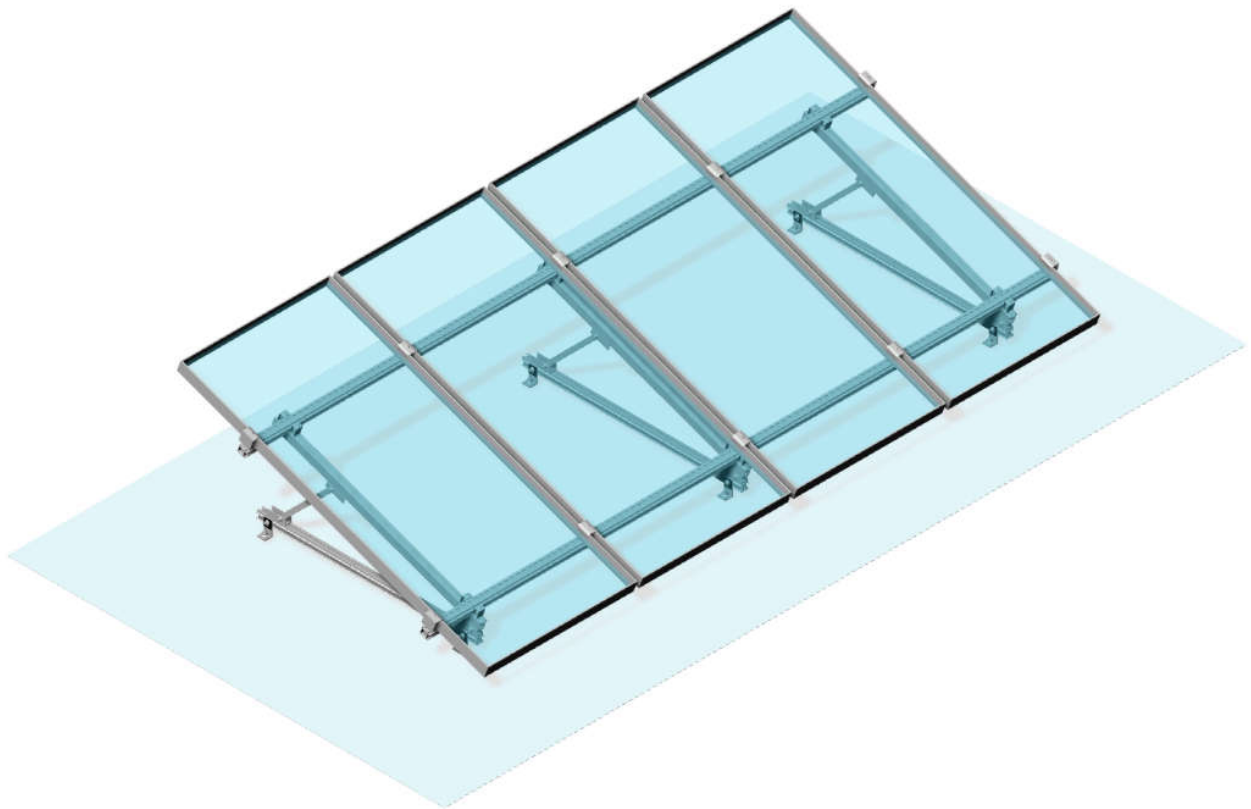


VESTFROST

SOLUTIONS

Solar Direct Drive Energy System
Roof mounting 4x180W/185W Panels



User and installation manual

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1. GENERAL INFORMATION

1.1. INTRODUCTION

- This document provides recommendations for the installation of the Vestfrost Solutions Solar Chill Energy System, and identifies some of the hazards associated with the handling and installation.
- Please read this document in its entirety before installing, wiring, or using your solar power system.

Disclaimer of Liability

- Vestfrost Solutions products are designed and manufactured in accordance with relevant international standards. However, as the conditions or methods of installation, operation, use and maintenance are beyond Vestfrost Solutions' control, Vestfrost Solutions does not assume responsibility and expressly disclaims liability for loss, damage or expense arising out of, or in any way connected with, such installation, operation, use or maintenance.
- A warranty claim will be invalidated if there is evidence that the product:
 - has either been tampered with, damaged, or something has been adhered/attached to the backsheet
 - has not been installed in accordance with these instructions

1.2. SAFETY AND RELIABILITY

General Safety Information

- These products are intended to operate under normal sunlight conditions, DO NOT attempt to increase module output by concentrating light on its surface.
- Prior to installation, seek guidance from a certified engineer to verify that the mounting arrangement is proper for the conditions of the location. Furthermore, if the solar power system is to be installed on a roof, ensure that a full structural evaluation covering the effects of module and mounting system on the roof is carried out by a competent person.
- The system has to be in compliance with all applicable building and electrical codes or regulations.
- The Vestfrost Solutions solar power system might have the ability to form high temperature arcs if the module, cabling or electrical devices are damaged.
- To minimize fire hazards:
 - For rooftop installations, mount the solar power system over a fire resistant roof covering rated for the application.
 - For ground mounted installation the design should take into account the growth of vegetation in order to minimize consequent fire risks.
 - System should be designed to allow all means of electrical disconnection to be readily accessible to fire fighters and responders to safety incidents.
 - The solar power system has not been certified for building integration (directly into the roof or wall), marine or vehicle applications. These applications may have additional requirements for which our products have not been certified.

Handling Safety

- Before performing any operation involving the solar power system or system electrical connections, perform a risk assessment paying particular attention to the environmental conditions and personal protection equipment required.
- Use appropriate protective safety equipment as recommended by local safety codes and practices (e.g. hard hat, scaffolding, steel toe capped shoes, gloves and restraining harness) and exercise caution, particularly when installing the solar power system at height.

- The solar system components are heavy and should always be handled by two people; furthermore, they contain glass, which can be easily broken if mistreated. DO NOT walk on, bend or drop the components. DO NOT place heavy loads or drop objects on the module and ALWAYS keep sharp objects away from the front and back surface.
- DO NOT install the solar power system if any component or glass is damaged because there is an electrical and fire risk. Modules can get very high temperatures when they are in operation and especially if they are partially shaded, be careful not to touch them without proper personal protection equipment.

Electrical Safety

- The modules can produce current and voltage when exposed to light of any intensity. Electrical current increases with higher light intensity. De-energize the photovoltaic modules by removing them entirely from light or by covering their front surface with an opaque material. Regard the safety regulations for live electrical equipment when working with modules that are exposed to any light. Use insulated tools and do not wear metallic jewelry while working with photovoltaic modules. Potentially lethal voltages can be present when more than two modules are connected in series.
- The installation and wiring of the solar power system should always be performed by an electrical installer who is qualified in accordance with ALL local standards and codes.
- When working with photovoltaic modules, the following precautions shall be taken;
 - Ensure that appropriate barriers (fences etc.) are installed to prevent interference or accidental contact with live circuit elements by unauthorized personnel or animals.
 - Disconnect the electrical circuit before disconnecting module cables.

DO NOT

 - Scratch or mishandle the product,
 - Damage, pull, bend or place heavy loads on the cables.
 - Connect cables when the terminals are wet.
 - Attempt any installation in adverse weather conditions (high winds, rain or when ice or snow are present).

Lightning protection

- The modules are equipped with a lightning protection set.
- All installation and maintenance work on the lightning protection should always be performed by an electrical installer who is qualified in accordance with ALL local standards and codes.

1.3. LOCATION

- Take into account the following statements before performing the mechanical installation of the solar power system.
- Ensure that there are no objects behind the module that can damage the back sheet when it deflects under normal operating conditions
- The amount of energy produced by the solar power system is dependent upon the incident sunlight and the temperature of the solar cells.
Best performance will be obtained by:
 - Ensuring adequate space behind the modules, allowing proper ventilation.
 - Installing the modules at an angle of at least 10° from the horizontal to aid self-cleaning and reduce dirt collection.
 - **Ensuring that the modules are not shaded at any time of the day.**

- The solar power system may be operated in ambient temperature between -40°C and 85°C, check if heat sources around that can create higher temperatures.

1.4. OPERATION AND MAINTENANCE

- In order to maximize system performance and ensure long lifetime and minimize risks, periodic maintenance must be carried out by qualified personnel.
- This maintenance must include but it is not limited to:
 - If the installation is in open field, clear periodically the vegetation or any other flammable material in the area.
 - It is also recommended to periodically confirm the system isolation,
 - verification of the integrity of electrical and mechanical connections,
 - cleaning of the panels (if required).
 - In extremely dry conditions increase visual inspection frequency.
 - Ensure that appropriate barriers (fences etc.) are adequately installed to prevent interference or accidental contact with live circuit elements by unauthorized personnel or animals.
 - Disconnect the electrical circuit before disconnecting module cables.

Module Cleaning

- The energy output of the solar power system can be impaired if the glass is dirty. Cleaning the modules periodically will ensure maximum output, however, if modules are installed at height (e.g. on a roof) then this should only be performed by competent personnel
- When cleaning the modules take the following precautions:
 - Clean the module surface with a soft cloth or sponge using clean and neutral water base cleaners (non-ammonia nor basic pH>7.5 solutions).
 - Only clean modules when there is low solar radiation and cells are producing low energy.
 - DO NOT use high-pressurized water, steam cleaners or any kind of aggressive tool or material that could scratch the surface coating on the glass.

1.5. END OF LIFE AND DISPOSAL

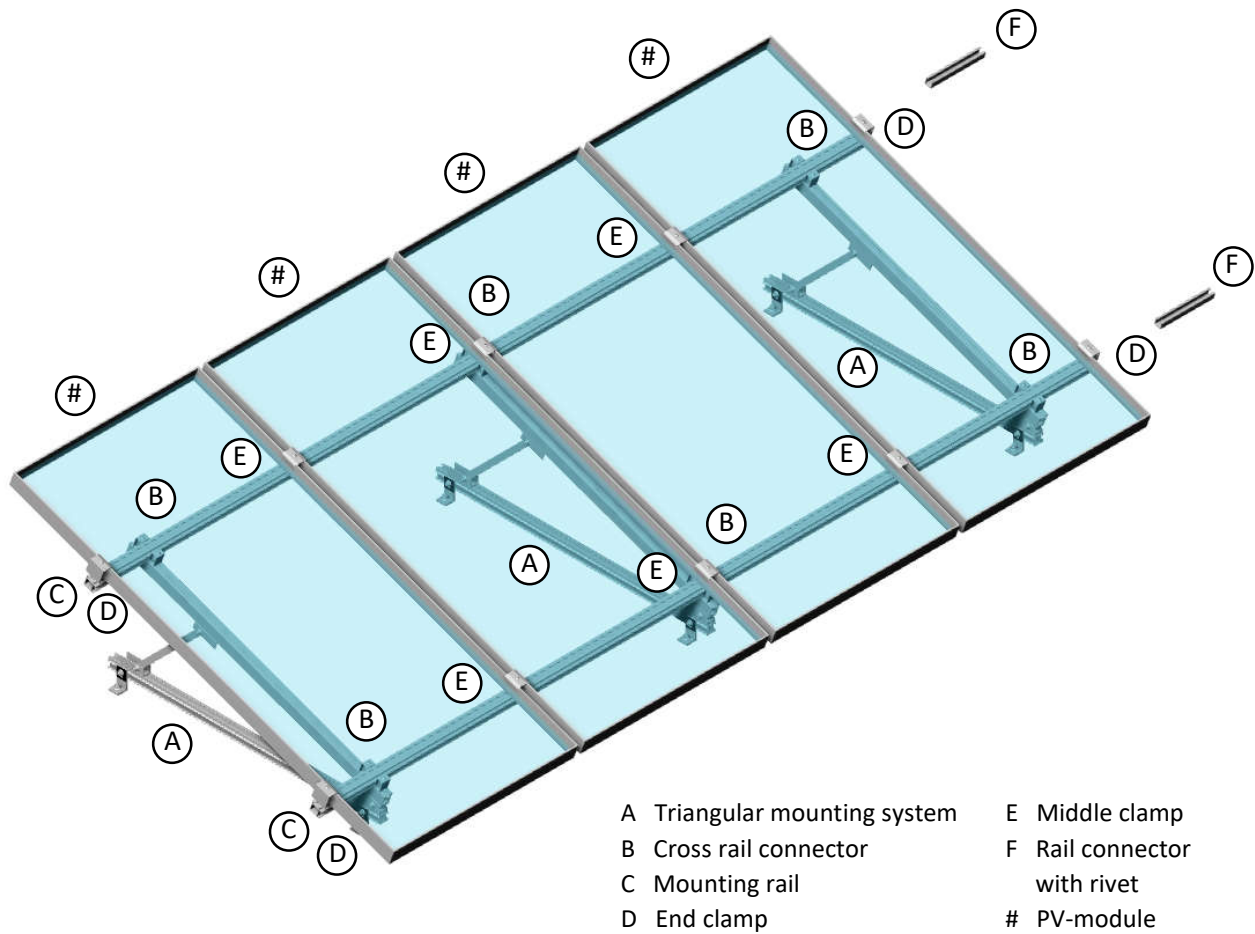
- This product must be disposed of in accordance with all applicable local, state, and national laws and regulations. It is the responsibility of the user to ensure that this product is disposed of properly.
- Please contact Vestfrost Solutions if you have any questions concerning the proper disposal of this product.

1.6. REQUIRED TOOLS FOR INSTALLATION

- The following tools are needed for the installation of the solar power system.
 - 1 Drilling machine
 - 1 metal drill 8mm
 - 1 metal drill 13mm
 - 1 rock drill 8mm
 - 1 rock drill 12mm
 - 1 wood drill 8mm
 - 1 tape measure
 - 1 hammer
 - 1 pozidriv screwdriver
 - 1 cutter

2. SOLAR CHILL ENERGY SYSTEM

2.1. SCOPE OF DELIVERY



NR	Designation	Quantity
A	Triangular mounting system	3
B	Cross rail connector	12
C	Mounting rail	6
D	End Clamp	4
E	Middle Clamp	6
F	Rail connector with rivet	4
#	PV-module	4

2.2. INSTALLATION

2.2.1 Mounting preparation

1) Solar Panel Orientation

Solar Panel Orientation refers to our *azimuth* setting. Most of the energy coming from the sun arrives in straight line. A solar panel or solar array will capture more energy if it is facing directly at the sun, perpendicular to the straight line between the position of the panels installation and the sun.

The solar panel needs to be turned towards the terrestrial equator (either facing south in the northern hemisphere, or north in the southern hemisphere) so that during the day its orientation allows the panel to catch the greatest possible amount of solar radiation possible.

Use the provided compass, to point the PV panels due south or north.

Note

If you are in possession of a smart phone, you alternatively could download the APP “PV Optimizer & Solar compass”, that can be used to determine the optimum orientation and inclination of PV panels at any specific location.

PV Optimizer & Solar compass is a tool intended to maximize the output of your solar panels.

To use the optimizer you only need to choose the option Align – 1 Year, place your device above your panels, and adjust its azimuth and tilt according with the values given by the app.

2) Solar Panel Inclination

Use the Inclination chart for step 3



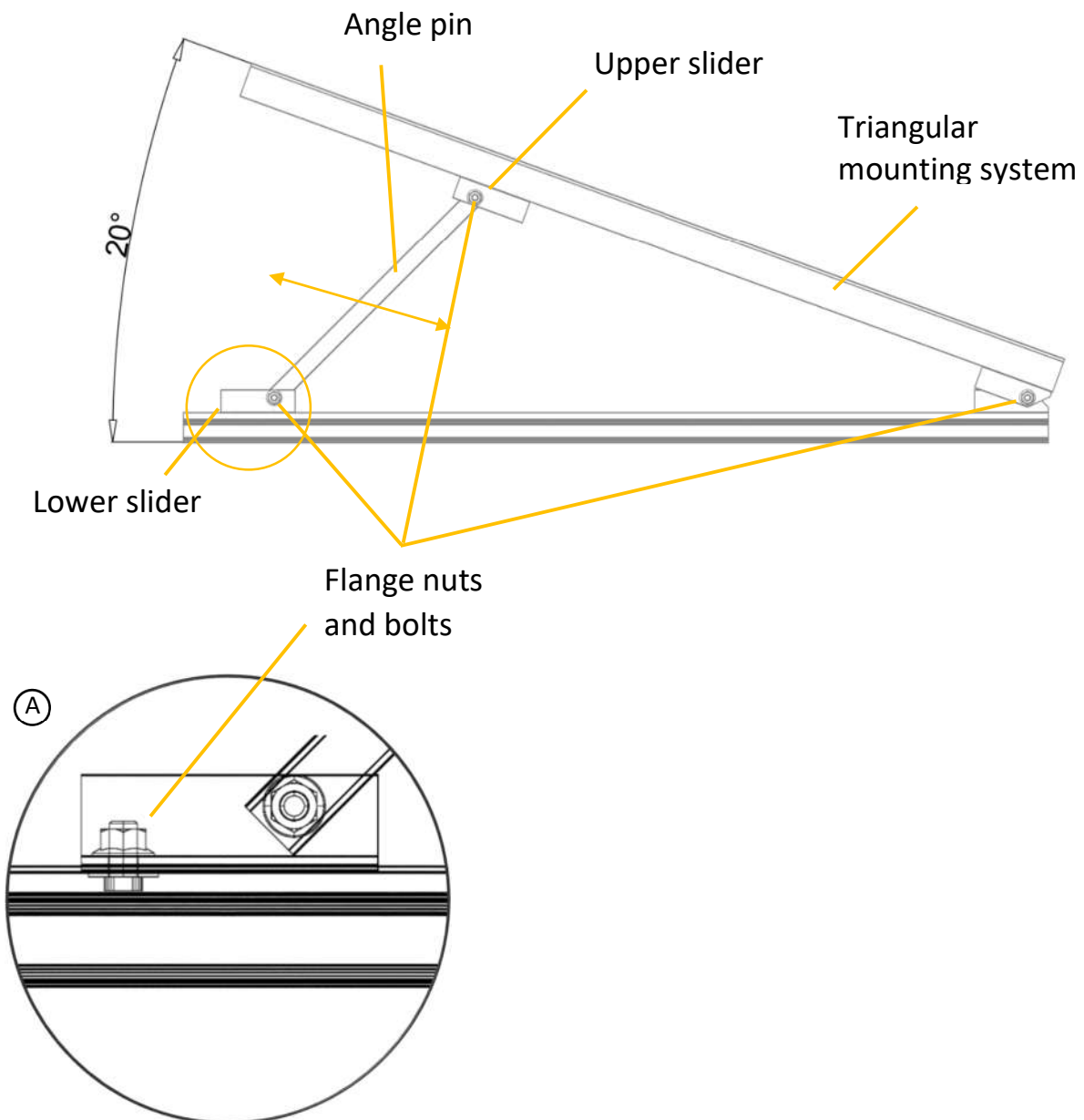
3) Set the angle of inclination

The triangle must be set to the desired angle of inclination. The angle is continuously adjustable between 10° and 45°.

To change the angle of inclination, loosen the flange nuts, on the inside (Fig. A) and outside of both sliders and set the desired angle by moving the angle pin backwards and forwards and/or up and down. Once the desired angle is reached, tighten all flange nuts and bolts.

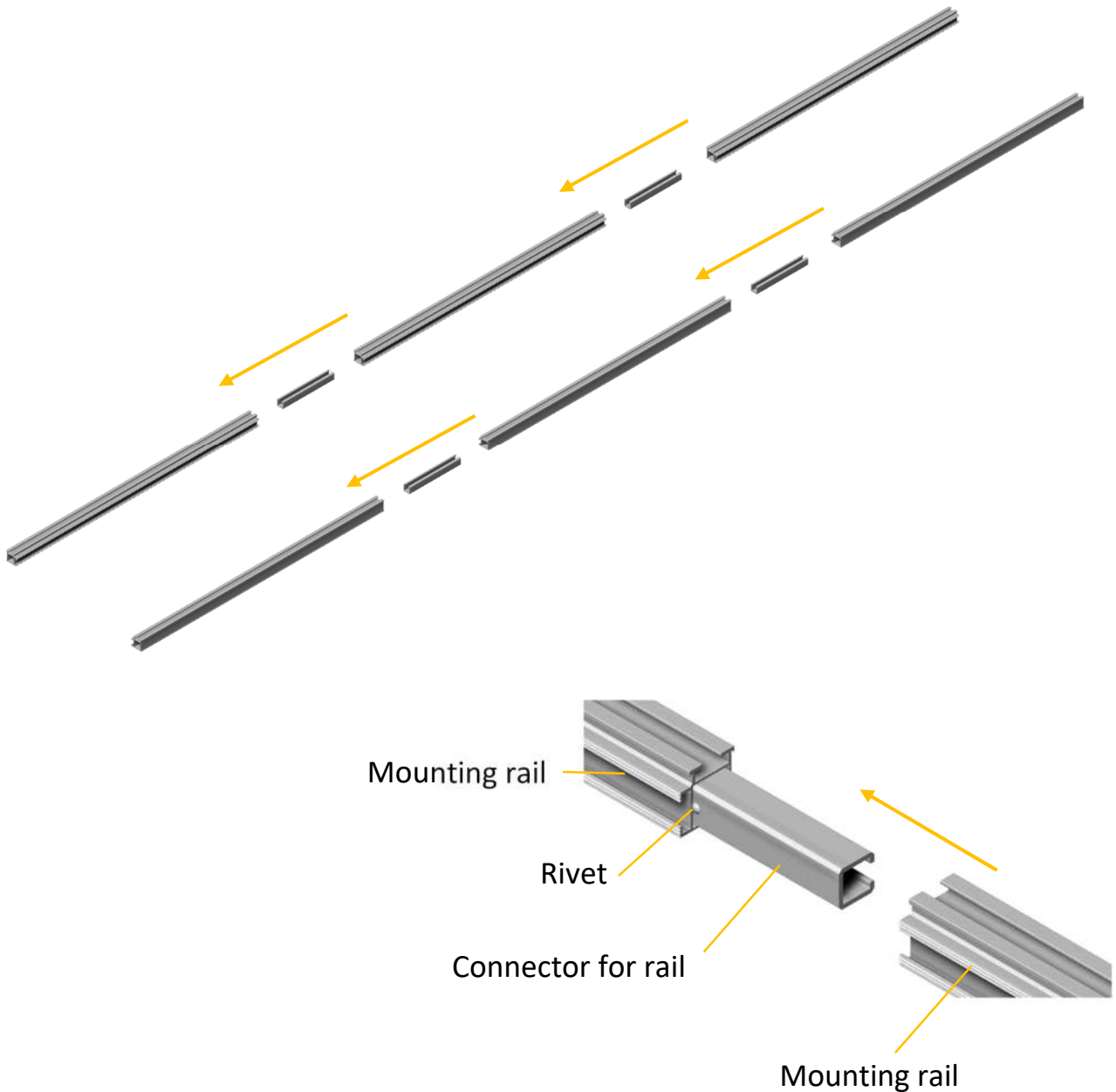
Note

The lower slider should always be nearest to the back of the triangle as shown below.



4) Join the mounting rails

The mounting rails are delivered in 2 sets of 3 parts. To join them push the connector with rivet into the mounting rail until clamping is achieved with the rivet. Push the next rail onto the connector until it is also clamped by the rivet. In order to compensate for the linear expansion, leave a gap of 2 mm between the mounting rails.



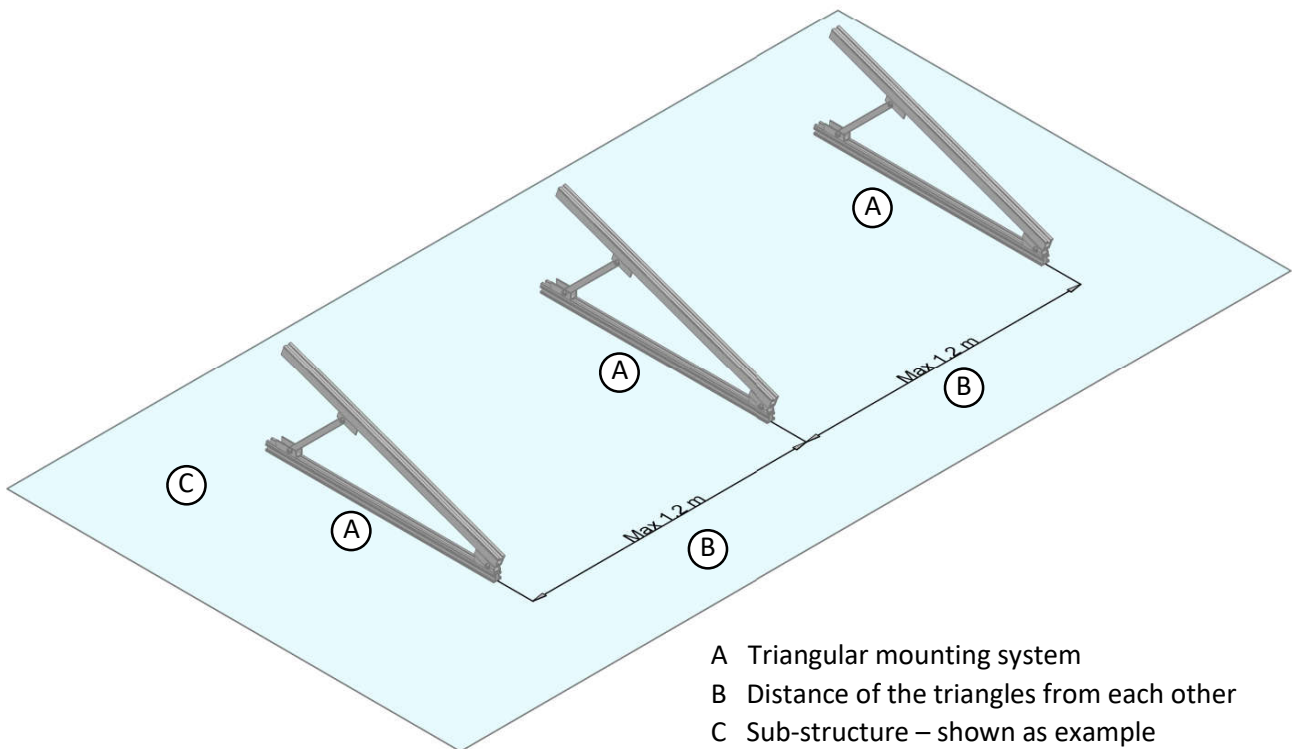
2.2.2 Mount on roof

1) Position triangles

Carefully and precisely align the triangles on the sub-structure using a plumb line. The distances of the triangular mounting system can be seen from the included documentation or from the specifications by the contracted structural engineer.

The three triangles must be aligned with the same spacing from number one to two and from number two to three.

For mounting without triangular mounting system see section 4.



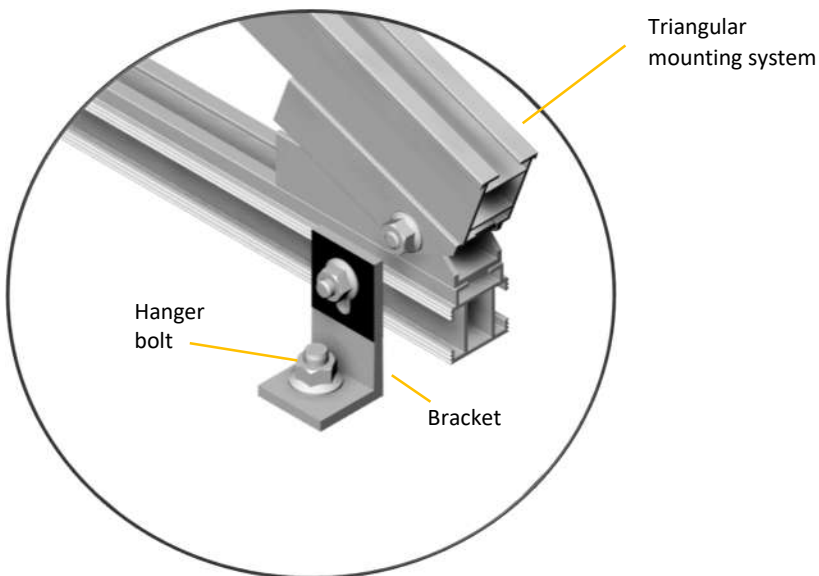
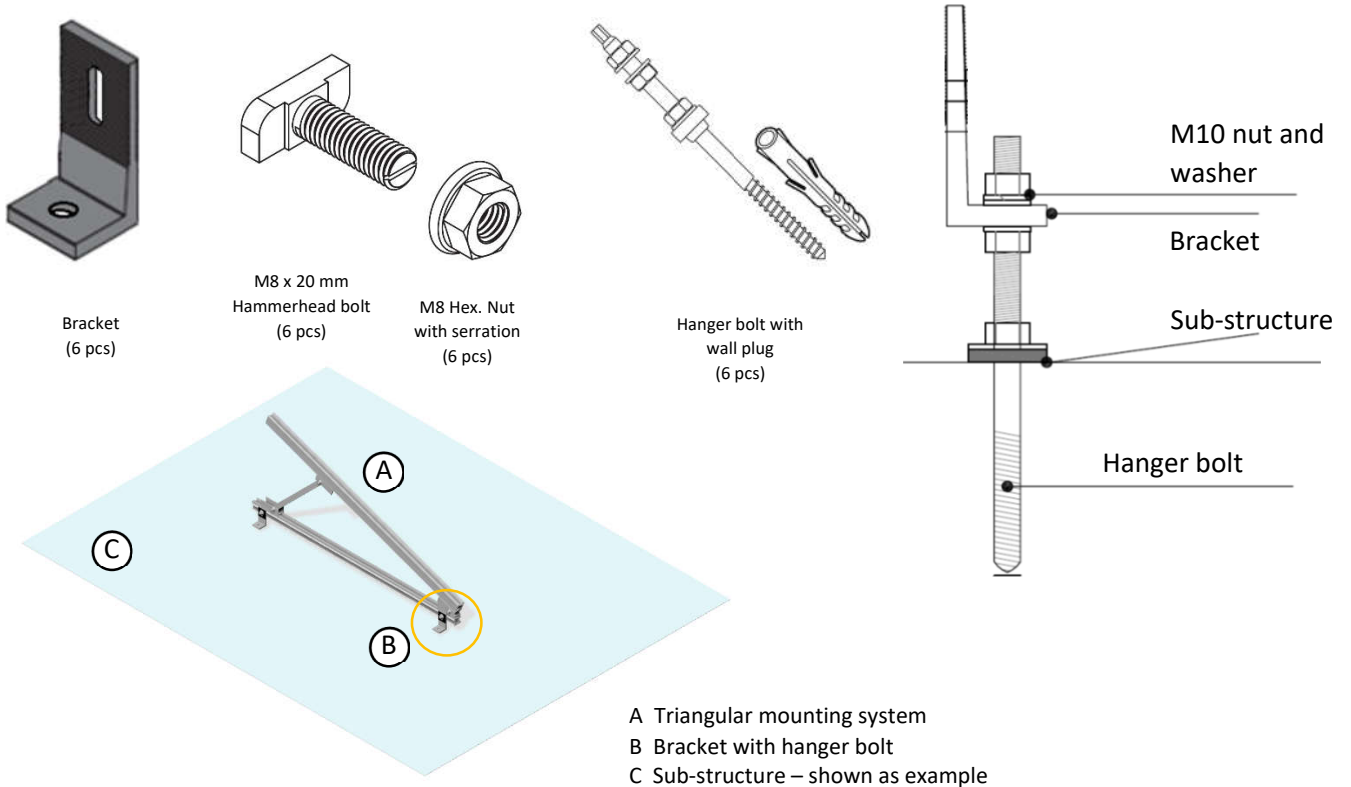
2) Mount with bracket and hanger bolt

Now mount the first row of the triangular mounting system according to the selected sub-structure. Statically check all fastening methods in advance and on-site.

Note

The load suspension through the sub-structure and the load capacity of the roof must be ensured. Before mounting, pre-drilling according to substructure is required.

- The mounting set consists of the following

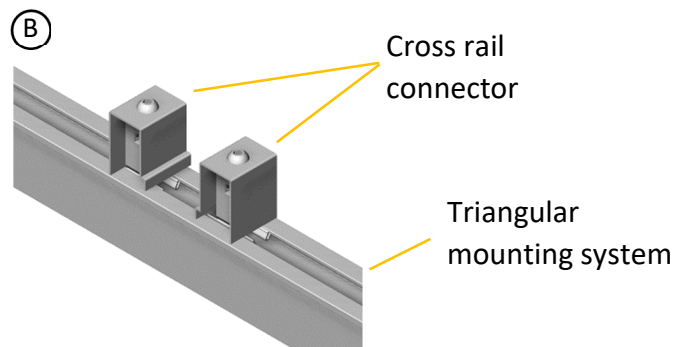
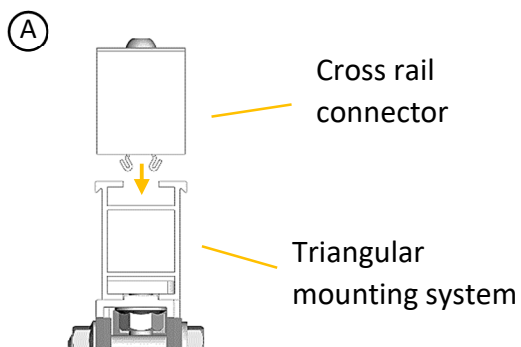
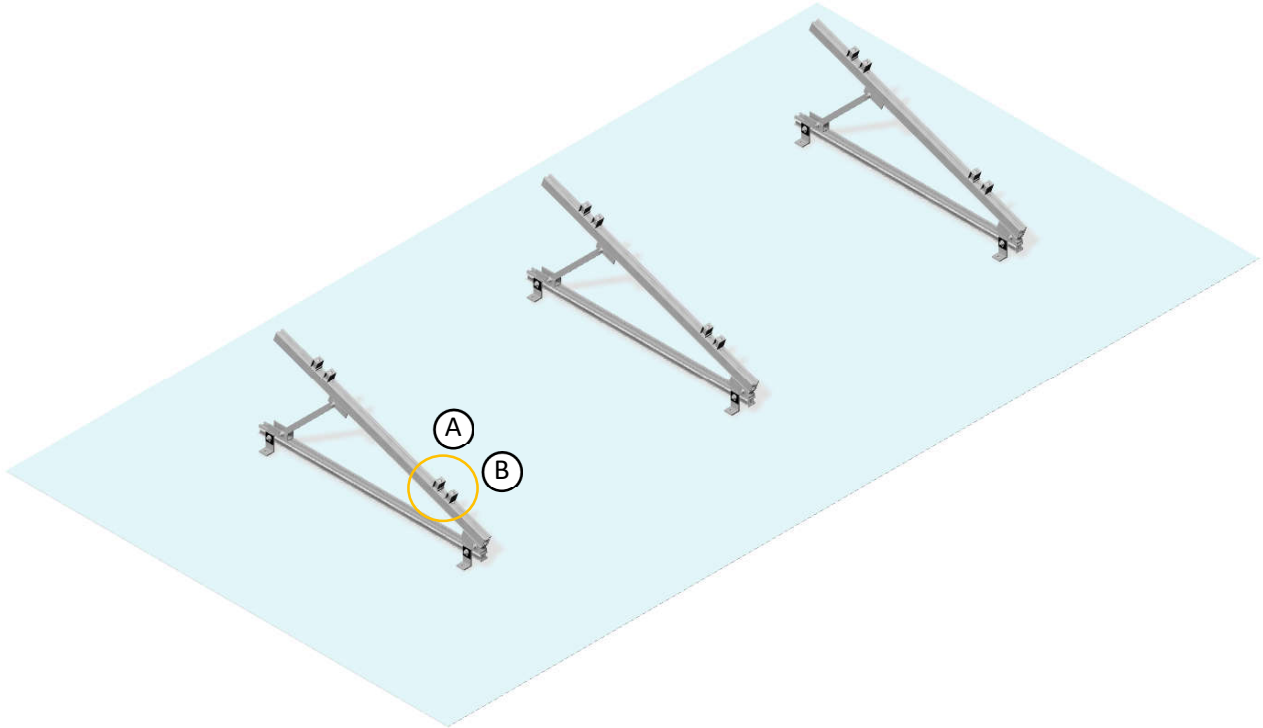


3) Snap in the cross rail connector

Snap the cross rail connector into the triangular mounting system (Fig. A). You need four cross rail connectors per triangle. Align and position the cross rail connectors in the top and bottom areas of each triangular mounting system in pairs. Then place the mounting rail in between (Fig. B).

Note

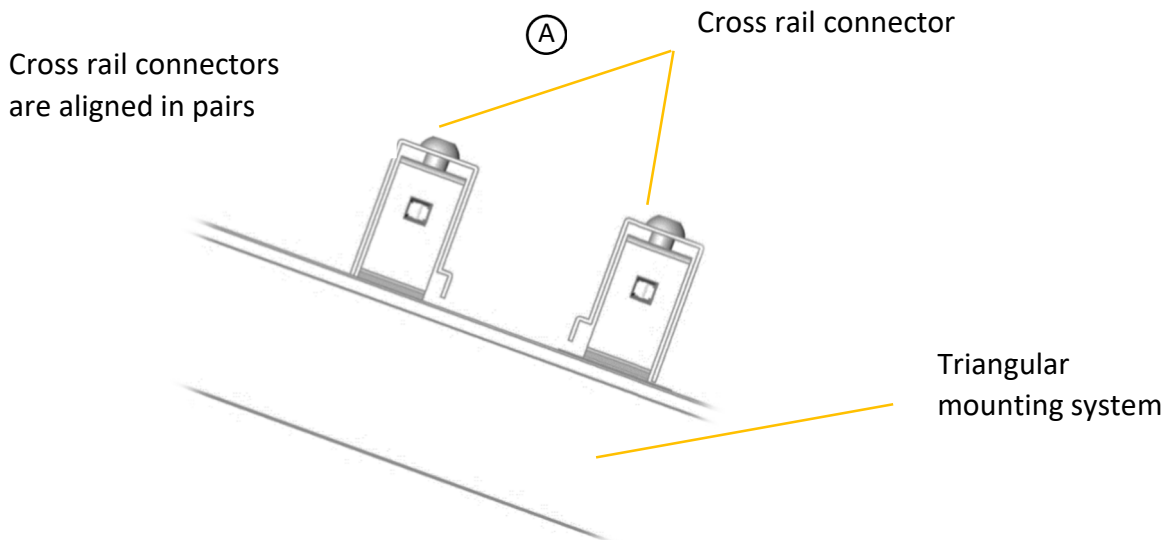
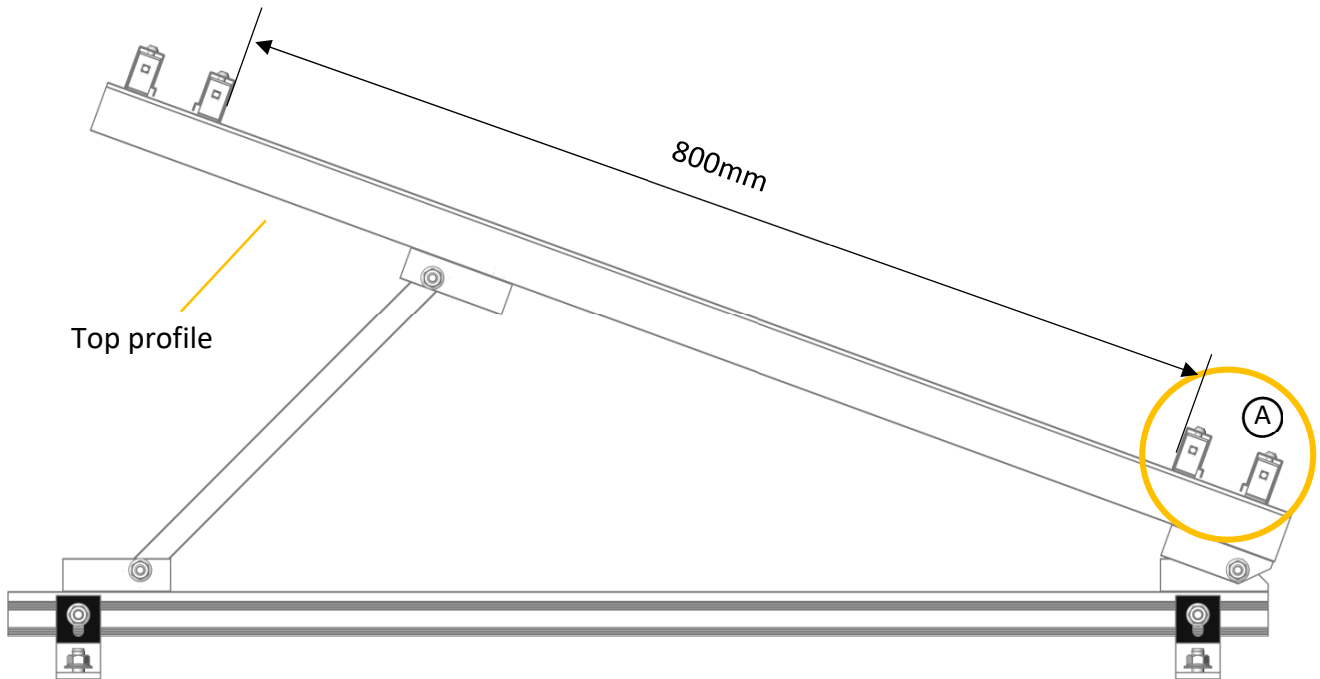
The position of the cross rail connector results from step 4.



4) Positioning the cross rail connectors

Always observe the instructions of the module manufacturer in this process! Then position the cross rail connectors according to the Fig. A. Cross rail connectors are aligned in pairs (Fig. A).

Note: Make sure the Cross rail connectors have equal distance to each end of Top profile



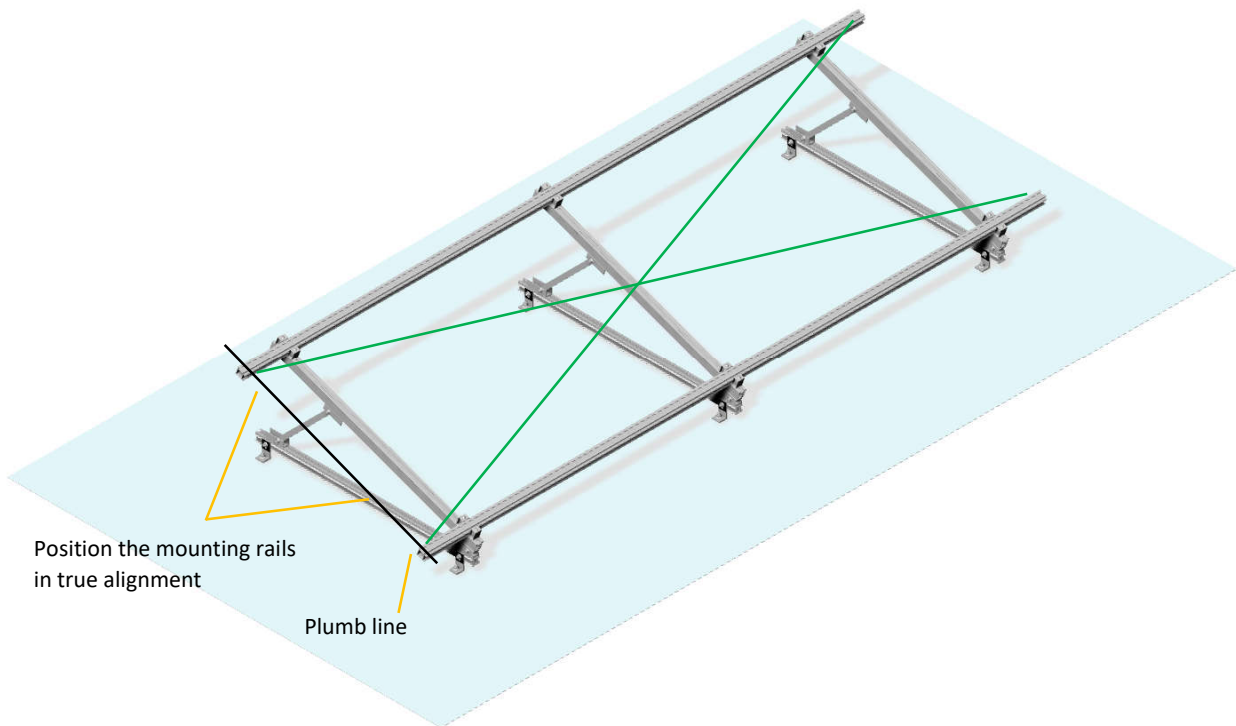
5) Align and fasten mounting rails

Insert the mounting rails between the cross rail connectors and hook the cross rail connector into the groove of the mounting rail (Fig. A). Mounting rails must be in true alignment at their run parallel to each other. Therefore, align the mounting rails using a plumb line. Then fasten the mounting rail with the screws on the cross rail connector. Tightening torque 12-15 Nm

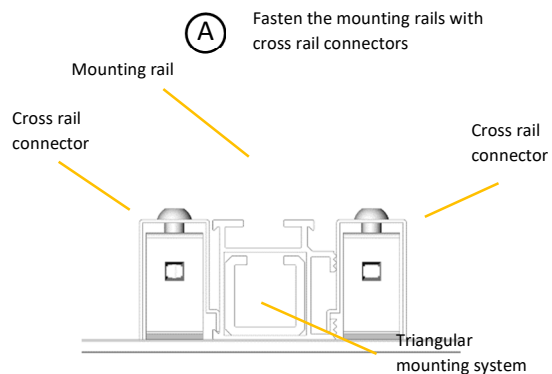
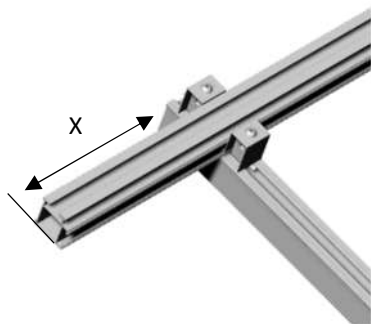
Important

X = Cantilever. The cantilever (max. 205 mm) must be calculated by a structural engineer.

The diagonals of the mounting rails (green lines) must be equal in length.



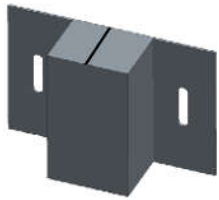
X = Cantilever
The cantilever must be calculated by a structural engineer



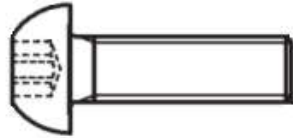
6) Mount safety brackets

Mount safety brackets onto the already fastened brackets (Fig. A) using safety screws (Fig. B).

- The safety bracket set consists of following parts



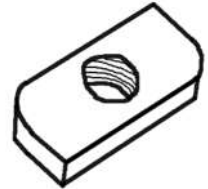
Safety bracket
(3 pcs)



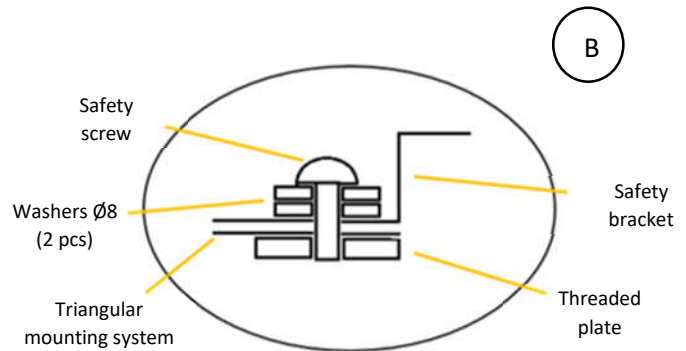
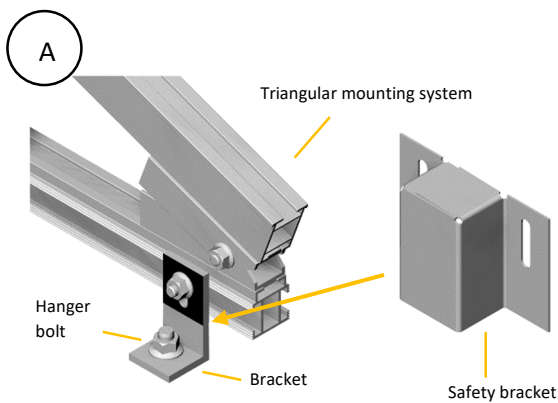
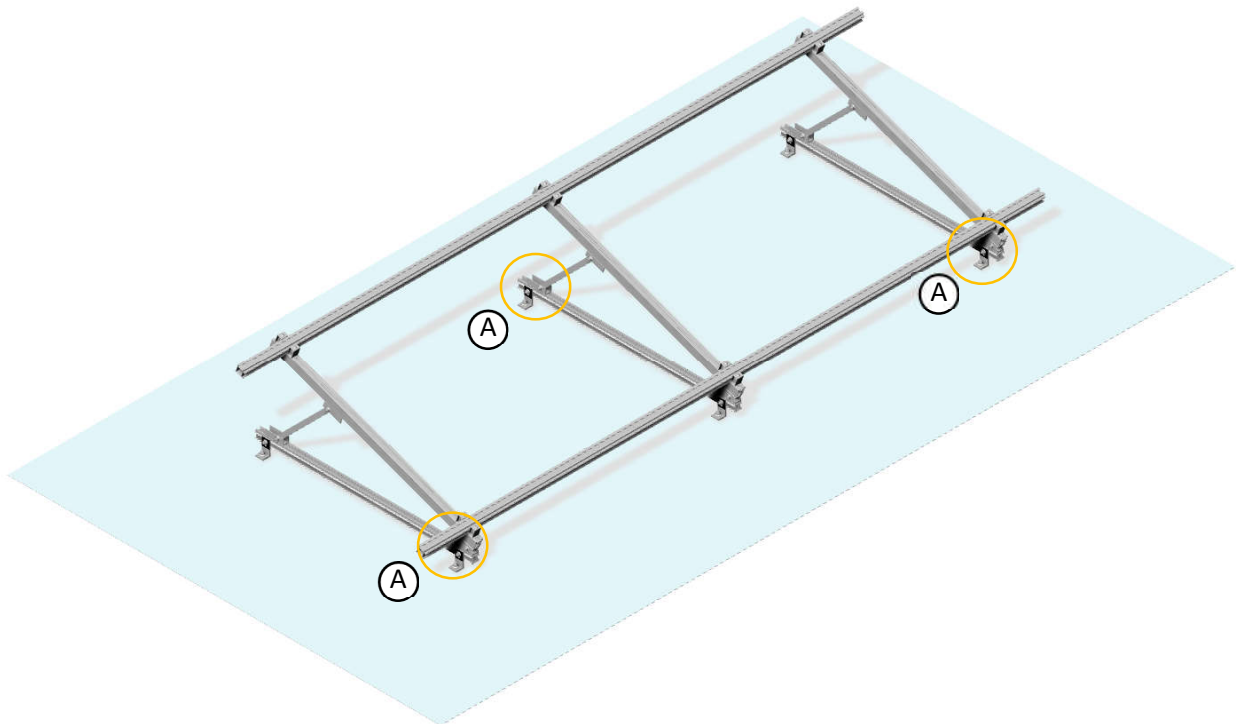
M8 x 12 Safety screw
(6 pcs)



Ø8 Washer 2 mm
(12 pcs)



Threaded plate
(6 pcs)



7) Mount the first module

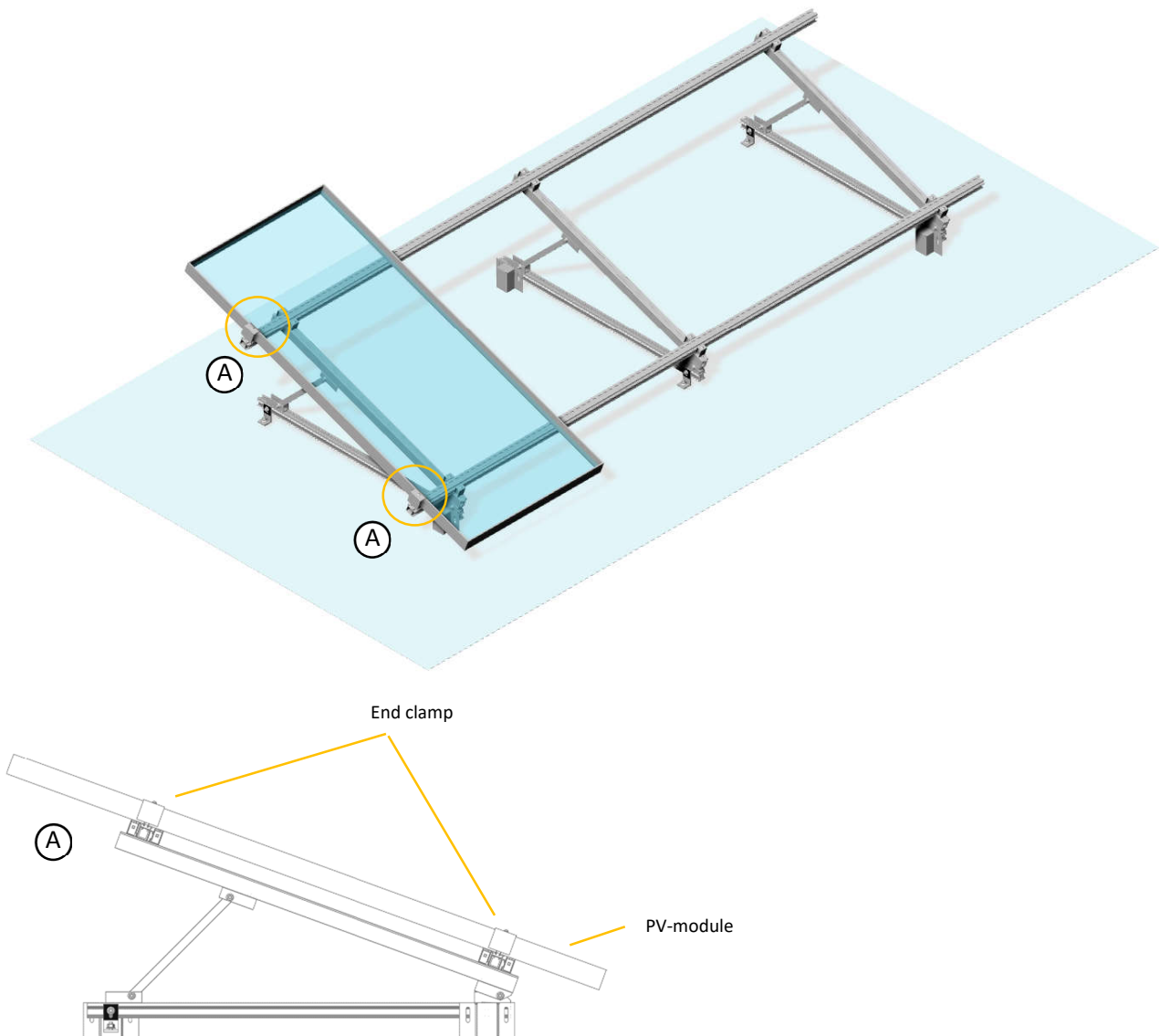
Place the module onto the mounting rail. Push the end clamp onto the rail until it touches the module frame. Align the modules so that the clamping points specified by the module manufacturer are met, as a rule of thumb in the 1/4 points (Fig. A). Fasten the module by turning the screw of the end clamp to the left.

Tightening torque 9-10 Nm.

Important

Make sure that the electrical connection is maintained. If necessary, wire the module beforehand.

The lower cantilever must not exceed 255mm



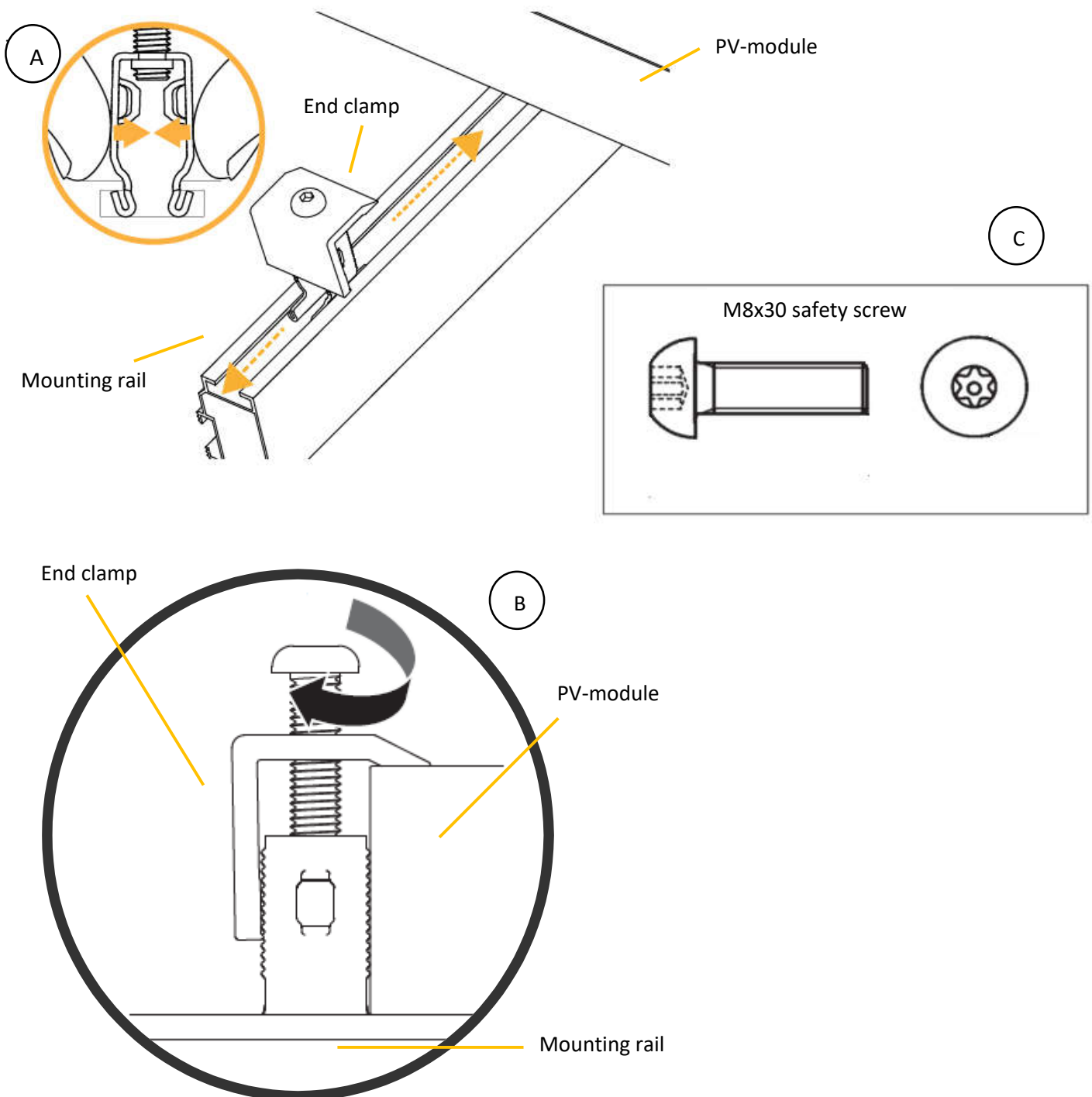
8) Detailed module mounting process

Push the end clamp onto the rail until it touches the module frame (Fig. A). Align the modules so that the clamping points specified by the module manufacturer are met, usually in the 1/4 points (see step 4). Fasten the module by turning the screw of the end clamp to the left (Fig. B).

Tightening torque 9-10 Nm.

Note

End clamps must be fastened using safety screws (Fig. C).

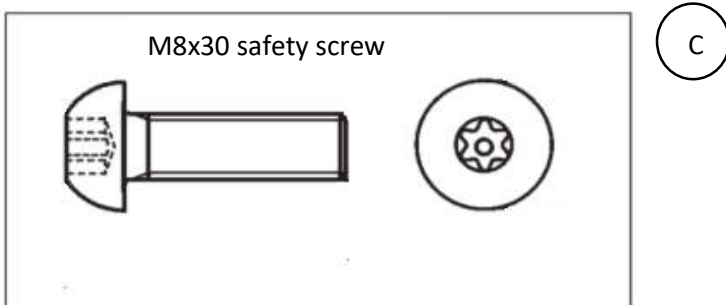
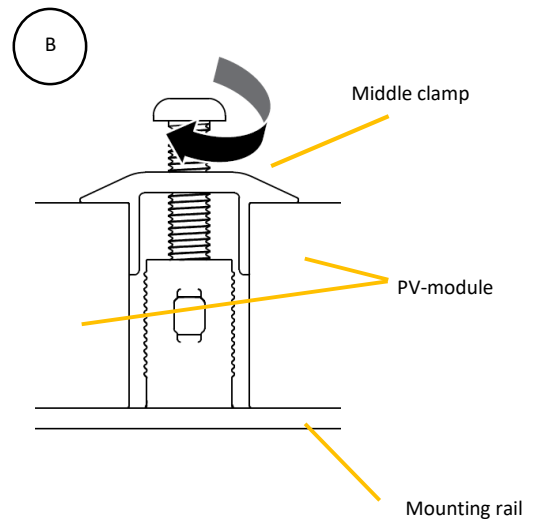
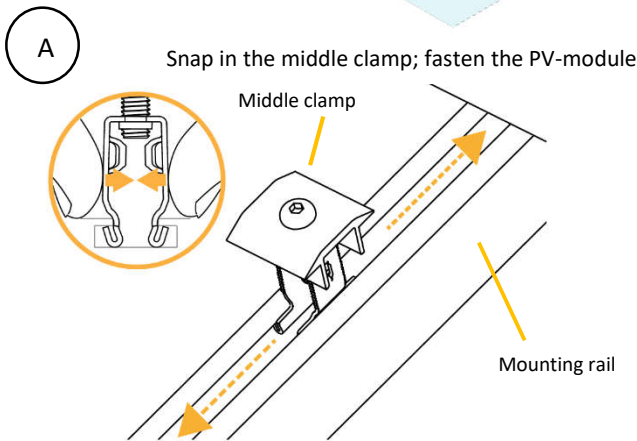
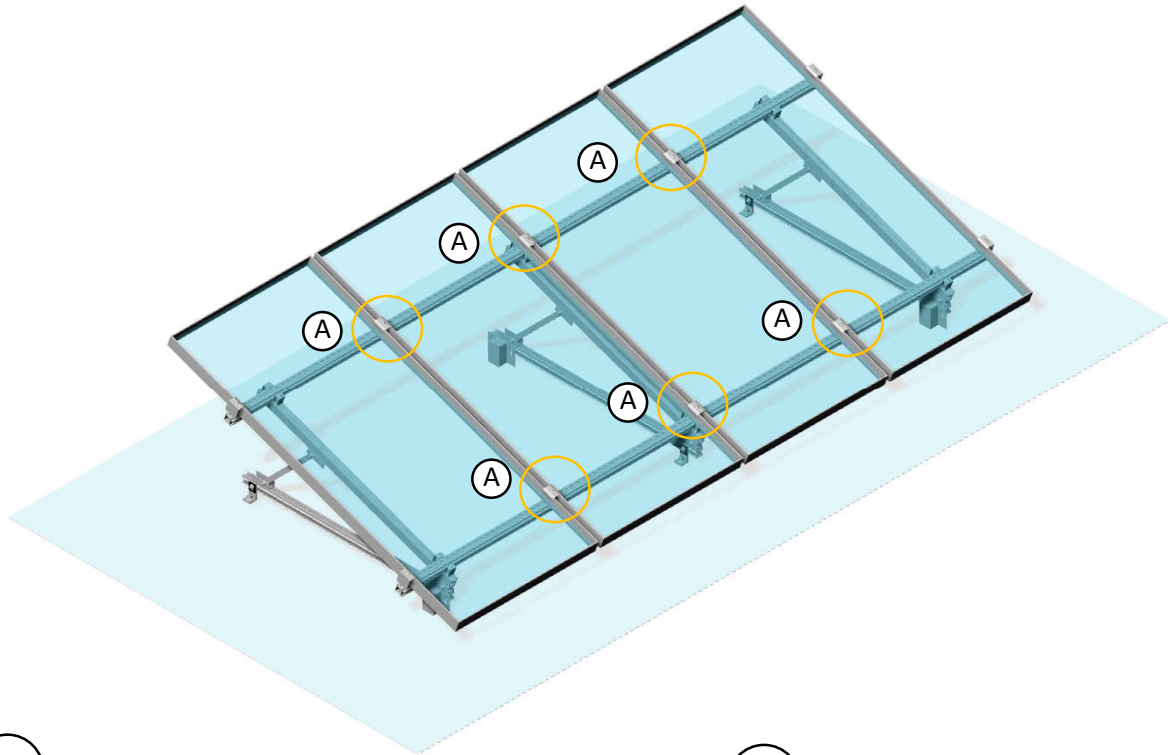


9) Mount the next modules

To mount additional modules, snap the middle clamp into the mounting rail and push against the already fastened module (Fig. A). Push the next module against the middle clamp and tighten with 12-15 Nm (Fig. B). Fasten the last module of the row with end clamps.

Note

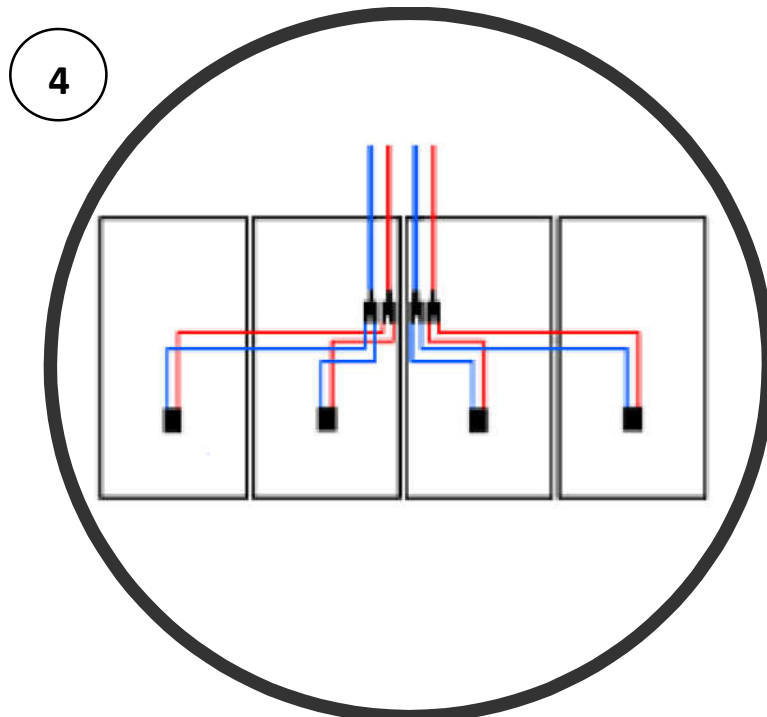
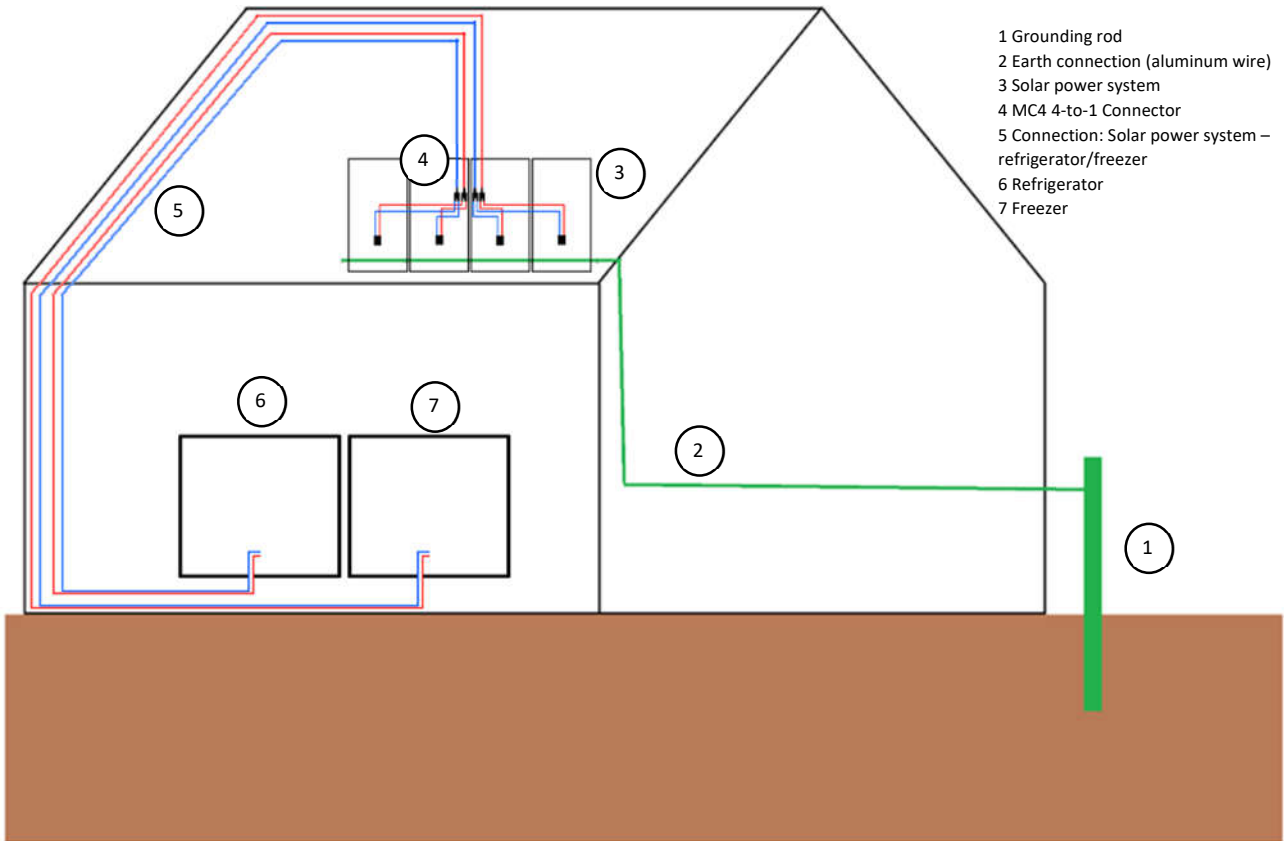
Middle clamps must be fastened using safety screws (Fig. C).



3. ELECTRICAL CONNECTION

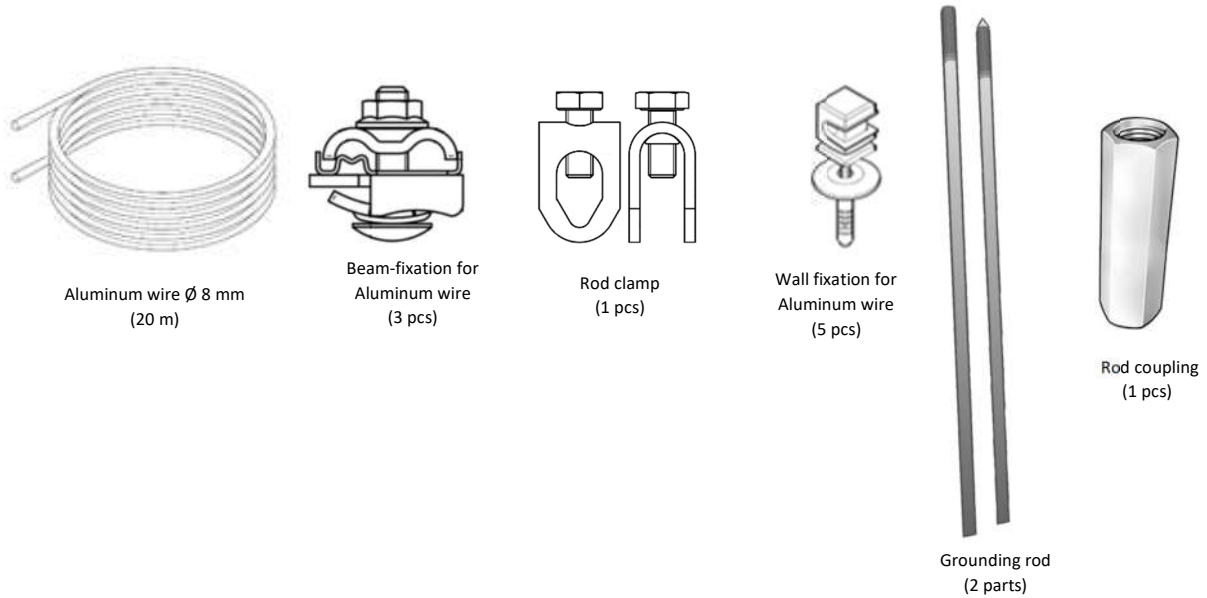
3.1. CONNECTION PRINCIPLE

- The electronic connection consists of 2 steps:
 - connection to the ground
 - connection to the refrigerator

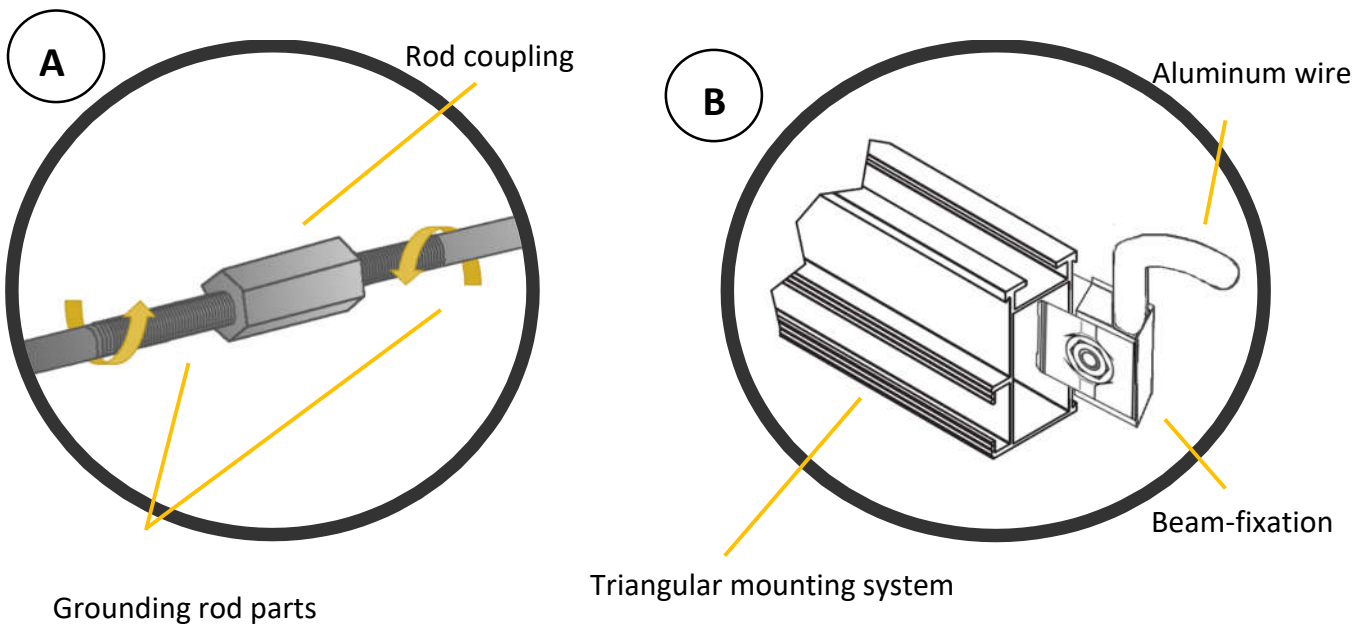


3.2. CONNECT THE SOLAR POWER SYSTEM TO THE GROUND

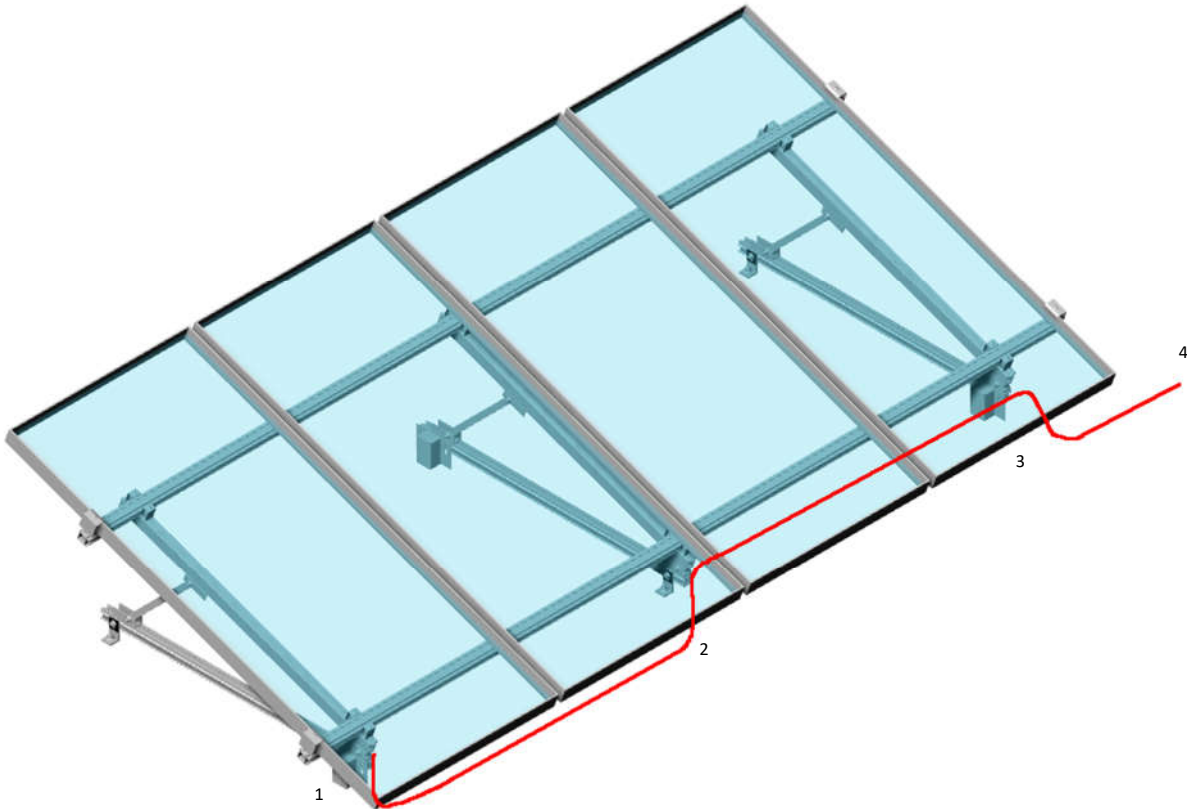
- The grounding set consists of following parts :



- Assemble the 2 parts of the grounding rod using the rod coupling (Fig. A)
- Drive the rod into the ground as near to the building and as deep as possible. Note: place a block on top of rod when hammering to prevent bending of rod.
- Keep the distance from the solar system components to the grounding rod as short as possible. The aluminium wire can be shortened if necessary.
- Connect the aluminium wire to the solar system components using the beam-fixation parts as described above (Fig. B).



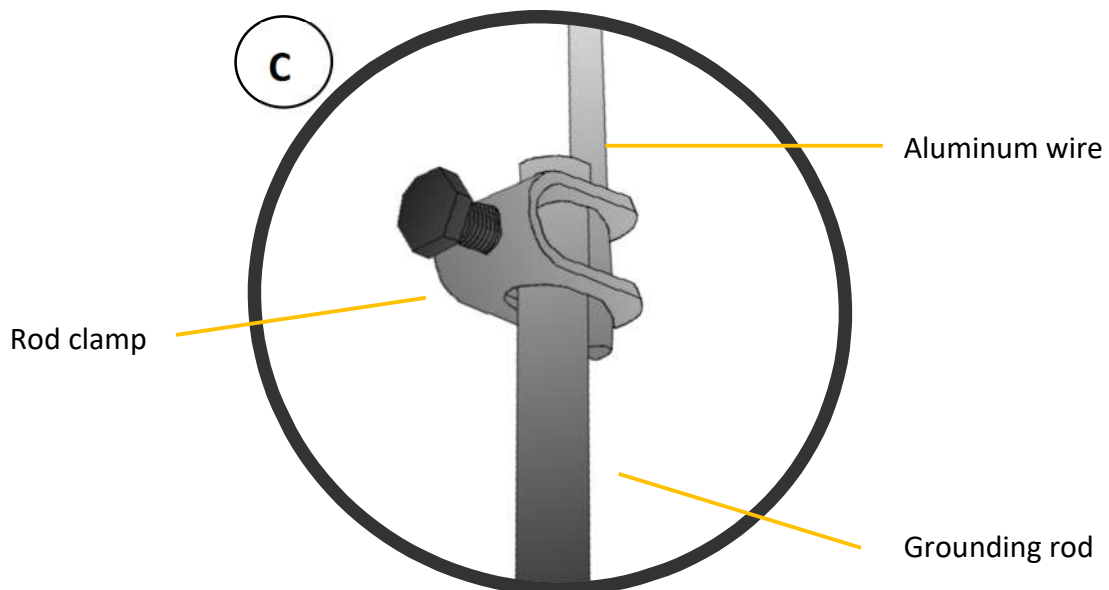
- According to the drawing below, the connection to the solar system components must be made on following specified positions:
 - 1-3 all three support elements (Fig. B)
 - 4 grounding rod (Fig. C)



- After fixation on point 3, pass the aluminium wire to the grounding rod where it is fixed with the rod clamp (Fig. C).
- Fix the aluminium wire to the building wall using the provided wall-fixation-elements.

IMPORTANT :

Do not fix the aluminium wire next to any electrical wiring.



3.3. CONNECT THE SOLAR POWER SYSTEM TO THE REFRIGERATOR

- The refrigerator set consist of following parts:



Cable clip 5-7 mm
(100 pcs)

(Use one clip per 300 mm cable)



Cable strip
(12 pcs)



4 mm² cable with MC4 Y Connector
(2 x 20 m)

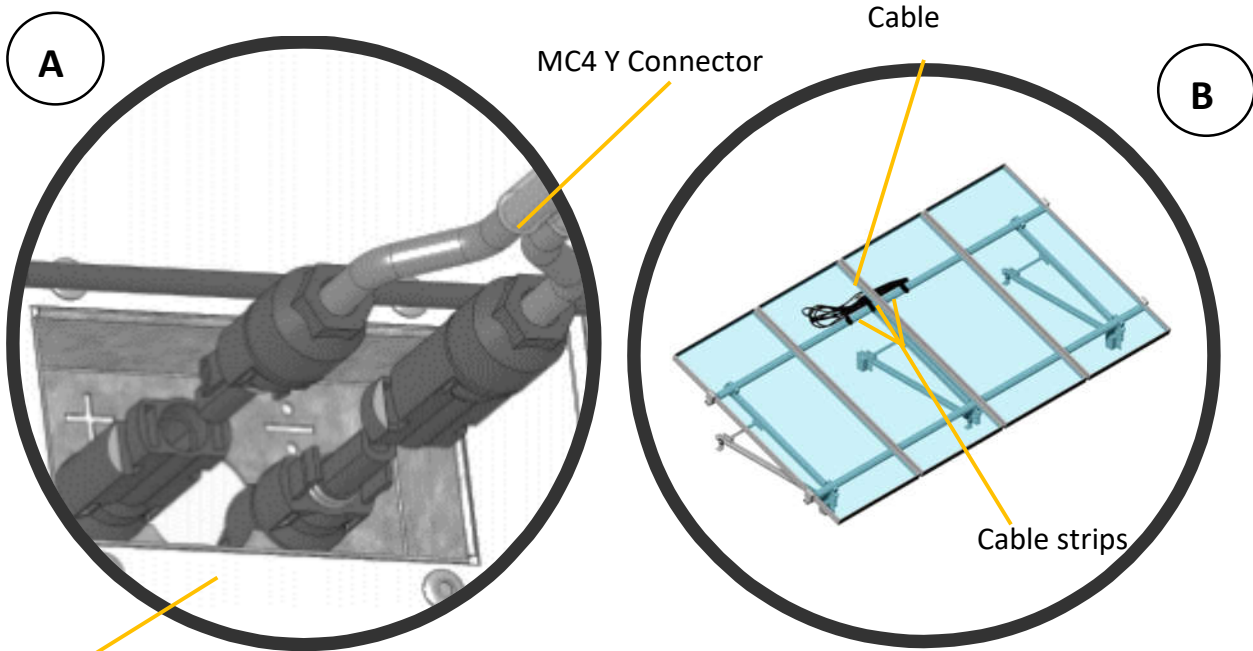


MC4-Y Connector
(2 set)

- The connection of the refrigerator to the solar power system is made with the provided cables (Fig. A)

Note

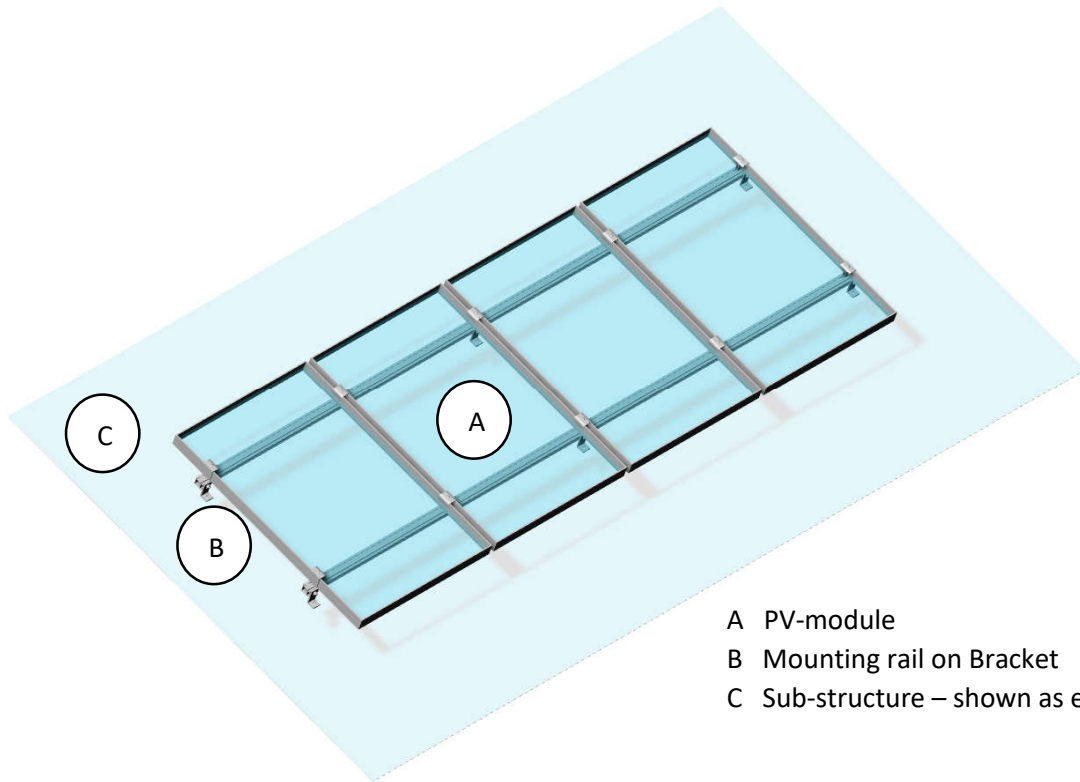
The cable strips are used to tie the connected cables together, possibly under the PV-modules (Fig. B).



Refrigerator

4. MOUNTING WITHOUT TRIANGULAR MOUNTING SYSTEM

If no angle adjustment is required, mount the mounting rail directly on the bracket as shown below. The installation follows the same steps from 2.2.2., but without the triangular mounting system.



- A PV-module
- B Mounting rail on Bracket
- C Sub-structure – shown as example

