



Assembly Instructions

HANGER BOLT / SOLAR FASTENER

Mounting system for PV systems parallel to the roof on industrial roofing with trapezoidal and corrugated sheet metal, corrugated fibre cement and sandwich profiles



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The S:FLEX mounting system for PV systems on industrial roofing with trapezoidal and corrugated sheet metal, corrugated fibre cement and sandwich profiles is a fastening system for the installation of PV modules. It includes hanger bolts/solar fasteners, brackets, mounting rails and all necessary small parts required to fasten PV modules, to connect components to each other and to fix on to the roof substructure (RS). It is possible to mount the modules both horizontally and vertically using the S:FLEX PV mounting system. Both single layer installation and double layer installation are possible.

The S:FLEX PV mounting system for industrial roofing is characterised by a high degree of pre-assembly.

The patented and proven click technology allows a maximum reduction in fitting times.

All components are manufactured from aluminium and stainless steel. The high corrosion resistance guarantees a maximum lifespan and provides the possibility of complete recycling.

1.1 Intended use

The S:FLEX PV mounting system for industrial roofing is a fastening system for the installation of PV modules. It is exclusively designed to accommodate PV modules.

Any use that deviates from this must be regarded as not the intended use. In particular, the observation of the information in these installation guidelines counts as intended use. S:FLEX GmbH is not liable for damage that results from not observing the installation guidelines or from the improper and not intended use of the product.

1.2 About the document

The S:FLEX PV mounting system for industrial roofing allows the installation on industrial roofing of PV systems that are parallel to the roof and elevated. It offers suitable solutions for easy fastening to conventional industrial roofing and/or substructures. They are:

- Trapezoidal and corrugated sheet metal
- Corrugated fibre cement sheets
- Sandwich profiles

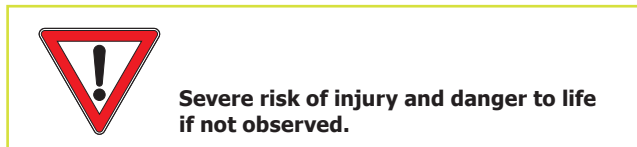
These installation guidelines describe the installation of the hanger bolts/solar fasteners.

It is possible for the above mentioned types of roofing.

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

1.3 Warnings

The warning notices used in these installation guidelines indicate safety related information. They are:



1.4 General information

Before starting work on the roof, it must be verified that all currently valid accident prevention regulations are observed and that adequate protection is provided against falling parts (e.g. occupational health and safety regulations of the German national association of roofers (ZVDH)).

Before installation, the PV system maker must ensure that the existing roofing and roof substructure are suitable for the occurring additional loads. The condition of the roof substructure is to be examined by the maker (e.g. quality and strength of the purlins, if necessary the rafters and the roof battens, quality of the roofing, sufficient fastening of the roofing to the substructure, maximum load bearing capacity of the roofing).

Installation should only be carried out by skilled workers who work in accordance with the rules of the German national association of roofers (ZVDH).

Before the installation of the substructure, it must be verified that the module manufacturer's specifications regarding module clamps (e.g. width and type of clamp, mounting guidelines for the clamp on the module) are observed. If this is not the case, the customer must obtain a declaration of consent from the module manufacturer before the installation, or the frame must be adjusted according to the module manufacturer's guidelines.

The requirements for the protection of PV mounting systems against lightning and surges are to be met in accordance with the DIN and VDE regulations (e.g. DIN EN 62305-1-4, DIN V VDE V 0100 Part 534, VdS guidelines 2010). The specifications of the relevant power supply company are to be observed.

During installation, fire protection regulations are to be observed, e.g. no firewalls are to be built over.

If the roofing is altered, the manufacturer's guidelines are to be observed. During and after the 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 it could be damaged.

1.5 Installation

The installation guidelines are for the installation of the S:FLEX PV mounting system on industrial roofs. The installation guidelines are intended for a group of people with relevant qualifications and who have been instructed by the operator of the PV system.

The installation of the S:FLEX PV mounting system on roofs with corrugated fibre cement sheets and sandwich profile roofing requires comprehensive professional knowledge on the part of the installer. For these installations, a specialist must be contacted in advance and the approval from the manufacturer of the roofing must be obtained.

In particular when installing PV systems on roofs with corrugated sheets, the admissibility of the installation and if necessary the observance of additional regulations in regard to occupational health and safety must be ensured in advance.



Please note: The installation should only be carried out by skilled workers who work in accordance with the rules of the German national association of roofers (ZVDH). System components (roof hooks, mounting rails) are not to be used as step ladders; the modules must not be stepped on.



When installing PV systems on roofs with corrugated metal roofing, the admissibility of the installation is to be ensured and, if necessary additional sealing measures in the area of the fastening to the roof membrane are to be implemented.

1.6 Standards and guidelines



These installation guidelines are based on current technology and many years of experience of how our systems can be installed on site. As individual project-related specifics must be considered for every roof, expert advice must always be sought before installation.

Before installation, the maker of the photovoltaic system must ensure that the existing roof substructure is suitable for the occurring additional loads.

To do this, contact structural engineers locally.

Every photovoltaic system must be mounted in accordance with the structural requirements of the location and the installation situation while observing the specifications in these installation guidelines.

It must be ensured that only current and complete installation guidelines are used for the installation and that a printout of the installation guidelines is kept in the immediate vicinity of the system.

Subject to technical modifications.

During installation of the PV system, the module manufacturer's mounting instructions, the corresponding standards, accident prevention regulations as well as any further regulations and provisions must always be observed.

Before installation, the maker of the photovoltaic system must ensure that the installation is carried out in strict adherence to national and local building regulations, occupational health and safety regulations and accident prevention regulations, standards and environmental protection regulations.

The documents listed in the following are information from S:FLEX GmbH and make no claim to be exhaustive. Every person who installs the S:FLEX PV mounting system has to independently inform themselves of all rules and guidelines for the technically correct planning and installation and observe them during the installation. This also includes obtaining the current version of the rules and guidelines.

BGV A2:	Electrical systems and equipment
BGV C22:	Construction work
BGV D36:	Ladders and step stools
BGV A1:	Accident prevention regulations
ZVDH:	Guidelines of the German national association of roofers (ZVDH)
Eurocode 0 (DIN EN 1990):	Basis of structural design
Eurocode 1 (DIN EN 1991):	Actions on structures
Eurocode 5 (DIN EN 1995):	Design of timber structures
Eurocode 9 (DIN EN 1999):	Design of aluminium structures – Execution class according to Eurocode and EN 1090, Part 1 and 3: EXC 2
DIN EN 1090-3:	Execution of steel structures and aluminium structures – part of aluminium structures
DIN EN 62305-1-4:	Protection against lightning
DIN EN 62305-3:	2011 Protection against lightning Part 3: Physical damage to structures and life hazard
DIN 18807-3:	Trapezoidal sheeting in buildings; steel trapezoidal sheeting; structural analysis and design
DIN 18807-9	Trapezoidal sheeting buildings, aluminium trapezoidal sheeting and their connections; application and construction
DIN 18299 VOB Part C:	General technical specifications in construction contracts (ATV) – General rules applying to all types of construction work
DIN 18338 VOB Part C:	General technical specifications in construction contracts (ATV) – Roofing work
DIN 18451 VOB PartC:	General technical specifications in construction contracts (ATV) – Scaffolding work
DIN V VDE V 0100 Part 534:	Devices for protection against overvoltage
VDE 0100 - 712 ; IEC 64/1736:	Low-voltage electrical installations
VDE 0185 Series, IEC 81/335:	Protection against lightning

1.7 Description of the system

Components for roof fastening

In regard to the roofing, industrial roofs can essentially be identified as either trapezoidal and corrugated sheet metal or sandwich profiles. Therefore, the S:FLEX PV mounting system provides suitable components for easy fastening to the existing roofing or roof construction. They can be identified according to:

1. Direct roof fastening (rivet, self-tapping screw) This is possible for:

- Trapezoidal and corrugated sheet metal
- Where applicable, sandwich profiles (approval of the manufacturer is required)

Please also see our system solutions: **ST-AK 1/12, Trapezoidal sheet metal rail** and **Bracket for sheet metal installation**, and the corresponding installation instructions.

2. Fastening to the roof substructure (hanger bolts, solar fasteners). This is possible for:

- Trapezoidal and corrugated sheet metal
- Corrugated fibre cement sheets
- Sandwich profiles

The fastening to wooden substructures (hanger bolts, type A solar fasteners) and to metal substructures (type BZ solar fasteners) is possible.

Solar fasteners

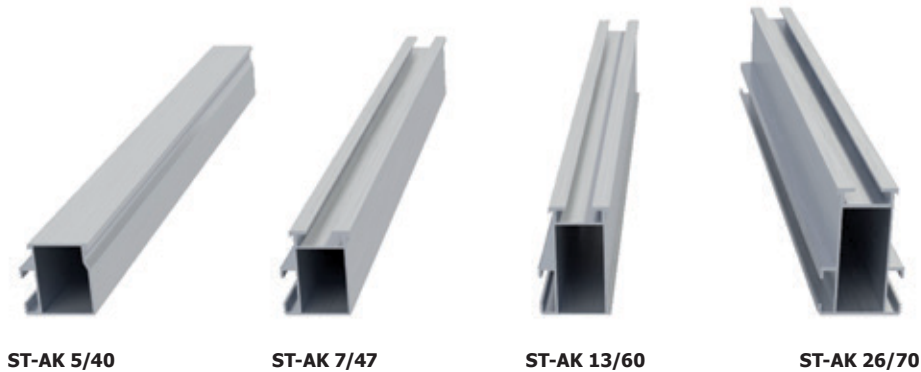


Hanger bolts



Mounting rails

The S:FLEX PV mounting system offers mounting rails of different strengths in order to achieve optimised systems in accordance with the structural requirements of the location and the installation situation:

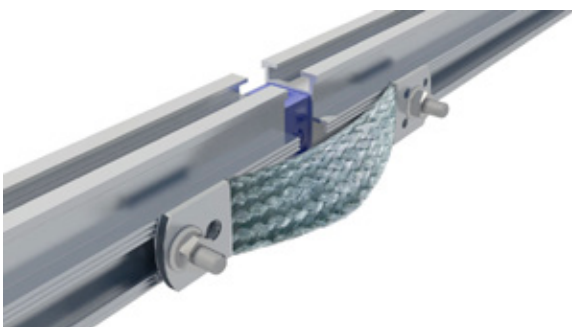


Splice technology

Further to simple installation, splice technology allows for system alignment without reducing the load bearing capacity in the splice zone as the splices have the same structural values as the corresponding mounting rails. When linking the mounting rails together by using the splices, a connection to earth is possible if the mounting rails are pushed flush into the splice with force. It must be ensured that the connection to earth is examined by a professional on site after installation.

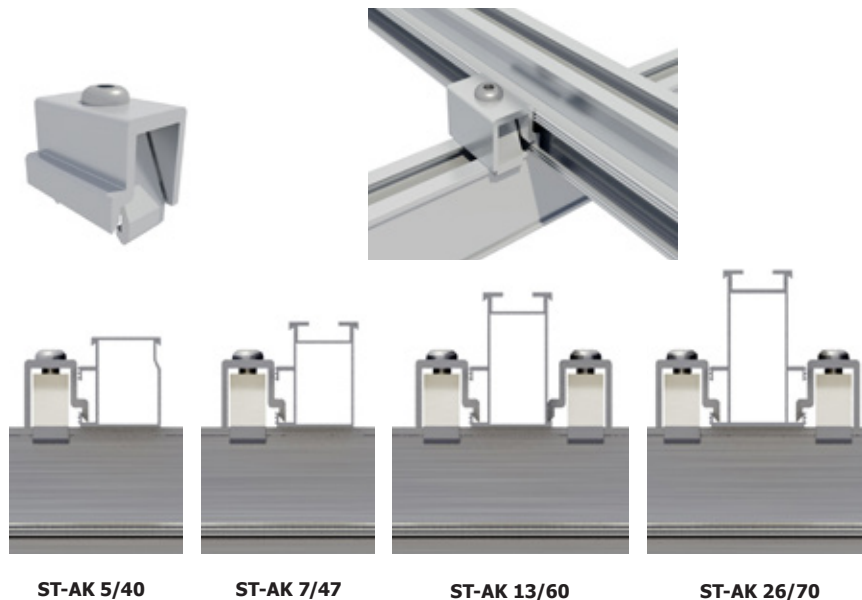


Furthermore, splice technology offers the simple and quick creation of expansion joints in accordance with the structural conditions of the roof. In this case, there is no connection to earth. This must be established by an expert on site without limiting the expansion joint's mode of operation. An example of the creation of a connection to earth in the area of the expansion joint can be seen in the following figure:



Cross adapter clamp

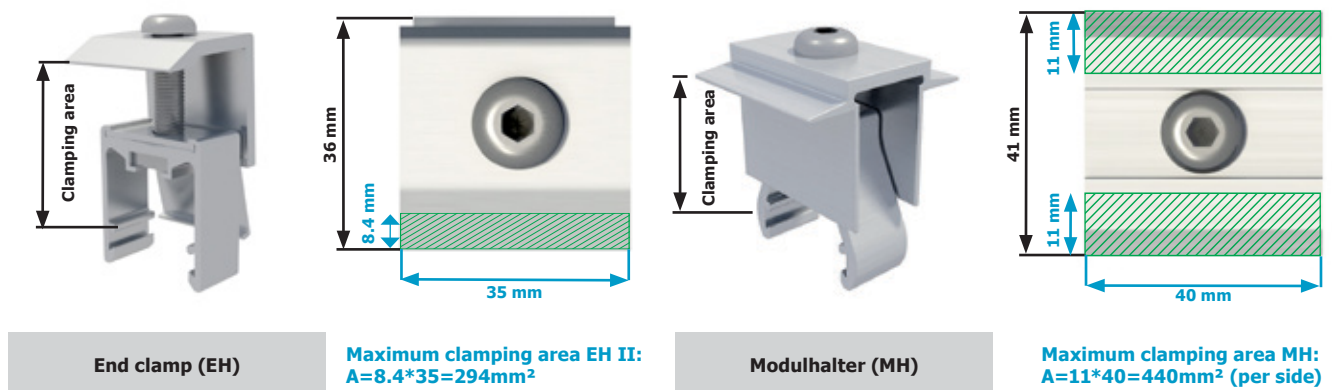
Crossing points (in double layer systems) can be quickly and viably achieved by using cross adapter clamps with patented and proven click technology. Depending on the structural requirements of the location and the installation situation, one or two cross adapter clamps must be used per crossing point.



Mid clamps and end clamps

Height-adjustable mid clamps and end clamps, both with click technology, allow for maximum flexibility during the installation of nearly all framed module types with a frame height of 30 to 50 mm. When fastening the PV module on to the mounting rails, the module manufacturer's installation instructions must always be observed.

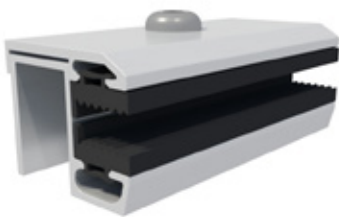
When fitting using mid clamps and end clamps, it must be ensured that they clamp the module frame at the clamping area defined by the module manufacturer. Every person who mounts the S:FLEX PV mounting system must ensure that existing clamping areas correspond to the module manufacturer's installation instructions. If the maximum clamping areas of the mid clamps and end clamps are not sufficient, it is possible to obtain the components in other lengths.



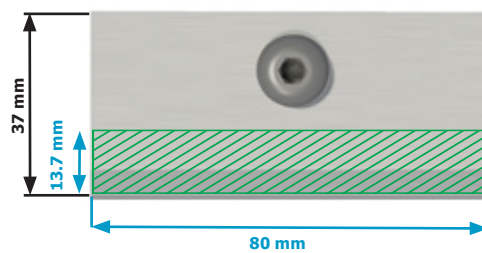
Laminate clamps

The installation of frameless PV modules (laminates) is made possible by using perfectly fitting, certified laminate end clamps and laminate mid clamps. They are available either with the patented and proven click technology or with hammer-head bolts. Depending on the specifications of the laminate, different clamping areas and lengths are available.

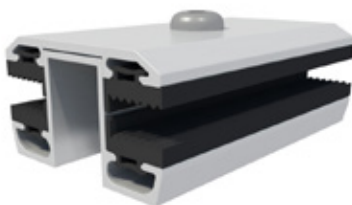
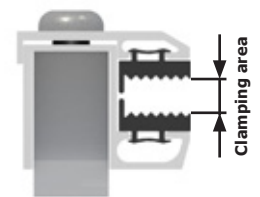
The module manufacturer must approve the use of the laminate end clamps and the laminate mid clamps (certification). You can receive an overview of the approvals from S:FLEX.



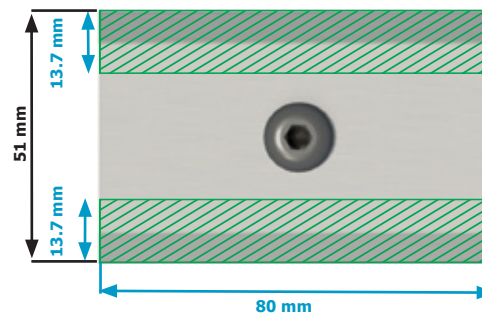
Laminate end clamp (LEK)



Maximum clamping area LEK:
 $A=13.7*80=1096 \text{ mm}^2$ (above and below)



Laminate mid clamp (LMK)



Maximum clamping area LMK:
 $A=13.7*80=1096 \text{ mm}^2$ (per side, above and below)



Earthing

Equipotential bonding between the individual system components is to be ensured according to the respective country-specific guidelines and standards. For that purpose, system-specific properties (see splice technology) can also be used.

An earthing design is not included in these installation guidelines and must be calculated and implemented by the responsible installer according to the valid standards and guidelines.



The module manufacturer's installation instructions must always be observed.

2.1 System components

① Roof fastenings

Hanger bolt
M8 x 200 pur

Hanger bolt
M10 x 200 pur

Hanger bolt
M12 x 250 pur



Solar fastener
RSB-A 8,4/M10

Solar fastener
RSB-BZ 8,0/M10



Bracket 40mm
M8 complete

Bracket 60mm
M10 complete

Bracket 60mm
M12 complete

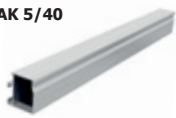


Adapter rail
l=235/366



② Mounting rails

ST-AK 5/40



ST-AK 7/47



ST-AK 13/60



ST-AK 26/70



ST-AK 182/120



③ Splices

Splice 5



Splice 7



Splice 13



Splice 26



Splice 182/120



④ End clamp

EH AK II Klick 30-50



EH AK II Klick 30-50 black



⑤ Mid clamp

MH AK II Klick 30-50 A



MH AK II Klick 30-50 black



⑥ Slipping protection

Slipping protection



⑦ Slider lock

Slider lock AK



⑧ Cross adapter clamp

Cross adapter clamp



⑨ Covering caps

Covering cap 5



Covering cap 7



Covering cap 13



Covering cap 26



⑩ Cable clips (optional)

Cable straps edge clip KC 15



2.2 Installation of PV systems parallel to the roof on industrial roofing

Installation – 1.1 – Fastening to the roof substructure using hanger bolts/solar fasteners

Hanger bolts or solar fasteners can be used for direct fastening to the roof substructure for the following types of roofing:

- Trapezoidal and corrugated sheet metal
- Corrugated fibre cement sheets
- Sandwich profiles

Fastening to roof substructures made of wood or steel is possible. This fastening is possible for pitched roofs with a tilt angle of max. 20°.

The positioning of the hanger bolts must be determined according to the structural requirements of the location and the installation situation. In doing so, it must again be checked whether the measurements taken as a basis in the planning match the actual measurements found on the roof (if necessary, adjustments must be made).

At the marked positions, the roofing is to be pierced in the area of the raised corrugation/ridge and subject to the existing roof structure the hanger bolts are to be fixed on the rafter/purlins in accordance with the regulations (Eurocode 5, information in the approvals from the building authority). In doing so, it must be ensured that the seals and/or storm washers are pressed to the roof membrane to create a form-fit connection.

It must be ensured that only hanger bolts or solar fasteners are used that are capable of safely transmitting the occurring forces to the roofing construction and of guaranteeing the impermeability of the roofing. The load bearing capacity of the hanger bolts must be proven.

Installation – 1.2 – Regulations and areas of application

Wood substructure

Installation with hanger bolts or type A solar fasteners

The wood substructure must be pre-drilled for the installation of wood screws > d=5 mm.

Pre-drill diameter: 0.7 x d

Screw depth: at least 4 x d – recommended: 7 x d

Purlin installation – distance to edge – below: at least 7 x d

Purlin installation – distance to edge – above: at least 3 x d

Rafter installation – distance to edge – side: at least 3 x d

Hole distance in direction of fibre: at least 7 x d

This leads to the following minimum purlin widths:

Hanger bolt 8x200: **80 mm** | Hanger bolt 10x200: **100 mm** | Hanger bolt 12x200: **120 mm**

The information for wood substructures is valid in compliance with the information in DIN EN 1995-1-1:2010-12 in connection with the national annex.

Steel/metal substructure

Installation with type BZ solar fasteners (d=8.0 mm)

Minimum material thickness: 1.5 mm steel (e.g. Z-purlin)

The steel substructure must be pre-drilled for the installation of type BZ solar fasteners.

Steel substructure 1.5 -5.0 mm: pre-drill bore 6.8 mm

Steel substructure 5.0-8.0 mm: pre-drill bore 7.0 mm

Steel substructure 8.0-10.0 mm: pre-drill bore 7.2 mm

Steel substructure >10 mm: pre-drill bore 7.4 mm

Screw depth: at least 10 mm

Purlin installation – distance to edge – above and below: at least 3 x d

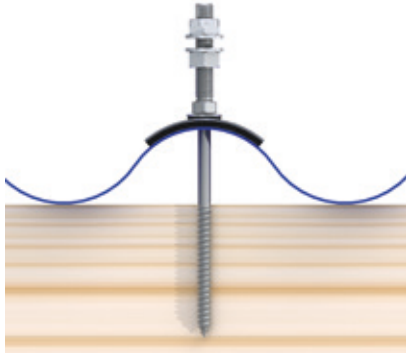
Rafter installation – distance to edge – side: at least 30 mm

Hole spacing: at least 40 mm

Installation – 1.3 – Types of roofing

Wood substructure

Corrugated sheet metal: Type A solar fastener or hanger bolt (EPDM seal or compatible storm washer)

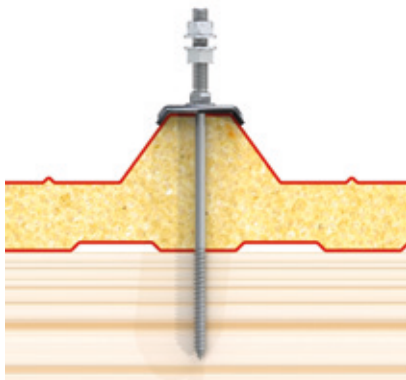


Corrugated fibre cement: Type A solar fastener or hanger bolt (EPDM seal)



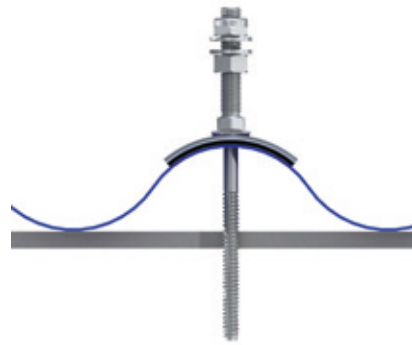
Trapezoidal sheet metal (no figure):
Type A solar fastener or hanger bolt
(EPDM seal or compatible storm washer)

Sandwich profiles: Type A solar fastener
(compatible storm washer)



Steel/metal substructure

Corrugated sheet metal: Type BZ solar fastener (EPDM seal or compatible storm washer)

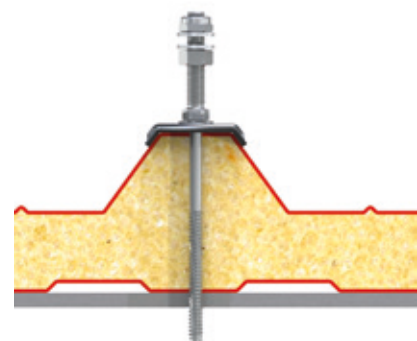












Corrugated fibre cement: Type BZ solar fastener (EPDM seal)



Trapezoidal sheet metal (no figure):
Type BZ solar fastener (EPDM seal or compatible
storm washer)

Sandwich profiles: Type BZ solar fastener
(compatible storm washer)



	Check the basis of the plans
	Positioning according to the structural requirements and the installation situation
	 Alignment of the roof hooks using plumb line
	 Observe Eurocode 5 regulations
 13-15-17	 Observe the distances to edges
	 The manufacturer's specifications for the installation of the hanger bolt/solar fastener must be observed

Following the positioning of the hanger bolts/solar fasteners, the brackets and/or adapter rails are fixed on to the hanger bolts/solar fasteners. The load bearing capacity of the hanger bolts/solar fasteners must be proven for a maximum distance between the brackets/adapter rails and the roofing.

It is recommended that for the certificate the maximum distance should be more than 40 mm.

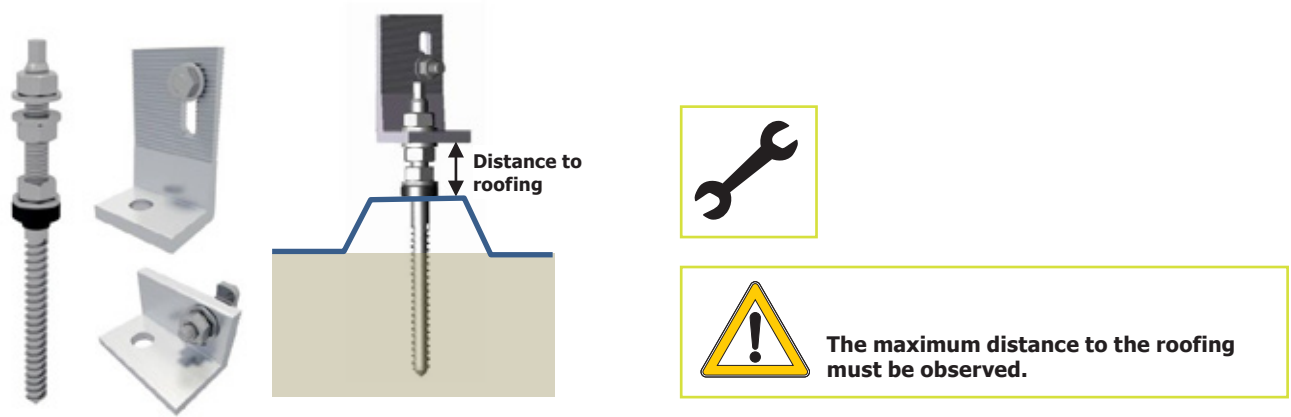
For the installation it must be ensured that the maximum distance between the bracket/adapter rail and the roofing is not exceeded.

Installation – 2.1 – Bracket complete and lower rail layer

The bracket must be selected subject to the diameter of the upper metric area of the hanger bolt/solar fastener

- Bracket 40mm, M8 complete
- Bracket 60mm, M10 complete
- Bracket 60mm, M12 complete

In order to fix the bracket to the hanger bolt, the upper nut and toothed washer must be removed, the bracket set must be placed on the hanger bolt and fixed with nut and toothed washer (torque M8: 12-15 Nm, torque M10: 20-25 Nm, torque M12: 25-30 Nm). The maximum distance between the bracket and the roofing must be observed.



Depending on the system layout, horizontally or vertically running mounting rails can be fixed to the brackets using the M8x25 hammer-head bolt and the self-locking nut.

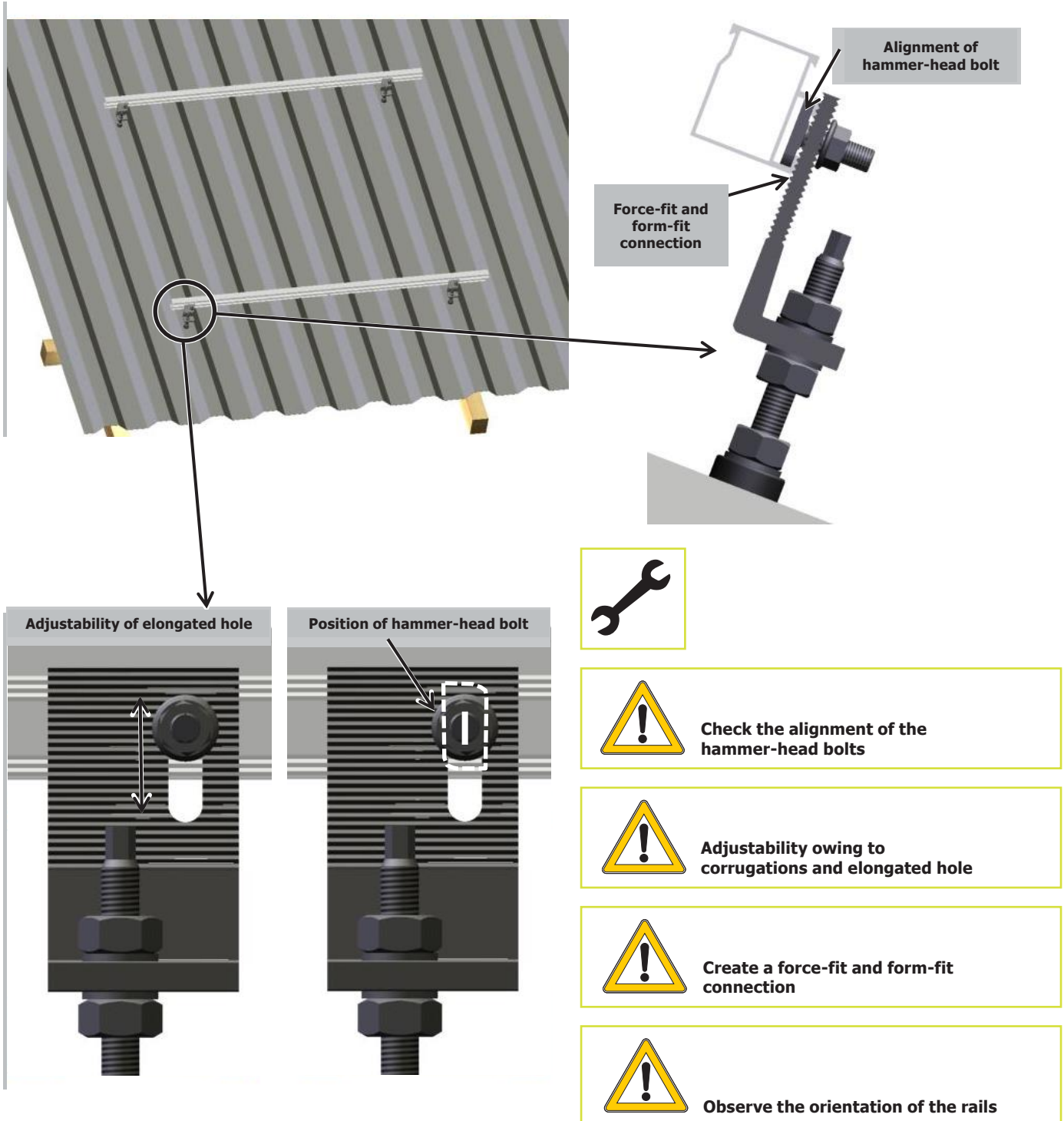
The correct alignment of the hammer-head bolts in the mounting rail channel (torque 12-15 Nm) must be observed.

The mounting rails must be mounted stress-free.

That is made possible by the corrugations of the components and the elongated hole.

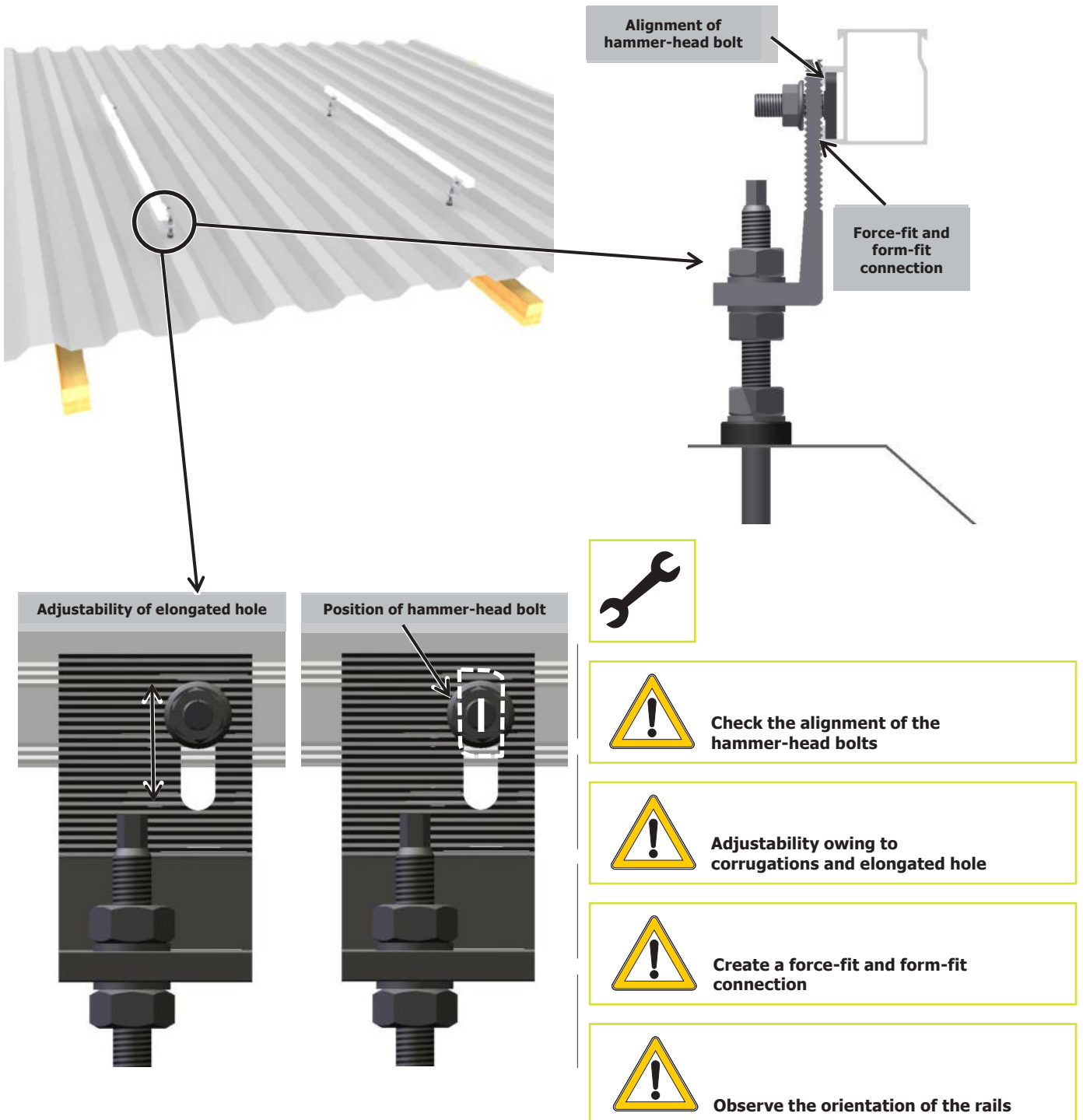
A force-fit and form-fit connection created by interlocking the corrugations must be ensured.

For horizontally (parallel to the eaves) running mounting rails (lower rail layer), it must be ensured that the rails are always positioned so that the bracket is fixed to the underside facing the eaves.



Above the horizontally running mounting rails (lower rail layer), either vertically running mounting rails are to be mounted using the cross adapter clamps that are positioned on both sides (see Installation – 4) or the modules are to be fixed directly using end clamps and mid clamps (see Installation – 8 ff).

For vertically (vertical to the eaves) running mounting rails (lower rail layer), it must be ensured that the rail orientation of neighbouring rails changes, i.e. that the bracket connects to the left of one rail and to the right of the neighbouring rail.



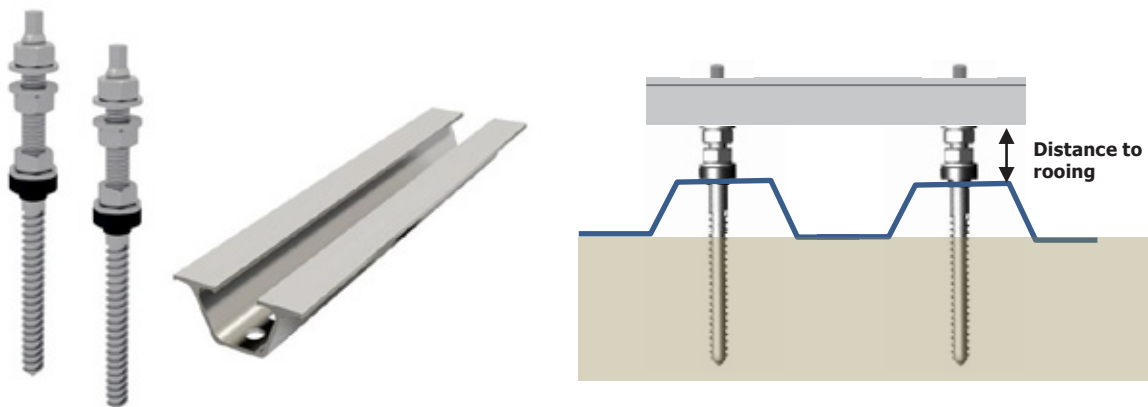
Above the vertically running mounting rails (lower layer), either horizontally running mounting rails are to be mounted using the cross adapter clamps that are positioned on both sides (see Installation – 4) or the modules are to be fixed directly using end clamps and mid clamps (see Installation – 5 ff).

Installation – 2.2 – Adapter rail l=235/366 and lower rail layer

If the forces to be transmitted are too large for fastening using a hanger bolt, then the adapter rails can be used. Two hanger bolts can be connected with each other using the adapter rail l=366. The adapter rail l=366 is pre-drilled at 12.5 mm for the conventional hanger bolt distances of 199 mm to 333 mm.

The adapter rail l=235 is designed especially for the dimensions of the corrugations of corrugated fibre cement and hanger bolt distances of 70 to 200mm. It comes pre-drilled with 12,5 mm holes.

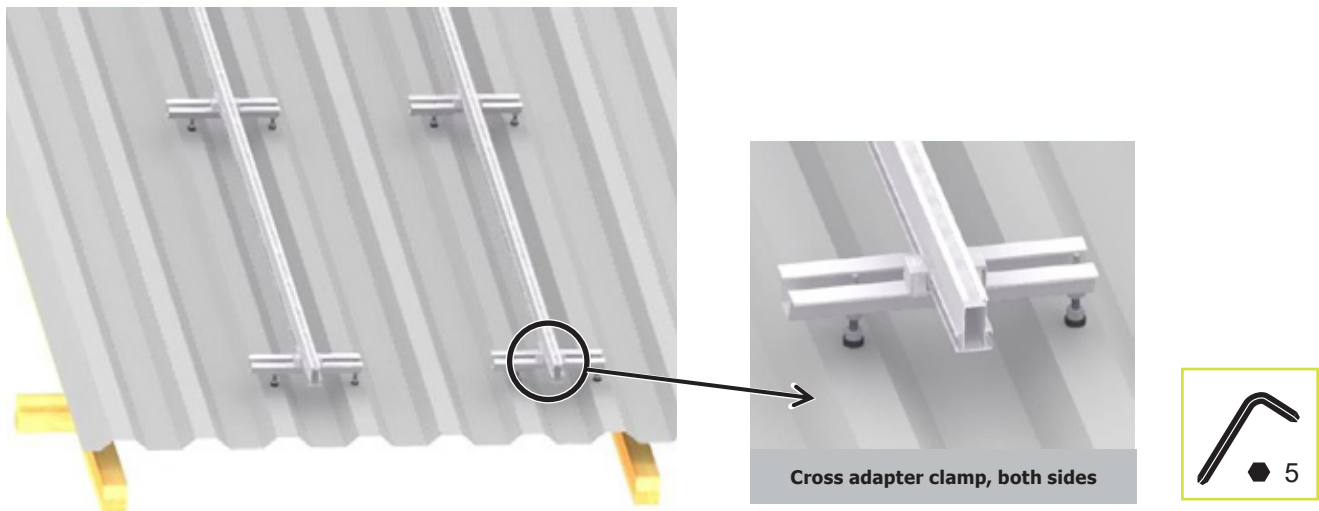
In order to fix the adapter rail l=366 to the hanger bolt, the upper nut and toothed washer of the two neighbouring hanger bolts must be removed, the adapter rail l=366 must be placed on the hanger bolts and fixed with nut and toothed washer (torque M10: 20-25 Nm, torque M12: 25-30 Nm). The maximum distance between the adapter rail and the roofing must be observed. It must be ensured that the adapter rail l=366 is horizontally mounted.



The maximum distance to the roofing must be observed.

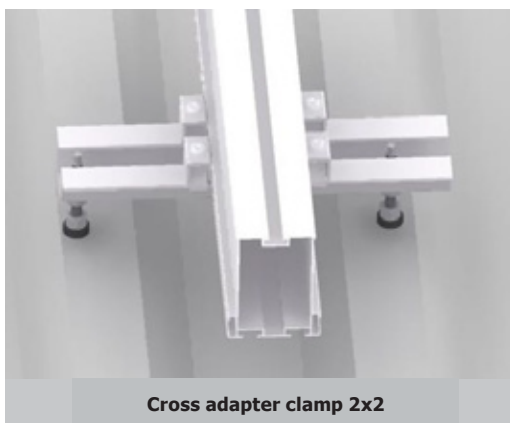
The adapter rails are installed parallel to the purlin (parallel to the eaves) so that only vertically running mounting rails are to be fixed using cross adapter clamps that are positioned on both sides.

To do this, click the cross adapter clamps on the adapter rail and fix the vertical mounting rail in the side hammer-head bolt channel and opposite. Ensure that the cross adapter clamp is clicked in on both sides of the adapter rail and tighten the screw (torque 8-10 Nm).



Additional details regarding the cross adapter clamp can be found in Section Installation – 4.

Depending on the structural requirements of the location and the installation situation, several cross adapter clamps (2x2) may be required per crossing point.

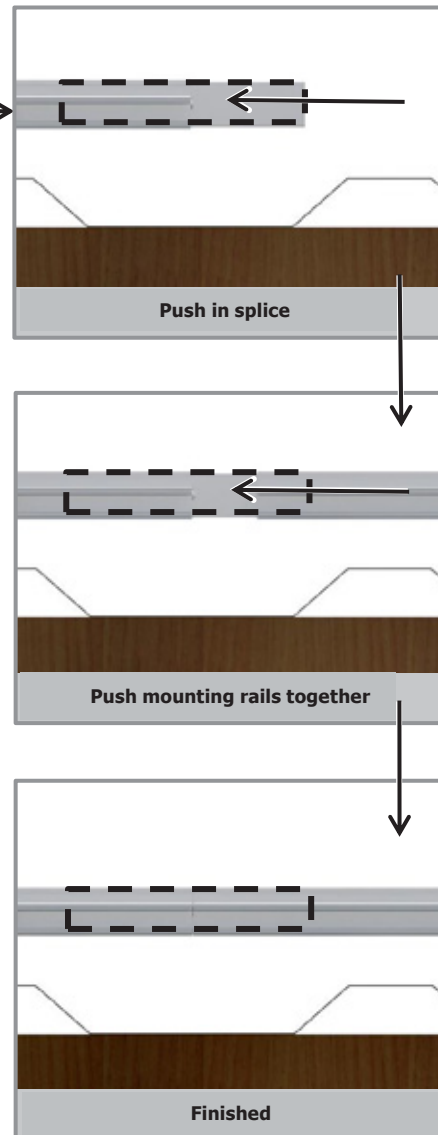
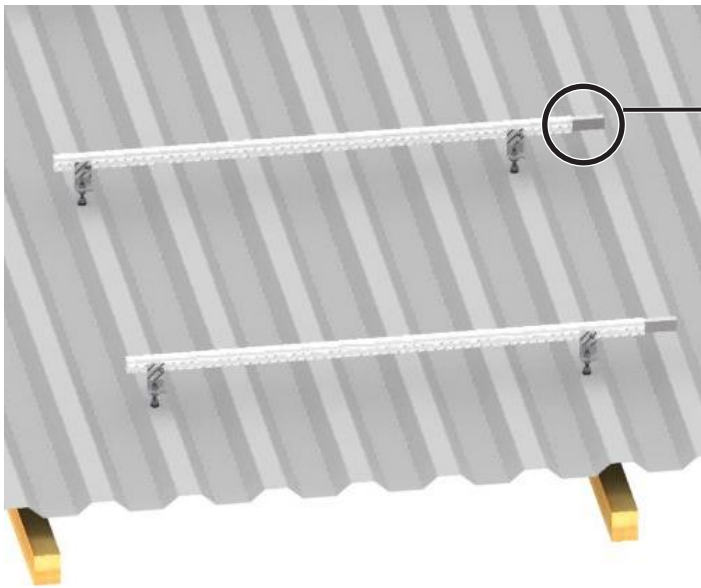



Installation – 3 – Splice


In order to link several mounting rails, half of the splice, which has the same structural values as the mounting rails, is pushed into the already installed mounting rail. Then push the other mounting rail on to the splice. Use pressure to push the mounting rails flush together and check if a connection to earth has been created. The connection is finished.

Fix the joined mounting rail as is described.

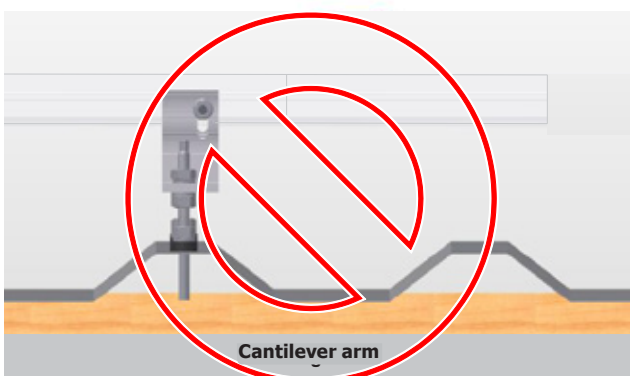
It is possible to use the splice to link mounting rails of the lower and upper rail layer and for vertically and horizontally running mounting rails.



 **Push in splice**

 **Check connection to earth, observe the notes contained under point 1.7**

 **No cantilever arms with splices. Position the splices so that they lie between 2 brackets, 2 adapter rails or 2 mounting rail crossing points.**

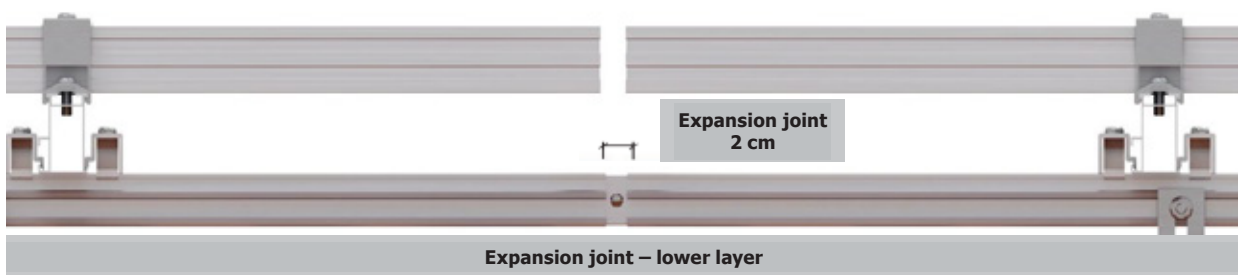




For double layer substructures, expansion joints are arranged in both layers. If the lower mounting rail is longer than 12.00 m, it must be separated and connected using a splice to allow the rail to move by 2 cm (expansion joint). The alignment of the expansion joints is to be adjusted according to the structural conditions of the roof and the different expansion properties of the materials.



Modules may not be built over expansion joints. There is no connection to earth. This must be established without limiting the expansion joint's mode of operation.



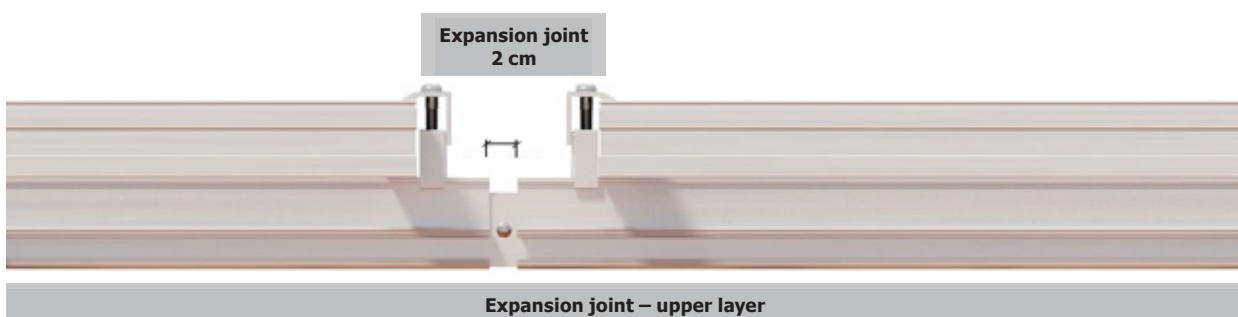
Expansion joint for the upper layer (for double layer and single layer substructures):



If the mounting rail is longer than 12.00 m, the module array is to be separated by placing two end clamps. In the zone between the end clamps, the mounting rail is to be separated and connected using a splice to allow the rail to move by 2 cm (expansion joint). The alignment of the expansion joints is to be adjusted according to the structural conditions of the roof and the different expansion properties of the materials. Observe the instructions in Installation – 8 of these installation guidelines when placing the end clamps.



Modules may not be built over expansion joints. There is no connection to earth. This must be established without limiting the expansion joint's mode of operation. Observe the notes contained under point 1.7



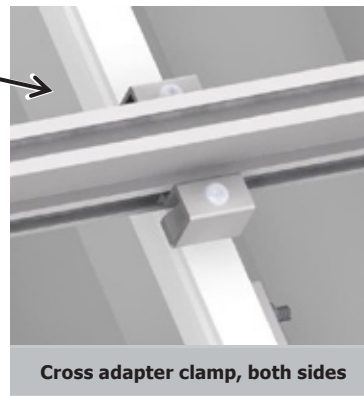
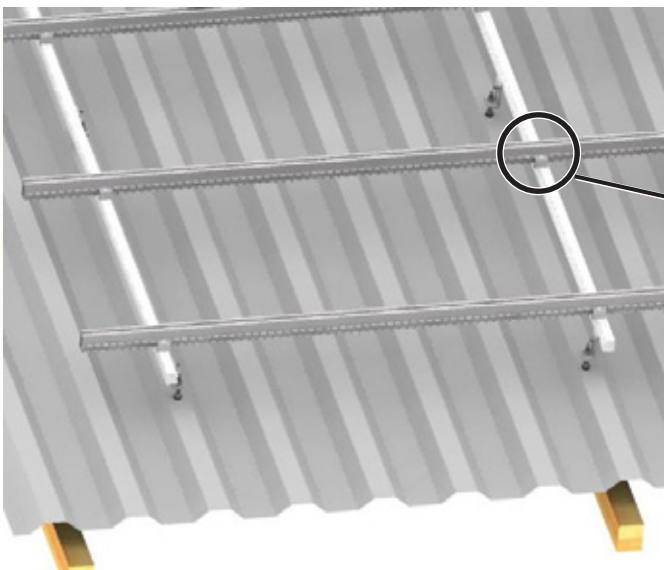
Installation – 4 – Cross adapter clamp

Connections points between the lower and upper layers of rails (for double layer systems and when using adapter rails) are quickly and viably achieved using cross adapter clamps.

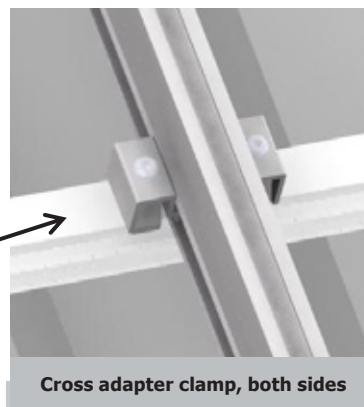
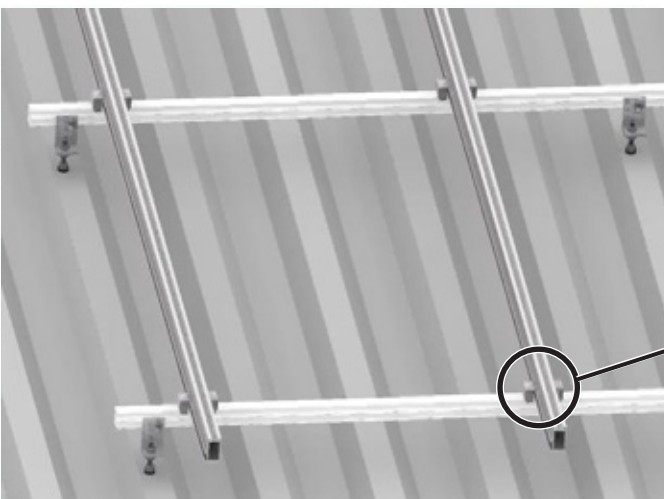
Mount the upper mounting rails on to the lower mounting rails using the cross adapter clamps. To do this, click the cross adapter clamp on to the lower mounting rails and fix the upper mounting rail with it.

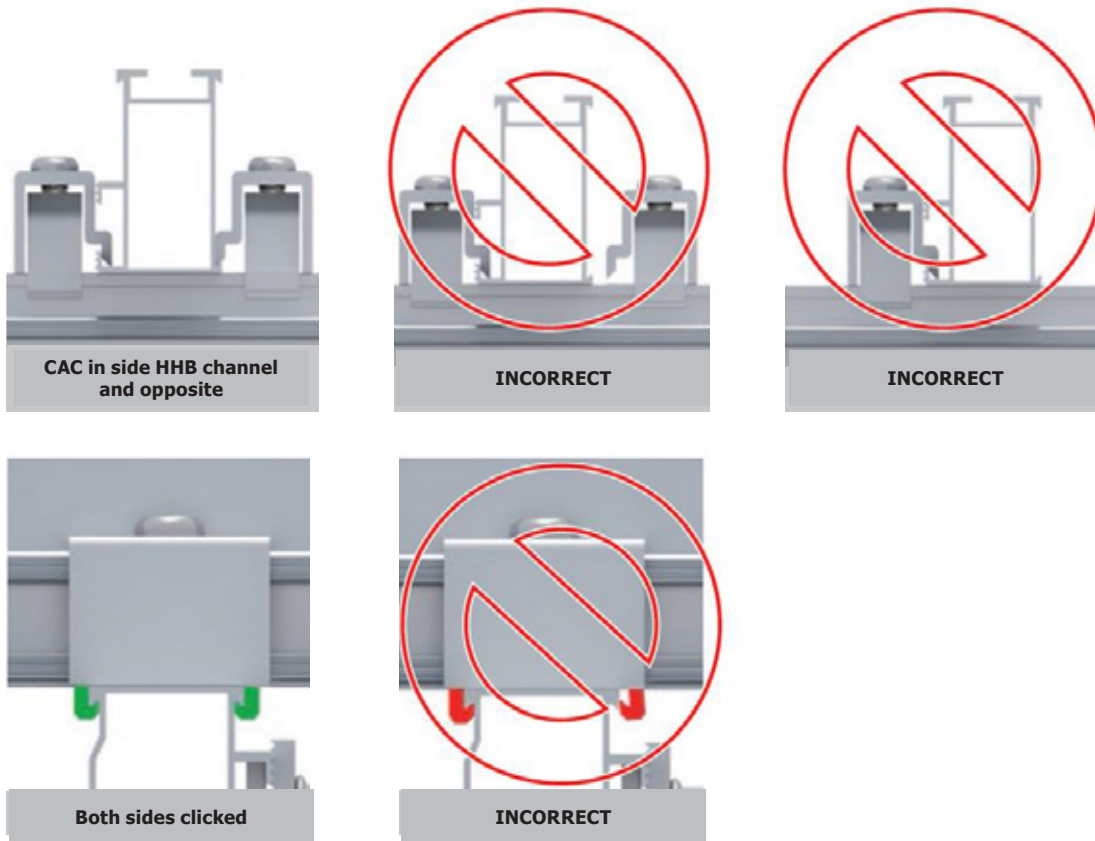
Check the distance of the upper mounting rails against the module's prescribed clamping distances. Ensure that the cross adapter clamp is clicked in on both sides of the mounting rail and tighten the screw (torque 8-10 Nm).

Upper rail layer – horizontal:



Upper rail layer – vertical:



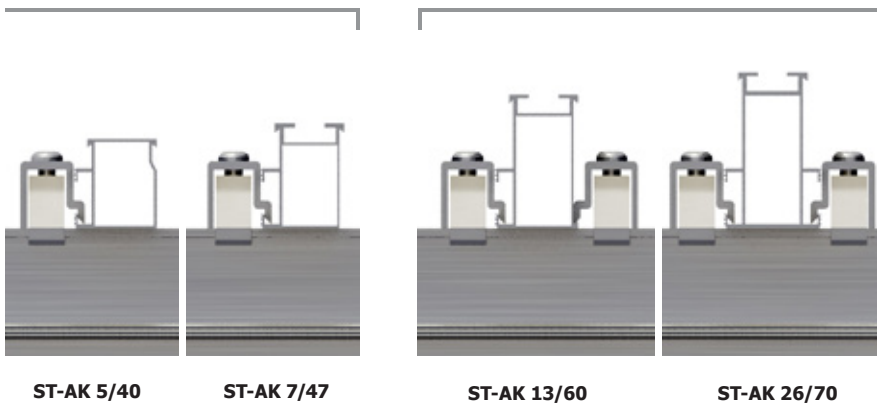


Depending on the structural requirements of the location and the installation situation, several cross adapter clamps may be required per crossing point. If a second cross adapter clamp is required, it is fixed to the opposite side, as described above (torque 8-10 Nm).

Crossing points:

1 CAC in side HHB channel

1 CAC in side HHB channel and 1 CAC opposite



Observe the module's installation instructions for the distance between the upper mounting rails.

Installation – 5 – Horizontal module installation, end clamp

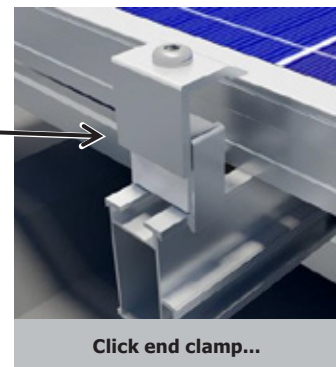
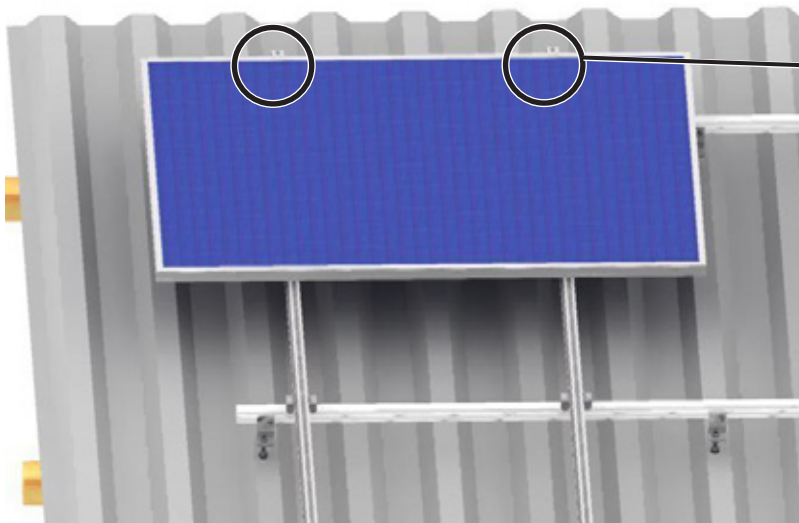
It is possible to mount the modules both horizontally and vertically using the S:FLEX PV mounting system. In the following (Installation – 5, 6 and 7), the module clamping of framed modules in horizontal alignment is described.



In the following, the column for column installation of the modules from top to bottom is described. The installation can also be carried out from bottom to top if the location requires it and the installation situation allows for it. In the case of installation from bottom to top, a slider lock is to be pushed on to each lower mounting rail and tightened (torque 8-10 Nm) before the module installation. Ensure that all slider locks are fixed in a horizontal line. The end clamps are then clicked on to the mounting rails and pushed on to the slider locks.

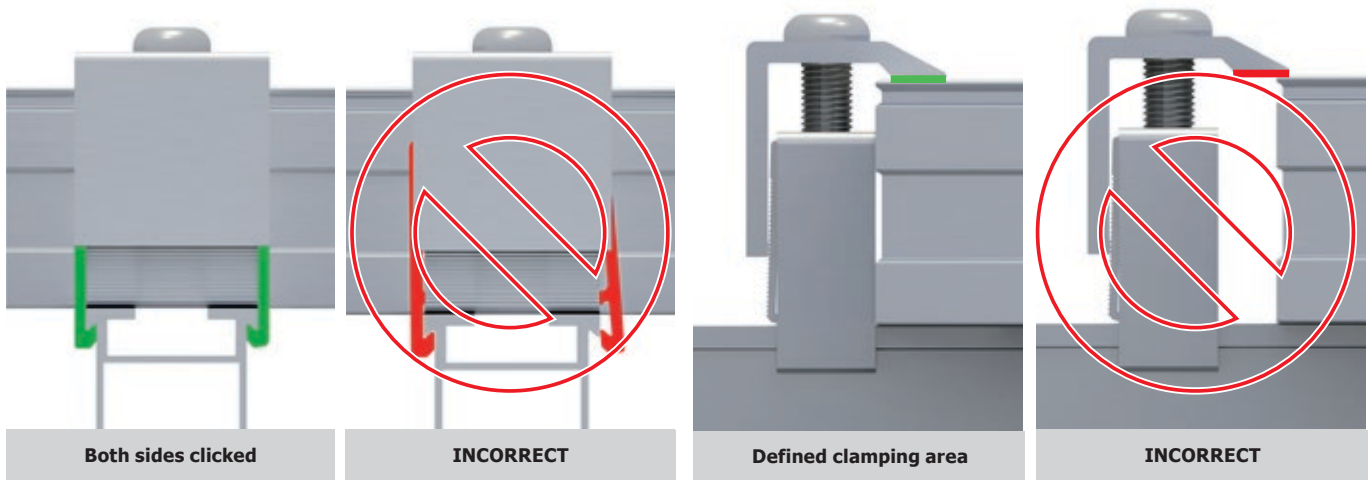
Place the module on the mounting rails. Mount the end clamps. To do this, click the end clamp on to the mounting rail and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the mounting rail. Now adjust the end clamp to the height of the module and tighten the screw (torque 8-10 Nm).

Ensure that the end clamp clamps the module frame at the clamping area defined by the module manufacturer.



Mount end clamp





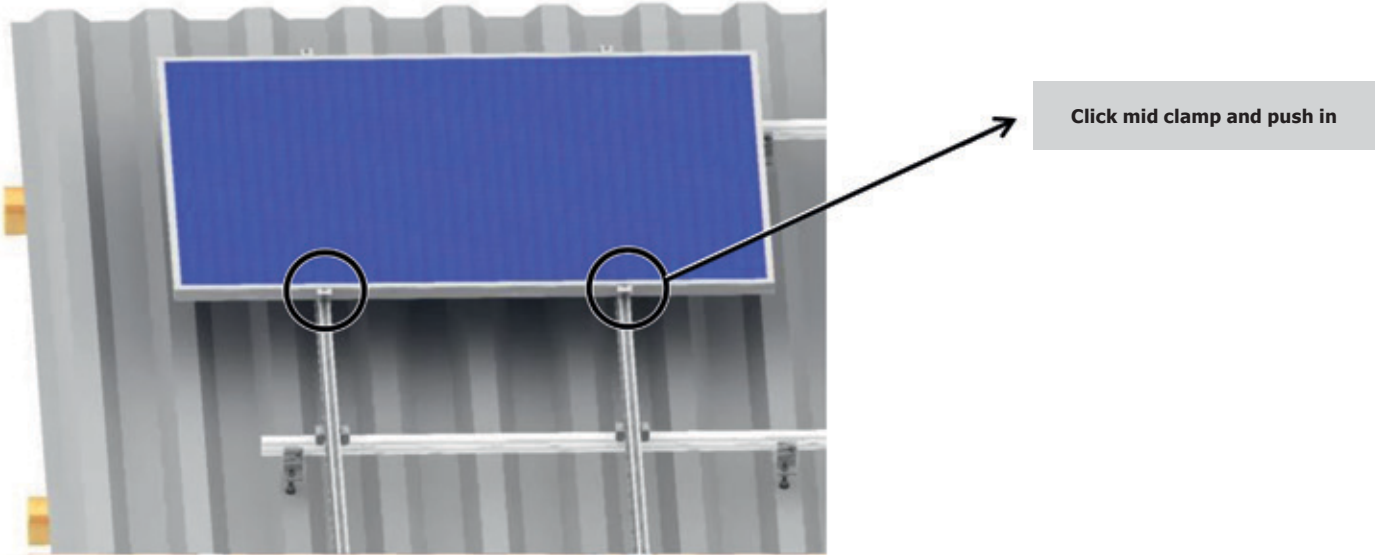
Check the end clamp has been clicked in



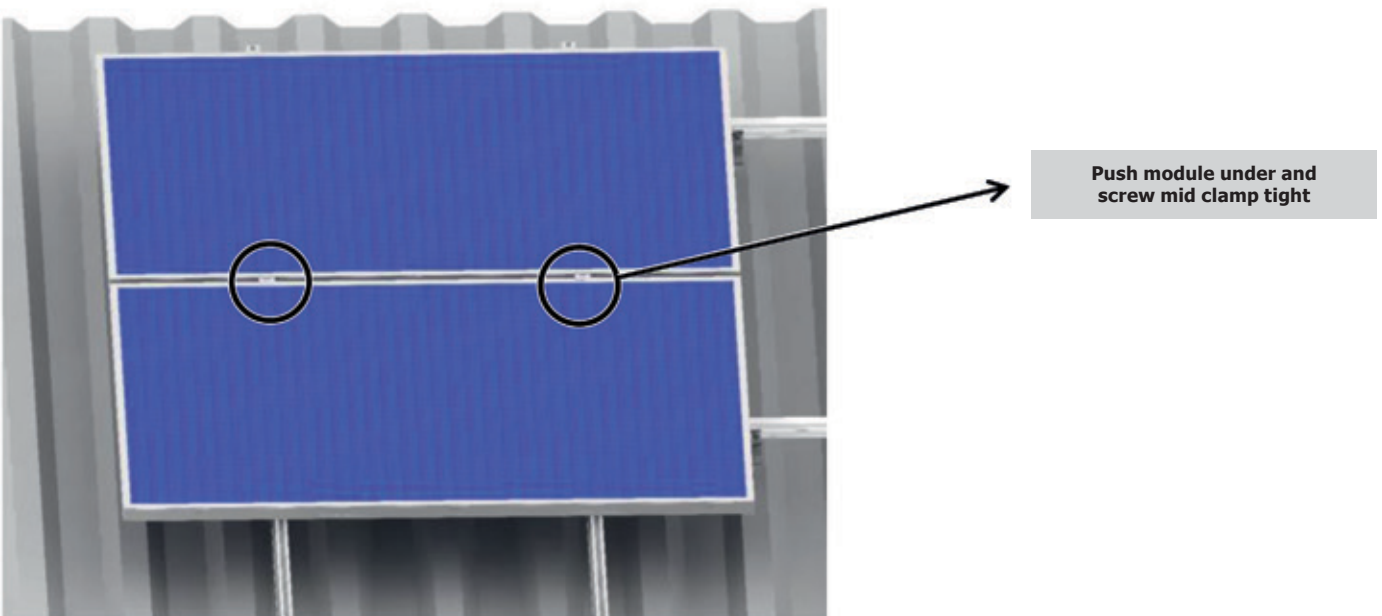
Check the clamping area defined by the module manufacturer, observe the notes contained under point 1.7 (observe module manufacturer's specifications).

Installation – 6 – Horizontal module installation, mid clamp

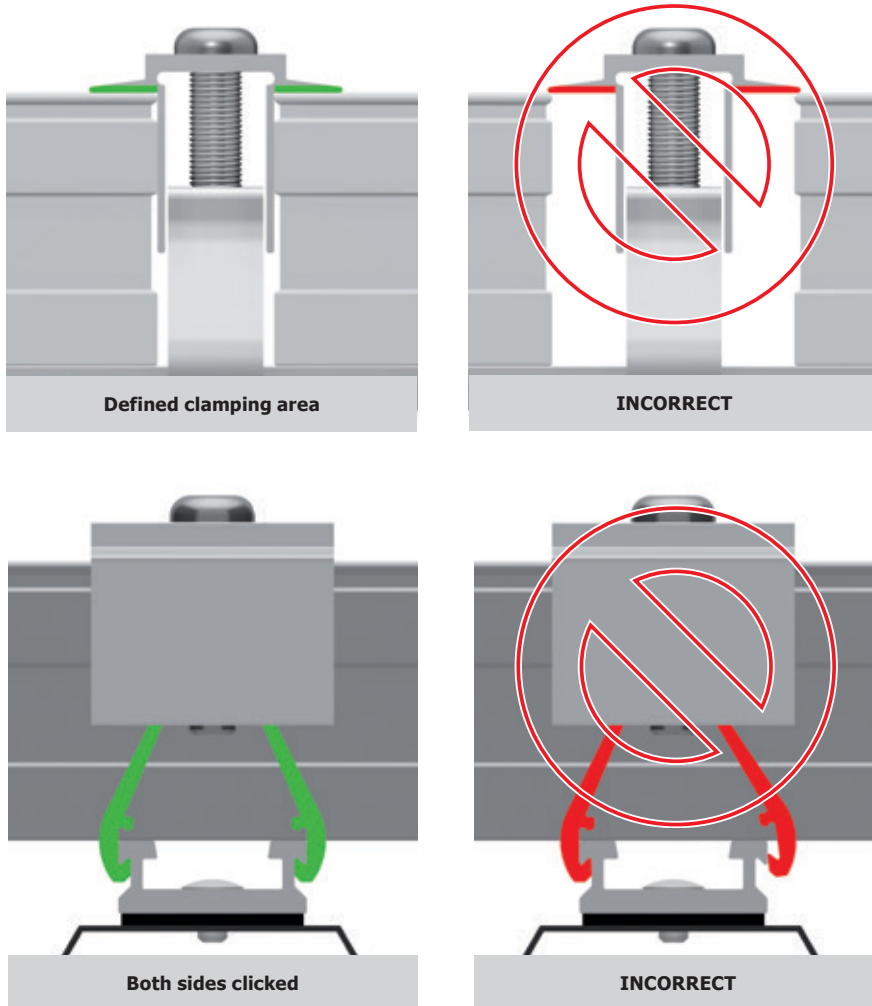
Now mount the mid clamps. To do this, click the mid clamp on to the mounting rail and push it on to the module. It must be ensured that the mid clamp is clicked into both sides of the mounting rail.



Now push the next module under the mid clamp, adjust the mid clamp to the height of the module frame and tighten the screw (torque 8-10 Nm).



Ensure that the mid clamp clamps both module frames at the clamping area defined by the module manufacturer.



Check that the mid clamp has been clicked in

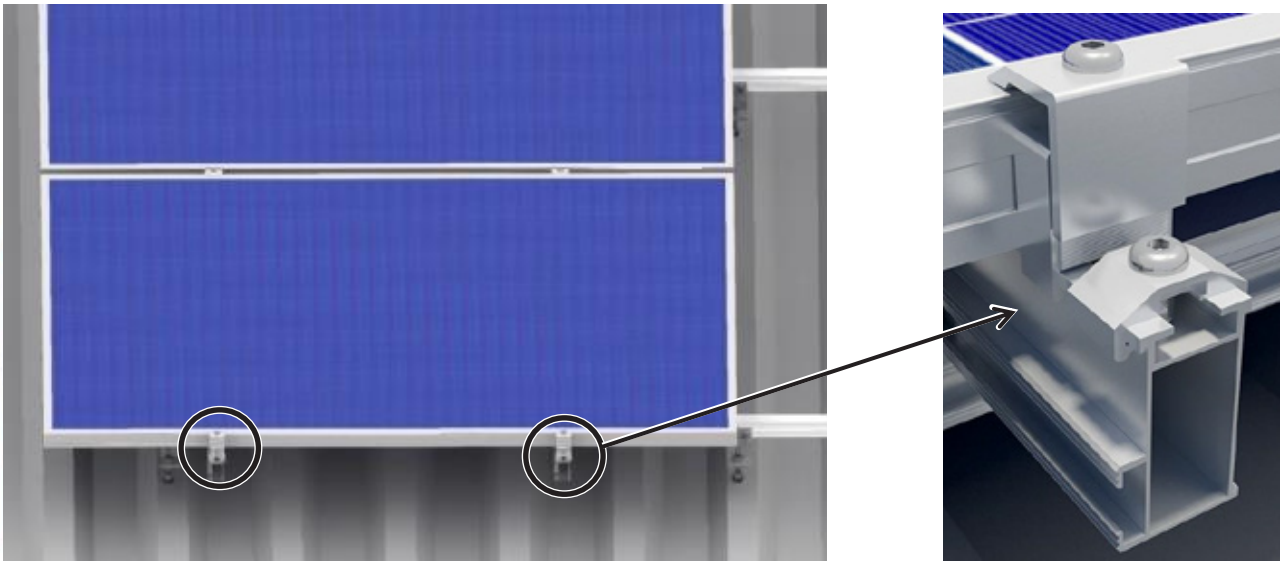


Check the clamping area defined by the module manufacturer, observe the notes contained under point 1.7 (observe module manufacturer's specifications).

Installation – 7 – Horizontal module installation, end clamp and slider lock on row end

On the last module in the row (if applicable, on expansion joints), end clamps are again to be mounted. To do this, click the end clamp on to the mounting rail and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the mounting rail. Now adjust the end clamp to the height of the module and tighten the screw (torque 8-10 Nm).

Ensure that the end clamp clamps the module frame at the clamping area defined by the module manufacturer (see Installation – 5). Push the slider lock from below on to the mounting rails up to the end clamp and fasten it (torque 8-10 Nm).



Mount end clamp and slider lock on the last module



Proceed as described for the following rows.
Ensure that all end clamps are fixed in a horizontal line.



Installation – 8 – Vertical module installation, end clamp

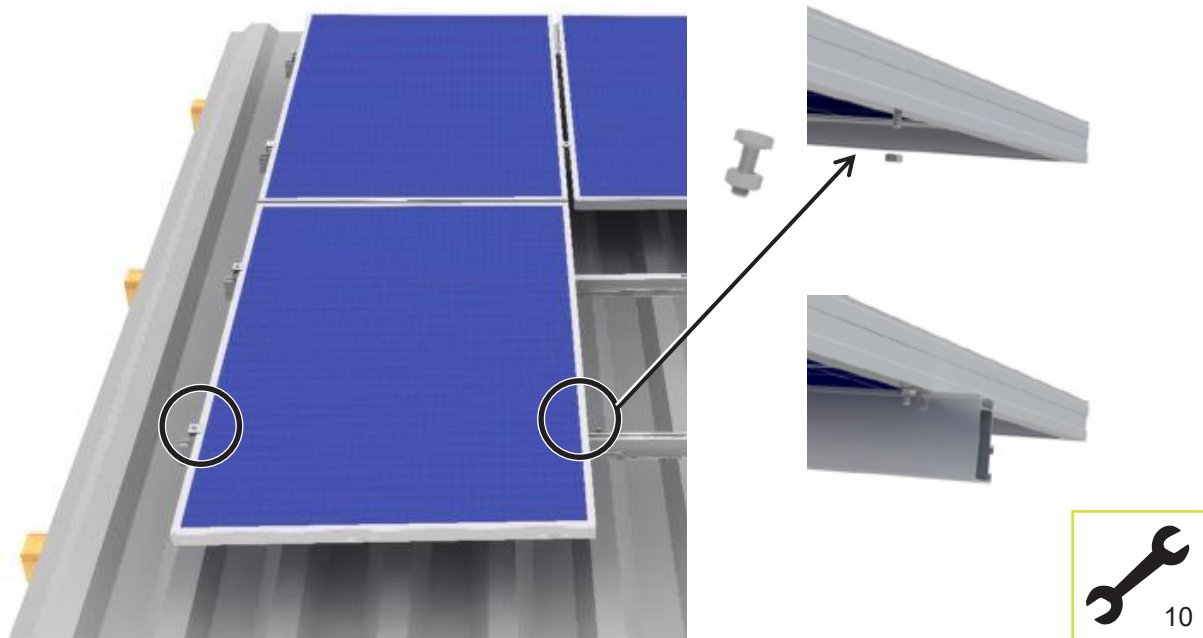
It is possible to mount the modules both horizontally and vertically using the S:FLEX PV mounting system. In the following (Installation – 8, 9 and 10), the module clamping of framed modules in vertical alignment is described.



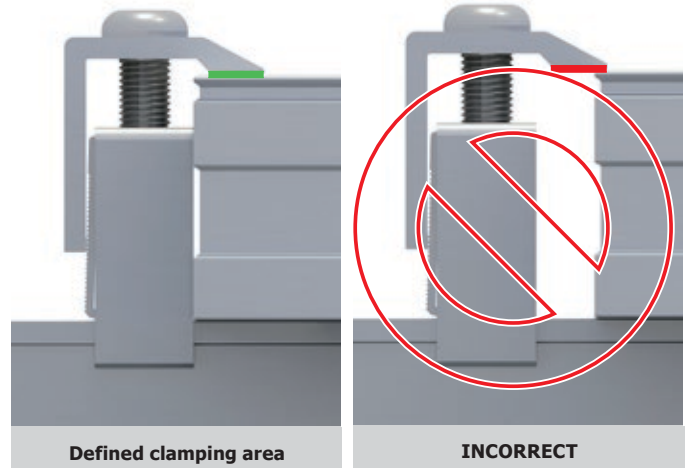
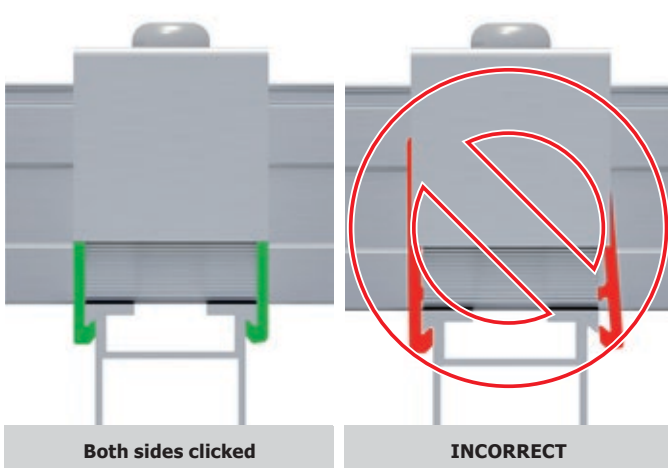
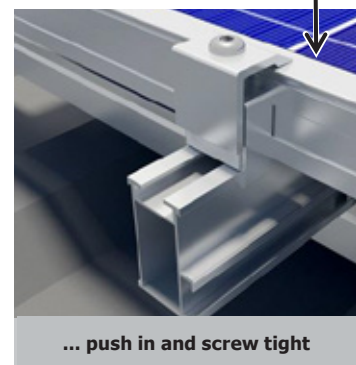
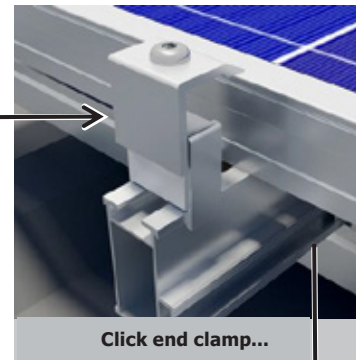
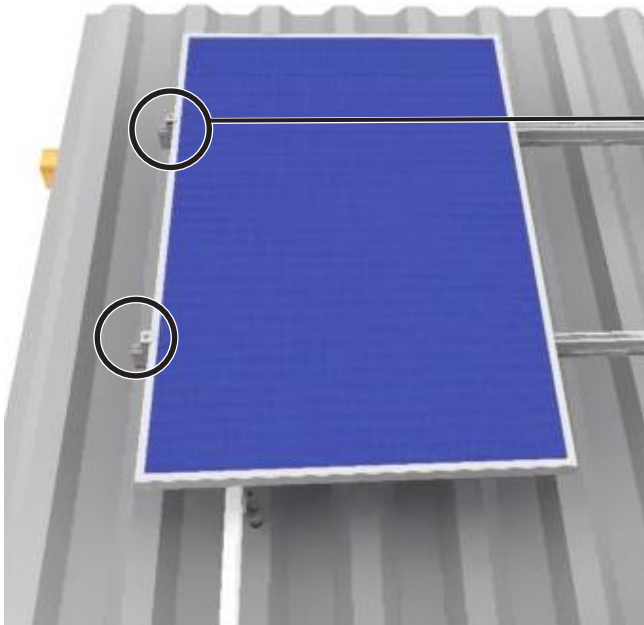
Before the installation of the modules in the lowest row of modules, the modules are generally to be furnished with the slipping protection. The same applies for modules under which no further module directly adjoins (modules above obstructions, e.g. windows, chimneys etc.).

Fix 2 screws M6 x 20 (with the shank downward) with nuts M6 in 2 of the module's frame holes (8 mm) so that the screws are at the same level and that when installed they are above at least one horizontal mounting rail layer, if necessary so that the screws on the underside of the module frame touch the horizontal mounting rails from above.

If the lower fastening borehole is larger than 8 mm, please use a screw appropriate for this.

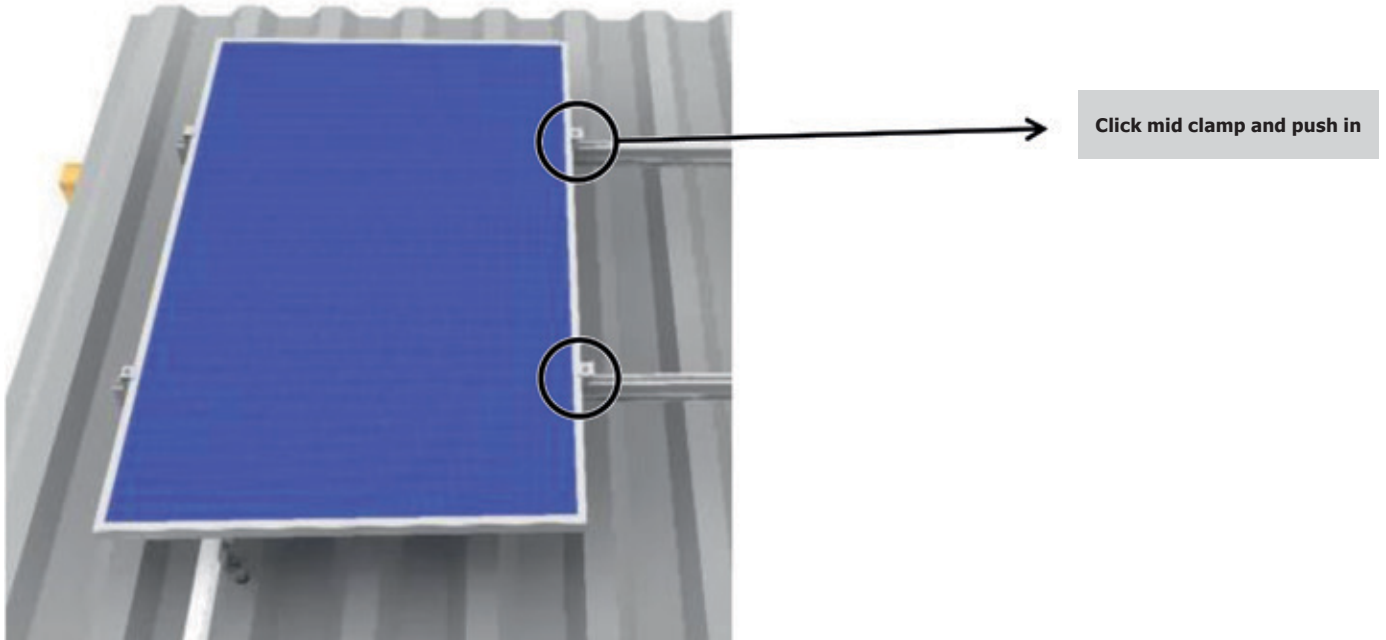


Place the module on the mounting rails. Mount the end clamps. To do this, click the end clamp on to the mounting rail and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the mounting rail. Now adjust the end clamp to the height of the module and tighten the screw (torque 8-10 Nm). Ensure that the end clamp clamps the module frame at the clamping area defined by the module manufacturer.

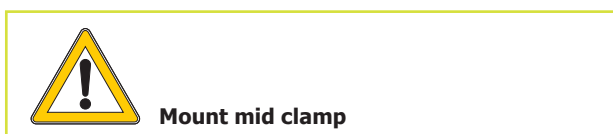
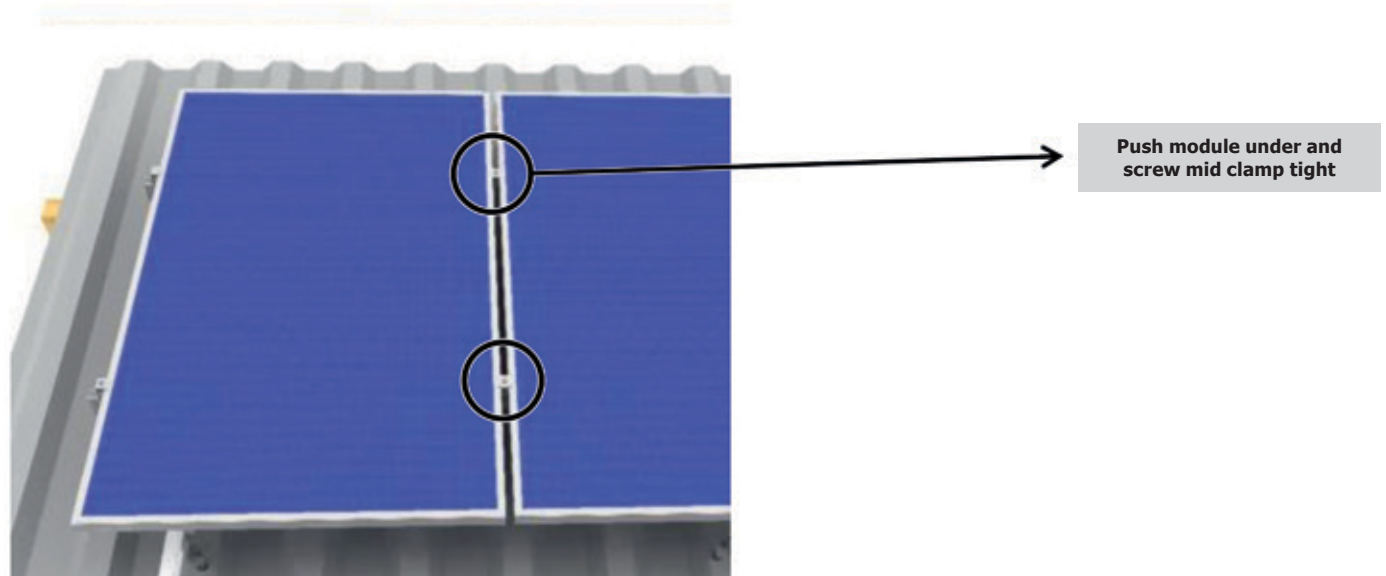


Installation – 9 – Vertical module installation, mid clamp

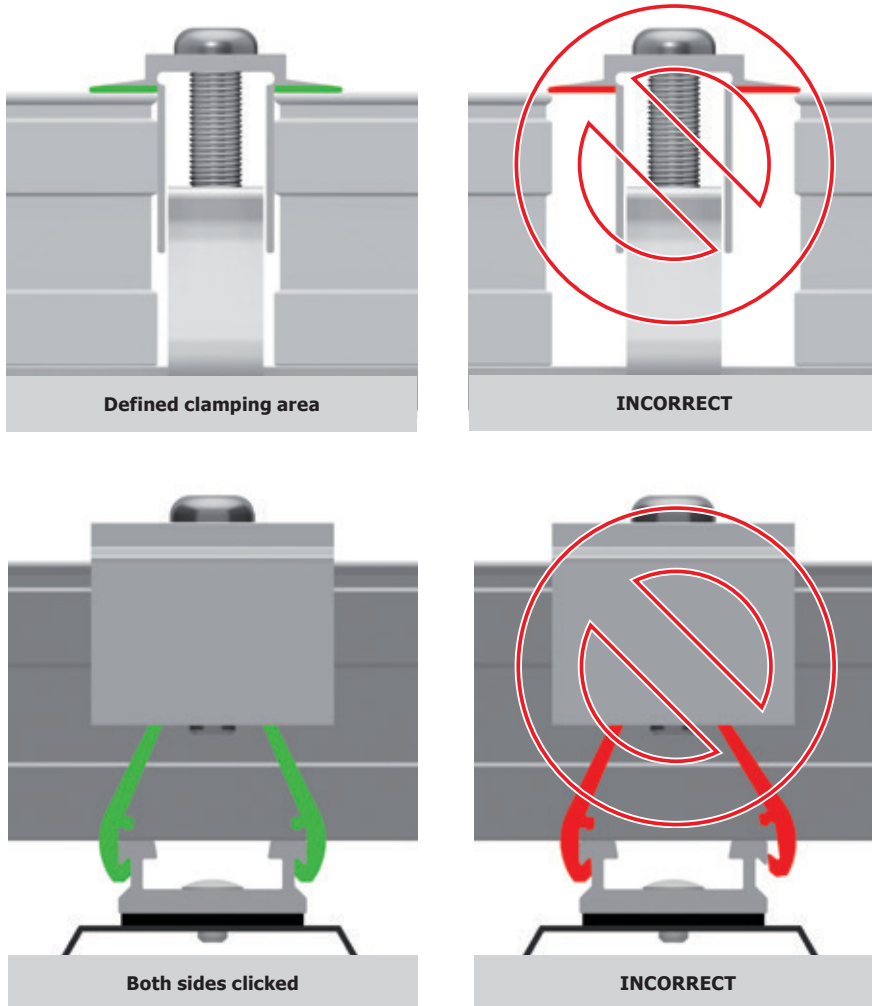
Now mount the mid clamps. To do this, click the mid clamp on to the mounting rail and push it on to the module. It must be ensured that the mid clamp is clicked into both sides of the mounting rail.



Now push the next module under the mid clamp, adjust the mid clamp to the height of the module frame and tighten the screw (torque 8-10 Nm).



Ensure that the mid clamp clamps both module frames at the clamping area defined by the module manufacturer.



Check that the mid clamp has been clicked in

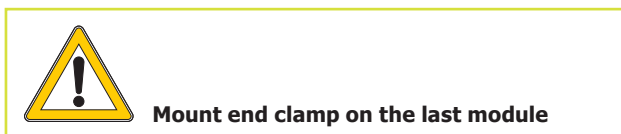
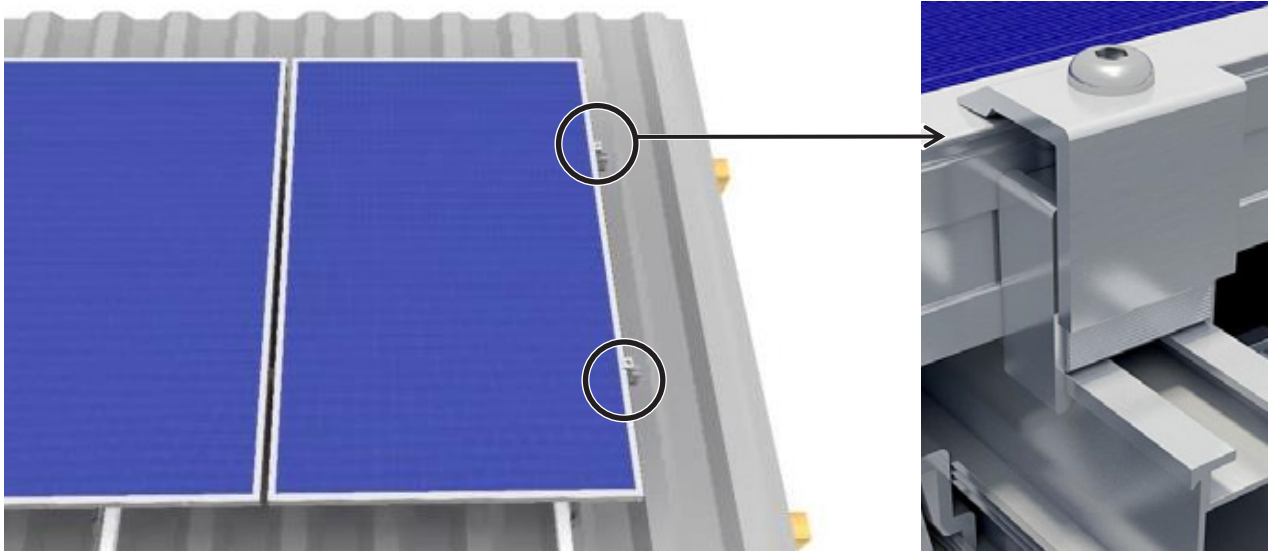


Check the clamping area defined by the module manufacturer, observe the notes contained under point 1.7 (observe module manufacturer's specifications).

Installation – 10 – Vertical module installation, end clamp on row end

On the last module in the row (if applicable, on expansion joints), end clamps are again to be mounted. To do this, click the end clamp on to the mounting rail and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the mounting rail. Now adjust the end clamp to the height of the module and tighten the screw (torque 8-10 Nm).

Ensure that the end clamp clamps the module frame at the clamping area defined by the module manufacturer (see Installation – 8).



Proceed as described for the following rows.

