# Report – Certified Passive House Component I Rapport – Composant certifié Maison passive

Passive House Institute

Recommended for | Recommandé pour

Cool, temperate climate | Climat tempéré froid

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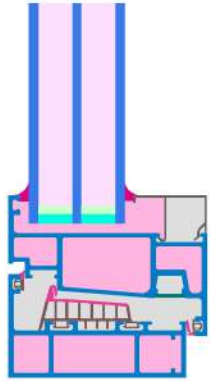
| | |
|---|---|
| Product \| Produit: | **SILEX 95 Series** |
| Client \| Fabricant: | **SILEX Fiberglass Windows & Doors** |
| Spacer \| Intercalaire: | **SuperSpacer Premium** |
| Date \| Date: | **04.05.2026** |
| Author \| Auteur: | **M. Arch. Enis Xhafa** |

**Window frame**
**Châssis de fenêtre**

2597wi03



Because a separate heating system is not necessarily required in Passive Houses, high demands are placed on the quality of the building components used. The colder the climate, the higher the requirements for the components. To cover this, PHI has identified regions of similar requirements, and defined certification criteria. These criteria are available for free download at the website of the Passive House Institute.

If no radiator is placed under the window, its thermal transmittance $U_W$ (U-value) may not exceed a climate-dependent value in order to prevent unpleasant radiation losses and cold down draughts. For a given quality of glazing, this results in restriction of the thermal losses of the window frame and the glass edge. In that context, the installation situation of the window in the wall is relevant. Because of that, a $U_{W,installed}$ exemplary tested for the certification has been defined.

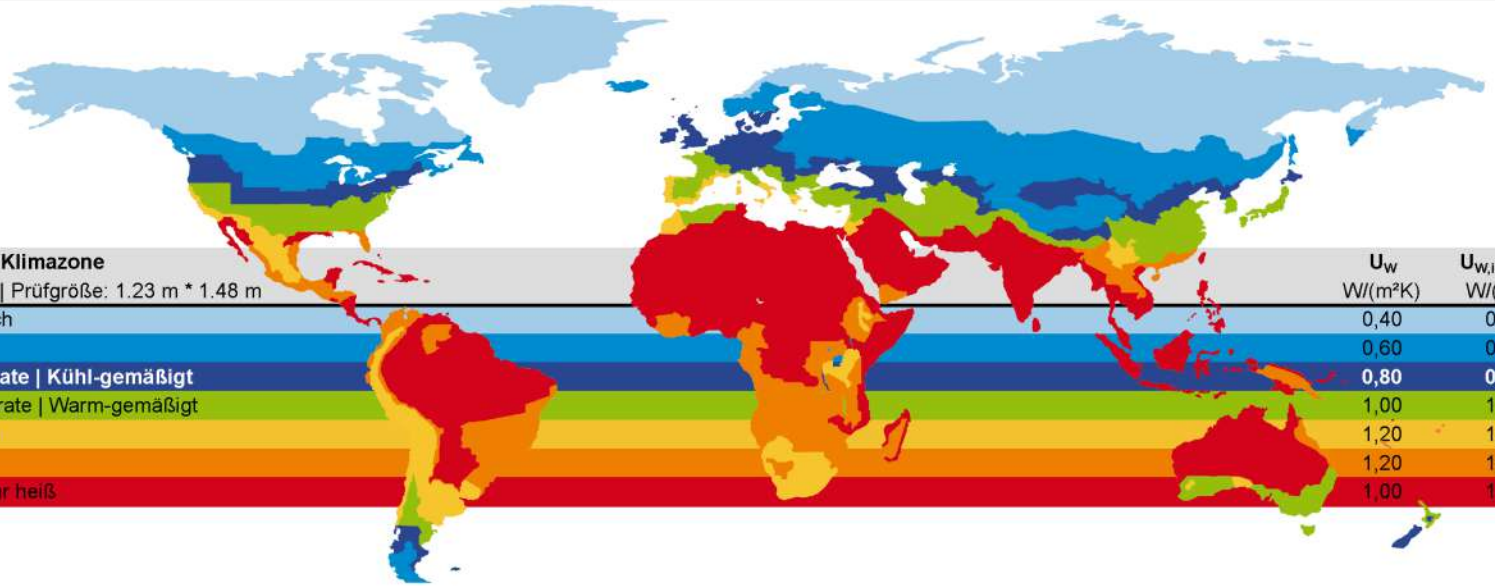
Also the hygiene criterion must be met. For reasons of hygiene, this criterion limits the minimum individual temperature on window surfaces to prevent condensate and mold growth.

The below stated requirements for awarding the label "Certified Passive House Component" have been set by the Passive House Institute (PHI).

Etant donné qu'un système de chauffage séparé n'est past obligatoirement nécessaie dans un Bâtiment Passif, de hautes exigences sont placées sur la qualité des composants utilisés. Plus le climat est froid, plus ces exigences sont élevées. C'est pour cela que le PHI a identifié des régions aux exigences similaires et défini des critères de certification pour ces dernières. Ces critères peuvent être librement téléchargés sur le site internet de l'Institut Passivhaus

Si aucun radiateur n'est placé sous la fenête, alors le coefficient de transmission thermique de cette fenêtre (valeur U de la fenêtre) UW ne doit pas dépasser une certaine valeur qui dépend du climat afin d'éviter d'incomfortables pertes thermiques par rayonnement et courants d'air froid. Pour un vitrage donné, cela résulte en des restrictions des pertes thermiques dans la zone du cadre de la fenêtre. Dans ce contexte, la situation d'installation de la fenêtre dans le mur a son importance. C'est pourquoi une valeur de UW,installée maximale a aussi été déterminée, qui a été vérifiée à titre d'exemple dans le cadre de la certification.

Le critère hygiénique doit également être respecté. Ce critère limite la température individuelle minimale sur la surface intérieure de la fenêtre pour éviter la formation de condensation et de moisissures. L'Institut Passivhaus a défini les exigences ci-dessous pour l'obtention de la distinction "Composant passif certifié".



| **Climate zone \| Klimazone**<br>Reference size \| Prüfgröße: 1.23 m * 1.48 m | $U_W$<br>W/(m²K) | $U_{W,installed}$<br>W/(m²K) | $U_g$ for cert.<br>W/(m²K) | $f_{Rsi=0,25\ m²K/W}$<br>- |
|---|---|---|---|---|
| 1 Arctic \| Arktisch | 0,40 | 0,45 | 0,35 | 0,80 |
| 2 Cold \| Kalt | 0,60 | 0,65 | 0,52 | 0,75 |
| **3 Cool, temperate \| Kühl-gemäßigt** | **0,80** | **0,85** | **0,70** | **0,70** |
| 4 Warm, temperate \| Warm-gemäßigt | 1,00 | 1,05 | 0,90 | 0,65 |
| 5 Warm \| Warm | 1,20 | 1,25 | 1,10 | 0,55 |
| 6 Hot \| Heiß | 1,20 | 1,25 | 1,10 | - |
| 7 Very hot \| Sehr heiß | 1,00 | 1,05 | 0,90 | - |

Certified windows are ranked by the thermal losses through the not transparent parts. These **efficiency classes** include the U-Value of the frame, the frame width, the Ψ-Value of the Glass edge and the length of the Glass edge.
Relevant for passive houses is the energy balance, the sum out of losses and gains. Because the solar gains are difficult to quote it is useful to rate the parts of the window, which do not allow solar gains. This is determined by $\Psi_{opaque}$.

The simulation of the thermal values of the frame sections are based on the regulations of the standard ISO 10077-1:2010 and 10077-2:2012. The thermal conductivities of the used materials refer to relevant standards, technical approvals or have been determined by measured values according to ISO 10077-2:2012, chapter 5.1. In case of one glazing, the models are to 40 cm height, in case of 2 glazing 60 cm in height.

The **spacers** were modeled according to the actual 2-Box-models of the working group “Warm Edge” of the Federal glass association (Bundesverband Flachglas) of Germany. Thermal bridge coefficients were calculated for typical **installation situations**. These values may be used in case of identical installations only in energy balance calculations. The wall-models are 1.41 m in height, glass and frame are 40 cm height, the installation gap is 1 cm.

For modeling and simulations, the software flixo 8 of Infomind was used. For the used **boundary conditions**, please have a look at following drawings and tables.

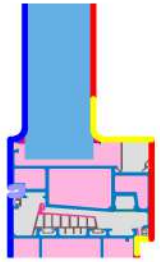
Les fenêtres sont classées en différentes classes d'efficacité en fonction des pertes thermiques à travers les parties opaques. Ces pertes thermiques prennent en compte la valeur U du cadre, la largeur du châssis, le pont thermique du bord de vitrage ainsi que la longueur du bord de vitrage. Le bilan énergétique, effectué à partir des pertes et des gains de chaleur, est très important pour un Bâtiment Passif. Comme il est difficile de déterminer précisément les gains solaires, il est utile de quantifier les pertes dues aux zones de la fenêtre qui me permettent pas de gains solaires. Cela est déterminé par Ψopaque.

Les caractéristiques thermiques de la section du cadre ont été déterminées selon les normes ISO 10077-1:2010 et 10077-2:2012. Les conductivités thermiques des matériaux utilisés proviennent de normes pertinentes, d'homologations ou ont été déterminées à l'aide de valeurs mesurées selon la norme ISO 10077-2:2012, chapitre 5.1. Les modèles ayant une seule partie en verre font 40cm de haut, ceux ayant deux parties en verre font 60cm de haut. Les intercalaires ont été modélisés selon l'actuel 2-Box-modèle du groupe de travail Warme Kante de la Fédération allemande des fabricants de verre plat.

Les coefficients de déperdition des ponts thermiques ont été calculés à titre d'exemple pour des structures de murs typiques. Ces valeurs peuvent uniquement être utilisées dans les calculs de bilan énergétique si un détails d'installation identique est mis en oeuvre. Les modèles de murs font 1,41m de haut, la hauteur du vitrage et du cadre est de 40cm et un interstice d'installation de 1cm a été modélisé. Le programme Flixo 8.1 Professional de l'entreprise Infomind a été utilisé pour les modélisations et les calculs des flux thermiques. Les conditions limites du modèle sont représentées ci-dessous:

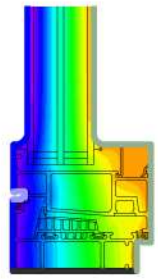
$$\Psi_{opak} = \Psi_g + \frac{U_f \cdot A_f}{l_g}$$

| max. $\Psi_{opak}$ [W/(mK)] | Efficiency class Effizienzklasse | Name Bezeichnung |
|---|---|---|
| 0,065 | phA+ | Very advanced component |
| 0,110 | phA | Advanced component |
| 0,155 | phB | Basic component |
| 0,200 | phC | Certifiable component |

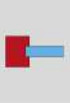
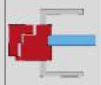
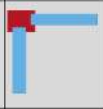


| Randbedingung | q[W/m²] | θ[°C] | R[(m²·K)/W] | ε |
|---|---|---|---|---|
| Adiabatic \| Adiabat | 0,000 | | | |
| Exterior \| Außen | | -10,000 | 0,040 | |
| Exterior \| Außen, Leicht belüftete Hohlräume | | -10,000 | 0,300 | |
| Interior, frame, normal | | 20,000 | 0,130 | |
| Interior, frame, reduced | | 20,000 | 0,200 | |
| e 0,9 Cavity \| Hohlraum | | | | 0,900 |

| Randbedingung | q[W/m²] | θ[°C] | R[(m²·K)/W] |
|---|---|---|---|
| Adiabatic \| Adiabat | 0,000 | | |
| Exterior \| Außen | | -10,000 | 0,040 |
| Exterior \| Außen, Leicht belüftete Hohlräume | | -10,000 | 0,300 |
| fRsi: Interior \| Innen | | 20,000 | 0,250 |



**Frame values | Frame values**

| SILEX Fiberglass Windows & Doors | | OB Bottom | OH Top | OJ Side | FB Bottom fixed | FH Top fixed | FJ Side fixed | OT Thres-hold | DL Side door | FM Flying mullion | 2M Mullion | 1M Mullion | 0M Mullion fixed | CO Corner | 2T Transom | 1T Transom | 0T Transom fixed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SILEX 95 Series | | Bas | Haut | Côté | Bas fixe | Haut fixe | Côté fixe | Seuil | Porte côté | Ouvrant | Batteme nt | Batteme nt | Batteme nt fixe | Angle | Traverse | Traverse | Traverse fixe |
| Spacer \| Intercalaire: SuperSpacer Premium | | | | | | |  | |  | | | | |  | | | |
| Temperaturefactor Facteur de température | $f_{Rsi=0,25m^2k/W}$ | 0,79 | 0,79 | 0,79 | | | | | | | 0,79 | | | | | | |
| Frame width Largeur du châssis | $b_f$ [mm] | 97 | 97 | 97 | | | | | | | 169 | | | | | | |
| U-value frame Valeur U du châssis | **Uf** [W/(m²K)] | 0,85 | 0,85 | 0,85 | | | | | | | 0,84 | | | | | | |
| Ψ-glass edge Ψ-intercalaire | **Ψg** [W/(mK)] | 0,025 | 0,025 | 0,025 | | | | | | | 0,025 | | | | | | |
| U-value window Valeur-U fenêtre | Uw [W/(m²K)] @Ug= 0,7 W/(m²K) | **0,8042** | | | | | | | | | | | | | | | |
| $\Psi_{opaque}$ | $\Psi_{opaque}$ W/(mK) | **0,114** | | | | | | | | | | | | | | | |
| Passive House effiziency class Efficacité | | **phB** | | | | | | | | | | | | | | | |

**Contact person | Contact**

SILEX Fiberglass Windows & Doors, Zhen Liu
2047880648 info@silexfiberglass.com

**Description**

Fiber reinforced PA frame(0,35 W/(mK)), and insulation insert PU In-situ foam(0,022 W/(mK)).
Maximum dimensions in accordance to the tested parameters.
Pane thickness: 51 mm (5/18/5/18/5), rebate depth: 15 mm.

**Installation | Installation**

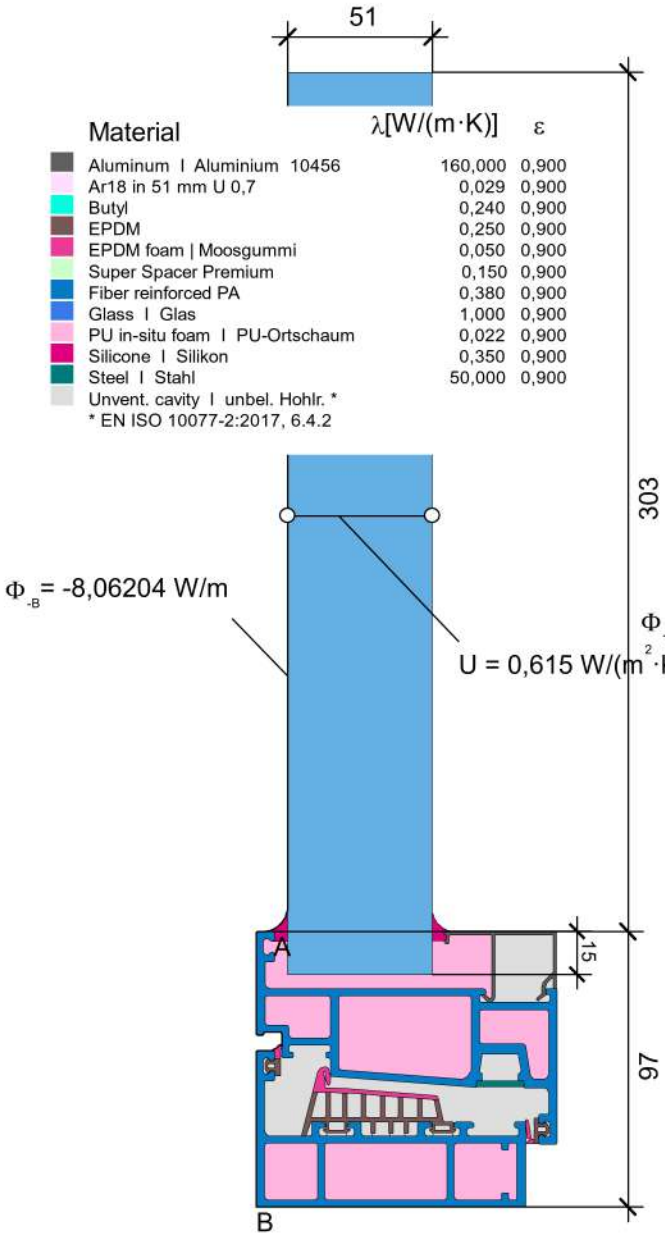
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **EIFS \| 0 U-Wall = 0,132 W/(m²K)** | | | | | | | | | |
| | $\Psi_{install}$ [W/(mK)] | 0,020 | 0,010 | 0,010 | | | | | |
| | $U_{W, installed}$ [W/(m²K)] | | 0,84 | | | | | | |
| **Lightweight timber construction \| Bois léger U-Wall = 0,132 W/(m²K)** | | | | | | | | | |
| | $\Psi_{install}$ [W/(mK)] | | | | | | | | |
| | $U_{W, installed}$ [W/(m²K)] | | | | | | | | |
| **Formwork blocks \| Coffrage de béton U-Wall = 0,146 W/(m²K)** | | | | | | | | | |
| | $\Psi_{install}$ [W/(mK)] | | | | | | | | |
| | $U_{W, installed}$ [W/(m²K)] | | | | | | | | |
| **Ventilated facade \| Mur rideau U-Wall = 0,133 W/(m²K)** | | | | | | | | | |
| | $\Psi_{install}$ [W/(mK)] | 0,020 | 0,007 | 0,007 | | | | | |
| | $U_{W, installed}$ [W/(m²K)] | | 0,83 | | | | | | |
| **Cavity wall \| Mur de cavité U-Wall = 0,13 W/(m²K)** | | | | | | | | | |
| | $\Psi_{install}$ [W/(mK)] | 0,020 | 0,007 | 0,007 | | | | | |
| | $U_{W, installed}$ [W/(m²K)] | | 0,83 | | | | | | |

**Description**

Châssis en PA renforcé de fibres (0,35 W/(mK)) et insert isolant en mousse de PU coulée sur place (0,022 W/(mK)).
Dimensions maximales conformes aux paramètres testés.
Épaisseur du verre 51 mm (5/18/5/18/5), Profondeur de remboursement: 15 mm.

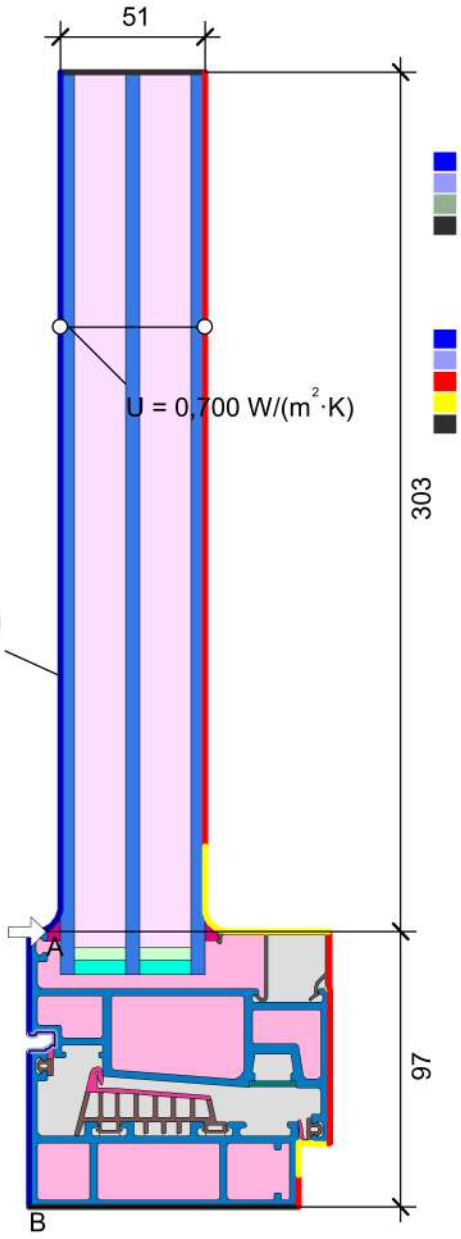
**Calculation | Calcul**

Passivhaus Institut Darmstadt 20.04.2026




| Material | λ[W/(m·K)] | ε |
|---|---|---|
| Aluminum I Aluminium 10456 | 160,000 | 0,900 |
| Ar18 in 51 mm U 0,7 | 0,029 | 0,900 |
| Butyl | 0,240 | 0,900 |
| EPDM | 0,250 | 0,900 |
| EPDM foam \| Moosgummi | 0,050 | 0,900 |
| Super Spacer Premium | 0,150 | 0,900 |
| Fiber reinforced PA | 0,380 | 0,900 |
| Glass I Glas | 1,000 | 0,900 |
| PU in-situ foam I PU-Ortschaum | 0,022 | 0,900 |
| Silicone I Silikon | 0,350 | 0,900 |
| Steel I Stahl | 50,000 | 0,900 |
| Unvent. cavity I unbel. Hohlr. * | | |

* EN ISO 10077-2:2017, 6.4.2




| Randbedingung | θ[°C] | R[(m²·K)/W] |
|---|---|---|
| Exterior \| Außen | -10,000 | 0,040 |
| Exterior \| Außen, Leicht belüftete Hohlräume | -10,000 | 0,300 |
| fRsi: Interior \| Innen | 20,000 | 0,250 |
| Adiabatic \| Adiabat | | |

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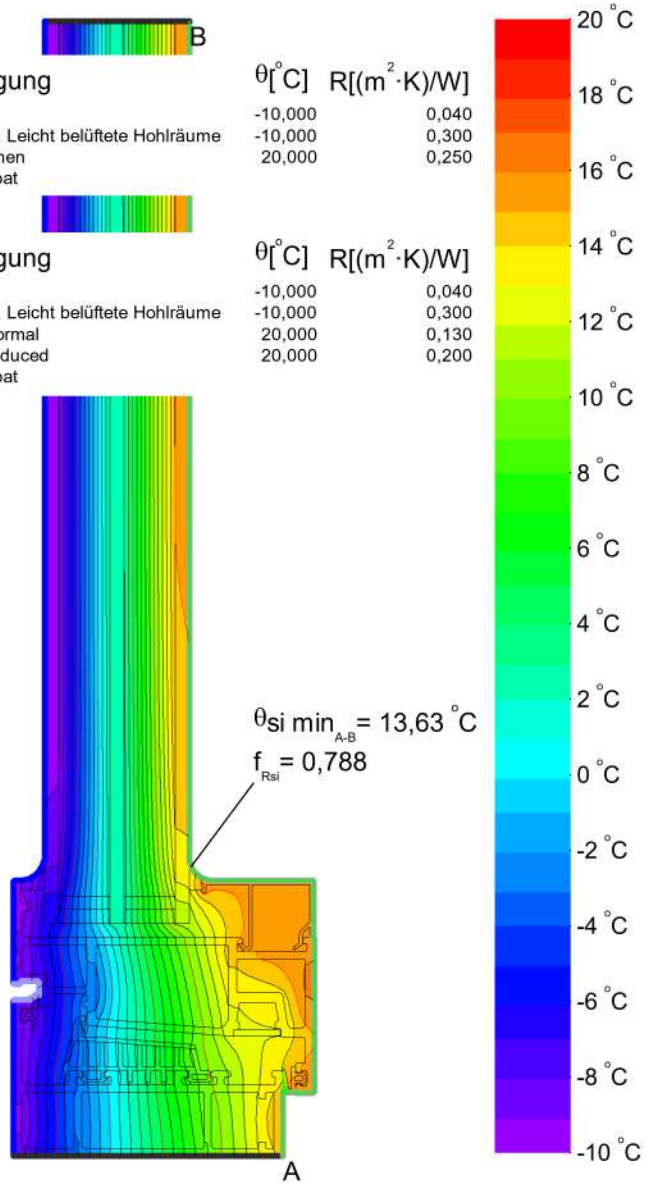


$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{8,062}{30,000} - 0,615 \cdot 0,303}{0,097} = 0,851\ W/(m^2 \cdot K)$$

$$\psi_{ed\,A} = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{9,590}{30,000} - 0,700 \cdot 0,303 - 0,851 \cdot 0,097 = 0,025\ W/(m \cdot K)$$



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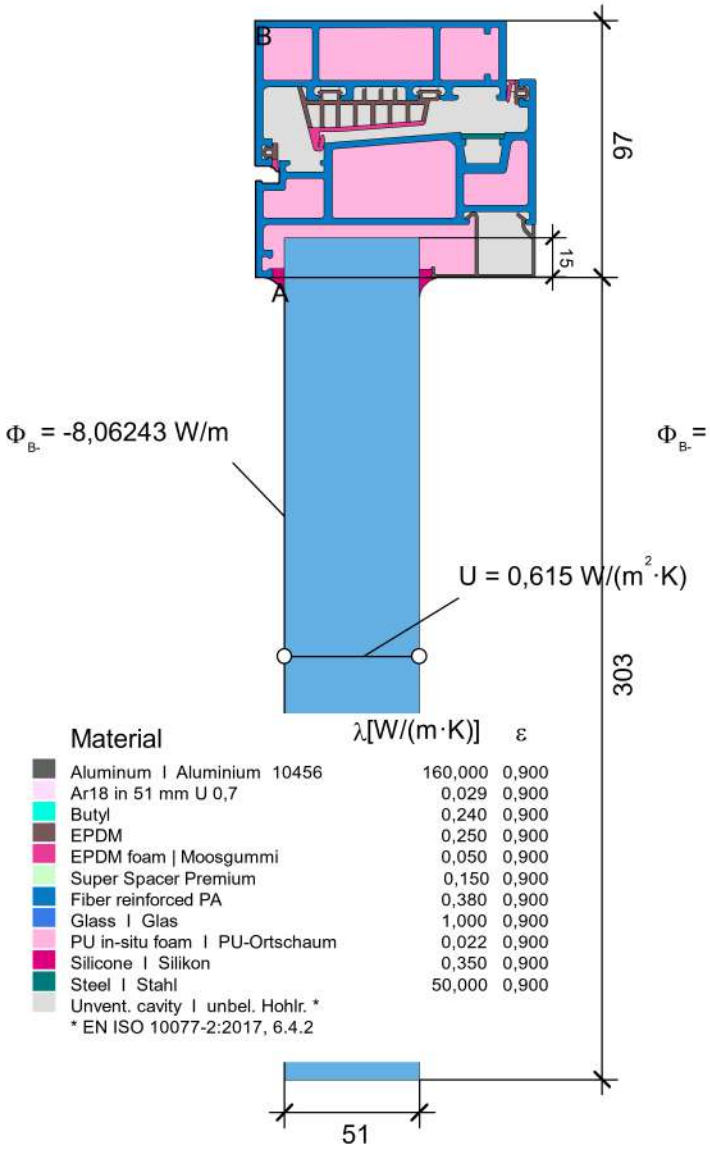


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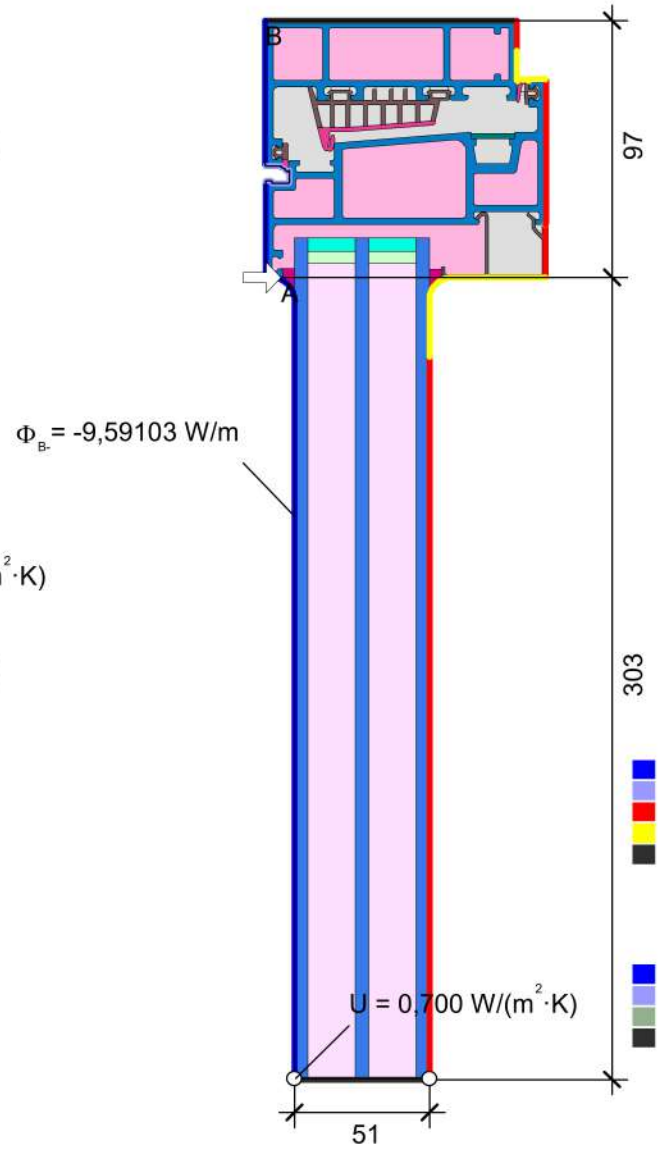


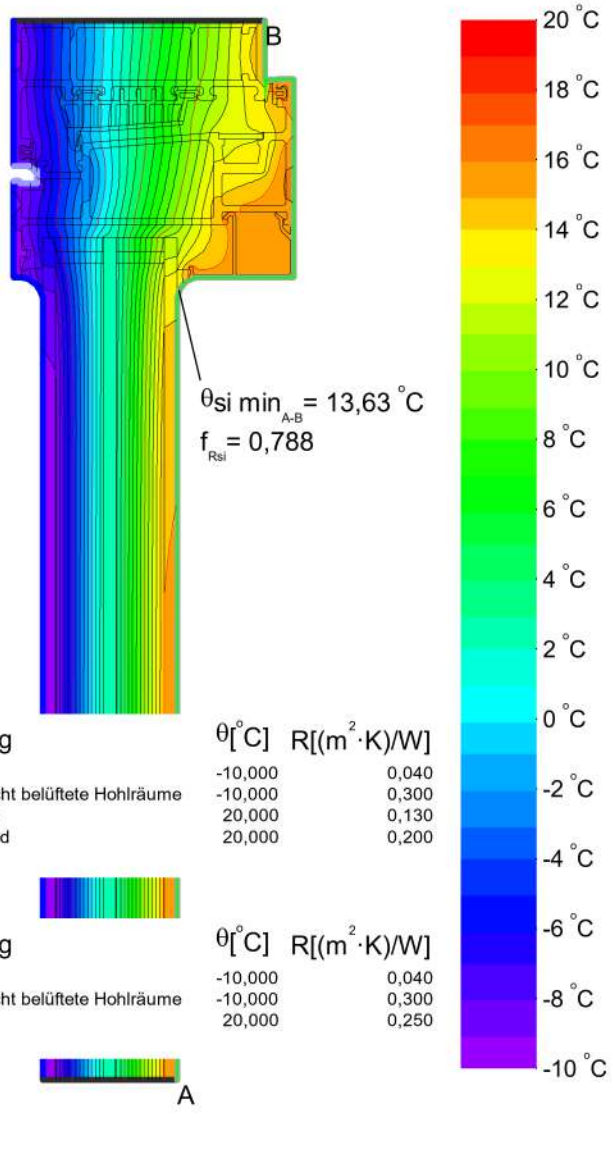


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| Adiabatic \| Adiabat | | |

$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{8,062}{30,000} - 0,615 \cdot 0,303}{0,097} = 0,851\ W/(m^2 \cdot K)$$

$$\psi_{ed\,A} = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{9,591}{30,000} - 0,700 \cdot 0,303 - 0,851 \cdot 0,097 = 0,025\ W/(m \cdot K)$$



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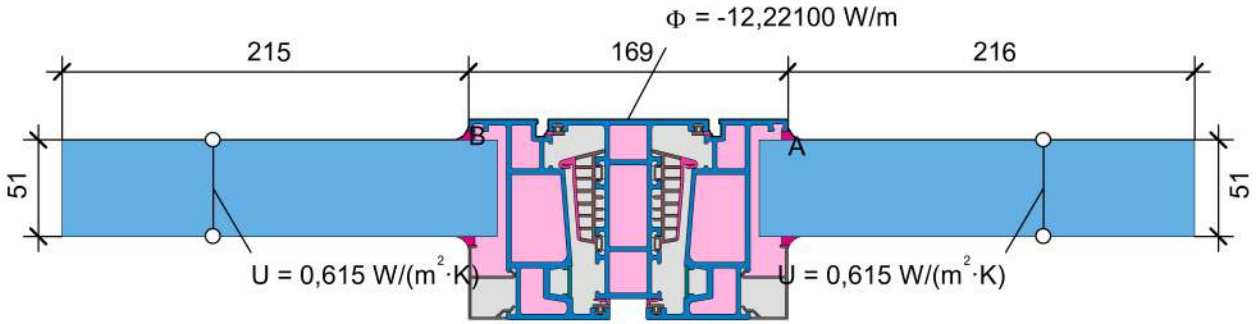


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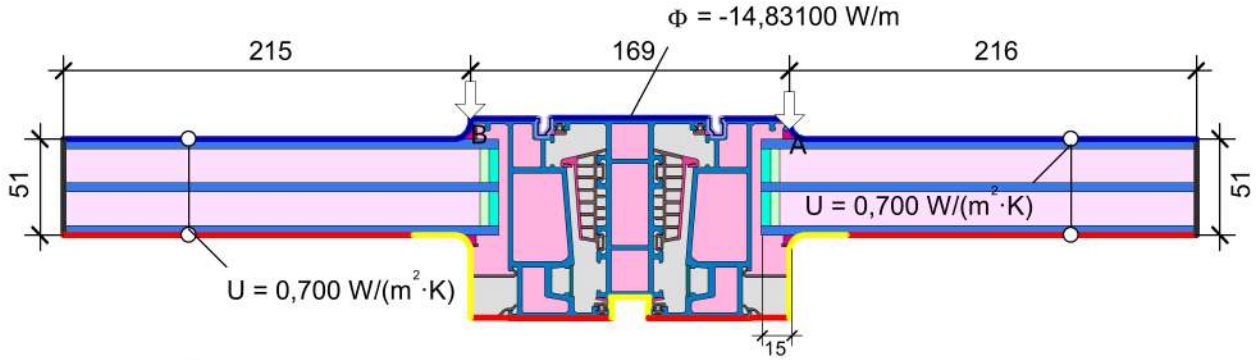
* EN ISO 10077-2:2017, 6.4.2

$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_{p1}\cdot b_{p1} - U_{p2}\cdot b_{p2}}{b_f} = \frac{\frac{12{,}221}{30{,}000} - 0{,}615\cdot 0{,}216 - 0{,}615\cdot 0{,}216}{0{,}169} = 0{,}843\ \mathrm{W/(m^2\cdot K)}$$

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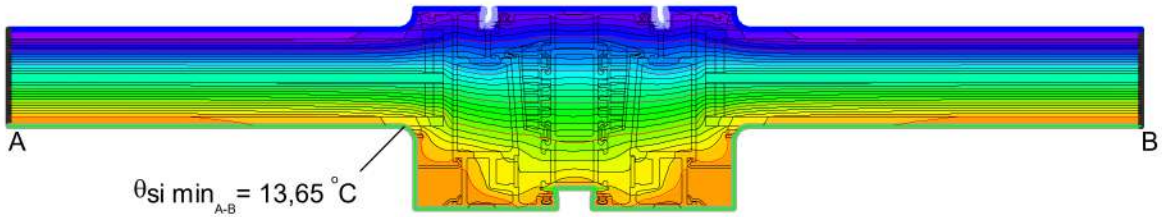
| Interior, frame, reduced | 20,000 | 0,200 |
| Adiabatic \| Adiabat | | |

$$\psi_{ed\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_{g1}\cdot b_{g1} - U_f\cdot b_f - U_{g2}\cdot b_{g2}}{2} = \frac{\frac{14{,}831}{30{,}000} - 0{,}700\cdot 0{,}216 - 0{,}843\cdot 0{,}169 - 0{,}700\cdot 0{,}216}{2} = 0{,}025\ \mathrm{W/(m\cdot K)}$$

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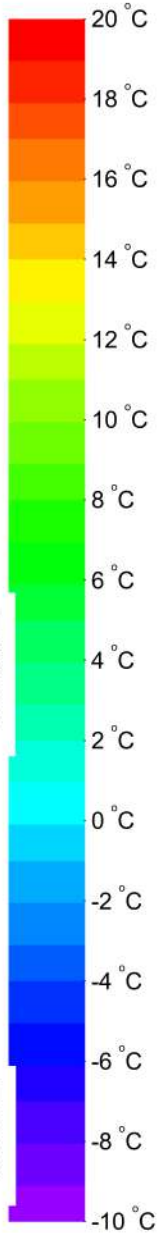
| fRsi: Interior \| Innen | 20,000 | 0,250 |
| Adiabatic \| Adiabat | | |



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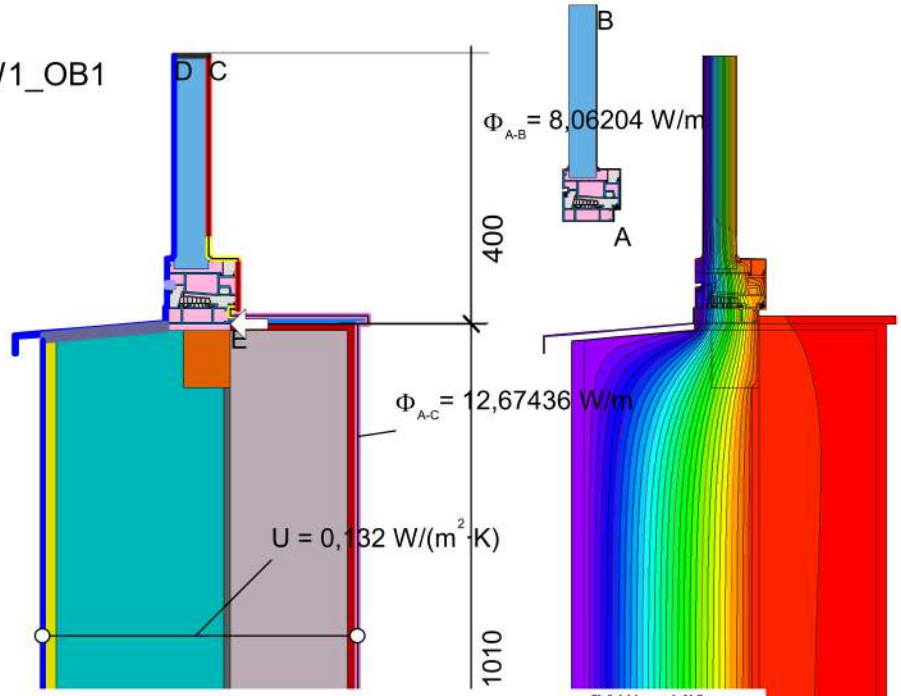
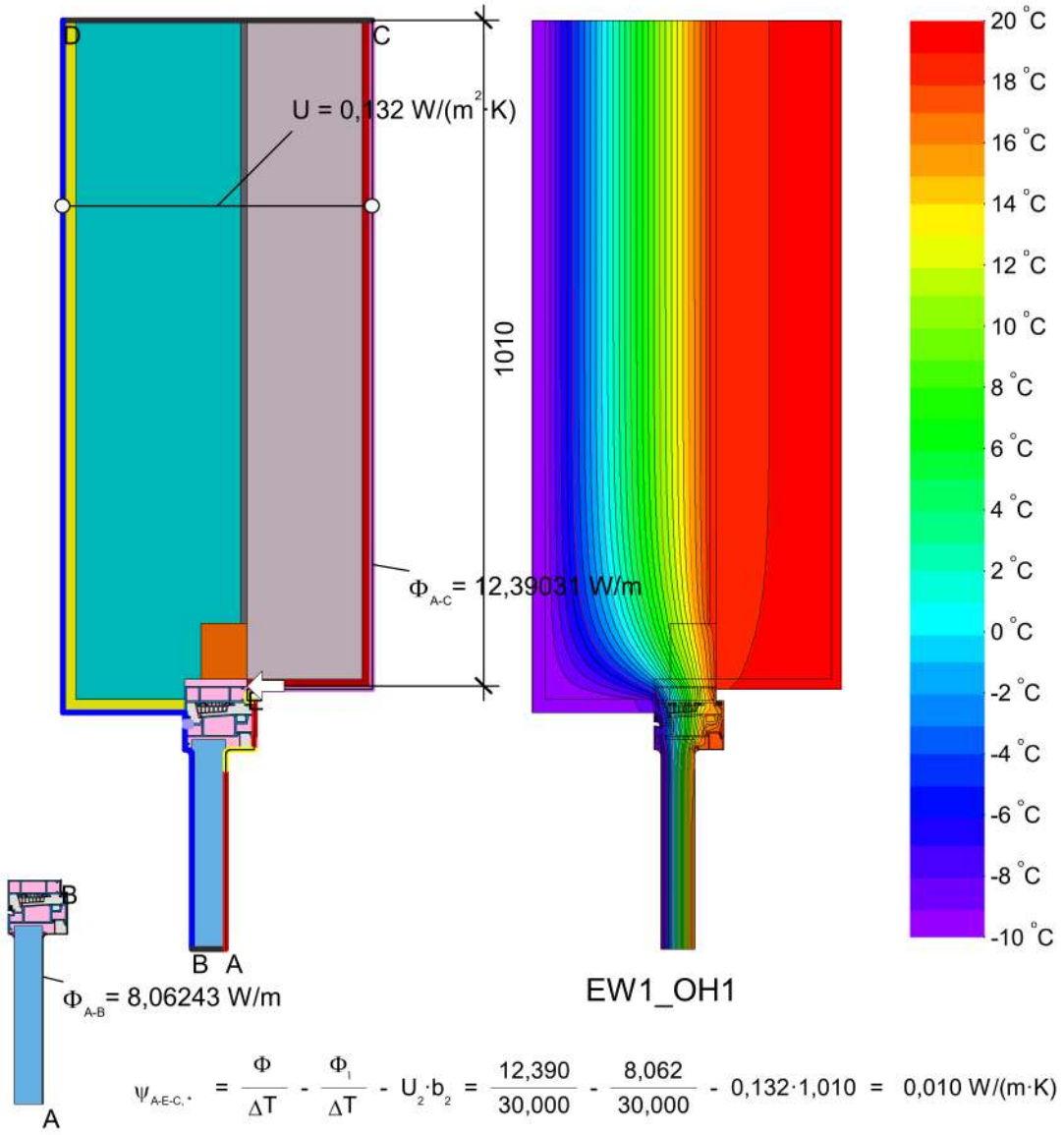
EW1_OB1




| Material | λ[W/(m·K)] | ε |
|---|---|---|
| Adhesive mortar I Klebemörtel | 0,700 | 0,900 |
| Aluminum I Aluminium 10456 | 160,000 | 0,900 |
| Artificial stone I Kunststein 10456 | 1,300 | 0,900 |
| EPDM | 0,250 | 0,900 |
| EPDM foam \| Moosgummi | 0,050 | 0,900 |
| Fiber reinforced PA | 0,380 | 0,900 |
| Insulation I Wärmedämmung 035 | 0,035 | 0,900 |
| Interior plaster I Gipsputz 10456 | 0,570 | 0,900 |
| Mörtel, Zement, Sand | 1,000 | 0,900 |
| PU in-situ foam I PU-Ortschaum | 0,022 | 0,900 |
| Panel I Maske | 0,035 | 0,900 |
| Rigid EPS-foam incl. screws \| Fester EPS-Schaum inkl. Schrauben | 0,045 | 0,900 |
| Sand-lime stone I Kalksandstein 1745 | 1,000 | 0,900 |
| Silicone I Silikon | 0,350 | 0,900 |
| Steel I Stahl | 50,000 | 0,900 |
| Unvent. cavity I unbel. Hohlr. * | | |

* EN ISO 10077-2:2017, 6.4.2




EW1_OH1

$$\psi_{A\text{-}E\text{-}C,\,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - \frac{\Phi_2}{\Delta T} = \frac{12{,}674}{30{,}000} - 0{,}132 \cdot 1{,}010 - \frac{8{,}062}{30{,}000} = 0{,}020\ \text{W/(m·K)}$$

$$\psi_{A\text{-}E\text{-}C,\,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{12{,}390}{30{,}000} - \frac{8{,}062}{30{,}000} - 0{,}132 \cdot 1{,}010 = 0{,}010\ \text{W/(m·K)}$$

| Randbedingung | θ[°C] | R[(m²·K)/W] |
|---|---|---|
| Adiabatic \| Adiabat | | |
| Exterior \| Außen | -10,000 | 0,040 |
| Exterior \| Außen, Leicht belüftete Hohlräume | -10,000 | 0,300 |
| Interior \| Innen | 20,000 | 0,130 |
| Interior, frame, normal | 20,000 | 0,130 |
| Interior, frame, reduced | 20,000 | 0,200 |



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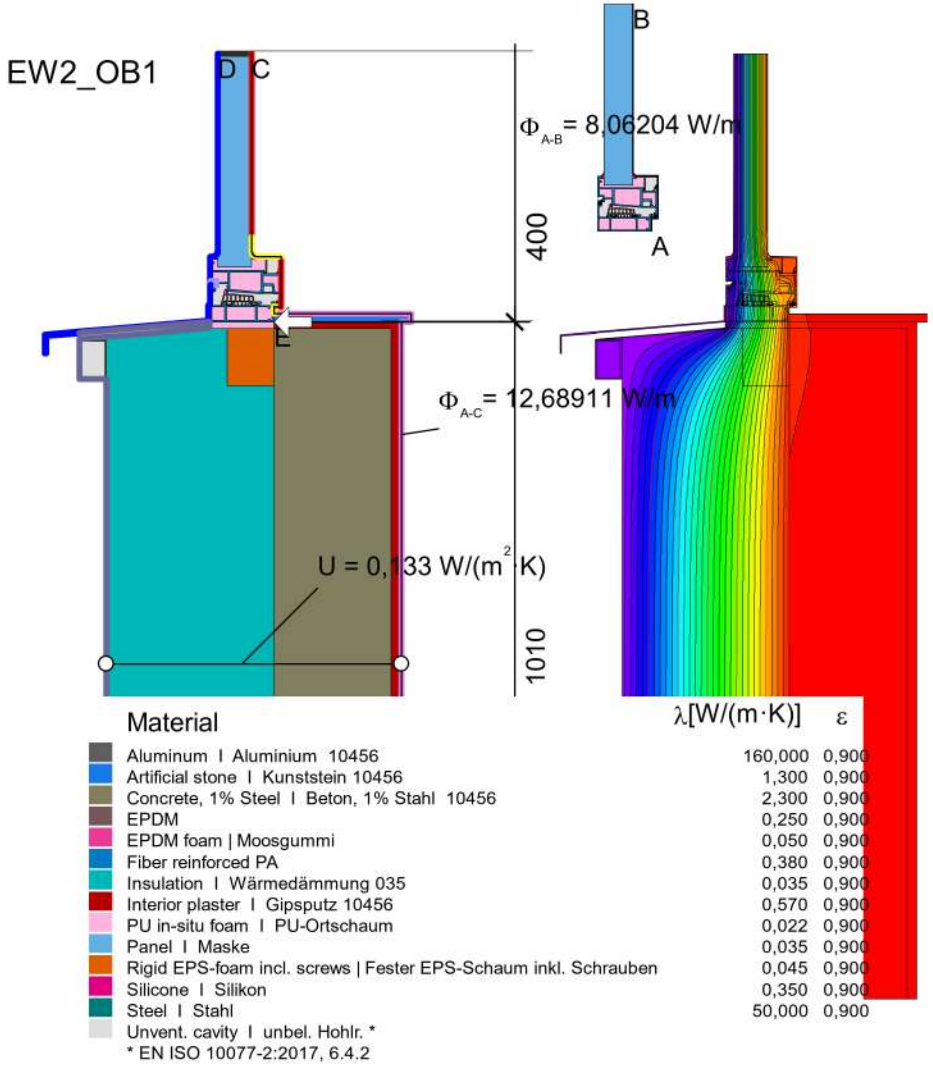
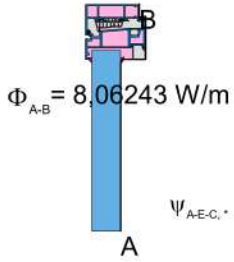
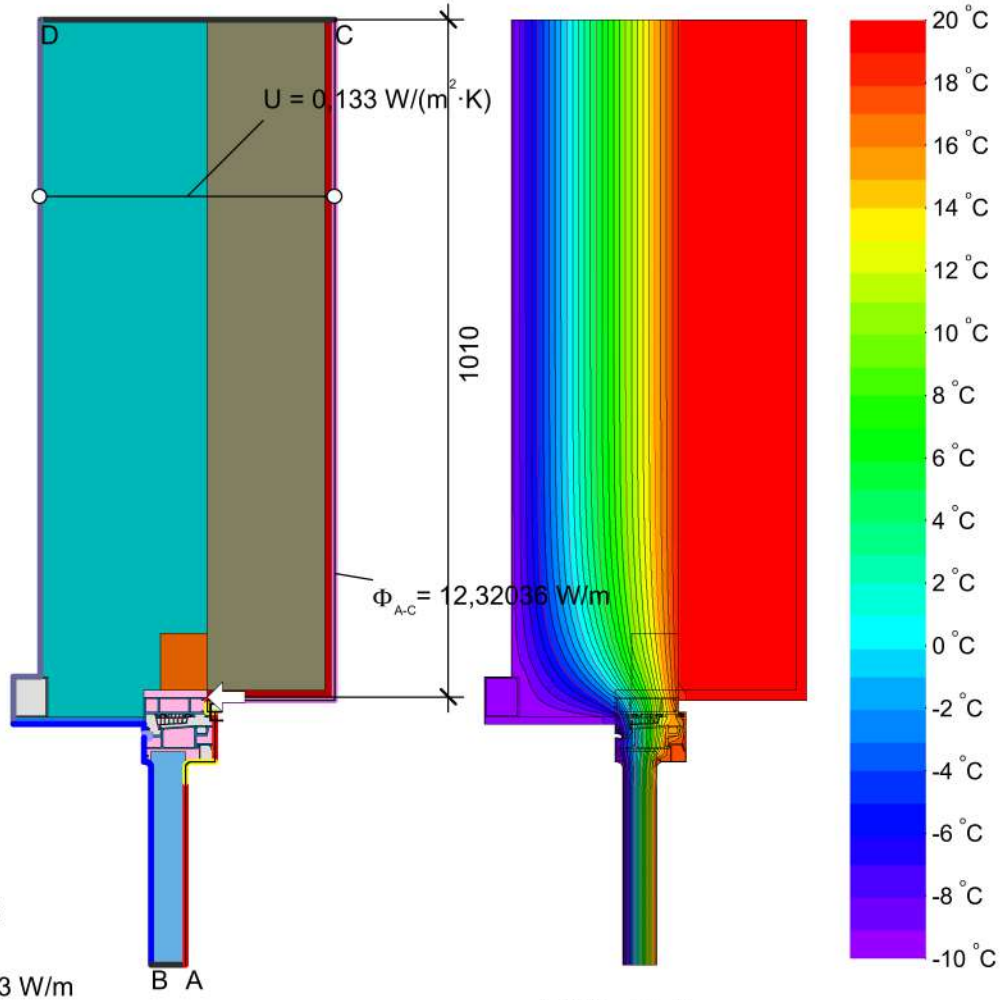



| Material | λ[W/(m·K)] | ε |
|---|---|---|
| Aluminum I Aluminium 10456 | 160,000 | 0,900 |
| Artificial stone I Kunststein 10456 | 1,300 | 0,900 |
| Concrete, 1% Steel I Beton, 1% Stahl 10456 | 2,300 | 0,900 |
| EPDM | 0,250 | 0,900 |
| EPDM foam \| Moosgummi | 0,050 | 0,900 |
| Fiber reinforced PA | 0,380 | 0,900 |
| Insulation I Wärmedämmung 035 | 0,035 | 0,900 |
| Interior plaster I Gipsputz 10456 | 0,570 | 0,900 |
| PU in-situ foam I PU-Ortschaum | 0,022 | 0,900 |
| Panel I Maske | 0,035 | 0,900 |
| Rigid EPS-foam incl. screws \| Fester EPS-Schaum inkl. Schrauben | 0,045 | 0,900 |
| Silicone I Silikon | 0,350 | 0,900 |
| Steel I Stahl | 50,000 | 0,900 |
| Unvent. cavity I unbel. Hohlr. * | | |

* EN ISO 10077-2:2017, 6.4.2




EW2_OH1

$$\psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{12{,}320}{30{,}000} - \frac{8{,}062}{30{,}000} - 0{,}133 \cdot 1{,}010 = 0{,}007\ \text{W/(m·K)}$$

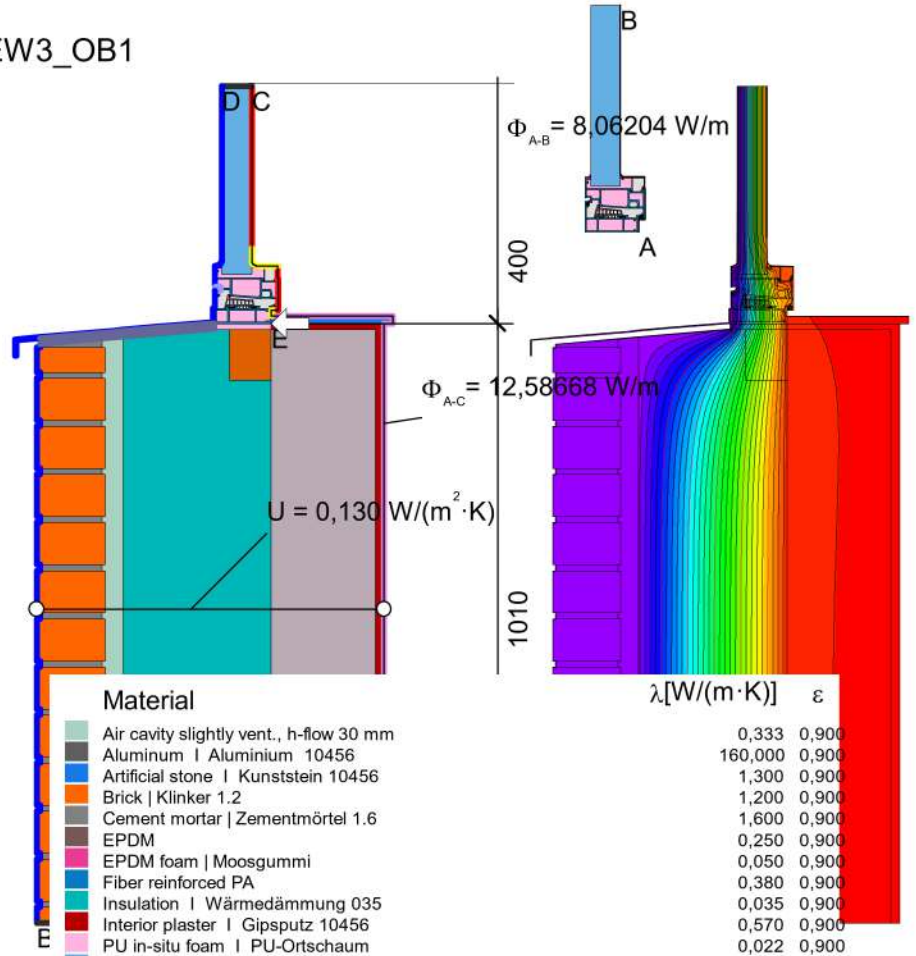
$$\psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - \frac{\Phi_2}{\Delta T} = \frac{12{,}689}{30{,}000} - 0{,}133 \cdot 1{,}010 - \frac{8{,}062}{30{,}000} = 0{,}020\ \text{W/(m·K)}$$

| Randbedingung | θ[°C] | R[(m²·K)/W] |
|---|---|---|
| Adiabatic \| Adiabat | | |
| Exterior vent. \| Außen belüftet | -10,000 | 0,130 |
| Exterior \| Außen | -10,000 | 0,040 |
| Exterior \| Außen, Leicht belüftete Hohlräume | -10,000 | 0,300 |
| Interior \| Innen | 20,000 | 0,130 |
| Interior, frame, normal | 20,000 | 0,130 |
| Interior, frame, reduced | 20,000 | 0,200 |



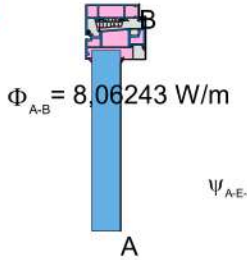
Passive House Institute

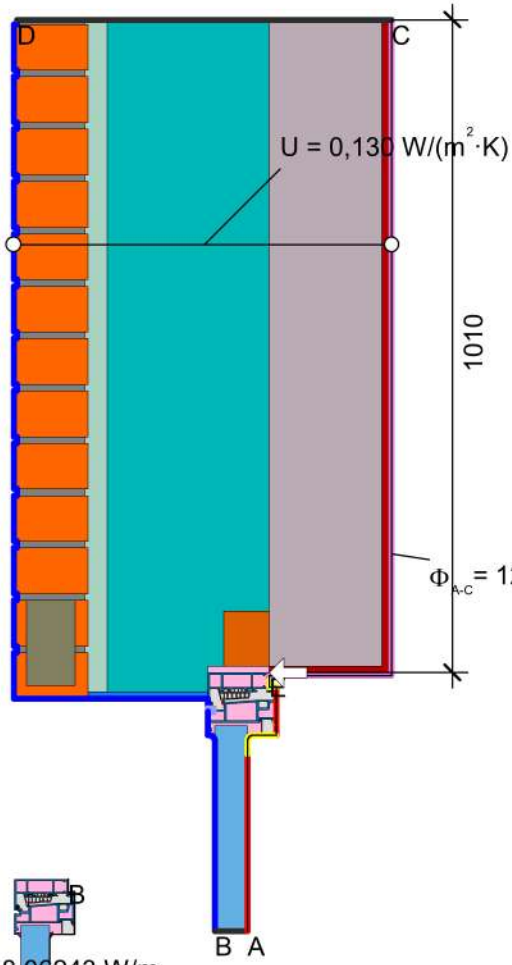
EW3_OB1

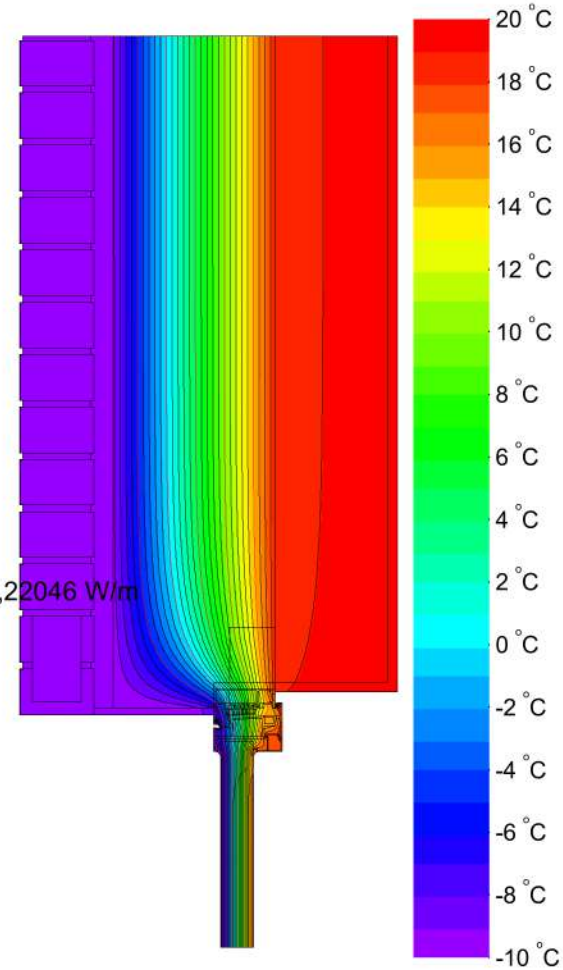



| Material | λ[W/(m·K)] | ε |
|---|---|---|
| Air cavity slightly vent., h-flow 30 mm | 0,333 | 0,900 |
| Aluminum I Aluminium 10456 | 160,000 | 0,900 |
| Artificial stone I Kunststein 10456 | 1,300 | 0,900 |
| Brick \| Klinker 1.2 | 1,200 | 0,900 |
| Cement mortar \| Zementmörtel 1.6 | 1,600 | 0,900 |
| EPDM | 0,250 | 0,900 |
| EPDM foam \| Moosgummi | 0,050 | 0,900 |
| Fiber reinforced PA | 0,380 | 0,900 |
| Insulation I Wärmedämmung 035 | 0,035 | 0,900 |
| Interior plaster I Gipsputz 10456 | 0,570 | 0,900 |
| PU in-situ foam I PU-Ortschaum | 0,022 | 0,900 |
| Panel I Maske | 0,035 | 0,900 |
| Rigid EPS-foam incl. screws \| Fester EPS-Schaum inkl. Schrauben | 0,045 | 0,900 |
| Sand-lime stone I Kalksandstein 1745 | 1,000 | 0,900 |
| Silicone I Silikon | 0,350 | 0,900 |
| Steel I Stahl | 50,000 | 0,900 |
| Unvent. cavity I unbel. Hohlr. * | | |

* EN ISO 10077-2:2017, 6.4.2




EW3_OH1

$$\psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{12{,}220}{30{,}000} - \frac{8{,}062}{30{,}000} - 0{,}130 \cdot 1{,}010 = 0{,}007 \text{ W/(m·K)}$$

$$\psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - \frac{\Phi_2}{\Delta T} = \frac{12{,}587}{30{,}000} - 0{,}130 \cdot 1{,}010 - \frac{8{,}062}{30{,}000} = 0{,}020 \text{ W/(m·K)}$$

| Randbedingung | θ[°C] | R[(m²·K)/W] |
|---|---|---|
| Adiabatic \| Adiabat | | |
| Exterior \| Außen | -10,000 | 0,040 |
| Exterior \| Außen, Leicht belüftete Hohlräume | -10,000 | 0,300 |
| Interior \| Innen | 20,000 | 0,130 |
| Interior, frame, normal | 20,000 | 0,130 |
| Interior, frame, reduced | 20,000 | 0,200 |