Evidence of Performance
Calculation of thermal transmittance

Test Report
No. 14-001048-PR01
(PB-K20-06-en-01)

ROSENHEIM

Client	ELVIAL S.A. Aluminium Extrusion 25th Km national road, Thessaloniki 61100 Kilkis Greece
Product	Thermal insulated metal profiles Profile combinations: frame, casement-frame, casement-overlap, casement-overlap-casement
Designation	System: Elvial XCLUSIVE 85/86
Performance-relevant product details	Material Aluminium alloy; Surface treatment painted / powder-coated / anodized; View width B in mm 79 – 164,5; Thermal break; Material Polyamide 6.6 with 25% glass fibre; Type of thermal break continuous bar / hollow chamber bar; Height of bars in mm 34; Distance of metal shells d in mm 29; Surface in thermal break untreated; Infill foam for thermal break; Material Polyurethane (PUR) foam “V-POR ECO 1622/3”; Thermal conductivity in W/(m K) 0,034; Infill foam for glazing rebate; Material Polyethylene foam; Replacement panel; Edge in mm 15; Thickness in mm 36
Special features	-

Results

Calculation of thermal transmittance according to EN ISO 10077-2:2012-02

$$U_f = 1,3 - 1,7 \text{ W/(m}^2\text{K)}$$

Basis *)

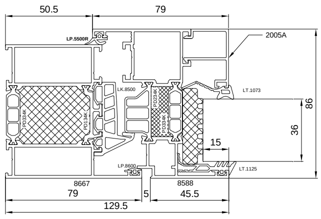
EN ISO 10077-2:2012-02

SG 06-verpflichtend
NB-CPD/SG06/11/083 2011-09

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

Representation

Specimen 02



further specimens see Annex

Instructions for use

The results obtained can be used as evidence in accordance with the above basis.

Validity

The data and results given relate solely to the tested and described specimen. This test does not allow any statement to be made on further characteristics of the present structure regarding performance and quality.

Notes on publication

The ift-Guidance Sheet "Conditions and Guidance for the Use of ift Test Documents" applies. The document may only be published in full.

Contents

The report contains a total of 8 page/s und Anlagen (4 Seiten).

ift Rosenheim
10.04.2014

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Deputy Head of Testing Department
Thermal & Climate

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Operating Testing Officer
Computerassisted Simulation

1 Object

1.1 Description of test specimen

Thermal insulated metal profiles
Profile combinations: frame, casement-frame, casement-overlap, casement-overlap-casement

Manufacturer	ELVIAL S.A., Aluminium Extrusion - Santa-Kilkis
System designation	Elvial XCLUSIVE 85/86
Material	Aluminium alloy
Surface treatment	painted / powder-coated / anodized
Infill foam for glazing rebate	
Material	Polyethylene foam
Thermal break	
Material	Polyamide 6.6 with 25 % glass fibre
Surface in thermal break	untreated
Infill foam for thermal break	
Material	Polyurethane (PUR) foam “V-POR ECO 1622/3”
Thermal conductivity in W/(m K)	0,034
Replacement panel	
Length in mm	190
Edge in mm	15
Thickness in mm	36

Test specimen	**01**	**02**
Profile combination	**Frame**	**Casement - frame**
View width B in mm	79	129,5
Sum b in mm	50,3	83,5
Ratio b / B	0,64	0,65
Sealing system	-	1 x overlap seal 1 x centre seal 1 x rebate seal
Frame		
Item number	8667	8667
Profile cross section, Width in mm	79	79
Profile cross section, Thickness i n mm	77	77
Infill foam for glazing rebate		
Width in mm	8	-
Height in mm	44	-
Insulation bars		
Type of thermal break	continuous bar / hollow chamber bar	continuous bar / hollow chamber bar
Thickness of bars in mm	1,8 / 0,8 + 0,8	1,8 / 0,8 + 0,8
Height of bars in mm	34	34
Distance of metal shells d in mm	29	29
Casement	**-**	
Item number	-	8588
Profile cross section, Width in mm	-	79
Profile cross section, Thickness in mm	-	86
Infill foam for glazing rebate		
Width in mm	-	12
Height in mm	-	44
Insulation bars	-	
Type of thermal break	-	hollow chamber bar
Number of bars	-	2
Thickness of bars in mm	-	0,8 + 0,8 / 1,4 + 1,0
Height of bars in mm	-	34
Distance of metal shells d in mm	-	29

Test specimen	**03**	**04**
Profile combination	**Casement – overlap**	**Casement – overlap - casement**
View width B in mm	151,5	164,5
Sum b in mm	77,9	90,0
Ratio b / B	0,51	0,55
Sealing system	1 x overlap seal 1 x centre seal 1 x rebate seal	1 x overlap seal 1 x centre seal 1 x rebate seal
Casement		**2 x Casement**
Item number	8588	8588
Profile cross section, Width in mm	79	79
Profile cross section, Thickness in mm	86	86
Infill foam for glazing rebate		
Width in mm	12	12
Height in mm	50	50
Insulation bars		
Type of thermal break	hollow chamber bar	hollow chamber bar
Number of bars	2	2
Thickness of bars in mm	0,8 + 0,8 / 1,0 + 1,4	0,8 + 0,8 / 1,0 + 1,4
Height of bars in mm	34	34
Distance of metal shells d in mm	29	29
Overlap		
Item number	8663	8504
Profile cross section, Width in mm	101	63,5
Profile cross section, Thickness in mm	77	83,5
Infill foam for glazing rebate		-
Width in mm	8	-
Height in mm	44	-
Insulation bars		
Type of thermal break	continuous bar	continuous bar / hollow chamber bar
Number of bars	2	2
Thickness of bars in mm	1,8	1,8 / 0,8 + 0,8
Height of bars in mm	34	34
Distance of metal shells d in mm	29	29

The description is based on specifications provided by the client and on inspection of the test specimen at the **ift.** (Item designations/ numbers as well as material specifications were provided by the client, unless designated as „***ift**-tested*".)

Test specimen are described in the annex "Product/Sample description".

1.2 Sampling

The following data for sampling have been presented to **ift**:

Sampler: ELVIAL S.A. Aluminium Extrusion, 61100 Santa-Kilkis (Greece)

Date: 21.03.2014

Documentation: ift Rosenheim did not receive a sampling report.

ift-test specimen-No.:14-001048-PK01

2 Procedure

2.1 Basic documents *) of the processes

EN ISO 10077-2:2012-02
Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2 - Numerical method for frames

SG 06-verpflichtend NB-CPD/SG06/11/083 2011-09
EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties to EN ISO 10077-2

*) correspond/s to the national standard/s, e.g. DIN EN

2.2 Short description of process

Calculation of thermal transmittance U_f
The profile section is subdivided into a sufficient number of elements; with subdivision into smaller elements not having any effect on the total heat flow. The relevant materials / boundary conditions are determined and the total heat flow calculated. The heat flow is used to determine the thermal transmittance.

3 Detailed results

Calculation of thermal transmittance

Project No.	14-001048-PR01 **Task No.** 14-001048
Basis of testing	SG 06-verpflichtend NB-CPD/SG06/11/083 2011-09 EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties to EN ISO 10077-2 EN ISO 10077-2:2012-02 Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2 - Numerical method for frames
Test equipment used	Sim/020576 - flixo 7.0
Test specimen	Thermally separated aluminium profiles Profile combination: Frame, casement-frame, casement-overlap, casement-overlap-casement
Number of test specimen	14-001048-PK01
Date of test	25 March 2014
Testing personnel in charge	Maurice Mayer
Test personnel	Maurice Mayer

Information on test setup / test method

Test method There are no deviations of the testing method according to the standards.

Boundary Conditions

Boundary conditions			Values	Source[1)]
θ_i	Air temperature inside	°C	20	-/-
θ_e	Air temperature outside	°C	0	-/-
ΔT	Temperature difference	K	20	-/-
R_{si}	Internal heat transfer resistance	(m²·K)/W	0,13	-/-
R_{si}	Internal heat transfer resistance (increased)	(m²·K)/W	0,20	-/-
R_{se}	External heat transfer resistance	(m²·K)/W	0,04	-/-

Material properties

Material properties			Values	Source[1)]
ε_n	Emissivities		0,9	-/-
λ	Thermal conductivity aluminium (Si - alloy)	W/(m·K)	160	-/-
λ	Thermal conductivity polyamide 6.6 with 25 % glass fibre	W/(m·K)	0,30	-/-
λ	Thermal conductivity EPDM (ethylene propylene diene monomer)	W/(m·K)	0,25	-/-
λ	Thermal conductivity polyethylene foam	W/(m·K)	0,05	-/-
λ	Thermal conductivity PUR Foam "V-POR ECO 1622/3" [2)]	W/(m·K)	0,034	Client
λ	Thermal conductivity replacement panel EN ISO 10077-2	W/(m·K)	0,035	-/-

1) Unless stated otherwise, data originate form standards EN ISO 10456 and EN ISO 10077-2.
The emissivity of low emitting layers must be taken to ensure through a factory production control.

2) Confirmation of thermal conductivity by test report of a measurement (deposited at ift) - according standards with 25 % addition

Determination of thermal transmittance U_f

Thermal transmittance of a frame profile is calculated as described below:

$$U_f = \frac{L_f^{2D} - U_p \cdot b_p}{b_f}$$

	Definitions	Units
U_f	thermal transmittance of frame profile	W/(m²K)
b_f	projected width of frame profile	m
b_p	visible width of replacement panel	m
d_p	thickness of replacement panel	m
U_p	thermal transmittance replacement panel	W/(m²K)
Q_{ges}	linear heat flow rate	W/m
L_f^{2D}	two-dimensional thermal conductance	W/(mK)

Sp-No.	Description	U_f	Q_{ges}	L_f^{2D}	b_{ges}	b_f	b_{p1}	d_{p1}	U_{p1}
Sp. 01	Frame	1,31	5,237	0,262	0,269	0,079	0,190	0,036	0,834
Sp. 02	Casment-frame	1,61	7,337	0,367	0,320	0,130	0,190	0,036	0,834
Sp. 03	Casement-overlap	1,56	11,075	0,554	0,532	0,152	0,380	0,036	0,834
Sp. 04	Casement-overlap-cas.	1,71	11,972	0,599	0,545	0,165	0,380	0,036	0,834

Test Result

Calculated thermal transmittance:

Sp-No.		
Sp-No.01	U_f =	**1,3 W/m² K**
Sp-No.02	U_f =	**1,6 W/m² K**
Sp-No.03	U_f =	**1,6 W/m² K**
Sp-No.04	U_f =	**1,7 W/m² K**

Test Report No. 14-001048-PR01 (PB-K20-06-en-01) dated 10.04.2014
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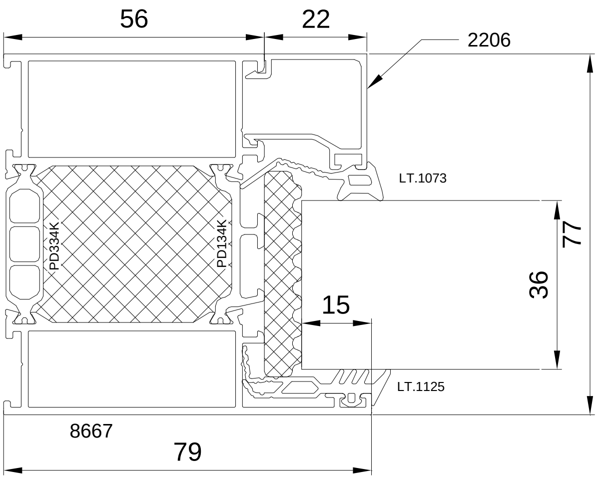

Fig. 1: Profile section test specimen 01

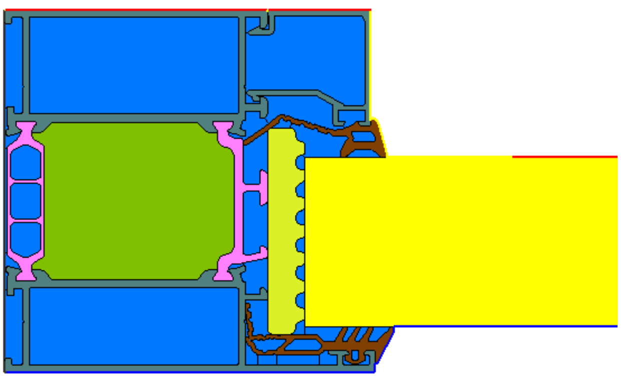

Fig. 2: Simulation model test specimen 01

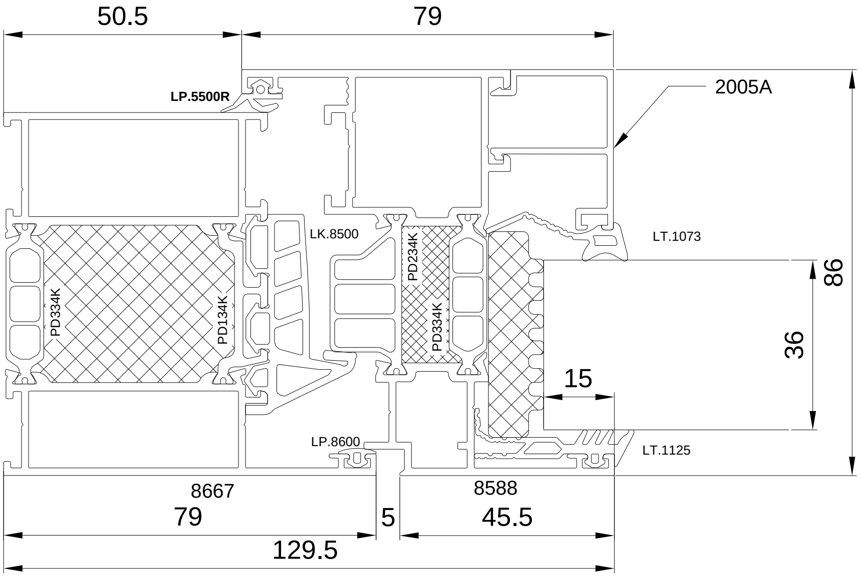

Fig. 3: Profile section test specimen 02

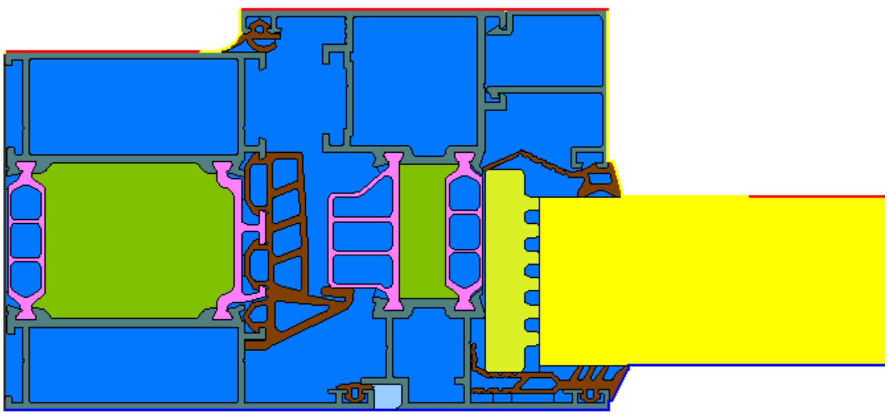

Fig. 4: Simulation model test specimen 02

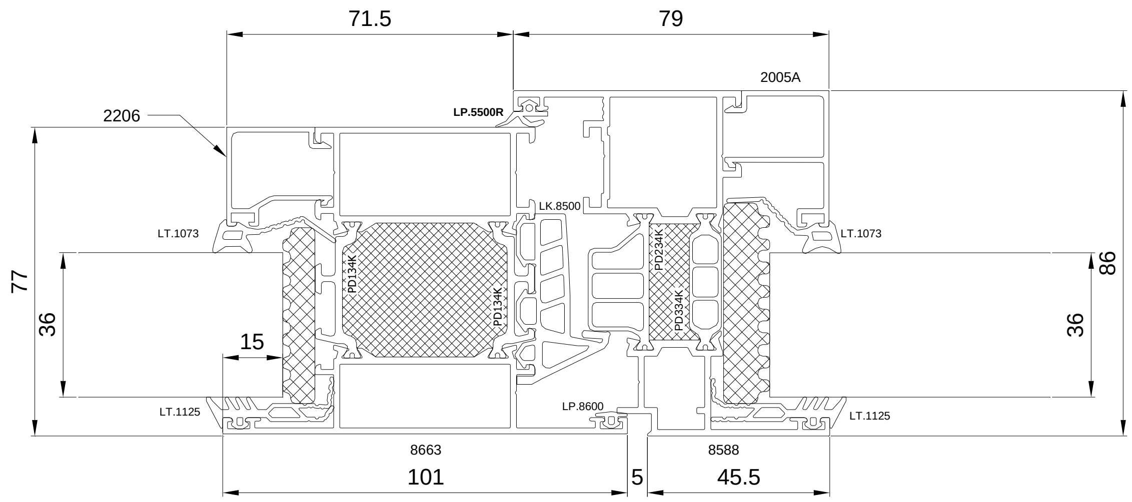

Fig. 5: Profile section test specimen 03

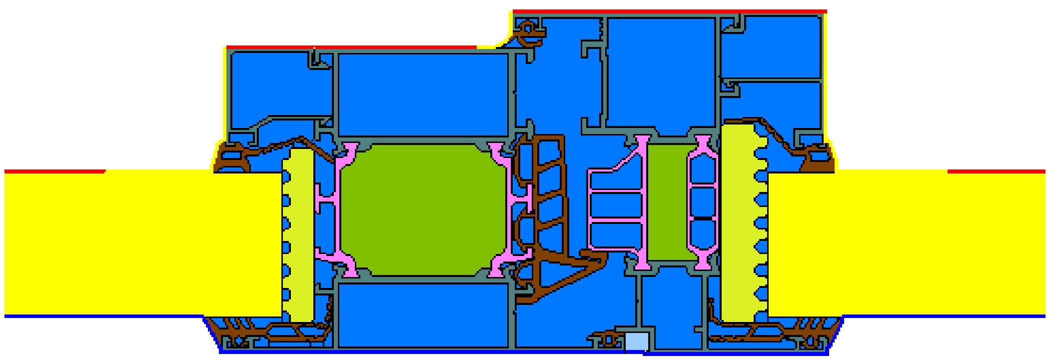

Fig. 6: Simulation model test specimen 03

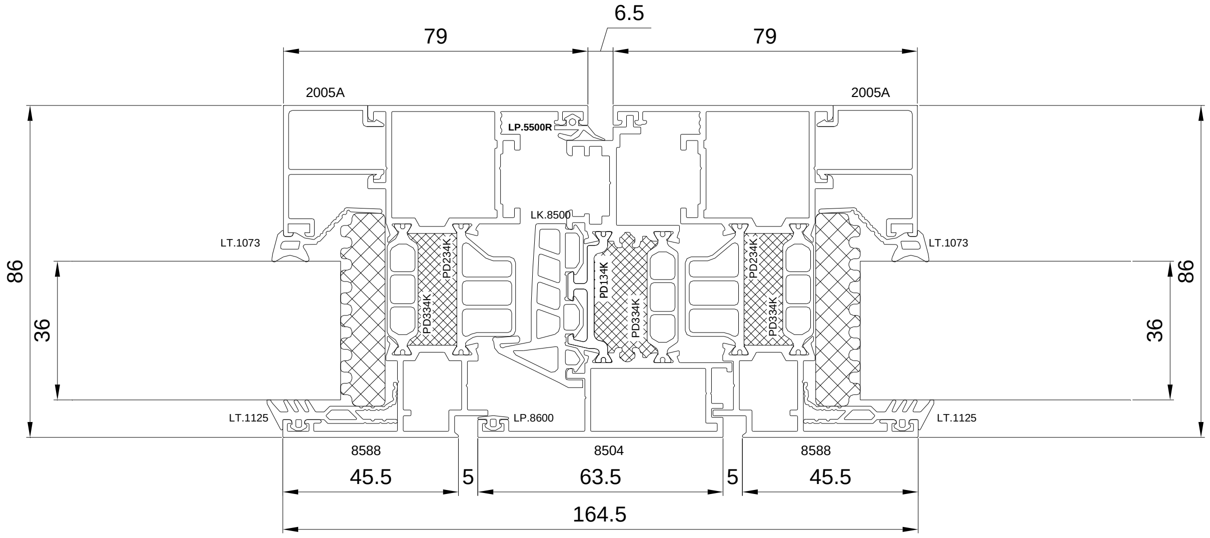

Fig. 7: Profile section test specimen 04

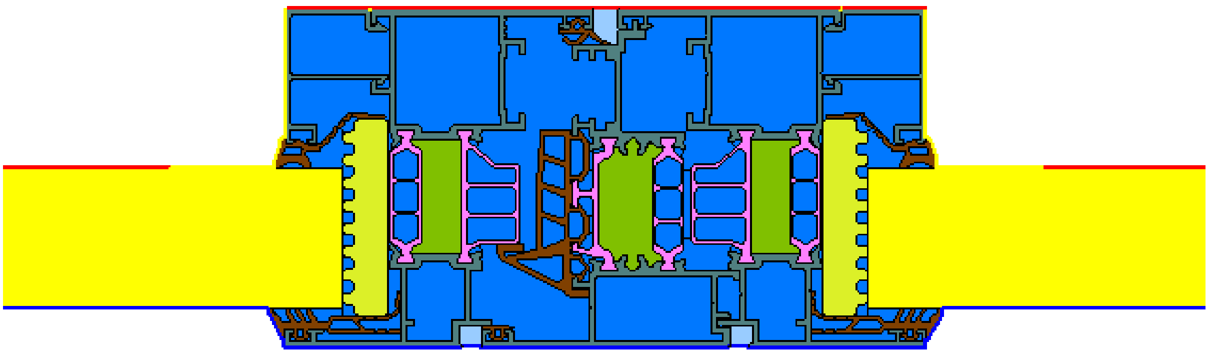

Fig. 8: Simulation model test specimen 04