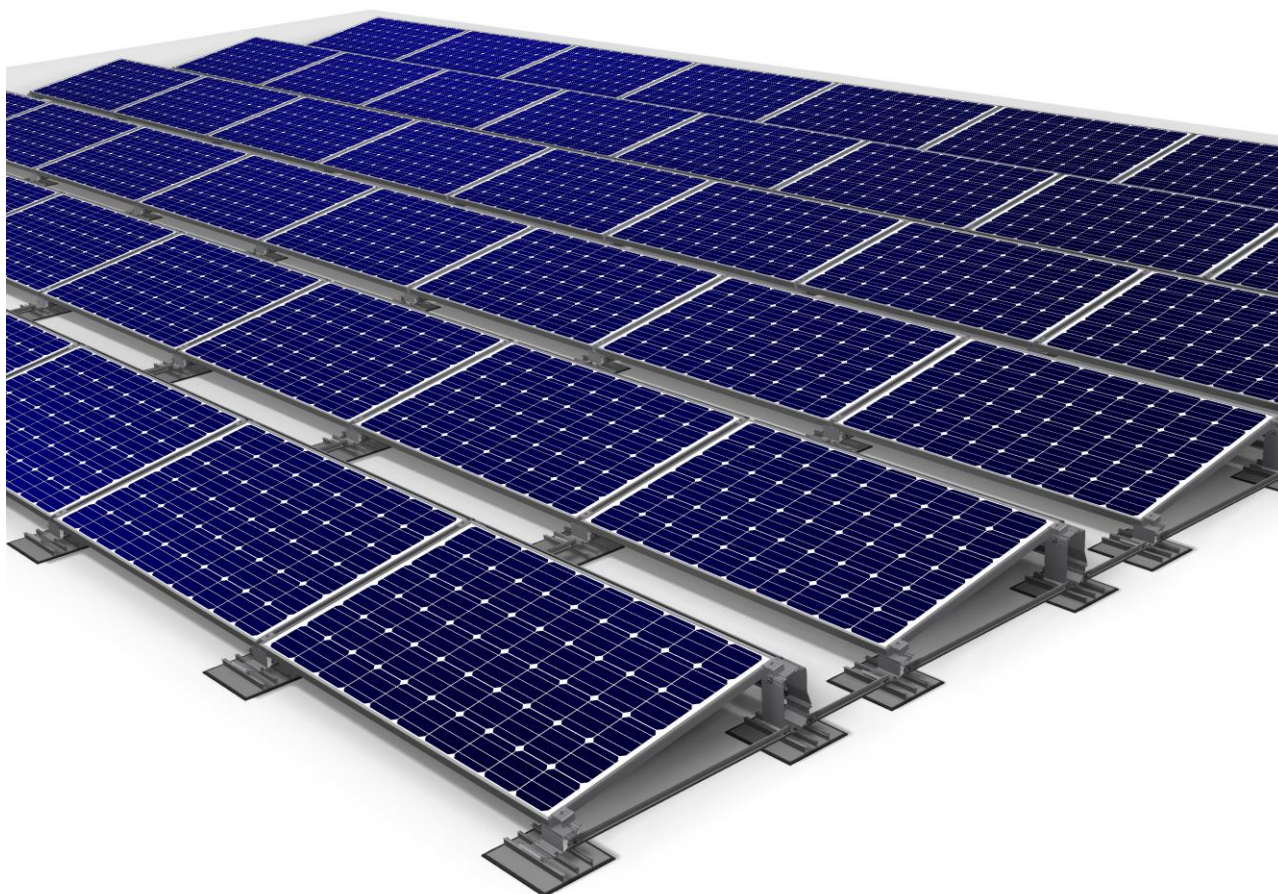


Solar Energy Systems from Schweizer:

Technical data

MSP-FR-S flat roof PV mounting system



Solar Energy Systems

Technical data – MSP-FR-S flat roof PV mounting system

1 Application range and system geometry

Table 1: Roof characteristics

Roof pitch	°	$\leq 3.0^\circ$
Unevenness	°	$\leq +2.5^\circ, \leq -2.5^\circ, \leq \pm 1.25^\circ$
Sealing membrane material	-	TPO/FPO, PVC, EVA, ASA, PVC-P, ECB, PIB, concrete, bitumen
Friction coefficient	-	Relevant to the layout, minimum requirement depending on wind load and field geometry
Insulation material	-	EPS/XPS, mineral fiber r, PUR, PIR, foam glass,...
Long-term pressure resistance	kN/m ²	Relevant to the layout, minimum requirement depending on ballast and module weight

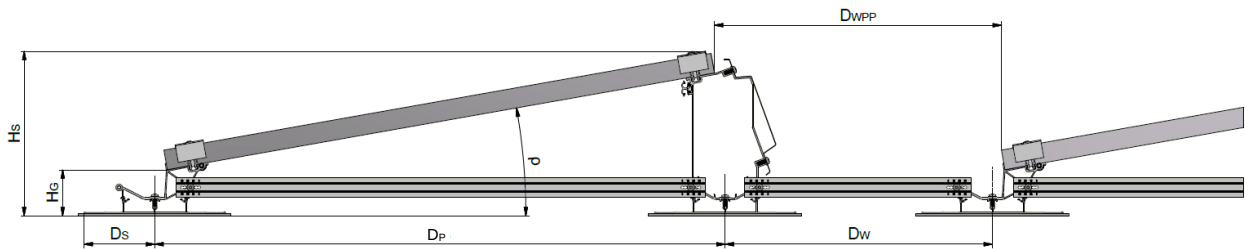


Figure 1: MSP-FR-S flat roof system side view

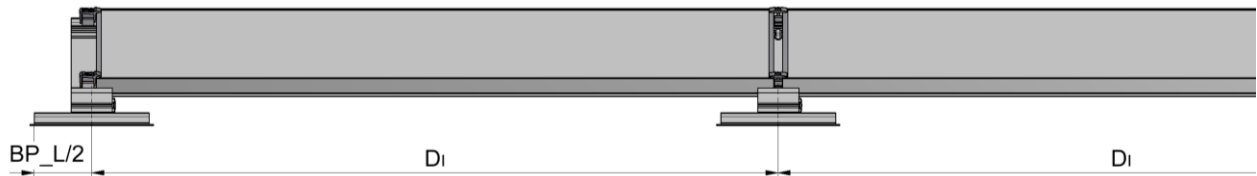


Figure 2: MSP-FR-S flat roof system view from the front

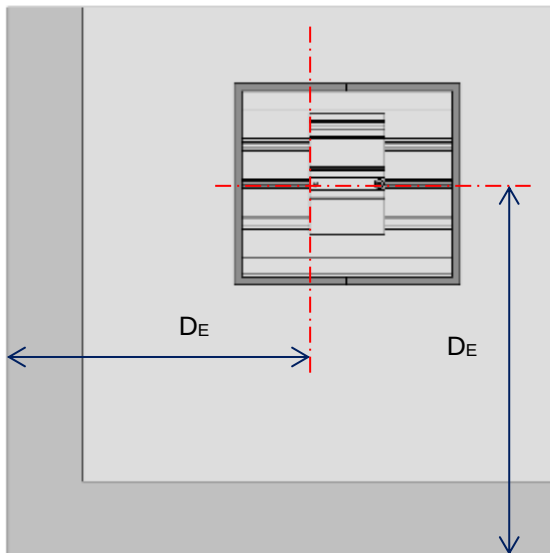


Figure 3: MSP-FR-S edge distances

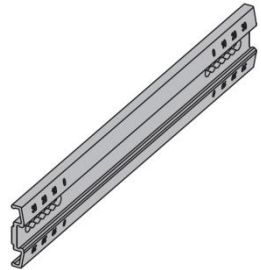
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Table 2: System characteristics

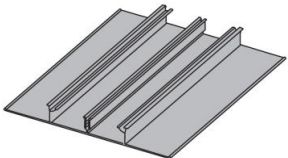
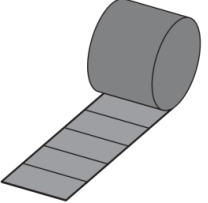
Max. block size	-	m	14.0 x 14.0
System height	H _S	mm	280 – 300
Ground clearance	H _G	mm	80
Row distance (support axes)	D _W	mm	301 / 471 / 1006
Row distance (module edges)	D _{WPP}	mm	351 / 506 / 1041
Support spacing X (North-South)	D _P	mm	976-1036
Support spacing Y (East-West)	D _I	mm	1642-1767
Min. edge distance	D _E	mm	1500 (standard), 500 with increased wind force coefficients
Modul tilt angle	ρ	°	9.6 – 10.3 (depending on the module width)
Panel width	-	mm	950 – 1102
Panel length	-	mm	1620 – 1749
Panel height	-	mm	30 – 50
Ballast object width	-	mm	100
Ballast object length	-	mm	200
Ballast object height	-	mm	40 – 80

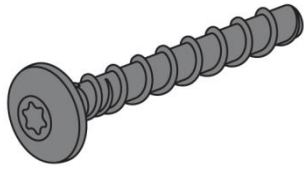
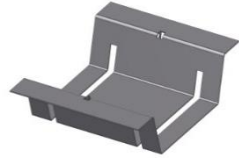
2 Components and materials

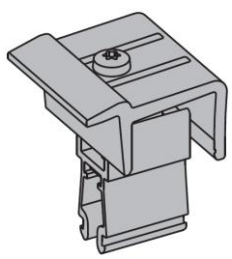
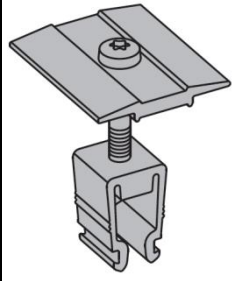
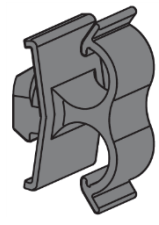
Description	Support	Support	Connection channel
Designation	MSP-FR-S-SH	MSP-FR-S-SL	MSP-FR-EW-C 300-360 MSP-FR-EW-C 470-530 MSP-FR-EW-C 950-1010
Figure			
Material Coating	EN AW-6063 T66 - EN 755-2	EN AW-6063 T66 - EN 755-2	EN AW-6063 T66 - EN 755-2

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Description	Profile	Protective sheet	Wind deflector
Designation	MSP-FR-EW-BP 150 MSP-FR-EW-BP 300 MSP-FR-EW-BP 450 MSP-FR-EW-BP 600 MSP-FR-EW-BP 900 MSP-FR-EW-BP 1200	MSP-FR-EW-PSF	MSP-FR-S-WD
Figure			
Material	EN AW-6060 T66 - EN 755-2	PES fleece 450 g/m ² 3-4 mm thickness with adhesive strips	S320GD+ZM275 - EN 10326

Description	Screw	Screw	Ballast carrier
Designation	MSP-FR-S M6x16	MSP-FR-GS 6x60	MSP-FR-S-SB
Figure			
Material	Carbon steel / ZnNi galvanised Coating thickness > 10 µm + dry lubricating film	Carbon steel / ZnNi galvanised Coating thickness > 10 µm + dry lubricating film	DX51D+Z275 – EN 10327

Description	End clamp	Middle clamp	Cable holder
Designation	MSP-PR-EC 30-50 mm	MSP-PR-MC 30-50 mm	MSP-FR-CH8
Figure			
Material	Clamp: EN AW-6063 T66 - EN 755-2 Screw: A2-70 - ISO 3506-1 Securing washer: PE-HD Nut: A4-70 - ISO 3506-2	Clamp: EN AW-6063 T66 - EN 755-2 Screw: A2-70 - ISO 3506-1 Securing washer: PE-HD	PA6

3 Design resistances of components and connections (ultimate limit states)

For the resistance verification of MSP-FR-S applications the following component design resistances have to be considered individually:

- Resistance of the roof structure - Pressure resistance of the insulation - Friction coefficient between the sealing membrane and the protective layer	- By the customer
- Base profile MSP-FR-EW-BP, see 3.1 and 3.2 - Support MSP-FR-S-SL see 3.1 - Support MSP-FR-S-SH see 3.2 - Connecting rail MSP-FR-EW-C see 3.1, 3.2 and 3.3 - Wind deflector MSP-FR-S-WD see 3.4 and 3.5 - Clamps MSP-PR-EC / MC see 3.6	- According to this document

The component with lowest resistance limits the application.

All resistances are calculated according to the following codes and guidelines:

- DIN EN 1990:2010-12
- DIN EN 1999-1-1:2010-05
- VDI 2230 Blatt 1:2003-02

The resistances are valid as long as the full Schweizer MSP-FR-S system is used and the installation is built according to the MSP-FR-S flat roof PV mounting system's mounting instructions.

3.1 MSP-FR-S-SL support / MSP-FR-EW-C connection channel / MSP-FR-EW-BP profile

The design resistances of the MSP-FR-S-SL support / MSP-FR-EW-C connection channel / MSP-FR-EW-BP profile combination is stated in Table 3.

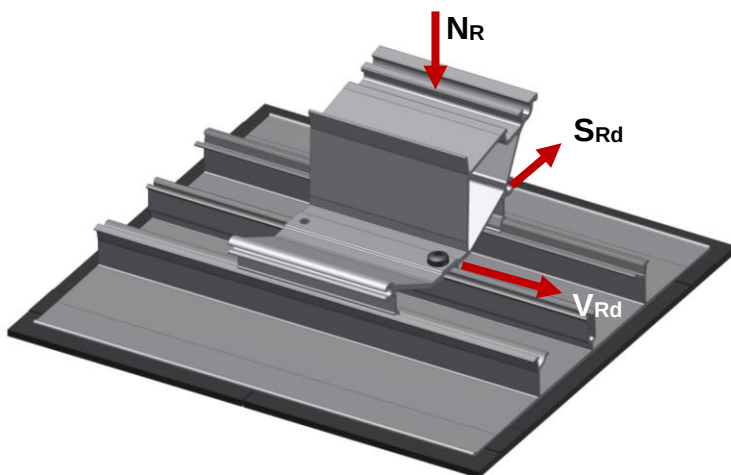


Figure 4: MSP-FR-S-SL / MSP-FR-EW-C / MSP-FR-EW-BP resistance vectors

Table 3: MSP-FR-S-SL / MSP-FR-EW-C / MSP-FR-EW-BP combination resistances

Pressure design resistance	N_{Rd} in kN	3.75
Suction design resistance	N_{Rd} in kN	-1.97
Shear design resistance	V_{Rd} in kN	± 1.95
Shear design resistance	S_{Rd} in kN	1.95
Shear design resistance	S_{Rd} in kN	-0.24

3.2 MSP-FR-S-SH support / MSP-FR-EW-C connection channel / MSP-FR-EW-BP profile

The design resistances of the MSP-FR-S-SH support / MSP-FR-EW-C connection channel / MSP-FR-EW-BP profile combination is stated in Table 4.

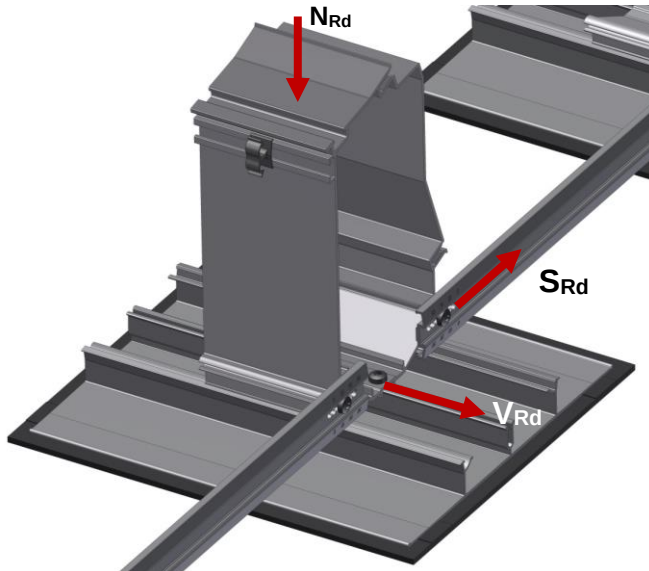


Figure 5: MSP-FR-S-SH / MSP-FR-EW-C / MSP-FR-EW-BP resistance vectors

Table 4: MSP-FR-S-SH / MSP-FR-EW-C / MSP-FR-EW-BP combination resistances

Pressure design resistance	N_{Rd} in kN	3.75
Suction design resistance	N_{Rd} in kN	-4.08
Shear design resistance	V_{Rd} in kN	±1.95
Shear design resistance	S_{Rd} in kN	±1.95

3.3 MSP-FR-EW-C connection channel

The design resistances of the MSP-FR-EW-C connection channel is stated in Table 5.

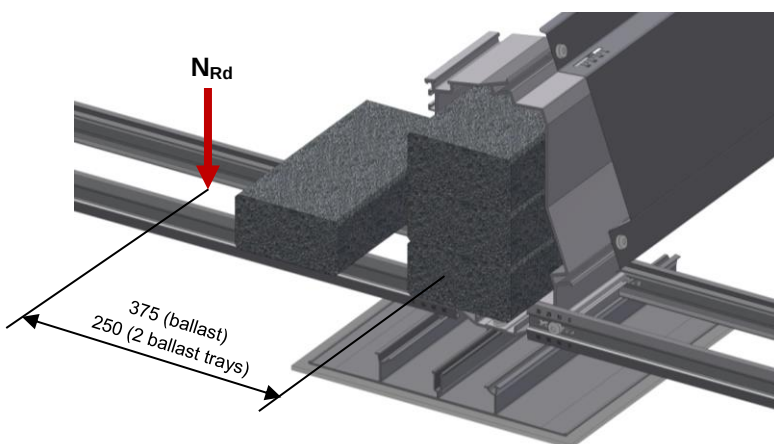


Figure 6: MSP-FR-EW-C resistance vectors

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Table 5: pressure design resistance of the MSP-FR-EW-C connection channel

Pressure design resistance (ballast)	N_{Rd} in kN	0.34
Pressure design resistance (with ballast tray holder)	N_{Rd} in kN	1.08

3.4 Wind deflector / ballast tray MSP-FR-S-WD

The design resistance per fixing point of the MSP-FR-S-WD wind deflector in the MSP-FR-EW-SH support is stated in Table 6.

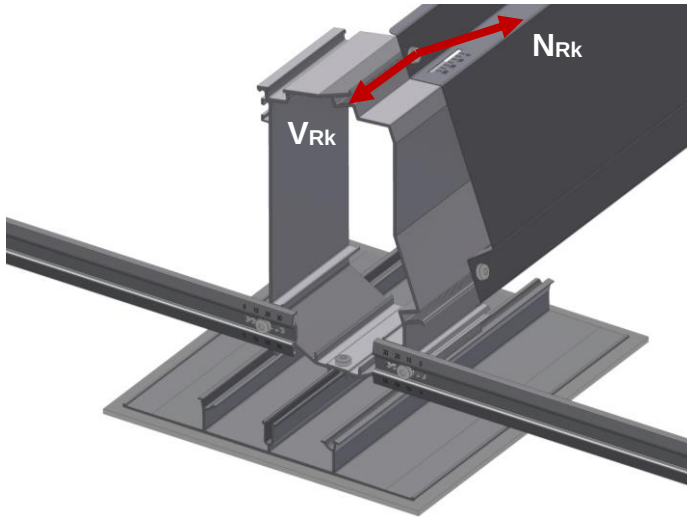


Figure 7: MSP-FR-S-WD resistance vectors

Table 6: MSP-FR-S-WD wind deflector connection resistances

		MSP-FR-S-WD 1620-1684	MSP-FR-S-WD 1695-1749	MSP-FR-S-WD 1750-1814
Suction design resistance	N_{Rk} in kN	0.80	0.80	0.80
Shear design resistance	V_{Rk} in kN	±0.80	±0.80	±0.80

The design resistance of the MSP-FR-S-WD wind deflector on wind loads as well as when used as ballast tray is shown in Table 7.

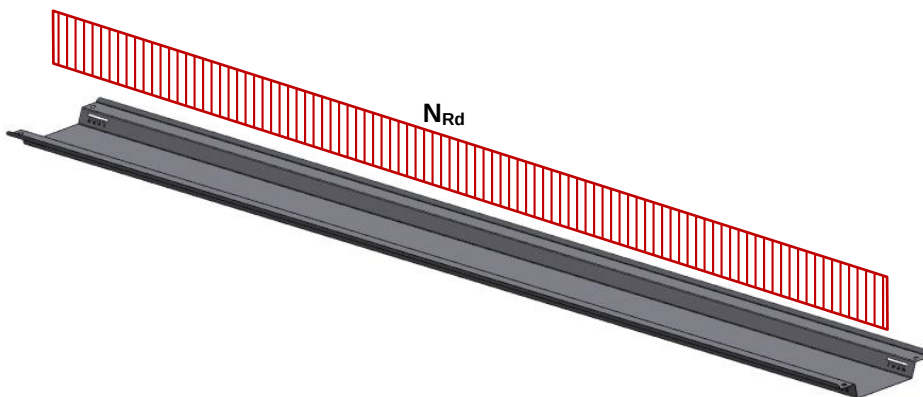


Figure 8: MSP-FR-S-WD illustration of the load effect

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Table 7: MSP-FR-S-WD wind deflector design resistance (with even load distribution)

		MSP-FR-S-WD 1620-1684	MSP-FR-S-WD 1695-1749	MSP-FR-S-WD 1750-1814
Pressure design resistance	N_{Rd} in kN	0.49	0.49	0.39
Suction design resistance	N_{Rd} in kN	-0.49	-0.49	-0.39

3.5 MSP-PR-MC / EC middle clamp / end clamp

The design resistance of the MSP-PR-MC middle clamp is stated in Table 8. The design resistance of the MSP-PR-MC end clamp is stated in Table 9.

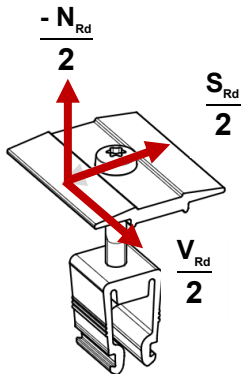


Figure 9: MSP-PR-MC/ECB middle clamp resistance vectors

Table 8: MSP-PR-MC / MCB middle clamp design resistance

Suction design resistance	N_{Rd} in kN	-5.17
Shear design resistance	N_{Rd} in kN	1.29
Suction design resistance	S_{Rd} in kN	1.29

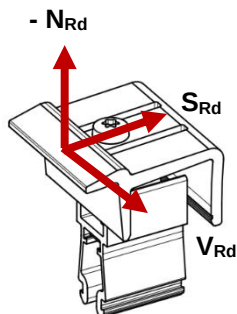


Figure 10: MSP-PR-EC/ECB end clamp resistance vectors

Table 9: MSP-PR-EC / ECB end clamp design resistances

Suction design resistance	N_{Rd} in kN	-1.90
Shear design resistance	N_{Rd} in kN	0.51
Suction design resistance	S_{Rd} in kN	0.51