



## European Technical Assessment

**ETA 16/0194**  
of 08.03.2016



### General part

<b>Trade name of the construction product</b>	<b>FAVEKER® ETICS</b>
<b>Product family to which the construction product belongs</b>	4 – Composite insulation kits/systems
<b>Manufacturer</b>	<b>GRES DE ARAGÓN SA</b> Ctra. Escatrón km 9 ES-44600 Alcañiz (Teruel) Spain
<b>Manufacturing plant(s)</b>	Ctra. Escatrón km 9 ES-44600 Alcañiz (Teruel) Spain
<b>This European Technical Assessment contains</b>	25 pages including 3 annexes which form an integral part of this assessment.
<b>This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of</b>	ETAG 017, <i>Vêture kits – Prefabricated units for external wall insulation</i> , edition November 2005, used as European Assessment Document (EAD)

**General comments**

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es)).

## Specific parts of the European Technical Assessment

### 1 Technical description of the product

This ETA is applicable to the following vêtture kits<sup>1</sup> for external wall insulation:

- FAVEKER® BRICK, whose skin is composed by several ceramic brick slips.
- FAVEKER® TILE, whose skin is composed by one or four ceramic tiles.

The components of the vêtture kits are given in table 1.1.

Detailed information and data of all the components are given in the annexes of this ETA.

**Table 1.1:** Kit components.

Components		FAVEKER® BRICK	FAVEKER® TILE		Annex
Prefabricated unit	Thermal insulation material <sup>2</sup>	Panel of expanded polystyrene (EPS)			Annex 1
		Without groove in the edges	With groove in the edges		
	Skin	Ceramic brick slips <sup>3</sup>	One ceramic tile	Four ceramic tiles	
	Adhesive <sup>2</sup> between the skin and the insulation	Cement-based adhesive <sup>3</sup>			
Joint grouting	Grout for tiles <sup>2</sup>	Cement-based grout			
Mechanical fixings	Plastic anchors <sup>2</sup>	Positioned through the insulation layer (family B)	Positioned in the groove of the insulation layer (family A)	Positioned through the insulation layer and in the groove of the insulation layer (families A & B)	

### 2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

FAVEKER® kits are intended for use as external insulation of buildings' walls. The walls are made of masonry (e.g. bricks, blocks, stones ...) or concrete (cast on site or as prefabricated panels).

The characteristics of the walls shall be verified prior to use of FAVEKER®, especially regarding conditions for reaction to fire classification and for mechanical fixing of FAVEKER®.

FAVEKER® kits are designed to give the wall to which it is applied a satisfactory thermal insulation.

The provisions made in this European Technical Assessment are based on an assumed working life of at least 25 years for FAVEKER®. 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 products in relation to the expected economically reasonable working life of the works.

<sup>1</sup> "Kit" means a construction product placed on the market by a single manufacturer as a set of at least two separate components that need to be put together to be incorporated in the construction works (Art. 2 n° 2 CPR).

<sup>2</sup> Not manufactured by the kit manufacturer.

<sup>3</sup> In the case of the FAVEKER® BRICK, this component is also used for finishing the prefabricated unit on site.

FAVEKER® kits are made of non-load bearing construction components. They do not contribute directly to the stability of the wall on which they are installed, but they can contribute to its durability by providing enhanced protection from the effect of weathering.

FAVEKER® kits can be used on new or existing (retrofit) vertical walls. They can also be used on horizontal or inclined surfaces which are not exposed to precipitation.

FAVEKER® kits are intended to be used with continuous areas of skin (that means without expansion joints) up to 6 m x 6 m.

FAVEKER® kits are not intended to ensure the airtightness of the building envelope.

The assembled system can also include the ancillary components indicated in table 2.1.

**Table 2.1:** Ancillary components for the assembled system.

Components	FAVEKER® BRICK	FAVEKER® TILE	Annex
Supplementary thermal insulation layer	Panel of expanded polystyrene (EPS)		Annex 2
Supplementary adhesive <sup>4</sup>	Cement-based adhesive		
Others	Special fittings <sup>5</sup> (e.g. base profiles, corner profiles...) to treat details of FAVEKER® (connections, apertures, corners, parapets, sills...).		---

### 3 Performance of the product and reference to the methods used for its assessment

The assessment of FAVEKER® kits for the intended use was performed following ETAG 017 *Véture kits – Prefabricated units for external wall insulation*, used as EAD.

**Table 3.1:** Performances of FAVEKER®.

Product: FAVEKER® ETICS		Intended use: external wall insulation			
Basic Works Requirement	ETA section	Essential characteristic	Performance		
			BRICK	4 TILES	TILE
BWR 2 Safety in case of fire	3.1	Reaction to fire	B,s1-d0		
	3.2	Watertightness and water permeability	Type II (*)		
	3.3	Water vapour permeability (resistance to water vapour diffusion)	See table 3.2		
BWR 3 Hygiene, health and the environment	3.4	Water absorption by capillarity	After 1 h	0,11 kg/m <sup>2</sup>	
			After 24 h	0,35 kg/m <sup>2</sup>	
	3.5	Hygrothermal behaviour	No defects		
	3.6	Freeze-thaw behaviour	No defects		
	---	Content and/or release of dangerous substances	Not assessed		

<sup>4</sup> The prefabricated units can be supplementary bonded on the substrate (bonded area  $\geq$  40% of the prefabricated unit area).

<sup>5</sup> The assessment and performance of these components is not addressed in this ETA, however the manufacturer is responsible for adequate compatibility and performance within the FAVEKER® when the components are delivered as a part of the kit.

**Table 3.1:** Performances of FAVEKER®.

<b>Product:</b> FAVEKER® ETICS		<b>Intended use:</b> external wall insulation				
<b>Basic Works Requirement</b>	<b>ETA section</b>	<b>Essential characteristic</b>	<b>Performance</b>			
			<b>BRICK</b>	<b>4 TILES</b>	<b>TILE</b>	
BWR 4 Safety and accessibility in use	3.7	Wind suction load resistance	4000 Pa			
	---	Fatigue test	Not relevant			
	3.8	Bond strength between skin and insulation product	Without ageing	0,08 MPa	0,09 MPa	
			After hygrothermal cycles	≥ 0,06 MPa	≥ 0,07 MPa	
			After freeze-thaw cycles	≥ 0,06 MPa	≥ 0,07 MPa	
	3.9	Pull-through resistance of fixings through the insulation panel	400 N		Not relevant	
	3.10	Resistance of grooved insulation	Not relevant	317 N		
	---	Dead load behaviour	Not assessed			
	3.11	Displacement behaviour	See section 3.11			
	---	Resistance to horizontal point load	Not assessed			
	3.12	Resistance to hard body impacts	Body 0,5 kg, 3 J impacts	Body 0,5 kg, 3 J impacts Body 1,0 kg, 10 J impacts		
			Resistance to soft body impacts	Body 3,0 kg, 60 J impacts Body 50,0 kg, 400 J impacts		
	---	Resistance to perforation	Not relevant			
	---	Dimensional stability	Not assessed			
	3.13	Thermal shock resistance of the skin	Resistant			
	3.14	Chemical and biological resistance of the skin	Resistant			
3.15	Corrosion of fixings	Resistant				
3.16	UV radiation resistance	Resistant				
BWR 5 Protection against noise	---	Improvement of airborne sound insulation	Not assessed			
BWR 6 Energy economy and heat retention	3.17	Thermal resistance	See table 3.8			

(\*) Type II: vêtüre kit in which the outer skin rejects the penetration of water thus protecting the substrate from water penetration.

**Complementary information:**

Requirements with respect to the mechanical resistance and stability of non-load bearing parts of the works are not included in the Basic Works Requirement *Mechanical resistance and stability* (BWR 1) but are treated under the Basic Works Requirement *Safety and accessibility in use* (BWR 4).

The fire resistance requirement is applicable to the wall itself (made of masonry, concrete, timber or metal frame) and not on the vêtüre kit alone.

### 3.1 Reaction to fire

The reaction to fire of FAVEKER® kits has been assessed according to section 5.2.1 of ETAG 017 used as EAD.

Reaction to fire of FAVEKER® kits according to EN 13501-1 is class B,s1-d0.

Note: A European reference fire scenario has not been laid down for façades. In some Member States, the classification of external wall claddings according to EN 13501-1 might not be sufficient for the use in façades. An additional assessment of external wall claddings according to national provisions (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 Watertightness and water permeability

Watertightness (resistance to driving rain) and water permeability (resistance to water diffusion) have been assessed by appraisal of design according to sections 5.3.1 and 5.3.2 of ETAG 017 used as EAD.

Taking into account the characteristics of the materials used, the geometry of the prefabricated units, the joints between them (see Annex 1), and the behaviour of the materials after hygrothermal and freeze-thaw tests (see sections 3.5 and 3.6), the products are classified as Type II according to ETAG 017, i.e.: a prefabricated kit in which the outer skin rejects the penetration of water and therefore protects the substrate from water penetration.

### 3.3 Water vapour permeability

Water vapour permeability (resistance to water vapour diffusion) has been assessed according to section 5.3.3 of ETAG 017 used as EAD.

Water vapour diffusion resistance (Z) has been calculated taking into account the water vapour diffusion resistance of the kit components (see Annex 1).

**Table 3.2:** Water vapour permeability.

Vêture kit		$Z_{vet}$ [(m <sup>2</sup> ·s·Pa)/kg]	$W_{vet}$ [kg/(m <sup>2</sup> ·s·Pa)]	$S_{dvet\_eq}$ (m)	$\mu_{vet\_eq}$	
FAVEKER® BRICK	without supplementary thermal insulation panel	4,86·10 <sup>+10</sup>	2,06·10 <sup>-11</sup>	10	112	
	with supplementary thermal insulation panel (thickness in mm)	20	5,56·10 <sup>+10</sup>	1,80·10 <sup>-11</sup>	11	104
		40	6,26·10 <sup>+10</sup>	1,60·10 <sup>-11</sup>	13	99
		60	6,96·10 <sup>+10</sup>	1,44·10 <sup>-11</sup>	14	95
		80	7,66·10 <sup>+10</sup>	1,30·10 <sup>-11</sup>	15	92
		100	8,36·10 <sup>+10</sup>	1,20·10 <sup>-11</sup>	17	89
		120	9,06·10 <sup>+10</sup>	1,10·10 <sup>-11</sup>	18	88
		140	9,76·10 <sup>+10</sup>	1,02·10 <sup>-11</sup>	20	86
FAVEKER® TILE & 4 TILES	without supplementary thermal insulation panel	5,06·10 <sup>+10</sup>	1,97·10 <sup>-11</sup>	10	116	
	with supplementary thermal insulation panel (thickness in mm)	20	5,76·10 <sup>+10</sup>	1,73·10 <sup>-11</sup>	12	108
		40	6,46·10 <sup>+10</sup>	1,55·10 <sup>-11</sup>	13	102
		60	7,16·10 <sup>+10</sup>	1,40·10 <sup>-11</sup>	14	97
		80	7,86·10 <sup>+10</sup>	1,27·10 <sup>-11</sup>	16	94
		100	8,56·10 <sup>+10</sup>	1,17·10 <sup>-11</sup>	17	92
		120	9,26·10 <sup>+10</sup>	1,08·10 <sup>-11</sup>	19	90
		140	9,96·10 <sup>+10</sup>	1,00·10 <sup>-11</sup>	20	88

Where:

$Z_{vet}$  = water vapour diffusion resistance of the vêtture unit;

$W_{vet}$  = water vapour diffusion permeance of the vêtture unit;

$S_{dvet\_eq}$  = water vapour diffusion-equivalent air layer thickness of the vêtture unit;

$\mu_{vet\_eq}$  = water vapour diffusion resistance-equivalent factor of the vêtture unit;

Results have been obtained with the value of water vapour permeability of the air:  $\delta_a = 2,0 \cdot 10^{-10}$  kg/(m·s·Pa).

### 3.4 Water absorption by capillarity

Water absorption by capillarity has been tested according to section 5.3.4.1 of ETAG 017 used as EAD. The worst case (pieces with the highest water absorption and maximum number of joints) has been tested. Water absorption by capillarity is 0,11 kg/m<sup>2</sup> after 1 hour and 0,35 kg/m<sup>2</sup> after 24 hours.

### 3.5 Hygrothermal behaviour

Hygrothermal behaviour of vêtture kits (with brick slips and with tile) has been tested according to section 5.7.1.1 of ETAG 017 used as EAD.

The following defects have not been observed:

- deterioration or detachment of the skin or joints between prefabricated units that allow water penetration to the insulation;
- irreversible deformation.

Mean values of the measured bond strength (according to section 5.4.2.1 of ETAG 017 used as EAD) before and after hygrothermal cycles are given in table 3.4.

Bond strength values after hygrothermal cycles are greater or equal than 75% of measured bond strength values before hygrothermal cycles.

In the case of FAVEKER® BRICK & 4 TILES kits, mean and characteristic values of the measured pull-through resistance of the insulation (according to section 5.4.2.2.1 of ETAG 017 used as EAD) before and after hygrothermal cycles are given in table 3.5.

In the case of FAVEKER® TILE & 4 TILES kits, mean and characteristic values of the measured resistance of the grooved insulation (according to section 5.4.2.2.4 of ETAG 017 used as EAD) before and after hygrothermal cycles are given in table 3.6.

### 3.6 Freeze-thaw behaviour

Freeze-thaw behaviour of vêtture kits (with brick slips and with tile) has been tested according to the alternative freeze-thaw test indicated in section 5.7.2.2 of ETAG 017 used as EAD.

The following defects have not been observed:

- deterioration or detachment of the skin or joints between prefabricated units that allow water penetration to the insulation;
- irreversible deformation.

Mean values of the measured bond strength (according to section 5.4.2.1 of ETAG 017 used as EAD) before and after freeze-thaw cycles are given in table 3.4.

Bond strength values after freeze-thaw cycles are greater or equal than 75% of measured bond strength values before freeze-thaw cycles.

In the case of FAVEKER® BRICK & 4 TILES kits, mean and characteristic values of the measured pull-through resistance of the insulation (according to section 5.4.2.2.1 of ETAG 017 used as EAD) before and after freeze-thaw cycles are given in table 3.5.

In the case of FAVEKER® TILE & 4 TILES kits, mean and characteristic values of the measured resistance of the grooved insulation (according to section 5.4.2.2.4 of ETAG 017 used as EAD) before and after freeze-thaw cycles are given in table 3.6.

### 3.7 Wind suction load resistance

Wind suction resistance has been tested for vêtture kits (with brick slips and with tile) according to the section 5.4.1.1 of ETAG 017 used as EAD.

**Table 3.3:** Wind suction.

Vêtture kit	Maximum load Q (Pa)	Type of failure	Deflection under maximum load (mm)
FAVEKER® BRICK & FAVEKER® 4 TILES	4000	No failure	4,5
FAVEKER® TILE	4000	No failure	6,3

### 3.8 Bond strength between the skin and the insulation product

Bond strength has been tested for vêtture kits (with brick slips and with tiles) according to section 5.4.2.1 of ETAG 017 used as EAD.

**Table 3.4:** Bond strength.

Vêtture kit	Ageing	Mean value (MPa)	Characteristic value (*) (MPa)	Ratio
FAVEKER® BRICK	Without ageing	0,09	0,09	---
	After hygrothermal cycles	0,11	0,07	≥ 0,75
	After freeze-thaw cycles	0,11	0,08	≥ 0,75
FAVEKER® TILE & 4 TILES	Without ageing	0,09	0,08	---
	After hygrothermal cycles	0,10	0,08	≥ 0,75
	After freeze-thaw cycles	0,13	0,09	≥ 0,75

(\*) Characteristic values giving 75% confidence that 95% of test results will be higher than this value.

### 3.9 Pull-through resistance of fixing through the insulation panel

This characteristic is only applicable to vêtture kits with brick slips and with four tiles.

Pull-through resistance of fixing through the insulation panel has been tested according to section 5.4.2.2.1 of ETAG 017 used as EAD.

**Table 3.5:** Pull-through resistance.

Vêtture kit	Ageing	Mean value (N)	Characteristic value (*) (N)
FAVEKER® BRICK & 4 TILES	Without ageing	587	451
	After hygrothermal cycles	596	400
	After freeze-thaw cycles	698	563

(\*) Characteristic values giving 75% confidence that 95% of test results will be higher than this value.



### 3.10 Resistance of grooved insulation panel

This characteristic is only applicable to vêtture kits with tiles.

Resistance of grooved insulation panel has been tested for the vêtture kit with tile according to section 5.4.2.2.4 of ETAG 017 used as EAD.

**Table 3.6:** Grooved insulation resistance.

Vêtture kit	Ageing	Mean value (N)	Characteristic value (*) (N)
FAVEKER® TILE & 4 TILES	Without ageing	413	319
	After hygrothermal cycles	420	352
	After freeze-thaw cycles	364	317

(\*) Characteristic values giving 75% confidence that 95% of test results will be higher than this value.

### 3.11 Displacement behaviour

FAVEKER® kits fulfil the following criteria according to section 5.4.2.4 of ETAG 017 used as EAD:

- The vêtture kits are intended to be used with continuous areas of the skin (that means without expansion joints) up to 6 m x 6 m (see section 2).
- In addition, when relevant, the prefabricated units can be mechanically fixed on the substrate and supplementary bonded on it with the supplementary adhesive defined in Annex 3 (bonded area  $\geq$  40% of the prefabricated unit area).

### 3.12 Impact resistance

Impact resistance has been tested for vêtture kit (with brick slips and with tiles) according to section 5.4.5 of ETAG 017 used as EAD.

**Table 3.7:** Impact resistance.

Vêtture kit	Impact resistance passed	Degree of exposure in use (*)
FAVEKER® BRICK	<ul style="list-style-type: none"> <li>▪ Hard body (0,5 kg) impacts of 3 joule</li> <li>▪ Soft body (3,0 kg) impacts of 60 joule</li> <li>▪ Soft body (50,0 kg) impacts of 400 joule</li> </ul>	Category III
FAVEKER® TILE & 4 TILES	<ul style="list-style-type: none"> <li>▪ Hard body (0,5 kg) impacts of 3 joule</li> <li>▪ Hard body (1,0 kg) impacts of 10 joule</li> <li>▪ Soft body (3,0 kg) impacts of 60 joule</li> <li>▪ Soft body (50,0 kg) impacts of 400 joule</li> </ul>	Category I

- (\*) Category I: This category means that the degree of exposure in use should be a zone readily accessible at ground level to the public and vulnerable to hard body impacts but not subject to abnormally rough use.
- Category II: This category means that the degree of exposure in use should be a zone liable to impacts from thrown or kicked objects, but in public locations where the height of the kit will limit the size of the impact; or at lower levels where access to the buildings is primarily to those with some incentive to exercise care.
- Category III: This category means that the degree of exposure in use should be a zone not likely to be damaged by normal impacts caused by people or by thrown or kicked objects.

### 3.13 Thermal shock resistance of the skin

The materials of the skin of FAVEKER® units (ceramic bricks and tiles) are resistant to thermal shock (see Annex 1).

### 3.14 Chemical and biological resistance of the skin

The materials of the skin of FAVEKER® units (ceramic bricks and tiles) are resistant to chemical and biological attack (see Annex 1).

### 3.15 Corrosion of fixings

Material of the metallic screws of fixings are resistant to corrosion (see Annex 1).

### 3.16 UV radiation resistance

The materials of the skin of FAVEKER® units (ceramic bricks and tiles) are resistant to UV radiation (see Annex 1).

### 3.17 Thermal resistance

Thermal resistance (R-value) has been assessed according to section 5.6.1 of ETAG 017 used as EAD.

Thermal resistance (R-value) of the vêtture kits has been calculated from the thermal values and geometry of the components (see Annex 1) according to section 6.2 of EN ISO 6946.

**Table 3.8:** Thermal resistance.

Vêtture kit		$R_{v\grave{e}tture}$ [ $(m^2 \cdot K)/W$ ] (*)	$\Delta U$ [ $W/(m^2 \cdot K)$ ] (**)	
FAVEKER® BRICK	without supplementary thermal insulation panel	1,89	0,030	
	with supplementary thermal insulation panel (thickness in mm)	20		2,46
		40		3,03
		60		3,60
		80		4,17
		100		4,75
		120		5,32
		140		5,89
FAVEKER® TILE & 4 TILES	without supplementary thermal insulation panel	1,86	0,033	
	with supplementary thermal insulation panel (thickness in mm)	20		2,44
		40		3,01
		60		3,58
		80		4,15
		100		4,72
		120		5,29
		140		5,86

(\*) Information regarding the thermal transmittance of the whole external wall (U) including the vêtture kit and the thermal bridges ( $\Delta U$ ) is given in Annex 3.

(\*\*)  $\Delta U$  = correction term of the thermal transmittance for anchors =  $n_{fix} \cdot X_p$ , where  $n_{fix}$  = number of anchors per unit area (see table A1.1 of Annex A1) and  $X_p$  = point thermal transmittance value of one anchor (see table A1.6 of Annex A1).

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

According to the decision 2001/308/EC, as amended of the European Commission<sup>6</sup>, the systems of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

**Table 4.1:** Applicable AVPC system.

Product	Intended use	Level or class	System
FAVEKER® ETICS	In external walls not subject to fire regulations	Any	3
	In external walls subject to fire regulations	B,s1-d0	

#### 5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC<sup>7</sup>, with which the factory production control shall be in accordance.

Issued in Barcelona on 8 March 2016

by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart  
Technical Director, ITeC

<sup>6</sup> 2001/308/EC – Commission Decision of date 31 January 2001, published in the Official Journal of the European Union (OJEU) L107/25 of 08/04/2001.

<sup>7</sup> The *Control Plan* is a confidential part of the ETA and is only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

## ANNEX 1: Components of the FAVEKER® ETICS

### A1.1 Prefabricated units

Three types of prefabricated units are considered, one in which the skin is composed by several ceramic brick slips and the others in which the skin is composed by one or four tiles. In all cases the ceramic pieces and the thermal insulations are bonded by means of a cement-based adhesive and also connected by tongue-groove in form of dovetail joint.

The characteristics of each prefabricated unit are given in table A1.1.

Specific information of each prefabricated unit component is given in the successive sections of this annex.

Characteristic	Reference	Value		
Trade name	---	FAVEKER® BRICK	FAVEKER® TILE	FAVEKER® 4 TILES
Form (i)	---	Figure A1.1	Figure A1.2	Figure A1.3
Thickness (mm)	EN ISO 10545-2 or EN 823		85 ± 2	
Length (mm)		1000 ± 2	600 ± 2	1200 ± 2
Width (mm)		600 ± 2	300 ± 2	600 ± 2
Straightness of sides				
Rectangularity	EN ISO 10545-2 or EN 822		± 0,5% (± 2,0 mm)	
Central curvature				
Lateral curvature				
Warping				
Surface appearance		> 95% undamaged units		
Weight per unit as delivery (kg)	---	13,8 ± 0,8	6,1 ± 0,5	24,4 ± 0,8
Weight per unit area (kg/m <sup>2</sup> ) (iv)	---	33,6 ± 1,0	38,8 ± 1,0	38,8 ± 1,0
Percentage of joints (%)	---	17,0		5,0
Number of anchors to support one prefabricated unit	---	6 (ii)	4 (iii)	10 (ii) (iii)
Number anchors per unit area (fix/m <sup>2</sup> )	---	10,0	11,1	11,1

(i) The prefabricated unit can be cut in any prescribed dimension.

(ii) In the FAVEKER® BRICK and 4 TILES units, the plate Ø60 mm of the mechanical fixing (see Annex 2) is positioned in the prefabricated unit during the manufacturing process, as shown in figure A1.1.

(iii) In the FAVEKER® TILE and 4 TILES units, the anchors with plate Ø90 mm are positioned in-situ in the groove of the insulation panel (there are no fixings or part of them incorporated during the manufacturing process). The position and dimensions of the edge grooves are shown in figures A1.7 and A1.8.

(iv) Value in final use conditions (including the grout and the complementary brick slips applied on site).

**Table A1.1:** Characteristics of the prefabricated units.



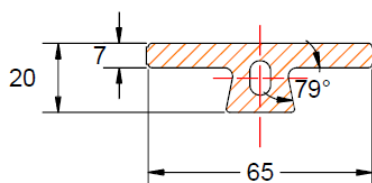
### A1.1.1 Skin

The ceramic pieces of the prefabricated units' skin are extruded ceramic tiles according to harmonized standard EN 14411. These ceramic pieces have a special section in form of dovetail joint to improve the adherence on the thermal insulation panel.

The characteristics of each type of ceramic piece are given in table A1.2.

Characteristic	Reference	Value	
Trade name	---	Ceramic brick slip for FAVEKER® BRICK	Ceramic tile for FAVEKER® TILE & 4 TILES
Designation	EN 14411	Ceramic extruded tiles Group All <sub>a-2</sub>	
Form	---	Figure A1.4	Figure A1.5
Thickness (mm)		7,0 ± 0,7	7,0 ± 0,7
Length (mm)		240,0 ± 2	590,0 ± 2
Width (mm)		65,0 ± 0,8	290,0 ± 2
Rectangularity			
Straightness of sides	EN ISO 10545-2	± 1,0%	± 1,0%
Central curvature			
Lateral curvature		± 1,5%	± 1,5%
Warping			
Surface appearance		> 95% undamaged units	> 95% undamaged units
Water absorption (% weight)		3% ≤ Eb ≤ 6%	3% ≤ Eb ≤ 6%
Apparent relative density (kg/m <sup>3</sup> )	EN ISO 10545-3	2100 ± 200	2500 ± 200
Bulk density (kg/m <sup>3</sup> )		2000 ± 200	2100 ± 200
Apparent porosity (%)		9,0 ± 1	9,0 ± 1
Weight per piece (kg)		0,32 ± 10%	4,00 ± 10%
Breaking strength (N)	EN ISO 10545-4	> 3000	> 1500
Bending strength (MPa)		> 20	> 13
Hardness, volume of missing material (mm <sup>3</sup> )	EN ISO 10545-6	< 393	< 393
Resistance to thermal shock	EN ISO 10545-9	Pass	Pass
Crazing resistance for glazed tiles	EN ISO 10545-11	Pass	Pass
Frost resistance	EN ISO 10545-12	No defects	No defects
Reaction to fire	Decision 96/603/EC as amended	A1	A1
Water vapour resistance factor, μ	EN 1745	≤ 500	≤ 450
Thermal conductivity (W/m·K)	EN ISO 10456	1,3	1,3

**Table A1.2:** Characteristics of the skin ceramic pieces.



**Figure A1.4:** Ceramic brick slip for FAVEKER® BRICK.

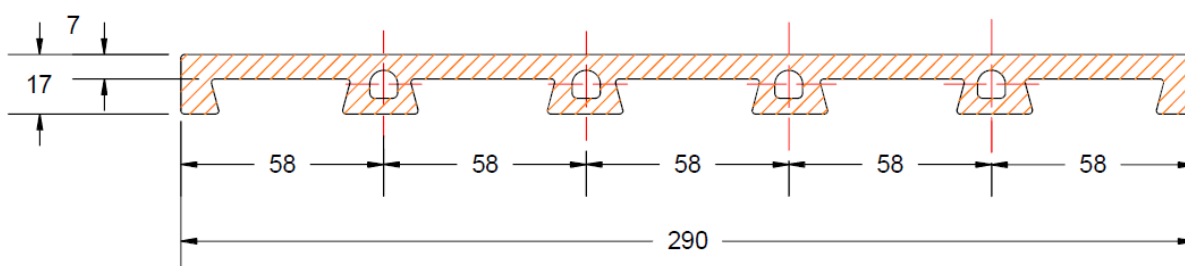


Figure A1.5: Ceramic tile for FAVEKER® TILE & 4 TILES.

### A1.1.2 Thermal insulation panels

The thermal insulation products of the prefabricated units are factory made expanded polystyrene panels (EPS) CE marked according to harmonized standard EN 13163. These panels include grooves with section in form of dovetail joint on one of their surfaces.

The characteristics of each type of EPS panel are given in table A1.3.

Characteristic	Reference	Value		
		EPS panel for FAVEKER® BRICK	EPS panel for FAVEKER® TILE	EPS panel for FAVEKER® 4 TILES
Designation	EN 13163	EPS-EN13163-T2-L2-W2-S2-P3-BS150-CS(10)80-DS(N)5-TR150		
Form	---	Figure A1.6	Figure A1.7	Figure A1.8
Reaction to fire	EN 13501-1	E		
Thickness (mm)	EN 823	60 ± 2		
Length (mm)	EN 822	1000 ± 2	600 ± 2	1200 ± 2
Width (mm)		600 ± 2	300 ± 2	600 ± 2
Squareness (mm/m)	EN 824	± 2		
Flatness (mm)	EN 825	± 3		
Density (kg/m <sup>3</sup> )	EN 1602	19 ± 1		
Tensile strength perpendicular to faces (kPa)	EN 1607	≥ 150		
Bending strength (kPa)	EN 12089	≥ 150		
Shear strength (kPa)	EN 12090	≥ 80		
Shear modulus (kPa)		≥ 2250		
Compressive stresses at 10% relative deformation (kPa)	EN 826	≥ 80		
Thermal conductivity, λ <sub>D</sub> (W/m·K)	EN 13163	0,035		
Water vapour resistance factor, μ	EN ISO 10456 or EN 12524	30 – 70		
Long term water absorption by immersion (kg/m <sup>2</sup> )	EN 12087	< 1,8		

Table A1.3: Characteristics of the thermal insulation panels.

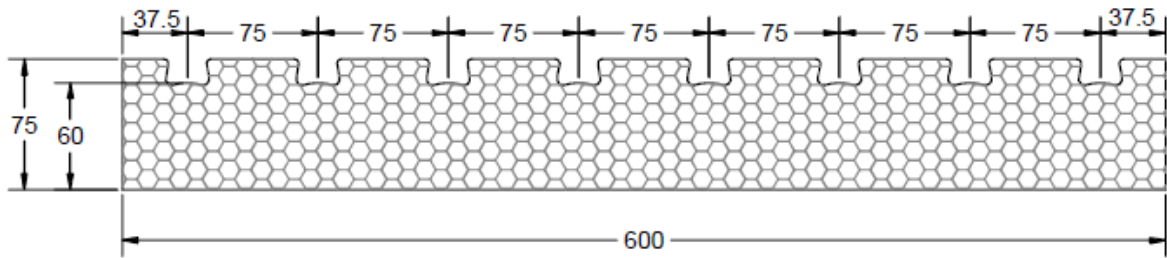


Figure A1.6: EPS panel for FAVEKER® BRICK.

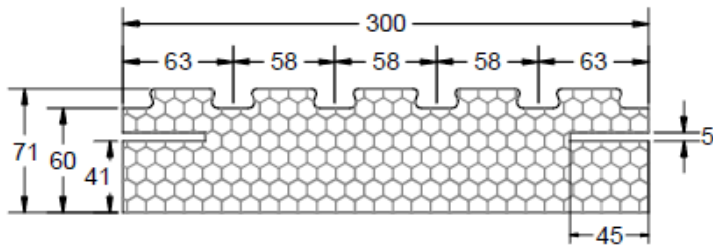


Figure A1.7: EPS panel for FAVEKER® TILE.

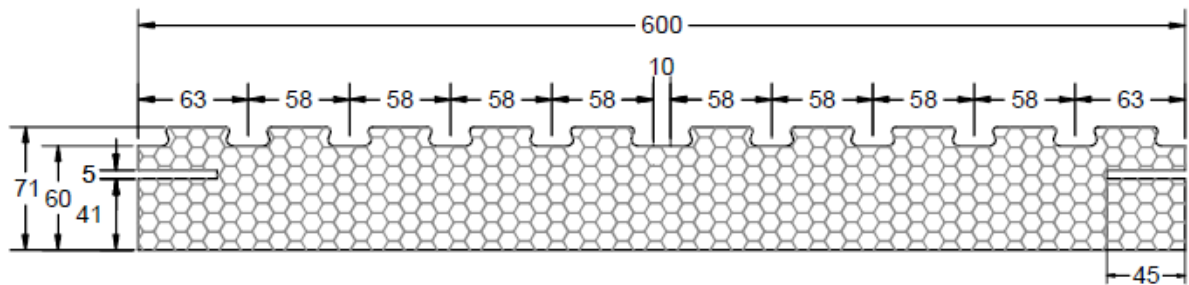


Figure A1.8: EPS panel for FAVEKER® 4 TILE.



### A1.1.3 Adhesive

The adhesive used to bond the ceramic pieces to the EPS panel in the prefabricated units is a cement-based adhesive for ceramic tiles, CE marked according to harmonized standard EN 12004.

The characteristics of the adhesive are given in table A1.4.

Characteristic	Reference	Value	
Generic type	EN 12004	Cementitious adhesive with improved characteristics, slip-resistance and extended open time	
Designation		C2TE	
Colour	---	Grey or White	
Organic content (%)	---	< 3,5	
As delivery (dry mortar)	Weight per bag (kg)	25	
	Particle size (mm)	< 0,5	
Paste	Density (kg/m <sup>3</sup> )	1500 ± 100	
	pH	> 10	
	Water-product ratio	Grey: 6,25 litres per bag (25 kg) White: 6,10 litres per bag (25 kg)	
Hardened mortar	Density (kg/m <sup>3</sup> )	1400 ± 100	
	Initial bond strength (MPa)	§8.2 EN 1348	
	Bond strength after immersion in water (MPa)	§8.3 EN 1348	
	Bond strength after ageing with heat (MPa)	§8.4 EN 1348	≥ 1,0
	Bond strength after freeze-thaw cycles (MPa)	§8.5 EN 1348	
	Slip (mm)	EN 1308	≤ 0,5
	Extended open time: bond strength (MPa)	EN 1346	≥ 0,5 at 30 min.
	Water vapour resistance factor, μ		15 – 35
Thermal conductivity, λ <sub>10,dry(p=90%)</sub> (W/m·K)	EN 1745	0,58	

**Table A1.4:** Characteristics of the adhesive between ceramic pieces and EPS panels in the prefabricated units.

## A1.2 Grout for tiles

The joints between the prefabricated units and also between the brick slips are filled (on site) with the grout for tiles according to standard EN 13888 defined in table A1.5.

Characteristic		Reference	Value	
Generic type		EN 13888	Premixed grout consisting of high-resistance cements, selected silicon/quartz mineral charges and specific additives, for grouting gaps from 4 to 20 mm width.	
Designation			CG2	
Colour		---	Grey	
Organic content (%)		---	≈ 5,0%	
As delivery (dry mortar)	Weight per bag (kg)	---	25	
	Particle size (mm)	EN 12192-1	≤ 0,5	
Paste	Water-product ratio	---	5,0 litres per bag (25 kg)	
Hardened mortar	Density (kg/m <sup>3</sup> )	EN 1015-10	1900 ± 100	
	Resistance to abrasion (mm <sup>3</sup> )	EN 12808-2	≤ 1000	
	Flexural strength (MPa)	after air cured	EN 12808-3	≥ 2,5
		after freeze-thaw cycles		
	Compressive strength (MPa)	after air cured	EN 12808-3	≥ 15,0
		after freeze-thaw cycles		
	Shrinkage (mm/m)		EN 12808-5	< 3,0
	Water absorption (g)	after 30 min.	EN 12808-5	< 2,0
		after 240 min.		< 5,0
	Water vapour resistance factor, $\mu$			15 - 35
Thermal conductivity, $\lambda_{10,dry(p=90\%)}$ (W/m·K)		EN 1745	1,21	

**Table A1.5:** Characteristics of the adhesive between ceramic pieces and EPS panels in the prefabricated units.

### A1.3 Mechanical fixings

The anchors used to fasten the prefabricated units to the substrate are plastic anchors for ETICS, CE marked according to ETAG 014 (ETA 04/0064).

The characteristics of the plastic anchors are given in table A1.6.

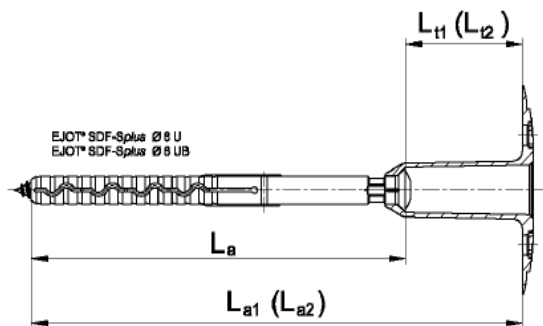
Characteristics		Value	
Trade name	Screw	Ejot SDF-S plus UB	
	Sleeve		
	Plate Ø60 mm	Ejot TE60 / 50	
	Plate Ø90 mm (for prefabricated units with tiles)	Ejot VT90	
Form	Assembled anchor (*)	Figure A1.9	
	Screw	Figure A1.10	
	Sleeve	Figure A1.11	
	Plate Ø60 mm	Figure A1.12	
	Plate Ø90 mm (for prefabricated units with tiles)	Figure A1.13	
Dimensions (mm)	Screw	$d_s$	5,5
		$c_1$	60
		$c$	70
		$\min l_d$	80
		$\max l_d$	300
	Sleeve	$d_{nom}$	8,0
		$h_{ef}$	70
		$\min L_a$	80
		$\max L_a$	300
		Plate Ø60 mm	$d_d$
	$d$		3,3
	$L_1$		45
	$L_2$		105
	$L_{Tmin}$		50
	$L_{Tmax}$		110
	$d_c$		15
	Plate Ø90 mm	$h_c$	16,5
$d_d$		17,5	
$d$		1,2	
Material	Screw	Galvanized steel	Electrogalvanized $\geq 5 \mu m$ (EN ISO 4042-1)
		Stainless steel	Material number 1.4401; 1.4571; 1.4301 or 1.4567 (EN ISO 3506-4)
	Sleeve		
	Plate Ø60 mm		Polyamide
	Plate Ø90 mm		
Mechanical characteristics	Minimum resistance to tension load $N_{Rk}$ in concrete and masonry for a single anchor (kN)		$\geq 0,80$
	Minimum load resistance of the anchor plate (kN)		$\geq 2,24$
	Plate stiffness (kN/mm)		0,70
Thermal characteristics	Point thermal transmittance for one anchor, $X_p$ [W/(K·fix)]		$\leq 0,003$

(\*) Determination of the combined length of the anchor  $L_{a1} = L_a + L_{t1}$  ;  $L_{a2} = L_a + L_{t2}$

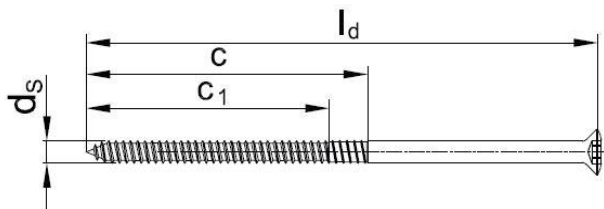
**Table A1.6:** Characteristics of the anchors.

Installation parameters (see figure A1.14)		Value
Drill hole diameter	$d_0$ (mm)	8
Cutting diameter of drill bit	$d_{cut}$ (mm)	$\leq 8,45$
Depth of drilled hole to deepest point	$h_1$ (mm)	$\geq 80$
Effective anchorage depth	$h_{ef}$ (mm)	$\geq 70$
Determination of maximum thickness of insulation		$h_D = L_a - t_{tol} - h_{ef}$
Installation instructions		See figure A1.15

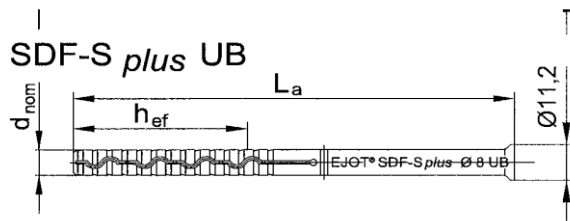
**Table A1.7:** Installation parameters of the anchors.



**Figure A1.9:** Assembled anchor.



**Figure A1.10:** Screw of the anchor.



**Figure A1.11:** Sleeve of the anchor.

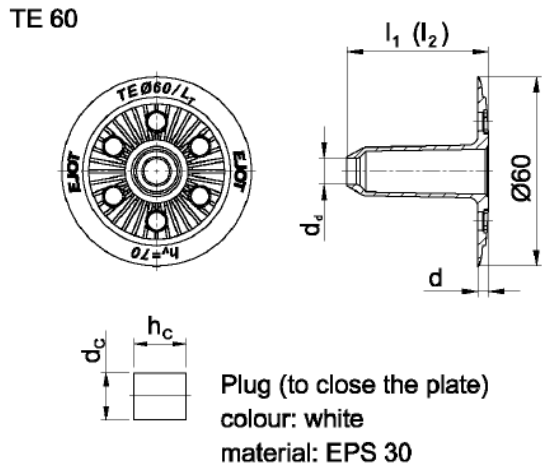


Figure A1.12: Plate Ø60 mm of the anchor.

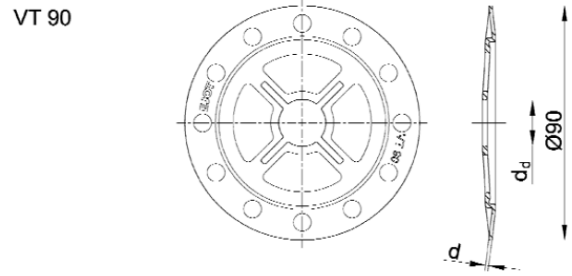
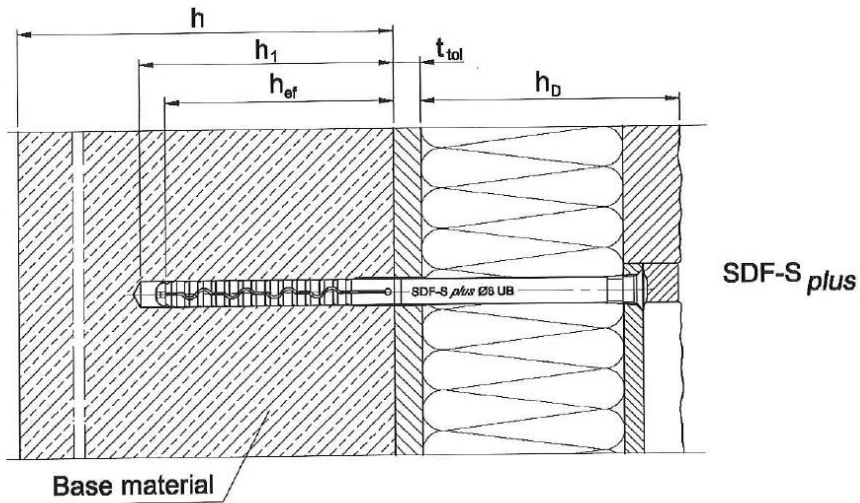


Figure A1.13: Plate Ø90 mm of the anchor.



- Legend:
- $h_D$  = thickness of insulation material
  - $h_{ef}$  = effective anchorage depth
  - $h$  = thickness of member (wall)
  - $h_1$  = depth of drilled hole to deepest point
  - $t_{tol}$  = thickness of equalizing layer or non-load-bearing coating

Figure A1.14: Installation parameters.

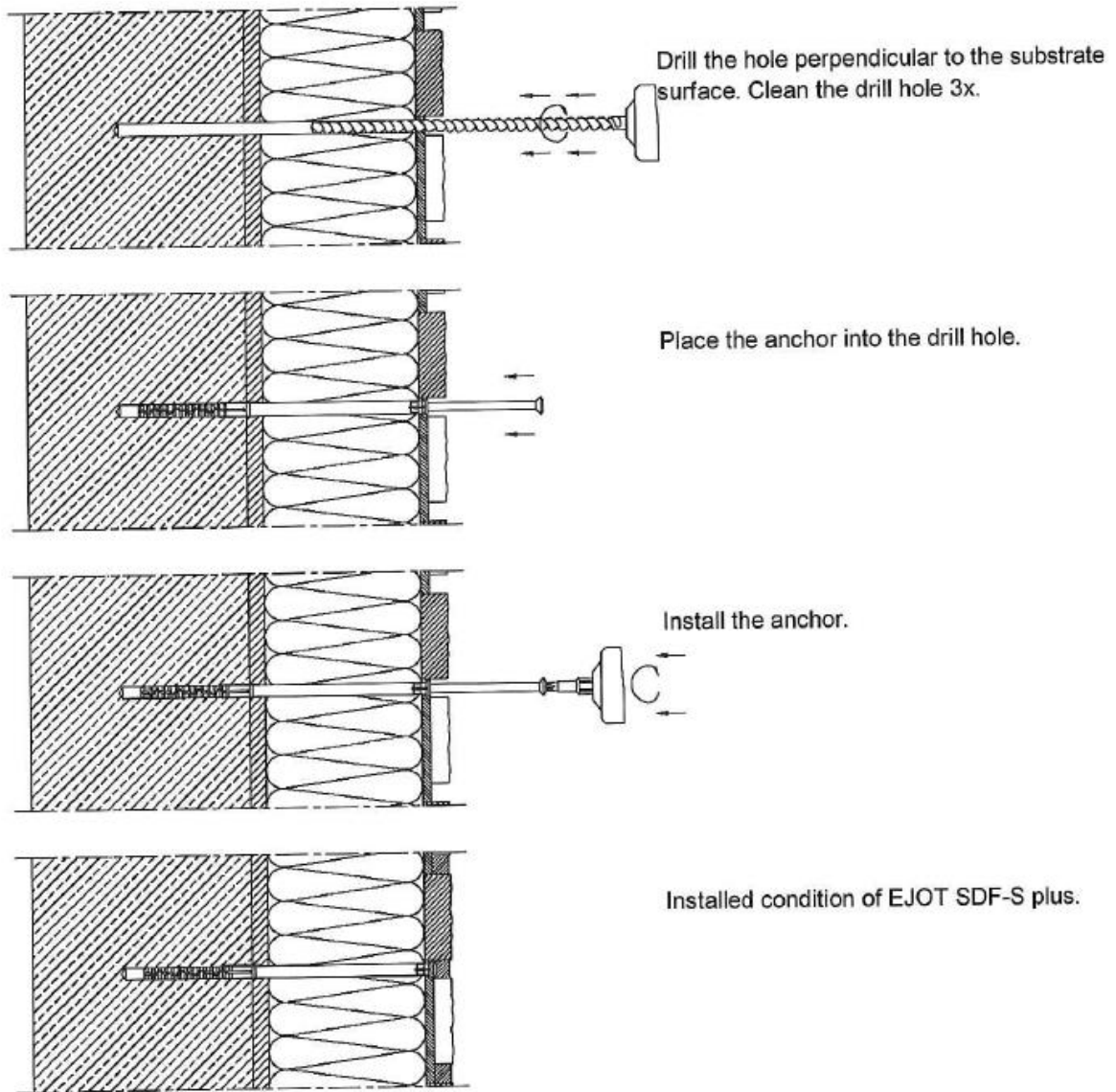


Figure A1.15: Installation instructions.

## ANNEX 2: Ancillary components

### A2.1 Supplementary thermal insulation layer

Supplementary thermal insulation layer is used to add to the vêtture kit more thickness than that given by the thermal insulation of the prefabricated units (see section A1.1 of Annex 1).

These thermal insulation panels are factory made expanded polystyrene panels (EPS) CE marked according to harmonized standard EN 13163.

The characteristics of the EPS panels are given in table A2.1.

Characteristic	Reference	Value
		Supplementary thermal insulation panel
Designation	EN 13163	EPS-EN13163-T2-L2-W2-S2-P3-BS150-CS(10)80-DS(N)5-TR150
Form	---	Panels with flat surfaces without grooves
Reaction to fire	EN 13501-1	E
Thickness (mm)	EN 823	between 20 and 140 (tolerance $\pm 2$ )
Length (mm)	EN 822	$1200 \pm 2$
Width (mm)		$1000 \pm 2$
Squareness (mm/m)	EN 824	$\pm 2$
Flatness (mm)	EN 825	$\pm 3$
Density (kg/m <sup>3</sup> )	EN 1602	$19 \pm 1$
Tensile strength perpendicular to the faces (kPa)	EN 1607	$\geq 150$
Bending strength (kPa)	EN 12089	$\geq 150$
Shear strength (kPa)	EN 12090	$\geq 80$
Shear modulus (kPa)		$\geq 2250$
Compressive stress at 10% relative deformation (kPa)	EN 826	$\geq 80$
Thermal conductivity, $\lambda_D$ (W/m·K)	EN 13163	0,035
Water vapour resistance factor, $\mu$	EN ISO 10456	30 – 70
Long term water absorption by immersion (kg/m <sup>2</sup> )	EN 12087	< 1,8

**Table A2.1:** Characteristics of the supplementary thermal insulation panels.

### A3.3 Supplementary adhesive

The prefabricated units can also be supplementary bonded on the substrate (bonded area  $\geq 40\%$  of the prefabricated unit area). In the same way this supplementary adhesive can also be used between the supplementary thermal insulation and the substrate or between the prefabricated unit and the supplementary thermal insulation.

This adhesive is a cement-based mortar. The characteristics of the adhesive are given in table A2.2.

Characteristic		Reference	Value
Generic type		EN 12004	Cementitious mortar improved with resins for general use
Designation			GP (mortar for general purpose)
Colour		---	Grey or white
Application thickness (mm)		---	≤ 5,0
Reaction to fire		EN 13501-1	A1
PCS (MJ/kg)		EN 1716	- 0,11
As delivery (dry mortar)	Weight per bag (kg)	---	25
	Particle size (mm)	EN 12192-1	< 0,5
Paste	Density (kg/m <sup>3</sup> )	EN 1015-6	1480 ± 100
	pH	---	> 10
	Water-product ratio	---	5,2 – 5,5 litres per bag (25 kg)
Hardened mortar	Density (kg/m <sup>3</sup> )	EN 1015-10	1500 ± 100
	Compressive strength (MPa)	EN 1015-11	≥ 7,5 (CS IV)
	Bond strength after climatic cycles (MPa)	EN 1015-21	≥ 1,2
	Water permeability (ml/cm <sup>2</sup> )		≤ 0,06
	Water absorption (kg/m <sup>2</sup> ·min <sup>0,5</sup> )	EN 1015-18	≤ 0,06 (W2)
	Water vapour resistance factor, μ	EN 1015-19	24
	Thermal conductivity, λ <sub>10,dry(p=90%)</sub> (W/m·K)	EN 1745	0,66

**Table A2.2:** Characteristics of the supplementary adhesive.



### ANNEX 3: Thermal transmittance

The thermal bridges caused by the anchors influence the thermal transmittance of the whole external wall and shall be taken into account using the following calculation:

$$U_c = U + \Delta U \quad [W/(m^2 \cdot K)]$$

Where:

$U_c$  : corrected thermal transmittance of the whole external wall, including thermal bridges;

$U$  : thermal transmittance of the whole external wall without thermal bridges;

$\Delta U$  : correction term of the thermal transmittance for anchors

$$U = \frac{1}{R_{si} + R_{substrate} + R_{v\acute{e}ture} + R_{se}}$$

$R_{v\acute{e}ture}$  : thermal resistance of the v\acute{e}ture kit [W/(m<sup>2</sup>·K)] (see table 3.8 of ETA).

$R_{substrate}$  : thermal resistance of the substrate wall [W/(m<sup>2</sup>·K)]

$R_{se}$  : external surface thermal resistance [W/(m<sup>2</sup>·K)]

$R_{si}$  : internal surface thermal resistance [W/(m<sup>2</sup>·K)]

$$\Delta U = X_p \cdot n_{fix}$$

$X_p$  : point thermal transmittance value of one anchor [W/K] (see table A1.6 of Annex 1)

$n_{fix}$  : number of anchors per unit area [1/m<sup>2</sup>].