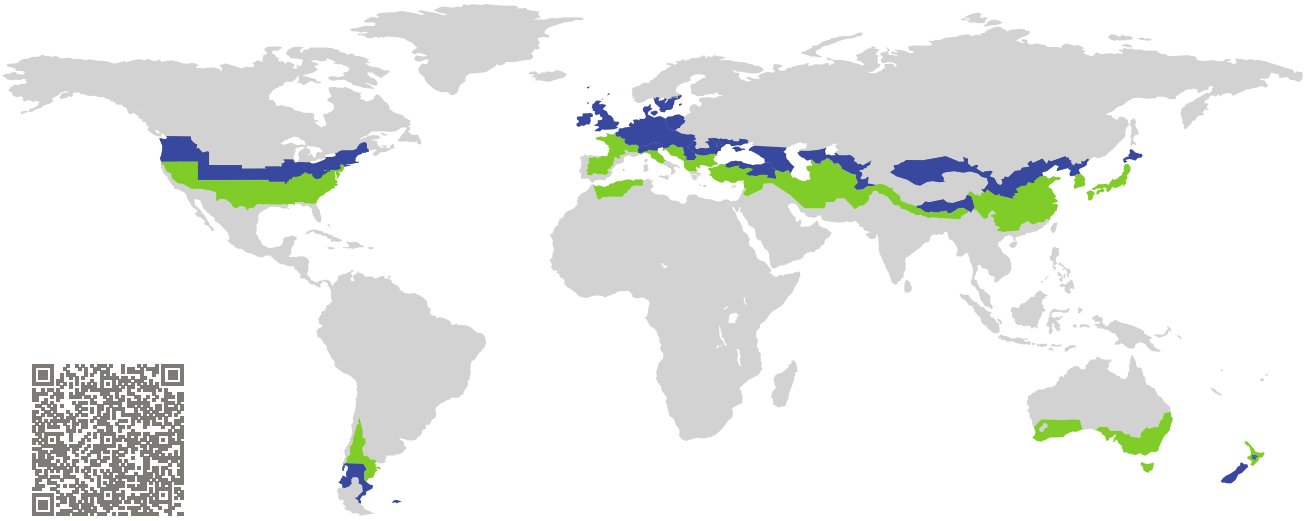
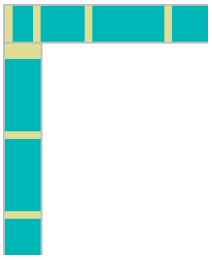
CERTIFICATE

Certified Passive House Component

Component-ID 2155cs03 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany





Category: **Construction system**

Manufacturer: **ERNE AG Holzbau, Laufenburg, Switzerland**

Product name: **Passivhaus-Modulbausystem ERNE**

Hygiene criterion

The mininum temperature factor of the interior surfaces is $f_{Rsi=0.25\,m^2\,K/W} \geq 0.70$

Comfort criterion

The U-value of the installed windows is $U_{wi} \leq 0.85\,W/(m^2\,K)$

Efficiency criteria

Heat transfer coefficient of building envelope: $U * f_{PHI} \leq 0.15\,W/(m^2\,K)$

Temperature factor of opaque junctions: $f_{Rsi=0.25\,m^2\,K/W} \geq 0.86$

Thermal bridge-free design for key connection details: $\Psi \leq 0.01\,W/(m\,K)$

An airtightness concept for all components and connection details was provided.

It was confirmed that the structure will dry out within 12 months and there is no risk of moisture-related damage.

cool, temperate climate

CERTIFIED COMPONENT

Passive House Institute

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Opaque building envelope

The wall elements of the modules consist of a 28 cm wooden frame insulated with mineral wool and with a gypsum fibre board on the inside and outside. Roof elements consist of a 24 cm wooden frame insulated with mineral wool with OSB boards on both sides and 8 cm insulation on top. Floor elements consist of a 30 cm wooden frame insulated with mineral wool, a flooring structure on top and a fibre cement board on the bottom. The 3D-modules are placed on point or linear footings with an air layer between the elements and the ground.

Windows

For the analysis of the consctruction system a wood-aluminium window AC 20 PH from Vilstal was used. This window is featuring a Chromatech Ultra F spacer and a polysulfide secondary seal. The calculations show that the window installations are suited to the cool-temperate climate zone, with no risk of surface condensation or subsequent mould growth.

Airtightness concept

Airtightness is achieved through the inner gypsum fibre board layer. At the seams a strip of the gypsum fibre board is left out, the seams are taped with airtight tape and the strip is inserted. Connections to the window frames are also connected with airtight tape.

Summary of values

Opaque assemblies		U-value W/(m² K)	Thickness mm
exterior wall	(EW1) 	0.15	310
flat roof	(FR1) 	0.13	360
floor slab	(FS1) 	0.13	374

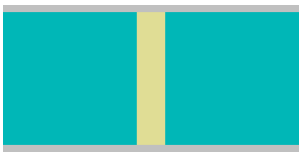
Frame Cuts with ”AC 20 PH” from ”FT-Vilstal GmbH” (1986wi03)					
Frame values		Frame width b_f mm	U-value frame U_f W/(m^2 K)	Ψ-glazing edge Ψ_g W/(m K)	Temp. Factor $f_{Rsi=0.25}$ [-]
Bottom	(OB1) 	131	0.68	0.034	0.74
Top	(OH1) 	123	0.66	0.034	0.74
Lateral	(OJ1) 	123	0.66	0.034	0.74
Spacer: CHROMATECH ultra F			Secondary seal: Polysulfide		

Frame Cuts with ”Standard window - cool-temperate” from ”dummy window manufacturer” (0002)					
Frame values		Frame width b_f mm	U-value frame U_f W/(m^2 K)	Ψ-glazing edge Ψ_g W/(m K)	Temp. Factor $f_{Rsi=0.25}$ [-]
Threshold	(OT1) 	100	0.98	0.032	0.65
Spacer: PHI phA Spacer			Secondary seal: Polysulfide		

Junctions	U1 U2 U3 W/(m² K)	Ψ-value Ψ W/(m K)	Temp. factor $f_{Rsi=0.25}$ [-]
Window jamb operable window to exterior wall corner (EW1_EW1_OJ1_ec_1) 	0.15 0.15 0.66	0.009	0.793
Window jamb operable window in exterior wall with panel joint (EW1_EW1_OJ1_pj_1) 	0.15 0.15 0.66	0.024	0.810
Ceiling integration into exterior wall (EW1_EW1_CE_1) 	0.15 0.15	0.047	0.853
Exterior corner exterior wall (EW1_EW1_ec_1) 	0.15 0.15	–0.022	0.837
Interior corner exterior wall (EW1_EW1_ic_1) 	0.15 0.15	0.068	0.931
Panel joint exterior wall (EW1_EW1_pj_1) 	0.15 0.15	0.014	0.932
Panel joint exterior wall (EW1_EW1_pj_1) 	0.15 0.15	0.012	0.937
Window head operable window in exterior wall to flat roof with shading box (EW1_FR1_OH1_rp_sb_1) 	0.15 0.13 0.66	0.040	0.805
Roof parapet flat roof (EW1_FR1_rp_1) 	0.15 0.13	–0.031	0.842
Window bottom operable window in exterior wall (EW1_OB1_1) 	0.15 0.68	0.033	0.798
Window head operable window in exterior wall with ceiling integration and shading box (EW1_OH1_CE_sb_1) 	0.15 0.66	0.026	0.806
Window jamb operable window in exterior wall (EW1_OJ1_1) 	0.15 0.66	0.014	0.809
Panel joint flat roof (FR1_FR1_pj_1) 	0.13 0.13	0.008	0.944
Threshold to floor slab (FS1_EW1_OT1_1) 	0.13 0.15 0.98	–0.021	0.759
Exterior wall plinth on floor slab (FS1_EW1_1) 	0.13 0.15	–0.030	0.832
Panel joint floor slab (FS1_FS1_pj_1) 	0.13 0.13	0.006	0.966

Opaque Assemblies

exterior wall (EW1)

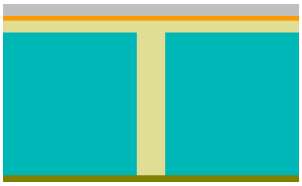


Material	Lambda W/(m K)	Thickness (mm)
fibre-cement board	0.350	15
insulation 036 + 9.4% softwood, OSB – perpendicular to grain direction	0.045	280
fibre-cement board	0.350	15
	Total thickness: 310 mm	
	Rsi: 0.13 m^2 K/W	
	Rse: 0.13 m^2 K/W	
	U-value: 0.15 W/(m^2 K)	

flat roof (FR1)

Material	Lambda W/(m K)	Thickness (mm)
Insulation 040	0.040	80
softwood, OSB – perpendicular to grain direction	0.130	25
ERNE FR1 Insulation & wood	0.044	240
softwood, OSB – perpendicular to grain direction	0.130	15
	Total thickness: 360 mm	
	Rsi: 0.10 m^2 K/W	
	Rse: 0.04 m^2 K/W	
	U-value: 0.13 W/(m^2 K)	

floor slab (FS1)

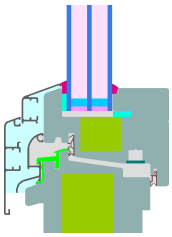


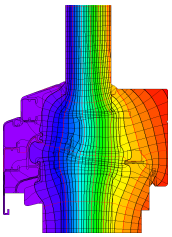
Material	Lambda W/(m K)	Thickness (mm)
FERMACELL gypsum fibre board	0.320	25
Insulation 040	0.040	10
softwood, OSB – perpendicular to grain direction	0.130	25
insulation 036 + 9.4% softwood, OSB – perpendicular to grain direction	0.045	300
fibre-cement board	0.350	14
	Total thickness: 374 mm	
	Rsi: 0.17 m^2 K/W	
	Rse: 0.17 m^2 K/W	
	U-value: 0.13 W/(m^2 K)	

Frame Cuts with ”AC 20 PH” from ”FT-Vilstal GmbH” (1986wi03)

Bottom

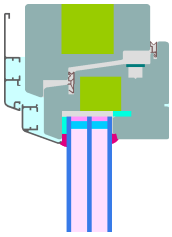
b_f = 131 mm
U_f = 0.68 W/(m^2 K)
Ψ_g = 0.034 W/(m K)
f_{Rsi} = 0.74

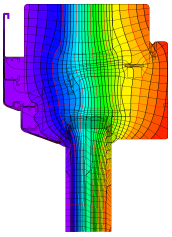




Top

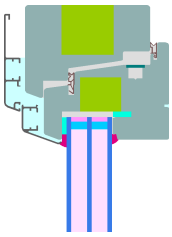
b_f = 123 mm
U_f = 0.66 W/(m^2 K)
Ψ_g = 0.034 W/(m K)
f_{Rsi} = 0.74

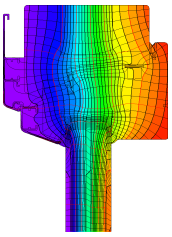




Lateral

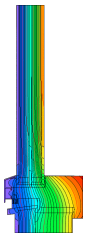
b_f = 123 mm
U_f = 0.66 W/(m^2 K)
Ψ_g = 0.034 W/(m K)
f_{Rsi} = 0.74





Threshold

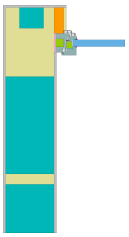
b_f = 100 mm
U_f = 0.98 W/(m^2 K)
Ψ_g = 0.032 W/(m K)
f_{Rsi} = 0.65

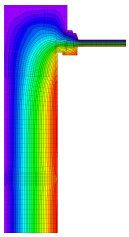


Window jamb

operable window to exterior wall corner (EW1_EW1_OJ1_ec_1)

U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
U_{OJ1} = 0.66 W/(m² K)
Ψ = 0.009 W/(m K)
f_{Rsi} = 0.793

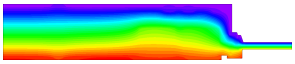




Window jamb

operable window in exterior wall with panel joint (EW1_EW1_OJ1_pj_1)

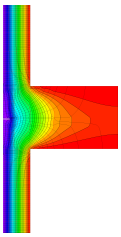
U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
U_{OJ1} = 0.66 W/(m² K)
Ψ = 0.024 W/(m K)
f_{Rsi} = 0.810



Ceiling integration

into exterior wall (EW1_EW1_CE_1)

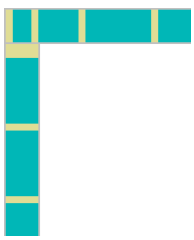
U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = 0.047 W/(m K)
f_{Rsi} = 0.853

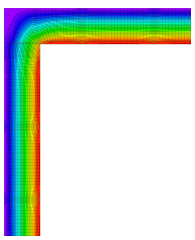


Exterior corner

exterior wall (EW1_EW1_ec_1)

U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = –0.022 W/(m K)
f_{Rsi} = 0.837

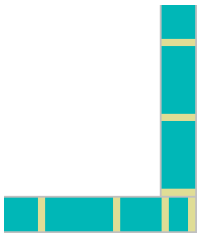
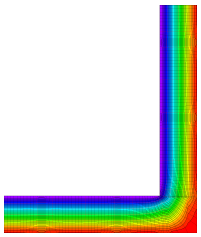




Interior corner

exterior wall (EW1_EW1_ic_1)

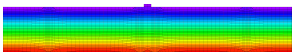
U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = 0.068 W/(m K)
f_{Rsi} = 0.931

Panel joint

exterior wall (EW1_EW1_pj_1)

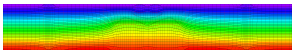
U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = 0.014 W/(m K)
f_{Rsi} = 0.932

Panel joint

exterior wall (EW1_EW1_pj_1)

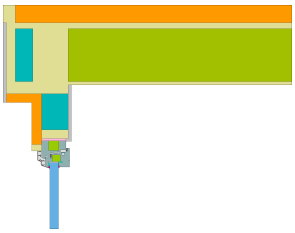
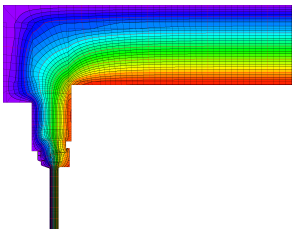
U_{EW1} = 0.15 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = 0.012 W/(m K)
f_{Rsi} = 0.937

Window head

operable window in exterior wall to flat roof with shading box (EW1_FR1_OH1_rp_sb_1)

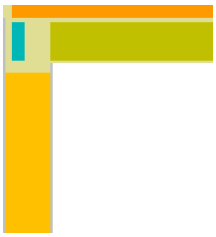
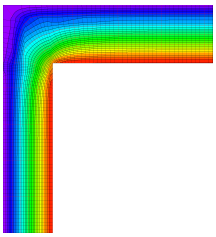
U_{EW1} = 0.15 W/(m² K)
U_{FR1} = 0.13 W/(m² K)
U_{OH1} = 0.66 W/(m² K)
Ψ = 0.040 W/(m K)
f_{Rsi} = 0.805

Roof parapet

flat roof (EW1_FR1_rp_1)

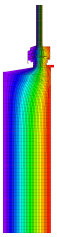
U_{EW1} = 0.15 W/(m² K)
U_{FR1} = 0.13 W/(m² K)
Ψ = –0.031 W/(m K)
f_{Rsi} = 0.842

Window bottom

operable window in exterior wall (EW1_OB1_1)

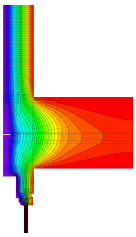
U_{EW1} = 0.15 W/(m² K)
U_{OB1} = 0.68 W/(m² K)
Ψ = 0.033 W/(m K)
f_{Rsi} = 0.798



Window head

operable window in exterior wall with ceiling integration and shading box (EW1_OH1_CE_sb_1)

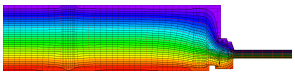
U_{EW1} = 0.15 W/(m² K)
U_{OH1} = 0.66 W/(m² K)
Ψ = 0.026 W/(m K)
f_{Rsi} = 0.806



Window jamb

operable window in exterior wall (EW1_OJ1_1)

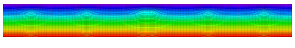
U_{EW1} = 0.15 W/(m² K)
U_{OJ1} = 0.66 W/(m² K)
Ψ = 0.014 W/(m K)
f_{Rsi} = 0.809



Panel joint

flat roof (FR1_FR1_pj_1)

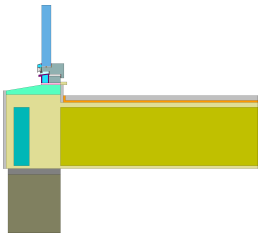
U_{FR1} = 0.13 W/(m² K)
U_{FR1} = 0.13 W/(m² K)
Ψ = 0.008 W/(m K)
f_{Rsi} = 0.944

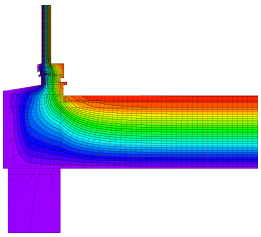


Threshold

to floor slab (FS1_EW1_OT1_1)

U_{FS1} = 0.13 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
U_{OT1} = 0.98 W/(m² K)
Ψ = –0.021 W/(m K)
f_{Rsi} = 0.759

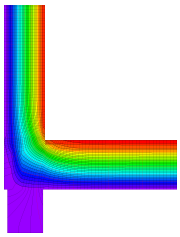




Exterior wall plinth

on floor slab (FS1_EW1_1)

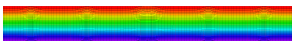
U_{FS1} = 0.13 W/(m² K)
U_{EW1} = 0.15 W/(m² K)
Ψ = –0.030 W/(m K)
f_{Rsi} = 0.832



Panel joint

floor slab (FS1_FS1_pj_1)

U_{FS1} = 0.13 W/(m² K)
U_{FS1} = 0.13 W/(m² K)
Ψ = 0.006 W/(m K)
f_{Rsi} = 0.966



Disclaimer: The Passive House Institute GmbH (PHI) carries out heat transfer analyses according to the standards set out in the document "Criteria and Algorithms for Certified Passive House Components: Opaque Construction Systems" and based on information provided by the manufacturer. It is the responsibility of the project leader, e.g. the architect to ensure the appropriate assessments have been carried out for specific buildings, which may include more detailed analyses than those carried out for this certification. Use of a certified Passive House component does not guarantee that a construction project will achieve the Passive House, EnerPHit or PHI Low Energy Building standard. In all cases full details are to be made available by the manufacturer on request to the engaged certified Passive House designer or certifier, who will be permitted to check these against the construction information and to perform on-site checks as part of the quality assurance process.