THERMAL REPORT IN ACCORDANCE WITH BFRC GUIDELINES AND REGULATIONS

REPORT INFORMATION

Report Nº:	S158/20220906/003
Report Date:	06/09/2022
Simulator:	*David Macía Arias*
Signature	

WINDOW SYSTEM SPECIFICATION

Manufacturer:	CORTIZO
System:	Cortizo Casement System
Type of Opening:	Casement
Air Leakage Details:	
Test Report	**Result Air permeability at 50 Pa**
Exova - WIL399383	0.22 m3/(hm)

GLAZING SPECIFICATION

Manufacturer:	Saint-Gobain
Composition:	4 Diamant (20 Argon 90%) 4 Planitherm Total + FG
Thickness:	28 mm
Solar Factor: (according BS EN 410)	75 (75%)
Ug centre value: (according BS EN 673)	1.22 W/m2K

THERMAL PERFORMANCE

BFRC Rating
kWh/(m²·yr)

- ≥20 A ++
- >10 to 20 A +
- 0 to <10 A ✓
- -10 to <0 B
- -20 to <-10 C
- -30 to <-20 D
- -50 to <-30 E

Thermal Transmittance (U_w)	1.61
Solar Factor (g_w)	0.52
Windows air leakage heat loss	0.01
Climate zone	UK
Energy Index	2.19
WER (Band/ rating)	A

SPACE BAR SPECIFICATION

Reference:	W19-SWISSPACER ULTIMATE
Ref. data source:	BF- W19 datasheet April-2013
Secondary Sealant	
Dimension / Conductivity	
Sealant (TwoBox1):	3.0 mm / 0.40 W/(mK)
Spacer (TwoBox2):	6.5 mm / 0.14 W/(mK)

The frame profile results showed in this document has been obtained by computer simulation using the software Flixo Pro 8.1 and following BFRC guidelines. This is a computer-based tool based on the finite element method for the resolution of the 2-D heat transmission equation. This computer software has been tested used the examples proposed by the regulation BS EN ISO 10077-2:2017

ALUMINIOS CORTIZO S.A.U.
Lugar de Extramundi, S/N
15.910 – Padrón (A Coruña)
SPAIN.
Telephone: +34 981 80 42 13
www.cortizo.com

BFRC Certified Simulator No S158

THERMAL CONDUCTIVITY VALUES

MATERIAL	STANDARD OR SOURCE	CONDUCTIVITY W/(mK)	EMISSIVITY
Aluminium (Si Alloys)	BS EN ISO 10077-2	160.000	0.90
EPDM	BS EN ISO 10077-2	0.250	0.90
Polyamid 6.6 with 25% GF	BS EN ISO 10077-2	0.300	0.90
Panel	BS EN ISO 10077-2	0.035	0.90
POLNA 30FR	Report nº21/25508-1444 (APPLUS)	0.036	0.90

AIR LEAKAGE REPORT - EXOVA WIL399383

AIR PERMEABILITY TEST RESULT - ACCORDING BS EN 1026 - Windows & Doors, Air permeability

Test Pressure	Calculated Air Permeability per unit length		
	Positive m^3 / h.m	Negative m^3 / h.m	Average m^3 / h.m
50 Pa	0.17	0.27	0.22
100 Pa	0.34	0.39	0.37

BS EN 673 CALCULATION

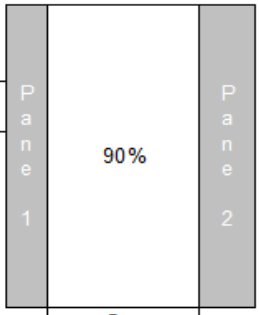
Version 12 18/06/2015. Calculations according to BS EN 673:2011

Number of spaces
1

Spaces 1

Glazing orientation	
	Vertical
Resistivity panes	1 m·K/W

Outside



		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

External, R_{se}	0.04	$(m^2 \cdot K)/W$
Internal, R_{si}	0.13	$(m^2 \cdot K)/W$

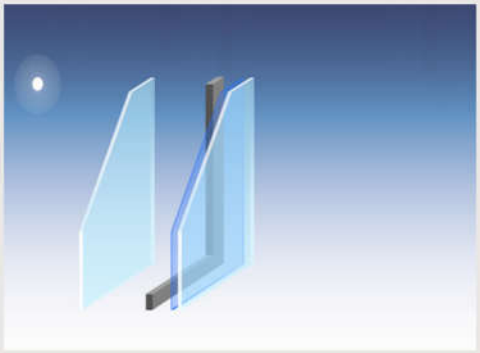
Iteration number	U value	$\sum 1/h_s$	λeff	ΔT
	W/(m²·K)	(m²·K)/W	W/(mK)	
1	1.219	0.64228	0.0311	15
2	1.219	0.64228	0.0311	15

GLASS DATA SHEET (Part1 :EN 410)

CORTIZO

SAINT-GOBAIN

CalumenLive
Tuesday, June 7, 2022



Glazing 1	DIAMANT 4 mm
Cavity 1	Argon 90% 20 mm
Glazing 2	PLANITHERM TOTAL+ FG PLANICLEAR 4 mm

Last name: David Macía Arias
Country: Spain

Notes:

Presiona Esc para salir de pantalla completa

LUMINOUS FACTORS — EN410 (2011-04)

Light Transmittance (TL)	80 %
Outdoor Reflectance (RLe)	13 %
Indoor Reflectance (RLi)	12 %

THERMAL TRANSMISSION — EN673-2011

Ug	1.2 W/(m².K)
Angle relative to the vertical	0 °

MANUFACTURING SIZES

Nominal Thickness	28.00 mm
Weight	20.0 kg/m²

ACOUSTICS — EN 12758

Acoustic simulated values

Rw (C;Ctr)	33 (-1; -5) dB
STC (ASTM E413)	34
OITC (ASTM E1332)	26

SAFETY CLASS — EN 12600

Pendulum Body Resistance	NPD

ENERGY FACTORS — EN410 (2011-04)

Transmittance (TE)	66 %
Outdoor Reflectance (Ree)	21 %
Indoor Reflectance (Rei)	21 %
Absorptance A1 (AE1)	3 %
Absorptance A2 (AE2)	10 %

SOLAR FACTORS — EN410 (2011-04)

Solar Factor (g)	0.75
Shading Coefficient (SC)	0.86

COLOR RENDERING

Transmission (Ra)	99
Reflection (Ra)	90

ANTI-BURGLARY — EN 356

Burglar Resistance	NPD

CARBON FOOTPRINT — EN 15804+A2

Global Warming Potential (GWP) (kg. CO_2 equiv/m²) European average	34.68

Calumen calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 11923R-11-33705). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.

GLASS DATA SHEET
(Part 2: Emissivity value EN 12898)

CORTIZO

SAINT-GOBAIN

DECLARATION OF PERFORMANCE

CE

Saint-Gobain Building Glass Europe
Tour Saint-Gobain 12 place de l'Iris 92400 Courbevoie France

EN 1096-4 - Coated glass
intended to be used in buildings and construction works

PLANITHERM TOTAL + FG 4 mm
M107762

NB: 0336, 0497, 0679, 0757, 0809, 1004, 1116, 1136, 1154, 1174, 1234, 1322, 1694, 1717, 1750, 1751

ESSENTIAL CHARACTERISTICS	AVCP SYSTEMS	PERFORMANCES
For uses relating to safety in case of fire:		
Resistance to fire	1	NPD
Reaction to fire	3,4	A1
External fire performance	3,4	NPD
For uses as anti-bullet or anti-explosion glazing		
Bullet resistance	1	NPD
Explosion resistance	1	NPD
For uses liable to present "safety-in-use" risks and subject to such regulations		
Burglar resistance	3	NPD
Pendulum body impact resistance	3	NPD
Resistance against sudden temperature changes and temperature differentials (K)	4	40
Wind, snow, permanent and imposed load resistance (N/mm^2)	4	45
For uses relating to noise reduction		
Direct airborne sound insulation (dB)	3	30(-2;-2)
For uses relating to energy conservation		
Emissivity ε_n	3	0.05
U-value ($W/(m^2.K)$)	3	NPD
Light transmittance τ_v	3	0.87
Light reflectance ρ_v/ρ'_v	3	0.07/0.06
Solar direct transmittance τ_e	3	0.69
Solar direct reflectance	3	0.17/0.19
g-value	3	0.71
Durability	3	C

F2=PLANITHERM TOTAL + FG
NPD : No Performance Determined

The performance of the product is in conformity with the declared performances.
This declaration of performance is issued under the sole responsibility of the manufacturer.
Signed for and on behalf of the manufacturer by:

Fabrice Desmons — 31/08/2022
International Product Strategy Director Building Glass — Courbevoie - France

WARM EDGE WORKING PARTY
DATA SHEET - BF

CORTIZO

April 2013 – No. W19 – Revision index 4-06/2021 – valid until June 30th, 2023 'WARM EDGE' WORKING PARTY

BF

RAL GÜTEZEICHEN MEHRSCHEIBEN ISOLIERGLAS

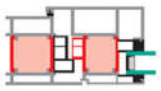
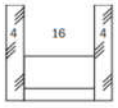
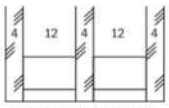
Data sheet Psi values for windows

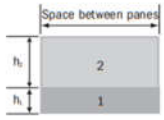
based on determination of the equivalent thermal conductivity of spacers by measurement

SWISSPACER

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

	Product name	Spacer height in mm	Material	Thickness d in mm
Profile description	ULTIMATE SWISSPACER 	6.5 Spacer category C	Metalized multilayer polyester film "High Tech Gas Barrier Foil"/ SAN-GF	~0.05 1.0

	Representative glass constructions	Metal with thermal break	Plastic	Wood	Wood/Metal
Representative frame profiles					
Representative psi value double-sheet thermally insulating glass W/mK	 Double-sheet insulating glass U_g=1.1 W/m²K	0.036	0.032	0.031	0.032
Representative psi value triple-sheet thermally insulating glass W/mK	 Triple-sheet insulating glass U_g=0.7 W/m²K	0.031	0.030	0.029	0.030

Two Box model Characteristic values	Space between panes in mm	$\lambda_{eq,2B}$ in W/mK	
		Box 1 · h_1 = 3 mm	Box 2 · h_2 = 6.5 mm
	Can be used for all spacer widths	0.40	0.14

Explanations

The equivalent thermal conductivity has been determined in accordance with the ift guideline WA-17engl/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 U_W of windows. They have been determined under the boundary conditions (frame profiles, glazing, glass mounting depth, back covering, primary and secondary sealant) defined in the ift guideline WA-08engl/3 "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 ± 0.003 W/mK. Differences of less than 0.005 W/mK are not significant. For further information, refer to the Bulletin 004/2008 "Guide to Warm Edge" of Bundesverband Flachglas.

Characteristic values determined by:

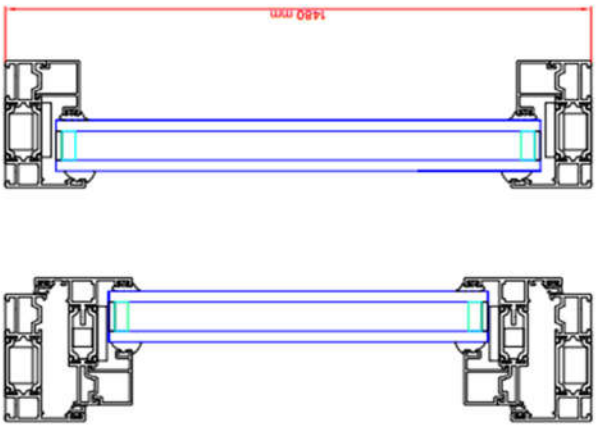
ift ROSENHEIM

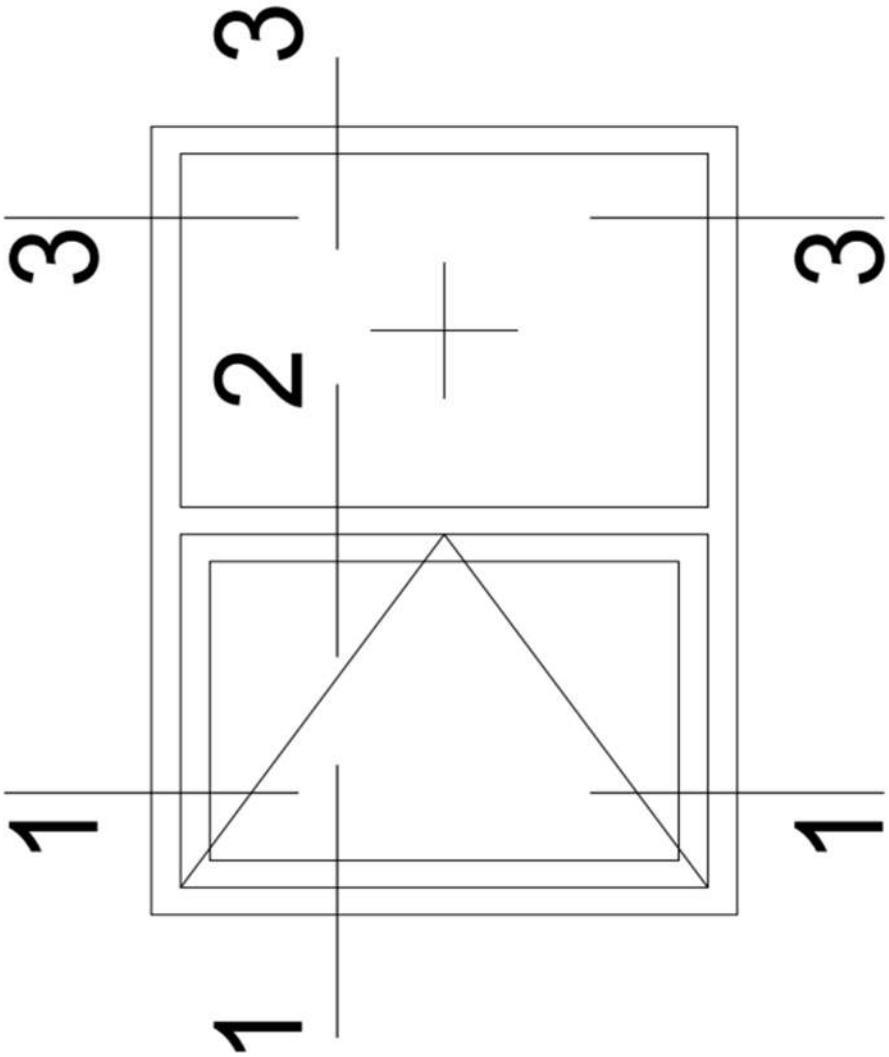
DRAWINGS

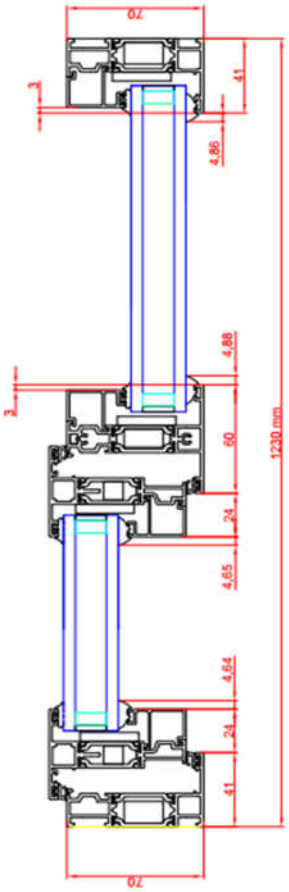
DO NOT SCALE

All dimensions are in mm.

Frame COR-3831
Sash COR-3821
Fly Mullion / interlock.....COR-3851
Bead: COR-3810

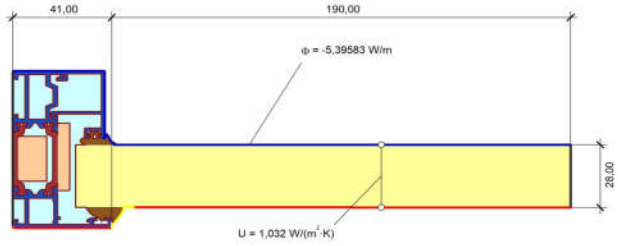




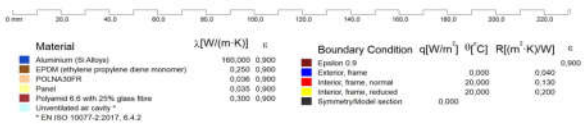


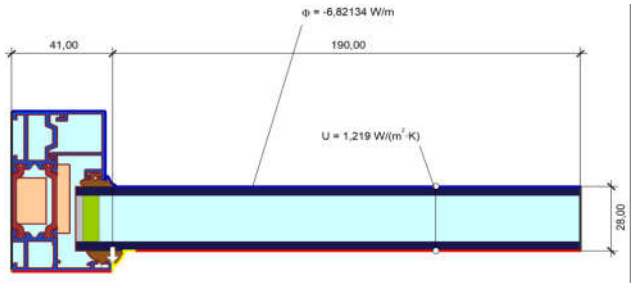
L2D VALUES (BS EN 10077-2)

SECTION F1 - F2 - F3

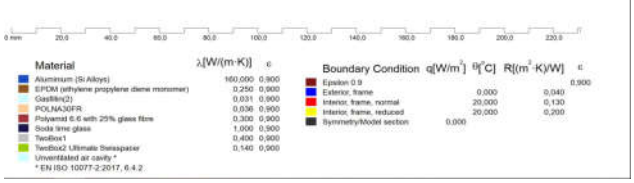


$$U_f = \frac{5,396 - 1,032 \cdot 0,190}{\frac{20,000}{0,041}} = 1,7974\ W/(m^2 \cdot K)$$

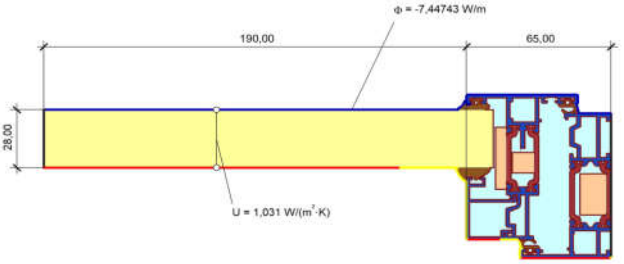




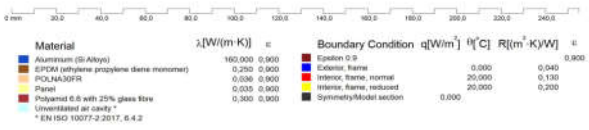
$$\Psi_{ed} = \frac{6,821}{20,000} - 1,219 \cdot 0,190 - 1,797 \cdot 0,041 = 0,03576\ W/(m \cdot K)$$

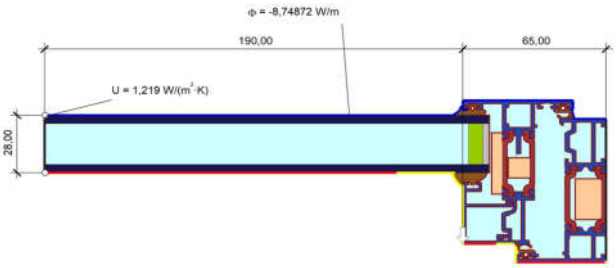


SECTION F4-F5-F6-F7-F8-F9

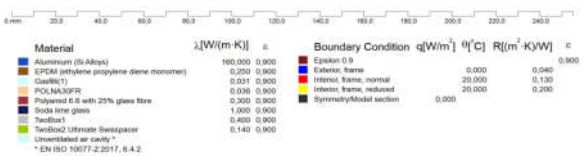


$$U_f = \frac{7,447 - 1,031 \cdot 0,190}{\frac{20,000}{0,065}} = 2,7153\ W/(m^2 \cdot K)$$



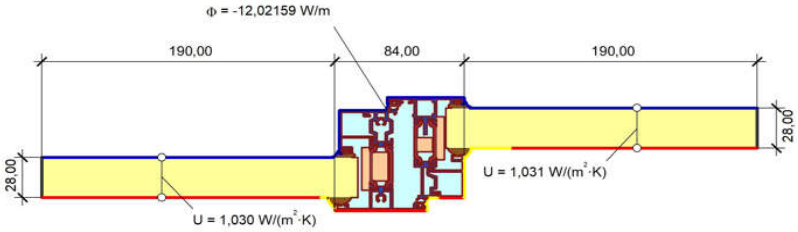


$$\Psi_{ed} = \frac{8,749}{20,000} - 1,219 \cdot 0,190 - 2,715 \cdot 0,065 = 0,02933\ W/(m \cdot K)$$

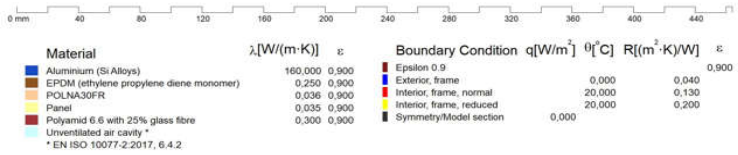


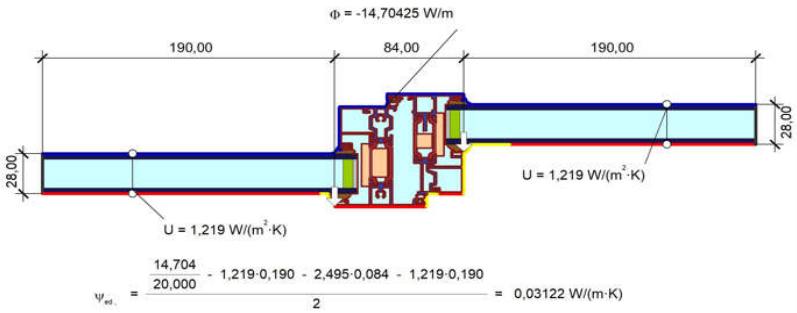
L2D VALUES (BS EN 10077-2)

SECTION F10-F11

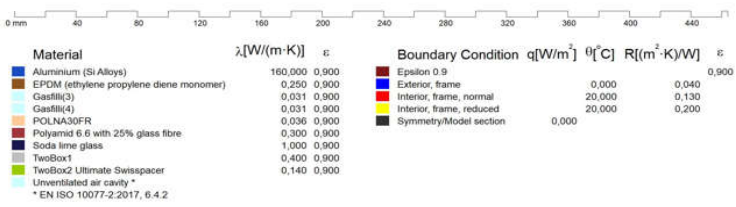


$$U_f = \frac{\frac{12,022}{20,000} - 1,031 \cdot 0,190 - 1,030 \cdot 0,190}{0,084} = 2,4946 \text{ W/(m}^2\text{·K)}$$



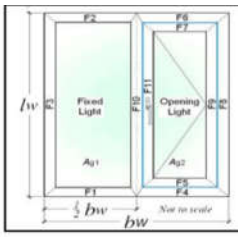


$$\Psi_{ed.} = \frac{\frac{14,704}{20,000} - 1,219 \cdot 0,190 - 2,495 \cdot 0,084 - 1,219 \cdot 0,190}{2} = 0,03122 \text{ W/(m·K)}$$



BFRC CALCULATION SHEET

CORTIZO



Sample Style:
Casement

Fixed Light / Side Hung

Blue line illustrates opening light length (air leakage)

Report Number:	S158/20220906/003
Report Date:	martes, 6 de septiembre de 2022
Project Details:	Cortizo Casement system (double glazing)

Issue No 22.3: 04/01/2016

THIS SPREADSHEET IS THE PROPERTY OF THE BFRC AND CAN ONLY BE USED IN CONJUNCTION WITH A BFRC LICENCE APPLICATION

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

Parameter	Symbol		Units
Total window height *0DP*	l_w	1480	mm
Total window width *0DP*	b_w	1230	mm

Frame offset:	Yes

Nominal 4mm etc to *0DP*, 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 TG IGU			
Pane 2/3 distance			mm
Gas fill (2/3)			
Thickness of pane 3			mm
Glazing Trans. - *3DP*	U_g	1.219	W/(m²·K)
g-value - *2DP*	$g_\perp$	0.75	

Thermal transmittance of window from hot box test		
U_{w} - *2DP*		W/(m²·K)

Frame dimensions:	(b_f)	Frame width, b_f (mm)	Frame offset, b_{of}	Gasket protrusion, b_{gf} (mm)	Frame & gasket widths (mm)	
All frame values round to nearest 1mm, gaskets to *1DP*	F1 fixed sill	41	3	4.9	45.9	
	F2 fixed head	41	3	4.9	45.9	
	F3 fixed jamb	41	3	4.9	45.9	Total
F4 + F5 sash sill	F4 fixed sash sill	41		n/a	41.0	69.6
	F5 moving sash sill	24	0	4.6	28.6	
F6 + F7 sash head	F6 fixed sash head	41		n/a	41.0	69.6
	F7 moving sash head	24	0	4.6	28.6	
F8 + F9 sash jamb	F8 Fixed sash jamb	41		n/a	41.0	69.6
	F9 moving sash jamb	24	0	4.6	28.6	
F10 + F11 mullion	F10 fixed mullion	60	3	4.9	64.9	93.6
	F11 moving mullion	24	0	4.7	28.7	
		Total gasket area		0.0359682	m^2	

Window Dimensions:			Area	
Section	Length (m)	Width (m)	No gasket (m^2)	With gasket (m^2)
Fixed Light	1.3980	0.5440	0.7605	0.7416
Opening light	1.3500	0.4960	0.6696	0.6526
	Total glazing, A_g		1.4301	1.3941
Frame	(m)	(m)	(m^2)	(m^2)
F1	0.6150	0.0410	0.0238	0.0264
F2	0.6150	0.0410	0.0238	0.0264
F3	1.4800	0.0410	0.0590	0.0658
F4	0.6150	0.0410	0.0238	0.0238
F5	0.5440	0.0240	0.0125	0.0147
F6	0.6150	0.0410	0.0238	0.0238
F7	0.5440	0.0240	0.0125	0.0147
F8	1.4800	0.0410	0.0590	0.0590
F9	1.3980	0.0240	0.0330	0.0392
F10	1.4800	0.0600	0.0863	0.0932
F11	1.3980	0.0240	0.0330	0.0393
		Total Frame	0.3903	0.4263
		Total Window, A_w	1.8204	1.8204
		Percentage fixed light glass area	41.78%	40.74%
		Percentage opening light glass area	36.78%	35.85%
		Percentage glass area (total)	78.56%	76.58%

Where a *Uw* value from hot box testing is available, no L_f^{2D} or L_ψ^{2D} values need to be entered

Frame conductance:	All *L* values to *4DP*. All b values to *0DP*					
		W/(m·K)	b_f (mm)		W/(m·K)	b_f (mm)
F1 fixed sill	L_f^{2D}	0.2698	190	L_ψ^{2D}	0.3412	190
F2 fixed head		0.2698	190		0.3412	190
F3 fixed jamb		0.2698	190		0.3412	190
F4 + F5 sash sill		0.3724	190		0.4374	190
F6 + F7 sash head		0.3724	190		0.4374	190
F8 + F9 sash jamb		0.3724	190		0.4374	190
F10 + F11 mullion		0.6011	380		0.7352	380

Frame:	Frame width, b_f	Frame U-value, U_f	Frame areas, A_f	Frame heat flow, HU	Linear trans, Ψ	Linear length, l_g	Junction heat flow, HΨ
Section	(m)	(W/(m²·K))	(m^2)	(W/K)	(W/(m·K))	(m)	(W/K)
F1 fixed sill	0.0410	1.8028	0.0238	0.0428	0.0356	0.5500	0.0196
F2 fixed head	0.0410	1.8028	0.0238	0.0428	0.0356	0.5500	0.0196
F3 fixed jamb	0.0410	1.8028	0.0590	0.1064	0.0356	1.4040	0.0500
F4 + F5 sash sill	0.0650	2.7153	0.0362	0.0984	0.0293	0.4960	0.0145
F6 + F7 sash head	0.0650	2.7153	0.0362	0.0984	0.0293	0.4960	0.0145
F8 + F9 sash jamb	0.0650	2.7153	0.0920	0.2497	0.0293	1.3500	0.0396
F10 + F11 mullion	0.0840	2.4920	0.1193	0.2973	0.0627	1.3770	0.0863
		Totals	0.3903	0.9359		Total	0.2442

Other parameters needed for calculation, taken from simulations:

λ_p =	0.035	W/(m·K)	R_{se} =	0.04	m²·K/W	$d_p = d_g$ =	0.028 m
R_p =	0.8000	m²·K/W	R_{tot} =	0.9700	m²·K/W	R_{se} =	0.13 m²·K/W
						U_p =	1.0309 W/(m²·K)

Solar Factor, *g*-value:	F_w	0.9
	g_w	0.52

U_{window}			
	No bars; or attached bars	1.61	W/(m²·K)
	Single cross bar in IGU	1.7	
	Multiple cross bar in IGU	1.8	
	Glazing bar (Georgian bar)	2.0	

Air Leakage loss:
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - *2DP*: 0.22 m³/(m·h)

Opening light length	3.8840	m	Total air leakage	0.854 m³/h
L_{50}	0.47	m³/(m²·h)	Heat loss = 0.0165 L_{50}	0.01 W/(m²·K)

Energy Window
Energy Index
2
Window Rating
A

BFRC Rating
kWh/(m²·yr)

≥20	A	++
>10 to 20	A	+
0 to <10	A	✓
-10 to <0	B	
-20 to <-10	C	
-30 to <-20	D	
-50 to <-30	E	

BFRC Rating =	
218.6g $_{window}$ - 68.5 x (U_{window} + Effective L_{50}) =	2.19
Climate zone is:	UK

Thermal transmittance, W/(m²·K)	U_{window}	1.6
Solar factor	g_{window}	0.52
Window air leakage heat loss, W/(m²·K)	L_{factor}	0.01

Simulator Name: David Macía Arias

BFRC

BFRC Certified Simulator No
S158