Installation and Operation
Instruction Manual ELIX PV150/200

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1. GENERAL WARNINGS

Be sure to carefully read the instructions and warnings in this manual before installing and operating the water heater. The information contained in this manual is intended to familiarize you with the water heater, the rules of its correct and safe operation, and the minimum requirements for its maintenance and servicing. Furthermore, you are obliged to make this manual available to the qualified persons who will install and potentially repair the appliance.

These instructions should always be kept near the appliance for future reference. Compliance with the rules here described is part of the measures for the safe use of the product and is considered part of the warranty conditions.

1.2. SAFETY INSTRUCTIONS

ATTENTION! This appliance must be installed by an authorized person and the installation must comply with the standards of EN60335-1, EN60336-2-21. Improper installation and connection of the appliance may make it hazardous for the health and life of consumers. It may cause grievous and permanent consequences, including but not limited to physical injuries and/or death. Improper installation and connection of the appliance may also lead to damage to the consumers' property/damage and/or destruction/,or to that of third persons, as a result of, but not limited to flooding, explosion and/or fire.

ATTENTION! This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

WARNING! Be sure to fill the water heater with water before connecting it to the electrical supply! Failure to comply with the electrical connection conditions affects the safety of the appliance, whereby the water heater must not be operated.

WARNING! Once installed the hot water tank is powered by DC&AC of power supply, both must be isolated before working on the appliance.

2. TECHNICAL SPECIFICATION

MODEL	ELIX Solar PV150	ELIX Solar PV200
Volume	150 L	200 L
Inner tank material	Enameled BTC340R steel	Enameled BTC340R steel
Outer tank material	Anti-corrosion steel	Anti-corrosion steel
Rated pressure	0.8 MPa	0.8 MPa
Tank diameter	520 mm	520 mm
Insulation thickness	54 mm	54 mm
Total height	1308 mm	1688 mm
Net weight	45 kg	55 kg
Water temperature setting range	30℃~75℃	30℃~75℃
Auto-reset thermostat	75℃	75℃
Non-self-resetting thermal cut-out	90℃	90℃

AC HEATING ELEMENT				
Voltage	230V		230V	
Heating power	2000W		2000W	
DC HEATING ELEMENT				
Resistance (Ω)	6.48	6.48	6.48	4.80*
Max.Open circuit voltage (V)	110	110	110	110

* The table includes two types of heating elements were utilized: 36V/200W and 36V/270W.
Standard water heater package is equipped with a 36V/200W heating element.

2.1. Solar Panels Safety

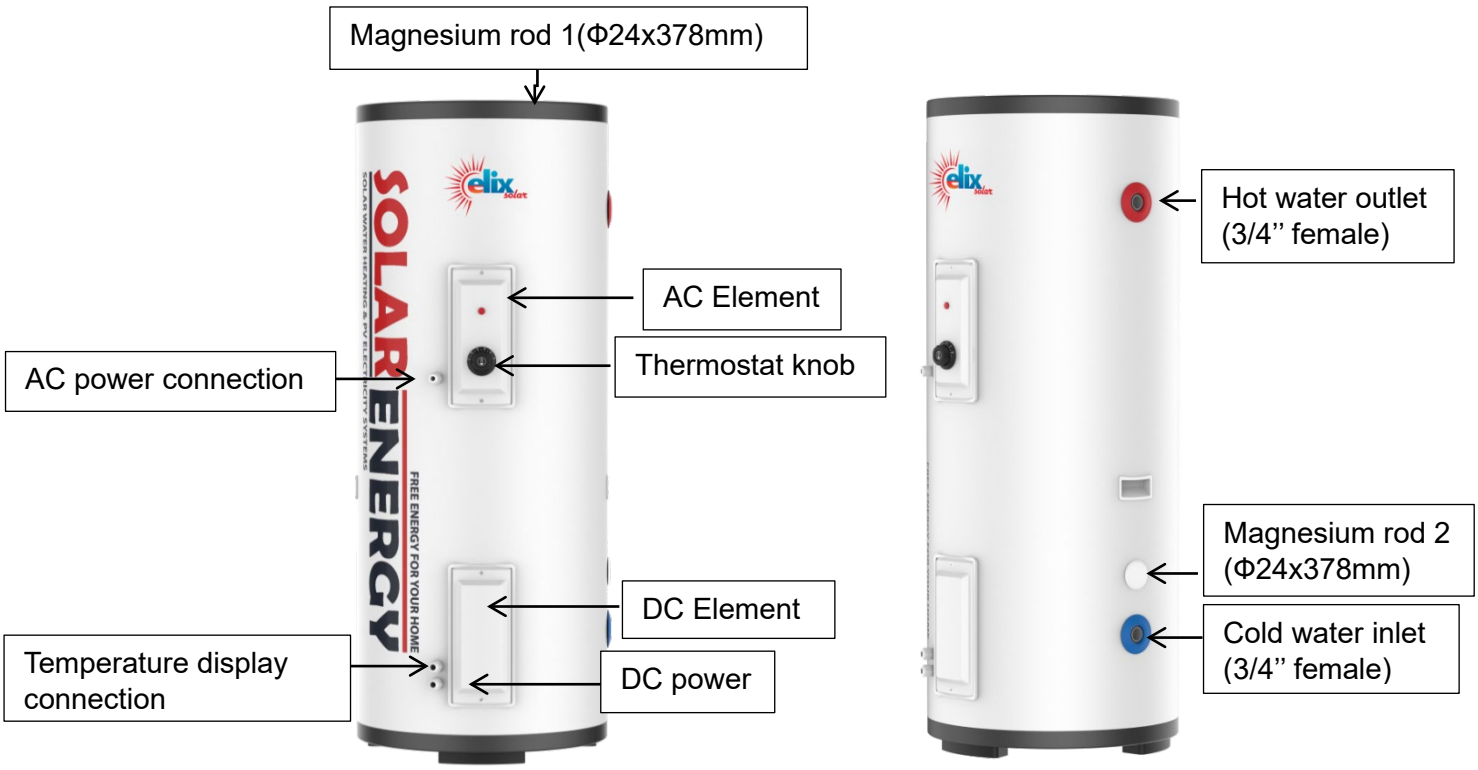
IMPORTANT!

- The DC heating element has a fixed resistance Rdc = 6,48 Ohm
- Open circuit voltage from all solar panels combined **(V_{oc_total})** must be less than **110V!** **$V_{oc\_total} < 110V$**
- In case V_{oc_total} > 110V, damage will be caused. Such defects will not be considered a warranty claim.

Recommended solar panels setups for you Elix PV water heater can be found in section 5 of this manual.

3. PRODUCT COMPONENTS

3.1. Hot Water Storage Tank



3.2. Accessories

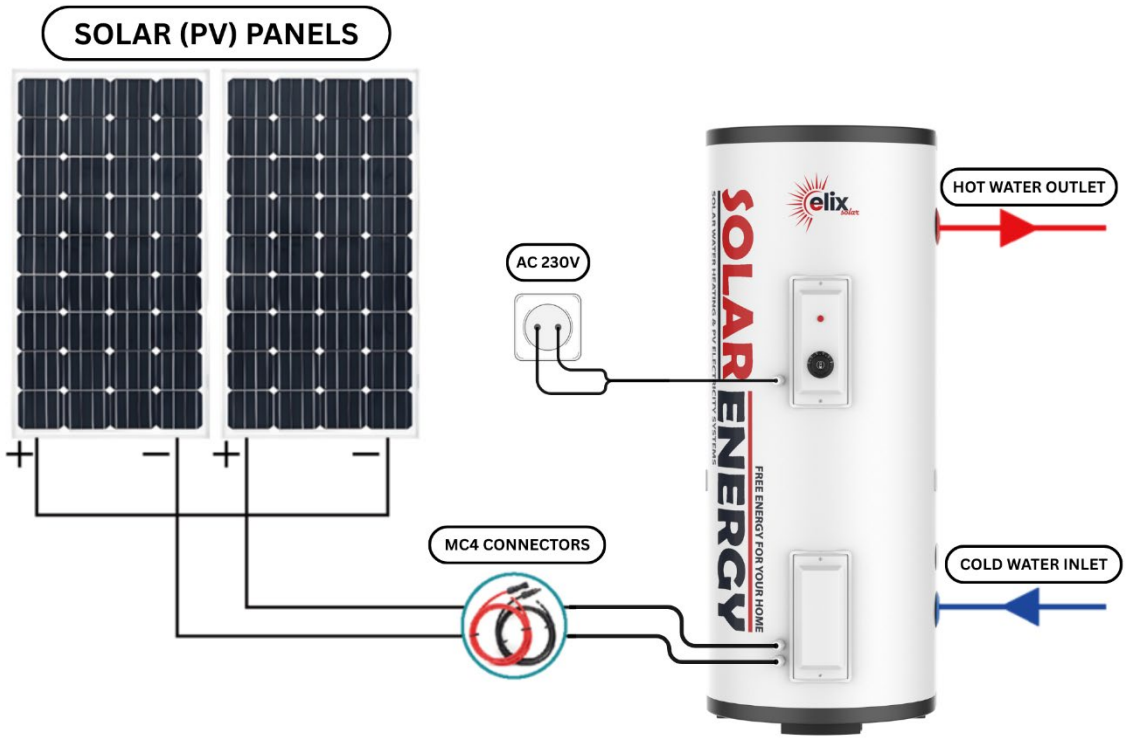
MC4 Connector

Display panel

Safety valve

4. INSTALLATION INSTRUCTION

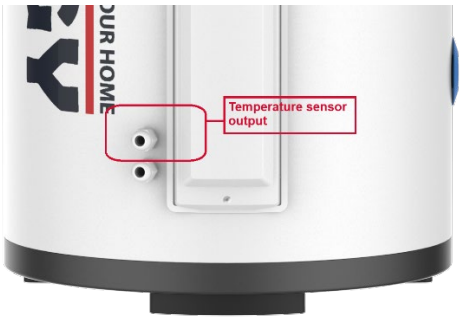
4.1 Installation Schematic Diagram



MPPT

To improve the heating efficiency from solar panels, our water heater **is compatible with the MPPT adapter**, model SWHC-2K-E.
The connection procedure is described in the MPPT controller manual.

Water heaters supplied with an MPPT controller, and marked MPPT, already include a built-in temperature sensor. The sensor cable exits through the upper DC wiring port of the unit.



Water heaters that are not supplied with an MPPT controller must be equipped with a temperature sensor (from MPPT set) manually.
The sensor is included in the controller delivery set.
The installation procedure is described in **section 5 step 3**.

4.2. Installation of Photovoltaic Panels

The installation of photovoltaic panels on the roof needs to be combined with the roof structure, which is generally divided into flat roof and pitched roof. The specific installation steps are as follows:

4.2.1. Preliminary Preparation

1. **Site Survey:** Assess the lighting conditions, load-bearing capacity, surrounding obstructions, and other factors at the installation location to determine the optimal installation area.
2. **Design Planning:** Design the photovoltaic panel arrangement and tilt angle (to maximize sunlight reception) based on the site conditions, and develop a wiring plan.
3. **Material and Tool Preparation:** Gather materials such as photovoltaic panels, brackets, cables, screws, and tools such as a drill, wrench, and multimeter.

4.2.2. Mounting the Bracket

Secure the bracket according to the design requirements. Ensure the bracket is level and stable, and can withstand the pressure of the photovoltaic panels and the elements (e.g., wind and snow).

4.2.3. Mounting the Photovoltaic Panels

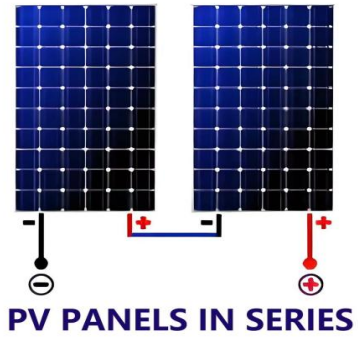
Secure the photovoltaic panels one by one to the bracket, tightening them with screws and other fasteners. Ensure the panels are aligned and have adequate gaps between them for heat dissipation.

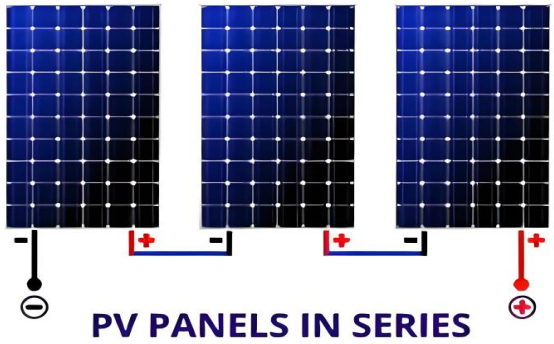
4.2.4. Mounting the Photovoltaic Panels

This water heater

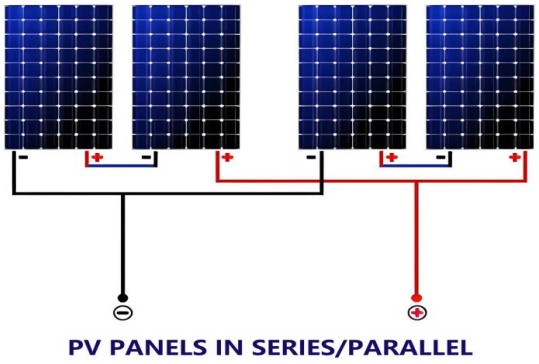
4.2.4 Photovoltaic Panels Connection

1. **Photovoltaic panels in series:** Connect the photovoltaic panels in series by MC4 connector, depending on the system voltage and max.power requirements (Figures below as reference).





2. **Photovoltaic panels in series/parallel:** Connect the photovoltaic panels in series/parallel by MC4 connector, depending on the system voltage and max.power requirements(Figures below as reference).



4.2.5 Inspection and Commissioning

Check that all wiring connections are secure and correct, and that there are no short circuits or leakage.

4.3. Installation of Hot Water Storage Tank

150L and 200L hot water storage tanks have large capacity and are heavy, so special attention must be paid to floor load-bearing capacity, water pressure, and circuit load. The specific steps are as follows:

4.3.1. Preliminary Preparation

1. **Confirm the installation location:** Choose a flat, load-bearing surface with a suitable power outlet (with leakage protection) and water inlet and outlet connections nearby.
2. **Check accessories:** Verify that all accessories, including hot water storage tank, water inlet and outlet pipes, safety valve, sealing ring, and wrench, are present.

4.3.2. Positioning Hot Water Storage Tank

Place the water heater firmly in the selected location and adjust the level. Ensure the unit is stable and does not wobble.

4.3.3. Water Pipes connection

1. **Prepare:** Turn off your home's main water supply and locate the hot and cold water line inlets (usually marked "Hot" and "Cold" on the hot water storage tank).
2. **Installing the Safety Valve:** First connect the safety valve to the cold water inlet (note the orientation, with the pressure relief port facing downward). Wrap the joints with Teflon tape to seal (Figure as reference).
3. **Connecting the Water Pipes:** Use a wrench to connect the cold water pipe to the safety valve and the hot water pipe to the hot water outlet of the hot water storage tank, ensuring the joints are tight and leak-proof.

4.3.4. Testing and Venting

1. **Turn on the water supply:** Slowly open the main water supply and the hot water

faucet to allow water to fill the inner tank and expel any air from the inner tank (until water flows continuously from the faucet without bubbles).

2. **Check for leaks:** Carefully inspect all connections for leaks and retighten if necessary.

4.4. Connecting The Electrical Circuits

Check AC power supply: ensure the socket is 230V AC and connecting of the conductors of the power cord of the appliance has to be carried out as follows:

● conductor with brown insulation- to the phase conductor of the electrical wiring(L)

● conductor with blue insulation- to the neutral conductor of the electrical wiring(N)

● conductor with yellow-green insulation-to the safety conductor of the electrical wiring marked ⏚

Connecting AC Power Supply: After confirming the water connections are correct, plug the appliance into the socket.

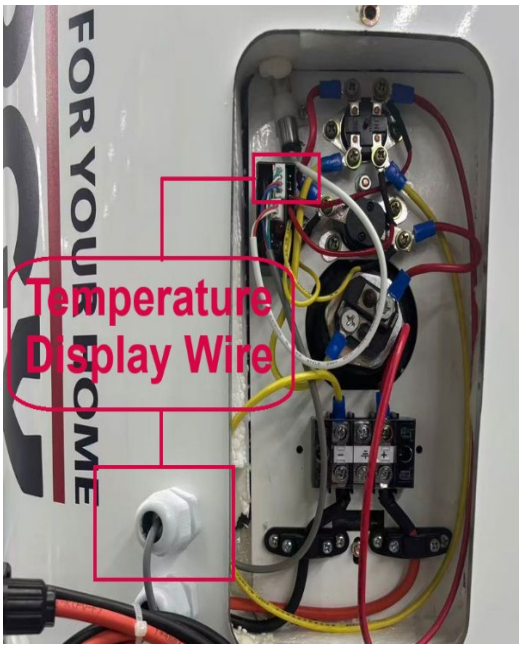
Connecting DC Power Supply: Connect the DC power from photovoltaic panels by MC4 connector (Figures below as reference).

When extending the photovoltaic cable, the MC4 contact plugs must be properly attached to ensure functionality and safety. Basically, the photovoltaic cable should be kept as short as possible. A length recommendation depending on DC electric element rated heating power can be found in the following table.

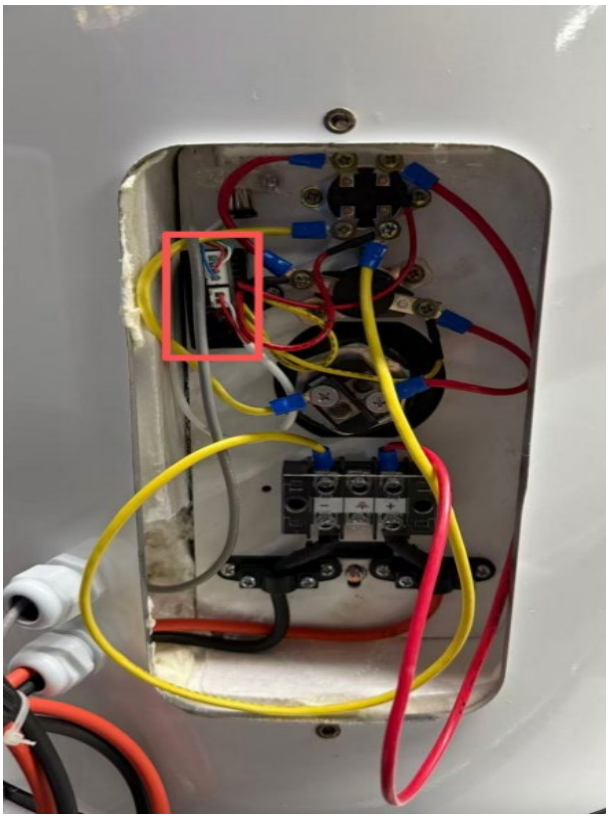
DC electric element rated heating power	Rated voltage	Rated current	2.5mm^2	4mm^2	6mm^2
1190W	88.44V	13.5A	≤28m	≤45m	≤67m
1072W	83.92V	12.8A	≤28m	≤45m	≤67m
1236W	90.12V	13.7A	≤28m	≤45m	≤67m
1470W	84.14V	17.5A	≤21m	≤33m	≤49m

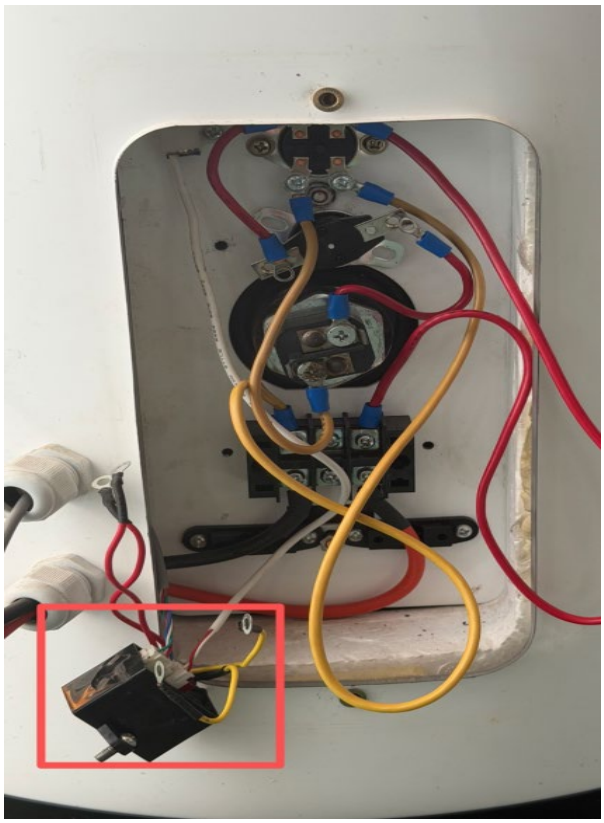
5. Adapting a solar (PV) water heater to work with an MPPT charge controller

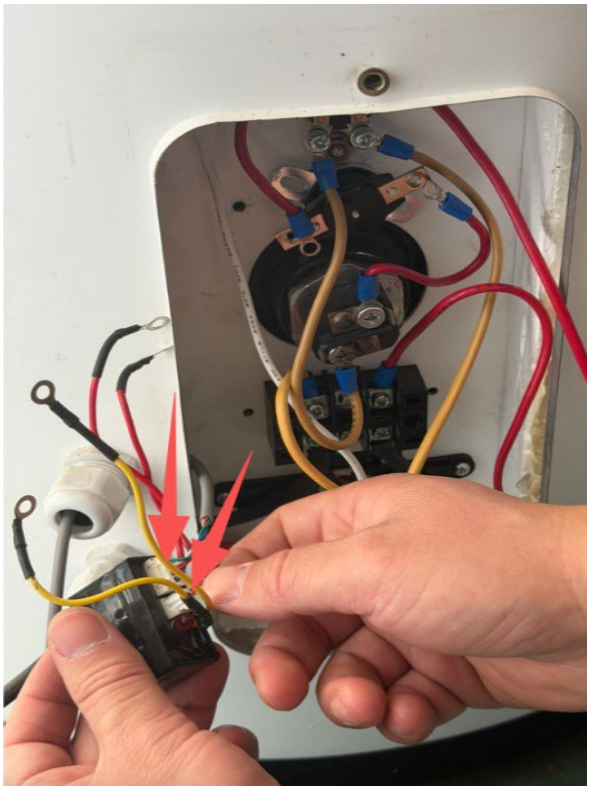
Step1: Remove the DC electric element cover, then remove Temperature Display wire

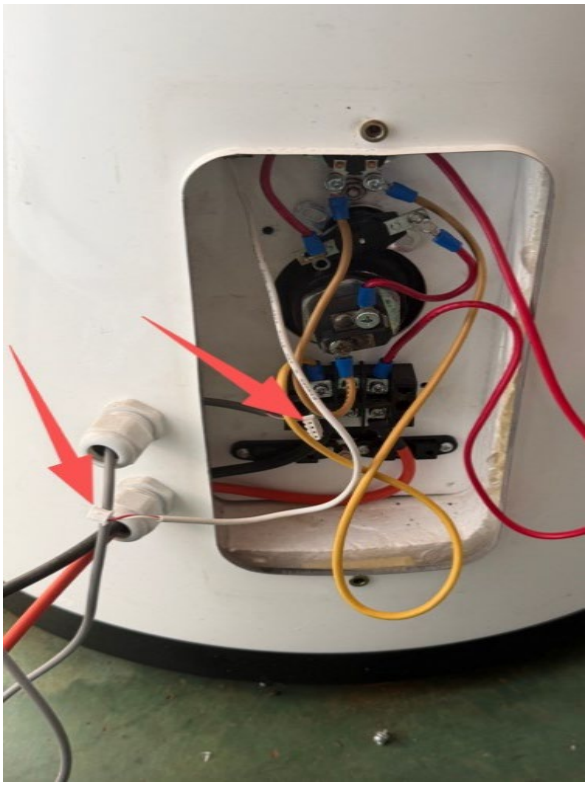


Step2: Remove the black thermostat protector including all connection wires

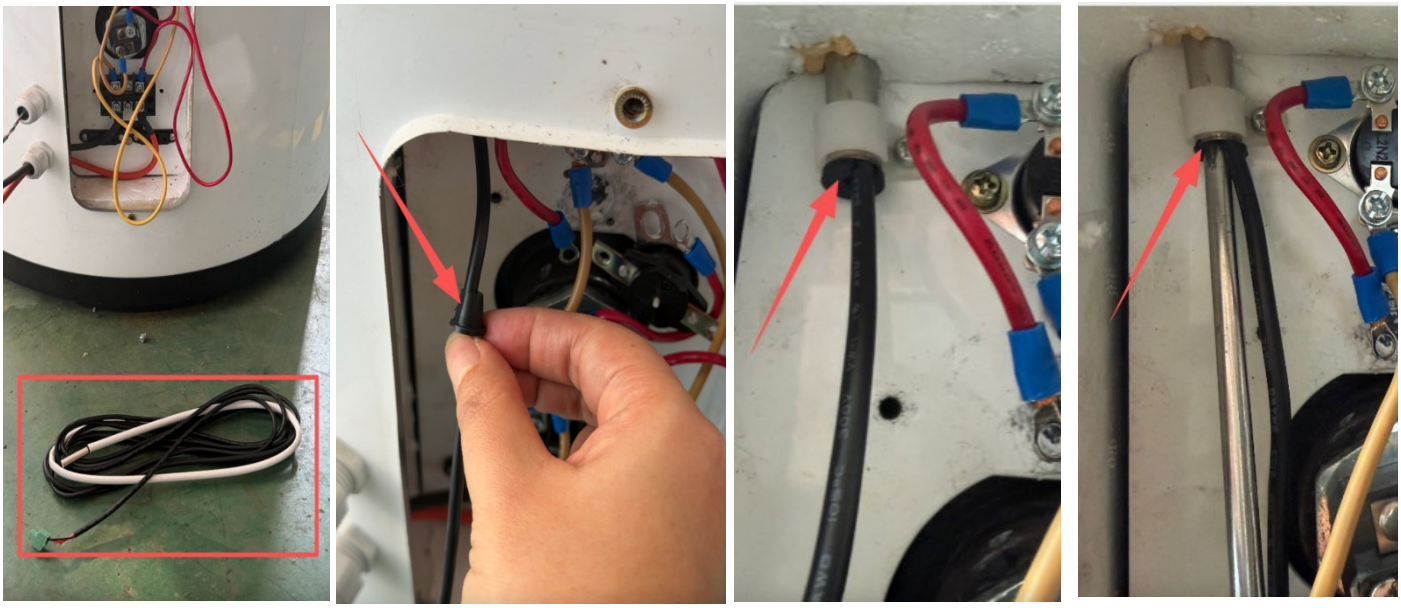




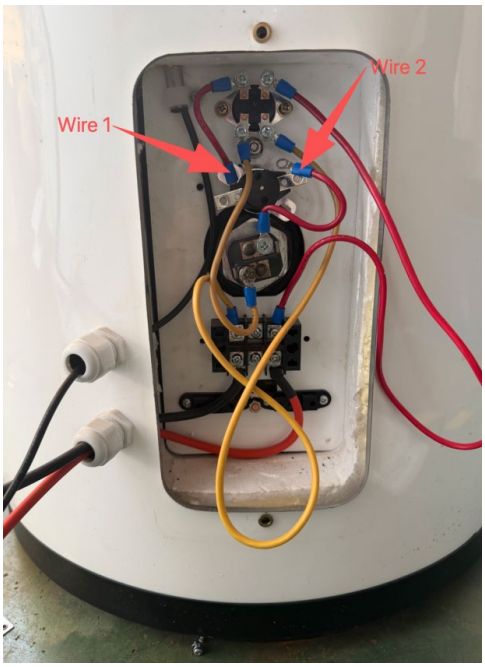




Step3: Pass the MPPT temperature probe wire (metallic end) through the stainless steel tube until it reaches the top of the tube. Then secure it firmly with a rubber stopper using a screwdriver to prevent the wire from sliding downward; otherwise, the temperature displayed on the MPPT will be incorrect.



Step4: Fix wire1 and wire2 by a screwdriver together.



6. How to calculate max. heating power of heating element?

6.1. How to calculate max. heating power (*P_dc*)?

$$\mathbf{P\_dc} = \frac{(V\_mp\_total)^2}{R\_dc} \text{ (W)}$$

- **V_mp_total** - max. power voltage from all pv panels combined
- **R_dc** - DC heating element resistance (**R_dc = 6.48**)

6.2. Max. heating power of heating element Calculations Example:

1. Let's assume we have **three 435W panels** with following characteristics:

- Max. power voltage **V_mp** - 29.48V
- Open circuit voltage **V_oc** - 34.72V
- DC heating element resistance **R_dc** – 6.48

2. We decide to connect these three panels **in series** to get highest V_mp_total:

3. First, we need to check if the V_oc_total of this panel's configuration is within safe limits:

- **V_oc_total** = 34.72 + 34.72 + 34.72 = 104.16 (V)
- **V_oc_total < 110V** => this configuration is safe

4. Finally, we calculate how much heat power we can get from this setup of panels:

$$\mathbf{P\_dc} = \frac{3 * \mathbf{V\_mp}^2}{\mathbf{R\_dc}} = \frac{88.44^2}{6{,}48} = \underline{\mathbf{1207\ (W)}}$$

3 × 435 W solar panels provide a total electrical output of 1305 W. This electrical energy is converted by the water heater into **1207 W** of thermal (heating) energy under perfect sunlight conditions (STC).

7. Recommended solar panels setup:

Two Longi LR7-72HVH-640M (640W) solar panels (or similar panels) in series connection:

- DC MPP heating power: **1215 W**

4 Examples for Most Popular Solar Panels				
PV Panel option *	435W *	550W *	450W *	720W *
Max. power voltage (from PV Datasheet)	29.48V	41.96V	30.04V	42.07V
Open circuit voltage (from PV Datasheet)	34.72V	49.9V	35.91V	50.17V

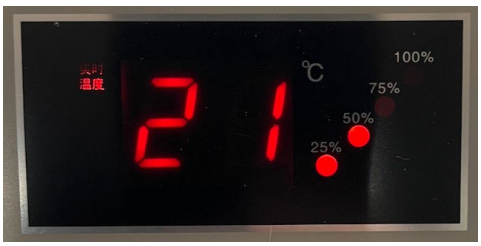
Calculated heating power of DC element				
PV panel quantity for best performance	3	2	3	2
Total DC voltage	88.44V	83.92V	90.12V	84.14V
Total Open circuit voltage	104.16V	99.8V	107.73V	100.34V
DC Heating power	1207W	1086W	1253W	1474W

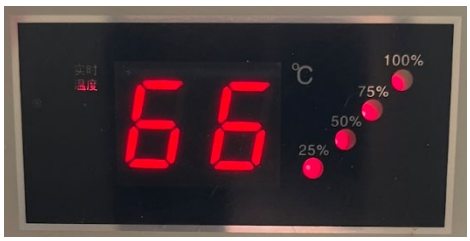
* The table includes sample data for 435W, 450W, 550W and 720W panels.
Users can substitute any panel from the available product range by applying the appropriate calculations based on the panel's specifications.

8. Operation instructions

1. Connect the temperature display to test whether the solar photovoltaic water heater can work normally, mainly to see whether the daily water temperature rise and the photovoltaic intensity on the temperature display are consistent with the sunlight on that day.

The photovoltaic intensity values on the display are 25%, 50%, 75% and 100% due to the sunlight.





Exceeding the open-circuit voltage (Voc) of 110V may damage the display. Such damage will not be covered under warranty.

Performance parameters under different photovoltaic intensity as follows:

Photovoltaic intensity	Rated voltage	Rated heating power	Water temperature rise per hour
25%	26V	103W	0.59℃
50%	58V	512W	2.9℃
75%	72V	789W	4.5℃
100%	88.44V	1190W	6.8℃

Note: Heating resistor is 6.568Ω; Rated voltage of DC electric element is 88.44V; Rated heating power of DC electric element is 1190W; Volume of water tank is 150L;

Photovoltaic intensity	Rated voltage	Rated heating power	Water temperature rise per hour
25%	26V	103W	0.59℃
50%	58V	512W	2.9℃
75%	72V	789W	4.5℃
100%	83.92V	1072W	6.1℃

Note: Heating resistor is 6.568Ω; Rated voltage of DC electric element is 83.92V; Rated heating power of DC electric element is 1072W; Volume of water tank is 150L;

Photovoltaic intensity	Rated voltage	Rated heating power	Water temperature rise per hour
25%	26V	103W	0.44℃
50%	58V	512W	2.2℃
75%	72V	789W	3.4℃
100%	90.12V	1236W	5.3℃

Note: Heating resistor is 6.568Ω; Rated voltage of DC electric element is 90.12V; Rated heating power of DC electric element is 1236W; Volume of water tank is 200L;

Photovoltaic intensity	Rated voltage	Rated heating power	Water temperature rise per hour
25%	26V	140W	0.6℃
50%	58V	699W	3.0℃
75%	72V	1076W	4.6℃
100%	84.14V	1470W	6.3℃

Note: Heating resistor is 4.8Ω; Rated voltage of DC electric element is 84.14V; Rated heating power of DC electric element is 1470W; Volume of water tank is 200L.

2. Water temperature setting range of AC electric element is from 30℃ to 75℃. You can turn the black knob to set the water temperature you want (turn clockwise to increase the temperature and turn counterclockwise to decrease the temperature), if the indicator light is on, it means the electric element is working.

Note:

1) You can turn the knob in a counterclockwise direction to the bottom if you don't need AC electric element as backup (Fig 1 below as reference)
2) You can turn the knob in a clockwise direction to the right end if want the maximum water temperature of 75℃ (Fig 2 below as reference)

Fig 1

Fig 2

9. MAINTENANCE

9.1. Rust protection magnesium anode

The magnesium anode protects the water tank's inner surface from corrosion.

For double protection, models PV-150 and PV-200 use two magnesium rods.

Ø24mm, length: 378 mm, Flange - DN20 (3/4"), M12
The anode element is an element undergoing wear and tear and is subject to periodic replacement.

In view of the long-term and accident-free use of your water heater, the manufacturer recommends periodic inspections of the magnesium anode's condition by a qualified technician and replacement whenever required, and this could be performed during the appliance's technical preventive maintenance.

9.2. Check/Replacement of magnesium anode

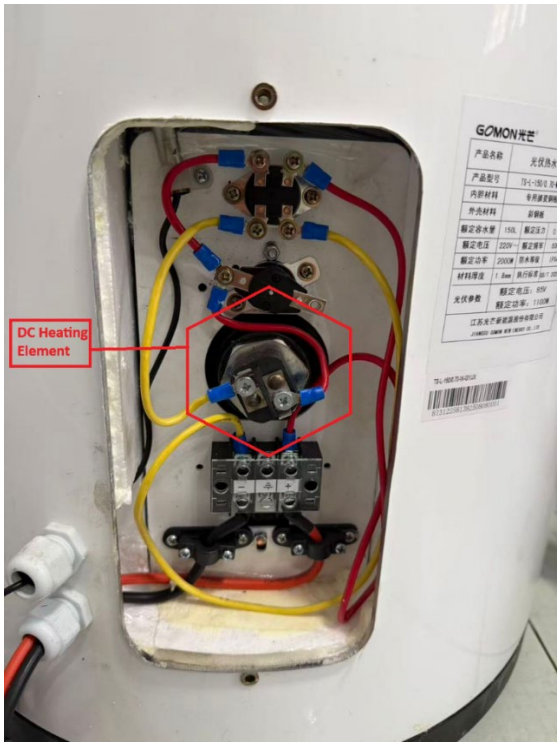
1. The first replacement of the magnesium anode must be made no later than 24 months after installation of the solar photovoltaic water heater.
2. Regular periodic maintenance and timely replacement of the magnesium anode are mandatory to maintain the manufacturer's warranty.
3. Replacement of the anode must be accompanied by keeping the document confirming the purchase of the anode in the warranty card of the solar photovoltaic water heater.

   For double protection, models PV-150 and PV-200 use two magnesium rods.

   Ø24mm, length : 378 mm, Flange DN20 (3/4"), M12

9.3. DC Heating Element replacement

The water heater is equipped with a DC heating element with a nominal power rating of **1100 W** (36 V / 200 W)**.**
It can be replaced with a higher-power element rated at **1500 W** (36 V / 270 W)**.**
If required, the replacement is performed by the customer.



10. WARRANTY

1. The warranty for the device is only valid under the following conditions:

- the appliance is installed according to the instruction manual.
- the appliance is only used for its intended purpose and in accordance with the assembly and use instructions.

2. The warranty includes the correction of all manufacturing defects that may occur during the warranty period. Only the professionals authorized by the seller are allowed to carry out the repairs. The warranty does not cover damages:

- improper transport,
- improper storage,
- improper use,
- unsuitable water parameters (pH value >8.5),

- improper electrical voltage that deviates from the rated voltage,
- the freezing of the water,
- extraordinary risks, accidents or another force majeure,
- failure to follow the assembly and use instructions,
- in all cases when an unauthorized person tries to repair the appliance.
- exceeding the open-circuit voltage (Uoc) of 110V may damage the display. Such damage will not be covered under warranty.

3. In the aforementioned cases, the damage will be repaired against payment. The warranty of the device does not apply to parts and components of the device that are worn out during its normal use, nor to parts that are degraded during normal use, to lights and signal lamps, etc., to discoloration of external surfaces, to changes in the shape, dimensions and arrangement of parts and components that have been subjected to an effect that does not correspond to the normal conditions of use of the device. Missed benefits, material and non-material damage resulting from the temporary impossibility of using the equipment during the period of its repair and maintenance are not covered by the warranty of the device.

4. Warranty Period

● 5 years for water tank

● 2 years for electronic components.

11. CONTACT ELIX NEW ENERGY:

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