

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-05/0130
of 7 June 2024

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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

StoTherm Vario 1

Product family
to which the construction product belongs

Product area code: 4

External Thermal Insulation Composite System with
rendering on expanded polystyrene 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

27 pages including 6 annexes which form an integral part
of this assessment

This European Technical Assessment is
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No 305/2011, on the basis of

040083-00-0404

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SPECIFIC PART

1 Technical description of the product

1.1 Definition of the kit

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 the ETICS.

The ETICS kit comprises a prefabricated insulation product of expanded polystyrene (EPS) to be bonded and if 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 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 "StoTherm Vario 1" 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 – Apparent density of the EPS-insulation product according to EN 1602	(see annex 2) Euroclass E according EN 13501-1 Value [kg/m ³]
Facade fire performance	no performance assessed
Propensity to undergo continuous smouldering of ETICS	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	 Average [kg/m ²] Average [kg/m ²]
EPS- insulation product after 24 h	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 rendering system with all finishing coats except "StoSil K/R/MP" and "StoMiral EKP(Edelkratzputz)" is less than 0.5 kg/m ² after 24 h. The ETICS with the finishing coats "StoSil K/R/MP" and "StoMiral EKP(Edelkratzputz)" has been assessed as freeze/thaw resistant according to the simulated method.
Impact resistance	(see annex 3.2) Category
Water vapour permeability - Rendering system - EPS insulation product	(see annex 3.3) 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 EPS-insulation product</p> <p>between adhesive and substrate</p> <p>between adhesive and EPS insulation</p>	<p>(see annex 4.1)</p> <ul style="list-style-type: none"> - Minimal value/average [kPa]: Initial state (28 d immersion) - Minimal value/average [kPa]: after hygrothermal cycles <p>(see annex 4.2)</p> <ul style="list-style-type: none"> - Thickness [mm] of the used adhesives - Minimal value/average [kPa]: Initial state (dry conditions) - Minimal value/ average [kPa]: after 2 d immersion in water, 2 h drying - Minimal value/ average [kPa]: after 2 d immersion in water, 7 d drying <p>(see annex 4.3)</p> <ul style="list-style-type: none"> - Thickness [mm] of the used adhesives - Minimal value/average [kPa]: Initial state (dry conditions) - Minimal value/ average [kPa]: after 2 d immersion in water, 2 h drying - Minimal value/ average [kPa]: after 2 d immersion in water, 7 d drying
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 4.4)</p> <ul style="list-style-type: none"> - R_{panel} [kN/fixing], - R_{joint} [kN/fixing], - Plate diameter of anchor ≥ 60 mm resp. ≥ 90 mm - plate stiffness ≥ 0.3 kN/mm² - load resistance of the anchor plate ≥ 1.0 kN
<p>Tensile strength perpendicular to the faces in dry conditions standard EPS</p> <p>elastified EPS</p>	<p>$\sigma_{mt} \geq 80$ kPa (bonded ETICS) $\sigma_{mt} \geq 100$ kPa (bonded ETICS with anchors) $\sigma_{mt} \geq 150$ kPa (bonded ETICS with profiles)</p> <p>$\sigma_{mt} \geq 80$ kPa</p>
Shear strength of the ETICS	$20 \leq f_{tk} \leq 170$ [kPa]
<p>Shear modulus of the ETICS standard EPS elastified EPS</p>	<p>$1.0 \leq G_m \leq 3.8$ [MPa] $0.3 \leq G_m \leq 1.0$ [MPa]</p>

Essential characteristic	Performance
Pull-through resistance of the fixing of profiles	≥ 0.5 kN
Render strip tensile test	(siehe Anhang 4.6) crack width w_{rk} [mm]
Bond strength after ageing finishing coat tested on the rig finishing coat not tested on the rig	(see annex 4.8) Minimal value/average [kPa] Minimal value/average [kPa]
Tensile strength of the glass fibre mesh in the as-delivered state	(see annex 4.9) Average [N/mm]
Residual tensile strength of the glass fibre mesh after aging	(see annex 4.9) Average [N/mm]
Relative residual tensile strength of the glass fibre mesh after aging	(see annex 4.9) Average [%]
Elongation of the glass fibre mesh in the as-delivered state	(see annex 4.9) Average [%]
Elongation of the glass fibre mesh after aging	(see annex 4.9) 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 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 Vario 1	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 bis E) ⁽³⁾ , F	2+
	ETICS in external wall not subject to fire regulations	any	2+
<p>⁽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)</p> <p>⁽²⁾ Products/materials not covered by footnote (1)</p> <p>⁽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)</p>			

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 7 June 2024 by Deutsches Institut für Bautechnik

Anja Rosch
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: <ul style="list-style-type: none"> • Insulation product (see annex 1 for product characteristics) factory-prefabricated expanded polystyrene (EPS)* <ul style="list-style-type: none"> - standard-EPS - elastified EPS • Adhesives <ul style="list-style-type: none"> - Sto-Baukleber (cement based powder requiring addition of 21 - 23 % water) - StoLevell Uni (cement based powder requiring addition of 24 - 26 % water) - StoLevell Duo (cement based powder requiring addition of 20 – 23 % water) - StoLevell Duo Plus (cement based powder requiring addition of about 25 % of water) - StoLevell Duo plus QS (cement based powder requiring addition of 22 – 25 % water) - StoLevell Novo (cement based powder requiring addition of about 37 % water) - StoLevell FT (cement based powder requiring addition of about 28 % water) - StoColl Mineral HP (cement based powder requiring addition of 23 - 25 % water) - StoColl IP (cement based powder requiring addition of about 20 % water) - StoLevell SW plus (cement based powder requiring addition of 21- 23 % water) - StoLevell Alpha (cement based powder requiring addition of 25 - 28 % of water) - Sto-Dispersionskleber (organic based ready to use paste) - StoPrefa Coll (organic based ready to use paste) • Foam adhesive Sto-Turbofix Mini (adhesive foam on polyurethane, ready to use, in bottles supplied) 	<p>–</p> <p>–</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>3.0 to 7.5 (powder)</p> <p>1.0 to 1.5 (prepared)</p> <p>0.8 to 1.5 (prepared)</p> <p>0.20 l/m²</p>	<p>≤ 400</p> <p>≤ 200</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p> <p>–</p>
	Mechanically fixed ETICS with profiles and supplementary adhesive: <ul style="list-style-type: none"> • Insulation product factory-prefabricated expanded polystyrene (EPS)* <ul style="list-style-type: none"> - standard-EPS • Supplementary adhesives (equal to bonded ETICS) 	<p>–</p>	<p>60 to 200</p>

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Insulation material with associated method of fixing	<ul style="list-style-type: none"> • Profiles <ul style="list-style-type: none"> - Sto-Halteleiste PVC - Sto-Verbindungsleiste PVC Polyvinylchlorid (PVC) profiles • Anchors for profiles <ul style="list-style-type: none"> - WS 8 L - ejothem SDK U - SDF-K plus - ejothem NKU 		
	<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 and foam adhesive (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>StoLevell Uni</p> <p>Identical with the equally named adhesive given above.</p>	<p>4.0 to 6.5 (powder)</p>	<p>3.0 to 5.0</p>
Glass fibre mesh	<p>Sto-Glasfasergewebe (see annex 4 for product characteristics) 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>–</p>	<p>–</p>
	<p>Sto-Glasfasergewebe F (see annex 4 for product characteristics) 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>–</p>	<p>–</p>
	<p>Sto-Panzergerewebe (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>

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	StoPutzgrund StoPrep Miral Sto-Putzgrund QS Ready to use pigmented acrylic- resin dispersion liquids. StoPrep Miral with additional potassium silicate binder. To be used with finishing coats indicated hereafter.	0.3	–
Finishing coat	To use with key coat "Sto-Putzgrund"/"Sto-Putzgrund QS", if applicable" <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 MP (thin, middle or thick layer) Stolit Effect (particle size 3.0 mm) Stolit Milano Stolit K (particle size 1.5 mm) + Stolit Milano StoSuperlit (particle size 1.5 to 2.0 mm) Sto-Ispolit K (particle size 1.5 to 3.5 mm) Sto-Ispolit R (particle size 1.5 to 3.5 mm) Sto-Ispolit MP (thin, middle or thick layer) StoLotusan K (Particle size 1.0 to 3.0 mm) StoLotusan MP (thin, middle or thick layer) StoMarlit K (particle size 1.5 to 3.5 mm) StoMarlit R (particle size 1.5 to 3.5 mm) • Ready to use pastes - acrylic/siloxane binder: <ul style="list-style-type: none"> Sto-Silkolit K (particle size 1.5 – 3.5 mm) Sto-Silkolit R (particle size 1.5 bis 3.5 mm) Sto-Ispolit MP (thin, middle or thick layer) StoSilco K (particle size 1.0 to 3.0 mm) StoSilco R (particle size 1.0 to 3.0 mm) StoSilco MP (thin, middle or thick layer) StoSilco blue K (particle size 1.0 to 3.0 mm) StoSilco blue MP (particle size 0.5 mm) • 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 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) 	1.8 to 6.0 1.8 to 6.0 1.5 to 4.0 3.5 to 5.5 1.5 to 2.5 3.8 to 4.8 4.5 to 6.0 2.3 to 4.3 2.3 to 4.3 2.3 to 4.0 1.8 to 4.3 1.5 to 4.0 2.3 to 4.3 2.3 to 4.3 2.3 to 4.0 1.8 to 4.3 1.8 to 4.3 1.5 to 4.0 1.6 to 4.6 1.5 to 4.0 3.0 to 3.5 0.2 to 0.4 l/ m ² 1.8 to 4.3 1.8 to 4.3 1.5 to 4.0	regulated by particle size 1.0 to 3.0 3.0 1.0 to 2.0 2.0 to 3.0 regulated by particle size 1.5 to 3.0 1.0 to 3.0 1.0 to 3.0 regulated by particle size 1.5 to 3.0 regulated by particle size 1.0 to 3.0 1.0 to 3.0 1.0 to 3.0 1.0 to 2.0 regulated by particle size 1.0 to 3.0

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Finishing coat	<ul style="list-style-type: none"> 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) 	1.8 to 4.3	} regulated by } particle size 1.0 to 3.0
	to use with key coat "StoPrep Miral" if applicable: **	1.8 to 4.3	
	<ul style="list-style-type: none"> Ready to use pastes - silicate binder: <ul style="list-style-type: none"> StoSil K (particle size 1.0 to 3.0 mm) StoSil R (particle size 1.0 to 3.0 mm) StoSil MP (thin, middle or thick layer) 	1.5 to 4.0	
	To use with key coat "Sto-Putzgrund"/"StoPrep Miral", if applicable: **	2.2 to 4.3	} regulated by } particle size 1.0 to 3.0
	<ul style="list-style-type: none"> Cement based powder requiring addition of about 25 % water: <ul style="list-style-type: none"> StoMiral K (particle size 1.0 to 6.0 mm) StoMiral R (particle size 1.0 to 6.0 mm) StoMiral MP (fine structure) 	2.2 to 4.3	
	<ul style="list-style-type: none"> Cement based powder requiring addition of 20 to 23 % water associated with a decorative paint: <ul style="list-style-type: none"> StoMiral Nivell F (fine structure) 	1.5 to 4.0	
	<ul style="list-style-type: none"> Cement based powder requiring addition of about 30 % water associated with decorative paints: <ul style="list-style-type: none"> Sto-Strukturputz K (particle size 2.0 and 3.0 mm) Sto-Strukturputz R (particle size 2.0 and 3.0 mm) 	1.6 to 5.2	} regulated by } particle size 1.0 to 3.0
	<ul style="list-style-type: none"> Cement based powder requiring addition of 24 to 32 % water: <ul style="list-style-type: none"> StoMiral EKP (Edelkratzputz) (particle size 2.0 to 4.0 mm) 	1.6 to 5.2	
	<ul style="list-style-type: none"> Ready to use paste – acrylic binder – associated with synthetic briquettes: <ul style="list-style-type: none"> StoCleyer B with 	1.5 to 4.0	} regulated by } particle size 1.0 to 3.0
	Sto-Klebe- und Fugenmörtel	3.0 to 5.1	
	StoEcoshape with	3.0 to 5.1	} regulated by } particle size 1.0 to 3.0
	Sto-Klebe- und Fugenmörtel	2.5 to 2.9	
	2.5 to 2.9	} regulated by } particle size 1.0 to 3.0	
	24.0 to 28.0		
	48 to 76 Piece/m ²	8.0 to 10.0***	
	3.0 to 3.5	(total) 5.0 to 6.0	
	2.4 to 780 Piece/m ²	(total) 5.0 to 8.0	
	3.0 to 3.5		

	Components National application documents shall be taken into account	Coverage [kg/m ²]	Thickness [mm]
Decorative paint (optional)	<ul style="list-style-type: none"> • 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 Solical StoColor Solical G StoColor Maxisil 	0.20 to 0.40 [l/m ²]	–
	<ul style="list-style-type: none"> StoColor Dryonic StoColor Dryonic G 	0.15 to 0.30 [l/ m ²]	
	<ul style="list-style-type: none"> StoColor Dryonic M 	0.10 to 0.17 [l/ m ²]	
Ancillary material	Remains the responsibility of the manufacturer of ETICS.		
<p>* Factory-prefabricated, uncoated panels made of expanded polystyrene (EPS) acc.to EN 133163 shall be used</p> <p>** The instruction to the installer concerning the use of a key coat remains the responsibility of the manufacturer.</p> <p>*** The applied thickness of 10 to 25 mm is reduced to 8 to 10 mm by scraping.</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
Foam adhesive	> 95.0 %	no flame retardant content	B – s2,d0
adhesive Sto-Dispersionskleber, StoPrefa Coll	max. 22.2		
Base coat:	max. 2.4 %		
EPS insulation product (density 15 – 20 kg/m ³)	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Profile	-		
Anchors	-		
Rendering system: Base coat with finishing coat and compatible key coat indicated hereafter			
Stolit K/R/MP with key coat "Sto-Putzgrund"	max. 9.6 %	min. 8.0 %	
Stolit Effect with key coat "Sto-Putzgrund"			
Stolit Milano with key coat "Sto-Putzgrund"			
Stolit K1.5 + Stolit Milano with key coat "Sto-Putzgrund"			
StoLotusan K/MP with key coat "Sto-Putzgrund"			
StoNivellit + StoColor Silco with key coat "Sto-Putzgrund"			
Sto-Silkolit K/R/MP with key coat "Sto-Putzgrund"			
StoSilco K/R/MP with key coat "Sto-Putzgrund"			
StoSilco blue K/MP			
Stolit QS K/R/MP with key coat "Sto-Putzgrund QS"			
StoSilco QS K/R/MP with key coat "Sto-Putzgrund QS"			
StoMarlit K/R with key coat "Sto-Putzgrund"		no flame retardant content	
Sto-Ispolit K/R/MP with key coat "Sto-Putzgrund"			

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
StoMiral EKP (Edelkratzputz) with key coat "StoPrep Miral"	max. 1.6 %	no flame retardant content	B – s2,d0
StoMiral K/R/MP			
StoMiral Nivell F			
Sto-Strukturputz K/R			
Sto-Klebe- und Fugenmörtel + Sto Cleyer B/ StoEcoshape with key coat "Sto-Putzgrund"	max. 8.0 % max. 7.9 %	min. 15.0°% min. 20.0°%	

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
Mineral adhesives	max. 7.7 %	no flame retardant content	B – s1,d0
Base coat	max. 2.4 %	no flame retardant	
EPS-insulation product (density 15 – 20 kg/m ³)	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Profiles	-		
anchors	-		
Rendering system: Base coat with finishing coat and compatible key coat indicated hereafter:			
StoSil K/R/MP with key coat "StoPrep Miral"	max. 6.0 %	no flame retardant	
StoMiral K/R/MP with key coat "StoPrep Miral"	max. 2.5 %	no flame retardant	
StoMiral Nivell F with key coat "StoPrep Miral" associated with a decorative paint			
Sto-Strukturputz K/R with key coat "StoPrep Miral", associated with decorative paints			
StoMiral EKP (Edelkratzputz) with key coat "StoPrep Miral"			

Configurations	Organic content	Flame retardant content	Euroklasse gemäß EN 13501-1
Foam adhesives	> 95.0 %	no flame retardant content	(no performance assessed)
Base coat	max. 2.4 %	no flame retardant	
EPS-insulation product (density 15 – 20 kg/m ³)	Euroclass E according to EN 13501-1	Euroclass E according to EN 13501-1	
Profiles	-		
anchors	-		
Rendering system: Base coat with finishing coat and compatible key coat indicated hereafter:			
StoSuperlit with key coat "Sto-Putzgrund"	-	-	

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	Mean value water absorption [kg/m ²]	
	after 24 h	nach 24 h
StoLevell Uni 3 mm	0.07	0.36

• Rendering system:

Rendering system: Base coat with finishing coat indicated hereafter	Mean value water absorption [kg/m ²]	
	nach 24 h	nach 24 h
Stolit K/R/MP/Effect 2 mm	0.04	0.20
Stolit Milano 1,5 mm	0.01	0.07
Stolit K 1,5 + Stolit Milano	0.04	0.07
StoSuperlit 2 mm	0.04	0.25
Sto-Ispolit K/R/MP 2,5 mm	0.02	0.18
StoLotusan K/MP 3 mm	0.01	0.12
StoMarlit K/R 2 mm	0.02	0.08
Sto-Silkolit K/R/MP 2,5 mm	0.05	0.30
StoSilco K/R/MP 2 mm	0.04	0.23
StoSilco blue K/MP 2 mm	0.04	0.25
StoNivellit + StoColor Silco	0.05	0.23
Stolit QS K/R/MP 2 mm	0.04	0.23
StoSilco QS K/R/MP 2 mm	0.03	0.23
StoSil K/R/MP 2 mm	0.15	0.69
StoMiral K/R/MP 2 mm	0.05	0.25
StoMiral Nivell F	0.04	0.44
Sto-Strukturputz K/R associated with decorative paints 2 mm	0.05	0.44
StoMiral EKP (Edelkratzputz)	0.05	0.87
StoCleyer B with Sto-Klebe-und Fugenmörtel	0.03	0.19
Sto Ecoshape with Sto-Klebe-und Fugenmörtel	0.03	0.19

English translation prepared by DIBt

3.2 Impact resistance

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

Rendering system: Base coat with finishing coat indicated hereafter	Standard mesh	Standard mesh + Sto Panzergerewebe
	Category	
Stolit K/R/Effect/MP	II	I
Stolit Milano	III	Not performance assessed
Stolit K1.5 + Stolit Milano	II	
Sto-Ispolit K/R/M		II
StoMarlit K/R		I
StoLotusan K/MP		
StoCleyer B mit Sto-Klebe- und Fugenmörtel		
Sto Ecoshape mit Sto-Klebe- und Fugenmörtel		
StoSuperlit		
StoNivellit + StoColor Silco		III
Sto-Silkolit K/R/MP	II	
StoSilco K/R/MP	II	I
StoSilco blue K/MP		II
Stolit QS K/R/MP		I
StoSilco QS K/R/MP		
StoSil K/R/MP		II
StoMiral K/R/MP		
StoMiral Nivell F		
Sto-Strukturputz K/R		II
StoMiral EKP (Edelkratzputz)	I	

3.3 Water vapour permeability

Base coat:	Equivalent air thickness s_d
StoLevell Uni	≤ 1.0 m (Test result obtained with $d = 3$ mm: 0.24 m)

Key coat:	Equivalent air thickness s_d
Sto-Putzgrund	≤ 1.0 m (Test result obtained with $d = 3$ mm: 0.23 m)
StoPrep Miral	≤ 1.0 m (Test result obtained with $d = 3$ mm: 0.05 m)
Sto-Putzgrund QS	≤ 1.0 m (Test result obtained with $d = 3$ mm: 0.02 m)

Rendering system: Base coat with finishing coat indicated hereafter (evaluated without decorative coating or key coat, if not stated differently)	Equivalent air thickness s_d
Stolit K/R/Effect/MP*	≤ 1.0 m (Test result obtained with Stolit K6: 0.41 m)
Stolit K/R/Effect/MP*	≤ 1.0 m (Test result obtained with Stolit K3: 0.48 m)
Stolit Milano	≤ 1.0 m (Test result obtained with t = 1 mm: 0.60 m)
Stolit K1.5 + Stolit Milano*	≤ 1.0 m (Test result obtained with t = 2 mm: 0.88 m)
Stolit K1,5*	≤ 1.0 m (Test result: 0.49 m)
Stolit K1,5 + StoColor Dryonic M*	≤ 1.5 m (Test result: 1.07 m)
StoMarlit K/R	≤ 1.0 m (Test result obtained with StoMarlit K2: 0.40 m)
Sto-Ispolit K/R/MP*	≤ 1.0 m (Test result obtained with Sto-Ispolit K3.5: 0.49 m)
StoLotusan K/R/MP*	≤ 1.0 m (Test result obtained with StoLotusan MP t = 3 mm: 0.43 m)
StoLotusan K/R/MP*	≤ 1.0 m (Test result obtained with StoLotusan K2: 0.11 m)
StoCleyer B/Sto Ecoshape with Sto-Klebe-und Fugenmörtel*	≤ 1.0 m (Test result obtained with StoCleyer B t = 8 mm: 0.54 m)
StoCleyer B/Sto Ecoshape with Sto-Klebe-und Fugenmörtel	≤ 1.0 m (Test result obtained with StoCleyer B t = 8 mm: 0.47 m)
StoSuperlit	≤ 1.0 m (Test result obtained with "Farbsand" (special colour coated grain) K2: 0.40 m) (Test result obtained with "Silmer" (natural coloured grain) K2: 0.30 m)
StoNivellit + StoColor Silco	≤ 1.0 m (Test result obtained with t = 1 mm: 0.30 m)
Sto-Silkolit K/R/MP*	≤ 1.0 m (Test result obtained with t = 1 mm: 0.20 m)
StoSilco K/R/MP*	≤ 1.0 m (Test result obtained with StoSilco MP t = 3 mm 0.36 m)
Sto Silco blue K/MP	≤ 1.0 m (Test result obtained with StoSilco K2: 0.02 m)
Stolit QS K/R/MP*	≤ 1.0 m (Test result obtained with Stolit QS K3: 0.65 m)
StoSilco QS K/R/MP*	≤ 1.0 m (Test result obtained with StoSilco QS t = 3 mm: 0.58 m)
StoSil K/R/MP*	≤ 1.0 m (Test result obtained with StoSil K3: 0.26 m)
StoSil K/R/MP*	≤ 1.0 m (Test result obtained with StoSil MP t = 3 mm: 0.30 m)
StoMiral K/R/MP*	≤ 1.0 m (Test result obtained with StoMiral MP t = 3 mm: 0.17 m)
StoMiral K/R/MP*	≤ 1.0 m (Test result obtained with StoMiral MP K6: 0.16 m)
StoMiral Nivell F	≤ 1.0 m (Test result obtained with t = 1.5 mm and a double coat of paint "StoSilco Color": 0.20 m)

Rendering system: Base coat with finishing coat indicated hereafter (evaluated without decorative coating or key coat, if not stated differently)	Equivalent air thickness s_d
Sto-Strukturputz K/R associated with decorative paints	≤ 1.0 m (Test result obtained with Sto-Strukturputz K2 and a double coat of paint "StoSilco Color": 0.20 m)
StoMiral EKP (Edelkratzputz)	≤ 1.0 m (Test result obtained with $t = 11$ mm: 0.40 m)
* checked with adhesive	

Annex 4

Safety and accessibility in use (BWR 4)

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

		Conditioning		
		Initial state	After hygrothermal cycles	After freeze/ thaw test
StoLevell Uni	Average	145	120	Test not required because freeze/thaw cycles not necessary
	Minimal value	110	110	

4.2 Bond strength between adhesive and substrate

Substrate: concrete		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	Average	1650	1020	1205
	Minimal value	935	719	1066
StoLevell Uni	Average	1240	430	1280
	Minimal value	935	360	1010
StoLevell Duo	Average	1925	720	1360
	Minimal value	1356	607	1268
StoLevell Duo Plus	Average	1522	746	1146
	Minimal value	1035	545	1056
StoLevell Duo Plus QS	Average	1264	523	2001
	Minimal value	961	341	1691
StoLevell Novo	Average	515	350	490
	Minimal value	413	319	401
StoLevell FT	Average	855	390	710
	Minimal value	726	363	650
Sto Coll Mineral HP	Average	2080	184	1790
	Minimal value	1927	173	1732
StoLevell SW plus	Average	131	141	211
	Minimal value	78	119	177
StoLevell Alpha	Average	1770	1135	2285
	Minimal value	1612	0869	2016
Sto-Dispersionskleber	Average	2700	1420	870
	Minimal value	2130	1180	710
Sto-Prefa Coll	Average	1220	120	1310
	Minimal value	1213	107	1203

4.3 Bond strength between adhesive and insulation product (EPS)

		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	Average	110	90	145
	Minimal value	86	60	105
StoLevell Uni	Average	145	65	145
	Minimal value	110	55	115
StoLevell Duo	Average	90	80	140
	Minimal value	90	55	130
StoLevell Duo Plus	Average	116	77	152
	Minimal value	93	66	144
StoLevell Duo Plus QS	Average	85	50	81
	Minimal value	74	45	67
StoLevell Novo	Average	125	65	140
	Minimal value	106	50	129
StoLevell FT	Average	112	53	125
	Minimal value	87	44	118
Sto Coll Mineral HP	Average	100	90	90
	Minimal value	88	87	80
StoLevell SW plus	Average	96	102	99
	Minimal value	82	89	93
StoLevell Alpha	Average	150	145	145
	Minimal value	143	136	136
Sto-Dispersionskleber	Average	190	200	170
	Minimal value	180	170	160
Sto-Prefa Coll	Average	120	120	130
	Minimal value	112	109	123

4.4 Bond strength of foam adhesive

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

Bonded surface:

$$S [\%] = 0,03 \text{ N/mm}^2 \times 100 / 0,08 \text{ N/mm}^2$$

$$S = 37,5 \%$$

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

English translation prepared by DIBt

4.5 Wind load resistance

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

4.5.1 Safety in use of mechanically fixed ETICS using profiles

Characteristics of the EPS (standard EPS)	Dimensions	500 mm x 500 mm
	Thickness	≥ 60 mm
	Tensile strength perpendicular to the faces	≥ 150 kPa
	Shear modulus	≥ 1.0 N/mm ²
Failure loads [kN / panel] (Static Foam Block Test)	Horizontal profiles fixed every 30 cm and 49.4 cm long vertical connection profiles	Minimal: 0.095 Average: 0.101

4.5.2 Safety in use of mechanically fixed ETICS using anchors

Apply to all anchors listed in the 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			∅ 60 mm	∅ 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 the 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			∅ 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 for a plate diameter of anchor of 60 mm apply to the following anchors with deep mounting but only on the following conditions of installation:

Anchor	Thickness of the EPS [t]	Conditions of installation*
ejothem STR U, ejothem STR U 2G (ETA-04/0023)	100 mm > t ≥ 80 mm (for standard and elastified EPS)	– Maximum installation depth of the anchor plate: 15 mm (△ thickness of insulation cover) – Incision depth: 20 mm
	≥ 100 mm (for standard and elastified EPS)	– Maximum installation depth of the anchor plate: 15 mm (△ thickness of insulation cover) – Incision depth: 35 mm
TERMOZ 8 SV (ETA-06/0180)	≥ 80 mm (for standard EPS only)	– Maximum installation depth of the anchor plate: 15 mm (△ thickness of insulation cover)
* according to the appropriate ETA of anchor		

4.6 Render strip tensile test

The average value of crack width of the base coat reinforced with the different glass fibre meshes measured at a render strain value of 1 % is:

StoLevell Uni with the glass fibre meshes specified below	Average value of crack width $w_{m(1\%)}$
Sto-Glasfasergewebe	0,16 mm
Sto-Glasfasergewebe F	0,06 mm

4.7 Foam adhesive characteristics

Trade name	Shear strength [N/mm ²]	Shear modulus [N/mm ²]	Maximum post expansion after 1.5 h [mm]
Sto Turbofix Mini	0.081	0.960	11.0

4.8 Bond strength after ageing

Finishing coat with base coat indicated hereafter		7 d immersion in water and 7 d drying [kPa]
Stolit K/R/Effect/MP	Average	125
	Minimal value	97
Stolit Milano	Average	120
	Minimal value	116
Stolit K1,5 + Stolit Milano	Average	125
	Minimal value	119
Sto-Ispolit K/R/MP	Average	121
	Minimal value	117
StoMarlit K/R	Average	125
	Minimal value	108
StoLotusan K/MP	Average	100
	Minimal value	89
StoCleyer B mit Sto-Klebe-und Fugenmörtel	Average	120
	Minimal value	96
Sto Ecoshape mit Sto-Klebe- und Fugenmörtel	Average	120
	Minimal value	96
StoSuperlit	Average	135
	Minimal value	129
StoNivellit	Average	135
	Minimal value	128
Sto-Silkolit K/R/MP	Average	119
	Minimal value	107
StoSilco K/R/MP	Average	115
	Minimal value	102
Sto-Silco blue K/MP	Average	112
	Minimal value	105
Stolit QS K/R/MP	Average	130
	Minimal value	117
StoSilco QS K/R/MP	Average	120
	Minimal value	103
StoSil K/R/MP	Average	110
	Minimal value	88
StoMiral K/R/MP	Average	135
	Minimal value	117
StoMiral Nivell F	Average	135
	Minimal value	83
Sto-Strukturputz K/R	Average	125
	Minimal value	104
StoMiral EKP (Edelkratzputz)	Average	105
	Minimal value	93

4.9 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	2150 N / 50 mm	2450 N / 50 mm
Residual tensile strength after aging	1100 N / 50 mm	1380 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-Panzergewebe	Average warp	Average weft
Tensile strength in as-delivered state	7954 N / 50 mm	8936 N / 50 mm
Residual tensile strength after aging	5886 N / 50 mm	5051 N / 50 mm
Relative residual tensile strength after aging	74.0 %	56.5 %
Elongation in as-delivered state	4.3 %	4.4 %
Elongation after aging	3.2 %	2.7 %

Annex 5

Energy economy and heat retention (BWR 6)

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 anchors profiles increases the thermal transmittance U . This influence had to take into account according to EN ISO 6946.

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

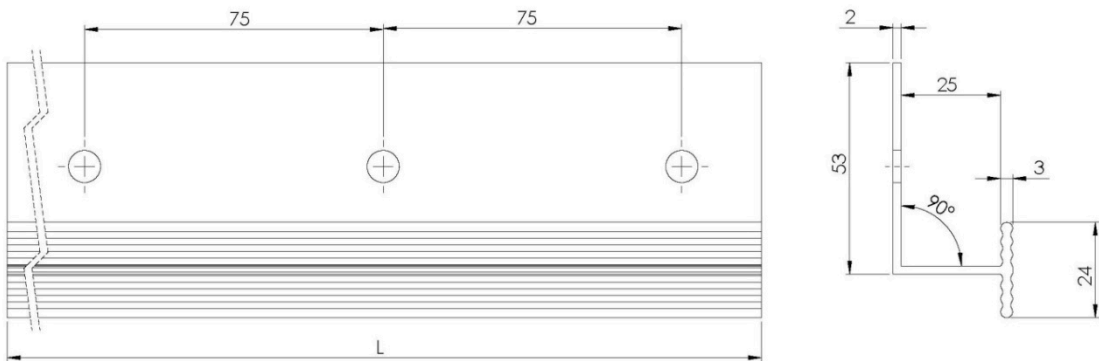
- Where:
- U_c : corrected thermal transmittance [$\text{W}/(\text{m}^2 \cdot \text{K})$]
 - n : number of anchors per m^2
 - χ_p : local influence of thermal bridge caused by an anchor. The values listed below can be taken into account if not specified in the anchor's ETA:
 - $\chi_p = 0.004 \text{ W/K}$ 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

The thermal bridges caused by profiles are negligible.

Annex 6: Profiles

Polyvinyl chloride (PVC) profiles, PVC-U, EGL, 082-05-T33 to EN ISO 1163-1: with the measurements are to be used in the mechanically fixed ETICS with profiles.
The Pull-through resistance of fixings from profiles is ≥ 500 N.

Horizontal profile – "Sto-Halteleiste PVC" (dimensions in millimetres)



Vertical connection profile "Sto-Halteleiste PVC" (dimensions in millimetres)

