



CONFIDENTIAL

Report: Chilt/T09002-2

**Thermal Performance Report in
Accordance with EN 10077 requirements**

Issue date: May 2009



committed to excellence

www.chilternfire.co.uk

www.chilterndynamics.co.uk

www.qmark.info

Prepared for:
Firat Plastik Kauçuk San. ve Tic. A.Ş
Tükoba Köyü P.K:12
Büyükçekmece
Istanbul
Turkey

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This document is confidential and remains the property of Chiltern International Fire Ltd. *The legal validity of this report can only be claimed on the presentation of the complete report.*



Chiltern House Stocking Lane Hughenden Valley
High Wycombe Buckinghamshire HP14 4ND UK



t +44 (0) 1494 569800 f +44 (0) 1494 564895
e cif@chilternfire.co.uk w www.chilternfire.co.uk

Thermal Performance Report in Accordance with EN 10077 requirements

For

FIRAT PLASTİK VE KAUCUK A.S.

CONFIDENTIAL THERMAL REPORT

Report reference: Chilt/T09002-2 Issue 02
Product Description: W70 PVC-U Casement Window
Issue date: 28th May 2009
Prepared for: FIRAT PLASTİK VE KAUCUK A.S.
Türkoba Köyü P.K. 12
34907 Büyükçekmece
İstanbul
Türkiye
Prepared by: Michael Chorlton (BFRC Certified Simulator 032)
Signed: 
(On Behalf of Chiltern International Fire Ltd)
Approved For Issue by:
Signed: 

*This document and all supporting data is confidential and remains the property of
Chiltern International Fire Ltd*

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

O:\CHILTERNFIRE\DYNAMICS\RESULTS\THERM FILES\Firat – Standart BM TRADA Turkey – F09002



Certified Simulator 032

Report for: FIRAT PLASTİK VE KAUCUK A.S.
Ref: Chilt/T09002-2

Page 1 of 9

1 Introduction

The thermal performance calculations of the window configurations detailed below were commissioned by Nihan Karaaslan of Standart BM TRADA certification co. under Chiltern Dynamics contract MTP/F08164 (Thermal Contract MTT/F09002) on behalf of FIRAT PLASTİK VE KAUCUK A.S.

The frame profile results detailed below are provided by computer simulation using LBNL software program THERM 5.2 (Validated against proofs in Annex D (D1 to D10) of BS EN ISO 10077-2:2003) and calculated in line with EN10077-2 with whole window U-Value calculated in line with EN10077-1.

Issue Status:

Issue 01	Original report
Issue 02	Re-issue report to clarify calculation methodology

2 Summary of Results

Results are shown for FIRAT PLASTİK VE KAUCUK A.S. / W70 range of Extruded PVC-U window products with the Insulating Glass Unit specification as detailed below only. Report covers fully reinforced or partially reinforced windows. Details of simulated profiles and materials are shown in Appendix A. The standard sample window used for analysis is shown in Appendix B. Drawings and Specification of the profiles to be analysed are given in Appendix C. Calculation spreadsheets used in the calculation are attached in Appendix D.

2.1 Thermal Conductance of frame with Insulating Panel (L_f^{2D}) (in accordance with EN10077-2)

Please refer to the Calculations in Appendix D for values.

2.2 Thermal Conductance of frame with Glazing Options (L_{ψ}^{2D}) (in accordance with EN10077-2)

Please refer to the Calculations in Appendix D for values.

2.3 Centre pane U-Value (U_g) of glazing options (calculated in accordance with BS EN 673, see appendix D)

Glazing unit	Centre pane U-value (U_g)
IGU Option 1 (4 – 16 - 4) External – 4mm Float Glass with or without Low Emissivity coating of ϵ_n 0.04 Gas fill – 90% Argon / 10% Air Internal – 4mm Float Glass with or without Low Emissivity coating of ϵ_n 0.04 Spacer – 15.5 mm Standard Aluminium Spacer Bar Sightline Height – 12mm Primary Edge Sealant – 0.25mm x 2 – Polyisobutylene Secondary Edge Sealant – Hot Melt Butyl	1.163 W/m ² K
Note: For U-Value to apply, IGU must comply with the above specification and have a Low Emissivity coating as listed above applied to surface 2 or surface 3.	

2.4 The thermal performance of the window (U_w) (in accordance with EN10077-1)

Window Configuration	Whole Window U-Value
As per appendix B with Option 1 IGU	1.4 W/m ² K

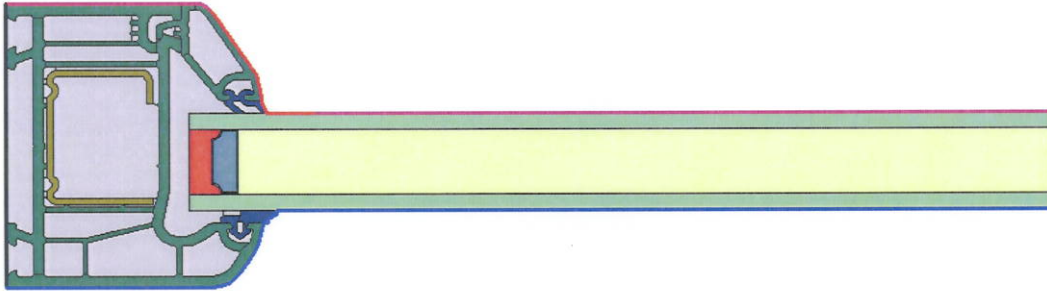
Appendix A

Casement Window Simulated Sections

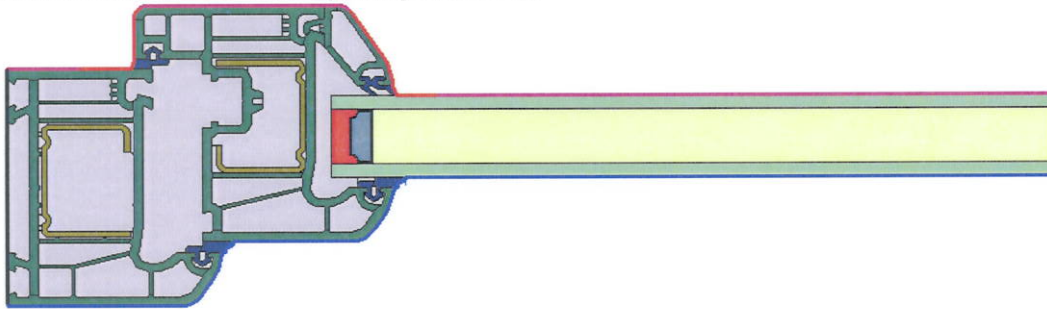
Appendix A – Material Specifications All values taken from EN10077-2 or EN12524 unless stated	Thermal Conductivity W/(m K)	Use
Soda Lime Glass	1.00	All glass panes
PVC-U	0.17	All Extruded PVC-U Profiles & Beads
Steel	50	All Reinforcement Profiles
EPDM / TPE Rubber	0.25	All weather seals and glazing gaskets
Aluminium	160	IGU Spacer Bar
Polyisobutylene	0.20	IGU Primary Sealant
Hot Melt Butyl	0.24	IGU Secondary Sealant
Molecular Sieve Desiccant	0.10	IGU Spacer Bar Desiccant Fill
K effective value from EN673 Calculation*	*	IGU Gas Space including Low Emissivity Coating

Simulated Frame Sections *(All Simulations carried out with glazing in vertical orientation)*

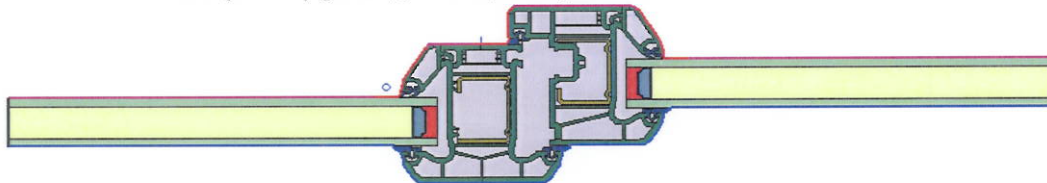
Head, Jamb and Sill with Fixed (Direct) glazing



Head, Jamb and Sill with Opening Casement



Mullion with fixed (Direct) glazing and Opening Casement

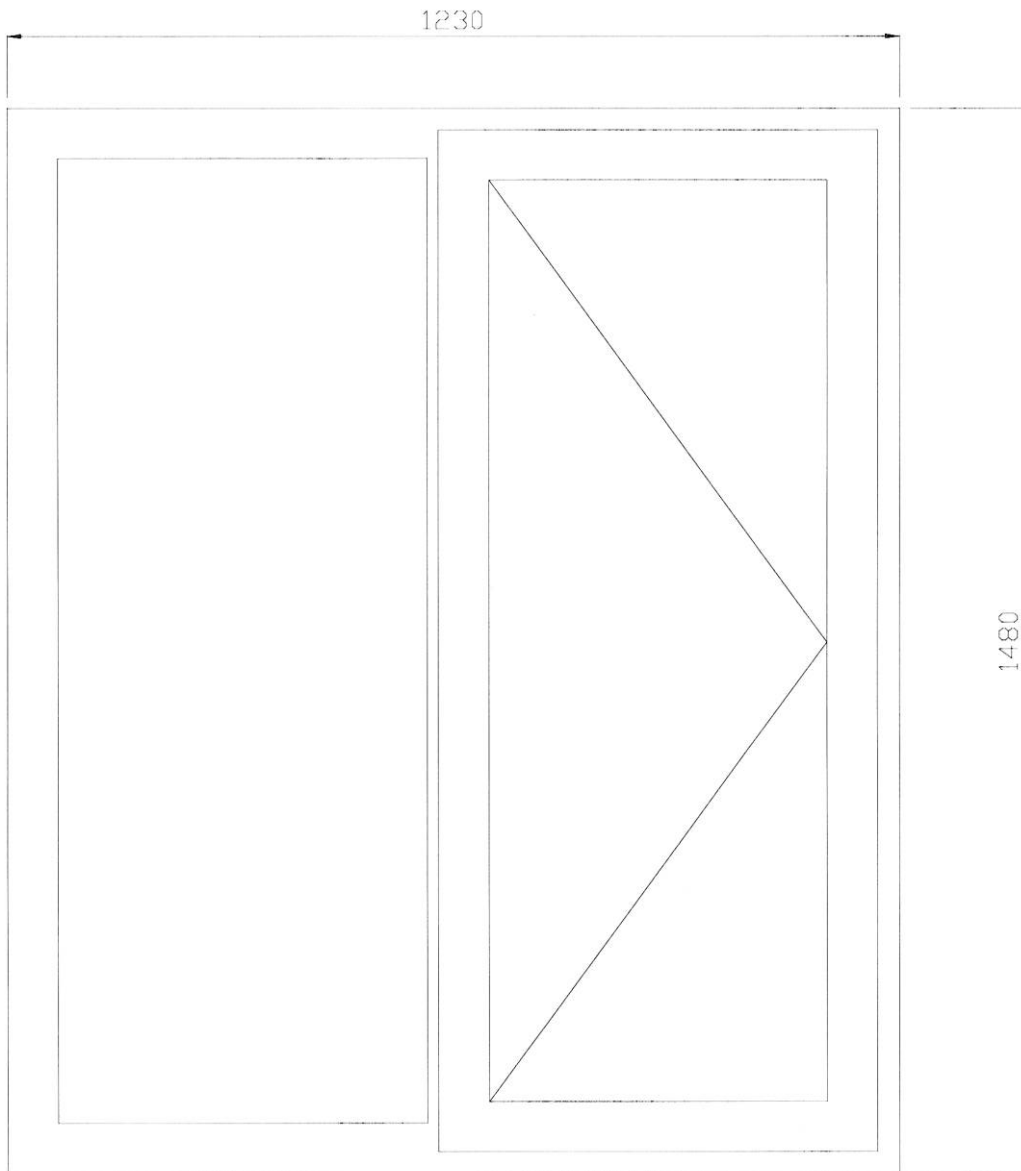


The legal validity of this report can only be claimed on presentation of the complete report..

Appendix B

Sample window:

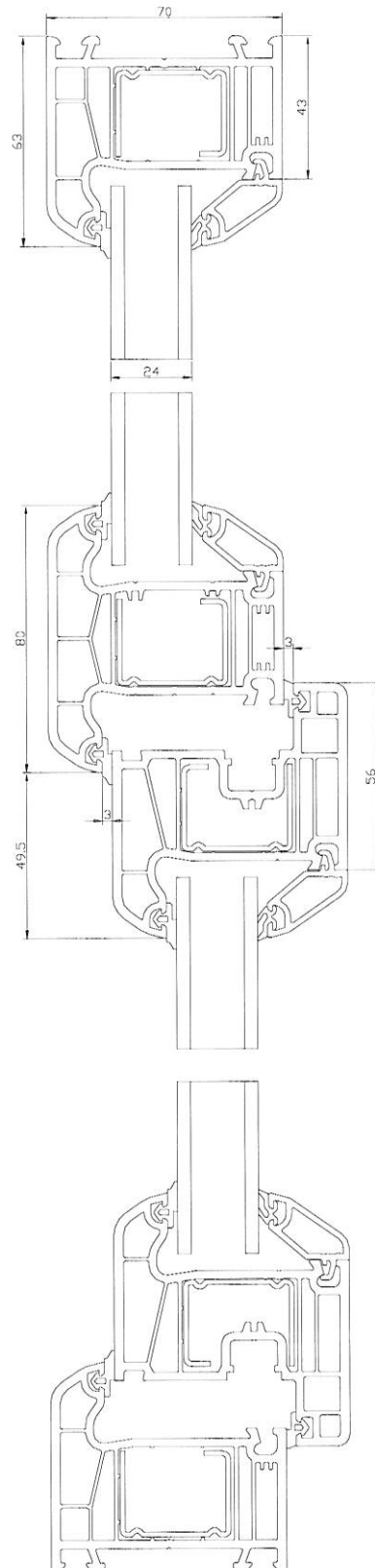
Side hung next to fixed light casement window with central mullion (1230mm wide x 1480mm high = 1.8204 m²)



Refer to Calculation Spreadsheets (Appendix D) attached for details of window cross section heights, areas, seal perimeter lengths and glazing fraction.

Appendix C (1)

Drawings used for analysis. The following drawings should not be scaled.



The legal validity of this report can only be claimed on presentation of the complete report..

Report for: FIRAT PLASTİK VE KAÇUK A.Ş.
Ref: Chilt/T09002-2

Appendix C (2)

Window Specification used for analysis.

Company: FIRAT PLASTİK VE KAUCUK A.S.		
Product Name: W70 Internally Glazed, Outward Opening PVC-U Casement Window		
Window Profiles	Outer Frame: PVC-U	Firat Plastik; Ref 5990101 (70 mm x 63 / 43 mm)
	Transom & Mullion: PVC-U	Firat Plastik; Ref 5990201 (70 mm x 80 / 40 mm)
	Opening Light: PVC-U	Firat Plastik; Ref 5990301 (70 mm x 76 mm)
	Glazing Bead: PVC-U	Firat Plastik; Ref 5990702
Reinforcement Profiles	Outer Frame: Galv. Steel 1.5 mm	Firat Plastik; Ref 001 (33 mm x 26 mm U channel)
	Transom & Mullion: Galv. Steel	Firat Plastik; Ref 001 (33 mm x 26 mm U channel)
	Opening Light: Galv. Steel	Firat Plastik; Ref 001 (33 mm x 26 mm U channel)
Weather-seals	Frame Rebate: EPDM	Firat Plastik; Ref 001
	Glazing Rebate: EPDM	Firat Plastik; Ref 002
	Casement Perimeter: EPDM	Firat Plastik; Ref 002
	Glazing Bead: EPDM	Firat Plastik; Ref 003
Notes:		

Appendix D

The following attached documents must accompany this thermal report to confirm validity:

Centre pane U-Value (U_g) calculation to EN 673 for each glass option.

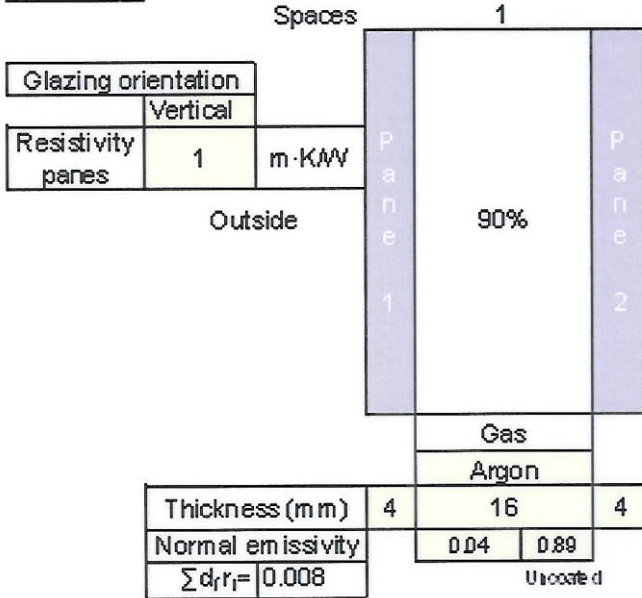
U-Value Calculation Spreadsheet for each option.

EN673 Calculation – Option 1

Version 4 Feb 2009. Calculations according to BS EN 673:1998 (A1)

Number of spaces
1

FIRAT -W70 Casement window- Chilt/T09002-2 - Option 1

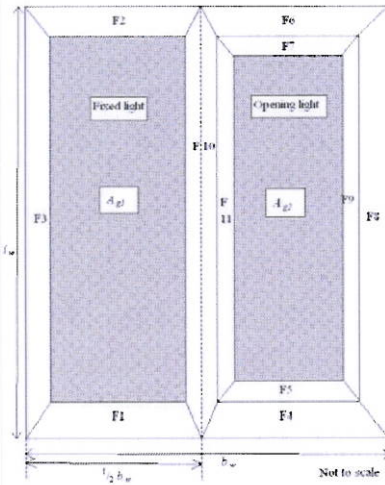


For uncoated surfaces input 0.89 for normal emissivity, which corresponds to a corrected emissivity of 0.837

Iteration number	U value	$\sum 1/h_i$	λ_{eff}	ΔT
	W/(m ² ·K)	(m ² ·K)/W		
1	1.163	0.68358	0.0234	15
2	1.163	0.68358	0.0234	15

Version 1.0
1 Feb 2007

U-Value Calculation – Option 1



ML 3/10/07
U VALUE ONLY

Project details: FIRAT PLASTİK VE KAUCUK A.Ş.
Chilt/T09002-2 Option 1 - W70 PVC-U Casement Window
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
		No gasket (mm) / Gasket protrusion (mm) / With gasket (mm)
b values to nearest 0.5 (Not including gaskets)		
F1 fixed sill (b ₁)	63	3.5 / 66.5
F2 fixed head (b ₂)	63	3.5 / 66.5
F3 fixed jamb (b ₃)	63	3.5 / 66.5
Total		
Sash sill (F4+F5)	F4 fixed (b ₄) 37.5 / F5 moving (b ₅) 76	37.5 / 79.5
Sash head (F6+F7)	F6 fixed (b ₆) 37.5 / F7 moving (b ₇) 76	37.5 / 79.5
Sash jamb (F8+F9)	F8 fixed (b ₈) 37.5 / F9 moving (b ₉) 76	37.5 / 79.5
Mullion	F10 fixed (b ₁₀) 53.5 / F11 moving (b ₁₁) 76	57 / 79.5
Total gasket area		0.024619 m ²

Conductance	$L_{i,j}^{2D}$	b_j (mm)
F1 fixed sill conductance	0.3185	190
F2 fixed head conductance	0.3185	190
F3 fixed frame conductance	0.3185	190
F4+F5 sash sill conductance	0.4036	190
F6+F7 sash head conductance	0.4036	190
F8+F9 sash jamb conductance	0.4036	190
F10+F11 mullion conductance	0.7763	380
All L values to 4DP. All b values to ODP		
F1 fixed sill conductance	0.3789	190
F2 fixed head conductance	0.3789	190
F3 fixed frame conductance	0.3789	190
F4+F5 sash sill conductance	0.4640	190
F6+F7 sash head conductance	0.4640	190
F8+F9 sash jamb conductance	0.4640	190
F10+F11 mullion conductance	0.6555	380

Glazing dimensions and properties		
All to ODP	Thickness of pane 1	4 mm
	Pane 1/2 distance	16 mm
	Thickness of pane 2	4 mm
No entry for DG	Pane 2/3 distance	
No entry for DG	Thickness of pane 3	
Thermal transmittance of glazing-3DP	U_g	1.163 W/m ² ·K

Window Dimensions:

Section	Length (mm)	Width (mm)	Area No gasket (m ²)	Area with gasket (m ²)
Fixed light	1354	525.25	0.7112	0.698083
Opening light	1253	398.75	0.4996	0.488121
Total glazing, A_g			1.2108	1.1862
Frame				
F1	615	63	0.0359	0.0377
F2	615	63	0.0359	0.0377
F3	1480	63	0.0893	0.0940
F4	615	37.5	0.0219	0.0219
F5	550.75	76	0.0361	0.0375
F6	615	37.5	0.0219	0.0219
F7	550.75	76	0.0361	0.0375
F8	1480	37.5	0.0541	0.0541
F9	1405	76	0.1010	0.1054
F10	1490	53.5	0.0795	0.0812
F11	1405	76	0.1010	0.1054
Total Frame, A_f			0.6096	0.6342
Total Window, A_w			1.820400	1.8204

Frame: Data from EN.573. U_g and ε to 2DP. Ke_{ff} to 4DP

Section	b _j (with gaskets) (m)	U _j (W/m ² ·K)	Frame areas (with gaskets) (m ²)	Heat flow (W/K)	ψ (W/m ² ·K)	l _j (m)	Heat flow (W/K)
F1 fixed sill	0.0665	1.4506	0.0377	0.0548	0.0610	0.51825	0.0316
F2 fixed head	0.0665	1.4506	0.0377	0.0548	0.0610	0.51825	0.0316
F3 fixed frame	0.0665	1.4506	0.0940	0.1364	0.0610	1.347	0.0822
F4+F5 sash sill	0.117	1.5518	0.0593	0.0921	0.0610	0.39175	0.0239
F6+F7 sash head	0.117	1.5518	0.0593	0.0921	0.0610	0.39175	0.0239
F8+F9 sash jamb	0.117	1.5518	0.1595	0.2475	0.0610	1.246	0.0760
F10+F11 mullion	0.1365	2.4339	0.1866	0.4542	-0.1190	1.2965	-0.1543
Totals			0.6342	1.1316		Total	0.1149

Other parameters needed for calculation, taken from simulations:	
Panel thickness, d _p = d _g =	0.024 m
λ _p =	0.035 W/m·K
R _{sp} =	0.04 m ² ·K/W
R _{st} =	0.8567 m ² ·K/W
R _{sf} =	0.6857 m ² ·K/W
R _{sc} =	0.13 m ² ·K/W
U _g =	1.1686 W/m ² ·K

	No gasket	With gasket
Percentage glass area	66.51%	65.16%

U(window) 3DP 1.443

U(window) 1DP 1.4

Certified Simulator No. 32