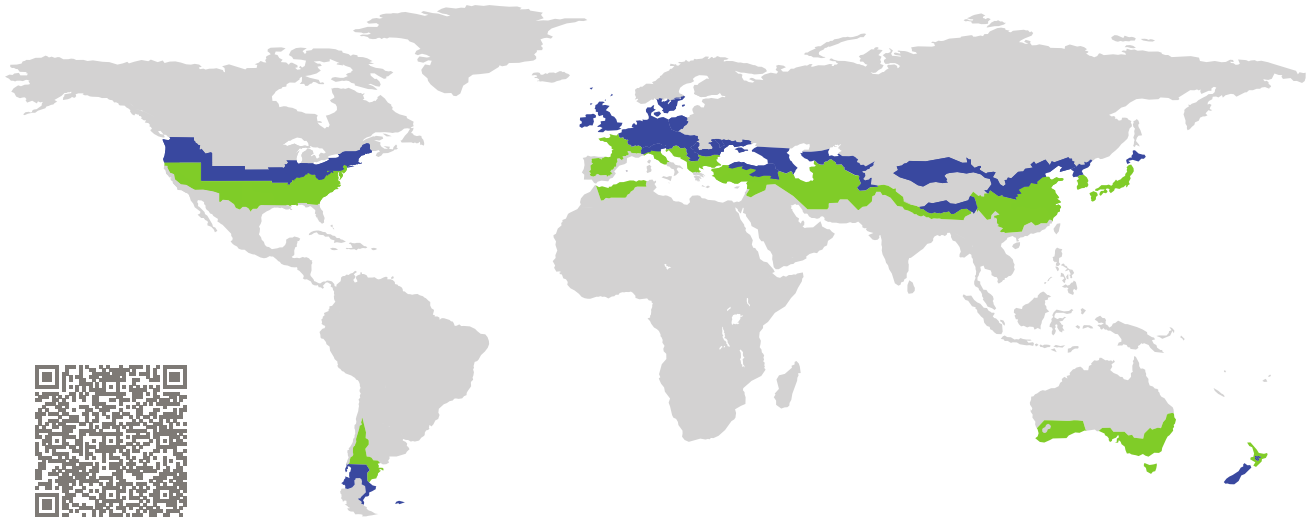


# CERTIFICATE

Certified Passive House Component

Component-ID 2444ws03 valid until 31st December 2025

Passive House Institute  
Dr. Wolfgang Feist  
64283 Darmstadt  
Germany



Category: **Window system**  
Manufacturer: **pro Passivhausfenster GmbH,  
Oberaudorf,  
Germany**  
Product name: **smartwin**

**This certificate was awarded based on the following  
criteria for the cool, temperate climate zone**

Comfort  $U_W = 0.78 \leq 0.80 \text{ W}/(\text{m}^2 \text{ K})$   
 $U_{W, \text{installed}} \leq 0.85 \text{ W}/(\text{m}^2 \text{ K})$   
with  $U_g = 0.70 \text{ W}/(\text{m}^2 \text{ K})$

Hygiene  $f_{Rsi=0.25} \geq 0.70$   
Airtightness  $Q_{100} = 0.11 \leq 0.25 \text{ m}^3/(\text{h m})$



Passive House  
efficiency class

phE

phD

phC

phB

phA

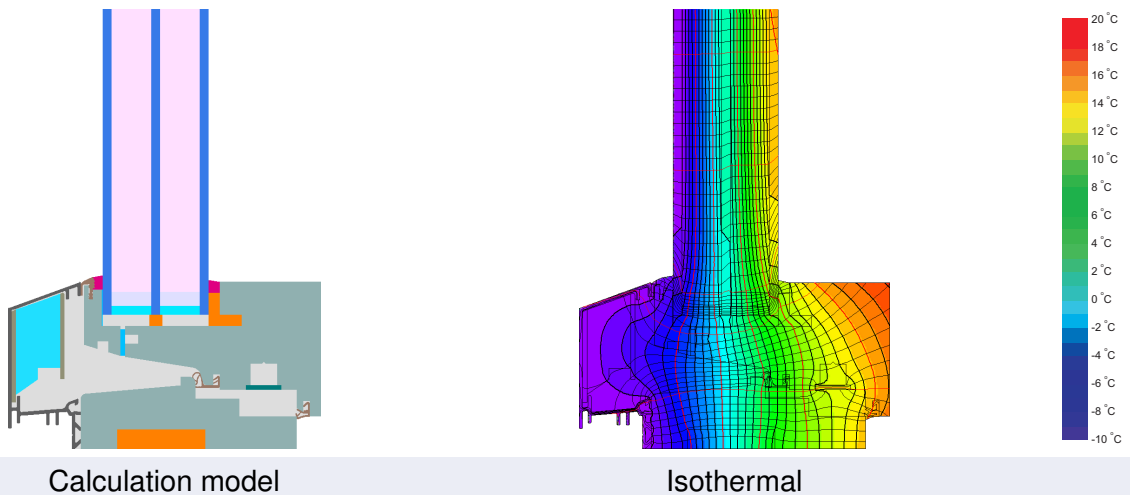
[www.passivehouse.com](http://www.passivehouse.com)

cool, temperate climate



**CERTIFIED  
COMPONENT**

Passive House Institute



## Description

Aluminum clad timber frame (Spruce/Fir, 0.11 W/(mK)), insulated by low density wood fibre board (0.05 & 0.04 W/(mK)) & PU insulation (0.03 W/(mK)) Pane thickness: 48 mm (4/18/4/18/4), rebate depth: 15 mm. Spacer: SWISSPACER Ultimate with polyurethane as secondary seal.

## Explanation

The window U-values were calculated for the test window size of 2.46 m × 1.48 m with  $U_g = 0.70 \text{ W/(m}^2 \text{ K)}$ . If a higher quality glazing is used, the window U-values will improve as follows:

|         |         |      |      |      |      |                      |
|---------|---------|------|------|------|------|----------------------|
| Glazing | $U_g =$ | 0.70 | 0.64 | 0.58 | 0.52 | W/(m <sup>2</sup> K) |
|         |         | ↓    | ↓    | ↓    | ↓    |                      |
| Window  | $U_w =$ | 0.78 | 0.73 | 0.68 | 0.63 | W/(m <sup>2</sup> K) |

Transparent building components are classified into efficiency classes depending on the heat losses through the opaque part. The frame U-Values, frame widths, thermal bridges at the glazing edge, and the glazing edge lengths are included in these heat losses. A more detailed report of the calculations performed in the context of certification is available from the manufacturer.

The Passive House Institute has defined international component criteria for seven climate zones. In principle, components which have been certified for climate zones with higher requirements may also be used in climates with less stringent requirements. In a particular climate zone it may make sense to use a component of a higher thermal quality which has been certified for a climate zone with more stringent requirements.

Further information relating to certification can be found on [www.passivehouse.com](http://www.passivehouse.com) and [passipedia.org](http://passipedia.org).

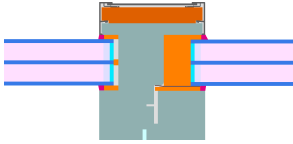
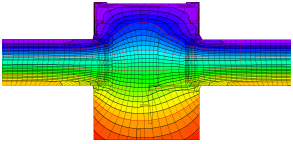
| Frame values                |       |                                                                                     | Frame width<br>$b_f$<br>mm | U-value frame<br>$U_f$<br>W/(m <sup>2</sup> K) | $\Psi$ -glazing edge<br>$\Psi_g$<br>W/(m K) | Temp. Factor<br>$f_{Rsi=0.25}$<br>[-] |
|-----------------------------|-------|-------------------------------------------------------------------------------------|----------------------------|------------------------------------------------|---------------------------------------------|---------------------------------------|
| Mullion fixed               | (0M1) |    | 110                        | 0.66                                           | 0.023                                       | 0.73                                  |
| Mullion fixed               | (0M2) |    | 110                        | 0.78                                           | 0.022                                       | 0.71                                  |
| Transom fixed               | (0T1) |    | 110                        | 0.80                                           | 0.023                                       | 0.71                                  |
| Transom fixed               | (0T2) |    | 110                        | 0.79                                           | 0.022                                       | 0.71                                  |
| Mullion 1 casement          | (1M1) |    | 110                        | 0.77                                           | 0.023                                       | 0.81                                  |
| Mullion 1 casement          | (1M2) |    | 110                        | 0.92                                           | 0.022                                       | 0.70                                  |
| Mullion 1 casement          | (1M3) |    | 89                         | 0.79                                           | 0.023                                       | 0.72                                  |
| Mullion 1 casement          | (1M4) |    | 89                         | 0.92                                           | 0.022                                       | 0.71                                  |
| Transom 1 casement          | (1T1) |    | 110                        | 0.94                                           | 0.022                                       | 0.70                                  |
| Transom 1 casement          | (1T2) |    | 110                        | 0.94                                           | 0.022                                       | 0.70                                  |
| Mullion 2 casements         | (2M1) |    | 142                        | 0.75                                           | 0.022                                       | 0.82                                  |
| Mullion 2 casements         | (2M2) |  | 142                        | 0.92                                           | 0.022                                       | 0.71                                  |
| Transom 2 casements         | (2T1) |  | 142                        | 0.91                                           | 0.022                                       | 0.71                                  |
| Transom 2 casements         | (2T2) |  | 142                        | 0.93                                           | 0.022                                       | 0.71                                  |
| Corner                      | (CO1) |  | 160                        | 0.25                                           | 0.022                                       | 0.73                                  |
| Door side                   | (DS1) |  | 146                        | 0.72                                           | 0.022                                       | 0.72                                  |
| Bottom fixed                | (FB1) |  | 76                         | 0.72                                           | 0.022                                       | 0.81                                  |
| Top fixed                   | (FH1) |  | 71                         | 0.57                                           | 0.023                                       | 0.73                                  |
| Lateral fixed               | (FJ1) |  | 71                         | 0.57                                           | 0.023                                       | 0.73                                  |
| Spacer: SWISSPACER Ultimate |       |                                                                                     |                            | Secondary seal: Polyurethan                    |                                             |                                       |

| Frame values                |       | Frame width<br>$b_f$<br>mm | $U$ -value frame<br>$U_f$<br>W/(m <sup>2</sup> K) | $\Psi$ -glazing edge<br>$\Psi_g$<br>W/(m K) | Temp. Factor<br>$f_{Rsi=0.25}$<br>[-] |
|-----------------------------|-------|----------------------------|---------------------------------------------------|---------------------------------------------|---------------------------------------|
| Flying Mullion              | (FM1) | 110                        | 0.77                                              | 0.022                                       | 0.73                                  |
| Flying Mullion              | (FM2) | 110                        | 0.89                                              | 0.022                                       | 0.72                                  |
| Bottom                      | (OB1) | 76                         | 0.93                                              | 0.022                                       | 0.71                                  |
| Head                        | (OH1) | 71                         | 0.74                                              | 0.022                                       | 0.73                                  |
| Jamb                        | (OJ1) | 71                         | 0.74                                              | 0.022                                       | 0.73                                  |
| Threshold                   | (OT2) | 76                         | 0.96                                              | 0.022                                       | 0.79                                  |
| Spacer: SWISSPACER Ultimate |       |                            | Secondary seal: Polyurethan                       |                                             |                                       |



**Mullion**  
fixed

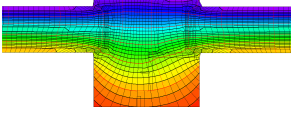
$b_f = 110 \text{ mm}$   
 $U_f = 0.66 \text{ W/(m}^2 \text{ K)}$   
 $\Psi_g = 0.023 \text{ W/(m K)}$   
 $f_{Rsi} = 0.73$



**Mullion**  
fixed

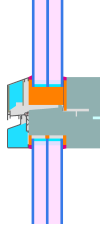
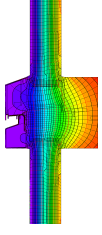
$b_f = 110 \text{ mm}$   
 $U_f = 0.78 \text{ W/(m}^2 \text{ K)}$   
 $\Psi_g = 0.022 \text{ W/(m K)}$   
 $f_{Rsi} = 0.71$



**Transom**  
fixed

$b_f = 110 \text{ mm}$   
 $U_f = 0.80 \text{ W/(m}^2 \text{ K)}$   
 $\Psi_g = 0.023 \text{ W/(m K)}$   
 $f_{Rsi} = 0.71$



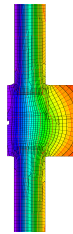
### Transom fixed

$$b_f = 110 \text{ mm}$$

$$U_f = 0.79 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.71$$



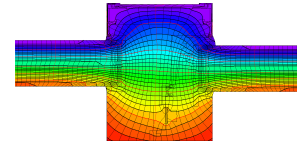
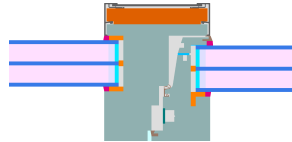
### Mullion 1 casement

$$b_f = 110 \text{ mm}$$

$$U_f = 0.77 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.023 \text{ W/(m K)}$$

$$f_{Rsi} = 0.81$$



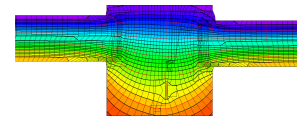
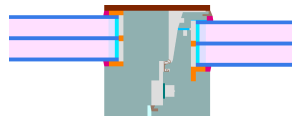
### Mullion 1 casement

$$b_f = 110 \text{ mm}$$

$$U_f = 0.92 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.70$$



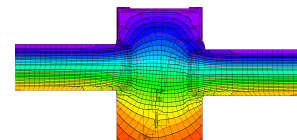
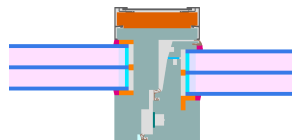
### Mullion 1 casement

$$b_f = 89 \text{ mm}$$

$$U_f = 0.79 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.023 \text{ W/(m K)}$$

$$f_{Rsi} = 0.72$$



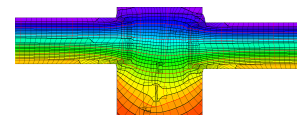
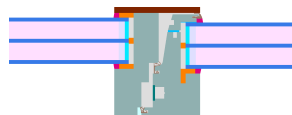
### Mullion 1 casement

$$b_f = 89 \text{ mm}$$

$$U_f = 0.92 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

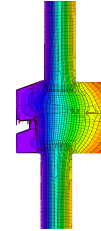
$$f_{Rsi} = 0.71$$





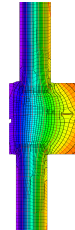
### Transom 1 casement

$$b_f = 110 \text{ mm}$$
$$U_f = 0.94 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.70$$



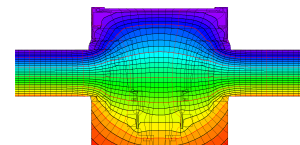
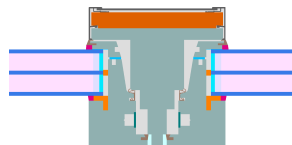
### Transom 1 casement

$$b_f = 110 \text{ mm}$$
$$U_f = 0.94 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.70$$



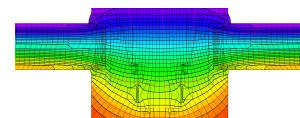
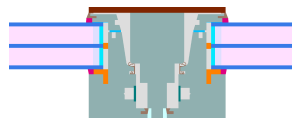
### Mullion 2 casements

$$b_f = 142 \text{ mm}$$
$$U_f = 0.75 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.82$$



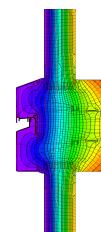
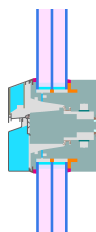
### Mullion 2 casements

$$b_f = 142 \text{ mm}$$
$$U_f = 0.92 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.71$$



### Transom 2 casements

$$b_f = 142 \text{ mm}$$
$$U_f = 0.91 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.71$$





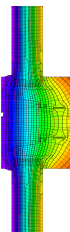
### Transom 2 casements

$$b_f = 142 \text{ mm}$$

$$U_f = 0.93 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.71$$



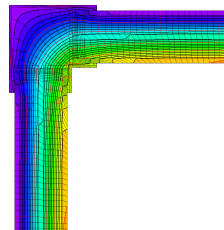
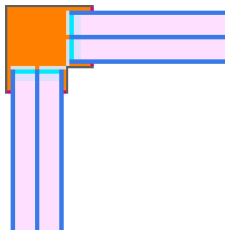
### Corner

$$b_f = 160 \text{ mm}$$

$$U_f = 0.25 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.73$$



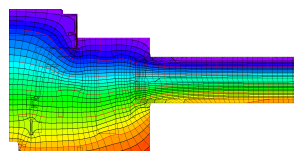
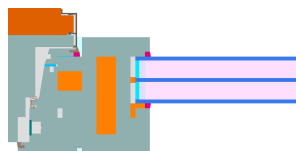
### Door side

$$b_f = 146 \text{ mm}$$

$$U_f = 0.72 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.72$$



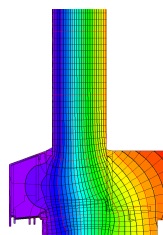
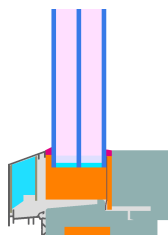
### Bottom fixed

$$b_f = 76 \text{ mm}$$

$$U_f = 0.72 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.81$$



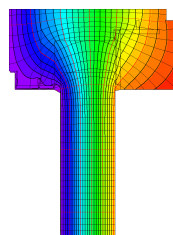
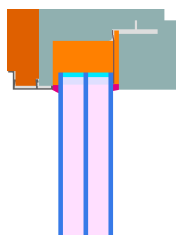
### Top fixed

$$b_f = 71 \text{ mm}$$

$$U_f = 0.57 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.023 \text{ W/(m K)}$$

$$f_{Rsi} = 0.73$$





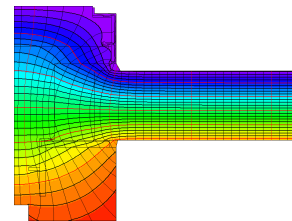
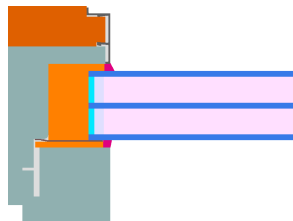
### Lateral fixed

$$b_f = 71 \text{ mm}$$

$$U_f = 0.57 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.023 \text{ W/(m K)}$$

$$f_{Rsi} = 0.73$$



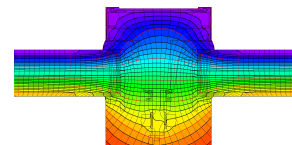
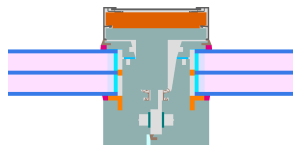
### Flying Mullion

$$b_f = 110 \text{ mm}$$

$$U_f = 0.77 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.73$$



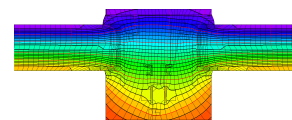
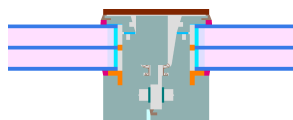
### Flying Mullion

$$b_f = 110 \text{ mm}$$

$$U_f = 0.89 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.72$$



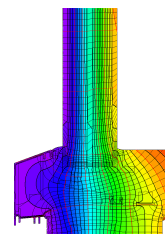
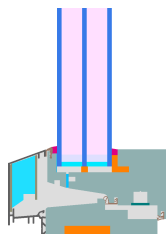
### Bottom

$$b_f = 76 \text{ mm}$$

$$U_f = 0.93 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

$$f_{Rsi} = 0.71$$



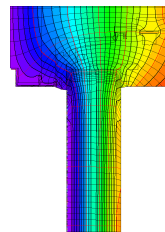
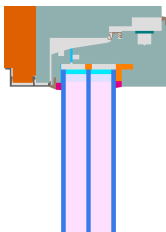
### Head

$$b_f = 71 \text{ mm}$$

$$U_f = 0.74 \text{ W/(m}^2 \text{ K)}$$

$$\Psi_g = 0.022 \text{ W/(m K)}$$

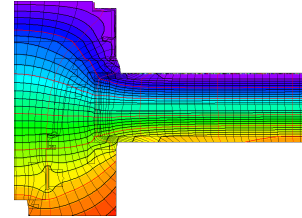
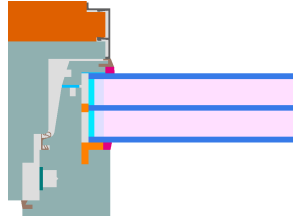
$$f_{Rsi} = 0.73$$





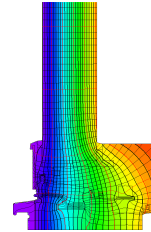
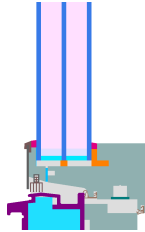
### Jamb

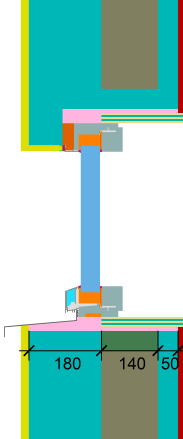
$$b_f = 71 \text{ mm}$$
$$U_f = 0.74 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.73$$

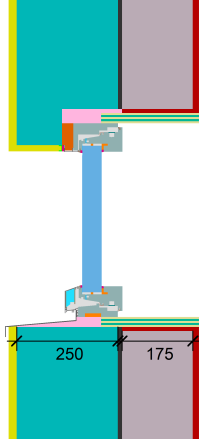


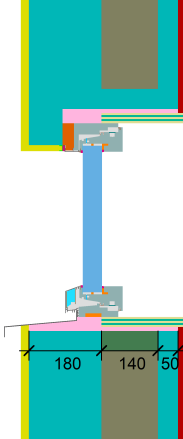
### Threshold

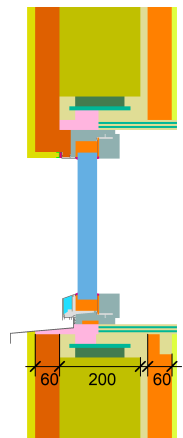
$$b_f = 76 \text{ mm}$$
$$U_f = 0.96 \text{ W/(m}^2 \text{ K)}$$
$$\Psi_g = 0.022 \text{ W/(m K)}$$
$$f_{Rsi} = 0.79$$

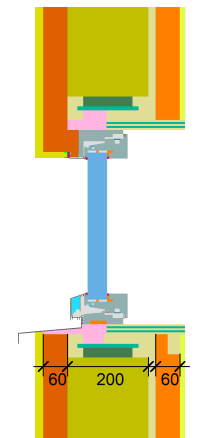


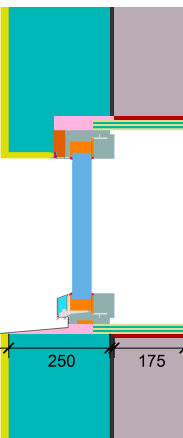
| Formwork blocks (fixed)                                                           |         |
|-----------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.15 \text{ W/(m}^2 \text{ K)}$                                       |         |
|  |         |
| $\Psi_{install}$                                                                  | W/(m K) |
| Top                                                                               | 0.004   |
| Left                                                                              | 0.004   |
| Right                                                                             | 0.004   |
| Bottom                                                                            | 0.019   |
| $U_{W,installed} = 0.80 \text{ W/(m}^2 \text{ K)}$                                |         |

| Exterior insulation and finishing system (EIFS) (operable)                        |         |
|-----------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.13 \text{ W/(m}^2 \text{ K)}$                                       |         |
|  |         |
| $\Psi_{install}$                                                                  | W/(m K) |
| Top                                                                               | 0.004   |
| Left                                                                              | 0.004   |
| Right                                                                             | 0.004   |
| Bottom                                                                            | 0.022   |
| $U_{W,installed} = 0.80 \text{ W/(m}^2 \text{ K)}$                                |         |

| Formwork blocks (operable)                                                          |         |
|-------------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.15 \text{ W/(m}^2 \text{ K)}$                                         |         |
|  |         |
| $\Psi_{install}$                                                                    | W/(m K) |
| Top                                                                                 | 0.005   |
| Left                                                                                | 0.005   |
| Right                                                                               | 0.005   |
| Bottom                                                                              | 0.020   |
| $U_{W,installed} = 0.80 \text{ W/(m}^2 \text{ K)}$                                  |         |

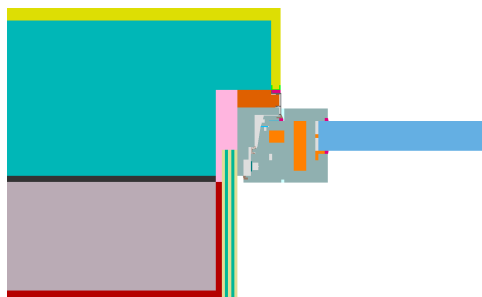
| Lightweight timber (fixed glazed)                                                   |         |
|-------------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.13 \text{ W/(m}^2 \text{ K)}$                                         |         |
|  |         |
| $\Psi_{install}$                                                                    | W/(m K) |
| Top                                                                                 | 0.019   |
| Left                                                                                | 0.016   |
| Right                                                                               | 0.016   |
| Bottom                                                                              | 0.033   |
| $U_{W,installed} = 0.83 \text{ W/(m}^2 \text{ K)}$                                  |         |

| Lightweight timber (operable)                                                       |         |
|-------------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.13 \text{ W/(m}^2 \text{ K)}$                                         |         |
|  |         |
| $\Psi_{install}$                                                                    | W/(m K) |
| Top                                                                                 | 0.019   |
| Left                                                                                | 0.017   |
| Right                                                                               | 0.017   |
| Bottom                                                                              | 0.034   |
| $U_{W,installed} = 0.83 \text{ W/(m}^2 \text{ K)}$                                  |         |

| Exterior insulation and finishing system (EIFS) (fixed glazed)                        |         |
|---------------------------------------------------------------------------------------|---------|
| $U_{Wall} = 0.13 \text{ W/(m}^2 \text{ K)}$                                           |         |
|  |         |
| $\Psi_{install}$                                                                      | W/(m K) |
| Top                                                                                   | 0.004   |
| Left                                                                                  | 0.004   |
| Right                                                                                 | 0.004   |
| Bottom                                                                                | 0.021   |
| $U_{W,installed} = 0.80 \text{ W/(m}^2 \text{ K)}$                                    |         |

# Exterior insulation and finishing system (EIFS) side (operable)

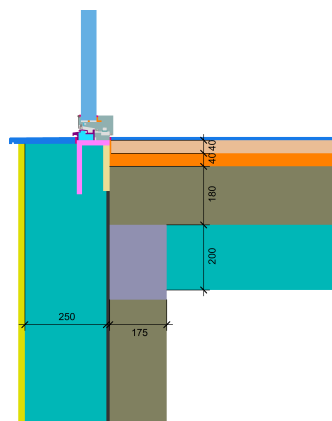
$$U_1 = 0.13 \quad [\text{W}/(\text{m}^2 \text{ K})]$$



$$\Psi_{\text{install}} = 0.006 \text{ W}/(\text{m K})$$

# Threshold balcony door

$$U_1 = 0.13 \quad U_2 = 0.14 \quad [\text{W}/(\text{m}^2 \text{ K})]$$



$$\Psi_{\text{install}} = 0.050 \text{ W}/(\text{m K})$$

