CEN/TC 88/WG 18 "External thermal insulation composite systems"
WG Secretariat: **DIN**
Convenor: **Lohmann Thomas Mr Dr.**

prEN 17237 - Draft (clean version, 2023-07-28)

Document type	Related content	Document date	Expected action
Project / Draft		2023-07-28	**INFO**

Description

Dear Sir or Madam

Attached you will find the draft of prEN 17237 where minor changes were implemented. The project WI 00088459 (prEN 17237) will be frozen as the current running project is expected to be replaced by a new PWI.

CEN will cancel the ongoing process due to expiration of the project duration. In order not to lose any data, the project will be rewritten as a PWI and the attached draft will serve as a basis for the new PWI.

Please view recommendation 01/2023 and 02/2023 for further information (N 1395).

Yours sincerely

DIN Standards Committee Coatings and Coating Materials

Kaja Pack

Secretary of CEN/TC 88/WG 18

CEN/TC 88

Date: 2023-07

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Secretariat: DIN

Thermal insulation products for buildings — External thermal insulation composite kits with a rendering system (ETICS kits) — Characteristics

ICS:

Contents

Page

European foreword 7
Introduction 8
1 Scope 8
2 Normative references 9
3 Terms and definitions 13
3.1 Terms and definitions 13
3.1.1 General 13
3.1.2 Components 19
3.1.3 Fixing methods 23
3.1.4 Other 30
3.2 Symbols and units 33
3.3 Abbreviated terms 36
4 Characteristics 36
4.1 General 36
4.2 Reaction to fire 36
4.3 Water absorption 37
4.4 Water tightness 37
4.5 Impact resistance 38
4.6 Water vapour permeability 39
4.7 Bond strength 39
4.7.1 Bond strength of adhesive to thermal insulation 39
4.7.2 Tensile strength perpendicular to faces of thermal insulation 41
4.7.3 Bond strength of the reinforced base coat to the thermal insulation 42
4.7.4 Bond strength of the rendering system to the thermal insulation in the ETICS kit 43
4.8 Fixing strength 44
4.8.1 General 44
4.8.2 Pull-through resistance 44
4.8.3 Pull-off tensile resistance 45
4.8.4 Pull-off tensile-shear resistance 45
4.8.5 Lateral shear resistance 46
4.8.6 Reduction factor 46
4.8.7 Characteristic load resistance of a plate anchor 47
4.8.8 Characteristic plate stiffness of a plate anchor 47
4.8.9 Fixing strength of anchored rails 47
4.8.10 Fixing strength of collar anchor 48
4.9 Airborne sound insulation 48
4.9.1 General 48
4.9.2 Dynamic stiffness of the thermal insulation 48
4.9.3 Airflow resistivity of the thermal insulation 49
4.9.4 Weight of rendering system 49
4.10 Thermal resistance 49
4.10.1 General 49
4.10.2 Thermal resistance of the thermal insulation 49

4.10.3 Point thermal transmittance of anchor 50
4.10.4 Δ*u*-value of profiles and rails 50
4.10.5 *Δu-value* of anchored metal mesh 50

5 Testing, assessment and sampling methods 51
5.1 General 51
5.1.1 Test specimens 51
5.1.2 Determination 51
5.1.3 Reporting 51
5.2 Reaction to fire 51
5.2.1 Determination for the product 51
5.2.2 Determination for the components 59
5.3 Water absorption 64
5.3.1 Preparation 64
5.3.2 Determination 64
5.3.3 Reporting 66
5.3.4 DiAp 66
5.4 Water tightness 67
5.4.1 Determination for the product 67
5.4.2 Determination for the components 72
5.5 Impact resistance 73
5.5.1 Preparation 73
5.5.2 Determination 73
5.5.3 Reporting 73
5.5.4 DiAp 73
5.6 Water vapour permeability 74
5.6.1 Determination for the components 74
5.7 Bond strength 76
5.7.1 Bond strength of adhesive to thermal insulation 76
5.7.2 Tensile strength perpendicular to faces of thermal insulation 78
5.7.3 Bond strength of the reinforced base coat to the thermal insulation 79
5.7.4 Bond strength of the rendering system to the thermal insulation in the ETICS kit 80
5.8 Fixing strength 82
5.8.1 Pull-through resistance 82
5.8.2 Pull-off tensile resistance 86
5.8.3 Pull-off tensile-shear resistance 88
5.8.4 Lateral shear resistance 92
5.8.5 Reduction factor 94
5.8.6 Characteristic load resistance of a plate anchor 95
5.8.7 Characteristic plate stiffness of a plate anchor 96
5.8.8 Fixing strength of anchored rails 96
5.8.9 Fixing strength of collar anchor 97
5.9 Airborne sound insulation 98
5.9.1 Dynamic stiffness of thermal insulation 98
5.9.2 Airflow resistivity of thermal insulation 99
5.9.3 Weight of rendering system 99
5.10 Thermal resistance 99
5.10.1 Thermal resistance of thermal insulation 99
5.10.2 Point thermal transmittance of anchor 100
5.10.3 *Δu-value* of profiles and rails with collar anchors 101
5.10.4 *Δu-value* of anchors for anchored metal mesh 101

6 Assessment and verification of constancy of performance – AVCP 101
6.1 General 101

6.2 Assessment of performance 101
6.2.1 General 101
6.2.2 Test samples, testing and assessment criteria 102
6.3 Verification of constancy of performance 103
6.3.1 Factory production control (FPC) 103
6.3.2 Initial inspection of factory and of FPC 105
6.3.3 Continuous surveillance of FPC 105

Annex A (normative) Parameters related to the basic components and to the fixing methods of the ETICS kits with the methods of their verification and acceptance criteria 106

A.1 Adhesives 106
A.1.1 Dry mix or ready to use adhesives 106
A.1.2 PU adhesive foam 106

A.2 Thermal insulation 107

A.3 Mechanical fixing device 109
A.3.1 Plate anchor 109
A.3.1.1 Plate anchor applied by expansion of a plastic sleeve in a pre-drilled hole 109
A.3.1.2 Plate anchor with powder actuated steel fastener 109
A.3.2 Spiral anchor 110
A.3.3 Collar anchor of the type “nailed-in” or of the type “screwed-in” 110
A.3.4 Profile made of polyvinylchloride or aluminium 111
A.3.5 Rail made of polyvinylchloride or aluminium 111
A.3.6 Anchor for an anchored metal mesh made of steel 111

A.4 Base coat 111
A.4.1 Dry mix base coat according to EN 998-1:2016 111
A.4.2 Ready to use base coat according to EN 15824:2017 111

A.5 Reinforcement 111
A.5.1 Glass fibre mesh 111
A.5.2 Stainless steel mesh according to AISI 302 or 304, galvanized after welding (Metal mesh) 112

A.6 Key coat 112

A.7 Finishing coat 112
A.7.1 Dry mix finishing coat according to EN 998-1:2016 112
A.7.2 Ready to use finishing coat according to EN 15824:2017 112
A.7.3 Finishing coat not according to EN 998-1:2016 and not according to EN 15824:2017 (Other finishing coat) 112

A.8 Decorative coat 112

A.9 Fixing method 113

Annex B (normative) Calculation of $PCS_{ETICS\ kit}$ (formulae and example) 117

B.1 General 117

B.2 Example 117

Annex C (normative) Characteristic load resistance and characteristic plate stiffness of plate anchors in the ETICS kit 118

C.1 General 118

C.2 Sampling, test specimen, conditioning and testing 118

C.3 Calculation 119
C.3.1 Characteristic load resistance 119
C.3.2 Characteristic plate stiffness 120

Annex D (normative) Point thermal transmittance of one plate or spiral anchor in the ETICS kit 122

D.1 General 122

D.2 Assessment of the point thermal transmittance 122
D.2.1 General 122
D.2.2 Calculation of the point thermal transmittance 123

D.3 Calculation 123
D.3.1 Determination 123
D.3.2 Reference construction 123
D.3.3 Consideration of anchor properties 124
D.3.4 Boundary conditions 124
D.3.5 Calculations according to EN ISO 10211:2017 125
D.3.5.1 General 125
D.3.5.2 Construction of a finite element system 125
D.3.5.3 Subdivision of the system 125
D.3.5.4 Determination of the thermal transmittance 125

Annex E (normative) Test plan and conformity tables 126

Annex F (normative) Table for particle distribution 151

Annex G (normative) Calculations for pull-off resistance 153

G.1 General 153

G.2 Test specimen showing anchors in middle area position only 153

G.3 Test specimen showing anchors in different anchor setting positions 154

G.4 Test specimen showing profiles and rails 157

G.5 Test specimen showing anchored metal mesh 157

Annex H (normative) Comparison of FPC test results with reference values 158

H.1 General 158
H.1.1 Validity sector with a lower limit 158
H.1.2 Validity sector with an upper limit 160
H.1.3 Validity sector with a lower and an upper limit 161
H.1.4 Validity sector derived from multiple reference values 162
H.1.5 Stability of production 162
H.1.6 Conformity of FPC test results with one production line 163
H.1.7 Conformity of FPC test results with more than one production line 167
H.1.8 Conformity of FPC test results of components not used for test specimens 167

Annex I (informative) Indirect testing with component properties – FPC examples 169

I.1 General 169

I.2 Procedure 169

I.3 Example 169

Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No. 305/2011 172

ZA.1 Scope and relevant characteristics 172

ZA.2 System of assessment and verification of constancy of performance (AVCP) 173
ZA.3 Assignment of AVCP tasks 174
Bibliography 175

European foreword

This document (prEN 17237:2023) 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 EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

The assessment methods take into account a working life of the ETICS kit for the intended use of at least 50 years, if installed and maintained properly in the works.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

Introduction

This document has been created by CEN/TC88/WG18, supported by many experts from across Europe. As different stakeholders were involved, in particular regulators, testing institutes, manufacturers (= system holders) and component suppliers, the current enquiry version considers many aspects of later use. However, the communication and discussion between all stakeholders should go on during enquiry.

1 Scope

This document specifies the characteristics for external thermal insulation composite kits with a rendering system (ETICS kits) for external walls and/or external finishes of walls.

In this document, ETICS kits are intended to be used on vertical external walls, which are made either of masonry (bricks, blocks, stones, etc.) or concrete (cast on site or as prefabricated panels).

NOTE Walls are considered vertical if the deviation from the vertical direction does not exceed ± 5°.

With regard to the components, this document covers ETICS kits with:

a) adhesives, which are ready to use mortars, dry mixed mortars or PU adhesive foams, all specified in A.1;

b) thermal insulations, which are made of one 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 specified in A.2;

c) mechanical fixing devices, which are plate anchors, spiral anchors, profiles and rails with collar anchors or anchors for an anchored metal mesh, all specified in A.3;

d) base coats, which are ready to use or dry mixed, all specified in A.4;

e) reinforcements, which are glass fibre meshes or metal meshes, all specified in A.5;

f) key coats, all specified in A.6;

g) finishing coats, which are ready to use or dry mixed, all specified in A.7;

h) decorative coats, all specified in A.8.

This document covers ETICS kits, which are fixed to the substrate either with adhesive or mechanical fixing devices or combination of both, clustered as the fixing methods (I to VIII), all defined in 3.1.3.1 to 3.1.3.8 and further specified in A.9.

This document specifies procedures for assessment and verification of constancy of performance (AVCP) of the ETICS kit characteristics.

This document does not cover

— ETICS kits with the components and the fixing methods a) other than those indicated above and b) not complying with the criteria for their parameters, further specified in Annex A,

— ETICS kits with other finishing layers than rendering systems, e.g. ceramic tiles, glass tiles, sand-lime-bricks, ceramic brick slips, natural and artificial stones,

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

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 755-2:2016, *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 2: Mechanical properties*

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 826:2013, *Thermal insulating products for building applications — Determination of compression behaviour*

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

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

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

EN 1015-18:2002, *Methods of test for mortar for masonry — Part 18: Determination of water absorption coefficient due to capillary action of hardened mortar*

EN 1015-19:1998, *Methods of test for mortar for masonry — Part 19: Determination of water vapour permeability of hardened rendering and plastering mortars*

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 10088-2:2014, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 10244-1:2009, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles*

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

EN 12127:1997, *Textiles — Fabrics — Determination of mass per unit area using small samples*

EN 12617-4:2002, *Products and systems for the protection and repair of concrete structures — Test methods — Part 4: Determination of shrinkage and expansion*

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 12939:2000, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Thick 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+A1:2015, *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 insulation 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+A1:2021, *Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)*

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

EN 13820:2003, *Thermal insulating materials for building applications — Determination of organic content*

EN 13823:2020, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 15715:2009, *Thermal insulation products — Instructions for mounting and fixing for reaction to fire testing — Factory made products*

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 — Methods of identification and test methods for one-component PU adhesive foam for External Thermal Insulation Composite Systems (ETICS)*

EN 29052-1:1992, *Acoustics — Determination of dynamic stiffness — Part 1: Materials used under floating floors in dwellings*

EN ISO 180:2019, *Plastics — Determination of Izod impact strength (ISO 180:2019)*

EN ISO 307:2019, *Plastics — Polyamides — Determination of viscosity number (ISO 307:2019)*

EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2013)*

EN ISO 1133-1:2011, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method (ISO 1133-1:2011)*

EN ISO 1133-2:2011, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 2: Method for materials sensitive to time-temperature history and/or moisture (ISO 1133-2:2011)*

EN ISO 1182:2020, *Reaction to fire tests for products — Non-combustibility test (ISO 1182:2020)*

EN ISO 1183-1:2019, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019, Corrected version 2019-05)*

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

EN ISO 9229:2020, *Thermal insulation — Vocabulary (ISO 9229:2020)*

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

EN ISO 10456:2007[1], *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)*

EN ISO 11357-3:2018, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization (ISO 11357-3:2018)*

EN ISO 11357-6:2018, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6:2018)*

EN ISO 11925-2:2020, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2020)*

EN ISO 12572:2016, *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties — Cup method (ISO 12572:2016)*

EN ISO 16535:2019, *Thermal insulating products for building applications — Determination of long-term water absorption by immersion (ISO 16535:2019)*

EN ISO 21306-1:2019, *Plastics — Unplasticized poly(vinyl chloride) (PVC-U) moulding and extrusion materials — Part 1: Designation system and basis for specifications (ISO 21306-1:2019)*

[1] As impacted by EN ISO 10456:2007/AC:2009.

EN ISO 29767:2019, *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion (ISO 29767:2019)*

ISO 527-1:2019, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 1887:2014, *Textile glass — Determination of combustible-matter content*

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

ISO 17738, *Thermal insulation products — Exterior insulation finish systems — Part 1: Materials*

3 Terms and definitions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229:2020 and the following apply.

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

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

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

3.1.1 General

3.1.1.2
reinforced base coat
base coat with embedded reinforcement

3.1.1.3
finishing layer
finishing coat with a key coat (optional) and/or a decorative coat (optional)

3.1.1.4
rendering system
reinforced base coat with finishing layer

3.1.1.5
External Thermal Insulation Composite kit (ETICS kit)
product specified by the comprising components together with the following information:

— bonded area;

— adhesive coverage;

— thermal insulation thickness;

— anchor plate distance perpendicular to substrate;

— number of anchors per unit area and setting position;

— distance c defining the middle area;

— minimum distance to the insulation border r_{min};

— profiles and rails distances;

— number of fixing points per rail length;

— base coat coverage;

— base coat thickness;

— key coat coverage;

— finishing coat coverage;

— finishing coat thickness;

— finishing coat aggregate size;

— decorative coat coverage;

— fixing method

Note 1 to entry: An ETICS kit is fixed to the substrate using adhesive or mechanical fixing devices with or without adhesive bed so that there is no air ventilation between the substrate and the thermal insulation layer. The continuous thermal insulation layer is faced with a rendering system consisting of two or more layers, one of which contains a reinforcement. The rendering system is applied directly to the thermal insulation boards, without any air gap or a disconnecting layer.

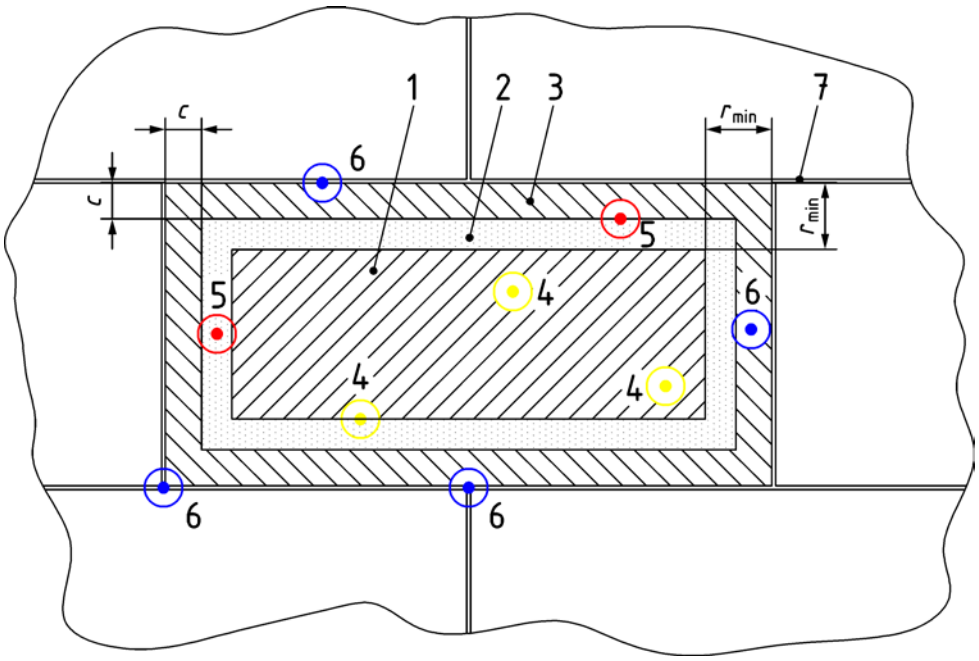
3.1.1.6
bonded area
percentage of the area of the substrate and thermal insulation simultaneously covered by the adhesive

3.1.1.7
coverage
consumption of a ready to use or wet dry mix component per unit area

3.1.1.8
aggregate size
highest peak after thinnest application of the component on a smooth surface because of the aggregate

3.1.1.9
anchor setting position
position of an anchor in relation to the edges and corners of the thermal insulation

Note 1 to entry: See Figure 1



Key

1	middle area
2	edge/corner area
3	joint area
4	middle area position example
5	edge/corner position example
6	joint area position example
7	panel border
r_{min}	minimum distance to the border according to EN 16382:2016 or the theoretical load cone according to 5.8.1.3.2.3/5.8.1.4.2.3, limiting the middle area
c	minimum edge distance according to EN 16382:2016, Figure 4d)

NOTE The solid line circles represent plate or spiral anchors.

Figure 1— Anchor setting positions

3.1.1.9.1
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 ≥ the minimum distance to the border r_{min} according to EN16382:2016 or 5.8.1.3.2.3/5.8.1.4.2.3.

Note 1 to entry: See Figure 1.

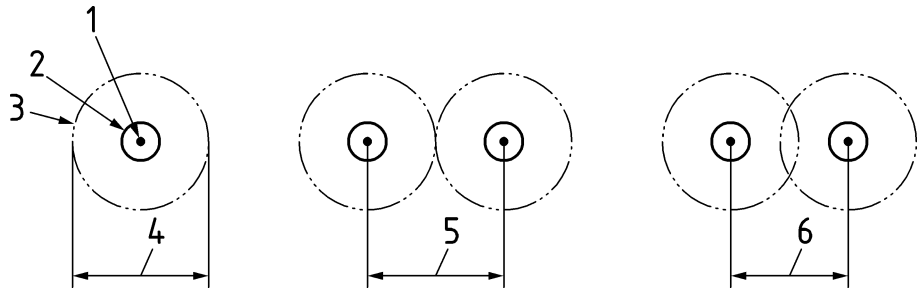
3.1.1.9.2
edge/corner position
position of an anchor in the edge/corner area of a thermal insulation board, keeping a distance ≥ c according to EN16382:2016 and < r_{min} according to EN16382:2016 or 5.8.1.3.2.3/5.8.1.4.2.3 to the border

Note 1 to entry: See Figure 1.

3.1.1.9.3
joint position
position of an anchor in the joint area of a thermal insulation board, keeping a distance < c according to EN16382:2016 to the border or set in joints

Note 1 to entry: See Figure 1.

3.1.1.10
Superposition of anchors
arrangement of anchors below the minimum distance between the anchor sleeves from which superposition is avoided d_{min}, explained in Figure 2, influencing the type of assessment of fixing strength



Key
1 anchor sleeve
2 anchor plate, including additional washer, if any
3 breaking cone according to EN 16382:2016 or theoretical load cone according to 5.8.1.3.2.3/5.8.1.4.2.3
4 d_{min} according to 5.8.1.3.2.3/5.8.1.4.2.3
5 no superposition, distance between two anchor sleeves ≥ d_{min}
6 superposition, distance between two anchor sleeves < d_{min}

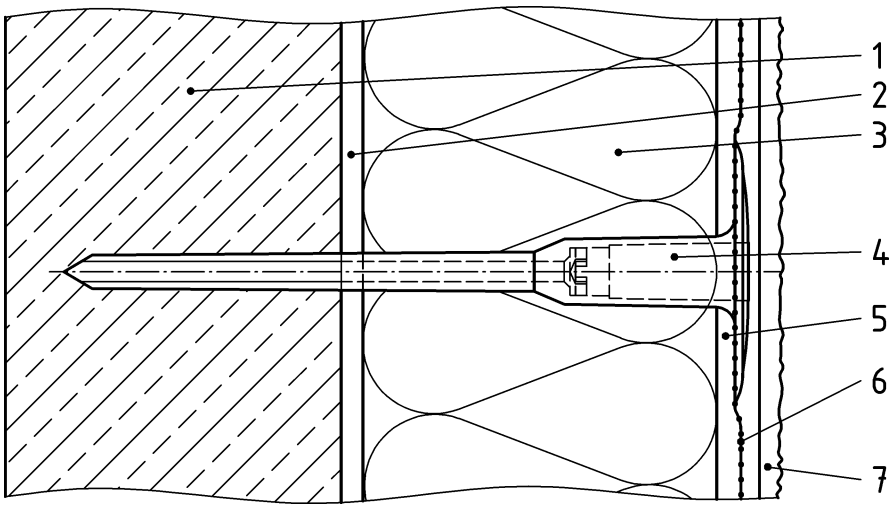
Figure 2 — Superposition of anchors

3.1.1.10
anchor plate distance perpendicular to substrate
position of an anchor plate in the thickness direction of a thermal insulation board, in particular “above the reinforcement”, “flush” or “countersunk”

Note 1 to entry: See Figure 3 to Figure 5.

3.1.1.11.1
plate anchor above reinforcement
plate anchors with a position of the anchor plate directly above reinforcement, embedded in the base coat

Note 1 to entry: See Figure 3.



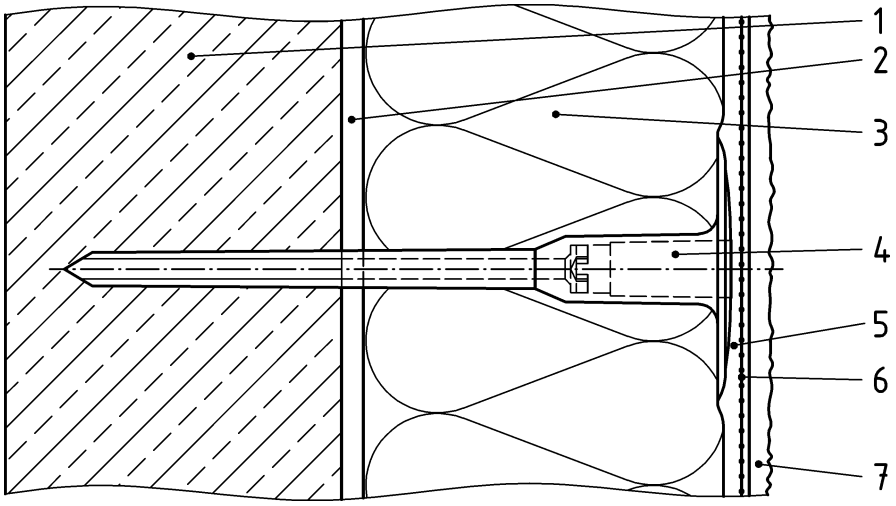
Key

1 substrate
2 adhesive
3 thermal insulation
4 plate anchor
5 base coat
6 reinforcement
7 finishing layer

Figure 3 — plate anchor above reinforcement

3.1.1.11.2
plate anchor flush
plate anchors with a position of the anchor plate flush with the thermal insulation

Note 1 to entry: See Figure 4.



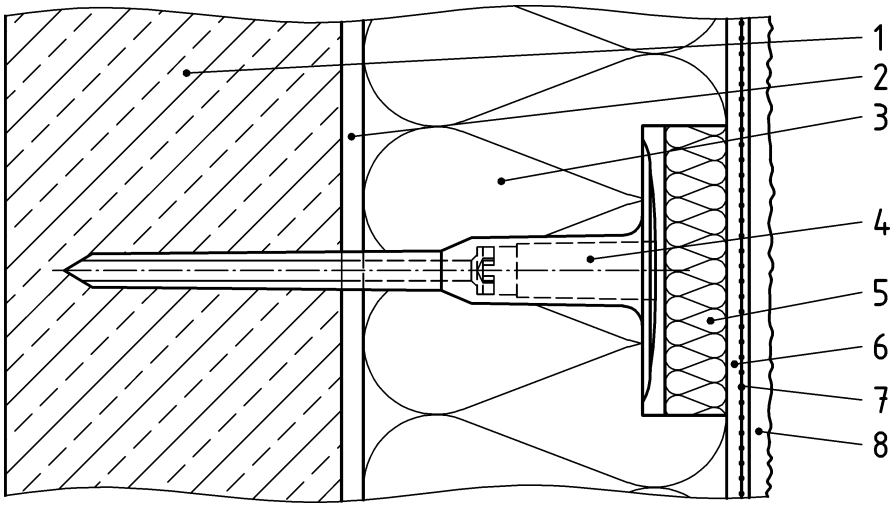
Key

1	substrate	5	base coat
2	adhesive	6	reinforcement
3	thermal insulation	7	finishing layer
4	plate anchor		

Figure 4 —Plate anchor flush

3.1.1.11.3
plate anchor countersunk
plate anchors set deeper than flush, together with a thermal insulation plug on top of the plate

Note 1 to entry: See Figure 5.



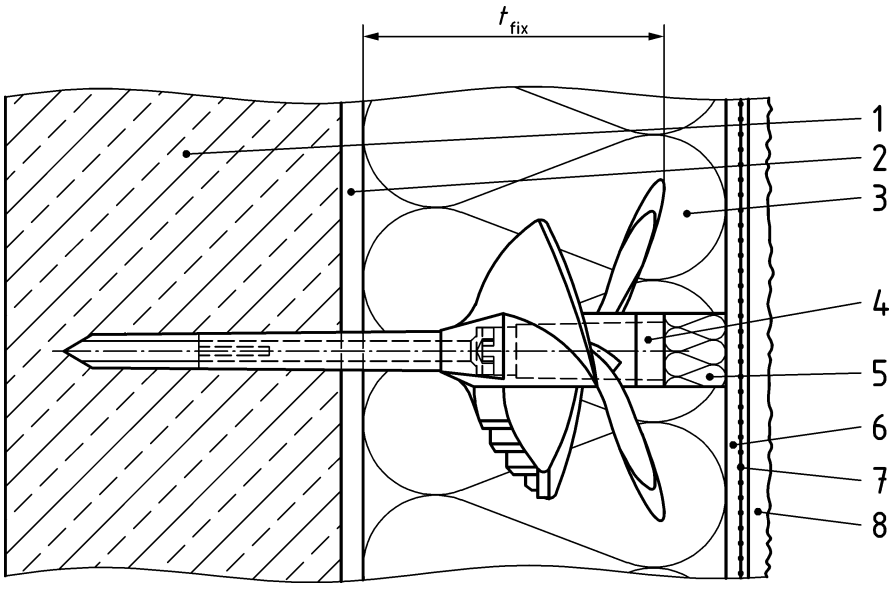
Key

1	substrate	5	thermal insulation plug
2	adhesive	6	base coat
3	thermal insulation	7	reinforcement
4	plate anchor	8	finishing layer

Figure 5 —Plate anchor countersunk

3.1.1.11.4
spiral anchor countersunk
spiral anchors are always set countersunk, with a thermal insulation plug on top

Note 1 to entry: See Figure 6.



Key
1 Substrate
2 adhesive
3 thermal insulation
4 spiral anchor
5 thermal insulation plug
6 base coat
7 reinforcement
8 finishing layer
t_{fix} thickness of fixture, which is the distance of the upper part of the spiral to the wall facing side of the thermal insulation

Figure 6 — Spiral anchor

3.1.2 Components

3.1.2.0
component
part of an ETICS kit, specified by its component name and its technical specification, produced in one or more production lines and supplied by one or more manufacturers

3.1.2.1
adhesive
component used for bonding the thermal insulation to the substrate or used for an adhesive bed

Note 1 to entry: Adhesives are available as dry mix, ready to use or PU adhesive foam.

Note 2 to entry: Adhesives contain either organic or inorganic binders.

Note 3 to entry: The adhesive is part of the assessment, regardless of its use as adhesive or adhesive bed.

3.1.2.2
dry mix
powder blended at the factory that requires only mixing with a small quantity of water specified by the manufacturer

3.1.2.3
ready to use
pastes, supplied in workable consistency to be processed directly, with a possible addition of a small quantity of water to adjust consistency

3.1.2.4
PU adhesive foam
foam of the material polyurethane, delivered in cans/containers to be sprayed

3.1.2.5
organic binder
binder type mainly consisting of organic reagents, e.g. silicon resin, synthetic resin, etc.

3.1.2.6
inorganic binder
binder type mainly consisting of inorganic reagents, e.g. cement, calcium hydroxide, alkali silicate, etc.

3.1.2.7
thermal insulation
component, thermal insulation material in its finished form, including all directly and factory-applied facings or coatings

3.1.2.7.1
mineral wool (MW) board
thermal insulation of the material mineral wool in its finished form, including any facings or coatings, with fibres oriented predominantly parallel to faces

3.1.2.7.1
mineral wool (MW) dual-layer board
mineral wool board having an outer layer intended as the surface for the rendering system, with a higher density and higher tensile strength than the inner layer beneath

3.1.2.7.2
mineral wool (MW) lamella
thermal insulation of the material mineral wool in its finished form, including any facings or coatings, with fibres oriented predominantly perpendicular to faces

3.1.2.8.
mechanical fixing device
component used for fixing parts of the kit to the substrate

3.1.2.8.1
rail
profiled continuous mechanical fixing device, form-locking fitting the thermal insulation board 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 collar anchors and pull through value of the head of the collar anchor.

3.1.2.8.2
profile
profiled continuous mechanical fixing device, placed and/or fixed perpendicular to a rail, holding two adjacent thermal insulation boards flush

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

3.1.2.8.3
collar anchor
component for fixing rails to the substrate, consisting of an expansion element head, a sleeve which passes through the rail and is partly embedded to the substrate

3.1.2.8.4
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

3.1.2.8.5
additional washer
an additional plastic ring for the plate anchor expanding the pressure zone

3.1.2.8.6
spiral anchor
component for fixing the thermal insulation to the substrate, consisting of a spiral/sleeve which is set countersunk and passes partially through the thermal insulation by screwing and a part which is embedded to the substrate

Note 1 to entry: See Figure 6.

3.1.2.8.7
supplementary mounting aid plate anchor
anchor 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

3.1.2.8.8
anchor for an anchored metal mesh
component for fixing a metal mesh, the reinforced base coat and the thermal insulation to the substrate

3.1.2.9
base coat
component applied directly to the thermal insulation after fixing and/or bonding to the substrate

Note 1 to entry: Base coats are available as dry mix or ready to use.

Note 2 to entry: Base coats contain either organic or inorganic binders.

3.1.2.10
reinforcement
component, mesh, embedded in the base coat to reinforce the rendering system

3.1.2.10.1
glass fibre mesh
mesh, consisting of continuous glass filament yarn in both the warp and the weft directions, intended for embedding in the base coat as reinforcement

3.1.2.10.2
metal mesh
mesh, consisting of galvanised steel or stainless steel, intended for embedding in the base coat as reinforcement

3.1.2.11
key coat
component applied to the base coat as a preparation for the application of the finishing coat in order to improve adhesion between base coat and finishing coat

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

3.1.2.12
finishing coat
component, available as dry mix mortar or ready to use mortar, applied to the reinforced base coat or key coat

Note 1 to entry: Finishing coats are available as dry mix or ready to use.

Note 2 to entry: Finishing coats contain either organic or inorganic binders.

3.1.2.12.1
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

3.1.2.12.2
felt coat
finishing coat applied in a layer thickness higher than the maximum size of aggregates providing a rather smooth, felt surface

3.1.2.12.3
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

3.1.2.12.4
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.

3.1.2.13
decorative coat
component which is applied to the finishing coat

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

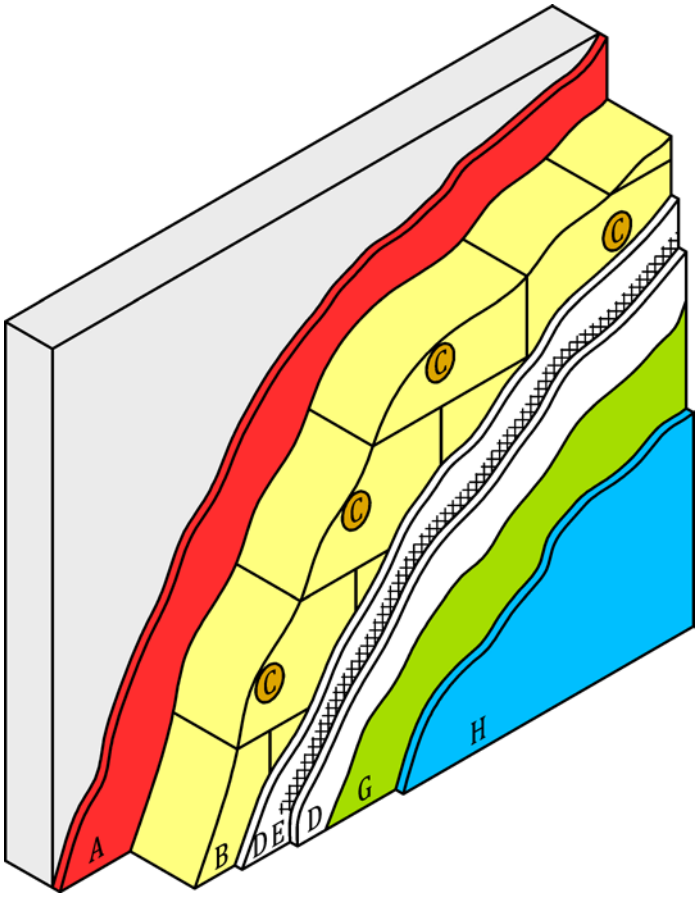
3.1.3 Fixing methods

3.1.3.1

ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I)

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

Note 1 to entry: The ETICS kit is fully bonded, partially bonded by strips or partially bonded by strips combined with dabs. Figure 7 shows an example of full-surface bonding.



Key

A	adhesive layer	E	glass fibre mesh
B	thermal insulation layer	G	key coat layer
C	supplementary mounting aid plate anchors	H	finishing coat layer
D	base coat layer		

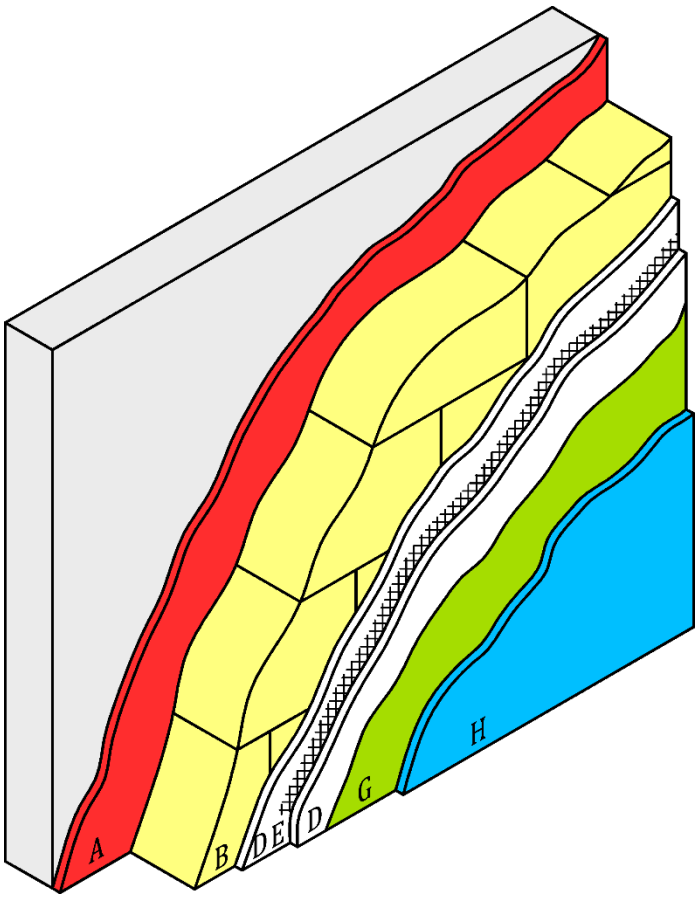
Figure 7 — Schematic sketch of an ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I)

3.1.3.2

ETICS kit bonded with adhesive (II)

ETICS kit comprising adhesive, a thermal insulation, a base coat, a reinforcement, a finishing coat and optionally a key coat and/or a decorative coat

Note 1 to entry: The ETICS kit is fully bonded, partially bonded by strips or partially bonded by strips combined with dabs. Figure 8 shows an example of full-surface bonding.



Key

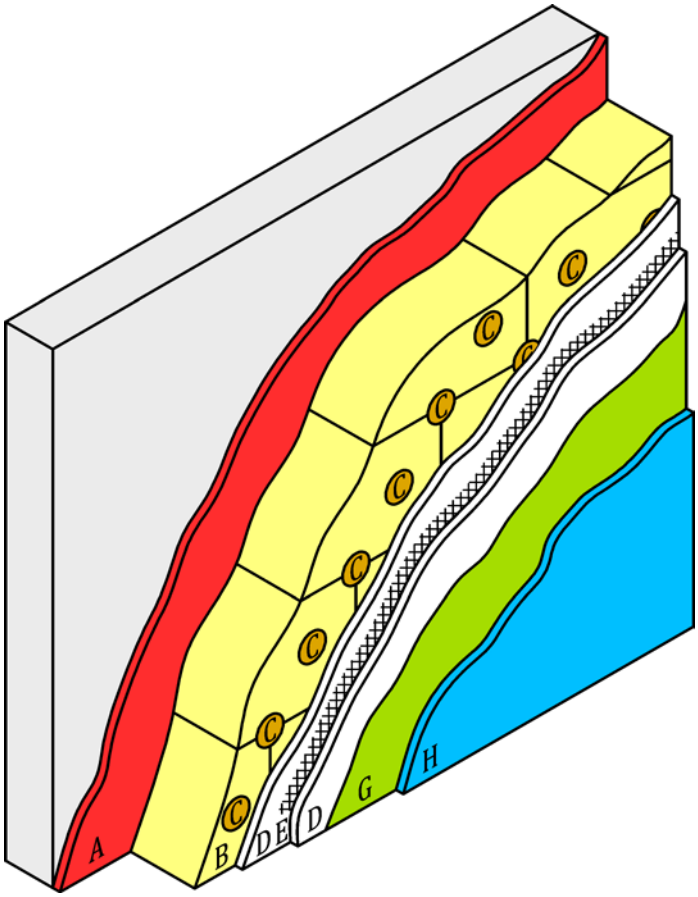
A	adhesive layer	E	glass fibre mesh
B	thermal insulation layer	G	key coat layer
C	plate anchors	H	finishing coat layer
D	base coat layer		

Figure 8 — Schematic sketch of an ETICS kit bonded with adhesive (II)

3.1.3.3
ETICS kit mechanically fixed on adhesive bed with plate anchors (III)

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

Note 1 to entry: The ETICS kit is fully bonded, partially bonded by strips or partially bonded by strips combined with dabs. Figure 9 shows an example of full-surface bonding.



Key

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

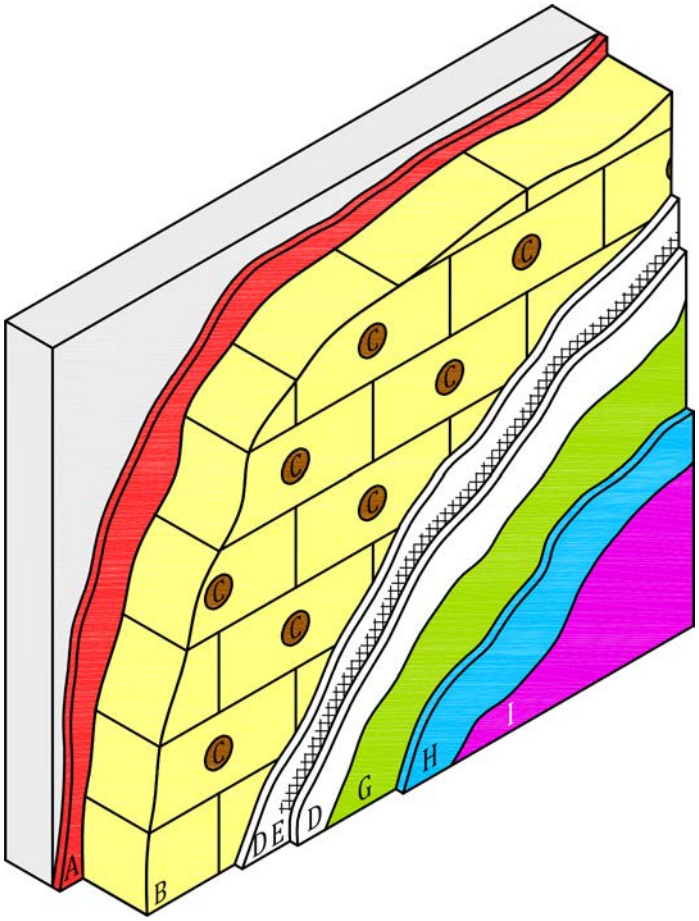
Figure 9 — Schematic sketch of an ETICS kit mechanically fixed on adhesive bed with plate anchors (III)

3.1.3.4
ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV)

ETICS kit comprising an adhesive bed, a thermal insulation, a spiral anchor, a base coat, a reinforcement, a finishing coat and optionally a key coat and/or a decorative coat

Note 1 to entry: The ETICS kit is fully bonded, partially bonded by strips or partially bonded by strips combined with dabs. Figure 10 shows an example of full-surface bonding.

Note 2 to entry: The spiral of the spiral anchor is completely located within the thermal insulation. In case a dual-layer thermal insulation is used, the spiral of the spiral anchor is completely located within the inner layer of the thermal insulation, directed to the substrate.



Key

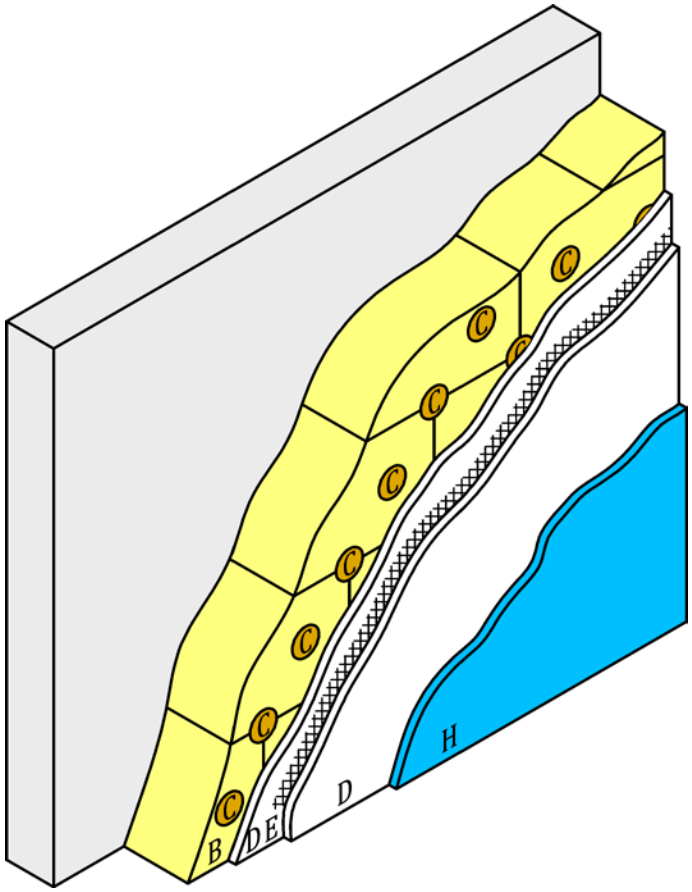
A	adhesive bed	E	glass fibre mesh
B	thermal insulation layer	G	key coat layer
C	spiral anchors	H	finishing coat layer
D	base coat layer	I	decorative coat layer

Figure 10 — Schematic sketch of an ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV)

3.1.3.5
ETICS kit mechanically fixed with plate anchors (V)

ETICS kit comprising a thermal insulation, a plate anchor, a base coat, a reinforcement, a finishing coat, and optionally a key coat and/or a decorative coat

Note 1 to entry: Figure 11 shows an example with the ETICS kit outlined in grey.



Key

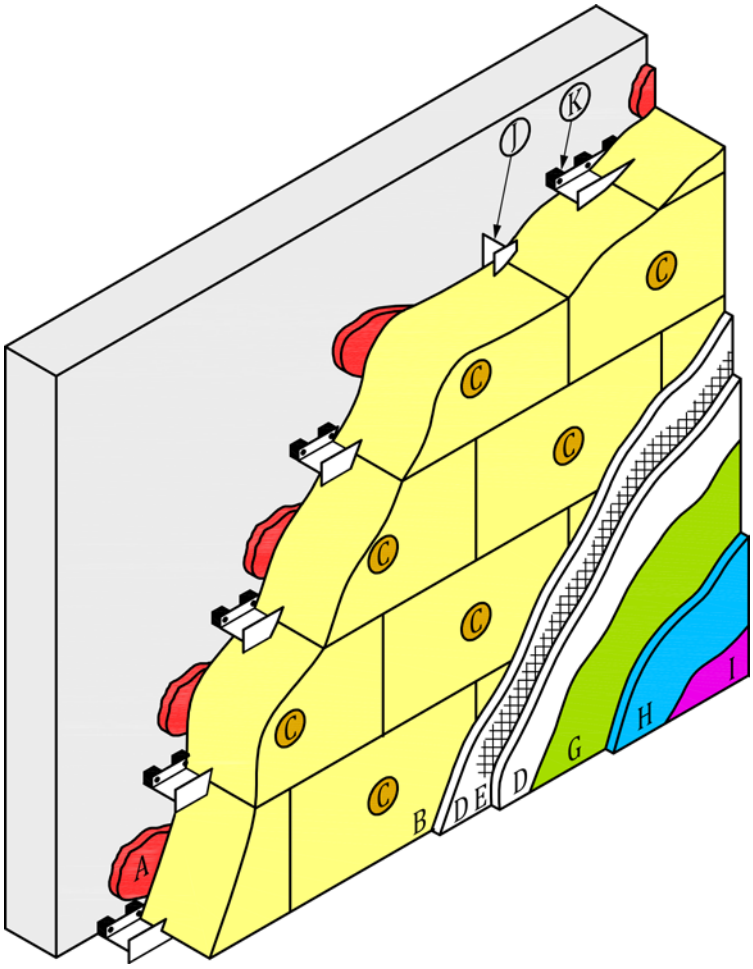
B	thermal insulation layer	E	glass fibre mesh
C	plate anchors	G	key coat layer
D	base coat layer	H	finishing coat layer

Figure 11 — Schematic sketch of an ETICS kit mechanically fixed with plate anchors (V)

3.1.3.6
ETICS kit mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI)

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

Note 1 to entry: Figure 12 shows an example with the ETICS kit outlined in grey.



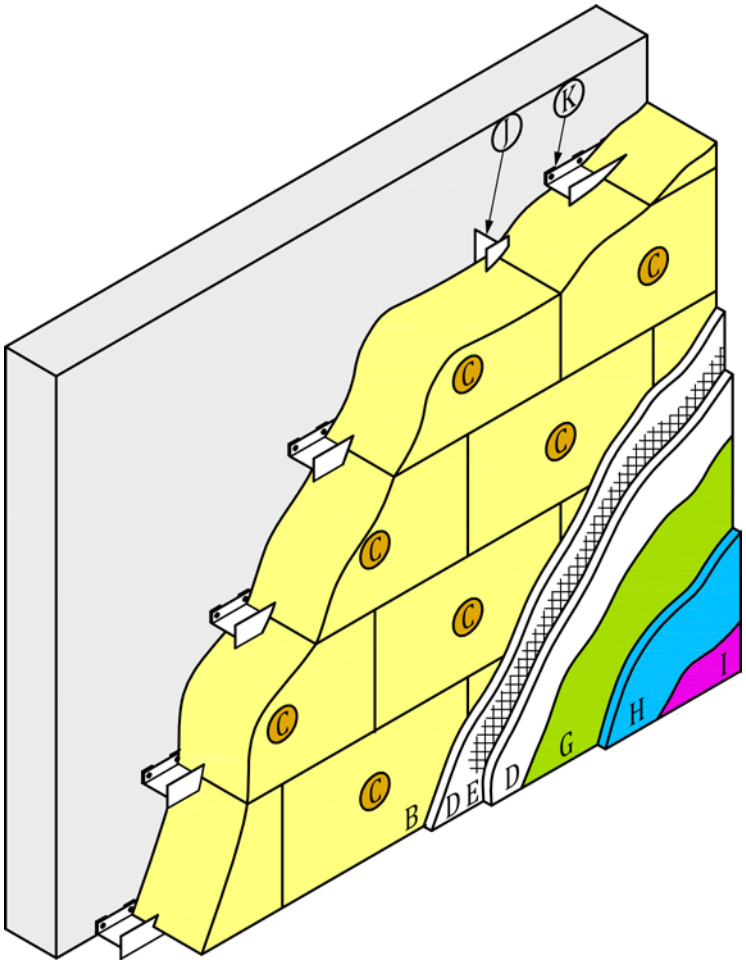
Key

A	adhesive bed	G	key coat layer
B	thermal insulation layer	H	finishing coat layer
C	optional plate anchors	I	decorative coat layer
D	base coat	J	profiles
E	glass fibre mesh	K	rails

Figure 12 — Schematic sketch of an ETICS kit mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI)

3.1.3.7
ETICS kit mechanically fixed with profiles and rails and optional plate anchors (VII)
ETICS kit comprising a rail, a collar anchor, a thermal insulation, a profile, optionally a plate anchor, a base coat, a reinforcement, a finishing coat and optionally a key coat and/or a decorative coat

Note 1 to entry: Figure 13 shows an example with the ETICS kit outlined in grey.



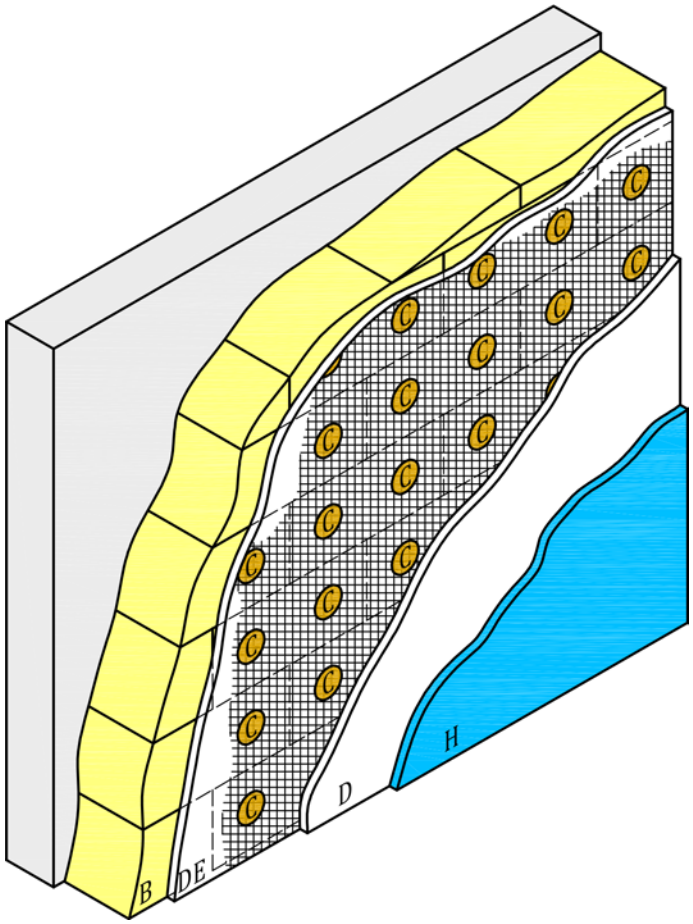
Key

B	thermal insulation layer	H	finishing coat layer
C	optional plate anchors	I	decorative coat layer
D	base coat layer	J	profiles
E	glass fibre mesh	K	rails
G	key coat layer		

Figure 13 — Schematic sketch of an ETICS kit mechanically fixed with profiles and rails and optional plate anchors (VII)

3.1.3.8
ETICS kit mechanically fixed by an anchored metal mesh (VIII)
ETICS kit comprising a thermal insulation, an anchor for the anchored metal mesh, a metal mesh, a base coat, a finishing coat and optionally a key coat and/or a decorative coat

Note 1 to entry: Figure 14 shows an example with the ETICS kit outlined in grey.



Key

B	thermal insulation layer	G	key coat layer
C	anchor for the anchored metal mesh	H	finishing coat layer
D	base coat layer	I	decorative coat layer
E	metal mesh		

Figure 14 — Schematic sketch of an ETICS kit mechanically fixed by an anchored metal mesh (VIII)

3.1.4 Other

3.1.4.1
5-symbol scheme
five symbols indicating possible combinations of parameters related to fixing methods and thermal insulation of the ETICS kit, as:

[a|b|c|d|e]

where the meaning of the symbols is:

a … fixing method (see 3.1.3.1 to 3.1.3.8), and

b … thermal insulation material, and

c … thermal insulation thickness, and

d … anchor plate distance perpendicular to substrate (see 3.1.1.10), and

e … superposition (see 3.1.1.9)

Note 1 to entry: The scheme facilitate the information, proposed in Clause 4, in the subclauses for characteristics related to fixing strength, airborne sound insulation and thermal resistance, for their applicability.

3.1.4.3
substrate
part of the wall or test assembly to which an ETICS kit is fixed

3.1.4.4
reference value
numerical value of a component property gained from a test obtained by the component batch used for the assessment of an ETICS kit characteristic

Note 1 to entry: The reference value is a mean value if not otherwise stated

3.1.4.5
Direct field of application (DiAp)
The outcome of a process (involving the application of defined rules that can incorporate calculation procedures) where the test result is to be equally valid for a variation of components properties and/or an ETICS kit specification(s), a test result on the basis of one or more test results to the same test standard

3.1.4.6
gross heat of combustion (PCS)
heat of combustion of a substance when the combustion is complete and any produced water is entirely condensed under specified conditions

[SOURCE: EN 13501-1:2018, 3.1.21]

3.1.4.7
substantial component
material that constitutes a significant part of a non-homogeneous product. A layer with a mass/unit area ≥ 1,0 kg/m^2 or a thickness ≥ 1,0 mm is considered to be a substantial component

[SOURCE: EN 13501-1:2018, 3.1.5]

3.1.4.8
non-substantial component
material that does not constitute a significant part of a non-homogeneous product. A layer with a mass/unit area < 1,0 kg/m^2 and a thickness < 1,0 mm is considered to be a non-substantial component

Note 1 to entry: Two or more non-substantial layers that are adjacent to each other (i.e. with no substantial component(s) in between the layers) are regarded as one non-substantial component when they collectively comply with the requirements for a layer being a non-substantial component.

[SOURCE: EN 13501-1:2018, 3.1.6]

3.1.4.9
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, with drying taking place at 105 °C.

3.1.4.10
wet condition
condition of a test specimen after at least one period exposure to higher temperature and higher humidity and subsequent re-drying

3.1.4.11
reference anchor
anchor to be used in the pull-through test of the ETICS kits.

Note 1 to entry: The reference anchor is a 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_(-1)^(+0) mm, a nominal thickness of 6 mm and the radius of roundness of 2 mm. Details are given in Figure 15.

Dimensions in millimetres

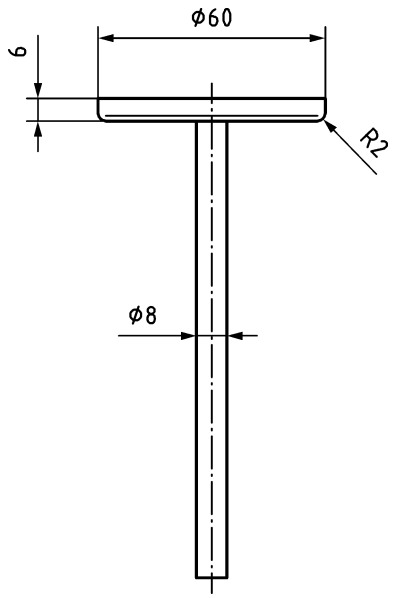


Figure 15— Reference anchor for pull-through tests

Key
R2 roundness of 2 mm

3.1.4.12
significant digits
number in positional notation are digits in the number that are reliable and necessary to indicate the quantity of something.

Examples for rounding to three significant digits:

0,003452 → 0,00345; 3400 → 3400; 3,456 → 3,46; 34235,4 → 34200

3.1.4.13
Component properties
properties of components used for Attestation of Performance (AoP) and Factory Production Control (FPC) issues

3.1.4.14
FPC test result
test result of a component property evaluated for factory production control issues in a production line

3.1.4.15
FPC mean value
mean value of FPC test results of a component property, considering all FPC test results of the last 365 days, a period of one year, in one production line

3.1.4.16
production week
time period of up to 5 production days in sequence in a maximum of 28 days

3.1.4.17
production month
time period of up to 20 production days in sequence in a maximum of three months

3.2 Symbols and units

Symbols	Description	Unit
A	unit area	m^2
A_p	bottom boundary area of the test specimen	m^2
B, b	width of the thermal insulation test specimen	m
c	Distance which defines the anchor setting position edge or corner at the insulation board	mm
c_i	tangent stiffness	kN/mm
d_{min}	minimum distance between the anchor sleeves from which superposition is avoided	mm
d_N	nominal thickness of the thermal insulation	m
d_P	diameter of the anchor plate including additional washer	mm
$d_{wire\ without\ zinc}$	wire diameter, measured on bare wire without zinc coating	mm
$F_{5\%}$	5 % quantile	kN
F_k	characteristic pull through resistance of an anchor	kN
$F_{k,a}$	characteristic pull through resistance of an anchor in a middle area position of a thermal insulation board	kN
$F_{k,ec}$	characteristic pull through resistance of an anchor at an edge/corner position of a thermal insulation board	kN
$F_{k,j}$	characteristic pull through resistance of an anchor at a joint position (T Joint or I Joint) of a thermal insulation board	kN
$F_{k,j}/F_{k,a}$	position factor in case of joint-positions	dimensionless
F_L	applied shear load	kN
$F_{p,k}$	characteristic load resistance of the anchor plate	kN
F_{Test}	mean value of maximum loads of one test series	kN
h_w	heating and wetting cycles	—
h_{wc}	heating and wetting and the heating and cooling cycles	—

Symbols	Description	Unit
h_{wcft}	heating and wetting, the heating and cooling and the wetting, freezing and thawing cycles	—
k_P	characteristic plate stiffness	kN/mm
k_s	k-factor for the tolerance interval	dimensionless
L, l	length of the thermal insulation test specimen	m
L^{3D}	heat flux of a thermal bridge	W/K
$m_{1\,h}$	mass after 1 h partial immersion in water	g
$m_{3\,min}$	mass after 3 min partial immersion in water	g
$m_{24\,h}$	mass of the test specimen after 24 h of partial immersion in water	kg
m_{dry}	Mass of test specimen dried at 105 °C to mass constancy	g
m_i	dry mass per unit area of a component (mass in dried condition as in end use application)	kg/m²
$m_{initial}$	mass of the initial test specimen including additives, e.g. tempering water	g
$m_{wire\ with\ zinc}$	wire weight before removing the zinc coating with HCl	g
$m_{wire\ without\ zinc}$	wire weight after removing the zinc coating with HCl	g
N_O	tensile load at s_0 = 1 mm	kN
N_U	tensile load at the origin	kN
n	total number of anchors per unit area	1/m²
n_a	number of anchors in middle area position per unit area	1/m²
n_{ec}	number of anchors in edge/corner position per unit area	1/m²
n_j	number of anchors in joint position per unit area	1/m²
oc_{dry}	organic content related to end use condition dried at 105 °C to mass constancy	%
$oc_{initial}$	organic content related to the recipe including additives, e.g. tempering water	%
PCS	gross heat of combustion	MJ/kg
$PCS_{,i}$	gross-heat of combustion of a component with a specific layer thickness and/or dry coverage	MJ/kg
R_2	Radius of roundness of the reference anchor	mm
R_D	thermal resistance of ETICS kit without mechanical fixing devices	(m²·K)/W
RH	relative humidity	%
R_{se}	external heat transfer resistance	(m²·K)/W
R_{si}	internal heat transfer resistance	(m²·K)/W
r_{min}	Distance defining the middle area	mm
r_{spiral}	maximum radius of the spiral of the spiral anchor	mm
r_{tl}	mean breaking cone	mm
S	external surface of the rendering system is considered only	—
S_{n-1}	standard deviation of one test series	kN

Symbols	Description	Unit
SR	external surface and the rear face of the rendering system are considered	—
s	displacement	mm
s_d	diffusion-equivalent air layer thickness	m
t_{Fix}	Thickness of fixture, which is the distance of the upper part of the spiral of spiral anchor to the wall facing side of the thermal insulation	mm
t_I	thickness of thermal insulation	mm
U	thermal transmission of the wall with an assembled ETICS kit without thermal bridges	W/(m²·K)
U_c	modified thermal transmission of the wall (with an assembled ETICS kit and mechanical fixing devices)	W/(m²·K)
V_{dry}	volume of the dried test specimen after curing and reaching the mass constancy	cm³
$V_{initial}$	volume of the test specimen, related to the recipe including additives, e.g. tempering water	cm³
ν	variation coefficient of one test series	dimensionless
$W_{1\,h}$	short term water absorption after 1 h	kg/m²
$W_{24\,h}$	short term µµ absorption after 24 h	kg/m²
w	wetting cycles of conditioning	—
$\alpha_{wet,7}$	reduction factor of the fixing strength with 7 days wet exposure.	—
$\alpha_{wet,28}$	reduction factor of the fixing strength with 28 days wet exposure.	—
ΔT	temperature difference between internal and external temperature	K
λ_D	thermal conductivity of the thermal insulation	W/(m·K)
θ_{se}	external temperature	°C
θ_{si}	internal temperature	°C
ρ_{dry}	density of the dried test specimen after curing and reaching the mass constancy	g/cm³
$\rho_{initial}$	density of the test specimen, related to the recipe including additives, e.g. tempering water	g/cm³
$\sigma_{k,anchors}$	pull-through resistance of an ETICS kit	kPa
$\sigma_{k,block,t}$	pull-off tensile resistance of an ETICS kit	kPa
$\sigma_{k,block,ts}$	pull-off tensile-shear resistance of an ETICS kit	kPa
$\overline{\sigma}_{mt,dry}$	mean value of the tensile strength perpendicular to faces in dry conditions	kPa
$\overline{\sigma}_{mt,wet,7}$	mean value of the tensile strength perpendicular to faces in wet conditions with 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH	kPa
$\overline{\sigma}_{mt,wet,28}$	mean value of the tensile strength perpendicular to faces in wet conditions with 28 days exposure at (70 ± 2) °C and (90 ± 5) % RH	kPa
$\tau_{k,block}$	lateral shear resistance of an ETICS kit	kPa
τ_{ts}	applied shear stress	kPa

Symbols	Description	Unit
χ	point thermal transmittance	W/K

3.3 Abbreviated terms

ETICS kit	external thermal insulation composite kit
MW	thermal insulation of the material mineral wool
EPS	thermal insulation of the material expanded polystyrene
XPS	thermal insulation of the material extruded polystyrene foam
PU	thermal insulation of the material polyurethane foam
PF	thermal insulation of the material phenolic foam
CG	thermal insulation of the material cellular glass
ICB	thermal insulation of the material expanded cork
WF	thermal insulation of the material wood fibre
PA6-GF50	short glass fibre reinforced polyamide 6
PA66-GF50	short glass fibre reinforced polyamide 6.6
DiAp	Direct field of application rule
S	the material shows propensity for continuous smoldering combustion
NoS	the material does not show propensity for continuous smoldering combustion
ANP	the assessment of the propensity for continuous smouldering combustion is not possible

4 Characteristics

4.1 General

The following clauses cover the characteristic reaction to fire, water absorption, water tightness, impact resistance, water vapour permeability, bond strength, fixing strength, airborne sound insulation and thermal resistance.The characteristics environmental performance and release of dangerous substances will be included in the next enquiry document.

4.2 Reaction to fire

4.2.1 The performance of the ETICS kit in relation to reaction to fire shall be determined in accordance with 5.2.1.

In addition and considering this ETICS kit, one or more results of the following properties of the components of this ETICS kit, all specified in 5.2.2, can be reported:

a) reaction to fire of the PU adhesive foam;

b) reaction to fire of the thermal insulation;

c) propensity to undergo continuous smouldering of thermal insulation of the materials MW, ICB and WF.

d) apparent density of the thermal insulation;

e) organic content of the base coat;

f) organic content of the finishing coat;

g) mass per unit area of the reinforcement;

4.2.2 The part of the results obtained, used for classification of this ETICS kit according to EN 13501-1:2018, shall be evaluated against the criteria specified therein for the claimed reaction to fire class.

4.2.3 The performance of the ETICS kit in relation to reaction to fire shall be expressed as the achieved reaction to fire class.

When chosen to indicate in addition also one or more results related to the properties of the components of this ETICS kit, see 4.2.1 a) to g), this shall be done respecting the following scheme: [a|b|c|d|e|f|g]:

EXAMPLE 1 A2-s1, d0

EXAMPLE 2 A2-s1, d0[-|A1|NoS|120 kg/m^3|4,9%|2,1%|-]

EXAMPLE 3 B-s2, d0 [E|C-s2, d0|ANP|25,0 kg/m^3|9,8%|6,2%|0,16 kg/m^2]

4.3 Water absorption

4.3.1 The performance of the ETICS kit in relation to water absorption, when determined in accordance with 5.3, shall be reported. This shall be expressed in units of kg/m^2, rounded to 0,01 kg/m^2:

a) water absorption level with a reinforced base coat only, and

b) water absorption level with a rendering system.

4.3.2 The performance of the ETICS kit in relation to water absorption shall be stated by the two values [see 4.3.1 a) and b)].

EXAMPLE 0,17 kg/m^2 | 0,21 kg/m^2

4.4 Water tightness

4.4.1 The performance of the ETICS kit in relation to water tightness shall be determined in accordance with 5.4.1

In addition and considering this ETICS kit, a result of the following property, specified in 5.4.2, can be reported:

a) moisture content of the thermal insulation after hygrothermal conditioning.

4.4.2 The following results shall be reported:

a) model of hygrothermal conditioning of the test specimen and related abbreviated part of the code, i.e. after:

— heating and wetting, as “hw”;

— heating and wetting + heating and cooling, as “hwc”;

— heating and wetting + heating and cooling + wetting, freezing and thawing, as “hwcft”; and

b) appearance of the surface with regards to defects and related part of the code either:

— with defects, as “defects”; or

— without defects, as “no defects”.

4.4.3 The performance of the ETICS kit in relation to water tightness shall be stated by the two parts of the code (see 4.4.2 a) and b)).

When chosen to indicate in addition also the result related to the moisture content of the thermal insulation after hygrothermal conditioning, see 4.4.1 a), this shall be done respecting the following scheme: [a]

EXAMPLE 1 hwc | no defects [12%]

EXAMPLE 2 hwc | no defects

4.5 Impact resistance

4.5.1 The performance of the ETICS kit in relation to impact resistance, when determined in accordance with 5.5, shall be reported. This shall be expressed as a combination of

a) evaluated sides of the test specimen and related abbreviated part of the code, either:

— external surface of the rendering system, as “S”, or

— external surface and rear face of the rendering system, as “SR”;

b) value in J of the chosen impact energy, and

c) model of hygrothermal conditioning of the test specimen and related abbreviated part of the code, i.e. after:

— procedure 1 with heating and wetting, as “hw”;

— procedure 1 with heating and wetting + heating and cooling, as “hwc”;

— procedure 1 with heating and wetting + heating and cooling + wetting, freezing and thawing, as “hwcft”;

— procedure 2 with wetting, as “w”.

4.5.2 The performance of the ETICS kit in relation to impact resistance shall be stated by the three parts of the code (see 4.5.1 a), b) and c)).

EXAMPLE 1 S | 10 J | w

EXAMPLE 2 SR | 25 J | hwcft

4.6 Water vapour permeability

4.6.1 The performance of the ETICS kit in relation to water vapour permeability shall be addressed with the water vapour diffusion-equivalent air layer thickness s_d, in m, rounded to 0,01 m, related to the components of this ETICS kit, as specified in 4.6.2.

4.6.2 The performance of the ETICS kit in relation to water vapour diffusion-equivalent air layer thickness shall be determined for the following components of the ETICS kit:

a) thermal insulation, for those one-layered, in accordance with 5.6.1.1.1 and for MW dual-layered, in accordance with 5.6.1.1.2;

b) base coat in accordance with 5.6.1.2;

c) key coat in accordance with 5.6.1.4;

d) finishing coat in accordance with 5.6.1.3;

e) decorative coat in accordance with 5.6.1.4;

4.6.3 The performance of the ETICS kit in relation to water vapour diffusion-equivalent air layer thickness, s_d, shall be stated by the values, as specified in 4.6.2, for the components (see 4.6.2 a) to e)) and shall be done respecting the following scheme: [a-b-c-d-e]:

EXAMPLE 1 3,98 m | 0,14 m | - | 0,28 m | -

EXAMPLE 2 3,45 m | 0,11 m | 0,17 m | 0,05 m | -

4.7 Bond strength

4.7.1 Bond strength of adhesive to thermal insulation

4.7.1.1 General

The performance of the ETICS kit in relation to bond strength of adhesive to thermal insulation shall be addressed with one of the following characteristics, related to the type of adhesive used in this ETICS kit, as indicated below:

a) bond strength of ready to use or dry mix adhesive to thermal insulation as specified in 4.7.1.3, or

b) bond strength of PU adhesive foam to thermal insulation of the material EPS, XPS and PU, as specified in 4.7.1.4.

4.7.1.2 Relevance

The performance of the ETICS kit in relation to this characteristic is relevant with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[I, II, III, IV or VI|all|all|all|all]

4.7.1.3 Bond strength of ready to use or dry mix adhesive to thermal insulation

4.7.1.3.1 The performance of the ETICS kit in relation to bond strength of ready to use or dry mix adhesive to thermal insulation, when determined in accordance with 5.7.1.1, shall be reported for each of the three test specimens conditions. This shall be expressed as a combination of

a) test specimens conditions applied, i.e. conditions dry, wet and wet plus redried in accordance with 5.7.3.1;

b) mean value of this bond strength in kPa, rounded to 3 significant digits;

c) minimum value of this bond strength in kPa, rounded to 3 significant digits; and

d) 5 %-quantile for a confidence level of 75 % of this bond strength in kPa, rounded to 3 significant digits.

4.7.1.3.2 The evaluation against threshold levels is relevant for the ETICS kit with the following combination of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[I or II|all|all|-|-]

The results obtained shall be evaluated for the threshold levels for each relevant test specimens condition against the appearance of cohesion failure in the thermal insulation, as given in Table 1.

Table 1 — Criteria for the compliance with the threshold levels for bond strength of ready to use and dry mix adhesive to thermal insulation

Cohesion failure in thermal insulation	**dry**	**wet**	**Wet plus redried**
yes	Mean value ≥ 30 kPa	no requirement	no requirement
no	Mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa	Mean value ≥ 30 kPa	Mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa

4.7.1.3.3 The performance shall be stated by the test specimens condition applied (see 4.7.1.3.1 a)), the mean value (see 4.7.1.3.1 b)), the minimum value (see 4.7.1.3.1 c)) and the 5 %-quantile for a confidence level of 75 % of the bond strength (see 4.7.1.3.1 d)).

EXAMPLE 1 dry | 85,4 kPa | 80,2 kPa | 75,7 kPa

EXAMPLE 2 wet | 35,6 kPa | 32,4 kPa| 30,1 kPa

EXAMPLE 3 wetplusdried | 45,6 kPa | 41,4 kPa | 39,3 kPa

4.7.1.4 Bond strength of PU adhesive foam to thermal insulation

4.7.1.4.1 The performance of the ETICS kit in relation to bond strength of PU adhesive foam to thermal insulation, when determined in accordance with 5.7.1.2, shall be reported ETICS kit. This shall be expressed as a combination of

a) mean value of the bond strength in kPa, rounded to 3 significant digits;

b) minimum value of this bond strength in kPa, rounded to 3 significant digits; and

c) 5 %-quantile for a confidence level of 75 % of the bond strength in kPa, rounded to 3 significant digits.

4.7.1.4.2 The mean value obtained shall be ≥ 80 kPa with one measurement < 80 kPa, but ≥ 60 kPa is admissible.

4.7.1.4.3 The performance shall be stated by the mean value (see 4.7.1.4.1 a)), the minimum value (see 4.7.1.4.1 b)) and the 5 %-quantile for a confidence level of 75 % of the bond strength (see 4.7.1.4.1 c))

EXAMPLE 90,3 kPa | 83,2 kPa | 80,1 kPa

4.7.2 Tensile strength perpendicular to faces of thermal insulation

4.7.2.1 The performance of the ETICS kit in relation to tensile strength perpendicular to faces of thermal insulation in dry condition, shall be determined in accordance with 5.7.2.1.

In addition and considering the ETICS kit, one or more results of the following properties, all specified in 5.7.2.2, can be reported:

a) tensile strength perpendicular to faces of thermal insulation in wet condition, days of additional exposure (i), mean value (ii), minimum value (iii) and 5 %-quantile for a confidence level of 75 % (iv);

b) compressive strength of thermal insulation in dry condition, mean value (i), minimum value (ii) and 5 %-quantile for a confidence level of 75 % (iii).

4.7.2.2 The performance of the ETICS kit in relation to tensile strength perpendicular to faces of thermal insulation in dry condition shall be provided as the tensile strength perpendicular to faces of thermal insulation in dry condition. The following results shall be reported:

a) mean value of this tensile strength in kPa, rounded to 3 significant digits;

b) minimum value of this tensile strength in kPa, rounded to 3 significant digits;

c) 5 %-quantile for a confidence level of 75 % of this tensile strength in kPa, rounded to 3 significant digits.

4.7.2.3 The performance shall be stated by the mean value (see 4.7.2.2 a)), the minimum value (see 4.7.2.2 b)) and the 5 %-quantile for a confidence level of 75 % (see 4.7.2.2 c)).

When chosen to indicate in addition also one or more results related to the properties of the thermal insulation of this ETICS kit, see 4.7.2.1 a) to b), this shall be done respecting the following scheme: [a(i)| a(ii)|a(iii)|a(iv)|b(i)|b(ii)| b(iii)]

EXAMPLE 1 13,5 kPa | 7,43kPa | 7,02 kPa [28d|7,45 kPa|5,41 kPa|5,23 kPa|5,34 kPa|3,4 kPa|3,2 kPa]

EXAMPLE 2 155 kPa | 110 kPa | 93,4 kPa [7d|121 kPa|80,4 kPa|75,3 kPa|-|-|-]

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

4.7.3.1 The performance of the ETICS kit in relation to bond strength of reinforced base coat to thermal insulation ETICS kit, when determined in accordance with 5.7.3, shall be reported for each of the two test specimens conditions, dry and hygrothermal. This shall be expressed as a combination of

a) test specimens conditions applied, condition 1 (dry) and hygrothermal condition 2 (hw, hwc, hwcft), and

b) mean value of the bond strength in kPa, rounded to 3 significant digits, and

c) minimum value of the bond strength in kPa, rounded to 3 significant digits, and

d) 5 %-quantile for a confidence level of 75 % of the bond strength in kPa, rounded to 3 significant digits. The model of hygrothermal conditioning (condition 2) of the test specimens shall be reported by the related abbreviated part of the code, i.e.

— heating and wetting, as “hw”, and

— heating and wetting + heating and cooling, as “hwc”, and

— heating and wetting + heating and cooling + wetting, freezing and thawing, as “hwcft”,

whereas the dry conditioning of the test specimens shall be reported as “dry”.

4.7.3.2 The results obtained shall be evaluated against the appearance of cohesion failure in thermal insulation, given in Table 2. The results are compliant for any combination of criteria that are in the rows of the following table.

Table 2 — Criteria for the compliance with the threshold levels for bond strength of reinforced base coat to thermal insulation

Cohesion failure in thermal insulation	**dry**	**hw, hwc, hwcft**
yes	no requirement	no requirement
No	mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa	mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa

4.7.3.3 The performance shall be stated by the results for the two test specimens condition applied (see 4.7.3.1 a)): the conditioning code, the mean value of the bond strength (see 4.7.3.1 b)), the minimum value of the bond strength (see 4.7.3.1 c)) and the 5 %-quantile for a confidence level of 75 % of the bond strength (see 4.7.3.1 d)).

EXAMPLE 1 dry | 8,53 kPa | 5,52 kPa | 5,13 kPa – hwc | 5,34 kPa | 3,51 kPa | 3,22 kPa

EXAMPLE 2 dry | 85,3 kPa | 50,9 kPa | 49,8 kPa – hw | 79,4 kPa | 53,2 kPa | 50,8 kPa

4.7.4 Bond strength of the rendering system to the thermal insulation in the ETICS kit

4.7.4.1 The performance of the ETICS kit in relation to bond strength of rendering system to thermal insulation, when determined in accordance with 5.7.4, shall be reported for each of the two test specimens conditions, dry and hygrothermal. This shall be expressed as a combination of

a) test specimens conditions applied, condition 1 (dry) and hygrothermal condition 2 (hw, hwc, hwcft), and

b) mean value of the bond strength in kPa, rounded to 3 significant digits, and

c) minimum value of the bond strength in kPa, rounded to 3 significant digits, and

d) 5 %-quantile for a confidence level of 75 % of the bond strength in kPa, rounded to 3 significant digits.

The model of hygrothermal conditioning (Set 2) of the test specimens shall be reported by the related abbreviated part of the code, i.e.

— heating and wetting, as “hw”, and

— heating and wetting + heating and cooling, as “hwc”, and

— heating and wetting + heating and cooling + wetting, freezing and thawing, as “hwcft”,

whereas the dry conditioning of the test specimens shall be reported as “dry”.

4.7.4.2 The results obtained shall be evaluated against the appearance of cohesion failure in the thermal insulation set 1 and set 2 of criteria for the threshold levels for each relevant test specimens condition, as given in Table 3.

Table 3 — Criteria for the compliance with the threshold levels for bond strength of rendering system to thermal insulation

Cohesion failure in thermal insulation	**dry**	**hw, hwc, hwcft**
yes	no requirement	no requirement
no	Mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa	Mean value ≥ 80 kPa and max. one of the individual measurements < 80 kPa, but ≥ 60 kPa

4.7.4.3 The performance shall be expressed with combined indication of the two results, the code of the test specimens condition applied (see 4.7.4.1 a)), the mean value of the bond strength (see 4.7.4.1 b)), the minimum value of the bond strength (see 4.7.4.1 c)) and the 5 %-quantile for a confidence level of 75 % of the bond strength (see 4.7.4.1 d)).

EXAMPLE 1 dry | 8,53 kPa | 5,54 kPa | 5,32 kPa – hwcft | 5,34 kPa | 3,52 kPa | 3,10 kPa

EXAMPLE 2 dry | 85,3 kPa | 65,2 kPa | 63,1 kPa – hw | 80,4 kPa | 60,8 kPa | 58,2 kPa

EXAMPLE 3 dry | 85,3 kPa | 65,2 kPa | 61,0 kPa – hw | 55,4 kPa | 34,5 kPa | 28,4 kPa

4.8 Fixing strength

4.8.1 General

The performance of fixing strength of an ETICS kit shall be addressed with one or more of the following characteristics:

a) Pull-through resistance, as specified in 4.8.2,

b) Pull-off tensile resistance, as specified in 4.8.3,

c) Pull-off tensile-shear resistance, as specified in 4.8.4,

d) Reduction factor, as specified in 4.8.5,

e) Characteristic load resistance of a plate anchor, as specified in 4.8.6,

f) Characteristic plate stiffness of a plate anchor, as specified in 4.8.7,

g) Fixing strength of anchored rails, as specified in 4.8.8,

h) Fixing strength of collar anchor, as specified in 4.8.9.

4.8.2 Pull-through resistance

4.8.2.1 The performance of the ETICS kit in relation to pull-through resistance, $\sigma_{k,anchors}$, when determined in accordance with 5.8.1, shall be reported. This shall be expressed in kPa, rounded to 3 significant digits. In addition and considering the ETICS kit, one or more results of the following properties of the ETICS kit, all specified for plate anchor in 5.8.1.3 and for spiral anchor in 5.8.1.4, can be reported:

a) value of the characteristic pull-through resistance of the anchor in middle area position in kN;

b) value of the characteristic pull-through resistance of an anchor in edge/corner position in kN;

c) value of the characteristic pull-through resistance of an anchor in joint position in kN;

d) distance *c* according to Figure 1 in mm;

e) minimum distance d_{min} between anchor sleeves according to Figure 2 in mm.

4.8.2.2 The performance of the ETICS kit in relation to this characteristic is relevant for the following combination(s) of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

a) [III|all|all|flush or countersunk|no superposition]

b) [IV|EPS|≤ 300 mm|-|no superposition]

4.8.2.3 The performance of the ETICS kit in relation to pull-through resistance, $\sigma_{k,anchors}$, shall be expressed by its value (see 4.8.2.1) for ETICS kits with the relevant combination of parameters (see 4.8.2.2). When chosen to provide one or more results related to the properties of this ETICS kit (see 4.8.2.1 a) to e)), this shall be done respecting the following scheme: [a|b|c|d|e]:

EXAMPLE 5,45 kPa [0,50 kN|0,31 kN|0,25 kN|120 mm|250 mm]

4.8.3 Pull-off tensile resistance

4.8.3.1 The performance of the ETICS kit in relation to pull-off tensile resistance, $\sigma_{k,block,t}$, when determined in accordance with 5.8.2, shall be reported. This shall be expressed in units of kPa, rounded to 3 significant digits.

4.8.3.2 The performance of the ETICS kit in relation to this characteristic is relevant for the following combination(s) of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

a) [III|all|all|above reinforcement|all];

b) [III|all|all| flush or countersunk|superposition];

c) [III|MW, PU, PF, CG, ICB, WF|all|flush or countersunk|no superposition];

d) [IV|EPS|≤ 300 mm|-|superposition] ;

e) [IV|MW|all|-|all];

f) [IV|EPS|> 300 mm|-|all];

g) [V|all|all|all|all];

h) [VI or VII|all|all|all|all].

4.8.3.3 The performance of the ETICS kit in relation to pull-off tensile resistance, $\sigma_{k,block,t}$, shall be reported (see 4.8.3.1) for ETICS kits with the relevant combination of parameters (see 4.8.3.2).

EXAMPLE 7,55 kPa

4.8.4 Pull-off tensile-shear resistance

4.8.4.1 The performance of the ETICS kit in relation to pull-off tensile-shear resistance, $\sigma_{k,block,ts}$, and the applied shear stress τ_{ts}, when ETICS kit determined in accordance with 5.8.3, shall be reported. This shall be expressed in units of kPa, rounded to 3 significant digits.

4.8.4.2 The performance of the ETICS kit in relation to this characteristic is relevant with the following combination(s) of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

a) [I or II|MW, ICB or WF|> 200 mm|-|-];

b) [I or II|EPS, XPS, PU, PF or CG|> 300 mm|-|-];

c) [III|MW, XPS, PU, PF, CG, ICB or WF|all|countersunk|all];

d) [III|MW, ICB or WF|> 200 mm|all|all];

e) [III|EPS, XPS, PU, PF or CG|> 300 mm|all|all];

f) [IV|MW|all|-|all];

g) [IV|EPS|> 300 mm|-|all];

h) [V|all|all|all|all];

i) [VI, VII or VIII|all|all|all|all].

4.8.4.3 The performance of the ETICS kit in relation to pull-off tensile-shear resistance $\sigma_{k,block,ts}$ and the applied shear stress τ_{ts} shall be expressed by its values (see 4.8.4.1) for ETICS kits with the relevant combination of parameters (see 4.8.4.2).

EXAMPLE 7,55 kPa | 1,25 kPa

4.8.5 Lateral shear resistance

4.8.5.1 The performance of the ETICS kit in relation to lateral shear resistance $\tau_{k,Block}$, when determined in accordance with EN 13495:2019, method E, and in accordance with 5.8.4, shall be reported. This shall be expressed in units of kPa, rounded to 3 significant digits. In case of a thermal insulation with direction-dependent properties the lateral shear resistance $\tau_{k,Block}$ shall expressed for both directions L and Q.

4.8.5.2 The performance of the ETICS kit in relation to this characteristic is relevant with the following combination(s) of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

a) [I or II | MW-lamella | > 200 | - | -]

b) [I or II | MW-board | all | - | -]

c) [I or II | XPS, PU, ICB, PF, WF, CG | > 200 | - | -]

d) [I or II | EPS | > 400 | - | -]

e) [III | MW, XPS, PU, ICB, PF, WF, CG | > 200 mm | all | all]f) [III | EPS | > 400| all | all]

g) [III | EPS, MW, XPS, PU, PF, CG, ICB, WF | all | countersunk | all]

h) [IV | EPS, MW, XPS, PU, PF, CG, ICB, WF | all | - | all]

i) [V | all | all | all | all]

j) [VI, VII or VIII | all | all | - | -]

4.8.5.3 The performance of the ETICS kit in relation to shear resistance $\tau_{k,Block}$ according to EN 13495:2019, method E, shall be expressed by its value (see 4.8.5.1) for ETICS kits with the relevant combination of parameters (see 4.8.5.2). In case of a thermal insulation with direction-dependent properties the performance shall expressed for both directions L and Q.

EXAMPLE 1 10,34 kPa

EXAMPLE 2 L 6,89 kPa | Q 7,48 kPa

4.8.6 Reduction factor

4.8.6.1 The performance of the ETICS kit in relation to the reduction factor, $\alpha_{wet,7}$ or $\alpha_{wet,28}$, when determined in accordance with 5.8.5, shall be reported. This shall be expressed dimensionless, rounded to 0,01, together with the statement of the conditioning applied.

4.8.6.2 The performance of the ETICS kit in relation to this characteristic is relevant with the following combination(s) of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[III, IV, V, VI or VII|MW, PF or WF|all|flush or countersunk|all]

4.8.6.3 The performance of the ETICS kit in relation to the reduction factor, $\alpha_{wet,7}$ or $\alpha_{wet,28}$, shall be reported in addition to the duration of wet exposure in whole days (see 4.8.6.1) for ETICS kits with the relevant combination of parameters (see 4.8.6.2).

EXAMPLE 1 0,63 | 7 d

EXAMPLE 2 0,74 | 28 d

4.8.7 Characteristic load resistance of a plate anchor

4.8.7.1 The performance of the ETICS kit in relation to the characteristic load resistance of the plate anchor, F_p, when determined in accordance with 5.8.6, shall be reported. This shall be expressed in units of kN, rounded to 3 significant digits.

4.8.7.2 The performance of the ETICS kit in relation to this characteristic is relevant with the following combination of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[III, V, VI or VII|all|all|all|all]

4.8.7.3 The performance of the ETICS kit in relation to load resistance of the plate anchor, F_p, shall be reported (see 4.8.7.1) for ETICS kits with the relevant combination of parameters (see 4.8.7.2).

EXAMPLE 3,45 kN

4.8.8 Characteristic plate stiffness of a plate anchor

4.8.8.1 The performance of the ETICS kit in relation to characteristic plate stiffness of the plate anchor, k_p, when determined in accordance with 5.8.7, shall be reported. This shall be expressed in units of kN/mm, rounded to 3 significant digits.

4.8.8.2 The performance of the ETICS kit in relation of this characteristic is relevant for ETICS kit the following combination of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[III or V|all|all|all|all]

4.8.8.3 The performance of the ETICS kit in relation to characteristic plate stiffness of the plate anchor, k_p, shall be stated (see 4.8.8.1) for ETICS kits with the relevant combination of parameters (see 4.8.8.2).

EXAMPLE 5,60 kN/mm

4.8.9 Fixing strength of anchored rails

4.8.9.1 The performance of the ETICS kit in relation to fixing strength of anchored rails, when determined in accordance with 5.8.8, shall be reported. This shall be expressed in units of kN per fixing point, rounded to 3 significant digits.

4.8.9.2 The performance of the ETICS kit in relation to this characteristic is relevant for the following combination of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[VI or VII|all|all|-|-]

4.8.9.3 The performance of the ETICS kit in relation to fixing strength of anchored rails shall be reported (see 4.8.9.1) for ETICS kits with the relevant combination of parameters (see 4.8.9.2).

EXAMPLE 0,235 kN

4.8.10 Fixing strength of collar anchor

4.8.10.1 The performance of the ETICS kit in relation to fixing strength of collar anchor, when determined in accordance with 5.8.9, shall be reported. This shall be expressed in units of kN, rounded to 3 significant digits.

4.8.10.2 The performance of the ETICS kit in relation to this characteristic is relevant for the following combination of parameters related to some of the ETICS kit components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[VI or VII|all|all|-|-]

4.8.10.3 The performance of the ETICS kit in relation to fixing strength of collar anchor shall be reported (see 4.8.10.1) for ETICS kits with the relevant combination of parameters (see 4.8.10.2).

EXAMPLE 0,730 kN

4.9 Airborne sound insulation

4.9.1 General

The airborne sound insulation of an ETICS kit shall be defined by reference to at least two of the following characteristics:

a) dynamic stiffness of thermal insulation, as specified in 4.9.2,

b) airflow resistivity of thermal insulation, as specified in 4.9.3, and

c) weight of rendering system, as specified in 4.9.4.

4.9.2 Dynamic stiffness of the thermal insulation

4.9.2.1 The performance of the ETICS kit in relation to dynamic stiffness of thermal insulation, when determined in accordance with 5.9.1, shall be reported. This shall be expressed in units of MN/m^3, rounded to 1 MN/m^3.

4.9.2.2 The performance of this characteristic is relevant for the ETICS kit with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[I, II, II, IV, V or VIII|MW, EPS or WF|all|all|all]

4.9.2.3 The performance of the ETICS kit in relation to dynamic stiffness of thermal insulation shall be stated (see 4.9.2.1) for ETICS kits with the relevant combination of parameters (see 4.9.2.2).

EXAMPLE 11 MN/m^3

4.9.3 Airflow resistivity of the thermal insulation

4.9.3.1 The performance of the ETICS kit in relation to airflow resistivity of thermal insulation, when determined in accordance with 5.9.2, shall be reported. This shall be expressed in units of $kPa \cdot s/m^2$, rounded to 1 $kPa \cdot s/m^2$.

4.9.3.2 The performance of this characteristic is relevant for the ETICS kit with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[all|MW or WF|all|all|all]

4.9.3.3 The performance of the ETICS kit in relation to airflow resistivity of thermal insulation shall be stated (see 4.9.3.1) for ETICS kits with the relevant combination of parameters (see 4.9.3.2).

EXAMPLE 29 $kPa \cdot s/m^2$

4.9.4 Weight of rendering system

4.9.4.1 The performance of the ETICS kit in relation to weight of rendering system, when determined in accordance with 5.9.3, shall be reported. This shall be expressed in units of kg/m^2, rounded to 1 kg/m^2.

4.9.4.2 The performance of the ETICS kit in relation to weight of rendering system shall be stated (see 4.8.4.1).

EXAMPLE 20 kg/m^2

4.10 Thermal resistance

4.10.1 General

Performance of thermal resistance of an ETICS kit shall be addressed with one or more of the following characteristics:

a) thermal resistance of thermal insulation, as specified in 4.10.2;

b) point thermal transmittance of anchor, as specified in 4.10.3;

c) *Δu-value* of profiles and rails, as specified in 4.10.4; and

d) *Δu-value* of anchored metal mesh, as specified in 4.10.5.

4.10.2 Thermal resistance of the thermal insulation

4.10.2.1 The performance of the ETICS kit in relation to thermal resistance of thermal insulation, R_D, when determined in accordance with 5.10.1, shall be reported. This shall be expressed in units of $m^2 \cdot K/W$, rounded to 0,01 $m^2 \cdot K/W$.

4.10.2.2 The performance of the ETICS kit in relation to thermal resistance of thermal insulation, R_D, ETICS kit shall be stated (see 4.10.2.1).

EXAMPLE 3,25 m²·K/W

4.10.3 Point thermal transmittance of anchor

4.10.3.1 The performance of the ETICS kit in relation to point thermal transmittance of anchor, χ, when determined in accordance with 5.10.2, shall be reported. This shall be expressed in units of W/K, rounded up to 0,001 W/K if $\chi \geq 0{,}0005$ W/K, rounded to 0 W/K otherwise.

4.10.3.2 The performance of this characteristic is relevant for the ETICS kit with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

a) [I, III, IV or V|all|all|all|all];

b) [VI or VII|all|all|all|all], if optional plate anchors are used.

4.10.3.3 The performance of the ETICS kit in relation to point thermal transmittance of anchor, χ, shall be stated (see 4.10.3.1) for ETICS kits with the relevant combination of parameters (see 4.10.3.2).

EXAMPLE 0,002 W/K

4.10.4 Δ*u*-value of profiles and rails

4.10.4.1 The *Δu-value* of profiles and rails, when determined in accordance with 5.10.3, shall be reported. This shall be expressed in units of W/(m·K), convergently rounded to 0,001 W/(m·K).

4.10.4.2 The performance of this characteristic is relevant for the ETICS kit with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[VI or VII|all|all|all|all]

4.10.4.3 The *Δu-value* of profiles and rails shall be expressed by its value (see 4.10.4.1) for ETICS kits with the relevant combination of parameters (see 4.10.4.2).

EXAMPLE 0,018 W/(m·K)

4.10.5 *Δu-value* of anchored metal mesh

4.10.5.1 The *Δu-value* of anchored metal mesh, when determined in accordance with 5.10.4, shall be reported. This shall be expressed in units of W/K, convergently rounded to 0,001 W/K.

4.10.5.2 The performance of this characteristic is relevant for the ETICS kit with the following combination(s) of parameters related to some of its components and the applicability shown in the 5-symbol scheme, as defined in 3.1.4.1:

[VIII|all|all|all|all]

4.10.5.3 The *Δu-value* of anchored metal mesh shall be expressed by its value (see 4.10.5.1) for ETICS kits with the relevant combination of parameters (see 4.10.5.2).

EXAMPLE 0,018 W/K

5 Testing, assessment and sampling methods

5.1 General

5.1.1 Test specimens

A test result is based on one or more test specimens. A test specimen is either an ETICS kit or a part thereof. Some ETICS kits require a two-test specimen configuration, defined in clauses “preparation”. In such a case, two test results are obtained, one for each configuration. The test result for the characteristic of this kit is the worse of the two.

5.1.2 Determination

The determination is based either on testing the ETICS kit in question or on known test results of other ETICS kits that differ in components and/or specification together with direct field of application rules (DiAp). The meaning of e.g. “≥ that tested” in a DiAp rule is “this component property shall be greater than or equal to the same component property of the test specimen already used to assess a particular characteristic of an ETICS kit”. In other words, for components for which there are no reference values, the same validity sector derived from the reference value(s) of the tested component applies. The values of the untested component are taken from the factory production control (FPC). See 6 and Annex H. The characteristic of the kit, which is assessed only by direct field of application rules and known test results, is the same as that of the previously tested ETICS kit.

One or more batches of a component can be used for the assessment of an ETICS kit by testing. One can use different batches for different characteristics, but also for one characteristic.

NOTE 1 The latter determination is used to minimize the testing effort, especially for small or medium sized enterprises (SME). However, manufacturers can decide to carry out more tests in order to better understand the characteristics of a particular ETICS kit.

NOTE 2 The comparison shall be made by using the factory production control data of the non-tested component with the validity range of the tested component – which provides one or more reference values – in annex E.

NOTE 3 Since all direct field of application rules are conservative with respect to other components and/or specifications, an ETICS kit characteristic can be better or even much better than assessed.

In case of results based on two- or more test specimen configurations, the worst result applies for the assessment.

5.1.3 Reporting

In addition of the reporting given in 5.2 to 5.10, also properties of components that are used to produce the test specimen(s) shall be reported. These properties of components are all steadiness properties as well as every reference value, detailed in Annex E. The steadiness properties can be found in the column “steadiness”. If a DiAp rule takes effect, the property, given in the column “validity”, becomes a reference value. Each batch of a component, used to produce the test specimen(s), generates reference values for certain component properties, depending on the assessed characteristic of the ETICS kit.

5.2 Reaction to fire

5.2.1 Determination for the product

5.2.1.1 General

The reaction to fire performance of the product shall be tested using the corresponding test method(s) as specified in EN 13501-1:2018 for the various classes. The corresponding test method(s) are

a) single burning item;

b) single--flame source test;

c) non-combustibility test;

d) gross heat of combustion.

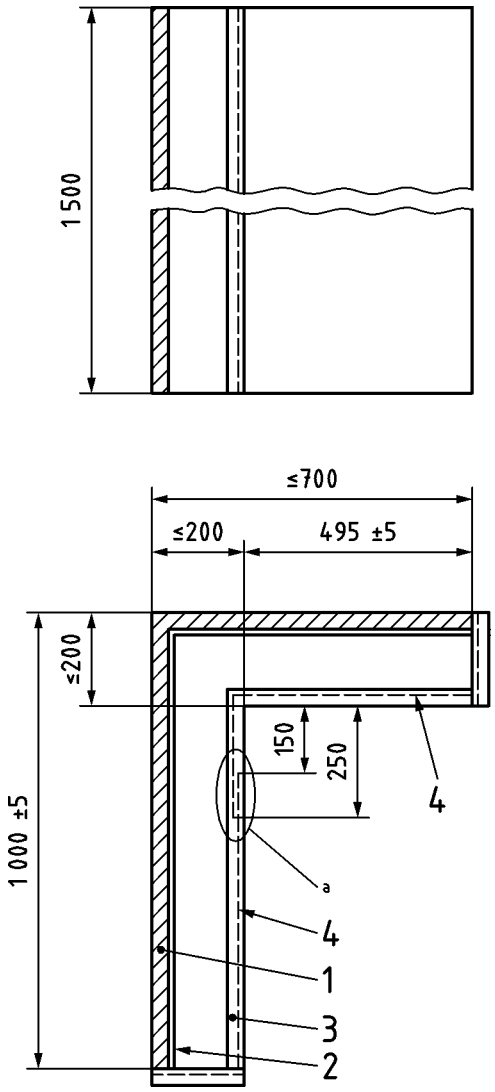
NOTE The product shall be classified according to Delegated Regulation (EU) 2016/364 in connection with EN 13501-1

5.2.1.2 Single burning item test

5.2.1.2.1 Preparation

A test specimen consists of a corner construction using the ETICS kit components. The components shall be fixed to a standard substrate in accordance with EN 13238:2010. ETICS kits with an adhesive present shall be fixed using an adhesive only. ETICS kits with no adhesive present shall be fixed using mechanical fixing devices only. At the long wing of the SBI test 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). In case of a fixing system VIII, at a distance of 150 mm to 230 mm from the inner corner two layers of reinforcement shall overlap. All edges shall be covered with the rendering system except the bottom side and the top side of the test specimen (see Figure 16). After preparation, the test specimens shall be conditioned according to EN 13238:2010.

NOTE A protection, e.g. an aluminium foil, can be used on the bottom side of the test specimen and/or the floor of the test trolley. The protection shall not influence the test result.



Key

1 substrate
2 adhesive
3 rendering system
4 reinforcement
[a] overlapping

Figure 16 — Schematic drawing of the test specimen in the SBI-test according to EN 13823:2020

The cases

a) adhesive with an organic content > 15 %,

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

c) standard substrate according to EN 13238:2010 of the achieved class D according to EN 13501-1:2018,

combined or not, require two-test specimen configurations instead of one with a different thickness of the thermal insulation (see 5.2.1.2.4.1 and 5.2.1.2.4.2 for DiAp).

Two configurations shall be considered regarding base and finishing coats (two-test specimen configuration). 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 configuration. 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 configuration, differing in the layer thicknesses of the base and/or the finishing coat.

In case of the need of two or four test specimen configurations, the test effort can be decreased by considering historical data and/or single measurements, showing a test result of less test specimen configurations 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.

5.2.1.2.2 Determination

The determination shall be done according to EN 13823:2020.

5.2.1.2.3 Reporting

The results shall be reported according to EN 13823:2020.

5.2.1.2.4 DiAp

5.2.1.2.4.1 Substrate

A test result gained with a standard substrate according to EN 13238:2010 with a class B, C or D according to EN 13501-1:2018 also covers a test result gained using a standard substrate according to EN 13238:2010 with an achieved class A1 or A2-s1, d0 according to EN 13501-1:2018.

5.2.1.2.4.2 Adhesive

5.2.1.2.4.2.1 Ready to use and dry mix

For adhesives with an organic content ≤ 15 %, a test result is valid for adhesives with an organic content ≤ and a flame retardant content ≥ and a coverage ≤ that tested, but for a standard substrate according to EN 13238:2010 with an achieved class B, C or D according to EN 13501-1:2018 and an adhesive with an organic content ≤ 5 %, a test result is valid for an organic content ≤, a flame retardant content ≥ and a coverage ≥ that tested.

For adhesives with an organic content > 15 %, a test result is valid for the tested component with a coverage ≤ that tested.

5.2.1.2.4.2.2 PU adhesive foam

For PU adhesive foams a test result is valid for the tested component with a coverage ≤ that tested.

5.2.1.2.4.3 Thermal insulation

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

In case of one test specimen configuration, a test result is valid for a thermal insulation thickness ≤ that 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 > that tested.

For a thermal insulation with an achieved class A1 or A2 according to EN 13501-1:2018, a test result is valid for any thermal insulation of the same material with an apparent density ≤ that tested, a PCS value ≤ that tested and an achieved class according to EN 13501-1:2018 ≥ that tested.

For a thermal insulation of the material MW, EPS, XPS, CG or WF with an achieved class B, C, D, E or F according to EN 13501-1:2018, a test result is valid for any thermal insulation of the same material with an apparent density ≤ that tested and an achieved class according to EN 13501-1:2018 ≥ that tested.

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

5.2.1.2.4.4 Mechanical fixing device

When only adhesives are used for preparing the test specimen, a test result is valid also for the use of 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 type and material as the tested mechanical fixing device. Additionally, if plastic mechanical fixings are used, a test result is also valid for metal fixings of the same type.

5.2.1.2.4.5 Base coat and finishing coat

For base coats and finishing coats, both with an organic content of ≤ 5 %, tested with a thermal insulation with an achieved class A1 or A2 according to EN 13501-1:2018, a test result is valid for any base coat and finishing coat with the same binder type, with a PCS-value ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ that tested.

For base coats and finishing coats, both with an organic content of ≤ 5 %, tested with a thermal insulation with an achieved class B, C, D, E or F according to EN 13501-1:2018, a test result is valid for any base coat and finishing coat with the same binder type, with an organic content ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ that tested.

For base coats and finishing coats, at least one with an organic content of > 5 %, tested with a thermal insulation with an achieved class A1 or A2 according to EN 13501-1:2018, a test result is valid for any base coat and finishing coat with the same binder type, with a PCS-value ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ the thinner and ≤ the thicker layer tested.

For base coats and finishing coats, at least one with an organic content of > 5 %, tested with a thermal insulation with an achieved class B, C, D, E or F according to EN 13501-1:2018, a test result is valid for any base coat and finishing coat with the same binder type, with an organic content ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ the thinner and ≤ the thicker layer tested.

In addition, for ETICS kits with an achieved class A1 or A2-s1, d0 and base coats and finishing coats, both with an organic content of > 5 %, a test result is valid for the tested components and a thickness ≥ the thinner and ≤ the thicker layer tested.

5.2.1.2.4.6 Reinforcement

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

In addition, for ETICS kits with an achieved class A1 or A2, a test result is valid for any reinforcement of the same type with a PCS-value, expressed in MJ/m^2, ≤ that tested.

5.2.1.2.4.7 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, 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 ≤ that tested and a layer thickness ≤ tested.

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004. The organic content of a key or decorative coat shall be calculated according to 5.2.2.4.

5.2.1.3 Single-flame source test

5.2.1.3.1 Preparation

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

Two cases 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 configuration. 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 configuration, differing in the layer thicknesses of the base and/or the finishing coat.

A test specimen shall show a thickness of 55 mm 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 some thermal insulation materials. In this case a 55 mm to 60 mm thick test specimen shall be cut on the reverse (non-exposed) side of the thermal insulation.

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

5.2.1.3.2 Determination

For test specimens with a rendering system the tests shall be performed according to EN ISO 11925-2:2020 with surface exposure on the front side as well as with edge exposure in the middle of each layer of test specimens turned longitudinally by 90°.

For test specimens without a rendering system and an adhesive with an organic content > 15 %, the tests shall be performed according to EN ISO 11925-2:2020 with edge exposure in the middle of the adhesive layer of test specimens turned longitudinally by 90°.

5.2.1.3.3 Reporting

The results shall be reported according to EN ISO 11925-2:2020.

5.2.1.3.4 DiAp

5.2.1.3.4.1 Substrate

A test result gained without a substrate is valid for any substrate.

A test result gained with a standard substrate according to EN 13238:2010 with a class B, C or D according to EN 13501-1:2018 also covers a test result gained using a standard substrate according to EN 13238:2010 with an achieved class A1 or A2-s1, d0 according to EN 13501-1:2018.

5.2.1.3.4.2 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 with the same binder type with an organic content ≤ that tested and with a coverage ≤ that tested.

5.2.1.3.4.3 Thermal insulation

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

For a thermal insulation with an achieved class A1 or A2 according to EN 13501-1:2018, a test result is valid for any thermal insulation of the same material with an apparent density ≤ that tested, a PCS value ≤ that tested and an achieved class according to EN 13501-1:2018 ≥ that tested.

For a thermal insulation of the material MW, EPS, XPS, CG or WF with an achieved class B, C, D, E or F according to EN 13501-1:2018, a test result is valid for any thermal insulation of the same material with an apparent density ≤ that tested and an achieved class according to EN 13501-1:2018 ≥ that tested.

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

5.2.1.3.4.4 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 with the same binder type, with an organic content ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ that 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 with the same binder type, with an organic content ≤ that tested, a flame retardant content ≥ that tested and a thickness ≥ the thinner and ≤ the thicker layer tested.

For base coats and finishing coats of an organic content > 5 %, a test result is valid for base coats and finishing coats with an organic content < 5% and a thickness ≥ the thinner layer tested.

5.2.1.3.4.5 Reinforcement

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

5.2.1.3.4.6 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, 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 ≤ that tested and a layer thickness ≤ tested.

The layer thickness of a key or decorative coat shall be assessed according to EN 1062-1:2004. The organic content of a key or decorative coat shall be calculated according to 5.2.2.4.

5.2.1.4 Non-combustibility test

5.2.1.4.1 Preparation

Test specimens shall be prepared according to EN ISO 1182:2020.

5.2.1.4.2 Determination

The determination shall be done according to EN ISO 1182:2020.

5.2.1.4.3 Reporting

The result shall be reported according to EN ISO 1182:2020.

5.2.1.4.4 DiAp

5.2.1.4.4.1 Adhesive

A test result is valid for any adhesive with an organic content ≤ that tested and a flame retardant content ≥ that tested.

5.2.1.4.4.2 Thermal insulation

EN 15715:2009, Tables A1 and A26 apply.

5.2.1.4.4.3 Base coat

A test result is valid for any base coat with an organic content ≤ that tested and a flame retardant content ≥ that tested.

5.2.1.4.4.4 Reinforcement

For reinforcements a test result is valid for the tested component.

5.2.1.4.4.5 Key coat

For key coats a test result is valid for the tested component.

5.2.1.4.4.6 Finishing coat

A test result is valid for any finishing coat with an organic content ≤ that tested and a flame retardant content ≥ that tested.

5.2.1.4.4.7 Decorative coat

For decorative coats a test result is valid for the tested component.

5.2.1.5 Gross heat of combustion

5.2.1.5.1 Preparation

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

5.2.1.5.2 Determination

The determination of heat of combustion is based on a calculation considering PCS-values of components in the ETICS kit. Components not covered by Decision 96/603/EC as amended shall be tested according to EN ISO 1716:2018.

The calculation shall be done according to Annex B.

The calculation is based on the sum of heat of combustion of each component in the ETICS kit. Hence, it is based on the specified layer thicknesses, density and/or coverage of each component in the ETICS kit. The PCS-value of a component shall be either tested according to EN ISO 1716:2018 or assumed as zero, if Decision 96/603/EC as amended applies.

5.2.1.5.3 Reporting

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

5.2.1.5.4 DiAp

5.2.1.5.4.1 Adhesive

For adhesives a test result is valid for the tested component.

5.2.1.5.4.2 Thermal insulation

EN 15715:2009, Table A1, applies.

5.2.1.5.4.3 Base coat

For base coats a test result is valid for the tested component.

5.2.1.5.4.4 Reinforcement

For reinforcements a test result is valid for the tested component.

5.2.1.5.4.5 Key coat

For key coats a test result is valid for the tested component.

5.2.1.5.4.6 Finishing coat

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

5.2.1.5.4.7 Decorative coat

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

The organic content of the decorative coat shall be calculated according to 5.2.2.4.

5.2.1.6 Reporting

The result of the assessment shall be specified in a classification report according to EN 13501-1:2018 with the achieved reaction to fire class of the ETICS kit together with the reporting of each individual test according to 5.2.1.2.3, 5.2.1.3.3, 5.2.1.4.3 and 5.2.1.5.3, if performed.

5.2.2 Determination for the components

5.2.2.1 Reaction to fire of PU adhesive foam

5.2.2.1.1 Preparation

The specimens shall be prepared in accordance with the provisions of the relevant test methods for the corresponding reaction to fire classes according to EN 13501-1. For that, the PU adhesive foam shall be applied all over on a fibre cement standard substrate or a calcium-silicate standard substrate according to EN 13238.

5.2.2.1.2 Determination

The reaction to fire of the PU adhesive foam shall be determined according to EN 13501-1:2018.

5.2.2.1.3 Reporting

The result shall be reported as the achieved reaction to fire class.

5.2.2.1.4 DiAp

For PU adhesive foams a test result is valid for the tested component with a thickness ≤ that tested and a coverage ≤ that tested.

5.2.2.2 Reaction to fire of the thermal insulation

5.2.2.2.1 Preparation

The specimens shall be prepared in accordance with the provisions of the relevant test methods for the corresponding reaction to fire classes according to EN 13501-1 and also considering the provisions of EN 15715:2009 as well.

5.2.2.2.2 Determination

The reaction to fire performance of the thermal insulation shall be determined using the test method(s) for the corresponding reaction to fire classes according to EN 13501-1.

5.2.2.2.3 Reporting

The result shall be reported as the achieved reaction to fire class.

5.2.2.2.4 DiAp

According to EN 13501-1:2018 and EN 15715:2009.

5.2.2.3 Propensity to undergo continuous smouldering of the thermal insulation

5.2.2.3.1 Preparation

The preparation of the test specimens, which consist only of thermal insulation, shall be done according to EN 16733:2016. Facings or coatings on samples shall be removed to prepare test specimens.

5.2.2.3.2 Determination

The determination shall be done according to EN 16733:2016.

5.2.2.3.3 Testing

The propensity to undergo continuous smouldering shall be assessed according to EN 16733:2016. If EN 16733:2016, 6.2.5 applies, a permanent contact between the pieces shall be assured.

5.2.2.3.4 Reporting

5.2.2.3.4.1 General

The result shall be reported by one of the codes “NoS”, “S” or “ANP” according to the following definition:

— the material does not show propensity for continuous smoldering combustion: NoS;

— the material shows propensity for continuous smoldering combustion: S;

— the assessment of the propensity for continuous smouldering combustion is not possible: ANP.

In addition, the following information shall be reported depending on the material of the tested thermal insulation:

5.2.2.3.4.2 Thermal insulation of the material wood fibre

— type of production process;

— binder chemistry and additives;

— apparent density according to EN 1602:2013;

— thermal insulation thickness according to EN 823:2013;

— fibre orientation.

5.2.2.3.4.3 Thermal insulation of the material mineral wool

— binder chemistry and additives;

— organic content (in percentage per mass) according to EN 13820:2003;

— absolute organic content expressed in kg/m^3;

— apparent density according to EN 1602:2013;

— thermal insulation thickness according to EN 823:2013;

— fibre orientation.

5.2.2.3.4.4 Thermal insulation of the material expanded cork

— type of production process;

— binder chemistry and additives;

— apparent density according to EN 1602:2013;

— thermal insulation thickness according to EN 823:2013.

5.2.2.3.5 DiAp

5.2.2.3.5.1 Thermal insulation of the material wood fibre

A test result is valid for any thermal insulation of the same material, the same type of production process, the same binder chemistry, and with the same additives as tested, with an apparent density ≤ the higher apparent density tested and ≥ the lower apparent density tested, a thickness ≤ that tested and a thickness ≥ that tested, if the nominal thickness of the test specimen was 100 mm, and with any facing or coating.

5.2.2.3.5.2 Thermal insulation of the material mineral wool

A test result is valid for any thermal insulation of the same material, the same binder chemistry and with the same additives as tested, with a loss of ignition in kg/m^3 ≤ that tested, an organic content in % ≤ that tested, an apparent density ≤ that tested, if the tested apparent density was ≤ 120 kg/m^3, a thickness ≤ the higher thickness tested and a thickness ≥ the lower thickness tested, if the nominal thickness of the test specimen was 100 mm, with the tested fibre orientation and any facing or coating.

For a thermal insulation with an apparent density > 120 kg/m^3 tested, a test result is valid for the tested thermal insulation.

5.2.2.3.5.3 Thermal insulation of the material expanded cork

A test result is valid for any thermal insulation of the same material, the same type of production process, the same binder chemistry, and with the same additives as tested with an apparent density ≤ the higher apparent density tested and ≥ the lower apparent density tested, a thickness ≤ that tested and a thickness ≥ that tested, if the nominal thickness of the test specimen was 100 mm, and with any facing or coating.

5.2.2.4 Apparent density of the thermal insulation

5.2.2.4.1 Preparation

The sampling, the preparation of the test specimens and conditioning shall be done according to one of the following standards, depending on the thermal insulation material:

a) MW: EN 13162:2012+A1:2015;

b) EPS: EN 13163:2012+A2:2015;

c) XPS: EN 13164:2012+A1:2015;

d) PU: EN 13165:2012+A2:2016;

e) PF: EN 13166:2012+A2:2016;

f) CG: EN 13167:2012+A1:2015;

g) ICB: EN 13170:2012+A1:2015;

h) WF: EN 13171:2012+A1:2015.

Full size thermal insulation boards shall be used as test specimens. The minimum number of test specimen is five, if not otherwise stated.

5.2.2.4.2 Determination

The apparent density of the thermal insulation shall be determined according to EN 1602:2013.

5.2.2.4.3 Reporting

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

5.2.2.4.4 DiAp

For a one-layer thermal insulation, a test result is valid for the tested component in any thickness.

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

5.2.2.5 Organic content of the dry mix adhesive, ready to use adhesive, the base coat and the finishing coat

5.2.2.5.1 Preparation

NOTE The same method can be used to obtain the content of a flame retardant of a component.

The test specimens shall be prepared either according to EN 1015-6:1998 or by placing a layer of the component on an inert crucible. The coverage shall be as specified by the manufacturer.

5.2.2.5.2 Determination

NOTE The same method can be used to obtain content of a flame retardant of a component.

The method comprises the following steps:

a) The mass or density of each initial base or finishing coat test specimen shall be measured according to EN ISO 3251:2019, used for the test, with a scale. The scale must make it possible to state the result

with at least 3 significant digits. The mass of an initial test specimen includes additives, e.g. tempering water.

b) Condition the initial test specimen for at least 28 days at (23 ± 2) °C and (50 ± 5) % RH.

c) Dry the test specimen to mass constancy at 105 °C achieving m_{dry} with a sufficient scale.

The organic content oc_{dry} shall be calculated in relation to end use condition dried at 105 °C to mass constancy. Any part of the recipe containing organic substances contributes to the organic content of the component.

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

where

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

$oc_{initial}$ 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, in grams

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

If the density and the volume of a test specimen is measured, oc_{dry} is calculated by

$$oc_{dry} = \frac{oc_{initial} \times \rho_{initial} \times V_{initial}}{\rho_{dry} \times V_{dry}}$$

where

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

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

$\rho_{initial}$ is the density of the test specimen, related to the recipe including additives, e.g. tempering water, in grams per millilitre

$V_{initial}$ is the volume of the test specimen in millilitre, related to the recipe including additives, e.g. tempering water

ρ_{dry} is the density of the dried test specimen in grams per millilitre after curing and reaching the mass constancy

V_{dry} is the volume of the dried test specimen in millilitre after curing and reaching the mass constancy

5.2.2.5.3 Reporting

The result shall be reported as the organic content level of the component in percent, rounded to 0,1 %.

5.2.2.5.4 DiAp

The result is valid for the tested component only.

5.2.2.6 Mass per unit area of the reinforcement

5.2.2.6.1 Preparation

The test specimens shall be prepared according to EN 12127:1997 with ambient conditioning.

5.2.2.6.2 Determination

The mass per unit area of the reinforcement shall be determined according to EN 12127:1997.

5.2.2.6.3 Reporting

The result shall be reported as the mean value of the mass per unit area in kg/m^2, rounded to 0,01 kg/m^2.

5.2.2.6.4 DiAp

The result is valid for the tested reinforcement only.

5.3 Water absorption

5.3.1 Preparation

Two different test specimens are used.

The first test specimen consists of the thermal insulation material and the reinforced base coat. The second test specimen consists of the thermal insulation material and the rendering system, i.e. the reinforced base coat and the finishing coat.

NOTE 1 The finishing layer can also show a key coat and/or a decorative coat

NOTE 2 Instead of test specimens showing one base coat thickness only, test specimens with different base coat thicknesses can be used, leading to a two-specimen configuration. (See 5.3.4.2 for DiAp regarding base coat.)

The test specimens shall be prepared according to manufacturer's instructions.

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

5.3.2 Determination

5.3.2.1 Testing

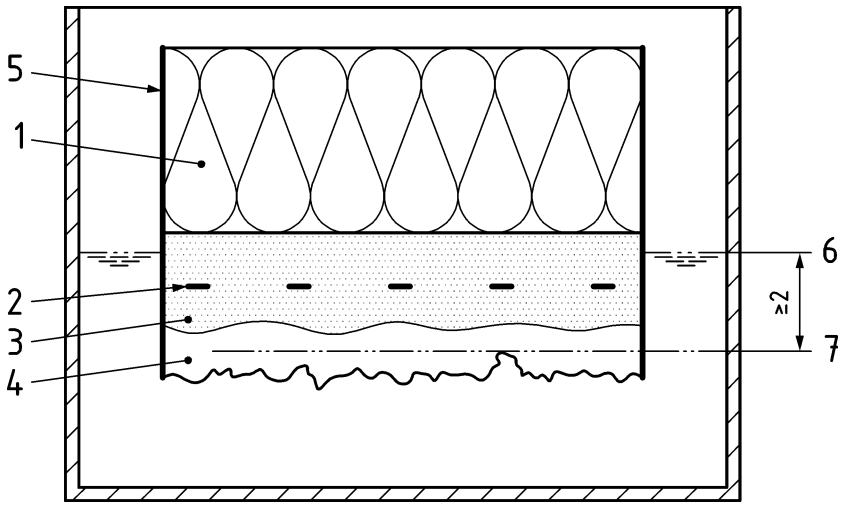
The ETICS kit water absorption shall be tested and assessed according to EN ISO 29767:2019 procedure B. Deviating from EN ISO 29767:2019, the following procedure shall be carried out:

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

— both the dry mass of a test specimen, the mass after 3 min partial immersion $m_{3\,min}$, the mass after 1 h partial immersion m_{1h} and the mass after 24 h partial immersions $m_{24\,h}$ 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.

Dimensions in mm



Key

1 thermal insulation
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

5.3.2.2 Calculation

A test result is calculated as follows:

$$W_{1\,\mathrm{h}} = \frac{m_{1\,\mathrm{h}} - m_{3\,\mathrm{min}}}{A_{\mathrm{p}}}$$

where

$W_{1\,\mathrm{h}}$ is short term water absorption after 1 hour in kg/m²;

$m_{1\,\mathrm{h}}$ is mass of the test specimen after 1 hour 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 ISO 29767:2019, in m².

and

$$W_{24\,\mathrm{h}} = \frac{m_{24\,\mathrm{h}} - m_{3\,\mathrm{min}}}{A_{\mathrm{p}}}$$

where

$W_{24\,\mathrm{h}}$ is short term water absorption after 24 hours in kg/m²;

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

$m_{3\,min}$ 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 ISO 29767:2019, in m^2.

For a two-test specimen configuration, the test result is the maximum of the two results.

5.3.3 Reporting

A test result shall be expressed as the water absorption level with a reinforced base coat only and a rendering system in kg/m^2, rounded to 0,01 kg/m^2.

5.3.4 DiAp

5.3.4.1 Thermal insulation

A test result is valid for a thermal insulation of the same material with a component water absorption according to EN ISO 29767:2019, method A, ≤ that tested.

5.3.4.2 Base coat

For a two-specimen configuration, differing in the thickness of the base coat, a test result is valid for the tested component with a thickness ≥ the thinner and ≤ the thicker layer tested.

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

5.3.4.3 Reinforcement

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

5.3.4.4 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 ≥ that tested and a thickness ≥ that tested.

NOTE The layer thickness of a key coat can be determined according to EN 1062-1:2004.

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.

5.3.4.5 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 chemistry, an aggregate size ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a component water absorption according to EN 1062-3:2008 ≤ that tested.

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

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:2002, a test result is valid for any coat of the same material with the same binder

chemistry, an aggregate size ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a component water absorption ≤ that 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 the same binder chemistry and with a component water absorption ≤ that tested and a thickness ≤ that tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:2002, a test result is valid for any coat of the same material with the same binder chemistry and with a component water absorption ≤ that tested and a thickness ≤ that tested.

For finishing coats according to EN 998-1:2016 or according to EN 15824:2017, but neither aggregate sized, nor felt/modelling nor scraped, a test result is valid for the tested component with a thickness ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm).

For finishing coats neither according to EN 998-1:2016 nor according to EN 15824:2017, a test result is valid for the tested component with a thickness ≥ 1 mm, ≥ (that tested − 2 mm) and ≤ (that tested + 1 mm).

5.3.4.6 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 ≤ that tested and a thickness ≥ that tested.

NOTE The layer thickness of a decorative coat can be determined according to EN 1062-1:2004.

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 Water tightness

5.4.1 Determination for the product

5.4.1.1 Preparation

For purely mechanical fixing methods a two-test specimen configuration can be used for direct field of application, considering different numbers of mechanical fixing devices per unit area. (See 5.4.4.8 for direct field of application rules regarding mechanical fixing devices.)

For base coats a two-test specimen configuration can be used for direct field of application, considering base coat layer thickness. (See 5.4.4.3 for DiAp regarding base coat.)

5.4.1.2 Determination

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

For ETICS kits with a thermal insulation of the material PF, a pre-storage by conditioning at 70°C for 14 days is added before starting the hygrothermal conditioning according to EN 16383:2016.

For ETICS kits with a thermal insulation of the material CG, past-storage by conditioning at 40°C and ≤ 30 % RH for 14 days is added after the hygrothermal conditioning according to EN 16383:2016

For ETICS with a thermal insulation of the material WF, at least five test specimens shall be taken after the hygrothermal conditioning according to EN 16383:2016. The moisture content of the Thermal insulation, in particular 1/3 of the insulation perpendicular to faces, adjacent to the rendering system, shall be determined according to EN 13183:XXXX.

The different hygrothermal conditionings are

— heating and wetting (hw);

— heating and wetting + heating and cooling (hwc);

— heating and wetting + heating and cooling + wetting, freezing and thawing (hwcft).

The following defects are considered:

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

— failure or cracks associated with joints between thermal insulation;

— cracks with a width > 0,2 mm.

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

The bonded area and thickness of adhesive shall be measured on two temporarily applied insulation boards on the test wall according to EN 16383:2016.

The adhesive is applied onto two thermal insulation boards and/or the substrate according to the manufacturer's instructions. Immediately after applying the boards onto the substrate, the thickness of the adhesive layer is evaluated by the distance between the surface of the substrate and the thermal insulation at all accessible edges. The minimum number of measurements shall be 8, evenly distributed.

The test result is the thickness of the adhesive in the ETICS kit, calculated as the mean of all measurements. The thickness of the adhesive shall be expressed in mm, rounded to 1 mm.

Immediately after the measurement of the thickness of adhesive, the two insulation boards are carefully removed from the test wall. The side of the insulation board with the adhesive of each thermal insulation board shall be examined. Also the surface of the substrate, where the two insulation boards have been applied, shall be examined.

The percentage of the area, which was covered with the adhesive in the applied stage, is determined visually.

NOTE The examination can be done immediately or by a photo documentation.

The result shall be documented photographically.

The test result is the bonded area. The bonded area shall be expressed in percent, rounded down to the nearest multiple of 5 %.

5.4.1.3 Reporting

The test/assessment result shall be expressed by a two part code.

The first part shows the hygrothermal conditioning according to EN 16383:2016, "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.

The second part of the code shows, if defects or no defects appeared after conditioning, "defects" or "no defects".

EXAMPLE 1 hwc | no defects

EXAMPLE 2 hwcft | defects

5.4.1.4 DiAp

5.4.1.4.1 Adhesive

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

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

For a fixing method using an adhesive only, a thermal insulation of the material XPS, PF or CG and an adhesive with inorganic binder, a test result is valid for any adhesive with inorganic binder, a shrinkage according to EN 12617-4:2002, procedure 6, Annex 1.3 ≤ that tested and a thickness ≤ that tested.

For a fixing method using an adhesive bed and additional mechanical fixing devices and a thermal insulation of the material MW, EPS, XPS, PU, PF, WF or IBC, a test result is valid for any adhesive.

For a fixing method using an adhesive bed and additional mechanical fixing devices and a thermal insulation of the material CG, a test result is valid for tested adhesive only.

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

5.4.1.4.2 Thermal insulation

For a thermal insulation of the types MW board one-layer, MW board dual-layer or MW lamella and a thickness of the thermal insulation in the test specimen ≥ 80 mm, a test result is valid for any thermal insulation of the same type as tested, a tensile strength perpendicular to faces ≥ that tested and any thermal insulation thickness.

In addition, for a thermal insulation of the type MW board one-layer and a thickness of the thermal insulation in the test specimen ≥ 80 mm, a test result is valid also for any thermal insulation of the type MW board dual-layer with a tensile strength perpendicular to faces ≥ that tested and any thickness of thermal insulation.

For a thermal insulation of the material EPS, PU and CG and a thickness of the thermal insulation in the test specimen ≥ 80 mm, a test result is valid for any thermal insulation of the same material as tested, a tensile strength perpendicular to faces ≥ that tested and any thermal insulation thickness.

For a thermal insulation of the material XPS, ICB and WF, a test result is valid for any thermal insulation of the same material as tested, a tensile strength perpendicular to faces ≥ that tested and a thickness ≤ that tested. For thermal insulation material XPS a test result without foam skin is only valid for XPS without foam skin.

For a thermal insulation of the material PF, a test result is valid for the tested component with a thickness ≤ that tested.

5.4.1.4.3 Base coat

For a two-specimen configuration, differing in the thickness of the base coat, a test result is valid for the tested component with a thickness ≥ the thinner and ≤ the thicker layer tested.

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

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

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

5.4.1.4.4 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 ≥ that tested, a mesh size ≤ that 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 component.

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

5.4.1.4.5 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 ≥ that tested and a thickness ≥ that tested.

NOTE The layer thickness of a key coat can be determined according to EN 1062-1:2004.

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.

5.4.1.4.6 Finishing coat

For finishing coats the following rules apply based on the water absorption with a reinforced base coat only and with a rendering system according to 5.3.

5.4.1.4.6.1 Reinforced base coat only with water absorption > 0,5 kg/m², according to 5.3

The rules in this clause apply if the water absorption with a reinforced base coat only is > 0,5 kg/m² according to 5.3.

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 chemistry, an aggregate size ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a finishing coat water absorption according to EN 1062-3:2008 ≤ that tested.

For felt/modelling coats according to EN 15824:2017, a test result is valid for any coat of the same material with a finishing coat water absorption according to EN 1062-3:2008 ≤ that tested and a thickness ≤ that 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 chemistry, an aggregate size ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a finishing coat water absorption ≤ that tested.

For aggregate sized coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:2002, a test result is valid for any coat of the same material with the same binder chemistry, an aggregate size ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a finishing coat water absorption ≤ that 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 finishing coat ≤ that tested and a thickness ≤ that tested.

For felt/modelling coats and scraped coats according to EN 998-1:2016 with a component water absorption tested according to EN 1015-18:2002 a test result is valid for any coat of the same material with a finishing coat water absorption ≤ that tested and a thickness ≤ that tested.

For finishing coats not according to EN 998-1, not according to EN 15824, neither aggregate sized, nor felt/modelling nor scraped, a test result is valid for the tested component with a thickness ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm).

5.4.1.4.6.2 Reinforced base coat only with water absorption ≤ 0,5 kg/m² and rendering system with water absorption > 0,5 kg/m², according to 5.3

The rules in this clause apply if the water absorption with a reinforced base coat only is ≤ 0,5 kg/m² according to 5.3 and if the water absorption with a rendering system is > 0,5 kg/m² according to 5.3.

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 ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a water absorption with a rendering system according to 5.3, including the finishing coat, ≤ 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 with a rendering system according to 5.3, including the finishing coat, ≤ assessed and a thickness ≤ that 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 ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a water absorption with a rendering system according to 5.3, including the finishing coat, ≤ 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 with a rendering system according to 5.3, including the finishing coat, ≤ assessed and a thickness ≤ that tested.

For finishing coats not according to EN 998-1, not according to EN 15824, neither aggregate sized, nor felt/modelling nor scraped, a test result is valid for the tested component with a thickness ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm).

5.4.1.4.6.3 Reinforced base coat only with water absorption ≤ 0,5 kg/m² and rendering system with water absorption ≤ 0,5 kg/m², according to 5.3

The rules in this clause apply if the water absorption with a reinforced base coat only is ≤ 0,5 kg/m² according to 5.3 and if the water absorption with a rendering system is ≤ 0,5 kg/m² according to 5.3.

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 ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a water absorption with a rendering system according to 5.3, including the finishing coat, ≤ 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 ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm) and a water absorption with a rendering system according to 5.3, including the finishing coat, ≤ assessed.

For finishing coats not according to EN 998-1, not according to EN 15824, neither aggregate sized, nor felt/modelling nor scraped, a test result is valid for the tested component with a thickness ≥ 1 mm, ≥ (that tested − 3 mm) and ≤ (that tested + 2 mm).

5.4.1.4.7 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 ≤ that tested and a thickness ≥ that tested.

NOTE The layer thickness of a decorative coat can be determined according to EN 1062-1:2004.

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.

5.4.1.4.8 Mechanical fixing device

If the kit, used as the test specimen, is bonded with adhesive only (II), a test result is valid for the following fixing methods of ETICS kits:

a) ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I), if anchors are countersunk;

b) ETICS kit bonded with adhesive (II);

c) ETICS kit mechanically fixed on adhesive bed with plate anchors (III), if anchors are countersunk;

d) ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV).

If the kit, used as the test specimen, is mechanically fixed on adhesive bed with plate anchors (III), a test result is valid for the following fixing methods of ETICS kits:

a) ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I);

b) ETICS kit bonded with adhesive (II);

c) ETICS kit mechanically fixed on adhesive bed with plate anchors (III);

d) ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV).

If the kit, used as the test specimen, is mechanically fixed on adhesive bed with spiral anchors countersunk (IV), a test result is valid for the following fixing methods of ETICS kits:

a) ETICS kit bonded with adhesive (II);

b) ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV).

If the kit, used as the test specimen, is mechanically fixed with plate anchors (V), mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI), mechanically fixed with profiles and rails and optional plate anchors (VII) or ETICS kit mechanically fixed by an anchored metal mesh (VIII), a test result is valid for the tested fixing method only. A test result is valid for anchors of the same type and of the same material (metal or plastic) as tested, with one exception. For profiles and rails a test result is valid also for the alternative material of profiles and rails, i.e. metal or plastic, as tested. A test result is valid for the number of mechanical fixing devices per unit area ≥ the lower number and ≤ the higher number that tested, if a two-test specimen configuration with different numbers of anchors per unit area is used.

5.4.1.4.9 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.

5.4.2 Determination for the components

5.4.2.1 Moisture content of the thermal insulation after hygrothermal conditioning

5.4.2.1.1 Preparation

The sampling shall be done after the hygrothermal conditioning according to EN 16383:2016. At least five test specimens shall be taken.

5.4.2.1.2 Determination

The moisture content of the first third of the thermal insulation perpendicular to faces, adjacent to the rendering system, shall be determined according to EN 13183:XXXX.

5.4.2.1.3 Reporting

The result shall be expressed as moisture content in %, rounded to 1%.

5.4.2.1.4 DiAp

All DiAp rules in 5.4.1.4 apply.

5.5 Impact resistance

5.5.1 Preparation

The test specimen shall be prepared according to EN 13497:2018+A1:2021 by using a thermal insulation and a rendering system. The use of a key and/or a decorative coat is optional.

5.5.2 Determination

The assessment of impact resistance is based on observation of the defects according to EN 13497:2018+A1:2021 at different levels of impact energy.

5.5.3 Reporting

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+A1:2021. 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 external surface and the rear side of the rendering system of the test specimen. “S” means external surface is considered only. “SR” means, external surface and rear side of the rendering system are considered.

The second part of the code shows the impact energy chosen according to EN 13497:2018+A1:2021 in J.

The third part shows the conditioning according to EN 13497:2018+A1:2021, 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.

The fourth part of the code shows, if any defect appeared after the test or not, “defects” or “no defects”.

The fifth part of the code shows, if cracks with crack widths > 0,2 mm appeared or not, “cracks” or “no cracks”.

EXAMPLE 1 S | 10 J | w | no defects | cracks.

EXAMPLE 2 SR | 25 J | hwcft | no defects | no cracks

5.5.4 DiAp

5.5.4.1 Thermal insulation

For thermal insulation, a test result is valid for the tested component with a thickness ≥ that tested.

5.5.4.2 Base coat

For base coats, a test result is valid for the tested component with a thickness ≥ that tested.

NOTE Differing thicknesses, caused e.g. by a coarse finishing coat, shall be measured with the calliper several times at randomly chosen positions.

5.5.4.3 Reinforcement

For reinforcements, a test result is valid for the tested component only.

5.5.4.4 Key coat

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

NOTE The layer thickness of a key coat can be determined according to EN 1062-1:2004.

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.

5.5.4.5 Finishing coat

For finishing coats, a test result is valid for the tested component with a thickness ≥ that tested.

5.5.4.6 Decorative coat

If a decorative coat is present in the test specimen, a test result is valid for any decorative coat with a thickness ≥ that 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 Water vapour permeability

5.6.1 Determination for the components

5.6.1.1 Water vapour diffusion-equivalent air layer thickness of the thermal insulation

5.6.1.1.1 One-layer thermal insulation

5.6.1.1.1.1 Preparation

The test specimens shall be prepared according to EN ISO 12572:2016.

5.6.1.1.1.2 Determination

For a one-layer thermal insulation, the thermal insulation shall be assessed according to EN ISO 12572:2016.

For a thermal insulation with a facing or coating, e.g. in the case of sprayed coating, the water vapour permeability of the layer is determined by testing the thermal insulation, with the facing or coating and with the facing or coating removed, according to EN ISO 12572:2016.

For a thermal insulation with a facing or coating, the diffusion-equivalent air layer thickness s_d of the facing alone is the difference of the tested s_d-values of the thermal insulation with the facing or coating and with the facing or coating removed.

For a thermal insulation of the material MW the result is calculated by the following: s_d = thickness · 1.

5.6.1.1.1.3 Reporting

A test result shall be reported as the water vapour diffusion-equivalent air layer thickness of the thermal insulation s_d in m, rounded to 3 significant digits.

5.6.1.1.1.4 DiAp

For thermal insulation, a test result is valid any thermal insulation of the same material, the same apparent density and the same thickness.

5.6.1.1.2 MW dual-layer thermal insulation

5.6.1.1.2.1 Preparation

The test specimens shall be prepared according to EN ISO 12572:2016.

5.6.1.1.2.2 Determination

For a dual-layer thermal insulation, each layer of the thermal insulation shall be assessed separately according to EN ISO 12572:2016.

For a thermal insulation with a facing or coating, e.g. in the case of sprayed coating, the water vapour permeability of the layer is determined by testing the thermal insulation, with the facing or coating and with the facing or coating removed, according to EN ISO 12572:2016.

For a thermal insulation with a facing or coating, the diffusion-equivalent air layer thickness s_d of the facing alone is the difference of the tested s_d-values of the thermal insulation with the facing or coating and with the facing or coating removed.

For a thermal insulation of the material MW the result is calculated by the following: s_d = thickness · 1.

5.6.1.1.2.3 Reporting

A test result shall be reported as the water vapour diffusion-equivalent air layer thickness of the thermal insulation s_d in m, rounded to 3 significant digits.

5.6.1.1.2.4 DiAp

For thermal insulation, a test result is valid for the tested component.

5.6.1.2 Water vapour diffusion-equivalent air layer thickness of the base coat

5.6.1.2.1 Preparation

The test specimens shall be prepared according to EN ISO 7783:2018 or EN 1015-19:1998.

5.6.1.2.2 Determination

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 1015-19:1998, if the thickness of the test specimen within the range of 10 mm to 30 mm is not applicable, it shall be assessed according to EN ISO 7783:2018.

5.6.1.2.3 Reporting

A test result shall be reported as the water vapour diffusion-equivalent air layer thickness of the basecoat s_d in m, rounded to 3 significant digits.

5.6.1.2.4 DiAp

For base coats, a test result is valid for the tested component and thickness only. If a two-specimen configuration with two thicknesses is used, results shall be linear interpolated between the thicknesses.

5.6.1.3 Water vapour diffusion-equivalent air layer thickness of the finishing coat

5.6.1.3.1 Preparation

The test specimens shall be prepared according to EN ISO 7783:2018 or EN 1015-19:1998.

5.6.1.3.2 Determination

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

For finishing coats of a material according to EN 998-1:2016, the water vapour permeability shall be assessed according to EN 1015-19:1998, if the thickness of the test specimen within the range of 10 mm to 30 mm is not applicable, it shall be assessed according to EN ISO 7783:2018.

5.6.1.3.3 Reporting

The water vapour permeability shall be expressed as the water vapour diffusion-equivalent air layer thickness of the finishing coat s_d in m, rounded to 3 significant digits.

5.6.1.3.4 DiAp

For finishing coats, a test result is valid for the tested component and thickness only. If a two-specimen configuration with two thicknesses is used, results shall be linear interpolated between the thicknesses.

5.6.1.4 Water vapour diffusion-equivalent air layer thickness of key or decorative coat

5.6.1.4.1 Preparation

The test specimens shall be prepared according to EN 7783:2018.

5.6.1.4.2 Determination

The water vapour permeability of the key coat or decorative coat shall be determined according to EN 7783:2018.

5.6.1.4.3 Reporting

The water vapour permeability of the key- or decorative coat shall be expressed as the water vapour diffusion-equivalent air layer thickness s_d in m, rounded to 3 significant digits.

5.6.1.4.4 DiAp

For key and decorative coats, a test result is valid for the tested components and thicknesses only. If a two-specimen configuration with two thicknesses is used, results shall be linear interpolated between the thicknesses.

5.7 Bond strength

5.7.1 Bond strength of adhesive to thermal insulation

5.7.1.1 Bond strength of ready to use or dry mix adhesive to thermal insulation

5.7.1.1.1 Preparation

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 additional conditioning (dry);

— 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 for 2 hours until the test is performed (wet);

— 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 (wet and redried).

5.7.1.1.2 Determination

The bond strength to the thermal insulation shall be assessed in accordance with EN 13494:2019. The failure is considered as cohesive in the thermal insulation, if more than 50% of the failure occurs in the thermal insulation.

5.7.1.1.3 Reporting

The result of the assessment shall be expressed as the bond strength level of adhesive to thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %. All values shall be given for each conditioning according to 5.7.1.1.1.

It shall also be reported, if cohesion failure within the thermal insulation appeared or not.

5.7.1.1.4 DiAp

5.7.1.1.4.1 Adhesive

For adhesives, a test result is valid for the tested component.

5.7.1.1.4.2 Thermal insulation

A test result is valid for any thermal insulation of the same material, type and facing/coating as tested and a tensile strength ≥ that tested in any thickness.

5.7.1.2 Bond strength of PU adhesive foam to thermal insulation

5.7.1.2.1 Preparation

The test specimen shall use the thermal insulation in question as substrate and prepared in accordance with EN 17101:2018 “Cohesion strength”.

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.

5.7.1.2.2 Determination

For PU adhesive foams, the bond strength to the thermal insulation shall be assessed in accordance with EN 17101:2018.

5.7.1.2.3 Reporting

A test result shall be expressed as the bond strength of adhesive to thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %.

It shall also be reported, if cohesion fracture within the thermal insulation material appeared or not.

5.7.1.2.4 DiAp

5.7.1.2.4.1 Adhesive

For adhesives, a test result is valid for the tested component.

5.7.1.2.4.2 Thermal insulation

A test result is valid for any thermal insulation of the same material, type and facing/coating as tested and a tensile strength ≥ that tested in any thickness.

5.7.2 Tensile strength perpendicular to faces of thermal insulation

5.7.2.1 Determination for the product

5.7.2.1.1 Preparation

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.

The test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The test is performed without additional conditioning (dry condition).

5.7.2.1.2 Determination

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

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

$\overline{\sigma}_{mt,dry}$ is the mean value of the tensile strength perpendicular to faces in dry conditions

5.7.2.1.3 Reporting

The result shall be expressed as the tensile strength perpendicular to faces of the thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %.

5.7.2.1.4 DiAp

For thermal insulation, the result is valid for the tested component in any thickness.

5.7.2.2 Determination for the properties

5.7.2.2.1 Tensile strength perpendicular to faces of thermal insulation in wet condition

5.7.2.2.1.1 Preparation

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.

The test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The test is performed after 7 or 28 days of additional 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. The 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH in a climatic chamber is considered to be the reference method, the 28 days exposure at (70 ± 2) °C and (90 ± 5) % RH in a climatic chamber is considered to be the alternative method.

5.7.2.2.1.2 Determination

The tensile strength perpendicular to faces of the thermal insulation shall be assessed after conditioning (wet condition) according to EN 1607:2013.

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

$\overline{\sigma}_{mt,wet,7}$ is the mean value of the tensile strength perpendicular to faces in wet conditions with 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH

$\overline{\sigma}_{mt,wet,28}$ is the mean value of the tensile strength perpendicular to faces in wet conditions with 28 days exposure at (70 ± 2) °C and (90 ± 5) % RH

5.7.2.2.1.3 Reporting

The result shall be expressed as the tensile strength perpendicular to faces of the thermal insulation in wet condition in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %. The days of additional exposure shall be given.

5.7.2.2.1.4 DiAp

For thermal insulation, the result is valid for the tested component in any thickness.

5.7.2.2.2 Compressive strength of thermal insulation in dry condition

5.7.2.2.2.1 Preparation

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.

The test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The test is performed without additional conditioning (dry condition).

5.7.2.2.2.2 Determination

The compression behaviour of the thermal insulation shall be assessed according to EN 826:2013. The test shall be selected 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.

The compression behaviour of the thermal insulation shall be calculated according to EN 826:2013.

5.7.2.2.2.3 Reporting

The result shall be expressed as the compression behaviour of the thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %.

5.7.2.2.2.4 DiAp

For thermal insulation, the result is valid for the tested component in any thickness.

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

5.7.3.1 Preparation

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 additional conditioning (dry);

— 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 (hw, hwc, hwcft)

NOTE The overall test specimen of the assessment of water tightness, 5.4, can be used.

5.7.3.2 Determination

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

5.7.3.3 Reporting

The result shall be expressed as the bond strength of base coat to thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %. All these values shall be given for each conditioning according to 5.7.3.1 and each thickness of reinforced base coat tested. Furthermore, the conditioning shall be given. The result shall also include the hygrothermal conditioning according to EN 16383:2016. The different hygrothermal conditionings are

— heating and wetting (hw);

— heating and wetting + heating and cooling (hwc);

— heating and wetting + heating and cooling + wetting, freezing and thawing (hwcft).

5.7.3.4 DiAp

5.7.3.4.1 Thermal insulation

See 5.4.1.4.2.

5.7.3.4.2 Base coat

See 5.4.1.4.3.

5.7.3.4.3 Reinforcement

See 5.4.1.4.4.

5.7.4 Bond strength of the rendering system to the thermal insulation in the ETICS kit

5.7.4.1 Preparation

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 additional conditioning (dry);

— 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 (hw, hwc, hwcft)

NOTE The overall test specimen of the assessment of water tightness, 5.4, can be used.

5.7.4.2 Determination

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

5.7.4.3 Reporting

The result shall be expressed as the bond strength of rendering system to thermal insulation in kPa, rounded to 3 significant digits, the mean value, the minimum value and the 5 %-quantile for a confidence level of 75 %.

The result shall also include the conditioning according to EN 16383:2016. The different hygrothermal conditionings are

— heating and wetting (hw),

— heating and wetting + heating and cooling (hwc),

— heating and wetting + heating and cooling + wetting, freezing and thawing (hwcft).

5.7.4.4 DiAp

5.7.4.4.1 Thermal insulation

See 5.4.1.4.2.

5.7.4.4.2 Base coat

See 5.4.1.4.3.

5.7.4.4.3 Reinforcement

See 5.4.1.4.4.

5.7.4.4.4 Key coat

See 5.4.1.4.5.

5.7.4.4.5 Finishing coat

See 5.4.1.4.6.

5.7.4.4.6 Decorative coat

See 5.4.1.4.7.

5.7.4.4.7 Test cycles according to EN 16383:2016

See 5.4.1.4.9.

5.8 Fixing strength

5.8.1 Pull-through resistance

5.8.1.1 General

The pull-through resistance is based on the pull-through resistance of single plate anchors or single spiral anchors, see 5.8.1.3 and 5.8.1.4. Only the results evaluated with the same anchor type (plate or spiral anchor) and, in case of plate anchors, the same anchor plate distance perpendicular to substrate (flush or countersunk) shall be used for determination.

5.8.1.2 Determination

The pull-through resistance $\sigma_{\text{k,anchors}}$ shall be calculated with the test results reported in accordance with 5.8.1.3.3 or 5.8.1.4.3:

$$\sigma_{k,\text{anchors}} = F_{k,a} \times n_a + F_{k,\text{ec}} \times n_{\text{ec}} + F_{k,j} \times n_j$$

where

$\sigma_{\text{k,anchors}}$ is pull-through resistance of the ETICS kit in kPa;

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

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

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

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

n_{ec} is the number of anchors in edge/corner position per unit area;

n_{j} is the number of anchors in joint position per unit area.

5.8.1.3 Pull-through resistance of the plate anchor

5.8.1.3.1 Preparation

The test specimens shall be prepared according to EN 16382:2016.

5.8.1.3.2 Determination

5.8.1.3.2.1 Pull-through resistance

The pull-through resistance of the plate anchor in the thermal insulation shall be tested according to EN 16382:2016 and the characteristic pull-through resistance F_{k} calculated according to EN 16382:2016.

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

where

F_{k} is characteristic pull-through resistance of an anchor in kN;

$F_{5\%}$ is 5 %-quantile for a confidence level of 75 % of the pull-through resistance according to EN 16382:2016 in kN;

If the reference anchor has been used for the test, the characteristic pull-through resistance F_k of an anchor is calculated as follows:

$F_k = 0{,}75$ kN if $F_{5\,\%} \geq 0{,}75$ kN

$F_k = F_{5\,\%}$ if $F_{5\,\%} < 0{,}75$ kN

Related to the anchor setting positions:

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

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

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

5.8.1.3.2.2 Distance c according to Figure 1

The distance *c* according to Figure 1 shall be determined according to EN 16382:2016.

5.8.1.3.2.3 Minimum distance between the anchor sleeves from which superposition is avoided

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

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

where

d_{min} is the minimum distance between the anchor sleeves from which superposition is avoided;

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

t_l is the thickness of thermal insulation in mm;

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

If tensile mode of failure occurred during the test, no breaking cone appears. In this case, the minimum distance between the anchor sleeves from which superposition is avoided d_{min} shall be at least the diameter of the tension plate used in the test according to EN 16382:2016.

If the distance between all anchor sleeves is ≥ the minimum distance, there is no superposition.

The distance to the border r_{min} defining the middle area position is

$$r_{min} = 0{,}5 \times d_{min}$$

where

r_{min} is the distance defining the middle area position;

d_{min} is the minimum distance between the anchor sleeves from which superposition is avoided

5.8.1.3.3 Reporting

The characteristic pull-through resistance $F_{k,a}$, $F_{k,ec}$ or $F_{k,j}$ of a single plate anchor shall be expressed in kN, rounded to 2 significant digits together with the distance *c* according to Figure 1 in mm, rounded to 1 mm, the minimum distance between the anchor sleeves from which superposition is avoided d_{min} in mm, rounded to 5 mm, and the load displacement graphs.

5.8.1.3.4 DiAp

5.8.1.3.4.1 Thermal insulation

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

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

— the resulting thickness of the thermal insulation below the anchor plate ≥ 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 ≥ the tested thermal insulation thickness.

For plate anchors countersunk in dual-layer thermal insulation with the plate of the anchor located within the outer layer, a test result evaluated with plate anchors flush is valid when

— the resulting thickness of the thermal insulation below the anchor plate ≥ the tested thermal insulation thickness,

— a depth of a cut made by a setting tool leading to a resulting thickness of the thermal insulation below the cut ≥ the tested thermal insulation thickness, and

— a remaining undisturbed outer layer thickness ≥ the tested undisturbed outer layer thickness.

5.8.1.3.4.2 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 $k_P \geq$ that tested, a plate diameter $d_P \geq$ that tested and a characteristic load resistance of the anchor plate $F_p \geq$ that tested.

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

For the reference anchor flush, a test result $F_k \leq 0{,}5$ kN is valid for plate anchors flush in any length with a characteristic plate stiffness $k_P \geq 0{,}3$ kN/mm, a plate diameter $d_P \geq 60$ mm and a characteristic load resistance of the anchor plate $F_p \geq 1{,}0$ kN.

For the reference anchor flush, a test result $F_k > 0{,}5$ kN is valid for plate anchors flush in any length with a characteristic plate stiffness $k_P \geq 0{,}6$ kN/mm, a plate diameter $d_P \geq 60$ mm and a characteristic load resistance of the anchor plate $F_p \geq 1{,}0$ kN.

For the reference anchor countersunk in one-layer thermal insulation, a test result $F_k \leq 0{,}5$ kN is valid for plate anchors flush or countersunk in any length with a characteristic plate stiffness $k_P \geq 0{,}3$ kN/mm, a plate diameter $d_P \geq 60$ mm and a characteristic load resistance of the anchor plate $F_p \geq 1{,}0$ kN.

For the reference anchor countersunk in one-layer thermal insulation, a test result $F_k > 0{,}5$ kN is valid for plate anchors flush or countersunk in any length with a characteristic plate stiffness $k_P \geq 0{,}6$ kN/mm, a plate diameter $d_P \geq 60$ mm and a characteristic load resistance of the anchor plate $F_p \geq 1{,}0$ kN.

A test result is valid for any anchor setting position ≥ that tested. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

For plate anchors used with an additional washer, a test result is valid for the tested anchor in any length and the tested additional washer only.

5.8.1.4 Pull-through resistance of the spiral anchor

5.8.1.4.1 Preparation

The test specimens shall be prepared according to EN 16382:2016.

5.8.1.4.2 Determination

5.8.1.4.2.1 Pull-through resistance

The pull-through resistance of the spiral anchor in the thermal insulation shall be tested according to EN 16382:2016 and the characteristic pull-through resistance F_k calculated according to 5.8.1.3.2.1.

5.8.1.4.2.2 Distance c according to Figure 1

The distance *c* according to Figure 1 shall be determined according to EN 16382:2016.

5.8.1.4.2.3 Minimum distance between the anchor sleeves from which superposition is avoided

If no tensile mode of failure occurred during the test, the minimum distance between the anchor sleeves from which superposition is avoided d_{min} shall be calculated by using the breaking cone 2 r_{tl} according to EN 16382:2016 or the theoretical load cone 2 × t_{fix} + 2 × r_{spiral}, whichever is the greatest:

$$d_{\min} = \max\left(2 \times r_{tl}\,;\, 2 \times t_{fix} + 2 \times r_{spiral}\right)$$

where

- d_{min} is the minimum distance between the anchor sleeves from which superposition is avoided;
- 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 spiral to the wall facing side of the thermal insulation;
- r_{spiral} is the maximum radius of the spiral of the spiral anchor in mm.

If tensile mode of failure occurred during the test, the minimum distance between the anchor sleeves from which superposition is avoided d_{min} shall be at least the diameter of the tension plate used in the test according to EN 16382:2016.

The distance to the border r_{min} defining the middle area position is

$$r_{\min} = 0{,}5 \times d_{min}$$

where

- r_{min} is the distance to the border defining the middle area position;
- d_{min} is the minimum distance between the anchor sleeves from which superposition is avoided

5.8.1.4.3 Reporting

The characteristic pull-through resistance $F_{k,a}$, $F_{k,ec}$ or $F_{k,j}$ of a single spiral anchor shall be expressed in kN, rounded to 2 significant digits together with the distance c according to Figure 1 in mm, rounded to 1 mm, and the minimum distance between the anchor sleeves from which superposition is avoided d_{min} in mm, rounded to 5 mm. In addition, all load-displacement graphs obtained during the tests shall be reported.

5.8.1.4.4 DiAp

5.8.1.4.4.1 Thermal insulation

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

For spiral anchors in dual-layer thermal insulation, a test result evaluated is valid for the tested type of thermal insulation, a tensile strength of the layer where the anchor is sitting in ≥ that tested and a thickness ≥ that tested.

5.8.1.4.4.2 Spiral anchors

For spiral anchors, a test result is valid for the tested anchor only and for a distance of the thermal insulation surface, directed to the substrate, to upper spiral end t_{fix} ≥ that tested.

A test result is valid for any anchor setting position ≥ that tested. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

5.8.1.5 Reporting

The pull-through resistance of an ETICS kit shall be expressed as $\sigma_{k,anchors}$ in kPa, rounded to 3 significant digits, and the minimum distance between the anchor sleeves from which superposition is avoided d_{min} in mm, rounded to 5 mm.

5.8.2 Pull-off tensile resistance

5.8.2.1 Preparation

For ETICS kits mechanically fixed on adhesive bed with plate or spiral anchors (III and IV), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. In case of a dual-layer thermal insulation, the spiral of a spiral anchor shall be completely located within the inner layer of the thermal insulation. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

For ETICS kits mechanically fixed with plate anchors (V), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

For ETICS kit mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. The test specimen shall have at least three parallel rails. A one or a two-specimen configuration, 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 ETICS kits mechanically fixed with profiles and rails and optional plate anchors (VII), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. The test specimen shall have at least three parallel rails. A one or a two-specimen configuration, 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.

5.8.2.2 Determination

5.8.2.2.1 General

The pull-off tensile resistance shall be assessed as the load bearing capability according to EN 13495:2019, method A.

The pull-off tensile resistance $\sigma_{k,block,t}$ shall be calculated with a test result reported in accordance with EN 13495:2019:

$$\sigma_{k,\text{block},t} = \frac{F_{5\,\%}}{l \times b}$$

where

$\sigma_{k,block,t}$ is the pull-off tensile resistance, in kPa;

$F_{5\%}$ is the characteristic failure load (load bearing capability) according to EN 13495:2019, in kN;

l is the length of the test specimen (thermal insulation) according to EN 13495:2019, in m;

b is the width of the test specimen (thermal insulation) according to EN 13495:2019, in m.

5.8.2.2.2 Test specimen showing plate anchors in middle area position only

See G.2.

5.8.2.2.3 Test specimen showing plate anchors in different anchor setting positions

See G.3.

5.8.2.2.4 Test specimen showing profiles and rails

See G.4.

5.8.2.3 Reporting

The pull-off tensile resistance, $\sigma_{k,block,t}$, shall be expressed as level in kPa, rounded to 3 significant digits. In addition, all load-displacement graphs obtained during the tests shall be reported.

5.8.2.4 DiAp

5.8.2.4.1 Thermal insulation

A test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested and a thickness ≥ that tested.

Additional rules for plate anchors countersunk:

For plate anchors countersunk in one-layer thermal insulation, a test result is valid when

— the resulting thickness of the thermal insulation below the anchor plate ≥ that tested, and

— the depth of a cut made by a setting tool leading to an undisturbed thickness of the thermal insulation ≥ that tested.

For plate anchors countersunk in dual-layer thermal insulation, a test result is valid when

— the resulting thickness of the outer layer of the dual-layer thermal insulation below the anchor plate is ≥ that tested, and

— the depth of a cut made by a setting tool leading to an undisturbed thickness of the outer layer of the dual-layer thermal insulation ≥ that tested.

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

— the resulting thickness of the thermal insulation below the anchor plate ≥ that tested, and

— the depth of a cut made by a setting tool leading to an undisturbed thickness of the thermal insulation ≥ that tested.

5.8.2.4.2 Base coat

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

5.8.2.4.3 Reinforcement

A test result is valid for any reinforcement.

5.8.2.4.4 Plate anchors

For plate anchors having a nominal plate diameter d_P = 60 mm, a test result is valid for plate anchors in any length with a characteristic plate stiffness k_P ≥ that tested, a plate diameter d_P ≥ that tested and a characteristic load resistance F_P ≥ that tested.

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

A test result is valid for any anchor setting position ≥ that tested. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

A test result is valid for any anchor plate distance perpendicular to substrate ≥ that tested. The range for an anchor plate distance 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 ≥ that 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 ≥ that tested.

For plate anchors used with an additional washer, a test result is valid for the tested anchor in any length and the tested additional washer.

5.8.2.4.5 Spiral anchors

For spiral anchors, a test result is valid for the tested anchor.

A test result is valid for a distance t_{fix} of the spiral of the spiral anchor to substrate faced side of thermal insulation ≥ that tested.

5.8.2.4.6 Profiles and rails

For profiles and rails, a test result is valid for the tested components.

5.8.2.4.7 Collar anchors

For collar anchors, a test result is valid for the tested component.

5.8.3 Pull-off tensile-shear resistance

5.8.3.1 Preparation

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

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

For ETICS kits mechanically fixed on adhesive bed with bonded area ≥ 40 %, with plate or spiral anchors (III and IV), a test specimen shows an adhesive, a thermal insulation, mechanical fixing devices and the reinforced base coat. Any adhesive effect shall be reduced by using formwork oil (spray the substrate twice). In case of a dual-layer thermal insulation, the spiral of a spiral anchor shall be completely located within the inner layer of the thermal insulation. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

For ETICS kits mechanically fixed on adhesive bed with bonded area < 40 %, with plate or spiral anchors (III and IV), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. In case of a dual-layer thermal insulation, the spiral of a spiral anchor shall be completely located within the inner layer of the thermal insulation. Additionally, a nearly non-polar foil between substrate and thermal insulation is mandatory. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

For ETICS kits mechanically fixed with plate anchors (V), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A nearly non-polar foil between substrate and thermal insulation is mandatory. Two configurations should be considered regarding the thermal insulation thickness, see 5.8.3.4.2. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

For ETICS kit mechanically fixed on adhesive bed with bonded area ≥ 20 % with profiles and rails and, optional plate anchors (VI), a test specimen shows the adhesive, the thermal insulation, the mechanical fixing devices and the reinforced base coat. Any adhesive effect shall be reduced by using formwork oil (spray the substrate twice). The test specimen shall have at least three parallel rails. A one or a two-specimen configuration, 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 ETICS kit mechanically fixed on adhesive bed with bonded area < 20 %, with profiles and rails and optional plate anchors (VI), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat, but no adhesive. A nearly non-polar foil between substrate and thermal insulation is mandatory. The test specimen shall have at least three parallel rails. A one or a two-specimen configuration, 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 ETICS kits mechanically fixed with profiles and rails and optional plate anchors (VII), a test specimen shows a thermal insulation, mechanical fixing devices and the reinforced base coat. A nearly non-polar nearly non-polar foil between substrate and thermal insulation is mandatory. The test specimen shall have at least three parallel rails. A one or a two-specimen configuration, 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 ETICS 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 nearly non-polar foil between substrate and thermal insulation is mandatory. A one or more specimen configuration, differing in the number of anchors per unit area and/or anchor setting positions, is possible.

NOTE A polyethylene or polypropylene foil is assumed to be nearly non-polar.

5.8.3.2 Determination

5.8.3.2.1 General

The fixing strength shall be assessed as the load bearing capability according to EN 13495:2019, method B, and the applied shear stress given.

5.8.3.2.2 Calculation

The pull-off tensile-shear resistance $\sigma_{k,block,ts}$ shall be calculated with a test result reported in accordance with EN 13495:2019:

$$\sigma_{k,\text{block,ts}} = \frac{F_{5\,\%}}{l \times b}$$

where

$\sigma_{k,block,ts}$ is the pull-off tensile-shear resistance, in kPa;

$F_{5\%}$ is the characteristic failure load (load bearing capacity) according to EN 13495:2019, in kN;

l is the length of the test specimen (thermal insulation) according to EN 13495:2019, in m;

b is the width of the test specimen (thermal insulation) according to EN 13495:2019, in m.

5.8.3.2.3 Applied shear stress

The applied shear stress is

$$\tau_{ts} = \frac{F_L}{l \times b}$$

where

τ_{ts} is the applied shear stress in kPa;

F_L is the applied shear load in kN;

l is the length of the test specimen (thermal insulation) according to EN 13495:2019, in m;

b is the width of the test specimen (thermal insulation) according to EN 13495:2019, in m.

5.8.3.2.4 Test specimen showing plate anchors in middle area position only

See G.2.

5.8.3.2.5 Test specimen showing plate anchors in different anchor setting positions

See G.3.

5.8.3.2.6 Test specimen showing profiles and rails

See G.4.

5.8.3.2.7 Test specimen showing anchored metal mesh

See G.5.

5.8.3.3 Reporting

The pull-off tensile-shear resistance, $\sigma_{k,block,ts}$, and the applied shear stress shall be expressed as level in kPa, rounded to 3 significant digits. In addition, all load-displacement graphs obtained during the tests shall be reported.

5.8.3.4 DiAp

5.8.3.4.1 Adhesive

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

5.8.3.4.2 Thermal insulation

For the fixing method I, II, IV, VI to VIII a test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and a thickness ≤ that tested.

For the fixing method III, a thermal insulation of the material MW, ICB or WF and a thermal insulation thickness > 200 mm, a test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and a thickness ≤ that tested.

For the fixing method III, a thermal insulation of the material EPS, XPS, PU, PF or CG and a thermal insulation thickness > 300 mm, a test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and a thickness ≤ that tested.

For the fixing method III, a thermal insulation of the material MW, XPS, PU, PF, CG, ICB or WF and plate anchors countersunk, a test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and a thickness ≥ that tested.

For the fixing method V a test result is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and a thickness ≥ the thinner and ≤ the thicker that tested.

Additional rules for plate anchors countersunk:

For plate anchors countersunk in one-layer thermal insulation, a test result is valid when

— the depth of a cut made by a setting tool ≤ that tested.

For plate anchors countersunk in dual-layer thermal insulation, a test result is valid when

— the resulting thickness of the outer layer of the dual-layer thermal insulation below the anchor plate is ≥ that tested, and

— a depth of a cut made by a setting tool leading to an undisturbed thickness of the outer layer of the dual-layer thermal insulation ≥ that tested.

5.8.3.4.3 Base coat

For base coats, a test result is valid for the tested component in any thickness.

5.8.3.4.4 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 ≥ that tested, a mesh size ≤ that tested and the optional use of additional reinforcement layer(s) of the same material.

For reinforcements of the material metal mesh, a test result is valid for the tested component.

5.8.3.4.5 Plate anchors

For fixing methods III and VI and plate anchors having a plate diameter d_P = 60 mm, a test result is valid for plate anchors in any length with a characteristic plate stiffness k_P ≥ that tested, a plate diameter d_P ≥ that tested and a characteristic load resistance F_P ≥ that tested.

For fixing method III and VI and plate anchors having a plate diameter d_P > 60 mm, a test result is valid for the tested anchor in any length.

For fixing method V and VII, a test result is valid for the tested anchor in any length.

A test result is valid for any anchor setting position ≥ that tested. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

A test result is valid for any anchor plate distance perpendicular to substrate ≥ that tested. The range for an anchor plate distance 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 ≥ that 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 ≥ that tested.

For plate anchors used with an additional washer, a test result is valid for the tested anchor in any length and the tested additional washer.

5.8.3.4.6 Spiral anchors

For spiral anchors, a test result is valid for the tested anchor.

A test result is valid for a distance t_{fix} of the spiral of the spiral anchor to substrate faced side of thermal insulation ≥ that tested.

5.8.3.4.7 Profiles and rails

For profiles and rails, a test result is valid for the tested components.

5.8.3.4.8 Collar anchors

For collar anchors, a test result is valid for the tested anchor.

5.8.3.4.9 Anchored metal meshes

For anchored metal meshes, a test result is valid for the tested anchored metal mesh.

5.8.4 Lateral shear resistance

5.8.4.1 Preparation

See 5.8.3.1

5.8.4.2 Determination

5.8.4.2.1 General

The lateral shear resistance shall be assessed as the lateral shear load capability according to EN 13495:2019, method E. In case of a thermal insulation with direction-dependent properties the tests shall be performed in both directions L and Q.

5.8.4.2.2 Calculation

The lateral shear resistance $\tau_{k,block}$ shall be calculated with a test result reported in accordance with EN 13495:2019, method E:

$$\tau_{k,\text{block}} = \frac{F_{5\,\%}}{l \times b}$$

where

$\tau_{k,block}$ is the lateral shear resistance, in kPa;

$F_{5\%}$ is the characteristic failure load (load bearing capability) according to EN 13495:2019, in kN;

l is the length of the test specimen (thermal insulation) according to EN 13495:2019, in m;

b is the width of the test specimen (thermal insulation) according to EN 13495:2019, in m.

5.8.4.2.3 Reporting

The shear resistance $\tau_{k,Block}$ shall be expressed as level in kPa, rounded to 3 significant digits. In case of a thermal insulation with direction-dependent properties the result shall be reported for both directions L and Q. In addition, all load-displacement graphs obtained during the tests shall be reported.

5.8.4.3 DiAp

5.8.4.3.1 Adhesive

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

5.8.4.3.2 Thermal insulation

A test result of fixing method I and II is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested, a shear strength ≥ that tested and the thickness that tested, i.e. the nominal value including the tolerance given in table A.1. If the minimum and the maximum thickness was tested the test result is valid for any thickness between minimum and maximum tested thickness.

A test result of fixing method III to VIII is valid for any thermal insulation of the same material and type as tested, a tensile strength ≥ that tested and a shear strength ≥ that tested and a thickness that tested, i.e. the nominal value including the tolerance given in table A.1. If the minimum and the maximum thickness were tested the test result is valid for any thickness between minimum and maximum tested thickness.

Additional rules for plate anchors countersunk:

For plate anchors countersunk in one-layer thermal insulation, a test result is valid when
— the depth of a cut made by a setting tool ≤ that tested.

For plate anchors countersunk in dual-layer thermal insulation, a test result is valid when

— the resulting thickness of the outer layer of the dual-layer thermal insulation below the anchor plate is ≥ that tested, and

— a depth of a cut made by a setting tool leading to an undisturbed thickness of the outer layer of the dual-layer thermal insulation ≥ that tested.

5.8.4.3.3 Base coat

For base coats, a test result is valid for the tested component in any thickness.

5.8.4.3.4 Reinforcement

For reinforcements, a test result is valid for the tested component in any thickness.

5.8.4.3.5 Plate anchors

For plate anchors having a plate diameter d_P =60 mm, a test result is valid for plate anchors in any length with a characteristic plate stiffness k_P ≥ that tested, a plate diameter d_P ≥ that tested and a characteristic load resistance F_P ≥ that tested.

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

A test result is valid for any anchor setting position ≥ that tested. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

A test result is valid for any anchor plate position perpendicular to substrate ≥ that tested. The range for an anchor 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 ≥ that 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 ≥ that tested.

For plate anchors used with an additional washer, a test result is valid for the tested anchor in any length and the tested additional washer.

5.8.4.3.6 Spiral anchors

For spiral anchors, a test result is valid for the tested anchor.

5.8.4.3.7 Profiles and rails

For profiles and rails, a test result is valid for the tested components.

5.8.4.3.8 Collar anchors

For collar anchors, a test result is valid for the tested anchor.

5.8.4.3.9 Anchored metal meshes

For anchored metal meshes, a test result is valid for the tested anchored metal mesh.

5.8.5 Reduction factor

5.8.5.1 Preparation

The Test specimen consists of the reference anchor or the spiral anchor of the ETICS kit and a thermal insulation of the ETICS kit with a thickness of ≥ 60 mm. The minimum number of test specimen is 5 for each conditioning. The thermal insulation test specimens shall be taken from the same batch.

For dry conditions, the thermal insulation test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The test is performed without additional conditioning.

For wet conditions, the thermal insulation test specimens shall be conditioned for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity. The test is performed after 7 or 28 days of additional 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. The 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH in a climatic chamber is considered to be the reference method, the 28 days exposure at (70 ± 2) °C and (90 ± 5) % RH in a climatic chamber is considered to be the alternative method.

5.8.5.2 Determination

The reduction factor for fixing strength shall be determined by the assessment of the fixing strength both, with a thermal insulation in dry conditions and the fixing strength with a thermal insulation in wet conditions, according to EN 16382:2016.

The reduction factor for the fixing strength is the ratio of the pull-through resistance, measured once with thermal insulation under wet conditions and once with thermal insulation under dry conditions.

$$\alpha_{\text{wet},7} = \frac{\bar{F}_{\text{wet},7}}{\bar{F}_{\text{dry}}}$$

$$\alpha_{\text{wet},28} = \frac{\bar{F}_{\text{wet},28}}{\bar{F}_{\text{dry}}}$$

where

$\bar{F}_{\text{dry}}$ is mean value of the failure load in dry condition;

$\bar{F}_{\text{wet},7}$ is mean value of the failure load in after condition with 7 days exposure at (70 ± 2) °C and (90 ± 5) % RH and re-drying;

$\bar{F}_{\text{wet},28}$ is mean value of the failure load in after condition with 28 days exposure at (70 ± 2) °C and (90 ± 5) % RH and re-drying;

$\alpha_{\text{wet},7}$ is the reduction factor of the fixing strength with 7 days wet exposure;

$\alpha_{\text{wet},28}$ is the reduction factor of the fixing strength with 28 days wet exposure.

5.8.5.3 Reporting

The reduction factor for fixing strength shall be expressed dimensionless and rounded to 0,01.

5.8.5.4 DiAp

5.8.5.4.1 Conditioning

A reduction factor gained by a 28 day wet conditioning is valid for a reduction factor gained by a 7 day wet conditioning.

5.8.5.4.2 Thermal insulation

For thermal insulation, a test result is valid for the tested component.

5.8.5.4.3 Anchors

If a spiral anchor was used for the test specimen, a test result is valid for the tested anchor.

If the reference anchor was used for the test specimen, a test result is valid for any plate anchor.

5.8.6 Characteristic load resistance of a plate anchor

5.8.6.1 Preparation

Test specimens shall be prepared according to Annex C.

5.8.6.2 Determination

The characteristic load resistance of a plate anchor shall be assessed according to Annex C.

5.8.6.3 Reporting

The characteristic load resistance of a plate anchor shall be expressed as F_p in kN, rounded to 3 significant digits.

5.8.6.4 DiAp

A test result is valid for any plate anchor of the same type and with a material E-modulus ≥ that tested and with a material tensile strength ≥ that tested.

5.8.7 Characteristic plate stiffness of a plate anchor

5.8.7.1 Preparation

Test specimens shall be prepared according to Annex C.

5.8.7.2 Determination

The characteristic plate stiffness of a plate anchor shall be assessed according to Annex C.

5.8.7.3 Reporting

The characteristic plate stiffness shall be expressed as k_p in kN/mm, rounded to 3 significant digits.

5.8.7.4 DiAp

A test result is valid for any plate anchor of the same type and with a material E-modulus ≥ that tested and with a material tensile strength ≥ that tested.

5.8.8 Fixing strength of anchored rails

5.8.8.1 Preparation

5.8.8.1.1 Test equipment

The test apparatus consists of a tensile testing machine, a support for the rail and a metal screw according to Figure 18.

5.8.8.1.2 Test specimen

5 test specimens of rail, each of (300 ± 20) mm length, showing a drilled 6 mm perforation in the centre, see Figure 18.

5.8.8.1.3 Conditioning

The test specimen shall be conditioned for at least 2 h at (23 ± 2) °C prior to test.

5.8.8.2 Determination

The fixing strength of a rail is assessed by the pull through resistance of a reference metal screw in the rail.

The test specimen is fixed and the metal screw is placed perpendicular to the profile, see Figure 18. The load is introduced by the screw at a tensioning speed of 20 mm/min at (23 ± 2) °C. The failure load is recorded.

The fixing strength of a rail is the mean of 5 measurements.

Dimensions in millimetres

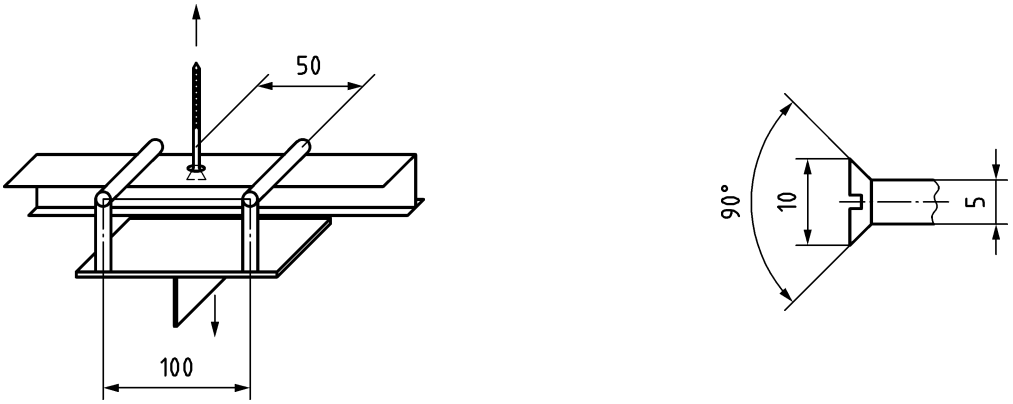


Figure 18 — Test apparatus for determining the fixing strength of rails

5.8.8.3 Reporting

The fixing strength of a rail shall be expressed as the fixing strength per fixing point in N, rounded to 3 significant digits, the 5 %-quantile for a confidence level of 75 %.

5.8.8.4 DiAp

For rails, a test result is valid for the tested component.

5.8.9 Fixing strength of collar anchor

5.8.9.1 Preparation

5.8.9.1.1 Test equipment

Tensile testing machine and concrete slab.

5.8.9.1.2 Test specimen

5 test specimens of rail, each of (300 ± 20) mm length, each fixed with the collar anchor on a smooth concrete slab according to Annex A.1.1.2 a), see Figure 19.

5.8.9.1.3 Conditioning

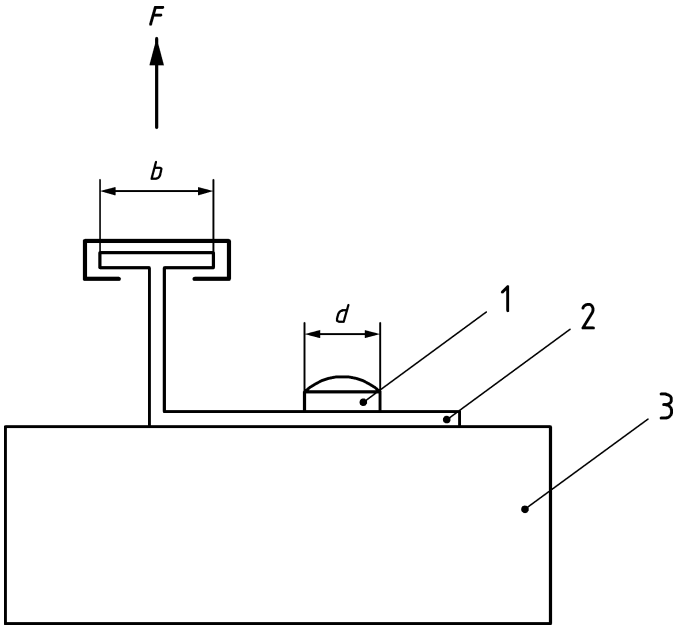
The test specimen shall be conditioned for at least 2 h at (23 ± 2) °C prior to test.

5.8.9.2 Determination

The fixing strength of a collar anchor in a rail is assessed by the pull through resistance of a collar anchor, fixing the rail.

A test specimen is fixed and the load is applied according to Figure 19. The load is introduced by the rail at a tensioning speed of 20 mm/min at (23 ± 2) °C. The failure load is recorded.

The fixing strength of a collar anchor is the mean of 5 measurements.



Key

1	collar anchor	b	height of rail clamp
2	rail	d	diameter of the collar anchor head
3	concrete slab	F	load

Figure 19 — Test apparatus for determining the fixing strength of for collar anchors

5.8.9.3 Reporting

The fixing strength of a collar anchor in a rail shall be expressed in N, rounded to 3 significant digits, the 5 %-quantile for a confidence level of 75 %.

5.8.9.4 DiAp

For rails and collar anchors, a test result is valid for the tested components.

5.9 Airborne sound insulation

5.9.1 Dynamic stiffness of thermal insulation

5.9.1.1 Preparation

Test specimens shall be prepared according to EN 29052-1:1992.

5.9.1.2 Determination

Dynamic stiffness shall be assessed on the thermal insulation only according to EN 29052-1:1992.

5.9.1.3 Reporting

The Dynamic stiffness of a thermal insulation shall be expressed as a value in MN/m^3, rounded to 1 MN/m^3.

5.9.1.4 DiAp

For thermal insulation, a test result is valid for the tested component.

5.9.2 Airflow resistivity of thermal insulation

5.9.2.1 Preparation

Test specimens shall be prepared according to EN ISO 9053-1:2018

5.9.2.2 Determination

Airflow resistivity of the thermal insulation shall be assessed according to EN ISO 9053-1:2018.

NOTE Impact of joints cannot be assessed.

5.9.2.3 Reporting

The air flow resistance shall be reported as value in kPa·s/m^2, rounded to 1 kPa·s/m^2.

5.9.2.4 DiAp

For thermal insulation, a test result is valid for the tested component.

5.9.3 Weight of rendering system

5.9.3.1 Preparation

The test specimens shall be prepared either according to EN 1015-6:1998 or by placing a layer of the base and finishing coat on an inert crucible. The coverage shall be as specified by the manufacturer.

5.9.3.2 Determination

The weight of the rendering system per unit area shall be assessed according to the following procedure.

The wet coverages of the base coat, the key coat, the finishing coat and the decorative coat of the ETICS kit shall all be considered and corrected by the loss of weight during curing and/or drying. The result shall be added to the weight per unit area of the reinforcement.

5.9.3.3 Reporting

The weight of the rendering system shall be expressed as the mass per unit area in kg/m^2, rounded to 0,1 kg/m^2.

5.9.3.4 DiAp

For rendering systems, a result is valid for the tested rendering system.

5.10 Thermal resistance

5.10.1 Thermal resistance of thermal insulation

5.10.1.1 Preparation

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 thermal insulation material.

5.10.1.2 Determination

The thermal resistance of thermal insulation shall be assessed 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.

NOTE The determination of thermal resistance leads to the λ_D according to the mentioned standards. This λ_D is the reference value.

5.10.1.3 Calculation

The thermal resistance shall be calculated considering the thickness of the thermal insulation in the ETICS kit by the following formula:

$$R_{D,\text{ETICS kit}} = \frac{d_N}{\lambda_D}$$

with

R_D thermal resistance, in (m²·K)/W;

d_N nominal thickness of the thermal insulation, in m;

λ_D thermal conductivity of the thermal insulation, in W/(m·K)

or the formula:

$$R_{D,\text{ETICS kit}} = R_D$$

5.10.1.4 Reporting

The result shall be expressed as the thermal resistance level without the influence of anchors R in (m²·K)/W, rounded to 0,01 (m²·K)/W.

5.10.1.5 DiAp

The result is valid for the assessed thermal insulation in the assessed nominal thermal insulation thickness only.

5.10.2 Point thermal transmittance of anchor

5.10.2.1 Determination

Thermal transmittance of an anchor χ in the ETICS kit shall be assessed according to Annex D.

5.10.2.2 Reporting

The result shall be expressed as the level of point thermal transmittance χ of an anchor in the ETICS kit expressed in W/K, rounded up to 0,001 W/K if $\chi \geq 0{,}0005$ W/K, rounded to 0 W/K otherwise.

5.10.2.3 DiAp

5.10.2.3.1 Mechanical fixing device

The result of the calculation is valid for the mechanical fixing device considered.

A result for a plate anchor flush is also valid for this plate anchor above reinforcement.

5.10.2.3.2 Thermal insulation

In case of one calculation for one thermal insulation thickness, the result of the calculation is valid for all thermal insulation with the considered thickness.

In case of two or more calculations, the greater result is valid for all thermal insulation with a thickness ≥ the thinner and a thickness ≤ the thicker used for calculations, if the difference between the thicker and the thinner thickness is ≤ 150 mm.

5.10.2.3.3 Reference substrate

The result of the calculation is valid for any reference substrate with a thermal conductivity ≤ used for calculation.

5.10.3 *Δu-value* of profiles and rails with collar anchors

5.10.3.1 Determination

The *Δu-value*s of profiles and rails with collar anchors shall be assessed according to EN ISO 10211:2017.

5.10.3.2 Reporting

The result shall be expressed as the *Δu-value* of profiles and rails with collar anchors expressed in W/(m·K), convergently rounded to 0,001 W/(m·K).

5.10.3.3 DiAp

A result is valid for the assessed profiles and rails only.

5.10.4 *Δu-value* of anchors for anchored metal mesh

5.10.4.1 Determination

The *Δu-value*s of anchors for anchored metal mesh shall be assessed according to EN ISO 10211:2017.

5.10.4.2 Reporting

The result shall be expressed as the *Δu-value* of an anchor for anchored metal mesh expressed in W/K, convergently rounded to 0,001 W/K.

5.10.4.3 DiAp

A result is valid for the assessed anchored metal mesh only.

6 Assessment and verification of constancy of performance – AVCP

6.1 General

The technical details necessary for the implementation of the system of assessment and verification of constancy of performance comprise provisions with regards to:

— the assessment of the performance of the construction product (ETICS kit), which may be carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product and

— the applicable factory production control.

6.2 Assessment of performance

6.2.1 General

When the intention is to declare any performance related to characteristics included in Annex ZA of this standard this shall be carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product, in accordance with Clause 4.

Assessment previously performed in accordance with the provisions of this standard, may be considered, provided that this assessment was performed to the same or a more rigorous assessment method, under

the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

For the purposes of assessment, the products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristic for all products within that same family.

NOTE Products may be grouped into different families for different characteristics.

In addition, the determination of the product performance shall be

— carried out for all characteristics included in the standard for which it is intended to declare the performance:

  — on first application of this standard; or

  — at the beginning of the production of a new or modified ETICS kit, unless a member of the same product family; or

  — at the beginning of a new or modified method of production, where the modification may affect the stated properties;

— repeated for the characteristic(s) in question, whenever a change occurs in the ETICS kit design, in the raw material(s) or in the supplier of the components, and/or in the method of production (subject to the definition of a family), which may significantly affect the performance in relation to one or more of the characteristics.

Where kit components are used whose performance in relation to their characteristics has already been determined on the basis of assessment methods of other harmonised technical specifications and those components bear CE marking in accordance with those harmonised technical specifications, these performances do not need to be re-assessed, if the intended use and the assessment methods of this standard correspond to previously used. The specifications of these components shall be documented.

6.2.2 Test samples, testing and assessment criteria

The ETICS kit samples to be tested/assessed shall be in accordance with Table 4.

Table 4 — Number of samples to be tested and assessment criteria

Characteristic	Clause	Assessment method	No. of samples	Assessment criteria
Reaction to fire	4.2	5.2	See 5.2	—
Water absorption	4.3	5.3	See 5.3	—
Water tightness	4.4	5.4	1	—
Impact resistance	4.5	5.5	1	—
Water vapour permeability	4.6	5.6	See 5.6	—
Bond strength	4.7	5.7	See 5.7	4.7.1.3.2, 4.7.3.2, 4.7.4.2
Fixing strength	4.8	5.8	See 5.8	—
Airborne sound insulation	4.9	5.9	See 5.9	—
Thermal resistance	4.10	5.10	See 5.10	—

6.3 Verification of constancy of performance

6.3.1 Factory production control (FPC)

6.3.1.1 General

An FPC system shall be established, documented, operated and maintained to ensure that the products placed on the market comply with the declared performance in relation to the essential characteristics.

The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

All the elements and provisions shall be documented in a systematic manner in the form of written policies and procedures.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting constancy of the performance of the product, shall be defined.

The qualification and competence (e.g. on the basis of education, training, skills, or experience) of personnel performing tasks affecting the assessment and verification of constancy of performance of the product shall be recorded.

Documents defining the factory production control system shall be drawn up and kept up-to-date. Documentation and procedures should be appropriate to the product and production process. The FPC system should achieve an appropriate level of confidence in the constancy of performance of the product. This involves:

a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the technical specification to which reference is made;

b) the effective implementation of these procedures and instructions;

c) the recording of these operations and their results;

d) the use of these results to correct any deviations, correct the effects of such deviations, treat any resulting instances of non-constancy and, if necessary, revise the FPC system to rectify the cause of non-constancy of performance.

6.3.1.2 Equipment

6.3.1.2.1 Testing

All weighing, measuring and testing equipment shall be checked, calibrated and regularly inspected according to documented procedures, frequencies and criteria.

6.3.1.2.2 Production

All equipment used in the production process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the production process. Inspections and maintenance shall be carried out and recorded in accordance with written procedures and the records retained for the period defined in the FPC procedures.

6.3.1.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their compliance.

6.3.1.4 Traceability and marking

Individual ETICS kits and the specific components that are part of the ETICS_kit shall be identifiable and traceable with regard to their place of production.

Written procedures ensuring that processes related to affixing traceability codes and/or markings are inspected regularly shall be maintained.

6.3.1.5 Product testing and evaluation

6.3.1.5.1 General

Procedures to ensure that the performance in relation to the declared characteristics are maintained shall be established, either by direct or indirect testing. The choice can be made for each single characteristic.

6.3.1.5.2 Direct testing

The characteristics, and the means of control, are:

— Reaction to fire shall be subject to the tests indicated in 5.2, at least twice per year.

— Water absorption shall be subject to the tests indicated in 5.3, at least four times a year.

— Water tightness shall be subject to the tests indicated in 5.4, at least once per year.

— Impact resistance shall be subject to the tests indicated in 5.5, at least once per year.

— Water vapour permeability shall be subject to the tests indicated in 5.6, at least once per year.

— Bond strength shall be subject to the tests indicated in 5.7, at least four times a year.

— Fixing strength shall be subject to the tests indicated in 5.8, at least once per year.

— Airborne sound insulation shall be subject to the tests indicated in 5.9, at least once per year.

— Thermal resistance shall be subject to the tests indicated in 5.10, at least four times a year.

6.3.1.5.3 Indirect testing

For factory production control purposes test method/method of evaluation other than those in the standard (for the assessment of the characteristic performance) may be used. It is on the manufacturer's responsibility to prepare suitable documentation describing such tests and their correlation with the recommended method to ensure that the appropriate characteristic is as declared.

6.3.1.5.3.1 Indirect testing using component properties

The indirect testing using component properties is described in detail below.

— The components of the test samples for the attestation of performance shall be tested on the respective batches used. The relevant component properties to be considered are (1) all identification properties listed in Annex E in the column "steadiness". If a DiAp rule is given for a component, the property given in the column "validity" becomes a reference value and this property shall also be considered (2). Other properties in the "validity" column are ignored. The test results for the validity properties from the assessment shall be documented as "reference values" of a component. Each batch of a component used to produce test specimens for the assessment shall be tested and the identification and reference values shall be documented.

— For the factory production control of components, the same component properties, which are taken into account for the attestation of performance, shall be tested and documented as “FPC test results”.

— If the ETICS kit is assessed according to DiAp rules, then component(s) of the ETICS kit are not used in the test(s) – as part of a test specimen – for assessment. The factory production control of these component(s) shall consider the reference value(s) gained from the component(s) used for the assessment together with the provisions of annex E.

— If the component properties are within the ranges, given in the tables in Annex E, the assessment result of the ETICS kit is considered valid.

See Annex H for the possibilities to compare FPC test results with reference values and Annex I for a general example of indirect testing using component properties.

6.3.2 Initial inspection of factory and of FPC

Initial inspection of factory and of FPC shall be carried out when the production process has been finalized and in operation. The factory and FPC documentation shall be assessed to verify that the provisions of clauses 6.3.1.2 to 6.3.1.5 are fulfilled.

During the inspection it shall be verified

a) that all resources necessary for the assessment of the performance in relation to the product characteristics to be declared by the manufacturer are in place and correctly implemented, and

b) that the FPC-procedures in accordance with the FPC documentation are followed in practice.

All locations where final assembly or at least final testing of the relevant product is performed, shall be assessed to verify that the above conditions a) and b) are in place and implemented. If the FPC system covers more than one product, production line or production process, and it is verified that the general provisions are fulfilled when assessing one product, production line or production process, the assessment of the general provisions does not need to be repeated when assessing the FPC for another product, production line or production process.

All assessments and their results shall be documented in the initial inspection report.

6.3.3 Continuous surveillance of FPC

Surveillance of the FPC shall be undertaken at least once per year. The surveillance of the FPC shall include a review of the FPC test plan(s) and production processes(s) for each product to determine if any changes have been made since the last assessment or surveillance. The significance of any changes shall be assessed.

Checks shall be made to ensure that the test plans are still correctly implemented and that the production equipment is still correctly maintained, checked and, if necessary calibrated at appropriate time intervals.

Where relevant, the records of tests and measurement made during the production process and to finished products shall be reviewed to ensure that the values obtained still correspond with those values for the samples, submitted to the assessment of performance of the product in relation to the essential characteristics, and that the correct actions have been taken for removing non-compliance with such declared performance.

Annex A
(normative)

Parameters related to the basic components and to the fixing methods of the ETICS kits with the methods of their verification and acceptance criteria

A.1 Adhesives

A.1.1 Dry mix or ready to use adhesives

A.1.1.1 Parameters related to the dry mix or ready to use adhesives used in ETICS kit, the methods of their verification, further specified also in A.1.1.2, and acceptance criteria, are the following:

a) a bond strength of the adhesive to a smooth concrete slab of ≥ 250 kPa, tested in accordance with EN 1542:1999. One measurement < 250 kPa, but > 200 kPa is admissible;

b) a bond strength of the adhesive to a smooth concrete slab after water exposure for (48 ± 3) h followed by 14 h to 20 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 < 80 kPa, but > 60 kPa is admissible;

c) a bond strength of the adhesive to a smooth concrete slab after water exposure for (48 ± 3) h followed by (168 ± 5) h conditioning at (23 ± 2) °C and (50 ± 5) % RH of ≥ 250 kPa, tested in accordance with EN 1542:1999. One measurement < 250 kPa, but > 200 kPa is admissible.

A.1.1.2 With the methods of verification also the following apply:

a) 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/mm^2 perpendicular to faces. The moisture content of the slab prior to the test shall be ≤ 3 % of the total mass.

b) The adhesive is applied onto the concrete slab with a thickness between (4 ± 1) mm. If the minimum nominal thickness of the adhesive is > 5 mm, the adhesive shall be applied with the given minimum nominal thickness. 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.

c) 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 stamps with a diameter of d = (50 ± 0,5) mm or (50 ± 0,5) mm by (50 ± 0,5) mm 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, rounded to 3 significant digits.

A.1.2 PU adhesive foam

Parameters related to the PU adhesive foam used in ETICS kit, the methods of its verification and acceptance criteria are the following:

a) tack free time ≥ 7 min, according to EN 17101:2018; and

b) cohesion strength ≥ 80 kPa, according to EN 17101:2018; one measurement < 80 kPa, but > 60 kPa is admissible.

A.2 Thermal insulation

Limits related to the following thermal insulation used in ETICS kit: MW, EPS, XPS, PU, PF, CG, ICB and WF and the methods of their verification are indicated in Table A.1.

Table A.1 — Limits related to the thermal insulation of the ETICS kit with the methods of their verification

Component property	Material/Type	MW/ lamella	MW/Board mono- or dual-layer	EPS	EPS elastified	XPS/-	PU/-	PF/-	CG/-	ICB/-	WF/-
Width tolerance [mm]	according to EN 822:2013	−1/+3	±5	±2	±2	±2	±2	±2	±2	±3	±3
Thickness tolerance [mm]	according to EN 823:2013	±1	+3/−1	±1	±1	±1	±2 (fixing method I and II, < 80 mm); ±3 (fixing method III, < 80 mm); ±3 (fixing method I and II, ≥ 80 mm); ±4 (fixing method III, ≥ 80 mm thickness)	±2 (<140 mm thickness); −2/+5 (≥ 140 mm thickness)	±2	±1 mm (20 mm to 50 mm); ±2 %, max. ±2 mm (>50 mm)	+3/−1
Squareness [mm/m]	according to EN 824:2013	≤ 5	≤5	≤ 3	±2	±2	≤ 3	±2	±2	≤ 2	≤ 3
Flatness tolerance [mm]	according to EN 825:2013	≤ 4	≤6	≤ 3	≤ 3	≤ 3	≤ 5	≤ 5	≤ 2	≤2	≤ 3
Dimensional stability at 70 °C/90 %, 48 h [%]	according to EN 1604:2013	±1	±1	≤ 2,0	±5,0	±2	≤ 2 (fixing method I and II); ≤ 3 (fixing method III, length and width); ≤ 4 (fixing method III, thickness)	±1,5	±0,5 (length and width); ±0,1 (thickness)	±1,0	±3
Tensile strength perpendicular to faces in dry condition [kPa]	according to EN 1607:2013	≥ 80	≥ 5	≥ 150 (profiles and rails); ≥ 80 (others)	≥ 80	≥ 100	≥ 80 (fixing method I and II); ≥ 50 (fixing method III, IV, VI and VII)	≥ 80	≥ 100	≥ 50	≥ 7,5

Component property	Material/Type	MW/ lamella	MW/Board mono- or dual-layer	EPS	EPS elastified	XPS/-	PU/-	PF/-	CG/-	ICB/-	WF/-
Shear strength (50 mm test specimens) [kPa]	according to EN 12090:2013	≥ 20	—	≥ 30	≥ 20	≥ 100	≥ 30 (fixing method I and II); ≥ 20 (fixing method III, IV, VI and VII)	≥ 30	≥ 50	≥ 50	—
Shear modulus [MPa] (50 mm test specimens)	according to EN 12090:2013	≥ 1	—	≥ 1	≥ 0,3	≥ 3	≥ 1 (fixing method I and II); ≥ 0,35 (fixing method III, IV, VI and VII)	≥ 0,35	≥ 1	≥ 1	—
Water absorption [kg/m^2]	according to product standard [a] (short term, if available)	≤1,0	≤1,0	≤ 0,5 (Method 2)	≤ 0,5 (Method 2)	≤ 1,5 Vol % (Method 2A)	≤1	≤ 1,0	≤ 0,5	≤ 0,5	≤ 1,0
Compressive Strength [kPa]	according to EN 826:2013	—	≥ 10, only for fixing method VIII	—	—	—	—	—	—	—	—

A.3 Mechanical fixing device

A.3.1 Plate anchor

A.3.1.1 Plate anchor applied by expansion of a plastic sleeve in a pre-drilled hole

Parameters related to the plate anchor used in ETICS kit, applied by expansion of a plastic sleeve in a pre-drilled hole in masonry or concrete substrate, the methods of its verification and acceptance criteria are the following:

a) an anchoring in the substrate applied by expansion of a plastic sleeve with a diameter of ≥ 5 mm; and

b) an expansion element of the type “nailed-in” or of the type “screwed-in”; and

c) an effective anchorage depth of ≥ 25 mm; and

d) a plate diameter of ≥ 60 mm; and

e) an anchor sleeve, plate and expansion zone made of

   1) polyethylene; or

   2) polypropylene; or

   3) polyamide 6; or

   4) polyamide 6.6; and

NOTE Anchor plates can be reinforced with glass fibres.

f) an expansion element made of

   1) galvanized steel; or

   2) stainless steel; or

   3) glass fibre reinforced polypropylene, glass fibre reinforced polyamide 6 or glass fibre reinforced polyamide 6.6; and

g) a plate stiffness k_P ≥ 0,3 kN/mm according to Annex C; and

h) a plate characteristic load resistance of ≥ 1,0 kN according to Annex C

A.3.1.2 Plate anchor with powder actuated steel fastener

Parameters related to the plate anchor with powder actuated steel fastener used in ETICS kit, applied in concrete substrate, the methods of their verification and acceptance criteria are the following:

a) an effective anchorage depth in the concrete part of ≥ 20 mm; and

b) a plate and body made of polyethylene; and

c) a plate diameter of ≥ 60 mm; and

d) a zinc flake coated nail made of tempered carbon steel with a diameter ranging from 3 mm to 5 mm; and

e) an plate stiffness of ≥ 0,3 kN/mm according to Annex C; and

f) an plate characteristic load resistance of ≥ 1,0 kN according to Annex C.

A.3.2 Spiral anchor

Parameters related to the spiral anchor used in ETICS kit for countersunk installation in the thermal insulation, applied in masonry or concrete substrate, the methods of its verification and acceptance criteria are the following:

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 fibre reinforced plastic.

A.3.3 Collar anchor of the type “nailed-in” or of the type “screwed-in”

Parameters related to the collar anchor of the type “nailed-in” or of the type “screwed-in” used in ETICS kit, the methods of its verification and acceptance criteria are the following

a) an anchoring in the substrate by expansion of a plastic sleeve with a diameter of ≥ 5 mm; and

b) an effective anchorage depth of ≥ 25 mm; and

c) an anchor sleeve, plate and expansion zone made of

   1) polyethylene; or

   2) polypropylene; or

   3) polyamide 6; or

   4) polyamide 6.6; and

d) an expansion element made of

   1) galvanized steel; or

   2) stainless steel; or

   3) glass fibre reinforced plastic.

A.3.4 Profile made of polyvinylchloride or aluminium

Parameters related to the profile made of polyvinylchloride or aluminium used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.3.5 Rail made of polyvinylchloride or aluminium

Parameters related to the rail made of polyvinylchloride or aluminium used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.3.6 Anchor for an anchored metal mesh made of steel

Parameters related to the anchors for an anchored metal mesh made of steel used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.4 Base coat

A.4.1 Dry mix base coat according to EN 998-1:2016

Parameters related to the dry mix base coat according to EN 998-1:2016 used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.4.2 Ready to use base coat according to EN 15824:2017

Parameters related to the base coat according to EN 15824:2017 used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.5 Reinforcement

A.5.1 Glass fibre mesh

Parameters related to the glass fibre mesh used in ETICS kit, the methods of its verification and acceptance criteria are the following:

a) tensile strength ≥ 40 N/mm with no additional conditioning according to EN 13496:2013; no measurement shall be < 36 N/mm and the mean elongation at maximum load shall be ≤ 5 %; and

b) tensile strength ≥ 20 N/mm after conditioning in alkaline solution according to EN 13496:2013; no measurement shall be < 18 N/mm and the mean elongation at maximum load shall be ≤ 5 %; and

c) a ratio of tensile strength with no conditioning according to EN 13496:2013 to tensile strength in alkaline solution according to EN 13496:2013 ≤ 2,0.

For the conditioning in alkaline solution, the conditioning C (28 d ageing in alkaline solution at (23 ± 5) °C) according to EN 13496:2022 is considered to be the reference method. The conditioning B (24 h in alkaline solution at (60 ± 2) °C) according to EN 13496:2022 is considered to be the alternative method. Only one conditioning shall be taken for testing according to EN 13496:2022.

A.5.2 Stainless steel mesh according to AISI 302 or 304, galvanized after welding (Metal mesh)

Parameters related to the stainless steel mesh according to AISI 302 or 304, galvanized after welding, used in ETICS kit, the methods of its verification and acceptance criteria are the following:

A zinc coat mass per unit area according to EN 10244-1:2009 of 300 g/m^2 showing a minimum of each measurement of 250 g/m^2.

A.6 Key coat

Parameters related to the key coat used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.7 Finishing coat

A.7.1 Dry mix finishing coat according to EN 998-1:2016

Parameters related to the dry mix finishing coat according to EN 998-1:2016 used in ETICS kit, the methods of its verification and acceptance criteria are the following:

The requirements of EN 998-1:2016 shall apply.

A.7.2 Ready to use finishing coat according to EN 15824:2017

Parameters related to the finishing coat according to EN 15824:2017 used in ETICS kit, the methods of its verification and acceptance criteria are the following:

The requirements according to EN 15824:2017 apply.

A.7.3 Finishing coat not according to EN 998-1:2016 and not according to EN 15824:2017 (Other finishing coat)

Parameters related to the finishing coat not according to EN 998-1:2016 and not according to EN 15824:2017 used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.8 Decorative coat

Parameters related to the decorative coat used in ETICS kit, the methods of its verification and acceptance criteria are the following:

None.

A.9 Fixing method

A.9.1 The series of the fixing methods used in the ETICS kits, the related parameters, the methods of their verification, further specified also in A.9.2, and acceptance criteria, are the following:

1) Fixing method I (see 3.1.3.1) – bonded with adhesive and supplementary mounting aid plate anchors, which:
   a) bonded area is ≥ 40 %; and
   b) thickness of the thermal insulation is ≤ 400 mm; and
   c) overlap of the reinforcement is ≥ 100 mm; and
   d) mass per unit area of the rendering system together with thermal insulation is ≤ 60 kg/m^2; and
   e) mass per unit area of the rendering system is ≤ 30 kg/m^2;
2) Fixing method II (see 3.1.3.2) – bonded with adhesive, which:
   a) bonded area is ≥ 40 %; and
   b) thickness of the thermal insulation is ≤ 400 mm; and
   c) overlap of the reinforcement is ≥ 100 mm; and
   d) mass per unit area of the rendering system together with thermal insulation is ≤ 60 kg/m^2; and
   e) mass per unit area of the rendering system is ≤ 30 kg/m^2;
3) Fixing method III (see 3.1.3.3) – mechanically fixed on adhesive bed with plate anchors, which:
   a) bonded area is ≥ 40 %; and
   b) thickness of the thermal insulation is ≤ 400 mm; and
   c) minimum number of anchors per square meter is 4; and
   d) overlap of the reinforcement is ≥ 100 mm; and
   e) mass per unit area of the rendering system together with thermal insulation is ≤ 65 kg/m^2; and
   f) mass per unit area of the rendering system is ≤ 40 kg/m^2;

   or

   a) bonded area is ≥ 20 %; and
   b) thickness of the thermal insulation is ≤ 200 mm; and
   c) minimum number of anchors per square meter is 4; and
   d) overlap of the reinforcement is ≥ 100 mm; and
   e) mass per unit area of the rendering system together with thermal insulation is ≤ 45 kg/m^2; and
   f) mass per unit area of the rendering system is ≤ 20 kg/m^2;
4) Fixing method IV (see 3.1.3.4) – mechanically fixed on adhesive bed with spiral anchors countersunk, which:

a) bonded area is ≥ 40 %; and

b) thickness of the thermal insulation is ≤ 400 mm; and

c) minimum number of anchors per square meter is 4; and

d) overlap of the reinforcement is ≥ 100 mm; and

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

f) mass per unit area of the rendering system is ≤ 40 kg/m^2;

5) Fixing method V (see 3.1.3.5) – mechanically fixed with plate anchors, which:

a) thickness of the thermal insulation is ≤ 200 mm; and

b) minimum number of anchors per square meter is 4; and

c) overlap of the reinforcement is ≥ 100 mm; and

d) mass per unit area of the rendering system together with thermal insulation is ≤ 45 kg/m2; and

e) mass per unit area of the rendering system is ≤ 20 kg/m^2;

6) Fixing method VI (see 3.1.3.6) – mechanically fixed on adhesive bed with profiles and rails and optional plate anchors, which:

a) bonded area is ≥ 40 %; and

b) thickness of the thermal insulation is ≤ 200 mm; and

c) overlap of the reinforcement is ≥ 100 mm; and

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

e) mass per unit area of the rendering system is ≤ 30 kg/m^2;

7) Fixing method VII (see 3.1.3.7) – mechanically fixed with profiles and rails and optional plate anchors, which:

a) thickness of the thermal insulation is ≤ 200 mm; and

b) overlap of the reinforcement is ≥ 100 mm; and

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

d) mass per unit area of the rendering system is ≤ 20 kg/m^2;

8) Fixing method VIII (see 3.1.3.8) – mechanically fixed by an anchored metal mesh, which:

a) thickness of the thermal insulation is ≤ 200 mm; and

b) overlap of the reinforcement is ≥ 50 mm; and

c) mass per unit area of the rendering system together with thermal insulation is ≥ 25 kg/m^2 and ≤ 80 kg/m^2; and

d) mass per unit area of the rendering system is ≥ 25 kg/m^2 and ≤ 70 kg/m^2;

9) with a combination of fixing method and thermal insulation material according to Table A.2, but PU adhesive foams only in combination with thermal insulation of the material EPS, XPS or PU.

Table A.2 — Possible combinations of fixing methods with required components and possible thermal insulation materials in ETICS kits (X)

Fixing method/Components	ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I) see 3.1.3.1	ETICS kit bonded with adhesive (II) see 3.1.3.2	ETICS kit mechanically fixed on adhesive bed with plate anchors (III) see 3.1.3.3	ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV) See 3.1.3.4	ETICS kit mechanically fixed with plate anchors (V) see 3.1.3.5	ETICS kit mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI) see 3.1.3.6	ETICS kit mechanically fixed with profiles and rails and optional plate anchors (VII) see 3.1.3.7	ETICS kit mechanically fixed by an anchored metal mesh (VIII) see 3.1.3.8
Adhesive	X	X	—	—	—	—	—	—
Adhesive bed	—	—	X	X	—	X	—	—
Thermal insulation MW-Board	X	—	X	X	X	X	X	X
Thermal insulation MW-Lamella	X	X	X	—	—	—	—	—
Thermal insulation EPS	X	X	X	X	—	X	X	—
Thermal insulation EPS elastified	X	X	X	X	—	—	—	—
Thermal insulation XPS	—	—	X	—	—	—	—	—
Thermal insulation PU	X	X	X	X	—	X	X	—
Thermal insulation PF	—	—	X	—	—	—	—	—
Thermal insulation CG	—	—	X	—	—	—	—	—
Thermal insulation ICB	—	—	X	—	—	—	—	—
Thermal insulation WF	—	—	X	—	—	—	—	—
Plate anchor	X	—	X	—	X	X	X	—
Spiral anchor	—	—	—	X	—	—	—	—
Collar anchor	—	—	—	—	—	X	X	—
Profile	—	—	—	—	—	X	X	—
Rail	—	—	—	—	—	X	X	—
Anchor for an anchored metal mesh	—	—	—	—	—	—	—	X

Fixing method/Components	ETICS kit bonded with adhesive and supplementary mounting aid plate anchors (I) see 3.1.3.1	ETICS kit bonded with adhesive (II) see 3.1.3.2	ETICS kit mechanically fixed on adhesive bed with plate anchors (III) see 3.1.3.3	ETICS kit mechanically fixed on adhesive bed with spiral anchors countersunk (IV) See 3.1.3.4	ETICS kit mechanically fixed with plate anchors (V) see 3.1.3.5	ETICS kit mechanically fixed on adhesive bed with profiles and rails and optional plate anchors (VI) see 3.1.3.6	ETICS kit mechanically fixed with profiles and rails and optional plate anchors (VII) see 3.1.3.7	ETICS kit mechanically fixed by an anchored metal mesh (VIII) see 3.1.3.8
Base coat	X	X	X	X	X	X	X	X
Glass fibre mesh	X	X	X	X	X	X	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

A.9.2 With the methods of verification also the following apply:

a) The bonded area and the thickness of adhesive shall be assessed according to 5.4.2.

b) The mass per unit area of the rendering system shall be assessed according to 5.9.3. The calculation without the correction by the loss of weight during curing and/or drying is considered as the alternative method.

c) The thickness of the thermal insulation is the thickness according to EN 823:2013. The thickness tolerance is the thickness tolerance according to Table A.1.

Annex B
(normative)

Calculation of $PCS_{ETICS\ kit}$ (formulae and example)

B.1 General

An ETICS kit, which is a combination of components, with specific layer thicknesses and/or coverages, has a specific gross heat of combustion.

The calculation shall be done using the following formula:

$$PCS_{\text{ETIC kit}} = \frac{\sum_{i=1}^{n}\left(m_i \times PCS_i\right)}{\Sigma m_i}$$

where

PCS_i is 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 after conditioning according to EN 13238).

B.2 Example

Table B.1 — Calculation for a specific ETICS kit

Component ***i***	PCS_i **MJ/kg**	Mass per unit area m_i **kg/m²**	$m_i \times PCS_i$ **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**

$$PCS_{\text{ETICS kit}} = \frac{54{,}534\text{MJ}/m^2}{40{,}557\text{kg}/m^2}$$

$$PCS_{\text{ETICS kit}} = 1{,}344\ \text{MJ/kg}$$

Annex C
(normative)

Characteristic load resistance and characteristic plate stiffness of plate anchors in the ETICS kit

C.1 General

This annex covers the tests for the determination of the characteristic load resistance F_p of the anchor plate and the characteristic plate stiffness k_p. The test shall be carried out according to C.3.

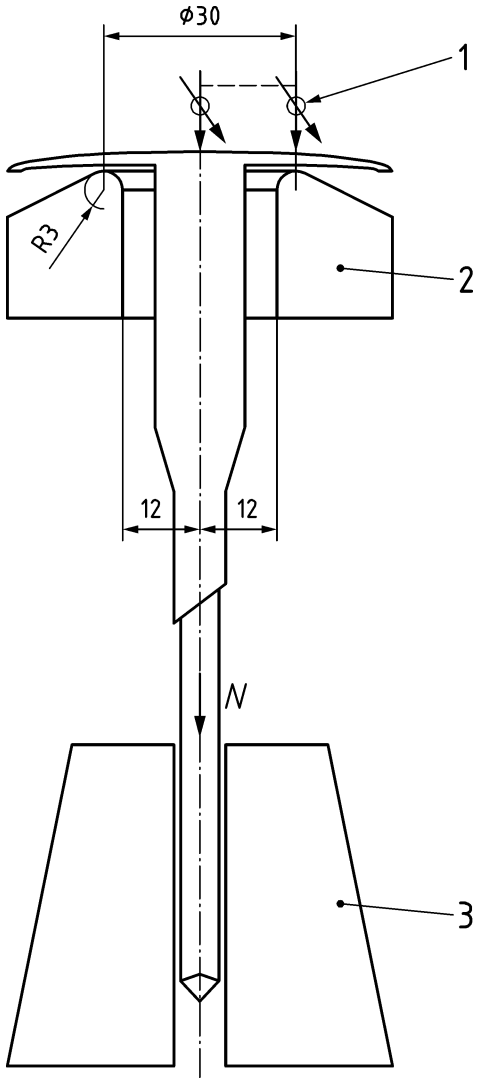
C.2 Sampling, test specimen, conditioning and testing

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 can 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 can be applied. The tensile load is raised until failure with a rate of (1 ± 0,2) kN/min.

C.3 Calculation

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 %.

$$F_p = F_{5\,\%} = \bar{F}_{\text{Test}} \cdot (1 - k_s \cdot v)$$

$$v = \frac{s_{n-1}}{\bar{F}_{\text{Test}}}$$

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 to ISO 12491:1997 in kN;

For the number of measurements of one test series k_s is

number of measurements of one test series	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

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 c_i shall be determined graphically or by regression. It represents the slope at 1 mm displacement. If the tangent stiffness is determined by graphically means, s_u at the corresponding tension force N_u = 0 kN and N_O at s_o = 1 mm shall be determined in the load-displacement-diagram (see Figure C.2).

$$k_p = \frac{\sum_{i=1}^{n} c_i}{n} \qquad \text{for } v \leq 20\ \%$$

$$k_p = \frac{\sum_{i=1}^{n} c_i}{n} \cdot \frac{20\ \%}{v} \qquad \text{for } v > 20\ \%$$

with

$$s_u \leq 0{,}3\ s_o$$

$$s_u \leq 0{,}3\ \text{mm}$$

where

$$c_i = \frac{N_o - N_u}{s_o - s_u} = \frac{N_o}{1\ \text{mm} - s_u}$$

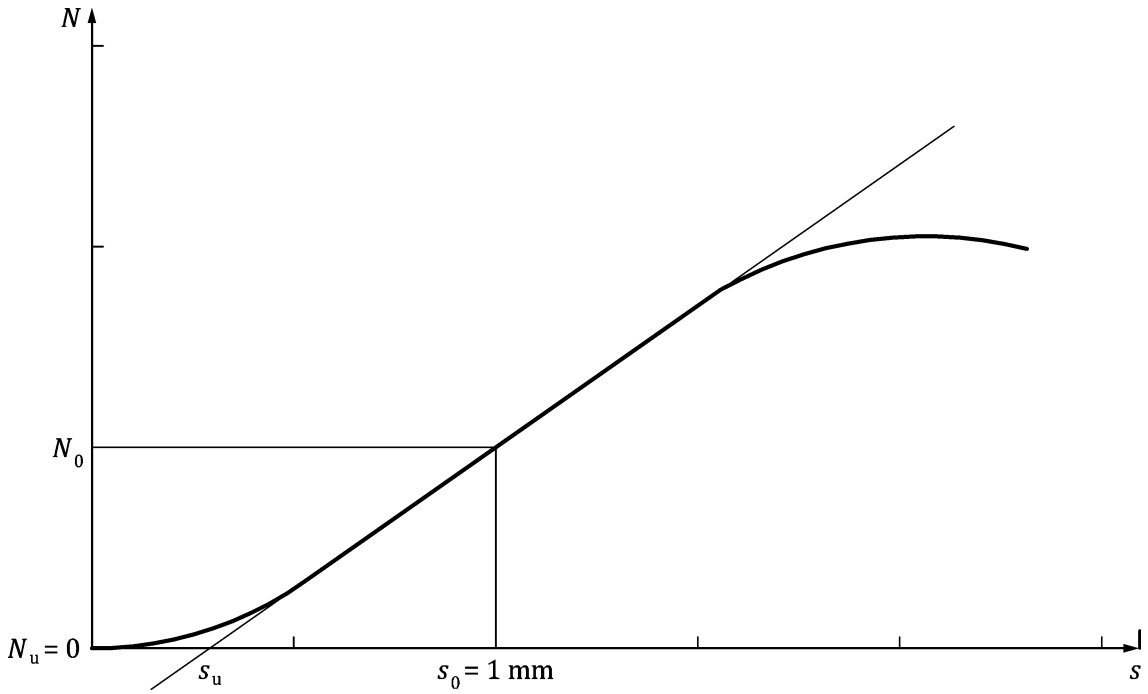
where

k_p is the characteristic plate stiffness 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.



Key

N tensile load in kN;

s displacement in mm;

Figure C.2 — Load-displacement-diagram with the tangent stiffness line

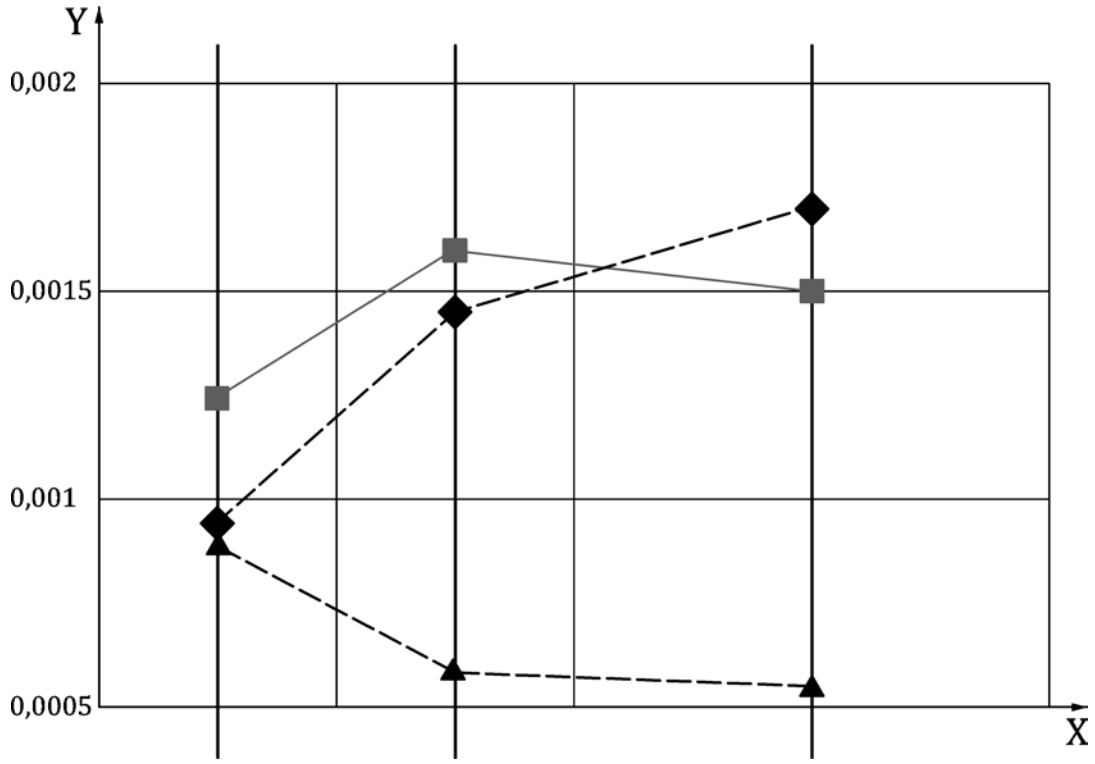
Annex D
(normative)

Point thermal transmittance of one plate or spiral anchor in the ETICS kit

D.1 General

This Annex serves for the determination of the point thermal transmittance χ of one anchor for different insulation thicknesses. It is based on the calculation of standards EN ISO 10211:2017 and EN ISO 6946:2017.

The point thermal transmittance χ of an anchor depends on the thickness of the thermal insulation. Figure D.1 shows three examples (different symbols).



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 types of anchors, marked by different symbols

D.2 Assessment of the point thermal transmittance

D.2.1 General

The assessment of the point thermal transmittance is based on the calculation of the heat transmission of an ETICS kit with and without anchors.

D.2.2 Calculation of the point thermal transmittance

A point thermal transmittance χ of one anchor and a thermal insulation with a specific thickness is calculated as follows:

$$\chi = \frac{U_c - U}{n}$$

where

χ is the point thermal transmittance of one anchor in W/K, rounded up to 0,001 W/K if $\chi \geq$ 0,000 5 W/K, rounded to 0 W/K otherwise;

U_c is the modified thermal transmission of the reference construction with anchors in W/(m²·K);

U is the thermal transmission of the reference construction without anchors in W/(m²·K);

n is the number of anchors per unit area of the reference construction expressed in 1/m²

D.3 Calculation

D.3.1 Determination

The assessment of the point thermal transmittance χ of the anchor is performed by means of calculation. It shall be carried out for the reference construction described in D.3.2.

D.3.2 Reference construction

For calculation of the point thermal transmittance χ the following reference construction applies:

Dimensions in mm

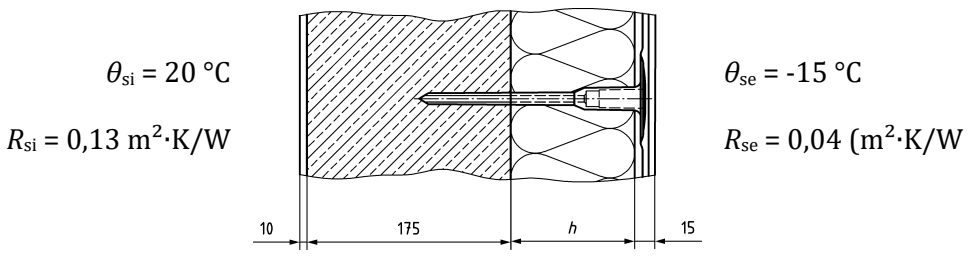


Figure D.2 — Reference construction with a plate anchor flush (not full-scale). Layers from left to right: (1) interior plaster, (2) reference substrate, (3) thermal insulation, (4) rendering system. R_{se} is the external heat transfer resistance and R_{si} the internal heat transfer resistance, in (m² K)/W. θ_{se} is the external temperature and θ_{si} is the internal temperature, in °C. Countersunk and spiral anchors adequate.

The material properties of the layers are given in Table D.1.

Table D.1 — Material properties of the reference construction

Component	Thermal conductivity W/(m·K)	Thickness Mm
(1) interior plaster	0,57	10
(2) reference substrate A	2,30	175
(2) reference substrate B	1,20	175
(2) reference substrate C	0,56	175
(2) reference substrate D	0,36	175
(2) reference substrate E	0,16	175
(3) thermal insulation	0,035	variable
(4) rendering system	1,0	15
Air at rest	0,026	
NOTE The reference substrates are based on common (A) normal weight concrete, (B) solid masonry, (C) hollow or perforated masonry, (D) lightweight aggregate concrete with open structure and (E) autoclaved aerated concrete.		

D.3.3 Consideration of anchor properties

The thermal conductivity of the anchor materials shall be chosen according to EN ISO 10456:2007. The thermal conductivity of PA6-GF50 and PA66-GF50 is 0,35 W/(m·K).

The dimensions and geometry of the anchor, in its installed condition, shall comply with a sample or the manufacturer's technical documentation.

D.3.4 Boundary conditions

The heat transfer resistances shall be in accordance with EN ISO 6946:2017 for the horizontal thermal conductivity:

R_{se} = 0,04 (m²·K)/W where R_{se} is the external heat transfer resistance in (m²·K)/W

R_{si} = 0,13 (m²·K)/W where R_{si} is the internal heat transfer resistance in (m²·K)/W

For calculation the following conditions apply: the temperature difference between inside and outside shall be ΔT = 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.3.5 Calculations according to EN ISO 10211:2017

D.3.5.1 General

For determination of the modified thermal transmission of the reference construction with anchors, the modified heat transmission of the reference construction with anchors U_c shall be determined.

D.3.5.2 Construction of a finite element system

A cuboid-shaped section of the wall containing an anchor shall be assumed for the calculation or the point thermal transmission. The anchor shall be placed in the centre of the area considered. In case the anchor is rotationally symmetric in its shape, the calculation is done either in polar coordinates or using a partial circular section of the anchor, which is placed in an edge of the area considered. The dimensions of the area to be considered shall be chosen according to EN ISO 10211:2017 so that the disturbance caused by the anchor has no appreciable effect on the edges.

D.3.5.3 Subdivision of the system

Any subdivision of the system for calculation by means of the numerical method shall be accomplished according to EN ISO 10211:2017.

D.3.5.4 Determination of the thermal transmittance

The thermal transmittance U_c of the wall section with anchor shall be determined according to EN ISO 10211:2017, but without rounding:

$$U_c = \frac{L^{3D}}{A}$$

where

U_c is the modified thermal transmission of the reference construction with anchors in W/(m²·K);

L^{3D} is the three-dimensional heat flux of the reference construction with anchors in W/K;

A is the area of the reference construction in m².

The thermal transmittance U of the undisturbed wall is calculated according to EN ISO 6946:2017.

Annex E
(normative)

Test plan and conformity tables

The test plan and conformity tables contain the information on the components of assessed ETICS kits. Relevant conformity criteria are given. One is the consistency of production and the other the validity of FPC test results. If the component properties, gained by factory production control, are within the given ranges the assessment result of the assessed ETICS kit is considered valid.

Table E.1 — Test plan and conformity for dry mix adhesives

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	... 0 to the lowest reference value +0,2 % (absolute)	5.2.1.2.4.2.1, 5.2.1.3.4.2, 5.2.1.4.4.1
Flame retardant content	5.2.2.4	Once per production month	—	... of the highest reference value −0,2 % (absolute) to infinite	5.2.1.2.4.2.1, 5.2.1.4.4.1
Shrinkage	EN 12617-4:2002, procedure 6, Annex 1.3	Once per production month	—	... 0 to the highest reference value - 0,4 mm/m	5.4.1.4.1
Bulk density of fresh mortar	EN 1015-6:1998	Once per production week	... FPC mean value ±10 % (relative)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	... FPC mean value ±2,0 % (absolute)	—	—
Particle size distribution	EN 1015-1:1998 (63 µm sieve is not mandatory)	Once per production week	... lower limit to upper limit according to Table F.1, considering FPC mean value as value. Every single fraction shall be considered.	—	—

Table E.2 — Test plan and conformity for ready to use adhesives

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	... 0 to the lowest reference value +0,2 % (absolute)	5.2.1.2.4.2.1, 5.2.1.3.4.2, 5.2.1.4.4.1
Flame retardant content	5.2.2.4	Once per production month	—	... of the highest reference value −0,2 % (absolute) to infinite	5.2.1.2.4.2.1, 5.2.1.4.4.1
Gross density	EN ISO 2811-1:2016	Once per production week	... FPC mean value ±10 % (relative)	—	—
Dry extract at 105°C	EN ISO 3251:2019	Once per production month	... FPC mean value ±2,0 % (absolute)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	... FPC mean value ±2,0 % (absolute)	—	—

Table E.3 — Test plan and conformity for PU adhesive foams

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	—	—	—	—	5.2.1.3.4.2, 5.2.1.4.4.1
Flame retardant content	5.2.2.4	Once per year	... FPC mean value ±0,2 % (absolute)	—	5.2.1.4.4.1
Foam Density	EN 17101:2018	Once per production week	... FPC mean value ±8 (relative)	—	—
Tack free time	EN 17101:2018	Once per production week	... FPC mean value ±1 min	—	—
Cutting time	EN 17101:2018	Once per production week	... FPC mean value ±1 min	—	—
Post application expansion behaviour	EN 17101:2018	Once per production week	... FPC mean value ±1 mm	—	—
Cohesion Strength	EN 17101:2018	Once per production week	... FPC mean value ±8 % (relative)	—	—
Shear Strength	EN 17101:2018	Once per production week	... FPC mean value ±8 % (relative)	—	—

Table E.4 — Test plan and conformity for thermal insulation

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Reaction to fire	EN 13501-1:2018[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	5.2.1.2.4.3, 5.2.1.3.4.3, 5.2.1.4.4.2, 5.2.2.2.4
Apparent density	EN 1602:2013[a]	Once per production day	... FPC mean value ±20 % (relative)	... 0 to the lowest reference value +15 % (relative)	5.2.1.2.4.3 and 5.2.1.3.4.3 for MW, 5.2.2.3.5.2 for MW with an apparent density ≤ 120 kg/m^3
			... FPC mean value ±15 % (relative)	... 0 to the lowest reference value +15 % (relative)	5.2.1.2.4.3 and 5.2.1.3.4.3 for EPS, XPS and CG
			... FPC mean value ±20 % (relative)	—	PU and PF
			... FPC mean value ±15 % (relative)	—	ICB
			... FPC mean value ±20 kg/m^3	... 0 to the lowest reference value +15 kg/m^3	5.2.1.2.4.3 and 5.2.1.3.4.3 for WF
			... FPC mean value ±20 % (relative)	... of the lowest reference value -15 kg/m^3 to the highest reference value +15 kg/m^3	5.2.2.3.5.2 for MW with an apparent density > 120 kg/m^3

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
			... FPC mean value ±15 % (relative)	... of the lowest reference value -15 % to the highest reference value +15 %	5.2.2.3.5.1 for ICB
			... FPC mean value ±20 kg/m3	... of the lowest reference value -15 kg/m3 to the highest reference value +15 kg/m3	5.2.2.3.5.3 for WF
Loss of ignition	EN 13820	[a]	—	0 to the lowest reference value +1 % (absolute)	5.2.2.3.5.2 for MW
PCS value	EN ISO 1716:2018	[a]	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.3 and 5.2.1.3.4.3 for thermal insulation with an achieved reaction to fire class A1 or A2
Water absorption	[a] (short term, if available)	Once per production month	... FPC mean value ±30 % (relative)	0 to the lowest reference value +20% (relative)	5.3.4.1
Tensile strength in dry conditions	EN 1607:2013[a]	Once per production week	... FPC mean value ±30 % (relative)	... of the highest reference value −20 % (relative) to infinite	5.4.1.4.2, 5.7.1.1.4.2, 5.7.1.2.4.2, 5.8.1.3.4.1, 5.8.1.4.4.1, 5.8.2.4.1, 5.8.3.4.2 and 5.8.4.3.2 for MW lamella, XPS, PU, CG, ICB and WF

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
			... FPC mean value +50 %/ −30 % (relative)	... of the highest reference value −20 % (relative) to infinite	5.4.1.4.2, 5.7.1.1.4.2, 5.7.1.2.4.2, 5.8.1.3.4.1, 5.8.1.4.4.1, 5.8.2.4.1, 5.8.3.4.2 and 5.8.4.3.2 for MW board
			... FPC mean value ±20 % (relative)	... of the highest reference value −15 % (relative) to infinite	5.4.1.4.2, 5.7.1.1.4.2, 5.7.1.2.4.2, 5.8.1.3.4.1, 5.8.1.4.4.1, 5.8.2.4.1, 5.8.3.4.2 and 5.8.4.3.2 for EPS
			... FPC mean value ±30 % (relative)	—	PF
Shear strength on 50 mm thick test specimens	EN 12090:2013 [a]	Once per 3 months	—	... of the highest reference value -20 % (relative) to infinite	5.8.3.4.2, 5.8.4.3.2
Thermal conductivity	EN 12667:2001 or EN 12939:2000[a]	[a]	—	... 0 to the lowest reference value NOTE 1 The reference value and FPC test result in case of thermal conductivity is λ_D, based on current $\lambda_{90/90}$	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 thermal insulation material.

Table E.5 — Test plan and conformity for plate anchors

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/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	—	Material test certificate 3.1 according to EN 10204:2004; minimum 3 test specimens
Failure load or tensile strength	EN ISO 898-1:2013				
Zinc plating (if relevant)	x-ray measurement				
Plastic pellets for plate anchors					
E-modulus		Once per 3 months	—	… of the highest reference value -20 % (relative) to infinite	5.8.6.4, 5.8.7.4
Tensile strength		Once per 3 months	—	… of the highest reference value -20 % (relative) to infinite	5.8.6.4, 5.8.7.4
Melting peak temperature	EN ISO 11357-3:2018	Every delivery of plastic pellets	Nominal value ±5 K	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens
Density	EN ISO 1183-1:2019, EN ISO 1183-2:2019 or EN ISO 1183-3:1999		Nominal value ±0,02 g/cm^3	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens
Viscosity Number	EN ISO 307:2019		Nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens; polyamide only

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect/Remarks
Melt Flow Index	EN ISO 1133-1:2011 EN ISO 1133-2:2011		For MFI ≤ 10: nominal value ±1 For MFI > 10: nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens;
Process stabilization	EN ISO 11357-6:2018		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non- virgin plastics only
Long term stabilization (if relevant) (Gas Chromatography)	Gas Chromatography GC		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non- virgin plastics only
Admissible contamination[d] by tensile test	ISO 527-1:2019		Nominal tensile modulus, nominal stress at yield[b] or at break[b]: −10 %[c]	—	non-virgin plastics only
Admissible contamination[d] by impact toughness	EN ISO 180:2019, test procedure: Table 1 ISO180/A		Nominal impact toughness −10 %[c]	—	Material test certificate 3.1 according to EN 10204:2004; minimum 5 test specimens; non-virgin plastics only

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/Remarks
Plate anchor					
Characteristic load resistance of the anchor plate	Annex C	Once per 3 months	—	… of the highest reference value -20 % (relative) to infinite	5.8.1.3.4.2, 5.8.2.4.4, 5.8.3.4.5, 5.8.4.3.5
Plate stiffness	Annex C	Once per 3 months	—	… of the highest reference value -20 % (relative) to infinite	5.8.1.3.4.2, 5.8.2.4.4, 5.8.3.4.5, 5.8.4.3.5
Flawless of plastic parts	Visual inspection	One shot of each production lot or shift	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	—	Minimum 3 test specimens

[a] The higher frequency is decisive.

[b] 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).

[c] The given tolerances refer to nominal specification given by supplier. If greater tolerances are desired, testing shall be done with boundary samples.

[d] Contaminations can influence mechanical performance thus mechanical performance has to be monitored.

[e] Reference values shall fall in the range of tolerances of nominal values indicated in the related drawings and specification documents.

[f] It is accepted that the determined reference value is declared to be the nominal value.

Table E.6 — Test plan and conformity for spiral anchors

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/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	—	Material test certificate 3.1 according to EN 10204:2004; minimum 3 test specimens
Failure load or tensile strength	EN ISO 898-1:2013				
Zinc plating (if relevant)	x-ray measurement				
Plastic pellets for spiral anchors					
Melting peak temperature	EN ISO 11357-3:2018	Every delivery of plastic pellets	Nominal value ±5 K	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens
Density	EN ISO 1183-1:2019 EN ISO 1183-2:2019 or EN ISO 1183-3:1999		Nominal value ±0,02 g/cm^3	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens
Viscosity Number	EN ISO 307:2019		Nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens; polyamide only
Melt Flow Index	EN ISO 1133-1:2011 EN ISO 1133-2:2011		For MFI ≤ 10: nominal value ±1 For MFI > 10: nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004; minimum 2 test specimens; polyethylene and polypropylene only

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/Remarks
Process stabilization	EN ISO 11357-6:2018 Oxidation Induction Time		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non-virgin plastics only
Long term stabilization (if relevant) (Gas Chromatography)	Gas Chromatography		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non-virgin plastics only
Admissible contamination[d] by tensile test	ISO 527-1:2019		Nominal tensile modulus[f], nominal stress at yield[b, f] or at break[b]: −10 %[c]	—	non-virgin plastics only
Admissible contamination[d] by impact toughness	EN ISO 180:2019, test procedure: Table 1 ISO180/A		Nominal impact toughness −10 %[c]	—	Material test certificate 3.1 according to EN 10204:2004; minimum 5 test specimens; non-virgin plastics only
Spiral anchor					
Flawless of plastic parts (spiral)	Visual inspection	One shot of each production lot or shift	No contraction cavities, no voids, no burns, no flow lines	—	All of one shot
Dimensions of spiral and anchor length	Calliper and/or gauge		… of tolerances of nominal values indicated in the related drawings and specification documents	—	Minimum 3 test specimens

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect/Remarks

[a] The higher frequency is decisive.

[b] 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).

[c] The given tolerances refer to nominal specification given by supplier. If greater tolerances are desired, testing shall be done with boundary samples.

[d] Contaminations can influence mechanical performance thus mechanical performance has to be monitored.

[e] Reference values shall fall in the range of tolerances of nominal values indicated in the related drawings and specification documents.

[f] It is accepted that the determined reference value is declared to be the nominal value.

Table E.7 — Test plan and conformity for collar anchors

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/Remarks
Expansion element made of steel					
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	—	Material test certificate 3.1 according to EN 10204:2004, minimum 3 test specimens
Failure load or tensile strength	EN ISO 898-1:2013				
Zinc plating (if relevant)	x-ray measurement				
Plastic pellets for collar anchors					
Melting peak temperature	EN ISO 11357-3:2018	Every delivery of plastic pellets	Nominal value ±5 K	—	Material test certificate 3.1 according to EN 10204:2004, minimum 2 test specimens
Density	EN ISO 1183-1:2019, EN ISO 1183-2:2019 or EN ISO 1183-3:1999		Nominal value ±0,02 g/cm^3	—	Material test certificate 3.1 according to EN 10204:2004, minimum 2 test specimens
Viscosity Number	EN ISO 307:2019		Nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004, minimum 2 test specimens; polyamide only

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect/Remarks
Melt Flow Index	EN ISO 1133-1:2011 EN ISO 1133-2:2011		For MFI ≤ 10: nominal value ±1 For MFI > 10: nominal value ±10 %	—	Material test certificate 3.1 according to EN 10204:2004, minimum 2 test specimens;
Process stabilization – Oxidation Induction Time	EN ISO 11357-6:2018		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non- virgin plastics only
Long term stabilization (if relevant) (Gas Chromatography)	Gas Chromatography		Nominal value −10 %	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004; polyethylene, polypropylene and polyamide; non- virgin plastics only
Admissible contamination[d] by tensile test	ISO 527-1:2019		Nominal tensile modulus, nominal stress at yield[b] or at break[b]: −10 %[c]	—	Minimum 2 test specimens; material test certificate 3.1 according to EN 10204:2004 non-virgin plastics only
Admissible contamination[d] by impact toughness	EN ISO 180:2019, test procedure: Table 1 ISO 180/A		Nominal impact toughness −10 %[c]	—	Minimum 2 test specimens; Material test certificate 3.1 according to EN 10204:2004, minimum 5 test specimens; non-virgin plastics only

Component property	Test method	Minimum frequency[a]	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect/Remarks
Collar anchor					
Flawless of plastic parts	Visual inspection	One shot of each production lot or shift	No damages, no cracks, no burning spots, no dirt	—	All of one shot
Dimensions (collar and shank diameter, length)	Calliper and/or gauge		… of tolerances of nominal values indicated in the related drawings and specification documents	—	Minimum 3 test specimens

[a] The higher frequency is decisive.

[b] 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).

[c] The given tolerances refer to nominal specification given by supplier. If greater tolerances are desired, testing shall be done with boundary samples.

[d] Contaminations can influence mechanical performance thus mechanical performance has to be monitored.

[e] Reference values shall fall in the range of tolerances of nominal values indicated in the related drawings and specification documents.

[f] It is accepted that the determined reference value is declared to be the nominal value.

Table E.8 — Test plan and conformity for profiles

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Depth	—	Once per production week	... FPC mean value ±0,7 mm (PVC) ... FPC mean value ±1,0 mm (metal)	—	—
Tongue width	—	Once per production week	... FPC mean value ±0,7 mm (PVC) ... FPC mean value +0,0/−2,0 mm (metal)	—	—
Thickness(es)	—	Once per production week	... FPC mean value ±0,3 mm (PVC) ... FPC mean value +0,0/−0,4 mm (metal whole form) ... FPC mean value +0,6/−0,0 mm (metal core)	—	—
Material de signation	Aluminium: EN 755-2:2016; PVC: EN ISO 21306-1:2019 Stainless steel EN 10088-2:2014	Each delivery	Match	—	—

Table E.9 — Test plan and conformity for rails

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect
Bearing depth	—	Once per production week	… FPC mean value ±0,5 mm (PVC) … FPC mean value ±0,5 mm (metal)	—	—
Tongue height	—	Once per production week	… FPC mean value ±0,7 mm (PVC) … FPC mean value +0,0/−2,0 mm (metal)	—	—
Flange height	—	Once per production week	… FPC mean value ±1,0 mm (PVC) … FPC mean value ±1,0 mm (metal)	—	—
Thickness(es)	—	Once per production week	… FPC mean value ±0,3 mm (PVC) … FPC mean value +0,0/−0,4 mm (metal whole form) … FPC mean value +0,6/−0,0 mm (metal core)	—	—
Material designation	Aluminium: EN 755-2:2016; PVC: EN ISO 21306-1:2019 Stainless steel EN 10088-2:2014	Each delivery	Match	—	—
Fixing strength of rails	PVC: 5.8.7, see Figure 18	Once per production week	… FPC mean value ±10 %	—	—

Table E.10 — Test plan and conformity for dry mix base coats

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	... 0 to the lowest reference value +0,2 % (absolute)	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.3
Flame retardant content	5.2.2.4	Once per production month	—	... of the highest reference value −0,2 % (absolute) to infinite	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.3
PCS value	EN ISO 1716:2018	Once per two years	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.5
Bulk density of fresh mortar	EN 1015-6:1998	Once per production week	... FPC mean value ±10 % (relative)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	... FPC mean value ±2,0 % (absolute)	—	—
Particle size distribution	EN 1015-1:1998 (63 µm sieve is not mandatory)	Once per production week	... lower limit to upper limit according to Table F.1, considering FPC mean value as value. Each individual fraction shall be considered.	—	—

Table E.11 — Test plan and conformity for ready to use base coats

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	... 0 to the lowest reference value +0,2 % (absolute)	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.3
Flame retardant content	5.2.2.4	Once per production month	—	... of the highest reference value −0,2 % (absolute) to infinite	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.3
PCS value	EN ISO 1716:2018	Once per two years	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.5
Gross density	EN ISO 2811-1:2016	Once per production week	... FPC mean value ±10 % (relative)	—	—
Dry extract at 105 °C	EN ISO 3251:2019	Once per production week	... FPC mean value ±2,0 % (absolute)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	...FPC mean value ±2,0 % (absolute)	—	—

Table E.12 — Test plan and conformity for glass fibre mesh

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Ash content	ISO 1887:2014 (620 ± 20) °C	Once per production week	... FPC mean value ±2,5 % (absolute)	—	—
PCS value	EN ISO 1716:2018	Once per two years	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.6
Mass per unit area	EN 12127:1997	Once per production month	... FPC mean value ±6,5 % (relative)	... of the highest reference value - 6,5 % (relative)	5.2.1.2.4.6, 5.2.1.3.4.5, 5.3.4.3
Mesh size	EN 13496:2013	Once per production month	... FPC mean value ±10 %, both length and width	... 0,0 % to the lowest reference value, both length and width, +10 % (relative)	5.4.1.4.4, 5.7.3.4.3, 5.7.4.4.3, 5.8.3.4.4
Tensile strength under normal conditions	EN 13496:2013	Once per production month	... FPC mean value ±10 %	—	—
Tensile strength after conditioning in aggressive medium	EN 13496:2013[a]	Once per production month	... FPC mean value ±15 %	... of the highest reference value −10 % (relative) to infinite	5.4.1.4.4, 5.8.3.4.4

[a] The 28d conditioning in aggressive medium at (23 ± 5) °C according to EN 13496:2013 is considered to be the reference method, the 24h conditioning in aggressive medium at (60 ± 2) °C according to EN 13496:2013 is considered to be the alternative method

Table E.13 — Test plan and conformity for metal mesh

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Mass per unit area	EN 13496:2013	Once per production month	... FPC mean value ±10 % (relative)	—	—
Mesh size	Caliper, measure center-center	Once per production month	... FPC mean value ±10 % (relative)	—	—
Wire thickness	Micrometer accuracy 0,01 mm	Once per 10 t of wire production	... FPC mean value ±0,1 mm	—	—
Corrosion protection	EN 10244-1:2009[a]	Once per 2000 m of wire production	... FPC mean value ±10 % (relative)	—	—

[a] The bare wire diameter is determined as average diameter from cross & longitudinal wire diameter measurement sample size 150 mm × 150 mm – method of double weighing. The zinc coating is determined on a square piece of welded mesh of approximately 300 cm² by the gravimetrical method according to EN 10244-1:2009, calculated by

$$\text{Coating mass per unit area} = \frac{m_{\text{wire with zinc}} - m_{\text{wire without zink}}}{m_{\text{wire without zink}}} \times \frac{1962{,}5}{d_{\text{wire without zinc}}}$$

with

$m_{\text{wire with zinc}}$ wire weight before removing the zinc coating with HCl

$m_{\text{wire without zinc}}$ wire weight after removing the zinc coating with HCl

$d_{\text{wire without zinc}}$ wire diameter, measured on bare wire without zinc coating

Table E.14 — Test plan and conformity for key coat

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per year	—	... 0 to the lowest reference value + 2 % (absolute)	5.2.1.2.4.7, 5.2.1.3.4.6, 5.2.1.4.4.5
				... of the highest reference value - 2 % (absolute) to infinite	5.3.4.4, 5.4.1.4.5, 5.7.4.4.4
Flame retardant content	5.2.2.4	Once per year	... of every reference value −0,2 % (absolute) to infinite	—	—
Density	EN ISO 2811-1:2016	Once per production week	... FPC mean value ±10 % (relative)	—	—
Dry extract at 105 °C	EN ISO 3251:2019	Once per production week	... FPC mean value ±10 % (relative)	—	—

Table E.15 — Test plan and conformity for dry mix finishing coat

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range …**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range …**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	… 0 to the lowest reference value +0,2 % (absolute)	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.6, 5.2.1.5.4.6
Flame retardant content	5.2.2.4	Once per production month	—	… of the highest reference value −0,2 % (absolute) to infinite	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.6
PCS value	EN ISO 1716:2018	Once per two years	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.5
Water absorption	EN 1062-3 EN 1015-18	Once per year	—	… 0 to the lowest reference value +25 % (relative)	5.3.4.5, 5.4.1.4.6, 5.7.4.4.5
Aggregate size	3.1.1.8	Once per year	—	… of the highest reference value -3 mm to lowest reference value +2 mm	5.3.4.5, 5.4.1.4.6, 5.7.4.4.5
Bulk density of fresh mortar	EN 1015-6:1998	Once per production week	… FPC mean value ±10 % (relative)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	… FPC mean value ±2,0 % (absolute)	—	—
Particle size distribution	EN 1015-1:1998 (63 µm sieve is not mandatory)	Once per production week	… lower limit to upper limit according to Table F.1, considering FPC mean value as value. Each individual fraction shall be considered.	—	—

Table E.16 — Test plan and conformity for ready to use finishing coat

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per production month	—	... 0 to every reference value +0,2 % (absolute)	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.6, 5.2.1.5.4.6
Flame retardant content	5.2.2.4	Once per production month	—	... of every reference value −0,2 % (absolute) to infinite	5.2.1.2.4.5, 5.2.1.3.4.4, 5.2.1.4.4.6
PCS value	EN ISO 1716:2018	Once per two years	—	0 to the lowest reference value +0,3 MJ/kg	5.2.1.2.4.5
Water absorption	EN 1062-3 EN 1015-18	Once per year	—	... 0 to the lowest reference value +25 % (relative)	5.3.4.5, 5.4.1.4.6, 5.7.4.4.5
Aggregate size	3.1.1.8	Once per year	—	... of the highest reference value -3 mm to lowest reference value +2 mm	5.3.4.5, 5.4.1.4.6, 5.7.4.4.5
Gross density	EN ISO 2811-1:2016	Once per production month	...FPC mean value ±10 % (relative)	—	—
Ash content	EN ISO 3451-1:2019 Method A at (450 ± 25) °C	Once per production week	... FPC mean value ±2,0 % (absolute)	—	—

Table E.17 — Test plan and conformity for decorative coat

Component property	Test method	Minimum frequency	Consistency of production of all components **Approved, if a FPC test result falls in the range ...**	Validity of FPC test results for components subject to a DiAp rule **Approved, if a FPC test result falls in the range ...**	Info, when a DiAp rule takes effect
Organic content	5.2.2.4	Once per year	—	… 0 to the lowest reference value +2 % (absolute)	5.2.1.2.4.7, 5.2.1.3.4.6, 5.2.1.5.4.7
Flame retardant content	5.2.2.4	Once per year	… of every reference value −0,2 % (absolute) to infinite	—	—
Water permeability	EN 1062-1:2004	Once per year	—	… 0 to the lowest reference value +25 % (relative)	5.3.4.6., 5.4.1.4.7, 5.7.4.4.6
Density	EN ISO 2811-1:2016	Once per production week	… FPC mean value ±10 % (relative)	—	—
Dry extract at 105 °C	EN ISO 3251:2019	Once per production week	… FPC mean value ±10 % (relative)	—	—

Annex F
(normative)

Table for particle distribution

Table F.1 — Range for particle size distribution

Lower limit	Value	Upper limit
0,0 %	0 %	4,3 %
0,0 %	1 %	5,3 %
0,0 %	2 %	6,3 %
0,0 %	3 %	7,3 %
0,0 %	4 %	8,3 %
0,7 %	5 %	9,3 %
1,7 %	6 %	10,3 %
2,7 %	7 %	11,3 %
3,7 %	8 %	12,3 %
4,7 %	9 %	13,3 %
5,7 %	10 %	14,3 %
6,4 %	11 %	15,6 %
7,1 %	12 %	16,9 %
7,8 %	13 %	18,2 %
8,6 %	14 %	19,4 %
9,3 %	15 %	20,7 %
10,0 %	16 %	22,0 %
10,8 %	17 %	23,2 %
11,5 %	18 %	24,5 %
12,3 %	19 %	25,7 %
13,1 %	20 %	26,9 %
13,9 %	21 %	28,1 %
14,7 %	22 %	29,3 %
15,5 %	23 %	30,5 %
16,3 %	24 %	31,7 %
17,1 %	25 %	32,9 %
17,9 %	26 %	34,1 %
18,8 %	27 %	35,2 %
19,6 %	28 %	36,4 %
20,5 %	29 %	37,5 %
21,3 %	30 %	38,7 %
22,2 %	31 %	39,8 %
23,1 %	32 %	40,9 %
23,9 %	33 %	42,1 %
24,8 %	34 %	43,2 %
25,7 %	35 %	44,3 %
26,6 %	36 %	45,4 %
27,5 %	37 %	46,5 %
28,5 %	38 %	47,5 %
29,4 %	39 %	48,6 %
30,3 %	40 %	49,7 %
31,3 %	41 %	50,7 %
32,2 %	42 %	51,8 %
33,1 %	43 %	52,9 %
34,1 %	44 %	53,9 %
35,1 %	45 %	54,9 %
36,0 %	46 %	56,0 %
37,0 %	47 %	57,0 %
38,0 %	48 %	58,0 %
39,0 %	49 %	59,0 %
40,0 %	50 %	60,0 %
41,0 %	51 %	61,0 %
42,0 %	52 %	62,0 %
43,0 %	53 %	63,0 %
44,0 %	54 %	64,0 %
45,1 %	55 %	64,9 %
46,1 %	56 %	65,9 %
47,1 %	57 %	66,9 %
48,2 %	58 %	67,8 %
49,3 %	59 %	68,7 %
50,3 %	60 %	69,7 %
51,4 %	61 %	70,6 %
52,5 %	62 %	71,5 %
53,5 %	63 %	72,5 %
54,6 %	64 %	73,4 %
55,7 %	65 %	74,3 %
56,8 %	66 %	75,2 %
57,9 %	67 %	76,1 %
59,1 %	68 %	76,9 %
60,2 %	69 %	77,8 %
61,3 %	70 %	78,7 %
62,5 %	71 %	79,5 %
63,6 %	72 %	80,4 %
64,8 %	73 %	81,2 %
65,9 %	74 %	82,1 %
67,1 %	75 %	82,9 %
68,3 %	76 %	83,7 %
69,5 %	77 %	84,5 %
70,7 %	78 %	85,3 %
71,9 %	79 %	86,1 %
73,1 %	80 %	86,9 %
74,3 %	81 %	87,7 %
75,5 %	82 %	88,5 %
76,8 %	83 %	89,2 %
78,0 %	84 %	90,0 %
79,3 %	85 %	90,7 %
80,6 %	86 %	91,4 %
81,8 %	87 %	92,2 %
83,1 %	88 %	92,9 %
84,4 %	89 %	93,6 %
85,7 %	90 %	94,3 %
86,7 %	91 %	95,3 %
87,7 %	92 %	96,3 %
88,7 %	93 %	97,3 %
89,7 %	94 %	98,3 %
90,7 %	95 %	99,3 %
91,7 %	96 %	100,0 %
92,7 %	97 %	100,0 %
93,7 %	98 %	100,0 %
94,7 %	99 %	100,0 %
95,7 %	100 %	100,0 %

NOTE 1 Example for particle size distribution of a dry mix base coat. A test result according to EN 1015-1:1998 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 consistency 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 distribution of a dry mix finishing coat. A test result according to EN 1015-1:1998 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 consistency 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 can be used for the test of this component only.

Annex G
(normative)

Calculations for pull-off resistance

G.1 General

This annex covers calculations used for the determination of pull-off resistance, both tensile and tensile-shear.

G.2 Test specimen showing anchors in middle area position only

For test specimens fixed with anchors, the pull-off resistance of ETICS kits with another number of anchors per unit area that 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 configuration exist. The result of the missing test is simply supposed to be $\sigma_{k,block} = 0$ kPa with no anchors.

For the calculation of the pull-off resistance of other anchor setting positions and numbers of anchors per unit area that 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)

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

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

Calculated pull-off resistances:

a) Linear Interpolation of middle area positions between pull-off test results:

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

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

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

b) Calculation of mixed joint and middle area positions

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

or

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

where

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;

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

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

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

rounded to 0,1 kPa.

G.3 Test specimen showing anchors in different anchor setting positions

For test specimens fixed with anchors, the pull-off resistance of ETICS kits with different number of anchors per unit area that 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 $\sigma_{k,block} = 0$ kPa with no anchors, $n_1 = 0$ and $n_{a,1} = 0$.

$\sigma_{k,block,1}$ and $\sigma_{k,block,2}$ are then graphed and linear interpolation used to determine the pull-off resistance for the desired number of anchors.

If the position of the area is not determined according to EN 16382:2016, r_{min} shall be determined by the calculation given in 5.8.1.3.2.3 or 5.8.1.4.2.3.

If the position of the edge/corner is not determined according to EN 16382:2016, the distance c is the distance of the anchor in the test specimen closest to the border.

If the joint position is not determined according to EN 16382:2016, only anchors placed directly in joints belong to this position.

The following rules apply:

The anchor setting positions shall remain conservative in the calculation for every total number of anchors per unit area to ensure a safe outcome. The minimum number of anchors in middle area, edge/corner and joint position is calculated as follows:

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

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

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

where

n_a is the number of anchors in middle area position per unit area;

n_{ec} is the number of anchors in edge/corner position per unit area;

n_j is the number of anchors in joint 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;

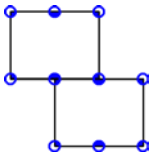
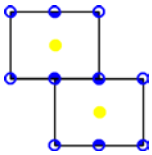
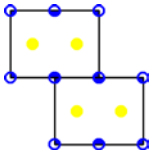
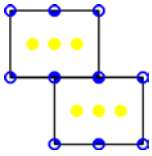
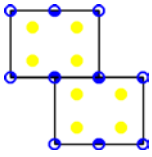
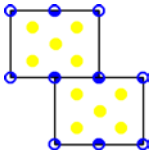
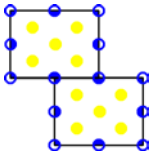
2 Index 2: figures of the test with the higher total number of anchors per unit area.

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

If a result for one anchor setting position is not an integer value, the remainder shall be added to the result of a conservative anchor setting position. The range order for an anchor setting position to consider is middle area position > edge/corner position > joint position.

EXAMPLE 1 Example for a conservative middle area to joint-position series with the test configuration 1 with 4 anchors in joint position (blue) per square meter and the test configuration 2 with 10 anchors in middle area (yellow) 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. $\sigma_{k,block,1}$ = 1,6 kN/m²and $\sigma_{k,block,2}$ = 7,6 kN/m².

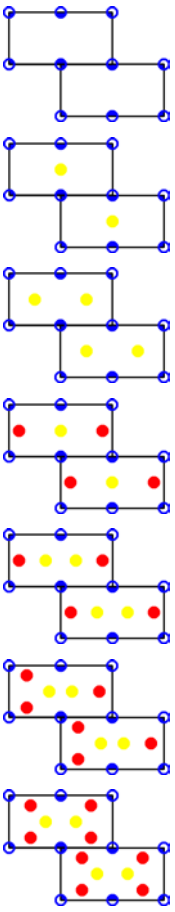
Table G.1 — Calculation of pull-off resistance – Example 1

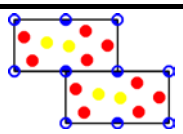
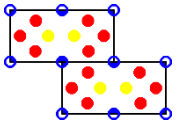
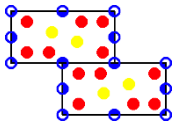
Number of anchors per square meter $\boldsymbol{n}$	Calculation according to the following formula $n_{\boldsymbol{a}}(\boldsymbol{n}) \geq \frac{(10-0)\times(n-4)}{(16-4)} + 0$	Minimum number of middle area to joint positions $\boldsymbol{n_a}$:$\boldsymbol{n_j}$	Chosen design with boards of 0,5 m²	Chosen number of anchor setting positions $\boldsymbol{n_a}$:$\boldsymbol{n_j}$	$\sigma_{\boldsymbol{k,block},\, n_a:n_j} = \frac{\sigma_{\boldsymbol{k,block}},10:6 - \sigma_{\boldsymbol{k,block}},0:4}{(16-4)} \times (n-4) + \sigma_{\boldsymbol{k}},\text{block},0:4$
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

Number of anchors per square meter n	Calculation according to the following formula $n_a(n) \geq \frac{(10-0)\times(n-4)}{(16-4)} + 0$	Minimum number of middle area to joint positions n_a:n_j	Chosen design with boards of 0,5 m²	Chosen number of anchor setting positions n_a:n_j	$\sigma_{k,block,\, n_a:n_j} = \frac{\sigma_{k,block,10:6} - \sigma_{k,block,0:4}}{(16-4)} \times (n-4) + \sigma_{k,\mathrm{block},0:4}$
Yellow – middle area position Blue – joint area position					

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 (blue) per square meter and the test configuration 2 with 4 anchors in middle area (yellow), 12 anchors in edge/corner (red) and 6 anchors in joint position per square meter ($n_{a,1}$ = 0, $n_{ec,1}$ = 0, $n_{j,1}$ = 4, $n_{a,2}$ = 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. $\sigma_{k,block,1}$= 1,6 kN/m²and $\sigma_{k,block,2}$ = 9,8 kN/m².

Table G.2 — Calculation of pull-off resistance – Example 2

Number of anchors per square meter n	Calculation according to the following formula $n_a(n) \geq \frac{(4-0)\times(n-4)}{(22-4)} + 0$ $n_{ec}(n) \geq \frac{(12-0)\times(n-4)}{(22-4)} + 0$		Minimum number of middle area and edge/ corner positions n_a:n_{ec}:n_j	Chosen design with boards of 0,5 m2	Chosen number of anchor setting positions n_a:n_{ec}:n_j	$\sigma_{k,block,\, n_a:n_{ec}:n_j} = \frac{\sigma_{k,block,4:12:6} - \sigma_{k,block,0:0:4}}{(22-4)} \times (n-4) + \sigma_{k,block,0:0:4}$
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

Number of anchors per square meter n	Calculation according to the following formula $n_a(n) \geq \frac{(4-0)\times(n-4)}{(22-4)} + 0$ $n_{ec}(n) \geq \frac{(12-0)\times(n-4)}{(22-4)} + 0$		Minimum number of middle area and edge/ corner positions n_a:n_{ec}:n_j	Chosen design with boards of 0,5 m2	Chosen number of anchor setting positions n_a:n_{ec}:n_j	$\sigma_{k,block,\, n_a:n_{ec}:n_j} = \frac{\sigma_{k,block,4:12:6} - \sigma_{k,block,0:0:4}}{(22-4)} \times (n-4) + \sigma_{k,block,0:0:4}$
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
Yellow – middle area position Red – edge/corner position Blue – joint area position						

G.4 Test specimen showing profiles and rails

For test specimens fixed with profiles and rails, the pull-off resistance of ETICS kits with another distance between profiles and/or another distance between rails that 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.

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

G.5 Test specimen showing anchored metal mesh

For test specimens fixed with an anchored metal mesh, the pull-off resistance of ETICS kits with another number of anchors per unit area that 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 $\sigma_{k,block}$ = 0 kPa with no anchors.

$\sigma_{k,block,1}$ and $\sigma_{k,block,2}$ are then graphed and linear interpolation used to determine the pull-off resistance for the required number of anchors.

Annex H
(normative)

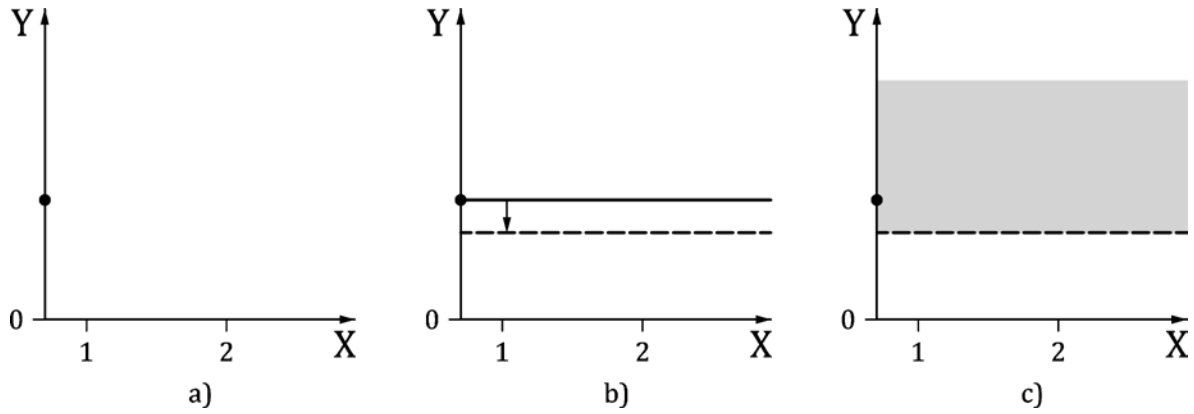
Comparison of FPC test results with reference values

H.1 General

Clause 6.3.1.5.3.1 describes a specific indirect test based on the properties of the components. The test results from factory production control shall correspond to the reference values from the assessment of performance. Different situations and their valuation are explained in the following.

Figures H.1 to H.12 in this annex shows the possibilities to compare FPC test results with reference values. Each diagram shows time in years on the x-axis and a value of a component property on the y-axis.

H.1.1 Validity sector with a lower limit



Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

Figure H.1 — Validity sector derived from one reference value – lower limit. a) reference value, b) lower limit, c) validity sector

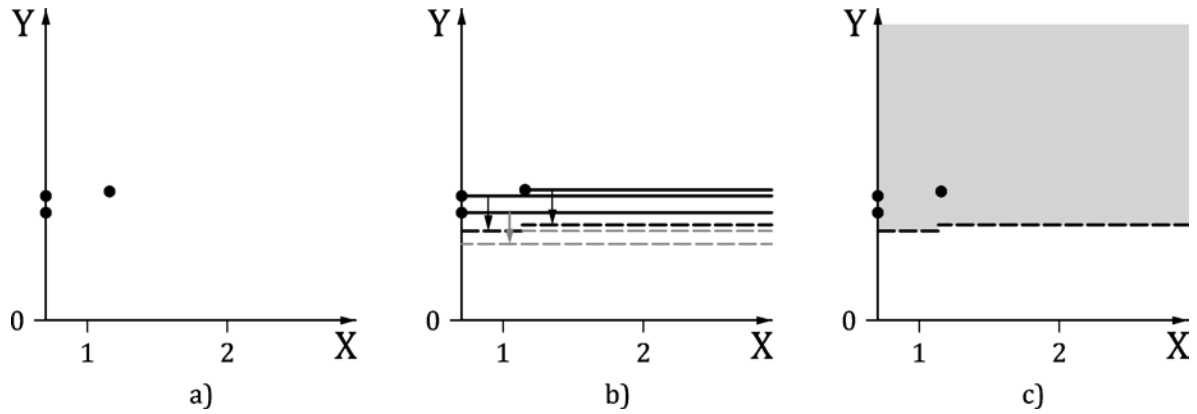
The large dot in Figure H.1 represents a reference value, evaluated during the attestation of performance on the batch of the component used to make the test specimen for testing a specific ETICS kit characteristic.

NOTE 1 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 H.1 b) added a continuous line over time representing the reference value found during attestation of performance. The small arrow indicates the allowed deviation of a FPC test result from the reference value, to be comparable to the component used for test specimen(s).

NOTE 2 The allowed deviation can be different for different component properties, see Annex E.

Figure H.1 b) shows a lower limit. Every FPC test result shall be ≥ the lower limit to pass the surveillance, i.e. the validity is stated. The lower limit is indicated by the dashed line. Figure H.1 c) indicates the validity sector by a grey area.



Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

Figure H.2 — Validity sector derived from multiple reference values – lower limit a) reference values, b) lower limits, c) validity sector

Figure H.2 a) shows three dots representing three different reference values. Three different batches of one component are used to make test specimens.

If a component is used for different kits, assessed by test specimens built with the three different batches of this component, each single validity sector shall be matched by every FPC test result. Hence, the intersection of the three sectors is the remaining validity sector.

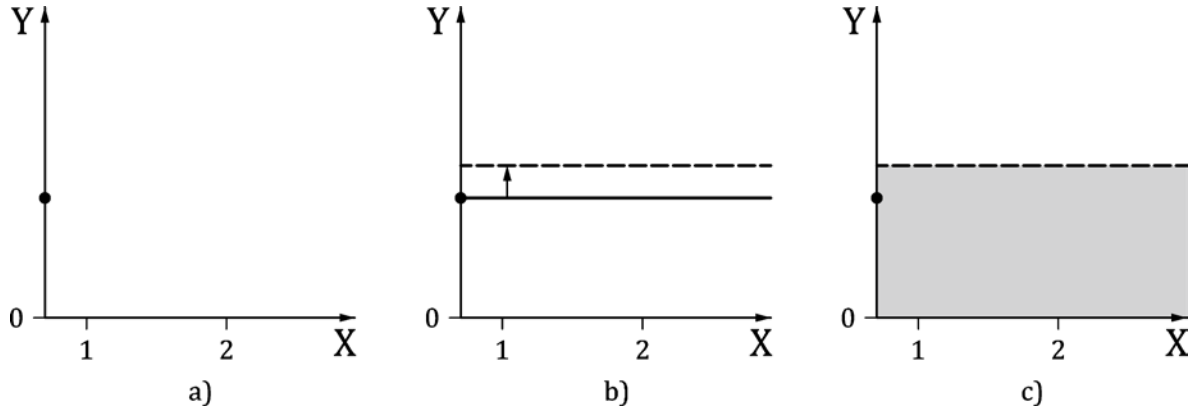
The dots in Figure H.2 a) are not all located at the same time. One test specimen was built later than the others with a new batch of the considered component. One validity sector starts later than the others though.

A reference value can also be superseded by another. In this case the validity sector of the previous reference value ends and a new starts. It can also happen, that ETICS kits are no longer on the market, which were connected to a specific reference value. In this case the corresponding validity 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 validity sector. For every change of the set of reference values over time, this procedure shall be repeated.

Figure H.2 b) shows a lower limit. Every FPC test result shall be ≥ the lower limit to pass the surveillance, i.e. the validity is stated. The lower limit is indicated by the black dashed line, providing a step. Figure H.2 c) indicates the validity sector by a grey area.

H.1.2 Validity sector with an upper limit

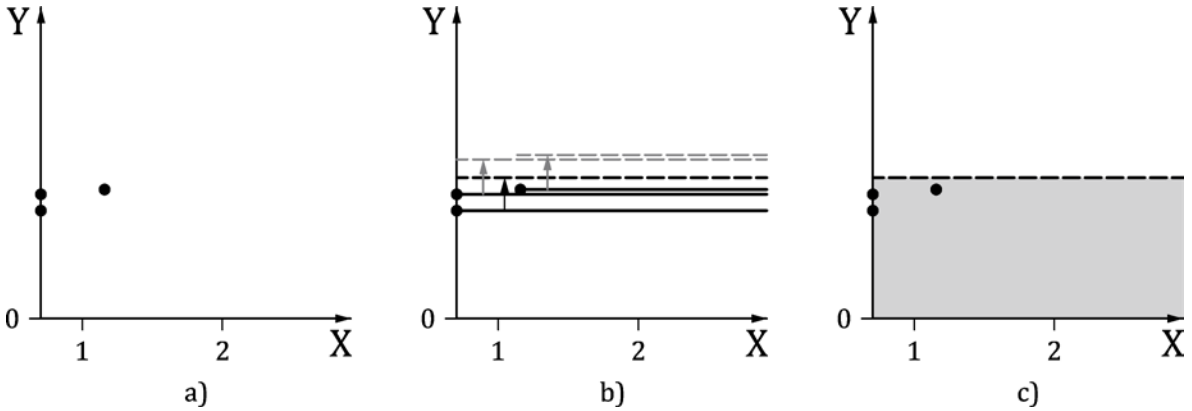


Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

Figure H.3 — Validity sector derived from one reference value – upper limit a) reference value, b) upper limit, c) validity sector

Figure H.3 b) shows an upper limit. Every FPC test result shall be ≤ the upper limit to pass the surveillance, i.e. the validity is stated. The upper limit is indicated by the dashed line. Figure H.3 c) indicates the validity sector by a grey area.



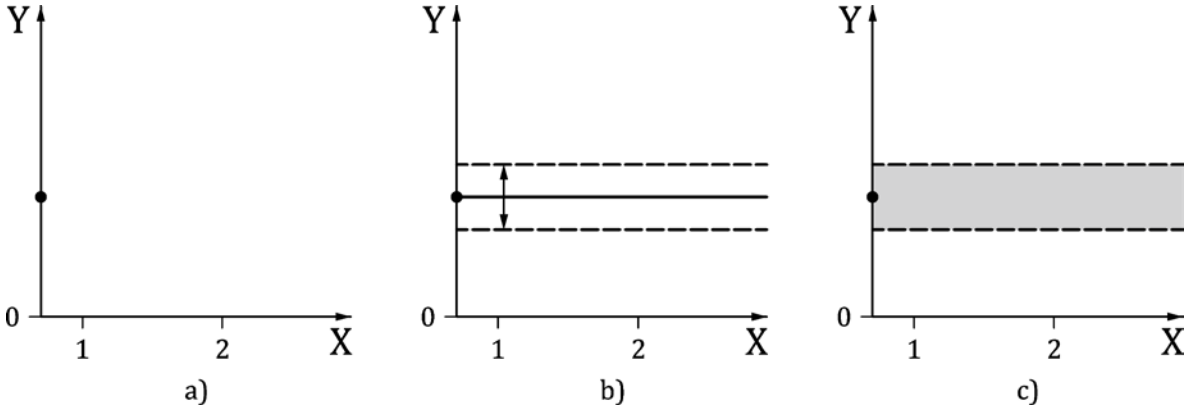
Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

Figure H.4 — Validity sector derived from multiple reference values – upper limit a) reference values, b) upper limits, c) validity sector

Figure H.4 b) shows an upper limit with multiple reference values. Every FPC test result shall be ≤ to the upper limit to pass the surveillance, i.e. the validity is stated. The upper limit is indicated by the black dashed line. Figure H.4 c) indicates the validity sector by a grey area.

H.1.3 Validity sector with a lower and an upper limit



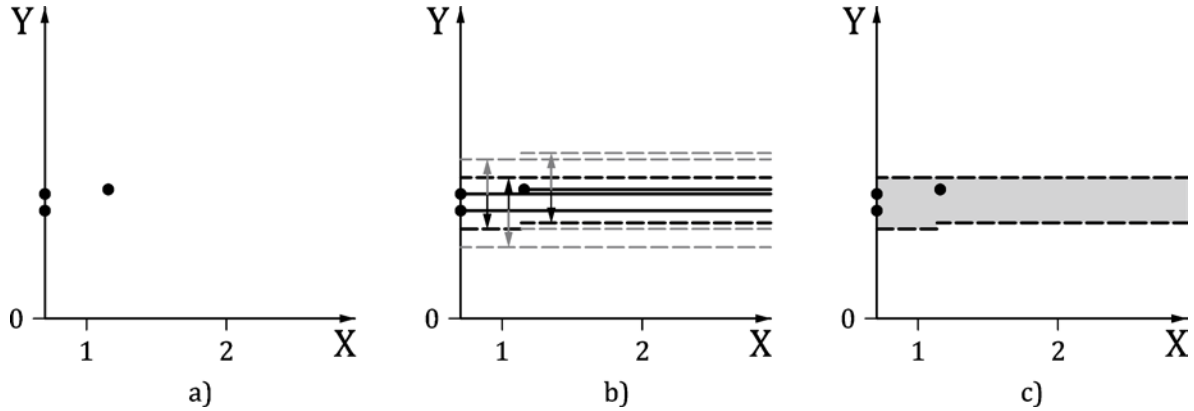
Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

Figure H.5 — Validity sector derived from one reference value – upper and lower limit a) reference value, b) lower and upper limit, c) validity sector

Figure H.5 b) indicates a two-sided situation with an upper and a lower limit. The limits are valid over time, shown by the two dashed lines. Figure H.5 c) now indicates the validity sector by a grey area, limited by the two dashed lines.

H.1.4 Validity sector derived from multiple reference values



Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black continuous line	Reference value over time
black dashed line	Limit for validity
grey area	Validity sector

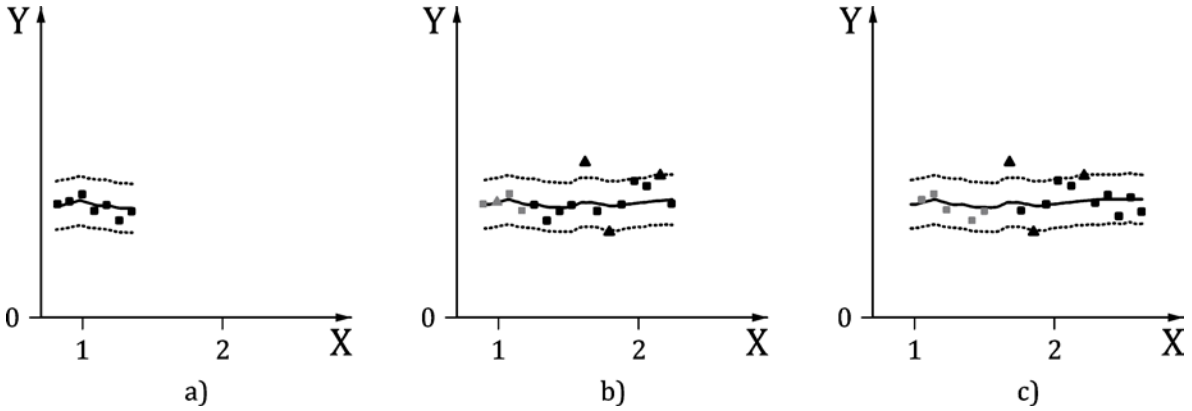
Figure H.6 — Validity sector derived from multiple reference values – upper and lower limit a) reference values, b) lower and upper limits, c) validity sector

Figure H.6 b) shows a lower and an upper limit. Every FPC test result shall be within these limits to pass the surveillance, i.e. the validity is stated. The limits are indicated by the dashed line. Figure H.6 c) indicates the validity sector by a grey area.

H.1.5 Stability of production

A mean value shall be calculated from the test results of the last 365 days (one year). This mean value is called the FPC mean value. Every FPC test result of the factory production control of a component shall

be within a lower and upper limit, calculated by the FPC 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 test result ≤ 365 days ago, to consider for FPC mean value
small grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production
small triangle	FPC test result not matching the criteria for a stable production
black dotted line	FPC limit for a stable production

Figure H.7 — Stability of production of one production line a) less than one year, b) one year, c) more than one year

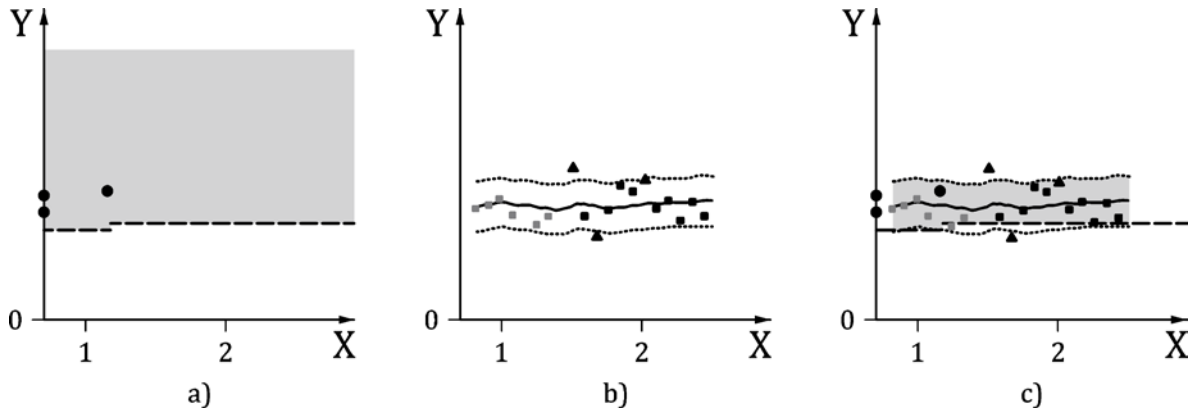
Figure H.7 a), b) and c) show an increasing number of FPC test results by time of one production line, starting production in the last quarter of year one. Every square or triangle represents a FPC test result. The mean value, recalculated with every new FPC test result, changes slightly as the continuous line shows. For the recalculation every FPC test result over the last 365 days shall be considered. In Figure H.5 a), b) and c) the black squares represent the FPC test results to consider. The grey symbols represent FPC test results older than one year and are no longer used to calculate the FPC mean value.

Figure H.7 a) starts with less than 365 days and every FPC test result is considered. Figure H.7 b) shows more than 365 days and some older FPC test results as grey squares or triangles. They are no longer considered for the calculation. In Figure H.7 c) even older FPC test 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 test result shall match these limits. The limits depend on the relevant ETICS characteristic, group of components and the component property, see Annex E.

H.1.6 Conformity of FPC test results with one production line

The conformity of FPC test results is given, if they match the criteria of validity with reference value(s) and stability of production.

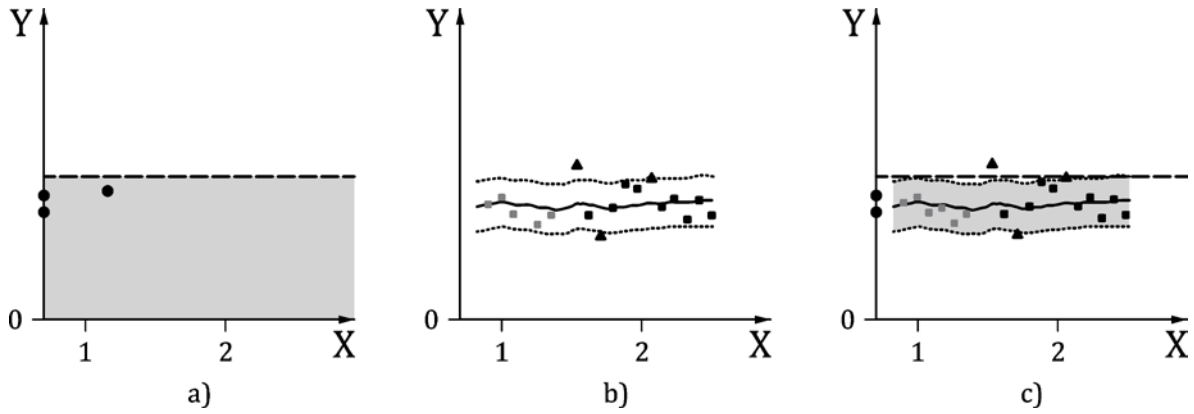


Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black symbol	FPC test result ≤ 365 days ago, to consider for FPC mean value
grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production in (b); FPC test result matching the criteria for conformity in (c)
small triangle	FPC test result not matching the criteria for a stable production (b); FPC test result not matching the criteria for conformity in (c)
black dotted line	FPC limit for a stable production
black dashed line	Limit for validity
grey area	Validity sector in (a); Conformity sector in (c)

Figure H.8 — Conformity sector derived from multiple reference values – lower limit – with one production line a) validity sector b) stability of production sector c) conformity sector

Figure H.8 c) shows the intersection of validity, Figure H.8 a), and stability of one production line, Figure H.8 b), leading to the conformity sector in grey. FPC test results shown as squares in Figure H.8 c) match the intersection and are conform, FPC test results shown as triangles are not conform.



Key

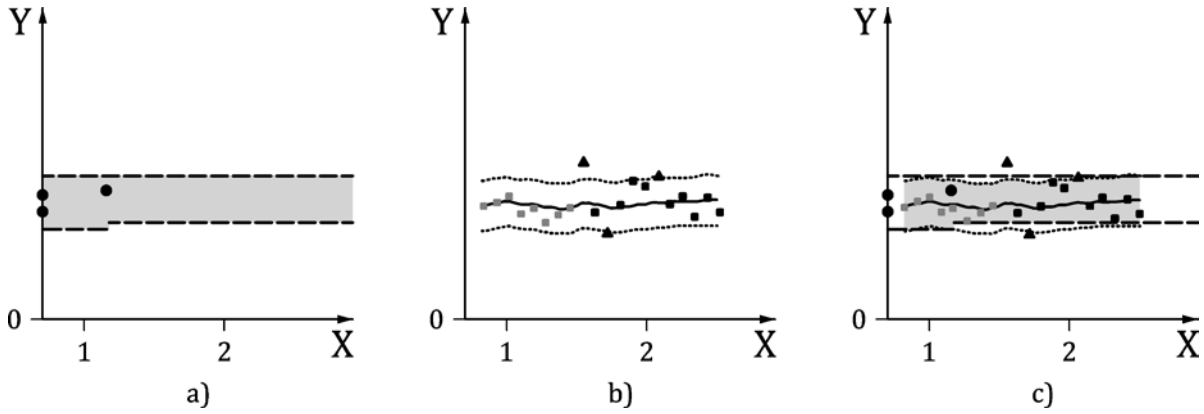
x-axis	Time in years
y-axis	Value of component property

large dot	Reference value
small black symbol	FPC test result ≤ 365 days ago, to consider for FPC mean value
small grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production in (b); FPC test result matching the criteria for conformity in (c)
small triangle	FPC test result not matching the criteria for a stable production (b); FPC test result not matching the criteria for conformity in (c)
black dotted line	FPC limit for a stable production
black dashed line	Limit for validity
grey area	Validity sector in (a); Comformity sector in (c)

Figure H.9 — Conformity sector derived from multiple reference values – upper limit – with one production line a) validity sector b) stability of production sector c) conformity sector

Figure H.9 c) shows the intersection of an upper limit validity sector of one production line, derived from Figures H.9 a) and H.9 b). Figure H.10 c) shows the intersection of a lower and an upper limit validity sector of one production line, derived from figures H.10 a) and H.10 b).

In case of more than one production line for one component, more than one comparison shall be made. Figure H.11 b) shows the FPC test results of another production line than Figure H.8 b), but the same component. The intersection with the relevant validity sector in Figure H.11 a), which is the same as in Figure H.8 a), leads to a different conformity sector. I.e., in case of more than one production line, the FPC test results of every production line shall be considered for its own.



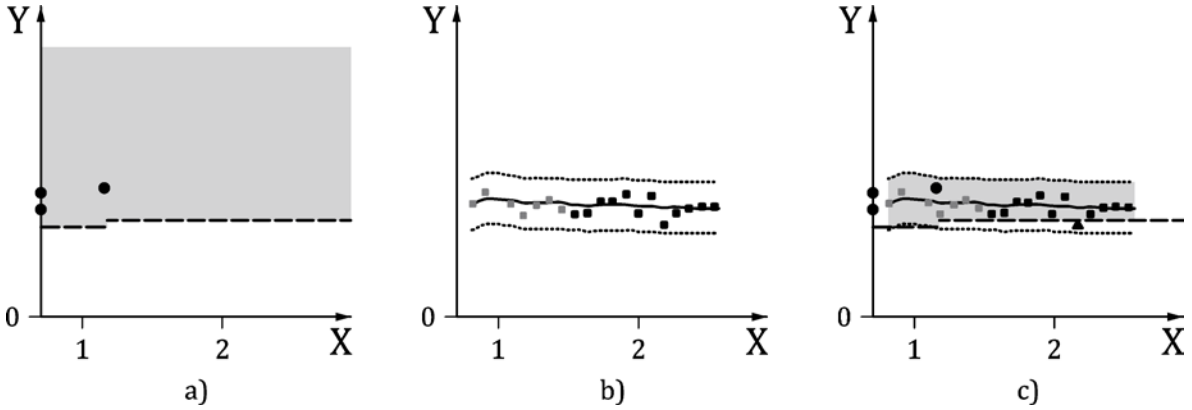
Key

x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
small black symbol	FPC test result ≤ 365 days ago, to consider for FPC mean value
small grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production in (b); FPC test result matching the criteria for conformity in (c)
small triangle	FPC test result not matching the criteria for a stable production (b); FPC test result not matching the criteria for conformity in (c)
black dotted line	FPC limit for a stable production
black dashed line	Limit for validity

grey area Validity sector in (a); Comformity sector in (c)

Figure H.10 — Conformity sector derived from multiple reference values – upper and lower limit – with one production line a) validity sector b) stability of production sector c) conformity sector

H.1.7 Conformity of FPC test results with more than one production line



Key

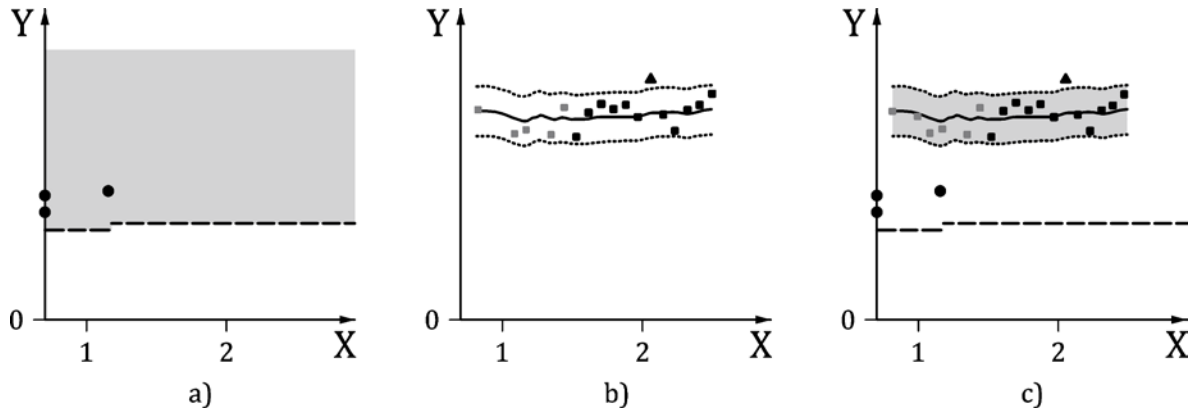
x-axis	Time in years
y-axis	Value of component property
large dot	Reference value
black symbol	FPC test result ≤ 365 days ago, to consider for FPC mean value
grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production in (b); FPC test result matching the criteria for conformity in (c)
small triangle	FPC test result not matching the criteria for a stable production (b); FPC test result not matching the criteria for conformity in (c)
black dotted line	FPC limit for a stable production
black dashed line	Limit for validity
grey area	Validity sector in (a); Comformity sector in (c)

Figure H.11 — Conformity sector derived from multiple reference values – lower limit – and another production line a) validity sector b) stability of production sector c) conformity sector

H.1.8 Conformity of FPC test results of components not used for test specimens

The assessment of an ETICS kit can be based on direct field of application rules together with known test results. The ETICS 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 validity 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 test result ≤ 365 days ago, to consider for FPC mean value
small grey symbol	FPC test result > 365 days ago, not to consider for FPC mean value
black continuous line	FPC mean value
small square	FPC test result matching the criteria for a stable production in (a); FPC test result matching the criteria for conformity in (c)
small triangle	FPC test result not matching the criteria for a stable production (a); FPC test result not matching the criteria for conformity in (c)
black dotted line	FPC limit for a stable production
black dashed line	Limit for validity
grey area	Validity sector in (a); Comformity sector in (c)

Figure H.12 — Conformity sector derived from multiple reference values – lower limit – and one production line of a component not used for test specimens a) validity sector b) stability of production sector c) conformity sector

Figure H.12 b) shows the FPC test 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 validity sector, the stability of production criteria, within the dotted lines in Figure H.12 b), is the same as the conformity sector in Figure H.12 c).

Annex I
(informative)

Indirect testing with component properties – FPC examples

I.1 General

Clause 6.3.1.5.3.1 describes a indirect testing based on the properties of the components. An example is given to show which component properties and how shall be considered in FPC and the surveillance to confirm compliance of specific ETICS kit characteristic with requirements coming from assessment.

I.2 Procedure

- During assessment
    - Define the ETICS kit to be assessed, the components, layer thicknesses, number of anchors etc.
    - Define the required characteristics of this ETICS kit, e. g. water tightness.
    - For each required characteristic, look into the DiAp rules for each component in 5, e.g. 5.4.1.4 for water tightness. If a DiAp rule exists for a component property, this property shall be measured on the batch used for the production of test specimens. The test result is a reference value.
    - Moreover, all identification properties of each component shall be measured on the batch used for the production of test specimens. They are given in the tables in Annex E in the column “consistency of production”.
    - The identification properties shall be consistent with the ranges given in tables in Annex E in the column “consistency of production”.
- During surveillance
    - The FPC test results shall be consistent with the new reference values and any existing reference value according to the ranges in the column “validity of FPC results” in the tables in Annex E.
    - The FPC test results shall comply with the criteria for “consistency of production”.

I.3 Example

For the purposes of this annex, the following code is used:

componentGeneric.componentName.componentBatch, e. g.

thermalInsulation.MW032.230504B, or shorter

ti.Blah_MW032.230504B

An ETICS kit with the following components is given

- Dry mix adhesive with an inorganic binder
    - ad.GLUE-201.4371BCA
- Thermal insulation of the material XPS

  - ti.X032.230504T
- Glas fibre mesh
  - gfm.Supermesh30.43N471
- Ready to use base coat
  - bc.Standard.223479
- Ready to use aggregate sized finishing coat
  - fc.coarse3-6.VV221

To evaluate e.g. the characteristic water tightness of ETICS kit, using indirect component properties method, following properties of the given components have to be considered as reference values, because they are used for DiAp rules according to 5.4.1.4.

- Dry mix adhesive with inorganic binder
  - shrinkage
- Thermal insulation of the material XPS
  - tensile strength
- Ready to use base coat
  - none
- Glas fibre mesh
  - mesh size
  - tensile strength after conditioning in aggressive medium
- Ready to use aggregate sized finishing coat
  - aggregate size
  - water absorption

Moreover, the following identification properties shall be considered according to Annex E, column 4.

- Dry mix adhesive with an inorganic binder, table E.1
  - bulk density of fresh mortar
  - ash content
  - particle size distribution
- Thermal insulation of the material XPS, table E.4
  - apparent density
  - tensile strength
- Ready to use base coat, table E.11
  - bulk density of fresh mortar
  - ash content
  - particle size distribution
- Glas fibre mesh, table E.12

  - ash content
  - mass per unit area
  - mesh size
  - tensile strength under normal conditions
  - tensile strength after conditioning in aggressive medium
- Ready to use aggregate sized finishing coat, table E.16
  - gross density
  - ash content

Note A component property can be a reference value and an identification property at the same time

Annex ZA
(informative)

Relationship of this European Standard with Regulation (EU) No. 305/2011

(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 Scope and relevant characteristics

This European Standard has been prepared under mandate M/489 — External thermal insulation composite systems/ETICS 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 external thermal insulation composite kits with a rendering system (ETICS kits[a]) to be used on external walls and/or external finishes of walls (including cladding)

Product:	**External thermal insulation composite kits with a rendering system (ETICS kits[a])**		
Intended use	**external walls and/or external finishes of walls (including cladding)**		
Essential Characteristics	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes[b]**
Reaction to fire	4.2	4.2.2	4.2.1 / all / 4.2.3
Water absorption	4.3	—	4.3.1 / all / 4.3.2
Water tightness	4.4	—	4.4.1 / all / 4.4.2
Impact resistance	4.5	—	4.5.1 / all / 4.5.2
Water vapour permeability	4.6	—	4.6.1 / all / 4.6.3
Bond strength, dealt with			
— Bond strength of adhesive to thermal insulation	4.7.1	4.7.1.3.2 4.7.1.4.2	4.7.1.3.1 / 4.7.1.2 / 4.7.1.3.3 4.7.1.4.1 / 4.7.1.2 / 4.7.1.4.3
— Tensile strength perpendicular to faces of thermal insulation	4.7.2	—	4.7.2.1 / all / 4.7.2.3
— Bond strength of the reinforced base coat to the thermal insulation	4.7.3	4.7.3.2	4.7.3.1 / all / 4.7.3.3
— Bond strength of the rendering system to the thermal insulation in the ETICS kit	4.7.4	4.7.4.2	4.7.4.1 / all / 4.7.4.3
Fixing strength, dealt with			

Product:	**External thermal insulation composite kits with a rendering system (ETICS kits[a])**		
Intended use	**external walls and/or external finishes of walls (including cladding)**		
Essential Characteristics	**Clauses of this European Standard related to essential characteristics**	**Classes and/or threshold levels**	**Notes[b]**
— Pull-through resistance	4.8.2	—	4.8.2.1 / 4.8.2.2 / 4.8.2.3
— Pull-off tensile resistance	4.8.3	—	4.8.3.1 / 4.8.3.2 / 4.8.3.3
— Pull-off tensile-shear resistance	4.8.4	—	4.8.4.1 / 4.8.4.2 / 4.8.4.3
— Reduction factor	4.8.5	—	4.8.5.1 / 4.8.5.2 / 4.8.5.3
— Characteristic load resistance of a plate anchor	4.8.6	—	4.8.6.1 / 4.8.6.2 / 4.8.6.3
— Characteristic plate stiffness of a plate anchor	4.8.7	—	4.8.7.1 / 4.8.7.2 / 4.8.7.3
— Fixing strength of anchored rails	4.8.8	—	4.8.8.1 / 4.8.8.2 / 4.8.8.3
— Fixing strength of collar anchor	4.8.9	—	4.8.9.1 / 4.8.9.2 / 4.8.9.3
Airborne sound insulation, dealt with			
— Dynamic stiffness of thermal insulation	4.9.2	—	4.9.2.1 / all / 4.9.2.2
— Airflow resistivity of thermal insulation	4.9.3	—	4.9.3.1 / 4.9.3.2 / 4.9.3.3
— Weight of rendering system	4.9.4	—	4.9.4.1 / all / 4.9.4.2
Thermal resistance, dealt with			
— Thermal resistance of thermal insulation	4.10.2	—	4.10.2.1 / all / 4.10.2.2
— Point thermal transmittance of anchor	4.10.3	—	4.10.3.1 / 4.10.3.2 / 4.10.3.3
— *Δu-value* of profiles and rails	4.10.4	—	4.10.4.1 / 4.10.4.2 / 4.10.4.3
— *Δu-value* of anchored metal mesh	4.10.5	—	4.10.5.1 / 4.10.5.2 / 4.10.5.3

[a] For definition of the ETICS kits, see 1 and 3.1.1.5, including the limitations further specified in Annex A.

[b] References to clauses indicating: the applicable assessment method / for which ETICS kits the characteristic applies / expression of results.

ZA.2 System of assessment and verification of constancy of performance (AVCP)

The AVCP system of external thermal insulation composite kits with a rendering system (ETICS kits), indicated in Table ZA.1, can be found in the following EC legal acts adopted by the EC: Commission decision 97/556/EC of 1997-07-14 (see OJEU L229 of 1997-08-20), as amended by Commission decision 2001/596/EC of 2001-01-08 (see OJEU L209 of 2001-08-02) and by Commission decision 2011/14/EC of 2011-01-13 (see OJEU L10 of 2011-01-14).

ZA.3 Assignment of AVCP tasks

The AVCP systems of external thermal insulation composite kits with rendering systems (ETICS kits), as provided in Table ZA.1, are defined in Table ZA.2, resulting from application of the clauses of this European Standard, as indicated therein. The content of the tasks assigned to the notified body shall be limited to those essential characteristics as provided for, if any, in the relevant standardization request and to those that the manufacturer intends to declare their performance.

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 kits with a rendering system (ETICS kits) 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	

Bibliography

EN 13499:2003, *Thermal insulation products for buildings - External thermal insulation composite systems (ETICS) based on expanded polystyrene - Specification*

EN 13500:2003, *Thermal insulation products for buildings - External thermal insulation composite systems (ETICS) based on mineral wool - Specification*

EN 16724:2015, *Thermal insulation products for building applications - Instructions for mounting and fixing for determination of the reaction to fire testing of external thermal Insulation composite systems (ETICS)*

EN 1990:2002[2], *Eurocode - Basis of structural design*

[2] As impacted by EN 1990:2002/A1:2005.