Das Kunststoff-Zentrum

SKZ

Test report no.: **120096/16-I**

Customer:
Salamander Industrie-Produkte GmbH
Jakob-Sigle-Straße 58
86842 Türkheim
GERMANY

Production site:
86842 Türkheim
GERMANY

Order:
Testing of Resistance to artificial weathering (fastness to weathering and resistance to weathering), classification for climate zone S (severe climate) according to DIN EN 12608-1: 2016-08 "Unplasticized poly (vinyl chloride) (PVC-U) profiles for the fabrication of windows and doors - Classification, requirements and test methods", Part 1: Non-coated PVC-U profiles with light coloured surfaces.

Artificial weathering according to DIN EN 513: 1999-10, procedure 2 (simulation of a severe climate zone S) up to a raised irradiation dose equivalent of altogether **20 GJ/m²** in the wave length range of 300 nm to 800 nm.

Letter of: 2016-04-06 **Ref:** Ms. Christiane Huith

Sample receipt: 2016-04-11

Test period: 2016-04-21 to 2017-07-27

This test report comprises 5 pages.

Würzburg, 2017-08-02
Rs/km/

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1. Order

By its letter dated 6 April 2016 the company Salamander Industrie-Produkte GmbH, Jakob-Sigle-Straße 58, 86842 Türkheim, GERMANY instructed SKZ - Testing GmbH to test the Resistance to artificial weathering (fastness to weathering and resistance to weathering), classification for climate zone S (severe climate) according to DIN EN 12608-1: 2016-08 "Unplasticized poly (vinyl chloride) (PVC-U) profiles for the fabrication of windows and doors - Classification, requirements and test methods", Part 1: Non-coated PVC-U profiles with light coloured surfaces. Artificial weathering was carried out according to DIN EN 513: 1999-10, procedure 2 (simulation of a severe climate zone S) up to a raised irradiation dose equivalent of altogether **20 GJ/m²** in the wave length range of 300 nm to 800 nm.

2. Test material

On 11 April 2016 SKZ - Testing GmbH received following test material:

8 x 1 m window profile sections made of PVC-U, colour white

Profile designation:	Rahmenprofil 110 220
Profile classification:	class A
Profile marking:	System Salamander SL 117 RAL 110220 EN 12608 SIIA 31116 08:11 (NF) CSTB 539 378 8 ATG 2838 SZ02
Profile manufacturer:	Salamander Industrie-Produkte GmbH, 86842 Türkheim, GERMANY
Formulation:	**HC-HGR**
Basis of stabilization:	**CaZn**

3. Test procedure

Following tests were performed according to DIN EN 12608-1: 2016-08, item 5.9 Resistance to weathering, climate zone S. Artificial weathering according to DIN EN 513: 1999-10, procedure 2 (simulation of a severe climate zone S) up to a raised irradiation dose equivalent of altogether **20 GJ/m²** in the wave length range of 300 nm to 800 nm.

Unless otherwise noted all tests were carried out at standard 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.

3.1 Resistance to artificial weathering

Testing of Resistance to artificial weathering (fastness to weathering and resistance to weathering) was performed according to DIN EN 12608-1: 2016-08. Procedure of artificial weathering is based on the requirements according to DIN EN 513, procedure 2, simulation of a severe climate zone (S). Surface outside was irradiated. The artificial weathering was carried out up to a raised irradiation dose of altogether 20 GJ/m² in the wave length range between 300 nm to 800 nm.

Parameter of xenon device

Type of weathering device:	XENOTEST® BETA LM
Light source:	Xenon-arc source
Filter:	Terrestrial daylight simulation
Black standard temperature:	65 ± 3 °C
White standard temperature:	45 - 50 °C
Relative humidity:	65 ± 5 %
Spray cycle:	6 min water spray, 114 min dry cycle
Irradiation energy E_{UV} (300 - 400) nm:	60 ± 2 W/m²
Total irradiation dose equivalent in the wavelength range (300 - 800) nm:	**20 GJ/m²**
Exposure period:	10.185 h
Start:	2016-04-27
End:	2017-07-20

3.1.1 Resistance to weathering

Testing of Resistance to weathering was carried out according to DIN EN 12608-1: 2016-08, item 5.9.2 on double notched specimen following DIN EN ISO 179-1/1fA: 2010-11, but with a residual width between notches of (3 ± 0.1) mm and with the dimensions (50 x 6 x wall thickness) mm. The test was carried out subsequent to artificial weathering on reference samples, which have been stored in the dark, as well as on weathered samples. During this test the weathered surface was subjected to tensile stress.

Requirements according to DIN EN 12608-1 (related to12 GJ/m²):

The mean value of Charpy notched impact strength at condition as delivered (unweathered) shall not drop below 55 kJ/m².

After artificial weathering Charpy notched impact strength of weathered samples shall not drop more than 40 % compared to the value of the unweathered samples.

3.1.2 Fastness to weathering

Testing of Fastness to weathering was carried out according to DIN EN 12608-1: 2016-08, item 5.9.3.

3.1.2.1 Visual assessment

Visual assessment was carried out according to ISO 4582: 2007-08 by using grey scale according to DIN EN 20105-A02: 1994-10.

3.1.2.2 Colorimetric assessment

The colorimetric assessment was carried out by a spectrophotometer in wavelength range from 360 to 750 nm, standard light type D65, gloss inclusion, 10° standard observation. The colour distance ΔE^*_{ab} was determined according to DIN EN ISO 11664-4: 2012-06.

Requirement according to DIN EN 12608-1 (related to 12 GJ/m²):

After artificial weathering colour distance ΔE^*_{ab} between unweathered and weathered samples shall not be larger than 5 and colour distance Δb^* shall not be larger than 3.

4. Test results

4.1 Resistance to artificial weathering

4.1.1 Resistance to weathering

Charpy notched impact strength

Samples corresponding to DIN EN ISO 179-1/ **1fA** (notch base radius 0.25 mm)				
reference sample (unweathered)		weathered sample		amendment
$\bar{x}$ [kJ/m²]	s	$\bar{x}$ [kJ/m²]	s	[%]
71.5	1.4	59.2	1.4	-17.2
10 x P* (10 x partial break)		10 x P* (10 x partial break)		---

$\bar{x}$ = mean value s = standard deviation

4.1.2 Fastness to weathering

4.1.1 Visual assessment

The sample reached the fastness grade **4** of the grey scale according to DIN EN 20105-A02.

Neither stains, blisters nor crack formations or anything that significant damages the appearance were observed.

4.1.2 Colorimetric assessment

Colour coordinates	Sample as supplied	Sample after weathering	Colour distance
L*	92.7	94.0	1.3
a*	-1.1	-0.8	0.3
b*	-0.6	-0.4	**0.2**
Colour distance ΔE^*_{ab}			**1.4**

5. Assessment of test results

The requirements (related to an irradiation dose equivalent of 12 GJ/m²) according to DIN EN 12608-1: 2016-08 regarding Resistance to artificial weathering (fastness to weathering and resistance to weathering), classification to climate zone S (severe climate) were met after a total irradiation dose equivalent of **20 GJ/m²**.