EAD **040868-00-0404**

www.eota.eu

May 2018

European Assessment Document for

Rigid polyurethane foam elements for fastening attachment parts to external walls

The reference title and language for this EAD is English. The applicable rules of copyright refer to the document elaborated in and published by EOTA.

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 5

1.1 Description of the construction product 5

1.2 Information on the intended use(s) of the construction product 6
1.2.1 Intended use(s) 6
1.2.2 Working life/Durability 6

1.3 Specific terms used in this EAD 7
1.3.1 PUR elements 7
1.3.2 Symbols 7

2 Essential characteristics and relevant assessment methods and criteria 8

2.1 Essential characteristics of the product 8

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product 9
2.2.1 Reaction to fire 9
2.2.2 Swelling due to water absorption 10
2.2.3 Raw density of PU foam 10
2.2.4 Load bearing capacity 10
2.2.5 Influencing factors 12
2.2.6 Thermal resistance 14

3 Assessment and verification of constancy of performance 15

3.1 System(s) of assessment and verification of constancy of performance to be applied 15

3.2 Tasks of the manufacturer 16

3.3 Tasks of the notified body 18

4 Reference documents 21

Annex A: ASSEMBLY SCENARIO 23

Annex B: Test configuaration heavy-load elements 25

Annex C: Test Of supporting brackets elements 26

Annex D: Test Of supporting brackets elements 27

1 SCOPE OF THE EAD

1.1 Description of the construction product

The rigid polyurethane foam (PUR) elements for fastening attachment parts to external walls, e.g., with external thermal insulation composite systems or other facade systems (in the following referred to as PUR elements) are made of PUR with optional integrated reinforcements made of steel, polyamide or aluminium elements. At the surface of the PUR elements pressure distributions plates made of high-pressure laminates or aluminium can be placed. The fixings products will be described in the ETA. The assessment of the load behaviour of the achoring in the substrate is not part of this EAD.

The PUR elements, single or multi-sectional units, can be shaped in different forms like cuboid, cylindrical or angular design.

The PUR elements can be allocated in the following two construction product families:

a) Heavy-load elements (Figure A.3 in Annex A)
   - Ashlar element with the following dimensions:
     length: up to 300 mm, width: up to 300 mm, thickness: minimum of 60 mm
   - Cylinder element with the following dimensions:
     diameter up to 200 mm, height: minimum of 60 mm

   Possible inserts: pressure distribution plates made of high-pressure laminate (HPL)

b) Supporting bracket elements (Figures A.1 and A.2 in Annex A)
   - Bracket element with the following dimensions:
     shaft length: up to 350 mm, bracket width: up to 150 mm, leg length (type): up to 300 mm

   Possible inserts: steel sheet, aluminium plates for fixation of the attachment, pressure distribution plates made of HPL.

The product is not covered by a harmonised European standard (hEN). EN 13165[1] covers only PUR-products which are used for thermal insulation of buildings and not for load-bearing capacity. EN 13165 does not include inlay reinforcements of PUR-products as well as characteristics in combination with fasteners. Therefore, the set of essential characteristics as well as the assessment methods differ from this standard significantly.

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 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.

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

1.2.1 Intended use(s)

PUR elements are used for the low thermal bridging fixation of primarily static loads from attachment parts such as awnings, canopies, stairways, railings, window blinds and sun protection elements on external walls, e.g., with external thermal insulation composite systems (ETICS) or other façade systems. Two types of the PUR elements are covered by this EAD: heavy-load elements and supporting bracket elements. The intended use for the heavy-load elements is the fixation of awnings, canopies and stairways and the support bracket elements are intended to be used for the fixation of railings, window blinds, sun protection elements. The heavy-load elements can be installed vertically or horizontally (Figure A.3 in Annex A). The fixation area for the supporting bracket elements can be on the long side of or on the face of the cantilever leg (Figures A.1 and A.2 in Annex A).

The product is directly fixed to external walls of buildings (usually in external walls with ETICS or in other facade systems). The products are factory-made and assembled on site with appropriate anchoring elements on a load-bearing substrate. For the anchoring the prefabricated holes in the PUR elements are used to secure the load transfer. The assessment of the load-bearing capacity of the anchoring in the substrate is not part of the EAD. The PUR elements are fixed with their entire surface on a flat, solid, load-bearing outer substrate.

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 PUR elements 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 works[2].

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.

[2] 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 PUR elements

The PUR Elements are made of Polyurethane (PUR) and will be installed on external walls. They are intended to be used for the low thermal bridging fixation of primarily static loads from attachment parts. The PUR Elements are determined for transfer of horizontal and/or vertical load from attachment parts into external walls.

1.3.2 Symbols

Symbol	Quantity	Unit
G	Swelling due to water absorption	[%]
ρ	Raw density of PU foam	[g/cm³]
F_{tens} / $F_{T,axia}$ / $F_{T,later}$	Load-bearing capacity under tensile load	[kN; N]
F_{compr} / $F_{C,/axi}$ / $F_{c,lateral}$	Load-bearing capacity under pressure load	[kN; N]
F_{shear}	Load-bearing capacity under shear load	[kN; N]
$F_{45°}$	Load-bearing capacity under transverse tension load	[kN; N]
F_{torque}	Load-bearing capacity under bending torque load	[kN; N]
$F_{pull-through}$	Pull-through resistance of the anchors	[kN; N]
F_{bstabi} / F_{bstab}	Embedment strength of the anchorage area	[kN; N]
A	Influencing factors	[-]
U	Thermal resistance	U [W/m²K]

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 PUR elements 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 4: Safety and accessibility in use			
2	Swelling due to water absorption	2.2.2	level G [%]
3	Raw density of PU foam	2.2.3	level ρ [g/cm³]
4	Load-bearing capacity - under tensile load - under pressure load - under shear load - under transverse tension load - under bending torque load - Pull-through resistance of the anchors - Embedment strength of the anchorage area	2.2.4 2.2.4.1 2.2.4.2 2.2.4.3 2.2.4.4 2.2.4.5 2.2.4.6 2.2.4.7	level F_{tens} / $F_{T,axia}$ / $F_{T,later}$ [kN; N] F_{compr} / $F_{C,/axi}$ / $F_{c,lateral}$ [kN; N] F_{shear} [kN; N] $F_{45°}$ [kN; N] F_{torque} [kN; N] $F_{pull-through}$ [kN; N] F_{bstabi} / F_{bstab} [kN; N]
5	Influencing factors - Aspects of temperature - Chemical and biological stresses - UV radiation - Climatic stresses - Aspects of pulsating/alternating load influences - Short-term creep behaviour - Long-term creep behaviour - Creep rupture behaviour	2.2.5 2.2.5.1 2.2.5.2.1 2.2.5.2.2 2.2.5.2.3 2.2.5.3 2.2.5.4.1 2.2.5.4.2 2.2.5.4.3	level $A_{1,-20°C}$ / $A_{1,+80°C}$ [-] $A_{2,C}$ / $A_{2,B}$ [-] A_3 [-] A_4 [-] $A_{5,W}$ / $A_{5,T}$ [-] A_6 [-] A_7 [-] A_8 [-]
Basic Works Requirement 6: Energy economy and heat retention			
6	Thermal resistance	2.2.6	U [W/m²K

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.

2.2.1 Reaction to fire

The PUR elements shall be tested using the test method(s) being relevant for the corresponding reaction to fire classes according to EN 13501-1. The products shall be classified according to Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

For purposes of testing and assessment of the PUR elements (with and without optional integrated reinforcements and pressure distribution plates) the provisions of EN 15715, clause 5 as well as tables A.6 and A.7, shall be considered for mounting and fixing of the test specimens and the application of test results, but with the following deviations and additions due to the specific nature of the PUR element and the optionally integrated components:

- For testing purposes, the PUR elements shall be cut to cuboid pieces to be used for preparing the test specimens.

- For tests according to EN 13823 (SBI) the specimens shall be built-up with a sufficient number of these cut pieces which are placed side by side with butt joints on a representative substrate according to EN 13238. The standard joint configuration as prescribed in the test standard shall (at least one vertical and one horizontal joint on the long wing of each specimen) be taken into account.

- PUR elements without and with integrated reinforcement shall be tested separately, whereby specimens with a reinforcement made of polyamide also cover elements with reinforcement made of aluminium or steel. Specimens with a reinforcement made of aluminium also cover elements with a reinforcement made of steel. The reinforcement made of polyamide shall be considered in each specimen piece with its highest weight (in percentage) related to the weight of the PUR elements.

- PUR elements without and with pressure distribution plate on the surface shall be tested separately, whereby in the latter case both variants of the pressure distribution plate (HPL and aluminium) shall be tested (due to their different thickness and behaviour in case of fire). The distribution plate shall be positioned on the fire-exposed surface of the specimens.

- The necessary tests according to EN ISO 11925-2 shall be performed with edge exposure as well as with surface exposure on the front surface of the specimens. In addition, PUR elements with a distribution plate shall also be tested in specimens turned 90 degrees on their vertical axis with edge exposure in the middle of the PUR layer as well as on the transition between distribution plate and PUR foam.

The results of tests considering all these provisions are valid for products with:

- applications on those substrates as represented by the substrate(s) used in the tests according to the provisions given in EN 13823,

- the tested composition(s) of PU foam, polyamide reinforcement and HPL distribution plate only (as defined by a certain combination of raw materials and a certain type of production process),

- the tested thickness of the PU foam of the PUR elements or the range between highest and lowest thickness evaluated in the tests,

- the tested type of a pressure distribution plate only,

- the tested thickness of an HPL distribution plate or the range between highest and lowest thickness evaluated in the tests,

- the same or higher thickness of a distribution plate made of aluminium than the tested thickness,

- the tested density (± 10% tolerance) of the PU foam as well as of the HPL distribution plate (where relevant) or the range between highest and lowest density of these components evaluated in the tests,

- for all three variations of reinforcement, if tested with a polyamide reinforcement, with the same or lower weight of a polyamide reinforcement than tested (in percentage per mass related to the weight of the PUR elements) and with any higher weight of a metal reinforcement (in percentage per mass related to the weight of the PUR elements) than tested,

- for metal reinforcements only, if tested with an aluminium reinforcement, with the same or higher weight (in percentage per mass related to the weight of the PUR elements) than tested.

The obtained reaction to fire class of the PUR element shall be stated in the ETA together with those conditions (cf. list of parameters before) for which the given classification is valid.

2.2.2 Swelling due to water absorption

The test shall be conducted as per EN 317 at a water temperature of 23 ± 2 °C over 28 days. In each case, at least 5 test specimens shall be completely immersed in water. In deviation to EN 317, the test shall be carried out on the whole element. Before and after the test period, the dimensions length, width and thickness (see as example Figure A.3, A1/A2, B and C), height and diameter for cylindrical elements or all dimensions characterising an angular-shaped element shall be determined. The swelling G [%] of all those dimensions shall be indicated in the ETA.

2.2.3 Raw density of PU foam

The determination of the raw density shall be conducted for at least 5 test specimens as per EN 1602. The minimum, maximum and the mean value of the raw density shall be indicated in the ETA.

2.2.4 Load bearing capacity

The following conditions apply unless otherwise specified in the corresponding subchapters.

All tests shall be carried out in the standard atmosphere (temperature 23±3 °C / relative humidity 50±5 %). For each test series the ultimate failure loads shall be submitted to a statistical analysis and the characteristic values shall be determined according to EN 1990, Table D1, V_x unknown.

The test of the heavy-load elements shall be conducted on vertically and horizontally installed heavy-load elements as per Figure A.3 in Annex A. The failure load (significant load drop) is

- the load at which a load drop can be ascertained accompanied by an increase in deformations which is related to the situation were a partial failure is occurred in the element (this load shall be considered decisive, even if the load rises again after that) or

- the load at which the test object clearly breaks (if no drop of load as given above occurred before break).

Generally, the failure load always corresponds to the maximum load determined in the tests according to the force acting in each direction.

The variation coefficient shall be based on the standard deviation of the logarithmic values and shall be recorded. If not specified otherwise in the following subclauses, at least 5 tests shall be performed (for 2.2.4.1 to 2.2.4.5).

The deformations shall be measured in load direction at the load application point. The force shall be exerted at a speed of 5 mm/min and the test equipment shall be in accordance with EAD 090062-01-0404, Annex L, Clauses L.1 and L.2. The test configuration and the deflection curve shall be recorded.

Test setups are shown in Annexes B, C and D.

The precise description of the anchoring (number, dimension, material) and the installation scenarios of the PUR elements on the substrate and the fastening (number, dimension, material) of the attachments to the PUR elements shall be defined in the ETA process. The type of anchoring and the number of fastening according to the test conditions (installation scenarios, embedment depth of the screw) shall be recorded in the ETA.

2.2.4.1 Load-bearing capacity under tensile load

Tests of the tensile load capacity shall be carried out for every PUR element according to the assessment method as described under clause 2.2.4. The tensile load capacity (F_{tens} / $F_{T,axia}$ / $F_{T,later}$) of the PUR elements shall be indicated in the ETA (see Annex B, Figure B.1, and Annex C, Figures C.1 and C.2).

2.2.4.2 Load-bearing capacity under pressure load

The pressure tests shall be conducted as per EN ISO 604 for fully contacted load transmission. For this purpose, the test specimens and the test setup shall be selected in accordance with Annexes B and C under pressure load. The pressure shall be transmitted via "Adapter (binding to testing machine)" as of Figure B.1.

In case of partial load transmission (over the fixation element) the test shall be conducted as the examples of test configuration show in Annex C. The pressure shall be transmitted via "Screw" as of Figures C.1 and C.2 of Annex C (point load transmission).

A loading speed of 5 mm/min shall be used. The tests shall be performed to determine the failure under the load as descripted. In case that the installation scenario leads to a cantilever of the wing (general intended use of the product) this scenario shall be tested.

The load-bearing capacity under pressure load in kN or N shall be indicated in the ETA.

2.2.4.3 Load-bearing capacity under shear load

The test shall be conducted in analogy to the tensile load capacity described in clause 2.2.4.1, except that shear force is applied. The load-bearing capacity under shear load shall be indicated in the ETA (see Annex B, Figure B.2, and Annex C, Figures C.3 and C.4).

2.2.4.4 Load-bearing capacity under combined tension and shear load

The test shall be conducted in analogy to the tensile load capacity described in clause 2.2.4.1, except that a tensile force with an angle of 45° is applied (example in Annex B, Figure B.3). The load-bearing capacity under transverse tension load shall be indicated in the ETA.

2.2.4.5 Load-bearing capacity under bending torque load

Tests shall be carried out for every bracket/family as per Annex B, Figure B.4. The load-bearing capacity under bending torque load shall be indicated in the ETA.

2.2.4.6 Pull-through resistance of the anchors

The aim of this test is to check whether the anchoring elements used for fixation to the substrate are being pulled through the PUR-material. At least 3 test specimens shall be tested in normal climatic conditions as per example of Annex D, Figure D.1. If the test failed because no pull-through failure occurred it shall be repeated with, where relevant, amended mounting and fixing of the specimen in the test apparatus. The load-bearing capacity of the pull-through resistance shall be indicated in the ETA.

2.2.4.7 Embedment strength of the anchorage area

The load-bearing capacity of the embedment strength of the PUR elements shall be determined. At least 3 test specimens shall be tested in normal climatic conditions as per Clause 2.2.4 and Annex D, Figures D.2 and D.3. The load-bearing capacity shall be indicated in the ETA.

2.2.5 Influencing factors

The following conditions apply unless otherwise specified in the corresponding subchapters.

All tests listed under clause 2.2.4 are performed with short-term loads and under standard atmosphere (temperature 23±3 °C / relative humidity 50±5 %). As regards to the assessment of load-bearing capacity for the PUR elements it will also be necessary to test the long-term behaviour under conditions and environmental influences that ETICS are commonly exposed to. The kit tested shall be described in the ETA.

The test shall be carried out at least with the most unfavourable/critical element according 2.2.4.1 - 2.2.4.4 and it shall be given in the ETA which element has been used for the assessment. The influencing factors A [-] (quotient of the results of short-term test and the results after the influences test (2.2.5.1-2.2.5.4)) shall be determined as a dimensionless value. Tests shall be performed on at least 3 specimens according to methods presented in clause 2.2.4 and the results are expressed as ratio between “result according to clause 2.2.4” and “result after exposure per relevant subclause of clause 2.2.5”. The result, therefore, is a dimensionless value. After all the following influences shall be taken into account:

- temperature -20 °C / +23 °C / +80 °C with tolerance of ±3 °C
- ageing and environmental influences
- pulsating/alternating load
- time dependent exposure

2.2.5.1 Aspects of temperature

The significant temperature-dependent changes for the plastic at -20 °C / +23 °C / up to +80 °C shall be tested. Therefore, the load-bearing capacity (for the main stress) under standard condition shall be compared with the load-bearing capacity at -20±3 °C °C and +80±3 °C °C (surface temperature of the element at beginning of the test) in order to determine the impact of temperature. The temperature related influencing factor $A1_{,-20°C}$ and $A_{1,+80°C}$ of the PUR elements shall be indicated in the ETA.

2.2.5.2 Ageing and environmental influences

2.2.5.2.1 Chemical and biological stresses

The influence of chemical strain from substances in atmosphere and cleaning agents as well as biological resistance shall be indicated together with the assessment method in the ETA.

To assess the chemical and biological attack, the Technical Assessment Body shall use the assessment methods as given in EN ISO 846 for biological attack (the method used shall be indicated in the ETA); for chemical attack EN ISO 175 shall be used as reference method or, alternatively, ISO 4433-1. The chemical and biological influencing factors $A_{2,C}$ and $A_{2,B}$ of the PUR elements shall be indicated in the ETA.

2.2.5.2.2 UV radiation

The exposure to ultraviolet radiation shall be determined according to EN ISO 4892-1 as reference method or, alternatively, EN ISO 877-3, and shall be indicated together with the assessment method in the ETA.

To determine the effect of the damage caused by the UV influence, one of the tests in accordance with Annexes B or C (the tests used shall be indicated), as relevant, shall be carried out after exposure to determine the influencing factor. The UV radiation influencing factor A_3 of the PUR elements shall be stated in the ETA.

2.2.5.2.3 Climatic stresses

For the simulation of climatic stresses with 10 alternating freeze/thaw cycles, the test specimens of storage under changing climate conditions shall be subjected to the following cycles with tolerance of ±3 °C:

- 72 h water storage at 23°C.
- 24 h frozen at -20 °C
- 72 h dry at 80 °C

In the last cycle, the drying shall be omitted and a tensile strength test as described in clause 2.2.4.1 shall be tested after thawing (24 h under standard atmosphere (temperature 23±3 °C / relative humidity 50±5 %). The influencing factor A_4 of the PUR elements shall be indicated in the ETA.

2.2.5.3 Aspects of pulsating/alternating load influences

The influence to the tensile load-bearing after 10000 load cycles of tensile-dynamic (pulsating) loading with 0,2 to 0,5 times of the characteristic load-bearing capacity under tensile load (the more critical case between wind pressure according to 2.2.4.2 or wind suction according to 2.2.4.1 shall be tested) at a frequency of 2 to 6 Hz shall be determined. The displacement shall be measured during the first loading up to max N (0,5 times of the characteristic load-bearing capacity) and either continuously or at least after 1, 10, 100, 1000 and 10000 load cycles. The influencing factor $A_{5,w}$ of the PUR elements as well as the related test shall be indicated in the ETA.

In accordance with the intended use as indicated by the manufacturer, which might involve cases where the elements are exposed to repeated deflection due to thermal elongation of the attached construction, the influence on the load-bearing capacity shall be determined by applying 10000 load cycles of alternating loads with minimum of 1 mm and maximum of 3 mm used as reference method or, alternatively, with the corresponding minimum and maximum deflection according by the manufacturer. The influencing factor of the pulsating load $A_{5,T}$ of the PUR elements as well as the minimum and maximum deflection and the test setup shall be indicated in the ETA.

2.2.5.4 Aspects of time dependent exposure

2.2.5.4.1 Short-term creep behaviour

The PUR elements shall be tested in normal climatic conditions (temperature 23±3 °C / relative humidity 50±5 %). Approximately 30 % of the maximum force (maximum single force) determined in 2.2.4 shall be applied as constant load. After applying the load, the deformation(s) shall be measured after one hour s(1h) and after 24 hours s(24h). The characteristic short-term creep deformation (1h) and the creep tendency s(24h)/s(1h) shall be determined. The short-term creep behaviour related influencing factor A_6 for one hour of the PUR elements shall be indicated in the ETA.

2.2.5.4.2 Long-term creep behaviour

The PUR elements shall be tested in normal climatic conditions ((temperature 23±3 °C / relative humidity 50±5 %).). Approximately 30 % of the maximum force (maximum single force) determined in 2.2.4.1 - 2.2.4.7 shall be applied as the load. Over a period of at least 2000 h, the deformation shall be measured in logarithmically equidistant time intervals. The measured results of the individual trials shall be represented in a double logarithmic time-deformation curve. The characteristic creep deformation shall be determined with a linear extrapolation of this curve to one week, three months and 25 years as per EAD 220089-00-0401, Annex C. The long-term creep behaviour related influencing factor A_7 for one week, three month and 25 years of the PUR elements shall be indicated in the ETA.

2.2.5.4.3 Creep rupture behaviour

The test shall be conducted in analogy to the long-term creep behaviour. The load shall begin, however, at 95 % of the determined maximum force (maximum single force) determined in clauses 2.2.4.1 - 2.2.4.7. If rupture of the specimens occurs, the load shall be reduced, and the test shall be carried out again on other PUR elements. The load shall be reduced (e.g., in steps of 10 %) until a lifetime of at least 2000 h is achieved. The measured results of the individual trials shall be represented in a double logarithmic time-breaking load curve. The characteristic breaking load shall be determined with a linear extrapolation of this curve to one week, three months and 25 years as per EAD 220089-00-0401, Annex C. The creep rupture behaviour related influencing factor A_8 for one week, three month and 25 years of the PUR elements shall be indicated in the ETA.

2.2.6 Thermal resistance

The thermal conductivity shall be determined according to EN 13165, clauses 4.2.1 and 5.3.2, on samples of PUR foam whose density corresponds to the density in the finished fastening element and for which the foaming direction corresponds to the later main heat flow direction in the application. The dimensions and thicknesses of the specimens shall meet the requirements specified in the standard.

In the ETA, the thermal conductivity λ_D shall be stated in accordance with EN 13165, clause 4.2.1.

For PUR elements with optional inlaying reinforcements of steel, polyamide or aluminium elements, the thermal conductivity of the inlaying material shall be specified in addition, using the tabulated thermal conductivity according to EN ISO 10456, Table 3.

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 2003/640/EC.

The system is 2+ for any use except for uses subject to regulations on reaction to fire performance.

For uses subject to regulations on reaction to fire the applicable AVCP systems 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	Dimension and weights - for all components of the product and for the finished product	Measuring instruments and gauge	As defined in the control plan	3	per start / midterm / end of production batch or each delivery
2	Raw density of PU foam	EN 1602	As defined in the control plan	3	Initial start of the production and every batch and each delivery
3	Inlaying reinforcements of metallic materials - approval certificate 3.1 according to EN 10204	EN 10204	As defined in the control plan	1	each delivery
4	Inlaying reinforcements of polyamide materials – density according EN ISO 1183-1; residue on ignition according EN ISO 1172; tensile strength according EN ISO 527-2	EN ISO 1183-1 EN ISO 1172 EN ISO 527-2	As defined in the control plan	3	per start / midterm / end of production batch or each delivery; residue on ignition: Initial start of production and every year
5	Mechanical properties of the HPL pressure distribution plates	Checking DoP of HPL	The declared performances shall satisfy the requirements for compact laminates for external wall claddings of the type EDF or EGF as per EN 438-6. The flexural strength, flexural strength module (mean value, as well as the raw density (mean value), are to be controlled based on the declaration of performance according to EN 438-7	1	each delivery
6	Thermal conductivity of PU foam	EN 12667	As defined in the control plan	3	Initial start of production and every year
7	Reaction to fire	Indirect: See lines 1 and 2	As defined in the control plan	See lines 1 and 2	Every batch

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
		EN ISO 11925-2 direct: 2.2.1	As defined in the control plan	1	Initial start of production and every 2 years
8	Swelling due to water absorption	2.2.2	As defined in the control plan	1	Initial start of production and every year
9	Tensile test of finished PUR elements	2.2.4.1	As defined in the control plan	1	per start / midterm / end of production batch / minimum every 250th PUR element
10	Long-term creep behaviour of finished PUR elements	2.2.5.4.2	As defined in the control plan	1	Initial start of production and every 500th PUR element

3.3 Tasks of the notified body

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 and 3.3.2.

Table 3.3.1 Control plan for the notified body; cornerstones (under AVCP System 2+ - for all essential characteristics with the exception of reaction to fire)

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 *(for systems 1+, 1 and 2+ only)*					
1	Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer considering the constancy of performances of the product defined in the Control Plan	Verification of the complete FPC, to be implemented by the manufacturer	As defined in the control plan	-	Initial inspection (when starting the production)
Continuous surveillance, assessment and evaluation of factory production control *(for systems 1+, 1 and 2+ only)*					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer considering the constancy of performances of product defined in the Control Plan	Verification of the controls carried out by the manufacturer on the raw materials, on the process and on the product as indicated in Table 3.2.1	As defined in the control plan	-	Twice per year

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 actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for rigid polyurethane foam (PUR) elements for fastening attachment parts in external thermal insulation composite systems or other facades are laid down in table 3.3.2.

Table 3.3.2 Control plan for the notified body; cornerstones (under AVCP system 1 – for reaction to fire)

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					
2	The notified body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of the product covered by the European Technical Assessment, taking especially into account a limiting of organic material, the addition of fire retardants and/or another clearly identifiable stage in the production process which results in the improvement of the reaction to fire classification. In particular the following items shall be appropriately considered – presence of suitable test equipment – presence of trained personnel – the suitability of the factory production control established by the manufacturer – full implementation of the prescribed test plan	Verification of the complete FPC related to reaction to fire, to be implemented by the manufacturer	As defined in the control plan	-	Initial inspection (when starting the production) or after modifications

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Continuous surveillance, assessment and evaluation of factory production control					
3	It shall be verified that the system of factory production control and the specified manufacturing process are maintained, taking into account a limiting of organic material, the addition of fire retardants and/or another clearly identifiable stage in the production process which results in the improvement of the reaction to fire classification. In particular the following items shall be appropriately considered: – Inspection of factory, of the production of the product and of the facilities for factory production control – Evaluation of the documents concerning factory production control – Issuing a report of surveillance	Verification of the controls carried out by the manufacturer regarding reaction to fire on the raw materials, on the process and on the product as indicated in Table 3.2.1	As defined in the control plan	-	Once per year

4 REFERENCE DOCUMENTS

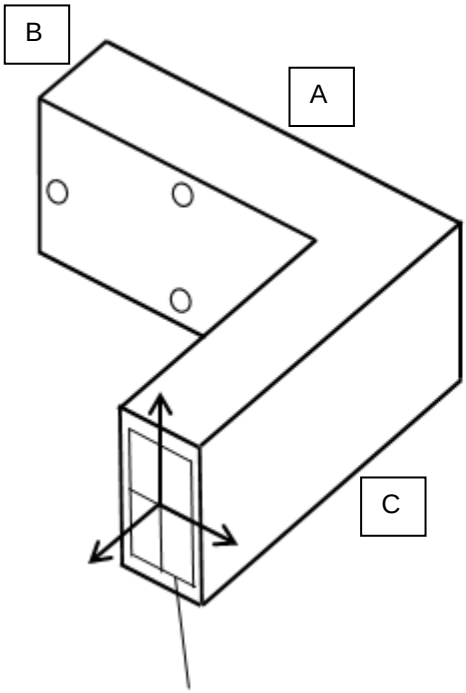
EAD 220089-00-0401	Self-supporting translucent roof kits with covering made of plastic sheets
EAD 090062-00-0404	Kits for external wall claddings mechanically fixed
EN 317:1993	Particleboards and fibreboards; determination of swelling in thickness after immersion in water
EN 438-6:2016	High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called laminates) - Part 6: Classification and specifications for Exterior-grade compact laminates of thickness 2 mm and greater
EN 438-7:2005	High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called laminates) - Part 7: Compact laminate and HPL composite panels for internal and external wall and ceiling finishes
EN 1602:2013	Thermal insulating products for building applications - Determination of the apparent density
EN 1990:2023	Eurocode: Basis of structural design
EN 10204:2004	Metallic products - Types of inspection documents
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 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13165:2012+A2:2016	Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products – Specification
EN 13238:2010	Reaction to fire tests for building products – Conditioning procedures and general rules for selection of substrates
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
EN 15715:2009	Thermal insulation products – Instructions for mounting and fixing for reaction to fire testing – Factory made products
EN ISO 175:2010	Plastics - Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:2010)
EN ISO 527-2:2012	Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)
EN ISO 604:2003	Plastics - Determination of compressive properties (ISO 604:2002)
EN ISO 846:2019	Plastics - Evaluation of the action of microorganisms (ISO 846:2019)
EN ISO 877-3:2018	Plastics - Methods of exposure to solar radiation - Part 3: Intensified weathering using concentrated solar radiation (ISO 877-3:2018)
EN ISO 1172:2023	Textile-glass-reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral-filler content using calcination methods (ISO 1172:2023)

EN ISO 1183-1:2019	Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019)
EN ISO 4892-1:2016	Plastics - Methods of exposure to laboratory light sources - Part 1: General guidance (ISO 4892-1:2016)
EN ISO 6946:2017	Building components and building elements - Thermal resistance and thermal transmittance - Calculation methods (ISO 6946:2017)
EN ISO 10211:2017	Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations (ISO 10211:2017)
EN ISO 10456:2007+AC:2009	Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007 + Cor. 1:2009)
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)
ISO 4433-1:1997	Thermoplastics pipes - Resistance to liquid chemicals - Classification - Part 1: Immersion test method

ANNEX A: ASSEMBLY SCENARIO

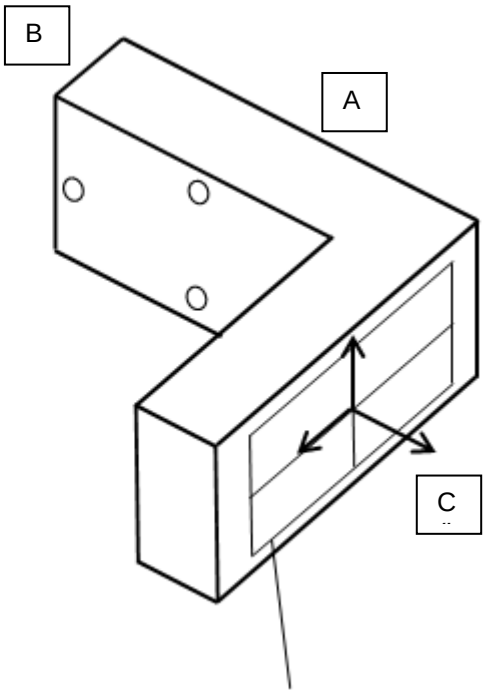
Supporting brackets elements - shaft length (A): up to 350 mm, bracket width (B): up to 150 mm, leg length (C) (type): up to 300 mm

The intended use for the support bracket elements is the fixation of railings, window blinds, sun protection elements.



Fixing area on the face

Figure A.1



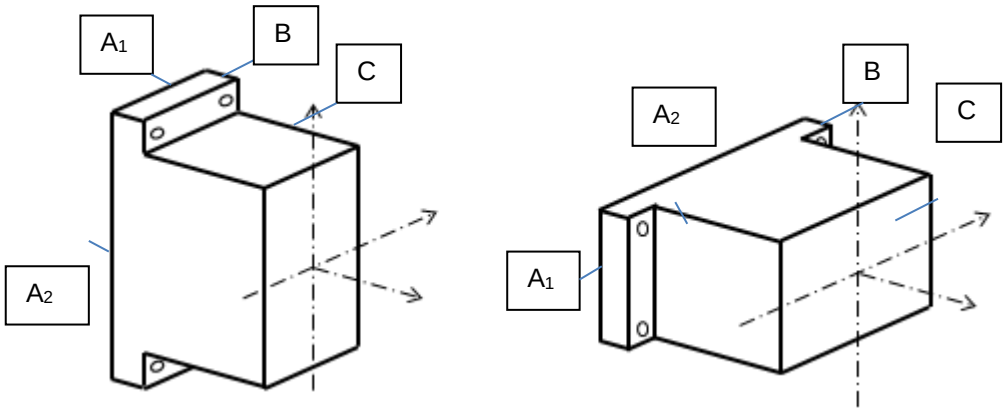
Fixing area on the longside

Figure A.2

Heavy-load elements

The intended use for the heavy-load elements is the fixation of awnings, canopies and stairways.

- shaft width (A_1/A_2): up to 300 mm, thickness (B): minimum 60 mm, length (C) (type): up to 300 mm



vertical installation situation horizontal installation situation

Figure A.3

ANNEX B: TEST CONFIGURATION HEAVY-LOAD ELEMENTS

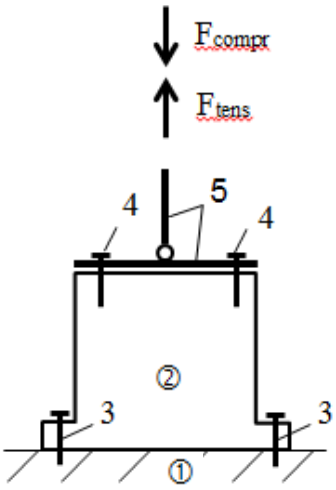


Figure B.1
Tensil and pressure load

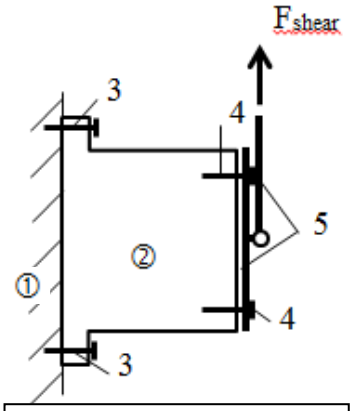


Figure B.2
shear load

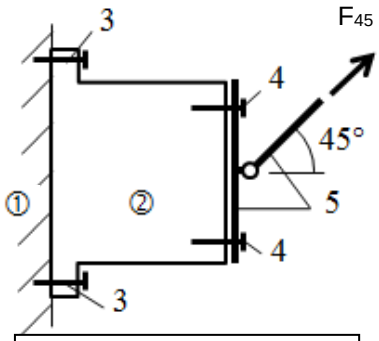


Figure B.3
transverse load

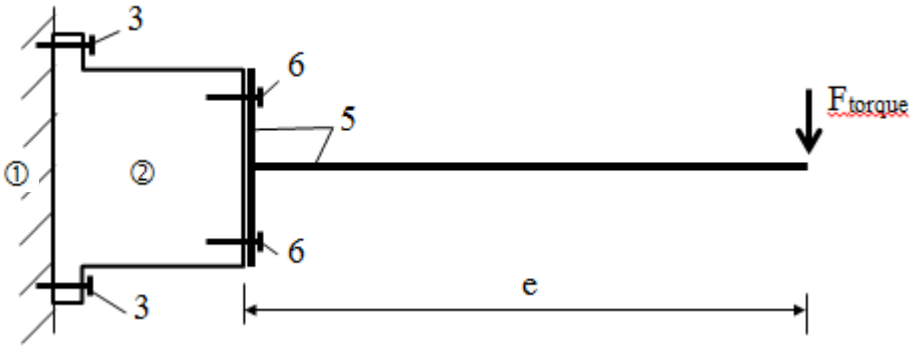


Figure B.4
bending torque load

① Substrate
② Heavy-load elements
3 Anchors
4 Screws
5 Adapter (binding to testing machine), properties shall be documented for the intended use
6 Screws
F_{compr} Testing pressure load
F_{tens} Testing tension load
F_{shear} Testing shear load
F_{45} Testing transverse tension load
F_{torque} Testing torque load
e Distance of torque load

ANNEX C: TEST OF SUPPORTING BRACKETS ELEMENTS

Axial and lateral load

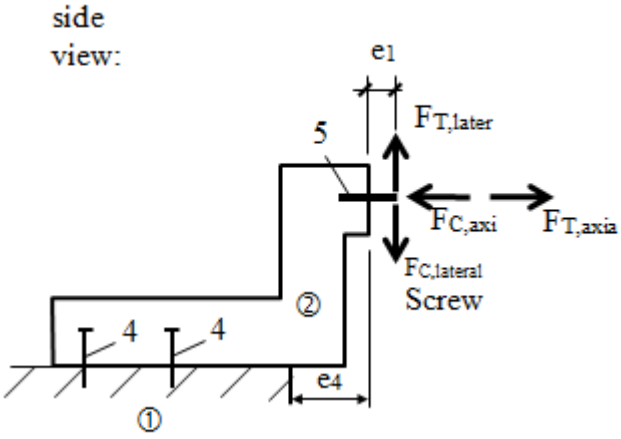


Figure C.1 Axial- and lateral load

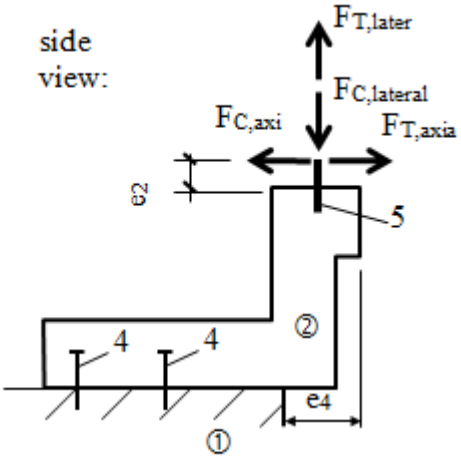


Figure C.2 Axial- and lateral load

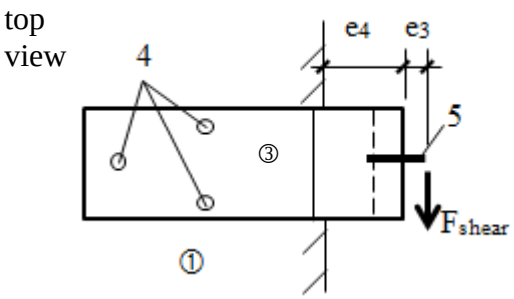


Figure C.3: Shear force test

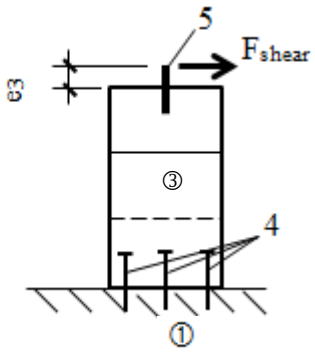


Figure C.4: Shear force test

① Substrate
②/③ Supporting Bracket Elements
4 Anchor
5 Screw
e_1 Distance of lateral load
e_2 Distance of axial load
e_3 Distance of shear load
e_4 Distance between pressure distribution plate and substrate

$F_{T,later}$ Testing force lateral tensile load

$F_{c,lateral}$ Testing force lateral pressure load

$F_{T,axia}$ Testing force axial tensile load

$F_{c,axi}$ Testing force axial pressure load

F_{shear} Testing force shear load

ANNEX D: TEST OF SUPPORTING BRACKETS ELEMENTS

Pull-through resistance of the anchoring elements:

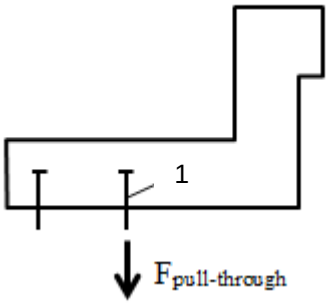


Figure D.1 Pull-through load

Embedment strength of the anchorage area of the elements

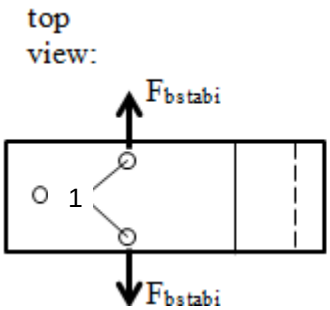


Figure D.2: Bearing stress load

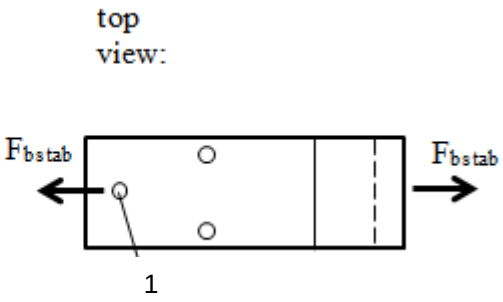


Figure D.3: Bearing stress load

1 Anchor

$F_{pul-through}$ Testing force pulling of fixation elements

F_{bstabi} Testing force bearing stress stability (embedment strengths) lateral

F_{bstab} Testing force bearing stress stability (embedment strengths) axial

The PUR element shall be fixed so that the failure occurs into the element.