Solar systems from Schweizer

Leaflet PV mounting system MSP-PR
On-site fasteners and components in the Solar.Pro.Tool (S.P.T)

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Contents

1 PV mounting system MSP-PR

The MSP-PR PV mounting system is designed for use on pitched roofs. A roof hook system made of aluminium with a sophisticated click fastening, supplemented by classic stainless steel roof hooks and hanger bolts, which secure the anchoring of the supporting structure in the roof. The support profiles are fastened with the prefabricated clamps in a single layer or in a cross-bond.

Combination of MSP-PR with on-site fasteners

Fig. 1 Hanger bolt plate MSP-PR-HBP

The MSP-PR-HBP hanger bolt plate (article number: 2065896) is available for combining on-site fasteners with the MSP mounting system. Depending on the on-site fastener, the additional fasteners (e.g. screws, nuts) must also be procured on site.

Information on strength values of on-site fasteners

- In approvals, characteristic values are usually specified, which are converted to design values using a partial safety factor γ_M .
- If no approvals are available, the rated values must be requested from the supplier.
- Data relating to pressure at an angle must be converted into the components pressure and shear force.
- The following catalogue provides tables with load-bearing capacity values and instructions for handling the values.
- All information is outside the responsibility of Ernst Schweizer AG and without guarantee of correctness, up-to-dateness or compatibility with the MSP components. If you are unsure, please contact the supplier of the fastening elements.

Interaction with simultaneously acting load directions

1. The standard calculation in SPT is without interaction, i.e. pressure and shear force may be fully utilised at the same time.
2. With some fasteners, the "linear interaction" between compression and shear force is applied, i.e. (utilisation of compression) + (utilisation of shear force) ≤ 100%.
3. Another variant is the quadratic interaction: (utilisation pressure) ²
   + (utilisation of shear force) ² ≤ 100%.

Note: If interaction is required, please contact the in-house service department (msp@ernstschweizer.com) for the design.

2 Planning in the Solar.Pro.Tool (S.P.T)

1. Selection of roof covering and substructure according to local conditions.
2. Selection of fastening system: "Roof hook/fastening element on site - without interaction".
3. Connection components: "Adapter plate MSP-PR-HBP" or "Without connection".
4. Installation system: All options are available. The planner must assess what is technically possible.
5. Enter the design values for pressure, tension and shear force according to the supplier's specifications or table values. The values listed below are taken from the data sheets or approvals of the respective manufacturers and are not guaranteed to be correct or applicable.

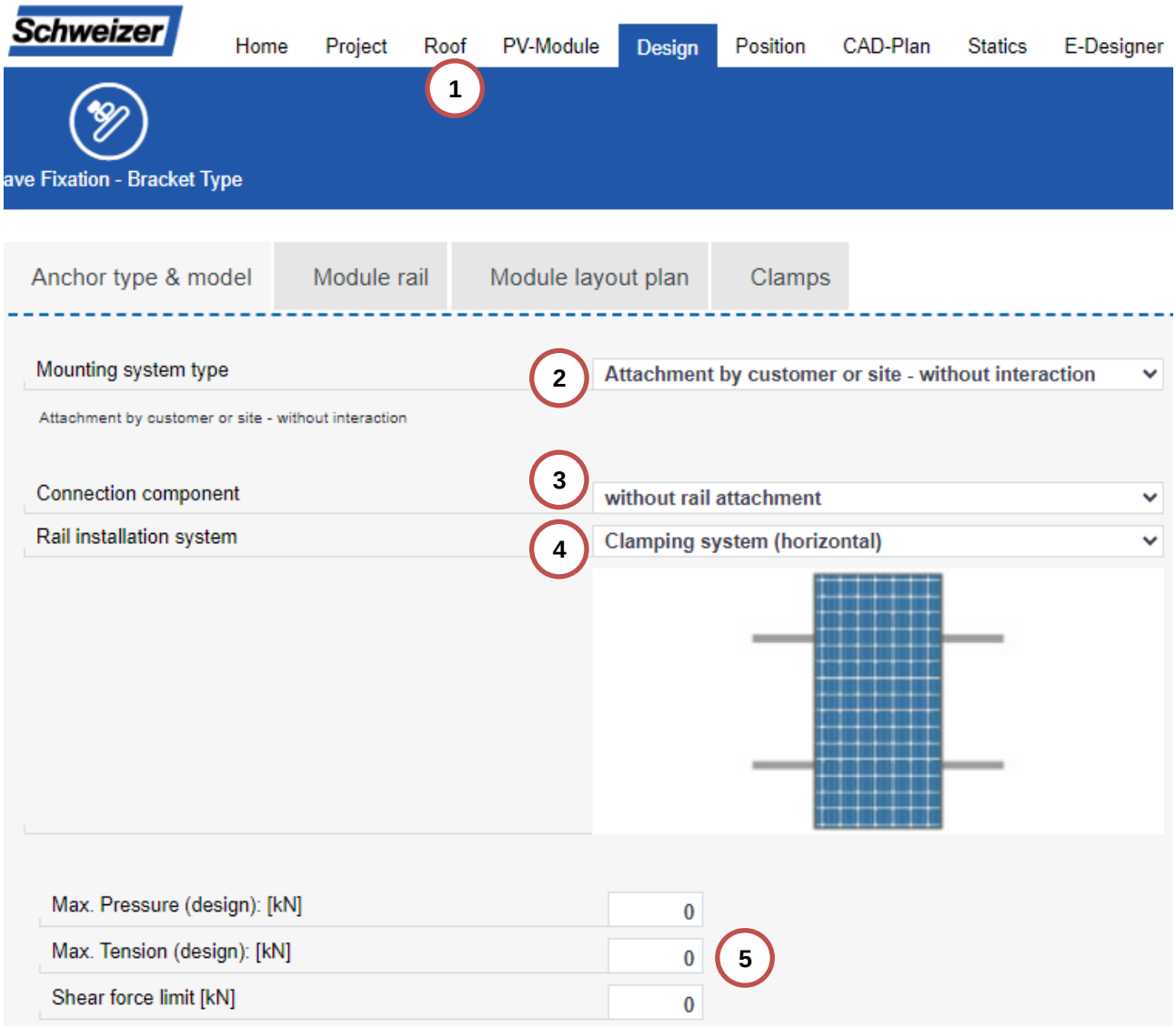


Fig. 2 Selection of parameters for on-site fasteners

* "Without interaction": Limit values must be entered for the load-bearing capacity compression and shear force, which may act in full at the same time.

3 Products

3.1 Manufacturer/Supplier: Otto Lehmann GmbH, D-93070 Neutraubling

Product designation: Lehmann roof module bracket 7300 riveted to metal roof panels

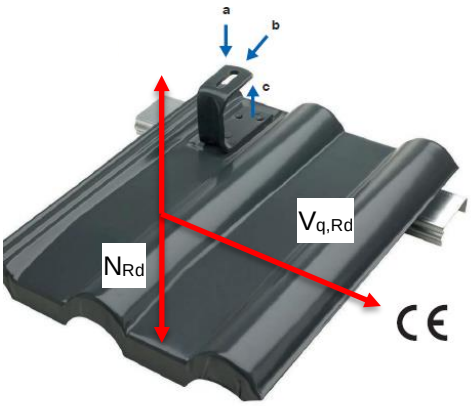


Fig. 3 Lehmann roof module holder

Application in S.P.T: Use the design values from Table 1 according to the roof pitch.
Interaction condition: "Without interaction".

Table 1Design values of the load-bearing capacity

Force angle	Pressure(N_{Rd})	Train ($-N_{Rd}$)	Shear force($V_{q,Rd}$)
0°	3.61 kN	2.16 kN	0.00 kN
5°	3.35 kN	2.16 kN	0.29 kN
10°	2.97 kN	2.16 kN	0.52 kN
15°	2.59 kN	2.16 kN	0.70 kN
20°	2.26 kN	2.16 kN	0.82 kN
25°	1.97 kN	2.16 kN	0.92 kN
30°	1.72 kN	2.16 kN	1.00 kN
35°	1.51 kN	2.16 kN	1.05 kN
40°	1.31 kN	2.16 kN	1.10 kN
45°	1.14 kN	2.16 kN	1.14 kN
50°	0.98 kN	2.16 kN	1.17 kN
55°	0.84 kN	2.16 kN	1.20 kN
60°	0.71 kN	2.16 kN	1.22 kN
65°	0.58 kN	2.16 kN	1.24 kN
70°	0.46 kN	2.16 kN	1.26 kN
75°	0.34 kN	2.16 kN	1.27 kN

3.2 Manufacturer/Supplier: Jacobi Walter GmbH, D-37434 Bilshausen I

Product description: Aluminium solar support with base tile, available with various roof tiles.

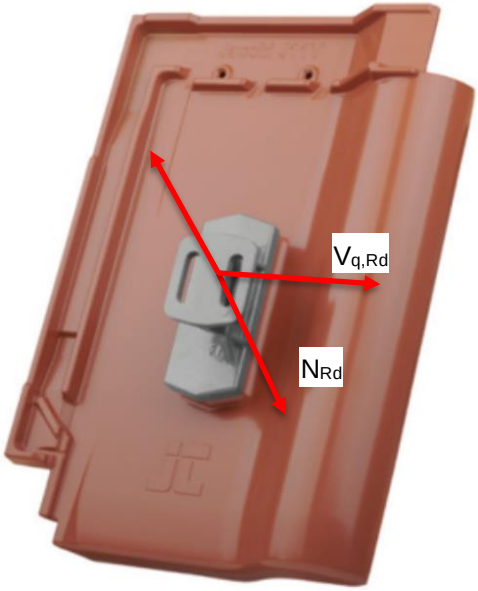


Fig. 4: Jacobi Walther flat roof tile J11v with aluminium solar support

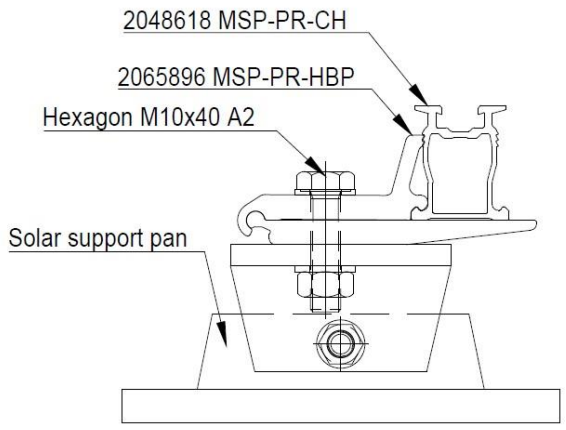
Application in S.P.T: Use the design values from Table 2 according to the roof tile.
Interaction condition: "Without interaction". This does not constitute a binding static verification; the responsibility lies with the person carrying out the work.

Table 2Design values of the load-bearing capacity

	Pressure(N_{Rd})	Train ($-N_{Rd}$)	Shear force($V_{q,Rd}$)
Flat roof tile J11v	6.1 kN	3.9 kN	6.3 kN
Flat roof tile J13v	4.4 kN	3.8 kN	5.7 kN
Flat roof tile J160	6.73 kN	3.81 kN	5.75 kN
Flat roof tile W6v	5.9 kN	5.0 kN	5.5 kN
Flat roof tile Z5	7.3 kN	4.8 kN	3.9 kN
Standard interlocking tile Z10	4.9 kN	2.8 kN	3.9 kN

Proposal for fastening adapter plate to solar support pan

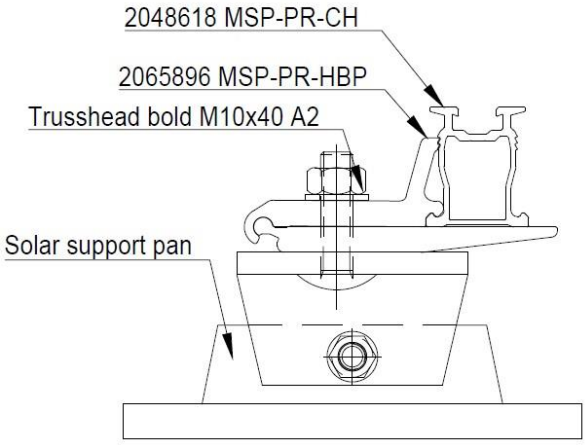
- Variant 1 with M10



Structure consisting of

- Solar support pan from Jacobi Walther
- 2065896 MSP-PR-HBP Hanger bolt plate
- 2048618 representative for all carrier profiles (MSP-PR-CH38 /-CH50 /-CH70)
- Screw DIN933 ISO4017 Stainless A2 M10x40
- Washer DIN125A ISO7089 Stainless A2 M10
- Hexagon nut DIN934 ISO4032 Stainless steel A2 M10

- Variant 2 with M10



Structure consisting of

- Solar support pan from Jacobi Walther
- 2065896 MSP-PR-HBP Adapter plate
- 2048618 representative for all carrier profiles (MSP-PR-CH38 /-CH50 /-CH70)
- Screw DIN603 UNI5732 Stainless steel A2 M10x40
- Washer DIN125A ISO7089 Stainless A2 M10
- Hexagon nut DIN6923 EN1661 Stainless steel A2 M10

3.3 Manufacturer/Supplier: Zambelli RIB-ROOF GmbH & Co KG, Hans-Sachs-Straße 3 + 5, D-94569 Stephansposching

Product designation: Standard solar holder RIB-ROOF

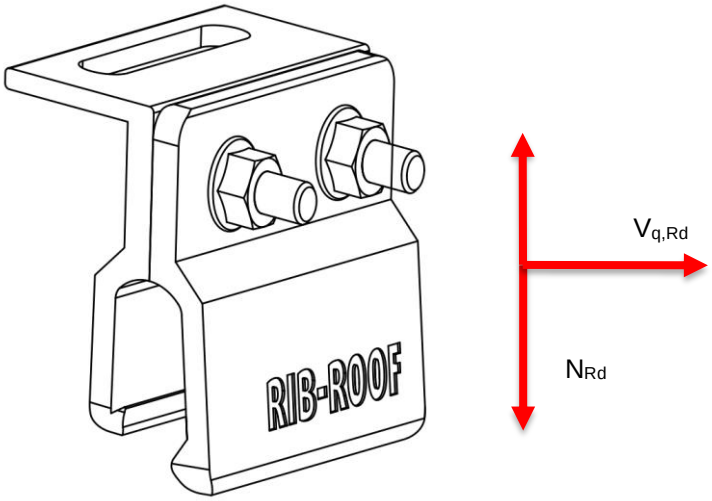


Fig.5: Standard solar holder RIB-ROOF

Application in S.P.T: Determination of the design values by dividing the characteristic values for pressure, suction and force parallel to the roof (shear force) by the partial safety factor γ_M = 1.33.
Approval Z-14.4-774 contains various characteristic values for different RIB-ROOF systems as well as numerous specifications, boundary conditions and interaction formulae. After rough planning, compliance with these must be checked and, if necessary, recalculated with new values.
Interaction condition: "Without interaction".

Table 3: Design values of the load-bearing capacity when all boundary conditions are met

	Pressure(N_{Rd})	Train ($-N_{Rd}$)	Shear force($V_{q,Rd}$)
RIB-ROOF 465 steel 0.63 mm	2.68 kN	1.47 kN	1.18 kN
RIB-ROOF 465 aluminium 0.70 mm	1.86 kN	1.17 kN	1.12 kN
RIB-ROOF Speed 500 steel 0.63 mm	2.50 kN	1.33 kN	1.18 kN
RIB-ROOF Speed 500 Alu 0.70 mm	1.41 kN	0.89 kN	1.67 kN
RIB-ROOF Evolution steel 0.63 mm	2.93 kN	3.32 kN	0.80 kN
RIB-ROOF Evolution Alu 0.70 mm	1.56 kN	2.11 kN	0.80 kN

3.4 Manufacturer/Supplier: RoofTech GmbH, Merklinger Straße 30, D-71263 Weil der Stadt

Product designation: S-5! E-Klemme

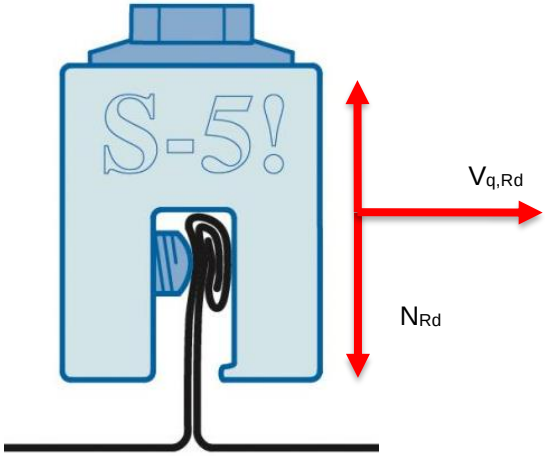


Fig. 6: S-5! E-Klemme

Application in S.P.T: Determination of the design values by dividing the characteristic values for pressure, suction and force parallel to the roof (shear force) by the partial safety factor γ_M = 1.33.
The approval Z-14.4-719 contains different characteristic values for different terminals as well as numerous specifications, boundary conditions and interaction formulae. After rough planning, compliance must be checked and, if necessary, recalculated with new values.
In addition, the standing seam profile must be verified in accordance with the relevant approvals.
Interaction condition: "Without interaction".

Table 4: Design values of the load-bearing capacity under optimum conditions

	Pressure(N_{Rd})	Train ($-N_{Rd}$)	Shear force($V_{q,Rd}$)
S-5-E, S-5-E Mini and S-5-E Mini FL	1.17 kN	1.42 kN	0.95 kN
S-5-Z, S-5-Z Mini and S-5-Z Mini FL	1.02 kN	0.86 kN	1.28 kN

3.5 Manufacturer/Supplier: Kalzip GmbH, August-Horch-Straße 20-22, D-56070 Koblenz

Product designation: Kalzip fixing clamp type FA and type FS

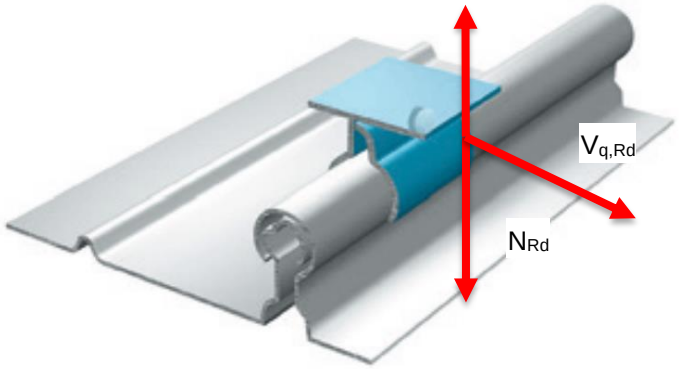


Fig. 7 Kalzip fixing clamp type FA

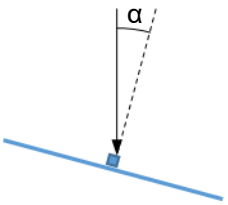
Application in S.P.T: Determination of the design values by dividing the characteristic value of the load-bearing capacity by the partial safety factor γ_M = 1.1. The same value applies in all directions (compression, suction, shear force); a linear interaction analysis is required between simultaneously acting forces.
The approval Z-14.4-560 contains further characteristic values for various clamps as well as numerous specifications, boundary conditions and interaction formulae.

Table 4 shows the load-bearing capacity depending on the sheet thickness t and clip spacing (fastening points of the sheet webs). This value for the load-bearing capacity can then be used to calculate the input values as a function of the force angle α. The interaction condition "Without interaction" applies to the calculated input values.

Table 5: Design values R_d of the load-bearing capacity according to the Kalzip data sheet

Sheet thickness t	Clip distance Lk [m]										
[mm]	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
0.80	1.12	1.06	1.02	0.96	0.92	0.86	0.81	0.76	0.71	0.66	0.61
0.90	1.25	1.21	1.16	1.11	1.06	1.02	0.97	0.92	0.87	0.83	0.78
1.00	1.40	1.35	1.29	1.24	1.18	1.13	1.07	1.03	0.97	0.92	0.86
1.20	1.67	1.61	1.55	1.48	1.42	1.35	1.29	1.23	1.16	1.10	1.02

Rated values (input values S.P.T)
Pressure = R_d * cos(α)
Suction = R_d
Shear force = R_d * sin(α)



3.6 Manufacturer/Supplier: PREFA Aluminiumprodukte GmbH, Werkstrasse 1, A-3182 Marktl/Lilienfeld

Product designation: PREFA, Prefalz Vario solar holder

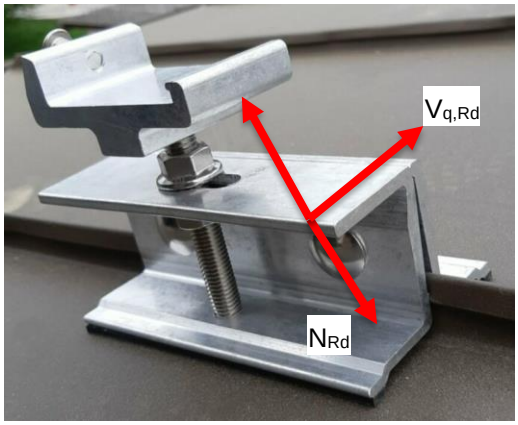


Fig. 8: PREFA, Prefalz Vario solar bracket

Important to know: A linear interaction verification is required between simultaneously acting forces. The permissible load is differentiated depending on the rebate spacing and load direction. The specified values only apply to prefabricated roofs with Prefa Adhesive installed. The formwork must have a minimum T ≥ 24 mm, C24 and the fasteners must be fixed with PREFA stainless steel grooved nail 28-30 or 28/25.
The value for "Roof normal" acts normally on the roof and "Roof parallel" in the direction of the eaves or ridge.
The distance between the start of the load-bearing timber material (upper edge of the formwork) to the load application point (lower edge of the solar panel) of the horizontal force is a maximum of 150 mm.

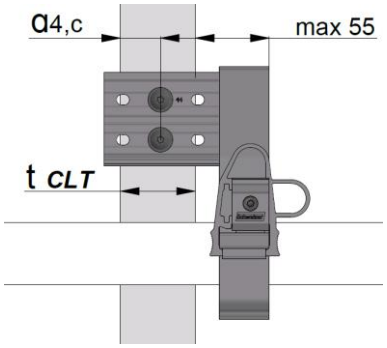
Note: For the input in S.P.T., if the distribution of fixed and sliding axes is not known, the values marked with an asterisk* are to be used.

Table 6: Design values of the load-bearing capacity under optimum conditions

	Pressure(N_{Rd})	Train ($-N_{Rd}$)	Shear force($V_{q,Rd}$)
Prefa fixed adhesion area, distance between two seam clamps on the same seam ≥ 600mm	5 kN*	1.1 kN*	1.35 kN*
Prefa fixed adhesion area, distance between two seam clamps on the same seam ≥ 400mm	5 kN*	0.725 kN*	1.3 kN*
Prefa sliding clamp area, distance between two clamps on the same rebate ≥ 600mm	5 kN	1.37 kN	1.38 kN
Prefa sliding clamp area, distance between two clamps on the same rebate ≥ 400mm	5 kN	0.915 kN	1.3 kN
Prefa long sliding clamp area, distance between two clamps on the same rebate ≥ 600mm	5 kN	1.5 kN	1.8 kN
Prefa long sliding clamp area, distance between two clamps on the same rebate ≥ 400mm	5 kN	1 kN	1.75 kN

3.7 Schweizer MSP-PR-RHM with Ø6 wood screws

Recommended use with smaller wood screws in accordance with ETA11/0024 or ETA11/0106.

1 		Screw dimensions	
		HS6 Ø6 	**HS Ø8** 
t_{CLT}	Minimum rafter width	35	65
$a_{4,c}$	Distance to rafter edge	17	32
Lg	Minimum thread depth in load-bearing rafters	70	90

Select the on-site fasteners with square interaction in the S.P.T planning software.
If Ø6 screws are used and supported on a 40 mm wide rafter, the following rated values result.

Table 3Rated resistance for MSP-PR-RHM.

Rated resistance Tension [N_{Rd} in kN]	-1.05
Rated resistance Pressure [N_{Rd} in kN]	1.21
Rated resistance Shear force [V_{Rd} in kN]	0.72