

Test report no.: 78868/07-I

Customer: Inoutic / Deceuninck GmbH
Bayerwaldstr. 18
94327 BOGEN
GERMANY

Production site: 94327 BOGEN
GERMANY

Order: Testing of Charpy V-notch impact strength, fastness to weathering, weathering resistance, thermostability and fire behaviour according to RAL-GZ 716/1 section I, part 1 on window profiles made of PVC-U as initial type testing for formulation and classification for climatic zone S.

Letter of: 2007-08-27 **by:** Dr. Attenberger

Sample receipt: 2007-08-31

Test period: 2007-09-05 to 2008-06-05

This test report comprises 6 pages.

Würzburg, 2008-07-24
Gra/ste

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The original language of the report is German. In case of doubt, the German version is obligatory.

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1. Order

By its letter of August 27, 2007 the company Inoutic / Deceuninck GmbH, Bayerwaldstr. 18, 94327 Bogen, GERMANY, instructed SKZ - TeConA GmbH to test the Charpy V-notch impact strength, fastness to weathering, weathering resistance, thermostability and fire behaviour according to RAL-GZ 716/1, section I, part 1 on window profiles made of PVC-U as initial type testing for formulation and classification for climatic zone S.

2. Test material

SKZ - TeConA GmbH had the following test material at their disposal on August 31, 2007:

8 x 1 m window profile and 3 welded corners made of PVC-U, colour white

Designation of profile	Rahmen 1338, L 710/R, P 14609
Designation of system:	THYSSEN
Profile marking:	INOUTIC 2565 EN12608 SIIA  121  807 (1) 199 07 L710/R P14609
Profile manufacturer:	Inoutic / Deceuninck GmbH, 94327 Bogen, GERMANY
Producer of formulation:	Inoutic / Deceuninck GmbH, 94327 Bogen, GERMANY
Designation of formulation:	700/57
Basis of stabilisation:	CaZn

3. Test procedure

The tests described below were carried out according to the quality and testing directive "**Plastic windows, quality assurance, RAL-GZ 716/1, section I, plastic window profiles**", test procedure and requirements, part 1, window profiles made of PVC-U with white surfaces (draft January 2007).

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 Charpy V-notch impact strength

The testing of Charpy V-notch impact strength was carried out according to item 3.7 of the test procedure. The samples were taken from the outer sight surface of the window profiles, in the direction of extrusion.

Requirement:

Arithmetic mean shall be at least 40 kJ/m² and no individual value shall remain under 20 kJ/m².

3.2 Fastness to weathering and weathering resistance

The fastness to weathering and weathering resistance test was carried out according to item 3.12 of the test procedure.

The procedure of artificial weathering was carried out according to DIN EN 513, procedure 2, simulation of a severe climate zone (S). The outer surface of the foil was exposed to irradiation.

Parameters of weathering device:

Type of weathering device:	XENOTEST® BETA LM
Light source:	Xenon arc source
Filter system:	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/m ²
Total irradiation dose equivalent in the wavelength range (300 - 800) nm:	12 GJ/m²
Exposure period:	6150 h
Start:	2007-09-05
End:	2008-06-02

3.2.1 Fastness to weathering

3.2.1.1 Visual assessment

Visual assessment was carried out by using the grey scale according to ISO 105-A02 as well as grey scale according to ISO 105-A03.

Requirement:

The change in color shall not be greater than grade 3 on grey scale according to ISO 105-A02. Changes must not bring about stains, bubbles, streaks, cracks or other significant negative effects.

3.2.1.2 Colourimetric assessment

The samples colour was measured by means of a spectrophotometer of a wave length area from 380 to 720 nm, standard light type D65, gloss inclusion, 10° normal inspection. The colour distance ΔE^* was determined according to ISO 7724-3.

Requirement:

none

3.2.2 Weathering resistance

Charpy V-notch impact strength

The test of the Charpy notched impact strength was carried out on double-notched samples, in line with DIN EN ISO 179-1/1fC, however, with a remaining width of (3 ± 0.1) mm between the notches and sized 50 mm x 6 mm x wall thickness.

The test was carried out subsequent to the artificial weathering on not weathered reference samples. During testing the weathered surface was subjected to tensile stress.

Requirement:

After a irradiation dose of 12 GJ/m² by artificial weathering the mean value of Charpy V-notch impact strength shall not be below 28 kJ/m².

3.3 Thermostability

Determination of stability period t_{st} was carried out according to item 3.6 of the test procedure, procedure B (conductivity procedure).

Requirement:

none

3.4 Fire behaviour

The fire behaviour test was conducted according to DIN 4102-B2 and DIN EN 13501-1, respectively. The outer surface of the profile sections was subjected to flame treatment for 15 seconds.

Requirement:

Classification B2 according to DIN 4102-1 and Euro-classification E according to DIN EN 13501-1, respectively, shall be achieved.

4. Test results

4.1 Charpy V-notch impact strength

PVC-U profile, condition as delivered

(notch base radius 0.1 mm, type of test specimen 1fC)

Charpy V-notch impact strength in [kJ/m ²]	
\bar{x}	s
62.9	0.9
10 x partial break (P)	

\bar{x} = mean value

s = standard deviation

smallest single value: 60.9 kJ/m²

4.2 Fastness to weathering and weathering resistance

4.2.1 Fastness to weathering

4.2.1.1 Visual assessment

The sample score the fastness grade 4 of the grey scale according to ISO 105-A02 and fastness grade 4 - 5 according to ISO 105-A03.

On the surface neither stains, blisters, strips nor crack formations or anything that significantly damages the appearance were observed.

4.2.1.2 Colourimetric assessment

Colour coordinates	Sample at state of delivery	Sample after weathering	Colour distance
L*	92.5	93.6	1.1
a*	-1.4	-1.3	0.1
b*	2.3	1.3	-1.0
Colour distance ΔE^*			1.5

4.2.2 Weathering resistance

(notch base radius 0.1 mm, type of test specimen 1fC)

Charpy V-notch impact strength in kJ/m ²				
reference sample (not weathered)		weathered sample		Change
\bar{x}	s	\bar{x}	s	%
65.4	0.7	48.9	1.1	-25.2
10 x partial break (P)		10 x partial break (P)		

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

4.3 Thermostability

The stability period t_{st} is 35.7 min (individual values: 35.4 min and 36.0 min).

4.4 Fire behaviour

The normal inflammability according to DIN 4102-B2 and the euro-classification E according to DIN EN 13501-1, respectively was proved.

5. Assessment of test results

The requirements of RAL-GZ 716/1 section I, part 1, item 2.7 Charpy V-notch impact strength condition as delivered, item 2.6 Thermostability, item 2.12.1 Fastness to weathering after artificial weathering, item 2.12.2 Resistance to weathering after artificial weathering and item 2.13 Fire behavior as initial type testing for formulation and classification for climatic zone S are met.