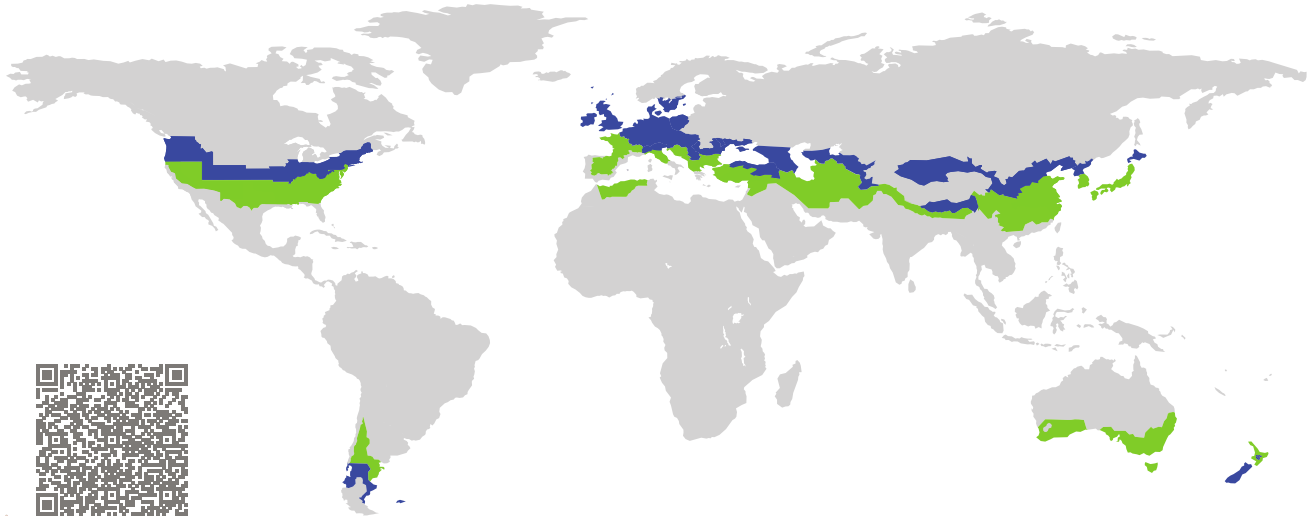


# CERTIFICATE

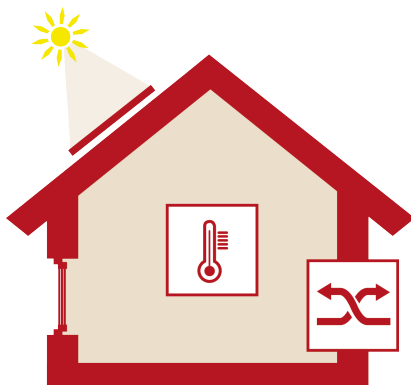
Certified Passive House Component

Component-ID 2352rn03 valid until 31st December 2025

Passive House Institute  
Dr. Wolfgang Feist  
64283 Darmstadt  
Germany



Category: **Renovation system**  
Manufacturer: **pro Passivhausfenster GmbH,  
Oberaudorf,  
Germany**  
Product name: **smartshell reno**  
Construction type: **Light (wood)**  
Main insulation type: **Cellulose**  
Window product: **smartwin solar HPL**







System includes wall and window modules plus roof modules and floor modules, plus ventilation, photovoltaics and heat pump






## Criteria

<b>1.1 Hygiene criterion:</b> Lowest interior surface temperature factor above 0.70?	✓
<b>1.2 Airtightness concept:</b> Comprehensive airtightness concept guide provided?	✓
<b>2.1 Max. heat transfer coefficient:</b> All U-values below climate zone-specific limit?	✓
<b>2.2 SRI of external finishes:</b> All solar reflectance indices above limit, where applicable?	N/A
<b>2.3 Absence of thermal bridges:</b> All Psi-values below limit, or sufficiently reduced?	✓
<b>2.4 Condensation limit:</b> Condensation evaporated within 12 month period?	✓
<b>2.5 Ma limit:</b> Moisture accumulation value below limit?	✓
<b>3.1 Window comfort criterion:</b> Uw-installed value below limit?	✓
<b>3.2 SHGC / g-value of glazing:</b> g-value of glazing below limit?	✓
<b>3.3 External shading:</b> External shading strategy for sun-facing windows provided?	✓
<b>4 Ventilation system:</b> Comprehensive ventilation concept document provided?	✓
<b>5 Installation manual:</b> Comprehensive installation guide provided?	✓
<b>6 Occupant manual:</b> Comprehensive use and maintenance guide provided?	✓

## Summary of values

Opaque assemblies		U-value W/(m <sup>2</sup> K)	Thickness mm
exterior wall	(EW1) 	0.11	802
floor slab	(FS1) 	0.25	320
pitched roof	(RO1) 	0.11	497
pitched roof	(RO2) 	0.10	440

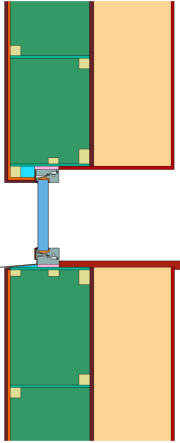
### Frame Cuts with "Smartwin Solar HPL" from "pro Passivhausfenster GmbH" (2353wi03)

Frame values	Frame width $b_f$ mm	U-value frame $U_f$ W/(m <sup>2</sup> K)	$\Psi$ -glazing edge $\Psi_g$ W/(m K)	Temp. Factor $f_{Rsi=0.25}$ [-]
Bottom (OB1) 	77	0.91	0.026	0.70
Top (OH1) 	62	0.86	0.026	0.71
Lateral (OJ1) 	62	0.86	0.026	0.71

Spacer: MULTITECH G      Secondary seal: Polysulfide

## Validated installations

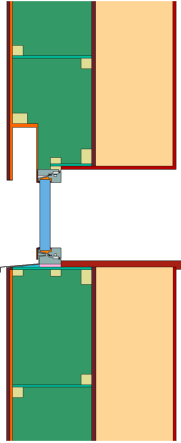
**Lightweight timber (operable) 1**



$\Psi_{\text{install}}$	W/(m K)
Top	0.012
Side	0.016
Bottom	0.025

$U_{W,\text{installed}} = 0.85 \text{ W}/(\text{m}^2 \text{ K})$



**Lightweight timber (operable) 2**


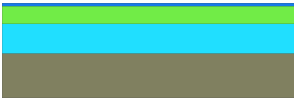




$\Psi_{\text{install}}$	W/(m K)
Top	0.041
Side	0.023
Bottom	0.025



$U_{W,\text{installed}} = 0.88 \text{ W}/(\text{m}^2 \text{ K})$

## Opaque Assemblies

	Material	Lambda W/(m K)	Thickness (mm)
 <b>exterior wall</b> (EW1) 	Interior plaster   Gipsputz 10456	0.570	15
	Existing wall   Bestandgebäude	0.650	365
	Lime mortar   Putzmörtel aus Kalk	1.000	20
	Smartshell Eq.   Smartshell Äq.	0.045	375
	Sto Ventec plaster baseboard   Sto Vente	0.150	12
	Putzträgerplatte		
	Lime mortar   Putzmörtel aus Kalk	1.000	15
	Total thickness: 802 mm		
	Rsi: 0.13 m <sup>2</sup> K/W		
	Rse: 0.04 m <sup>2</sup> K/W		
U-value: 0.11 W/(m <sup>2</sup> K)			

	Material	Lambda W/(m K)	Thickness (mm)
 <b>floor slab</b> (FS1) 	Concrete, 1% Steel   Beton, 1% Stahl	2.300	150
	PU foam   PU-Schaum	0.027	100
	Cement screed   Zement-Estrich	1.400	60
	Artificial stone   Kunststein	1.300	10
	Total thickness: 320 mm		
	Rsi: 0.17 m <sup>2</sup> K/W		
Rse: - m <sup>2</sup> K/W			
U-value: 0.25 W/(m <sup>2</sup> K)			

 <b>pitched roof</b> (RO1)	Material	Lambda W/(m K)	Thickness (mm)
		Softwood   Weichholz	0.130
	Smartshell Eq.   Smartshell Äq.	0.045	375
	Softwood   Weichholz	0.130	22
	Total thickness: 497 mm		
	Rsi: 0.10 m <sup>2</sup> K/W		
Rse: 0.10 m <sup>2</sup> K/W			
U-value: 0.11 W/(m <sup>2</sup> K)			

 <b>pitched roof</b> (RO2)	Material	Lambda W/(m K)	Thickness (mm)
		Softwood   Weichholz	0.130
	Smartshell Eq.   Smartshell Äq.	0.052	160
	Softwood   Weichholz	0.130	20
	EPS   Styropor	0.035	220
	Softwood   Weichholz	0.130	20
	Total thickness: 440 mm		
Rsi: 0.10 m <sup>2</sup> K/W			
Rse: 0.10 m <sup>2</sup> K/W			
U-value: 0.10 W/(m <sup>2</sup> K)			

Junctions		U1	U2	$\Psi$ -value $\Psi$ W/(m K)	Temp. factor $f_{Rsi=0.25}$ [-]
Ceiling integration into exterior wall (EW1_EW1_CE_1)		0.11	0.11	0.023	0.974
Ceiling integration into exterior wall (EW1_EW1_CE_2)		0.11	0.11	0.009	0.973
Exterior corner exterior wall (EW1_EW1_ec_1)		0.11	0.11	-0.072	0.930
Interior corner exterior wall (EW1_EW1_ic_1)		0.11	0.11	0.042	0.971
Internal wall integration into exterior wall (EW1_EW1_IW_1)		0.11	0.11	-0.008	0.973
Roof eave pitched roof (EW1_RO1_ea_1)		0.11	0.11	-0.037	0.940
Roof verge pitched roof (EW1_RO1_ve_1)		0.11	0.11	-0.087	0.924
Roof eave pitched roof (EW1_RO2_ea_2)		0.11	0.10	-0.016	0.942
Roof verge pitched roof (EW1_RO2_ve_2)		0.11	0.10	-0.083	0.934
Roof ridge pitched roof (RO1_RO1_ri_1)		0.11	0.11	-0.024	0.928
Roof ridge pitched roof (RO2_RO2_ri_2)		0.10	0.10	-0.033	0.948

## Junctions

**Ceiling integration**  
into exterior wall  
(EW1\_EW1\_CE\_1)

$U_{EW1} = 0.11 \text{ W/(m}^2 \text{ K)}$   
 $U_{EW1} = 0.11 \text{ W/(m}^2 \text{ K)}$   
 $\Psi = 0.023 \text{ W/(m K)}$   
 $f_{Rsi} = 0.974$



### Ceiling integration

into exterior wall

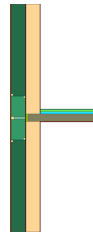
(EW1\_EW1\_CE\_2)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = 0.009 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.973$$



### Exterior corner

exterior wall

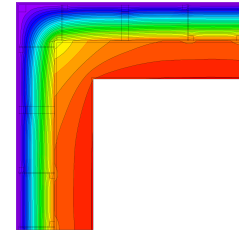
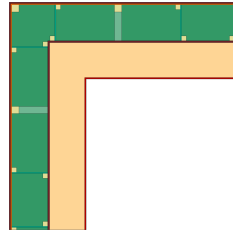
(EW1\_EW1\_ec\_1)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.072 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.930$$



### Interior corner

exterior wall

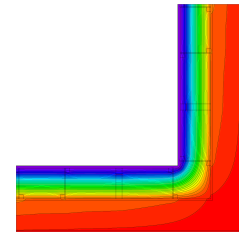
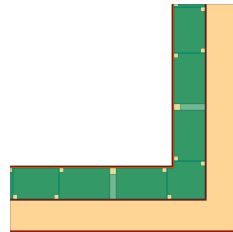
(EW1\_EW1\_ic\_1)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = 0.042 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.971$$



### Internal wall integration

into exterior wall

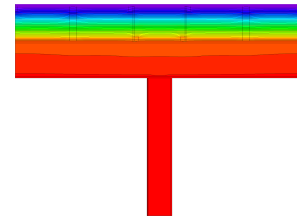
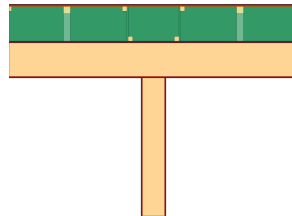
(EW1\_EW1\_IW\_1)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.008 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.973$$



### Roof eave

pitched roof

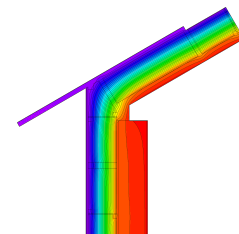
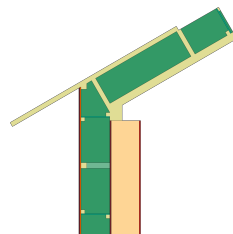
(EW1\_RO1\_ea\_1)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.037 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.940$$





### Roof verge

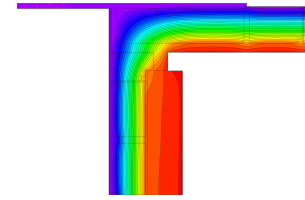
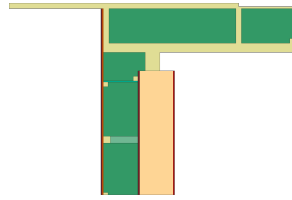
pitched roof (EW1\_RO1\_ve\_1)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.087 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.924$$



### Roof eave

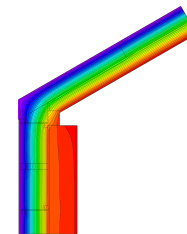
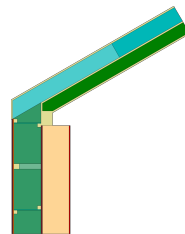
pitched roof (EW1\_RO2\_ea\_2)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO2} = 0.10 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.016 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.942$$



### Roof verge

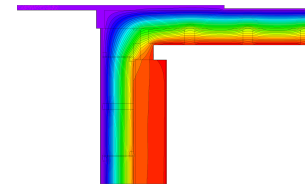
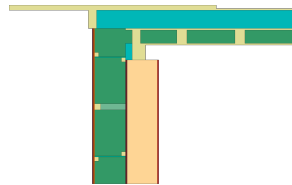
pitched roof (EW1\_RO2\_ve\_2)

$$U_{EW1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO2} = 0.10 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.083 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.934$$



### Roof ridge

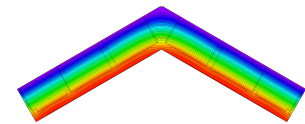
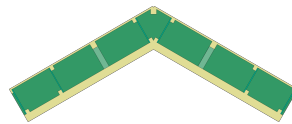
pitched roof (RO1\_RO1\_ri\_1)

$$U_{RO1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO1} = 0.11 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.024 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.928$$



### Roof ridge

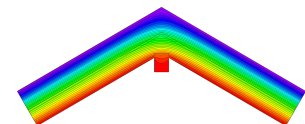
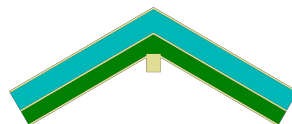
pitched roof (RO2\_RO2\_ri\_2)

$$U_{RO2} = 0.10 \text{ W}/(\text{m}^2 \text{ K})$$

$$U_{RO2} = 0.10 \text{ W}/(\text{m}^2 \text{ K})$$

$$\Psi = -0.033 \text{ W}/(\text{m K})$$

$$f_{Rsi} = 0.948$$





### **System description**

The Smartshell Reno renovation system from Pro Passivhausfenster GmbH is an innovative solution designed for retrofitting existing buildings to enable achievement of the EnerPHit standard. The system comprises pre-fabricated structures with pre-installed Smartwin Solar HPL windows, which are installed over window reveals, fitted in the window production. Prefabricated cassettes constructed from timber Z-profiles are then installed to the walls and roof of the existing building and connected to the window sections using Sto Ventec plaster underlay plates, which are then covered with lime plaster. The resulting cavities are then filled with cellulose insulation (0,040 W/(mK)). The existing floor is insulated with PU foam (0,027 W/ (mK)) and the basement ceiling is also insulated with XPS foam (0,037 W/ (mK)). The airtight layer of the system is created from a layer of lime cement plaster located between the existing structure and the Smartshell Reno system.

### **Window description**

The Smartwin Solar HPL window is a variant of the standard Smartwin Solar window, but rather than an aluminium weather profile to the exterior, a high-pressure laminated (HPL) plate is used. The main window profile is made from spruce/fir (0,11 W/(mK)) and insulated with natural insulation (0,040 W/(mK)). Glass loads are carried by special corner pieces. The airtightness test was conducted on a combination of fixed glazing and tilt and turn sash, element size 2.0 x 2.6 m. Pane thickness: 48 mm (4/18/4/18/4), rebate depth: 15 mm. Spacer: MULTITECH G with polysulfide secondary seal.

### **Airtightness concept**

The Smartshell Reno renovation system enables achievement of the high degree of airtightness required for the EnerPHit standard. In general, this is achieved either by upgrading the external plaster, or by using suitable airtightness membranes and tapes. A full airtightness concept has been provided, and a summary is given in the certification report.

### **Ventilation concept**

The Smartshell Reno renovation system uses the Smartvent heat recovery ventilation system, also manufactured by ProPassivhausfenster GmbH, to enable the level of ventilation required by the EnerPHit standard. A full ventilation concept has been provided, and a summary is given in the certification report.

### **Heating concept**

The Smartshell Reno renovation system uses NIBE heat pump units to provide heating to refurbished dwellings. Depending on the configuration and location of the scheme, the units can take the form of air- or ground-source systems. A full heating concept has been provided, and a summary is given in the certification report.

## Additional services

The following services are offered by for the smartshell Reno 2024 system:

Service	Description
Design & consulting	Propassivhausfenster GmbH provides design and consulting services as standard for all projects.
On-site generation	The Smartshell system can be integrated seamlessly with on-site energy generation systems
Quality assurance & monitoring	Pro Passivhausfenster GmbH offers close involvement with all projects, with quality assurance services offered as standard, and ongoing monitoring offered as an additional service.
Heating, DHW and cooling compatibility	Heat pump systems can be seamlessly integrated into the Smartshell Renovation system, offering both heating and cooling.

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.