

Test report no.: 124945/17

Customer: NEOFLEX S.L.U.
Camino de Castilla Km. 5
03207 ELCHE (ALICANTE)
SPAIN

Order: Testing of the Hydrolysis/Thermolysis and Peel test after cold storage according to Technical appendix "Section II" to RAL-GZ 716 Quality and test requirements for components and procedures (issue December 2013) on window profiles made of PVC-U laminated with films.

E-mail of: 2017-03-16

Ref: Mr Pedro Cuesta

Test samples received: 2017-03-24

Test period: 2017-03-28 to 2017-05-11

This test report consists of 13 pages.

Würzburg, 2017-05-19
Wk/km

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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

The company NEOFLEX S.L.U., Camino de Castilla Km. 5, 03207 ELCHE (ALICANTE), SPAIN, instructed the SKZ - Testing GmbH by e-mail dated 16 March 2017 to test Hydrolysis/Thermolysis and Peel test after cold storage according to Technical appendix "Section II" to RAL-GZ 716 Quality and test requirements for components and procedures (issue December 2013) on window profiles made of PVC-U laminated with films.

2. Test material

On 24 March 2017 SKZ - Testing GmbH received following samples for testing (description is based on inspection of the samples at SKZ - Testing GmbH and on the manufacturer's data):

Each series approx. 3 x 1 m window profile sections made of PVC-U with interrupted lamination (contact barrier) on one side with following designation:

Series I:

Profile manufacturer:	REHAU
Colour of basic profile:	White
Marking of the profile:	REHAU SIIC G302 2020 0509 160220 500403
Adhesive manufacturer:	NEOFLEX S.L.U.
Adhesive:	NEOTHERM PU 3353
Primer:	Primer 3424 F
Foil manufacturer:	Konrad Hornschuch AG
Colour of foil:	F4362075
Number of foil	12574812
Lamination side:	NACITEX S.L., SAX (ALICANTE), SPAIN

Series II:

Profile manufacturer:	REHAU
Colour of basic profile:	White
Marking of the profile:	REHAU SIIC G302 2020 0509 160220 500403
Adhesive manufacturer:	NEOFLEX S.L.U.
Adhesive:	NEOTHERM PU 3366
Primer:	Primer 3432 F
Foil manufacturer:	Konrad Hornschuch AG
Colour of foil:	F4362075
Number of foil	12574812
Lamination side:	NACITEX S.L., SAX (ALICANTE), SPAIN

Series III:

Profile manufacturer:	REHAU
Colour of basic profile:	White
Marking of the profile:	REHAU SIIC G302 2020 0509 160220 500403
Adhesive manufacturer:	NEOFLEX S.L.U.
Adhesive:	NEOTHERM PU 2774
Primer:	Primer 1822 F
Foil manufacturer:	Konrad Hornschuch AG
Colour of foil:	F4362075
Number of foil	12574812
Lamination side:	NACITEX S.L., SAX (ALICANTE), SPAIN

3. Test procedure

The tests described in the following have been performed in accordance with the Technical appendix "Section II" to RAL-GZ 716 Quality and test requirements for components and procedures (issue December 2013), Part II-a-4: Adhesives for laminating PVC-U-window profiles, item 5.3-2.2, item 5.3-2.3 and item 5.3-2.4.

The test procedure was carried out according to standard climate 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 Peel test at 23 °C

The test was performed in accordance with Part II-a-4, Item 5.3-2.2. For each adhesive system 4 peel strength values were determined.

Conditions:

Test method: Peel test at 23 °C according to Technical Appendix, Section I, 4-A1-2.17.

The testing of adhesion of film was carried out by means of a peel test following the DIN EN 1372: 1999-10 in a vertical position with respect to the profile surface with a withdrawal speed of 10 mm/min.

Requirement:

The peel resistance of any of the 4 samples shall not be less than 3.0 N/mm.

3.2 Peel test after cold storage

The test was performed in accordance with Part II-a-4, Item 5.3-2.3. For each adhesive system 4 peel strength values were determined.

Conditions:

Test method: Peel test at 23 °C according to Technical Appendix Section I, 4-A1-2.17.

Cold storage: at -10 °C (+0/-2) for 24 hours

Reconditioning: standard conditioning atmosphere 23 °C / 50 % rel. humidity, class 1 according to DIN EN ISO 291: 2008-08 (approx. 2 h)

The testing of adhesion of film was carried out by means of a peel test following the DIN EN 1372: 1999-10 in a vertical position with respect to the profile surface with a withdrawal speed of 10 mm/min.

Requirement:

After the cold storage, the peel resistance of any of the 4 samples shall not be less than 3.0 N/mm.

3.3 Hydrolysis/thermolysis test

The test was performed in accordance with Part II-a-4, Item 5.3-2.4. Each 4 peel strength values were determined prior to and after storage in a climate cabinet.

Conditions:

Test method:	Peel test at 23 °C according to Technical Appendix, Section II, Annex I-5.3
Storage duration:	42 days in the climate cabinet
Climatic conditions:	70 °C and 98 % rel. humidity
Reconditioning:	standard conditioning atmosphere 23 °C / 50 % rel. humidity, class 1 according to DIN EN ISO 291: 2008-08 (approx. 2 h)

The testing of adhesion of film was carried out by means of a peel test following the DIN EN 1372: 1999-10 in a vertical position with respect to the profile surface with a withdrawal speed of 10 mm/min.

Requirement:

Prior to the storage in a climate cabinet the peel resistance of any of the 4 samples shall not be less than 3.0 N/mm.

After the storage in a climate cabinet the peel resistance of any of the 4 samples shall not be less than 1.5 N/mm (or film crack).

4. Test results

4.1 Test results of series I: NEOTHERM PU 3353 + Primer 3424 F

4.1.1 Peel test at 23 °C

Adhesion of film at 23 °C

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.7	73.4	crack of film without stretching and peeling off from supporting profile
2	---	3.8	75.2	crack of film without stretching and peeling off from supporting profile
3	---	3.5	69.8	crack of film without stretching and peeling off from supporting profile
4	---	3.7	74.4	crack of film without stretching and peeling off from supporting profile

4.1.2 Peel test after cold storage

Adhesion of film after cold storage

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.8	76.2	crack of film without stretching and peeling off from supporting profile
2	---	3.7	73.9	crack of film without stretching and peeling off from supporting profile
3	---	3.6	71.7	crack of film without stretching and peeling off from supporting profile
4	---	3.7	73.2	crack of film without stretching and peeling off from supporting profile

4.1.3 Hydrolysis/thermolysis test

Adhesion of film after storage in a climate cabinet

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	2.0	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing
2	2.1	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing
3	2.1	---	---	approx. 48 mm peeling of film without stretching, subsequently discontinuation of testing
4	2.1	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing

4.2 Test results of series II: NEOTHERM PU 3366 + Primer 3432 F

4.2.1 Peel test at 23 °C

Adhesion of film at 23 °C

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.5	69.9	crack of film without stretching and peeling off from supporting profile
2	---	3.5	70.9	crack of film without stretching and peeling off from supporting profile
3	---	3.4	68.6	crack of film without stretching and peeling off from supporting profile
4	---	3.6	71.1	crack of film without stretching and peeling off from supporting profile

4.2.2 Peel test after cold storage

Adhesion of film after cold storage

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.5	70.7	crack of film without stretching and peeling off from supporting profile
2	---	3.6	71.2	crack of film without stretching and peeling off from supporting profile
3	---	3.5	69.4	crack of film without stretching and peeling off from supporting profile
4	---	3.5	70.1	crack of film without stretching and peeling off from supporting profile

4.2.3 Hydrolysis/thermolysis test

Adhesion of film after storage in a climate cabinet

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	2.1	---	---	approx. 45 mm peeling of film without stretching, subsequently discontinuation of testing
2	2.1	---	---	approx. 47 mm peeling of film without stretching, subsequently discontinuation of testing
3	2.1	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing
4	2.1	---	---	approx. 47 mm peeling of film without stretching, subsequently discontinuation of testing

4.3 Test results of series III: NEOTHERM PU 2774 + Primer 1822 F

4.3.1 Peel test at 23 °C

Adhesion of film at 23 °C

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.5	69.0	crack of film without stretching and peeling off from supporting profile
2	---	3.4	68.5	crack of film without stretching and peeling off from supporting profile
3	---	3.4	67.6	crack of film without stretching and peeling off from supporting profile
4	---	3.4	68.5	crack of film without stretching and peeling off from supporting profile

4.3.2 Peel test after cold storage

Adhesion of film after cold storage

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	---	3.4	67.8	crack of film without stretching and peeling off from supporting profile
2	---	3.4	68.3	crack of film without stretching and peeling off from supporting profile
3	---	3.5	70.9	crack of film without stretching and peeling off from supporting profile
4	---	3.4	67.4	crack of film without stretching and peeling off from supporting profile

4.3.3 Hydrolysis/thermolysis test

Adhesion of film after storage in a climate cabinet

Sample no.	Peel resistance [N/mm]		Ultimate tensile stress [N]	Remark
	avg. peel force sample width	tear force sample width		
1	1.8	---	---	approx. 47 mm peeling of film without stretching, subsequently discontinuation of testing
2	1.9	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing
3	1.9	---	---	approx. 47 mm peeling of film without stretching, subsequently discontinuation of testing
4	1.8	---	---	approx. 46 mm peeling of film without stretching, subsequently discontinuation of testing

5. Assessment of the test results

The requirements of the Technical Appendix „Section II“ to RAL-GZ 716 Quality and test requirements for components and procedures (issue December 2013) with regard to the peel test at 23 °C, the peel test after cold storage and the hydrolysis/thermolysis test are met.