

Report in Accordance with BFRC Guidelines and Regulations

Product description: “The Sash Window Workshop Accoya Casement Window”

CONFIDENTIAL

Client:	The Sash Window Workshop Ltd Unit 4 Kiln Lane Bracknell Berkshire RG12 1NA
Project:	Accoya Casement Window
Project reference:	CU14332-9
Prepared By:	Richard Bate Technical Director
Issue date:	27 April 2015

Build Check Ltd
Montrose House,
Lancaster Road,
Cressex Business Park,
High Wycombe,
Bucks, HP12 3PY

Tel: 01494 452713
Fax: 0870 2101013
E-mail: info@buildcheck.co.uk



Approved Simulator 001

This document is confidential and remains the property of Build Check Ltd. The legal validity of this report can only be claimed on the presentation of the complete report with supporting electronic information.

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

1 Introduction

The U-value calculations of The Sash Window Workshop Accoya casement window detailed below were commissioned by Peter Smith of The Sash Window Workshop.

2 Validation of Program

The Therm 5.2 analysis software has been validated against proofs in Annex D (D1 to D10) of BS EN ISO 10077-2:2012.

3 Analysis Method

The frame profile results detailed below are provided by computer simulation using LBL software program THERM 5.2 and BFRC guidelines and regulations.

4 Summary of Results

A summary of results are detailed in the following sections. The details supplied for the analysis as well as all information required to verify the analysis can be found in the attached CD.

4.1 Frame thermal transmittance (following the principles of BS EN ISO 10077-2)

SWW Accoya Casement Frame Profile	Frame Thermal Transmittance (U_f)
Fixed Head & Jamb	1.5 W/(m ² ·K)
Fixed Cill	1.4 W/(m ² ·K)
Mullion	1.7 W/(m ² ·K)
Casement Head & Jamb	1.6 W/(m ² ·K)
Casement Cill	1.5 W/(m ² ·K)

4.2 Linear thermal transmittance (following the principles of BS EN ISO 10077-2)

SWW Accoya Casement Frame Profile	Linear Thermal Transmittance (ψ)
Fixed Head & Jamb	0.040 W/(m·K)
Fixed Cill	0.040 W/(m·K)
Mullion	0.082 W/(m·K)
Casement Head & Jamb	0.042 W/(m·K)
Casement Cill	0.042 W/(m·K)

4.3 Centre pane U-Value of glazing calculated in accordance with BS EN 673.

Glazing Unit	Centre Pane U-value (U_g)
4-10-4 Low-E 0.05 uncorrected emissivity (St Gobain Planitherm Total+), 90% krypton 10% air filled, low iron outer pane (St Gobain Diamant) glazing unit with Edgetech Superspacer Premium spacer bar with 5mm hot melt butyl secondary seal.	1.1 W/(m ² ·K)

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

4.4 The thermal performance of the windows (Uw) in accordance with BFRC guidelines and regulations:

SWW Accoya Casement Frame Profile	Window U-Value
Timber frame system with 4-10-4 Low-E 0.05 uncorrected emissivity (St Gobain Planitherm Total+), 90% krypton 10% air filled, low iron outer pane (St Gobain Diamant) glazing unit with Edgetech Superspacer Premium spacer bar with 5mm hot melt butyl secondary seal.	1.4 W/(m ² ·K)

4.5 The Effective L₅₀ in accordance with BFRC guidelines and regulations:

SWW Accoya Casement Frame Profile	Effective L ₅₀
Air permeability at 50 pa	0.00 W/(m ² ·K)

4.6 Total solar energy transmittance (g) in accordance with EN 410

SWW Accoya Casement Frame Profile	g _{window}
Timber frame system with 4-10-4 Low-E 0.05 uncorrected emissivity (St Gobain Planitherm Total+), 90% krypton 10% air filled, low iron outer pane (St Gobain Diamant) glazing unit with Edgetech Superspacer Premium spacer bar with 5mm hot melt butyl secondary seal.	0.46


5.0 BFRC Rating

5.1 SWW Accoya Casement window system

SWW Accoya Casement Frame Profile	Rating
Timber frame system with 4-10-4 Low-E 0.05 uncorrected emissivity (St Gobain Planitherm Total+), 90% krypton 10% air filled, low iron outer pane (St Gobain Diamant) glazing unit with Edgetech Superspacer Premium spacer bar with 5mm hot melt butyl secondary seal.	+3 (Rating Scale A)

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

6.0 Authorisation

	Prepared by:
Signature:	
Name:	Richard Bate
Title:	Technical Director

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

Technical Specification

Profiles		Ref. No.	Material Type/Manufacturer's Name & Density (Timber only)	Dimensions (Height & Width)
Outer Frame	Head & jambs	N/A	Accoya - Sash Window Workshop	45mm x 90mm
	Cill	N/A	Accoya – Sash Window Workshop	55mm x 145mm
Sash	Top rail & jambs	N/A	Accoya – Sash Window Workshop	52mm x 48mm
	Bottom rail	N/A	Accoya – Sash Window Workshop	90mm x 48mm
Mullion		N/A	Accoya – Sash Window Workshop	40mm x 90mm
Fixed Glass Check Bead		N/A	Accoya – Sash Window Workshop	15mm x 55mm
Casement Check Bead		N/A	Accoya – Sash Window Workshop	15mm x 33mm
Glazing Bead		N/A	Accoya – Sash Window Workshop	15mm x 6mm
Cill Fixed Glass Shim		N/A	Accoya – Sash Window Workshop	8.1mm x 51.3mm

Weather Seals	Ref. No.	Material Type/ Manufacturer's Name
Glazing Bead	N/A	Silicone sealant
Glazing Rebate	N/A	Silicone sealant
Casement Rebate	R12	Polypropylene - Reddiseal

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

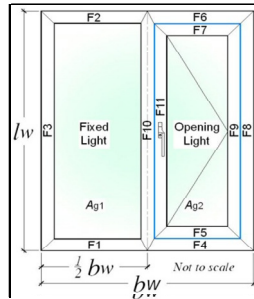
Glazing Component	Specification
Overall sealed unit: 1. Thickness (mm)	1. 18mm
Outer pane 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. St Gobain 3. Diamant
Inner pane: 1. Thickness 2. Manufacturer 3. Description	1. 4mm 2. St Gobain 3. Planitherm Total+
Spacer bar: 1. Manufacturer 2. Description	1. Edgetech 2. Superspacer Premium
Cavity 1. Distance (mm) 2. Gas %	1. 10mm 2. Krypton 90% Air 10%
Edge seal 1. Manufacturer 2. Description	1. N/A 2. 5.3mm Hot Melt Butyl

Additional Notes

Air leakage data is taken from Build Check Ltd Test report ref. W10168-2 dated 28 May 2010 (data at 50Pa pressure = 0.00 m³/h/m).

Solar heat gain figures are calculated from g-values supplied by the product manufacturer from EN 410 calculations for the glass units used in this simulation. The value used is 0.75.

BFRC Spreadsheet



Sample Style:
Casement
Fixed Light / Side Hung

Blue line illustrates opening light length (air leakage)

Frame offset: No

Nominal 4mm etc to ODP , others 1DP	
Glazing dimensions and properties:	
Thickness of pane 1	4 mm
Pane 1/2 distance	10 mm
Gas fill (1/2)	Argon 90%
Thickness of pane 2	4 mm
Complete next 3 cells for TG IGU	
Pane 2/3 distance	mm
Gas fill (2/3)	
Thickness of pane 3	mm
Glazing Trans. - 3DP	U_g 1.120 W/(m ² ·K)
g -value - 2DP	g 0.75

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

Section	Window Dimensions:		Area	
	Length (m)	Width (m)	No gasket (m ²)	With gasket (m ²)
Fixed Light	1.3500	0.5200	0.7020	0.6953
Opening light	1.2400	0.4400	0.5456	0.5396
Total glazing, A_g		1.2476	1.2348	
Frame		(m)	(m)	(m ²)
F1	0.6150	0.0700	0.0397	0.0407
F2	0.6150	0.0600	0.0341	0.0350
F3	1.4800	0.0600	0.0849	0.0873
F4	0.6150	0.0700	0.0341	0.0341
F5	0.5200	0.0700	0.0336	0.0344
F6	0.6150	0.0600	0.0397	0.0397
F7	0.5200	0.0400	0.0192	0.0200
F8	1.4800	0.0600	0.0849	0.0849
F9	1.3500	0.0400	0.0518	0.0540
F10	1.4800	0.0700	0.0991	0.1015
F11	1.3500	0.0400	0.0518	0.0540
Total Frame		0.5728	0.5856	
Total Window, A_w		1.8204	1.8204	
Percentage fixed light glass area		38.56%	38.19%	
Percentage opening light glass area		29.97%	29.64%	
Percentage glass area (total)		68.53%	67.83%	

Solar Factor, g-value:		F_w	0.9
		g_w	0.46

U_{window}	No bars; or attached bars	1.42	W/(m ² ·K)
	Single cross bar in IGU	1.5	
	Multiple cross bar in IGU	1.6	
	Glazing bar (Georgian bar)	1.8	

BFRC Rating kWh/(m ² ·yr)	Label index	EWER Rating Scale	Window Rating
≥10		A+	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	

Report Number: **U14332-9** Issue No 22.1: 11/03/2013
 Report Date: **23 March 2015**
 Project Details: **Accoya Casement, Superspacer Premium, Total+, Diamant, Krypton**

THIS SPREADSHEET IS THE PROPERTY OF THE BFRC AND CAN 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 ODP	l_w	1480	mm
Total window width ODP	b_w	1230	mm

Frame dimensions:	(b _f)	Frame width, b _f	Gasket protrusion, b _{gf}	Frame & gasket widths	
		(mm)	(mm)	(mm)	
All frame values round to nearest 1mm, gaskets to 1DP	F1 fixed sill	70	1.8	71.8	Total
	F2 fixed head	60	1.8	61.8	
	F3 fixed jamb	60	1.8	61.8	
F4 + F5 sash sill	F4 fixed sash sill	70	n/a	70.0	141.8
	F5 moving sash sill	70	1.8	71.8	
F6 + F7 sash head	F6 fixed sash head	60	n/a	60.0	101.8
	F7 moving sash head	40	1.8	41.8	
F8 + F9 sash jamb	F8 Fixed sash jamb	60	n/a	60.0	101.8
	F9 moving sash jamb	40	1.8	41.8	
F10 + F11 mullion	F10 fixed mullion	70	1.8	71.8	113.6
	F11 moving mullion	40	1.8	41.8	
Total gasket area				0.0127541	m ²

Where a U_w value from hot box testing is available, no L_f^{2D} or L_{ψ}^{2D} values need to be entered					
Frame conformance:	Section	All L values to 4DP		All b values to 0DP	
		L_f^{2D} W/(m ² ·K)	b_g (mm)	L_{ψ}^{2D} W/(m ² ·K)	b_g (mm)
	F1 fixed sill	0.3736	190	0.3491	190
	F2 fixed head	0.3673	190	0.3428	190
	F3 fixed jamb	0.3673	190	0.3428	190
	F4 + F5 sash sill	0.4902	190	0.4676	190
	F6 + F7 sash head	0.4338	190	0.4107	190
	F8 + F9 sash jamb	0.4338	190	0.4107	190
	F10 + F11 mullion	0.7456	380	0.6983	380

Frame:	Frame width, b _f	Frame U-value, U _f	Frame areas, A _f	Frame heat flow, HU	Linear trans.	Linear length, l _g	Junction heat flow, H _ψ
Section	(m)	(W/(m ² ·K))	(m ²)	(W/K)	(W/(m ² ·K))	(m)	(W/K)
F1 fixed sill	0.0700	1.3705	0.0397	0.0544	0.0404	0.5200	0.0210
F2 fixed head	0.0600	1.4940	0.0341	0.0509	0.0404	0.5200	0.0210
F3 fixed jamb	0.0600	1.4940	0.0849	0.1268	0.0404	1.3500	0.0545
F4 + F5 sash sill	0.1400	1.5181	0.0677	0.1027	0.0423	0.4400	0.0186
F6 + F7 sash head	0.1000	1.5614	0.0589	0.0920	0.0418	0.4400	0.0184
F8 + F9 sash jamb	0.1000	1.5614	0.1367	0.2134	0.0418	1.2400	0.0518
F10 + F11 mullion	0.1100	1.7298	0.1509	0.2609	0.0824	1.2950	0.1067
Totals		0.5728	0.9012			Total	0.2920

Air Leakage loss:			Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP	0.00	m ³ /(m·h)
Opening light length	3.7400	m	Total air leakage	0.000	m ³ /h
L_{50}	0.00	m ³ /(m ² ·h)	Heat loss = 0.0165 L_{50}	0.00	W/(m ² ·K)

Other parameters needed for calculation, taken from simulations:					
λ_p	0.035	W/(m·K)	R_{se}	0.04	K/W
R_p	0.5143	m ² ·K/W	R_{tot}	0.6843	K/W
$d_p=d_g$	0.018	m	R_{sp}	0.13	m ² ·K/W
U_p	1.4614	W/(m ² ·K)			

BFRC Rating =	218.6g window - 68.5 x (U_{window} + Effective L_{50}) =	3.29
Climate zone is:		UK
Thermal transmittance, W/(m²·K)	U_{window}	1.4
Solar factor	g_{window}	0.46
Window air leakage heat loss, W/(m²·K)	L_{factor}	0.00



BFRC Certified Simulator Name: **Richard Bate** Simulator **001**

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

BS EN 673 Spreadsheet

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

Number of spaces	Help		1				
Glazing orientation	Vertical	Spaces 1					
Resistivity panes	1	m·K/W	<table border="1"> <tr> <td>Pane 1</td> <td>90%</td> <td>Pane 2</td> </tr> </table>		Pane 1	90%	Pane 2
Pane 1	90%	Pane 2					
Emissivities		Outside					
Calculate		Gas					
		Krypton					
Thickness (mm)	4.0	10	4.0				
Normal emissivity	0.89		0.05				
$\sum d_i \cdot r_i =$	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	$\sum 1/h_s$	λ_{eff}	ΔT
	W/(m ² ·K)	(m ² ·K)/W		
1	1.120	0.71474	0.0140	15
2	1.120	0.71474	0.0140	15

Thermal Conductivity Values Used

Material/Conductivity W/(m.K)	Reference
PVCu / 0.17	(Annex A BS EN ISO 10077-2)
Accoya / 0.12	(IFT Rosenheim report 10-000788-PR01)
Silicone / 0.35	(Annex A BS EN ISO 10077-2)
Soda Lime Glass / 1.0	(Annex A BS EN ISO 10077-2)
Hot Melt Butyl / 0.24	(Annex A BS EN ISO 10077-2)
Superspacer Premium / 0.15	(BF Website)
Elastomeric Foam / 0.05	(Annex A BS EN ISO 10077-2)

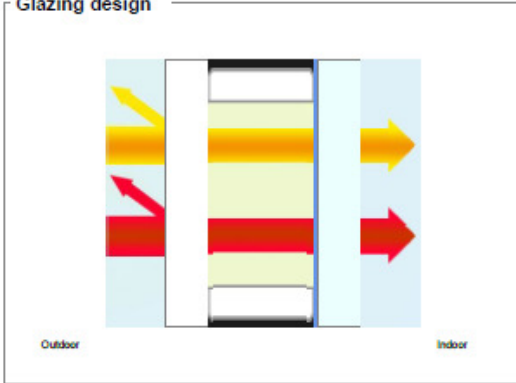
The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

G Value Source

Calumen® II 1.3.1
26 March 2015
Data base : SGG UK



Glazing design



	First glazing	Second glazing
Gas		Krypton 92% 10.00mm
Coating		PLANITHERM TOTAL+
First glass	DIAMANT 4.00mm	PLANICLEAR 4.00mm
Coating		
Layer		
Coating		
Second glass		
Coating		

--

Manufacturing sizes

Nominal thickness : 18.0 mm
Weight : 20.0 kg/m²

Luminous factors (EN410-2011) : (D65 2°)

Transmittance : 81 %
Outdoor reflectance : 12 %
Indoor reflectance : 13 %

Energy factors (EN410-2011) :

Transmittance : 66 %
Outdoor reflectance : 21 %
Indoor reflectance : 20 %
Absorptance A1 : 3 %
Absorptance A2 : 10 %

Solar factors (EN410-2011) :

g : 0.75
Shading coefficient : 0.86

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

Ug : 1.1 W/(m².K)



Sue Peatey
Build Check Manager
Technical
Montrose House, Lancaster Road
HP12 3PY High Wycombe

Phone :
Mobile :
Fax :
sue.peatey@buildcheck.co.uk

01494 452713

CALLUMEN® 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.

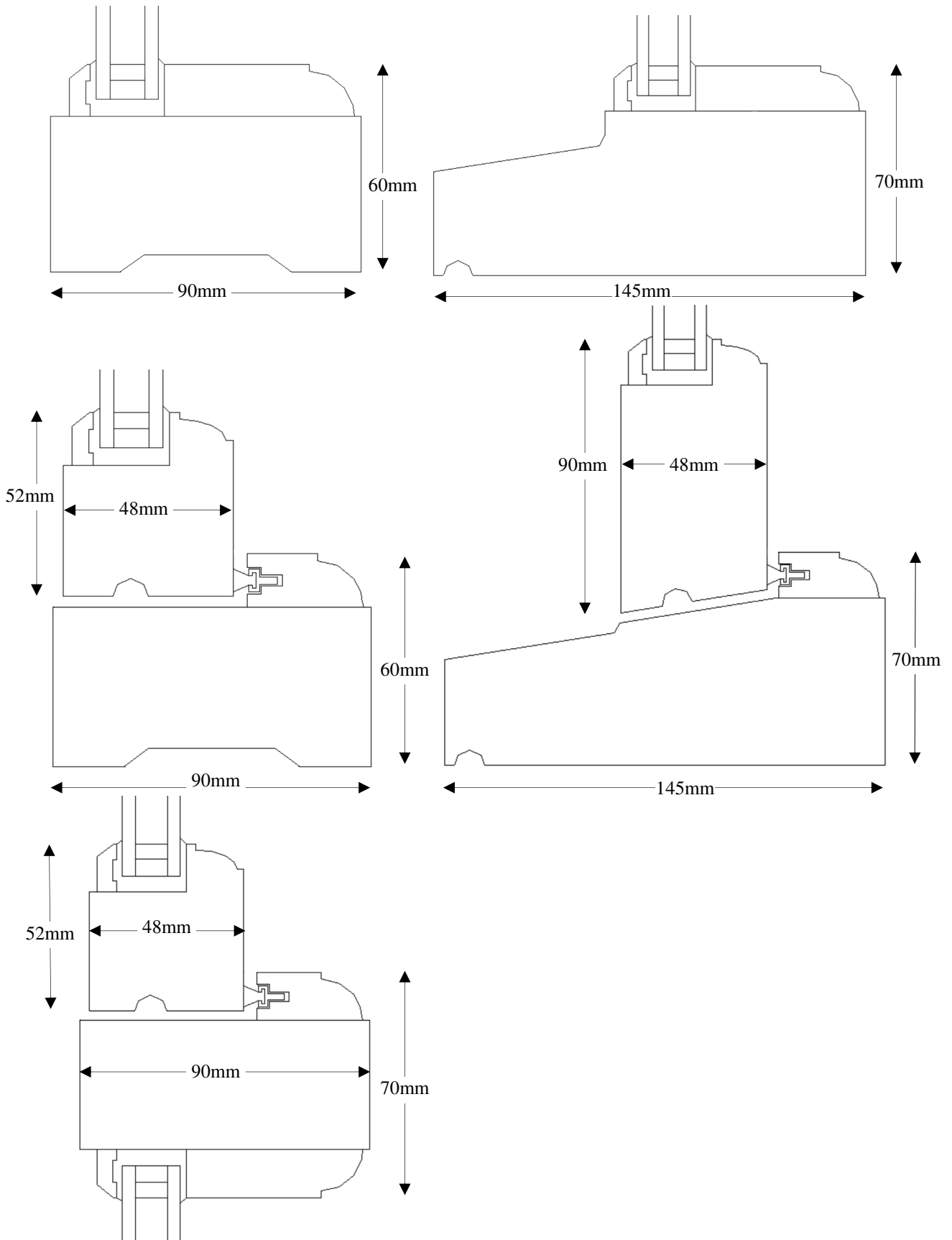
These values are calculated according to EN410-2011 and EN673-2011 standards. Tolerances are defined according to EN 1096-4 or ISO9050-2003 standards. Nevertheless, user must check the feasibility of the associated products, in particular in terms of thickness and colour. Furthermore, it is his responsibility 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



The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.

Appendix Profile Drawings



The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.