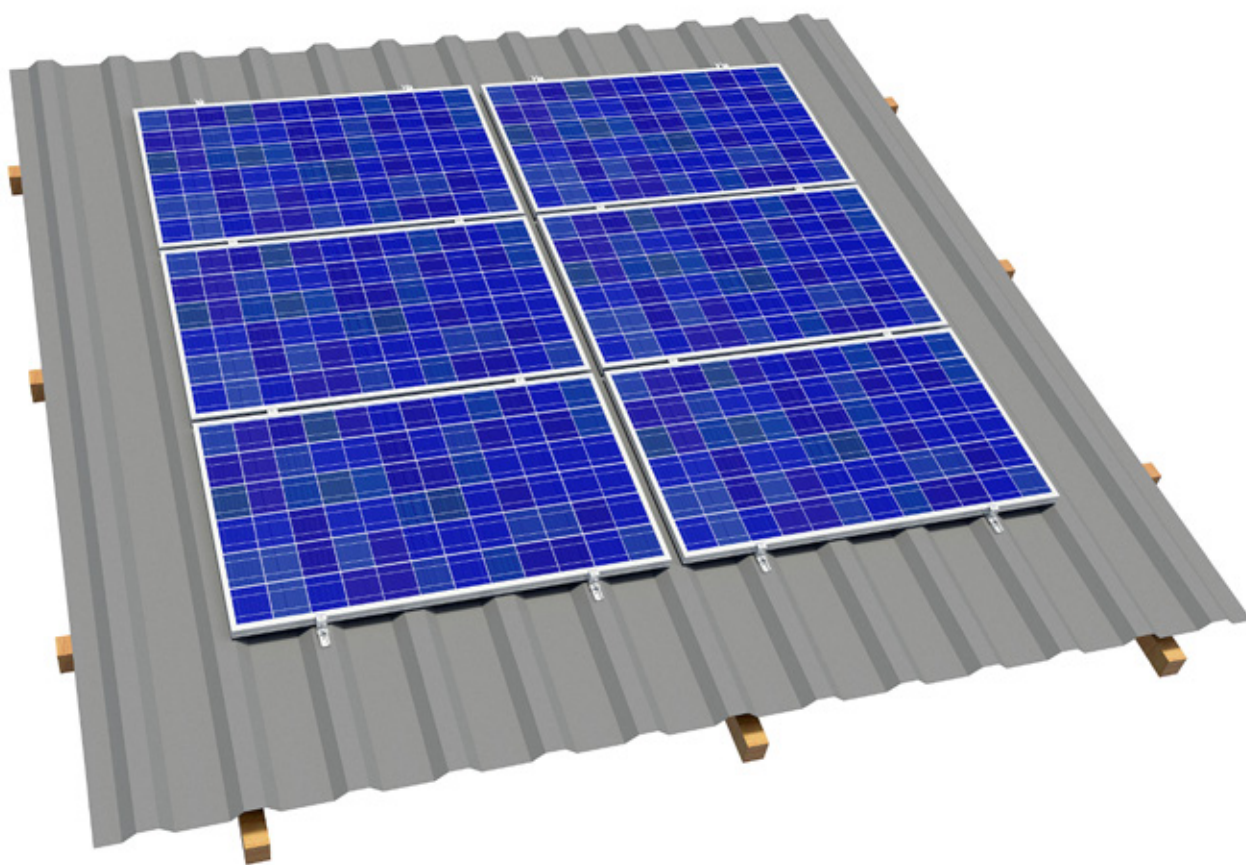




## Assembly Instructions

### ST-AK 1/12

Mounting system for roofing with trapezoidal sheet metal



## 1 Introduction

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## 2 Installation – ST-AK 1/12

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The S:FLEX PV mounting system for trapezoidal sheet roofs is a fastening system for the installation of PV modules. It is possible to both horizontally and vertically mount the modules using the S:FLEX mounting system. Both single layer installation and double layer installation are possible. The S:FLEX PV mounting system for trapezoidal sheet roofs 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 trapezoidal sheet roofs 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 damages that result from not observing the installation guidelines or from the improper and not intended use of the product.

### 1.2 About the document

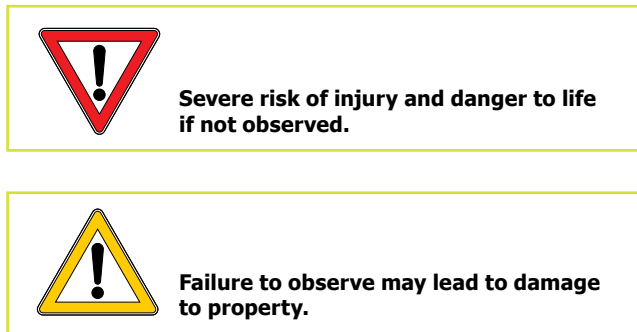
The S:FLEX PV mounting system for trapezoidal sheet metal allows the installation of PV systems parallel to the roof. These installation guidelines describe the installation of the ST-AK 1/12. This is possible for:

- Trapezoidal and corrugated sheet metal
- Where applicable, sandwich profiles (if the manufacturer approves)

It is to 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 overbuilt.

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 trapezoidal sheet 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.



**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.

While installing 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.

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.

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

## 2.1 System components

### ① Components for roof fastenings

ST-AK 1/12 l=180 (d=5-8,5) complete



### ② Mounting rails

ST-AK 5/40



ST-AK 7/47



ST-AK 13/60



ST-AK 26/70



### ③ Splice

Splice 5



Splice 7



Splice 13



Splice 26



### 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 locks

Slider lock AK



### ⑧ Sheet metal screws

Sheet metal screw A2



### ⑨ Cross adapter clamp

Cross adapter clamp



### ⑩ Covering caps

Covering cap 5



Covering cap 7



Covering cap 13



Covering cap 26



### ⑪ Cable clips (optional)

Cable straps edge clip KC 15



## 2.2 Direct roof fastening using rivets/sheet metal screws

When mounting the rivets or the sheet metal screws, the regulations stated in the approvals from the building authorities regarding the rivets/sheet metal screws are to be observed (e.g. area of application, pre-drill diameter, minimum strength of the materials to be fastened, hole diameter for existing holes). The corresponding rivets/sheet metal screws are part of our delivery. The selection of the fasteners depends on the roofing and the occurring forces. Rivets/sheet metal screws must only be positioned in the zone of the raised corrugations/ridges.

### Sheet metal screw:

4.5 x 25 (standard)

6 x 25 (for trapezoidal sheet metal joints and tilt angle > 15°)

Installation: SW 10

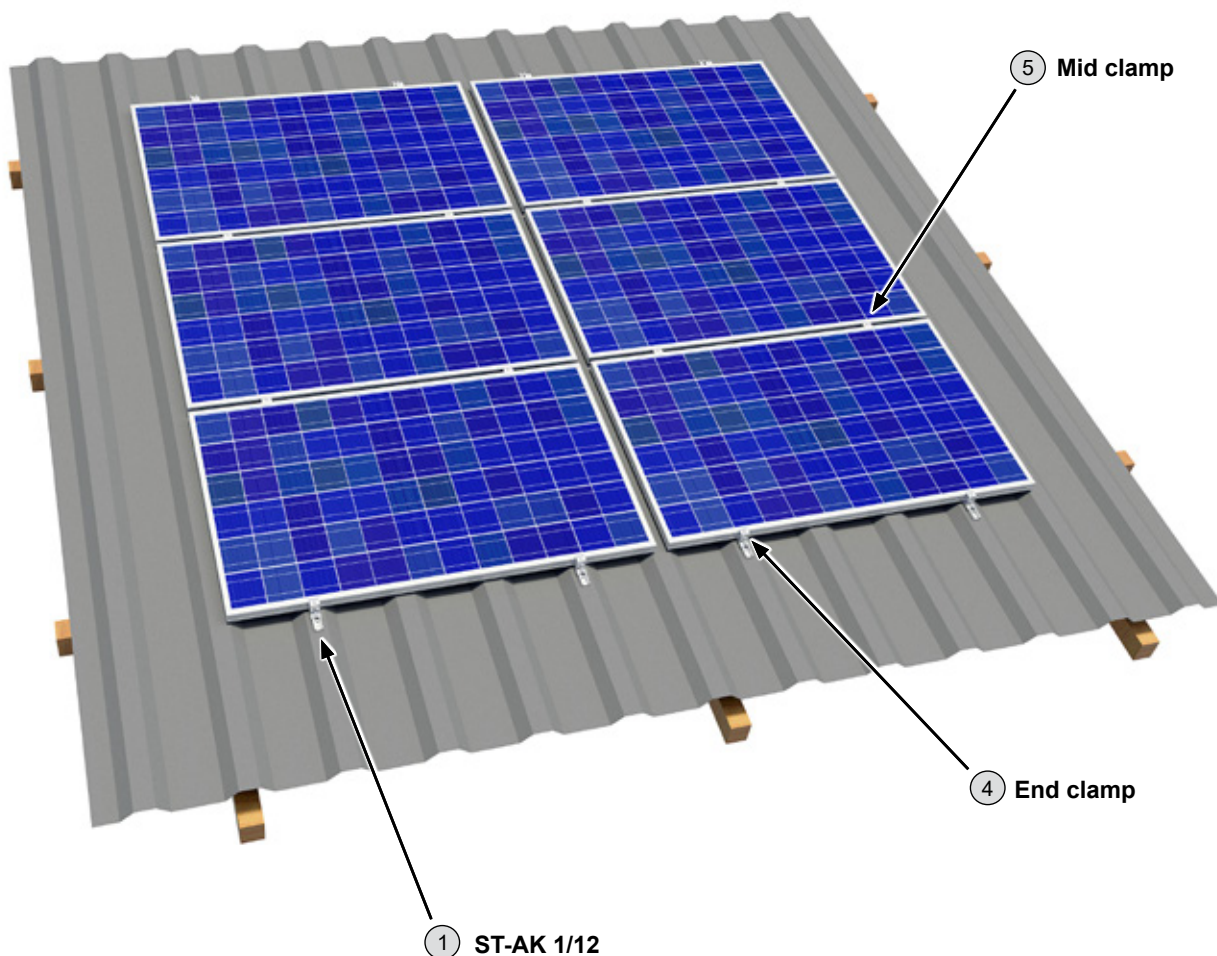
### Rivets:

Blind rivet Polygrip Alu/Niro 4.8 x 12





### 2.3 Installation – single layer substructure



**Installation – 1 (positioning of the ST-AK 1/12 as lower layer of rails)**

The positioning of the ST-AK 1/12  $l=180$  ( $d= 5-8.5$ ) complete 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). For single layer substructures, the position of the ST-AK 1/12 must be checked against the module's prescribed clamping distances.

The ST-AK 1/12  $l=180$  ( $d= 5-8.5$ ) are to be positioned so that the end clamps and mid clamps can later be fixed exactly in the centre of the two fixing points (sheet metal screws/rivets). This guarantees equal load on both fixing points.



**Check the basis of the plans**



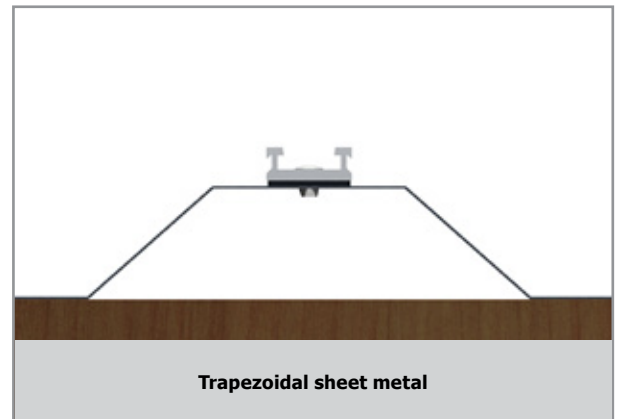
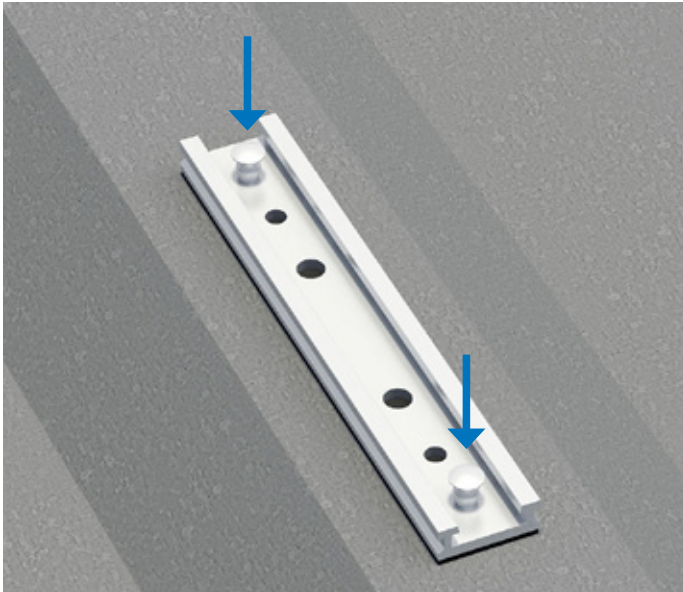
**Positioning according to the structural requirements and the installation situation**



**Align the ST-AK 1/12  $l=180$  ( $d=5-8.5$ ) complete using plumb line**

Mount the ST-AK 1/12  $l=180$  ( $d=5-8.5$ ) complete with the correct fasteners (rivets/sheet metal screws). Use 2 rivets or 2 sheet metal screws per ST-AK 1/12 (in the following figures blind rivets are used). To avoid water penetration between the ST-AK 1/12 and the roofing, the ST-AK 1/12 must always be mounted on the raised corrugation/ridge. The underside of the ST-AK 1/12 is extensively bonded with EPDM sealing tape.

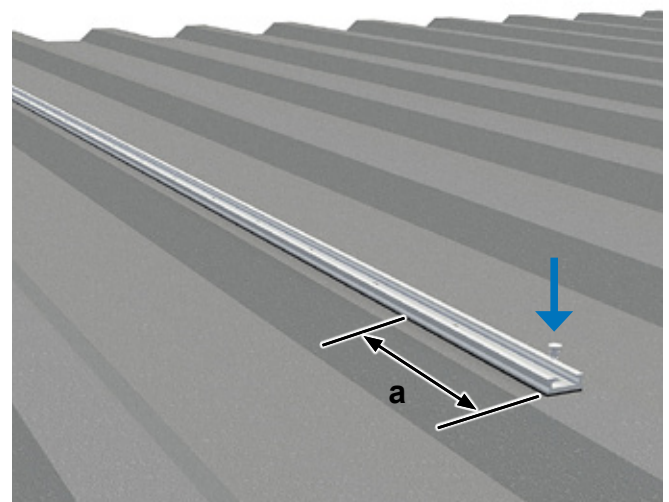
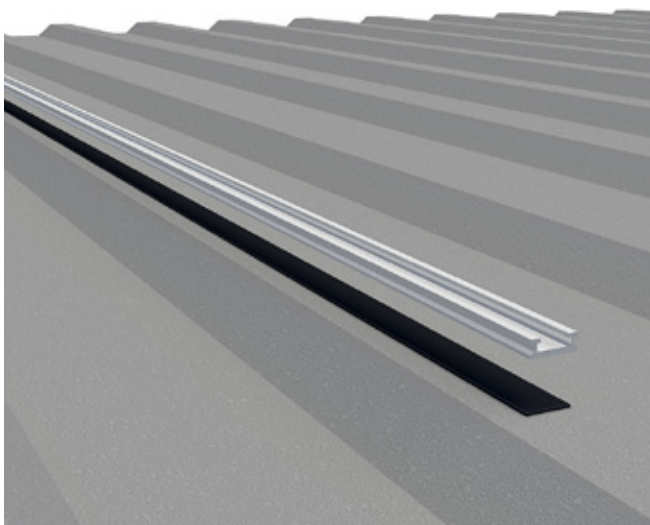
### Single layer installation with framed PV modules, horizontally mounted



**2 rivets or 2 sheet metal screws per ST-AK 1/12 l=180 (d=5-8.5) complete**



**If the ST-AK 1/12 is ordered without EPDM, an EPDM sealing tape (Tape Tec moll 7202) must be affixed to the raised corrugations or under the ST-AK 1/12 before installation in order to protect the roof from penetrating water. The distance a between the fasteners must be structurally verified before installation. In this case, the ST-AK 1/12 must be cut and drilled by the customer.**



## Single layer installation with framed PV modules, horizontally mounted



For single layer substructures, if the module array vertical to the eaves is longer than 6.00 m, it is to be separated by placing an ST-AK 1/12l=180 (d=5-8.5) complete with end clamps.

If the ST-AK 1/12 is not used in prefabricated rail sections l=180, but is used as a continuous rail, then the module array is to be separated by placing two end clamps. The ST-AK 1/12 is to be separated in the zone between the end clamps (expansion joint).

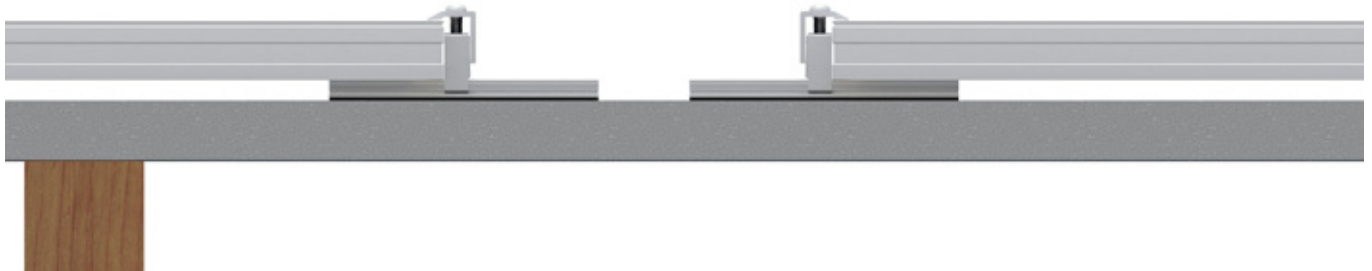
The alignment of the expansion joints is to be adjusted according to the structural conditions of the roof and the different expansion properties of the materials. Observe the instructions in Section "Installation – 2" in these installation guidelines when placing the end clamps.



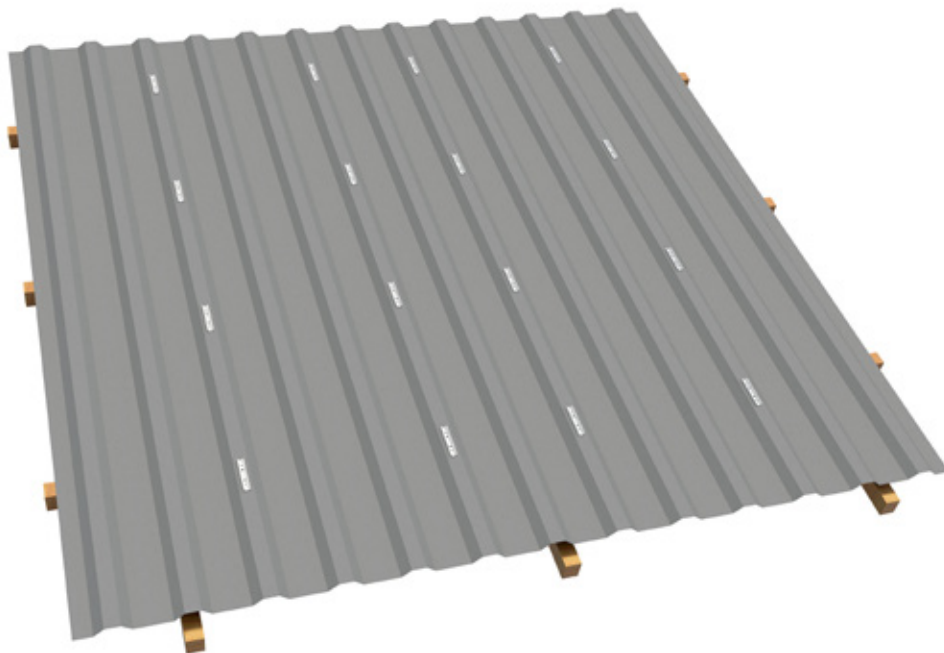
Modules may not be built over expansion joints.

There is no connection to earth.

This must be established without limiting the expansion joint's mode of operation.



Completion of the installation of the lower rail layer.



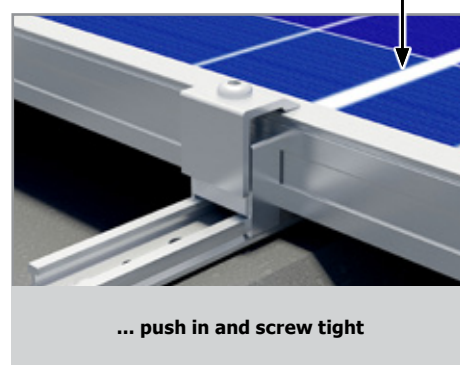
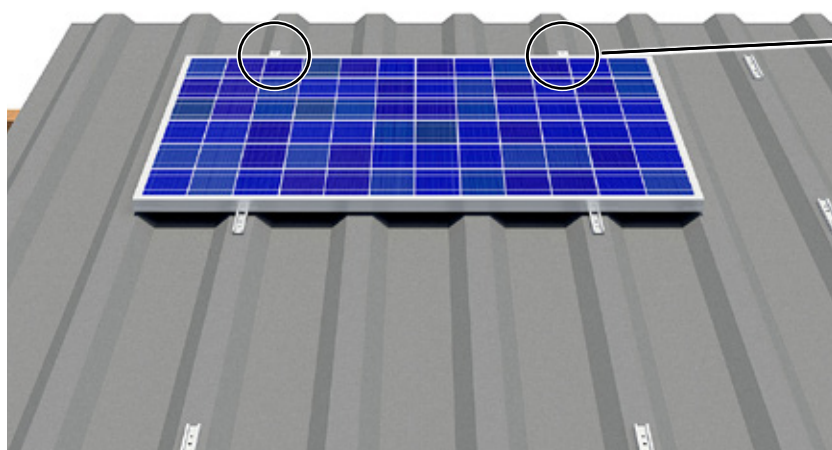
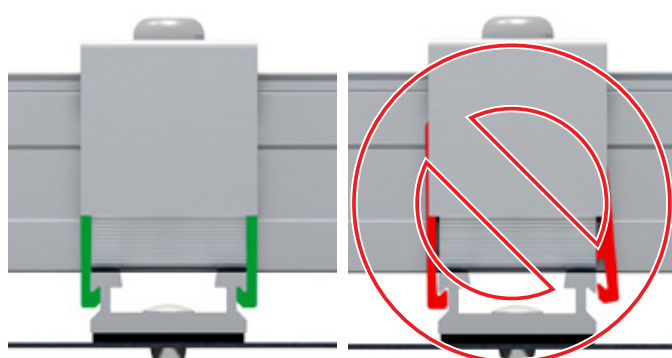
In the following, the column for column installation of the modules from top to bottom is described.

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.



**Installation – 2 (module installation, end clamp)**

Place the module on the ST-AK 1/12. Install the end clamps. To do this, click the end clamp on to the ST-AK 1/12 and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the ST-AK 1/12. 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. The end clamps must be mounted exactly in the centre of ST-AK 1/12 so that the load is spread equally between the rivets/sheet metal screws.

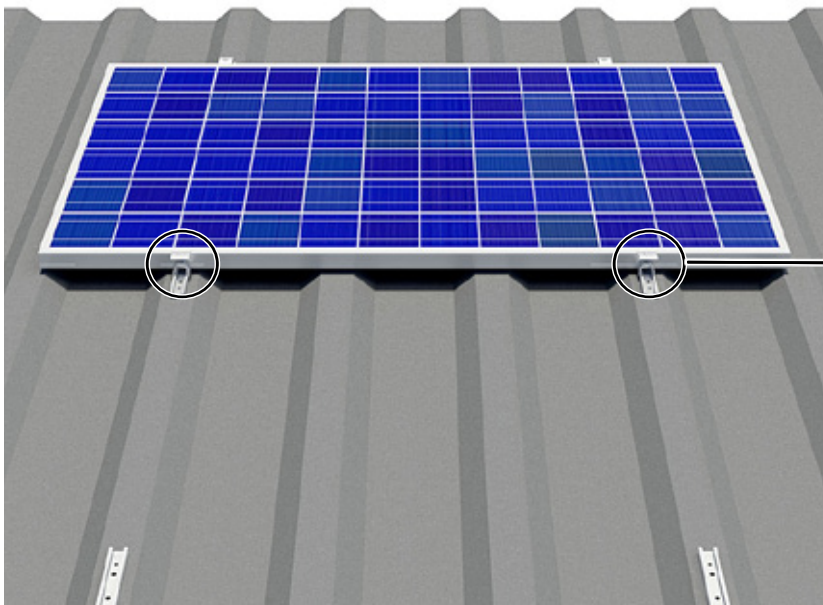
**Mount end clamp****Both sides clicked****INCORRECT****Defined clamping area****INCORRECT****Check the end clamp has been clicked in**

**Check the clamping area defined by the module manufacturer and observe the module manufacturer's specifications**

## Single layer installation with framed PV modules, horizontally mounted

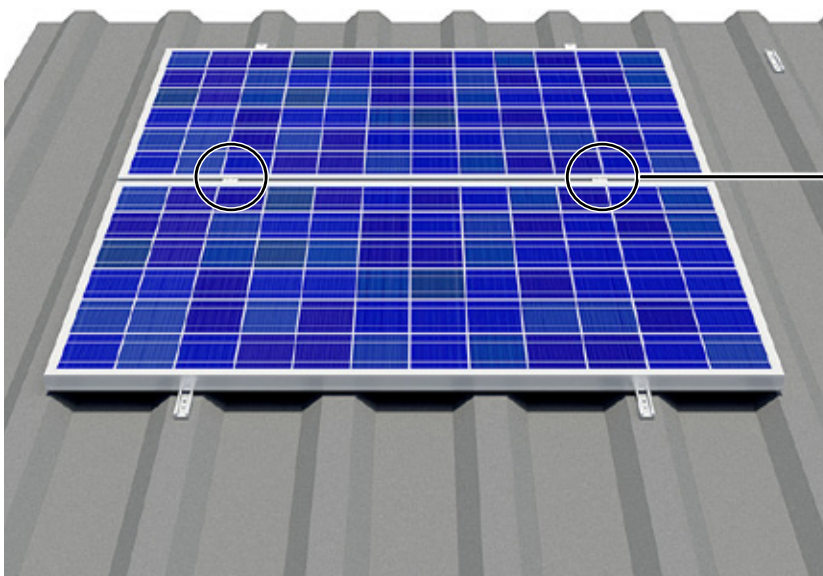
**Installation – 3 (module installation, mid clamp)**

Now mount the mid clamps. To do this, click the mid clamp on to the ST-AK 1/12 and push it on to the module. It must be ensured that the mid clamp is clicked into both sides of the ST-AK 1/12. The end clamps must be mounted exactly in the centre of ST-AK 1/12 so that the load is spread equally between the rivets/sheet metal screws.



Click mid clamp and push in

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).



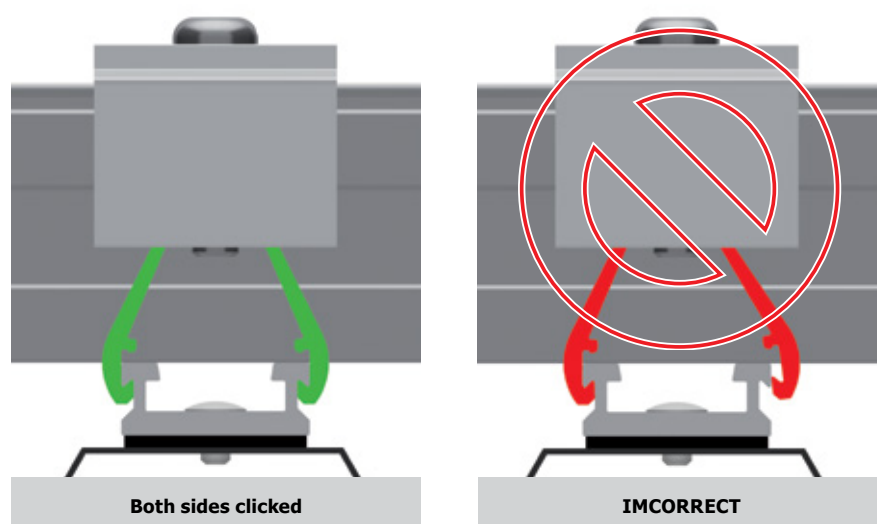
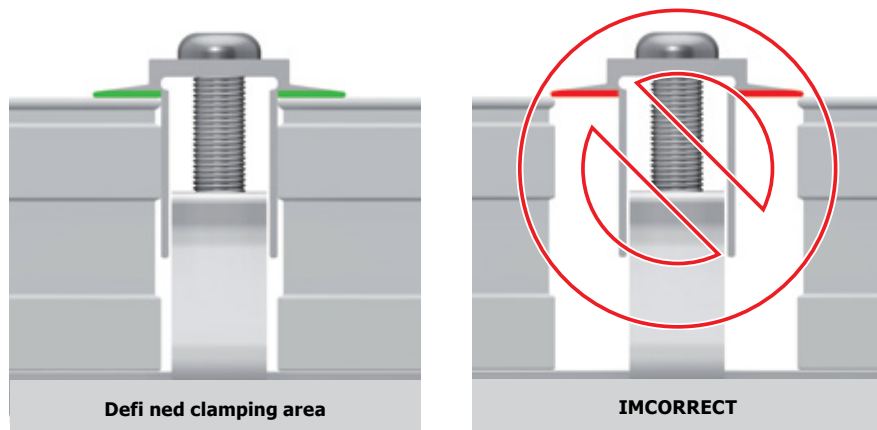
Push module under and  
screw mid clamp tight



Mount mid clamp

## Single layer installation with framed PV modules, horizontally mounted

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

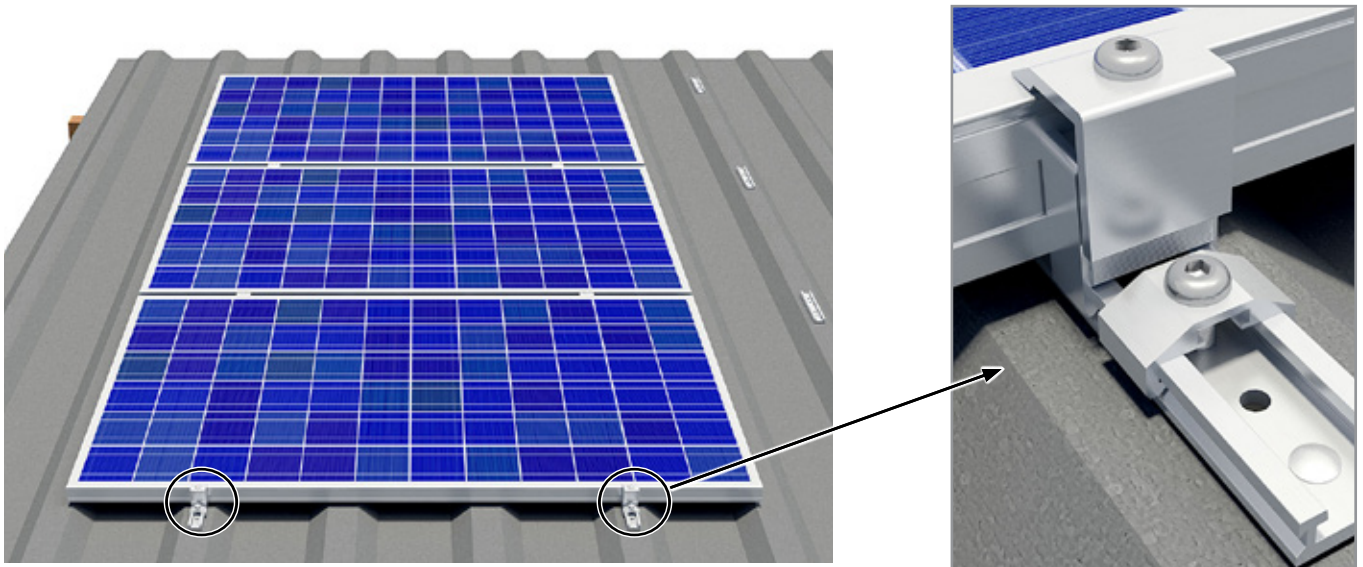


Check the defined clamping area and observe the module manufacturer's specifications

**Installation – 4 (module installation, end clamp on row end)**

On the last module in the row (if applicable, on expansion joints), end clamps and slider locks are again to be mounted. To do this, click the end clamp on to the ST-AK 1/12 and push it on to the module. It must be ensured that the end clamp is clicked into both sides of the ST-AK 1/12. 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 – 2).

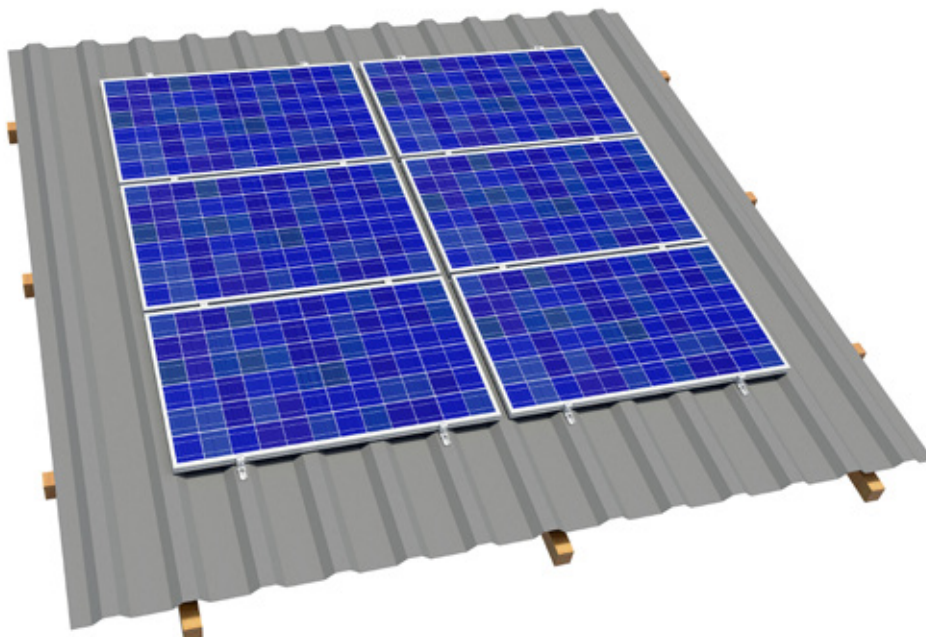
Push the slider lock from below on to the ST-AK 1/12 up to the end clamp and fasten it (torque 8-10 Nm).



**Mount end clamp and slider lock on the last module.**

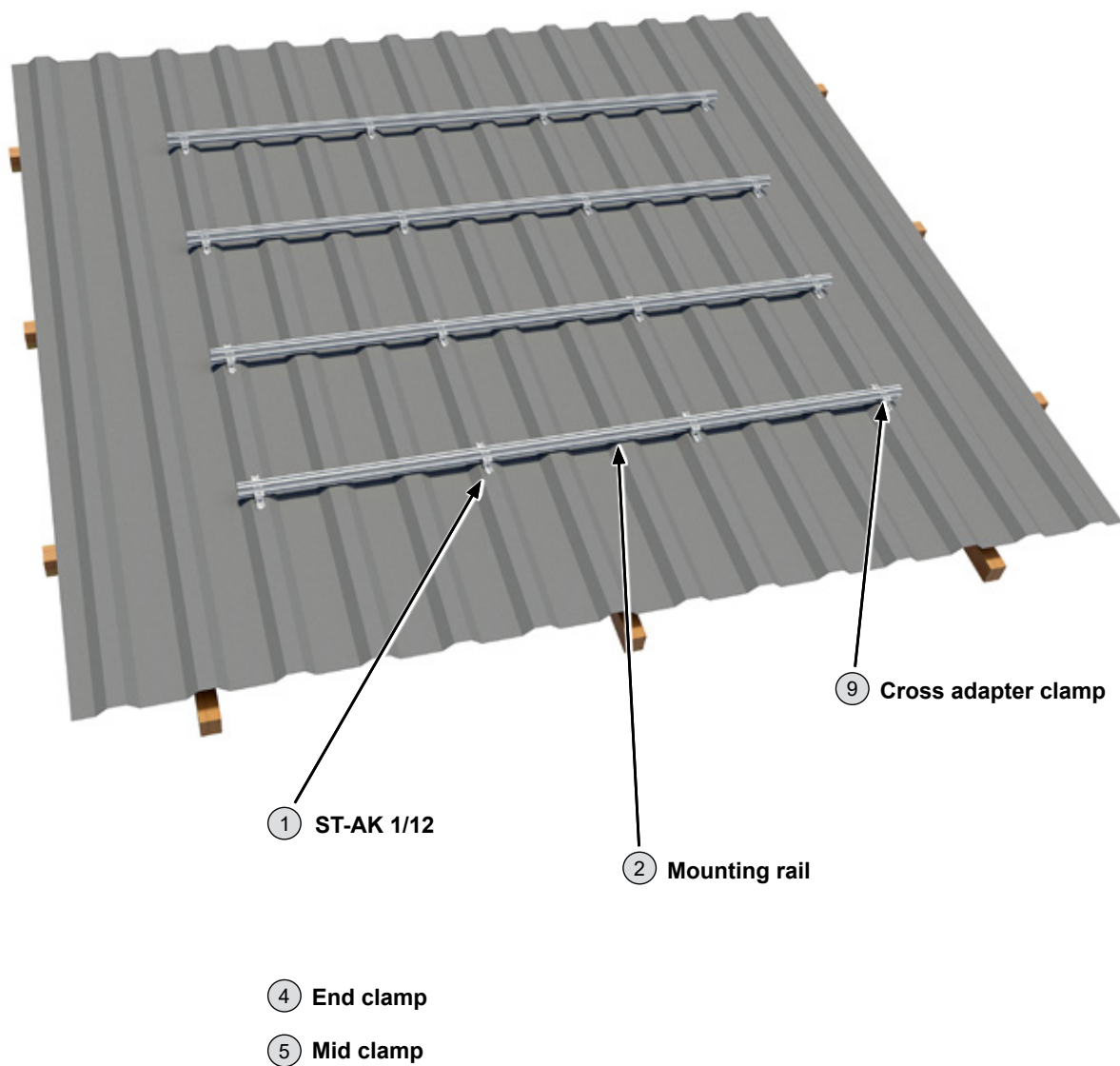


Proceed as described for the following rows.  
Ensure that all end clamps are fixed in a horizontal line.





## 2.4 Installation – double layer substructure

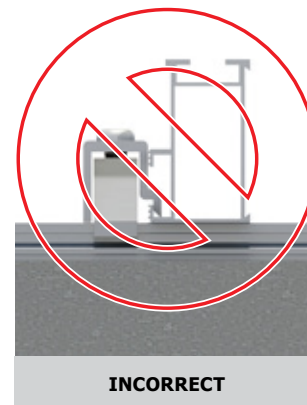
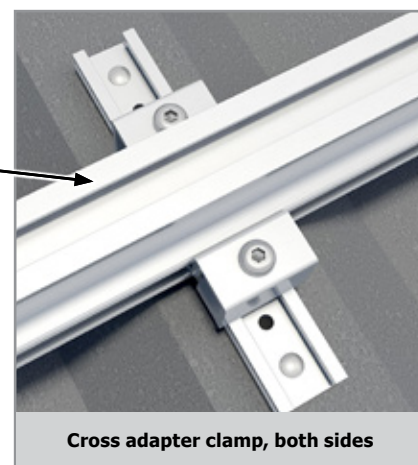
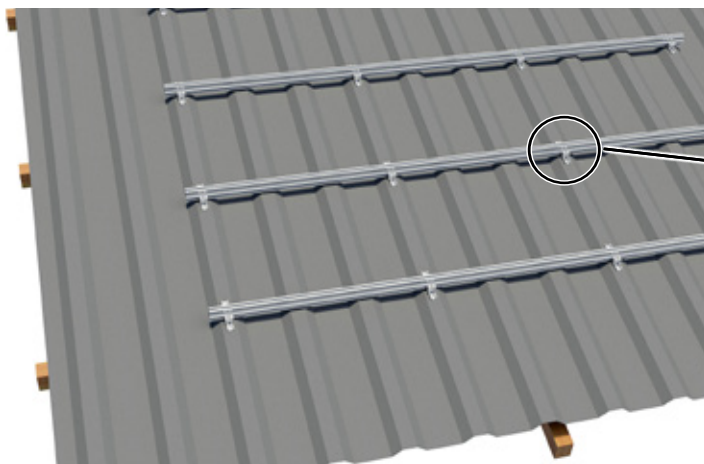


**Installation – 1 (positioning of the ST-AK 1/12 as lower layer of rails)**

The installation of the ST-AK 1/12 for double layer substructures is carried out as is described in Section 2.3 (Installation – 1) for single layer systems.

**Installation – 2 (installation of upper layer of rails)**

Mount the horizontal mounting rails on to the vertical ST-AK 1/12 for each row of modules using the cross adapter clamps. To do this, click the cross adapter clamp on to the ST-AK 1/12 and fix the horizontal mounting rail with it. Check the distance of the horizontal 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). The horizontal mounting rails must be mounted exactly in the centre of ST-AK 1/12 so that the load is spread equally between the rivets/sheet metal screws.

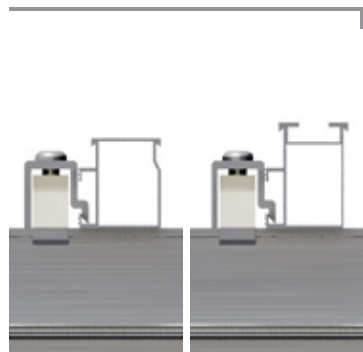


**Double layer installation with framed PV modules, vertically mounted**

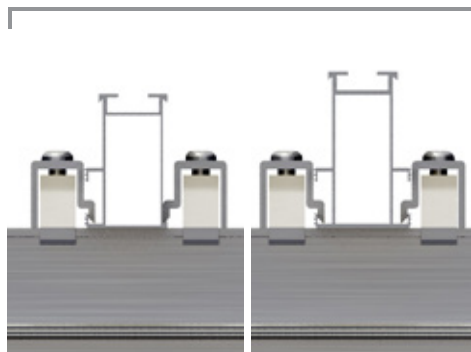
Depending on the structural requirements of the location and the installation situation, several cross adapter clamps may be required per crossing point. If a second cross adapter clamp is required, it is fixed to the opposite side, as described above (torque 8-10 Nm).

**Crossing points:**

1 CAC in side HHB channel

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

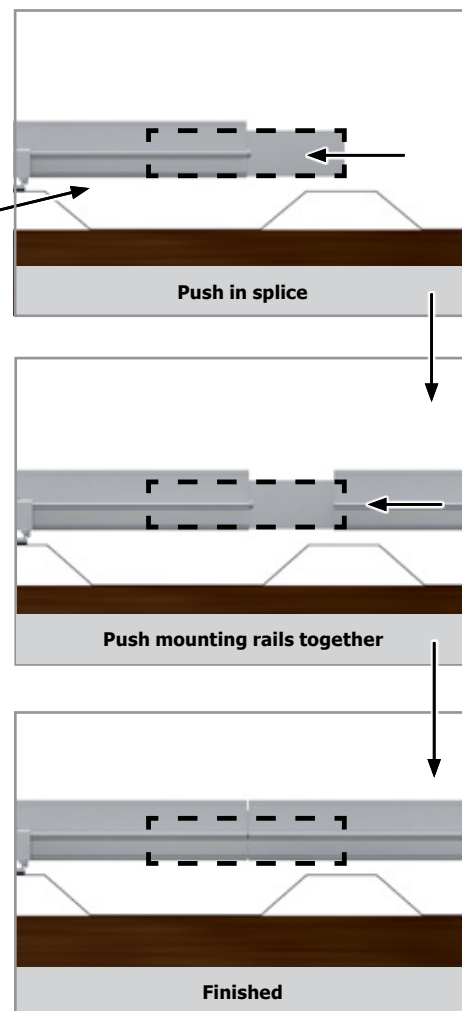
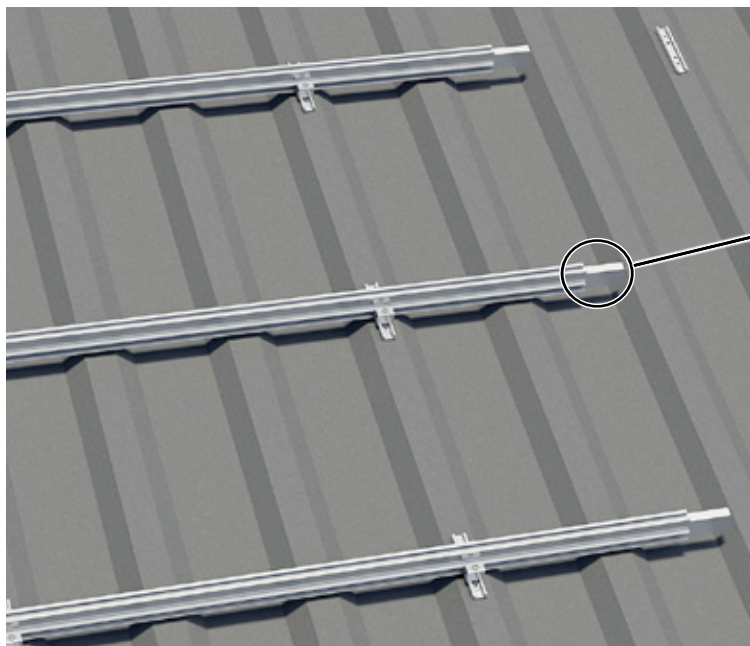
1 CAC in side HHB channel and 1 CAC opposite

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

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

**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 on to the ST-AK 1/12 using the cross adapter clamp, as described in Installation – 2.



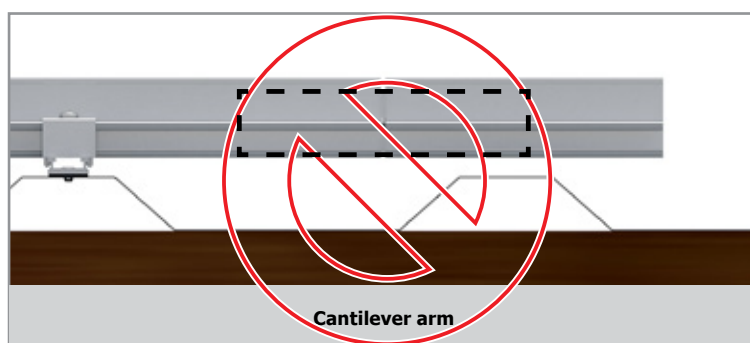
**Push in splice**



**Check connection to earth**



**No cantilever arms with splices.  
Position the splices so that they lie between  
two ST-AK 1/12.**



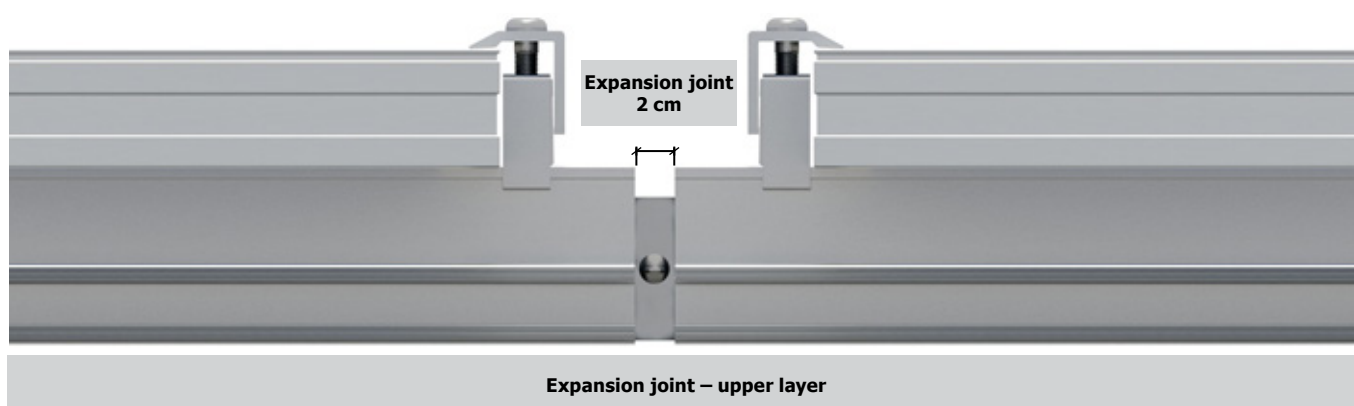
## Double layer installation with framed PV modules, vertically mounted



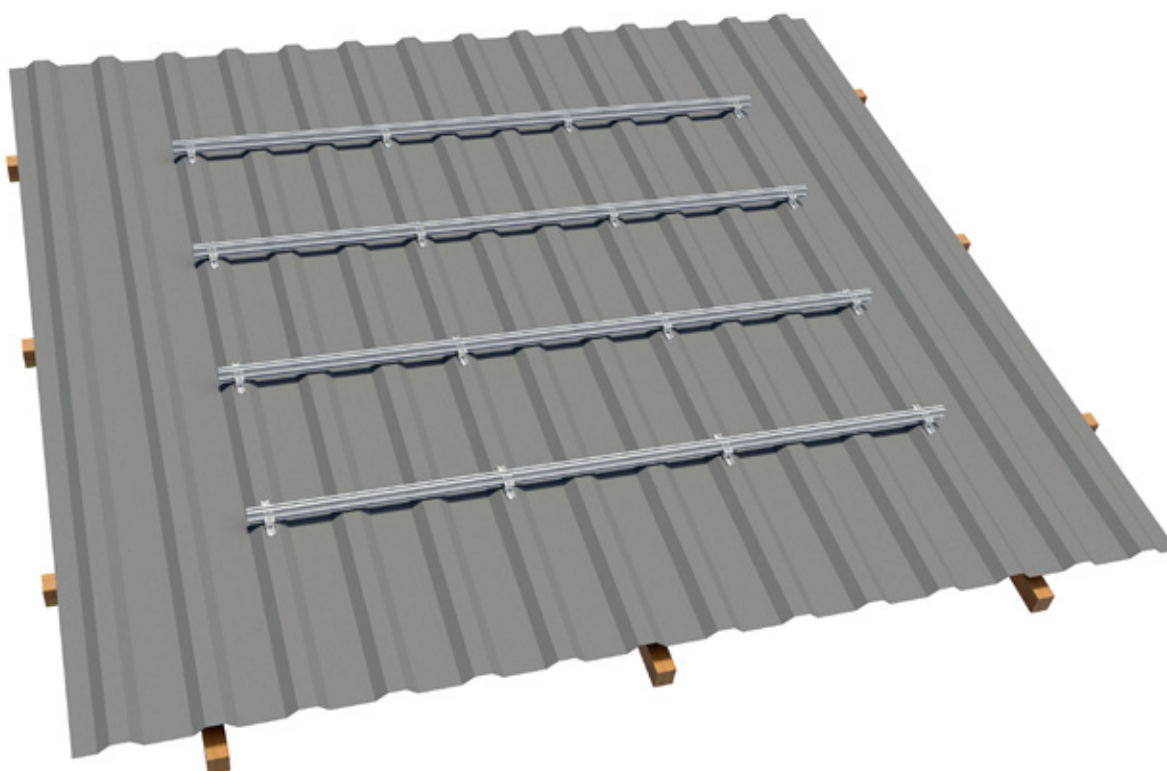
If the mounting rail is longer than 6.00 m, the module array is to be separated by placing two end clamps. In the zone between the end clamps, the mounting rail is to be separated and connected using a splice to allow the rail to move by 2 cm (expansion joint). The alignment of the expansion joints is to be adjusted according to the structural conditions of the roof and the different expansion properties of the materials. Observe the instructions in Installation – 5 in 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.



Completion of the installation of the upper rail layer.



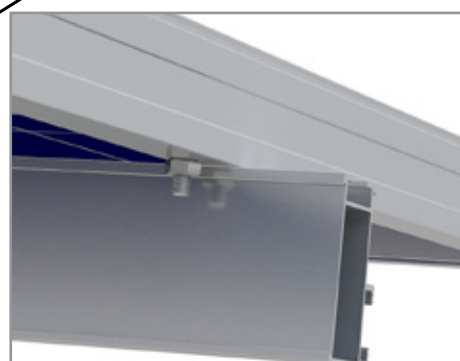
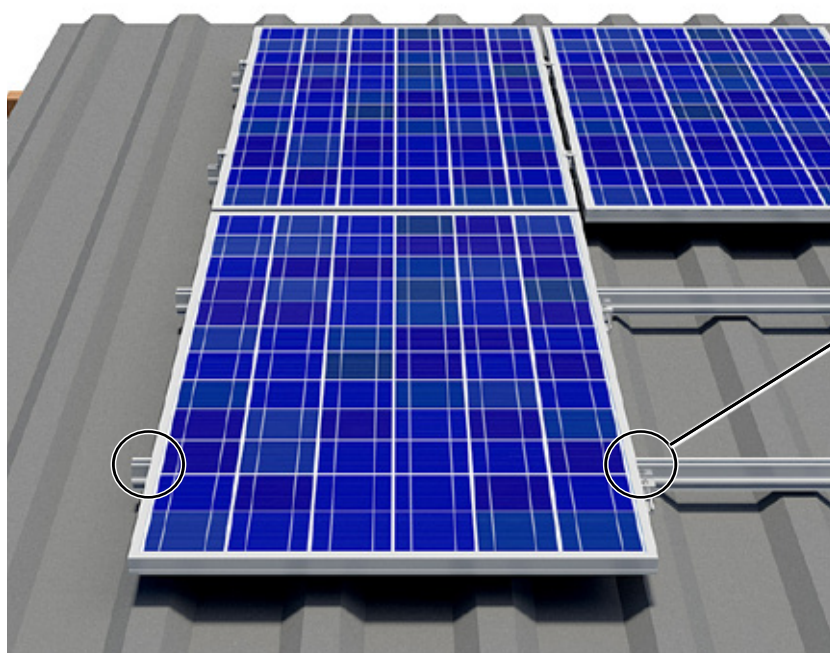


## Installation – 4 (module installation, slipping protection)



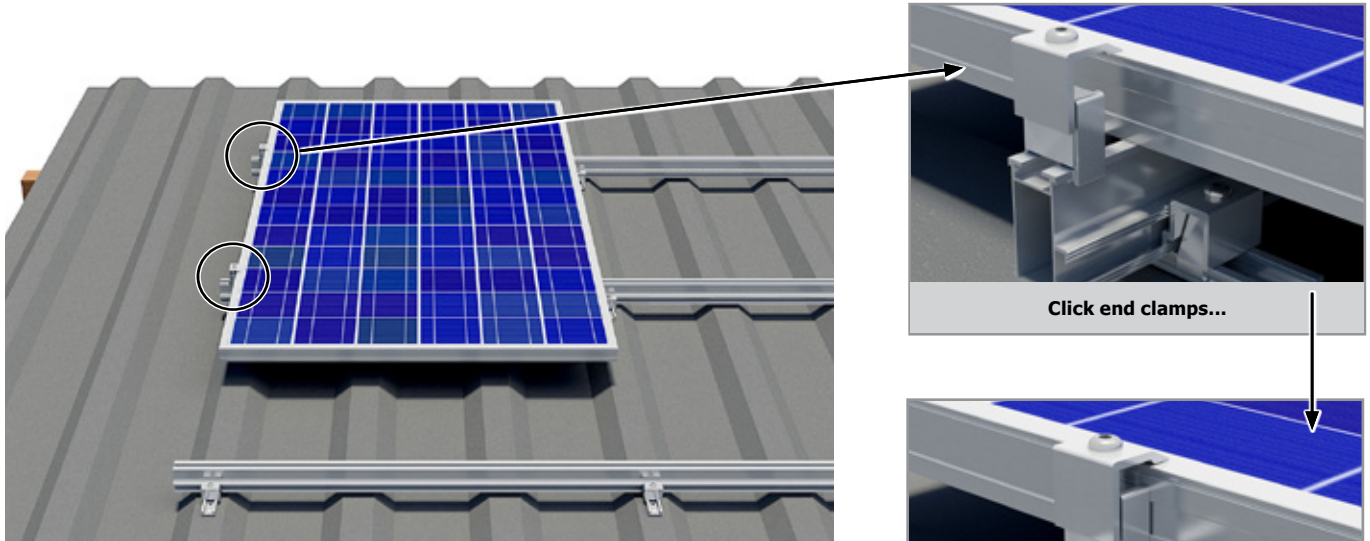
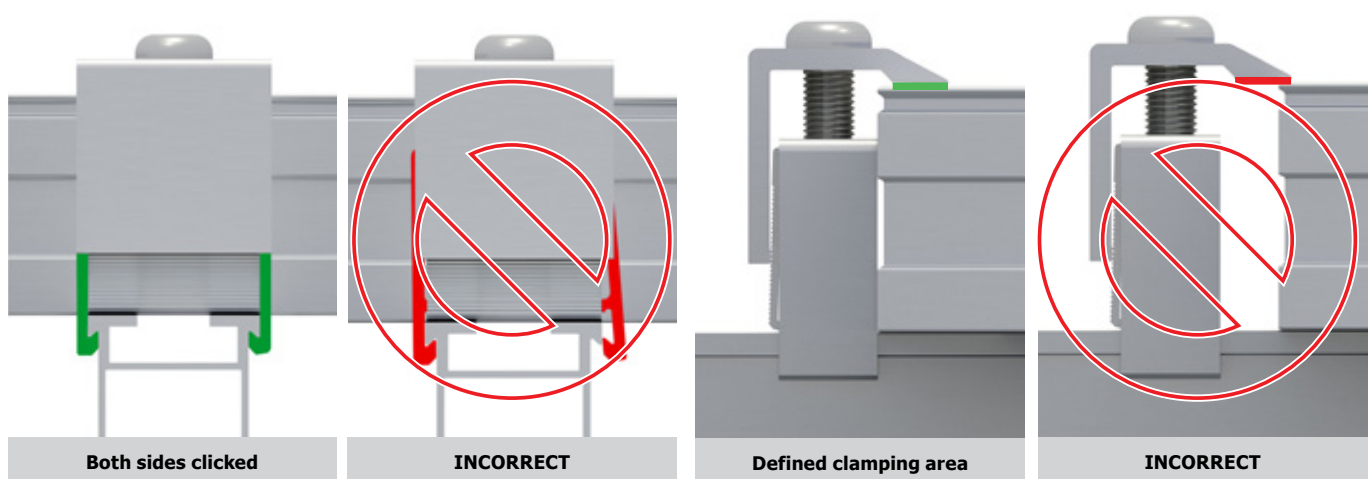
Before the installation of the modules in the lowest row of modules, the modules are generally to be furnished with the slipping protection. The same applies for modules under which no further module directly adjoins (modules above obstructions, e.g. windows, chimneys etc.).

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.

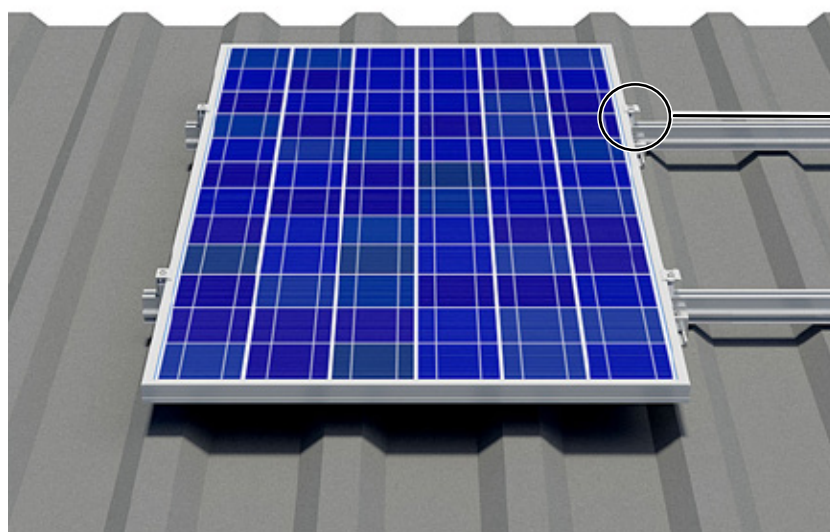


**Installation – 5 (module installation, end clamp)**

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.

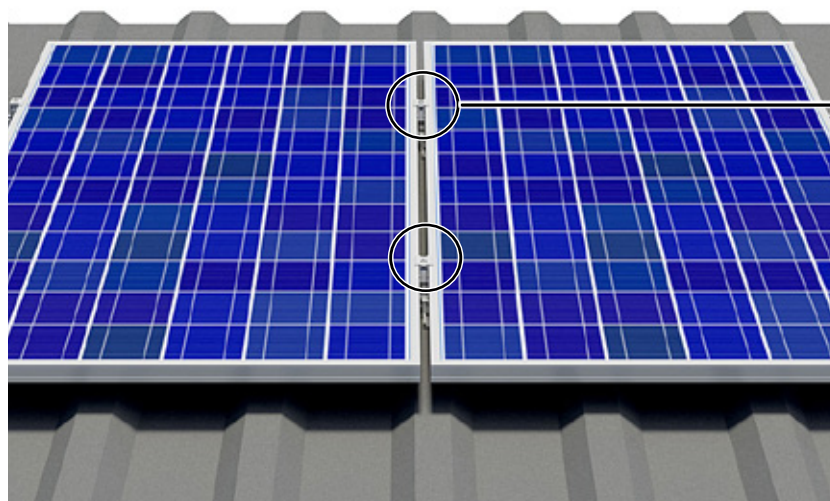
**Mount end clamp****Check the end clamp has been clicked in**

**Check the clamping area defined by the module manufacturer and observe the module manufacturer's specifications**

**Installation – 6 (module installation, mid clamp)**

Click mid clamp and push in

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).

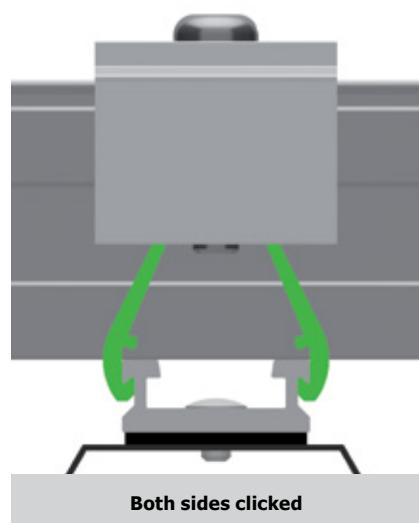
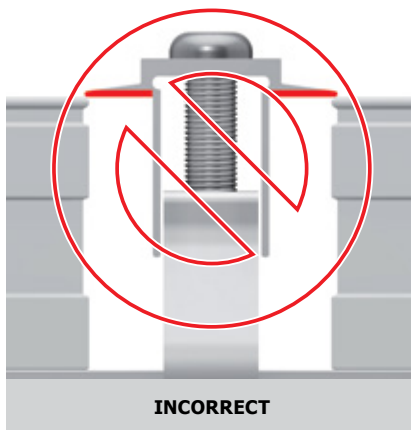
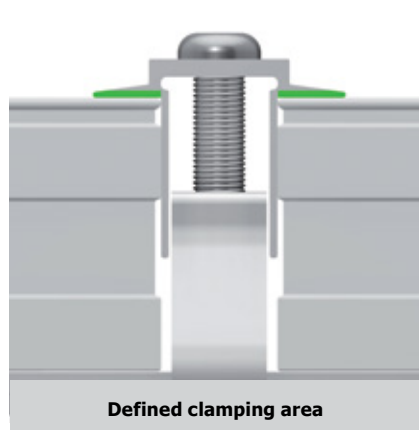
Push module under and  
screw mid clamp tight**Mount mid clamp**



## Double layer installation with framed PV modules, vertically mounted

**Installation – 6 (module installation, mid clamp)**

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

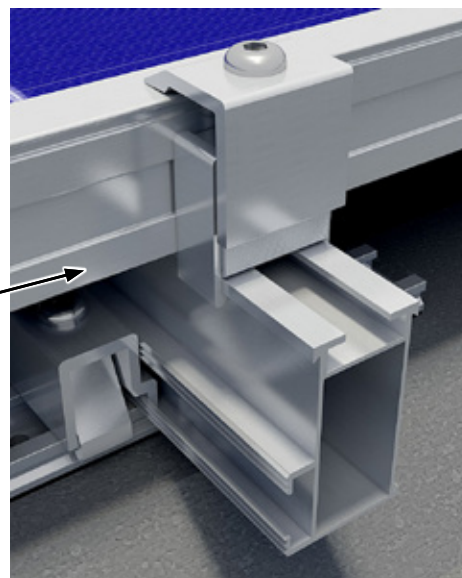
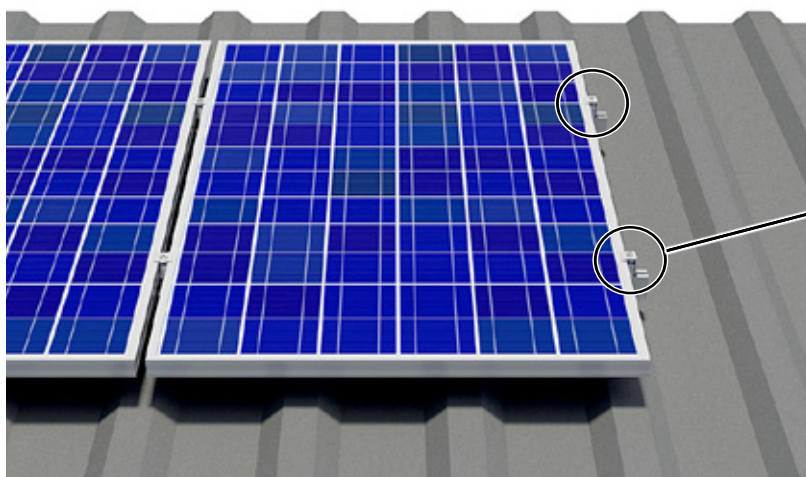


Check the clamping area defined by the module manufacturer and observe the module manufacturer's specifications

**Installation – 7 (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 at the clamping area defined by the module manufacturer (see Installation – 5).



**Mount end clamp on the last module**



Proceed as described for the following rows.

