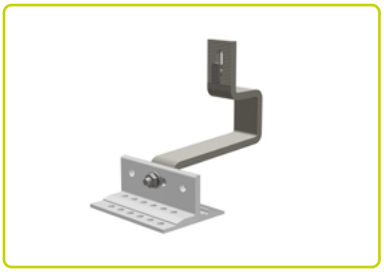
S:FLEX

**Assembly Instructions**

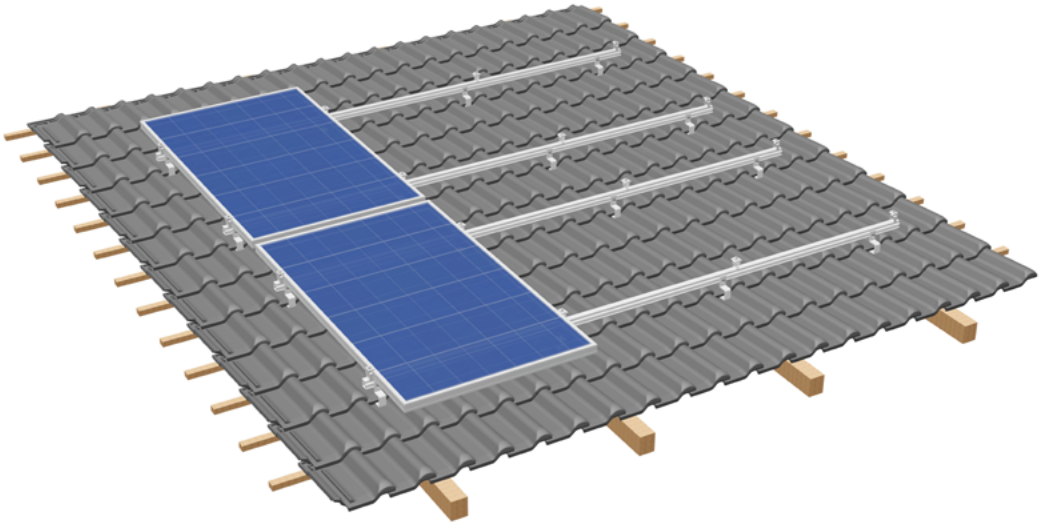
# Pitched roof installation AK

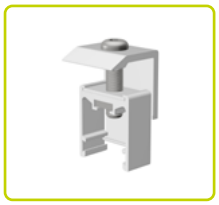
## For roofing tiles, plain tiles and slates



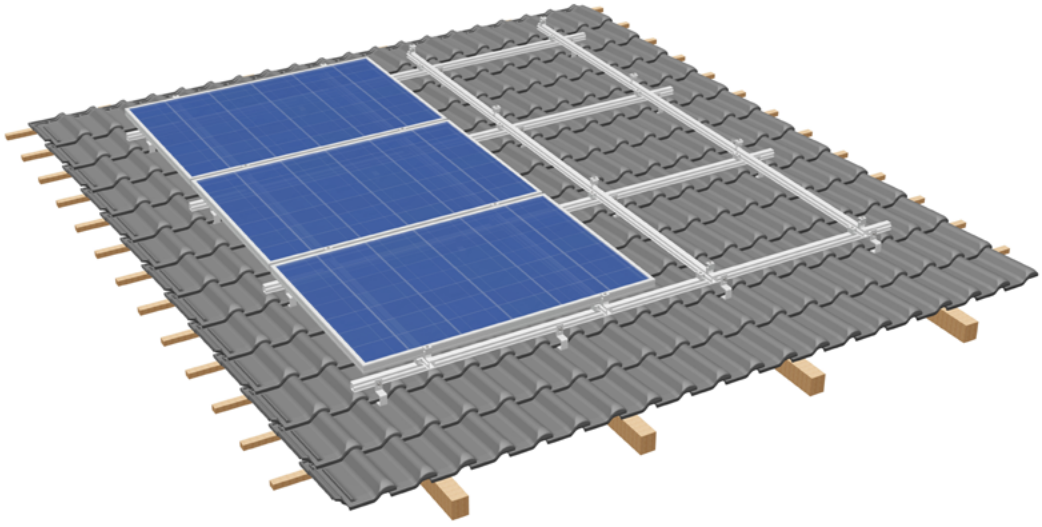












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## 1 Introduction

1.1 Intended use 3
1.2 About this document 3
1.3 Warnings 4
1.4 General information — standards and guidelines 4
1.5 Description of the system 6

## 2 Pitched roof installation AK

2.1 System components 11
2.2 Installing the roof hooks 13
2.2.1 Above-rafter and between-rafter insulation 13
2.2.2 Roof connection for roofing tiles 13
2.2.3 Roof connection for plain tiles 17
2.2.4 Roof connection for slates 19
2.3 Frame assembly 22
2.3.1 Single-layer assembly in upright orientation 22
2.3.2 Double-layer assembly in transverse orientation 26
2.4 Module installation 30
2.4.1 Module installation, vertical 30
2.4.2 Module installation, transverse 35

## 3 Disassembly and disposal

3.1 Disassembly 39
3.2 Disposal 39

## 4 Terms of use and warranty

4.1 User agreement 40
4.2 Warranty / disclaimer 40



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Read these installation guidelines carefully before installing the S:FLEX mounting system and retain them for future reference!
These installation guidelines are only complete with the project-specific implementation plans (project report)!

The S:FLEX PV fastening system for pitched roofs with roofing tiles, plain tiles and slate roofing is a frame system for mounting PV modules. It consists of mounting rails, roof hooks and all necessary small parts for fastening the PV modules on the mounting rails, for connecting the components to each other and for fastening to the roof substructure (RS).
The S:FLEX mounting system allows upright or transverse installation of the modules. The modules can be mounted in one or two rows.

An outstanding feature of the S:FLEX PV fastening system for pitched roofs with roofing tiles is the high availability of pre-assembled parts. The patented and proven click technology ensures the shortest possible installation times.
All components are generally made of aluminium and stainless steel. Their high degree of corrosion resistance ensures a long service life and offers the possibility of complete recycling.

### 1.1 Intended use

The S:FLEX PV fastening system for pitched roofs with roofing tiles, plain tiles and slate roofing is a frame system for mounting PV modules. It is designed exclusively for the installation of PV modules.
Any other use in this regard is considered misuse of the product. Observance of the information in these installation guidelines in particular, is a prerequisite for intended use.
S:FLEX GmbH accepts no liability for damage resulting from non-observance of the installation guide or from misuse or incorrect use of the product.

### 1.2 About this document

This assembly instruction describes the installation of the pitched roof frame for roof coverings with roofing tiles. For this purpose, the S:FLEX PV fastening system offers suitable solutions for easy connection to the existing roof substructure. Within the scope of this assembly instructions, the installation options are described separately for common roofing tiles:

- Roofing tiles
- Plain tiles
- Slates

This document shows the assembly instructionss for:

- Single-layer assembly with framed PV modules in upright orientation
- Double-layer assembly with framed PV modules in transverse orientation

It must be ensured that only current and complete installation guides are used for the installation process.


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### 1.3 Warnings

The warning texts provided in these installation guidelines relay safety-related information.
They are:



**Unless observed, there is a major risk of injury as well as a risk of death.**



**Non-compliance may lead to property damage.**

### 1.4 General information - Standards and guidelines

Every photovoltaic system must be installed in accordance with the instructions contained in the respective installation guidelines and the project report.
These installation instructions are based on state-of-the-art technology and many years of experience of installing our systems on site. It must be ensured that only the current and complete installation instructions are used for the installation, and that a print-out of the installation guidelines is stored in the immediate vicinity of the system. The system and these guidelines are subject to technical changes.

The project report is part of the installation instructions and is created on a project-specific basis. All of the information contained in the project report must be strictly observed. The project report contains the location-based static calculations. The S:FLEX mounting system must be designed and created with the S:FLEX software.

Since individual project-specific features must be considered with every roof, expert advice must always be sought prior to installation. Before installation, the PV system creator must ensure that the existing roofing and roof substructure are suitable for the additional loads. The condition of the roof substructure, the quality of the roof covering and the maximum load-bearing capacity of the roof construction must be checked by the system creator.
Contact a local specialist installer or structural engineer for this purpose.

Note on mounting underneath components containing copper: On tiled roofs, sheets containing copper (e.g. as chimney flashing, flashing for skylights, guttering, dormer roofing, dormer cladding) and strips (ridge tape to protect against moss growth) may be used.
Only roof hooks with anodised brackets may be used below these components. The copper-containing run-off rainwater attacks press-finished aluminium brackets or coated steel brackets and can destroy them in the medium term. An alternative to using roof hooks with anodised brackets is to remove the copper components or copper-containing ridge strips above the PV system. To do this, contact a specialist tradesman / roofer directly on site.

When installing the PV system, always comply with the module manufacturer's installation instructions. In particular, it is necessary to check that the module manufacturer's instructions regarding the module clamping guidelines (number of clamping points, module clamping surface and clamping range) are complied with. If this is not the case, the customer must obtain a declaration of consent from the module manufacturer before the installation; alternatively, the mounting system must be adapted in accordance with the module manufacturer's specifications.


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The requirements for the protection of PV mounting systems against lightning and surges must be met in accordance with the DIN and VDE regulations. The specifications of the relevant power supply company must be observed.

Care must be taken that the PV system to be installed does not impair the functioning of the existing lightning protection system. It is also important to ensure that the PV system is designed so that it can be included in the protection zone of the building's lightning protection system. The separation distances between the PV system and the lightning protection system specified in the relevant regulations must be adhered to.

The valid fire protection regulations must be observed during installation. Fire protection walls may not be built over, fire protection compartments must be preserved and the corresponding spacing regulations must be adhered to.

If the roofing is altered, the manufacturer's guidelines must be observed. During and after installation, the frame components may not be stepped on or be used as a climbing aid. There is a risk of falling and the roofing underneath could be damaged.

Prior to installation, the creator of the photovoltaic system must ensure that the installation is carried out while strictly adhering to national and location-specific building regulations, safety and accident prevention regulations, standards and environmental protection regulations.

Every person who installs the S:FLEX PV mounting systems is obligated to independently inform himself/herself about all rules and regulations for professionally correct planning and installation, and to comply with said rules and regulations during the installation process. This also includes compliance with the latest versions of the respective rules and regulations.
Installation of the PV system may only be carried out by trained specialists.



**All system components must be checked for damage before installation.**
**Damaged components must not be used!**



**Installation of the S:FLEX substructure and the PV system may only be carried out by trained specialists. System components must not be used as step ladders. The modules must not be stepped on. When working on roofs, there is a risk of falling off and falling through roofs. A fall can result in injury or death. Ensure that appropriate climbing aids and fall-protection equipment (e.g. scaffolding) are provided as well as protection from falling parts.**



**Check the building statics and construction/condition of the roof substructure before starting the installation.**
**During installation, the instructions in the installation guidelines and project report must be strictly observed. Failure to observe the installation guidelines and the project report may result in damage to the PV system and to the building.**



**In the area below copper components, only roof hooks with anodised aluminium brackets may be used. Bare aluminium brackets or coated steel brackets in the area underneath copper-containing components can be destroyed by water containing copper. This endangers the permanent secure fastening of the PV system.**


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## 1.5 Description of the system

The S:FLEX pitched roof AK offers suitable solutions for a range of different requirements:

### System features of the pitched roof AK

| | |
|---|---|
| Application: | Tiles, plain tiles, slates |
| Module type: | Framed modules, frameless |
| Module orientation: | Upright, transverse |
| Roof inclination: | max. 60° |
| Module field length: | max. 13.20 m connected module array |
| Max. load: | 5.4 kN/m² |
| Connection: | Roof hooks |
| Material: | Aluminium EN AW-6063 T6, EN AW-6082 T6, A2 stainless steel, mild steel with corrosion protection (DIN EN ISO 12944-5 C4 long) |
| Colour: | Nature, press blank, black anodised |



**The module manufacturer's installation instructions must always be observed. All of the manufacturer's specifications relating to installation on the roofing must be observed.**

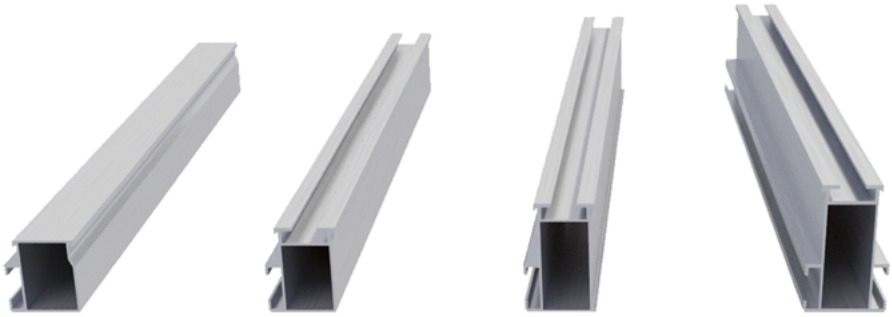
The roof hooks are suitable for horizontal and vertical installation of the mounting rails. Details of the various roof hooks are provided in the sections on installation.

Height adjustment in the area of the roof battens and rails ensures a level PV field – even on uneven roof surfaces. The system can therefore be installed on old and new buildings without any problems. The advantages of the extrusion process are exploited for this purpose. The interlocking of grooved, optimally matched surfaces of the roof hooks and mounting rails ensures a force-fit and form-fit connection as well as a high degree of variability.


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**Mounting rails**

The S:FLEX pitched roof system is available with aluminium mounting rails of different thickness to ensure the system corresponds
optimally to the requirements of the location and the installation situation.
The S:FLEX mounting rails feature a hammerhead slot on the side for connection to the fasteners. The mid clamps and end clamps are mounted from above by means of click technology.



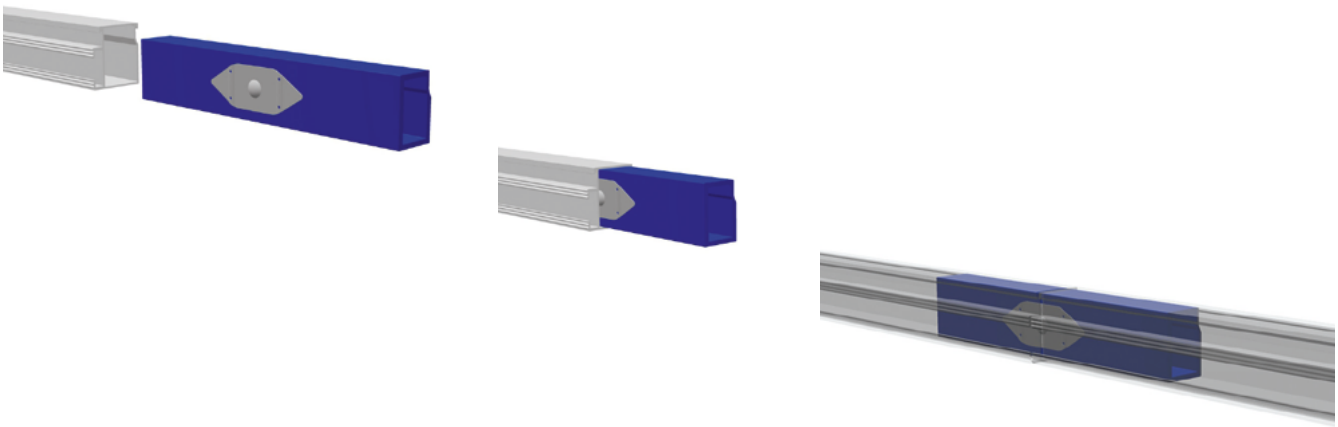
**ST-AK 5/40** **ST-AK 7/47** **ST-AK 13/60** **ST-AK 26/70**

**Rail splices**

In addition to the basic installation, the splice technology allows a system orientation without a reduction in the load-bearing capacity in the area of the splices, since they have the same static values as the associated mounting rail.

When connecting the mounting rails in succession using splices, an earthed connection can be created by applying pressure to push the mounting rails together flush to the splices. It must be ensured that the earthed connection is professionally inspected on site after installation.

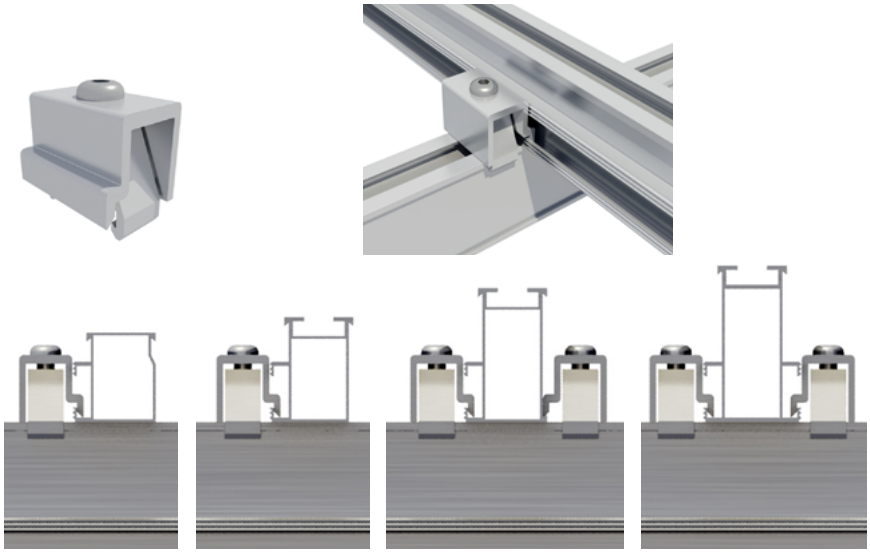
In addition, the splice technology offers the possibility to quickly and easily create expansion joints according to the conditions of the roof. This is also feasible as a ground-locking connection, as shown below.




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### Cross adapter

Intersection points (for double-layer systems) can be quickly realised in a load-bearing manner with cross adapters with patented and proven click technology. Depending on the static requirements of the location and the installation situation, one or two cross adapters must be arranged per intersection point.

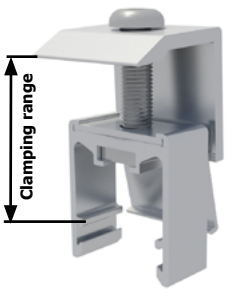


ST-AK 5/40 | ST-AK 7/47 | ST-AK 13/60 | ST-AK 26/70

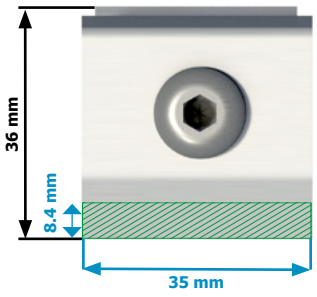
### Module mid clamps and module end clamps

Height-adjustable module mid clamps and module end clamps with click technology allow for maximum flexibility when installing virtually all framed module types with a frame height of 30 – 50 mm. When installing the PV modules to the mounting rail, always comply with the installation instructions of the module manufacturer.

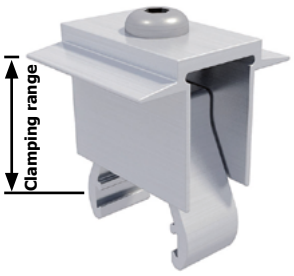
When performing the fastening by means of the module mid clamp and module end clamp, ensure that these clamp onto the module frame on the clamping surface defined by the module manufacturer. Every person who installs the S:FLEX PV fastening systems is obligated to ensure that the existing clamping surfaces correspond with the module manufacturer's installation instructions. If the maximum clamping surfaces of the module mid clamps and module end clamps are insufficient, it is also possible to obtain the components in different lengths.



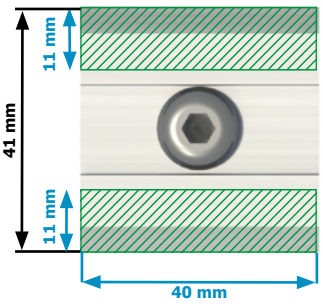

**Module end clamp (EC)**




**Maximum clamping surface EC II: A=8.4*35=294mm²**




**Module mid clamp (MC)**



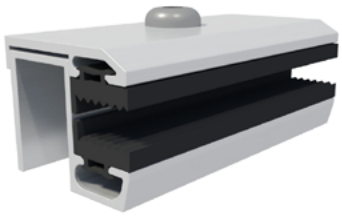

**Maximum clamping surface MH: A=11*40=440mm² (per side)**


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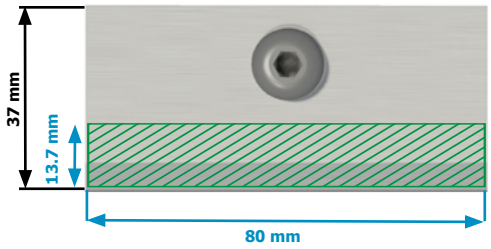
## Laminate clamps

The installation of frameless PV modules (laminates) is made possible by means of precisely fitting, certified laminate end and mid clamps. These are available with our patented and proven click technology or with a hammerhead bolt. Depending on the requirements of the laminate, different clamping ranges and lengths are available.

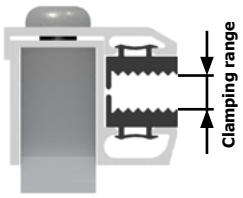
The suitability of the laminate end and mid clamps must be confirmed by the module manufacturer (certification). You can obtain an overview of the respective approvals from S:FLEX.

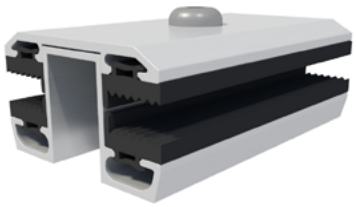


**Laminate end clamp (LEC)**

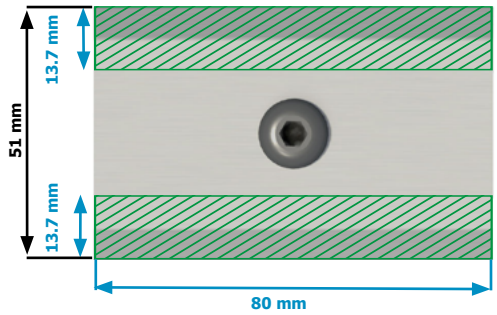



**Maximum clamping surface LEC:**
**A=13.7*80=1096mm² (top and bottom)**

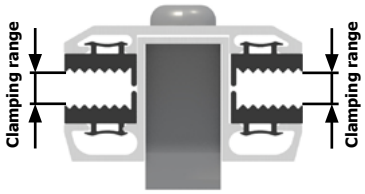


**Laminate mid clamp (LMC)**




**Maximum clamping surface LMC:**
**A=13.7*80=1096mm² (per side, top and bottom)**





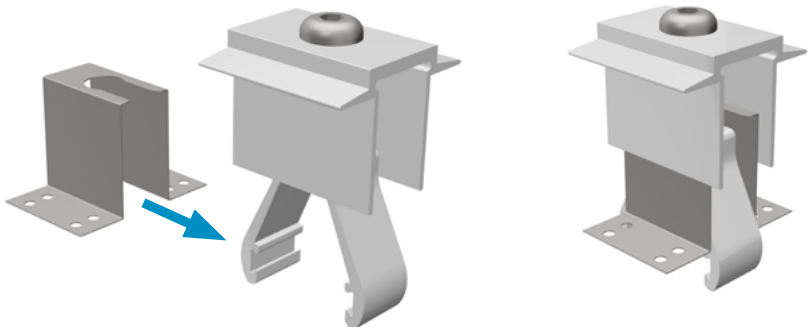
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**Earthing**

Equipotential bonding between the individual system components must be ensured in accordance with the respective country-specific guidelines and standards. System-specific properties (see splice technology) among other things can be used for this purpose.
This assembly instruction does not include an earthing concept and must be calculated or compiled by the installer in accordance with the applicable standards and guidelines.

**The earthing system is not a lightning protection system! When installing a lightning protection system, a specialist company must be consulted and a project-specific lightning protection plan drawn up. The module manufacturer's installation instructions must always be observed.**

The earthed connection of the mounting rails is established by the splice. Additional earthing of the modules can be achieved via the grounding plate by mounting it under the mid clamps. Before earthing the module, the corresponding specifications issued by the module manufacturer must be followed.

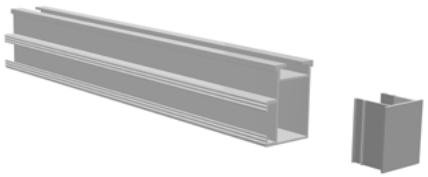


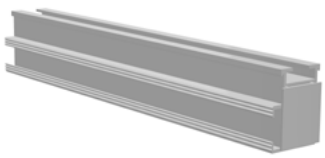
**Optional items**

**Covering caps**

The S:FLEX PV fastening system includes matching covering caps for the mounting rails.










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## 2.1 System components

### ① Roof hooks

Roof hook Hybrid 112-7-43 6 mm II



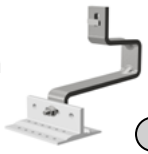
Roof hook Hybrid 112-7-46 8 mm II

Roof hook Hybrid 149-9-43 6 mm



Roof hook Hybrid 149-9-46 8 mm

Roof hook Hybrid 112-7-56 XL 8mm



Roof hook Alu 93-7-45



Roof hook Alu 111-9-45

Roof hook Alu 93-7-40



Roof hook Alu 111-9-40

Roof hook Alu 150-7-45



Roof hook Alu 180-9-40

Roof hook Vario 2 93-7-40



Roof hook Vario 2 111-9-40

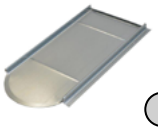
Roof hook slate



Roof hook plain tile



"Biber Vario" metal roof plate



### ② Mounting rails

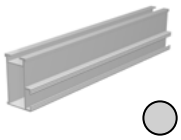
ST-AK 5/40



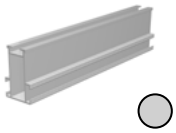
ST-AK 7/47



ST-AK 13/60

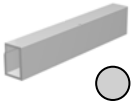


ST-AK 26/70

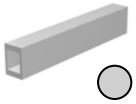


### ③ Splices

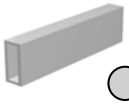
Splice 5



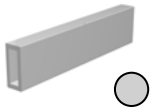
Splice 7



Splice 13



Splice 26



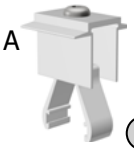
### ④ End clamp

EH AK II Klick 30-50



### ⑤ Mid clamp

MH AK II Klick 30-50 A



MH AK II Klick 30-50 with grounding plate



### ⑥ Cross adapter

Cross adapter AK



### ⑦ Locking clips

Locking clip AK




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### ⑧ Covering caps

Covering cap 5 



Covering cap 7 



Covering cap 13 



Covering cap 26 



### ⑨ Slipping protection set

Slipping protection set 

### ⑩ Wood screws



### ⑪ Cable clips (optional)

Cable clip edge clip KC 15 


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## 2.2 Mounting roof hook

### 2.2.1 Above-rafter and between-rafter insulation

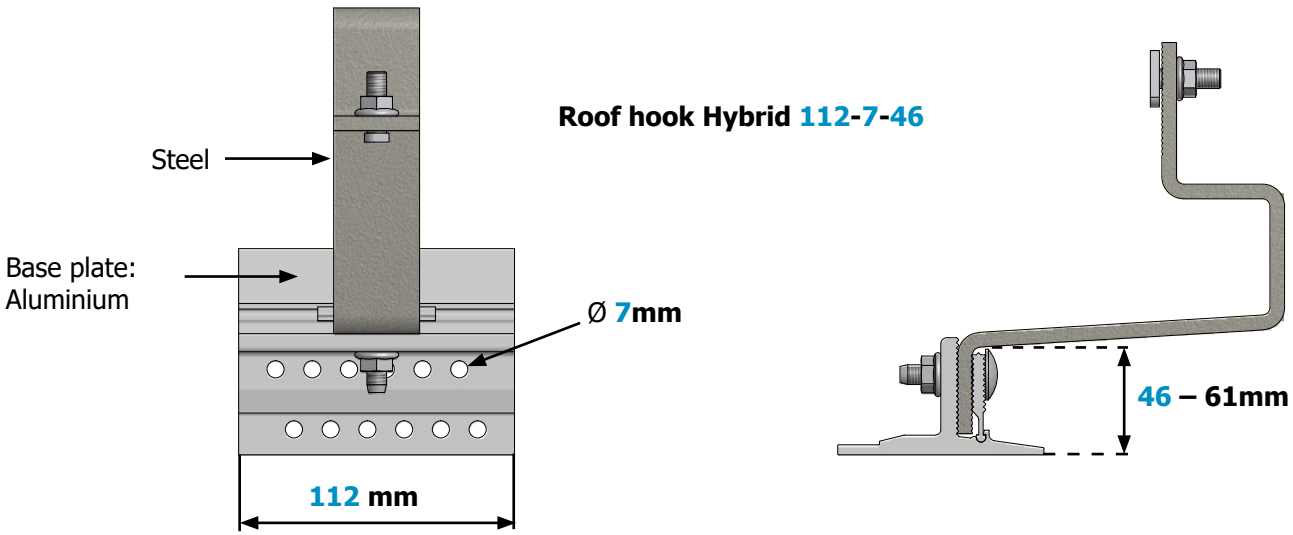
Tiled and plain tile roofs can be designed as between-rafter or above-rafter insulation or as a mixed variant of the two insulation types. For between-rafter insulation, S:FLEX wood screws with a diameter of d=6 mm are mainly used. In the case of above-rafter insulation, longer screws are required to reach over the insulation into the rafters. For this reason, wood screws with a diameter of d=8 mm are used for this purpose. S:FLEX offers wood screws in different lengths, depending on the insulation and possibly counter batten height. In the case of soft insulation with counter-battening, it is important to ensure that wood screws with a bottom thread are used, which are screwed into the counter-batten.

### 2.2.2 Roof connection for roof tiles and roofing tiles

The majority of roof coverings are made with roof tiles or roofing shingles. Here, the S:FLEX PV mounting system offers adjustable roof hooks for variable attachment to the existing roofing (tile dimensions) or roof structure (tile thickness and roof batten height). The S:FLEX roof hooks are suitable for mounting horizontal system supports. For different tile dimensions, roof hooks with suitable adapter plates are offered to realize the corresponding lateral adjustability. The roof hooks are mounted with suitable wood screws.

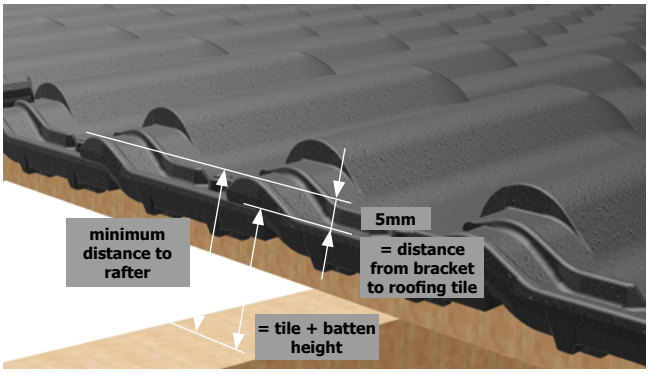
In the area of the roof batten/tile, the roof hooks are variably adjustable from 40 - 72 mm. If the adjustment possibilities of the roof hooks are no longer sufficient, the roof hook must be fully underlaid with a pressure-resistant carpet pad. The described adjustment possibilities can be found in the designation of the roof hooks.
DH Alu base plate width - hole pattern - minimum distance to the rafter.

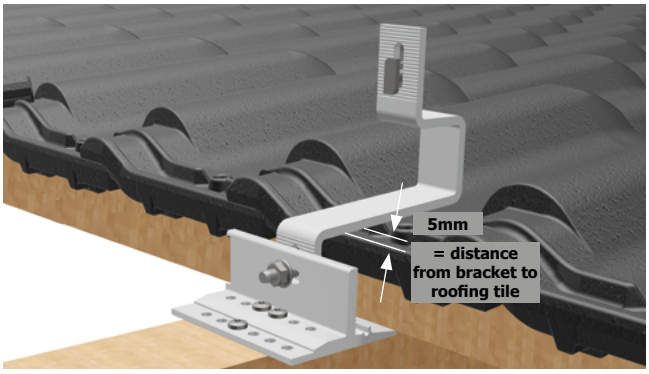
**Explanation of the terms using the example of:**
**Roof hook Hybrid 112-7-46**





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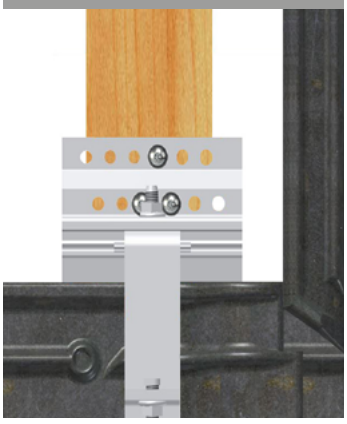




The following minimum rafter dimensions and rules apply for the installation of roof hooks and wood screws.
Standard: DIN EN 1995-1-1:2010-12 Eurocode 5 Design of timber structures

| **Minimum rafter width 45 mm** | **Minimum rafter width 50 mm** | **Minimum rafter width 53 mm** | **Minimum rafter width 57 mm** |
|---|---|---|---|
| Roof hook Alu xx-7-xx<br>Roof hook Hybrid xxx-7-xx<br>DH Vario 2 xx-7-xx | Roof hook Alu xxx-7-xx | Roof hook Hybrid xxx-9-xx | Roof hook Alu xxx-9-xx<br>Roof hook Vario 2 xxx-9-xx |

**Roof hook Hybrid 112-7-46**
(example illustration)

**Min. 3 screws with d=6mm**

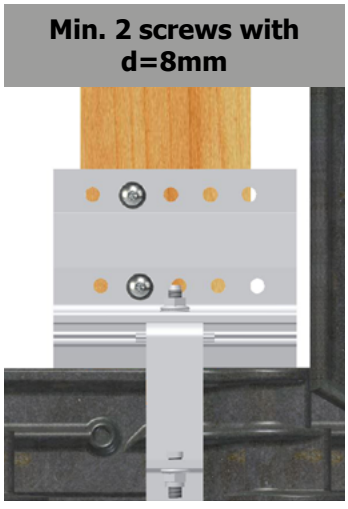




- Two screws in the lower row of holes and one screw in the upper row of holes
- Edge distance: Screw centre – rafter edge at least 2.5xd[1] = 15mm
- Centre distance: screw centre- screw centre=2.5xd[2] = 15mm
- all roof hooks with 7mm hole diameter: 3x wood screw d=6mm
- Minimum screw-in depth: 50mm

**Roof hook Hybrid 149-9-46**
(example illustration)

**Min. 2 screws with d=8mm**





- One screw in the lower row of holes and one screw in the upper row of holes
- Edge distance: Screw centre – rafter edge at least 3.0xd = 24mm
- all roof hooks with 9mm hole diameter: 2x wood screw d=8mm
- Minimum screw-in depth: 70mm

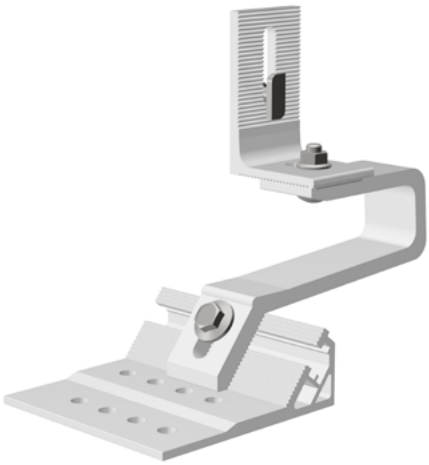
**Observe rafter dimensions and rules for screw mounting!**

**The use of an impact screwdriver to fasten the wood screws of the roof hook is not permitted.**

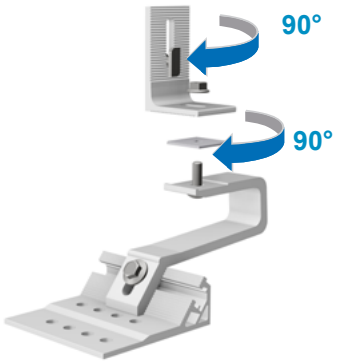
[1] 2.5xd only applies when using S:FLEX screws (Art. No. 700-102-68x) or wood screws of the same design, which are approved for these edge distances according to the approval. In special cases, installation on rafters with a width between 36mm and 45mm is possible. This always requires project-specific planning and approval.
[2] Since the centre distances of the DH xxx-7-xx are 15mm, S:FLEX screws or wood screws of the same design, which are approved for these centre distances according to the approval, must be used when setting two adjoining screws.


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**Roof hook Vario for vertical and horizontal rail connection**



The roof hook Vario enables module support rails to be mounted vertically. In this case, the installation rules for roofing tiles apply.





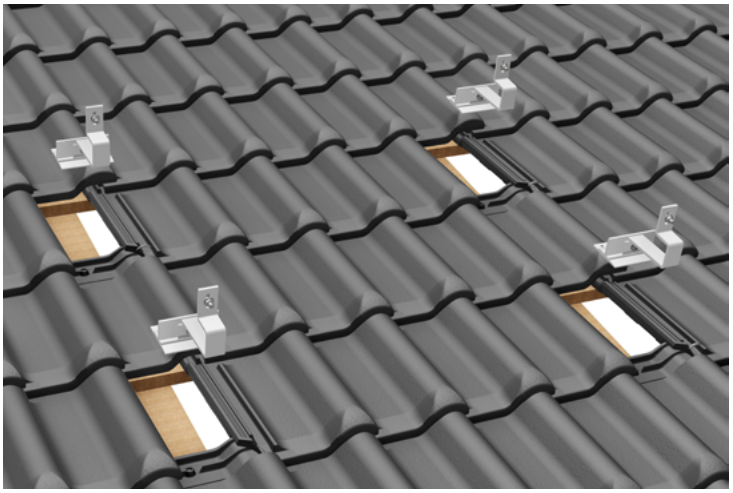

The bracket is rotated by 90° for the horizontal rail connection. Loosen nut, rotate bracket and ribbed plate by 90° and re-tighten nut (tightening torque 12–15 Nm)

**DH Hybrid XL for longer roof lengths**

The DH Hybrid XL 8 mm is the roof hook for longer roofing lengths (>100mm) and large batten heights. This may be necessary for tiled roofs with low roof pitches on the one hand and for large-surface tiles on the other.

**Installing the roof hooks**

The positioning of the roof hooks must be determined in accordance with the static requirements of the location and the installation situation. Mark the vertical course of the rafters in chalk on the tile surface, as well as the outline of the module array and the course of the individual module rows. Mark the position of the roof hooks according to the project report. When doing so, it must again be checked whether the measurements used during planning match the actual measurements found on the roof (if necessary, adjustments must be made). The position of the mounting rails must be checked against the modules' prescribed clamping distances. Please remove the roof tiles at the marked positions (if necessary, only push the tiles up).



**Check planning basis.**



**Position the roof hooks in accordance with the static requirements and installation situation.**

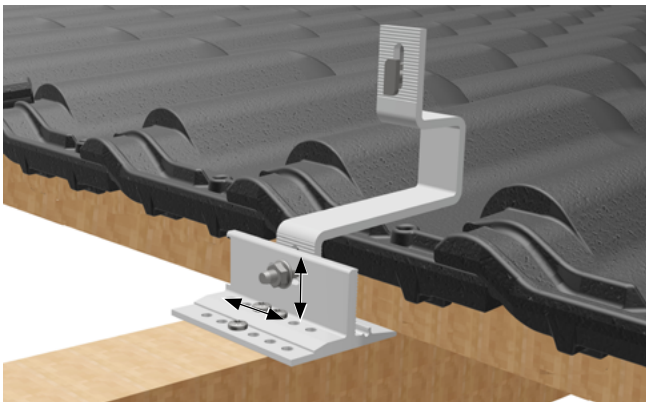


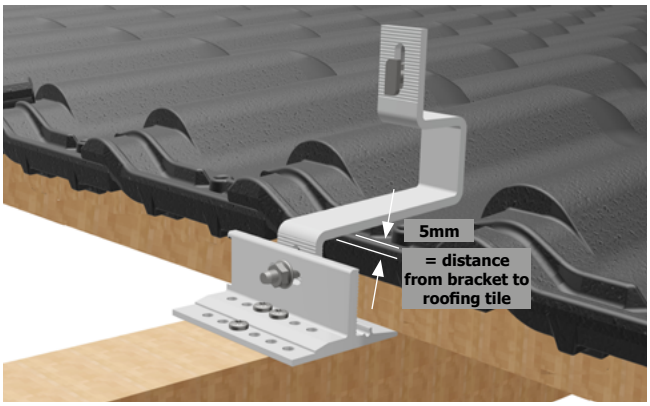
**Align the roof hooks using a plumb line.**


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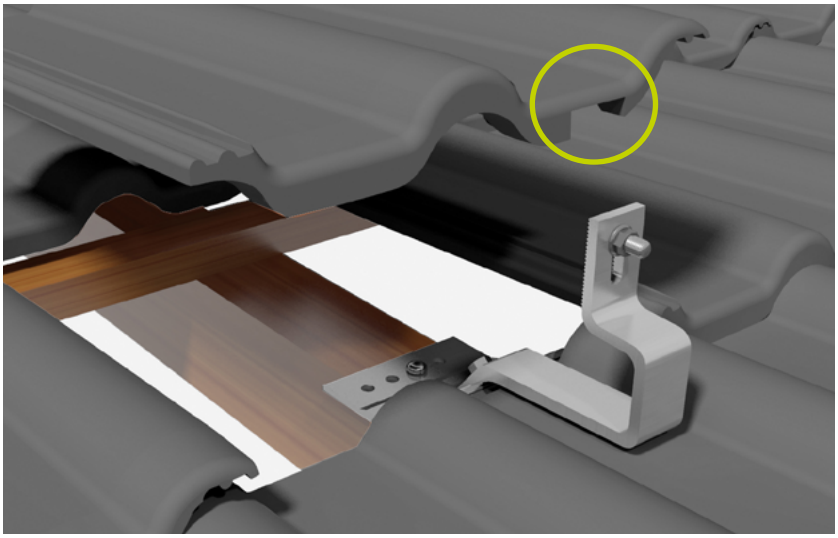
Loosen the screw on the roof hook bracket until the bracket can be moved. Position the roof hook (use a guide) and fix it to the rafters with wood screws.

Next, adjust the roof hook bracket vertically and laterally until it is situated in the trough of the tile. There must be 5 mm clearance between roof tile and bracket. Tighten the bracket with the screw (tightening torque 20–25 Nm).






Reposition the removed tiles correctly. After the installation of the roof hooks, the tiles must lie flat again to ensure that the roof covering is watertight. In the case of roofing with interlocking tiles, the seams on the upper and lower tile must be cut out with an angle grinder at the point where the roof hook passes through. With roof tiles (e.g. Frankfurter Pfanne), only the upper roof tile should be cut out. In case of high snow loads, the lower tile can be replaced with a suitable metal roof plate. Suitable metal roof plates for all common tile types are available from S:FLEX.







**Recess on the roofing tiles**


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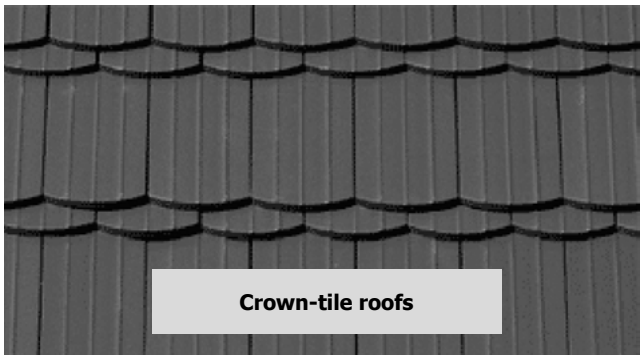
### 2.2.3 Roof connection for plain tiles

For plain-tile roofing, the S:FLEX PV fastening system includes the roof hook plain tile with metal roof tiles. The plain tiles must be removed and then and replaced during installation.
The plain tile situated under the roof hook is replaced with a “Biber Vario” metal roof plate, so that the roof hook does not press on the roofing. The metal roof plates are included in the S:FLEXproduct range.

**To design the connection of the S:FLEX PV fastening system on roofs covered with plain tiles, please contact a specialist roofing company.**

The plain-tile roof hooks allow the mounting rails to be installed horizontally.


Double roofing


Crown-tile roofs

The installation sequences for the roof connection are described below using the example of double roofing (most frequently encountered) with the roof hook plain tile.

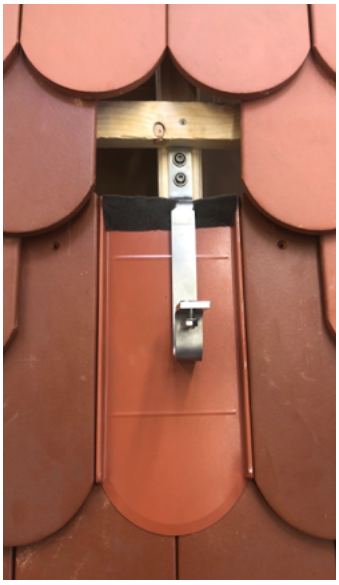
**The following assembly instruction for connecting the S:FLEX PV fastening system to plain-tile roofs with double roofing serves as an example. To ensure a technically correct execution of the connection to the roof, contact a specialist roofing company.**

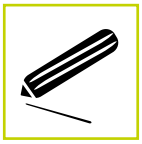

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## Roof connection for plain tiles

The positioning of the roof hooks must be determined according to the static requirements of the location and the installation situation. It must be checked again whether the dimensions used as a basis in the planning correspond to the dimensions found on the roof (adjustments may have to be made). The fit of the system supports with the prescribed clamping distances of the modules must be checked.
Cover the surrounding plain tiles and replace the plain tile under the roof hook with a metal roof plate. To do this, fix the metal roof plate to the roof batten at the drill holes provided with nails or suitable screws and glue in the foam wedge at the upper edge. Position the beaver roof hook and fix it with two wood screws plate head (8x80). In the case of above-rafter insulation, correspondingly longer wood screws are used. Then re-cover the remaining plain tiles.











**Check planning basis and remove roof tiles, if necessary simply push them up.**

**Position the roof hooks in accordance with the static requirements and installation situation.**

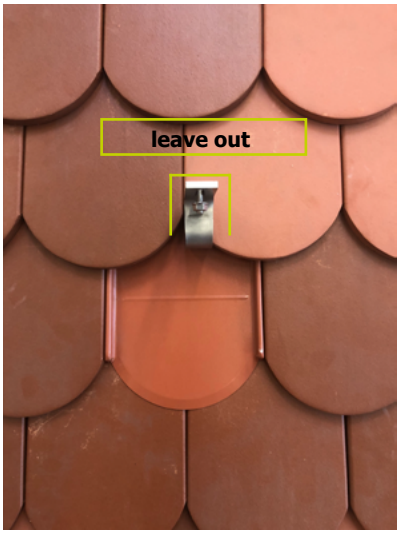
**Always use metal roof plates.**

**Align the roof hooks using a plumb line**

**Observe screw arrangement and edge distances.**

**The use of an impact screwdriver to fasten the wood screws of the roof hook is not permitted. The use of an impact screwdriver can lead to preliminary damage to the fastener and the thread being torn out of the wood.**

If the plain tile collides with the roof hook, push the tile up a little or, if necessary, leave it out at this point. Make sure that the double covering is still guaranteed. If this is not guaranteed, we recommend additionally sealing above the roof hook with a bitumen cloth or a sheet of metal.




**The double cover must be guaranteed at all times with regard to water drainage**


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### 2.2.4 Roof connection for slates

As a solution for slate roofs, the S:FLEX PV fastening system includes the roof hook slate. The installation of the roof hook slate should take place while the roofing is being laid (new buildings). If the roofing is already installed, the slates must be removed and, if necessary, processed (recessed) prior to installation.

As a rule, a titanium zinc sheet is attached to the formwork above the formwork liner. The sheet should overlap with the slate roofing around the exposed area to an extent that ensures the roofing remains watertight. The roof hook slate is mounted to the rafters above this sheet. Above the roof hook slate, an additional titanium zinc sheet is attached to the formwork to ensure that the roofing is watertight. The titanium zinc sheet must be procured on site to ensure it matches the existing roofing. The required sheets are not included in the S:FLEX delivery.

**To design the connection of the S:FLEX PV fastening system on slate roofs, please contact a specialist roofing company.**

The slate roof hooks allow the mounting rails to be installed horizontally.



**Universal roofing**

The installation sequences for the roof connection are described below using the example of universal roofing with full formwork and the roof hook slate.

**The following installation instructions for connecting the S:FLEX PV fastening system to slate roofs serves as an example. To ensure a technically correct connection to the roof, contact a specialist roofing company.**

The positioning of the roof hooks must be determined in accordance with the static requirements of the location and the installation situation. When doing so, it must again be checked whether the measurements used during planning match the actual measurements found on the roof (if necessary, adjustments must be made). The position of the mounting rails must be checked against the modules' prescribed clamping distances. Remove the slates at the marked positions.


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**Check the planning basis and remove slates if necessary.**

**Position the roof hooks in accordance with the static requirements and installation situation.**



**Align the roof hooks using a plumb line.**



**Use titanium zinc sheet and ensure it overlaps by the correct distance.**

Depending on their size, one or two slates must be replaced with a titanium zinc plate (to be provided by the customer). This is attached to the formwork. It is important to ensure that the sheet extends under the slates at the sides and over the slates at the bottom to ensure that the roofing is watertight.

Position the roof hook slate (use a plumb line) and fix it to the rafters with three countersunk screws 6x80.

**Install with three wood screws**
**Countersunk screws 6x80**





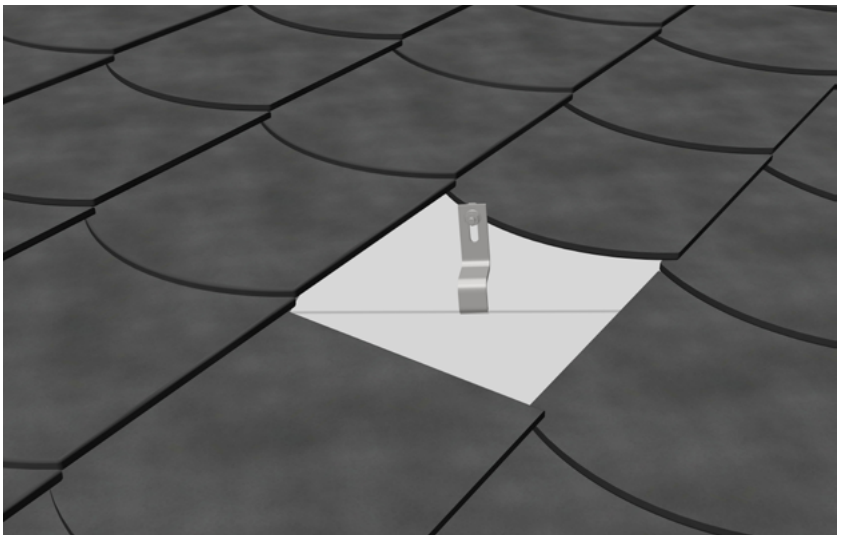

**Observe screw arrangement and edge distances.**

**The use of an impact screwdriver to fasten the wood screws of the roof hook is not permitted. The use of an impact screwdriver can lead to preliminary damage to the fastener and the thread being torn out of the wood.**


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An additional titanium zinc sheet must be installed above the roof hook. Any resulting free spaces between the titanium zinc
sheets and adjacent slates must be sealed with sealing tape (to be provided by the customer).

The adjoining slates must be fastened in accordance with the rules and regulations of the roofing trade.







**Seal free spaces with sealing tape**



**If necessary, create a recess in the roofing tiles**

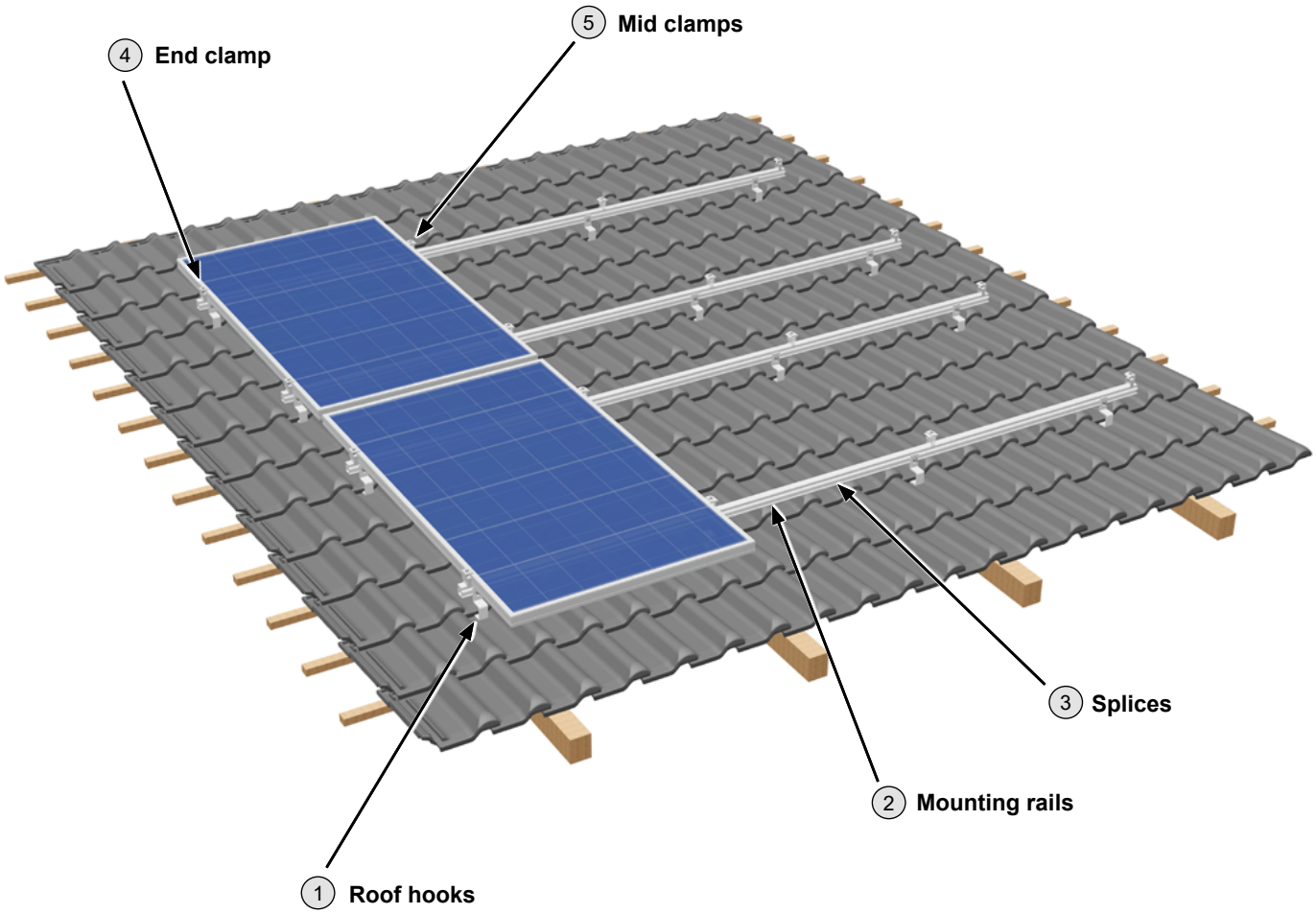
Schematic diagram – due to the diversity of slate roofing types, the roof hooks should always be installed by a specialist roofing company.


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## 2.3 Frame assembly

### 2.3.1 Single-layer assembly with framed PV modules in upright orientation

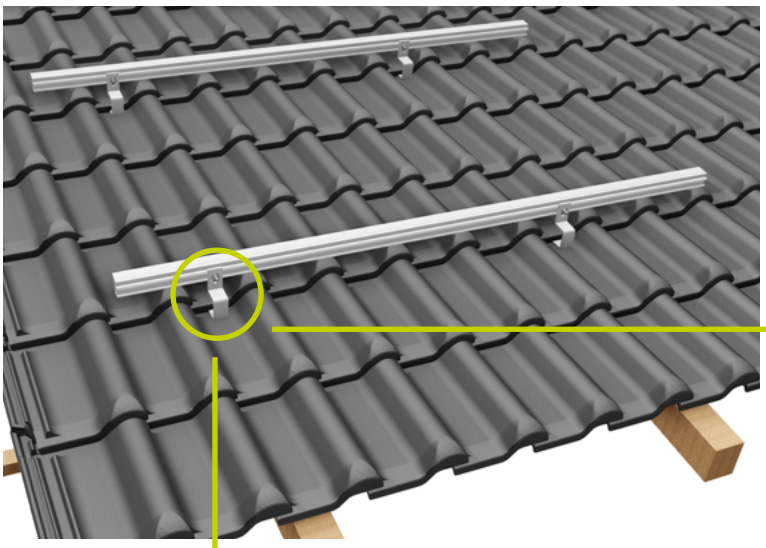
The installation instructions for "Single-layer assembly with framed PV modules in upright orientation" are only valid in conjunction with the instructions in section 2.2. The installer must ensure that only current and complete assembly instructions are used for the installation process.

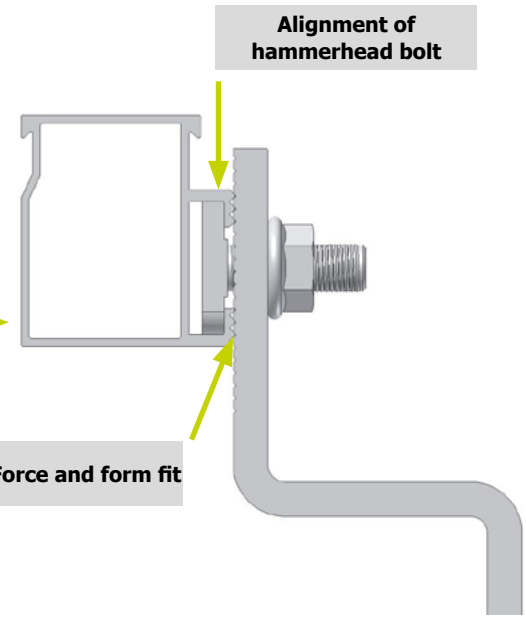


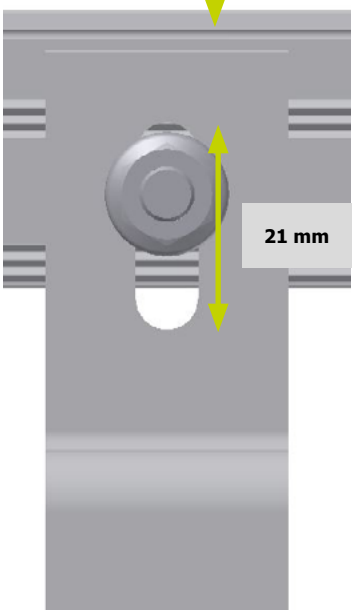


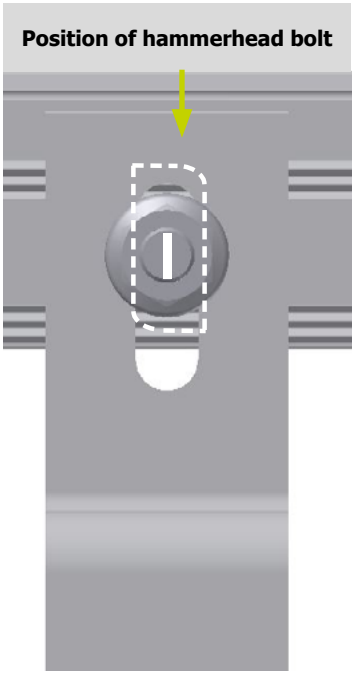
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Attach the horizontal mounting rail (which runs parallel to the eaves) to the roof hooks using a hammerhead bolt M8x25 and self-locking nut. Make sure that the hammerhead bolts are correctly aligned in the channel of the mounting rail (tightening torque 12–15 Nm) and that the mounting rail is not under tension. To do this, use the adjustability that is created by the corrugation of the components and the elongated hole. Ensure that a force-fit and form-fit connection is created by interlocking the corrugations.






13

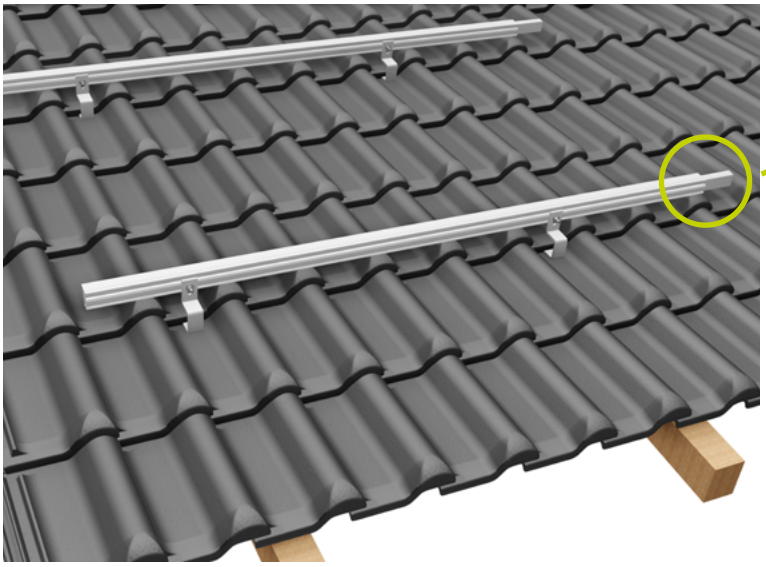
**Check the alignment of the hammerhead bolts. The hammerhead bolt is only correctly mounted if the vertical notch is visible.**

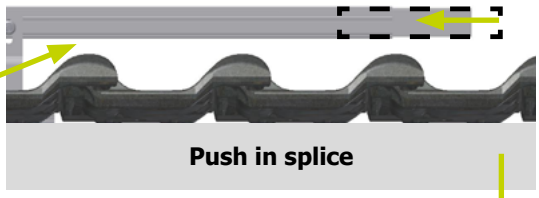
**Use the adjustability due to corrugation and elongated hole**

**Create force-fit and form-fit connection**


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To join several rails together, the splice with identical static values to the mounting rail is pushed half-way into the previously installed mounting rail. Then push the next mounting rail onto the splice. Use pressure to push the mounting rails together flush.
The connection is then complete.
Fasten the pushed-on mounting rail to the roof hooks as described.





**Push in splice**



**Push mounting rails together**



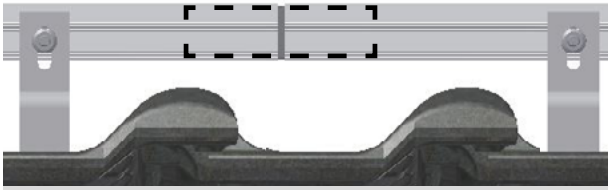
**Complete**

**Push in splice.**

**No cantilevers with splices.**
**Position the splices between two roof hooks.**



**Cantilever – incorrect!**

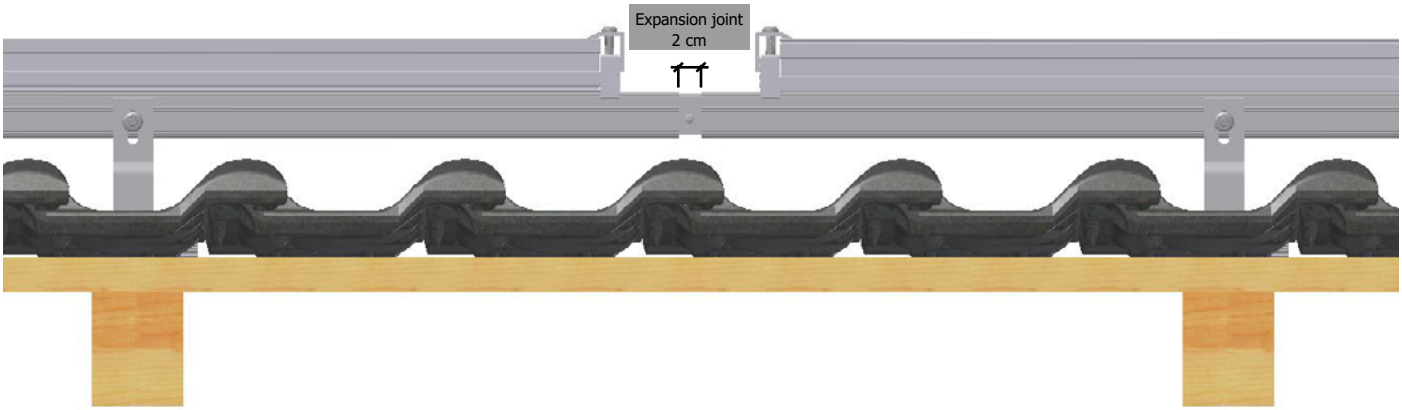


**Correct!**

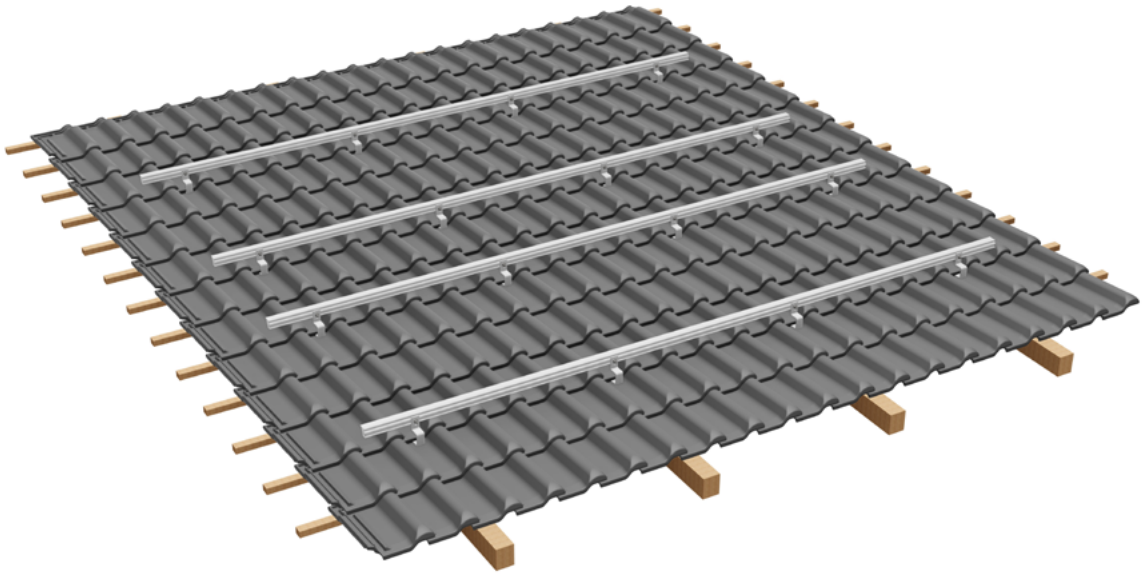

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**If the mounting rail is longer than 13.20 m, the module array must be separated by placing two end clamps.**
**The mounting rail must be separated in the area between the end clamps and connected with a splice to ensure a 2 cm compensation in length (expansion joint).**
**The arrangement of the expansion joints must be adapted in accordance with the structural conditions of the roof and the expansion properties of the respective materials.**

**Modules must not be built over expansion joints. There is no connection to earth.**
**This must be established without restricting the effect of the expansion joint. The connectors with earthing plate can be used for this purpose.**



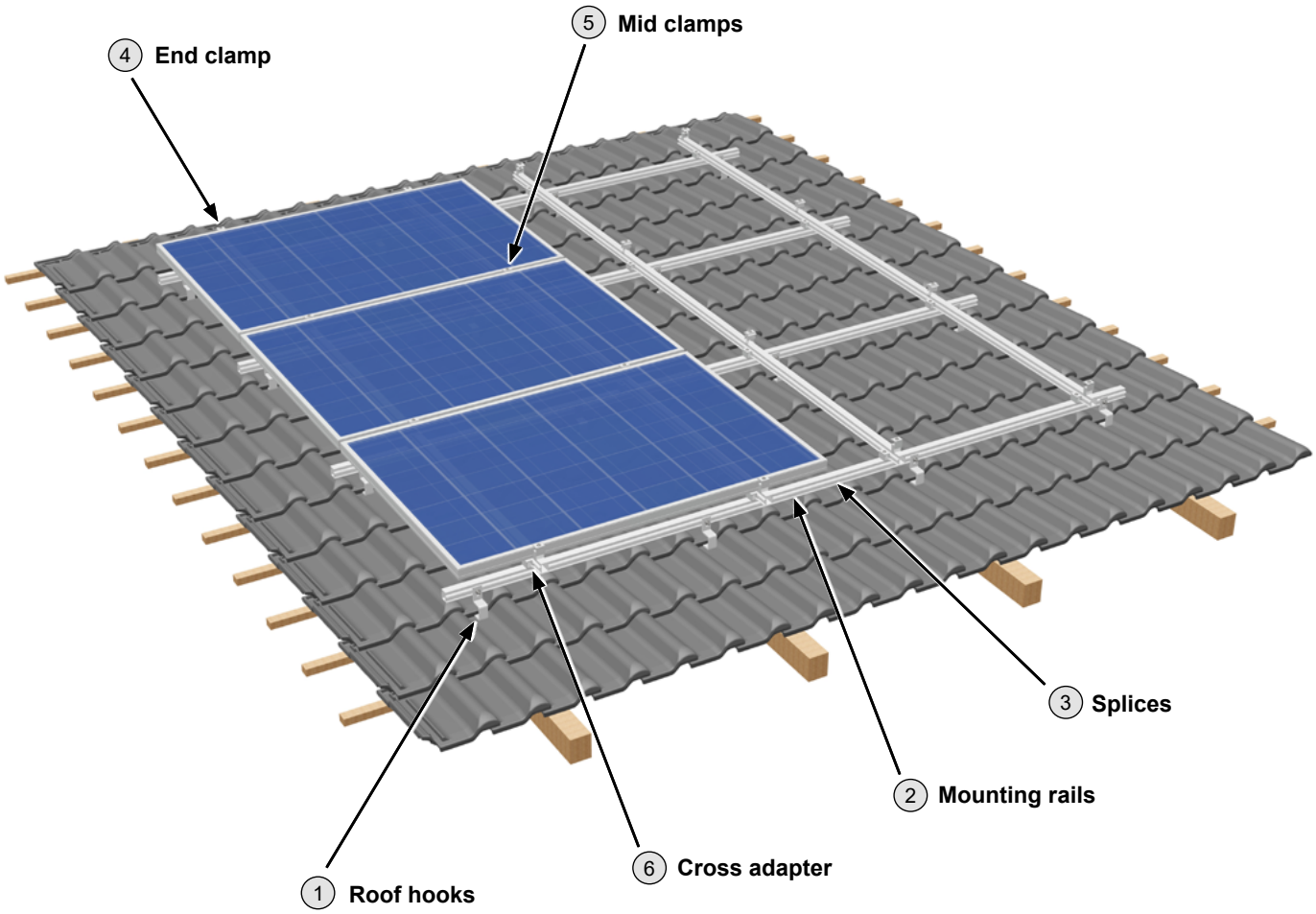

Completed installation of the mounting-rail layer.




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### 2.3.2 Double-layer assembly with framed PV modules in transverse orientation

The installation instructions for "Double-layer assembly with framed PV modules in horizontal orientation" are only valid in conjunction with the instructions in section 2.2. The installer must ensure that only current and complete assembly instructions are used for the installation process.



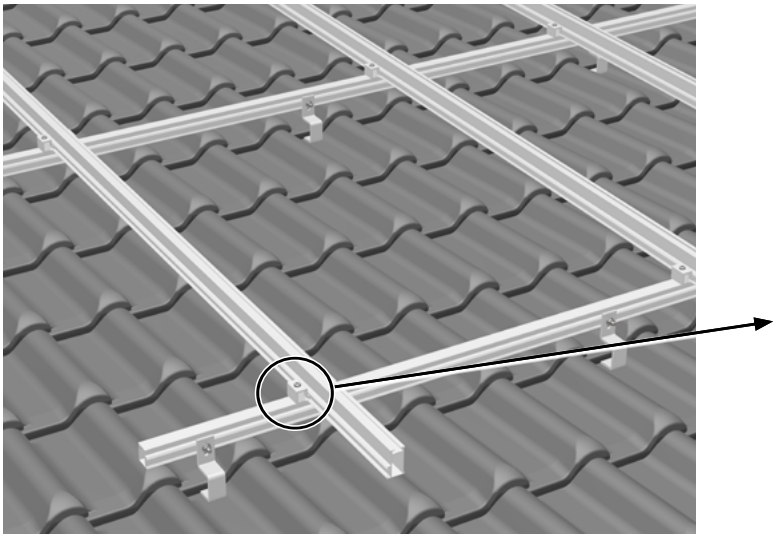


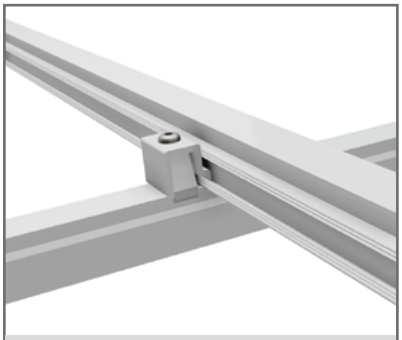
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The installation of the lower horizontal rail layer is carried out as shown in 2.3.1 "Single-layer installation".

Install the horizontal mounting rails for each module row on the horizontal mounting rails using the cross adapters. The spacing between the vertical mounting rails is determined by the clamping areas, which are described in the installation instructions. To proceed, click the cross adapter onto the horizontal mounting rail and then use it to secure the vertical mounting rail.
Ensure that the spacing between the vertical rails corresponds to the prescribed clamping distances for the module. The vertical mounting rails should always be assembled from bottom to top.

Ensure that the cross adapter is clicked in properly and tighten the screw (tightening torque 8–10 Nm).





Mounting the cross adapters



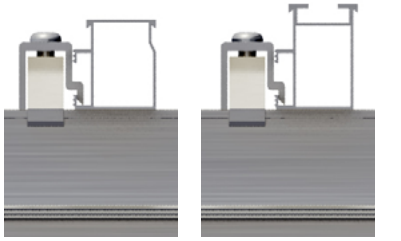


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The number of cross adapters required per fixing point depends on the static requirements of the location and the installation situation. A second cross adapter is also mounted as described above. Position it on the side of the rail opposite the first crossbar connector (tightening torque 8–10 Nm).

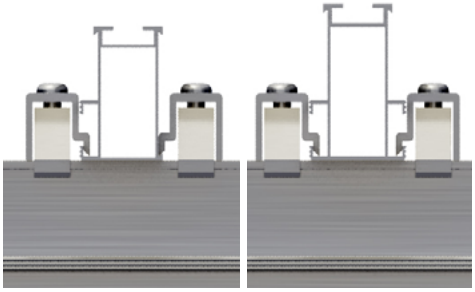
**Intersection points:**

1x cross adapter in the side hammerhead channel



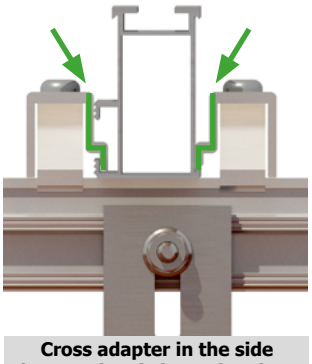
ST-AK 5/40 ST-AK 7/47

1x cross adapter in the side hammerhead channel and 1 cross adapter on the opposite side

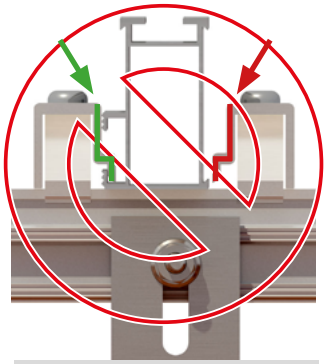


ST-AK 13/60 ST-AK 26/70

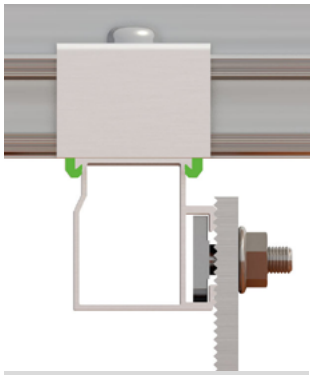
Specifications for the spacing between the vertical mounting rails can be found in the installation instructions.



**Cross adapter in the side hammerhead channel and on opposite side**



**INCORRECT**



**Both sides clicked in**

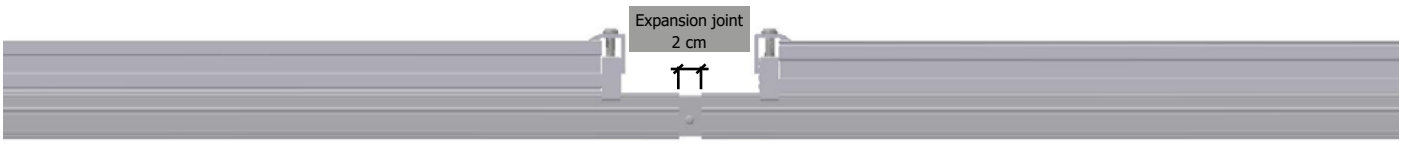


**INCORRECT**


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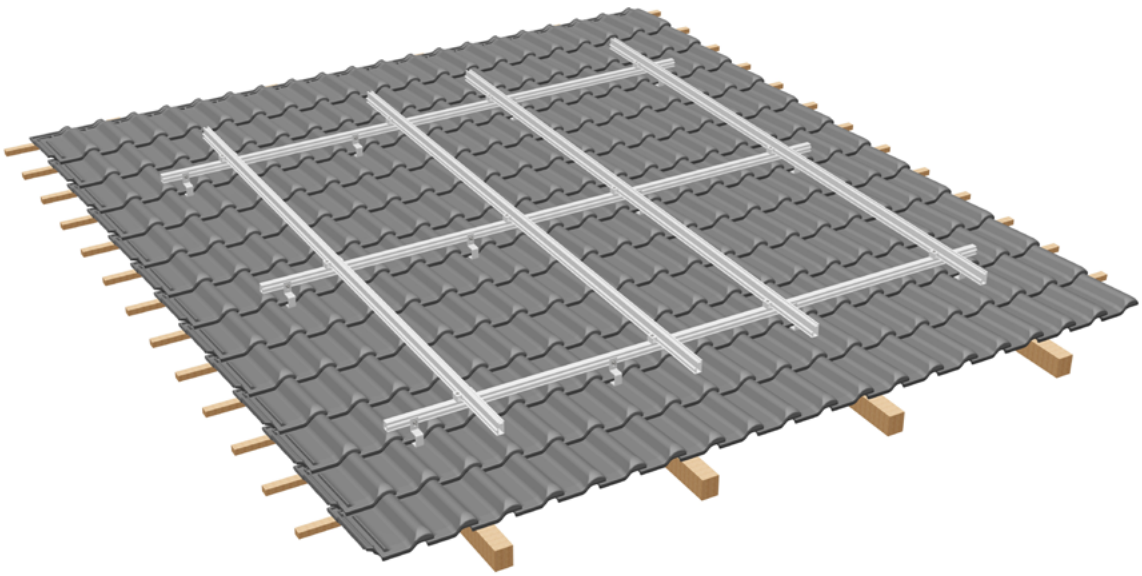
**Vertical mounting rails are arranged in lines in the same way as shown for horizontal mounting rails.**
**The splices must be positioned in such a way that they lie between two mounting rail intersection points (no cantilevers with splices). When extending the vertical mounting rails at the lower section of the eaves, it must be ensured that the short mounting rail sections, which are connected at the bottom, run over at least two rails in the lower layer of mounting rails.**

**If the mounting rail is longer than 13.20 m, the module array must be separated by placing two end clamps.**
**The rail must be separated in the area between the end clamps and connected with a splice to ensure a 2 cm compensation in length (expansion joint).**
**The arrangement of the expansion joints must be adapted in accordance with the structural conditions of the roof and the expansion properties of the respective materials.**
**To install the end clamps, please refer to the "Module installation" section of these installation instructions. Modules must not be built over expansion joints.**




**Expansion joint upper layer**

Completed installation of the mounting-rail layer.




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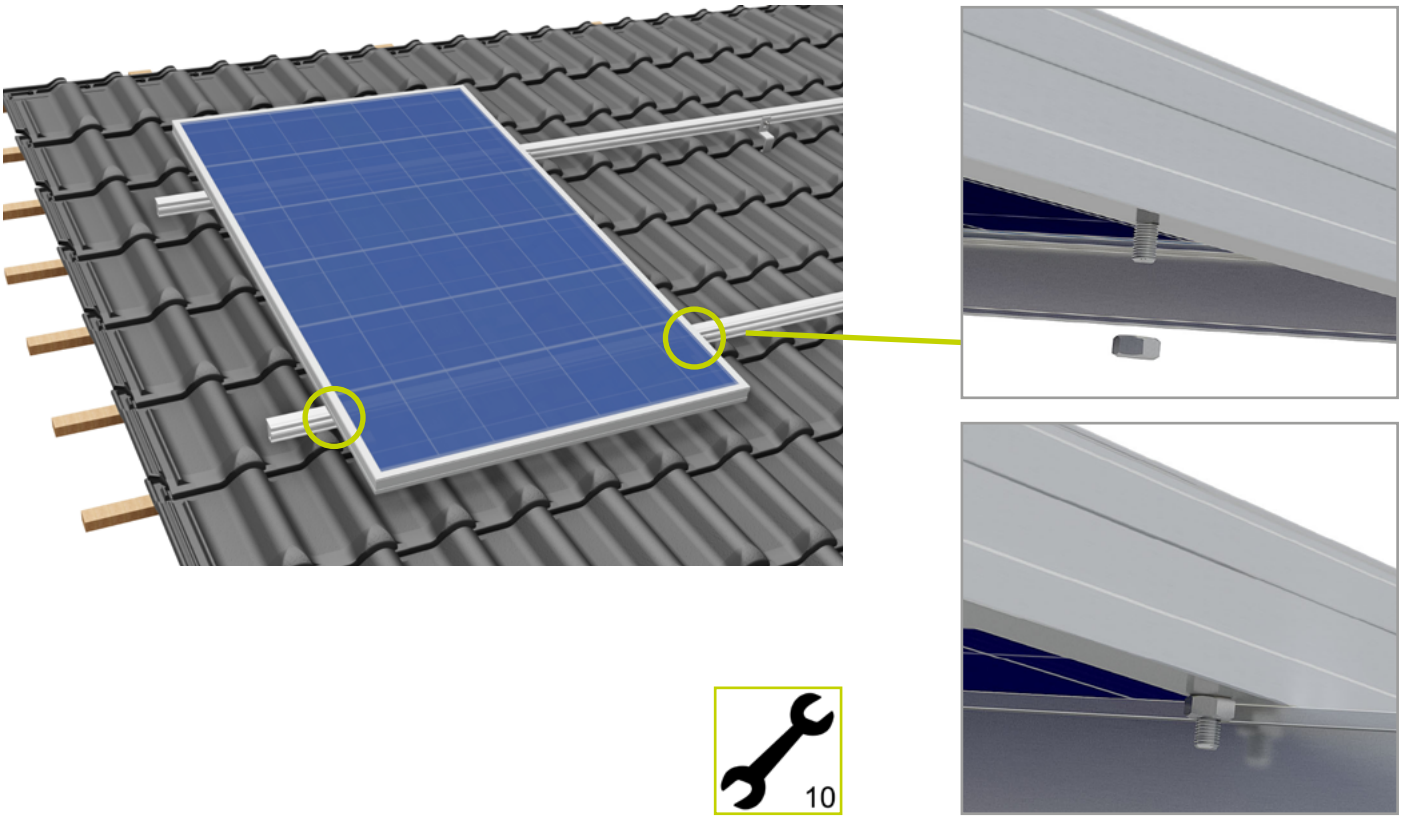
## 2.4 Installing PV modules

**The installation instructions provided by the module manufacturer must be observed, especially with regard to clamping surfaces and clamping areas. S:FLEX GmbH is not liable for damage to the modules and all other consequences resulting from non-compliance with the module manufacturer's installation instructions.**

### 2.4.1 Module installation, upright

**Before installing the modules in the lowest row of modules, the modules generally need to be equipped with slipping protection. The same applies to modules which do not have any modules directly below them (modules above obstructions such as windows, chimneys, etc.).**

**Fix two screws M6 x 20 (with the shank downward) with nuts M6 in two of the module's frame holes (8 mm) so that the screws are at the same level and, when installed, they are above at least one horizontal mounting rail layer.**
**If the lower mounting hole is larger than 8 mm, please use an appropriately sized (8 mm) screw.**

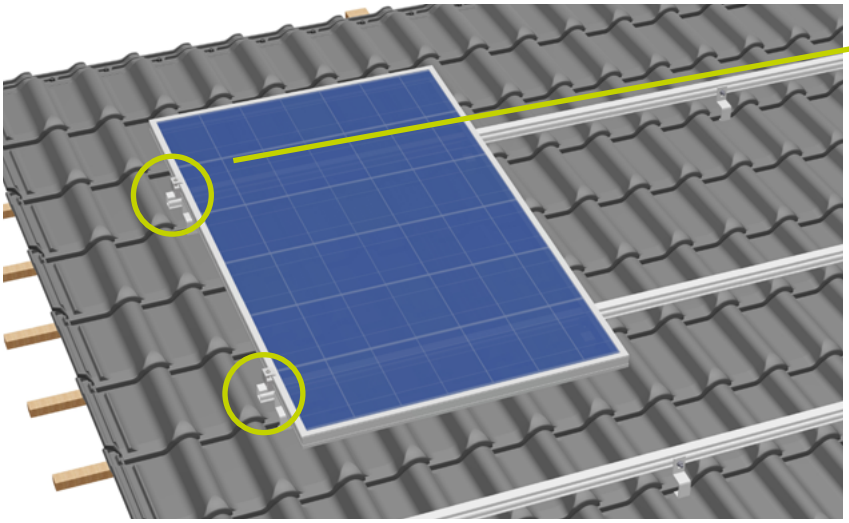


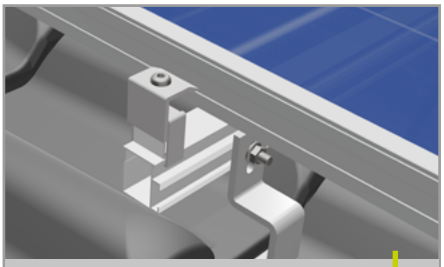


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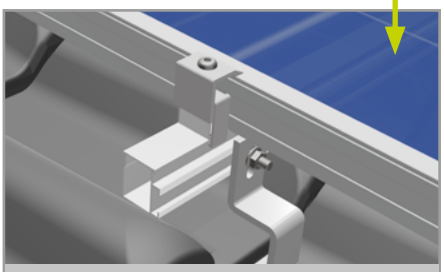
**Module installation – (end clamps)**

Make sure that the correct module or end bracket with the corresponding cut length is used so that the defined clamping surface of the module manufacturer is ensured. Place the module on the system supports. Mount the end brackets. Make sure that the end bracket is clicked in on both sides of the system support and is flush with the module. Now adjust the end bracket to the module height and tighten the screw (tightening torque 8-10 Nm). Make sure that the specified clamping areas and clamping surfaces are observed. The distance between the module frame and the end of the rail must be at least 35 mm.





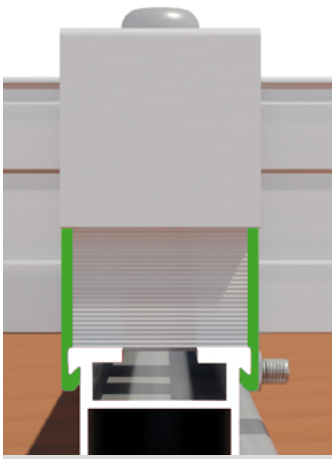
**Snap in the end clamp...**



**Push flush and tighten**

**Install the end clamp**



**Both sides clicked in**



**INCORRECT**



**Defined clamping area**



**INCORRECT**

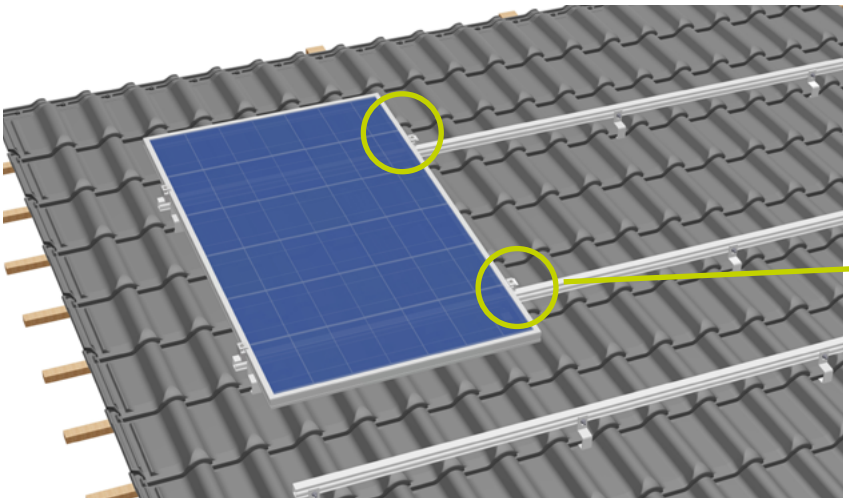
**Check that the end clamp has been clicked in properly**

**Check the clamping surface defined by the module manufacturer, follow the instructions in section 1.5 (observe the module manufacturer's specifications).**


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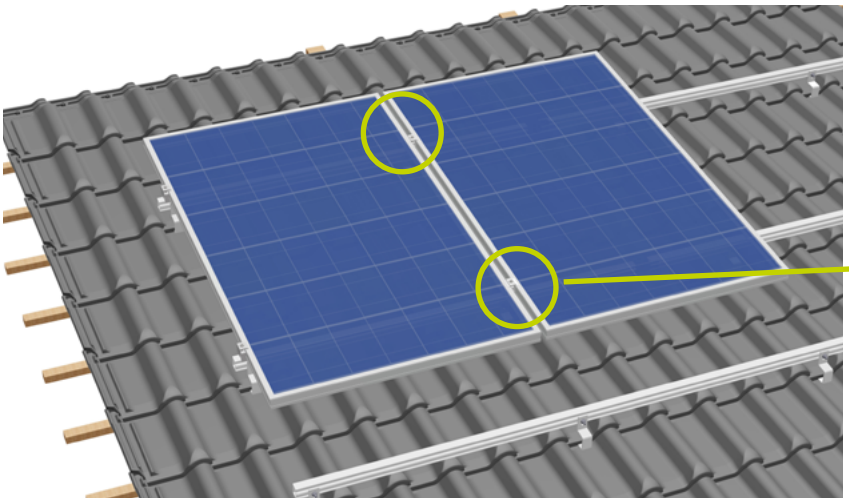
**Module installation – (mid clamps)**

Now mount the module holders. The earthing plate must be mounted (if required) before mounting the module holder. To do this, insert the earthing plate laterally between the “bracket” and the “upper part” in the module holder (Section 1.5). Then click the module holder onto the system support and push it onto the module. Make sure that the module holder is clicked in on both sides of the system support.
Make sure that the specified clamping areas and clamping surfaces are observed. When using the earthing plate, the module must be positioned between the plate and the “upper part” of the module holder. The earthing plate is then pressed against the system support from the underside of the module frame.



**Click on module holder and push flush**

Align the upper row of modules with the aid of a guide or levelling instrument.
Now slide the next module underneath the mid clamp, adjust the mid clamp to the height of the module's frame and tighten the screw (tightening torque 8–10 Nm).



**Slide module underneath and tighten mid clamp**

**Install mid clamp**

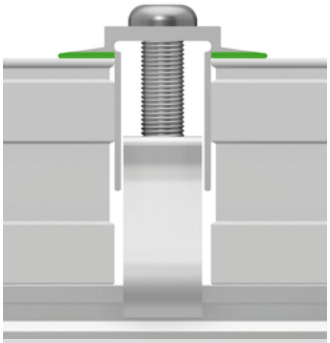




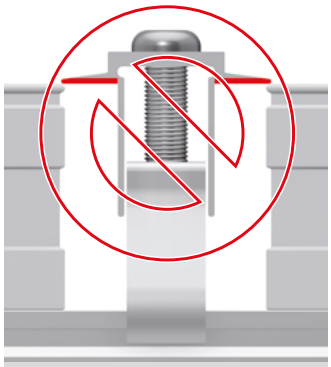


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Ensure that the mid clamp grips both of the module frames on the clamping surface defined by the module manufacturer.

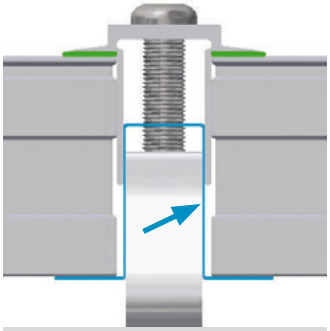


**CORRECT –
defined clamping area –**

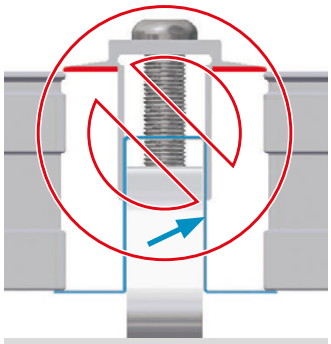


**INCORRECT**

Mounting with grounding plate:

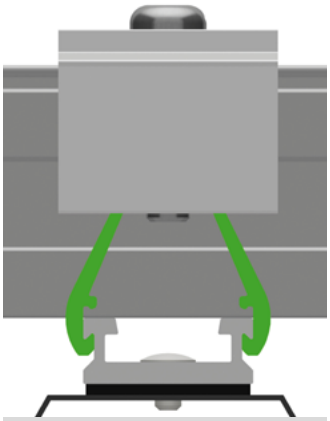


**CORRECT
– defined clamping area –**

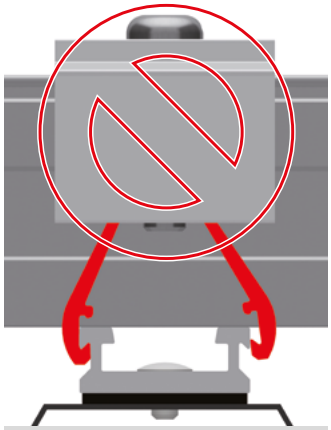


**INCORRECT**

**Check the clamping surface defined by the module manufacturer, follow the instructions in section 1.5 (observe the module manufacturer's specifications).**



**CORRECT
– clickedin on both sides –**



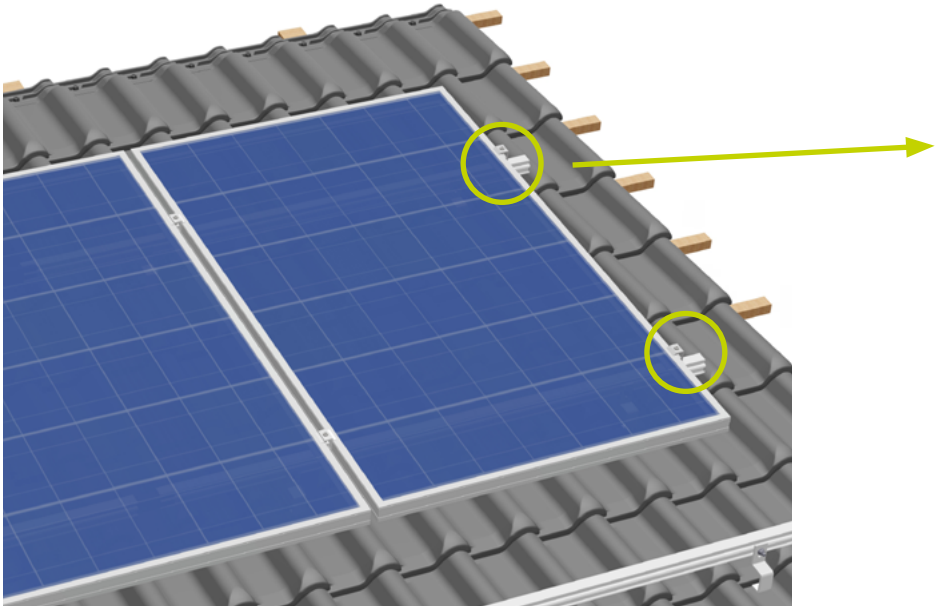
**INCORRECT**

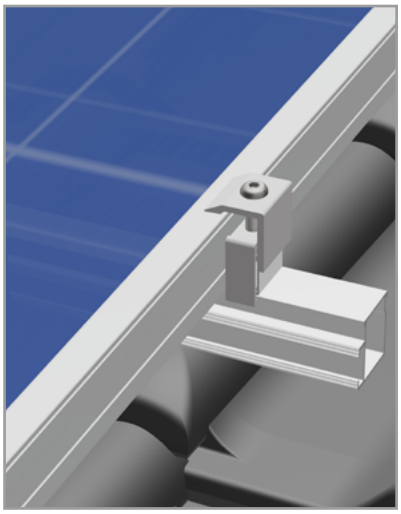
**Check the mid clamp has been clicked in properly.**


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**Module installation – (end clamps at the end of the row)**

End clamps must be installed on the last module in each row (if applicable, on expansion joints). To do this, click the end bracket onto the system support and push it flush against the module. Ensure that the end clamp is clicked in to both sides of the mounting rail. Now adjust the end clamp to match the height of the module and tighten the screw (torque 8–10 Nm).
Pay attention to the prescribed clamping areas and clamping surfaces. Shorten projecting rails parallel to the module frame. The distance between the module frame and rail end must be at least 35 mm.

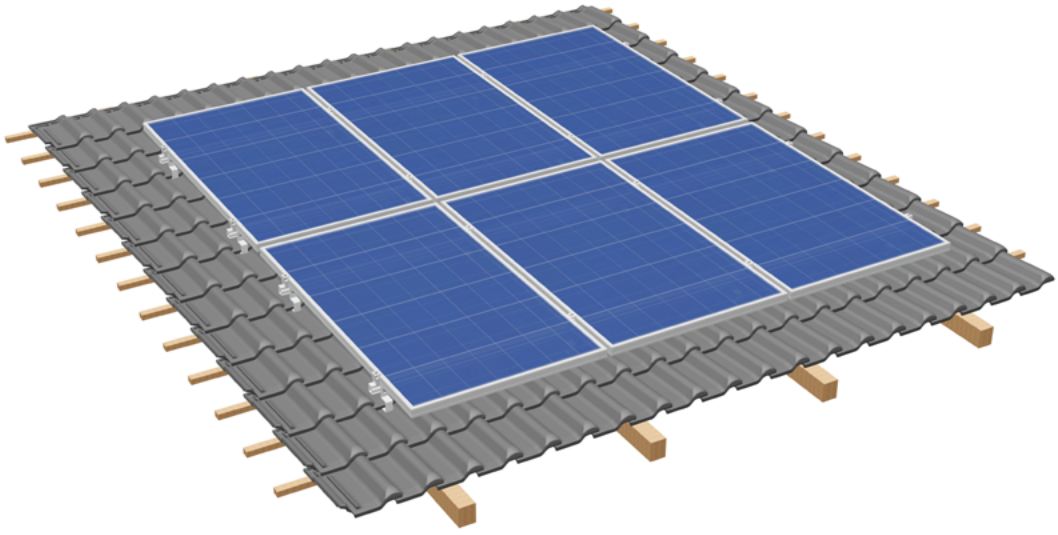




**Install end clamp on the last module**




Proceed as described for the following rows.

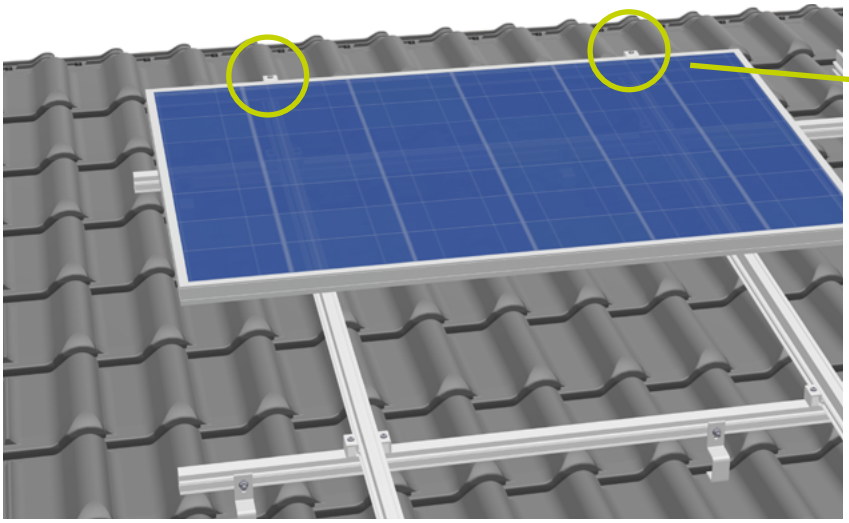


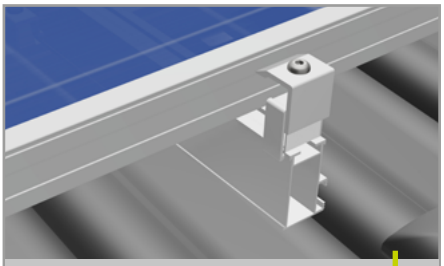

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### 2.4.2 Module installation, transverse

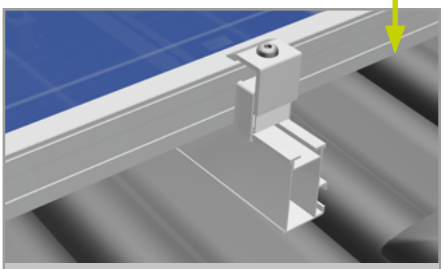
**Module installation – (end clamps)**

Place the module on the system supports. Mount the end brackets. To do this, click the end bracket onto the system support and push it flush against the module. Make sure that the end bracket is clicked in on both sides of the system support and is flush with the module.
Now adjust the end bracket to the module height and tighten the screw (tightening torque 8-10 Nm). Make sure that the specified clamping areas and clamping surfaces are observed. The distance between the module frame and the end of the rail must be at least 35 mm.





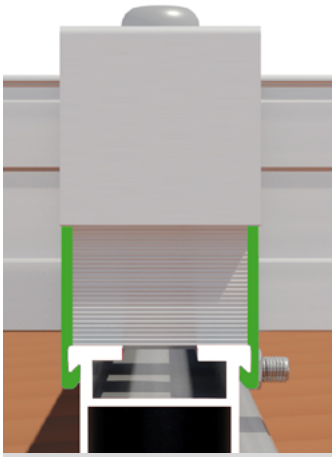
**Snap in the end clamp...**



**Push flush and tighten**

**Install the end clamp**



**Both sides clicked in**



**INCORRECT**



**Defined clamping area**



**INCORRECT**

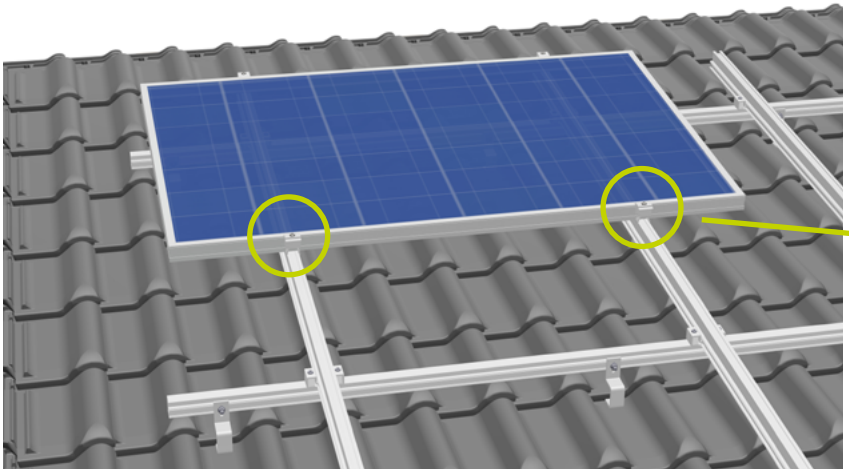
**Check that the end clamp has been clicked in properly**

**Check the clamping surface defined by the module manufacturer, follow the instructions in section 1.5 (observe module manufacturer's specifications).**


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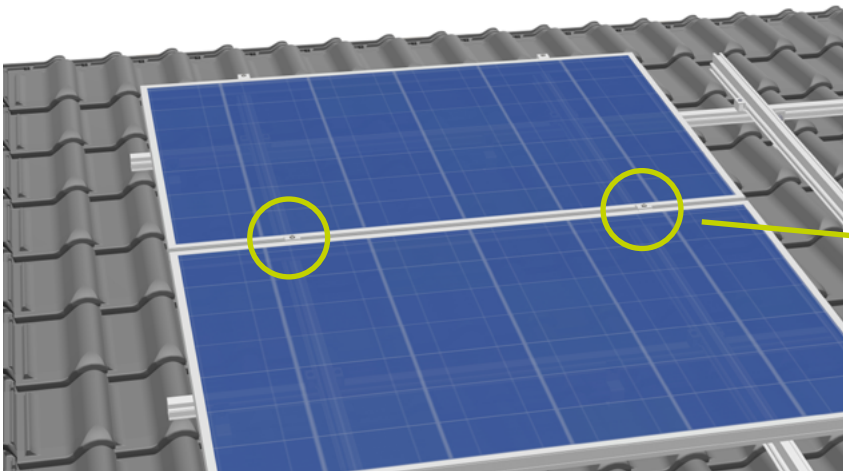
**Module installation – (mid clamps)**

Now mount the module holders. The earthing plate must be mounted (if required) before mounting the module holder. To do this, insert the earthing plate laterally between the “bracket” and the “upper part” in the module holder (Section 1.5). Then click the module holder onto the system support and push it onto the module. Make sure that the module holder is clicked in on both sides of the system support.
Make sure that the specified clamping areas and clamping surfaces are observed. When using the earthing plate, the module must be positioned between the plate and the “upper part” of the module holder. The earthing plate is then pressed against the system support from the underside of the module frame.



**Click mid clamp and push in**

Now slide the next module underneath the mid clamp, adjust the mid clamp to the height of the module's frame and tighten the screw (tightening torque 8–10 Nm).



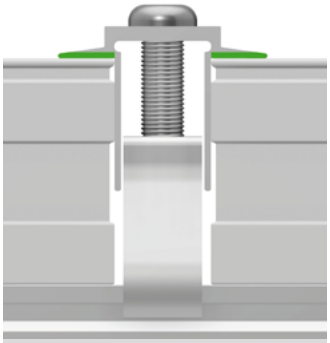
**Click on module holder and push flush**

**Install mid clamp**

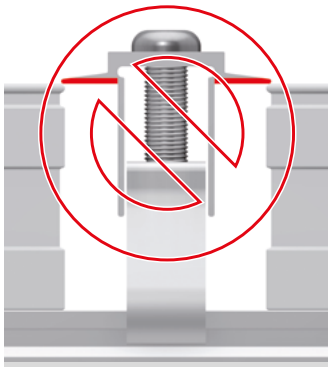
5


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Ensure that the mid clamp grips both of the module frames on the clamping surface defined by the module manufacturer.

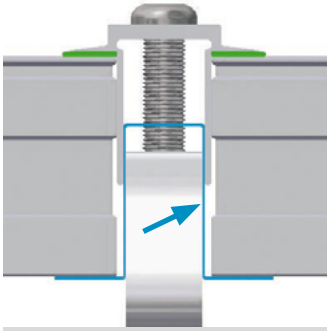


**CORRECT**
**– defined clamping area –**

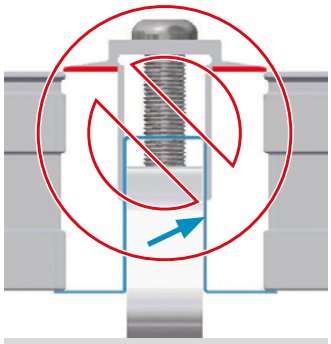


**INCORRECT**

Mounting with grounding plate:

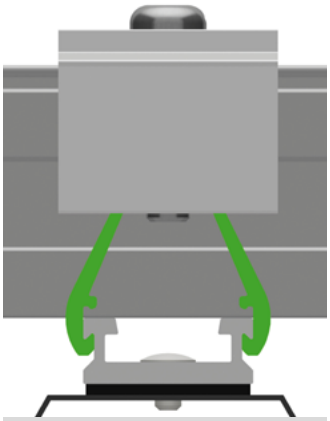


**CORRECT**
**– defined clamping area –**

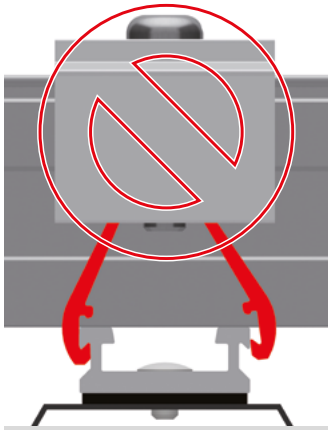


**INCORRECT**

**Check the clamping surface defined by the module manufacturer, follow the instructions in section 1.5 (observe the module manufacturer's specifications).**



**CORRECT**
**– clickedin on both sides –**



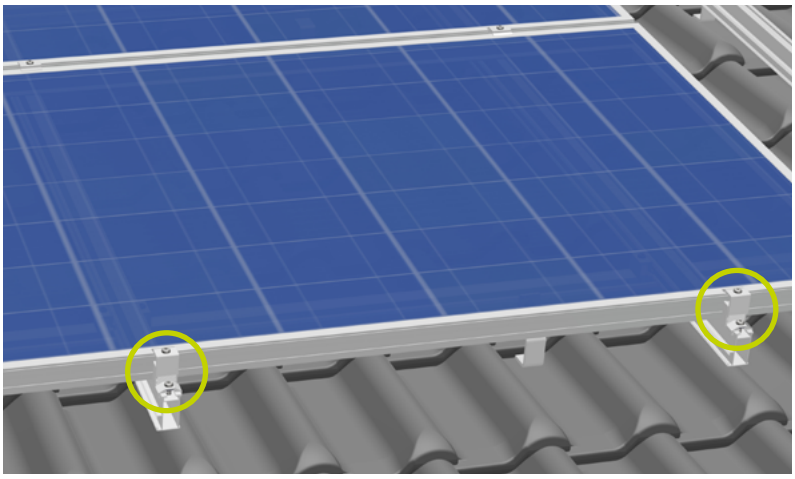
**INCORRECT**

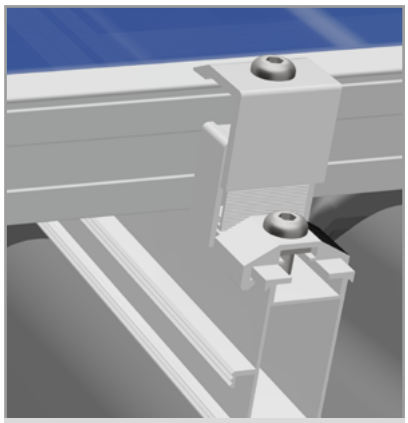
**Check that the mid clamp has been clicked in properly.**


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**Module installation – (end clamps at the end of the row)**

End brackets must be fitted at the end of the module row and in the area of the expansion joints. To do this, click the end bracket onto the system support and push it flush against the module. Make sure that the end bracket is clicked in on both sides of the system support. Now adjust the end bracket to the module height and tighten the screw (tightening torque 8-10 Nm).
Below the lowest module row, a locking clip must generally be mounted on the vertical rail. The same applies to modules below which no other module is directly adjacent (modules above interfering objects, e.g. windows, chimneys, etc.). The locking clip serves as an additional anti-slip device. Push the locking clip from below onto the system supports up to the end bracket and fix it (tightening torque 8-10 Nm). Make sure that the specified clamping areas and clamping surfaces are observed. The distance between the module frame and the end of the rail must be at least 60 mm.

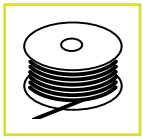




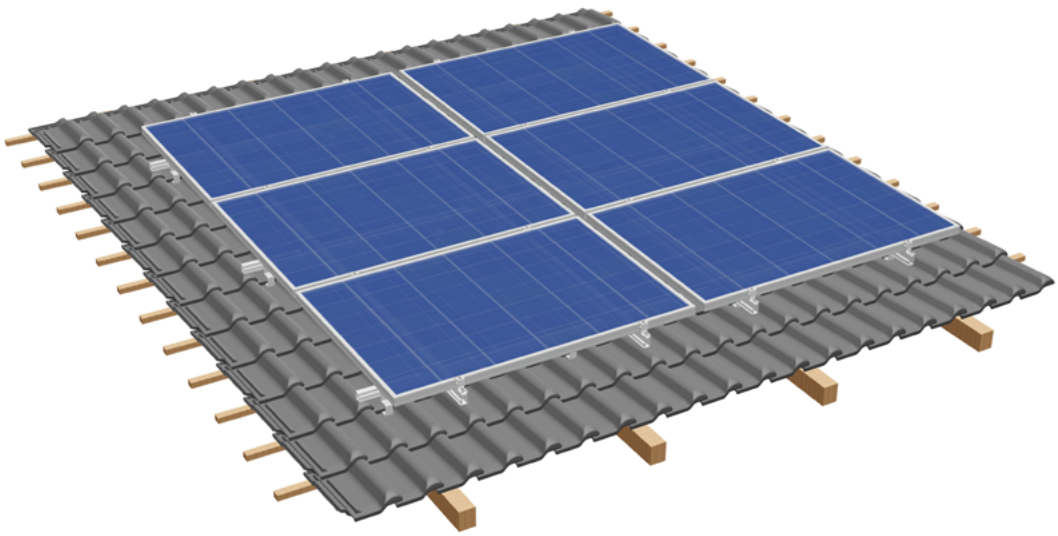
Mount end clamp and locking clip

**Mount an end clamp and locking clip on the last module.**



Proceed as described for the following rows.
It should be ensured here that all end clamps are secured in a horizontal line.
Align the upper row of modules with the aid of a guide or levelling instrument.




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### 3.1 Disassembly

Disassembly of the S:FLEX mounting system may only be carried out by trained specialist personnel. Observe the same safety instructions, standards and guidelines as provided for the installation.

In general, disassembly is carried out in reverse order to the described installation.



**Before disassembly, disconnect the PV modules from the mains network.**
**Disconnect all of the PV modules' electrical cables (string lines and plug connectors) and remove them from the frame system.**



**Improper disassembly can lead to damage to the modules.**

Remove the modules and store them safely.
Disassemble frame system and safely store all of the parts.
Check the roof surface and roof covering for damage. Any damage must be repaired professionally to prevent water ingress and consequential damage. Any damaged tiles must be replaced, any drill holes in the sheet metal sealed, and any openings in the roof cladding closed.



**Disassemble frame system and safely store all of the parts.**
**Any holes in the roof must be sealed by a specialist.**

### 3.2 Disposal

The S:FLEX mounting system is made from aluminium, stainless steel and steel components. These materials can be recycled after disassembly.

The frame system must only be disposed of by a specialist waste management company. Observe the applicable national standards and guidelines.


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## 4.1 User agreement for the pitched roof system

We expressly point out that the assembly system is sold under a purchase agreement.
Its installation/processing or acquisition by a third party is not carried out in the name of, or on behalf of, S:FLEX GmbH. Installation/processing of the system must be carried out by appropriately qualified personnel and strictly in accordance with the installation instructions.

The design and planning of the system must be undertaken using the S:FLEX Planning Software. S:FLEX GmbH is neither responsible for the project-specific structural analysis of the roof structure, nor for obtaining and documenting the approval of the roof manufacturer for use of the respective fastening system on the roof in question (in the terms of the warranty), nor for correct installation of the fastening system.

S:FLEX GmbH accepts no liability for faults and damage and/or a restricted or limited operational capability of the system which has resulted from incorrect installation and/or installation which was not undertaken in accordance with the installation instructions and/or the project report. In the case of incorrect installation, the buyer's right to assert claims for material defects shall expire.

The system warranty is only valid if all system components were acquired from S:FLEX GmbH.

## 4.2 Warranty / disclaimer

The information regarding dimensioning provided in these instructions is merely suggested values based on prior experience. Binding structural analyses for installation frames can be created using the S:FLEX planning software.

As an installation company, you are responsible for the correct execution of the installation. S:FLEX GmbH is not liable for the dimensional information contained in commercial system quotations.

As the installation company, you are responsible for the mechanical durability of the installed interface connections on the building envelope, in particular also for their watertightness. The components supplied by the company S:FLEX GmbH are designed for the expected loads and in accordance with the currently available technology.
In this context, you must provide the company S:FLEX GmbH with information about all general technical conditions in writing via the project data collection sheet (information about the supporting structure, snow load zone, building heights, wind loads, etc.).

S:FLEX GmbH is not liable if the installed components are not properly handled. Any use close to the sea needs to be clarified with S:FLEX GmbH directly on a case-by-case basis due to the increased risk of corrosion. Provided that the system is handled properly and dimensioned according to the structural conditions and normal environmental and ambient conditions, the company S:FLEX GmbH provides a warranty from transfer of risk to the warranty holder, which guarantees that the metallic components of the racks will remain free from defects with regard to material and workmanship for a period of 10 years. This warranty does not apply to wear parts. For additional information, please refer to the separate warranty provisions.

This applies within the context of the generally prevalent weather and environmental conditions.


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