

**NFRC SIMULATION IN ACCORDANCE WITH  
ANSI/NFRC 100, ANSI/NFRC 200 and NFRC 500**

CLEB laboratory Inc.	Submitted to:	Reissued To:
Report No.: NS-02952-1	Aluminco S.A.	
Reissued Report No.: N/A	Viotia Inofita Greece , +30 22620 47090	N/A

**Report Summary**

Operation Type:	FIXD	Product Line ID Number:	N/A
Series/Model:	Fixed Window	Report Type:	Initial Certification
Report Date:	2017-11-10	Simulation Date :	2017-11-10
Revision Date:	N/A	Number of Pages:	6

**Reissue Information**

Model:	N/A	Date of Reissue:	N/A
Reason for submittal:	N/A	Revision Date:	N/A
Product Line ID Number:	N/A		

**Validation test sample configuration**

Operation Type:	FIXD	Door description:	N/A
Series/Model:	Fixed Window	Panel	N/A
Frame Type:	AT	Core Fill:	N/A
Sash Type:	NA	Skin:	N/A
Reinforcement:	None	Sub-Structure:	N/A
Size:	1200 mm W. x 1500 mm H. (47.24" x 59.06")		

**Glazing: AL\_7037#2-Arg90-ClrGuard**

Type: Double Sealed Unit  
 Spacer Type: A1-D  
 Overall Thickness: 26.50 mm (1.04")  
 Filling Technique: Single probe  
 Design Gas Fill: Argon/Air  
 Gas Concentration: 90% Argon, 10% Air

	Thickness		Emissivity							
	mm	inch	S1	S2	S3	S4	S5	S6	S7	S8
<b>Glass 1</b>	6.0	0.24	0.840	0.025						
<b>Glass 2</b>	5.0	0.20			0.840	0.840				
<b>Glass 3</b>	N/A	N/A					N/A	N/A		
<b>Glass 4</b>	N/A	N/A							N/A	N/A
<b>Gap 1</b>	15.50	0.61								
<b>Gap 2</b>	N/A	N/A								
<b>Gap 3</b>	N/A	N/A								

**U:1.87 W/(m².K); 0.33 BTU/(hr.ft².F)**

Note: Reference must be made to CLEB laboratory Inc. complete report for specimen description and detailed simulation results.

Simulated by:



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 Simulator, Thermal Evaluation  
 CLEB laboratory Inc.

Approved by:



Dave Deshaies Mc Mahon, Eng.  
 NFRC Certified Simulator, Person in Responsible Charge  
 CLEB laboratory Inc.



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## APPENDIX A: DRAWINGS AND PRODUCT INFORMATION

Report No: **NS-02952-1**, Reissued: **N/A**

**Fixed Window**

**Simulation in accordance with ANSI/NFRC 100, 200, NFRC 500**

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## NFRC SIMULATION IN ACCORDANCE WITH: ANSI/NFRC 100, ANSI/NFRC 200 AND NFRC 500

### 1 INTRODUCTION

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CLEB laboratory Inc. has been retained by Aluminco S.A. to evaluate a *fixed window* in accordance with ANSI/NFRC 100 Procedure for Determining Fenestration Product U-Factors, ANSI/NFRC 200 Solar Heat Gain Coefficient and Visible Transmittance and NFRC 500 Procedure for Determining Fenestration Product Condensation Resistance Values. The product components and manufacturing details are documented in section 4 of this report. Rounding is per NFRC 601 NFRC Unit and Measurement Policy. All imperial values are for reference only. Appendix A of this report includes drawings and information of the product.

Rating values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes.

The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

Simulations were conducted in full compliance with NFRC requirements.

### 2 SPECIFICATION

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ANSI/NFRC 100-2017:	Procedure for Determining Fenestration Product U-Factors
ANSI/NFRC 200-2017:	Solar Heat Gain Coefficient and Visible Transmittance
NFRC 101-2017:	Procedure for Determining Thermophysical Properties of Materials for Use in NFRC-Approved Software
NFRC 500-2017:	Procedure for Determining Fenestration Product Condensation Resistance Values
NFRC 601-2017:	NFRC Unit and Measurement Policy
WINDOW 7:	Software by Lawrence Berkeley National Laboratory
THERM 7:	Software by Lawrence Berkeley National Laboratory

### 3 DISCLAIMER

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Data required for this evaluation were taken from the best available sources and every effort was taken to accurately perform the simulation documented in this report. Because of the large amount of input data and analysis it is possible that errors or omissions could occur. Neither CLEB laboratory Inc. nor any of its employees shall be held responsible for any loss or damage resulting directly or indirectly from any default, error or omission.



## 4 PRODUCT DESCRIPTION

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### 4.1 OPERATOR TYPE:

FIXD, Fixed

### 4.2 SERIES/MODEL:

Fixed Window

### 4.3 FRAME:

4.3.1	Material:	AT, Aluminium w/ Thermal breaks - All members
4.3.2	Finish:	Painted Aluminum
4.3.3	Reinforcement:	None
4.3.4	Weatherstripping:	None
4.3.5	Continuous Hardware:	N/A
4.3.6	Overall dimensions:	1200 mm W. x 1500 mm H. (47.24 "x 59.06")

### 4.4 SASH(ES)

4.4.1	Material:	N/A
4.4.2	Sash 1:	N/A
4.4.3	Sash 2:	N/A
4.4.4	Sash 3:	N/A
4.4.5	Sash 4:	N/A

### 4.5 GLAZING METHOD:

4.5.1	Exterior face:	EPDM gasket
4.5.2	Interior face:	EPDM gasket

### 4.6 SPACER:

Spacer type:	Material:	Primary sealant:	Secondary sealant:
Aluminum (A1-D)	Aluminum (Mill Finish)	Polyisobutylene	Hot-Melt Butyl

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**Fixed Window**

### Simulation in accordance with ANSI/NFRC 100, 200, NFRC 500

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**4.7 GRID:**

- 4.7.1 Grid: None
- 4.7.2 Material and finish: N/A
- 4.7.3 Standard NFRC Grid Pattern: N/A

**4.8 GLAZING:**

- 4.8.1 Filling Technique: Single probe
- 4.8.2 Capillary tube: No
- 4.8.3 Gas fill percentage: 90% Argon, 10% Air
- 4.8.4 Comment: None



## 5 SIMULATION RESULTS

**Table 1: Center of glazing results**

ID	Name	Insulating Glass Unit										U factor		SHGC	VT
		Glass 1				Gap 1		Glass 2							
		Type	mm	Emissivity		mm	gas	Type	mm	Emissivity		W/m2-K	Btu/hr-ft2-F		
				Surface #1	Surface #2					Surface #3	Surface #4				
10	7037#2-Arg90-3013-Kuraray Trosifol 15mil-3013	SunGuard SN 70/37 HT	6.0	0.840	0.025	14.50	Arg 90%	3013-Kuraray Trosifol 15mil-3013	6.3	0.840	0.840	1.389	0.245	0.345	0.695
20	7037#2-Arg90-ClrGuard	SunGuard SN 70/37 HT	6.0	0.840	0.025	15.50	Arg 90%	Clear, Guardian	5.0	0.840	0.840	1.410	0.248	0.346	0.700

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**Table 2: Overall fenestration products results**

ID	Option Name	Insulating Glass Unit								Overall Product				
		Glass 1		Gap 1			Glass 2			U Factor		SHGC	VT	CR
		Type	mm	mm	Gas	Spacer	Grid	Type	mm	W/m2-K	Btu/hr-ft2-F			
10	AL_7037#2-Arg90-3013-Kuraray Trosifol 15mil-3013	SunGuard SN 70/37 HT	6.0	14.50	Arg 90%	A1-D	None	3013-Kuraray Trosifol 15mil-3013	6.3	1.85	0.33	0.29	0.57	49
20	AL_7037#2-Arg90-ClrGuard	SunGuard SN 70/37 HT	6.0	15.50	Arg 90%	A1-D	None	Clear, Guardian	5.0	1.87	0.33	0.29	0.57	49

Report No: **NS-02952-1**, Reissued: **N/A**

**Fixed Window**

**Simulation in accordance with ANSI/NFRC 100, 200, NFRC 500**

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## 6 REVISION LOG

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Revision Number	Revision Date	Description
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## APPENDIX A: DRAWINGS AND PRODUCT INFORMATION

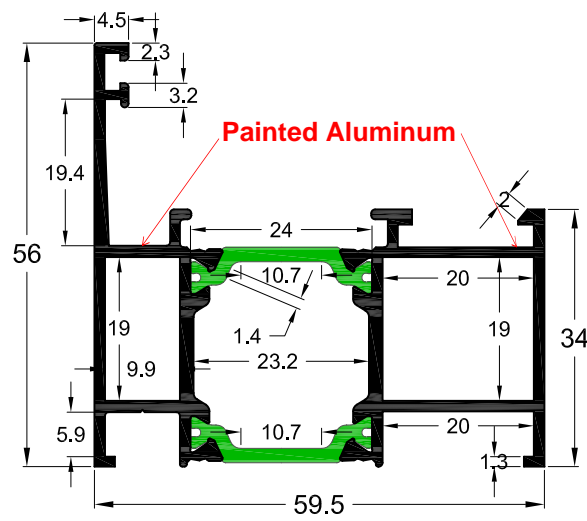
Report No: **NS-02952-1**, Reissued: **N/A**

**Simulation in accordance with ANSI/NFRC 100, 200, NFRC 500**

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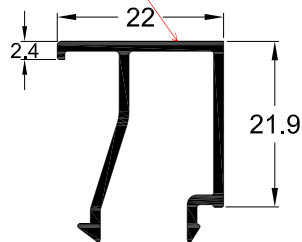
## FIX WINDOW

**ALUMINCO**  
ALUMINIUM BUILDING SYSTEMS



Κωδικός   Code	450-107
Βάρος   Weight	1197 gr/m
Περιγραφή	Κάσα
Description	Frame

Painted Aluminum

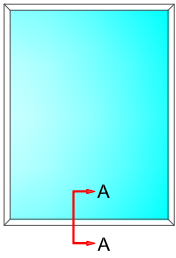


Κωδικός   Code	540-773
Βάρος   Weight	275 gr/m
Περιγραφή	Πηχάκι
Description	Bead

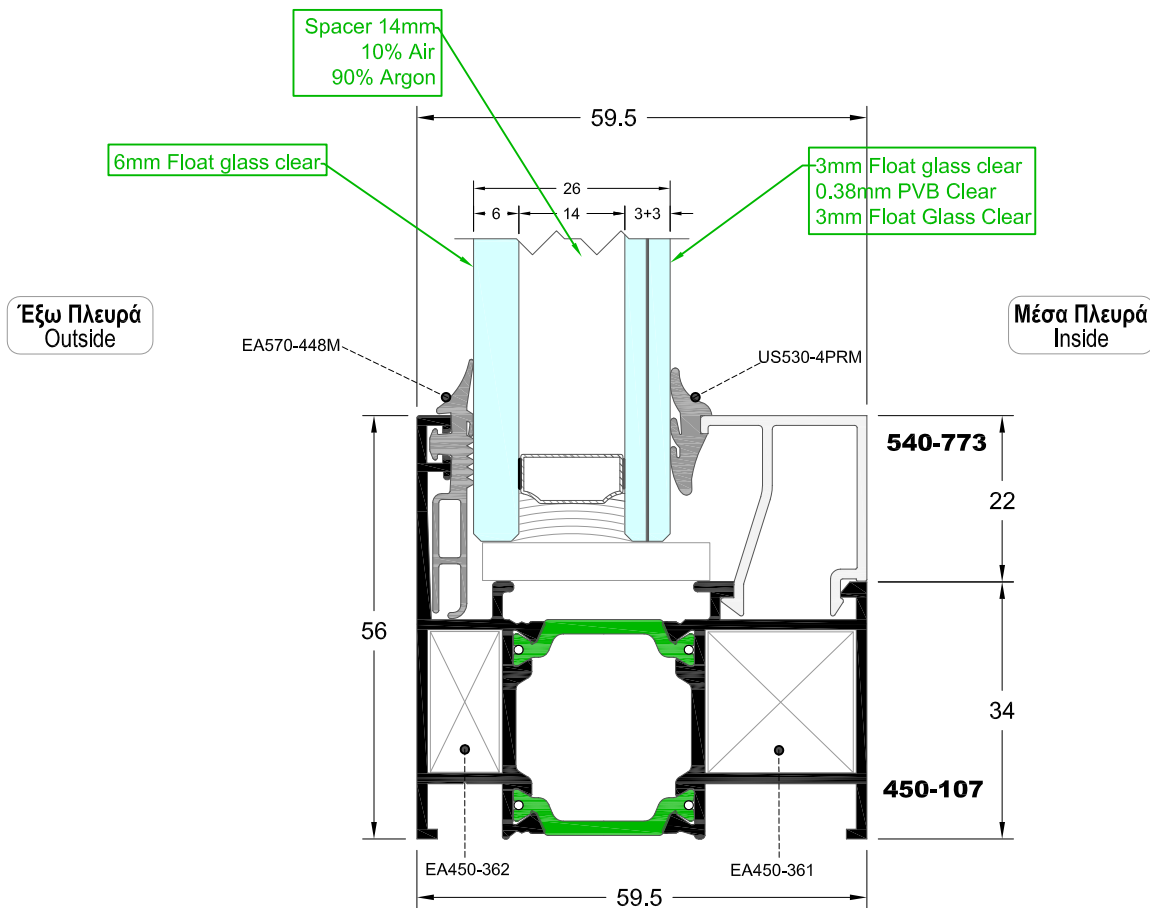
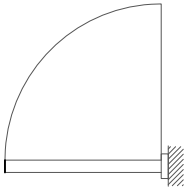
FIX WINDOW



ΟΨΗ  
FRONT VIEW



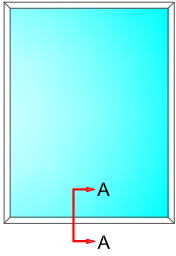
ΚΑΤΟΨΗ  
TOP VIEW



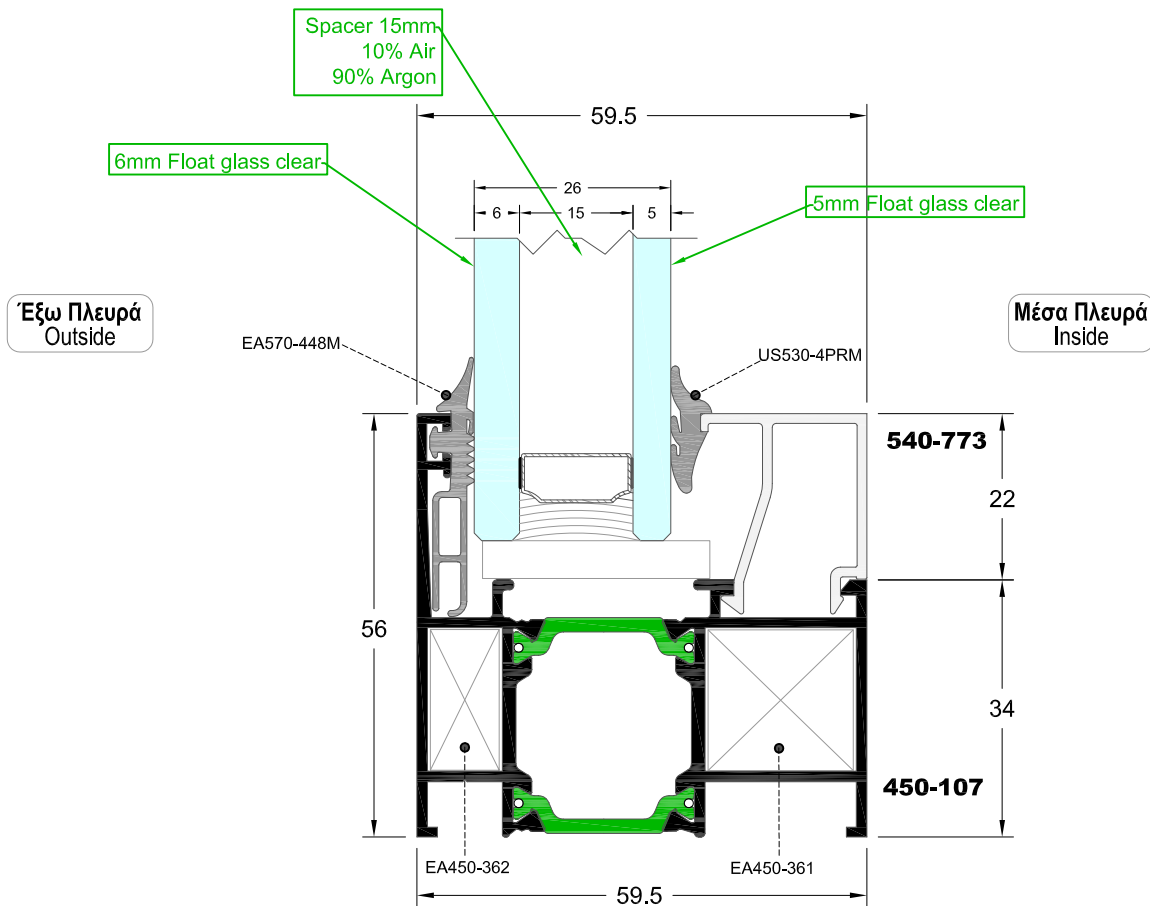
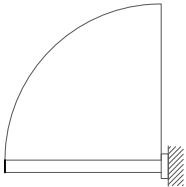
FIX WINDOW



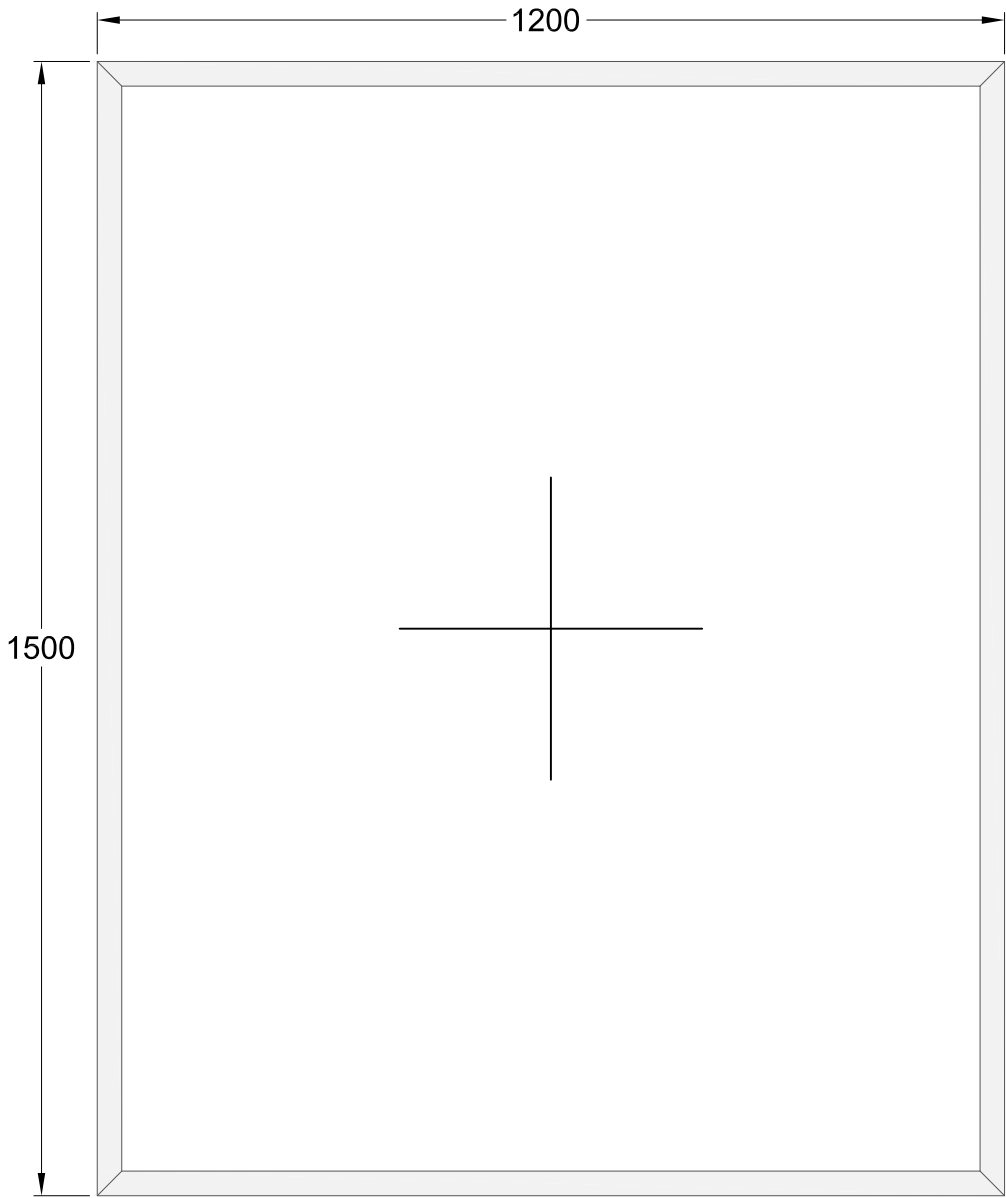
**ΟΨΗ**  
FRONT VIEW



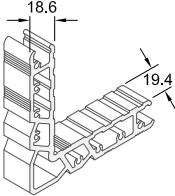
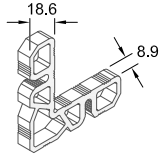
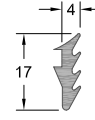
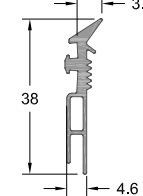
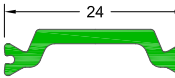
**ΚΑΤΟΨΗ**  
TOP VIEW

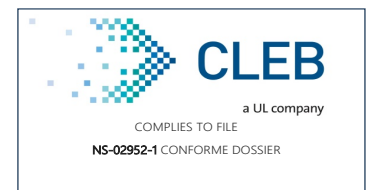


Build of materials			
A/A	CODE	DESCRIPTION	MATERIAL
1	<b>450-107</b>	FRAME PROFILE	10.8m
2	<b>540-773</b>	BEAD	10.8m
3	<b>EA450-361</b>	CRIMPING CORNER 19.4x18.6mm (SIEGENIA)	8pcs
4	<b>EA450-362</b>	CRIMPING CORNER 8.9x18.6	8pcs
5	<b>US530-4PRM</b>	GLAZING GASKET	10.8m
6	<b>EA570-448M</b>	EPDM GLAZING GASKET	10.8m



ACCESSORIES

	<p>Code:</p> <p><b>EA450-361U</b></p>	<p>Description      CRIMPING CORNER 19.4 x 18.6 mm (SIEGENIA)</p>
	<p>Code:</p> <p><b>EA450-362U</b></p>	<p>Description      CRIMPING CORNER 8.9 x 18.6 mm</p>
	<p>Code:</p> <p><b>US530-4PRM</b> (4 mm)</p>	<p>Description      <b>EPDM</b> GLAZING GASKET</p>
	<p>Code:</p> <p><b>EA570-448M</b></p>	<p>Description      EPDM GLAZING GASKET</p>
	<p>Code:</p> <p><b>3120-024</b></p>	<p>Description      THERMAL BRAKE STRIP OF 24mm (Ω) SHAPE</p> <p>Material Data Sheets      PA 66 GF 25</p>



# Material Data sheets

## Insulating Profiles made of **PA 66 GF 25** / **Recycled PA 66 GF25** – dry impact resistant

No.	Characteristic	Reference standard	Unit	Samples prepared from extruded insulating strips		Injected-moulded samples
				Dry <sup>(1)</sup>	Equilibrium <sup>(2)</sup> moisture content	Dry <sup>(1)</sup>
1	Melting temperature	EN ISO 11357-3	°C	min. 250 <sup>(3)</sup>	min. 250 <sup>(3)</sup>	min. 250 <sup>(3)</sup>
2	Density	EN ISO 1183-1 or -3	g/cm <sup>3</sup>	1.3 +/- 0.05	1.3 +/- 0.05	1.3 +/- 0.05
3	Annealing residue (glass fibre content)	EN ISO 1172	%	25 +/- 2.5	25 +/- 2.5	25 +/- 2.5
4	Shore hardness D	EN ISO 868	-	82 +/- 4 <sup>(4)</sup>	78 +/- 4 <sup>(4)</sup>	84 +/- 2
5	Impact strength	EN ISO 179-1	kJ/m <sup>2</sup>	min. 30 or without break <sup>(5)</sup>	min. 40 or without break <sup>(5)</sup>	min. 35 <sup>(6)</sup>
6	Tensile strength	EN ISO 527-2 and -4	N/mm <sup>2</sup>	min. 80 <sup>(7)</sup>	min. 50 <sup>(7)</sup>	min. 110 <sup>(8)</sup>
7	Young's modulus	EN ISO 527-2 and -4	N/mm <sup>2</sup>	min. 4500 <sup>(7)</sup>	min. 2000 <sup>(7)</sup>	min. 6000 <sup>(8)</sup>
8	Elongation at break	EN ISO 527-2 and -4	%	min. 3 <sup>(7)</sup>	min. 7 <sup>(7)</sup>	min. 3 <sup>(8)</sup>

(1) Sample water content less than 0.2 % by weight (2) Fast conditioning acc. to EN ISO 1110 (23°C/50%) (3) Maximum temperature 300°C  
 (4) Specimen thickness 2mm, unstacked (5) Specimen Typ 2fU (50 mm x 10 mm x 2mm) (6) Specimen Typ 1fU (80 mm x 10 mm x 4mm) (7) Specimen Typ 1BA  
 (8) Specimen Typ 1A

## Insulating strips of **Low Lambda PA 66 GF25** - dry impact resistant

No.	Characteristic	Reference standard	Unit	Samples prepared from extruded insulating strips	
				Dry <sup>(1)</sup>	Equilibrium <sup>(2)</sup> moisture content
1	Melting temperature	EN ISO 11357-3	°C	min. 250 <sup>(3)</sup>	min. 250 <sup>(3)</sup>
2	Density	EN ISO 1183-1 or -3	g/cm <sup>3</sup>	1.0 +/- 0.1	1.0 +/- 0.1
3	Annealing residue (glass fibre content)	EN ISO 1172	%	25 +/- 2.5	25 +/- 2.5
4	Shore hardness D	EN ISO 868	-	77 +/- 4 <sup>(4)</sup>	67 +/- 4 <sup>(4)</sup>
5	Impact strength	EN ISO 179-1	kJ/m <sup>2</sup>	min. 20 <sup>(5)</sup>	min. 30 <sup>(5)</sup>
6	Tensile strength	EN ISO 527-2 and -4	N/mm <sup>2</sup>	min. 50 <sup>(6)</sup>	min. 35 <sup>(6)</sup>
7	Young's modulus	EN ISO 527-2 and -4	N/mm <sup>2</sup>	min. 2900 <sup>(5)</sup>	min. 1300 <sup>(6)</sup>
8	Elongation at break	EN ISO 527-2 and -4	%	min. 5 <sup>(6)</sup>	min. 8 <sup>(5)</sup>

1) Sample water content less than 0,2% by weight 2) Fast conditioning acc. to EN ISO 1110 (23°C / 50%) 3) Maximum temperature 300°C  
 4) Specimen thickness 2mm, unstacked 5) Specimen Typ 2fU (50 mm x 10 mm x 2mm) 6) Specimen Typ 1BA

Product code

68 / 38 / 1,1



total thickness = 26,38 mm

Glazing from external to internal:

<b>Pane 1</b>		<b>Pane 2</b>	
6 mm	Float Glass ExtraClear SunGuard SN 70/37 HT	3 mm	Float Glass Clear Guardian
		0,38 mm	PVB Clear Kuraray/Trosifol/15mil.
		3 mm	Float Glass Clear Guardian
<b>Spacer 1 - 14 mm</b>			
10%	Air		
90%	Argon		

**Results**

Visible light (EN 410 - 2011)

transmittance [%]	$\tau_v = 68,4$
reflectance external [%]	$\rho_v = 12,3$
reflectance internal [%]	$\rho_v = 13,0$
general colour rendering index [%]	$R_a = 93,3$

Thermal properties (EN 673 - 2011)

U-value [W/(m <sup>2</sup> K)]	$U_g = 1,1$
slope $\alpha = 90^\circ$	

Solar energy (EN 410 - 2011)

solar factor [%]	$g = 37,9$
shading coefficient [g/0.87]	$sc = 0,44$
direct transmittance [%]	$\tau_e = 33,3$
direct reflectance external [%]	$\rho_e = 35,2$
direct reflectance internal [%]	$\rho_e = 32,2$
direct absorption [%]	$a = 31,5$
UV transmittance [%]	$\tau_{UV} = 1,9$
secondary internal heat transfer factor [%]	$q_i = 4,6$

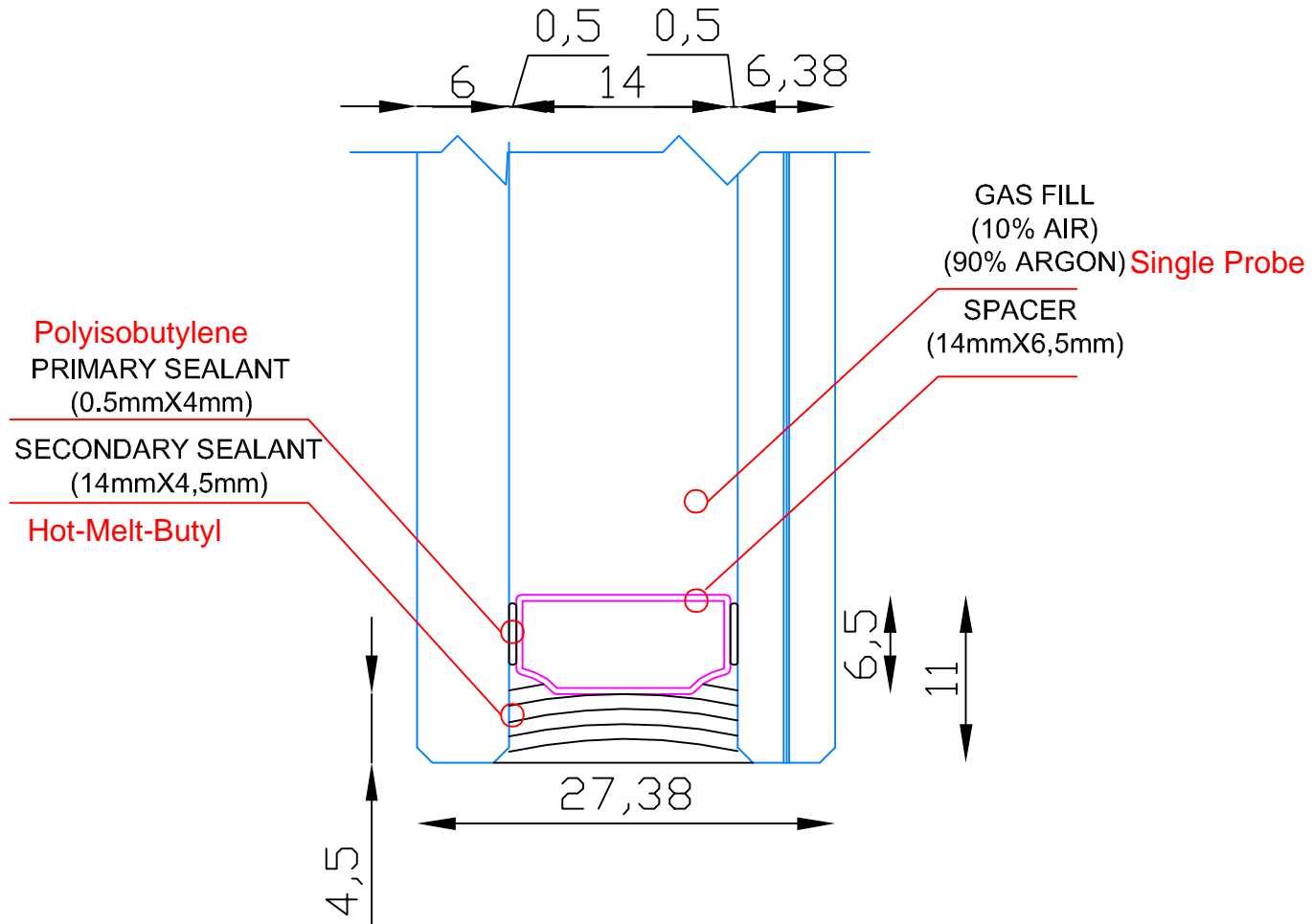
Other data

estimated sound reduction index [dB] (EN 717-1)	$R_w = \text{NPD}$ $C = \text{NPD}$ $C_{tr} = \text{NPD}$
--	---



The calculated values are for orientation only and do not offer any guarantee regarding the fabrication of the un-intended end-product. Glass configurations do not amount to a guarantee of product availability.





Product code

69 / 38 / 1,0



total thickness = 26 mm

Glazing from external to internal:

<p><b>Pane 1</b></p> <p>6 mm Float Glass ExtraClear SunGuard SN 70/37 HT</p>	<p><b>Spacer 1 - 15 mm</b></p> <p>10% Air 90% Argon</p>	<p><b>Pane 2</b></p> <p>5 mm Float Glass Clear <b>Guardian</b></p>
--	---	--

## Results

### Visible light (EN 410 - 2011)

transmittance [%]	$\tau_v = 69,0$
reflectance external [%]	$\rho_v = 12,3$
reflectance internal [%]	$\rho_v = 13,1$
general colour rendering index [%]	$R_a = 93,5$

### Thermal properties (EN 673 - 2011)

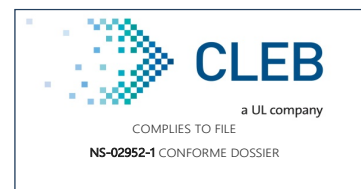
U-value [W/(m <sup>2</sup> K)]	$U_g = 1,0$
slope $\alpha = 90^\circ$	

### Solar energy (EN 410 - 2011)

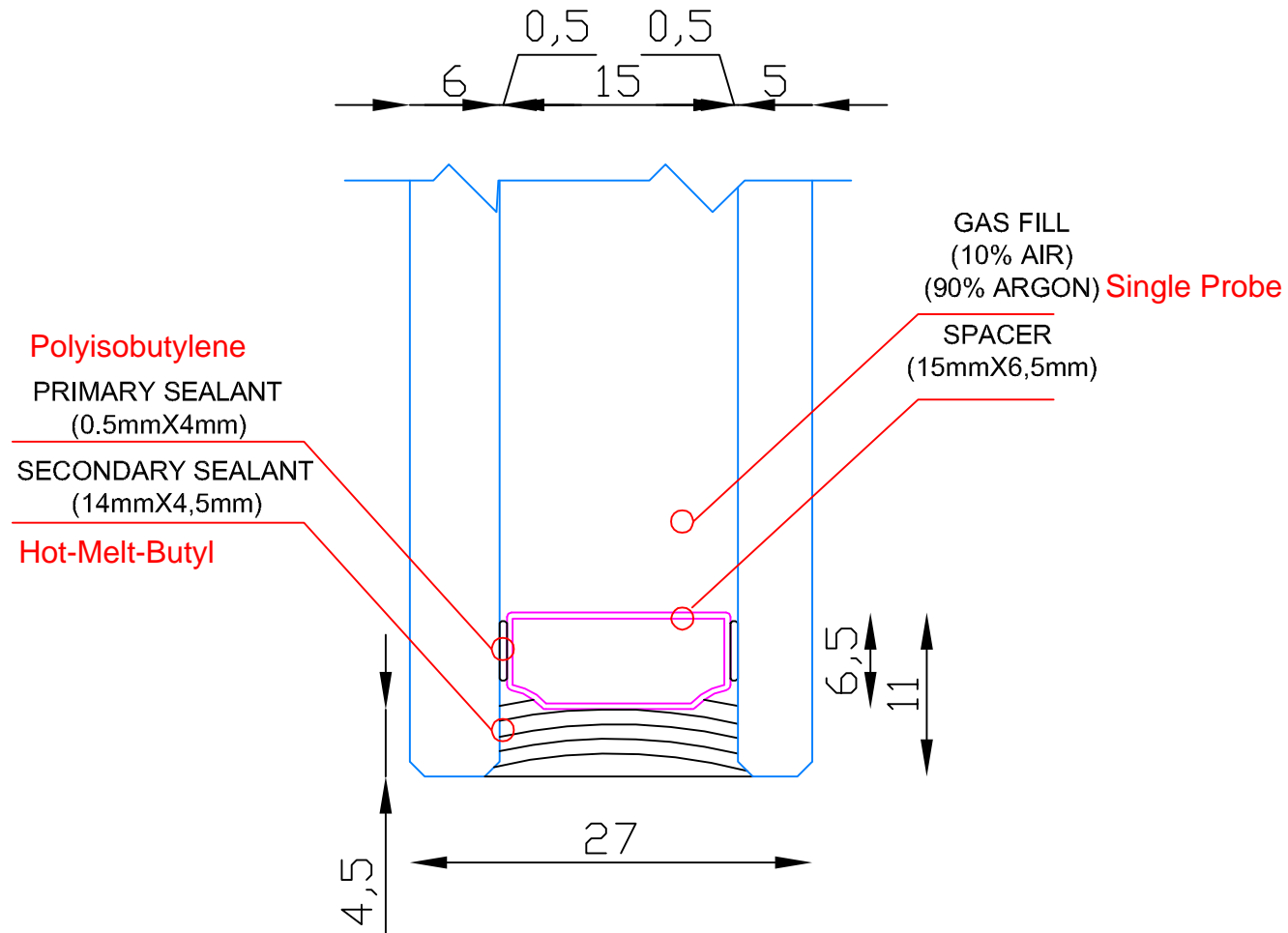
solar factor [%]	$g = 38,0$
shading coefficient [g/0.87]	$sc = 0,44$
direct transmittance [%]	$\tau_e = 35,1$
direct reflectance external [%]	$\rho_e = 35,3$
direct reflectance internal [%]	$\rho_e = 36,8$
direct absorption [%]	$a = 29,6$
UV transmittance [%]	$\tau_{uv} = 25,1$
secondary internal heat transfer factor [%]	$q_i = 2,9$

### Other data

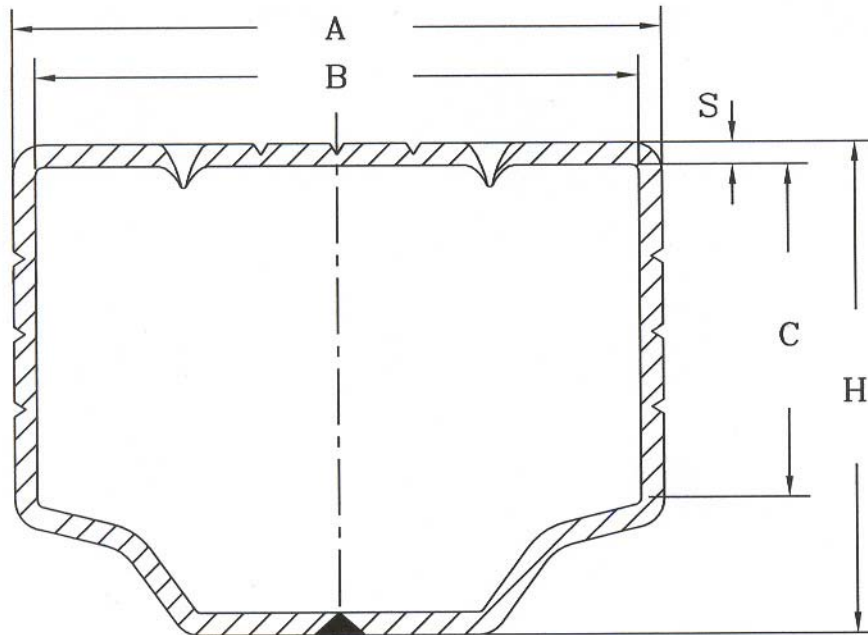
estimated sound reduction index [dB]	$R_w = \text{NPD}$
(EN 717-1)	$C = \text{NPD}$
	$C_{tr} = \text{NPD}$



The calculated values are for orientation only and do not offer any guarantee regarding the fabrication of the un-intended end-product. Glass configurations do not amount to a guarantee of product availability.



# PNAAAHHGSSSN



**Mill finish Aluminum Spacer**

## PGS

RIFERIMENTI	A	H	S	B	C
TOLLERANZE	+ 0.05	± 0.10	+ 0.01	± 0.20	+ 0.20
SIGLA (Profilo)	- 0.15		- 0.03		- 0.10
P. 5.5 S.L.	5.60	6.55	0.36	4.70	4.20
P. 6.5	6.50	6.50	0.36	5.70	4.20
P. 7.5	7.50	6.50	0.36	6.70	4.20
P. 8.5	8.45	6.50	0.36	7.65	4.20
P. 9.5	9.45	6.50	0.36	8.65	4.20
P. 10.5	10.45	6.50	0.36	9.65	4.20
P. 11.5	11.45	6.50	0.36	10.65	4.20
P. 12.5	12.45	6.50	0.36	11.65	4.20
P. 13.5	13.45	6.50	0.36	12.65	4.20
P. 14.5	14.45	6.50	0.36	13.65	4.20
P. 15.5	15.45	6.50	0.36	14.65	4.20
P. 17.5	17.45	6.50	0.36	16.65	4.20
P. 18.5	18.45	6.50	0.36	17.65	4.05
P. 19.5	19.45	6.50	0.36	18.65	4.20
P. 21.5	21.45	6.50	0.36	20.65	4.05
P. 23.5	23.45	6.50	0.36	22.65	4.05
P. 26.5	26.45	6.50	0.36	25.65	4.05

### NOTE:

A) Sulla lunghezza si considera una tolleranza di  $\pm 3$  mm

B) Per i profili verniciati, le misure esterne sono maggiorate di una quota variabile tra 12 e 20  $\mu$