CERTIFICATE

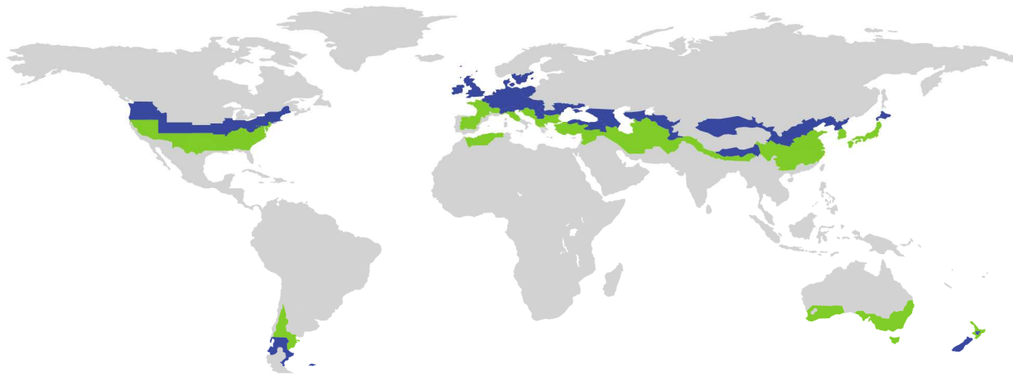
Certified Passive House Component

ID: 0842ws03 valid until 31. December 2018

Passive House Institute
Dr. Wolfgang Feist
64342 Darmstadt
GERMANY

Aditional thermal bridges

Name	Thermal bridge	f_{Rsi}	Description
EWPA01	X= 0.002 W/K	0.99	Punkctual thermal bridge wall-anchor
ROPA01	X= 0.003 W/K	0.97	Anchor-screw trough external insulation



Catregory **Construction system | EnerPHit insulation system**
Manufacturer **pro Passivhausfenster GmbH**
Oberaudorf
GERMANY
Product name **smartshell reno**

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

Hygiene criterion

The minimum temperature factor of the interior surfaces is $f_{Rsi=0,25m^2K/W} \geq$ **0.70**

Comfort criterion

The U-value of the installed windows is $U_{W,i} \leq$ **0.85** W/(m²K)

Efficiency criteria

Heat transfer coefficient of building envelope $U*f_{PHI} \leq$ **0.15** W/(m²K)
Temperaturfactor of opaque junctions $f_{Rsi=0,25m^2K/W} \geq$ **0.86**
Thermal bridge free design for key connection details $\Psi \leq$ **0.01** W/(m²K)

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

cool, temperate climate

CERTIFIED COMPONENT
Passive House Institute

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Opaque building envelop

The system is dedicated as an additional external insulation for existing buildings. For the certification it was assumed, that the flor slap is enhanced by a PU-foam insulation.
The thermal quality of the walls is improved by an exterior insulation. A plastered wood fiber board is located on the very outside of the new insulation layer. It is connected to the existing walls via timber beams and punctual anchors. The space in between the old wall and the wood fiber board is filled with cellulose.
An additional insulation layer outside the existing roof construction in combination with a cellulose infill insulation between the rafters reduces the thermal losses of the roof.

Windows

The certification was done with the window smartwin solar I², which is a very slim phA-class window with triple 18 mm argon glazing, Swisspacer Ulti-mate spacer bar with PU secondary seal. A special feature of smatwin solar I² is, that the reveal becomes part of the windows frame.
In No. 01, the window is installed in flush with the exterior plaster.
In No. 02, it is installed deeper in the wall.
In No. 03, the windows are installed right at the edge of the existing wall, see certification report.

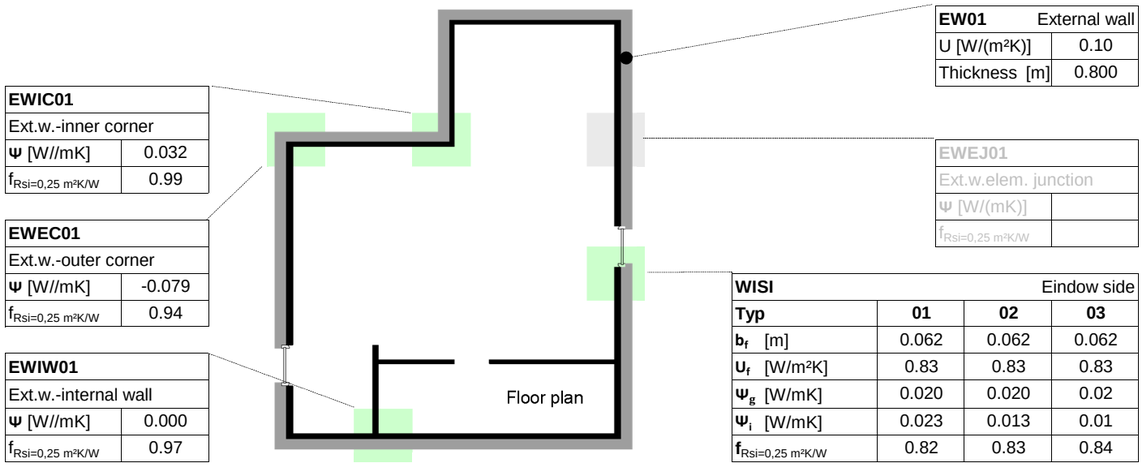
Airtightness concept

The airtightness layer in the walls is the improved external plaster. The plaster and the windows as well as other junctions are connected via airtight-ness tapes. In the roof, an OSB-board at the room-side of the construction serves as airtightness lay-er. The boards are connected by an airtightness tape.

Explainatory notes

The Passive House Institute has defined international component criteria for seven climate zones based on hygiene-, comfort- and affordability criteria. In principle, components which have been certified for climate zones with higher requirements may also be used in climates with less stringent requirements. This use might make sense in certain circumstances.

Thermal bridge not calculated
Criteria achieved
Efficieny driteria not achieved
Hygiene- or comfortcriterion not achieved



EWIC01	
Ext.w.-inner corner	
Ψ [W//mK]	0.032
$f_{Rsi=0,25\ m²K/W}$	0.99

EWEC01	
Ext.w.-outer corner	
Ψ [W//mK]	-0.079
$f_{Rsi=0,25\ m²K/W}$	0.94

EWIW01	
Ext.w.-internal wall	
Ψ [W//mK]	0.000
$f_{Rsi=0,25\ m²K/W}$	0.97

EW01 External wall	
U [W/(m²K)]	0.10
Thickness [m]	0.800

EWEJ01	
Ext.w.elem. junction	
Ψ [W/(mK)]	
$f_{Rsi=0,25\ m²K/W}$	

WISI Eindow side			
Typ	**01**	**02**	**03**
b_f [m]	0.062	0.062	0.062
U_f [W/m²K]	0.83	0.83	0.83
$Ψ_g$ [W/mK]	0.020	0.020	0.02
$Ψ_i$ [W/mK]	0.023	0.013	0.01
$f_{Rsi=0,25\ m²K/W}$	0.82	0.83	0.84

ROVE01	
Verge	
Ψ [W//mK]	-0.074
$f_{Rsi=0,25\ m²K/W}$	0.95

ROIW01	
Roof - internal wall	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

RWSI01	
Roof window top	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

EWCE01	
Ext.w.-ceiling	
Ψ [W//mK]	0.007
$f_{Rsi=0,25\ m²K/W}$	0.98

RO01 Roof	
U [W/(m²K)]	0.10
Thickness [m]	0.420

WITH01	
Window threshold	
b_f [m]	0.067
U_f [W/m²K]	1.03
$Ψ_e$ [W/mK]	0.020
$Ψ_i$ [W/mK]	-0.103
$f_{Rsi=0,25\ m²K/W}$	0.79
$U_{w,i}$ [W//m²K]	**0.78**

FS01 Floor slab	
U [W/(m²K)]	0.25
Thickness [m]	0.310

FSIW01	
Fl.slab-intern.w	
Ψ [W//mK]	0.196
$f_{Rsi=0,25\ m²K/W}$	0.80

Cross section

BW01 Basement wall	
U [W/(m²K)]	
Thickness [m]	

FS02 Floor slab	U [W/(m²K)]		Thickness [m]	

WITO Window top			
Typ	**01**	**02**	**03**
b_f [m]	0.062	0.062	0.062
U_f [W/m²K]	0.83	0.83	0.83
$Ψ_g$ [W/mK]	0.020	0.020	0.020
$Ψ_i$ [W/mK]	0.022	0.013	0.09
$f_{Rsi=0,25\ m²K/W}$	0.82	0.83	0.84

WIBO Window bottom			
b_f [m]	0.062	0.062	0.062
U_f [W/m²K]	0.93	0.93	0.93
$Ψ_g$ [W/mK]	0.020	0.020	0.020
$Ψ_i$ [W/mK]	0.028	0.023	0.033
$f_{Rsi=0,25\ m²K/W}$	0.82	0.80	0.81
$U_{w,i}$ [W//m²K]	**0.85**	**0.83**	**0.83**

BWBC01 Basem.w.-basem.c.	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

BWFS01 Basem.w.-floor slab	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

FSBW01 Fl.slab-basem.w.	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

ROEA01 Eaves	
Ψ [W//mK]	-0.031
$f_{Rsi=0,25\ m²K/W}$	0.95

RWBO01 Roof window bottom	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

RWTO01 Roof window side	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

RORI01 Ridge	
Ψ [W//mK]	-0.030
$f_{Rsi=0,25\ m²K/W}$	0.95

FRAW01	
Flat r. - asc. wall	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

TC01 Top ceiling	
U [W/(m²K)]	
Thickness [m]	

ROJU01 Junction	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

FR01 Flat roof	
U [W/(m²K)]	
Thickness [m]	

EO01 Overhang	
U [W/(m²K)]	
Thickness [m]	

TCEA01 Top ceiling - eaves	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

EWEO01 Ext.w. overhang	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

BC01 Basement ceiling	
U [W/(m²K)]	
Thickness [m]	

Longitudinal section

EWEO02 Ext.w. overhang	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

BCEW01 Basem.ce.-EW	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

FRRP01 Roof parapet	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

FSEW01 Floor slab-ext.w.	
Ψ [W//mK]	-0.038
$f_{Rsi=0,25\ m²K/W}$	0.77

FSBW02 Fl.slab-basem.w.	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

BCIW01 Basem.ce.-IW	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	