



**Mounting
Solutions**

AS 2.1
TRAPEZOIDAL SHEET
LIGHTWEIGHT ELEVATION ELEMENTS

EN

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Before beginning the installation, please carefully read through the safety instructions, which you will find at the end of these installation instructions. Before beginning installation, please ensure that you are using the latest version of the installation instructions.

The design and planning of the installation system should be performed using the **MOUNTING SOLUTIONS Solar.Pro.Tool** software. For information on the materials required and the positions and arrangement of the individual components, please refer to the project report which you have received from the Solar.Pro.Tool or from your MOUNTING SOLUTIONS distribution partner. This data is based on structural calculations and of crucial importance for the safe and error-free functioning of the installation.

Before installation, the technician installing the photovoltaic system is to ensure that the existing roof substructure is designed for the additional loads that will occur.

These installation instructions explain the installation procedures for the MOUNTING SOLUTIONS trapezoidal sheet roof components, how fastening to the roof substructure is carried out, and the installation of the modules.

Purlin roofs are usually used for the substructure. When the "Plus trapezoidal sheet bridges" are used on trapezoidal sheet roofs, they must always be anchored directly in the trapezoidal sheet. With the lightweight elevation element system, the modules can be mounted on edge and lying on their side such that the mounting profiles are parallel to the ridge. By default, two mounting profiles are used per row of modules.

The MOUNTING SOLUTIONS trapezoidal sheet roof system has been designed exclusively for holding PV modules. Any other use is considered improper.

Installation must be carried out by trained specialists. In particular, work on the roof covering should be performed by a roofer.

Should you have any further questions, please make use of ALUMERO's professional and comprehensive consultation service.

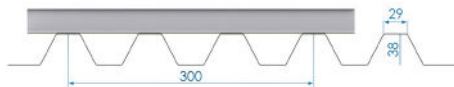
GENERAL INFORMATION

Min. sheet thickness:	Steel sheet min. 0.5 mm Aluminium min. 0.75 mm	
Roof inclination:	5° - 13° for horizontal module arrangement 5° - 15° for vertical module arrangement	
Trapezoidal sheet, upper bead:	Minimum width of upper bead 22 mm (25 mm recommended). The height of the upper bead is not relevant.	
Upper bead spacing:	100 - 333mm	
Fastening:	Thin sheet metal screws	
Max. module field size:	12 m length	
Screw installation:	M8 (A2-70)	M10 (A2-70)
Torque:	15 Nm	30 Nm

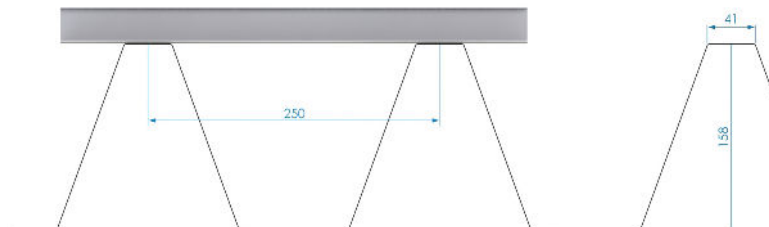
39/333.3



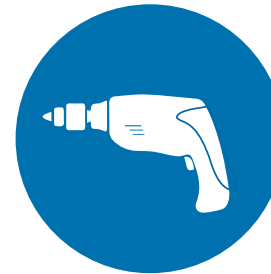
38/300



158/250

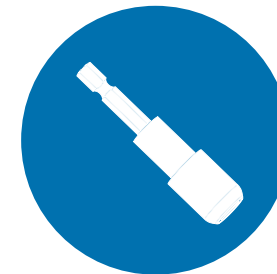


REQUIRED TOOLS

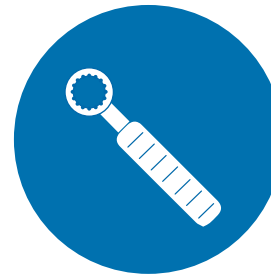


Cordless screwdriver

with bit inserts:
Allen key **WAF 8**



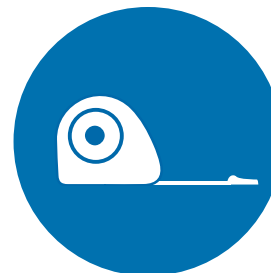
Bit attachment WAF 8



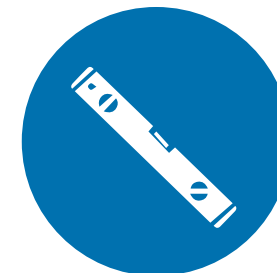
Torque spanner



Measuring tape



Chalk line



Spirit level

COMPONENTS

STANDARD



**Trapezoidal sheet bridge
2.1 Plus L=400**
Product number:
802445



**Trapezoidal sheet bridge
2.1 Plus L=250**
Product number:
802452



Front piece Plus
Product number:
802446



Rear piece Plus
Product number:
802447



Securing set Plus
Product number:
802448



**Closing clamp,
pre-mounted with pin**
Product number:
802304-xxV P1



Closing clamp, pre-mounted
Product number:
802304-xxV



**End clamp (Click)
with pin**
Product number:
802304CP



**End clamp (Click)
without pin**
Product number:
802304C



**Middle clamp (Click)
with pin**
Product number:
802301C P1 30-45



**Middle clamp, (Click)
without pin**
Product number:
802301C 30-45

COMPONENTS

ACCESSORIES



Cable tie incl. clip

Product number:
802604



Wire clamp

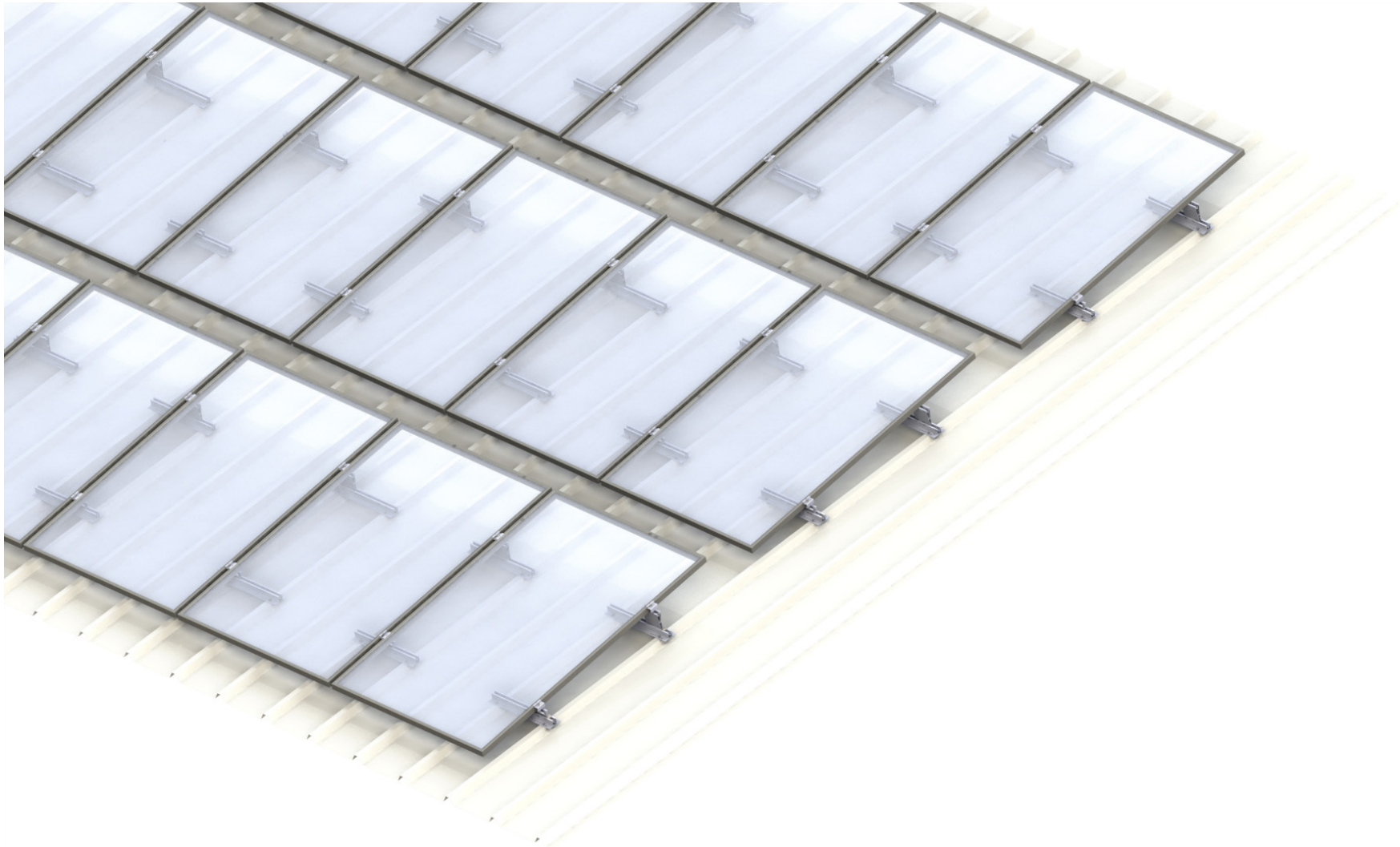
Product number:
802603



Aluminium wire

Product number:
802602

LAYOUT WITH TRAPEZOIDAL SHEET LIGHTWEIGHT ELEVATION ELEMENTS 5° MODULE ARRANGEMENT – VERTICAL

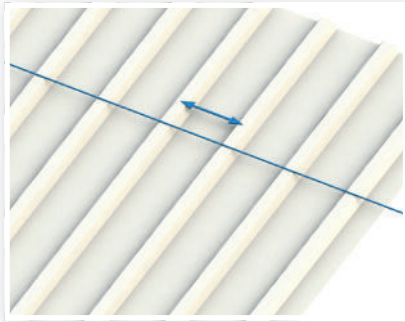


INSTALLATION

1

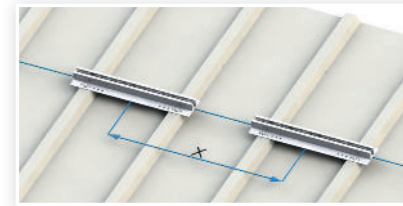
MEASURE OUT AND MARK POSITIONS

Measure out and mark the positions of the Plus trapezoidal sheet bridges on the roof using a chalk line based on the Solar.Pro.Tool project report. Measure the distance (spacing) between high beads and position Plus trapezoidal sheet bridges.



Place the next Plus trapezoidal sheet bridges on the subsequent high beads such that the **distance X** is maintained. The **distance X** depends on the module width + clamping width (20 mm) + minimum distance to the end of the respective Plus trapezoidal sheet bridge (20 mm).

The **distance Y** depends on the module length and should correspond to the chosen clamping area of the module.



2

INSTALLATION OF PLUS TRAPEZOIDAL SHEET BRIDGE

Screw the Plus trapezoidal sheet bridge onto the middle of two high beads using 4 thin sheet metal screws. Ensure that the EPDM seal under the trapezoidal sheet bridge and the sealing washers of the thin sheet metal screws are not compressed by more than 50%. The distance between the thin sheet metal screws and the edge of the bead should not be less than 8 mm.



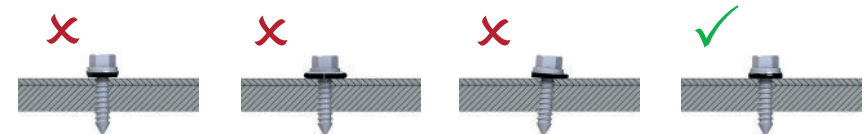
Please note: Mounted trapezoidal sheet bridges are not to be used as stepladders!



Please note: For the clamping areas and the resulting loads, please refer to the installation manual for the modules used.

Note on the thin sheet metal screws

Screw in the thin sheet metal screws slowly, in a controlled fashion, and using low torque to avoid overtightening the screw or severely damaging the sheet metal. Only screw in the screw until the EPDM seal under the rail and the thin sheet metal screws is compressed to approx. 50 % of the original thickness. Tightening it further does not increase the strength of the connection, but only the risk of failure.



INSTALLATION OF THE PLUS FRONT AND REAR PIECES

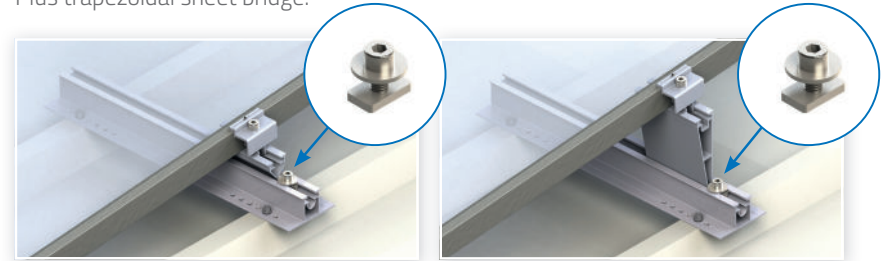
Fit the **Front piece Plus** and **Rear piece Plus** adapters into the already installed Plus trapezoidal sheet bridges. Position the adapters such that they are located between two high beads and the modules can be fixed in place centrally on the adapters.



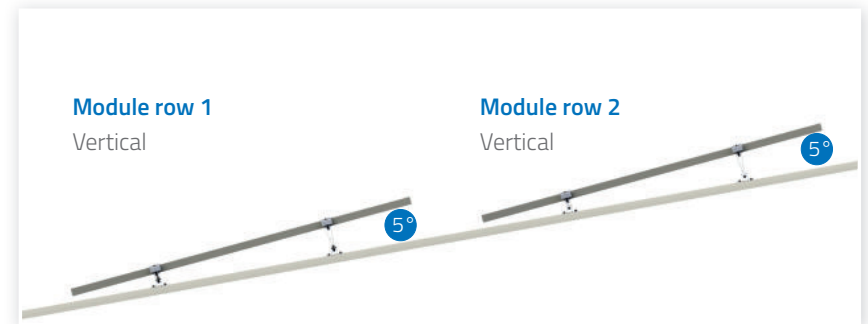
Install the modules vertically to obtain an additional inclination of 5°.



Install the **Securing set Plus** on the outer side, at the end of each module row, to prevent the adapters from sliding out. The adapters, including the securing screws, must be installed at least 20 mm before the end of the respective Plus trapezoidal sheet bridge.

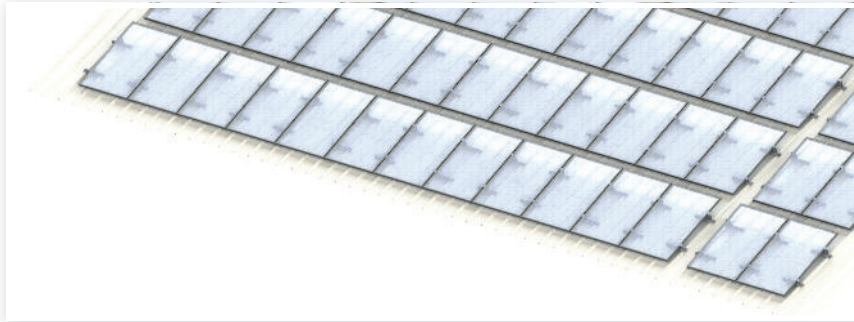


For the distance between module row 1 and module row 2, please refer to the Solar. Pro.Tool project report.



THERMAL SEPARATION AND MAINTENANCE ROUTES

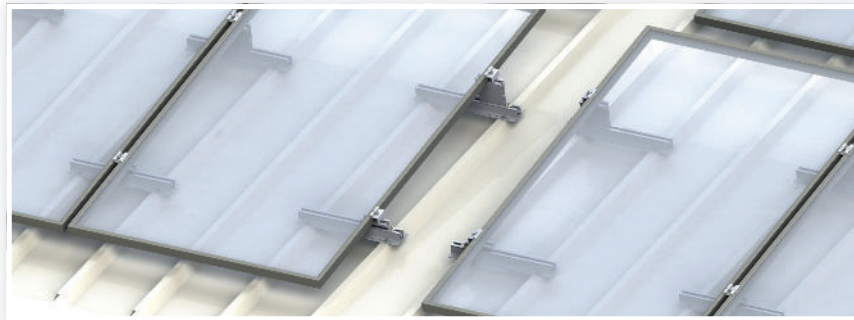
Note the maximum module field length of 12 m. After this length, a thermal separation of the modules must take place. For this purpose, a high bead should be left free.



As a rule, plan for maintenance routes in both horizontal and vertical directions on larger installations.



Detail: Thermal separation after 12 m in a horizontal direction.



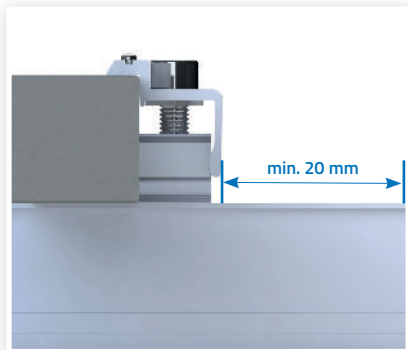
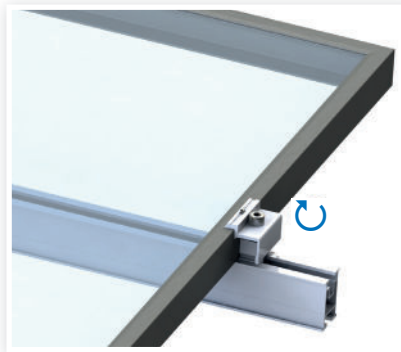
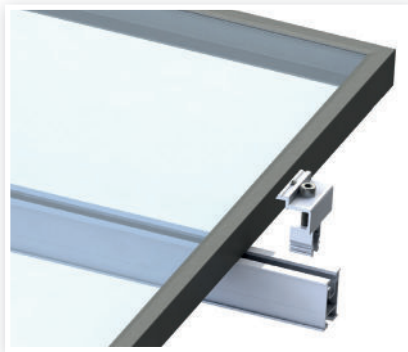
INSTALLING MODULES

1

INSTALLING END CLAMPS

Start with the lowest module row. Place the first module on the Plus front and rear piece adapters and align it.

Click in the end clamp (Click) at a slight angle and push it towards the module frame.



Please note: The closing clamps must be fitted at least 20 mm from the end of the respective mounting profile.

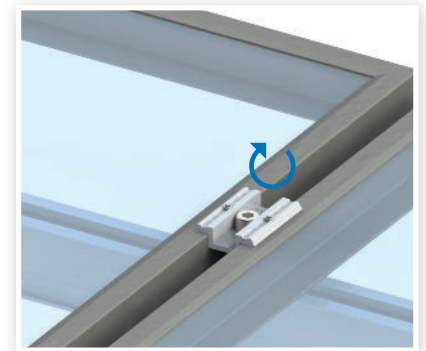
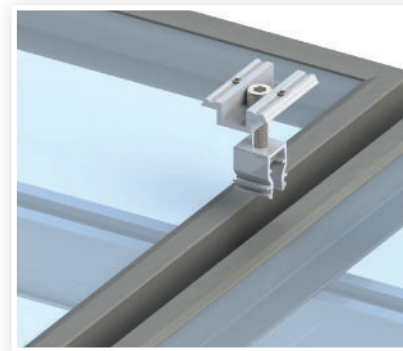


Note: When using end clamps with threaded plates, attention needs to be paid to the alignment. The threaded plate must be positioned at right angles to the profile channel.

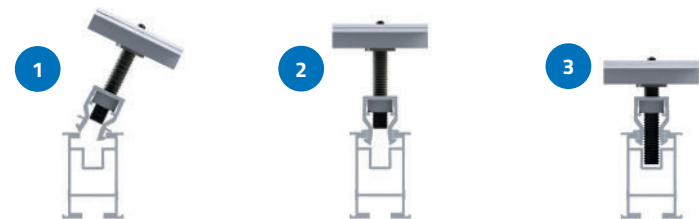
2

INSTALLING THE MIDDLE CLAMP

Place the middle clamp (Click) on the frame of the previous module and click it in at a slight angle. Push the module in so that both modules firmly touch each other. Tighten the Allen screw with a torque of **15 Nm**.



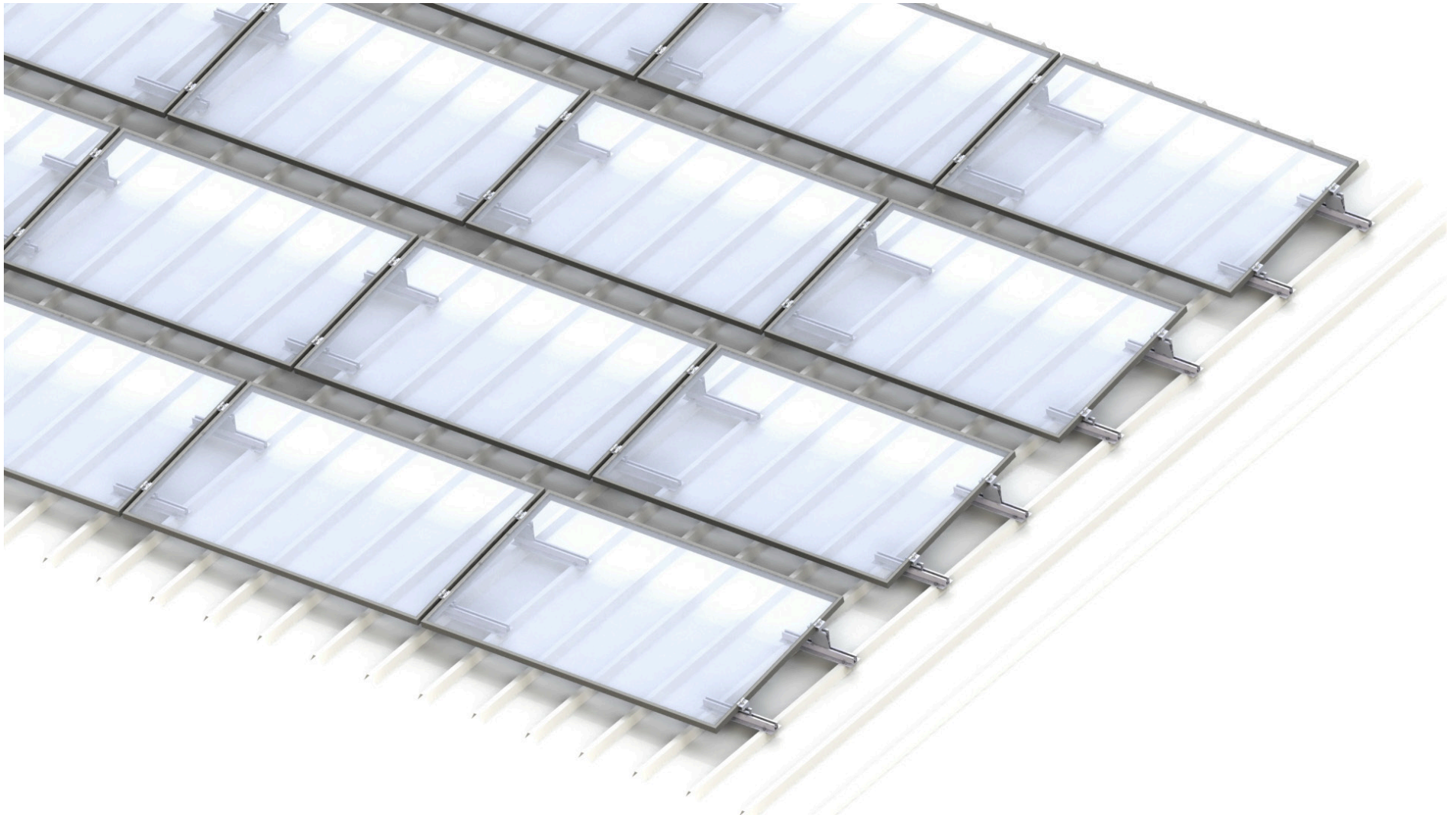
Mount the last module of each module row using closing clamps, as previously described. Mount the remaining module rows in the same way.



Please note:

- + Distance between the clamps and the ends of the Plus front and rear pieces: **min. 20 mm!**
- + Modules are only to be clamped at prescribed fastening areas! For information on which these are, please refer to the module data sheet provided by the module manufacturer.
- + Clearance (horizontal) between the modules: **approx. 20 mm!**

LAYOUT WITH TRAPEZOIDAL SHEET LIGHTWEIGHT ELEVATION ELEMENTS 7° MODULE ARRANGEMENT – HORIZONTAL

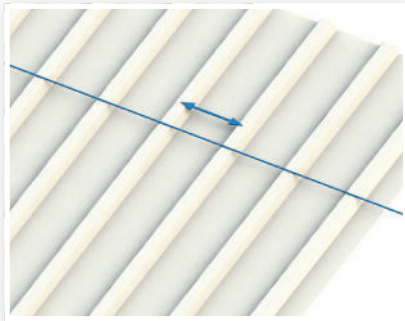


INSTALLATION

1

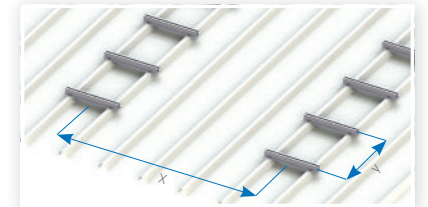
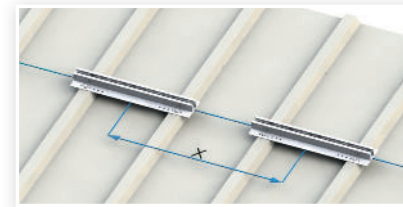
MEASURE OUT AND MARK POSITIONS

Measure out and mark the positions of the Plus trapezoidal sheet bridges on the roof using a chalk line based on the Solar.Pro.Tool project report. Measure the distance (spacing) between high beads and position Plus trapezoidal sheet bridges.



Place the next trapezoidal sheet bridges on the subsequent high beads such that the **distance X** is maintained. The **distance X** depends on the module length + clamping width (20 mm) + minimum distance to the end of the respective trapezoidal sheet bridge (20 mm).

The **distance Y** depends on the module width and should correspond to the chosen clamping area of the module.



2

INSTALLATION OF PLUS TRAPEZOIDAL SHEET BRIDGES

Screw the Plus trapezoidal sheet bridge onto the middle of two high beads using 4 thin sheet metal screws. Ensure that the EPDM seal under the trapezoidal sheet bridge and the sealing washers of the thin sheet metal screws are not compressed by more than 50%.



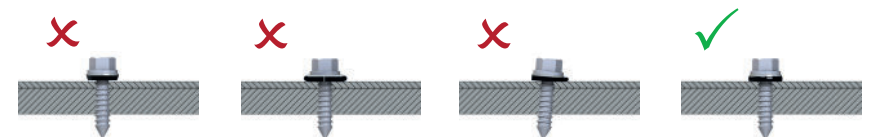
Please note: Mounted trapezoidal sheet bridges are not to be used as stepladders!



Please note: For the clamping areas and the resulting loads, please refer to the installation manual for the modules used.

Note on the thin sheet metal screws

Screw in the thin sheet metal screws slowly, in a controlled fashion, and using low torque to avoid overtightening the screw or severely damaging the sheet metal. Only screw in the screw until the EPDM seal under the rail and the thin sheet metal screws is compressed to approx. 50 % of the original thickness. Tightening it further does not increase the strength of the connection, but only the risk of failure.

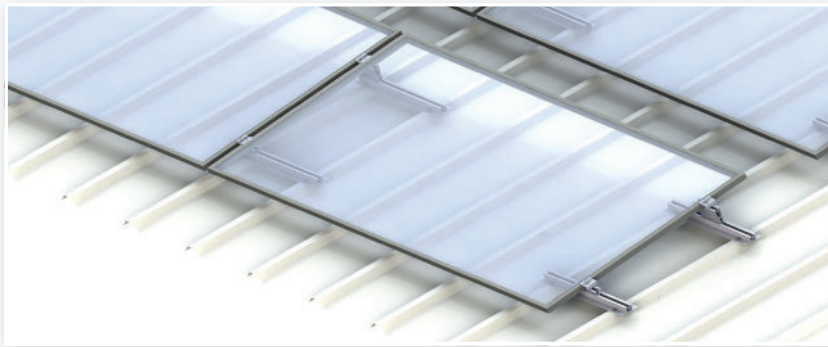


INSTALLATION OF THE PLUS FRONT AND REAR PIECES

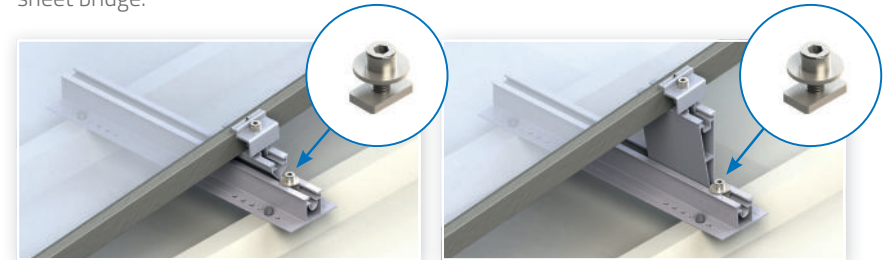
Fit the **Front piece Plus** and **Rear piece Plus** adapters into the already installed Plus trapezoidal sheet bridges. Position the adapters such that they are located between two high beads and the modules can be fixed in place centrally on the adapters.



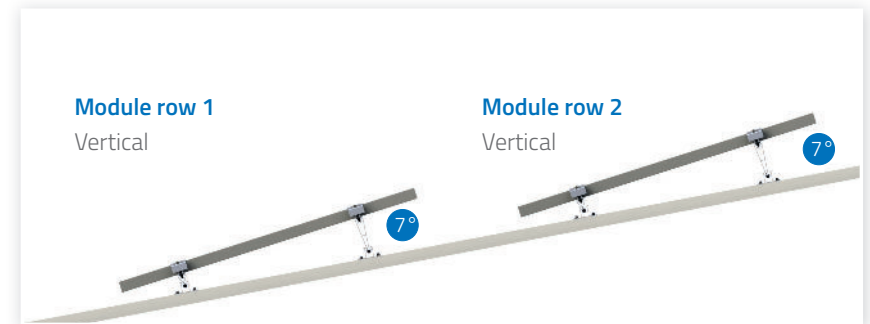
Install the modules vertically to obtain an additional inclination of 7°.



Install the **Securing set Plus** on the outer side, at the end of each module row, to prevent the adapters from sliding out. The adapters, including the securing screws, must be installed at least 20 mm before the end of the respective Plus trapezoidal sheet bridge.

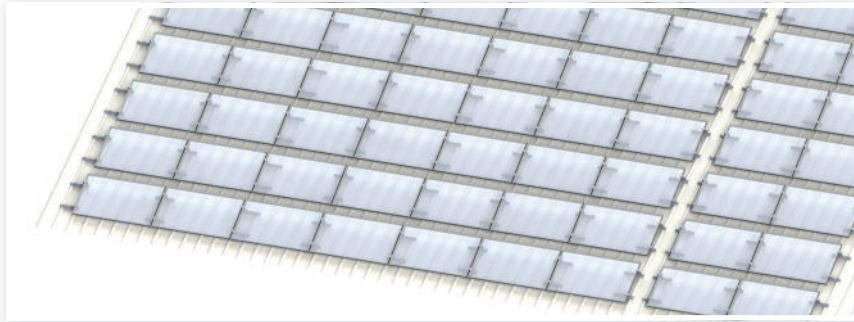


For the distance between module row 1 and module row 2, please refer to the Solar.Pro.Tool project report.

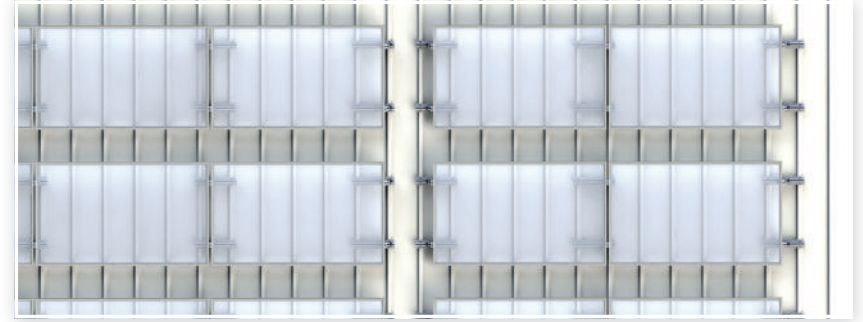


THERMAL SEPARATION AND MAINTENANCE ROUTES

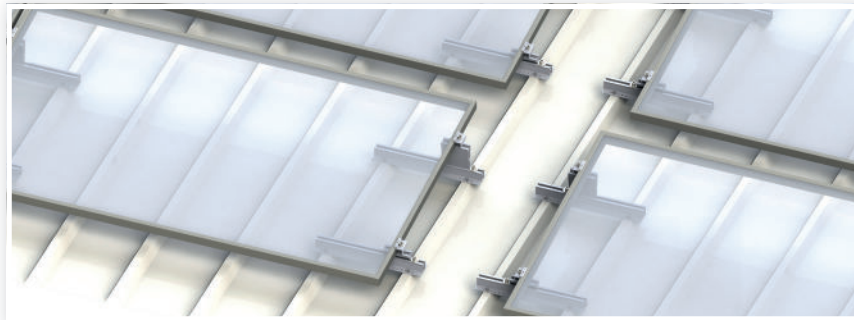
Note the maximum module field length of 12 m. After this length, a thermal separation of the modules must take place. For this purpose, a high bead should be left free.



As a rule, plan for maintenance routes in both horizontal and vertical directions on larger installations.



Detail: Thermal separation after 12 m in a horizontal direction.



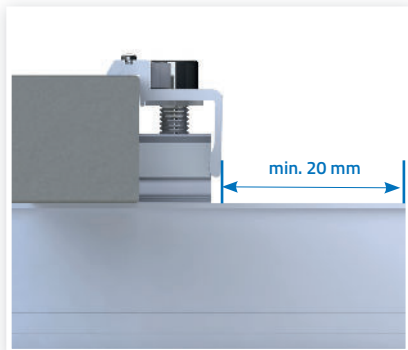
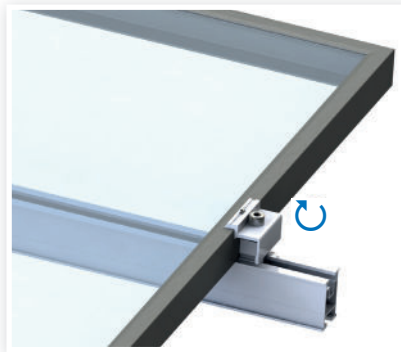
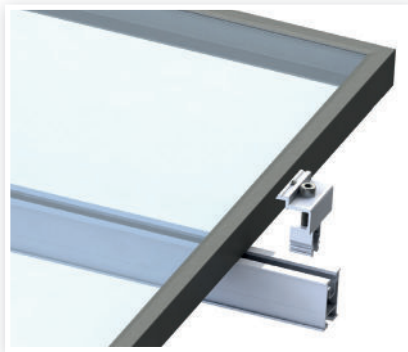
INSTALLING MODULES

1

INSTALLING END CLAMPS

Start with the lowest module row. Place the first module on the Plus front and rear piece adapters and align it.

Click in the end clamp (Click) at a slight angle and push it towards the module frame.



Please note: The closing clamps must be fitted at least 20 mm from the end of the respective mounting profile.

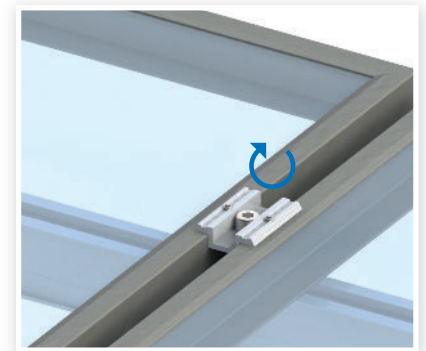
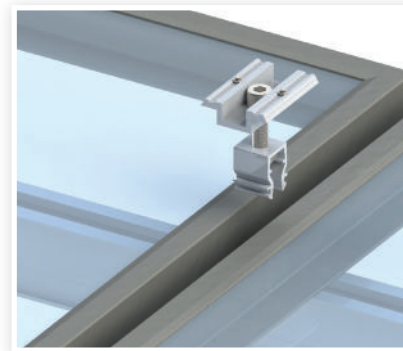


Note: When using end clamps with threaded plates, attention needs to be paid to the alignment. The threaded plate must be positioned at right angles to the profile channel.

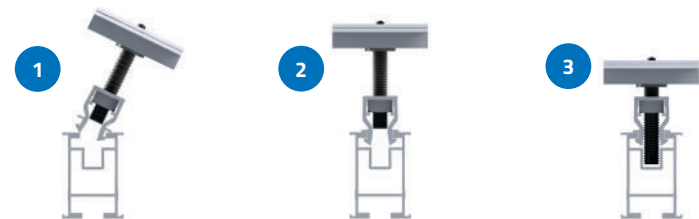
2

INSTALLING THE MIDDLE CLAMP

Place the middle clamp (Click) on the frame of the previous module and click it in at a slight angle. Push the module in so that both modules firmly touch each other. Tighten the Allen screw with a torque of **15 Nm**.



Mount the last module of each module row using closing clamps, as previously described. Mount the remaining module rows in the same way.



Please note:

- + Distance between the clamps and the ends of the Plus front and rear pieces: **min. 20 mm!**
- + Modules are only to be clamped at prescribed fastening areas! For information on which these are, please refer to the module data sheet provided by the module manufacturer.
- + Clearance (horizontal) between the modules: **approx. 20 mm!**

OPTIONAL: BARREL ROOF WITH TRAPEZOIDAL SHEET LIGHTWEIGHT ELEVATION ELEMENTS

MODULE ARRANGEMENT – HORIZONTAL/VERTICAL

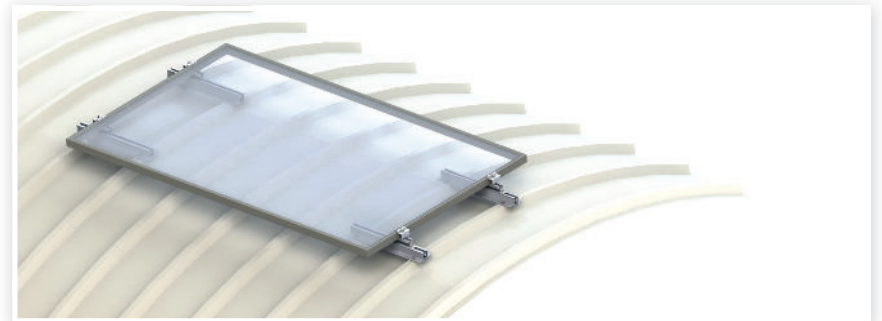
GENERAL INFORMATION

Min. sheet thickness:	Steel sheet min. 0.5 mm Aluminium min. 0.8 mm	
Module orientation:	Vertical, horizontal	
Installation:	Parallel to roof	
Roof radius:	> 3.5 m	
Trapezoidal sheet, upper bead:	Minimum width of upper bead 25 mm The height of the upper bead is not relevant.	
Upper bead spacing:	100 - 333mm	
Fastening:	Thin sheet metal screws	
Max. module field size:	12 m length	
Screw installation:	M8 (A2-70)	M10 (A2-70)
Torque:	15 Nm	30 Nm

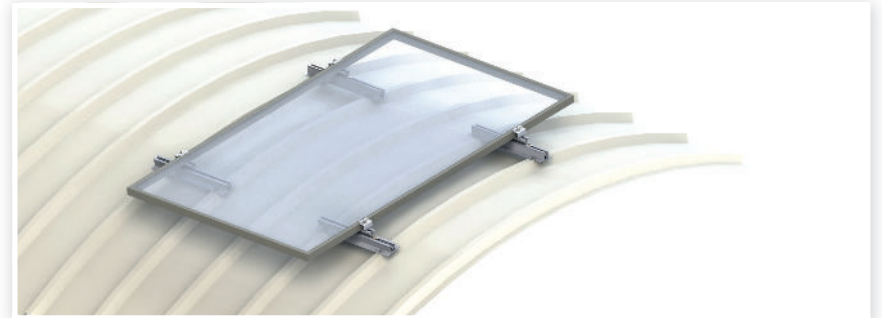


Note: It is recommended that only the **Plus front piece adapters** be used, which means that the modules are not given any additional inclination. Any other use is considered improper.

The **Plus trapezoidal sheet bridge** can be used for installation on arched trapezoidal sheet roofs. To compensate for the curvature, the **Plus front piece adapters** are fitted into the Plus trapezoidal sheet bridges.



The installation of the **Plus trapezoidal sheet bridge** and the **Plus front piece adapter** is described on pages 12 and 13.



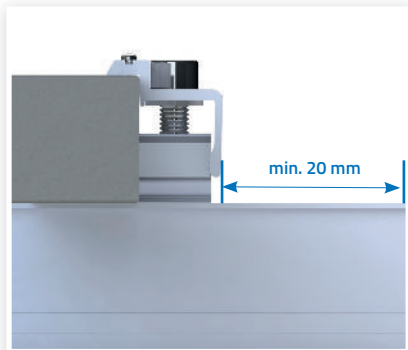
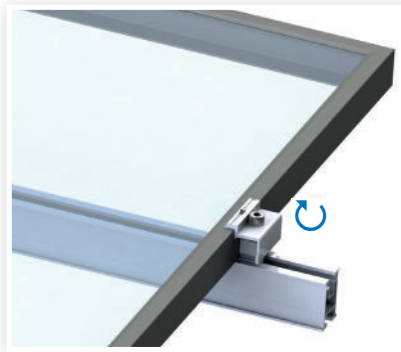
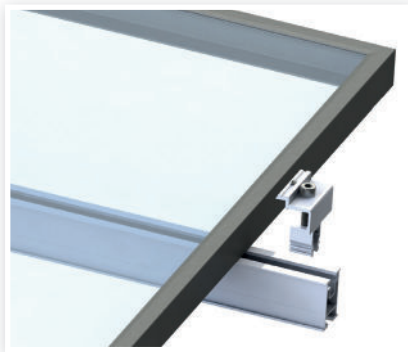
INSTALLING MODULES

1

INSTALLING END CLAMPS

Start with the lowest module row. Place the first module on the Plus front piece adapters and align it.

Click in the end clamp (Click) at a slight angle and push it towards the module frame.



Please note: The closing clamps must be fitted at least 20 mm from the end of the respective mounting profile.

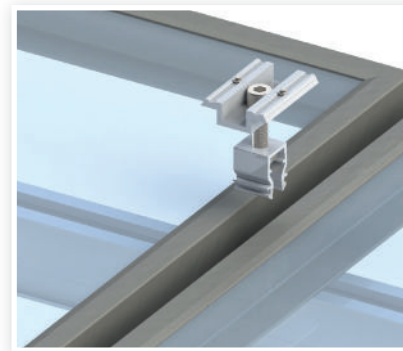


Note: When using end clamps with threaded plates, attention needs to be paid to the alignment. The threaded plate must be positioned at right angles to the profile channel.

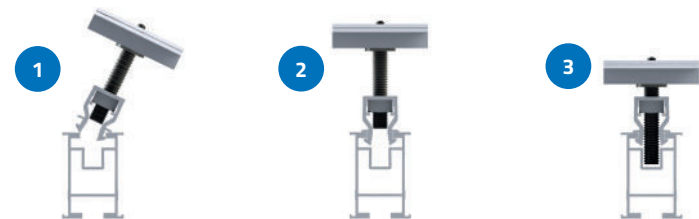
2

INSTALLING THE MIDDLE CLAMP

Place the middle clamp (Click) on the frame of the previous module and click it in at a slight angle. Push the module in so that both modules firmly touch each other. Tighten the Allen screw with a torque of **15 Nm**.



Mount the last module of each module row using closing clamps, as previously described. Mount the remaining module rows in the same way.



Please note:

- + Distance between the clamps and the ends of the Plus front piece: **min. 20 mm!**
- + Modules are only to be clamped at prescribed fastening areas! For information on which these are, please refer to the module data sheet provided by the module manufacturer.
- + Clearance (horizontal and vertical) between modules: **approx. 20 mm!**

FASTENING MODULE CABLES

1

Module cables should not hang down or rest on the roof covering. Press the clip attached to the cable tie into a profile channel of the support profile. Tie cables together using the cable tie.

Remove the clip by pushing it sideways out of the profile channel.



POTENTIAL EQUALISATION

Potential equalisation between the individual parts of the system is to be carried out in accordance with the respective country-specific regulations. The following shows one possibility for earthing the MOUNTING SOLUTIONS trapezoidal sheet roof system. Cable cross-sections and the overall earthing concept are not provided in these instructions, and will need to be calculated or created by the executing fitter in accordance with applicable standards and guidelines. Professional earthing methods other than those listed here are also possible.

1

EARTHING THE TRAPEZOIDAL SHEET BRIDGE ROWS

Insert a wire clamp into the lower profile channel of the support profile in each trapezoidal sheet bridge row. Insert the aluminium wire into the wire clamp and fix it in place by tightening the screw. Establish a conductive connection between all module rows in this manner.



Fastening the aluminium wire
using a wire clamp



Fastening the earthing wire
using a hammerhead screw.

2

EARTHING THE MODULES

Whether the modules need to be earthed is specified by the module manufacturer in the respective module data sheet. If this is the case, the potential equalisation of the modules can be established in the following manner, which is recommended by ALUMERO:

To integrate the modules into the potential equalisation, you can use MOUNTING SOLUTIONS end and middle clamps with pin. The pins sit in the clamps and pierce through the anodised layer of the module frames, thereby conductively connecting all module rows with each other.



End clamp (Click) with pin



Middle clamp (Click) with pin



All product illustrations in these installation instructions are for illustrative purposes and are not to scale. Errors and omissions excepted!

PLEASE PAY ATTENTION TO THE FOLLOWING INSTRUCTIONS!

We recommend that you read the following instructions very carefully, as they are extremely important for the handling of the product. Please also inform yourself about the safety instructions for the other system components.

SAFETY AND WARNING INSTRUCTIONS

The pitched roof system AS 2.1 has been designed exclusively for holding PV modules. Any other use is considered improper. Intended use also includes compliance with the information in these installation instructions. MOUNTING SOLUTIONS cannot be held liable for damages resulting from non-compliance with the installation instructions, in particular the safety instructions, or from misuse of the product.

- + MOUNTING SOLUTIONS accepts no liability whatsoever for loss of performance or damage of any kind to the module.

All work on the PV system should be carried out in strict accordance with these instructions. Installation, commissioning, maintenance, and repair may only be performed by persons who are appropriately qualified and authorised.

Please observe the applicable regulations and safety instructions.

The following accident prevention regulations must be taken into account:

- + BGV A 1 – General regulations
- + BGV A 3 – Electrical installations and equipment
- + BGV C 22 – Construction work (personal protective equipment against falls from a height)
- + BGV D 36 – Ladders and steps
- + Rules of the Employer's Liability Insurance Association for Safety and Health at Work BGR 203 (Roof Work) and DIN EN 516 Prefabricated accessories for roofing
- + Work attire and health and safety regulations in accordance with the regulations of the employer's liability insurance association

You must comply with the following DIN standards:

- + DIN 18299 – General rules applying to all types of construction work.
- + DIN 18338 – Roofing and roof waterproofing works
- + DIN 18360 – Metal construction work, locksmith work
- + DIN 4102 – Fire behaviour of building materials and components

Work on the systems of MOUNTING SOLUTIONS PV Systems GmbH is only to be carried out by authorised personnel. The operator of the system has the following safety-relevant obligations:



- + We require that an inspection and maintenance of the installed pitched roof system AS 2.1 components and the roof cladding is performed at least once annually. During this, at least the following aspects should be checked:
 - » Correct fit and tightness of all mechanical connections
 - » Position of the system on the roof and the system itself with regard to deformation.
 - » Wiring is intact
 - » PV modules for damage

- + Installation of the frame is only to be carried out by persons with appropriate qualifications, trade-specific skills, and a basic knowledge of mechanics.

- + It must be ensured that the persons commissioned are able to assess the tasks assigned to them and recognise possible dangers.

- + The installation instructions are a component of the product and must be available during installation.



- + It must be ensured that the installation instructions, and in particular the safety instructions, are read and understood by the personnel commissioned before installation.



- + The regulations of the employers' liability insurance association, the local health and safety regulations, and the rules of engineering must be observed.
- + Suitable lifting gear and ladders must be used for assembly. No leaning ladders are to be used.



- + It is necessary that a structural analysis of the existing building be performed by a competent civil engineer with regard to the additional loads from a PV system.
- + Applicable general load limits specified by MOUNTING SOLUTIONS PV Systems GmbH (e.g. need for snow clearance to limit snow load) must be taken into account.



WARRANTY / PRODUCT LIABILITY (EXCLUSION)

The information on dimensioning contained in these instructions merely constitutes practical advice. Binding mounting frame structural information can be generated using the program MOUNTING SOLUTIONS Solar.Pro.Tool.

As an installation company, you are responsible for the correct execution of the installation. MOUNTING SOLUTIONS PV Systems GmbH cannot be held liable for the dimensioning information contained in commercial system offerings.



As the installation company, you are responsible for the mechanical durability of the installed interface connections on the building envelope, in particular also for ensuring the absence of leaks. The components provided by MOUNTING SOLUTIONS PV Systems GmbH are designed for this purpose according to the expected loads and the valid state of the art. For this purpose, you must specify all general technical framework conditions in writing in the project description sheet (details of the supporting structure, snow load zone, building heights, wind loads, etc.) in the enquiry/order submitted to MOUNTING SOLUTIONS PV Systems GmbH.

MOUNTING SOLUTIONS PV Systems GmbH shall not be held liable in the case of improper handling of the installed parts.

Use near the sea is excluded due to the risk of corrosion.

With proper handling, dimensioning according to the structural framework conditions and normal environmental and ambient conditions, MOUNTING SOLUTIONS PV Systems GmbH grants a 2-year product guarantee on the service life and durability of the frame systems. This applies within the framework of generally prevailing weather and environmental conditions.

Material and workmanship warranty: MOUNTING SOLUTIONS PV Systems GmbH grants a material and workmanship guarantee of 10 years on the materials used. For more detailed information, please refer to the separate warranty conditions.

NOTES ON ELECTRICAL INSTALLATION



All electrical work is to be carried out by a qualified electrician. The applicable DIN standards, VDE regulations, VDEW guidelines, VDN guidelines, accident prevention regulations and the regulations of the local electricity supply company (EVU) are authoritative in this regard.

- + DIN VDE 0100 (Erection of power installations with nominal voltages up to 1000 V)
- + VDEW guideline for parallel operation of domestic power-generating systems with the low-voltage grid of the electricity supply company
- + VDI 6012 Guideline for decentralised energy systems in buildings: Photovoltaics
- + Leaflet on the VDEW guideline "Domestic power-generating systems connected to the low-voltage grid"
- + VDN Guideline "Domestic power-generating systems connected to the low-voltage grid"
- + DIN/VDE regulations, DIN/VDE 0100 "Erection of high voltage current installations with mains voltages up to 1000 V", in particular VDE 0100 Part 410 "Protection against direct and indirect contact" (DC voltages > 120 V, < 1000 V DC) and the "Accident Prevention Regulations of the Industrial Trade Associations" VBG4 "Electrical installations and equipment".
- + DIN VDE 0100-540 Selection and erection of electrical equipment - Earthing arrangements and protective conductors
- + VDE 0185 Erection of a lightning protection system and VDS 2010

IMPORTANT WARNINGS



Solar modules generate a current as soon as they are exposed to light, i.e. they are always live. Although the fully insulated plug contacts provide protection against contact, you must pay attention to the following when handling the solar modules:

- + Do not insert any electrically conductive parts into the plugs and sockets.
- + Do not install solar modules and cables when plugs and sockets are wet.
- + Perform all work on the cables with extreme caution.
- + Do not perform any electrical installation work under damp conditions.
- + Even at low light levels, extremely high DC voltages are generated at the series connection of solar modules, which are life-threatening if touched. In particular, consider the possibility of secondary damage in the event of electric shocks.



High contact voltages can occur in the inverter even when it is in a disconnected state:

- + Be especially careful when working on the inverter and the cables.
- + Even after switching off the inverter and performing subsequent work, make sure to observe the time intervals specified by the manufacturer to allow the high-voltage components to discharge.
- + Please also adhere to the installation instructions provided by the manufacturer of the inverter.



Opening a closed circuit path (e.g. disconnecting the DC cable from the inverter under load) can cause a lethal electric arc to be discharged:

- + Never disconnect the solar generator from the inverter while it is connected to the grid.

STANDARDS AND GUIDELINES

All the standards and guidelines listed have been issued for Germany and are to be applied. Please observe the respective prevailing version. Outside Germany, also observe the applicable national standards and guidelines.

NOTES ON FRAME INSTALLATION

For installation in roof areas, you will need to observe the prevailing rules of structural engineering, in particular the requirements formulated in the DIN standards and in the "Rules of the German Roofers' Association".



- + Check that all screw connections are tightly fastened.
- + Adhere to the torques specified.
- + Regardless of verifiable structural properties, you must ensure prior to every installation that the product complies with the structural requirements on site in accordance with DIN EN 1991.
- + DIN standard EN 1991 "Actions on structures" – and all associated national application documents
 - » Part 1-1: Densities, self-weight, imposed loads for buildings
 - » Part 1-3: Snow loads
 - » Part 1-4: Wind actions
- + DIN standard EN 1990: "Basis of structural design" – and all associated national application documents
- + The design of the mounting frame is carried out according to DIN EN 1993 "Design of steel structures" and DIN EN 1999 "Design of aluminium structures".
- + Ensure that the substructure is suitable in terms of its load-bearing capacity (dimensions, condition, relevant material parameters), support structure, and other layers which are affected (e.g. insulation layer).
- + Ensure that the drainage of rainwater is not impeded.
- + Consider physical building aspects (e.g. possible condensation when insulation layers are penetrated).



PRODUCT LIABILITY

The technical documentation is a component of the product. MOUNTING SOLUTIONS Systematic PV Systems GmbH cannot be held liable for damages resulting from non-compliance with the installation instructions, in particular the safety instructions, or from misuse of the products.

YOUR DISTRIBUTOR



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