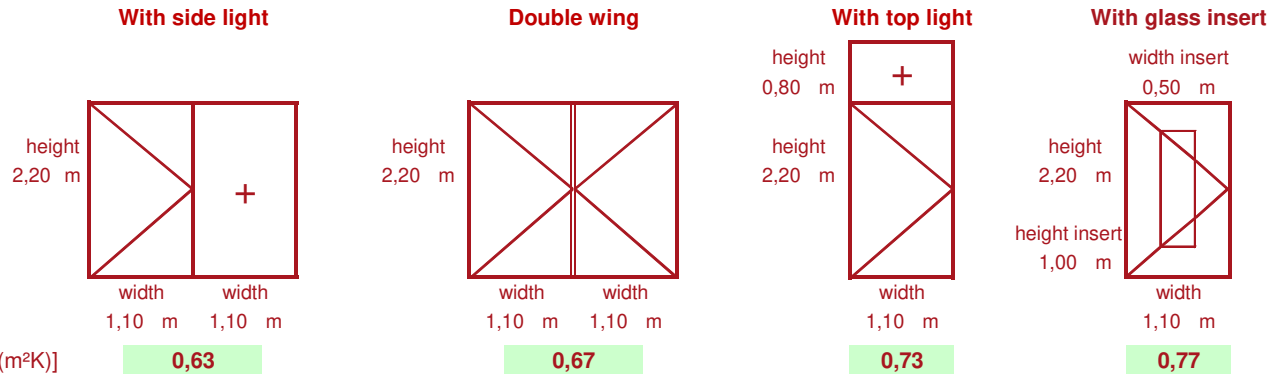


On behalf of: **Moralt AG, Hausham, GERMANY**
 Project/Product: **FERRO PASSIV KlimaSoft**

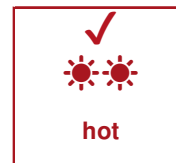
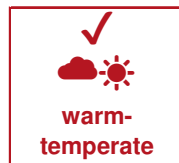
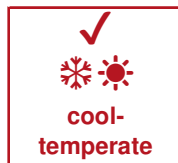
Description	Door leaf / Glazing		Uf value [W/(m²K)]				Frame Width [m]				Glazing Edge Ψ-value [W/(m²K)]				Temperature factor (min) $f_{Rsi=0,25}$ [-]	Overall U-value [W/(m²K)]
	U _d -value [W/(m²K)]	U _g -value [W/(m²K)]	Lock s.	Hinge s.	Sill	Head	Lock s.	Hinge s.	Sill	Head	Lock s.	Hinge s.	Sill	Head		
FERRO PASSIV KlimaSoft	0,48		0,97	1,09	1,69	1,09	0,199	0,114	0,080	0,114	0,001	0,001	0,002	0,001	0,46	0,69
FERRO PASSIV KlimaSoft side light		0,60	1,03	1,03	1,03	1,03	0,087	0,087	0,087	0,087	0,026	0,026	0,026	0,026	0,71	0,76
Flying mullion	0,48	0,60	0,92				0,284				0,001				0,76	
Mullion 1 casement	0,48	0,60	0,11				0,252				0,015				0,70	
Transom 1 casement	0,48	0,60	1,08				0,167				0,019				0,70	
Glass insert	0,48	0,60									0,038				0,75	

Drawings and material data were provided by the manufacturer. The sole responsibility for the provided information lies with the manufacturer. f_{Rsi} and PSI_g - values of side- and top light were determined with $U_g=0,7$ W/(m²K).



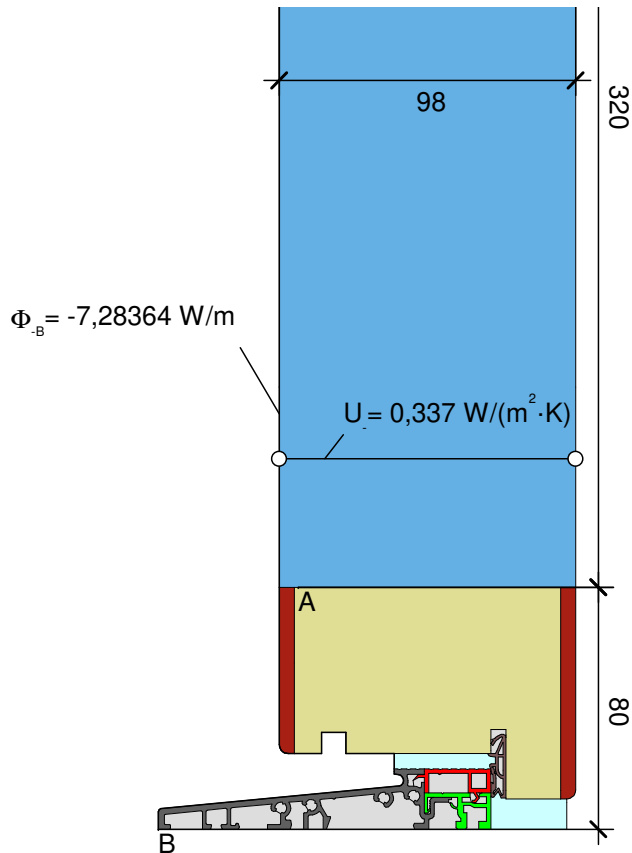
comfort criterion for cool-temperate climate zone achieved

Suitable for climate zone



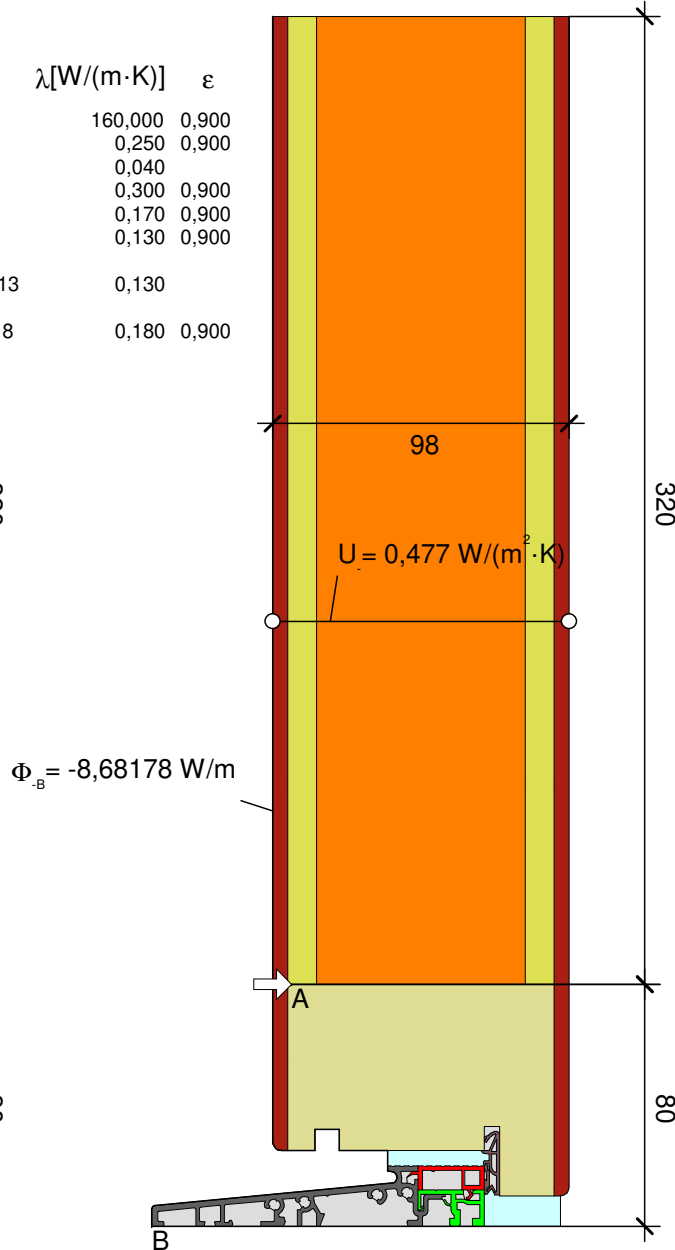
Material	λ [W/(m·K)]	ϵ
Aluminum Aluminium 10456	160,000	0,900
EPDM	0,250	0,900
Insulation Wärmedämmung 040	0,040	
Polyamide 25% Glassfiber	0,300	0,900
Polyvinylchloride (PVC)	0,170	0,900
Softwood, OSB Weichholz, OSB 10456	0,130	0,900
Unvent. cavity unbel. Hohlr. **		
Wooden-based material Holzwerkstoff 0.13	0,130	
slightly vent. cav. leicht bel. Hohlr. **		
wooden-based material Holzwerkstoff 0.18	0,180	0,900

** EN ISO 10077-2:2017, 6.4.3

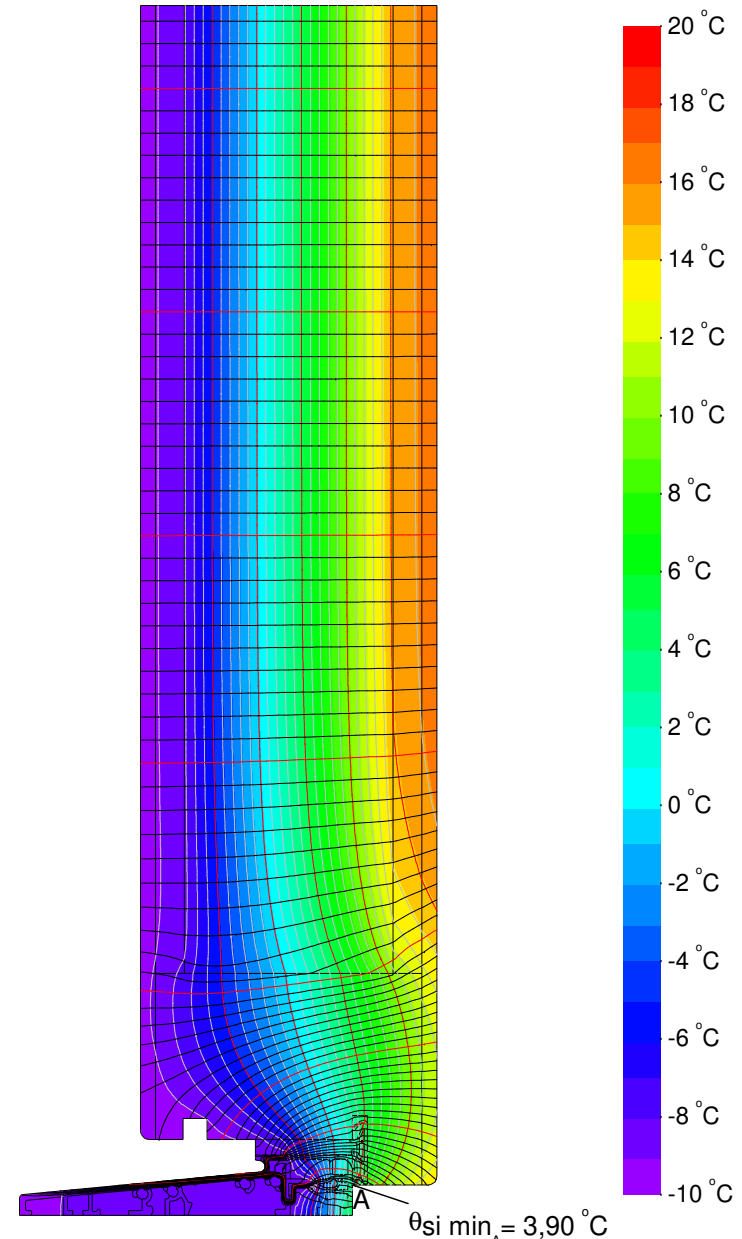


$$U_{fA,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{7,284}{30,000} - 0,337 \cdot 0,320}{0,080} = 1,688 \text{ W/(m}^2 \cdot \text{K)}$$

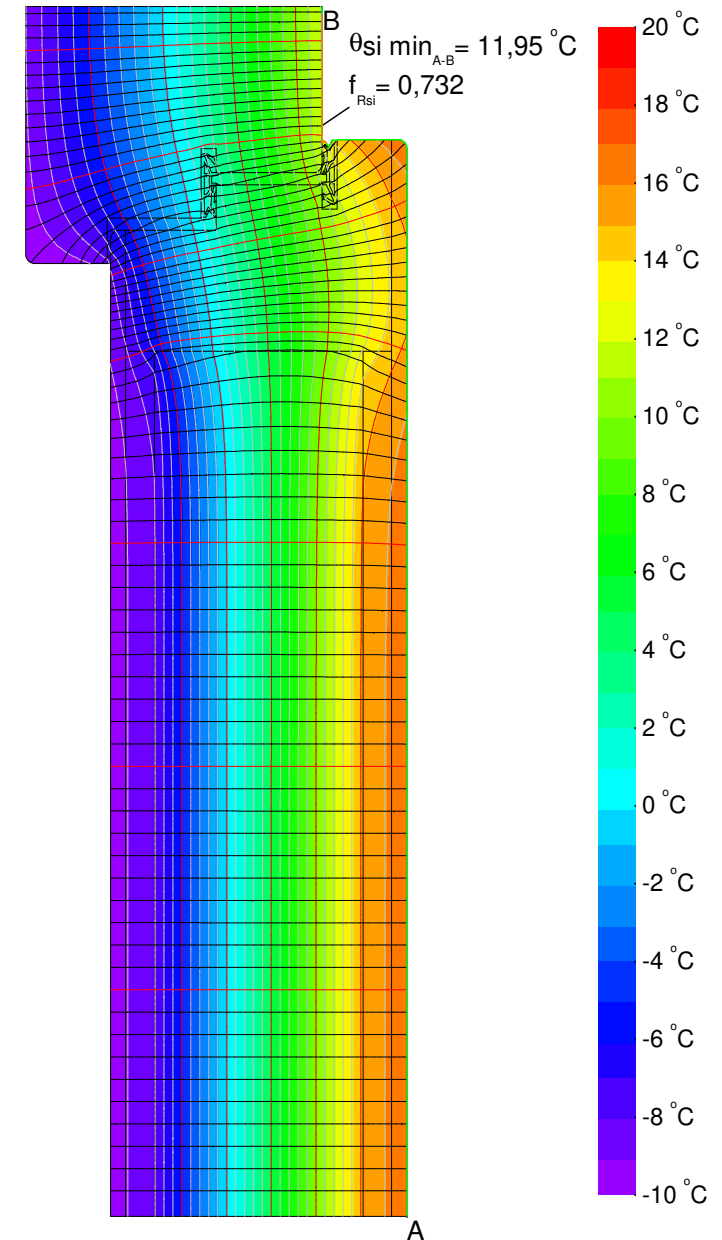
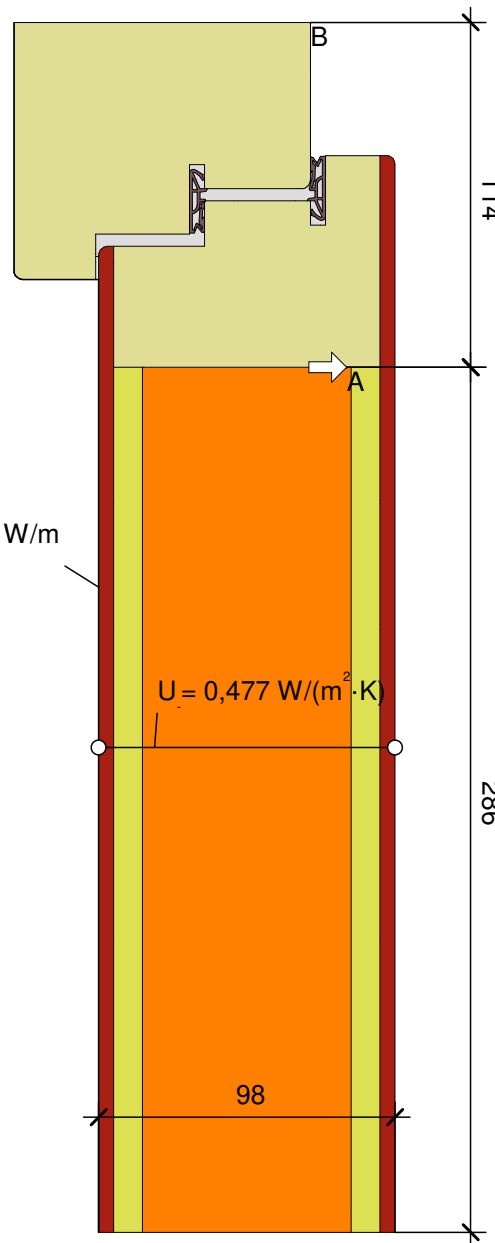
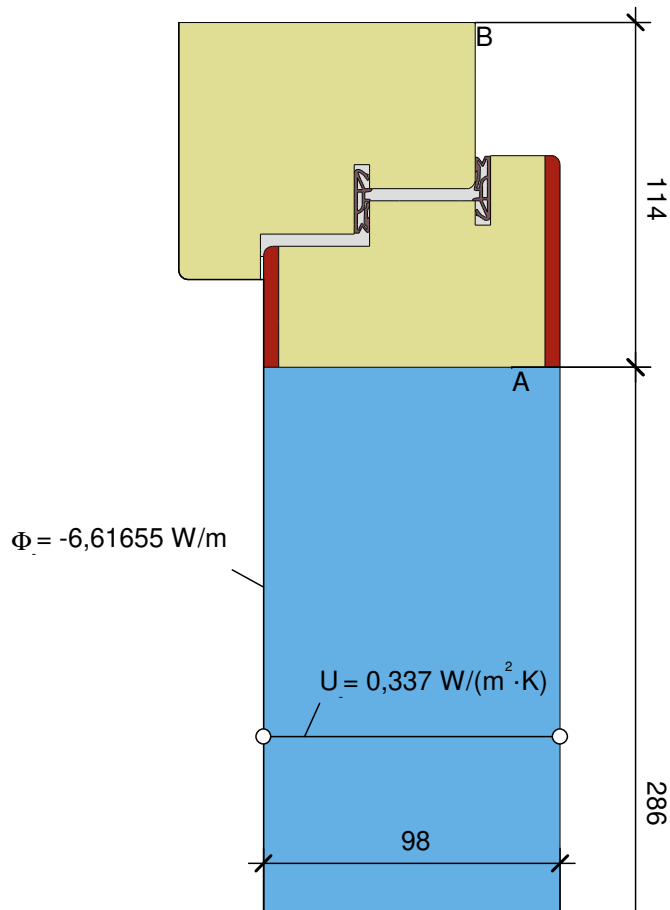
th - THRESHOLD | SCHWELLE



$$\psi_A = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{8,682}{30,000} - 0,477 \cdot 0,320 - 1,688 \cdot 0,080 = 0,002 \text{ W/(m} \cdot \text{K)}$$



$\theta_{si \min_A} = 3,90 \text{ } ^\circ\text{C}$
 $f_{Rst} = 0,463$



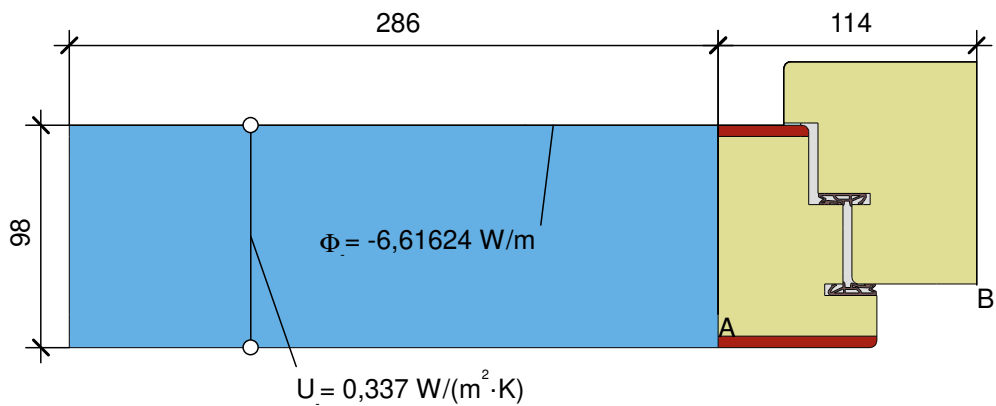
Material	λ [W/(m·K)]	ϵ
EPDM	0,250	0,900
Insulation I Wärmedämmung 040	0,040	
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Unvent. cavity I unbel. Hohlr. **		
Wooden-based material I Holzwerkstoff 0.13	0,130	
slightly vent. cav. I leicht bel. Hohlr. **		
wooden-based material I Holzwerkstoff 0.18	0,180	0,900

** EN ISO 10077-2:2017, 6.4.3

$$U_{f_{A,B}} = \frac{\Phi}{\Delta T} - \frac{U_p \cdot b_p}{b_f} = \frac{6,617}{30,000} - \frac{0,337 \cdot 0,286}{0,114} = 1,090 \text{ W/(m}^2 \cdot \text{K)}$$

to - TOP I OBEN

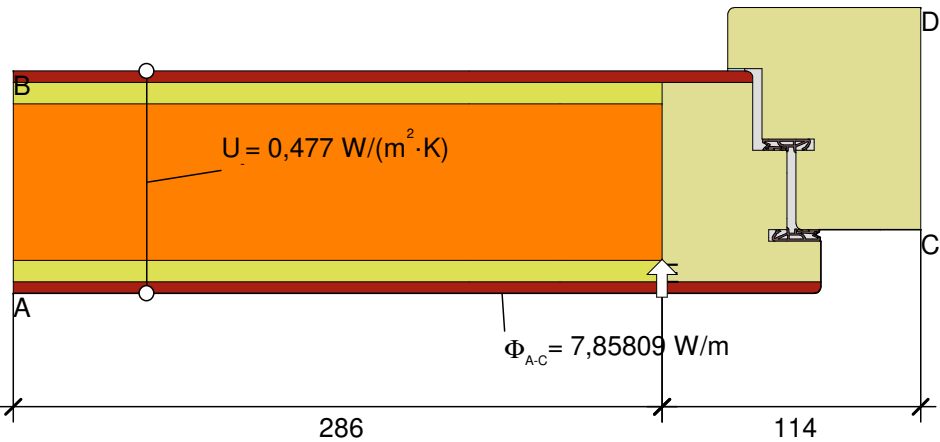
$$\psi_A = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{7,858}{30,000} - 0,477 \cdot 0,286 - 1,090 \cdot 0,114 = 0,001 \text{ W/(m} \cdot \text{K)}$$



$$U_{f,A,B} = \frac{\Phi}{\Delta T} - U_p \cdot b_p = \frac{6,616}{30,000} - 0,337 \cdot 0,286 = \frac{0,000220533}{0,114} = 1,090 \text{ W}/(\text{m}^2 \cdot \text{K})$$

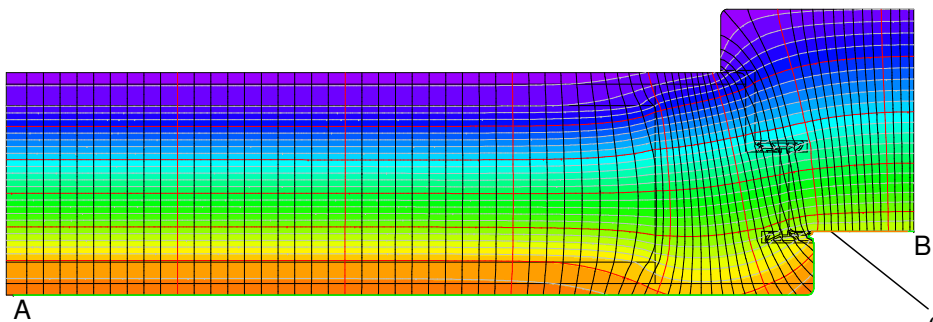
Material	λ [W/(m·K)]	ϵ
EPDM	0,250	0,900
Insulation I Wärmedämmung 040	0,040	
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Unvent. cavity I unbel. Hohlr. **		
Wooden-based material I Holzwerkstoff 0.13	0,130	
slightly vent. cav. I leicht bel. Hohlr. **		
wooden-based material I Holzwerkstoff 0.18	0,180	0,900

** EN ISO 10077-2:2017, 6.4.3



Randbedingung	q [W/m²]	θ [°C]	R [(m²·K)/W]	ϵ
Adiabatic Adiat	0,000			
Exterior Außen		-10,000	0,040	
Interior, frame, normal		20,000	0,130	
Interior, frame, reduced		20,000	0,200	
e 0,9 Cavity Hohraum				0,900

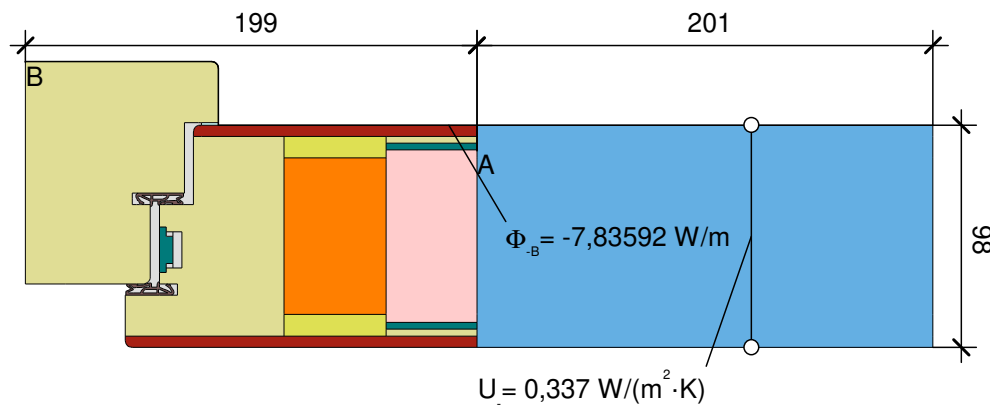
$$\psi_{A-E.C.} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{7,858}{30,000} - 0,477 \cdot 0,286 - 1,090 \cdot 0,114 = 0,001 \text{ W}/(\text{m}^2 \cdot \text{K})$$



Randbedingung	q [W/m²]	θ [°C]	R [(m²·K)/W]	ϵ
Adiabatic Adiat	0,000			
Exterior Außen		-10,000	0,040	
e 0,9 Cavity Hohraum				0,900
fRsi: Interior Innen		20,000	0,250	

$\theta_{si \min_{A-B}} = 11,95 \text{ } ^\circ\text{C}$
 $f_{Rsi} = 0,732$

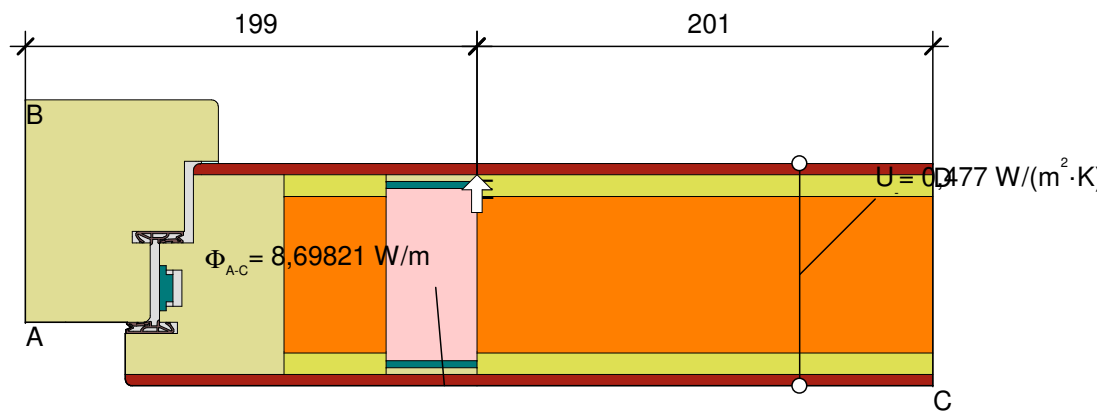
si HINGE SIDE | BANDSEITE



Material	$\lambda[\text{W}/(\text{m} \cdot \text{K})]$	ϵ
Balsa qsenkrecht 0.11 W/(mK)	0,110	
EPDM	0,250	0,900
Insulation I Wärmedämmung 040	0,040	
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. **		
Wooden-based material I Holzwerkstoff 0.13	0,130	
slightly vent. cav. I leicht bel. Hohlr. **		
wooden-based material I Holzwerkstoff 0.18	0,180	0,900

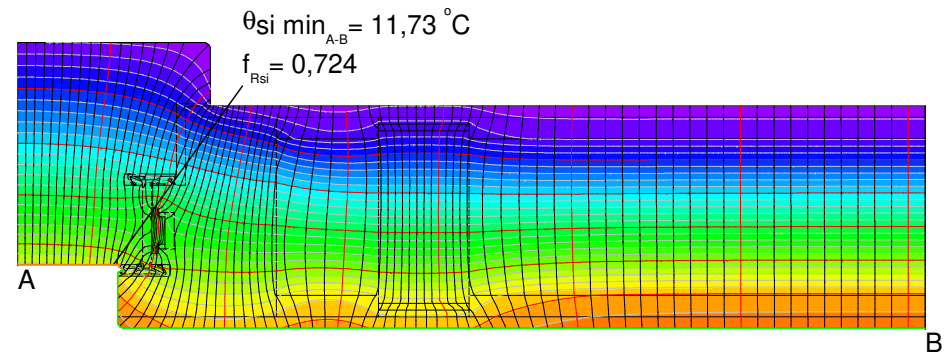
** EN ISO 10077-2:2017, 6.4.3

$$U_{f,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{7,836}{30,000} - 0,337 \cdot 0,201}{0,199} = 0,972 \text{ W}/(\text{m}^2 \cdot \text{K})$$



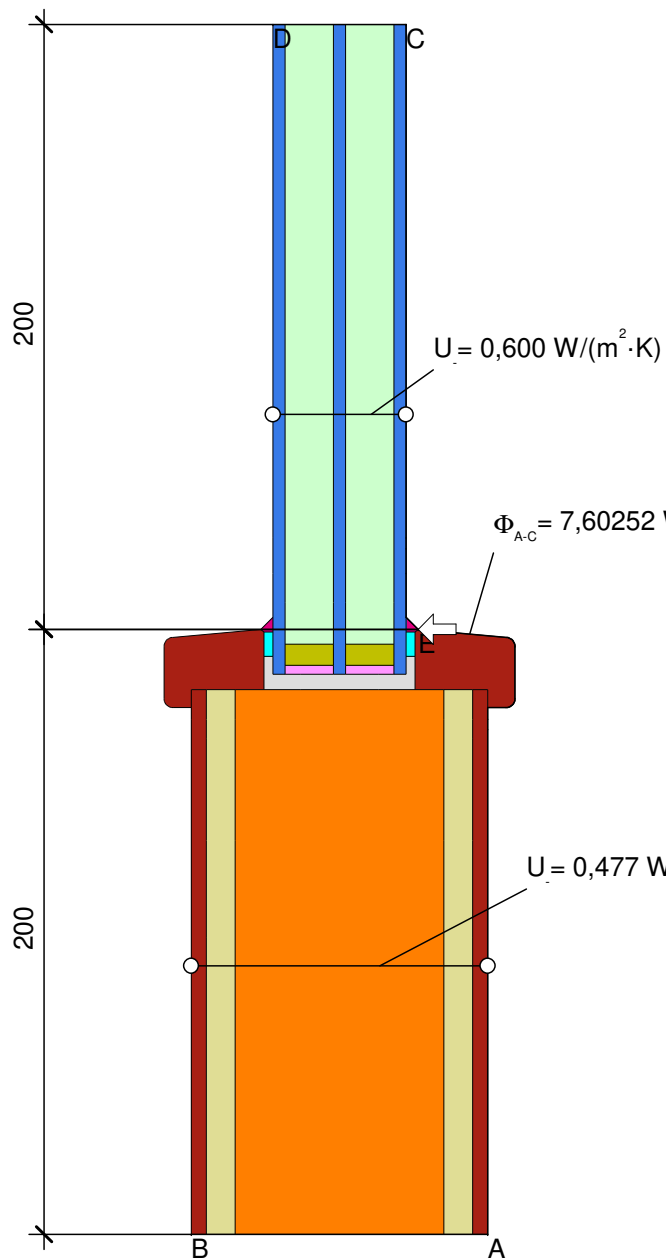
Randbedingung	$q[\text{W}/\text{m}^2]$	$\theta[^\circ\text{C}]$	$R[(\text{m}^2 \cdot \text{K})/\text{W}]$	ϵ
Adiabatic Adiat	0,000			
Exterior Außen		-10,000	0,040	
Interior, frame, normal		20,000	0,130	
Interior, frame, reduced		20,000	0,200	
e 0,9 Cavity I Hohlraum				0,900

$$\psi_{A-E-C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{8,698}{30,000} - 0,972 \cdot 0,199 - 0,477 \cdot 0,201 = 0,001 \text{ W}/(\text{m} \cdot \text{K})$$



Randbedingung	$q[\text{W}/\text{m}^2]$	$\theta[^\circ\text{C}]$	$R[(\text{m}^2 \cdot \text{K})/\text{W}]$	ϵ
Adiabatic Adiat	0,000			
Exterior Außen		-10,000	0,040	
e 0,9 Cavity I Hohlraum				0,900
fRsi: Interior Innen		20,000	0,250	

sh - LOCK SIDE | SCHLOSS SEITE



$U = 0,600 \text{ W}/(\text{m}^2 \cdot \text{K})$

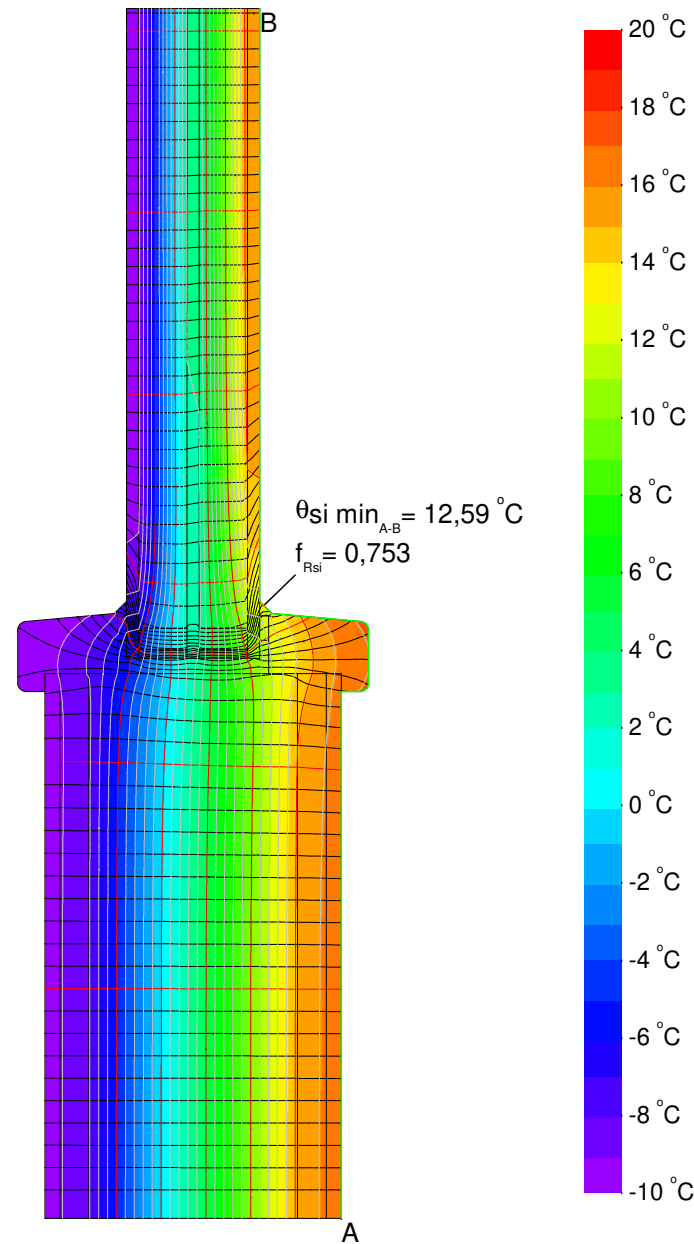
$\Phi_{A-C} = 7,60252 \text{ W/m}$

$U = 0,477 \text{ W}/(\text{m}^2 \cdot \text{K})$

$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{7,603}{30,000} - 0,477 \cdot 0,200 - 0,600 \cdot 0,200 = 0,038 \text{ W}/(\text{m} \cdot \text{K})$$

Material	λ [W/(m·K)]	ϵ
Ar16 in 44mm Ug 0,60	0,022	
Glass Glas	1,000	0,900
Hardwood Hartholz 0.18 700 kg/m3 10456	0,180	0,900
Insulation Wärmedämmung 040	0,040	0,900
Insulation tape Vorlegeband	0,060	0,900
Polysulfide Polysulfid	0,400	0,900
Silicone Silikon	0,350	
Softwood, OSB Weichholz, OSB 10456	0,130	
Thermix LowPsi [cert]	0,155	
Unvent. cavity unbel. Hohlr. **		
wooden-based material Holzwerkstoff 0.18	0,180	

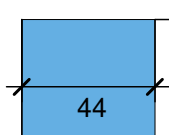
** EN ISO 10077-2:2017, 6.4.3



$\theta_{si \text{ min}}_{A-B} = 12,59 \text{ }^\circ\text{C}$

$f_{Rsi} = 0,753$

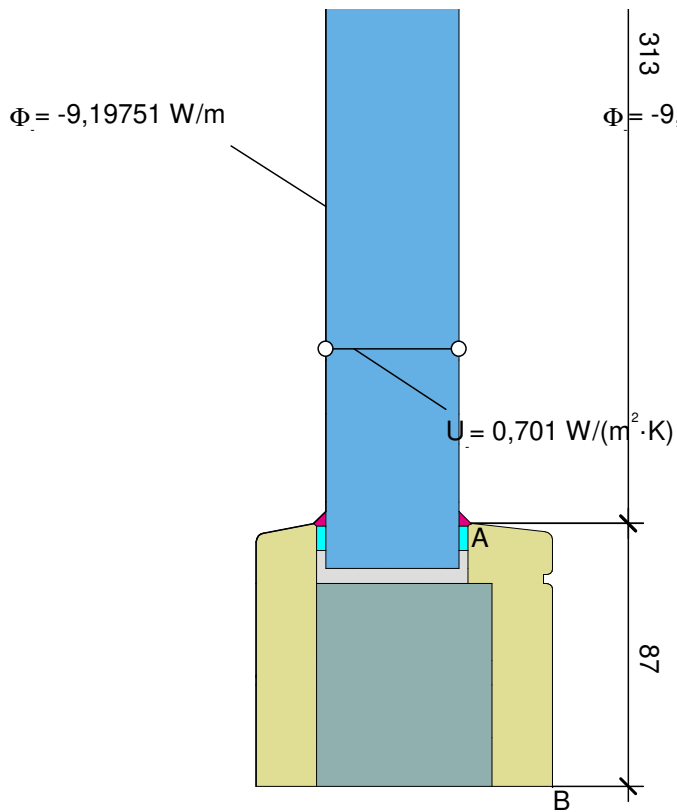
GLASS INSERT | GLASEINSATZ



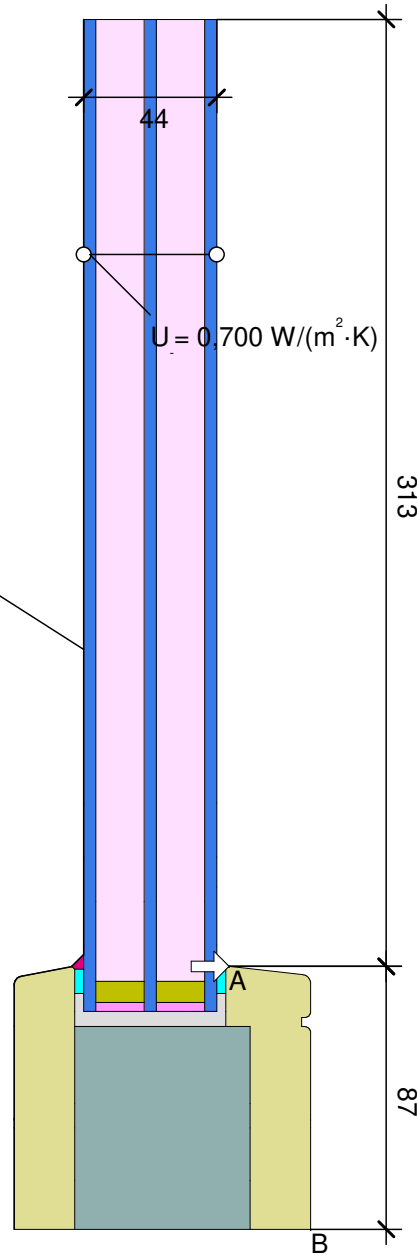
Material

- Ar16 in 44 mm U 0,7
 - Glass | Glas
 - Insulation tape | Vorlegeband
 - Polysulfide | Polysulfid
 - Silicone | Silikon
 - Softwood, OSB | Weichholz, OSB 10456
 - Spruce, Fir | Fichte, Tanne
 - Thermix LowPsi [cert]
 - Unvent. cavity | unbel. Hohlr. **
- ** EN ISO 10077-2:2017, 6.4.3

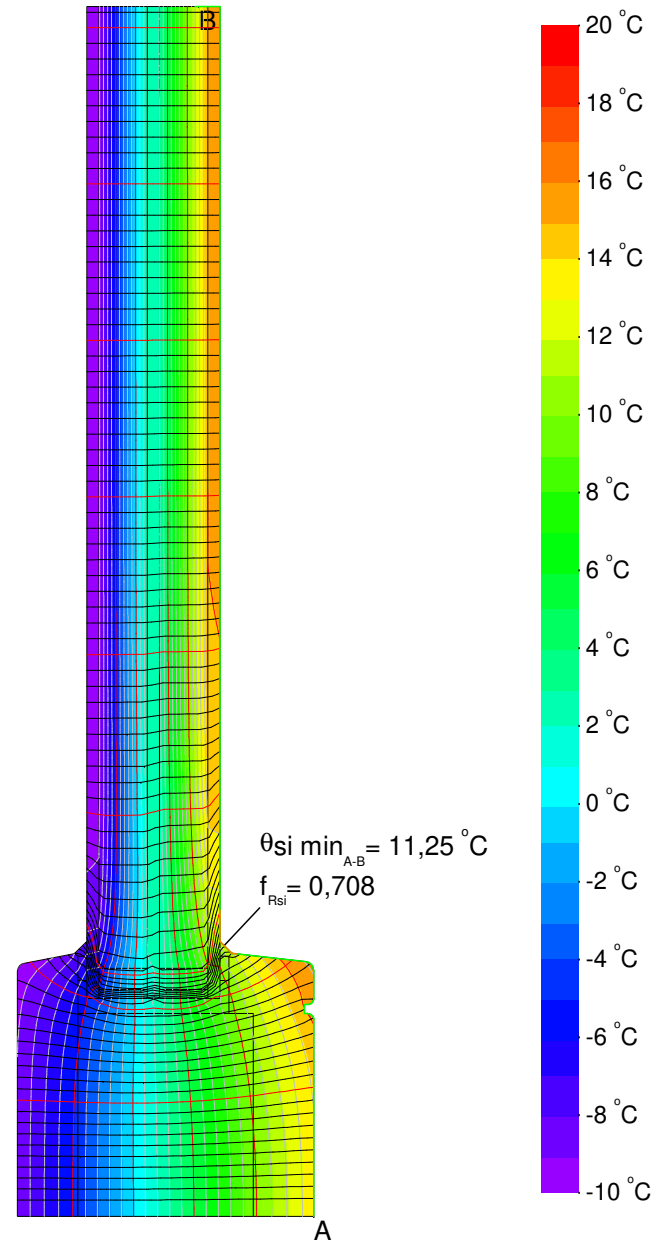
λ [W/(m·K)]	ϵ
0,026	
1,000	0,900
0,060	0,900
0,400	0,900
0,350	
0,130	0,900
0,110	0,900
0,155	



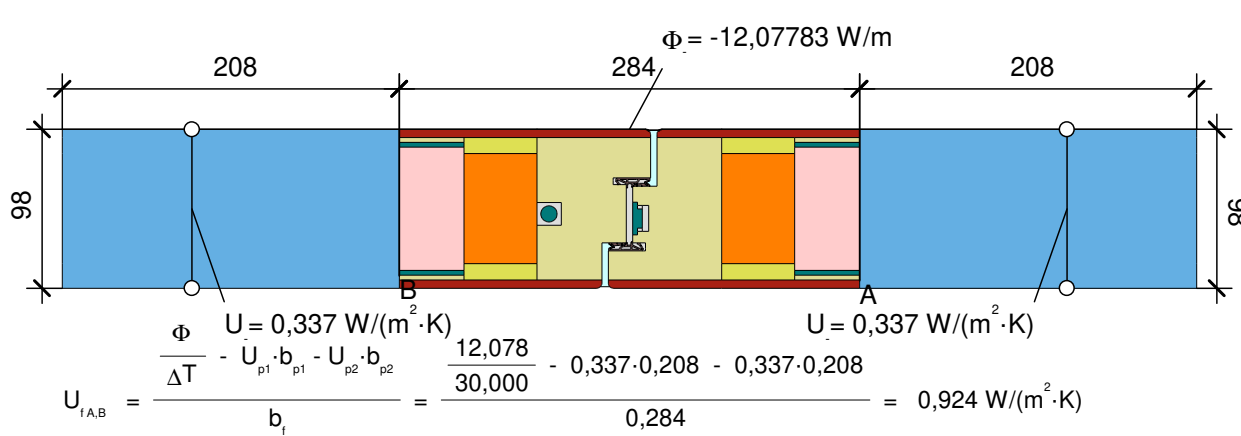
$$U_{f,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{9,198}{30,000} - 0,701 \cdot 0,313}{0,087} = 1,003 \text{ W/(m}^2 \cdot \text{K)}$$



$$\psi_A = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_i \cdot b_i = \frac{9,960}{30,000} - 0,700 \cdot 0,313 - 1,003 \cdot 0,087 = 0,026 \text{ W/(m} \cdot \text{K)}$$



bof BOTTOM FIXED | UNTEN FEST VERGLAST

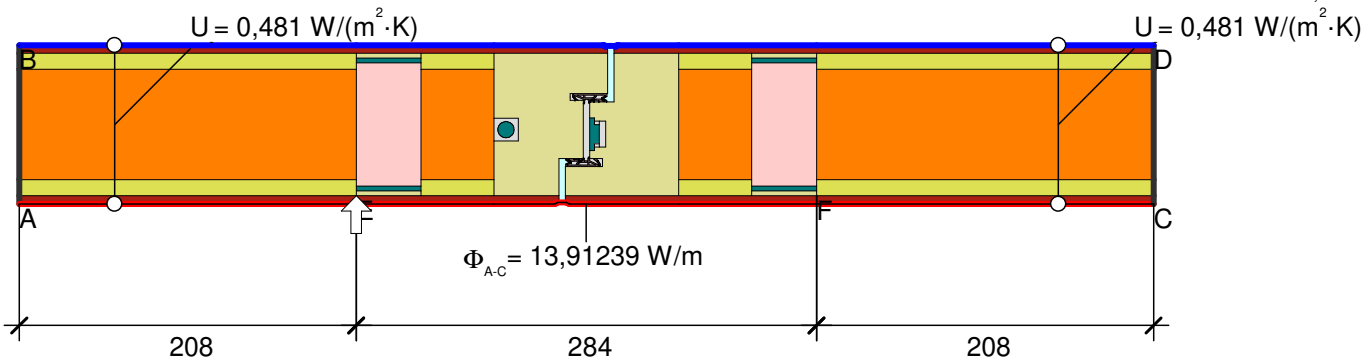


Material	λ [W/(m·K)]	ϵ
Balsa qsenkrecht 0.11 W/(mK)	0,110	
EPDM	0,250	0,900
Insulation I Wärmedämmung 040	0,040	0,900
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. **		
Wooden-based material I Holzwerkstoff 0.13	0,130	
slightly vent. cav. I leicht bel. Hohlr. **		
wooden-based material I Holzwerkstoff 0.18	0,180	0,900

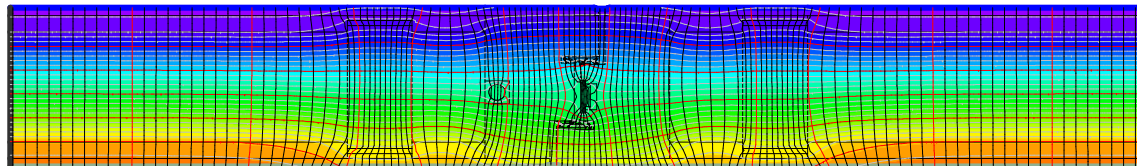
** EN ISO 10077-2:2017, 6.4.3

$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 - U_3 \cdot b_3 = \frac{13,912}{30,000} - 0,481 \cdot 0,208 - 0,924 \cdot 0,284 - 0,481 \cdot 0,208 = 0,001 \text{ W}/(\text{m} \cdot \text{K})$$

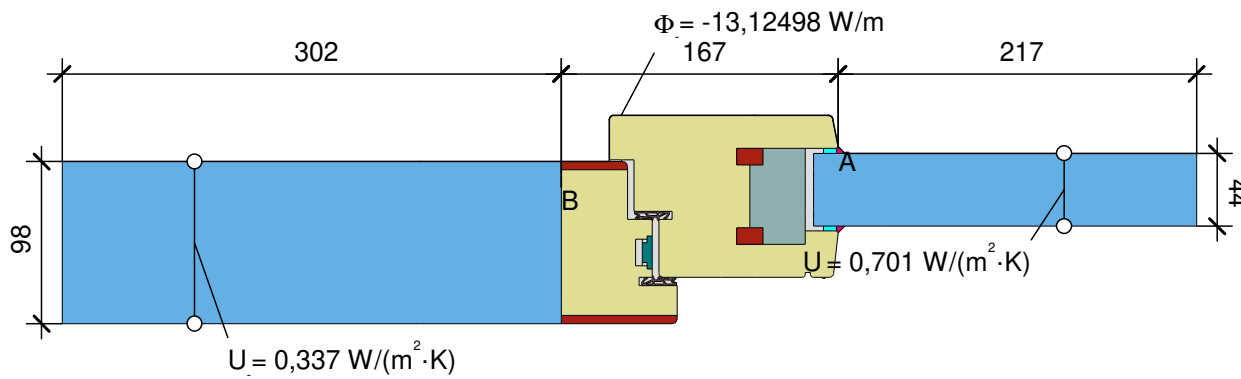
Randbedingung	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiabat	0,000			
Exterior Außen		-10,000	0,040	
Interior, frame, normal e 0,9 Cavity Hohraum		20,000	0,130	0,900



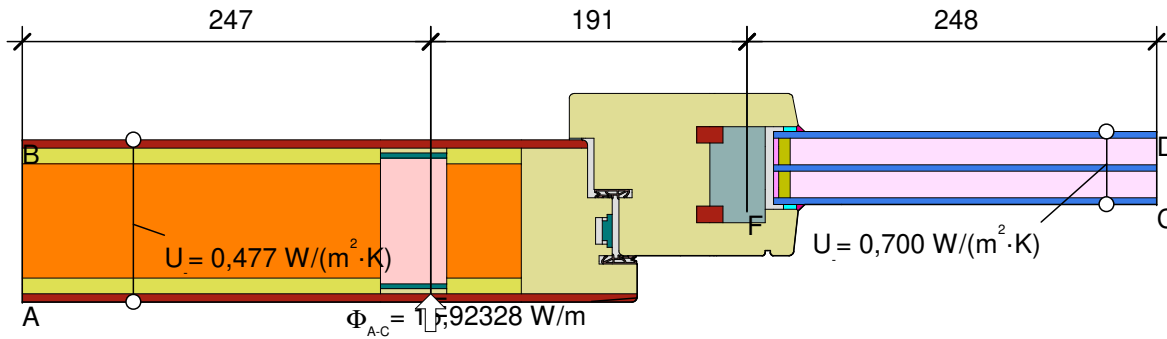
$$\Psi_{(E)} = \Psi_{(F)} = \Psi_{(A-E-C)} / 2 = 0,000 / 2 = 0,000 \text{ W}/(\text{m} \cdot \text{K})$$



Randbedingung	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiabat	0,000			
Exterior Außen		-10,000	0,040	
e 0,9 Cavity Hohraum		20,000	0,250	0,900
fRsi: Interior Innen				

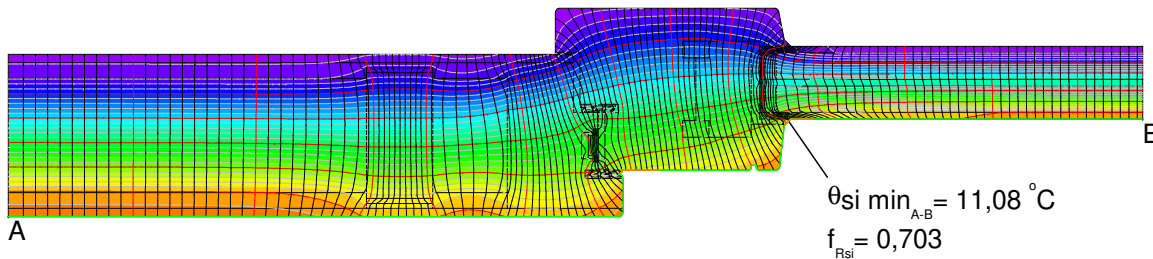


$$U_{f,A,B} = \frac{\Phi}{\Delta T} - \frac{U_{p1} \cdot b_{p1}}{b_i} - \frac{U_{p2} \cdot b_{p2}}{b_i} = \frac{13,125}{30,000} - \frac{0,701 \cdot 0,217}{0,167} - \frac{0,337 \cdot 0,302}{0,167} = 1,100 \text{ W}/(\text{m}^2 \cdot \text{K})$$



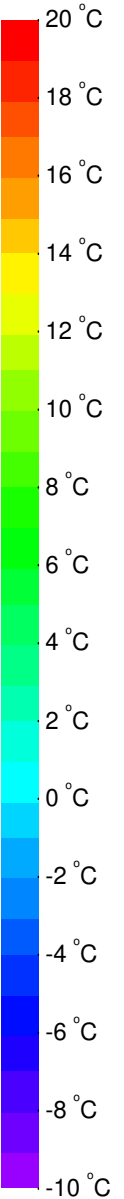
$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 - U_3 \cdot b_3 = \frac{15,923}{30,000} - 0,477 \cdot 0,247 - 1,100 \cdot 0,191 - 0,700 \cdot 0,248 = 0,029 \text{ W}/(\text{m} \cdot \text{K})$$

$$\Psi_{(E)} = \Psi_{(F)} = \Psi_{(A-E-C)} / 2 = 0,029 \text{ W}/(\text{mK}) / 2 = 0,015 \text{ W}/(\text{mK})$$

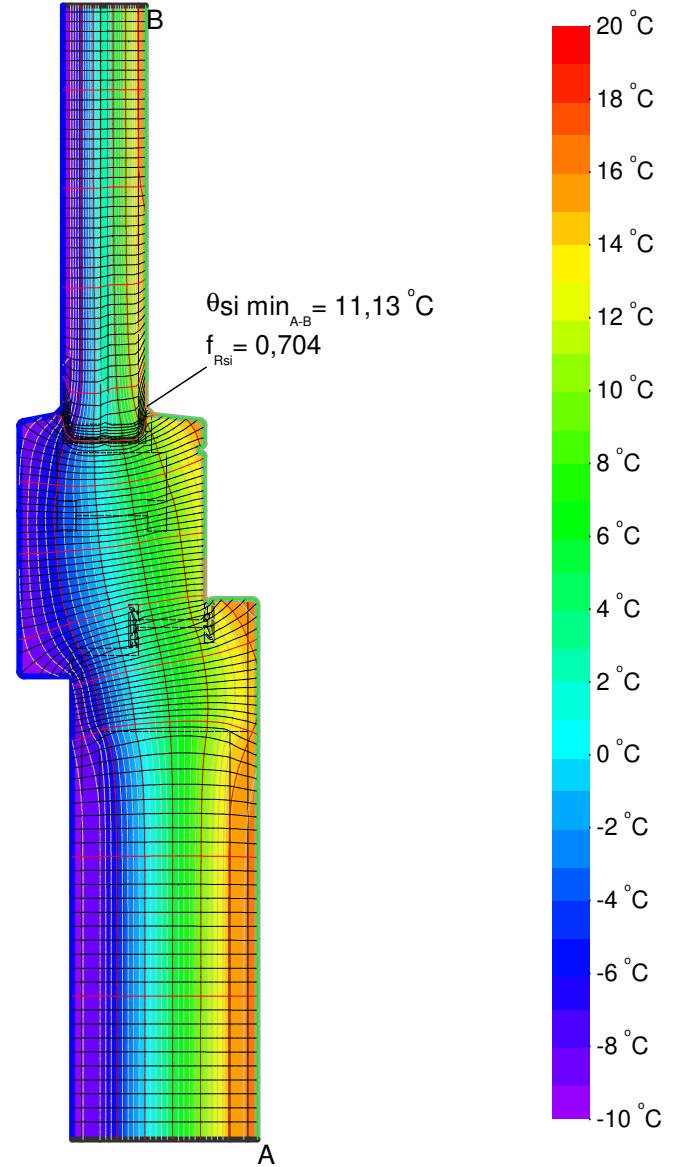
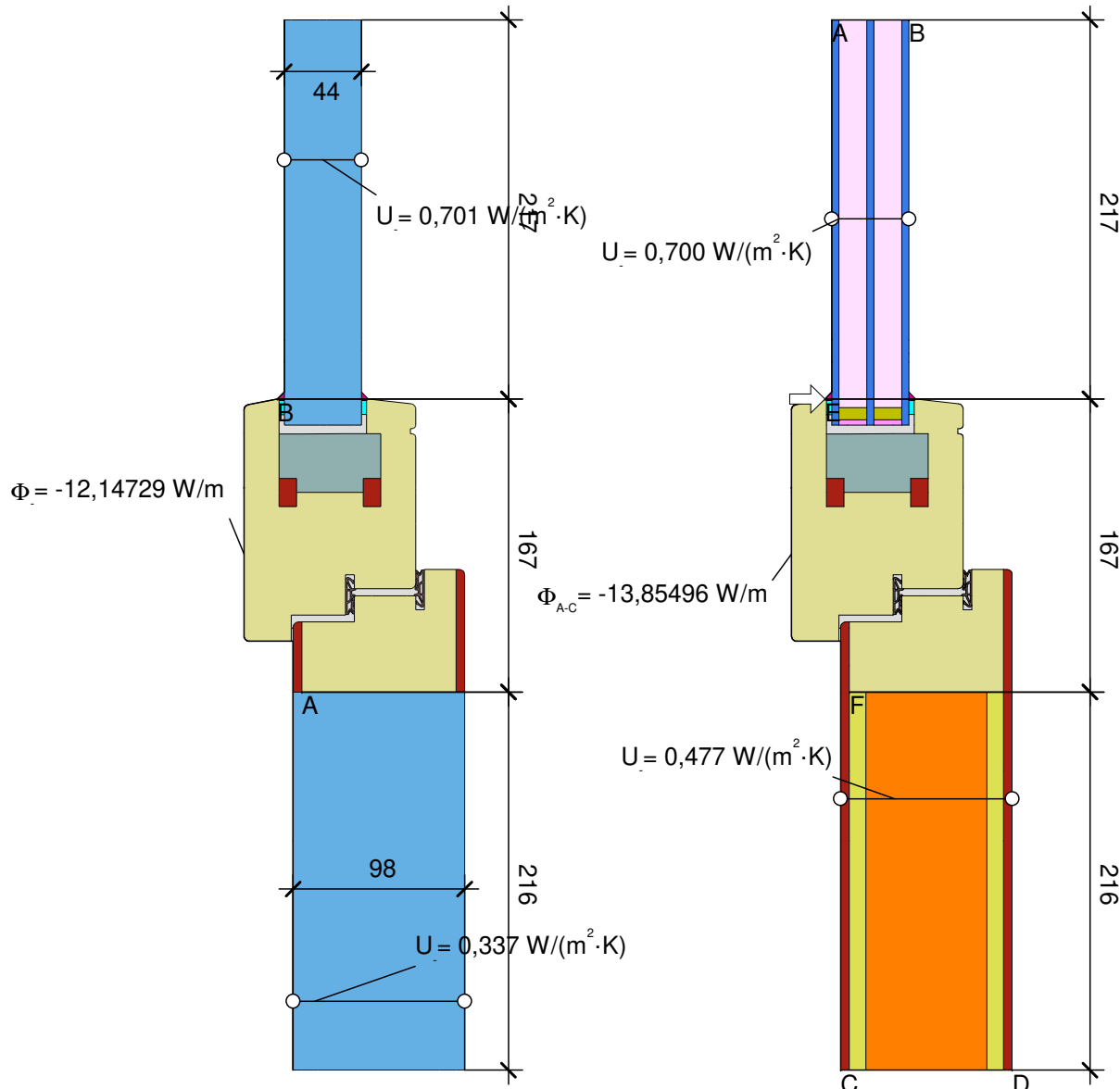


Material

Material	λ [W/(m·K)]	ϵ
Ar16 in 44 mm U 0,7	0,026	
Balsa qsenkrecht 0.11 W/(mK)	0,110	
EPDM	0,250	0,900
Glass Glas	1,000	0,900
Hardwood Hartholz 0.18 700 kg/m3 10456	0,180	
Insulation Wärmedämmung 040	0,040	
Insulation tape Vorlegeband	0,060	0,900
Polysulfide Polysulfid	0,400	0,900
Silicone Silikon	0,350	
Softwood, OSB Weichholz, OSB 10456	0,130	0,900
Spruce, Fir Fichte, Tanne	0,110	0,900
Steel Stahl	50,000	0,900
Thermix LowPsi [cert]	0,155	
Unvent. cavity unbel. Hohlr. **		
Wooden-based material Holzwerkstoff 0.13	0,130	
slightly vent. cav. leicht bel. Hohlr. **		
wooden-based material Holzwerkstoff 0.18	0,180	0,900



m1 MULLION, 1 SASH | PFOSTEN 1 FLÜGEL



$$U_{fA,B} = \frac{\frac{\Phi}{\Delta T} - U_{p1} \cdot b_{p1} - U_{p2} \cdot b_{p2}}{b_f} = \frac{\frac{12,147}{30,000} - 0,337 \cdot 0,216 - 0,701 \cdot 0,217}{0,167} = 1,078 \text{ W}/(\text{m}^2 \cdot \text{K})$$

$$\Psi_{A-E,C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 - U_3 \cdot b_3 = \frac{13,855}{30,000} - 0,700 \cdot 0,217 - 1,008 \cdot 0,167 - 0,477 \cdot 0,216 = 0,038 \text{ W}/(\text{m} \cdot \text{K})$$

$$\Psi_{si}(E) = \Psi_{si}(F) = \Psi_{si}(A-E-C) / 2 = 0,038 / 2 = 0,019 \text{ W}/(\text{m} \cdot \text{K})$$

t1 TRANSOM, 1 SASH | RIEGEL 1 FLÜGEL