

**Report in Accordance with
BS EN ISO 10077-1:2017**

**Thermal Performance of
Windows, Doors & Shutters**

**Calculation of Thermal Transmittance
Part 1: Simplified Method**

CONFIDENTIAL

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Project: Composite Door Analysis

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1 Introduction

This document details the thermal performance calculation of the doorset configuration as detailed below.

The results in this report relate only to the specimen tested and as drawings and specification received.

The frame profile results detailed below are provided by computer simulation using LBL software program THERM 5.2 and validated against proofs in Annex D (I1 to I10) of BS EN ISO 10077-2:2017. The frame profile results detailed below are provided from methods contained in BS EN ISO 10077-1:2017 and in accordance with thermal transmittance requirements detailed in BS EN 14351-1:2006 +A1:2010. Cavities are calculated in accordance with BS EN ISO 10077-2 section 6.4.3 Treatment of cavities using the single equivalent thermal conductivity method.

2 Summary of Results

2.1 Frame thermal transmittance (in accordance with BS EN ISO 10077-1:2017)

Frame Profile	Frame Thermal Transmittance (U_f)
Cill	1.1 W/m ² K
Left jamb	1.1 W/m ² K
Right Jamb	1.1 W/m ² K
Head	1.1 W/m ² K
Glazing Cassette	1.4 W/m ² K

2.2 Linear thermal transmittance (in accordance with BS EN ISO 10077-1:2017)

Frame Profile	Linear Thermal Transmittance (ψ)
Cill	0.010 W/m.K
Left jamb	0.010 W/m.K
Right Jamb	0.010 W/m.K
Head	0.010 W/m.K
Glazing Cassette	0.061 W/m.K
Moulding	0.028 W/m.K

2.3 Centre panel U-Value of panel calculated (in accordance with BS EN ISO 10077-1:2017)

Opaque Panel	Centre pane U-value (U_p)
Nominally 48mm thick leaf comprising nominally 1.5mm PVC-U facings both sides of a 45mm thick Timber core	1.3 W/m ² K

2.4 Centre pane U-Value of glazing calculated in accordance with BS EN 673: 2011

Glazing unit	Centre pane U-value (U_g)
Nominal dimensions 4-20-4 90% argon 10% air filled, normal emissivity 0.01 (4mm Planitherm One, 4mm Float, 20mm Swisspacer Ultimate spacer)	1.1 W/m ² K

2.5 U-Value

The thermal performance of the doorset (U_w) in accordance with EN ISO 10077-1:2017 is:

1.4 W/m²K

All profile calculations based on BS EN ISO 10077-2:2017

3 Authorisation



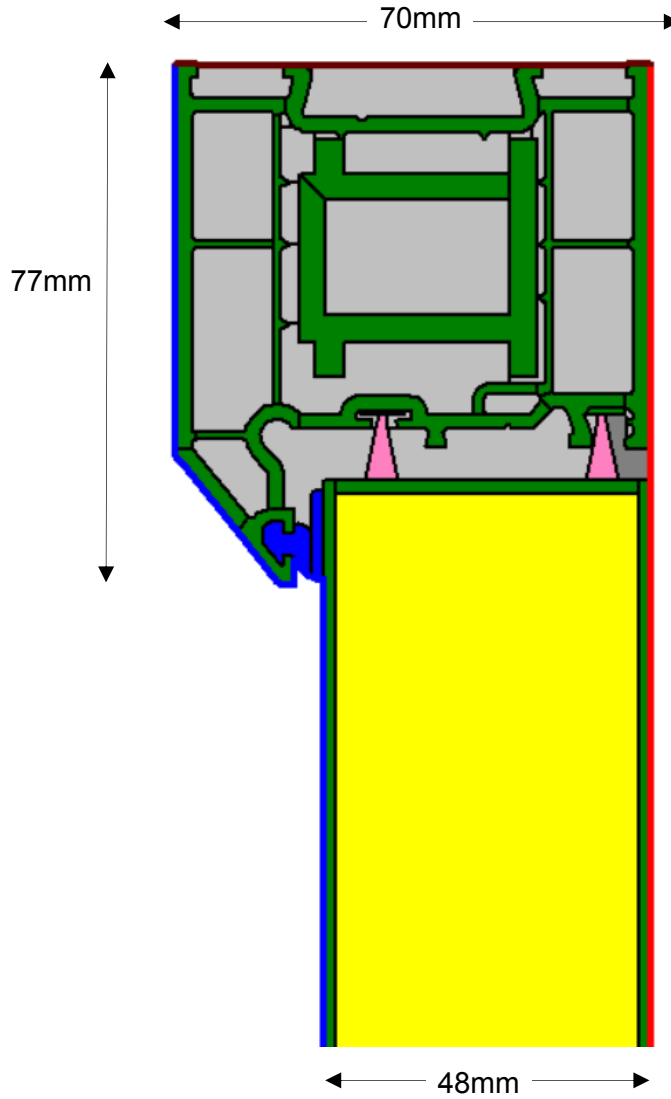
	Issued by:	Checked by:
Signature:		
Name:	Richard Bate	Sue Peatey
Title:	Managing Director	Laboratory Manager

Figure 1. Technical drawing of Head,Cill and Jamb profile.

External Environment
 R_{si} Normal = 0.04 m²K/W
 R_{si} Reduced = 0.04 m²K/W
 Temperature = 0 °C

Internal Environment
 R_{si} Normal = 0.13 m²K/W
 R_{si} Reduced = 0.20 m²K/W
 Temperature = 20 °C



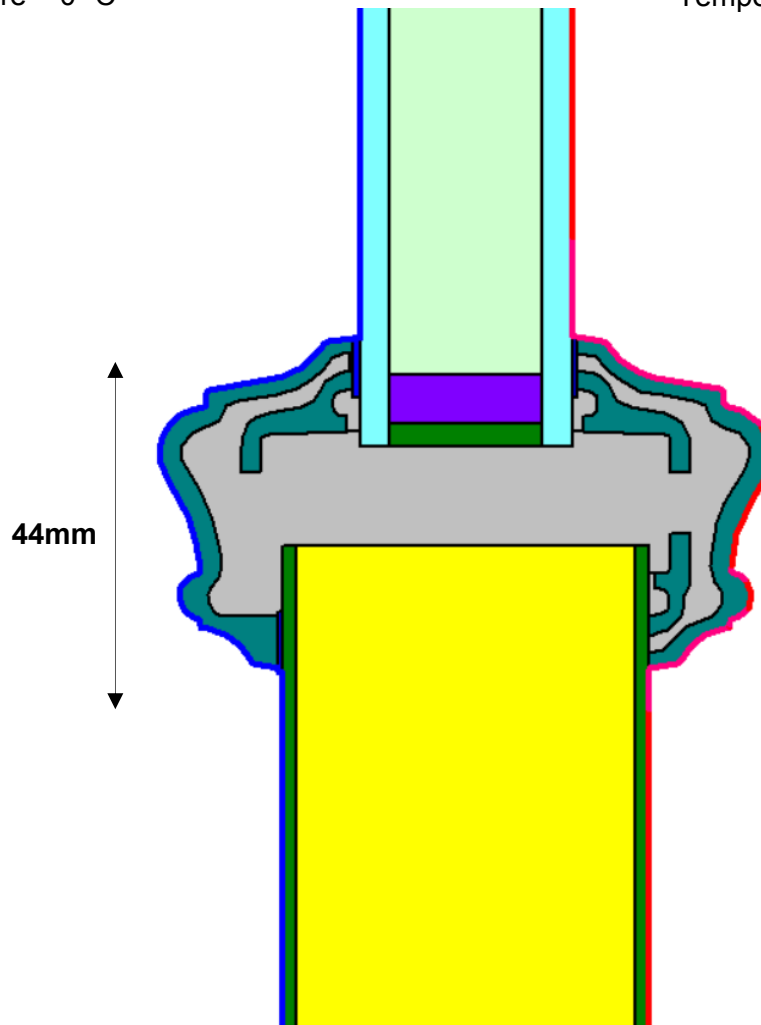
Quad Tree Mesh Parameter 9

	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, Annex D of BS 10077-2	0.17
	Albasia Falcatta (declared value) 53642THA, B and C	0.078
	Mohair, Annex D of BS 10077-2	0.14
	Elastomeric Foam, Annex D of BS 10077-2	0.05

Figure 2. Technical drawing of Cassette Profile.

External Environment
 R_{si} Normal = 0.04 m²K/W
 R_{si} Reduced = 0.04 m²K/W
 Temperature = 0 °C

Internal Environment
 R_{si} Normal = 0.13 m²K/W
 R_{si} Reduced = 0.20 m²K/W
 Temperature = 20 °C



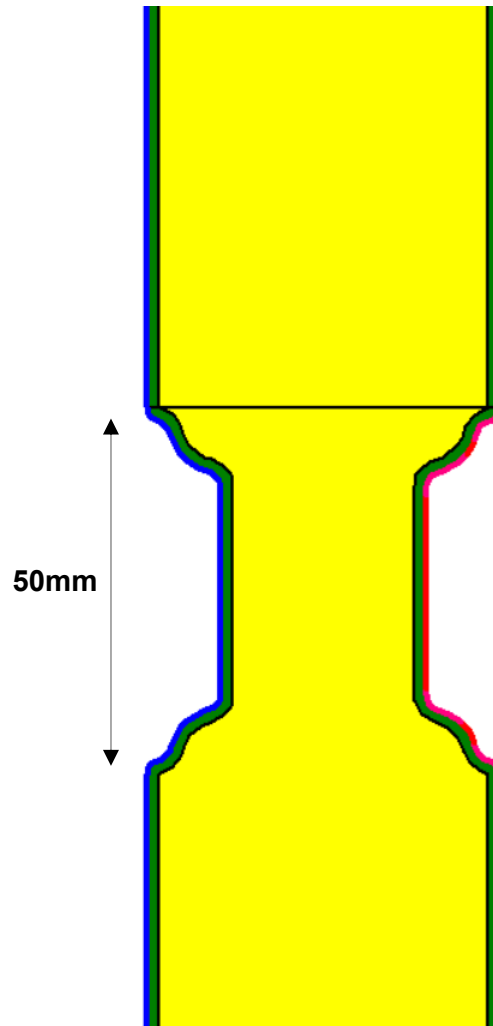
Quad Tree Mesh Parameter 9

	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, Annex D of BS 10077-2	0.17
	Albasia Falcatta, BBA refs 53642THA, B and C	0.078 (declared value)
	ABS, Annex D of BS 10077-2	0.20
	Elastomeric Foam, Annex D of BS 10077-2	0.05
	Swisspacer Ultimate, IFT ref 13-000369-PR02	0.14 (declared value)
	Polysulfide, Annex D of BS 10077-2	0.40
	Soda Lime Glass, Annex D of BS 10077-2	1.0

Figure 3. Technical drawing of Moulding Profile.

External Environment
 R_{si} Normal = 0.04 m²K/W
 R_{si} Reduced = 0.04 m²K/W
 Temperature = 0 °C

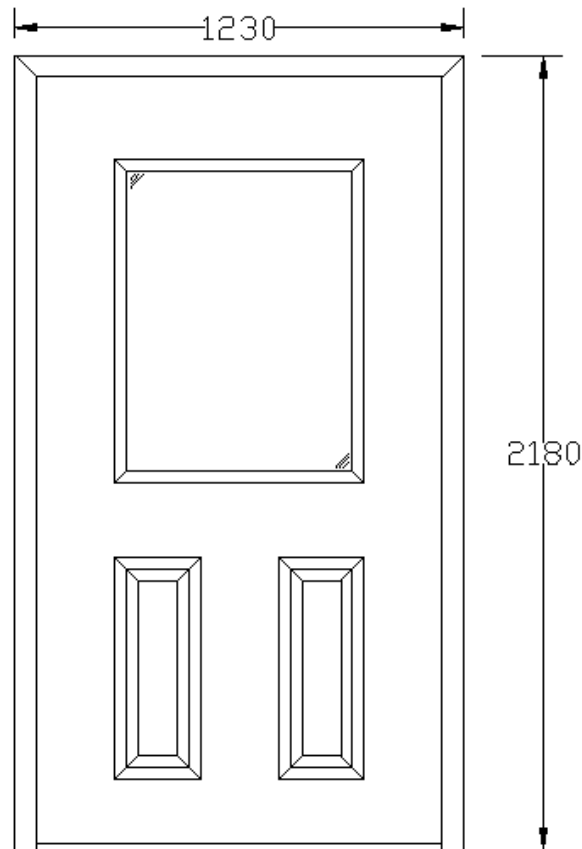
Internal Environment
 R_{si} Normal = 0.13 m²K/W
 R_{si} Reduced = 0.20 m²K/W
 Temperature = 20 °C



Quad Tree Mesh Parameter 9

	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, Annex D of BS 10077-2	0.17
	Albasia Falcatta, BBA refs 53642THA, B and C	0.078 (declared value)

Figure 4. Drawing of the doorset configuration without glazing bars and overall dimensions (from the internal face)



Internal projected frame area ($A_{f,i}$)	0.535 m ²
External projected frame area ($A_{f,e}$)	0.629 m ²
Panel area of configuration (A_p)	1.612 m ²
Glazed area of configuration (A_g)	0.433 m ²
Frame area of configuration (A_f)	0.629 m ²
Perimeter length of the glazing (l_g)	2.906 m
Perimeter length of panel (l_p)	6.412 m
Perimeter length of moulding (l_m)	3.100m

Glazing unit 4-20-4 Low E 0.01 uncorrected 90% argon 10% air filled

BS EN 673:2011 Glass in building- Determination of thermal transmittance (U value)-Calculation method.				
Standardised boundary conditions (section 8)				
r	1	m.K/w		Thermal resistivity of soda lime glass
ϵ glass	0.837			Corrected emissivity of uncoated soda lime and borosilicate glass surface
ΔT	15	K		Temperature difference between bounding glass surface
T_m	283	K		Mean temperature of gas space
σ	5.67E-08	W/(m ² K ⁴)		Stefan-Boltzmann's constant
h_e	25	W/(m ² K)		External heat transfer coeff. for uncoated soda lime glass surfaces
h_i	7.7	W/(m ² K)		Internal heat transfer coeff. for uncoated soda lime glass surfaces
A	0.035			Constant
n	0.38			Exponent
Gas properties (section 6)				
Density: ρ	1.6523	kg/m ³		
Dynamic viscosity: μ	2.12E-05	kg/(ms)		
Thermal conductance: λ	0.017652	W/(m.K)		
Specific Heat Capacity: c	567.9	J/(kg.K)		
s	0.02	m		width of gas space
ϵ_1	0.837			corrected emissivity of surface 1
ϵ_2	0.013			corrected emissivity of surface 2
Glass pane 1 d	0.004	m		thickness of glass 1
Glass pane 2 d	0.004	m		thickness of glass 2
Calculated values				
Pr	6.83E-01			
Gr	2.52E+04			
Nu	1.42E+00	1	1.42E+00	If Nu is less than 1, use $Nu = 1$.
h_r	6.46E-02			
h_g	1.26E+00			
$h_s = h_r + h_g$	1.32E+00			
$1/h_t$	7.65E-01			
$1/U = 1/h_e + 1/h_t + 1/h_i$	9.34E-01			
Centre pane U value	<u>1.070</u>			