

Evidence of Performance

Air permeability, Watertightness, Resistance to wind load



Test Report

No. 11-001345-PR01

(PB-A01-02-en-01)

Client PVC - LUK d.o.o.
Knez Mihajlova 86
14000 Valjevo
Serbia

Product Tilt and turn window

Designation System designation: Rehau Euro 70

Performance-relevant product details Material: PVC/U white

Overall dimensions (WxH) 1230 mm x 1480 mm

Special features

Basis

EN 14351-1:2006+A1:2010

Test standard/s:

EN 1026:2000-06
EN 1027:2000-06
EN 12046-1:2003-11
EN 12211:2000-06
EN 14609:2004-06

Correspond/s to the national standard/s (e.g. DIN EN)

Representation



Results

Air permeability according to EN 12207:1999-11



Class 3

Watertightness according to EN 12208:1999-11



Class 4A

Resistance to wind load according to EN 12210:1999-11/AC:2002-08



Class C3 / B3

Instructions for use

The results obtained can be used by the manufacturer as the basis for the manufacturer ITT test report summary. Observe the specifications set out by the applicable product standard.

Validity

The data and results refer solely to the tested and described specimen. Classification remains valid as long as the product and the above basis remain unchanged. The results can be extrapolated under the manufacturer's own liability subject to observation of the relevant specifications set out by the applicable product standard. This test/evaluation does not allow any statement to be made on any further characteristics regarding performance and quality of the construction presented, in particular the effects of weathering and ageing were not taken into account.

Notes on publication

The ift-Guidance Sheet "Advertising with ift test documents" applies. The cover sheet can be used as an abstract.

The report contains a total of 17 pages.

ift Rosenheim

17.07.2012

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Building Components



1. Object

1.1 Description of test specimen

Product	Tilt and turn window
Manufacturer	PVC-LUK d.o.o.
Date of manufacture	01.06.2012.
System	REHAU Euro 70
Type of opening / Opening directions	Tilt and turn, DIN right inward opening
Frame material	PVC/U white
Overall frame dimensions (W x H)	1230 mm x 1480 mm
Overall casement dimensions (W x H)	1151 mm x 1400 mm
Casement weight	40,2 kg
Frame member	REHAU 550713-601 with reinforcement profile
Frame connection	REHAU 244506-001, further details are given in drawings mitre-cut and welded
Casement member	REHAU 550460-601 with reinforcement profile
Frame connection	REHAU 244506-001, further details are given in drawings mitre-cut and welded
Additional profile / Frame connection	Glazing bar 550110-601, mitre-cut
Rebate design	
Rebate drainage	3 slots of 5 mm x 27 mm inside rebate, side slots 30 and 35 mm from the inner edge of the frame member, center slot 560 mm from the left inner edge of the frame member, to outside front 2 slots 4,5 mm x 27 mm, 115 mm from the edge of frame member, with cover caps ASA 11
Rebate seal	
External	
Material	Sealing material - EPDM
Manufacturer	REHAU AG + Co.
Article number	864952-010
Corner configuration	continuous, at top butt-jointed at centre and bonded
Internal	
Material	Sealing material - EPDM
Manufacturer	REHAU AG + Co.
Article number	864952-010
Corner configuration	continuous, at top butt-jointed at centre and bonded
Pressure equalisation	3 slots of 5 mm x 27 mm inside rebate, side slots 35 and 40 mm from the inner edge of the frame member, center slot 555 mm from the left inner edge of the frame member, to outside bottom 2 drills Ø 6 mm 60 mm from the edge of frame member
Infill	
Installation of infills	
Glazing gasket	Insulating glass unit, configuration 4 / 16 argon / 4 Low-E

**External**

Material	Sealing material - EPDM
Manufacturer	REHAU AG + Co.
Article number	865002-010
Corner configuration	continuous, at top butt-jointed at centre and bonded

Internal

Material	Sealing material – TPE
Manufacturer	REHAU AG + Co.
Article number	-
Corner configuration	mitre-cut with with glazing bead 550110-601 at bottom and at top 3 slots 5 mm x 21 mm, side slots 95 and 100 mm from external edge of casement mem- ber, center slot 520 mm from the left external edge of the casement member

Vapour pressure equalisation**Hardware**

Type / Manufacturer	Tilt and turn hardware, ROTO NT Designo, Vision
Hinges / Bearings	1 Tilt mechanism pivot 1 Corner pivot
Number of lockings	at bottom 2, at top 1, on hinge side 2, on lock side 2
max. locking distance	775 mm
Position of lockings	neutral

The description is based on information provided by the client and inspection of the test specimen at the ift (item designations / numbers as well as material specifications were provided by the client unless stated "*ift-checked*").

Test specimen representations are documented in the Annex "Representation of product/test specimen". The design details were examined solely on the basis of the characteristics / performance to be classified. The drawings are based on unchanged documentation provided by the client unless stated otherwise; the photographs were taken by the ift Rosenheim unless stated otherwise.

1.2 Sampling

The below sampling data were provided to the ift:

Sampling by:	PVC-LUK d.o.o. Zoran Tesic
Date:	01.06.2012
Verification:	A sampling report has been provided to the ift.

Delivered on:

ift-Pk-Number: 001



2. Procedure

2.1 Basis*) referring to methods

Testing

EN 1026:2000-06

Windows and doors - Air permeability - Test method

EN 1027:2000-06

Windows and doors - Watertightness - Test method

EN 12046-1:2003-11

Operating forces - Test method - Part 1: Windows

EN 12211:2000-06

Windows and doors - Resistance to wind load - Test method

EN 14609:2004-06

Windows - Determination of the resistance to static torsion

Classification / Evaluation

EN 12207:1999-11

Windows and doors - Air permeability - Classification

EN 12208:1999-11

Windows and doors - Watertightness - Classification

EN 12210:1999-11/AC:2002-08

Windows and doors - Resistance to wind load - Classification

EN 14351-1:2006+A1:2010

Windows and doors - Product standard, performance characteristics -
Part 1: Windows and external pedestrian doorsets without resistance to fire and/or
smoke leakage characteristics

*) and the equivalent national versions, e.g. DIN EN



2.2 Brief description of procedure

Air permeability - EN 1026

Prior to testing, the operating forces are determined as per EN 12046-1 for the release / locking operation of the hardware.

Air permeability is tested in accordance with EN 1026 and conducted in steps at negative pressure and positive pressure up to the maximum test pressure difference. Leakages of the test set-up are made visible using artificially generated fog and sealed using permanently resilient sealant. The test specimen is exposed to three pressure pulses $\Delta p_{max} + 10\%$ or at least 500 Pa. This is followed by measurement of air permeability for the respective pressure steps.

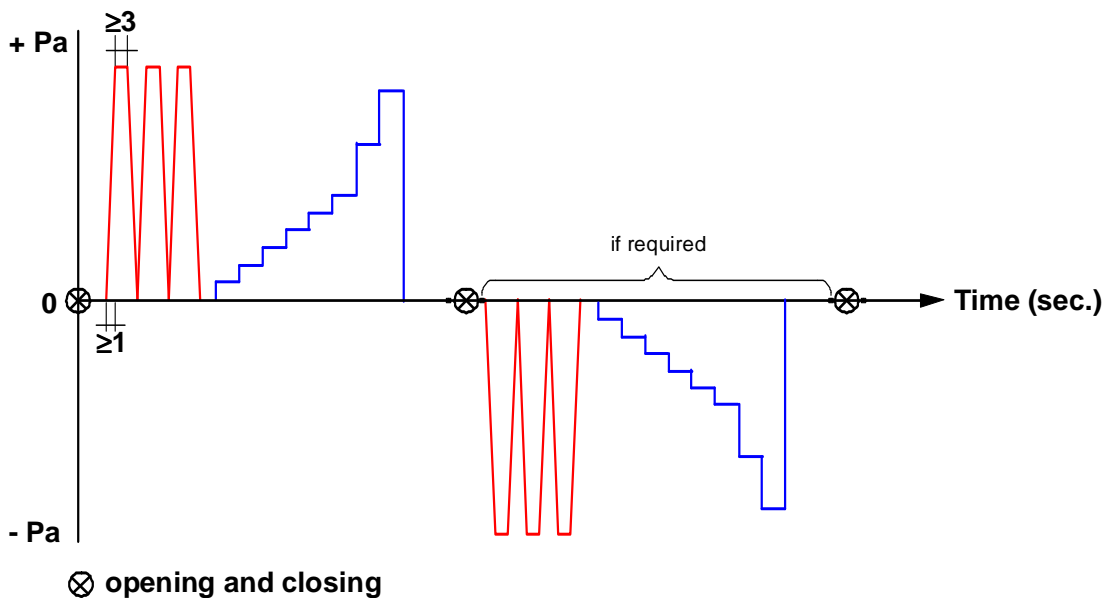


Illustration Test sequence for air permeability

Resistance to wind load - Deflection and alternating negative/positive pressures - EN 12211

Resistance to wind load is tested in accordance with EN 12211 and conducted in steps at negative pressure and positive pressure up to the test pressure p_1 . The test specimen is exposed to three pressure pulses $\Delta p_1 + 10\%$. This is followed by determination of the frontal deflection of test specimen for each pressure step when exposed to positive test pressure Δp_1 and negative test pressure Δp_1 . Then the test specimen is subjected to 50 cycles including negative and positive pressures of $\pm \Delta p_2 = \Delta p_1 - 50\%$.

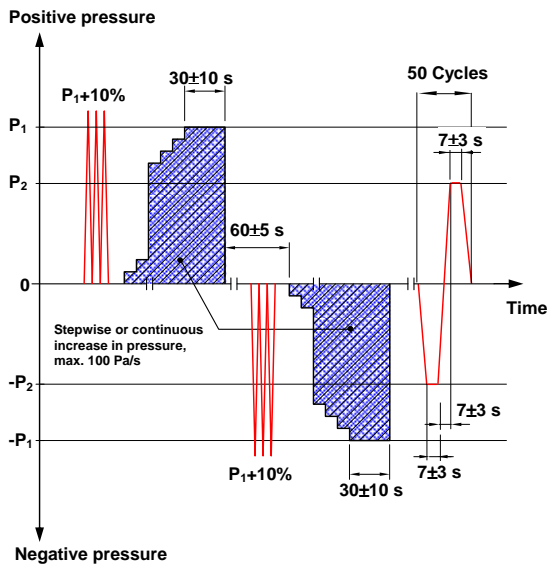


Illustration Test sequence for resistance to wind load



Air permeability – Repeat test - EN 1026

Following resistance to wind load test for p_1 (deflection) and p_2 (alternating positive/negative pressure), air permeability must not exceed by more than 20% the upper limit of the specified class as set out by EN 12207.

Watertightness - EN 1027

Watertightness is tested in accordance with EN 1027 up to the maximum test pressure difference. The external face of the test specimen is subjected to constant spraying of water by an upper row of nozzles at a flow rate of approx. 2 l/min per nozzle while increments of positive test pressure are applied at regular intervals. For test specimen exceeding 2.50 m in overall height, additional rows of nozzles are fixed at vertical intervals at 1.5 m below the top nozzle line. The water flow rate of the additional nozzle rows is approx. 1 l/min per nozzle.

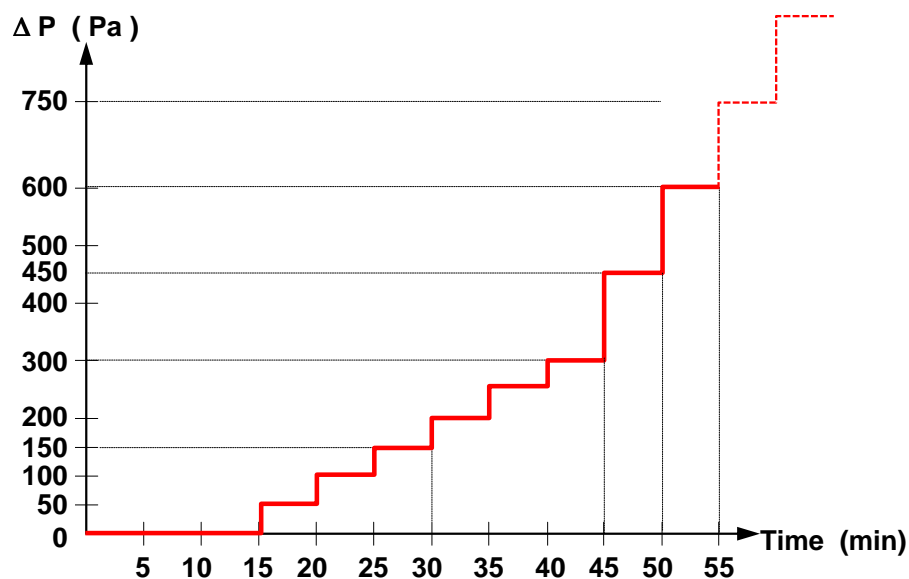


Illustration Test sequence for watertightness

Resistance to wind load – Safety test - EN 1211

The wind resistance test (safety test) is conducted at negative pressure and positive pressure in accordance with EN 12211 up to test pressure $\Delta p_3 = p_1 + 50\%$.

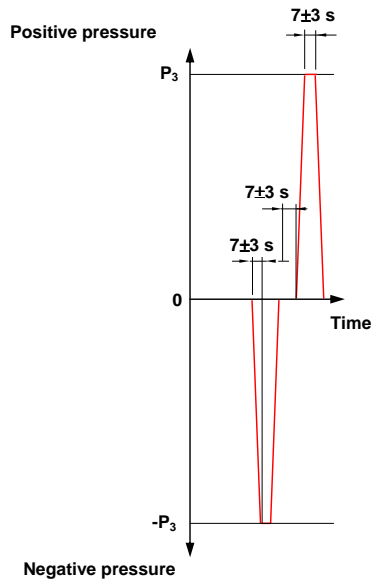


Illustration Test sequence for safety test

Load-bearing capacity of safety devices - EN 14609

Load-bearing capacity of safety devices is tested in accordance with EN 14609. The safety devices are subjected to individual loads of 350 N in the most unfavourable loading direction for 60 seconds. The load is applied pointwise. In deviation from EN 14609 the load can be applied directly to the safety device so as to test the most unfavourable load application to the stay bearing.

3. Detailed results

Performance data sheet

Specimen	Tilt and turn window		
Project No.	11-001345		
Client	PVC-LUK d.o.o.	Size of window frame	1230 x 1480 mm
System	REHAU Euro 70	Size of active casement	1151 x 1400 mm
Frame material	PVC	Size of inactive casement	mm
Date of test	05.07.2012.	Area of test specimen	1,820 m ²
Tester	Mario Šimunović	Length of opening joints	5,102 m
Specimen No.	1	Casement weight	40,2 kg
Date of delivery	05.07.2012.	Temperature	29,2 ° C
Date of manufacture	01.06.2012.	Air humidity	53 %
Attended by:	Zoran Tešić, Dragan Škobalj	Air pressure	1001 hPa

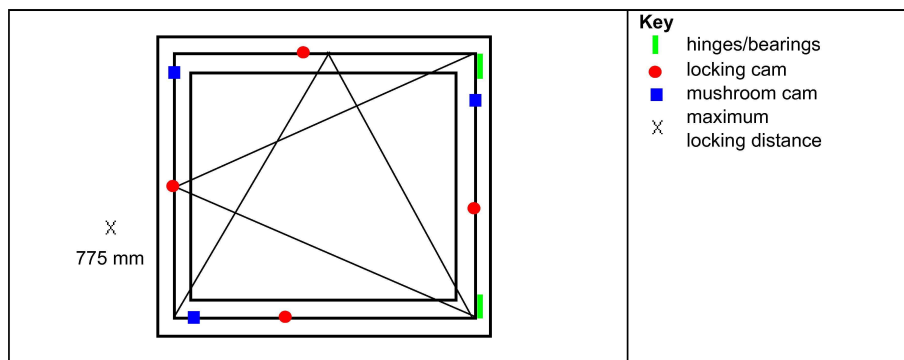


Figure 1 View of specimen

1 Operating forces - Test according to EN 12046

Table: Measurement of operating forces

Individual measured	1	2	3	Average value
in Nm	4,8	4,6	4,8	4,7

2 Air permeability - Test according to EN 1026

Table: Air permeability at positive wind pressure

Measured results at positive wind pressure	Pressure differential in Pa	50	100	150	200	250	300	450	600
		Flow rate (volume) m ³ /h	1,0	1,7	2,3	2,7	3,5	5,0	15,1
	Joint length-related m ³ /hm	0,19	0,34	0,45	0,54	0,68	0,99	2,97	8,29
	Overall area-related m ³ /hm ²	0,54	0,94	1,27	1,50	1,90	2,77	8,32	23,23

Table: Air permeability at negative wind pressure

Measured results at negative wind pressure	Pressure differential in Pa	50	100	150	200	250	300	450	600
		Flow rate (volume) m ³ /h	1,0	1,5	2,0	2,3	2,5	2,9	3,7
	Joint length-related m ³ /hm	0,19	0,30	0,38	0,44	0,50	0,56	0,73	0,84
	Overall area-related m ³ /hm ²	0,52	0,83	1,08	1,25	1,39	1,58	2,03	2,36

Table: Air permeability from average values from positive and negative wind pressures

Average value from positive and negative wind pressures	Pressure differential in Pa	50	100	150	200	250	300	450	600
		Flow rate (volume) m ³ /h	1,0	1,6	2,1	2,5	3,0	4,0	9,4
	Joint length-related m ³ /hm	0,19	0,32	0,42	0,49	0,59	0,78	1,85	4,57
	Overall area-related m ³ /hm ²	0,53	0,88	1,18	1,37	1,64	2,17	5,17	12,80

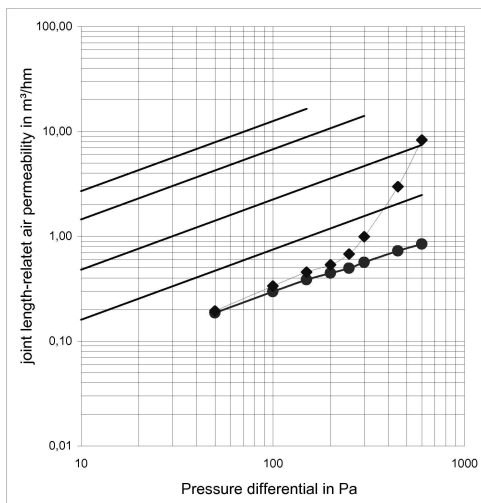


Diagram: Joint length-related air permeability (positive and negative wind pressures)

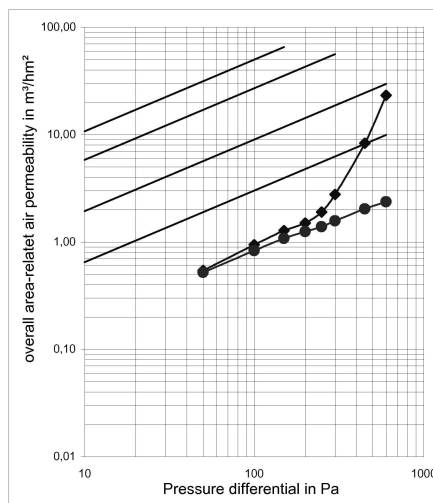


Diagram: Overall area-related air permeability (positive and negative wind pressures)

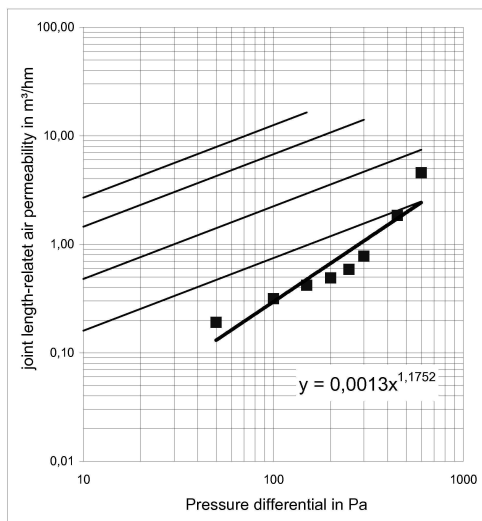


Diagram: Joint length-related air permeability (average value from positive and negative wind pressures)

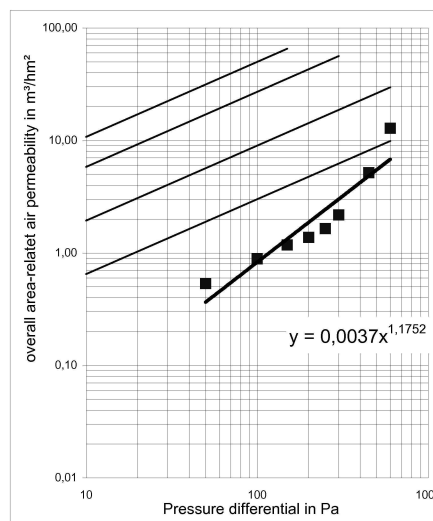


Diagram: Overall area-related air permeability (average value from positive and negative wind pressures)

Table: Measured results

Reference air permeability related to joint length	Q100 = 0,30 m³/hm
Reference air permeability related to overall area	Q100 = 0,85 m³/hm²

3 Resistance to wind load - Test according to EN 12211

3.1 Deflection under wind load

Maximum test pressure: \pm 1200 Pa 3 pressure pulses of 1320 Pa

Deflection was not measured because due to the perimeter locking and the existing locking distance no deformation of the frame members $> l/300$ is likely to occur at the specified wind loads.

The test specimen was exposed to a load \pm 1200 Pa as specified by EN 12211.

3.2 Dynamic wind loads (negative / positive pressures)

Table: Pressure steps

p_2	Pa	200	400	600	800	1000
passed				√		

50 cycles at $p_2 \pm$ 600 Pa

No malfunctions were detected.

4 Repeat test of air permeability - Test according to EN 1026

Subsequent to the test of resistance to wind load by application of test pressures p_1 and p_2 , the upper limit of the achieved air permeability class must not be exceeded by more than 20% as set out by EN 12207 (Clause 2 of this test record).

The requirements were fulfilled.

5 Watertightness - Test according to EN 1027

No water penetration at up to 150 Pa detected.

3.3 Resistance to wind load - Test according to EN 12211 - Safety test

p_2	Pa	positive wind pressure					negative wind pressure				
		600	1200	1800	2400	3000	-600	-1200	-1800	-2400	-3000
passed				√					√		

Safety test passed at up to $p_3 \pm$ 1800 Pa passed.

6 Load-bearing capacity of safety devices

The testing of the safety device is carried out with a load of 350N for 60s.

No malfunctions were detected at the test specimen.

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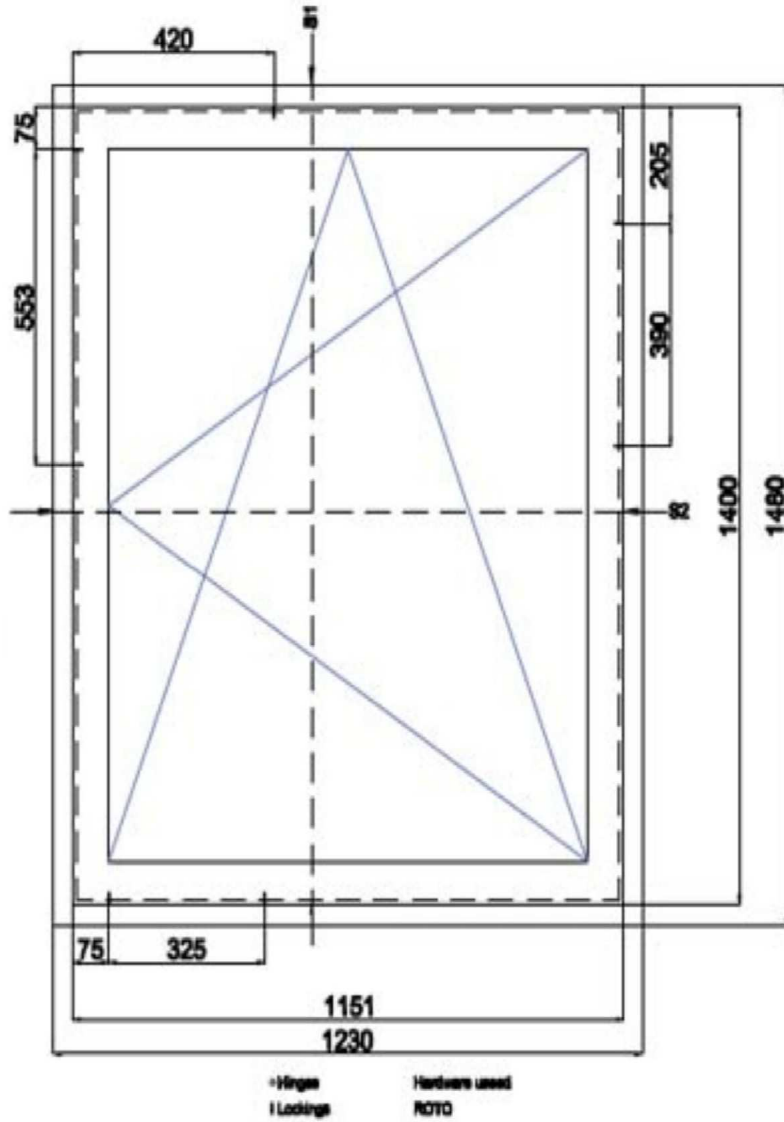
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Evidence of Performance

Air permeability, Watertightness, Resistance to wind load

Test Report No. 11-001345-PR01 PB-A01-02-en-01 dated 17. Juli 2012

Client: PVC - LUK d.o.o., 14000 Valjevo (Serbia)



Drawing 1
Test specimen

Evidence of Performance

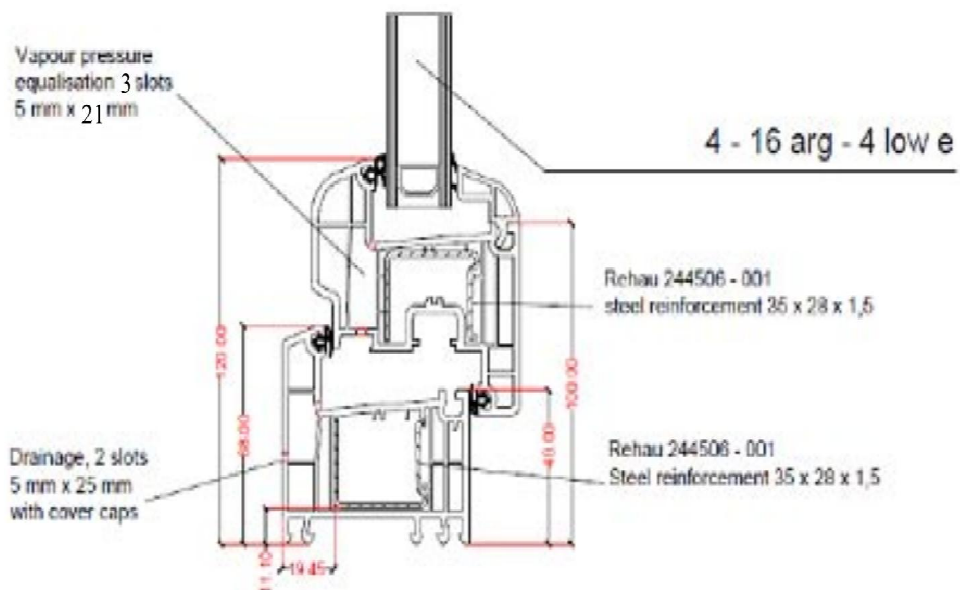
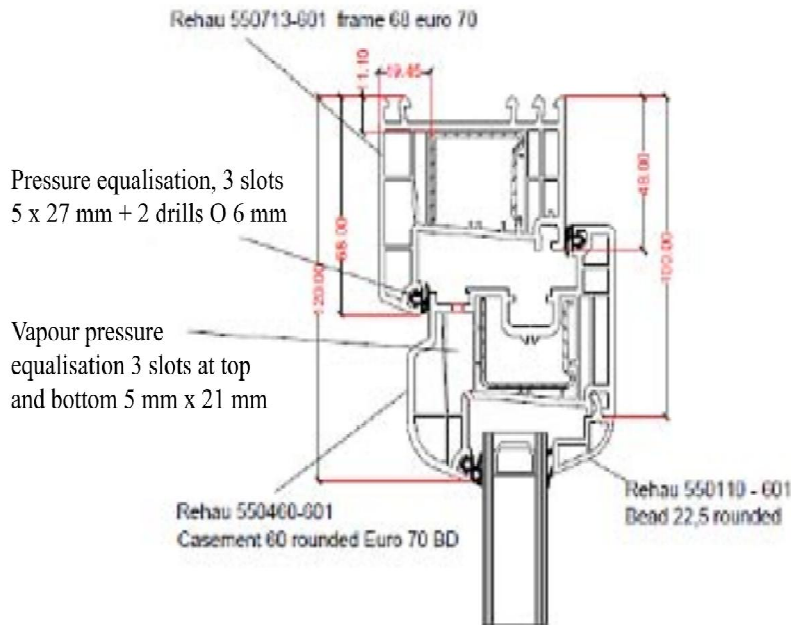
Air permeability, Watertightness, Resistance to wind load

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VERTICAL SECTION



Drawing 3
Vertical section

Evidence of Performance

Air permeability, Watertightness, Resistance to wind load

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Picture 1
View of test specimen on window test rig
Window closed



Picture 2
View of test specimen on window test rig
Window open



Picture 3
Rebate drainage



Picture 4
Rebate drainage



Picture 5
Rebate drainage



Picture 6
Rebate drainage

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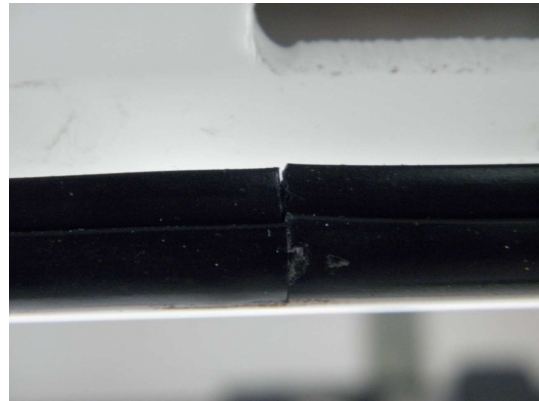
Picture 7
Rebate drainage



Picture 8
Rebate drainage



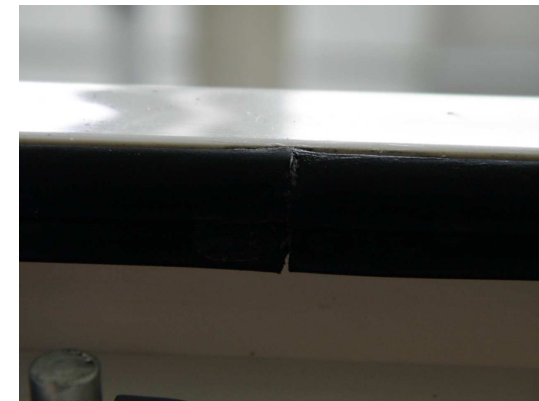
Picture 9
External rebate seal, corner configuration



Picture 10
External rebate seal, sealant joint



Picture 11
Internal rebate seal, corner configuration



Picture 12
Internal rebate seal, sealant joint

Evidence of Performance

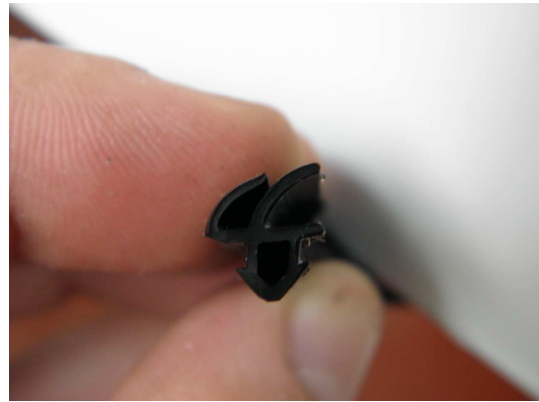
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Picture 13
External rebate seal



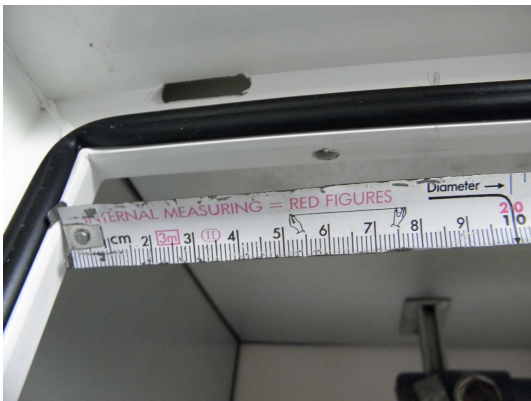
Picture 14
Internal rebate seal



Picture 15
Pressure equalisation



Picture 16
Pressure equalisation



Picture 17
Pressure equalisation



Picture 18
Pressure equalisation

Evidence of Performance

Air permeability, Watertightness, Resistance to wind load

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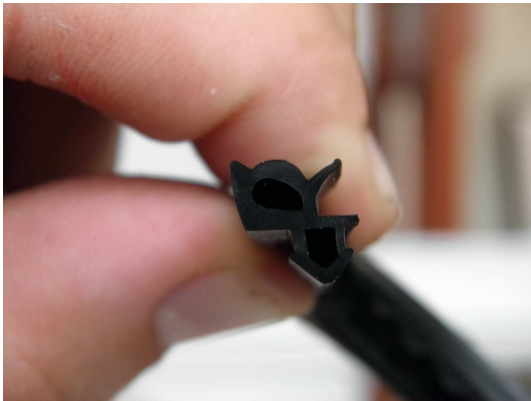
Client: PVC - LUK d.o.o., 14000 Valjevo (Serbia)



Picture 19
External glazing seal, corner configuration



Picture 20
External glazing seal, sealant joint



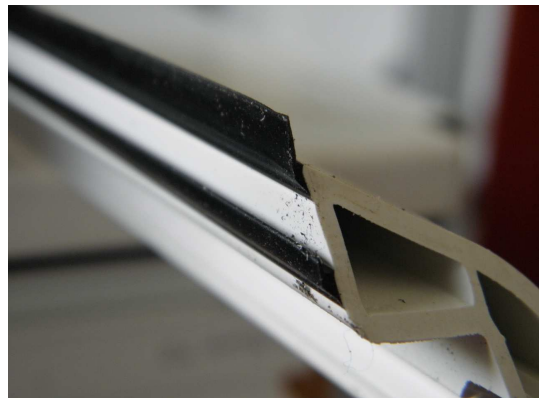
Picture 21
External glazing seal



Picture 22
View of horizontal glazing rebate



Picture 23
Internal glazing seal, corner configuration



Picture 24
Internal glazing seal

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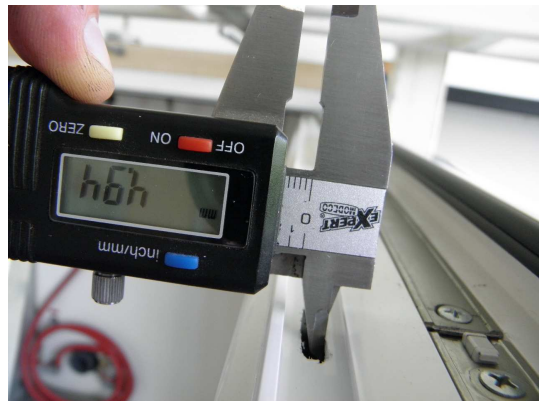
Picture 25
Vapour pressure equalisation



Picture 26
Vapour pressure equalisation



Picture 27
Vapour pressure equalisation



Picture 28
Vapour pressure equalisation



Picture 29
Tilt mechanism pivot, internal view



Picture 30
Tilt mechanism pivot, rebate view

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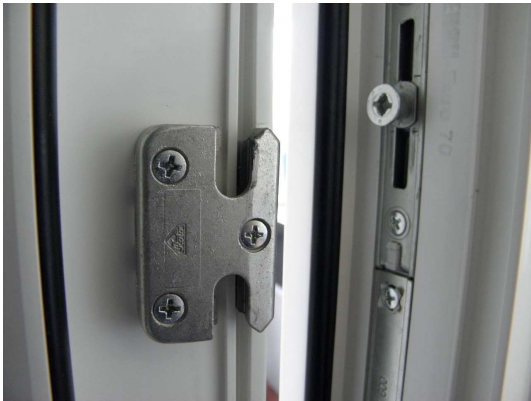
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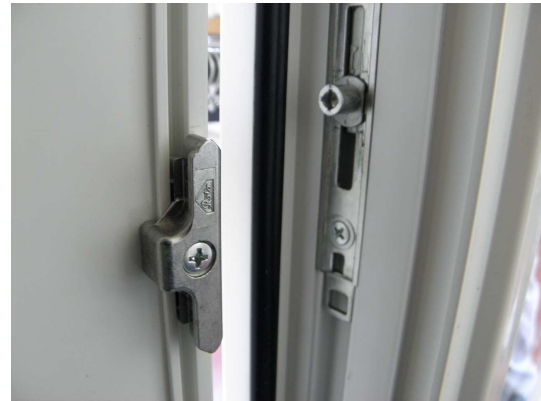
Picture 31
Corner pivot, internal view



Picture 32
Corner pivot, rebate view



Picture 33
Locking situation, frame member / casement member 1



Picture 34
Locking situation, frame member / casement member 2



Picture 35
Locking situation, frame member / casement member 3



Picture 36
Locking situation, frame member / casement member 3

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Picture 37
Cutback reinforcement frame member



Picture 38
Cutback reinforcement casement member