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Designated according to Article29 of Regulation (EU) Nº 305/2011

Member of EOTA
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European Technical Assessment ETA 13/0626 of 20/09/2016

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) Nº305/2011:	Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)
Trade name of the construction product	ProdEX exposed fixing and ProdEX concealed fixing
Product family to which the construction product belongs	Kits for external wall claddings
Manufacturer	PRODEMA, S.A. Bº de San Miguel, 9. 20250 LEGORRETA (Guipúzcoa) España website: www.prodema.com
Manufacturing plant(s)	PRODEMA, S.A. Bº de San Miguel, 9. 20250 LEGORRETA (Guipúzcoa) España
This European Technical Assessment contains	24 pages including 4 Annexes which form an integral part of this assessment. Annex D contains confidential information and is not included in the ETA when is publicly available
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	Guideline for European Technical Approval (ETAG) nº 034 ed. April 2012, part 1 and 2 used as European Assessment Document (EAD)

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SPECIFIC PART

1. Technical description of the product

The assessed kits for ventilated external wall claddings “ProdEX exposed fixing” and “ProdEX concealed fixing” consist of an external cladding, mechanically fastened to a framework, which is fixed to the external wall of new or existing buildings (retrofit). An insulation layer is usually fixed on the external wall.

These kits for vertical exterior wall claddings are classified as family A (exposed fixing) and B (concealed fixing), according to the ETA Guidance nº 034: *Kits for external wall claddings*. *Part 1: Ventilated cladding kits comprising cladding components and associated fixings and Part 2: Cladding kits comprising cladding components, associated fixings, subframe and possible insulation layer*, edition April 2012 (hereinafter ETAG 034), used as European Assessment Document (EAD), and comprises the components specified in table 1, which are factory produced by the ETA holder or a supplier.

TABLE 1 – DEFINITION OF THE KIT COMPONENTS

Components				**Material**			**Sizes** [mm]
Cladding element			HPL compact panels for exterior **ProdEX IGN** (1) produced by PRODEMA, S.A. EDF(2) quality and CE marking(3) according to Annex ZA of the EN 438-7:2005(4)	High-density, no porous and homogeneous stratified timber panels for external use. This quality of panel is reached by the simultaneous application of high temperature and pressure. Layers of the panel (figure 1): a. PVDF Antigraffiti overlay b. Pigmented Melaminic Overlay c. Natural timber veneer d. one-color barrier e. HPL core : Kraft paper impregnated with phenol/formaldehyde resins f. Natural timber veneer g. one-color barrier h. Balancing film			6 8 2440 x 1220 x 10 12 14
Cladding fixings			Elements used to secure the cladding panels to the subframe(5)	EXPOSED FIXINGS (6)	To aluminium subframe	Stainless steel self-drilling screw	Ø 5,5 L=32
						Aluminum rivet	Ø 5 L=e_{pan}+e_{perf}+$Ø_{cuerpo}$
					To timber subframe	Stainless steel self-drilling screw	Ø 4,8 L=38
				CONCEALED FIXINGS (7)	Stainless steel self-drilling screws + Aluminium hanging hooks screwed to the rear of the panel + Horizontal guide rails to hung the panels by the mean of hanging hooks		Ø 6 L=11,5 68.50 x 38 x 50 (e=5) 31 x 60 x L (e=3.3)
Subframe(8)	EXPOSED F.	Vertical profiles	Vertical elements(9) used to fix the panels	Aluminium			80 x 60 (e= 2.5)
				Wood(10)			40 x 60
	CONC F.	Vertical profiles	Vertical elements(11) used to fix the horizontal guide rails	Aluminium			80 x 60 (e= 2.5)
	Brackets		Metalic elements(12) used as load trasmission between the subframe and the substrate wall.	Extruded aluminium(13)			40 x 80 x 60 40 x 80 x 100
Ancillary material			Screws between brackets and vertical elements(14)	Stainless steel self-drilling screw			Ø 5,5 L=25
			Tape used to form the joints in the timber subframe	Ethylene propylene diene monomer (*EPDM*)			W=60-100
			Screw used to levelling the panel in the concealed fixing system	Stainless steel A2			Ø 8 L=25
			Screw used to securing the panel in the concealed fixing system				Ø 5.5 L=19.25
Auxiliary components			Anchorage to substrate(15)	-			-

(1) Dimensional features, physical – mechanical and weather resistance properties in Annex 1
(2) Panels for exterior use, severe conditions, fire-retardant
(3) Certificate of constancy of performance 1239/CPR/0801101
(4) EN 438-7:2005 “High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (Usually called Laminates) - Part 7: Compact laminate and HPL composite panels for internal and external wall and ceiling finishes”
(5) See Annex 2
(6) All the thickness (6 mm to 14 mm) of panels are allowed with exposed fixings
(7) Only 10mm, 12mm and 14mm thickness of panels are allowed with concealed fixings
(8) Not manufactured by PRODEMA, S.A.
(9) Geometric and mechanical features in Annex 2 and figure 5
(10) Technical specifications in Annex 2.
(11) Geometric and mechanical features in Annex 2 and figure 5
(12) Geometric and mechanical features in Annex 2 and figure 4
(13) Physical and mechanical properties in Annex 2
(14) Geometric and mechanical features in Annex 2
(15) See Annex 3

2. Specification of the intended use in accordance with the applicable EAD

2.1 Intended use

"ProdEX exposed fixing" and "ProdEX concealed fixing" are intended to be used for ventilated external wall claddings which can be fixed to the external wall of new or existing buildings.

The substrate walls are made of masonry (bricks or blocks), concrete (cast on site or as prefabricated panels), timber or metal frame. Insulation material is defined in accordance with an EN standard or an ETA and is not manufactured by PRODEMA, S.A.

Kit for ventilated external wall claddings is non-load-bearing construction system. It does not contribute to the stability of the wall on which is installed, neither to ensure the air tightness of the building structure but it can contribute to durability of the works by providing enhanced protection from the effect of weathering.

2.2 Relevant general conditions for the use of the kit

The provisions made in this European Technical Approval, according to the ETAG 034 used as EAD, are based on an assumed working life of 25 years as minimum, provided that the conditions lay down in sections 4.2, 5.1. and 5.2. for the installation, packaging, transport and storage as well as appropriate use, maintenance and repair are met.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

2.3 Design of the kits

The design of the external wall cladding system for ventilated façade using "ProdEX exposed fixing" and "ProdEX concealed fixing" kit should take into account:

- The mechanical characteristic values of the kit components (e.g. plates, cladding fixings and subframe) in order to resist the actions applying on the specific work. National safety factor must be used.
- The substrate material to define the suitable anchorages.
- The possible movements of the substrate and the position of the building expansion joints.
- The dilation of the kit components and of the plates.
- The category of corrosivity of the atmosphere of the works [(16)].
- Because joints are not watertight, the first layer behind ventilated air space must be composed by materials with low water absorption.
- The construction of façade specific parts (e.g. base, top, corners, windows etc.)
- If the entire building must comply with the specific building regulations, particularly concerning fire and wind-load resistances of the Member State where the work is to be built.

2.4 Installation of the kits in works

Installation should be carried out according to the ETA holder's specifications and using the specific kit components, manufactured by the ETA holder or by suppliers recognized by the ETA holder.

Installation should be carried out by appropriately qualified staff and under the supervision of the technical responsible of the site.

2.5 Use, maintenance and repair of the works

Maintenance of the assembled systems or kit components includes inspections on site, taking into account the following aspects:

- Regarding the plates: appearance of any damage such as cracking o detachment due to permanent and irreversible deformation.
- Regarding metallic components: presence of corrosion or water accumulation.

Necessary repairs should be done rapidly, using the same kit components and following the repair instructions given by ETA holder.

[(16)] (E.g. See table 1 of Standard EN ISO 12944-2: 1998. Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments.

3. Performance of the product and references to the methods used for its assessment.

The identification tests and the assessment for the intended use of these kits for ventilated external wall claddings according to the Basic Work Requirements (BWR) were carried out in compliance with the ETAG 034 used as an EAD. The characteristics of the components shall correspond to the respective values laid down in the technical documentation of this ETA, checked by IETcc.

3.1 Mechanical resistance and stability (BWR1)

Requirements with respect to the mechanical resistance and stability of non-load bearing parts of the works are not included in this Basic Requirement but are treated under the Basic Requirement Safety in use (See section 3.4)

3.2 Safety in case of fire (BWR2)

3.2.1 Reaction to fire

Euro class B-s2, d0 according to standard EN 13501-1: 2007 + A1:2010[(17)].

This classification is valid for the commercial reference “ProdEX IGN” of high-pressure compact laminate panels in thicknesses of 6mm or greater in accordance with standard EN 438-7:2005 for high-pressure compact laminate, as long as the insulation layer placed in the ventilated air space is made of a non-combustible material (mineral wool) or the layer behind the cladding elements is a mineral substrate like masonry or concrete (A1 or A2-s1, d0).

In other cases the class of reaction to fire is NPD (No performance determined).

A European reference fire scenario has not been laid down for facades. In some Member States, the classification of external wall cladding kits according to Standard EN 13501-1 might not be sufficient for the use in facades. An additional assessment of the system according to the national provision (e.g. on the basis of a large scale test) might be necessary to comply with Member State Regulations, until the existing European classification system has been completed.

3.2.2 Fire resistance

The fire resistance requirement is applicable to the wall itself (made of masonry, concrete, timber or metal frame) and not on the cladding kits. The cladding kit alone does not meet any fire resistance requirements. The evaluation of “fire propagation to upper levels” is not part of the European classification and thus, cannot be evaluated, i.e. to be omitted.

3.3 Hygiene, health and the environment (BWR3)

3.3.1 Watertightness of joints

Joints in “ProdEX exposed fixing” and “ProdEX concealed fixing” kits are open, therefore they are not waterthight.

3.3.2 Water permeability and Water vapour permeability

These performances are not relevant for external wall cladding kits with ventilated air space.

3.3.3 Drainability

On the basis of the standard construction details (see figures 13, 14, 15, 16, 17, 18 and 19) and the installation criteria of these kits and the technical knowledge and experience, it may be said the water which penetrates into the air space or the condensation water can be drained out from the cladding without accumulation or moisture damage into the substrate.

(17) EN 13501-1:2007 + A1:2010 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

3.3.4 Release of dangerous substances

The HPL compact panels for exterior **ProdEX IGN** complies with the Annex ZA of the EN 438-7:2005. A declaration of conformity in this respect was made by the manufacturer.

According to this declaration **ProdEX IGN** panels for exterior use contain:

- In the flame retardant additive

Chemicals: inorganic salts, which amount are 5-7% of the final product's weight and applied by immersion in a solution of the product and subsequent oven-drying

Polybrominated diphenylether: no used.

- Formaldehyde: class E1 according to EN 438-7:2005.

Also regarding the subframe a declaration of conformity in this respect was made by the manufacturer.

According to this declaration the aluminium alloys used for the subframe contain:

- hexavalent Cr, Hg, Pb which amount is always less than 0.1%;
- Cd which amount is always less than 0.1%.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the kits falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Regulations, these requirements need also to be complied with, when and where apply.

3.4 Safety in use (BWR4)

3.4.1 Wind load resistance

3.4.1.1 Wind suction resistance

Wind suction resistance has been determined by test carried out according to ETAG 034 part 1, § 5.4.1.1.

The weakest design mechanically has been tested.

a. ProdEX exposed fixing (family A)

Cladding elements **ProdEX IGN** – 6 mm (minimum thickness allowable for exposed fixing ProdEX kit)
Fixings Maximum distance between cladding fixings in horizontal direction H=400mm
Maximum distance between cladding fixings in vertical direction V=400mm in panel with 2 vertical fixings and V=600 in panel with 3 vertical fixings.

The test results and calculated values for the tested specimen are indicated in table 2

TABLE 2 – WIND SUCTION TEST RESULT

TEST SPECIMEN	MAXIMUM LOAD Q (Pa)	TYPE OF FAILURE	DISPLACEMENT UNDER MAXIMUM LOAD (mm)
Wood subframe [18] Brackets distance: 800mm Vertical profile distance 400mm Stainless steel self-drilling screw One panel: 1640 x 1220 x 6mm – 15 fixings Two panels: 440 x 440 x 6mm – 4 fixings/panel One panel: 774 x 440 x 6mm – 6 fixings Two panels: 197x2385x6mm – 12 fixings/panel Two panels: 1640x350x6mm – 10 fixings/panel	3000[19]	-	13,11
Aluminum subframe [20] Brackets distance: 800mm Vertical profile distance 400mm Aluminum rivet One panel: 1640 x 1220 x 6mm – 15 fixings Two panels: 440 x 440 x 6mm – 4 fixings/panel One panel: 774 x 440 x 6mm – 6 fixings Two panels: 197x2385x6mm – 12 fixings/panel Two panels: 1640x350x6mm – 10 fixings/panel	4000[21]	-	19,45

[18] Characteristics of component are indicated in Annex 1 and 2
[19] The test had to be stopped at 3200Pa because the equipment did not achieve stabilization. No failure occurs.
[20] Characteristics of component are indicated in Annex 1 and 2
[21] Maximum load allowed by the test equipment.

b. ProdEX concealed fixing (family B)

Cladding elements **ProdEX IGN** – 10 mm (minimum thickness allowable for concealed fixing ProdEX kit)
Fixings Maximum distance between cladding fixings in horizontal direction H=600mm
Maximum distance between cladding fixings in vertical direction V=600mm.

The test results and calculated values for the tested specimen are indicated in table 3

TABLE 3 – WIND SUCTION TEST RESULT			
TEST SPECIMEN	**MAXIMUM LOAD Q (Pa)**	**TYPE OF FAILURE**	**DISPLACEMENT UNDER MAXIMUM LOAD (mm)**
Aluminum subframe [22] Brackets distance: 800mm Vertical profile distance 1000mm Stainless steel self-drilling screw One panel: 1880 x 1220 x 10mm – 12 fixings One panel: 680 x 690 x 10mm – 4 fixings Two panels: 590 x 690 x 10mm – 4 fixings/panel	3400[23]	-	18.17

3.4.1.2 Wind pressure resistance

The kit behaviour exposed to wind pressure is most favourable than when exposed to wind suction. Therefore, according to paragraph § 5.4.1.2 of ETAG 034, wind pressure test has been avoided and wind pressure resistance of kit can be considered as equal to wind suction resistance.

3.4.2 Mechanical test

3.4.2.1 Mechanical test (Family A)

3.4.2.1.1 Pull-through resistance of cladding element

Pull-through resistance of cladding element has been tested according to ETAG 034 part 1 section 5.4.2.1.1, using rivets as cladding fixings[24].

Test results are indicated in table 4.

TABLE 4 - PULL-THROUGH RESISTANCE OF CLADDING ELEMENT					
PANEL THICKNESS (mm)	**SUPPORT Ø (mm)**	**FIXING POSITION (Aluminum rivet)**	**FAILURE LOAD (N)**		**FAILURE MODE**
			F_m	**$F_{u,5}$**	
6	180	Centre	2054	1938	Panel
		Border	1139	951	Rivet
		Corner	666	605	Panel
	270	Centre	1537	1322	Panel
		Border	925	848	Rivet
		Corner	341	263	Panel
	350	Centre	1582	1260	Panel
		Border	767	682	Panel
		Corner	232	201	Panel
12	180	Centre	2548	948	Rivet deformation
		Border	3218	1930	Rivet
		Corner	1242	848	Panel
	270	Centre	3194	1685	Rivet
		Border	3549	2842	Rivet
		Corner	799	501	Panel
	350	Centre	3312	2918	Rivet
		Border	3035	1746	Rivet
		Corner	718	558	Panel

3.4.2.1.2 Pull-through resistance under shear load

Pull-through resistance under shear load has been tested according to ETAG 034 part 1 section 5.4.2.1.2.

Tests results are indicated in table 5.

[22] Characteristics of component are indicated in Annex 1 and 2
[23] The test had to be stopped at 3600Pa because the equipment did not achieve stabilization. No failure occurs.
[24] Taking into account that the tensile strength of the screws are higher than the rivet one for the tests it was considered the weakest design.

TABLE 5 - PULL-THROUGH RESISTANCE UNDER SHEAR LOAD			
PANEL THICKNESS (mm)	FAILURE LOAD (N)		FAILURE MODE
	F_m	$F_{u,5}$	
6 Wood subframe	3950.20	3815.83	Screw deformation
6 Aluminium subframe + Aluminium rivet	3415.76	3220.90	Rivet

3.4.2.2 Mechanical test (Family B)

3.4.2.2.1 Axial tension test with varying diameter of support

Resistance under axial tension has been tested according to ETAG 034 part 1 section 5.4.2.2.1.

Tests results are indicated in table 6.

TABLE 6 – RESISTANCE UNDER AXIAL TENSION OF CLADDING ELEMENT					
PANEL THICKNESS (mm)	SUPPORT Ø (mm)	FIXING POSITION (Stainless steel self-drilling screw)	FAILURE LOAD (N)		FAILURE MODE
			F_m	$F_{u,5}$	
10	180	Centre	2723.5	1098.3	Panel
	270	Centre	2802.2	2399.1	Panel
	350	Centre	2886.2	2069.8	Panel

3.4.2.2.2 Shear test

Resistance under shear load has been tested according to ETAG 034 part 1 section 5.4.2.2.2.

Tests results are indicated in table 7.

TABLE 7 - RESISTANCE UNDER SHEAR LOAD			
PANEL THICKNESS (mm)	FAILURE LOAD (N)		FAILURE MODE
	F_m	$F_{u,5}$	
10	4826	4216.5	Panel

3.4.2.2.3 Tests with combined tension and shear loading

Resistance under the combination of tension and shear load has been tested according to ETAG 034 part 1 section 5.4.2.2.3.

Tests results are indicated in table 8.

TABLE 8 – RESISTANCE UNDER COMBINATION OF TENSION AND SHEAR LOAD						
PANEL THICKNESS (mm)	ANGLE	SUPPORT Ø (mm)	FIXING POSITION	FAILURE LOAD (N)		FAILURE MODE
				F_m	$F_{u,5}$	
10	30º	350	Centre	2080.7	804.35	Panel
10	60º	350	Centre	975.9	372.0	Panel

3.4.2.3 Mechanical test (Subframe)

3.4.2.3.1 Load bearing capacity of the brackets

The resistance of the brackets and their fixings under tension and shear loads was determined by calculation using the specifications defined in the annex E of ETAG 034 part 2.

The calculation results are indicated in table 9 and 10.

TABLE 9: RESISTANCE TO VERTICAL LOAD OF BRACKETS – CALCULATION RESULT				
BRACKETS DIMENSIONS	F_r (daN) ΔL=0.2% de L	F_{1d}(daN) ΔL=1mm	F_{3d}(daN) ΔL=3mm	F_s(daN) failure
(60+40) x 80 x 3	120	178	202	Purposeless
(100+40) x 80 x 3	101	152	183	Purposeless

TABLE 10: RESISTANCE TO HORIZONTAL LOAD OF BRACKETS – CALCULATION RESULT		
BRACKETS DIMENSIONS	F_c(daN) ΔL=1mm	F_s(daN) failure
(60+40) x 80 x 3	376	Purposeless
(100+40) x 80 x 3	405	Purposeless

3.4.3 Resistance to horizontal point loads

This performance has not been determined (NPD).

3.4.4 Impact resistance

Impact resistance has been tested and classified according to the method indicated in section 5.4.4 of ETAG 034 part 1.

According with the test results the use category of “ProdEX exposed fixing” and “ProdEX concealed fixing” kits for vertical exterior wall claddings is the Category I, that means this kit can be used in zones readily accessible at ground level to the public and vulnerable to hard body impacts but not subjected to abnormally rough use (e.g. public locations, such as squares, schoolyards, parks or commercial areas with usual movement of goods).

3.4.5 Resistance to seismic actions

This performance has not been determined (NPD).

3.4.6 Hygrothermal behaviour

The hygrothermal behaviour test has been carried out according to the method indicated in section 5.4.6 of ETAG 034 part 1 and during the test cycles, none of the following defects occurs during testing:

- deterioration such as cracking or delamination of the cladding element that allows water penetration to the insulation
- detachment of the cladding element
- Irreversible deformation

This system is therefore assessed as resistant to hygrothermal cycles.

The joint in “ProdEX exposed fixing” and “ProdEX concealed fixing” kits are not waterthight so the insulation layer shall be made of EPS to EN 13163, XPS to EN 13164, PUR to EN 13165, phenolic foam to EN 13166 or mineral wool to EN 13162 (WS or WL(P), depending on the national regulations).

3.5 Protection against noise (BWR5)

This requirement is not relevant for cladding kits designed with ventilated air space.

3.6 Energy economy and heat retention (BWR6)

This requirement is not relevant for cladding kits designed with ventilated air space.

3.7 Sustainable use of natural resources (BWR7)

This performance has not been determined (NPD).

3.8 Aspects of durability and serviceability

3.8.1 Pulsating load

After pulsating load cycles, resistance under axial tension of the panel (concealed fixing kit) have been tested according to the method indicated in section 5.7.1 of ETAG 034 part 1.

The test results are indicated in table 11.

TABLE 11 – ProdEX concealed fixing (family B) RESISTANCE UNDER AXIAL TENSION OF CLADDING ELEMENT AFTER PULSATING LOAD CYCLES					
PANEL THICKNESS (mm)	SUPPORT Ø (mm)	FIXING POSITION (Stainless steel self-drilling screw)	FAILURE LOAD (N)		FAILURE MODE
			F_m	$F_{u,5}$	
10	350	Centre	2750.5	1521.7	Panel

3.8.2 Dimensional stability

The dimensional stability at elevated temperature of the panel has been determined according to EN 438-2: 2005[25] (section 17).

The test results are indicated in table 12.

TABLE 12 – ACCUMULATED DIMENSIONAL VARIATION		
PANEL THICKNESS (mm)	DIRECTION	ACCUMULATED DIMENSIONAL VARIATION (%)
6	Longitudinal	0,136
	Transverse	0,218
12	Longitudinal	0.033
	Transverse	0,043
14	Longitudinal	0,043
	Transverse	0,088

3.8.3 Immersion in water

After immersion in water, flexural strength, pull-through resistance of the panel (exposed fixing kit) and resistance under axial tension of the panel (concealed fixing kit) have been tested according to EN ISO 178[26] and ETAG 034 part 1 section 5.4.2.1.1.

Tests results are indicated in table 13, 14 y 15.

TABLE 13 – FLEXURAL STRENGTH AFTER IMMERSION IN WATER		
PANEL THICKNESS (mm)	DIRECTION	TENSIL STREGTH (MPa)
6	Centre - Transverse	112,00
12	Centre - Transverse	140,82
14	Centre - Transverse	137,35

TABLE 14 – ProdEX exposed fixing (family A) PULL-THROUGH RESISTANCE OF CLADDING ELEMENT AFTER IMMERSION IN WATER					
PANEL THICKNESS (mm)	SUPPORT Ø (mm)	FIXING POSITION (Aluminum rivet)	FAILURE LOAD (N)		FAILURE MODE
			F_m	$F_{u,5}$	
6	180	Border	1144	918,30	Panel
		Corner	628,75	472,50	
	270	Border	833	706,45	
		Corner	323,75	260,70	
	350	Border	644,50	567,75	
		Corner	254,06	206,45	
12	180	Border	3534	2941	Rivet
		Corner	1495	707,40	
	270	Border	2903,45	2477,61	
		Corner	872,4	473,30	
	350	Border	2966,85	2762,20	
		Corner	671,3	580,55	

TABLE 15 – ProdEX concealed fixing (family B) RESISTANCE UNDER AXIAL TENSION OF CLADDING ELEMENT AFTER IMMERSION IN WATER					
PANEL THICKNESS (mm)	SUPPORT Ø (mm)	FIXING POSITION (Stainless steel self-drilling screw)	FAILURE LOAD (N)		FAILURE MODE
			F_m	$F_{u,5}$	
10	350	Centre	2367.2	1764.9	Panel

[25] EN 438-2:2005 “High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called Laminates) - Part 2: Determination of properties”

[26] EN ISO 178:2003 “Plastics - Determination of flexural properties”.

3.8.4 Freeze / thaw behaviour

After freeze-thaw cycles (50 cycles), flexural strength, pull-through resistance of the panel (exposed fixing kit) and resistance under axial tension of the panel (concealed fixing kit) have been tested according to EN ISO 178 and ETAG 034 part 1 section 5.4.2.1.1.
Tests results are indicated in table 16, 17 y 18.

TABLE 16 – FLEXURAL STRENGTH AFTER FREEZE-THAW CYCLES		
PANEL THICKNESS (mm)	**DIRECTION**	**TENSIL STREGTH**
6	Centre - Transverse	105,07
12	Centre - Transverse	132.85
14	Centre - Transverse	141,01

TABLE 17 – ProdEX exposed fixing (family A) PULL-THROUGH RESISTANCE OF CLADDING ELEMENT AFTER FREEZE-THAW CYCLES					
PANEL THICKNESS (mm)	**SUPPORT Ø (mm)**	**FIXING POSITION (Aluminum rivet)**	**FAILURE LOAD (N)**		**FAILURE MODE**
			F_m	$F_{u,5}$	
6	180	Border	1139,65	1084,25	Panel
		Corner	612,80	480,15	
	270	Border	754	680,40	
		Corner	331,30	306,82	
	350	Border	637,85	580,20	
		Corner	226,10	190,60	
12	180	Border	3574,65	2963,55	Rivet
		Corner	1088,15	660	Panel
	270	Border	3482,65	2720,55	Panel/Rivet
		Corner	979,65	751	Panel
	350	Border	2986,05	2440,25	Panel/Rivet
		Corner	712,65	445,95	Rivet

TABLE 18 – ProdEX concealed fixing (family B) RESISTANCE UNDER AXIAL TENSION OF CLADDING ELEMENT AFTER FREEZE-THAW CYCLES					
PANEL THICKNESS (mm)	**SUPPORT Ø (mm)**	**FIXING POSITION (Stainless steel self-drilling screw)**	**FAILURE LOAD (N)**		**FAILURE MODE**
			F_m	$F_{u,5}$	
10	350	Centre	2671.3	1616.4	Panel

3.8.5 Chemical and biological attack

This performance has not been determined (NPD).

3.8.6 Corrosion

The material and corrosion protection of the kit components are defined in the relevant table of Annex 2.

3.8.7 UV radiation

The UV radiation resistance has been tested according to EN 438-2:2005 section 28 on ProdEX IGN HPL samples with the following references:

- CLARO
- MARRÓN CLARO
- MARRÓN OSCURO
- MOCCA
- RUSTIK
- MARRÓN TOSTADO
- ICE GREY
- CREAM
- NUX
- MINT

Based on the test results after accelerating ageing from UV radiation the colour stability is satisfactory for the reference of colour tested.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performances

According to the decision 2003/640/EC of the European Commission [27] the system of assessment and verification of constancy of performances (see Annex V to Regulation (EU) Nº 305/2011) given in the following table applies:

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Claddings kit based on HPL panels fastened to the subframe by visible and invisible fixings	kit for uses subject to regulations on reaction to fire	B-s2 d0	1

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the quality plan deposited at the Instituto de Ciencias de la Construcción Eduardo Torroja.

Instituto de Ciencias de la Construcción Eduardo Torroja
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

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Tel: (34) 91 302 04 40 Fax. (34) 91 302 07 00
www.ietcc.csic.es

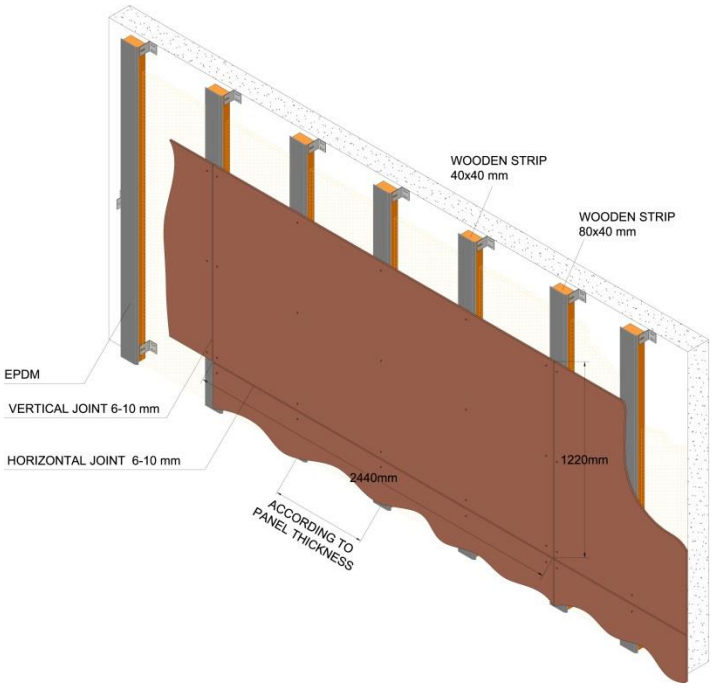
On behalf of the Instituto de Ciencias de la Construcción Eduardo Torroja
Madrid, 20th of September 2016

Marta Castellote Armero
Directora

[27] Published in the Official Journal of the European Communities L226/21 of 10.09.2003. See www.new.eur-lex.europa.eu/oj/direct-access.html

FIGURE 1: ProdEX EXPOSED FIXING KIT– GENERAL CONFIGURATION

A. TIMBER SUBFRAME



B. ALUMINIUM SUBFRAME

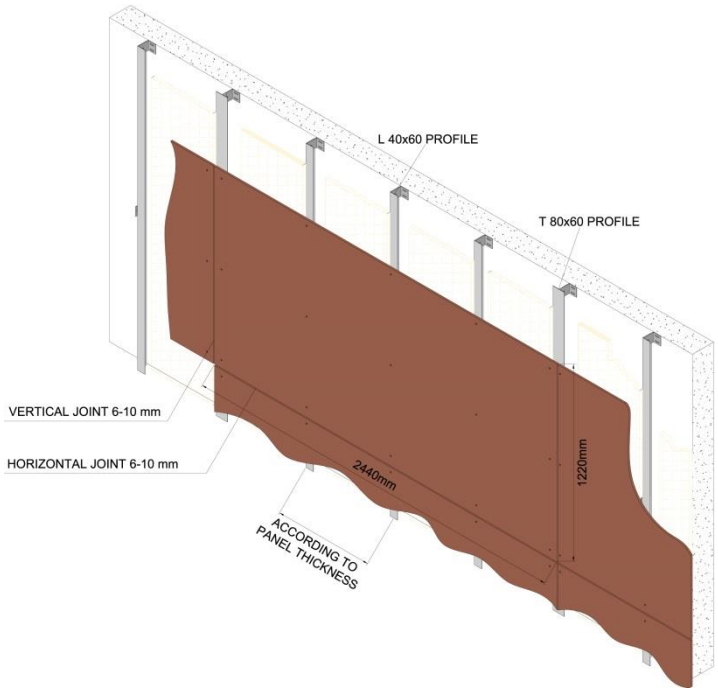


FIGURE 2: ProdEX CONCEALED FIXING KIT– GENERAL CONFIGURATION

ALUMINIUM SUBFRAME

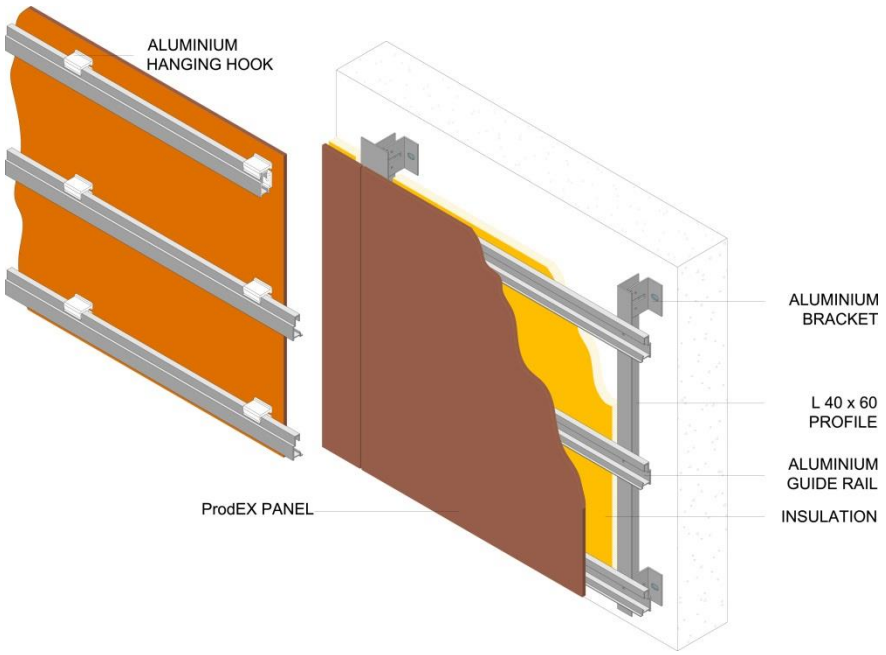
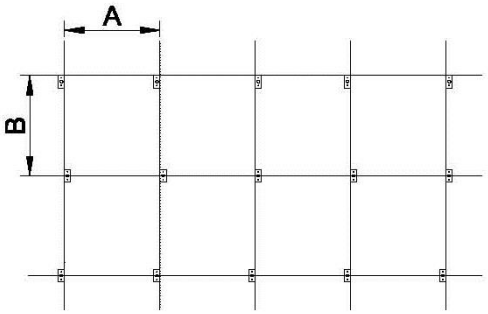
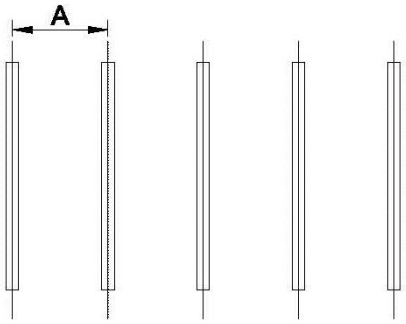


FIGURE 3: INSTALLATION PROCESS

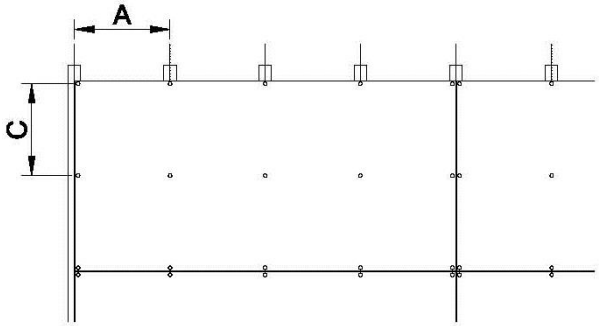
ProdEX EXPOSED FIXING KIT



1: BRACKETS INSTALLATION



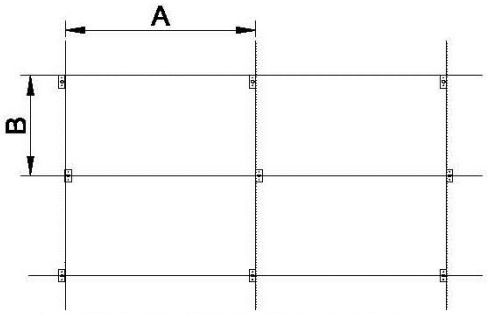
2: VERTICAL PROFILES INSTALLATION



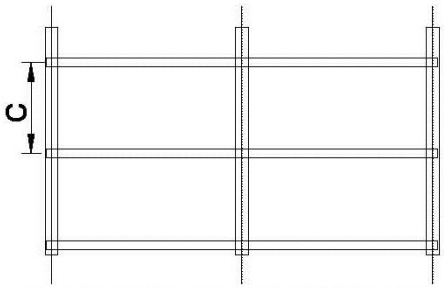
3: PANEL INSTALLATION ON THE VERTICAL BATTEN BY SCREWS OR RIVETS

A y C according to panel thickness
B max = 1000 mm

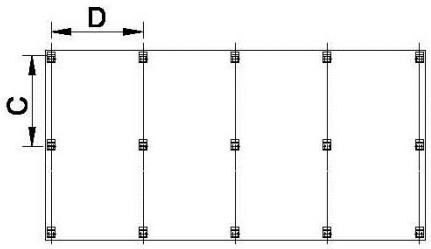
ProdEX CONCEALED FIXING KIT



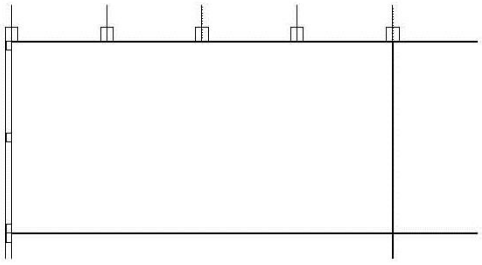
1: BRACKETS INSTALLATION



2: VERTICAL PROFILES AND GUIDE RAILS INSTALLATION



3: HANGING HOOKS INSTALLATION ON THE BACK SIDE OF THE PANEL



4: PANEL INSTALLATION

A, C y D according to panel thickness
B max = 1000 mm

FIGURE 4: CLADDING ELEMENTS – LAYERS OF HPL COMPACT PANEL FOR EXTERIOR ProdEX

PVDF Antigraffiti overlay

Pigmented Melaminic overlay

Natural timber veneer (Okume or Ayous)

One-color barrier

HPL core: Kraft paper impregnated with phenol/formaldehyde resins (The layer number depends on the required thickness)

Natural timber veneer (Okume or Ayous)

One-color barrier

Balancing film

FIGURE 5: SUBFRAME – ALUMINIUM BRACKETS

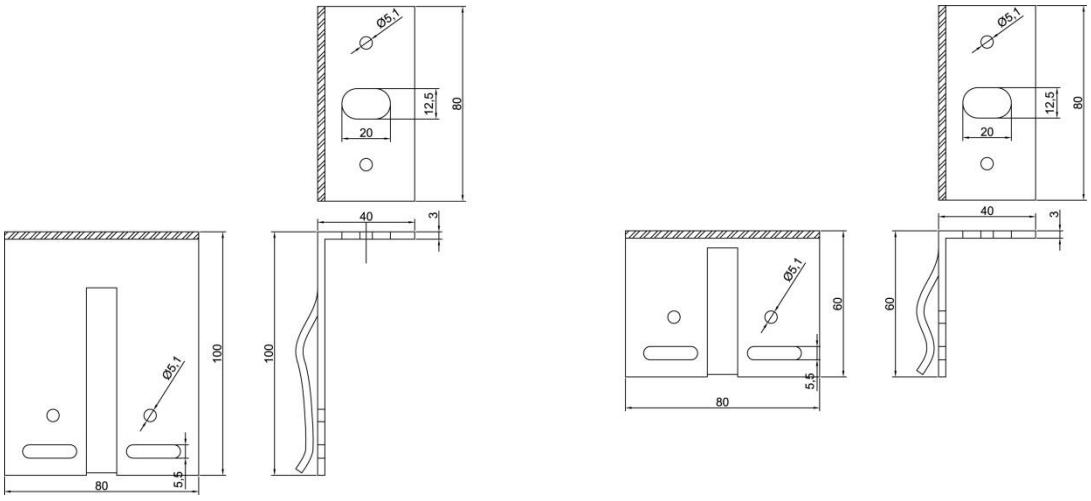


FIGURE 6: SUBFRAME – ALUMINIUM VERTICAL PROFILES

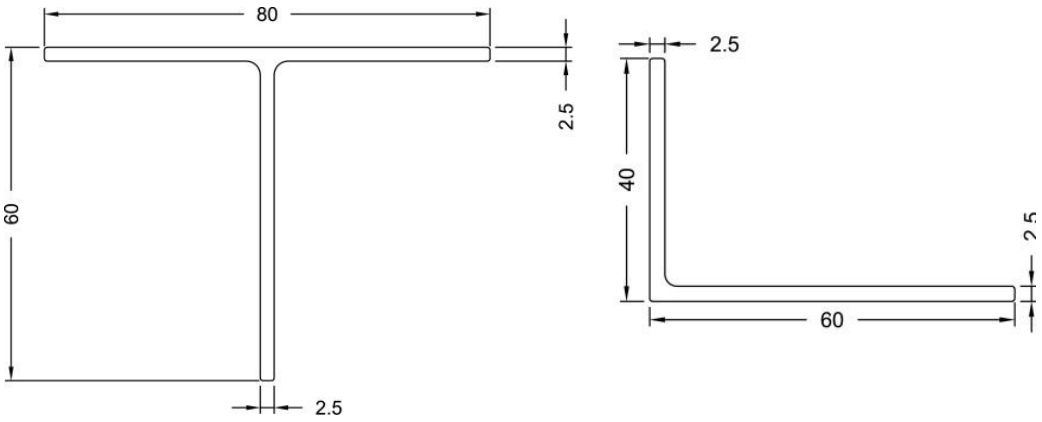


FIGURE 7: ProdEX EXPOSED FIXING KIT –-CLADDING FIXINGS

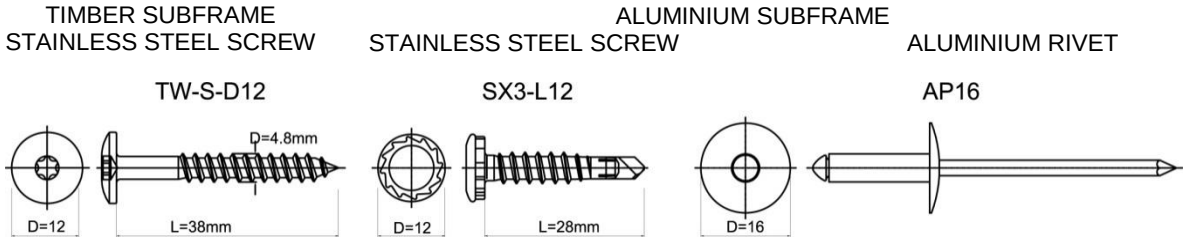


FIGURE 8: ProdEX EXPOSED FIXING KIT –- FIXED POINT AND FLOATING POINT POSITION

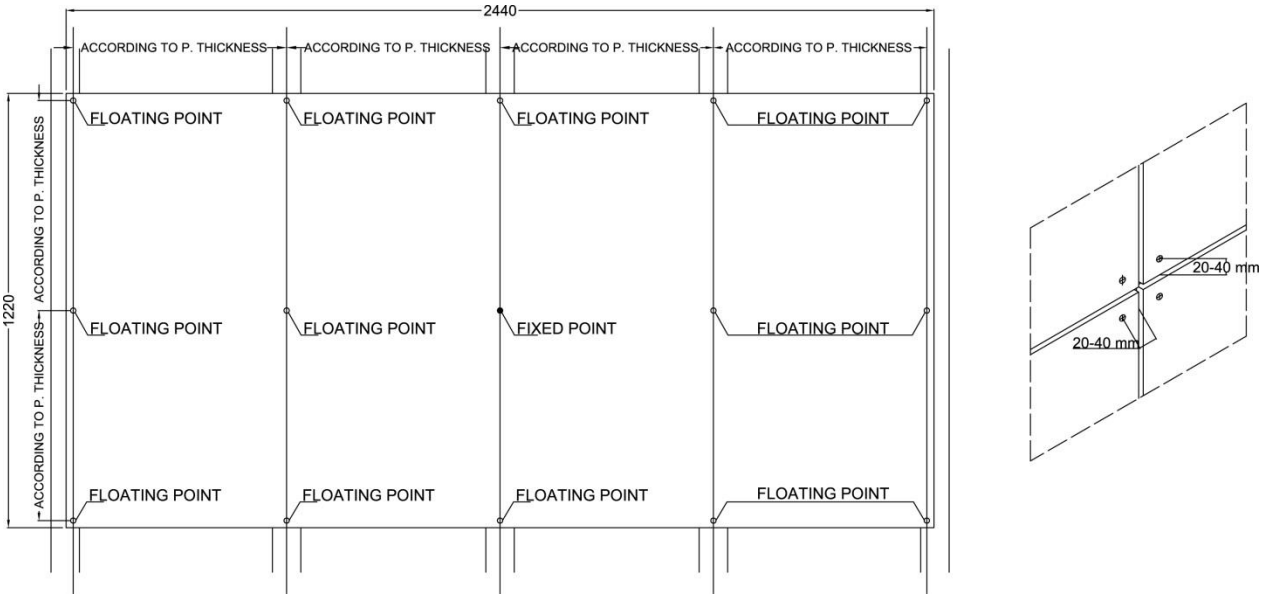


FIGURE 9. ProdEX EXPOSED FIXING KIT –- FIXED POINT AND FLOATING POINT

FIGURE 9.1. TIMBER SUBFRAME (TW-S-D12)

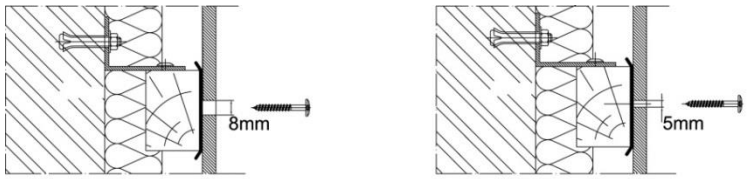


FIGURE 9.2. ALUMINIUM SUBFRAME (SX3-L12)

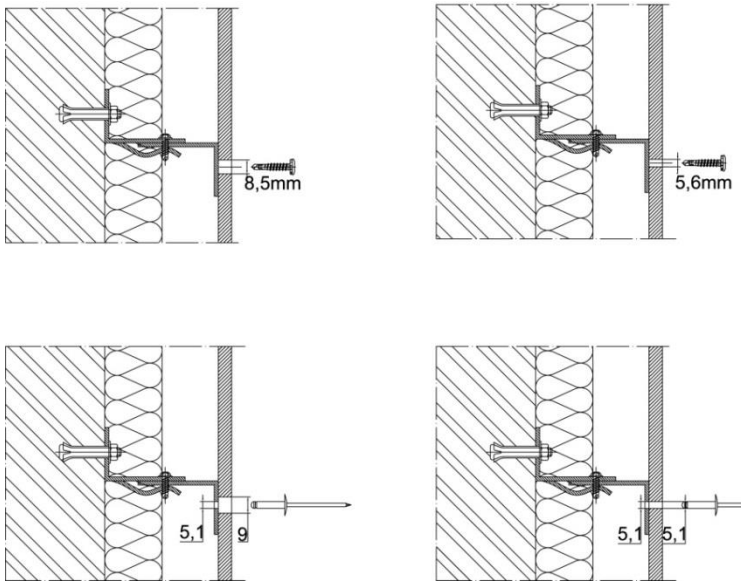
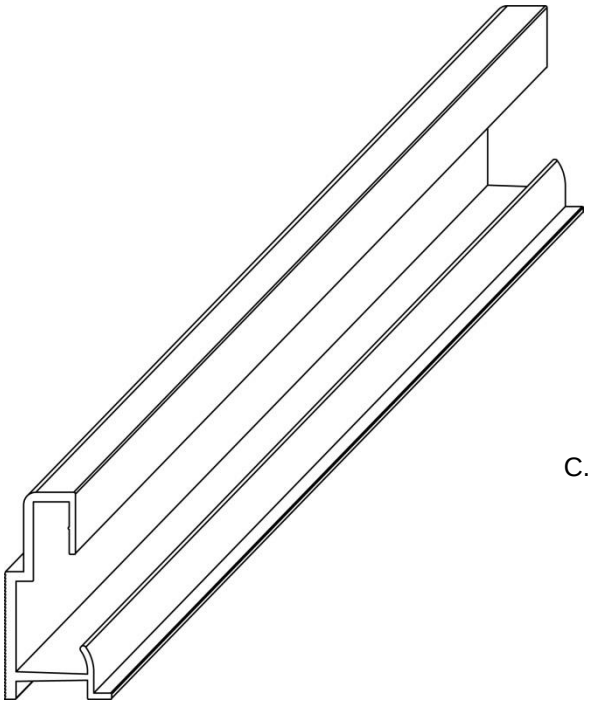
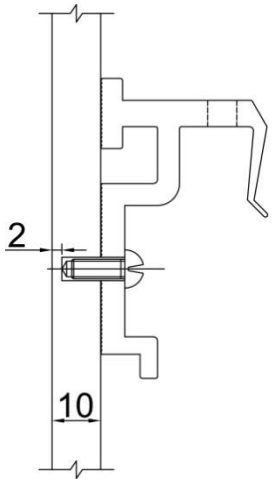


FIGURE 10: ProdEX CONCEALED FIXING KIT – FIXING ELEMENTS

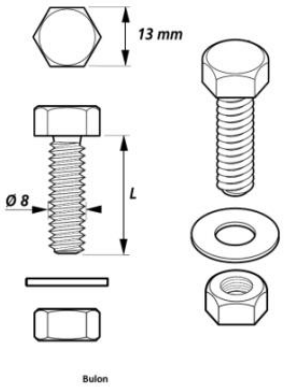
A. HORIZONTAL GUIDE RAIL



B. HANGING HOOK



D. HEIGHT ADJUSTMENT SCREW



C. SCREW (PANEL – H. HOOK)

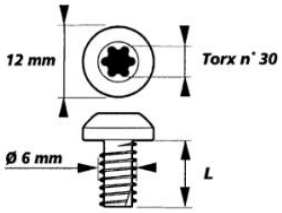


FIGURE 11: ProdEX CONCEALED FIXING KIT – FIXED POINT AND HEIGHT ADJUSTMENT POINT POSITION

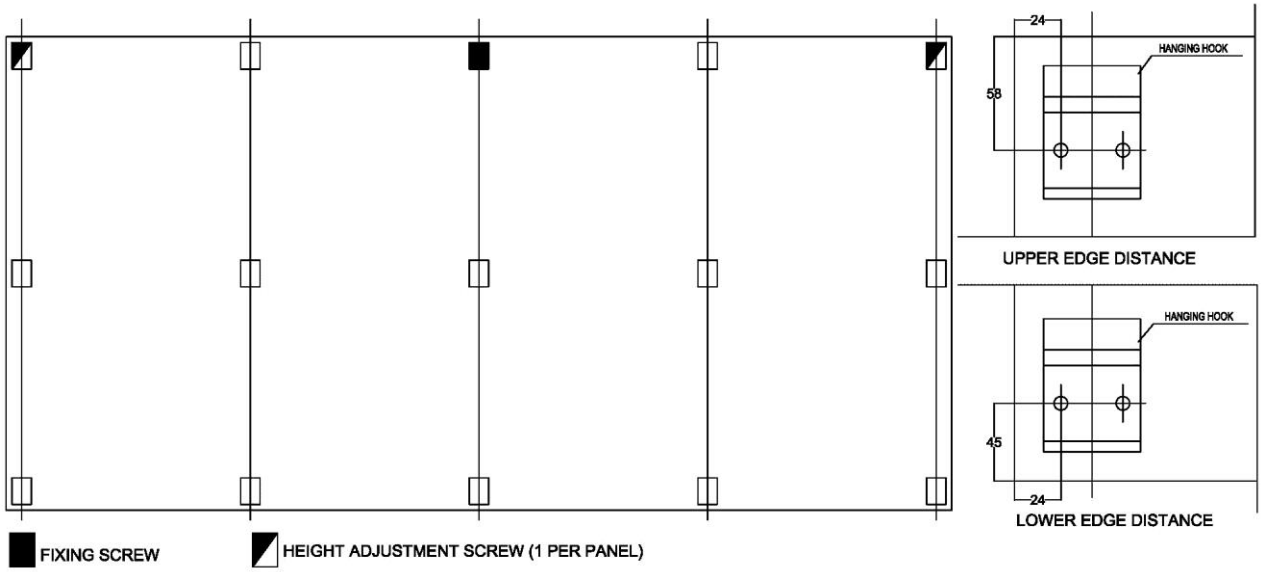
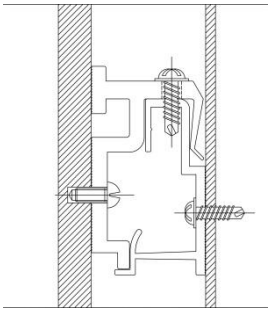


FIGURE 12: ProdEX CONCEALED FIXING KIT – FIXED POINT AND HEIGHT ADJUSTMENT POINT

FIXED POINT



HEIGHT ADJUSTMENT POINT

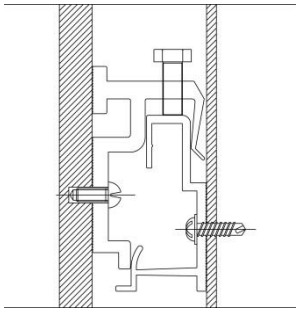


FIGURE 13. DETAIL OF CROWN AND BASE

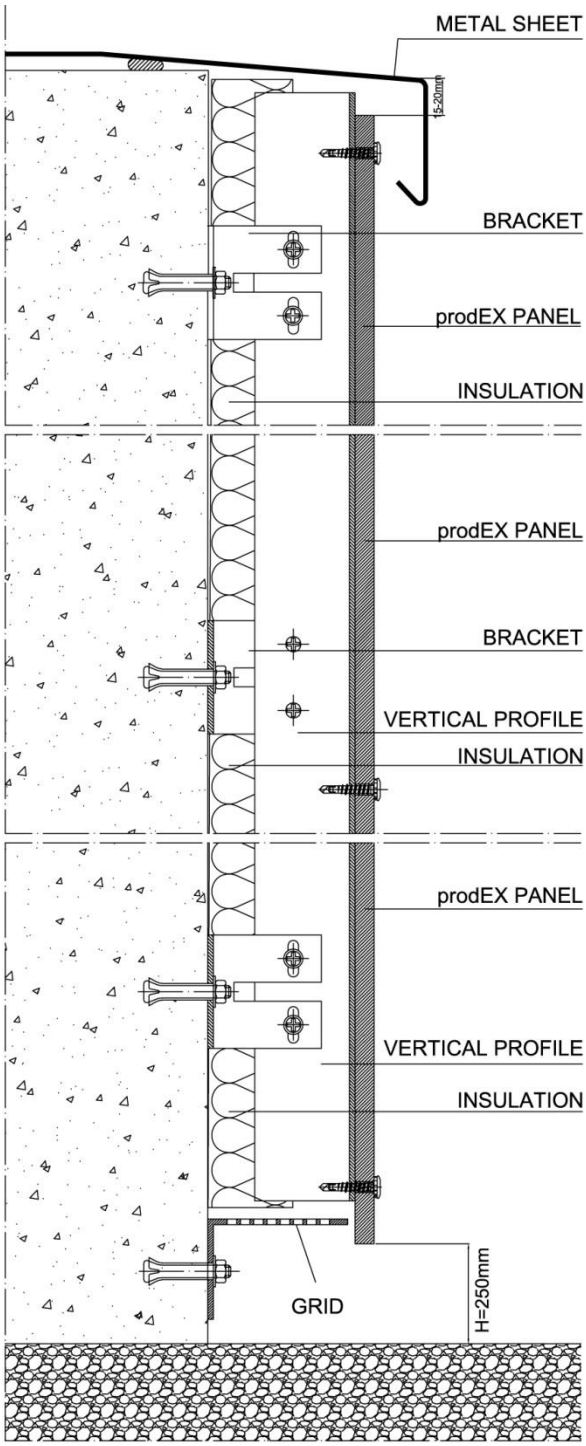


FIGURE 14. EXTERNAL CORNER

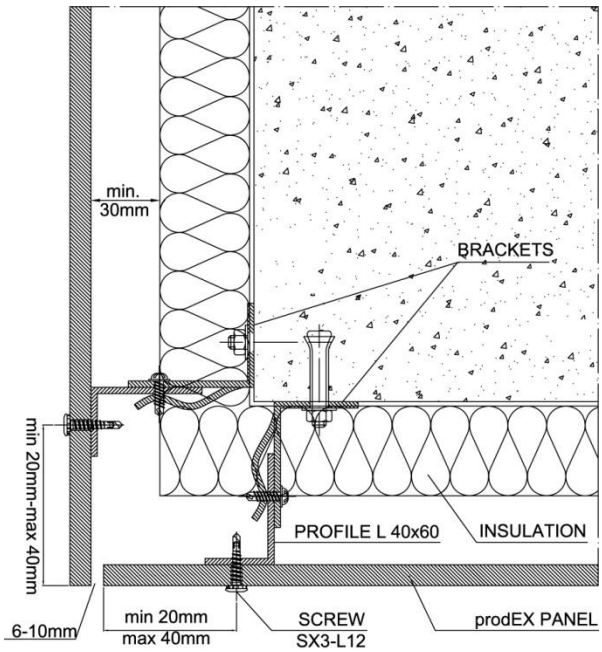


FIGURE 15. INTERNAL CORNER

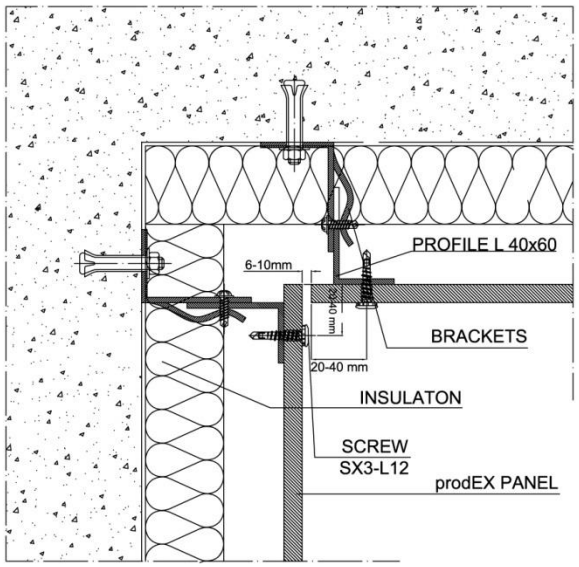


FIGURE 16. DETAIL OF CROWN AND BASE

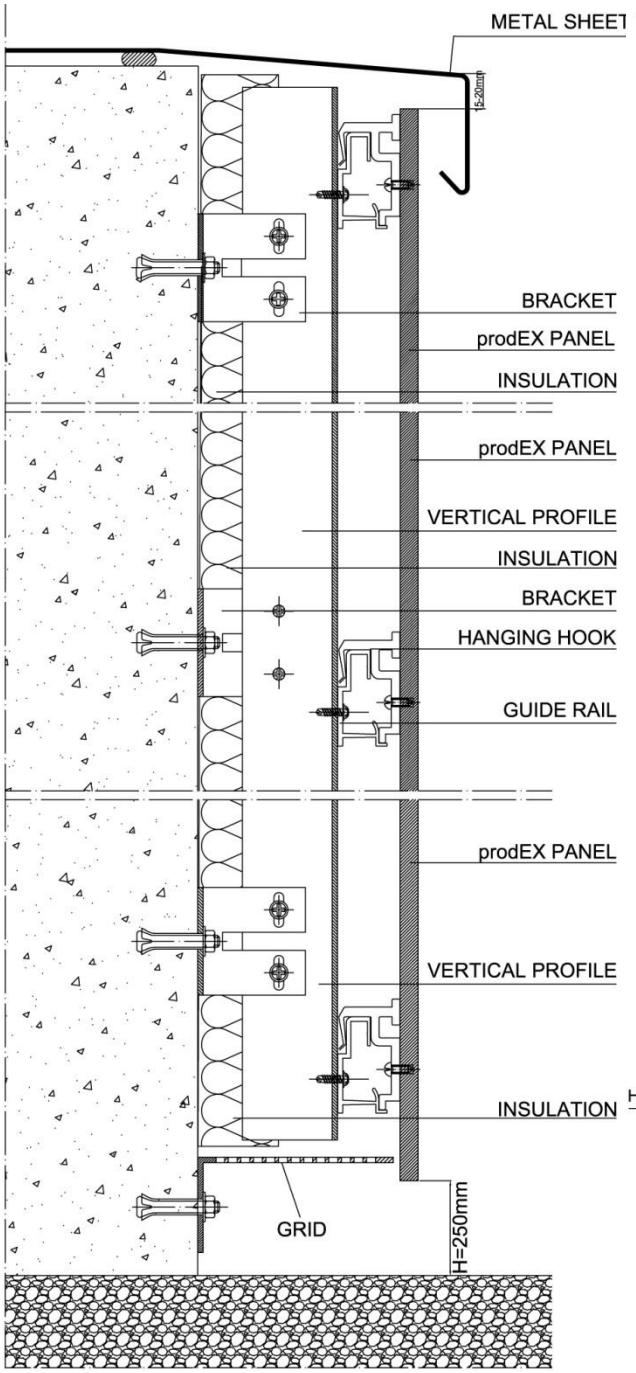


FIGURE 17. EXTERNAL CORNER

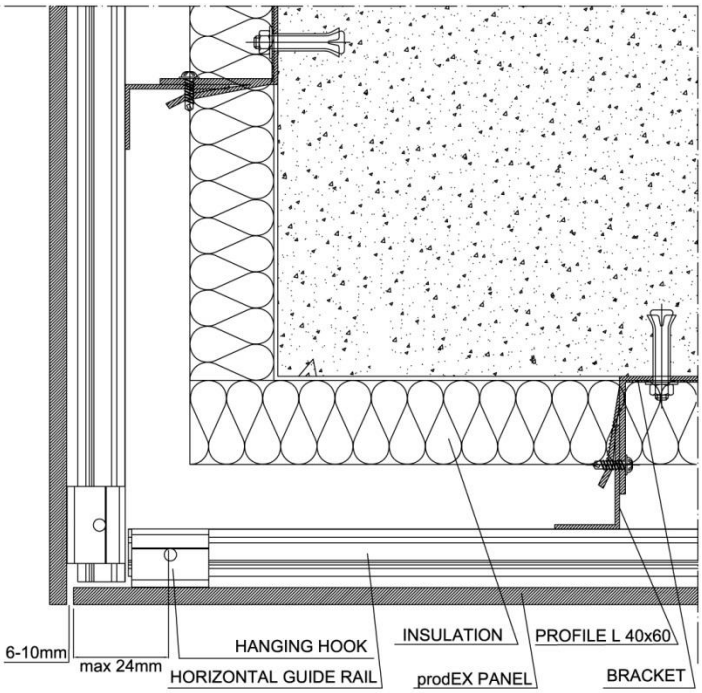


FIGURE 18. INTERNAL CORNER

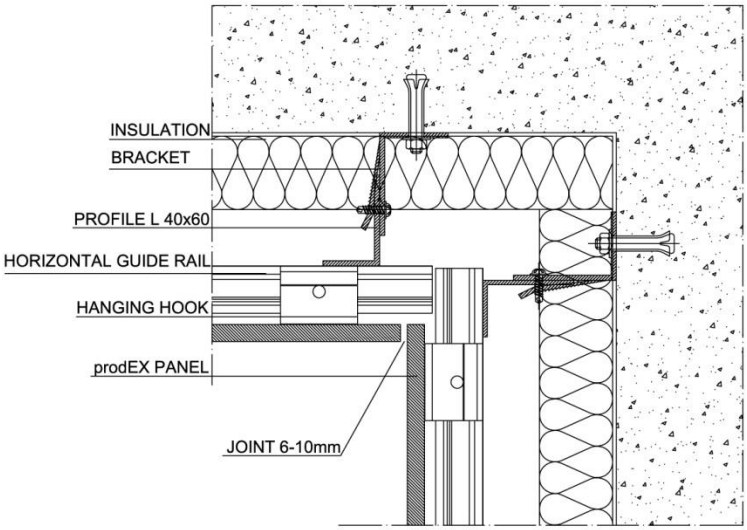
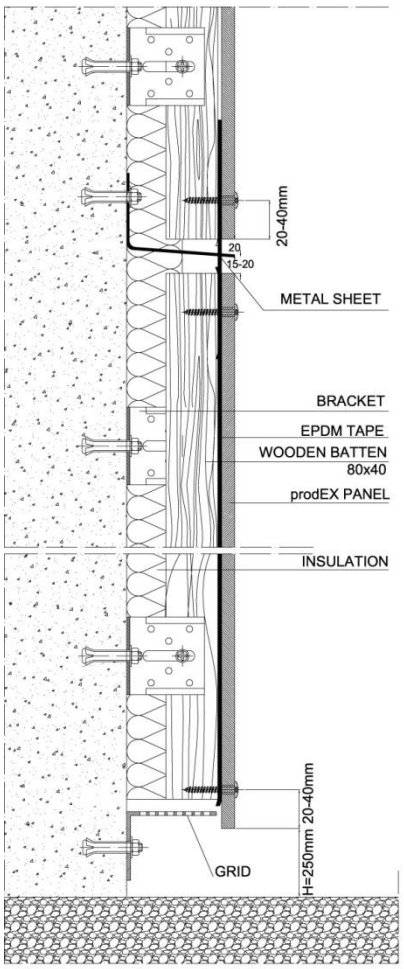
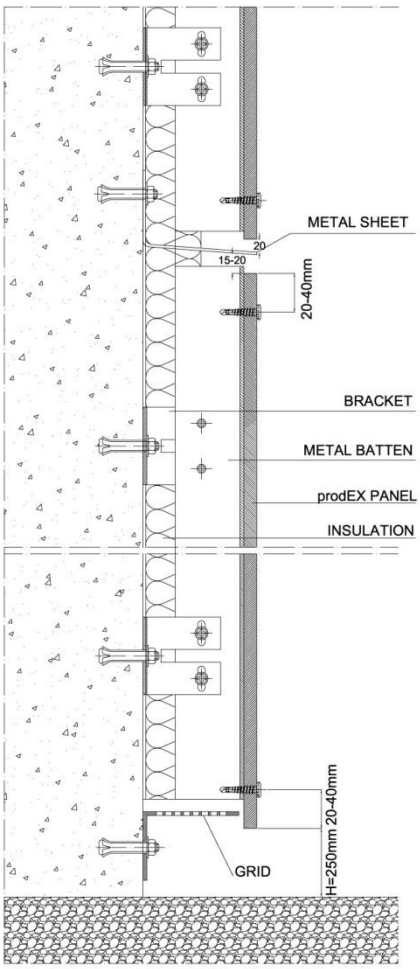


FIGURE 19. AIR SPACE SECTORIZATION

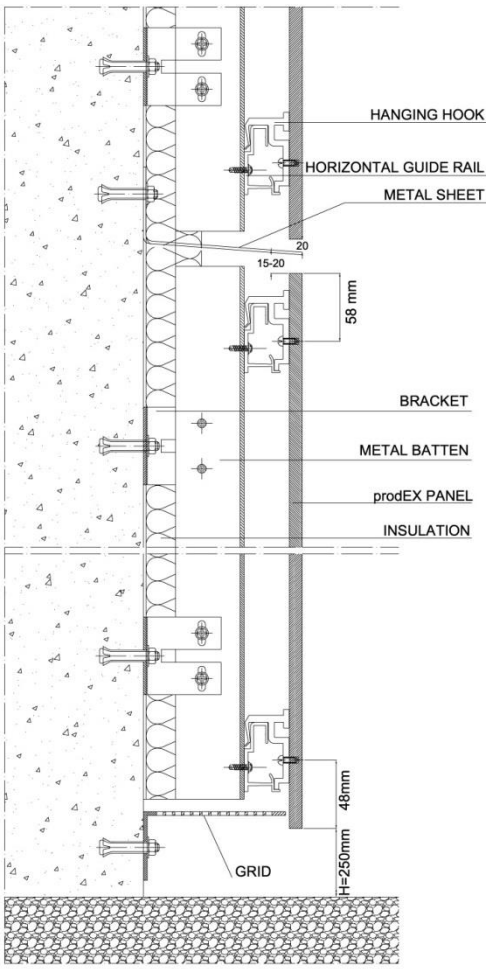
19.1 EXPOSED FIXING KIT TIMBER SUBFRAME



19.2 EXPOSED FIXING KIT ALUMINIUM SUBFRAME



19.3 CONCEALED FIXING KIT



Note: The details shown in figures above are approximate and must be defined for each project.

Annex A: Cladding element specifications

Dimensional features

STANDARD DIMENSIONS[28]				
Length (mm)	**Width** (mm)	**Tolerance** (mm)	**Thickness** (mm)	**Tolerance** (mm)
2440 x 1220		- 0 + 10	6	± 0,40
			8	± 0,50
			10	
			12	± 0,60
			14	

GEOMETRY[29]				
Thickness	**Flatness**	**Straightness**	**Squareness**	**Weight**
Nominal (mm)	Tolerance (mm/m)	Deviation (mm/m)	Deviation (mm/m)	Nominal (kg/m^2)
6	≤ 5,0 mm/m	≤ 1,5 mm/m	≤ 1,5 mm/m	8,1
8				10,8
10	≤ 3,0 mm/m			13,5
12				16,2
14				18,9

Physical, mechanical and weather resistance properties

PHYSICAL AND MECHANICAL PROPERTIES				
Property	**Attribute**	**Value**	**Unit**	**Test**
Density	Density	≥ 1,35	g/cm^3	EN ISO 1183-1[30]
Elastic modulus	Stress	≥ 9.000	MPa	EN ISO 178[31]
Flexural stregth	Stress	≥ 80	MPa	EN ISO 178
Tensil stregth	Stress	≥ 60	MPa	EN ISO 527-2[32]
Resistance to humidity	Mass increase	≤ 8	%	EN 438-2[33]-15
	Appearance	≥ 4	1 a 5	
Dimensional stability at high temp.	Cumulative dimensional change	L ≤ 0,30 T ≤ 0,60	%	EN 438-2-17
Impact resistance	Mean failure height	≥ 1800	mm e ≥ 6	EN 438-2-21
Resistance to fixings	6 mm	2.000	N	EN 438-7
	8 mm	3.000		
	10 mm	4.000		
	12 mm			
	14 mm			
PCP contents (pentaclorofenol)		Not contain	-	EN 438-7
Formaldehyde emission		E1 Class	-	EN 438-7

WEATHER RESISTANCE PROPERTIES				
Property	**Attribute**	**Value**	**Unit**	**Test**
Resistance to climatic shock	Appearance	≥ 4	1 a 5	EN 438-2 (19)
	Flexural strength index (Ds)	≥ 0,95		
	Flexural modulus index (Dm)	≥ 0,95		
UV resistance	Contrast	≥ 3	Grey scale	EN 438-2 (28)
	Appearance	≥ 4	1 a 5	
Artificial climate resistance	Contrast	≥ 3	Grey scale	EN 438-2 (28)
	Appearance	≥ 4	1 a 5	
Reaction to fire	-	B-s2, d0	-	EN 13501-1[34]

(28) Available smaller dimensions with the same thickness
(29) Properties according to EN 438-6:2005
(30) EN ISO 1183-1:2004 “Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pyknometer method and titration method”.
(31) EN ISO 178:2003 “Plastics - Determination of flexural properties”.
(32) EN ISO 527-2:1997 “Plastics. Determination of tensile properties. Part 2: test conditions for moulding and extrusion plastics”.
(33) EN 438-2:2005 “High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called Laminates) - Part 2: Determination of properties”.
(34) EN 13501-1:2007 “Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests”.

Annex B: Subframe specifications

Wood requirements

Resistance class	≥ C 18[35]
Durability	Class 3[36]
Processing	Autoclave level 5
Damp control	≤ 18%

Aluminium Physical and mechanical properties

Symbolic designation	EN AW-Al MgSi	
Numeric designation	AW 6060/ AW 6063[37]	
Treatment	T5	
Corrosion protection	Anodic oxidation	Class 15 or 20[38]
	Lacquered (thickness 0.1 mm and 0.15 mm)	Class SEASIDE[39]
PHYSICAL PROPERTIES		
Specific weight	2,70 g/cm^3	
Coefficient of linear thermal expansion	23,5·10^{-6} K^{-1} (20/100 ºC)	
Elastic modulus	70.000 MPa	
Poisson coefficient	0,33	
MECHANICAL PROPERTIES		
Tensile strength (R_m)	≥ 160/175 N/mm^2	
Elastic limit ($R_{p0,2}$)	≥ 120/130 N/mm^2	
Elongation (A)	≥ 8 %	
Elongation (A_{50mm})	≥ 6 %	
Brinell hardness	60 HB	
According to EN 755-2[40] and EN 12020-1[41]		

Brackets Geometrical and mechanical features

BRACKET	Material	Dimensions (mm)	Thickness (mm)	Section (mm^2)	x_c (mm)	I_{xc} (cm^4)	y_c (mm)	I_{yc} (cm^4)
ISOLALU R80 de ETANCO	Aluminium Al 6060 T5	40 x 80 x 40 - 160	3,0	231	11	3,5	11	3,5
		40 x 150 x 40 - 160		591	5	157,9	65	4,9

Vertical profiles Geometrical and mechanical features

VERTICAL PROFILE		Dimensiones (mm)	Espesor (mm)	Sección (mm^2)	Peso (kg/m)	x_c (mm)	I_{xc} (cm^4)	y_c (mm)	I_{yc} (cm^4)
Wooden strip two panels fixing		≥ 80 x 40	-	3.000	1,6	40	42,67	20	170,67
Wooden strip One panel fixing		≥ 40 x 40	-	1.600	0,8	20	21,33	20	21,33
Aluminium strip (L) Al 6063 T5		L 40 x 60	2,5	244	0,659	8,91	9,27	41,20	3,40
Aluminium strip (T) Al 6063 T5		T 80 x 60	2,5	345	0,932	40,00	11,58	46,29	10,64

Stainless steel screw between vertical elements and brackets

Description	PERCINOX special head self-drilling screw
Diameter	5.5 mm
Length	25 mm
Material	Stainless steel
Standard	EN ISO 3506-1: 2010
Pull-out resistance (mean value on aluminium sheet – t=3mm)	3790 N

(35) EN 338:2011 Structural timber - Strength classes

(36) EN 335-2:2007 Durability of wood and wood-based products - Definition of use classes - Part 2: Application to solid Wood

It may use wood battens with treatment for risk category 2, provided that they are protected in the joint between panels with an EPDM elastomeric belt of a thickness exceeding 10/20 mm the width of the strips. In this case, it is necessary verify that the strips are protected from damp in other points as the start of them.

(37) Aluminium alloy 6063 T5 is classified as class A (No Known instance of failure in service or in laboratory tests) according to "Aluminium standards and data" (Aluminium association edition)

(38) Mean thickness 15µ or 20µ according to the quality mark QUALANOD

(39) According to the quality mark QUALICOAT

(40) EN 755-2 Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 2: Mechanical properties.

(41) EN 12020-1 Aluminium and aluminium alloys. Extruded precision profiles in alloys en aw-6060 and en aw-6063. Part 1: technical conditions for inspection and delivery.

Cladding fixings specifications

EXPOSED FIXING KIT

STAINLESS STEEL SCREW TO ALUMINIUM SUBSFRAME	
Designation	SX3-L12Ø5,5xL
Diameter	$Ø_{body}$ = 5,5 mm
Head screw	$Ø_{head}$ = 12 mm
Length	L= 28 mm (e_{panel}≤10mm) L= 38 mm (e_{panel}>10mm)
Tensile strength (mean value)	14.000 N
Shear strength (mean value)	9.500 N
Pull- out breaking load (mean value on steel sheet – t=1.5mm)	2.700 N

ALUMINIUM RIVET TO ALUMINIUM SUBSFRAME	
Designation	AP16Ø5,0xL
Diameter	$Ø_{body}$ = 5 mm
Head screw	$Ø_{head}$ = 16 mm
Length	e_{panel} + e_{perfil} + $Ø_{body}$
Tensile strength (mean value)	3.700 N
Shear strength (mean value)	2.400 N
Pull- out breaking load (mean value on aluminium sheet – t=1.8mm)	2.410 N
Shear breaking load (mean value on aluminium)	2.800 N

STAINLESS STEEL SCREW TO TIMBER SUBSFRAME	
Designation	TW-SØ4,8xL
Diameter	$Ø_{body}$ = 4,8 mm
Head screw	$Ø_{head}$ = 12 mm
Length	L = 38 mm
Tensile strength (mean value)	7.100 N
Shear strength (mean value)	5.400 N
Pull- out breaking load (mean value on wood t=26mm)	3.000 N
Shear breaking load (mean value on wood)	1.100 N

CONCEALED FIXING KIT
Horizontal profiles Geometrical and mechanical features

HORIZONTAL GUIDE RAIL	Material	Dimensions (mm)	Thickness (mm)	I_{xc} (cm^4)	I_{yc} (cm^4)
Aluminium profile to hung the panel with concealed fastening	Aluminium Al 6063 T5	31 x 60 x 3000	3,3	13.76	2.26

Fixings

HANGING HOOK	Material	Dimensions (mm)	Thickness (mm)	I_{xc} (cm^4)	I_{yc} (cm^4)
Aluminium bracket screw to the rear of the panel	Aluminium Al 6063 T5	68.5 x 38 x 50	5	25.69	7.93

STAINLESS STEEL SCREW (HANGING HOOK – PANEL)	
Designation	TB A2 TX30
Diameter	$Ø_{body}$ = 6 mm
Head screw	$Ø_{head}$ = 12 mm
Length	L= 11.5 mm
Diameter panel hole	Ø = 5.5mm ± 0.1mm
Panel perforated depth	L= 7.5 mm
Pull – out breaking load	170 daN

Annex C: Anchorage to substrate

The fixings between the subframe and the substrate are not part of the kit, therefore have not been assessed, even so it is important define type, position and number of the anchorage according to the substrate material and the resistance required due to the envisaged actions and when possible, CE marking according to the ETA via ETAG 001, ETAG 020 or ETAG 029 is recommended.