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European Technical Assessment

ETA 21/0947
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General part

Technical Assessment Body issuing the ETA: ITeC	
ITeC has been designed according to Article 29 of Regulation (UE) No 305/2011 and is a member of EOTA (European Organisation for Technical Assessment).	
Trade name of the construction product	Mapetherm EPS System
Product family to which the construction product belongs	Product Area Code: 04 External Thermal Insulation Composite Systems (ETICS) with rendering on EPS for the use as external insulation of building walls.
Manufacturer	MAPEI SpA Via Cafiero 22 20158 Milano Italy www.mapei.com
Manufacturing plant(s)	According to Annex N kept by ITeC.
This European Technical Assessment contains	28 pages including 3 annexes which form an integral part of this assessment and Annex N, which contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available.
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	EAD 040083-00-0404 <i>External Thermal Insulation Composite Systems (ETICS) with renderings</i> , edition 2019.
This ETA replaces	ETA 21/0947 issued on 13.05.2022

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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Specific parts of the European Technical Assessment

1 Technical description of the product

Mapetherm EPS System is an ETICS (External Thermal Insulation Composite System) with rendering – a kit comprising components which are factory-produced by the manufacturer or by component suppliers.

The ETICS kit comprises a prefabricated insulation product of expanded polystyrene (EPS) to be bonded onto a wall with (or without) supplementary mechanical fixings. The methods of fixing and the relevant components are specified in the table below. The insulation product is faced with a rendering system consisting of several layers (site applied), one of which contains reinforcement. The rendering is applied directly to the insulating panels, without any air gap or disconnecting layer.

The ETICS includes special fittings (e.g. base profiles, corner profiles...) to treat details of ETICS (connections, apertures, corners, parapets, sills...). The assessment and performance of these components is not addressed in this ETA, however the ETICS manufacturer is responsible for adequate compatibility and performance within the ETICS when the components are delivered as a part of the kit.

Composition of the ETICS:

	Components	Coverage (kg/m ²)	Thickness (mm)
Purely bonded ETICS or Bonded ETICS with supplementary mechanical fixings (pursuant to ETA holder's instructions, the minimal bonded surface shall be 40%; National application documents shall be taken into account.)			
Adhesives	Mapetherm AR1: Grey powder consisting of cement, fine grained sands, synthetic resins and additives. The product requires the addition of 21%-24% water (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	5 to 8
	Mapetherm AR1 GG grey/white: Grey/white powder consisting of grey/white cement, sand, synthetic resins, polypropylene fibres and additives. The product requires the addition of 21%-24% water (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	5 to 8
	Mapetherm AR1 Light white: White powder consisting of cement, lightweight mineral aggregates, fine grained sands, synthetic resins and additives. The product requires the addition of 29% - 31% water (6,7 l – 7,1 l of water per 23 kg).	3 to 5 (powder)	5 to 8
	Mapetherm AR1 MAXI grey/white: Grey/white powder consisting of cement, sand, synthetic resins, polypropylene fibres and additives. The product requires the addition of 21% - 24% water (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	5 to 8

	Components	Coverage (kg/m ²)	Thickness (mm)
Insulation products	EPS board (TR100): - Generic expanded polystyrene standard insulation board with or without graphite with TR100 according to EN 13163 with the characteristics described in the table A1.1. - Mapetherm EPS G Mapetherm EPS G CAM: Expanded polystyrene standard insulation board with graphite according to EN 13163, with TR100 and with the characteristics described in the table A1.4.	--	40 to 300
	EPS board (TR150): - Generic expanded polystyrene standard insulation board with or without graphite with TR150 according to EN 13163 with the characteristics described in the table A1.2. - Mapetherm EPS 100 CAM Mapetherm EPS G 100 Mapetherm EPS G 100 CAM: Expanded polystyrene standard insulation board without/with graphite according to EN 13163, with TR150 and with the characteristics described in the tables A1.3 and A1.5 respectively.	--	40 to 300
Base coats	Mapetherm AR1: Grey powder consisting of cement, fine grained sands, synthetic resins and additives. The product requires the addition of 21% - 24% water (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	4 to 5
	Mapetherm AR1 GG grey/white: Grey/white powder consisting of grey/white cement, sand, synthetic resins, polypropylene fibres and additives. The product requires the addition of 21% - 24% water (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	4 to 5
	Mapetherm AR1 Light white: White powder consisting of cement, lightweight mineral aggregates, fine grained sands, synthetic resins and additives. The product requires the addition of 29% - 31% water (6,7 l – 7,1 l of water per 23 kg).	3 to 5 (powder)	5 to 8
	Mapetherm AR1 MAXI grey/white: Grey/white powder consisting of cement, sand, synthetic resins, polypropylene fibres and additives. The product requires the addition of 21% - 24% water, (5,25 l - 6 l of water per 25 kg).	4 to 6 (powder)	4 to 6
Glass fibre meshes	Mapetherm Net Standard glass fibre mesh. See Annex 3, table A3.1 for product characteristics.	--	--
	Mapetherm Net R131 Standard glass fibre mesh. See Annex 3, table A3.2 for product characteristics.	--	--

	Components	Coverage (kg/m ²)	Thickness (mm)
Key coats	Quarzolite Base Coat: ready to use water acrylic based dispersion. This product can be applied before the following finishing coats: - Quarzolite Tonachino - Quarzolite Tonachino Plus - Quarzolite Tonachino PRO - Quarzolite Tonachino PRO S - Elastocolor Tonachino Plus	0,3 – 0,5	0,3 – 0,4
	Silancolor Base Coat: ready to use water silicone resin-based dispersion. This product can be applied before the following finishing coats: - Silancolor Tonachino - Silancolor Tonachino Plus - Silancolor AC Tonachino - Silancolor AC Tonachino Plus	0,3 – 0,5	0,3 – 0,4
	Silancolor Base Coat Plus: ready to use water silicone resin-based dispersion with a mould and algae resistant component. This product can be applied before the following finishing coats: - Quarzolite Tonachino Plus - Silancolor Tonachino Plus - Silancolor AC Tonachino Plus - Elastocolor Tonachino Plus	0,2 – 0,3	0,05 – 0,15
	Silancolor Primer: ready to use water silane and siloxane based dispersion. This product can be applied before the following finishing coats: - Silancolor Tonachino - Silancolor AC Tonachino	0,1 – 0,15	--
	Silancolor Primer Plus: ready to use water silane and siloxane based dispersion with a mould and algae resistant component. This product can be applied before the following finishing coats: - Quarzolite Tonachino Plus - Silancolor Tonachino Plus - Silancolor AC Tonachino Plus - Elastocolor Tonachino Plus	0,1 – 0,15	--
	Malech: Water micronized acrylic resin based dispersion. This product can be applied before the following finishing coats: - Quarzolite Tonachino - Quarzolite Tonachino PRO - Quarzolite Tonachino PRO S - Elastocolor Tonachino Plus	0,1 – 0,15	--
Finishing coats	Quarzolite Tonachino: ready to use acrylic binder paste. Rustic finishing aspect. Maximum particle size: - 0,7 mm - 1,2 mm - 1,5 mm - 2,0 mm	1,7 – 2,0 1,9 – 2,3 2,2 – 2,6 3,0 – 3,5	Regulated by particle size

Components	Coverage (kg/m ²)	Thickness (mm)
Quarzolite Tonachino Plus: ready to use acrylic binder paste with a mould and algae resistant component. Rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Quarzolite Tonachino PRO: ready to use acrylic binder paste with mould and algae resistant component. Compact-rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Quarzolite Tonachino PRO S: ready to use acryl-siloxane binder paste, with a mould and algae resistant component. Compact-rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Silancolor Tonachino: ready to use silicon-resin binder paste. Rustic finishing aspect. Maximum particle size: - 0,7 mm - 1,2 mm - 1,5 mm - 2,0 mm	1,7 – 2,0 1,9 – 2,3 2,2 – 2,6 3,0 – 3,5	Regulated by particle size
Silancolor Tonachino Plus: ready to use silicon-resin binder paste with a mould and algae resistant component. Rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Silancolor AC Tonachino: ready to use acryl-siloxane binder paste. Rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Silancolor AC Tonachino Plus: ready to use acryl-siloxane binder paste with a mould and algae resistant component. Rustic finishing aspect. Maximum particle size: - 1,2 mm - 1,5 mm	1,9 – 2,3 2,2 – 2,6	Regulated by particle size
Elastocolor Tonachino Plus: ready to use elastomeric binder paste with a mould and algae resistant component. Rustic finishing aspect. Maximum particle size: 1,2 mm.	1,9 – 2,3	Regulated by particle size
Fixings	Supplementary fixings according to the description of Annex 2.	Remain under the ETA holder's responsibility.
Ancillary components	Remain under the ETA holder's responsibility.	

Table 0: Components of the ETICS Mapetherm EPS System.

2 Specification of the intended use(s) in accordance with the applicable EAD

This ETICS is intended for use as external insulation of buildings' walls. The walls are made of masonry (bricks, blocks, stones ...) or concrete (cast on site or as prefabricated panels). The characteristics of the walls shall be verified prior to use of the ETICS, especially regarding conditions for reaction to fire classification and for fixing of the ETICS either by bonding or mechanically. The ETICS is designed to give the wall to which it is applied satisfactory thermal insulation.

The ETICS is made of non-load-bearing construction components. It does not contribute directly to the stability of the wall on which it is installed, but it can contribute to its durability by providing enhanced protection from the effect of weathering.

The ETICS can be used on new or existing (retrofit) vertical walls. It can also be used on horizontal or inclined surfaces which are not exposed to precipitation.

The ETICS is not intended to ensure the airtightness of the building structure.

The product will be installed according to the manufacturer's instructions.

The provisions made in this ETA are based on an assumed working life of at least 25 years for **Mapetherm EPS System**. These provisions are based upon the current state of the art and the available knowledge and experience.

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 mean for choosing the right products in relation to the expected economically reasonable working life of the works.

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

Performance of the system **Mapetherm EPS System** related to the basic requirements for construction works (hereinafter BWR) were determined according to EAD 040083-00-0404 for *External Thermal Insulation Composite Systems (ETICS) with Rendering*.

Essential characteristics of **Mapetherm EPS System** are indicated in the following sections.

Essential characteristic	ETA section	Performance
Basic Works Requirement 2: Safety in case of fire		
Reaction to fire	3.1	<u>Reaction to fire of the ETICS:</u> B-s1,d0. See table 2 for details.
		<u>Reaction to fire of the insulation material:</u> Class E
		<u>Reaction to fire of PU foam adhesive:</u> Not relevant.
Façade fire performance	--	Not assessed
Propensity to undergo continuous smouldering of ETICS	--	Not relevant for EPS.

Essential characteristic	ETA section	Performance
Basic Works Requirement 3: Hygiene, health and the environment		
Content, emission and/or release of dangerous substances – leachable substances	--	Not assessed.
Water absorption	3.2.1	<u>Water absorption of the base coat and the rendering system:</u> See tables 3a and 3b for results. <u>Water absorption of the insulation product:</u> According to the DoP (see tables A1.1 to A1.5).
Water tightness of the ETICS: hygrothermal behaviour	--	Test passed (without defects). The ETICS is assessed as resistant to hygrothermal cycles.
Water tightness: freeze-thaw behaviour	3.2.2	The system “Mapetherm EPS System” is freeze-thaw resistant. See section 3.2.2.
Impact resistance	3.2.3	See table 4 for results.
Water vapour permeability	3.2.4	<u>Water vapour permeability of the rendering system:</u> See tables 5 for results. <u>Water vapour permeability of the insulation product:</u> According to the DoP (see tables A1.1 to A1.5).
Basic Works Requirement 4: Safety and accessibility in use		
Bond strength between base coat and insulation product	3.3.1	≥ 80 kPa. Cohesive failure in the insulation product. See table 6 for results.
Bond strength between adhesive and substrate	3.3.2	<u>Dry condition:</u> ≥ 250 kPa. Cohesive rupture in the adhesive. <u>48 h immersion in water + 2 h at 23°C and 50% RH:</u> ≥ 80 kPa. Cohesive rupture in the adhesive. <u>48 h immersion in water + 7 days at 23°C and 50% RH:</u> ≥ 250 kPa. Cohesive rupture in the adhesive. See table 7 for results.

Essential characteristic	ETA section	Performance
Bond strength between adhesive and insulation product	3.3.3	<u>Dry condition:</u> ≥ 80 kPa. Cohesive rupture in the insulation product. <u>48 h immersion in water + 2 h at 23°C and 50% RH:</u> ≥ 30 kPa. Adhesive rupture and/or cohesive rupture in the insulation product. <u>48 h immersion in water + 7 days at 23°C and 50% RH:</u> ≥ 80 kPa. Cohesive rupture in the insulation product. See table 8 for results.
Bond strength of the foam adhesives	--	Not relevant.
Fixing strength (transverse displacement)	--	Test not required because the ETICS fulfils the following criteria: $E \times d < 50.000 \text{ N/mm}$. Note: 'E' is modulus of elasticity of the base coat without mesh and 'd' the mean dry thickness of the base coat.
Wind load resistance	--	Not relevant (purely bonded ETICS or bonded ETICS with supplementary mechanical fixings)
Tensile strength perpendicular to the faces of insulation product	--	<u>In dry conditions:</u> According to the DoP: TR100 or TR150 (see tables A1.1 to A1.5). <u>In wet conditions:</u> Not assessed.
Shear strength and shear modulus of elasticity test of ETICS	--	Shear strength: ≥ 20 kPa. Shear modulus of elasticity: ≥ 1000 kPa. (see tables A1.1 to A1.5)
Pull-through resistance of fixings from profiles	--	Test not necessary (bonded system with supplementary fixings)
Render strip tensile test	--	Not assessed.
Shear strength and shear modulus of foam adhesives	--	Not relevant.
Post expansion behaviour of foam adhesives	--	Not relevant.
Bond strength after ageing	3.4	≥ 80 kPa. Cohesive rupture in the insulation product. See table 9 for results.

Essential characteristic	ETA section	Performance
Mechanical and physical characteristics of the mesh	Annex 3	<u>Tensile strength of the glass fibre mesh:</u> See A3.1 and A3.2 for results. <u>Protection of metal mesh:</u> Not relevant.
Basic Works Requirement 5: Protection against noise.		
Airborne sound insulation of ETICS	--	Not assessed.
Dynamic stiffness of the thermal insulation product	--	Not assessed
Air flow resistance of the thermal insulation product	--	Not relevant for EPS.
Basic Works Requirement 6: Energy economy and heat retention.		
Thermal resistance and thermal transmittance of ETICS	3.5	<u>Thermal resistance and thermal transmittance of the ETICS:</u> See section 3.5 and table 10. <u>Thermal resistance of the thermal insulation product:</u> According to the DoP (see tables A1.1 to A1.5).

Table 1: Essential characteristics of the ETICS Mapetherm EPS System.

3.1 Safety in case of fire (BWR 2)_ Reaction to fire of the system

EAD 040083-00-0404, clause 2.2.1.

The reaction to fire of **Mapetherm EPS System** according to EN 13501-1 is defined in table 2. The configuration tested was the worst case with regard to reaction to fire.

Reaction to fire classification of Mapetherm EPS System according to EN 13501-1: B-s1,d0		
Component	ETICS configuration	
Adhesive	Mapetherm AR1 Mapetherm AR1 GG Mapetherm AR1 Light Mapetherm AR1 MAXI	
Insulation: EPS boards	In quantity ensuring class E according to EN 13501-1.	
Base coat	Mapetherm AR1 Mapetherm AR1 GG Mapetherm AR1 Light Mapetherm AR1 MAXI	
Glass fibre mesh	Mapetherm Net Mapetherm Net R131	

Reaction to fire classification of **Mapetherm EPS System** according to EN 13501-1: **B-s1,d0**

Component	ETICS configuration
Key coat	All key coats defined in table 0.
Finishing coat	All finishing coats defined in table 0.
With the exception of the thermal insulation, none of the components of the system contains flame retardants.	

Table 2: Reaction to fire classification of **Mapetherm EPS System**.

Note: A European reference fire scenario has not been laid down for facades. In some Member States, the classification of ETICS according to EN 13501-1 might not be sufficient for the use in facades. An additional assessment of ETICS 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 Hygiene, health and environment (BWR 3)

3.2.1 Water absorption

EAD 040083-00-0404, clause 2.2.5.1.

		Water absorption [kg/m ²]	
		After 1 hour	After 24 hours
<i>Water absorption of the base coat - Mapetherm AR1</i>			
Base coat onto EPS white		< 0,5 (test result: 0,10)	< 0,5 (test result: 0,47)
Base coat onto EPS grey		< 0,5 (test result: 0,14)	< 0,5 (test result: 0,45)
<i>Water absorption of the rendering system</i>			
Rendering systems: base coat + key coat + finishing coats indicated hereafter:	Quarzolite Tonachino	< 0,5 (test result: 0,05)	< 0,5 (test result: 0,15)
	Quarzolite Tonachino Plus	< 0,5 (test result: 0,07)	< 0,5 (test result: 0,49)
	Quarzolite Tonachino PRO	< 0,5 (test result: 0,02)	< 0,5 (test result: 0,07)
	Quarzolite Tonachino PRO S	< 0,5 (test result: 0,06)	< 0,5 (test result: 0,21)
	Silancolor Tonachino	< 0,5 (test result: 0,04)	< 0,5 (test result: 0,26)
	Silancolor Tonachino Plus	< 0,5 (test result: 0,01)	< 0,5 (test result: 0,10)
	Silancolor AC Tonachino	< 0,5 (test result: 0,04)	< 0,5 (test result: 0,26)
	Silancolor AC Tonachino Plus	< 0,5 (test result: 0,01)	< 0,5 (test result: 0,10)

Table 3a: Water absorption test results (mean values).

		Water absorption [kg/m ²]	
		After 1 hour	After 24 hours
<i>Water absorption of the base coat – Mapetherm AR1 GG / AR1 Light / AR1 MAXI</i>			
Base coat onto EPS white		< 1,0 (test result: 0,54)	≥ 0,5 (test result: 1,03)
<i>Water absorption of the rendering system</i>			
Rendering systems: base coat + key coat + finishing coats indicated hereafter:	Quarzolite Tonachino	< 0,5 (test result: 0,12)	≥ 0,5 (test result: 0,72)
	Quarzolite Tonachino Plus		
	Quarzolite Tonachino PRO	< 0,5 (test result: 0,07)	< 0,5 (test result: 0,49)
	Quarzolite Tonachino PRO S	< 0,5 (test result: 0,02)	< 0,5 (test result: 0,07)
	Silancolor Tonachino	< 0,5 (test result: 0,10)	< 0,5 (test result: 0,47)
	Silancolor Tonachino Plus		
	Silancolor AC Tonachino	< 0,5 (test result: 0,06)	< 0,5 (test result: 0,29)
	Silancolor AC Tonachino Plus		
	Elastocolor Tonachino Plus	< 0,5 (test result: 0,02)	< 0,5 (test result: 0,04)

Table 3b: Water absorption test results (mean values).

3.2.2 Water tightness: freeze-thaw behaviour

EAD 040083-00-0404, clause 2.2.7.

For the base coat Mapetherm AR1 with all the renderings, the ETICS is freeze-thaw resistant as the water absorption of both reinforced base coat and the renderings systems was less than 0,5 kg/m² after 24 hours.

For the base coats Mapetherm AR1 GG / AR1 Light / AR1 MAXI with all the renderings, the ETICS have demonstrated resistance to freeze-thaw cycles, as evidenced by passing the test without defects (see table 6 in clause 3.3.1 and table 9).

3.2.3 Impact resistance

EAD 040083-00-0404, clause 2.2.8.

Rendering system Base coat + key coat and the finishing coats indicated hereafter:	Max. impact Ø mark		Category
	3 J	10 J	
Single mesh – Test on small samples			
Quarzolite Tonachino Quarzolite Tonachino Plus	No marks	52 mm Presence of micro-cracks but rendering not penetrated.	II
Quarzolite Tonachino PRO	No marks	Rendering not penetrated	II
Quarzolite Tonachino PRO S	No marks	Rendering not penetrated	II
Silancolor Tonachino Silancolor Tonachino Plus	No marks	35 mm Superficial marks without cracks	I
Silancolor AC Tonachino Silancolor AC Tonachino Plus	No marks	No marks	I
Elastocolor Tonachino Plus	No marks	No marks	I
Single mesh – Test on hygrothermal wall			
Quarzolite Tonachino (2 mm)	No deterioration	Rendering not penetrated	II
Double mesh – Test on hygrothermal wall			
Quarzolite Tonachino (2 mm)	No deterioration	No deterioration	I
Silancolor Tonachino (2 mm)	No deterioration	No deterioration	I

Table 4: Category of use according to impact resistance test results.

3.2.4 Water vapour permeability

EAD 040083-00-0404, clause 2.2.9.1.

Product	Thickness (mm)	Equivalent air thickness, S _d (m)
Mapetherm AR1	5,0	≤ 2,0 (test result: 0,10)
Mapetherm AR1 GG	5,0	≤ 2,0 (test result: 0,08)
Mapetherm AR1 Light	8,0	≤ 2,0 (test result: 0,09)
Mapetherm AR1 MAXI	6,0	≤ 2,0 (test result: 0,08)

Table 5a: Water vapour permeability test results of the base coats.

Rendering systems: Base coat + key coats + finishing coats indicated hereafter		Equivalent air thickness S_d (m)
Key coat	Finishing coat	
Malech	Quarzolite Tonachino	$\leq 2,0$ (test result: 0,21)
Quarzolite Base Coat	Quarzolite Tonachino	$\leq 2,0$ (test result: 0,23)
Silancolor Primer Plus	Quarzolite Tonachino Plus	$\leq 2,0$ (test result: 0,15)
Quarzolite Base Coat	Quarzolite Tonachino Plus	$\leq 2,0$ (test result: 0,19)
Silancolor Base Coat Plus	Quarzolite Tonachino Plus	$\leq 2,0$ (test result: 0,19)
Malech	Quarzolite Tonachino PRO	$\leq 2,0$ (test result: 0,25)
Quarzolite Base Coat	Quarzolite Tonachino PRO	$\leq 2,0$ (test result: 0,24)
Malech	Quarzolite Tonachino PRO S	$\leq 2,0$ (test result: 0,23)
Quarzolite Base Coat	Quarzolite Tonachino PRO S	$\leq 2,0$ (test result: 0,21)
Silancolor Primer	Silancolor Tonachino	$\leq 2,0$ (test result: 0,24)
Silancolor Base Coat	Silancolor Tonachino	$\leq 2,0$ (test result: 0,24)
Silancolor Base Coat Plus	Silancolor Tonachino Plus	$\leq 2,0$ (test result: 0,20)
Silancolor Base Coat	Silancolor Tonachino Plus	$\leq 2,0$ (test result: 0,19)
Silancolor Primer Plus	Silancolor Tonachino Plus	$\leq 2,0$ (test result: 0,23)
Silancolor Base Coat	Silancolor AC Tonachino	$\leq 2,0$ (test result: 0,19)
Silancolor Primer	Silancolor AC Tonachino	$\leq 2,0$ (test result: 0,21)
Silancolor Base Coat	Silancolor AC Tonachino Plus	$\leq 2,0$ (test result: 0,21)
Silancolor Primer Plus	Silancolor AC Tonachino Plus	$\leq 2,0$ (test result: 0,23)
Silancolor Base Coat Plus	Silancolor AC Tonachino Plus	$\leq 2,0$ (test result: 0,24)
Malech	Elastocolor Tonachino Plus	$\leq 2,0$ (test result: 0,27)
Quarzolite Base Coat	Elastocolor Tonachino Plus	$\leq 2,0$ (test result: 0,25)
Silancolor Primer Plus	Elastocolor Tonachino Plus	$\leq 2,0$ (test result: 0,23)
Silancolor Base Coat Plus	Elastocolor Tonachino Plus	$\leq 2,0$ (test result: 0,29)

Table 5b: Water vapour permeability test results of the rendering systems.

3.3 Safety and accessibility in use (BWR 4)

3.3.1 Bond strength between base coat and insulation product

EAD 040083-00-0404, clause 2.2.11.1.

	Bond strength			
	Minimum value (kPa)	Mean value (kPa)	Rupture typology	Required value (kPa)
Mapetherm AR1				
On samples after 28 days drying under the same conditions of the rig	160	176	C	≥ 80
After hygrothermal cycles on the rig	160	169	C	
After freeze-thaw test	Test not required because freeze/thaw cycles not necessary.			
Mapetherm AR1 GG / AR1 LIGHT / AR1 MAXI				
On samples after 28 days drying under the same conditions of the rig	80	94	A / C	≥ 80
After hygrothermal cycles on the rig	175	187	A / C	
After freeze-thaw test	166	197	C	

A: adhesive rupture.

C: cohesive rupture in insulation product.

Table 6: Bond strength between base coat and insulation product test results.

3.3.2 Bond strength between the adhesive and the substrate

EAD 040083-00-0404, clause 2.2.11.2.

	Bond strength			
	Minimum value (kPa)	Mean value (kPa)	Rupture typology	Required value (kPa)
Mapetherm AR1				
No complementary conditioning	1120	1410	B	≥ 250
2 days immersion in water + 2 h drying	440	562	B	≥ 80

	Bond strength			
	Minimum value (kPa)	Mean value (kPa)	Rupture typology	Required value (kPa)
2 days immersion in water + 7 days drying	1040	1222	B	≥ 250
Mapetherm AR1 GG				
No complementary conditioning	600	684	B	≥ 250
2 days immersion in water + 2 h drying	410	504	B	≥ 80
2 days immersion in water + 7 days drying	670	840	B	≥ 250
Mapetherm AR1 Light				
No complementary conditioning	830	986	B	≥ 250
2 days immersion in water + 2 h drying	610	632	B	≥ 80
2 days immersion in water + 7 days drying	800	946	B	≥ 250
Mapetherm AR1 MAXI				
No complementary conditioning	730	840	B	≥ 250
2 days immersion in water + 2 h drying	460	512	B	≥ 80
2 days immersion in water + 7 days drying	800	960	B	≥ 250

B: cohesive rupture in adhesive.

Table 7: Bond strength between adhesive and substrate (concrete) test results.

3.3.3 Bond strength between adhesive and the insulation product

EAD 040083-00-0404, clause 2.2.11.3.

	Bond strength			
	Minimum value (kPa)	Mean value (kPa)	Rupture typology	Required value (kPa)
Mapetherm AR1				
No complementary conditioning	160	184	C	≥ 80 (A, B) or ≥ 30 (C)

	Bond strength			
	Minimum value (kPa)	Mean value (kPa)	Rupture typology	Required value (kPa)
2 days immersion in water + 2 h drying	100	140	A	≥ 30 (A, B) or no requirement (C)
2 days immersion in water + 7 days drying	170	190	A / B / C	≥ 80 (A, B) or no requirement (C)
Mapetherm AR1 GG				
No complementary conditioning	100	126	C	≥ 80 (A, B) or ≥ 30 (C)
2 days immersion in water + 2 h drying	60	80	A	≥ 30 (A, B) or no requirement (C)
2 days immersion in water + 7 days drying	110	146	B / C	≥ 80 (A, B) or no requirement (C)
Mapetherm AR1 Light				
No complementary conditioning	80	102	A	≥ 80 (A, B) or ≥ 30 (C)
2 days immersion in water + 2 h drying	70	84	A	≥ 30 (A, B) or no requirement (C)
2 days immersion in water + 7 days drying	100	126	A	≥ 80 (A, B) or no requirement (C)
Mapetherm AR1 MAXI				
No complementary conditioning	80	88	A	≥ 80 (A, B) or ≥ 30 (C)
2 days immersion in water + 2 h drying	70	88	A	≥ 30 (A, B) or no requirement (C)
2 days immersion in water + 7 days drying	120	144	A	≥ 80 (A, B) or no requirement (C)

A: adhesive rupture.

B: cohesive rupture in adhesive.

C: cohesive rupture in insulation product.

Table 8: Bond strength between adhesive and insulation product results.

3.4 Bond strength after ageing

EAD 040083-00-0404, clauses 2.2.20.

Base coat	Rendering systems: key coat + finishing coats indicated hereafter:	Bond strength		
		Individual values (kPa)	Mean value (kPa)	Rupture typology
Mapetherm AR1	Quarzolite Base Coat + Quarzolite Tonachino*	151 / 186 / 148 / 189 / 174	170	C
	Quarzolite Base Coat + Quarzolite Tonachino PRO S	148 / 103 / 102 / 114 / 82	110	C
	Quarzolite Base Coat + Quarzolite Tonachino PRO	128 / 96 / 117 / 100 / 107	110	C
	Silancolor Base Coat + Silancolor Tonachino*	103 / 143 / 131 / 196 / 174	150	C
	Silancolor Base Coat + Silancolor AC Tonachino Plus	195 / 206 / 216 / 260 / 234	222	C
	Quarzolite Base Coat + Elastocolor Tonachino Plus	223 / 217 / 211 / 175 / 178	201	C
	Malech + Elastocolor Tonachino Plus	180 / 190 / 277 / 277 / 233	219	C
Mapetherm AR1 GG / AR1 Light / AR1 MAXI	Quarzolite Base Coat + Quarzolite Tonachino	101 / 116 / 213 / 169 / 147	149	A
	Quarzolite Base Coat + Quarzolite Tonachino PRO	191 / 141 / 127 / 118 / 141	144	A / C
	Quarzolite Base Coat + Quarzolite Tonachino PRO S	152 / 118 / 131 / 126 / 122	130	A / C
	Silancolor Base Coat + Silancolor Tonachino	180 / 161 / 166 / 124 / 141	154	A / C
	Silancolor Base Coat + Silancolor AC Tonachino Plus*	126 / 135 / 76 / 149 / 131	123	A / C
	Quarzolite Base Coat + Elastocolor Tonachino Plus*	102 / 55 / 141 / 101 / 86	97	A / C
	Malech + Elastocolor Tonachino Plus	82 / 99 / 114 / 98 / 131	105	A
	<i>After freeze-thaw test**</i>			
	Silancolor Base Coat + Silancolor Tonachino	158 / 185 / 208 / 172 / 206	186	A / C

* Cases tested on the wall after hygrothermal cycles.

** One rendering system exhibiting a water absorption greater than 0,5 kg/m² after 24 hours.

A: adhesive rupture.

B: cohesive rupture in adhesive.

C: cohesive rupture in insulation product.

Table 9: Bond strength after ageing test results.

3.5 Energy economy and heat retention (BWR 6)

EAD 040083-00-0404, clause 2.2.23.

The thermal resistance of the ETICS is calculated as follows (see table 10). For the insulation boards not included in the table, the calculations have to be done as are described in notes (1) and (2) of table 10 taking the thermal conductivity value of the DoP for calculations.

Insulation product	Thermal conductivity (W/m·K)	Thickness ⁽¹⁾ (mm)	Thermal resistance (m ² ·K/W) ⁽²⁾		
			R _{insulation}	R _{render}	R _{ETICS}
Mapetherm EPS G 100	0,030	40	1,33	0,02	1,35
Mapetherm EPS G 100 CAM		300	10,00		10,02
Mapetherm EPS G	0,031	40	1,29	0,02	1,31
Mapetherm EPS G CAM		300	9,68		9,70
Mapetherm EPS 100 CAM	0,035	40	1,14	0,02	1,16
		300	8,57		8,59

(1) Minimum and maximum thickness considered in the ETA.

(2) R_{insulation}: thermal resistance of the insulation panel (in accordance with the DoP of the insulation panels). See section 2.2.23.1 of EAD 040083-00-0404.

R_{render}: thermal resistance of the render (base coat + key coat + finishing coat).

R_{ETICS}: thermal resistance of the ETICS (R_{ETICS} = R_{insulation} + R_{render}).

Table 10: Thermal resistance of the ETICS.

The thermal transmittance of the substrate wall covered by the ETICS is calculated in accordance with the standard EN ISO 6946:

$$U_c = U + \chi_p \cdot n$$

Where: $\chi_p \cdot n$: has to be taken into account only if it is greater than 0,04 W/(m²·K).

U_c : global (corrected) thermal transmittance of the covered wall W/(m²·K).

n : number of anchors (through insulation product) per m².

χ_p : local influence of thermal bridge caused by anchor. The values listed below can be taken into account if not specified in the anchor's ETA:

= 0,002 W/K for anchors with a stainless steel screw covered by plastic material and for anchors with an air gap at the head of the screw ($\chi_p \cdot n$ negligible for $n < 20$).

= 0,004 W/K for anchors with a galvanized steel screw with the head covered by a plastic material ($\chi_p \cdot n$ negligible for $n < 10$).

= 0,008 W/K for all other anchors (worst case).

The influence of thermal bridges can also be calculated as described in EN ISO 10211.

U : thermal transmittance of the normal part of the covered wall (excluding thermal bridges) (W/(m²·K)) determined as follows:

$$U = \frac{1}{R_i + R_{\text{render}} + R_{\text{substrate}} + R_{\text{se}} + R_{\text{si}}}$$

Where:

- R_i : thermal resistance of the insulation product (according to declaration of performance) in (m²·K)/W.
- R_{render} : thermal resistance of the render (about 0,02 (m²·K)/W).
- $R_{\text{substrate}}$: thermal resistance of the substrate of the building (concrete, brick...) in (m²·K)/W.
- R_{se} : external surface thermal resistance in (m²·K)/W.
- R_{si} : internal surface thermal resistance in (m²·K)/W.

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

According to the decision 97/556/EC amended by Decision 2001/596/EC, as amended of the European Commission¹, the systems of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the table 11 applies.

Trade name of the system	Intended use(s)	Level(s) or class(es) (Reaction to fire)	AVCP system
Mapetherm EPS System	External thermal insulation composite system/kits (ETICS) with rendering in external walls subject to fire regulations.	A1 ⁽²⁾ , A2 ⁽²⁾ , B ⁽²⁾ , C ⁽²⁾ , D, E, F or A1 ⁽³⁾ to E ⁽³⁾	2+
	External thermal insulation composite system/kits (ETICS) with rendering in external walls not subject to fire regulations.	Any	2+

- (1) Products/material for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).
- (2) Products/materials not covered by note (1).
- (3) Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of classes A1 according to Commission Decision 96/603/EC).

Table 11: Applicable AVCP system.

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 ITeC², with which the factory production control shall be in accordance.

Products not manufactured by the kit manufacturer shall also be controlled according to the Control Plan.

¹ Official Journal of the European Union (OJEU) L229/15 of 20/08/1997.

Official Journal of the European Union (OJEU) L209/33 of 02/08/2011.

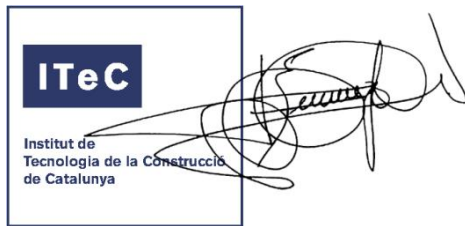
² The *Control Plan* is a confidential part of the ETA and is only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then they shall be subject to suitable checks/tests by the kit manufacturer before acceptance.

Any change in the manufacturing procedure which may affect the properties of the product shall be notified and the necessary type-testing revised according to the *Control Plan*.

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by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart
Technical Director, ITeC

ANNEX 1: Insulation product characteristics

Descriptions and characteristics	Performance
Trade name	Generic standard expanded polystyrene insulation board with TR100 with or without graphite (EPSG/EPS).
Description	Factory-prefabricated uncoated boards with straight edges for bonded ETICS, made of expanded polystyrene (EPS) with or without graphite according to EN 13163. The surface of the board is homogeneous and without "skin".
Length (mm) EN 822	$\pm 2 - L2$
Width (mm) EN 822)	$\pm 2 - W2$
Squareness (mm/m) EN 824	$\pm 2 - S2$
Flatness (mm) EN 825	$\pm 5 - P5$
Dimensional stability under laboratory conditions (%) EN 1603	$\pm 0,2 - DS(N)2$
Shear strength EN 12090 (N/mm ²)	$\geq 0,02$
Shear modulus EN 12090 (N/mm ²)	$\geq 1,0$
Characteristics declared in the insulation board DoP	
Thermal conductivity (W/m·K) EN 12667	According to Declaration of Performance
Thickness (mm) EN 823	$\pm 1 - T1$
Reaction to fire EN 13501-1	E
Tensile strength (kPa) EN 1607	$\geq 100 - TR100$
Long-term water absorption (partial immersion) EN 12087	$WL(P) \leq 0,5 \text{ kg/m}^2$
Water vapour diffusion resistance factor (μ) EN 12086	30 to 70

Table A1.1: Characteristics of EPS/EPSG insulation boards with TR100.

Descriptions and characteristics	Performance
Trade name	Generic standard expanded polystyrene insulation board with TR150 with or without graphite (EPSG/EPS).
Description	Factory-prefabricated uncoated boards with straight edges for bonded ETICS, made of expanded polystyrene (EPS) with or without graphite according to EN 13163. The surface of the board is homogeneous and without "skin".
Length (mm) EN 822	$\pm 2 - L2$
Width (mm) EN 822)	$\pm 2 - W2$
Squareness (mm/m) EN 824	$\pm 2 - S2$
Flatness (mm) EN 825	$\pm 5 - P5$
Dimensional stability under laboratory conditions (%) EN 1603	$\pm 0,2 - DS(N)2$
Shear strength EN 12090 (N/mm ²)	$\geq 0,02$
Shear modulus EN 12090 (N/mm ²)	$\geq 1,0$
Characteristics declared in the insulation board DoP	
Thermal conductivity (W/m·K) EN 12667	According to Declaration of Performance
Thickness (mm) EN 823	$\pm 1 - T1$
Reaction to fire EN 13501-1	E
Tensile strength (kPa) EN 1607	$\geq 150 - TR150$
Long-term water absorption (partial immersion) EN 12087	$WL(P) \leq 0,5 \text{ kg/m}^2$
Water vapour diffusion resistance factor (μ) EN 12086	30 to 70

Table A1.2: Characteristics of EPS/EPSG insulation boards with TR150.

Descriptions and characteristics	Performance
Trade name	Mapetherm EPS 100 CAM
Description	Factory-prefabricated uncoated boards with straight edges for bonded ETICS, made of expanded polystyrene (EPS) according to EN 13163. The surface of the board is homogeneous and without "skin".
Length (mm) EN 822	$\pm 2 - L2$
Width (mm) EN 822)	$\pm 2 - W2$
Squareness (mm/m) EN 824	$\pm 2 - S2$
Flatness (mm) EN 825	$\pm 5 - P5$
Dimensional stability under laboratory conditions (%) EN 1603	$\pm 0,2 - DS(N)2$
Shear strength EN 12090 (N/mm ²)	$\geq 0,02$
Shear modulus EN 12090 (N/mm ²)	$\geq 1,0$
Characteristics declared in the insulation board DoP	
Thermal conductivity (W/m·K) EN 12667	0,035
Thickness (mm) EN 823	$\pm 1 - T1$
Reaction to fire EN 13501-1	E
Compression strength (kPa) EN 826	$\geq 100 - CS(10)100$
Tensile strength (kPa) EN 1607	$\geq 150 - TR150$
Long-term water absorption (partial immersion) EN 12087	$WL(P) \leq 0,5 \text{ kg/m}^2$
Water vapour diffusion resistance factor (μ) EN 12086	30 to 70

Table A1.3: Characteristics of Mapetherm EPS 100 CAM.

Descriptions and characteristics	Performance
Trade name	Mapetherm EPS G Mapetherm EPS G CAM
Description	Factory-prefabricated uncoated boards with straight edges for bonded ETICS, made of expanded polystyrene with graphite (EPSG) according to EN 13163. The surface of the board is homogeneous and without "skin".
Length (mm) EN 822	$\pm 2 - L2$
Width (mm) EN 822)	$\pm 2 - W2$
Squareness (mm/m) EN 824	$\pm 2 - S2$
Flatness (mm) EN 825	$\pm 5 - P5$
Dimensional stability under laboratory conditions (%) EN 1603	$\pm 0,2 - DS(N)2$
Shear strength EN 12090 (N/mm ²)	$\geq 0,02$
Shear modulus EN 12090 (N/mm ²)	$\geq 1,0$
Characteristics declared in the insulation board DoP	
Thermal conductivity (W/m·K) EN 12667	0,031
Thickness (mm) EN 823	$\pm 1 - T1$
Reaction to fire EN 13501-1	E
Tensile strength (kPa) EN 1607	$\geq 100 - TR100$
Long-term water absorption (partial immersion) EN 12087	$WL(P) \leq 0,5 \text{ kg/m}^2$
Water vapour diffusion resistance factor (μ) EN 12086	30 to 70

Table A1.4: Characteristics of Mapetherm EPS G / Mapetherm EPS G CAM.

Descriptions and characteristics	Performance
Trade name	Mapetherm EPS G 100 Mapetherm EPS G 100 CAM
Description	Factory-prefabricated uncoated boards with straight edges for bonded ETICS, made of expanded polystyrene with graphite (EPSG) according to EN 13163. The surface of the board is homogeneous and without "skin".
Length (mm) EN 822	$\pm 2 - L2$
Width (mm) EN 822	$\pm 2 - W2$
Squareness (mm/m) EN 824	$\pm 2 - S2$
Flatness (mm) EN 825	$\pm 5 - P5$
Dimensional stability under laboratory conditions (%) EN 1603	$\pm 0,2 - DS(N)2$
Shear strength EN 12090 (N/mm ²)	$\geq 0,02$
Shear modulus EN 12090 (N/mm ²)	$\geq 1,0$
Characteristics declared in the insulation board DoP	
Thermal conductivity (W/m·K) EN 12667	0,030
Thickness (mm) EN 823	$\pm 1 - T1$
Reaction to fire EN 13501-1	E
Tensile strength (kPa) EN 1607	$\geq 150 - TR150$
Compression strength (kPa) EN 826	$\geq 100 - CS(10)100$
Long-term water absorption (partial immersion) EN 12087	$WL(P) \leq 0,5 \text{ kg/m}^2$
Water vapour diffusion resistance factor (μ) EN 12086	30 to 70

Table A1.5: Characteristics of Mapetherm EPS G 100 / Mapetherm EPS G 100 CAM.

ANNEX 2: Anchors characteristics

Anchors with an ETA according to EAD 330196-01-0604 (or according to ETAG 014 used as EAD).

The anchors are composed of a plastic expansion sleeve with a plate with a diameter of 60 mm, and a plastic or metallic nail or screw.

Use categories and characteristic resistances in the substrate are given in each anchor's ETA.

Other characteristics:

- Mounting: surface assembly.
- Plate stiffness: $\geq 0,5$ kN/mm.

ANNEX 3: Glass fibre mesh characteristics

Trade name: Mapetherm Net.

Mesh size: 4,3 mm $\pm$ 0,5 mm (warp) x 3,6 mm $\pm$ 0,5 mm (weft).

Weight per unit area: 150 g/m² ($\pm$ 5 %).

	Mapetherm Net		Required value
	Warp	Weft	
Tensile strength in the as-delivered state (mean value)	≥ 40 N/mm	≥ 38 N/mm	--
Tensile strength after artificial ageing (mean value)	≥ 20 N/mm	≥ 20 N/mm	≥ 20 N/mm
Residual strength after artificial ageing	50 %	53 %	$\geq 50\%$
Elongation after artificial ageing (mean value)	$\leq 3,0$ %	$\leq 3,0$ %	--

Table A3.1: Mechanical characteristics of the glass fibre mesh **Mapetherm Net** and required values stated in the EAD 040083-00-0404.

Trade name: Mapetherm Net R131

Mesh size: 4,0 mm (warp) x 4,6 mm (weft).

Weight per unit area: 167 g/m².

	Mapetherm Net R131		Required value
	Warp	Weft	
Tensile strength in the as-delivered state (mean value)	≥ 48 N/mm	≥ 50 N/mm	--
Tensile strength after artificial ageing (mean value)	≥ 33 N/mm	≥ 38 N/mm	≥ 20 N/mm
Residual strength after artificial ageing	69 %	76 %	$\geq 50\%$
Elongation after artificial ageing (mean value)	$\leq 3,0$ %	$\leq 3,0$ %	--

Table A3.2: Mechanical characteristics of the glass fibre mesh **Mapetherm Net R131** and required values stated in the EAD 040083-00-0404.