

Off-Grid Solar Inverter

OG-1P6K5-DT



User Manual

Version 2.0

About This Manual

Scope of Validity

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations.

This manual is valid for the following inverter models: **PHOTON PRO PV9500-48**.

Model Description

OG - 1P6K5 - DT



The diagram shows the model number 'OG - 1P6K5 - DT' with four vertical lines pointing down to the numbers 1, 2, 3, and 4, which correspond to the four parts of the model description table below.

- | | | |
|---|---------------------|---|
| 1 | Product Type | "OG" refers to Off Grid Solar Inverter. |
| 2 | Grid Type | "1P" refers to Single Phase. |
| 3 | Rated Power | "6K5" refers to the rated output power of 6.5 kW. |
| 4 | Battery Type | "D" is a Dual Output, "T" has a Built-in Power Booster. |

Target Group

This document is intended for qualified persons and end users. Tasks that do not require any particular qualification can also be performed end users. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of the applicable standards and directives
- Knowledge of the compliance with this document and all safety information

Symbol Description

Different levels of warning messages in this manual are defined as follows:



DANGER!

- Indicates a high-level hazard that, if not avoided, will result in death or serious injury.



WARNING!

- Indicates a medium-level hazard that, if not avoided, could result in death or serious injury.



CAUTION!

- Indicates a low-level hazard that, if not avoided, could result in minor or moderate injury.



NOTICE

- Provide important operation information and techniques for high efficient, proper using and maintenance.

Change History

Version 2.0 (07/07/2025)

Updated

Version 1.0 (03/31/2025)

Initial release

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1 Safety

1.1 Symbols on the Label and Inverter

Table 1-1 Symbols

Symbol	Description
	Do not disconnect under load!
	Danger: High Voltage!
	Danger: Electrical Hazard!
	Delayed discharge. Wait 5 minutes after power is completely discharged.
	Read instructions carefully before performing any operation on the INVERTER.
	Grounding: The system must be firmly grounded for operator safety.

1.2 Safety Instructions



WARNING!

- This chapter contains important safety and operating instructions.
 - Read and keep this manual for future reference.
- 1 Please be clear which kind of battery system you want, lithium battery system or lead-acid battery system, if you choose the wrong system, energy storage system can not work normally.
 - 2 Before using the unit, read all instructions and cautionary marking on the unit, the batteries and all appropriate sections of this manual. The company has the right not to quality assurance, if not according to the instructions of this manual for installation and cause equipment damage.
 - 3 All the operation and connection please professional electrical or mechanical engineer.
 - 4 All the electrical installation must comply with the local electrical safety standards.
 - 5 When install PV modules in the daytime, installer should cover the PV modules by

opaque materials, otherwise it will be dangerous as high terminal voltage of modules in the sunshine.

- 6 CAUTION-To reduce risk of injury, charge only deep-cycle lead-acid type rechargeable batteries and lithium batteries. Other types of batteries may burst, causing personal injury and damage.
- 7 Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
- 8 To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
- 9 NEVER charge a frozen battery.
- 10 For optimum operation of this inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.
- 11 Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
- 12 Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
- 13 GROUNDING INSTRUCTIONS - This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
- 14 NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
- 15 Make sure the inverter is completely assembled, before the operation.

1.3 Inverter Load Management Instruction

This product features excellent overload handling capability, allowing it to operate continuously for short periods under various overload conditions. When the load exceeds the allowable limit, the protection mechanism is promptly activated to ensure equipment safety. The specific overload capabilities are as follows:

- Capable of withstanding a load between 102% and 110% for up to 1 minutes;
- Capable of withstanding a load between 110% and 130% for up to 10 seconds;
- Capable of withstanding a load between 130% and 150% for up to 3 seconds;
- Capable of withstanding a load exceeding 150% for up to 200 milliseconds.

The system will automatically trigger the protection mechanism when the above time or load limits are exceeded, preventing damage to the equipment.

Table 1-2 Load Type and Power Requirements

Type of load	Equipment	Power(W)	Start power
Resistive Load(R)	Lamp	40~100	1.5 x
	Hair dryer	1200~1800	1.5 x
	Iron	1000~2200	1.2 x
	Heater	1000~3000	1.2 x
Inductive Load(L)	Refrigerator	100~200	5~8 x
	Air conditioner	800~3500	4~7 x
	Washing machine	400~800	4~7 x
	Fan	30~100	3~5 x
	Vacuum cleaner	800~2000	3~6 x
	Induction Cooker	1200~2200	3~5 x
	Microwave oven	700~1200	2~3 x
Capacitive Load(C)	Laser Printer / Copier	300~1500	5~30 x
	Phone charger	5~30	10~100 x(<1 ms)
	Old radio,record player DC supply, Cheap half-wave rectified appliances	5~30	20 x

***Inductive load and Capacitive load** can referred to as **Shock load**.

Shock loads may experience shock currents or surges during startup, which can cause voltage fluctuations, current inrushes, motor vibrations, and voltage surges. These anomalies may exceed the load-bearing capacity of the inverter, resulting in damage or even failure.

Therefore, it is necessary to control the total amount of inductive and capacitive loads connected to the inverter to ensure safe and stable operation.

- When selecting an inverter, the loading capacity should be taken into consideration to ensure that the total amount of connected inductive and capacitive loads fall within its rated capacity.
- When connecting Shock loads to the off-grid inverter, it is necessary to limit the total load capacity to ensure safe and reliable operation of the inverter.

Continuous Output	Surge Power (< 200 ms)	Maximum individual Shock load power, Maximum total load power
6.5 kW	16500 VA	≤ 2.2 kVA (Individual Shock load) (1Hp AC x3 or 1.5Hp x2 or 2Hp x1)
		≤ 4 kVA (Total load include Shock load) (1Hp AC x2 or 1.5Hp x1 or 2Hp x1)
		≤ 4.5 kVA (Total load without Shock load)



WARNING!

- Earth connection essential before connecting supply.
- Be sure that AC power source is disconnected before attempting to hardwire it to the unit.
- Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.



NOTICE

- It is important to make sure that the combined power required for all devices connected to this EPS output does not exceed the power rating of the inverter.
- Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances.
- To prevent this kind of damage, please check manufacturer of air conditioner if it is equipped with time-delay function before installation. Otherwise, this inverter will trig overload fault and cutoff output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

2 Introduction

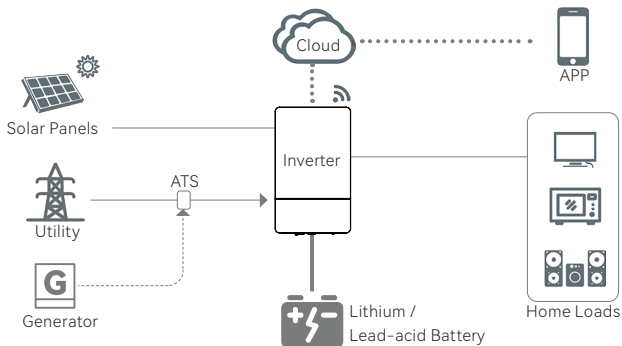


Figure 2-1 System Overview

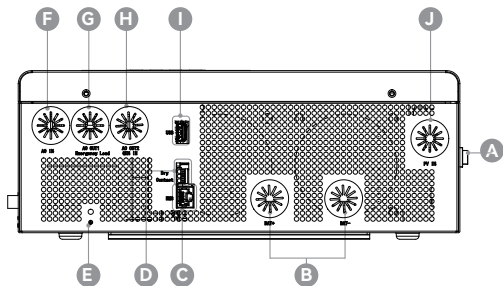
This is a multifunctional solar inverter, integrated with a MPPT solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. This inverter can work with or without batteries.

The whole system also need other devices to achieve complete running such as PV modules, generator, or utility. Please consult with your system integrator for other possible system architectures depending on your requirements. The WiFi / GPRS module is a plug-and-play monitoring device to be installed on the inverter. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

2.1 Features

- Pure sine wave AC output
- High frequency inverter with small size and light weight
- Solar and utility can power loads at the same time
- Dual AC output
- With RS485 for BMS communication
- With the ability to work without battery
- (Optional) WiFi/GPRS remote monitoring

2.2 Terminal Description



A	Power ON/OFF Switch	F	AC Input
B	Battery Input	G	AC Output 1 / Emergency Load
C	BMS Communication Port	H	AC Output 2 / Generator Input
D	Dry Contact	I	WiFi
E	PE	J	PV Input

Figure 2-2 Terminal

3 Installation

3.1 Unpacking and Inspection

3.1.1 Installation Tools

Products have been strictly tested before leaving the factory. Please sign for them after inspection. If the product is damaged, please contact the local distributor. Please open the box to check whether the outer packaging is intact or damaged, whether the internal equipment is damaged.

3.1.2 Installation Tools



Goggles



Safety shoes



Safety gloves



Dust mask



RJ45 crimping tool



Diagonal pliers



Wire stripper



Hammer drill



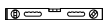
Heat gun



Vacuum cleaner



Marker



Level



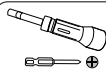
Heat shrink tube



Cable tie



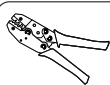
Rubber hammer



M2/M3/M4/M5
Torque wrench



Multimeter



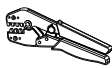
PV crimping tool



Tube type terminal
crimping tool



YQK-70 hydraulic
pliers



4-6 mm²
Crimping tool



Hex socket



Measuring tape

3.1.3 Packing List

Description	Quantity
Inverter	1 pc
Document	-
M6*50, SUS304 Expansion Screw	2 pcs
E6010 Tubular Terminal, for AC input/output, PV, Generator Input	9 pcs

3.2 Mounting Unit

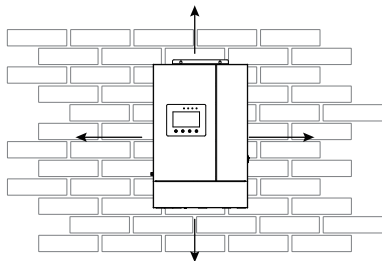


Figure 3-1 Installation distance recommendation

Consider the following points before selecting where to install:

- Mount on a solid surface or non-combustible surfaces like concrete
- Place at eye level for LCD visibility.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the diagram above to guarantee sufficient and to have enough space for removing wires.

Installation steps:

Step 1: Mark two drilling positions.

Step 2: Drill holes and knock the expansion bolts into the holes.

Step 3: Secure the device to the wall with screws by torque wrench.

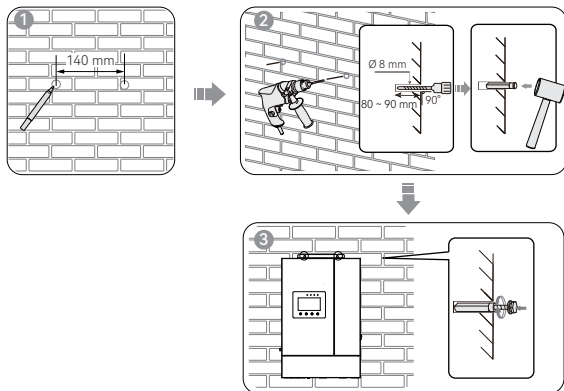


Figure 3-2 Installing the inverter

Before connecting all wiring, please take off bottom cover by removing four screws as shown below:

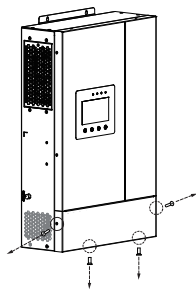


Figure 3-3 Removing screws

4 Electrical Connection



WARNING!

- Make sure AC power is disconnected before attempting to connect AC power to the unit.
- All operations during the electrical connection process, as well as the specifications of cables and components used, must comply with local laws and regulations.
- All wiring must be performed by a qualified personnel.



WARNING!

- To ensure safe and efficient operation of the system and reduce the risk of injury, please use the recommended cable specifications.

4.1 PE Connection

Be sure to connect PE protective cable on the inverter side first.

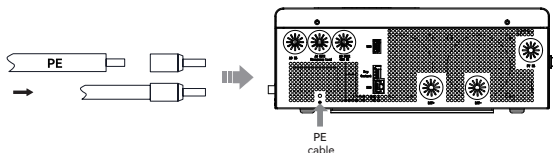


Figure 4-1 PE connection

4.2 AC Input / Output Connection



CAUTION!

- Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. The recommended spec of AC breaker is 40 A for 6.5 kW inverter.
- There are three terminal blocks with 'AC IN', 'GEN /AC OUT 2', 'AC OUT 1' markings. Do not mis-connect input and output connectors.

Table 4-1 Suggestion for AC input wires

Model	Wire Size	Cross Section
6.5 kW Inverter	10 AWG	6 mm ²

Table 4-2 Suggestion for AC output wires

Model	Wire Size	Cross Section
6.5 kW Inverter	12 AWG	4 mm ²

AC input/output connection steps:

Step 1: Before connecting to AC power, make sure that the AC circuit breaker between inverter and AC input power source is disconnected.

Step 2: Remove 12 mm insulation. Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly.

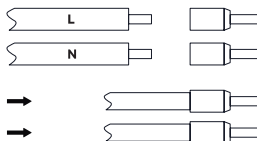


Figure 4-2 AC cable connection

Step 3: Insert AC input cables according to polarities indicated on terminal blocks and tighten the terminal screws.

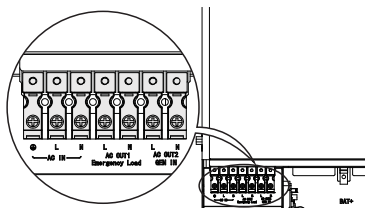


Figure 4-3 AC side connection

NOTICE

- Output 1 is for connecting general loads, while Output 2 is designated for heavy loads. Please ensure this distinction is maintained to guarantee the safe and effective operation of the equipment.

4.3 Generator Input & Dry Contact Connection

4.3.1 Generator Input Connection

NOTICE

- If a generator is connected, the generator power must exceed twice the rated power of the inverter.

Table 4-3 Suggestion for Generator input wires

Model	Gauge	Cross Section
6.5 kW Inverter	10 AWG	6 mm ²

Step 1: Before connecting GEN, make sure that the AC circuit breaker between inverter and generator is disconnected.

Step 2: Remove insulation sleeve 12 mm from the head of cables, shorten the conductor part to 10 mm. Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly.

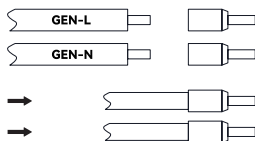


Figure 4-4 GEN cable connection

Step 3: Insert GEN cables according to polarities indicated on terminal blocks and tighten the terminal screws. Be sure to connect PE protective cable first.

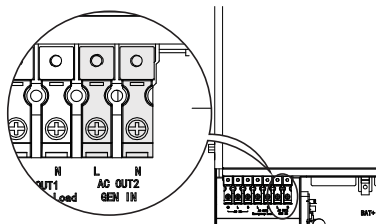


Figure 4-5 Generator side connection

Step 4: Make sure the cables are securely connected.

4.3.2 Dry Contact Connection:

In communication port area of inverter bottom, there is a dry contact port for generator control.



Figure 4-6 Dry contact connection

4.4 PV Connection



DANGER!

- Direct sunlight can cause dangerous high voltages in solar panels. Therefore, be sure to follow the safety guidance in the solar panel manual plus related documents.



WARNING!

- Make sure to connect the PV terminals to the corresponding ports inverter, as reversing the polarity can damage the inverter.



CAUTION!

- Before connecting to PV modules, please install a separate DC circuit breaker between inverter and PV modules. Do not connect any DC switches or AC/DC circuit breakers before completing the electrical connections.

Table 4-4 Suggestion for PV wires

Model	Gauge	Cross Section
6.5 kW Inverter	10 AWG	6 mm ²

PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters.

- 1 Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

2 Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage.

Inverter Model	6.5 kW Inverter
Max. PV Array Open Circuit Voltage [Vdc]	500
PV Array MPPT Voltage Range [Vdc]	60 ~ 450

PV module connection step:

Step 1: Before connecting the PV module, make sure that the DC circuit breaker between inverter and PV modules is disconnected.

Step 2: Remove 12mm insulation. Insert the cable into the tubular terminal. Then use terminal crimping tool make the terminal and cable connected tightly.

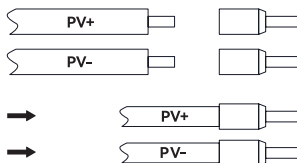


Figure 4-7 PV cable connection

Step 3: Use multi-meter check to ensure the polarities are correct.

Step 4: Insert PV cables according to polarities indicated on terminal block and tighten the terminal screws.

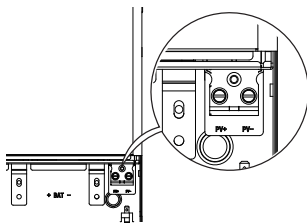


Figure 4-8 PV side connection

Step 5: Make sure the cables are securely connected.

4.5 Battery Connection

4.5.1 Lead-acid Battery Connection

User can choose proper capacity lead acid battery with a nominal voltage at 48V. Also, you need to choose battery type as "AGM" or "FLD". For specific settings, please refer to ["5.3.1 LCD Setting"](#).



CAUTION!

- Do not place anything between the flat part of the inverter terminal and the DT terminal. Otherwise, overheating may occur.
- For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. The recommended size of protector or disconnect is 175 A.

Table 4-5 Suggestion for battery wires

Model	Wire Size	Cross Section
6.5 kW Inverter	2 AWG	35 mm ²



NOTICE

- For lead acid battery, the recommended charge current is 0.3C (C > battery capacity).

Battery connection step:

Step 1: Unscrew the pre-fixed screws on battery poles. Prepare 2 DT terminals (It should fit for AWG2 cables).

Step 2: Remove 12mm insulation. Insert the cable into the DT terminal. Then use terminal crimping tool make the terminal and cable connected tightly.

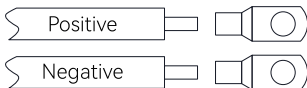


Figure 4-9 Battery cable connection

Step 3: Pass the battery cable through the battery installation hole on bottom shell, and tighten the terminal screws. Make sure polarity at both the battery and inverter are

correctly connected and DT terminals are tightly screwed to the battery terminals.

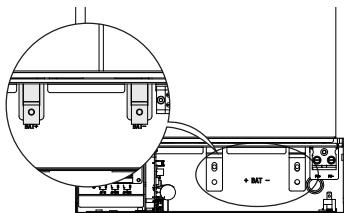


Figure 4-10 Battery side connection

Step 4: Connect all battery packs as units requires. It's suggested to connect at least 200Ah capacity battery.



CAUTION!

- Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.
- Before making the final DC connection or closing DC breaker / disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

4.5.2 Lithium Battery Connection

If choosing lithium battery for inverter, please check the compatibility of the protocol first. There are two connectors on the lithium battery, RJ45 port of BMS and power cable.

Please follow steps below to implement lithium battery connection:

Step 1: Follow section “[4.5.1 Lead-acid Battery Connection](#)” to implement the power cable connection.

Step 2: Connect RJ45 terminal of battery communication cable to BMS communication port of inverter. The communication protocol should be RS485.

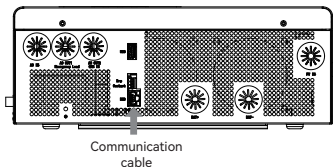


Figure 4-11 Lithium battery connection

Step 3: Insert the other end of RJ45 (battery communication cable) to battery communication port of lithium battery.

Lithium battery communication and setting:

In order to communicate with battery BMS, you should set the battery type as "Lib" in ["5.3.1 LCD Setting"](#).

Make sure the lithium battery BMS port connects to the inverter is Pin to Pin, the inverter BMS port Pin assignment shown as below:

Table 4-6 BMS port Pin assignment

Pin	BMS Port
1	RS485B
2	RS485A
3	-
4	-
5	-
6	-
7	-
8	-

Communicating with battery BMS in parallel system

If need to use communicate with BMS in a parallel system, you should make sure to connect the BMS communication cable between the battery and one inverter of the parallel system.

4.6 Final Assembly

After connecting all wiring, please secure bottom cover back by screwing four screws mentioned in ["3.2 Mounting Unit"](#).

4.7 Smart Communication Stick Connection (Optional)

The smart communication stick is used to connect to cloud platform. Please insert the stick into COM port directly.

4.8 Meter Connection (Optional)

Insert the RJ45 connector (communication cable) from meter.

Make sure that the meter port connected to the inverter is Pin to Pin, and the inverter meter port pin assignment is as shown below:

Table 4-7 Meter port pin assignment

Pin	Meter Port
1	Meter RS485B
2	Meter RS485A
3	-
4	-
5	-
6	-
7	-
8	-

5 Operation

5.1 Power ON

Step 1: Turn on the battery breaker to connect the battery to the inverter.

Step 2: Turn on the switch on the inverter to start the inverter.

Step 3: Turn on the PV breaker.

Step 4: Turn on the AC breaker between the inverter and the power grid.

Step 5: Turn on the load breaker to supply power to the connected loads.

5.1.1 Power OFF

Step 1: Turn off the load switch to ensure that all connected loads are disconnected.

Step 2: Turn off the PV breaker to disconnect the PV from the inverter.

Step 3: Turn off the AC switch between the inverter and the power grid.

Step 4: Turn off the switch on the inverter.

Step 5: Turn off the battery switch to disconnect the battery from the inverter.



CAUTION!

- After the inverter system is powered down, there is still residual electricity and heat, which may cause electric shock or burns. Therefore, wear protective gloves to operate the inverter after the inverter system has been powered down for 5 minutes.

5.2 Operation and Display Panel

The panel indicates the operating status and input/output power information.

5.2.1 Panel

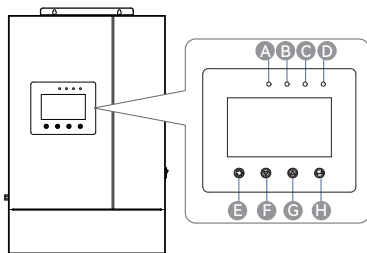


Figure 5-1 LED Panel

Table 5-1 LED indicator

LED Indicator	Description	
A AC Status indicator (Green)	Solid On	The mains power is normal and enters the mains power operation.
	Flashing	The mains power is normal, but it has not entered mains power operation.
	Off	The mains power is abnormal.
B Invert indicator (Yellow)	Solid On	Output is powered by battery or PV in battery mode.
	Off	Other states.
C Charging indicator (Yellow)	Solid On	The battery is in float charging.
	Flashing	The battery is in constant voltage charging.
	Off	Other states.
D Fault indicator (Red)	Solid On	Fault occurs in the inverter.
	Flashing	Warning condition occurs in the inverter.
	Off	The inverter is working properly.

Table 5-2 Function Buttons

Button	Description	
E	ESC	To exit setting mode.
F	UP	To go to previous selection.
G	DOWN	To go to next selection.
H	ENTER	To confirm the selection in setting mode or enter setting mode.

5.2.2 LCD Display Icons

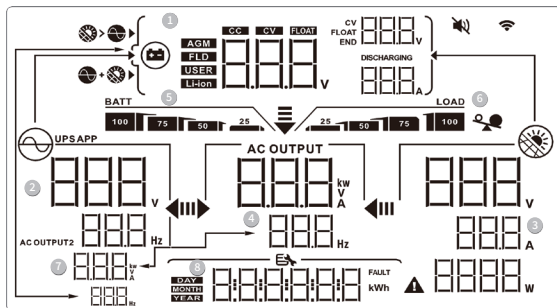


Figure 5-2 LCD Display

Table 5-3 LCD Icons

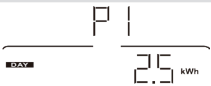
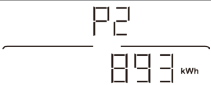
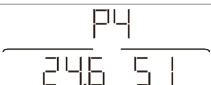
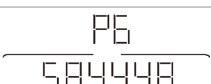
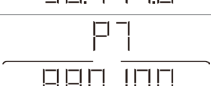
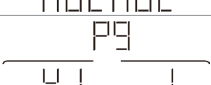
Display area	Icon	Description
1 Battery Information		Battery icon
		Battery type
		Three charging period. The CC icon is illuminated during the constant current charging stage, the CV icon is illuminated during the constant voltage charging stage, and the FLOAT icon is illuminated during the float charging stage.
		Indicate battery voltage
		During the constant voltage charging stage, the CV voltage is displayed and the CV icon is illuminated. During the float charging stage, the float voltage is displayed and the END icon is illuminated.
		Battery charging/discharging current
		Fault indicator

Display area	Icon	Description
2 AC Input Information		AC input icon
	UPS APP	UPS or APP input mode When set to GEN input, it display as APP
		AC input voltage and frequency
3 PV Input Information		PV input icon
		Indicate PV power, PV voltage, PV current, etc.
4 Output Information		Indicate output voltage (V), apparent power (VA or kVA), output active power (W or kW) alternately, switching every five seconds indicate output frequency.
5 Battery Capacity		Indicate battery capacity
6 Load Capacity		Indicate load capacity
		Over load icon
7 AC OUTPUT2 Information	AC OUTPUT2	Second AC output icon
		Indicate AC output 2 voltage (V)
8 Parameter Query, Function Setting or Fault/Alarm Information		Indicate system information; Function setting indicate Fault/Alarm
		Mute
Other Information		WiFi connected
		If PV+Utility, the left and right icon light at same time; if only PV, the right icon is light
		If PV first, the left and right icon light at same time

5.3 Display Information

The selectable information is switched as below.

Table 5-4 LCD display information

LCD display	Information
	Display the daily power generation from solar.
	Display total power generation from solar.
	Display lithium battery voltage and current. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery temperature and SOC. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery rated capacity and remaining capacity. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery maximum charging voltage and minimum discharging voltage. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery maximum charging current and maximum discharging current. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display lithium battery alarm and fault information. Display ERR when BMS communication fails. If BMS function is disabled, the page will not display.
	Display inverter firmware version.

5.3.1 LCD Setting

After pressing and holding ENTER button for 2 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. Then press "ENTER" button to confirm the selection or ESC button to exit.

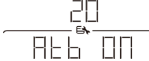
Table 5-5 LCD Setting

No.	Description		
00	Exit setting mode		Return to main page
01	Output source priority		Solar powers loads first
			- Default mode - Utility powers loads first
			Solar and battery powers loads first
			Generator powers loads first
02	Maximum charging current		- Set total charging current for solar and utility chargers - Default: 60 A - Available options: 2/10/20...100/110/120A
03	Input mode		- Applied to household appliance - Typical switching time is 10 ms
			- Applied to computer and other devices. - Typical switching time is 10 ms
			- Applied to connect generator from AC IN port - Typically switching time is 20 ms
04	Energy-saving mode		- Default OFF - ON: In battery mode, if load < 25W, output stops temporarily then resumes. Repeats if load remains < 25W. Resumes normal output if load > 35W

No. Description

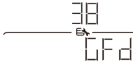
05	Battery type		• Default: AGM (Lead-Acid Battery)
			• FLD (Flooded Battery)
			• LIB (Lithium Battery)
			• FEL (Lithium iron)
			• USE (User-Defined)
06	Auto restart when overload occurs		• Default ON
07	Auto restart when over temperature occurs		• Default ON
08	Reset factory setting		• Default OFF • ON: Resets all settings to factory defaults. Automatically returns to OFF after reset. • The setting can be applied immediately in mains and standby modes, but can not be set in battery mode
09	Output frequency		• Default: 50 Hz • Options: 50 Hz, 60 Hz
10	Output voltage		• Default: 230 V • Options: 208 V, 220 V, 230 V, 240 V
11	Utility charging current		• Default: 30 A • Options: 2-120A continuously selectable

No.	Description		AGM/FLD Type
12	Battery return to Grid voltage setting		• Range: 44-52V • Default: 46V
13	Switching back to battery mode voltage setting		LIB/USE Type: • Range: 40-50V • Default: 47.6V FEL Type • Range: 40-50V • Default: 49.6V
14	Utility low voltage setting		AGM/FLD Type • Range: 48-58V • Default: 52V LIB/USE Type • Range: 46-58V • Default: 53.2V FEL Type • Range: 46-58V • Default: 53.2V APP/GEN Mode • Range: 90-154V • Default: 154V UPS Mode • Range: 170-200V • Default: 185V
15	Utility high voltage setting		APP/GEN Mode • Range: 264-280V • Default: 264V UPS Mode • Fixed at 264V
16	Charge source priority	  	• Default: Solar and Utility are charged at the same time • Only Solar charge • Solar first; if both available, solar charge

No.	Description		
17	PV charging current		- Set the maximum charging current value of the inverter when only photovoltaic power is present - Options: 2/10/20/30/40/50/60/70/80/90/100/110/120A - Default: 60A
18	Silent mode setting		- OFF: Buzzer sounds for alarms or faults. - ON (default): Buzzer silent in all modes
19	Menu default		- ON(default): Returns to the first page if no operation for 1 minute (when not on the first page) - OFF: Stays on current page
20	Automatic turn off backlight		Default ON: Backlight off after 1 min of inactivity
21	Battery disconnection alarm		- OFF(default): No alarm - ON: Alarms when battery disconnected
22	Main input cut warning		- ON(default): Buzzer sounds for 5 sec if grid input lost - OFF: No sound
23	Overload transfer to bypass		- Default OFF - ON: Transfers to bypass mode on overload
24	Alarm setting		- OFF(default): All the alarm have no sound or light display - ON: Alarms active
25	Inverter soft start setting		- OFF(default): Output jumps to target voltage - ON: Output gradually increases to target voltage

No.	Description		
26	Constant voltage mode voltage setting		AGM/FLD Type • AGM Default: 56.4V • FLD Default: 58V Notice: Unable to adjust LIB/USE Type • Range: 48-60V • Default: 56.4V Notice: Must > Float Charge Voltage FEL Type • Range: 48-60V • Default: 55.2V Notice: Must > Float Charge Voltage
27	Floating charge mode voltage setting		AGM/FLD Type • Default: 54V Notice: Unable to adjust LIB Type • Range: 50-58V • Default: 55.2V Notice: Must < Constant Voltage USE Type • Range: 48-60V • Default: 55.2V Notice: Must < Constant Voltage FEL Type • Range: 50-58V • Default: 54.4V Notice: Must < Constant Voltage
28	Battery low voltage setting		AGM/FLD Type • Default: 44V Notice: Unable to adjust LIB/USE Type • Range: 41.2-50V • Default: 47.6V FEL Type • Range: 41.2-50V • Default: 48V

No.	Description		AGM/FLD Type • Default: 42V Notice: Unable to adjust LIB/USE Type • Range: 41.2-50V • Default: 47.6V FEL Type • Range: 40-48V • Default: 46V AGM/FLD/LIB/USE Type • Default: 58.4 V • Range 48-60V FEL Type • Default: 56V • Range 48-60V • Default: 120 min • Range: 5-900 min (adjust in 5-min steps) • Controller charges at max current until equalization voltage, then switches to constant voltage mode for set duration. • Default: 120 minutes • Range: 5-900 min (adjust in 5-min steps) • Extends equalization if voltage not reached; returns to float charging if voltage is still below equalization voltage after delay • The function can be set as OFF. • Default: 30 days • Range: 1-90 days (increment of 1 day) • Enters equalization phase when interval is reached • Default: OFF • Activates equalization immediately when ON and battery connection is detected
29	Battery shutdown voltage point		
30	Equalization voltage setting		
31	Equalization charging time setting		
32	Equalization delay time setting		
33	Equalization interval time setting		
34	Enable equalization immediately		

No.	Description		
35	Enable equalization mode		- Set whether to enable the equalization mode of the inverter - Default: OFF - ON: The controller enters the equalization state when the conditions are met
38	Grid function ON/OFF		- Set whether the grid function is enabled - Default: GFD (Disabled)
39	Grid function power		- Set the output power value - Default: 6.5 kW - Range: 0-6.5 kW (0.1kW steps)
40	Generator mode enabled		- Set the auxiliary port to generator function - Default: OFF
41	Generator rated power		- Set the rated power of the generator. - Default: 0 - Range: 0-6.5 kW (0.1kW steps)
42	Generator maximum power		- Set the maximum power of the generator - Default: 0 kW - Range: 0-6.5 kW (0.1kW steps)
43	Generator overload reset		- Reset the generator. - Default: OFF - After a generator fault, it must be set to ON to clear the generator fault status.
44	BMS communication function		- Manages communication with BMS protocols. - Default OFF CVT: CVTE protocol PYL: PYLON protocol GRO: GROWATT protocol VOL: VOLTRONIC protocol IRF: China Tower protocol PAR: PACE RTU protocol
45	BMS ID		- Sets ID for BMS communication. - Default: ATO(Auto) - Range: [0-9]/A/B/C/D/E/F/ATO/OVE - When system poll for the first ID with a correct response, it locks the ID and only asks the BMS with that ID

No. Description

46 Low SOC shutdown



- Inverter shutdown when SOC falls below the set value
- Default: 20%
- Range: 5-50%
- In battery mode, if SOC reaches the set value, the inverter shuts down and triggers alarm 68, which clears when SOC returns to set value + 5%
- In standby mode, inverter switches to battery mode when SOC reaches set value + 10%; otherwise, it triggers alarm 69
- Alarm 69 is triggered when $SOC \leq +5\%$ of set value and cleared at +10% of set value.
- If off, inverter ignores SOC status for shutdown/startup/alarm operations.
- Communication errors cause SOC data to be ignored and related alarms to be cleared

47 High SOC to Battery



- Set the SOC value for the inverter to switch to battery mode
- Default: 90%
- Range: 10-100%
- In SBU mode, if $SOC \geq$ set value and battery voltage > grid voltage, switch to battery
- Can be set to OFF to disable switching based on SOC
- If communication fails, inverter stops using SOC and clears alarms

48 Low SOC to Grid



- Set SOC for inverter to switch to grid mode
- Default: 50%
- Range: 10-90%
- In SBU mode, if $SOC \leq$ set value and battery voltage < grid voltage, switch to grid mode
- Can be set to OFF to disable switching based on SOC
- If communication fails, inverter stops using SOC and clears alarms

No. Description

60	Battery dual output duration		• Default OFF • Range: [5,900min]/OFF/FUL • When enabled, the secondary output of the inverter is enabled by default. In battery mode, it turns off when the discharge time reaches the set point • Setting to FUL allows unlimited output time
61	Battery dual output low voltage shutdown point		• After entering battery mode, when the battery voltage falls below the set point, the secondary output is turned off. • Default: 48V • Range:44-60V
62	Dual output battery mode cut-off SOC		• After entering battery mode, when the battery voltage falls below the set point, the secondary output is turned off • Default: 30 • Range: [5-90]/OFF
63	Battery dual output restart setting		• After entering battery mode, when the battery voltage higher than the set point, the secondary output is turned on • Default: 48V • Range:44-60V
64	Dual output battery mode restart SOC		• Default: 30 • Range: [5-90]/OFF
85	Timing setting-Minute		• Default: Current minutes • Range: 0-60 minutes • During first setup, it should be set according to real time
86	Timing setting-Hour		• Default: Current hour • Range: 0-24 hour • During first setup, it should be set according to real time
87	Timing setting-Day		• Default: Current day • Range: 1-31 day • During first setup, it should be set according to real time

No.	Description
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88	Timing setting-Month		• Default: Current month • Range: 1-12 month • During first setup, it should be set according to real time
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89	Timing setting-Year		• Default: Current year • Range: 0-99 • During first setup, it should be set according to real time
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6 Troubleshooting Guide

Contact the Customer Service for further assistance.

6.1 Fault Code

When a fault occurs, the inverter enters fault mode, with a constant red LED light and LCD displaying a fault code.



Figure 6-1 Fault display

Table 6-1 Fault code sheet

No.	Meaning	Trigger conditions	Resume conditions
F01	Bus Boost Fail	Grid soft start process starts but bus voltage does not reach set value	Recover in 15 seconds
F02	System Over Temperature	1. Temperature exceeds overheat setting value 2. Fan not connected	When the temperature is below the set value and the fan is turned on, it will recover after 15 minutes
F03	Bus Short	Bus voltage is lower than set value	Cannot restore
F04	Battery Over Current	Battery current is higher than set value	Cannot restore
F07	Over load	The load current is higher than the set value	Recover in 15 seconds
F08	Bus Over Voltage	Bus voltage is higher than set value	After the bus voltage is restored, restore again after 15 seconds
F09	Bus Soft start Fail	Battery soft start process starts but the bus voltage has not reached set value	Recover in 15 seconds
F10	Battery Over Voltage	Battery voltage is higher than set value	Restore after reaching the set voltage for 15 minutes

No.	Meaning	Trigger conditions	Resume conditions
F12	Inverter Short	The inverter voltage is less than the set value, and the current is greater than the set value.	1. Check if there is a short circuit at the output terminals (such as a screw piercing through the locking terminal causing a L/N short circuit) 2. Verify if the inverter voltage and inverter current meet the triggering conditions
F13	Inverter Negative Power	The inverter power is negative and exceeds the set value for a period of time	Recover in 15 seconds
F17	Program updating	Inverter updating or OTA	Restore after updating
F18	Panel Reverse	PV reverse connection	Restore after connecting correctly for 15 seconds
F26	BMS Fault	Error code in BMS	Restore after BMS fault resolved
F29	Inverter Load Abnormal	Abnormal inverter load leads to abnormal voltage	Recover in 15 seconds
F52	Bus Below Voltage	Bus voltage is lower than set value	Cannot restore
F53	Inverter soft start fail	Inverter soft start process starts but the inverter voltage has not reached set value	Recover in 15 seconds
F58	Invert Under Voltage	The inverter voltage is lower than the set value in battery mode	Recover in 15 seconds

6.2 Alarm Reference Code

Alarm: the inverter does not enter the fault mode, LED red light flashing, LCD displays the Alarm code.



Figure 6-2 Alarm display

Table 6-2 Alarm code sheet

No.	Meaning	Relevant action	Trigger conditions	Resume conditions
1	Fan lock	Alarm, fan operation in full speed	No fan speed signal detected	Restore after fan speed signal detected
4	Battery below voltage	Alarm	Battery voltage is lower than BAL set value	Battery above BAL set value 2V
50	Battery open	Alarm	Battery disconnected for no more than 10 minutes	Charging after connecting the battery 2 min
51	Battery under voltage	Alarm, battery low voltage shutdown or cannot power on	Battery voltage is lower than BAU set value	Battery above 52V
53	Battery charge short	Alarm, battery does not charge/discharge	Cell voltage is less than 6V and there is charging current	Recovery time after short circuit clearance: maximum 1 minute
56	BMS loss	Alarm	Communication failure after BMS communication function is enable	Restore after communication function disabled or communication success
59	EEPROM	Alarm	EEPROM read/write exception	Cannot restore
60	Over load	Alarm	Mains current/battery discharge current/load power greater than rated value	Mains current/battery discharge current/load power is less than the rated value

No.	Meaning	Relevant action	Trigger conditions	Resume conditions
62	PV energy weak	Alarm, Turn off the PV output to the load, but keep the PV charging the battery	When the battery is not connected, the bus voltage is lower than the set value	The battery or mains power is connected normally, or will be disconnected after 1 minutes
68	Battery under SOC	Alarm, turn to standby mode	BMS reports SOC lower than BSU set value	1. Turn off the low SOC shutdown function 2. Turn off the BMS communication function 3. Restore the SOC to the set value + 5%.
69	Battery below SOC	Alarm, turn to standby mode.	SOC is lower than set value +5% (grid or battery mode), lower than set value +10% (standby mode)	1. Disable low SOC shutdown function 2. Disable BMS communication function 3. SOC restored to set value + 10%
72	Battery can not startup	Alarm	After power-on, the battery voltage is lower than the allowable startup voltage.	Battery voltage exceeds the permissible startup voltage
77	Line Unstable	Alarm	5min power loss 3 times	Power is restored 5 minutes after the first utility power loss

7 Battery Equalization

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.



NOTICE

- Do not activate this mode when using lithium batteries.

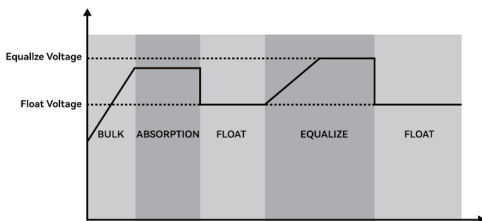
How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting “Program 35” first. Then, you may apply this function in device by either one of following methods:

- 1 Set balance mode on “Program 35”.
- 2 Set balance voltage point on “Program 30”.
- 3 Set balance charging time on “Program 31”.
- 4 Set balance delay time on “Program 32”.
- 5 Set balance interval time on “Program 33”.
- 6 Set immediate balance mode activation on “Program 34”.

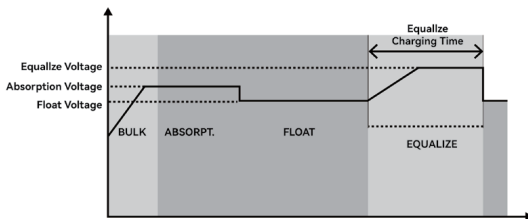
When to Equalize

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

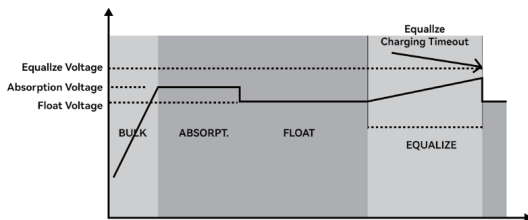


Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery remain in the Equalize stage until setting battery zed time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage does not rise to battery equalization: voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



8 Specifications

• PV INPUT

Model	PHOTON PRO PV9500-48
Max. PV Power	9000 W
Max. PV Array Open Circuit Voltage	500 Vdc
MPPT Range @ Operating Voltage	60-450 Vdc
Number of MPP Tracker	1

• AC OUTPUT

Model	PHOTON PRO PV9500-48
Nominal Output Voltage	230 Vac
AC Voltage Range	195-253 Vac
AC Frequency Range	49-51 Hz $\pm$ 0.1% / 59-61 Hz $\pm$ 0.1%
Nominal Output Current	28.3A
Power Factor Range	> 0.99
Maximum Conversion Efficiency (DC/AC)	96.5%

• GRID INPUT

Model	PHOTON PRO PV9500-48
Acceptable Input Voltage Range	90-280 Vac
Frequency Range	50-60 Hz (auto sensing)
Rating of AC Transfer Relay	40 A

• BATTERY MODE OUTPUT

Model	PHOTON PRO PV9500-48
Nominal Output Voltage	230 Vac
Output Waveform	Pure Sine Wave
Efficiency (DC to AC)	93.5%

• BATTERY & CHARGER

Model	PHOTON PRO PV9500-48
Nominal DC Voltage	48 Vdc
Maximum Charging Current (from Grid)	120 A
Maximum Charging Current (from PV)	120 A
Maximum Charging Current	120 A

• GENERAL

Model	PHOTON PRO PV9500-48
Dimension (W * D * H)	338 * 129 * 529.6 mm
Net Weight	12 kg

- INTERFACE

Model	PHOTON PRO PV9500-48
Communication	RS485 / USB / DRY

- ENVIRONMENT

Model	PHOTON PRO PV9500-48
Humidity	5 - 95% (Non-condensing)
Operating Temperature	-10 - 50°C

