Deutsches Institut für Bautechnik

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Bautechnisches Prüfamt

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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 4
Product family to which the construction product belongs	Product area code: 4 External Thermal Insulation Composite System with rendering on expanded polystyrene 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	23 pages including 4 annexes which form an integral part of this assessment Annex 5 Control Plan contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "External Thermal Insulation Composite Systems with Rendering", ETAG 004, edition 2000, amended 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.
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Specific Part

1 Technical description of the product

1.1 Definition and composition of the kit

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 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 additional mechanically fixed onto a wall. The methods of fixing and the relevant components are specified in the table below.

The insulation product is faced with a rendering system consisting of one or more layers (site applied), one of which contains reinforcement. The rendering is applied directly to the insulating panels, without any air gap or disconnecting layer.

The ETICS may include special fittings (e.g. base profiles, corner profiles ...) to treat details of ETICS (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.

Definition of the construction product

	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** (see annex 1 for product characteristics) factory-prefabricated expanded polystyrene (EPS) – standard EPS – elastified EPS • **Adhesives** – **Sto Levell FT** (cement based powder requiring addition of 28 % of water) - **StoLevell Duo** (cement based powder requiring addition of about (20 - 23) % of water) - **StoLevell Duo Plus** (cement based powder requiring addition of 25 % of water) - **Sto-Baukleber** (cement based powder requiring addition of (21 - 23) % of water) - **Sto-Coll IP** (cement based powder requiring addition of 20 % of water) - **Sto-Dispersionskleber** (organic based ready to use paste)	– 4.0 to 7.0 (powder) 4.5 to 6.0 (powder) 4.0 to 4.5 (powder) 3.0 to 5.0 (powder) 4.0 to 5.0 (powder) 1.0 to 1.5	≤ 400 ≤ 200 – – – – – –
	Mechanically fixed ETICS with profiles and supplementary adhesive: • **Insulation product** (see annex 1 for product characteristics) factory-prefabricated expanded polystyrene (EPS)		

	Components (National application documents shall be taken into account)	**Coverage [kg/m²]**	**Thickness [mm]**
	– standard EPS	–	60 to 200
Insulation material with associated method of fixing	• **Supplementary adhesive** (equal to bonded ETICS) • **Profiles** (see annex 3 for product characteristics) – "Sto-Halteleiste PVC" – "Sto-Verbindungsleiste PVC" Polyvinyl chloride (PVC) profiles • **Anchors for profiles** (see annex 2 for product characteristics) – ejotherm SK U – WS 8 L – WS 8 N – ejotherm SDK U – IsoFux ND-8Z – SDF-K plus, SDF-S plus – ejotherm NK U		
	Mechanically fixed ETICS with anchors and supplementary adhesive: • **Insulation product** (see annex 1 for product characteristics) factory-prefabricated expanded polystyrene (EPS) – standard EPS – elastified EPS • **Supplementary adhesive** (equal to bonded ETICS) • **Anchors for insulation product** (see annex 2 for product characteristics) all anchors with ETA according to ETAG 014[1] with characteristics defined in annex 2	 – –	 60 to 400 60 to 200
Base coat	**StoLevell Duo** **StoLevell Duo Plus** Identical with the equally named adhesives given above.	4.5 to 6.0 (powder)	3 to 5
Glass fibre mesh	• **Sto-Glasfasergewebe** Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 150 g/m² and mesh size of about 6.0 mm x 6.0 mm. (see annex 4 for product characteristics)	–	–

[1] ETAG 014 Plastic anchors for fixing of external thermal insulation composite systems with rendering

	Components (National application documents shall be taken into account)	**Coverage [kg/m²]**	**Thickness [mm]**
Glass fibre mesh	• **Sto-Glasfasergewebe F** Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 160 g/m² and mesh size of about 4.0 mm x 4.0 mm. (see annex 4 for product characteristics)	–	–
	• **Sto-Abschirmgewebe AES** (special mesh including a thin stainless yarn to reduce radiation of electric fields) Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 170 g/m² and mesh size of about 4.0 mm x 4.0 mm. (see annex 4 for product characteristics)		
	• **Sto-Panzergewebe** (reinforced mesh implemented in addition to the meshes described above to improve the impact resistance) Alkali- and slide-resistant glass fibre mesh with mass per unit area of about 500 g/m² and mesh size of about 7.5 mm x 7.5 mm.	**–**	**–**
Key coat	**StoPrep Miral** **Sto-Putzgrund** **Sto-Putzgrund QS** **StoPrep QS** Ready to use pigmented acrylic-resin dispersion liquids. StoPrep Miral with additional potassium silicate binder. For the compatibility with the finishing coats see below.	about 0.3	–
Finishing coat	**To use with key coat "Sto-Putzgrund"/ "StoPrep QS", if applicable:***		
	• Ready to use pastes – acrylate binder:		
	Stolit K (particle size 1.0 to 6.0 mm)	2.0 to 6.5	regulated by particle size
	Stolit R (particle size 1.5 to 6.0 mm)	2.2 to 6.1	
	Stolit Effect (particle size 3.0 mm)	4.5 to 5.5	
	Stolit MP (thin, middle or thick layer)	2.2 to 4.7	1.5 to 3.5
	Stolit Milano	2.0 to 4.0	1.0 to 2.0
	Stolit Milano + Stolit K (particle size 1.5 mm)	about 2.3 + about 3.0	2.0 to 3.0
	StoMarlit K (particle size 1.5 to 3.0 mm)	2.6 to 4.9	regulated by particle size
	StoMarlit R (particle size 1.5 to 3.0 mm)	2.5 to 4.4	
	Sto-Ispolit K(particle size 1.5 – 2.5 and 3.5 mm)	2.3 to 4.3	
	Sto-Ispolit R (particle size 1.5 – 2.5 and 3.5 mm)	2.3 to 4.3	
	StoSuperlit K (particle size 1.5 to 2.0 mm)	4.5 to 6.0	
	StoLotusan K (particle size 1.0 to 3.0 mm)	2.0 to 5.0	
	StoLotusan MP (thin, middle or thick layer)	2.2 to 4.7	1.5 to 3.5

	Components (National application documents shall be taken into account)	**Coverage [kg/m²]**	**Thickness [mm]**
Finishing coat	• Ready to use paste - acrylic binder -associated with a decorative paint:		
	StoNivellit + **StoColor Silco** (acrylic/siloxane binder)	3.0 to 3.5 0.2 to 0.4 l/m²	1.0 to 1.5
	• Ready to use paste - acrylic binder - associated with synthetic briquettes		
	Sto-Klebe- und Fugenmörtel + **Sto-Flachverblender - size I, II and III**	3.0 to 4.0 76, 64 and 48 pieces/m² **	4.0 to 7.0
	• Ready to use pastes – acrylic/siloxane binder:		
	Sto-Silkolit K (particle size 1.5 – 2.5 and 3.5 mm)	2.3 to 4.3	
	Sto-Silkolit R (particle size 1.5 – 2.5 and 3.5 mm)	2.3 to 4.3	regulated by particle size
	StoSilco K (particle size 1.0 to 3.0 mm)	2.0 to 5.0	
	StoSilco R (particle size 1.5 to 3.5 mm)	2.9 to 4.5	
	StoSilco MP (thin, middle or thick layer)	2.2 to 4.7	1.5 to 3.5
	To use with key coat "Sto-Putzgrund QS"/"StoPrep QS", if applicable: **		
	• Ready to use paste – acrylic binder: (application between 0 °C and 15 °C):		
	Stolit QS K (particle size 1.0 to 3.0 mm)	2.0 to 4.8	regulated by particle size
	Stolit QS R (particle size 1.5 to 3.0 mm)	2.2 to 4.5	
	Stolit QS MP (thin, middle or thick layer)	2.2 to 4.7	1.5 to 3.5
	• Ready to use paste – acrylic/siloxane binder (application between 0 °C and 15 °C):		
	StoSilco QS K (particle size 1.0 to 3.0 mm)	2.0 to 5.0	regulated by particle size
	StoSilco QS R (particle size 1.5 to 3.0 mm)	2.9 to 4.5	
	StoSilco QS MP (thin, middle or thick layer)	2.2 to 4.7	1.5 to 3.5
	To use with key coat "StoPrep Miral", if applicable: *		
	• Ready to use pastes – silicate binder:		
	StoSil K (particle size 1.0 to 3.0 mm)	2.2 to 4.4	regulated by particle size
	StoSil R (particle size 1.5 to 3.0 mm)	2.4 to 3.9	
	StoSil MP (thin, middle or thick layer)	1.5 to 4.0	1.5 to 3.5
	• Cement based powder requiring addition of about 25 % in weight of water:		
	StoMiral K (particle size 1.5 to 6.0 mm)	1.7 to 5.0	regulated by particle size
	StoMiral R (particle size 1.5 to 6.0 mm)	1.7 to 4.5	
	StoMiral MP (fine structure)	1.5 to 4.0	1.5 to 3.5
	• Cement based powder requiring addition of about 20 to 23 % in weight of water associated with a decorative paint:		

	Components (National application documents shall be taken into account)	**Coverage [kg/m²]**	**Thickness [mm]**
	StoMiral Nivell F (fine structure)	3.0 to 4.5	2.0 to 5.0
Finishing coat	• Cement based powder requiring addition of about 30 % in weight of water associated with a decorative paint:		
	Sto-Strukturputz K (particle size 2 and 3 mm)	2.3 to 2.7	Regulated by particle size
	Sto-Strukturputz R (particle size 2 and 3 mm)	2.4 to 2.7	
	• Cement based powder requiring addition of about 24 to 32 % in weight of water:		
	StoMiral Edelkratzputz (particle size 2.0 to 4.0 mm)	15 to 25	8 to 10 ***
Decorative paint	• Ready to use paint with acrylic/siloxane binder: **StoColor Silco** **StoColor Jumbosil**	0.2 to 0.4 l/m²	
Ancillary material	Remain under the manufacturer's responsibilities.		

* The instruction to the installer concerning the use of a key coat remains the responsibility of the ETA-holder.
** Depend on the size of the pieces (I, II or III).
*** The applied thickness of 10 to 25 mm is reduced to 8 to 10 mm by scraping.

2. Specification of the intended use in accordance with the applicable European assessment Document (EAD)

2.1 Intended use

This ETICS is intended to be used as external insulation to the walls of buildings made of masonry (bricks, blocks, stones …) or concrete (cast on site or as prefabricated panels) with and without rendering. The characteristics of the walls shall be verified prior to use of the ETICS, especially regarding conditions for reaction to fire classification and for fixing of the ETICS either by bonding or mechanically. It shall be designed to give the wall to which it is applied satisfactory thermal insulation.

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

The ETICS can be used on new or existing (retrofit) vertical walls.

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

The choice of the method of fixing depends on the characteristics of the substrate, which could need preparation (see clause 7.2.1 of ETAG 004) and on the national instructions.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the ETICS "Sto Therm Vario 4" 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.

2.2 Manufacturing

The European Technical Assessment (ETA) is issued for the ETICS on the basis of agreed data/information, deposited with the DIBt, which identifies the ETICS that has been assessed and judged. Changes to the ETICS or the components or their production process, which could result in this deposited data/information being incorrect, should be notified to the DIBt before the changes are introduced. The DIBt will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

2.3 Design and installation

The installation instructions including special installation techniques and provisions for the qualification of the personnel are given in the manufacturer's technical documentation.

Design, installation and execution of ETICS are to be in conformity with national documents. Such documents and the level of their implementation in Member States' legislation are different. Therefore, the assessment and declaration of performance are done taking into account general assumptions introduced in the chapters 7.1 and 7.2 of ETAG 004 used as EAD, which summarize how information introduced in the ETA and related documents is intended to be used in the construction process and gives advice to all parties interested when normative documents are missing.

2.4 Packing, transport and storage

The information on packaging, transport and storage is given in the manufacturer's technical documentation. It is the responsibility of the manufacturer to ensure that this information is made know to the concerned people.

2.5 Use, maintenance, 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 localised damaged areas due to accidents,
- the aspect maintenance with products adapted and compatible with the ETICS (possibly after washing or ad hoc preparation).

Only products which are compatible with the ETICS shall be used.

Necessary repairs should be performed 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 know to the concerned people.

3 Characteristics of products and methods of verification

3.0 General

The performances of the kit as described in this chapter are valid provided that the components of the kit comply with Annexes 1- 4.

3.1 Mechanical resistance and stability (BWR 1)

not relevant

3.2 Safety in case of fire (BWR 2)

Reaction to fire (BWR 2) (ETAG 004 - clause 5.1.2)

Configurations	**Organic content**	**Flame retardant content**	**Euroclass according to EN 13501-1**
Base coat	max. 3.5 %	no flame retardant	
EPS	In quanity ensuring Euroclass E according to EN 13501-1	In quanity ensuring Euroclass E according to EN 13501-1	
Profiles	-	-	
anchors	-	-	
Rendering system: Base coat with finishing coat and compatible key coat indicated hereafter :			
Stolit K/R (particle size 3,5 to 6,0 mm) with key coat "Sto-Putzgrund"/ "StoPrep QS"	max. 9.8 %	min. 8.8 %	C – s2,d0
Stolit K/R (particle size 1,0 to 3,0 mm) with key coat "Sto-Putzgrund"/ "StoPrep QS"	max. 9.9 %	min. 10.0 %	B – s2,d0
Stolit Effect/MP with key coat "Sto-Putzgrund"/ "StoPrep QS"			
Stolit Milano with key coat "Sto-Putzgrund"/ "StoPrep QS"			
Stolit K1,5 + Stolit Milano with key coat "Sto-Putzgrund"/ "StoPrep QS"			
StoMarlit K/R with key coat "Sto-Putzgrund"/ "StoPrep QS"			
Sto-Ispolit K/R with key coat "Sto-Putzgrund"/ "StoPrep QS"			
StoLotusan K/MP with key coat "Sto-Putzgrund/ "StoPrep QS"			
StoNivellit + StoSilco Color with key coat "Sto-Putzgrund"/ "StoPrep QS"			

Configurations	Organic content	Flame retardant content	Euroclass according to EN 13501-1
Sto-Silkolit K/R with key coat "Sto-Putzgrund"/ "StoPrep QS"			
StoSilco K/R/MP with key coat "Sto-Putzgrund"			
Stolit QS K/R/MP with key coat "Sto-Putzgrund QS"/"StoPrep QS"			
StoSilco QS K/R/MP with key coat "Sto-Putzgrund QS"/"StoPrep QS"			
StoSil K/R/MP with key coat "StoPrep Miral"	max. 5.2 %	no flame retardant	B – s1,d0
StoMiral K/R/MP with key coat "StoPrep Miral"	max. 3.1 %	no flame retardant	B – s1,d0
StoMiral Nivell F with key coat "StoPrep Miral" associated with a decorative paint			
Sto-Strukturputz K/R with key coat "StoPrep Miral", associated with a decorative paint			
StoMiral Edelkratzputz with key coat "StoPrep Miral"			
Sto-Klebe- und Fugenmörtel + Sto-Flachverblender with key coat "Sto-Putzgrund"/"StoPrep QS"	max. 8,4 %	min. 20.0%	B – s2,d0
StoSuperlit K with key coat "Sto-Putzgrund"/"StoPrep QS"			F (no performance determined)

3.3 Hygiene, health and environment (BWR 3)

3.3.1 Water absorption (capillarity test) (ETAG 004 - clause 5.1.3.1)

- **Base coat:** StoLevell Duo
  StoLevell Duo Plus
  - Water absorption after 1 hour < 1 kg/m^2
  - Water absorption after 24 hours $< 0{,}5$ kg/m^2

- **Rendering system:**

		Water absorption after 24 hours	
		< 0.5 kg/m²	≥ 0.5 kg/m²
Rendering systems: Base coat "StoLevell Duo" or "StoLevell Duo Plus" with finishing coats indicated hereafter:	Stolit K/R/Effect/MP	x	
	Stolit Milano	x	
	Stolit K1.5 + Stolit Milano	x	
	StoMarlit K/R	x	
	Sto-Ispolit K/R	x	
	StoLotusan K/MP	x	
	Sto-Klebe- und Fugenmörtel + Sto-Flachverblender	x	
	StoSuperlit K	x	
	StoNivellit + StoSilco Color	x	
	Sto-Silkolit K/R	x	
	StoSilco K/R/MP	x	
	Stolit QS K/R/MP	x	
	StoSilco QS K/R/MP	x	
	StoSil K/R/MP		x
	StoMiral K/R/MP	x	
	StoMiral Nivell F, associated with a decorative paint	x	
	Sto-Strukturputz K/R associated with a decorative paint	x	
	StoMiral Edelkratzputz		x

3.3.2 Hygrothermal behaviour (ETAG 004 - clause 5.1.3.2)

Pass (without defects)

Freeze/thaw behaviour

The ETICS with the finishing coats "StoSil" and "StoMiral Edelkratzputz" has been assessed as freeze/thaw resistant according to the simulated method.

3.3.3 Impact resistance (ETAG 004 – clause 5.1.3.3)

Rendering system: Base coat "StoLevell Duo" or "StoLevell Duo Plus" with finishing coats indicated hereafter:	**Sto Glasfasergewebe or Sto Glasfasergewebe F**	**Sto Glasfasergewebe or Sto Glasfasergewebe F + Sto-Panzer-gewebe**	**Sto-Abschirm-gewebe AES**
Stolit K/R/Effect/MP	Category II	Category I	Category II
Stolit Milano	Category III		
Stolit K1.5 + Stolit Milano	Category II		
Sto-Ispolit K/R			

Rendering system: Base coat "StoLevell Duo" or "StoLevell Duo Plus" with finishing coats indicated hereafter:	**Sto Glasfasergewebe or Sto Glasfasergewebe F**	**Sto Glasfasergewebe or Sto Glasfasergewebe F + Sto-Panzer-gewebe**	**Sto-Abschirm-gewebe AES**
StoMarlit K/R	Category II		Category II
StoLotusan K/MP		Category I	
Sto-Klebe- und Fugenmörtel + Sto-Flachverblender	Category I		Category I
StoSuperlit K	Category II	Category I	Category II
StoNivellit + StoColor Silco	Category III	Category II	Category III
Sto-Silkolit K/R	Category II		
StoSilco K/R/MP	Category II	Category I	Category II
Stolit QS K/R/MP			
StoSilco QS K/R/MP			
StoSil K/R/MP		Category II	
StoMiral K/R/MP			
StoMiral Nivell F			
Sto-Strukturputz K/R	Category II		
StoMiral Edelkratzputz	Category I		

3.3.4 Water vapour permeability (ETAG004 – clause 5.1.3.4)

Rendering system: Base coat "StoLevell Duo" or "StoLevell Duo Plus" with finishing coat indicated hereafter (evaluated without decorative coating or key coat)	**Equivalent air thickness s_d** (Test results obtained with a layer thickness of the base coat of 6 mm)
Stolit K/R/Effect/MP	≤ 1.0 m (Test result obtained with Stolit K2: 0.4 m)
Stolit Milano	≤ 1.0 m (Test result obtained with d = 1 mm: 0.5 m)
Stolit K1.5 + Stolit Milano	≤ 1.0 m (Test result obtained with d = 2.5 mm: 0.8 m)
Sto-Ispolit K/R	≤ 1.0 m (Test result obtained with StoMarlit K2: 0.4 m)
StoMarlit K/R	≤ 1.0 m (Test result obtained with d = 2.5 mm: 0.41 m)
StoLotusan K/MP	≤ 1.0 m (Test result obtained with StoLotusan K2: 0.2 m)
Sto-Klebe- and Fugenmörtel + Sto-Flachverblender	≤ 1.0 m (Test result obtained with size III: 0.6 m)

Rendering system: Base coat "StoLevell Duo" or "StoLevell Duo Plus" with finishing coat indicated hereafter (evaluated without decorative coating or key coat)	**Equivalent air thickness s_d** (Test results obtained with a layer thickness of the base coat of 6 mm)
StoSuperlit K	≤ 1.0 m (Test result obtained with "Farbsand" (special colour coated grain) K2: 0.4 m) (Test result obtained with "Silmer" (natural coloured grain) K2: 0.3m)
StoNivellit + StoColor Silco	≤ 1.0 m (Test result obtained with d = 1 mm: 0.4 m)
Sto-Silkolit K/R	≤ 1.0 m (Test result obtained with d = 2.5 mm: 0.21 m)
StoSilco K/R/MP	≤ 1.0 m (Test result obtained with StoSilco K2: 0.3 m)
Stolit QS K/R/MP	≤ 1.0 m (Test result obtained with Stolit QS K2: 0.3 m)
StoSilco QS K/R/MP	≤ 1.0 m (Test result obtained with StoSilco QS K2: 0.3 m)
StoSil K/R/MP	≤ 1.0 m (Test result obtained with StoSil K2: 0.2 m)
StoMiral K/R/MP	≤ 1.0 m (Test result obtained with StoMiral K2: 0.1 m)
StoMiral Nivell F associated with decorative paint	≤ 1.0 m (Test result obtained with d = 2 mm and a double coat of paint "StoSilco Color": 0.2 m) (Test result obtained with d = 2 mm and a double coat of paint "StoColor Jumbosil": 0.2 m)
Sto-Strukturputz K/R associated with decorative paint	≤ 1.0 m (Test result obtained with Sto-Strukturputz K3 and a double coat of paint "StoSilco Color": 0.2 m) (Test result obtained with Sto-Strukturputz K3 and a double coat of paint "StoColor Jumbosil": 0.3 m)
StoMiral Edelkratzputz	≤ 1.0 m (Test result obtained with d = 11 mm: 0.4 m)

3.3.5 Release of dangerous substances (ETAG 004 - clause 5.1.3.5, EOTA TR 034)

Essential characteristic	**Performance**
Release of dangerous substances	no performance assessed

3.4 Safety and accessibility in use (BWR 4)

3.4.1 Bond strength between base coat and insulation product (EPS) (ETAG 004 - clause 5.1.4.1.1)

	Conditioning		
Base coat	**After hygrothermal cycles**	**After freeze/thaw test**	**Initial state**
StoLevell Duo	≥ 0,08 MPa	≥ 0,08 MPa	≥ 0,08 MPa
StoLevell Duo Plus	≥ 0,08 MPa	≥ 0,08 MPa	Test not required because freeze/thaw cycles not necessary

3.4.2 Bond strength between base coat and adhesive resp. insulation product (ETAG 004 - clause 5.1.4.1.2 and 5.1.4.1.3)

		Conditioning		
Adhesive	**Substrate resp. insulation product**	**Initial state**	**2 d immersion in water and 2 h drying**	**2 d immersion in water and 7 d drying**
StoLevell FT	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa
StoLevell Duo	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa
StoLevell Duo Plus	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa
Sto-Baukleber	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa
Sto-Coll IP	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa
Sto-Dispersions-kleber	Concrete	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	Brick	≥ 0.25 MPa	≥ 0.08 MPa	≥ 0.25 MPa
	EPS	≥ 0.08 MPa	≥ 0.03 MPa	≥ 0.08 MPa

Bonded surface:

For bonded ETICS the calculated minimal bonded surface area, according to ETAG 004, clause 6.1.4.1.3 is 40 %.

3.4.3 Bond strength after ageing

Rendering system: Base coat "StoLevell Duo" oder "StoLevell Duo Plus" with finishing coat indicated hereafter	Stolit K/R/Effect/MP	≥ 0.08 MPa
	Stolit Milano	
	Stolit K1.5 + Stolit Milano	
	Sto-Ispolit K/R	
	StoMarlit K/R	
	StoLotusan K/MP	
	Sto-Klebe- und Fugenmörtel + Sto-Flachverblender	
	StoSuperlit K	
	StoNivellit + StoSilco Color	
	Sto-Silkolit K/R	
	StoSilco K/R/MP	
	Stolit QS K/R/MP	
	StoSilco QS K/R/MP	
	StoSil K/R/MP	
	StoMiral K/R/MP	
	StoMiral Nivell F	
	Sto-Strukturputz K/R	
	StoMiral Edelkratzputz	

3.4.4 Fixing strength (displacement test) (ETAG 004 - clause 5.1.4.2)

Test not required (no limitation of ETICS length)

3.4.5 Wind load resistance (ETAG 004 - clause 5.1.4.3)

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

3.4.5.1 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/mm²
Failure loads [N / panel] (Static Foam Block Test)	Horizontal profiles fixed every 30 cm and 49.4 cm long vertical connection profiles	Minimal: 950 Average: 1010

3.4.5.2 Safety in use of mechanically fixed ETICS using anchors

Apply to all anchors listed in the clause .1 mounted on the insulation panels surface				
Characteristics of the EPS **(standard EPS)**	Thickness		≥ 60 mm	
	Tensile strength perpendicular to the faces		≥ 100 kPa	
	Shear modulus		≥ 1.0 N/mm²	
Plate diameter of anchor			∅ 60 mm	∅ 90 mm
Failure loads [N]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 510 Average: 520	Minimal: 720 Average: 730
	Anchors placed at the panel joints (Pull-through test)	R_{joint}	Minimal : 400 Average: 430	Minimal: 430 Average: 470

Apply to all anchors listed in the clause 1.1 mounted on the insulation panels surface			
Characteristics of the EPS **(elastified EPS)**	Thickness		≥ 60 mm
	Tensile strength perpendicular to the faces		≥ 80 kPa
	Shear modulus		≥ 0.3 N/mm²
Plate diameter of anchor			∅ 60 mm
Failure loads [N]	Anchors not placed at the panel joints (Static Foam Block Test)	R_{panel}	Minimal: 350 Average: 360
	Anchors placed at the panel joints (Pull-through test)	R_{joint}	Minimal: 300 Average: 310

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 [d]	Conditions of installation*
ejotherm STR U, ejotherm STR U 2G (ETA-04/0023)	100 mm > d ≥ 80 mm (for standard and elastified EPS)	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover) – Maximum depth of die: 5 mm
	≥ 100 mm (for standard and elastified EPS)	– Maximum installation depth of the anchor plate: 15 mm (≙ thickness of insulation cover) – Maximum depth of die: 20 mm
IsoFux NDT8LZ (ETA-05/0080)	≥ 80 mm (for standard and elastified EPS)	– Maximum depth of countersink: 20 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)
Hilti ETICS screwed-in anchor D 8-FV (ETA-07/0288)	≥ 100 mm (for standard and elastified EPS)	– Minimum thickness of fixture in the insulation panel: t_{fix} = 80 mm; only setting tools according to ETA-07/0288 are to be used.
* According to the appropriate ETA of anchor		

3.4.6 Render strip tensile test (ETAG 004 – clause 5.5.4.1)

The average value of crack width of the base coats reinforced with the different glass fibre meshes measured at a render strain value of 1.0 % is:

Base coat	Glass fibre mesh	Average value of crack width $w_{m(1\%)}$
StoLevell Duo	Sto-Glasfasergewebe	0.11 mm
	Sto-Glasfasergewebe F	No performance determined
	Sto-Abschirmgewebe AES	No performance determined
StoLevell Duo Plus	Sto-Glasfasergewebe	0.12 mm
	Sto-Glasfasergewebe F	0.12 mm
	Sto-Abschirmgewebe AES	0.10 mm

3.5 Protection against noise (BWR 5)

NPD (no performance determined)

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal resistance

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

$R = R_D + R_{render}$

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

$U_c = U + \chi_p \cdot n$ corrected thermal transmittance (W/(m² ·K)).

Where: $\chi_p \cdot n$: influence of thermal bridges

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:

$\chi_p = 0.002$ 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

$\chi_p = 0.004$ W/K for anchors with a galvanized steel screw with the head covered by a plastic material

U: thermal transmittance

The thermal bridges caused by profiles are negligible.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was investigated for this product.

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

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

Product	Intended use	Levels or classes (Reaction to fire)	Systems
"StoTherm Vario 4"	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+
	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 EAD

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 13 July 2016 by Deutsches Institut für Bautechnik

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Head of Department

beglaubigt:
Windhorst

Annexes:

Annex 1:	Thermal insulation product characteristic
Annex 2:	Anchors
Annex 3:	Profiles
Annex 4:	Reinforcement

Annex 1: Thermal insulation product characteristic

Factory-prefabricated, uncoated panels made of expanded polystyrene (EPS) to EN 13163:2008 shall be used, having the description and characteristics defined in the Table below.

Description and characteristics	For bonded ETICS	For mechanically fixed ETICS	
		with anchors and supplementary adhesive	with profiles and supplementary adhesive****
Reaction to fire; EN 13501-1:2007	Class E*		
Thermal resistance [(m²·K)/W]	Defined in the CE marking in reference to EN 13163:2008		
Tolerances			
Length; EN 822:1994	± 0.6 % or ± 3 mm whichever gives the greatest numerical tolerance (class L1 or class L2)		
Width [mm]; EN 822:1994	± 2 (class W2)		
Thickness [mm]; EN 823:1994	± 1 (class T2)		
Squareness [mm/m]; EN 824:1994	± 2 (class S2)		
Flatness [mm/m]; EN 825:1994	5 (class P4)		
Dimensional stability under			
- laboratory conditions [%]; EN 1603:1996	± 0.2 (class DS(N)2)		
- specified temperature and humidity conditions [%]; EN 1604:1996	2 (level DS(70,-)2 or level DS(70,-)1)		
Water absorption (long term partial immersion) [kg/m²]; EN 12087:1997	$W_{lp} \leq 0.5$		
Water vapour diffusion resistance factor; EN 12086:1997	$\mu = 20 – 78$		
Tensile strength perpendicular to the faces in dry conditions** [kPa]; EN 1607:1996			
- standard EPS	$\sigma_{mt} \geq 80$	$\sigma_{mt} \geq 100$	$\sigma_{mt} \geq 150$
- elastified EPS***	$\sigma_{mt} \geq 80$	$\sigma_{mt} \geq 80$	not used
Bending strength** [kPa]; EN 12089:1997	$\sigma_b \geq 50$		
Apparent density [kg/m³]; EN 1602:1996	$\rho_a \leq 30$		
Shear strength** [kPa]; EN 12090:1997	$20 \leq f_{\tau k} \leq 170$		
Shear modulus [MPa]; EN 12090:1997			
- standard EPS	$1.0 \leq G_m \leq 3.8$		
- elastified EPS***	$0.3 \leq G_m \leq 1.0$	$0.3 \leq G_m \leq 1.0$	not used
Testing of characteristics see EN 13163:2008.			

* See the conditions of clause 3.2 for the EPS.

** Minimal value of all single values

*** Elastified EPS is made from standard EPS by short time high load pressing to reduce the dynamic stiffness. The protection against noise of the entire wall is improved by the use of elastified EPS related to an ETICS with standard EPS.

**** Thermal insulation materials for mechanically fixed ETICS with profiles must circumferentially at the edges, 24 mm from the inner surface, get an approx. 3 mm wide and 13 to 18 mm deep groove cut-in at the factory.

Annex 2: Anchors

All anchors with ETA according to ETAG 014[1] with characteristics having the description below shall be used in the mechanically fixed ETICS:

- plate diameter of anchor ≥ 60 mm resp. ≥ 90 mm
- plate stiffness ≥ 0.3 kN/mm
- load resistance of the anchor plate ≥ 1.0 kN

These characteristics and the characteristic tension resistance of the anchors shall be taken from the corresponding ETA.

The anchors listed in the Table in clause 1.1 with reference to the respective ETA shall be used in the mechanically fixed ETICS with profiles for fixing the horizontal profiles.

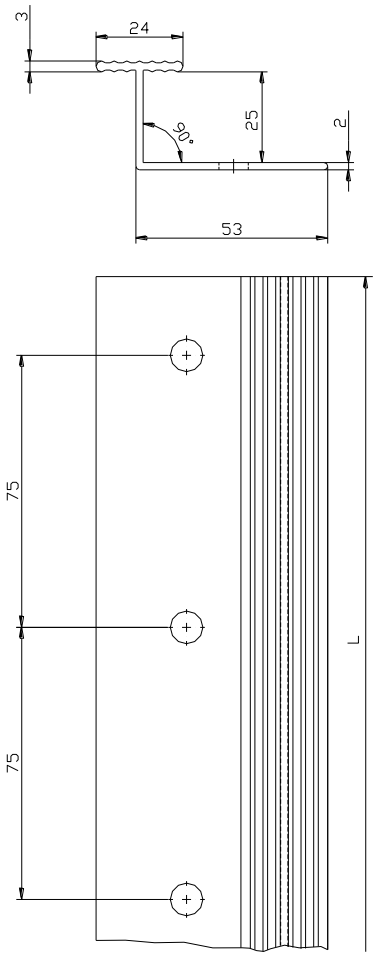
Trade name	ETA-number
ejotherm SK U	ETA-02/0018
WS 8 L	ETA-02/0019
WS 8 N	ETA-03/0019
ejotherm SDK U	ETA-04/0023
IsoFux ND-8Z	ETA-04/0032
SDF-K plus, SDF-S plus	ETA-04/0064
ejotherm NK U	ETA-05/0009

Annex 3: Profiles

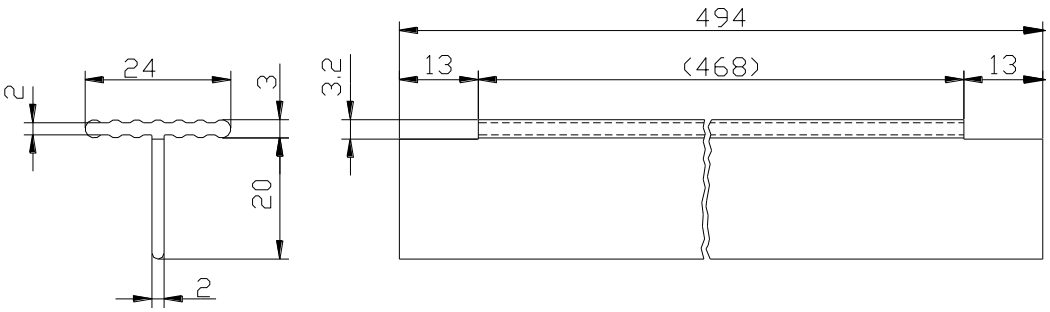
Polyvinyl chloride (PVC) profiles, PVC-U, EGL, 082-05-T33 to EN ISO 1163-1:1999, are to be used in the mechanically fixed ETICS with profiles.

The Pull-through resistance of fixings from profiles is ≥ 500 N.

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



Vertical connection profile "Verbindungsleiste PVC" (dimensions in millimetres)



Annex 4: Reinforcement (glass fibre mesh)

Characteristics (alkali resistance): Pass

	Sto-Glasfaser-gewebe		Sto-Glasfaser-gewebe F		Sto-Abschirmgewebe AES	
	Warp	Weft	Warp	Weft	Warp	Weft
Residual strength after ageing [N/mm]	≥ 20	≥ 25	≥ 20	≥ 20	≥ 20	≥ 25
Relative residual resistance after ageing in % of the strength in the as-delivered state	≥ 55	≥ 50	≥ 50	≥ 50	≥ 50	≥ 55