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European Assessment Document for

Pre-wall mounting kits for windows and doors

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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

The pre-wall mounting kits for windows and doors (hereinafter referred to as “PWMK”) consist of the following components

- mounting profiles made as one piece (not from individual components), factory contour-defined or linear profiles or a combination of both, made of expanded polystyrene (EPS) in accordance with EN 13163[1],
- a load-transferring seal between the load-bearing exterior wall and mounting profile made from silane-modified polymers, and
- force-transmitting fasteners made of steel e.g., factory-made screws[2].

Screws can be used as optional auxiliary components for fastening the windows and doors.

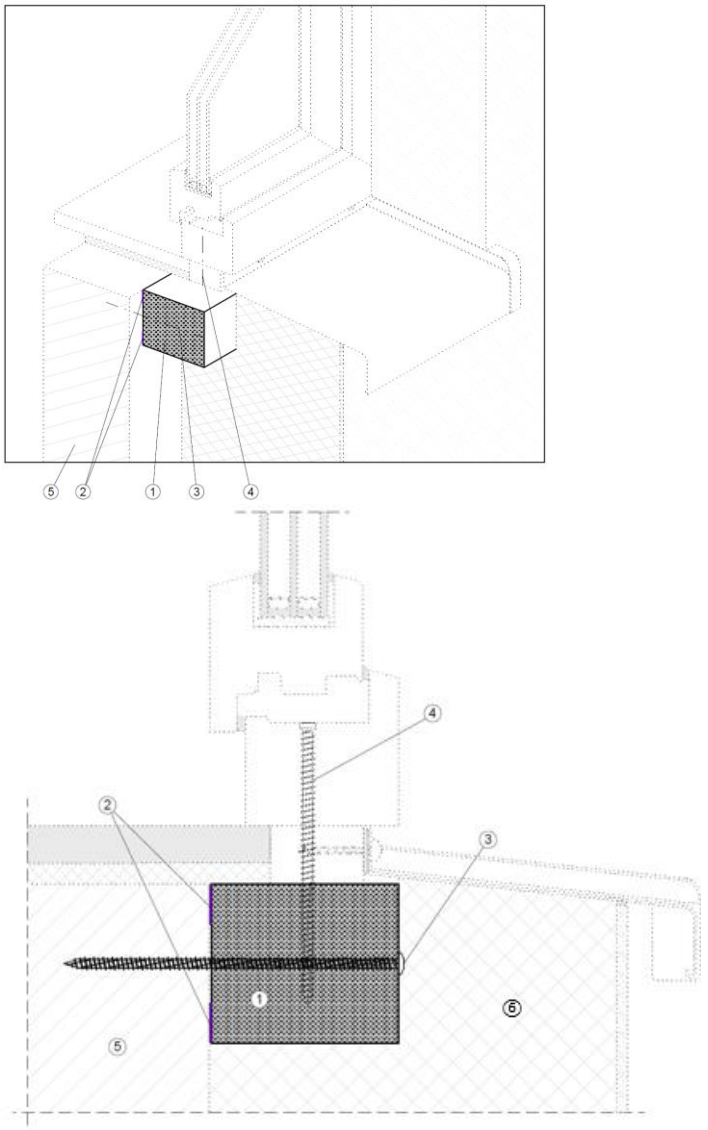
The load-bearing exterior wall and the windows and doors are not part of the PWMK.

The installation of the PWMK (mounting profiles, load-transferring seal and force-transmitting fasteners) on the load-bearing exterior wall is carried out on site according to the manufacturer's product installation instructions (MPII; see Figures 1.1.1 and 1.1.2). Hereby, the mounting profiles are attached to the load-bearing exterior wall with at least 2 fasteners per mounting profile. The individual mounting profiles are connected to each other force-fitting and/or form-fitting (e.g., a dovetail connection and/or a sealing), framing the wall opening and, thus, form the substrate for fastening the windows or doors.

The fully assembled PWMK is then completely covered by a facade system and is not directly exposed to the weather.

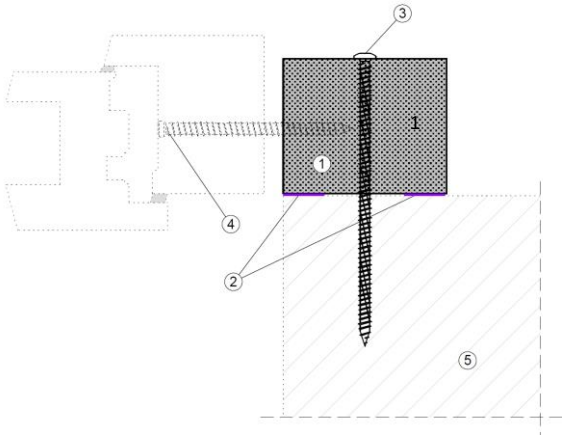
1 All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

2 Only products falling under Commission Decision 96/603/EC as amended by Commission Decision 2000/605/EC and Commission Decision 2003/424/EC are covered by this EAD.



1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
4 = screws as optional auxiliary components
5 = load-bearing exterior wall (not part of the PWMK)
6 = external thermal insulation composite system (ETICS, not part of the PWMK)

Figure 1.1.1: Exemplary vertical section below of a PWMK with a load-bearing exterior wall, external thermal insulation composite system (ETICS) and window



1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
4 = screws as optional auxiliary components
5 = load-bearing exterior wall (not part of the PWMK)

Figure 1.1.2: Exemplary horizontal section of a PWMK with the 3 components, mounting profile (1), load-transferring seal (2) and force-transmitting fasteners (3)

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

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

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

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

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

1.2.1 Intended use(s)

The PWMK are used as a fastening substrate for windows and doors in the insulation level of load-bearing exterior walls in new constructions and renovations. The windows and doors are attached to the load-bearing exterior walls in a linear manner. PWMK are mounted on the exterior walls with an incline of up to and including 10° and are not directly exposed to the weather.

The PWMK are intended for use in building structures to transfer forces, such as the dead weight of the building elements, wind and live loads and, if necessary, loads for fall protection and burglar resistance into the load-bearing exterior wall, which is made of, e.g., bricks, concrete, aerated concrete, solid masonry, cross-laminated timber or wooden frameworks.

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 PWMK for the intended use of 25 years when installed in the works (provided that the PWMK is subject to appropriate installation (see 1.1)). These provisions are based upon the current state of the art and the available knowledge and experience.

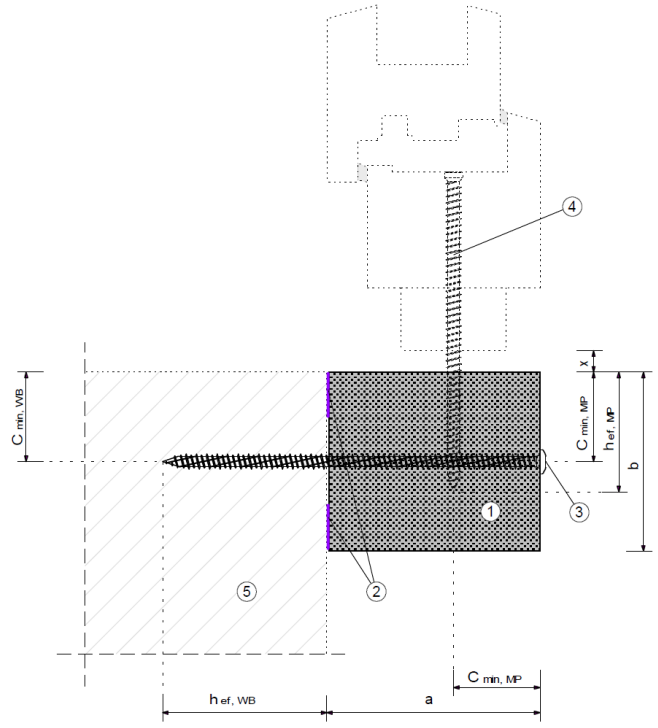
When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[3].

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.

1.3 Specific terms used in this EAD

1.3.1 PWMK components and designation

The components of the PWMK and their designation are shown in Figure 1.3.1.1.



1 =	mounting profile	a	= mounting profile width in mm
2 =	load-transferring seal	b	= mounting profile thickness in mm
3 =	force-transmitting fasteners	$h_{ef,WB}$	=effective anchorage depth in the load-bearing exterior wall in mm
4 =	screws as optional auxiliary components	$h_{ef,MP}$	= effective anchoring depth in the mounting profile in mm
5 =	load-bearing exterior wall (not part of the PWMK)	$c_{min,WB}$	= minimal edge distance in the load-bearing exterior wall in mm
x =	maximum distance of the windows and doors to the mounting profile in mm	$c_{min,MP}$	= minimal edge distance in the mounting profile in mm

Figure 1.3.1.1: Components of the PWMK and their designation

[3] 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.

1.3.2 Load-bearing exterior wall

The layer of the exterior wall, which performs the load-bearing function for fixing the PWMK.

1.3.3 Water tightness of the connection to the load-bearing exterior wall

Level indicating watertightness between the PWMK and the load-bearing exterior wall.

1.3.4 Airtightness of the connection to the load-bearing exterior wall

Level indicating the airtightness between the PWMK and the load-bearing exterior wall.

1.3.5 Symbols

a	Mounting profile width	mm
b	Mounting profile thickness	mm
$h_{ef,WB}$	Effective anchorage depth in the load-bearing exterior wall	mm
$h_{ef,MP}$	Effective anchoring depth in the mounting profile	mm
$c_{min,WB}$	Minimal edge distance in the load-bearing exterior wall	mm
$c_{min,MP}$	Minimal edge distance in the mounting profile	mm
x	Maximum distance of the window to the mounting profile	mm
F	Force in general	kN
F_m	Mean value of the test series	kN
F_{Rk}	Characteristic load-bearing capacity	kN
$F_{Rk,\perp}$	Characteristic load-bearing capacity perpendicular to the window plane	kN
$F_{Rk,\parallel}$	Characteristic load-bearing capacity parallel to the window plane	kN
$F_{Rk,P}$	Characteristic pull-out strength of fastening from the mounting profiles	kN
$F_{Rk,T}$	Characteristic transverse tensile strength from the mounting profiles to the fastening	kN
s	Centre distance	mm
c	Edge distance	mm
n	Number of attempts in a test series	–
S	Standard deviation of the test series	–
k_n	Fractile factor for n = X samples (see EN 1990, Table D.1)	–
f_{ck}	Nominal value of the characteristic concrete compressive strength	MPa
$f_{c,test}$	Concrete compressive strength of the samples	MPa
f_b	Standardised mean stone compressive strength of the selected masonry block	MPa
$f_{b,test}$	Mean stone compressive strength of the specimens	MPa
$\sigma_{2,min}$	minimum compressive stress at 2 % compression	MPa
$\sigma_{10,min}$	minimum compressive stress at 10 % compression	MPa
$\sigma_{2,max}$	maximum compressive stress at 2 % compression	MPa
$\sigma_{10,max}$	maximum compressive stress at 10 % compression	MPa
$\sigma_{2,mean}$	mean compressive stress at 2 % compression	MPa
$\sigma_{10,mean}$	mean compressive stress at 10 % compression	MPa
$\sigma_{b,min}$	minimum bending strength	MPa
$\sigma_{b,max}$	maximum bending strength	MPa
$\sigma_{b,mean}$	mean bending strength	MPa

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the products

Table 2.1.1 shows how the performance of the PWMK 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 these 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 environment			
2	Watertightness of the connection to the load-bearing exterior wall	2.2.2	Level differential pressure level at which no water ingress has been detected in Pa[Pa]
Basic works requirement 4: Safety and accessibility in use			
3	Compressive stress and bending strength of the mounting profile	2.2.3	Level compressive stress at 2% and 10 % compression: $\sigma_{2,min}$ and $\sigma_{10,min}$ [MPa] $\sigma_{2,max}$ and $\sigma_{10,max}$ [MPa] $\sigma_{2,mean}$ and $\sigma_{10,mean}$ [MPa] bending strength: $\sigma_{b,min}$ [MPa] $\sigma_{b,max}$ [MPa] $\sigma_{b,mean}$ [MPa]
4	Load-bearing capacity	2.2.4	Level load-bearing capacity perpendicular to the window plane: $F_{Rk,\perp}$ [kN] load-bearing capacity parallel to the window plane: $F_{Rk,\parallel}$ [kN] pull-out strength of fastening from the mounting profiles : $F_{Rk,P}$ [kN] transverse tensile strength from the mounting profiles to the fastening : $F_{Rk,T}$ [kN]
5	Resistance to repeated opening and closing	2.2.5	Class and level (number of cycles)
6	Resistance to racking	2.2.6	Class and level (load [N])

No	Essential characteristic	Assessment method	Type of expression of product performance
7	Creep behaviour	2.2.7	Level load per fastening point [N]
8	Wind resistance	2.2.8	Level differential pressure [Pa] and position changes and deformations [mm]
9	Soft and heavy body impact	2.2.9	Class
Basic works requirement 5: Protection against noise			
10	Sound reduction index of the joint	2.2.10	Level sound reduction index $R_{s,w}$ (C,C_{tr}) [dB]
Basic works requirement 6: Energy economy and heat retention			
11	Thermal conductivity of the mounting profile	2.2.11	Level thermal conductivity λ [W/(mK)]
12	Air permeability of the connection to the load-bearing exterior wall	2.2.12	Level air permeability at a differential pressure of +600 Pa [m^3/(m.h)]

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

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

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

Standard test configurations for assessing the performance are given in the Annexes A, B and C. In addition, general rules for transferring test results tested with this standard test configurations are given in Annex A.1, B and C.3.

External load-bearing wall materials used for the assessment of the PWMK, such as bricks, concrete, aerated concrete, solid masonry, cross-laminated timber and wooden frameworks, shall be stated in the ETA.

2.2.1 Reaction to fire

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

Therefore, when the conditions referred to above are fulfilled, the performance of the force-transmitting fasteners is class A1 which shall be given in the ETA.

The other components of the PWMK relevant for the classes A1 and A2 shall be tested according to EN ISO 1182 for substantial components, which are defined by thickness (≥ 1 mm) and /or weight per unit area (≥ 1 kg/m²) and EN ISO 1716 for all other components relevant to the classes A1 and A2, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The components shall be classified in accordance with the Commission Delegated Regulation (EU) No. 2016/364 in connection with EN 13501-1.

The reaction to fire class of the components shall be stated in the ETA.

2.2.2 Watertightness of the connection to the load-bearing exterior wall

Purpose of the assessment

Assessment of the watertightness of the connection to the load-bearing exterior wall as differential pressure where the PWMK is tight against driving rain.

Assessment method

Watertightness of the connection to the load-bearing exterior wall shall be assessed in accordance with Annex C. The PWMK shall be mounted on a load-bearing exterior wall in accordance with Annex C and the individual tests shall be carried out in the order given.

The test of tightness against driving rain when new and after exposure to wind and temperature shall be carried out based on EN 1027, with the spraying method 1A up to a differential pressure at which water ingress occurs.

The differential pressure level at which no water ingress has been detected shall be assessed in new condition and after exposure to wind and temperature.

Expression of results

The lower differential pressure from the two tests in new condition and after exposure to wind and temperature shall be given in the ETA in Pa.

2.2.3 Compressive stress and bending strength of the mounting profiles

2.2.3.1 Compressive stress

Purpose of the assessment

Assessment of the compressive stress and bending strength of the mounting profile as this is representative for the kit.

Assessment method

The compressive stress of the mounting profile shall be determined in accordance with EN 13163, Section 4.3.4. In addition to the compressive stress at 10% compression σ_{10}, the compressive stress at 2 % compression σ_2 shall be assessed.

Specimens of size of 100 x 100 x b mm shall be tested.

Expression of results

The following results for σ_2 and σ_{10} shall be given in the ETA:
- minimum value $\sigma_{2,min}$ and $\sigma_{10,min}$ in MPa
- maximum value $\sigma_{2,max}$ and $\sigma_{10,max}$ in MPa
- mean value $\sigma_{2,mean}$ and $\sigma_{10,mean}$ in MPa

2.2.3.2 Bending strength

Purpose of the assessment

Assessment of the bending strength of the mounting profile.

Assessment method

The bending strength (σ_b) of the mounting profile shall be determined in accordance with EN 13163, Section 4.3.5, and EN 12089, Section 6.1.2 (test method B).

Expression of results

The results for σ_b shall be given in the ETA:
- minimum value $\sigma_{b,min}$ in MPa
- maximum value $\sigma_{b,max}$ in MPa
- mean value $\sigma_{b,mean}$ in MPa

2.2.4 Load-bearing capacity

Purpose of the assessment

The load-bearing capacity (vertical and horizontal loads) per fastening point transmitted by the PWMK shall be assessed on small specimen for different load directions and load-bearing exterior walls.

Assessment method

Assessment of the load-bearing capacity shall be performed in accordance with Annex A, clauses A1 to A4, and

- for load-bearing capacity perpendicular to the window plane, in accordance with Annex A, Section A.5,
- for load-bearing capacity parallel to the window plane, in accordance with Annex A, Section A.6,
- for pull-out strength of fastening from the mounting profiles, in accordance with Annex A, Section A.7, and
- for transverse tensile strength from the mounting profiles to the fastening, in accordance with Annex A, Section A.8.

From the individual results of each test series, a characteristic load-bearing capacity F_{Rk} shall be determined based on the 5% quantile with a confidence level of 75%.

$$F_{Rk} = F_m - k_n \cdot S \qquad (2.2.4.1)$$

If the compressive strength of the load-bearing exterior walls deviates from the nominal value of the characteristic compressive strength for concrete or from the standardised mean compressive strength for masonry blocks, a correction according to equation (2) shall be carried out.

$$F_{Rk,c/b} = F_{Rk} \cdot (f_{ck/b} / f_{c,test/b,test}) \qquad (2.2.4.2)$$

Expression of results

The following characteristic load-bearing capacities shall be given in the ETA:
- the load-bearing capacity perpendicular and parallel to the window plane $F_{Rk,\perp}$ and $F_{Rk,\parallel}$,
- the characteristic pull-out strength of fastening from the mounting profiles $F_{Rk,P}$ and type and designation of the fastener,
- the characteristic transverse tensile strength from the mounting profiles to the fastening $F_{Rk,T}$,

together with
- the assessed load-bearing exterior walls, and
- the edge distance ($c_{min,WB}$ and $c_{min,MP}$) and anchorage depth ($h_{ef,WB}$ and $h_{ef,MP}$).

2.2.5 Resistance to repeated opening and closing

Purpose of the assessment

Assessment of function and durability of a PWMK as resistance to repeated opening and closing.

Assessment method

The PWMK shall be mounted on a load-bearing exterior wall according to Annex C, Section C.1, using a window element.
The resistance to repeated opening and closing shall be assessed based on EN 14351-1, clause 4.21.

Expression of results

The class in accordance with EN 12400 and the number of cycles shall be given in the ETA.

2.2.6 Resistance to racking

Purpose of the assessment

Assessment of function and durability of a PWMK as resistance to racking.

Assessment method

The PWMK shall be mounted on a load-bearing exterior wall in accordance with Annex C, Section C1, using a window element.
Resistance to racking shall be assessed with a load at the sash corner in accordance with EN 14351-1, clause 4.17. The test shall be carried out based on EN 14608.

Expression of results

The class in accordance with EN 13115, section 4.3.3, and respective load in N shall be given in the ETA.

2.2.7 Creep behaviour

Purpose of the assessment

The creep test under long-term loading is used to assess the stability under continuous loading of the PWMK. The permanent load corresponds to the effects of its own weight and, if applicable, additional loads of a window in relation to a fastening point.

Assessment method

Assessment shall be performed in accordance with Annex B.

Expression of results

The load per fastening point in N at which the deformation under load is ≤ 3 mm and the permanent deformation is ≤ 1 mm shall be given in the ETA together with parameters of the load-bearing exterior walls and fasteners used in assessment procedure.

2.2.8 Wind resistance

Purpose of the assessment

Assessment of the wind resistance of the connection to the load-bearing exterior wall as differential pressure where the PWMK is wind resistant.

Assessment method

Wind resistance of the connection to the load-bearing exterior wall shall be assessed in accordance with Annex C. The PWMK shall be mounted on a load-bearing exterior wall in accordance with Annex C and the individual tests shall be carried out in the order given.

The evaluation is carried out by visual inspection and with the aid of simple test equipment (e.g., measuring tape, knife, screwdriver). Adhesion problems, delamination, discoloration or other changes in the materials shall be documented. Position changes and deformations shall be documented.

Expression of results

At least the maximum tested differential pressure in Pa under static and alternating wind loads and the corresponding maximum position change and/or deformation of the PWMK in mm shall be given in the ETA. E.g., Wind load with static pressure and suction of ± 2000 Pa leads to a maximum position change and/or deformation of the profiles [mm] and alternating wind load with ± 2000 Pa leads to a maximum position change and/or deformation of the profiles [mm].

2.2.9 Soft and heavy body impact

Purpose of the assessment

Assessment of soft and heavy body impact of the PWMK.

Assessment method

A concrete wall (minimum strength class C25/30 in accordance with EN 206) with a minimum size of w × h = 1,8 m × 2,0 m shall be used as the standard load-bearing exterior wall. Other load-bearing exterior walls are permitted and shall be precisely described in the test report. In this wall there shall be a window opening with a standard size of 1,26 m × 1,51 m.

The PWMK shall be installed on four sides on the load-bearing exterior wall according to the MPII and a window or a door (the standard test configuration shall be a turn-tilt plastic window with P4A glazing in accordance with EN 356 or higher with a size of 1,23 m × 1,48 m) shall be installed in the PWMK.

Extrapolation of the test results shall be applied in accordance with EN 14351-1, table E.1, clause 4.8.

The test shall be conducted in accordance with EN 13049.

The direction of impact of the impact body shall correspond to a load on the wall mounting system away from the wall.

The PWMK itself, the connection between the load-bearing exterior wall and the PWMK as well as between the PWMK and the window shall be assessed. The test results shall be classified in accordance with EN 14351-1, clause 4.7..

Expression of results

The class shall be given in the ETA.

2.2.10 Sound reduction index of the joint

Purpose of the assessment

Assessment of the sound reduction index of the joint with the PWMK (mounting profile, load-transferring seal, force-transmitting fasteners and connection joints to the window).

Assessment method

The sound reduction index of the joint with the PWMK shall be determined in accordance with the specifications of EN ISO 10140-1, Annex J, and EN ISO 10140-2, whereby the test opening for "specific small-sized test openings" shall be used in accordance with EN ISO 10140-5, Section 4.3.4.

The PWMK shall be installed on four sides on the load-bearing exterior wall according to the MPII in front of the test opening in the transmitter room on the wall former.

A highly sound-insulating element of size (W x H x D) 1230 mm x 1480 mm x ≤ 90 mm shall be inserted into the frame made of circumferential PWMK and sealed according to the MPII.

The test results shall be documented in accordance with EN ISO 10140-1.

The sound reduction index of the joint $R_{s,w}$ shall be assessed in accordance with EN ISO 717-1.

Expression of results

The sound reduction index of the joint $R_{s,w}$ and the associated spectrum adaptation values C and C_{tr} of the tested PWMK shall be given in the ETA.

2.2.11 Thermal conductivity of the mounting profile

Purpose of the assessment

Assessment of the thermal conductivity of the mounting profile as this is representative for the kit.

Assessment method

The thermal conductivity of the EPS material shall be determined in accordance with EN 13163, Section 5.3.2.

The size of the test specimen shall be plate-shaped either 500 mm × 500 mm × mounting profile thickness or 150 mm × 150 mm × mounting profile thickness.

Expression of results

At least the nominal value of the thermal conductivity at a mean temperature of 10°C = λ_{10} in W/(mK) shall be given in the ETA.

2.2.12 Air permeability of the connection to the load-bearing exterior wall

Purpose of the assessment

Assessment of the air permeability of the connection to the load-bearing exterior wall at differential pressure of 600 Pa.

Assessment method

Air permeability of the connection to the load-bearing exterior wall shall be assessed according to Annex C. The PWMK shall be mounted on a load-bearing exterior wall in accordance with Annex C and the individual tests shall be carried out in the order given.

The air permeability test when new and after exposure to wind and temperature shall be carried out based on EN 1026.

For the air permeability of the tested PWMK, the length-related air permeability at a reference differential pressure of 600 Pa shall be assessed in $m^3/(h \cdot m)$.

Expression of results

The higher length-related air permeability at a reference differential pressure of 600 Pa from the two tests before and after exposure to wind and temperature shall be given in the ETA in $m^3/(h \cdot m)$.

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 1999/93/EC, as amended by Decision 2011/246/EC.

The system is 3.

3.2 Tasks of the manufacturer

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

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

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Object / type of control	Test or control procedure	Criteria, if available	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory according to a prescribed test plan]					
1	Incoming control (e.g., material composition, delivery notes)	Control of delivery notes and visual control	According to Control plan	-	each delivery
2	Production control for the EPS mounting profile	in accordance withEN 13163	in accordance with EN 13163	in accordance with EN 13163	in accordance with EN 13163
3	Determination of the raw density of the mounting profile	in accordance with EN 13163, clause 4.3.16	According to Control plan	10	once/week
4	Geometry control for components	Measurement of dimensions with measuring device	According to Control plan	10	once/week
5	Production control for the fastening element	Tensile breaking load and shear breaking load of respective fastener	According to Control plan	10 10	once/year once/year
6	Reaction to fire	CWFT: Control of compliance of CWFT-decision. Testing: check at each reception that the relevant parameters of the tests are fulfilled.	According to Control plan	1	once/shift
7	**Final check** Checking the composition of the individual components of the PWMK	visual control	completeness	10	once/week

4 REFERENCE DOCUMENTS

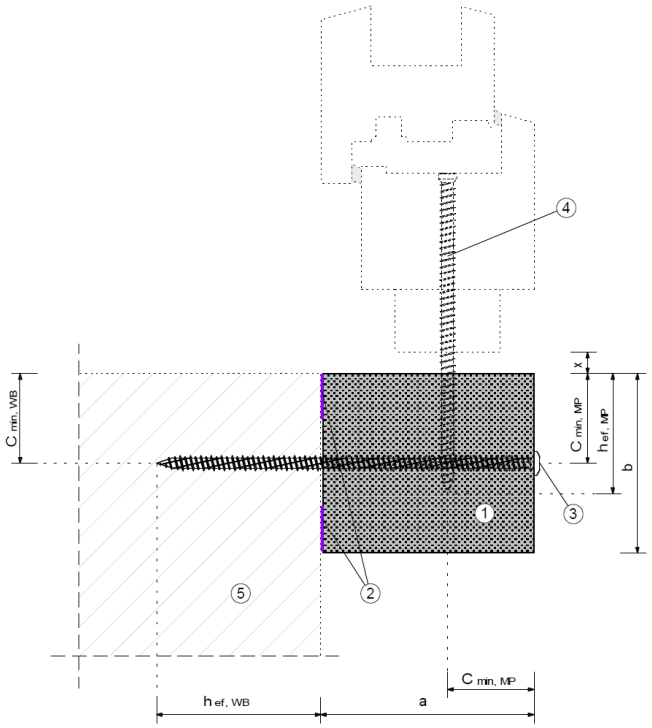
EN 206:2013+A2:2021	Concrete - Specification, performance, production and conformity
EN 356:1999	Glass in building - Security glazing - Testing and classification of resistance against manual attack
EN 1026:2016	Windows and doors - Air permeability - Test method
EN 1027:2016	Windows and doors - Water tightness - Test method
EN 1191:2012	Windows and doors - Resistance to repeated opening and closing - Test method
EN 1627: 2021	Pedestrian doorsets, windows, curtain walling, grilles and shutters - Burglar resistance - Requirements and classification
EN 1628:2021	Pedestrian doorsets, windows, curtain walling, grilles and shutters - Burglar resistance - Test method for the determination of resistance under static loading
EN 1629:2021	Pedestrian doorsets, windows, curtain walling, grilles and shutters - Burglar resistance - Test method for the determination of resistance under dynamic loading
EN 1630:2021	Pedestrian doorsets, windows, curtain walling, grilles and shutters - Burglar resistance - Test method for the determination of resistance to manual burglary attempts
EN 1990:2023	Eurocode - Basis of structural and geotechnical design
EN 12089:2013	Thermal insulating products for building applications - Determination of bending behaviour
EN 12211:2016	Windows and doors - Resistance to wind load - Test method
EN 12400:2002	Windows and pedestrian doors - Mechanical durability - Requirements and classification
EN 13049:2023	Windows and doors - Soft and heavy body impact - Test method, safety requirements and classification
EN 13115:2020	Windows - Classification of mechanical properties - Racking, torsion and operating forces
EN 13163:2012+A1:2015	Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products - Specification
EN 13501-1:2018	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 14608:2004	Windows - Determination of the resistance to racking
EN ISO 717-1:2020	Acoustics - Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation (ISO 717-1:2020)
EN ISO 7500-1:2018	Metallic materials - Calibration and verification of static uniaxial testing machines – Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1:2018)
EN ISO 9513:2012/AC:2013	Metallic materials - Calibration of extensometer systems used in uniaxial testing (ISO 9513:2012+Cor 1:2013)
EN ISO 10140-1:2021	Acoustics - Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products (ISO 10140-1:2021)
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140 2:2021))
EN ISO 10140-5:2021	Acoustics - Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment (ISO 10140-5:2021)

ANNEX A: DETERMINATION OF THE LOAD-BEARING CAPACITY

A.1 General

For assessing the essential characteristics of a PWMK (see figure A1.1) two cases shall be taken into account.

1. If the PWMK consists of one specific variant, e.g., only one mounting profile width and thickness is available, then the performance of this specific kit shall be assessed.
2. If the PWMK can consist of several variants, e.g., only one mounting profile thickness but different mounting profile widths and/or force-transmitting fasteners are available, the worst case of the possible variant's combination shall be assessed.



1 =	mounting profile	a =	mounting profile width in mm
2 =	load-transferring seal	b =	mounting profile thickness in mm
3 =	force-transmitting fasteners	$h_{ef,WB}$ =	effective anchorage depth in the load-bearing exterior wall in mm
4 =	screws as optional auxiliary components	$h_{ef,MP}$ =	effective anchoring depth in the mounting profile in mm
5 =	load-bearing exterior wall (not part of the PWMK)	$c_{min,WB}$ =	minimal edge distance in the load-bearing exterior wall in mm
x =	maximum distance of the windows and doors to the mounting profile in mm	$c_{min,MP}$ =	minimal edge distance in the mounting profile in mm

Figure A.1.1: Components of the PWMK and their designation

The following standard test configurations shall be taken into account for assessing the essential characteristics of a PWMK that consists of several variants. These test configurations are based on the following assumptions and prerequisites:

- The material(s) used for the PWMK are homogeneous in such a way that the performance does not differ in between one part or zone of the PWMK (e.g., if the mounting profile does not have a specific top and bottom side the performance concerning pull-out is identical on all sides),

- The tested PWMK consists of representative components and is not preloaded (e.g., specimens for compressive strength shall not be pre-compressed), and
- The components used for the tests shall be chosen if possible, within given strength classes or on the basis of characteristic strength.
- The following materials for samples forming the load bearing exterior wall shall be considered.
    - Concrete with a strength class of C25/30 or lower
    - Sand lime brick with a characteristic compressive strength of 12 kN or lower
    - Vertical coring brick with a characteristic compressive strength of 12 kN or lower
    - Wood with a strength class of C24 or lower
    - Aerated concrete with a strength class of PP4 or lower
    - Expanded clay with a strength class of LAC 8 or lower

For the worst case of the possible variant's combination the following applies:

- Fasteners
    a. If the PWMK can consist of different fasteners, the fastener with the smallest diameter and smallest head shall be tested at least.
- Bending strength
    If the mounting profile is available in several dimensions, the smallest dimension shall be tested at least.
- Load bearing capacity normal and parallel to the window level shall be tested with
    a. the load-bearing exterior wall with the lowest strength class,
    b. minimum edge distance in the mounting profile ($c_{min,MP}$),
    c. minimum edge distance in the exterior wall ($c_{min,WB}$), and
    d. minimum anchorage depth in the exterior wall ($h_{ef,WB}$).
- Pull-out of fastening from the mounting profile and transverse load from the mounting profiles to the fastening shall be tested with
    a. minimum edge distance in the mounting profile ($c_{min,MP}$), and
    b. minimum anchorage depth in the mounting profile ($h_{ef,MP}$).

The following rules for transferring the results of tests to other configurations are based on the assumptions and prerequisites mentioned above.

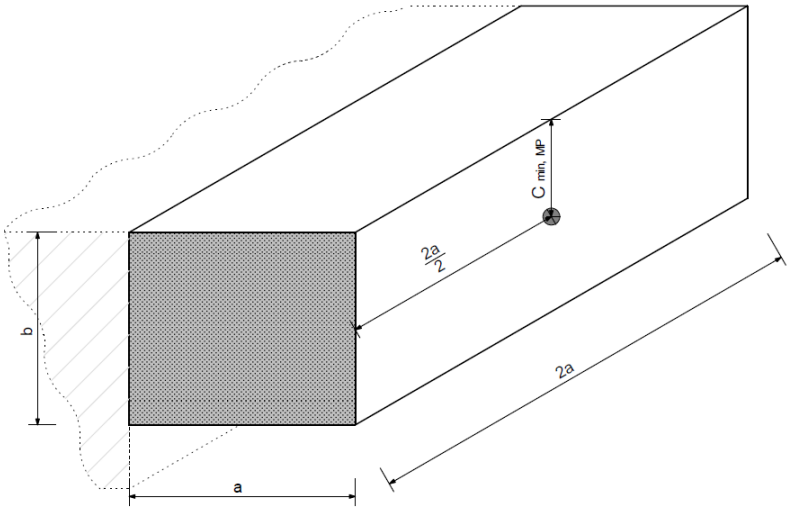
- Test results concerning bending strength can be transferred to mounting profile configurations with a higher bending strength.
- Test results concerning the load-bearing capacity normal and parallel to the window level can be transferred to configurations with
    a. load-bearing exterior walls with a higher strength class as tested,
    b. a higher edge distance in the mounting profile and exterior wall as tested,
    c. or a bigger anchorage depth in the exterior wall.
- Test results concerning pull-out of fastening from the mounting profile and transverse load from the mounting profiles to the fastening can be transferred to configurations with
    a. either a higher edge distance in the mounting profile,
    b. and or a higher anchorage depth in the mounting profile.

A.2 Test facilities

The tests shall be carried out with a universal testing machine with a force measuring device in accordance with EN ISO 7500-1, class 1, and displacement transducers according to EN ISO 9513, class 1, or with measurement accuracy requirements and error limits in accordance with EN ISO 7500-1, Table 2, and EN ISO 9513, Table 2.

A.3 Geometry of the specimen

The load-bearing capacity per fixing point transmitted by the PWMK shall be assessed on specimens of geometry according to Figure A.3.1.



a = profile width

b = profile thickness

Length of specimen = 2 • a

Position of fixing point = (*2 • a) / 2* and $c_{min\ MP}$

Figure A.3.1: Geometry of the specimen

The tests shall be carried out on concrete blocks (standard test configuration) or on the load-bearing exterior walls intended to be used.

The test specimens shall be assembled according to the MPII in a normal room climate of 23°C ±2°C and 50% ±10% relative humidity.

In the case of concrete blocks, several fixing points shall be used, considering the minimum distances between each other (≥ 3 h_{ef}).

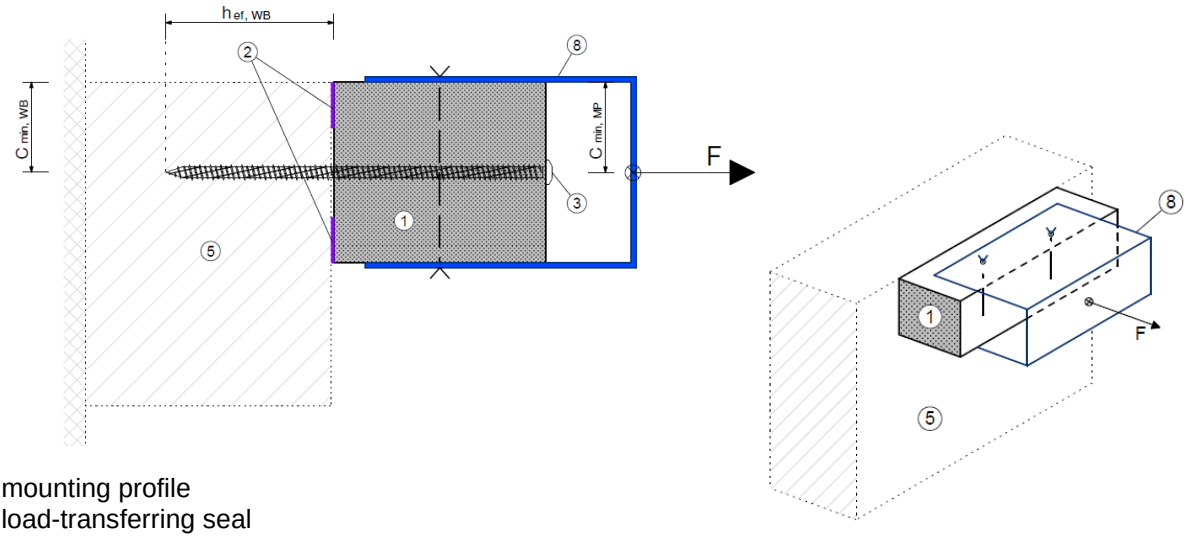
In the case of masonry, the brick size for the test setup shall allow the installation considering the minimum distances ≥ 2 h_{ef} (tensile test) or ≥ 2 $c_{min,WB}$ (shear load test) to the free edge according to figure A.1.1.

A.4 Test procedure

A minimum of 5 specimens shall be tested per sample. For assessment of the load-bearing capacity normal and parallel to the window level as well as transverse load from the mounting profiles to the fastening, metal adapter pieces that are matched to the PWMK and the load case to be tested shall be used for load introduction (for examples, see Figures A.5.1, A.6.1, and A.8.1 in blue colour). A joint shall be provided between the adapter piece and the load device to enable the load to be centrally introduced.

The load shall be applied in such a way that the maximum load is reached in 1 to 3 minutes.

A.5 Testing of load-bearing capacity normal to the window level



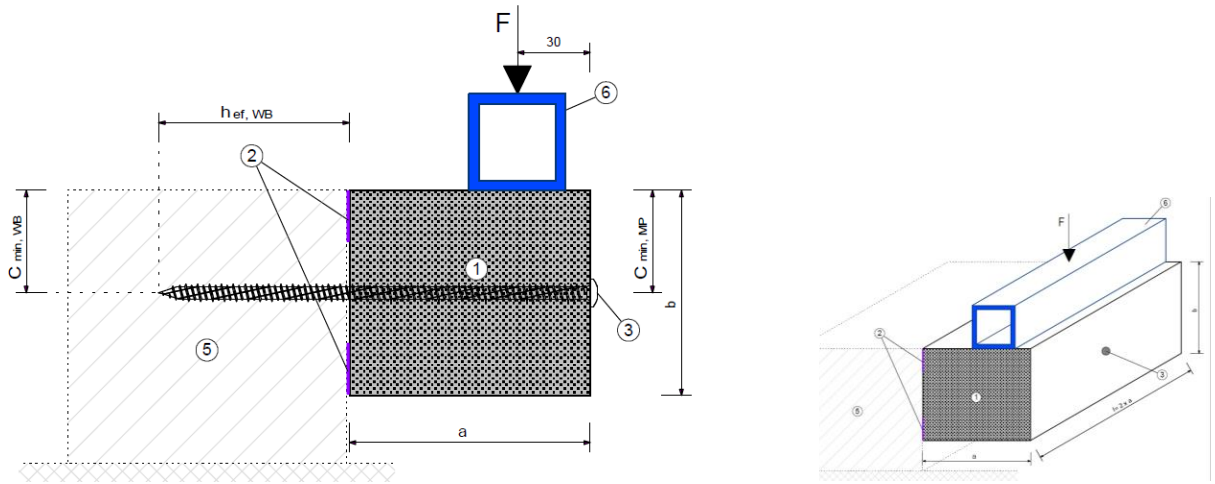
1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
5 = load-bearing exterior wall (not part of the PWMK)
8 = metal adapter piece- auxiliary device for initiation of force F

Figure A.5.1: Schematic representation of the loading normal to the window level

The test shall be performed with the anchorage depth $h_{ef,WB}$ and the minimal edge distance in the exterior wall $c_{min,WB}$ and the minimal edge distance in the mounting $c_{min,MP}$.

The load-displacement curve shall be recorded for each individual test. In addition to the maximum force and deformation, the cause of failure shall be documented.

A.6 Testing of load-bearing capacity parallel to the window level



1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
5 = load-bearing exterior wall (not part of the PWMK)
6 = metal adapter piece- square tube 40 x 40 mm for load distribution

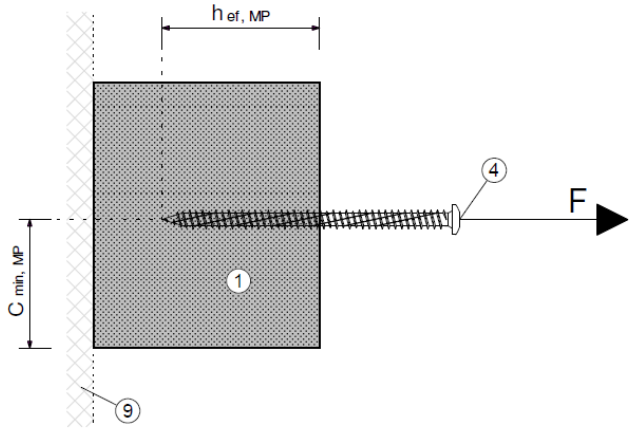
Figure A.6.1: Schematic representation of the loading parallel to the window level, where the specimen length l = 2 a

The load-bearing capacity of the PWMK for cantilevered installation in the window level shall be determined depending on the width a. In the case of several variants, at least the minimum height b and maximum

width a shall be assessed. The test shall be performed with the anchorage depth $h_{ef,WB}$ and the mimimal edge distance in the exterior wall $c_{min,WB}$ and the minimal edge distance in the mounting $c_{min,MP}$.

The load-displacement curve shall be recorded for each individual test. In addition to the maximum force at 3 mm deformation and the cause of failure shall be documented.

A.7 Testing of pull-out of fastening from the mounting profiles



1 = mounting profile
4 = force-transmitting fasteners and/or screws as optional auxiliary components
9 = base crosshead (“table”) of the universal testing machine

Figure A.7.1: Schematic representation of the loading for pull-out of the fastening from the mounting profile

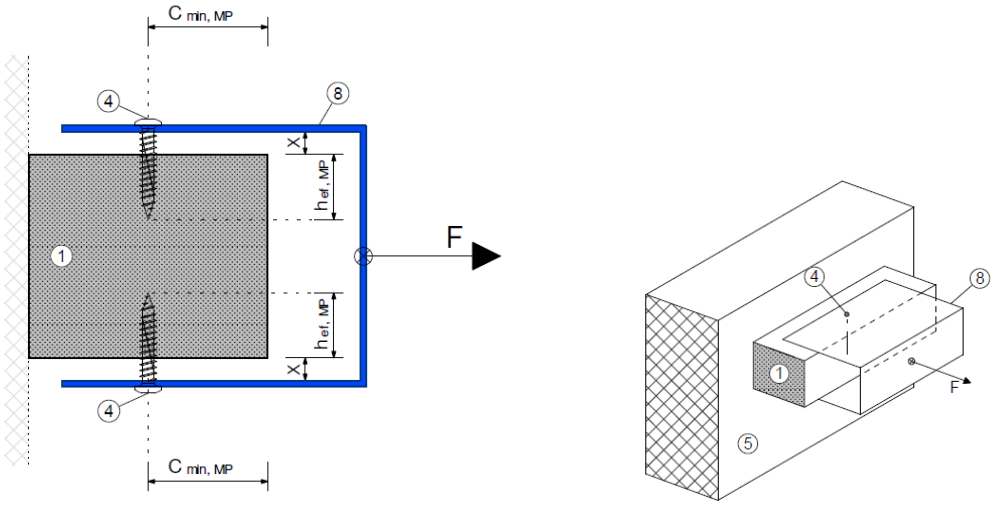
The specimen shall be rigidly connected to the testing machine. Any fixing device such as clamps, should be positioned in such a way that the cause of failure is not influenced by the fixing device, e.g., fracture zones of the mounting profile should be not covered by fixing devices.

The test shall be performed with the anchorage depth $h_{ef,MP}$ and the minimal edge distance in the mounting profile $c_{min,MP}$.

The load-displacement curve shall be recorded for each individual test. In addition to the maximum force and deformation, the cause of failure shall be documented.

The specification of the used screws (dimension, tensile strength, material) shall be given in the ETA.

A.8 Testing of the window fastening for transverse load from the mounting profiles



1 = mounting profile
4 = screws as optional auxiliary components
5 = base crosshead (“table”) of the universal testing machine
8 = metal adapter piece- auxiliary device for initiation of force F

Figure A.8.1: Schematic representation of the loading for transverse load from the mounting profiles to the fastening

The specimen shall be rigidly connected to the testing machine. Any fixing device such as clamps for example, should be positioned in such a way that the cause of failure is not influenced by the fixing device, e.g., fracture zones of the mounting profile should be not covered by fixing devices.

The test shall be performed with the anchorage depth $h_{ef,MP}$ and the minimal edge distance in the mounting profile $c_{min,MP}$.

The dimension x is the largest intended installation joint of the window to the PWMK.

The load-displacement curve shall be recorded for each individual test. In addition to the maximum force and deformation and the cause of failure shall be documented.

ANNEX B: TESTING OF THE CREEP BEHAVIOUR

If there are several variants of the PWMK available, at least the mounting profile with the smallest thickness and biggest width per variant shall be tested.

Before starting the test, the specimens shall be conditioned for at least 24 hours at the intended test temperature of 20 °C ± 5 °C.

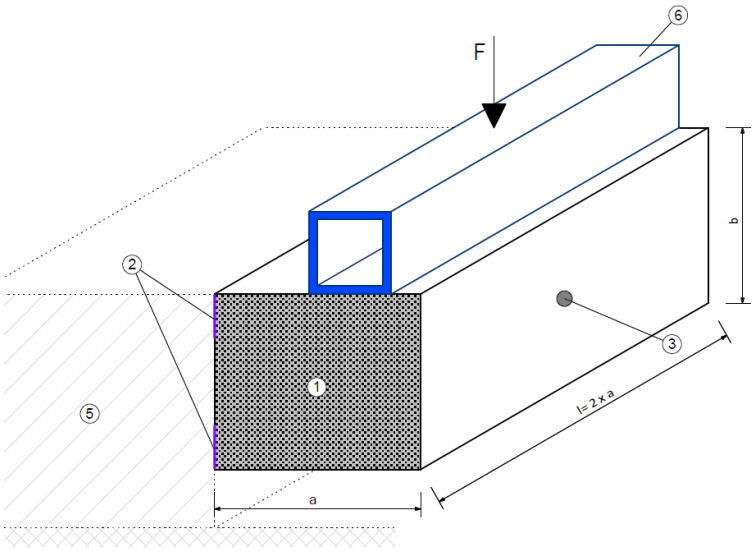
A load shall be applied to each fixing point that shall correspond to the half weight of a window element with a heavy glazing of > 30 kg/m².

Testing of the creep behaviour of the fixing points shall be carried out by introducing loads to 5 horizontal mounting profiles each. At least the maximum overhang "a" for each variant shall be tested.

The creep behaviour shall be assessed on specimens of geometry according to Figure B.1 with:

- at least at the maximum mounting profile width "a" (projection),
- at least the minimum mounting profile thickness "b", and
- a length of the mounting profile of 2 x a.

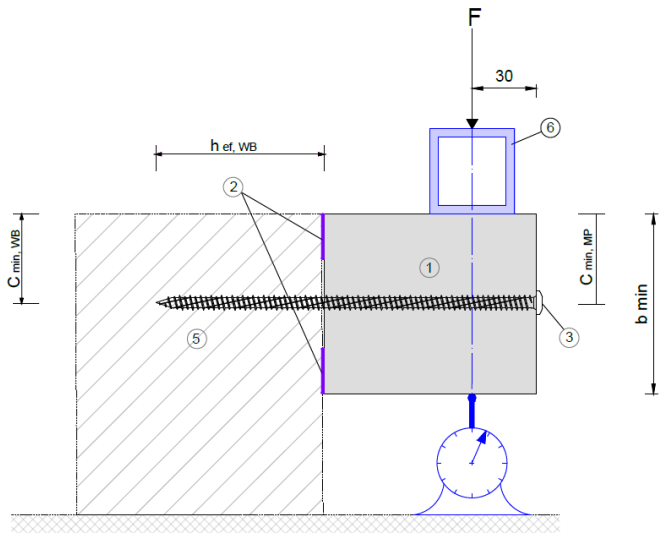
Concrete of minimum strength class C25/30 in accordance with EN 206 shall be used as the exterior load-bearing wall.



1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
5 = load-bearing exterior wall (not part of the PWMK)
6 = Shaped tube 40 x 40 mm for load distribution

Figure B.1: Specimen geometry and load application

The vertically load shall be introduced via a load application profile (shaped tube 40 x 40 mm) and the deformation in the axis of load application (30 mm from the outside) in the middle of the specimen length (2xa)/2 is determined (see Figure B.2).



1 = mounting profile
2 = load-transferring seal
3 = force-transmitting fasteners to the load-bearing exterior wall
5 = load-bearing exterior wall (not part of the PWMK)
6 = Shaped tube 40 x 40 mm for load distribution

Figure B.2: Schematic representation of the test for creep behaviour on a horizontally mounted mounting profile

The specimens shall be loaded and after 24 hours the recording of the creep deformation shall start. The creep deformation of the loaded specimens shall be measured after 1, 3, 7 days and then every 7 days
- until the termination criterion (deformation of < 0,1 mm during 3 consecutive weeks) is reached, or
- up to 90 days, or
- until the specimen breaks.

The test specimen shall be relieved and the permanent deformation shall be determined after 24 hours.

The deformation curve and, if applicable, the fracture pattern shall be shown in relation to the applied load. The applied load, the mean values of creep deformation under load of the 5 specimens and the permanent deformation shall be recorded.

The load in N at which the deformation under load is ≤ 3 mm and the permanent deformation is ≤ 1 mm shall be given in the ETA.

Test results of the test for creep behaviour can be transferred to configurations with
- either smaller mounting profile widths as tested,
- and or bigger mounting profile thicknesses as tested.

ANNEX C: TESTING OF WATERTIGHTNESS, WIND RESISTANCE AND AIR PERMEABILITY

Assessment of the watertightness, the wind resistance and the air permeability of the PWMK shall be performed on a test specimen, whereby all tests shall be performed with the same load-bearing exterior wall and window or door.

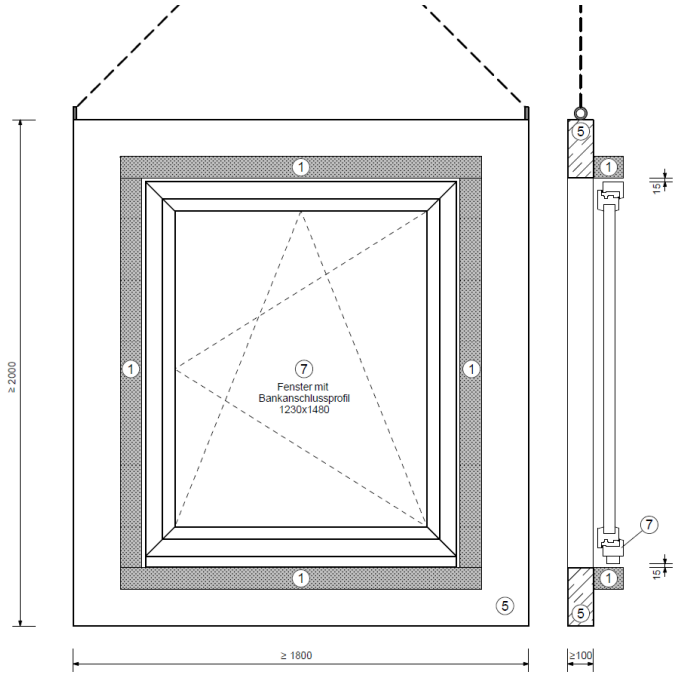
C.1 Specimen, specimen production, documents

A concrete wall (minimum strength class C25/30 in accordance with EN 206) with a minimum size of w × h = 1,8 m × 2,0 m shall be used as the standard load-bearing exterior wall. Other load-bearing exterior walls are permissible and shall be precisely defined in the test report. In this wall there shall be a window opening with a standard size of 1,26 m × 1,51 m.

The specimen shall be transportable specimen so that tests can be performed at the various test rigs (Figure C.1.1). The load-bearing exterior wall shall be torsional rigid and shall be manufactured with brackets for crane transport. The load-bearing exterior wall shall have a flat bearing surface in the outer edge area for an airtight connection to the test rig.

A single-leaf turn-tilt plastic-aluminium window with a floor outer dimension of 1,23 m x 1,48 m and a heat transfer coefficient U of the triple insulating glass of $U_g \leq 0,7$ W/(m^{2}K) shall be installed.

The PWMK shall be mounted on the load-bearing exterior wall according to the MPII (see Figure C.1.1). Loads at window level shall be transferred by e.g., blocks in accordance with the type of opening of the window, unless the window attachment provides for load transfer at window level. When there are no provisions in the MPII, the installation shall be carried out with a circumferential connection joint of 15 mm. The window joint and the connection joint of the window to the PWMK shall be sealed air and watertight as only the PWMK shall be tested.



1 = mounting profile
5 = load-bearing exterior walls
7 = window

Figure C.1.1: Specimen setup (schematic)

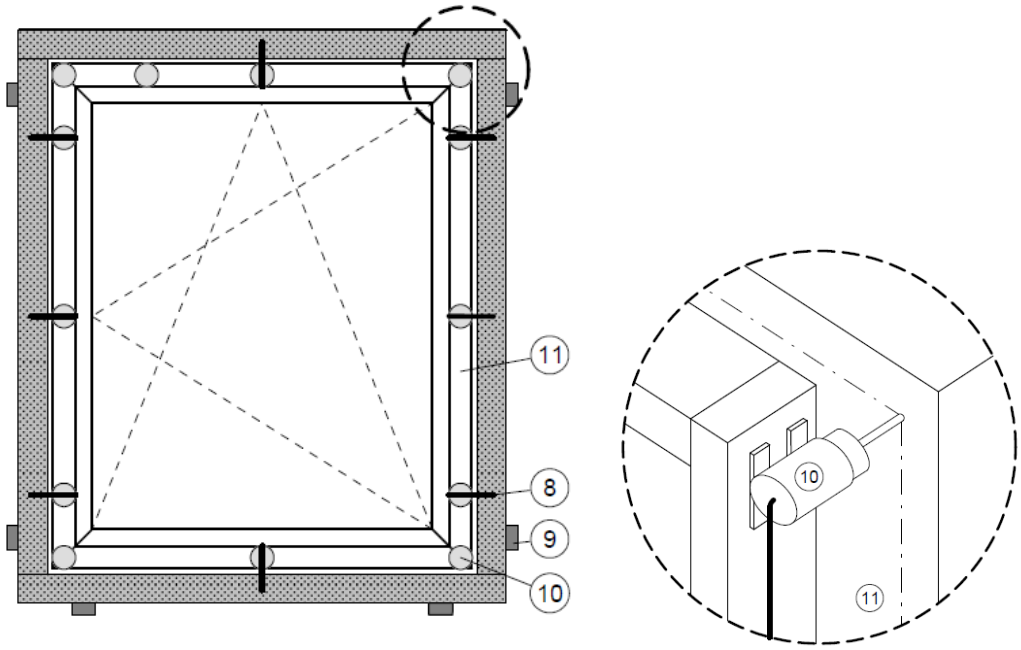
Note: the use of a smooth coating on the wall with a maximum grain size of 1,5 mm and/or a primer can be necessary to reach these requirements.

C.2 Test setup

The test equipment shall comply with the specifications and requirements in the test standards mentioned below. The climatic load shall be applied using a climatic chamber that is adapted to the outside of the test specimen.

In order to record displacements between the window and the load-bearing exterior wall perpendicular to the window plane under load, displacement transducers shall be installed on all 4 sides of the window (in the corners, in the fastening area and between two fastening points with the largest centre-to-centre distance) (Figure C.2.1). The displacement transducers shall be mounted either directly on the load-bearing exterior wall or on an attachment frame that shall be fastened to the building structure.

At the PWMK, two blocks per frame part are provided as measuring points in the window plane, see figure C.2.1, number 9. At these points, displacements and position changes shall be recorded with a caliper gauge.



8 = window attachment (screws as optional auxiliary components)
9 = measuring points parallel to the window plane
10 = measuring points perpendicular to the window plane
11 = window frame / frame

Figure C.2.1: Arrangement of the measuring points in PWMK (shown in grey)

C.3 Test method

The following tests shall be performed in the specified order on one specimen:

1. air permeability test in in accordance with on EN 1026;
2. test of watertightness in in accordance with on EN 1027;
3. test of wind resistance under repeated pressure (pressure-suction-change load) following EN 12211, 200 cycles with a differential pressure of ± 1000 Pa, the changes in position and (permanent) deformations due to wind load of the PWMK shall be recorded. Wind load as static pressure and suction following EN 12211 with a differential pressure of ± 2000 Pa, the changes in position and (permanent) deformations of the PWMK shall be recorded; the minimum quality concerning the recording of changes in position and/or (permanent) deformations while wind loads are as follows:

- cyclic wind load, at least the position change while the first and the last cycle and the permanent deformation after the test shall be recorded for each measuring point according to figure C.2.1 and
- static wind load: the position change and the permanent deformation after the test shall be recorded for each measuring point according to figure C.2.1.

At least the maximum tested differential pressure in Pa under static and alternating wind loads and the corresponding maximum position change and/or deformation of the PWMK in mm shall be given in the ETA;

4. test under alternating thermal stress with frost at an outdoor climate of +55°C/-15°C; at least 15 cycles (see Figure C.3.1);
5. air permeability test in accordance with on EN 1026;
6. test of watertightness in accordance with on EN 1027.

During the tests, the room climate (test hall climate) shall be between 15°C and 30°C and between 30% and 70% relative humidity.

After the test of watertightness (no. 7) the PWMK shall be dismantled in such a way that possible leakages between the PWMK and the load bearing exterior wall can be located. If applicable the position of leakages or water ingress or changes to the connection shall be precisely detected and described. Adhesion problems, delamination, discoloration or other changes in the materials used shall be documented.

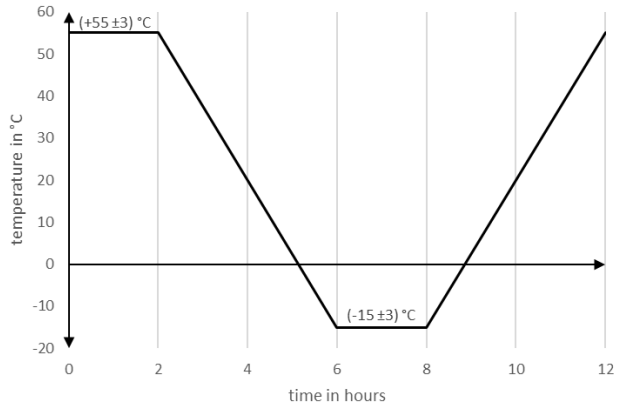


Figure C.3.1: Alternating thermal stress scheme with frost at an outdoor climate of +55°C/-15°C (one cycle)

Test results concerning the air and driving rain tightness of the PWMK can be transferred to exterior wall configurations with surfaces that are even/flat (e.g., no mortar joints, breakouts, gravel pockets, voids, etc.), non-sandy, dry and free of cracks (hairline cracks up to a maximum of 0,2 mm permitted) and are applicable for all window and door constructions with frames made out of plastic, wood and thermal-isolated aluminium.

The tested configuration and extended application of results shall be stated in the ETA.