



Calculation of energy data for frame/sash cross section

System Europa A40

**Carried out for:
Europa Profil Aluminio S.A.
56th km National Road Athens – Lamia
Inofita 32011
Greece**

Att.: Mr. Galazoulas Andreas

Carried out by Lars Thomsen Nielsen

Aarhus, June 15th 2016

Project No.: 0108/696770

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As agreed, the Danish Technological Institute, Glass and Windows has performed calculations of U_f -values for the following window profiles from Europa Profil Aluminio S.A., system Europa A40:

Cross sections	Source file	Date
Europa A40 (1-25)	A40 Uf Calc Final.dwg	2016-05-18
Europa A40 (26)	SECTION_REVISION1.dwg	2016-05-31

The calculations have been carried out in accordance with EN ISO 10077-2:2011. The PC-programme Flixo (version 7.0.631.1) has been applied.

Yours sincerely,

Danish Technological Institute, Glass and Windows

A handwritten signature in blue ink, appearing to read 'Lars Thomsen Nielsen'.

Lars Thomsen Nielsen
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A handwritten signature in blue ink, appearing to read 'Mikkel Svane Dalegaard'.

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Calculations

The calculations have been carried out in accordance with EN ISO 10077-2:2011 thus:

1. The actual overlap for the IGU has been used
2. U_f is always stated to 2 places of decimal

Two panel thicknesses have been applied in the calculations.

- 28 mm, 48 mm and 52 mm thick panel plates with $\lambda_p = 0.035 \text{ W/m K}$

$$U_f = \frac{U_{tot}^{panel} \times \ell_{tot} - U_p \times \ell_p}{\ell_f}$$

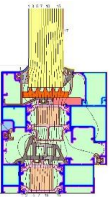
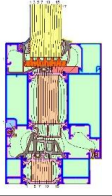
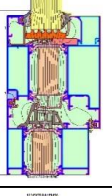
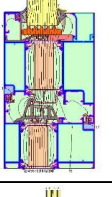
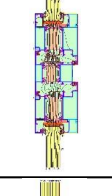
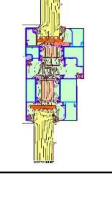
- where U_{tot}^{panel} = thermal transmittance for total construction ($\text{W/m}^2 \text{ K}$)
 U_p = thermal transmittance for panel plate ($\text{W/m}^2 \text{ K}$)
 ℓ_{tot} = total length of construction (m)
 ℓ_f = length of frame/sash (m)
 ℓ_p = length of panel plate in m ($\ell_p = 0.19 \text{ m}$ is generally chosen)

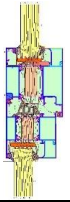
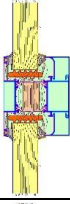
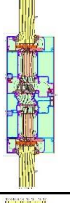
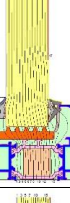
Materials used in calculations:

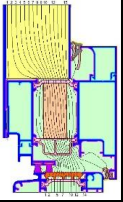
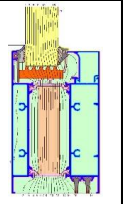
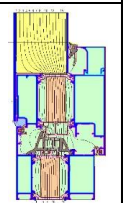
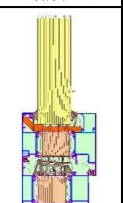
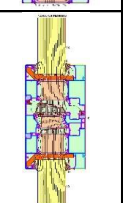
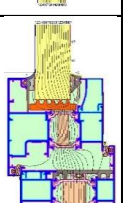
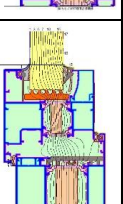
Material	$\lambda [\text{W}/(\text{m} \cdot \text{K})]$	ε
 EPDM (soft 0,030) - Confirmed	0,030	0,900
 EPS (0,030) - Confirmed	0,030	0,900
 Polyethylene - Confirmed	0,038	0,900
 VT-00001: Not ventilated cavity		
 VT-00011: Aluminium alloys	160,000	0,900
 VT-00011: Aluminium alloys	160,000	0,100
 VT-00011: Aluminium alloys	160,000	0,300
 VT-00019: Polyamid-nylon	0,250	0,900
 VT-00028: PVC-flexible	0,140	0,900
 VT-00029: Polyester mohair	0,140	0,900
 VT-00031: EPDM	0,250	0,300
 VT-00031: EPDM	0,250	0,900
 VT-00041: Panel	0,035	0,900

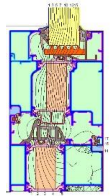
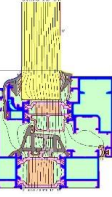
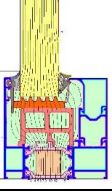
Results of the calculations

The calculated sections for Europa A40 has U_f -values ranging from 0,89 W/m^2K to 3,20 W/m^2K . Below is an overview of the results of the calculations, showing the b_f and U_f of the 8 calculated sections.

No.	Profile sections			d_g	U_{panel}	Thermal conductance	$U_{total, panel}$	b_{tot}	b_p	b_{calc}	b_f	U_f	Visualisation
	Pro. 1	Pro. 2	Pro. 3	[mm]	[W/m^2K]	[W/m]	[W/m^2K]	[mm]	[mm]	[mm]	[mm]	[W/m^2K]	
01	TH56101	TH56201		28	1,0309	7,957	1,1865	335,3	232,3	103,0	103	1,54	
02	TH56101	TH56201		28	1,0309	8,460	1,1611	364,3	232,3	132,0	132	1,39	
03	TH56201	TH56102		28	1,0309	8,258	1,1641	354,7	232,3	122,4	122	1,42	
04	TH56202	TH56102		28	1,0309	8,832	1,1509	383,7	232,3	151,4	151	1,34	
05	TH56202	TH56110		28	1,0309	8,821	1,1495	383,7	232,3	151,4	151	1,33	
06	TH56101	TH56401	TH56202	28	1,0309	16,356	1,1415	716,4	464,6	251,8	252	1,34	
07	TH56201	TH56401		28	1,0309	13,520	1,1066	610,9	464,6	146,3	146	1,35	

No.	Profile sections			d_g	U_{panel}	Thermal conductance	$U_{total, panel}$	b_{tot}	b_p	b_{calc}	b_f	U_f	Visualisation
	Pro. 1	Pro. 2	Pro. 3	[mm]	[W/m ² K]	[W/m]	[W/m ² K]	[mm]	[mm]	[mm]	[mm]	[W/m ² K]	
08	TH56202	TH56401		28	1,0309	14,133	1,1028	640,8	464,6	176,2	176	1,29	
09	TH56401			28	1,0309	11,783	1,0515	560,3	460,6	99,7	100	1,14	
10	TH56201	TH56301	TH56201	28	1,0309	15,174	1,2026	630,9	464,6	166,3	166	1,69	
11	TH56202	TH56301	TH56202	28	1,0309	16,123	1,1710	688,4	464,6	223,8	224	1,46	
12	TH56102			28	1,0309	6,539	1,0716	305,1	230,2	74,9	75	1,20	
13	TH56101			28	1,0309	6,209	1,0866	285,7	230,2	55,5	56	1,31	
14	TH56102	TH56601		28	1,0309	9,179	1,3049	351,7	232,3	119,4	119	1,84	

No.	Profile sections			d_g	U_{panel}	Thermal conductance	$U_{total, panel}$	b_{tot}	b_p	b_{calc}	b_f	U_f	Visualisation
	Pro. 1	Pro. 2	Pro. 3	[mm]	[W/m ² K]	[W/m]	[W/m ² K]	[mm]	[mm]	[mm]	[mm]	[W/m ² K]	
15	TH56212	TH56601		52	0,6463	4,582	1,5585	147,0	28,0	119,0	119	1,77	
16	TH56405			28	1,0309	7,981	1,1172	357,2	232,3	124,9	125	1,28	
17	TH56211	TH56102		52	0,6463	4,140	1,1564	179,0	28,0	151,0	151	1,25	
18	TH56130	TH56230		48	0,6487	5,415	0,7398	366,0	229,1	136,9	137	0,89	
19	TH56130	TH56330	TH56130	48	0,6487	9,460	0,7246	652,8	458,0	194,8	195	0,90	
20	TH56204	TH56101		28	1,0309	9,331	1,3840	337,1	227,8	109,3	109	2,13	
21	TH56204	TH56102		28	1,0309	9,711	1,3624	356,4	227,7	128,7	129	1,94	

No.	Profile sections			d_g	U_{panel}	Thermal conductance	$U_{total, panel}$	b_{tot}	b_p	b_{calc}	b_f	U_f	Visualisation
	Pro. 1	Pro. 2	Pro. 3	[mm]	[W/m ² K]	[W/m]	[W/m ² K]	[mm]	[mm]	[mm]	[mm]	[W/m ² K]	
22	TH56202	TH56110		28	1,0309	8,346	1,0898	382,9	231,5	151,4	151	1,18	
23	TH56220	TH56120		28	1,0309	7,334	1,1630	315,3	228,2	87,1	87	1,51	
24	TH56220	TH56320	TH56220	28	1,0309	13,549	1,1471	590,6	456,6	134,0	134	1,54	
25	TH56220	TH56420	TH56220	28	1,0309	13,967	1,1280	619,1	456,2	162,9	163	1,40	
26	TH56120			28	1,0309	6,881	1,1095	310,1	231,2	78,9	79	1,34	

The calculation results for frame/sash profiles are included in the data sheets, Appendix 1.