

Report in Accordance with BFRC Guidelines and Regulations



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Glazing System Specification	
Supplier	Saint-Gobain
Sealed Unit	Style: 4-20-4 Thickness: 28.0 mm
Outer pane	Description: Planilux Thickness: 4.0 mm
Cavity	Description: Argon Thickness: 20.0 mm
Inner pane	Description: Planitherm T + Thickness: 4.0 mm
Solar - g _L (Source EN 410-2011)	0.71 (LT 71%)
Centre Pane (Source BS EN 673)	1.219 W/(m ² ·K)

Report Details	
Report No	W0198
Issue Date	01 May 2015
Simulator	Andy Gibson
Signature	<i>A. Gibson</i>

Window System Specification	
Opening Style	Casement, Fixed Light/Side Hung
Window Suite	Liniar Sculptured Suite
Ancilleries	-

Spacer Bar Specification	
Spacer Bar	Swisspacer Ultimate
Ref Source	BF 'Warm Edge' Working Party Data Sheet Ref: April 2013 - No.19 - Revision index 0
Secondary Sealant	Hot Melt Conductivity 0.24 W/(m·K)
Spacer Bar sightlines	Spacer depth 6.5 mm Total 12 mm Sealant depth 5.5 mm

Thermal Performance		
	Thermal Transmittance (U window)	1.33
	Energy Index (kWh/m ² /year)	5.08
	WER (Band/Rating)	A

Air Leakage Details	
BSI Test Report : 261/7183666 (dated 02/04/2008)	Air Permeability @ 50Pa : 0.00 W/(m ³ (m·k))

The frame profile results detailed below are provided by computer simulation using Sommer Informatik GmbH software program WinIso 2D alongside BFRC guidelines and regulations

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Approved Simulator 018

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Thermal Conductivity Values Used



Material	Reference / Source	Conductivity (W/(m·K))
PVC-U	Annex A, BS EN ISO 10077-2	0.17
Steel	Annex A, BS EN ISO 10077-2	50.00
PVC-P	Annex A, BS EN ISO 10077-2	0.14
Soda lime Glass	Annex A, BS EN ISO 10077-2	1.00
Hot Melt	Annex A, BS EN ISO 10077-2	0.24
Plastic/Multilayer-Polyester	BF 'Warm Edge' Working Party Data Sheet Ref: April 2013 - No.19 - Revision index 0	0.14
-	-	-
-	-	-
-	-	-

BS EN 673 Calculation

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

Number of spaces: **1**

Help

Spaces: **1**

Glazing orientation: **Vertical**

Resistivity panes: **1** m-K/W

Outside

Emissivities

Calculate

Gas: **Argon**

Thickness (mm): **4.0** **20** **4.0**

Normal emissivity: **0.89** **0.05**

$\sum d_j \cdot r_j =$ **0.008** Uncoated

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

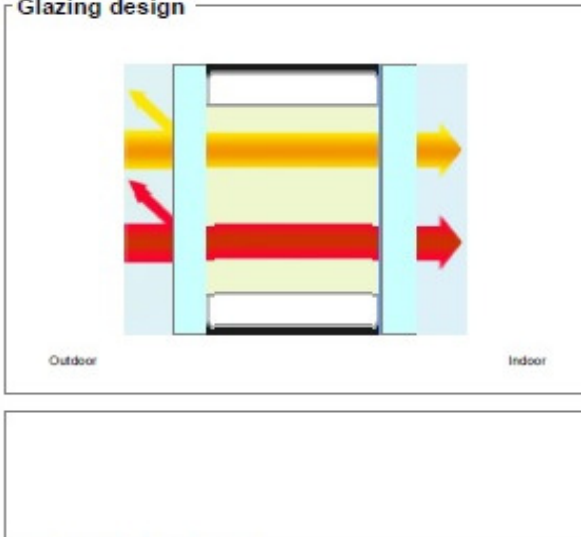
Iteration number	U value W/(m ² ·K)	$\sum 1/h_s$ (m ² ·K)/W	λ_{eff} W/(mK)	ΔT
1	1.219	0.64228	0.0311	15
2	1.219	0.64228	0.0311	15

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Calumen® II 1.2.7
07 October 2014
Data base : SGG UK

Glazing design



	First glazing	Second glazing
Gas		Argon 90% 20.00mm
Coating		PLANITHERM TOTAL+
First glass	PLANILUX 4.00mm	PLANILUX 4.00mm
Coating		
Layer		
Coating		
Second glass		
Coating		

Manufacturing sizes

Nominal thickness : 28.0 mm
Weight : 20.0 kg/m²

Luminous factors (EN410-2011)

Transmittance : 80 %
Outdoor reflectance : 12 %
Indoor reflectance : 12 %

Energy factors (EN410-2011)

Transmittance : 60 %
Outdoor reflectance : 19 %
Indoor reflectance : 19 %
Absorptance A1 : 9 %
Absorptance A2 : 12 %

Solar factors (EN410-2011)

g : 0.71
Shading coefficient : 0.81

Thermal transmission (EN673-2011) - 0° related to vertical position

Ug : 1.2 W/(m².K)



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CALUMEN® II is a simulation software to calculate key performance of glass such as light transmission, solar factor or thermal insulation coefficient. Computed values are indicative and subject to change. They can not be used to guarantee performance of the products.

These values are calculated according to EN410-2011 and EN673-2011 standards. Tolerances are defined according to EN 1096-4 or ISO9050 standards. Nevertheless, user must check the feasibility of the associated products, in particular in terms of thickness and colour. Furthermore, it is his responsibility to check that the resulting combination of glazing meets regulatory requirements at national, local or regional level.

Calculation rules and functional output of Calumen II have been validated by TÜV Rheinland Quality Report 11923R-11-33705



April 2013 – No.19 – Revision Index 0

WARM EDGE WORKING PARTY



Data sheet Psi values for windows

based on determination of the equivalent thermal conductivity of spacers by measurement

SWISSPACER®

Vetrotech Saint-Gobain (International) AG
Zweigverfasserung Kreuzlingen
Sonnenwiesenstrasse 15
CH-8280 Kreuzlingen

SWISSPACER®

Product name	Ultimate SWISSPACER		Spacer height in mm	6.5	Material	Plastic / Multilayer - polyimide coated film "High Tech Gas Barrier foil"	Thickness d in mm	1.0 0.097	
Representative frame profile		Metal with thermal break		Plastic		Wood		Wood / Wood	
Argon filled or noble gas Double sheet insulating glass U _g = 1.1 W/m ² K		0.036	0.032	0.031	0.032				
Argon filled or noble gas Triple sheet insulating glass U _g = 0.7 W/m ² K		0.031	0.030	0.029	0.030				
Spacer width in mm (the outside value) 	Spacer between panes in mm		$U_{sp, 25^\circ\text{C}}$ in W/m ² K						
	Can be used for all spacer widths		Size 1 - $b_s = 3 \text{ mm}$	Size 2 - $b_s = 6.5 \text{ mm}$					
			0.40	0.14					

The equivalent thermal conductivity has been determined in accordance with the ift guideline WA-01/1 "Thermally improved spacers - Determination of the equivalent thermal conductivity by measurement". The representative linear heat transfer coefficients calculated in this way (representative psi values) apply to typical frame profiles and glazing for the determination of the heat transfer coefficient (UW) of windows. They have been determined under the boundary conditions (frame profiles, glazing, glass mounting depth, back coating, primary and secondary sealant) defined in the ift guideline WA-01/2 "Thermally improved spacers - Part 1: Determination of the representative psi value for window frame profiles". This guideline also governs the area of validity and application of the representative psi values. In order to avoid rounding errors, the psi values in the data sheet have been given at 0.001 W/mK. The method for the arithmetical determination of the psi values has an accuracy of $\pm 0.003 \text{ W/mK}$. Differences of less than 0.005 W/mK are not significant. For further information, refer to the Bulletin 004/2008 "Compass Warm Edge" for Windows" of Bundesverband Flachglas.

Certification partners:

Hochschule Passenheim

University of Applied Sciences



Sash / Frame Specification

	Code	Size	Material
Frame :	LSW011	57 x 70mm	PVC-U & PVC-P
Frame Rein :	n/a	-	-
Sash :	LSW031	75 x 70mm	PVC-U & PVC-P
Sash Rein :	n/a	-	-
Bead :	LSW041	-	PVC-U & PVC-P
Ancilleries :			

Mullion / Sash Specification

	Code	Size	Material
Mullion :	LSW022	67 x 70mm	PVC-U & PVC-P
Mullion Rein :	LSR021	36 x 11.6mm	Steel
Sash :	LSW031	75 x 70mm	PVC-U & PVC-P
Sash Rein :	n/a	-	-
Bead :	LSW041	-	PVC-U & PVC-P
Ancilleries :			

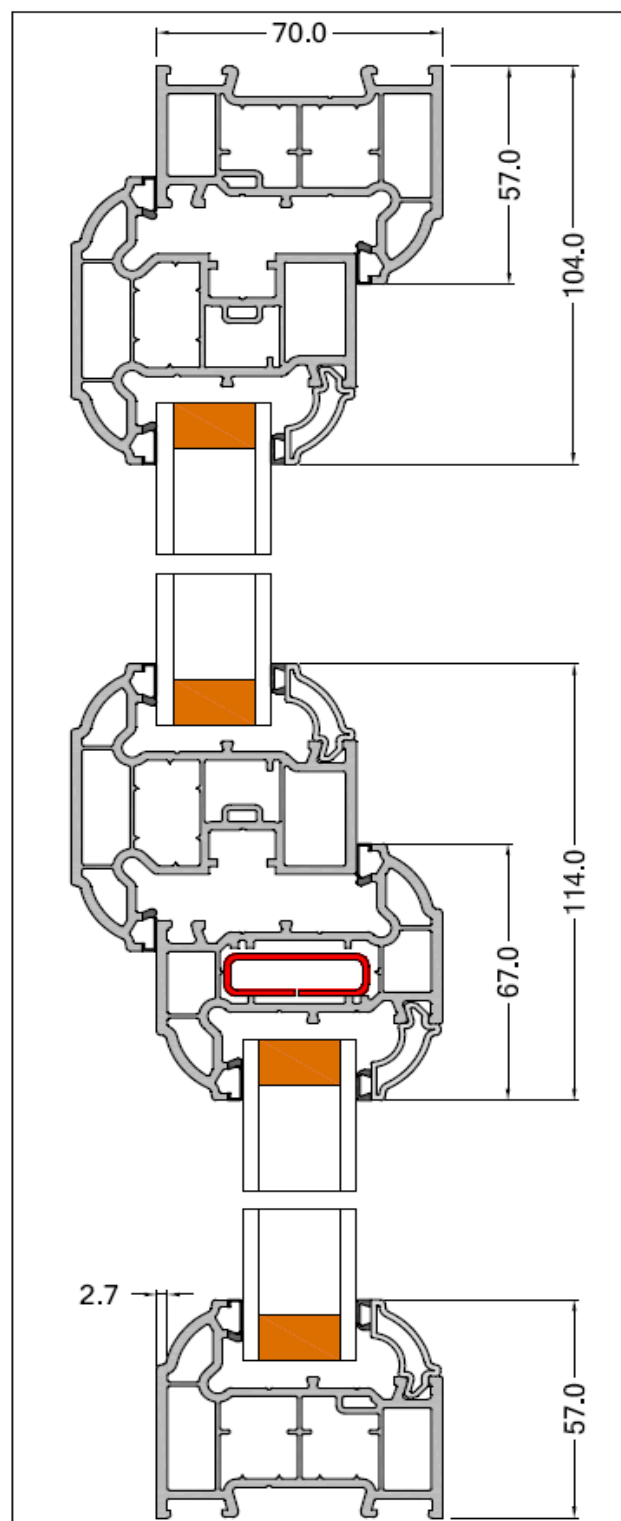
Frame Specification

	Code	Size	Material
Frame :	LSW011	57 x 70mm	PVC-U & PVC-P
Frame Rein :	n/a	-	-
Bead :	LSW041	-	PVC-U & PVC-P
Ancilleries :			

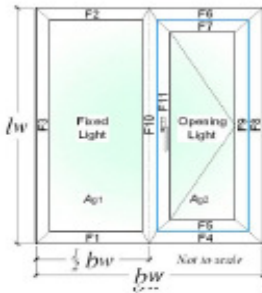
Additional Specifications

Glazing :	28mm 4-20-4	See pages 2 & 3
Spacer Bar :	Swisspacer Ultimate	See page 4

Profile Drawings (Do not Scale)



Linier Sculptured Suite



Sample Style:
Casement

Fixed Light /
Side Hung

Blue line illustrates
opening light length
(air leakage)

Report Number: **W0198** Issue No 22.1: 11/03/2013
Report Date: **07 October 2014**
Project Details: **Std Sculp, Planilux, Argon, Total+,
Swisspacer Ultimate, Hot Melt**

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ONLY BE USED IN CONJUNCTION WITH A BFRC LICENCE**

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

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

Frame offset: **No**

Nominal 4mm etc to ϕDP , others 1DP			
Glazing dimensions and properties:			
Thickness of pane 1	4	mm	
Pane 1/2 distance	20	mm	
Gas fill (1/2)	Argon 90%		
Thickness of pane 2	4	mm	
Complete next 3 cells for IG IGU			
Pane 2/3 distance		mm	
Gas fill (2/3)			
Thickness of pane 3		mm	
Glazing Trans. - 3DP	U_g	1.219	W/(m ² ·K)
g-value - 2DP	g_L	0.71	

Thermal transmittance of window from hot box test		
U_w - 2DP		W/(m ² ·K)

Window Dimensions:		Area	
	Length	Width	No gasket
	(m)	(m)	(m ²)
Section			
Fixed Light	1.3680	0.5245	0.7165
Opening light	1.2720	0.4305	0.5476
Total glazing, A_g			1.2641
Frame			
F1	0.6150	0.0570	0.0325
F2	0.6150	0.0570	0.0325
F3	1.4800	0.0570	0.0811
F4	0.6150	0.0570	0.0325
F5	0.5245	0.0470	0.0224
F6	0.6150	0.0570	0.0325
F7	0.5245	0.0470	0.0224
F8	1.4800	0.0570	0.0811
F9	1.3680	0.0470	0.0620
F10	1.4800	0.0670	0.0953
F11	1.3680	0.0470	0.0620
Total Frame			0.5563
Total Window, A_w			1.8204
Percentage fixed light glass area			39.36%
Percentage opening light glass area			30.08%
Percentage glass area (total)			69.44%

Solar Factor, g-value:	F_w	0.9
	g_w	0.44

U_{window}	No bars; or attached bars	1.33
	Single cross bar in IGU	1.4
	Multiple cross bar in IGU	1.5
	Glazing bar (Georgian bar)	1.7

BFRC Rating	Label	EWER	Window
kWh/(m ² ·yr)	index	Rating Scale	Rating
≥10		A+	
0 to <10		A	
-10 to <0		B	
-20 to <-10		C	
-30 to <-20		D	
-50 to <-30		E	
-70 to <-50		F	

Frame dimensions:		Frame width, b_f	Gasket protrusion, b_g	Frame & gasket widths
		(mm)	(mm)	(mm)
All frame values round to nearest 1mm, gaskets to 1DP	F1 fixed sill	57		57.0
	F2 fixed head	57		57.0
	F3 fixed jamb	57		57.0
F4 + F5 sash sill	F4 fixed sash sill	57	n/a	57.0
	F5 moving sash sill	47		47.0
F6 + F7 sash head	F6 fixed sash head	57	n/a	57.0
	F7 moving sash head	47		47.0
F8 + F9 sash jamb	F8 fixed sash jamb	57	n/a	57.0
	F9 moving sash jamb	47		47.0
F10 + F11 mullion	F10 fixed mullion	67		67.0
	F11 moving mullion	47		47.0
Total gasket area			0	m ²

Where a U_w value from hot box testing is available, no $L_{f,2D}$ or $L_{p,2D}$ values need to be entered						
Frame conductance:		All L values to 4DP. All b values to 0DP				
		$W/(m^2 \cdot K)$	b_f (mm)		$W/(m^2 \cdot K)$	b_g (mm)
$L_{f,2D}$	F1 fixed sill	0.2570	190	$L_{p,2D}$	0.3220	190
	F2 fixed head	0.2570	190		0.3220	190
	F3 fixed jamb	0.2570	190		0.3220	190
	F4 + F5 sash sill	0.3210	190		0.3850	190
	F6 + F7 sash head	0.3210	190		0.3850	190
	F8 + F9 sash jamb	0.3210	190		0.3850	190
	F10 + F11 mullion	0.5430	380		0.6710	380

Frame:	Frame width, b_f	Frame U-value, U_f	Frame area, A_f	Frame heat flow, H_U	linear trans.	Linear length, l_s	Junction heat flow, H_j
Section	(m)	(W/(m ² ·K))	(m ²)	(W/K)	(W/(m·K))	(m)	(W/K)
F1 fixed sill	0.0570	1.0723	0.0325	0.0348	0.0293	0.5245	0.0154
F2 fixed head	0.0570	1.0723	0.0325	0.0348	0.0293	0.5245	0.0154
F3 fixed jamb	0.0570	1.0723	0.0811	0.0870	0.0293	1.3680	0.0400
F4 + F5 sash sill	0.1040	1.2031	0.0549	0.0661	0.0283	0.4305	0.0122
F6 + F7 sash head	0.1040	1.2031	0.0549	0.0661	0.0283	0.4305	0.0122
F8 + F9 sash jamb	0.1040	1.2031	0.1431	0.1722	0.0283	1.2720	0.0360
F10 + F11 mullion	0.1140	1.3267	0.1573	0.2087	0.0565	1.3190	0.0746
Totals		0.5563	0.6697			Total	0.2055

Air Leakage loss:			
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP			
Opening light length	3.7810	m	Total air leakage
L_{50}	0.00	m ³ /(m ² ·h)	0.000 m ³ /h
Heat loss = 0.0165 L_{50}			0.00 W/(m ² ·K)

Other parameters needed for calculation, taken from simulations:				$d_p - d_g =$	0.028	m		
$\lambda_p =$	0.035	W/(m·K)	$R_{se} =$	0.04	$^2 \cdot K / W$	$R_{pe} =$	0.13	$m^2 \cdot K / W$
$R_p =$	0.8000	$m^2 \cdot K / W$	$R_{tot} =$	0.9700	$^2 \cdot K / W$	$U_p =$	1.0309	W/(m ² ·K)

BFRC Rating =
218.6g U_{window} - 68.5 x (Effective L_{50}) = **5.08**
Climate zone is: **UK**

Thermal transmittance, $W/(m^2 \cdot K)$	U_{window}	1.3
Solar factor	g_{window}	0.44
Window air leakage heat loss, $W/(m^2 \cdot K)$	L_{factor}	0.00

Simulator Name: **Andy Gibson**



BFRC Certified
Simulator **018**