Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-09/0058 of 18 April 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	StoTherm Classic 5
Product family to which the construction product belongs	External Thermal Insulation Composite System with rendering on expanded polystrene intended for use on building walls
Manufacturer	Sto SE & Co. KGaA Ehrenbachstraße 1 79780 Stühlingen DEUTSCHLAND
Manufacturing plant	Sto SE & Co. KGaA Ehrenbachstraße 1 79780 Stühlingen DEUTSCHLAND
This European Technical Assessment contains	29 pages including 5 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 040083-00-0404
This version replaces	ETA-09/0058 issued on 14 June 2018

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Specific Part

1 Technical description of the product

This product is an ETICS (External Thermal Insulation Composite System) with rendering - a kit comprising components which are factory-produced by the manufacturer or component suppliers. It's made up on site from these. The ETICS manufacturer is ultimately responsible for the ETICS.

The ETICS kit comprises a prefabricated insulation product of mineral wool (MW) to be bonded and if necessary additional mechanically fixed onto a wall. 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 one base and finishing coat (site applied), the base coat contains reinforcement. The rendering system is applied directly to the insulating panels, without any air gap or disconnecting layer.

The ETICS may include special fittings (e.g. base profiles, corner profiles ...) for connection to adjacent building elements (apertures, corners, parapets...). 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.

2 Specification of the intended use in accordance with the applicable European assessment Document

The performances in Section 3 can only be assumed if the ETICS is used in accordance with the specifications and under the boundary conditions specified in Annexes 2 to 5.

The verifications and assessment methods on which this ETA is based lead to the assumption of a working life of the ETICS " StoTherm Classic 5" of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the assumed economically reasonable working life of the works.

For use, maintenance and repair, the finishing coat shall normally be maintained in order to fully preserve the ETICS performance. Maintenance includes at least:

- visual inspection of the ETICS,
- the repairing of localized damaged areas due to accidents,
- the aspect maintenance with products compatible with the ETICS (possibly after washing or ad hoc preparation).

Necessary repairs are to be carried out as soon as the need has been identified.
The information on use, maintenance and repair is given in the manufacturer’s technical documentation.
It is the responsibility of the manufacturer to ensure that this information is made known to the concerned people.

3 Characteristics of products and methods of verification

3.1 Safety in case of fire (BWR 2)

Essential characteristic	**Performance**
Reaction to fire of the ETICS	(see annex 2) Euroclass according to EN 13501-1
Reaction to fire of the EPS-insulation product	(see annex 2) Euroclass E according EN 13501-1
Reaction to fire of foam adhesive	(see annex 2) Euroclass E according EN 13501-1
Apparent density EN 1602 of the EPS-insulation product according to EN 1602	$\rho_a \leq 30$ [kg/m³]

3.2 Hygiene, health and environment (BWR 3)

Essential characteristic	**Performance**	
Release of dangerous substances	no performance assessed	
Water absorption Base coat after 1 hour after 24 hours **Rendering system** after 1 hour after 24 hours MW insulation product after 24 hours	(see annex 3.1) Average [kg/m²] Average [kg/m²] Average [kg/m²] Average [kg/m²] Maximum value ≤ 0.5 [kg/m²]	
Water-tightness of the ETICS Hygrothermal behaviour on the test wall	Pass without defects	
Freeze/thaw behaviour	The water absorption of the base coat as well as the rendering systems is less than 0.5 kg/m² for all configurations of the ETICS. The ETICS is so assessed as free/thaw resistant.	
Impact resistance	(see annex 3.2) Category	
Water vapour permeability - Rendering system	(see annex 3.3) s_d value [m]	
- EPS insulation product	μ = 60	Thickness of the insulation product 400 [mm]

3.3 Safety and accessibility in use (BWR 4)

Essential characteristic	**Performance**
Bond strength between base coat and EPS-insulation product	(see annex 4.1) - Minimal value/ average [kPa], rupture type: Initial state (28 d immersion) - Minimal value/ average [kPa], rupture type: after hygrothermal cycles

Essential characteristic	**Performance**
between adhesive and substrate	(see annex 4.2) - Thickness [mm] of the used adhesives - Minimal value [kPa], rupture type: Initial state (dry conditions) - Minimal value/ average [kPa], rupture type: after 2 d immersion in water, 2 h drying - Minimal value/ average [kPa], rupture type: after 2 d immersion in water, 7 d drying
between adhesive and EPS insulation	(see annex 4.3) - Thickness [mm] of the used adhesives - Minimal value [kPa], rupture type: Initial state (dry conditions) - Minimal value/ average [kPa], rupture type: after 2 d immersion in water, 2 h drying - Minimal value/ average [kPa], rupture type after 2 d immersion in water, 7 d drying
of foam adhesive	(see annex 4.4) - Minimal value/ average [kPa]
Minimal bonded surface area	S [%] = 0.03 N/ mm² x 100 / 0.74 N/ mm² S = 40.5 % The minimal bonded surface S of bonded ETICS is 40 %
Fixing strength (displacement test)	Test not required therefore no limitation of ETICS length required.
Wind load resistance of ETICS pull-through test of fixing static foam block test	(see annex 4.5) - R_{panel} [kN/fixing], - R_{joint} [kN/fixing], - Plate diameter of anchor ≥ 60 mm, ≥ 90 res. ≥140 mm - plate stiffness ≥ 0.3 [kN/mm²] - load resistance of the anchor plate ≥ 1.0 [kN]
Tensile strength perpendicular to the faces in dry conditions standard EPS elastified EPS	 $\sigma_{mt} \geq 80$ [kPa] (bonded ETICS) $\sigma_{mt} \geq 100$ [kPa] (bonded ETICS with anchors) $\sigma_{mt} \geq 80$ [kPa]
Shear strength of the ETICS	$20 \leq f_{\tau k} \leq 170$ [kPa]
Shear modulus of the ETICS standard EPS elastified EPS	 $1,0 \leq G_m \leq 3,8$ [MPa] $0,3 \leq G_m \leq 1,0$ [MPa]
Render strip tensile test	crack width w_{rk} [mm] (no performance assessed)
Shear strength of foam adhesive	$f_{\tau k}$ = 75,8 [kPa] minimal value $f_{\tau k}$ = 81,0 [kPa] average

Essential characteristic	Performance
Shear modulus of foam adhesive	G_m = 0,91 [MPa] minimal value $G_m \leq$ 0,96 [MPa] average
Post expansion behavior of foam adhesive	max. 11 [mm]
Bond strength after ageing finishing coat tested on the rig finishing coat not tested on the rig	(see annex 4.6) Minimal value/ average[kPa], rupture type Minimal value/ average [kPa], rupture type
Tensile strength of the glass fibre mesh in the as-delivered state Standard mesh Reinforced mesh	(see annex 4.7) Average [N/mm] Average [N/mm]
Residual tensile strength of the glass fibre mesh after aging Standard mesh Reinforced mesh	(see annex 4.7) Average [N/mm] Average [N/mm]
Relative residual tensile strength of the glass fibre mesh after aging Standard mesh Reinforced mesh	(see annex 4.7) Average [%] Average [%]
Elongation of the glass fibre mesh in the as-delivered state Standard mesh Reinforced mesh	(see annex 4.7) Average [N/mm] Average [N/mm]
Elongation of the glass fibre mesh after aging Standard mesh Reinforced mesh	(see annex 4.7) Average [%] Average [%]

3.4 Protection against noise (BWR 5)

Essential characteristic	Performance
Airborne sound insulation of ETICS	no performance assessed
Dynamic stiffness of the EPS insulation product	no performance assessed
Air flow resistance of the EPS insulation product	no performance assessed

3.5 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal resistance and thermal transmittance of ETICS	Calculated value or measurement value $(m^2 \cdot K)/W$, see annex 5.

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

According to the European Commission decision 97/556/EC amended by the European Commission decision 2001/596/EC, the assessment and verification of constancy of performance system (AVCP) applies suitable following table (see Annex V to Regulation (EU) No 305/2011).

In accordance with EAD No. 010083-00-0404 the applicable European legal act is: [97/556/EC changed by 2001/596/EC

The systems to be applied are:

Product	Intended use	Levels or classes (Reaction to fire)	Systems
"StoTherm Classic 5"	ETICS in external wall subject to fire regulations	A1 (1), A2 (1), B (1), C (1)	1
		A1 (2), A2 (2), B (2), C (2), D, E, (A1 to E) (3), F	2+
	ETICS in external wall not subject to fire regulations	any	2+

(1) Products/materials 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 footnote (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)

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 18 April 2021 by Deutsches Institut für Bautechnik

Anja Rogsch
Head of Section

beglaubigt:
Windhorst

Annex 1
Composition of the ETICS

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Insulation material with associated method of fixing	**Bonded ETICS:**		
	• **Insulation product** factory-prefabricated expanded polystyrene (EPS)****		
	- standard-EPS	–	≤ 400
	- elastified EPS	–	≤ 200
	• **Adhesives**		
	- **Sto-Baukleber** (cement based powder requiring addition of 21 - 23 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Duo plus (**cement based powder requiring addition of about 25 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Uni** (cement based powder requiring addition of 24 - 26 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell FT** (cement based powder requiring addition of about 28 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Duo** (cement based powder requiring addition of 20 - 23 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Duo plus QS (**cement based powder requiring addition of about 22 – 25 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Alpha** (cement based powder requiring addition of 25 - 28 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Novo (**cement based powder requiring addition of about 37 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell SW plus (**cement based powder requiring addition of 21 - 23 % of water)	3.0 to 7.5 (powder)	–
	- **StoColl Mineral HP** (cement based powder requiring addition of 23 – 25 % of water)	3.0 to 7.5 (powder)	–
	- **StoColl IP (**cement based powder requiring addition of about 20 % of water)	4.0 to 5.0 (powder)	–
	- **Sto-Dispersionskleber** (organic based ready to use paste)	1.0 to 1.5 (prepared)	–
	- **StoPrefa Coll** (organic based ready to use paste)	0.8 to 1.5 (prepared)	–
	- **StoPrefa Coll 500** (organic based ready to use paste)	about 1.3 (prepared)	–

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Insulation material with associated method of fixing	• **Foam adhesive** - **Sto – Turbofix Mini** (foam adhesive on polyurethane, ready to use, in bottles supplied)	0,20 l/m²	–
	Mechanically fixed ETICS with anchors and supplementary adhesive: • **Insulation product** Werkmäßig vorgefertigtes expandiertes Polystyrol (EPS)**** - standard-EPS - elastified EPS • **Supplementary adhesives** (equal to bonded ETICS) • **Anchors for insulation product** all anchors with ETA according to EAD 330196-01-0604[1]	 – – 	 60 to 400 60 to 200
Base coat	**StoArmat Classic plus** Ready to use paste on an organic basis: styrene-acrylic copolymer binder **StoArmat Classic plus QS** Ready to use paste on an organic basis: styrene-acrylic copolymer binder (application between 0 °C and 15 °C) **StoArmat Classic plus F/M/G** Ready to use paste on an organic basis: pure acrylic binder **StoArmat Classic plus QS F/M/G** Ready to use paste on an organic basis: pure acrylic binder (application between 0 °C and 15 °C)	3.5 to 9.5 3.5 to 9.5 3.5 to 9.5 3.5 to 9.5	2.0 to 5.0* 2.0 to 5.0* 2.0 to 5.0* 2.0 to 5.0*
Glass fibre mesh	**Sto-Glasfasergewebe** Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 165 g/m² and mesh size of about 6.0 mm x 6.0 mm **Sto-Glasfasergewebe F** Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 165 g/m² and mesh size of about 4.0 mm x 4.0 mm **Sto-Panzergewebe** (reinforced mesh implemented in addition to the mesh described above to improve the impact resistance) Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 450 g/m² and mesh size of about 7.5 mm x 7.5 mm	– – –	– – –

[1] EAD 330196-01-0604 Plastic anchors for fixing of external thermal insulation composite systems with rendering

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Glass fibre mesh	**Sto-Abschirmgewebe AES** (Special mesh including a thin stainless yarn to reduce radiation of electric fields) Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 165 g/m² and mesh size of about 4.0 mm x 4.0 mm.	–	–
Key coat	**Sto-Putzgrund** Ready to use pigmented acrylic- resin dispersion liquids	0.3 to 0.4 l/m²	–
	Sto-Putzgrund QS Ready to use pigmented acrylic- resin dispersion liquids For the compatibility with the finishing coats see below	0.3 to 0.4 l/m²	–
Finishing coat	**To use with key coat "Sto-Putzgrund" or "Sto Putzgrund QS", if applicable****		
	• Ready to use paste - acrylic binder:		
	Stolit K (particle size 1.5 to 6.0 mm)	2.2 to 6.5	regulated by particle size*
	Stolit R (particle size 1.5 to 6.0 mm)	2.2 to 6.5	
	Stolit Effect (particle size 3.0 mm)	4.5 to 5.5	
	Stolit MP (thin, middle or thick layer)	2.2 to 4.7	1.5* to 3.5
	Stolit Milano	2.0 to 4.0	1.0* to 2.0
	Stolit K (particle size 1.5 mm) + **Stolit Milano**	4.7 to 5.6	2.0 to 3.0
	Sto-Ispolit K*** (particle size 1.5 – 2.5 and 3.5 mm)	2.3 to 4.3	regulated by particle size*
	Sto-Ispolit R*** (particle size 1.5 and 3.5 mm)	2.3 to 4.3	
	Sto-Ispolit MP*** (thin, middle or thick layer)	2.3 to 4.3	1.5* to 3.5
	StoSuperlit*** (particle size 2.0 mm)	4,5 bis 6,0	regulated by particle size
	StoLotusan K (particle size 1.5 and 3.0 mm)	2.2 to 4,3	
	StoLotusan MP* (thin, middle or thick layer)	2.2 to 4,3	1.5* to 3.5
	• Ready to use paste – acrylic binder – associated with a decorative paint:		
	StoNivellit + **StoColor Silco**	3.0 to 3.5 0.2 to 0.4 l/m²	1.0* to 1.5
	• Ready to use paste – acrylic binder – associated with synthetic briquettes:		
	Sto-Flachverblender or Sto-Ecoshapes embedded in Sto-Klebe und Fugenmörtel***	5.0 to 9.0	4.7 to 7.0

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Finishing coat	• Ready to use pastes – acrylic/siloxane binder:		
	Sto-Silkolit K*** (particle size 1.5 to 3.0 mm)	2.3 to 4.3	regulated by particle size*
	Sto-Silkolit R*** (particle size 1.5 to 3.0 mm)	2.3 to 4.3	regulated by particle size*
	Sto-Silkolit MP*** (thin, middle or thick layer)	2.3 to 4.3	1.5* to 3.5
	StoSilco K (particle size 1.5 to 3.0 mm)	2.2 to 4.3	regulated by particle size*
	StoSilco R (particle size 1.5 to 3.0 mm)	2.2 to 4.3	
	StoSilco MP (thin, middle or thick layer)	2.2 to 4.3	1.5* to 3.5
	StoSilco blue MP (thin, middle or thick layer)	2.2 to 4.0	1.5* to 3.5
	StoSilco blue K (particle size 1.5 to 3.0 mm)	2.2 to 4.7	regulated by particle size*
	• Ready to use pastes – acrylic binder (application between 0 °C and 15 °C):		
	Stolit QS K (particle size 1.5 to 3.0 mm)	2.2 to 4.3	regulated by particle size*
	Stolit QS R (particle size 1.5 to 3.0 mm)	2.2 to 4.3	
	Stolit QS MP (thin, middle or thick layer)	2.2 to 4.3	1.5* to 3.5
	• Gebrauchsfertige Pasten – Acrylsiloxan-Bindemittel (Verarbeitungstemperatur zwischen 0 °C und 15 °C):		
	StoSilco QS K (particle size 1.5 to 3.0 mm)	2.2 to 4.3	regulated by particle size*
	StoSilco QS R (particle size 1.5 to 3.0 mm)	2.2 to 4.3	
	StoSilco QS MP (thin, middle or thick layer)	2.2 to 4.3	1.5* to 3.5

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Decorative paint (optional)	• Ready to use paint with acrylic/siloxane binder: **StoColor Silco** **StoColor Silco G** **StoColor Lotusan** **StoColor Lotusan G** **StoColor Jumbosil** **StoColor Maxicryl** **StoColor Crylan** **StoColor X-black** **StoColor Silco Variant** **StoColor Silco Variant G** **StoColor Solical** **StoColor Solical G** **StoColor Silcocryl**	[l/ m²] 0,20 bis 0,40	
Zubehör	Die Verantwortung obliegt dem Hersteller.		

* The minimum thickness of the rendering system (base coat and finishing coat) is 4.0 mm.
** The instruction to the installer concerning the use of a key coat remains the responsibility of the manufacturer.
*** Only to use with base coats "StoArmat Classic plus" or "StoArmat Classic plus F/M/G".
**** Factory-prefabricated, uncoated panels made of expanded polystyrene (EPS) to EN 13163: 2015 shall be used.

Annex 2

Safety in case of fire (BWR 2)

Reaction to fire

Table 2.1

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
Foam adhesive	> 95.0 %	no flame retardant	B - s2,d0
Base coats: StoArmat Classic plus, StoArmat Classic plus F/M/G, StoArmat Classic plus QS F/M/G	max. 7.5 %	min. 10.0 %	
EPS Dämmstoff (Apparent density ≤ 17 kg/m³)	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Anchors	-	-	
All mentioned above base coats with finishing coat and compatible key coat indicated in annex 1			
Stolit K/R/Effect/MP Stolit Milano Stolit K 1.5+ Stolit Milano StoLotusan K/MP StoNivellit + StoColor Silco StoSilco K/R/MP StoSilco blue K/MP Stolit QS K/R/MP StoSilco QS K/R/MP	max. 9.6 %	min. 7.6 %	
Sto-Ispolit K/R/MP Sto-Silkolit K/R/MP	max. 9.3 %	no flame retardant	
StoSuperlit	-	-	(no performance assessed)

Table 2.2

Configurations	**Organic content**	**Flame retardant content**	**Euroclass according to EN 13501-1**
base coats: StoArmat Classic plus StoArmat Classic plus F/M/G StoArmat Classic plus QS F/M/G	max. 7.5 %	min. 10.0 %	B - s2,d0
EPS Dämmstoff (Apparent density ≤ 17 kg/m³)	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Anchors	-	-	
All mentioned above base coats with finishing coat and compatible key coat indicated in annex 1			
Stolit K/R/Effect/MP Stolit Milano Stolit K 1.5+ Stolit Milano StoLotusan K/MP StoNivellit + StoColor Silco StoSilco K/R/MP StoSilco blue K/MP Stolit QS K/R/MP StoSilco QS K/R/MP	max. 9.6 %	min. 7.6 %	
Sto-Ispolit K/R/MP Sto-Silkolit K/R/MP	max. 9.3 %	no flame retardant	
Sto-Klebe- und Fugenmörtel +Sto-Flachverblender oder Sto-Ecoshapes	max 8.0 % max 7.9 %	min. 15.0 % min. 20.0 %	
StoSuperlit	-	-	(no performance assessed)

Table 2.3

Configurations	**Organic content**	**Flame retardant content**	**Euroclass according to EN 13501-1**
Base coat: "StoArmat Classic plus QS"	max. 9.9 %	min. 10.0 %	C - s2,d0
EPS- Dämmstoff	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Anchors	-	-	
Rendering system: base coats "StoArmat Classic plus QS" with finishing coat and compatible key coat indicated in annex 1			
Stolit K/R/Effect/MP Stolit Milano Stolit K 1.5+ Stolit Milano StoLotusan K/MP StoNivellit + StoColor Silco StoSilco K/R/MP StoSilco blue K/MP Stolit QS K/R/MP StoSilco QS K/R/MP	max. 9.6 %	min. 7.6°%	

Annex 3

Hygiene, health and environment (BWR 3)

3.1 Water absorption (capillarity test)

Base coat

Base coat	Average water absorption [kg/m²]	
	after 1h	after 24h
StoArmat Classic plus	0.05	0.13
StoArmat Classic plus QS	0.05	0.18
StoArmat Classic plus F/M/G	0.06	0.20
StoArmat Classic plus QS F/M/G	0.07	0.18

3.2 Rendering system

Finishing coat with base coat "Sto Armat Classic plus" indicated hereafter	Average water absorption [kg/m²]	
	after 1h	after 1h
Stolit K/R/Effect/MP	0.030	0.143
Stolit Milano	0.027	0.113
Stolit K1.5 + Stolit Milano	0.014	0.114
Sto-Ispolit K/R/MP	0.036	0.175
StoSuperlit	0.038	0.260
StoLotusan K/MP	0.021	0.122
StoNivellit + StoSilco Color	0.030	0.204
Sto-Klebe- und Fugenmörtel + Sto-Flachverblender oder Sto-EcoShapes	0.031	0.190
Sto-Silkolit K/R/M	0.068	0.221
StoSilco K/R/MP	0.015	0.128
StoSilco blue K/MP	0.040	0.420
Stolit QS K/R/MP	0.021	0.206
StoSilco QS K/R/MP	0.160	0.123

Finishing coat with base coat "StoArmat Classic plus F/M/G" indicated hereafter	**Average water absorption [kg/m²]**	
	after 1h	**after 1h**
Stolit K/R/Effect/MP	0.040	0.233
Stolit Milano	0.037	0.183
Stolit K1.5 + Stolit Milano	0.024	0.184
Sto-Ispolit K/R/MP	0.046	0.245
StoSuperlit	0.048	0.260
StoLotusan K/MP	0.031	0.192
StoNivellit + StoSilco Color	0.040	0.274
Sto-Klebe- und Fugenmörtel + Sto-Flachverblender oder Sto-EcoShapes	0.041	0.260
Sto-Silkolit K/R/MP	0.078	0.291
StoSilco K/R/MP	0.025	0.198
StoSilco blue K/MP	0.050	0.490
Stolit QS K/R/MP	0.031	0.276
StoSilco QS K/R/MP	0.170	0.193

Finishing coat with base coat "Sto Armat Classic plus QS" indicated hereafter	**Average water absorption [kg/m²]**	
	after 1h	**after 1h**
Stolit K/R/Effect/MP	0.037	0.143
Stolit Milano	0.024	0.123
Stolit K1.5 + Stolit Milano	0.081	0.180
StoLotusan K/MP	0.049	0.172
StoNivellit + StoSilco Color	0.069	0.374
StoSilco K/R/MP	0.027	0.420
StoSilco blue K/MP	0.040	0.410
Stolit QS K/R/MP	0.026	0.291
StoSilco QS K/R/MP	0.028	0.322

Finishing coat with base coat "StoArmat Classic plus QS F/M/G" indicated hereafter	**Average water absorption [kg/m²]**	
	after 1h	**after 1h**
Stolit K/R/Effect/MP	0.057	0.143
Stolit Milano	0.044	0.123
Stolit K1.5 + Stolit Milano	0.101	0.180
StoLotusan K/MP	0.069	0.172
StoNivellit + StoSilco Color	0.089	0.374
StoSilco K/R/MP	0.047	0.420
StoSilco blue K/MP	0.060	0.410
Stolit QS K/R/MP	0.046	0.291
StoSilco QS K/R/MP	0.048	0.322

3.3 Impact resistance t

Standard mesh: "Sto-Glasfasergewebe" oder Sto-Glasfasergewebe F"

Rendering system: Both base coats with finishing coat indicated hereafter:	Single standard mesh with		"Sto-Abschirm-gewebe AES" with "StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	Double mesh: Sto-Glasfasergewebe with		Standard-mesh with Sto-Panzer-gewebe and all base coats
	"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"		"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"	
	Category					
Stolit K/R/Effect/MP	II	II	II	I	I	I
Stolit Milano	II	II	II	II	I	I
Stolit K1.5 + Stolit Milano	II	II	II	I	I	I
Sto-Ispolit K/R/MP*	II	-	npa**	II	-	I
StoSuperlit*	I	-	II	I	-	I
StoLotusan K/MP	I	-	I	I	-	I
StoNivellit mit StoColor Silco	III	II	III	II	I	I
Sto-Klebe- und Fugenmörtel mit Sto-Flachverblender oder Sto-EcoShapes*	I	-	I	I	-	I
Sto-Silkolit K/R/MP*	II	-	npa**	II	-	I

Rendering system: Both base coats with finishing coat indicated hereafter:	Single standard mesh with		"Sto-Abschirm-gewebe AES" with "StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	Double mesh: Sto-Glasfasergewebe with		Standard-mesh with Sto-Panzer-gewebe and all base coats
	"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"		"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"	
StoSilco K/R/MP	II	II	II	I	I	I
StoSilco blue K/MP	II	I	npa**	npa**	npa**	npa**
Stolit QS K/R/MP	II	II	II	I	I	I
StoSilco QS K/R/MP	II	II	II	I	I	I

* only to use with base coat "StoArmat Classic plus" or "StoArmat Classic plus F/M/G"

** npa- no performance assessed

3.4 Water vapour permeability ETICS

Rendering system: Base coat with finishing coat indicated hereafter:	Equivalent air thickness s_d	
	"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"
Stolit K/R/ Effect/MP	≤ 1.5 m (Test result obtained with Stolit K2: 1.0 m)	≤ 1.0 m (Test result obtained with Stolit K2: 0.85 m)
Stolit Milano	≤ 1.5 m (Test result obtained with d = 1 mm: 1.1 m)	≤ 1.0 m (Test result obtained with d = 1 mm: 0.95 m)
Stolit K1.5 + Stolit Milano	≤ 2.0 m (Test result obtained with d = 2.5 mm: 1.4 m)	≤ 2.0 m (Test result obtained with d = 2.5 mm: 1.3 m)
Sto-Ispolit K/R/MP*	≤ 1.0 m (Test result obtained with d = 2.5 mm: 0.41 m)	-
StoSuperlit *	≤ 1.0 m (Test result obtained with "Farbsand" (special colour coated grain) K2: 1.0 m) (Test result obtained with "Silmer" (natural coloured grain) K2: 0.9 m)	-
StoLotusan K/MP	≤ 1.0 m (Test result obtained with StoLotusan K2: 0.8 m)	≤ 1.0 m (Test result obtained with StoLotusan K2: 0.7 m)
StoNivellit + StoColor Silco	≤ 1.0 m (Test result: 0.9 m)	≤ 1.0 m (Test result: 0.75 m)
Sto-Klebe- und Fugenmörtel mit Sto-Flachverblender* or Sto-EcoShapes*	≤ 1.0 m (Test result obtained with size III: 0.8 m)	-

Rendering system: Base coat with finishing coat indicated hereafter:	Equivalent air thickness s_d	
	"StoArmat Classic plus" or "StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS" or "StoArmat Classic plus QS F/M/G"
Sto-Silkolit K/R/MP*	≤ 1.0 m (Test result obtained with d = 2.5 mm: 0.21 m)	-
StoSilco K/R/MP	≤ 1.0 m (Test result obtained with StoSilco K2: 0.9 m)	≤ 1.0 m (Test result obtained with StoSilco K2: 0.75 m)
StoSilco blue	≤ 2.0 m (Test result obtained with StoSilco blue K2: 1,32 m)	≤ 2.0 m (Test result obtained with StoSilco blue K2: 1,67 m)
Stolit QS K/R/MP	≤ 1.0 m (Test result obtained with Stolit QS K2: 0.9 m)	≤ 1.0 m (Test result obtained with Stolit QS K2: 0.75 m)
StoSilco QS K/R/MP	≤ 1.0 m (Test result obtained with StoSilco QS K2: 0.9 m)	≤ 1.0 m (Test result obtained with StoSilco QS K2: 0.75 m)
* applicable with the base coat "StoArmat Classic plus" or "StoArmat Classic plus F/M/G" only		

Annex 4

Safety and accessibility in use (BWR 4)

4.1 Bond strength between base coat and EPS

		Conditioning		
		Initial state [kPa]	**After hygrothermal cycles [kPa]**	**After freeze/thaw test**
StoArmat Classic plus	Average	125	124	Test not required because freeze/thaw cycles not necessary
	Minimal value	110	115	
StoArmat Classic plus QS	Average	83	130	
	Minimal value	73	111	
StoArmat Classic plus F/M/G	Average	125	103	
	Minimal value	119	90	
StoArmat Classic plus QS F/M/G	Average	131	121	
	Minimal value	116	99	

4.2 Bond strength between adhesive and substrate

Substrate: concrete		**Conditioning**		
		Initial state [kPa]	**48 hrs. immersion in water and 2 hrs. drying [kPa]**	**48 hrs. immersion in water and 7 days drying [kPa]**
Sto-Baukleber	Average	1930	770	1890
	Minimal value	1770	631	1793
StoLevell Duo plus	Average	1522	746	1146
	Minimal value	1035	545	1056
StoLevell Uni	Average	1700	445	1250
	Minimal value	1581	412	1019
StoLevell FT	Average	855	390	710
	Minimal value	726	363	650
StoLevell Duo	Average	1925	720	1360
	Minimal value	1356	607	1268
StoLevell Duo plus QS	Average	1264	523	2001
	Minimal value	961	341	1691
StoLevell Alpha	Average	1770	1135	2285
	Minimal value	1612	869	2016
StoLevell Novo	Average	515	350	490
	Minimal value	413	319	401

Substrate: concrete		**Conditioning**		
		Initial state [kPa]	**48 hrs. immersion in water and 2 hrs. drying [kPa]**	**48 hrs. immersion in water and 7 days drying [kPa]**
StoLevell SW plus	Average	131	141	211
	Minimal value	78	119	177
Sto Mineral HP	Average	2080	184	1790
	Minimal value	1927	173	1732
StoColl IP	Average	1565	975	1830
	Minimal value	1407	577	1738
Sto-Dispersionskleber	Average	1525	1480	1043
	Minimal value	1364	1349	870
StoPrefa Coll	Average	690	250	430
	Minimal value	542	209	327
StoPrefa Coll 500	Average	1185	975	1130
	Minimal value	909	833	1008

4.3 Bond strength between adhesive and EPS

		Conditioning		
		Initial state [kPa]	**48 hrs. immersion in water and 2 hrs. drying [kPa]**	**48 hrs. immersion in water and 7 days drying [kPa]**
Sto-Baukleber	Average	110	90	145
	Minimal value	86	60	105
StoLevell Duo plus	Average	116	77	152
	Minimal value	93	66	144
StoLevell Uni	Average	145	65	145
	Minimal value	110	55	115
StoLevell FT	Average	112	53	125
	Minimal value	87	44	118
StoLevell Duo	Average	90	80	140
	Minimal value	90	55	130
StoLevell Duo plus QS	Average	85	50	81
	Minimal value	74	45	67
StoLevell Alpha	Average	150	145	145
	Minimal value	143	136	136
StoLevell Novo	Average	125	65	140
	Minimal value	106	50	129
StoLevell SW plus	Average	96	102	99
	Minimal value	82	89	93
Sto Mineral HP	Average	100	90	90
	Minimal value	88	87	80
StoColl IP	Average	145	95	145
	Minimal value	138	90	141
Sto-Dispersionskleber	Average	148	183	160
	Minimal value	124	168	128
StoPrefa Coll	Average	145	150	150
	Minimal value	123	125	122
StoPrefa Coll 500	Average	140	170	165
	Minimal value	124	163	148

4.4 Bond strength of foam adhesive

Foam adhesive		Standard application conditions [kPa]	Modification of foam thickness [kPa]	Modification of processing time (open time 5 min) [kPa]	Modification of temperature (low temperature) [kPa]	Modification of temperature (low temperature) [kPa]
Sto-Turbofix Mini	Average	112	82	99	88	132
	Minimal value	104	76	92	79	127

4.5 Wind load resistance

The following failure loads only apply to the listed combination of component characteristics and the characteristics of the insulation product.

4.5.1 Safety in use of mechanically fixed ETICS using anchors

Apply to all anchors listed in annex 1 mounted on the insulation panels surface				
Characteristics of the EPS **(standard EPS)**	Thickness		≥ 60 mm	
	Tensile strength perpendicular to the faces		**≥ 100 kPa**	
	Shear modulus		≥ 1.0 N/mm²	
Plate diameter of anchor			∅ 60 mm	∅ 90 mm
Failure loads [N]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 0.51 Average: 0.52	Minimal: 0.72 Average: 0.73
	Anchors placed at the panel joints (Pull-through test)	R_{joint}	Minimal : 0.40 Average: 0.43	Minimal: 0.43 Average: 0.47

Apply to all anchors listed in annex 1 mounted on the insulation panels surface			
Characteristics of the EPS **(elastified EPS)**	Thickness		≥ 60 mm
	Tensile strength perpendicular to the faces		**≥ 80 kPa**
	Shear modulus		≥ 0.3 N/mm²
Plate diameter of anchor			∅ 60 mm
Failure loads [N]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 0.35 Average: 0.36
	Anchors placed at the panel joints (Pull-through test)	R_{joint}	Minimal: 0.30 Average: 0.31

The failure loads of table 1 specified above only apply to the following anchors even with deep mounting but only under the given conditions of installation:

Anchor	Thickness of the EPS panel [t]	Conditions of installation *
ejotherm STR U, ejotherm STR U 2G (ETA-04/0023)	t ≥ 80 mm	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover) – Incision depth: 20 mm
	t ≥ 100 mm	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover) – Incision depth: 35 mm
TERMOZ 8 SV (ETA-06/0180)	t ≥ 80 mm	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover)

* according to the appropriate ETA of anchor

4.6 Bond strength after aging [kPa]

Finishing coat with base coat indicated hereafter		**After hygrothermal cycles [kPa] with base coat "StoArmat Classic plus F/M/G"**	**7 d immersion in water and 7 d drying [kPa] with base coat "StoArmat Classic plus"**
Stolit K/R/Effect/MP	Average	no performance assessed	165
	Minimal value		148
Stolit Milano	Average		110
	Minimal value		107
Stolit K1.5 + Stolit Milano	Average		120
	Minimal value		94
Sto-Ispolit K/R/MP	Average		124
	Minimal value		94
StoSuperlit	Average		120
	Minimal value		107
StoLotusan K/MP	Average		120
	Minimal value		102
StoNivellit + StoColor Silco	Average	67 < 80 kPa but failure in the insulation product	130
	Minimal value	78 < 80 kPa but failure in the insulation product	111
Sto-Klebe- und Fugenmörtel mit Sto-Flachverblender or Sto-EcoShapes	Average	no performance assessed	95
	Minimal value		82
StoSilkolit K/R/MP	Average		118
	Minimal value		114
StoSilco K/R/MP	Average		90
	Minimal value		78
StoSilco blue K/MP	Average		100
	Minimal value		98
Stolit QS K/R/MP	Average		115
	Minimal value		94
StoSilco QS K/R/MP	Average	109	115
	Minimal value	97	104

Finishing coat with base coat indicated hereafter		**After hygrothermal cycles [kPa] with base coat "StoArmat Classic plus QS F/M/G"**	**7 d immersion in water and 7 d drying [kPa] with base coat "StoArmat Classic plusQS"**
Stolit K/R/Effect/MP	Average	no performance assessed	146
	Minimal value		140
Stolit Milano	Average		133
	Minimal value		125
Stolit K1.5 + Stolit Milano	Average		123
	Minimal value		114
StoLotusan K/MP	Average		128
	Minimal value		102
StoNivellit + StoColor Silco	Average	143	134
	Minimal value	125	130
StoSilco K/R/MP	Average	no performance assessed	128
	Minimal value		119
StoSilco blue K/MP	Average		100
	Minimal value		97
Stolit QS K/R/MP	Average		140
	Minimal value		116
StoSilco QS K/R/MP	Average	140	129
	Minimal value	133	123

4.7 Reinforcement (glass fibre mesh)

Sto-Glasfasergewebe	**Average warp**	**Average weft**
Tensile strength in as-delivered state	2154 N / 50 mm	2883 N / 50 mm
Residual tensile strength after aging	1274 N / 50 mm	1807 N / 50 mm
Relative residual tensile strength after aging	59.1 %	62.7 %
Elongation in as-delivered state	3.7 %	3.8 %
Elongation after aging	1.8 %	2.1 %

Sto-Glasfasergewebe F	**Average warp**	**Average weft**
Tensile strength in as-delivered state	2236 N / 50 mm	2434 N / 50 mm
Residual tensile strength after aging	1494 N / 50 mm	1523 N / 50 mm
Relative residual tensile strength after aging	66.8 %	68.1 %
Elongation in as-delivered state	3.9 %	4.2 %
Elongation after aging	2.7 %	2.6 %

Sto-Abschirmgewebe AES	**Average warp**	**Average weft**
Tensile strength in as-delivered state	1812 N / 50 mm	2361 N / 50 mm
Residual tensile strength after aging	1085 N / 50 mm	1829 N / 50 mm
Relative residual tensile strength after aging	59.9 %	77.5 %
Elongation in as-delivered state	3.86 %	3.46 %
Elongation after aging	2.62 %	2.66 %

Annex 5

5 Energy economy and heat retention (BWR 6)

5.1 Thermal resistance

The nominal value of the additional thermal resistance R provided by the ETICS to the substrate wall is calculated in accordance with EN ISO 6946:2007 from the nominal value of the insulation product's thermal resistance R_D given accompanied to the CE marking and from the thermal resistance of the rendering system R_{render} which is about 0.02 (m² · K)/W.

$R = R_D + R_{render}$

The thermal bridges caused by mechanical fixing (anchors, profiles) increases the thermal transmittance U. This influence had to take into account according to EN ISO 6946:2007

$U_c = U + \chi_p \cdot n$

Where:	U_c:	corrected thermal transmittance [W/(m² · K)]
	n:	number of anchors per m²
	χ_p:	local influence of thermal bridge caused by an anchor. The values listed below can be taken into account if not specified in the anchor's ETA:
	χ_p = 0.004 W/K	for anchors with a galvanized steel screw with the head covered by a plastic material
	χ_p = 0.002 W/K	for anchors with a stainless steel screw covered by plastic anchors and for anchors with an air gap at the head of the screw