



TECHNICAL REPORT

Determination of fire-related  
characteristics of external wall cladding  
in EADs

TR 078

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## **1 INTRODUCTION**

This document has been developed by EOTA PT4 with the aim of providing guidance for the handling of the determination of fire-related characteristic of external wall claddings in EADs.

It deals with model clauses for EADs, provisions for specific aspects to be considered within the necessary fire tests as well as with rules for the assessment and application of test results. In particular, the provisions of Annex B of this guidance document can be seen as 'state of the art' when testing boards/panels of cladding kits or complete cladding kits in the relevant reaction to fire tests.

Investigations after the 'Grenfell disaster 2017' in London had shown the importance of such provisions for appropriate mounting and fixing conditions to simulate the intended end-use of the cladding kits as far as possible.

## **2 MODEL CLAUSES FOR EAD**

### **2.1 Reaction to fire**

Reaction to fire of the whole kit shall be assessed by considering the reaction to fire of the components (cladding element, cladding fixings, adhesive system components, subframe components, thermal insulation products, etc.), in order to be classified according to Commission Delegated Regulation (EU) 2016/364.

When relevant (e.g. asymmetrically composed cladding elements, or relevant surfaces of the kit components of the back side), reaction to fire of the rear side of the cladding element shall also be assessed in order to be classified according to Commission Delegated Regulation (EU) 2016/364.

For the assessment of reaction to fire of the entire kit, one of the following options shall apply:

- a) The whole kit shall be assessed based on the worst class of any component obtained according to a CWFT Decisions or according to the relevant tests method(s) according to EN 13501-1.
- b) If option (a) leads to a classification of the kit which is too onerous, or if classification for one or several components are missing, then the kit shall be tested, using the test method(s) according to EN 13501-1 relevant for the corresponding reaction to fire class, in order to be classified according to the Commission Delegated Regulation (EU) 2016/364.

Criteria indicated in Annex A shall be taken into account. Associated mounting and fixing rules for the SBI test as well as for tests according to EN ISO 11925-2 shall be in accordance with Annex B.

Components fulfilling the conditions as stated in Annex D can be considered as small components without the need for testing and assessment of their reaction to fire performance, except where it is explicitly prescribed in Annexes A and B.

### **2.2 Façade fire performance**

If the manufacturer intends to declare the façade fire performance of the product, in absence of a European assessment approach, the ETA shall state the results of the product assessment(s) according to the assessment method(s) required by the regulatory provisions of those countries, in which the manufacturer intends to make the product available on the market, according to the table given in Annex E.

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**2.3 Propensity to undergo continuous smouldering**

This characteristic is only required in some Member States and applicable for kits partially or completely consisting of components made of mineral wool (MW), wood wool (WW), cork, wood-based boards/panels, wood fibres (WF), any other vegetal or animal fibres or phenolic foam.

The assessment of the kit regarding propensity to undergo continuous smouldering is carried out by means of the assessment of the propensity to undergo continuous smouldering of the concerned kit component(s). Propensity to undergo continuous smouldering of concerned kit component(s) shall be tested and assessed according to EN 16733.

*Note: When available, performance included in the DoP regarding individual component(s) should be used as far as possible to avoid retesting or reassessment.*

The conditions and parameters which shall be taken into account within the tests as well as the extended application rules for the test results are specified in Annex C.

In accordance with EN 16733, clause 11, the ETA shall specify the following information:

<b>Performance according to EN 16733, clause 11, of the kit component as given in its own DoP or after testing</b>	<b>Description of the performance of the cladding kit regarding the characteristic Propensity to undergo continuous smouldering to be stated in the ETA</b>
The thermal insulation product does not show propensity to undergo continuous smouldering (NoS).	The cladding kit does not show propensity to undergo continuous smouldering.
The thermal insulation product shows propensity to undergo continuous smouldering (S).	The cladding kit shows propensity to undergo continuous smouldering.
Assessment of the propensity for continuous smouldering combustion is not possible (ANP).	Assessment of the propensity to undergo continuous smouldering is not possible

## ANNEX A. REACTION TO FIRE

### A.1 General

#### A.1.1 Principle

The determination of reaction to fire of the kits is based on testing of “the worst case” - the most critical configuration in sense of reaction to fire. According to the rules described further in the text, the classification obtained on the most critical configuration of the kit components is valid for all configurations of kit components having better performance in sense of reaction to fire.

For testing of the cladding kit, the following principles shall apply regarding the selection of the relevant kit components:

- The kit components material with the highest amount of organic content<sup>1</sup> (if the only differences lay with the amount of organic content but not in the organic component itself) or the highest PCS value (according to EN ISO 1716) shall be tested.
- The influences of different colours can be considered by performing tests on a light, on a dark and on a colour in the middle of the range (e.g. CIELAB 40.51, 59.28, 47.98; RGB 184, 29, 19; Munsell ref. 7.5R 4/13; RAL 3020; or BS04E56).
- In addition, each kit components material selected for testing according to the previous point shall have the lowest amount of the same type of flame retardants.

Components of a kit which are classified A1 without testing according to Decision 96/603/EC (as amended) do not need to be tested. This provision is only relevant for tests where each component is tested separately.

#### A.1.2 Physical properties influencing the reaction to fire behaviour

- Type of cladding element (e.g. composition, thickness, density, weight per unit area).
- When applicable (e.g. cladding elements made of resin mortar, fibre-cement, concrete, cement bonded particle, etc.), the organic content of the binder and of any organic additive; can be checked by providing the formulation of the component, by performing suitable characterization tests or by determining the glow loss (Loss on ignition or ash content) or net calorific value.
- Type and amount of flame retardant.
- (for glued cladding kits) Type and nature of the adhesive system components, the subframe components and the supplementary mechanical cladding fixings.
- (for mechanically fixed cladding kits) Type and nature of cladding fixings and subframe components.

*Note: Fire breaks and cavity barriers are important for the behaviour of the whole facade cladding system and cannot be assessed on the basis of SBI-testing. The influence can only be observed during a large-scale test. Therefore, breaks are not included in the mounting and fixing rules for the SBI-test.*

Although the rest of this annex applies the “worst case scenario” for deciding what to test, it is accepted that, where the manufacturer wants to assess a range of cladding kit configurations having different overall classifications, it may group these together into a number of different sub-groups (e.g. each sub-group corresponding to a different overall classification) with the ‘worst case scenario’ being identified for each sub-group.

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<sup>1</sup> When relevant, the manufacturer is responsible for the information on organic content per unit area. If the information is not available, the PCS value shall be tested to decide about the worst case.

## **A.2 Testing according to EN ISO 1182**

This test method is relevant for classes A1 and A2.

Using this test method, only the substantial components of the kit need to be tested. 'Substantial components' are defined by thickness ( $\geq 1$  mm) or mass per unit area ( $\geq 1$  kg/m<sup>2</sup>).

Parameters relevant indicated in section A.1.1. and A.1.2 shall apply.

## **A.3 Testing according to EN ISO 1716 (PCS value)**

This test method is relevant for classes A1 and A2.

This test method shall be performed to all components of the kit except for cases which are classified as A1 without testing.

Parameters relevant for this test method are: composition (when performing calculation of the PCS<sub>s</sub>-value, density or mass per unit area and thickness are relevant). Discrete and discontinuous mechanical fixings and ancillary materials which fulfil the conditions for small components according to Annex D do not need to be considered for testing and for the calculation of the PCS<sub>s</sub>.

It is not necessary to test a cladding element with different grain sizes if the organic content is the same as or lower than that of the tested cladding element.

## **A.4 Testing according to EN 13823 (SBI-test)**

This test method is relevant for classes A2, B, C and D (in some cases also for A1).

Mounting and fixing provisions for the SBI-test for cladding kits are indicated in Annex B.

Parameters which are relevant for this test method:

- Type of kit components (e.g. composition, dimensions, density, weight per unit area).
- Amount of organic content of the kit components.
- Amount of flame retardant, if any.
- Colour according to the principles as in A.1.1.

In principle, it is desirable to find the test specimen configuration that gives the worst case concerning the reaction to fire test results. In the test procedure according to EN 13823, values for the rate of heat release, total heat release, lateral flame spread, rate of smoke release, total smoke release and burning droplets are determined.

The test specimen shall be prepared with the kit components with the highest organic content or PCS<sub>s</sub>-value per unit area.

### **A.4.1 Direct application rules of test results**

See section B.3 of Annex B.

## **A.5 Testing according to EN ISO 11925-2**

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

Mounting and fixing provisions for the tests are indicated in Annex B.

Parameters which are relevant:

- Type of kit components (e.g. composition, dimensions, density, weight per unit area).
- Amount of organic content of the kit components.
- Amount of flame retardant, if any.
- Colour according to the principles as in A.1.1.

For cladding elements with covered edges, the specimens shall be prepared both with covered edges and edges without covering (cut edges).

The tests are performed with surface exposure of the front side, edge exposure and possibly edge exposure of multi-layered test specimen turned 90° on their vertical axis according to the rules of standard EN ISO 11925-2. Besides, the principles specified in section A.1 shall be applied.

### **A.5.1. Application of test results**

See section B.3 of Annex B.



## **ANNEX B. MOUNTING AND FIXING PROVISIONS FOR THE SBI TEST (EN 13823) AND SINGLE-FLAME SOURCE TEST (EN-ISO 11925-2)**

Considerations for cladding kits included in section A.4 of Annex A shall also be considered for SBI test.

The reaction to fire testing shall be given for the whole cladding system, in simulating its end-use conditions.

The testing standard EN 13823 gives a general description of the arrangement of the test specimen for SBI test, applicable to classes A2, B, C and D (in some cases also to A1).

This Annex describes specific provisions for cladding kits.

### **B.1 General information**

As a function of the use of the kit, the specimen shall be installed on a substrate in accordance with standard EN 13238:

- Calcium silicate or fibre-cement board or laminated gypsum board simulates a wall made of masonry or concrete.
- Non-fire-retardant treated particle board or plywood board simulate a frame wall made with an outer planking of wood or wood-based boards.
- Steel sheet simulates a frame wall made with an outer planking of metal sheets with a melting temperature range above at least 1000 °C, but no aluminium sheets.
- Aluminium sheet simulates a frame wall made with an outer planking of aluminium or aluminium alloy sheets with a melting temperature range above at least 500 °C.
- Additional substrates not covered by EN 13238 for specific uses. In such cases, test results only applicable for the tested configuration.

A necessary subframe should be formed by vertically directed beams or profiles made of non-fire-retardant treated timber (spruce recommended, saw-cut, density not less than 350 kg/m<sup>3</sup>), aluminium or steel.

A wooden subframe also covers metal subframes. Aluminium profiles only cover subframe made of aluminium or aluminium alloy with a melting temperature range above at least 500 °C. Steel profiles in the tests covers metal subframes with a melting range above at least 1000 °C.

All ancillary components which form part of the kit (e.g. breather membranes, thermal brake pads, gaskets, seals, adhesive strips or double sided tapes) shall be included in a representative manner in the test specimen.

An air space is always provided behind the cladding element in accordance with the manufacturer's instructions (minimum of 20 mm). The bottom and top edges of the specimen shall also remain opened.

For ventilated cladding systems, there shall be a gap of 10 mm between the bottom of the specimen and top level of U-profile of the SBI-test device, except in cases where air can flow into the air gap from the outer, lateral edges of the specimen wings (e. g. when using punctually positioned subframe devices) or in case of non-ventilated cladding kits.

For cladding kits without thermal insulation applied to the substrate (supporting wall), the minimum air gap depth as defined by the manufacturer and allowed by the subframe dimensions and geometry (but not less than 20 mm recommended) and a 40 mm air gap depth between rear side of the cladding and substrate) will be tested. First, an indicative test will be performed (1 sample out of 3 for the SBI test) for both air gap depths. The depth showing the worst results will be completed (additional 2 tests) in order to obtain the worst classification. If both indicative tests point to the same classification, any greater depth of the air gap than the tested minimum one could be classified based on this worst result, without additional testing. If the indicative tests point to different classifications, additional 2 tests could be done for the air gap depth that leads to the best classification. This air gap will obtain the best classification, but the rest of the range will

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remain with the worst classification, unless additional depths are tested in order to improve the results within the depth range.

For cladding kits with thermal insulation applied to the substrate (supporting wall), a minimum air gap depth as defined by the manufacturer and allowed by the subframe dimensions and geometry (but not less than 20 mm recommended) and a depth of 40 mm between rear side of the cladding and front surface of the insulation will be tested. First, an indicative test will be performed (1 sample out of 3 for the SBI test) for both air gap depths. The depth showing the worst results will be completed (additional 2 tests) in order to obtain the worst classification. If both indicative tests point to the same classification, any greater depth of the air gap than the tested minimum one could be classified based on this worst result, without additional testing. If the indicative tests point to different classifications, additional 2 tests could be done for the air gap depth that leads to the best classification. This air gap will obtain the best classification, but the rest of the range will remain with the worst classification, unless additional depths are tested in order to improve the results within the depth range.

If the kit includes the thermal insulation product, for insulation materials of class A1 or A2 as part of the kit a standard mineral wool insulation according to EN 13238, but with a thickness of 50 mm, shall be installed between subframe and substrate.

For other insulation materials, different conditions can be used for testing (e.g. maximum and/or minimum thicknesses, maximum and/or minimum density, unless proven otherwise). In absence of representative insulation materials, the test results will only be valid for those applications as tested.

Tests on specimen with a total thickness of at least 200 mm (maximum testable thickness according to EN 13823, including cladding, airgap, subframe, insulation and substrate) will be valid for cladding kit with higher thickness.

The cladding kit is fixed to the subframe. The cladding kit shall be installed with the cladding fixing density defined by the manufacturer as specified in the ETA.

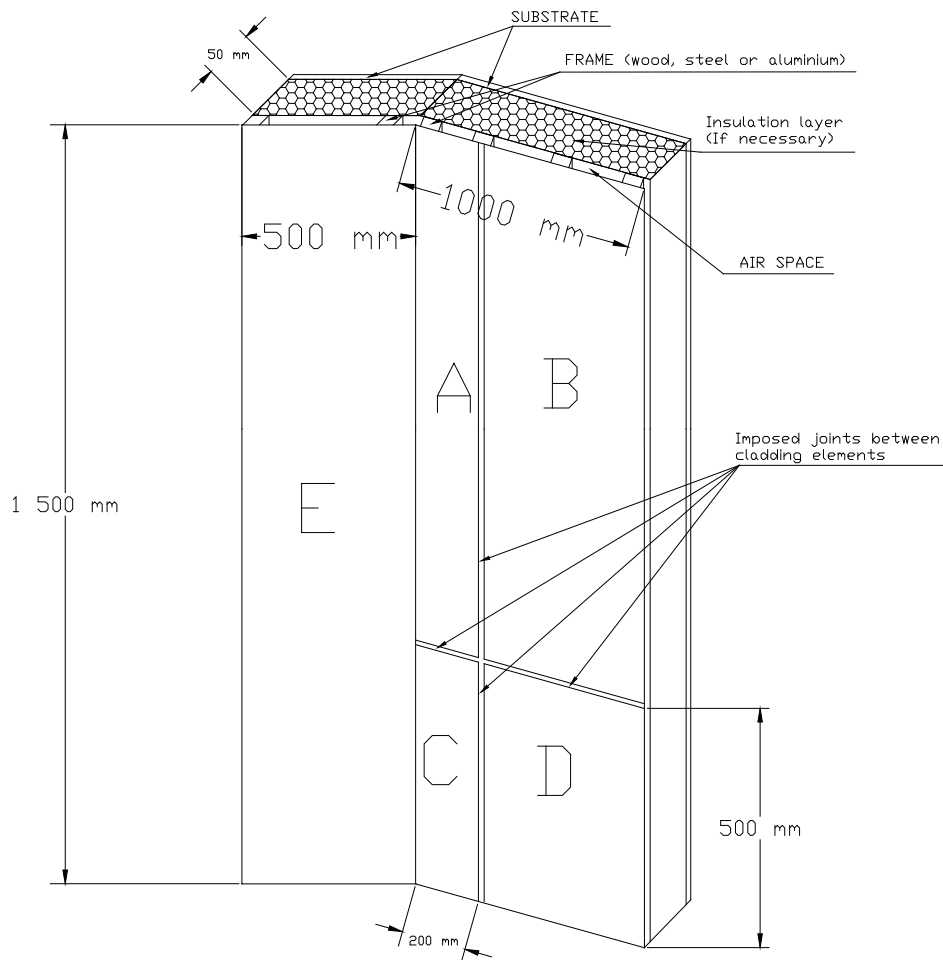
When the kit presents horizontal joints, it shall be tested with, at least, a horizontal joint in the long wing at a height of 500 mm from the bottom edge of the specimen to the centre axis of the joint and when the kit tested presents vertical joints, it shall be tested with, at least, a vertical joint in the long wing at a distance of 200 mm from the corner line to the centre axis of the joint, in accordance with the figure B.1. In the areas A, B, C, D and E, it is possible to have other vertical and/or horizontal joints between cladding elements.

For covering a range of different widths of open joints the test shall be conducted on specimens with the highest possible width of the open joints. If only butt joints are foreseen it is recommended to conduct the test with butt joints in the test assembly.

In cases where the cladding size would require more joints than described before, the minimum and maximum density of joints shall be tested. In the internal vertical angle, no profile shall be used and the cladding elements create a vertical closed joint. Cladding elements shall not be extended up to the substrate board in order to close the air cavity behind and provide additional protection. Air cavity shall be unobstructed.

When tested rear side cladding kit (in case of asymmetrically composed cladding products), the test shall involve a free-hanging arrangement with the flame impingement to the rear side in accordance with EN 13823 (test arrangement without open joints between the cladding elements and without insulation layer on A1 or A2 substrate, so that the distance between the backing board and the cladding elements amounts to at least 80 mm – cf. figure B.3.7).

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**Figure B.1:** Example of SBI test installation.

*Note: The two wings are perpendicular.*

## B.2 Specific information

The kits are tested in a limited number of configurations to cover the influence of the parameters indicated in section A.4 of Annex A.

The cladding elements can be cut to size as shown in figures B.2 and B.3.

The subframe (or the cladding fixings, when the cladding element is fixed directly to the substrate) shall be fixed to the substrate through fixings adapted to the type and material of the substrate.

## B.3 Extension of results

The test result (classification) shall remain valid, without test:

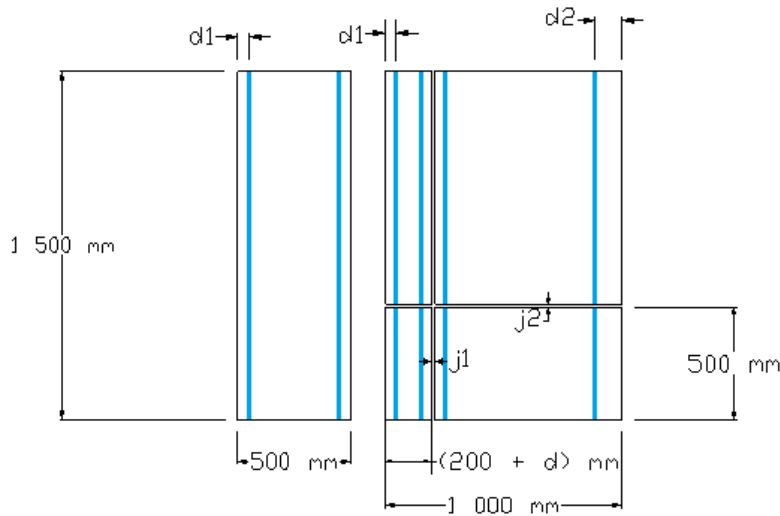
- For greater dimensions (height and width) of cladding elements.
- For the same adhesive with equal -or lower applied quantity per unit are (glued cladding kits).
- For other metal mechanical fixings with the same or higher number of cladding fixings (mechanically fixed cladding kits), if metal fixings were used for testing.

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- For the same type of plastic fixings as well as for metal fixings, each with the same or higher number of cladding fixings (mechanically fixed cladding kits), if plastic fixings were used for testing.
- For the same type of cladding element used in applications with open vertical joint  $\leq j_1$  (tested value) and open horizontal joint  $\leq j_2$  (tested value) (see  $j_1$  and  $j_2$  in figures B.2.1 to B.3.5).
- For the same density of joints or the range between the minimum and maximum density as tested
- For other higher depth of air gap.
- When the test is carried out without insulation layer, the test result is only applicable to end-use applications without insulation layers.
- When the test is carried out with mineral wool insulation the test result shall be valid for:
  - all other greater thickness of mineral wool insulation layer with the same or higher density and the same or better reaction to fire classification;
  - the same type of panel used without insulation, if the substrate chosen according to EN 13238 is made of panel with Euro-class A1 or A2 (e.g. fibre-cement panel).
- The results of reaction to fire tests, where a combustible insulation material was used, are also valid for end-use applications of the tested product without insulation on solid mineral substrates of class A1 or A2-s1,d0 like masonry or concrete.
- The test result of a test with non-fire-retardant-treated timber subframe shall be valid, without test, for the same type of cladding element used with aluminium or steel subframe. The test result of a test with an aluminium frame shall be valid, without test, for the same type of cladding element used with aluminium or steel frame. Result of tests with a steel frame are only valid for the same type of cladding elements used with metal frames with a melting point higher than 1000 °C.
- If the classification is the same, the test result of the lowest and highest thickness of the cladding element shall be valid, without test, for all the thickness in between. In other case the worst classification applies to the other thicknesses of the range.
- The result from a test with open joints shall be valid, without test, for the same type of cladding element used in applications with butt joints or joints closed by steel or aluminium profiles.
- The test results are valid for cladding elements with the same composition and same assembly (*or alternatively*: all product types of the same defined product family) than used in the tests. In addition, the provisions of A.1.1. regarding organic content and content of flame retardants are to be considered:
- The test results are valid for the same density / weight per unit area (if only one value was tested) or the range between those values evaluated in the tests.
- The test results are valid for the same organic coating/finish or any other coatings/finishes with the same or lower PCS value (related to the mass in dried condition), each with the same or lower applied quantity (in dried condition) than tested.
- The test results are valid for the same inorganic coating or facing and other inorganic coatings / facings with the same or higher applied quantity per unit area.
- The test results are valid for the same colour of cladding elements than tested or for the entire range of colours, if colours as prescribed in clause A.1.1. were tested.
- The test results are valid for the same or greater size of overlapping of cladding elements than tested.

*Note: other aspects indicated in the relevant hEN standards or EADs for the cladding element material should be also taken into account.*

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**Legend:**

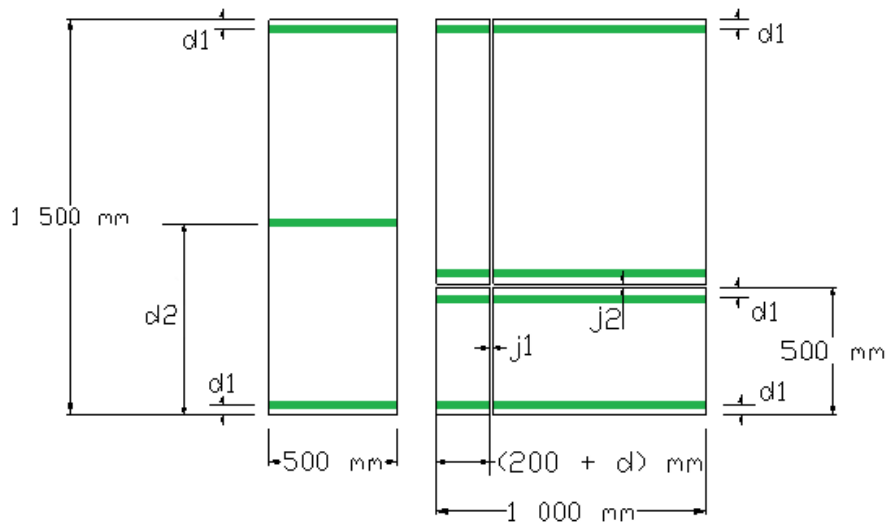
j1 = width of vertical joint

j2 = width of horizontal joint

d1, d2 = distance of the axis of subframe profiles to the edges of the cladding element.

d = short wing cladding element thickness.

**Figure B.2.1:** Example of installation for glued cladding assembled systems with vertical profiles.



**Legend:**

j1 = width of vertical joint

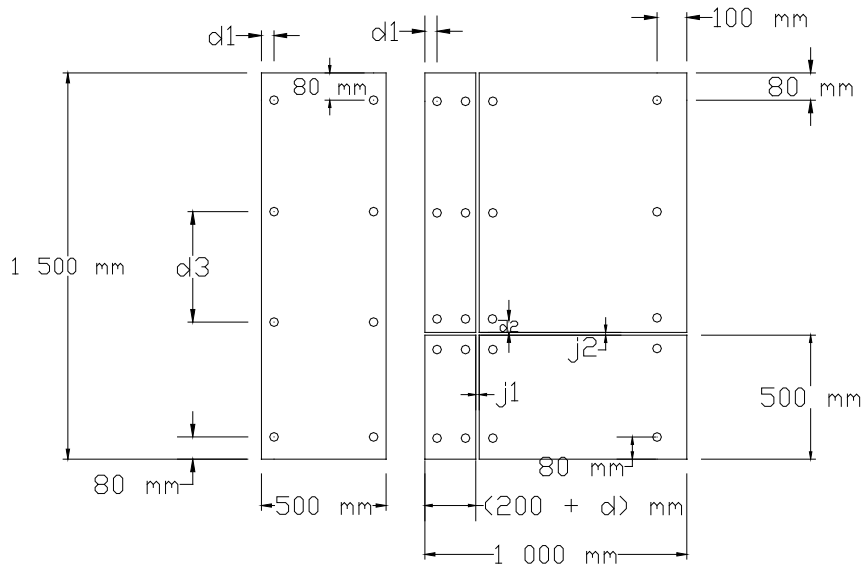
j2 = width of horizontal joint

d1, d2 = distance of the axis of subframe profiles to the edges of the cladding element.

d = short wing cladding element thickness.

**Figure B.2.2:** Example of installation for glued cladding assembled systems with horizontal profiles.

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**Legend:**

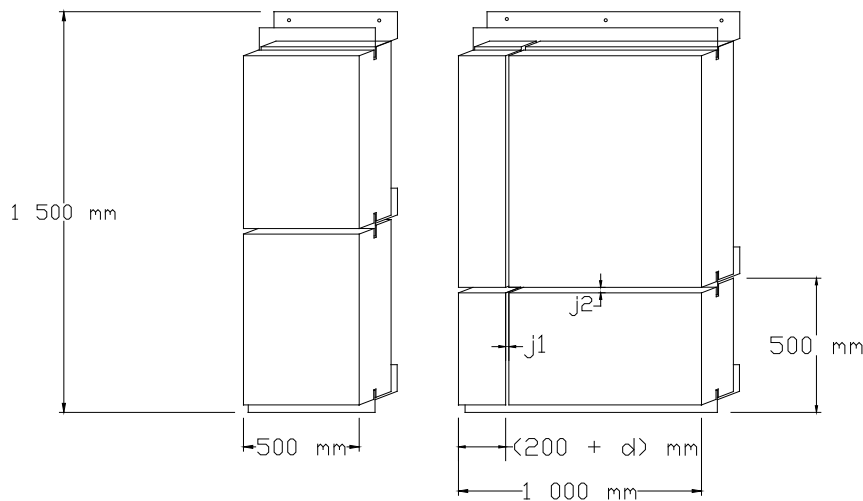
j1 = width of vertical joint

j2 = width of horizontal joint

d1, d2 = distance of the axis of cladding fixing to the edges of the cladding element.

d = short wing cladding element thickness.

**Figure B.3.1:** Example of installation for mechanically fixed kits family A or B.



**Legend:**

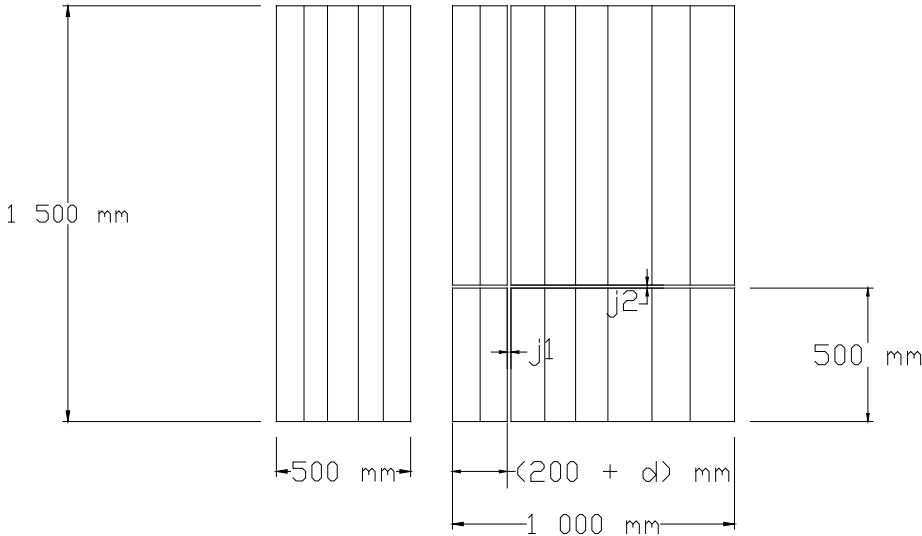
j1 = width of vertical joint

j2 = width of horizontal joint

d = short wing cladding element thickness.

**Figure B.3.2:** Example of installation for mechanically fixed kits family C or D.

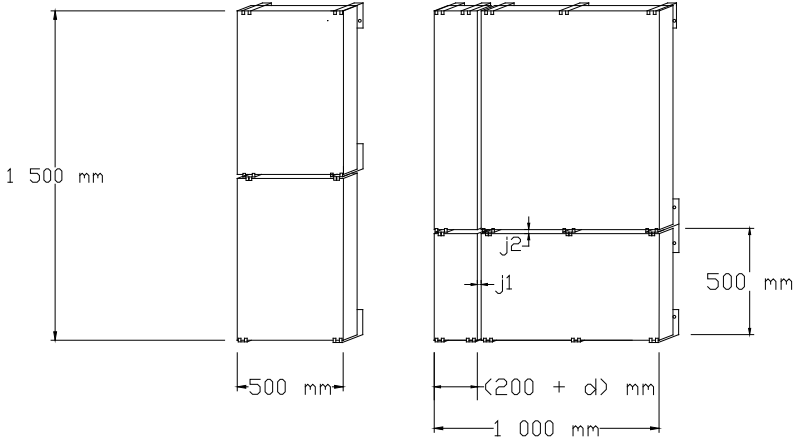
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**Legend:**

- $j1$  = width of vertical joint
- $j2$  = width of horizontal joint
- $d$  = short wing cladding element thickness.

**Figure B.3.3:** Example of installation for mechanically fixed kits family E.

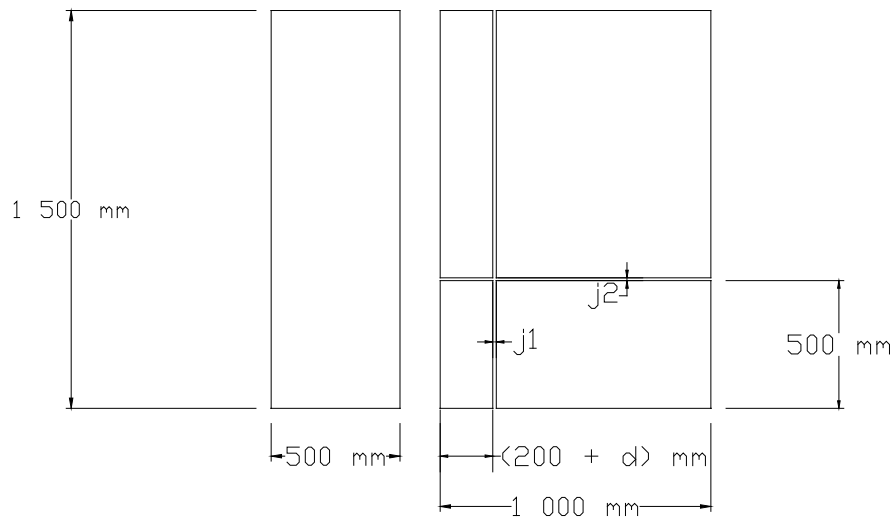


**Legend:**

- $j1$  = width of vertical joint
- $j2$  = width of horizontal joint
- $d$  = short wing cladding element thickness.

**Figure B.3.4:** Example of installation for mechanically fixed kits family F.

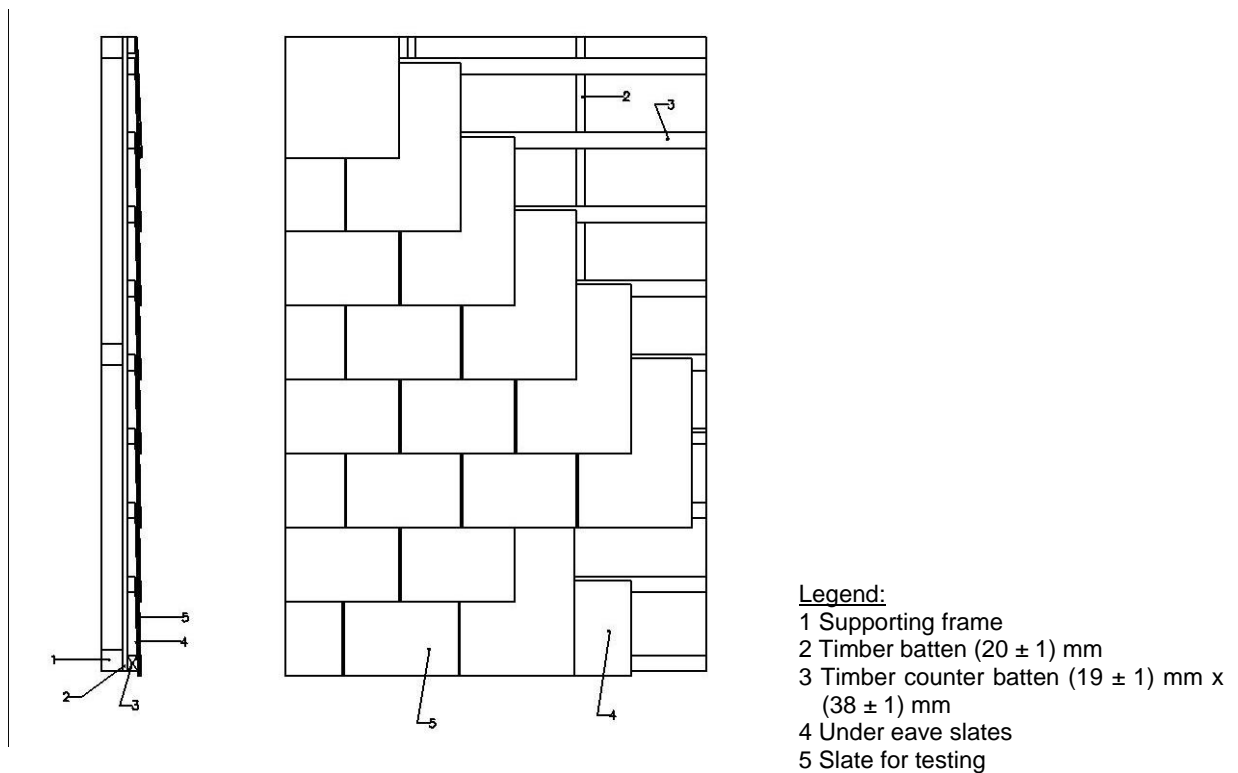
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**Legend:**

- j1 = width of vertical joint
- j2 = width of horizontal joint
- d = short wing cladding element thickness.

**Figure B.3.5:** Example of installation for mechanically fixed kits family G.



**Figure B.3.6:** Example of installation for mechanically fixed kits family H.



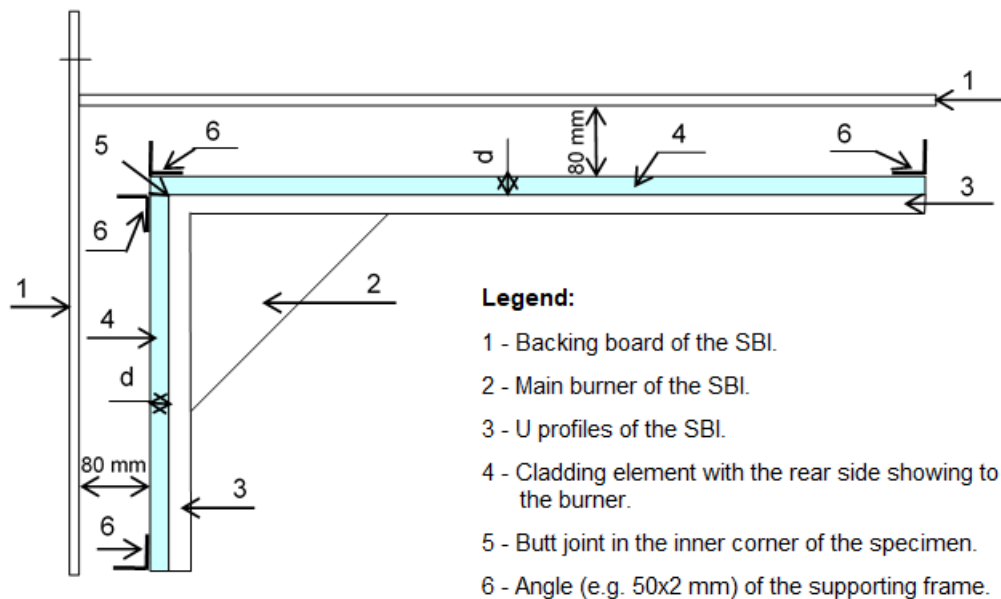


Figure B.3.7: Principle of testing the rear side.

## B.4 Testing of the reaction to fire according to EN ISO 11925-2 (single flame source test)

### B.4.1 General

Due to the very limited size of the specimens as prescribed by the test standard, it is widely impossible to test the cladding kit as whole. Therefore, all essential components of the kit shall be tested separately except in cases prescribed below.

For the relevant flame exposure types to be applied within testing, see clause A.5.

### B.4.2 Thermal insulation

#### Case 1)

Products covered by a harmonized product specification do not need to be tested if reaction to fire is declared in their Declaration of performance and the given class according to EN 13501-1 of the thermal insulation product is equal to or higher than the intended class for the external cladding kit (e. g. class B or C shall be determined for the kit, then at least the insulation product must be classified as class C too).

#### Case 2)

If testing of the insulation product is required, the test shall be performed according to the provisions of the test standard and taking into consideration the specific mounting and fixing provisions of the relevant harmonized product specification (e. g. an EAD or a hEN in connection with EN 15715).

Results and classification according to cases 1 and 2 are valid for the application of the insulation product on any substrate covered by standard substrates according to EN 13238 using mechanical fixing means or adhesives (mortars) with an organic content equal to or lower than 15 % (related to the mass in dried condition; cf. cl. B.4.3).

If an adhesive with an organic content higher than 15 % (related to the mass in dried condition) is used for fixing the insulation product to the substrate, separate testing is required as prescribed in B.4.3.

*[Note: For the use of insulation products not covered by any harmonized product specification as part of the kit, development of separate mounting and fixing provisions as well as extended application rules for the test results has to be done when drafting a respective EAD.]*

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### **B.4.3 Fixing means**

Discrete mechanical fixing means do not need to be tested according to EN ISO 11925-2 within the assessment of the kit, because their contribution to fire spread and fire growth is zero (in case of metal fixings) or low (in case of plastic fixings) due to their limited dimensions and the distance to each other.

For adhesives (mortars) with an organic content of equal or lower than 15 % (related to the mass in dried condition) used for fixing a thermal insulation product to the substrate, it can be assumed that they fulfil the requirements of the classes B (or lower) within testing according to EN ISO 11925-2. Therefore, no need exists to consider such adhesives for preparing and testing specimens of the respective insulation product within the assessment of the cladding kit.

If adhesives with an organic content of more than 15 % (related to the mass in dried condition) is used for fixing the insulation product to the substrate, it is necessary to carry out a complete set of six tests on specimens turned at 90 degrees on their vertical axis with edge exposure of the adhesive layer. The specimens consist of the substrate, the adhesive and the thermal insulation product. The following rules shall be applied for preparing the specimens:

- each type of adhesive with a different composition shall be used by selecting the variant with the highest amount of organic content and with the highest thickness,
- the thermal insulation product shall be used with the lowest thickness applied for the assessment,
- the substrate shall be the same as the one used for SBI testing of the external cladding kit as a whole.

Adhesives used for fixing the cladding elements on the subframe profiles shall be tested and assessed together with the cladding element.

### **B.4.4 Breather membranes**

#### Case 1)

Products covered by a harmonized product specification do not need to be tested, if reaction to fire is declared in their Declaration of performance, the given class according to EN 13501-1 of the breather membrane is equal to or higher than the intended class for the external cladding kit (e. g. class B or C shall be determined for the kit, then at least the breather membrane must be classified as class C too) and conditions for the validation of the classification are fulfilled, when using the membrane as part of the cladding kit.

#### Case 2)

If testing of the breather membrane is required, the test shall be performed according to the provisions of the test standard and taking into consideration the following mounting and fixing provisions:

- free-hanging arrangement of the specimens without any substrate behind -> it covers all end use applications with or without any material behind,
- arrangement of the specimens directly mechanically fixed onto a representative standard substrate according to EN 13238 covering the specific application of the membrane as part of the kit.

The following product parameters are relevant for testing:

- variations of a product family (as defined by a certain combination of raw materials and a certain type of production process),
- organic content - where relevant, the product with the highest organic content shall be tested,
- thickness – where relevant, the highest and lowest thickness shall be tested,
- density / weight per unit area – where relevant, the highest and lowest density as well as the highest and lowest weight per unit area shall be tested,

Breather membranes glued to an insulation product shall be tested and assessed together with the insulation product.

#### **B.4.5 Subframe**

Case 1)

Subframe profiles made of wood / wood-based materials or of metal classified as A1 or A2 according to EN 13501-1 do not need to be tested, since it can be assumed that they fulfil the requirements of the classes B (or lower) within testing according to EN ISO 11925-2.

Case 2)

Subframe components used for mechanically fixed cladding elements and not covered by case 1) shall be tested separately according to the provisions of the test standard and using a free-hanging test arrangement.

Case 3)

Subframe components used for glue-fixed cladding elements shall be tested together with the relevant cladding element and the adhesive used for its fixing.

#### **B.4.6 Cladding elements**

Mechanically fixed cladding elements shall be tested in a free-hanging test arrangement without any substrate or subframe profile behind.

Glue-fixed cladding elements shall be tested together with the adhesive and the subframe profile.

If the cladding elements are built-in with a specific type of joints (except open joints) between neighbouring elements, this type of joint shall be considered at the lengthwise centre axis of at least two specimens of both flame exposure types (edge flaming and surface flaming).

#### **B.4.7 Other ancillary components**

Each different ancillary component of the kit (except small components as defined in Annex D) shall be tested separately according to the provisions of the test standard and their own harmonized product specification, if available.

Otherwise the component shall be tested using a free-hanging test arrangement. If these tests fail, a test set-up with an appropriate standard substrate according to EN 13238 can be used representing the end-use application of the component in the kit.

## **ANNEX C. Additional provisions for determination the characteristic Propensity to undergo continuous smouldering of kit components made of mineral wool, wood wool, cork, wood-based boards/panels, wood fibres, any other vegetable or animal fibres or phenolic foam**

*[Note: The following clauses are widely taken from EOTA TR 072 and provide examples for the implementation of appropriate rules when drafting EADs with regard to the determination of propensity to undergo continuous smouldering of the most typical products for which this characteristic may be relevant. However, depending on the current version of TR 072 and the specific product in question for which an EAD is under development these example provisions may need modification.]*

### **C.1 Provisions for products made of mineral wool<sup>2</sup>**

#### **C.1.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- the product variations of a product family (as defined by a certain combination of raw materials and other additives and produced in a certain production process)<sup>3</sup>;
- the product or product variant with the highest organic content (in percentage per mass), determined according to EN 13820;
- the product or product variant with the highest density as well as a density of about 100 kg/m<sup>3</sup> ( $\pm 15\%$ ); if this range is lower than 115 kg/m<sup>3</sup>, then only the product or product variant with the highest density (density determined in accordance with EN 1602);
- the product or product variant with the highest thickness. If the highest thickness is greater than 100 mm, then the specimen thickness shall be reduced from the backside to the maximum testable thickness of about 100 mm. (thickness determined in accordance with EN 823 on at least three specimens),
- each different produced fibre orientation, i.e. lengthwise and crosswise to the length direction of the specimen as well as perpendicular to the surface of the specimen front side;
- without any facings, coatings (or similar) – existing facings or coatings shall be removed when preparing the test specimens.

#### **C.1.2 Preparation of test specimen**

The tests shall be done on free-hanging specimens without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions, and without any joints (see further).

If the product is only available in lengths lower than 800 mm, the test specimens shall be prepared by using two (or more) smaller pieces of the mineral wool, which shall put together with a butt joint. This joint shall be positioned in the highest possible distance to the bottom edge of the test specimens. Connection of the pieces of the test specimens shall be carried out in such a manner that a permanent and close contact is ensured between both pieces at the joint for the entire testing and monitoring time.

#### **C.1.3 Extended application of test results**

The test results considering the aforementioned parameters are also valid for products:

- of the same defined product-family,
- with lower organic content,
- with all lower densities,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,

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<sup>2</sup> For products made of mineral wool fibres and aerogel the same provisions shall apply as given in this clause **C.1** for factory-made products made of mineral wool.

<sup>3</sup> To permit the TAB to apply EXAP-rules, the manufacturer should provide sufficient information (e. g. on the basis of the composition of the products in question), allowing the TAB to determine which products or product variants should be submitted to testing.

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- with all fibre orientations,
- with any facings or coatings and
- for any end-use conditions.

### **C.2 Provisions for products made of wood wool or wood chips**

#### **C.2.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

##### a) Homogeneous products

- product-variations of a product family (as defined by a certain combination of raw materials, e.g. the type of wood, binder and additives, and produced in a certain production process)<sup>Error! Bookmark not defined.</sup>,
- the product or product variant with the highest organic content (in percentage per mass), determined according to EN 13820;
- the product or product variant with the highest density as well as the lowest density, determined by tests according to EN 1602;
- the product or product variant with the highest thickness or – if greater than 100 mm – highest testable thickness of 100 mm, determined according to EN 823 on at least three specimens;
- each different produced orientation of the wood wool / wood chips (i. e. lengthwise and crosswise to the length direction of the specimen),
- without any facings, coatings or suchlike – existing facings or coatings shall be removed when preparing the test specimens

##### b) Non-homogeneous products (composite boards)

- product-variations of a product family (as defined by a certain combination of raw materials, e.g. the type of wood, binder and additives, possible combinations of wood wool / wood chips and other possible layer materials, and produced in a certain production process)<sup>Error! Bookmark not defined.</sup>,
- the product or product variant with the highest as well as lowest density of the wood wool / wood chip layer;
- the product or product variant with the highest thickness of the wood wool / wood chip layer
- each different produced orientation of the wood wool / wood chips and the fibres of the second layer in case of materials made of mineral wool, wood fibres, cork or any other animal or vegetable fibres (i. e. lengthwise and crosswise to the length direction of the specimen);
- the product or product variant with the highest organic content (in percentage per mass), determined by tests according to EN 13820;
- the product or product variant with the highest as well as lowest density of the second layer material, in case of combination with material which may also show propensity to undergo continuous smouldering (wood fibre, cork or materials made of any other vegetable or animal fibres);
- the product or product variant with the highest density as well as a density of about 100 kg/m<sup>3</sup> ( $\pm 15\%$ ) of the second layer in case the material is made of mineral wool; if the highest density of the range is equal or lower than 115 kg/m<sup>3</sup>, then only the product or product variant with the highest density. The density shall be determined in accordance with EN 1602);
- the product or product variant with the highest density of the second layer material, in case of combination with any other products which do not show propensity to undergo continuous smouldering;
- the product or product variant with the highest thickness of the second layer material, in case of combination with material which may also show propensity to undergo continuous smouldering (wood fibre, cork, mineral wool or materials made of any other vegetable or animal fibres) or
- the product or product variant with the lowest thickness of the second layer material, in case of combination with any other material which do not show propensity to undergo continuous smouldering.

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### **C.2.2 Preparation of tests specimens**

The tests shall be done on specimens taken from 2-layer-composite boards (with one external wood wool / wood chip layer), which also cover 3-layer composite boards (with two external wood wool / wood chip layers).

In case of composite boards made of wood wool / wood chips and second layer material which may also show propensity to undergo continuous smouldering (wood fibre, cork, mineral wool or materials made of any other vegetable or animal fibres), both layers shall be exposed by the ignition source within the tests.

In case of composite boards made of wood wool / wood chips and any other second layer material, which do not show propensity to undergo continuous smouldering, only the wood wool / wood chip layer shall be exposed by the ignition source within the tests.

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.

### **C.2.3 Extended application of test results**

The determined performance of the tested product shall be expressed in accordance with clause 11 of EN 16733. The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family (as defined by e.g. type of wood, binder and additives),
- with lower organic content of the wood wool / wood chip layer,
- with all densities of the wood wool / wood chip layers between those evaluated,
- with lower densities in case of mineral wool as second layer material or in case of layer material which do not show propensity to undergo continuous smouldering,
- with all densities between those evaluated in case of wood fibre, cork or any other materials made of vegetable or animal fibres as second layer,
- with lower thickness of the wood wool / wood chip layer as well as of the second layer and also with higher thickness of the layers when the layer thickness of the tested specimen was of about 100 mm,
- with all orientations of the wood wool / wood chips and the second layer material in case of materials made of mineral wool, wood fibre, cork or any other animal or vegetable fibres,
- with any facings or coatings or suchlike and
- for any end-use conditions.

## **C.3 Provisions for products made of cork**

### **C.3.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- product-variations of a product family (as defined by a certain combination of raw materials, e.g. type of binder and additives etc., and produced in a certain production process) Error! Bookmark not defined.,
- the product or product variant with the highest and lowest density, determined by tests according to EN 1602;
- the product or product variant with the highest thickness, determined by tests according to EN 823 on at least three specimens;
- each different produced orientation, if relevant (i. e. lengthwise and crosswise to the length direction of the product),
- without any facings, coatings or suchlike – existing facings or coatings shall be removed when preparing the test specimens.

### **C.3.2 Preparation of tests specimens**

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.

### **C.3.3 Extended application of test results**

The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family,
- with all densities between those evaluated,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,
- with all orientations, if all relevant orientations (lengthwise and crosswise) had been tested,
- with any facings or coatings or suchlike and
- for any end-use conditions.

## **C.4 Provisions for wood-based boards / panels**

### **C.4.1 Sample taking**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- product-variations of a product family (as defined by a certain combination of raw material, e. g. binder, additives, wood type of the wood shapes / wood fibres etc., and produced in a certain production process)<sup>Error! Bookmark not defined.</sup>;
- the product or product variant with the highest as well as the lowest density of the wood-based board / panel, determined by tests according to EN 323;
- the product or product variant with the highest thickness of the wood-based board / panel, determined by tests according to EN 823 on at least three specimens;
- each different produced shape / fibre orientation (i. e. lengthwise and crosswise to the length direction of the specimen);
- without any external non-substantial facings, coatings or suchlike – existing external non-substantial facings or coatings shall be removed when preparing the test specimens

### **C.4.2 Preparation of tests specimens**

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.

### **C.4.3 Extended application of test results**

The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family,
- with all densities of wood-based boards / panels between those evaluated,
- with lower thickness of wood-based boards / panels and also with higher thickness when 100 mm thick specimens were tested,
- with all shape / fibre orientations, if all relevant orientations had been tested,
- with any external non-substantial facings or coatings or suchlike and
- for any end-use conditions.

[Note: The aforementioned provisions / model clauses refer to homogenous boards / panels or non-homogenous boards / panels only with external non-substantial layers. In case of composite products consisting of wood-based boards / panels and further substantial layers, the provisions / model clauses given in cl. C.2 may be used as orientation for the development of appropriate provisions.]

## **C.5 Provisions for products made of wood fibre**

### **C.5.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- product-variations of a product family (as defined by a certain combination of raw materials, e.g. type of binder and additives, and produced in a certain production process)<sup>Error! Bookmark not defined.</sup>,
- wood type of the wood fibres,
- type of production process,
- the product or product variant with the highest and lowest density, determined by tests according to EN 1602;
- the product or product variant with the highest thickness, determined by tests according to EN 823 on at least three specimens;
- each different produced fibre orientation (i. e. lengthwise and crosswise to the length direction of the product),
- without any facings, coatings or suchlike – existing facings or coatings shall be removed when preparing the test specimens.

### **C.5.2 Preparation of tests specimens**

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.

### **C.5.3 Extended application of test results**

The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family (as defined by e.g. binder type and additives, wood type of the fibres, including the production process),
- with all densities between those evaluated,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,
- with all fibre orientations, if all relevant orientations had been tested,
- with any facings or coatings or suchlike,
- for any end-use conditions.

## **C.6 Provisions for products made of vegetable or animal fibre**

### **C.6.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- product-variations of a product family (as defined by a certain combination of raw materials, e. g. type of fibres, type of binder and additives / treatment, and produced in a certain type of production process)<sup>Error! Bookmark not defined.</sup>,
- the product or product variant with the highest and lowest density, determined by tests according to EN 1602;
- the product or product variant with the highest thickness, determined by tests according to EN 823 on at least three specimens;
- each different produced fibre orientation (i. e. lengthwise and crosswise to the length direction of the specimen),
- without any facings, coatings or suchlike – existing facings or coatings shall be removed when preparing the test specimens.

### **C.6.2 Preparation of tests specimens**

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.



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### **C.6.3 Extended application of test results**

The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family,
- with all densities between those evaluated,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,
- with all fibre orientations, if all relevant orientations had been tested,
- with any facings or coatings or suchlike and
- for any end-use conditions.

### **C.7 Provisions for products made of phenolic foam**

#### **C.7.1 Sample input data**

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- product-variations of a product family (as defined by a certain combination of raw materials, e.g. type of binder and additives / treatment, and produced in a certain type of production process)<sup>Error! Bookmark not defined.</sup>
- the product or product variant with the highest and lowest density, determined by tests according to EN 1602;
- the product or product variant with the highest thickness, determined by tests according to EN 823 on at least three specimens;
- each different produced orientation (i. e. lengthwise and crosswise to the length direction of the specimen),
- without any facings, coatings or suchlike – existing facings or coatings shall be removed when preparing the test specimens.

#### **C.7.2 Preparation of tests specimens**

The tests shall be done without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions. If the paragraph 6.2.5 of EN 16733 applies, a permanent contact between the pieces shall be assured.

#### **C.7.3 Extended application of test results**

The results of tests considering the aforementioned parameters in fully are also valid for products:

- of the same defined product-family,
- with all densities between those evaluated,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,
- with all orientations, if all relevant orientations had been tested,
- with any facings or coatings or suchlike and
- for any end-use conditions.

## **ANNEX D. REACTION TO FIRE ASSESSMENT OF SMALL COMPONENTS**

A small component is considered as such when it satisfies all the following requirements:

- not made from class A1/A2 material,
- a mass  $\leq 50$  g,
- a size of  $\leq 50$  mm x  $\leq 50$  mm or a diameter of  $\leq 57$  mm (equal area size as for a rectangular size of  $\leq 50$  mm x  $\leq 50$  mm) and
- a distance  $\geq 200$  mm to similar components when:
  - is forming part of a composite kit component (e.g, undercut anchors or anti-vibration ancillary pieces) and being situated on the surface of a component (e.g. cladding element) made of material of classes B, C, D, or E,

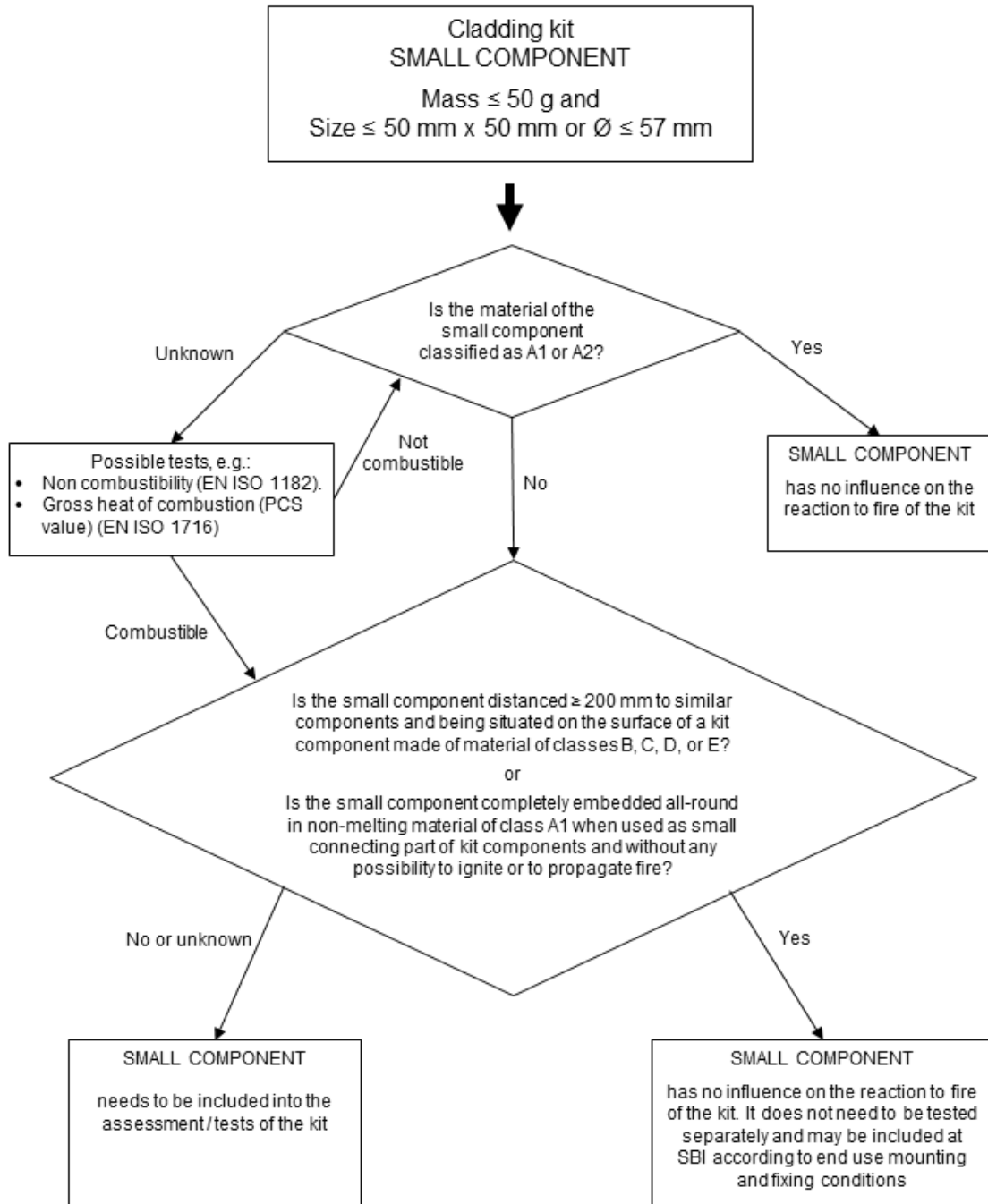
or

is completely embedded all-round in non-melting material of class A1 when used as small connecting part of kit components and without any possibility to ignite or to propagate fire.

Where the conditions are not met regarding the distance to other similar components or the all-round covering by non-melting A1 materials, the component shall be tested as part of the kit. The ETA shall state which components are considered as small components, where the reaction to fire performance can be seen as negligible.

Regarding linear joints (e.g. joints between cladding elements or ancillary components such as adhesive strips or double sided tapes) might have small sizes on the surface of the elements but can contribute to fire propagation. Fire spread through the linear jointing material on the surface of the element or the façade or into the interior is of concern. Therefore, joints generally cannot be considered as products having small areas and/or surfaces.

SYNOPSIS OF ASSESSMENT APPROACH



FigureD.1: Synopsis of small components assessment approach.

## ANNEX E. ASSESSMENT METHODS APPLIED IN EU/EFTA MEMBER STATES FOR ASSESSING THE FIRE PERFORMANCE OF FACADES

Country	Assessment method
Austria	ÖNORM B 3800-5
Czech Republic	ČSN ISO 13785-1
Denmark, Sweden, Norway	SP Fire 105
Finland	<ul style="list-style-type: none"> <li>• SP Fire 105</li> <li>• BS 8414</li> </ul>
France	LEPIR 2
Germany	<ul style="list-style-type: none"> <li>• DIN 4102-20 Complementary reaction-to-fire test for claddings of exterior walls,</li> <li>• Technical regulation A 2.2.1.5</li> </ul>
Hungary	MSZ 14800-6:2009 Fire resistance tests. Part 6: Fire propagation test for building façades
Ireland	BS 8414 (BR 135)
Poland	PN-B-02867:2013
Slovak Republic	ISO 13785-2
Switzerland, Lichtenstein	<ul style="list-style-type: none"> <li>• DIN 4102-20</li> <li>• ÖNorm B 3800-5</li> <li>• Prüfbestimmung für Aussenwandbekleidungssysteme</li> </ul>

*[Note: Consult the latest overview provided by the EC (AG016 - Advisory Group on Construction Products)]*

**ANNEX F. REFERENCE DOCUMENTS**

EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
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 16733:2016	Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering
EN ISO 1716:2018	Reaction to fire tests for products – Determination of gross heat of combustion (caloric value)
EN ISO 1182:2020	Reaction to fire tests for products – Non-combustibility test
EN ISO 11925-2:2020	Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test
EN 15715:2009	Thermal insulation products - Instructions for mounting and fixing for reaction to fire testing - Factory made products
EN 13820:2003	Thermal insulating materials for building applications - Determination of organic content
EN 1602:2013	Thermal insulating products for building applications - Determination of the apparent density
EN 823:2013	Thermal insulating products for building applications - Determination of thickness
EN 323:1993	Wood-based panels. Determination of density
Commission Delegated Regulation (EU) 2016/364 of 1 July 2015	The classification of the reaction to fire performance of construction products pursuant to Regulation (EU) No 305/2011
EC Decision 96/603/EC as amended	Commission Decision of 4 October 1996 establishing the list of products belonging to Classes A 'No contribution to fire' provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products