

INSTALLATION AND SAFETY MANUAL

for CIGS ePower Tile



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1. Installation Notice

- This manual indicates the information regarding CIGS ePower Tile installation and safety notices.
- To protect your safety, equipment and property, please read thoroughly this manual before the installation, and follow the instructions given in this manual while carrying, installing, testing, operating and maintaining. If you have any questions, please contact our Technical Service Department at +886 37637668 or at info@eterbright.tw. Keep the manual with you for future reference.
- Please conform to local and national codes while installing.

1.1 Disclaimer of Liability


- The manual provides the basic installation information of CIGS ePower Tile. If your installation method is different from the manual's instructions, please ensure the feasibility of installation method and the feasibility of product application. ETERBRIGHT SOLAR CORPORATION disclaims all responsibility of any damages, losses, expenses and legal liability resulting from other components/equipment and improper installation, operation, application or maintenance since the installation, operation, application and maintenance of PV system are beyond ETERBRIGHT SOLAR CORPORATION's control.
- ETERBRIGHT SOLAR CORPORATION accepts no responsibility for the infringements of patent law or of other third party rights arising from installation methods or the use of the product.
- The users shall not have the right to further sub-license of any intellectual property rights and patents about CIGS ePower Tile.
- ETERBRIGHT SOLAR CORPORATION reserves the right to modify this manual, technical specifications and all the information about CIGS ePower Tile.

1.2 General Information

- Installation should be performed only by qualified persons.
- Before the installation, installers are required to have a comprehensive understanding of all mechanical and electrical requirements for PV system, and assume all the risks of damage that might occur.
- Installers must conform to all the safety precautions when installing CIGS ePower Tile.

1.3 Warnings and Cautions

1.3.1 Warnings

- Each individual CIGS ePower Tile may generate DC voltages greater than 30 volts when exposed to direct sunlight. Protection measures must be taken during the installation since DC voltages above 30V are potentially hazardous. (Please refer to the Suggested Tools for Installation in Article 3.1.) 
- Installers are required to assume all the risks of damage that may occur during the installation, including electric shock.
- The installation should be in accordance with local and national standards, codes and regulations.
- CIGS ePower Tile should be ONLY installed over fire resistant roofs.

1.3.2 Cautions

- Do not disassemble CIGS ePower Tile. Remove neither attached labels nor components from the product.
- Do not apply paint or adhesive to CIGS ePower Tile.
- Do not put mirrors or magnifiers on CIGS ePower Tile for concentrating the sunlight.
- Keep the storage place flat, ventilated and dry. If CIGS ePower Tiles are stored outdoors, keep them under protective covers to avoid moisture.

1.4 Safety

1.4.1 Carrying

- Hold the carrier of CIGS ePower Tile and wear non-slip gloves to prevent the product from falling.
- Keep children away from CIGS ePower Tile while carrying and installing CIGS ePower Tile.
- To avoid glass breakage, heavy objects are not allowed to be placed on CIGS ePower Tile.
- Do not drop CIGS ePower Tile heavily.
- Do not damage cables and connectors.

1.4.2 Installation

- To avoid electricity generated during the disassembling, CIGS ePower Tile must be completely covered with an opaque material.
- Do not unplug CIGS ePower Tile connections while under load (when CIGS ePower Tile is supplying electricity to distribution board).
- Use the insulated tools and insulated gloves that meet the electrical installation standards.
- Do not stand or step on CIGS ePower Tile.
- All the electric components used in PV systems, including cables, connectors, charging regulators, inverters, storage batteries, etc., should abide by the safety regulations.
- Do not wear metallic rings, watchbands, earrings, nose rings, lip rings or other metallic objects while installing and maintaining PV systems.

- Complete protection measures, including non-slip shoes, aerial lift and fall arrest system, are necessary for roofing. Installers must conform to local and national construction and safety codes regarding weight limit while carrying objects.
- Stop installing once severe weather conditions occur, including but not limited to strong wind, earthquake, rainfall and snowfall.

1.4.3 Electricity Safety

- Under normal conditions, the current and voltage generated by CIGS ePower Tile can be higher than the value of I_{sc} (short circuit current) and V_{oc} (open circuit voltage) at standard test conditions. Therefore, the value of I_{sc} and V_{oc} at STC should be multiplied by a factor of 1.5625 when determining voltage ratings, conductor current ratings, fuse sizes, controller sizes of other equipment and components related to the output power. Please note that the factor refers to National Electrical Code ARTICLE 690-8 (USA) or other relevant document valid in the country of installation.
- The sum of V_{oc} in series MUST NOT exceed the maximum system voltage (IEC 1000V / UL 1000V) under any conditions.
- Though the cables and connectors of CIGS ePower Tile are insulated, please check regularly whether they are damaged in order to avoid electric shock.
- Before connecting CIGS ePower Tile to the inverter, turn off the breaker and the inverter.
- Do not carry out the installation when CIGS ePower Tile, installation tools or installation area are exposed to water in order to avoid electric shock.
- Before turning the system on, please ensure every CIGS ePower Tile is wired up, and use multimeters to check the total voltage of CIGS ePower Tile array.
- Please prevent cables from being directly exposed to the sun or being stained with asphalt.



2. General Information of Installation

2.1 Site Selection

- It is recommended that CIGS ePower Tile is installed in the location where it will receive the maximum sunlight throughout the year. Try to avoid any objects such as trees and buildings that may shade over the product.
- For the best results, CIGS ePower Tile should face to the south when being installed in the northern hemisphere; in contrary, it should face to the north when being placed in the southern hemisphere.
- Do not install CIGS ePower Tile in the location where flammable gases generate or gather easily.
- The site should conform to all the electrical and fire regulations.

2.2 Installation Requirements on the Roof or Buildings




- CIGS ePower Tile is applicable to both new and existing buildings, and can be installed with most types of roof tile. Before the installation, the following advices must be considered:
 1. The battens should be resistant to mold, acid, alkali, bad weather conditions and UV light.
 2. The battens should also be able to bear wind and snow loads.
 3. All the components and materials, including bolts, should be resistant to corrosion, UV light and bad weather conditions.
 4. The compatibility of roof tile's size with CIGS ePower Tile's size.
 5. Distance between two battens. (refer to 4.1.1)
 6. Thickness of the batten. (refer to 4.1.1)
 7. Roof drainage system should not be clogged.
- Please assure that CIGS ePower Tile is securely fastened and resistant to strong wind and snow.
- All the CIGS ePower Tiles should be installed tightly to avoid water leakage.

3. Preparation and Caution before the Installation

- Please install with the components indicated in the manual and follow the instructions. ETERBRIGHT SOLAR CORPORATION is not responsible for any damages caused by the installation without conforming to the instructions given in this manual.
- Before the installation, installers must ensure that the quantity of CIGS ePower Tile and the wiring are compatible with the installation area, and must follow the installation instructions of inverter.

3.1 Accessories and Suggested Tools for Installation

➤ Accessories

	
<p>Dust cap for MC4 connector ①</p>	<p>Stainless self-tapping screw used on wood ② M8 (4.5 x 48mm) ; Hexagon head with washer</p>
	
<p>PV-JB12K Junction box ③ Length of the cables: 60 cm</p>	

➤ Suggested Tools

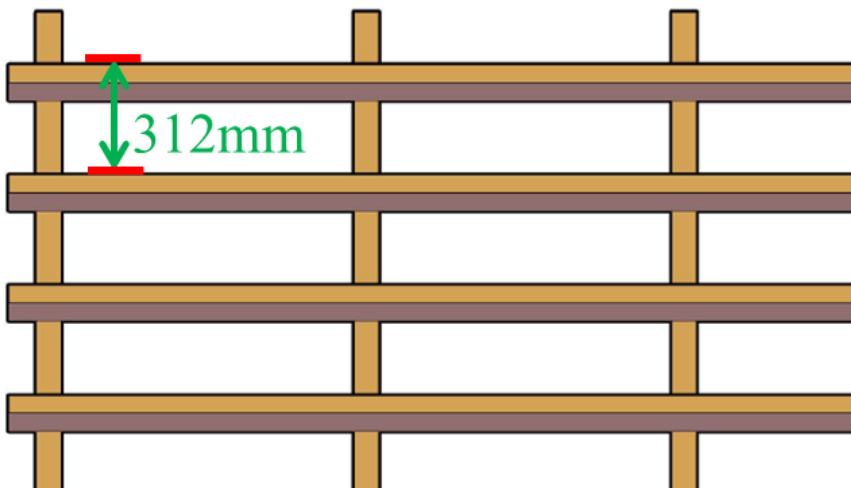
		
<p>Electric drill (12 V / 0-3300 rpm)</p>	<p>Sleeve 5/16 inches (8mm); Hexagon head</p>	<p>Non-slip shoes</p>
		
<p>Insulated gloves</p>	<p>L-shaped tool (Hex key) 5/32 inches (4mm)</p>	<p>Tape measure</p>

4. CIGS ePower Tile System Installation

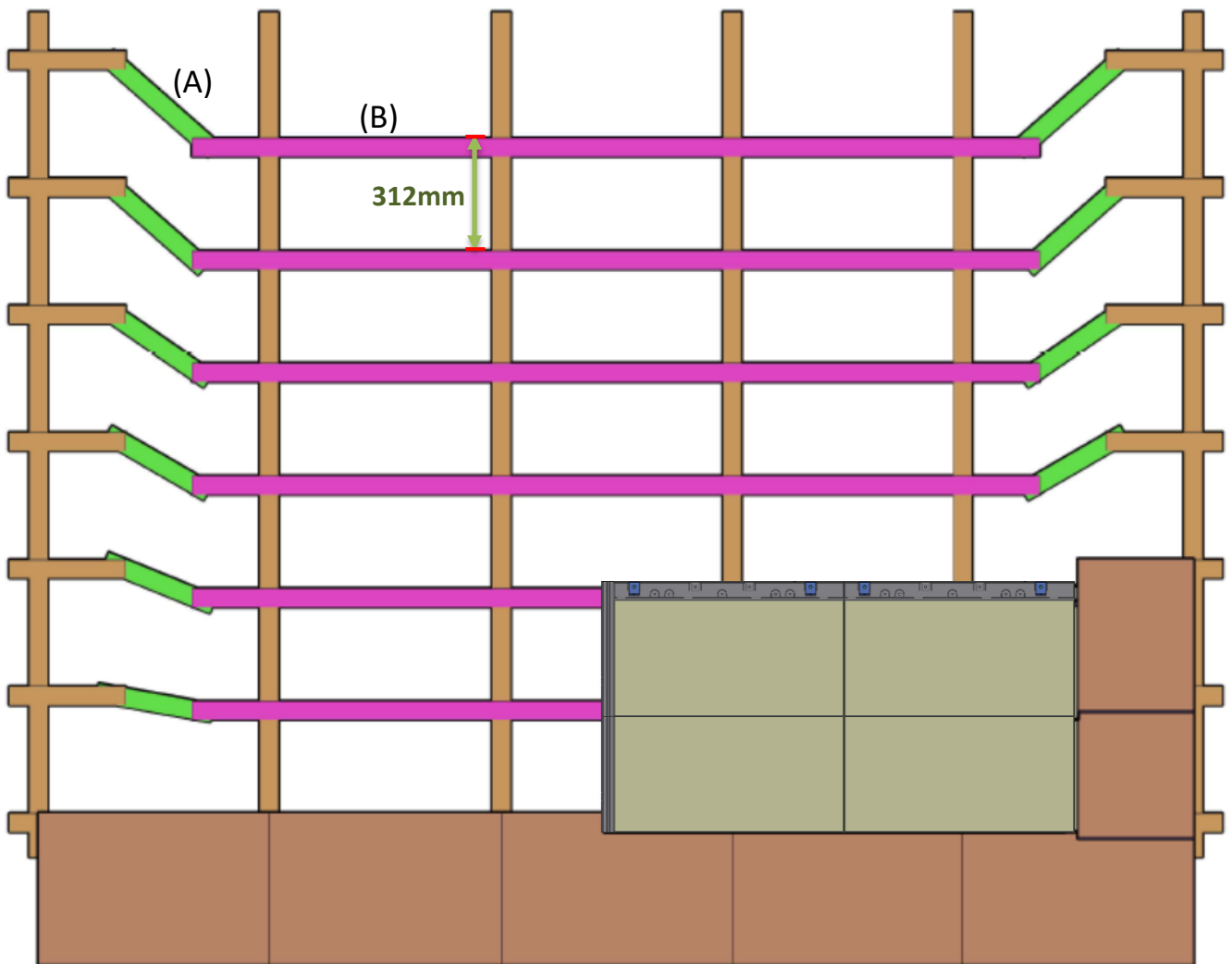
4.1 Structure Installation

4.1.1 Batten Installation

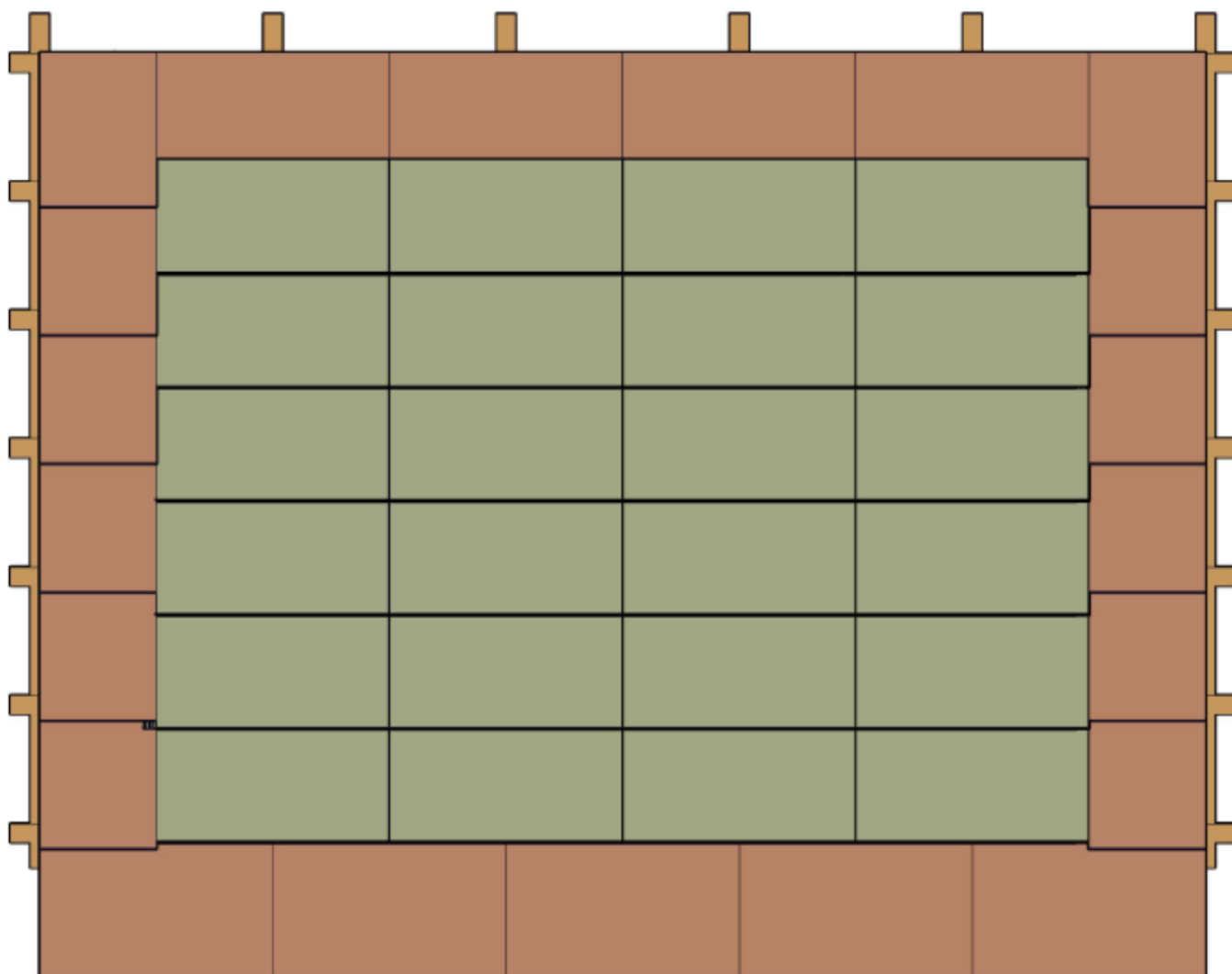
1. The roofing underlayment should be set before installing battens.
2. Here are some advices for batten installation, installers must conform to local and national codes:
 - To be compatible with the dimension of CIGS ePower Tile, the battens should be 50mm wide and 30mm thick at the minimum.
 - Distance between two horizontal battens: 312mm.



3. If the size of roof tile is different from the size of CIGS ePower Tile, you could connect Pink Battens (B) to the original battens with Green Battens(A). The distance between two Pink Battens (B) should be 312mm.

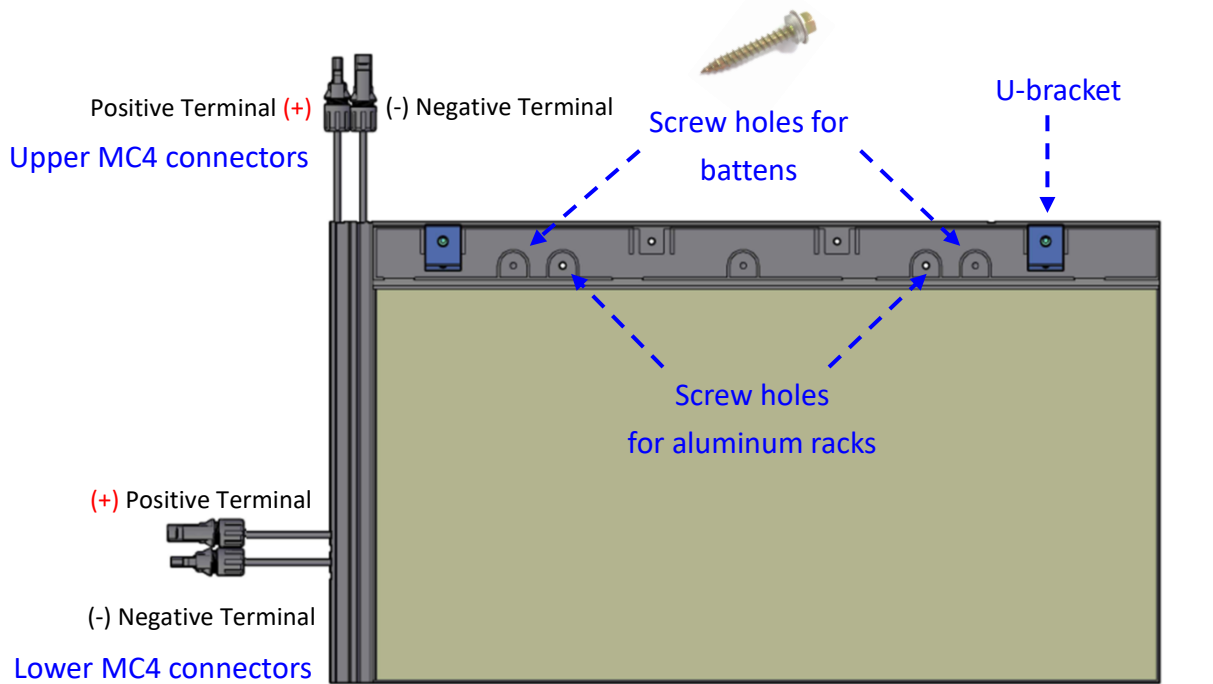


The combination of CIGS ePower Tiles and roof tiles:

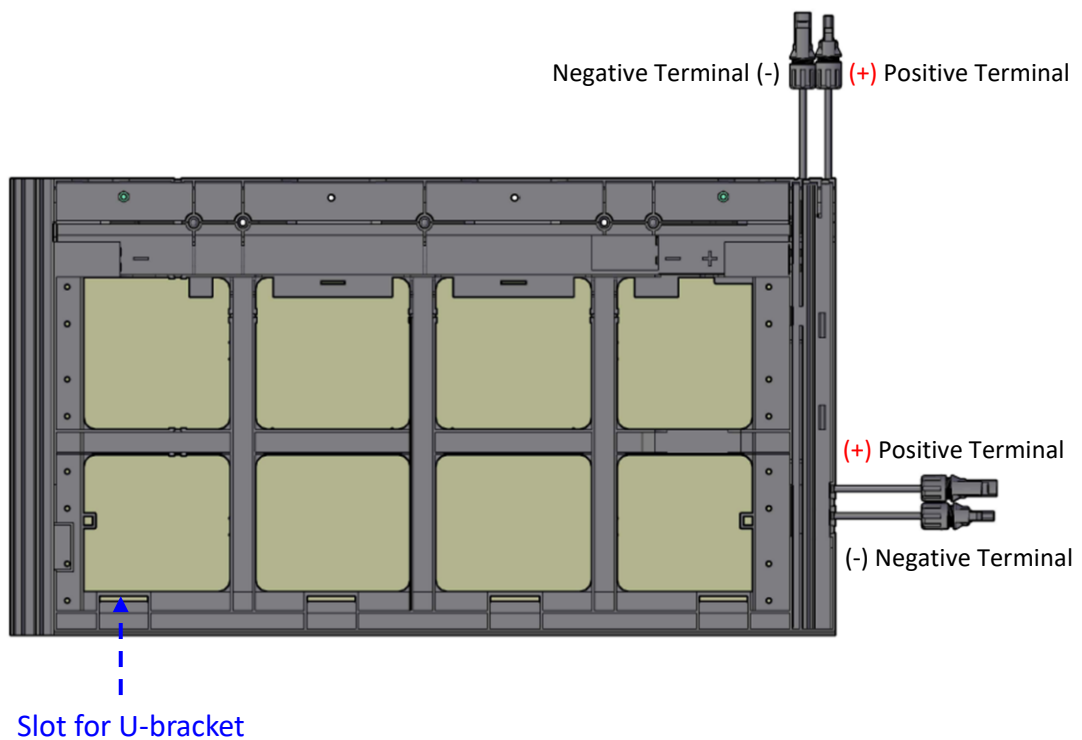


4.1.2 CIGS ePower Tile Installation

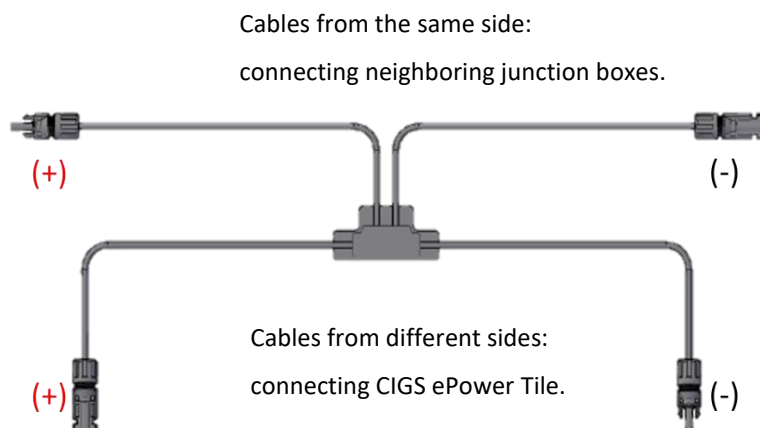
➤ Product parts:



Front side



Back side

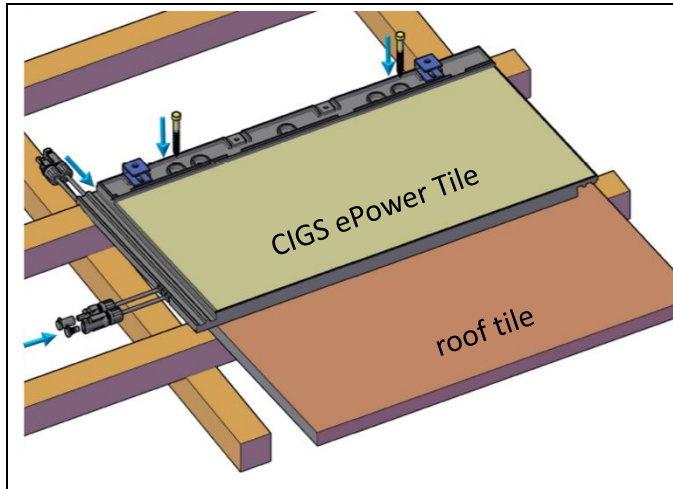


Junction box for connection in series



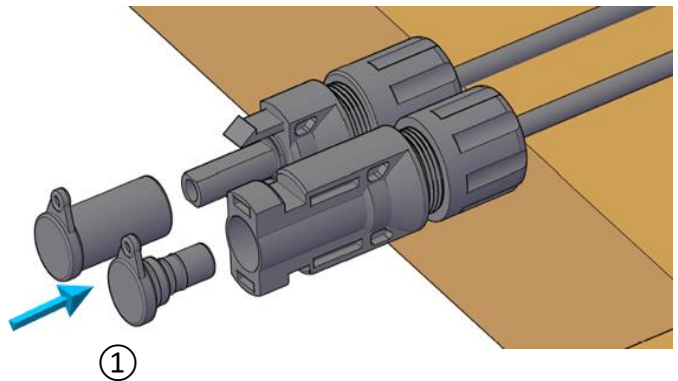
Junction box with logo facing upwards

➤ Installation Instructions I:



Place CIGS ePower Tile on the batten and follow the instructions.

*** Start the installation from the bottom-right corner.**

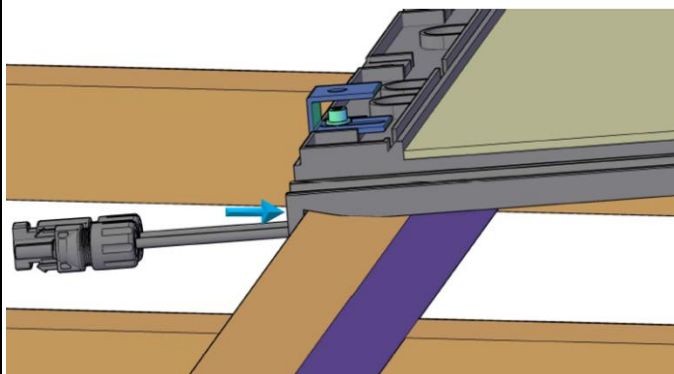


STEP 1

Put dust caps ① into the lower MC4 connectors.

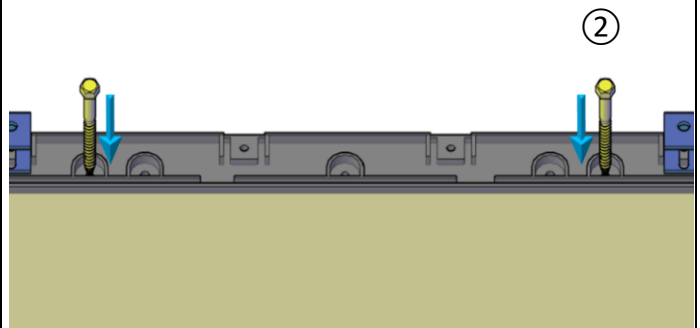
In case of getting loose, it is recommended to use silicone adhesive to stick them together.

*** This step is ONLY for the first CIGS ePower Tile in each row.**



STEP 2

Lean the groove of CIGS ePower Tile against the side of batten, and attach CIGS ePower Tile tightly to neighboring roof tiles.

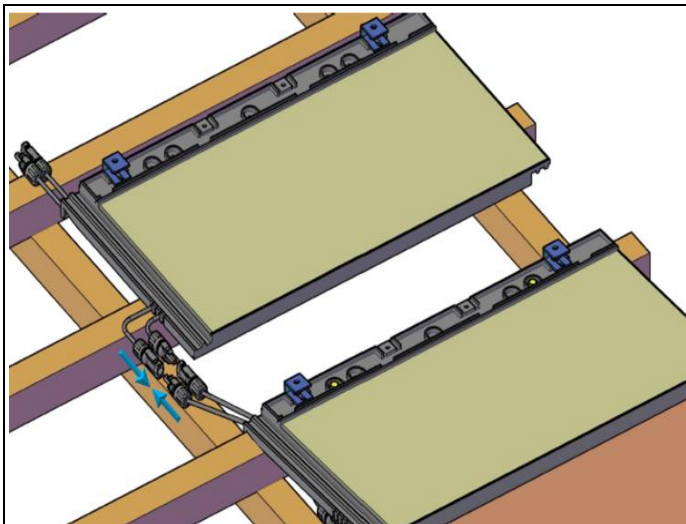


STEP 3

Fix two screws ② into the holes for battens with an electric drill of 3300 rpm.

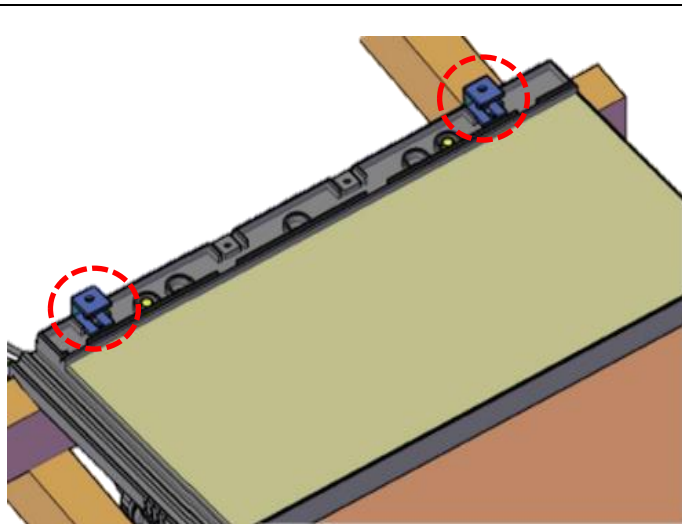
*** Do not drill on the glass or other areas that are not indicated in this manual.**

*** Make sure that screws and washers are firmly fastened, but do not over-torque them.**



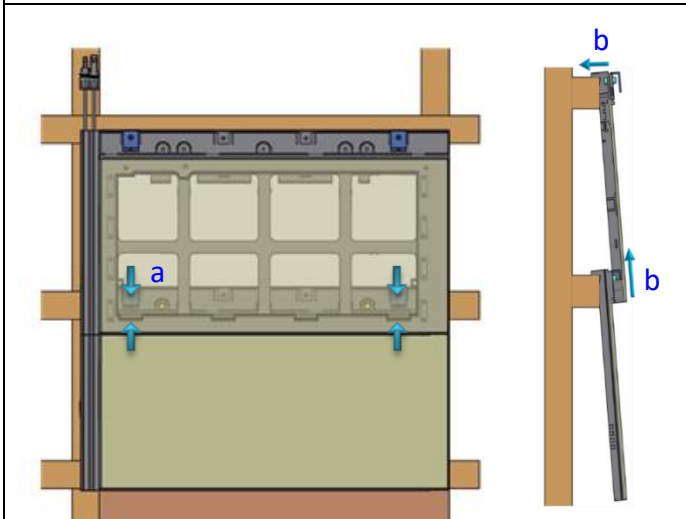
STEP 4

Join two CIGS ePower Tiles together using MC4 connectors. You will hear a click once the connection is made. Then put the cables under the batten.



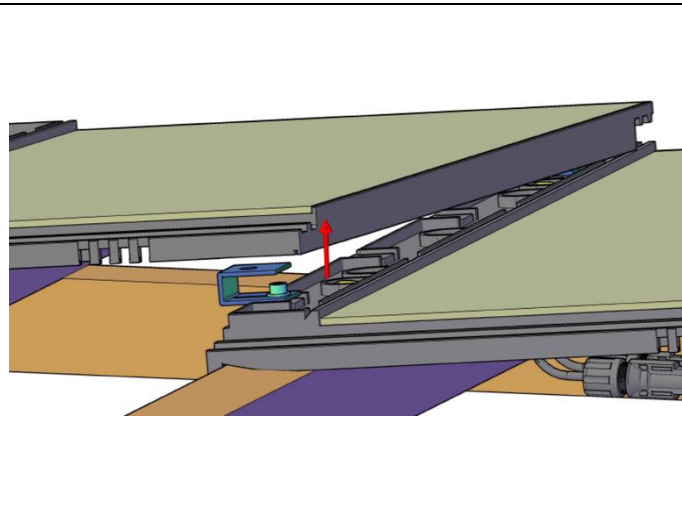
STEP 5

Keep the U-brackets in red circles in the frame of carrier.



STEP 6

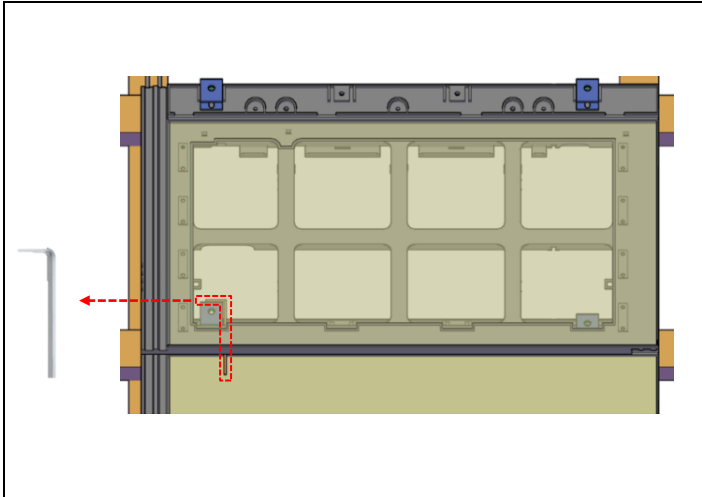
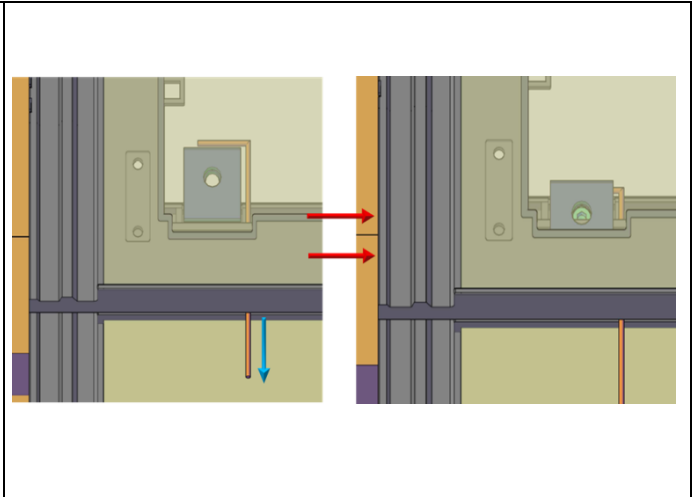
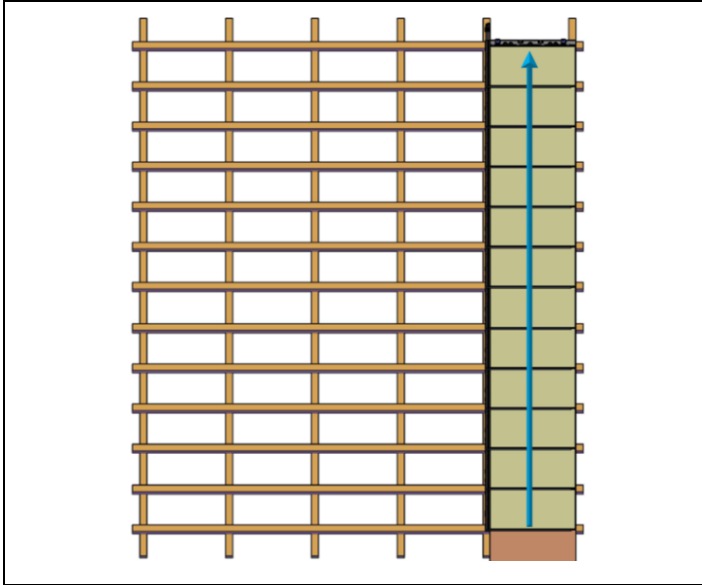
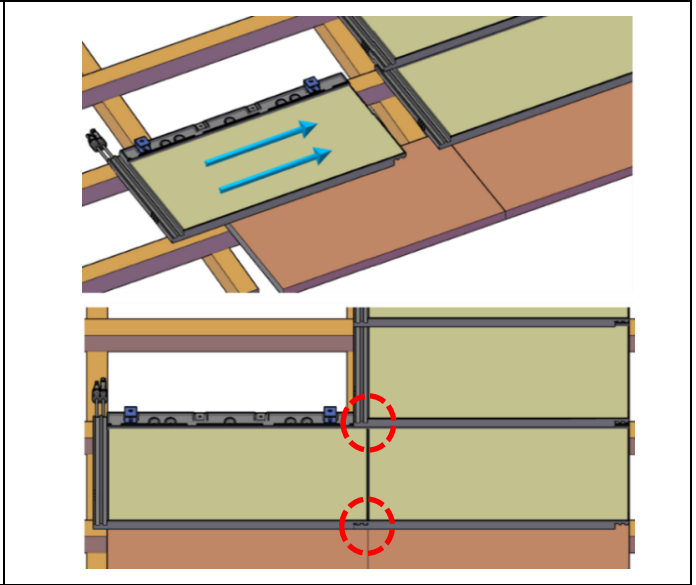
- a.** Align the slots of upper CIGS ePower Tile with the U-brackets of lower CIGS ePower Tile.
- b.** Next, slide upper CIGS ePower Tile upwards and lean it against the batten.

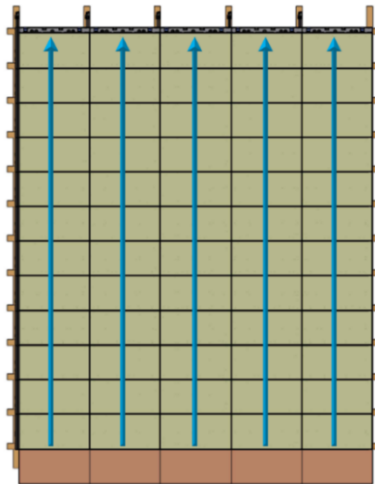


STEP 7

Try to lift CIGS ePower Tile to check U-brackets slide into slots.

*** If U-brackets fail to slide into slots, please follow STEPS 8 and 9.**

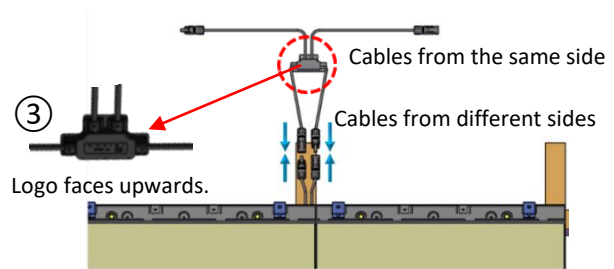
	
<p>STEP 8 Use an L-shaped tool to reach the U-bracket.</p>	<p>STEP 9 Pull down the U-bracket and slide it into the slot of lower CIGS ePower Tile.</p>
	
<p>STEP 10 Install the first row according to the previous steps.</p>	<p>STEP 11 For the next row, attach CIGS ePower Tile to the one on the right side, and make sure CIGS ePower Tiles are connected firmly.</p>



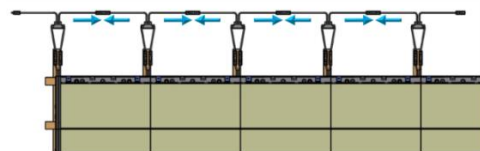
STEP 12

Install the entire CIGS ePower Tile array by following STEPs 1 to 11.

a



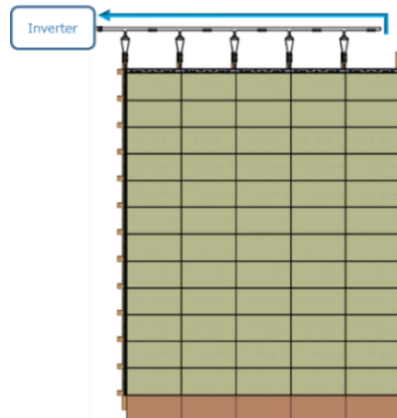
b



STEP 13

- a. Connect junction boxes (3) to the CIGS ePower Tiles at the top, with junction box logo facing upwards, cables from different sides connecting to CIGS ePower Tile, and cables from the same side connecting to neighboring junction boxes.
- b. Then connect each junction box to the neighboring junction box. You will hear a click once the connection is made.

Warning: wrong connection may cause damage to the product.



STEP 14

Join the connectors from two sides to the inverter by using PV extension cables. To prevent junction boxes from being exposed to the sun, please put all of them under the battens.

*** Please source PV extension cables locally.**

*** The voltage in series and the current in parallel must not exceed max. input voltage and max. input current of the inverter. (Each CIGS ePower Tile: 72.1V / 0.57A.)**

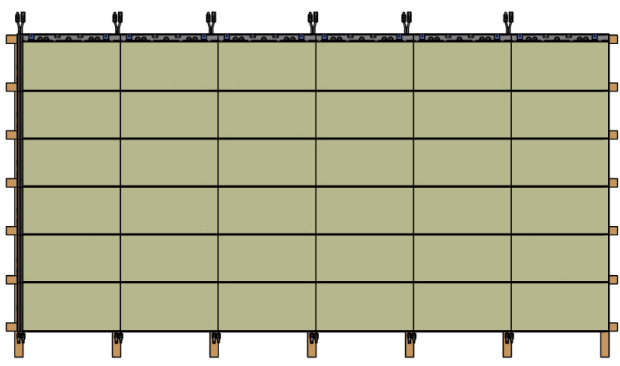
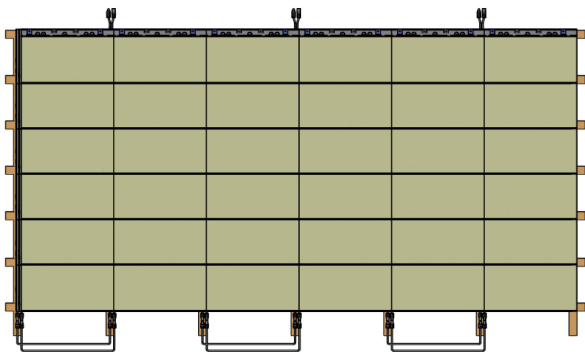
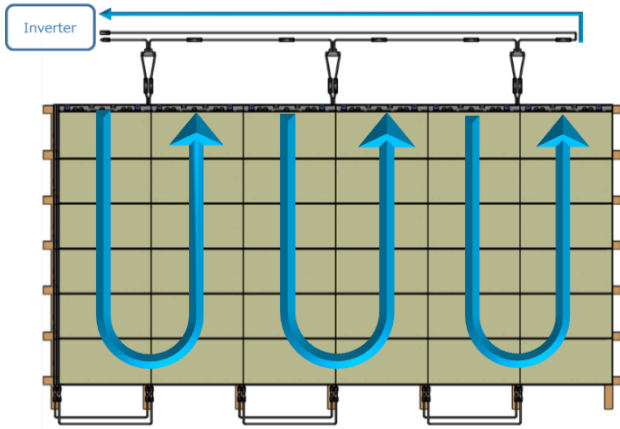
*** Different numbers of CIGS ePower Tile per row may lower the system's power generation.**

- Installation Instructions II: If the installation is limited to irregularly shaped areas, chimneys, windows or roof sizes, you can connect one row to another row in parallel according to the following instructions.

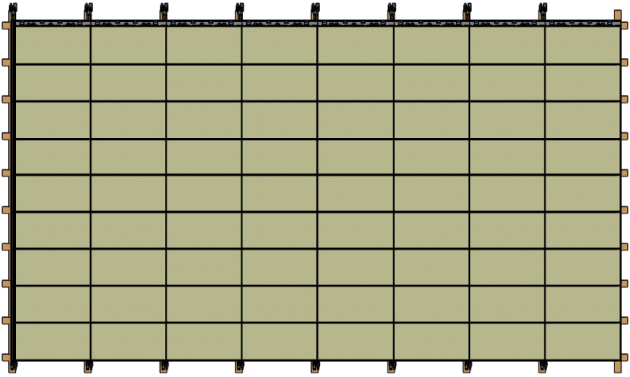
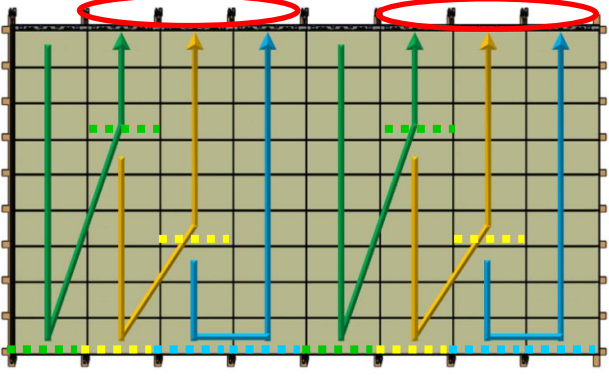
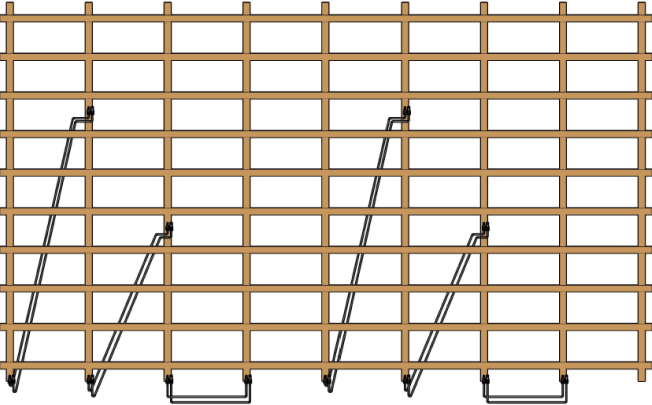
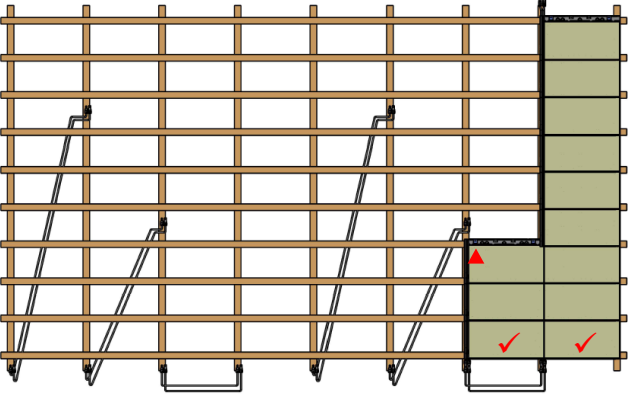
Example ONE:

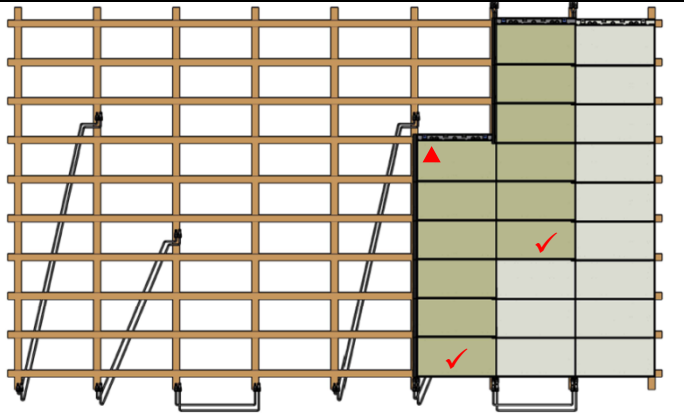
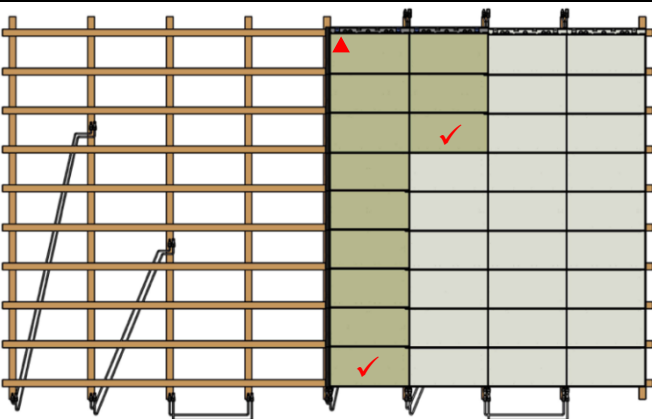
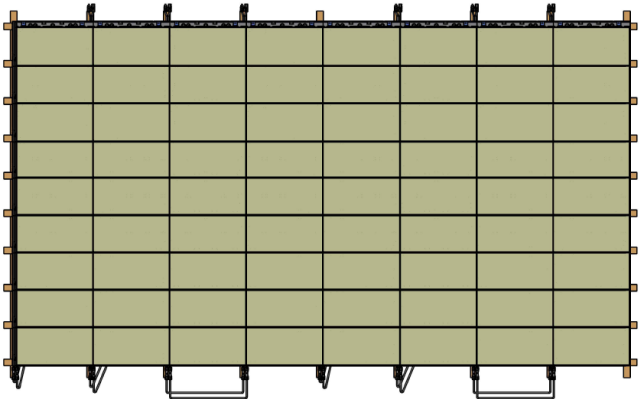
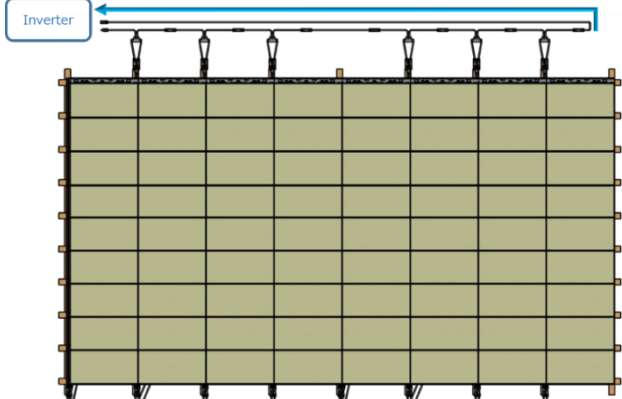
<p>Take the connection in parallel of 12 CIGS ePower Tiles as an example.</p> <p>* The voltage in series and the current in parallel must not exceed max. input voltage and max. input current of the inverter.</p> <p>* Different numbers of CIGS ePower Tile per row may lower the system's power generation.</p>	<p>STEP 1</p> <p>Join a cable with 2 male connectors to the female connectors of two CIGS ePower Tiles.</p> <p>Then join a cable with 2 female connectors to the male connectors of two CIGS ePower Tiles.</p> <p>* Please source cables with 2 male connectors & cables with 2 female connectors locally.</p>
<p>STEP 2</p> <p>Follow STEP 1 to connect CIGS ePower Tiles.</p>	<p>STEP 3</p> <p>Connect junction boxes ③ to the CIGS ePower Tiles at the top, with the junction box logo facing upwards, cables from different sides connecting to CIGS ePower Tile, and cables from the same side connecting to the neighboring junction box.</p> <p>You will hear a click once the connection is made.</p> <p>Warning: wrong connection may cause damage to the product.</p>

Example TWO:

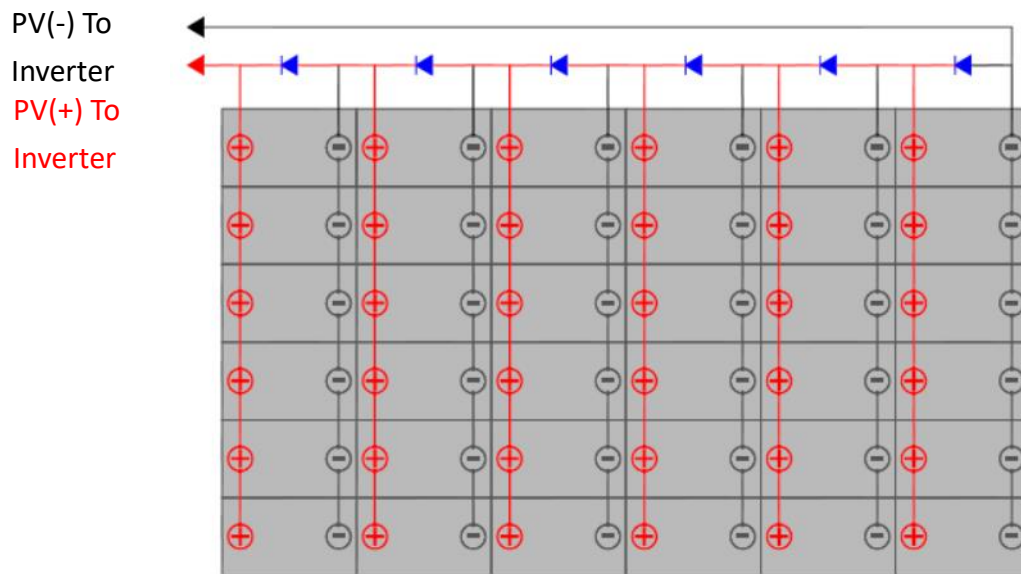
	
<p>Take the installation of 6x6 CIGS ePower Tile array as an example.</p>	<p>STEP 1 Connect two rows in parallel for an array. (3 arrays in total)</p>
	
<p>STEP 2 Join the connectors from two sides to the inverter by using PV extension cables. * Please source PV extension cables locally.</p>	

Example THREE:

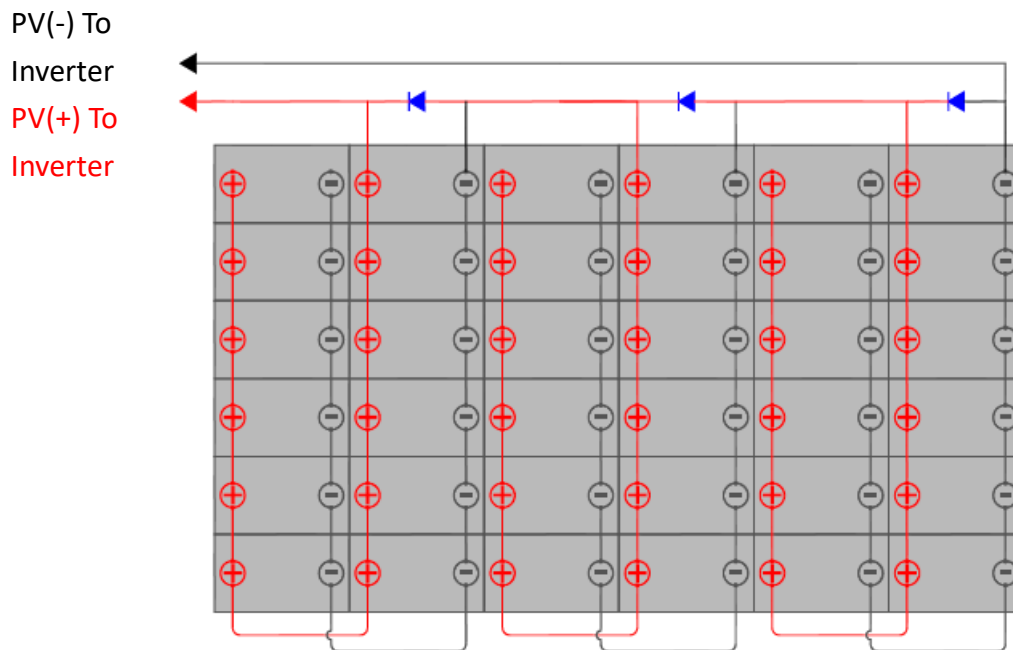
	
<p>Take the installation of 8x9 CIGS ePower Tile array as an example.</p>	<p>Design a wiring diagram: connecting 12 CIGS ePower Tiles in parallel for an array. (6 arrays in total)</p> <ul style="list-style-type: none"> * The connection of an array starts and ends with the CIGS ePower Tiles of which the bottom is marked by dotted lines. * Connect the CIGS ePower Tiles in red circle to junction boxes.
 <p>C-2 B-2 A-2 C-1 B-1 A-1</p>	 <p>C-2 B-2 A-2 C-1 B-1 A-1</p>
<p>STEP 1</p> <p>Place the cables with 2 male connectors and the cables with 2 female connectors under battens according to the wiring diagram.</p>	<p>STEP 2</p> <p>Array 1</p> <p>Install 12 CIGS ePower Tiles, then join the two Tiles of which the bottom is marked by ticks using Connectors A-1.</p> <p>Next, put dust caps① into the upper MC4 connectors (marked by red triangles) of the last CIGS ePower Tile in Array 1.</p>

 <p>C-2 B-2 A-2 C-1 B-1 A-1</p>	 <p>C-2 B-2 A-2 C-1 B-1 A-1</p>
<p>STEP 3 Array 2</p> <p>Install 12 CIGS ePower Tiles, then join the two Tiles of which the bottom is marked by ticks using Connectors B-1.</p> <p>Next, put dust caps① into the upper MC4 connectors (marked by red triangles) of the last CIGS ePower Tile in Array 2.</p>	<p>STEP 4 Array 3</p> <p>Install 12 CIGS ePower Tiles, then join the two Tiles of which the bottom is marked by ticks using Connectors C-1.</p> <p>Next, put dust caps① into the upper MC4 connectors (marked by red triangles) of the last CIGS ePower Tile in Array 3.</p>
	
<p>STEP 5</p> <p>Finish all the connection in parallel.</p>	<p>STEP 6</p> <p>Connect CIGS ePower Tiles at the top to junction boxes, then connect the junction boxes to the inverter.</p> <ul style="list-style-type: none"> * The voltage in series and the current in parallel must not exceed max. input voltage and max. input current of the inverter. * Different numbers of CIGS ePower Tile per row may lower the system's power generation.

4.2 CIGS ePower Tile System Wiring Diagram



Wiring diagram: Installation I



Wiring diagram: Installation II

5. CIGS ePower Tile Characteristics

Models:

- B (Black): Standard Glass
- C (Color): Colored Glass
- S (Stylux): Textured Glass (e.g. wood pattern)



5.1 Electrical Specification

At Standard Test Conditions (STC): Irradiance 1000W/m², cell temperature at 25°C (77°F), AM 1.5G

Model	CIGS-TB-0011	
Nominal power (+5%/-3%)	P _{mpp} [W]	28
Open circuit voltage	V _{oc} [V]	72.1
Short circuit current	I _{sc} [A]	0.57
Voltage at P _{max}	V _{mpp} [V]	55.4
Current at P _{max}	I _{mpp} [A]	0.51

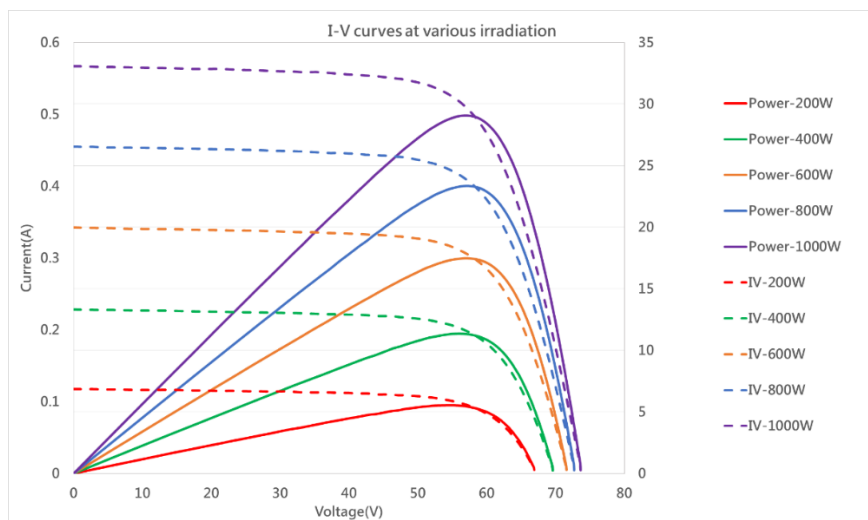
At Nominal Module Operating Temperature (NMOT):

Irradiance 800W/m², cell temperature at 20°C/68°F, Wind speed 1m/s, AM 1.5G

Model	CIGS-TB-0011	
Nominal power (+5%/-3%)	P _{mpp} [W]	22
Open circuit voltage	V _{oc} [V]	68.1
Short circuit current	I _{sc} [A]	0.47
Voltage at P _{max}	V _{mpp} [V]	52.3
Current at P _{max}	I _{mpp} [A]	0.43

- The rated power of CIGS ePower Tile is measured under Standard Test Conditions (irradiance 1000W/m², cell temperature of 25°C (77°F), AM 1.5G), so the actual output power varies according to different operating conditions. The amount of DC power generated by CIGS ePower Tile is proportional to the radiation intensity; the voltage decreases as the temperature rises.
- The electrical characteristics are within ±10% of the indicated values of I_{sc} and V_{oc} under STC.
P_{max} tolerance after Light Soaking (IEC) is from -3% to +5%.

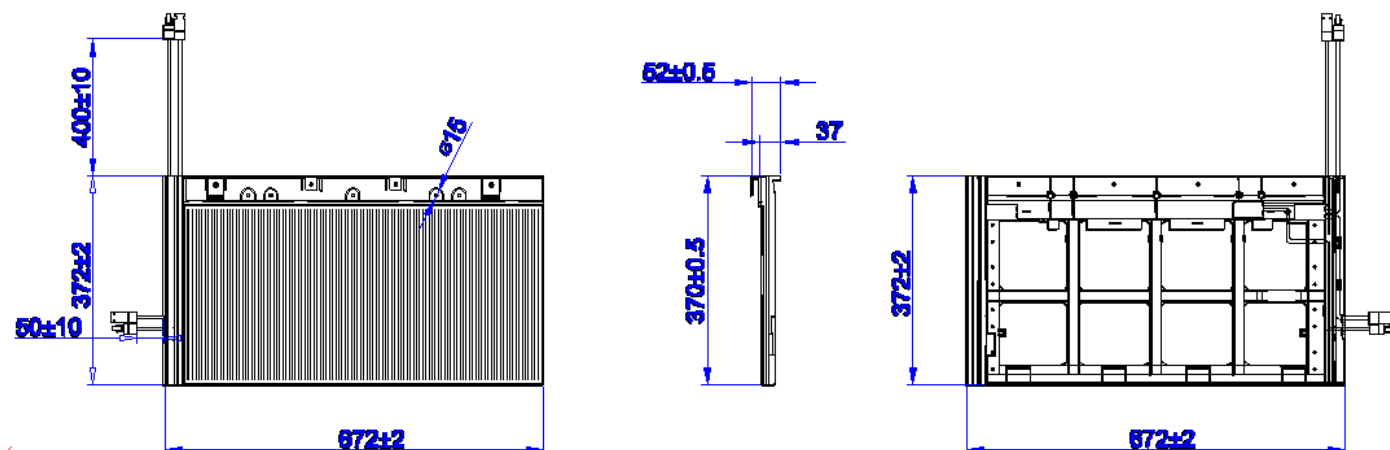
5.2 I-V and P-V Curves at Different Irradiance Levels



5.3 Mechanical Specification

Dimension(L*W*H)	672*372*37mm
Exposed Area	636*317mm
Weight	4.7kg
Operating Temperature	-40°C~85°C
Application Class on IEC 61730	A
Fire Safety Class on IEC 61730	C
Snow Load	5400 Pa
Wind Load	2400 Pa
Cell Type	CIGS (Free of Cadmium)
Front Cover	3.2mm tempered glass
Encapsulant	EVA (Ethylene Vinyl Acetate)
Back Glass	1.8mm
Connectors	MC4 or Compatible Connectors
Cables (PV-JB12K)	Section area: 4.0mm ² (12AWG)/ Length: 60cm

5.4 Physical Specification



5.5 Bypass Diode

Model	Nominal Voltage	Nominal Current
UKTH30100	100V	15A

Note: Bypass Diode is attached in PV-JB12K junction box.

5.6 System Operation Characteristics

Max. system voltage	V _{sys}	1000V DC / UL1000V DC
Maximum series fuse rating ¹	I _{sf}	1A (one CIGS ePower Tile)
Max. number for connection ²	in series ³	11 (UL: 11)
	in parallel	20

Note 1: CIGS ePower Tile system is designed for connection in parallel before connection in series.

The maximum series fuse rating must be no less than “1.5625 times the maximum system I_{sc} in parallel”. For example, a fuse of 18A is suggested for the connection in parallel of 20 ($0.57A \times 20 \times 1.5625$); a fuse of 15A is suggested for the connection in parallel of 16 ($0.57A \times 16 \times 1.5625$). The fuse size must be chosen according to the numbers of connection in parallel and according to the assessment from professionals.

Note 2: The number for connection in series/parallel must depend on the inverter’s capacity and local weather conditions.

Note 3: +10% tolerance of V_{oc} at STC. The sum of V_{oc} in series MUST NOT exceed the maximum system voltage under any conditions.

- * The value of I_{sc} and V_{oc} listed in the above STC specification should be multiplied by a factor of 1.5625 when determining voltage ratings, conductor current ratings, fuse sizes, controller sizes of other equipment and components related to the output power.

6. Maintenance

- Clean the surface of CIGS ePower Tile with wet sponges or rags.
- Check the electrical, grounding and mechanical connections every six months to ensure that they are clean, secure, undamaged and free of corrosion.
- When replacement parts are required, the installer or servicer should ensure that the parts are specified by the manufacturer, with the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazard.
- Please maintain all the components of PV system, including racks, rectifiers, inverters, batteries, etc.

7. Cautions for System Shutdown

- To avoid electricity generated during the disassembling, CIGS ePower Tile must be completely covered with an opaque material.
- The disassembling can be done ONLY AFTER the system is shut down. Please follow the instruction manuals of each system component.