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Instalation manual
TopFix 200

IBC SOLAR AG

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1. Introduction

Dear customer,

Congratulations, you have chosen an IBC product! Now you can enjoy the quality and reliability of the IBC TopFix 200 module mounting system.

To ensure that you can install and start up your IBC TopFix 200 module mounting system quickly and simply we have enclosed detailed assembly instructions. They should help you to quickly become familiar with the assembly of the bracket and the modules.

Please read these instructions carefully before installation. If you still have questions after reading them, please contact your IBC partner, who will be happy to assist you.

We wish you a sunny day!

Your team

IBC SOLAR AG

ibc-solar.de/link/mv25

2. Tool list

- Power drill or cordless screwdriver with wrench socket, a variety of bits (TX 25, TX 30, TX 40, socket SW8, SW10.) and torque control
- Drill bits (up to Ø 15 mm)
- Pencil
- Tape measure
- Folding rule
- Plumb line
- Angle grinder with diamond cutting disc
- Torx screwdriver with T-grip, size TX40, TX30, TX25, socket SW8, SW10
- Torque wrench
- Assembly gloves
- Assembling jig

Section 5.9.2 Required tools/auxiliary agents lists any additional tools required exclusively for our IBC trapezoidal sheet metal assembly system as the mounting system fastener type differs from some other fasteners. For this reason, we have described these in a separate section.

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3. General information, standards and regulations

The IBC TopFix 200 mounting system is is used for installing your solar modules.

The number of components varies according to the size of the system.

ⓘ Important information

- Your IBC TopFix 200 mounting system will be delivered complete with all accessories!
- Before you begin, please check that all parts are included by using the attached packing list and parts list.
- Electrical work must be carried out by a qualified electrician!
- The processing guidelines and in individual cases specific guidelines from the relevant manufacturer for the roofing and modules must be adhered to!
- Condition for the 10-year guarantee to be granted: this only applies with the use of IBC components. The guarantee is not valid for components from other suppliers. Complete guarantee conditions are stated in the guarantee document.
- We advise the use of gloves to avoid injuries.
- During the entire assembly time, it must be ensured that at least one copy of the current installation manual is available on the construction site.
- Coated or anodized components may have visual defects due to packaging, transport or manufacturing.

ⓘ Other important information and dimensioning standards

The entire PV system must be mounted according to the generally recognized technical regulations. Please ensure that you observe the national accident prevention regulations e.g. of the German employer‘s liability insurance associations (Berufsgenossenschaften), in particular.

- DGUV Regulation 1 Principles of Preventation
- DGUV Regulation 3 Electrical installations and equipment
- DGUV Regulation 38 Construction work
- DGUV Information 208-016 the use of ladders and steps

Please ensure that installation is adapted to on-site conditions and corresponds to the respective generally recognised technical regulations. Local regulations must be observed.

Please observe all regulations and guidelines under public law during planning, erection, operation and maintenance of grid-connected PV plants including the following: EN standards, DIN standards, TAB, accident prevention regulations, the guidelines from the association of property insurers (VDS – fire protection guidelines), the professional guidelines of the roofing association and general guidelines (e.g. timber structures, roofing and roof-sealing works).

Please note in particular (this is not an exhaustive list):

- DIN / VDE 0100, particularly part 712 (erection of power installations with nominal voltage up to 1000 V)
- DIN / VDE 0298 (electric cables)
- VDI 6012 Blatt 1.4 (Integration of distributed and renewables-based energy systems in buildings - Fundamentals - Fixing of solar modules and solar collectors on buildings)
- DIN / VDE 0126 (solar energy systems for domestic use)
- DIN / VDE 0185 part 1 to 4 (lightning protection)
- DIN 18338 Roof covering and roof sealing works
- DIN 18451 Scaffolding work
- DIN 18531 Waterproofing of roofs
- DIN 18015 Planning and erection of electrical installations in residential buildings
- TAB (technical closing conditions for connecting to the low-voltage grid of power supply companies)
- VDEW guidelines (guidelines for connection and parallel operation of decentralised power generation in the low-voltage grid)
- Notes on solar from the German Institute of Civil Engineering (DIBt), in the current edition
- DIBt building regulation list, in the current edition
- DIN 4102-1:1998 Fire behaviour of building materials and elements – part 1: Building materials; classification, requirements and tests
- DIN EN 13501-1:2010-01 Fire classification of construction products and building elements – part 1: Classification using the results from fire behaviour tests on construction products
- EN 1990 (Basis of structural design)
- EN 1991-1-3 (General actions – snow loads)
- EN 1991-1-4 (General actions – wind loads)
- EN 1993-1-1 Design of steel structures: General rules and rules for buildings
- EN 1995-1-1 Design of timber structures
- EN 1999-1-1 Design of aluminum structures
- General certificate of building approval Z-30.3-6: Products, connecting devices and structural components made from stainless steel
- DIN 4426 Equipment for building maintenance - Safety requirements for workplaces and accesses - Design and construction

- DGUV Information 203-080 - Installation and maintenance of PV systems
- DGUV Information 201-056 - Planning principles of anchor devices on roofs
- Model Building Regulation (MBO) / state building regulations

Solar modules

Framed solar modules may only be used if they fulfill the following criteria:

- Hold valid IEC 61215 / IEC 61646 and protection class II / IEC 61730

Framed solar modules

Please note that the guarantee for the solar modules will expire if modifications are made to the module frames (e.g. by drilling additional holes). For warranty reasons, the assembly instructions from the respective solar module manufacturer must be strictly adhered to.

Lightning and surge protection

Please note that the lightning and surge protection of the PV system is to meet the current requirements for

- DIN / VDE 0185 part 1 to 4,
- DIN / VDE 0100 part 712 and
- VdS 2010

For more detailed information please refer to the local regulations and the aforementioned standards and guidelines.

In general we recommend that you integrate the assembly system and the module frames into the local potential equalisation and use surge protection devices.

Potential equalisation is always necessary if the used solar modules do not meet requirements for protection class II and/or transformerless inverters are used.

The cross-section of the potential equalisation conductor must correspond to the main DC cables but must be at least 6 mm² (copper).

If the building has a lightning protection system and the PV generator is not in the protection area of the arresting device, then the module frame and assembly system must be integrated into the external lightning protection and surge protection devices must also be installed.

The electroconductive connection must be implemented with at least 16 mm² (copper).

Cable routing

Even when you are installing the frame, certain points regarding cable routing and wiring should be kept in mind.

- To avoid surge voltage couplings from lightning strikes, the resulting conductor loop must be kept as small as possible.
- The cable routing must allow for any future slipping caused by snow and ice.
- Water must not be allowed to collect around the wiring, continuous water drainage must be provided.
- The wires must be installed with maximum possible UV and weather protection.

Dimensioning

Our TopFix 200 mounting system is dimensioned using our very own PV Manager software, used to determine the degree of utilisation and hence the suitability of the components to be mounted on your roof. The software is designed as a planning tool. It does not substitute official, static calculations.

If you do not have the PV Manager available for PV plant dimensioning, please contact your responsible sales representative to determine and dimension the mounting system.

⚠ Attention!
Any calculations for the roof construction as well as any existing superstructures do not form part of the static calculations as part of the PV substructure dimensioning. A civil engineer must inspect and approve of the increased and rearranged loads caused by the PV plant on site.

4. Mounting diagram

There are various possibilities for the arrangement of the mounting system and the modules on the roof. The most common option is to horizontally assemble type e.g. TF50+ support rails and arrange solar modules vertically. For this reason, any further mounting procedures describe such an arrangement.

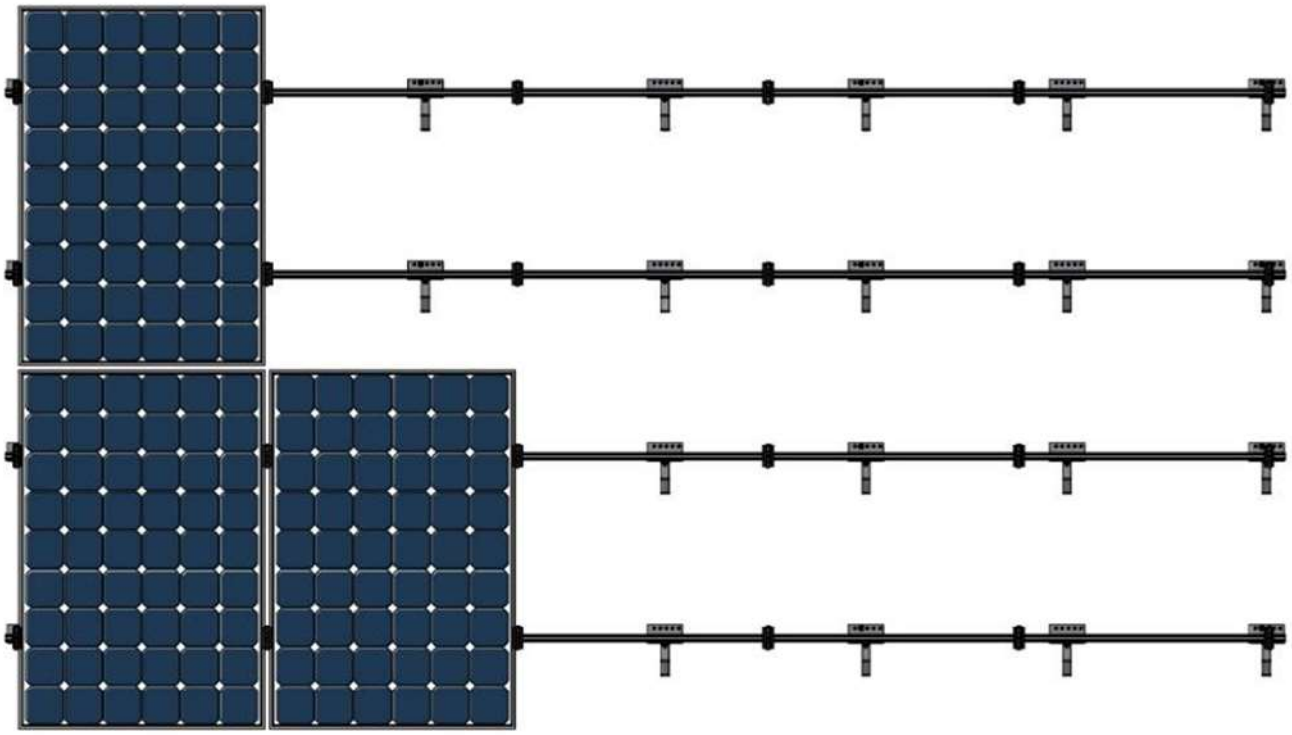


Figure 1 View of the IBC TopFix 200 pitched roof mounting system

We have illustrated the layout of the IBC TopFix 200 mounting system to improve transparency:

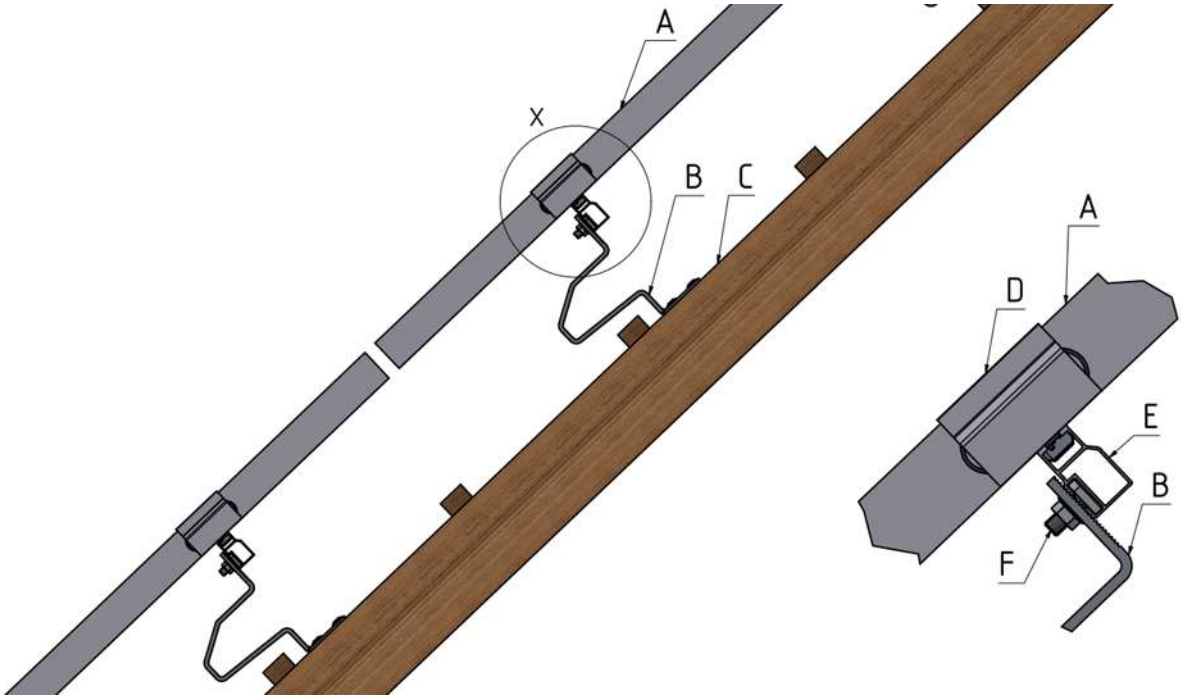


Figure 2 Fastenings for the IBC TopFix 200 pitched roof mounting system

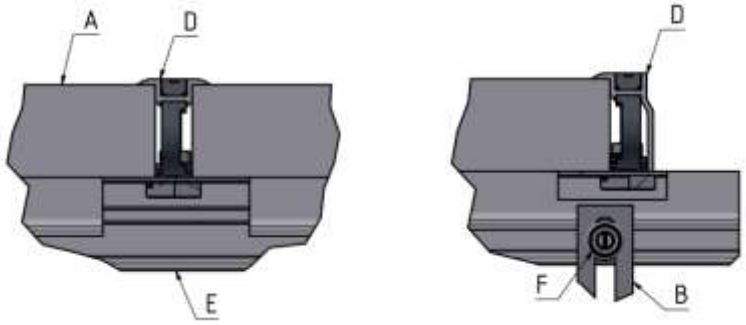


Figure 3 Module fastening of the IBC TopFix 200 pitched roof mounting system

	Description
A	Solar moduel
B	Roof hooks
C	Rafters
D	Module clamp
E	TF50+/ TF50+m/ TF60 support rail
F	M10x25 A2 T-head screw and M10 A4 hexagon nut with locking teeth

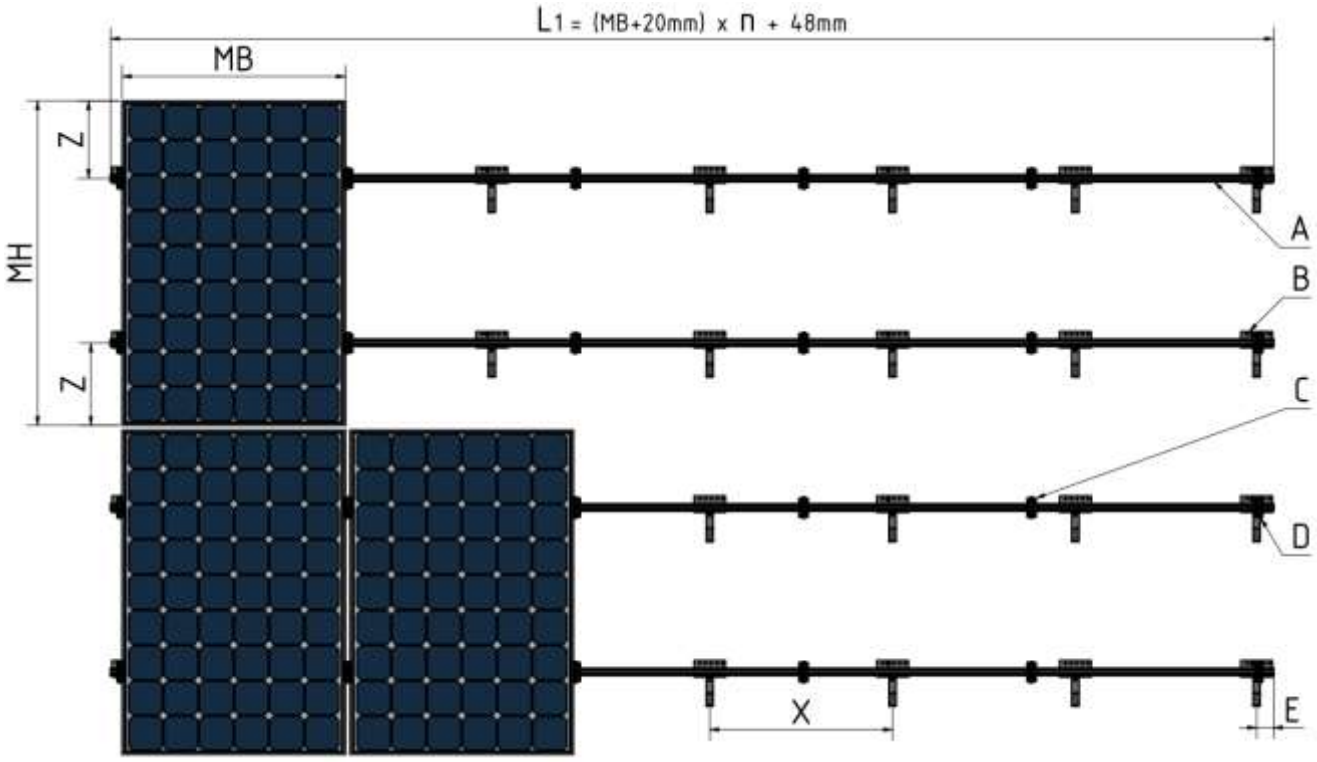


Figure 4 Layout of the IBC TopFix 200 pitched roof mounting system

	Description
L = (MB + 20 mm) × n + 48 mm	Support rail= (MB + 20 mm) × number of modules per row + 48 mm
MB	Module width
MH	Module hight
n	Number of modules
A	TF50+ / TF50+m / TF60 support rail
B	Roof hook
C	Middle clamp
D	Outside clamp
E	max. 400 mm
X	X–selected fixing interval (dimensioned using PV-Manager software)
Z	Please observe module manufacturer specifications

5. Fitting the various mounting systems

5.1 General dimensioning information

The PV system on your roof is subject to considerable forces caused by snow and, most of all, wind. Improper fastening of the PV system, particularly the modules, may cause significant damage to objects as well as personal injury. For this purpose, it is crucial you observe the following section.

The number of fixing points on the roof is always dependent on the particular design of the roof, building height, roof pitch, the wind and snow load zone and a large number of other factors.

The compatibility of the material pairings between the roof and the PV system must be checked before the installation.

Edges and corner areas must be particularly taken into account as per EN 1991-1-4 (Euro code 1) as increased loads may apply due to wind dynamics, depending on the building type. For more detailed information, please see the graphical indications of fixing points in our PV Manager software. Calculate and verify any specific details according to the applicable standards. In this process, we recommend you consult a civil engineer.

Before starting installation, the existing substructure of the building must be checked for sufficient stability. The wooden substructure must have a service life of more than 20 years. In case of doubt, consult a roofer or joiner and a civil engineer.

As a rule, verify on-site static conditions and whether or not the outer roofing in conjunction with the substructure (steel beams/purlins, rafters, roof battens,etc.) is able to bear the additional pressure and dynamic loads of the PV plant.

We shall not assume any system liability for the integrity of the roof as this mainly depends on the quality of mounting or subsequent sealing procedures. The rules of the building trade as well as guidelines and instructions of the roofing manufacturer are to be observed. Mounting system parts must not be treated with additional anti-corrosion protection in normal, atmospheric conditions (corrosivity categories C1-C3 according to EN ISO 12944-2 and surrounding temperatures of -30°C to +50°C). Take additional, suitable anti-corrosion protection measures in the event of other assembly locations (e.g. contact with grit, direct vicinity to the coast, acidic or alkaline environments).

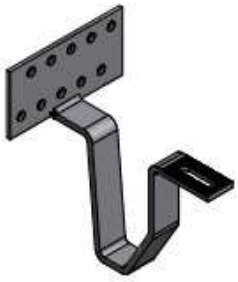
The maximum allowed roof inclination for the mounting system is 75°. It is limited by the permissible inclination of the modules.

Modifications that are not permitted and improper use of our components during assembly and construction shall render and liability and guarantee claims void.

5.2 Fitting the roof hooks

In order to comply with warranty conditions (rain-proofing etc.) we recommend having the roof hooks fitted by a professionally trained personal e.g. roofing firm. Please also take into account the manufacturer's regulations and specifications for the corresponding roofing, in particular with regard to the use of manufacturer accessories for roofing as well as the overview in section 11 containing data on the rafter dimensions required as per EN 1995-1-1.

Fitting steps:



- Remove the roof tile above the rafter.
- Place the roof hook in the depression in the pantile and align it centrally.
- Screw the roof hook to the rafter using two offset flat head screws. There is no need to drill holes beforehand. Observe edge distances under **Figure 200**.
- Align other roof hooks using a piece of string.
- Reinsert roofing tile that has been bent out.

Figure 5 Roof hook

Different country-specific roof constructions can result in mounting variants. Please take these variants from separate installation manuals.

⚠ Attention!
Do not use fitted roof hooks as a step ladder, as the pantile below could be damaged by the extreme concentrated load! A deformation of the roof hook itself cannot be excluded.



Figure 6 Roof hook on the rafter



Figure 7 Fitted roof hook



Figure 8 Fitted roof hook



Figure 9 Alignment with piece of string

If the roof hook cannot be fitted as shown above due to the form of the tile or the position of the depression, it is imperative that a roofer is engaged. Changes to roof covering materials (roof tiles, clay tiles, roof panels, cast stone, etc.) may only be made in accordance with the applicable roofing trade regulations and the manufacturer's guidelines.

⚠ Attention!

The leg of the roof hook lies in the depression in the pantile and must have a clearance of minimum 5mm from the surface of the tile. If necessary an underlay of suitable material should be installed in the space between the rafter and the roof hook's base plate as per Figure 10.

The roofing must not be damaged by loads arising from the fitted roof hooks! If there is a risk of this occurring, additionally install suitable supports to distribute the load. Especially with older tiles, plain tiles and slate roofs and where the installation site is in a high snow load zone, the use of sheet metal supports or tin tiles is recommended. The guidelines of the roofing manufacturer must be observed.

The securing screws in the rafters and the rafters themselves are extremely important for the overall system stress. Chipboard screws are not suitable owing to their smaller head diameter. It must screwing the roof hook to the rafter using two approved 8x100 respectively 6x100 flat head screws from our product range, where no pre-drilling is required. Grease screws to facilitate fastening.

Roof hooks are suitable for most tile types. In individual cases, it may be necessary to remove small pieces from the roof tiles using an angle grinder and suitable cutting disc to ensure that the tile sits flush. The guidelines of the roofing manufacturer must be observed. Particular attention must be paid to the accident prevention regulations when undertaking this work. If applicable, use wooden base blocks on eccentric roof hook connections to distribute the load according to the following figure or other professional solutions.

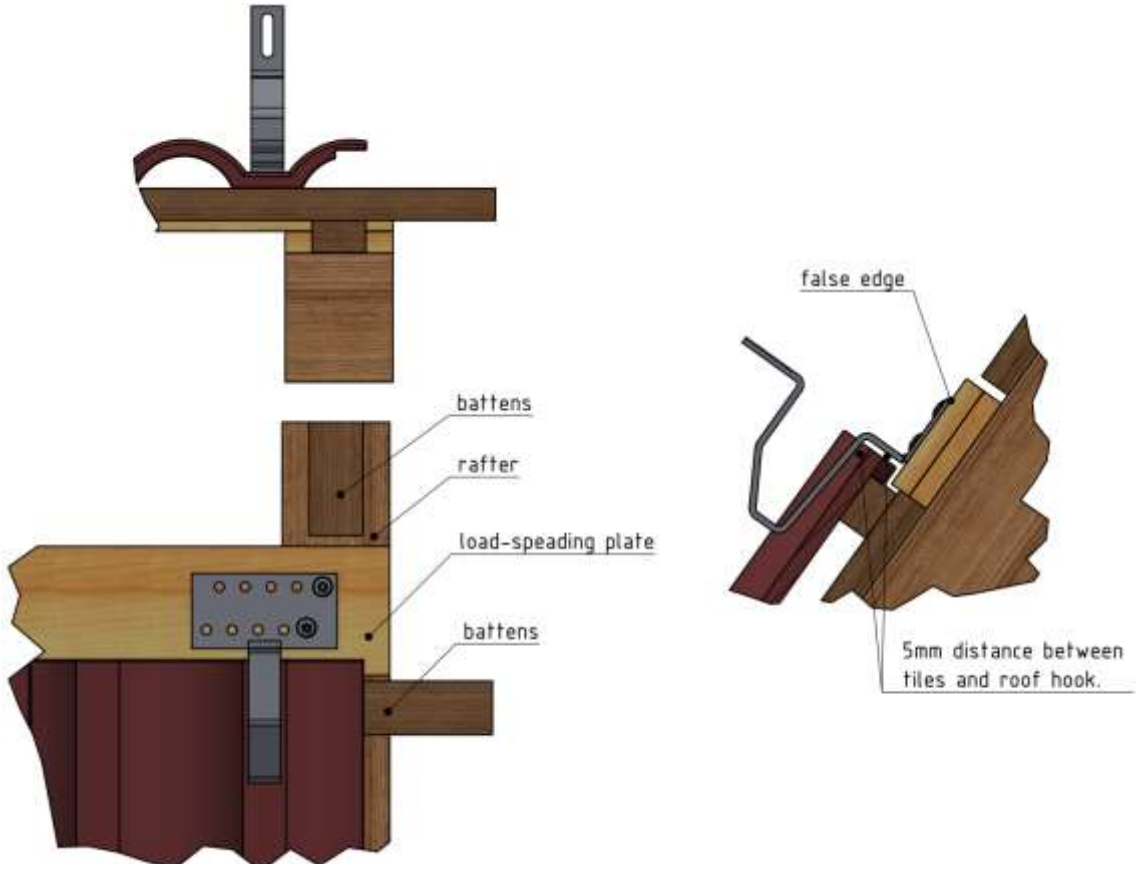
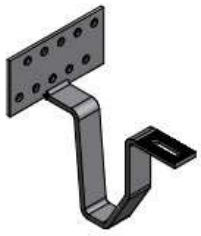


Figure 10 Roof hook load distribution

5.3 Roof hook types

⚠ Attention!
The specifications of the general building approval Z-14.4.-661 for steel roof hooks and Z-14.4.-515 for aluminum roof hooks have to be considered.

5.3.1 Standard S+ roof hook



Generally the "Standard S+" roof hook is used.

It is suitable for the most commonly used types of pantiles.

Figure 11 Standard S+ roof hook

Parameters	Value
Material	Stainless steel 1.4307 S275 + S460
yield strength	Stirrup: fy,k = 460 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 4 mm
Dimensions hook (width / height)	30/ 6 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	45 mm
weight	0,830 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 12 Parameters roof hook Standard S+

5.3.2 Standard S+ 35 mm roof hooks

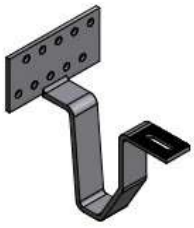


Figure 13 Standard
S+ 35 mm roof hook

Parameters	Value
Material	Stainless steel 1.4307 S275 + S460
yield strength	Stirrup: fy,k = 460 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 4 mm
Dimensions hook (width / height)	30/ 6 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	35 mm
weight	0,820 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 14 Parameters roof hook “Standard S+ 35 mm“

5.3.3 Mammut S+ roof hooks



Mammut S+ roof hooks are used to ensure the safety of the structure under high snow loads. This roof hook provides improved static characteristics compared with the "Standard S+" roof hook. In certain conditions (e.g. low snow load zone), it may be possible to install "Mammut S+" roof hooks only on every second rafter and consequently reduce the number of roof hooks. The load-bearing capacity of the substructure must be given special consideration.

Figure 15 Mammut S+ roof hook

Parameters	Value
Material	Stainless steel 1.4307 S275 + S460
yield strength	Stirrup: fy,k = 460 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 4 mm
Dimensions hook (width / height)	35/ 6 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	45 mm
weight	0,985 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 16 Parameters roof hook Mammut S+

5.3.4 Mammut XL S+ roof hooks



Mammut XL S+ roof hooks are used to ensure the safety of the structure under very high snow loads. This roof hook provides improved static characteristics compared with the "Mammut S+" roof hook. In certain conditions (e.g. low snow load zone), it may be possible to install "Mammut XL S+" roof hooks only on every second rafter and consequently reduce the number of roof hooks. The load-bearing capacity of the substructure must be given special consideration.

Figure 17 Mammut XL S+ roof hook

Parameters	Value
Material	Stainless steel 1.4307 S275 + S355
yield strength	Stirrup: fy,k = 350 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 5 mm
Dimensions hook (width / height)	35/ 8 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	45 mm
weight	1,18 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 18 Parameters roof hook Mammut XL S+

5.3.5 Mammut SV+ roof hooks



Suitable for vertical installation of the support profile in the 1st layer, e.g. insertion system or module portrait at two-layer systems.

Figure 19 Mammut SV+ roof hook

Parameters	Value
Material	Stainless steel 1.4307 S275 + S460
yield strength	Stirrup: fy,k = 460 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 5 mm
Dimensions hook (width / height)	35/ 6 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	45 mm
weight	1,02 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 20 Parameters roof hook „Mammut SV+

5.3.6 Vario S+ roof hooks



For horizontal and vertical adjustability at the base plate.

Figure 21 Vario S+ roof hook

Parameters	Value
Material	Stainless steel 1.4307 S460
yield strength	fy,k = 460 N/mm²
Dimensions base plate (length / width / height)	155/ 75/ 5 mm
Dimensions hook (width / height)	35/ 6 mm
Drilling holes baseplate	12 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	42 mm – 55 mm
weight	1,355 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 22 Parameters roof hook Vario S+

5.3.7 Schiefer S+ roof hook



Special roof hooks designed for the particular roofing tile shape are used for slate tiles.

Figure 23 Schiefer S+
slate tile roof hook

Parameters	Value
Material	Stainless steel 1.4307 S460
yield strength	fy,k = 460 N/mm²
Dimensions base plate (length / width / height)	280/ 30/ 6 mm
Dimensions hook (width / height)	30/ 6 mm
Drilling holes baseplate	3 x Ø 8,5 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	Not specified
weight	0,55 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
countersunk screw 8x100 A2 TX40	
connection piece for roof hook profile M10	

Figure 24 Parameters roof hook “Schiefer S+”

5.3.8 Plain tile S+ roof hook



Figure 25 Biber S+ plain tile roof hook

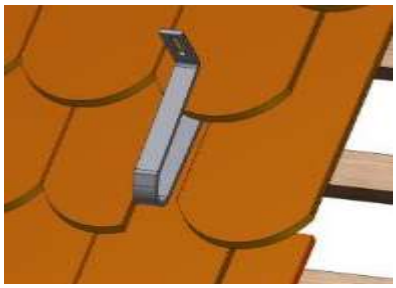


Figure 26 Depression for Biber S

Plain tiles have a different shape from normal roofing tiles. For this reason, a different roof hook type is used.

Parameters	Value
Material	Stainless steel 1.4307 S275 + S460
yield strength	Stirrup: fy,k = 460 N/mm² Ground plate: 275 N/mm²
Dimensions base plate (length / width / height)	135/ 70/ 4 mm
Dimensions hook (width / height)	30/ 6 mm
Drilling holes baseplate	10 x Ø 9 mm
Drilling holes hook	Slot Ø 11 mm, L=30 mm
Hook distance from the base plate	45 mm
weight	0,97 kg
General construction approval	Z-14.4.-661
Maximum ch. load / roof hook [kN]	Calculation via PV Manager
Accessories	
flat head screw 6x100-A2 TX30	
flat head screw 8x100-A2 TX40	
flat head screw 8x140-A2 TX40	
flat head screw ASD 8x240-A2 TX40	
countersunk screw 8x280 TX40	
flat head screw ASD 8x300-A2 TX40	
countersunk screw 8x340 TX40	
connection piece for roof hook profile M10	

Figure 27 parameters roof hook Biber S+

5.3.9 Alu-Vario Eco S+ roof hooks



4-way adjustable aluminum roof hooks

Figure 28 Alu-Vario Eco S+ roof hook

Parameters	Value								
Material	EN AW 6005-T6								
yield strength	Stirrup: fy,k = 225 N/mm² Ground plate: 225 N/mm²								
Dimensions base plate (length / width / height)	135/ 70/ 4 mm								
Dimensions hook (width / height)	30/ 6 mm								
Drilling holes baseplate	10 x Ø 9 mm								
Drilling holes hook	Slot Ø 11 mm, L=30 mm								
Hook distance from the base plate	45 mm								
weight	0,97 kg								
General construction approval	Z-14.4.-661								
Maximum ch. load / roof hook [kN]	pressure $N_{DR,k,5mm}$				suction $N_{ZR,k}$	shear $N_{R,k}$, 5mm			
	0°	20°	45°	90°		0°	20°	45°	90°
	1,27	1,56	0,5	0,5	1,86	0	0,57	0,5	0,5
Accessories									
flat head screw 6x100-A2 TX30									
connection piece for roof hook profile M8									

Figure 29 Parameters roof hook Alu-Vario Eco S+

5.3.10 Alu-Mammut S+ roof hooks



Figure 30 Alu-Mammut S+ roof hook

Parameters	Value		
Material	Alumnium EN AC-42100-K-T6 (DIN EN 1706)		
yield strength	Hook: fy,k = 210 N/mm²		
Dimensions base plate (length / width / height)	150/ 63,5/ (12) mm		
Dimensions hook (width / height)	35/ 6 - 8 mm		
Drilling holes baseplate	10 x Ø 7 mm		
Drilling holes hook	Slot Ø 9 mm, L=25 mm		
Hook distance from the base plate	46 mm		
weight	0,367 kg		
General construction approval	Z-14.4.-515		
Maximum ch. load / roof hook [kN]	pressur $F_{R,k,-x}$= 3,04	suction $F_{R,k,+x}$= 3,14	shear $F_{R,k,y}$= 3,17
Accessories			
flat head screw 6x100-A2 TX30			
connection piece for roof hook profile M8			

Figure 31 Parameters roof hook Alu-Mammut S+

5.3.11 Alu-Mammut SV+ roof hooks



Suitable for vertical installation of the support profile in the 1st layer, e.g. insertion system.

Figure 32 Alu-Mammut SV+ roof hook

Parameters	Value		
Material	Alumnium EN AC-42100-K-T6 (DIN EN 1706)		
yield strength	Hook: fy,k = 210 N/mm²		
Dimensions base plate (length / width / height)	181/ 71/ (12) mm		
Dimensions hook (width / height)	40/ 6 - 8 mm and 35/ 6 – 8 mm		
Drilling holes baseplate	2 x Ø 9 mm, 3 x Ø9 x 14 mm, 2 x Ø9 x 19 mm		
Drilling holes hook	Slot Ø 8,5 mm, L=26,5 mm		
Hook distance from the base plate	46 mm		
weight	0,455 kg		
General construction approval	Z-14.4.-515		
Maximum ch. load / roof hook [kN]	pressur $F_{R,k,-x}$= 2,85	suction $F_{R,k,+x}$= 1,90	shear $F_{R,k,y}$= 2,20
Accessories			
flat head screw 6x100-A2 TX30			
flat head screw 8x100-A2 TX40			
flat head screw 8x140-A2 TX40			
flat head screw ASD 8x240-A2 TX40			
countersunk screw 8x280 TX40			
flat head screw ASD 8x300-A2 TX40			
countersunk screw 8x340 TX40			
connection piece for roof hook profile M8			

Figure 33 Parameters roof hook Alu-Mammut SV+

5.4 ASD screws- Mounting on rafter-mounted insulation systems

ASD screws are designed to install roof hooks on roofs with rafter-mounted insulation roofing. The insulation is designed in such a way that it is installed on the rafters, between the rafter layer and the roof battens. This insulation layer must not be subjected to static, individual loads, such as roof hooks. The loads from the roof hooks are diverted through the space between the insulation to the load-bearing rafter design using the ASD screws.

Information

If the roof structure is too high over the rafters for the ASD scrwes, the roof hooks can also be fixed in the counter battens. By the customer it must be proofed that the corresponding counter battens are fastend to the substructure so that the additional loads can be absorbed and the function of the insulation is not impaired. Observe the minimum edge distances and dimensions according Figure 200.

Select the required screw length according to Figure 34 or using the IBC SOLAR AG PV Manager dimensioning software. It is not required to drill bores before inserting the screws.

Description	Item number	Roof installation height* Max. 235 mm	Roof installation height* Max. 295 mm
ASD flat head screw 8x240-A2	6900300014	X	
ASD flat head screw 8x300-A2	6900300015		X
ASD Countersunk screw 8x280-A2	6900300016	X	
ASD Countersunk screw 8x340-A2	6900300017		X

Figure 34 Overview of screw lengths

*) formwork + insulation + counter batten + integration depth 50 mm

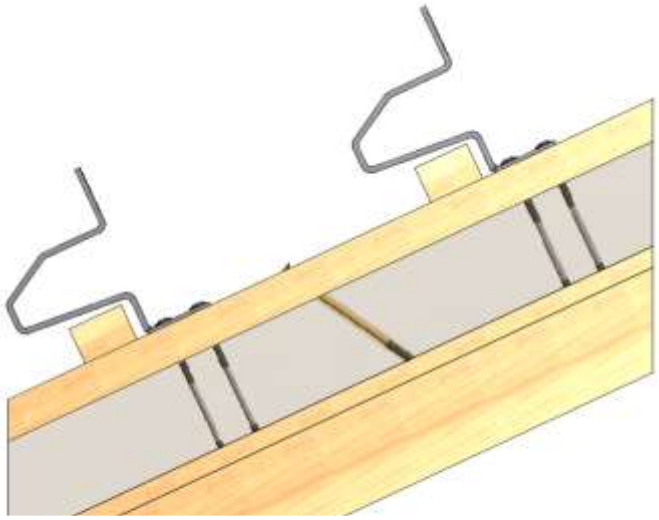


Figure 35 Roof hooks on rafter-mounted insulation systems

Proceed as follows when assembling:

- Two ASD flat head screws are required to fasten one roof hook.



Figure 36 Inserting flat head screws

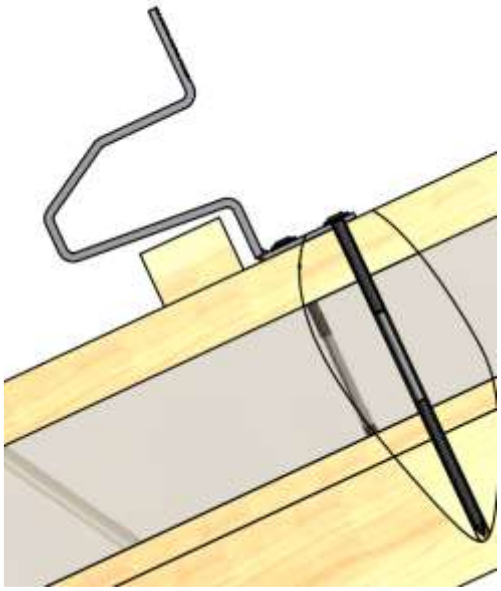


Figure 37 Inserted flat head screws

- Each roof hook connection must additionally be secured by a ASD countersunk screw to absorb sliding / transverse forces at an angle of 60°.

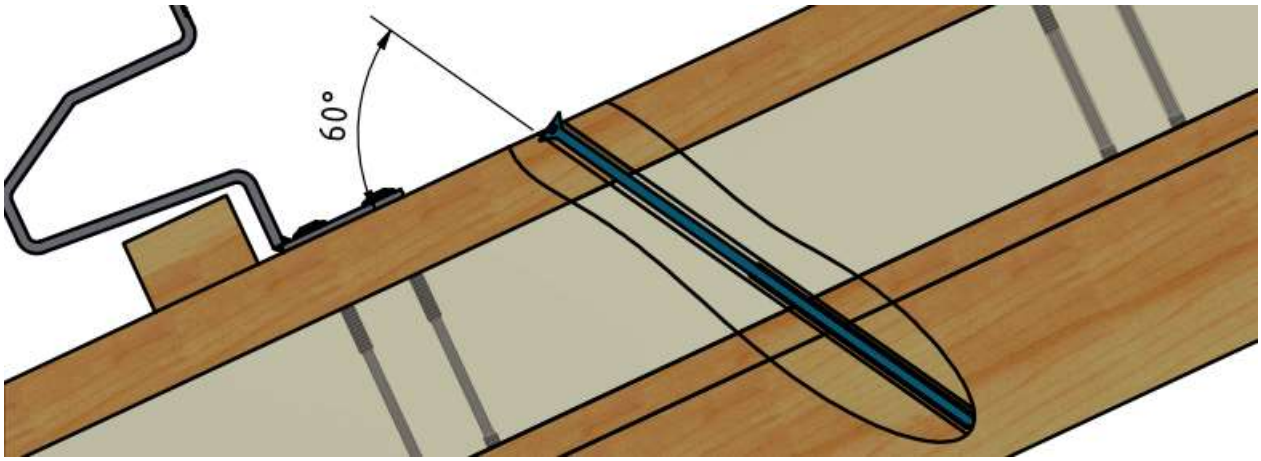


Figure 38 Inserting countersunk screws to absorb sliding forces

Have sun!

5.5 Mammut Form S+ roof hook

The same conditions and prerequisites as described in section 5.1 apply. Mammut Form S+ roof hooks are suitable for 30×50mm and 40×60 mm battens. If the Mammut Form S+ is only fastened to the counter battens instead of to the rafters, the counter battens must be at least 40 mm thick and sufficiently connected to the roof construction in order to be able to transfer the additional loads.

For available types and colours of tiles, please refer to the IBC Premium Partner portal. Your personal IBC SOLAR AG contact person will of course also be happy to help.

⚠ Attention!
The maximum permissible roof pitch for the Mammut Form S+ roof hook is 60°.

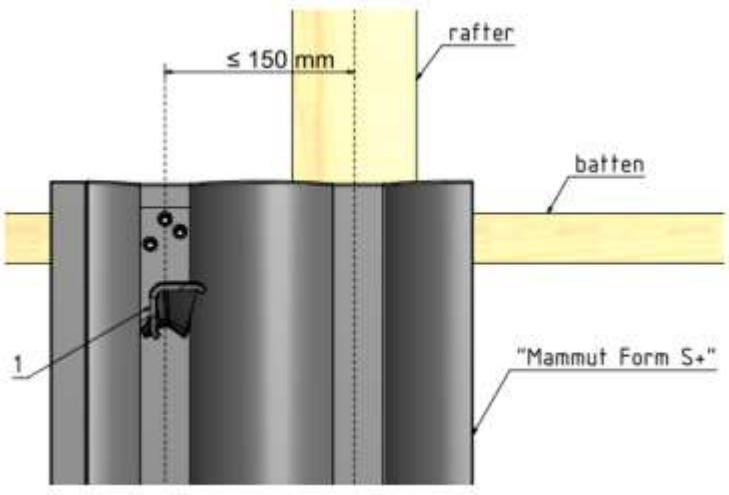
ⓘ Information
Superficial damage to the surfaces (scratches) that affect neither static, nor anti-corrosion properties of the roof hook shall not be accepted as a valid reason for complaints.

IBC SOLAR AG recommends to test one "Mammut Form S+" on the available roof tiles. Due to dimensional changes by the manufacturer, there may be deviations, although the designation is identical (e.g. Tegalit before 1996).

Depending on the type of existing roofing, existing roof tieles may have to be treated.

5.5.1 Fitting "Mammut Form S+" roof hooks

Step 1:



Legend:
(1) Hook
(2) Reinforcing runner
(3) Support member
(4) 4.2×32 mm drilling screw
(5) drilling screw fastening
in the rafter 5.0×120 mm
in the counter battens 5.0×70 mm
(6) 5.0×60 mm drilling screw

Figure 39 Mammut Form S+ roof hook

- Specify the roof hook position so that you do not exceed a distance of 150 mm between fastener element (1) and the centre of the rafter/counter battens.

Step 2:

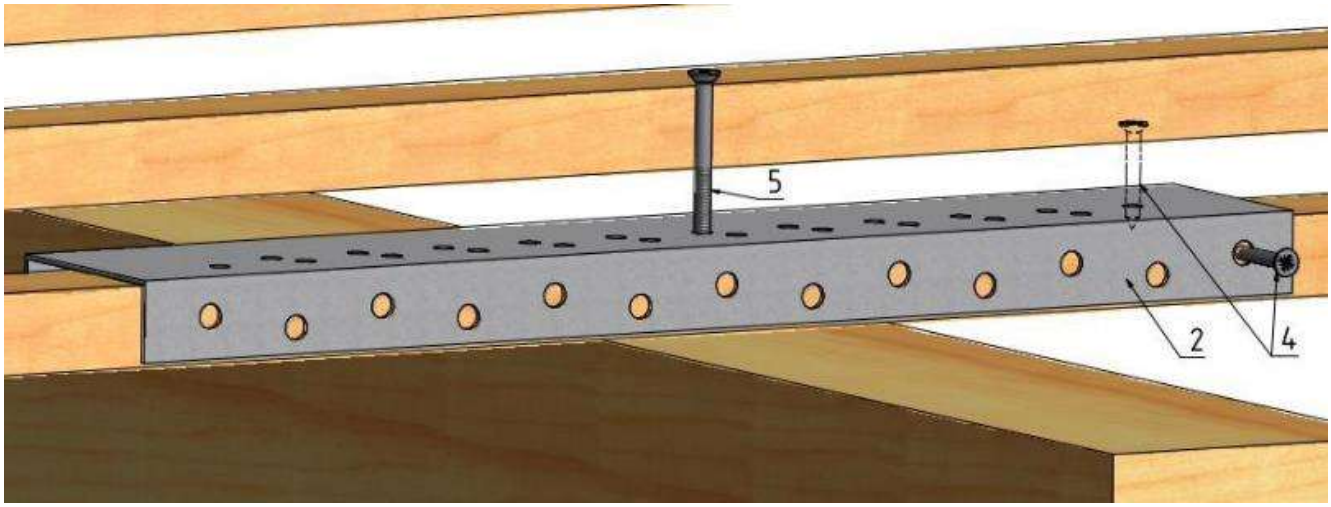


Figure 40 Fastening the reinforcing runner in the rafter with drilling screw 5.0×120 mm

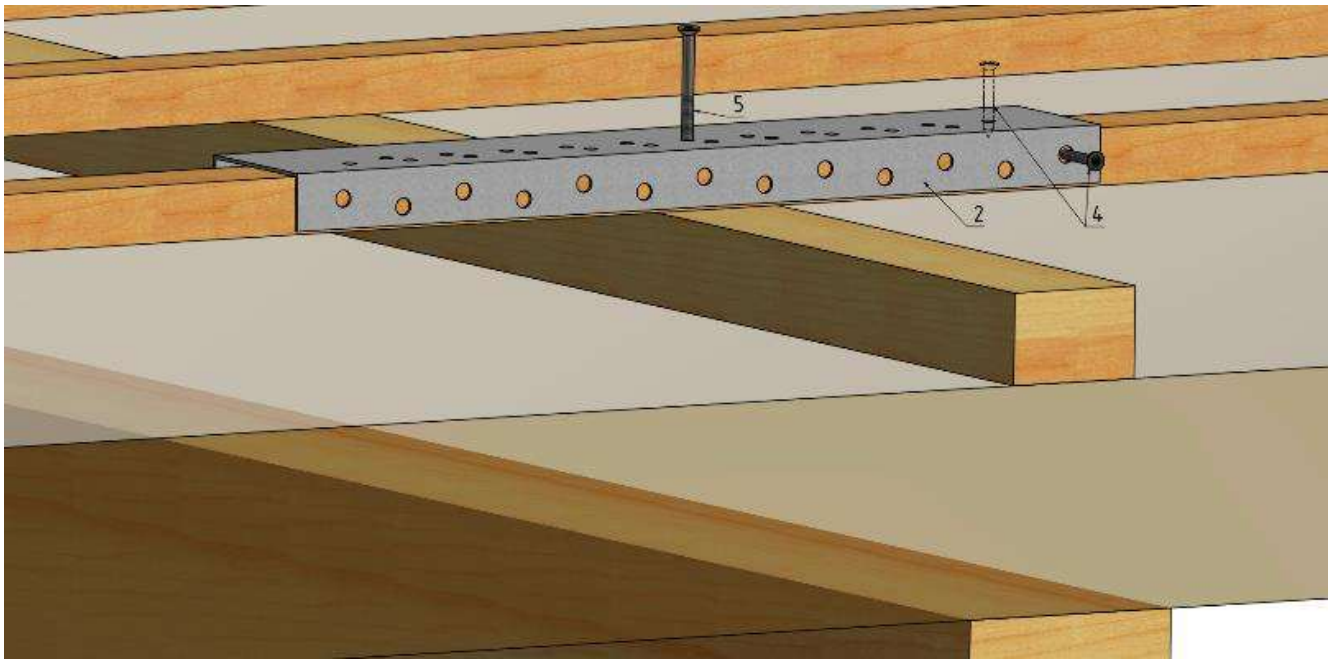


Figure 41 Fastening the reinforcing runner in the counter battens with drilling screw 5.0×70 mm

- Remove roof tile from the specified area
- Horizontally move the reinforcing runner (2) horizontally until the slot on the support member (3) covers the hole of the reinforcing rail. Secure the reinforcing runner using one screw (4) (screw may alternatively be fastened from the top).
- Remove the roof hook once again and fasten the reinforcing runner to the rafter using screws (5) 5.0×120 or to the counter batten 5.0×70.

Step 3:

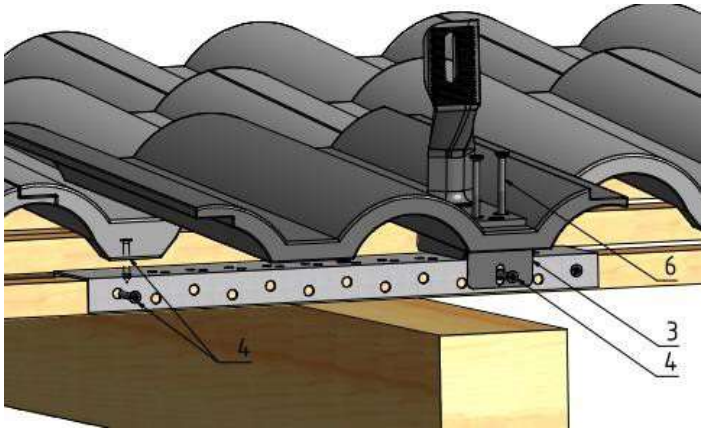


Figure 42 Connecting sheet metal roof tiles with batten rail

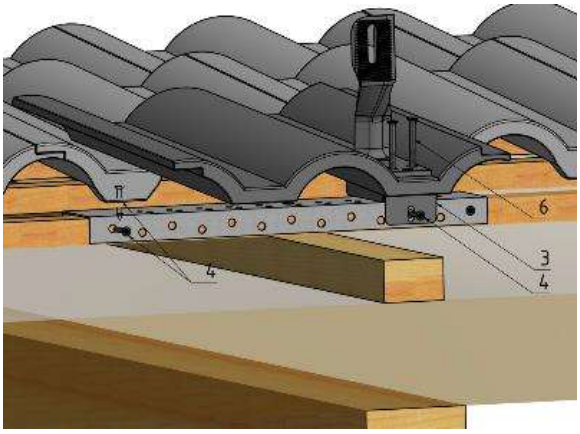


Figure 43 Connection of sheet metal tiles with batten rails for on-roof insulation

- Fit roof hooks using screws (6) and (4) and additionally secure the reinforcing runner to the batten using screw (4) (may alternatively be fastened from the top).

ⓘ Information
If the existing screw connection of the counter battens cannot adequately dissipate the forces that occur during the on-site structural check, it is possible to reinforce them with the ASD screws from "Figure 34 Overview of screw lengths". The number and position of the screws must be based on the structural requirements.

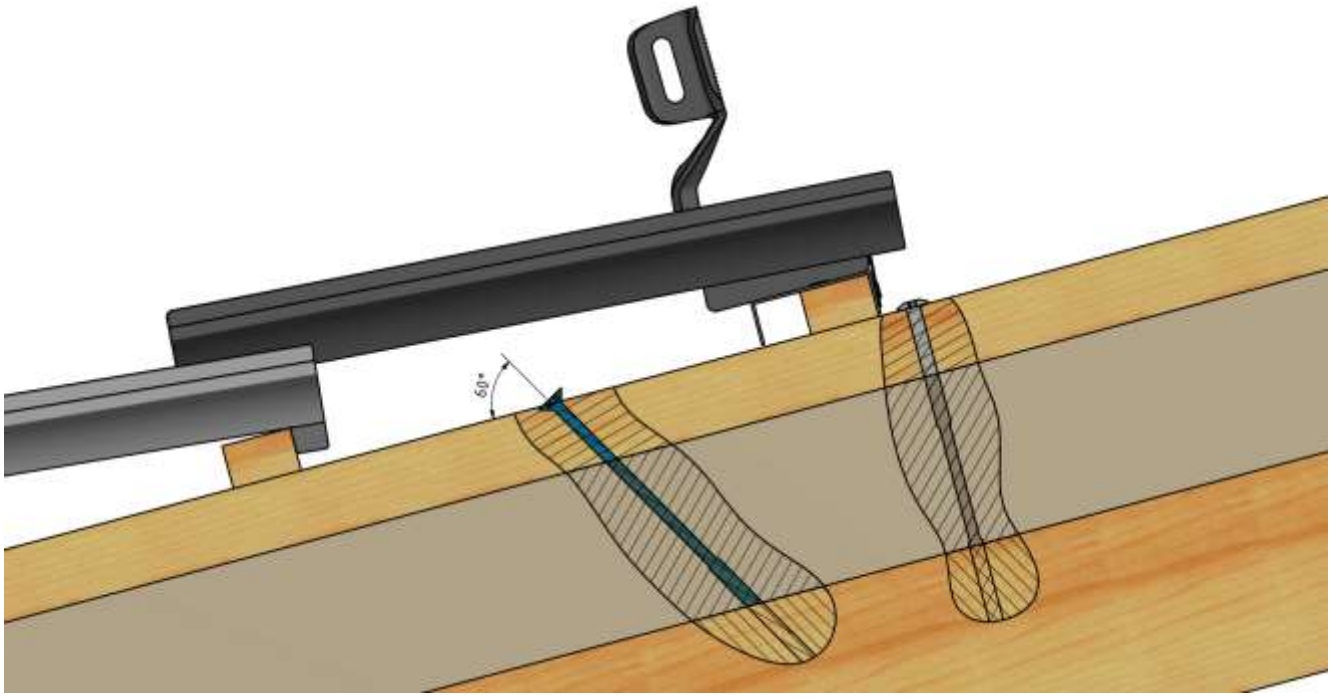
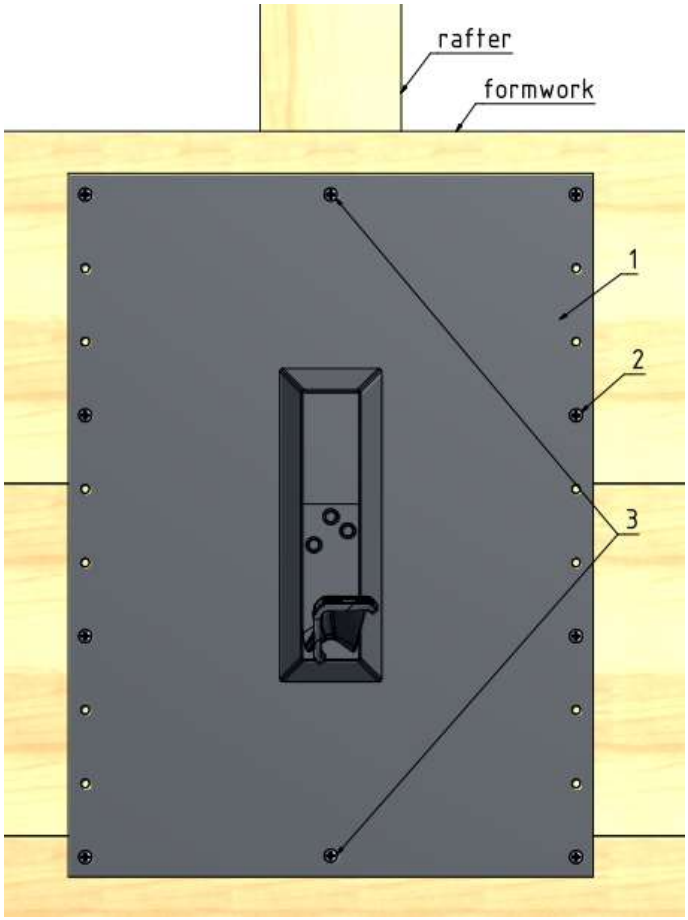


Figure 44 Possible position of the ASD countersunk and flat head screws

5.5.2 Fitting “Mammut Form S+” roof hooks on bitumen roofs



Legend:
(1) Roof hook
(2) 4.8×32 mm drilling screw
(3) 4.8×60 mm drilling screw

Figure 45 Mammut Form S+ Bitumen

- Specify the roof hook position so that the roof hook (1) can be attached to the rafter using screws (3).
- Secure roof hooks to the roofing substructure using screws (2+3).
- In accordance with the valid specialist professional code and directives governing flat roofs set out by the association of German roofers (Deutsches Dachdecker Handwerk) the roof sealing must be certified by a specialist.
- The seal may be applied as follows:
    - Separately (polymer bitumen shingles)
    - Using self-adhesive components (roof sealing)
    - Thermally activated (gassed roof seal)

5.5.3 Fitting "Mammut Form S+" roof hooks on plain tile roofing

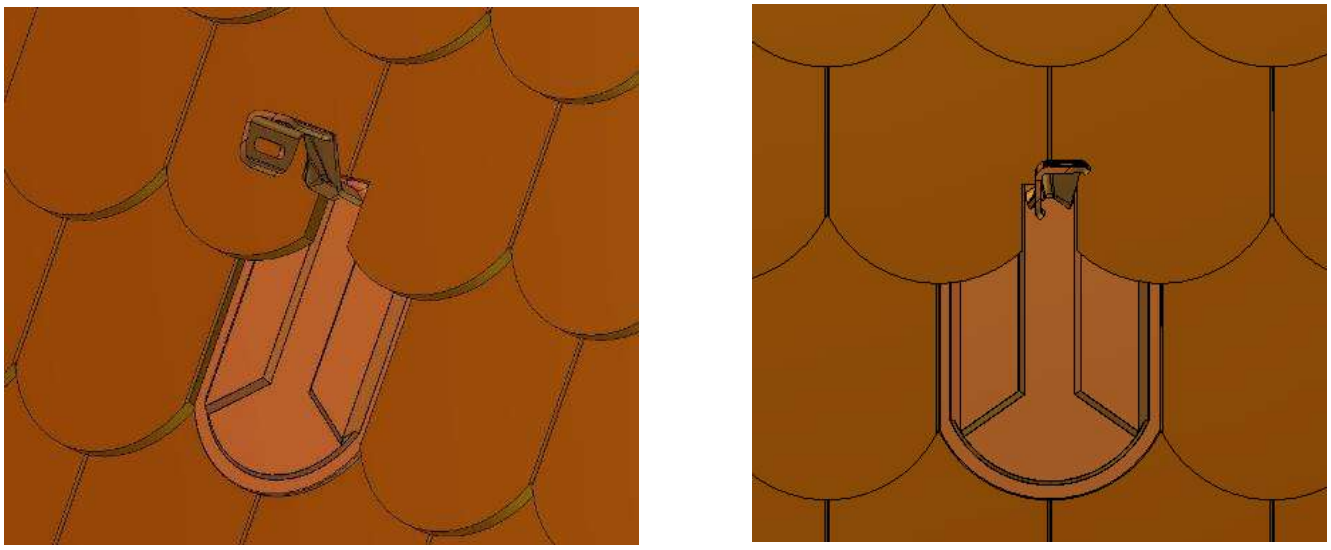


Figure 46 Mammut Form S+ plain tile dual roofing

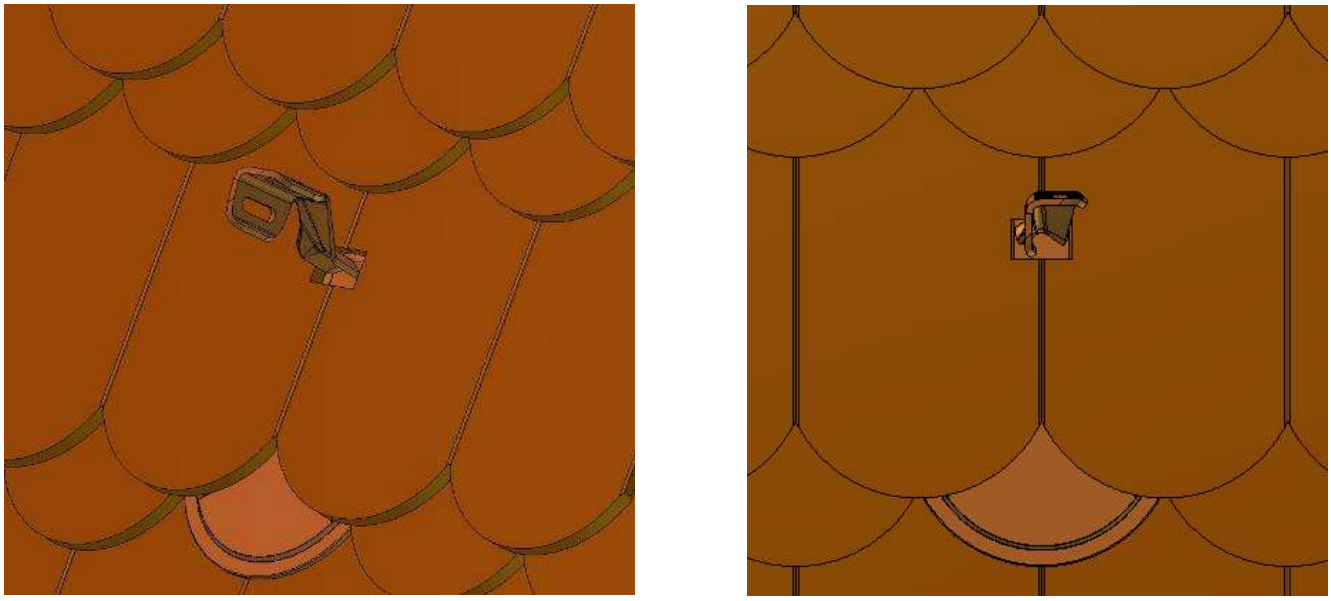


Figure 47 Mammut Form S+ plain tile crown roofing

- Installation is as described in chapter 5.5.1 Fitting "Mammut Form S+" roof hooks. The beaver bricks lying above must be processed.

5.5.4 Fitting “Mammut Form S+“ roof hook for slate and metal shingle roofs

Step 1:

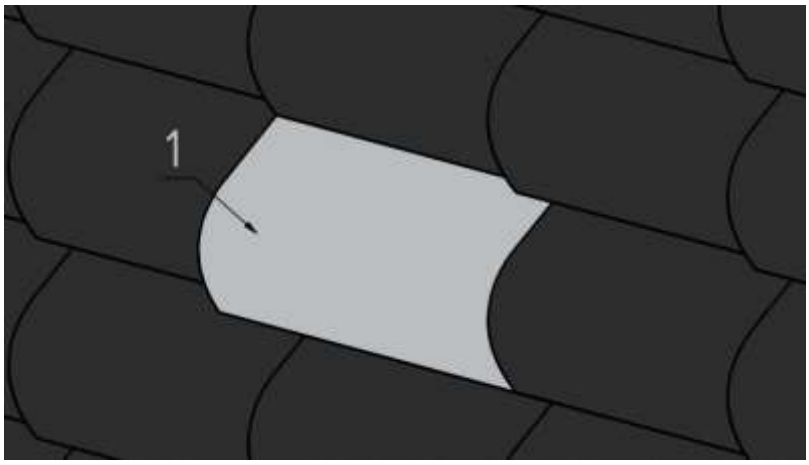


Figure 48 Insert the metal plate (slte roof only)

Legend:
(1) Metal plate
(2) Mounting plate
(3) Woodscrew 8x140 mm
(4) cover cap
(5) roof hook
(6) Screw nut M6

- Fix the position of the roof hook in such a way, that this can be fastened with the screws in the rafter. Observe the edge distances according Figure 200
- Replace the slate plate with an individual manufactured metal plate (1). Not necessary for metal shingle roofs.

Step 2:

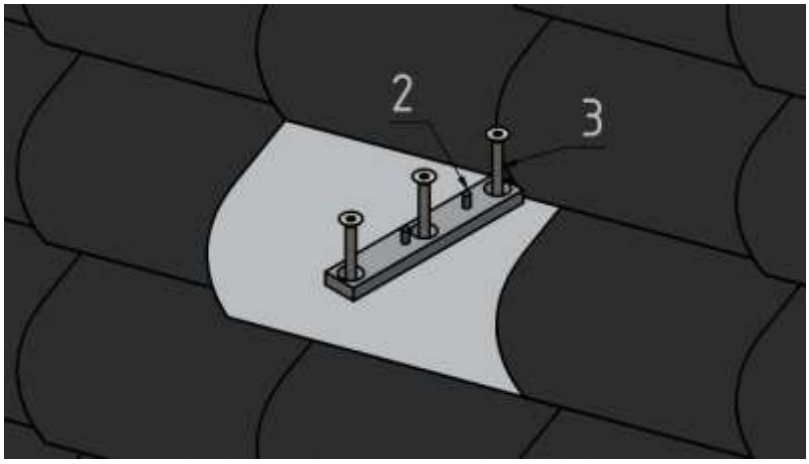


Figure 49 Fix the mounting plate

- Position the mounting plate (2) an d fix it with the wood screws (3) in the rafter.

⚠ Attention!
The mounting plate must lie completely on the metal plate or the metal shingle.

Step 3:

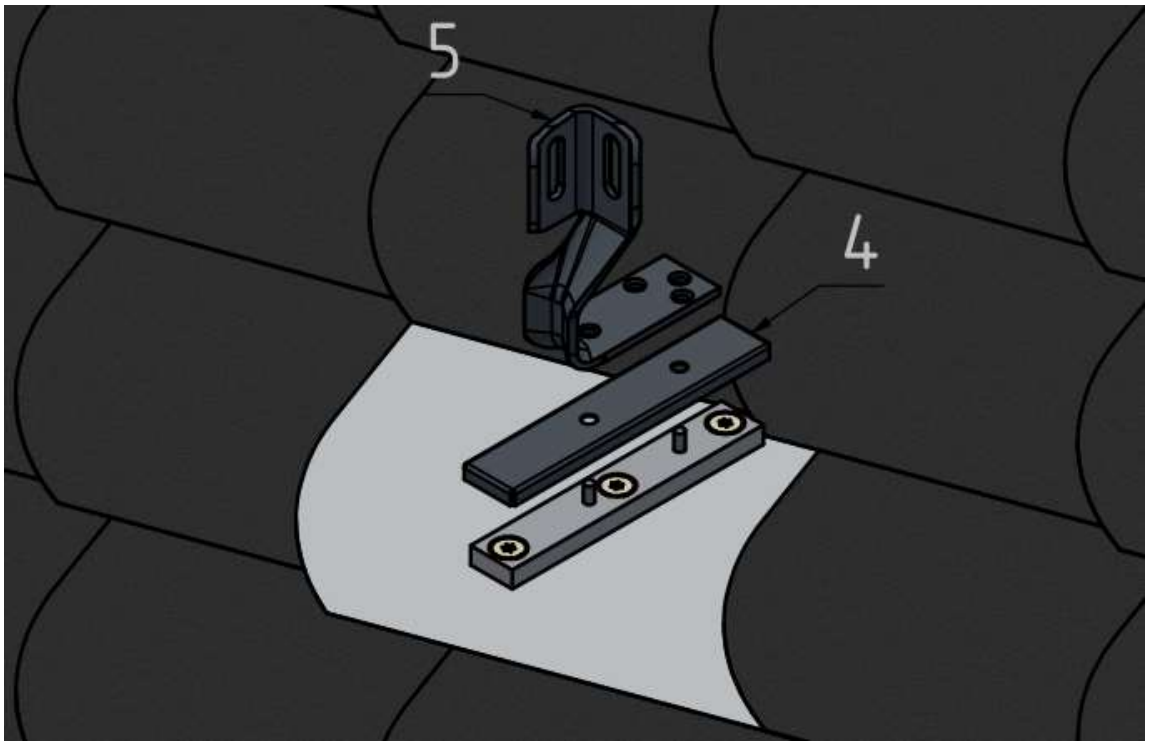


Figure 50 Cover cap and roof hook

Step 4:

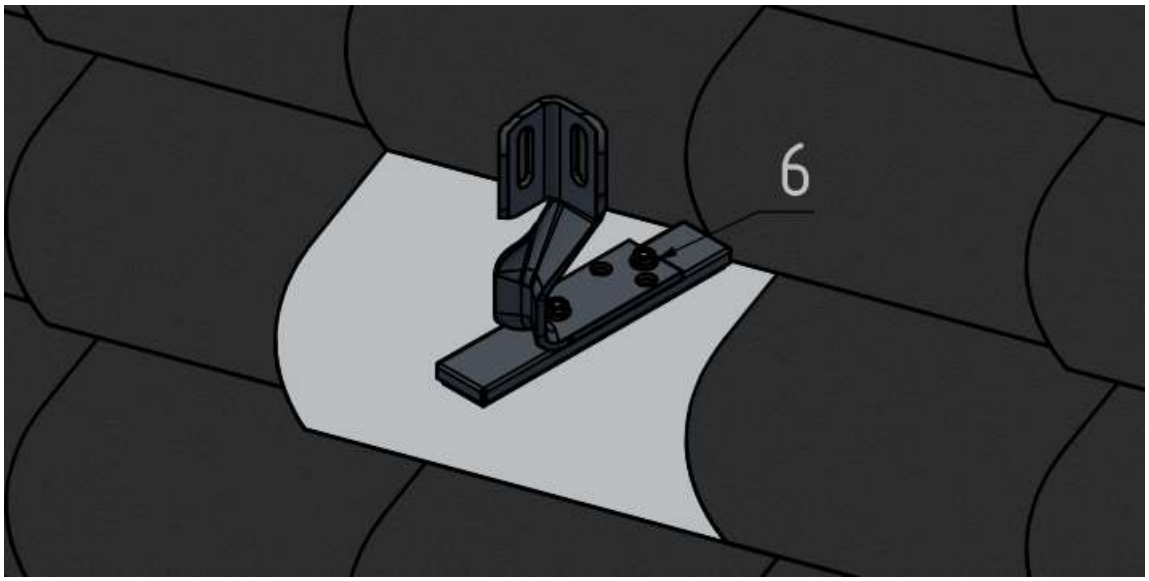


Figure 51 Roof hook fixing

- Fix the cover cap (4) and the roof hook (5) at the mountig plate with the M6 nuts (6). (torque 10 Nm)

5.6 Installation using M12×300, M12×250 and M10×200 hanger bolts on the timber substructure



Figure 52
Hanger bolt

Hanger bolts are used on corrugated eternit, trapezoidal sheet metal- and sandwich element roofs as well as bitumen roofs to attach the support rails. The load bearing roof construction to which the hanger bolt is secured consists of timber purlins or timber rafters.

Compensate for any difference in height of the purlins/rafters using the thread of the hanger bolts.

Comply with the valid, generally applicable building surveillance certificate Z-14.4-602 and the regulations contained therein for the use on trapezoidal roofs.

The roofing must not be damaged by pressure from the installed hanger bolts. If there is a risk of this, suitable measures must be taken to spread the load. Furthermore, the penetration point of the hanger bolts through the water conducting level should be sealed in accordance with roofing trade regulations. For this reason, we recommend having hanger bolts fitted by a roofing company. Please also observe the guidelines and regulations of the manufacturer of the respective roofing.

Proceed as follows during mounting:

- Do not drill into the water bearing depressions, but into the protruding parts.
- Use the pre-drilling diameters, screwing depths illustrated in Figure 53 and minimum dimension in Figure 200.

Hanger bolt	pre-drilling diameter [mm]	Screwing depth lef [mm]
Hanger bolt M12x300 A2 Hanger bolt M12x250 A2	8,4	48...100
Hanger bolt M10x200 A2	7,0	40...67

Figure 53 Pre-drilling diameters for plate and substructure; screwing depths for substructure

- Determine the purlin position (potentially mark using a piece of string). Drill the bores into the outer roofing (e.g. sheet metal, corrugated eternit) and purlin. Subsequently drill 15mm bores into the outer roofing.
- Tighten the lower nut on the machine thread to press the rubber seal against the outer roofing, thus sealing the hole.
- Carefully press down the seal. Risk of cracks and deformation!
- For stress reasons, the distance to the roofing must be kept as small as possible, see Figure 55 Fixing distance.
- Cut hanger bolts using an angle grinder if they protrude too far (comply with accident prevention regulations).

- For stress reasons, the universal connector must always be mounted in the direction of the roof ridge.

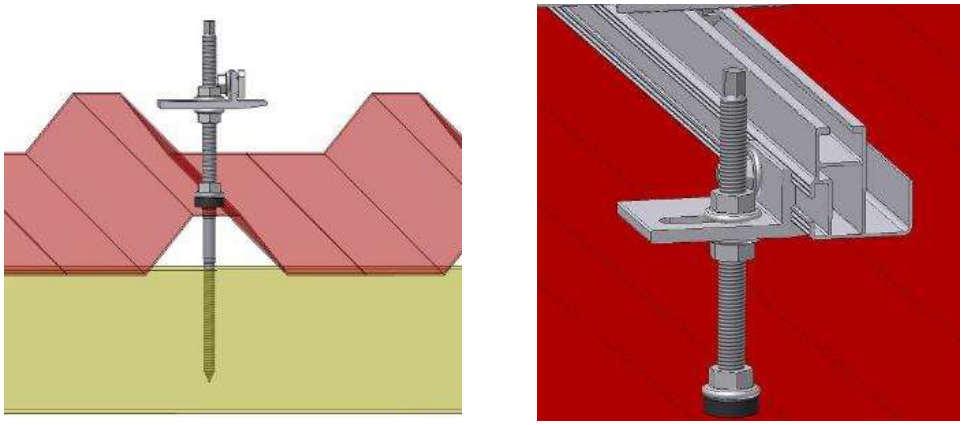
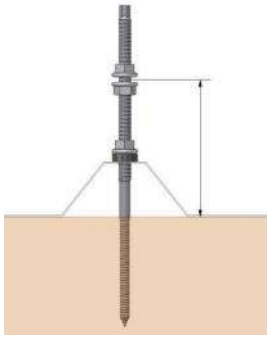


Figure 54 Correctly fitted hanger bolt with universal connector

⚠ Attention!



The stress values for the M12x300 hanger bolt relate to a fixing distance l = 100mm for a use of corrugated eternit panels. Exceeding the fixing distance has a detrimental effect on static values. The calculation in the PV Manager software is based on a fixing distance of l = 100 mm.

Figure 55 Fixing distance

⚠ Attention!

Always install universal connectors in each row of modules, as shown on the Figure 56

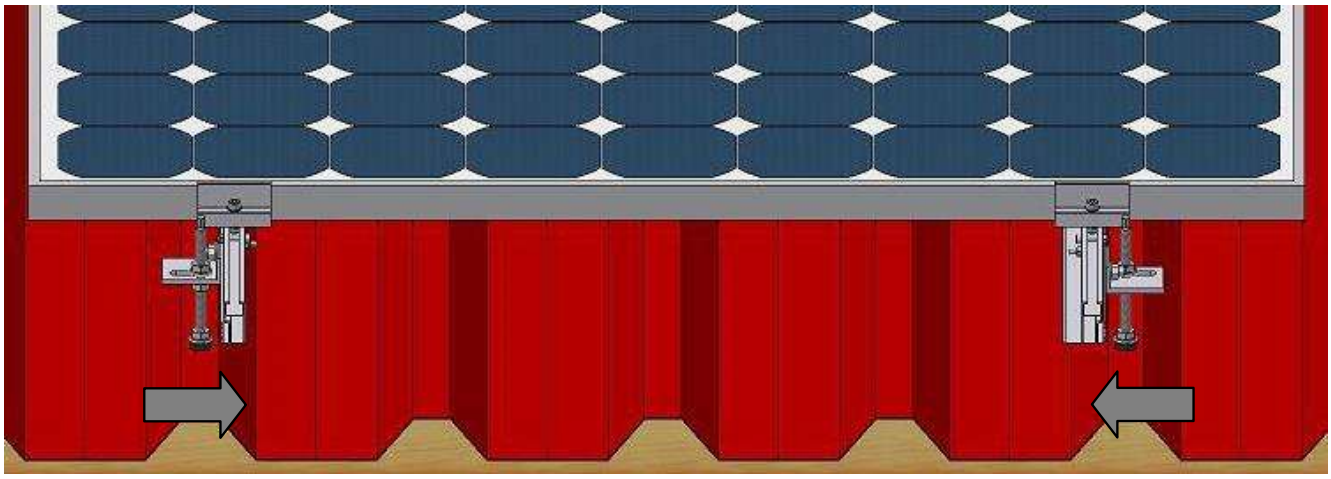


Figure 56 Mounted hanger bolt with "universal connector"

5.7 Assembly with solar fasteners on a steel substructure



Solar fasteners are intended for attachment to metal purlin or rafter structures with roofing made of trapezoidal profiles and sandwich profiles. In this process, the outer shell is made either of steel or aluminum.

Just as with hanger bolts, solar fasteners are inserted through the roofing and fastened to the substructure.

Comply with the valid, generally applicable building surveillance certificate Z-14.4-638 and the regulations contained therein for the use on trapezoidal sheet metal and sandwich roofs.

Figure 57
Solar fastener

Proceed as follows during mounting:

- Do not drill into the water bearing depressions, but into the protruding parts.
- Determine the rafter/purlin position (potentially mark using a piece of string).
- Drill 11 mm bores into the outer roofing (sheet metal).
- Depending on the thickness of the steel, drill into the metal substructure accordingly to fasten the solar fasteners. For this purpose, take into account the data illustrated in Figure 57 below.

	Thickness of the steel substructure [mm]			
	1,5 < 5,0	5,0 < 8,0	8,0 < 10	> 10
Pre-drilling diameter [mm]	6,8	7	7,2	7,4

Figure 58 Steel substructure pre-drilling diameter

- Screw the solar fastener into the steel substructure to safeguard it demonstrates secure static properties.
- Tighten the lower nut on the machine thread to press the rubber seal against the outer roofing, thus sealing the hole.
- Carefully press down the seal. Risk of cracks and deformation!
- For stress reasons, the universal connector must always be mounted in the direction of the roof ridge.
- Adapt the required length of the solar fastener to the height of the roof structure. Use IBC SOLAR AG's very own "PV Manager" planning software to ensure you select the right solar fastener.

Information

Comply with the following requirements regarding the roof profile type:

- The steel purlins must be made of steel types S235 according to DIN EN 10025-2 or S280GD or S320GD according to DIN EN 10346. The solar fastener cannot be screwed into higher quality steel grades. On request, it may be possible to order suitable solar fasteners from the manufacturer EJOT for higher-quality steel grades.
- The nominal sheet metal profile panel thickness around the fasteners is ≥ 0.4 mm for steel and ≥ 0.5 mm for aluminum.
- The nominal width of the outer layer of the sandwich element around the fasteners is ≥ 0.4 mm.
- The nominal width of the steel substructure (rafters/purlins) around the fasteners is ≥ 1.5 mm.
- The available rib height h for sandwich roofs is 35 mm ≤ h ≤ 45 mm
- The available upper belt width b for sandwich roofs is 20 mm ≤ b ≤ 40 mm
- When putting a load on solar fasteners in a transverse direction to the profile panels, the profile panels must be fastened to the corrugated elements on the substructure that are in the vicinity and at the same height.
- For additional framework conditions, see the valid version of the Z-14.4-638 certificate.

5.8 Mounting plate duo

The mounting plate duo is used for fixing with two hanger bolts or two solar fasteners. The two screws are connected through the mounting plate duo. The rooftop connector profile is then fixed on the mounting plate duo.

There are two different variants for connecting the profiles. For fixing the profiles TF50+ and TF50+m, on the other hand, a universal connector and additional screws for fixing the universal connector are required in accordance with Figure 59. For fixing a TF60 profile, only a RH-profile connecting element is required in accordance with Figure 60 Mounting plate duo with connecting element RH-profileFigure 60

The mounting plate duo can be used for trapezoidal sheet or corrugated eternit roof coverings. The maximum high-beading space must be 330 mm.

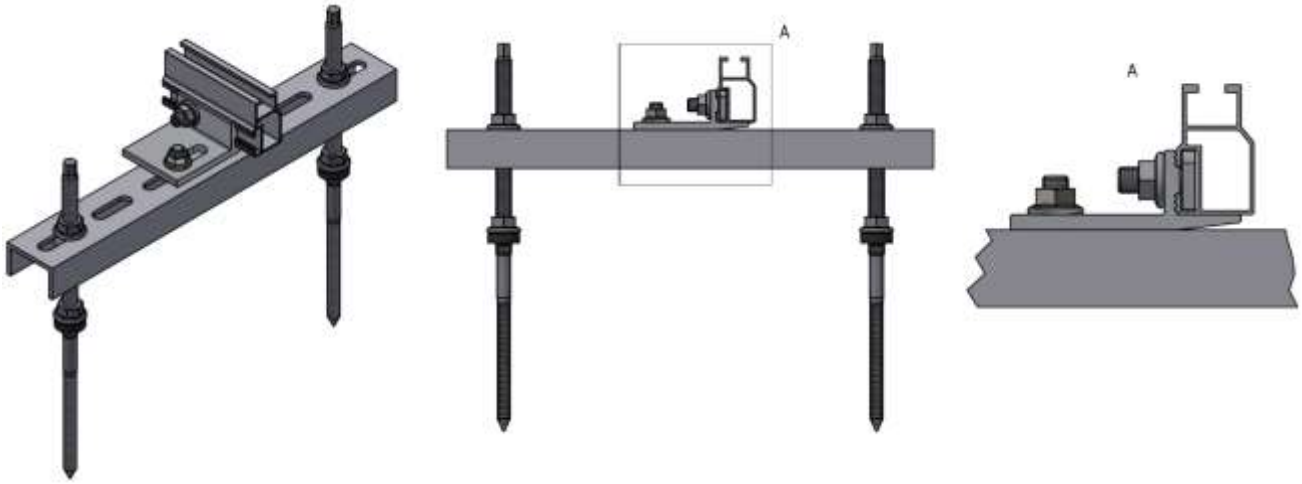


Figure 59 Mounting plate Duo with universal connector

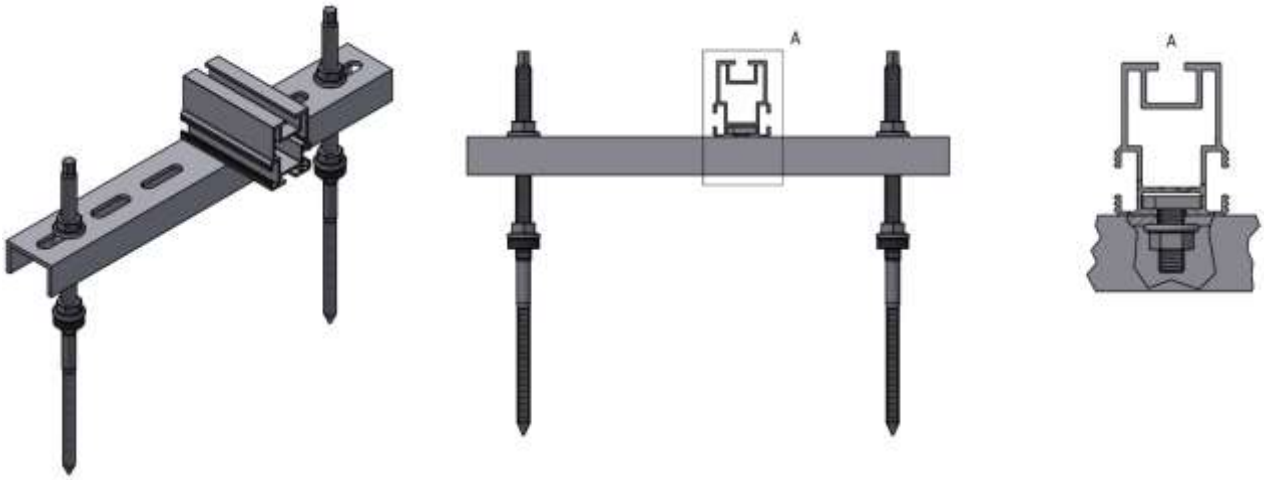


Figure 60 Mounting plate duo with connecting element RH-profile

Have sun!

5.9 Mounting with trapezoidal sheet metal clamps

5.9.1 Introduction

IBC SOLAR AG trapezoidal sheet metal mounting systems in combination with the IBC TopFix 200 mounting system is a fast, universal and structurally tested solution for attaching solar modules onto trapezoidal sheet metal roofs. The trapezoidal sheet clamp and the Trapezoidal System Eco 340mm & 430mm will be secured either by rivets or self-drilling screws. The Trapezoidal System Eco 120mm will be secured only by self-drilling screws.

ⓘ Information

- The minimum trapezoidal sheet thickness of steel or aluminum must be 0.5 mm.
- The enclosed special 4.8×15 blind rivets with flat, round head are certified for a sheet metal or aluminum thickness of between 0.5 mm and 1.5 mm.
- Observe the ETA-13/0255 for the blind rivets.
- The enclosed self-drilling screws 5,5x25 are certified for a sheet metal or aluminum thickness of between 0.5 mm and 1.5 mm.
- Observe the ETA-10/0200 for the self-drilling screws.
- Do not fall below the raised bead support width of 15 mm.
- The maximum width of the raised bead must not exceed 40 mm.
- Because additional loads are created by the PV system in connection with the IBC mounting system and fixing points (fixed-points) and wind suction, the installer (contractor) has to check the statics of the load capacity of the roofing and the substructure, which requires the services of a civil engineer.
- Plan the IBC mounting system and attachment points so that there is no load concentration or overloading in the system or building.
- Assemblies on narrow or wider raised beads, sandwich elements and elevations must be verified on-site as part of individual statics inspections and a certificate for trapezoidal sheet or sandwich profiles may have to be obtained from building surveillance authorities.

⚠ Attention!
Do not mount trapezoidal sheet clamps on the trapezoidal sheet metal panel blocks (two layers of sheet metal)!

5.9.2 Required tools/auxiliary agents*

- Riveter (by connection with rivets)
- Drill, Ø 5.0 mm (by connection with rivets)
- Socket wrench 6-kant SW8 (when mounted with self-drilling screws)
- Cleaning agent
- Lint-free paper towels
- Cleaning fleece for badly contaminated roofs

*The listed tools and auxiliary agents are required exclusively for installation and processing of the trapezoidal sheet metal panels. Information about tools for module and support rail mounting is provided in section 2 Tool list in these installation instructions.

5.9.3 Dimensioning

The mounting system is dimensioned in our very own PV Manager software, taking into account local conditions.

⚠ Attention!

Do not exceed a maximum support profile length of approximately 11.90 m (5 beams 2.38 m) for continuous support rails due to thermal expansion.

5.9.4 Mounting trapezoidal sheet metal panels

Step 1: Dimensioning using "PV Manager"

Step 2: Mark the fixing points of the clamp

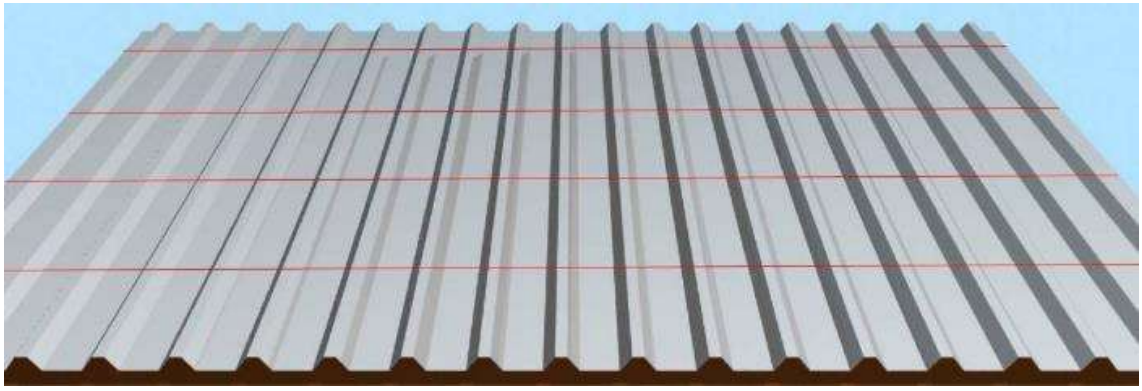


Figure 61 Marking fixing points

Step 3: Clean the roofing

Exclusively clean the roofing in areas where you intend to affix trapezoidal clamps at a later point. The surfaces must be dry and free from grease, oil or silicone as well as dirt particles to safeguard optimum integrity. In the event of heavy-duty contamination, we recommend to carefully roughen up the surface with suitable materials (e.g. fleece cleaning cloth) to subsequently clean it. We recommend using isopropyl alcohol or acetone in combination with lint-free paper towels for cleaning.

⚠ Attention!

Please observe the safety regulations when handling solvents and chemicals.

Step 4: Affix the TRAPEZOIDAL CLAMP

ⓘ Information
The heavy-duty adhesive tape can be used from an object and working temperature of 0° C; final adhesion occurs after approx. 72 h at an ambient temperature of 20° C. The higher the temperatures, the faster this process is complete.

We do not recommend to bond surfaces below these temperatures as the adhesive agent may become too hard and prevent adequate adhesion. After adhesion has taken place, low temperatures do not normally create any problems. Prevent the formation of condensation to safeguard appropriate adhesive properties. Condensate can form if, for example, the materials to be connected have high temperature differences.

- TRAPEZOIDAL CLAMPS are aligned with the adjustable element towards the ridge and affixed to the surface so that the type TF27 support rail can be mounted without tension and it is in contact with the trapezoidal sheet clamp. Please fully remove the protective foil!

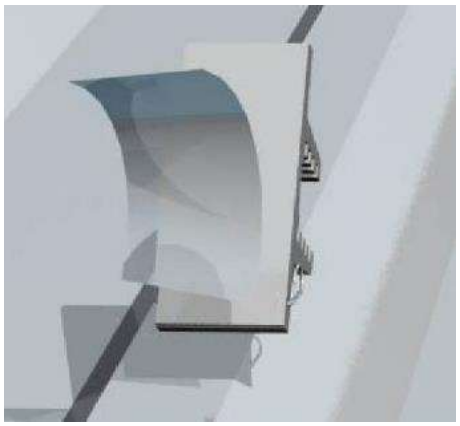


Figure 62 Removing the protective foil

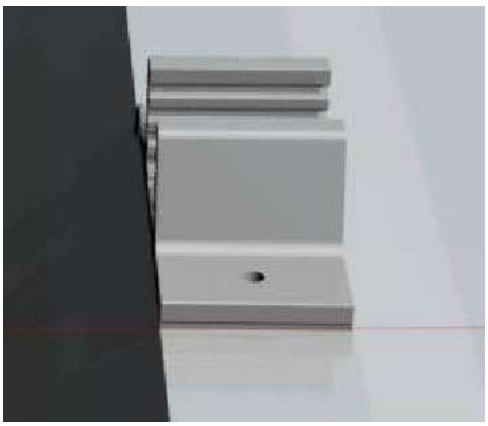


Figure 63 Affixing the trapezoidal clamp

Step 5: Distribute the clamps according to the instructions

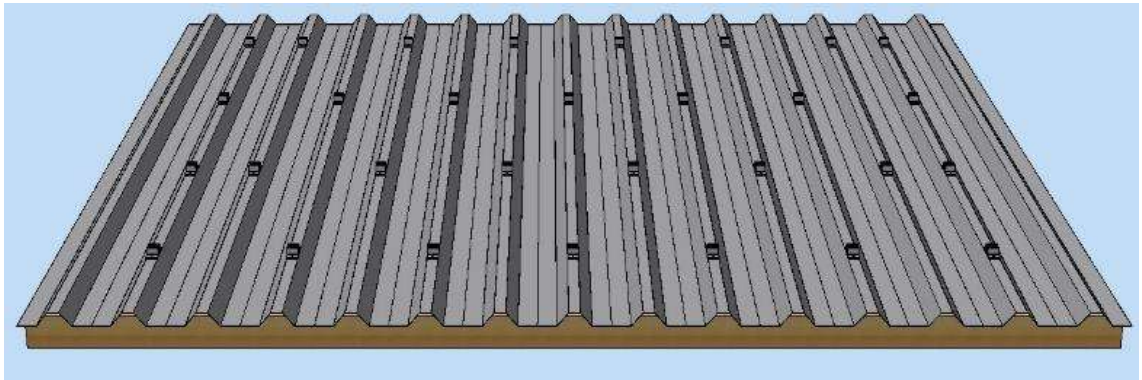


Figure 64 Distribute the clamps according to the instructions

Step 6: Insert and align the TF27-T support rail

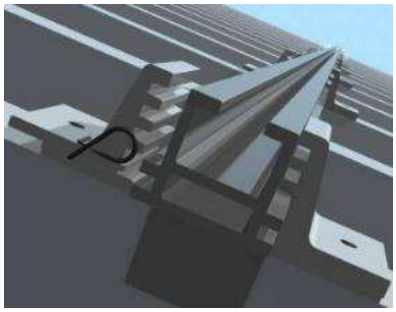


Figure 65 Insert the support rail

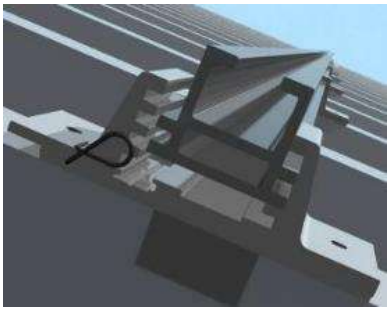


Figure 66 Align the support rail

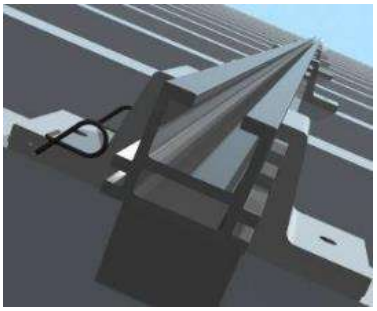


Figure 67 Close the clamp

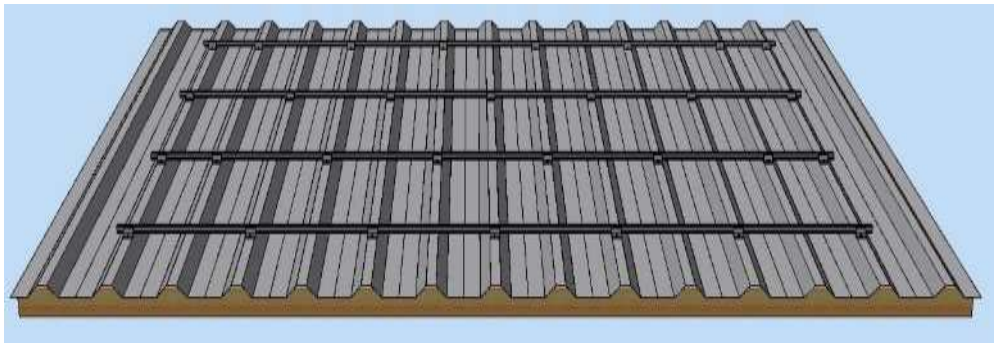


Figure 68 Mount support rail

Step 7A: Affix the Trapezoidal Sheet Metal Clamp to the outer roofing with blind rivets

⚠ Attention!
A drill with a diameter of 5.0 mm is mandatory to maintain static properties!



Figure 69 Drilling trapezoidal sheet metal

- When using the rivets drill two bores with a diameter of 5.0 mm per Trapezoidal Sheet Metal Clamp. In this process, make sure you drill carefully to maintain static properties.
- Now insert the 4.8x15mm blind rivets into the bores and rivet.
- The enclosed 4.8x15 mm blind rivets are approved for a sheet metal or aluminum thickness of 0.5 mm to 1.5 mm.

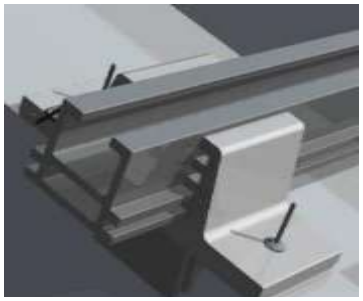


Figure 70 Inserting blind rivets

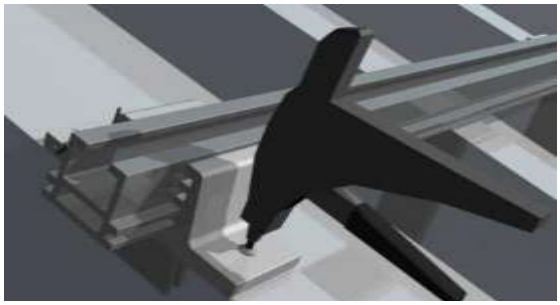


Figure 71 Riveting using a standard rivet head

Step 7B: Affix the Trapezoidal Sheet Metal Clamp to the outer roofing with self-drilling screws

- When using the self-drilling screws, two screws are placed per Trapezoidal Sheet Metal Clamp. In this process, make sure you screw carefully to maintain static properties. The self-drilling screws are tightened until the seal swells out a little.
- The enclosed self-drilling screws 5,5x25 are approved for a sheet metal or aluminum thickness of 0.5 mm to 1.5 mm.

⚠ Attention!
Pre-drilling of the trapezoidal sheet is not permitted.

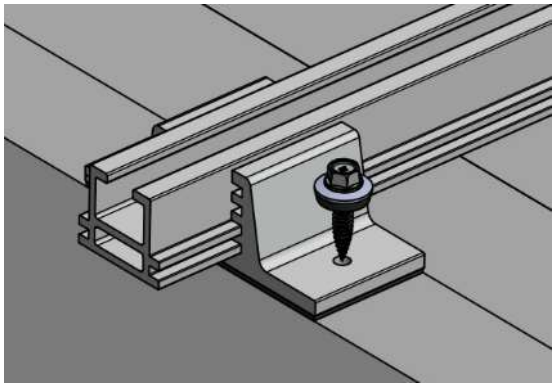


Figure 72 Apply the screw

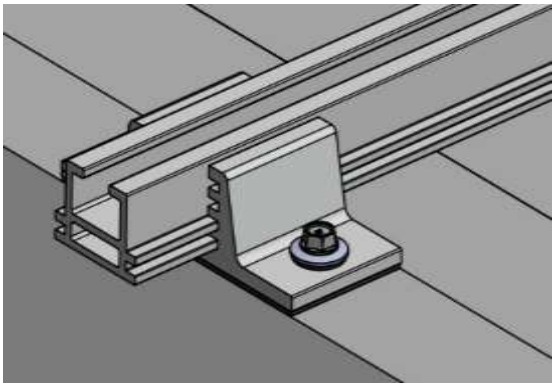


Figure 73 Trapezoidal clamp screwed

Step 8A: Insert and affix the transverse securing clamp with blind rivets

- The transverse securing clamps are affixed next to the trapezoidal clamp on the left and right with a clearance of approximately 20 mm.
- The gap of 20 mm must remain free due to the floating bearing. Otherwise, damage may occur.
- There must be a minimum of two transverse securing clamp per string (11.90 m).

⚠ Attention!
Mount additional transverse securing clamps on roofs that are particularly exposed to wind.

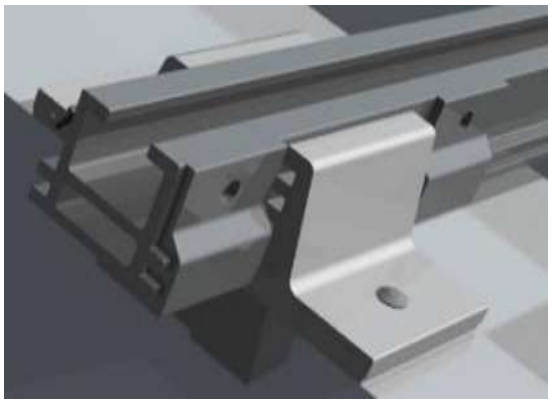


Figure 74 Insert transverse securing clamps

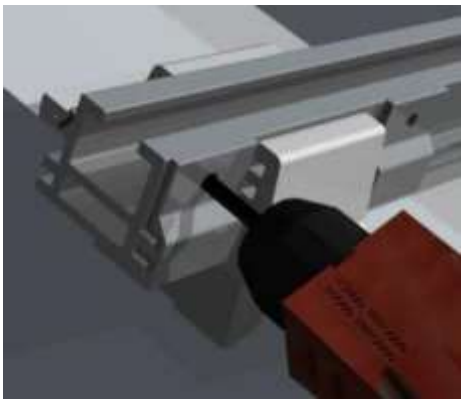


Figure 75 Drilling transverse securing clamps

- Now insert the 4.8x15mm blind rivets into the bores and rivet.

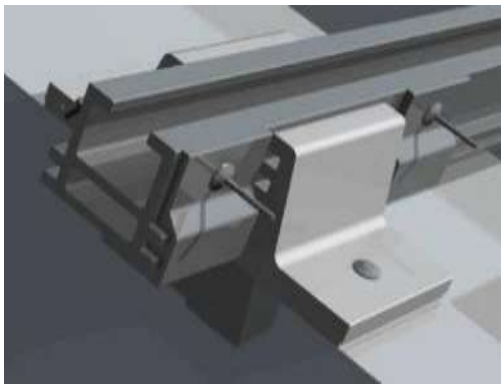


Figure 76 Rivet transverse securing clamps

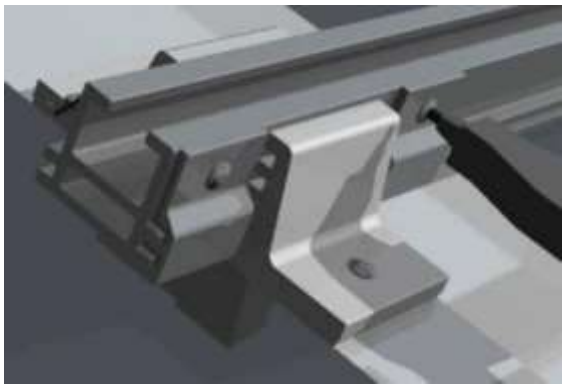


Figure 77 Rivet transverse securing clamps

Step 8B: Insert and affix the transverse securing clamp with self-drilling screws

- The transverse securing clamps are affixed next to the trapezoidal clamp on the left and right with a clearance of approximately 20 mm.
- There must be a minimum of two transverse securing clamp per string (13,50 m).

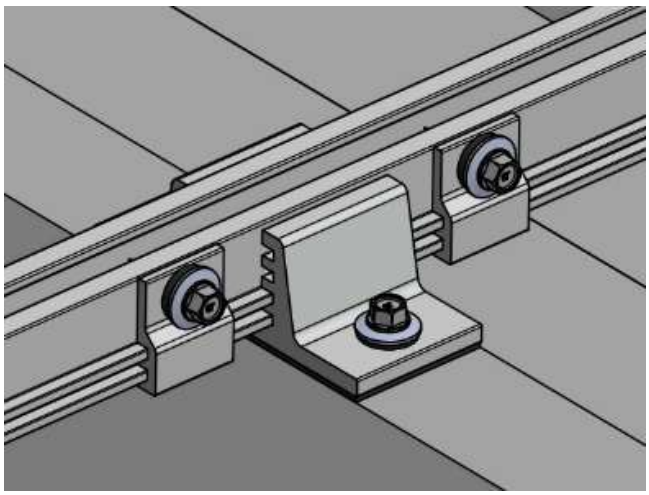


Figure 78 Screwed transverse securing clamps

Step 9: If required: Insert butt connector

- Butt connectors are inserted via the TF27 support rail and fixed.
- The butt connector is either attached using two 4.8x15 mm blind rivets (pre-drilling) or two 5.5x25 mm self-drilling screws.



Figure 79 Insert butt connectors



Figure 80 Joining together the support rails

5.9.5 Trapezoidal support

⚠ Attention!
The system is not wind tunnel tested and must be verified on site by a structual engineer. A static calculation by IBC not occur.

The trapezoidal support is a combination of the trapezoidal sheet metal mounting listed in 5.9.4 and the AeroFix G3 supports. Depending on the system the modules can be installed landscape or portrait.

It is recommended to maintain the AeroFix G3 standard grid spacing from the front edge Bottom Support to the front edge next Bottom Support same alignment. These are as follows.

AeroFix G3 15-S

Southern orientation

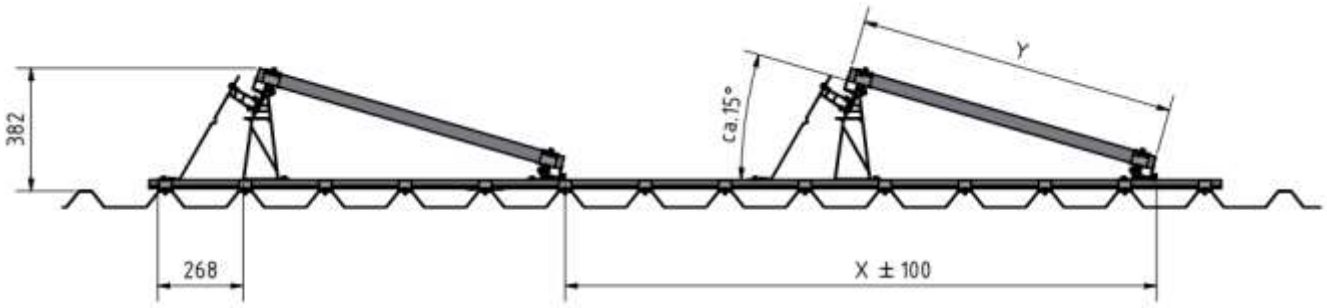


Figure 81 AeroFix G3 15-S

Center to center distance X ±100 (mm)	Module width Y (mm)
1850	980-1150

AeroFix G3 15-EW

East-west orientation

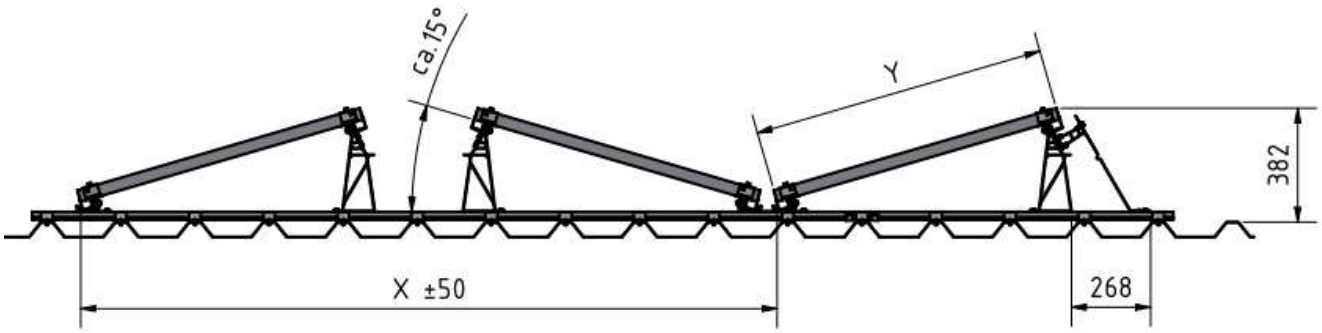


Figure 82 AeroFix G3 15-EW

Center to center distance X ±50 (mm)	Module width Y (mm)
2300	980 - 1039
2400	1040 – 1099
2550	1100 - 1150

AeroFix G3 10-S

Southern orientation

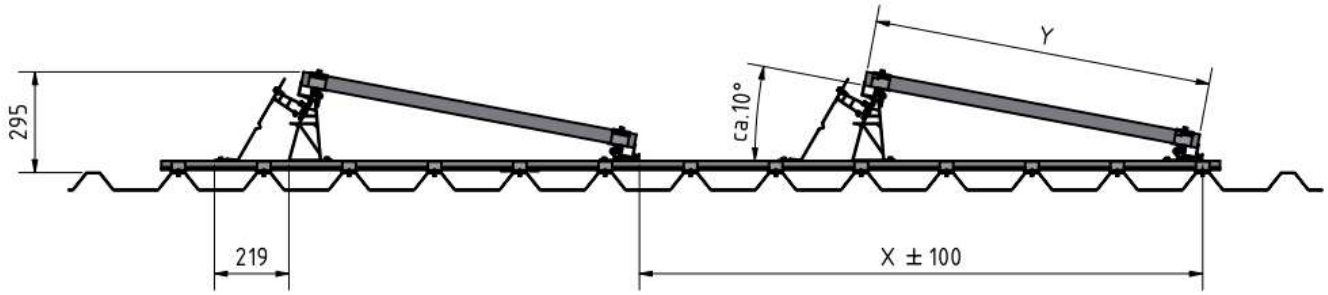


Figure 83 AeroFix G3 10-S

Center to center distance X ±100 (mm)	Module width Y (mm)
1650	980-1150

AeroFix G3 10-EW

East-west orientation

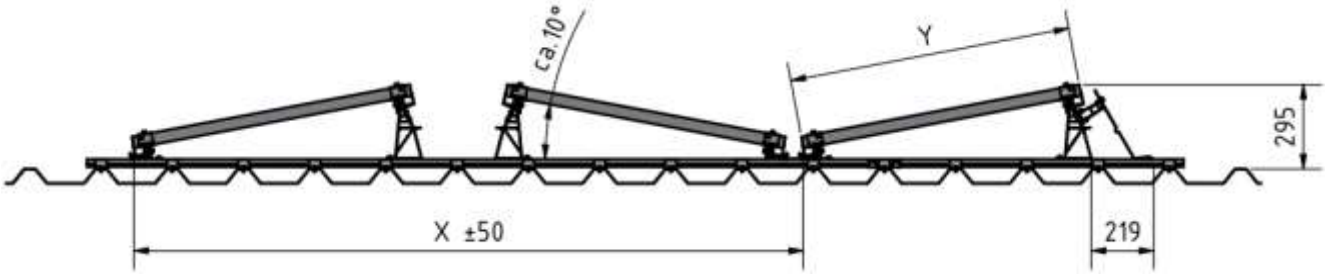


Figure 84 AeroFix G3 10-EW

Center to center distance X ±50 (mm)	Module width Y (mm)
2350	980 - 1039
2450	1040 – 1099
2600	1100 - 1150

AeroFix G3 8-S

Southern orientation

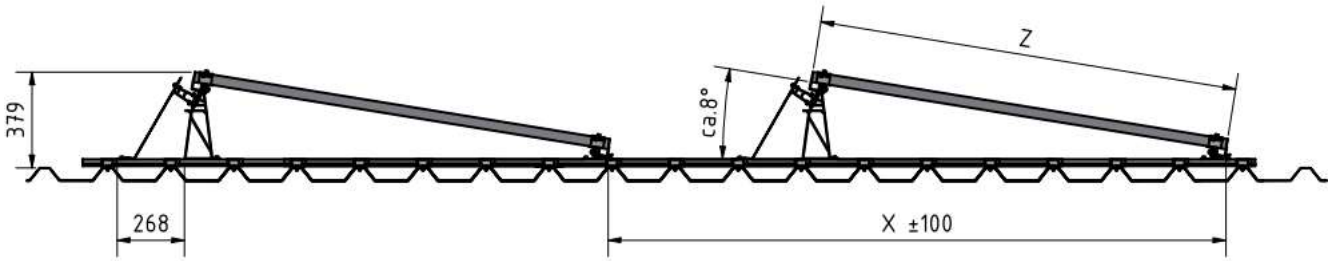


Figure 85 AeroFix G3 8-S

Center to center distance X ±100 (mm)	Module length Z (mm)
2450	1500 - 1699
2650	1700 – 1899
2850	1900 - 2100

AeroFix G3 8-EW

East-west orientation

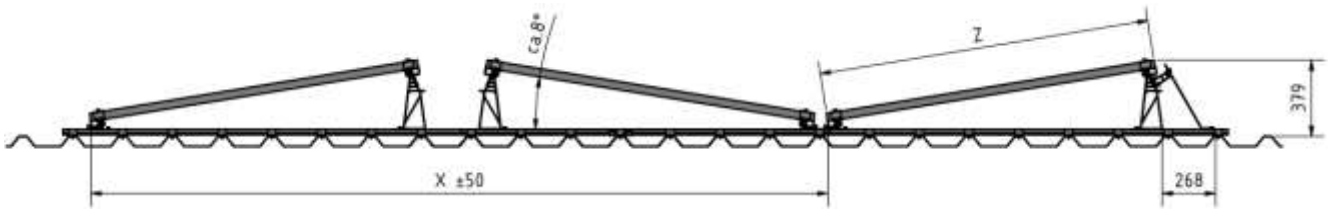


Figure 86 AeroFix G3 8-EW

Center to center distance X ±50 (mm)	Module length Z (mm)	Center to center distance X ±50 (mm)	Module length Z (mm)
3400	1500 – 1549	4000	1800 – 1849
3500	1550 – 1599	4100	1850 – 1899
3600	1600 – 1649	4200	1900 – 1949
3700	1650 – 1699	4300	1950 – 1999
3800	1700 – 1749	4400	2000 – 2049
3900	1750 – 1799	4500	2050 -2100

Step 1: Fix the Trapezoidal Sheet Metal Clamp and support profile TF27 at the correct distance

The Trapezoidal Sheet Metal Clamp and support profiles are mountet as described in 5.9.4. Depending on the system, the support profiles must be laid parallel at a center distance of A (module length or width) + 20 mm (clamp width).

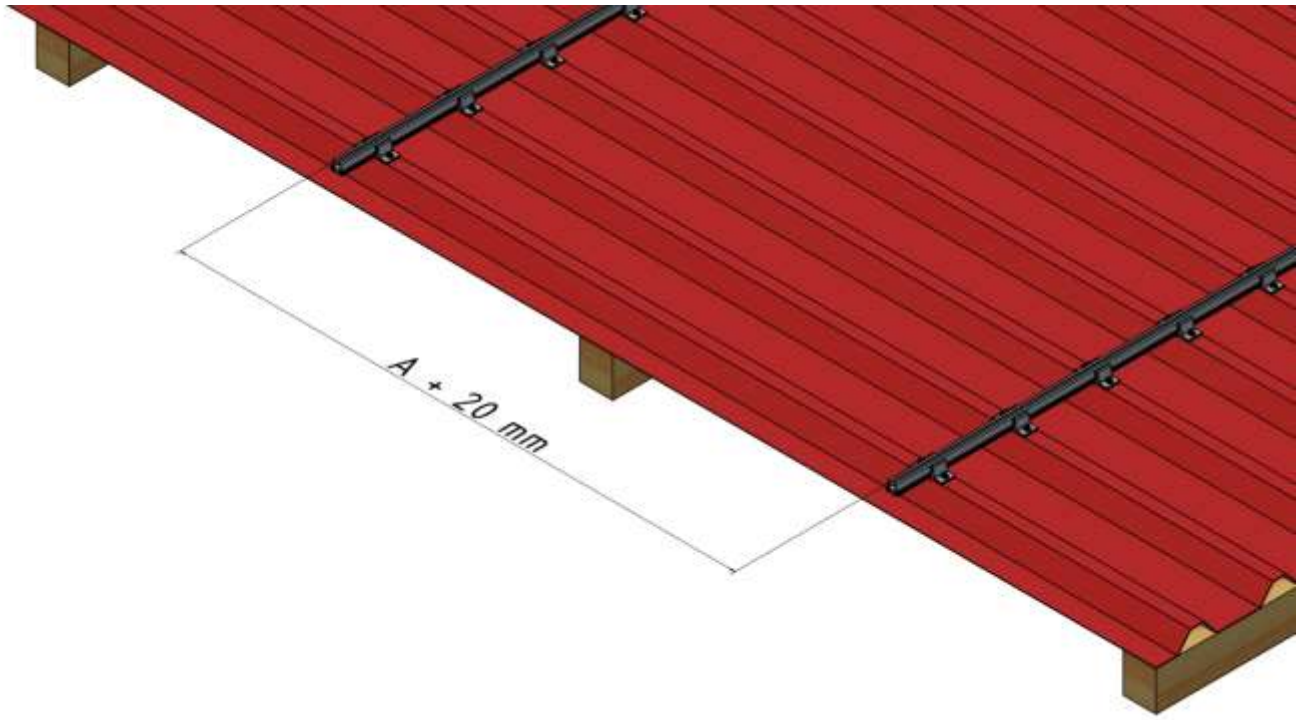


Figure 87 Distance A (module length or width) +20 mm (clamp width)

Step 2: Mounting Bottom Support

⚠ Attention!
All supports must lie fully on the support profile. The supports are attached to the support profile with the Universal connecting Piece M6. The tightening torque is 10 Nm! It is important to ensure that the slot nut is always fully swiveled into the slot channel.

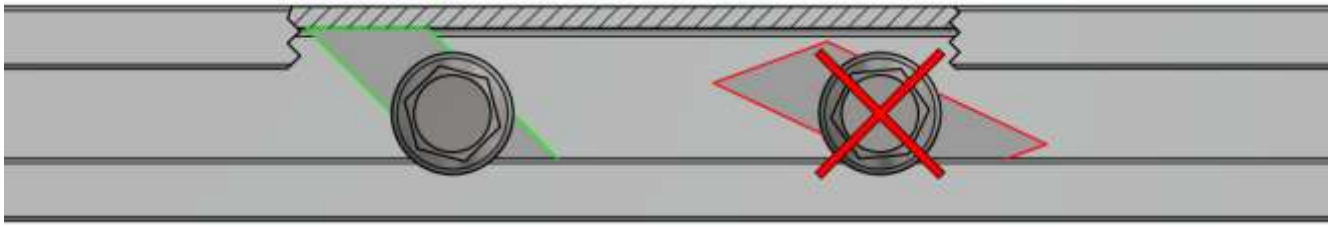


Figure 88 Universal Connecting Piece M6 installed correctly (green) and incorrectly (red)

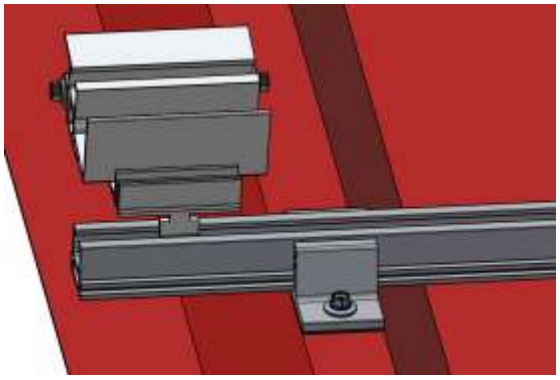


Figure 89 Screw in bottom support G3 single in the slot channel

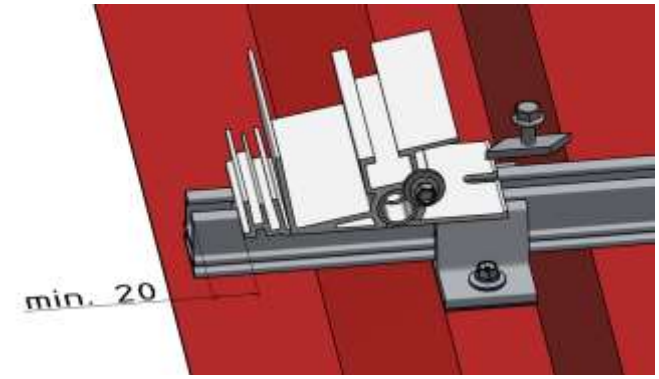


Figure 90 Bottom support G3 single easy to attach with Universal Connecting Piece M6

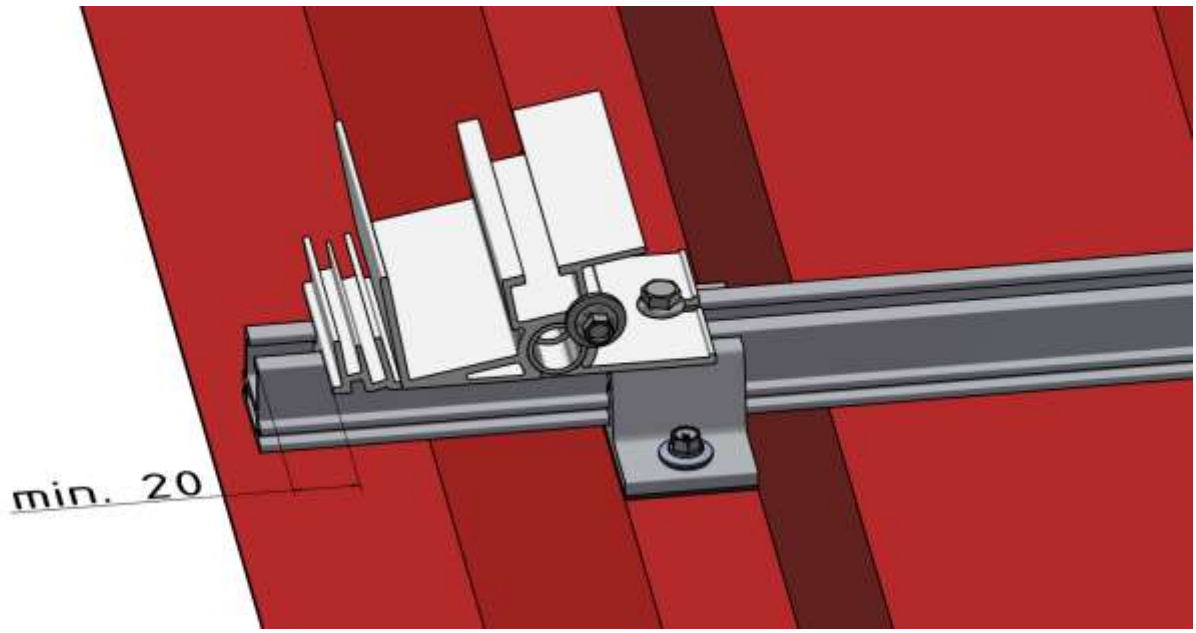


Figure 91 Bottom support G3 single mounted

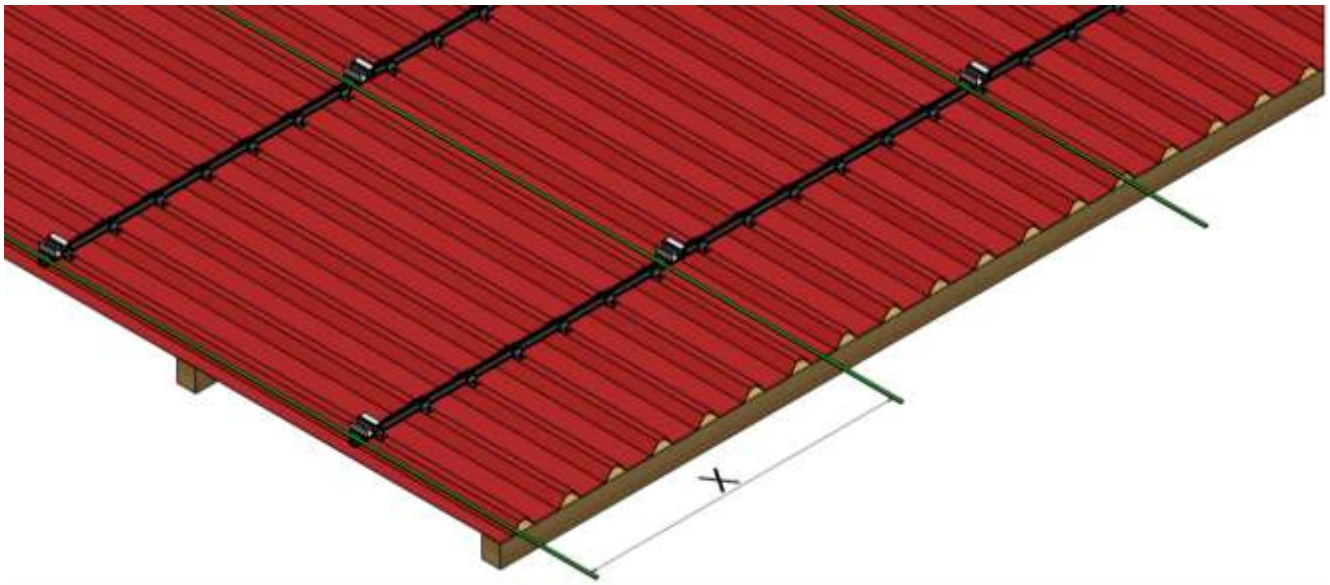


Figure 92 Mark center-to-center distance x

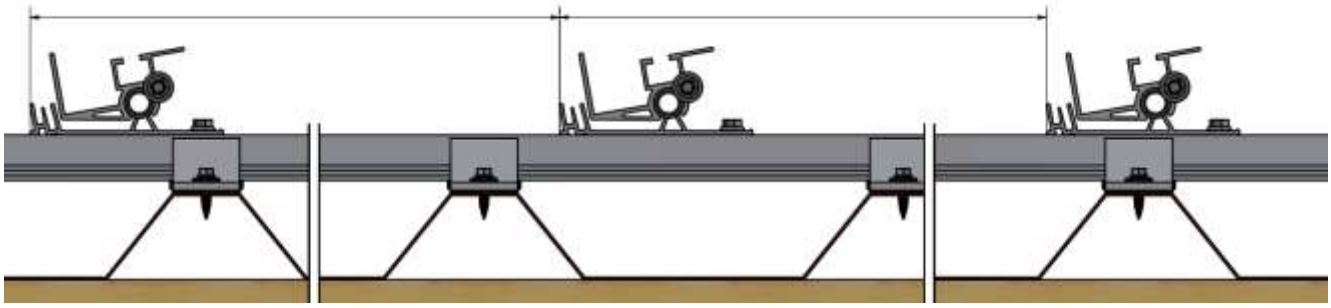


Figure 93 Bottom support G3 single: Applied center to center distance from the same point

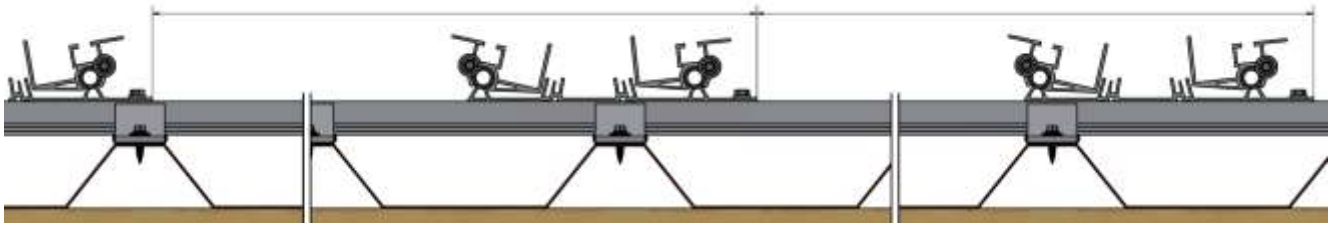


Figure 94 Bottom support G3 double: Applied center to center distance from the same point

Step 3: Mounting Top Support

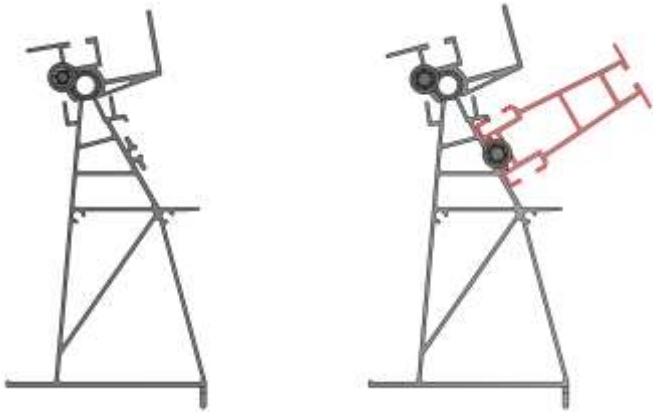


Figure 95 Difference between top support G3 10° without and with windshield holder

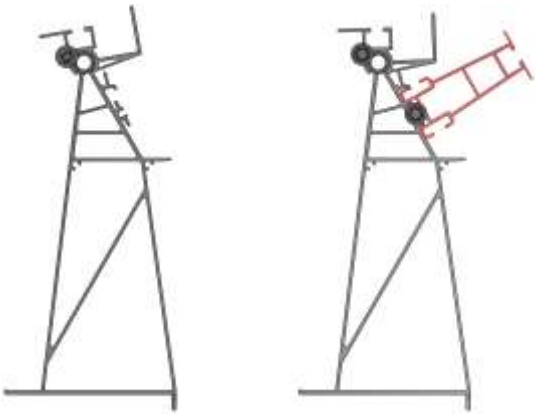


Figure 96 Difference between top support G3 15° without and with windshield holder

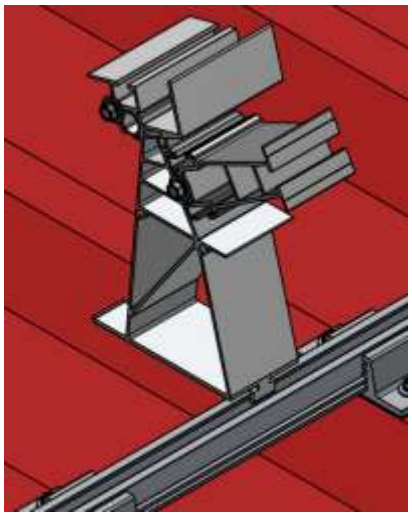


Figure 97 Screw in top support G3 in the slot channel

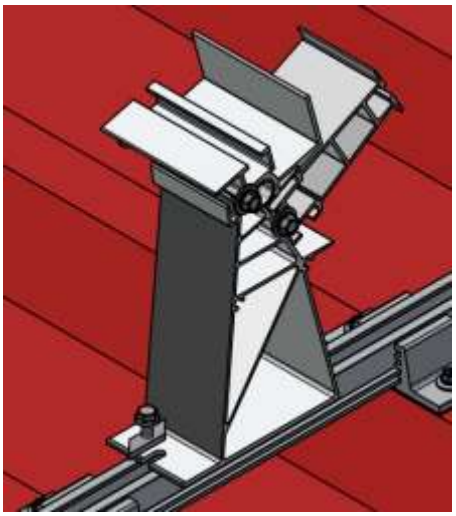


Figure 98 Top support G3 easy to attach with Universal Connecting Piece M6

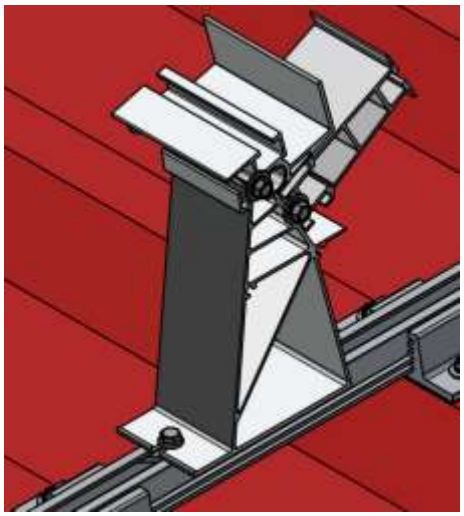


Figure 99 Top support G3 mounted

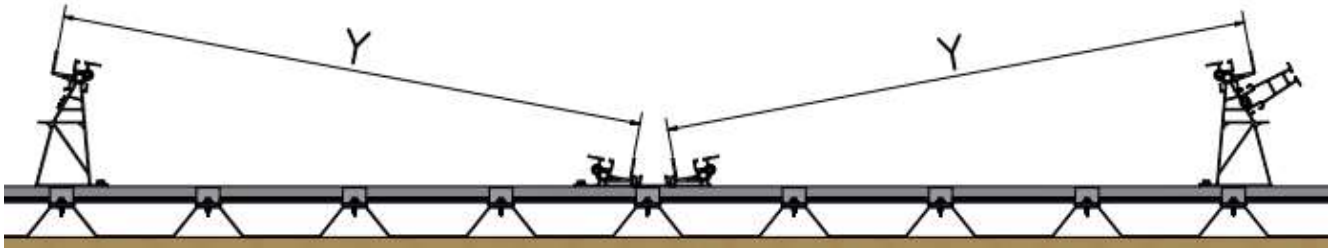


Figure 100 AeroFix 15-EW: Y = Module width

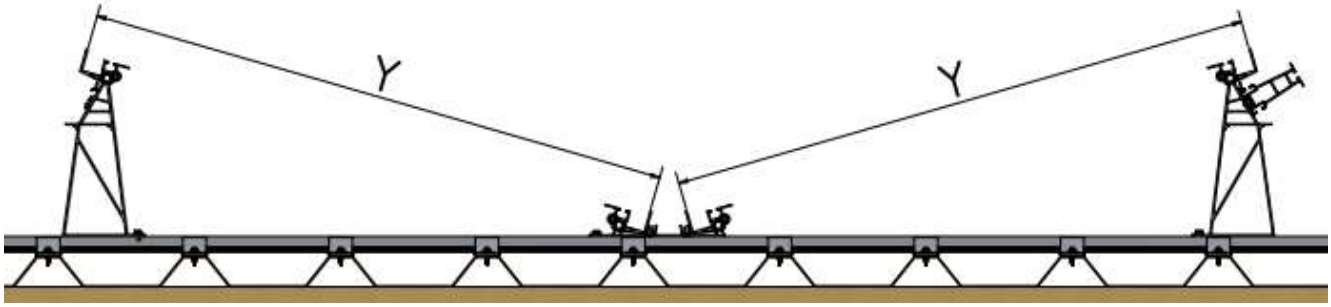


Figure 101 AeroFix 10-EW: Y = Module width

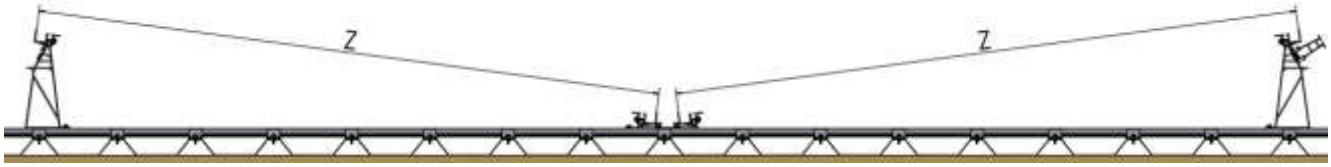


Figure 102 AeroFix 8-EW: Z = Module length

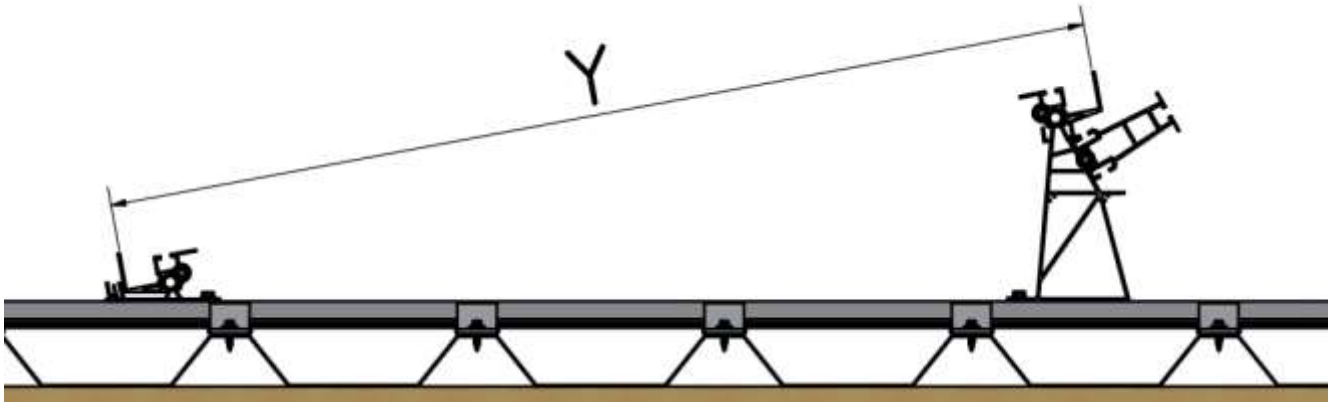


Figure 103 AeroFix 15-S: Y = Module width

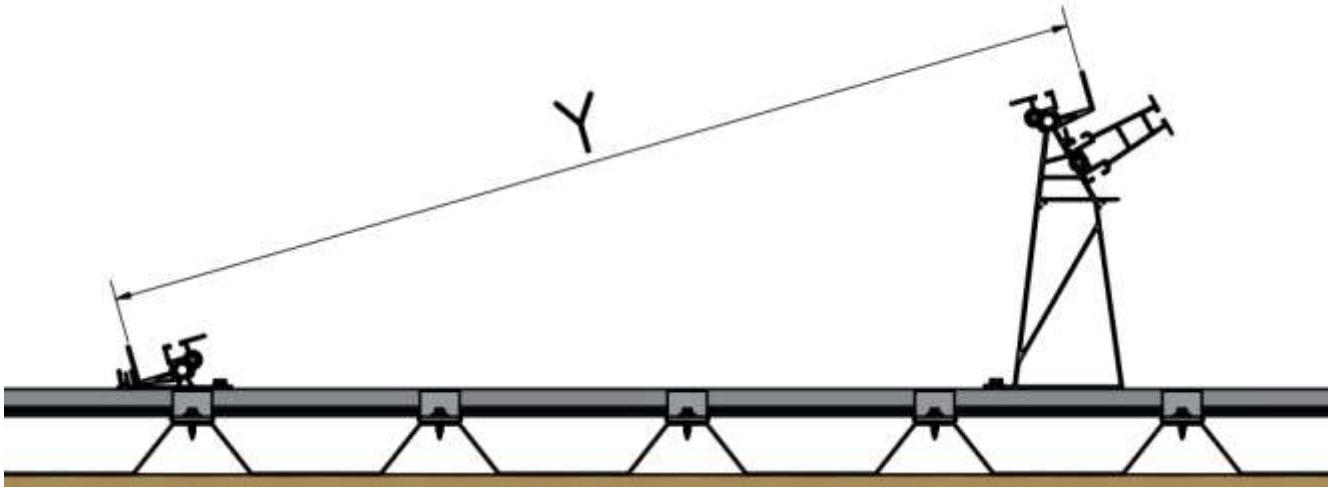


Figure 104 AeroFix 10-S: Y = Module width

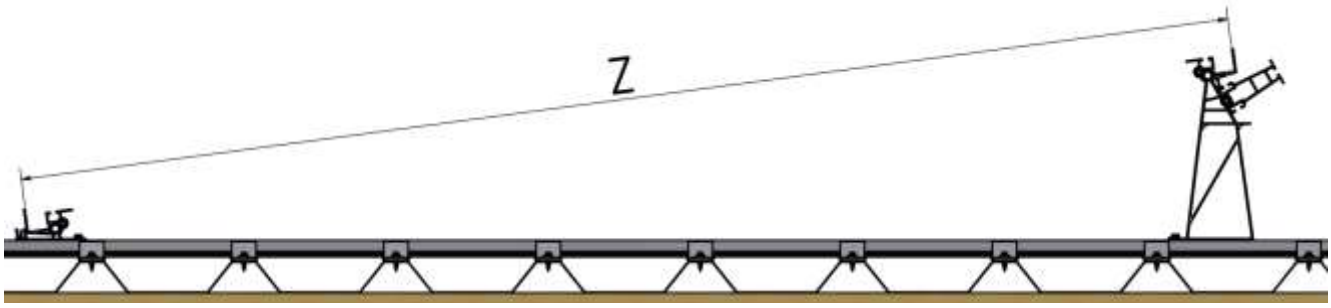


Figure 105 AeroFix 8-S: Z = Module length

Step 4: Module assembly

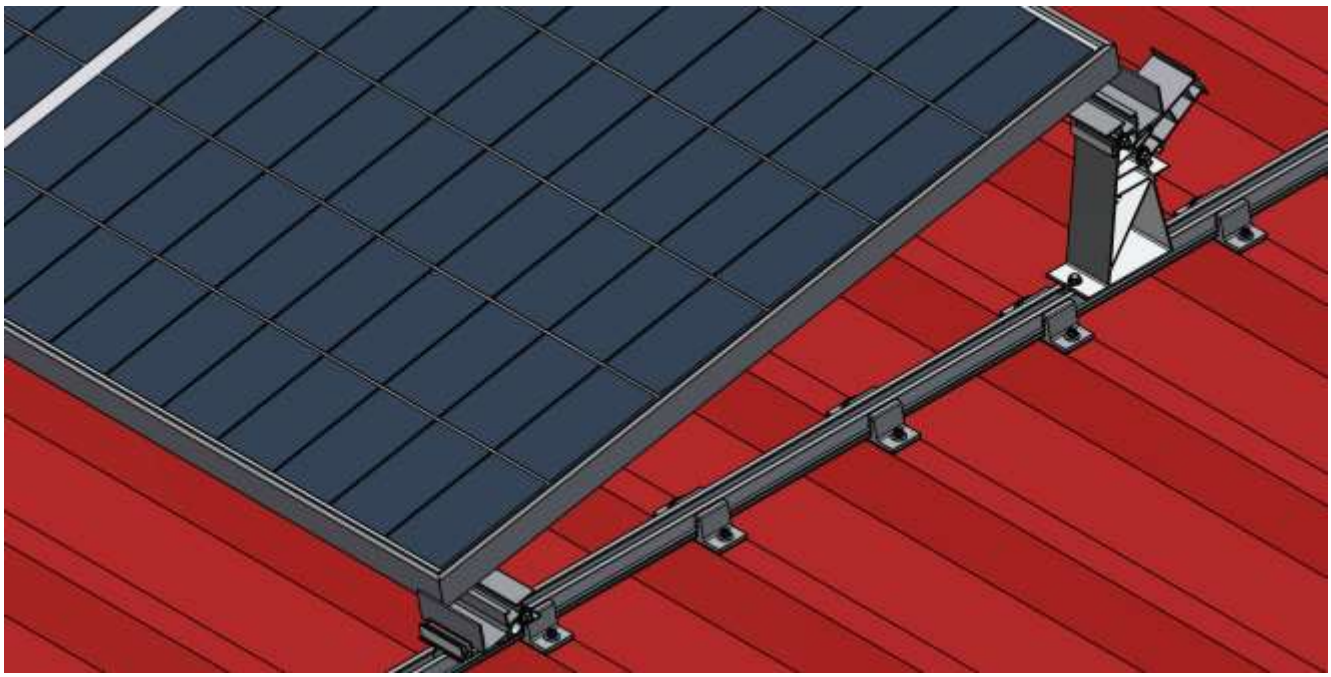


Figure 106 Insert the module into the supports

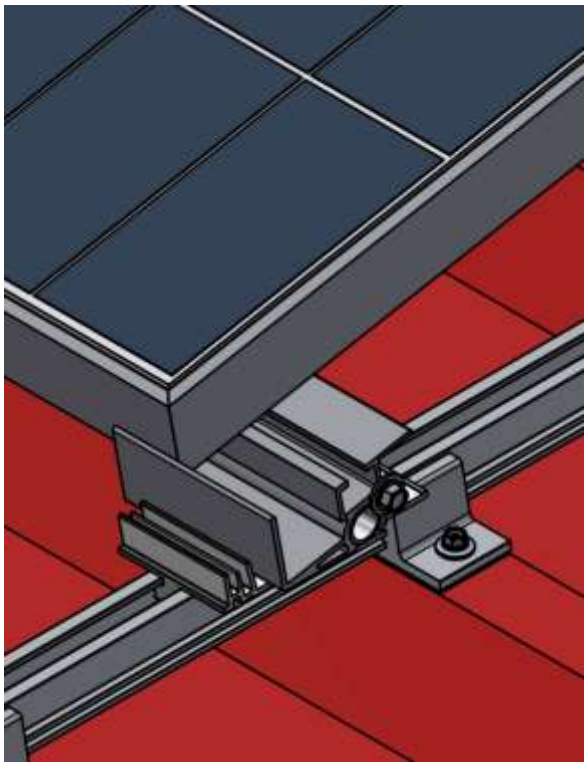


Figure 107 The module must be in full contact and rest against the stop of the module holder

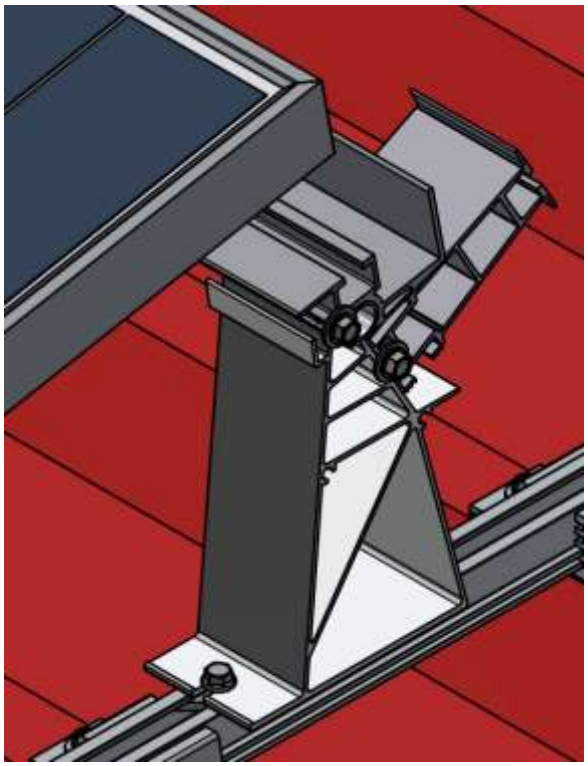


Figure 108 The module must be rest completely of the module holder

⚠ Attention!
The module clamp must not protrude above the module frame.

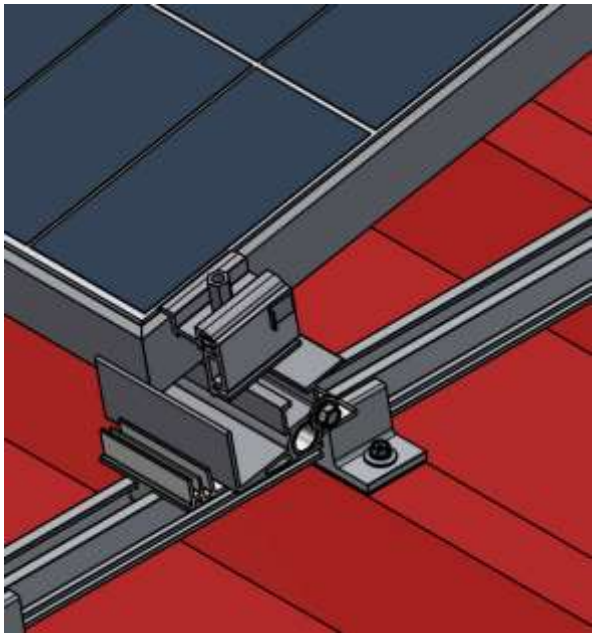


Figure 109 Module with module clamp attached to the bottom support G3 single

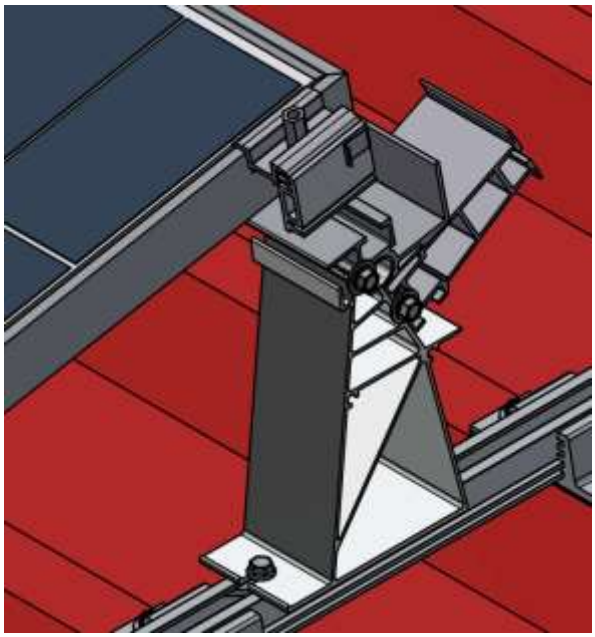


Figure 110 Module with module clamp attached to the top support G3 10° mWbh

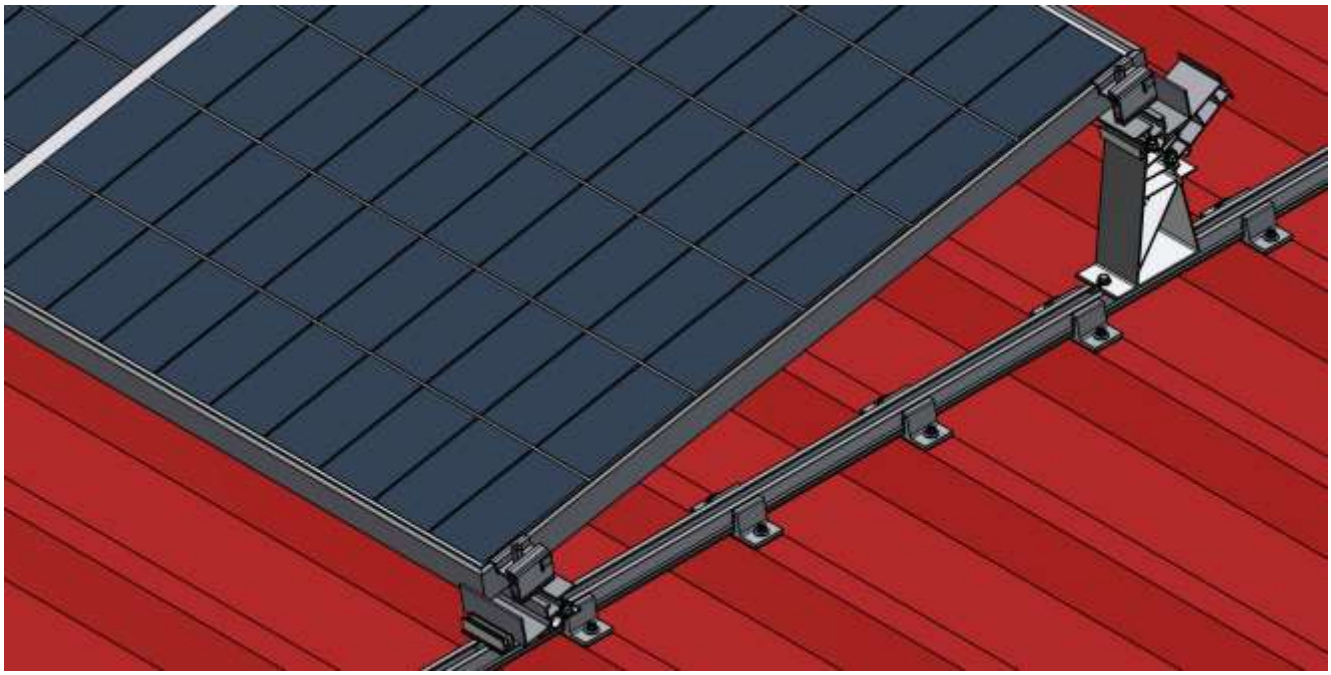


Figure 111 Module fixed on the supports

Step 5: Wind plate assembly

⚠ Attention!
The system is not wind tunnel tested. The wind plate is therefore not mandatory. However, it is still recommended to use it. The suction loads can thus be reduced.

With the AeroFix G3 EW systems, wind plates and the matching AeroFix top support G3 XX° mWbh are only recommended for the modules if

- the first/last row begins/ends with an “Top Support”.
- within a module field, the high open module side ends and no module follows.

⚠ Attention!
Wind plate must not protrude from the side of the module field. Overhanging wind plates must be shortened.

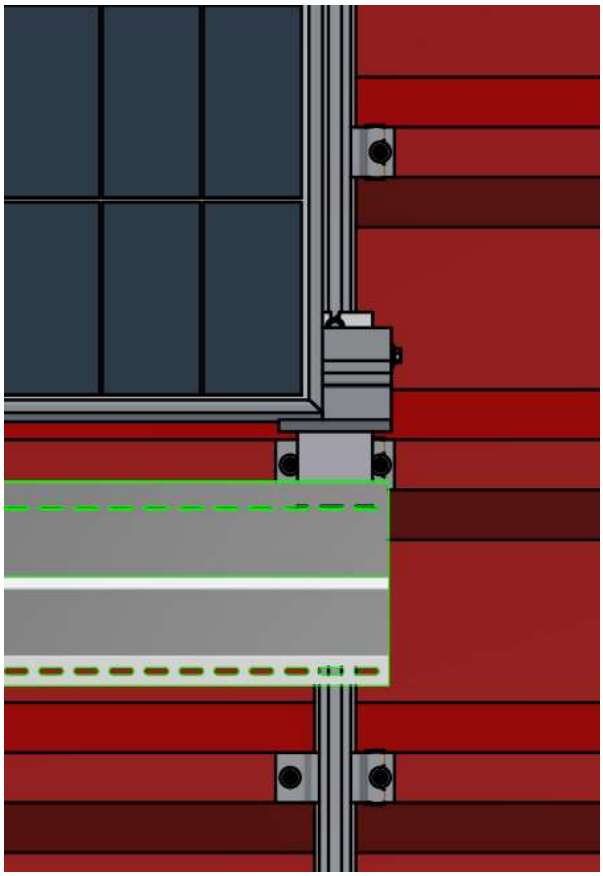


Figure 112 Wind plate ok

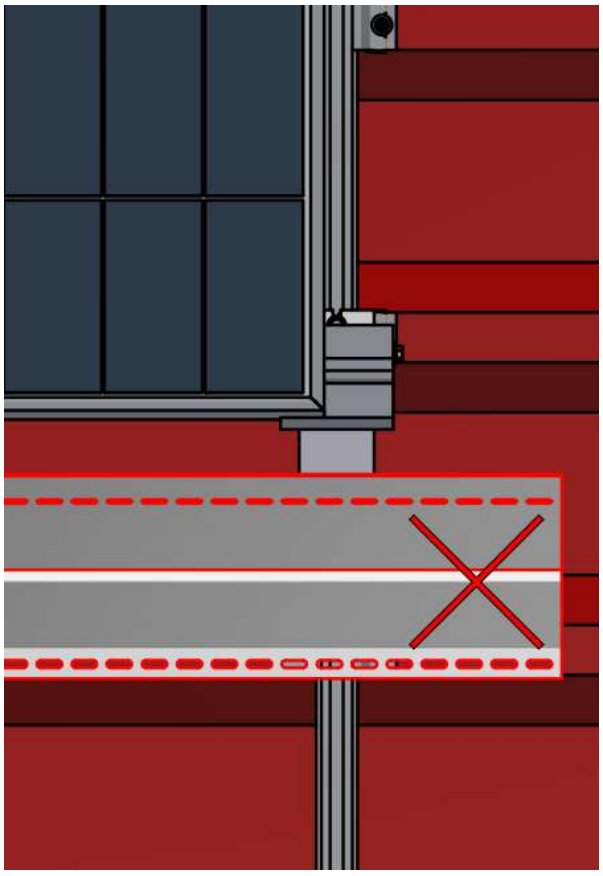


Figure 113 Windb plate not ok

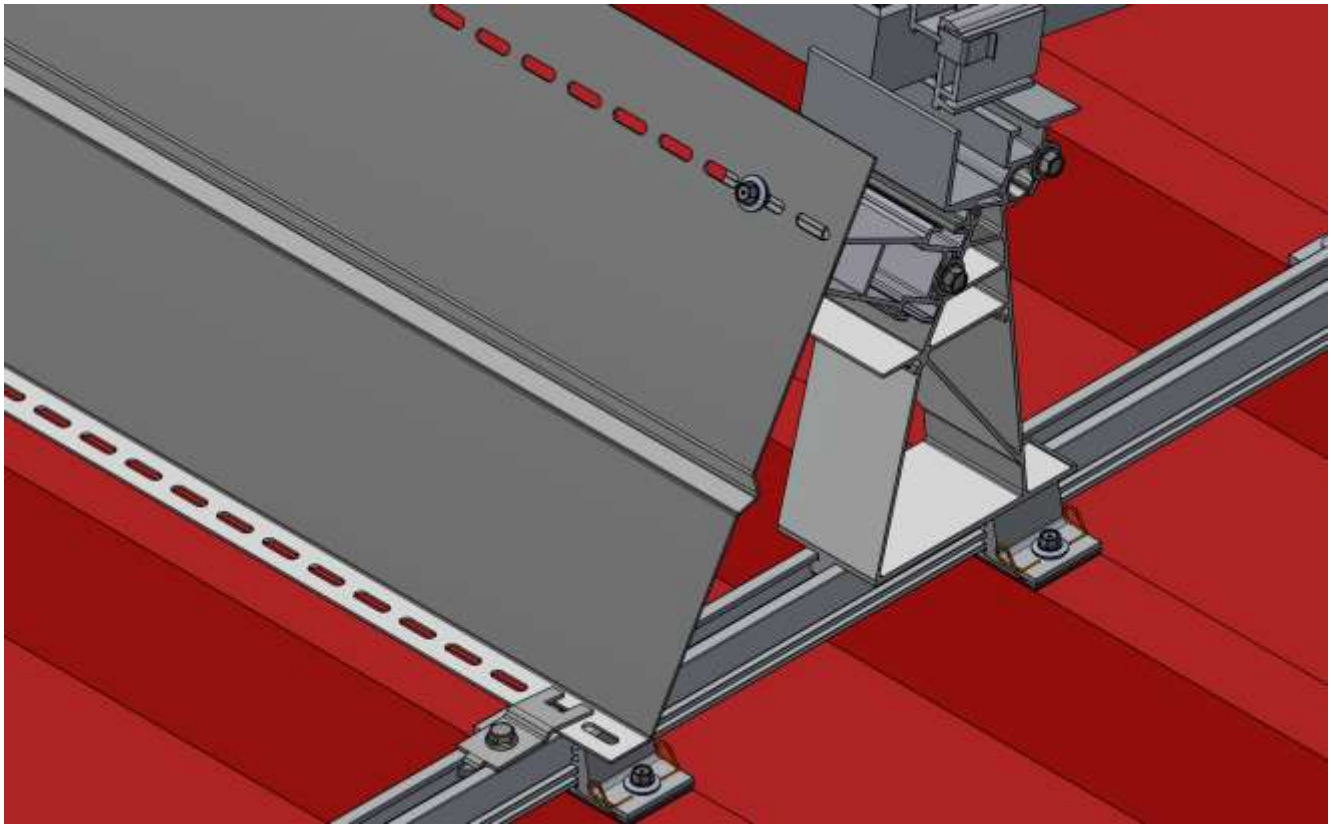


Figure 114 Attach the wind plate to the top support and support rail

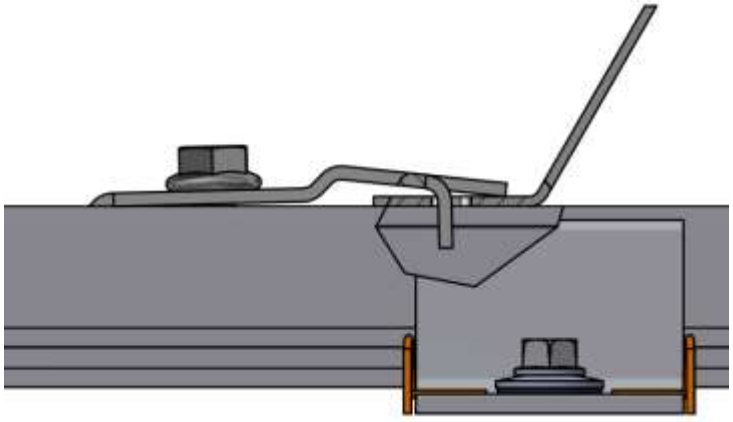


Figure 115 Fastening the wind plate to the support rail with a wind plate clamp

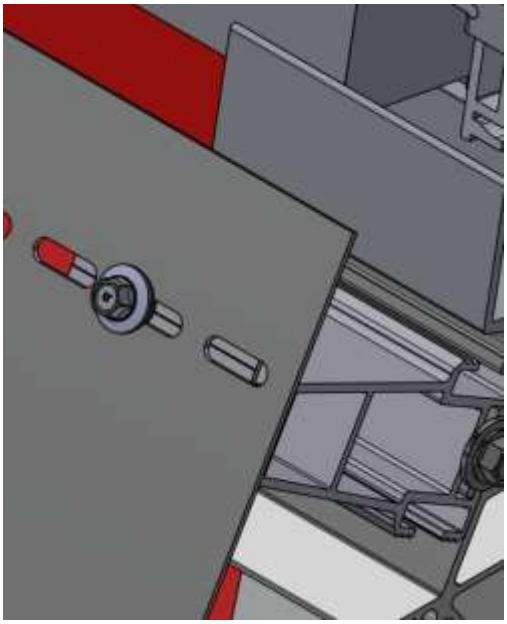


Figure 116 Fastening the wind plate to the top support with self-drilling-screw 4.8x19

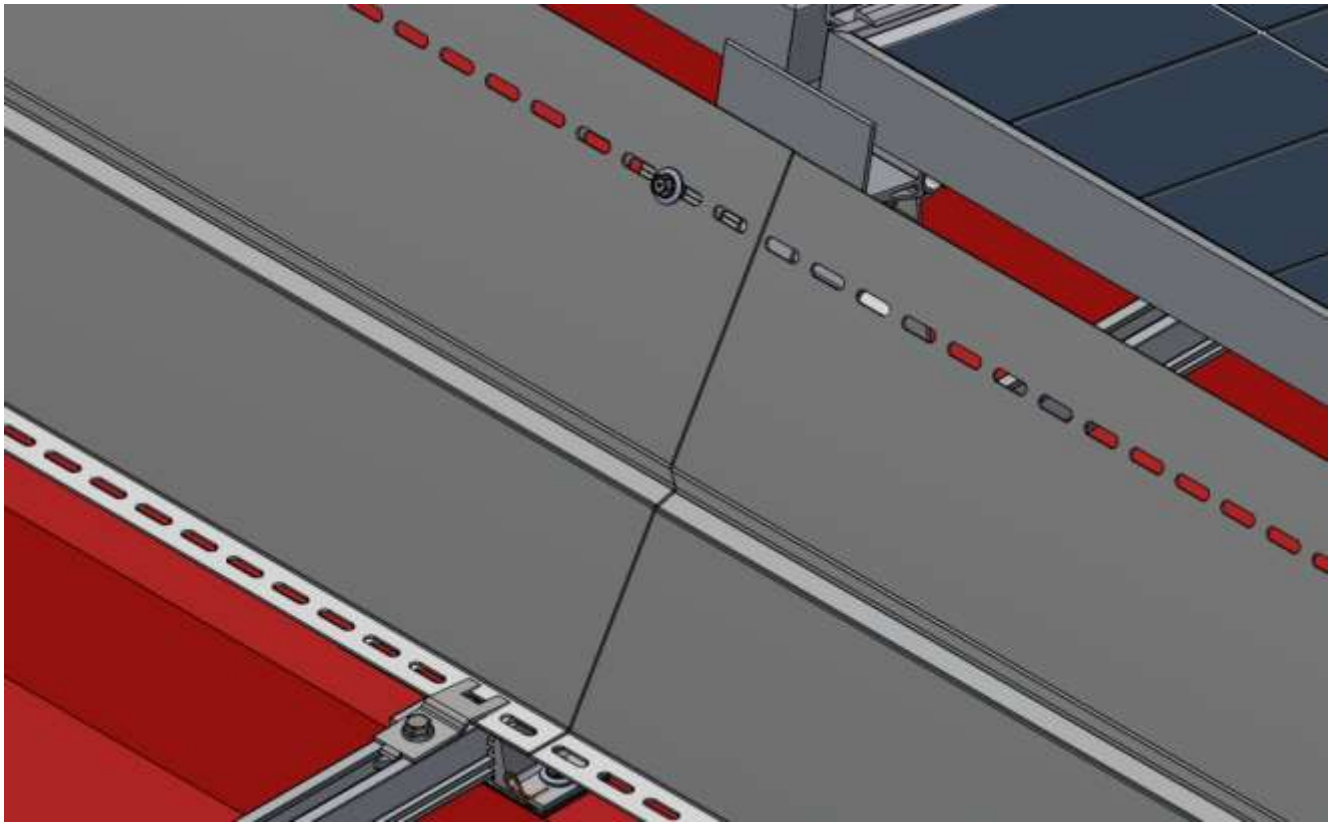


Figure 117 Overlapping wind plates in the middle of the row

5.9.6 Trapezoidal System Eco 340mm & 420mm

The Trapezoidal System Eco 340mm & 420mm is a pre-assembled, short-rail system to which trapezoidal profiles are riveted or scrwed together.

- Trapezoidal System Eco 340 mm: raised bead distance 207 - 250 mm
- Trapezoidal System Eco 420 mm: raised bead distance 251 - 333 mm

⚠ Attention!
Thermal expansion dictates a thermal separation after 11.90 m in one row.

Step 1: Dimensioning using "PV Manager"

Step 2: Mark the fixing points of the clamp

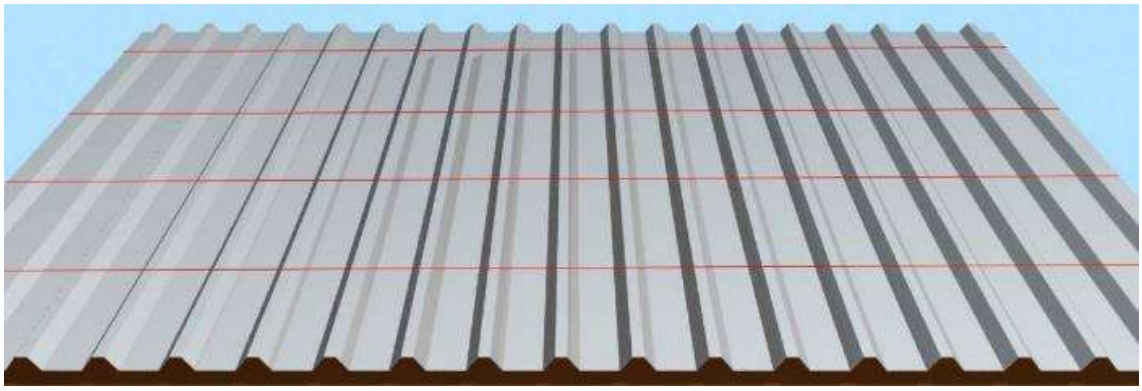


Figure 118 Marking fixing points

Step 3: Clean the roofing

Exclusively clean the roofing in areas where you intend to affix trapezoidal clamps at a later point. The surfaces must be dry and free from grease, oil or silicone as well as dirt particles to safeguard optimum integrity. In the event of heavy-duty contamination, we recommend to carefully roughen up the surface with suitable materials (e.g. fleece cleaning cloth) to subsequently clean it. We recommend using isopropyl alcohol or acetone in combination with lint-free paper towels for cleaning.

⚠ Attention!
Please observe the safety regulations when handling solvents and chemicals.

Step 4: Affixing the "Trapezoidal System Eco 340mm & 420mm"

ⓘ Information
The heavy-duty adhesive tape can be used from an object and working temperature of 0° C; final adhesion occurs after approx. 72 h at an ambient temperature of 20° C. The higher the temperatures, the faster this process is complete.

We do not recommend to bond surfaces below these temperatures as the adhesive agent may become too hard and prevent adequate adhesion. After adhesion has taken place, low temperatures do not normally create any problems. Prevent the formation of condensation to safeguard appropriate adhesive properties. Condensate can form if, for example, the materials to be connected have high temperature differences.

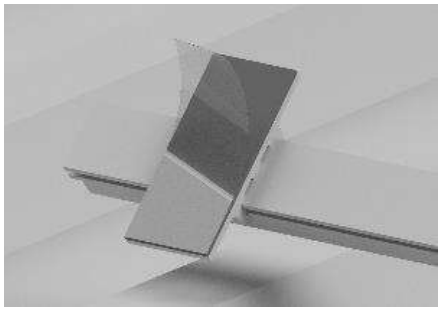


Figure 119 Removing the protective foil

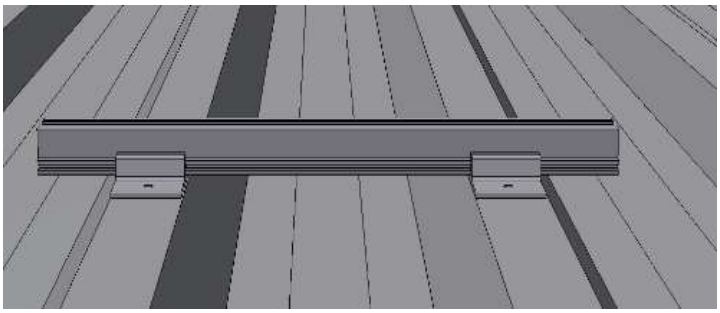


Figure 120 Affixing the "Trapezoidal System Eco"

Step 5: Distributing the "Trapezoidal System Eco 340mm & 420mm" as specified



Figure 121 "Trapezoidal system Eco 340mm & 420mm" distributed as specified

Step 6A: Affix " Trapezoidal System Eco 340mm & 420mm" to the outer roofing with blind rivets

⚠ Attention!
A drill with a diameter of 5.0 mm is mandatory to maintain static properties!



- When using the rivets drill two bores with a diameter of 5.0 mm per "clamp base". In this process, make sure you drill carefully to maintain static properties.
- Now insert the 4.8x15mm sheet blind rivets into the bores and rivet.
- The enclosed 4.8x15 mm sheet blind rivets are approved for a sheet metal or aluminum thickness of between 0.5 mm and 1.5 mm.

Figure 122 Drilling clamps

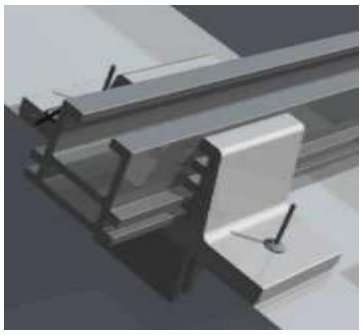


Figure 123 Inserting blind rivets



Figure 124 Riveting using a standard rivet head

Step 6B: Affix " Trapezoidal System Eco 340mm & 420mm " to the outer roofing with self-drilling screws

- When using the self-drilling screws, two screws are placed per “clamp base”. In this process, make sure you screw carefully to maintain static properties. The self-drilling screws are tightened until the seal swells out a little.
- The enclosed self-drilling screws 5,5x25 are approved for a sheet metal or aluminum thickness of 0.5 mm to 1.5 mm.

⚠ Attention!
Pre-drilling of the trapezoidal sheet is not permitted.

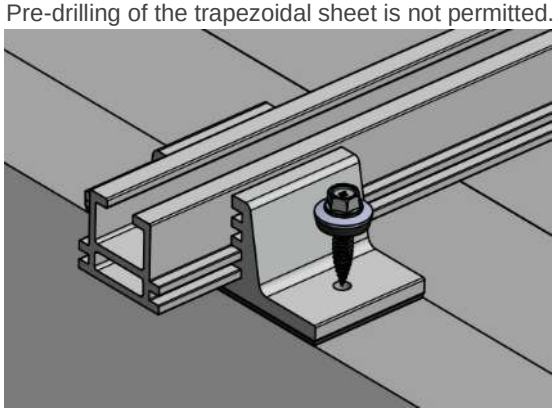


Figure 125 Apply the screw

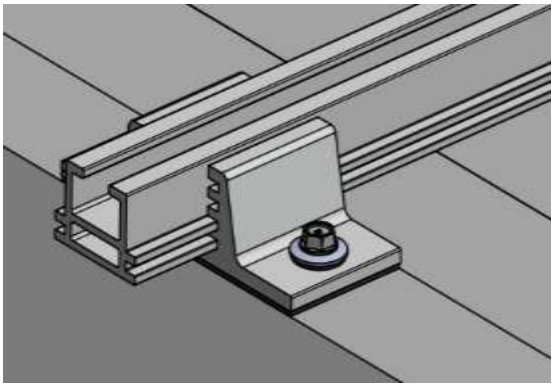


Figure 126 Trapezoidal System Eco screwed

ⓘ Information
Positive-Locking-Clamps do not have to be used because the carrier profile is plastically deformed at the end.

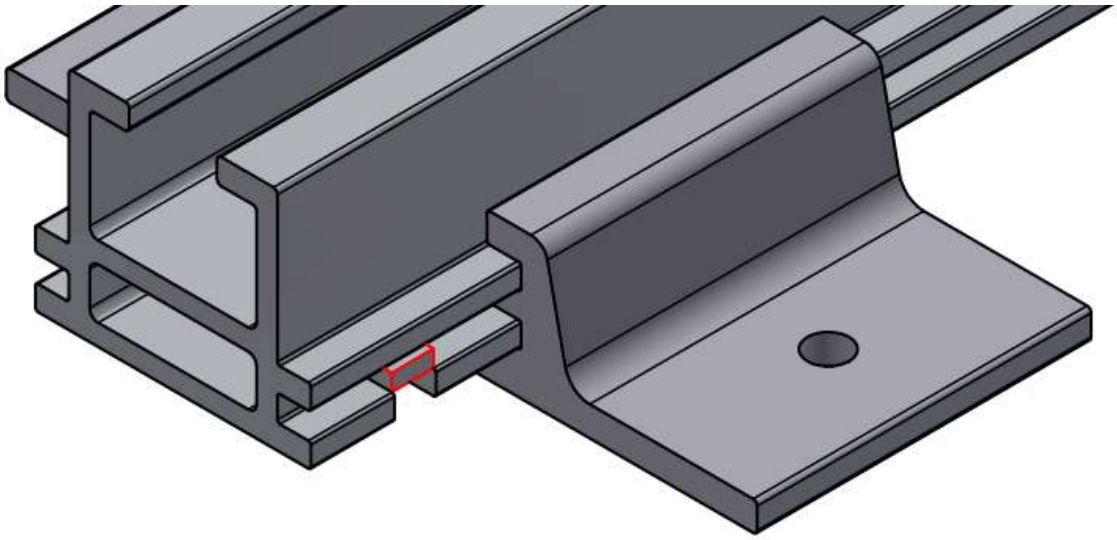


Figure 127 Crimping trapezoidal system Eco 340 or 420

Step 7: Alignment of PV modules

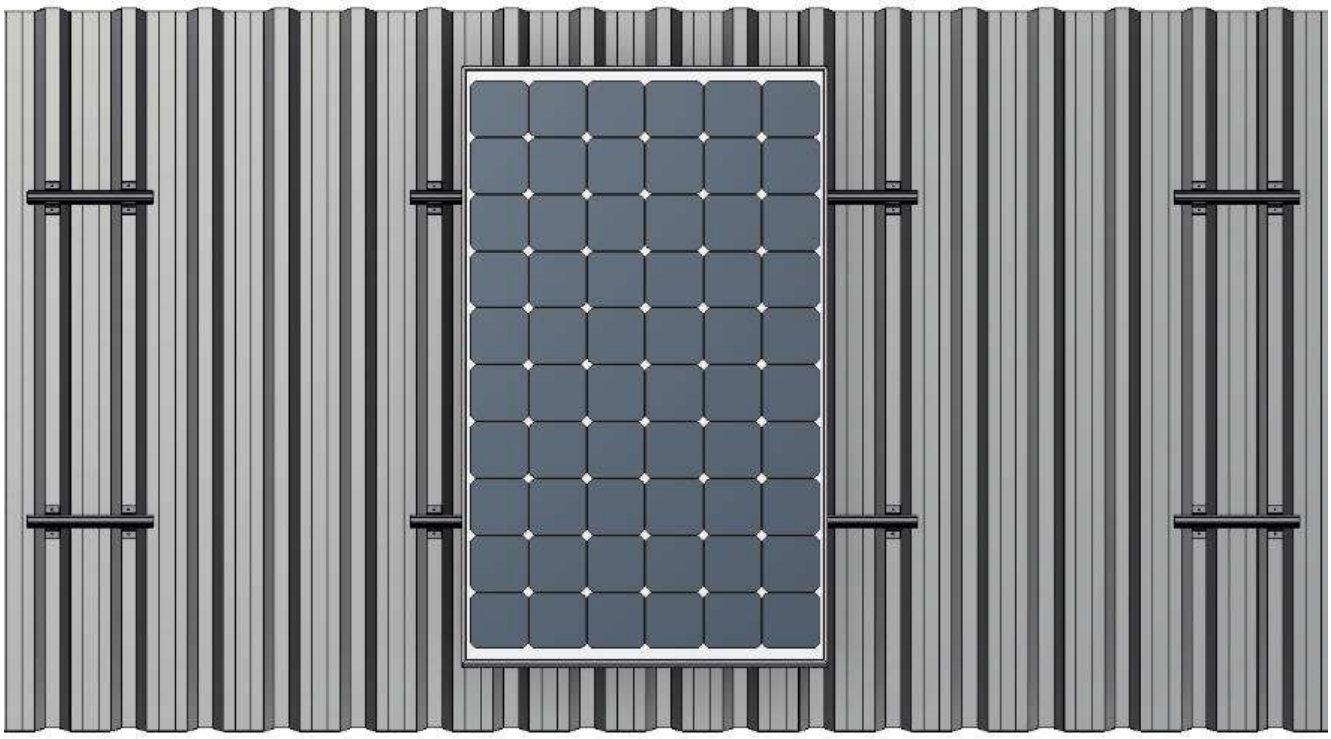


Figure 128 Aligning PV modules

5.9.7 Trapezoidal System Eco 120 mm

Step 1: Dimensioning using "PV Manager"

Step 2: Mark the fixing points of the Trapezoidal System Eco 120mm

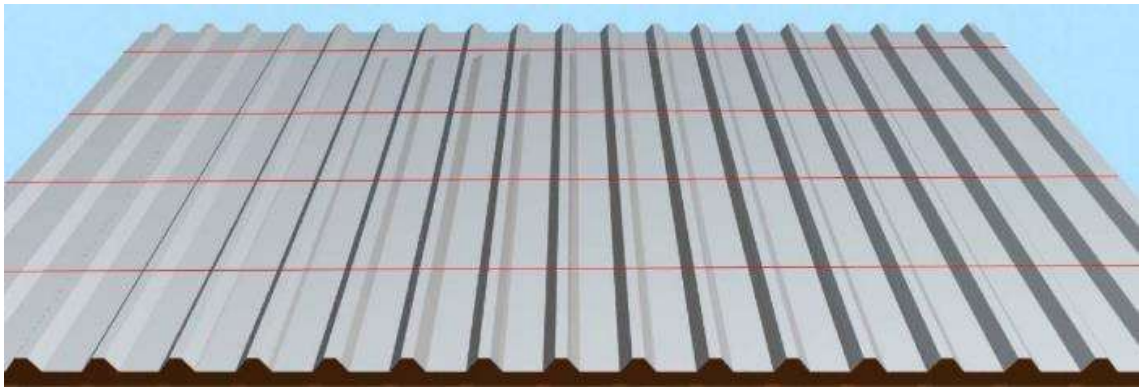


Figure 129 Marking fixing points

Step 3: Clean the roofing

Exclusively clean the roofing in areas where you intend to affix trapezoidal clamps at a later point. The surfaces must be dry and free from grease, oil or silicone as well as dirt particles to safeguard optimum integrity. In the event of heavy-duty contamination, we recommend to carefully roughen up the surface with suitable materials (e.g. fleece cleaning cloth) to subsequently clean it. We recommend using isopropyl alcohol or acetone in combination with lint-free paper towels for cleaning.

⚠ Attention!
Please observe the safety regulations when handling solvents and chemicals.

Step 4: Affix the Trapezoidal System Eco 120mm

ⓘ Information
The heavy-duty adhesive tape can be used from an object and working temperature of 0° C; final adhesion occurs after approx. 72 h at an ambient temperature of 20° C. The higher the temperatures, the faster this process is complete.

We do not recommend to bond surfaces below these temperatures as the adhesive agent may become too hard and prevent adequate adhesion. After adhesion has taken place, low temperatures do not normally create any problems. Prevent the formation of condensation to safeguard appropriate adhesive properties. Condensate can form if, for example, the materials to be connected have high temperature differences.

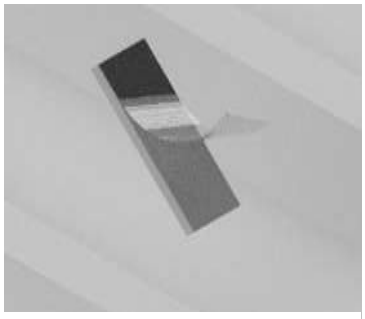


Figure 130 Removing the protective foil

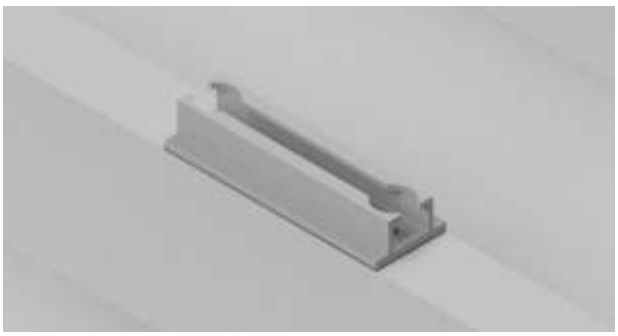


Figure 131 Affixing the "Trapezoidal System Eco 120mm"

Step 5: Distributing the " Trapezoidal System Eco 120mm" as specified

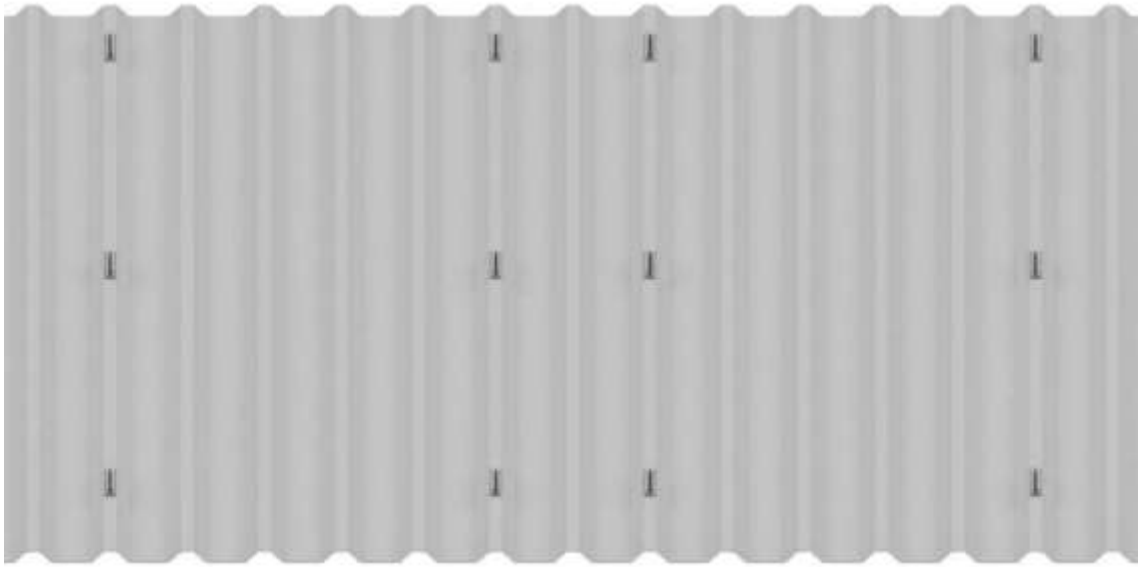


Figure 132 "Trapezoidal System Eco 120mm " distributed as specified

Step 6: Affix " Trapezoidal System Eco 120mm" to the outer roofing with self-drilling screws

- When using the self-drilling screws, two screws are placed per “clamp base”. In this process, make sure you screw carefully to maintain static properties. The self-drilling screws are tightened until the seal swells out a little.
- The enclosed self-drilling screws 5,5x25 are approved for a sheet metal or aluminum thickness of 0.5 mm to 1.5 mm.
- It is not possible to use the rivets, as with the other trapezoidal systems.

⚠ Attention!
Pre-drilling of the trapezoidal sheet is not permitted.

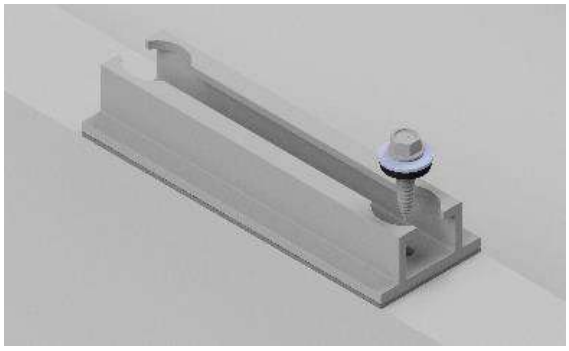


Figure 133 Apply the screw

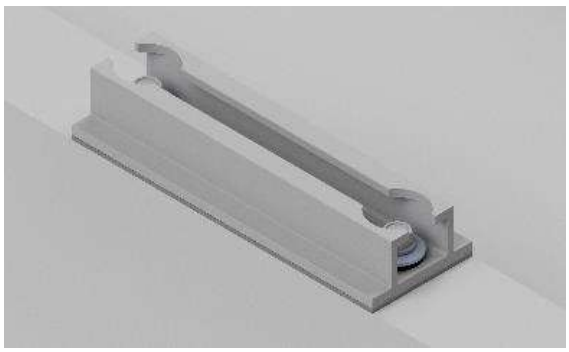


Figure 134 Trapezoidal System Eco 120mm screwed

Step 7: Alignment of PV Modules

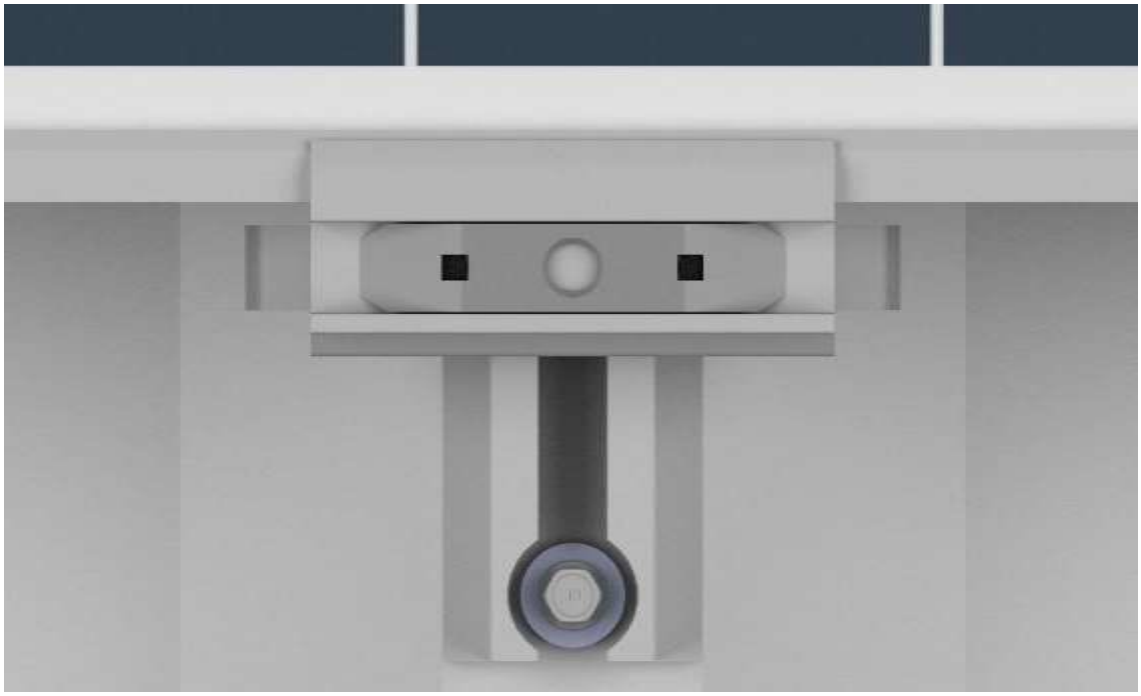


Figure 135 Place the clamps on the center of the Trapezoidal System Eco 120mm

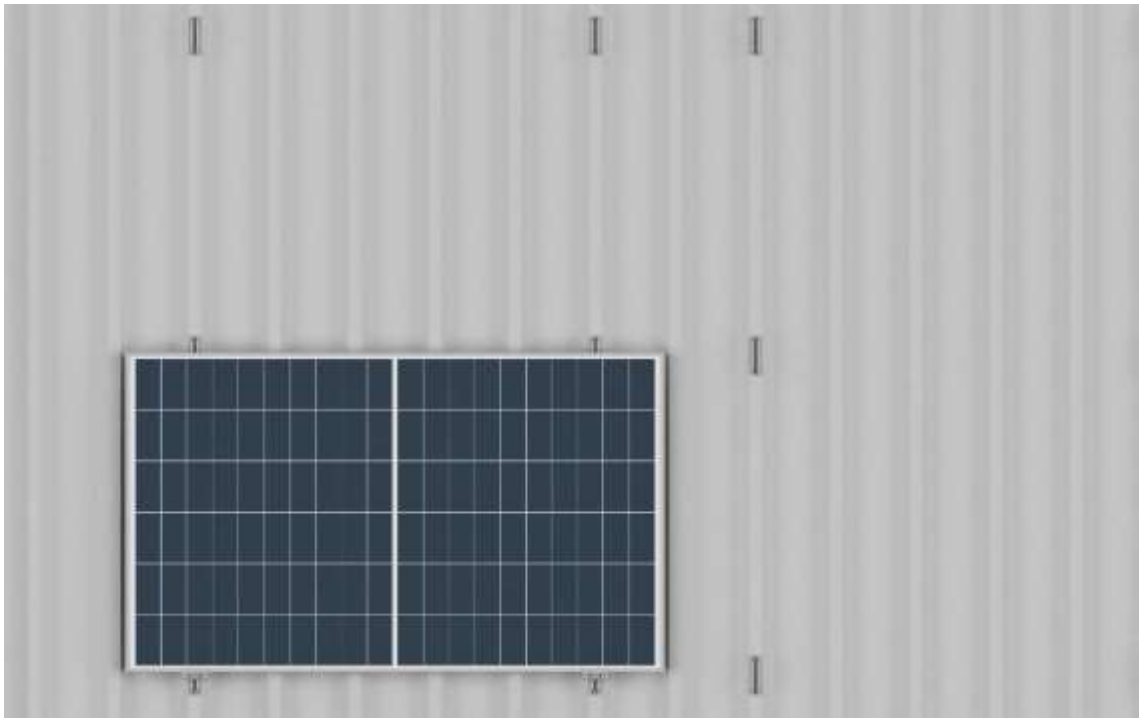


Figure 136 Aligning PV modules

5.10 Installation of sheet seam clamps

Special fastening elements are used to fasten PV modules on standing seam roofs, which are then attached to the support rails or module clamps.



Figure 137 Universal Metal Seam Clamp G2

The roofing must not be damaged by the load on the installed clamps. For this reason, we recommend having sheet seam clamps fitted by a roofing company.The tightening torque of the sheet seam clamp must be limited in such a way that the sheet metal is not deformed and the thermal expansion of the sheets is not hindered.

The clamps are mounted vertically according to the number of modules or support rails. As a rule, fit one standing seam to each clamp. On each side the support rail must protrude by a maximum of 0.4 m. Observe the thermal separations of the profiles after 3.3m or the specifications of the respective sheet seam manufactures.

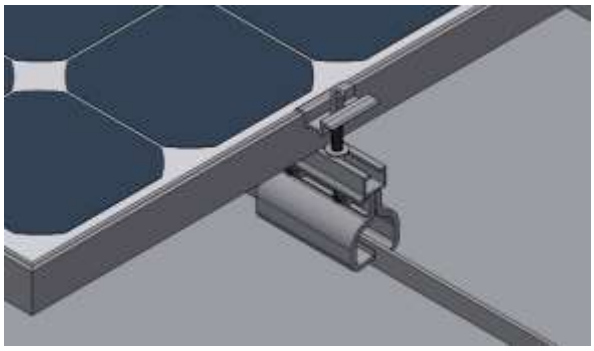


Figure 138 Direct assembly

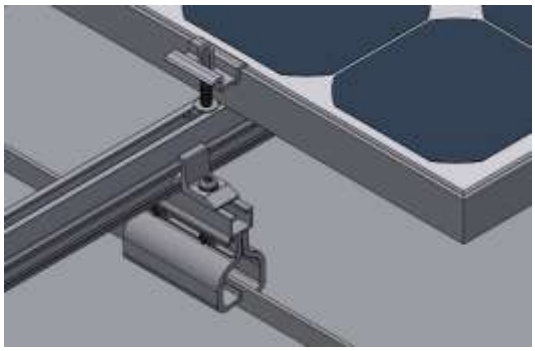


Figure 139 With support rail and 2-layer connector

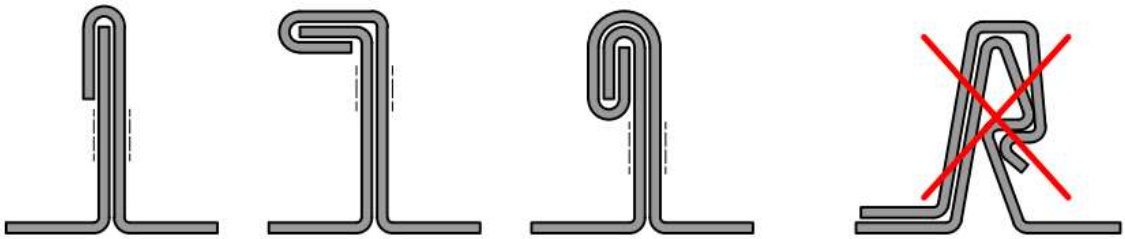


Figure 140 Standing seam variants

⚠ Attention!

Clarify on site whether the roof and the substructure are able to withstand the additional forces caused by installing the PV system. If you intend to assemble PV plants on standing seam roofs, the roof must not only carry the additional loads, it must also withstand the additional wind dynamics. A civil engineer must check the number of fixing points (sheet seam clamps) according to the on-site conditions. The position of the metal seam clamp should not be on a retaining clip of the metal seam. In case of doubt, a roof expert should be consulted. Keep the alternator size to a minimum to minimise occurring tension values. A connection on titan's zinc roofs or copper roofs is not recommended. In advance the clamp should be checked for correct fit and material compatibility.

5.11 Installation of Kalzip® clamps

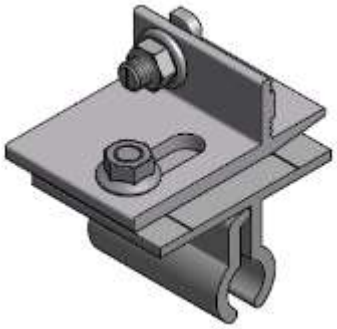


Figure 141 Kalzip® clamp with universal connector

Use "Kalzip® clamps" to fasten the system on so-called Kalzip® roofs. The clamps are distributed vertically according to the number of cross girders. As a rule, fit one standing seam to each clamp. On each side the support rail must protrude by a maximum of 0.4 m. Observe the thermal separations of the profiles after 3.3m or the specifications of the respective manufactures.

⚠ Attention!

Clarify on site whether the roof and the substructure are able to withstand the additional forces caused by installing the PV system. If you intend to assemble PV plants on Kalzip roofs, the roof must not only carry the additional loads, it must also withstand the additional wind dynamics. A structural engineer must check the number of fixing points (Kalzip clamps) according to the on-site conditions. Keep the alternator size to a minimum to minimise occurring tension values. A connection on titan's zinc roofs or copper roofs is not recommended. In advance the clamp should be checked for correct fit and material compatibility.

Please also take into account the manufacturer's specifications for the corresponding roofing, as well as the specifications of the corresponding general building approval Z-14.4-560!

6. Fitting support rails

- Insert the pre-assembled securing screw (M10 connection piece for roof hook profile) through the roof hook slot. Rotate by 90° and insert into the mounting groove of the e.g. TF50+ support rail. Connect TF50+ support rail to the roof hooks at the required height and tighten the screw.

⚠ Attention!
Please ensure all teeth of the type e.g. TF50+ support rail have engaged in the recess and that the T-head screw is completely swiveled in.

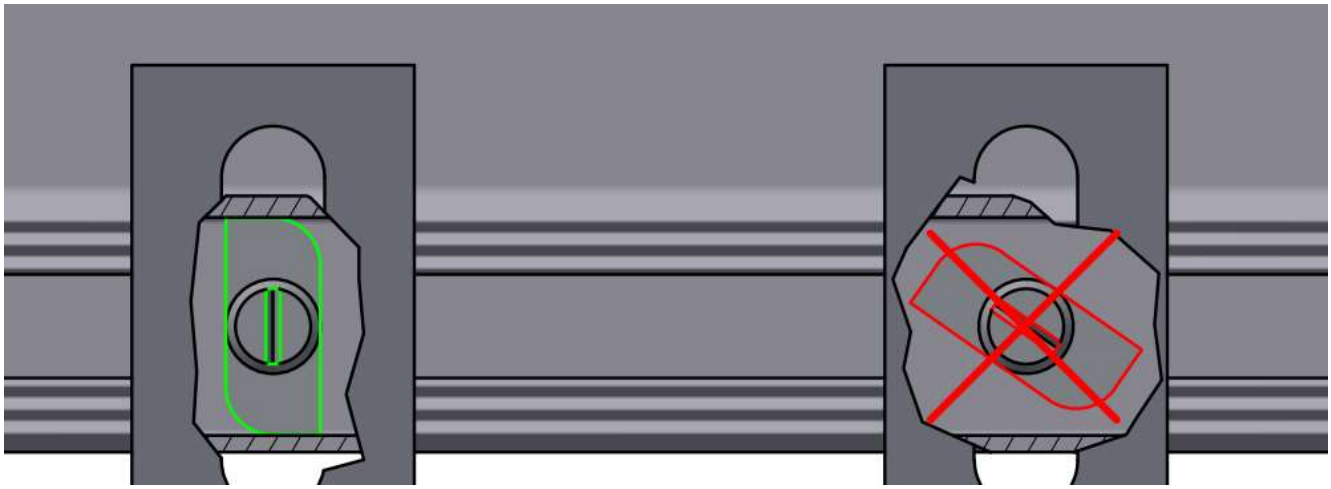


Figure 142 T-head screw installed correctly (green) and incorrectly (red)

- Start with the top or the bottom support rail. Align the screws with the fixing points (e.g. roof hooks) and secure them. See Figure 145.
- Align the other support rails with each other by means of a cord.
- If required, extend the support profiles using butt connectors. Butt connectors enable ideal alignment of the support rails.
- Do no exceed a maximum support rail length of 11.90 m (5 beams 2.38 m) for continuous support rails due to thermal expansion.
- Prevent any water from collecting in the support rails to prevent frost damage.



Figure 143 Support rail, fitted

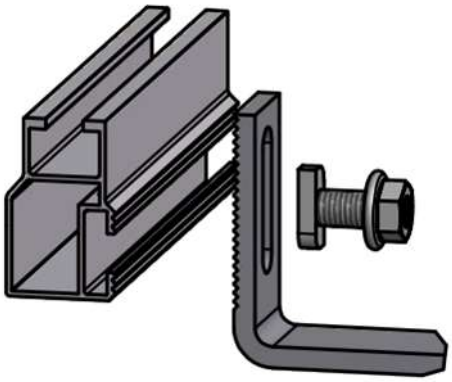


Figure 144 Mounting support rails

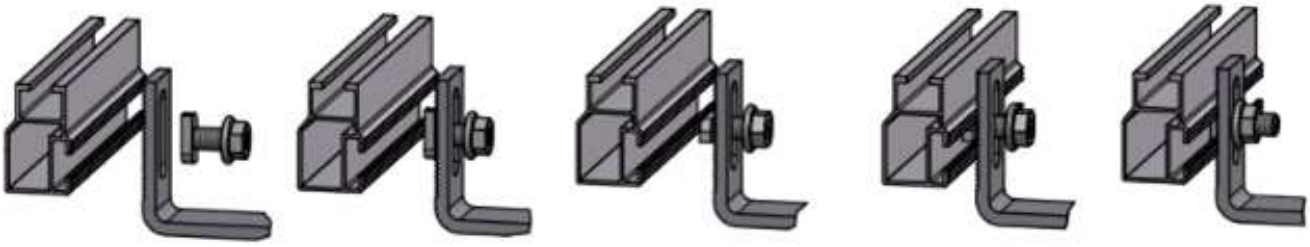


Figure 145 Fitting support rails

⚠ Attention!
Do not use fitted carrier rails as step ladders!
Ensure that all T-head screws and hammer nuts have engaged with the rail so they are completely inserted.
The support rail pieces must be fastened to at least two support points before a butt connector may be installed. Not more than one butt connector may be installed within two support points.



Figure 146 Butt connector TF50+ / TF50+m inside

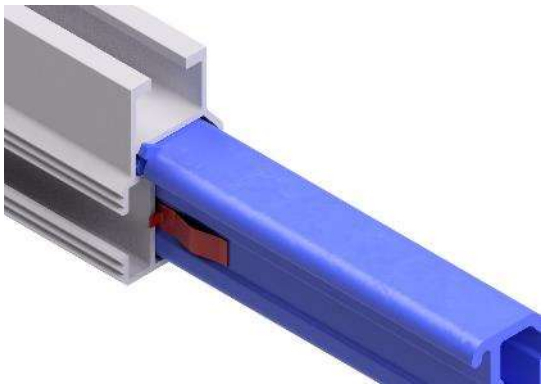


Figure 147 Insert butt connector (blue) and leaf spring for potential equalization (red) into the support profile



Figure 148 Join the second support profile together

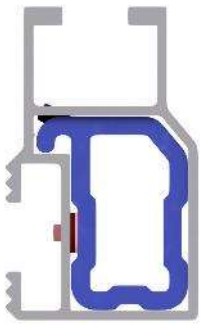


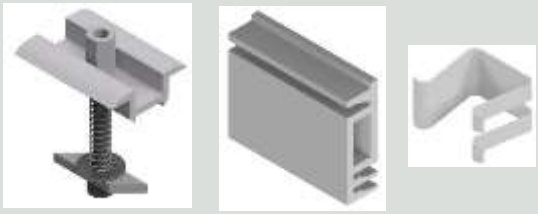
Figure 149 Butt connector TF50 + / TF50+m inside (blue) and leaf spring for potential equalization (red)

ⓘ Information

- Interlocking has been provided on roof hooks and type e.g. TF50+ carrier rails to compensate for differences in height on uneven roofs.
- Any carrier rails installed above each other must be in parallel.
- The ends of the rows must be aligned at an exact right angle (90°) to the bottom rail, as otherwise it will not be possible to align the joints between the modules.
- Once the carrier rails have been aligned, re-tighten IBC SOLAR AG screws to the corresponding tightening torque and re-check.

Have sun!

7. Fitting PV modules

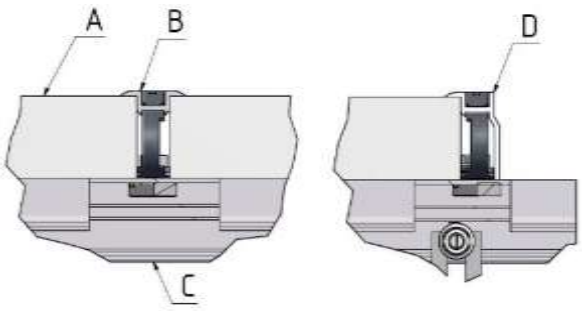
The Middle and End Clamp are delivered pre-assembled. The Middle Clamp G3 covers a clamping area of 30-50 mm. The End Clamp G3 must be ordered for the respective module height over 40 - 50 mm. The End Clamp G3 Vario can be adjusted for the respective module height of 30 - 40 mm..	 G3 Middle, End and Vario Clamp
The Middle Clamp G5 covers a clamping area of 30-40 mm. The EC adapter 30-40 mm is installed with the middle clamp G5 and Secure clip for EC adapter / cable guide and replaces the traditional outer clamp. The EC adapter 30-40 mm for G5 middle clamp covers only the frame sizes 30, 32, 35, 38 und 40 mm.	 G5 Middle Clamp and EC adapter 30-40 mm

Attention!

- The tightening torque of the G3 clamps is 15 Nm!
- The tightening torque of the G5 clamps is 10 Nm!

Do not use a ratchet or a wrench with high leverage as the maximum tightening torque could easily be exceeded.

Please only use a Torx screwdriver with T-handle or cordless screwdrivers with the appropriate torque settings.



A	Solar module
B	G3 Middle clamp
C	TF50+ carrier rail
D	G3 Outside clamp

Figure 150 Assembled clamps (sectional view)

- Using the slider to set the End Clamp G3 vario to the desired module frame hight.

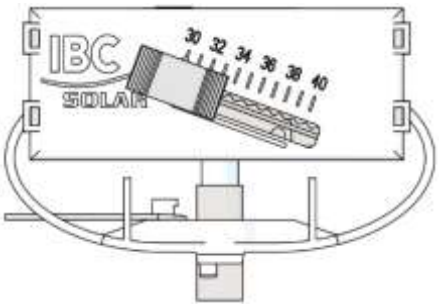


Figure 151 Slider End Clamp G3 Vario

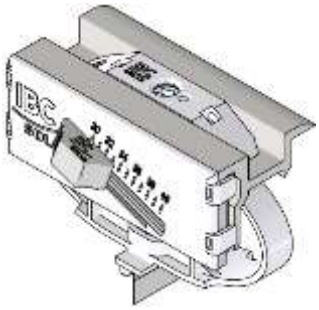


Figure 152 Slider End Clamp G3 Vario

- The middle and outside clamps can be inserted into the carrier rail directly from the top, into the position where they are required.

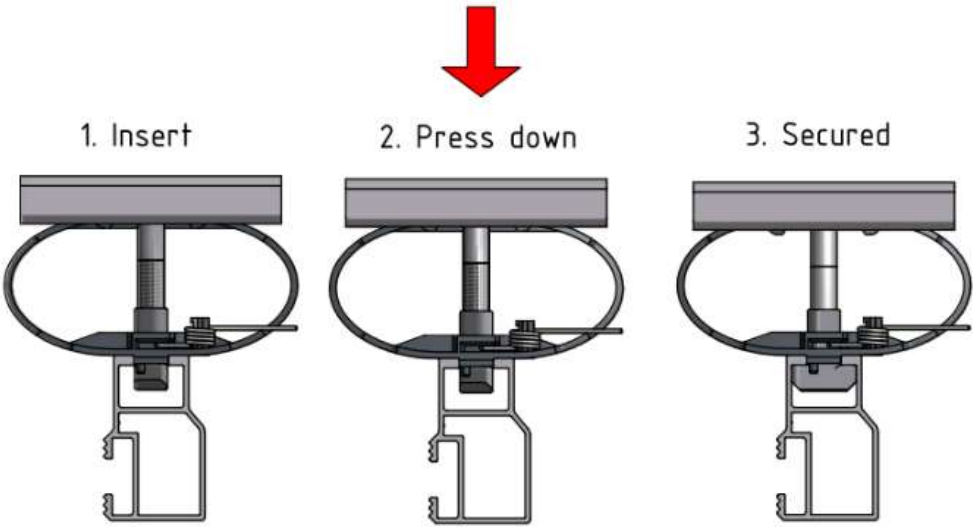


Figure 153 Inserting middle clamps G3

- The middle clamps G5 can be inserted into the supports directly from above where required.

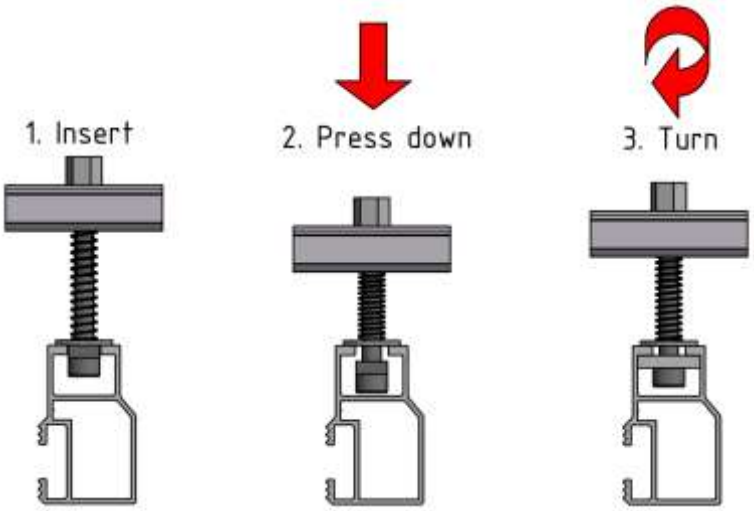


Figure 154 Inserting the middle clamp G5

- The adaptor EC 30-40 mm is clamped by the given frame height with the middle clamp G5 and substitutes thus the end clamp. Secure clip for EC adapter / cable guide fixes the AK adapter to the middle clamp G5..



Figure 155 EC adapter 30-40 mm with middle clamp G5 and secure clip

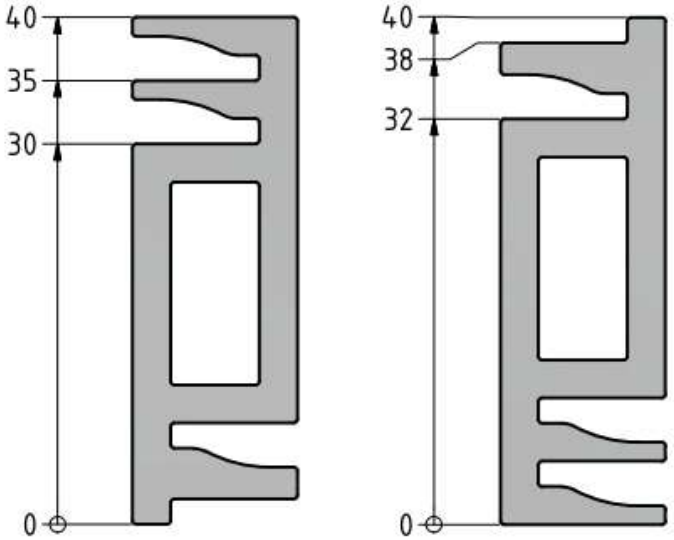


Figure 156 EC adapter 30-40 mm frame hights

- Subsequently place the first module onto both carrier rails, loosely tighten it to the outside clamps respectively the middle clamp including EC adapter and align the module. You may also use a piece of string to facilitate alignment. Then tighten the clamps to the tightening torque specified in Figure 199 in the Appendix.
- Also tighten all remaining modules in this way. We recommend you start with the top row of modules. Assemble all other rows below once it has been exactly aligned.
- Please observe the specifications of the currently valid Z-14.4-660 building surveillance certificate.

8. Fitting cable clips

The cable clips are used to fix the module connector cables and prevent sagging of the cable. The clips can be clamped to the carrier rails of the mounting system TopFix 200 or to the photovoltaic module frames without any tools. Figure 157shows the attachment of the cable clips 0° at the PV-module frame. In Figure 158 the cable clip is shown schematically 90° on a support profile.



Figure 157 Cable Clip 0°



Figure 158 Cable Clip 90°



Figure 159 Cable Clip MC4-Plug



Figure 160 Cable Clip 0° on module frame

9. Fitting the two-layer carrier system

9.1 General information

In contrast to single-layer carrier rails, this method additionally employs carrier rails as so-called roof hook connecting rails before the actual carrier rail is fitted.

9.2 Roof hook connecting support profiles e.g. type TF50+

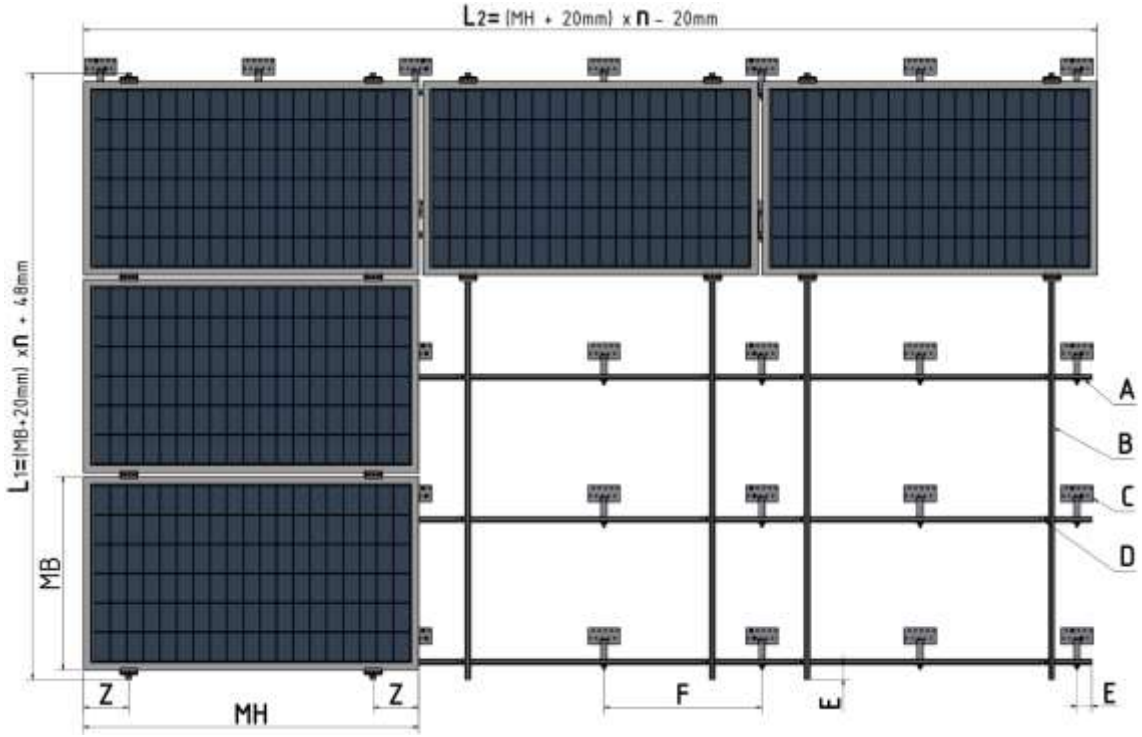


Figure 161 Roof hook connecting support profiles and support profiles as a unit

	Description
L = (MB + 20 mm) × n + 48 mm	Support rail length = (MB + 24 mm) × number of modules per row + 32 mm
L2 = (MH +20 mm) × n2 – 20 mm	Roof hook support rail length = (MH + 20 mm) × number of module rows – 20 mm
MB	Module width
MH	Module height
n	Number of modules
A	TF50+ / TF50+m / TF60 roof hook support rails
B	TF50+ / TF50+m / TF60 support rails
C	Roof hook
D	Two-layer connector
E	Max. 400 mm
F	As per PV Manager
Z	Please observe module manufacturer specifications

Dimensioning:

Two-layer systems are dimensioned in the same way as single-layer systems. However, the following special features must be taken into account:

- A two-layer connector must be plannes for each intersection of roof hook connection rail and support profile..
- Please also take into account the static values of roof hook connecting rails in addition to the roof hooks and carrier profiles. Use the PV Manager software to determine the static dimensions.
- We do not recommend you exceed a maximum carrier rail length of 11.90 m (5 beams 2.38 m) due to thermal expansion.

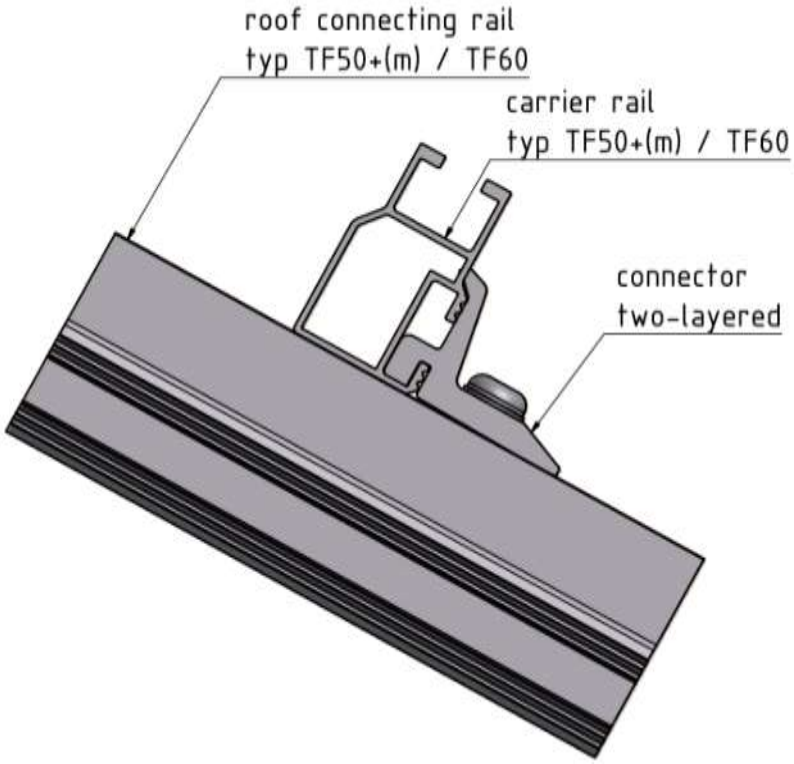


Figure 162 Cross section of a two-layer system structure

Have sun!

10. Delta support



10.1 General information

Delta supports enable to use the IBC TopFix 200 mounting system as an elevated mounting system and achieve optimum module inclination.

Delta supports are available with single as well as continuous base rails. Inclination angles between 10° and 45° can be adjusted in 5° steps.





Figure 163 Delta support with single base rail





Figure 164 Delta support with continuous base rail

10.2 Assembly

Assembling Delta supports

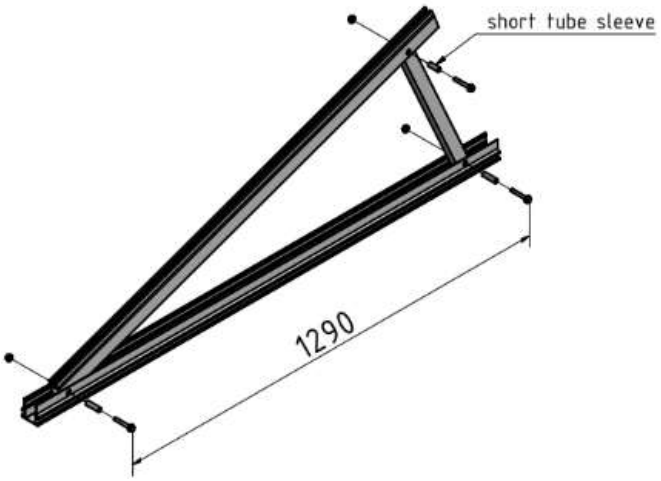


Figure 165 Assembling Delta supports at the base rails

Delta supports is supplied dissasembled, including three M8×50 hex screws with self-locking nut and tube sleeves. When assembling, all screw connections must be tightened to 15 Nm.

Only by the Delta support with continuous base rail, the 12.5mm holes in the base rail must be drilled on site in the centering groove. The hole spacing within the Delta support is 1290mm. The row spacing is individually manufactured according to the project.

At the Delta support single the base rail is 1,51 m, at the Delta support continuous is the base rail 4,9 m long.

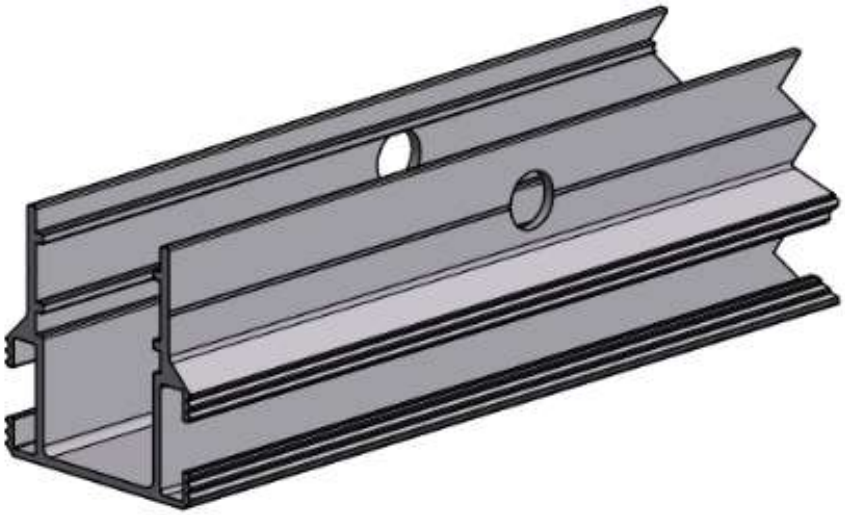


Figure 166 Centering groove for drilling

10.3 Connection to the roof

We offer the following connection types to connect Delta supports, depending on the available roof seal and roof substructure:

- Fixation by hanger bolt
- Fixation by universal connector
- Fixation by additional weight (e.g. positioning walkways, etc.)
- Fixation by trapezoidal clamps (two-layer connection with TF27)
- Fixation by roof hooks (single or two-layer connection)



Figure 167 Fixation by hanger bolt

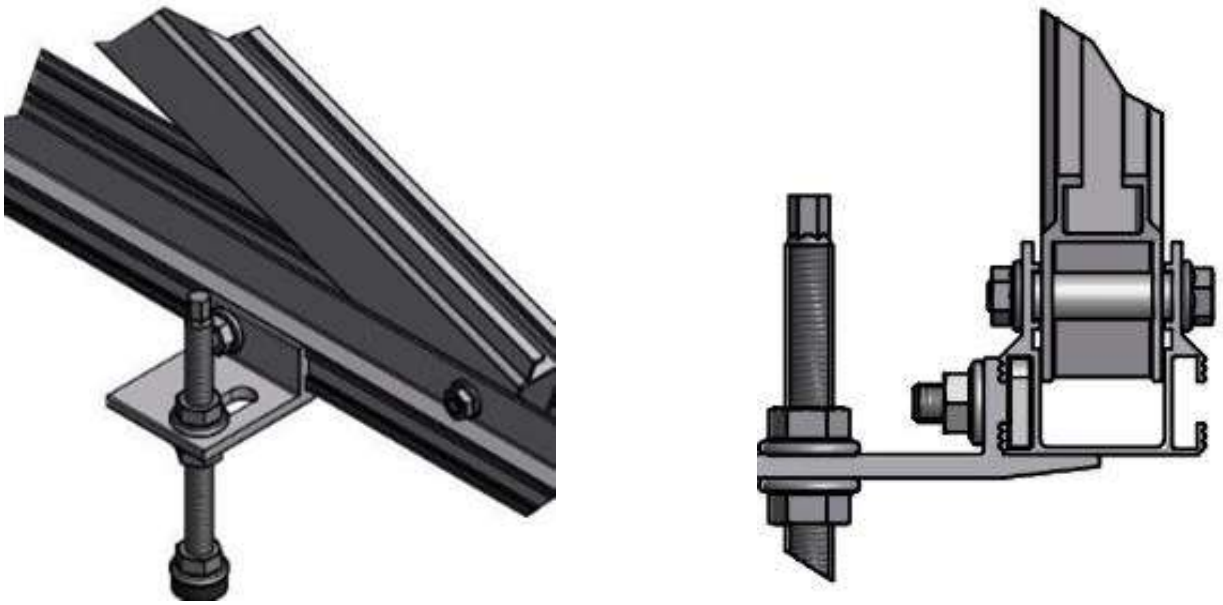


Figure 168 Fixation by universal connector

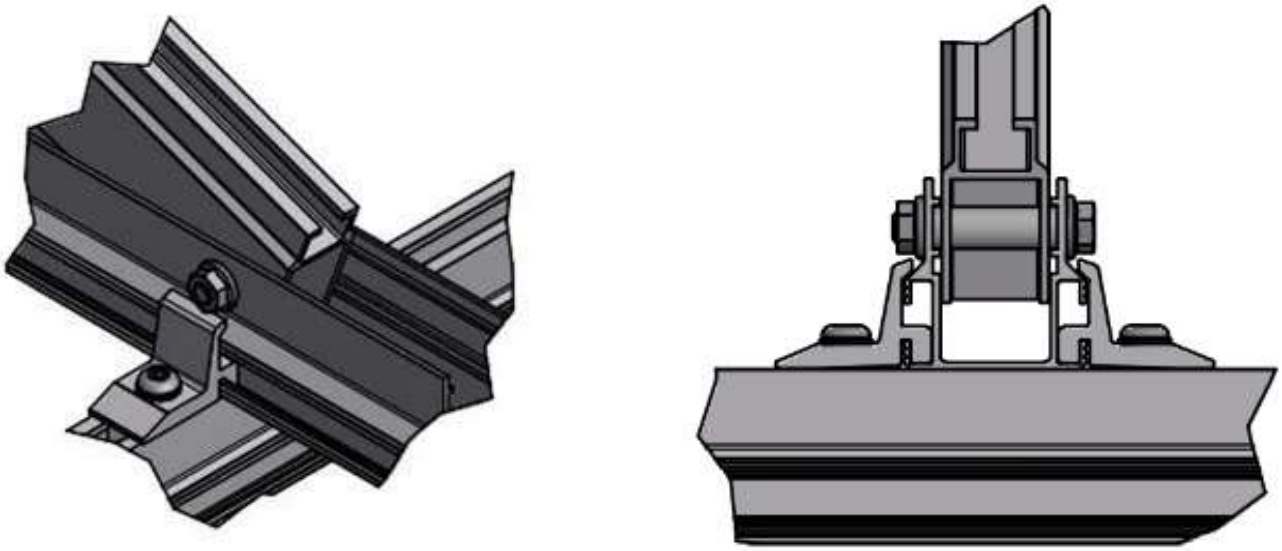
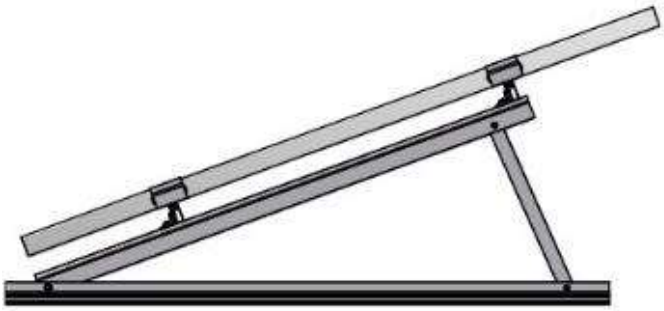


Figure 169 Two--layer fixation (two-layer connector)

10.4 Mounting modules

Modules can be mounted either horizontally or vertically using Delta supports. Modules up to a module size of 1.7 m can are suitable for vertical mounting.

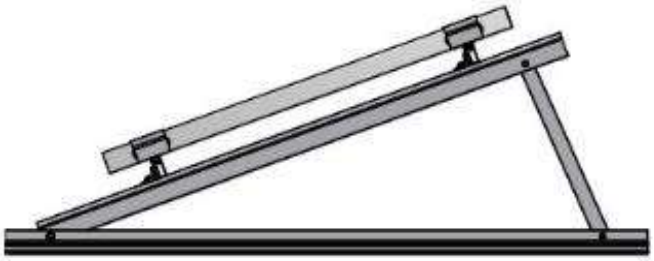
- Vertical module – clamps on the long sides



In this case, Delta supports are connected using two support rails (TF50+/TF50+m/TF60). Modules are then mounted on said carrier rails.

Figure 170 Vertically mounted modules with module support rail

- Horizontal module – clamps on the short sides



In this case, Delta supports are connected using two support rails (TF50/TF50+m/TF60). Modules are then mounted on said support rails. Please ensure that the modules have been approved for clamping on the short sides.

Figure 171 Horizontally mounted modules with module support rail

- Horizontal module – clamps on the long sides



In this assembly process, modules are mounted directly on the Delta support. In this case, no further support rails are used. However, two Delta supports are required per module.

Figure 172 Horizontally mounted modules without module support rail

Have sun!

11 Insertion system

11.1 General

The same conditions and prerequisites apply as described in section 5.1 General dimensioning information. The insertion rail is always mounted horizontally. On tiled roofs the insertion system is built as a 2 layer system. Therefore, only roof hooks can be used where the roof connector rail can be mounted from ridge to eaves.

For a better water drainage ≤Ø5 mm holes may be drilled in the insertion rails. The load capacity of the insertion rail must not be affected.

11.2 System installation

Step 1: Dimensioning using "PV Manager"

Step 2: Roof hook

- Install roof hooks as described in section 5.2 Fitting the roof hooks, 5.4 ASD screws- Mounting on rafter-mounted insulation systems or 5.5 "Mammut Form S+" roof hook.

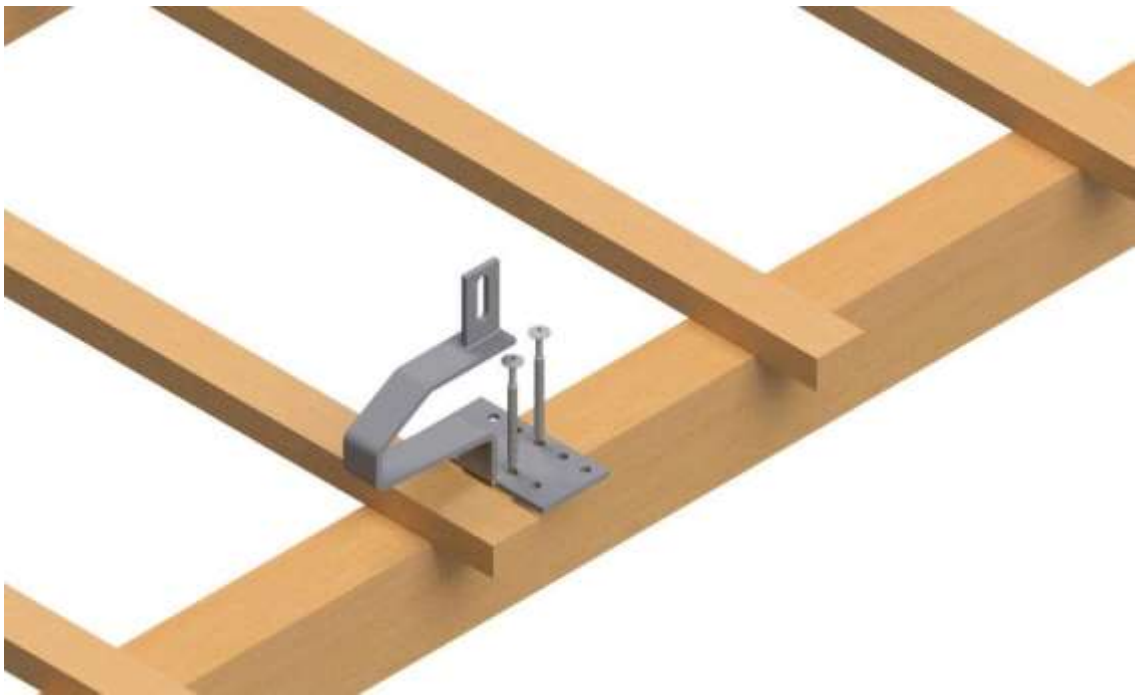


Figure 173 Example roof hook Mammut SV+

Step 3: Roof connector rail

- Mount and extend the profiles as shown in chapter 6. Fitting carrier rails
- Align the other rails with each other by means of a cord.

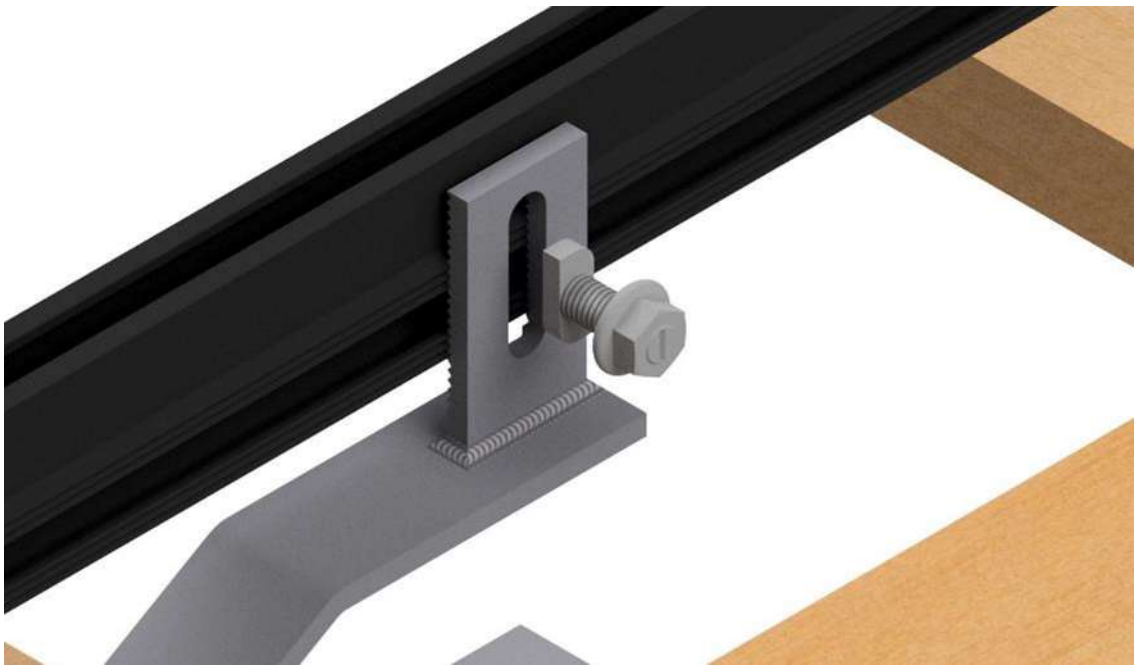


Figure 174 Roof connector rail assembly

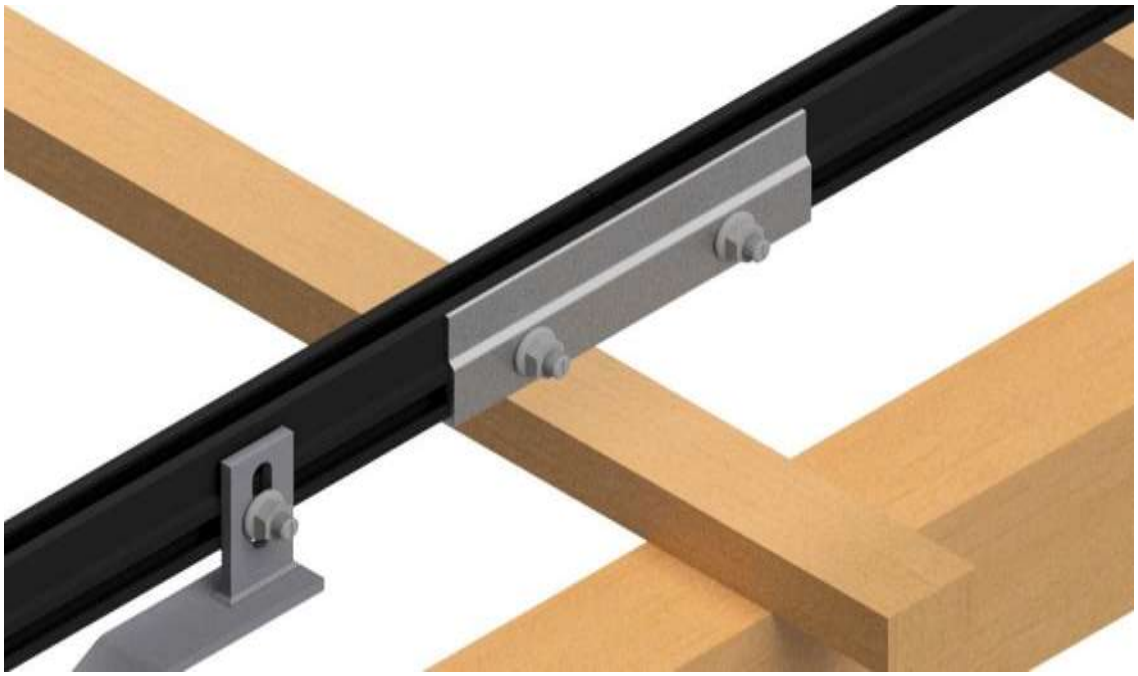


Figure 175 Butt connector for carrier rail TF50+

Step 4: Insertion rail distances and assembly jig

⚠ Attention!
Position the legs of the insertion rails as shown in Figure 176 in relation to the roof pitch.

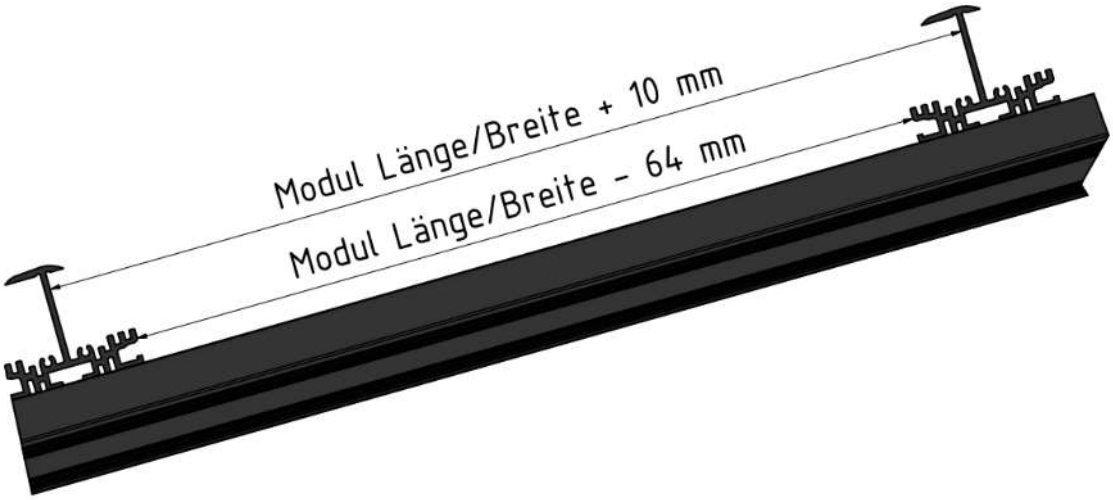


Figure 176 Insertion rails distance: Module length / -width + 10 mm, or module length / width - 64 mm

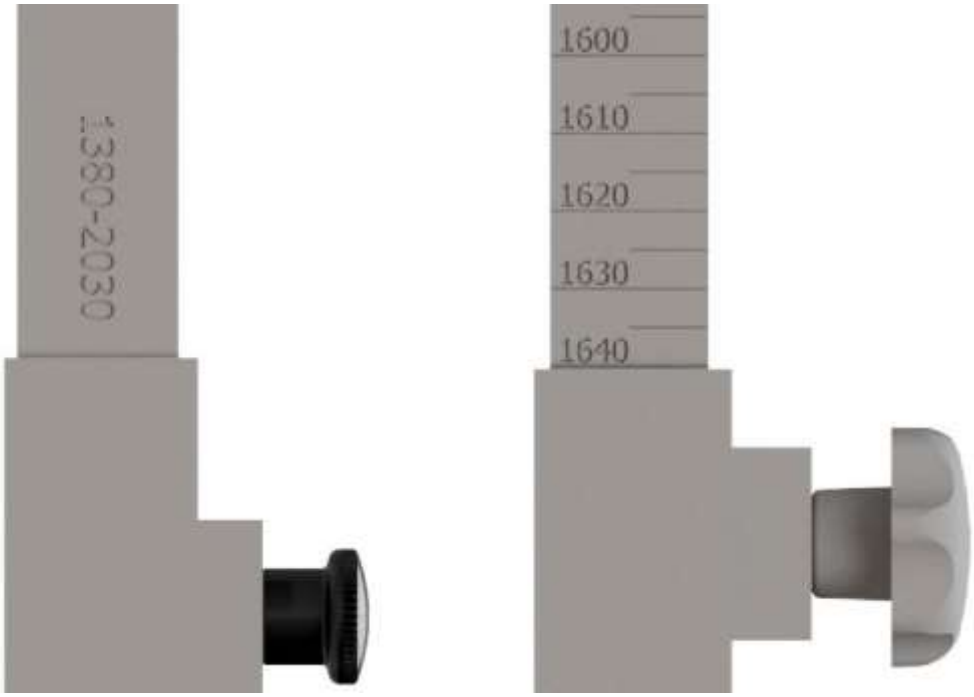


Figure 177 Adjusting the assembly jig

⚠ Attention!
The dimension set on the assembly jig does not correspond to the real length.



Figure 178 Positioned assembly jig

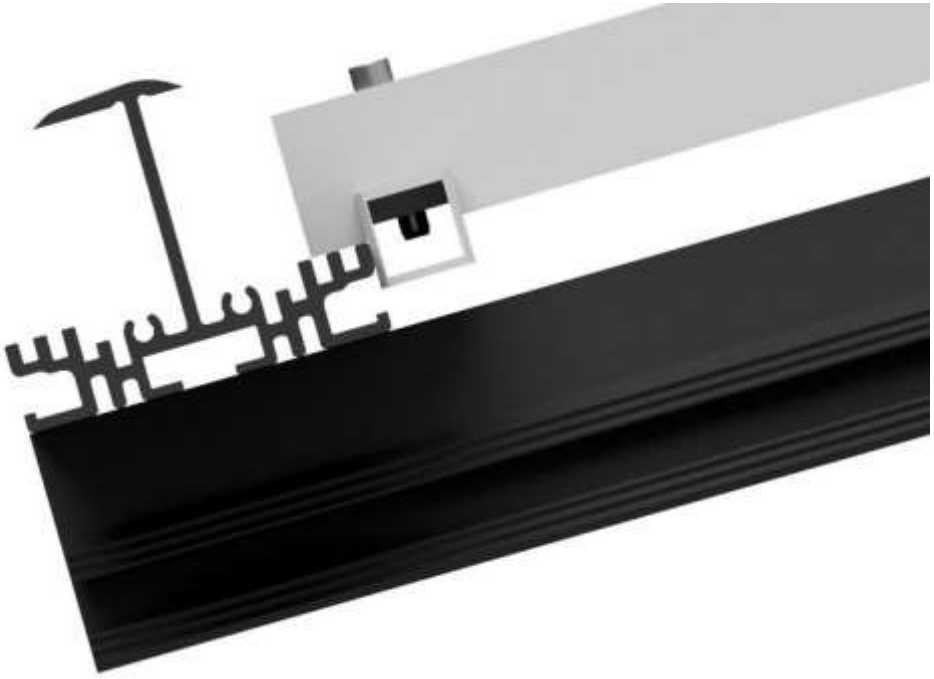


Figure 179 Detail position assembly jig bottom, analog top

Step 5: Two-layer connector

- The two-layer connector is mounted on the top and bottom insertion profile only on the inside. All other insertion profiles are fitted with a two-layer connector on both sides.



Figure 180 Position two-layer connector



Figure 181 Two-layer connector

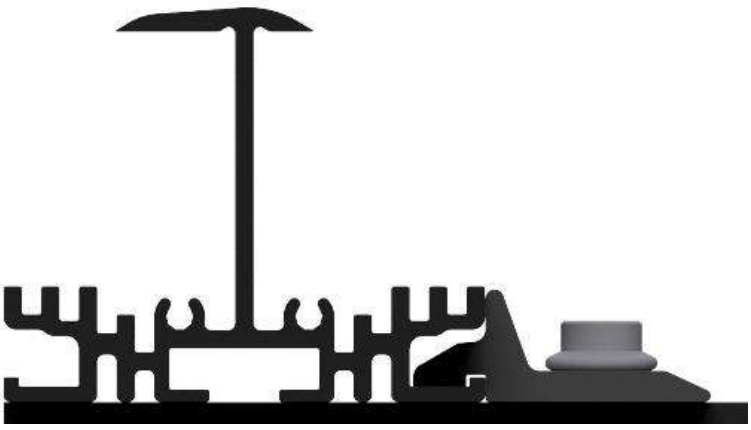


Figure 182 Side view two-layer connector

Step 6: Butt connector

- The butt connector is screwed from below with 4 t-head screws to the insertion rail.
- A small gap between the insertion rails can be left for a better water drainage.

⚠ Attention!
Ensure that all t-head screws have turned in the rail and are therefore completely engaged. The insertion rail pieces must be fastened to at least two support points before a butt connector may be installed. Not more than one butt connector may be installed within two support points.

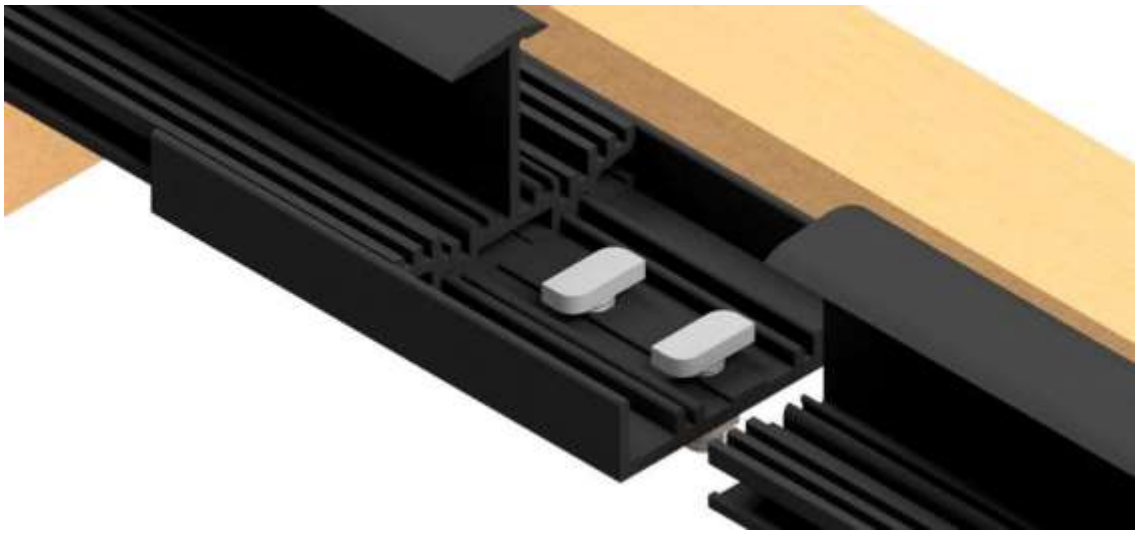


Figure 183 Butt connector insertion rail

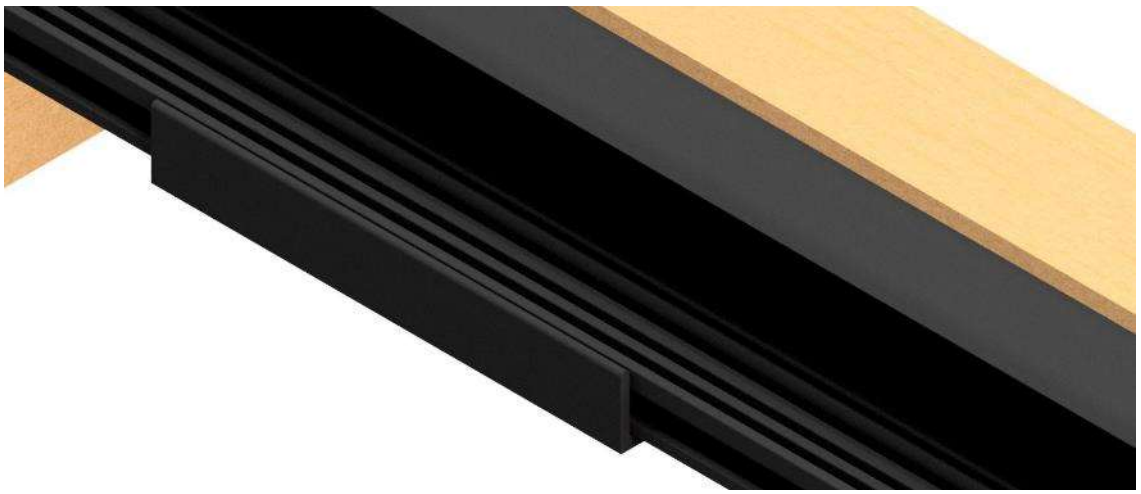


Figure 184 Mounted butt connector insertion rail

Step 7: Module frame height and adapter rail

- At 40 mm module frame height, no adapter rail is required
- The adapter rail is inserted into the insertion rail only at module frame heights of 38, 35, 33, 32, 31 and 30 mm at the corresponding position.

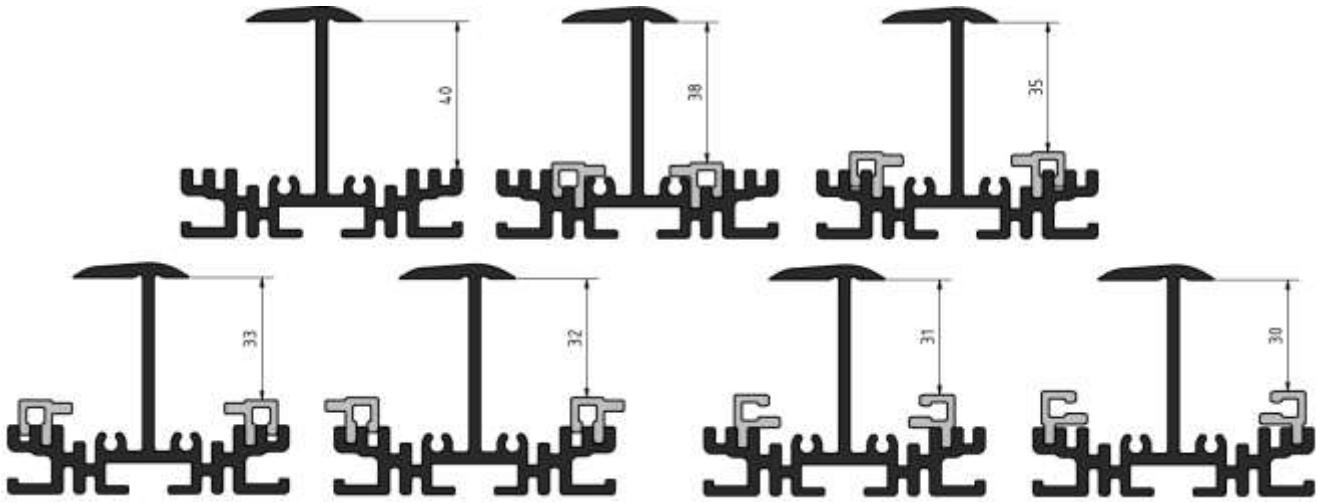


Figure 185 Possible module frame heights



Figure 186 Insertion system adapter rail

Step 8: Insert module

- The modules are inserted diagonally into the upper insertion rail, placed on the lower insertion rail and pushed down to the stop.

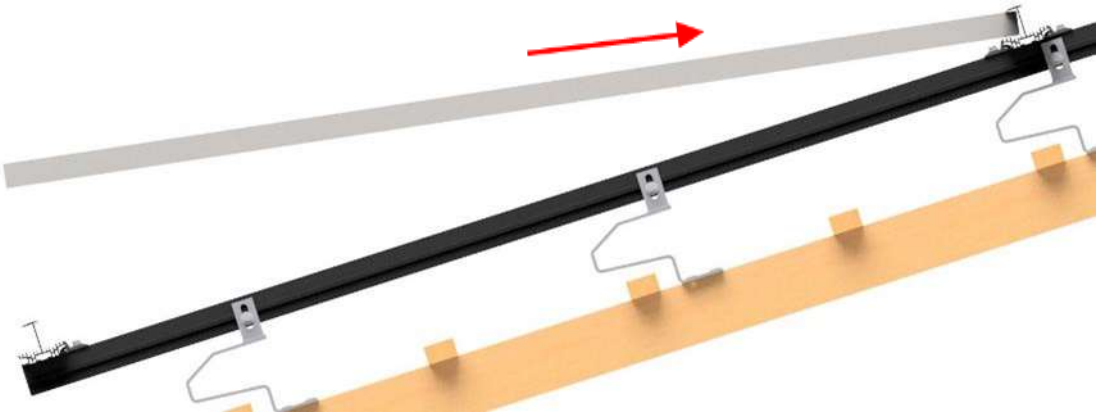


Figure 187 Insert module



Figure 188 Put down module



Figure 189 Slide module into position

Step 9: Spacer / protection against theft

- The spacer is inserted at the top between the module and the insertion rail
- A ratting of the modules by wind is prevented, bacaus the modules are easily clamped.
- An illegal removal of the modules is prevented.
- Note the gap between the modules in module installation manual. 10 mm gap for IBC modules is maintained.
- If the roof pitch is <15°, the spacer must be installed.

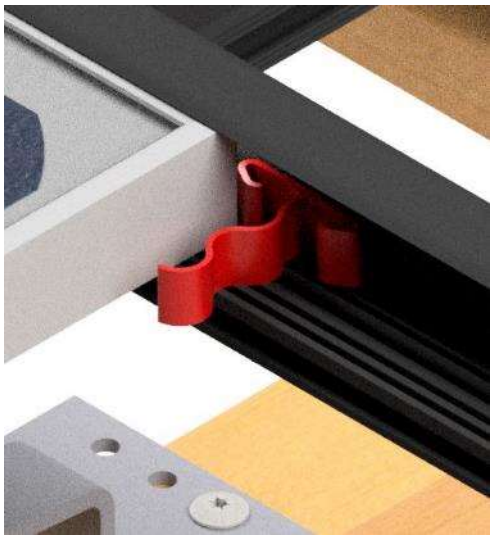


Figure 190 Attach spacer

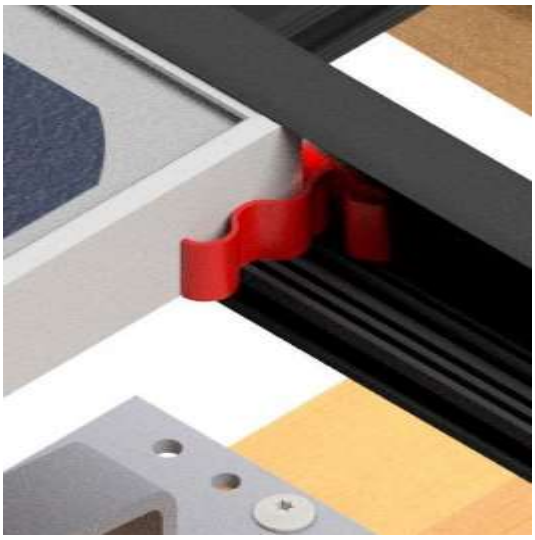


Figure 191 Insert spacer

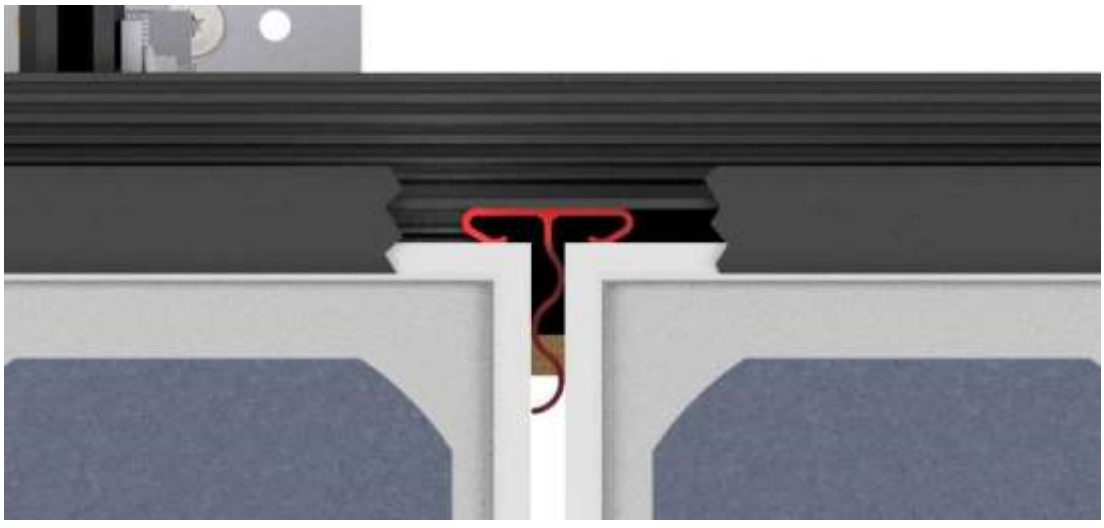


Figure 192 Mounted spacer

Step 10: Side plate

- The side plate is fixed to the insertion rail with 2 sheet metal svrews 4.8x19.
- Holes in the side plate allow a drainage of water

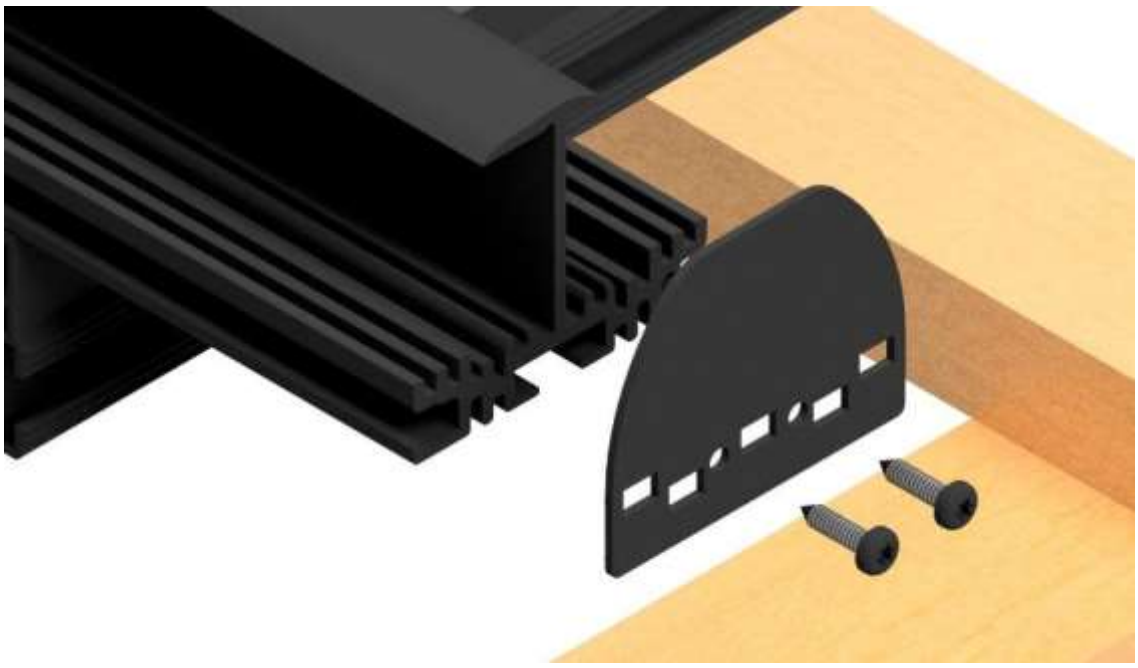


Figure 193 Side plate

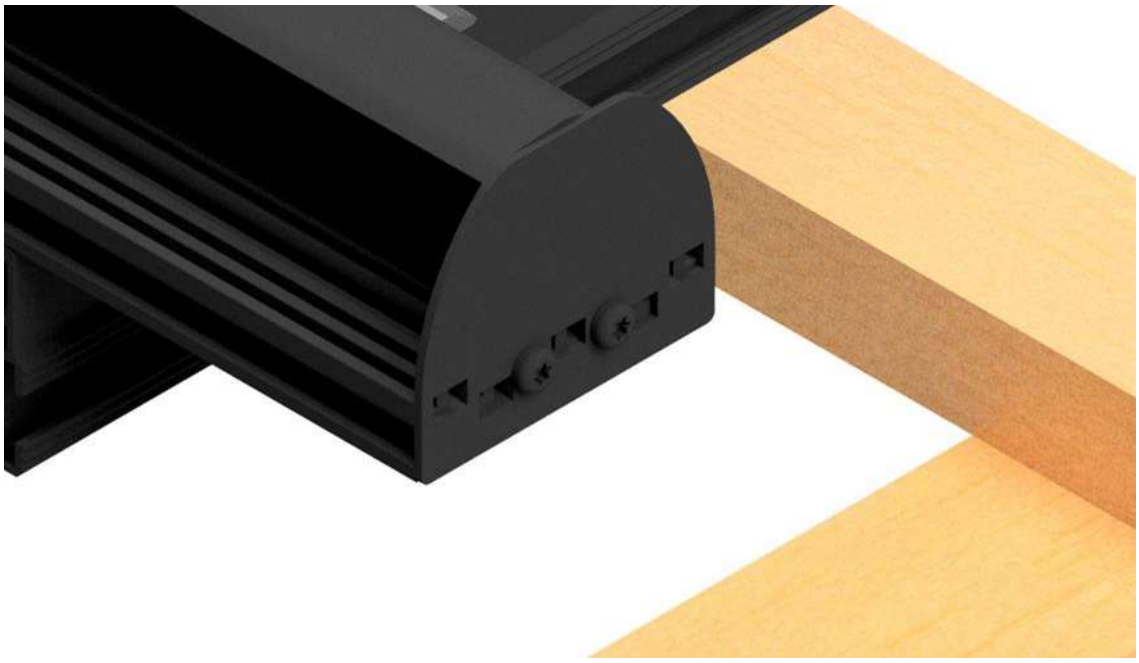


Figure 194 Mounted side plate

Step 11: End cover

- The end cover is clicked into the top and bottom insertion rail. If modules are missing within the module field, end covers are also installed here.

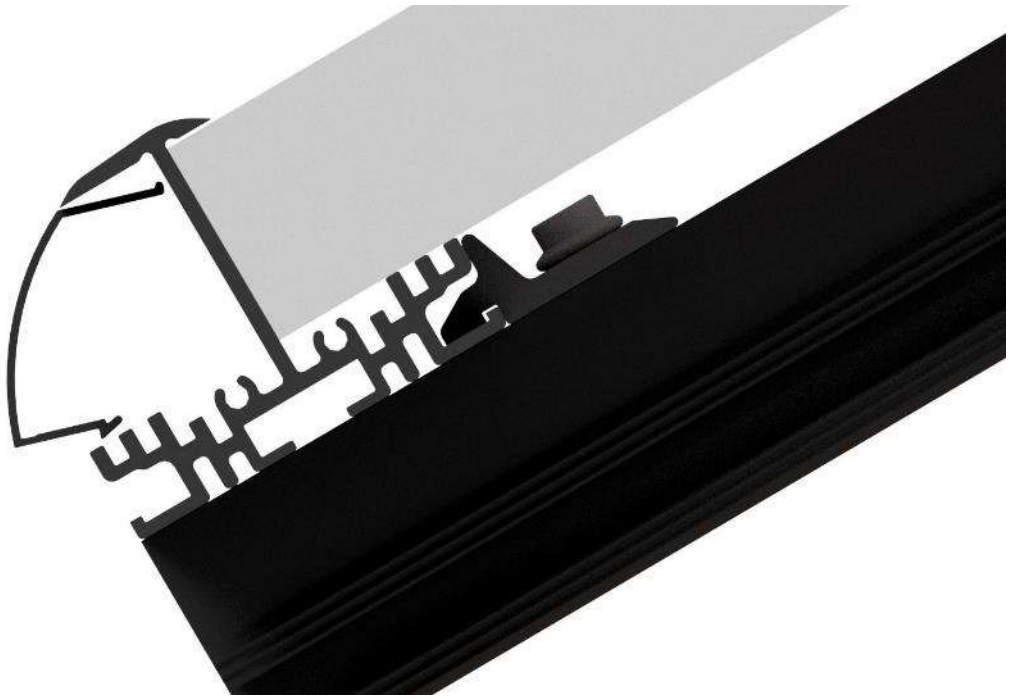


Figure 195 Attach the end cover and click in



Figure 196 Mounted end cover at the bottom

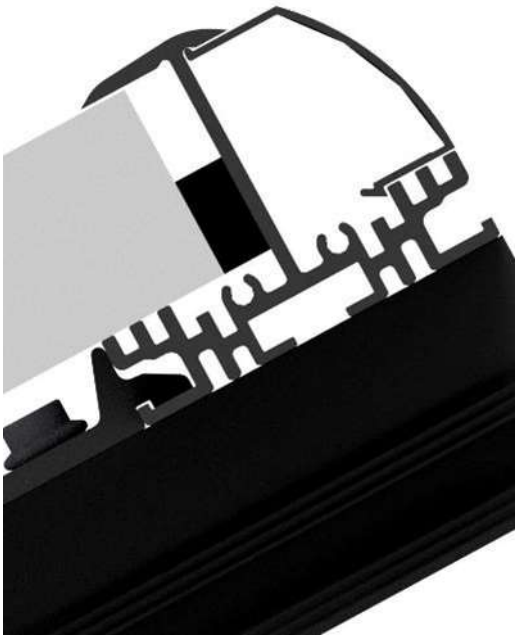


Figure 197 Mounted end cover at the top

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12. Bill of materials

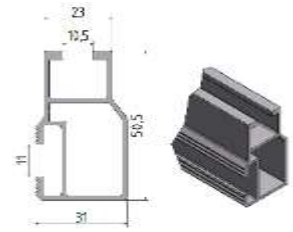
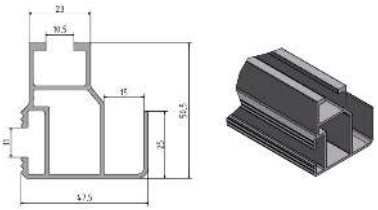
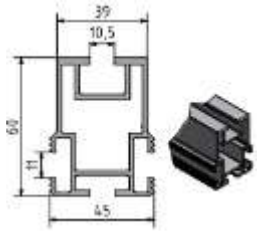
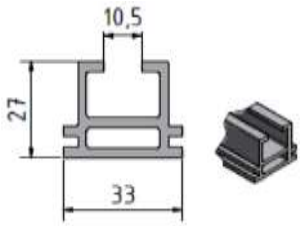
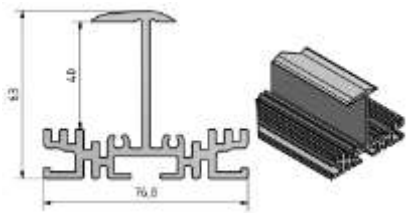
Illustration	Item no.:	Item
	6800100062	Support Rail TF50+, 5850mm
	6800100063	Support Rail TF50+, 5850mm black
	6800100064	Support Rail TF50+, 3550mm
	6800100065	Support Rail TF50+, 2380mm
	6800100066	Support Rail TF50+, 2380mm black
	6800100067	Support Rail TF50+m, 5850mm
	6800100068	Support Rail TF50+m, 5850mm black
	6800100069	Support Rail TF50+m, 2380mm
	6800100070	Support Rail TF60, 5850mm
	6800100071	Support Rail TF60, 2380mm
	6101100111	TF27 support PIECE 420mm
	6800100072	Support Rail TF27-T, 5850mm
	6800100073	Support Rail TF27-T, 3550mm
	6800100074	Support Rail TF27-T, 2380mm
	6800100058	Insertion Rail, 5715mm black
	6800100059	Insertion Rail, 2280mm black

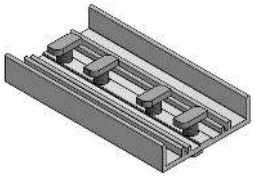
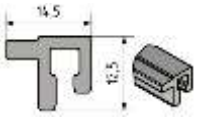
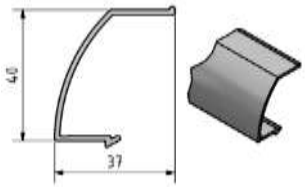
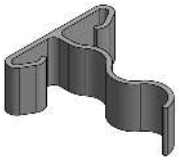
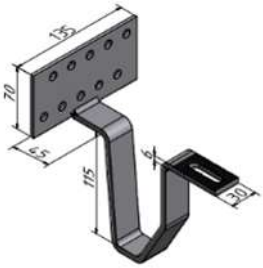
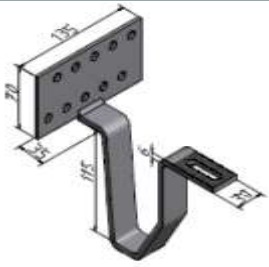
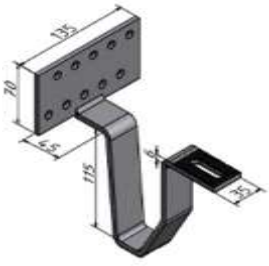
Illustration	Item no.:	Item
	6700300064	Butt Connector Insertion Rail black
	6800100061	Adapter Rail, 2280mm, 30-33,35,38mm
	6800100036	End Cover, 2010mm black
	6800100060	End Cover, 2280mm black
	6700200051	Side Plate black
	6700300063	Two-Layer Connector black TX40 or SW 13
	6700200052	Spacer black
	6900600012	Tapping Screw 4.8x19 black
		Middle Clamp G3
	6700400125	Middle Clamp G3 30-50mm
	6700400126	Middle Clamp G3 30-50mm black

Illustration	Item no.:	Item
		End Clamp G3 IBC TopFix 200
	6700400170	End Clamp G3 30mm
	6700400171	End Clamp G3 30 mm black
	6700400127	End Clamp G3 31 mm *(Discontinued products)*
	6700400128	End Clamp G3 31 mm black *(Discontinued products)*
	6700400165	End Clamp G3 32mm *(Discontinued products)*
	6700400166	End Clamp G3 32mm black *(Discontinued products)*
	6700400129	End Clamp G3 33 mm *(Discontinued products)*
	6700400169	End Clamp G3 33mm black *(Discontinued products)*
	6700400130	End Clamp G3 35mm *(Discontinued products)*
	6700400131	End Clamp G3 35 mm black *(Discontinued products)*
	6700400132	End Clamp G3 38 mm *(Discontinued products)*
	6700400133	End Clamp G3 38 mm black *(Discontinued products)*
	6700400134	End Clamp G3 40 mm *(Discontinued products)*
	6700400135	End Clamp G3 40 mm black
	6700400136	End Clamp G3 42 mm
	6700400137	End Clamp G3 42 mm black
	6700400138	End Clamp G3 45 mm
	6700400139	End Clamp G3 45 mm black
	6700400140	End Clamp G3 46 mm
	6700400141	End Clamp G3 46mm black
	6700400142	End Clamp G3 50 mm
	6700400143	End Clamp G3 50 mm black
	6700400176	End Clamp G3 Vario
	6700400177	End Clamp G3 Vario black

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Illustration	Item no.:	Item
	6700400172	Middle Clamp G5 30-40mm
	6700400173	Middle Clamp G5 30-40mm black
	6700400174	EC Adapter 30-40mm
	6700400175	EC Adapter 30-40mm black
	6700300067	Secure clip for EC adapter / cable guide
	6700100026	Roof Hook Standard S+
	6700100032	Roof Hook Standard S+ 35mm
	6700100027	Roof Hook Mammut S+

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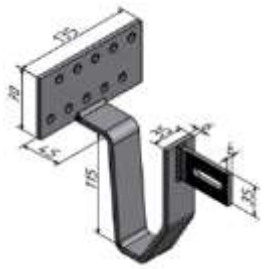
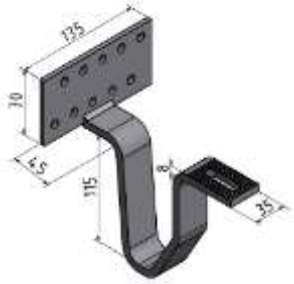
Illustration	Item no.:	Item
	6700100028	Roof Hook Mammut SV+
	6700100029	Roof Hook Vario S+
	6700100030	Roof Hook Plain Tile S+
	6700100031	Roof Hook Slate S+
	6700100041	Roof Hook Mammut XL S+

Illustration	Item no.:	Item
	6700700037- 6700700040 & 6700700042- 6700700050 & 6700700052- 6700700099 & 6700700101- 6700700102 & 6700700117- 6700700121	Mammut Form S+ roof hook Includes: 1x roof hook with sheet metal tile 1x reinforcing runner 3x 4.2x32 mm drilling screw (tallow-drop screw, galvanised, AW 20) 1x 5.0x120 mm drilling screw (self-tapping, countersunk screw, galvanised, AW 20 type 2) 2x 5.0x60 mm drilling screw (self-tapping screw, A2 stainless steel, AW 20 type 2) For available types see "Mammut Form S+" leaflet
	6700700051	"Mammut Form S+" roof hook for bitumen roofs Includes: 1x roof hook with sheet metal tile 8x 4.8x32 mm drilling screw (tallow-drop screw, galvanised, AW 25) 2x 4.8x60 mm drilling screw (tallow-drop screw, galvanised, AW 25)
	6700700041	“Mammut Form S+“ roof hook For slate & metal shingle Includes: 1x roof hook 1x mounting plate with seal 1x.cover cap 3x wood screw 8 x 140 mm 2 St. nuts M6
	6700700100	Form S+ exchange screw for rafter-mounted insulati
	6700700122	Form S+ Screwset like in the original package

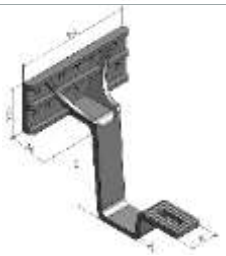
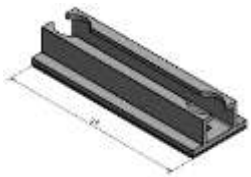
Illustration	Item no.:	Item
	6700100045	Roof Hook Alu-Vario Eco S+
	6700100038	Roof Hook Alu-Mammut S+
	6700100039	Roof Hook Alu-Mammut SV+
	6700200036	Trapezoidal Sheet Metal Clamp Without accessories
	6700200037	Trapezoidal System Eco, 340 mm Without accessories
	6700200038	Trapezoidal System Eco, 420 mm Without accessories
	6700200058	Trapezoidal System Eco 120 mm Without accessories

Illustration	Item no.:	Item
	6700200041	Hanger bolt M12x300 A2 SW9 Including 1x EPDM seal 3x M12 A2 self-locking nuts → completely pre-assembled
	6700200045	Hanger bolt M12x250 A2 SW9 Including 1x EPDM seal 3x M12 A2 self-locking nuts → completely pre-assembled
	6700200026	Hanger bolt M10x200 A2 SW7 Including 1x EPDM seal 3x M10 A2 self-locking nuts → completely pre-assembled
	6700200018	Solar fastener 8/M10x80/50 Including bell-type seal and nuts, pre-assembled
	6700200019	Solar fastener 8/M10x100/50 Including bell-type seal and nuts, pre-assembled
	6700200020	Solar fastener 8/M10x125/50 Including bell-type seal and nuts, pre-assembled
	6700200021	Solar fastener 8/M10x150/50 Including bell-type seal and nuts, pre-assembled
	6700200022	Solar fastener 8/M10x160/50 Including bell-type seal and nuts, pre-assembled
	6700200023	Solar fastener 8/M10x200/50 Including bell-type seal and nuts, pre-assembled

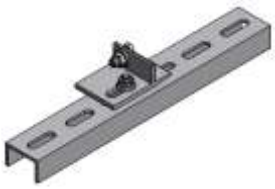
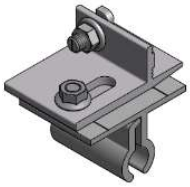
Illustration	Item no.:	Item
	6700300050	Mounting plate duo TopFix 200 Including screws + universal connector
	6700300051	Mounting plate duo TopFix 200 Including Connecting Connection Piece M10
	6700200049	Universal Metal Seam Clamp G2
	6700200027	Original Kalzip® clamp Including universal connector
	6101100027	Cable clip 0°
	6101100028	Cable clip 90°
	6700300070	Cable Clip MC4-Plug

Illustration	Item no.:	Item
		Delta-Stütze, single
	6100300024	Delta support, 10°, single
	6100300025	Delta support, 15°, single
	6100300026	Delta support, 20°, single
	6100300027	Delta support, 25°, single
	6100300028	Delta support, 30°, single
	6100300029	Delta support, 35°, single
	6100300030	Delta support, 40°, single
	6100300031	Delta support, 45°, single
		Delta support, continuous without base rail
	6100300032	Delta support, 10°, continuous
	6100300033	Delta support, 15°, continuous
	6100300034	Delta support, 20°, continuous
	6100300035	Delta support, 25°, continuous
	6100300036	Delta support, 30°, continuous
	6100300037	Delta support, 35°, continuous
	6100300038	Delta support, 40°, continuous
	6100300039	Delta support, 45°, continuous

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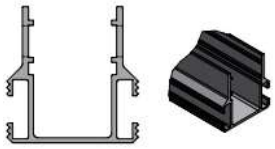
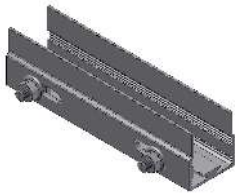
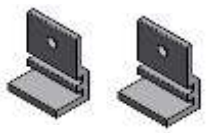
Illustration	Item no.:	Item
	6800900014	Base Rail D-S, 4900mm
	6700300066	Butt connector TF50+ / TF50+m inside Including 1x leaf spring for potential equalization
	6700300044	Butt connector TF60 Including 2x M10x25 A2 T-head screws 2x DIN 6923 M10 A4 locking nuts
	6700300058	Butt connector TF27-T Without accessories
	6700300047	Butt Connector Base Rail D-S Including 2x M10x25 A2 T-head screws 2x DIN 6923 M10 A4 locking nuts
	6700300059	Positive-Locking-Clamp Set Without accessories
	6700300035	Universal connector Including 1x M10x35 A2 T-head screw 1x M10 A4 locking nut → completely pre-assembled

Illustration	Item no.:	Item
	6700300037	Two-layer connector → completely pre-assembled
	6700300041	Rail end cap for TF50+ and TF50+m
	6700300061	Rail end cap black for TF50+ and TF50+m
	6700300045	Rail end cap for TF60
	6900300022	Flange Head Screw 6x100 A2
	6900300008	Flange Head Screw 8 x 100 A2
	6900300010	Flange Head Screw 8 x 140 A2
	6900300011	Countersunk screw 8x 100 A2
	6900300012	Flange Head Screw 8x 40 A2
	6900300014	ASD Flange Head Screw 8x240 A2 With thread under the screw head
	6900300015	ASD Flange Head Screw 8x300 A2 With thread under the screw head
	6900300016	ASD countersunk screw 8x280
	6900300017	ASD countersunk screw 8x340

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Illustration	Item no.:	Item
	6908300003	Blind Rivet 4.8x15
	6900600011	Self-Drilling-Screw 5.5x25
	6700300032	Connection Piece M10
	6700300053	Connection Piece M8
	6700300033	Universal Connection Piece TX40 or SW 13
	6700300068	Universal Connection Piece M6
	6700300076	Windblechklemme TF27 / AeroFix
	6700200013	Clamp for equipotential bonding
	6101100100	Bottom support G3 single
	6101100099	Bottom support G3 double

Illustration	Item no.:	Item
	6101100093	Top support G3 10° oWbh
	6101100094	Top support G3 10° mWbh
	6101100096	Top support G3 15° L, 8° P oWbh
	6101100095	Top support G3 15° L, 8° P mWbh
	6101100102	Bottom support G3 single basic
	6101100101	Bottom support G3 double basic
	6101100097	Top support G3 10° basic
	6101100098	Top support G3 15° L, 8° P basic

Illustration	Item no.:	Item
	6101100118	Wind plate 10°, module width max. 1750mm 4PK
	6101100119	Wind plate 10°, module width max. 2100mm 4PK
	6101100120	Wind plate 15° L, 8° P, module length max. 1750mm 4PK
	6101100121	Wind plate 15° L, 8° P, module length max. 2100mm 4PK
	6101100122	Wind plate 8° P, module width max. 1150mm 4PK
	6101100124	ballast rail 1,2 m 4PK, module length max. 1750mm
	6101100125	ballast rail 1,8 m 4PK, module length max. 1750mm
	6101100126	ballast rail 2,15 m 4PK, module length max. 1750mm
	6101100112	Alu-L-Profile 50x30x4 support PIECE 180mm
	6000300021	Assembly jig AeroFix G3 & insertion system TopFix200

Figure 198 Bill of materials

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13 Appendix

13.1 Notes on IBC TopFix 200

The tightening torques for the screw connections used in the IBC TopFix200 mounting system must be dimensioned in accordance with DIN ISO 3506, to document and archive for 10 years. Due to the difficulty in determining the outdoor friction coefficients, dimensioning in accordance with DIN ISO 3506 can prove difficult. We therefore recommend the following tightening torques:

Screw connection	Tightening torque
M6	10 Nm
M8	15 Nm
M8 connection piece for roof hook-profile	30 Nm
M10	
Self-Drilling-Screw 5.5x25	approx. 4 Nm (tighten until the sealing washer swells out slightly)

Figure 199 Pre-tension for screws

We do not recommend using a wrench as this may quickly cause you to exceed the tightening torque. It is sufficient to use a torque wrench or a hex spanner with T-grip.

⚠ Attention!
When using laminate clamps, please clarify the tightening torque for the corresponding assembly situation with the laminate manufacturer.

Required rafter and purlin dimensions

Comply with the following minimum dimensions for rafters and purlins as per EN 1995-1-1.

structural element	stress		title edge distance		diameter d [mm]	miniumum depth [mm]	minimum dimension width "b" [mm] (pre-drilled)	edge distances not pre-drilled ρ_k < 420 kg/m³	not pre-drilled 420 kg/m³ < ρ_k < 500 kg/m³	pre-drilled ρ_k > 500 kg/m³
		1		type of wood				soft wood - solid wood C24 – C40 laminated timber GL24 - GL28 and GL32c	laminated timber GL32h, GL36	hard wood - solid wood D30 – D60
rafter	vertikal (roof hook)	2		formula		4 x d	2 x $a_{2,c}$ + 15 mm*)	$a_{2,c}$ = 5 x d	$a_{2,c}$ = 7 x d	$a_{2,c}$ = 3 x d
		3	$a_{2,c}$	unstressed edge	6	24 mm	51 mm	30 mm	42 mm	18 mm
					8	32 mm	63 mm	40 mm	56 mm	24 mm
					10	40 mm	75 mm	50 mm	70 mm	30 mm
					12	48 mm	87 mm	60 mm	84 mm	36 mm
purlin	horizontal (Hanger bolt)	4		formula		4 x d	$a_{2,t}$ + $a_{2,c}$	$a_{2,t}$ = (5 + 5 x sin α) x d	$a_{2,t}$ = (7 + 5 x sin α) x d	$a_{2,t}$ = (3 + 4 x sin α) x d
		5	$a_{2,t}$	stressed edge	6	24 mm	60 mm	60 mm	72 mm	42 mm
					8	32 mm	80 mm	80 mm	96 mm	56 mm
					10	40 mm	100 mm	100 mm	120 mm	70 mm
					12	48 mm	120 mm	120 mm	144 mm	84 mm

*) 15 mm = center distance between flat head screws
α angle between direction of force and direction of fiber (purlins 90°)
pre-drill with 0,7 x d

Figure 200 Minimum distance and required timber component dimensions

The minimum rafter/purlin height must be 100 mm.

The minimum distance between fastened flat head screws and the edges of rafters and purlins must be three times the flat head screw diameter. Position hanger bolts in the centre of rafters and outside the centre on purlins.

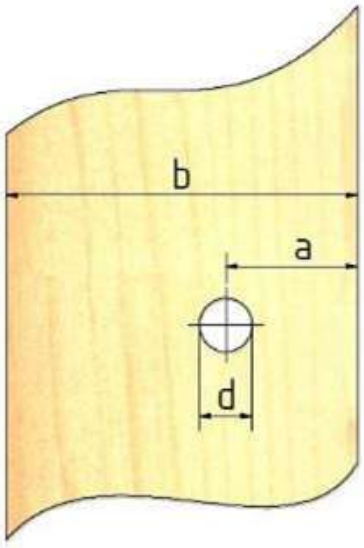


Figure 201 Defining the distance to the edge of rafters

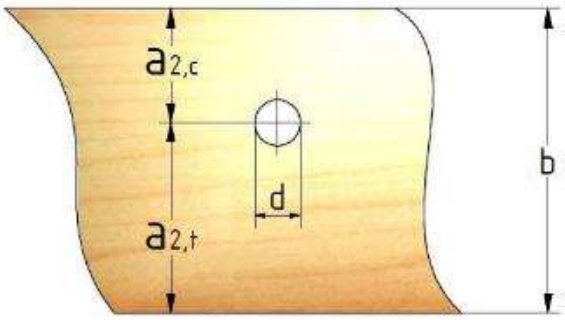


Figure 202 Defining the distance to the edge of purlins

13.2 Weights/installation times for pitched roof installations

	Weight per m² of module surface	Weight per kWp
Thin-film solar modules	10 ... 17 kg/m²	130 ... 300 kg/kWp
Crystalline solar modules	11 ... 21 kg/m²	70 ... 175 kg/kWp
Single-layer mounting system	*2,4 ... 5 kg/m²	*18 ... 35 kg/kWp
Two-layer mounting system	*5 ... 7 kg/m²	*35 ... 50 kg/kWp

*Values are based on crystalline solar modules, the weight of the mounting system increases with thin-film solar modules.

13.3 Notes on maintenance

In addition to the electrical inspections prescribed for the entire PV system, it must be carried out an annual and event-dependent (heavy storm, hail etc.) inspections of the mounting system into account the points of the maintenance log. In the maintenance log, "not ok" points must be repaired to avoid further damage.

Mechanical connections, e.g. the module clamps must be checked for firm seating and tightening torque and tightened if necessary. Building protection mats can slip and have to be put back in position.

Disassemly of the mounting system is carried out in the reverse order of assemly steps.

If it becomes necessary to clean the modules, this must be done without chemical cleaning products and using clear water only. Observe the specifications of the module manufacturer.

The modules can easily be replaced by removing the module cabling and undoing the corresponding module clamps. In this process, please observe the relevant safety requirements.

Have sun!

13.4 Documents

Wartungsprotokoll ☒ **TopFix 200** ☐ **AeroFix** ☐ **AeroFlat**
Maintenance log TopFix 200 AeroFix AeroFlat

Kommission:
Commission: .....
Standort:
Place: .....

i.O. Ok	n.i.O. not Ok	
☐	☐	Anlage befindet sich in einem optisch einwandfreien Zustand und laut Montageplan auf korrekter Position The system is in a visually perfect condition and according to the installation plan in the correct position
☐	☐	Montagesystem auf Standfestigkeit und Korrosion geprüft Mounting system tested for stability and corrosion
☐	☐	Keine Beschädigungen der Dachhaut durch die PV Anlage No damage to the roof by the PV system
☐	☐	Mechanische Verbindungen auf festen Sitz und Anzugsmoment gemäß Montageanleitung geprüft Mechanical connections for tight fit and tightening torque tested according the installation manual

Zusätzlich nur bei AeroFix und AeroFlat
Additional only with AeroFix and AeroFlat

☐	☐	Bautenschutzmatten befinden sich in korrekter Position Building protection mats are in the correct position
☐	☐	Ballast befindet sich auf richtiger Position (auf der Bodenschiene oder Ballastschiene) Ballast is in the correct position (on the base rail or ballast rail)
☐	☐	Ballast ist optisch in Ordnung (keine Risse, Brüche etc.) Ballast is visually fine (no cracks, breaks etc.)
☐	☐	ungehinderter Wasserablauf Unhindered water drainage

Anmerkungen
Comments

.....

.....

.....

Have sun!

Wartung wurde durchgeführt von
Maintenance was carried out by

Firma:
Company: .....

Person:
Person: .....

Die Wartungsarbeiten sind durch eine Fachfirma, die Erfahrung mit elektrischen Anlagen und Arbeiten mit dem Montagesystem vorweisen kann, auszuführen.
The maintenance work must be carried out by a technical company that has experience with electrical systems and works with the mounting systems.

Das ausgefüllte Wartungsprotokoll muss in Kopie der anlagebetreibenden Person ausgehändigt werden.
The completed maintenance log must be handed over in copy to the plant

Hiermit bestätige ich die Korrektheit und Ausführung der Wartung
I confirm the correctness and execution of the maintenance

Ort, Datum
Place, date .....

Unterschrift
Signature .....

Bedarf der eigenhändigen Schriftform einer bevollmächtigten Person!
Need of the written form of an authorized person!

Name in Druckbuchstaben
Printed Name .....

IBC SOLAR

Have sun!

Checkliste - Schrägdachsystem

zur Ermittlung relevanter Faktoren in Bezug auf die Montage einer PV-Anlage

Checklist - pitched roof system

to evaluate relevant factors regarding the assembly of a PV system

Bitte füllen Sie dieses Formular vollständig aus, um eine schnelle Bearbeitung Ihrer Anfrage zu gewährleisten.
Please fill in this questionnaire completely to guarantee a quick processing of your request.

Kundeninformationen (Installateur) | Owner information (Installer)

Name | Name _____

Firma | Company _____

Straße/Nr. | Street address _____

PLZ/Stadt | ZIP code/city _____

Ansprechpartner | Contact person _____

Telefon | Telephone _____

Mobil | Cell phone _____

Fax | Fax _____

E-Mail | E-mail _____

Kom. | Com. _____

Standortinformationen (PV-Anlage) | Site information

☐ Deutschland | Germany
☐ Frankreich | France
☐ Spanien | Spain
☐ Belgien | Belgium
☐ Niederlande | Netherlands
☐ Italien | Italy
☐ Österreich | Austria
☐ Andere | Other

PLZ/Stadt | ZIP code/city _____

Straße/Nr. | Street address _____

Geo. Längengrad | Degree of longitude _____

Geo. Breitengrad | Degree of latitude _____

Umgebung des Standorts (PV-Anlage) | Site surroundings (PV system)

Angaben für nicht aufgeführte Länder | Description for countries not mentioned above

Anzusetzende Grundschneelast s0 = | Determined snow load s0 = _____ kN/m²

Anzusetzende Grundwindlast q = ( ) | Determined wind load q = _____ kN/m² (Böengeschwindigkeitsdruck peak velocity pressure)

Angabe falls Windlastzone/Schneelastzone bekannt | Description if the snow and wind load zones are known

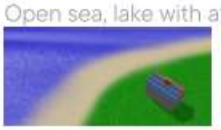
Windlastzone nach DIN EN 1991-1-4 | Wind load zone according to DIN EN 1991-1-4 _____

Schneelastzone nach DIN EN 1991-1-3 | Snow load zone according to DIN EN 1991-1-3 _____

Höhe über N.N. | Height above sea level _____ m

Geländekategorie | Terrain category

☐ Geländekategorie I | Terrain category I
Offene See, Küstennahes Gebiet
Open sea, lake with at least 5 km open area




☐ Geländekategorie II | Terrain category II
Offenes Gelände mit vereinzelten Hindernissen
Open terrain with isolated obstacles




☐ Geländekategorie III | Terrain category III
Dörfer, vorstädtische Bebauung, Waldgebiete
Village, suburban, woodland




☐ Geländekategorie IV | Terrain category IV
Stadt
Urban




Angaben zum Modul | Information about the module

Name des Moduls | Name of module _____

Modulabmaße (L x B x H) | Dimension of module (l x w x h) _____ mm

Modulleistung | Performance of module _____ W

Oder | or ☐ Datenblatt liegt vor | Datasheet is available

Angaben zur Modulanordnung | Module statement

☐ hochkant | vertical ☐ quer | horizontal

Anzahl der Module pro Reihe | Number of modules per row _____

Anzahl der Reihen | Number of rows _____

Gewünschter Modulneigungswinkel | Desired inclination _____ °

☐ Aufgeständerte PV-Anlage | Elevated PV-system

☐ Dachparallele PV-Anlage | Roof-parallel PV-system

Angaben zum Dach | Roof statement

Grundmaße Schrägdach | Basic measurements pitched roof

Dachhöhe (Ortgang) A
Roof height A _____ m

Dachneigung ß
Slope of the roof ß _____ °

Dachbreite B
Roof width B _____ m

Gebäudehöhe C
House high C _____ m

Höhe Attika D (falls vorhanden)
Height Attica D (if existing) _____ m

Ausrichtung
Orientation _____



Sparren, Binder (senkrecht) | Rafter (vertical)

Abstand | Distance _____ mm

Material | Material _____

Pfetten (waagrecht) | Purlin (horizontal)

Abstand | Distance _____ mm

Material | Material _____

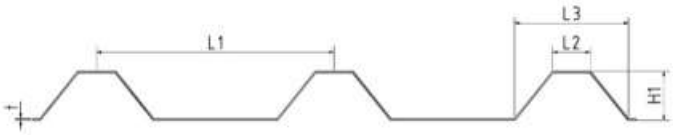
Angaben zur Dacheindeckung | Roof covering statement

☐ Ziegeldach | Tiled roof

☐ Trapezblechdach | Trapezoidal sheet roof

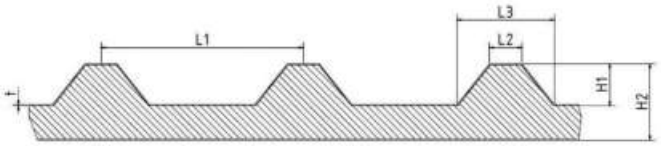
☐ Kalzipdach – Typ | Kalzip roof – Type

Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Maß | dimension L3 in mm	
Maß | dimension H1 in mm	
Maß | dimension t in mm	
Material | Material	



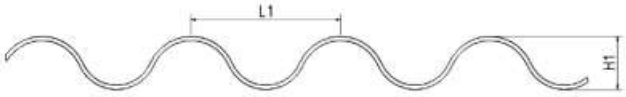
☐ Trapez-Sandwich-Dach | Trapezoidal plate roof

Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Maß | dimension L3 in mm	
Maß | dimension H1 in mm	
Maß | dimension H2 in mm	
Maß | dimension t in mm	



☐ Welleternitdach | Eternit currugated plate roof

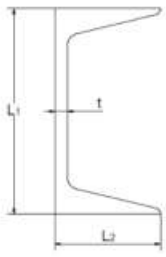
Maß | dimension L1 in mm	
Maß | dimension L2 in mm	



☐ Sonstiges
Other _____

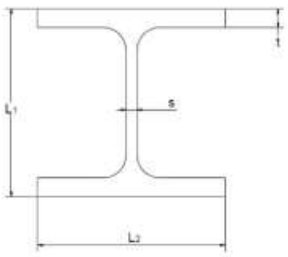
Angaben zur Unterkonstruktion | Type of substructure

☐



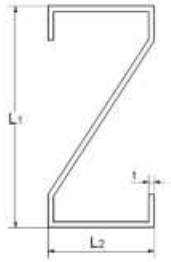
Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Maß | dimension t in mm	
Material | material	

☐



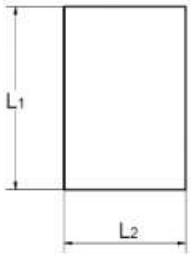
Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Maß | dimension t in mm	
Maß | dimension S in mm	
Material | material	

☐



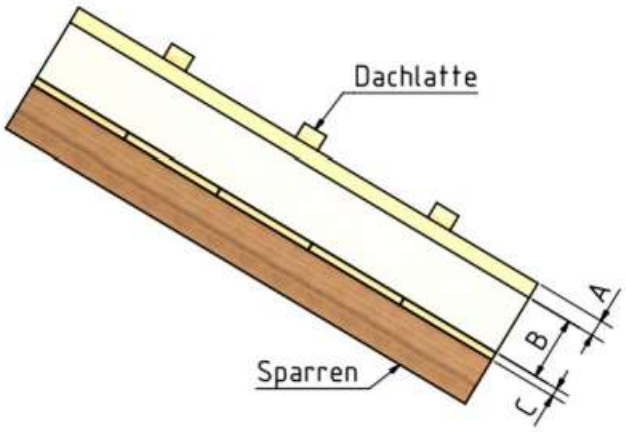
Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Maß | dimension t in mm	
Material | material	

☐



Maß | dimension L1 in mm	
Maß | dimension L2 in mm	
Material | material	

Angaben zum Dachaufbau bei Aufdachsparrendämmung
Information about the roof construction (on roof top insulation)



Höhe der Konterlatte A | Height from the counter-batten A _____ mm

Höhe der Dämmung B | Height from the insulation B _____ mm

Höhe der Schalung C | Height from the formwork C _____ mm

Wichtig: Die Konterlattenbreite muss mindestens 60 mm betragen!
Important: The batten width must be at least 60 mm!

Sonstiges | Other

Dachskizze | Roof drawings

(Bitte Grundriss des Daches und Verlauf der Unterkonstruktion mit Maßangaben einzeichnen.)
(Please sketch the layout of the roof and the position of the substructure including measurements.)

Oder | or ☐ Skizze wird extra angefügt | Drawings will be attached separately

Notizen und sonstige Angaben | Notes and other comments

Hiermit bestätige ich die Richtigkeit der Angaben
Herewith confirm the correctness of the statements.

Ort, Datum | Town, date

Unterschrift, Stempel | Signature, stamp

Have sun!

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