Deutsches Institut für Bautechnik

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Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment ETA-09/0231 of 3 April 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 Mineral 1
Product family to which the construction product belongs	Product area code: 4 External Thermal Insulation Composite System with rendering on mineral wool 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	26 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	ETA-09/0231 issued on 28 August 2023

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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 is comprised a prefabricated insulation product of mineral wool (MW) to be bonded and if necessary additional mechanically fixed onto a wall.

The walls are made of masonry (bricks, blocks, stones…) or concrete (cast on site or as prefabricated panels). The methods of fixing and the relevant components are specified in annex 1 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 Mineral 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 Performance of the product and references to the methods used for its assessment

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 MW-insulation product - Cross heat of combustion for the MW-insulation product EN ISO 1716 - Apparent density EN 1602	(see annex 2) Euroclass A1 according EN 13501-1 Value [MJ/kg] Value [kg/m³]
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 **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 3.0 kg/m²	
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 with all finishing coats except "StoSil" and "StoMiral EKP (Edelkratzputz)" is less than 0.5 kg/m² after 24 hours. The ETICS with the finishing coat "StoSil" 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	(see annex 3.3) s_d value [m]	
- MW insulation product	μ = 1	Thickness of the insulation product 340 mm

3.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Bond strength	
between base coat and MW insulation product	(see annex 4.1) - Minimal value/average [kPa] - Minimal value/average [kPa]
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 MW 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
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 4.4) - R_{panel} [kN/fixing], - R_{joint} [kN/fixing], - Plate diameter of anchor ≥ 60 mm, ≥ 90 mm 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 MW panel, MW panel	σ_{mt} ≥ 14 kPa, σ_{mt} ≥ 5 kPa (mechanically fixed ETICS with anchors and supplementary adhesive)
MW lamella	σ_{mt} ≥ 80 kPa (bonded ETICS)
in wet conditions - series 2 - series 3	≥ 33 % of average value in dry conditions ≥ 50 % of average value in dry conditions

Essential characteristic	Performance
Shear strength of the ETICS MW panel $\sigma_{mt} \geq 14$ kPa MW lamella $\sigma_{mt} \geq 80$ kPa MW panel $\sigma_{mt} \geq 5$ kPa	 ≥ 20 kPa ≥ 20 kPa ≥ 6 kPa
Shear modulus of the ETICS MW panel $\sigma_{mt} \geq 14$ kPa MW lamella $\sigma_{mt} \geq 80$ kPa MW panel $\sigma_{mt} \geq 5$ kPa	 ≥ 1.0 MPa ≥ 1.0 MPa ≥ 0.3 MPa
Render strip tensile test	(see annex 4.5) Crack width w_{rk} [m]
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 MW insulation product	no performance assessed
Air flow resistance of the MW 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 [$(m^2 \cdot K)/W$]
Thermal transmittance of ETICS	(see annex 5) Calculated value or measurement value U [$W/(m^2 \cdot K)$]

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 Mineral 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 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 3 April 2024 Deutsches Institut für Bautechnik

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beglaubigt:
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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 mineral wool (MW) product*		
	- MW lamella	–	≤ 340
	• **Adhesive**		
	- **StoLevell FT** (cement based powder requiring addition of 28 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Duo Plus** (cement based powder requiring addition of 25 % of water)	3.0 to 7.5 (powder)	–
	- **Sto-Baukleber** (cement based powder requiring addition of 21 – 23 % 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)	–
	- **StoColl IP** (cement based powder requiring addition of 20 % of water)	4.0 to 5.0 (powder)	–
	- **StoLevell Novo** (cement based powder requiring addition of 37 % of water)	3.0 to 7.5 (powder)	–
	- **StoLevell Duo** (cement based powder requiring addition of 20 – 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)	–
	- **StoColl Mineral HP** (cement based powder requiring addition of 23 – 25 % of water)	3.0 to 7.5 (powder)	–
	- **StoColl IP plus** (cement based powder requiring addition of 21 – 23 % of water)	3.0 to 7.5 (powder)	–
	Mechanically fixed ETICS with anchors and supplementary adhesive:		
	• **Insulation product** factory-prefabricated mineral wool (MW) product*		
	- MW panel	–	60 to 340
	- MW lamella	–	60 to 200
	• **Supplementary adhesives** (equal to bonded ETICS)		
	• **Anchors for insulation product** all anchors with ETA according to EAD330196-00-0604[1]		

[1] EAD330196-01-0604 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/m²]**	**Thickness [mm]**
Base coat	**StoLevell Uni** Identical with the equally named adhesive given above.	4.0 bis 6.5 (powder)	3.0 to 5.0
Glass fibre mesh	**Sto-Glasfasergewebe** Alkali- and slide-resistant glass fibre mesh with mass per unit area of 165 ± 15 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 165 ± 15 g/m² and mesh size of about 4.0 mm x 4.0 mm	–	–
	Sto-Panzergewebe (implemented in addition to the standard mesh to improve the impact resistance) Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 330 g/m² and mesh size of about 7.5 mm x 7.5 mm	–	–
Key coat**	**StoPrep Miral** **StoPrep Isol Q** **Sto-Putzgrund** **Sto-Putzgrund QS** **StoPrep Miral AimS** Ready to use pigmented acrylic-resin dispersion liquids. "StoPrep Miral" with additional potassium silicate binder.	about 0.3	– – – –
Finishing coat	• Ready to use paste – acrylic binder:		
	Stolit K (particle size 1.0 to 6.0 mm)	1.8 to 6.0	regulated by particle size
	Stolit R (particle size 1.0 to 6.0 mm)	1.8 to 6.0	
	Stolit Effect (particle size 3.0 mm)	3.5 to 5.5	
	Stolit MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	Stolit Milano	1.5 to 2.5	1.0 to 2.0
	Stolit K (particle size 1.5 mm) **+ Stolit Milano**	3.8 to 4.8	2.0 to 3.0
	Sto-Ispolit K (particle size 1.5 to 3.5 mm)	2.3 to 4.3	regulated by particle size
	Sto-Ispolit R (particle size 1.5 to 3.5 mm)	2.3 to 4.3	
	Sto-Ispolit MP (thin, middle or thick layer)	2.3 to 4.0	1.5 to 3.0
	StoMarlit K (particle size 1.5 to 3.5 mm)	2.3 to 4.3	regulated by particle size
	StoMarlit R (particle size 1.5 to 3.5 mm)	2.3 to 4.3	
	StoLotusan K (particle size 1.0 to 3.0 mm)	1.8 to 4.3	
	StoLotusan MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	• Ready to use paste – acrylic/siloxane binder:		
	Sto-Silkolit K (particle size 1.5 to 3.5 mm)	2.3 to 4.3	regulated by particle size
	Sto-Silkolit R (particle size 1.5 to 3.5 mm)	2.3 to 4.3	
	Sto-Silkolit MP (thin, middle or thick layer)	2.3 to 4.0	1.5 to 3.0

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
Finishing coat	**StoSilco K** (particle size 1.0 to 3.0)	1.8 to 4.3	regulated by particle size
	StoSilco R (particle size 1.0 to 3.0)	1.8 to 4.3	
	StoSilco MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	StoSilco blue K (particle size 1.0 to 3.0 mm)	1.6 to 4.6	regulated by particle size
	StoSilco blue MP (thin, middle or thick layer)	1.5 to 4.0	1.5 to 3.0
	• Ready to use paste – acrylic binder (application between 0 °C und 15 °C)		
	Stolit QS K (particle size 1.0 to 3.0 mm)	1.8 to 4.3	regulated by particle size
	Stolit QS R (particle size 1.0 to 3.0 mm)	1.8 to 4.3	
	Stolit QS MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	• Ready to use paste – acrylic/siloxane binder (application between 0 °C und 15 °C)		
	StoSilco QS K (particle size 1.0 to 3.0 mm)	1.8 to 4.3	regulated by particle size
	StoSilco QS R (particle size 1.0 to 3.0 mm)	1.8 to 4.3	
	StoSilco QS MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	• Ready to use paste – silicate binder		
	StoSil K (particle size 1.0 to 3.0 mm)	2.2 to 4.3	regulated by particle size
	StoSil R (particle size 1.0 to 3.0 mm)	2.2 to 4.3	
	StoSil MP (thin, middle or thick layer)	1.5 to 4.0	1.0 to 3.0
	• Cement based powder requiring addition of about 25 % in weight of water:		
	StoMiral K (particle size 1.0 to 6.0 mm)	1.6 to 5.2	regulated by particle size
	StoMiral R (particle size 1.0 to 6.0 mm)	1.6 to 5.2	
	StoMiral MP (fine structure)	1.5 to 4.0	1.0 to 3.0
	• Cement based powder requiring addition of about 28 % in weight of water associated with a decorative paint:		
	StoMiral Nivell F (fine structure)	3.0 to 5.1	1.0 to 3.0
	• Cement based powder requiring addition of about 30 % in weight of water associated with a decorative paint:		
	Sto-Strukturputz K (particle size 2.0 and 3.0 mm)	2.5 to 2.9	regulated by particle size
	Sto-Strukturputz R (particle size 2.0 and 3.0 mm)	2.5 to 2.9	
	• Cement based powder requiring addition of 24 to 32 % in weight of water:		
	StoMiral EKP (Edelkratzputz) (particle size 2.0 to 4.0 mm)	24.0 to 28.0	8.0 to10.0***

	Components National application documents shall be taken into account	**Coverage [kg/m²]**	**Thickness [mm]**
	• Ready to use pastes – actylic binder – associated with synthetic briquettes		
	StoCleyer B +	48 to 76 [pieces/m²]	4,0
	Sto-Klebe- und Fugenmörtel	3.0 to 3.5	1.0 to 2.0
	StoEcoshape +	2.4 to 780 [pieces/m²]	4.0 to 7.0
	Sto-Klebe- und Fugenmörtel	3.0 to 3.5	1.0 to 2.0
Decorative paint (optional)	StoColor Silco	0.2 to 0.4 l/m²	–
	StoColor Silco G	0.2 to 0.4 l/m²	–
	StoColor Jumbosil	0.2 to 0.4 l/m²	–
	StoColor Silco + 2% StoAdditiv QS	0.2 to 0.4 l/m²	–
	StoColor Jumbosil + 2% StoAdditiv QS	0.2 to 0.4 l/m²	–
	StoColor Maxicryl	0.2 to 0.4 l/m²	–
	StoColor Maxicryl + 2% StoAdditiv QS	0.2 to 0.4 l/m²	–
	StoColor Crylan	0.2 to 0.4 l/m²	–
	StoColor Lotusan	0.2 to 0.4 l/m²	–
	StoColor Lotusan G	0.2 to 0.4 l/m²	–
	StoColor Silco Variant	0.2 to 0.4 l/m²	–
	Stocolor Silco Variant G	0.2 to 0.4 l/m²	–
	StoColor Solical	0.2 to 0.4 l/m²	–
	StoColor Solical G	0.2 to 0.4 l/m²	–
	StoColor X-black	0.2 to 0.4 l/m²	–
	StoColor Maxisil	0.2 to 0.4 l/m²	–
	StoColor Top	0.15 to 0.3 l/m²	–
	StoColor Dryonic	0.15 to 0.3 l/m²	–
	StoColor Dryonic G	0.15 to 0.3 l/m²	–
	StoColorDryonic M	0.1 to 0.17 l/m²	–
Ancillary material	Remains the manufacturer's responsibility		

* Factory-prefabricated panels and lamella made of mineral wool (MW) with the following designation code and the other properties shall be used, provided that the manufacturer and the trade name of the MW are deposited with the DIBt
MW – EN 13162 – T5 – DS(T+) – WS – WL(P) – MU1

** The instruction to the installer concerning the use of a key coat remains the responsibility of the ETA-holder.

*** The applied thickness of 10 to 25 mm is reduced to 8 to 10 mm by scraping.

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
Base coat	max. 2.4 %	no flame retardant	
Mineral wool insulation product	Euroclass A1 according to EN 13501-1	no flame retardant	
Profile	-	-	
Anchors	-	-	
Rendering system: Base coat with finishing coat and compatible key coat indicated in clause 1			
Stolit K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"	max. 9.6 %	min. 8.0 %	A2 - s1,d0
Stolit K 1,5 + Stolit Milano with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
Stolit Effect with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
Stolit Milano with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/"StoPrep Miral AimS"			
StoLotusan K/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "StoPrep Miral"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
StoSilco K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "StoPrep Miral"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
StoSilco blue K/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "StoPrep Miral"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
Sto-Ispolit K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"		no flame retardant	

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
StoMarlit K/R with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"	max. 9,6 %	no flame retardant	A2 - s1,d0
Sto-Silkolit K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "StoPrep Miral"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
Stolit QS K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"		min. 9.4 %	
StoSilco QS K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"			
StoSil K/R/MP with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"	max. 6.0 %	no flame retardant	
StoMiral K/R/MP with key coat "StoPrep Miral"/ "Sto-Putzgrund"/ "StoPrep Miral AimS"	max. 1.8 %		
StoMiral Nivell F with key coat "StoPrep Miral"/ "Sto-Putzgrund"/ "StoPrep Miral AimS"			
Sto-Strukturputz K/R with key coat "StoPrep Miral"/ "StoPrep Miral AimS", associated with a decorative paint			
StoMiral EKP (Edelkratzputz) with key coat "StoPrep Miral"/ "StoPrep Miral AimS"			
Sto-Klebe- und Fugenmörtel + StoCleyer B oder Sto-EcoShape with key coat "StoPrep QS"/ "Sto-Putzgrund"/ "Sto-Putzgrund QS"/ "StoPrep Miral AimS"	max. 8.0 %	min. 15.0 % min. 20.1 %	A2 - s1,d0

2.2 Cross heat of combustion for the MW-insulation product EN ISO 1716

PCS ≤ 1.02 MJ/kg

2.3 Apparent density EN 1602

Description and characteristics	MW panel	MW panel	MW lamella
Tensile strength perpendicular to the faces [kPa]; EN 1607 - in dry conditions*	$\sigma_{mt} \geq 14$	$\sigma_{mt} \geq 5$	$\sigma_{mt} \geq 80$
Apparent density [kg/m³]; EN 1602	$120 \leq \rho_a \leq 150$	85 (nominal value) $\leq \rho_a \leq 150$	$80 \leq \rho_a \leq 150$
* Minimal value of all single values			

Annex 3

Hygiene, health and environment (BWR 3)

3.1 Water absorption (capillarity test)

Base coat:

Unterputz	Thickness	Average water absorption [kg/m²]	
		after 1 h	after 24 h
StoLevell Uni	4 mm	0.044	0.299

Rendering system:

Finishing coat with base coat "StoLevell Uni" indicated hereafter	Average water absorption [kg/m²]	
	after 1 h	after 24 h
Stolit K/R/Effect/MP	0.012	0.097
Stolit Milano	0.057	0.427
Stolit K + Stolit Milano	0.006	0.112
Sto-Ispolit K/R/MP	0.007	0.093
StoMarlit K/R	0.007	0.093
StoLotusan K/MP	0.008	0.065
Sto-Silkolit K/R/MP	0.015	0.199
StoSilco K/R/MP	0,016	0.150
StoSilco blue K/MP	0.037	0.221
Stolit QS K/R/MP	0.017	0.228
StoSilco QS K/R/MP	0.062	0.403
StoSil K/R/MP	0.340	0.820
StoMiral K/R/MP	0.039	0.178
StoMiral Nivell F	0.019	0.128
Sto-Strukturputz K/R	0.040	0.167
StoMiral EKP (Edelkratzputz)	0.278	0.990
Sto-Klebe- und Fugenmörtel + StoCleyer B or Sto-EcoShapes	0.020	0.240

3.2 Impact resistance (tested on the rig and on small samples)

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

Rendering system: Base coat "StoLevell Uni" with finishing coat indicated hereafter:	**Standard mesh [Category]**	**2 x Standard mesh [Category]**	**Standard mesh with Sto-Panzergewebe [Category]**
Stolit K/R/Effect/MP	II	II	I
Stolit Milano	III	II	II
Stolit K + Stolit Milano	I	no performance assessed	no performance assessed
Sto-Ispolit K/R/MP	II	II	II
StoMarlit K/R	II	II	II
StoLotusan K/MP	II	II	II
Sto-Silkolit K/R/MP	I	no performance assessed	no performance assessed
StoSilco K/R/MP	II	II	II
StoSilco blue K/MP	II	no performance assessed	no performance assessed
Stolit QS K/R/MP	II	II	II
StoSilco QS K/R/MP	II	II	II
StoSil K/R/MP	II	II	II
StoMiral K/R/MP	II	II	II
StoMiral Nivell F	III	II	II
Sto-Strukturputz K/R	II	II	II
StoMiral EKP (Edelkratzputz)	I	I	I
Sto-Klebe- und Fugenmörtel + StoCleyer B or Sto-EcoShapes	I	no performance assessed	no performance assessed

3.3 Water vapour permeability ETICS

Equivalent air thickness s_d [m]				**Calculated Equivalent air thickness s_d [m]**
Base coat:				
"StoLevell Uni"	0.06 m			
Rendering system:				
Finishing coat		**Decorative coat**		**of the system**
Stolit K/R/MP/Effect	0.18 m	StoColor Silco / G	0.08 m	0.32 m
		StoColor Silco Variant / G	0.10 m	0.34 m
		StoColor Jumbosil	0.13 m	0.37 m
		StoColor Lotusan / G	0.03 m	0.27 m
Sto-Ispolit K/R/MP	0.04 m	StoColor Silco / G	0.08 m	0.18 m
		StoColor Silco Variant / G	0.10 m	0.20 m
		StoColor Jumbosil	0.13 m	0.23 m
		StoColor Lotusan / G	0.03 m	0.13 m
StoMarlit K/R	0.04 m	StoColor Silco / G	0.08 m	0.18 m
		StoColor Silco Variant / G	0.10 m	0.20 m
		StoColor Jumbosil	0.13 m	0.23 m
		StoColor Lotusan / G	0.03 m	0.13 m
StoLotusan K/MP	0.11 m	StoColor Silco / G	0.08 m	0.25 m
		StoColor Silco Variant / G	0.10 m	0.27 m
		StoColor Jumbosil	0.13 m	0.30 m
		StoColor Lotusan / G	0.03 m	0.20 m
Sto-Silkolit K/R/MP	0.04 m	StoColor Silco / G	0.08 m	0.18 m
		StoColor Silco Variant / G	0.10 m	0.20 m
		StoColor Jumbosil	0.13 m	0.23 m
		StoColor Lotusan / G	0.03 m	0.13 m
StoSilco K/R/MP	0.08 m	StoColor Silco / G	0.08 m	0.22 m
		StoColor Silco Variant / G	0.10 m	0.24 m
		StoColor Jumbosil	0.13 m	0.27 m
		StoColor Lotusan / G	0.03 m	0.17 m
StoSilco blue K/MP	0.10 m	StoColor Silco / G	0.08 m	0.24 m
		StoColor Silco Variant / G	0.10 m	0.26 m
		StoColor Jumbosil	0.13 m	0.29 m
		StoColor Lotusan / G	0.03 m	0.19 m
Stolit QS K/R/MP	0.16 m	StoColor Silco / G	0.08 m	0.30 m
		StoColor Silco Variant / G	0.10 m	0.32 m
		StoColor Jumbosil	0.13 m	0.35 m
		StoColor Lotusan / G	0.03 m	0.25 m

Equivalent air thickness s_d [m]				**Calculated Equivalent air thickness s_d [m]**
Base coat:				
"StoLevell Uni"	0.06 m			
Rendering system:				
Finishing coat		**Decorative coat**		**of the system**
StoSilco QS K/R/MP	0.11 m	StoColor Silco / G	0.08 m	0.25 m
		StoColor Silco Variant / G	0.10 m	0.27 m
		StoColor Jumbosil	0.13 m	0.30 m
		StoColor Lotusan / G	0.03 m	0.20 m
StoSil K/R/MP	0.07 m	StoColor Silco / G	0.08 m	0.21m
		StoColor Silco Variant / G	0.10 m	0.23 m
		StoColor Jumbosil	0.13 m	0.26 m
		StoColor Lotusan / G	0.03 m	0.16 m
StoMiral K/R/MP	0.05 m	StoColor Silco / G	0.08 m	0.19 m
		StoColor Silco Variant / G	0.10 m	0.21 m
		StoColor Jumbosil	0.13 m	0.24 m
		StoColor Lotusan / G	0.03 m	0.14 m
Stolit Milano	0.42 m	-	-	0.48 m
Stolit K 1,5 + Stolit Milano	0.18 m + 0.42 m	-	-	0.66 m
StoMiral Nivell F	0.02 m	StoColor Silco / G	0.08 m	0.16 m
Sto-Strukturputz K/R	0.02 m	StoColor Silco / G	0.08 m	0.16 m
StoMiral EKP (Edelputz)	0.31 m	-	-	0.37 m
Sto-Klebe- und Fugenmörtel	0.32 m	StoEcoshape	0.58	0.96 m
		StoCleyer B	0.33	0.71 m

Annex 4

Safety and accessibility in use (BWR 4)

4.1 Bond strength between base coat and MW lamella

		Conditioning		
		Initial state [kPa]	**After hygrothermal cycles [kPa]**	**After freeze/thaw test**
StoLevell Uni	Average	87	44*	Test not required because freeze/thaw cycles not necessary
	Minimal value	77	30*	

* < 80 kPa, but failure in thermal insulation material

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]**
StoLevell FT (5 mm)	Average	in adhesive	1233	369	1157
	Minimal value		784	299	1026
StoLevell Duo Plus (5 mm)	Average	in adhesive	1230	583	2020
	Minimal value		1166	501	1893
Sto-Baukleber (5 mm)	Average	in adhesive	1210	1150	1620
	Minimal value		930	970	1210
StoColl IP plus (5 mm)	Average	in adhesive	1210	1150	1620
	Minimal value		930	970	1210
StoLevell Uni (5 mm)	Average	in adhesive	1793	637	2560
	Minimal value		1586	467	2489
StoColl IP (3 – 5 mm)	Average	in adhesive	1565	975	1830
	Minimal value		1407	577	1738
StoLevell Novo (5 mm)	Average	in adhesive	793	405	1059
	Minimal value		733	327	947
StoLevell Duo (5 mm)	Average	in adhesive	1175	524	1874
	Minimal value		983	456	1660
StoLevell Alpha (5 mm)	Average	in adhesive	2178	1133	2554
	Minimal value		2066	989	2339
StoColl Mineral HP (5 mm)	Average	in adhesive	2080	1840	1790
	Minimal value		1927	1732	1732

4.3 Bond strength between adhesive and MW lamella

		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]
StoLevell FT (3 – 5 mm)	Average	in insulation product	86	64	68*
	Minimal value		73*	57	56*
StoLevell Duo Plus (3 – 5 mm)	Average	in insulation product	91	74	92
	Minimal value		85	67	80
Sto-Baukleber (3 – 5 mm)	Average	in insulation product	102	92	78
	Minimal value		91	81	70*
StoColl IP plus (3 – 5 mm)	Average	in insulation product	102	92	78
	Minimal value		91	81	70*
StoLevell Uni (3 – 5 mm)	Average	in insulation product	87	60	81
	Minimal value		77*	55	78*
StoColl IP (3 – 5 mm)	Average	in insulation product	105	85	105
	Minimal value		971	776	945
StoLevell Novo (3 – 5 mm)	Average	in insulation product	81	41	80
	Minimal value		75*	34	72*
StoLevell Duo (3 – 5 mm)	Average	in insulation product	130	135	125
	Minimal value		108	121	111
StoLevell Alpha (3 – 5 mm)	Average	in insulation product	110	95	100
	Minimal value		102	85	87
StoColl Mineral HP (3 – 5 mm)	Average	in insulation product	140	110	110
	Minimal value		128	106	101
* < 80 kPa but failure in thermal insulation material					

Minimal bonded surface area

S [%] = 0.03 N/mm² x 100 / 0.08 N/mm²

S = 37.5 %

The minimal bonded surface S of bonded ETICS is 50 % (systemic).

4.4 Wind load resistance

The following failure loads only apply to the listed combination of component characteristics and the characteristics of the insulation product in annex 1.

4.4.1 Safety in use of mechanically fixed ETICS using anchors

Failure loads – table 1

Apply to all anchors listed in the annex 1 mounted on the insulation panels surface			
Characteristics of the **MW panels**	Thickness		≥ 60 mm
	Tensile strength perpendicular to the faces		**≥ 14 kPa**
Plate diameter of anchor			≥ ∅ 60 mm
Failure load [kN]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 0.65 Average: 0.74
	Anchors placed at the panel joints (Static Foam Block Test)	R_{joint}	Minimal: 0.59 Average: 0.61
	Anchors not placed at the panel joints (Pull-through test, dry conditions)	R_{panel}	Minimal: 0.64 Average: 0.60
	Anchors not placed at the panel joints (Pull-through test, wet conditions) - series 2* - series 3*	R_{panel}	Minimal: 0.36 Average: 0.39 Minimal: 0.41 Average: 0.45
* according to EAD 040083-00-0404 clause 2.2.14.2			

Failure loads – table 2

Apply to all anchors listed in the annex 1 mounted on the insulation panels surface				
Characteristics of the **MW panels**	Thickness		≥ 80 mm	
	Tensile strength perpendicular to the faces		**≥ 5.0 kPa**	
Plate diameter of anchor			≥ ∅ 90 mm	≥ ∅ 140 mm
Failure load [kN]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 0.48 Average: 0.49	Minimal: 0.56 Average: 0.69
	Anchors placed at the panel joints (Static Foam Block Test)	R_{joint}	Minimal: 0.38 Average: 0.39	Minimal: 0.44 Average: 0.54
	Anchors not placed at the panel joints (Pull-through test, dry conditions)	R_{panel}	Minimal: 0.54 Average: 0.61	no performance assessed
	Anchors not placed at the panel joints (Pull-through test, wet conditions) - series 2*	R_{panel}	Minimal: 0.40 Average: 0.46	no performance assessed
* according to EAD 040083-00-0404 clause 2.2.14.2				

Failure loads – Table 3

Apply to all anchors listed in the annex 1 mounted on the insulation panels surface			
Characteristics of the **MW lamella**	Thickness		≥ 60 mm
	Tensile strength perpendicular to the faces		**≥ 80 kPa**
Plate diameter of anchor			≥ ∅ 140 mm
Failure load [kN]	Anchors placed at the panel joints (Pull-through test, dry condition)	R_{joint}	Minimal: 0.62 Average: 0.66
	Anchors placed at the panel joints (Pull-through test, wet condition)	R_{joint}	Minimal: 0.51 Average: 0.57
	Anchors placed at the panel joints (Static Foam Block Test)	R_{joint}	Minimal: 0.71

The failure loads specified above with a plate diameter of anchor of 60 mm apply to the following anchors with deep mounting only under the following conditions:

Anchor	Thickness of the MW 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) – Cutting depth 20 mm
	t ≥ 100 mm	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover) – Cutting 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

4.5 Bond strength after aging

Finishing coats with base coats indicated hereafter		**7 d immersion in water and 7 d drying [kPa]**
Stolit K/R/Effect/MP	Average	88
	Minimal value	76*
Stolit Milano	Average	104
	Minimal value	99
Stolit K + Stolit Milano	Average	100
	Minimal value	87
Sto-Ispolit K/R/MP	Average	78*
	Minimal value	67*
StoMarlit K/R	Average	78*
	Minimal value	67*
StoLotusan K/MP	Average	107
	Minimal value	102
Sto-Silkolit K/R/MP	Average	76*
	Minimal value	72*
StoSilco K/R/MP	Average	81
	Minimal value	72*
StoSilco blue K/MP	Average	151
	Minimal value	139.8
Stolit QS K/R/MP	Average	81
	Minimal value	74*
StoSilco QS K/R/MP	Average	100
	Minimal value	95
StoSil K/R/MP	Average	82
	Minimal value	78*
StoMiral K/R/MP	Average	133
	Minimal value	117.6
StoMiral Nivell F	Average	80.8
	Minimal value	73.3
Sto-Strukturputz K/R	Average	83.4
	Minimal value	78.7*
StoMiral EKP (Edelkratzputz)	Average	81.4
	Minimal value	76.2*
Sto-Klebe- und Fugenmörtel + StoCleyer B or StoEcoShape	Average	133
	Minimal value	91.2
* < 80 kPa but failure in thermal insulation material		

4.6 Render strip tensile test

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

Base coat	Glass fibre mesh	Average value of crack width $w_{m\ (1\%)}$
StoLevell Uni	Sto-Glasfasergewebe	0.06 mm
	Sto-Glasfasergewebe F	0.10 mm

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 %

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)

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 (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

$U_c = U + \chi_p \cdot n$

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