EAD **090018-00-0404**

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European Assessment Document for

Reduced thermal bridge wall brackets as part of the subframe of ventilated wall cladding systems or other façade systems

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 reduced thermal bridge wall brackets as part of the subframe of ventilated wall cladding systems or other façade systems (in the following referred to as brackets) are reduced thermal bridge L-shaped brackets made of aluminium (always made of non-coated or inorganic coated aluminium) and plastic (made of polyamide), glass-fibre reinforced polymer (GFRP)) or muscovite mica sheet with silicone resin matrix. as part of the substructure for ventilated external wall cladding systems or other façade systems. The distinctive feature of the brackets is that part of the protruding leg is made of plastic to minimize the thermal loss caused by the brackets. The base plates and the front parts of the protruding wing of the brackets are made out of aluminium. The central part is made of plastic made of polyamide or glass-fibre reinforced polymer (GFRP), which is connected with the aluminium part due to tight fit of an injection moulding process. The product is fixed to external walls of buildings, these fixings not being subject of this EAD. The minimum thickness is ≥ 2 mm for the load-bearing aluminium and the plastic parts.

Brackets for vertical subframes (see Figure 1.1.1)

The protruding wings of the brackets have a maximum length of 320 mm. The brackets have a maximum height of 150 mm. All dimensions are based on the experience gained in assessing these products and reflect the applicability of the assessment methods.

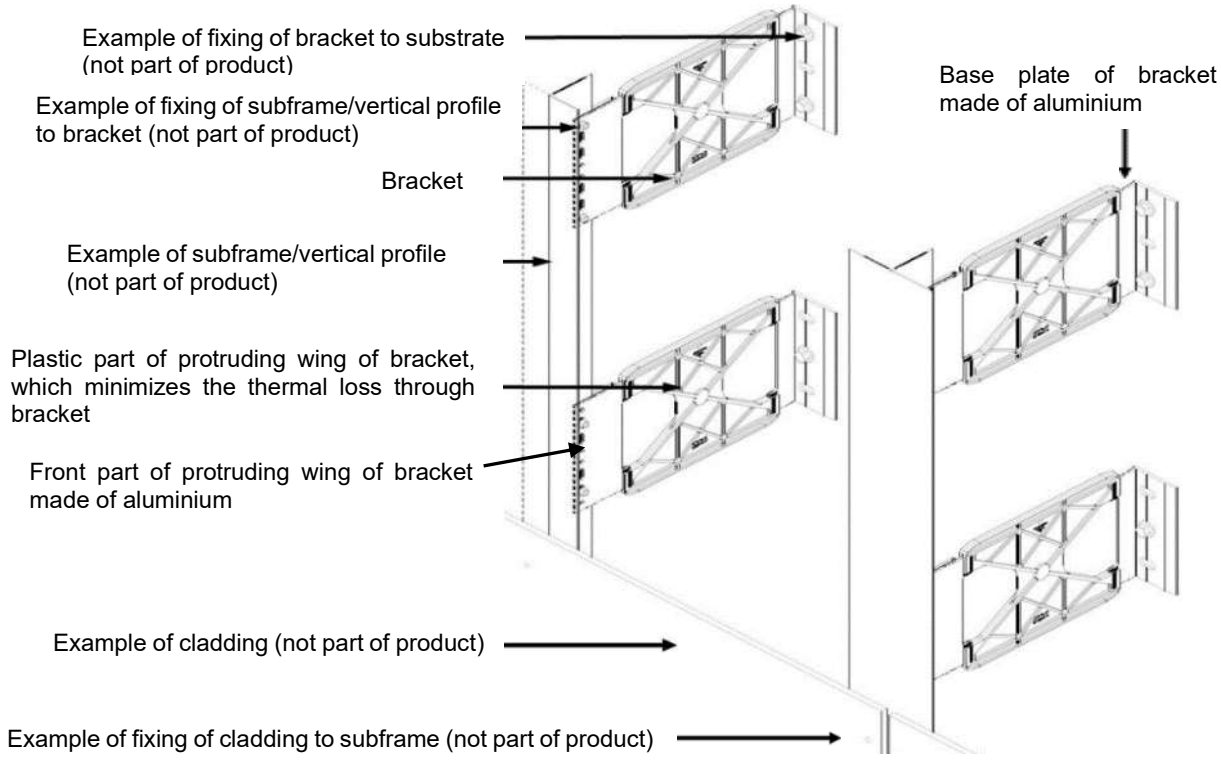


Figure 1.1.1: Example of brackets for vertical subframes

Brackets for horizontal subframes (see 1.1.2)

The brackets are generally identical to the brackets for vertical substructures with the exception of the possibility of fixing horizontal subframes to them:

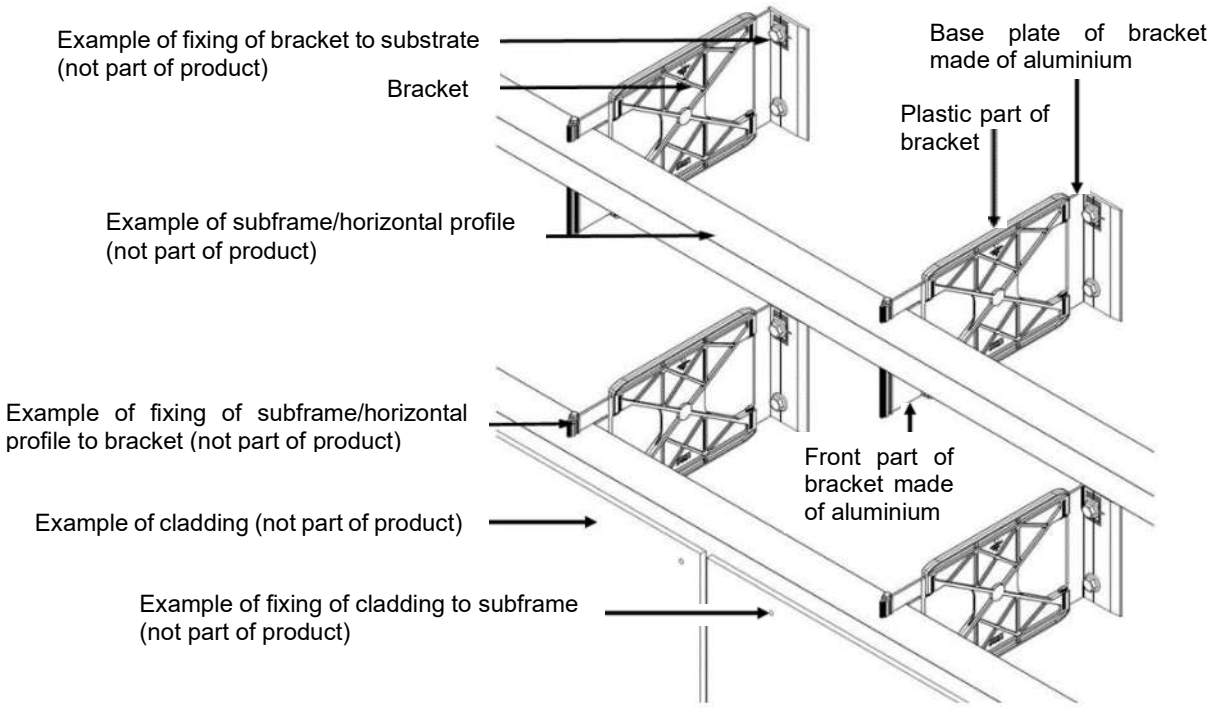


Figure 1.1.2: Example of brackets for horizontal subframes

The product is not covered by a harmonised European standard (hEN). The product is neither covered by EAD 090062-01-0404[1] nor by EAD 090034-00-0404 because they only cover metal brackets as a component of a kit. Furthermore, they do not cover composite brackets made of a combination of aluminium and plastic as covered by this EAD which needs a different assessment approach.

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 All undated references to standards 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)

The brackets are intended to be used for attaching substructure profiles of ventilated external wall cladding systems or other façade systems to the load-bearing substrate. Depending on the energy requirements of the building, installations with or without thermal insulation are possible. Depending on the orientation of the subsequent subframe profiles, two types of brackets are provided. The bracket types are intended to be used with vertical subframe profiles as well as with horizontal subframe profiles of external wall claddings.

The brackets are intended to be fixed mechanically to the substrate by three types of anchoring. These types are:

- anchoring with anchors/dowels,
- anchoring with screws, and
- anchoring with powder actuated fasteners.

Each of them can have a different design of the holes in the base plate.

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 brackets 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 the working life referred to above.

1.3 Specific terms used in this EAD

Symbol	Quantity	Unit
$F_{T,h}$ / $F_{T,v}$	Load-bearing capacity under tensile load h = horizonal subframe v = vertical subframe	[kN; N]
$F_{P,h}$ / $F_{P,v}$	Load-bearing capacity under pressure load h = horizonal subframe v = vertical subframe	[kN; N]
F_H	Constant force to simulate prestress due to thermal elongation of horizontal profile	[kN; N]
$F_{Q,h}$ / $F_{Q,v}$	Load-bearing capacity under dead load h = horizonal subframe v = vertical subframe	[kN; N]
$F_{u,m}$ / $F_{u,c}$	Load-bearing capacity of subframe components (in accordance with EAD 090062-01-0404, clause 2.2.12 d)	[kN; N]
α	Inclination for misalignment	[°]
l_S	Length of vertical profile for testing of single fixed point	[mm; m]
l_D	Length of vertical profile for testing of double fixed point	[mm; m]
a	Overlap of vertical profile and bracket	[mm]
e1	Distance to anchor	[mm]
e2	Distance to load eccentricity	[mm]
A $A_{1,-20°C}$ / $A_{1,+80°C}$ A_2 $A_{3,a}$ / $A_{3,b}$ A_4 A_5 $d_{A3a,1/10/100/1.000/10.000}$	Influencing factor A - Aspects of temperature - Aspects of ageing and environment - Aspects of alternating load/pulsating load - Long-term creep behaviour - Creep rupture behaviour - Displacement of alternating load / pulsating load after cycles	[-] [mm]
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 brackets 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	Load-bearing capacity - under monoaxial stress from wind pressure / wind tension - under monaxial strain from dead load - under combined stress from wind pressure / wind tension plus dead load - of the connection between bracket and subframe	2.2.2 2.2.2.1 2.2.2.2 2.2.2.3 2.2.2.4	Level [kN; N] $F_{T,h}$ / $F_{T,v}$ $F_{P,h}$ / $F_{P,v}$ $F_{Q,h}$ / $F_{Q,v}$ $F_{Q/P,h}$ / $F_{Q/P,v}$ / $F_{Q/T,h}$ / $F_{Q/T,v}$ $F_{u,m}$ / $F_{u,c}$
3	Influencing factors - Aspects of temperature - Aspects of moisture / humidity (ageing and environmental influences) - Aspects of alternating load/pulsating load - Long-term creep behaviour - Creep rupture behaviour	2.2.3 2.2.3.1 2.2.3.2 2.2.3.3 2.2.3.4.1 2.2.3.4.2	Level A_x [-] / $d_{A3a,x}$ [mm] $A_{1,-20°C}$ / $A_{1,+80°C}$ A_2 $A_{3,a}$ / $A_{3,b}$ / $d_{A3a,x}$ A_4 A_5
Basic Works Requirement 6: Energy economy and heat retention			
4	Thermal conductivity	2.2.4	Level 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

Considering the description of the product in clause 1.1, the metal part of the brackets (always made of non-coated or inorganic coated aluminium) is considered to satisfy the requirements of class A1 of the reaction-to-fire characteristic 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.

Therefore, the performance of the metal parts of the brackets is class A1.

One of the two following methods of assessment a) or b) shall be used for the plastic parts (made of polyamide or GFRP) of the brackets, depending on which of them applies:

a) The plastic part of the brackets (made of polyamide or GFRP) fulfils all of the following conditions:
   - a mass ≤ 50 g,
   - a size of ≤ 50 mm x ≤ 50 mm) and
   - a distance ≥ 200 mm to similar components when 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
     completely embedded all-round in non-melting material of class A1 when used as small connecting part of a composite product and without any possibility to ignite or to propagate fire.

   In this case the plastic part of the brackets can be considered as a small component and its reaction to fire performance can be neglected and doesn't need to be tested and classified separately.

b) The reaction to fire performance of the material used for producing the plastic part of the brackets not fulfilling the requirements of sub-point a) shall be tested, using the test method for the corresponding reaction to fire class in accordance with EN 13501-1. The material of the plastic part of the brackets shall be classified in accordance with Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1.

   The following conditions and parameters shall be taken into account when preparing test specimens and conducting the tests:
   - Separate boards shall be produced from the same material as used for manufacturing the plastic part of the brackets and with the largest possible dimensions that can be produced.
   - The specimens for tests according to EN ISO 11925-2 shall be cut from these separately produced boards to obtain that specimen size as prescribed in the test standard.
   - The specimens for tests according to EN ISO 11925-2 shall be tested free-hanging without consideration of a substrate and exposed with surface flaming as well as with edge flaming.
   - The specimens for tests according to EN 13823 (SBI) shall be built-up from separately produced boards which are placed side by side with closed butt joints on a sub-construction made of vertically positioned linear metal profiles (Z- or I-profiles are recommended) and shall be mounted with a distance of 80 mm in front of a representative standard substrate board in accordance with EN 13238. Each of the plastic boards shall be mechanically fixed to the profiles of the sub-construction with four small metal nails or screws (one fixing mean in each corner of the boards).
   - Each different type of a product family (as defined by a certain combination of raw materials and other additives and produced in a certain production process) of the plastic material shall be tested in all relevant test methods. If the manufacturer provides sufficient information (e.g., on the basis of the composition of the products in question) this can allow the TAB to determine which material or material variants should be submitted to testing in order to reduce the number of tests.
   - The highest and lowest thickness of the plastic plates shall be considered when preparing and testing the specimens with the methods in accordance with EN ISO 11925-2 and EN 13823.

- If relevant, the highest and lowest density shall be considered within all relevant tests of the material of which the plastic parts of the brackets are made.

The result of tests taking into account the aforementioned conditions and parameters are valid for:

- the performance of the plastic parts of the brackets in intended end-use applications where they are not protected against fire exposure as well as in intended applications where they are fully covered by non-melting material of class A1 in accordance with EN 13501-1,
- applications of the brackets on substrates represented by the standard substrate used in the SBI tests in accordance with EN 13823,
- the tested type of the plastic material only or for all products of the same defined product family (if the most onerous type was tested in accordance with the above-mentioned conditions and parameters for preparing the test specimens and conducting the tests),
- for any thickness between those values evaluated in the tests or the tested thickness (if only one thickness was tested),
- for any density of the material of which the plastic parts of the brackets are made between those values evaluated in the tests or the tested density only (± 10 %; if only one density was tested).

The reaction to fire classes of the whole brackets is given by the classification of the plastic parts and shall be stated in the ETA together with those conditions (see parameters above) for which the classifications are valid. It shall also be stated in the ETA when the plastic parts are considered to be small components and, therefore, do not need to be tested because their contribution to fire is negligible.

2.2.2 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 %). All plastic parts shall be pre-conditioned according to EN ISO 1110 (62±5 % relative humidity, 70±3 °C, 5 days). For each test series the failure loads shall be submitted to a statistical analysis and the characteristic values shall be determined using k_n according to EN 1990/Table D.1, $V_{x,unknown}$.

The failure load 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 connection between the aluminium part(s) and the plastic part (this load shall be considered decisive, even if the load rises again after that, because a damage in the connection is occurred),
  or
- the load at which the test object clearly breaks (if no drop of load as given above is occurred before break).

In general, the failure load corresponds with the maximum load determined in the tests.

For each test series the variation coefficient shall be based on the standard deviation of the logarithmic values and shall be stated in the ETA. At least 5 tests shall be performed.

The type of anchoring and the number of fasteners according to the test configuration shall be reported in the ETA. The anchorage shall be positioned such that the maximum load is created in the wall bracket. This is normally the case when they are fixed, e.g., at the end of slotted holes in the base plate which is furthest from the legs of the wall bracket. The most rigid fasteners shall be used to avoid failure in the fasteners or in the substrate (not part of this EAD). If the fasteners or the substrate fail, the test shall be repeated with a new configuration (higher performance of the fastener or substrate).

The additional information according to Annexes A-G shall also be given in the ETA. 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.

The test setups are shown in the Annexes on principle, for combined stress the tests shall be combined. The brackets can be divided in different product families (where the geometry of the brackets is identical except the length of the wing or the location of the plastic parts); therefore, the test shall be carried out at least with the most unfavourable bracket (the weakest design).

2.2.2.1 Load-bearing capacity under monoaxial stress from wind pressure / wind tension

Tests of the load-bearing capacity under monoaxial stress shall be carried out for every bracket (see Annexes D and E). In the course of these tests, it shall be differentiated between pressure and tension as well as between horizontal and vertical substructures.
In case of wind tension a distinction of the disposal of the fastener to the substrate and a possible inclination of the bracket due to the roughness of the wall surface shall be taken into account (see Annexes D and E).
The characteristic load-bearing capacities $F_{T,h}$ / $F_{T,v}$ and $F_{P,h}$ / $F_{P,v}$ (N or kN) of the brackets shall be stated in the ETA.

2.2.2.2 Load-bearing capacity under monoaxial strain from dead load

Tests of the characteristic load-bearing capacity under monoaxial strain from dead load shall be carried out for every bracket/family according to Annexes A, B or C, depending on the intended use(s)). The shape of the connected substructure profiles for the characteristic load-bearing capacity of the bracket shall be considered (see Annexes A, B and C). The characteristic load-bearing capacities $F_{Q,h}$ / $F_{Q,v}$ (N or kN) of the brackets shall be stated in the ETA.

2.2.2.3 Load-bearing capacity under combined stress from wind pressure / wind tension plus dead load

The tests under clause 2.2.2.1 (wind pressure / wind tension) shall be carried out, though modified by applying a vertical load that remains constant during the tests (simulated dead load of the ventilated external

wall cladding system). The application of the dead load shall follow the test under clause 2.2.2.2 (dead load) depending on the type of bracket (see Annexes A and G). The characteristic load-bearing capacities $F_{Q/P,h}$ / $F_{Q/P,v}$ / $F_{Q/T,h}$ / $F_{Q/T,v}$of the brackets shall be indicated in the ETA.

2.2.2.4 Load-bearing capacity of the connection between bracket and subframe

The test shall be carried out to assess the characteristic load-bearing capacity between brackets and the subframe which is intended to be used (pull-out/pull-through, shear). The capacity in N or kN and the test configuration shall be assessed according to EAD 090062-01-0404, clause 2.2.12.15 (pull-out/pull-through) and 2.2.12.16 (shear load). The characteristic load-bearing capacities $F_{u,m}$ / $F_{u,c}$ shall be stated in the ETA.

2.2.3 Influencing factors

All tests listed under clause 2.2.2 shall be made with short-term loads and under normal climatic conditions (temperature 23±3 °C / relative humidity 50±5 %). As regards to the assessment of load-bearing capacity for the brackets, it shall be necessary to determine the influence of the long-term behaviour, ageing and environmental influences, temperature, alternating load / pulsating load under conditions as given in the related sub-chapters (2.2.3.1 – 2.2.3.4.2) and under those environmental influences that ventilated external wall cladding systems are commonly exposed to. The brackets can be divided into different types (e.g., where the geometry of the brackets is identical except the length of the wing or the location of the plastic parts). Therefore, the test shall be carried out at least with the most unfavourable bracket. The most unfavourable bracket/the weakest design is where the main stress of the tests referred to in 2.2.2 (main stress) is greatest. Tests shall be performed on at least 3 specimens according to methods presented in clause 2.2.2. The most unfavourable result shall be expressed as ratio between “result according to clause 2.2.2” and “result after exposure per relevant subclause of clause 2.2.3” based on characteristic value . The result, therefore, is a dimensionless value.

The following influences shall be assessed.

- temperature (-20 °C / +80 °C with tolerance of ±3 °C),
- moisture / humidity (ageing and environmental influences,)
- alternating load / pulsating load (fatigue),
- time dependent exposure (e.g., permanent strain from dead load and restraint).

2.2.3.1 Aspects of temperature

The significant temperature-dependent changes (behaviour after high and low temperature) for the plastic at -20±3°C and at +80±3°C shall be tested (surface temperature of the element at beginning of the tests). The tests themselves are carried out under normal climatic conditions (temperature 23±3 °C / relative humidity 50±5 %). Therefore, the load-bearing capacity under standard conditions shall be compared with the load-bearing capacity at -20°C and at +80 °C. At least 5 tests shall be performed for each of both temperatures (see 2.2.3). The temperature dependent influencing factors $A_{1,-20°C}$ / $A_{1,+80°C}$ of the plastic material parts of the brackets / family shall be indicated in the ETA.

2.2.3.2 Aspects of moisture / humidity (ageing and environmental influences)

The effect of moisture / humidity (behaviour after high relative humidity) on the load-bearing capacity shall be assessed with a conditioning of 7 days at 95 ±5 %) relative humidity. After this conditioning the load-bearing tests (for the main stress) shall be performed immediately. The specimens shall be still wet during the test. The moisture / humidity influencing factors of the brackets (A_2) and the used aluminium (and its corrosion protection) shall be indicated in the ETA.

2.2.3.3 Aspects of alternating load / pulsating load

The influence ($A_{3,a}$) on the load-bearing capacity under tension load after 10000 load cycles of tensile-dynamic (pulsating) loading at a frequency of 2 to 6 Hz with 0,2 to 0,5 times of the characteristic load-bearing capacity under uniaxial stress from wind pressure / wind tension shall be determined. If the fasteners or the substrate fail, the test shall be repeated with a new configuration (higher performance of the fastener or substrate). The displacement $d_{A3a,x}$ [mm] shall be measured during the first loading up to

max N either continuously or at least after 1, 10, 100, 1000 and 10000 load cycles and shall be given in the ETA.
In case where the load-bearing capacity against wind pressure is less than against wind tension, the test shall be carried out under wind pressure loading (the more critical situation) and vice versa.

In addition, in cases ~~to 2.2.3.3 a)~~ if the brackets are exposed to repeated displacement due to thermal elongation (lengths, material, temperature variation) of the subframe, the influence ($A_{3,b}$) on the load-bearing capacity shall be determined by applying 10000 load cycles of alternating loads. 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 deflection. Alternatively, the same test (10000 load cycles) shall be carried out with the corresponding minimum and maximum deflection as indicated by the manufacturer ($A_{3,min,max}$).The value of min, max deflection shall be indicated on the influence factor $A_{3,\ min,\ max}$)

The influencing factor of the alternating load / pulsating load of the brackets $A_{3,a}$ / $A_{3,b}$ / ($A_{3,min,max}$) shall be indicated in the ETA.

2.2.3.4 Aspects of time dependent exposure

2.2.3.4.1 Long-term creep behaviour

The elements shall be tested in normal climatic conditions (temperature 23±3 °C / relative humidity 50±5 %), where 80% / 60 % / 40% and 30 % of the maximum force determined in 2.2.2.2 shall be applied as the load. Over a period of at least 2000 h, the deformation shall be measured in logarithmically equidistant time intervals (minimum 10 times). The measured results of the individual trials shall be represented in a double logarithmic time-deformation curve. The characteristic creep deformation A_4 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 influencing factor of the long-term creep behaviour of the brackets A_4 (separately for one week, three months and 25 years) shall be indicated in the ETA.

2.2.3.4.2 Creep failurebehaviour

The test shall be conducted in analogy to the long-term creep behaviour (clause 2.2.3.4.1). The load shall begin, however, at 95 % of the determined maximum force determined in clause 2.2.2.2. If failure of the specimen occurs, the load shall be reduced and the test shall be carried out again on other elements. The load shall be reduced step-by-step in this manner 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 influencing factor of creep failure behaviour A_5 of the brackets shall be determined with a linear extrapolation of this curve to one week, three months and 25 years and indicated in the ETA.

2.2.4 Thermal conductivity

The thermal conductivity of the plastic material shall be determined in accordance with EN 12664 with 3 test specimens obtained from different brackets. The dimension of the test specimen shall be in accordance with EN 12664 Annex B.5 under normal climatic conditions (temperature 23±3 °C / relative humidity 50±5 %). The median value shall be indicated in the ETA.

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.

For uses subject to regulations on reaction to fire the applicable AVCP systems are 1, or 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	Check of inspection certificates 3.1 according to EN 10204 for (aluminium) metal and plastics (granulate)	EN 10204	Conformity with the order		Each delivery
2	Check of inspection certificates 3.1 according to EN 10204 for plastics granulate at least viscosity, total filler content	EN 10204	Conformity with the order		Each delivery
3	Inspection of defined measures of aluminium profiles	Measuring instruments & gauge	As defined in the control plan	3	Each delivery
4	Aluminium material: check of aluminium profiles	EN 755-2	As defined in the control plan	3	Each delivery
5	Inspection of defined measures of cutting and stamped aluminium pieces	Measuring instruments & gauge	As defined in the control plan	3	1 per production batch
6	Inspection of defended measures of (injection moulded) finished bracket	Measuring instruments & gauge	As defined in the control plan	3	3 per start / midterm / end of production batch
7	Tensile test of (injection moulded) finished bracket	2.2.3.1	As defined in the control plan	3	Per start / midterm / end of production batch / minimum every bracket
8	Differential Scanning Calorimetry (DSC)	EN ISO 11357-1	As defined in the control plan	1	Every six months
9	DMA (dynamic mechanical analysis)	EN ISO 6721-1	As defined in the control plan	1	Every six months
10	Viscosity number	EN ISO 307	As defined in the control plan	1	Every six months
11	Reaction to fire **	Indirect: See lines 1, 12 and 13	As defined in the control plan	See lines 1, 12 and 13	Every batch
		2.2.1, Option "b)"	As defined in the control plan	3	Initial start of production and: • EN ISO 11925-2 every six months • EN 13823 every 2 years

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
12	Constancy of the composition of the plastic **	According to control plan	According to control plan	-/-	Continuously during the production process
13	Fibre content	EN ISO 1172*	As defined in the control plan	3	Initial start of production and every six months

* Use method A to determine the fibre content [%] when no mineral fillers are present and, alternatively, method B in case when mineral fillers are present.

** If the manufacturer voluntarily provides information on the composition of his product / product variants as basis for controlling the constancy of the composition of the plastic and the corresponding provisions in the control plan, the minimum frequency of direct tests within the framework of the factory production control with respect to reaction to fire can be reduced to every two years for tests according to EN ISO 11925-2 and once per five years for tests according to EN 13823.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body 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	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the product	As defined in the control plan	As defined in the control plan	-	Initial inspection (when starting the production)
Continuous surveillance, assessment and evaluation of factory production control					
2	Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of 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	As defined in the control plan	Twice per year

The intervention of the notified body under AVCP system 1 with regard to the reaction to fire behaviour of the product is only necessary in so far as the conditions for the applicability of system 1 as defined in Commission Decision 2003/640/EC are fulfilled.

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in table 3.3.2.

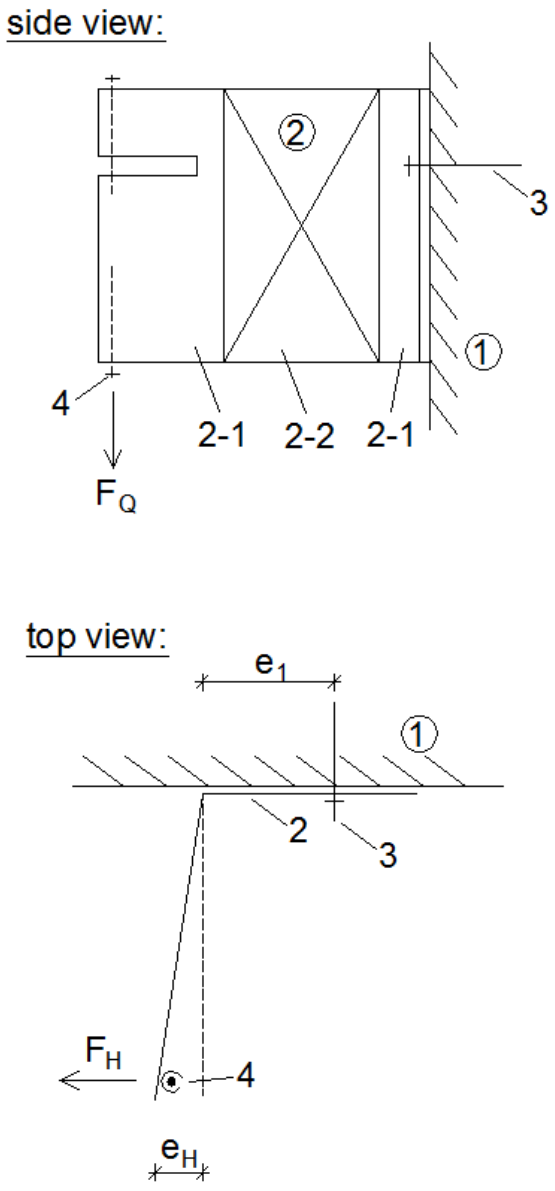
Table 3.3.2: Control plan of the notified body, cornerstones (AVCP system 1 – for reaction to fire)

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 carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the product taking especially into account the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., the limiting of organic material and/or the addition of fire retardants)	As defined in the control plan	As defined in the control plan	-	Initial inspection (when starting the production)
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
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	-	Once/year

4 REFERENCE DOCUMENTS

EN 755-2:2016	Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties
EN 1990:2023	Eurocode: Basis of structural and geotechnical design
EN 10204:2004	Metallic products - Types of inspection documents
EN 12664:2001	Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products with medium and low thermal resistance
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 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 ISO 307:2019	Plastics - Polyamides - Determination of viscosity number (ISO 307:2019)
EN ISO 1110:2019	Plastics - Polyamides - Accelerated conditioning of test specimens (ISO 1110:2019)
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 6721-1:2019	Plastics - Determination of dynamic mechanical properties – Part 1: General principles (ISO 6721-1:2019)
EN ISO 10211:2017	Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations (ISO 10211:2017)
EN ISO 11357-1:2023	Plastics - Differential scanning calorimetry (DSC) - Part 1: General principles (ISO 11357-1:2023)
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)
EAD 090034-00-0404	Kit composed by subframe and fixings for fastening cladding and external wall elements
EAD 090062-01-0404	Kits for external wall claddings mechanically fixed
EAD 220089-00-0401	Self-supporting translucent roof kits with covering made of plastic sheets

ANNEX A: MONOAXIAL STRAIN FROM DEAD LOAD (HORIZONTAL SUBFRAME)



1 substrate
2 bracket
2-1 aluminium part
2-2 plastic part
3 anchor
4 screw
F_Q simulated dead load
F_H constant force to simulate max. prestress due to thermal elongation of horizontal profile
e_H displacement due to F_H
e_1 maximum distance of anchor

Figure A.1: Setup for monoaxial dead load (horizontal subframe)

Information:

F_H shall be taken into account if the wall bracket is subjected to a load due to thermal expansion of the horizontal profiles in the intended use. With a reference method of F_H = 500 N, alternatively, F_H can be based on the use as intended by the manufacturer.

ANNEX B: MONOAXIAL STRAIN FROM DEAD LOAD WITH DOUBLE FIXED POINT (VERTICAL SUBFRAME)

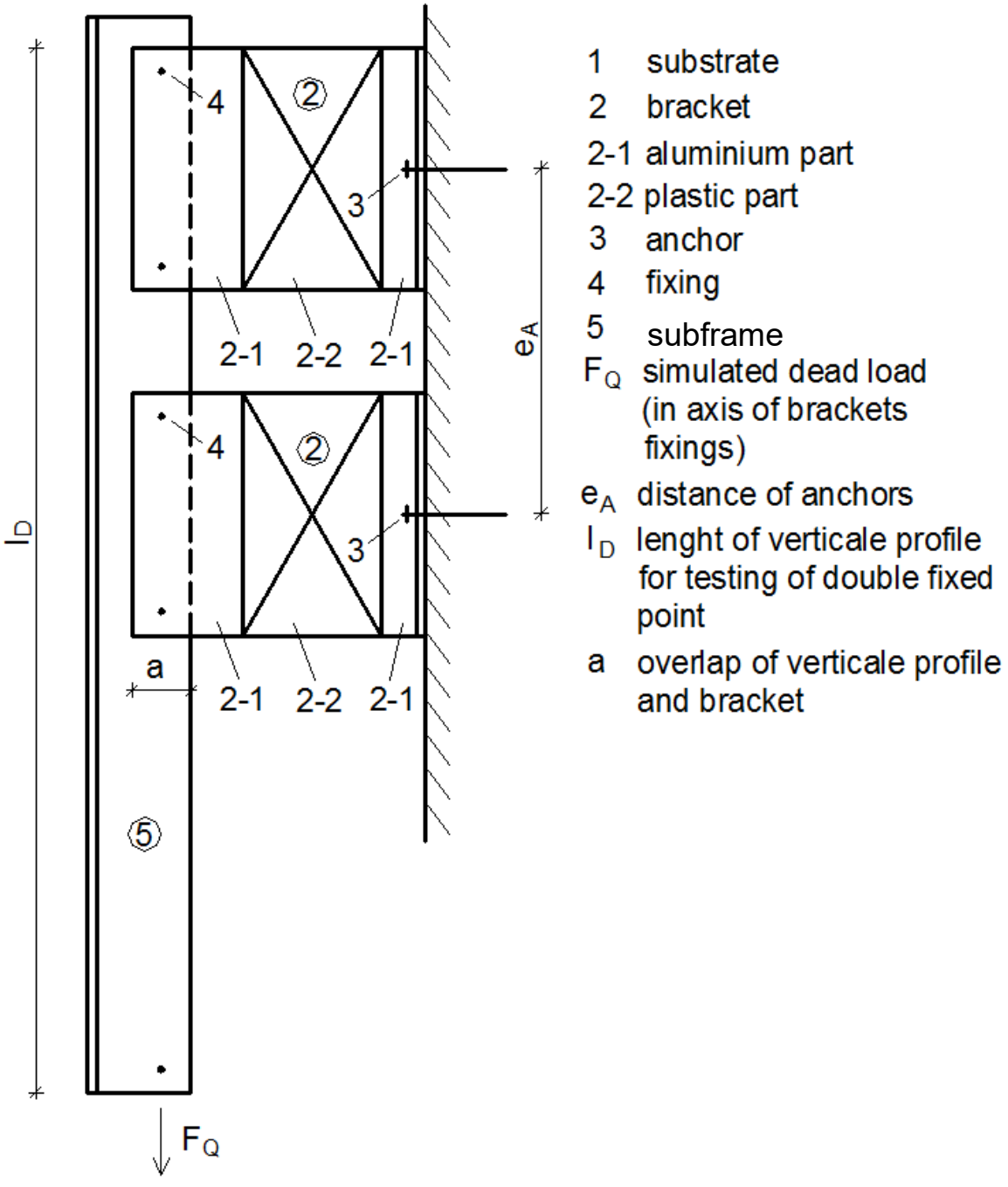


Figure B.1: Example for setup for monoaxial dead load with double fixed point (vertical subframe)

ANNEX C: MONOAXIAL STRAIN FROM DEAD LOAD WITH SINGLE FIXED POINT (VERTICAL SUBFRAME)

:

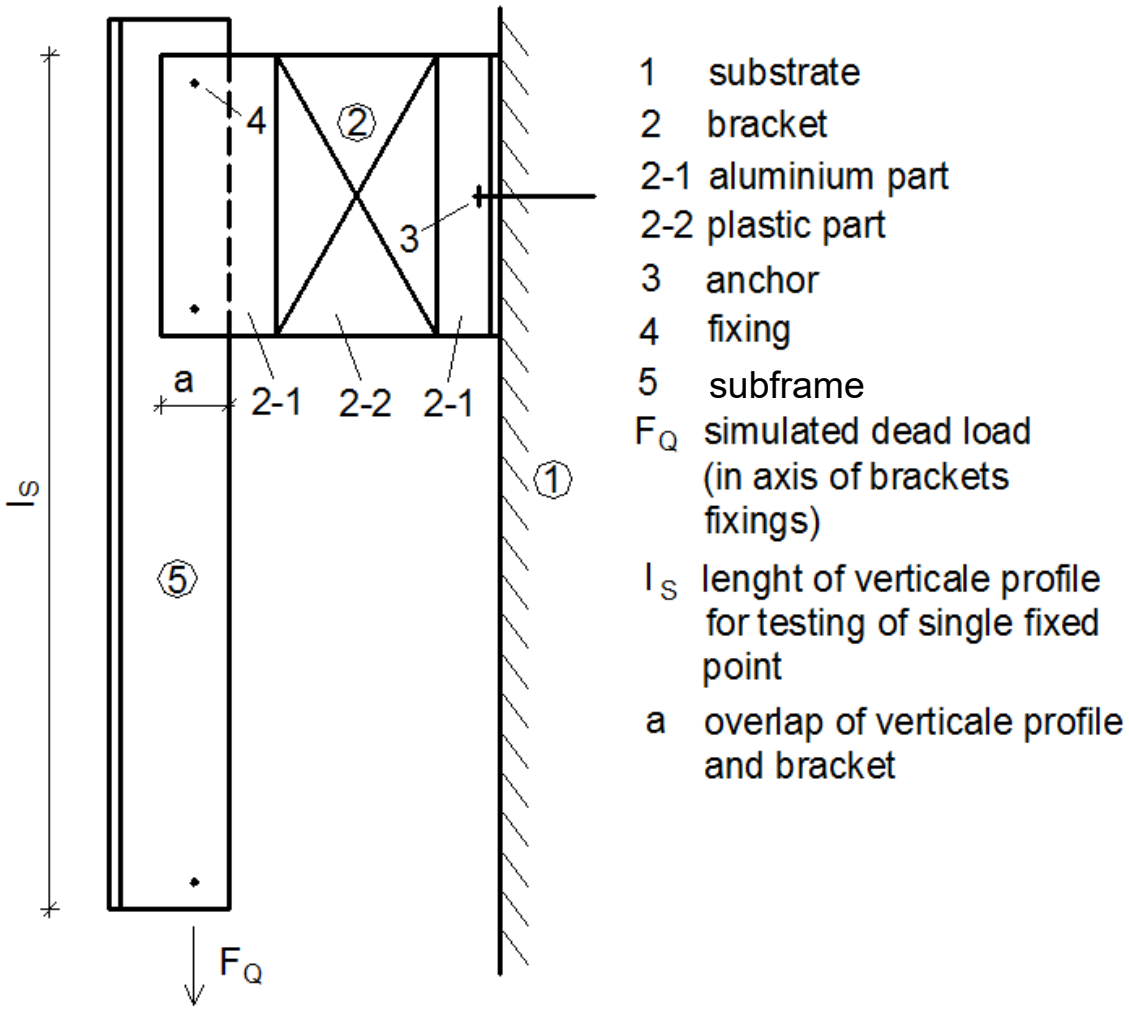
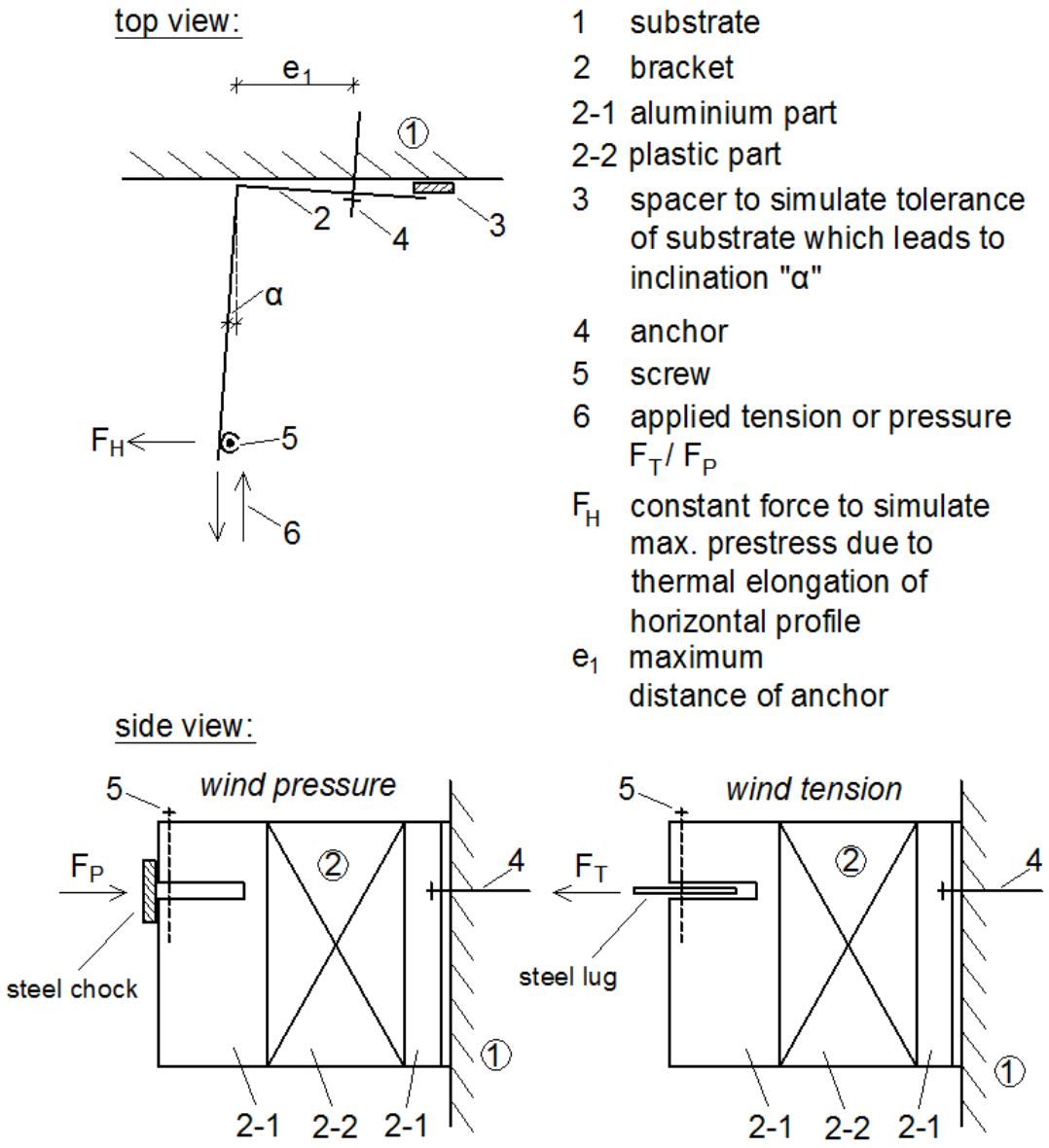


Figure C.1: Example for setup for monoaxial dead load with single fixed point (vertical subframe)

ANNEX D: MONOAXIAL WIND PRESSURE / WIND TENSION (HORIZONTAL SUBSTRUCTURE)



1 substrate
2 bracket
2-1 aluminium part
2-2 plastic part
3 spacer to simulate tolerance of substrate which leads to inclination "α"
4 anchor
5 screw
6 applied tension or pressure F_T/ F_P
F_H constant force to simulate max. prestress due to thermal elongation of horizontal profile
e_1 maximum distance of anchor

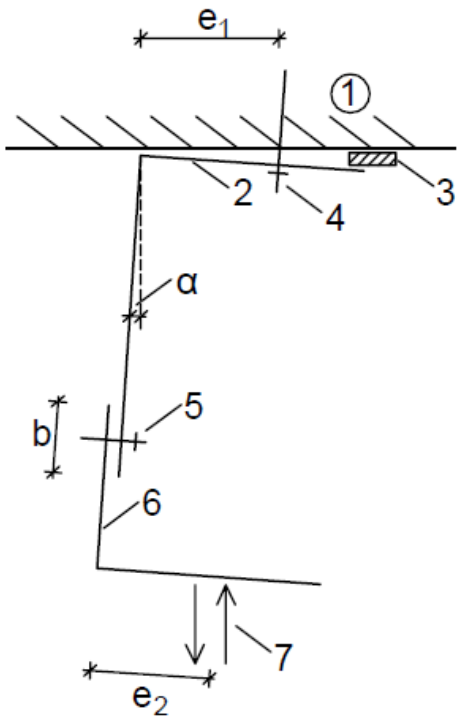
Figure D.1: Example for setup for monoaxial wind pressure/tension (horizontal substructure)

In Figure D.1 distinction is made between the parallel applied force F_H to the wall (simulated elongation / preformation of thermal change in length horizontal profile) and perpendicular forces F_P/F_T to the wall (simulated wind tension / pressure). The spacer is located at the end of the base plate.

The head diameter of the steel chock shall be indicated in the ETA.

Optionally uneven substrates, as they can appear in later use, can be reflected in the tests (see spacer to simulate tolerances of the substrate).

ANNEX E: MONOAXIAL WIND PRESSURE/ WIND TENSION (VERTICAL SUBFRAME)



1 substrate
2 bracket
3 spacer to simulate tolerance of substrate which leads to inclination "α"
4 anchor
5 fixing
6 profile
e_1 maximum distance of anchor
e_2 maximum load eccentricity
b minimum overlap between bracket and profile
7 applied tension or pressure F_T / F_P

Figure E.1: Example for setup for monoaxial wind pressure/tension (vertical subframe)

In Figure E.1, the applied tension/pressure F_T/F_P (7) from wind is perpendicular to the wall (simulated wind load). Optionally the spacer (3) can be used to take an uneven installation scenario into account. The reference spacer has a thickness of 5 mm; alternatively, the specification of the spacer thickness according to the planned installation situation can be taken into account. The spacer is located at the end of the base plate.

ANNEX F: COMBINED STRESS FROM WIND PRESSURE / WIND TENSION PLUS DEAD LOAD (HORIZONTAL SUBFRAME)

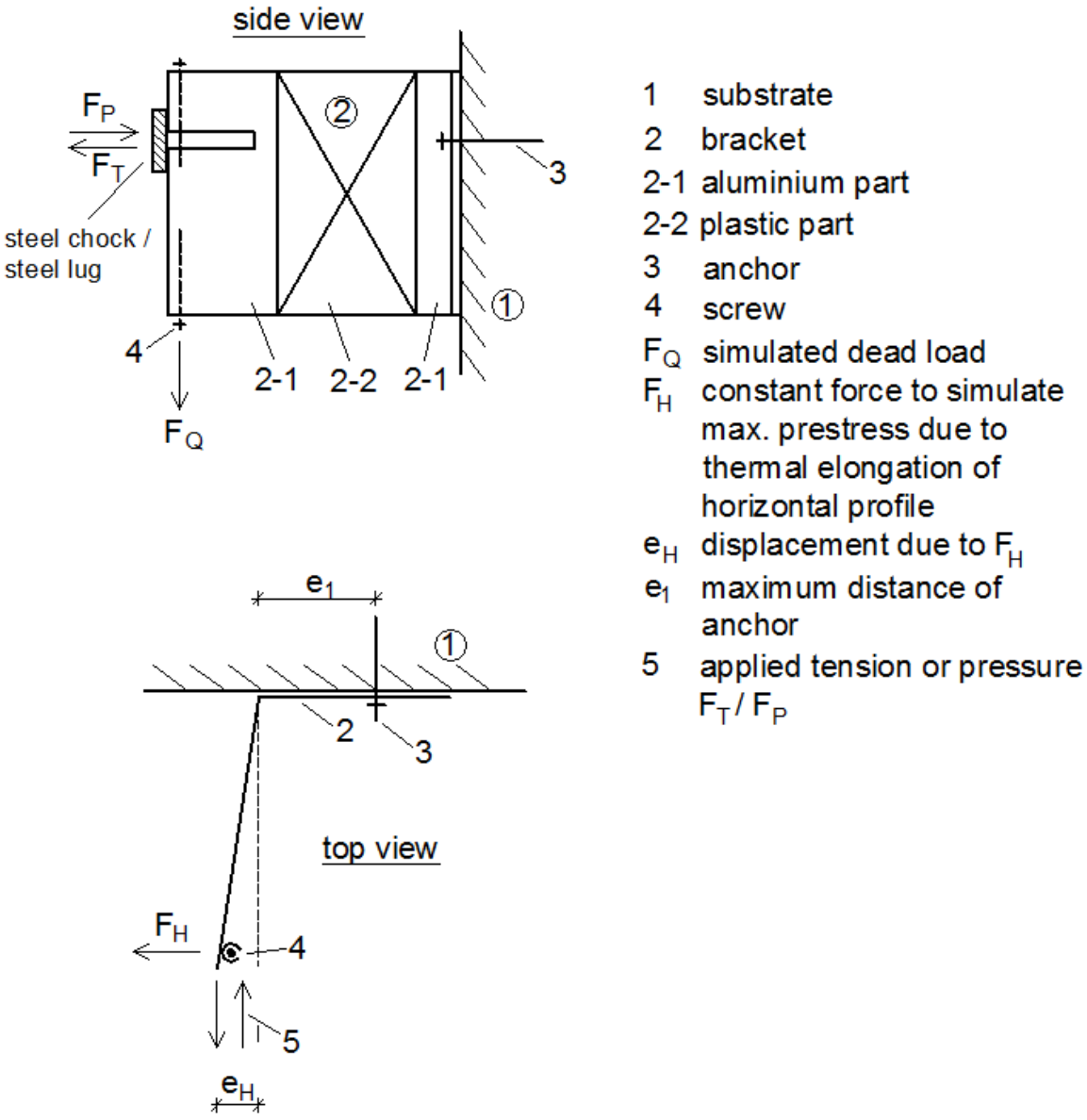
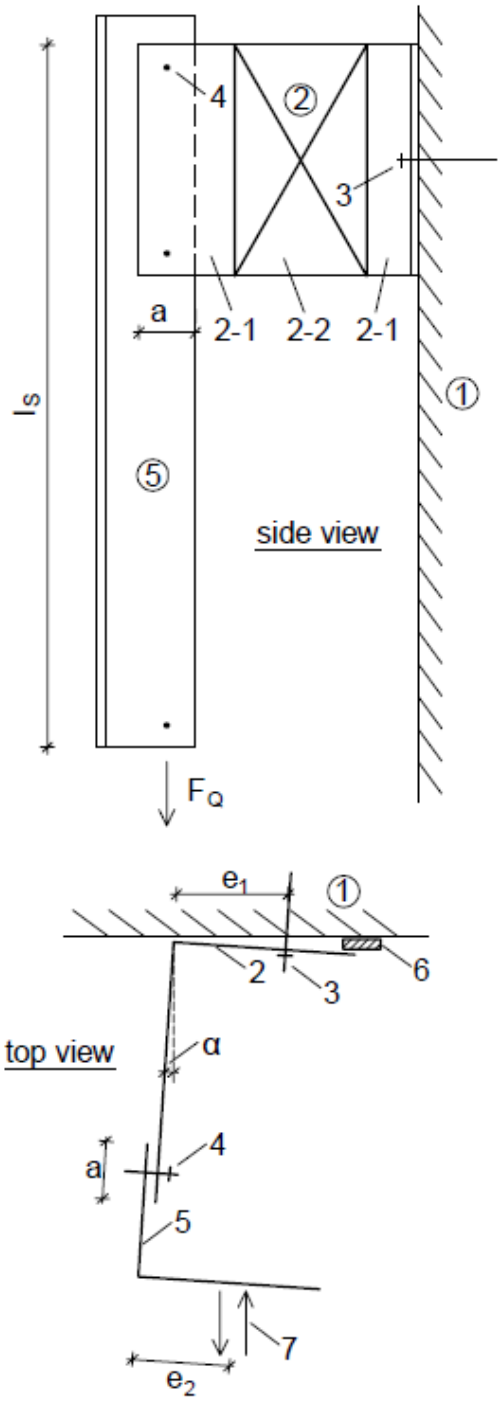


Figure F.1: Example for setup for combined dead load and wind load (horizontal subframe)

The applied tension/pressure F_T/F_P from wind is perpendicular to the wall (simulated wind load).

The connection to the testing machine shall be made using adapters and by installing it in a pre-stressed state. The displacement e_H occurs because of the constant force F_h.

ANNEX G: COMBINED STRESS FROM WIND PRESSURE / WIND TENSION PLUS DEAD LOAD (SINGLE FIXED POINT (VERTICAL SUBSTRUCTURE)



1 substrate
2 bracket
2-1 aluminium part
2-2 plastic part
3 anchor
4 fixing
5 substructure
F_Q sir subframe (in axis of brackets fixings)
l_s lenght of verticale profile for testing of single fixed point
a overlap of verticale profile and bracket
6 spacer to simulate tolerance of substrate which leads to inclination "α"
7 applied tension or pressure F_T / F_P
e_1 maximum distance of anchor
e_2 maximum load eccentricity

The applied tension/pressure F_T/F_P from wind is perpendicular to the wall (simulated wind load)

Figure G.1: Example for setup for combined dead load and wind load single fixed point (vertical substructure) The spacer is located at the end of the base plate.