

Test report no.: 218124/21

Customer: Sika Deutschland GmbH
Stuttgarter Straße 117
72574 Bad Urach
Germany

Order: Testing of the non-structural joint sealant **Sikaflex®-403** in accordance with EN 15651-4 Sealants for non-structural use in joints in buildings and pedestrian walkways - Part 4: Sealants for pedestrian walkways

E-mail of: 2021-06-02

Ref: Mr Ralf Heinzmann

Sample receipt: 2021-07-15

Test period: 2021-08-03 to 2022-01-25

The test report comprises 12 pages and 1 annex.

Würzburg, 26 January 2022
Lg/km

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Die auszugsweise Wiedergabe, Vervielfältigung und Übersetzung dieses Berichtes bedarf der schriftlichen Genehmigung der SKZ-Testing GmbH. Die Ergebnisse beziehen sich auf die geprüften Produkte. Der Akkreditierungsumfang kann im Internet unter www.skz.de eingesehen werden.

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1. Order

The Company Sika Services AG, Stuttgarter Straße 117, 72574 Bad Urach, GERMANY, instructed SKZ - Testing GmbH by e-mail of 2 June 2021 to test the performance of an one-component joint sealant **Sikaflex®-403** in accordance with with EN 15651-4:2012-09 Sealants for non-structural use in joints in buildings and pedestrian walkways - Part 4: Sealants for pedestrian walkways. At time of testing, the standard EN 15651-4:2012-09 was superseded by EN 15651-4:2017-07. The testing was carried out according to EN 15651-4:2012-09 in accordance with the requirements of the Construction Products Regulation (Regulation No. 305/2011) to enable the CE conformity marking for sealants. For further information see website and the Official Journal of the European Commission.

2. Test material

The SKZ - Testing GmbH received the following samples for testing (description is based on inspection of the samples at SKZ - Testing GmbH and on the manufacturer's data):

10 cartridges one-component sealant

Designation:	Sikaflex®-403
Type (chemical family):	---
Colour:	Black
Batch number:	3005235461
Sample receipt:	2021-07-15

1x 250 mL Primer

Designation:	Sika Primer-115
Batch number:	3005341004
Sample receipt:	2021-07-15



3. Test procedure

The test of the performance of the non sagging one-component sealant **Sikaflex®-403** performed in accordance with EN 15651-4:2012-09, Part 4: Sealants for pedestrian walkways, class 20HM.

The testing scope includes a product type determination according to EN 15651-4.

SKZ - Testing GmbH is a notified body approved according to the Construction Products Regulation for the product standard EN 15651-4 (code no.: NB 1213).

Unless indicated otherwise, preconditioning and test procedure was performed at standard conditioning atmosphere 23/50, class 1 according to DIN EN ISO 291:2008-08.

Usually we carry out tests according to standards for which we have an accreditation. The list of all standards for which we are accredited is shown on the homepage at www.skz.de. In case of non-accredited procedures they are marked with *.

Production and pre-treatment of test specimens

For the test specimens with the joint dimensions 12 x 12 x 50 mm were produced according to ISO 8340:2005-06.

For the determination of all tensile properties and adhesion/cohesion properties substrate according to the following table was used and prepared:

Substrate according to ISO 13640:1999-12	Primer	Drying time of the primer up to the application of the sealant in the joints
Mortar M1	Sika® Primer-115	90 min

The preconditioning of the test specimens was carried out according to DIN EN ISO 8340:2005-09, method B.

Method A: Standard conditioning atmosphere 23/50, class 1 according to DIN EN ISO 291:2008-08

Method B: The test specimens were conditioned according to method A and subsequently, subjected three times to the following storage cycle:

- a) 3 days in the oven at $(70 \pm 2) ^\circ\text{C}$;
- b) 1 day in distilled water at $(23 \pm 2) ^\circ\text{C}$;
- c) 2 days in the oven at $(70 \pm 2) ^\circ\text{C}$;
- d) 1 day in distilled water at $(23 \pm 2) ^\circ\text{C}$



3.1 Performance requirements for non-structural sealants for pedestrian walkways

3.1.1 Elastic recovery

The test was carried out according to DIN EN ISO 7389:2004-04 with test specimens made of anodised aluminium with a 60 % extension, in relation to the initial joint width.

Requirement:

The elastic recovery shall be at least 60 %.

3.1.2 Resistance to flow

The test was carried out according to DIN EN ISO 7390:2004-04.

Requirement:

According to method A at 5 °C und 50 °C the slump (flow) of the joint sealant must not exceed 3 mm.

3.1.3 Tensile properties (secant tensile modulus)

The test was carried out according to DIN EN ISO 8339:2005-09. The secant tensile modulus was determined on test specimens, which were extended by 60 % of the original width at temperatures of 23 °C and -20 °C.

Requirement:

Secant tensile modulus at 23 °C: > 0.4 MPa
or
at -20 °C: > 0.6 MPa

3.1.4 Tensile properties at maintained extension

The test was carried out according to ISO 8340:2005-09 with an extension of 60 % at temperatures of 23 °C and -20 °C.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 60 %.



3.1.5 Determination of adhesion/cohesion properties at variable temperatures

The test was carried out according to DIN EN ISO 9047:2016-02. The amplitude of extension/compression was ± 20 % of the initial joint width.

Requirement:

The joint sealant must not separate from the contact material nor shall the joint sealant display any signs of crack formation.

3.1.6 Adhesion/cohesion properties at maintained extension after immersion in water

The test was carried out according to DIN EN ISO 10590:2005-10 with an extension of 60 %.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 60 %.

3.1.7 Change in volume

The test was carried out according to DIN EN ISO 10563: 2017-09 in a forced ventilated oven with open flap.

Requirement:

The change in volume must be ≤ 10 %.

3.1.8 Tear resistance

This test was carried out according to EN 15651-4:2012-09, 4.3.2.7 with an extension of 50 %.

Requirement:

The crack width must be ≤ 12 mm.



3.2 Additional requirements for outdoor application

3.2.1 Adhesion and cohesion properties after exposure to artificial irradiation

This test was carried out according to DIN EN ISO 11431:2003-01, item 8.2.2, automatic weathering cycle. The irradiation was carried out even during raining phase.

Weathering device according to DIN EN ISO 4892-2:2013-06

Type of weathering device:	XENOTEST® BETA LM
Light source:	Xenon-arc source
Filter system:	terrestrial daylight simulation
Operation:	non-alternating mode
Black standard temperature:	65 ± 3 °C
White standard temperature:	40 - 45 °C
Test chamber temperature:	38 ± 3 °C
Relative humidity:	65 ± 10 %
Spray cycle:	18 min water spray, 102 min dry cycle
Irradiation energy EUV (300 - 400) nm:	60 ± 2 W/m ²
Exposure period:	500 h

After the artificial weathering, the specimens were stored for 24 h at standard conditioning atmosphere 23/50, class 1. Subsequently, the adhesion and cohesion behaviour test was effected with a 60 % extension, taking the initial joint width as a basis.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 60 % and the tensile strength after the exposure to artificial weathering shall not be > 20 % compared to untreated test specimen. Additionally the samples were visually checked for changes (e. g. cracks or sticky surfaces).

3.2.2 Adhesion and cohesion properties at maintained extension after water immersion for 28 days

The test was carried out according to EN 15651-4:2012-09 and modified DIN EN ISO 10590:2005-10 with 28 days water immersion instead of 4 days.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 60 %. Change of secant modulus must be ≤ 50 %.



3.2.3 Adhesion and cohesion properties at maintained extension after salt water immersion for 28 days

The test was carried out according to EN 15651-4:2012-09 and modified DIN EN ISO 10590:2005-10 with 28 days salt water immersion (10 % NaCl- solution) instead of 4 days water immersion.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 60 %.

3.3. Essential characteristics

3.3.1 Reaction to fire

The test was performed according to DIN EN ISO 11925-2:2011-02 for classification of the sealant according to DIN EN 13501-1:2010-02. As substrate calcium silicate panels in accordance with EN 13238:2010-02 were used. 6 samples were tested with edge flaming according to EN 15651-4:2012-09.

The test was not carried out at SKZ - Testing GmbH, but within the scope of a sub-contract at a testing institute accredited according to DIN EN ISO 17025:2005-08 for the test.

Requirement:

Classification in fire behaviour class between A1 and F

3.3.2 Durability

No extra test of durability had been carried out.

Requirement:

In accordance to EN 15651-4:2012-09, the durability can be assessed by the properties of ISO 8339:2005-06 or ISO 8340:2005-06 and the properties of ISO 9046:2002-05, ISO 9047:2001-12, ISO 10590:2005-07 or ISO 10591:2005-07.

3.3.3 Release of chemicals dangerous to environment and health

No extra test of the release of chemicals dangerous to environment and health had been carried out.



3.4 Identification requirements

3.4.1 Thermogravimetric test

The test was performed in accordance with EN ISO 11358:1997-04, between 35 °C and 900 °C, temperature slope 10 °C/min, non-oxidative condition (nitrogen). The test was performed in accordance with DIN EN ISO 868:2003-10 after preconditioning at standard climate 23/50, class 1, for 28 days.

3.4.2 Specific gravity

The test was performed in accordance with DIN EN ISO 1183-1:2013-04 procedure B with a metal pycnometer.

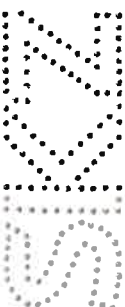
3.4.3 Shore hardness

The test was performed in accordance with DIN EN ISO 868:2003-10 after preconditioning at standard climate 23/50, class 1, for 28 days.

The test was conducted using a Shore durometer type A. The test specimens were 6 mm thick and 60 mm in diameter.

Readings were taken 1 and 15 seconds after the fixed contact of the pressure foot with the test specimen had been effected.

Three samples were tested and five measurements were taken per sample.



4. Test results - Sikaflex®-403

4.1 Performance requirements for non-structural sealants for pedestrian walkways					
	<i>Property</i>	<i>Unit</i>	<i>Requirement</i>		<i>Result</i>
4.1.1	Elastic recovery (DIN EN ISO 7389)	%	≥ 60		88
4.1.2	Resistance to flow (DIN EN ISO 7390)	mm	A vertical 5 °C	≤ 3	0
			A vertical 50 °C	≤ 3	0
4.1.3	Secant tensile modulus (DIN EN ISO 8339)	MPa	at 23 °C, 60 % extension	> 0.4	0.9
		MPa	at -20 °C, 60 % extension	> 0.6	1.2
4.1.4	Tensile properties at maintained extension (DIN EN ISO 8340)	---	No failure (NF) at 23 °C and -20 °C		NF ¹
4.1.5	Adhesion/cohesion properties at variable temperatures (DIN EN ISO 9047)	---	No failure (NF)		NF ¹
4.1.6	Adhesion/cohesion properties at maintained extension after immersion in water (DIN EN ISO 10590)	---	No failure (NF)		NF ¹
4.1.7	Change in volume (DIN EN ISO 10563)	%	≤ 10		-0.5
4.1.8	Tear resistance (EN 15651-4, 4.3.2.7)	mm	≤ 12		6
4.2 Additional requirements for outdoor application					
	<i>Property</i>	<i>Unit</i>	<i>Requirement</i>		<i>Result</i>
4.2.1	Adhesion and cohesion properties after exposure to artificial irradiation (DIN EN ISO 11431)	---	No failure (NF)		NF ¹
		%	± 20		4.3 ²
4.2.2	Adhesion/cohesion properties at maintained extension after immersion in water for 28 days (EN 15651-4)	---	No failure (NF)		NF ¹
		%	≤ 50		-2.2 ³
4.2.3	Adhesion/cohesion properties at maintained extension after immersion in salt water for 28 days (EN 15651-4)	---	No failure (NF)		NF ¹
4.3 Essential characteristics					
	<i>Property</i>				<i>Result</i>
4.3.1	Reaction to fire (DIN EN ISO 11925-2)				Class E ⁴
4.3.2	Durability (EN 15651)				Pass ⁵
4.3.3	Release of chemicals dangerous to environment and health (EN 15651)				NPD ⁶

¹ Neither adhesive nor cohesive failure occurred.

² Change of tensile strength after the exposure to artificial weathering must be ≤ 20 %.

³ Change of secant tensile modulus must be ≤ 50 %.

⁴ The test was not carried out at SKZ - Testing GmbH, but within the scope of a subcontract at a testing institute accredited for the test. The test report and classification report are present at the SKZ - Testing GmbH.

⁵ Durability had been shown by positive results according to ISO 8339, ISO 8340, ISO 9047 and ISO 10590.

⁶ NPD: No performance determined.



4.4 Identification requirements						
	<i>Property</i>	<i>Unit</i>	<i>Single values</i>			<i>Result</i>
4.4.1	Ash content (EN ISO 11358)	%	---	---	---	21.5 ⁷
4.4.2	Specific gravity (DIN EN ISO 1183-1)	g/cm ³	1.18	1.18	1.20	1.19
4.4.3	Shore hardness (DIN EN ISO 868) after 1 and 15 s	Shore A	1 s: 40	1 s: 41	1 s: 42	1 s: 41
			15 s: 37	15 s: 39	15 s: 39	15 s: 38



⁷ The results of the thermogravimetric test are indicated in annex 1.

5. Assessment of the test results

The one-component non-structural joint sealant **Sikaflex®-403** in conjunction with substrate mortar M1 (with Primer 115) meets the requirements according to EN 15651-4:2012-09, class 20HM.

This comprises the additional requirements for outdoor applications and the use in cold climates.

Designation	
Type:	Non-structural sealant type PW (pedestrian walkways)
Intended Use:	EXT-INT (external and internal use)
Further designation:	---
Substrate:	Mortar M1 (with primer)
Pre-conditioning	Procedure B (according to DIN EN ISO 8340)
Class:	20HM



Annex 1
Test report no. 218124/21



Modul: TG H/03/47200/1573
Norm: DIN EN ISO 11358-1 (10/2014)
Dateiname: 218124_TG_A
Datum: 08.10.2021
Probe: Sikaflex 0416 A
Probengewicht: 23,170 mg
Referenz: leerer Keramiktiegel
Referenzgewicht: 0,000 mg

Temperature Program:

1	2	3	4
Cel	20	20	900
Cel	20	900	950
ml/min	20	20	10
Gas1	Off	On	Off
Gas2	Off	On	On
ml/min	0	200	0
Store	Off	On	On

 Temperature Program Mode: Ramp
 Cooling unit: Auto air cooling

Operator: Schießer
Gas1: Stickstoff
Gas2: Synthtische Luft
Pan: 0
218124
Fa. Sika
PS: 55107
Sikaflex 0416 A

DIN EN ISO 11358-1 (10/2014)

