Test report no.: **220740/21-VIII**

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

Order:
Testing of the booster accelerated joint sealant **Sikaflex®-423 PowerCure** for non-structural use in accordance with EN 15651-4 Sealants for non-structural use in joints in buildings and pedestrian walkways - Part 4: Sealants for pedestrian walkways

Letter of: 2021-11-11 **Ref:** Mr. Ralf Heinzmann

Sample receipt: 2021-11-24 and 2021-12-01 (Primer)

Test period: 2021-12-08 to 2022-03-23

The test report comprises 13 pages and 2 annexes.

Würzburg, 13 April 2022
Fs/km

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1. Order

The Company Sika Deutschland GmbH, Stuttgarter Straße 117, 72574 Bad Urach, GERMANY, instructed SKZ - Testing GmbH by letter of 11 November 2021 to test the performance of a booster accelerated joint sealant **Sikaflex®-423 PowerCure** in accordance 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 At time of testing, the standard EN 15651-4:2012-09 was superseded by EN 15651-4:2017-07.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):

6 cartridges booster accelerated sealant

Designation:	**Sikaflex®-423 PowerCure**
Type (chemical family):	Polyurethane
Colour:	concrete-grey
Batch number:	3005424469
Sample receipt:	2021-11-24

250 ml one-component primer for absorbent surfaces (concrete)

Designation:	**Sika® Primer 115**
Batch number:	3005641873
Sample receipt:	2021-12-01

3. Test procedure

The test of the performance of the non sagging booster accelerated sealant **Sikaflex®-423 PowerCure** was performed in accordance with EN 15651-4:2012-09, Part 4: Sealants for pedestrian walkways, class 25HM.

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 *. If it is only a matter of deviating test conditions of an accredited standard, this is 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 test specimens Mortar (M1) were blown off with compressed air.

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

Methode B: The test specimens shall be conditioned according to method A and shall then be submitted three times to the following storage cycle:

a) 3 days in the oven at (70 ± 2) °C;

b) 1 day in distilled water at (23 ± 2) °C;

c) 2 days in the oven at (70 ± 2) °C;

d) 1 day in distilled water at (23 ± 2) °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 100 % extension, in relation to the initial joint width.

Requirement:

The elastic recovery shall be at least 70 %.

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 5 mm.

3.1.3 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 %.

3.1.4 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 100 % 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

3.1.5 Tensile properties at maintained extension

The test was carried out according to ISO 8340:2005-09 with an extension of 100 % 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 100 %.

3.1.6 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 ± 25 % 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.

3.1.7 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 100 %.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 100 %.

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/m²
Exposure period:	550 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 100 % 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 100 % 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 100 %. 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 100 %.

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 Additional requirements for the use in cold climates

3.4.1 Tensile properties (secant tensile modulus) at -30 °C

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 100 % of the original width at a temperature of -30 °C.

Requirement:

None

3.4.2 Tensile properties at maintained extension at -30 °C

The test was carried out according to DIN EN ISO 8340:2005-09 with an extension of 100 % at a temperature of -30 °C.

Requirement:

After 24 h neither an adhesive nor a cohesive failure shall occur on the test specimens which are extended by 100 %.

3.5 Identification requirements

3.5.1 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.

3.5.2 Specific gravity

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

3.5.3 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®-423 PowerCure

4.1 Performance requirements for non-structural sealants for pedestrian walkways					
	Property	*Unit*	*Requirement*		*Result*
4.1.1	Elastic recovery (DIN EN ISO 7389)	%	≥ 70		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	Change in volume (DIN EN ISO 10563)	%	≤ 10		-0.9
4.1.4	Secant tensile modulus (DIN EN ISO 8339)	MPa	at 23 °C, 100 % extension	> 0.4 or	0.6
		MPa	at -20 °C, 100 % extension	> 0.6	1.0
4.1.5	Tensile properties at maintained extension (DIN EN ISO 8340)	---	No failure (NF) at 23 °C and -20 °C		NF [1]
4.1.6	Adhesion/cohesion properties at variable temperatures (DIN EN ISO 9047)	---	No failure (NF)		NF [1]
4.1.7	Adhesion/cohesion properties at maintained extension after immersion in water (DIN EN ISO 10590)	---	No failure (NF)		NF [1]
4.1.8	Tear resistance (EN 15651-4, 4.3.2.7)	mm	≤ 12		6
4.2 Additional requirements for outdoor application					
	Property	*Unit*	*Requirement*		*Result*
4.2.1	Adhesion and cohesion properties after exposure to artificial irradiation (DIN EN ISO 11431)	---	No failure (NF)		NF [1]
		%	≤ 20		- 0 [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		-6.8 [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]

[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 %.

4.3 Essential characteristics						
	Property					*Result*
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]
4.4 Additional performance requirements for the use in cold climates						
	Property	*Unit*	*Requirement*			*Result*
4.4.1	Secant tensile modulus at -30 °C (DIN EN ISO 8339)	MPa	None			1.0
4.4.2	Tensile properties at maintained extension at -30 °C (DIN EN ISO 8340)	---	No failure (NF)			NF [1]
4.5 Identification requirements						
	Property	*Unit*	*Single values*			*Result*
4.5.1.1	Ash content (EN ISO 11358)	%	---	---	---	24.6 [7]
4.5.1.2	Ash content (Booster) (EN ISO 11358)	%				20.6 [8]
4.5.2.1	Specific gravity (DIN EN ISO 1183-1)	g/cm³	1.17	1.17	1.18	1.17
4.5.2.2	Specific gravity (Booster) (DIN EN ISO 1183-1)	g/cm³	1.29	1.28	1.28	1.28
4.5.3	Shore hardness (DIN EN ISO 868) after 1 and 15 s	Shore A	1 s: 33	1 s: 35	1 s: 33	1 s: 34
			15 s: 29	15 s: 29	15 s: 30	15 s: 29

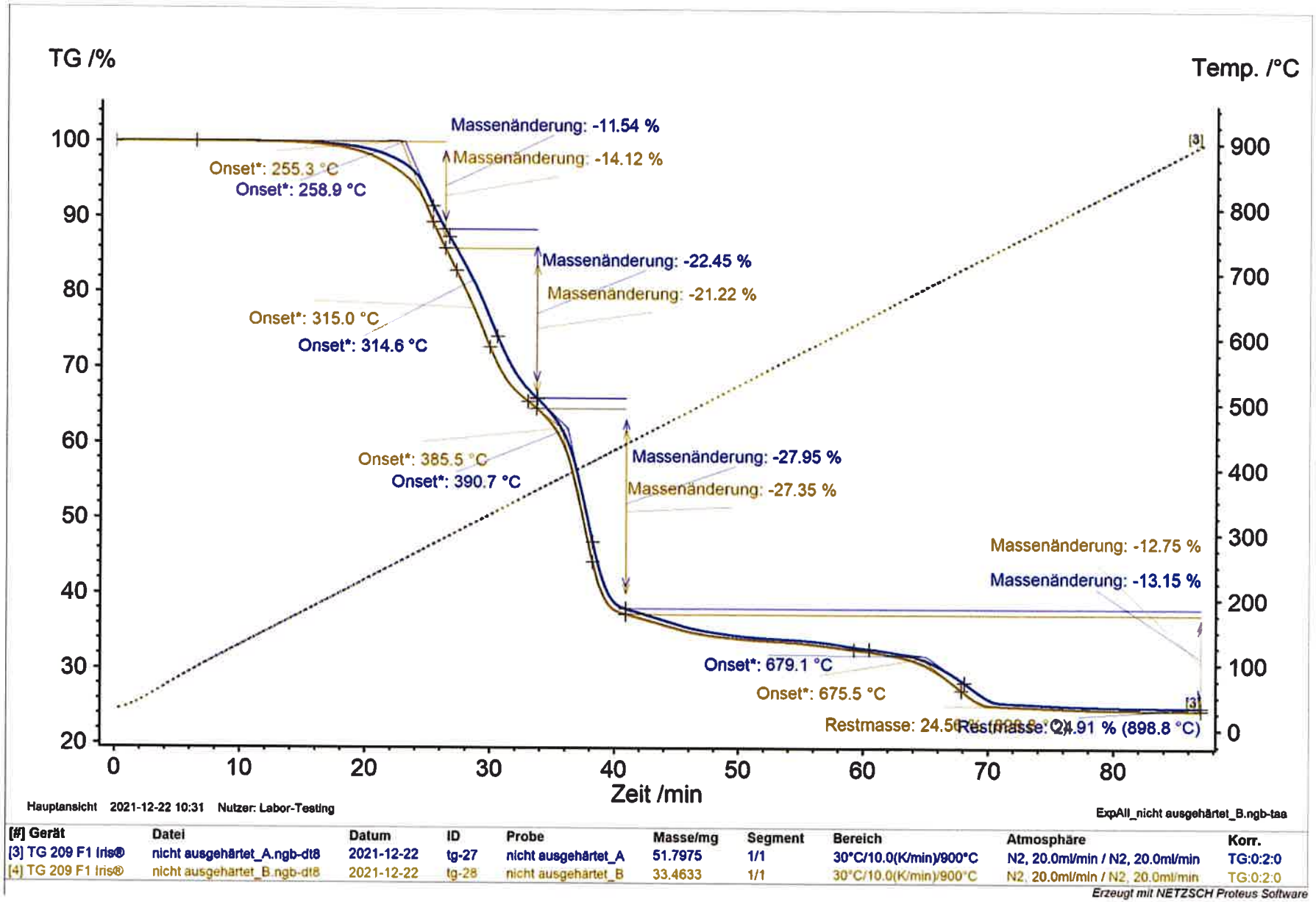
4 The test was not carried out at SKZ - Testing GmbH, but within the scope of a subcontract at a testing institute accredited for the test. The test report and classification report are present at the SKZ - Testing GmbH.
5 Durability had been shown by positive results according to ISO 8339, ISO 8340, ISO 9047 and ISO 10590.
6 NPD: No performance determined.
7 The results of the thermogravimetric test are indicated in annex 1.
8 The results of the thermogravimetric test are indicated in annex 2.

5. Assessment of the test results

The booster accelerated joint sealant **Sikaflex®-423 PowerCure** for non-structural use in conjunction with substrate mortar M1 (with **Primer Sika® Primer 115**) meets the requirements according to EN 15651-4:2012-09, class 25HM.

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

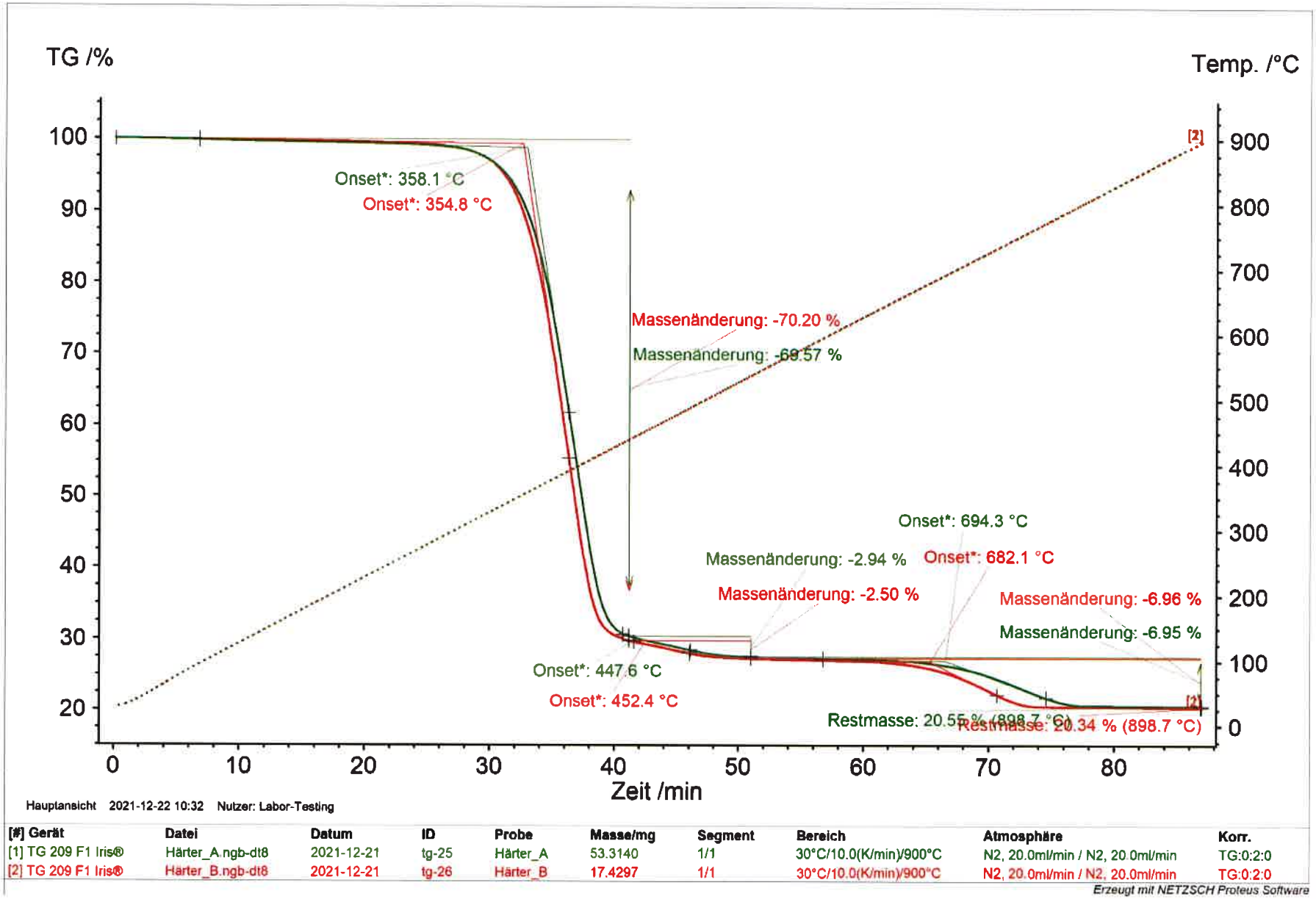
Designation	
Type:	Non-structural sealant type PW (pedestrian walkways)
Intended Use:	EXT-INT (external and internal use)
Further designation:	CC (cold climate)
Substrate:	Mortar M1 (with primer)
Pre-conditioning	Method B (according to DIN EN ISO 8340)
Class:	25HM



[#] Gerät	Datei	Datum	ID	Probe	Masse/mg	Segment	Bereich	Atmosphäre	Korr.
[3] TG 209 F1 Iris®	nicht ausgehärtet_A.ngb-dt8	2021-12-22	tg-27	nicht ausgehärtet_A	51.7975	1/1	30°C/10.0(K/min)/900°C	N2, 20.0ml/min / N2, 20.0ml/min	TG:0:2:0
[4] TG 209 F1 Iris®	nicht ausgehärtet_B.ngb-dt8	2021-12-22	tg-28	nicht ausgehärtet_B	33.4633	1/1	30°C/10.0(K/min)/900°C	N2, 20.0ml/min / N2, 20.0ml/min	TG:0:2:0

Erzeugt mit NETZSCH Proteus Software

Annex
Test report no. 220740/21-VIII



[#] Gerät	Datei	Datum	ID	Probe	Masse/mg	Segment	Bereich	Atmosphäre	Korr.
[1] TG 209 F1 Iris®	Härter_A.ngb-dt8	2021-12-21	tg-25	Härter_A	53.3140	1/1	30°C/10.0(K/min)/900°C	N2, 20.0ml/min / N2, 20.0ml/min	TG:0:2:0
[2] TG 209 F1 Iris®	Härter_B.ngb-dt8	2021-12-21	tg-26	Härter_B	17.4297	1/1	30°C/10.0(K/min)/900°C	N2, 20.0ml/min / N2, 20.0ml/min	TG:0:2:0

Erzeugt mit NETZSCH Proteus Software