



Hybrid PVT modules

Installation manual PVTmodules

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1 GENERAL INFORMATION

This installation manual provides general and specific information relative to the Ensun thermal-photovoltaic modules which is based on a photovoltaic module with electric power of 330W – 450W – 540W in nominal electric power and 1085W-1210W-1397W nominal thermal power.

Ensun Solar PVT modules comply with standards IEC 61215 and IEC 61730. They must be used exclusively for the transformation of solar radiation in electrical energy, and recovery of the modules' own heat to produce thermal energy.

Ensun Solar PVT modules must be installed only by highly specialized personnel in possession of the technical and professional qualifications and in accordance with suitable installation projects and authorization from the appropriate local offices.

The word “module” used in this manual refers to one *Ensun Solar PVT module*.

READ THIS MANUAL WITH THE MAXIMUM ATTENTION BEFORE INSTALLING THE MODULES AND FOLLOW THE INSTRUCTIONS EXACTLY. FAILURE TO COMPLY WITH THE INSTRUCTIONS BELOW COULD INVALIDATE THE WARRANTY ON THE MODULES!

This manual must not be used for the installation of modules produced by other manufacturers.

1.1 Disclaimer of installation manual

The information contained in this manual is subject to change by Ensun without prior notice. Ensun makes no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained here.

1.2 Limitation of liability

Ensun Solar has no liability in case of failure to comply with the instructions in this manual.

2 IMPORTANT SAFETY NOTES



Warning: All instructions must be read and understood before attempting to install, wire, operate or maintenance the module. Avoid any careless action that could cause a danger of electrocution. These modules produce direct current (DC) when exposed to the light! Always comply with the electrical safety standards of the country of installation of the modules and the laws in force for thermal installations! Observe all national regulations including lightning protection requirements.

- Use personal protection equipment (PPE) in accordance with the regulations in force, when installing and performing periodical maintenance of the modules!
- Use suitable insulating instruments for the electrical connections and wear insulating gloves and footwear to reduce to a minimum any risk of electrocution!
- Always cover the modules with non-transparent cloth when working on the electrical part!
- Never open connectors. The junction boxes and connectors are watertight. Any tampering with them will immediately invalidate the warranty!
- Do not short-circuit the modules and never unplug the connectors when powered!

- Do not insert electrically conductive parts into the plugs and junction box. Do not touch the contacts or exposed terminals.
- Keep children and unauthorized people away from the modules.
- In case of damaged modules or operational errors of the solar array, always contact your installer or Ensun Solar.
- The regulations and safety instructions for the installation of electrical devices and systems must be observed .

3 TECHNICAL SPECIFICATION

The module electrical ratings are measured under Standard Test Conditions (STC) of 1000W/m² irradiance with cell temperature of 25°C and AM1.5 spectrum.

Electrical characteristics of the module can be found in table 1 of this manual. Thermal characteristics of the module can be found in table 2 of this manual. Mechanical characteristics of the module can be found in table 3 of this manual.

Table 1 Electrical characteristics

Type name or model number	EN-xxx-36V-MH (xxx = 525-545, in steps of 5W)	EN-xxx-33V-MH (xxx = 480-500, in steps of 5W)	EN-xxx-30V-MH (xxx = 440-455, in steps of 5W)	EN-xxx-27V-MH (xxx = 395-405, in steps of 5W)
Rated maximum power range [W]	525,530,535,540,545	480,485,490,495,500	440,445,450,455	395,400,405
Module technology	Mono-Si	Mono-Si	Mono-Si	Mono-Si
Number of cells	144	132	120	108
Rated short circuit current range [A]	13.56,13.65,13.74 13.83,13.92	13.46,13.55,13.64 13.73,13.82	13.56,13.65,13.74 13.83	13.58,13.67,13.76
Rated open circuit voltage range [V]	49.10,49.30,49.50 49.70,49.90	44.94,45.14,45.34 45.54,45.74	41.00,41.20,41.40 41.60	36.85,37.05,37.25
Rated current at Pmax range [A]	20	20	20	20
Rated voltage at Pmax range [V]	1500	1500	1500	1500
Maximum system voltage [VDC]	UL1500	UL1500	UL1500	UL1500
Over-current protection rating [A]	20	20	20	20
Dimensions (l x w x h) [mm]	2279x1134 x35	2094x1134 x35	1909x1134 x35	1724*1134*35
Module area [m ²]	2.58	2.37	2.16	1.96
Application class (for IEC certification)	Class A	Class A	Class A	Class A
Fire protection class (for IEC certification)	Class C	Class C	Class C	Class C
Fire classification Type (for UL certification)	Type 1	Type 1	Type 1	Type 1

Type name or model number	EN-xxx-36V-MH(xxx = 430-460, in steps of 5W)	EN-xxx-33V-MH (xxx = 395-420, in steps of 5W)	EN-xxx-30V-MH(xxx = 360-380, in steps of 5W)
Rated maximum power range [W]	430,435,440,445,450,455,460	395,400,405,410,415,420	360,365,370,375,380
Module technology	Mono-Si	Mono-Si	Mono-Si
Number of cells	144	132	120
Rated short circuit current range [A]	11.31,11.39,11.46,11.53,11.60,11.66,11.72	11.36,11.42,11.48,11.54,11.60,11.66	11.35,11.43,11.52,11.60,11.69
Rated open circuit voltage range [V]	48.50,48.70,48.90,49.10,49.30,49.50,49.70	44.50,44.70,44.90,45.10,45.30,45.50	40.50,40.80,40.90,41.10,41.30
Rated current at Pmax range [A]	20	20	20
Rated voltage at Pmax range [V]	1500	1500	1500
Maximum system voltage [VDC]	UL1500	UL1500	UL1500
Over-current protection rating [A]	20	20	20
Dimensions (l x w x h) [mm]	2094x1038 x35	1925x1038 x35	1755x1038 x35
Module area [m ²]	2.17	2.00	1.82
Application class (for IEC certification)	Class A	Class A	Class A
Fire protection class (for IEC certification)	Class C	Class C	Class C
Fire classification Type (for UL certification)	Type 1	Type 1	Type 1

Referred to STC conditions : 1000 W/m² ; 25°C; AM 1,5

4 TRANSPORT AND STORAGE

To prevent damage of the modules:

- Store the modules securely in cool and dry rooms.
- Transport the module in its original packaging until installation.
- Do not stack the modules.
- Use a glass suction cup to remove and transport a module or hold the module at the edges. Carry the module vertically over longer distances.
- Do not lift or move the module using the cables or at the junction box.
- Do not rest the module unprotected on its edges.

5 INSTALLATION



Precautions and general safety:

- During installation, take care not to damage the modules by impacting them against hard surfaces and do not install modules if the glass surface or rear surface are damaged!
 - Do not install the modules under bad weather conditions such as wind, rain or snow, in order to prevent accidents to people, property or the modules!
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- Make sure the zone of installation is free of corrosive agents such as brine, chemicals, etc.!
 - Do not install the modules in contact with flammable materials and always comply with the regulations for accident prevention!
 - These modules are heavier than standard modules so make sure the structure on which they will be installed is suitable to withstand the load!
 - Do not walk on the glass surface of the modules during installation and cleaning. Failure to comply with this recommendation could cause breakage of the modules and possible injury to the person. (Danger of cuts and electrocution)!
 - Do not allow the fastening clamps to come into contact with the glass front and tighten the fasteners adequately without distorting the frame.
 - Do not alter the frame of the module in any case, and do not drill holes in the frame for any reason!
 - Do not exceed the pressure of 6 bar while charging the hydraulic circuit with the water/glycol mixture!
 - Observe the lightning protection requirements of the country of installation: in case it is necessary the structure must be connected to a lightning protection device.

The hydraulic and electrical connections are independent: it is not important which one has to be made first.

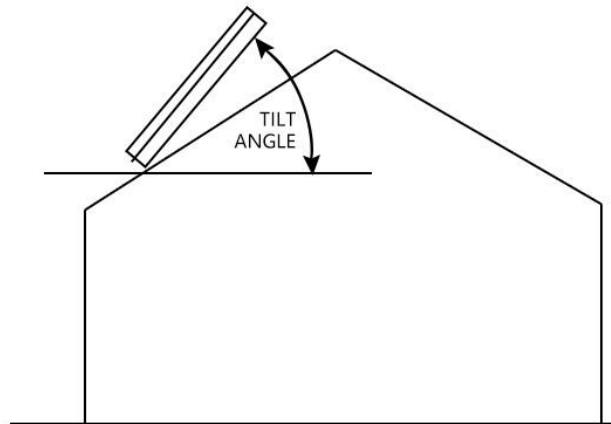
5.1 Module orientation and tilt angle

The modules can be installed either landscape or portrait position but never with the junction box facing downward!

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The tilt range is between 3° and 90°.

Picture 1 Tilt range



Always choose the maximum solar exposure and tilt of the modules to prevent loss of power! Do not install the modules in the shadow of trees, buildings or obstacles of any kind!

The modules are equipped with diode or bypass to reduce to a minimum any loss of power.

5.2 Mounting structure and module fastening

The modules must be installed using suitable fastening and bracketing kits similar to those used to fasten traditional photovoltaic panels with frame.

Do not use structures and fastening screws that could create corrosion of the aluminum frame on the modules by effects of electrolysis!

All mounting hardware (bolt/spring washer/flat washer/nut) should be made with stainless steel and M8. The only method suitable is the clamping method.

5.2.1 Clamping method

Top or bottom clamping methods will vary depending on mounting structures, but the clamp centerlines must only be positioned as indicate in table 4 and the clamp must have at least a width of 70mm.

Respecting the authorized clamping position, the module can support the following loads:

- Uplift load ≤ 5400 Pa
- Downforce load ≤ 3600 Pa

Follow mounting guidelines recommended by the mounting system supplier.

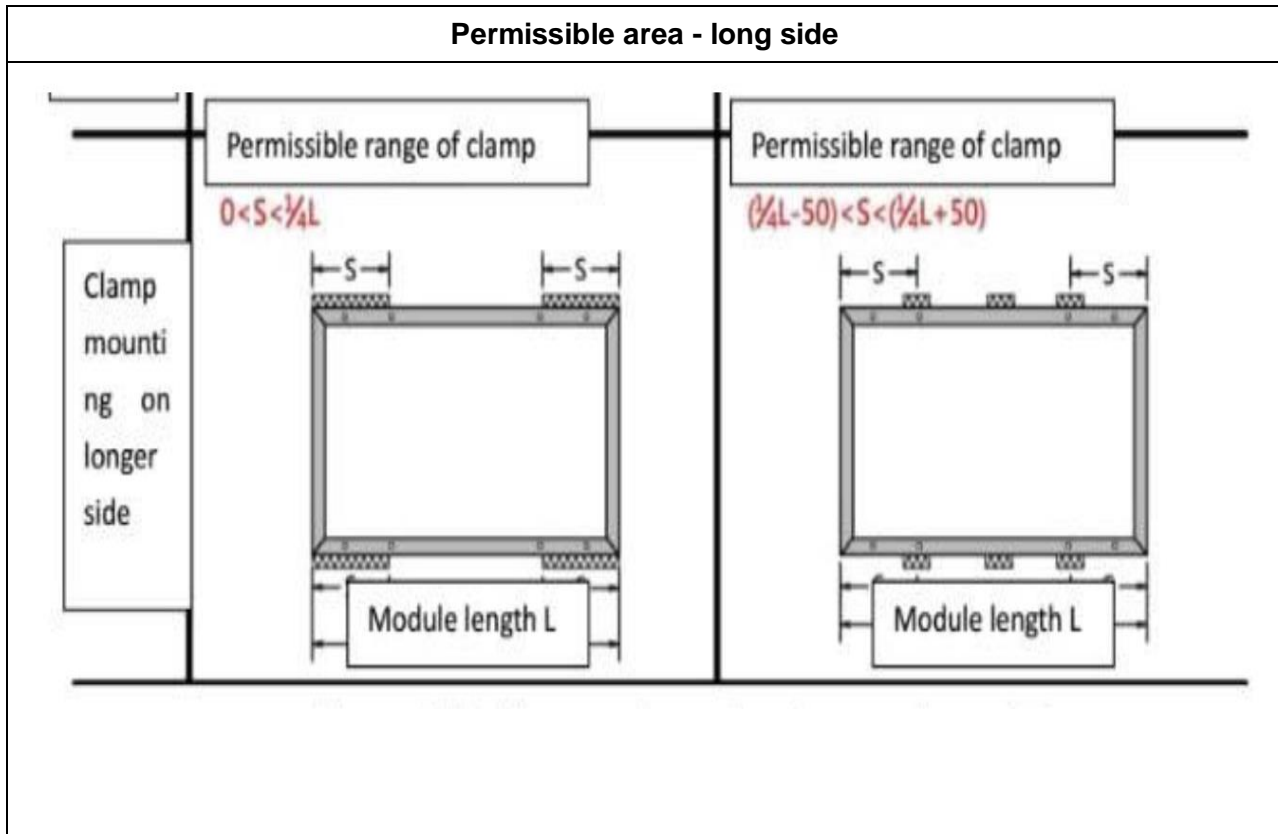
Ensun limited warranty will be void in cases where improper clamps or installation methods deviating from this manual are used.

Ensun solar When installing inter-modules or end type clamps, take measures so as:

- Not to bend the module frame.
- Not to touch or cast shadow on the front glass.
- Not to damage the surface of the frame.
- To ensure the claps overlap the module frame by at least 9mm.

- The minimum spacing recommended between solar modules is 5mm, in order to guarantee the thermal dilation of the individual modules.
- If the panel is installed vertically the junction box must be in the highest position.

Table 4 Authorized clamping



5.3 Module wiring

To optimize the output of the modules:

- Connect in series only modules facing in the same direction and at the same angle.
- Do not install the modules in the shadow of trees, buildings or obstacles of any kind!
- Only connect modules of the same type and voltage class.

Do not exceed the maximum permissible reverse current as given in the respective data sheet. In the event of reverse currents (caused by module defects, ground leakage or shading), modules can be placed under strain.

When designing the system, avoid forming loops of cables to minimize risk in the event of an indirect lightning strike.

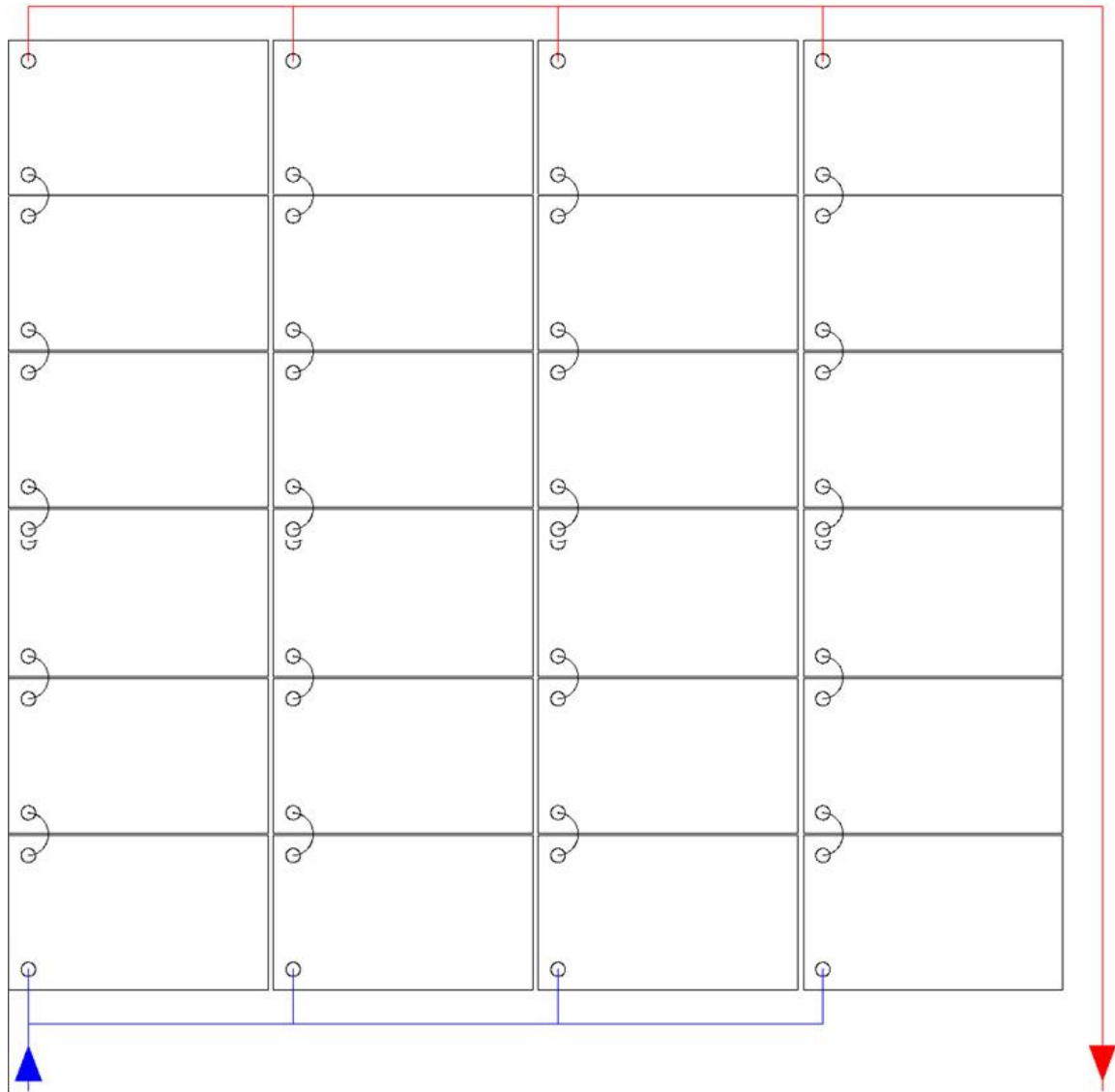
A series connection of modules is only permitted up to the maximum system voltage specified in the respective data sheet revision.

The permitted type of solar cable is single conductor, 2,5-10 mm² (8-14 AWG), 90°C wet rated, with proper insulation to withstand the maximum possible system open-circuit voltage. The conductor material should be copper only. select a suitable conductor gauge to minimize voltage drop.

5.4 Hydraulic circuit

Connect the hydraulic circuit in parallel. Connection in series will guarantee uniform cooling of the modules for a maximum of 6 manifolds.

Picture 2 Example of hydraulic connection, 6 modules in series and 4 rows in parallel Tichelmann configuration



The hydraulic circuit must be filled with water/glycol in a suitable percentage to prevent the danger of freezing during the winter season. To determine the percentage of glycol refer to the minimum winter conditions of the site of installation.

To fill the hydraulic circuit use a normal hose, possibly at high speed, equipped with an anti-impurity filter, and make sure the circuit is completely free of air before starting the system.

The maximum admitted temperature of fluid vector in the solar thermal circuit is 80° C.
The cold pressure of the circuit must be between 2,5 and 3 bar!

The pressure conditions are the same in case of unfrozen or frozen conditions.

Drainage from the safety valve must be channeled into an empty tank with a transparent rubber hose (not included) having a large enough diameter so that the water/glycol solution, in case of discharge, does not drain into the sewer system or pollute the soil.

ATTENTION: IN ORDER TO PREVENT THE RUPTURE OF THE PIPE OF THE SOLAR COLLECTOR , DURING THE CONNECTION ACTIVITY OF HYDRAULIC CIRCUIT, AVOID OF ROTATING THE BRASS PLUG CONNECTION OF FOTOTHERM SOLAR COLLECTOR.

5.4.1 Commissioning

The following explains the various steps for the commissioning the thermal system in a PVT plant :

- Check all connections for leakage, test pressure up to 5 bar;
- In case of piping realized in electrically conductive tubes, ground the pipes;
- Check that the admission pressure of the expansion vessel is correct;
- Use the filling pump until no more air bubbles can be seen in the liquid container, the liquid is a mixture of water and glycol in the correct percentage depending of altitude of installation site;
- Set the position of the valves in operation mode;
- Set the volume flow as indicated in Fototherm data sheet;
- Set the differential temperature data in the unit control of circulation, the suggested value is between 5 and 10°C;

6 CLEANING AND MAINTENANCE

Ensun solar modules are highly reliable and require practically no maintenance for the electrical part except for normal cleaning of the part exposed to radiation using suitable highly biodegradable detergents for maximum environmental protection.



Precautions and general safety:

- Do not change the module components (diode, junction box, plug connectors).
- Do not use abrasive sponges to clean the modules, or chemical products and acids that could render the transparent glass surface opaque!
- Do not use any metal objects when cleaning the surface!
- Do not walk on the glass surface of the modules during cleaning.
- If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed, authorized professional carry out the job to avoid hazards of electric shock or injury.

6.1 Cleaning

When there is a noticeable buildup of soiling deposits on the module surface, wash the module array with water and a gentle cleaning implement (a sponge) during the cool part of the day. Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches.

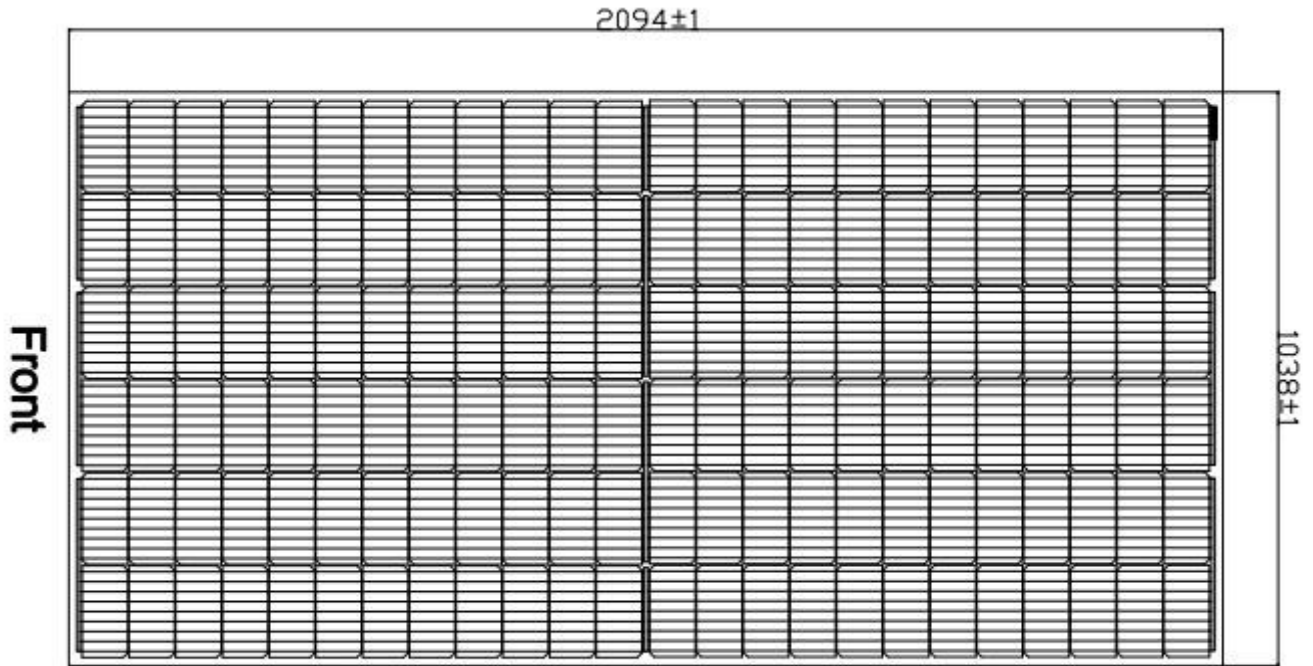
If snow is present, a brush with soft bristles can be used to clean the surface of the module.

6.2 Maintenance of the hydraulic circuit

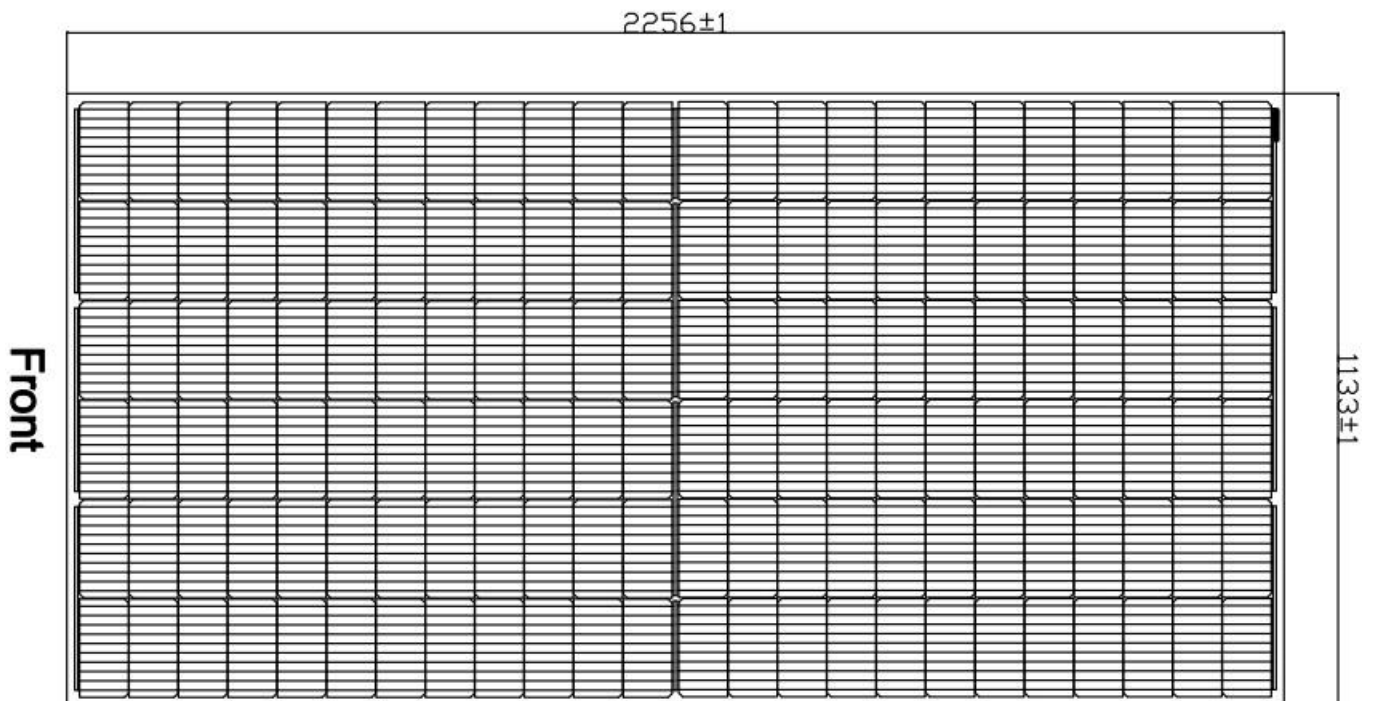
To guarantee a good functionality of the hydraulic circuit, it is necessary to perform every year the following checks:

- If glycol is used as heat transfer fluid, check the pH.
- Review the functionality of the circulation unit.
- Check the pressure of the fluid.
- Verify the functionality of the thermal probe

7 DRAWING



EN450-36V-MH



EN540-36V-MH

8 CONTACT

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