



MOUNTING SYSTEMS
INSTALLATION INSTRUCTIONS

EN



Deutsches
Institut
für
Bautechnik

DIBt



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Safety and Danger instructions

Please carefully read the installation instruction before starting with the installation



1. Advice



- This instruction only refers to qualified persons and skilled craftsmen.
- The SOL mounting system has only been designed to carry photovoltaic modules and may only be used for the respective type of module approved by the manufacturer.
- The accident prevention regulations, rules and guide lines of the appropriate public authorities and facilities apply to the installation, operation and maintenance. Please note national and regional regulations if so especially the fire protection regulations.
- Non-compliance may lead to considerable personal and property damages.
- The SOL mounting system may only be used according to its intended purpose. SEN will not assume liability in case of incorrect application, use, maintenance or mounting.
- SEN will not assume responsibility and liability for losses, damages or costs arising from incorrect mounting, improper application, installation of non-system parts and materials, extension on non-system constructions, as well as faulty use or maintenance or in any manner associated therewith.
- The current valid detailed guarantee conditions can be seen on the SEN Homepage (www.sen.eu), contact / legal / written guarantee. We will send you the detailed written guarantee on request.
- We will not be in a position to examine the conformance of the mounting instruction with all national and international building regulations. Therefore the user has to ensure their adherence onsite! The customer has to ensure that the respective roof can accept the weight of the mounting system and the modules or rather fulfills the static requirements of the building! The examination has to be carried out by a skilled structural engineer or construction engineer and has to be documented in written form.
- All information of this mounting instruction are copyrighted and base on the developments and experiences acquired during the existence of the company SEN. No responsibility is taken for the correctness of contents including product specifications and product recommendation

This mounting instruction does not replace the know-how, which is necessary to construct a photovoltaic installation.

Safety and Danger instructions

2. General safety instructions



- Never make any unauthorized changes of our mounting system or its components.
- Do not use damaged parts
- In case a constructional part has to be replaced please compare and verify the characteristics of the new one with the parts already inserted.
- Please obey the individual safety instructions for further components used for your photovoltaic installation.
- The safety instructions of other installation components have to be obeyed.
- Do not cover the drain holes; if necessary drill a new hole at a suitable position.
- The project planning and installation of the system may only be carried out by technical experts or trained persons. Furthermore for installations on the roof or façade the regulations of the respective country have to be obeyed.
- During the installation at least 2 persons have to be present on the construction site.
(emergency aid)
- Roofer working has to be carried out by roofers.



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3. Hazard warnings Accident risks

- During assembly please respect the compliance of the norms on-site. Building regulations and accident prevention regulations.
- On Jobs at height please avoid danger due to falling objects.
- Do not work on the roof during rain, snow and strong wind.
- Mounted roof hooks and system components do not have to be used as additional ladder.
- At works in big heights please use suitable protections against risk of falling. Please also note the respective recommendation and regulations of the trade association or similar establishments.
- The surface of the mounting system can be heated due to solar radiation; there will be danger of burning. Please use protective clothing, safety shoes, and protective gloves.
- Keep children away from the mounting of a photovoltaic installation.
- Observe the safety distances to energized overhead lines
- Carefully lay PV modules; they are impact sensitive and not walkable.
- During light influence the PV modules are electrical voltage sources which cannot be switched off, thus do not insert any metallic parts into the plug-in connection.
- the plug-in connections have to be free of pollution
- Before starting the works on the system the inverter has to be activated by an electronic specialist alternating current sided and direct current sided.

Safety and Danger instructions



- Please observe our mounting advices
- Only a licensed electrical installer may make the contact of the inverter
- Before connecting the inverter the string voltage has to be controlled
- The maximum input voltage of the inverter has to be observed
- Before plugging or pulling the connector release the solar generator from the inverter.
- Never pull or plug under the influence of current voltage load
- If the material delivered by SEN is cut at the respective sites attention has to be paid that the end of the cutting is treated in a way that it does not lead to risks of injury due to sharp edges and angles.



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4. Updating

- SEN reserves the right without any prior notice to make modifications with regard to the products, technical data or mounting instructions. Beyond the delivered mounting instructions the constantly updated and detailed mounting instructions have to be obeyed, which are available on the SEN Homepage (www.sen.eu) or which can be requested without any charges at SEN directly.
- The mounting systems of SEN are constantly under development. Thus assembly processes or components might change in short terms. Please always compare the printed version of the mounting instruction with the actual valid mounting instruction on www.sen.eu. In case no internet connection is available we can send you the actual valid version on enquiry. In case problems or questions occur during the installation please contact us. We will be pleased to support you.

5. Maintenance and inspection

- Installation and maintenance may solely be carried out by qualified and trained persons and only in accordance with regional regulations.
- The maintenance of the mounting systems may solely be carried out by qualified persons. We recommend the following regular maintenance and inspections works:
 - Visual inspection of the mounting system
 - Visual inspection of the solar modules
 - Visual inspection of the electrical connections
 - Removal of the pollution
 - If necessary removal of snow, slipping snow may lead to personal injury and damage to property!
 - Do not clean the mounting system with aggressive detergents.

Safety and Danger instructions

6. Norms and Rules



In general, all regulations for the technology are to be adhered to for the planning, mounting and operation of solar installations. Important standards and regulations are:



- DIN VDE 0100 (IEC 60364), Section 712 "Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems"
- DIN VDE 0100 Part 5-54 „Selection and Set-up of electrical equipment, earthing systems, protective earth and protective bonding conductors“
- DIN EN 62305– Lightning protection
- DIN VDE 0185 Teil 1-4 (Lightning protection)
- DIN VDE 0100 Teil 410 (earthing)
- DIN VDE 0105 (Operation of electrical plants)
- DIN VDE 0298 (Electrical plants)
- Directive VDEW (2010)
- Directive VDI 6012 (2002)
- VDS 2023 „ Electrical plants in engineered structures with mainly combustible building materials – Guidelines for loss prevention “
- DIN EN 1993 (Eurocode3)
- DIN EN 1995 (Eurocode5)
- DIN EN 1999 (Eurocode9)
- BGV A1 (Basics of prevention)
- BGV A3 (electrical equipment and machinery)
- BGV C22 (Building work)
- BGV D35 (Ladders and Stepladders)
- DIN 1052-2 (Timber Trade)
- DIN 1860 (Drainage systems for buildings and properties)
- DIN 1986-100 (Roof drainage)
- DIN 4012 (Fire behaviour of building materials and structural elements)
- DIN 4420 (Working and protective scaffolding)
- DIN 18015 (Planning and construction of electrical installations in residential buildings)
- DIN 18299 (General rules for constructional works)
- DIN 18338 (Roof working)
- DIN 18451 (Scaffold works)
- DIN 18531 (Roof sealing)
- EN 1991-1-3 (Snowloads, Eurocode1)
- EN 1991-1-4 (Windloads, Eurocode1)
- Regulations of local energy suppliers
- National building regulations
- Local building regulations
- Employers' Liability Insurance Association of the building industry — working on roofs
- All country-specific norms and rules have to be obeyed

Performance declaration according to regulation (EU) 305 / 2011



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 0780-CPR-153363	
SEN Solare Energiesysteme Nord Vertriebsgesellschaft mbH Wörpedorfer Ring 3, D-28879 Grasberg	
Ref.-Nr.: 00001 / 2015	
EN 1090-1:2009 + A1:2011	
SOL-50 Montagesystem für Photovoltaikanlagen	
geometrische Toleranzen:	nach 1090-3
Schweißeignung:	NPD
Bruchzähigkeit:	NPD
Brandverhalten:	Material in Klasse A1 eingestuft
Freisetzung von Cadmium:	NPD
Freisetzung von radioaktiver Strahlung:	NPD
Dauerhaftigkeit:	NPD
Tragfähigkeit:	nach EN 1990, EN 1991, EN 1999, siehe zugehörige statische Berechnung. Es gelten die in Deutschland festgelegten NDP.
Verformung im Grenzzustand der Gebrauchstauglichkeit:	nach EN 1990, EN 1991, EN 1999 siehe zugehörige statische Berechnung. Es gelten die in Deutschland festgelegten NDP.
Ermüdungsfestigkeit:	NPD
Feuerwiderstand:	NPD
Herstellung:	nach EN 1090-3
Ausführungsklasse:	EXC 1 und EXC 2

Leistungserklärung nach Verordnung (EU) 305 / 2011 07/2015

1. Kenn-Code des Produkttyps: SOL-50 Montagesystem für Photovoltaikanlagen

2. Kennzeichen zur Identifikation des Bauproduktes: Montagesystem

3. Verwendungszweck: Befestigungssystem für Solarmodule

4. Hersteller: SEN Solare Energiesysteme Nord
Vertriebsgesellschaft mbH
Wörpedorfer Ring 3, D-28879 Grasberg
www.sen.de

5. System zur Bewertung und Überprüfung der Leistungsbeständigkeit des Bauproduktes: System 2+ entsprechend Anhang ZA der EN 1090-1

6. Die notifizierte Stelle: TÜV Rheinland LGA Bautechnik GmbH / Nr. 0780 hat die Bewertung und Überprüfung der Leistungsbeständigkeit nach dem System 2+ vorgenommen und ein EG-Zertifikat Nr. 0780-CPR-153363 für die werkseigene Produktionskontrolle ausgestellt.

7. Nur bei Europäischer techn. Bewertung (ETA). Hier nicht zutreffend!

8. Erklärte Leistung: siehe umseitig abgedruckte CE-Kennzeichnung

9. Die Leistung des Produktes gemäß den Nummern 1 und 2 entspricht der erklärten Leistung nach Nummer 8 bzw. nach der CE-Kennzeichnung

Unterzeichnet für den Hersteller und im Namen des Herstellers von:

Grasberg, 01.06.2015 
Klaus-Dieter Osmer, Geschäftsleitung

Grasberg, 01.06.2015 
Andy Satzer, Geschäftsleitung

SOL-50 mounting systems

Solar modules are often considered to be the core of any photovoltaic system.



From a technical point of view, the manner in which the modules are mounted is equally important. Only when the solar module is securely mounted can it produce energy fault-free over its entire service life.



We have developed the “SOL mounting systems” for just that purpose.



Our partners have decades of experience in assembling all kinds of photovoltaic systems on a daily basis and we have fed this knowledge directly into improving our products and components. We only approve our systems for sale once they have successfully passed all the tests and all the static load calculations are complete.

In addition to factors such as safety, durability and quick assembly, we place particular value on the visual design of the generator surface. Our aim is to integrate photovoltaic systems harmoniously with their surroundings, so that they do not give the impression of a visual foreign body and consequently appeal to the investor.

SOL-50 Mounting Systems can be used with standard types of modules and are suitable for almost any form of mounting structure and roof covering. They can be used for on-roof, in-roof, flat-roof, and roof canopy applications as well as on facades.

The “SOL-50 mounting systems” can easily and reliably handle solar modules with frames of varying heights and thickness.

Service:

We are available at any time for rapid and competent advice, or individual problem solving.

Mo. - Fr. 7.30 - 16.30

Tel: +49(0)4208/91690

Fax: +49(0)4208/916950

Mail: info@sen.eu

Internet: www.sen.eu

Technical specifications for our SOL-50 mounting systems, installations instructions or videos can be found on www.sen.eu, in the download area. When logged in as a customer, you can also use our online software to plan your installations. Price lists can be consulted using the online shop.

Thank you for your interest in our products.

We look forward to working with you.

With best regards,

Your SEN team

System description - SOL-50 mounting systems / insertion system



The SOL-50 profile system is a universal fixing system for the safe and quick installation of framed solar modules (for frame heights up to 50 mm) and can be inserted in connection with different fastening elements in nearly all kind of installations. The connection of corrosion resistant materials (aluminium / stainless steel) with a stable construction (system static) guarantees a long durability and thus safety of investment. By fastening the modules via a positive and stress less connection with the mounting system optimal conditions are created for the operational safety and resistance of the solar modules.



Advantages of the SOL-50 profile system

Optical:

- Aesthetic fitting of the profile system into the surroundings
- Uniform energy area by pushing the components into the horizontal profile, even with uneven roof surfaces
- Later extension of the system easily possible

Costs:

- Quick and secure installation provides a cost advantage.
- Higher yields through optimum back-ventilation of the modules.
- Installation video for rapidly learning the installation process
- Module installation on the roof without tools

Safety:

- Large spacing between the roof hooks due to the high rigidity of the horizontal and vertical profiles
- Stress-free seating of the modules with a positive-fit connection with the horizontal profile
- Secure drainage and ventilation using special profiles for the horizontal profiles, thus eliminating frost and corrosion damage to the modules
- Protected cable runs in the horizontal and vertical profiles.
- System statics for the SOL-50 on-roof system
- Wind Channel tested

**SOL-50 profile systems are a patent of
“SEN Solare Energiesysteme Nord Vertriebsgesellschaft mbH”**

Subject to technical changes!

System description - SOL-50 insertion system on-roof system

The SOL-50 on-roof system is a universal mounting system for fast and secure mounting of framed solar panels with a frame height up to 50 mm and a high-performance flat collector specially developed for this system.



As a rule, it consists of a grid system with vertical base profiles and horizontal mounting profiles as insertion profiles. In conjunction with various fixing elements, the system can be used for virtually all types of mounting. We differentiate between pan tiled, corrugated and trapezoid panel roofs for on-roof mounting. In these cases the interfaces are realised using roof hooks, hanger bolts or direct attachment with bolts to the sheet.

Alternative attachments are on facades, canopy, Kalzip and standing seam roofing. The connection is made using universal roof attachments or Kalzip or clamp blocks.

The way in which the components are inserted into the mounting system as a positive fit but stress-free prevents stress cracks that, for example, can be caused by the movement of the roof construction. In this way, optimum conditions are established for operational reliability and durability of the modules. The module frames are not damaged or tensioned, i.e. they remain in the original manufactured state with all positive effects. A minimum amount of time is required for the assembly of the components thanks to the inserted system. In general, there are end caps on all vertical and horizontal profiles. The lowest horizontal profiles have additional cover strips.

The system has many optional accessories, such as anti-theft protection, cable protection net, cable clips, cable sleeves, vertical seals and water panels. Our horizontal profiles are supplied as Premium (aluminium, anodised in silver and powder coated black) and Standard versions (aluminium, plate-finished) in 4 m lengths.

We also provide an assembly system consisting of 2 m lengths (vertical and horizontal) with riveted connectors. All connectors are bending resistant connections once installed. The vertical frames are made of plate-finished aluminium.

In the majority of cases, a self-cutting, self-drilling screw in stainless steel is used, so that a minimum of effort with tools is required.

The aluminium used is 100% recyclable and 100% will be taken back by us. The combination of corrosion-resistant materials (aluminium/stainless steel) with a robust design (system statics) guarantees a long life and thus security for the investment.

System description - SOL-50i insertion system in-roof system



The SOL-50i in-roof system is a fastening system for all standard framed solar modules up to 50 mm frame height. The modules can be mounted in portrait or landscape orientations. It was specially developed for roof integration on roofs even with a small pitch and completely replaces the traditional roof covering. Installing the SOL-50 in-roof system consisting of the trapezoid roof profiles and the generator surface ensures simple and waterproof mounting. Connection plates provide the upper connection and lateral connection between roofing tiles and in-roof system in a stylish and attractive manner. Ventilation grills provide good ventilation behind the modules as with a traditional on-roof installation.

The integration of the SEN combination collector for service water heating can likewise be easily implemented with the in-roof system. This patented installation system is often superior with regard to cost and visual appearance to normal on-roof installation for new buildings and roof renovation. As with other systems in the SOL-50 series, high-quality, corrosion-resistant materials are used for the SOL-50i in-roof system. Simple installation by inserting the modules makes the building of the in-roof system faster.

Cover strips and section end caps provide a harmonious look to the frame. Furthermore, the system provides cable holding nets and a cable duct system as well as a functional anti-theft protection via the SOL-Guard module locks.

Advantages of the SOL-50i premium in-roof system:

Optical:

- Can be used with roof slopes starting from 10°.
- Use with angles under 10° on request
- Aesthetic integration of the generator surface in the roof covering
- Attractive side connection between roof tiles and in-roof system
- Framing system in black powder coated or anodized aluminium available matched to the solar modules

Costs:

- Use of standard framed solar modules up to 50 mm frame height
- High yields from the modules thanks to the stack effect
- The conventional roof cladding is no longer required: the photovoltaic system serves two purposes.
- Installation instructions and installation video for rapidly learning the simple installation process

Safety:

- Double waterproofing with two levels for carrying water and static calculation for the SOL-50i in-roof system
- High-quality silicon sections for sealing between modules and as a visual eye-catcher
- Stress-free, safe seating of the modules with a positive-fit connection with the installation system.
- Use of multiple support profiles for increased snow loads.
- SOL-Guard module lock for securing modules with distance pieces
- Cable protection net and cable duct system to secure module cabling.
- Patented TÜV-certified mounting system.

Notes on statics - SOL-50 insertion system on-roof

Determination of the span distance at the installation location:



Eurocode 1 EN 1991 specifies extensive calculation methods for the maximum pressure loads and suction loads.



On the base of your site relevant parameters you determine the max. forces arising. Compare these values with the tables shown below and thus determine the maximum permitted span distances.

**Allowed surface load using the SOL-50 roof hooks incl. Base plate for pan tiled roofs.
Fixing on the roof rafters.**

		rafter distance/ horizontal distance of the roof hooks								
		600mm		700mm		800mm		900mm		
vertical distance of the roof hooks/ modul length	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	
	1685 mm		1,35 KN/m ²	-1,53 KN/m ²	1,15 KN/m ²	-1,32 KN/m ²	1,01 KN/m ²	-1,17 KN/m ²	0,90 KN/m ²	-1,05 KN/m ²
	1409 mm		1,61 KN/m ²	-1,80 KN/m ²	1,38 KN/m ²	-1,56 KN/m ²	1,21 KN/m ²	-1,38 KN/m ²	1,08 KN/m ²	-1,24 KN/m ²
	1318 mm		1,73 KN/m ²	1,92 KN/m ²	1,48 KN/m ²	-1,66 KN/m ²	1,30 KN/m ²	-1,46 KN/m ²	1,15 KN/m ²	-1,31 KN/m ²
	1129 mm		2,02 KN/m ²	-2,22 KN/m ²	1,73 KN/m ²	-1,92 KN/m ²	1,51 KN/m ²	-1,69 KN/m ²	1,35 KN/m ²	-1,51 KN/m ²

		rafter distance/ horizontal distance of the roof hooks									
		1000mm		1200mm		1400mm		1600mm		1800mm	
vertical distance of the roof hooks/ modul length	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	
	1685 mm	0,81 KN/m ²	-0,96 KN/m ²	0,68 KN/m ²	-0,81 KN/m ²	0,58 KN/m ²	-0,71 KN/m ²	0,51 KN/m ²	-0,63 KN/m ²	0,45 KN/m ²	-0,57 KN/m ²
	1409 mm	0,97 KN/m ²	-1,12 KN/m ²	0,81 KN/m ²	-0,95 KN/m ²	0,69 KN/m ²	-0,83 KN/m ²	0,61 KN/m ²	-0,74 KN/m ²	0,54 KN/m ²	-0,67 KN/m ²
	1318 mm	1,04 KN/m ²	-1,19 KN/m ²	0,87 KN/m ²	-1,01 KN/m ²	0,74 KN/m ²	-0,88 KN/m ²	0,74 KN/m ²	-0,78 KN/m ²	0,58 KN/m ²	-0,71 KN/m ²
	1129 mm	1,21 KN/m ²	-1,37 KN/m ²	1,01 KN/m ²	-1,16 KN/m ²	0,87 KN/m ²	-1,01 KN/m ²	0,87 KN/m ²	-0,90 KN/m ²	0,67 KN/m ²	-0,81 KN/m ²

The length of the cantilever arm should be at least 0,45 times of the span distance calculated!

Higher span distances and cantilever arm lengths differing from these are possible in special circumstances.

Additional comments:

We recommend, due to the thermally caused expansion of material, a maximum generator width of 12-15 m. Wider area generator should always be interrupted, these interruptions can also be used as service rise.

Do not hesitate to contact us by telephone if you have any questions.

Notes on statics - SOL-50 insertion system on-roof



Reliable distributed load using SOL-50 solar fasteners in steel trapezoid sheets – aluminium sheets and corrugated fibre cement sheets. Bolting to sub-construction, steel or wood purlins. For installations on timber purlins please care for enough cross section of the material. The required distances of the DIN to the loaded and unloaded border have to be obeyed.



Solarbefestiger bei einer Dacheindeckung aus Trapezblech auf Stahlprofilen

Dachneigung 15° ; Pfettenabstand 1,50 m
Die Grenzen der Drucklast von $D = 5,40 \text{ kN/m}^2$ und der Zuglast von $Z = -2,40 \text{ kN/m}^2$ werden durch die Zulassung der Module vorgegeben.
zulässige Belastung in kN/m^2 (Druck pro m^2 Grundfläche; Zug pro m^2 Dachfläche)

Elot - JA3-SB-8,0*L ; Stahl-Trapezblech

Einzugsbreite der Horizontalprofile / Modullänge	Abstand der Vertikalprofile / Solarbefestiger																			
	500 mm		600 mm		700 mm		800 mm		900 mm		1000 mm		1200 mm		1400 mm		1600 mm		1800 mm	
	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug		
1685 mm	1,94	-2,18	1,59	-1,83	1,34	-1,58	1,15	-1,40	1,01	-1,25	0,89	-1,14	0,72	-0,96	0,59	-0,84	0,50	-0,75	0,43	-0,67
1409 mm	2,08	-2,32	1,71	-1,95	1,44	-1,69	1,24	-1,49	1,09	-1,34	0,96	-1,21	0,78	-1,03	0,64	-0,89	0,54	-0,79	0,46	-0,72
1318 mm	2,08	-2,33	1,71	-1,96	1,44	-1,69	1,24	-1,49	1,08	-1,34	0,96	-1,21	0,77	-1,03	0,64	-0,90	0,54	-0,80	0,46	-0,72
1129 mm	2,07	-2,33	1,70	-1,96	1,43	-1,69	1,23	-1,50	1,08	-1,34	0,95	-1,22	0,77	-1,03	0,63	-0,90	0,53	-0,80	0,46	-0,72
994 mm	2,07	-2,33	1,70	-1,96	1,43	-1,70	1,23	-1,50	1,07	-1,34	0,95	-1,22	0,76	-1,04	0,63	-0,90	0,53	-0,80	0,45	-0,73
810 mm	2,06	-2,34	1,69	-1,97	1,42	-1,70	1,22	-1,51	1,06	-1,35	0,94	-1,23	0,75	-1,04	0,62	-0,91	0,52	-0,81	0,44	-0,73

Elot - JA3-SB-8,0*L ; Aluminium-Trapezblech

Einzugsbreite der Horizontalprofile / Modullänge	Abstand der Vertikalprofile / Solarbefestiger																			
	500 mm		600 mm		700 mm		800 mm		900 mm		1000 mm		1200 mm		1400 mm		1600 mm		1800 mm	
	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug		
1685 mm	1,53	-2,18	1,26	-1,83	1,07	-1,58	0,92	-1,40	0,81	-1,25	0,72	-1,14	0,59	-0,96	0,49	-0,84	0,42	-0,75	0,36	-0,67
1409 mm	1,53	-2,32	1,26	-1,95	1,06	-1,69	0,92	-1,49	0,81	-1,34	0,72	-1,21	0,58	-1,03	0,48	-0,89	0,41	-0,79	0,36	-0,72
1318 mm	1,53	-2,33	1,25	-1,96	1,06	-1,69	0,92	-1,49	0,80	-1,34	0,71	-1,21	0,58	-1,03	0,48	-0,90	0,41	-0,80	0,35	-0,72
1129 mm	1,52	-2,33	1,25	-1,96	1,06	-1,69	0,91	-1,50	0,80	-1,34	0,71	-1,22	0,57	-1,03	0,48	-0,90	0,40	-0,80	0,35	-0,72
994 mm	1,51	-2,33	1,24	-1,96	1,05	-1,70	0,91	-1,50	0,79	-1,34	0,70	-1,22	0,57	-1,04	0,47	-0,90	0,40	-0,80	0,34	-0,73
810 mm	1,50	-2,34	1,23	-1,97	1,04	-1,70	0,90	-1,51	0,78	-1,35	0,69	-1,23	0,56	-1,04	0,46	-0,91	0,39	-0,81	0,33	-0,73

Gebrauchslasten

Solarbefestiger bei einer Dacheindeckung aus Faserzement-Wellplatten

Dachneigung 15° ; Pfettenabstand 1,15 m
Die Grenzen der Drucklast von $D = 5,40 \text{ kN/m}^2$ und der Zuglast von $Z = -2,40 \text{ kN/m}^2$ werden durch die Zulassung der Module vorgegeben.
zulässige Belastung in kN/m^2 (Druck pro m^2 Grundfläche; Zug pro m^2 Dachfläche)

Elot - JA3-SB-8,0*L

Einzugsbreite der Horizontalprofile / Modullänge	Abstand der Vertikalprofile / Solarbefestiger																			
	500 mm		600 mm		700 mm		800 mm		900 mm		1000 mm		1200 mm		1400 mm		1600 mm		1800 mm	
	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug	Druck	Zug		
1685 mm	1,66	-2,40	1,36	-2,10	1,15	-1,82	0,99	-1,60	0,87	-1,43	0,77	-1,30	0,62	-1,10	0,52	-0,96	0,44	-0,85	0,38	-0,76
1409 mm	1,77	-2,40	1,45	-2,40	1,23	-2,15	1,06	-1,89	0,93	-1,69	0,83	-1,53	0,67	-1,29	0,56	-1,12	0,47	-1,00	0,41	-0,90
1318 mm	1,81	-2,40	1,49	-2,40	1,26	-2,29	1,09	-2,01	0,95	-1,80	0,85	-1,63	0,69	-1,38	0,57	-1,19	0,49	-1,06	0,42	-0,95
1129 mm	1,86	-2,40	1,53	-2,40	1,29	-2,40	1,11	-2,19	0,98	-1,96	0,87	-1,77	0,70	-1,50	0,59	-1,30	0,50	-1,15	0,43	-1,03
994 mm	1,85	-2,40	1,52	-2,40	1,29	-2,40	1,11	-2,19	0,97	-1,96	0,86	-1,78	0,70	-1,50	0,58	-1,30	0,49	-1,15	0,42	-1,04
810 mm	1,84	-2,40	1,51	-2,40	1,28	-2,40	1,10	-2,20	0,96	-1,97	0,85	-1,78	0,69	-1,51	0,57	-1,31	0,48	-1,16	0,41	-1,04

Conditions:

PV modules with a grammage between 11,5 and 18,5 kg/m²

System: at least 3 fields

The static calculation considers not increased snow loads with snow accumulations through eaves, adjacent building or snow guards. The roof hooks are set into every crossing point of the horizontal and vertical profiles. They may lay maximally 300 mm beyond or below the crossing points.

Connection of the vertical profile on the roof hook with 2 self cutting drilling screws.

Remark: Larger distances are possible according to the system static under certain surrounding conditions, they can be requested by indicating the boundary conditions.

Building notes - SOL-50i insertion system in-roof system

General



Roof coverings have limited resistance to precipitation.

As a result, there are technical requirements that must particularly be adhered to that are generally formulated in the rules for roof coverings.



Tile-type roof coverings are generally proofed against rain, but in extreme locations or particular weather conditions, they cannot completely prevent the ingress of driving rain or very fine, driven snow. For this reason, additional measures such as the installation of trussing, underroofs or roof lining are necessary.

The SOL-50i in-roof system

The SOL-50i in-roof system is designed on two levels – the generator surface and the tiled roof covering. This is constructed with the SOL-50i in-roof system using trapezoid metal profiles and is laid with overlapping dependent on the roof slope:

Roof pitch	Overlap
10° — 20°	150 mm (sealing tape included)
> 20°	150 mm

Roof slopes <10° possible on request

(see also the installation instructions for the trapezoidal sheets joined to this document)

The special rules for roofing and the general rules for the technology used are to be observed in the choice and design of the overall construction.

We recommend:

Roof pitch	Building requirements
≤ 22°	waterproof underlay
> 22° *	Underroof
> 35° *	trussing

* When choosing, the local building regulations and the use of the roof area are to be observed. In cases of doubt, a higher level specification should be chosen. (see "Data sheet for roof liners, underroofs, trussing" from the German roofers' association)

Mounting notes

- It is necessary to check the roofing type before proceeding to the installation of the system. The mounting system is designed for the following structure (from inner to outer parts): rafters, under-roof screens/panels, counter-batten, batten (6,0x4,0cm).
- The edge covering of the generator surface must be adapted to the local requirements. Integration must be carried out properly by qualified professionals.

Notes on statics - SOL-50i insertion system in-roof system

Those notes are valid for the components of the SOL-50i mounting system for different solar modules (weight, size and repartition)



We disclaim any responsibility concerning the roofing itself, i.e the rafters, purlins, etc... In normal cases, if the roof is approved for tiles, its structure should be sufficient to support our system. The modules and their fastening have been submitted to different constraints. The statics calculations can be provided on request.

The following constraints are pre-requisites of the system statics:

- The SOL-50 in-roof system may generally only be installed up to a building height of 18 metres.
- A 6/4 cm NH S10 (cutting grade) roof batten was selected as the basis for the statics. Existing roof battens may have to be replaced or more added. The roof battens must be screwed on and not nailed.
- A maximum roof batten spacing of 35 cm has been assumed.
- A maximum rafter spacing of 95 cm has been assumed.
- The connection of the trapezoid sheets to the roof battens is made in every second raised bead and on the roof batten above and below the position of the horizontal profile in each case.
- The connection of the SOL-50 horizontal profile is carried out using two self-drilling screws in each case in every second raised bead of the trapezoid metal sheet.
- At the seaside and on islands, you have to make sure that the specific building requirements comply with our specifications (see „Installing on the edge area“)
- The conditions given above are conform to EN 1991-1-4 Eurocode 1 (area H). They are not valid when mounting our system in edge area of the roofing.

Notes on statics - SOL-50i insertion system in-roof system

Installing on the edge area of the roof



Take the biggest value out of length and width of the building. Compare it to twice the height of the roof ridge and take the smallest value. The edge is defined as 1/10th of this value.

Example:



ridge height = 7 metres; building length = 15 metres; building width = 8 metres

According to the first sentence, we take the building length.

1/10th of double the ridge height = 1.4 metres

1/10th of the building length = 1.5 metres

Thus the edge area is 1.4 metres

Where the edge area is used, the statics prescribe a general limit of 2400 Pa (2.4 KN/m²). This limit arises from the maximum permitted negative pressure load (wind suction) of the standard solar modules on the market. Ensure that you do not exceed the 2400 Pa at the system location. The SOL-50 in-roof system can be used up to a maximum permitted wind suction load of 2400 Pa. At the same time, additional measures are necessary:

- Additional use of roof battens in the edge area used centrally between the existing roof battens. (insert additional roof battens and screw on).
- Screw on the SOL-50 horizontal profiles to each raised bead of the trapezoid metal sheet in the defined edge area using two self-tapping, self-drilling screws.

Use at locations with increased snow loads:

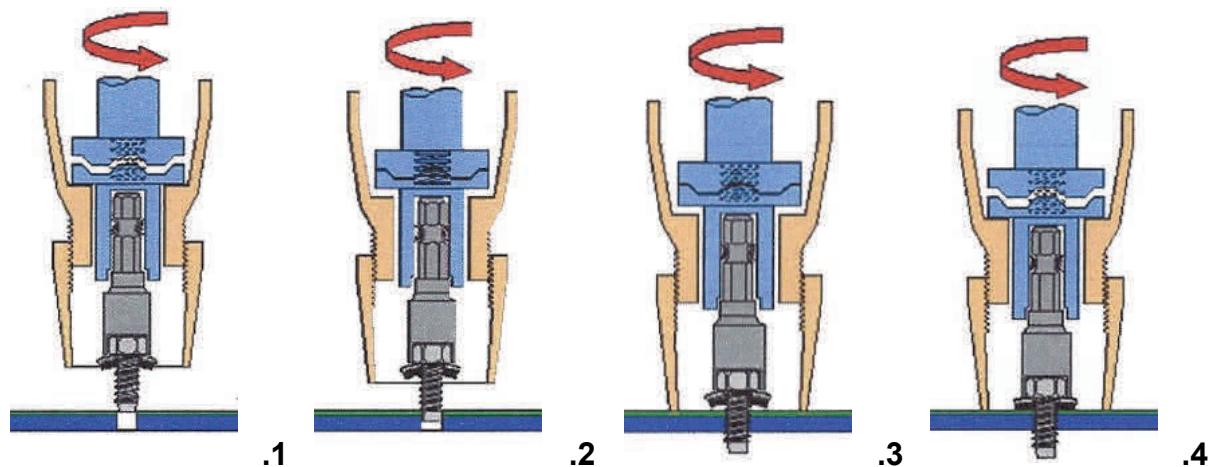
- When using the system at locations with increased snow loads (exceeding 1400 Pa), a maximum rafter spacing of 65 cm is assumed.
- From a positive pressure load of 2600 Pa, an additional roof batten must be attached in addition under each horizontal profile to be mounted later.
- With a pressure load of more than 4200 Pa, the statics assumes a rafter spacing of a maximum of 50 cm. The system is generally approved for a maximum of 5400 Pa (5.4 KN/m², positive pressure) under the pre-requisites mentioned (additional roof batten under each horizontal profile).

Additional comments:

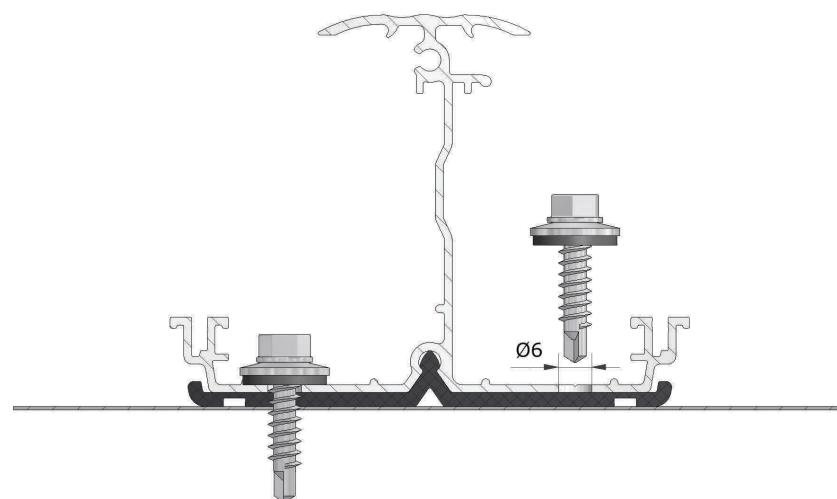
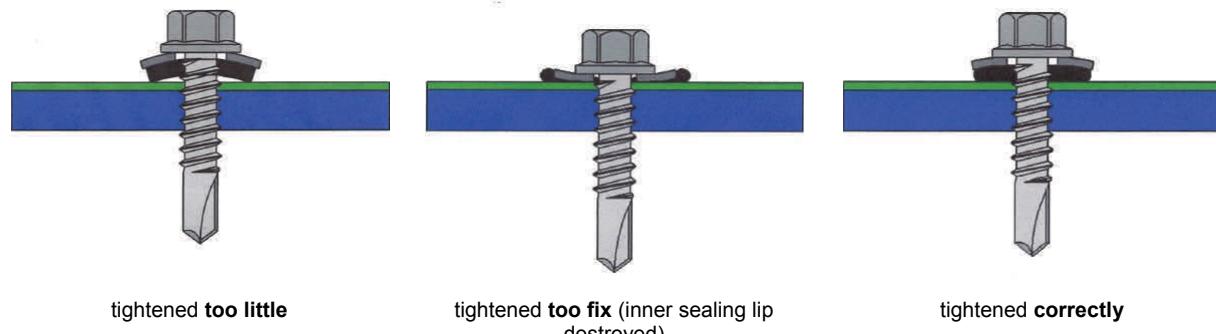
We recommend, due to the thermally caused expansion of material, a maximum generator width of 12-15 m. Wider area generator should always be interrupted, these interruptions can also be used as service rise.

Installation of bolts

Installation of bolts with sealing shim



According to the recommendation of a screw manufacturer and the directives of the Industrial association for constructional systems in the metal light construction all self-cutting screws have to be screwed depth stop.

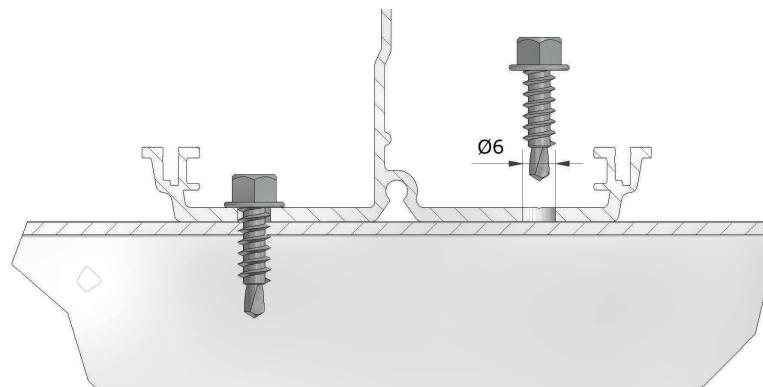


Installation of bolts

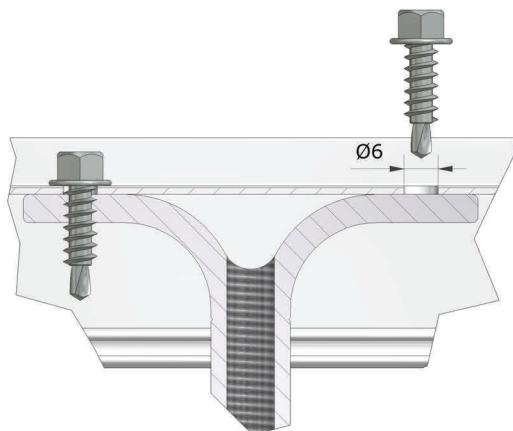
Installation of drilling screw: connecting alu profiles without sealing shim



Example: mounting the horizontal profile - vertical profile



Example: mounting vertical profile - roof hook



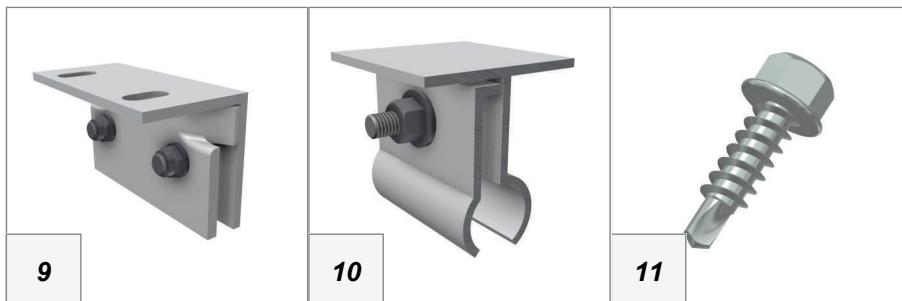
Connecting the alu profiles by means of a drilling screw the upper profile has to be pre-drilled. (p.e. drilling screw 5,5x22 with 6 mm pre-drilling). The profile surfaces have to be absolutely flush. The tightening torque should not be too strong because the screw thread may break.

SOL-50 roof mounting components



1	SOL-50 VarioDuo XXL- Universal roof hooks Universal Base Plate 80mm Universal Base Plate 180mm	Artikel: 10 548 Artikel: 10 542 Artikel: 10 544
2	SOL-50 VarioSolo XXL- Universal roof hooks Universal Base Plate 80mm Universal Base Plate 180mm	Artikel: 10 546 Artikel: 10 542 Artikel: 10 544
3	SOL-50 corrugated roof VA-Solar fastener	Artikel: 10 441 Artikel: 10 595
4	SOL-50 Trapezoidal roof VA-Solar fastener	Artikel: 10 450
5	SOL-50 XL-Vertical Top Part 62mm M10	Artikel: 10 560
6	SOL-50 XL-Vertical Top Part 42mm M10	Artikel: 10 565
7	SOL-50 Slate Tile Dummy Plate 380x280x1mm	Artikel: 10 593
8	SOL-50 metal plain tile	Artikel: 10 594

SOL-50 roof mounting components



9 SOL-50 Alu balk clip for roof fastening Artikel: 10 596

10 SOL-50 KalZip-clamp for roof fastening Artikel: 10 597

11 SOL-50 Self drilling screw-alu/alu 5,5 x 22mm Artikel: 10 720

Main components SOL-50 insertion– Onroof system



1	SOL-50 XXL Horizontal profile	mill finish silver black	Artikel: 10 052 Artikel: 10 100 Artikel: 10 102
1	SOL-50 L - Horizontal profile	mill finish silver black	Artikel: 10 056 Artikel: 10 106 Artikel: 10 108
2	SOL-50 Inner horizontal jointer		Artikel: 10 802
3	SOL-50 XXL– Vertical frame		Artikel: 10 240
4	SOL-50 XXL– Vertical jointer		Artikel: 10 815
5	SOL-50 XL- Vertical frame		Artikel: 10 244
6	SOL-50 XL– Vertical jointer 2 x 100 mm		Artikel: 10 820
7	SOL-50 T-Distance adapters L =155 mm	T-Adapter 39 / 40 T-Adapter 37 / 38 T-Adapter 35 / 36 T-Adapter 33 / 34 T-Adapter 31 / 32	Artikel:10 657 Artikel:10 659 Artikel:10 661 Artikel:10 663 Artikel:10 665
8	SOL-50 Universal Distance adapters L = 150mm		Artikel: 10 606

Main components SOL-50 insertion– Onroof system



9	SOL-50 cover trim	mill finish silver black	Artikel: 10 060 Artikel: 10 110 Artikel: 10 112
10	SOL-50 STANDARD Horizontal frame end cap, polyamide	silver black	Artikel: 10 071 Artikel: 10 072
11	SOL-50 Premium Horizontal frame end cap, aluminium	black	Artikel: 10 143
12	SOL-50 STANDARD Vertical frame end cap, polyamide	black	Artikel: 10 073
13	SOL-50 SOL-Guard, polyamide theft prevention		Artikel: 10 790
14	SOL-50 AC/DC Mounting base plate - 57 mm -		Artikel: 10 835
15	SOL-50 Maintenance Element / escalator black		Artikel: 10 095

Main components SOL-50 insertion– Onroof system



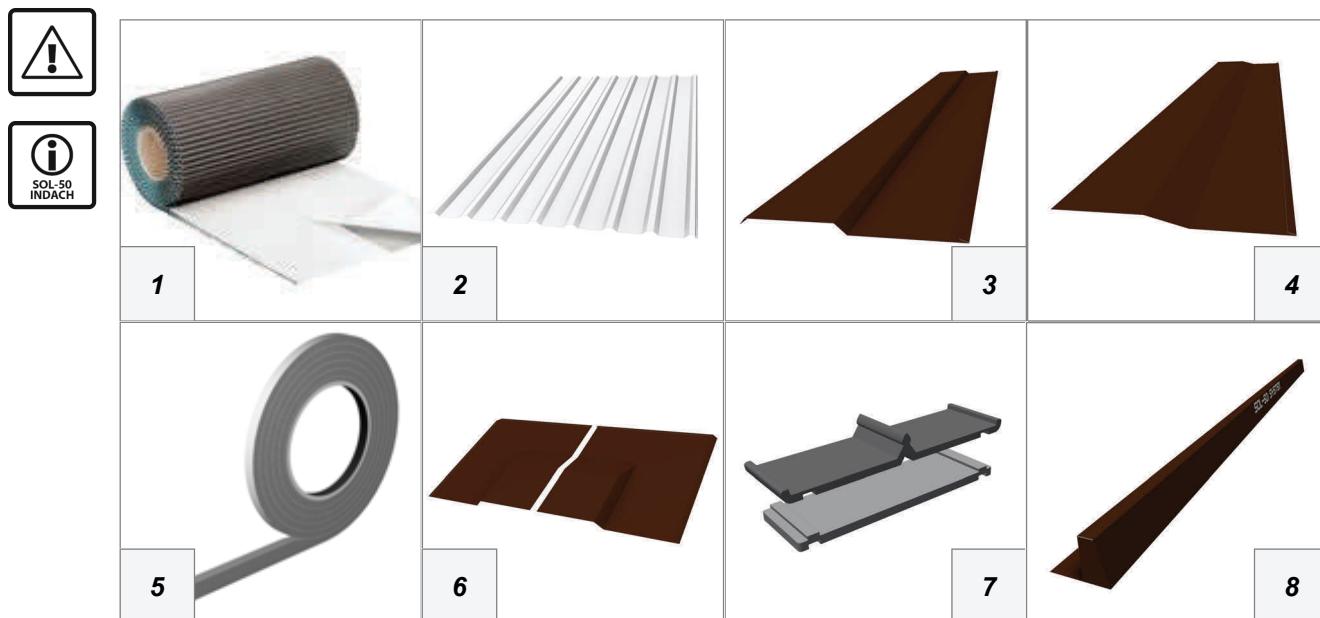
1	SOL-50 L - Horizontal profile L=4,00m	mill finish silver black	Artikel: 10 056 Artikel: 10 106 Artikel: 10 108
2	SOL-50 VA -Jointer		Artikel: 10 825
3	SOL-50 Trapezoidal corrosion protection & Height Adjustm. SOL-50 Trapezoidal corrosion protection SOL-50 Trapezoidal Height Adjustment		Artikel: 10 845 Artikel: 10 850 Artikel: 10 855
4	SOL-50 Self Extrusion screw 5,5 x 25		Artikel: 10 722
5	SOL-50 STANDARD Horizontal frame end cap, polyamide	silver black	Artikel: 10 071 Artikel: 10 072
6	SOL-50 Premium Horizontal frame end cap, aluminium	black	Artikel: 10 143
7	SOL-50 T-Distance adapters L =155 mm	T-Adapter 45 / 46 T-Adapter 39 / 40 T-Adapter 37 / 38 T-Adapter 35 / 36 T-Adapter 32 / 33	Artikel:10 651 Artikel:10 657 Artikel:10 659 Artikel:10 661 Artikel:10 667
	SOL-50 Universal distance adapter 150mm		Artikel: 10606
8	SOL-50 cover trim L = 4,00m	mill finish silver black	Artikel: 10 060 Artikel: 10 110 Artikel: 10 112

Main components SOL-50 special solutions



1	SOL-50 SolarCarport XXL-horizontal profile 6,04m, black	Artikel: 18 100
2	SOL-50 SolarCarport rain gutter 6m, black	Artikel: 18 140
3	SOL-50 Vertical sealing strip black	Artikel: 10 700
4	SOL-50 SolarCarport safety net 3,3 m x 7,0 m	Artikel: 18 180
5	SOL-50 self drilling screw 6,5 x 50mm with seal washer	Artikel: 17 702
6	SOL-50 SolarCarport rubber seal 8mm	Artikel: 18 165
7	SOL-50 T-Distance adapter black 35/36mm L = 4,00m	Artikel: 20 250
8	SOL-50 XL Universal fastening 70mm	Artikel: 10 602

Main components SOL-50i insertion– Inroof system



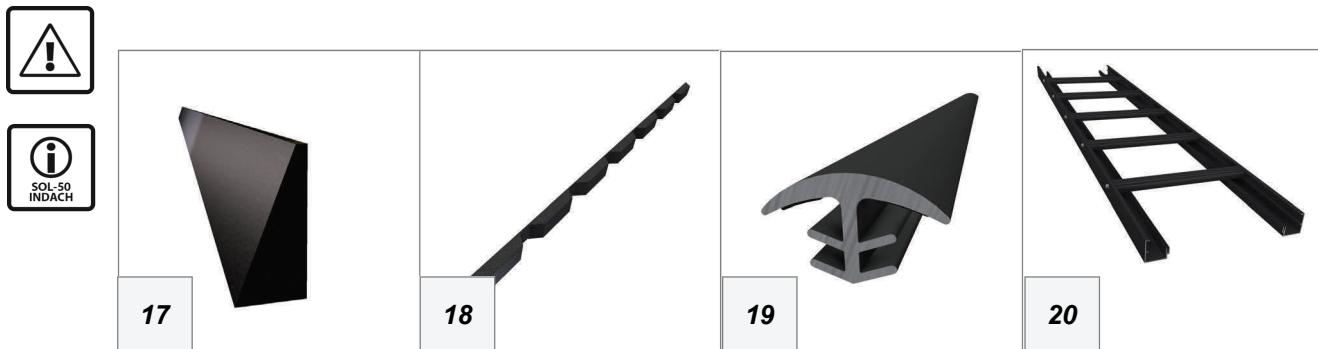
1	SOL-50i Flexible eaves strip	Artikel: 17 620
2	SOL-50i Trapezoid sheet L = 2,00m SOL-50i Trapezoid sheet L = 1,00m	Artikel: 17 608 Artikel: 17 609
3	SOL-50i Lateral connection plate	Artikel: 17 501
4	SOL-50i Upper connection plate	Artikel: 17 500
5	SOL-50i Sealing tape	Artikel: 17 735
6	SOL-50i Upper corner pieces	Artikel: 17 499
7	SOL-50i Corrosion protection with height compensator	Artikel: 17 750
8	SOL-50i Lateral ending sheet	Artikel: 17 502

Main components SOL-50i insertion– Inroof system



9	SOL-50i PREMIUM L-horiz. plug-in frame, 2m	silver Artikel: 17 510 black Artikel: 17 511
10	SOL-50 T-Distance adapters L =155 mm	T-Adapter 39 / 40 Artikel:10 657 T-Adapter 37 / 38 Artikel:10 659 T-Adapter 35 / 36 Artikel:10 661 T-Adapter 33 / 34 Artikel:10 663 T-Adapter 31 / 32 Artikel:10 665
11	SOL-50 Univ. distance adapter L = 150mm	Artikel: 10606
12	SOL-50 cover trim, L = 2,00 m	silver Artikel: 10 110 black Artikel: 10 112
13	SOL-50i VA- Self-drilling screws 6,5 x 50 mm	Artikel: 17 702
14	SOL-50i VA- Self-drilling screws 5,5 x 25 mm	Artikel: 17 710
15	SOL-50 STANDARD Horizontal frame end cap, polyamide	silver Artikel: 10 071 black Artikel: 10 072
16	SOL-50 Premium Horizontal frame end cap, aluminium	black Artikel: 10 143

Main components SOL-50i insertion- Inroof system



17	SOL-50i seal strips for grooves 60 mm			Artikel: 17 615
18	SOL-50i trapezoidal sheet profile filler, black 18/160			Artikel: 17 610
19	SOL-50 Vertical sealing strip	black silver		Artikel: 10 700 Artikel: 10 702
20	SOL-50 Maintenance Element / escalator black			Artikel: 70 095

SOL-50 components cable conduit system



16	SEN SOL-50 Cable save net for panel circuits	Artikel: 11 005
17	SEN SOL-50 Clip cable connector	Artikel: 11 008
18	SEN SOL-50 Cable clip for Carrier profile	Artikel: 11 010
19	SEN SOL-50 Cable duct	Artikel: 11 030
20	SEN SOL-50 Cable funnel	Artikel: 11 035
21	SEN SOL-50 Cable tray	Artikel: 11 040
22	SOL-50 Pipe collar for conduits 40-100 mm	Artikel: 11 025

System sketches - SOL-50 on-roof

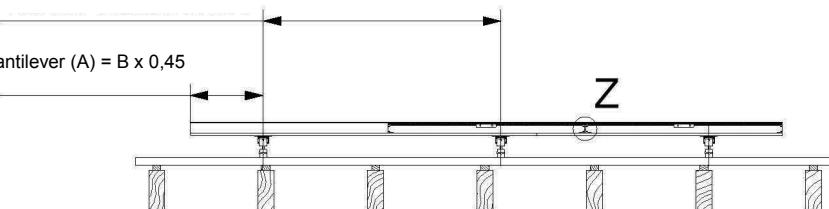


Span width (B) = Table static advice

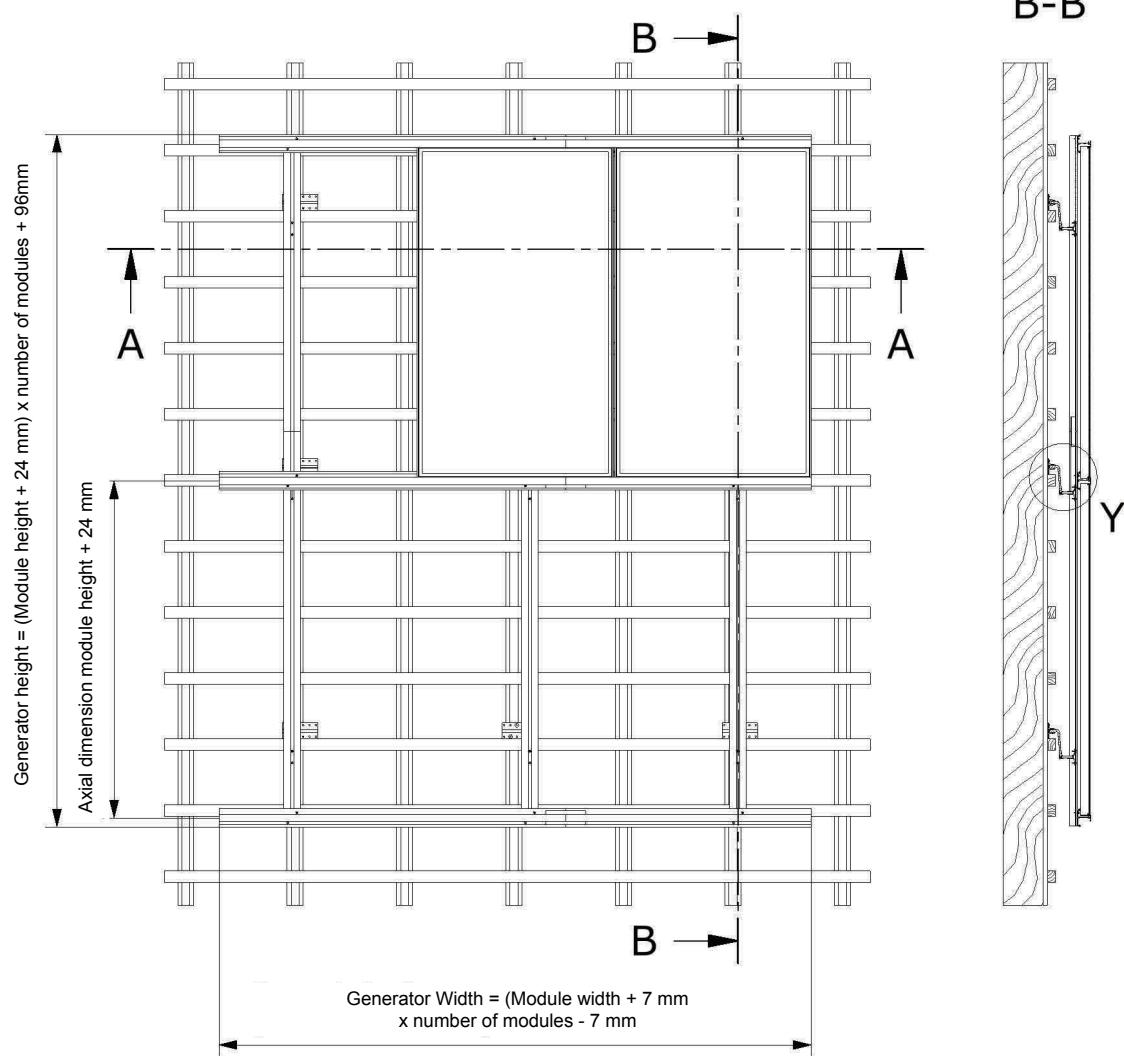


Cantilever (A) = B x 0,45

A-A



B-B

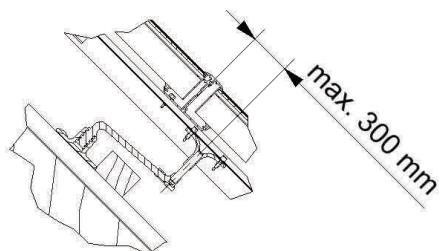


System sketches - SOL-50 on-roof

Roof hook 2012

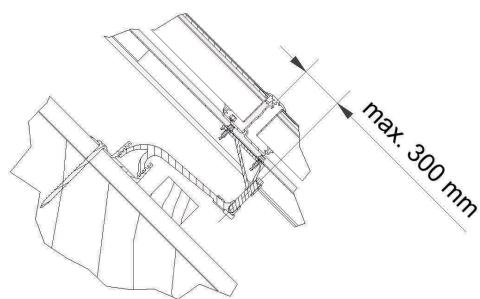


Y



Roof hook as Q IV 2013

Y



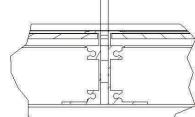
Upper completion

Axial dimension module height + 24 mm

Lower completion

Z

Intermediate space 5 - 7 mm

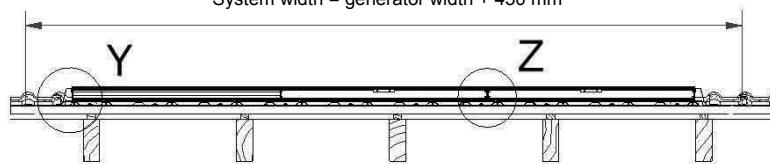


System sketches - SOL-50i in-roof

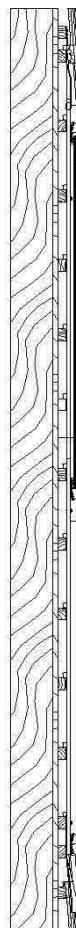
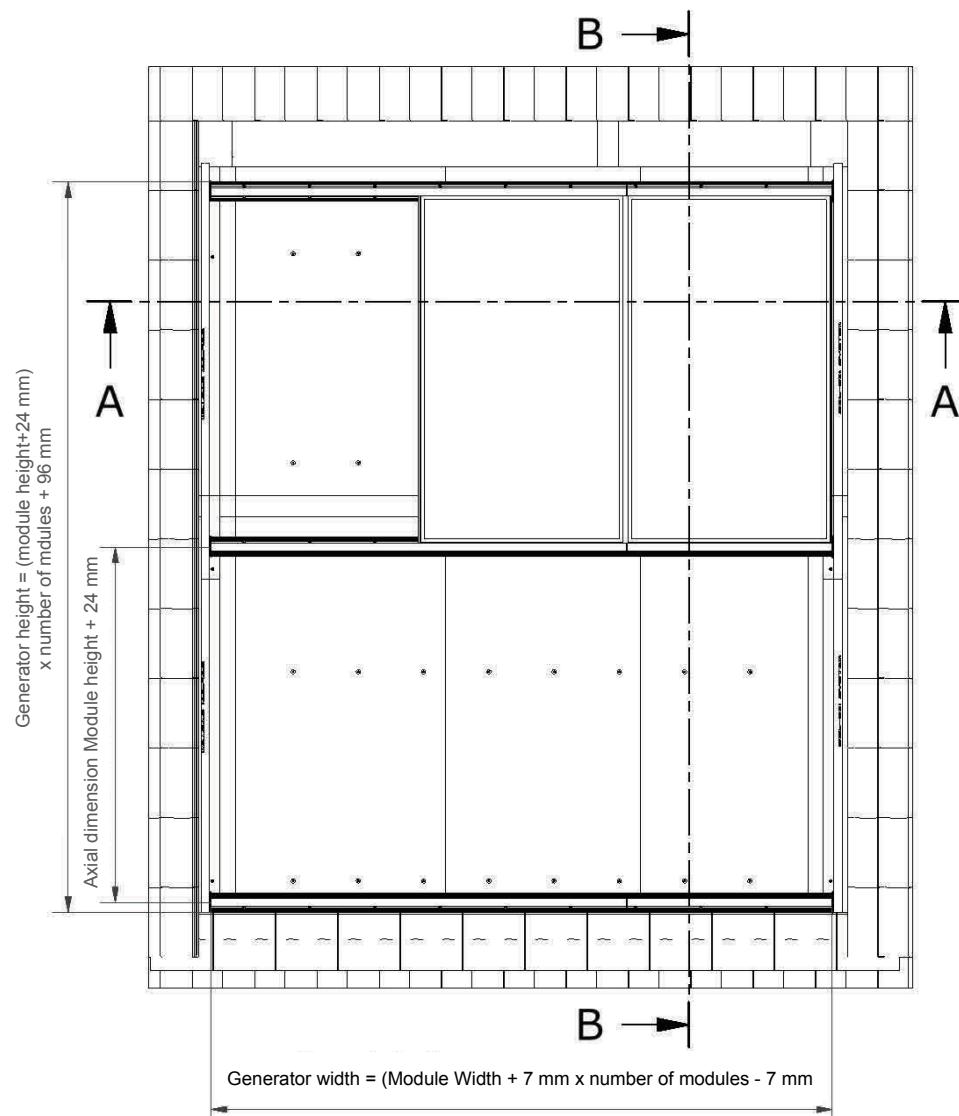


A-A

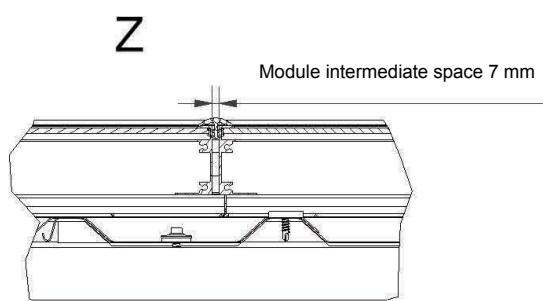
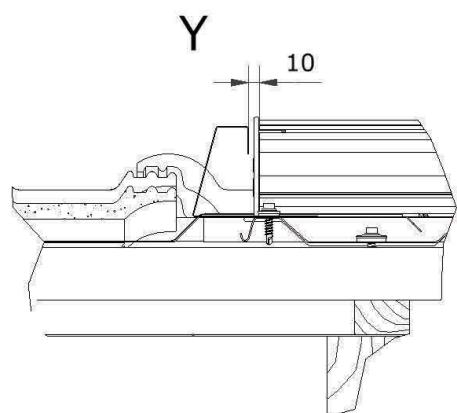
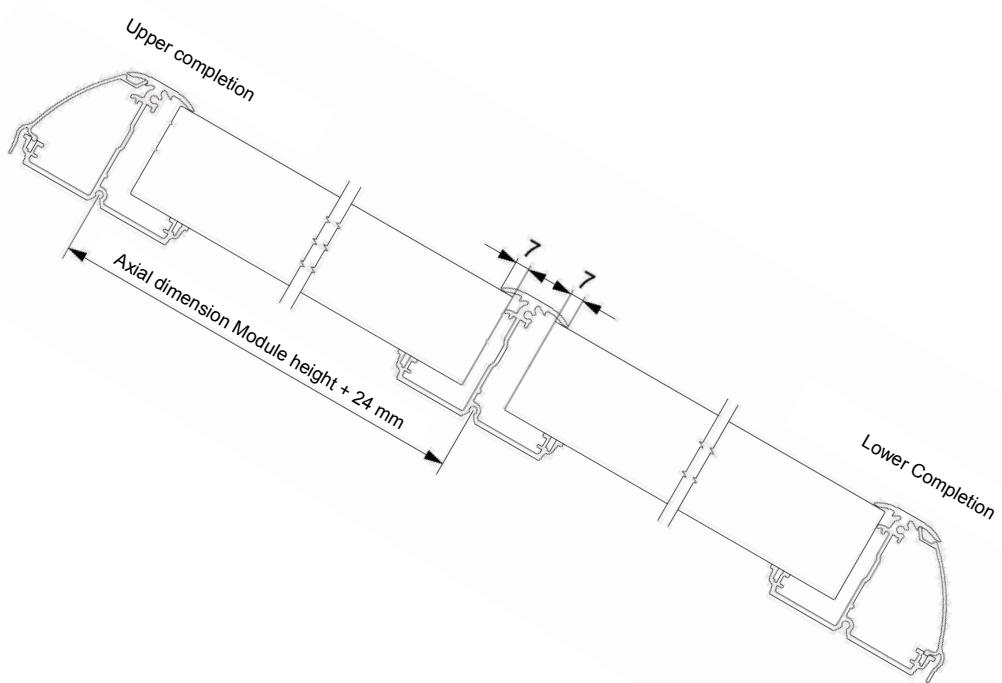
System width = generator width + 450 mm



B-B



System sketches - SOL-50i in-roof



Preparation

Preparation general



Check the delivery for completeness and damage.
Check the quality of the roof battens and rafters. Check the suitability of the roof.



The roof must have the static capability to carry the PV system. The check must be carried out on-site and **is not verified in the system statics of the SOL mounting systems.**
Determine the space requirement and position of the system before laying it.

Remark: The horizontal profile is available for module frame heights of 50 mm. For different frame heights distance adapters have to be inserted accordingly (see page 36). The profile is available in the sizes XXL, XL and L. The choice of the profile depends on the site relevant parameter (max. forces).

SOL - 50 on-roof system

The dimensions, length and width of the generators can be found on the system sketches. Afterwards, establish the exact position of the system and the roof hooks. In the process, take account of the position of the roof battens. The arrangement of the roof hooks and vertical and horizontal profiles can be found in the system sketches.

SOL - 50i in-roof system

The SOL-50 in-roof system is rain-proof if installed correctly. To prevent any water damage, for example caused by dripping condensation, installation errors, damage to the system, weathering, local conditions, etc., we recommend following our building notes.

Important remark: please note that when fastening the trapezoidal sheet drilling on the upper waves, the screws shall not coincide with the place where the horizontal profiles are fastened.

Shavings arising from drilling or cuttings of the profiles have to be removed.

Tools



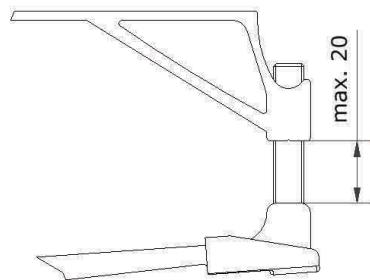
	SOL-50 On Roof	SOL-50i In Roof
Drill and/or cordless screwdriver	●	●
6mm and 9.5 mm drill bits	●	●
one-handed angle grinder with cutting disk for metal and stone	●	●
mitre saw for trimming the aluminium profiles	●	●
8 mm socket bit for drill or cordless screwdriver	●	●
Cross-head screwdriver or bit, Z2, Z3, TX 25, TX 40 tips	●	●
Cutting knife	●	●
metal shears		●
alloy or plastic hammer	●	●
carpenter's square or try square (min. 1000 mm)	●	●
10 or 20 m tape measure, inch rule	●	●
chalk line	●	●
Glass lifter/Panel lifter	●	●
SOL-50 module template (recommended)	●	●
SOL-50 drill template (recommended)	●	●

Only work on the trapezoid metal profiles with coldcutting tools!

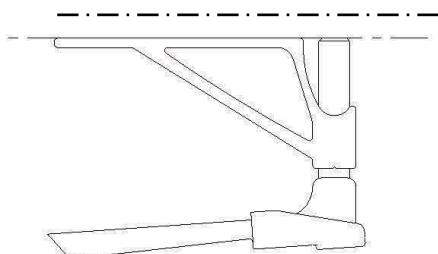
Please note the installation instructions for the trapezoidal sheet (see joined document)

Mounting roof hooks Vario Solo & Duo XXL

Adjusting the vertical attachment VarioDuo XL

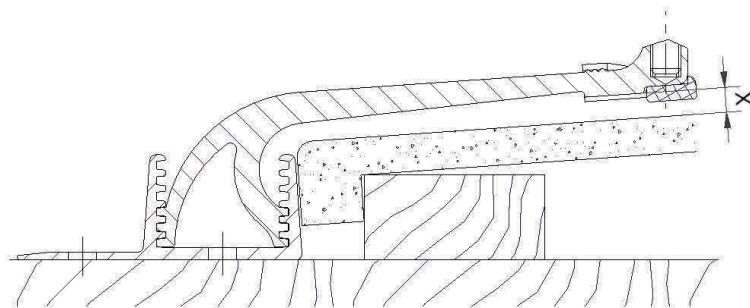


Attention: According to the statics at least 20 mm thread of the vertical attachment must be unscrewed so that a maximum height adjustment of 20 mm is given.

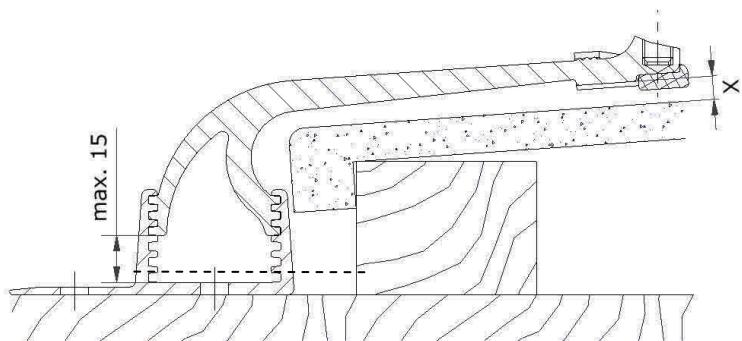


Advice: The upper edge of the threaded stud must terminate flush-mounted with the upper edge of the vertical attachment because otherwise the profiles which are mounted do not lay correctly.

Adjusting the Roof Hook VariouDuo XXL + VarioSolo XXL



Roof hook fully inserted into the base plate



Support arm at least 3 tooth inserted (max. height)

Mounting roof hooks Vario Solo XXL & Vario Duo XXL



Preparation

Fix the mounting position of the roof hooks and remove the pan tiles.

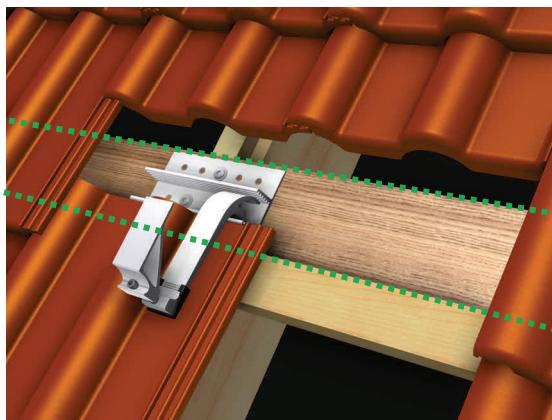
Remark:

Take the generator dimensions from the system sketches, the spaces of the roof hooks from the static of the system.



The base plate (70 mm) will be positioned centrally on the rafter and screwed together with two timber bolts (8 x 120 mm) on the rafter. In this connection pay attention to a sufficient wood cross-section and we recommend to pre-drill.

The support arm of the roof hooks can be moved over the width of the base plate, so that it is positioned in the middle of the pan tile vale.

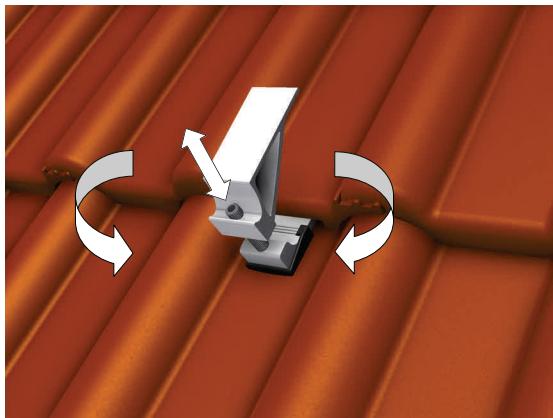


In case the width of the base plate is not sufficient to position the support arm centrally in the pan tile vale it can be replaced by the 180 mm base plate alternatively. In this connections a plank must be mounted sided for reasons of stabilization. The plank will be screwed together with the base plate on the rafter with two wood screws (8 x 120 mm).



Now the removed roof pan tiles are re-inserted. In this connection in the range of the support shaft the lower bead of the pan tile will be polished by means p. e. of an angle grinder or a tile milling machine so that the pan tile lays flush.

Mounting roof hooks Vario Solo XXL & Vario Duo XXL



VarioDuo XXL Universal Roof Hook

Via the threaded connection of the vertical attachment with the support arm small unevenness on the roof surface can be compensated (max. 20 mm).
Caution: When turning, make sure that the threaded rod does not rotate out of the support arm.



VarioSolo XXL

Here the mounting is done in the same way like the Vario Duo universal roof hook mounting, however there is no possibility to adjust the attachment in order to compensate roof unevenness



Mounting on roofs with plain tiles

The plain tile laying underneath the support arm is replaced by a galvanized metal tile with bottom bead. The mounting of the roof hook then takes place in the same way as the pan tiled installation. The plain tile which lays above must be notched in the range of the support arm. If necessary openings in the metal tile must be sealed p.e. with a foil.

Precondition: roof batten height min. 40 mm, or crown cover.

Requirement:

For the use of the roof hooks in combination with the "galvanized metal tile", a minimum roof batten height of 40mm. If the height of the roof batten is less than 40 mm, the roof connection must be made using a solar fastener in combination with the "SOL-50 Slate Tile Dummy Plate".

See page 41

Important NOTE:

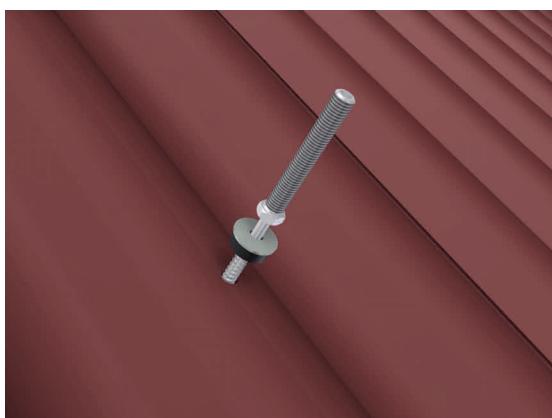
No copper plate or tape may be installed near or above the "metal tile" (E.g., chimney covers, mounting frames, or copper bands). Copper would react with the galvanized metal tile. In such a case, a powder-coated metal tile would have to be installed.

Mounting solar fasteners on corrugated sheeting

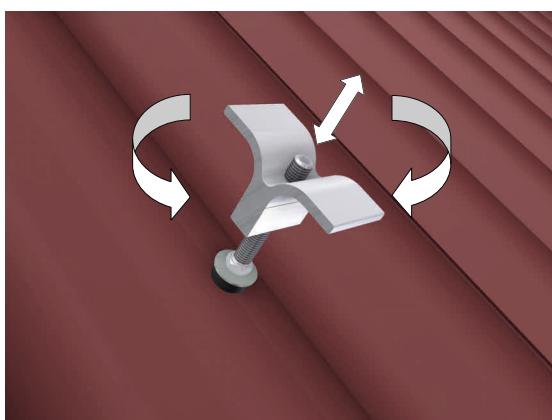


The fixing of the roof construction is done with the solar fastener with sealing. After having determined the mounting position of the solar fastener the corrugated plates must be pre-drilled centrally on the wave according to manufacturer instruction.

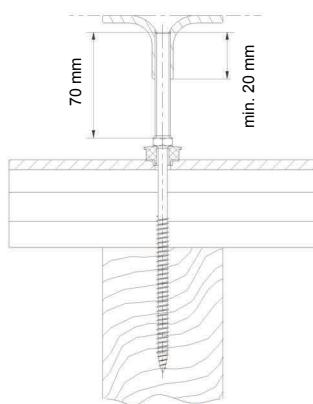
Remark: Please take the generator dimension from the system sketches, the distances of the solar fasteners from the static of the system.



The solar fastener with sealing is directly bolted into the purlin or into the rafter.



By unscrewing the vertical attachment the height is adjusted. The alignment is done vertically to the roof.



Attention: According to the static of the system at least 20 mm thread must be screwed with the vertical attachment.

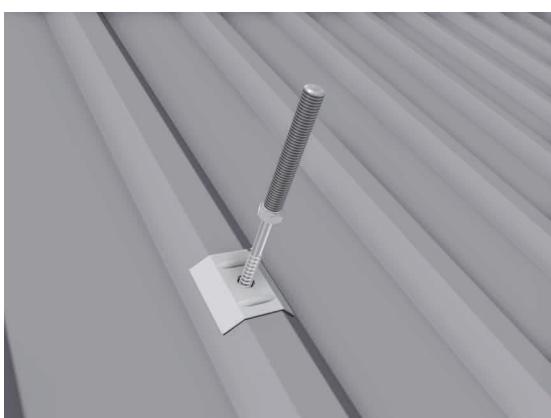
Requirements: Roof pitch between 15° and 50°

Mounting solar fasteners on trapezoid panel roofs



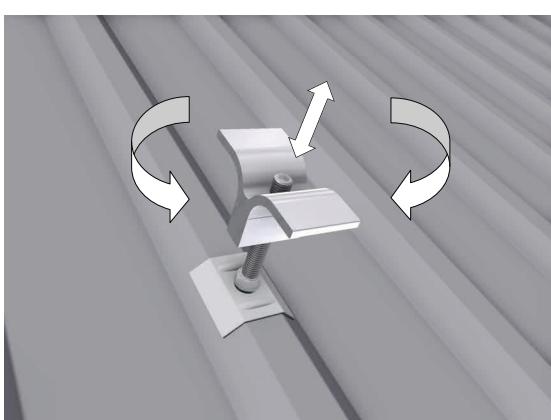
The fastening of the roof construction is done with a "solar fastener with calotte".

After having determined the mounting position of the solar fastener the high beading must be pre-drilled centrally according to the instruction of the manufacturer.

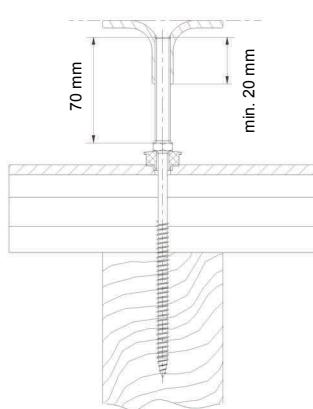


Remark: Please take the generator dimensions from the system sketches, the dimensions of the solar fasteners from the static of the system.

The solar fasteners with calotte are directly bolt into the purlins (wood or steel).



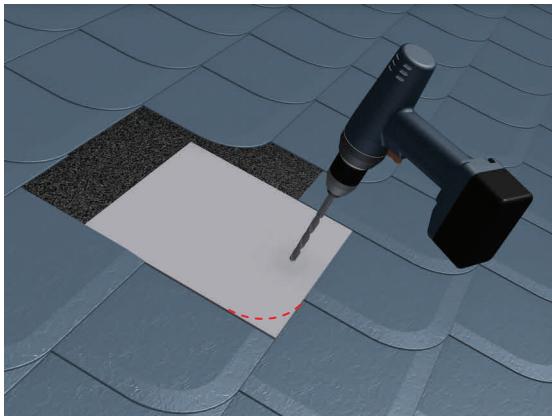
By unscrewing the vertical attachment the height is adjusted. The alignment is done vertically to the roof.



Attention: According to the static of the system at least 20 mm thread must be screwed with the vertical attachment.

Requirements: Roof pitch between 15° and 50°

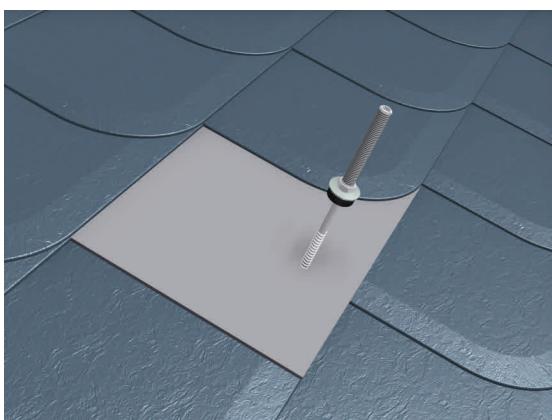
Mounting solar fasteners on slate tiled roofs



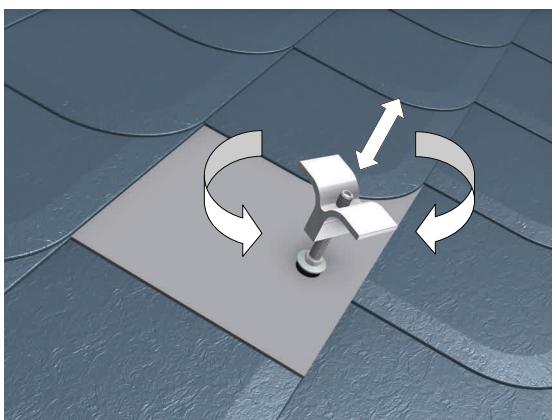
The fastening of the roof construction is done via the "solar fastener with sealing".

After having determined the position of the solar fastener the original slate tile is replaced by an aluminum universal dummy plate and pre-drilled.

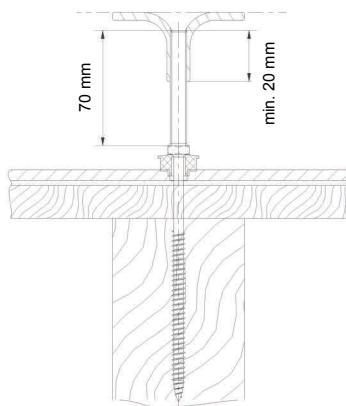
If necessary it can be adapted to the shape of the roof slate.



The solar fasteners will be screwed directly into the roof purlins or rafters.



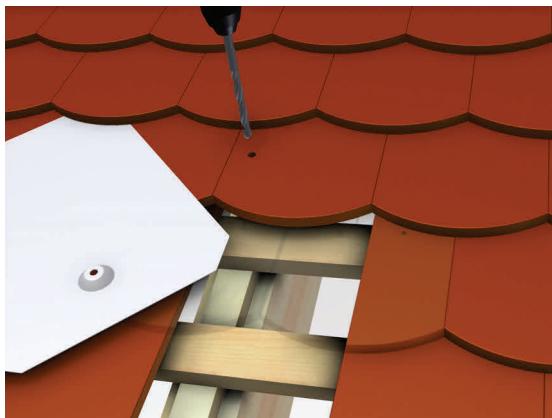
By unscrewing the vertical attachment the height is adjusted. The alignment is done vertically to the roof.



Attention: According to the static of the system at least 20 mm thread must be screwed with the vertical attachment.

Requirements: Roof pitch between 15° and 50°

Mounting solar fasteners on tiled roofs



The fastening in the roof structure is made via a form sheet and the "solar fasteners with sealing".

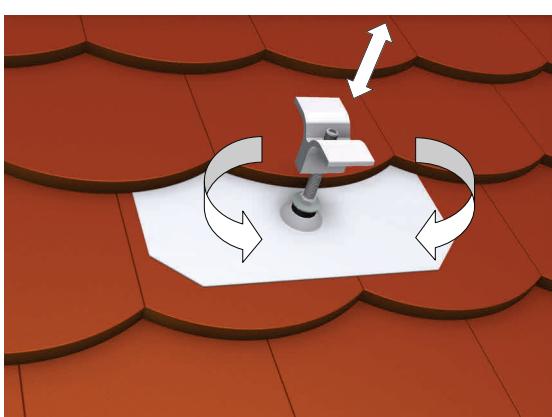
The sheet is inserted between the individual shingle layers and thus positioned so that it is placed directly above the rafters.

The roof covering below the form sheet must be provided with a bore Ø 10.



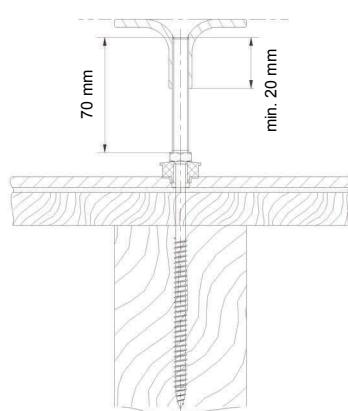
The correct position is pre-marked by the rise in the form of punched sheet metal on the roof tiles. The same applies to the pre-drilled rafters. Then the solar fastener is bolted. The mold sheet may possibly be adapted to the contour of the roof covering.

When tightening the Solar fasteners it has to be ensured that the two sealing elements are properly matched. Only then the screw joint seals optimally.



By screwing the vertical attachment, the height is adjusted. The alignment is vertically to the roof.

This type of mounting is possible with slate roof, vinyl slate roof, sheet metal shingle roof and asphalt shingle roof.



Warning:

According to system statics at least 20 mm thread of the vertical attachment must be screwed

Requirements:

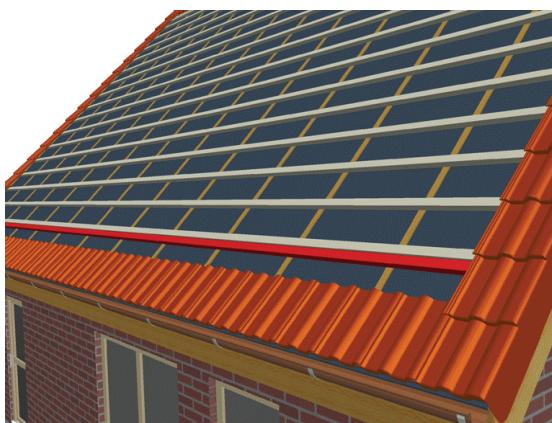
Roof slope between 15 ° and 50 °

SOL-50i In-roof subconstruction



Roof partitioning

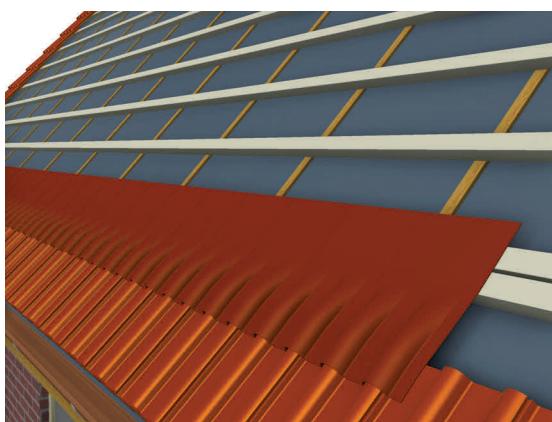
First the horizontal and vertical reference edges of the roof surface are defined. The generator surface of the solar power system is then marked using these edges as reference points. You obtain the dimensions of the generator surface from the system sketches. Within the area of the generator surface, remove the existing roof cladding down to the battens, with an extra margin of 0.3 - 0.5 m.



Mounting the eaves strip

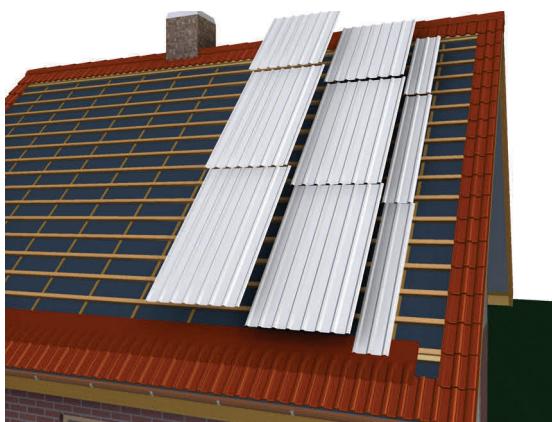
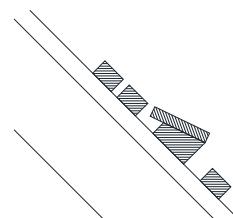
The lower connection is formed with a flexible eaves strip. This realises the transition between the trapezoid sheets and the roof covering.

In order to ease the mounting of the eaves strip, the space under the first roof batten almost up to the next batten below it should be filled with suitable packing wood (e.g. roof battens).



The eaves strip is then rolled out and fixed across the complete system width + 10 cm on both sides additionally. Fixing takes place in combination with screwing down the trapezoid sheets. When laying the eaves tape (e.g. Wakaflex), follow the manufacturer's instructions.

For additional support and an improved contact area of the eaves strip, the open space at the transition to the pantile will be relined with a wedge and a wooden plank.

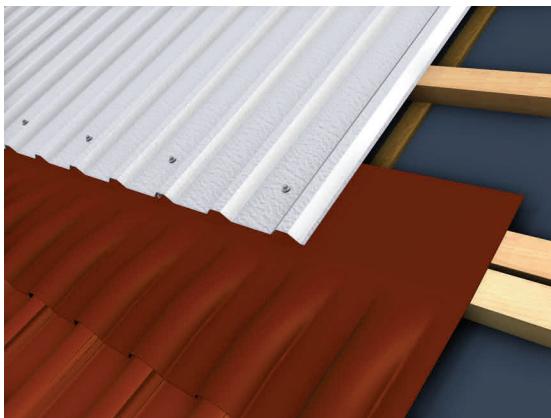


Mounting trapezoid sheets

The direction for laying the sheets is **against** the main wind direction. When laying with cross-pieces, a complete row is laid first in the roof direction (eaves to ridge), then the next row, etc. The cross-pieces should have a minimum overlap of 150 mm, for a roof pitch under 20° a sealing strip must be used.

Follow the installation instructions for the trapezoidal sheets!

SOL-50i In-roof subconstruction



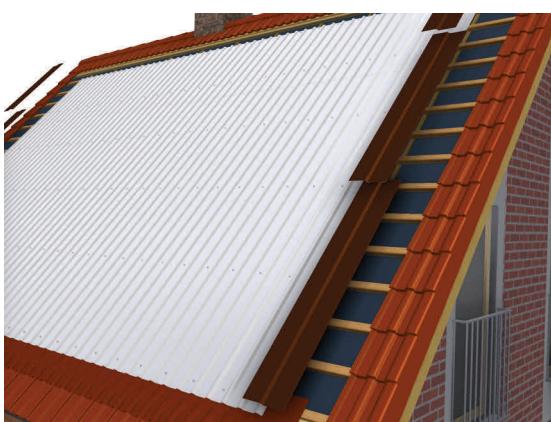
Mounting trapezoid sheets

The lower edge of the first metal sheet is laid over the batten underneath the flexible eaves strip. The attachment is done at the bottom chord, using self-drilling screws (6.0 x 50mm) with a sealing washer E22/3, making sure that the flexible eaves strip is fastened.

Follow the installation instructions for the trapezoidal sheets!

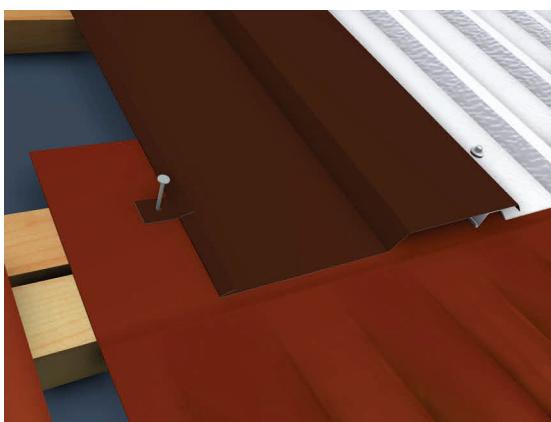


The complete width of the trapezoid roof profile surface must be equal to or at the max. 170mm smaller than the generator width, in order to achieve an optimum connection with the lateral connection plates. The complete height of the surface should be 300mm higher than the generator height, to ensure the sealing by the roof covering in the upper roof connection.



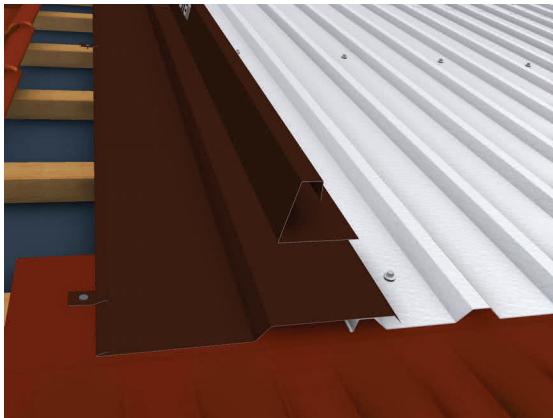
Mounting the lateral connections plates

Starting at the bottom, the lateral connection plates are laid with a cross-piece overlap of 150mm (200 mm for a roof pitch smaller than 20°). At the top, the connection plates end flush with the trapezoid sheets.



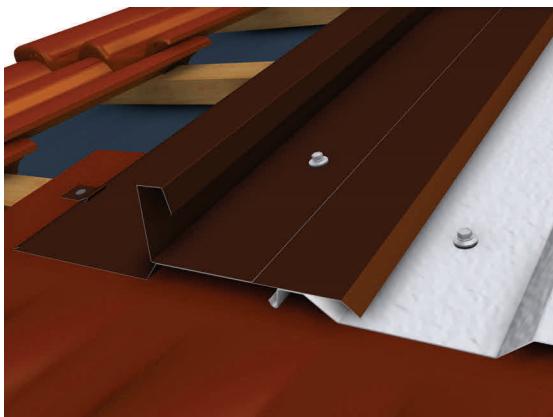
The fastening of the lateral connection plates is done by nailing some clamp-type holders in the battens (3 to 5 holders per sheet). The nails are not included. The complete width of the trapezoid roof surface incl. lateral connection plates equals the generator surface width + 450 mm (system width). The space between the lateral ending sheets and the generator field width equals 10 mm.

SOL-50i In-roof subconstruction



Mounting the lateral ending sheets

The lateral ending sheets are **only** mounted in the area of the generator field so that a problem-free roof covering is possible in the upper area.
(see vertical section – generator height equals the length of the lateral ending sheets).

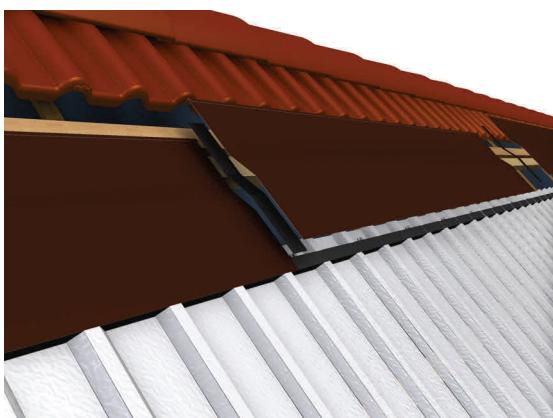


The fastening is carried out with 5,5 x 25 mm self-drilling screws onto the lateral connection plate roughly every other roof batten.



Mounting the upper connections plates

Before the upper connection plates are mounted, self-adhesive profile fillers must be laid in the trapezoid sheets across the whole width of the generator with upper spacing of 150 mm.

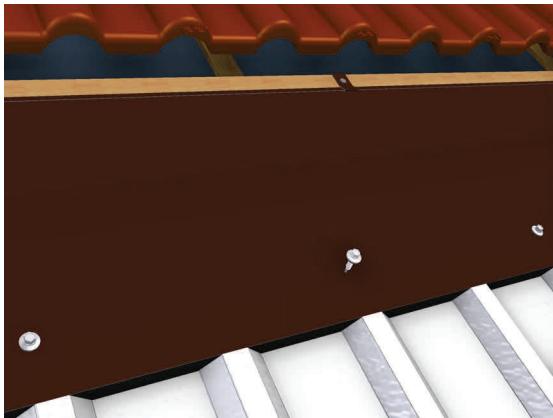


The upper connection is done using a suitable connection plate (upper connection plate). The assembly must be performed by skilled personnel (roofer). The plates should have a 150 mm overlap. During installation, a vertical sealing tape is laid in the strut area on the weather side.

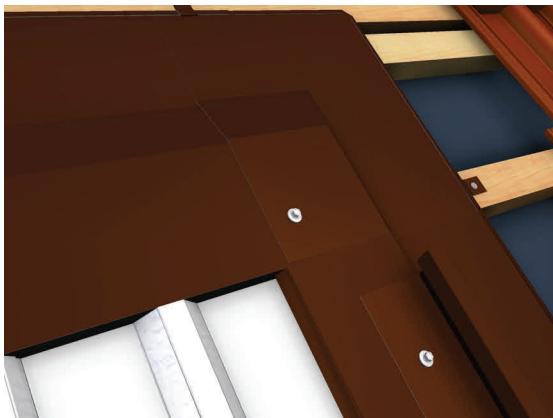
SOL-50i In-roof subconstruction



SOL-50
INDACH



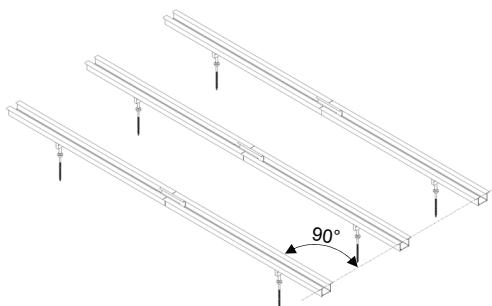
The fastening of the upper connection plates is done with stainless steel, self-drilling screws with sealing washer. In the area of the trapezoidal sheets, every other raised bead is screwed down. The fastening of the upper lateral connection plate is carried out by clamp holders which are nailed into the roof battens. The nails have to be provided on site.



Corner areas / Profiles assembly

The corner areas are covered using the corner pieces. Lay a sealing band between the corner pieces and the horizontal/vertical connection plates. The corner are then fastened with stainless steel, self-drilling screws (5,5 x 25 mm) with sealing washers on the raised bead. The outer corner must be nailed on the roof battens. The nails have to be provided on site.

Mounting vertical profiles XXL on solar fasteners

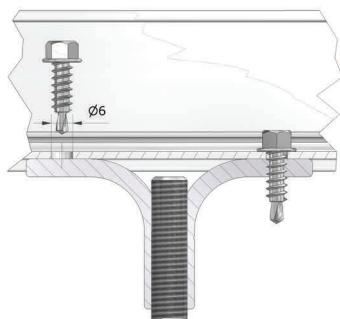


Please take the permitted distances of the profiles and the solar fasteners as well as the profile lengths from the system sketches and the static of the system. On the solar fasteners mounted in a vertical line the vertical profile is installed. In this connection please pay attention that the lower profile edges are in alignment and that the profiles form a right angle to this alignment.

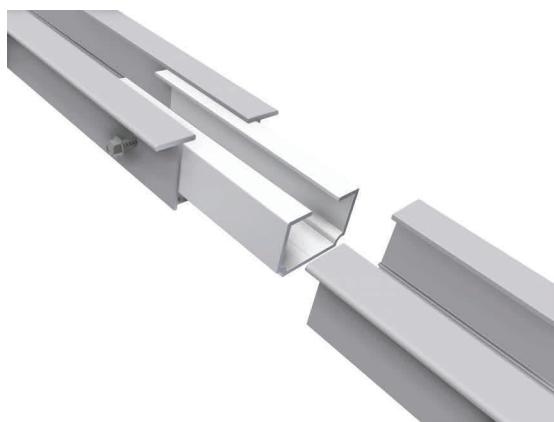


After having adjusted the vertical profiles they are fixed with each 2 drilling screws on the vertical attachment of the solar fastener.

Take care of the general advice for bolt assembly.

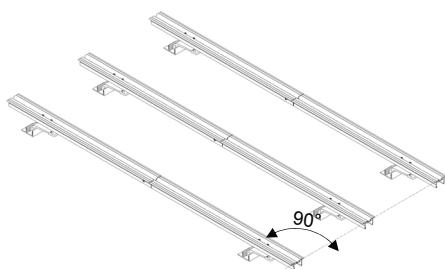


The vertical profiles are first of all pre-drilled and then fastened by means of drilling screws. The positions of the drilled holes can be marked by means of the drilling template which is included in the delivery.



In case the lengths of the vertical profiles is not sufficient further profiles can be connected by means of the vertical joiners. The vertical joiners are pulled equally into the vertical profiles and are fixed by means of a drilling screw. The connection of the vertical profiles represents a bending resistant connection.

Mounting vertical profiles XL on roof hook XXL



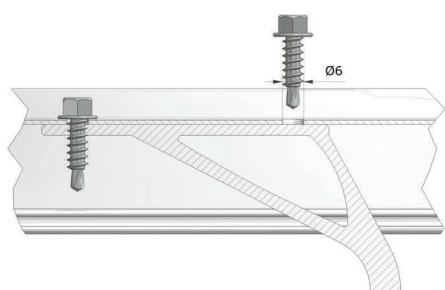
Please take the permitted distances of the profiles and roof hooks as well as the profile lengths from the system sketches and the static of the system.

The vertical profile is placed on the roof hooks mounted in a vertical line. In this connection please take care that the lower profile edges are in alignment and that the profiles form a right angle to this alignment.

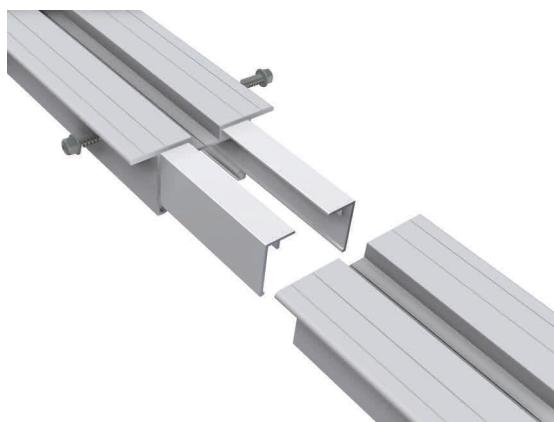


After having adjusted the vertical profiles they are fixed with each 2 drilling screws on the vertical attachment of the roof hook.

In this connection pay attention to the general advice of the bolt assembly.

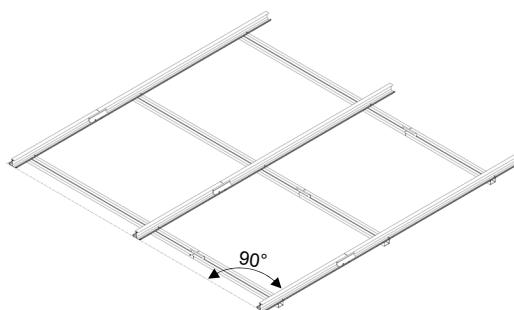


The vertical profiles are first of all pre-drilled and then fastened via drilling screws. The positions of the drilled holes can be marked by means of a drilling template which is included in the delivery.



In case the length of the vertical profiles is not sufficient further profiles can be connected by means of the vertical joiner. The vertical joiners are pulled equally into the vertical profiles and are fixed by means of a drilling screw.

Mounting horizontal profiles



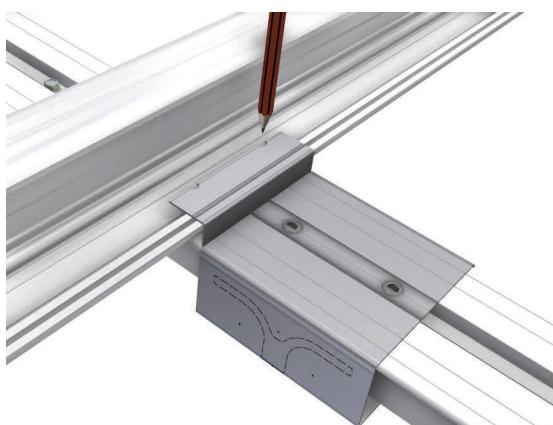
Starting from below the horizontal profiles are mounted parallel to each other with the calculated distances on the vertical profiles. Adjusting the horizontal profiles attention has to be paid to the perpendicularity.

Please take the lengths and distances of the horizontal profiles from the system sketches.



For the installation of further horizontal profiles we recommend to prepare two installation aids according to the module types.

In this connection we recommend to use the module templates available optionally. These may be adjusted variably and assure the optimal and rectangular installation of the horizontal profiles.

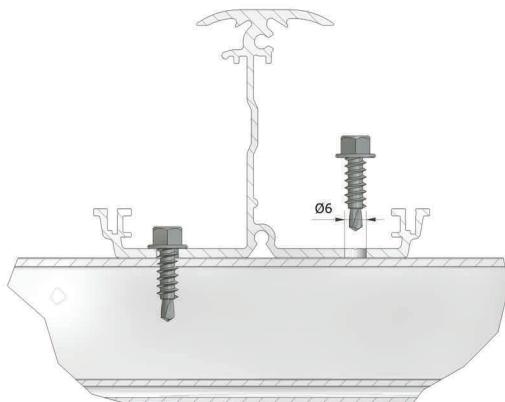


The positions of the drilling holes can be marked by means of the drilling template included in the delivery.



The fastening of the horizontal profiles is made via two drilling screws per junction which are bolt diagonally into the upper supporting surface of the vertical profile. The horizontal profile must be pre-drilled with 6,0 mm.

Mounting horizontal profiles



It should be ensured here that the horizontal profile lies properly on the vertical profile and does not slip during drilling.

Please observe the general notes for installation of bolts.



In case the length of the horizontal profile is not sufficient further profiles can be connected via the horizontal joiner. The horizontal joiners are inserted equally into the horizontal profiles and are secured against slipping by means of drilling screw.

The horizontal profiles must keep a distance of 1 - 2 mm in order to compensate temperature effected linear expansions of 1 - 2 mm



If not present or if covered at the horizontal profiles, before inserting the modules, water drainage holes must be drilled with a spacing of a module width if not present or if covered. (Ø approx. 10 mm).

Mounting horizontal profiles



The horizontal profiles are connected via connecting pins in the plug-in channel of the profile so that the generator width results. Between the profiles there should always be a distance of 1 - 2 mm in order to compensate temperature-affected linear expansions. The horizontal profiles are delivered in 2 m lengths. If needed they can be cut with a chop saw.



Between the horizontal profiles and the trapezoidal sheet there is corrosion protection rubber which is clamped on the profile in the range of the beat and bolt with it. Also more of the rubber can be used above each other in order to compensate small unevenness.



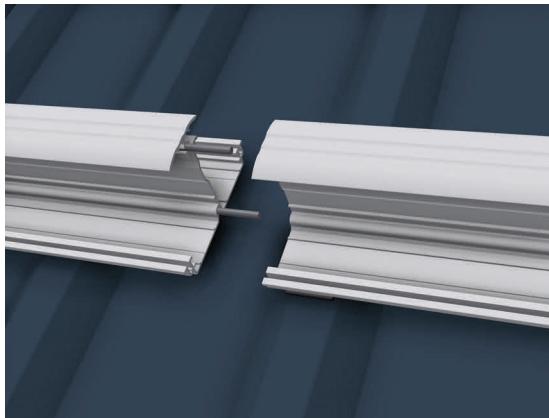
On both sides of the total profile a horizontal end cap is pushed into the plug-in channels which are foreseen in this case. The horizontal profile has to be sloped over the entire length so that on each side an air gap of about 5 mm arises.



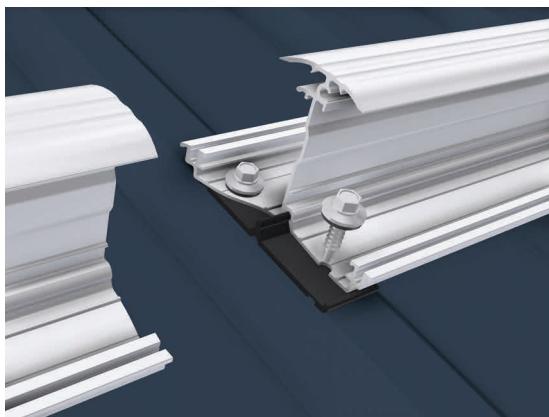
The bolting is done on each other bead (in the edge of each bead) by means of two drilling screws into the drill mark of the horizontal profile.

The horizontal profile must be pre-drilled with 6,0 mm. Please pay attention to the general advice for bolt assembly. Please take the distance to the above profiles from the system sketches..

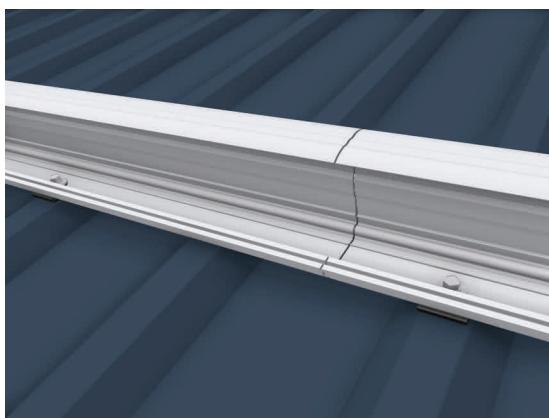
Mounting horizontal profiles on trapezoid panel roofs



The horizontal profiles are connected via connecting pins in the plug-in channel of the profile so that the generator width results. Between the profiles there should always be a distance of 1 - 2 mm in order to compensate temperature-affected linear expansions.

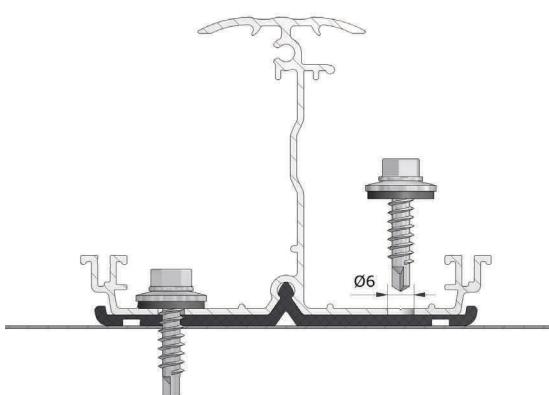


Between the horizontal profiles and the trapezoidal sheet there is corrosion protection rubber which is clamped on the profile in the range of the beat and bolt with it. Also more of the rubber can be used above each other in order to compensate small unevenness.



The bolting is done on each other bead (in the edge of each bead) by means of two drilling screws into the drill mark of the horizontal profile.

The horizontal profile must be pre-drilled with 6,0 mm. Please pay attention to the general advice for bolt assembly. Please take the distance to the above profiles from the system sketches.



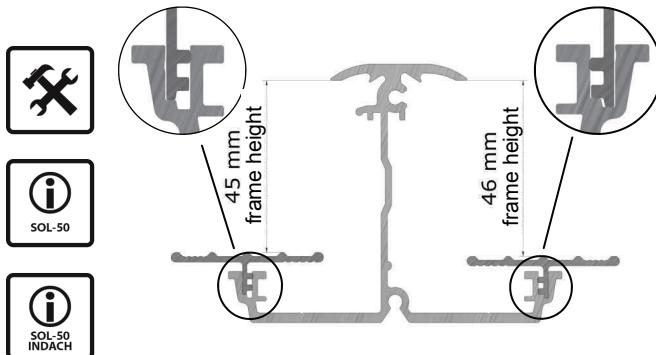
Conditions:

Sheet thickness: min. t = 0,63 mm (steel)
min. t = 0,90 mm (aluminium)

Distance of the connection points: <=0,45 m with each 2 screws (selfcutting screw 5,5 x 25 mm A2, according to SEN indications).

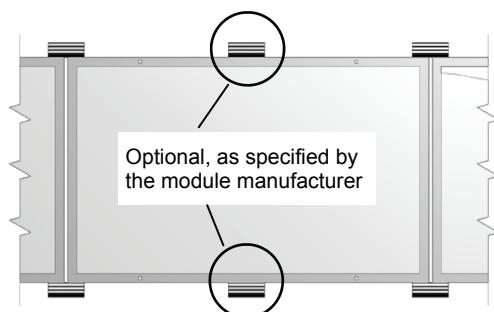
Screw connection in steel plate <0,63mm on request possible. E.g. 0,60mm or 0,50mm

Mounting distance adapters



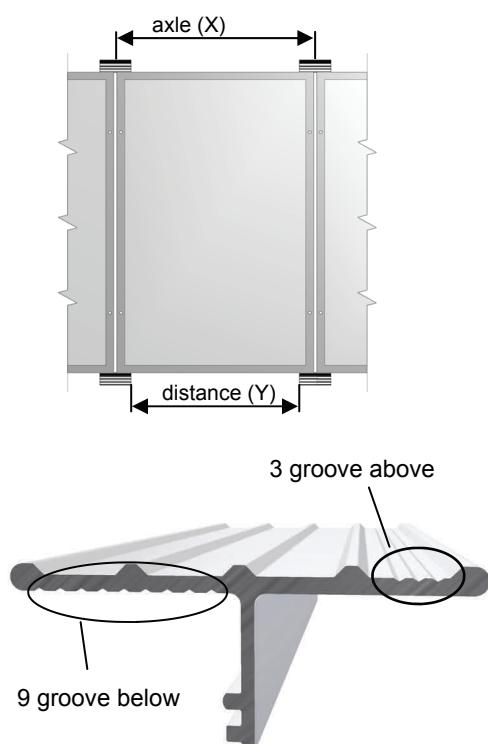
Distance adapters have to be inserted for module frame heights lower than 50 mm. The distance adapters care for the height adjustment and are placed under the module frame and are secured against shifting. Per each module 2 distance adapters are necessary, additionally two at the end of each module row. For landscape assembly two distance adapters in the middle of the module frame.

Pay attention to the mounting instructions of the manufacturer!



The distance adapter profiles must be inserted exactly in the horizontal profile.

$$\begin{array}{ll} \text{Axial dimension (X)} = & \text{Module dimension} + 5 \text{ mm} \\ \text{Distance (Y)} = & \text{Module dimension} + 5 \text{ mm} \\ & \text{Length distance adapter} \end{array}$$



Identification SEN SOL-50 distance adapter

In order to chose the correct distance adapter for the existing frame height there are marks above and below in the support.

The above marks differ roughly in 30 and 40 mm frame height. In this connection three mean 30 mm and four mean 40 mm height.

The furrows below show the smallest of the two frame heights respectively which can be installed with the adapter.

Example: 3 furrows on top □ 30 mm + 9 furrows at the bottom □ 9 mm = 39 mm distance adapter

for module frame heights 39 and 40 mm

Mounting distance adapters



Securing the position of the distance adapter:

Inserting the distance adapters with hand or by means of pliers.

Remark: The distance adapters can hardly be moved after having inserted them. Therefore a correct position is important.



Fixing the position by means of glue.



Fixing the position by means of pressing the conductive furrow.

Potential equalisation



Potential equalisation

The PV generator, (the assembly frame) must be included in the potential equalisation.

To create the potential equalisation, use a 10mm² copper cable and the earthing set provided, consisting of plastic connector and clamp.

The earthing set is attached with two of the stainless steel screws (supplied) to a suitable point on the vertical or module carrier profile.

The counterpart is placed on the potential equalisation rail.

The potential equalisation has to be done according to IEC 60364.

Potential equalisation



ALLGEMEIN



Mounting earth and potential equalization

To create the potential equalization, use a 10mm² copper cable and the earthing set provided, consisting of plastic connector and clamp.



The earthing set is attached with two stainless steel screws, (supplied) to a suitable point on the trapezoid roof profile.

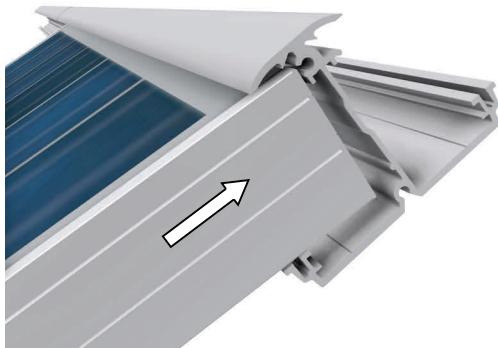
The counterpart is placed on the potential equalisation rail.

The potential equalisation has to be done according to IEC 60364.

Mounting modules SOL-50 and SOL-50i



Once the profile has been installed, the modules can be mounted, beginning with the top row. Suction clamps are best suited for installing the modules. The electrical connection of the solar panels uses connectors with reverse polarity protection. The supply cables can be laid protected in the horizontal and vertical profiles or in the optional cable channel using cable protection nets or clips.



The solar module is inserted first of all in the upper profile and pushed up completely.



Thereafter it is led down in the lower profile up to the support edge or for module frames below 50mm on the distance adapter.

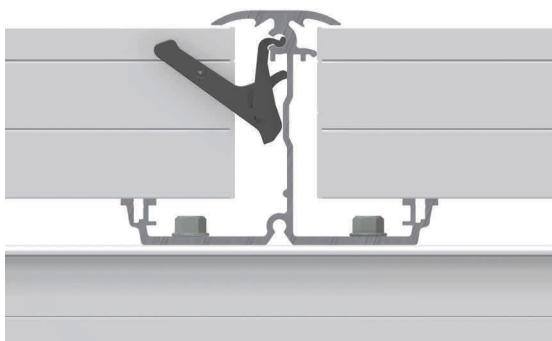


Finally the module is pulled into the profile up to the limit stop. Attention has to be paid that the module is surrounded equally from the upper and lower horizontal profile (above and below 7 mm) (compare system sketches)

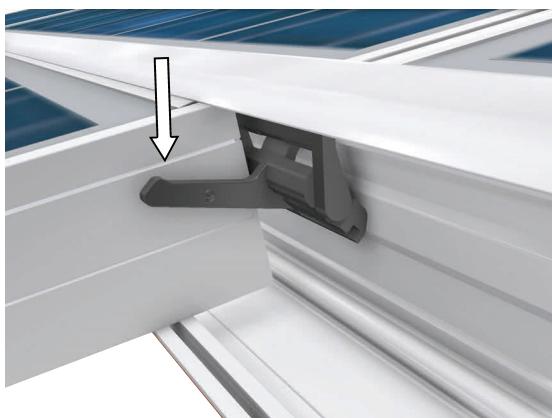
Mounting modules SOL-50 and SOL-50i



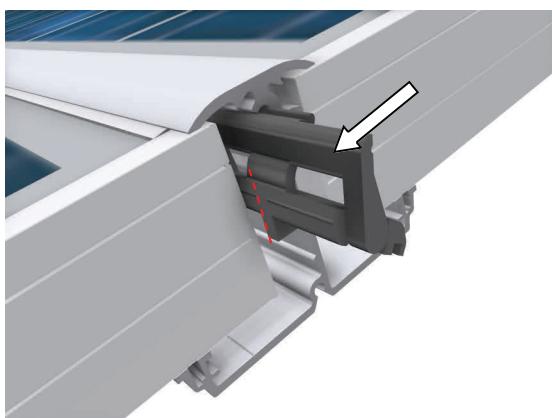
Before installing the next module insert the module protection. The **SOL-Guard** Anti-theft Protection is placed between two modules respectively and will be clipped into the upper screw duct . After having inserted SOL-Guard pull it up to the safety lever behind the first module.



Only after insertion of the adjoining module the safety lever in the centre will be moved downwards and locked in place. This fixation avoids that the module can be pulled upwards and thus be removed (anti-theft protection).

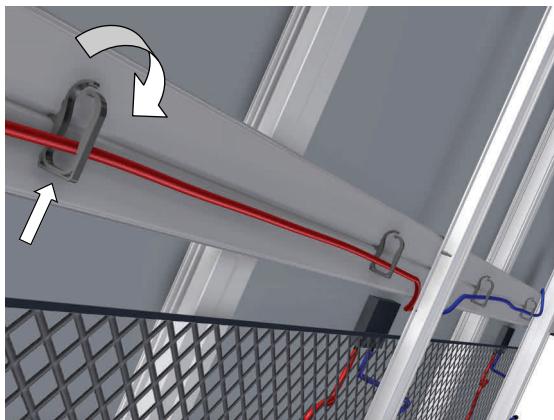


The gap of 5mm between all modules effected by SOL-Guard is imperative because of the wind permeability !



The first and last one of this series, outside, be additionally secured with a module protection . The lever of the module fuse must be removed for installation. Only now the module protection can be mounted laterally in the locked state to the upper screw and placed behind the module.

Installation cable run

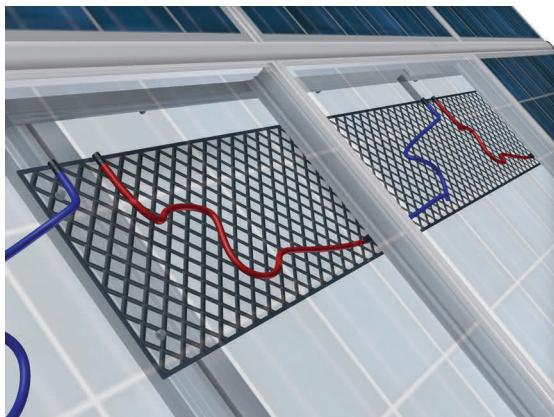


SOL-50 cable clips

The SOL-50 cable clips can be used optionally. They are fixed without tool by means of 90° rotation under the horizontal profile or the carrier profile at the SOL-SMART system.

We recommend using one clip every 80 cm.

This should, however, be adapted on-site to the local conditions.

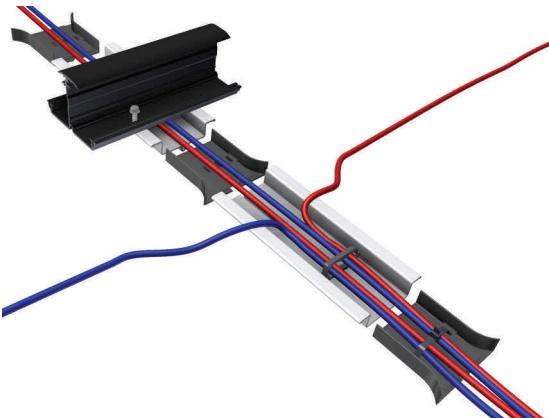


SOL - 50 Cable protection nets

Where the optional cable protection nets are used, insert two self-drilling screws in each vertical profile with a spacing of approx. 25 cm at the height of the module connection socket to be added later. Stretch the cable protection net across the whole length of the row of modules using the self-drilling screws inserted previously.

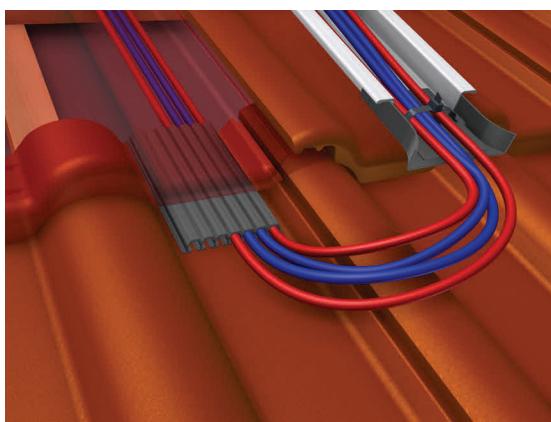
The net should be tight and the cables easily inserted into the nets before connecting together.

Installation cable run

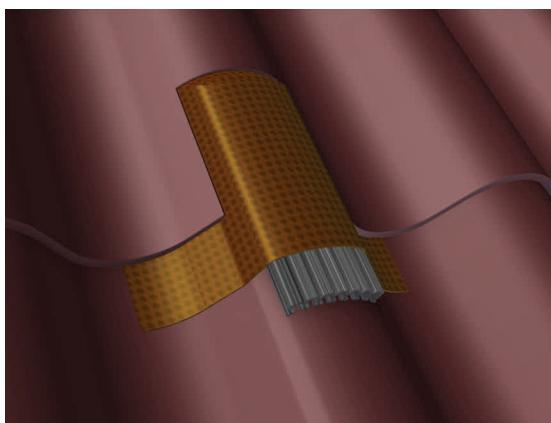


Cable routing - Set

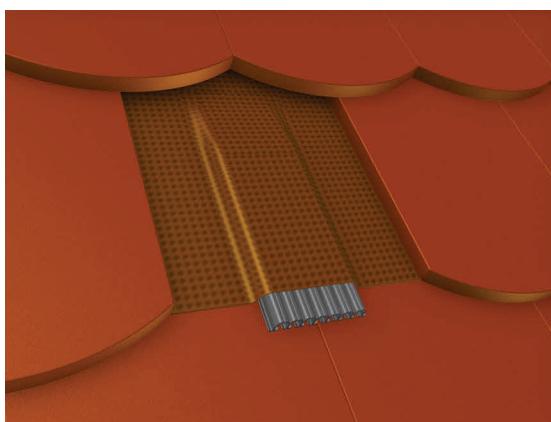
The cable routing set enables a clean and safe cable routing of the PV installation on the roof. The set contains the cable routing profile, the connections and the entry funnel as well as the conducting funnel, the roof duct pan tile, cable clips, cable straps and repair adhesive tape for the implementation on corrugated roofs.



Installation of roof duct pan tile.



Installation of the roof duct wave.



Installation of the roof duct plain tile.

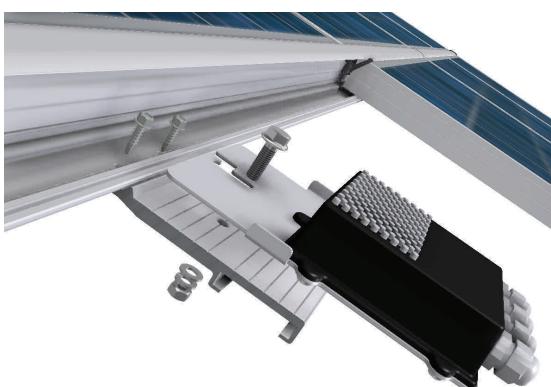
SOL-50 AC/DC mounting base plate



Fixing the mounting base plate

For instance, the mounting base plate can be used for fastening power optimizers.

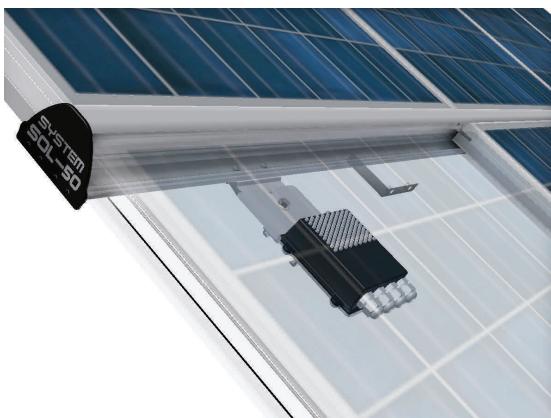
The mounting base plate is hang up into the lower screw channel of the SOL-50 horizontal profile and is folded up so far that it rests flush against the bottom of the profile.



The mounting base plate is fixed to the SOL-50 horizontal profile with two drill screws. Both building components must be pre-drilled.

For the mounting of power optimizers, a suitable hole for the corresponding device has to be drilled into the plate before installation.

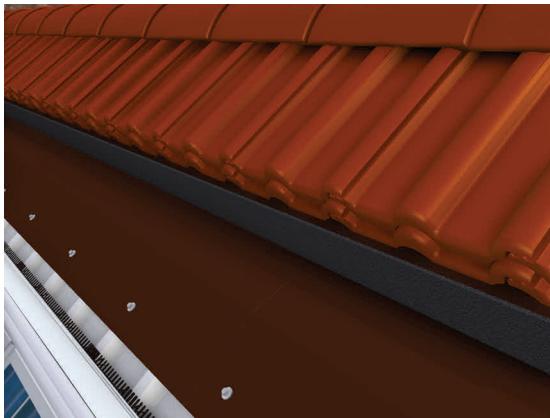
Then, the mounting on the mounting plate will be done with machine screws (not included in the scope of delivery).



Tip:

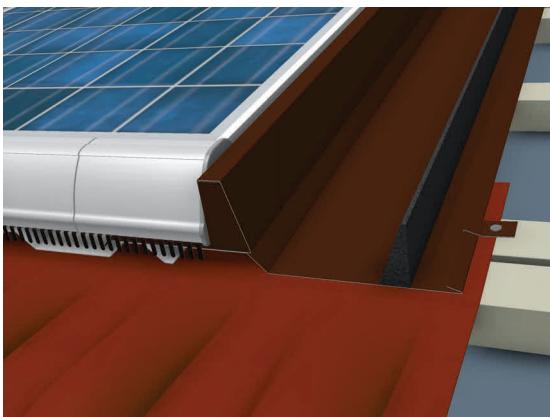
All preparation work, such as the pre-drilling of the mounting plate and the horizontal profiles as well as the fastening of the power optimizers on the plate, should be done outside the roof on the ground floor.

SOL-50i Final mounting



Upper and lateral connection

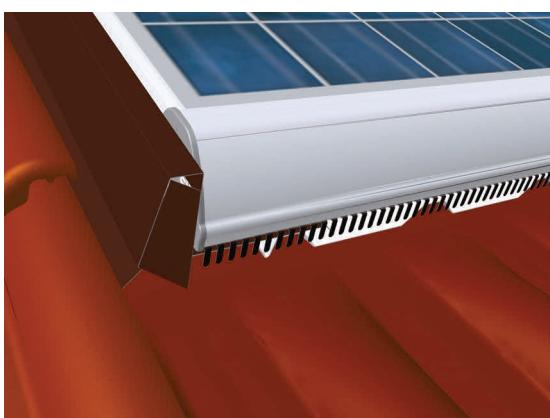
On the upper completion sheet over the complete width a self adhesive sealing strip is glued



Also the lateral sealing is done by self adhesive sealing strips which are glued on the right and left side on the lateral cover sheet.



Afterwards the roof cladding is carried out. In the lateral range it might occur that parts of the roof cladding have to be cut to size. Finally the pan tiles are layed.



Completion of the lateral completion sheets

The lateral completion sheets have pre-punched flaps which will be folded for closing.

Final mounting SOL-50 and SOL-50i



Cover trim

After installing the modules, the aluminium cover panels click into the upper and lower horizontal profiles of the energy area.

The lower panel is additionally secured with suitable adhesive (p.e. SikaBond or roofing silicone) so that it cannot fall out as the result of any stress from the installation or of roof movement.



After the installation please check that the cover trim fits tightly. For larger uneven nesses or restraints the 4 m lengths should be installed section wise.



Horizontale end caps

End caps are plugged in all open ends of the horizontal profiles.

They prevent sideways slippage of the modules and finish off the overall effect. The end caps are secured in the grooves with self-tapping screws, where the connecting bolts can also be positioned.



The Premium horizontal end cap is fixed with two sheet metal screws in the plug-in channel.

Final mounting SOL-50 and SOL-50i



Vertikal end caps

Finally, the lower open ends of the vertical profiles are provided with end caps.



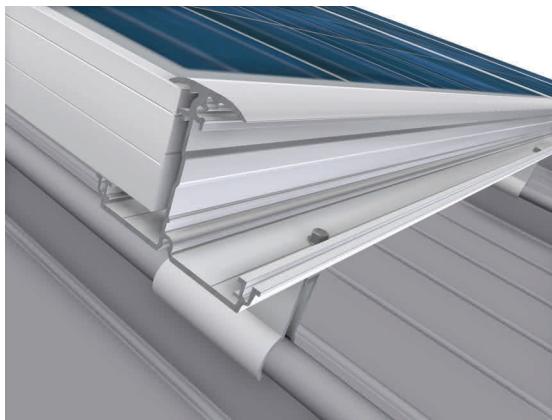
Installation of the vertical sealing for SOL-50 in-roof system

Between the single modules now a suitable silicon glue is fixed.

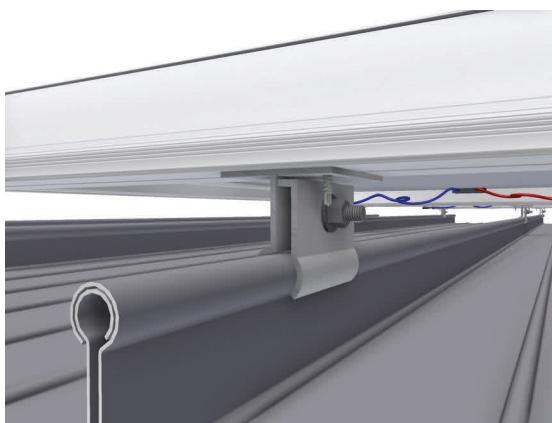


In the next step the vertical sealings which have been cut to length are installed up to the stop in the glue.

Mounting onto "Kal Zip" roof coverings

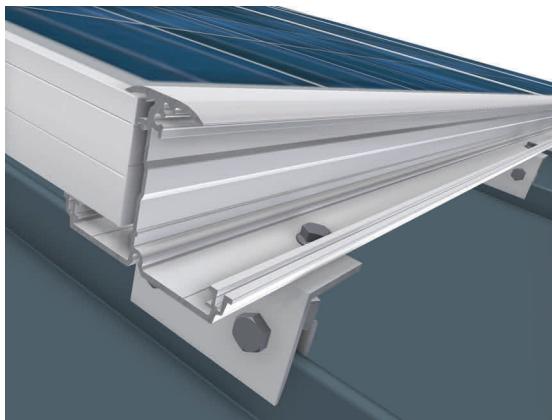


For this kind of installation the horizontal profile is bolted onto the
Kal Zip clamps with self-cutting drilling screws.

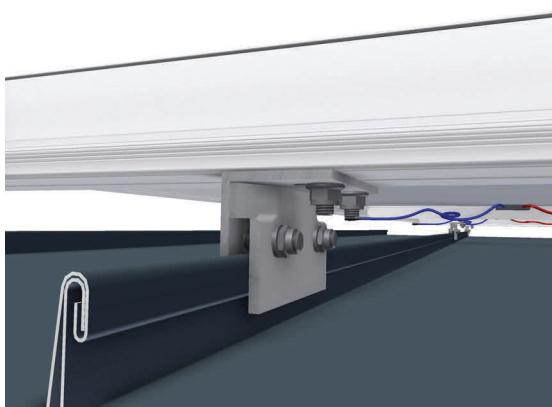


The clamps are securely fastened onto the roof guide.

Mounting on standing seam roof coverings



The balk clip is installed according to manufacturer information.



As for the Kal Zip roof cladding the horizontal profile is screwed on the standing seam clamp.



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