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European Technical Assessment

ETA 21/0333
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General part

Technical Assessment Body issuing the ETA: ITeC

ITeC has been designated according to Article 29 of Regulation (EU) No 305/2011 and is member of EOTA (European Organisation for Technical Assessment)

Trade name of the construction product

Sikasil® SG-510

Product family to which the construction product belongs

Structural glazing sealant

Manufacturer

Sika Services AG

Tueffenwies 16
CH-8048 Zurich
Switzerland

Manufacturing plant(s)

Sika Engineering Silicones S.R.L.

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This European Technical Assessment contains

11 pages including 2 annexes which form an integral part of this assessment.

This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of

ETAG 002-1 *Structural sealant glazing kits (SSGK) - Part 1 supported and unsupported systems used as EAD.*

This ETA replaces

ETA 21/0333 issued on 18.05.2021

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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Specific parts of the European Technical Assessment

1 Technical description of the product

This ETA is applicable to the Sikasil® SG-510 two-component silicone-based structural sealant to be used in structural sealant glazing systems (SSGS) for bonding glazing products to metallic support frames. Design characteristics are given in table 1.1.

Ancillary products for adhesion surface pre-treatment are indicated in Annex 1 of this ETA as well as Sikasil® SG-510 detailed information and data.

The structural sealant is one component of the SSGS. The SSGS is not covered by this ETA.

Table 1.1: Sikasil® SG-510 sealant design characteristics.

Characteristic	Value
Maximum thickness for unsupported systems	$e = 6,0 \text{ mm}$
Maximum design tensile stress	$\sigma_{\text{des}} = 0,15 \text{ MPa}$
Maximum design dynamic shear stress	$\Gamma_{\text{des}} = 0,13 \text{ MPa}$
Maximum design static shear stress	$\Gamma_{\infty} = 0,011 \text{ MPa}$
Elastic modulus in tension or compression secant to the origin	$E_o = 1,29 \text{ MPa}$
Elastic modulus in shear secant to the origin	$G_o = 0,43 \text{ MPa}$
Thermal conductivity	$\lambda = 0,35 \text{ W/(m}\cdot\text{K)}$

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

Sikasil® SG-510 is intended for bonding glazing products to metallic support frames.

Sikasil® SG-510 is part of bonded glazing systems used as facades and roofs, or parts thereof, with glazing at any angle between vertical and 7° above horizontal.

Substrate materials intended to be used with Sikasil® SG-510 are given in table 2.1.

Sikasil® SG-510 may be used in any of the four types (I, II, III and IV) of structural sealant glazing systems indicated in section 2.1 of ETAG 002-1.

Table 2.1: Substrate materials.

Generic type of substrate	European technical specification reference
Float glass (uncoated)	EN 572-2
Thermally toughened safety glass (uncoated)	EN 12150-1
Heat strengthened glass (uncoated)	EN 1863-1
Insulated glass unit (uncoated)	EN 1279-1 & EN 1279-5
Laminated safety glass (uncoated) (*)	EN ISO 12543-2
Anodised aluminium	EN 755 & EN 1999-1

(*) Fire resistant laminated glasses and laminated glasses with cast-in-place resin interlayer (e.g. acoustic glazing) are not assessed by this ETA.

The provisions made in this European Technical Assessment are based on an assumed working life of at least 25 years for Sikasil® SG-510. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer or the assessment body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

Detailed information and data regarding design, installation, maintenance and repair criteria are given in Annex 2.

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

The assessment of Sikasil® SG-510 for the intended use was performed following ETAG 002-1 *Structural sealant glazing kits (SSGK)*.

Table 3.1: Summary of the Sikasil® SG-510 performance (see also detailed performance in relevant sections).

Product:	Sikasil® SG-510	Intended use:	Bonding of glazing products to metallic support frames (anodised aluminium).				
Basic Works Requirement	ETA section	Essential characteristic		Performance			
BWR 2 Safety in case of fire	3.1	Reaction to fire		E			
BWR 3 Hygiene, health and the environment	---	Content and/or release of dangerous substances		Not assessed			
BWR 4 Safety and accessibility in use	3.2	Initial mechanical strength	Tensile stress	+ 23 °C + 80 °C - 20 °C	$R_{u,5} = 1,07 \text{ MPa}$ $R_{u,5} = 1,09 \text{ MPa}$ $\Delta X_m = 1,05$ $R_{u,5} = 0,99 \text{ MPa}$ $\Delta X_m = 1,07$		
			Shear stress	+ 23 °C + 80 °C	$R_{u,5} = 0,96 \text{ MPa}$ $R_{u,5} = 0,90 \text{ MPa}$ $\Delta X_m = 1,00$		
				- 20 °C	$R_{u,5} = 0,91 \text{ MPa}$ $\Delta X_m = 1,00$		
			3.3	Residual mechanical strength after artificial ageing	Immersion in water at high temperature with solar radiation	21 days 42 days	$\Delta X_m = 1,27$ $\Delta X_m = 0,97$
					Humidity and NaCl atmosphere		$\Delta X_m = 0,93$
					Humidity and SO ₂ atmosphere		$\Delta X_m = 1,19$
	Facade cleaning products				$\Delta X_m = 0,97$		
	3.4	Physical properties of structural sealant	Effects of materials in contact		Not assessed		
			Gas inclusion Elastic recovery Shrinkage Elastic modulus of the sealant		See table 3.3		
	3.5	Physical properties of structural sealant	Resistance to tearing		$\Delta X_m = 0,93$		
	3.6		Mechanical fatigue		$\Delta X_m = 1,01$		
	---		UV resistance of the sealant		See test results of immersion in water at high temperature with solar radiation		
3.7		Creep under long-term shear and cycling tensile loading		See table 3.4			

3.1 Reaction to fire

The reaction to fire of Sikasil® SG-510 has been assessed according to section 5.1.2.1 of ETAG 002-1.

The reaction to fire of Sikasil® SG-510 according to Commission Delegated Regulation (EU) 2016/364 and EN 13501-1 is class E. It is based on the relevant tests according to EN 13501-1.

Note: A European reference fire scenario has not been laid down for façades. In some Member States, the classification of structural sealant according to EN 13501-1 might not be sufficient for the use in façades. An additional assessment of structural sealant according to national provisions (e.g. on the basis of a large-scale test) might be necessary to comply with Member State regulations, until the existing European classification system has been completed.

3.2 Initial mechanical strength

Initial mechanical strength has been tested according to section 5.1.4.1 of ETAG 002-1.

Test results are given in table 3.2.

Value of the secant stiffness at 12,5% elongation in the initial state, $K_{12,5}$, is 2,76 MPa.

Table 3.2: Sikasil® SG-510 mechanical strength.

Test type		Breaking tensile stress (MPa)		Elongation at break (%)	Ratio	Cohesive rupture (%)	
		$\sigma_{u,m}$	$R_{u,5}$	$\epsilon_{u,m}$	ΔX_m	$C_{r,m}$	
Initial	Tensile stress	NT	1,13	1,07	225	---	100
		HT	1,19	1,09	164	1,05	100
		LT	1,21	0,99	229	1,07	100
	Shear stress	NT	1,17	0,96	346	---	100
		HT	1,17	0,90	268	1,00	100
		LT	1,16	0,91	374	1,00	100
Residual	H ₂ O+HT+UV (21 d)	1,44	---	197	1,27	100	
	H ₂ O+HT+UV (42 d)	1,07	---	208	0,97	100	
	HR+NaCl	1,05	---	260	0,93	100	
	HR+SO ₂	1,34	---	152	1,19	100	
	FCP	1,10	---	302	0,97	100	
Physical properties	RT	1,05	---	227	0,93	---	
	MF	1,14	---	205	1,01	---	

Where:

NT = At normal temperature, +23 °C.

HT = At high temperature, +80 °C.

LT = At low temperature, -20 °C.

H₂O+HT+UV = After immersion in water at high temperature (45 °C ± 1°C, with solar radiation for 21 days (504 h ± 4 h) and for 42 days (1008 h ± 4 h).

HR+NaCl = After high humidity and NaCl atmosphere for 480 hours.

HR+SO₂ = After high humidity and SO₂ atmosphere.

FCP = After immersion in façade cleaning products for 21 days at 45 °C ± 2 °C.

RT = Resistance to tearing.

MF = After mechanical fatigue conditioned for 28 days at normal temperature.

m = Mean (average) value.

$R_{u,5}$ = Characteristic value of breaking tensile stress giving 75% confidence that 95% of the test results will be higher than this value.

3.3 Residual mechanical strength

Residual mechanical strength has been tested according to section 5.1.4.2 of ETAG 002-1.

Test results are given in table 3.2.

Value of the secant stiffness at 12,5% elongation after immersion in water at high temperature with solar radiation for 42 days, $K_{12,5,c}$, is 2,14 MPa. Therefore, the ratio $K_{x,c} / K_x$, is 0,78.

3.4 Physical properties of structural sealant

Relevant properties of Sikasil® SG-510 have been tested according to section 5.1.4.6 of ETAG 002-1.

Test results are given in table 3.3.

Table 3.3: Sikasil® SG-510 physical properties test results.

Characteristic	Reference	Value
Gas inclusion	§ 5.1.4.6.1 of ETAG 002-1	No generation of gas bubbles
Elastic recovery (after 24 h)	EN ISO 7389, conditioning A	97,8 %
Shrinkage	EN ISO 10563	Change in mass: $\Delta m = - 1,9\%$ (*) Change in volume $\Delta V = - 2,1\%$ (*)
Elastic modulus	EN ISO 527-3	1,29 MPa
Specific mass	EN ISO 1183-1, method A	1,368 kg/l
Hardness Shore A	EN ISO 868	35
Thermogravimetric analysis	EN ISO 11358-1	Curve kept in ETA technical dossier
Colour	EN ISO 7724-1, EN ISO 7724-2	Black

(*) The symbol “-“ indicates a decrease of mass or volume.

3.5 Resistance to tearing

Resistance to tearing has been tested according to section 5.1.4.6.4 of ETAG 002-1. Sikasil® SG-510 use category is 1.

Test results are given in table 3.2.

3.6 Mechanical fatigue

The effect of fatigue stresses on the residual mechanical strength has been tested according to section 5.1.4.6.5 of ETAG 002-1.

Test results are given in table 3.2.

3.7 Creep under long-term shear and cycling tensile loading

Creep under long-term shear and tensile loading has been tested according to section 5.1.4.6.8 of ETAG 002-1.

Test results are given in table 3.4.

Table 3.4: Sikasil® SG-510 creep under long-term shear and tensile loading results.

Test type	Deformation after 91 days before unloading (mm)	Residual deformation 24 h after unloading (mm)
	d_m	r_m
Creep under long-term shear and cyclic tensile loading	0,13	0,05

Where:

m = mean (average) value.

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

According to the decision¹ 96/582/EC of the European Commission, the system of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 4.1: Applicable AVPC system.

Product	Intended use(s)	Level(s) or class(es)	AVCP System(s)
Structural sealant	For SSGS types I, II, III and IV	Any	1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC², with which the factory production control shall be in accordance.

Issued in Barcelona on 6 September 2021

by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart
 Technical Director, ITeC

¹ Official Journal of the European Union (OJEU) L 254 of 08/10/1996.

² The *Control Plan* is a confidential part of the ETA and is only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

ANNEX 1: Product description

A1.1 Sikasil® SG-510

Information included in table A1.1 has been taken from the technical data sheet of the manufacturer.

- Working time at 23 °C / 50% RH: < 35 minutes
- Skin-over time: not applicable for 2 component silicone glazing sealants
- Tack-free time at 23 °C / 50% RH: 200 minutes – 300 minutes
- Time before transport of bonded frame: 7 days; an earlier transportation is possible if the following two conditions are respected (see ETAG 002-1 Table 11): The quality control samples give the following results: rupture 100 % cohesive (H-specimen or peel adhesion test on original substrates) and breaking stress $\geq 0,75$ MPa.

Table A1.1: Sikasil® SG-510 Sealant.

Typical Product Data	Reference	Value	
		Component A	Component B
Chemical base	---	2-component silicone	
Colour	CQP 001-1	White	Black
Mixed colour		Black	
Cure mechanism	---	Polycondensation	
Cure type	---	Neutral	
Density (uncured)	---	1,37 kg/l	1,06 kg/l
Mixed density	---	1,34 kg/l	
Mixing ratio	A:B by volume	10:1	
	A:B by weight	13:1	
Viscosity	CQP 029-6	1100 Pa·s	800 Pa·s
Consistency	---	Paste	
Service temperature	CQP 513-1	- 40 °C to 150 °C	
Shelf-life storage below 25 °C	CQP 016-1	9 months	

CQP = Corporate Quality Procedure.

The maximum storage life of the sealant is given in the data sheet and the labelling.

Sikasil® SG-510 shall be applied between 5 °C and 35 °C under workshop conditions. The bonding shall be tooled before the snap time has been reached, preferably within 35 minutes after the extrusion. It is important to realise that the snap time can vary in temperature and relative humidity. For consulting the technical services of Sika should be contacted.

After the snap time has been reached, no relative moment shall be induced anymore between the glass and the metal frame.

In all cases it should be checked that there is no condensation on the substrates prior to the sealant application.

A1.2 Ancillary components

The ancillary components for adhesion surface pre-treatment are:

- Sika® Cleaner P or Sika® Cleaner G+M: surface cleaning agents.
- Sika® Aktivator-100: surface pre-treatment and cleaning agent.

Depending on the type of substrate, the corresponding ancillary products for adhesion surface pre-treatment should be used (see table A1.2 and section A2.1 of Annex 2 for more information on surface specifications).

Table A1.2: Other ancillary-pre-treatments products indicated by the manufacturer.

Generic type of substrate (*)	Surface pre-treatment
Float glass (including tempered, toughened, laminated)	Sika® Cleaner G+M or Sika® Cleaner P
Anodised aluminium	Sika® Cleaner P (*) or Sika® Cleaner P (*) & Sika® Aktivator-100
(*) For greasy or oily metal surfaces, Sika® Cleaner G+M is recommended instead of Sika® Cleaner P.	

ANNEX 2: Design, installation, maintenance and repair criteria

A2.1 Design

The design of structural sealant glazing systems used as facades and roofs using Sikasil® SG-510 for bonding glazing products on aluminium alloy support frames should consider:

- Failure of the adhesive bead might cause risk to human life and/or have considerable economic consequences. Therefore, special care should be considered with respect to:
 - The verification of the minimum dimension of the adhesive section (bead bite, bead thickness) by means of calculation, considering the design values given in table 1.1 of this ETA. National safety factors, other national provisions and specific provisions given by the sealant manufacturer must be followed.
 - The maximum thickness of the Sikasil® SG-510 seal assessed in this ETA for its use in unsupported glazing systems is 6 mm.
 - The verification of the adherence on the specific materials (glazing products and support frames) to be used on-site (see table 2.1) should be carried out according to manufacturer instructions.
 - The verification of the specific qualification and training of the Sikasil® SG-510 installer.
- The verification of the suitability of the specified adhesion surface preparation components (see Annex 1) by Sika Services AG for general and specific bonding surfaces.
 - The composition of effective cleaning and pre-treatment steps for specific bonding surfaces have to be discussed and agreed with the structural sealant manufacturer.
 - The surface pre-treatment agents recommended in Sika laboratory report shall be used. Otherwise, any guaranty for the adhesion behaviour of Sikasil® silicone adhesive is not valid.
- Sikasil® SG-510 may only be used after a detailed examination and written approval of the corresponding project details by the Technical Department of Sika Industry.
- For facade cleaning it is recommended to use a 1 % solution in water of a neutral detergent with pH 7 approximately. However, the assessment of the façade cleaning product must be done in the framework of the ETA for the structural glazing system to check compatibility aspect with other components. After the snap time has been reached, no relative movement shall be induced anymore between the glass and the metallic support frame.
- Glazing system shall be designed to allow the realisation of a regular, rectangular structural sealant bead without insert or discontinuous substrate.

A2.2 Installation

Installation of the structural sealant glazing systems used as facades and roofs using Sikasil® SG-510 should be carried out:

- According to the specifications of the manufacturer and using the product specified in this ETA.
- In accordance with the design and drawings prepared for the specific works. The manufacturer should ensure that the information on these provisions is given to those concerned.
- By appropriately qualified staff and under the supervision of the technical responsible of the specific works.
- Components' shelf-life and storage conditions must be respected (see tables in Annex 1 of this ETA).
- It should be checked that there is no condensation on the substrates before the sealant application.
- Preliminary surface cleaning by Sika® Cleaner P or Sika® Cleaner G+M should be applied before application of any primer or activating agent.
- Sika® Aktivator-100 is an activating agent to pre-treat surfaces to improve adhesion and shall always be applied on substrates after they have been properly cleaned with Sika® Cleaner G+M or Sika® Cleaner P.

A2.3 Maintenance and repair

Maintenance of the structural sealant glazing systems used as facades and roofs using Sikasil® SG-510 includes inspections on-site, to observe the appearance of any damage as cracking, detachment, delamination, mould presence, corrosion presence or water accumulation due to permanent moisture or permanent irreversible deformation.

When necessary, any repair must be carried out with the same components and following the repair instructions given by the manufacturer.