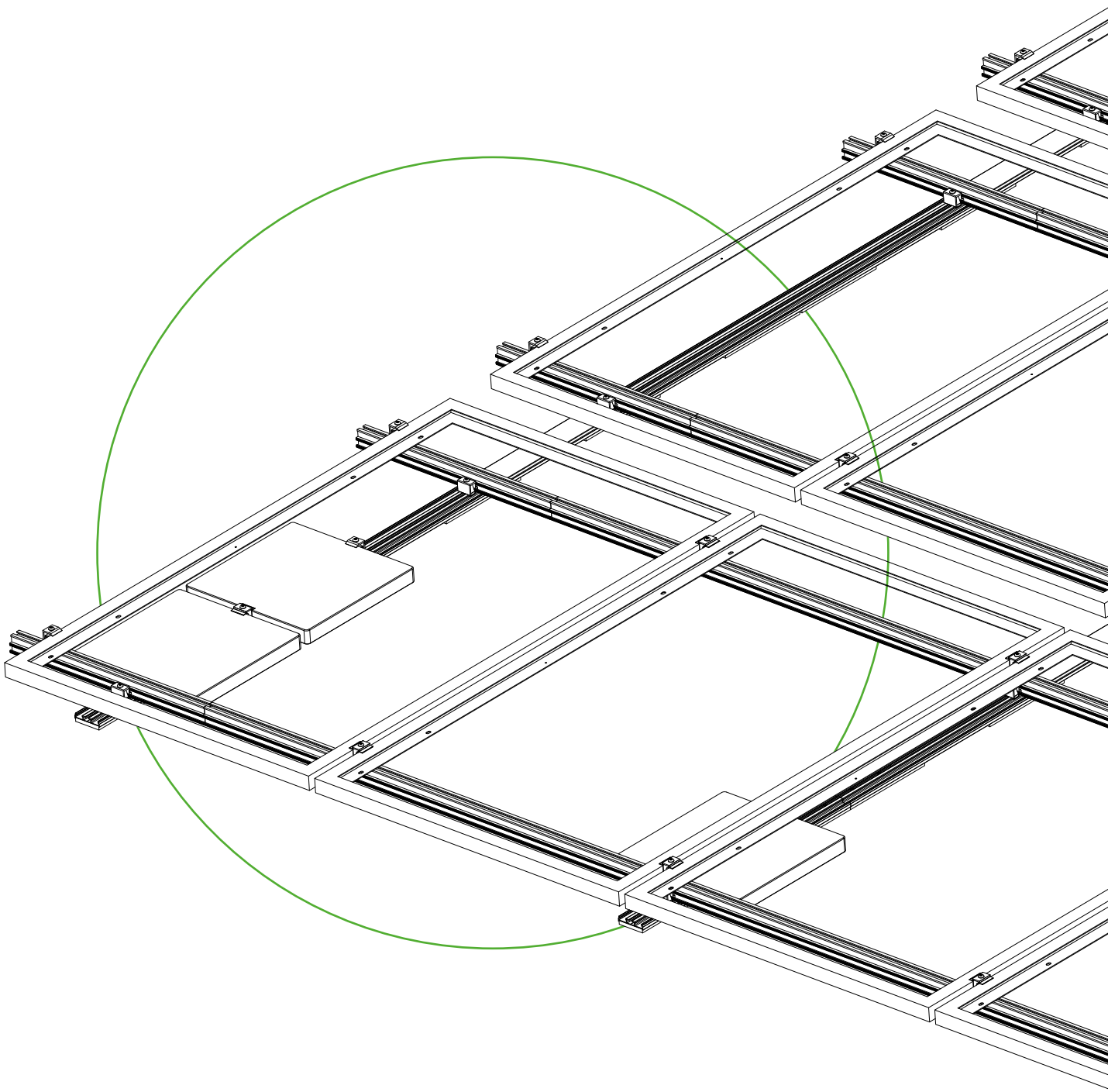
PMT FLAT DIRECT

ASSEMBLY INSTRUCTIONS



A FINISHED SYSEM
IN JUST **SIX STEPS**

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General safety instructions

Please note that our general safety instructions must be observed.

Installation by specialists only

PMT photovoltaic substructures may only be assembled and commissioned by qualified personnel. These persons must be able to ensure the proper and professional assembly of our products on the basis of their professional aptitude, which they have acquired, for example, through training or professional experience.

Before assembly starts:

1. Check the structural requirements of the roof and the building:
Before installing the PMT photovoltaic substructure, it is imperative that the customer checks whether the roof and building structure permits the safe installation and operation of the photovoltaic system. This must be checked on site by a qualified person, e.g. a structural engineer, before installation. The information in the project report is based only on planning assumptions, which do not necessarily have to correspond to the conditions on site. Static requirements must therefore be clarified on site and in advance of assembly. Before proceeding, ensure you have confirmation from a qualified person and do not begin assembly without such a document.

2. Compliance with building and accident prevention regulations:
National and local building regulations, standards and environmental protection regulations must be strictly observed.

Occupational safety and accident prevention regulations as well as the regulations of professional associations must be observed.

In particular, the following must be taken into account:

- It is necessary to wear safety clothing [esp. safety helmet, work shoes and gloves].
- For roof work, the regulations for work on the roof must be observed [e.g. use of fall protection, scaffolding with safety gear from an eaves height of 3 m etc.].
- The presence of two people is mandatory for the entire assembly process in order to be able to provide rapid assistance in the event of an accident.

3. Check assembly instructions for updates:
PMT assembly systems are subject to continuous further development. Assembly procedures can change as a result. Therefore, be sure to check the assembly instructions for updates before assembly. They can be found at **https://pmt.solutions/downloads/.** On request, we will also be happy to send you the current version of the assembly instructions.

During the entire assembly time, it must be ensured that a copy of the assembly instructions is available to each installer.

4. The module manufacturer's assembly instructions must also be observed.

5. Equipotential bonding between the individual system parts must be carried out in accordance with the relevant country-specific regulations.

PMT assumes no liability for damages resulting from non-compliance with general safety instructions.

General System Notes

a. Basics of planning with PMT PLAN

What is PMT PLAN for?

PMT PLAN is used to plan the substructures distributed by PMT on roofs on the basis of data entered by the user and the planning assumptions based on this, which are stored in PMT PLAN.

Who can use PMT PLAN to make plans?

Requirement of expertise for planning with PMT PLAN
The proper and correct use of PMT PLAN requires expertise and experience not only in the field of substructures for solar power systems, but also in the construction industry with regard to the roofs on which the entire system is to be used by the end customer.

How does PMT PLAN make plans?

1. Data input by the user as the basis for planning
The starting point and basis for planning with PMT PLAN is always and exclusively the project data entered by the user. PMT does not check the accuracy of these data. Rather, the user is solely responsible for correct data collection and entry in PMT PLAN.

Attention: If the data is not collected and/or entered correctly by the user, this will have an impact on planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

2. Planning assumptions in PMT PLAN
PMT PLAN processes data entered by the user and uses certain planning assumptions in the process. These planning assumptions in turn result from technical regulations that underlie the calculations of PMT PLAN.

Which planning assumptions underlie the concrete planning can be taken from the project report?

PMT PLAN takes into account the Eurocodes, i.e. the European-wide uniform rules for measurement in the construction industry, including national annexes, as well as national building regulations.

PMT endeavours to ensure the up-to-dateness of the Eurocodes taken into account by means of updates. However, we would like to point out that after the publication of new rules, a certain period of time is always required to implement them in the software, which is why there is no entitlement to appropriate updates and the user is always responsible for observing the latest state of the rules on which the program is based.

The rules are applied on the basis of the specified location. It is the responsibility of the user to check planning assumptions for their correctness.

Attention: If planning assumptions are not checked by the user for correctness, this has an impact on the planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

3. What is the purpose of the project report?
What does “What's important is what's on the roof” mean?
PMT PLAN creates a project report based on the user's input. However, this planning report cannot and should not replace the expert planning based on actual conditions on site.

The project report is therefore not the end of your project planning, but the beginning.

The only appropriate professional approach is the following, which is the sole responsibility of the user:

First step: Before ordering the photovoltaic substructures and even more so before assembling them on the roof, the user must check the correctness and plausibility of the data, planning assumptions and results in the project report.

Second step: ("What's important is what's on the roof!") It is imperative that the user verifies the project report also on the basis of the actual conditions on the roof. In our experience, project-specific features must be taken into account for each roof, which usually only arise on the roof on site.

If the user does not have the necessary expertise to review the project report, they must consult an expert for this purpose.

If changes arise from these mandatory audit steps compared to the project report, a new planning must be carried out with the changed data in PMT PLAN.

Attention: If the data is not verified or is not correctly verified by the user based on the actual circumstances, this has an impact on the planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

4. In addition, which other technical requirements must always be observed by the customer and checked independently?

a. Technical requirements for the roof and its components

PMT PLAN assumes that the roof and its components are suitable for the installation of a photovoltaic system and that the customer has had this verified by an expert prior to planning.

PMT PLAN does not guarantee the compatibility of the PMT photovoltaic substructure with the roof in terms of roof covering, roof substructure and roof construction. Rather, this is to be checked by the user themselves.

Before installation, users must ensure that the functional layers of the roof structure (e.g. waterproofing layer, thermal insulation layer) are suitable and designed for the installation of solar power systems. In particular, it must be ensured by the user that the suitability for use of the thermal insulation layer continues to exist despite the additional loads which arise as a result of the assembly of the solar power system (substructure and solar modules).

Tip: To do this, obtain the approval of the manufacturer of the individual components and verify the manufacturer's specifications with the conditions on site on the roof.

The user must check the suitability, load-bearing capacity and serviceability of the entire roof structure for the assembly of the solar power system as a whole.

A structural engineer must be consulted to check the loadbearing capacity. PMT-PLAN does not replace this check under any circumstances.

Attention: If the user does not check the compatibility of the photovoltaic substructure with the roof and/ or does not check it properly, this will have an impact on the planning. Changes may lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

b. Static requirements

PMT PLAN does not take into account the static requirements of the building on the roof of which the solar power system is to be built.

Building and roof statics must therefore be professionally checked by the user before assembly on his own responsibility.

A structural engineer must be consulted for this purpose. PMT-PLAN does not replace this check under any circumstances.

Attention: If the building statics are not checked or not checked correctly by the user, this has an impact on the planning. Changes can lead, among other things, to deviating quantities of material and deviating static requirements. This may lead to personal injury as well as financial losses for which PMT assumes no liability.

c. Photovoltaic modules

PMT-PLAN enables planning with a variety of photovoltaic modules. However, due to the large number of photovoltaic modules available on the market, not all modules are stored in the database. Missing modules are added to the database on a separate request based on the module manufacturer's data sheet.

PMT does not guarantee that the module data is up to date. In particular, dimensions and weight parameters must be verified by the customer before planning.

PMT-PLAN only takes into account the dimensions and weight of the modules. Other parameters are not taken into account.

Therefore, please check the compatibility of the module with the substructure before assembly on the basis of the assembly guidelines of the module manufacturer.

PMT-PLAN requires that the module may also be used in the mounting form clamping on the short module sides. Therefore, please check whether the clamping points of the module comply with the manufacturer's specifications before assembly. If the connection points do not correspond to the specifications of the module manufacturer, it is recommended that the module manufacturer be contacted in order to obtain approval of the planning.

This approval can either be generally available as part of the module certification or possibly also be granted by the module manufacturer on a project-specific basis.

Attention: If the user does not clarify the compatibility of the substructure with the solar modules, this can lead to financial losses for which PMT accepts no liability.

d. Securing the solar power system against shifts due to thermal expansion (so-called "caterpillar effect")

The solar power system is exposed to constant temperature fluctuations on the roof. This can lead to very slow downward movements of the substructure on the roof sealing over the course of the service life of the solar power system, even with a very flat roof pitch. This process is also referred to as "temperature migration" or more vividly as the "caterpillar effect".

The gradual displacement of the solar power system on the roof can lead to damage to the cabling, the roof covering (such as, for example, foil, bitumen, gravel, substrate, etc.) of the further functional layers and any rising components present (such as, for example, skylights, aeration and ventilation systems, drainage systems, chimneys etc.). In the worst case, the solar power system can gradually move beyond the roof edge over time.

In order to prevent this damage, we have decided to give a general recommendation for a connection from 1.0° roof pitch.

This follows from a recommendation of the German Solar Industry Association (Bundesverband Solarwirtschaft e. V. – BSW-Solar), titled: "Position Securing Due to Thermal Expansions ("Temperature Migration")".

Suitable measures for securing the solar power system against displacements due to thermal expansion are, for example, the coupling of module fields via the roof ridge or selective fastening of the system to the roof structure.

With the introduction of the new version of the EVO 2.1 system with ProPlate and its mechanical attachment to the ground profile, we are adapting our recommendation for connecting the EVO 2.1 system to a flat roof. However, this amended recommendation only applies to the EVO 2.1 system. The connection to the roof must only be made from a gradient of about 2% (roof inclination about 1.15°), provided that the following requirements are met:

- The **PMT checklist** must be completed in full and has been taken into account in the planning.

- Compliance with the following **maintenance routine** by PMT's customer:

Maintenance interval	Shift	Measure
Annual maintenance	No shift	No need for action
annual maintenance	up to approx. 2 cm	Inspect the situation with special attention during the next maintenance
annual maintenance	2-3 cm	Intermediate inspection after approx. 6 months
Intermediate inspection (6 months)	further shift of 1.5 cm or more	subsequent mechanical connection

Attention: Failure to secure the solar power system against displacement due to thermal expansion may lead to personal injury as well as property and financial losses for which PMT assumes no liability.

Route connection

The connection of cable routes to the PMT substructure is not part of the structural calculation of the module fields in PMT PLAN. Consequently, the structural stability of the cable routes used must be ensured on site. The components provided by PMT for supporting and connecting the cable routes to the PMT substructure (description: "Route Support" and "Adapter to Tower") are solely intended to provide support for the cable routes/cable trays used on site.

The Adapter to Tower component has a designated breaking point to ensure that no forces that could endanger structural stability are transferred to the PMT substructure. Before any such forces can be transferred to the PMT substructure, an intentional material failure is induced in the Adapter to Tower component. This means that the component will break to prevent compromising the stability of the main substructure.

Assembly Instructions and Maintenance

Assembly instructions

Assembly should not begin until the construction manager's written instructions have been received.
The components of PMT's installation system are used exclusively for fastening PV modules. Depending on the type of roof on the building and the characteristics of the roof, the components intended for this purpose should be used. The exact item details can be found in the project documents, consisting of the project report and the CAD plan.

When using the assembly system, it is essential to observe the assembly instructions, safety instructions and system instructions.

In the event of improper use of the components, noncompliance with the notes and the use of components not belonging to the system, all warranty, guarantee and liability claims against PMT are void. The user is liable for damage and consequential damage to other components, PV modules or the building, as well as for personal injury.

Before starting the assembly, the compatibility between the roof skin and the assembly system must be tested and ensured and the roof checked for damage of any kind. These must be recorded in the **Roof Inspection Protocol**. Repair work may be necessary.

In the case of very uneven roofs or roof seals, compensation measures must be taken if necessary to ensure uniform load introduction. In order to ensure a flat support of the main bottom profiles on the roof skin, the roof surface must be cleaned before construction begins and impurities, such as moss, leaves, dirt, stones, etc. removed.

The necessary distances to the roof edges specified in the project documents must be observed. The maximum module field size depends on the type of roof. In the case of roofs with substrate or gravel fill, it must be ensured that a sufficiently non-slip connection is made.

The surface load must not exceed the residual load-bearing capacity of the building. It must be ensured that the runoff of rainwater is not hindered. Roof drainage must be included in the assembly planning.

It must be checked whether lightning protection provisions have to be changed and reworked as a result of the assembly of the PV system. A thermal separation (distance between module fields) must be maintained according to the PMT PLAN project documents.

Attention: If the actual module dimensions exceed the module widths specified in the table, assembly must not be started.

The specified tightening torques in these assembly instructions must be strictly observed.

After events such as storms, heavy rain, earth movements, etc., the system must be checked by a specialist for damage. If damage is detected during the inspection, these must be remedied immediately. Defective components must be replaced by new components.

Maintenance

Photovoltaic substructures are not maintenance-free. Maintenance, in particular of the correct positioning of the ballast stones and the building protection mats, must be carried out annually and documented in a maintenance log. Furthermore, all components of the PMT mounting system must be checked at regular intervals and documented accordingly. We recommend annual maintenance as per our **Maintenance Protocol**.

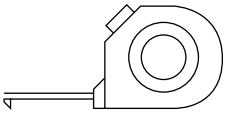
The recommendations for maintenance routines of the EVO 2.1 system due to thermal expansion must be observed.

After exceptional strong-wind events, we recommend maintenance immediately after the strong-wind event.

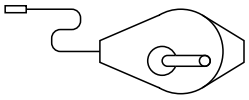
Attention: Failure to maintain the assembly may lead to personal injury as well as financial losses for which PMT assumes no liability.

Required Tools

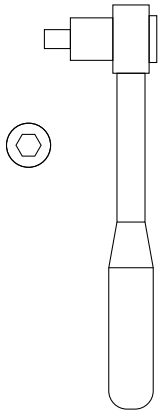
1 Tape measure



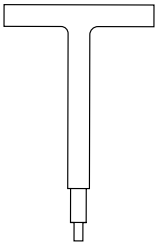
2 Chalk line



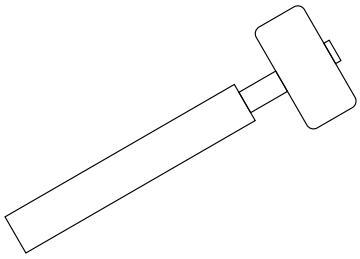
3 Torque-wrench with attachment Hexagon socket SW 5 mm



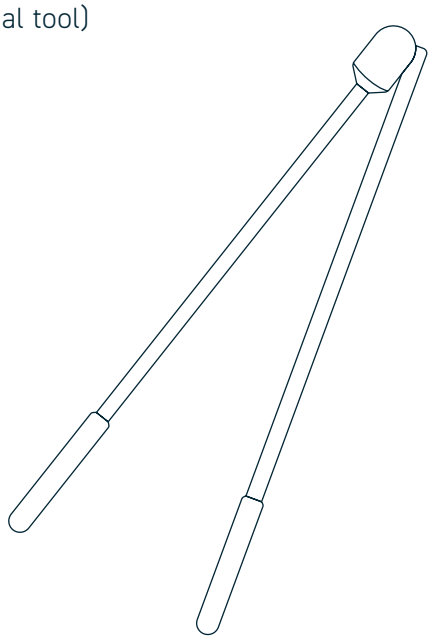
4 T-handle (or impact spanner) with attachment Hexagon socket SW 5 mm



5 Rubber hammer (optional tool)



6 Bending tool (optional tool)

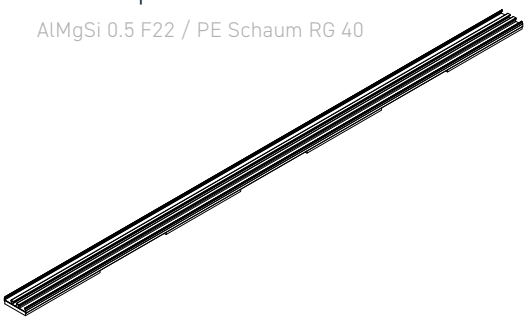


Attention! Some components are available in different lengths and versions.
The exact lengths of components that need to be cut can be found in the corresponding plan in the project report

Component Types

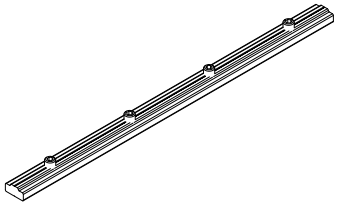
A Ground profile

AlMgSi 0.5 F22 / PE Schaum RG 40



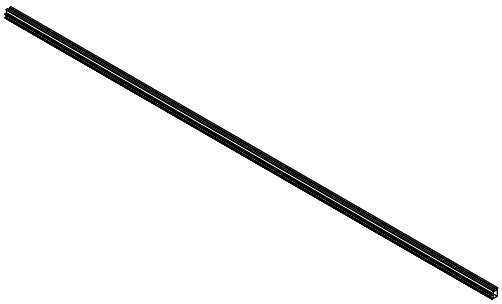
B Ground profile connector

Al 6061



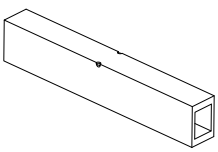
C Mounting rail

Aluminium EN-AW-6063 T6



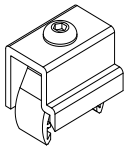
D Mounting rail connectors

3.3211 - EN AW 6061 T6 (EP)



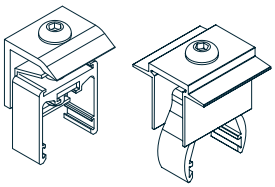
E Crossbar connectors

3.3206 - EN AW 6063 T6

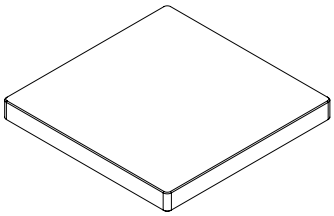


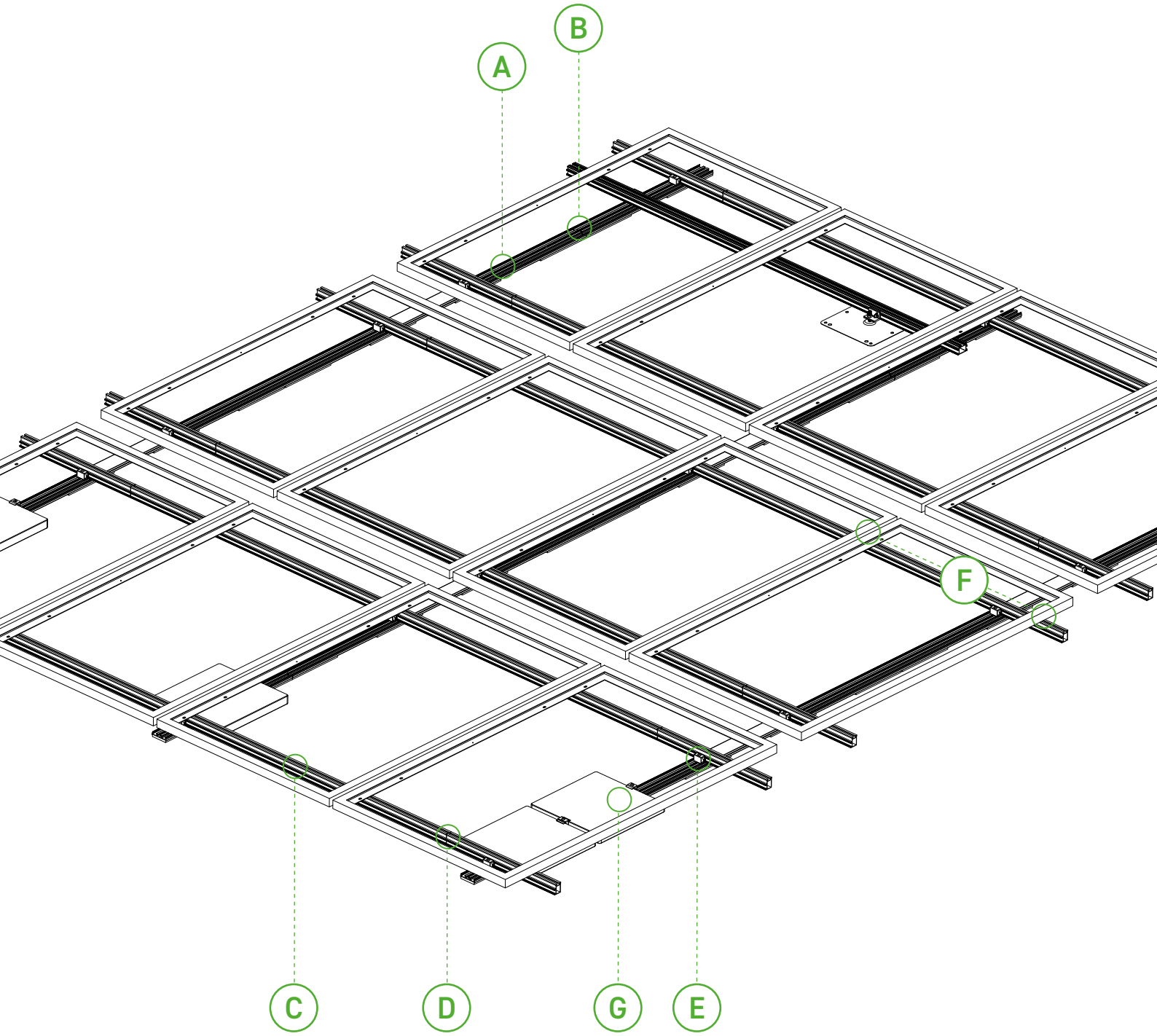
F Middle and end clamp

AlMgSi 0.5 F22 / 1.4301



G Ballast stone with the standard dimensions 40 × 40 × 4 cm (not included in delivery)





A Ground profile

B Ground profile connector

C Mounting rail

D Mounting rail connectors

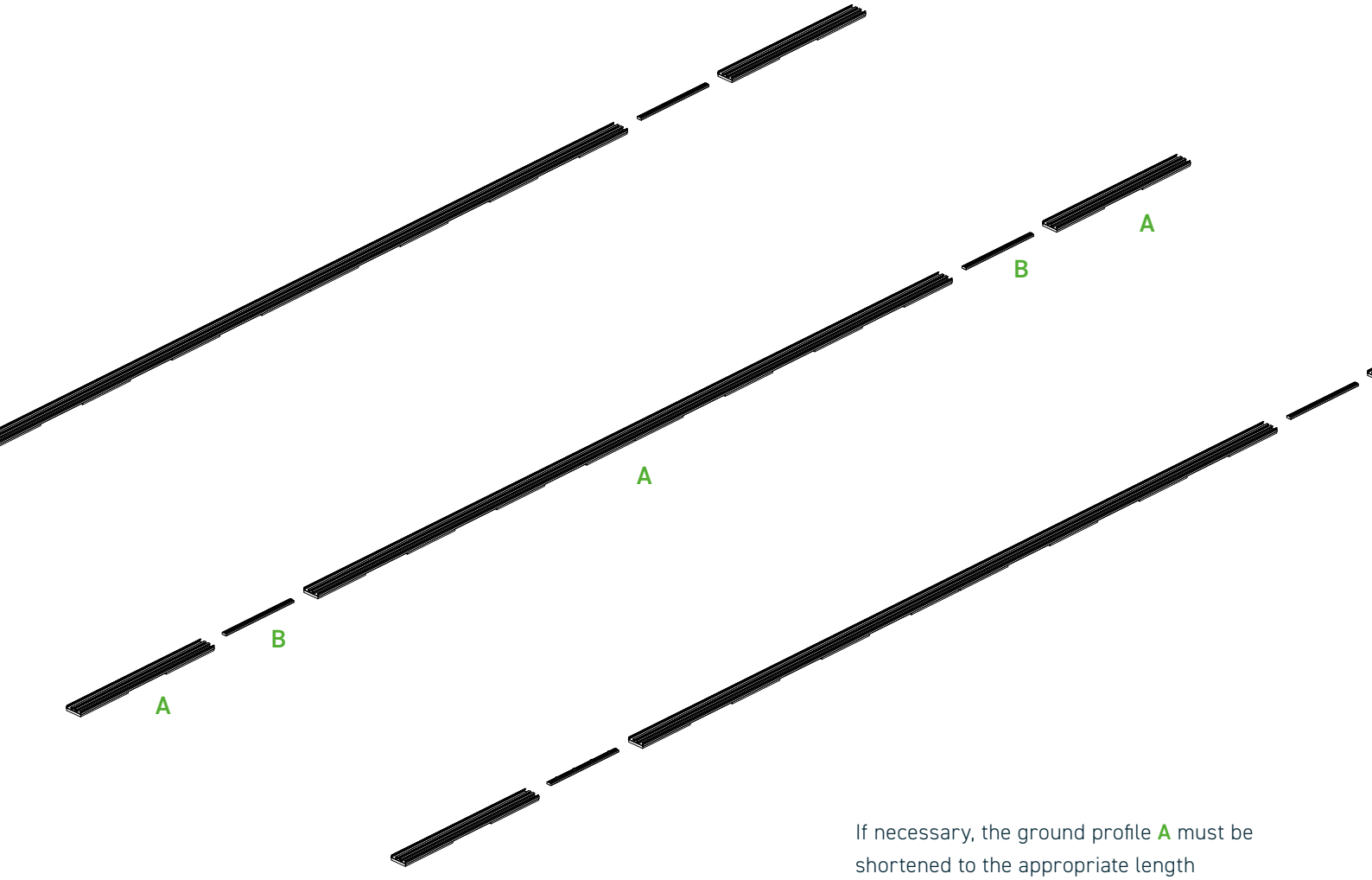
E Crossbar connectors

F Middle and end clamp

G Standard ballast stone

1

Position ground profile **A** and connect with ground profile connector **B**.



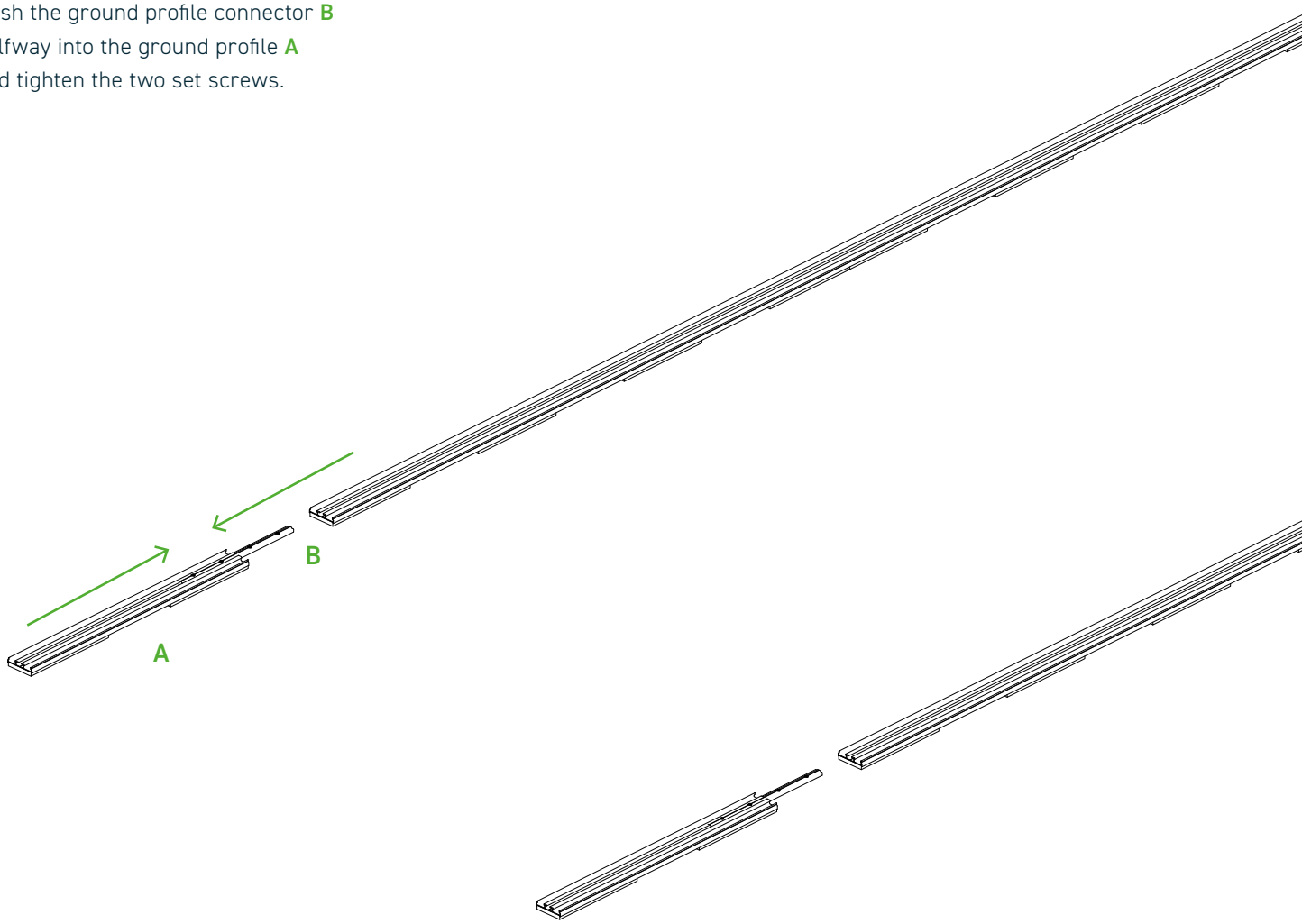
If necessary, the ground profile **A** must be shortened to the appropriate length according to the planning documents before installation. The end of the ground profile **A** must always be covered with a protective mat.

Attention:
Failure to do so may result in damage to the roof skin.

Ground profile **A** and ground profile connector **B** must be positioned one behind the other in accordance with the planning documents.
The ground profiles must be installed from the high point to the low point.

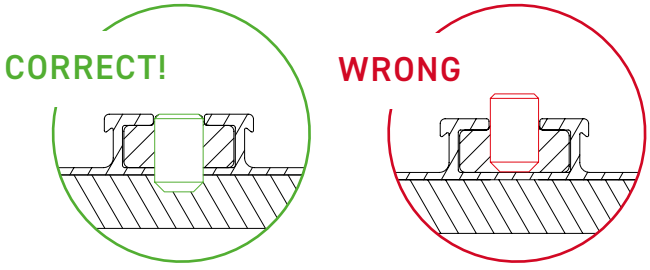
1.1

Push the ground profile connector **B**
halfway into the ground profile **A**
and tighten the two set screws.



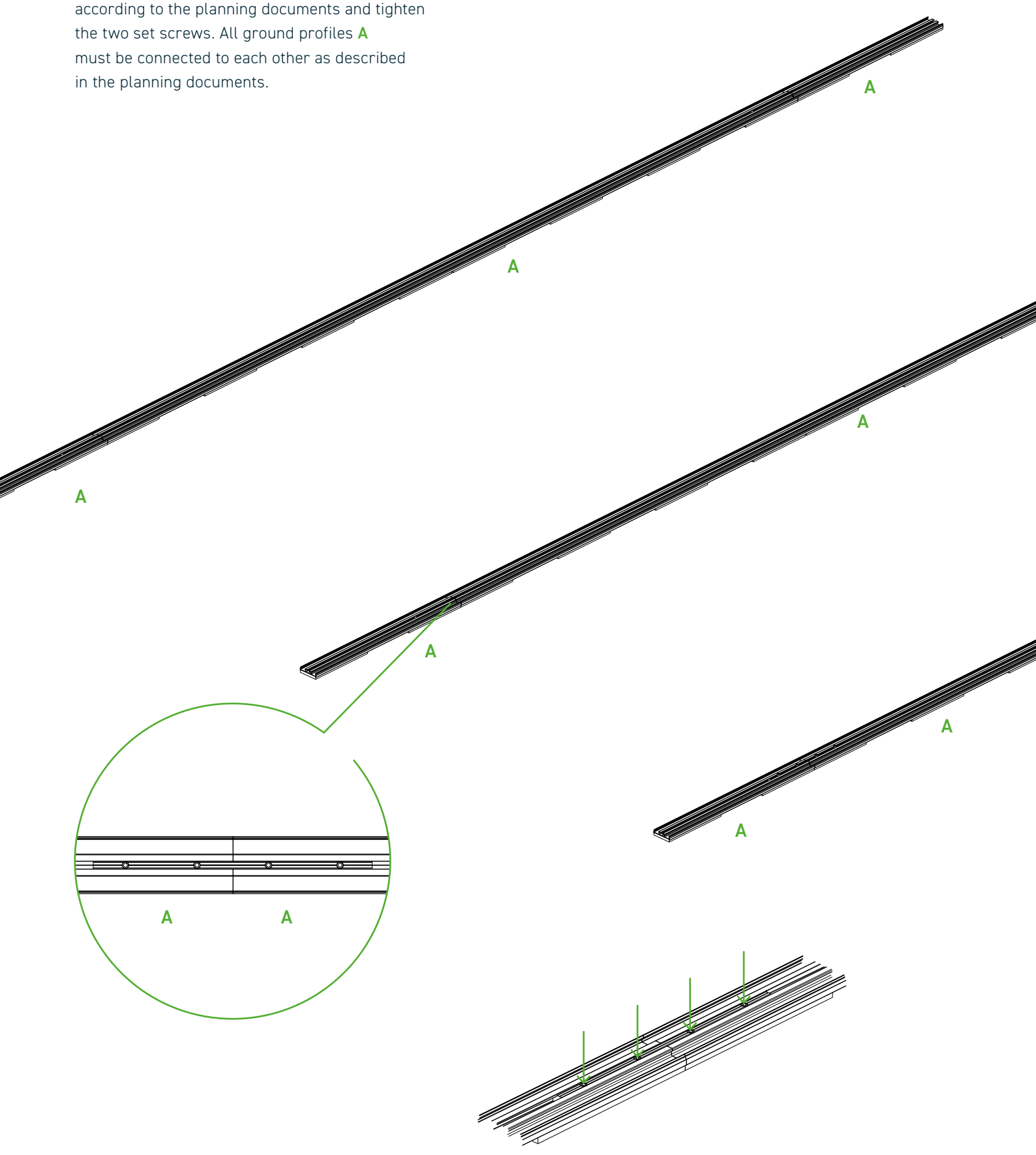
Attention:
Do not screw in the set screw too deeply.

The set screw must be countersunk
at least flush with the connector.



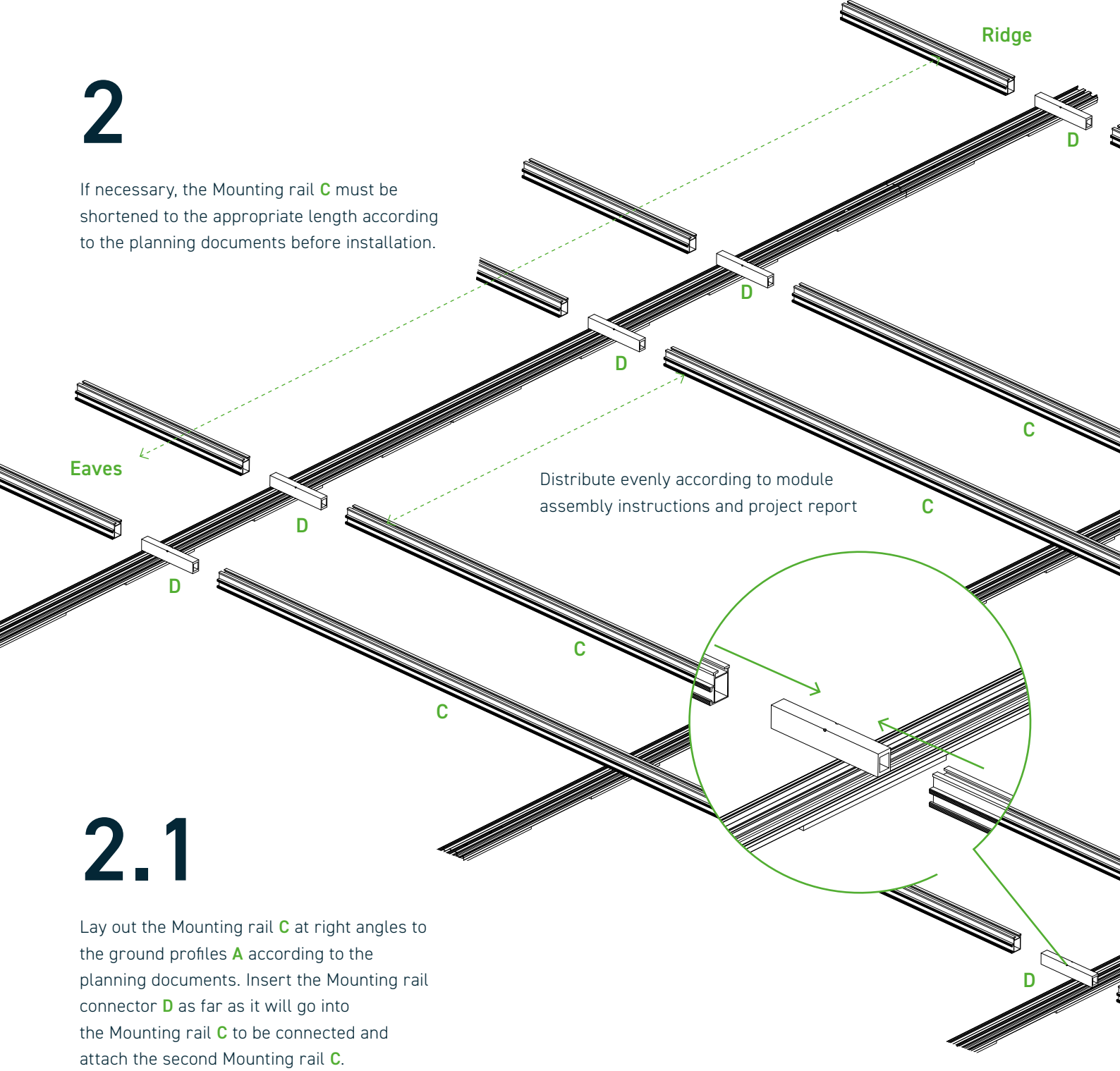
1.2

Insert the ground profile **A** that follows according to the planning documents and tighten the two set screws. All ground profiles **A** must be connected to each other as described in the planning documents.



2

If necessary, the Mounting rail **C** must be shortened to the appropriate length according to the planning documents before installation.



2.1

Lay out the Mounting rail **C** at right angles to the ground profiles **A** according to the planning documents. Insert the Mounting rail connector **D** as far as it will go into the Mounting rail **C** to be connected and attach the second Mounting rail **C**.
If necessary, use the rubber hammer to make it flush.

The cross bar connector **E** must always be attached to the side of the Mounting rail **C** facing the low point of the roof. To do this, ensure that the Mounting rail **C** is correctly positioned on the ground profile **A**.

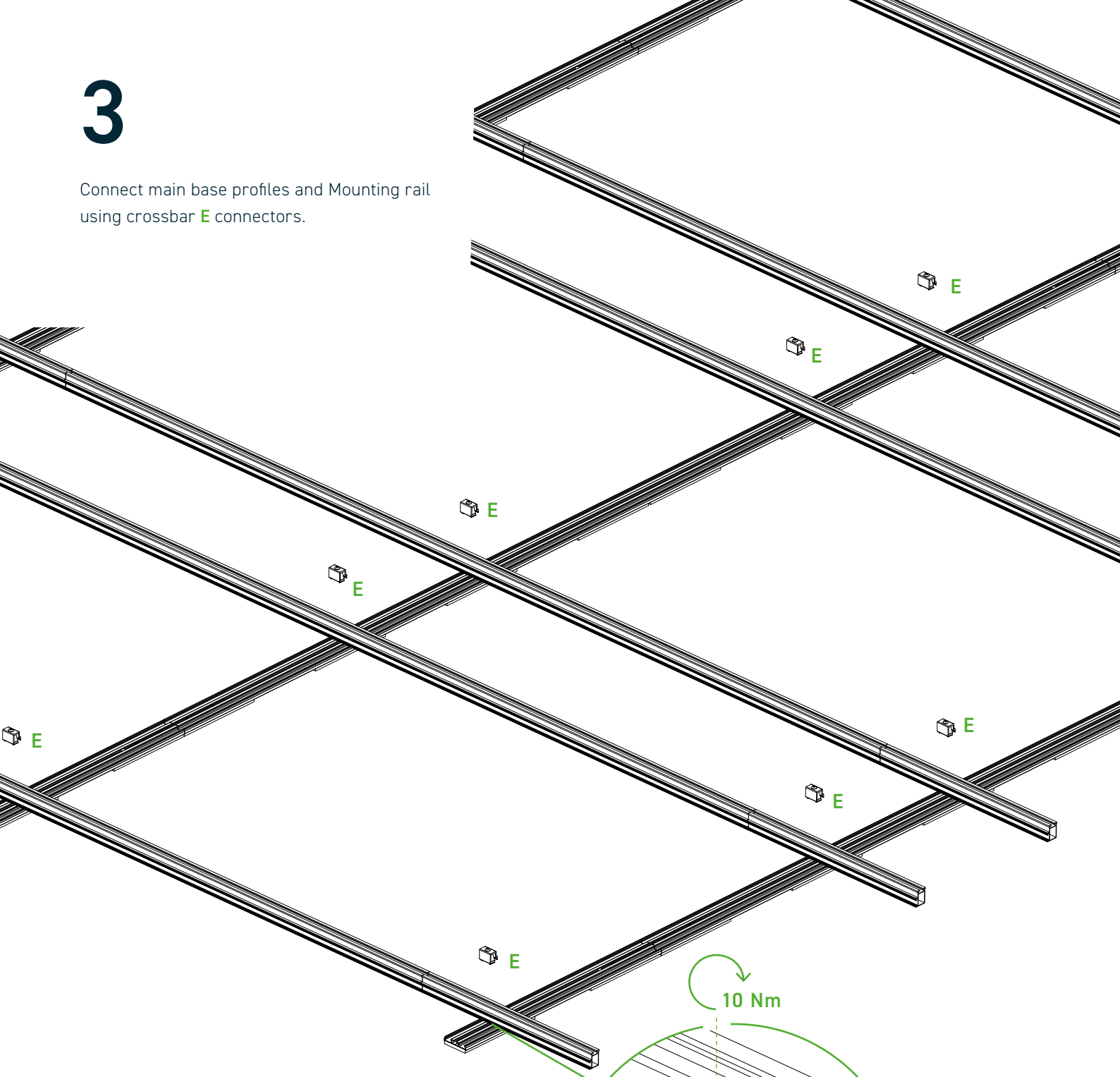
Attention:
There must be enough space for the ballast stones as specified in the project report.

Maintain the distance between clamps in accordance with the module's installation instructions.

The first two requirements may be in conflict with each other; this makes an on-site check of the module mounting dimensions (as described above) necessary.

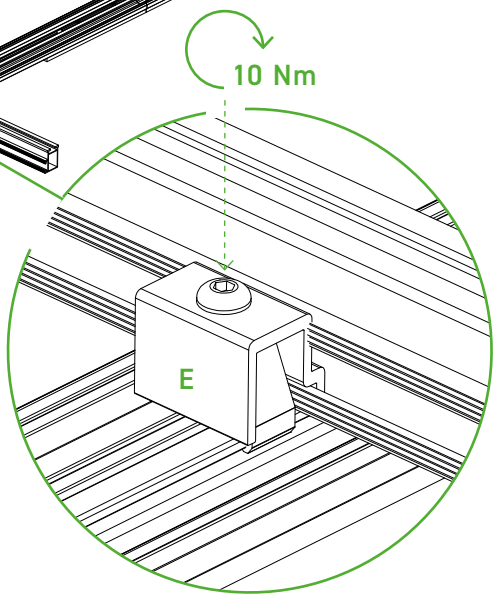
3

Connect main base profiles and Mounting rail using crossbar **E** connectors.



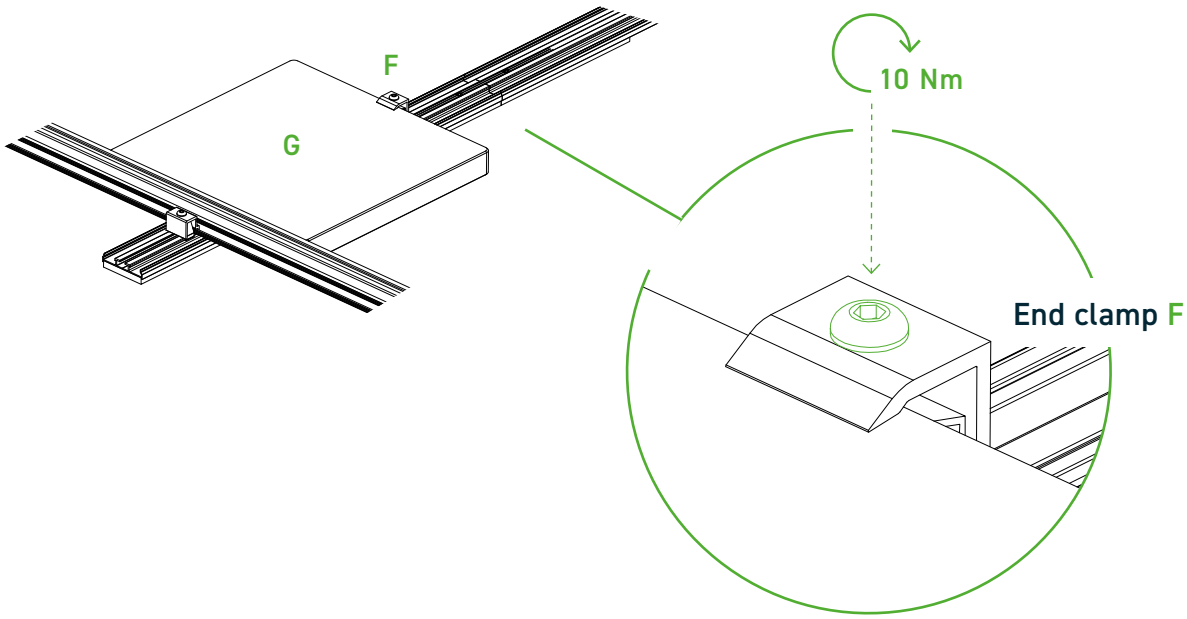
Install the Mounting rail strips on the ground profile **A** using crossbar **E** connectors. To do so, click the crossbar connector **E** onto the ground profile **A** and connect it via the lateral mounting channel of the Mounting rail **C**. Crossbar connectors must always be installed on the eaves side of the Mounting rails.

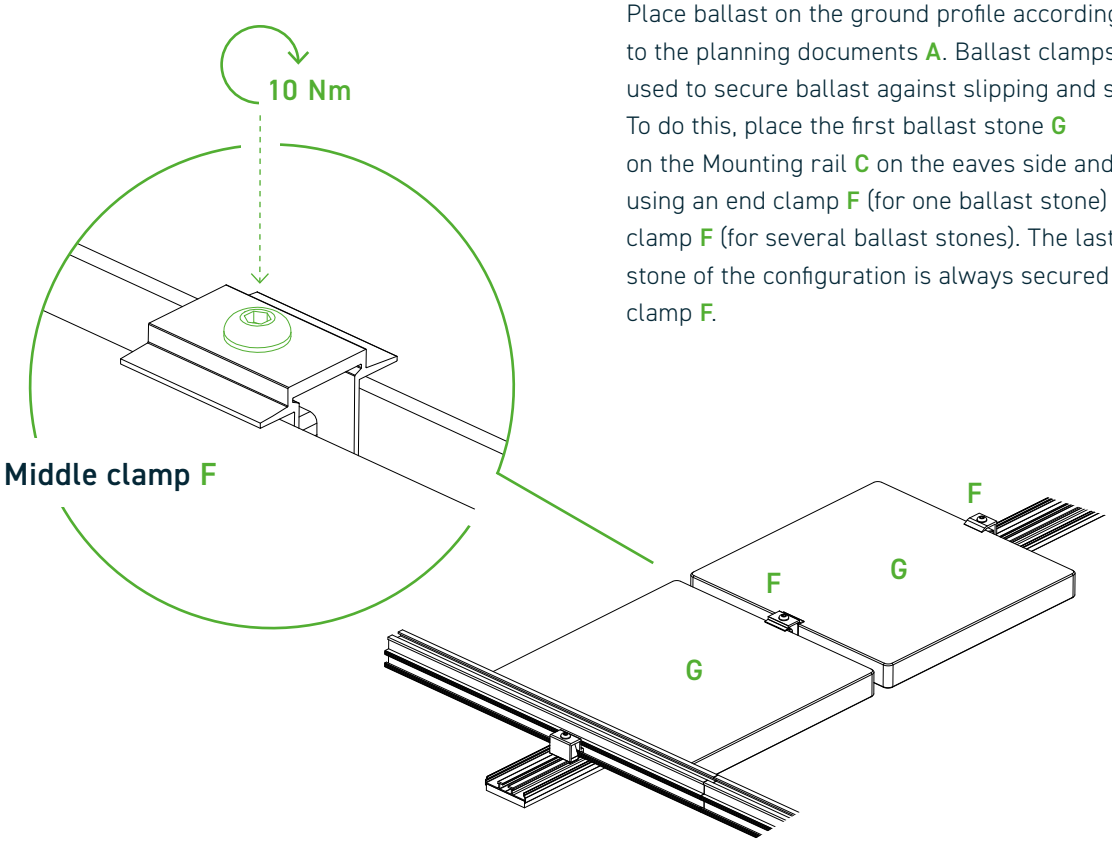
Note that the tightening torque of 10 Nm is used for locking.



4

Position ballast stones **G** and secure with middle and end clamps **F**.



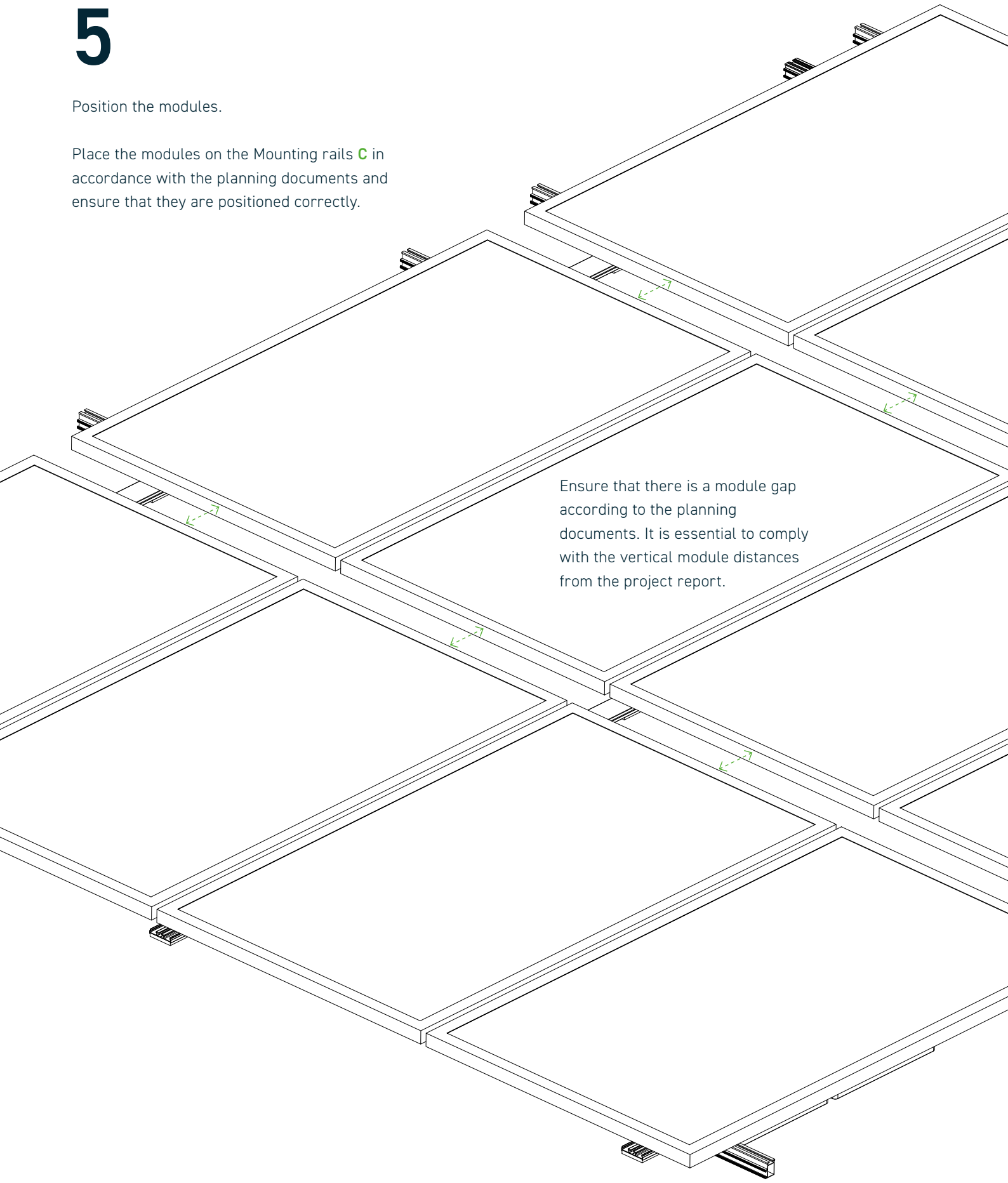


Place ballast on the ground profile according to the planning documents **A**. Ballast clamps **F** must be used to secure ballast against slipping and shifting. To do this, place the first ballast stone **G** on the Mounting rail **C** on the eaves side and secure it using an end clamp **F** (for one ballast stone) or a middle clamp **F** (for several ballast stones). The last ballast stone of the configuration is always secured with an end clamp **F**.

5

Position the modules.

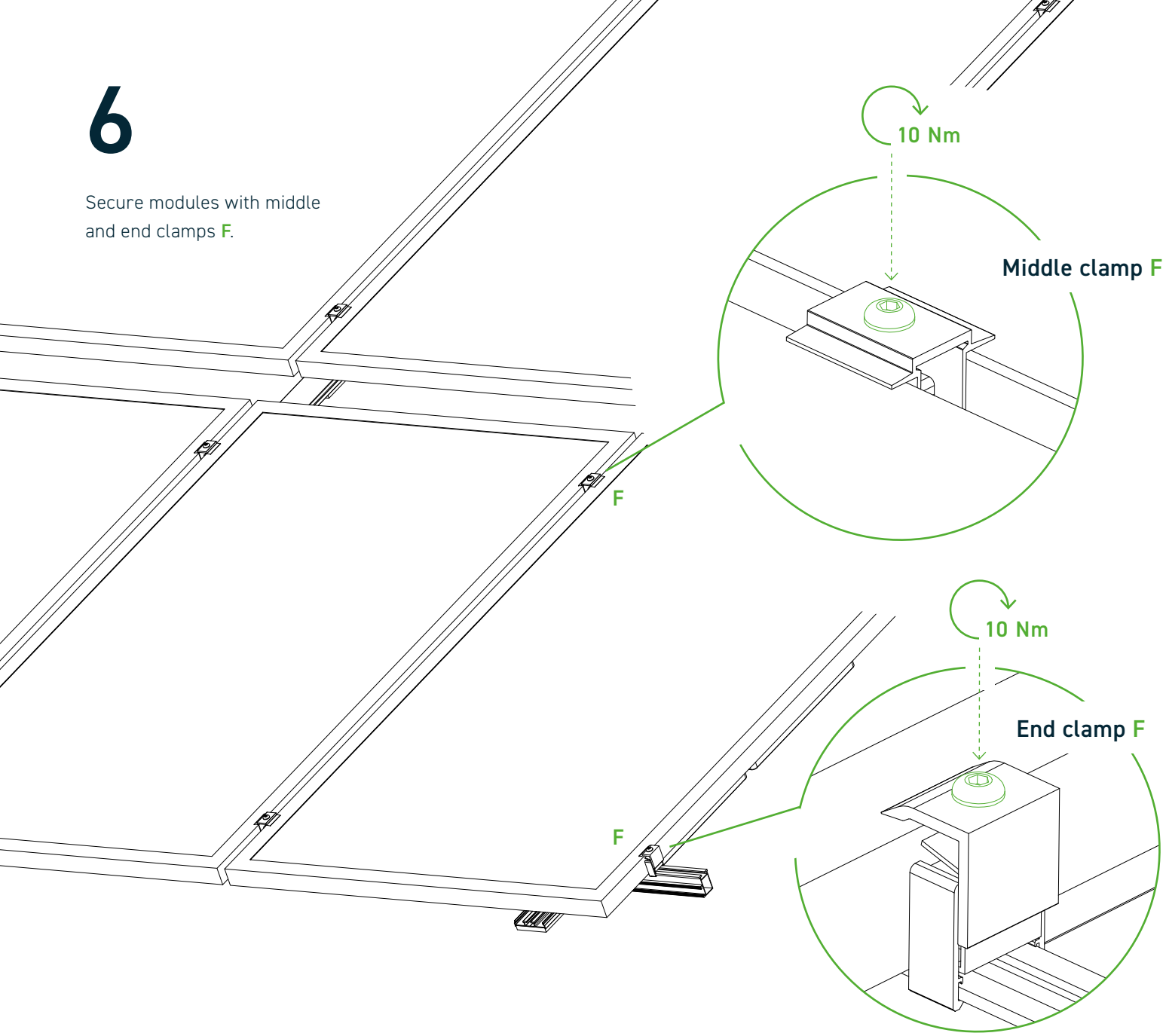
Place the modules on the Mounting rails **C** in accordance with the planning documents and ensure that they are positioned correctly.



Ensure that there is a module gap according to the planning documents. It is essential to comply with the vertical module distances from the project report.

6

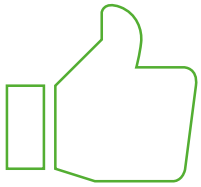
Secure modules with middle and end clamps **F**.



Place the middle and end clamps **F** on the guide groove of the Mounting rail **C** and press them onto the opposite guide groove until you hear the snap lock engage. Ensure that the clamps are seated securely and flush in the guide grooves.

Make sure that the middle and end clamps **F** are positioned flush and correctly on the module. Then tighten the locking screws. The assembly instructions of the module manufacturers must be observed. Note that the tightening torque is 10 Nm.

DONE WITH THE BASIC SYSTEM!

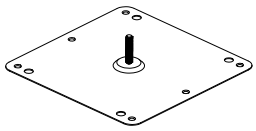


Attention! Some components are available in different lengths and versions.
The exact lengths of components that need to be cut can be found in the corresponding plan in the project report

Optional component types

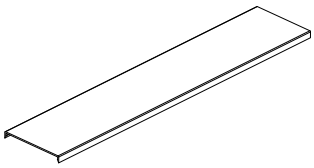
1 Connection set

Al 6061



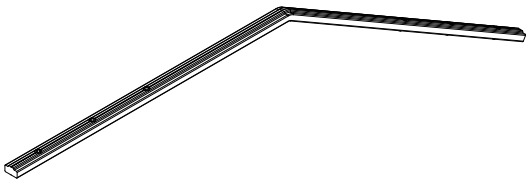
2 Cable channel cover

Al 6061



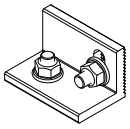
3 Ridge connector

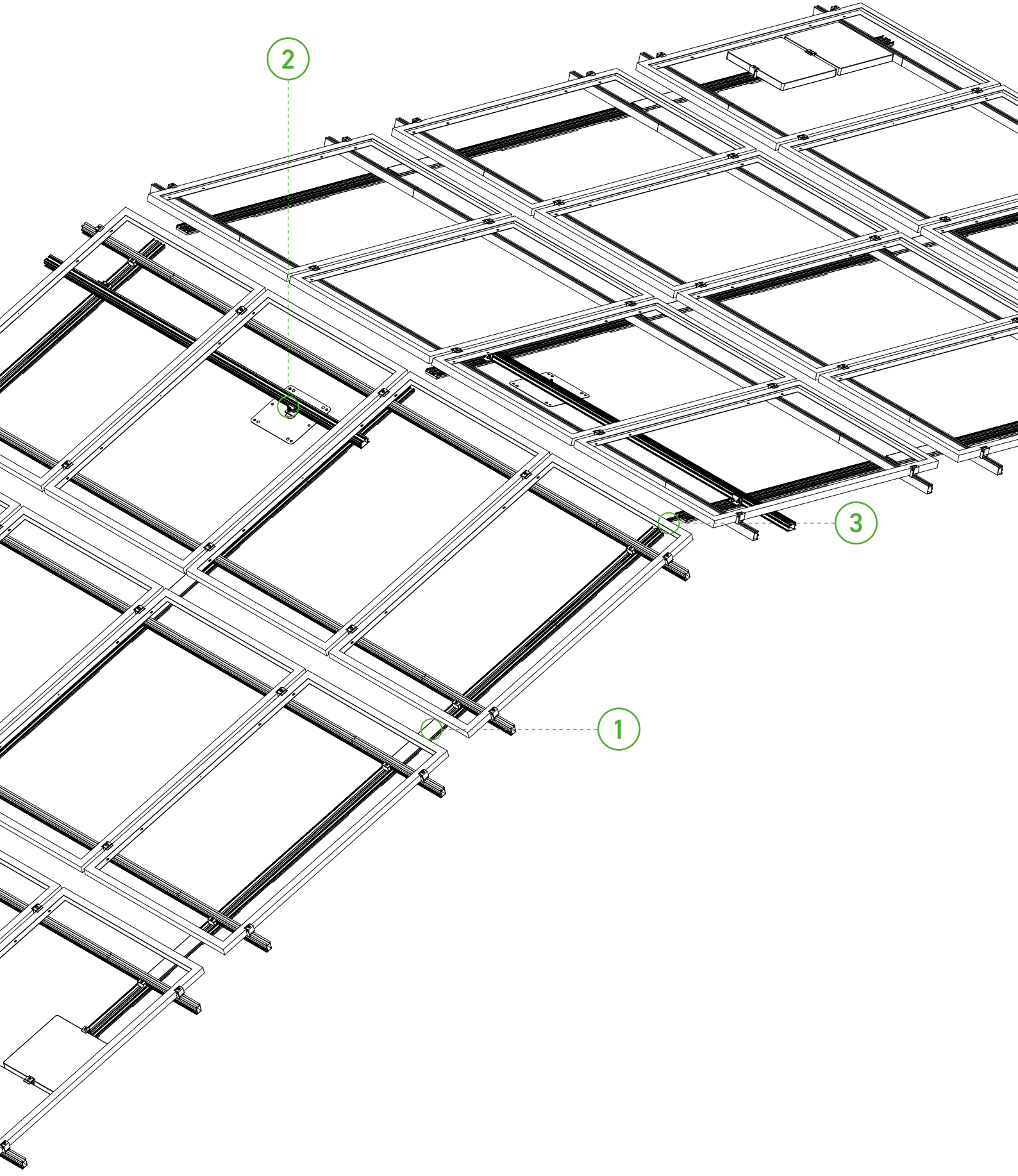
3.206 - EN AW 6060 T66



4 Cross profile connector 40 mm, M8 fastening

Aluminium EN-AW-6063 T6





1 Cable channel cover

2 Connection set

3 Ridge connector

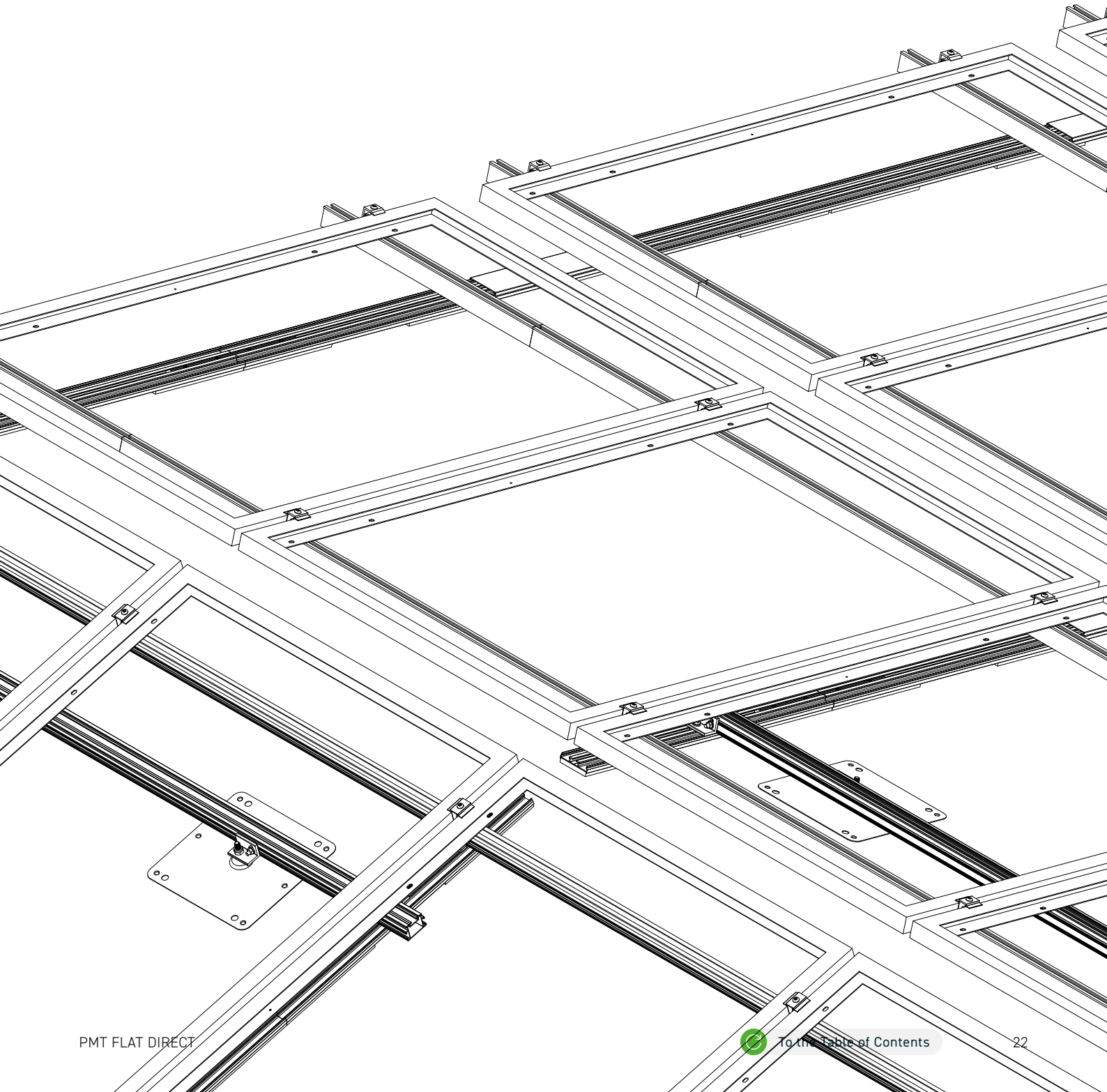
Assembly of special components

Optional installation steps:

1 **Connection set**

2 **Cable channel cover**

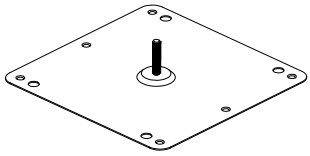
3 **Ridge connector**



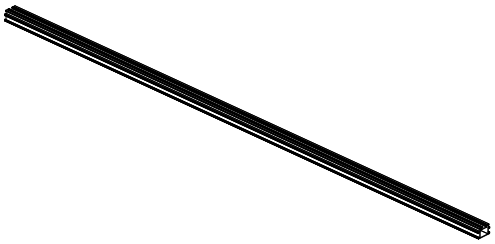
1

OPTIONAL ASSEMBLY STEP
FASTENING THE CONNECTION SET

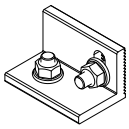
Component
Connection set



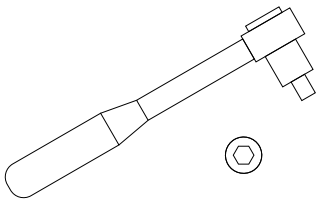
Mounting rail connection point



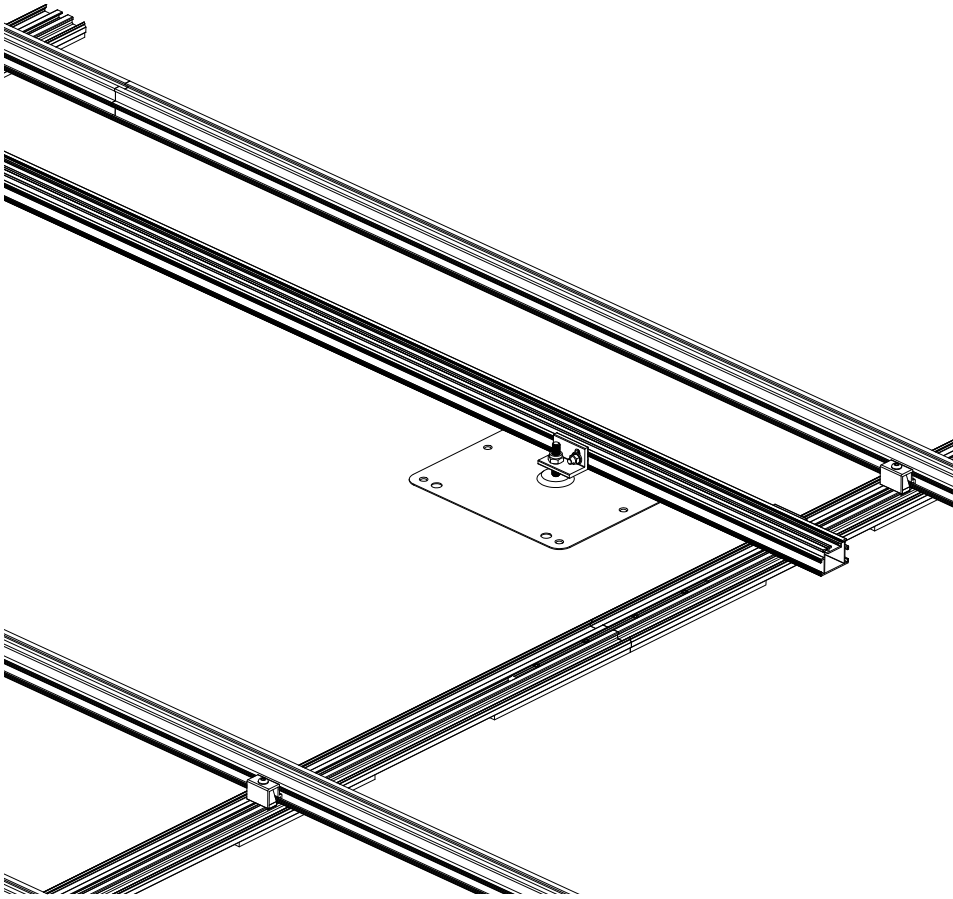
Cross profile connector plate



Required tools
Torque-wrench with attachment
Hexagon socket SW 5 mm

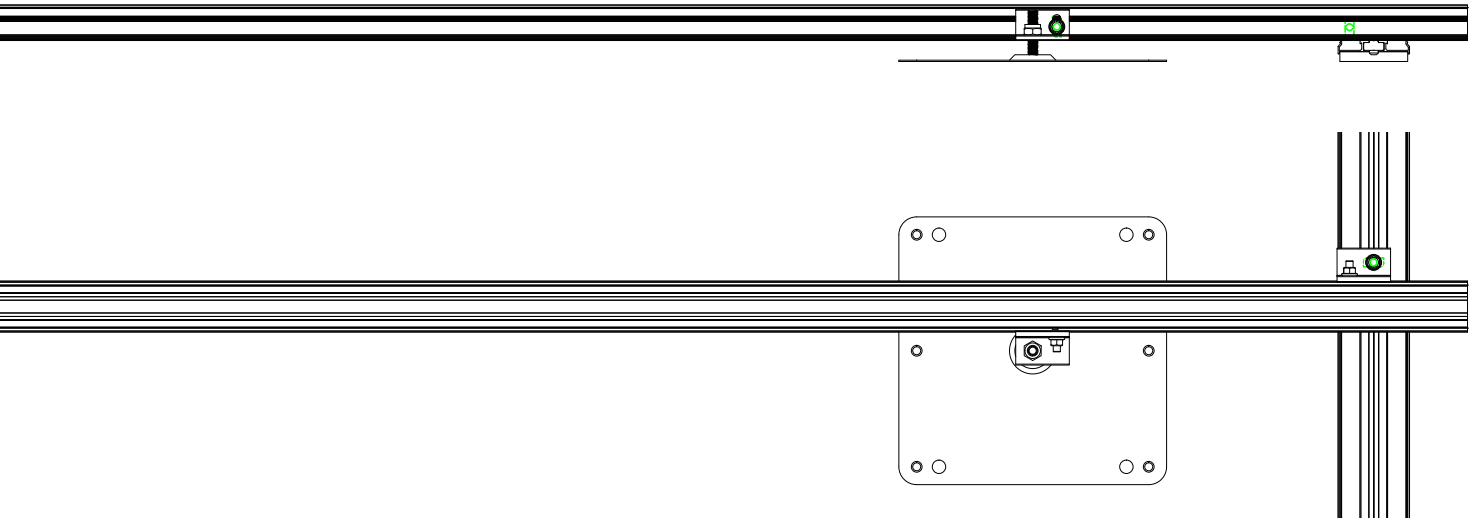


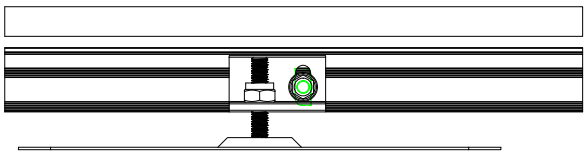
The connection between the Flat Direct installation system and the roof connection points is made via the horizontal Mounting rails attachment point. These are attached with cross profile connectors to the vertical ground profiles and the roof connection points.

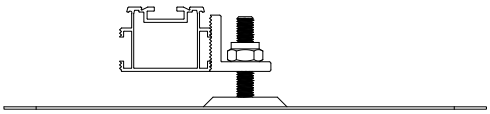


Place the 60 mm M12 cross profile connector with the round hole on the thread. Screw the self-locking nut onto the thread of the attachment point. Repeat the process for all roof connection points.

Mount the Mounting rail attachment point to the brackets using the M8x25 hammerhead screw and the locking nuts in the slotted holes of the cross profile connectors. Make sure that the hammer head screw is facing in the correct direction and that the assembly is carried out without tension. Note that the tightening torque is 10 Nm.



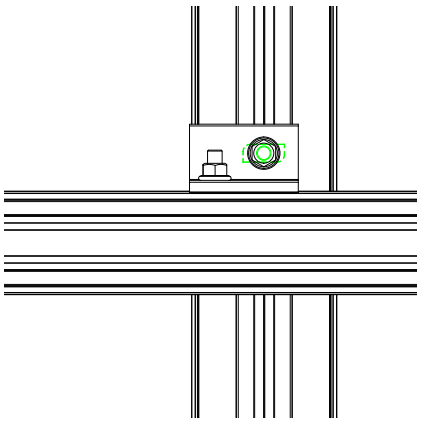




Note
At least 1 thread of the stud bolt must protrude from the nut.

Once all the cross profile connectors have been fastened to the Mounting rail attachment point, the Mounting rail attachment point must be aligned in height and the locknut must be screwed onto the thread until it rests on the cross profile connector, but at least until 1 thread of the stud bolt protrudes from the nut. The cross profile connector must always be fastened to the eaves side of the Mounting rail attachment point.

Mount the Mounting rail attachment point to the cross profile connectors using the M8 x 25 hammerhead screw and the locking nut. Make sure that the hammer head screw is facing in the correct direction and that the assembly is carried out without tension. Note that the tightening torque is 10 Nm. Ensure a frictional and keyed connection is made.



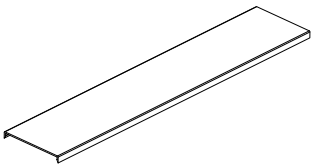
Mount the 60 mm M10 cross profile connector on the ridge side of the Mounting rail attachment point on the ground profile using the M8 x 25 hammerhead screw and the locking nut. Make sure that the hammer head screw is facing in the correct direction and that the assembly is carried out without tension. Note that the tightening torque is 10 Nm.

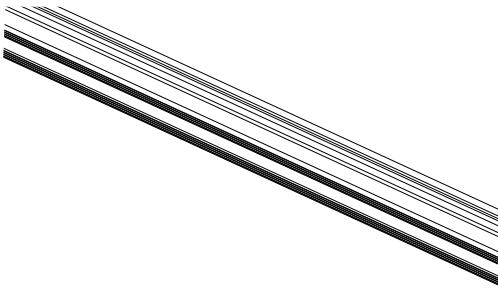
2

OPTIONAL ASSEMBLY STEPS **CABLE CHANNEL COVER**

Component

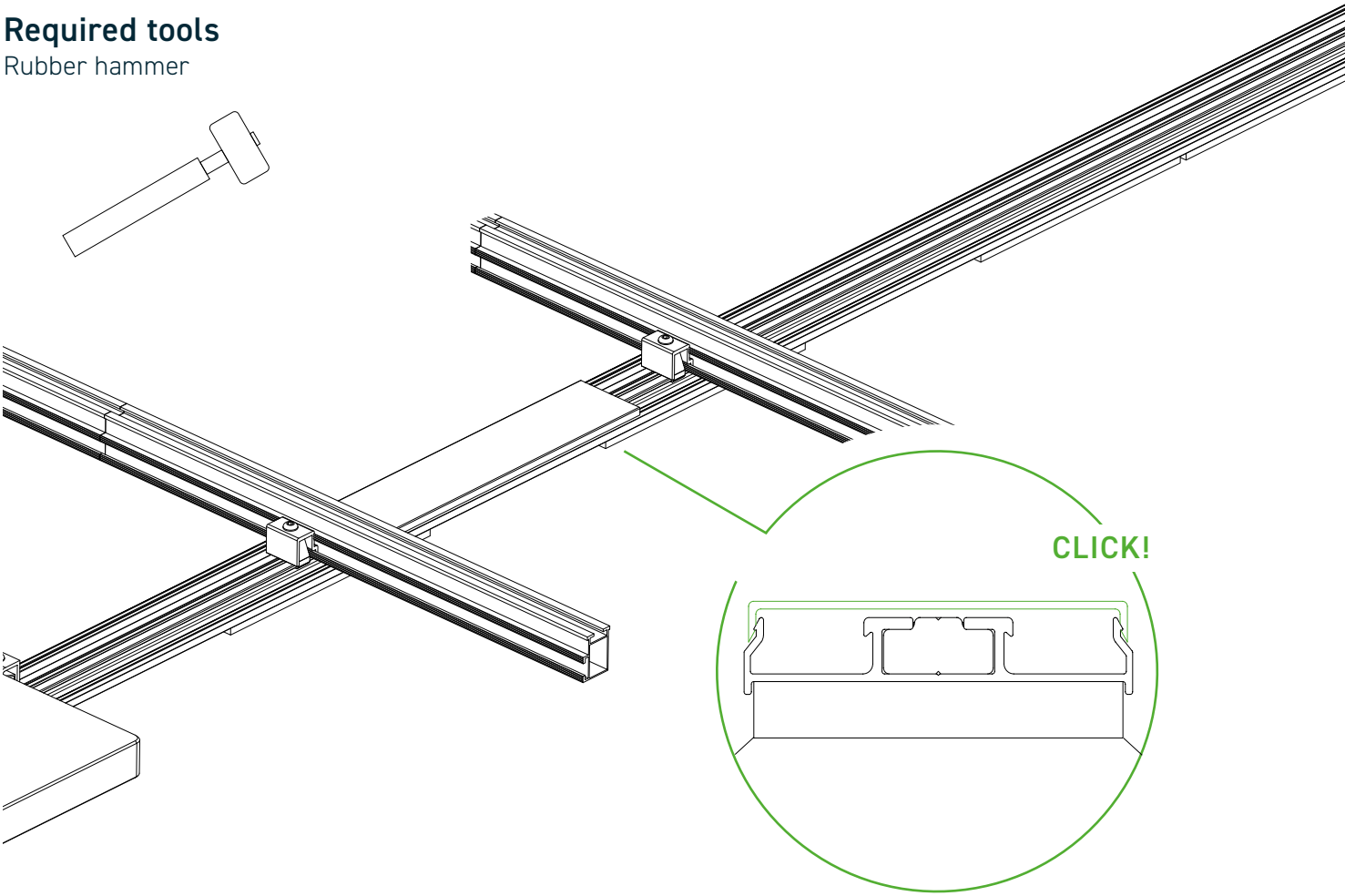
Cable channel cover





Required tools

Rubber hammer



The cable channel cover is fitted after the cable has been laid.

Place the cable channel cover on the ground profile between the modules and press down on the centre until you hear the snap lock engage.

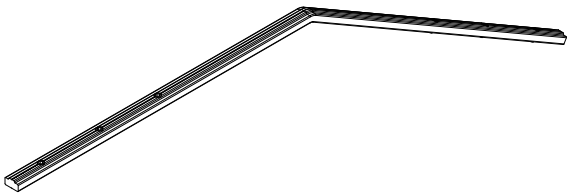
Attention:
Ensure that the cables are not damaged when the cable channel cover is fitted.

3

OPTIONAL ASSEMBLY STEPS
RIDGE CONNECTOR

Component

Ridge connector in the direction of the rails

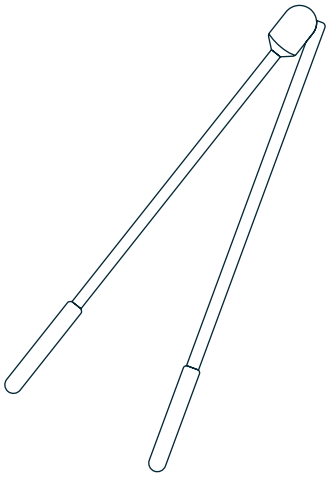


The ridge line must be checked to ensure that it is even and level. Contact of the ridge connector with the roof skin must be strictly avoided. If necessary, additional building protection mats must be placed between them.

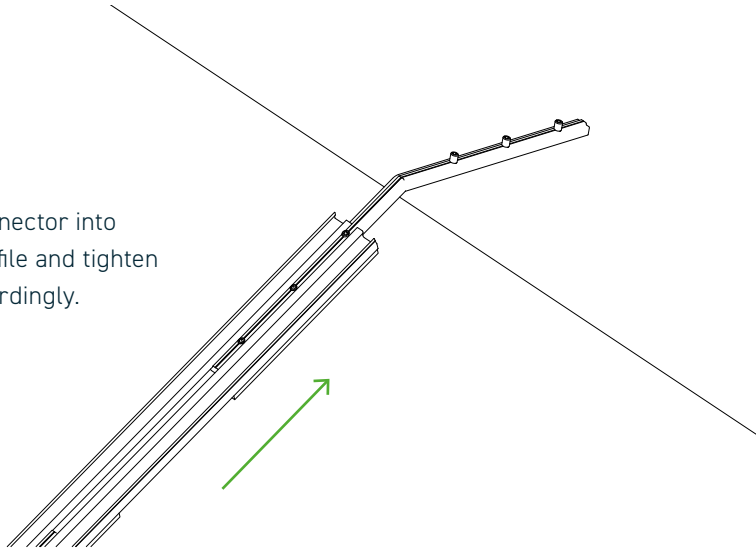
Bend the ridge connector to the roof-specific pitch angle using the bending tool.

Required tools

Bending tool

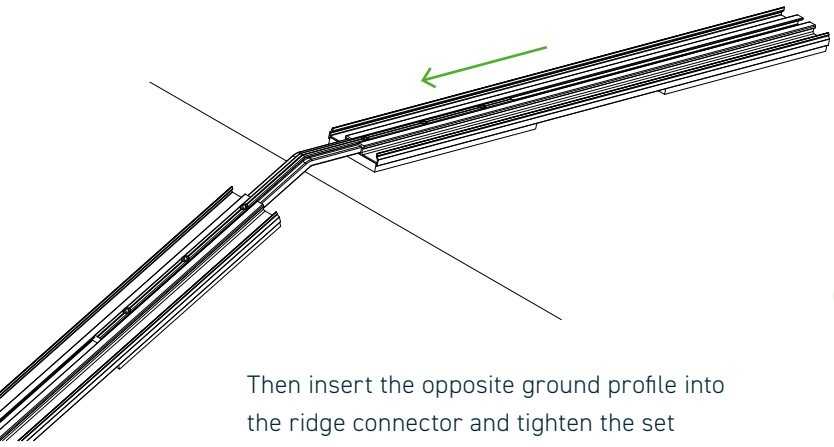


Insert the ridge connector into the first ground profile and tighten the set screws accordingly.

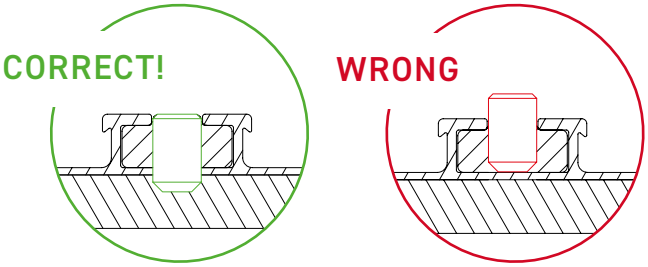


Attention:
Do not screw in the set screw too deeply.

The set screw must be countersunk at least flush with the connector.



Then insert the opposite ground profile into the ridge connector and tighten the set screws.



Final examination

Final Examination

- Check whether the entire system and all components have been installed according to the current project report.
- It must be checked whether all screws are inserted at the intended points and tightened with the specified tightening torque.
- Information on the tightening torque can be found in the assembly instructions or on the packaging. Attention! These are safety-relevant and can lead to considerable damage if not observed.
- Check whether all ballast assembly has been performed with the specified weights. The information can be found in the current project report. Make sure that slipping, tilting or wobbling of the ballast elements is permanently eliminated. Attention! These are safety-relevant and can lead to considerable damage if not observed.
- Check that all click-connections are locked correctly.

Maintenance

- The upper and lower limits of the tightening torque of the screw connections must be checked regularly as part of the maintenance (maintenance interval at least once a year; observe the maintenance protocol).
- The recommendations for maintenance routines of the EVO 2.1 system due to thermal expansion must be observed.

Warranty and product liability

Please note that a product warranty is only granted in accordance with our warranty conditions if all safety and system instructions have been complied with and the system has been installed properly. The warranty conditions can be found at pmt.solutions/downloads/.

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