# PERFORMANCE TESTING IN ACCORDANCE WITH AAMA/WDMA/CSA 101/I.S.2/A440-11 (NAFS 2011) & A440S1-17

**Product Manufacturer:** ALUMINCO S.A.
Inofita, Viotia
Greece
32011

**Report no.:** **AI-04639-A1**

**Product type:** Dual Action Window

**Product series/model:** AL450

| TEST REPORT SUMMARY | |
|---|---|
| **Primary product designator** | **Class CW – PG45 : Size tested 1200 x 1800 mm (~ 47 x 71 in) - Type DAW** |
| **Optional secondary designator** | **Positive Design pressure (DP) = 2160 Pa (~45 psf)**<br>**Negative design pressure (DP) = -2160 Pa (~-45 psf )**<br>**Water penetration resistance test pressure = 400 Pa (~8.25 psf)**<br>**Canadian air infiltration / exfiltration level = A3 Level** |
| ***CAN/CSA A440-00 ratings*** | ***A3 / B4 / C3 / F20*** |
| **Primary product designator** | **Class CW – PG45 : Size tested 1200 x 1800 mm (~ 47 x 71 in) - Type DAW** |
| **Optional secondary designator** | **Positive Design pressure (DP) = 2160 Pa (~45 psf)**<br>**Negative design pressure (DP) = -2160 Pa (~-45 psf )**<br>**Water penetration resistance test pressure = 720 Pa (~15 psf)**<br>**Canadian air infiltration / exfiltration level = A3 Level** |
| ***CAN/CSA A440-00 ratings*:**<br>**Option(s)** | ***A3 / B7 / C3 / F20***<br>**With heel bead** |

*See CLEB laboratory Inc. complete report AI-04639-A1 for test specimen description and detailed test results*

**Test completion date:** 2016-11-28
**Report date:** 2017-03-09
**Revision date:** -
**Number of pages:** 6 pages & 1 appendix

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## 1.0 INTRODUCTION

CLEB Laboratory Inc. was retained by *" **ALUMINCO S.A.** "* to test a fenestration product according to the performance levels in the *AAMA/WDMA/CSA 101/I.S. 2/A440-11 (NAFS 2011) & A440S1-17* Standards. The sample components and manufacturing are documented in section 2.0.

*Note concerning the use of units of measurement in this report:*

*According to the AAMA/WDMA/CSA 101/I.S.2/A440 Standard, the use of SI (metric) units is the standard, while IP (Imperial) values given in parentheses are for reference purposes only, and are inexact rounded values. Section 5.0 contains testing results converted to IP units for the sake of convenience only. The only exception to using Si values is in the Performance Grade (PG) portion of the product designation.*

*Note concerning drawings:*

*The drawings reviewed for the production of this report are stamped and are on file at CLEB Laboratory Inc. The availability of individual drawings will be at the discretion of the client.*

## 2.0 DESCRIPTION OF THE SPECIMEN(S) TESTED

**Model:** AL450

**Product type:** Dual-action window

**Operation mode:** Inswing opening

**Configuration:** A

**Drawings (Appendix):** AI-04639-A1 Dual Action Window (6 Drawings); Bill of Materials

**Drawings (Others):** AL450 Dual Action Window (2 Sheets)

**Date(s) of sample reception:** 2016-10-24

**Date(s) of testing:** 2016-10-24, 2016-11-04, 2016-11-28

*For items marked with *, please refer to Section 3.0, for detailed alterations.*

**Test specimen installation (test buck):**

- Material: Pine (~2" x 8")
- R.O. clearances: None
- Fastening: Sill & Head: (4) # 8 x 2-1/2" screws; at 150 mm (6.00") from each corner and at every 480 mm (19.00"). Jambs: (4) # 8 x 2-1/2" screws; at 150 mm (6.00") from each corner and at 300 mm (12.00").
- Sealing detail: Sealant between test buck and specimen on exterior perimeter only

**Frame:**

- Material: Extruded Aluminum
- Joinery type: Mechanical assembly (Crimped)
- Reinforcement: See drawing(s) Appendix
- Weatherstripping: See drawing(s) Appendix
- Sealant: See drawing(s) Appendix
- Drainage: See drawing(s) Appendix
- Glazing: None
- Frame depth: 130 mm (5.12")
- Overall dimensions: 1200 mm (47.24") W x 1800 mm (70.86") H

**Sash:**

- Material: Extruded Aluminum
- Joinery type: Mechanical assembly (Crimped)
- Reinforcement: See drawing(s) Appendix
- Weatherstripping: See drawing(s) Appendix
- Sealant: See drawing(s) Appendix
- Drainage: See drawing(s) Appendix
- Glazing: Double glazed sealed unit (29.5 mm)
  Glass thickness: 6.0 mm / Air space gap: 17.5 mm
  Type of glass: Annealed and Tempered with LowE

Type of spacer: Plastic
Type of sealant: Dual-sealed
Type of filling gas: Argon
Glass retention: Glazing stop
Glazing seals: Gasket on the exterior face (dry glazing) and gasket on the interior face (dry glazing)
Grid description: None
Setting blocks: (2) blocks at jamb and (2) blocks at sill.
Daylight opening: 985 mm W x 1565 mm H

- Overall dimensions: 1148 mm (45.19") W x 1748 mm (68.81") H

**Hardware (per sash):**
See drawing(s) Appendix

**Screen**:
None

## 3.0 ALTERATION(S)

Alteration(s) performed in the laboratory on tested specimen to meet the reported performances:

**Water Resistance Test (Option)**
Sealant between glass unit and sash member at sill and upward (150 mm) on each side.

## 4.0 TEST BENCH INFORMATION

Test bench identification: TB-AWS-03

The calibration of this test bench was done as per Article 9.0 of *ASTM E283*, *Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors*, and *ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference* and *ASTM E547 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Cycling Static Air Pressure Difference.* The last calibration of this test bench and related equipment was performed in July, 2016.

## 5.0 RESULTS OF PERFORMANCE TESTS

| SPECIFICATIONS | TEST RESULTS |
|---|---|
| **U.S. Air Leakage Resistance Test**<br>R – LC – CW Classifications:<br>$Q_{inf}$ ≤1.5 l/s-m² @ 75 Pa *(~ ≤ 0.3 cfm/ft² @ 1.6 psf)*<br>AW Classification:<br>$Q_{inf}$ ≤0.5 l/s-m² @ 300 Pa *(~ ≤ 0.1 cfm/ft² @ 6.2 psf)*<br>**Canadian air infiltration/exfiltration level**<br>R – LC – CW Classifications:<br>A2: Q ≤ 1.5 l/s-m² @ 75 Pa *(~ ≤ 0.3 cfm/ft² @ 1.6 psf)*<br>A3: Q ≤ 0.5 l/s-m² @ 75 Pa *(~ ≤ 0.1 cfm/ft² @ 1.6 psf)*<br>AW Classification:<br>A2: Q ≤ 0.5 l/s-m² @ 300 Pa *(~ ≤ 0.1 cfm/ft² @ 6.2 psf)*<br>A3: Q ≤ 0.5 l/s-m² @ 300 Pa *(~ ≤ 0.1 cfm/ft² @ 6.2 psf)*<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.2*<br>*A440S1-17 Canadian Supplement par. 5.3*<br>*ASTM-E283-04 (2012)* | **Class CW – U.S. Requirements**<br>**A3 Level –Canadian Requirements**<br>Surface: 2.16 m² *(~23.25 ft²)*<br>$Q_{inf}$ = 0.22 l/s-m² @ 75 Pa *(~0.04 cfm/ft² @ 1.6 psf)*<br>$Q_{exf}$ = 0.23 l/s-m² @ 75 Pa *(~0.04 cfm/ft² @ 1.6 psf)* |
| **Water Resistance Test**<br>No water infiltration under a minimum pressure differential:<br>Class R: 140 Pa *(~ 2.9 psf)*<br>Class LC: 180 Pa *(~ 3.75 psf)*<br>Class CW: 220 Pa *(~ 4.50 psf)*<br>Class AW: 390 Pa *(~ 8.00 psf)*<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.3.*<br>*A440S1-17 Canadian Supplement par. 5.4*<br>*ASTM-E547-00 (2009)*<br>*ASTM-E331-00 (2009)* | **Class CW – U.S. & Canadian Requirements**<br>No water infiltration under the minimum test pressure for the Class.<br>No water infiltration at an optional test pressure differential of:<br>**400 Pa** *(~ 8.25 psf)* - U.S. & Canadian Requirements<br>**Option**<br>**Class CW – U.S. & Canadian Requirements**<br>No water infiltration under the minimum test pressure for the Class.<br>No water infiltration at an optional test pressure differential of:<br>**580 Pa** *(~12.00 psf)* - Canadian and U.S. requirements<br>**720 Pa** *(~15.00 psf)* - Canadian requirements only |
| **Uniform Load Deflection Test**<br>Member deflection at a minimum design pressure (DP) and at optional DP:<br>Class R: 720 Pa (~15 psf) – Reported only<br>Class LC: 1200 Pa (~25 psf) – Reported only<br>*Class* CW: Limited to L/175 at 1440 Pa *(~30 psf)*<br>*Class* AW: Limited to L/175 at 1920 Pa *(~40 psf)*<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.4*<br>*ASTM-E330-02 (2010)* | **DP 45 – Class CW**<br>Net deflection measured on stile:<br>0.63 mm @ –1440 Pa *(~0.02" @ –30 psf)*<br>0.53 mm @ +1440 Pa *(~0.02" @ +30 psf)*<br>1.04 mm @ –2160 Pa *(~0.04" @ –45 psf)*<br>0.87 mm @ +2160 Pa *(~0.03" @ +45 psf)*<br>Allowed ≤ 9.60 mm *(0.37")* |
| **Uniform Load Structural**<br>Permanent deformation is limited at a minimum structural test pressure (STP) and at optional STP of:<br>*Class* R: ≤ 0.4% (L) at 1080 Pa *(~22.5 psf)*<br>*Class* LC: ≤ 0.4% (L) at 1800 Pa *(~37.5 psf)*<br>*Class* CW: ≤ 0.3% (L) at 2160 Pa *(~45 psf)*<br>*Class* AW: ≤ 0.2% (L) at 2880 Pa *(~60 psf)*<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.4*<br>*ASTM-E330-02 (2010)* | **STP 45 – Class CW**<br>Permanent deformation measured on stile:<br>0.02 mm @ –2160 Pa *(~0.00" @ –45.00 psf)*<br>0.03 mm @ +2160 Pa *(~0.00" @ +45.00 psf)*<br>0.04 mm @ –3240 Pa *(~0.00" @ –67.50 psf)*<br>0.15 mm @ +3240 Pa *(~0.01" @ +67.50 psf)*<br>Allowed ≤ 5.04 mm *(~0.19")* |

| | |
|---|---|
| **Forced-Entry Resistance**<br>All windows shall be tested according to ASTM F588-07 Grade 10.<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.5* | **Passed**<br>**Grade 40**<br>$T_1$=10 min., $L_1$=1334 N *(~300 lbf)*, $L_2$=667 N *(~150 lbf)* & $L_3$=267 N *(~60 lbf)* |
| **Sash/Leaf Concentrated Load Test on Latch Rail**<br>Dual-Action Window - Maximum deflection:<br>Class R: 1.5 mm (0.06") under a perpendicular load of 135 N *(~30 lbf)* and 1.5 mm (0.06") under a parallel load of 135 N *(~30 lbf)*.<br>Class LC: 1.5 mm (0.06") under a perpendicular load of 135 N *(~30 lbf)* and 2.3 mm (0.09") under a parallel load of 180 N *(~40 lbf)*.<br>Class CW: 1.5 mm (0.06") under a perpendicular load of 135 N *(~30 lbf)* and 3.3 mm (0.13") under a parallel load of 230 N *(~50 lbf)*.<br>Class AW: 1.5 mm (0.06") under a perpendicular load of 270 N *(~60 lbf)* and 6.4 mm (0.25") under a parallel load of 400 N *(~90 lbf)*.<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.6.4.3* | **Passed**<br>**Class CW**<br>Perpendicular deflection under a load 135 N *(~30 lbf):*<br>Allowed = 1.5 mm *(0.06")*<br>Measured = 0.43 mm *(0.02")*<br>Parallel deflection under a load of 230 N *(~50 lbf):*<br>Allowed = 3.3 mm *(0.13")*<br>Measured = 0.61 mm *(0.02")* |
| **Stabilizing Arm Load Test**<br>Vertical concentrated load apply on a complete assembled window for 10 sec shall not damage the frame or the sash or any hardware components :<br>Class R: 445 N *(~100 lbf)* at sash corner and 890 N *(~200 lbf)* at center of top rail.<br>Class LC & CW: 890 N *(~200 lbf)* at sash corner and 1780 N *(~400 lbf)* at center of top rail.<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.6.5.3* | **Passed**<br>**Class CW**<br>After loads removal of 890 N *(~200 lbf)* at sash corner and 1780 N *(~400 lbf)* at center of top rail, the window presents no damage and functions normally. |
| **Welded Corner Test**<br>When loaded to failure, the break shall not extend along the entire weld line.<br>*AAMA/WDMA/CSA 101/I.S.2/A440-11 par. 9.3.6* | **N/A**<br>Not applicable for mechanical assemblies. |
| **Insect Screen Test**<br>Canadian (only)requirements:<br>Insect screens shall be tested in accordance with ASTM E1748-95(09) in the outward direction only under a load of 60 N (13 lbf).<br>*A440S1-17 Canadian Supplement par. 5.1* | **N/A**<br>No screen supplied with the product. |

## 6.0 CONCLUSION

Based on the tests results, the fenestration product described in this report meets the requirements of the *AAMA/WDMA/CSA 101/I.S. 2/A440-11 (NAFS 2011)* & *A440S1-17* Standards regarding performance testing.

Detailed assembly drawings showing wall thickness of all members, corner construction and hardware application are on file and have been compared to the sample submitted.

The above results were secured by using the designated test methods and they indicate compliance with the performance requirements of the referenced specification. The test records from this evaluation will be retained for a minimum of four (4) years from the date of report issuance. This report does not constitute certification of this product, which may only be granted by a certification agency.

*Note on the Limitation of Liability:*
*Due care was taken in performing the testing sequence and in reporting the results related to the test specimen received for evaluation. Through acceptance of this report, the Client agrees to exempt CLEB Laboratory Inc. employees and owners from all liability claims and demands arising from any matter related to or concerning the quality and execution of the performance evaluation contained in this report.*

## 7.0 REVISION LOG

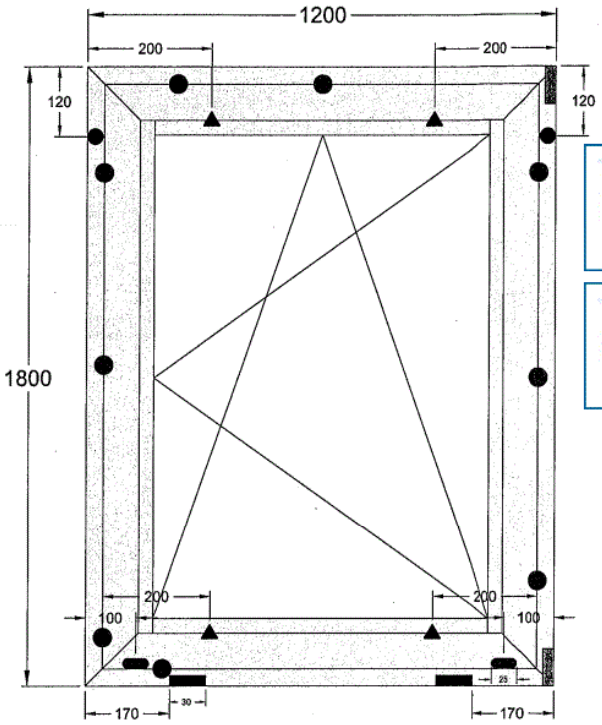
| Rev. # | Date | Page(s) | Revision(s) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# APPENDIX

# DRAWINGS, BILL OF MATERIALS, SEALANT & DRAINAGE DETAILS

# AI-04639-A1

## DUAL-ACTION WINDOW

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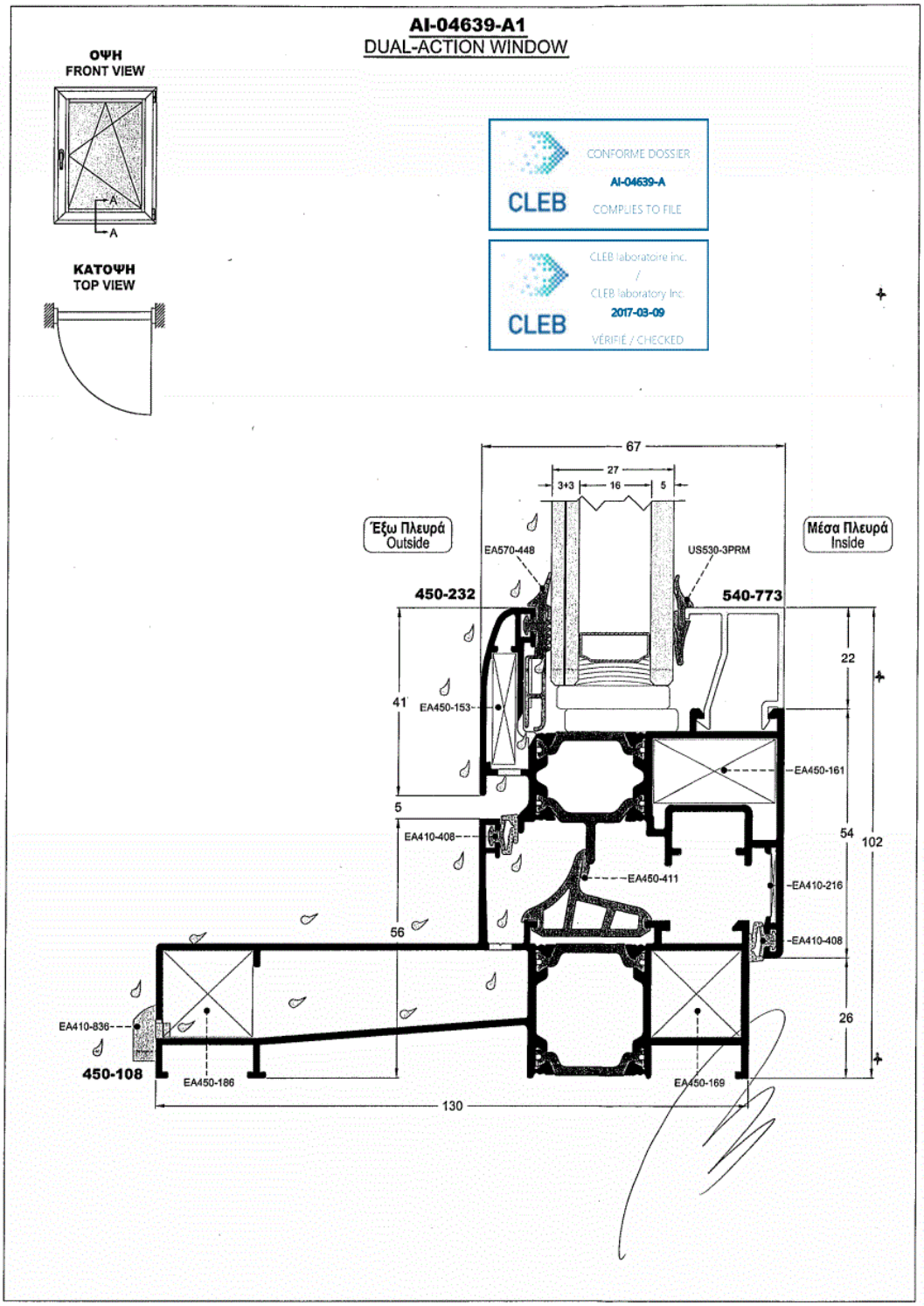
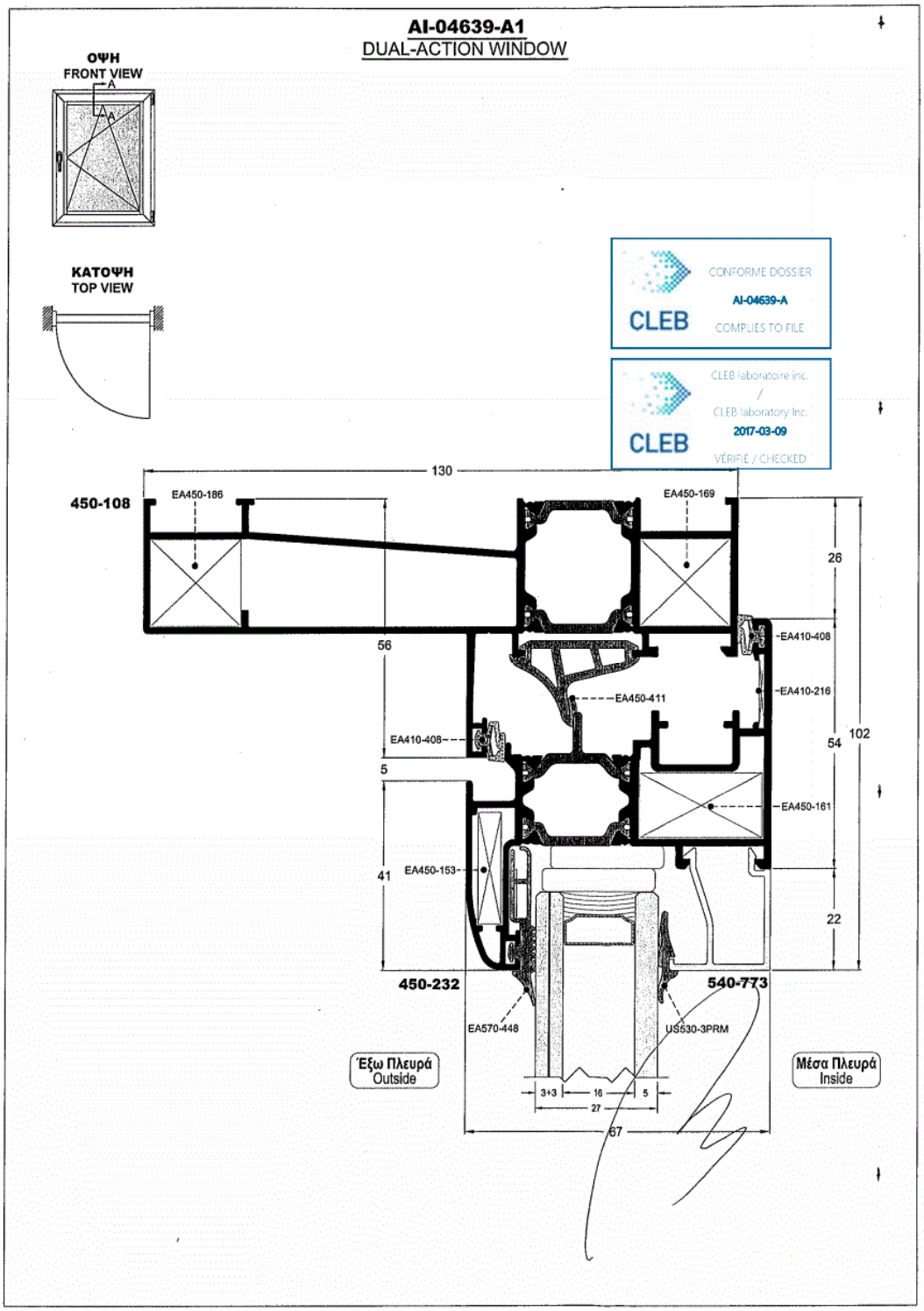
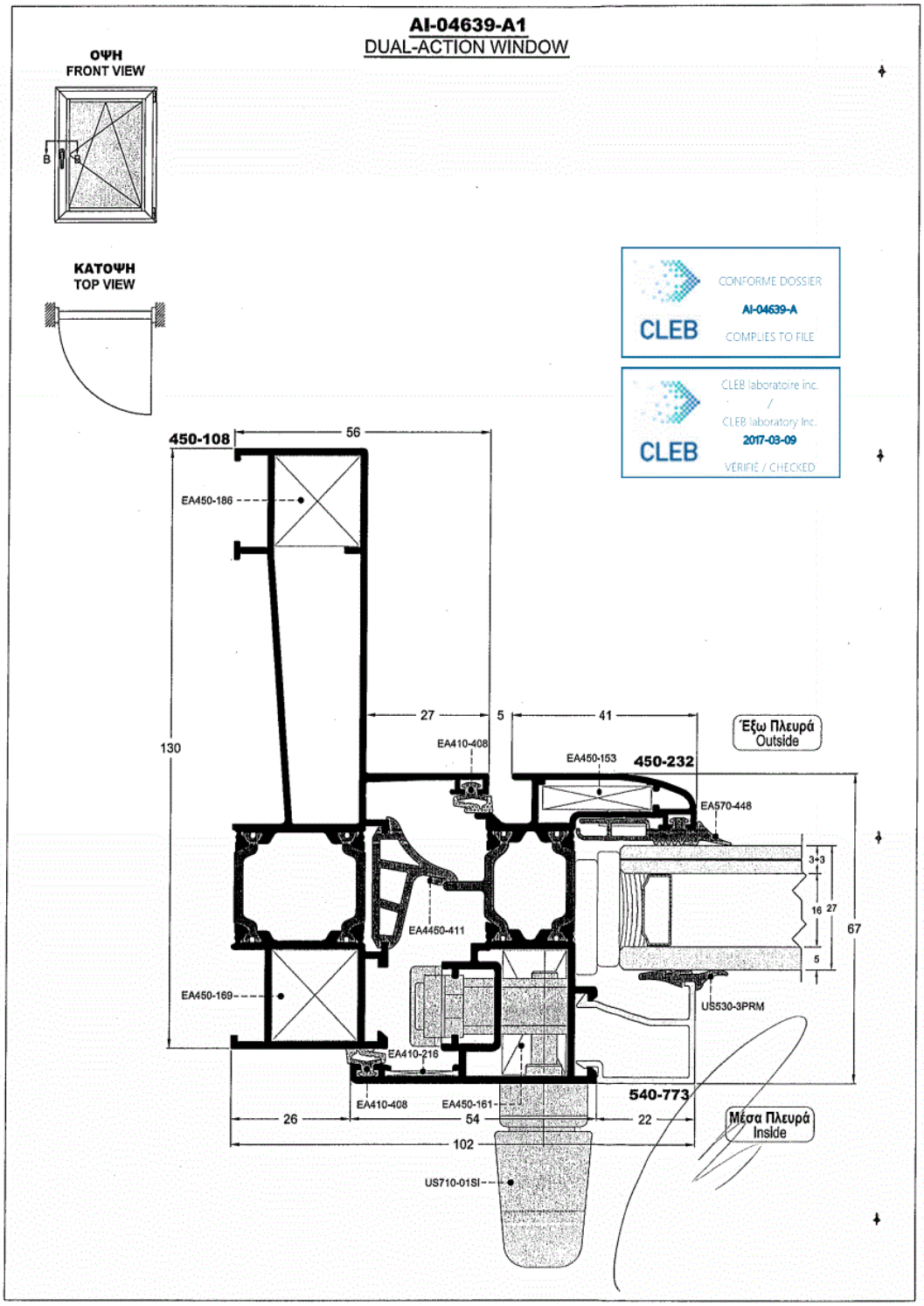
| | |
|---|---|
| ● | 9 LOCKINGS |
| ▮ | 2 HINGES |
| ▲ | 2 CASEMENT DRAINAGE 25mm |
| ▬ | 2 INTERNAL FRAME DRAINAGE 25mm |
| ▬ | 2 EXTERNAL FRAME DRAINAGE 30mm |
| ● | 2 VENT HOLES Ø6mm |

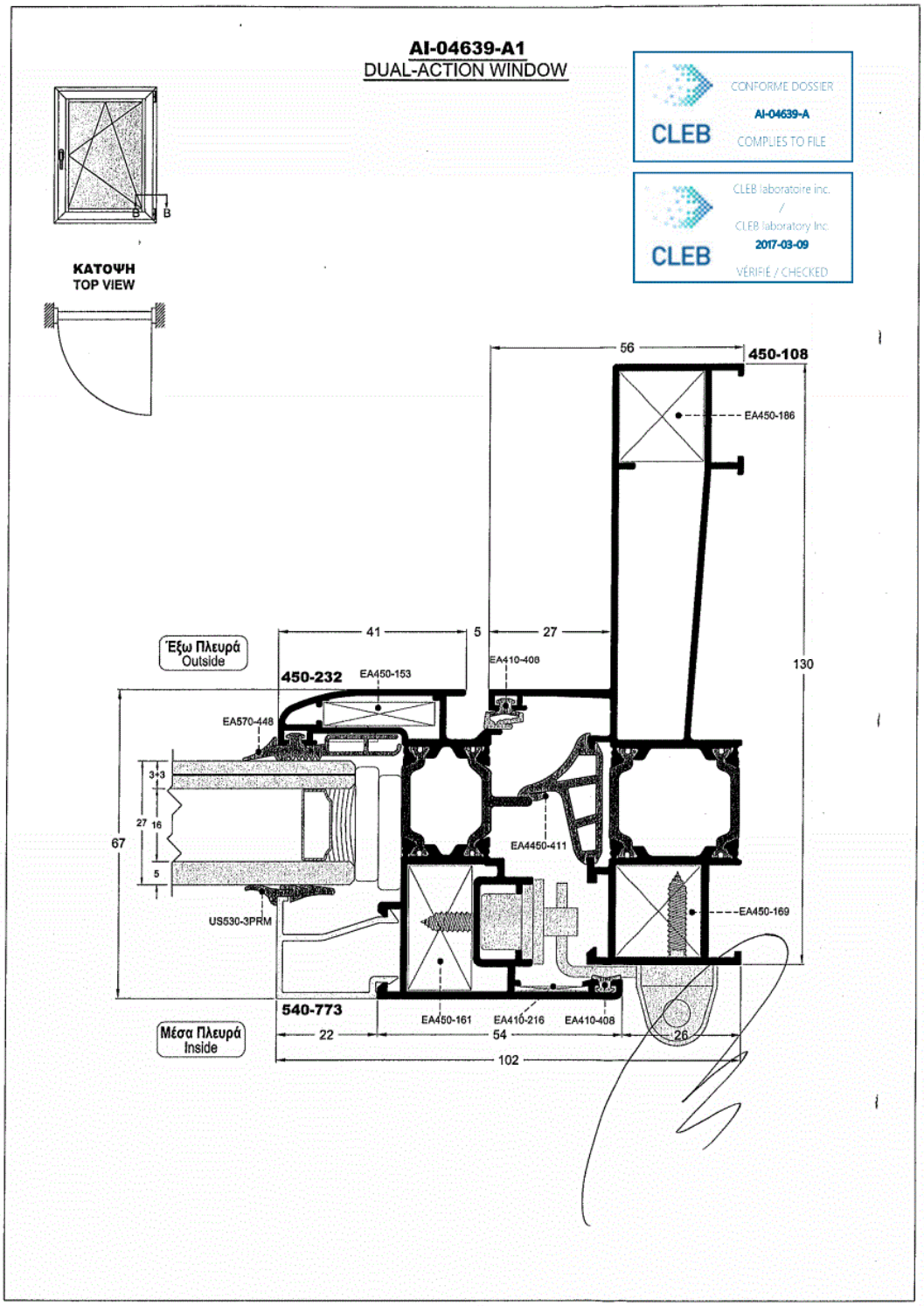
▮ HINGES
● LOCKINGS
▬ EXTERNAL FRAME DRAINAGE
▬ INTERNAL FRAME DRAINAGE
▲ CASEMENT DRAINAGE
● VENT HOLE

*DIMMENSIONS IN mm









**AI-04639-A1**
DUAL-ACTION WINDOW

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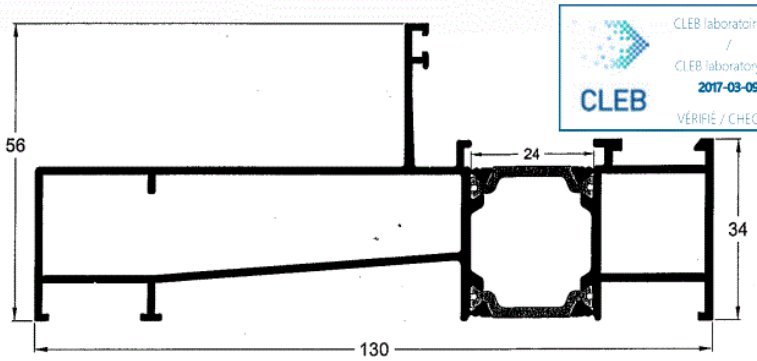
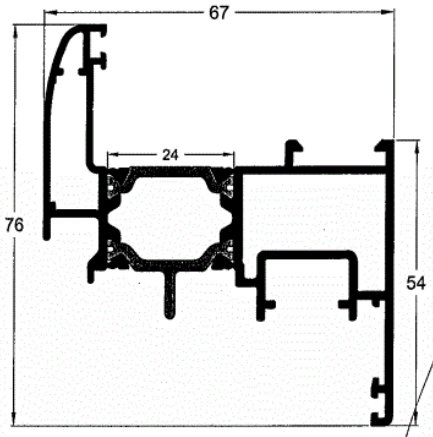
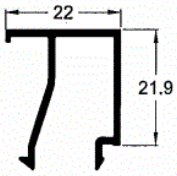



| | |
|---|---|
| Κωδικός \| Code | 450-108 |
| Βάρος \| Weight | 1796 gr/m |
| Περιγραφή | Κάσα |
| Description | Frame |




| | |
|---|---|
| Κωδικός \| Code | 450-232 |
| Βάρος \| Weight | 1414 gr/m |
| Περιγραφή | Φύλλο (ALU 16) |
| Description | Casement (ALU 16) |

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

**Build of materials (BOM):**

| AI-04639-A1 & AI-04639-B1 | | | |
|---|---|---|---|
| A/A | Code | Description | Material |
| 1 | **450-108** | Frame profile | 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 | **EA450-169** | Crimping corner for frame | 8pcs |
| 8 | **EA450-161** | 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 |
| 9m | **EA450-411M** | Epdm central gasket | 9m |
| 18 | **US710-01IA** | Handle for perimetrical mechanism Siegenia | 2pcs |
| 19 | **Favorit Siegenia** | Perimetric mechanism ALU16 | - |

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