



## Energy Rating Report

Report Number:

SYN-03600-9

|                   |                                 |                |                   |
|-------------------|---------------------------------|----------------|-------------------|
| Window System     | Synseal Evolve VS               |                |                   |
| Window Type       | Vertical Sliding Sash           |                |                   |
| Size & Style      | 1230mm x 1480mm Vertical Slider |                |                   |
| Frame Material    | PVC-U                           |                |                   |
| Outer Frame       | VS-F1                           | Reinforcement  | VS-RSF1 / VS-RAF1 |
| Top Vent          | VS-V1                           | Reinforcement  | VS-RSV1           |
| Bottom Vent       | VS-V2                           | Reinforcement  | VS-RSV2           |
| Outer Frame Sill  | VS-S154                         | Sash Stop      | VS-SS1            |
| Glazing Bead      | VS-JB24                         | Bead Gasket    | Co-ex PVC-P       |
| Meeting Bead      | VS-SB24                         | Glazing Gasket | Co-ex PVC-P       |
| Interlock         | VS-IN1                          | Weather Seal   | WS-A-WP01         |
| Deep Rail         | N/a                             | Weather Gasket | WS01              |
| Glazing Unit      | 24mm                            | Arrangement    | 4/16/4            |
| Outer Pane        | Diamant                         | Low-e Coating  | N/a               |
| Cavity            | Argon 90%                       |                |                   |
| Inner Pane        | Planitherm Total+               | Low-e Coating  | 0.05              |
| Spacer Bar        | Edgetech TruPlas                |                |                   |
| Primary Sealant   | Polyisobutylene (PIB)           |                |                   |
| Secondary Sealant | Polysulfide (PS)                | Sealant Depth  | 3mm               |

## RESULTS

|                                                     |      |                            |
|-----------------------------------------------------|------|----------------------------|
| Frame U-value ( $U_{\text{window}}$ ):              | 1.4  | (W/(m <sup>2</sup> ·K))    |
| Solar Energy Transmittance ( $g_{\text{window}}$ ): | 0.50 |                            |
| Effective Air Leakage ( $L_{\text{factor}}$ ):      | 0.02 | (W/(m <sup>2</sup> ·K))    |
| Energy Index:                                       | 12   | (kWh/m <sup>2</sup> /year) |
| BFRC Energy Rating Band:                            | A+   |                            |

Prepared by: Ben Foulds  
R&D Technician  
Synseal Extrusions Ltd

Signed:



Date: 02 October 2014

BFRC Certified Simulator 104

Report in Accordance with BFRC Guidelines and Regulations  
Simulations in accordance with BS EN ISO 10077-2:2012, performed with Therm 5.2.14

## Summary of Frame and Glazing Results

| Frame Results: | Frame Thermal Transmittance ( $U_f$ ) | Linear Thermal Transmittance ( $\Psi$ ) |
|----------------|---------------------------------------|-----------------------------------------|
| Top Rail:      | 1.3 W/(m <sup>2</sup> ·K)             | 0.032 W/(m·K)                           |
| Top Jamb:      | 1.4 W/(m <sup>2</sup> ·K)             | 0.032 W/(m·K)                           |
| Meeting:       | 2.1 W/(m <sup>2</sup> ·K)             | 0.068 W/(m·K)                           |
| Bottom Jamb:   | 1.5 W/(m <sup>2</sup> ·K)             | 0.033 W/(m·K)                           |
| Bottom Rail:   | 1.5 W/(m <sup>2</sup> ·K)             | 0.032 W/(m·K)                           |

| Glazing Results:                            |                       |                               |                |
|---------------------------------------------|-----------------------|-------------------------------|----------------|
| $U_{\text{glass}}$ (W/(m <sup>2</sup> ·K)): | 1.2                   | Solar Factor ( $g_{\perp}$ ): | 0.74           |
| Source:                                     | BS EN 673 Spreadsheet | Source:                       | SGG Calumen II |

| Air Permeability at 50Pa: |                          |                |        |
|---------------------------|--------------------------|----------------|--------|
| Test Authority:           | Build Check Ltd          | Report Number: | W10220 |
| Test Date:                | 3 <sup>rd</sup> Aug 2010 | Result:        | 0.26   |

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

*Simulations in accordance with BS EN ISO 10077-2:2012. Simulation Program: LBNL Software Therm 5.2.14.*

Report for: Synseal Extrusions Ltd

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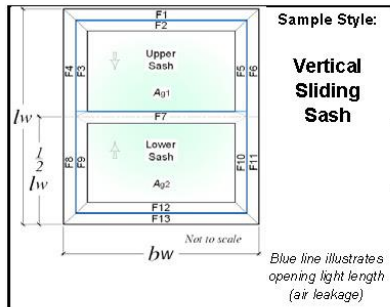
Ref: SYN-03600-9

Report Layout Issue 130722

Prepared By: Synseal Extrusions Ltd, Common Rd, Huthwaite, Sutton in Ashfield, Nottingham. NG17 6AD

Tel: 01623 443200 Fax: 01623 550243 www.synseal.com

## BFRC Spreadsheet



Frame offset: No

Nominal 4mm etc to 0DP, others 1DP

### Glazing dimensions and properties:

|                                      |             |                       |
|--------------------------------------|-------------|-----------------------|
| Thickness of pane 1, $d_{p1}$        | 4.0         | mm                    |
| Glazing fill thickness 1/2, $d_{g1}$ | 16.0        | mm                    |
| Gas fill (1/2)                       | Argon 90%   |                       |
| Thickness of pane 2, $d_{p2}$        | 4.0         | mm                    |
| Complete next 3 cells for TG IGU     |             |                       |
| Glazing fill thickness 2/2, $d_{g2}$ |             | mm                    |
| Gas fill (2/3)                       |             |                       |
| Thickness of pane 3, $d_{p3}$        |             | mm                    |
| Glazing Trans. - 3DP                 | $U_g$ 1.195 | W/(m <sup>2</sup> ·K) |
| g-value - 2DP                        | $g$ 0.74    |                       |

Thermal transmittance of window from hot box test

 $U_w$  - 2DP W/(m<sup>2</sup>·K)

| Window Dimensions:            |           | Area, A  |                |
|-------------------------------|-----------|----------|----------------|
| Section                       | Length, l | Width, b | No gasket      |
|                               | m         | m        | m <sup>2</sup> |
| Upper glazing                 | 0.6035    | 1.0200   | 0.6156         |
| Lower glazing                 | 0.6075    | 1.0200   | 0.6197         |
| Total of glazing              |           | 1.2352   | 1.2352         |
| Frame                         | m         | m        | m <sup>2</sup> |
| F1                            | 1.2300    | 0.0540   | 0.0635         |
| F2                            | 1.1220    | 0.0510   | 0.0546         |
| F3                            | 0.6860    | 0.0510   | 0.0329         |
| F4                            | 0.7400    | 0.0540   | 0.0385         |
| F5                            | 0.6860    | 0.0510   | 0.0329         |
| F6                            | 0.7400    | 0.0540   | 0.0385         |
| F7                            | 1.1220    | 0.0630   | 0.0675         |
| F8                            | 0.7400    | 0.0540   | 0.0383         |
| F9                            | 0.6800    | 0.0510   | 0.0328         |
| F10                           | 0.6800    | 0.0510   | 0.0328         |
| F11                           | 0.7400    | 0.0540   | 0.0383         |
| F12                           | 1.1220    | 0.0410   | 0.0439         |
| F13                           | 1.2300    | 0.0600   | 0.0706         |
| Total Frame                   |           | 0.5852   | 0.5852         |
| Total Window, $A_w$           |           | 1.8204   | 1.8204         |
| Percentage upper glass area   |           | 33.82%   | 33.82%         |
| Percentage lower glass area   |           | 34.04%   | 34.04%         |
| Percentage glass area (total) |           | 67.85%   | 67.85%         |

|                        |                                      |        |
|------------------------|--------------------------------------|--------|
| Solar Factor, g-value: | glazing area $A_g$ (m <sup>2</sup> ) | 1.3546 |
|                        | $F_w$                                | 0.9    |
|                        | $g_w$                                | 0.50   |

|              |                            |      |
|--------------|----------------------------|------|
| $U_{window}$ | No bars, or attached bars  | 1.40 |
|              | Single cross bar in IGU    | 1.5  |
|              | Multiple cross bar in IGU  | 1.6  |
|              | Glazing bar (Georgian bar) | 1.8  |

| BFRC Rating | Label index | EWER Rating Scale | Window Rating |
|-------------|-------------|-------------------|---------------|
| ≥10         | 12          | A+                | A+            |
| 0 to <10    |             | A                 |               |
| <10 to <0   |             | B                 |               |
| <20 to <-10 |             | C                 |               |
| <30 to <-20 |             | D                 |               |
| <50 to <-30 |             | E                 |               |
| <70 to <-50 |             | F                 |               |

Report Number: SYN-03600-9  
Report Date: 02/10/2015  
Report Issue No. 15.1 (11/03/13)

Project Details: EvolveVS 4/16/4, Diamant / Argon 90% / Planitherm Total+ / Edgetech TruPlas (PS), full reinforcement

**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 place to enter

| Parameter               | Symbol | Units |
|-------------------------|--------|-------|
| Total window height 0DP | $l_w$  | mm    |
| Total window width 0DP  | $b_w$  | mm    |

| Frame dimensions (All frame values to 0dp, gaskets to 1DP) |         | Frame height, b <sub>f</sub> (mm) |          | Gasket protrusion (mm) | With gasket (mm) | Total |
|------------------------------------------------------------|---------|-----------------------------------|----------|------------------------|------------------|-------|
|                                                            |         | Internal                          | External |                        |                  |       |
| F1 fixed top rail                                          |         | 54                                | 69       | n/a                    | 54.0             | 105.0 |
| F2 moving top rail                                         |         | 51                                | 36       | 0.0                    | 51.0             |       |
| F3 top (LH) jamb (moving sash)                             |         | 51                                | 36       | 0.0                    | 51.0             |       |
| F4 top (LH) jamb (fixed frame)                             |         | 54                                | 69       | n/a                    | 54.0             | 105.0 |
| F5 top (RH) jamb (moving sash)                             |         | 51                                | 36       | 0.0                    | 51.0             | 105.0 |
| F6 top (RH) jamb (fixed frame)                             |         | 54                                | 69       | n/a                    | 54.0             |       |
| F7 mid rail                                                | (upper) | 63                                |          | 0.0                    | 63.0             |       |
|                                                            | (lower) |                                   |          | 0.0                    |                  |       |
| F8 bottom (LH) jamb (fixed frame)                          |         | 54                                | 69       | n/a                    | 54.0             | 105.0 |
| F9 bottom (LH) jamb (moving sash)                          |         | 51                                | 36       | 0.0                    | 51.0             |       |
| F10 bottom (RH) jamb (moving sash)                         |         | 51                                | 36       | 0.0                    | 51.0             |       |
| F11 bottom (RH) jamb (fixed frame)                         |         | 54                                | 69       | n/a                    | 54.0             | 105.0 |
| F12 bottom moving rail                                     |         | 41                                |          | 0.0                    | 41.0             | 101.0 |
| F13 bottom fixed rail                                      |         | 60                                |          | n/a                    | 60.0             |       |
| Total gasket area                                          |         |                                   |          | 0                      | m <sup>2</sup>   |       |

| Where a $U_w$ value from hot box testing is available, no $L_{f,20}$ or $L_{w,20}$ values need to be entered |         |            |         |            |         |
|--------------------------------------------------------------------------------------------------------------|---------|------------|---------|------------|---------|
| All L values to 4DP. All b values to 0DP                                                                     |         |            |         |            |         |
| Frame conductance:                                                                                           |         | $L_{f,20}$ |         | $L_{w,20}$ |         |
| Section                                                                                                      | W/(m·K) | $b_p$ (mm) | W/(m·K) | $b_g$ (mm) | W/(m·K) |
| F1+F2 top rail                                                                                               | 0.3548  | 190        | 0.3920  | 190        | 0.4019  |
| F3+F4 top (LH) jamb                                                                                          | 0.3645  | 190        | 0.4019  | 190        | 0.4019  |
| F5+F6 top (RH) jamb                                                                                          | 0.3645  | 190        | 0.4019  | 190        | 0.4019  |
| F7 mid rail                                                                                                  | 0.5738  | 380        | 0.6522  | 380        | 0.6522  |
| F8+F9 bottom (LH) jamb                                                                                       | 0.3806  | 190        | 0.4181  | 190        | 0.4181  |
| F10+F11 bottom (RH) jamb                                                                                     | 0.3806  | 190        | 0.4181  | 190        | 0.4181  |
| F12+F13 bottom rail                                                                                          | 0.3710  | 190        | 0.4081  | 190        | 0.4081  |

| Frame:                 | Frame width, $b_f$ | Frame $U_f$ value, $U_f$ | Frame area, $A_f$ | Frame heat flow, HU | Linear trans, $\psi$ | Linear length, $l_g$ | Junction heat flow, $H_{jp}$ |
|------------------------|--------------------|--------------------------|-------------------|---------------------|----------------------|----------------------|------------------------------|
| Section                | m                  | W/(m <sup>2</sup> ·K)    | m <sup>2</sup>    | W/K                 | W/(m·K)              | m                    | W/K                          |
| F1+F2 top rail         | 0.1050             | 1.2644                   | 0.1181            | 0.1494              | 0.0322               | 1.0200               | 0.0328                       |
| F3+F4 top left jamb    | 0.1050             | 1.3568                   | 0.0714            | 0.0969              | 0.0324               | 0.6035               | 0.0195                       |
| F5+F6 top right jamb   | 0.1050             | 1.3568                   | 0.0714            | 0.0969              | 0.0324               | 0.6035               | 0.0195                       |
| F7 mid rail            | 0.0630             | 2.0592                   | 0.0675            | 0.1389              | 0.0684               | 1.0200               | 0.0697                       |
| F8+F9 btm left jamb    | 0.1050             | 1.5101                   | 0.0712            | 0.1075              | 0.0325               | 0.6075               | 0.0197                       |
| F10+F11 btm right jamb | 0.1050             | 1.5101                   | 0.0712            | 0.1075              | 0.0325               | 0.6075               | 0.0197                       |
| F12+F13 bottom rail    | 0.1010             | 1.4749                   | 0.1145            | 0.1688              | 0.0321               | 1.0200               | 0.0327                       |
| Totals                 |                    | 0.5852                   | 0.8658            |                     |                      | Total                | 0.2139                       |

|                                                                                    |        |                                     |                                                        |
|------------------------------------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------|
| Air Leakage loss:                                                                  |        |                                     |                                                        |
| Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP | 0.26   | m <sup>3</sup> /(m·h)               |                                                        |
| Opening light length, $l_{opening}$                                                | 6.3700 | m                                   | Total air leakage 1.656 m <sup>3</sup> /h              |
| $L_{20}$                                                                           | 0.91   | m <sup>3</sup> /(m <sup>2</sup> ·h) | Heat loss = 0.0165 $L_{20}$ 0.02 W/(m <sup>2</sup> ·K) |

|                                                                  |                                       |                                      |  |
|------------------------------------------------------------------|---------------------------------------|--------------------------------------|--|
| Other parameters needed for calculation, taken from simulations: |                                       |                                      |  |
| $\lambda_p = 0.035$ W/(m·K)                                      | $R_{se} = 0.04$ m <sup>2</sup> ·K/W   | $d_p = d_g = 0.024$ m                |  |
| $R_p = 0.6857$ m <sup>2</sup> ·K/W                               | $R_{bt} = 0.8557$ m <sup>2</sup> ·K/W | $R_{se} = 0.13$ m <sup>2</sup> ·K/W  |  |
|                                                                  |                                       | $U_p = 1.1686$ W/(m <sup>2</sup> ·K) |  |

|                  |                                                                |       |
|------------------|----------------------------------------------------------------|-------|
| BFRC Rating =    | 218.6g window - 68.5 x ( $U_{window}$ + Effective $L_{20}$ ) = | 12.03 |
| Climate zone is: |                                                                | UK    |

|                                                     |              |      |
|-----------------------------------------------------|--------------|------|
| Thermal transmittance, W/(m <sup>2</sup> ·K)        | $U_{window}$ | 1.4  |
| Solar factor                                        | $g_{window}$ | 0.50 |
| Window air leakage heat loss, W/(m <sup>2</sup> ·K) | $L_{factor}$ | 0.02 |

Simulator Name: Ben Foulds


BFRC Certified  
Simulator 104

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

Simulations in accordance with BS EN ISO 10077-2:2012. Simulation Program: LBNL Software Therm 5.2.14.

Report for: Synseal Extrusions Ltd

Ref: SYN-03600-9

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Prepared By: Synseal Extrusions Ltd, Common Rd, Huthwaite, Sutton in Ashfield, Nottingham. NG17 6AD

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## Thermal Conductivity Table

| Materials Used in Synseal Simulations                | Conductivity (W/(m·K)) | Emissivity of Material | Reference / Source             |
|------------------------------------------------------|------------------------|------------------------|--------------------------------|
| Aluminium (Painted/Anodised)                         | 160.00                 | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Aluminium (Unfinished)                               | 160.00                 | 0.3                    | Annex A BS EN ISO 10077-2:2012 |
| Butyl (isobutene) rubber, solid / hot melt           | 0.24                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| EPDM                                                 | 0.25                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Molecular Sieve (desiccant)                          | 0.10                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Polyethylene Foam (glazing tape)                     | 0.05                   | 0.9                    | BS EN ISO 10456                |
| Polyisobutylene (PIB)                                | 0.20                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Polypropylene (PP), solid                            | 0.22                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Polysulfide (PS) (sealant)                           | 0.40                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Polyurethane (PU) (sealant)                          | 0.40                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| PVC-U                                                | 0.17                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| PVC-P (Thermoplastic Elastomer TPE)                  | 0.14                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Silica Gel (desiccant)                               | 0.13                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Soda Lime Glass                                      | 1.00                   | 0.9                    | Annex A BS EN ISO 10077-2:2012 |
| Stainless Steel (incl. galvanised)                   | 17.00                  | 0.3                    | Annex A BS EN ISO 10077-2:2012 |
| Steel (incl. galvanised)                             | 50.00                  | 0.3                    | Annex A BS EN ISO 10077-2:2012 |
| <b>Additional materials specific to this report:</b> |                        |                        |                                |
|                                                      |                        |                        |                                |
|                                                      |                        |                        |                                |
|                                                      |                        |                        |                                |
|                                                      |                        |                        |                                |
|                                                      |                        |                        |                                |

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## BS EN 673 Spreadsheet

4/16/4: Float / Argon 90% / Planitherm Total+ or K Glass S or ClimaGuard A+

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

|                  |  |   |  |
|------------------|--|---|--|
| Number of spaces |  | 1 |  |
|------------------|--|---|--|

|                     |   |          |  |
|---------------------|---|----------|--|
| Glazing orientation |   | Vertical |  |
| Resistivity panes   | 1 | m·K/W    |  |

|                        |       |           |     |
|------------------------|-------|-----------|-----|
| Outside                |       | Spaces 1  |     |
| P a n e 1              | 90%   | P a n e 2 |     |
| Gas                    |       | Argon     |     |
| Thickness (mm)         | 4.0   | 16        | 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           | $\sum 1/h_s$      |
|                  | $W/(m^2 \cdot K)$ | $(m^2 \cdot K)/W$ |
| 1                | 1.195             | 0.65864           |
| 2                | 1.195             | 0.65864           |

|                 |            |
|-----------------|------------|
| $\lambda_{eff}$ | $\Delta T$ |
| $W/(mK)$        |            |
| 0.0243          | 15         |
| 0.0243          | 15         |

## Additional Notes

- Polysulfide (PS) secondary sealant covers the use of all other sealant types to a worst case result. Therefore this report also covers the use of Polyurethane (PU) and Butyl hot melt sealant types.
- Glazing bead used is to the worst case available for the system tested.
- Steel Reinforcement present in all profiles.

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Simulations in accordance with BS EN ISO 10077-2:2012. Simulation Program: LBNL Software Therm 5.2.14.

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## Glazing g<sub>L</sub> Results

[SGG Calumen II version 1.3.3]

4mm Diamant / 16mm Argon 90% / 4mm Planitherm Total+




Calumen® II 1.3.0  
30 October 2014  
Data base : SGG UK

### Glazing design



|              | First glazing  | Second glazing    |
|--------------|----------------|-------------------|
| Gas          |                | Argon 90% 16.00mm |
| Coating      |                | PLANITHERM TOTAL+ |
| First glass  | DIAMANT 4.00mm | PLANICLEAR 4.00mm |
| Coating      |                |                   |
| Layer        |                |                   |
| Coating      |                |                   |
| Second glass |                |                   |
| Coating      |                |                   |

### Manufacturing sizes

Nominal thickness : **24.0 mm**  
Weight : **20.0 kg/m²**

### Luminous factors (EN410-2011)

Transmittance : **81 %**  
Outdoor reflectance : **12 %**  
Indoor reflectance : **13 %**

### Energy factors (EN410-2011)

Transmittance : **66 %**  
Outdoor reflectance : **21 %**  
Indoor reflectance : **20 %**  
Absorptance A1 : **3 %**  
Absorptance A2 : **10 %**

### Solar factors (EN410-2011)

g : **0.75**  
Shading coefficient : **0.86**

### Thermal transmission (EN673-2011) -- 0° related to vertical position

U<sub>g</sub> : **1.2 W/(m².K)**



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01623 443200

CALUMEN® II is a simulation software to calculate key performance of glass such as light transmission, solar factor or thermal insulation coefficient. Computed values are indicative and subject to change. They can not be used to guarantee performance of the products.

These values are calculated according to EN410-2011 and EN673-2011 standards. Tolerances are defined according to EN 1096-4 or ISO9050 standards. Nevertheless, user must check the feasibility of the associated products, in particular in terms of thickness and colour. Furthermore, it is his responsibility to check that the resulting combination of glazing meets regulatory requirements at national, local or regional level.

Calculation rules and functional output of Calumen II have been validated by TÜV Rheinland Quality Report 11923R-11-33705



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## Glazing Spacer Bar Conductivity Data

July 2015 – Ref: CU15229-2

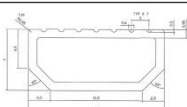
### Datasheet Psi values for windows

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



Edgetech (UK) Ltd Stonebridge House  
Rowley Drive  
Coventry  
CV3 4FG

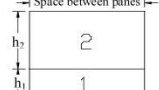
#### Cross section

| Product name                                                     | Dimensions (mm)                                                                                         | Material          | Thickness d (mm) |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------|------------------|
| Superspacer<br>Truplas (only valid for use with hotmelt sealant) |  7.0 high<br>15.5 wide | Mylar Foil<br>GFP | 0.10<br>0.95     |

#### Representative Psi value W/mK

| Representative frame profile                                                                                                                              | Metal with thermal break                                                                    | Plastic                                                                                     | Wood                                                                                        | Wood / Metal                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <br>Double-sheet insulating glass<br>$U_g = 1.1 \text{ W/m}^2\text{K}$ | <br>0.033 | <br>0.031 | <br>0.029 | <br>0.030 |
| <br>Triple-sheet insulating glass<br>$U_g = 1.1 \text{ W/m}^2\text{K}$ | 0.028                                                                                       | 0.031                                                                                       | 0.026                                                                                       | 0.029                                                                                         |

#### Two box model characteristic values

|  | Space between panes (mm) | $\lambda_{eq,2B}$ in W/mK |                    |
|-------------------------------------------------------------------------------------|--------------------------|---------------------------|--------------------|
|                                                                                     |                          | Box 1 · h1 = 3.0mm        | Box 2 · h2 = 7.0mm |
| Can be used for all spacer widths                                                   |                          | 0.24                      | 0.15               |

The equivalent thermal conductivity has been determined in accordance with the IFT guideline WA-17/1 "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<sub>W</sub> 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-08/2 "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 "Compass 'Warm Edge' for Windows" of Bundesverband Flachglas.

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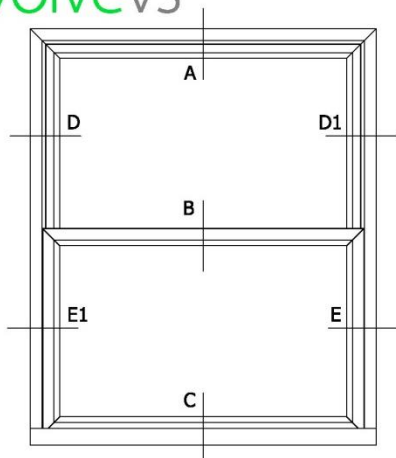
*This document is confidential and remains the property of Build Check Ltd*

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

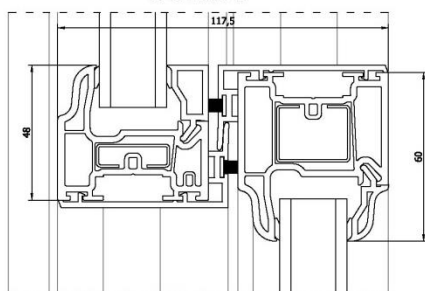
*Simulations in accordance with BS EN ISO 10077-2:2012. Simulation Program: LBNL Software Therm 5.2.14.*

## Profile Drawings

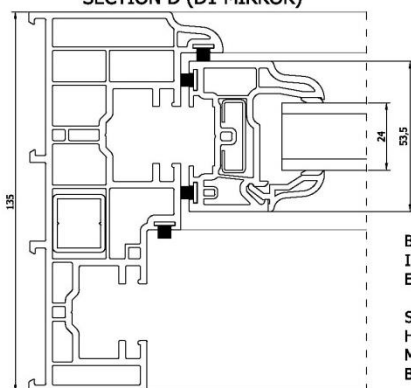
evolve<sup>vs</sup>



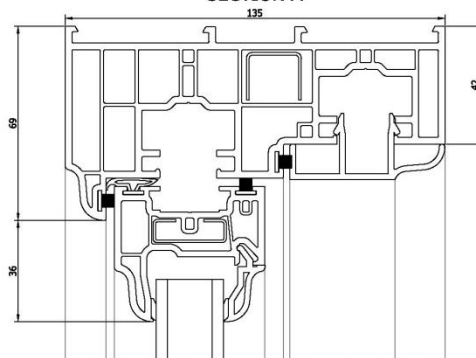
SECTION B



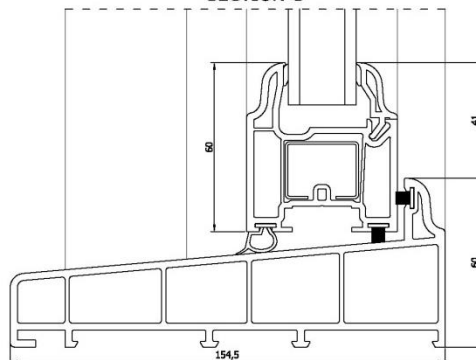
SECTION D (D1 MIRROR)



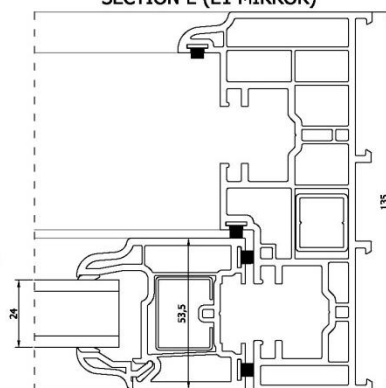
SECTION A



SECTION C



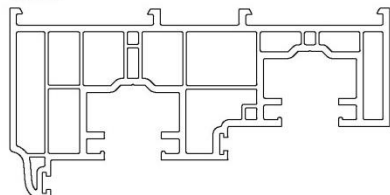
SECTION E (E1 MIRROR)



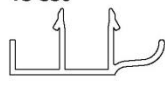
BOUNDARY CONDITIONS:  
INTERNAL (BEADED SIDE) @ 20°C  
EXTERNAL @ 0°C

SURFACE RESISTIVITY FOR  
HORIZONTAL HEAT FLOW  
MODELLED AS DEFINED IN  
BS EN ISO 10077-2:2012 ANNEX B

VS-F1



VS-SS6



VS-IN1



VS-A-WP01



VS-A-WS01



5RA-S07



VS-RSV1



VS-SB24



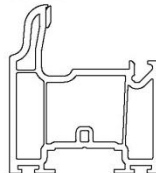
3JB28



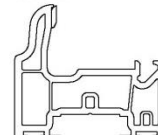
VS-RSV2



VS-V2



VS-V1



VS-S154

