1 —Test setup for determination of the characteristic plate stiffness and characteristic load resistance

A dead load may be applied. The tensile load is raised until failure with a rate of (1 ± 0,2) kN/min.

C.3 Assessment

C.3.1 Characteristic load resistance

The characteristic load resistance shall be determined from the 5%-quantile of the maximum loads for a confidence level of 90 %.

$$F_p = F_{5\%} = \bar{F}_{Test} \cdot (1 - k_s \cdot v)$$

$$v = \frac{s_{n-1}}{\bar{F}_{Test}}$$

where

F_p is the characteristic load resistance of the anchor plate in kN

$F_{5\%}$ is the 5%-quantile of the maximum loads for a confidence level of 90% in kN

$\bar{F}_{Test}$ is the mean value of maximum loads of one test series in kN

k_s is the k-factor for the tolerance interval

v is the variation coefficient of one test series

s_{n-1} is the standard deviation of one test series according ISO 12491 in kN

For n measurements of one test series k_s is

n	5	6	7	8	9	10	11	12
k_s for 90% confidence level	3,40	3,09	2,89	2,75	2,65	2,57	2,50	2,45

The characteristic load resistance shall be rounded to one decimal.

C.3.2 Characteristic plate stiffness

The characteristic plate stiffness k_p shall be expressed as the mean value of the tangent stiffness of the conducted tests. The tangent stiffness of a measurement ci shall be determined graphically or by regression. It represents the slope at 1mm displacement. If the tangent stiffness is determined by graphically means, su at the corresponding tension force N_u = 0 kN and N_0 at so = 1 mm shall be determined in the load-displacement-diagram (see Figure C.2).

$$k_p = \frac{\sum_{i=1}^{n} c_i}{n} \quad \text{for } v \leq 20\%$$

$$k_p = \frac{\sum_{i=1}^{n} c_i}{n} \cdot \frac{20\%}{v} \quad \text{for } v > 20\%$$

with

$s_u \leq 0{,}3\ s_o$

$s_u \leq 0{,}3$ mm

where

$$c_i = \frac{N_o - N_u}{s_o - s_u} = \frac{N_o}{1mm - s_u}$$

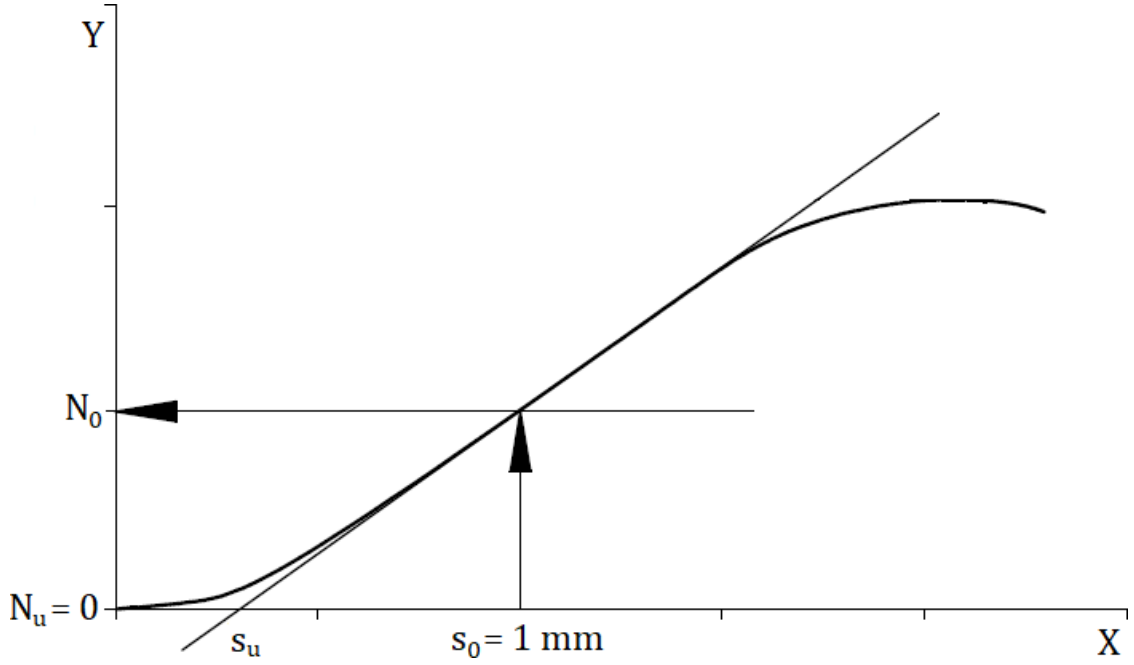
k_p is the characteristic plate stiffness of the anchor in kN/mm

c_i is the tangent stiffness of a single test in kN/mm

v is the variation coefficient of one test series

s is the displacement in mm

The characteristic plate stiffness shall be rounded to one decimal place, expressed in kN/mm, and declared.



Key

X displacement s in mm

Y tensile load in kN

Figure C.2 — Load-displacement-diagram with the tangent stiffness line

Annex D
(normative)

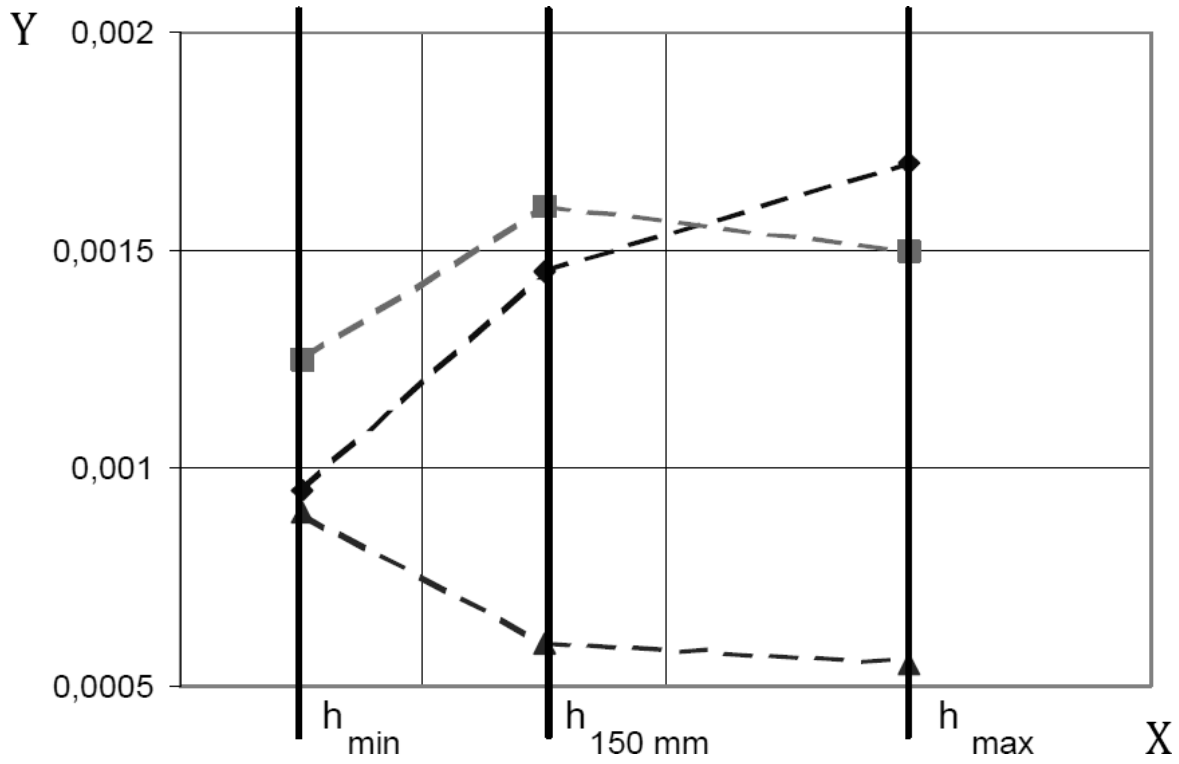
Point thermal transmittance of mechanical fixing devices

D.1 General

This Annex serves for determination of the point thermal transmittance of anchors for use in ETICS. It is based on the calculation of standards EN ISO 10211:2017 and EN ISO 6946:2017.

Every mechanical fixing device may cause a thermal bridge. The thermal property of an anchor is expressed by its point thermal transmittance χ. This value is expressed for different insulation thicknesses.

NOTE The point thermal transmittance χ of a mechanical fixing device may lead to an increase of the required thickness of the insulation component in order to achieve a specific thermal resistance of the wall construction. The behaviour is not linear, see Figure D.1.



Key

X Thickness of insulating layer h in mm

Y actual point thermal transmittance in W/K

Figure D.1 — Point thermal transmittance depending on the thickness of the insulating layer for three different types of anchors

D.2 Assessment of point thermal transmittance

D.2.1 Determination of point thermal transmittance

The point thermal transmittance χ is calculated as follows:

$$\chi = U_c - U$$

where

χ is the point thermal transmittance of a mechanical fixing device in W/K

U_c is the modified thermal transmission of the wall (with an assembled ETIC_kit and mechanical fixing devices) in W/(m^2K)

U is the thermal transmission of the wall with an assembled ETIC_kit without thermal bridges in W/(m^2K)

D.2.2 Determination of the nominal value

D.2.2.1 Nominal values for different ranges of insulation thickness

The point thermal transmittance will be determined for the different ranges as follows:

$\chi(h < 150)$ the greater value of $\chi(h_{min})$ and χ(150 mm)

$\chi(h > 150)$ the greater value of $\chi(h_{max})$ and χ(150 mm)

where

$\chi(h < 150)$ is the point thermal transmittance of a mechanical fixing device for nominal thicknesses of insulation components of equal or lower than 150 mm in W/K

$\chi(h_{min})$ is the point thermal transmittance of a mechanical fixing device for the minimum nominal thickness of insulation component in W/K

χ(150 mm) is the point thermal transmittance of a mechanical fixing device for 150 mm nominal thickness of insulation component in W/K

$\chi(h > 150)$ is the point thermal transmittance of a mechanical fixing device at an nominal thickness of insulation component greater than 150 mm in W/K

$\chi(h_{max})$ is the point thermal transmittance of a mechanical fixing device for the maximum nominal thickness of insulation component in W/K

D.2.2.2 No distinction between ranges of insulation thickness

If only one performance value is intended to be declared as nominal value, it shall be determined as follows:

$\chi(h_{min} - h_{max})$ maximum value out of $\chi(h_{min})$, χ(150 mm) and $\chi(h_{max})$

where

$\chi(h_{min} - h_{max})$ is the point thermal transmittance of a mechanical fixing device applicable for the entire range of nominal thickness of insulation component in W/K

The nominal value of the point thermal transmittances shall be rounded upwards to three decimals. For point thermal transmittances equal or lower than 0,0005 W/K the nominal value 0 W/K shall apply.

D.3 Description of the test method

D.3.1 General

The determination of the point thermal transmittance χ is performed by means of calculation. It shall be carried out for the reference construction described in D.3.6.4.

D.3.2 Reference construction

For calculation of the point thermal transmittance χ the following reference construction applies:

Dimensions in mm

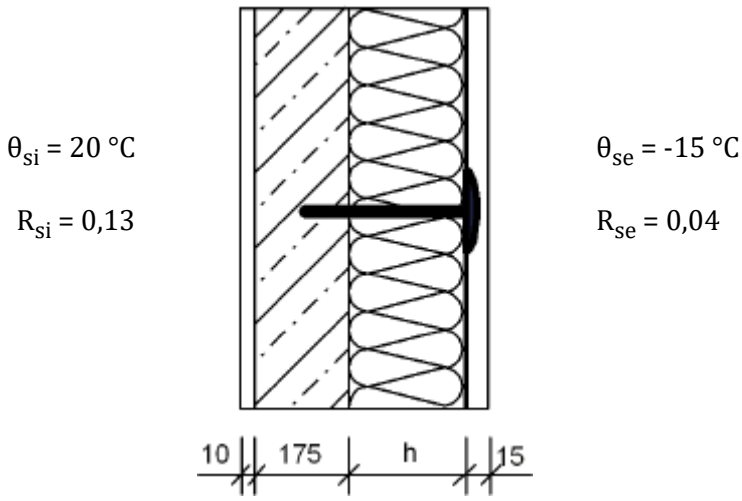


Figure D.2 — Reference construction (not full-scale)

For the building component layers the material properties according to EN 12524:2000 shall be used, see Table D.1.

Table D.1 — Material properties of components of the reference construction

Component	Thermal conductivity W/(m K)	Thickness mm
(1) interior plaster[1)]	0,57	10
(2) substrate	see Table F.2	175
(3) insulation component	0,035	see F.4.3
(4) rendering system[2)]	1,0	15
[1)] For calculation a gypsum plaster is assumed to represent the direct field of application rule. [2)] For calculation a lime cement render is assumed to represent the direct field of application rule.		

Table D.2 — Material properties of plate anchor parts

material	thermal conductivity W/(m K)
PA6-GF50	0,41
Polypropylen (PP)	0,23
Polyethylen (PE)	0,23
Steel	42,0
Air at rest	0,026

The χ-value is determined in the substrate with the highest thermal conductivity, which is assumed to represent the direct field of application rule.

NOTE 1 The χ-value can be determined and declared for each substrate separately.

NOTE 2 Alternatively the χ-value may be determined and declared for each substrate separately.

A χ-value determined, for a specific substrate, covers all substrates with a lower thermal conductivity. When selecting normal weight concrete as substrate for the determination, the χ-value is applicable for all other masonry and concrete substrates.

Table D.3 — Material properties of different substrate groups

Substrate group	Description	Thermal conductivity W/(m K)
A	**Normal weight concrete** between strength classes C12/15 and C50/60 , inclusively according to EN 206.	2,30
B	**Solid masonry** masonry units consisting of solid units according to EN 771-1, -2, -3, -5, which do not have any holes or cavities other than those	1,20
C	**Hollow or perforated masonry** masonry units consisting fo hollow or perforated units according to EN 771-1, -2, -3, -5, which have a certain volume percentage of voids which pass through the masonry unit	0,56
D	**Lightweight aggregate concrete** with open structure between strength classes LAC 2 and LAC 25, inclusively, according to EN 1520 and in lightweight aggregate concrete blocks	0,36
E	**Autoclaved aerated concrete** according to EN 771-4 or EN 12602, having a strength class between AAC 2 and AAC 7, inclusively.	0,16

D.3.3 Consideration of insulation thickness

For calculation of the point thermal transmittance χ three thicknesses of insulation components shall be considered:

χ (h_{min}) is the point thermal transmittance in connection with the smallest thickness h_{min} of the insulation component

χ (150 mm) is the point thermal transmittance in connection with an insulation thickness of 150 mm

χ (h_{max}) is the point thermal transmittance in connection with the highest insulation thickness

NOTE In case $\chi(150\ mm)$ is smaller than $\chi(h_{min})$, it can be assumed that $\chi(h_{max})$ is smaller than or equal to $\chi(150\ mm)$.

D.3.4 Consideration of mechanical fixing device's properties

The thermal conductivities of the mechanical fixing device's materials shall be chosen according to EN 12524:2000 or EN ISO 10456:2007 + AC:2009. The dimensions shall comply with a test specimen or the manufacturer's technical documentation. The thermal conductivity of potential air-filled cavities shall be determined according to EN ISO 6946:2017.

D.3.5 Boundary conditions

The heat transfer resistances shall be in accordance with EN ISO 6946:2017 for the horizontal thermal conductivity:

$R_{se} = 0{,}04\ (m^2K)/W$ where R_{se} is the external heat transfer resistance in $(m^2K)/W$

$R_{si} = 0{,}13\ (m^2K)/W$ where R_{si} is the internal heat transfer resistance in $(m^2K)/W$

For calculation the following conditions apply: the temperature difference between inside and outside shall be $\Delta T = 35$ K. The edge surfaces of the reference construction are considered as adiabatic.

Example:

$\theta_{se} = -15\ °C$; $\theta_{si} = 20\ °C$.

where

ΔT	is the temperature difference between internal and external temperature in K
θ_{se}	is the external temperature in °C
θ_{si}	is the internal temperature in °C

D.3.6 Calculations according to EN ISO 10211:2017

D.3.6.1 General

For determination of the point thermal transmittance, the modified heat transmission of the wall (with an ETIC_kit and mechanical fixing devices) U_c shall be determined.

D.3.6.2 Construction of a finite element system

As significant section for the calculation of the thermal bridge effect a cuboid-shaped section of the wall containing a mechanical fixing device shall be assumed. The mechanical fixing device shall be placed in the centre of the area considered. In case the mechanical fixing device is rotationally symmetric in its shape, a partial circular section of the anchor, which is placed in an edge of the area considered, may also be used for the calculation or the calculation may be done in polar coordinates. The dimensions of the area to be considered shall be chosen according to EN ISO 10211:2017 so that the disturbance caused by the mechanical fixing device has no effects on the edges.

D.3.6.3 Subdivision of the system

The subdivision of the system for calculation by means of the numerical method shall be accomplished in accordance with EN ISO 10211:2017.

D.3.6.4 Determination of the thermal transmittance

The thermal transmittance U_c of the wall section with mechanical fixing device shall be determined according to EN ISO 10211:2017 by the thermal coupling coefficient calculated:.

$$U_c = \frac{L^{3D}}{A}$$

Deviating from EN ISO 10211:2017 the thermal transmittance shall be determined with five decimal places. This is necessary because the point thermal transmittance χ to be calculated shall be given rounded to four decimal places.

The thermal transmittance U of the undisturbed wall is calculated according to EN ISO 6946:2017.

Annex E
(normative)

Test plan and conformity tables

Table E.1 — Test plan and conformity for dry_mix adhesives

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Fresh mortar gross density	EN 1015-6: 1998+A1:2006	Once per production week	… FPC_mean_value ± 8 % (relative)	… of every reference_value ± 8 % (relative) [a]	5.2, 5.8
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2,0 % (absolute)	… 0,0 % to every reference_value + 2,0 % (absolute) [a]	5.2, 5.8
Particle size grading	EN 1015-1: 1998+A1:2006 (63 µm sieve is not mandatory)	Once per production week	… lower limit to upper limit according Table F.1, considering FPC_mean_value as value. Every single fraction shall be considered.	… lower limit to upper limit according Table F.1, considering every reference_value as value. Every single fraction shall be considered. [a]	5.8
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Table E.2 — Test plan and conformity for ready_to_use adhesives

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Fresh mortar gross density	EN 1015-6: 1998+A1:2006	Once per production week	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative) [a]	5.2, 5.8
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2,0 % (absolute)	… 0,0 % to every reference_value + 2,0 % (absolute) [a]	5.2, 5.8
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Table E.3 — Test plan and conformity for adhesive_foams

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Foam Density	EN 17101:2018	Once per production week	… FPC_mean_value ± 8 (relative)	… of every reference_value ± 15 %	5.2, 5.8
Tack free time	EN 17101:2018	Once per production week	… FPC_mean_value ± 1 min	… of every reference_value ± 1 min	5.8
Cutting time	EN 17101:2018	Once per production week	… FPC_mean_value ± 1 min	… of every reference_value ± 5 min	5.8
Post application expansion behaviour	EN 17101:2018	Once per production week	… FPC_mean_value ± 1 mm	… of every reference_value ± 2 mm	5.8
Cohesion Strength	EN 17101:2018	Once per production week	… FPC_mean_value ± 8 % (relative)	… of every reference value - 15 % (relative) to infinite	5.8
Shear Strength	EN 17101:2018	Once per production week	… FPC_mean_value ± 8 % (relative)	… of every reference value - 15 % (relative) to infinite	5.8

Table E.4 — Test plan and conformity for thermal insulation

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Reaction to fire	a)	a)	—	… of the reference_value (class) or a higher class	5.2
Reaction to fire-classification	a)	a)	—	… of given reaction to fire class or better. The range for reaction to fire classes to consider is A > B > C > D > E > F	5.2.2 5.2.6
Continuous smouldering	a)	a)	—	… of class or better. The range for classes to consider is NoS > S and S > ANP	5.3 for MW, ICB and WF
Apparent density	a)	a)	… FPC_mean_value ± 15 % (relative)	… 0 to every reference_value + 20% (relative)	5.2 for MW, EPS, XPS, CG and ICB; 5.3 for MW, ICB and WF
Apparent density	a)	a)	… FPC_mean_value ± 15 % (relative)	… of every reference_value ± 25 % (relative)	5.2 for PU, PF and WF
Apparent density	a)	a)	… FPC_mean_value ± 15 % (relative)	… of every reference_value - 20 % (relative) to infinite	5.8
Organic content	a)	a)	… FPC_mean_value ± 15 % (relative)	0 to every reference value + 20 % (relative)	5.2 for MW
Organic content	a)	a)	—	0 to 1,0 % (absolute)	5.2 for CG
Organic content	a)	a)	… FPC_mean_value ± 15 % (relative)	… of every reference_value - 20 % (relative) to infinite	5.8
Tensile strength in dry conditions	a)	a)	… FPC_mean_value ± 30 % (relative)	… of every reference value - 30 % (relative) to infinite	5.5 for MW lamella and CG; 5.8 for MW lamella and CG
tensile strength in dry	a)	a)	… FPC_mean_value + 50% / - 30 % (relative)	… of every reference value - 30 % (relative)	5.5 for MW board; 5.8 for MW board

conditions				to infinite	
Tensile strength in dry conditions	a)	a)	… FPC_mean_value ± 20 % (relative)	… of every reference value - 20 % (relative) to infinite	5.5 for EPS; 5.8 for EPS
Tensile strength in dry conditions	a)	a)	… FPC_mean_value ± 30 % (relative)	… of every reference value - 30 % (relative) to infinite	5.5 for XPS, ICB and WF
Tensile strength in dry conditions	a)	a)	… FPC_mean_value ± 30 % (relative)	… of every reference_value ± 30 % (relative)	5.5 for PU and PF; 5.8 for XPS, PU, PF, ICB and WF
Tensile strength in wet conditions	a)	a)	—	… of every reference value - 30 % (relative) to infinite	5.8 for MW lamella
Compression behaviour	a)	a)	… FPC_mean_value ± 20 % (relative)	… 0 to every reference value + 25 % (relative)	5.6 for ETIC_kits with base coat of binder type inorganic
Compression behaviour	a)	a)	… FPC_mean_value ± 20 % (relative)	… of every reference value - 25 % (relative) to infinite	5.6 for ETIC_kits with base coat of binder type organic
Water vapour permeability	a)	a)	—	… 0 to every reference value + 50 % (relative)	5.7
Pull through with reference anchor	a)	a)	—	… of every reference value - 10 % (relative) to infinite	5.8
Dynamic stiffness	a)	a)	—	… 0 to every reference value + 10 % (relative)	5.9
Airflow resistance	a)	a)	—	… of every reference value - 10 % (relative) to infinite	5.9
Thermal conductivity	a)	a)	—	… 0 to every reference value	5.10
a) according to EN 13162:2012+A1:2015 to EN 13167:2012+A1:2015, EN 13170:2012+A1:2015 or EN 13171:2012+A1:2015, depending on the kind of thermal insulation material					

Table E.5 — Test plan and conformity for plate anchors

Component property	Test method	Minimum frequency[1)]	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause / Remarks
Expansion element made of steel (if relevant)					
Dimensions (length, thread diameter, core diameter, thread length, head diameter etc.)	Calliper and/or gauge	Every manufacturing batch or 100'000 expansion elements or when raw material has been changed	… of the tolerances of nominal values indicated in the related drawings and specification documents	-[5)]	Minimum 3 test specimens
Failure load (Np) or tensile strength	ISO 898-1				
Zinc plating (if relevant)	x-ray measurement				
Plastic pellets for plate anchors					
Melt peak temperature	ISO 11357 (DSC)	Every delivery of plastic pellets	Nominal value +/- 5 K	-[5) 6)]	Minimum 2 test specimens
Density	DIN EN ISO 1183		Nominal value +/- 0.02 g/cm³	-[5) 6)]	Minimum 2 test specimens
Viscosity Number (VZ)	ISO 307		Nominal value +/- 10%	-[5) 6)]	Minimum 2 test specimens; polyamide only
Melt Flow Index (MFI)	ISO 1133		For MFI ≤ 10: nominal value +/-1 For MFI > 10: nominal value +/-10%	-[5) 6)]	Minimum 2 test specimens;
Process stabilization	Oxidation Induction Time (OIT)		Nominal value - 10%	-[5) 6)]	Minimum 2 test specimen; evidence via material test certificate (MTC);

Component property	Test method	Minimum frequency[1)]	Steadiness of production Approved, if a FPC_result falls in the range …]	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause / Remarks
					polyethylene and polypropylene only; non-virgin plastics only
Long term stabilization (if relevant) (Gas Chromatography GC)	Gas Chromatography GC		Nominal value - 10%	-[5) 6)]	Minimum 2 test specimen; evidence via material test certificate (MTC); polyamide only; non-virgin plastics only
Admissible contamination [4)] by tensile test	ISO 27-1		Nominal tensile modulus, nominal stress at yield[2)] or at break[2)]: - 10%[3)]	-[5) 6)]	Evidence via material test certificate (MTC); non-virgin plastics only
Admissible contamination [4)] by impact toughness	ISO 180/1A		Nominal impact toughness - 10%[3)]	-[5) 6)]	Minimum 5 test specimens; non-virgin plastics only
Impact toughness			impact toughness -10%[3)]	-[5) 6)]	Minimum 5 test specimens; non-virgin plastics only
Plate anchor					
Flawless of plastic parts	Visual inspection	One shot of each production lot or shift	No damages, no cracks, no burning spots, no dirt	No damages, no cracks, no burning spots, no dirt	All of one shot
Dimensions (plate and shank diameter, length)	Calliper and/or gauge		…of tolerances of nominal values indicated in the related drawings and specification documents	-[5)]	Minimum 3 test specimens
1) The higher frequency is decisive					

Component property	Test method	Minimum frequency[1)]	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause / Remarks
2) Stress at yield for ductile plastics (e.g. Polyethylene, Polypropylene, Polyamide) and stress at break for brittle plastics (e.g. glass fibre reinforced polyamide or glass fibre reinforced polypropylene) 3) The given tolerances refer to nominal specification given by supplier. If greater tolerances are desired, testing shall be done with boundary samples 4) Contaminations may influence mechanical performance thus mechanical performance has to be monitored 5) Reference values must fall in the range of tolerances of nominal values indicated in the related drawings and specification documents 6) It is accepted that the determined reference_value is declared to be the nominal value					

Table E.6 — Test plan for helix type anchors

Component property	Test method	Minimum frequency[1)]	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause / Remarks
Expansion element made of steel (if relevant)					
Dimensions (shank diameter, head diameter, length)	Calliper and/or gauge	Every manufacturing batch or 100'000 expansion elements or when raw material has been changed	… of the tolerances of nominal values indicated in the related drawings and specification documents	-[5)]	Minimum 3 test specimens
Failure load (Np) or tensile strength	ISO 898-1				
Zinc plating (if relevant)	x-ray measurement				
Plastic pellets for helix_type anchors					
Melt peak temperature	ISO 11357 (DSC)	Every delivery of plastic pellets	Nominal value +/- 5 K	-[5) 6)]	Minimum 2 test specimens
Density	DIN EN ISO 1183		Nominal value +/- 0.02 g/cm^3	-[5) 6)]	Minimum 2 test specimens
Viscosity Number (VZ)	ISO 307		Nominal value +/- 10%	-[5) 6)]	Minimum 2 test specimens; polyamide only
Melt Flow Index (MFI)	ISO 1133		For MFI ≤ 10: nominal value +/-1 For MFI > 10: nominal value +/-10%	-[5) 6)]	Minimum 2 test specimens; polyethylene and polypropylene only
Process stabilization	Oxidation Induction Time (OIT)		Nominal value - 10%	-[5) 6)]	Minimum 2 test specimen; evidence via material test certificate (MTC);

Component property	Test method	Minimum frequency[1)]	Steadiness of production Approved, if a FPC_result falls in the range … Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values	Relevant clause / Remarks
					non-virgin plastics only
Long term stabilization (if relevant) (Gas Chromatography GC)	Gas Chromatography GC		Nominal value - 10%	-[5) 6)]	Minimum 2 test specimen; evidence via material test certificate (MTC); non-virgin plastics only
Admissible contamination [4)] by tensile test	ISO 27-1		Nominal tensile modulus[6)], nominal stress at yield[2) 6)] or at break[2)]: - 10%[3)]	-[5) 6)]	Evidence via material test certificate (MTC); non-virgin plastics only
Admissible contamination [4)] by impact toughness	ISO 180/1A		Nominal impact toughness - 10%[3)]	-[5) 6)]	Minimum 5 test specimens; non-virgin plastics only
Helix_type anchor					
Flawless of plastic parts (helix)	Visual inspection	One shot of each production lot or shift	No contraction cavities, no voids, no burns, no flow lines	No contraction cavities, no voids, no burns, no flow lines	All of one shot
Dimensions of helix and anchor length	Calliper and/or gauge		…of tolerances of nominal values indicated in the related drawings and specification documents	-[5)]	Minimum 3 test specimens

1) The higher frequency is decisive
2) Stress at yield for ductile plastics (e.g. Polyethylene, Polypropylene, Polyamide) and stress at break for brittle plastics (e.g. glass fibre reinforced Polyamide or glass fibre reinforced Polypropylene)
3) The given tolerances refer to nominal specification given by supplier. If greater tolerances are desired, testing shall be done with boundary samples
4) Contaminations may influence mechanical performance thus mechanical performance has to be monitored
5) Reference values must fall in the range of tolerances of nominal values indicated in the related drawings and specification documents
6) It is accepted that the determined reference_value is declared to be the nominal value

Table E.7 — Test plan and conformity for dry_mix base coats

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Fresh mortar gross density	EN 1015-6: 1998+A1:2006	Once per production week	… FPC_mean_value ± 8 % (relative)	… of every reference_value ± 8 % (relative)	5.8
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2,0 % (absolute)	… 0,0 % to every reference_value + 2,0 % (absolute)	5.8
Particle size grading	EN 1015-1: 1998+A1:2006 (63 µm sieve is not mandatory)	Once per production week	… lower limit to upper limit according Table F.1, considering FPC_mean_value as value. Every single fraction shall be considered.	… lower limit to upper limit according Table F.1, considering every reference_value as value. Every single fraction shall be considered.	5.8

Table E.8 — Test plan and conformity for ready_to_use basecoats

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Fresh mortar gross density	EN 1015-6: 1998+A1:2006	Once per week or once per week of production	… ± 10 % (relative)	… of every reference value ±10% (relative)	5.2
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per per production week	…FPC mean value ± 2,0 % (absolute)	… of every reference_value ± 2,0 % (absolute)	5.8

Table E.9 — Test plan and conformity for glass fibre mesh

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference values / Remarks
Ash content	ISO 1887 (625 ± 25) °C	Once per production week	… FPC_mean_value ± 2,5 % (absolute)	… of every reference_value - 2,5 % (absolute) to 100%	5.2.6.5
Mass per unit area	EN 13496:2013	Once per month of production	… FPC_mean_value ± 6,5 % (relative)	… of every reference_value ± 6,5 % (relative)	5.2.5, 5.6
Mass per unit area	EN 13496:2013	Once per month of production	… FPC_mean_value ± 6,5 % (relative)	… of every reference_value – 6,5 % (relative) to infinite	5.2.6.3, 5.2.6.4, 5.4
Mesh size	EN 13496:2013	Once per month of production	… FPC_mean_value ± 10 %, both length and width	… 0,0 % to every reference_value, both length and width, + 10%	5.5, 5.8.4, 5.8.5
Tensile strength under normal conditions	EN 13496:2013	Once per month of production	… FPC_mean_value ± 10 %	… of every reference_value – 10 % (relative) to infinite	5.5, 5.8.4, 5.8.5
Tensile strength after conditioning in aggressive medium	EN 13496:2013	Once per month of production	… FPC_mean_value ± 10 %	… of every reference_value – 10 % (relative) to infinite	5.5, 5.8.4, 5.8.5

Table E.10 — Test plan and conformity for metal mesh

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Mass per unit area	EN 13496:2013	Once per month of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative)	5.6, 5.8.6
Mesh size	Caliper, measure center-center	Once per month of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative)	5.6, 5.8.6
Wire thickness	Micrometer accuracy 0,01 mm	Once per 10 t of wire production	… FPC_mean_value ± 0,1 mm	… of every reference_value ± 0,1 mm	5.6, 5.8.6
Corrosion protection	EN 10244-1 [a]	Once per 2000 m of wire production	… FPC_mean_value ± 10 % (relative)	… of every reference_value – 10 % (relative)	5.6, 5.8.6

[a] The blanc wire diameter is determined as average diameter from cross & longitudinal wire diameter measurement.sample size 150x150 mm - method of double weighing. The zinc coating is determined on a square piece of welded mesh of approximately 300 cm^2 by the gravimetrical method according to EN 10244-1, calculated by

$$Coating\ mass\ per\ unit\ area = \frac{m_{wire\ with\ zinc} - m_{wire\ without\ zink}}{m_{wire\ without\ zink}} \times \frac{1962{,}5}{d_{wire\ without\ zinc}}$$

with

$m_{wire\ with\ zinc}$ wire weight before removing the zinc coating with HCl

$m_{wire\ without\ zinc}$ wire weight after removing the zinc coating with HCl

$d_{wire\ without\ zinc}$ wire diameter, measured on blanc wire without zinc coating (mean value of 3 wires, measured in both directions MD and CMD)

Table E.11 — Test plan and conformity for key coat

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Organic content	5.2.4	Once per year	—	… of every reference_value - 0,2 % (absolute) to infinite	5.4, 5.5, 5.8
Density	EN ISO 281 1-1:2016	Once per week or once per week of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative) [a]	5.7
Dry extract	EN ISO 325 1:2019	Once per week or once per week of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative) [a]	5.7
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2 % (absolute)	… of every reference_value ± 2 % (absolute) [a]	5.7
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Table E.12 — Test plan and conformity for dry_mix finishing coat

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Fresh mortar gross density	EN 1015-6: 1998+A1:2006	Once per production week	… FPC_mean_value ± 8 % (relative)	… of every reference_value ± 8 % (relative) [a]	5.8
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2,0 % (absolute)	… 0,0 % to every reference_value + 2,0 % (absolute) [a]	5.8
Particle size grading	EN 1015-1: 1998+A1:2006 (63 µm sieve is not mandatory)	Once per production week	… lower limit to upper limit according Table F.1, considering FPC_mean_value as value. Every single fraction shall be considered.	… lower limit to upper limit according Table F.1, considering every reference_value as value. Every single fraction shall be considered. [a]	5.8
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Table E.13 — Test plan and conformity for ready_to_use finishing coat

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Flame retardant content	5.2.4	Once per year	—	… 0 to every reference_value + 0,1 % (absolute)	5.2
Gross density	EN ISO 281 1-1:2016	Once per production week	…FPC mean value ± 10 % (relative)	… of every reference value ± 10 % (relative) [a]	5.8
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC mean value ± 2 % (absolute)	… of every reference value ± 2 % (absolute) [a]	5.8
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Table E.14 — Test plan and conformity for decorative coat

Component property	Test method	Minimum frequency	Steadiness of production Approved, if a FPC_result falls in the range …	Comparability of FPC_results with reference_values Approved, if a FPC_result falls in the range …	Relevant clause for reference_values / Remarks
Organic content	5.2.4	Once per year	—	… 0 to every reference_value + 0,2 % (absolute)	5.2
Organic content	5.2.4	Once per year	—	… of every reference_value - 0,2 % (absolute) to infinite	5.8
Density	EN ISO 281 1-1:2016	Once per week or once per week of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative) [a]	5.7
Dry extract	EN ISO 325 1:2019	Once per week or once per week of production	… FPC_mean_value ± 10 % (relative)	… of every reference_value ± 10 % (relative) [a]	5.7
Ash content	EN ISO 345 1-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC_mean_value ± 2 % (absolute)	… of every reference_value ± 2 % (absolute) [a]	5.7
[a] only valid for components, which were part of the assessment, i.e. part of test specimen(s)					

Annex F
(normative)

Table for particle distribution

Table F.1 — Range for particle size grading

Lower limit	Value	Upper limit		Lower limit	Value	Upper limit		Lower limit	Value	Upper limit
0,0 %	0 %	4,3 %		24,8%	34 %	43,2 %		59,1%	68 %	76,9 %
0,0 %	1 %	5,3 %		25,7%	35 %	44,3 %		60,2%	69 %	77,8 %
0,0 %	2 %	6,3 %		26,6%	36 %	45,4 %		61,3%	70 %	78,7 %
0,0 %	3 %	7,3 %		27,5%	37 %	46,5 %		62,5%	71 %	79,5 %
0,0%	4 %	8,3 %		28,5%	38 %	47,5 %		63,6%	72 %	80,4 %
0,7%	5 %	9,3 %		29,4%	39 %	48,6 %		64,8%	73 %	81,2 %
1,7%	6 %	10,3 %		30,3%	40 %	49,7 %		65,9%	74 %	82,1 %
2,7%	7 %	11,3 %		31,3%	41 %	50,7 %		67,1%	75 %	82,9 %
3,7%	8 %	12,3 %		32,2%	42 %	51,8 %		68,3%	76 %	83,7 %
4,7%	9 %	13,3 %		33,1%	43 %	52,9 %		69,5%	77 %	84,5 %
5,7%	10 %	14,3 %		34,1%	44 %	53,9 %		70,7%	78 %	85,3 %
6,4%	11 %	15,6 %		35,1%	45 %	54,9 %		71,9%	79 %	86,1 %
7,1%	12 %	16,9 %		36,0%	46 %	56,0 %		73,1%	80 %	86,9 %
7,8%	13 %	18,2 %		37,0%	47 %	57,0 %		74,3%	81 %	87,7 %
8,6%	14 %	19,4 %		38,0%	48 %	58,0 %		75,5%	82 %	88,5 %
9,3%	15 %	20,7 %		39,0%	49 %	59,0 %		76,8%	83 %	89,2 %
10,0%	16 %	22,0 %		40,0%	50 %	60,0 %		78,0%	84 %	90,0 %
10,8%	17 %	23,2 %		41,0%	51 %	61,0 %		79,3%	85 %	90,7 %
11,5%	18 %	24,5 %		42,0%	52 %	62,0 %		80,6%	86 %	91,4 %
12,3%	19 %	25,7 %		43,0%	53 %	63,0 %		81,8%	87 %	92,2 %
13,1%	20 %	26,9 %		44,0%	54 %	64,0 %		83,1%	88 %	92,9 %
13,9%	21 %	28,1 %		45,1%	55 %	64,9 %		84,4%	89 %	93,6 %
14,7%	22 %	29,3 %		46,1%	56 %	65,9 %		85,7%	90 %	94,3 %
15,5%	23 %	30,5 %		47,1%	57 %	66,9 %		86,7%	91 %	95,3 %
16,3%	24 %	31,7 %		48,2%	58 %	67,8 %		87,7%	92 %	96,3 %
17,1%	25 %	32,9 %		49,3%	59 %	68,7 %		88,7%	93 %	97,3 %
17,9%	26 %	34,1 %		50,3%	60 %	69,7 %		89,7%	94 %	98,3 %
18,8%	27 %	35,2 %		51,4%	61 %	70,6 %		90,7%	95 %	99,3 %
19,6%	28 %	36,4 %		52,5%	62 %	71,5 %		91,7%	96 %	100,0 %
20,5%	29 %	37,5 %		53,5%	63 %	72,5 %		92,7%	97 %	100,0 %
21,3%	30 %	38,7 %		54,6%	64 %	73,4 %		93,7%	98 %	100,0 %
22,2%	31 %	39,8 %		55,7%	65 %	74,3 %		94,7%	99 %	100,0 %
23,1%	32 %	40,9 %		56,8%	66 %	75,2 %		95,7%	100 %	100,0 %
23,9%	33 %	42,1 %		57,9%	67 %	76,1 %				

NOTE 1 Example for particle size grading of a dry_mix base coat. A test result according to EN 1015-1:1998+A1:2006 is the following cumulative curve/table:

a) FPC_test_result: 4,2 % ≤ 125 µm, 15,3 % ≤ 250 µm, 84,2 % ≤ 500 µm, 92,1 % ≤ 1 000 µm, 98,3 % ≤ 2 000 µm;

b) FPC_mean_value: 1,0 % ≤ 125 µm, 20,2 % ≤ 250 µm, 79,1 % ≤ 500 µm, 90,5 % ≤ 1 000 µm, 99,9 % ≤ 2 000 µm;

c) Lower limits according to Table F.1: 0,0 % ≤ 125 µm, 13,1 % ≤ 250 µm, 71,9% ≤ 500 µm, 86,7 % ≤ 1 000 µm, 95,7 % ≤ 2 000 µm;

d) Upper limits according to Table F.1: 5,3 % ≤ 125 µm, 26,9 % ≤ 250 µm, 86,1% ≤ 500 µm, 95,3 % ≤ 1 000 µm, 100,0 % ≤ 2 000 µm.

The FPC_test_result matches the steadiness of production criteria. The measurement of the 63 µm sieve would not change the matching, as the measurement of the 125 µm sieve is already ≤ 4,3 %. The measurements of the 4 000 µm and 8 000 µm sieves would not change the matching as the measurement of the 2 000 µm sieve is already ≥ 95,7 %. The other sieves can be used for the test of this component only.

NOTE 2 Example for particle size grading of a dry_mix finishing coat. A test result according to EN 1015-1:1998+A1:2006 is the following cumulative curve/table.

a) FPC_test_result: 2,1 % ≤ 250 µm, 76,3 % ≤ 500 µm, 97,5 % ≤ 1 000 µm;

b) FPC_mean_value: 2,5 % ≤ 250 µm, 75,1 % ≤ 500 µm, 95,7 % ≤ 1 000 µm;

c) Lower limits according to Table F.1: 0,0 % ≤ 250 µm, 67,1 % ≤ 500 µm, 91,7 % ≤ 1 000 µm;

d) Upper limits according to Table F.1: 7,3 % ≤ 250 µm, 82,9 % ≤ 500 µm, 100,0 % ≤ 1 000 µm.

The FPC_test_result matches the steadiness of production criteria. The measurements of the 63 µm and 125 µm sieve would not change the matching, as the measurement of the 250 µm sieve is already ≤ 4,3 %. The measurements of the 2 000 µm, 4 000 µm and 8 000 µm sieves would not change the matching as the measurement of the 1 000 µm sieve is already ≥ 95,7 %. The 250 µm, 500 µm and 1 000 µm sieves may be used for the test of this component only.

Annex ZA
(informative)

(When applying this standard as a harmonized standard under Regulation (EU) No. 305/2011, manufacturers and Member States are obliged by this regulation to use this Annex)

ZA.1 Relevant clauses for ETICS and intended use

This European Standard has been prepared under standardization request M489 — External thermal insulation composite systems/ETIC_kits with a rendering system (ETICS) given to CEN and CENELEC by the European Commission (EC) and the European Free Trade Association (EFTA).

When this European Standard is cited in the Official Journal of the European Union (OJEU), under Regulation (EU) No 305/2011, it shall be possible to use it as a basis for the establishment of the Declaration of Performance (DoP) and the CE marking, from the date of the beginning of the co-existence period as specified in the OJEU.

Regulation (EU) No 305/2011, as amended, contains provisions for the DoP and the CE marking.

Table ZA.1 — Relevant clauses for ETICS and intended use

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
Reaction to fire	5.2	Euroclass A1, A2, B, C, D, E, F	
Reaction to fire of the PU adhesive foam	5.2.1	Euroclass A1, A2, B, C, D, E, F	
Reaction to fire of the thermal insulation	5.2.2	Euroclass A1, A2, B, C, D, E, F	
Apparent density of thermal insulation	5.2.3		levels with steps of 0,1 kg/m^3
Organic content of the base and the finishing coat	5.2.4		levels with steps of 0,1 %
Q_{PCS}-Value of the base coat and finishing coat	5.2.5		single values according to EN ISO 1716:2018
Mass per unit area of the reinforcement	5.2.6		levels with steps of 0,1 kg/m^2
Reaction to fire of ETIC kits	5.2.7	Euroclass A1, A2, B, C, D, E, F	

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
Propensity to undergo continues smouldering	5.3	—	
Water absorption	5.4		kg/m² rounded to 0,1
Water tightness	5.5	codes “hw”, “hwc”, “hwcft” acc. to EN 16383:2016	
Impact resistance	5.6	code consisting of three parts part1: “S”, “SB” part 2: impact energy in Joule part 3: “w”, “hw”, “hwc”, “hwcft” acc. to EN 13497:2018	
Water vapour permeability	5.7	—	
Water vapour permeability of thermal insulation	5.7.2		μ rounded to 0,01
Water vapour permeability of base coat	5.7.3		s_D in m rounded to 0,1 acc. to EN 15824:2017 or μ rounded to 0,01 acc. to EN 998-1:2016
Water vapour permeability of finishing coat	5.7.4		s_D in m rounded to 0,1 acc. to EN 15824:2017 or μ rounded to 0,01 acc. to EN 998-1:2016 or s_D in m rounded to 0,1 in all other

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
			cases
Water vapour permeability of finishing coat with key and/or decorative coat	5.7.5		s_D in m rounded to 0,1 acc. to EN 15824:2017 or μ rounded to 0,01 acc. to EN 998-1:2016 or s_D in m rounded to 0,1 in all other cases
Bond strength / Fixing strength	5.8		See 5.8.6.2 for relevance of this proxy for a fixing method
Bond strength of adhesive to the thermal insulation	5.8.2	For ETICS bonded with adhesive and for ETICS bonded with adhesive and supplementary plate anchors, a test result for bond strength of adhesive to thermal insulation shall be ≥ 80 kPa; one measurement ≤ 80 kPa but ≥ 60 kPa is admissible	kPa rounded to 1
Tensile strength perpendicular to the surface of the thermal insulation	5.8.3		levels with steps of 0,1 kPa
Bond strength of the reinforced base coat to the thermal insulation	5.8.4	For ETICS bonded with adhesive and for ETICS bonded with adhesive and	kPa rounded to 0,5

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
		supplementary plate anchors, a test result for bond strength of base coat to thermal insulation after each conditioning shall be at least 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than 60 kPa is admissible.	
Bond strength of the rendering system to the thermal insulation	5.8.5	For ETICS bonded with adhesive and for ETICS bonded with adhesive and supplementary plate anchors, a test result for rendering system to thermal insulation after each conditioning shall be at least 80 kPa or cohesion fracture within the insulation material. Where no fracture in the insulation material occurs, one measurement lower than 80 kPa but higher than	kPa rounded to 0,5

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
		60 kPa is admissible.	
Fixing strength of mechanical fixing devices	5.8.6		See 5.8.6.2 for relevance of this proxy for a fixing method
Fixing strength of plate anchors according to EN 16382:2016	5.8.6.3		kN rounded to 0,5 together with the anchor position concerned
Fixing strength of plate helix_type anchors according to EN 16382:2016	5.8.6.4		
Load bearing capability	5.8.6.5		Fk,block in kPa rounded to 0,5. See 5.8.6.2 for relevance of this proxy for a fixing method
Characteristic load resistance and characteristic load stiffness of a plate anchor	5.8.6.6		F_p in kN rounded to 0,1 (load resistance) k_p in kN/mm rounded to 0,1 (plate stiffness). See 5.8.6.2 for relevance of this proxy for a fixing method
Airborne sound insulation	5.9		
Dynamic stiffness	5.9.1	-	
Airflow resistance	5.9.2	-	Relevant for thermal

Product:	External Thermal Insulation Composite Systems / Kits with a rendering system (ETIC_kits)
Intended use	External thermal insulation to be used on external walls (including cladding) and/ or external finishes of walls

Essential Characteristics **Proxy Characteristics**	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes**
Weight of rendering system	5.9.3	-	insulation of the material MW, WF only
Thermal resistance	5.10		
Thermal resistance of ETICS without anchors	5.10.1		steps of 0,05 $m^2 \cdot K/W$
Thermal transmittance of anchors	5.10.2		Relevant for fixing methods I, III, IV and VIII
Correction factor for u-value of profiles and rails	5.10.3		Relevant for fixing methods VI and VII
Correction factor for u-value of collar anchors and anchors for anchored metal mesh	5.10.4		Relevant for fixing method VIII
Durability	included in 5.2.3 5.2.4 5.2.6 5.2.8	—	

ZA.2 System of assessment and verification of constancy of performance (AVCP)

The AVCP system of External Thermal Insulation Composite systems / ETIC_kits with a rendering system (ETICS) indicated in Table ZA.1 can be found in the EC legal act(s) adopted by the EC: European Commission Decision 2011/14/EU of 2011-01-13 Decision (notified under document C (2011) 34) OJ L 10/5 14.1.2011.

ZA.3 Assignment of AVCP tasks

The AVCP system External Thermal Insulation Composite systems / ETIC_kits with a rendering system (ETICS) as provided in Table ZA.1 is defined in Table ZA.3.1 resulting from application of the clauses of this or other European Standards indicated therein. The content of the tasks assigned to the notified body shall be limited to those essential characteristics, if any, as provided for in Annex III of the relevant standardization request and to those that the manufacturer intends to declare.

Taking into account the AVCP systems defined for the products and the intended uses the following tasks are to be undertaken by the manufacturer and the notified body respectively for the assessment and verification of the constancy of performance of the product.

Table ZA.2 — Assignment of AVCP tasks for External Thermal Insulation Composite systems / ETIC_kits with a rendering system (ETICS) under system 1

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	
	Further testing of samples taken at the manufacturing plant by the manufacturer in accordance with the prescribed test plan	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	
Tasks for the notified product certification body	An assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	
	Initial inspection of manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which is declared. Documentation of the FPC.	
	Continuing surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which is declared. Documentation of FPC	

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EN 12664:2001, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Dry and moist products of medium and low thermal resistance*

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EN ISO 1182:2010, *Reaction to fire tests for products — Non-combustibility test (ISO 1182:2010)*

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