Roofit.Solar

NuClick
Safety and Installation Manual

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→ Acronyms and definitions

BIPV	Building Integrated Photovoltaics (i.e. metal integrated photovoltaics)
DC	Direct Current
JB	Junction box
STC	Standard Test Conditions (T= 25 °C, Solar Irradiance = 1000 W/m^2, AM = 1.5)
VDC	Volts of direct current
Isc	Short circuit current
Voc	Open circuit voltage
Pa	Pascal
Roofit Solar Energy OÜ	Producer of BIPV modules, hereinafter referred to as Roofit.Solar.
Buyer	A person or party that purchases the BIPV module from Roofit.Solar.
BIPV module	Building integrated photovoltaic device that converts sunlight into electricity.
Warranty period	The period beginning on the date of purchase of the BIPV module by the Buyer.
BIPV system	A system composed of two or more Roofit.Solar BIPV modules combined with an inverter and other electrical accessories.

→ Introduction

This manual contains essential safety information about the electrical and mechanical installation that must be followed before handling, installing, and maintaining BIPV modules of Roofit.Solar. Mechanical and electrical installation of BIPV systems must follow all safety precautions described in this guide with all applicable local codes, including electrical codes, building codes and electric utility interconnection requirements. Electrical connection must be made by a certified electrician of a corresponding country, and planning the location of the modules on the roof should be carried out by a competent professional with experience in designing PV systems. Failure to follow these instructions may result in death, injury, or property damage. The installation and handling of BIPV modules require professional skills in both BIPV module and roof installation and must only be performed by qualified persons. The installer or distributor must inform the end-user (or consumer) of the above matters accordingly and provide this manual.

Disclaimer of Liability

All the information contained in this manual is the intellectual property of Roofit.Solar and is based on the technologies and experience acquired and accumulated by the company. This manual does not constitute a warranty, either explicit or implicit. Roofit.Solar does not assume responsibility and expressly disclaims liability for any loss, damage, or expenses arising from or in any way related to the installation, operation, use or maintenance of our BIPV module. Roofit.Solar assumes no responsibility for any infringements of patents or other rights of third parties that may result from using our BIPV module.

Roofit.Solar reserves the right to change the safety and installation manual without prior notice. The latest versions will be available on our website https://roofit.solar/. If BIPV modules are installed as per requirements set forth in this manual, only then the limited warranty provided for customers will be valid. In case of any inconsistency among different language versions of this document, the English version shall prevail.

Electrical safety

Observe all relevant laws, regulations, guidelines, and safety measures when handling solar modules and PV system parts. Only work on a rooftop once the necessary safety precautions have been identified and taken. Sufficient personal protective equipment (e.g., fall protection, insulated rubber gloves, tools, etc.) is required throughout the installation to protect from falling, electrical shock or sharp edges.

Roofit.Solar BIPV modules can be combined with other components to form a BIPV system. In this case, installation and operating instructions for these additional components must be followed.

Roofit.Solar BIPV module has been classified as Class II device intended for installation where general user access and contact with insulated live parts is anticipated. BIPV system generates DC electricity when exposed to light and runs on voltage higher than 30VDC and currents exceeding 30mA. Therefore, all contacts with electrically active parts of the module can result in death or injury, irrespective of whether the module and the other electrical equipment have been connected. Dangerous voltages can also occur at night. The danger increases when multiple modules are connected to provide higher system voltage or current levels. To work on a module or wiring safely, disconnect modules from a larger BIPV array to lower the voltage and current to unlethal levels or remove them from sunlight by fully covering their front side with an opaque material.

Under normal conditions, the BIPV module can produce higher current and/or voltage than stated on the label measured under 1000W/m^2, with an AM1.5 spectrum and a cell temperature of 25°C. Colder temperatures can increase voltage and power; reflection from snow or water can increase the irradiance, therefore boosting current performance and power. Accordingly, the values of Isc and Voc marked on the module should be corrected with an appropriate safety factor when determining component voltage ratings, conductor current ratings, and size of controls connected to the BIPV output.

Operation safety

Unpacking and storing:

- Open the package up to 2 days before installation.
- Transport and store the BIPV modules in the original box in a ventilated, rainproof, dry location.
- Storage requirements: relative humidity < 85% and temperature range of -40°C to 50°C.
- In case of a longer storing period (>6 months), box should be opened or otherwise ventilated.
- The thickness of the forklift blades should be less than 80 mm for convenient handling of the pallet from all sides.
- DO NOT stack more than 3 wooden pallets on top of each other. Cardboard boxes are stored in 1 layer.
- Do not expose the modules and their electrical contacts to any unauthorized chemical substance.

Handling:

- Be careful with the sharp edges and corners of the BIPV module metal.
- DO NOT lift the module by holding it from the junction box or cables.
- Avoid stepping or placing heavy loads on the modules. Do not allow the module to bow or twist due to external forces. Do not drop BIPV modules or allow objects to hit or fall directly on the modules. Localized stress causes microcracks at the cell level, which may reduce the module's reliability and lead to the withdrawal of the warranty.
- DO NOT place the module so that a load is applied onto junction box or cables.
- DO NOT leave the module unsecured. If it falls, the glass layer could break. The module with a broken glass layer cannot be repaired and must not be installed.

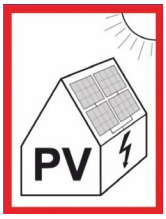
Installation:

- Do not paint or apply any unauthorized adhesive on the modules.
- DO NOT disconnect/connect electrical connections under load.
- DO NOT install the modules in adverse conditions (rain, strong or gusty winds, wet or snowy roof surfaces, etc.).
- DO NOT use mirrors or other magnifiers to concentrate sunlight onto the module.
- DO NOT overbend or apply stress to the cables. Observe the recommended cable bending radius.
- Ensure that all electrical connections are properly secured and protected from unwanted interference.
- The cables shall be fixed on the installation system to avoid direct sunlight or immersion in water and mechanical damage to the cable; otherwise, it may cause accelerated cable ageing or fire.
- Before installation, ensure all the connectors are equipped with dust caps. Uncapped connectors are not waterproof when unmated. Therefore, remove the dust caps only prior to making electrical connections.
- DO NOT connect different connectors (different brands or models).
- The BIPV module does not contain any serviceable parts. DO NOT open, repair or disassemble any part of the module.
- DO NOT attempt to remove any markings, labels or parts attached to the module.
- DO NOT cut or drill holes in the glass part of the module. Roofing metal or metal parts of the BIPV module can only be cut with tools that do not produce excessive heat (e.g. metal scissors, low-speed circular saw etc.).
- Avoid damage to the metal coating by using proper accessories for installation. If any damage occurs, for example, coating scratches, those have to be promptly repaired with suitable touch-up paint. Any debris from the construction must be removed from the modules.

Fire Safety

Consult your local authority for building or structural fire safety guidelines and requirements.
According to **IEC 61730 Part 2**, the fire rating of Roofit.Solar modules are classified as **Class A.**
According to **EN 13501-5** and test method CEN/TS 1187, the modules are labelled as **Broof (t1)** and **Broof (t2).**
According to **EN 13501-1** and test method CEN/TS 1187, the modules are labelled as **D-s1, d0**.
Self-supporting metal sheet has been tested according to **EN 14782**.

Roof constructions and installations may affect the fire safety of the buildings. Improper installation may lead to hazards in the event of a fire. Use appropriate components such as fuses and grounding connectors as required by the local authorities. The fire class of the underlayer must be chosen according to the specifications of the house. The underlayer must withstand a temperature of at least 80 °C.



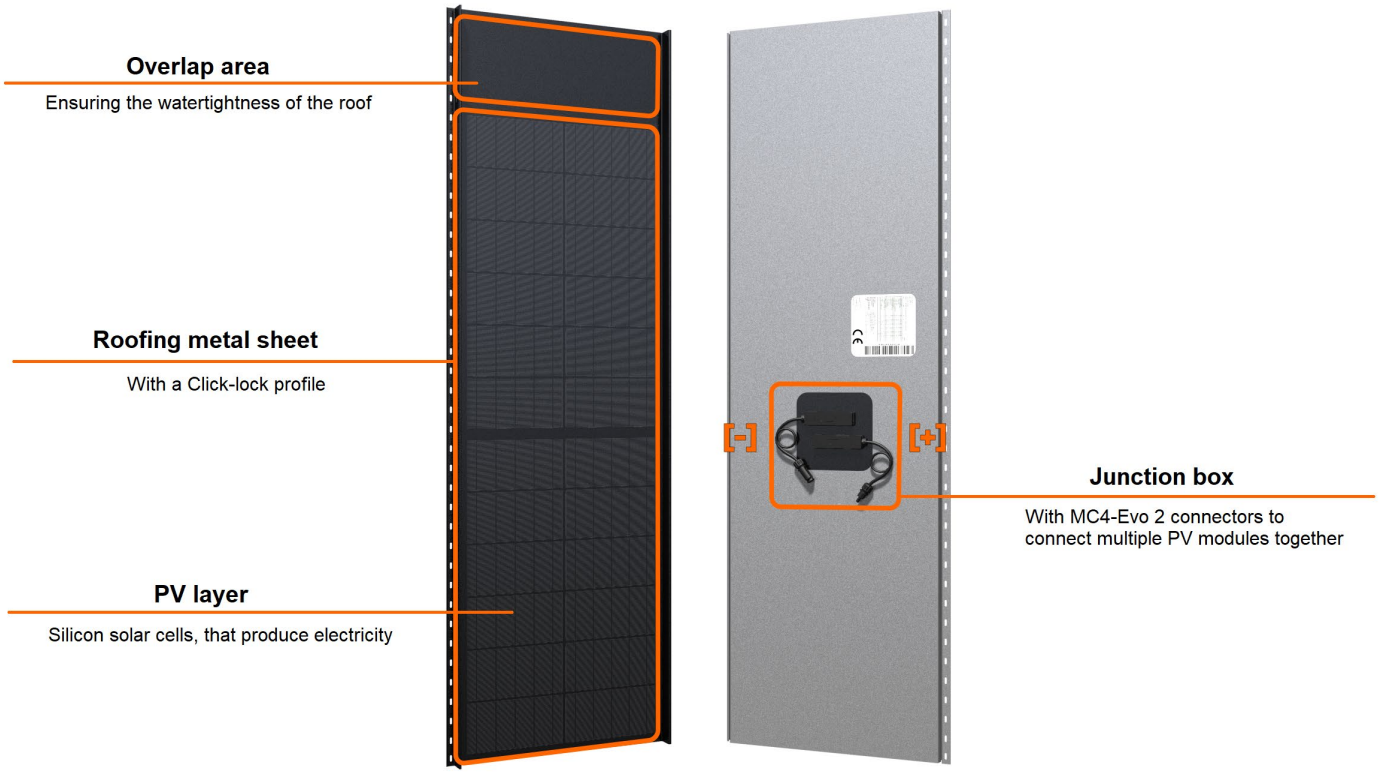
Inform firefighters about the existence of a photovoltaic system in the building.

Roofit.Solar recommends using a combiner box equipped with an emergency disconnect mechanism which enables shutting down the BIPV system and surge protection device that protects your installation from overvoltage caused by lightning strikes. Emergency disconnect mechanism (fireman's switch) enables to disconnect the DC power lines between the solar modules and the inverter. Please, follow the combiner box instructions during the connection to the system, as in most cases, the maximum distance between the combiner box and the BIPV modules must not exceed 10 meters of cable length. If this distance is exceeded, an additional combiner box must be installed.

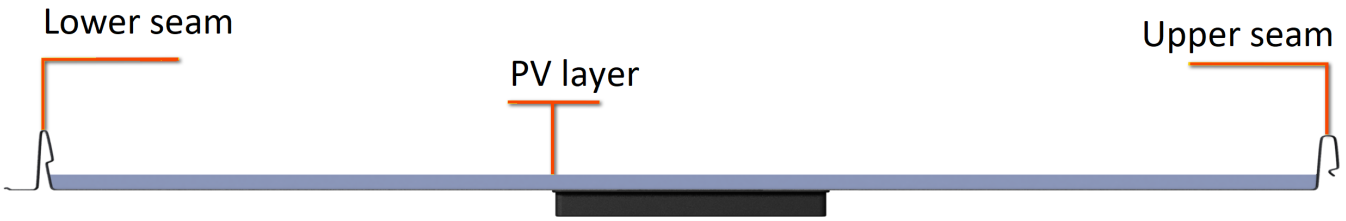
Roofit.solar BIPV system must be equipped with **a DC arc-fault circuit interrupter (AFCI)**, which provides supplementary protection against fires that may arise from arcing faults in BIPV system components or wiring. Therefore, inverters with AFCI must be used for Roofit.solar BIPV system installation.

Mechanical drawing

Roofit.Solar BIPV module is a BIPV product that can be used as a construction material on roofs and is available in 2 size variations. General information about the components of Roofit.Solar BIPV module and their functions are depicted in the pictures below. Detailed information about the dimensions, including electrical, mechanical, and thermal characteristics, can be found in the datasheets of the corresponding BIPV module sizes.



View from the front View from the back



View from the bottom edge

→ BIPV system planning

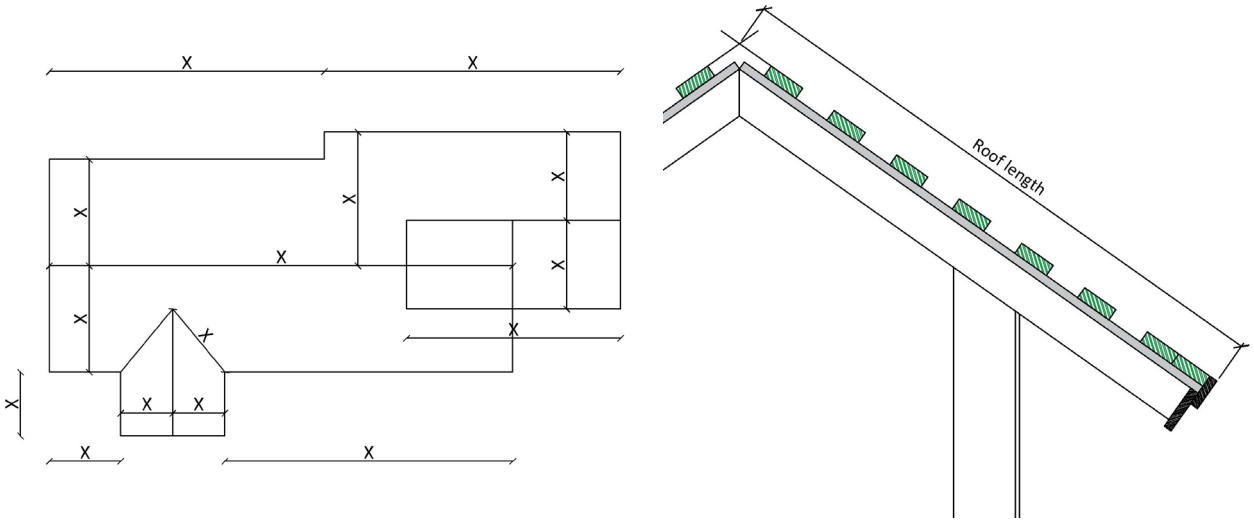
Please obtain information about any requirements and necessary approvals for the site, installation, and inspection from relevant authorities. Proper measures must be taken to ensure the performance and safety of the BIPV module when installed or operated in areas with heavy snow, extreme cold, strong wind, near coastal areas or deserts. The operating temperature range of the module is between **–40°C and 85°C with up to 100% relative humidity** and rain. The maximum altitude for installation is **2000 meters above sea level** for a **maximum system voltage of 1500 V.**

Ensure that the module is not exposed to wind or snow that exceeds the maximum permissible load. BIPV modules have been tested for 6000 Pa downforce and 2400 Pa uplift force according to IEC 61215. A safety factor 1.5 needs to be considered for determining the final design load for installation. According to that:
The maximum permissible designed **snow load is 6666 Pa** with a safety factor 1.5.
The maximum permissible designed **wind load is 3000 Pa** with a safety factor 1.5.

Roofit.Solar is not responsible or liable for BIPV modules damaged during lightning. Therefore, surge protection is recommended for BIPV modules to be installed in locations with a high probability of lightning strikes. BIPV modules should not be installed where any corrosive agents and/or flammable gases may be generated or collected.

Measuring the roof

The customer needs to provide Roofit.Solar with a drawing or a simple sketch of their roof with essential measurements for the BIPV system planning. The length of the roof is measured from the outer surface of the farthest-facing board from the eaves to the middle of the ridge.



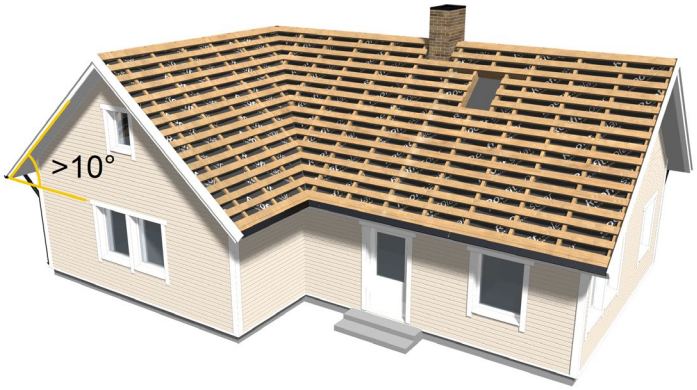
Prevention of the shadows

Modules must not be permanently shaded (including partial shading, spot shading, uniform shading, or uneven shading). Do not install the modules directly behind any objects (e.g. trees, antennas, chimneys) to avoid permanent shading. A module whose entire surface is not shaded all year round can be considered unshaded. Special care should be taken to avoid shading from dirt and debris (e.g. tree leaves, bird droppings), therefore regular maintenance is required to keep the modules clean.

Permanent shading includes shading of a module cell, module cell row, or module section over an extended and repeated period time (e.g. 200 daylight hours over the warrantied service lifetime). Power directed into shaded or partially shaded module cells causes power loss, reduces productivity, and can cause localized overheating, which in turn can negatively affect module's life. Permanent shading can cause accelerated ageing of the encapsulation material and induce thermal stress to bypass diodes. The above would void the module's warranty if not adequately reduced.

Roof Support Structure

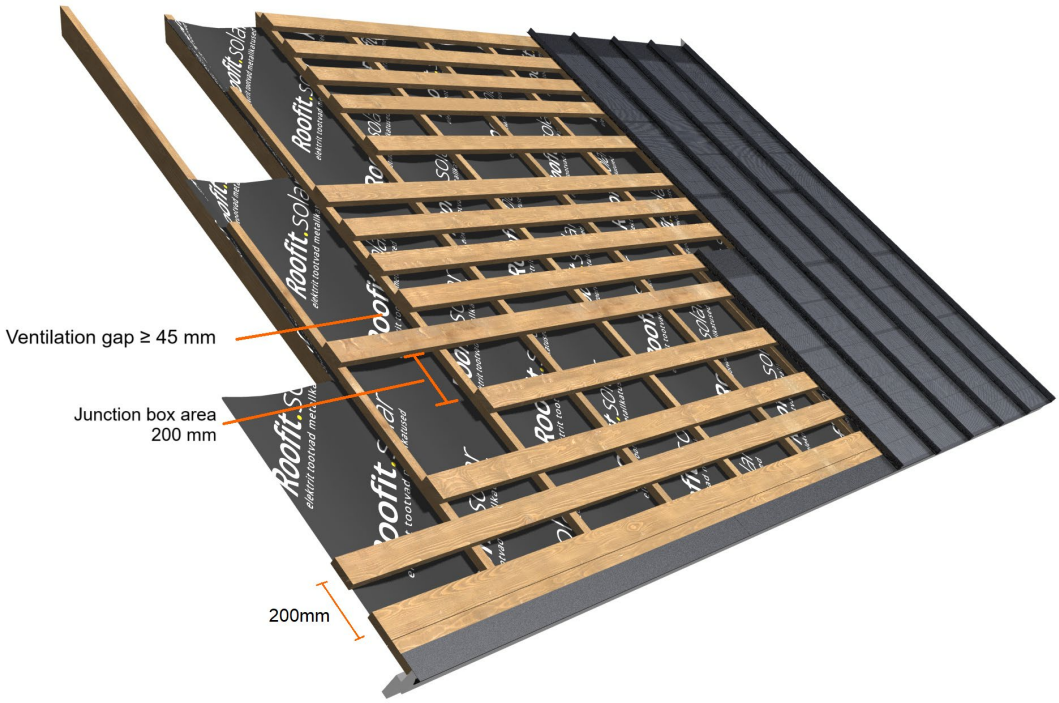
Roof support must be evaluated by construction engineers for the entire roof structure and will be proved capable of supporting the load of the BIPV modules. The supporting system must be installed following local, national, or international standards. For the purposes of waterproofing as well as maintenance, the slope of the roof must be more than **10 degrees**.

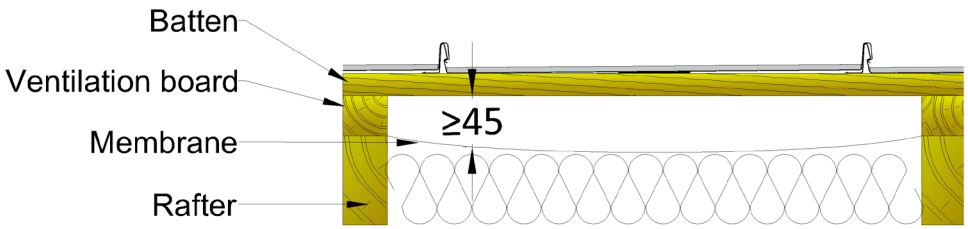


The use of an underlayer membrane under Roofit.Solar BIPV modules is mandatory. Any penetration (e.g. chimney, pipes etc.) to the roof must be adequately sealed to prevent leaks. The back of the module must be kept free of foreign objects that are not part of the support structure. The minimum allowed **ventilation gap of 45 mm** is required between the batten and the moisture barrier.

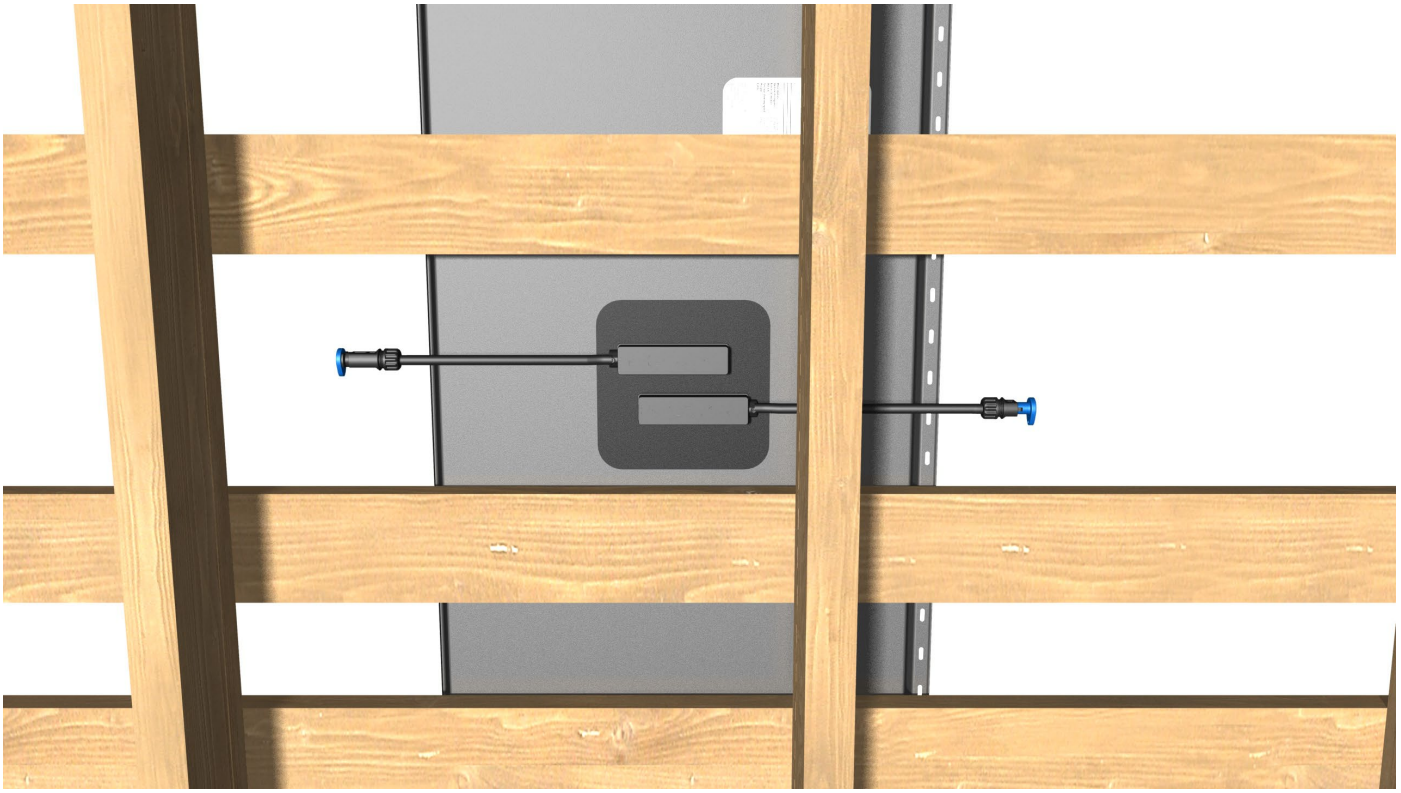
Battens support the BIPV module and must be installed on the same level and form a flat surface to reduce the chance of glass layer damage, provide proper locking quality, and decrease passive metal oil canning. Tolerance of **±15 mm over 5 m** is allowed for unevenness of the battening in both vertical, horizontal, and diagonal directions. Levelled rafters and calibrated wood is the best practice for achieving that.

General practice recommends using a 100 mm battening board and a spacing of 200 mm to ensure adequate cooling and best compatibility with passive roof installation rules. The minimum and maximum allowed center-to-center **batten spacing is 200 and 400 mm**, respectively. Wider battening boards require larger spacing to ensure adequate cooling. A minimum of 200 mm from the bottom of the roof should be fully decked.



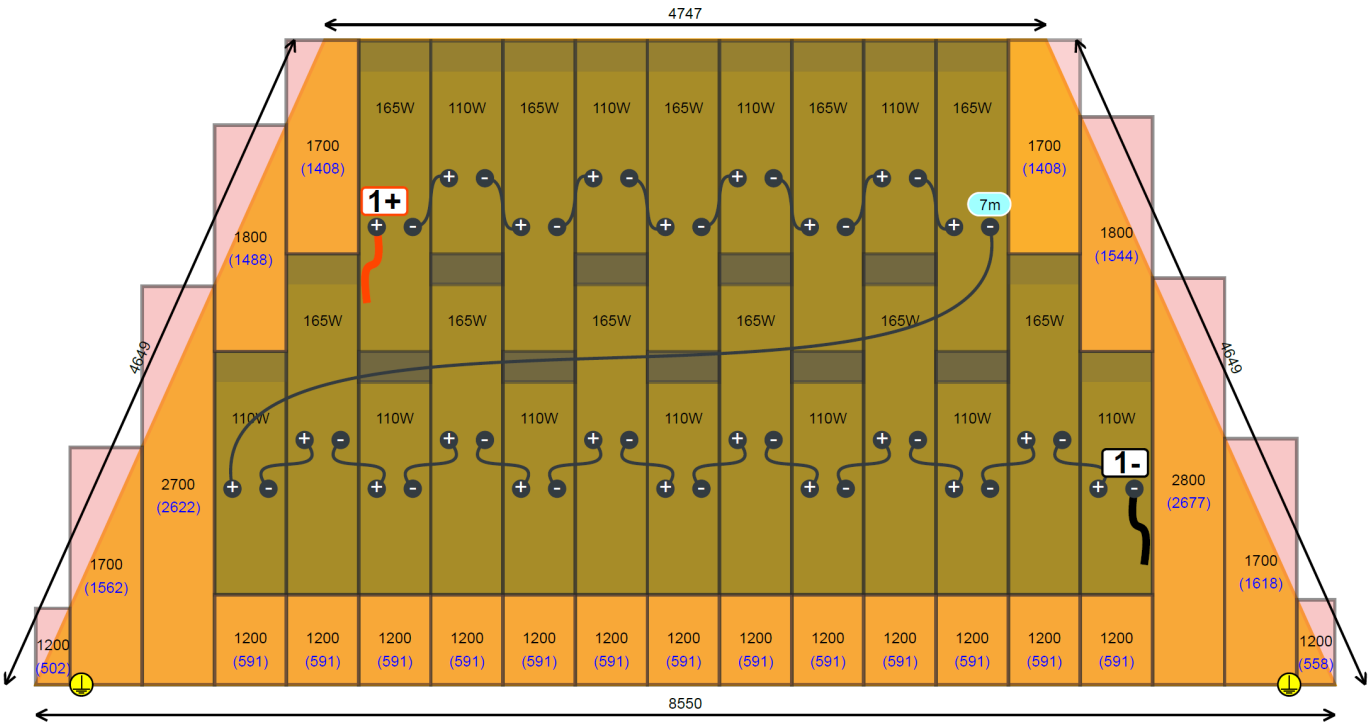


When installing the modules, pay attention to where the battens are placed in relation to the junction box. Each BIPV module has a junction box that needs to be placed between the battens. Consider **200 mm of free space** for the cable tray, junction box, wires and any potential misplacements. If the battens are in the way of the junction box, move them up or down before installing the module.



Planning the layout

Roofit app software helps with roof planning by determining the most effective solar module placement based on the complexity of each roof. Shadow analysis determines the potential power loss from trees, chimneys, dormers, and other structures and determines the best location for solar modules. Snow guards, passage ladders, skylights, and personal demands from the Buyer are other factors influencing BIPV module layout. Roofit.Solar needs as much information about the roof as possible, including the estimated height of the chimneys, vent pipes, and nearby trees, to offer the most accurate design.



All penetrating roof elements (chimneys, skylights etc.), valleys, snow guard and ladders must be surrounded with standard metal sheets with minimum 300 mm from the element, as the BIPV layer of Roofit.solar module must not be shaded, cut, bent or stressed.

Electrical connection accessories

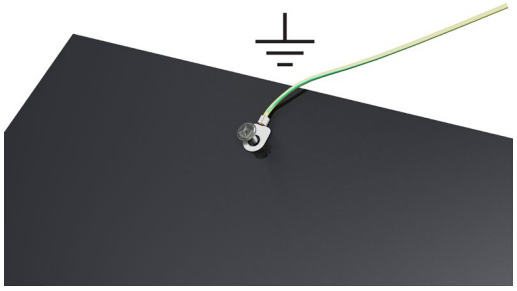
Extension cable with MC4-Evo 2 male/female connectors

Connection of two junction boxes, that are more than 1m away from each other.

String cable with MC4-Evo 2 male/female connectors

Connecting the PV system strings to the inverter.

Grounding cable



Spanner/unlocking tool

1. Tightening the connector nuts.
2. Disconnecting male-female connectors.

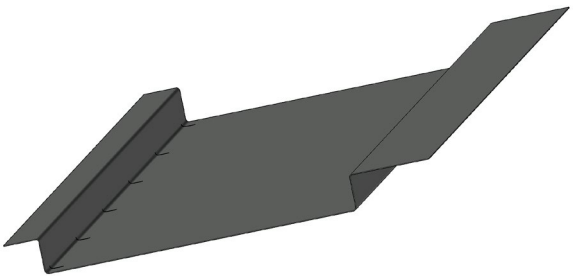
Crimping pliers

Attaching the connector to a bare DC cable.

Cable strippers

Removing of the cable insulation.

Cable tray

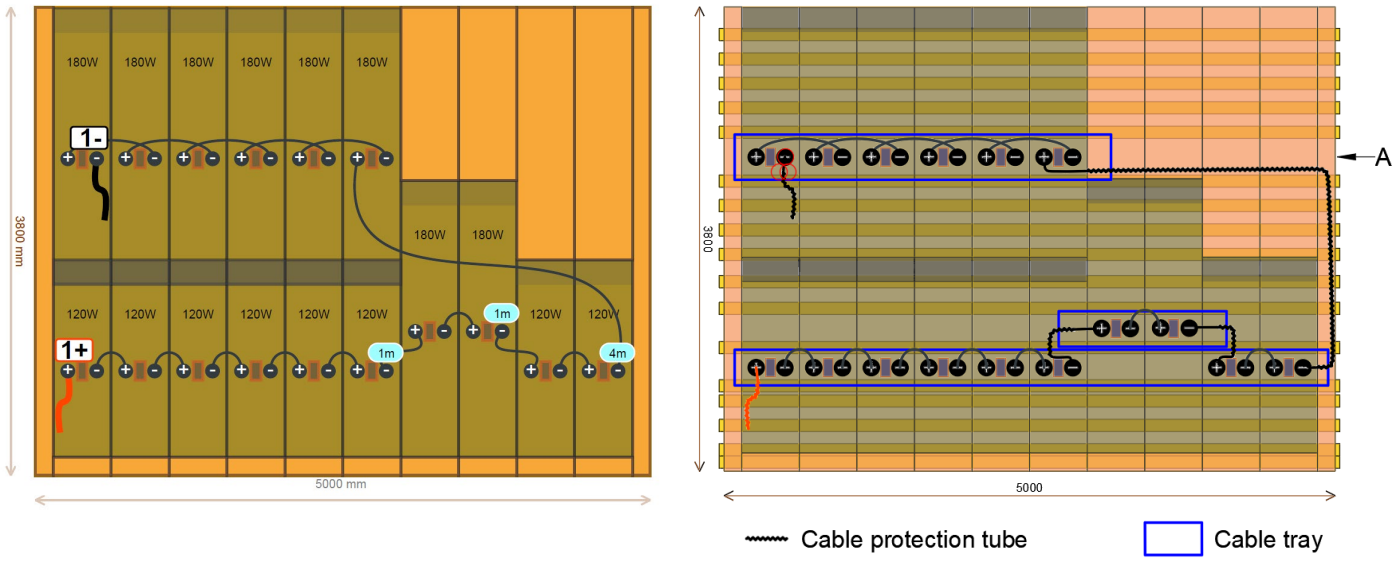


Cable tray is a mandatory component designed to isolate module's junction box and connectors from the roof structure.

Wiring Considerations

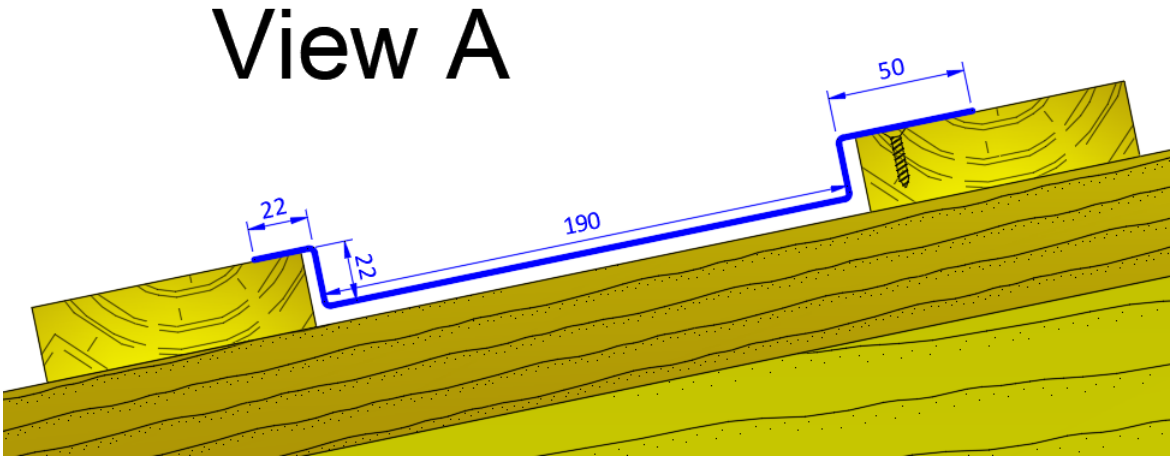
All wiring installations must be carried out by qualified installers in accordance with the requirements written in this manual as well as any local electrical construction codes, procedures and regulations.

All cables that connect the DC system must use copper wires with a cross-section area of at least 4 mm², with double insulation and certified according to IEC 62930. Cables must withstand temperatures of at least 90°C. The polarities of cables and terminals must be matched when making the connections; failure to do so may result in damage to the module and to a person. Ensure that all electrical connections are secure and tight – confirm that you hear *click* to indicate that the connection is successful.

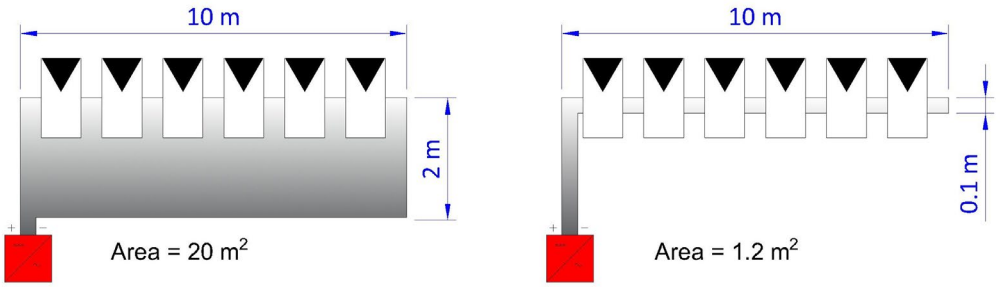


Cable trays, inverter cables ([–] String, [+] String), the grounding and extension cables should be positioned on site before the installation. Depending on local regulations, loose inverter and extension cables might be required to be placed in the cable protection tube. Back of the PV module and connectors must be placed inside the cable tray.

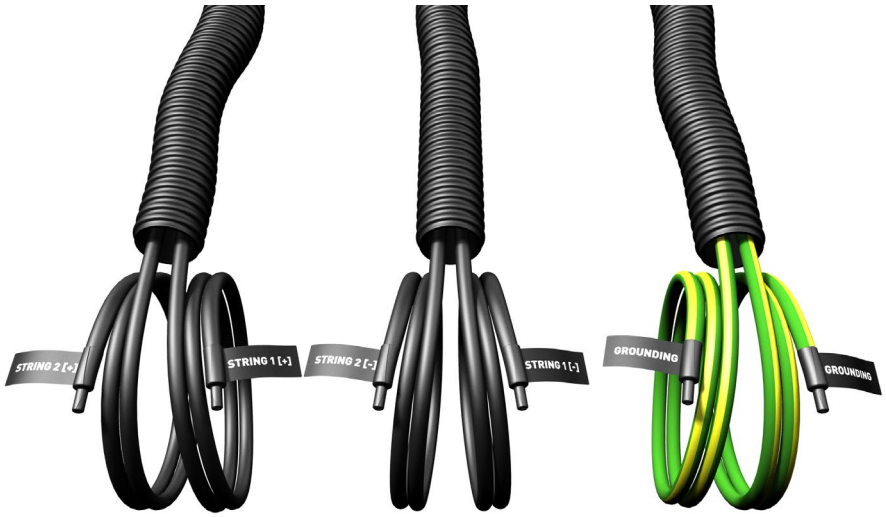
Metal cable trays can be pierced or cut to size, making sure to leave 300mm overhang from left and right side of the module if there are no obstacles. Fix the cable tray with flat-head screw. In the areas where cable is entering/exiting the cable tray, make sure not to damage the cable with sharp edges. Tape or bend the cable tray edges or place the cable into the cable protection tube. In order to ground the metal cable trays, fix at least one PV module clamp though the cable tray. Recommended dimensions for cable tray with drainage holes below:



For the BIPV system to maximize EMC (Electromagnetic compatibility) and minimize the electromagnetic radiation, cabling should be positioned to minimize the area of the wiring loop.



DO NOT group positive, negative, and grounding cables together to avoid ground fault and short circuit. Each cable type should be separately routed to the protective tubes and taken to the technical room, where they will later be connected to the inverter. Insulate bare DC cables and mark them accordingly for the time between the BIPV system and inverter installation. Cables must be protected from any possible physical damage.



Modules can be wired in series to increase the voltage or in parallel to increase the current. BIPV circuits should be designed according to the best practice guidelines of the respective country. A maximum of 2 strings can be connected in parallel without using an over-current protection device (fuses, etc.) incorporated in series within each string. It shall be ensured in the BIPV system design that the reverse current of any particular string is lower than the module maximum fuse rating under any circumstances.

Modules must not be connected together to create a voltage higher than the maximum permitted system voltage stated by local regulations, BIPV module nameplate, inverter input or all other DC components of the BIPV system. To ensure this, the open circuit voltage of an array needs to be calculated at the lowest expected local ambient temperature, which can be determined using the following formula:

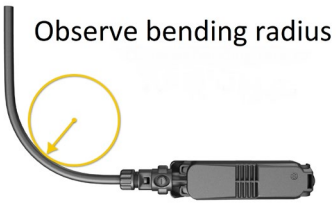
Max System Voltage ≥ N × Voc × [1 + β × ($Tmin$ − 25)]

Where

N	Number of modules in series
Voc	Open circuit voltage (refer to the datasheet)
β	Temperature coefficient (refer to the datasheet)
$Tmin$	The minimum ambient temperature in °C

Connectors

Roofit.Solar modules have 2 junction boxes with positive and negative connectors. The junction box has been designed to be electrically interconnected in series with IP68 (1m/1h) protection grade. Do not bend the cables less than 45 mm in radius.
Many connector brands state “compatible with MC4”; however a reliable connection of different brands is not guaranteed and can therefore cause arching, hot spots and fire that are not covered by warranty conditions. Therefore, the extension and inverter cables must only use original MC4 or MC4-Evo 2 connectors from Stäubli.



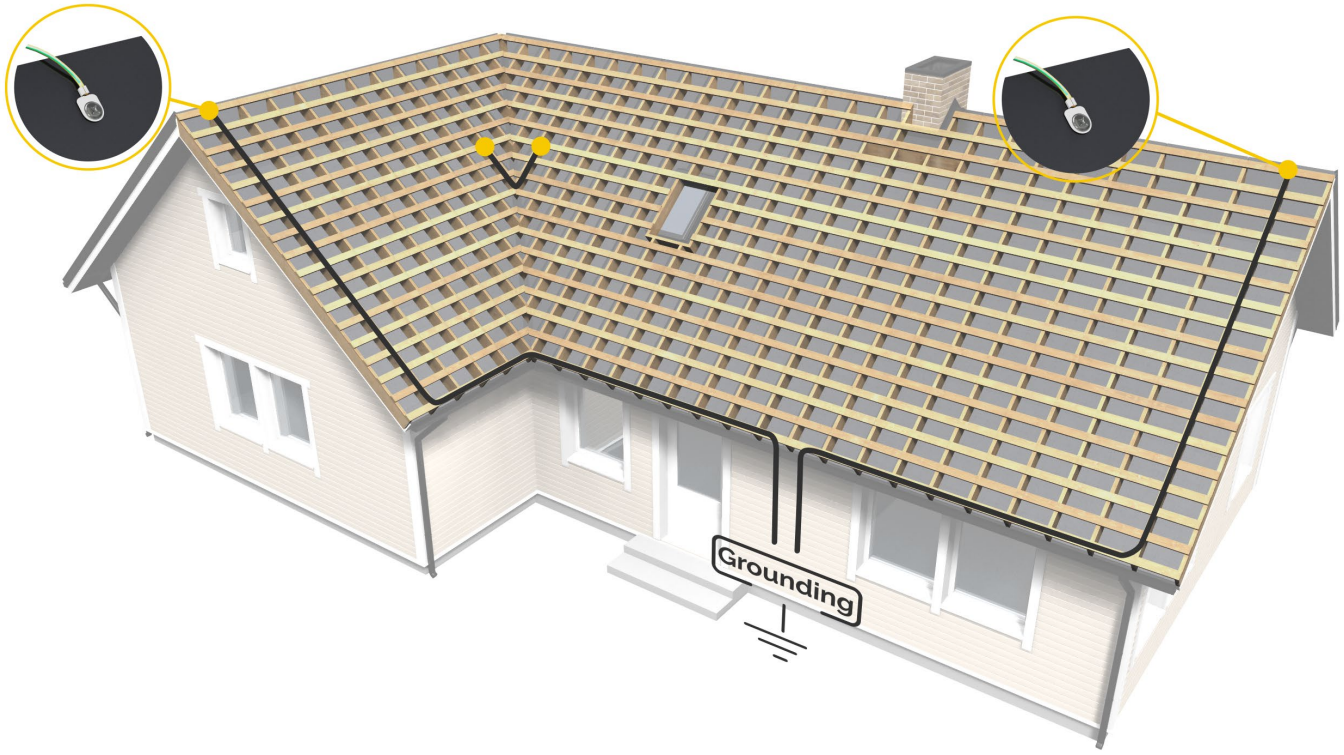
Type	Designation code	Pluggable with
Stäubli MC4-Evo 2	BIPV-KST4-EVO 2/xy-UR (male) BIPV-KBT4-EVO 2/xy-UR (female)	MC4 and MC4-Evo 2

Bypass diodes

Each of the 2 junction boxes of the BIPV module contains 1 bypass diode wired in parallel with the solar cell strings. In the case of partial shading, the diodes bypass the current generated by the unshaded cells, thereby limiting excessive heating. BIPV module must not be installed under constant shadows; bypass diodes only protect from partial shading. Bypass diodes are not overcurrent protection devices.
In the event of a known or suspected diode failure, installers or maintenance providers should contact the supplier.

Rated bypass current	Rated reverse current	Operating junction temperature
25 A	40 A	-55 to +200 °C

Grounding



Each BIPV system must be connected to the grounding cable to ensure electrical safety. All Roofit.Solar modules that are seamed with each other are galvanically connected. Use adequate grounding cables with a cross-section of at least 4 mm² and A2 or A4 stainless steel screw. The grounding cable is connected to the uppermost metal sheet of the roof under the ridge cap. The grounding is finalized by connecting the grounding conductors to the equipotential grounding.

Use 2 grounding cables per roof surface to provide the possibility to measure ground connection quality. If the building has more than one roof surface with BIPV modules, they can be connected in one grounding circuit to minimize the number of grounding cables, as shown in the figure above. Double grounding of the BIPV system is recommended even when applicable regulations, code requirements and standards do not require any safety-related grounding.

Accessories for installation

Truss head screw

Min. 4,2 x 25 mm, stainless steel. Attachment of the BIPV modules

Flat head screw

eg. 5,2 x 25 mm, class C4

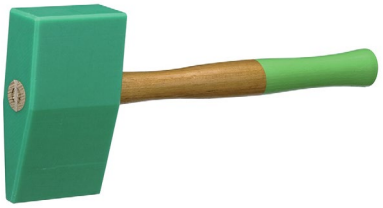
Overlapping fastening element

Used in case of horizontal joints

Acoustic tape

Low-speed circular saw (max. 3600 rpm)

Bumping mallet



Metal scissors

Seaming pliers

Butyl sealant

Supports waterproofing of seams in the overlapping area for horizontal joints

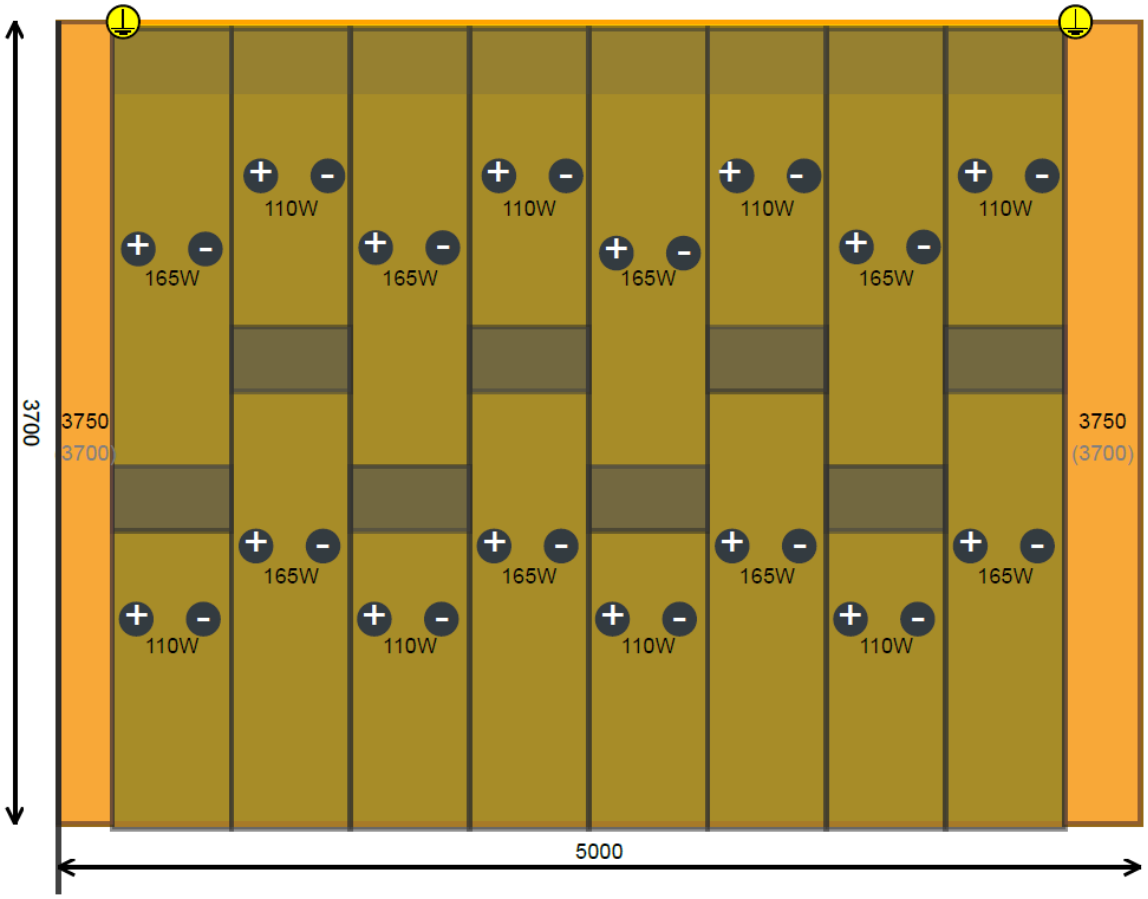
Installation instructions

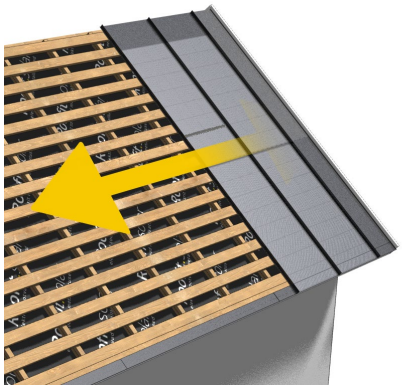
Depending on the roof dimensions, design or other needs, Roofit.Solar modules can either cover the entire roof or be used with regular metal. By default, NuClick module is required to be installed in a chess-pattern layout to ensure a good quality workmanship. **Annex 1 outlines the procedures for 1-line installation, a process permitted only for certified installation partners who have obtained explicit written authorization from Roofit.Solar. Installation in 1-line without a written permission by Roofit.Solar leads to withdrawal of the warranty.**
Below, 3 different chess-pattern installation scenarios are presented with the most important aspects one must follow during the installation.

Case 1 represents the most trivial scenario: the full roof is covered with solar modules.
Case 2 describes the installation, where the column starts from the eave side with a regular metal sheet.
Case 3 describes the installation, where the column ends from the ridge side with a regular metal sheet.

Some of the steps in Case 1 are universal and won't be duplicated in the other cases. Therefore, in any case, go through Case 1 and consult our technical support for any questions. For the planning stage, between Case 2 and Case 3 - Case 2 is preferable due to an easier installation process.

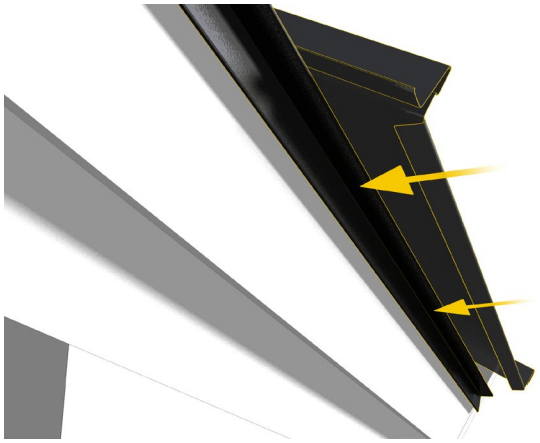
Case 1: Roof fully covered with Roofit.solar modules





Step 1.
Begin with the rightmost column and start the first column with either a BIPV module or a regular metal sheet depending on the roof planning layout.

Before starting, install the eave flashing in a continuous line, rather than overlapping it. Use acoustic tape under the regular metal to prevent issues like oil canning and noise.

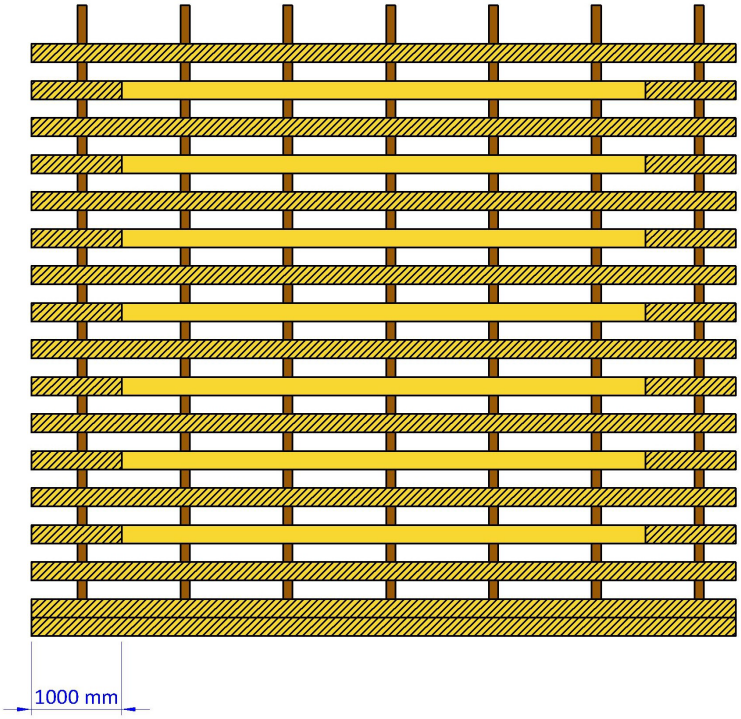


Step 2.
When installing the first sheet, ensure the bottom backbend is tucked under the lip of the eaves flashing. Then, pull the sheet towards the ridge until the lip of the eaves flashing is at the bottom of the backbend.

Step 3.
First, fix the roofing sheet with just one screw at the bottom corner of the sheet.

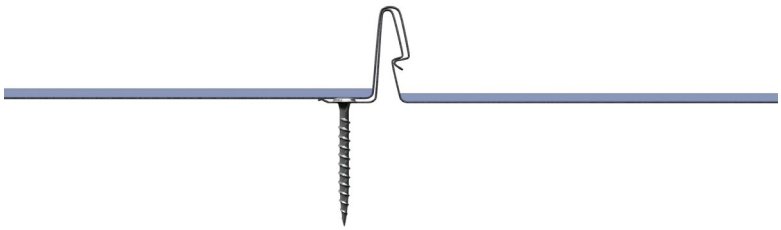
Use extra caution when installing the first roofing sheet. Ensuring that the first roofing sheet is at a right angle to the eaves flashing will make the installation of the rest of the roof easier.

90° angle can be determined with a right-angled triangle equation A2 + B2 = √C. For example, with dimensions of A=3 m; B=4 m; C=5 m. Mark measurement A on the roofing sheet and B on the eaves flashing. Adjust the roofing sheet around the fixing point to achieve a value of precisely 5 m for line C.



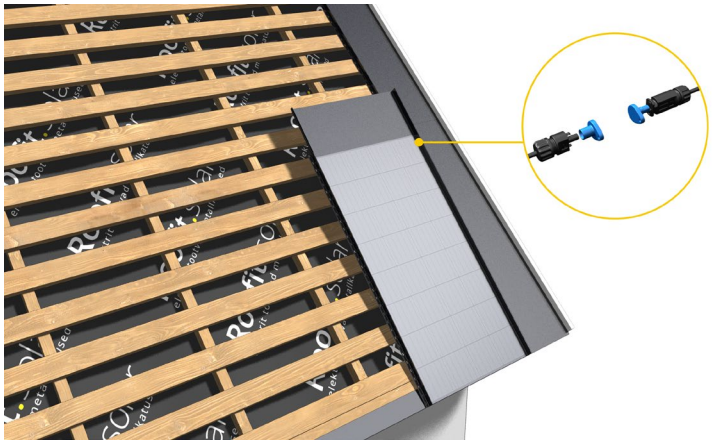
Step 4.
After the angle has been adjusted, fix the metal with more screws. The general rule requires min. 6 screws/m^2 for the roof. Areas with high wind speed require 10 screws/m^2.

If you follow the recommended batten spacing of 200 mm, both the BIPV module and passive metal require 1 screw for every second batten in the center part of the roof and 1 screw for every batten up to 1 m from the sides. A minimum of 200 mm from the bottom edge of the roof should have full decking with additional screws to ensure adequate wind resistance.

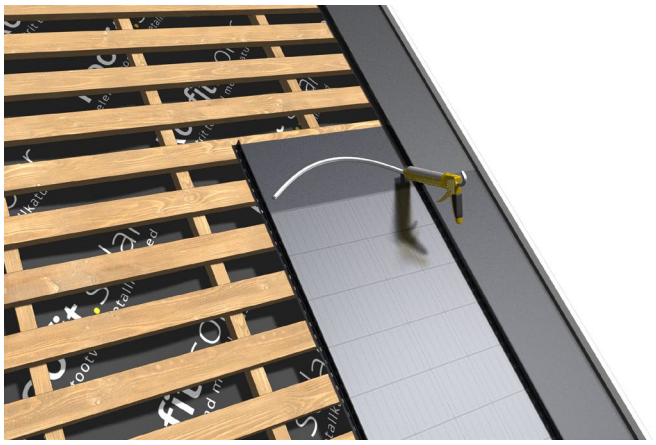


Step 5.
Be mindful of how tight the screws are when fixing the sheets and the direction in which they are screwed. If the screws are too tight, it can prevent the sheets from expanding and contracting properly due to temperature changes.

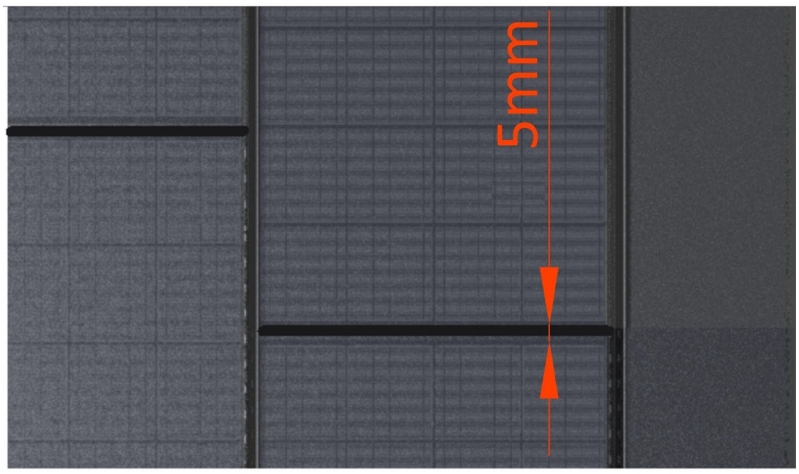
Step 6.
All BIPV modules have a precut lock in the upper left and right corners.
All BIPV modules, except those finishing the ridge of the roof, need an additional cut made in the right corner.



Step 7.
Before fixing the BIPV module, cut the seams (if needed) and connect the cable with the previous module/inverter cable. Remove the dust caps and push the connectors together until you hear a *click*. Bring the second cable of the BIPV module out from the side to ease the connection of the next module afterwards.



Step 8.
Butyl sealant is applied in a curved line in the middle of the overlap section, leaving a few centimeters gap on the sides for condensation water drainage.

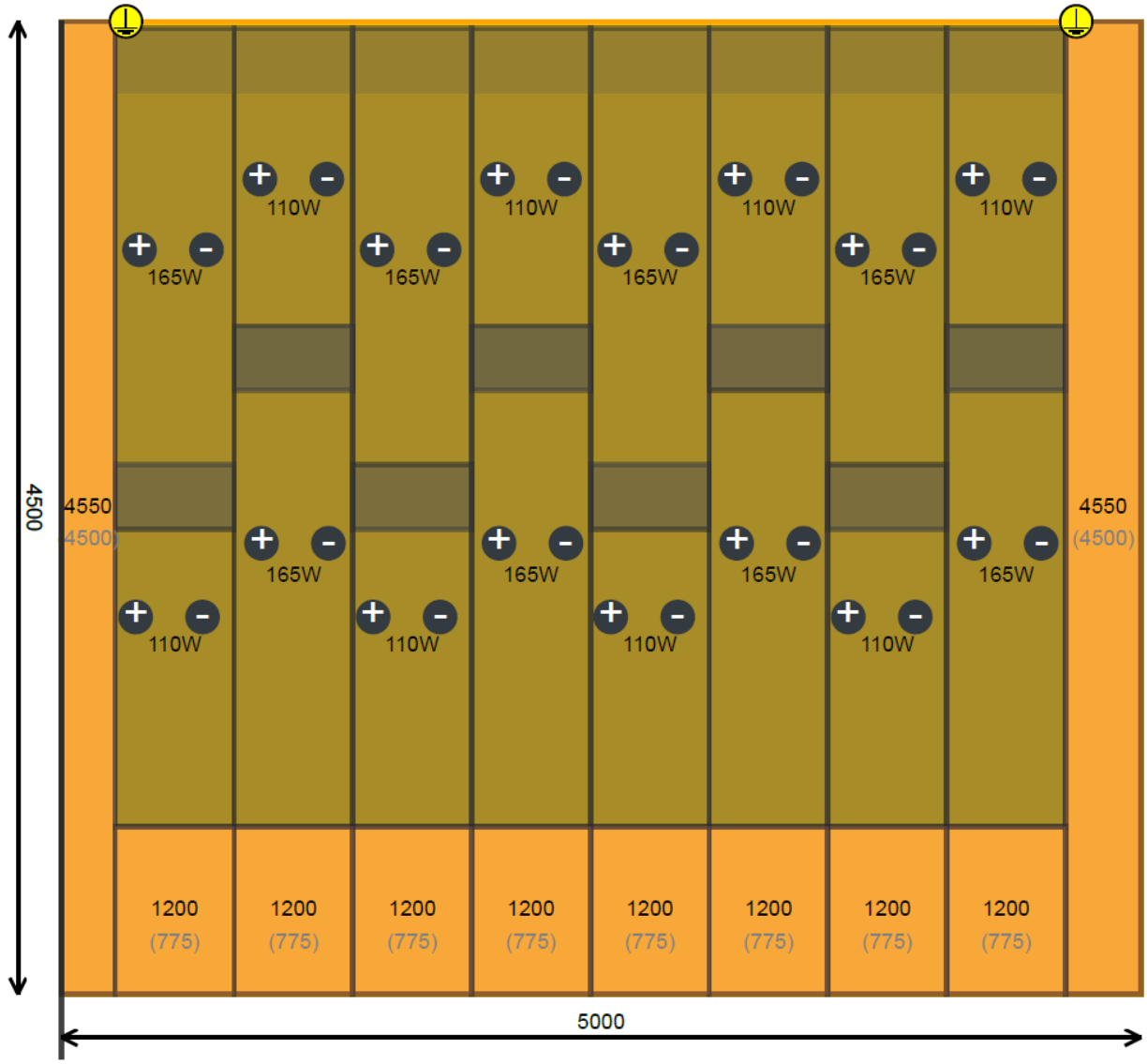


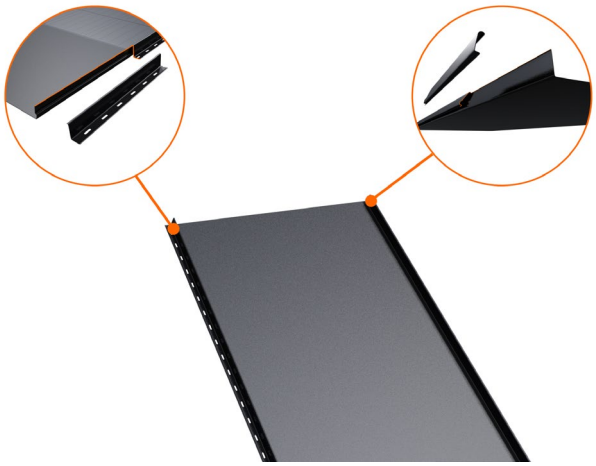
Step 9.
While placing the next module on top, leave a 5 mm gap between the two glass surfaces.

Step 10.
In the brick-pattern layout the next column of the BIPV modules is shifted up or down. The minimum recommended distance between 2 horizontal seams is 250 mm.

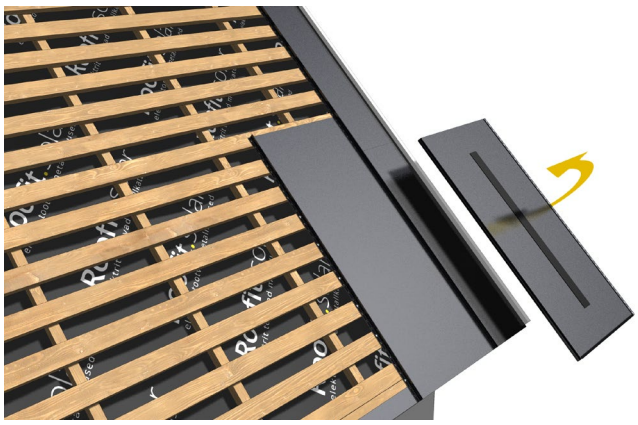
Case 2: The column starts with a regular metal sheet

Most installation steps are similar to Case 1, except the lower part starts with regular metal. This layout is mostly used when show guards are needed.

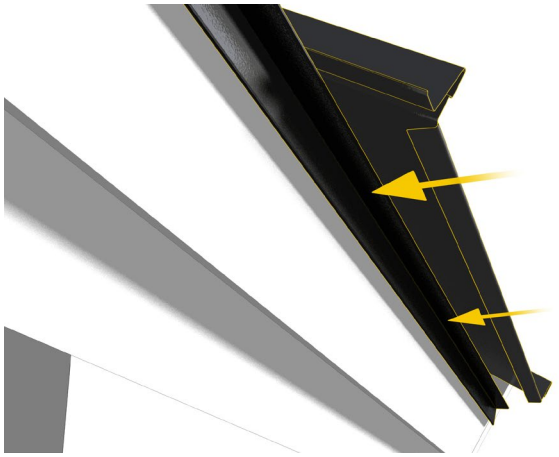




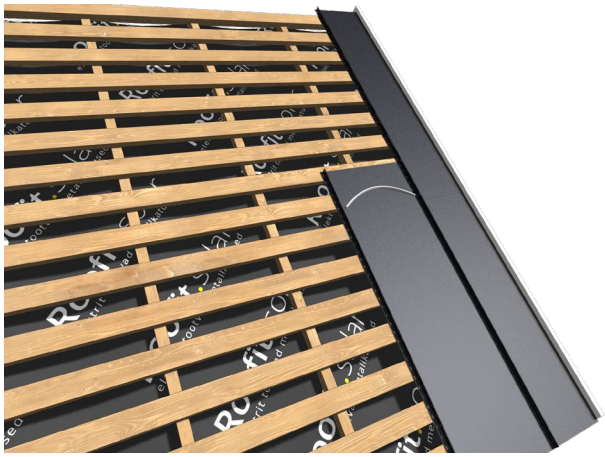
Step 1.
The top part of the left and right seams must be cut in the same manner as already done for the BIPV modules in the length of 205mm before installing the next BIPV module on top.



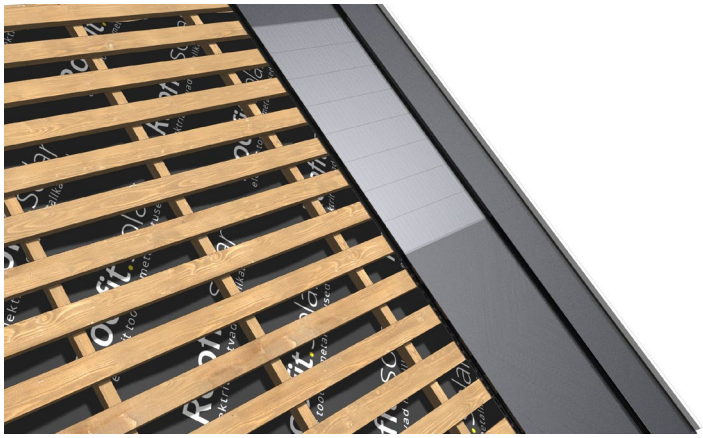
Step 2.
Use acoustic tape under the regular metal sheet to reduce wind noise and oil canning. Be careful when handling the metal sheet and place it on a soft surface to prevent scratches on the paint or zinc coating. When gluing the acoustic tape, apply 1-2 stripes, leaving 300 mm clear from the top and bottom. There must not be any sound insulation under the metal sheet in the area that overlaps with the module, as this can cause tension to the glass.



Step 3.
The bottom sheet shall be installed as required in the installation manual of the passive metal with metal folding under the eave.

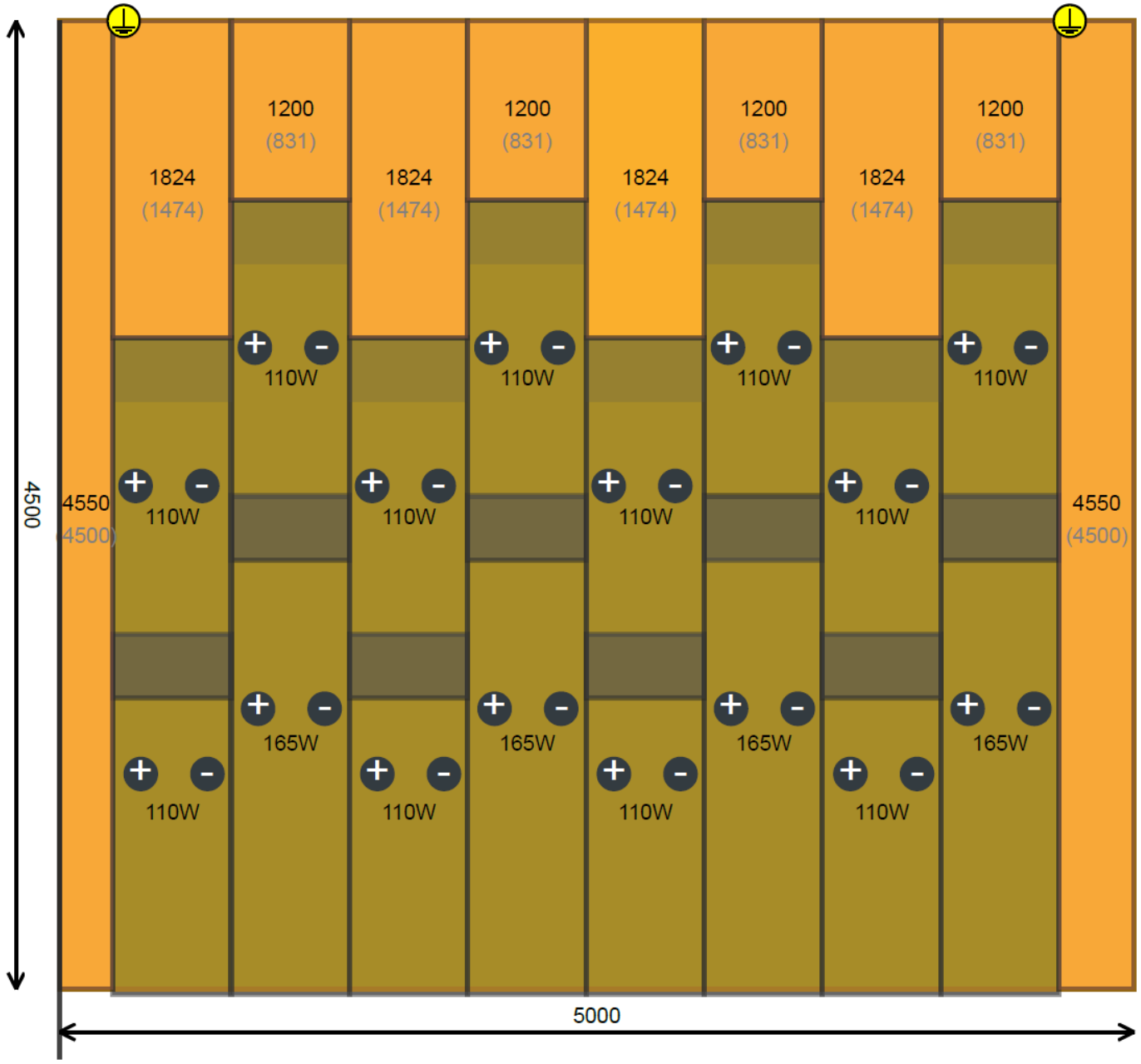


Step 4.
Attach the sealant to the upper edge of the standard metal sheet, where the 200 mm overlap will be.



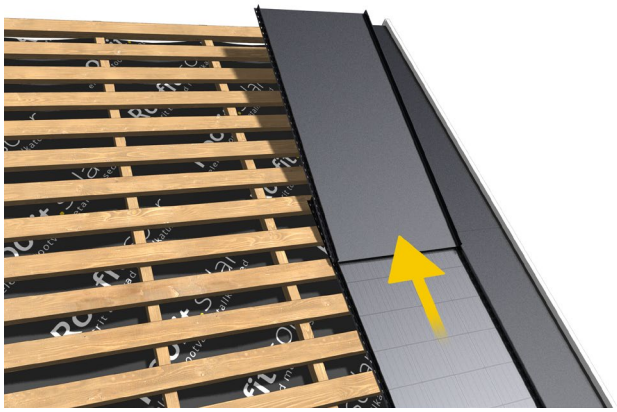
Step 5.
Install the next BIPV module on top with a 200 mm overlap to ensure adequate water resistance.

Case 3: The column ends with a regular metal sheet

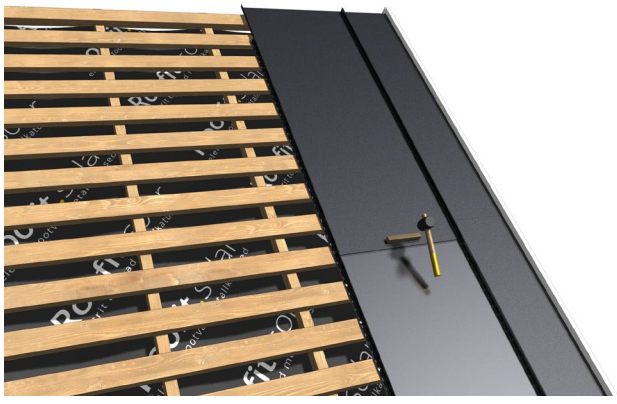


Step 1.
Upper extensions are provided with a backbend with a minimum length of 1200 mm. If a shorter piece is needed, one must use metal scissors, low-speed circular saw (max. 3600 rpm), a nibbling machine, a jigsaw or any other device that does not produce heat.

Step 2.
To install a regular metal sheet on top of the BIPV module, an overlap element is placed on the lower BIPV module. The overlap element is attached with 3 flat-head screws. If there is no batten underneath the overlap area, install an additional batten. Bending the lower side of the overlap element upwards also enables an easier installation in the next step.



Step 3.
The folded end of the metal sheet must be inserted under the extension flashing and then pulled toward the ridge to fix it into place.



Step 4.
The backbend of the regular metal can be flattened with a wooden board and bumping mallet.

Pay attention not to hit the glass of the lower BIPV module.

→ Maintenance

Regular inspection and maintenance of the modules is necessary, especially within the Warranty Period. For detailed maintenance actions **Roofit.Solar Building Integrated Photovoltaic Products Maintenance Manual** must be followed.

Cleaning
Dust accumulation on the glass may reduce power output and even cause regional hot- spot effects that can damage the modules. Negative environmental effects, such as foreign objects casting shadows or laying directly on the roof, may adversely affect the power output of the modules. Roofit.Solar advises that the PV part of the system should not be obstructed at any time. The module cleaning frequency depends on environmental factors. Often, natural rainfall is enough to adequately clean the module, reducing the need for manual cleaning.

Before cleaning, thoroughly inspect the modules for cracks or damage. Cleaning activities involve the risk of damaging modules and system parts, as well as increasing the risk of electric shock. Cracked or damaged modules present a risk of electric shock, and the risk increases if the modules are wet.
Before cleaning, make sure that:
• The circuit is switched off.
• The PV system string is disconnected from other active components (such as the inverter).

For lighter dirt (e.g. tree leaves, dust), we recommend using compressed air for cleaning. This solution can be used as long as the method is effective enough.
If more effective cleaning is required, wet cleaning methods can be used. When wet cleaning the modules, use a nonconductive soft cloth, sponge, or brush with soft bristles, making sure they are not abrasive to glass, silicone, or metal. Cleaning should be carried out during the cooler period of the day (morning, evening) to avoid thermal stress on the module. Wear appropriate electrically insulating protective equipment (clothing, insulating gloves, etc.). Do not use abrasive, acidic, or alkaline cleaning agents and degreasing agents for cleaning.
Damages caused by insufficient or incorrect cleaning can lead to withdrawal of the warranty conditions of Roofit Solar Energy OÜ.

Visual inspection
An annual visual inspection is required to identify any possible issues. Check the modules for:
- Any visible signs of damage (glass damage, discoloration, other visual abnormalities).
- Obstacles shading the modules.
- Buildup of contamination (for example dirt and debris).
- Physical damage of the metal sheet and paint coating (scratches, peeling, uneven fading, blistering and cracking)

Decommissioning and Disposal

Roofit.Solar is firmly committed to protecting the environment. BIPV modules are durable for decades and built from non-hazardous materials. When modules have reached the end of their life cycle, they should be disposed of by following local recycling regulations, considering that BIPV modules are electronic devices.

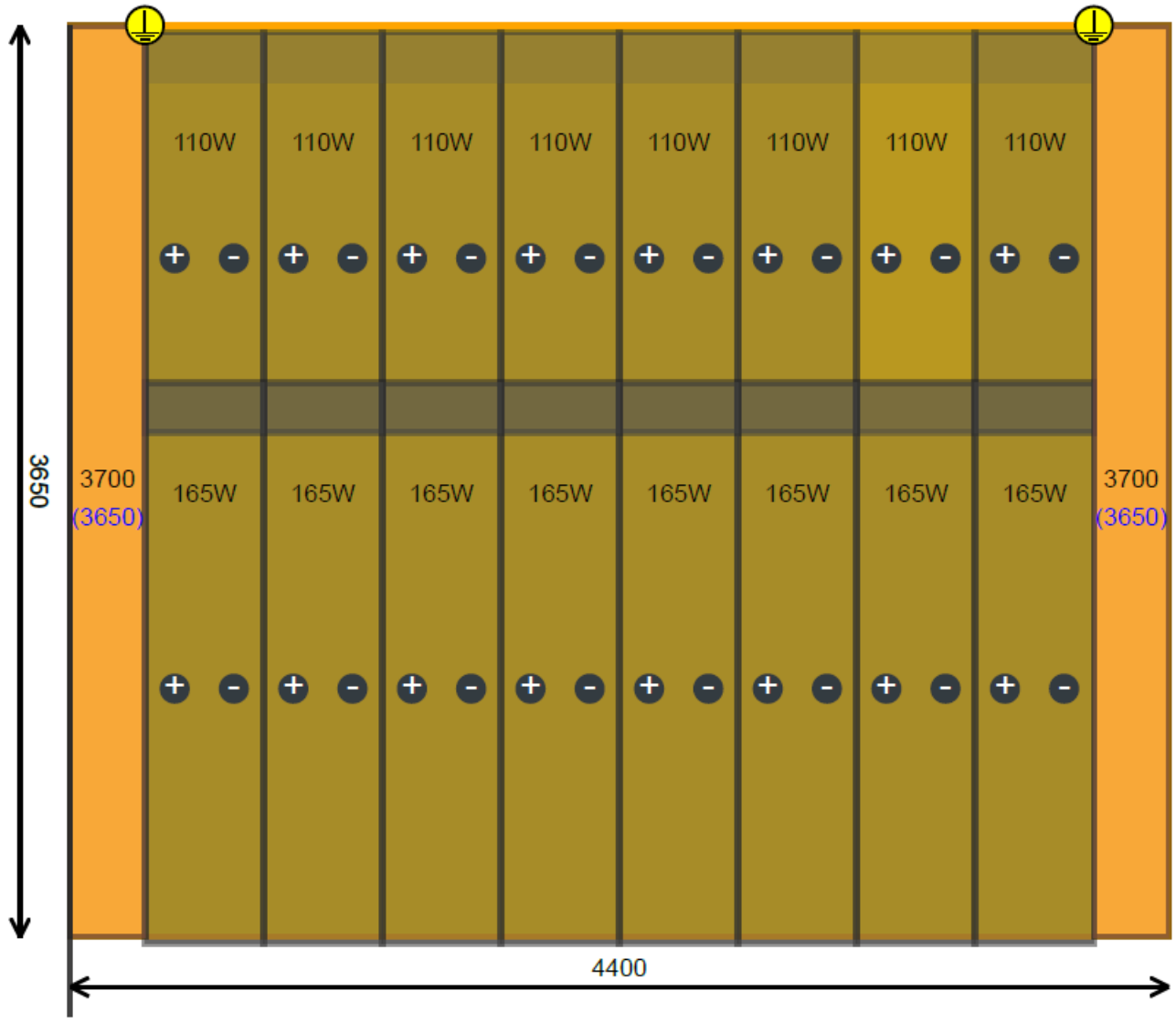
Customer Support

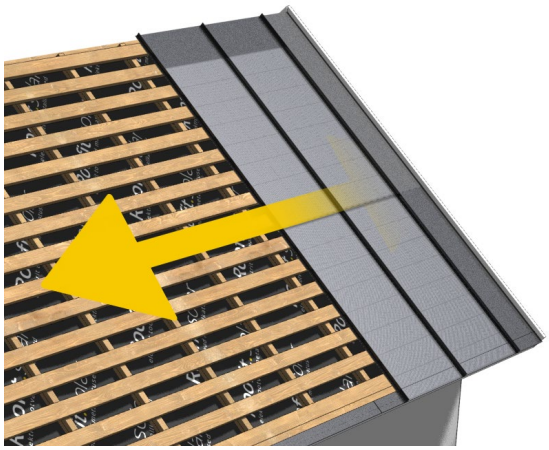
Technical support shall be provided to the owner of the BIPV system by Roofit.Solar. For more information, please visit Roofit.Solar website https://roofit.solar/

→ Annex 1: installation in 1-line

Installation in 1-line configuration is permitted only for certified installation partners who have obtained explicit written authorization from Roofit.Solar.

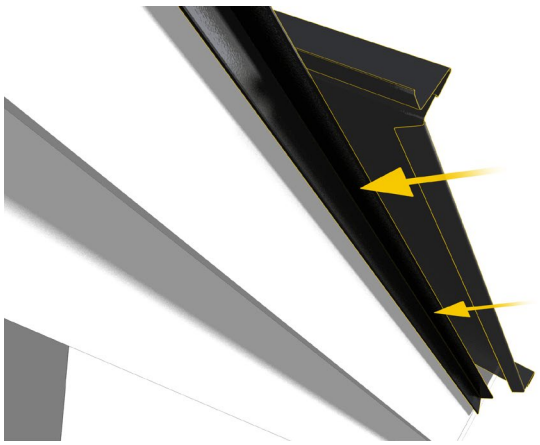
Case 4: Roof fully covered with Roofit.solar modules





Step 1.
Begin with the rightmost column and start the first column with either a BIPV module or a regular metal sheet depending on the roof planning layout.

Before starting, install the eave flashing in a continuous line, rather than overlapping it. Use acoustic tape under the regular metal to prevent issues like oil canning and noise.

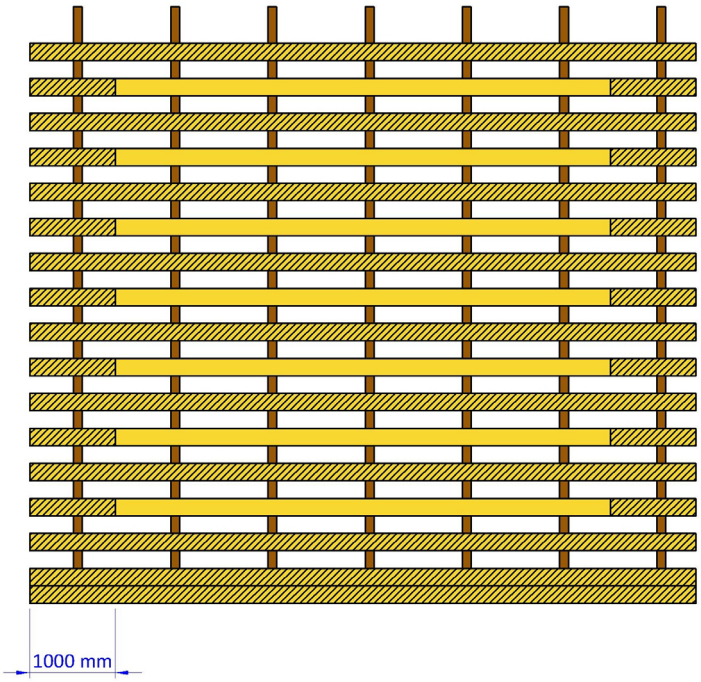


Step 2.
When installing the first sheet, ensure the bottom backbend is tucked under the lip of the eaves flashing. Then, pull the sheet towards the ridge until the lip of the eaves flashing is at the bottom of the backbend.

Step 3.
First, fix the roofing sheet with just one screw at the bottom corner of the sheet.

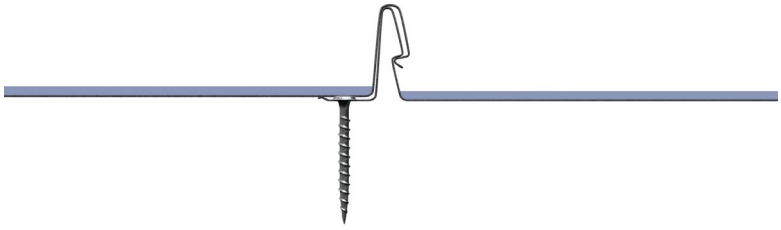
Use extra caution when installing the first roofing sheet. Ensuring that the first roofing sheet is at a right angle to the eaves flashing will make the installation of the rest of the roof easier.

90° angle can be determined with a right-angled triangle equation A2 + B2 = √C. For example, with dimensions of A=3 m; B=4 m; C=5 m. Mark measurement A on the roofing sheet and B on the eaves flashing. Adjust the roofing sheet around the fixing point to achieve a value of precisely 5 m for line C.



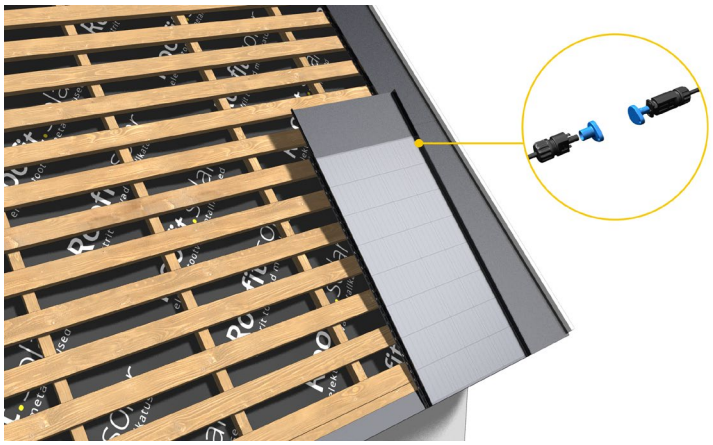
Step 4.
After the angle has been adjusted, fix the metal with more screws. The general rule requires min. 6 screws/m^2 for the roof. Areas with high wind speed require 10 screws/m^2.

If you follow the recommended batten spacing of 200 mm, both the BIPV module and passive metal require 1 screw for every second batten in the center part of the roof and 1 screw for every batten up to 1 m from the sides. A minimum of 200 mm from the bottom edge of the roof should have full decking with additional screws to ensure adequate wind resistance.

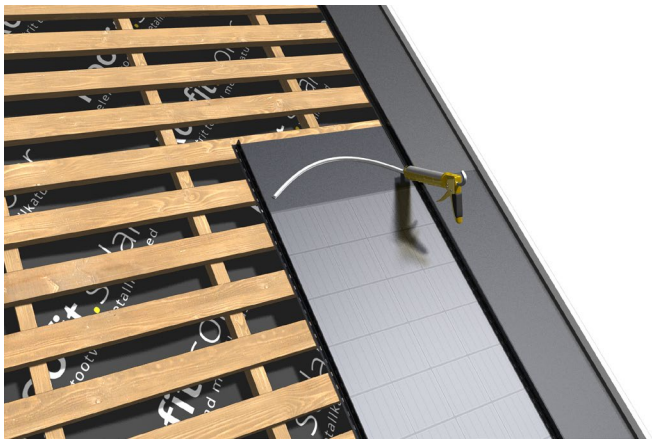


Step 5.
Be mindful of how tight the screws are when fixing the sheets and the direction in which they are screwed. If the screws are too tight, it can prevent the sheets from expanding and contracting properly due to temperature changes.

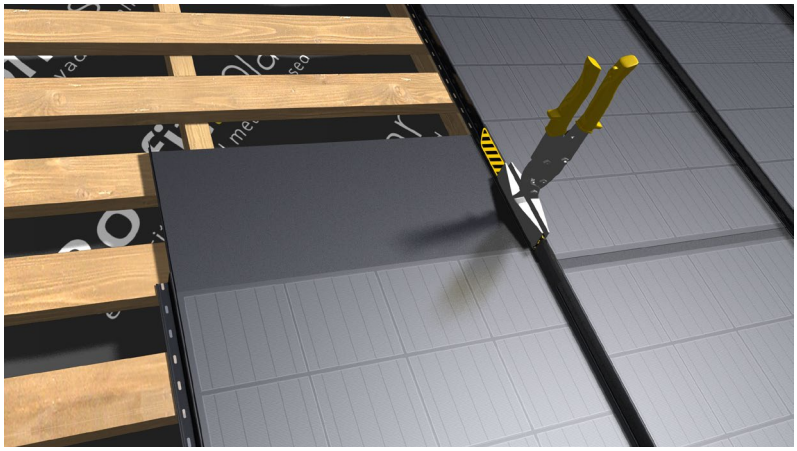
Step 6.
All BIPV modules have a precut lock in the upper left and right corners.
All BIPV modules, except those finishing the ridge of the roof, need an additional cut made in the right corner.



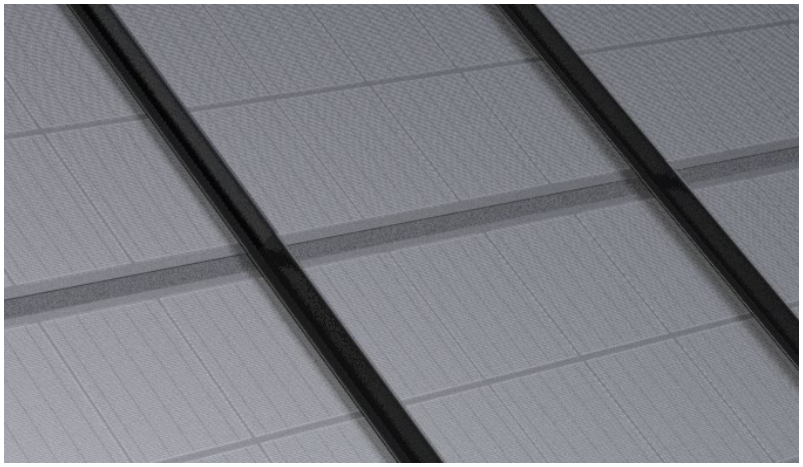
Step 7.
Before fixing the BIPV module, cut the seams (if needed) and connect the cable with the previous module/inverter cable. Remove the dust caps and push the connectors together until you hear a *click*. Bring the second cable of the BIPV module out from the side to ease the connection of the next module afterwards.



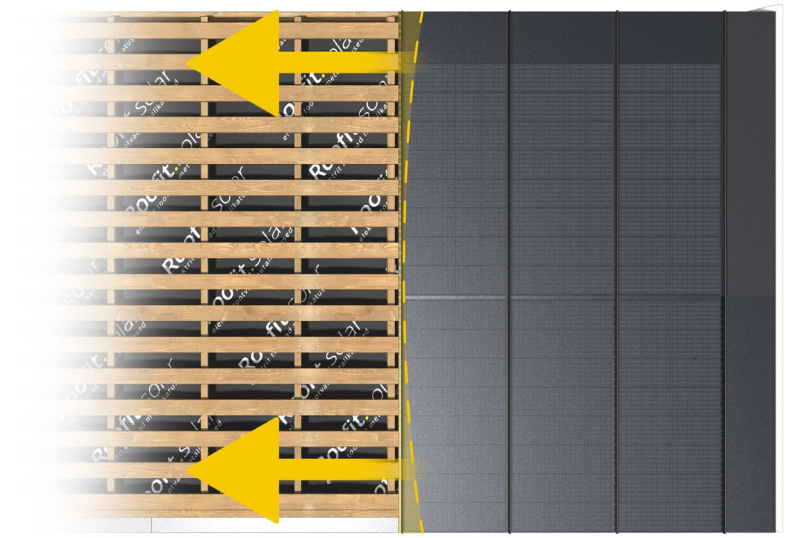
Step 8.
Butyl sealant is applied in a curved line in the middle of the overlap section, leaving a few centimeters gap on the sides for condensation water drainage.



Step 9.
In corners, where 4 modules meet, use pliers to tighten the upper right side lock before next module is installed.



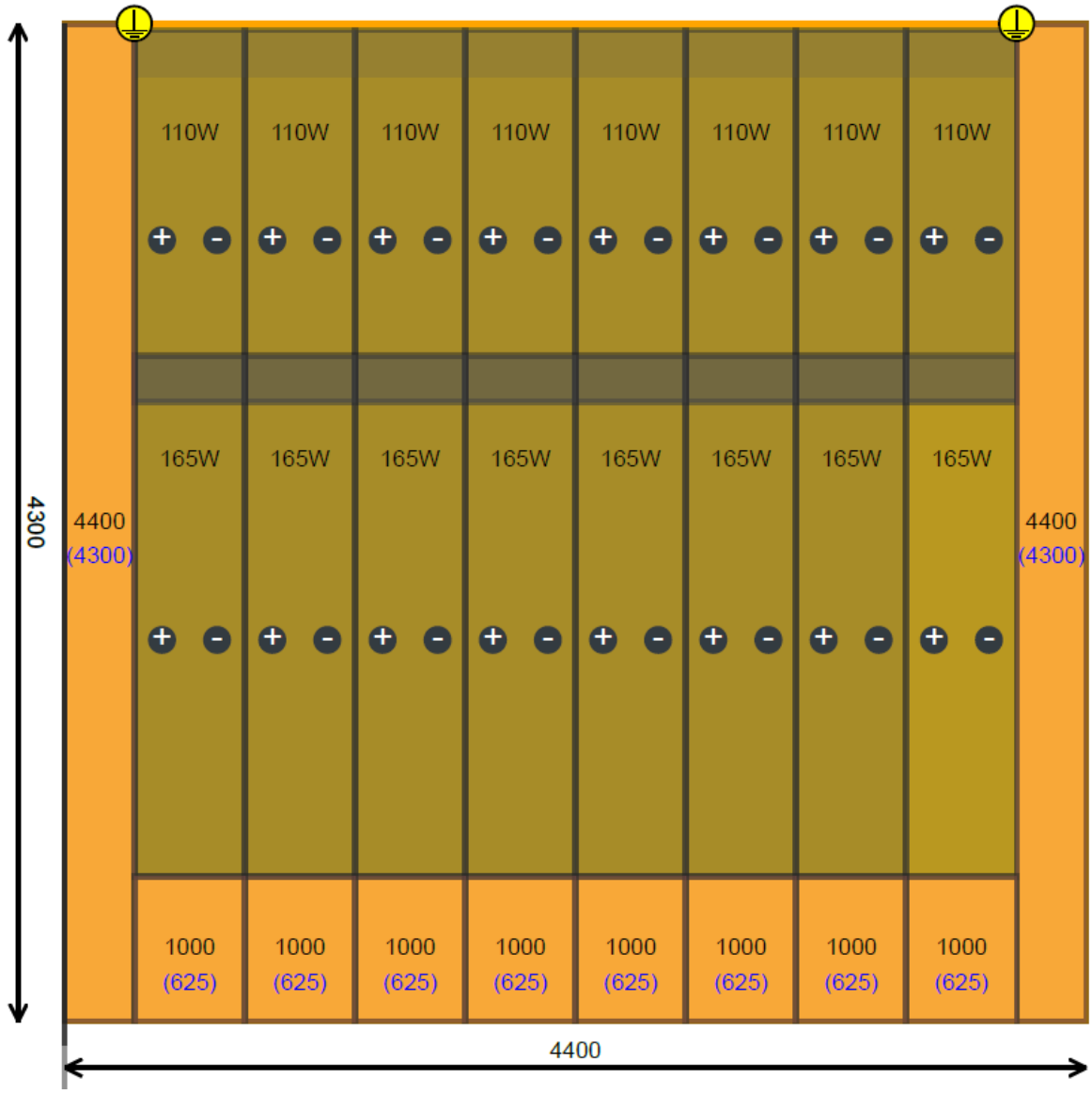
Step 10.
While placing the next module on top, leave a 5 mm gap between the two glass surfaces.

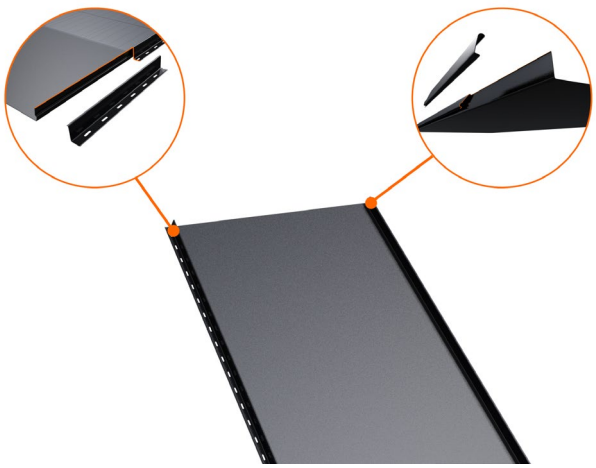


Step 11.
During the installation, be aware that multiple metal layers come together in the overlap area, which can cause misalignment. Make sure to check the width of the roof and if needed, adjust the line by slightly pulling the left side lock before attaching the screw to ensure everything is lined up correctly.

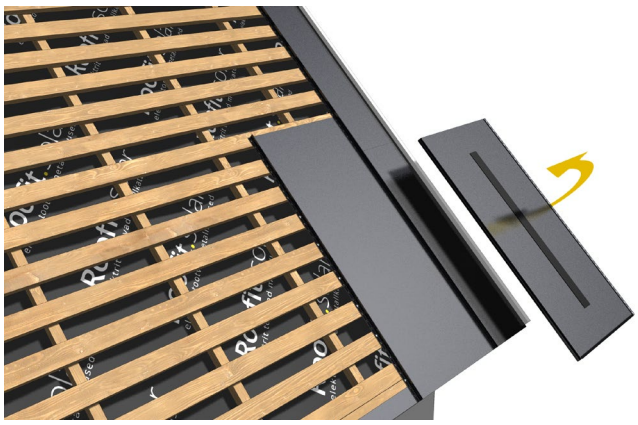
Case 5: The column starts with a regular metal sheet

Most installation steps are similar to Case 1, except the lower part starts with regular metal. This layout is mostly used when show guards are needed.

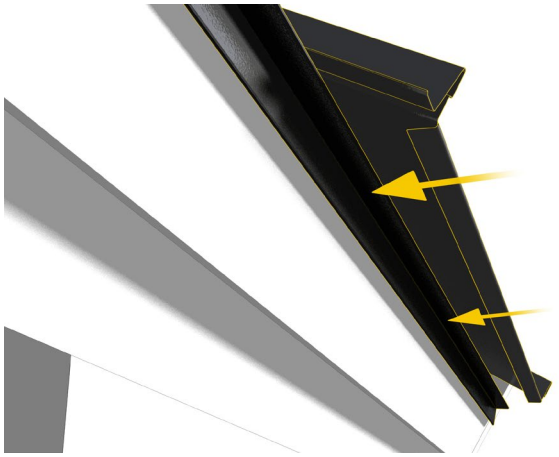




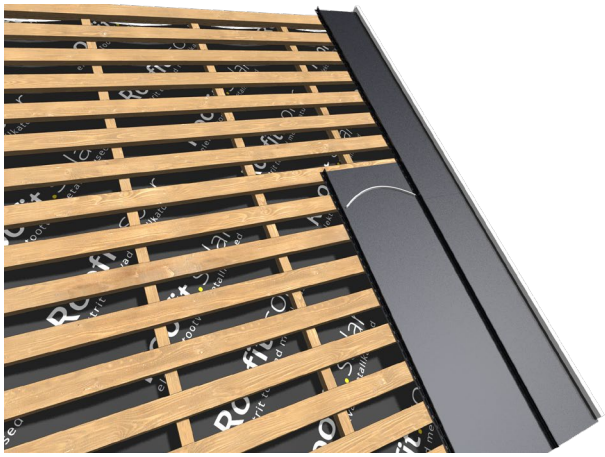
Step 1.
The top part of the left and right seams must be cut in the same manner as already done for the BIPV modules in the length of 205mm before installing the next BIPV module on top.



Step 2.
Use acoustic tape under the regular metal sheet to reduce wind noise and oil canning. Be careful when handling the metal sheet and place it on a soft surface to prevent scratches on the paint or zinc coating. When gluing the acoustic tape, apply 1-2 stripes, leaving 300 mm clear from the top and bottom. There must not be any sound insulation under the metal sheet in the area that overlaps with the module, as this can cause tension to the glass.

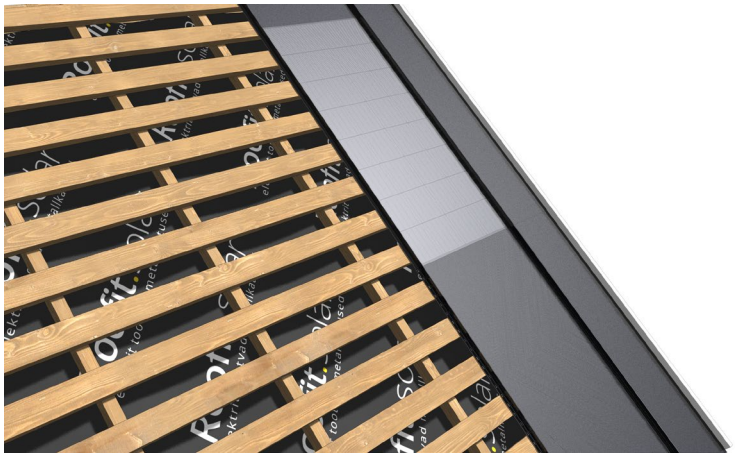


Step 3.
The bottom sheet shall be installed as required in the installation manual of the passive metal with metal folding under the eave.



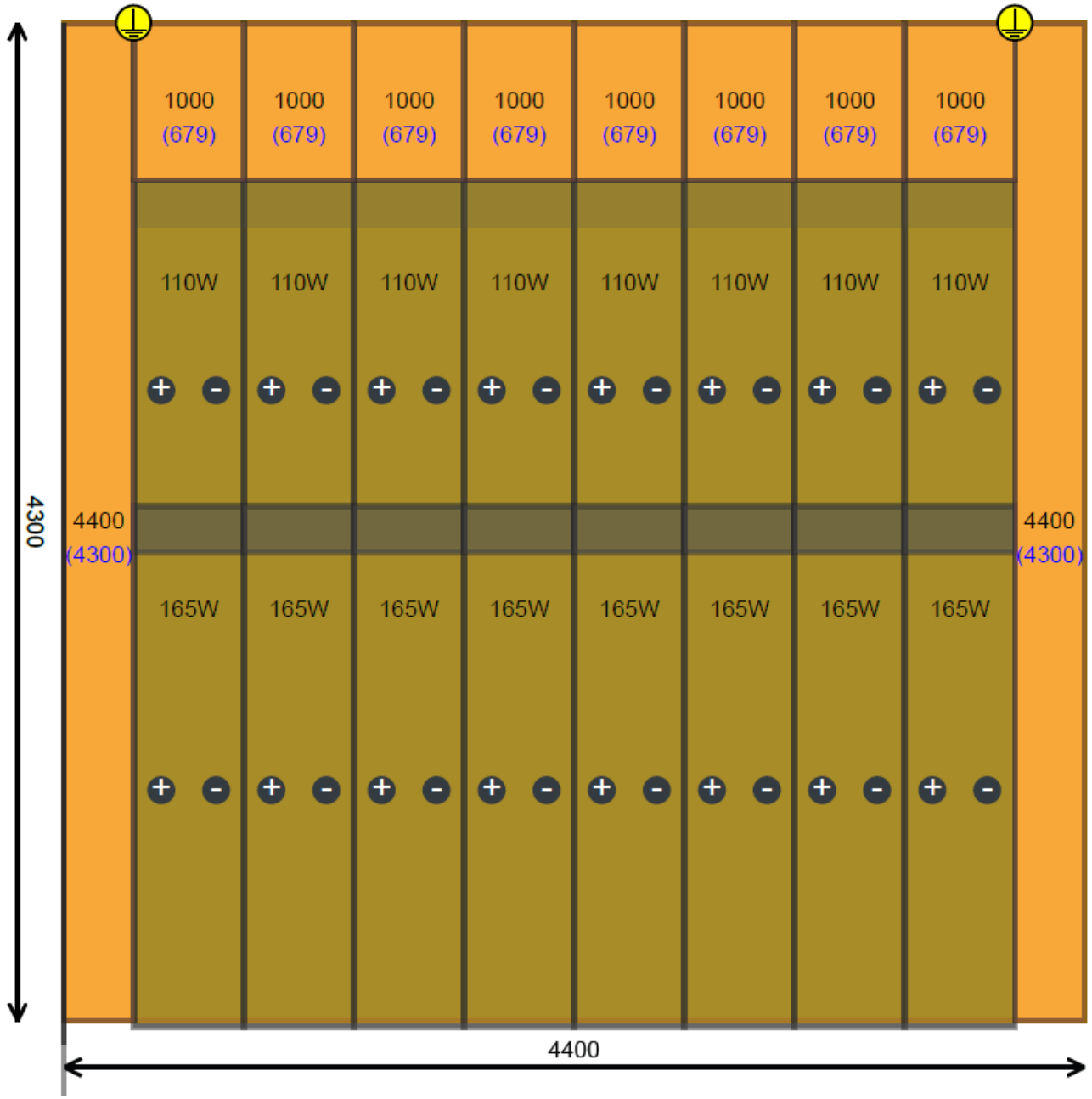
Step 4.
The acoustic tape under the regular metal sheet helps to reduce wind noise and oil canning.

Attach the sealant to the upper edge of the standard metal sheet, where the 200 mm overlap will be.



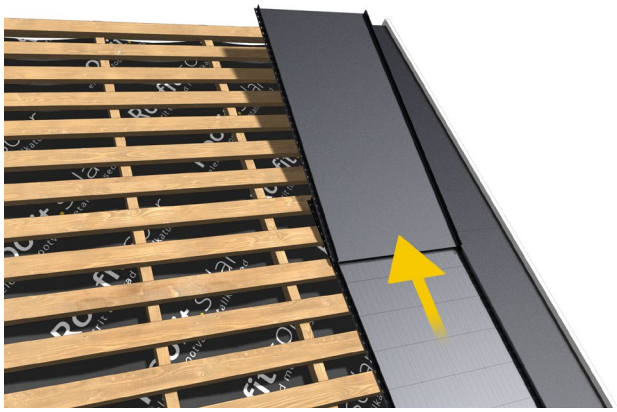
Step 5.
Install the next BIPV module on top with a 200 mm overlap to ensure adequate water resistance.

Case 6: The column ends with a regular metal sheet

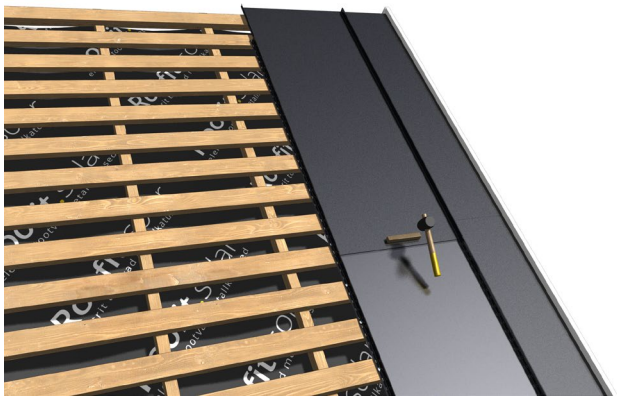


Step 1.
Upper extensions are provided with a backbend with a minimum length of 1200 mm. If a shorter piece is needed, one must use metal scissors, low-speed circular saw (max. 3600 rpm), a nibbling machine, a jigsaw or any other device that does not produce heat.

Step 2.
To install a regular metal sheet on top of the BIPV module, an overlap element is placed on the lower BIPV module. The overlap element is attached with 3 flat-head screws. If there is no batten underneath the overlap area, install an additional batten. Bending the lower side of the overlap element upwards also enables an easier installation in the next step.



Step 3.
The folded end of the metal sheet must be inserted under the extension flashing and then pulled toward the ridge to fix it into place.



Step 4.
The backbend of the regular metal can be flattened with a wooden board and bumping mallet.

Pay attention not to hit the glass of the lower BIPV module.