



mounting
systems

Alpha+ On-Roof System

Installation manual





Alpha+ – A stroke of genius with a plus

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1. Introduction

1.1. Short Description

The Alpha+ on-roof system is a robust mounting system for the installation of PV modules on pitched roofs. It consists of aluminium support rails and all necessary small parts for the fastening of the rails to the roof, the modules on to the rails as well as for the connection of the components with each other. Alpha+ allows for both portrait and landscape installation of the modules.

1.2. About These Instructions

Content

These instructions describe the mounting of the on-roof system Alpha+ and all system-specific information for planning, components and safety warnings. The first part of the Instructions (chapters 5–7) demonstrates the complete portrait installation of framed modules. Thereafter, (chapters 8–11) the mounting steps for certain specific roof types and material options are explained.

Applicable Documents

In addition to this document, the document "Installation Instructions for PV Mounting Systems: General Part" is part of each product delivery. This document describes the general applicable information for Mounting Systems products on standardisation, safety, transport, maintenance, disassembly and disposal. Both the present Instructions and the "Installation Instructions for PV Mounting Systems: General Part" are an integral part of the system Alpha+ and must be adhered to for each installation.

It is crucial to carefully read these Instructions as well as all applicable documents prior to carrying out any installation, maintenance or disassembly work.

You are provided with the information required for the safe and complete installation, maintenance and disassembly. Should you have any questions, please contact Mounting Systems GmbH.

User Group

Mounting Systems GmbH's installation instructions are intended for the following persons (user group):

- Skilled personnel
- Instructed personnel

Skilled personnel

Skilled personnel are individuals who, on the basis of their professional training, are able to execute installation, maintenance, and disassembly work appropriately.

Instructed personnel

Instructed personnel are individuals who have been instructed and taught appropriately regarding the assigned tasks and the possible risks in the event of improper conduct. An instructed individual must have received instructions regarding the required safety policies, precautions, relevant regulations, accident prevention regulations, as well as operating conditions and must have demonstrated his/her competence. The implemented work must be approved by skilled personnel.

Orientation Guide

The following visual aids will make installation easier.

Pictograms:



This symbol indicates important information and useful tips.



This symbol indicates tips and tricks to make processes easier.

1.3. Warnings

The warnings used in these Mounting Instructions indicate safety-related information. They include:

- Warning symbols (pictograms)
- Signal words for the identification of the hazard level
- Information about the type and source of the hazard
- Information about potential consequences in case of the hazard being disregarded
- Measures for the prevention of hazards and the prevention of injuries or damage to property.

The signal words of the warnings respectively indicate one of the following hazard levels:

 DANGER	Indicates a great and extraordinary danger , which may result in death or serious injury if ignored.
 WARNING	Indicates a potentially dangerous situation , which may result in serious or medium injury or damage to the property.
 CAUTION	Indicates a potentially dangerous situation , which may result in minor injuries or damage to the property if ignored.
 ATTENTION	Indicates potential danger , which can result in damage to the property.

1.4. Safety

All generally applicable safety regulations for products of Mounting System GmbH can be viewed in the document "Installation Instructions for PV mounting Systems: General Part". Please read this document carefully and adhere to the described points - only use the system for its intended purpose, comply with the obligations of the building proprietor and follow both the general and specific safety instructions. In addition, please observe the specific safety instructions which precede the process steps in the present product-specific Mounting Instructions.

2. Technical Description

2.1. System Overview

In the following, the most important system parts are described.

The design of the individual system components can vary, or additional components (e.g. cross rail connectors) may be required, depending on:

- Type of roof (substructure and roof cladding)
- Type of module
- Number of modules and configuration
- Local conditions

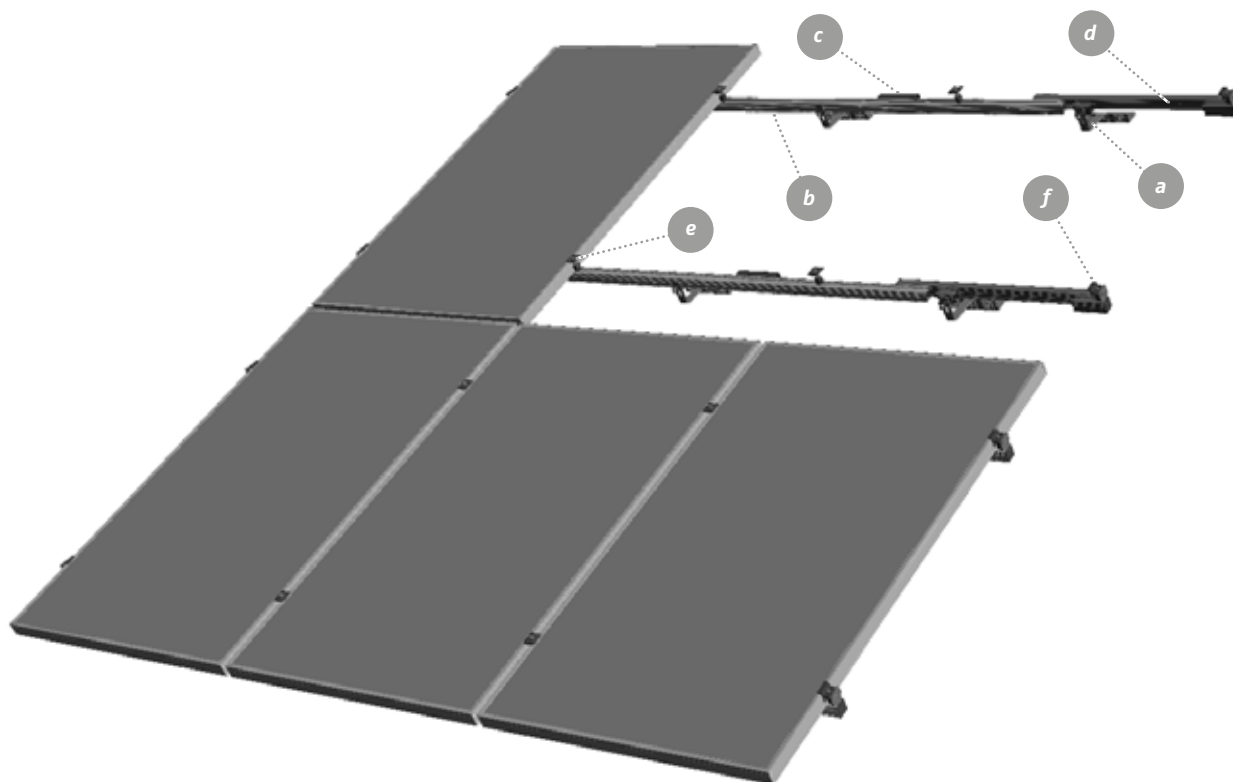
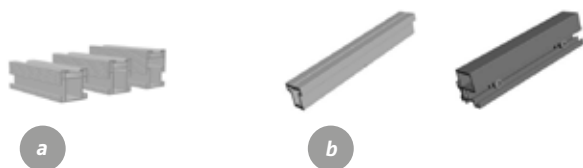


Image 2.1. – 1

- a** Roof hook
- b** Base rail
- c** Connector
- d** Telescoping end piece (optional)
- e** Module clamp
- f** Module end clamp

2.2. Components

In the following all mounting system parts of the Alpha+ are shown, which can be included in the scope of the delivery. The exact scope of the delivery and the number of individual components depends on your order.



- a** Alpha+ base rail (BR), options:
- BR 4/35 in various lengths
 - BR 6/40 in various lengths
 - BR 10/48 in various lengths
 - 0.6 m pieces, either mill finished or black



- b** Alpha+ connector, options:
- Internal connectors (respectively for BR 4/35, BR 6/40 and BR 10/48)
 - External connectors (respectively for BR 4/35, BR 6/40 and BR 10/48)



- c** Telescoping end-piece (optional), options:
- For BR 4/35, BR 6/40 and BR 10/48
 - Either with mill finished or black end piece



- d** Module end clamp, options:
- For different module frame heights
 - Mill finished or black



- e** Module clamp, options:
- For different spans of module frame heights
 - Mill finished or black

- f** Roof fastener, options:
- Roof hooks in various designs (example shown here: standard roof hook)
 - Hanger bolts in various designs (example shown here: hanger bolt with rubber seal)
 - Sheet-metal clamps in various designs (example shown here: Kalzip clamp)

- g** Fastening materials for roof hooks in various designs depending on type of roof hook



- h** Small parts for connecting the roof fastener to the base rail, options:
- L-bracket + small parts (required for some roof hooks, hanger bolts and sheet-metal clamps)
 - T-head bolt and serrated lock nut (supplied loose)
 - Rail support with position lock (pre-mounted to the respective roof hook)



- i** Cross rail connector, options:
- Simple design, pre-assembled
 - Design with position lock of the T-head bolt, pre-assembled



- j** End caps, options:
- For BR 4/35, BR 6/40 and BR 10/48
 - Grey or black

2.3. Technical Data

Application	<i>Pitched roof – on-roof</i>
Roof cladding	<i>Suitable for most types of roof cladding</i>
Roof slope	<i>Up to 60° ¹</i>
Building height	<i>Up to 20 m ¹</i>
PV modules	<i>Framed</i>
Module orientation	<i>Landscape, portrait</i>
Size of module array	<i>Any size possible ²</i>
Position of the module array	<i>No special requirements</i>
Distance between roof fixing points	<i>Up to 2m ¹</i>
Standards	<i>Eurocode 1 – Actions on structures Eurocode 9 – Design of aluminium structures</i>
Supporting profiles	<i>Extruded Aluminium (EN AW 6063 T66)</i>
Hooks, small parts	<i>Stainless steel (V2A)</i>
Colour	<i>Aluminium: plate finish; on request: Visible components available in black</i>
Warranty	<i>10 Years ³</i>

¹ Different maximum values may apply, depending on site, building, choice of roof fixations and module type.

Using the Alpha+ calculation tool, you can have the exact values for your specific project calculated quickly and easily.

² Due to thermal expansion of the material, we recommend an interruption of the array after 12 m.

³ Please find the exact terms in the Mounting Systems GmbH warranty document.

3. Important Installation Information

3.1. Conditions of Use

The Alpha+ on-roof system is designed with different rail and on-roof fastener variations in accordance with Eurocode 1-DIN EN 1991-1-1 for various maximum loads. The suitability of the material must therefore be verified for each system, e.g. by means of the Alpha+ configuration tool. Please also observe the constraints, listed in chapter 2.3 "Technical Data".



DANGER

Risk of fatal injury from damage to roof

Excessive loads can severely damage the roof.

- Before mounting and installation, please make sure that the building and especially the roof cladding meets the increased structural requirements for the PV system and the mounting operation.



DANGER

Risk of fatal injury from falling objects

Parts falling from the roof can result in serious injuries or death.

- Before commencing with the installation, please ensure that the material used meets the structural requirements of the site.

3.2. Mounting Preparations

Mounting Systems GmbH recommends you inquire about the local conditions before ordering the Alpha+. In particular, acquaint yourself with:

- The roof structure and any irregularities
- Dimensions, material, quality and distance of the rafters / purlins
- Type, quality and fastening method of the roof tiles / roofing

3.3. Mounting Aids and Required Tools

For the installation of the mounting system, you will require the following tools:

- Allen key / hexagon socket drill bit, 5 mm
- Socket key / socket key attachment size 13
- Cordless screwdriver / electric drill with attachment for fastening the wood screws; (varying depending on the roof hooks selected):
 - Cross recess (for chipboard screws)
 - AW 30 (for 6x80 wood screws)
 - Socket key attachment size 13 (for 8x80 wood screws)
 - Socket key attachment size 9 (for M12x300 hanger bolts)
 - Socket key attachment size 7 (for M12x200 hanger bolts)
- Angle grinder with
 - Metal cutting disc
 - Stone disc
- Chalk Line
- Spirit level
- Yard stick / tape measure

3.4. About the Installation Instructions

In the following chapters all steps for the planning and mounting of the Alpha+ are listed in the correct sequence. Chapters 5, 6 and 7 describe the mounting steps for a portrait layout of the modules with interior rail connectors; chapters 8–11 describe the mounting steps for other material and installation variations.

Please adhere to the mounting steps listed and be ensure to follow the safety instructions.

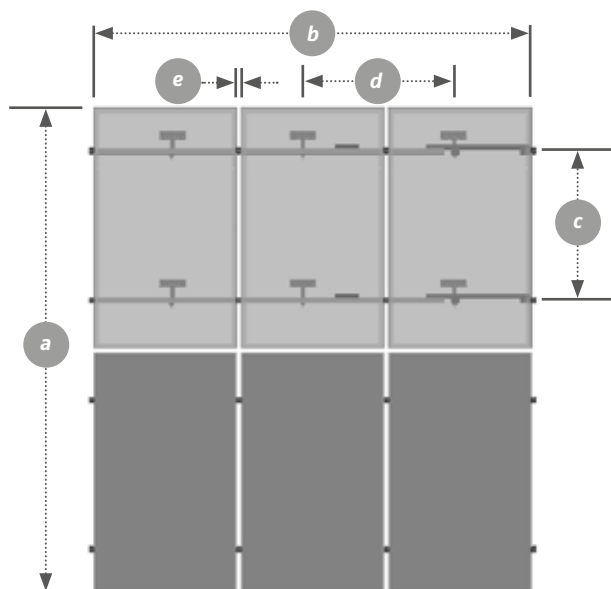


Image 4. – 1 Modul Area

- a** Height of the module field: Number of modules vertically x module length (+ any clearances)
- b** Width of the module field: Number of modules horizontally x (module width + 19 mm) + 41 mm
- c** Distance of the base rails vertically (taking into account the tile pattern as well as the number and positioning of module clamping points approved by the manufacturer): Approx. quarter points of the modules = $1/2 \times$ module length.
- d** Distance of the roof hooks horizontally: According to the project layout, depending on the rafter distance and the structural calculations *
- e** Distance between the modules = 17–19 mm

* *Layout required according to local conditions in accordance with Eurocode 1-DIN EN 1991-1-1/Eurocode 9-DIN EN 1999-1-1.*

4. Planning the Module Area

For installation, the base rails are fastened to the rafters or purlins (for metal roofs) of the building with roof fasteners (e.g. roof hooks). The roof fasteners must be mounted at defined distances, depending on the distance of the rafters/purlins, the position on the roof and on the on-site conditions*. The layout is defined using a configuration tool or project-related structural analyses.

* *Layout required according to local conditions in accordance with Eurocode 1-DIN EN 1991-1-1/Eurocode 9-DIN EN 1999-1-1.*



DANGER

Risk of fatal injury from damage to roof

Excessive loads can severely damage the roof.

- Before mounting and installation, please make sure that the building and especially the roof construction meets the increased structural requirements resulting from the PV system and the assembly operation.



DANGER

Risk of fatal injury from falling objects

Parts falling from the roof can result in serious injuries or death.

- Before any mounting or installation, please make sure that the material used is suitable for the building structure and meets the structural requirements applicable on-site.

**Risk of fatal injury due to falling**

Falling from the roof can result in serious injuries or death.

- Please wear the statutory protective equipment.
- Secure yourself against falling.
- Do not perform any work in strong winds.

**Risk of fatal injury from falling objects**

Parts falling from the roof can result in serious injuries or death.

- Block off the hazard area on the ground prior to the mounting work to prevent falling objects injuring persons.
- Ensure that no parts can fall off the roof.
- Please wear the statutory protective equipment.
- Do not stay in the hazard area.
- Do not perform any work in strong winds.
- After completion of the installation, check the racking system and the modules for a tight fit.

5. Installation of Roof Fasteners

The roof fasteners are fixed to the roof structure and serve as a connector to the base rails. The permissible distance between the roof fasteners depends on the structural requirements and must be laid out specifically for the project, e.g. with the Alpha+ configuration tool. The type of roof fastener must be selected according to the respective structural load, substructure and roof cladding. Depending on the roof construction and the type of roof fastener, the installation process or the preparation of the substructure can vary or require additional structural measures. If you have any doubts, please contact a specialist roofer.

In the following, the installation of a standard roof hook is described. The mounting steps for other types of roof fasteners are described in chapter 8.

5.1. Preparation of the Roof Substructure

Mounting steps:

- Determine the position of the base rails and the roof fasteners on the roof, taking into account the system planning, the tile and rafter pattern and the permissible clamping points of the PV modules used.
- Push up or remove the roof tiles at the appropriate points.

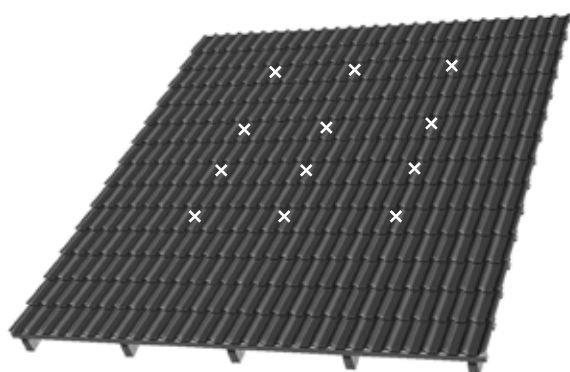


Image 5.1. - 1

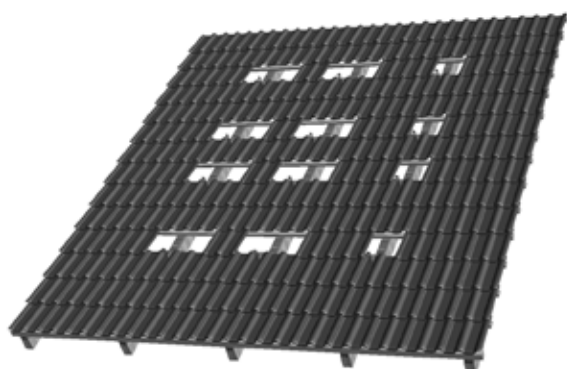


Image 5.1. - 2



CAUTION

Damage to the building and the PV system due to incorrect mounting

Incorrect distance between the roof fasteners can cause damage to the building and the PV system.

- Select the distance of the roof fasteners according to the tool layout and adhere to it.
- Adhere to the potentially different distance values defined for roof fasteners to be placed in the middle of the roof or along the edge / in the corners of the roof.

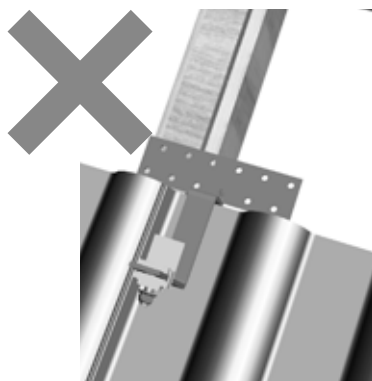


Image 5.1. - 3

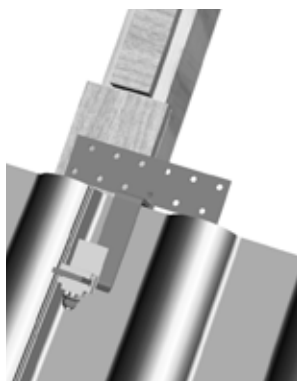


Image 5.1. - 4

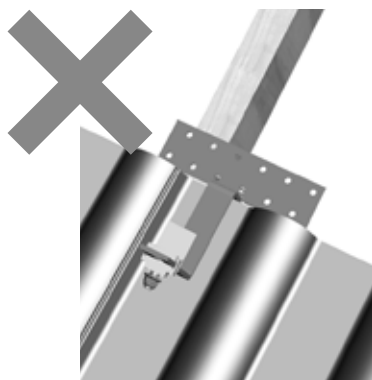


Image 5.1. - 5

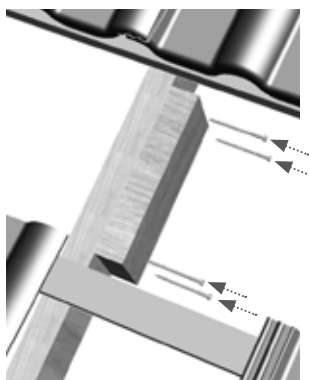


Image 5.1. - 6

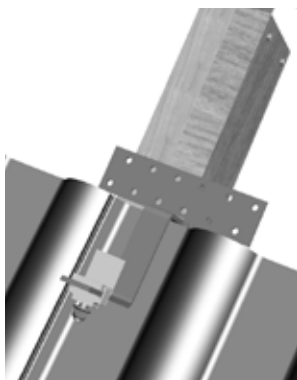


Image 5.1. - 7

- Prepare the fastening points of the substructure for professional mounting of the roof fasteners and ensure sufficiently load-bearing, wide and level contact surface.

**Note:**

Depending on the roof structure, type of roof fastener and structural requirements, various additional structural measures might be required at the fastening points. For example, in a counter-batten construction, the contact surface might need to be expanded by additional squared timber screwed to the rafters. With a frame structure, the roof trusses might need to be doubled up at the appropriate positions.

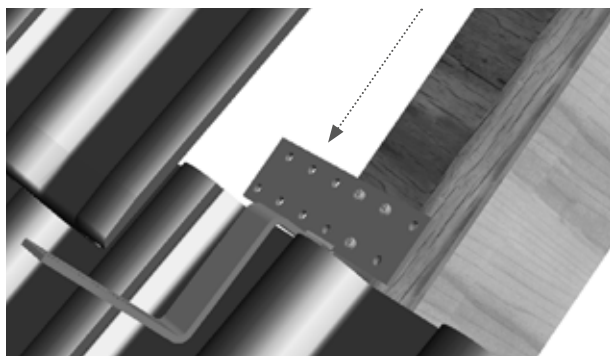


Image 5.2. - 1

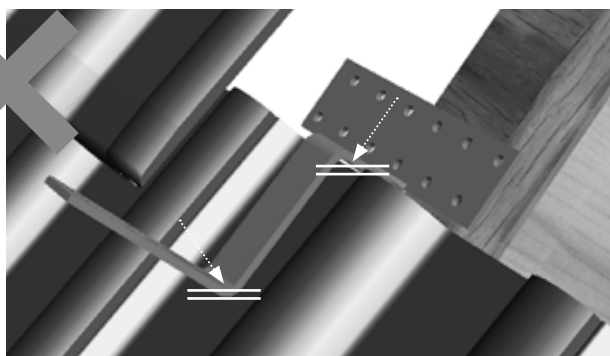


Image 5.2. - 2

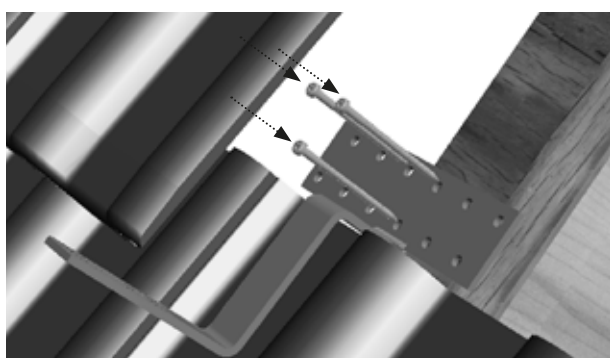


Image 5.2. - 3

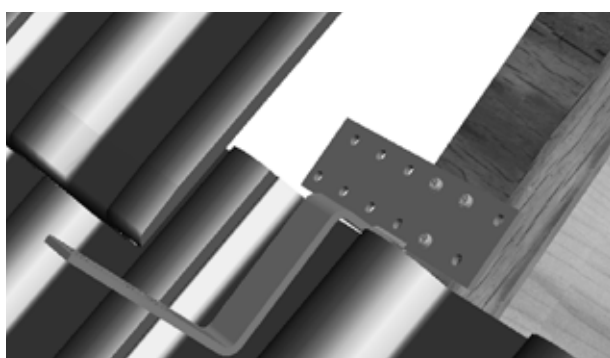


Image 5.2. - 4

5.2. Placing the Roof Fasteners - Here: Standard Roof Hook

Mounting steps:

- Position the roof hook and, if required, underlay it; neither the vertical nor the horizontal stay of the roof hook may touch the underlying roof tile.
- Align the roof hook.

- Fasten the roof hook with 3 wood screws 6x80 to the rafter. Observe the permissible edge distance for wood drilling.

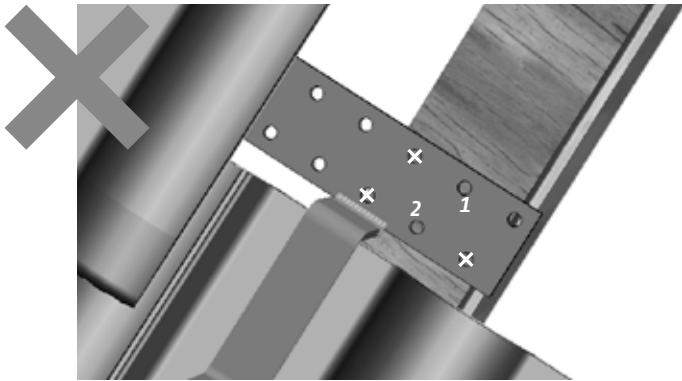


Image 5.2. - 5

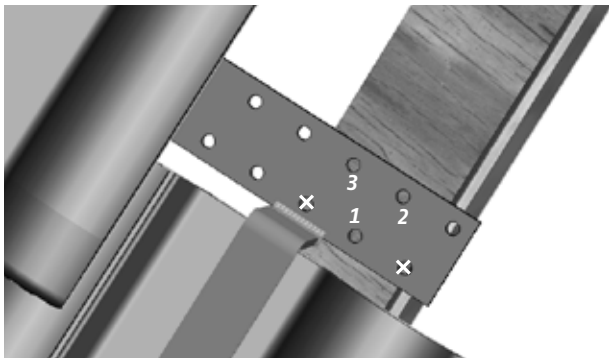


Image 5.2. - 6



CAUTION

Damage to the building and the PV system due to incorrect mounting

Incorrectly installed roof hooks can break away.

- Fasten each roof hook to the substructure with the stipulated number of screws.
- Adhere to the permissible edge distances distance when positioning the screws. If necessary, structurally widen the substructure.

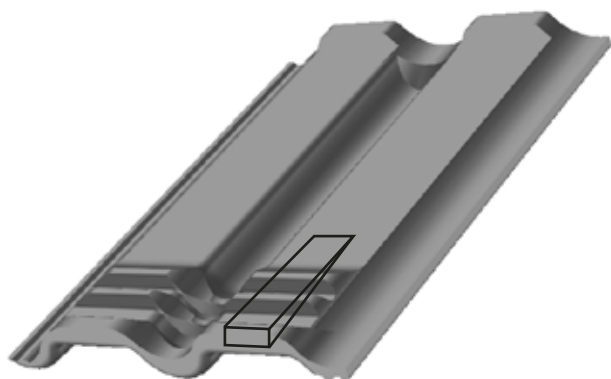


Image 5.3. - 1

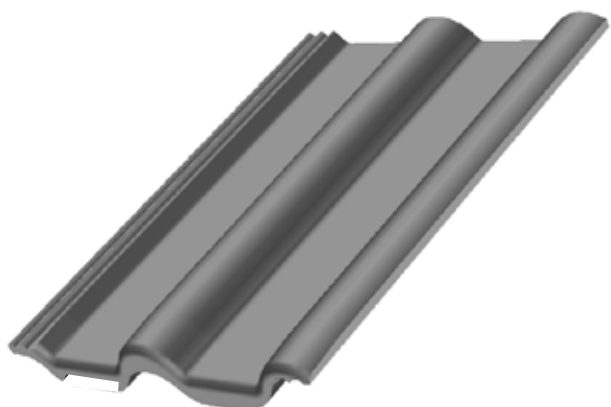


Image 5.3. - 2



Image 5.3. - 3

5.3. Placing the Roof Tiles

Mounting steps:

- Correctly process the underside of the removed roof tiles to ensure that the roof tile can be replaced cleanly and does not stand up due to the underlying roof hook.



CAUTION

Damage to building from leaking

Incorrectly installed roof hooks and incorrectly performed restoration of the rain proofing of the roof cladding can result in leakages.

- Prior to installation, make sure to choose a roof fastener variant that is suitable for the roof and its requirements.
- Do not install unsuitable roof fasteners.
- When mounting the roof fastener adhere precisely to the mounting instructions.
- Make sure to perform cut-outs on the tile or any additional structural measures that might be required in a professional manner. If you have any doubts please contact a specialist roofing company.

- Reinstall the roof tiles.
- If required, take additional structural measures to restore rain proofing.

6. Installing the Base Rails

The base rails serve as module support and are available in different strengths and lengths.

6.1. Placing and Alignment of the Base Rails

Mounting steps:

- Pre-mount the T-head bolt and serrated lock nut to the roof hook (nut must point in the direction of the eaves, T-head bolt in the direction of the ridge)
- Lay out the total rail length per rail track (see chapter 4) and perform any rail cut-outs that might be necessary.
- Distribute the base rails on the roof.



Image 6.1. - 1



Image 6.1. - 2

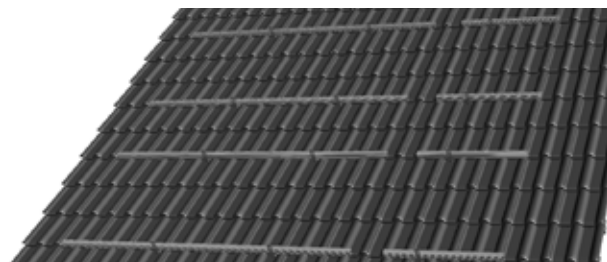


Image 6.1. - 3



Note:

The permitted cantilever (overhanging of the loose rail ends over the last roof fastener) is limited to 30 cm. Do not exceed this limit.



Note:

Do not fasten all the base rails at once, but alternate between installation steps 6.1. and 6.2. Install the individual base rails plugged together with a connector.



Note:

Connected rails should not exceed a length of 12 m. Thereafter, an expansion joint (approx. 5 cm) must be considered. Do not install modules over expansion joints. The total rail length required depends on the width of the module field. (see chapter 4)

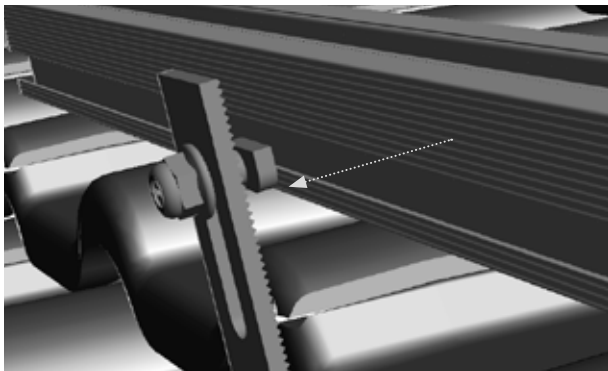


Image 6.1. - 4

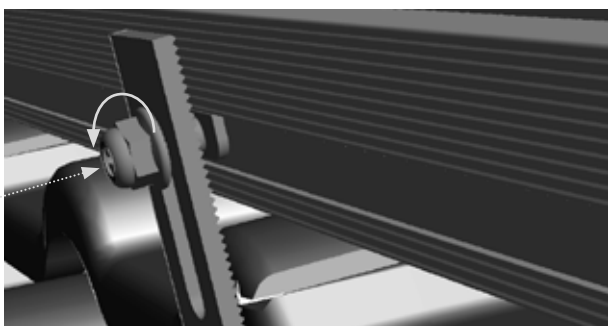


Image 6.1. - 5

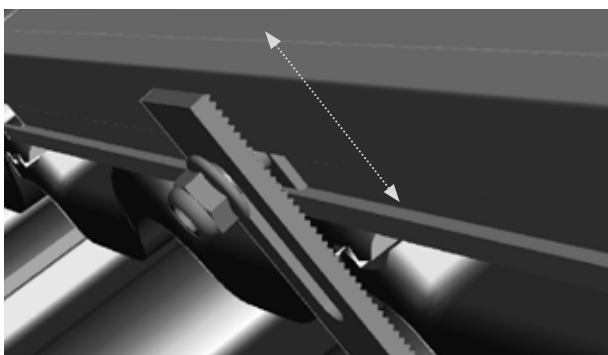


Image 6.1. - 6

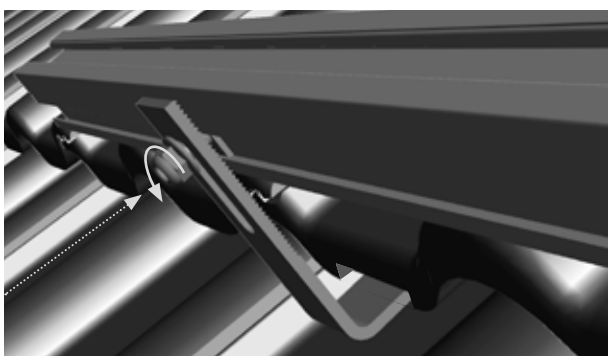


Image 6.1. - 7

- Hold the rail against the roof hook, insert the T-head bolt in the side channel, loosely fasten the screw with a quarter-turn in the side channel of the base rail, and loosely tighten the nut.



CAUTION

Material damage due to incorrect mounting

Incorrectly mounted T-head bolts can slip out.

- When inserting the T-head bolts, always ensure the correct, vertical fit of the bolt head in the channel.
- When aligning the rails and during the final fastening of the T-head bolts, make sure that the head of the bolt does not slip into an incorrect position.
- Adhere to the specified torque of 20 Nm.

- Align the base rails by using a chalk line or spirit level.

- Tighten the lock nuts - torque: 20 Nm. Make sure the T-head bolts are positioned correctly in the rail channel.

6.2. Connection of the Base Rails

Rail connectors are provided for the linking of the individual base rails. There are two different versions of connectors available for each rail thickness; an interior connector and an exterior connector. The mounting steps for the interior connector are specified below; the mounting of the exterior connector is described in chapter 10.1.

Mounting steps:

- Insert the rail connector into the first base rail until the stop.

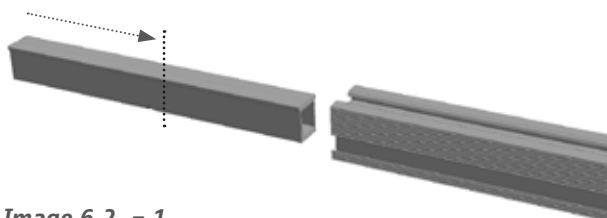


Image 6.2. - 1

- Slide the next base rail onto the placed rail connector until the stop.

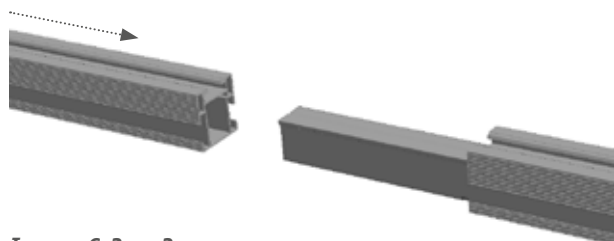


Image 6.2. - 2

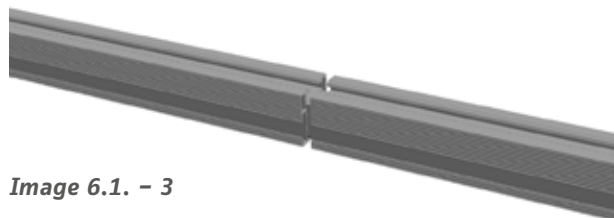


Image 6.1. - 3

6.3. Placing the End Caps

The end caps are optional components and only have an optical function.

Mounting steps:

- From the outside, push the end caps onto the ends of the base rails.

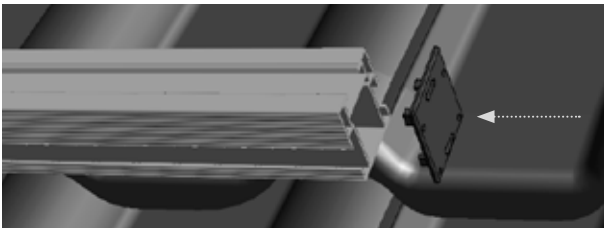


Image 6.3. - 1

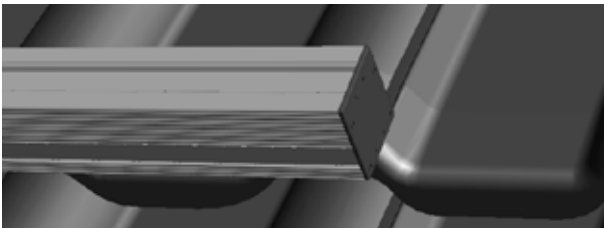


Image 6.3. - 2

7. Module Installation

The modules are installed on the base rails one by one. Mounting Systems GmbH recommends mounting the modules starting from one side. Module clamps and module end clamps are used for the fastening of the modules. The module end clamps can hold one module each. The module clamps are positioned between two modules.

7.1. Installing Clickstones

Clickstones are used for the fastening of the modules. The Clickstone is a special clip with which the module clamps are fastened in the base rail. You only need an Allen key (5 mm) for the installation. You can insert the Clickstone from above into the top channel of the base rail.

Mounting steps:

- Insert the Clickstone at a slight angle into the rail channel.
- Push the Clickstone down. Make sure you hear the Clickstone clicking into the base rail.



Note:

The shape of the Clickstone corresponds exactly to the profile of the rail channel. It has been consciously constructed not to run easily in order to prevent unintentional slipping in vertical rail tracks. To move the Clickstone, press lightly on the bolt, from above, and move the stone with a little pressure along the rail channel.

- Tighten the bolt with a torque of 8 Nm.

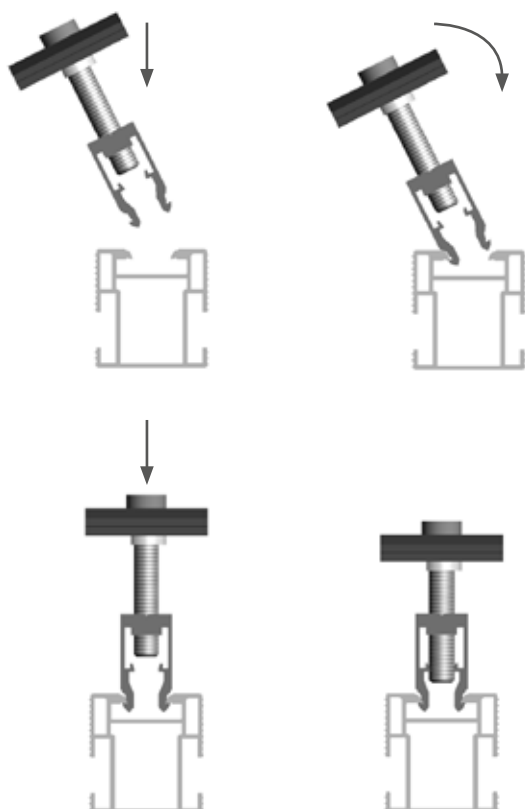


Image 7.1. – 1
Mounting steps from top left to bottom right

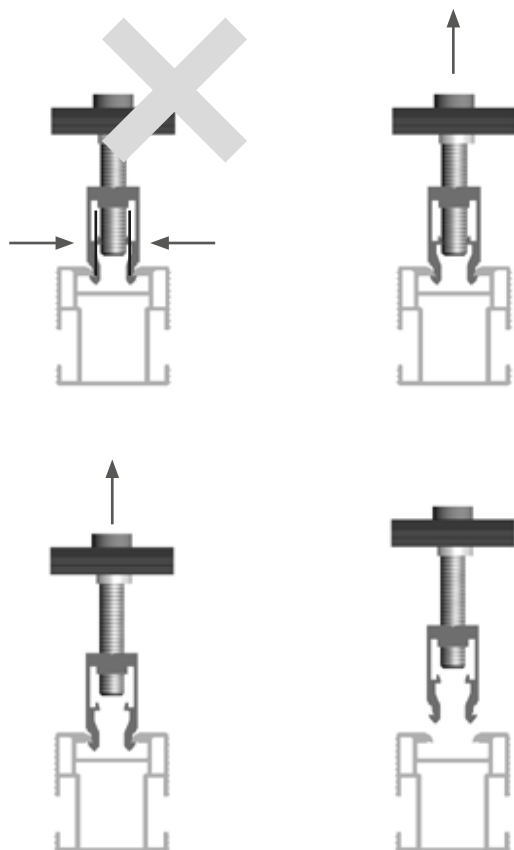


Image 7.1. – 2
Mounting steps from top left to bottom right



Note:

The lugs on the inside of the Clickstones are designed in such a way that once the bolt has been tightened, they prevent a "click out" mechanically. Accordingly, the bolt must first be unscrewed to above the lugs before the Clickstone can be removed from the base rail by pressing the sides of the stone together and lifting.



CAUTION

Material damage due to incorrect installation

Incorrectly mounted Clickstones can slip out. PV modules can fall and be damaged.

- Mount all Clickstone connections in accordance with the instructions.



CAUTION

Material damage caused by deformed Clickstones

If clearly deformed Clickstones are used, the safety of the module fastening is not guaranteed. PV modules can fall and be damaged.

- Only use Clickstones where the lugs are parallel to each other and you can clearly hear them clicking into the rail channel.
- Replace deformed Clickstones prior to installation.

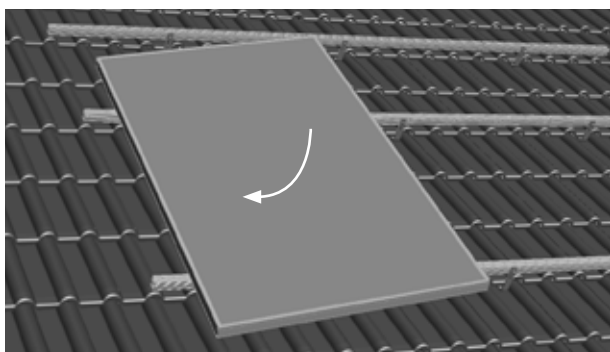


Image 7.2. - 1

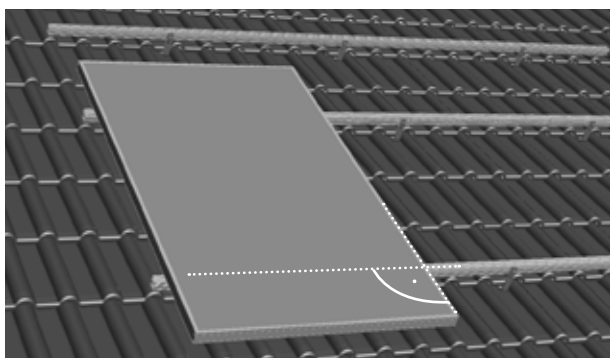


Image 7.2. - 2

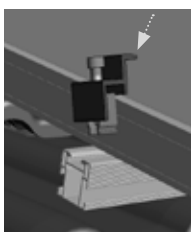


Image 7.2. - 3

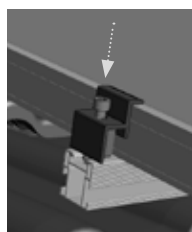


Image 7.2. - 4



Image 7.2. - 5

7.2. Fastening the Modules on the Outer Side

The margin modules of the PV system (for portrait mounting, the left and right module column) are fastened on the outer side with two module end clamps each.

Mounting steps:

- Place and align an outside module. The base rail must protrude the module frame by 30 mm.

- Insert the Clickstone of the module end clamp into the channel of the base rail.
- Push the module end clamp right to the module frame.
- Tighten the bolt (torque 8 Nm) and thus clamp the module.



CAUTION

Material damage due to incorrect mounting

Incorrectly fastened modules can fall and become damaged.

- Make sure the Clickstones click in correctly.
- Push the module end clamp all the way to the module.
- Adhere to the stipulated torque of 8 Nm when tightening the bolt.
- Check the module fits tightly after mounting.

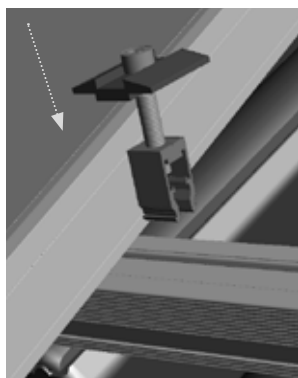


Image 7.3. - 1

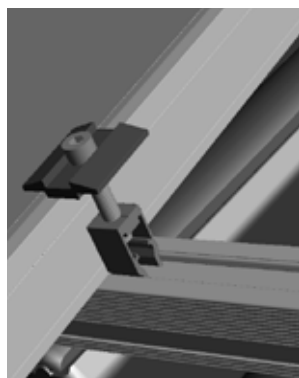


Image 7.3. - 2

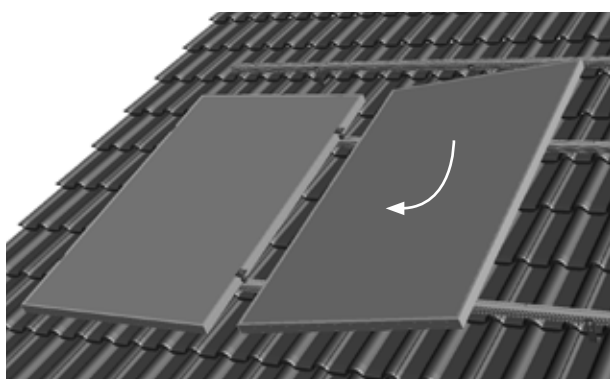


Image 7.3. - 3

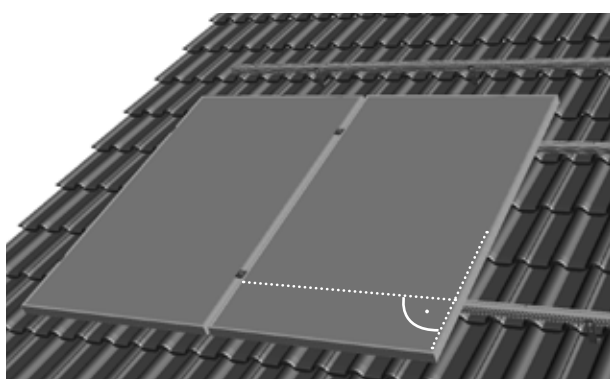


Image 7.3. - 4

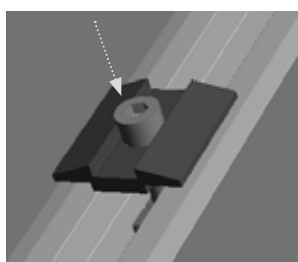


Image 7.3. - 5

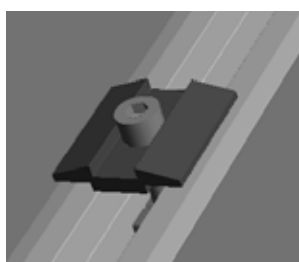


Image 7.3. - 6

7.3. Fastening the Modules on the Inner Side

Two module clamps are fastened between two modules.

Mounting steps:

- Insert the Clickstone of the module clamp into the channel of the base rail.
- Push the module clamp all the way to the frame of the already mounted module.
- Push the second module to the module clamp and align.



CAUTION

Material damage due to incorrect mounting

Incorrectly fastened modules can fall and become damaged.

- Make sure the Clickstones click in correctly.
- Push the modules all the way to the module clamp.
- Adhere to the stipulated torque of 8 Nm when tightening the bolt.
- Check both modules fit tightly after mounting.

- Tighten the bolt (torque 8 Nm) and thus clamp the modules.

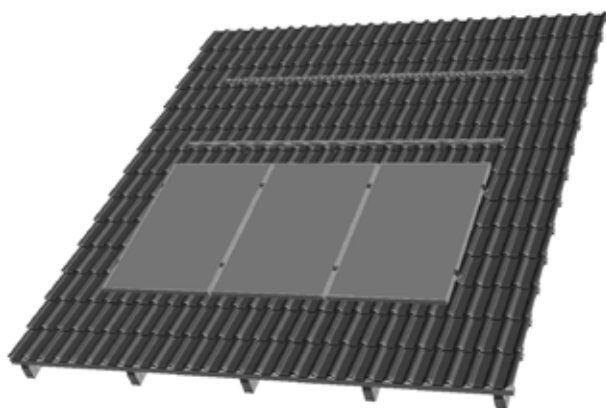


Image 7.4. - 1

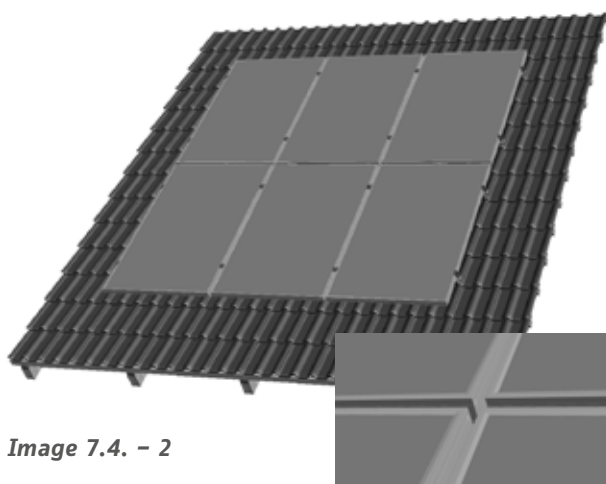


Image 7.4. - 2

7.4. Fastening Additional Module Rows

Mounting steps:

- Push the modules in the upper rows from above down to the modules in the lower rows. For optical reasons you can also keep a distance to the lower module.



Note:

Use e.g. a module clamp as a spacer gauge. This way you will achieve identical horizontal and vertical distances between modules.

- Fasten the modules analogously to the 1st row with module end clamps and module clamps (cf. chapters 7.2 and 7.3).

8. Installing Additional Roof Fastener – Variants

8.1. Installation of the Heavy Load Roof Hooks

The heavy load roof hook is designed for increased snow loads and therefore has a slightly different shape and is made from thicker material. Adjustment of the roof tiles or additional structural measures for the restoration of the rain-proofing is therefore more likely to be necessary than for the standard roof hook.

Mounting steps:

- Position the roof hook and, if required, underlay it; neither the vertical nor the horizontal stay of the roof hook may touch the underlying tile.
- Align the roof hook.
- Pre-drill with a diameter of 5 mm at the 2 fastening points. Observe the permissible edge distance for wood drilling.
- Fasten the roof hooks to the rafters with 2 wood screws 8x80 and 2 washers.

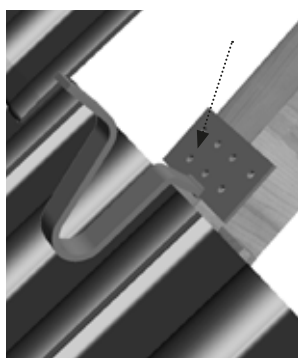


Image 8.1. - 1

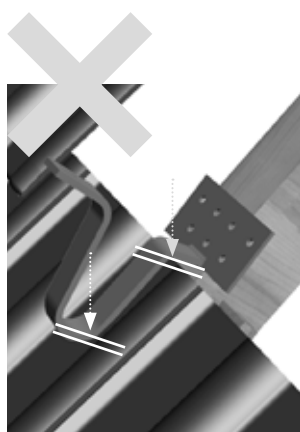


Image 8.1. - 2

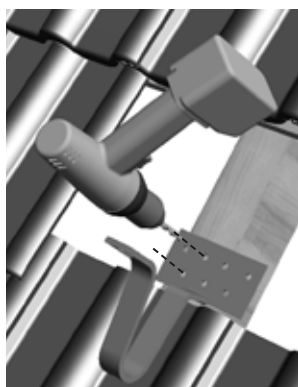


Image 8.1. - 3

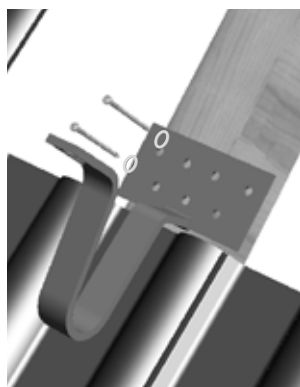


Image 8.1. - 4



Image 8.1. - 5

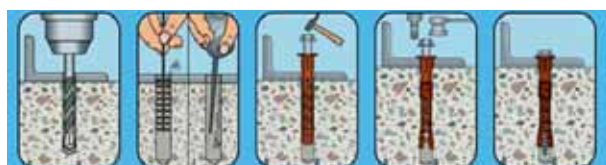


CAUTION

Damage to the building and the PV system due to incorrect installation

Incorrectly installed roof hooks can break away.

- Fasten each roof hook to the substructure with the stipulated number of screws.
- Adhere to standard edge distance when positioning the screws. If necessary, structurally widen the substructure.
- Pre-drill holes.



Drill hole Clean drill hole Insert dowel and screw Tighten screw Tighten screw flush

Image 8.2. – 1

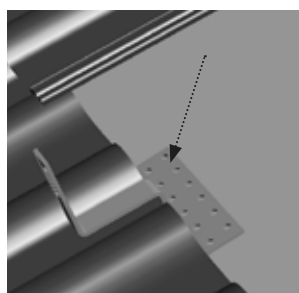


Image 8.2. – 2

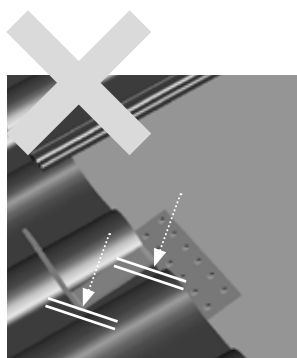


Image 8.2. – 3

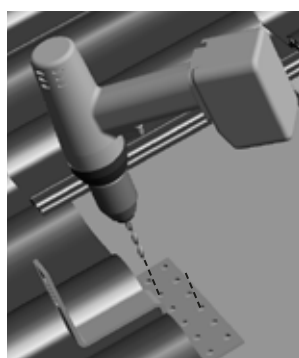


Image 8.2. – 4

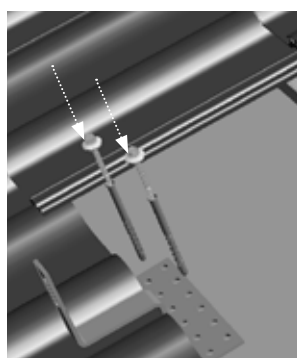


Image 8.2. – 5

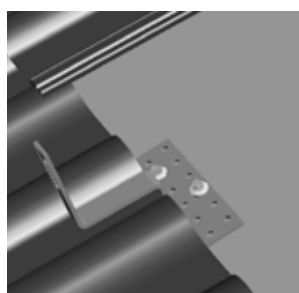


Image 8.2. – 6

8.2. Installation of Roof Hooks on Concrete

All standard roof hooks can be used on concrete, provided that the holes in the base plate are large enough for the positioning of the necessary concrete dowels.

To ensure a tight fit, both correct installation and especially sufficient thickness and quality of the concrete layer are crucial. Please note that for the fastening on Italian Pignatte structures, slightly different conditions apply.

Conditions of Use

- Concrete class: C20/25
- Thickness of the concrete layer: Min. 4 cm
- Minimum distance to the edge: 50 mm (standard), 100 mm (Pignatte)
- Minimum distance between dowels: 50 mm

Mounting steps:

- Position the roof hook and, if required, underlay it; neither the vertical nor the horizontal stay of the roof hook may touch the underlying roof tile.
- Mark the fastening points and remove the roof hooks again. Make sure to keep to the permissible distances for concrete fastening.
- Pre-drill fastening points. Make sure to drill at least 10 mm deeper than the length of the dowel. CAUTION. Drill without impact for Pignatte.
- Clean the drill holes thoroughly.
- Reposition and align the roof hooks.
- Insert dowel with screw.
- Tighten the screws.

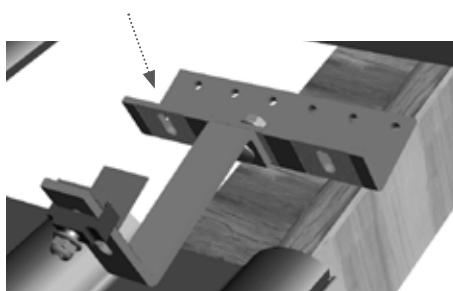


Image 8.3. - 1

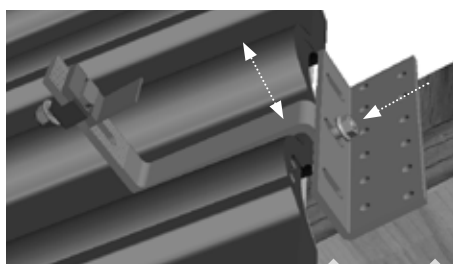


Image 8.3. - 2

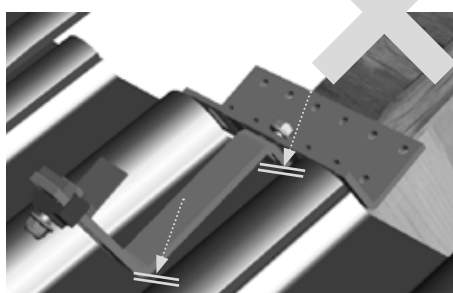


Image 8.3. - 3



CAUTION

Damage to the building and the PV system due to incorrect installation

Incorrectly installed roof hooks and concrete dowels can pull out.

- Only use concrete dowels in compliance with the specified conditions of use.
- Fasten the roof hooks to the substructure with the stipulated number of screws.
- Adhere to standard distances when positioning the dowels.
- Pre-drill holes in the specified depth and clean them.

8.3. Installing Adjustable Roof Hooks

Adjustable roof hooks allow for more mounting flexibility and are thus suitable for a larger range of roof tiles and batten strengths than standard roof hooks. The necessity of underlying the roof hooks is less likely. Please ensure safe blocking of the adjusting points.

Mounting steps:

- Position the roof hook and select the stay height. Position in such a way that neither the vertical nor the horizontal stay of the roof hook touches the underlying roof tile.
- Tighten the connecting bolt at the adjusting point (torque of 20 Nm).
- Align roof hook.

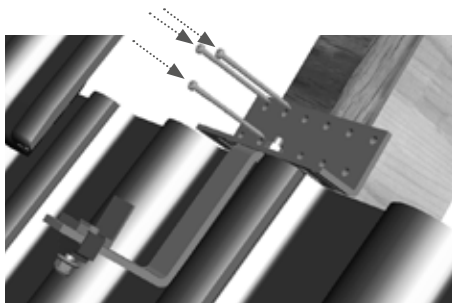


Image 8.3. - 4

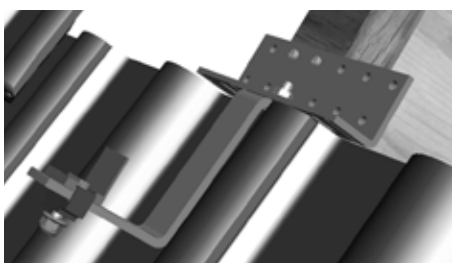


Image 8.3. - 5

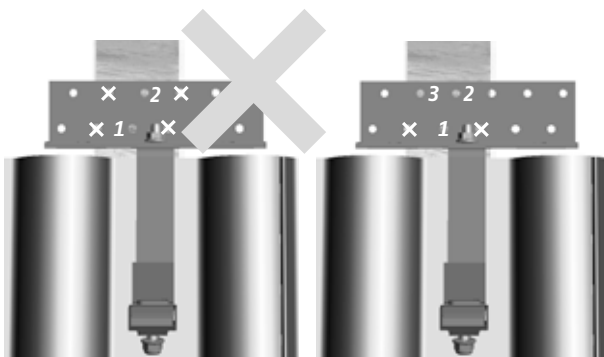


Image 8.3. - 6

Image 8.3. - 7

- Fasten the roof hooks to the rafters with 3 wood screws 6x80. Observe the permissible edge distance for wood drilling.



CAUTION

Damage to the building and the PV system due to incorrect installation

Incorrectly installed roof hooks can break away.

- Fasten each roof hook to the substructure with the stipulated number of screws.
- Adhere to standard edge distance when positioning the screws.
- If necessary, structurally widen the substructure.



CAUTION

Damage to building from leaking

Incorrectly performed additional structural measures can lead to leaks.

- When installing the flat tile or slate roof hooks adhere precisely to the mounting instructions.
- Use appropriate shims adhering to the national and local roofing regulations.
- Make sure to perform cut-outs on the roof tile or any additional structural measures that might be required in accordance with the national and local roofing regulations. If you have any doubts please contact a specialist roofing company.

8.4. Installation of Plain Tile and Slate Roof Hooks

Unlike other tile roofing, for plain tile or slate roofs the roof tiles / slates above the roof hooks need to be completely cut out as the material is often too thin for a partial cut-out on the underside. In this case, appropriate additional structural measures need to be carried out in order to ensure the restoration of the rain-proofing of the roof.

Mounting steps:

- Loosely fasten the supplied L-bracket with bolt, washer, lock washer and nut to the roof hook.
- Apply water drips to a shim made from a suitable material (e.g. aluminium or titanium zinc) - width of the shim for flat tile at least 10 cm, for slate at least 20 cm.

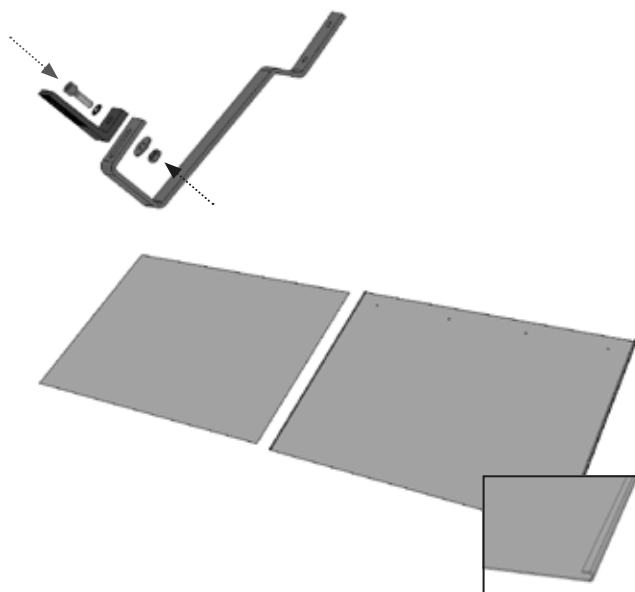


Image 8.4. - 1

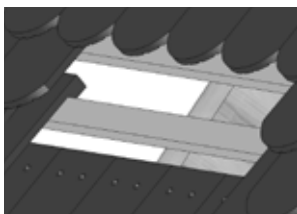


Image 8.4. - 2

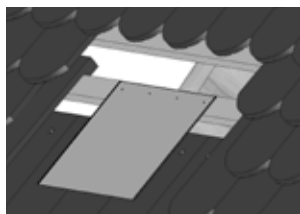


Image 8.4. - 3

- Place the shim and roof hook together at the fastening point and align.

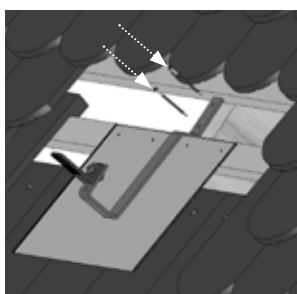


Image 8.4. - 4

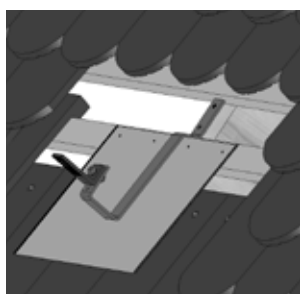


Image 8.4. - 5

- Fasten flat-tile roof hooks to the substructure with 2 wood screws 6x80, slate roof hooks with 3 chipboard screws 6x100, drilling through the shim. Observe the permissible edge distance for wood drilling.



Image 8.4. - 6

- Work the flat tiles / slates of the next row towards the roof hook, i.e. by notching or cutting.

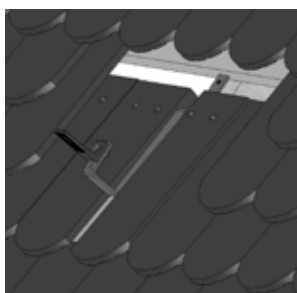


Image 8.4. - 7

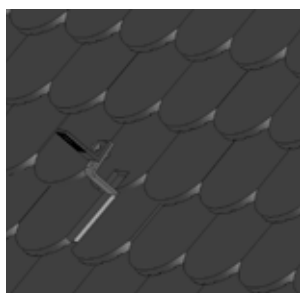


Image 8.4. - 8

- Lay the flat tiles / slates of the following row as normal.

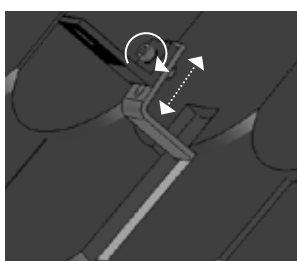


Image 8.4. - 9

- Align the loosely pre-mounted L-brackets in one row and tighten finally (torque of 20 Nm).



CAUTION

Damage to building from leaking

Incorrectly positioned hanger bolts can lead to leaks.

- Always place hanger bolts on the high beads, never in the low beads.
- Ensure a clean fit and sufficient contact pressure of the rubber seal or cap.

8.5. Installing Hanger bolts

Hanger bolts can be used as roof fasteners on tin or cement asbestos roofs. These roof types have different sealing methods (rubber seal or caps) and different threading types on the lower part of the bolt (for wood or metal purlins). The correct fit of the seals is crucial to a correct installation.

Additionally, tin roofs or cement asbestos roofs usually have a purlin substructure. This means that the base rails run vertically instead of horizontally, in contrast to the tile roofs mentioned above. Therefore, landscape orientation of the modules is the preferred type of installation; otherwise the mounting steps for the rail and module fastening remain identical.

Mounting steps:

- Pre-drill holes for the hanger bolts. Always make sure that the hanger bolts sit on the high beads. Also observe the permissible edge distance when drilling into the substructure.
- Insert screw.
- Sufficiently tighten the sealing or cap with the nut, without damaging or deforming the roof cladding.
- Mount the supplied L-brackets on the hanger bolts. Position all brackets at one height, e.g. by using a chalk line.

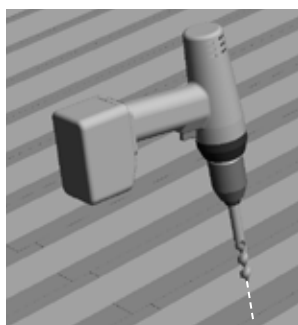


Image 8.5. - 1

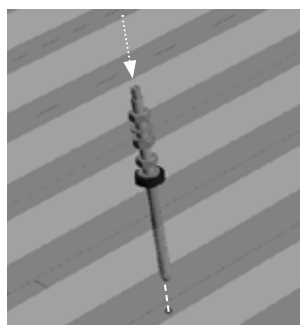


Image 8.5. - 2

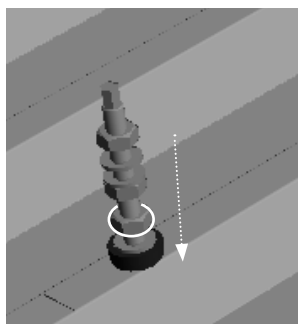


Image 8.5. - 3

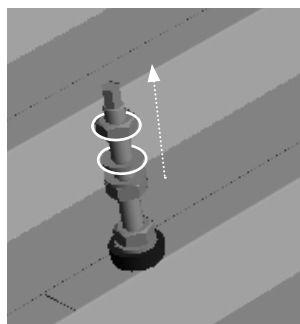


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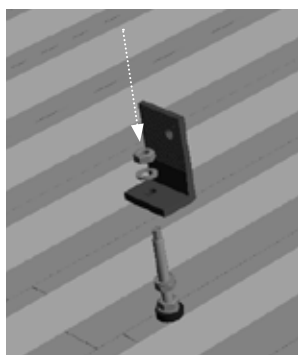


Image 8.5. - 5

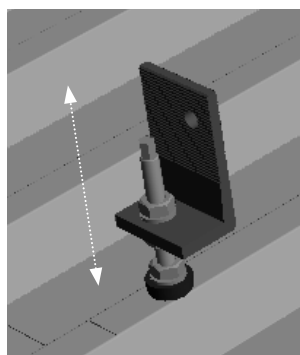


Image 8.5. - 6



CAUTION

Damage to the building and the PV system due to incorrect installation

Incorrectly mounted hanger bolts can pull out.

- Pre-drill holes for the hanger bolts.
- Make sure to observe the permissible edge distance for drill holes in wood / metal when fastening in the purlin.

**CAUTION****Damage to the building and the PV system due to an unsuitable roof structure**

Installation on unsuitable or inadequately fastened standing seam roofs can result in severe damage to or the breakaway of the sheet metal elements.

- Prior to installation, make sure the sheet metal elements and the fastening thereof are suited to permanently carrying the additional PV-system.
- Do not install standing seam clamps on unsuitable roof structures!
- Make sure to perform any additional structural measures that might be required in accordance with the national and local regulations. If you have any doubts please contact a specialist roofing company!

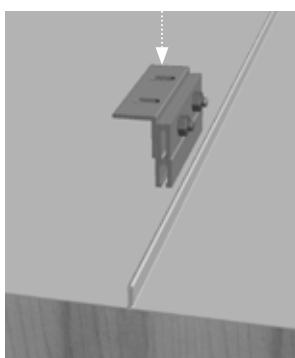
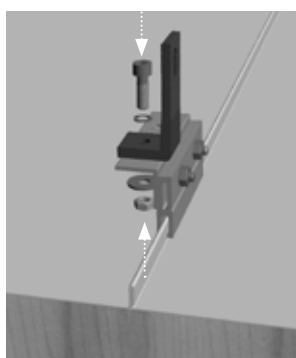
8.6. Installing Standing Seam Clamps

Standing seam clamps can be used as roof fasteners on standing seam roofs. The design of standing seam clamps varies according to the type of standing seam. It is important to note that for this type of fastening, the roof cladding must be able to absorb the wind suction forces flowing from the PV system. The suitability of the roof cladding and fastener must therefore be verified on site for each project. Additional structural measures such as e.g. an improved fastening of the sheet metal elements on to the purlins might be required.

**CAUTION****Damage to the building and the PV system due to incorrect installation**

Incorrectly installed standing seam clamps can break away.

- When installing the standing seam clamps, adhere to the torque specified by the manufacturer.

*Image 8.6. - 1**Image 8.6. - 2***Installation steps:**

- Place the standing seam clamps at the defined fastening points on the standing seam.
- Align standing seam clamps, e.g. with the help of a chalk line.
- Tighten the standing seam clamps. Make sure to adhere to the torques specified by the respective manufacturers of the standing seam clamp.
- Fasten the supplied L-bracket with bolt, washer, lock washer and nut to the clamp (torque 20 Nm).

9. Option: Fastening the Base Rails with Rail Support

Optionally, instead of a simple base rail connection to the roof fastener, a more convenient variant can be used, which makes placing and alignment of the rails easier. In this case, the rail connection is supplied preassembled to the roof hook.

Installation steps:

- Place the base rails on the pre-assembled bracket at the roof fastener.
- Align base rails horizontally.
- Lightly press the T-head bolt and nut in the direction of the rail and turn left by 90° to the stop. The T-head bolt is now in a vertical position, inside the side channel of the base rail.
- Position bracket and base rail in the desired height.
- Finally tighten the locking nut (torque 20 Nm).

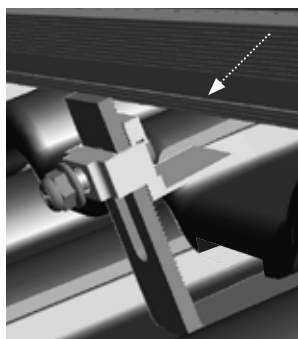


Image 9. - 1

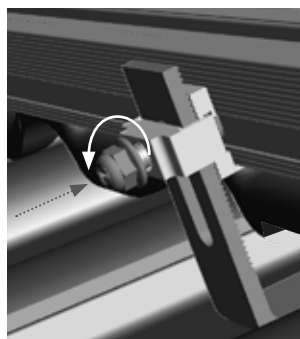


Image 9. - 2

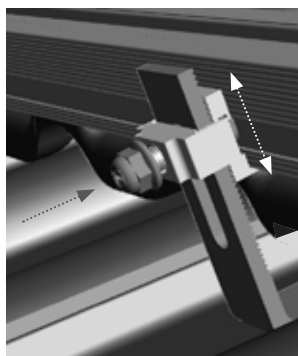


Image 9. - 3

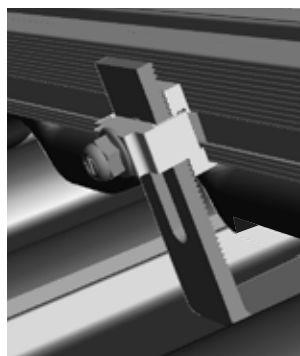


Image 9. - 4



CAUTION

Material damage due to incorrect installation

Incorrectly installed T-head bolts can pull out.

- When inserting the T-head bolts, always ensure the correct, vertical fit of the bolt head in the channel!
- When aligning the rails and during the final fastening of the T-head bolts, make sure that the head of the bolt does not slip into an incorrect position!
- Adhere to the specified torque of 20 Nm!

10. Option: Base Rail Installation with Outer Connectors and Telescopic End Pieces

Optionally, you can choose an outer variant instead of the inner connector. The same connector profile in a longer design with two pre-assembled base rail sections can also be inserted as a telescopic end piece, which allows for on-site installation with no cutting required.

10.1. Connecting Base Rails

Mounting steps:

- Slide the connector halfway into the side channel on the back of the base rail.
- Push the second base rail to the stop on the connector.
- Tighten both bolts manually, thus completing the connection.



Image 10. - 1

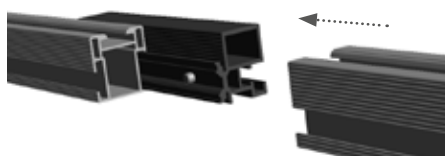


Image 10. - 2



Image 10. - 3



Image 10. - 4



Image 10. - 5



Note:

For this connection type, the base rails can be pre-assembled on the ground. This may facilitate transport onto and placing on the roof.

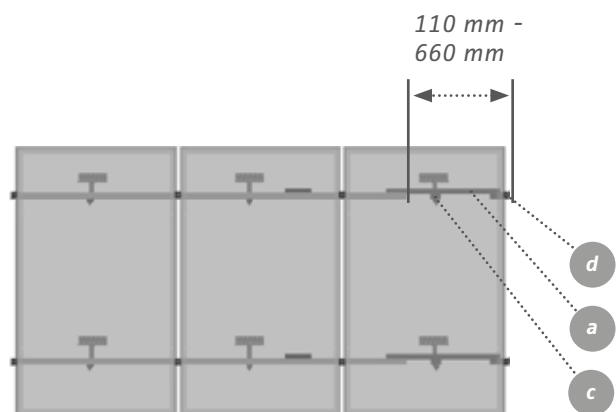


Image 10.2. - 1

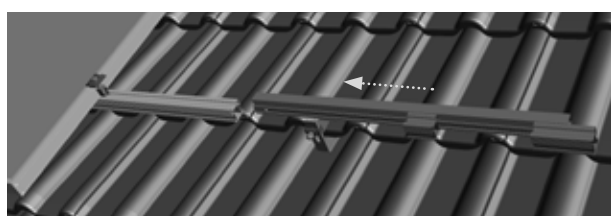
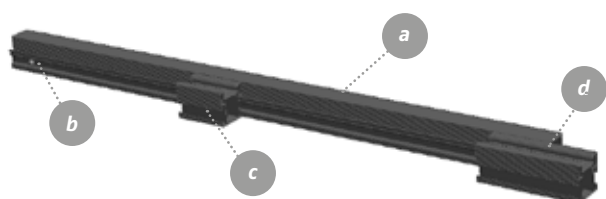


Image 10.2. - 2

10.2. Using Telescoping End Pieces

The telescoping end pieces allow for the cut-out-free setting of the base rail length, precisely to the millimetre; They are placed on the right side of each continuous base rail row. You can lengthen the base rail by a maximum of 66 cm. The telescoping end pieces are supplied pre-assembled including a narrow base rail section for fastening to the roof fastener (c) as well as a slightly wider base rail section for fastening the module end clamp (d).

- a** Connector piece for variable insertion into the base rail
- b** Bolt and square nut for fastening to the base rail
- c** Loose base rail section for connection to a roof fastener (if required)
- d** Permanently mounted base rail section to take the module end clamp.

Mounting steps:

- Do not finish the base rail row with a pre-cut base rail but with the telescoping end piece.
- Slide the telescoping end piece into the side channel on the back of the base rail.

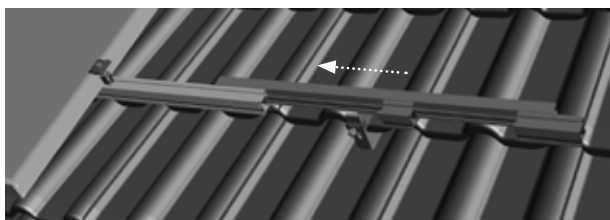


Image 10.2. - 3

- If required, push the loose base rail section to the position of the last roof fastener. Adjust the slide-in to achieve the desired length for the rail row - for a clean finish, the rail and telescope should protrude by the width of the module + 50 mm over the second last module.

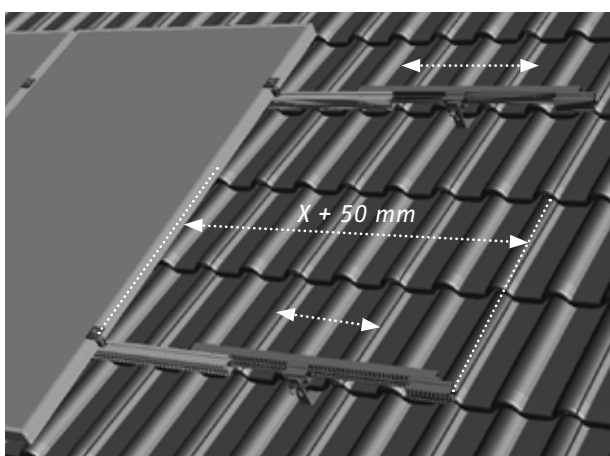


Image 10.2. - 4



Image 10.2. - 5

- Fasten the telescoping end piece by manually tightening the bolt at the base rail.

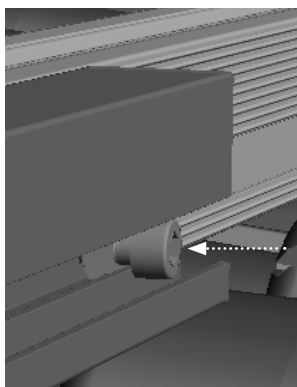


Image 10.2. - 6

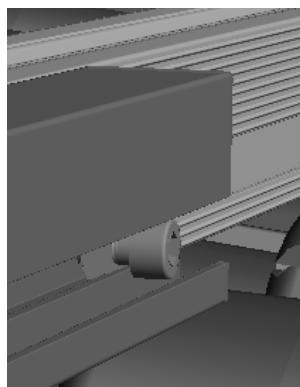


Image 10.2. - 7

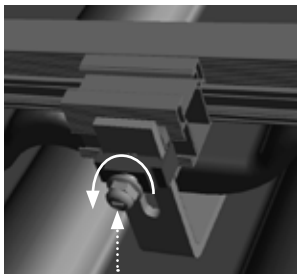


Image 10.2. - 8

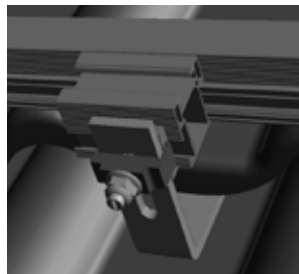


Image 10.2. - 9

- Mount the last roof fastener and the module as described above (chapters 6.1./9. and 7.2.).

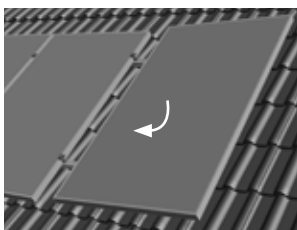


Image 10.2. - 7

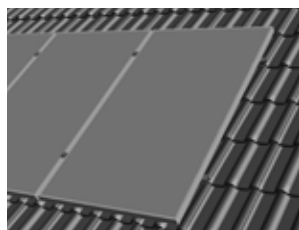


Image 10.2. - 8

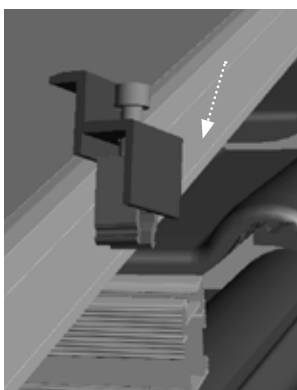


Image 10.2. - 9

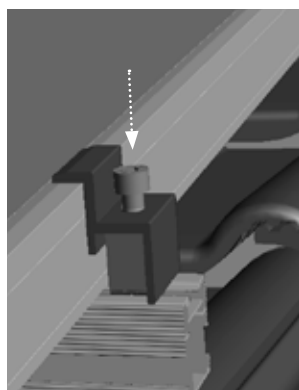


Image 10.2. - 10

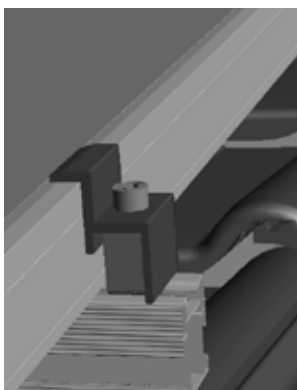


Image 10.2. - 11

**CAUTION****Material damage due to incorrect installation**

Incorrectly installed T-head bolts can pull out.

- When inserting the T-head bolts, always ensure the correct, vertical fit of the bolt head in the channel.
- When aligning the rails and during the final fastening of the T-head bolts, make sure that the head of the bolt does not slip into an incorrect position unnoticed.
- Adhere to the specified torque of 20 Nm.

11. Cross Rail Installation

For certain structural requirements or roof conditions, a cross rail layout might be necessary. In this case, cross rail connectors are used, which connect both base rail layers with each other. The type of the base rail is irrelevant.

There are 2 cross rail connector types available, one simple variant and a variant with position-locked T-head bolt for extra mounting convenience.

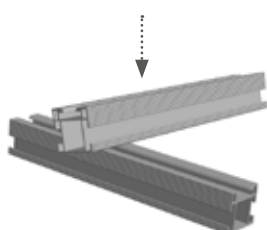


Image 11.1. - 1

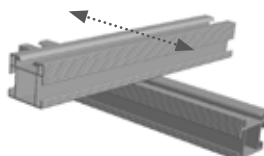


Image 11.1. - 2



Image 11.1. - 3

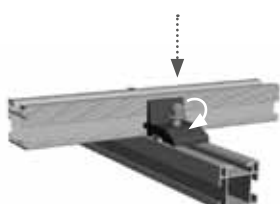


Image 11.1. - 4

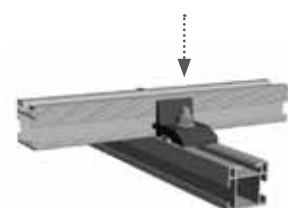


Image 11.1. - 5

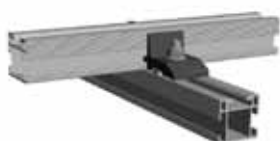


Image 11.1. - 6

Mounting steps:

- Place the base rails of the 2nd rail layer at an angle of 90° over the previously mounted rail layer and align.
- Hook the cross rail connector into the side channel of the upper base rail and position in such a way that the T-head bolt fits into the lower base rail.
- Turn the T-head bolt by 90° up to the stop, so that the head sits squarely in the channel of the lower base rail.
- Convenience variant: Before turning, gently press down the bolt. After turning, the bolt is locked in position.
- Tighten the locking nut (torque: 20 Nm), thus completing the connection. Make sure the T-head bolt sits correctly in the rail channel.



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