



GWH02D Solar MPPT Controller for Water Heating

Order No. 04291121



Operating Instructions

Please read the user manual carefully before using the device.
Pay particular attention to all warnings and safety instructions.
Keep this manual for future reference.

Contents

- 1. Important safety instructions 14
 - 1.1 Safety symbols.....14
 - 1.2 Safety instructions 14
- 2. Introduction 14
 - 2.1 Overview 14
 - 2.2 Description of the controller 15
 - 2.3 Technical Specifications.....15
 - 2.4 System diagram 16
 - 2.4.1 Schematic diagram of the operating principle.....16
 - 2.4.2 System wiring diagram 16
- 3. Installation.....17
 - 3.1 Getting started 17
 - 3.2 Installation instructions 17
 - 3.2.1 Selecting the conductor diameter 17
 - 3.2.2 Selecting a heating element 17
 - 3.2.3 Wall mounting.....18
 - 3.2.4 Removing the cable cover.....18
 - 3.2.5 Connecting the power supply 18
 - 3.2.6 Start-up.....19
 - 3.2.7 Switching off 19
- 4. Operating instructions 19
 - 4.1 Maximum Power Point Tracking (MPPT) technology 19
 - 4.2 Protection functions.....20
 - 4.3 Alarm function 20
 - 4.4 Inspection and maintenance 20
 - 4.4.1 System inspection 20
 - 4.4.2 Inspection of the controller’s cable cover 20
- 5. LCD display 21
- 6. Troubleshooting 21
- 7. Warranty terms.....21
 - 7.1 Claiming warranty service.....21
 - 7.2 Repair Procedure 21

1. Important safety instructions

To ensure your safety, please read the user manual carefully before installing and using the MPPT controller for solar water heating, and keep this manual for future reference. This manual contains detailed information on the installation and operation of the MPPT controller for solar water heating. The person installing the controller must have the necessary qualifications and skills, and must be familiar with the design and wiring regulations for solar systems.

The information in this manual is intended for qualified professionals.

WARNING! The inverter is only suitable for use with a purely resistive load. It is not suitable for electronically controlled thermostats.

The following symbols are used in this manual to indicate potentially hazardous situations or to highlight important safety points.

1.1 Safety symbols



WARNING!

This symbol indicates a potential hazard.



CAUTION!

This symbol draws attention to key steps to ensure safe operation.

NOTE!

A note draws attention to safe operation and correct operating procedures.

1.2 Safety instructions

- Before starting installation, read the instructions and safety precautions in this manual carefully.
- You must not dismantle the controller for the purpose of carrying out your own repairs or maintenance.
- Before installing or moving the controller, ensure that you have disconnected all power sources connected to the controller.
- Heat is generated inside the controller during operation, which may cause burns.
The controller should therefore be installed in a location where it cannot be easily touched by accident.
- Use only insulated tools when connecting the power cable.
- Remove all jewellery before installation.
- The power cable connection must be secure to prevent overheating or fire caused by a poor cable connection.
- Use appropriately rated cables and circuit breakers.

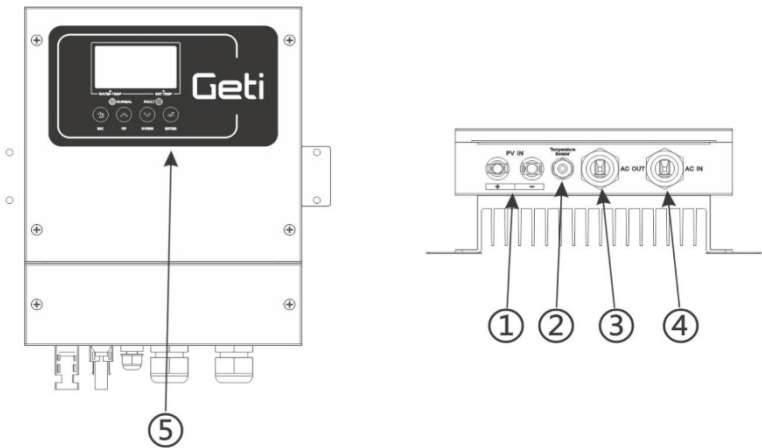
2. Introduction

2.1 Overview

The purpose of the solar MPPT controller for electric water heating (hereinafter referred to as the controller) is to supply the energy generated by the solar panel to the electric water heater with maximum efficiency using MPPT technology. Direct current is converted into a square-wave alternating current, which can be used to connect conventional domestic water heaters directly. The controller is equipped with an intelligent control function that ensures maximum energy yield from the solar array.

2.2 s of the controller

The characteristics of the controller and a description of the functions of its individual components are shown in the figure.



1. PV input terminal

- + Connect to the positive terminal of the PV (+)
- Connect to the negative terminal of the PV (-)

2. Input terminal for temperature sensor

3. AC output terminal to the load

L: Connect to the L phase conductor of the heating appliance

N: Connect to the neutral (N) conductor of the heating appliance

PE: Connect to the protective earth conductor

4. AC mains input terminal

L: Connect to the mains phase (L) conductor

N: Connect to the mains neutral (N) conductor

PE: Connect to the protective earth conductor

5. LCD display

Displays the controller’s operating status

Green LED: standard operating status

Red LED: fault condition

Button descriptions:

ESC: Cancel/Reset

UP/DOWN: mode switching/
Temperature setting

ENTER: Confirm/change temperature

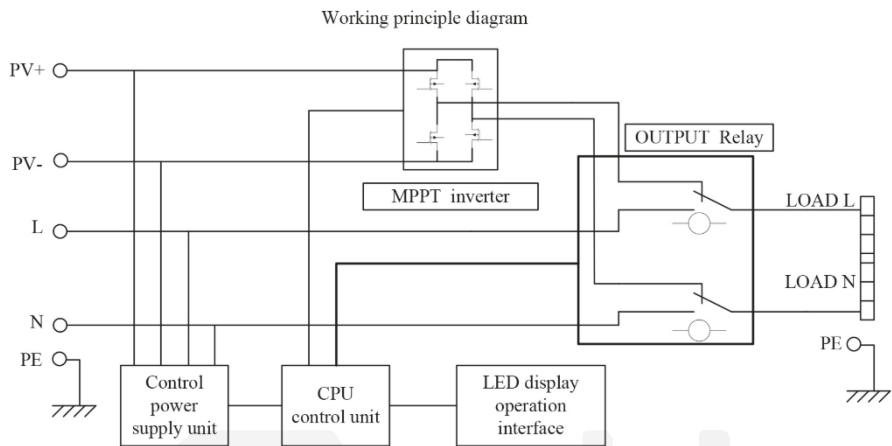
2.3 Technical specifications

Rated power	4000 W
Scope of application	The MPPT controller for water heating is only suitable for powering resistive heating elements using solar energy, with a supply voltage of up to 230 V and a power output of up to 4000 W.
Solar controller parameters	
Maximum solar power	4000 W
Maximum input current	≤ 20 A
Input voltage	160 ~ 350 V DC
MPPT operating voltage	120 ~ 340 V DC
MPPT efficiency	> 99%
Output current for heating	≤ 20 A
AC mains parameters	
Rated AC power (bypass)	4000 W
Rated AC voltage	230 V AC
Operating AC voltage range	180–260 V AC
Rated AC current	≤ 20 A
Load characteristics	
Waveform	Rectangular, suitable for resistive loads only

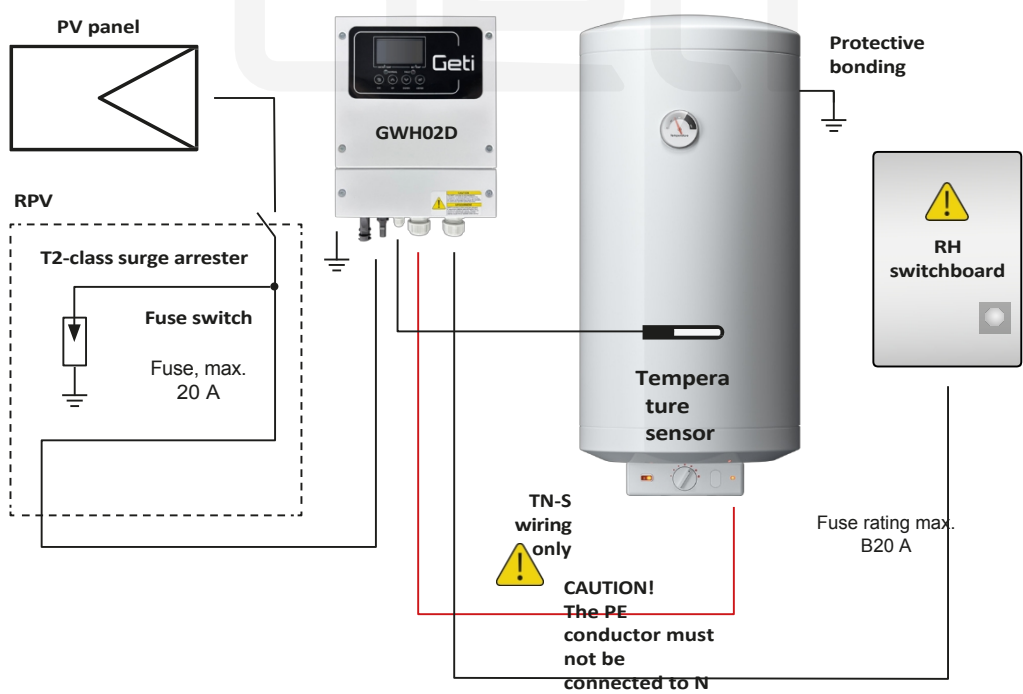
Load	The load must not exceed 230 V / 4000 W and the resistance must not be less than 13 Ω
Other features	
Product / packaging dimensions	212.4 × 187 × 79.5 mm / 299 × 265 × 170 mm
Product / packaging weight	2.35 kg / 2.90 kg
Protection rating	IP65

2.4 system diagram

2.4.1 's operating principle diagram



2.4.2 system wiring diagram



Recommended $3 \times 4 \text{ mm}^2$

TN-S/TN-C wiring Recommended conductor cross-section 4 mm^2

Note: For better protection against lightning, we recommend fitting fuses and surge protection on the cables running from the solar panels to the device.

3. Installation

3.1 Getting started

The installation environment is crucial for the performance and service life of the control unit. It is recommended to install the controller in a dry environment and to prevent water ingress. It is best to ensure adequate ventilation around the controller and sufficient airflow.



Never install the controller in an enclosed cabinet!
This controller must not be used in parallel with other units!

- THE INVERTER OUTPUT (L, N) MUST NOT BE CONNECTED TO THE ELECTRICAL MAINS OR EARTH!
- THE CONTACTS OF THE CONTROLLER’S OUTPUT TERMINAL MUST NOT BE CONNECTED TO A TN-C SYSTEM.



If the controller is installed in an enclosed space, sufficient air circulation must be ensured. An enclosed space will cause the controller’s temperature to rise excessively and reduce its service life. Before installing the controller, read all installation instructions carefully and follow them precisely. Any incorrect handling may damage the controller and affect its operation.

NOTE: We recommend that installation and wiring be carried out only by an electrician with the appropriate qualifications to work on electrical equipment and experience with photovoltaic systems.

3.2 Installation Instructions

3.2.1 Selecting the cable diameter

It is very important to select a suitable cable diameter for the controller. As a general rule, the voltage drop across the cable between the controller, the solar array and the load should be less than 2 per cent.

The following table sets out the minimum conductor diameter requirements at an ambient temperature of 45 °C:

	Maximum current material	Conductor	Recommended conductor cross-section diameter	Min. required Conductor
Between the controller and the solar system	20 A	copp er	6 mm ²	4 mm ²
Between the controller and the load	20 A	copp er	6 mm ²	4 mm ²
Between the controller and the AC mains input				

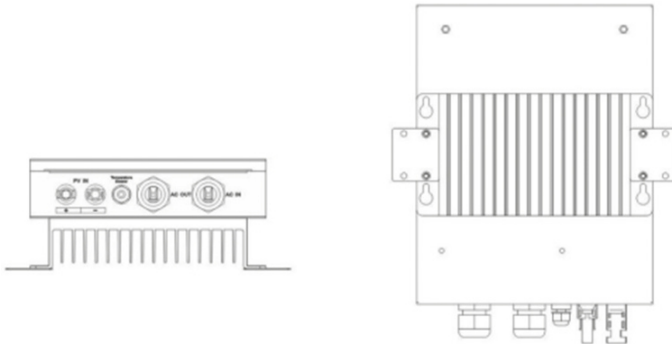
3.2.2 Selection of heating element

Output terminal: the heating load power must not exceed 230 V/4000 W and the resistance value must not be less than 13 Ω. The heating element must not exhibit any capacitive or inductive characteristics and must not be fitted with an electronic control unit.

Wall mounting

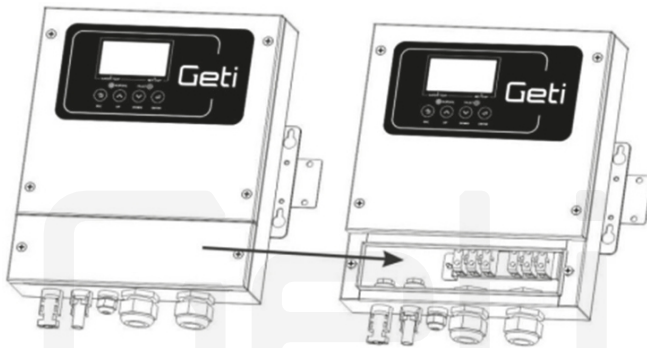
NOTE: Ensure that the mounting surface is capable of supporting the weight of the controller! Otherwise, the controller may be damaged and, if it falls, may cause injury to persons!
The controller must be positioned perpendicular to a vertical surface. If it is positioned on a surface that deviates from the vertical axis by more than 45°, this will result in poor heat dissipation from the controller, which may affect its performance.

3.2.3 Mounting on a wall with a ‘ ‘



Select any set of mounting holes and install the controller vertically on the wall using expansion bolts.

3.2.4 Removing the cover and wiring



WARNING! Risk of electric shock!

Before removing the cable cover, ensure that the controller is disconnected from all power sources and leave the controller switched off for at least 5 minutes to allow any residual electrical charge to dissipate. Working on live equipment is dangerous for the operator and may cause damage to the controller or an electric shock.

Remove the cable cover as shown in the illustration below.

3.2.5 Power connection



WARNING! Risk of electric shock!

The maximum open-circuit voltage of the solar panel system must not exceed 350 V DC (controller limit). Before installation, ensure that there is no voltage present on the solar panel cables.

When connecting the terminals, follow the steps below:

- Before connecting, ensure that the circuit breakers on all wires connected to the controller are switched off.
- The controller is not fitted with a circuit breaker.
- Position the temperature sensor in a suitable location within the boiler so that the temperature shown on the display corresponds to the actual temperature.



WARNING!

- The positive and negative terminals of the solar panel must not be reversed!
 - The controller must be properly earthed before being put into operation.
 - Connecting a load exceeding the controller's power rating may cause irreversible damage to the controller!
1. Connect the + (positive) lead from the solar panel to the PV+ terminal on the controller. Connect the – (negative) lead from the solar panel to the PV– terminal on the controller.

2. Connect the load wire to the controller's output terminal. Select a load with the correct rated power; the load power must not exceed 230 V/4000 W and the resistance must not be less than 13 Ω .
 - Connect the load wire L to the output terminal L;
 - Connect the load N wire to the N output;
 - Connect the load PE conductor to the PE terminal;



CAUTION! The controller is only suitable for using solar energy to heat resistive heating components with a heating power of up to 230 V/4000 W, such as AC water heaters, heating coils, heating rods and PTC elements. Do not connect capacitive or inductive loads, as these may damage the controller.

3. Connecting the AC input. Connect the AC mains lead to the controller's mains input.
 - Connect the AC phase lead (L) to the AC IN L terminal;
 - Connect the mains neutral conductor N to the AC IN N terminal;
 - Connect the AC PE conductor to the AC IN PE input;

The connected cables must be secured to prevent unwanted movement or loosening.

3.2.6 Start-up



CAUTION! Pay attention to the labelling and polarity of the terminals! Reverse polarity or swapping the AC and solar power input terminals will cause irreversible damage to the controller.



WARNING! Before starting up the controller, ensure that the earth connection is correctly connected. Incorrect earth connection will affect the controller's protection against electrical leakage, which may seriously endanger the user!

- Check that the polarity of the solar panels is connected correctly.
- Check that the protective conductor of the mains socket is in good condition.
- Switch on the solar array's input circuit breaker. Provided the voltage of the solar array is within the permitted range, the controller will begin to use solar energy for heating.
- Switch on the AC mains input circuit breaker. If voltage from the solar array is not currently available, the controller will start supplying power to the load directly from the AC mains.

3.2.7 Switching off



CAUTION! Pay attention to the sequence when switching off! First disconnect the AC mains supply, then disconnect the solar array. You can then disconnect all the cables.

4. nd operating instructions

Once installed, the MPPT controller will operate intelligently. Solar energy is the priority source; when solar energy is insufficient, the controller automatically switches the load's power supply to the mains AC network.

Temperature settings for PV/AC:

- Use the **UP/DOWN** buttons to select PV or AC mode.
- Press the **ENTER** button to confirm your selection.
- Use the **UP/DOWN** buttons to select the desired temperature.
- Press the **ENTER** button to confirm your selection.

AC emergency water heating function:

- Press and hold the **ESC** button for 3 seconds. The controller will then switch to AC water heating mode. You can use this function to activate one-off water heating from the mains to the set temperature for AC, if required. Once the set temperature for the AC has been reached, the controller will automatically switch to PV heating mode (provided that the conditions for PV heating are met).

4.1 s (MPPT) technology

Maximum Power Point Tracking technology is able to determine the power generated by a solar panel in real time and modulate the current draw to ensure maximum energy yield from the solar array at all times. This process is carried out automatically through a series of calculations performed by the processor.

4.2 nd protection functions

Solar panel output is too high

The controller's maximum input voltage is limited to 350 V DC. If the output of the solar cell array connected to the controller exceeds the nominal maximum value, the controller will limit the output to the nominal value only. The remaining power from the solar array will not be utilised.

Short circuit on the solar system's input line

If the input cable of the solar panel is short-circuited, the controller will behave as if no solar array were connected. Once the short circuit has been rectified, the controller will automatically resume operation.

Overheating protection

If there is insufficient ventilation around the controller, the controller's temperature will rise and exceed the normal operating temperature range; the controller will then begin to throttle its output to prevent overheating. As soon as the temperature drops, the controller will automatically resume operation at full power.

4.3 larm function

High AC Input Voltage Alarm

If the AC voltage exceeds 260 VAC, the fault indicator will light up and the AC output will be disconnected. If the voltage drops below 260 VAC, the fault indicator will go out and the controller will restore power to the output.

Solar array high input voltage alarm

The open-circuit voltage of the solar panel array connected to the controller must be less than 350 VDC. If the open-circuit voltage of the solar panels exceeds the maximum input voltage specified by the controller, the controller will cease to function or may be damaged.

4.4 Inspection and maintenance

Carry out the following checks twice a year to extend the life of the controller.

4.4.1 nd system inspection

- Check that the controller is securely mounted and that the surrounding area is sufficiently clean.
- Check that there is adequate ventilation around the controller and clean the surface of the controller to remove dust and dirt.
- Check that the connected wires are not damaged in any way by ageing, chafing, bites from insects or small animals, or damaged insulation. If any of the wires are damaged, replace them promptly.
- Check that the wires are securely connected at all terminals and tighten any loose contacts.
- Check that the LED indicators correspond to the device's operation. If you detect any faults or incorrect indications, take immediate action to rectify them.
- Check that all the system's earthing wires are properly earthed.

4.4.2 Check the wiring cover of the controller

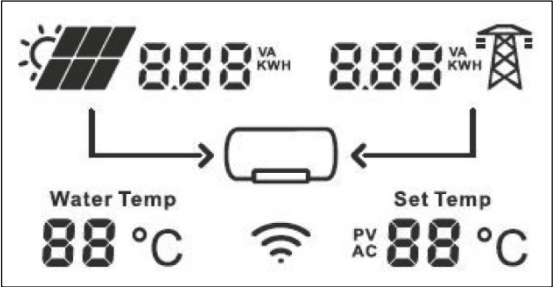


WARNING! Risk of electric shock!

Before removing the wiring compartment cover, ensure that all power supplies to the controller have been disconnected. Do not open the controller's wiring compartment cover if the power supply has not been disconnected. Do not open the controller's wiring compartment cover until at least 5 minutes after disconnecting all power supplies.

- Check that the power cable inside the controller housing is not damaged due to ageing, chafing, or being gnawed by insects or small animals, etc. If damage is found, replace it promptly.
- If any of the wires are damaged, replace them immediately.

5. 's LCD display



6. Troubleshooting

Problem	Solution
No LED indicator is lit and the controller appears to have no power connection and will not start	Use a multimeter to measure the voltage at the solar array terminals. The voltage at the solar array terminals must be higher than 160 V DC for the controller to function. If the voltage at both ends of the terminals is within the range of 160–350 V DC and no LED is lit, please contact your dealer.
	Use a multimeter to measure the voltage across the L-N socket on the AC voltage range. The voltage must be higher than 180 VAC. If the voltage at the L-N socket is between 180 and 260 V, check that the AC plug is properly inserted or securely connected. If no LED indicator appears on the controller, contact your dealer.
	If there is no voltage at either end of the solar array terminals, check that the electrical installation is in good condition and that the circuit has not been interrupted by a blown fuse or a tripped circuit breaker. If there is no voltage at the AC socket, check the mains supply.
A red indicator light indicates a fault	Check whether the control unit has triggered any of the protection mechanisms listed in section 4.2 or a fault condition as described in section 4.3. If the controller still does not work, contact your dealer.

7. warranty terms and conditions

7.1 Claiming warranty service

If, within the first two years from the date of manufacture, a fault occurs in the controller’s performance that was not caused by human intervention.

Please contact your retailer to arrange warranty service.

Warranty service does not cover the following situations (though not limited to them):

- damage caused by human error as a result of an accident, negligence, incorrect installation or misuse
- exceeding the rated voltage, current and power
- damage to the controller resulting from the incorrect selection of heaters with unsuitable specifications
- unauthorised modification or repair of the product
- damage to the product resulting from transport
- damage caused by natural disasters, such as lightning strikes and extreme weather
- damage caused by natural forces and acts of God, such as fire or flooding

NOTE! The warranty does not cover the operation of the controller outside the intended purpose and scope of the operating parameters. No one is authorised to carry out any modifications or extend the warranty without the manufacturer’s authorisation. The manufacturer is not liable for any financial losses arising therefrom.

7.2 Repair procedure

Before making a warranty claim, please read the product’s operating instructions carefully once again, particularly the section on troubleshooting.

1. Contact an authorised dealer or sales representative. Your dealer can often resolve a warranty issue quickly.

2. Please provide the following information:
 - a) the name of the business or company on the original invoice
 - b) the full model number and serial number (the SN is a 16-digit number on the product label)
 - c) the behaviour of the unit during the fault, including the LED indicator display
 - d) maximum power output of the solar array, open-circuit voltage, voltage at the maximum power point, short-circuit current of the panels, as well as the power consumption and resistance value of the connected load
3. Once the warranty claim has been approved, please send the controller to the designated address and provide the shipping documents to your dealer.
4. Stay in contact with your dealer. Once repaired, the controller will be returned to the original address stated on the shipping document you provided.

NOTE: Removing or altering the product labels, seals and serial numbers of the device will void the warranty on the controller.

WE RECOMMEND THAT THE WATER HEATING SYSTEM BE FITTED WITH CURRENT PROTECTION DEVICES (FUSES, DISCONNECTORS, CIRCUIT BREAKERS) OF APPROPRIATE RATINGS.

- Neither the manufacturer nor the retailer accepts any liability for any damage arising from the use of the product in a manner other than that specified in this manual, in particular due to incorrect use, improper connection or failure to follow the recommendations and warnings.
- Any other use or connection of the product, apart from the procedures and connections specified in the manual, is considered incorrect, and the manufacturer accepts no liability for the consequences resulting from such actions.
- Furthermore, the manufacturer accepts no liability for damage to property, injury to persons, or damage to or destruction of the product caused by unsuitable placement or improper installation, incorrect operation, or use of the product contrary to these instructions for use.



WARNING!

- Installation may only be carried out by a qualified technician holding a qualification in accordance with Decree No. 50/1978 Coll., as amended, and possessing at least the level of knowledge specified in Section 5 of Decree No. 50/1978 Coll., as amended.

Disposal of the product



This symbol indicates that the appliance should not be disposed of with general waste. To prevent potential harm to the environment or human health, please recycle the appliance responsibly to support the sustainable renewal of natural resources. To return your used appliance, please use collection points or contact the retailer from whom you purchased the device. They can send the device for environmentally safe recycling.