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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)

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National foreword

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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)

Produits isolants thermiques pour le bâtiment - Instructions de montage et de fixation pour l'essai de réaction au feu des systèmes composites d'isolation thermique par l'extérieur (ITE)

Wärmedämmstoffe für Gebäude - Einbau- und Befestigungsbedingungen für die Prüfung des Brandverhaltens von außenseitigen Wärmedämm-Verbundsystemen (WDVS)

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European foreword

This document (EN 16724:2015) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by June 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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1 Scope

This European Standard specifies instructions for mounting and fixing for reaction to fire testing for External Thermal Insulation Composite Systems (ETICS) and gives rules for the field of application of test results.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

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

EN 15725, *Extended application reports on the fire performance of construction products and building elements*

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

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

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

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

3 Terms and definitions

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

3.1
gross heat of combustion
Q_{PCS}
heat of combustion of a substance when the combustion is complete and any produced water is entirely condensed under specified conditions

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

3.2
adhesive
component used for bonding the thermal insulation product to the substrate

3.3
anchors for thermal insulation products
fixing device consisting of a plate for fixing the thermal insulation product and if appropriate also the reinforced base coat, a sleeve which passes through the thermal insulation product and a part which is embedded or otherwise affixed to the substrate

3.4
anchors for profiles and rails
device for fixing the profiles or rails to the substrate

3.5
ancillary material
any supplementary component used in addition to the kit, which shall be used according to system holders application rules

Note 1 to entry: Ancillary materials are used e.g. to form joints or to achieve continuity or to give specific protection (mastics, joint-covers, corner stripes, corner profiles, base profiles, fire barriers etc.)

3.6
base coat
component applied directly by rendering on to the thermal insulation product

3.7
component
group of factory-made products fulfilling the same functions as a part of the design ETICS

3.8
finishing coat
component applied to the reinforced base coat, possibly preceded by a key coat

3.9
glass fibre mesh as reinforcement
textile fabrics consisting of continuous glass filament yarn in both the warp and the weft directions embedded in the base coat

3.10
metal mesh as reinforcement
galvanized steel or stainless steel mesh fixed with anchors embedded in the reinforced base coat

3.11
mechanical fixing device
device for fixing assembled kits to the substrate

EXAMPLE Rails, anchors, profiles

3.12
substrate
part of the wall/test assembly to which the kit is fixed

3.13
substantial components
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 13501-1:2007+A1:2009, 3.1.5]

3.14
non-substantial components
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 13501-1:2007+A1:2009, 3.1.6]

3.15
organic content
total amount of organic substances as part of a component or a product related to the mass in cured and dried conditions

Note 1 to entry: Will be declared by the system holder according to the formulation of the product in question and will be determined by calculation. It is given in percentage by mass in cured and dried condition.

3.16
worst case
configuration of specified ETICS components for test purposes that leads to the most discriminating class or level of a certain characteristic which leads to results valid for a group of configurations with assumed equal or better performance

Note 1 to entry: Characteristics can be e.g. impact resistance, reaction to fire, etc.

4 Principle

The reaction to fire classification (Euro classes) shall be determined in accordance with EN 13501-1, respecting the test conditions of the ETICS laid down in this standard.

In order to evaluate the reaction to fire all kits of the design ETIC system as well as the individual components shall be considered. Test results may be also valid for the assessment of the reaction to fire of further design ETICS. Rules are given below.

NOTE 1 A European reference fire scenario has not been laid down for facades. In some Member States, the classification of ETICS according to EN 13501–1 might not be sufficient for the use on facades. An additional assessment of ETICS according to national provisions (e.g. on the basis of large scale tests) might be necessary to comply with Member State regulations, until the existing European classification system has been completed.

NOTE 2 In some Member States the requirements might exist to demonstrate the behaviour of products with respect to continuous glowing combustion in the case of fire. Additional national assessments e.g. on the basis of national procedures to demonstrate this behaviour might be required until a European harmonized procedure will be available.

5 Instructions for mounting and fixing, field of application

5.1 General

This clause gives instructions for mounting and fixing for reaction to fire testing of a kit and its single components.

This clause includes the field of application of the test results of the kits as well as of its single components.

Base coats shall be grouped according to the binder type into inorganic (cement-calcium hydroxide, alkali silicate, etc.) and organic (silicon resin, synthetic resin, etc.) coats. Finishing coats shall be grouped in the same way.

For each group of base coats and finishing coats the product with the highest organic content shall be tested in combination with the adhesive having the highest organic content. If there are only differences in the organic content but no difference in the organic component itself, the product with the highest organic content shall be tested.

The test results are valid also for adhesives, base coats and finishing coats with equal or lower organic content.

If adhesives, base coats or finishing coats include flame retardants, those components with the lowest amount of flame retardant shall be tested additionally.

The key coat and the decorative coat may be neglected if the layer thickness of each coat is less than 200 µm and the organic content is less than 5 %.

NOTE The layer thickness may be calculated by the coverage.

Key coat and decorative coat shall be considered for testing unless it can be neglected according to the rules mentioned in the paragraph before. The key coat and the decorative coat with the highest PCS-value (according to EN ISO 1716) shall be used for preparing the specimens.

5.2 Testing according to EN ISO 1182 (Non-combustibility test)

5.2.1 General

This test method is relevant for the classes A1 and A2.

For classes A1 and A2 every substantial component (3.12) shall be tested.

Mechanical fixing devices and ancillary materials which are not continuous but discrete components of an ETICS shall not be considered for testing and classification regarding non-combustibility.

NOTE Base coats, finishing coats and adhesives in accordance with the provisions of EC decision 96/603/EC (amended by decisions 2000/605/EC and 2003/424/EC) are considered to satisfy the requirements for performance class A1 without the need for testing.

5.2.2 Base coat and finishing coats

The reaction to fire behaviour of base coats and finishing coats not falling under EC decision 96/603/EC (amended by decisions 2000/605/EC and 2003/424/EC) shall be tested by using the product with the highest amount of organic content. The test result is then also valid for all products with lower organic content.

5.2.3 Reinforcement

Each product identified as a substantial component shall be tested. Products falling under EC decision 96/603/EC (amended by decisions 2000/605/EC and 2003/424/EC) need not to be tested.

5.2.4 Thermal insulation products

The reaction to fire classification of each thermal insulation product shall be declared according to the respective sub clause on reaction to fire of the product as placed on the market of the relevant product standard or other harmonized technical specification.

5.2.5 Adhesives

If the adhesive is identical to the base coat, the adhesive does not need to be tested separately.

The reaction to fire behaviour of adhesives not falling under EC decision 96/603/EC (amended by decisions 2000/605/EC and 2003/424/EC) shall be tested by using the product with the highest amount of organic content. The test result is then also valid for all products with lower organic content.

5.2.6 Key coat and decorative coat

Each type of key coat and decorative coat identified as substantial component shall be tested. For exceptions see 5.1.

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

5.3.1 General

This test method is relevant for the classes A1 and A2.

This test method shall be performed with all components. For exceptions see 5.1.

Mechanical fixing devices and ancillary materials which are not continuous but discrete components of ETICS shall not be considered for testing and classification regarding heat of combustion (Q_{PCS}).

5.3.2 Base coat and finishing coat

Each base coat and each finishing coat shall be tested. It is not necessary to test a finishing coat with different grain sizes if the organic content is the same or lower than that of the tested coat.

5.3.3 Reinforcement

Each product shall be tested. Products falling under EC decision 96/603/EC (amended by decisions 2000/605/EC and 2003/424/EC) need not to be tested. In this case their PCS-value is considered to be zero.

5.3.4 Thermal insulation products

The reaction to fire classification of each thermal insulation product shall be declared according to the respective subclause on reaction to fire of the product as placed on the market of the relevant product standard or other harmonized technical specification.

5.3.5 Adhesives

All adhesives shall be tested. If the adhesive is identical to the base coat, the adhesive does not need to be tested separately.

5.3.6 Calculation of the highest gross heat of combustion of a kit $Q_{PCS, kit, decisive}$

The combination of products and layer thicknesses leading to the highest gross heat of combustion of a design ETICS has to be identified. For an example see Annex A.

NOTE The maximum/minimum thickness and the maximum gross heat of combustion of each component does not necessarily lead to this value.

5.3.7 Key coat and decorative coat

Each key coat and decorative coat shall be tested. If the binder type of some decorative coats is always the same, but there are differences in the organic content, only the decorative coat with the highest organic content shall be used for testing. The test result is also valid for other decorative coats with the same binder type but equal or lower organic content.

5.4 Testing according to EN 13823 (Single burning item – SBI)

5.4.1 General

This test method is relevant for ETICS which shall be classified into reaction to fire classes according to EN 13501-1 (A2, B, C or D, or in some cases class A1).

5.4.2 Test specimen

By this test procedure a specific kit shall be tested. The kit shall be fixed to a substrate representing the one to which the kits of a design ETICS are intended to be fixed in the end use application (reference is made to EN 13238). The fixing shall be made using either an adhesive used in the end use application or, in case of purely mechanical fixing, by using the mechanical fixing devices used in the end use application. When only adhesives are used for preparing the test specimen, the test result is valid also for the use of mechanical fixings. In case a purely mechanical fixing with plastic anchors is used, the test result is also valid for the use of metallic anchors.

If the thickness of the test specimen, including a standard substrate according to EN 13238 is 180 mm to 200 mm, the test result is also valid for greater thicknesses of the insulation product that has been tested.

The test specimen consists of a corner construction using the kit. The components shall be fixed to a substrate representing the end-use substrate (in accordance with EN 13238). All edges shall be covered with the rendering system except the bottom edge and the top of the specimen (see Figure 1). After preparation, the test specimens shall be conditioned according to EN 13238.

The test specimen shall be prepared with the reinforcement that is intended to be used in end use application.

At the long wing of the SBI specimen a vertical joint of the reinforcement shall be installed. At a distance of 150 mm to 250 mm from the inner corner the two layers of reinforcement shall overlap (see Figure 1).

NOTE An aluminium foil is sometimes used as protection on the bottom edge of the test specimen.

5.4.3 Base coat and finishing coat

When testing base coats or finishing coats the following rules shall apply:

a) Base coats and the finishing coats shall be grouped according to the binder type in accordance with the principles specified in 5.1 and below.

b) If the organic content of both the base coat and the finishing coat is ≤ 5 %, the lowest declared layer thicknesses shall be used for preparing all three test specimens.

   If the worst case is known on the basis of existing test results, only this configuration needs to be tested.

c) For the base coats and/or the finishing coats having an organic content higher than 5 % the worst case has to be determined out of two configurations. If the worst case can be extrapolated on the basis of historical data, only this configuration needs to be tested. Otherwise two configurations have to be prepared as follows:

   1) one test specimen with lowest declared thicknesses of the layer of the base coat and finishing coat

   2) one test specimen with highest declared thicknesses of the layer of the base coat and finishing coat

   Both test specimens have to be tested in order to identify the worst case. After that two further tests shall be performed with the worst case configuration.

d) The test result is also valid for any finishing coat and/or base coat with a lower organic content than the tested base coat and finishing coat.

5.4.4 Reinforcement

The product with the lowest weight per unit area shall be used for preparing the test specimens.

The test results with an overlap of the reinforcement of 10 cm are valid for overlapping of 10 cm or more.

The test results are also valid for all reinforcements of the same material with equal or higher weights per unit areas than that of the tested product.

5.4.5 Thermal insulation products

The reaction to fire classification of each thermal insulation product shall be declared according to the respective sub clause on reaction to fire of the product as placed on the market of the relevant product standard or other harmonized technical specification.

For kits using adhesives with an organic content of more than 15 % by mass in dried condition, the thermal insulation product with the lowest thickness shall be used for additional tests.

When using a combustible substrate (class B or lower) also the lowest thickness and lowest density of the thermal insulation product shall be tested. The test result is also valid for all thicknesses and all densities of the thermal insulation product between those evaluated in the tests (for exceptions see 5.4.2). If the thickness of the test specimen, including a standard substrate is 180 mm to 200 mm, the test result is also valid for greater thicknesses of the thermal insulation product that has been tested.

The following rules apply depending on the material of the thermal insulation product:

a) Mineral Wool, Cellular Glass

   1) 1) For ETICS with thermal insulation products with reaction to fire class A1 or A2 the thermal insulation product of the same material and with the highest thickness and the highest organic content (expressed in kg/m2) shall be used for preparing the test specimen. The reaction to fire class A1 or A2 of the insulation product shall be proven separately.

   2) 2) A test result of a kit with an A1 or A2 classified thermal insulation product, mounted on an A1 or A2 substrate, is valid for thermal insulation products of the same material with the same or better reaction to fire classification. They are also valid if thicknesses are equal or lower than the thickness of the thermal insulation product tested and if the total organic content is not more than 10 % higher than that used in the test. Concerning the field of application the rules given in EN 13238 apply for any change in substrates.

b) EPS, XPS, Corc, Wood Wool

   1) For ETICS with thermal insulation products with reaction to fire class B and lower, each material of thermal insulation products shall be tested within the system. For each material of thermal insulation products the thermal insulation product with the highest thickness and highest density shall be used for preparing the test specimen. The reaction to fire class of the thermal insulation products shall be proven separately e.g. by using the classification report.

   2) A test result of a kit with a B or lower classified thermal insulation product is valid for thermal insulation products of the same material, mounted on an A1 or A2-s1, d0 substrate, with the same or better reaction to fire classification, with thicknesses equal or lower than the thickness of the thermal insulation product used in the test and with densities not more than 15 % higher than those used in the test. Concerning the field of application the rules given in EN 13238 apply for any change in substrates.

c) PU, PF, Wood fibre

For kits with one of these thermal insulation materials, each product shall be tested considering the lowest and highest thickness.

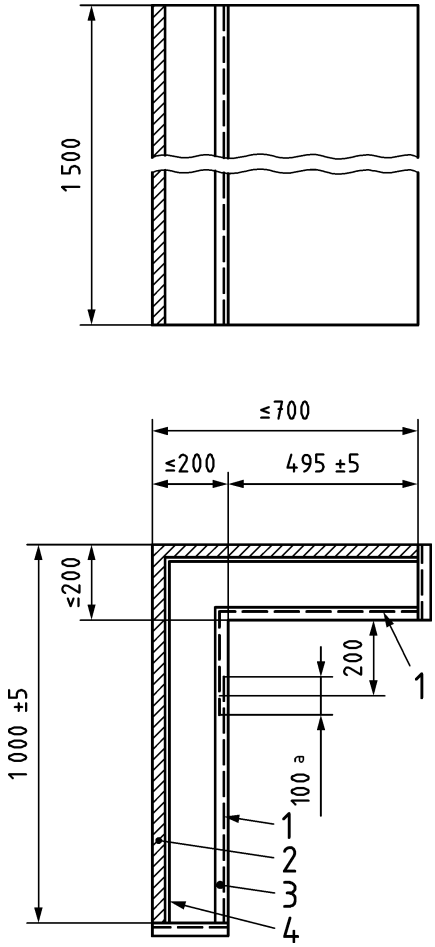
The worst test result is applicable for all thicknesses of the product. For exceptions see 5.4.2.

5.4.6 Adhesives

For adhesives with an organic content equal to or less than 15 % (related to the mass in dried condition), the adhesive with the highest amount of organic content applied according to the manufacturer's instructionsshall be used for preparing the test specimens. The test results are valid for adhesives with equal or less organic content and equal or less coverage.

For adhesives with an organic content of more than 15 % (related to the mass in dried condition) each type of adhesive with a different composition shall be used for preparing the specimens by selecting the product with the highest amount of organic content and with the highest layer thickness. The test result is valid for adhesives of the same type, with equal or less organic content and equal or less mass per area coverage.

Dimensions in millimetres



Key

1 reinforcement
2 substrate
3 rendering system (base coat, key coat, finishing coat, decorative coat if necessary)
4 adhesive
a overlapping

Figure 1 — Schematic drawing of the test specimen in the SBI-test according to EN 13823

5.4.7 Key coat and decorative coat

Test results for kits with a key coat and/or a decorative coat are also valid for kits with other key coats and/or decorative coats with lower organic content.

5.5 Testing according to EN ISO 11925-2 (Small flame test)

5.5.1 General

This test method is relevant for reaction to fire classes B, C, D, E and F.

5.5.2 Test specimen

For adhesives with an organic content equal to or less than 15 % (related to the mass in dried condition), the test specimen is a whole kit without substrate. For adhesives with an organic content greater than 15 % (related to the mass in dried condition), the test specimen is a whole kit with substrate.

The maximum thickness of the test specimen is 60 mm. In cases where the thickness of the kit is higher than 60 mm, the thickness of the thermal insulation product shall be reduced to perform the tests. In addition the lowest thickness of the entire kit shall be tested. If both tests are passed, the test result is valid for all other thicknesses.

The test specimen shall be tested with uncovered edges. Results from tests with uncovered edges are also valid for systems used with covered edges in end-use application.

The tests are performed with surface flaming of the front side and edge flaming of the test specimen turned by 90° according to the rules of EN ISO 11925-2.

5.5.3 Base coat and finishing coats

Base coats and finishing coats to be used for preparing the test specimen, taking into account of the permissible configuration(s) foreseen by the system holder, shall be determined in accordance with the principles specified in 5.1 and below.

If the worst case is known on the basis of existing test results, only this configuration shall be tested.

The test specimens are prepared with the lowest declared thickness of the layer of the base coat and finishing coat. If the organic content of either the base coat or the finishing coat is higher than 5 %, the highest thickness shall be used additionally for preparing the test specimens.

If the class achieved with a base coat and a finishing coat with organic binders is also accepted for ETICS with base coats and finishing coats with inorganic binders, no tests of specimens with base coat and finishing coat with inorganic binders are necessary.

5.5.4 Reinforcement

The product with the lowest weight per unit area shall be used for preparing the test specimens.

The test results are also valid for all reinforcements of the same material with equal or higher weights per unit area than that of the tested product.

5.5.5 Thermal insulation products

The reaction to fire classification of each thermal insulation product shall be declared according to the respective sub clause on reaction to fire of the product as placed on the market of the relevant product standard or other harmonized technical specification.

The following rules apply depending on the material of the thermal insulation product:

a) Mineral Wool, Cellular Glass

1) For ETICS with thermal insulation products with reaction to fire class A1 or A2 the thermal insulation product with the highest organic content (expressed in kg/m3) shall be used for preparing the test specimen. The reaction to fire classes A1 or A2 of the thermal insulation product shall be proven separately.

2) A test result of a kit with a A1 or A2 classified thermal insulation product, mounted on a A1 or A2 substrate, is valid for thermal insulation products of the same material with the same or better reaction to fire classification and a total organic content of not more than 10 % higher than that used in the test.

b) EPS, XPS, Corc, Wood Wool

1) For ETICS with thermal insulation products with reaction to fire class B and lower, each material of thermal insulation products shall be tested within the system. For each material of thermal insulation products the insulation product with the highest thickness and highest density shall be used for preparing the test specimen. The reaction to fire class of the thermal insulation products shall be proven separately e.g. by using the classification report.

2) A test result of a kit with a B or lower classified thermal insulation product is valid for thermal insulation products of the same material, mounted on an A1 or A2-s1, d0 substrate, with the same or better reaction to fire classification with densities not more than 15 % higher than those used in the test. Concerning the field of application the rules given in EN 13238 apply for any change in substrates.

c) PU, PF, Wood fibre

For kits with one of these thermal insulation materials, each product shall be tested considering the lowest and highest thickness.

The worst test result is applicable for all thicknesses of the product. For exceptions see 5.4.2.

5.5.6 Adhesives

For adhesives with an organic content equal to or less than 15 % (related to the mass in dried condition) there is no need to take into account such adhesives for preparing and testing specimens of ETICS according to this standard. The test results are valid for adhesives with equal or less organic content and equal or less coverage if the organic content is equal to or less than 15 %.

For adhesives with an organic content of more than 15 % (related to the mass in dried condition) a test series shall be carried out consisting of a complete set of six additional tests on specimens turned at 90° on their vertical axis with edge exposure of the adhesive layer. The specimens shall consist of the substrate, the adhesive and the insulation product. For each type of adhesive the product with the highest organic content and with the highest thickness shall be selected for testing.

The test results are valid for the respective type of adhesive with equal or less organic content and equal or less coverage.

NOTE It can be assumed that adhesives with an organic content of equal or less than 15 % fulfil the requirements of the classes B to E without testing according to EN ISO 11925-2.

5.5.7 Key coat and decorative coat

The key coat and the decorative coat to be used for preparing the specimens, taking into account the combination(s) identified by the system holder, shall be determined acc. to the principles given in 5.1 and using the highest coverage per area.

6 Test results and classification report

Test results and classification shall be reported according to EN 13501-1.

Annex A
(informative)

Calculation of $Q_{PCS,\ kit,\ decisive}$ (formulae and example)

A.1 General

The combination of products and layer thicknesses leading to the highest gross heat of combustion of a design ETICS has to be identified (worst case). The presented calculation is only an example.

Formula:

$$Q_{PCS,kit} = \frac{\sum_{i=1}^{n}\left(m_i \times Q_{PCS,i}\right)}{\sum\left(m_i\right)}$$

Where

$Q_{PCS,i}$ is the the gross-heat of combustion of a product given in MJ/kg;

m_i is the dry mass per unit area of a product (see Table A.1) in given in kg/m^2 (mass in dried condition as in end use application).

EXAMPLE Calculation of $Q_{PCS,\ kit,\ decisive}$ (worst-case scenario = max. Q_{PCS})

Table A.1 — Data of the ETICS-components

Product *i*	**Mass per unit area,** *m* kg/m^2	$Q_{PCS,i}$ MJ/kg	$m_i \times Q_{PCS,i}$ MJ/m^2	**Mass per unit area,** $m_{i,decisive}$ kg/m^2	$Q_{PCS,i,decisive}$ MJ/m^2
Adhesive 1	3,443	0,654	2,252	3,443	2,252
Adhesive 2	3,925	0,208	0,816		
Adhesive 3	2,698	0,811	2,188		
MW-Insulation	27,726	1,430	39,648	27,726	39,648
Base coat 1	8,778	0,208	1,826		
Base coat 2	5,298	0,811	4,297	5,298	4,297
Glass fibre mesh 1	0,180	7,834	1,410	0,180	1,410
Glass fibre mesh 2	0,165	7,925	1,308		
Key coat	0,210	4,519	0,949	0,210	0,949
Finishing coat 1	2,445	1,594	3,897		
Finishing coat 2	2,284	0	0		
Finishing coat 3	3,720	1,607	5,978	3,720	5,978
Finishing coat 4	2,986	0,494	1,475		
			∑	40,577	54,534

A.2 Conversion

$$Q_{\text{PCS, kit, decisive}} = \frac{\sum Q_{\text{PCS, i, desisive}} \left[\frac{\text{MJ}}{\text{m}^2}\right]}{\sum m_{\text{i, decisive}} \left[\frac{\text{kg}}{\text{m}^2}\right]}$$

$$Q_{\text{PCS, kit, decisive}} = \frac{54{,}534 \frac{\text{MJ}}{\text{m}^2}}{40{,}557 \frac{\text{kg}}{\text{m}^2}}$$

$$Q_{\text{PCS, kit, decisive}} = 1{,}344\ \text{MJ/kg} \quad < 3{,}0\ \text{MJ/kg}$$

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