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European Assessment Document for

Balcony and terrace glazing systems without vertical frames

This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The balcony and terrace glazing systems without vertical frames (in the following referred to as glazing system(s)) are kits which consist of anodised or painted horizontal aluminium frames and/or rails, metal and plastic hinges, thermally toughened (with or without heat soaking) glass panes[1], sealing strips and fastening screws or anchors made of stainless steel, which are used to fasten the system into balcony parapet or railing and upper horizontal element. Glass panes can one by one glide into side direction and be turned inward so that the whole balcony front is free from glazing.

A kit can also include external sills, made of coil coated steel or aluminium.

Thicknesses of the panes may vary within a range specified by the manufacturer (see 1.3) and depends on the pane size, wind load resistance requirements and height of the glass panel.

Balcony railing (barrier against falling) is not part of the glazing systems.

All the components of the kit are described in Annex A together with an illustration.

This EAD only covers kits with metal components made of the following materials:

- continuously hot-dip coated steel in accordance with EN 10346[2],
- aluminium alloys in accordance with EN 573-3, EN 755-1 or EN 1999-1-1,
- stainless steels in accordance with EN 10088-4 or EN 10088-5.

Components of the kit:

The obligatory and optional components of balcony and terrace glazing systems are mentioned below. For further clarification, reference is made to the drawing of an example of a glazing system in Annex A. This example also shows further complementary components which, in addition to the list below, can be optional components of the kit.

A. Supporting structure (Horizontal aluminium profiles), obligatory components,
B. Toughened glass panels, obligatory components,
C. Sliding components (Tracks or rails and rollers/sliders), obligatory components,
D. Sealing components (Sealing strips or gaskets), optional components,
E. System components (mechanism), optional components,
F. Complementary components[3], optional components.

The metallic components can have a corrosion protection coating.

The product is not covered by a harmonised European standard (hEN).

EN 14351-1 cannot be applied because:

- EN 14351-1 covers only windows and external pedestrian doorsets.
- The glazing systems are not windows, because they are not intended to be installed in the external vertical wall apertures of buildings but only as glazing for balconies and terraces which are not warm or half-warm spaces and which are not totally watertight or airtight (see intended use). Therefore, the glass panes of a balcony glazing do not have (as well do not need) any vertical frames like windows.

1 The set of essential characteristics and the related assessment methods covered by this EAD are suitable for the kits covering glass panes; for panes made of other materials, other essential characteristics and assessment methods might be relevant.

2 All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

3 Annex A provides an example of components based on current market knowledge. If there are other such components the TAB shall verify the applicability of the EAD for such a kit i.e., such optional components will not have an impact on assessment methods.

- The glazing systems are also not unframed doorsets in the sense of EN 14351-1, because the glazing systems are not intended to be used as doors or to be systematically passed through.
- Based on the above, the glazing system is neither fully nor partially falling within the scope of EN 14351-1. However, some of the assessment methods of EN 14351-1 are, where applicable, used as standardised basis for the development of assessment methods of this EAD.

This document supersedes EAD 020002-00-0404. In comparison to the previous version, the following has been changed:

- The scope has been broadened with regard to thickness and size of the panes.
- Ventilation dampness has been removed as it depends on multiple external factors related to overall building conditions, while ventilation capacity is more appropriate as essential characteristic.
- Some details have been added in the description of the assessment methods for clarification.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations, e.g., with regard to the intended end use conditions, having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA as long as the details of the assessment methods as laid down in this EAD are respected.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The glazing systems are intended to be used to protect balcony or terrace interior from rain, snow, wind and dirt. The glazed balcony or terrace is not considered to be warm or half-warm space. The glazing systems are not totally watertight or airtight. When closed, the glazing systems are intended - to some extent - to be used to diminish sound penetration to the balcony and indoors.

The glazing systems are intended to be fastened into concrete, brick, steel, aluminium or timber substrates.

Sometimes the system is used on terraces or high balconies and then it is fastened to floor and roof construction. When used in this way, the system is not intended to act as a barrier against falling.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the glazing systems for the intended use of 25 years when installed in the works, provided that the glazing systems are subject to appropriate installation, use and maintenance (see clause 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the glazing systems, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[4].

The indications given as to the working life of the glazing systems cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

4 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

1.3 Specific terms used in this EAD

1.3.1 Glazing system combination

A glazing system consists of a frame/rails (type 1, type 2, …) and glazing (type A, type B, …).
One type of frame/rails can be used with different types of glazing. Every different type of glazing is considered a new combination. For example:

- Combination 1: Frame/rails type 1 with glass type A,
- Combination 2: Frame/rails type 1 with glass type B,
- Combination 3: Frame/rails type 2 with glass type A.

1.3.2 Glazing system range

Within a glazing system glass pane size may vary. A range is the set of values between the maximum and a minimum within one glazing system combination.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the glazing systems is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class
Basic Works Requirement 3: Hygiene, health and the environment			
2	Ventilation capacity	2.2.2	Class
Basic Works Requirement 4: Safety and accessibility in use			
3	Resistance to wind load	2.2.3	Level
4	Impact resistance (internal and external)	2.2.4	Class, level
5	Corrosion resistance	2.2.5	Description
6	Resistance to racking	2.2.6	Level
7	Resistance to static torsion	2.2.7	Level
Basic Works Requirement 5: Protection against noise			
8	Airborne sound insulation	2.2.8	Level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as "shall be stated in the ETA" or "it has to be given in the ETA" shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant essential characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

The product and its cross sections and materials shall be described in the ETA, including:

- A principal drawing of the cross sections of profiles,
- The types of glazing used including a description of the glass pane fixing,
- The metal and plastic materials and components,
- Seals and gaskets,
- The (required) fixing materials.

2.2.1 Reaction to fire

Reaction to fire of the whole kit shall be assessed by considering the reaction to fire of the separate components (glass panes, metal frames and rails, fixings, components, etc.), in order to be classified in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.

When relevant (e.g., asymmetrically composed glazing systems or relevant surfaces of the kit components of the back side), reaction to fire of the rear side of the glazing system shall also be assessed in order to be classified in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.

For the assessment of reaction to fire of the entire kit, for which the worst performance of a component is decisive, one of the following options shall apply:

a) The component is considered to satisfy the requirements of class A1 of the reaction-to-fire performance in accordance with the Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, without the need for testing on the basis of it fulfilling the conditions set out in (EU) 2016/364 and its intended use being covered by that Decision.

   Therefore, when the conditions referred to above are fulfilled, the performance of the component is class A1.

b) The component shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The component shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

c) Components fulfilling the conditions as stated in clause B.2 can be considered as small components without the need for testing, except where it is explicitly prescribed in Annex B.

If the assessment of the performance of the glazing system based on the worst performance of a component 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) in accordance with EN 13501-1 relevant for the corresponding reaction to fire class, in order to be classified in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.

Criteria indicated in Annex B shall be taken into account. With regard to mounting and fixing for the SBI test as well as for tests in accordance with EN ISO 11925-2 clauses B.5 and B.6 apply.

2.2.2 Ventilation capacity

The purpose of this assessment method is to assess the sizes of the air vent slots, which are decisive for the ventilation capacity of the glazing system (important for the prevention of dampness).

For the configuration with the narrowest and tallest glass panes within the range, the dimensions of the following air vent slots shall be measured in closed position of the glass panes:

- Vertical air vent slots between two glass panes,

- Horizontal air vent slots between the glass panes and supporting rails, if available (system dependent).

The air permeability of the glazing system shall be classified based on an analytical approach, using the average width of the air vent slots of each direction (vertical and horizontal) in the following equation for airflow through small openings:

$$Q = C \cdot A \cdot \Delta P^n$$

Where:

Q = air permeability rate (m³/h·m²),

C = 0,65 discharge coefficient (typically 0,6–0,7 for sharp-edged for rectangular openings),

ΔP = 100 pressure difference (Pa), (reference conditions <u>100 Pa</u> in accordance with EN 12207),

n = 0,5 flow exponent (typically <u>0,5</u> for turbulent flow),

A = total open area of ventilation slots (m²), calculated as: $A = (Wv \cdot Lv) + (Wh \cdot Lh)$.

Where: Wv and Wh are the slot widths and Lv and Lh are the corresponding total lengths.

The air permeability (Q) shall be classified in accordance with EN 14351-1, Annex I and the corresponding air permeability classification (class1-4) shall be stated in the ETA.

2.2.3 Resistance to wind load

The determination of wind load resistance shall be carried out according to the test sequence presented in EN 12211.

At least the worst case or most representative case (one glazing system with the lowest thickness and with three of the largest size panes) shall be tested. This test result is representative of the full range of panes with higher thicknesses and with a smaller width, smaller height or both than the tested size. Greater thicknesses or smaller sizes within this range can be tested additionally and the relevant performance indicated in the ETA based on the wish of the manufacturer.

The glazing system shall be mounted for a test as intended for use by the manufacturer and in accordance with EN 12211, clause 6.1. Joints, air gaps and ventilation slots shall be taped airtight to achieve the required test pressure. The test pressure value, P1 (Pa) in upwards steps in accordance with EN 14351-1, table 1, row 1 (clause 4.2) shall be applied. The relative frontal deflection of the glazing shall be recorded at test pressure P1.

Air permeability test shall be excluded from the standard test sequence of EN 12211, as the air permeability performance is assessed separately under Section 2.2.2 based on the analytical approach and classification in accordance with EN 14351-1, Annex I.

The resistance to wind load is the pressure at which the glazing system resists the applied pressure without dislodging or breakage of any component or loss of functionality.

To simulate the wind load resistance of the complete glazing system, the test chamber in accordance with EN 12211, clause 5, as applied to windows and door sets of EN 14351-1 shall be used.

For the configuration of the glazing system to be tested, the following rules shall be taken into account:
- a lower thickness of glass pane provides worse performance,

- a higher glass pane provides worse performance,
- a lower number of fixings provides worse performance.

The following extension rules shall be applied:
- the performance measured may also be used for panes with higher thicknesses,
- the performance measured may also be used for panes with smaller sizes,
- the performance measured may also be used for glazing systems with fewer fixings, while all other parameters are identical.

For each combination (glass pane types), range (of dimensions and glass pane thickness) and number of glass panes, the applied test pressure (P1) and relative frontal deflection in accordance with EN 12211 shall be stated in ETA. The classification of resistance to wind load in accordance with EN 14351-1 in connection with EN 12210 shall be stated in ETA.

2.2.4 Impact resistance

The impact resistance shall be tested in accordance with EN 13049. Point of impact shall be set halfway up the height of the glass pane.

Both sides of the systems shall be tested.

The test specimen is a complete glazing system (including the horizontal frames and/or rails with all accessories) with one glass pane. Mounting and fixing shall be in line with manufacturer's product installation instructions.

Per glazing system combination, two types of glass panes shall be tested:
- three test specimens with the most flexible glass pane, i.e., the pane with the largest size and lowest thickness glass pane within the range;
- three test specimens with the least flexible glass pane, i.e., the pane with the smallest size and highest thickness glass pane within the range.

The lowest result of both tests is representative of the full range of this type. Extended application rules as defined in clause 2.2.3 shall also apply for this clause, including the extension rules for glass pane sizes, thickness and combinations.
Different glass pane sizes, types or thicknesses can be tested additionally and the relevant performance indicated in the ETA based on the wish of the manufacturer.

For each range of dimensions, glass pane thickness and side of impact, the class and drop height in accordance with EN 13049, Table 1, shall be stated in the ETA.

2.2.5 Corrosion resistance

The assessment of the corrosion resistance of the kit shall be carried out by means of the assessment of the corrosion resistance of its metal components and the performance shall be considered representative for the glazing system(s) assessed.

The corrosion protection of the metal components of the glazing systems shall be assessed based on standards depending on the metal components:

- EN 10346 for continuously hot-dip coated steel,
- EN 573-3, EN 755-1 and EN 1999-1-1 for aluminium alloys,
- EN 10088-4 and EN 10088-5 for stainless steels,

and, in case of protective coatings, in accordance with EN ISO 12944-1 or EN 14879-2.

The associated category of corrosivity of atmospheres, in function of the field of application and the material corrosion protection, shall be assessed and stated in the ETA in accordance with EN ISO 9223 (e.g., marine atmosphere, industrial atmosphere, etc.).

2.2.6 Resistance to racking

Resistance to racking of the glazing systems shall be tested in accordance with EN 14608. Per glazing system and combination (glass pane type), one specimen shall be tested. The test specimen shall be a complete glazing system (including the horizontal frames and rails with all accessories) with three glass panes of the largest size as well as the lowest thickness within the range. The load shall be applied on the first to open glass pane.

The load on an opened pane shall be increased by 100 N in accordance with EN 14608, clause 7, until functionality is no longer maintained. The F_{max} is the maximum load where functionality is still maintained and shall be stated in the ETA. If the performance falls within the test loads of EN 13115, table 2, the relevant standardised categorisation of EN 13115, table 2, shall be additionally stated in the ETA.

For the configuration of the glazing system to be tested, the following rules shall be taken into account:

- A lower thickness of glass pane provides worse performance,
- a bigger width of glass pane provides worse performance,
- a lower number of fixings with identical height provides worse performance.

The following extension rules shall be applied:

- the performance measured may also be used for panes with higher thicknesses,
- the performance measured may also be used for panes with smaller width,
- the performance measured may also be used for glazing systems with more fixings, while all other parameters are identical.

The result of the test is representative of the full range of the tested combination. Different glass pane sizes, types or thicknesses can be tested additionally and the relevant performance indicated in the ETA based on the wish of the manufacturer.

2.2.7 Resistance to static torsion

Resistance to static torsion of the glazing systems shall be tested in accordance with standard EN 14609. Per glazing system and combination (glass pane type), one specimen shall be tested. The test specimen shall be a complete glazing system (including the horizontal frames and rails with all accessories) and with three glass panes of the largest size as well as the lowest thickness within the range. The load shall be applied on the first to open glass pane.

The load on an opened pane shall be increased by 100 N in accordance with EN 14609, clause 7, until functionality is no longer maintained. The F_{max} is the maximum load where functionality is still maintained and shall be stated in the ETA.

For the configuration of the glazing system to be tested, the following rules shall be taken into account:

- A lower thickness of glass pane provides worse performance,
- a bigger width or height of glass pane provides worse performance,

lower number of fixings with identical height provides worse performance. The following extension rules shall be applied:

- the performance measured may also be used for panes with higher thicknesses,
- the performance measured may also be used for panes with smaller sizes,
- the performance measured may also be used for glazing systems with more fixings, while all other parameters are identical.

2.2.8 Airborne sound insulation

The airborne sound insulation shall be tested in accordance with EN ISO 10140-2. For each combination (glass pane type), one specimen with at least two of the glass panes with the lowest thickness and the largest size within the range shall be tested. The test specimen shall be tested in closed position.

The measured airborne sound insulation R_w and the spectrum adaptation terms C and C_{tr} in accordance with EN ISO 717-1 and the number and dimensions of tested glass panes shall be stated in the ETA.

Based on the wish of the manufacturer, different combinations can be tested additionally and the relevant performance indicated in the ETA together with the information about the combination used.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Commission Decision 96/580/EC, as amended by Commission Decision 2001/596/EC.

The system is 3 for any use except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire the applicable AVCP systems are 1 or 3 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

The manufacturer (regarding the components he buys from the market with DoP) shall take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Reaction to fire (i)				
	▪ Reaction to fire (for any classification)	Indirect tests as specified in Tables 3.2.2 to 3.2.4	See Tables 3.2.2 to 3.2.4	See Tables 3.2.2 to 3.2.4	See Tables 3.2.2 to 3.2.4
	▪ Reaction to fire (for class A1)	Direct test according to EN ISO 1182	According to Control Plan	According to test method and Control Plan (v)	(iv)
	▪ Reaction to fire (for class A1 or A2)	Direct test according to EN ISO 1716	According to Control Plan	According to test method and Control Plan (v)	At least once each two years
	▪ Reaction to fire (for class A2 to D)	Direct test according to EN 13823 (ii)	According to Control Plan	According to test method and Control Plan (v)	(iv)
	▪ Reaction to fire (for class B to F)	Direct test according to EN ISO 11925-2	According to Control Plan	According to test method and Control Plan (v)	(iv)
2	Components produced by the manufacturer himself:				
	▪ Glass panes	See Table 3.2.2	See Table 3.2.2	See Table 3.2.22	See Table 3.2.2
	▪ Fixings and aluminium frames and/or rails and hinges	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3
	▪ Ancillary components	According to Control Plan	According to Control Plan	According to Control Plan	According to Control Plan
3	Components not produced by the manufacturer himself (iii)	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4

(i) Indirect tests shall be applied to all components independent from the source of their classification (Testing, Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, or any other applicable CWT/CWFT decision). Direct tests within the FPC shall only apply to those components where the classification is based on the prescribed tests for the corresponding class(es) in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.
If it is necessary to perform SBI tests within the FPC, the test set-up that was classified as the worst case within the ETA procedure shall be tested.
These refers to additional components that can be produced by the supplier under the specifications of the manufacturer.
The tests shall always be carried out whenever the performance is not verified by means of indirect tests (see Tables 3.2.2 to Table 3.2.4) or, at least, once each five years when the indirect tests verify the performance.
For this minimum frequency, the sufficient correlation between the foreseen system of indirect FPC measures and the direct tests shall be stated in the Control Plan. Otherwise, the minimum frequency of direct tests within the FPC shall be at least once per two years.
The necessary number of specimens shall be detailed in the Control Plan depending on the test method and the class to be verified within the FPC. The tests shall be performed on randomly taken specimens from the production process.

Table 3.2.2: Control plan when the glass panes are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
Incoming materials					
1	Received materials and components	Delivery ticket or label on the package	Conformity with the order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with the order	---	Each delivery
		Control of dimensions of incoming raw material	Conformity with the order	---	Each delivery
Process					
2	When relevant, fire-retardant quantity (i)	Quantity measurement	According to Control Plan	---	Each batch
Finished component					
3	Geometry (form and dimensions) (i)	Measuring and visual check according to the technical specifications	According to Control Plan	According to Control Plan	Daily(ii)
4	Mechanical characteristics	Test or control based on relevant clauses in 2.2.2 to 2.2.6	According to Control Plan	According to Control Plan	According to Control Plan (ii)
5	PCS value (for class B to D) (i)	Test in accordance with EN ISO 1716	According to Control Plan	According to Control Plan	Monthly (ii)
6	Organic content (i)	Ash content / loss on ignition in accordance with clause 3.4.1. Otherwise, Thermogravimetry test based on EN ISO 11358-1	According to Control Plan	According to Control Plan	Once per batch (ii)
(i) Indirect characteristic related to reaction to fire. (ii) Deviations from the given cornerstones (higher or lower frequencies) shall be agreed between manufacturer and TAB and laid down in the Control Plan case by case depending on the type of production process, the variation in the volume produced and the production process control.					

Table 3.2.3: Control plan when the <u>fixings and/or aluminium frames or rails</u> are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
Incoming materials					
1	Received materials and components	Delivery ticket or label on the package	Conformity with the order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with the order	---	Each delivery
2	Type of component material (i)	Checking of supplier certificates or supplier tests	Conformity with the order	---	Each delivery
Finished component					
3	Geometry (form and dimensions) (i)	Measuring and visual check	According to Control Plan	According to tests or control methods	Daily (ii)
4	Mechanical characteristics	Test or control based on relevant clauses 2.2.2 to 2.2.6	According to Control Plan	According to Control Plan	According to Control Plan (ii)
		Direct test in accordance with 2.2.2 to 2.2.6	According to Control Plan	According to Control Plan	At least once each 5 years
5	When relevant, organic content (i)	Ash content / loss on ignition in accordance with clause 3.4.1. Otherwise, Thermogravimetry test based on EN ISO 11358-1	According to Control Plan	According to Control Plan	Once per batch (ii)
(i) Indirect characteristic related to reaction to fire. (ii) Deviations from the given cornerstones (higher or lower frequencies) shall be agreed between manufacturer and TAB and laid down in the Control Plan case by case depending on the type of production process, the variation in the volume produced and the production process control.					

Table 3.2.4: Control plan when the components are <u>not produced</u> by the manufacturer; cornerstones

No	Subject/type of control (ii)	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Components belonging to <u>Case 1</u> (i)	(1)	Conformity with the order	Testing is not required	Each delivery
		(2)	According to Control Plan	Testing is not required	Each delivery
2	Components belonging to <u>Case 2</u> (i):	(1)	Conformity with the order	Testing is not required	Each delivery
	▪ Characteristics declared in the Declaration of Performance (DoP) for the specific use within the kit	(2)	According to Control Plan	Testing is not required	Each delivery
	▪ Characteristics not declared in DoP for the specific use within the kit	(3)	According to Control Plan	According to Control Plan	According to Control Plan
3	Components belonging to <u>Case 3</u> (i)	(1)	Conformity with the order	Testing is not required	Each delivery
		(3)	According to Control Plan	According to Control Plan	According to Control Plan

(1) Checking of delivery ticket and/or label on the package
(2) Checking of technical data sheet and DoP or, when relevant: checking of supplier certificates or supplier tests control according to Tables 3.2.2 to 3.2.4 above.
(3) Checking of supplier certificates or supplier tests or test or control according to Tables 3.2.2 to 3.2.4 above

(i) *Case 1: The component is covered by a DoP for all characteristics needed for the specific use within the kit.*
Case 2: the component is a product covered by a DoP which, however, does not include all characteristics needed for the specific use within the kit or the characteristic is presented as NPD option for the component manufacturer.
Case 3: The component is not covered by a DoP.
(ii) *Component characteristics are those defined in Tables 3.2.1 to 3.2.3 above.*

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to control plan	According to control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product	According to control plan	According to control plan	Once a year

3.4 Special methods of control and testing used for the assessment and verification of constancy of performance

3.4.1 Ash content or Loss on ignition

For products which are inorganic, i.e., products containing a low percentage of organic compounds and for thermal insulation products as well, the test method shall be based on EN 13820.

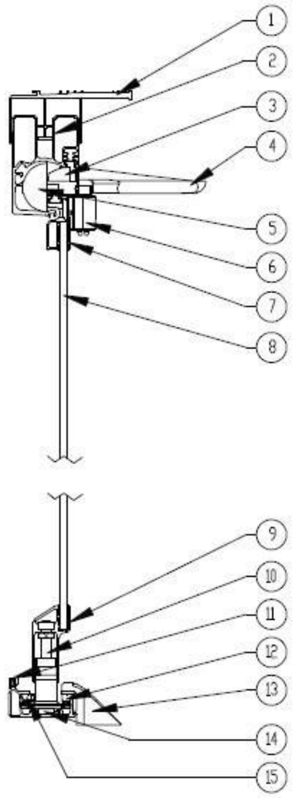
For products which are organic, the test method shall be based on EN ISO 3451-1.

4 Reference Dokuments

EN 573-3:2019+A2:2023	Aluminium and aluminium alloys – Chemical composition and form of wrought products – Part 3: Chemical composition and form of products
EN 755-1:2016	Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles – Part 1: Technical conditions for inspection and delivery
EN 1999-1-1:2023	Eurocode 9: Design of aluminium structures – Part 1-1: General rules
EN 10088-4:2009	Stainless steels – Part 4: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for construction purposes
EN 10088-5:2009	Stainless steels – Part 5: Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels for construction purposes
EN 10346:2015	Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions
EN 12207:2016	Windows and doors - Air permeability - Classification
EN 12210:2016	Windows and doors - Resistance to wind load - Classification
EN 12211:2016	Windows and doors - Resistance to wind load - Test method
EN 12758:2019+A1:2023	Glass in building - Glazing and airborne sound insulation - Product descriptions, determination of properties and extension rules
EN 13049:2023	Windows and doors - Soft and heavy body impact - Test method, safety requirements and classification
EN 13115:2020	Windows - Classification of mechanical properties - Racking, torsion and operating forces
EN 13238:2010	Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
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+A1:2022	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14351-1:2006+A2:2016	Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets
EN 14608:2004	Windows - Determination of the resistance to racking
EN 14609:2004	Windows - Determination of the resistance to static torsion
EN 14879-2:2006	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 2: Coatings on metallic components
EN ISO 717-1:2020	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:2020)
EN ISO 1182:2020	Reaction to fire tests for products - Non-combustibility test (ISO 1182:2020)
EN ISO 1716:2018	Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716:2018)
EN ISO 3451-1:2019	Plastics — Determination of ash - Part 1: General methods (ISO 3451-1:2019)

EN ISO 9223:2012	Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation (ISO 9223:2012)
EN ISO 10140-1:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products (ISO 10140-1:2021)
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2021)
EN ISO 10140-3:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation (ISO 10140-3:2021)
EN ISO 10140-4:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 4: Measurement procedures and requirements (ISO 10140-4:2021)
EN ISO 10140-5:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment (ISO 10140-5:2021)
EN ISO 11358-1:2022	Plastics - Thermogravimetry (TG) of polymers - Part 1: General principles (ISO 11358-1:2022)
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 12944-1:2017	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction (ISO 12944-1:2017)

ANNEX A: EXAMPLE OF GLAZING SYSTEM



Description of components:
1 Telescopic profile
2 Aluminium frame/rails
3 Locking comb, top
4 Gate
5 Bearing
6 String lock (optional)
7 Upper glazing bead
8 Toughened glass panel
9 Lower glazing bead
10 Slider
11 Front seal
12 Wedge (optional)
13 Ramp (optional)
14 Locking piece for 1st glass (optional)
15 Locking comb, bottom (optional)

Figure A.1: Details of the construction product

Explanation:

A. Supporting structure (horizontal aluminium profiles):

Component 2 (Aluminium frame/rails): These are the horizontal aluminium profiles that support the glass panels.

B. Toughened glass panels:

Component 8 (Toughened glass panel): These are the toughened glass panels necessary for the system.

C. Sliding components (Tracks or rails and rollers/sliders):

Component 10 (Slider): This is the component that allows the panels to move.

Component 5 (Bearing): These are the bearings that facilitate smooth sliding.

D. Sealing components (Sealing strips or gaskets):

Component 11 (Front seal): Acts as a sealing element to prevent the entry of air, water or dust.

E. System components (mechanism):

Component 1 (Telescopic profile): Allows the structure to be adjusted or extended as needed.

Component 9 (Lower glazing bead): Secures the glass panels in their lower position.

Component 7 (Upper glazing bead): Complements the fixation of the glass in the upper position.

Component 3 (Locking comb, top): A mechanism that secures the panels in their closed position.

Component 4 (Gate): A mechanism that allows the panels to fold.

F. Complementary components of the kit

Component 6 (String lock): Ensures stability or restricts unwanted movement.

Component 15 (Locking comb, bottom): Additional locking mechanism at the bottom.

Component 12 (Wedge): Provides additional support for the panels.

Component 13 (Ramp): Facilitates the transition of panel movement.

Component 14 (Locking piece for 1st glass): Secures the 1st panel for more complex systems.

ANNEX B: REACTION TO FIRE

B.1 GENERAL

The reaction to fire classification of the kit shall be derived from the worst performing individual component, determined in accordance with clause 2.2.1. If the assessment of the performance of the glazing system based on the worst performance of a component 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.

The reaction to fire assessment shall be done for the whole glazing system, simulating its end-use conditions when the glazing system is installed in accordance with the manufacturer product installation instructions.

The kit components as mentioned in clause 1.1.1 and Annex A

- A. Supporting structure,
- B. Toughened glass panels,
- C. Sliding components,
- D. Sealing components (if relevant),
- E. System components (if relevant),
- the complementary components as shown in Annex A (F.), and
- organic coating/top layers (if relevant),

shall be considered as decisive for the reaction to fire behaviour.

The distinction between small and non-small components shall be determined on the basis of clause B.2.The determination of reaction to fire of the glazing system shall be 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 glazing system components is valid for all configurations of glazing system.

For testing of the glazing system, the following principle shall apply regarding the selection of the relevant kit components:

- The kit components material with the highest amount of organic content (if the only differences lay with the amount of organic content but not in the organic component itself) or the highest PCS value (in accordance with EN ISO 1716) shall be tested.
- The kit components material with the lowest amount of flame retardant additive, when variations in that additive exist.

Components of a kit which are considered to satisfy the requirements of class A1 of the reaction-to-fire performance in accordance with the Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision do not need to be tested. This provision is only relevant for tests where each component is tested separately.

Although the following clauses 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 glazing system 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.

B.2 SMALL COMPONENTS

The term “small component” is used for a component which satisfies all of the following requirements:

- Its mass is ≤ 50 g,
- Its size is ≤ 50 mm x ≤ 50 mm or its diameter is ≤ 57 mm (equal area size as for a rectangular size of ≤ 50 mm x ≤ 50 mm) and
- Its distance is ≥ 200 mm to similar components when:
  - o is forming part of a composite product) and being situated on the surface of a product 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 a product consisting of various components and without any possibility to ignite or to propagate fire.

In this case, its reaction to fire performance shall not be tested because contribution to fire growth and fire spread is negligible due to size, mass and configuration. If the specified 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 assessed as part of the kit to evaluate its fire performance. The ETA shall state which components are considered as small components, where the reaction to fire performance can be seen as negligible.

Linear joints (such as sealing strips) 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 into the interior is of concern. Therefore, joints generally shall not be considered as products having small areas and/or surfaces.

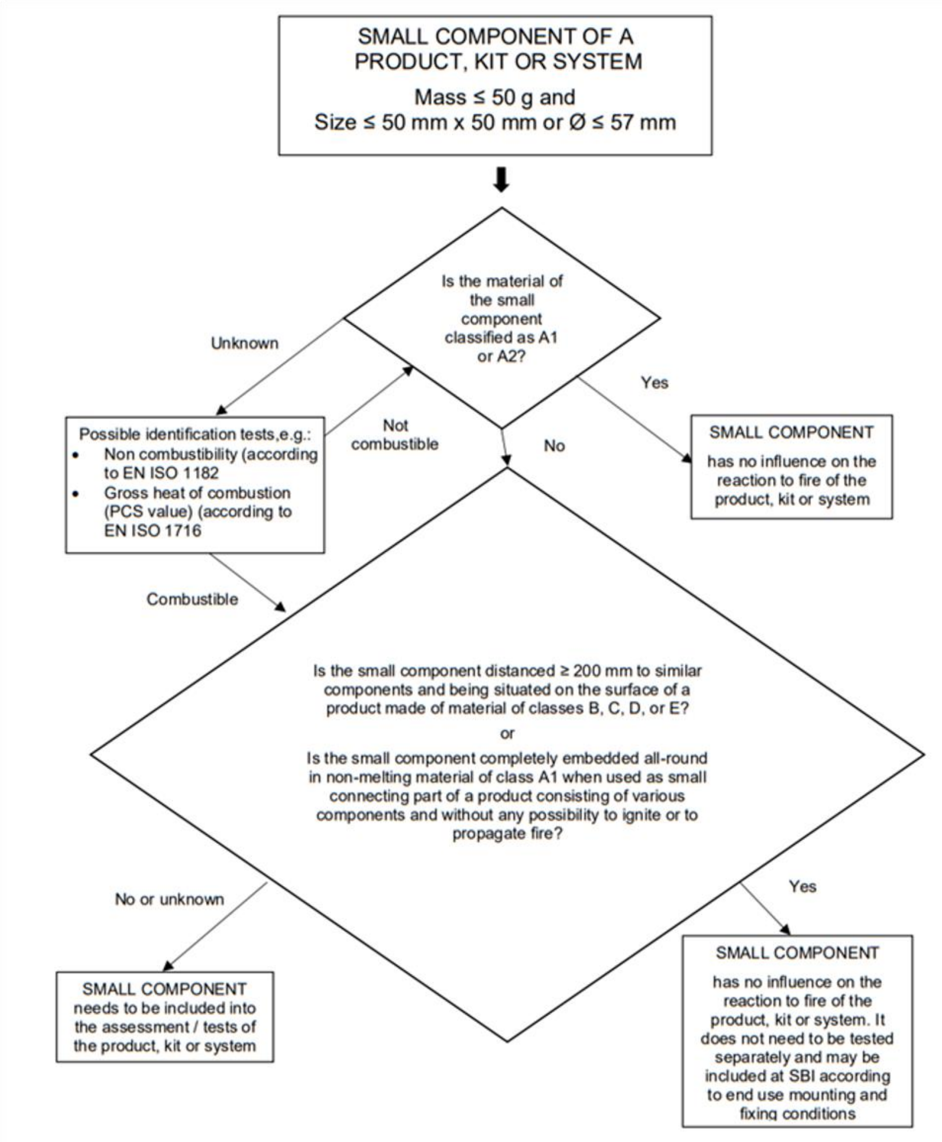


Figure B.2.1: Synopsis of small components assessment approach

B.3 TESTING IN ACCORDANCE WITH EN ISO 1182 (NON-COMBUSTIBILITY TEST)

This test method shall be done in accordance with EN ISO 1182, if 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 (≥ 1 mm) or mass per unit area (≥ 1 kg/m^2), whichever is the most onerous.

The test specimen for the material shall be selected in accordance with EN ISO 1182.

B.4 TESTING IN ACCORDANCE WITH EN ISO 1716 (DETERMINATION OF THE HEAT OF COMBUSTION)

This test method shall be done in accordance with EN ISO 1716, if relevant, for classes A1 and A2 in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.

The test method shall be performed to all components of the glazing systems except for components which are classified as A1 without testing.

Discrete and discontinuous mechanical fixings and ancillary materials which fulfil the conditions for small components according to clause B.2 do also not need to be considered for testing and for the calculation of the Q_{PCS}-values.

The test specimen for the material shall be selected in accordance with EN ISO 1716.

B.5 TESTING IN ACCORDANCE WITH EN 13823 (SBI-TEST)

If the assessment of the performance of the glazing system based on the worst performance of a component 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.

This test method is relevant for classes A1 (for components not classified without testing), A2, B, C and D.

Mounting and fixing provisions for the SBI-test for glazing systems are indicated in Annex B.7.

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.

Considering the worst case: Smallest thickness of external glass panes, highest thickness of glass panes, highest thickness and weight per unit area of external organic coatings, maximum number and dimensions of sealing strips.

In principle, it is desirable to find the test specimen configuration that gives the worst case concerning the reaction to fire test results. Using the test procedure in accordance with 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 shall be determined.

The test specimens shall be prepared representing the kit components with the highest organic content or Q_{PCS}-value per unit area in accordance with EN ISO 1716.

The selected worst-case component shall be tested to cover the influence of the parameters indicated above.

B.6 TESTING IN ACCORDANCE WITH EN ISO 11925-2 (SINGLE FLAME TEST)

This test shall be done in accordance with EN ISO 11925-2, if relevant, for classes B, C, D, E and F.

Mounting and fixing provisions for the tests are indicated in Annex B.7.

Considering the worst case: Smallest thickness of external glass panes, highest thickness of internal plastic layer of laminated glass panes, highest thickness and weight per unit area of external organic coatings, maximum number and dimensions of sealing stripes.

Parameters which are relevant: Extended application rules as defined in clause 2.2.2 shall also apply for this clause, including the extension rules for glass pane sizes, thickness and combinations.

- Type of kit components (e.g., composition, dimensions, density, weight per unit area),
- Amount of organic content of the kit components.
- Frames and/or rails made of metal classified as A1 or A2 in accordance with the Commission Decision 96/303/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, do not require testing.

The tests shall be performed with surface exposure of the front side and edge exposure EN 13823. Besides, the principles specified in clause B.1 shall be applied.

Glass, not covered by Commission Decision 96/6036/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, shall additionally be tested with edge exposure of the internal layer on specimens turned 90 degrees on their vertical axis.

B.7 MOUNTING AND FIXING FOR EN 13823 AND EN ISO 11925-2

B.7.1 MOUNTING AND FIXING PROVISIONS FOR EN 13823

For glazing systems included in Annex B.5, the kit shall be tested in the SBI with a ventilated air gap of 80 mm between the rear of glass panes and the SBI backing board. No additional substrate in accordance with EN 13238 shall be used for testing purposes.

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 clause describes specific provisions for glazing systems.

The test specimen for the components shall be selected as follows:

Frames and/or rails:

The test specimen of the frame and/or rails shall form a continuous plane. It shall be represented by the same composition of material layers of the frame.

Glass panes:

The test specimen of the glass pane shall form a continuous plane. It shall be represented by the same composition of material layers of the glass pane.

Organic coating/top layers

For metal frames the test specimen shall be a representative coating on a plate in accordance with EN 13238.

For symmetric layer composition the exterior or interior surface shall be placed on the side of the burner.

If the surface material on the inside is different to the one on the outside (asymmetrical condition), the interior surface shall be placed on the side of the burner, for the classification with internal flame exposure and/or the exterior surface shall be placed on the side of the burner, for the classification with exterior flame exposure.

Supporting constructions for the test specimen may be used to prevent the specimen to collapse.

Handles (if any) shall be removed from the test specimen; the hole(s) shall be covered by means of non-combustible material covering a minimum area of the test specimen.

The test specimen and ventilation devices, if any, shall be tested in closed position.

Remaining openings, if any, shall be filled out with non-combustible calcium silicate (CaSi)-board in accordance with EN 13238.

The two wings shall be joined in a way which does not influence the test result.

B.7.2 MOUNTING AND FIXING PROVISIONS FOR EN ISO 11925-2

All relevant components shall be tested separately due to the very limited size of the specimens for tests in accordance with EN ISO 11925-2, taking into account the following provisions.

Frames and/or rails:

The test specimen shall be a representative section of a frame (minimum wall thickness of the sight surface, material). It may be closed at the top and the bottom.

Sealing between glass pane and frame:

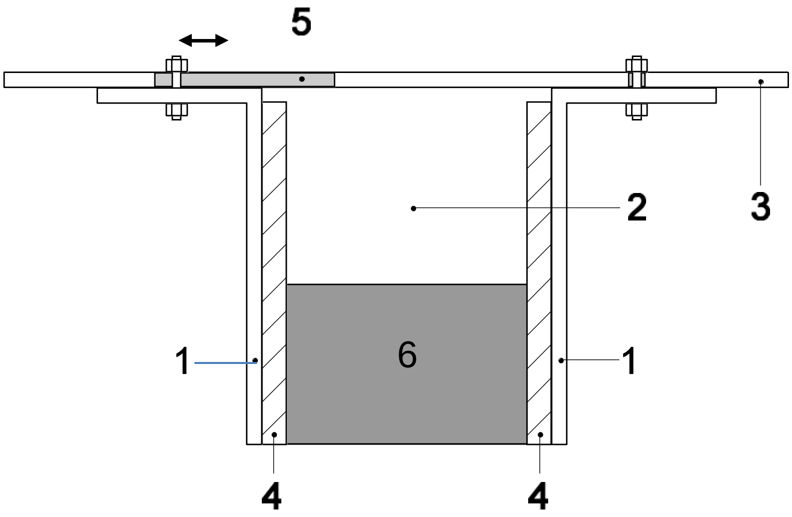
The sealing shall be mounted, if relevant, in a compressed situation as in practice. The test shall be performed with surface flame attack only (surface flame exposure).

The test shall be conducted in accordance with EN ISO 11925-2 subject to the following provisions:

- The test specimen used shall simulate a joint seal. The joint faces are made from steel angles, calcium silicate or fibre cement board. An example for a set-up is shown in Figure B.7.2.1.
- The joint seal shall have the maximum nominal width applied for, subject to maximum 90 mm. The seal shall be tested without any backfilling material / backer rod.
- The smallest and the largest depths[5] specified for application shall be used. For depths smaller than 10 mm a backing board shall be used, made from calcium silicate.
- Any surface (face) that may be exposed in practice shall be tested.
- Where two adjacent surfaces forming an edge are exposed in practice, edge exposure shall be used.

5 The Technical Assessment Body can reduce the test amount for justified reasons (e.g., only to test the smallest depth if minimum and maximum depth do not vary essentially).

— Compressed materials: The compression used in practice shall be simulated in the test. The result only will be valid for the equal or higher compression.



Key

1 Steel angle
2 Air gap
3 Base plate
4 Calcium silicate
5 Slot to allow adjustment to different specimen width and compression
6 Specimen

Figure B.7.2.1 – Example for a test setup for the small burner test

Organic coating/top layers:

The test specimen for metal frames which use coating (if relevant) with an appropriate standard substrate in accordance with EN 13238.

Other ancillary components:

Each different ancillary component of the kit (except small components as defined in Annex B.2) shall be tested separately according to the provisions of the relevant harmonised standard or EAD, if available.

However, when available, performance included in the DoP shall be used as far as possible to avoid retesting or reassessment.

Otherwise, the component shall be tested using a free-hanging test arrangement of the specimens without any substrate behind (it covers all end use applications with or without any material behind). If these tests fail, a test set-up with an appropriate standard substrate in accordance with EN 13238 can be used representing the end-use application of the component in the kit.

B.8 EXTENDED APPLICATION

The test results are also applicable to glazing systems:

- with smaller dimensions (height and width) of glazing systems,
- for the same or also other metal mechanical fixings with the same or higher number of fixings, if metal fixings were used for testing,
- for the same type and number of fixings than those used for testing,

- for the same type of cladding element used in applications with open vertical joint ≤ tested value joint,
- for components of the same or lower amount of the same combustible materials or of the same or higher reaction to fire classification in accordance with EN 13501-1,
- for the same or lower number of the same type of internal layers of laminated glass with the same or lower thickness of these internal layers than tested,
- with the same or higher grade of compression of sealings than tested.

If the classification is the same, the test result of the lowest and highest thickness of the glass pane shall be valid, without test, for all the thicknesses in between. In other cases, 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.
Concerning the application rules for the frames and/or rails, the following shall apply:

- For all metal profiles containing organic components, a test specimen made out of a frame with the highest amount of organic components shall be used. The test result is valid also for all other frames of the same material with a lower amount of organic components made out of the same organic material.
- Frames made exclusively from materials classified as A1or A2 in accordance with the Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, do not require testing.
- For organic finishes apply the rule that all finishes of the same generic organic material family (wet painting or powder coating) with lower mass per unit area and PCS value are covered by the test result.
- The test result of a test with an aluminium frame shall be valid, without test, for the same type of glazing system used with 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.