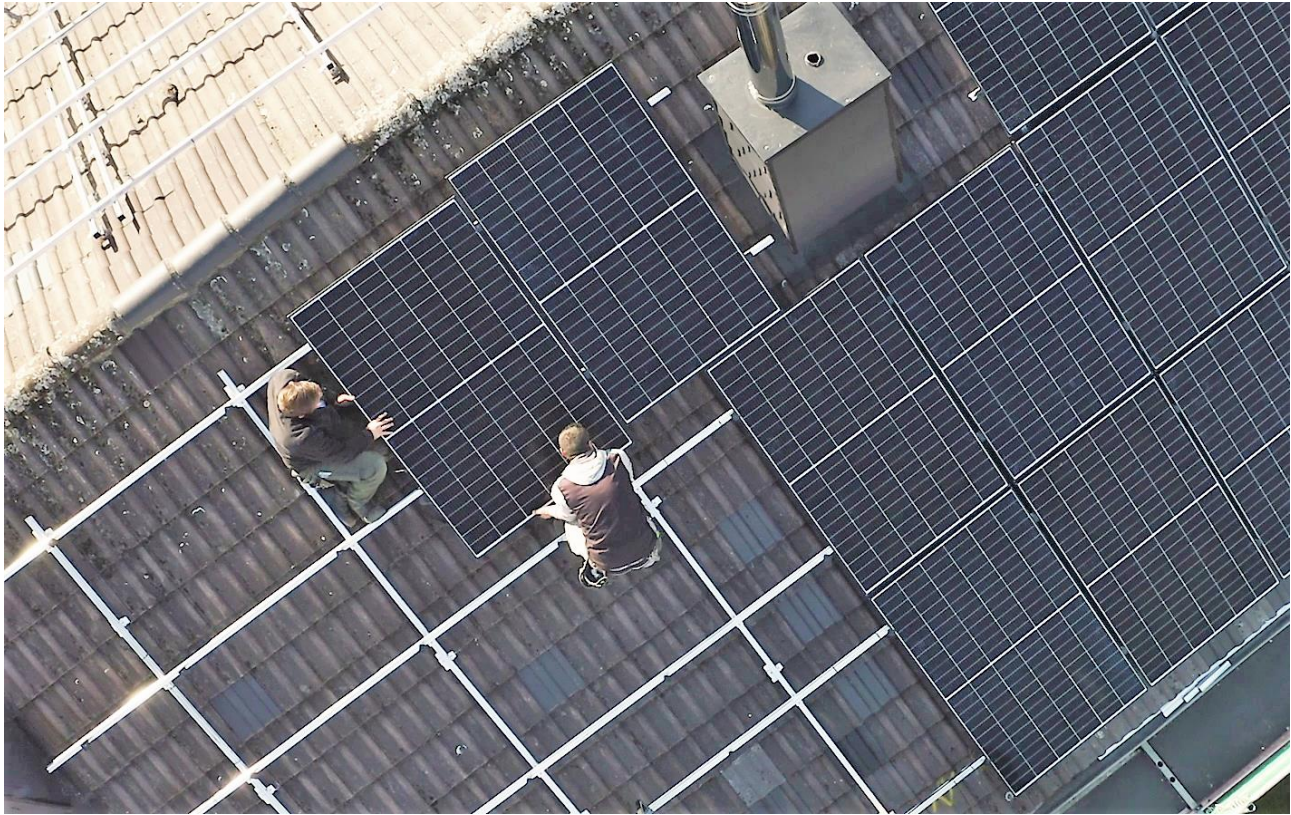


Solar Systems from Schweizer



Data Sheet for MSP-PR

PV Pitched Roof Mounting System



All information and illustrations are up to date at the time of publication.

The current version can be downloaded at any time at [Data Sheet MSP-PR](#).

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06/2024
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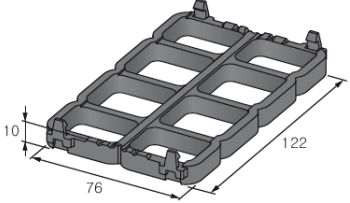
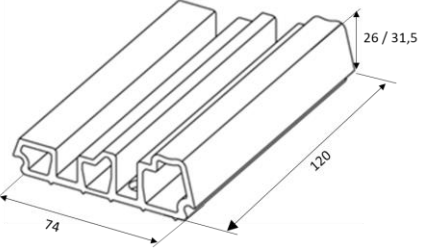
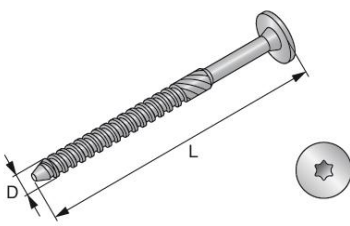
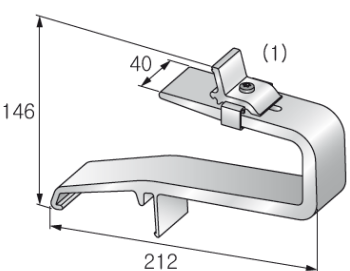
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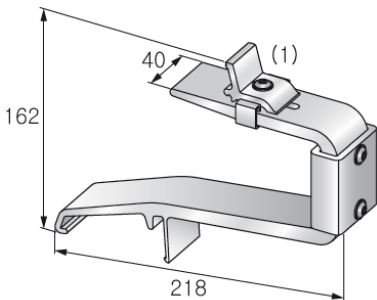
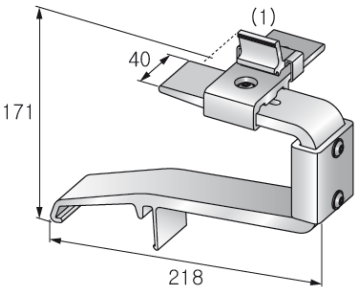
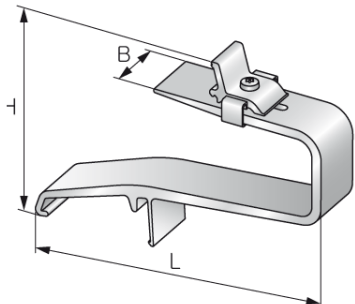
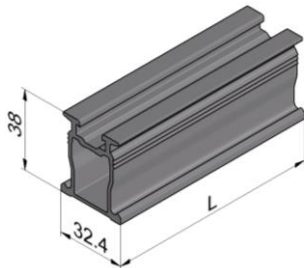
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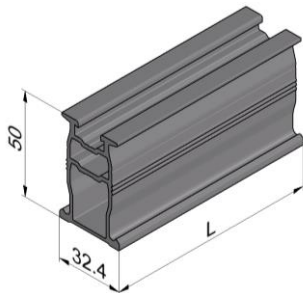
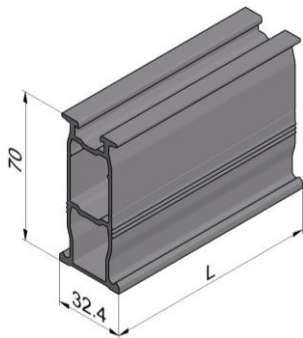
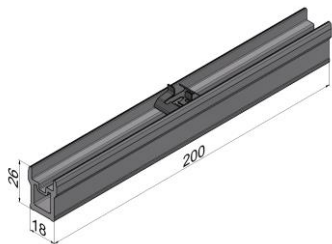
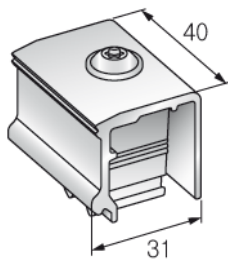
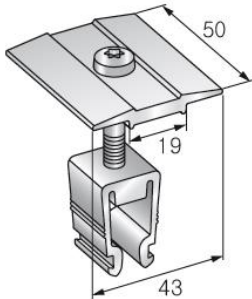
1 Application and application limits

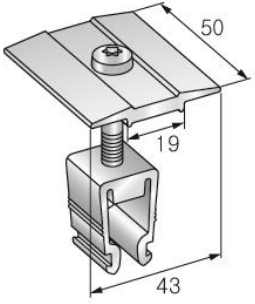
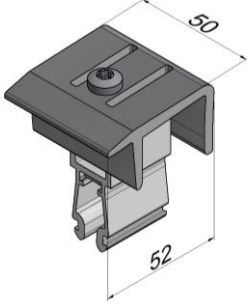
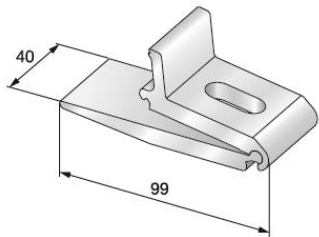
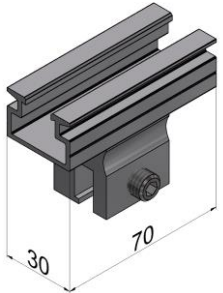
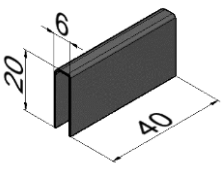
Roof types:	Pitched roof with tile cladding (other claddings available on request)
Roof pitch:	10° to 75°
Roof structure:	Load-bearing rafters/counter batten and roof battens with a thickness of 24 to 40 mm
PV module:	Frame heights from 28 to 45 mm. Length and width are without restriction. Assessment of the strength by the planner with regard to external impacts and support points (calculation in SPT).
Alignment:	Portrait and landscape format
Wind and snow loads:	Depending on roof parameters and installation system, according to static calculation in SPT.

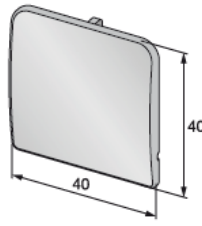
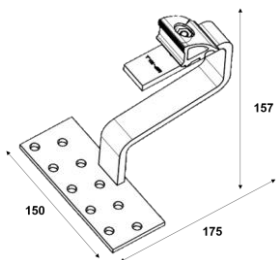
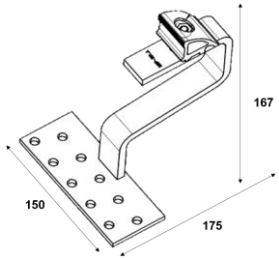
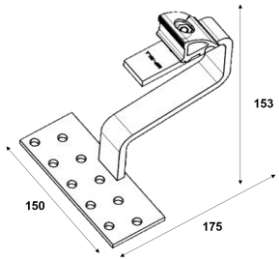
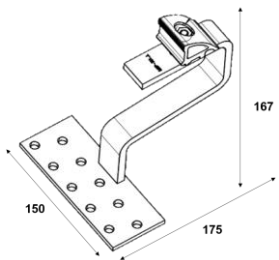
2 Components

Product designation	Material designation	Dimensions (rounded up to full mm)
Spacer plate MSP-PR-SP 10 mm	PA66 GF30	
Base plate MSP-PR-BP 39 mm MSP-PR-BP 45 mm	EN AW-6063 T66 – EN 755-2	
Wood screw DxL MSP-PR-HS 8x100 mm A2 MSP-PR-HS 8x120 mm A2	Stainless steel A2	
Roof hook MSP-PR-RHF	Clamp (1) EN AW-6060 T66 - EN 755-2 All other aluminium components EN AW-6063 T66 - EN 755-2 Screws A2-70 - ISO 3506-1 Nuts A4-70 - ISO 3506-2	

Product designation	Material designation	Dimensions (rounded up to full mm)
Roof hook MSP-PR-RHA	Clamp (1) EN AW-6060 T66 - EN 755-2 All other aluminium components EN AW-6063 T66 - EN 755-2 Screws A2-70 - ISO 3506-1 Nuts A4-70 - ISO 3506-2	
Roof hook MSP-PR-RHC	Clamp (1) EN AW-6060 T66 - EN 755-2 All other aluminium components EN AW-6063 T66 - EN 755-2 Screws A2-70 - ISO 3506-1 Nuts A2 - ISO 3506-2	
Roof hook MSP-PR-RHL	Clamp (1) EN AW-6060 T66 - EN 755-2 All other aluminium components EN AW-6063 T66 - EN 755-2 Screws A2-70 - ISO 3506-1 Nuts A2 - ISO 3506-2	
Support profile MSP-PR-CH 38 6.3 m MSP-PR-CH 38 4.8 m MSP-PR-CH 38 3.55 m	EN AW-6063 T66 - EN 755-2	

Product designation	Material designation	Dimensions (rounded up to full mm)
Support profile MSP-PR-CH 50 6.3 m MSP-PR-CH 50 4.8 m MSP-PR-CH 50 3.55 m	EN AW-6063 T66 - EN 755-2	
Support profile MSP-PR-CH 70 6.3 m MSP-PR-CH 70 4.8 m MSP-PR-CH 70 3.55 m	EN AW-6063 T66 - EN 755-2	
Rail connector MSP-PR-SL	Rail EN AW-6063 T66 - EN 755-2 Spring 1.4404 - EN 10088-2	
Cross-connector MSP-PR-CC	Mounting bracket EN AW-6063 T66 - EN 755-2 Screw A2-70 - ISO 3506-1	
Middle clamp MSP-PR-MC 28-45 mm MSP-PR-MCB 28-45 mm mm	Mounting bracket EN AW-6063 T66 - EN 755-2 Screw A2-70 - ISO 3506-1 Washer PVC	

Product designation	Material designation	Dimensions (rounded up to full mm)
Middle clamp, conductive MSP-PR-MC/MCG 28-45 mm MSP-PR-MCB/MCBG 28-45 mm	Mounting bracket EN AW-6063 T66 - EN 755-2 Screw A2-70 - ISO 3506-1 Washer PVC Earthing bridge stainless steel A4	
End clamp MSP-PR-EC 28-45 mm MSP-PR-ECB 28-45 mm	Mounting bracket EN AW-6063 T66 - EN 755-2 Screw A2-70 - ISO 3506-1 Washer PVC Nut A2- ISO 3506-2	
Adapter plate MSP-PR-HBP	EN AW-6063 T66 - EN 755-2 Slot 12x27 mm	
Sheet metal seam clamp MSP-PR-SC 70	EN AW-6063 T6	
Stainless steel saddle MSP-PR-SCC 40	Stainless steel X5CrNi18-10 Sheet thickness 0.5 mm	

Product designation	Material designation	Dimensions (rounded up to full mm)
Rail end cap MSP-PR-CAP	PA66 GF30	
Stainless steel roof hook MSP-RHC 45/5	Plate and hook: X5CrNi18-10, X2CrNi19-11, X2CrNi18-9 Clamp: EN AW-6063 T66 Spring: X12CrNi17-7, X10CrNi18-8 Truss-head screw: stainless steel A2-70 Hexagon nut: stainless steel A4-70	
Stainless steel roof hook MSP-RHC 55/5	Plate and hook: X5CrNi18-10, X2CrNi19-11, X2CrNi18-9 Clamp: EN AW-6063 T66 Spring: X12CrNi17-7, X10CrNi18-8 Truss-head screw: stainless steel A2-70 Hexagon nut: stainless steel A4-70	
Stainless steel roof hook MSP-RHC 41/8	Plate and hook: X5CrNi18-10, X2CrNi19-11, X2CrNi18-9 Clamp: EN AW-6063 T66 Spring: X12CrNi17-7, X10CrNi18-8 Truss-head screw: stainless steel A2-70 Hexagon nut: stainless steel A4-70	
Stainless steel roof hook MSP-RHC 55/8	Plate and hook: X5CrNi18-10, X2CrNi19-11, X2CrNi18-9 Clamp: EN AW-6063 T66 Spring: X12CrNi17-7, X10CrNi18-8 Truss-head screw: stainless steel A2-70 Hexagon nut: stainless steel A4-70	

3 Design resistance of components (load-bearing capacity limit condition)

In order to verify the resistance values of type MSP-PR pitched roof systems, the values of each component must be considered individually:

– Load-bearing capacity and suitability of the roof structure and, if applicable, the specific cladding (e.g. for standing seam roofs) – Rated value of the module according to manufacturer's specifications	– From the customer
– MSP-PR-SP spacer plate, MSP-PR-BP base plate and MSP-PR-HS wood screw, see 3.1 – MSP-PR-RHF/RHA/RHC/RHL roof hook, see 3.2 – MSP-RHC roof hook, see 0 – MSP-PR-CH support profile, see 3.4 – MSP-PR-CC cross-connector, see 3.5 – MSP-PR-MC/MCB/EC/ECB middle/end clamp, see 3.6 – Hanger bolts and adapter plate, see 0	– According to this data sheet

The component with the lowest resistance values is design relevant.

All resistance values are calculated in accordance with the following regulations and standards:

- DIN EN 1990:2010 (EC 0)
- DIN EN 1999-1-1:2010 (EC 9)
- VDI 2230 Sheet 1:2003 (VDI 2230)
- DIN EN 1995-1-1:2012 (EC 5)

The resistance values only apply if the complete MSP-PR system from Schweizer is used and the installation is realised in accordance with the installation instructions for the MSP-PR PV pitched roof mounting system.

3.1 MSP-PR-SP spacer plate, MSP-PR-BP base plate and MSP-HS wood screw

The design resistance values in Table apply to type MSP-PR-RHF/RHA/ RHC/RHL roof hooks which are fastened in conjunction with all versions of the MSP-PR-SP spacer plate, MSP-PR-BP base plate and MSP-HS wood screw (see chapter 1).

All resistance values listed here are made up of the individual resistances of the components and are transferred to the connection between the MSP-PR-RHF/RHA/RHC/RHL roof hook and the MSP-PR-CH support profile. The corresponding resistance vectors can be found at Fig. 1 . When calculating the resistance values, a fixed connection between the MSP-PR-RHF/RHA/RHC/RHL roof hook and the MSP-PR-CH support profile is assumed.

The construction timber used must comply with standards EN 338 and DIN EN 14081-1 and have a strength class of C24 to C40 and a density ρ of at least 350 kg/m^3 .

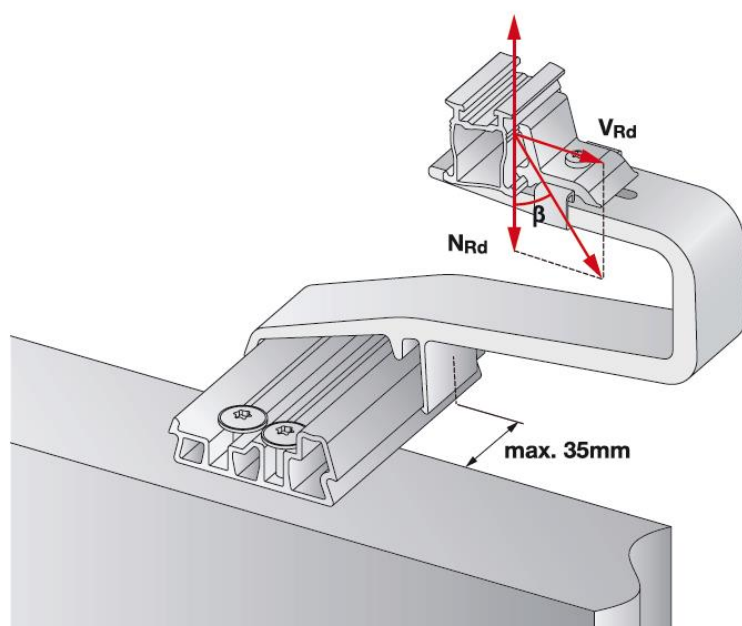


Fig. 1: Resistance vectors of roof hooks and roof hook assembly

Table 1: Design resistance for MSP-PR-SP, MSP-PR-BP and MSP-HS

Design resistance Tension [N_{Rd} in kN]	-1.66
Design resistance Pressure [N_{Rd} in kN]	2.43
Design resistance Shear force [V_{Rd} in kN]	1.73

3.2 MSP-PR-RHF/RHA/RHC/RHL roof hook

Table 2: Design resistance for MSP-PR-RHF

Tension [N_{Rd} in kN]	-2.28
Pressure [N_{Rd} in kN]	2.28
Shear force [V_{Rd} in kN]	2.87

Table 3: Design resistance for MSP-PR-RHA and MSP-PR-RHC

Tension [N_{Rd} in kN]	-2.28
Pressure [N_{Rd} in kN]	2.28
Shear force [V_{Rd} in kN]	2.52

Table 4: Design resistance for MSP-PR-RHL

Tension [N_{Rd} in kN]	-1.36
Pressure [N_{Rd} in kN]	1.36
Shear force [V_{Rd} in kN]	1.67

3.3 MSP-RHC roof hook

Table 5: Design resistances without support

	MSP-RHC 45/5	MSP-RHC 55/5	MSP-RHC 41/8	MSP-RHC 55/8
Tension [N _{Rd} in kN]	-0.60	-0.60	-1.49	-1.49
Pressure [N _{Rd} in kN]	0.39	0.39	1.03	1.03
Shear force [V _{Rd} in kN]	0.27	0.25	0.71	0.63

Pressure / shear force interaction

Proof of linear interaction is required:

$$\frac{N_{Ed}}{N_{Rd}} + \frac{V_{Ed}}{V_{Rd}} \leq 1$$

Table 6: Design resistances with support on a load-bearing metal tile

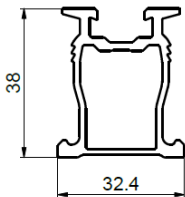
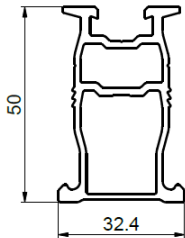
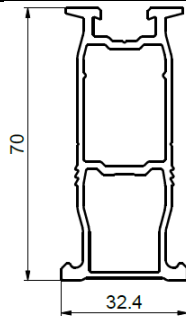
	MSP-RHC 45/5	MSP-RHC 55/5	MSP-RHC 41/8	MSP-RHC 55/8
Tension [N _{Rd} in kN]	-0.60	-0.60	-1.49	-1.49
Pressure [N _{Rd} in kN]	0.59	0.59	1.55	1.55
Shear force [V _{Rd} in kN]	0.80	0.80	1.99	1.99

Pressure / shear force interaction

No proof of interaction is required.

3.4 MSP-PR-CH support profile

Table 7: Cross-section values for MSP-PR-CH

				
Profile	Unit	MSP-PR-CH 38	MSP-PR-CH 50	MSP-PR-CH 70
Yield strength f ₀	MPa	200	200	200
E-module E	MPa	70,000	70,000	70,000
Weight per metre	kg/m	0.77	0.97	1.15
Cross-sectional area A	mm ²	286	360	425
Moment of inertia I _y	mm ⁴	52,300	103,054	241,481
Moment of inertia I _z	mm ⁴	28,100	33,898	42,222
Moment of resistance W _y	mm ³	2,710	4,031	6,833
Moment of resistance W _z	mm ³	1,740	2,092	2,606

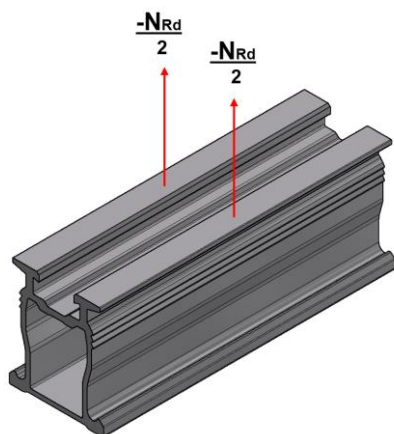


Fig. 2 Design resistance vectors of the MSP-PR-CH support profile; interface to middle/end clamp or cross-connector

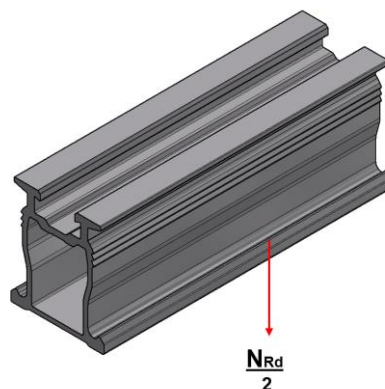


Fig. 3 Design resistance vectors of the MSP-PR-CH support profile; interface to clamp for roof hook or cross-connector

Table 8: Design resistance of the MSP-PR-CH support profile; interface to middle/end clamp or cross-connector

Tension	$[N_{Rd} \text{ in kN}]$	-4.35
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Table 9: Design resistance of the MSP-PR-CH support profile; interface to clamp for roof hook or cross-connector

Tension	$[N_{Rd} \text{ in kN}]$	5.88
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3.5 MSP-PR-CC cross-connector

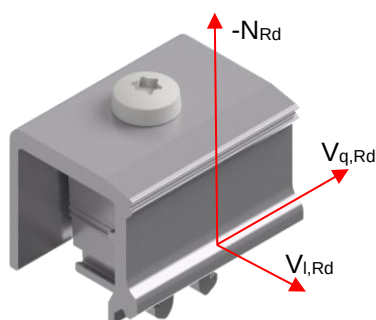


Fig. 4 Resistance vectors of the MSP-PR-CC cross-connector

Table 10: Design resistances of the MSP-PR-CC cross-connector

Tension	$[N_{Rd} \text{ in kN}]$	-1.87
Transverse shear force in kN	$[V_{q,Rd}]$	0.78
Longitudinal shear force in kN	$[V_{l,Rd}]$	1.48

3.6 MSP-PR-MC/G & MSP-PR-MCB/G middle clamp

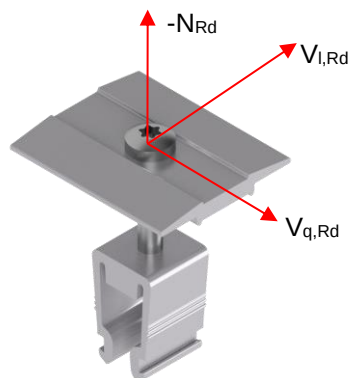


Fig. 5: Resistance vectors of the MSP-PR-MC/G & MSP-PR-MCB/G middle clamp

Table 11: Design resistances of the MSP-PR-MC/G & MSP-PR-MCB/G middle clamp

Tension	$[N_{Rd} \text{ in kN}]$	-6.14
Transverse shear force in kN]	$[V_{q,Rd} \text{ in kN}]$	2.20
Longitudinal shear force in kN]	$[V_{l,Rd} \text{ in kN}]$	2.04

3.7 MSP-PR-EC/B end clamp

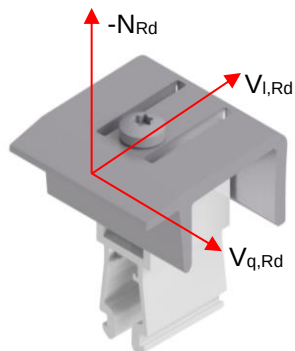


Fig. 6: Resistance vectors of the MSP-PR-EC/B end clamp

Table 12: Design resistances of the MSP-PR-EC/B end clamp

Tension	$[N_{Rd} \text{ in kN}]$	-3.76
Transverse shear force in kN]	$[V_{q,Rd} \text{ in kN}]$	1.33
Longitudinal shear force in kN]	$[V_{l,Rd} \text{ in kN}]$	1.93

3.8 Hanger bolts of MSP-PR-HBP adapter plate (without hanger bolt)

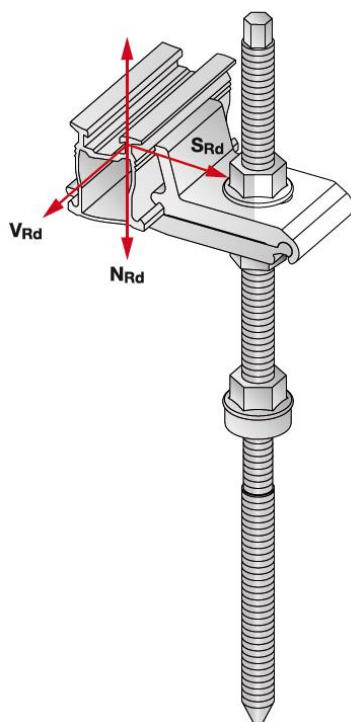


Fig. 7 Resistance vectors of the MSP-PR-HBP hanger bolt plate

Table 13: Resistance values of MSP-PR-HBP adapter plate hanger bolts

Tension	$[N_{Rd} \text{ in kN}]$	-3.00
Pressure	$[N_{Rd} \text{ in kN}]$	2.93
Shear force	$[V_{Rd} \text{ in kN}]$	± 0.79
Shear force	$[S_{Rd} \text{ in kN}]$	± 2.17

4 Deflection of MSP-RHF/RHA/RHC/RHL roof hook (serviceability limit state)

When installed in accordance with the MSP-PR instruction manual, the minimum clearance on the underside of the roof hook is at least 7 mm in a load-free state (see Fig. 8). The deflection of the MSP-PR-RHF/RHA/RHC/RHL roof hook can be up to 5 mm. This leaves a safety dimension of 2 mm. The deflection of the MSP-PR-BP base plate and deformation of the MSP-PR-SP spacer plate and the structural timber are not taken into account.

The actual values of deflection in the serviceability limit state for type MSP-PR-RHF/RHA/RHC/RHL roof hooks are listed in Table 14, Table 15 and Table 16. The deflection values are calculated according to the design resistance limit and divided by the overall safety factor of 1.4.

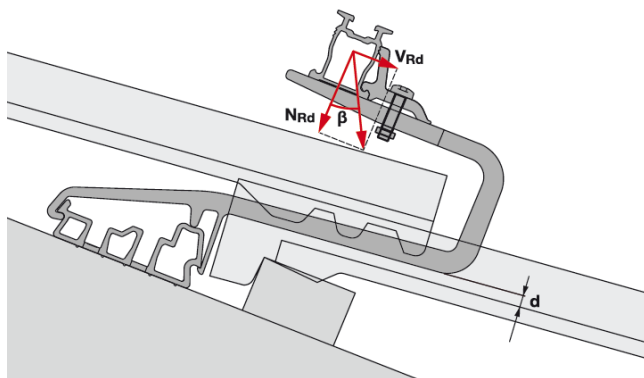


Fig. 8: MSP-PR-RHF/RHA/RHC/RHL roof hook in unloaded condition

Table 14

Deflection (serviceability limit state) for MSP-PR-RHF roof hook under the effect of compressive and shear forces

Resulting impact angle [β in °]	0	10	20	30	40	50	60	70	80	90
Deflection [d in mm]	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.0	2.6	2.2

Table 15

Deflection (serviceability limit state) for MSP-PR-RHA/RHC roof hook under the effect of compressive and shear forces

Resulting impact angle [β in °]	0	10	20	30	40	50	60	70	80	90
Deflection [d in mm]	3.3	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.6	3.6

Table 16

Deflection (serviceability limit state) for MSP-PRL roof hook under the effect of compressive and shear forces

Resulting impact angle [β in °]	0	10	20	30	40	50	60	70	80	90
Deflection [d in mm]	3.3	3.5	3.5	3.5	3.5	3.3	3.1	2.9	2.5	2.2

5 Information on MSP-PR-SC 70 sheet metal seam clamp

5.1 Cladding

The MSP-PR-SC 70 sheet metal seam clamp has building authority approval for the Rheinzink standing seam system (DIBt Z-14.1-773). Similarly, it is also suitable for double standing seam claddings with the following materials:

1. Titanium zinc (0.7 mm to 1 mm)
2. Aluminium (0.7 mm to 1 mm)
3. Stainless steel (0.7 mm to 1 mm)
4. Coated steel (0.7 mm to 1 mm)
5. Copper (0.7 mm), in conjunction with stainless steel saddle

Minimum total thickness of double standing seam (s) = 3.5 mm

Maximum total thickness of double standing seam (s) = 5 mm

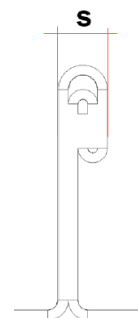


Fig. 9: Double standing seam

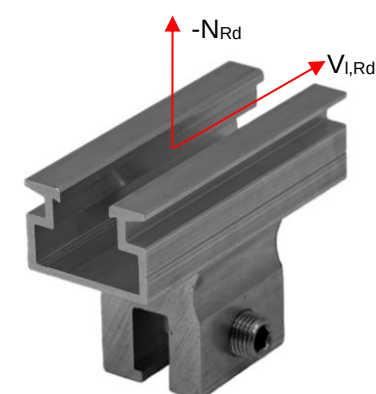
5.2 Laying method and field size

1. Horizontal system installation: recommended max. field length = 3.55 m or as specified by the roof cladding manufacturer
2. Cross-bond system installation: recommended max. field length = 3.55 m or as specified by the roof cladding manufacturer

Direct mounting of the modules on the MSP-PR-SC 70 sheet metal seam clamp is not permitted. The MSP-PR-SC 70 sheet metal seam clamp may only be installed in conjunction with the MSP-PR-CH* support profile. The "vertical" and "insertion system" installation methods are not permitted with the MSP-PR-SC 70 sheet metal seam clamp.

5.3 Design values

The following design values conforming to approval DIBt Z-14.4-912 apply when correctly installed on a Rheinzink standing seam system in compliance with approval DIBt Z-14.1-773. The properties of the standing seam cladding are largely decisive for the load-bearing capacity (i.e. a specific assessment or testing of the load-bearing capacity may be required for installation on other steel seam systems).



Horizontal support profile

Tension	[N_{Rd} in kN]	-1.21
Longitudinal shear force in kN]	[$V_{L,Rd}$ in kN]	2.16

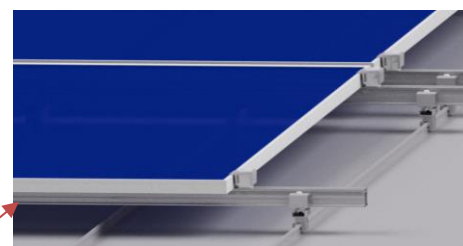


Fig. 10: Horizontal system installation

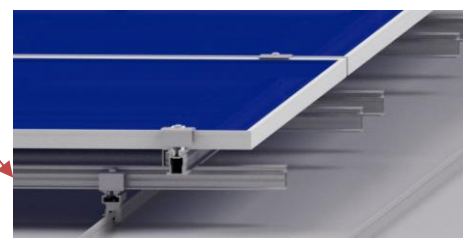


Fig. 11: Cross-bond system installation