



(2023)

Installation Manual

— Solar-Powered Urban Architectural Aestheticians —

Singer Cailin (Tianjin) Building Tech. Co., Ltd.



Guide

Customers are the lifeblood of our business, and we firmly believe that providing sustained, efficient, excellent, innovative, and personalized service is the foundation for maintaining long-term and good cooperation with customers. Therefore, we always root ourselves in the market, hold customers in our hearts, and adhere to the principle of quality first and service supreme, striving to continuously meet customer needs, provide more professional and humanized services, and create more value for all types of customers.

Our development comes from the success of our customers!



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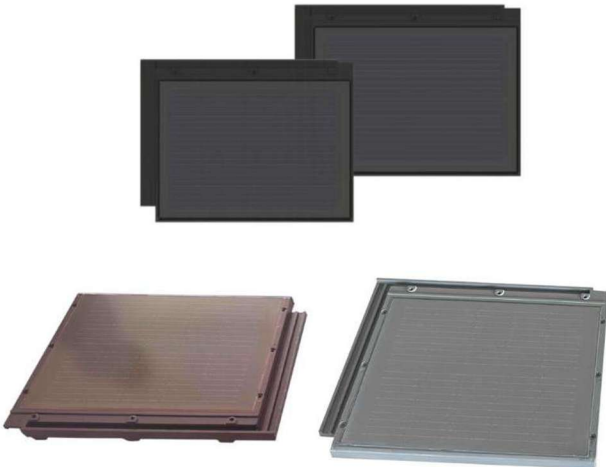


Product introduction



Physical Parameters

Product Name	T-max Tile_O
Dimensions (mm)	1260*480mm
Weight (Kg)	15.5kg
Tempered glass (mm)	3.2mm
Battery size (mm)	182*91mm
Junction box	≥ IP67
Cable type	900mm / 4mm ²
Cable connector	MC4
Service life (year)	>30



Physical Parameters

Product Name	T-max Tile_O
Dimensions (mm)	630*480mm
Weight (Kg)	7.5kg
Tempered glass (mm)	3.2mm
Battery size (mm)	182*91mm
Junction box	≥ IP67
Cable type	450mm / 4mm ²
Cable connector	MC4
Service life (year)	>30

Electrical Performance Parameters (STC)

Color	Black	Grey	Red
Chip type	Monocrystalline silicon	Monocrystalline silicon	Monocrystalline silicon
Power output (W)	90	78	75
Component efficiency (%)	18.9	16.4	15.8
Voltage at Pmax (V)	13.7	13.5	13.4
Current at Pmcax (A)	6.57	5.78	5.59
Open-circuit current (V)	16.3	16.2	16.1
Short-circuit current (A)	6.89	6.07	5.93

Performance Class

Load Class	2400Pa
Fire-proof level	Class A
Anti-hail Rating	Φ25mm/23m/s
Operating Temperature	-40°C to +85°C
Working Humidity	0-80%

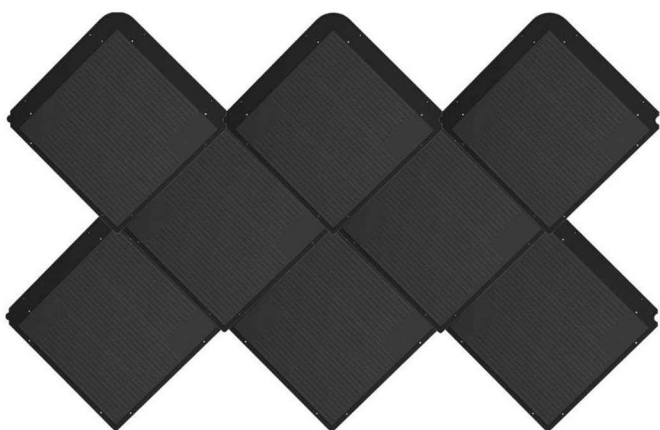
Electrical Performance Parameters (STC)

Color	Black	Grey	Red
Chip type	Monocrystalline silicon	Monocrystalline silicon	Monocrystalline silicon
Power output (W)	38	32	31
Component efficiency (%)	17.3	14.5	14.1
Voltage at Pmax (V)	5.71	5.63	5.58
Current at Pmcax (A)	6.65	5.68	5.56
Open-circuit current (V)	6.79	6.76	6.71
Short-circuit current (A)	6.97	5.96	5.89

Performance Class

Load Class	2400Pa
Fire-proof level	Class A
Anti-hail Rating	Φ25mm/23m/s
Operating Temperature	-40°C to +85°C
Working Humidity	0-80%

Physical Parameters



Product Name	T-max Tile_R
Dimensions (mm)	935*944mm
Weight (Kg)	10.5kg
Tempered glass (mm))	3.2mm
Battery size (mm)	182*91mm
Junction box	≥ IP67
Cable type	500mm / 4mm ²
Cable connector	MC4
Service life (year)	>30

Electrical Performance Parameters (STC)

Color	Black
Chip type	Monocrystalline silicon
Power output (W)	55
Component efficiency (%)	15.4
Voltage at Pmax (V)	8.9
Current at Pmcax (A)	6.18
Open-circuit current (V)	10.59
Short-circuit current (A)	6.54

Performance Class

Load Class	2400Pa
Fire-proof level	Class A
Anti-hail Rating	Φ25mm/23m/s
Operating Temperature	-40°C to +85°C
Working Humidity	0-80%



Physical Parameters

Product Name	T-max Tile_L
Dimensions (mm)	1340*420mm
Weight (Kg)	6kg
Tempered glass (mm))	3.2mm
Battery size (mm)	182*91mm
Junction box	≥ IP67
Cable type	500mm / 4mm ²
Cable connector	MC4
Service life (year)	>30

Electrical Performance Parameters (STC)

Color	Black	Grey	Red
Chip type	Monocrystalline silicon	Monocrystalline silicon	Monocrystalline silicon
Power output (W)	65	58	56
Component efficiency (%)	17.8	16.1	15.6
Voltage at Pmax (V)	10.3	10.1	10.1
Current at Pmcax (A)	6.6	5.74	5.54
Open-circuit current (V)	12.3	12.1	12.1
Short-circuit current (A)	6.97	5.96	5.89

Performance Class

Load Class	2400Pa
Fire-proof level	Class A
Anti-hail Rating	Φ25mm/23m/s
Operating Temperature	-40°C to +85°C
Working Humidity	0-80%



Physical Parameters

Product Name	T-max Tile_S
Dimensions (mm)	586*400mm
Weight (Kg)	5kg
Tempered glass (mm))	3.2mm
Battery size (mm)	182*91mm
Junction box	≥ IP67
Cable type	300mm / 4mm ²
Cable connector	MC4
Service life (year)	>30

Electrical Performance Parameters (STC)

Color	Black
Chip type	Monocrystalline silicon
Power output (W)	30
Component efficiency (%)	12.8
Voltage at Pmax (V)	2.91
Current at Pmcax (A)	10.21
Open-circuit current (V)	4.13
Short-circuit current (A)	11.08

Performance Class

Load Class	2400Pa
Fire-proof level	Class A
Anti-hail Rating	Φ25mm/23m/s
Operating Temperature	-40°C to +85°C
Working Humidity	0-80%

B. General Guidance

1. Product Description:

Solar roof tiles are a roofing material that integrates photovoltaics and buildings. It is suitable for single-slope or multi-slope roofs with slopes greater than 15 degrees and less than 60 degrees. As a roofing material, it not only matches the style of the building itself, but also replaces the traditional tile material, and at the same time given it with the function of generating electricity, so the building itself can achieve zero carbon in the true sense.

2. Operator Requirements

Anyone who installs photovoltaic modules should receive correct manual operation practice training, and must carry out general construction site training and high-altitude safety operation training. All appropriate health and safety regulations should be properly complied with and avoid installing the system in adverse weather conditions including strong wind, rain, ice or snow etc.

3. Applicable Standards:

- The performance of solar tiles should comply with "Safety Appraisal of Photovoltaic Modules" IEC61730, "Code for Acceptance of photovoltaic Power Generation Projects" GB/T 50796-2012, and the performance of ventilated self-adhesive membranes and self-adhesive finished waterproof membranes should comply with "Butyl Rubber Waterproof Sealing adhesive tape" JCT 942-2004 requirements.
- The waterproof requirements of the roof should meet the requirements of the current national standard "Code for Quality Acceptance of Building Roof Engineering" GB50207 and "Technical Specifications for Roof Engineering" GB 50345-2012.
- International and domestic certification



GB/T 19001
ISO 9001:2015



GB/T 24001-2016
ISO 14001:2015



GB/T 45001-2020
ISO 45001:2018



Intellectual Property
Management System (IPMS)
Certificate



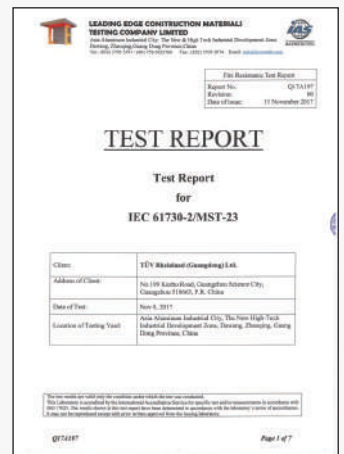
TUV Certification (IEC 1616)
the industry's first BIPV PV
certification in the world



CE Certification

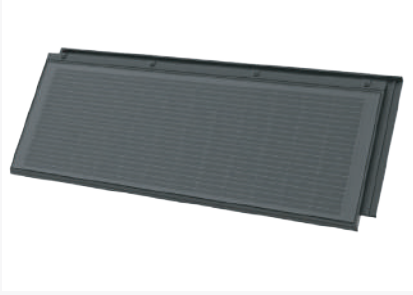


Glass breakage
safety certification



Fair Test
IEC 61730-1=UL 790

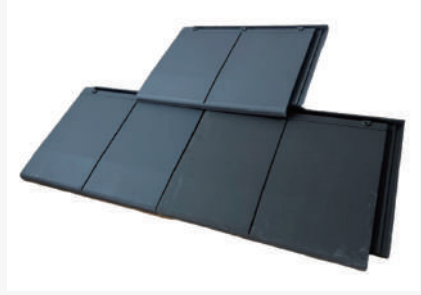
4. List of Roofing Materials



Solar roof tile #1 | 16.5kg / 1260*480mm



Solar roof tile #2 | 8.5kg / 630*480mm



Flat tile | 6kg / 630*480mm



Main ridge | 1.25kg / 330*260mm



End cap | 0.4kg / 295*265*40mm



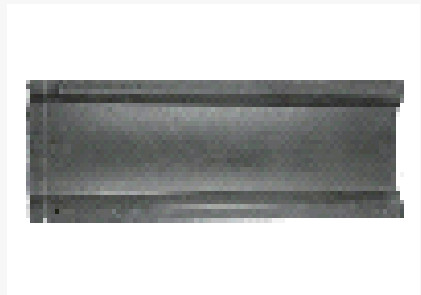
Ridge cap | 2kg / 325*260*90mm



Left barge board cover |
2.25kg / 420*180mm



Right barge board cover |
2.25kg / 420*180mm



Valley tile | 2.4kg / 700*230*6mm

5. List of Roofing Accessories



Tile bar | 4.2kg / 130*4000mm



Water strip | 4.2kg / 130*4000mm



Ridged tile | 2.4kg / 30*40*3000mm



Wood support | 0.115kg
50*200mm



Windresistance snap |
55*12mm 0.01kg



Ventilating grate |
700*230*6mm
0.046kg



Ventilated coil | 0.175kg
300*10000mm

C. Preparation

1. Construction Method

Before the system is installed, it is necessary to combine the layout guide and the schematic diagram of the installation guide designed by the Sunraven technical team to determine the final system position of the roof photovoltaic tile and the use position of the supporting products.

2. Preparation

Tile roof installation tools



Hand drill



Cutting saw



Angle grinder



Welding machine



Utility knife



Folding pliers



Box ruler



Tape measure



Ink fountain



Hammer



Level ruler



Infrared level



Glue gun



Power box with leakage protector



Temporary power cord



Safety belt



Safety hat



Reflective vest



Broom



Goggles

3.Pre-installed

The construction personnel are familiar with the overall layout according to the roof module layout drawing provided by the owner, and determine the position where the cables enter the roof.

• Please check the following before installation:

(1)The surface of solar tiles and modules is not damaged, and the quantity is consistent with the bill of materials.

(2)The installation tools are ready, including a multimeter.

(3)All relevant site requirements have been checked and allowed.

(4)Make sure all cable connectors are dry and free from dirt before installation.

• Check the cable connection method

The solar tile units are connected in series according to the layout diagram, and connected to the photovoltaic special cable pre-laid on the roof, and the other side of the cable is connected to the inverter equipment.

4.Roof Preparation

4.1 Solar tile applicable roof: steel structure roof, concrete roof, wooden roof.



Wooden roof



Steel structure roof



Concrete roof

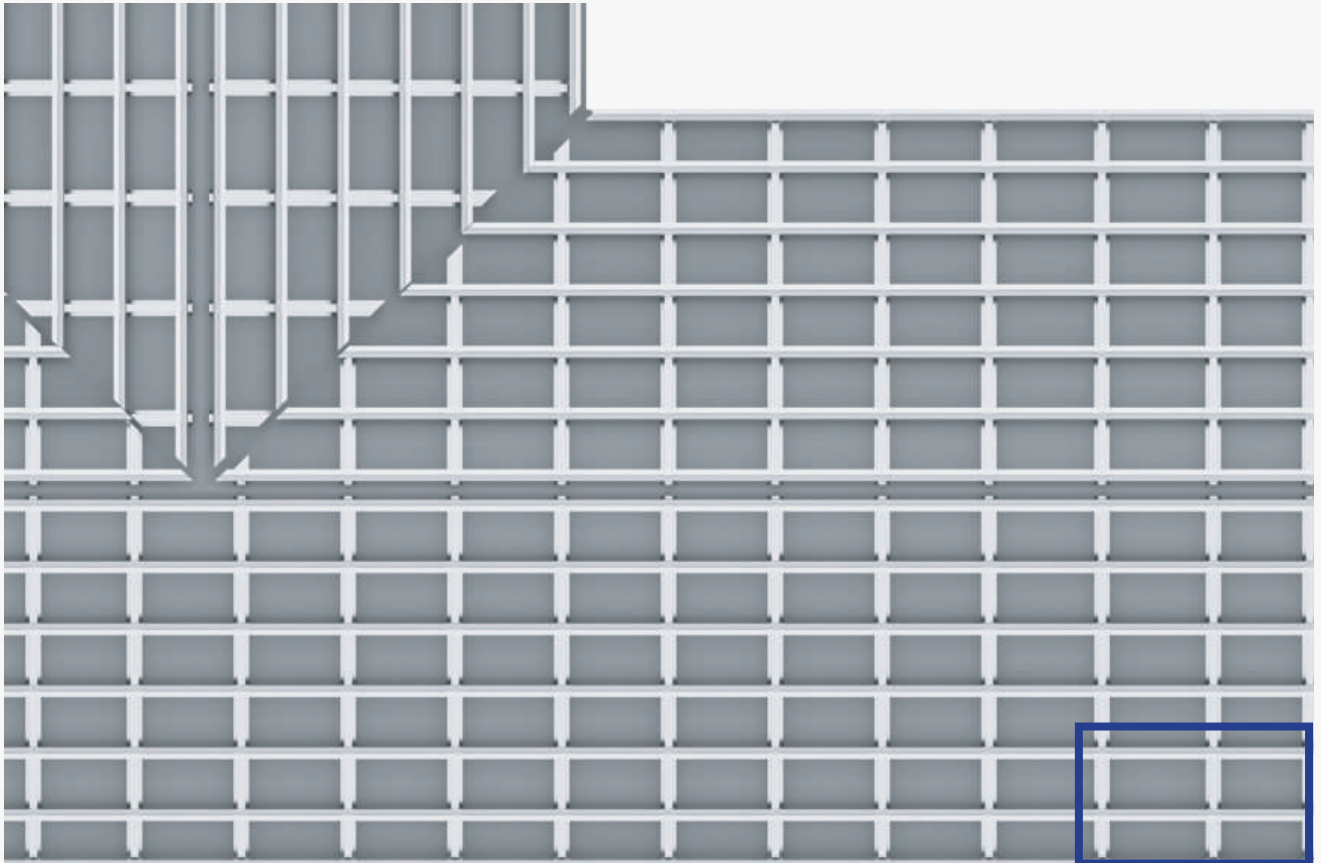
4.2 Slope requirements

Solar tiles are suitable for roofs with a slope of 15-60 degrees. For roof slopes less than 15 degrees or greater than 60 degrees, please consult Sunraven Technical Center.

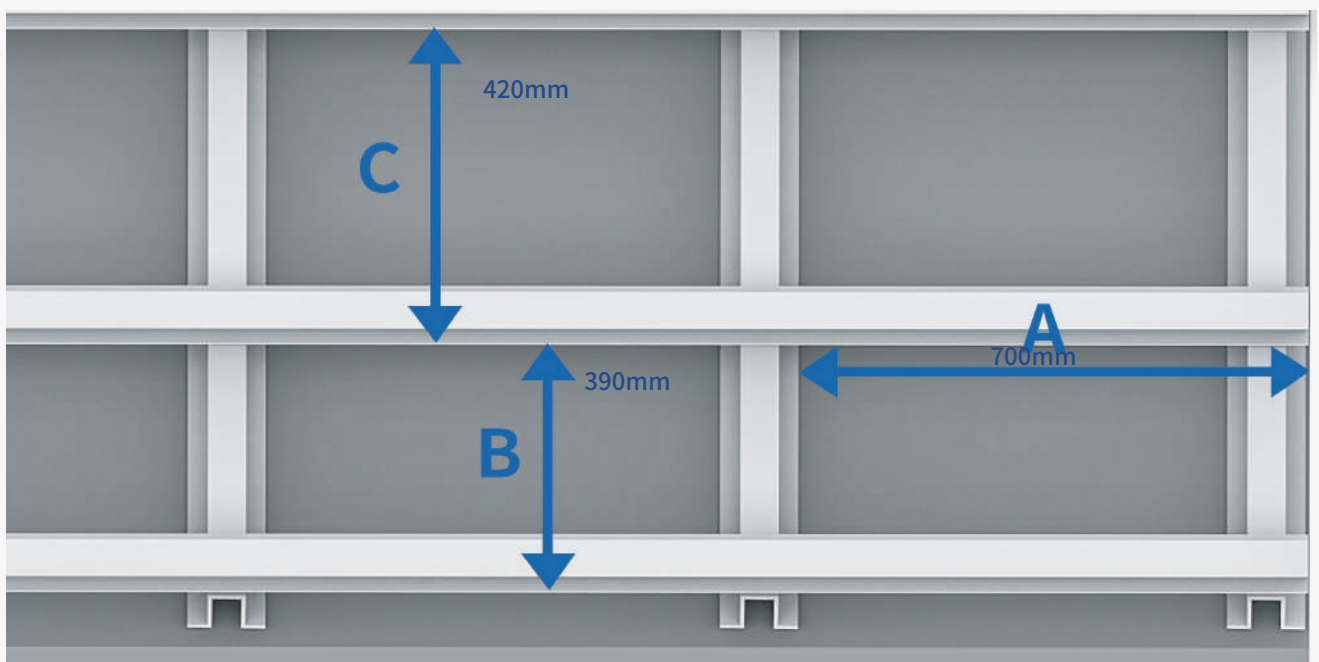
4.3 Water strip and hanging tile strip

Water strip: the Water strip is the metal strip or wood strip vertically intersected with the hanging tile strip under the roof tile hanging tile strip, which is used to fix the hanging tile strip and the overhead roof tile, which is conducive to roof ventilation. The spacing is A(700mm).

Hanging tile strips: refers to the process method of arranging tiles on the slope roof. Generally, hanging tile strips are installed on the roof, and the tiles are hung on the hanging tile strips, from the first and second cornice to the middle distance B(390mm). The spacing between the third and second articles is C(420mm), and so on.



Hanging tile strips and water strips overall arrangement

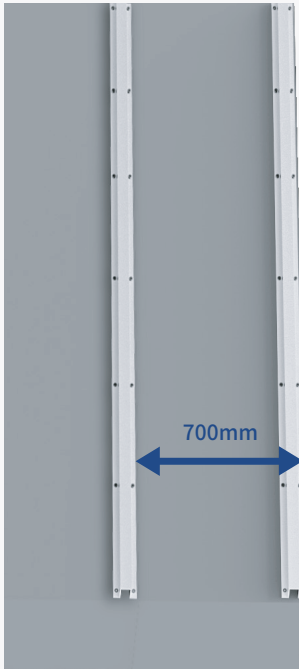


Permutation distance

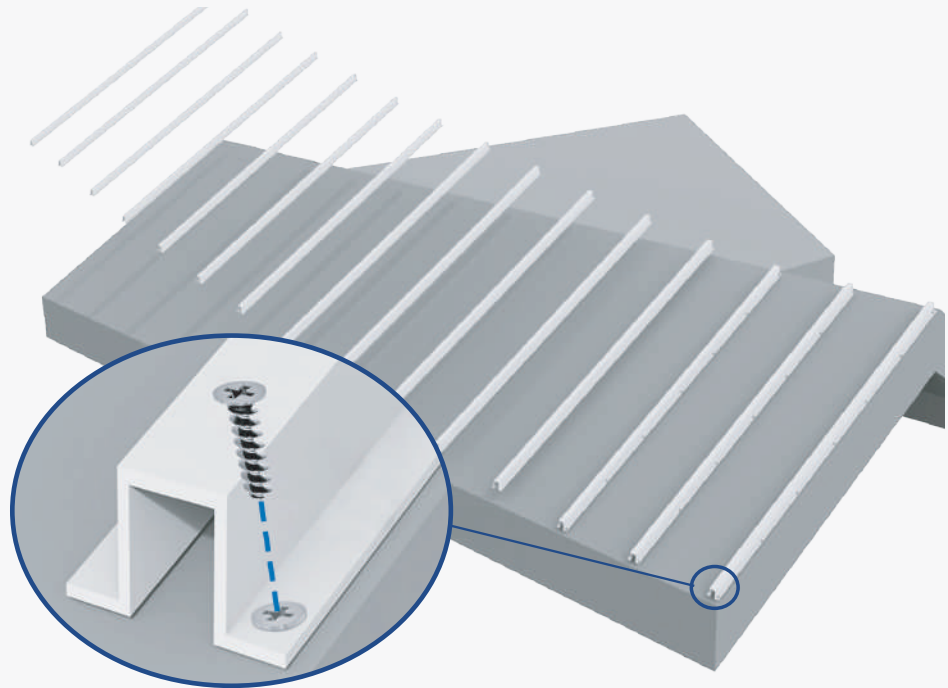
D. Construction

1. Fix The Water Strip

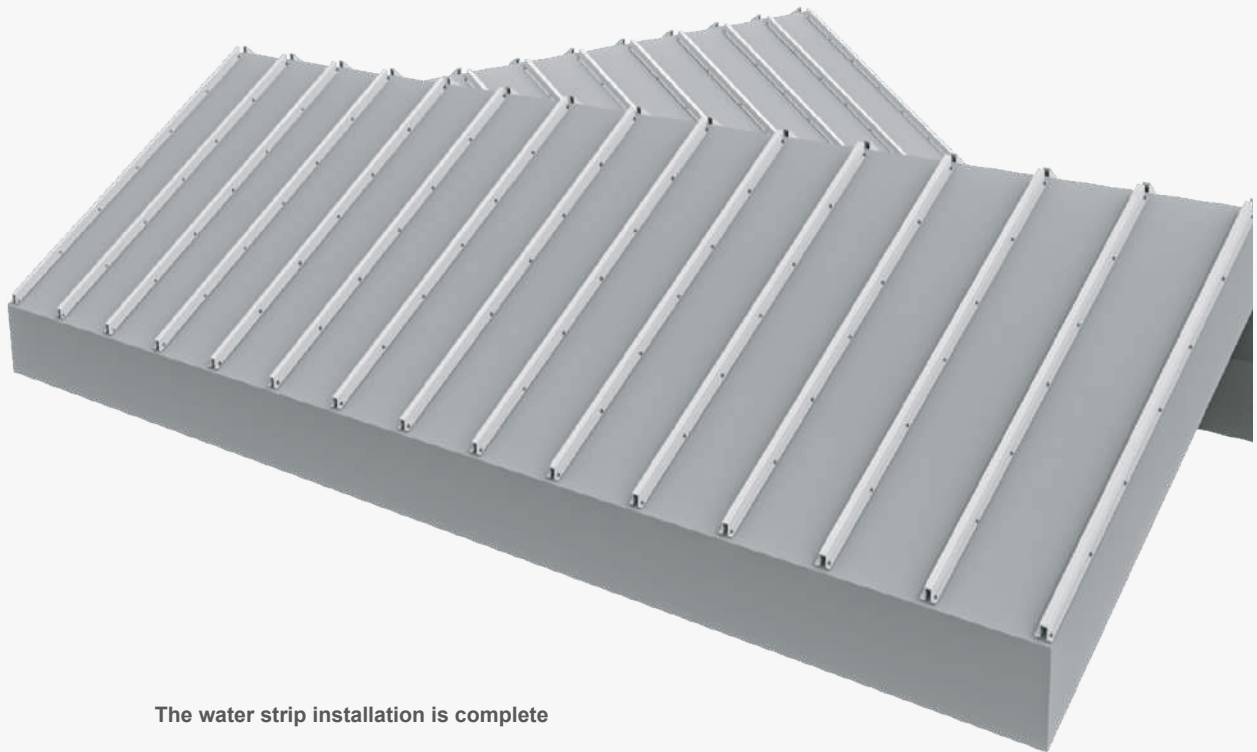
The size of the water strip is 30*35*1mm, a few-shaped metal strips, with an interval of 700mm, the position line of the water strip pops up, and the water strip is installed (Use 8mm lightweight expansion bolts to fix).



Install along the water strip



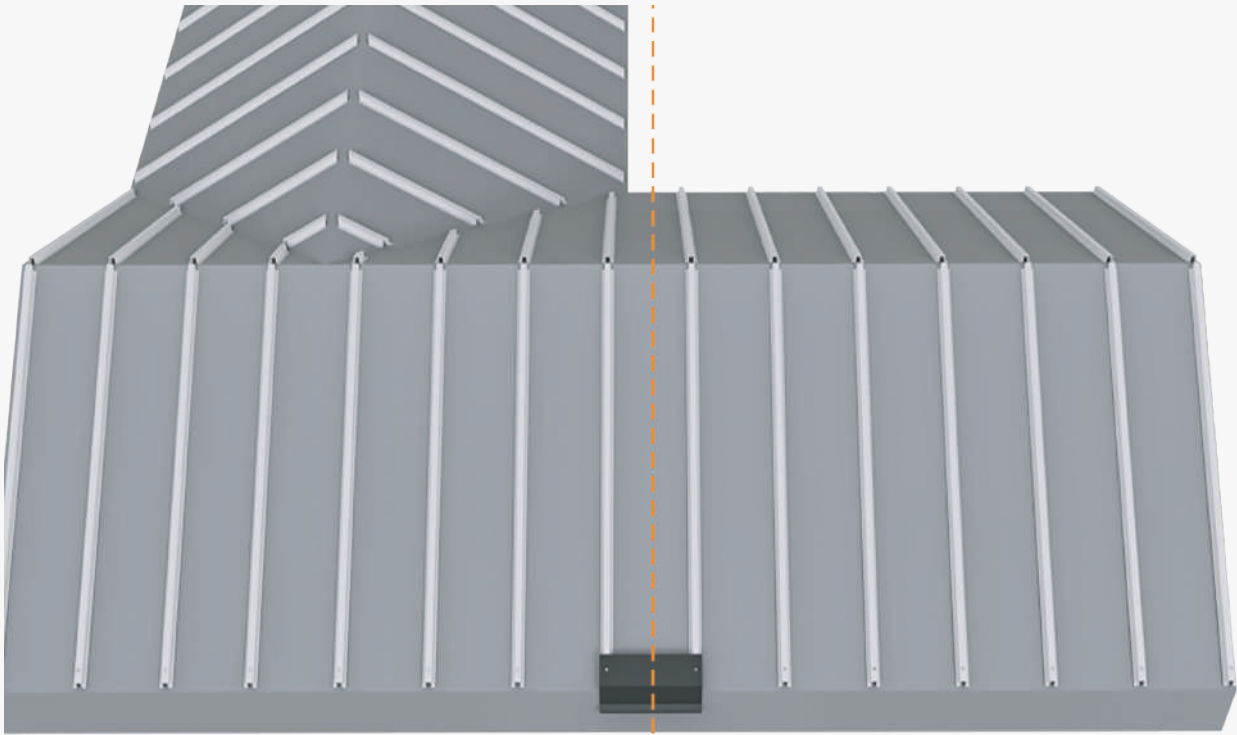
Sequence of installing water strips



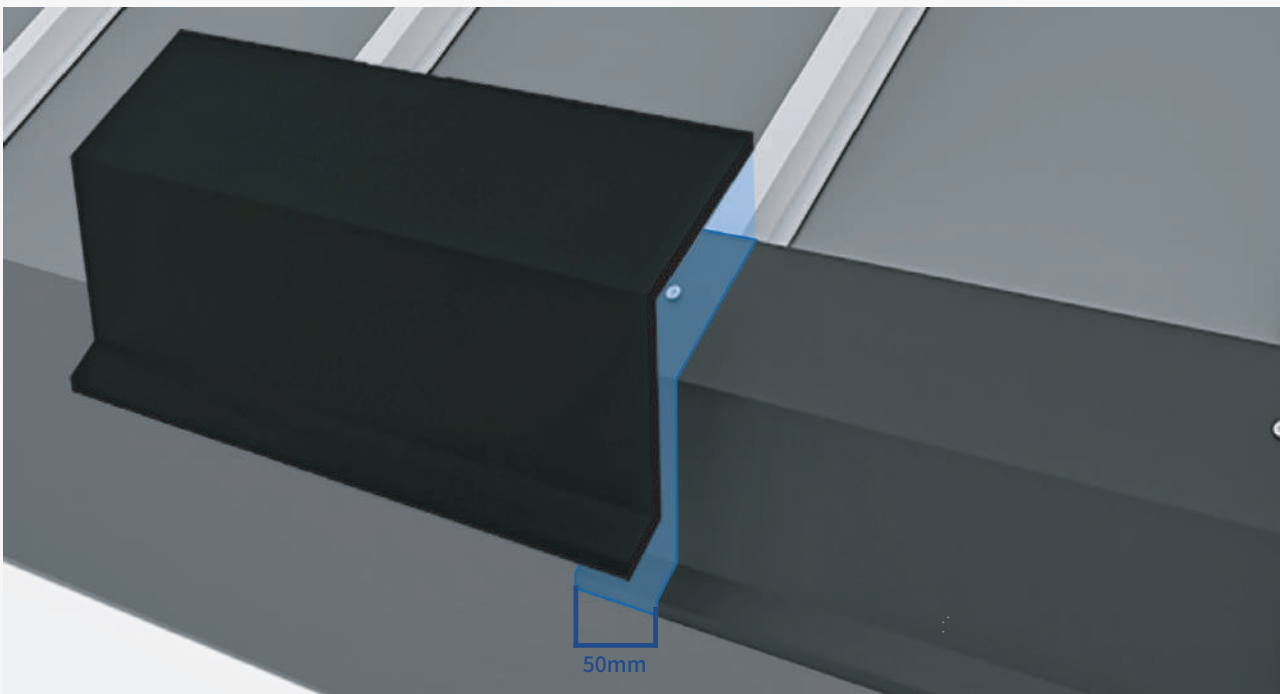
The water strip installation is complete

2.Lay the Bottom Cornice

Install the Bottom cornice in the middle and then on both sides.

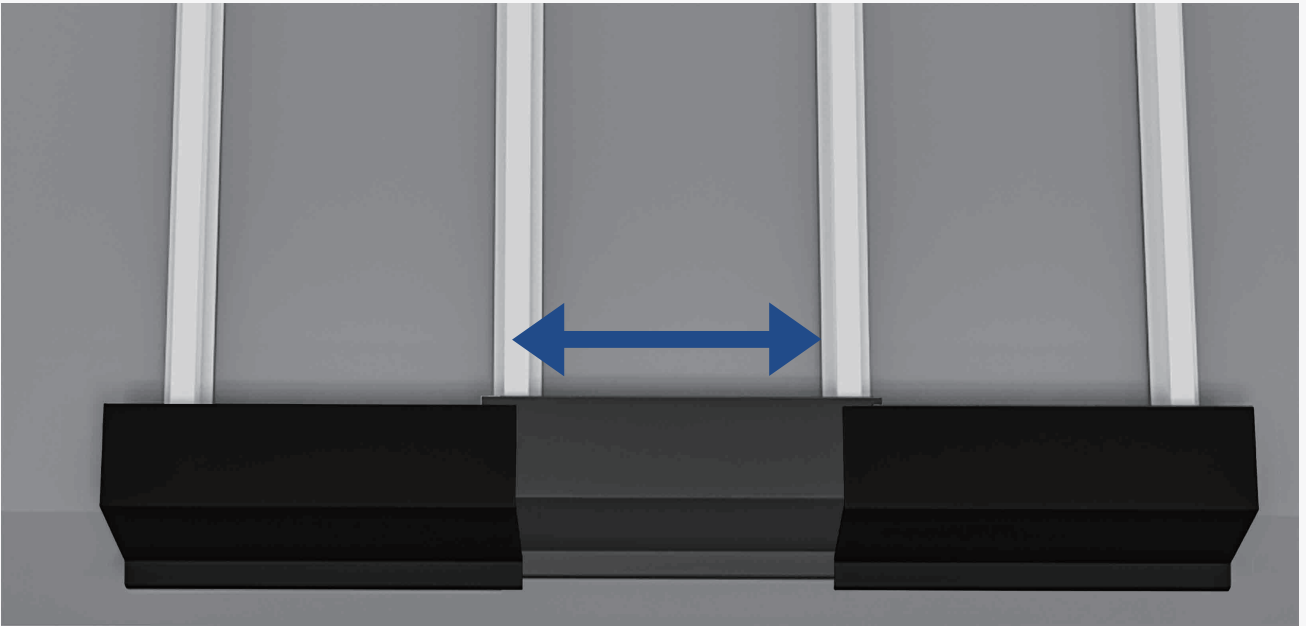


Install the Bottom cornice



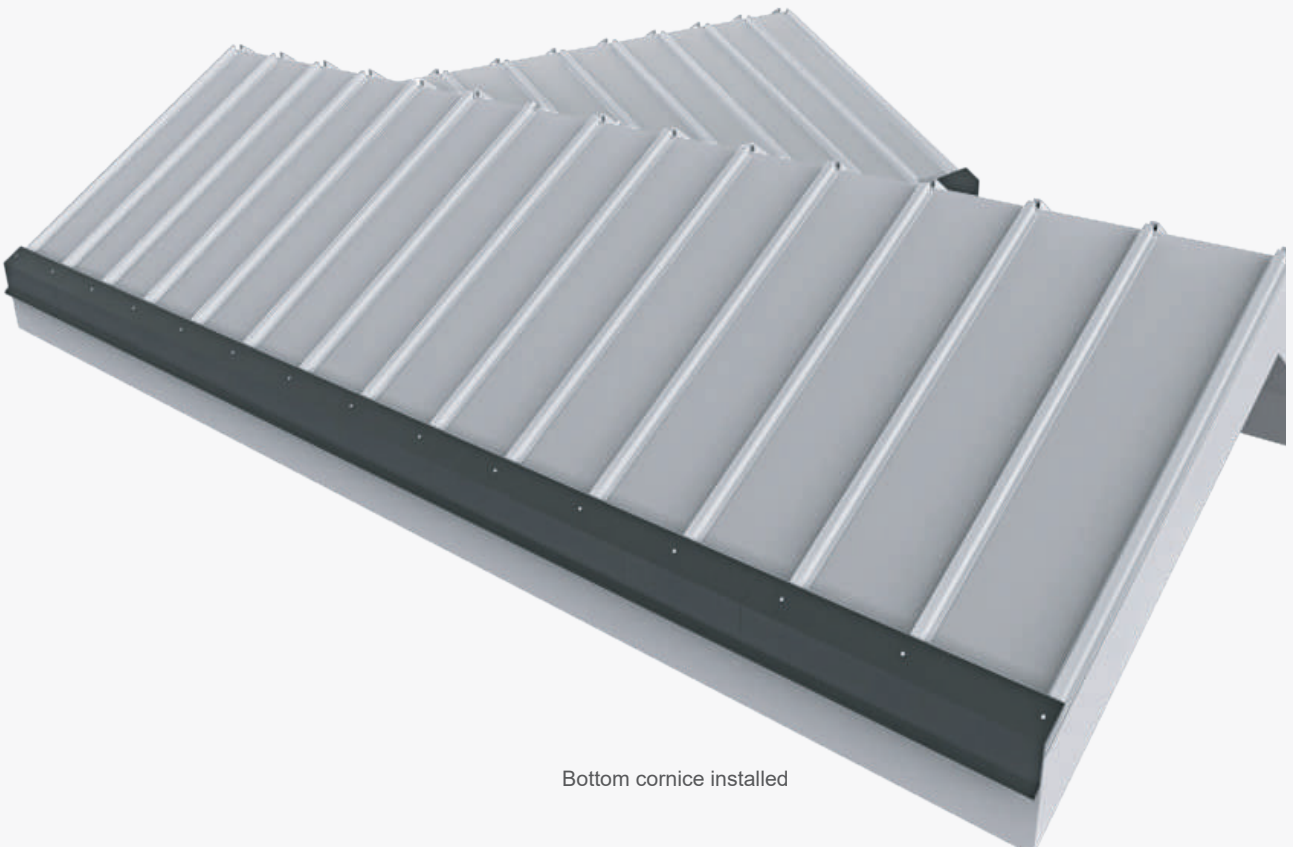
Overlap about 50mm

Note: The next Bottom cornice should be pressed against the previous Bottom cornice by about 50mm during installation to prevent rainwater.



Bottom cornice installation sequence

Use galvanized nails to fix the Bottom cornice on the water strips, install them to both sides in turn, and cut off the excess length.

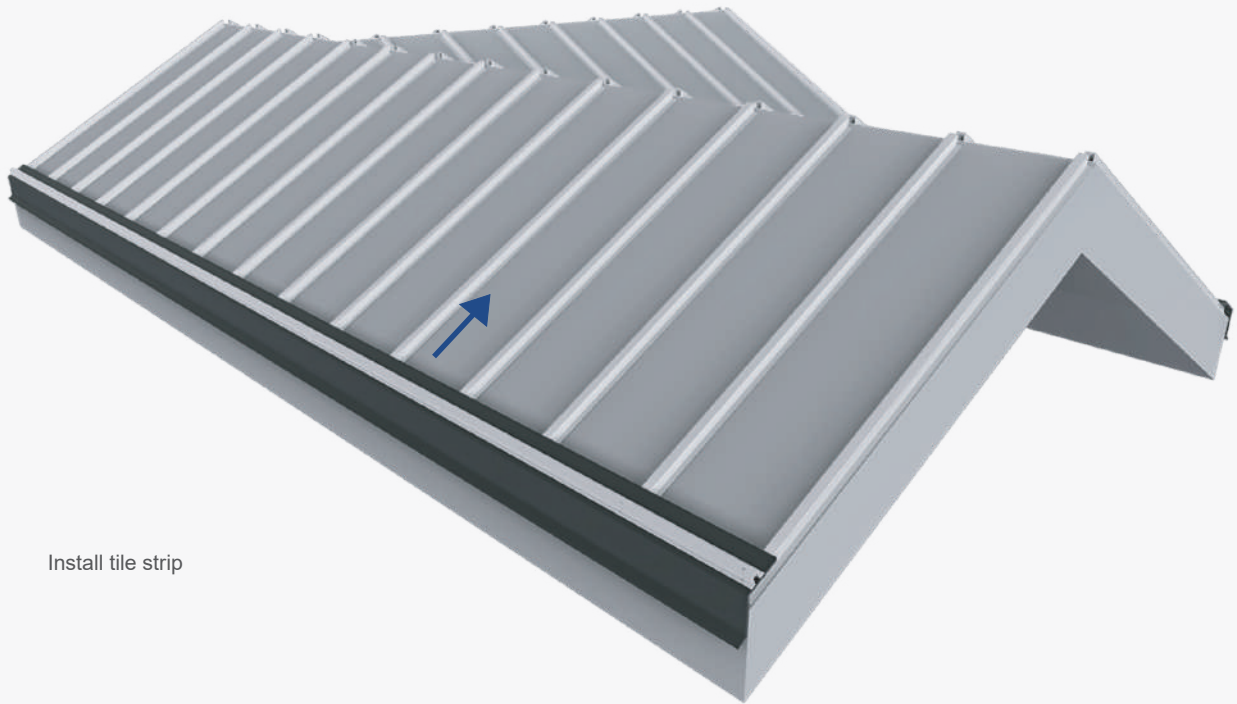


Bottom cornice installed

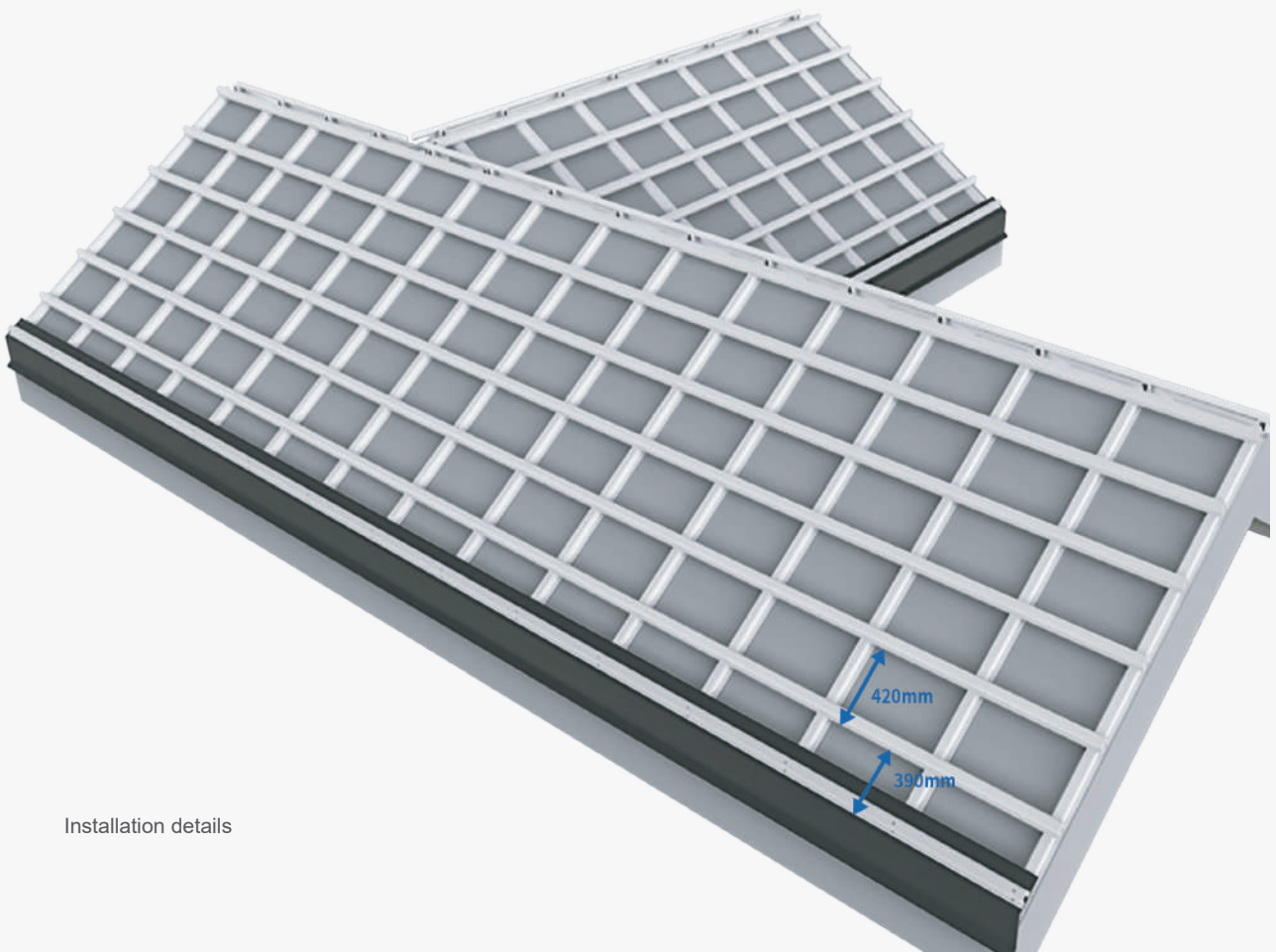
3.Fixed Hanging Tile Strip

The roof tiles strip should be installed straight, inspected during construction, and correct the deviation at any time to avoid rework;

The bottom tile strips are used as flashing boards and grate installation strips, the distance between the first and second strips is 390mm, and the distance between the third and 420mm is maintained.



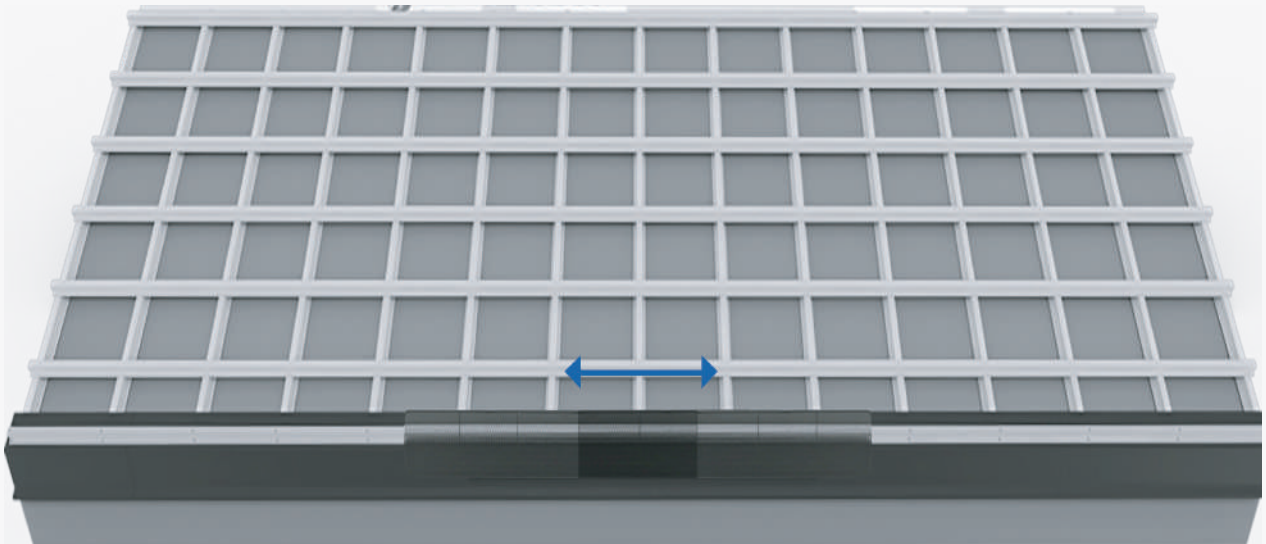
Install tile strip



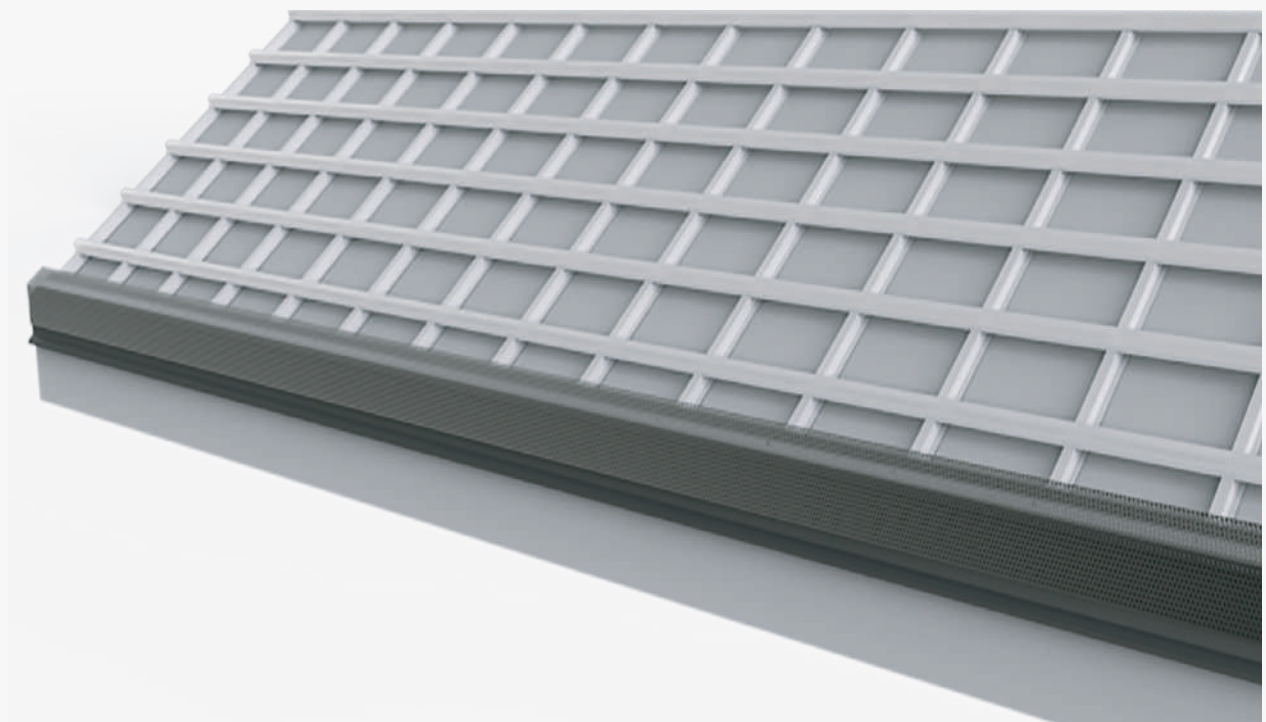
Installation details

4. Laying Grate

The grate is fixed and connected with galvanized nails in the order of the middle first and then both sides. Wrap the grate outside the hanging tiles, arrange and install it to both sides in sequence, and cut off the excess length.



Install the grate



Grate installed

5. Install Solar Roof Tiles

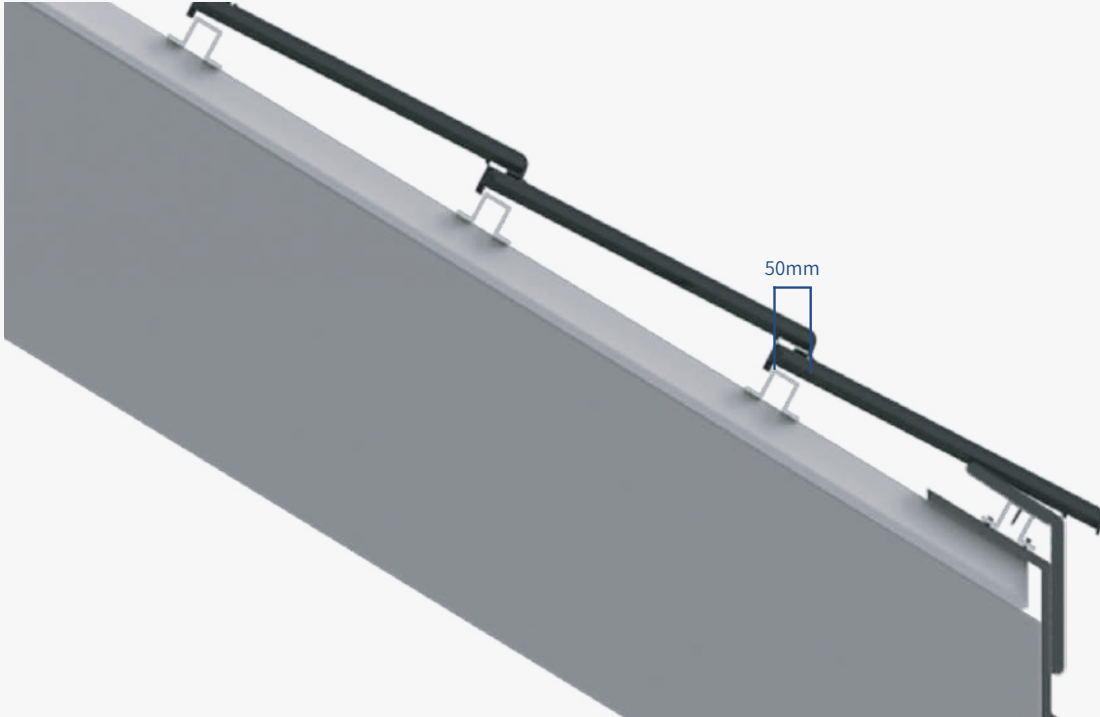
Take out the solar tile layout diagram provided by Sunraven Technology Department in advance;

According to the schematic position of the layout diagram, fix the solar tile unit to the hanging tile strip with self-tapping screws (countersunk self-drilling nail ST4.8*50mm galvanized) from left to right, and need to overlap 50mm.

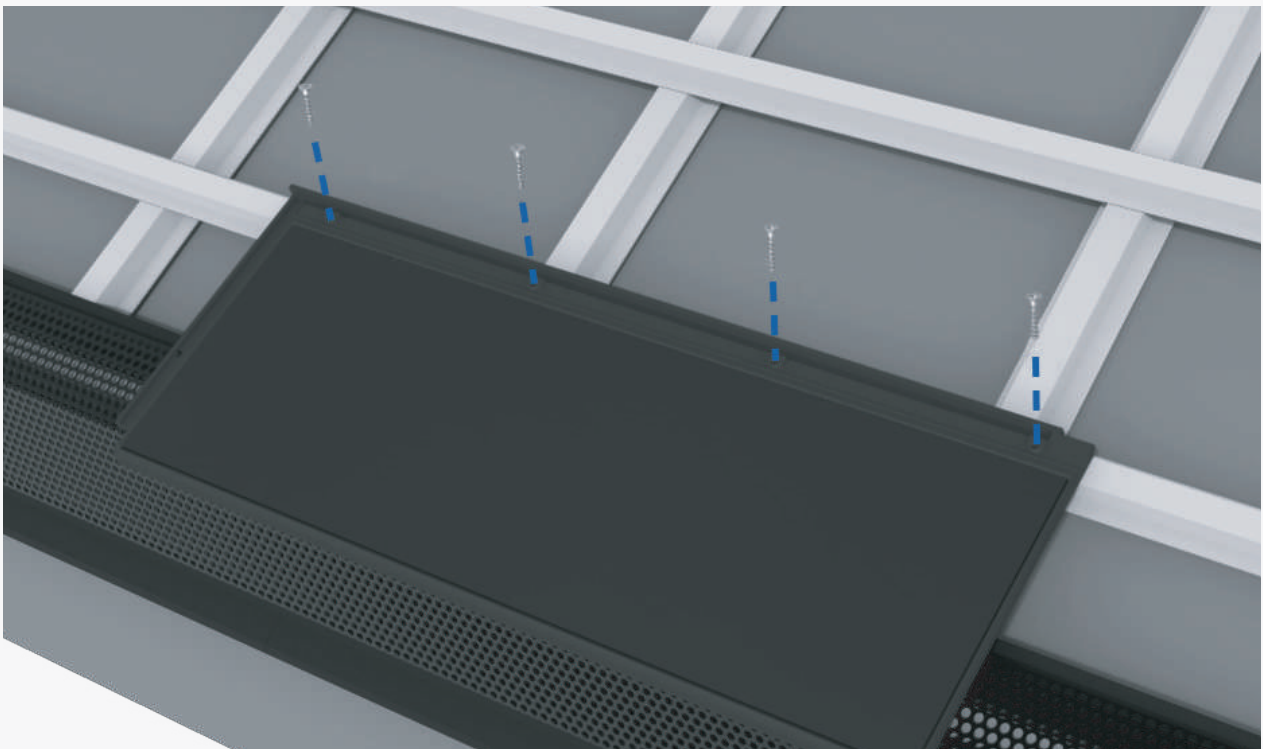
After fixing, check the cables of the two solar tile units and connect them, if the test passes, install the next photovoltaic tile unit, and so on;

When the solar tile unit is combined up and down, it needs to be overlapped by 50mm.

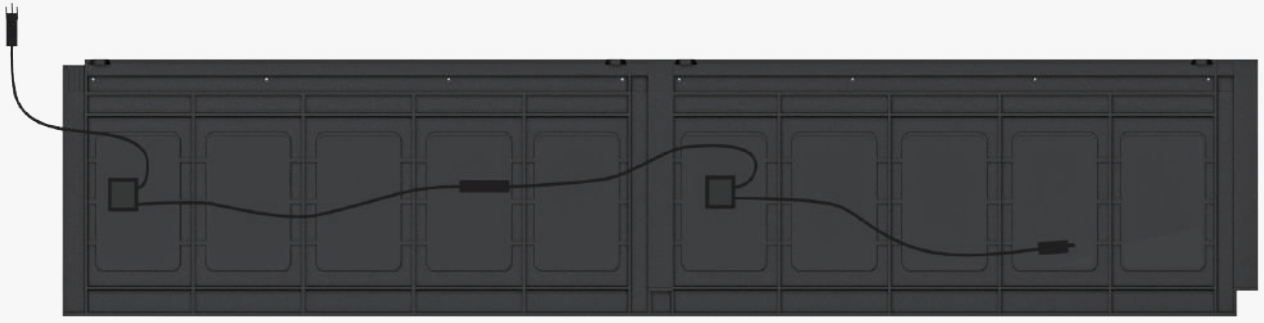
Note: Please avoid pressing the cornice of the upper solar tile unit on the glass of the lower piece.



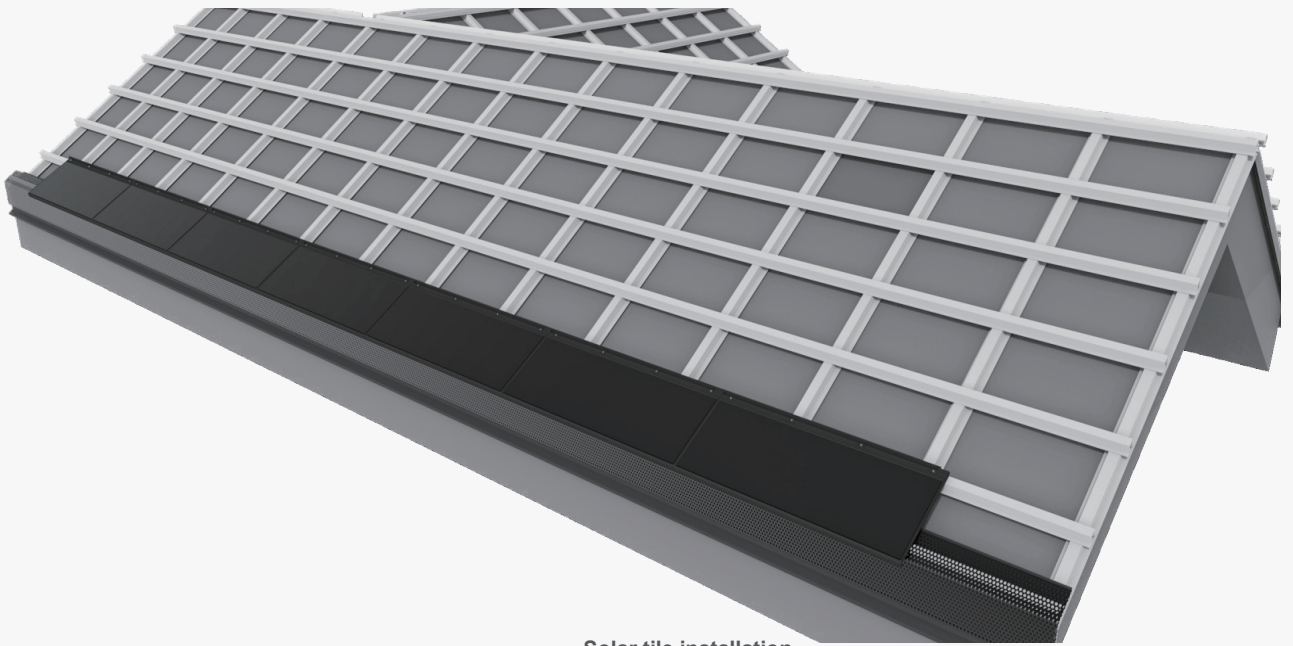
Lap 50mm



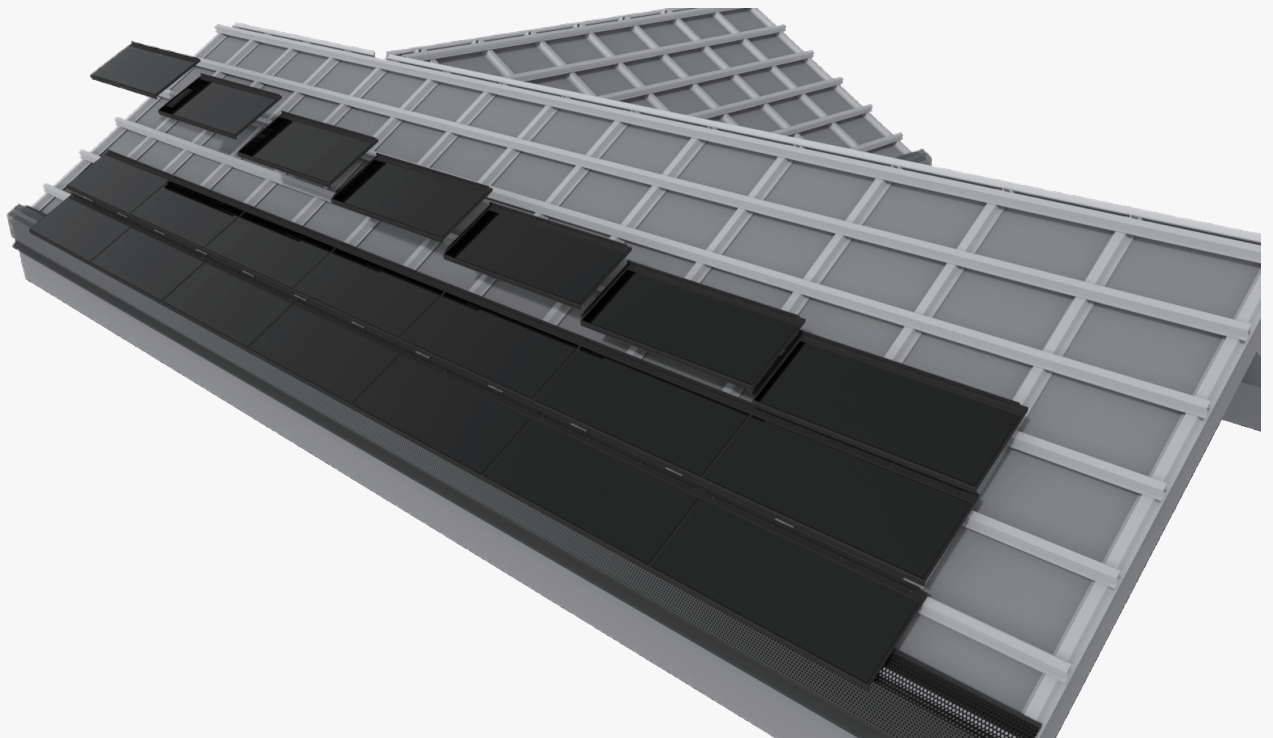
Installation of solar tiles



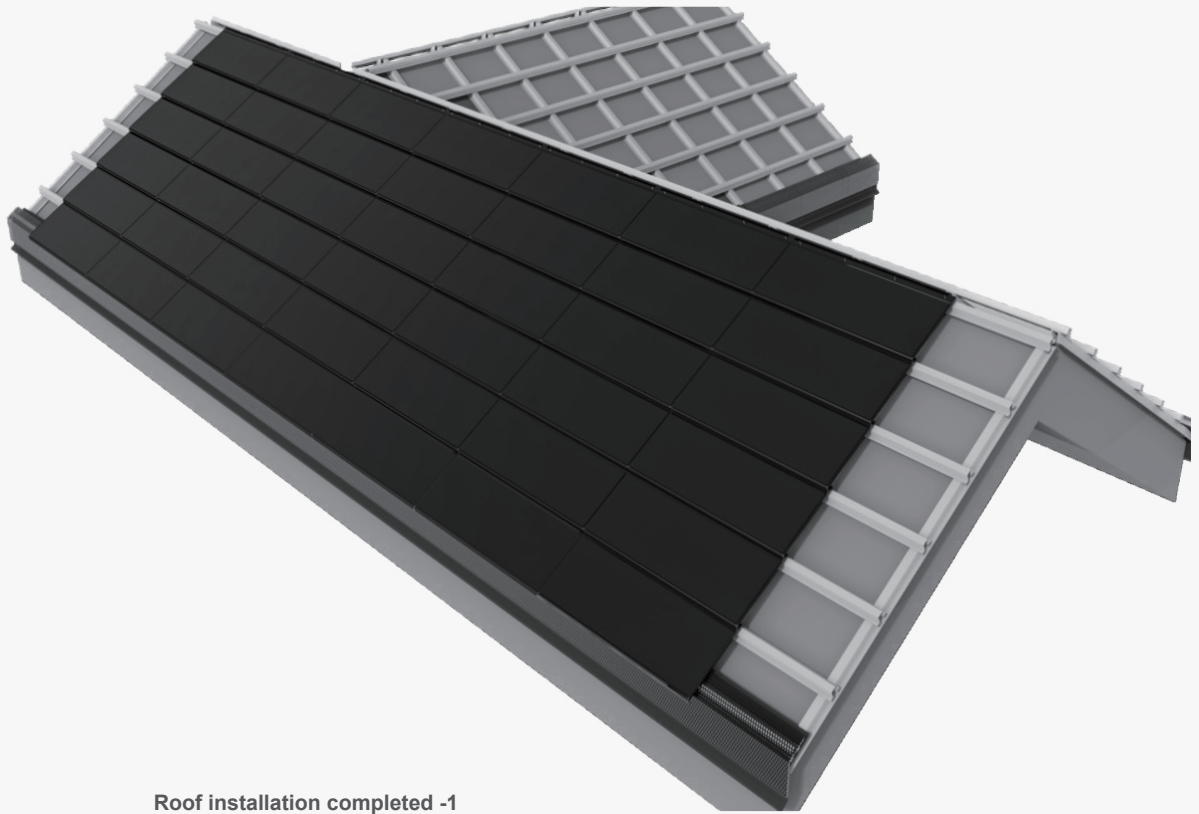
Solar tile connection



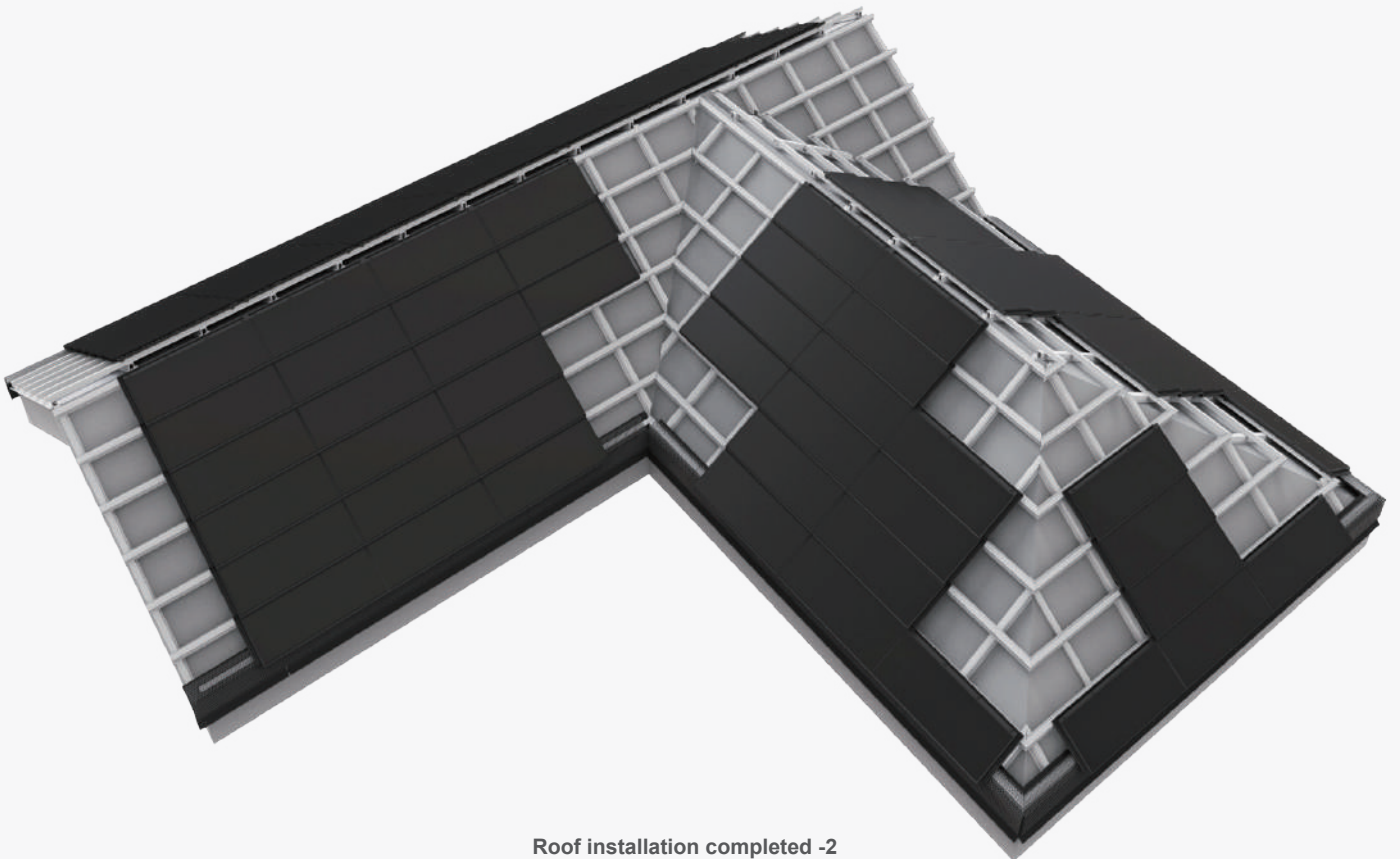
Solar tile installation



Solar tile installation

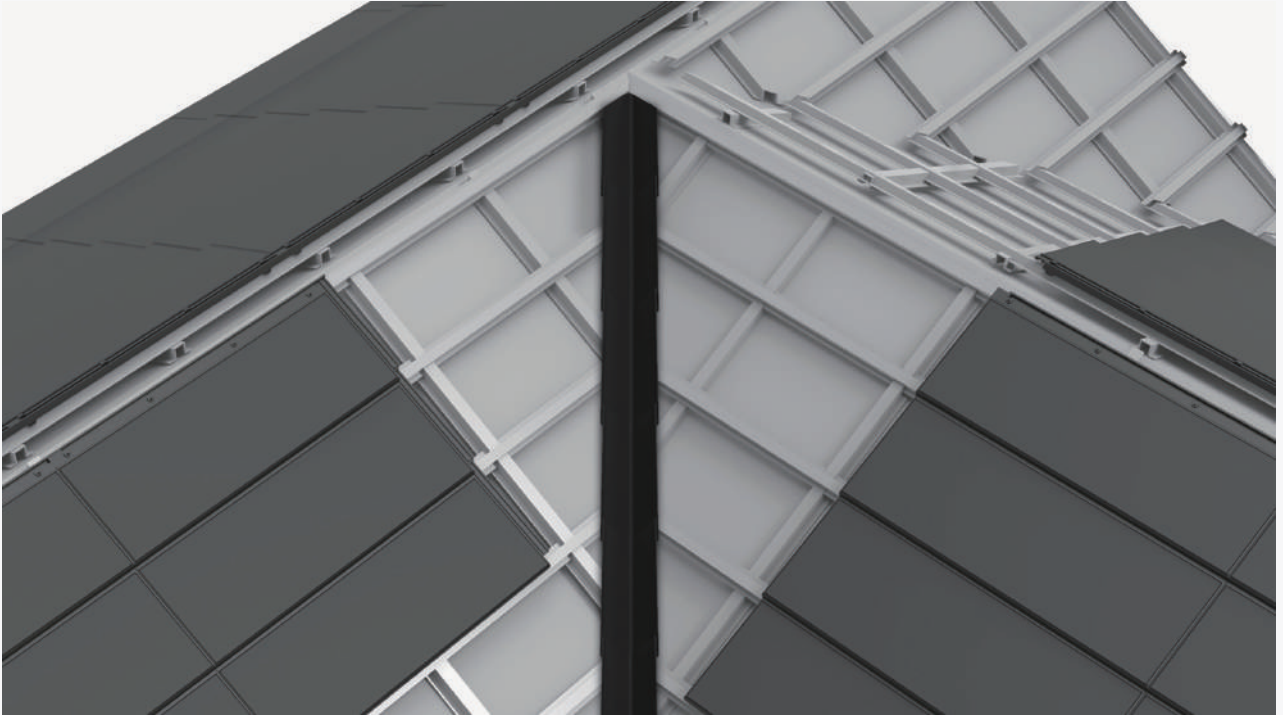


Roof installation completed -1

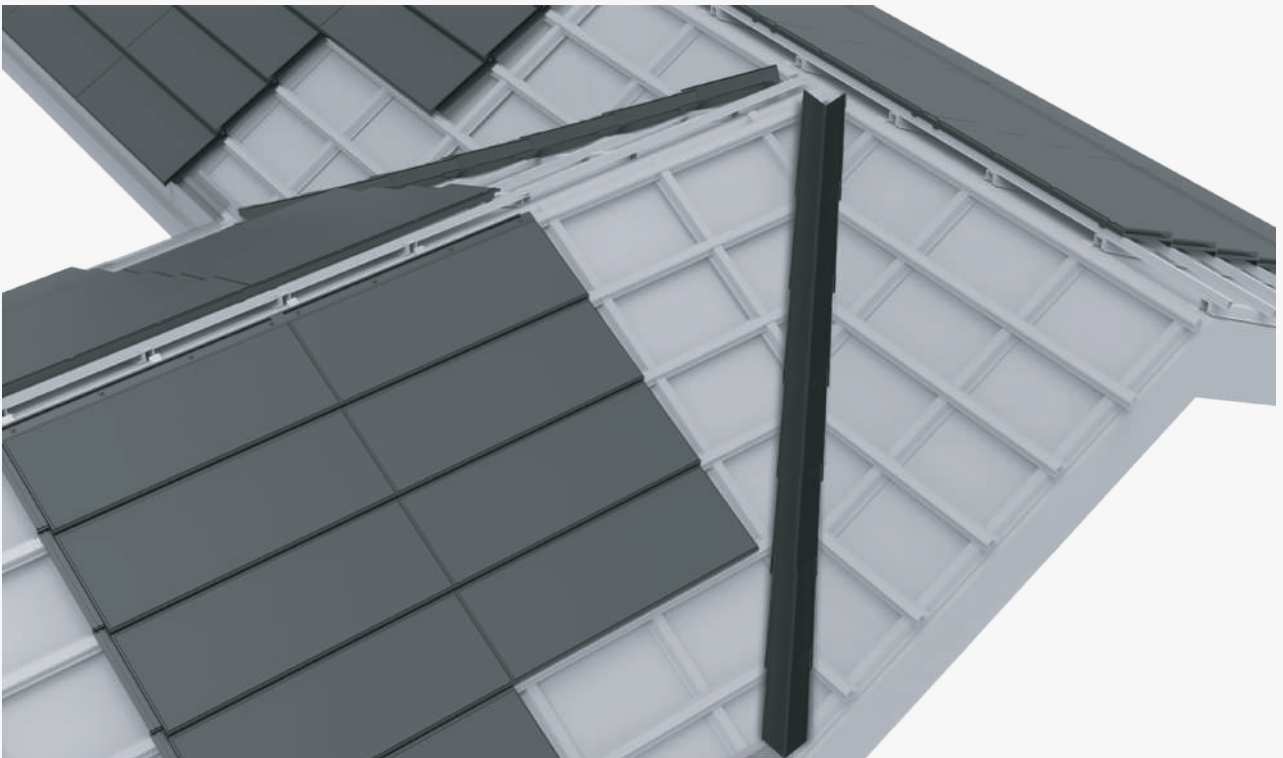


Roof installation completed -2

Install the ditch tile from the roof valley , fix them on the tile strips, overlap each other, and the lines should be straight.



Ditch tile installation -1



Ditch tile installation -2

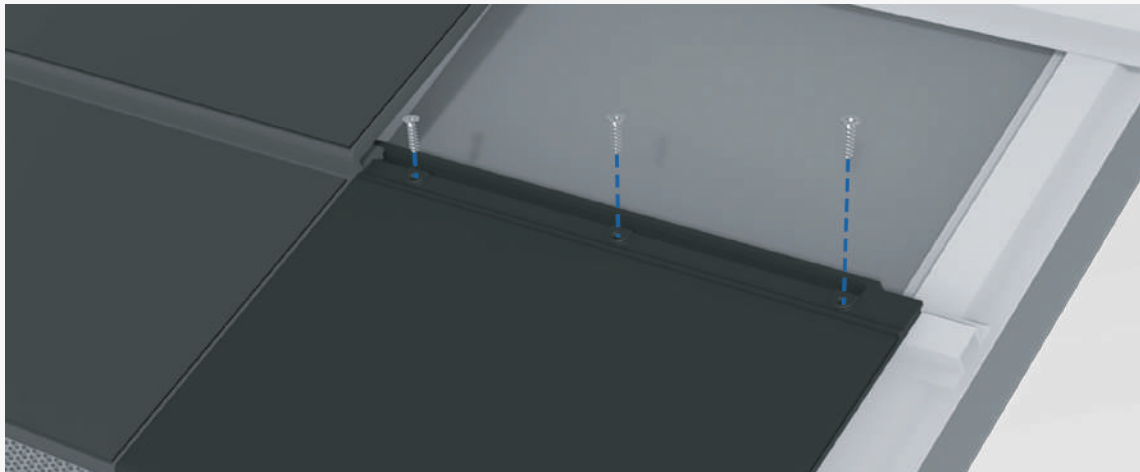
6. Install Tiles

Take out the solar tile layout diagram provided by Gain solar Technology Department in advance;

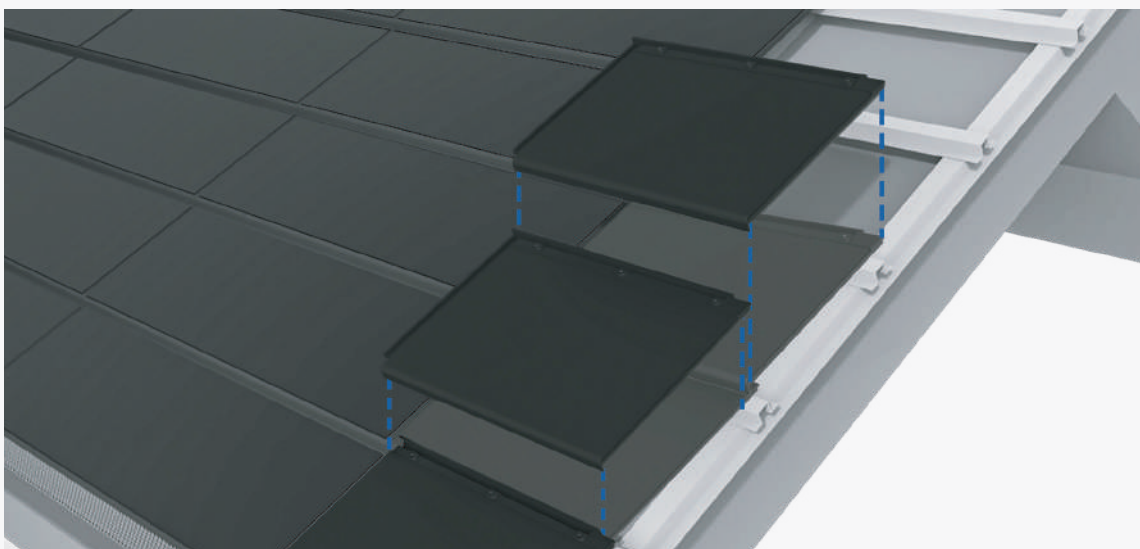
According to the position shown in the layout diagram, fix the matching tiles to the hanging tiles with self-tapping screws (countersunk self-drilling nails ST4.8*50mm galvanized) from left to right, and an overlap of 50mm is required;

If you need to cut tiles, please follow this order:

6.1 Arrange tiles on the roof

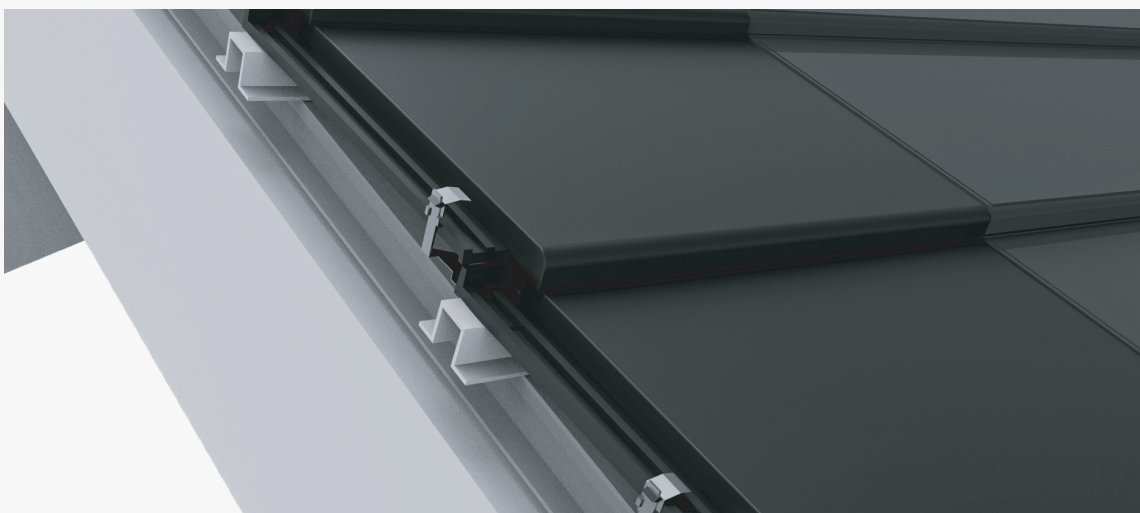


Auxiliary tile installation sequence



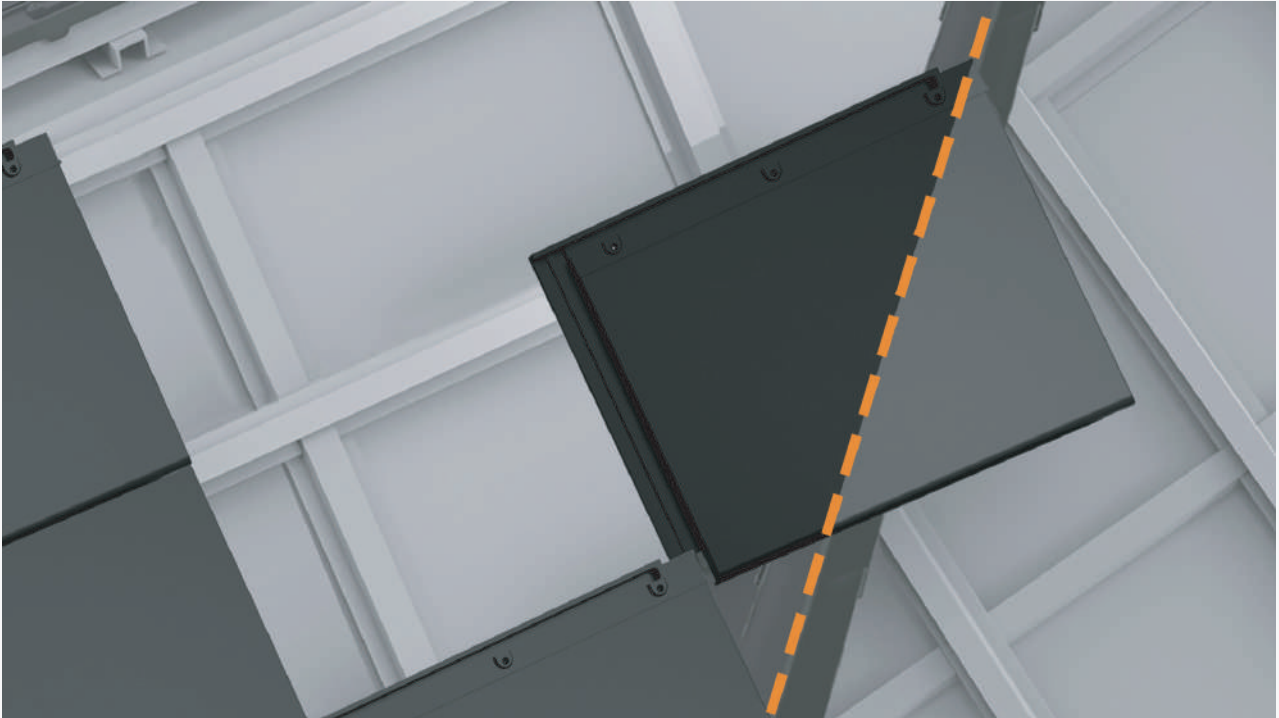
Auxiliary tile installation

6.2 Install windproof buckle



Windproof buckle installation for tiles

6.3 Elastic thread according to the cutting position

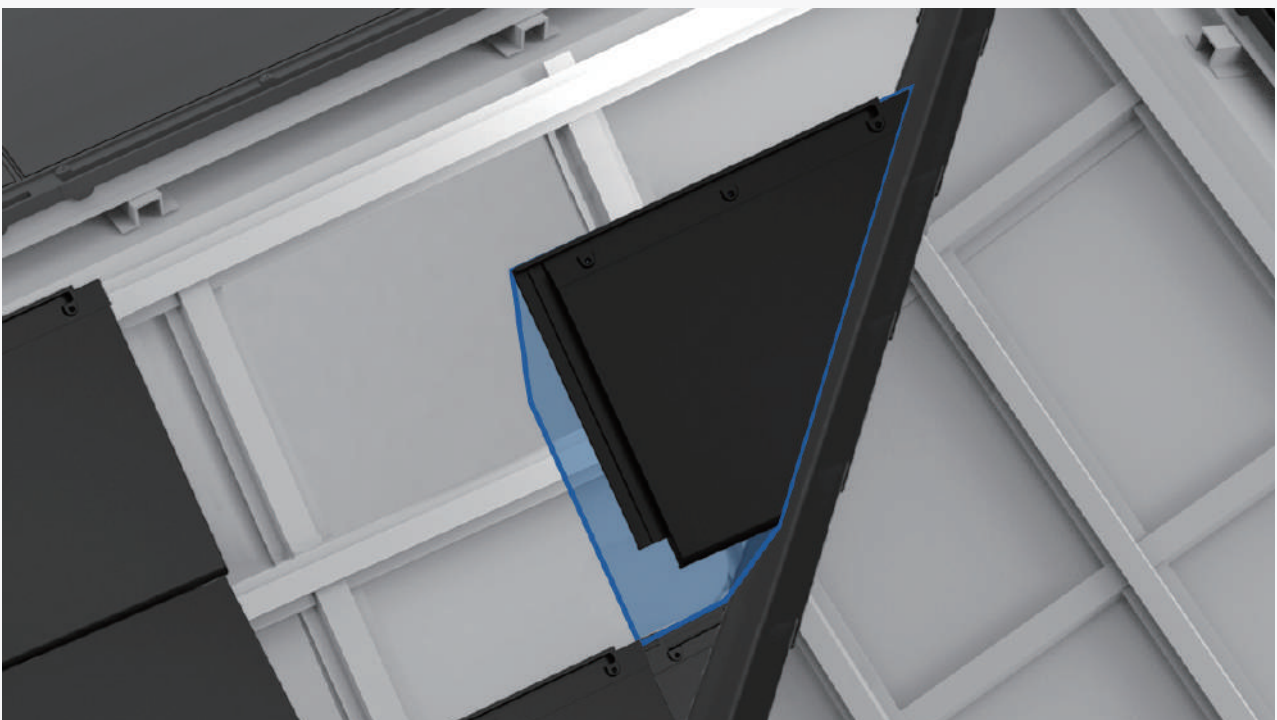


Auxiliary tile installation

6.4 45 degree internal chamfer cutting with cutting machine

Note: Do not cut any products on the sloping roof, please go to a special workshop for operation.

Anyone who installs photovoltaic modules should receive correct manual operation practice training, and must carry out general construction site training and high-altitude safety operation training. All applicable health and safety regulations must be followed correctly, and installation in adverse weather conditions should be avoided, including strong winds, rain, ice, or snow.



Cut auxiliary tile

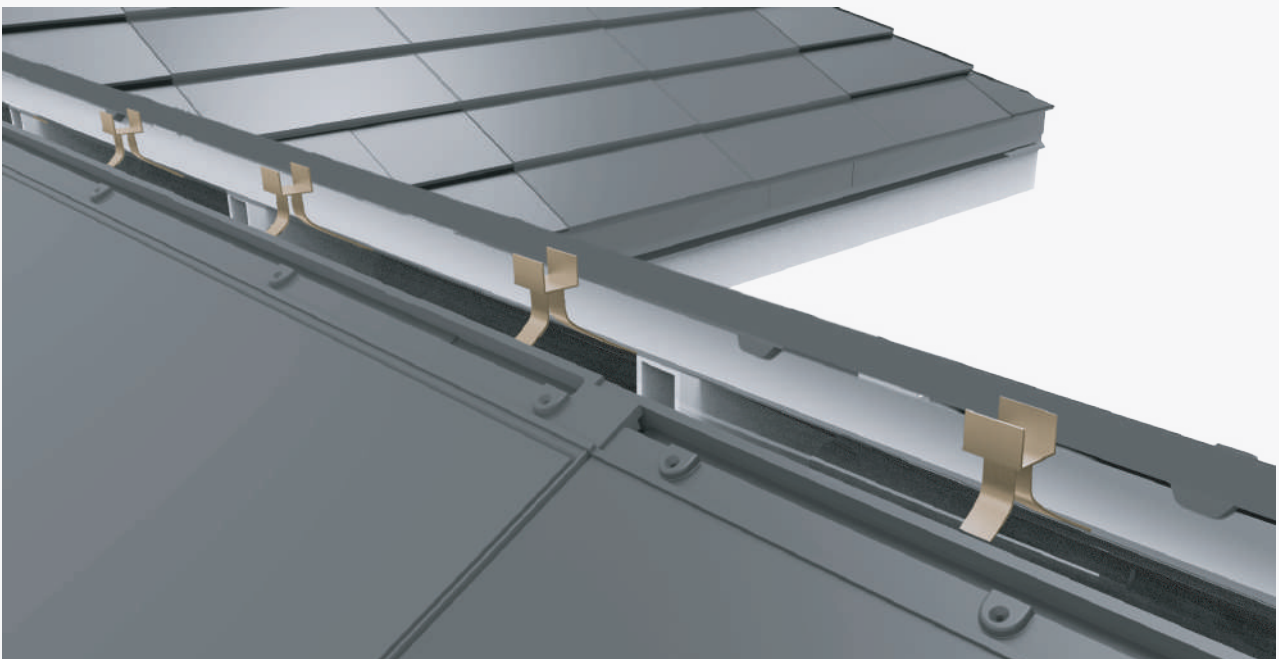


Auxiliary tile installation completed

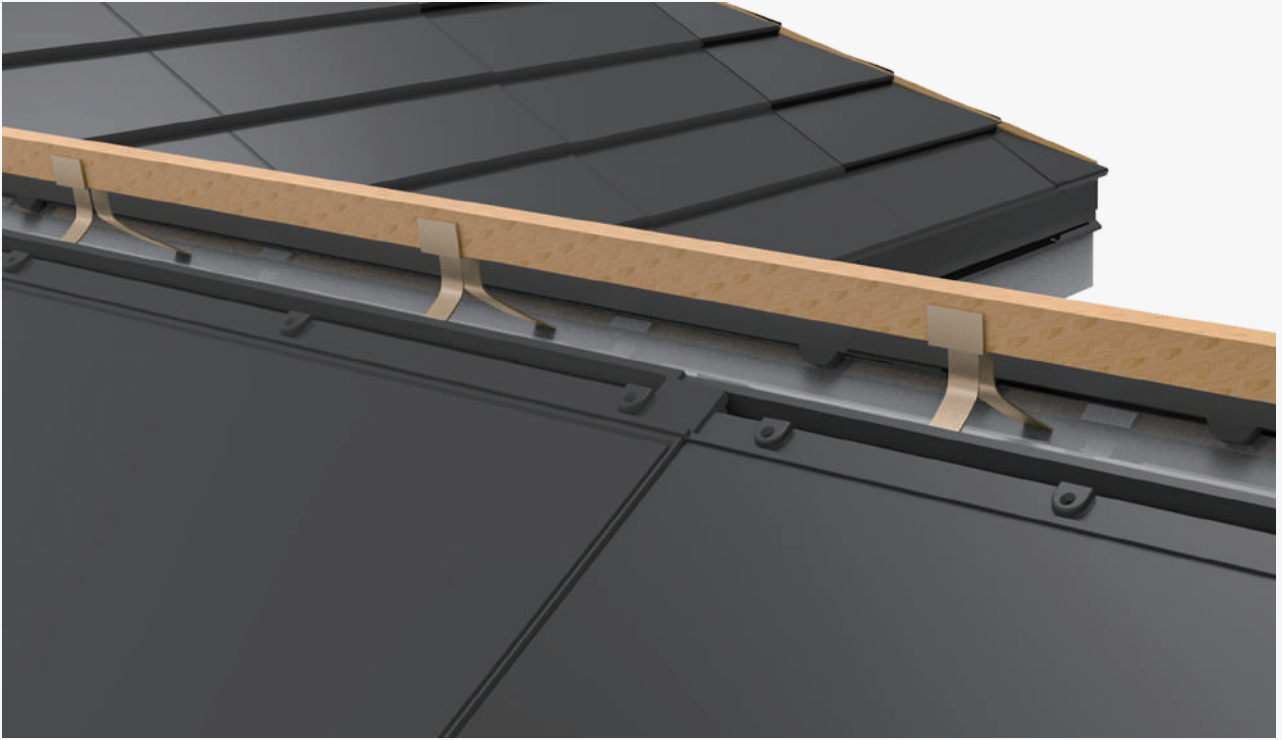
7. Ridge Tile Installation

7.1 Main ridge installation

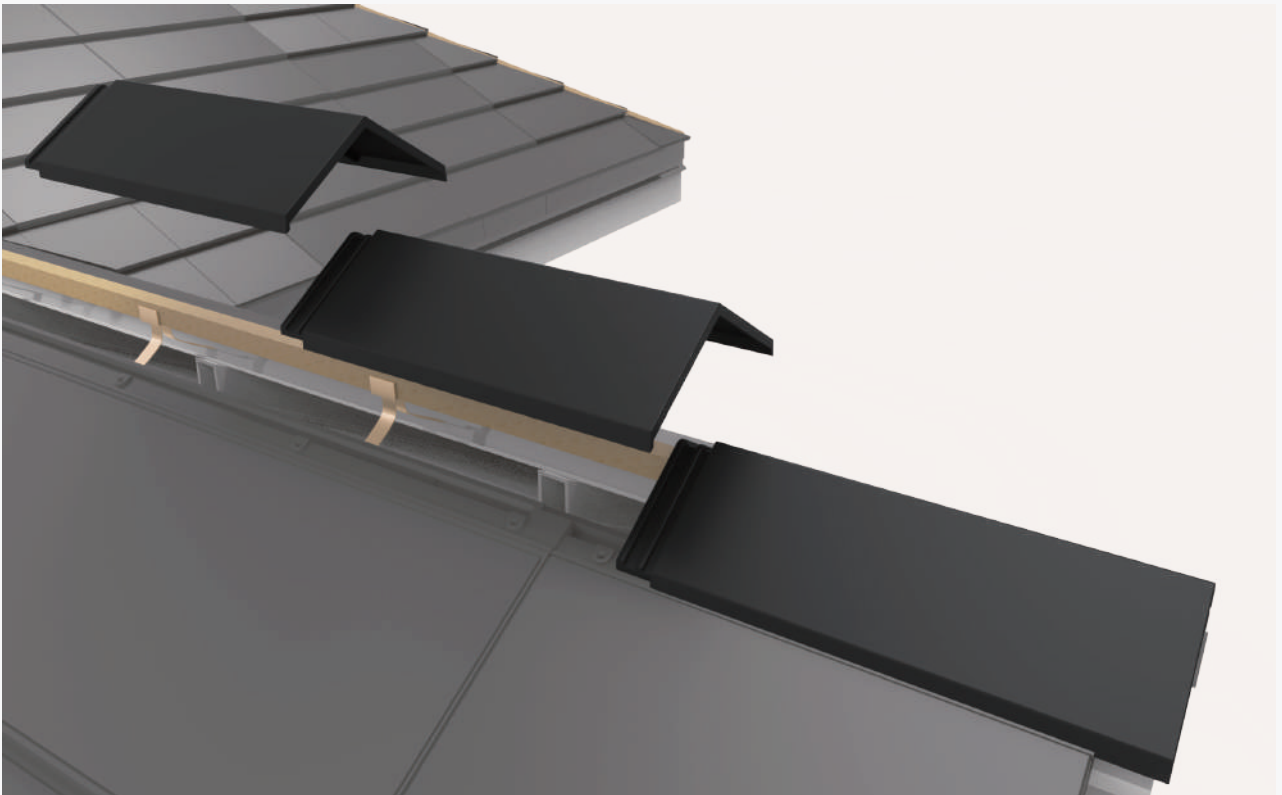
Install the main ridges in sequence from right to left, cut the main ridges at both ends according to the shape of the side eaves, and use self-tapping screws (countersunk self-drilling screws ST4.8*50mm galvanized) to connect the main ridges with the the backing bracket is connected and fixed.



Install the backstop



Install wooden battens

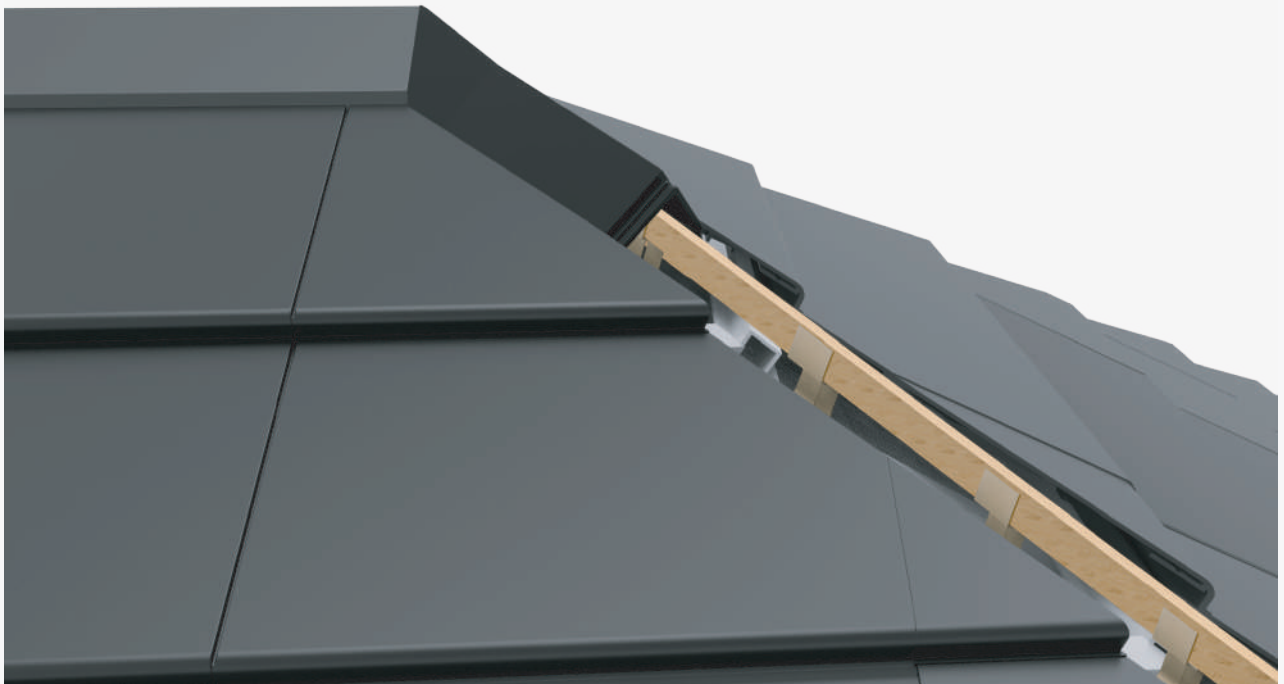


Install ridge tile

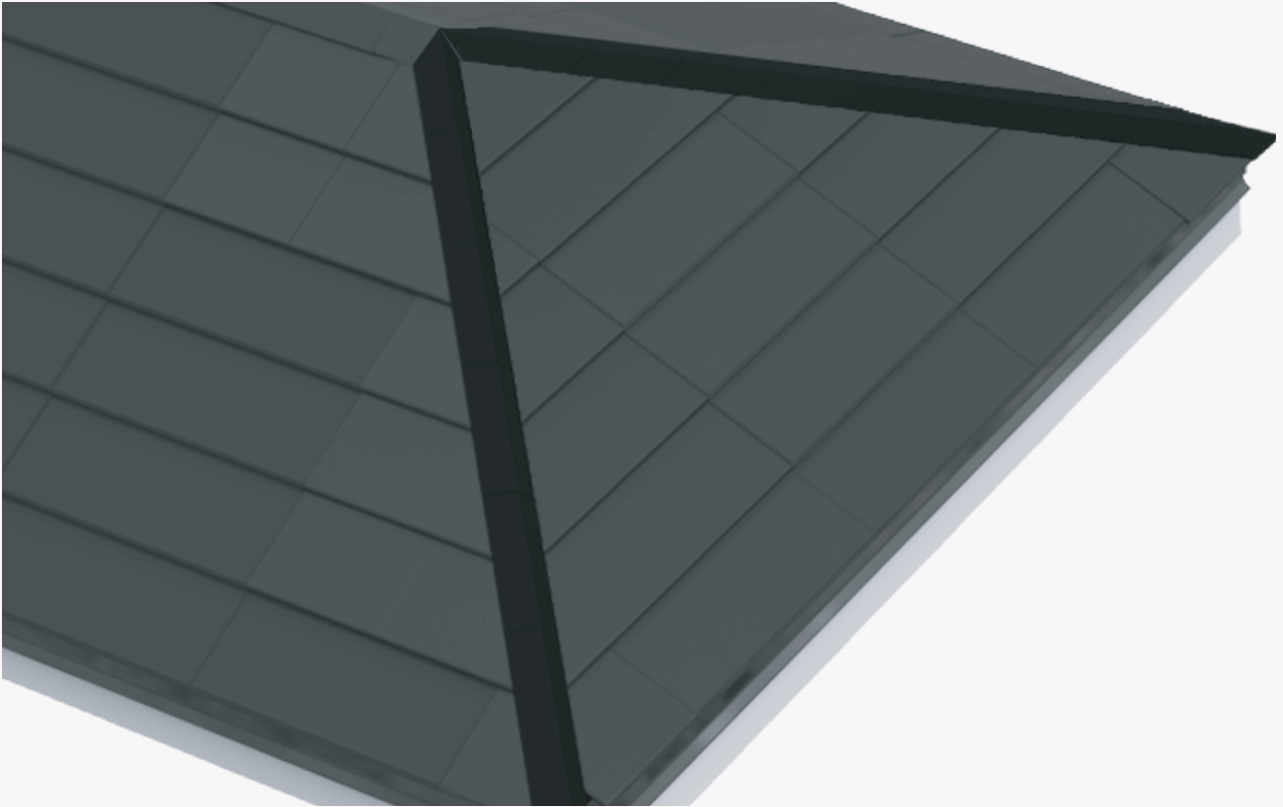


Ridge installation complete

When the inclined ridge tile is installed, it needs to be aligned up and down. The straight side is elasticated, and the inclined ridge is in a straight line, and the inclined ridge tile is installed on the backing bar with self-tapping screws (countersunk self-drilling nails ST4.8*50mm galvanized). Fix the slanted ridge tile at the highest point of the slanted ridge, and the straight side also needs to be snapped. After the thread is snapped, the slanted ridge tile can be installed. A nail needs to be nailed on both sides of each tile as a fixation.



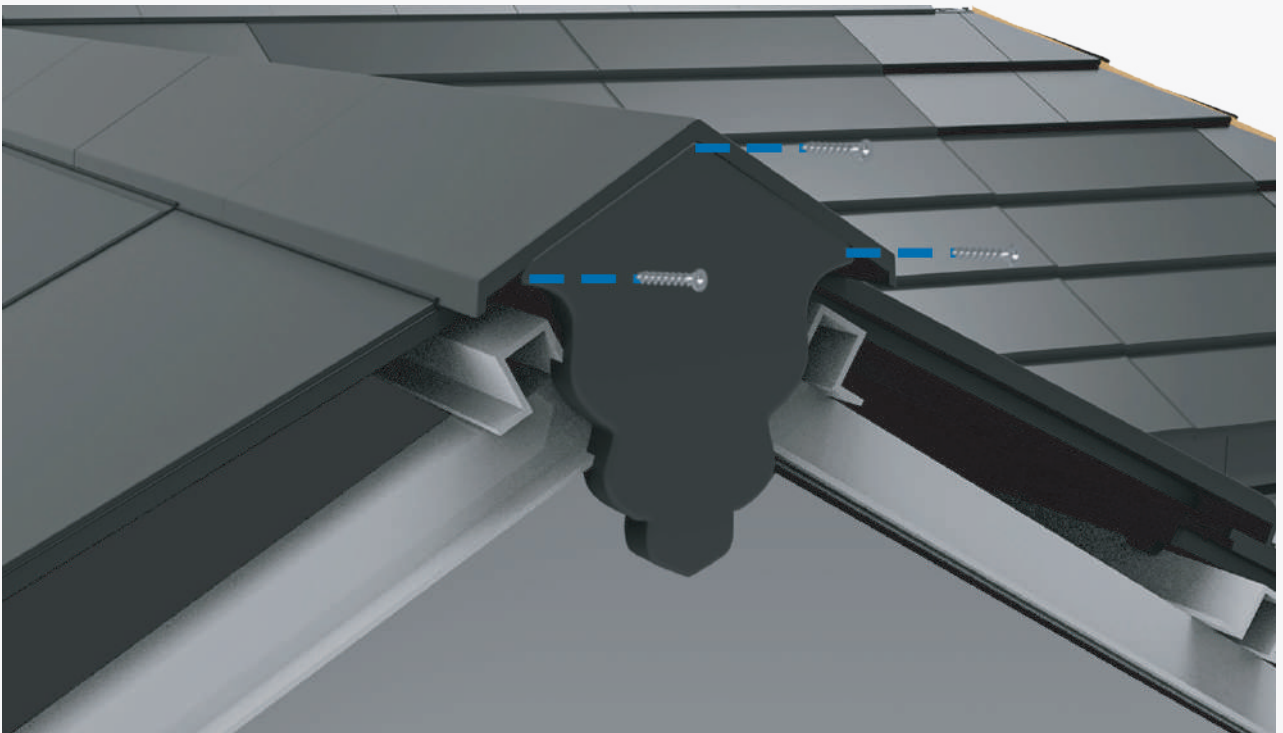
Install the ridge



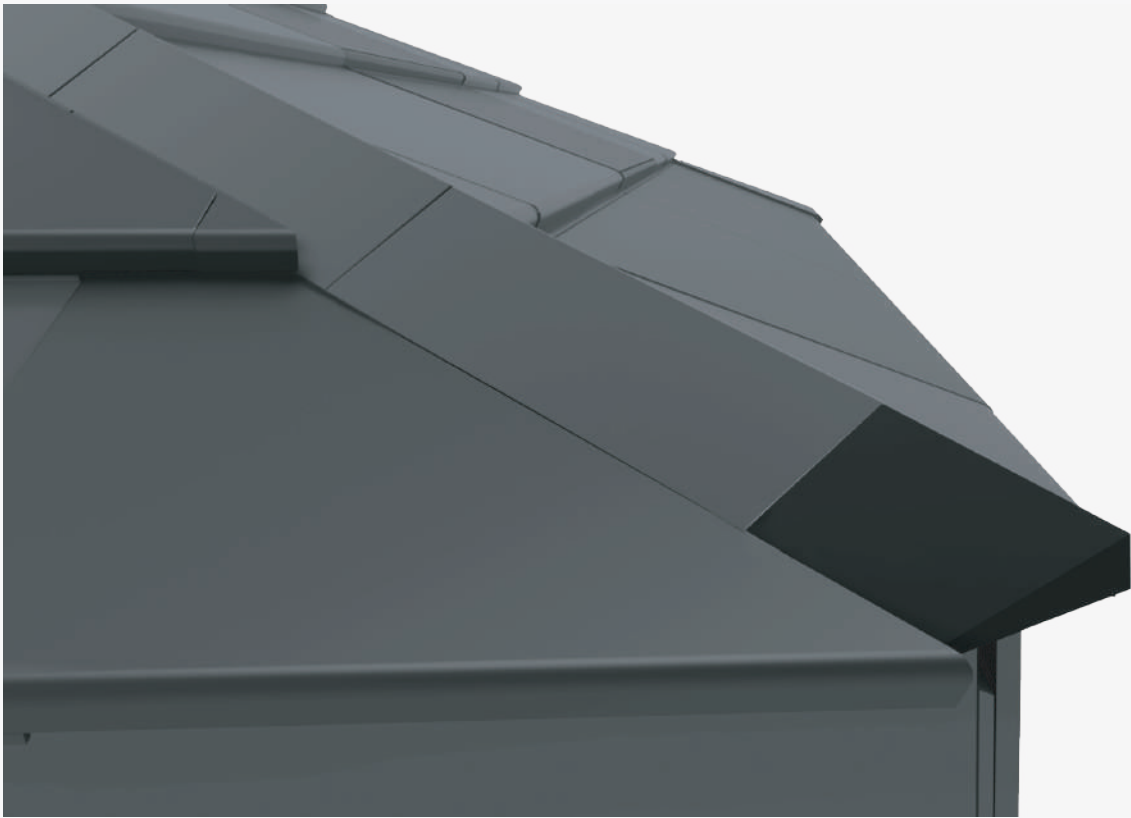
Ridge installation complete

7.2 Plug installation

Lap the positive ridge plugs on the left and right sides to the main ridge and fix them with self-tapping screws (countersunk self-drilling screws ST4.8*50mm galvanized).



Positive ridge plug installation

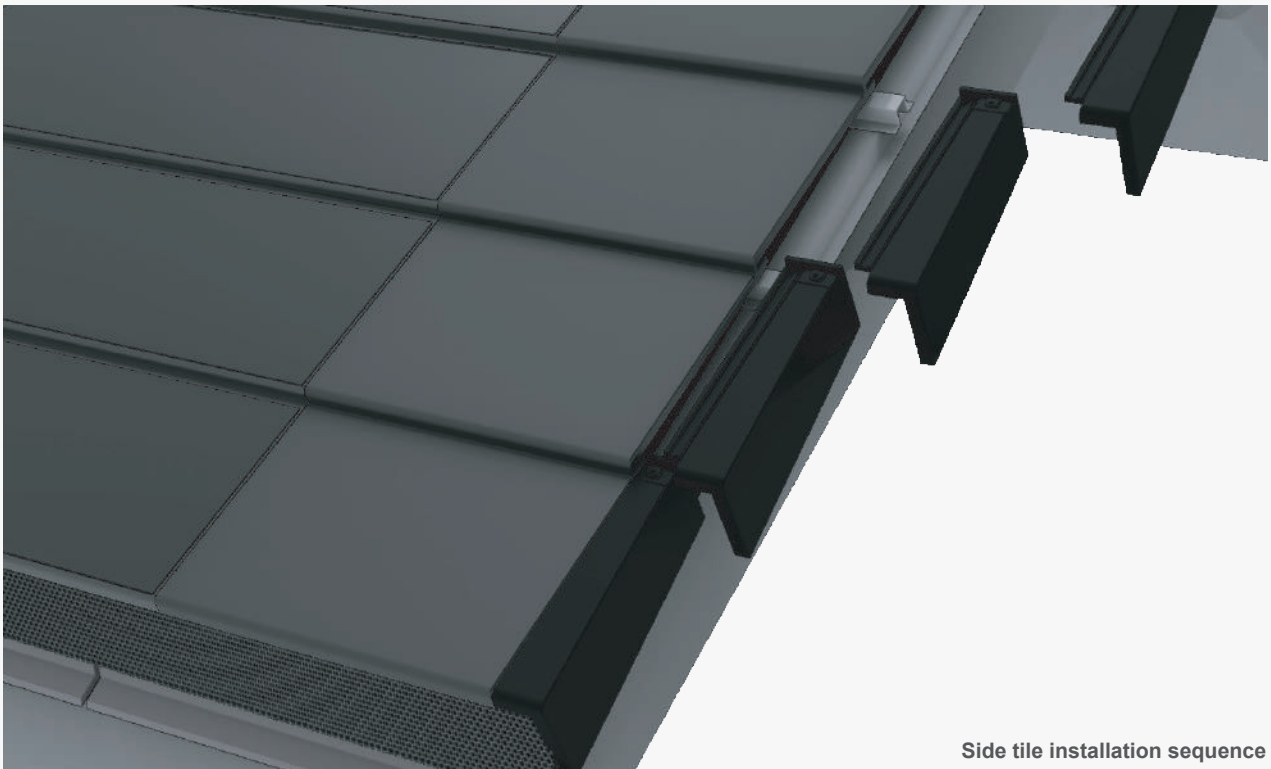


Install the ridge plug

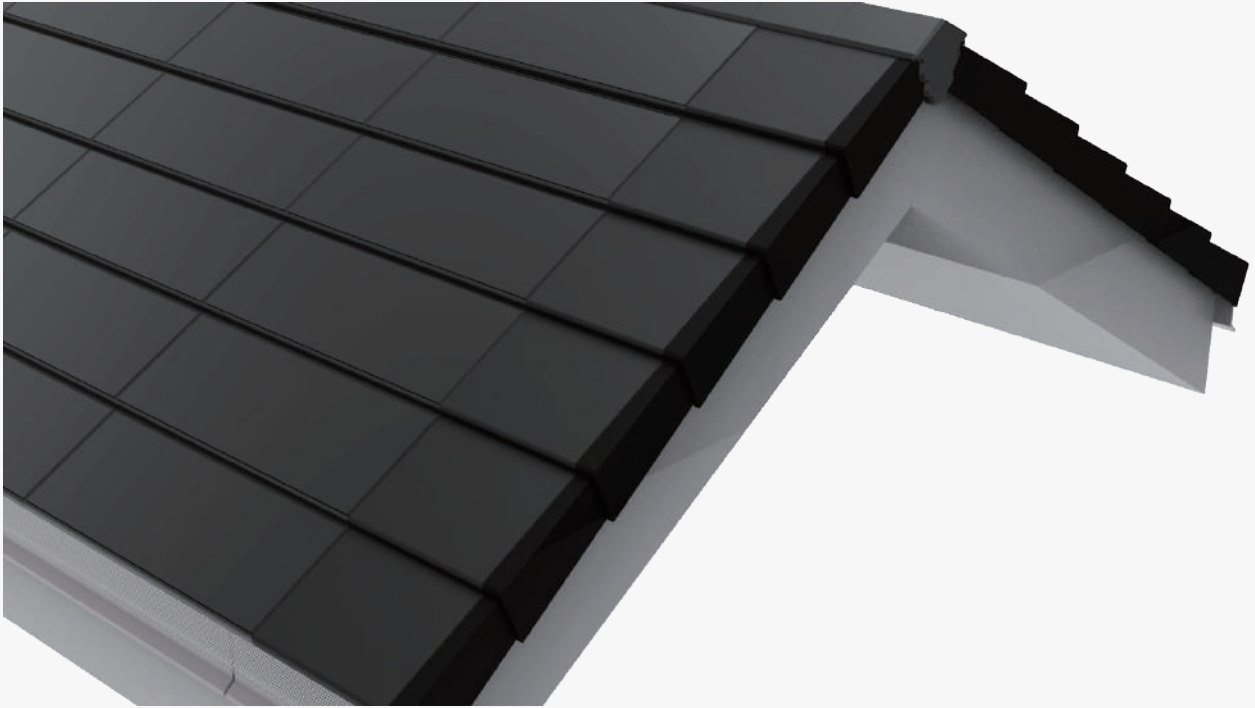
7.3 Edge Tile Installation

Lay the left and right side tiles in order from bottom to top, fix them with self-tapping screws (countersunk self-drilling nails ST4.8*50mm galvanized), install them to the top in turn, cut off the excess length and perform corner cutting.

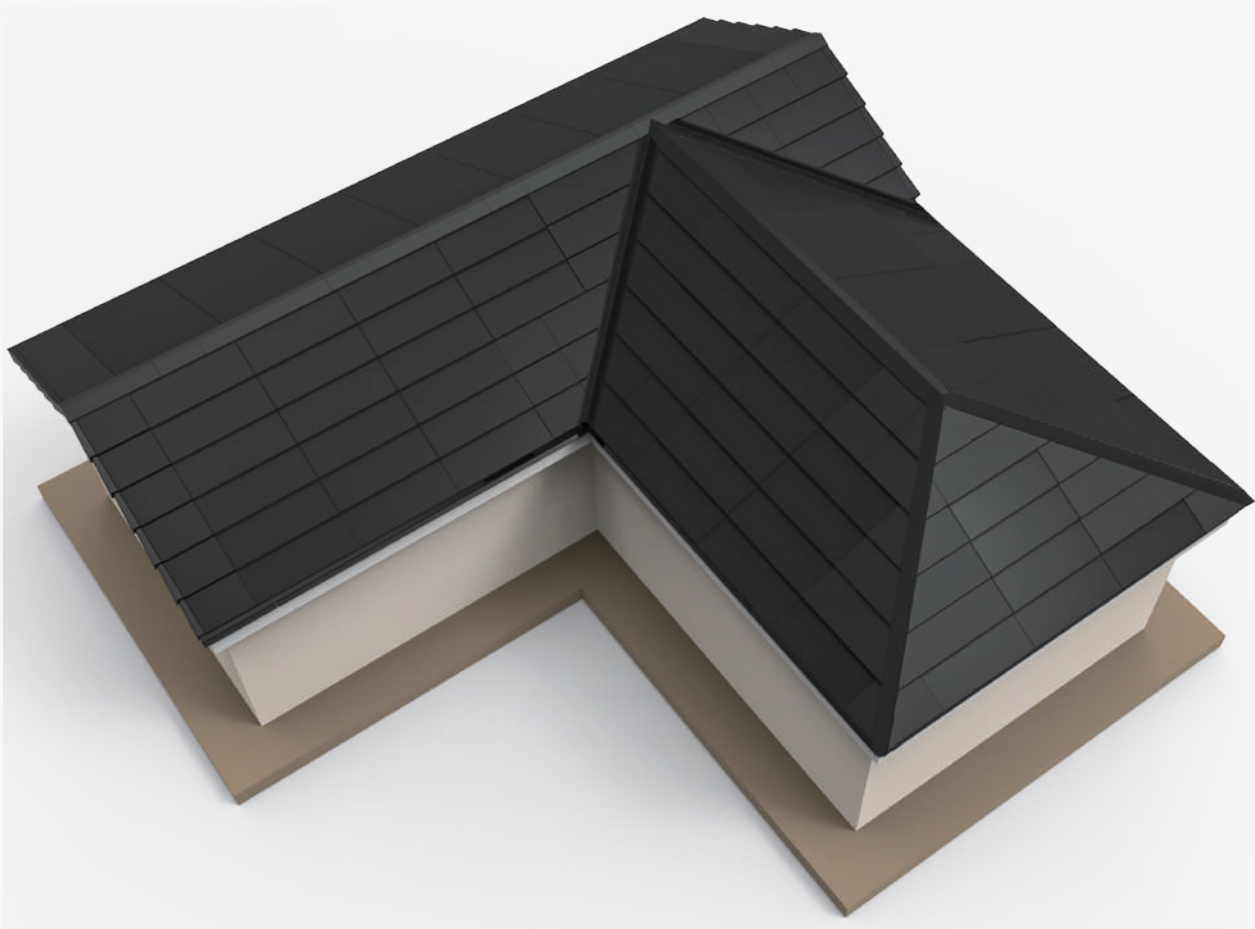
Note: Depending on the actual project situation, it may be necessary to pre-install the right tile to determine the accurate placement of the photovoltaic tile.



Side tile installation sequence



Side tile installation completed



Integral roof installation

Electrical Installation

1. Electrical System Bill of Materials



Inverter



Photovoltaic grid-connected box



DC cable



AC cable



MC4 connector

2. First, please follow the list above to check whether the model and quantity of the incoming materials are correct, and do the following checks:

- (1) Appearance should be intact;
- (2) The model and specification shall meet the requirements of design drawings;
- (3) Accessories and spare parts are complete.

2.1 Electrical system bill of materials



Wire strippers



Cord cutters



Screwdriver



Crimping tool



MC4 wrench



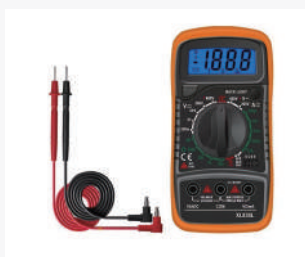
Hydraulic pliers



Thermal casing



Heat gun



Multimeter



Insulating gloves

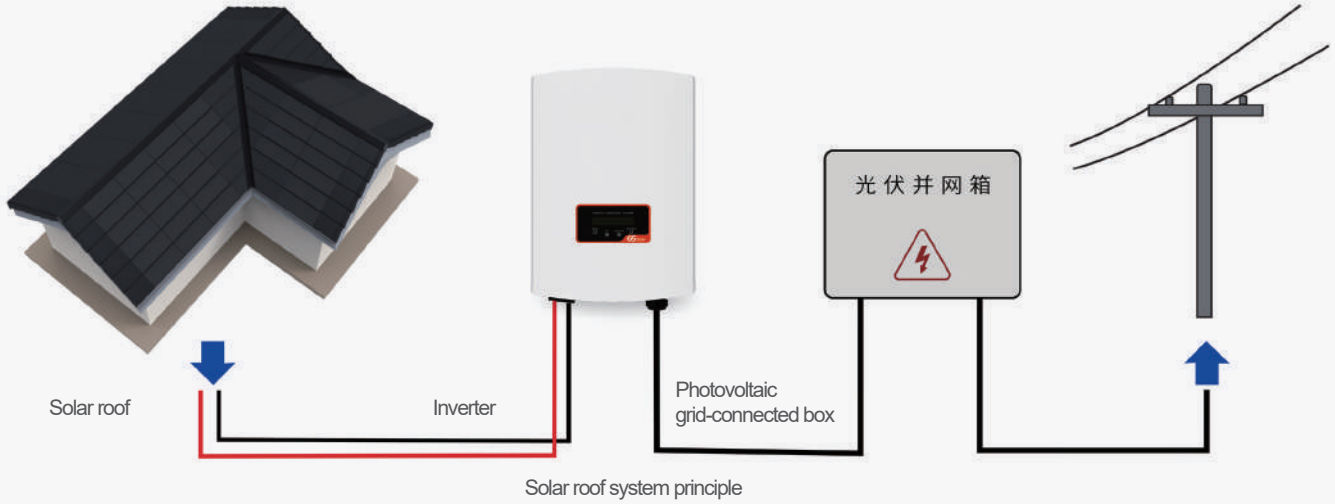


Protection goggle



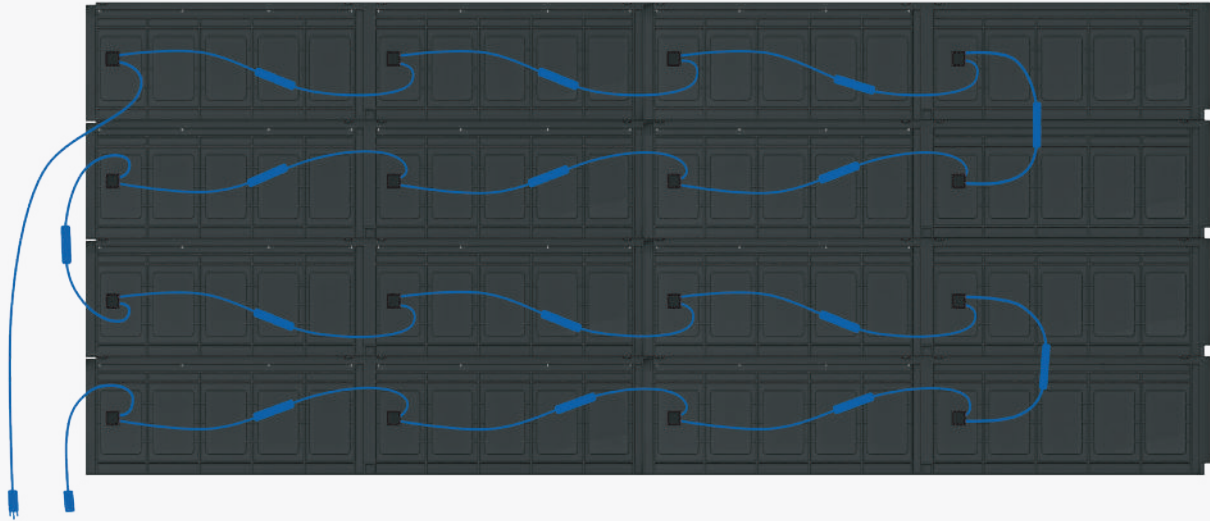
Safety shoes

3. Electrical System Installation

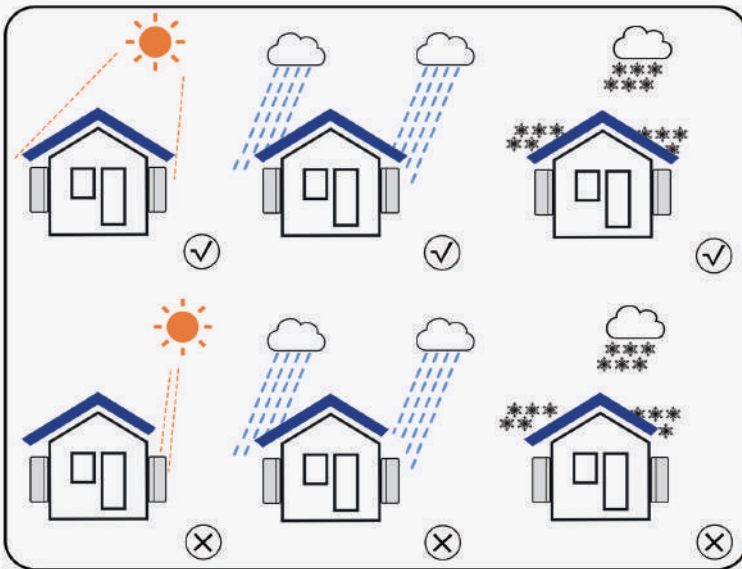


3.1 Roof solar tile string electrical connection

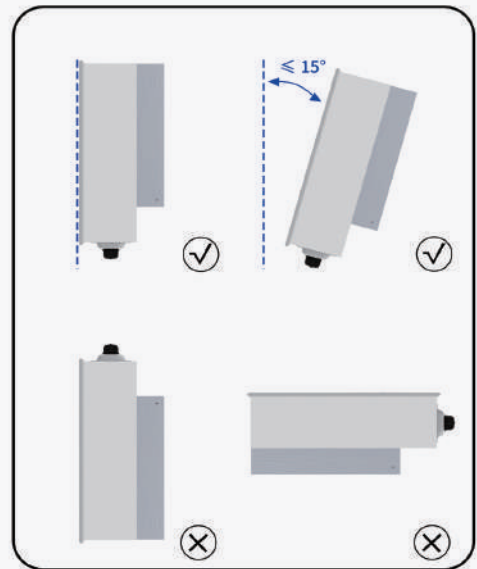
Solar tiles should be installed from bottom to top. Under normal circumstances, the installation and wiring of the second row can only be done after the installation and wiring of the lower row is completed. For those that need to connect solar tiles, it is necessary to increase the extension line processing. When installing, first install the conventionally installed solar tiles according to the drawings, and reserve the cables for the solar tiles that need to be bridged, and do not install the solar tiles at the bridged parts first. And connect the extension cord here first. Lead out the other end of the extension cable, and lead it to another location to be bridged according to the wiring diagram, and then complete the installation of the nearby solar tile. To be installed to the PV watt-hours at the other end of the jumper cable, complete the installation at the other end.



3.2 Inverter installation



Location selection



Angle requirements



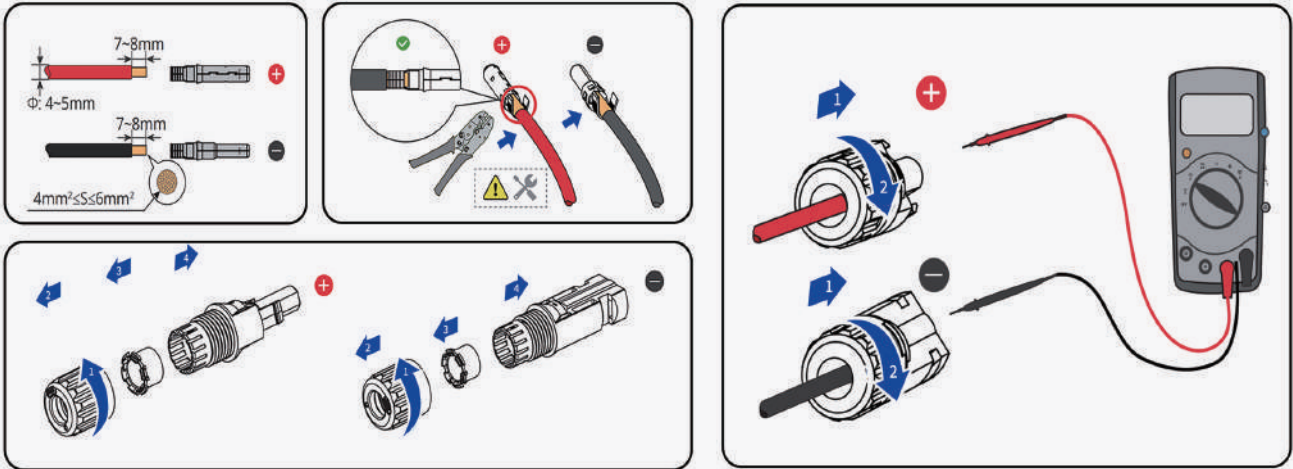
Space requirements



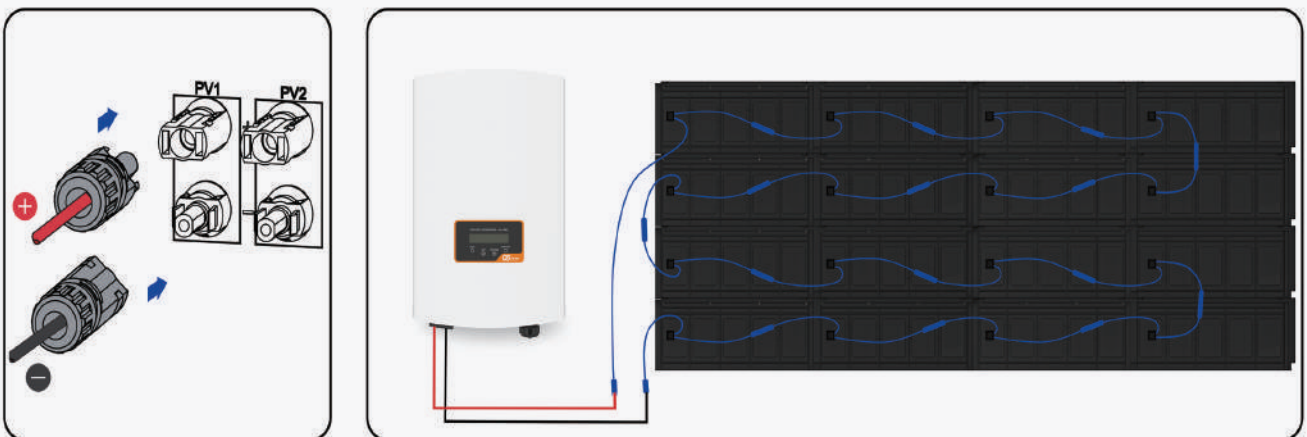
Bracket installation

3.3 Photovoltaic connector production

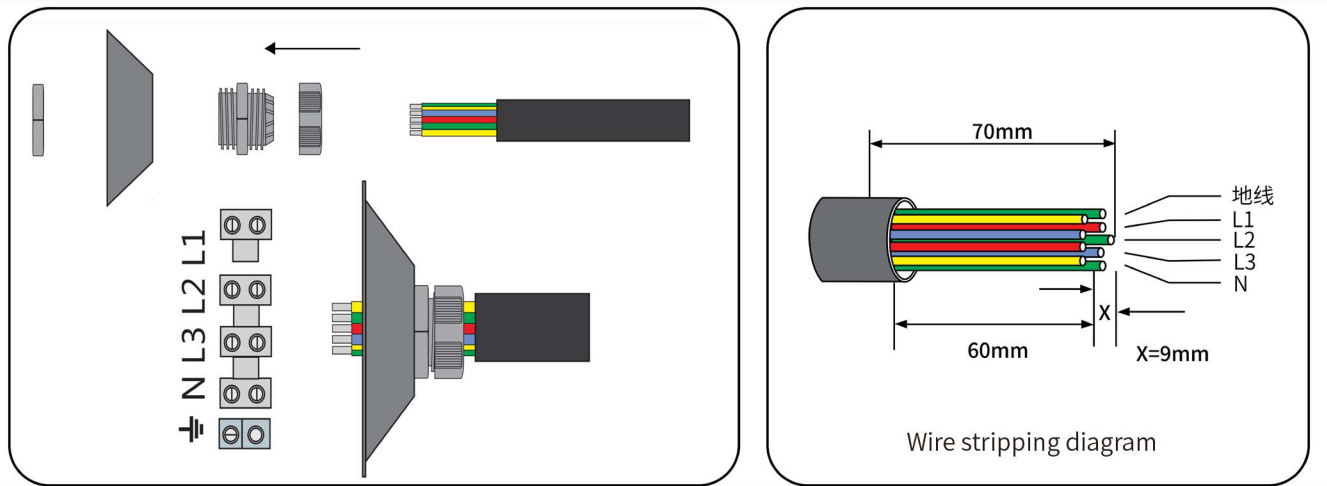
Use a multimeter to measure the photovoltaic voltage of the DC input, and verify that the value and polarity of the DC input voltage are consistent with the requirements of the design drawings.



3.4 Photovoltaic DC line connection to the inverte

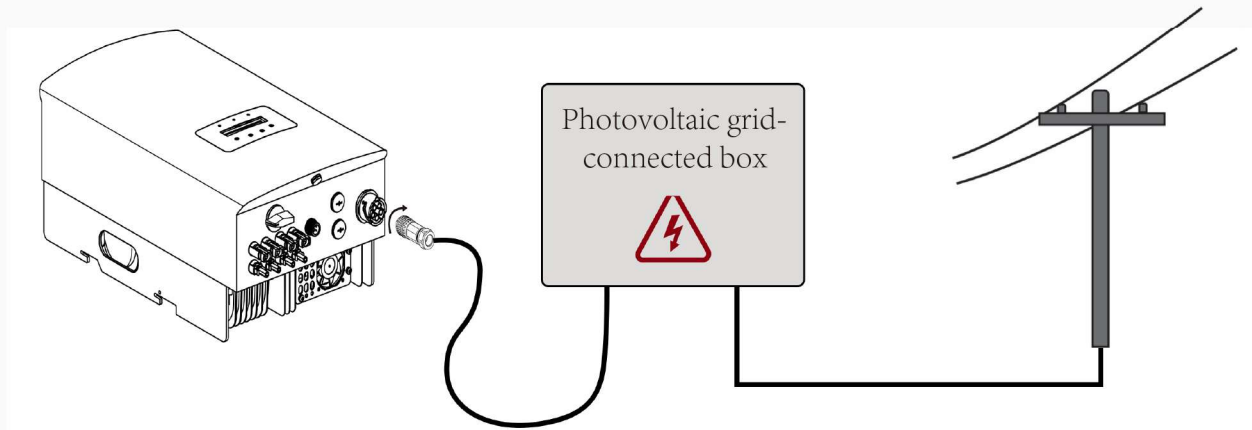


3.5 Inverter AC line terminal production



1. Choose the right tool to strip the insulating sheath.
2. Connect the wires to the AC terminals correctly according to the wiring diagram.

3.6 The AC line of the inverter is connected to the grid. Connect the AC connector to the inverter, then turn the AC connector to the right and hear a slight click to indicate a good connection.

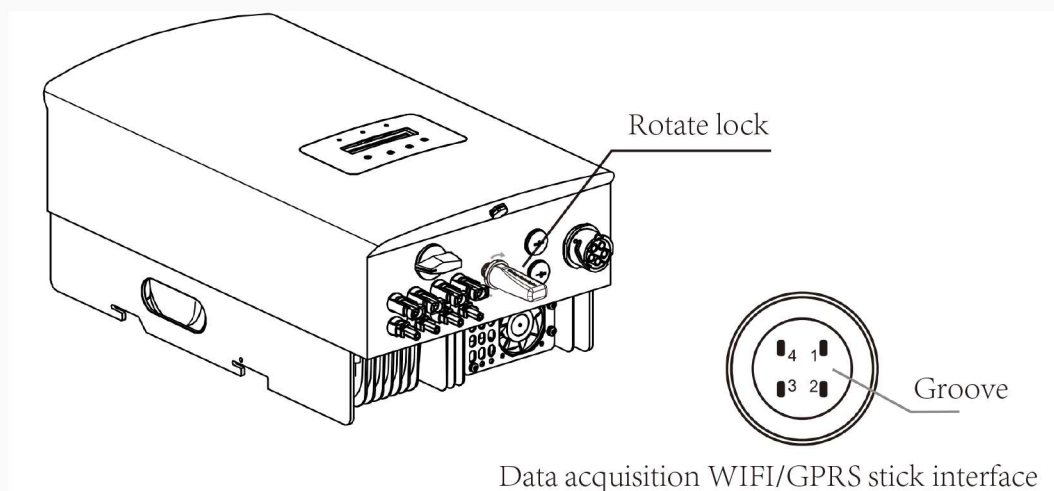


Correctly connect the photovoltaic tile array, inverter and AC grid according to the aforementioned installation process. Ensure that the AC and DC side voltages meet the machine start-up conditions.

Number	Check Item
1	The inverter is firmly installed, the installation location is convenient for operation and maintenance, the installation space is convenient for ventilation and heat dissipation, and the installation environment is clean and tidy.
2	The protective ground wire, DC input wire, AC input wire, and communication wire are correctly and firmly connected.
3	The cable binding meets the routing requirements, the distribution is reasonable, and there is no damage.
4	Unused ports are blocked.
5	The voltage and frequency of the grid-connected inlet of the inverter meet the grid-connected requirements.

3.7 Data collector installation

Please turn off the AC and DC power supply of the inverter before inserting the monitoring stick into the COM, and turn the black coil clockwise after inserting the monitoring stick (do not directly rotate the shell of the collector).

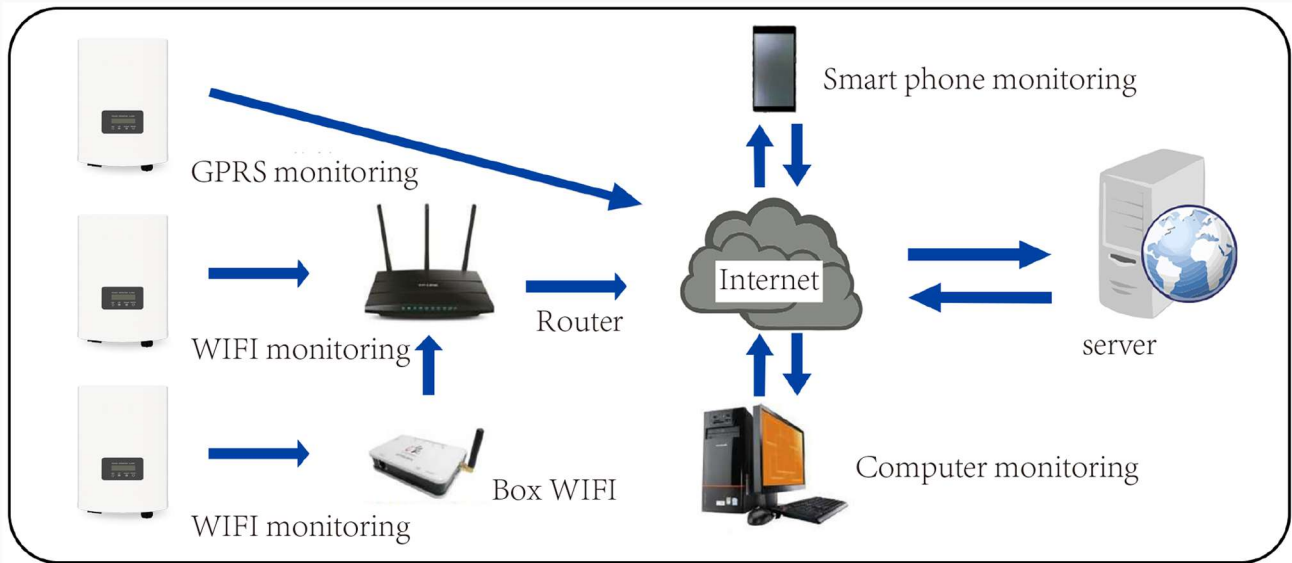


Data acquisition WIFI/GPRS stick interface

3.8 Communication connection

The inverter can be monitored via Wi-Fi or GPRS, and these communication functions are optional. Please refer to the operating instructions of the relevant communication methods.

Please turn off the AC and DC power supply of the inverter before inserting the monitoring stick into the COM, and turn the black coil clockwise after inserting the monitoring stick (do not directly rotate the shell of the collector).

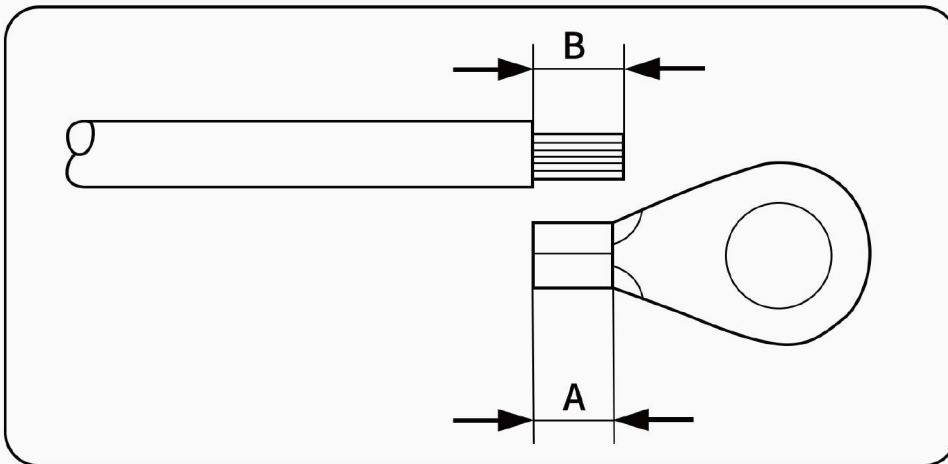


3.9 Connecting the protective earth (PE)

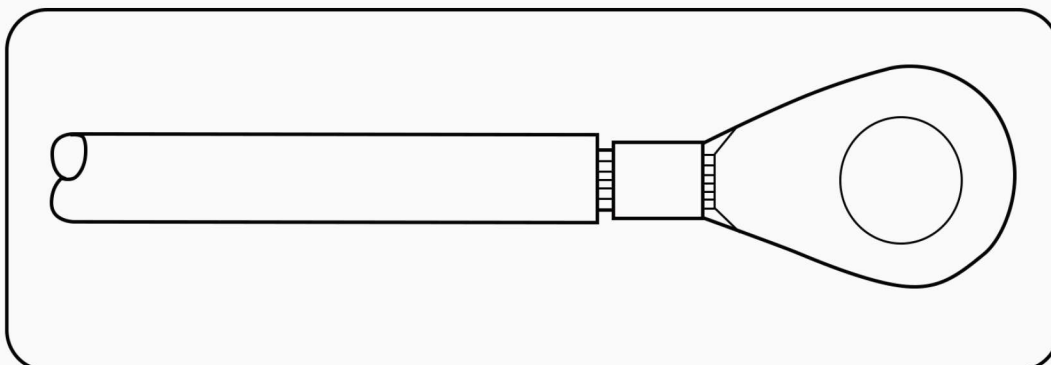
In order to effectively protect the inverter, two grounding methods must be used at the same time. Make sure that the AC ground wire and the external ground terminal are reliably grounded, and connect to the external ground terminal.

Please follow the steps below :

- Prepare grounding cable: It is recommended to use outdoor copper core cables with a cross-sectional area $\geq 6\text{mm}^2$.
- Prepare OT terminal: M4.
- Use a wire stripper to strip the insulation layer of the grounding cable to an appropriate length (B is 2mm~3mm longer than A).



- Feed the stripped wire core into the conductor crimping area of the OT terminal and press it tightly with hydraulic pliers.



- Unscrew the screw at the ground location.
- Fix the prepared ground cable with the screw at the ground position, and fasten the screw with a Phillips screwdriver.

4. Lightning Protection

Installing a photovoltaic roof system on a building should not lower the lightning protection level of the building, and should meet the requirements of the current national standard GB 50057, and make multi-point reliable connections with the roof lightning protection grounding device. The metal bracket of the roof photovoltaic roof system should be reliably connected to the grounding system of the building or grounded separately.

5. Functional Ground

Repeated grounding of distribution box and inverter Functional grounding: use tinned copper braid or annealed copper wire.

Connect the ground bar of the device to the ground jumper.

Grounding resistance measurement: The integrated grounding resistance of the system is required to be no greater than 4 ohm.

6. Power Generation Test Run

- (1) Ensure that the above inspection items meet the requirements;
- (2) Close the circuit breaker on the DC input side;
- (3) Close the grid side circuit breaker;
- (4) When the conditions required for the normal operation of the machine are met, the inverter will automatically start and perform grid-connected power generation.

7. Shutdown Process

- (1) When the light is not enough to generate electricity, the grid-connected inverter will automatically shut down;
- (2) Emergency shutdown process: When encountering the risk of electric shock or other emergencies, the grid side circuit breaker and DC side circuit breaker can be disconnected;
- (3) After the grid-connected inverter is in normal operation, no human control is required, and it has the function of automatic shutdown and startup after a fault.

F. Cautions

1. Electrical Construction Operation Requirements

Requirements: professional electrician, welding work, holding a certificate.

2. Solar Tile DC Side Wiring

- (1) Do not open the junction box on the back of the photovoltaic tile;
- (2) Do not directly touch the positive and negative poles of the photovoltaic tile with your hands;
- (3) Do not directly unplug the positive and negative terminals of the string when the power is supplied;
- (4) Do not exert mechanical force on the photovoltaic tile backplane wire;
- (5) After laying the DC line between the square array and the inverter, measure the insulation resistance of the positive and negative poles to the ground to avoid grounding electric shock accidents caused by damage to the cable sheath.

3. Wiring between the inverter and the photovoltaic grid-connected box side.

After the laying of the AC cable is completed, the insulation resistance between each phase, zero and ground should be measured first, and the electrical debugging can only be carried out after the measured resistance value is qualified.

4. As-built Drawing

After the completion of the project, the owner should submit a completed drawing, including the layout diagram of the actual installation of the roof, the string diagram, and the electrical diagram, so as to facilitate later maintenance.

5. Customer Service and Warranty

- (1) Solar Tile Customer Service and Warranty

For details of the warranty terms, please refer to the "PV Watt Warranty Commitment Letter". If you have any of the above questions, please contact your dealer.

- (2) Inverter and Other Materials and Equipment Customer Service and Warranty.

For inverters and other equipment produced by third-party companies, please refer to the third-party company's quality assurance documents for details on maintenance and after-sales.

6. Statement of Responsibility

This installation instruction is only a general guideline for design. Due to the wide variety of materials and equipment, installations that may involve this guideline cannot take into account the technical requirements of each individual project or site. No part of this guide may be reproduced in any form by any means.



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