CLEB
a UL company

# VALIDATION TEST IN ACCORDANCE WITH NFRC 102-2017

| CLEB laboratory Inc. | Submitted To: | Re-issued To: |
|---|---|---|
| **Tested Report No.:**<br>**NV-02951**<br>**Re-issued Report No.:**<br>**N/A** | **Aluminco S.A.**<br>**Viotia Inofita**<br>**Greece, ,**<br>**32011**<br>**+30 22620 47090** | **N/A** |

## Test Report Summary

***General Information :***

| | |
|---|---|
| **Operation type :** | CSSV |
| **Model** | Casement Window |
| **Type :** | Production Line |
| **Submitted for :** | Initial certification |
| **Product Line ID Number:** | N/A |
| **Test date** | 2017-12-17 |
| **Report date** | 2017-12-19 |
| **Revision date** | N/A |
| **Number of pages** | 8 |
| **$U_s$:** | 2.51 ± 0.08 W/(m²C) ( 0.44 ± 0.01 BTU/(hrft²°F)) |
| **$U_{st}$:** | 2.42 ± 0.08 W/(m²C) ( 0.43 ± 0.01 BTU/(hrft²°F)) |

***Product description :***

| | |
|---|---|
| **Frame type :** | AT |
| **Sash type :** | AT |
| **Door Description** | N/A |
| **Panel :** | N/A |
| **Core fill :** | N/A |
| **Skin :** | N/A |
| **Sub-Structure** | N/A |
| **Size in mm :** | 600 mm W. x 1500 mm H. |
| **Size in inch :** | 23.62" W x 59.06" H. |
| **Comment :** | |

## Glazing information

| | |
|---|---|
| **Type :** | Double Sealed Unit |
| ***Spacer type :** | A1-D |
| **Overall thickness** | 25.80 mm (1.02") |
| ***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 |
| **Glass 1** | 5.89 | 0.12 | 0.840 | 0.025 | | | | | | |
| **Glass 2** | 4.87 | 0.19 | | | 0.840 | 0.840 | | | | |
| **Glass 3** | N/A | N/A | | | | | N/A | N/A | | |
| **Glass 4** | N/A | N/A | | | | | | | N/A | N/A |
| **Gap 1** | 15.04 | 0.59 | | | | | | | | |
| **Gap 2** | N/A | N/A | | | | | | | | |
| **Gap 3** | N/A | N/A | | | | | | | | |

*Notes: Reference must be made to CLEB laboratory Inc. complete report for test specimen description and details test results.*

**: Data obtained by the manufacturer.*

## Re-issue Information

| | | | |
|---|---|---|---|
| **Model:** | N/A | **Date of Re-issue:** | N/A |
| **Submitted For:** | N/A | **Product Line ID Number:** | N/A |
| **Revision Date:** | N/A | | |

**Tested by:**

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Dave Deshaies McMahon

**Dave Deshaies McMahon, P.Eng.**
Person-in-Responsible Charge,Thermal Evaluation
CLEB laboratory Inc.

## TABLE OF CONTENTS

## 1 INTRODUCTION

CLEB laboratory Inc. has been retained by Aluminco S.A. to test a casement window in accordance with NFRC 102 Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems. The sample components and manufacturing are documented in section 3.0. In this report, all values in parenthesis are for reference only.Ratings included in this report are for submittal to an NFRC-licensed IA for certification purposes and are not meant to be used for labelling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labelling purposes.

## 2 SPECIFICATION

NFRC 102-2017 Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems

## 3 DESCRIPTION OF THE TESTED SPECIMEN

### 3.1 OPERATOR TYPE

CSSV, Casement

### 3.2 TYPE

Production Line

### 3.3 MODEL

Casement Window

### 3.4 GLAZING DAYLIGHT OPENING

3.4.1 Lite 1: 360 mm W. x 1257 mm H. (14,17" x 49,49")

3.4.2 Lite 2: N/A

3.4.3 Lite 3: N/A

3.4.4 Lite 4: N/A

### 3.5 DATE OF SAMPLE RECEPTION

2017-11-29

### 3.6 DATE OF TESTING

2017-12-17

## 3.7 FRAME

3.7.1 Material: AT, Aluminum w/ Thermal breaks - All members

3.7.2 Finish: Painted Aluminum

3.7.3 Joinery type: Mechanical assembly crimped and sealed

3.7.4 Reinforcement:

*3.7.4.1 Reinforcement 1: None*
*3.7.4.2 Reinforcement 2: None*
*3.7.4.3 Reinforcement 3: None*
*3.7.4.4 Reinforcement 4: None*
*3.7.4.5 Reinforcement 5: None*
*3.7.4.6 Reinforcement 6: None*

3.7.5 Weatherstripping:

*3.7.5.1 Weatherstripping 1: Compression bulb Weatherstripping at All Perimeter*
*3.7.5.2 Weatherstripping 2: Extruded fins Weatherstripping at All Perimeter*
*3.7.5.3 Weatherstripping 3: None*
*3.7.5.4 Weatherstripping 4: None*
*3.7.5.5 Weatherstripping 5: None*
*3.7.5.6 Weatherstripping 6: None*

3.7.6 Drainage:

*3.7.6.1 Drainage 1: 2 Oblong Hole(s) 26 mm x 4 mm*
*3.7.6.2 Drainage 2: 2 Oblong Hole(s) 15 mm x 5 mm*
*3.7.6.3 Drainage 3: None*
*3.7.6.4 Drainage 4: None*
*3.7.6.5 Drainage 5: None*
*3.7.6.6 Drainage 6: None*

3.7.7 Overall dimensions: 600 mm W. x 1500 mm H. (23.62” x 59.06”)

## 3.8 SASH(ES)

3.8.1 Material: AT, Aluminum w/ Thermal breaks - All members

3.8.2 Finish: Painted Aluminum

3.8.3 Joinery type: Mechanical assembly crimped and sealed

3.8.4 Reinforcement:

*3.8.4.1 Reinforcement 1: None*
*3.8.4.2 Reinforcement 2: None*
*3.8.4.3 Reinforcement 3: None*
*3.8.4.4 Reinforcement 4: None*
*3.8.4.5 Reinforcement 5: None*
*3.8.4.6 Reinforcement 6: None*

3.8.5 Weatherstripping:

*3.8.5.1 Weatherstripping 1: Compression bulb Weatherstripping at All Perimeter*
*3.8.5.2 Weatherstripping 2: None*
*3.8.5.3 Weatherstripping 3: None*
*3.8.5.4 Weatherstripping 4: None*
*3.8.5.5 Weatherstripping 5: None*
*3.8.5.6 Weatherstripping 6: None*

3.8.6 Drainage:

*3.8.6.1 Drainage 1: 2 Oblong Hole(s) 30 mm x 5 mm*
*3.8.6.2 Drainage 2: None*
*3.8.6.3 Drainage 3: None*
*3.8.6.4 Drainage 4: None*
*3.8.6.5 Drainage 5: None*
*3.8.6.6 Drainage 6: None*

3.8.7 Overall dimensions:

*3.8.7.1 Sash 1:546 mm W. x 1445 mm H. (21,5" x 56,89")*
*3.8.7.2 Sash 2: N/A*
*3.8.7.3 Sash 3: N/A*
*3.8.7.4 Sash 4: N/A*

## 3.9 DOOR SLAB

3.9.1 Description: N/A, N/A

3.9.2 Panel: N/A, N/A

3.9.3 Material:

*3.9.3.1 Core fill: N/A, N/A*
*3.9.3.2 Skin: N/A, N/A*
*3.9.3.3 Sub-structure: N/A, N/A*

3.9.4 Lite frame

*3.9.4.1 Material: N/A, N/A*

*3.9.4.2 Joinery type: N/A*

*3.9.4.3 Weatherstripping: N/A*

*3.9.4.4 Overall dimensions: N/A*

3.9.5 Drainage: N/A

**3.10 HARDWARE**

3.10.1 Operator: Lever Arm

3.10.2 Lock: Multi-point lock

3.10.3 Quantity of Keepers: 3

3.10.4 Quantity of Hinges: 2

3.10.5 Quantity of Snubbers: 1

**3.11 GLAZING METHOD**

3.11.1 Exterior face: EPDM Gasket

3.11.2 Interior face: EPDM Gasket and Silicone

**3.12 SPACER**

3.12.1 *Spacer Type: A1-D, Aluminum

3.12.2 *Spacer Name: A1-D

3.12.3 *Primary sealant: Aluminum (Mill finish)

3.12.4 *Secondary sealant: Hot-Melt Butyl

**3.13 GRID**

3.13.1 Grid: N, No Grids

3.13.2 Grid type: N/A

3.13.3 Grid size: N/A

### 3.14 GLAZING

3.14.1 Type: Double Sealed Unit

3.14.2 Overall thickness: 25.80 mm (1.02”)

3.14.3 *Filling Technique: Single probe

3.14.4 *Design Gas Fill: Argon/Air

3.14.5 *Gas Concentration: 90% Argon, 10% Air

3.14.6 Capillary tube: No

**GLASS AND CAVITY PROPERTIES**

| | Thickness | | *Emissivity | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm | inch | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 |
| **Glass 1** | 5.89 | 0.23 | 0.840 | 0.025 | | | | | | |
| **Glass 2** | 4.87 | 0.19 | | | 0.840 | 0.840 | | | | |
| **Glass 3** | N/A | N/A | | | | | N/A | N/A | | |
| **Glass 4** | N/A | N/A | | | | | | | N/A | N/A |
| **Gap 1** | 15.04 | 0.59 | | | | | | | | |
| **Gap 2** | N/A | N/A | | | | | | | | |
| **Gap 3** | N/A | N/A | | | | | | | | |

**: Data obtained from the manufacturer*

## 4 SPECIMEN PREPARATION PRIOR TO TEST

The test specimen was preconditioned at ambient laboratory conditions prior to the test. The surround panel-to-specimen interfaces were sealed with a non-reflective tape. The specimen was sealed on the exterior with a non-reflective tape.

## 5 TEST PARAMETERS

Tests to determine the Standardized Thermal Transmittance (Ust) of the specimen were performed in the guarded hot box located at Varennes, Quebec. The most recent calibration of the hot box apparatus was in 2017-11-15. The thermal performance evaluations were completed in accordance with the NFRC Test Procedure using a dynamic wind perpendicular to the specimen on the weather side and simulated natural convection on the room side. A zero static pressure differential was maintained across the specimen during the test by pressurizing the guard box on the room side. Data was collected over two successive 2 hour periods after 4 hours of steady state conditions as defined in section 5.2.1.A of the NFRC Test Procedure.

Heat Flow vs EMF Equation: Qmb (W) = -1.4 EMF (mV) + -1.5.

# 6 RESULTS

## 6.1 MEASURES TEST DATA

| | | ***Metric unit (Imperial unit)*** |
|---|---|---|
| 6.1.1 | Glass Thickness and Glazing Deflection | |
| *6.1.1.1* | *Glazing Deflection Before Test:* | *0.04 mm (0.00 inch)* |
| *6.1.1.2* | *Glazing Deflection During Test:* | *0.75 mm (0.03 inch)* |
| 6.1.2 | Heat Flows | |
| *6.1.2.1* | *Total Measured Input into Metering Box (Q):* | *142.26 W (485.86 BTU/hr)* |
| *6.1.2.2* | *Surround Panel Heat Flow ($Q_{sp}$):* | *56.59 W (193.25 BTU/hr )* |
| *6.1.2.3* | *Metering Box Wall Heat Flow ($Q_{mb}$):* | *2.03 W (6.93 BTU/hr )* |
| *6.1.2.4* | *Net Specimen Heat Loss ($Q_s$):* | *87.71 W (299.53 BTU/hr )* |
| 6.1.3 | Areas | |
| *6.1.3.1* | *Test Specimen Projected Area ($A_s$):* | *0,90 m² (9,69 ft²)* |
| *6.1.3.2* | *Test Specimen Interior Total (3-D) Surface Area ($A_h$):* | *0,99 m² (10,69 ft²)* |
| *6.1.3.3* | *Test Specimen Exterior Total (3-D) Surface Area ($A_c$):* | *0,96 m² (10,37 ft²)* |
| *6.1.3.4* | *Metering Box Opening Area (Amb):* | *5,95 m² (64,00 ft²)* |
| *6.1.3.5* | *Metering Box Baffle Area ($A_{b1}$):* | *5.57 $m^2$ (60.00 $ft^2$)* |
| *6.1.3.6* | *Surround Panel Interior Exposed Area ($A_{sp}$):* | *5,05 m² (54,31 ft²)* |
| 6.1.4 | Test Conditions | |
| *6.1.4.1* | *Average Metering Room Air Temperature ($t_h$):* | *21.01 °C (69.83 °F)* |
| *6.1.4.2* | *Average Cold Side Air Temperature ($t_c$):* | *-17.85 °C (-0.13 °F)* |
| *6.1.4.3* | *Average Guard/Environmental Air Temperature:* | *22.74 °C (72.93 °F)* |
| *6.1.4.4* | *Metering Room Maximum Relative Humidity:* | *12 % (12 %)* |
| *6.1.4.5* | *Measured Cold Side Wind Velocity:* | *6.44 km/h (4.00 mph)* |
| *6.1.4.6* | *Measured Maximum Static Pressure Difference Across Specimen:* | *-0.01Pa (0.00 psf)* |
| *6.1.4.7* | *Surround Panel Thickness* | *102 mm (4 inches)* |
| *6.1.4.8* | *Surround Panel Conductance ($C_{sp}$)* | *0,30 W/(m²C) (0,05 BTU/(hrft²°F))* |
| 6.1.5 | Surface Temperature Data | |
| *6.1.5.1* | *Area-Weighted Surround Panel Warm Side Surface Temperature ($t_{sp1}$):* | *20.05 °C (68.10 °F)* |
| *6.1.5.2* | *Area-Weighted Surround Panel Cold Side Surface Temperature ($t_{sp2}$):* | *-17.07 °C (1.27 °F)* |
| 6.1.6 | Results | |
| *6.1.6.1* | *Thermal Transmittance of Test Specimen ($U_s$)[1]:* | *2.51 ± 0.08 W/(m²C) ( 0.44 ± 0.01 BTU/(hrft²°F))* |
| *6.1.6.2* | *Standardized Thermal Transmittance of Test Specimen ($U_{st}$)* | *2.42 ± 0.08 W/(m²C) ( 0.43 ± 0.01 BTU/(hrft²°F))* |

## 7 CALCULATED DATA TEST

| | | ***Metric unit (Imperial unit)*** |
|---|---|---|
| 7.1.1 | Method B (Equivalent CTS Method) | |
| *7.1.1.1* | *Emittance of Glass ($e_1$):* | *0,84 (0,84)* |
| *7.1.1.2* | *Warm Side Baffle Emittance ($e_{b1}$):* | *0,91 (0,91)* |
| *7.1.1.3* | *Equivalent Warm Side Surface Temperature ($t_1$):* | *8.56 °C (47.41 °F)* |
| *7.1.1.4* | *Equivalent Weather Side Surface Temperature ($t_2$):* | *-14.52 °C (5.87 °F)* |
| *7.1.1.5* | *Warm Side Baffle Surface Temperature ($t_{b1}$):* | *20.42 °C (68.75 °F)* |
| *7.1.1.6* | *Measured Warm Side Surface Conductance ($h_h$):* | *7.83 W/(m²C) (1.38 BTU/(hrft²°F))* |
| *7.1.1.7* | *Measured Weather Side Surface Conductance ($h_c$):* | *29.28 W/(m²C) (5.16 BTU/(hrft²°F))* |
| *7.1.1.8* | *Test Specimen Thermal Conductance ($C_s$):* | *4.22 W/(m²C)(0.74 BTU/(hrft²°F))* |
| *7.1.1.9* | *Convection Coefficient (K):* | *2,04 W/(m2C1,25) (0,31) BTU/(hrft2°F1,25)* |
| *7.1.1.10* | *Radiative Test Specimen Heat Flow ($Q_{r1}$):* | *44.70 W (152.64 BTU/hr)* |
| *7.1.1.11* | *Conductive Test Specimen Heat Flow ($Q_{c1}$):* | *43.01 W (146.89 BTU/hr)* |
| *7.1.1.12* | *Radiative Heat Flux of Test Specimen ($q_{r1}$):* | *49.66 W/m² (15.76 BTU/(hr ft²))* |
| *7.1.1.13* | *Convective Heat Flux of Test Specimen ($q_{c1}$):* | *47.79 W/m² (15.16BTU/(hr ft²))* |
| *7.1.1.14* | *Standardized Warm Side Surface Conductance ($h_{sth}$):* | *7.03 W/(m²C) (1.24 BTU/(hrft²°F))* |
| *7.1.1.15* | *Standardized Cold Side Surface Conductance ($h_{stc}$):* | *30,00 W/(m²C) (5,28 BTU/(hrft²°F))* |
| *7.1.1.16* | *Standardized Thermal Transmittance (Ust) [1]:* | *2.42 ± 0.08 W/(m²C) ( 0.43 ± 0.01 BTU/(hrft²°F))* |
| 7.1.2 | Test Duration | |
| *7.1.2.1* | *The environmental systems were started on:* | *2017-12-16 at 09:37 AM* |
| *7.1.2.2* | *The test parameters were considered stable for two consecutive two hours test periods on:* | *2017-12-17 from 04:47 AM to 08:42 AM* |
| *7.1.2.3* | *The thermal performance test results were derived from:* | *2017-12-17 from 06:47 AM to 08:42 AM* |

[1] *Uncertainty : 95% confidence interval*

## 8 GENERAL COMMENTS

None

## 9 CONCLUSION

This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which may be expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that may occur due to the specific design and construction of the fenestration system opening. Therefore, it should be recognized that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage, and thermal bridge effects.

Detailed drawings were available for laboratory records and compared to the test specimen at the time of this report, representative sections of the test specimen will be retained by CLEB laboratory Inc. for a period of 2 1/2 years and report will be retained by CLEB laboratory Inc. for a period of 5 years. The results obtained apply only to the specimen tested. Testing described in this report was conducted in full compliance with NFRC requirements.

Appendix A of this report includes drawings and information of the product.

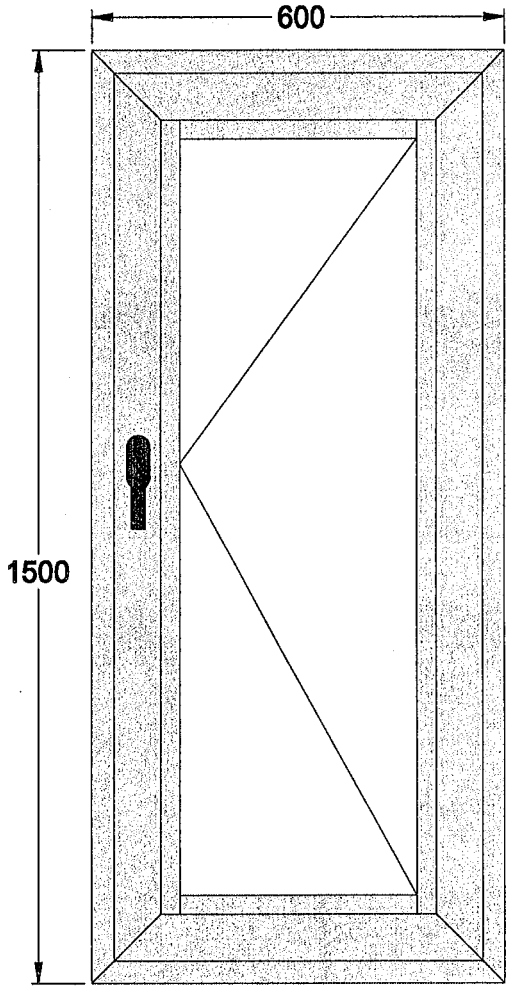
## 10 REVISION LOG

| Revision Number | Revision Date | Description |
|---|---|---|

## APPENDIX A – DRAWINGS AND PRODUCT INFORMATIONS

**Build of Materials**

| A/A | Code | Description | Material |
|---|---|---|---|
| 1 | **450-108** | Frame profile fgjdgkfm,f,m | 15m |
| 2 | **450-232** | Casement profile | 10m |
| 3 | **450-302** | Transom profile | 4m |
| 4 | **540-771** | Bead profile | 21m |
| 5 | **EA450-153** | Extra crimping corner for casement | 8pcs |
| 6 | **EA450-186** | Crimping corner for frame | 8pcs |
| 7 | **EA450-361** | Crimping corner for frame | 8pcs |
| 8 | **EA450-362** | Crimping corner for casement | 8pcs |
| 9 | **EA410-216** | Alignment corner | 8pcs |
| 10 | **EA450-141L/R** | Transom connector | 8pcs |
| 11 | **EA450-875** | Vulcanized epdm corner for central gasket | 12pcs |
| 12 | **EA450-874M** | Vulcanized epdm corner for sash gasket | 8pcs |
| 13 | **EA410-874B** | Vulcanized epdm corner for frame gasket | 12pcs |
| 14 | **US530-3PRM** | Glazing gasket | 9m |
| 15 | **EA570-448M** | External epdm glazing gasket | 9m |
| 16 | **EA410-408M** | Epdm gasket for sash & frame with weatherstrips foam | 17m |
| 17 | **EA450-411M** | Epdm central gasket | 9m |
| 18 | **UO110-01SI** | Handle for tilt & turn mechanism Siegenia | 1pcs |
| 19 | **Siegenia** | Tilt & turn mechanism CAMERA EUROPEA | - |
| 20 | **EA450-388M** | Insulation Bars Neocoat EPS (λ=0,03 W/m x K) | 4.2m |
| 21 | **EA450-389M** | Insulation Bars Neocoat EPS (λ=0,03 W/m x K) | 4.2m |
| 22 | **E2900-585M** | Foam Insulation 35x10mm (λ=0,038 W/m x K) | 4.2m |
| 23 | **E2900-585M** | Foam Insulation 19x5mm (λ=0,038 W/m x K) | 4.2m |

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ACCESSORIES

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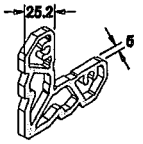
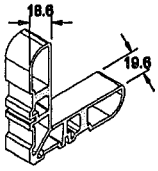
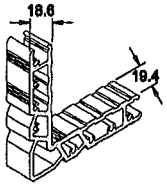
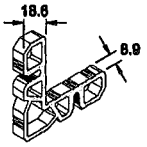
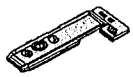
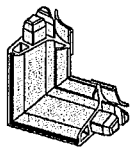
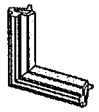
|  | **Code:**<br>**EA450-153U** | **Description** CRIMPING CORNER 5 x 25.2mm WITHOUT SCREWS |
|  | **Code:**<br>**EA450-186U** | **Description** CORNER JOINT 19.6 x 18.6 mm |
|  | **Code:**<br>**EA450-361U** | **Description** CRIMPING CORNER 19.4 x 18.6 mm (SIEGENIA) |
|  | **Code:**<br>**EA450-362U** | **Description** CRIMPING CORNER 8.9 x 18.6 mm |
|  | **Code:**<br>**EA410-216I/U** | **Description** ALIGMENT CORNER 16mm |
|  | **Code:**<br>**EA450-141L/R** | **Description** MULLION CONNECTOR LEFT/ RIGHT |
|  | **Code:**<br>**EA450-875M** | **Description** VULCANIZED EPDM CORNER FOR CENTRAL GASKET EA450-411M |
|  | **Code:**<br>**EA410-874B** | **Description** VULCANIZED EPDM CORNER FOR FRAME GASKET EA410-408M |

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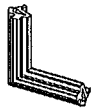
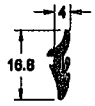
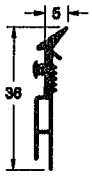
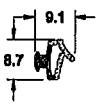
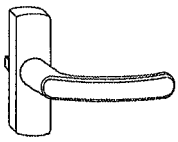
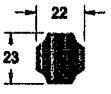
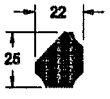
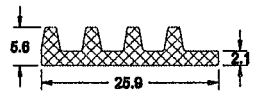
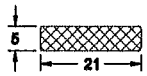
| | | |
|---|---|---|
|  | **Code:** **EA410-874M** | **Description** VULCANIZED EPDM CORNER FOR SASH GASKET EA410-408M |
|   | **Code:** **US530-4PRM** (4mm) | **Description** GLAZING GASKET |
|   | **Code:** **EA450-411M** | **Description** EPDM CENTRAL GASKET |
|   | **Code:** **EA570-448M** | **Description** EPDM GLAZING GASKET |
|   | **Code:** **EA410-408M** | **Description** EPDM GASKET FOR SASH & FRAME WITH WEATHERSTRIPS FOAM |
|  | **Code:** **U0110-01SI** | **Description** CREMONE BOLT |
|   | **Code:** **EA450-388M** | **Description** Insulation Bars Neocoat EPS (λ=0,03 W/m x K) |
|   | **Code:** **EA450-389M** | **Description** Insulation Bars Neocoat EPS (λ=0,03 W/m x K) |

CONFORME DOSSIER
NV-02951 LB.
COMPLIES TO FILE

ACCESSORIES

| | | |
|---|---|---|
|  | Code:<br>**E2900-585** | Description: FOAM INSULATION 35x10mm (λ=0,038 W/m x K) |

| | | |
|---|---|---|
|  | Code:<br>**E2900-586** | Description: FOAM INSULATION 19x5mm (λ=0,038 W/m x K) |

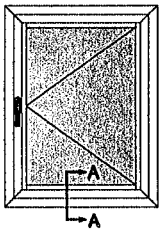
CONFORME DOSSIER

NV-02951 DB.

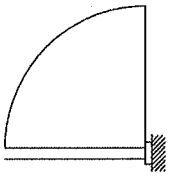
COMPLIES TO FILE

# CASEMENT WINDOW

**ΟΨΗ**
**FRONT VIEW**




**ΚΑΤΟΨΗ**
**TOP VIEW**



CONFORME DOSSIER

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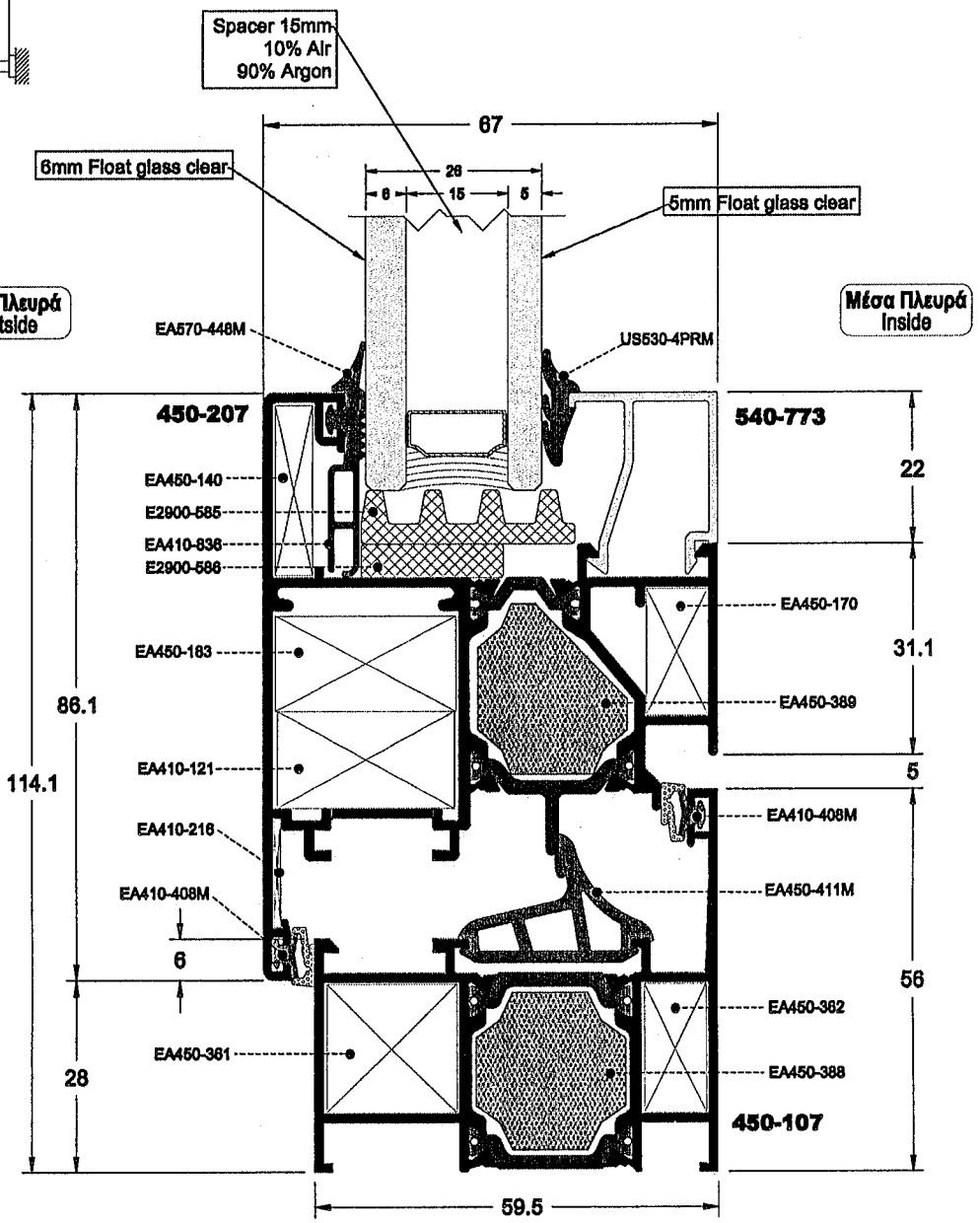
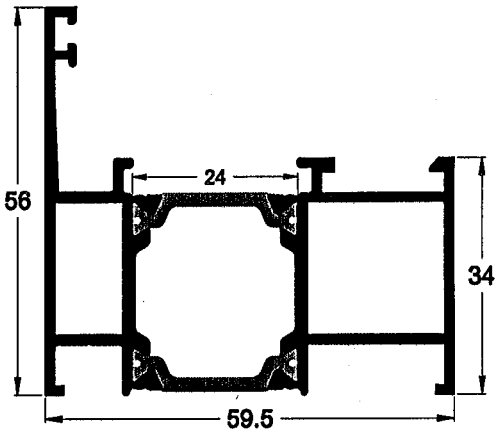
COMPLIES TO FILE



# CASEMENT WINDOW

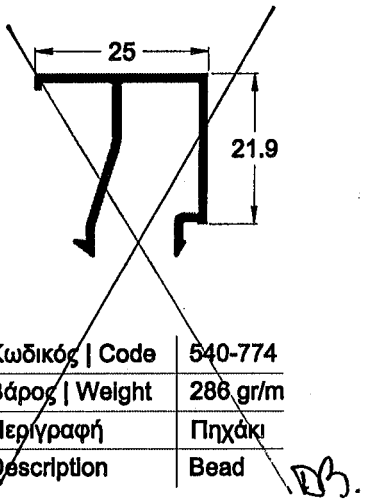



CONFORME DOSSIER

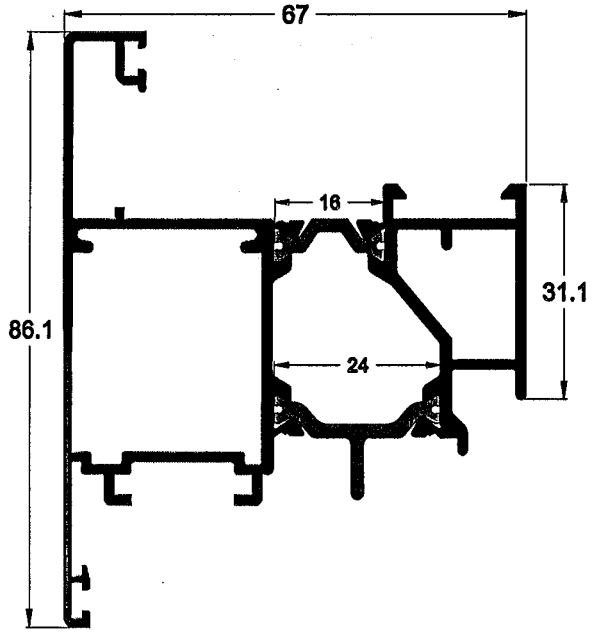
NV-02951

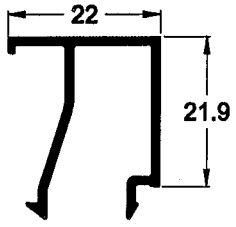
COMPLIES TO FILE

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




| | |
|---|---|
| Κωδικός \| Code | 540-774 |
| Βάρος \| Weight | 286 gr/m |
| Περιγραφή | Πηχάκι |
| Description | Bead |

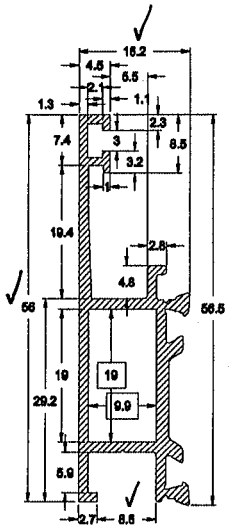



| | |
|---|---|
| Κωδικός \| Code | 450-207 |
| Βάρος \| Weight | 1639 gr/m |
| Περιγραφή | Φύλλο τζαμιού ανοιγόμενο προς τα έξω (Camera Europea) |
| Description | Outwards opening window sash (Camera Europea) |

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

# CASEMENT WINDOW

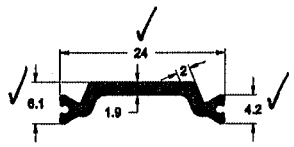


| Code | 450-1K7 |
|---|---|
| Weight | 545 gr/m |
| Description | Frame |

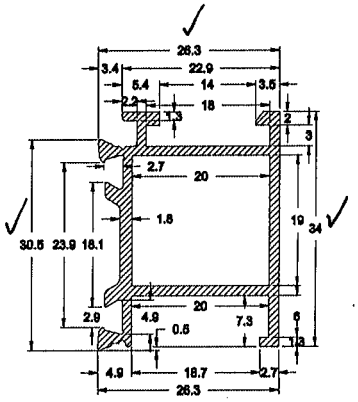
CONFORME DOSSIER

NV-02951 DB.

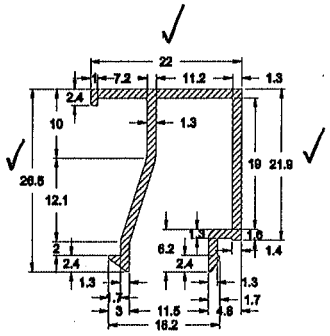
COMPLIES TO FILE



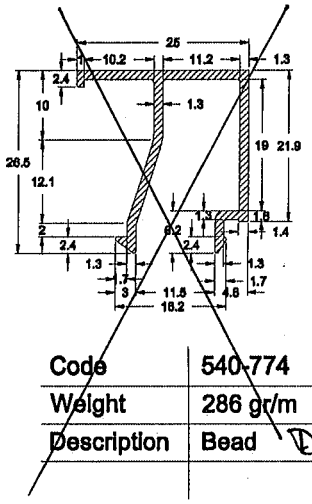
| Code | 3120-024 |
|---|---|
| Weight | 70 gr/m |
| Description | Polyamide |



| Code | 450-1B1 |
|---|---|
| Weight | 512 gr/m |
| Description | Frame |

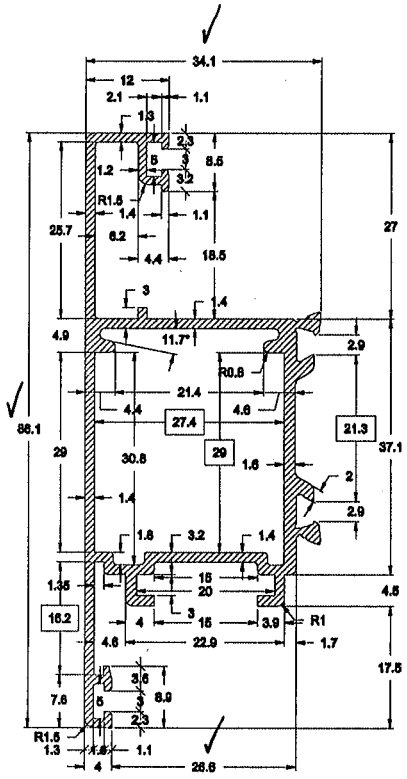


| Code | 540-773 |
|---|---|
| Weight | 275 gr/m |
| Description | Bead |

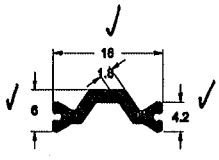


| Code | 540-774 |
|---|---|
| Weight | 286 gr/m |
| Description | Bead |

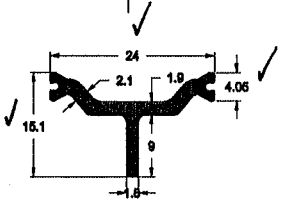
DB.



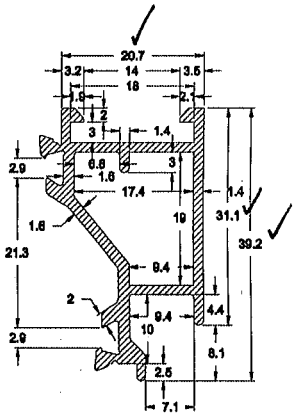
| Code | 450-2K7 |
|---|---|
| Weight | 987 gr/m |
| Description | Sash |



| Code | 3120-016 |
|---|---|
| Weight | 46 gr/m |
| Description | Polyamide |



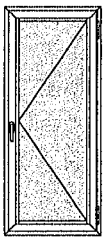
| Code | 3120-904 |
|---|---|
| Weight | 102 gr/m |
| Description | Polyamide |



| Code | 450-2B7 |
|---|---|
| Weight | 504 gr/m |
| Description | Sash |

## Turn only single sash

**CAMERA EUROPEA**



Accessories for frame

Accessories for sash

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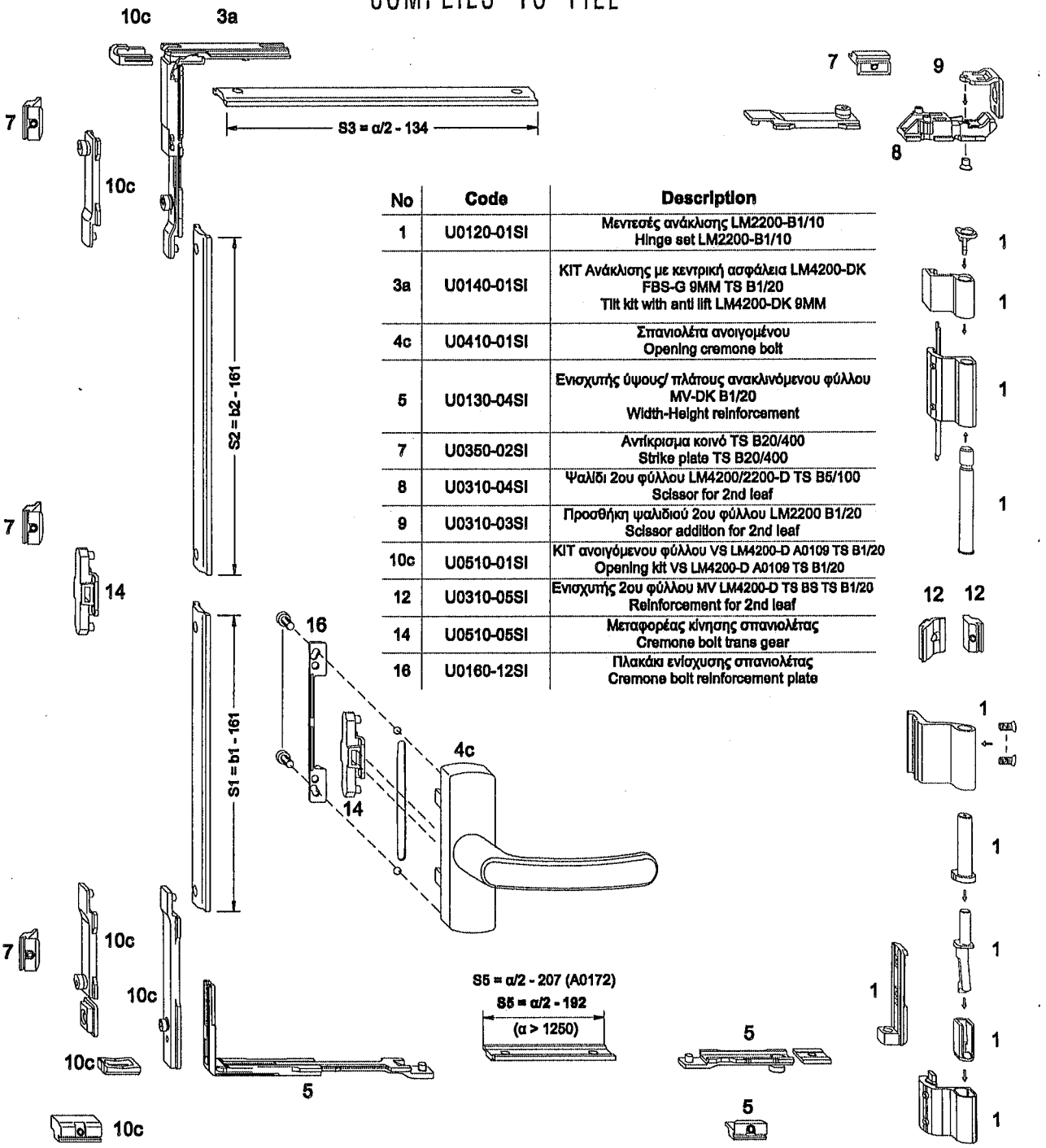
NV - 02951 DB.

COMPLIES TO FILE




| No | Code | Description |
|---|---|---|
| 1 | U0120-01SI | Μεντεσές ανάκλισης LM2200-B1/10<br>Hinge set LM2200-B1/10 |
| 3a | U0140-01SI | KIT Ανάκλισης με κεντρική ασφάλεια LM4200-DK FBS-G 9MM TS B1/20<br>Tilt kit with anti lift LM4200-DK 9MM |
| 4c | U0410-01SI | Σπανιολέτα ανοιγομένου<br>Opening cremone bolt |
| 5 | U0130-04SI | Ενισχυτής ύψους/ πλάτους ανακλινόμενου φύλλου MV-DK B1/20<br>Width-Height reinforcement |
| 7 | U0350-02SI | Αντίκρισμα κοινό TS B20/400<br>Strike plate TS B20/400 |
| 8 | U0310-04SI | Ψαλίδι 2ου φύλλου LM4200/2200-D TS B5/100<br>Scissor for 2nd leaf |
| 9 | U0310-03SI | Προσθήκη ψαλιδιού 2ου φύλλου LM2200 B1/20<br>Scissor addition for 2nd leaf |
| 10c | U0510-01SI | KIT ανοιγόμενου φύλλου VS LM4200-D A0109 TS B1/20<br>Opening kit VS LM4200-D A0109 TS B1/20 |
| 12 | U0310-05SI | Ενισχυτής 2ου φύλλου MV LM4200-D TS BS TS B1/20<br>Reinforcement for 2nd leaf |
| 14 | U0510-05SI | Μεταφορέας κίνησης σπανιολέτας<br>Cremone bolt trans gear |
| 16 | U0160-12SI | Πλακάκι ενίσχυσης σπανιολέτας<br>Cremone bolt reinforcement plate |

# 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[1] | Equilibrium[2] moisture content | Dry[1] |
| 1 | Melting temperature | EN ISO 11357-3 | °C | min. 250 [3] | min. 250 [3] | min. 250 [3] |
| 2 | Density | EN ISO 1183-1 or -3 | g / cm³ | 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 [4] | 78 +/- 4 [4] | 84 +/- 2 |
| 5 | Impact strength | EN ISO 179-1 | kJ / m² | min. 30 or without break [5] | min. 40 or without break [5] | min. 35 [6] |
| 6 | Tensile strength | EN ISO 527-2 and -4 | N / mm² | min. 80 [7] | min. 50 [7] | min. 110 [8] |
| 7 | Young's modulus | EN ISO 527-2 and -4 | N / mm² | min. 4500 [7] | min. 2000 [7] | min. 6000 [8] |
| 8 | Elongation at break | EN ISO 527-2 and -4 | % | min. 3 [7] | min. 7 [7] | min. 3 [8] |

(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[1] | Equilibrium[2] moisture content |
| 1 | Melting temperature | EN ISO 11357-3 | °C | min. 250 [3] | min. 250 [3] |
| 2 | Density | EN ISO 1183-1 or -3 | g / cm³ | 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 [4] | 67 +/- 4 [4] |
| 5 | Impact strength | EN ISO 179-1 | kJ / m² | min. 20 [5] | min. 30 [5] |
| 6 | Tensile strength | EN ISO 527-2 and -4 | N / mm² | min. 50 [6] | min. 35 [6] |
| 7 | Young's modulus | EN ISO 527-2 and -4 | N / mm² | min. 2900 [5] | min. 1300 [5] |
| 8 | Elongation at break | EN ISO 527-2 and -4 | % | min. 5 [6] | min. 8 [6] |

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

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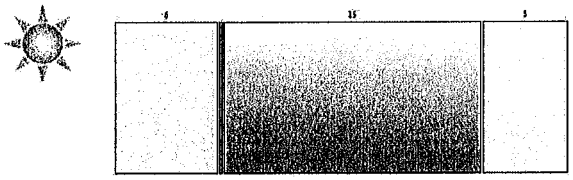
NV - 02951
COMPLIES TO FILE

# GUARDIAN CONFIGURATOR
GLASS PERFORMANCE CALCULATOR

KIWA confirms to have verified the calculation engine of the software Guardian Configurator 4.1 TESTED BY kiwa to be compliant to EN 410 and EN 673.

Product code

69 / 38 / 1,0



total thickness = 26 mm

Glazing from external to internal:

| | Pane 1 | | Pane 2 |
|---|---|---|---|
| 6 mm | Float Glass ExtraClear<br>SunGuard SN 70/37 HT | 5 mm | Float Glass ClearGuardian |

**Spacer 1 - 15 mm**

10% Air
90% Argon

## Results

| Visible light (EN 410 - 2011) | | Solar energy (EN 410 - 2011) | |
|---|---|---|---|
| transmittance [%] | $\tau_v$ = 69,0 | solar factor [%] | g = 38,0 |
| reflectance external [%] | $\rho_v$ = 12,3 | shading coefficient [g/0.87] | sc = 0,44 |
| reflectance internal [%] | $\rho_v$ = 13,1 | direct transmittance [%] | $\tau_e$ = 35,1 |
| general colour rendering index [%] | $R_a$ = 93,5 | direct reflectance external [%] | $\rho_e$ = 35,3 |
| | | direct reflectance internal [%] | $\rho_e$ = 36,8 |
| **Thermal properties (EN 673 - 2011)** | | direct absorption [%] | a = 29,6 |
| U-value [W/(m²K)] | $U_g$ = 1,0 | UV transmittance [%] | $\tau_{uv}$ = 25,1 |
| slope α = 90° | | secondary internal heat transfer factor [%] | $q_i$ = 2,9 |
| | | **Other data** | |
| | | estimated sound reduction index [dB] | $R_w$ = NPD |
| | | (EN 717-1) | $C$ = NPD |
| | | | $C_{tr}$ = NPD |

CONFORME DOSSIER

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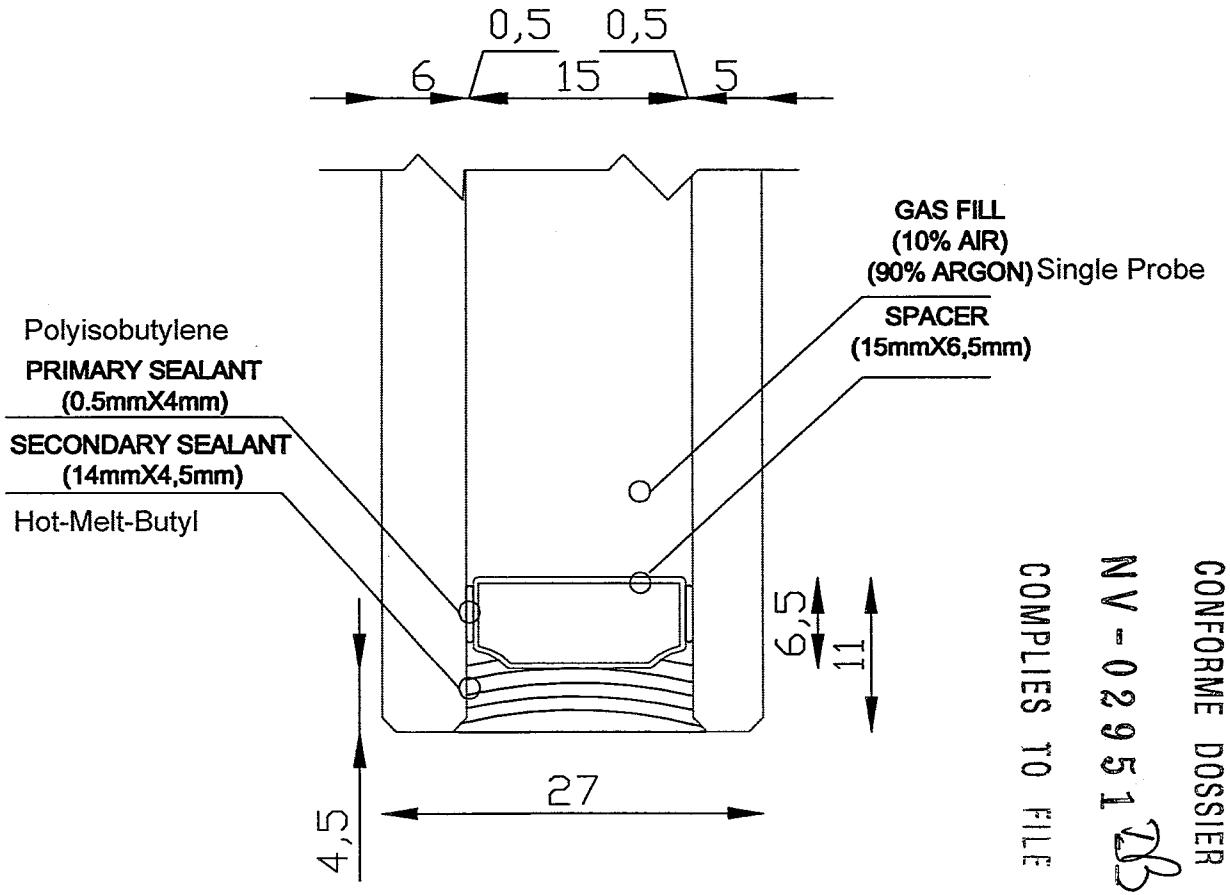
The calculated values are for orientation only and do not offer any guarantee regarding the fabrication of the un- intended end- product. Glass configurations do not amount to a guarantee of product availability.

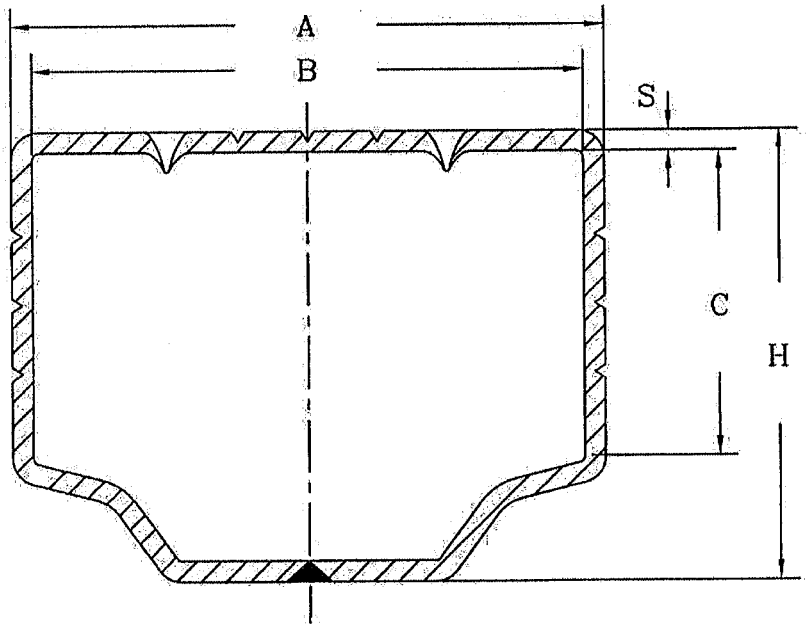
VASILIOU GLASS TECHNOLOGIES
KARAGIANNIS VAGELIS

Date: 16/10/2017
Database version: 20170118
Program version: 4.1.181




CONFORME DOSSIER
NV-02951 B.
COMPLIES TO FILE

# PNAAAHHGSSSN




**Mill finish Aluminum Spacer**

PGS

| RIFERIMENTI | A | H | S | B | C |
|---|---|---|---|---|---|
| TOLLERANZE / SIGLA (Profilo) | + 0.05 - 0.15 | ± 0.10 | + 0.01 - 0.03 | ± 0.20 | + 0.20 - 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 |

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NOTE:

A) Sulla lunghezza si considera una tolleranza di ± 3 mm

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