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European Assessment Document for

Kit of polyurethane elements
for thermal insulation frame
around windows,
made of unplasticized
polyvinyl chloride profiles



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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) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

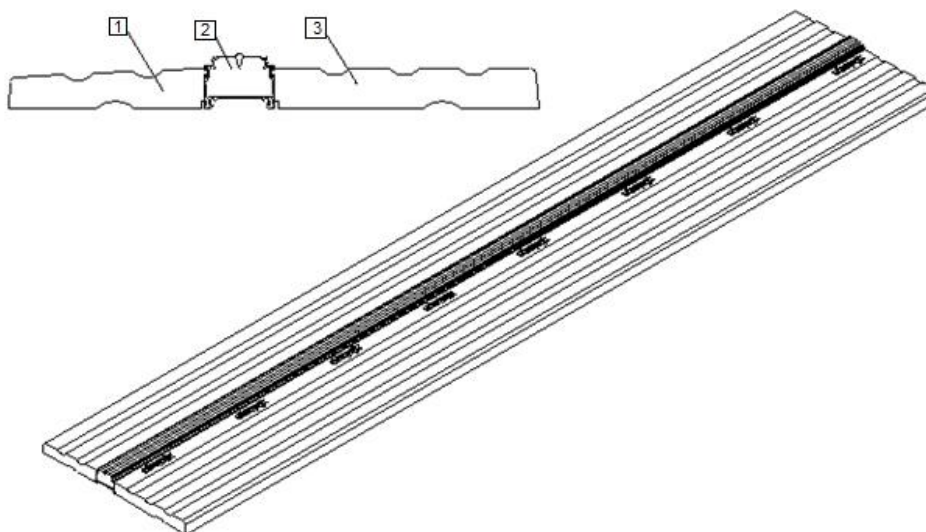
This EAD covers the kit of polyurethane elements for thermal insulation frame around windows made of unplasticized polyvinyl chloride (PVC-U) profiles (hereinafter referred to as kit of polyurethane elements for thermal insulation frame around the PVC-U windows). The kit covers the following components:

- The windowsill element consisting of rigid polyurethane foam and the lock made of PVC-U filled with rigid polyurethane foam (Figure 1.1.1).
- The lock made of PVC-U profile filled with rigid polyurethane foam (Figure 1.1.2). A shape of PVC-U profile allows to connect the lock with the window's frame and to connect the stacked locks. The stacked and connected locks are faced with covering elements made of magnesium oxide board (Figure 1.1.4).
- The side/top element (Figure 1.1.3) consisting of rigid polyurethane foam and the lock made of PVC-U filled with rigid polyurethane foam, partly faced with magnesium oxide board.

In the windowsill and side/top elements connection between the lock and polyurethane foam is factory-made. The lock may comprise the seal (gasket). The seal (gasket) is made of flexible polyurethane foam. The minimum density of rigid polyurethane foam is 80 kg/m³.

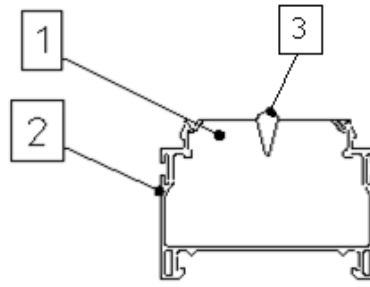
The lock is used to connect the windowsill and side/top elements with the members of the frame of PVC-U window during the installation. The lock is not responsible for mechanical resistance of connection between windowsill and side/top elements and the window frame. Mechanical resistance to loads caused by wind or impacts is provided by fixings which are not included in the EAD.

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



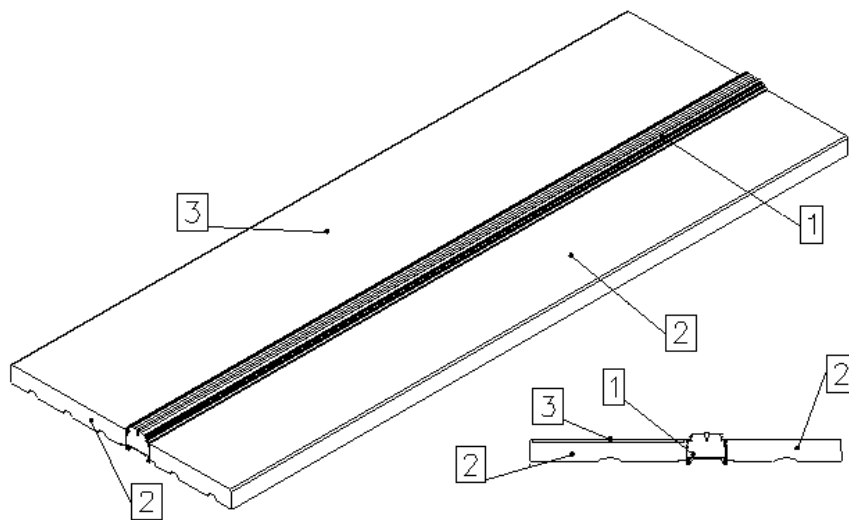
1, 3 – rigid polyurethane foam; 2 – the lock (Figure 1.1.2)

Figure 1.1.1. Windowsill element



1 – rigid polyurethane foam; 2 – PVC-U; 3 – the seal (gasket)

Figure 1.1.2. Lock with the seal (gasket)



1 – the lock (Figure 1.1.2); 2 – rigid polyurethane foam;
3 – magnesium oxide board

Figure 1.1.3. Side/top element (partly faced with magnesium oxide board)

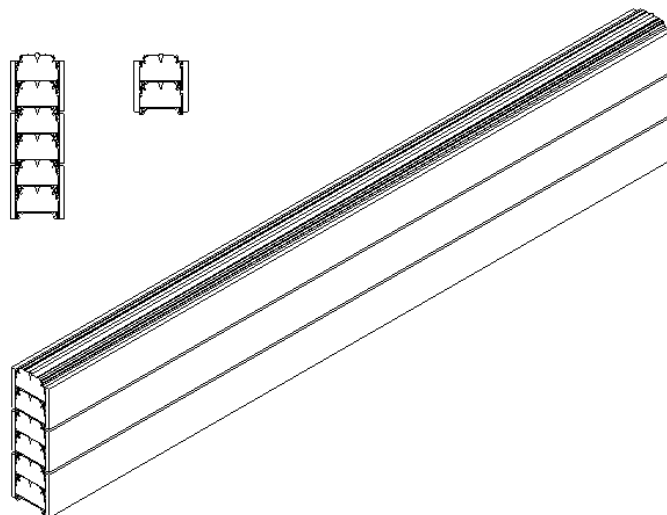


Figure 1.1.4. Example of stacked and connected locks with covering elements

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 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.

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

1.2.1 Intended use(s)

The product is intended to be used for a thermal insulation frame around the PVC-U windows (including PVC-U casement doors). The product shall be fixed directly to external walls of buildings, to be insulated afterwards with external thermal insulation composite system (ETICS). After installation the visible surface of the polyurethane elements shall be covered with a finishing layer in order not to be exposed to weather conditions.

Thermal insulation frame around the window consists of the windowsill element, the lock and side/top elements (Figures 1.2.1.1 and 1.2.1.2.b). Thermal insulation frame around the casement door consists of stacked and connected locks with covering elements and side/top elements (Figure 1.2.1.2.a).

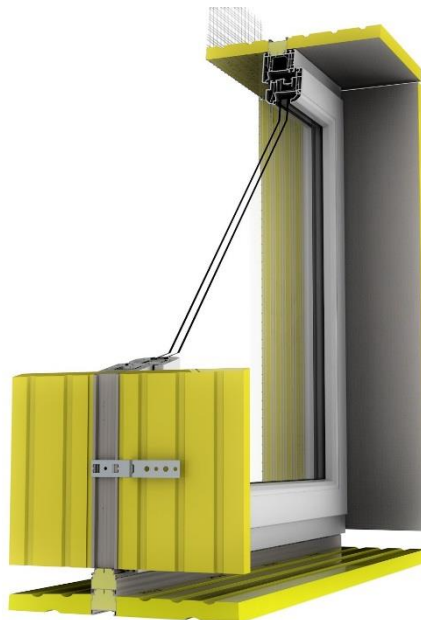
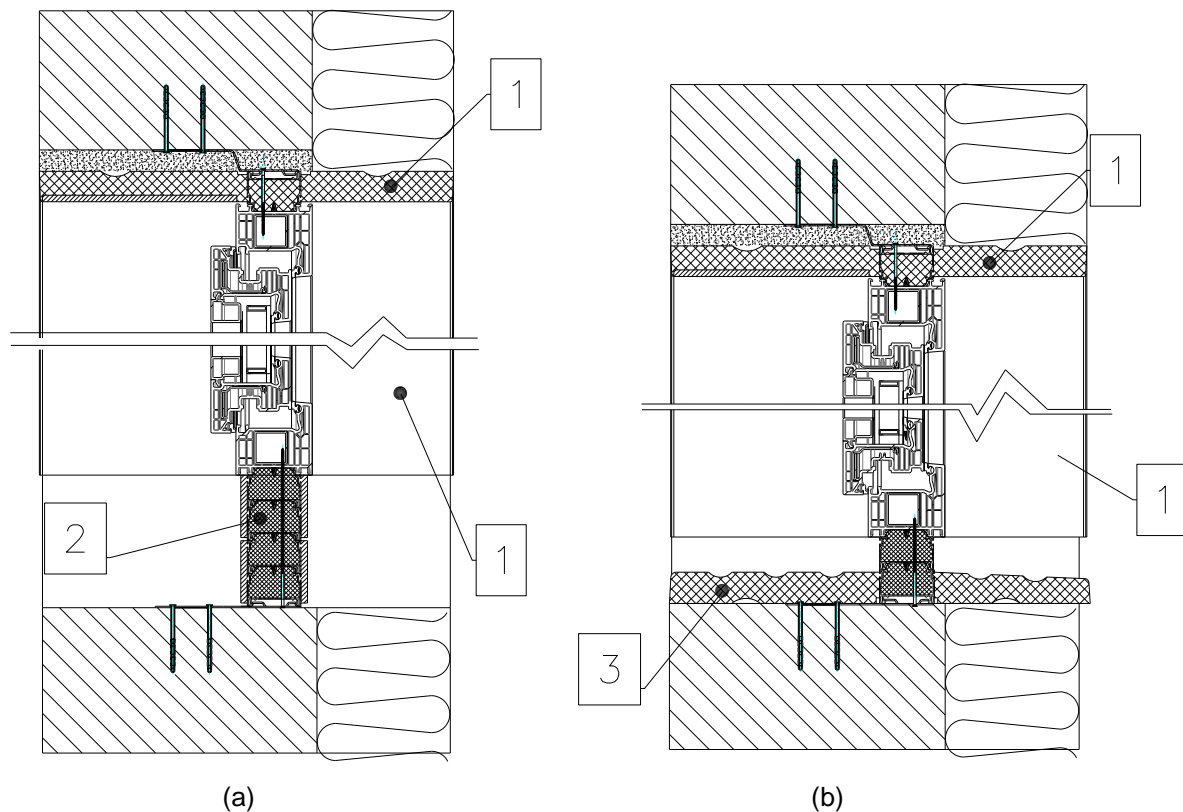


Figure 1.2.1.1. Example of thermal insulation frame around the PVC-U window



1 – side/top element; 2 – stacked locks with covering elements; 3 – windowsill element

Figure 1.2.1.2. Examples of cross sections of installed thermal insulation frame around the PVC-U casement door (a) and window (b)

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 kit of polyurethane elements for thermal insulation frame around the PVC-U windows for the intended use of 25 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, 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 works¹.

The indications given as to the working life of the construction product 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.

¹ 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.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

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

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the kit of polyurethane elements for thermal insulation frame around the PVC-U windows 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	Watertightness	2.2.2	class
3	Watertightness after exposure to high temperature	2.2.3	class
Basic Works Requirement 4: Safety and accessibility in use			
4	Compressive stress at 10 % deformation	2.2.4	level
5	Dimensional stability under specified temperature and humidity conditions	2.2.5	level
Basic Works Requirement 6: Energy economy and heat retention			
6	Thermal conductivity	2.2.6	level
7	Air permeability	2.2.7	level
8	Air permeability after exposure to high temperature	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.

Testing will be limited only to the essential characteristics which the manufacturer intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

2.2.1 Reaction to fire

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

Mounting and fixing rules indicated in Annex A shall be taken into account.

Reaction to fire class shall be stated in the ETA.

2.2.2 Watertightness

Watertightness of the connection between the polyurethane elements and PVC-U window frame shall be tested according to EN 1027, Method 1A. Testing shall be performed on specimen of completely assembled fixed window made of profiles matching the lock, installed in accordance with manufacturer's specification, without a waterproofing membrane, window sill and finishing layers. For the preparation of the test specimen the windowsill and side/top elements shall be used. Test result is valid for windows with overall area -100 % and +50 % as tested, made of profiles matching the lock. The result of the test carried out on two connected lock elements is valid for all combinations of assembly.

Watertightness shall be classified according to EN 12208.

2.2.3 Watertightness after exposure to high temperature

Watertightness of the connection between the polyurethane elements and PVC-U window frame shall be tested according to EN 1027, Method 1A, after exposure to high temperature. Testing shall be performed on specimen of completely assembled fixed window made of profiles matching the lock, installed in accordance with manufacturer's specification, without a waterproofing membrane, window sill and finishing layers. For the preparation of the test specimen the windowsill and side/top elements shall be used. Specimen shall be subject of 10 cycles of the following exposure:

- exposure in (65 ± 5) °C for 8 h,
- cooling in laboratory temperature for 16 h.

Test result is valid for windows with overall area -100 % and +50 % as tested, made of frame profiles matching the lock. The result of the test carried out on two connected lock elements is valid for all combinations of assembly.

Watertightness after exposure to high temperature shall be classified according to EN 12208.

2.2.4 Compressive stress at 10 % deformation

The assessment of the compressive stress at 10 % deformation is carried out by means of the assessment of the compressive stress at 10 % deformation of the rigid polyurethane foam of the polyurethane elements that are representative of this essential characteristic for the product.

Compressive stress at 10 % deformation of the rigid polyurethane foam shall be tested according to EN 826, on at least 6 specimens with the dimensions of 100 x 100 mm and original element thickness, cut from the same polyurethane element (not faced with magnesium oxide board). It means one testing series on 6 specimens for each thickness of polyurethane element shall be done. Specimens shall be prepared according to clauses 6.1 to 6.3 of EN 826 and conditioned according to clause 6.4 of EN 826. Specimens shall be compressed with constant speed of 6 mm/min.

The mean value of compressive stress at 10 % deformation, kPa, shall be stated in the ETA.

2.2.5 Dimensional stability under specified temperature and humidity conditions

The assessment of the dimensional stability under specified temperature and humidity conditions is carried out by means of the assessment of the dimensional stability under specified temperature and humidity

conditions of the rigid polyurethane foam of the polyurethane elements that are representative of this essential characteristic for the product.

The determination of the dimensional stability under specified temperature and humidity conditions of the rigid polyurethane foam shall be tested according to EN 13165, clause 4.3.2, under conditions $(70 \pm 2) ^\circ\text{C}$ and $(90 \pm 5) \%$ relative humidity, on at least 5 specimens with the dimensions of 200 x 200 mm and original element thickness, cut from the same polyurethane element (not faced with magnesium oxide board). It means one testing series on 6 specimens for each thickness of polyurethane element shall be done. Testing shall be performed after 24 h storage at $(70 \pm 2) ^\circ\text{C}$ and $(90 \pm 5) \%$ relative humidity.

The relative change in dimensions, %, in length, width and thickness shall be stated in the ETA.

2.2.6 Thermal conductivity

The assessment of the thermal conductivity is carried out by means of the assessment of the thermal conductivity of the rigid polyurethane foam of the polyurethane elements that are representative of this essential characteristic for the product.

Thermal conductivity at temperature of $10 ^\circ\text{C}$ of the rigid polyurethane foam shall be tested according to EN 13165, clause 4.2.1, Annex A, Annex C and EN 12667. Dimensions of test specimens shall be suitable for the dimensions of the test device listed in EN 12667. At least 10 measurements shall be performed.

The thermal conductivity at $23 ^\circ\text{C}$ and 50 % relative humidity, representing at least 90 % of the production with a confidence level of 90 % shall be determined according to EN 13165.

The thermal conductivity coefficient " λ_D ", W/(m·K), shall be stated in the ETA.

2.2.7 Air permeability

Air permeability of the connection between the polyurethane elements and PVC-U window frame shall be tested according to EN 12114. Testing shall be performed on specimen of completely assembled fixed window made of profiles matching the lock, installed in accordance with manufacturer's specification, without waterproofing membrane. For the preparation of the test specimen the windowsill and side/top elements shall be used. Test result is valid for windows with overall area -100 % and +50 % as tested, made of profiles matching the lock. The result of the test carried out on two connected lock elements is valid for all combinations of assembly.

Air volume coefficient " C ", $\text{m}^3/(\text{h}\cdot\text{Pa}^n)$, and leakage exponent " n " according to EN 12114 shall be stated in the ETA.

Additionally, the mean value of air permeability coefficient " a ", $\text{m}^3/[\text{hm}(\text{daPa})^{2/3}]$, shall be calculated and stated in the ETA.

The mean value of the air permeability coefficient " a " (at pressure differences Δp : 50, 100, 150, 200, 250 ... to 1000 Pa) shall be determined from the formula:

$$a = \frac{\dot{V}_0}{L \cdot (\Delta p)^{\frac{2}{3}}}$$

where:

a – air permeability coefficient, $\text{m}^3/[\text{hm}(\text{daPa})^{2/3}]$,

\dot{V}_0 – corrected air flow rate at reference conditions given in EN 12114, m^3/h ,

L – total length of contact line between the polyurethane elements and the window, m,

Δp – air pressure difference between the outside and inside, $\Delta p = 1 \text{ daPa}$.

2.2.8 Air permeability after exposure to high temperature

Air permeability of the connection between the polyurethane elements and PVC-U window frame shall be tested according to EN 12114, after exposure to high temperature. Testing shall be performed on specimen of completely assembled fixed window made of profiles matching the lock, installed in accordance with manufacturer's specification, without waterproofing membrane. For the preparation of the test specimen the windowsill and side/top elements shall be used. Specimen shall be subject to 10 cycles of the following exposure:

- exposure in (65 ± 5) °C for 8 h,
- cooling in laboratory temperature for 16 h.

Test results are valid for windows with overall area -100 % and +50 % as tested, made of profiles matching the lock. The result of the test carried out on two connected lock elements is valid for all combinations of assembly.

Air volume coefficient "C", $m^3/(h \cdot Pa^n)$, and leakage exponent "n" according to EN 12114 shall be stated in the ETA.

Additionally, the mean value of air permeability coefficient "a", $m^3/[hm(daPa)^{2/3}]$, shall be calculated and stated in the ETA.

The mean value of the air permeability coefficient "a" after exposure to high temperature shall be determined according to the formula given in clause 2.2.7.

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 1999/91/EC, as amended by Commission Decision 2001/596/EC.

The applicable AVCP 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 regarding reaction to fire are 1, 3 or 4 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.

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 samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Incoming raw materials	according to delivery documents	as laid down in control plan	as laid down in control plan	each delivery
2	Density of rigid polyurethane foam	EN 1602	as laid down in control plan	as laid down in control plan	once per batch
3	Compressive stress at 10% deformation of rigid polyurethane foam	2.2.4	as laid down in control plan	as laid down in control plan	once a year
4	Thermal conductivity of rigid polyurethane foam	2.2.6	as laid down in control plan	as laid down in control plan	once a year
5	Dimensions of polyurethane elements	size check	as laid down in control plan	as laid down in control plan	once per batch
6	Watertightness	2.2.2	as laid down in control plan	1	once every 3 years
7	Air permeability	2.2.7	as laid down in control plan	1	once every 3 years
8	Reaction to fire	EN ISO 11925-2	as laid down in control plan	as laid down in control plan	once a week
		EN ISO 1182 EN ISO 1716			once a year
		EN 13823			once every 2 years

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).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 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 <i>carried out by the manufacturer</i>					
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	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control <i>carried out by the manufacturer regarding the constancy of performing related to reaction to fire</i>					
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 as indicated in Table 3.2.1	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	once a year

4 REFERENCE DOCUMENTS

EN 826:2013	Thermal insulating products for building applications - Determination of compression behaviour
EN 1027:2016	Windows and doors - Watertightness - Test method
EN 1602:2013	Thermal insulating products for building applications - Determination of the apparent density
EN 12114:2000	Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method
EN 12208:1999	Windows and doors - Watertightness - Classification
EN 12667:2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance
EN 13165:2012+A2:2016	Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification
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 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN ISO 1182:2020	Reaction to fire tests for products - Non-combustibility test
EN ISO 1716:2018	Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value)
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Single-flame source test

ANNEX A: MOUNTING AND FIXING RULES FOR REACTION TO FIRE TESTS

A.1 General

This Annex provides for specific instructions on testing according to:

- EN ISO 11925-2 for determination of classes F and E,
- EN 13823 (SBI-test) for determination of classes D to A2.

A.2 Testing according to EN ISO 11925-2

A.2.1 Preparation of the specimens

Rigid polyurethane foam of the polyurethane elements and the lock equipped with the seal (gasket) shall be tested (the worst case).

Specimens for tests of the rigid polyurethane foam shall be prepared according to EN ISO 11925-2. The fire exposure shall be surface and edge exposure (Figure A.2.1.1). The specimens shall be tested without substrate (in a free-hanging arrangement). The rigid polyurethane foam shall be tested from one side.

Specimens for tests of the lock shall be prepared according to EN ISO 11925-2. The fire exposure shall be surface and edge exposure (Figure A.2.1.2). The specimens shall be tested without substrate (in a free-hanging arrangement). The lock shall be tested from the PVC-U profile side and from the seal (gasket) side.

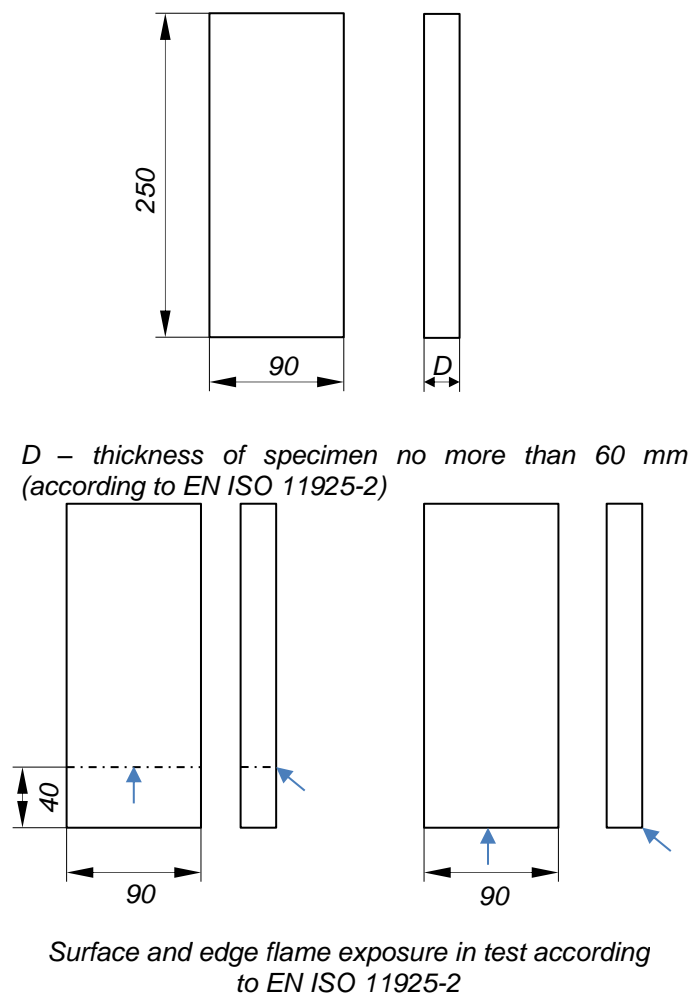
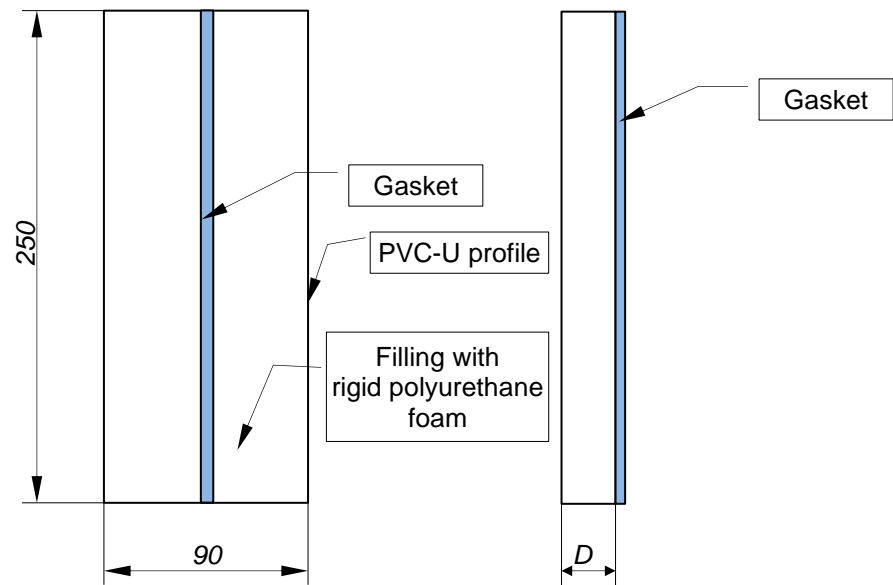
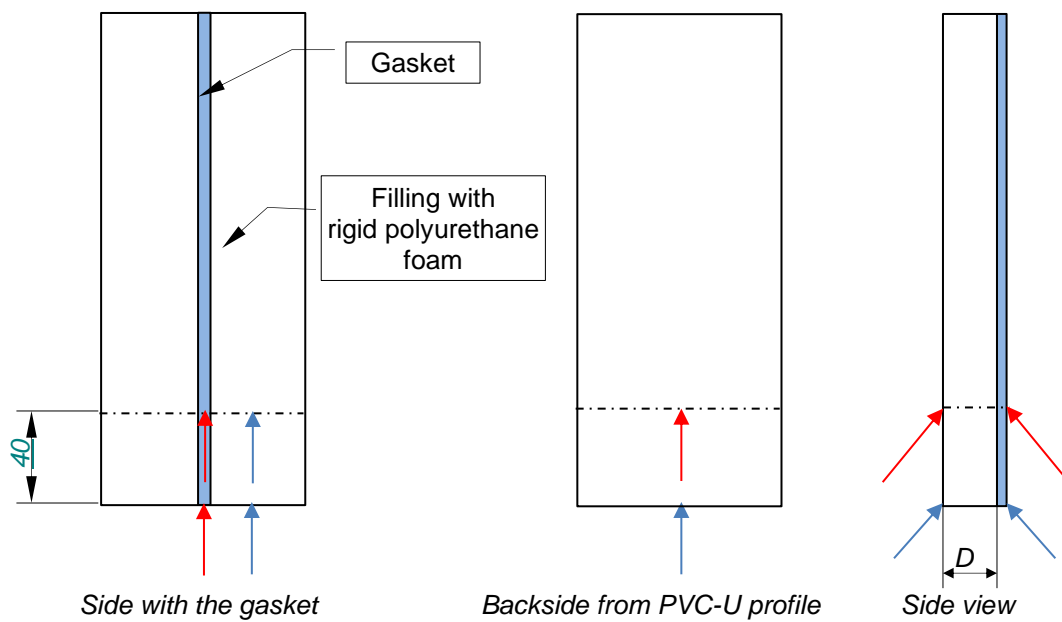


Figure A.2.1.1. Specimen dimensions and place of flame exposure for the rigid polyurethane foam (all dimensions are in mm)



D – thickness of specimen no more than 60 mm (according to EN ISO 11925-2)



Surface and edge flame exposure in test according to EN ISO 11925-2

Figure A.2.1.2. Specimen dimension and place of flame exposure for the lock (all dimensions are in mm)

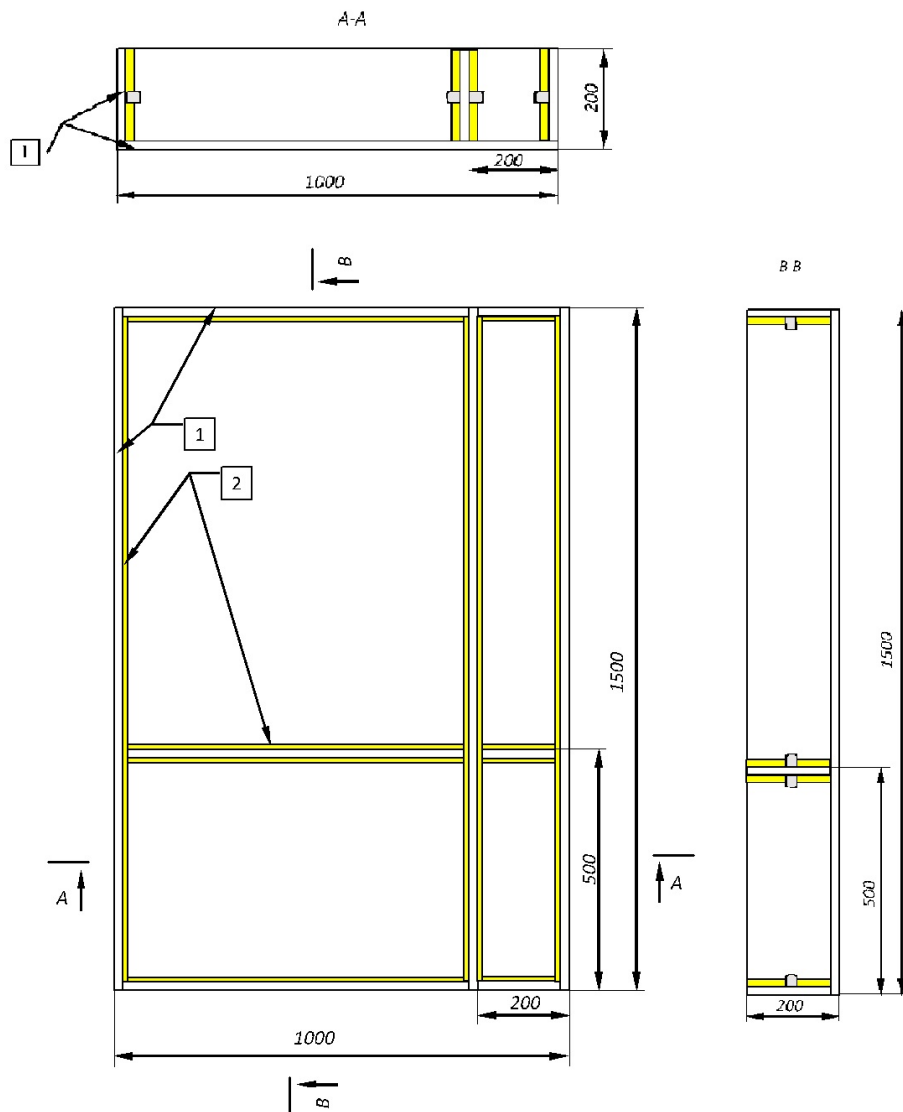
A.3 Testing according to EN 13823 (SBI-test)

A.3.1 Preparation of the specimens

Specimens for tests of the rigid polyurethane foam elements shall be prepared according to EN 13823 and Figure A.3.1.1. Corner specimen shall consist of two wings:

- long wing (according to Figure A.3.1.1) made of windowsill elements (without windows) fixed to calcium silicate board (substrate) according to EN 13823,
- short wing made of calcium silicate board according to EN 13823.

The thickness of a specimen shall be 200 mm. Windowsill elements with thickness higher than 200 mm shall be reduced to a thickness of 200 mm by cutting away rigid polyurethane foam symmetrically to the lock. Windowsill elements shall be fixed mechanically to a substrate (calcium silicate board).



- 1 – calcium silicate board (substrate)
2 – windowsill elements

Figure A.3.1.1. Long wing of specimen for SBI-test method
(all dimensions are in mm)

A.4 Field of application of test results

The results of tests are valid for:

- the same rigid polyurethane foam of the thermal insulation element as tested (also partly faced with magnesium oxide board),
- the same combination of PVC-U, rigid polyurethane foam and the seal (gasket) of the lock as tested,
- the same density of the rigid polyurethane foam with a tolerance of $\pm 10\%$ or alternatively, the whole range between the highest and lowest density evaluated in the tests, the same or higher thickness of the rigid polyurethane foam than tested.