

INSTALLATION INSTRUCTION

1. CLIMATE CONDITION

Install the PV module in the following conditions:

Ambient temperature: -20°C to +40°C.

Operating temperature: -40°C to +85°C.

Mechanical Loading Test: 5400Pa.

Water resistance: don't install the PV module in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc.

Corrosion resistance: except for corrosive salt area and sulfurous area.

2. ORIENTATION

Install the PV module facing South (in Northern Hemisphere), or North (in Southern Hemisphere). Module facing West or East can generate a smaller amount of electricity than facing South (in Northern Hemisphere), or North (in Southern Hemisphere). Incorrect orientation will result in loss of power output.

PV modules connected in series should be installed in same orientation and angle. Different orientation or angle may cause loss of output power due to difference of amount of sunlight exposed to the module.

Install the PV as free as possible from shading. Shading causes loss of output, even though the factory fitted bypass diode of the PV module will minimize any such loss.

3. MOUNTING AND NOTES

The basis for durable and safe mounting is an assembly frame which corresponds to the appropriate structural requirements, which is securely anchored to the ground, to the roof, or to a facade, and whose long-term stability is guaranteed. The mounting structure and the module attachments must be designed in accordance with the local wind and snow loads. Ensure that the modules are mounted over a fire resistant roof covering rated for the application.

To prevent bending, vibration, mechanical stress or warpage, mount the module onto a flat contact surface. Secure the module along the long edges with the correct number of clamps. The minimal distance between mounted modules should be no less than 20 mm. Use all the mounting points provided and avoid direct contact between glass and metal (e.g. mounting rails).

The junction box should be located in upper or lateral area of the module and the cables should hang downwards.

MOUNTING METHODS FOR ULICA MODULES

Option 1: Clamping mounting

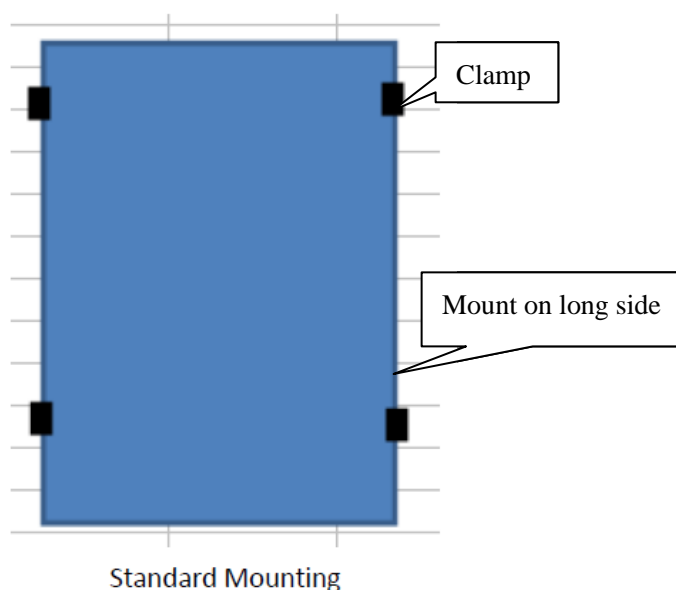
The module may be clamped only in the permitted clamping areas as indicated on following drawings. And the module clamps must not overlap the glass or shade the module surface.

Recommended tightening torque: 5Nm.

Option 2: Bolting mounting

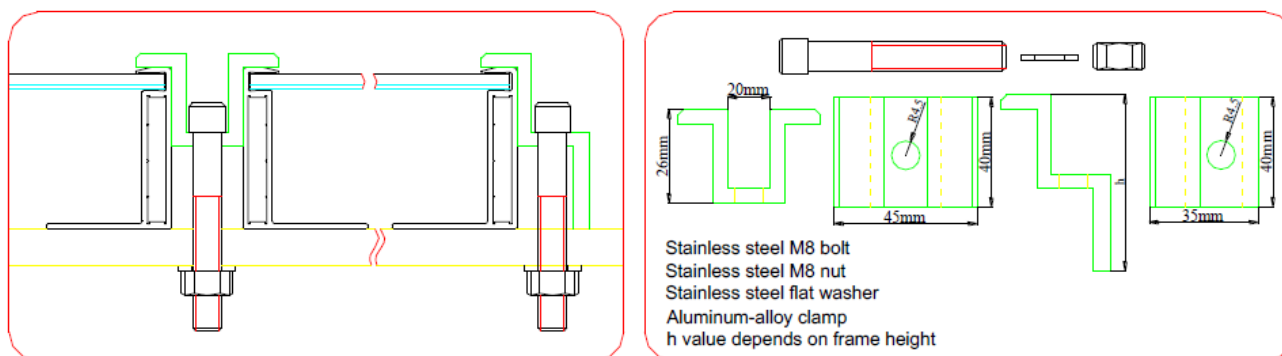
Use the existing installation holes instead of drilling additional holes for installation (Drilling holes shall against the reliability and warranty of the module). The installation and attachment materials (nuts, bolts, etc.) must be corrosion-resistant.

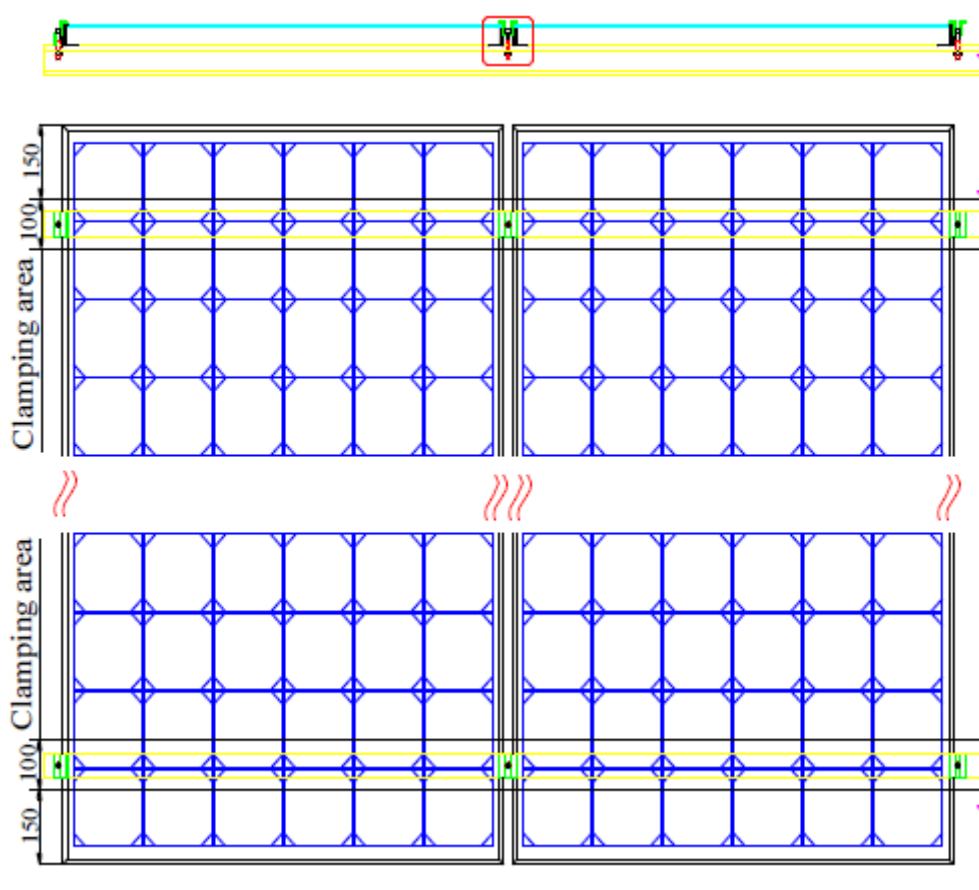
Recommended tightening torque: 5Nm.



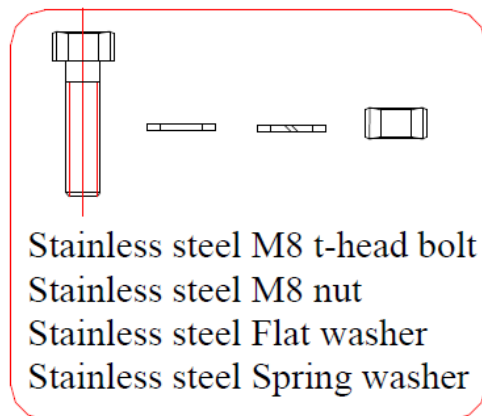
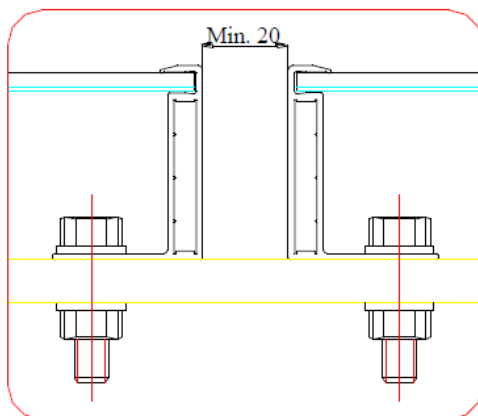
Mounting details

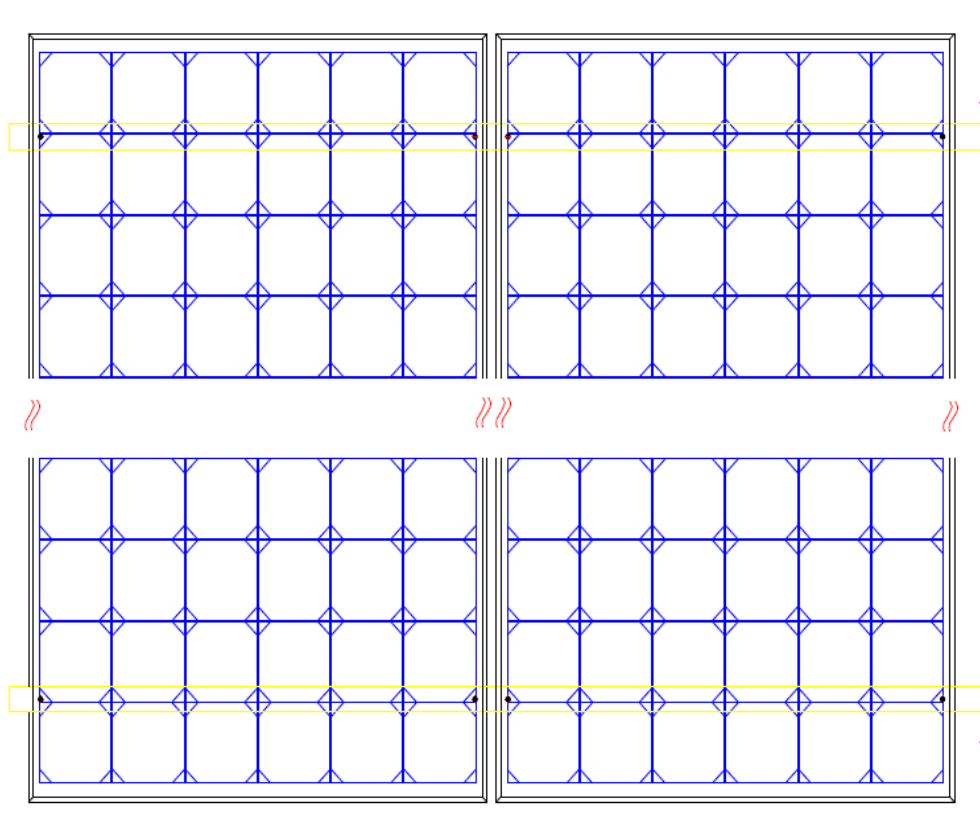
1. Clamping drawing





2. Bolting drawing





4. WIRING AND NOTES

In modules, bypass diode nominal current as the Electrical parameter .The PV module has a pair of male and female waterproof connectors. For a series electrical connection, connect positive (+) connector of the first PV module to the negative (-) connector of the following module.

Connect the output cable with equipment correctly.

The connectors and wires should be what our company provides.

Be sure connector no gap between the insulators. In case there is a gap, a fire and/or an electrical shock may occur.

The connect temperature ratings is $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$.

Restrain from non-linker connecting method. For a non-integral module or panel, the assembly is to be mounted over a fire resistant roof covering rated for the application.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this module should be multiplied by the factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes and size of controls connected to the PV output.

The value of the series fuse rating of a module string is 15A for 156x156 mm solar cells , 10A for 125 x125 mm solar cell.

5. GROUNDING METHOD

Adopting the grounding hole method; the peripheral electrophoresis coating of grounding hole is wiped off. When mounting, you can select 8# stainless steel screw to well connect copper wires (diameter 4mm) and modules. The torque rating of screw is 1.2N·m at least. Then, copper wires should be connected with grounding wires.

Note:

The electrical characteristics are within $\pm 3\%$ of the indicated values of I_{sc} , V_{oc} , and P_{max} under standard test conditions (irradiance of $100\text{mW}/\text{cm}^2$, AM 1.5, and a cell temperature of 25°C (77°F)).

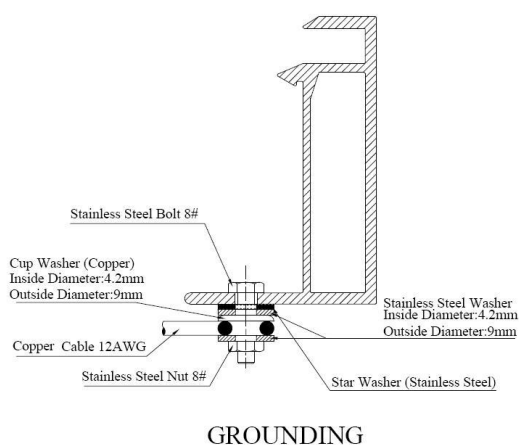


Fig 3:

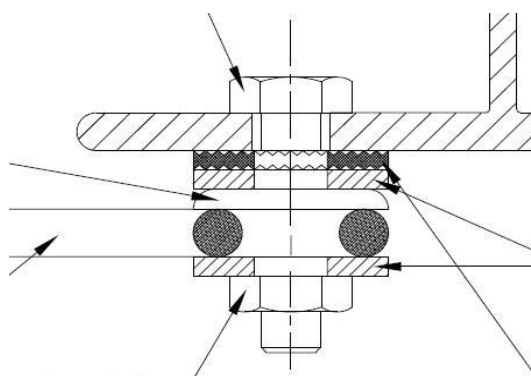
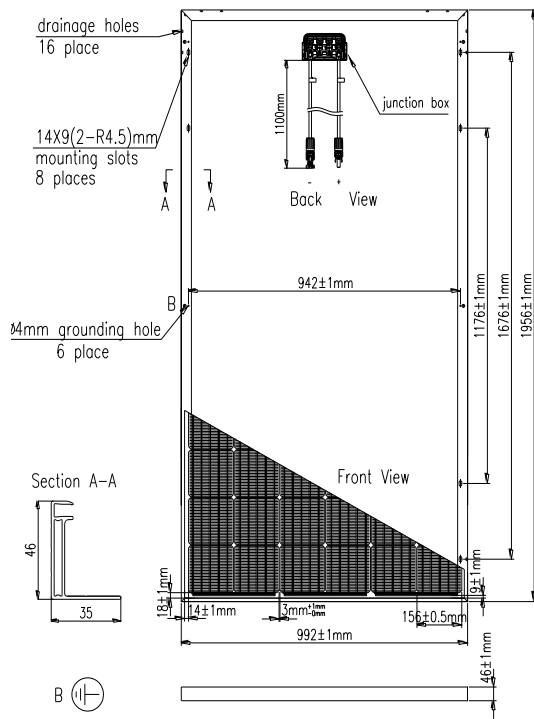


Fig 4:

Declarations:

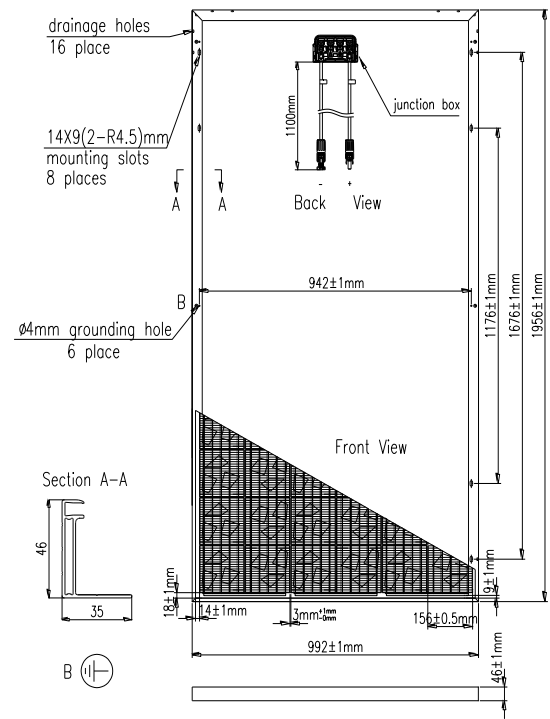
- ① Each module has two grounding holes (see Fig. 5-1, Fig. 5-2, Fig. 5-3, Fig. 5-4, Fig. 5-5, Fig. 5-6, Fig. 5-7, Fig. 5-8, Fig. 5-9, Fig. 5-10). The symbol is located adjacent to the terminal.

The grounding point must be installed separately from the mechanical mountings.



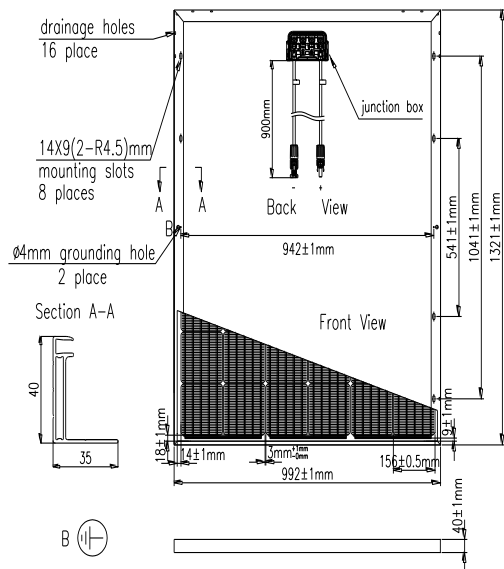
TS-xxxM-72

Fig.5-1



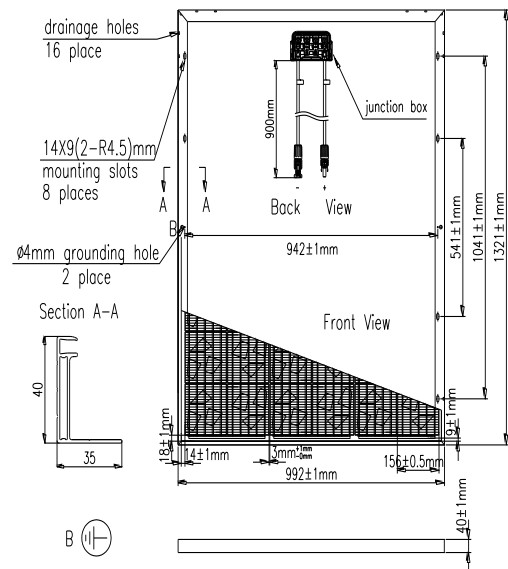
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Fig.5-2



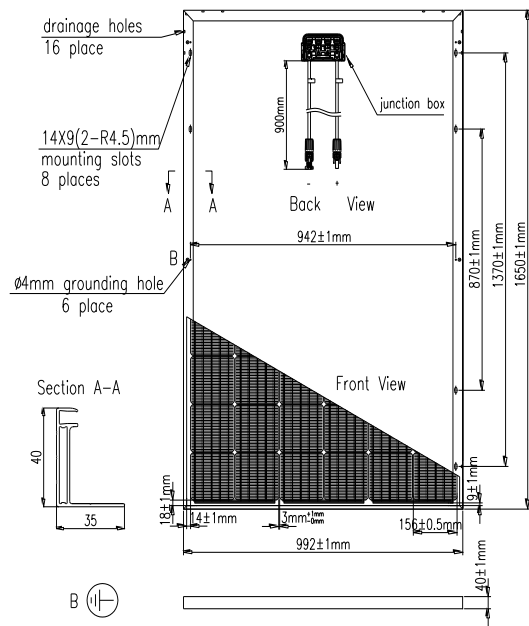
TS-xxxM-48

Fig.5-3



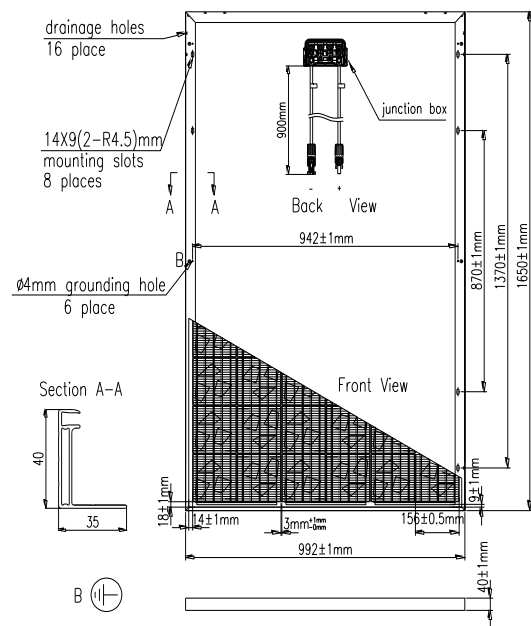
TS-xxxP-48

Fig.5-4



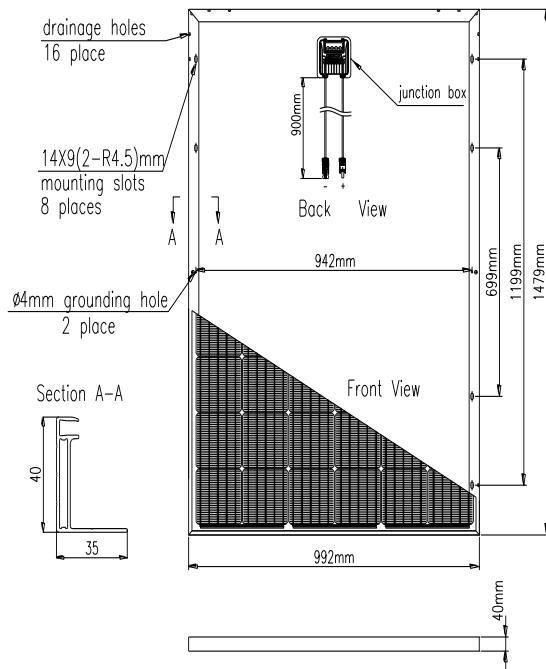
TS-xxxM-60

Fig.5-5



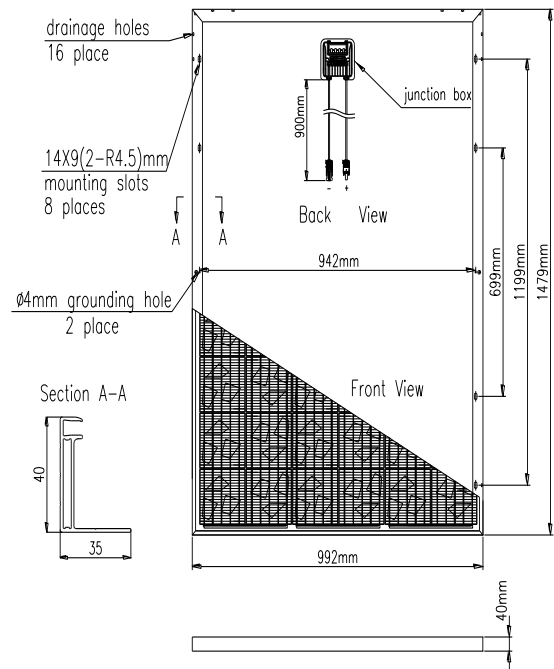
TS-xxxP-60

Fig.5-6



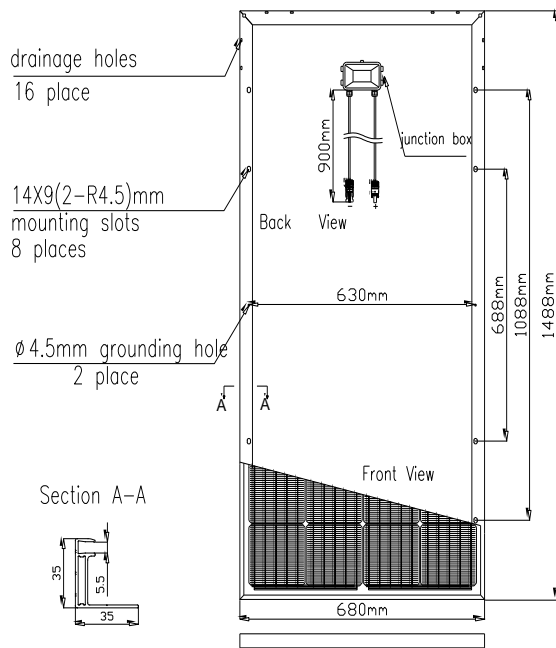
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Fig.5-7



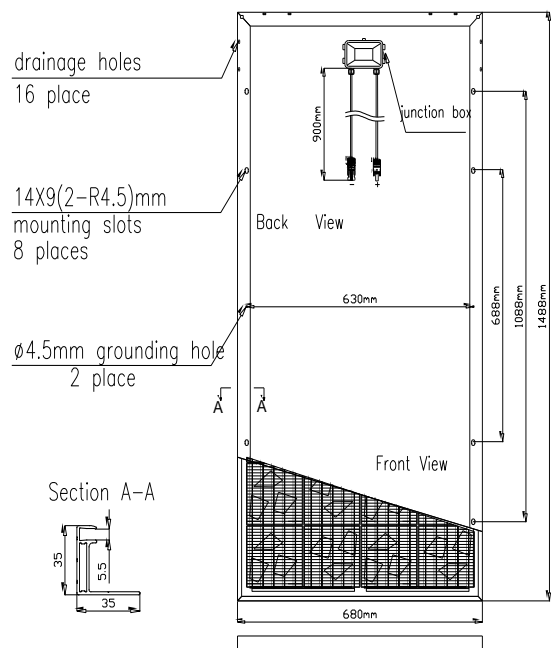
TS-xxxP-54

Fig.5-8



TS-xxxM-36

Fig.5-9



TS-xxxP-36

Fig.5-10

- ② We apply a highly visible warning label regarding electrical shock hazard (see Fig. 6) near the means of connection on every single module.

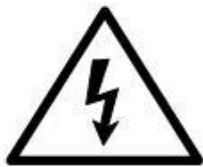


Fig. 6

- ③ The following mentioned are the conditions of the application class A:
The modules are qualified for Application Class A: Hazardous voltage (IEC 61730: higher than 50VDC; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated (Modules qualified for safety through EN IEC 61730-1 and -2 within this application class are considered to meet the requirements for Safety Class II.)

6. Figure 1 shows a schematic diagram of a cross-section of a photovoltaic module.

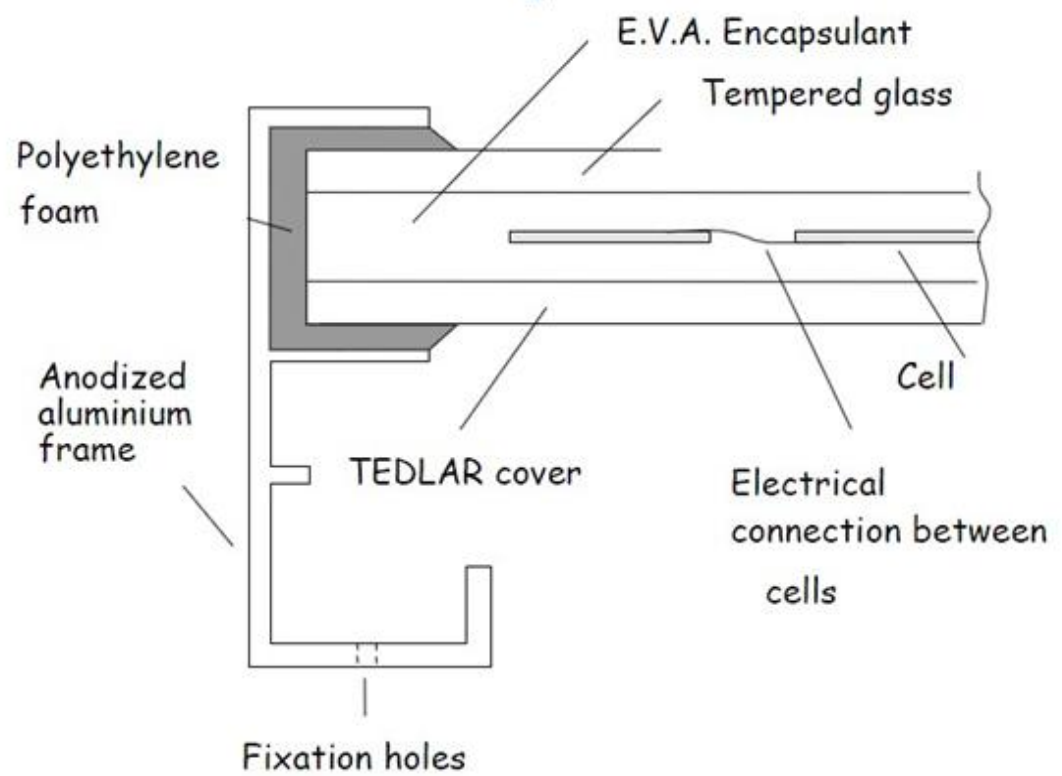


Fig. 7

The electrical characteristics are within ± 3 percent of the indicated values of I_{sc} , V_{oc} and P_{max} under standard test conditions (irradiance of 100 mW/cm^2 , AM1.5 spectrum, and a cell temperature of 25°C)

- Safety Standard for Electrical Installations, please refer to national building codes and safety requirements.

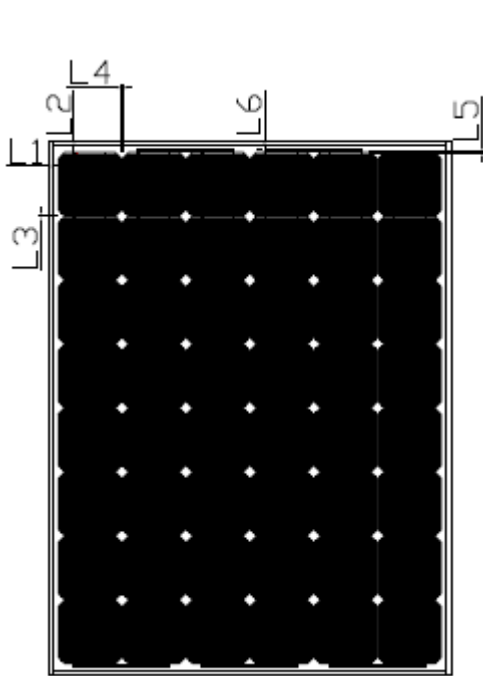


Fig. 8-1 (1321X997X46)

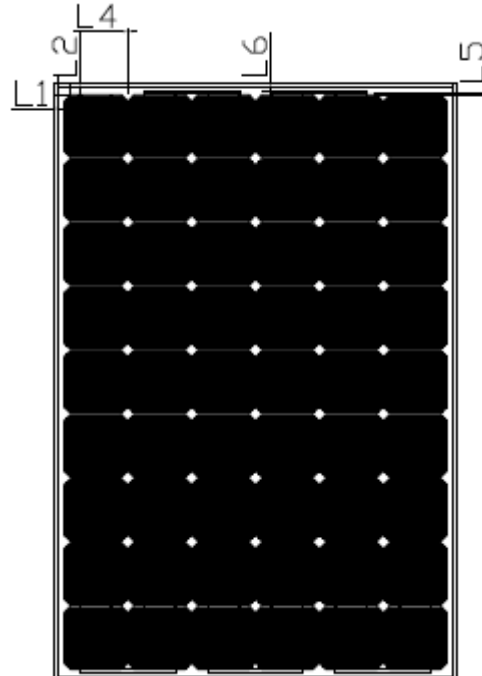


Fig. 8-2 (1479X997X46)

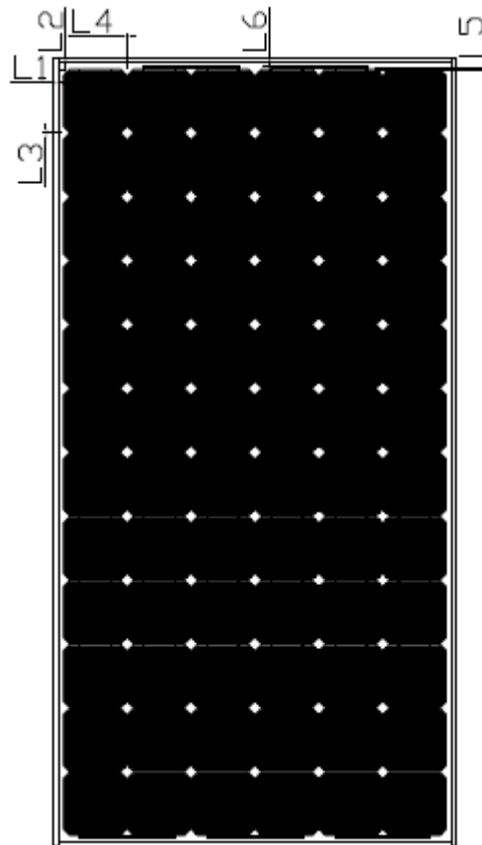
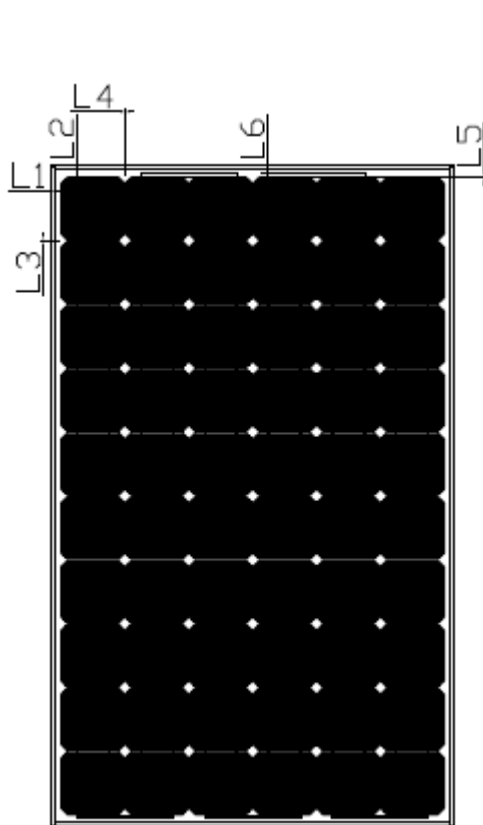


Fig. 8-3 (1637X997X46)

Fig. 8-4 (1953X997X46)

DISTANCE	DESCRIPTION	VALUE	TOLERANCE
L1	from cell edge to frame edge	14	± 2
L2	from cell edge to frame edge	18	± 2
L3	from cell edge to cell edge	2	± 0.5
L4	from cell edge to cell edge	2	± 0.5
L5	from bus bar to cell edge	2	± 0.5
L6	from bus bar to frame edge	10	± 2

The argument of Fig. 8-1, Fig. 8-2, Fig. 8-3, Fig. 8-4

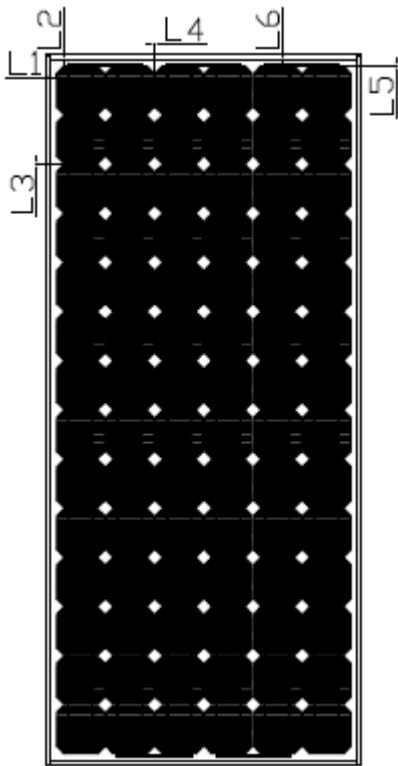


Fig. 8-5 (1835X800X46)

DISTANCE	DESCRIPTION	VALUE	TOLERANCE
L1	from cell edge to frame edge	8.5	± 2
L2	from cell edge to frame edge	17.5	± 2
L3	from cell edge to cell edge	2	± 0.5
L4	from cell edge to cell edge	2	± 0.5
L5	from bus bar to cell edge	2	± 0.5
L6	from bus bar to frame edge	10	± 2

The argument of Fig. 8-5

8、Suggested maximum number of modules in parallel and in series

When designing the system, we recommend that the maximum number of modules in parallel should be no more than two while the maximum number of modules in series no more than the quantity

Cell quantity/module	Maximum number of modules in series
<40	30
48	25
54	22
60	20
72	17
84	15
96	13

9、Wiring

For the wiring, pay attention to:

- THE type of junction box for every module is related to Sheet-1. The This box, on the back side of the module, is weatherproof and is designed to be used with standard wiring or conduit connections. Bypass diodes and cable clamps are included with each module when shipped from the factory.

- **Correct wiring scheme**

When designing the system, avoid forming loops (to minimize risk in the event of an indirect lightning strike). Check that wiring is correct before starting up the generator. If the measured open circuit voltage (U_{oc}) and short-circuit current (I_{sc}) differ from the specifications, then there is a wiring fault.

- **Correct connection of contact plug connectors**

10、Bypass diodes

Partial shading of an individual module can cause a reverse voltage across the shaded module. Current is then forced through the shaded area by the other modules.

When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded module, thereby minimizing module heating and array current losses.

Diodes that are used as bypass diodes must:

Have a Rated Average Forward Current above maximum system current at highest module operating temperature.

Have a Rated Repetitive Peak Reverse Voltage above maximum system voltage at lowest module operating temperature.

11、 Battery

When solar modules are used to charge batteries, the battery must be installed in a manner which will protect the performance of the system and the safety of its users. The battery should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which is explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

12、 Maintenance and cleaning

- Do not change the PV components optionally (diode, junction box, plug connectors)
- Given a sufficient tilt (at least 15°), it is not generally necessary to clean the modules (rainfall will have a self-cleaning effect). In case of heavy soiling (which will result in output reductions), we recommend cleaning the modules using plenty of water (from a hose) without cleaning agents and using a gentle cleaning implement (a sponge). Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches. We recommend that the system be inspected at regular intervals.
- All fastenings are tight and secure and free of corrosion.
- All cable connections are secure, tight, clean and free of corrosion.
- Cables are not damaged in any way.
- Checking the earthing resistivity of metals.

13、 Danger of death from electric shock!

Solar modules generate electricity as soon as they are exposed to light. One module on its own is below the safety extra low volt level, but multiple modules connected in series (summing the voltage) or in parallel (summing the current) represent a danger. The following points must be observed when handling the solar modules to avoid the risk of fire, sparking and fatal electric shock.

- **Do not insert electrically conducting parts into the plugs or sockets!**
- **Do not fit solar modules and wiring with wet plugs and sockets!**
- **Exercise utmost caution when carrying out work on wiring and safety equipment (use insulated tools, insulated gloves, etc.)!**
- **Do not use damaged modules! Do not dismantle modules! Do not mark on the rear of the module using sharp objects!**
- **Exercise utmost caution when working on wiring and the inverter. Be sure carefully to follow manufacture's installation instructions!**

Danger of death from arcing !

Modules generate direct current when light shines on them. An arc may be produced when connections are separated. We therefore recommended covering modules with a lightproof cloth during installation. When breaking a connected string of modules (e.g. when disconnecting the DC line from the

inverter under load), a lethally strong arc can occur:

- **Never disconnect the solar generator from the inverter while the inverter is connected to the mains grid—remove the fuse from the AC side on the inverter first!**
- **Ensure cable connections in perfect condition (no splitting, soiling or other contamination)!**

Remark: all size are based in mm unit, and the tolerance is +/- 2 mm

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