

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-09/0058
of 6 June 2024

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 for the use as external insulation of 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

25 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

040083-00-0404

This version replaces

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Specific Part

1 Technical description of the product

This product is an External Thermal Insulation Composite System (ETICS) 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 all components of the ETICS specified in this ETA.

The ETICS kit comprises a prefabricated insulation product of expanded polystyrene (EPS) to be bonded and if it necessary additionally mechanically fixed onto a wall. The methods of fixing and the relevant components are specified in annex 1.

The insulation product is faced with a rendering system consisting of one base coat and finishing coat (site applied), in which the base coat contains reinforcement. The rendering 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 are 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.

English translation prepared by DIBt

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

3.1 Safety in case of fire (BWR 2)

Wesentliches Merkmal	Leistung
Reaction to fire of the ETICS	(see annex 2) Euroclass according to EN 13501-1
Reaction to fire of insulation product (EPS) - Apparent density EN 1602 of insulation product (EPS)	(see annex 2) Euroclass E according EN 13501-1 Value [kg/m ³]
Reaction to fire of foam adhesive	(see annex 2) Euroclass E according EN 13501-1
Façade fire performance	no performance assessed

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	(see annex 3.1) Average [kg/m ²] Average [kg/m ²]
Rendering system after 1 hour after 24 hours	(see annex 3.2) Average [kg/m ²] Average [kg/m ²]
EPS insulation product after 24 hours	Maximum value 0.5 kg/m ²
Water-tightness of the ETICS: Hygrothermal behaviour on the test wall	Pass without defects
Water-tightness of the ETICS: freeze/thaw behaviour	The water absorption of the base coats as well as the rendering systems after 24 h is less than 0.5 kg/m ² for all configurations of the ETICS. The ETICS is so assessed as freeze/thaw resistant.
Impact resistance	(see annex 3.3) Category
Water vapour permeability - Rendering system - EPS insulation product	(see annex 3.4) s _d value [m] μ = 20 - 70 Thickness of the insulation product 400 mm

3.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
<p>Bond strength between base coat and insulation product (EPS)</p> <p>between adhesive and substrate</p> <p>between adhesive and insulation product (EPS)</p> <p>of foam adhesive</p>	<p>(see annex 4.1) - Minimal value/ average [kPa] - Minimal value/ average [kPa]</p> <p>(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</p> <p>(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</p> <p>(see annex 4.4) - Minimal value/ average [kPa]</p>
Fixing strength (displacement test)	Test not required therefore no limitation of ETICS length required.
<p>Wind load resistance of ETICS pull-through test of fixing static foam block test</p>	<p>(see annex 4.5) - R_{panel} [kN/fixing], - R_{joint} [kN/fixing], - Plate diameter of anchor ≥ 60 mm res. ≥ 90 mm - plate stiffness ≥ 0.3 kN/mm² - load resistance of the anchor plate ≥ 1.0 kN</p>
<p>Tensile strength perpendicular to the faces in dry conditions standard EPS</p> <p>elastified EPS</p>	<p>$\sigma_{\text{mt}} \geq 80$ kPa (bonded ETICS) $\sigma_{\text{mt}} \geq 100$ kPa (mechanically fixed ETICS with anchors and supplementary adhesive) $\sigma_{\text{mt}} \geq 80$ kPa (mechanically fixed ETICS with anchors and supplementary adhesive)</p>

Essential characteristic	Performance
Shear strength of the ETICS	≥ 20 kPa
Shear modulus of the ETICS standard EPS elastified EPS	≥ 1.0 MPa ≥ 0.3 MPa
Render strip tensile test	no performance assessed
Shear strength of foam adhesive	$f_{tk} = 75.8$ kPa minimal value $f_{tk} = 81.0$ kPa average
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] Minimal value/ average [kPa]
Tensile strength of the glass fibre mesh in the as-delivered state	(see annex 4.7) Average [N/mm]
Residual tensile strength of the glass fibre mesh after aging	(see annex 4.7) Average [N/mm]
Relative residual tensile strength of the glass fibre mesh after aging	(see annex 4.7) Average [%]
Elongation of the glass fibre mesh in the as-delivered state	(see annex 4.7) Average [%]
Elongation of the glass fibre mesh after aging	(see annex 4.7) 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 of ETICS	(see annex 5) Calculated value or measurement value R [(m ² · K)/W]
thermal transmittance of ETICS	(see annex 5) Calculated value or measurement value U [W/(m ² · K)]

English translation prepared by DIBt

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

In accordance with EAD No. 040083-00-0404 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 6 June 2024 by Deutsches Institut für Bautechnik

Anja Rogsch
Head of Section

beglaubigt:
Khayata

Annex 1

Composition of the ETICS

	Components National application documents shall be taken into account	Coverage [kg/m ²]	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)	–
	- StoLevell S 35 (organic based ready to use paste requiring addition of 30 % of cement)	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)	–	
- StoColl IP plus (cement based powder requiring addition of 21 - 23 % of water)	3.0 to 7.5 (powder)	–	
- Sto-Dispensionskleber (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)	–	
• Foam adhesive			
- Sto – Turbofix Mini (foam adhesive on polyurethane, ready to use, in bottles supplied)	0.20 l/m ²	–	

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Insulation material with associated method of fixing	<p>Mechanically fixed ETICS with anchors and supplementary adhesive:</p> <ul style="list-style-type: none"> • Insulation product factory-prefabricated expanded polystyrene (EPS)^{****} <ul style="list-style-type: none"> - standard EPS - elastified EPS • Supplementary adhesives (equal to bonded ETICS) • Anchors for insulation product all anchors with ETA according to EAD 330196-01-0604¹ 	<p>–</p> <p>–</p>	<p>60 to 400</p> <p>60 to 200</p>
Base coat	<p>StoArmat Classic plus F/M/G Ready to use paste on an organic basis: pure acrylic binder</p> <p>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)</p>	<p>3.5 to 9.5</p> <p>3.5 to 9.5</p>	<p>2.0 to 5.0*</p> <p>2.0 to 5.0*</p>
Glass fibre mesh	<p>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</p> <p>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</p> <p>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</p>	<p>–</p> <p>–</p> <p>–</p>	<p>–</p> <p>–</p> <p>–</p>

¹ EAD 330196-01-0604

Plastic anchors made of virgin or non-virgin material for fixing of external thermal insulation composite systems with rendering (and previous versions)

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Key coat (optional)	Sto-Putzgrund Ready to use pigmented acrylic- resin dispersion liquids	0.3 to 0.4 l/m ²	–
	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/m ²	–
Finishing coat	<p>To use with key coat "Sto-Putzgrund" or "Sto Putzgrund QS", if applicable**</p> <ul style="list-style-type: none"> Ready to use paste - acrylic binder: <ul style="list-style-type: none"> Stolit K (particle size 1.0 to 6.0 mm) Stolit R (particle size 1.0 to 6.0 mm) Stolit Effect (particle size 3.0 mm) Stolit MP (thin, middle or thick layer) Stolit Milano Stolit K (particle size 1.5 mm) + Stolit Milano Sto-Ispolit K*** (particle size 1.5 to 2.5 and 3.5 mm) Sto-Ispolit R*** (particle size 1.5 to 3.5 mm) Sto-Ispolit MP*** (thin, middle or thick layer) StoMarlit K** (particle size 1.5 to 2.5 and 3.5 mm) StoMarlit R** (particle size 1.5 to 3.5 mm) StoSuperlit *** (particle size 2.0 mm) StoLotusan K (particle size 1.0 and 3.0 mm) StoLotusan MP* (thin, middle or thick layer) Ready to use paste – acrylic binder – associated with a decorative paint: <ul style="list-style-type: none"> StoNivellit + StoColor Silco (acrylic/siloxane binder) Ready to use paste – acrylic binder – associated with synthetic briquettes: <ul style="list-style-type: none"> StoCleyer B or StoEcoshape embedded in Sto-Klebe und Fugenmörtel*** Ready to use pastes – acrylic/siloxane binder: <ul style="list-style-type: none"> Sto-Silkolit K*** (particle size 1.5 to 3.0 mm) Sto-Silkolit R*** (particle size 1.5 to 3.0 mm) Sto-Silkolit MP*** (thin, middle or thick layer) 	<ul style="list-style-type: none"> 1.8 to 6.0 1.8 to 6.0 4.5 to 5.5 2.2 to 4.7 2.0 to 4.0 ca. 2.3 + ca. 3.0 2.3 to 4.3 2.3 to 4.3 2.3 to 4.3 2.3 to 4.3 4.5 to 6.0 1.8 to 4.3 2.2 to 4.3 3.0 to 3.5 0.2 to 0.4 l/m² 5.0 to 9.0 2.3 to 4.3 2.3 to 4.3 2.3 to 4.3 	<ul style="list-style-type: none"> regulated by particle size* 1.5* to 3.5 1.0* to 2.0 2.0 to 3.0 regulated by particle size* 1.5* to 3.5 regulated by particle size* regulated by particle size 1.5* to 3.5 1.0* to 1.5 4.7 to 7.0 regulated by particle size* 1.5* to 3.0

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Finishing coat	<p>StoSilco K (particle size 1.0 to 3.0 mm)</p> <p>StoSilco R (particle size 1.0 to 3.0 mm)</p> <p>StoSilco MP (thin, middle or thick layer)</p> <p>StoSilco blue K (particle size 1.5 to 3.0 mm)</p> <p>StoSilco blue MP (thin, middle or thick layer)</p> <ul style="list-style-type: none"> Ready to use pastes – acrylic binder (application between 0 °C and 15 °C): <ul style="list-style-type: none"> Stolit QS K (particle size 1.0 to 3.0 mm) Stolit QS R (particle size 1.0 to 3.0 mm) Stolit QS MP (thin, middle or thick layer) Ready to use pastes – acrylic/siloxane binder (application between 0 °C and 15 °C): <ul style="list-style-type: none"> StoSilco QS K (particle size 1.0 to 3.0 mm) StoSilco QS R (particle size 1.0 to 3.0 mm) StoSilco QS MP (thin, middle or thick layer) Stolit AimS K (particle size 1.0 to 3.0 mm) Stolit AimS MP (thin, middle or thick layer) 	<p>1.8 to 4.3</p> <p>1.8 to 4.3</p> <p>2.2 to 4.7</p> <p>2.2 to 4.0</p> <p>2.2 to 4.7</p> <p>1.8 to 4.3</p> <p>1.8 to 4.3</p> <p>2.2 to 4.3</p> <p>1.8 to 4.3</p> <p>1.8 to 4.3</p> <p>2.2 to 4.3</p> <p>1.6 to 4.6</p> <p>1.5 to 4.0</p>	<p>regulated by particle size*</p> <p>1.5* to 3.5</p> <p>regulated by particle size*</p> <p>1.5* to 3.5*</p> <p>regulated by particle size*</p> <p>1.5* to 3.0</p> <p>regulated by particle size*</p> <p>1.5* to 3.5</p> <p>regulated by particle size</p> <p>1.0 to 3.0</p>
Decorative paint (optional)	<ul style="list-style-type: none"> Ready to use paint with acrylic/siloxane binder: <ul style="list-style-type: none"> 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 StoColor Maxisil StoColor Dryonic StoColor Lotusan AimS StoColor Dryonic G StoColor Dryconic M 	<p>[l/ m²]</p> <p>0.20 bis 0.40</p> <p>0.24 bis 0.30</p> <p>0.20</p>	
Ancillary material	Remains the responsibility of the manufacturer of ETICS.		
<p>* The minimum thickness of the rendering system (base coat and finishing coat) is 4.0 mm.</p> <p>** The instruction to the installer concerning the use of a key coat remains the responsibility of the manufacturer.</p> <p>*** Only to use with base coat "StoArmat Classic plus F/M/G".</p> <p>**** Factory-prefabricated, uncoated panels made of expanded polystyrene (EPS) to EN 13163 shall be used.</p>			

Annex 2

Safety in case of fire (BWR 2)

2.1 Reaction to fire

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
adhesive	max. 22,2 %	no flame retardant	B - s2,d0
Foam adhesive	> 95.0 %	no flame retardant	
Base coats: StoArmat Classic plus F/M/G, StoArmat Classic plus QS F/M/G	max. 7.5 %	min. 10.0 %	
EPS insulation material (Apparent density $\leq 17 \text{ kg/m}^3$)	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 StoMarlit K/R Sto-Silkolit K/R/MP	max. 9.3 %	no flame retardant	
Sto-Klebe- und Fugenmörtel + StoCleyer B or StoEcoshape	max 8.0 % max 7.9 %	min. 15.0 % min. 20.0 %	
Stolit AimS K/MP	max. 8.5 %	min. 10 %	
StoSuperlit	-	-	no performance assessed

2.2 Apparent density of the EPS-insulation product according to EN 1602

$\rho_a \leq 30 \text{ kg/m}^3$

Annex 3

Hygiene, health and environment (BWR 3)

3.1 Water absorption (capillarity test)

Base coat:

Base coat	Average water absorption [kg/m ²]	
	after 1h	after 24h
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:

Rendering system: base coat "StoArmat Classic plus F/M/G" with finishing coat indicated hereafter	Average water absorption [kg/m ²]	
	after 1h	after 24h
Stolit K/R/Effect (3 mm)	0.014	0.129
Stolit K/R/Effect (6 mm)	0.015	0.173
Stolit MP (3 mm)	0.012	0.149
Stolit Milano (2 mm)	0.007	0.097
Stolit K1.5 + Stolit Milano	0.024	0.184
Sto-Ispolit K/R/MP	0.046	0.245
StoMarlit K/R	0.046	0.245
StoSuperlit	0.048	0.260
StoLotusan K/MP (6-7 mm)	0.015	0.108
StoNivellit + StoSilco Color	0.040	0.274
Sto-Klebe- und Fugenmörtel +StoCleyer B or StoEcoshape (about 10 mm)	0.013	0.202
Sto-Silkolit K/R/MP	0.078	0.291
StoSilco K/R/MP (3 mm)	0.032	0.439
StoSilco blue K/MP	0.050	0.490
Stolit QS K/R/MP (3 mm)	0.019	0.340
StoSilco QS K/R/MP (3 mm)	0.014	0.105
Stolit AimS K/MP	0.018	0.213

Rendering system: base coat "StoArmat Classic plus QS F/M/G" with finishing coat indicated hereafter	Average water absorption [kg/m ²]	
	after 1h	after 24h
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 (6-7 mm)	0.013	0.098
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
Stolit AimS K/MP	0.028	0.180

3.3 Impact resistance

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

Rendering system: base coats with finishing coat indicated hereafter	Single standard mesh with		Double mesh: Sto-Glasfasergewebe with		Standard-mesh with Sto-Panzer-gewebe and with all base coats
	"StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS F/M/G"	"StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS F/M/G"	
	Category				
Stolit K/R/Effect/MP	I	II	I	I	I
Stolit Milano	I	II	II	I	I
Stolit K1.5 + Stolit Milano	I	II	I	I	I
Sto-Ispolit K/R/MP*	I	-	I	-	I
StoMarlit K/R	I	-	I	-	I
StoSuperlit*	I	-	I	-	I
StoLotusan K/MP	I	-	I	-	I
StoNivellit mit StoColor Silco	III	II	II	I	I
Sto-Klebe- und Fugenmörtel mit StoCleyer B or StoEcoshape	I	-	I	-	I
Sto-Silkolit K/R/MP*	II	-	II	-	I
StoSilco K/R/MP	I	II	I	I	I
StoSilco blue K/MP	II	I	**	**	**
Stolit QS K/R/MP	I	II	I	I	I
StoSilco QS K/R/MP	I	II	I	I	I
Stolit AimS K/MP	I	I	**	**	**
* only to use with base coat "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 [m]	
	"StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS F/M/G"
Stolit K/R/Effect (1.5 mm)	≤ 1.0 m (Test result obtained with Stolit K1.5: 0.98 m)	-
Stolit K/R/Effect (3 mm)	≤ 1.0 m (Test result obtained with Stolit K3: 0.92 m)	-
Stolit K/R/Effect (6 mm)	≤ 1.0 m (Test result obtained with Stolit K6: 0.89 m)	-
Stolit MP (3 mm)	≤ 1.5 m (Test result obtained with Stolit MP: 1.01 m)	-
Stolit Milano	≤ 1.5 m (Test result obtained with t = 1 mm: 1.1 m)	≤ 1.0 m (Test result obtained with t = 1 mm: 0.95 m)
Stolit K1.5 + Stolit Milano	≤ 2.0 m (Test result obtained with Stolit K1.5 + Stolit Milano (2 mm): 1.32 m)	≤ 2.0 m (Test result obtained with t = 2.5 mm: 1.3 m)
Sto-Ispolit K/R/MP*	≤ 1.0 m (Test result obtained with K3.5: 0.88 m)	-
StoMarlit K/R/*	≤ 1.0 m (Test result obtained with K3.5: 0.88 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: 0.49 m)	≤ 1.0 m (Test result obtained with StoLotusan K2: 0.59 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 StoCleyer B or StoEcoshape*	≤ 1.0 m (Test result obtained with t = 8 mm: 0.8 m)	-
Sto-Klebe- und Fugenmörtel with StoCleyer B*	-	≤ 1.5 m (Test result obtained with Sto-Klebe- und Fugenmörtel with StoCleyer B*: 1.4 m)
Sto-Klebe- und Fugenmörtel with StoEcoshape*	-	≤ 1.5 m (Test result obtained with mit Sto-Klebe- und Fugenmörtel with StoEcoshape: 1.22 m)
Sto-Silkolit K/R/MP*	≤ 1.0 m (Test result obtained with t = 2.5 mm: 0.81 m)	-
StoSilco K/R/MP	≤ 1.0 m (Test result obtained with StoSilco MP: 0.76 m)	≤ 1.0 m (Test result obtained with StoSilco K2: 0.75 m)

Rendering system: Base coat with finishing coat indicated hereafter:	Equivalent air thickness s_d [m]	
	"StoArmat Classic plus F/M/G"	"StoArmat Classic plus QS F/M/G"
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 K3: 0.68 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 MP: 0.62 m)	≤ 1.0 m (Test result obtained with StoSilco QS K2: 0.75 m)
Stolit AimS K/MP	≤ 1.0 m (Test result obtained with Stolit AimS MP: 0.88 m)	≤ 2.0 m (Test result obtained with Stolit AimS MP: 1.59 m)
* applicable with the base coat "StoArmat Classic plus F/M/G" only		

Annex 4

Safety and accessibility in use (BWR 4)

4.1 Bond strength between base coat and insulation product (EPS)

		Conditioning		
		Initial state [kPa]	After hygrothermal cycles [kPa]	After freeze/thaw test
StoArmat Classic plus F/M/G	Average	125	103	Test not required because freeze/thaw cycles not necessary
	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		Rupture type	Conditioning		
			Initial state [kPa]	2 d immersion in water and 2 h drying [kPa]	2 d immersion in water and 7 d drying [kPa]
Sto-Baukleber (5 mm)	Average	In adhesive	1210	1150	1620
	Minimal value		930	970	1210
StoLevell Duo plus (5 mm)	Average	In adhesive	1230	583	2020
	Minimal value		1166	501	1893
StoLevell Uni (5 mm)	Average	In adhesive	1793	637	2560
	Minimal value		1586	467	2489
StoLevell FT (5 mm)	Average	In adhesive	1233	369	1157
	Minimal value		784	299	1026
StoLevell Duo (5 mm)	Average	In adhesive	1175	524	1874
	Minimal value		983	456	1660
StoLevell Duo plus QS (3 – 5 mm)	Average	In adhesive	1264	523	2001
	Minimal value		961	341	1691
StoLevell Alpha (5 mm)	Average	In adhesive	2178	1133	2554
	Minimal value		2066	989	2339
StoLevell Novo (5 mm)	Average	In adhesive	793	405	1059
	Minimal value		733	327	947
StoLevell SW plus (3 – 5 mm)	Average	In adhesive	131	141	211
	Minimal value		78	119	177
Sto Mineral HP (3 – 5 mm)	Average	In adhesive	2080	184	1790
	Minimal value		1927	173	1732
StoColl IP (3 – 5 mm)	Average	In adhesive	1565	975	1830
	Minimal value		1407	577	1738
StoColl IP plus (5 mm)	Average	In adhesive	1210	1150	1620
	Minimal value		930	970	1210
Sto-Dispersionskleber (3 – 5 mm)	Average	*	1525	1480	1043
	Minimal value		1364	1349	870
StoPrefa Coll (3 – 5 mm)	Average	In adhesive	1220	120	1310
	Minimal value		1213	107	1203
StoPrefa Coll 500 (3 – 5 mm)	Average	In adhesive	1185	975	1130
	Minimal value		909	833	1008
StoLevell S 35 (3 – 5 mm)	Average	In adhesive	1997	682	2917
	Minimal value		1852	651	2442

* Initial state: 100 % in adhesive
2 d immersion in water and 2 h drying: 45 % in substrate; 55 % in adhesive
2 d immersion in water and 7 d drying: 5 % in substrate; 95 % in adhesive

4.3 Bond strength between adhesive and insulation product (EPS)

		Rupture type	Conditioning		
			Initial state [kPa]	2 d immersion in water and 2 h drying [kPa]	2 d immersion in water and 7 d drying [kPa]
Sto-Baukleber (5 mm)	Average	in insulation product	128	120	141
	Minimal value		107	119	132
StoLevell Duo plus (5 mm)	Average	in insulation product	109	74	101
	Minimal value		99	58	81
StoLevell Uni (5 mm)	Average	in insulation product	121	99	122
	Minimal value		112	81	112
StoLevell FT (5 mm)	Average	in insulation product	103	89	120
	Minimal value		84	84	113
StoLevell Duo (5 mm)	Average	in insulation product	109	74	101
	Minimal value		99	58	81
StoLevell Duo plus QS (5 mm)	Average	in insulation product	85	50	81
	Minimal value		74	45	67
StoLevell Alpha (5 mm)	Average	in insulation product	122	119	115
	Minimal value		112	112	105
StoLevell Novo (5 mm)	Average	in insulation product	115	74	108
	Minimal value		107	58	92
StoLevell SW plus (3 – 5 mm)	Average	in insulation product	96	102	99
	Minimal value		82	89	93
Sto Mineral HP (3 – 5 mm)	Average	in insulation product	100	90	90
	Minimal value		88	87	80
StoColl IP (3 – 5 mm)	Average	*	145	95	145
	Minimal value		138	90	141
StoColl IP plus (5 mm)	Average	in insulation product	128	120	141
	Minimal value		107	119	132
Sto-Dispersionskleber (3 – 5 mm)	Average	in insulation product	148	183	160
	Minimal value		124	168	128
StoPrefa Coll (3 – 5 mm)	Average	in insulation product	120	120	130
	Minimal value		112	109	120
StoPrefa Coll 500 (3 – 5 mm)	Average	in insulation product	140	170	165
	Minimal value		124	163	148
StoLevell S 35 (3 – 5 mm)	Average	in insulation product	158	147	171
	Minimal value		127	136	149
<p>* Initial state: 100 % in insulation product 2 d immersion in water and 2 h drying: 95 % in adhesive; 5 % in insulation product 2 d immersion in water and 7 d drying: 100 % in insulation product</p>					

minimal bonded surface area

$$S [\%] = 0.03 \text{ N/mm}^2 \times 100 / 0.08 \text{ N/mm}^2$$

$$S = 37.5\%$$

The minimal bonded surface S of bonded ETICS is 40%.

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) [kPa]	Modification of temperature (low) [kPa]
Sto-Turbofix Mini	Average	112	82	99	88	132
	Minimal value	104	76	92	79	127

English translation prepared by DIBt

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/mm ²	
Plate diameter of anchor			Ø 60 mm	Ø 90 mm
Failure loads [kN]	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/mm ²	
Plate diameter of anchor			Ø 60 mm	
Failure loads [kN]	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 specified above with a plate diameter of anchor of 60 mm apply to the following anchors even with deep mounting only under the given conditions:

Anchor	Thickness of the EPS panel [t]	Conditions of installation *
ejothem STR U, ejothem 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

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 plus F/M/G"	
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	
StoMarlit K/R	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 with StoCleyer B or StoEcoshape	Average	no performance assessed	95	
	Minimal value		82	
StoSikolit 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 plus F/M/G"	
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
Stolit AimS K/MP	Average	119		117
	Minimal value	113		111

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 %

Annex 5
Energy economy and heat retention (BWR 6)

5.1 Thermal resistance and thermal transmittance

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 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 $0.02 \text{ (m}^2 \cdot \text{K)/W}$.

$$R = R_D + R_{render}$$

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

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

- Where:
- U_c : corrected thermal transmittance [$\text{W}/(\text{m}^2 \cdot \text{K})$]
 - n : number of anchors per m^2
 - 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
 - $\chi_p = 0.004 \text{ W/K}$ for anchors with a galvanized steel screw with the head covered by a plastic material
 - $\chi_p = 0.002 \text{ W/K}$ for anchors with a stainless steel screw covered by plastic anchors and for anchors with an air gap at the head of the screw