

THERMAL SIMULATION REPORT

Report Number:	TCL2014-SWA-019
Prepared For:	Steel Window Association 42 Heath Street Tamworth Staffordshire B79 7HJ
Window System Identifier:	W40
Meeting Rail Identifier:	N/A
Vent Frame Identifier:	SW5
Outer Frame Identifier:	SW8
Glazing System:	4mm Planitherm One/4S – 8mm 90% Krypton – 4mm Planilux -8 mm 90% Krypton – 4mm Planitherm One/4S
Spacer Bar:	8mm Edgetech Super Spacer Standard with butyl secondary sealant
Notes:	Stainless Steel Bead Reference Drawing SWA-W40-015

Result

Thermal Transmittance (U_{Window})	1.6	W/(m ² K)
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(Window Configuration as defined in BS EN 14351-1 Annex E)
(1230mm wide x 1480 high – single vent)

Report Prepared By Dr Gary Morgan
 Therm Consulting

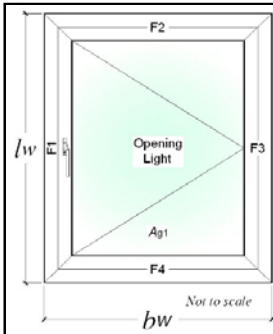
Signed: *G. Morgan*

Date: 22nd May 2014

The simulations in this report were performed using Win IsoPro 7.80
strictly according to EN ISO 10077 – 2:2012
The files generated are attached to this report as appendices



**BFRC Certified
Simulator 016**



Window Style:
L2
Side Hung
Casement

Report Number: **TCL2014 SWA019** Report Issue Status: 02 (04/2008)
 Report Date: **22 May 2014**
 Project Details: **4-8-4-8-4 Planitherm One / 4S (x2) Clear Float 90% Krypton Super Spacer Standard**

Input Values:
 Yellow input, green intermediary, blue finals X DP is no. of decimal points to enter

Parameter	Symbol	Units
Total window height ODP	l_w	1480 mm
Total window width ODP	b_w	1230 mm

Glazing dimensions and properties:
 Nominal 4mm etc to **ODP**, others **1DP**

Thickness of pane 1	4	mm
Pane 1/2 distance	8	mm
Krypton Gas fill (1/2)	90	%
Thickness of pane 2	4	mm
No further entry required for double glazed units		
Pane 2/3 distance (n/a for DG)	8	mm
Krypton Gas fill (2/3)	90	%
Thickness of pane 3 (n/a for DG)	4	mm
Thermal transmittance of glazing - 3DP	U_g	0.602 W/(m ² ·K)

Frame dimensions:

	(b _f) (mm)	No gasket (mm)	Gasket protrusion (mm)	With gasket (mm)
All frame values to nearest 0.5mm, gaskets to 1DP				
F1 LH jamb		54	0.5	54.5
F2 head		54	0.5	54.5
F3 RH jamb		54	0.5	54.5
F4 sill		54	0.5	54.5
Total gasket area				0.0025 m ²

Window Dimensions:

Section	Length (mm)	Width (mm)	Area	
			No gasket (m ²)	With gasket (m ²)
Window	1372	1122	1.5394	1.5369
Total glazing, A _g			1.5394	1.5369

All L values to **4DP**. All b values to **ODP**

	W/(m·K)	b _p (mm)	W/(m·K)	b _g (mm)
F1 LH jamb	0.5230	190	0.4920	190
F2 head	0.5230	190	0.4920	190
F3 RH jamb	0.5230	190	0.4920	190
F4 sill	0.5270	190	0.4920	190

Frame	(mm)	(mm)	(m ²)	(m ²)
F1	1480	54	0.0770	0.0777
F2	1230	54	0.0635	0.0641
F3	1480	54	0.0770	0.0777
F4	1230	54	0.0635	0.0641
Total Frame			0.2810	0.2835
Total Window, A _w			1.8204	1.8204
Percentage glass area			84.56%	84.43%

Frame:

Section	b _f (with gaskets) (m)	U _f (W/(m ² ·K))	Frame areas (with gaskets) (m ²)	Heat flow (W/K)	ψ (W/(m·K))	l _g (m)	Heat flow (W/K)
F1 LH jamb	0.0545	6.0023	0.0777	0.4663	0.0500	1.3710	0.0686
F2 head	0.0545	6.0023	0.0641	0.3845	0.0500	1.1210	0.0561
F3 RH jamb	0.0545	6.0023	0.0777	0.4663	0.0500	1.3710	0.0686
F4 sill	0.0545	6.0757	0.0641	0.3892	0.0460	1.1210	0.0516
Totals			0.2835	1.7064	Total		0.2447

Other parameters needed for calculation, taken from simulations:
 Panel thickness, d_p = d_g = 0.028 m U_p = 1.0309 W/(m²·K)
 λ_p = 0.035 W/(m·K) R_{se} = 0.04 m²·K/V R_{tot} = 0.9700 m²·K/W R_p = 0.8000 m²·K/W R_{si} = 0.13 m²·K/W

U_{window}	U _w =	1.58	W/(m ² ·K)
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Thermal transmittance, W/(m²·K)	U _{window}	1.6
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Simulator Name: **Dr Gary Morgan**



BFRC Certified
 Simulator **016**

Version 11 23/10/2012. Calculations according to BS EN 673:2011

Number of spaces	Help							
2								
Spaces			1		2			
Glazing orientation								
Vertical								
Resistivity panes	1	m·K/W	P a n e 1	90%		P a n e 2	90%	
Outside								
Emissivities								
Calculate								
			Gas		Gas			
			Krypton		Krypton			
Thickness (mm)	4.0		8	4.0	8	44		
Normal emissivity			0.01	0.89	0.89	0.01		
$\sum d_j \cdot r_j =$	0.052		Uncoated		Uncoated			

For uncoated surfaces input 0.89 for normal emissivity, which corresponds to a corrected emissivity of 0.837

Iteration number	U value	$\sum 1/h_s$	λ_{eff}	ΔT	λ_{eff}	ΔT
	W/(m ² ·K)	(m ² ·K)/W	W/(mK)		W/(mK)	
1	0.602	1.4398	0.0111	7.5	0.0111	7.5
2	0.602	1.4398	0.0111	7.5	0.0111	7.5

Simulation software: WinIso2D 7.80

Date: 21.05.2014

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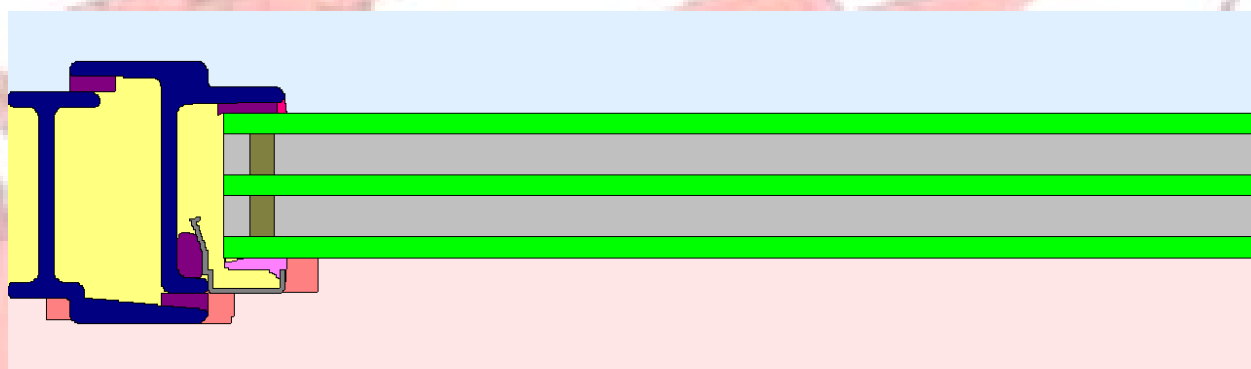


Calculation of the linear thermal transmission coefficient Ψ according to EN ISO 10077-2

Simulation model:

Dimensions (width x height): 243,99 x 70,90 mm

Number of elements in simulation model: X-direction: 207; Y-direction: 133



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C
Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C
Surface resistance R_{si} 1: 0,130 m²K/W
Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K
Total heat flow Q : 9,842 W/m
2D thermal conductance $L2D$: 0,492 W/mK

Length top/left: 190,00 mm
U-value top/left: 0,602 W/m²K

Length bottom/right: 0,00 mm
U-value bottom/right: 0,000 W/m²K

Ψ -value: 0,051 W/mK

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-9,842	X
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	7,673	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	2,168	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-

Simulation software: WinIso2D 7.80

Date: 21.05.2014

File: C:\Users\Gary\Documents\MyDocs from Thermbridge\Thermal Simulation Output Files\Steel Window Association\May 2014\W40 - SIMULATIONS Doors and Windows\W40-012\Section 1.f2d

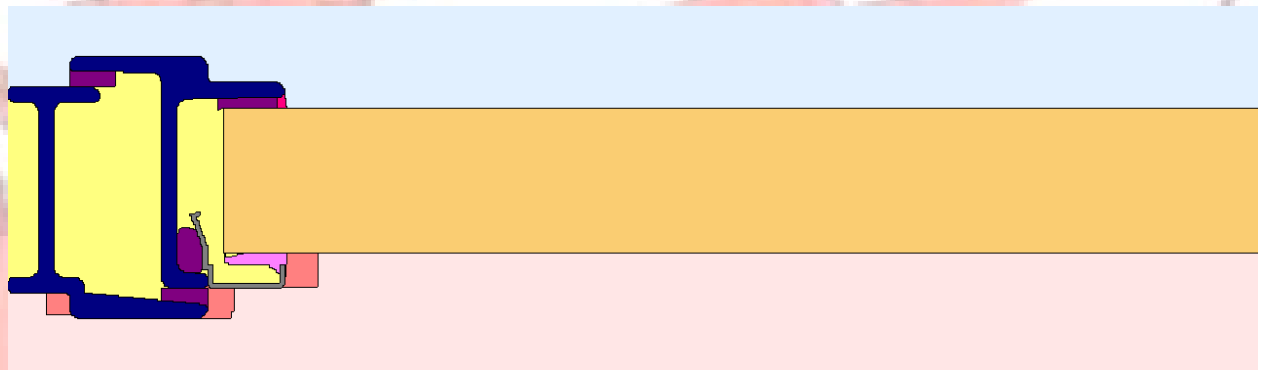


Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 243,99 x 70,90 mm

Number of elements in simulation model: X-direction: 207; Y-direction: 133



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 10,450 W/m

2D thermal conductance $L2D$: 0,523 W/mK

Length 1: 190,00 mm

U-value 1: 1,031 W/m²K

Length 2: 0,00 mm

U-value 2: 0,000 W/m²K

U_f -value: 6,048 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-9,842	X
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	7,673	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	2,168	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-