EPEVER®

Home Battery Backup

User Manual

Solar Power System
AC Fast Charger/Inverter Combined
PV MPPT Controller & Battery

HPS1022-AL0210
HPS1522-AL0210
HPS2522-AL0315

EN

Contents

Important Safety Instructions

Please reserve this manual for future review.

This manual contains all the safety, installation, and operation instructions for the HPS-AL series home battery backup ("energy storage system" referred to as this manual).

1. Explanation of symbols

To enable users to use the product efficiently and ensure personal and property safety, please read the related words carefully when you encounter the following symbols in the manual.

Symbol	Definition
Tip	Indicates any practical advice for reference
	IMPORTANT: Indicates a critical tip during the operation, if ignored, may cause the device to run in error.
	CAUTION: Indicates potential hazards, if not avoided, may cause the device damage.
	WARNING: Indicates the danger of electric shock, if not avoided, would cause casualties.
	WARNING HOT SURFACE: Indicates the risk of high temperature, if not avoided, would cause scalds.
	Read the user manual carefully before any operation.

WARNING:	The entire system should be installed by professional and technical personnel.

2. Requirements for professional and technical personnel

- Professionally trained.
- Familiar with related safety specifications for the electrical system.
- Read this manual carefully and master related safety cautions.

3. Professional and technical personnel is allowed to do

- Install the energy storage system to a specified location.
- Conduct trial operations for the energy storage system.
- Operate and maintain the energy storage system.

4. Safety cautions before installation

! **CAUTION**	When receiving the energy storage system, please check if there is any damage in transportation. If you find any problem, please contact the transportation company or our company in time.
⚠ **CAUTION**	• When installing or moving the energy storage system, follow the instructions in the manual. • When installing the energy storage system, end-users must evaluate whether the operation area exists arc danger.
⚡ **WARNING**	• Keep the energy storage system out of the reach of children. • The energy storage system is only allowed for stand-alone operation. Connecting multiple units' AC output in parallel or series is prohibited. Otherwise, the energy storage system may be damaged.

5. Safety cautions for mechanical installation

⚡ **WARNING**	• Before installation, confirm the energy storage system has no electrical connection. • Ensure enough heat dissipation space for the energy storage system before installation. • Do not install the energy storage system in humid, salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments. • Ensure the ground is flat and place the energy storage system horizontally.

6. Safety cautions for electrical connection

⚠ **CAUTION**	• Check whether wiring connections are tight to avoid the danger of heat accumulation due to loose connections. • The energy storage system shell shall be connected to the ground. The cross-section of the connection wire should not be less than 4mm^2 • A fast-acting fuse or breaker, whose rated current is twice the energy storage system rated input current, should be used between the external battery and the energy storage system. **The external and internal batteries can be connected in parallel when their voltage are the same.** • DO NOT put the energy storage system close to the flooded lead-acid battery because the sparkle in the terminals may ignite the hydrogen released by the battery.
⚡ **WARNING**	• The AC output terminal is only for the load connection. Do NOT connect it to another power source or Utility. Otherwise, the energy storage system will be

	damaged. Turn off the energy storage system before connecting the loads. And then, turn on the energy storage system again after connecting the loads successfully.
	• It is strictly forbidden to connect a transformer or a load with a surge power (VA) exceeding the overload power at the AC output port. Otherwise, damage will be caused to the energy storage system.
	• Both the utility input and AC output are of high voltage, do not touch the wiring connection to avoid electric shock.

7. Safety cautions for energy storage system operation

⚠️ **WARNING HOT SURFACE**	When the energy storage system works, the shell will generate much heat, and the temperature is very high. Please do not touch it, and keep it far from the equipment susceptible to high temperature.
⚠️ **CAUTION**	• When the energy storage system is working, please do not open the energy storage system cabinet to operate. • When eliminating the fault that affects the safety performance of the energy storage system or disconnecting the DC input, turn off the energy storage system switch and operate it after the LCD is completely OFF.

8. The dangerous operations would cause an electric arc, fire, or explosion.

• Touch the wire end that hasn't been insulation treated and may be electriferous.
• Touch the wiring copper row, terminals, or internal devices that may be electriferous.
• The connection of the power cable is loose.
• Screw or other spare parts inadvertently falls into the energy storage system.
• Improper operations are carried out by untrained non-professional or technical personnel.

⚡ **WARNING**	Once an accident occurs, it must be handled by professional and technical personnel. Improper operations would cause more serious accidents.

9. Safety cautions for stopping the energy storage system

• First, turn off the AC output and disconnect the utility input breakers. Then, turn off the DC switch.
• After the input and output wires are disconnected for ten minutes, the internal conductive modules can be touched.
• No maintenance parts in the energy storage system. If maintenance service is required, please get in touch with our after-sales service personnel.

⚠ **WARNING**	Do NOT touch or open the shell after the energy storage system is powered off within ten minutes.

10. Safety cautions for maintenance

- It is recommended to check the energy storage system with testing equipment to ensure there is no voltage and current.
- When conducting the electrical connection and maintenance, post a temporary warning sign or put up barriers to prevent unrelated personnel from entering the electrical connection or maintenance area.
- Improper maintenance of the energy storage system may cause personal injury or equipment damage;
- It is recommended to wear an antistatic wrist strap or avoid unnecessary contact with the circuit board.

⚠ **CAUTION**	The safety mark, warning label, and nameplate on the energy storage system should be visible, not removed or covered.

Disclaimers

The warranty does not apply to the following conditions:

- Damage caused by improper use or inappropriate environment (such as the humid, salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments).
- The actual current/voltage/power exceeds the limit value of the energy storage system.
- Damage caused by working temperature exceeding the rated range.
- Arc, fire, explosion, and other accidents caused by failure to follow the energy storage system stickers or manual instructions.
- Unauthorized dismantling or attempted repair.
- Damage caused by force majeure.
- Damage occurred during transportation or handling.

⚡ WARNING	Equipment damage caused by polarity reversal is not covered by the warranty! Please operate under the guidance of professional personnel.

1 General Information

1.1 Overview

HPS-AL series, upgrade hybrid energy storage systems that support utility charging, oil generator charging ①, solar charging, utility output, inverter output, and energy management. With a built-in long-life and deep-cycle sealed valve-controlled GEL battery, the energy storage system can meet customers' energy storage needs.

The DSP chip with an advanced control algorithm brings high response speed, reliability, and conversion efficiency.

Multiple charging and output modes to suit different scenarios.

Three-stage charging method (Bulk Charging, Constant Charging, and Float Charging) is adopted to ensure battery safety.

The large lattice LCD screen shows the operational status and full parameters.

The communication interface with the standard Modbus protocol allows end-users to expand their applications and is suitable for different monitoring requirements.

The new optimized MPPT tracking technology can fast-track the PV array's maximum power point in various situations and obtain the maximum energy in real time.

Adopting the advanced control algorithm, the AC to DC charging process brings the full digital PFC and dual closed-loop voltage-current control. It enables the input power factor close to 1 and improves the control accuracy.

The fully smart digital DC to AC inverting process adopts the advanced SPWM technology, outputs a pure sine wave, and converts the DC power to AC power. It is suitable for household appliances, power tools, industrial equipment, audio systems, and other electronics.

Multiple DC output ports can connect different DC loads, including 5V/3A port*2pcs and 12V/2A port*2pcs. In addition, two Type-C dedicated ports (5V/3A and 100W PD) meet the fast charging of mobile phones and notebooks.

End-users can choose energy sources according to actual needs to maximize solar energy utilization and flexibly take the Utility as a supplement in the hybrid system. This energy storage system provides high-quality, high-stability, and high-reliability electric energy to the end-users by improving the solar system's power supply efficiency, widely used in household power generation systems in areas with low or no utility.

Features

• Full intelligent digital energy storage equipment.

• Circuit breaker at the Battery output terminal to ensure the battery safe running.

- Remote temperature compensation feature for batteries.

- Three-stage charging method to ensure battery safety.

- Advanced MPPT technology, with maximum tracking efficiency no less than 99.5%.

- Circuit breaker at the PV input terminal to ensure the PV array safe running.

- Lightning protection circuit for the Utility input terminal.

- PFC technology to reduce the usage of grid.

- Bypass automatic switching function (switch to utility mode if the power supply is normal).

- Overload relay at the Utility input terminal to disconnect the energy storage system when the fault occurs.

- Advanced SPWM technology and pure sine wave output.

- EMC design for the AC output, reducing interference to the AC loads.

- Work continuously at full power for a long time.

- Adopt the bidirectional isolation topology, high safety, reliability, and impact resistance.

- 3.5-inch LCD screen to monitor and modify system parameters.

- Multiple LED indicators display system status in real time.

- OUTPUT button controls the DC output and AC output.

- Multiple DC output ports (5V/3A ports, 12V/2A ports, 100W PD port).

- RS485 communication interface with optional 4G or Wi-Fi modules for remote monitoring.

- Built-in Bluetooth to adjust settings through EPEVER APP.

- Built-in GEL battery.

- Comprehensive electronic protection.

- Complete power distribution, easy to use.

- Separate warehouse design and isolated heat dissipation to provide a high dust-proof, moisture-proof and anti-fog performance (IP30).

1.2 Appearance

• **HPS1022-AL0210**
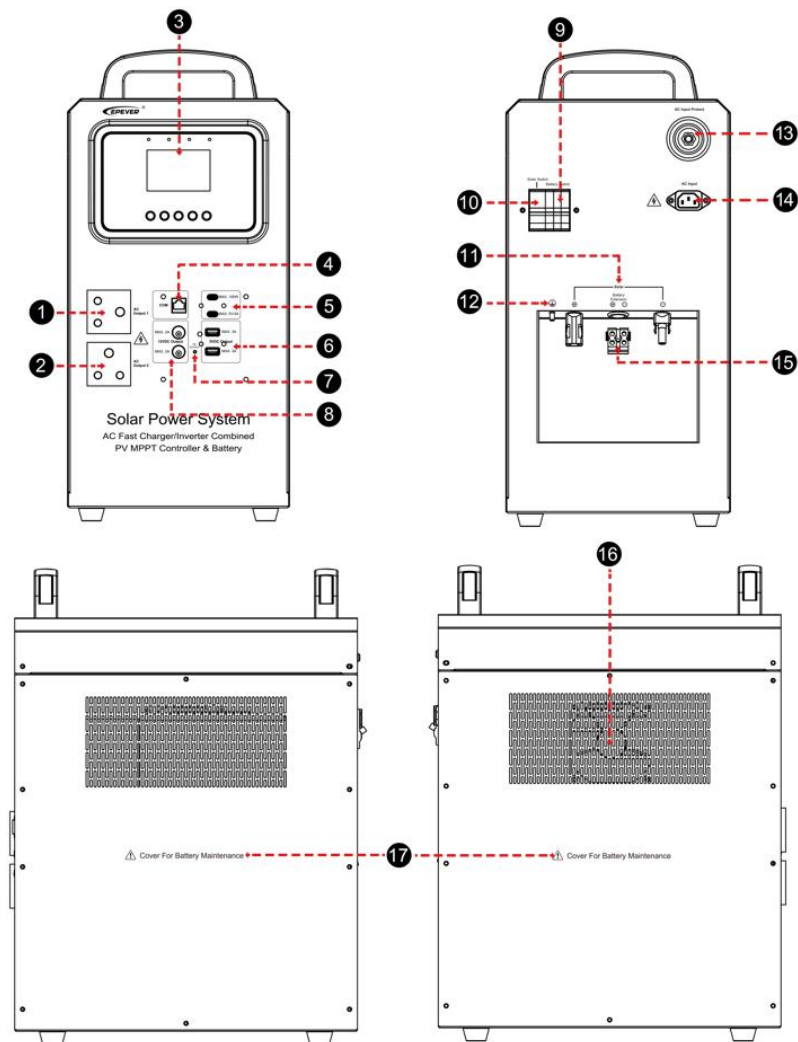
Solar Power System
AC Fast Charger/Inverter Combined
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Cover For Battery Maintenance

Cover For Battery Maintenance

- **HPS1522-AL0210**

Solar Power System
AC Fast Charger/Inverter Combined
PV MPPT Controller & Battery

Cover For Battery Maintenance

Cover For Battery Maintenance

9

- **HPS2522-AL0315**

Solar Power System
AC Fast Charger/Inverter Combined
PV MPPT Controller & Battery
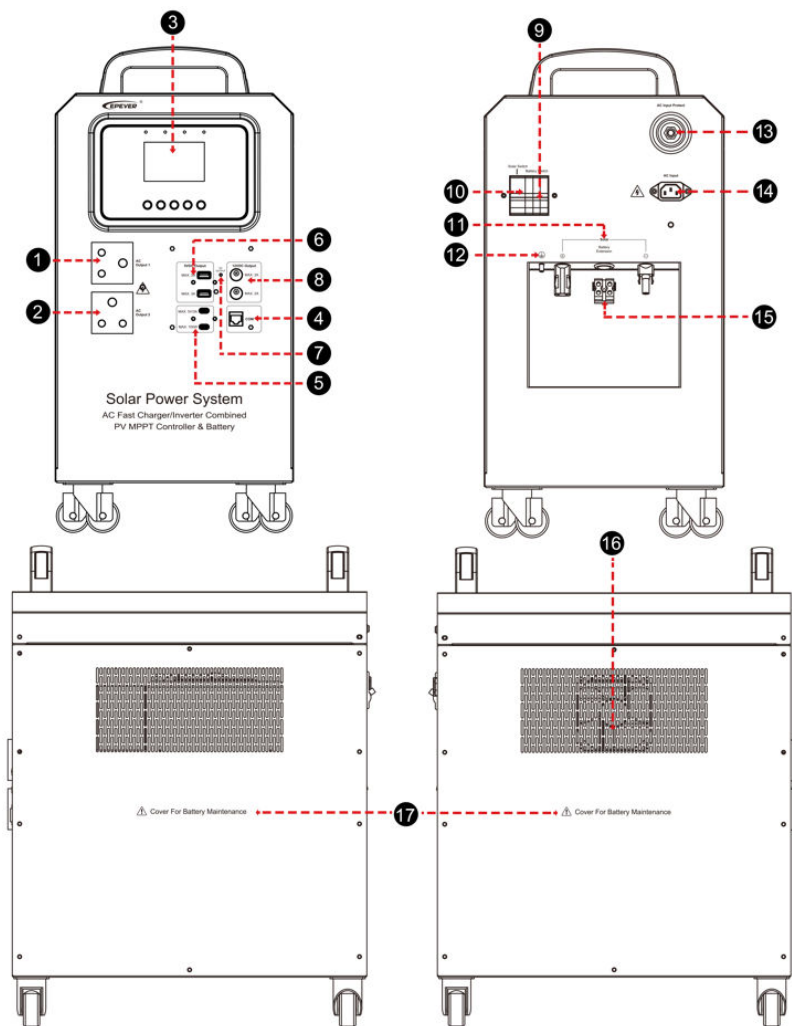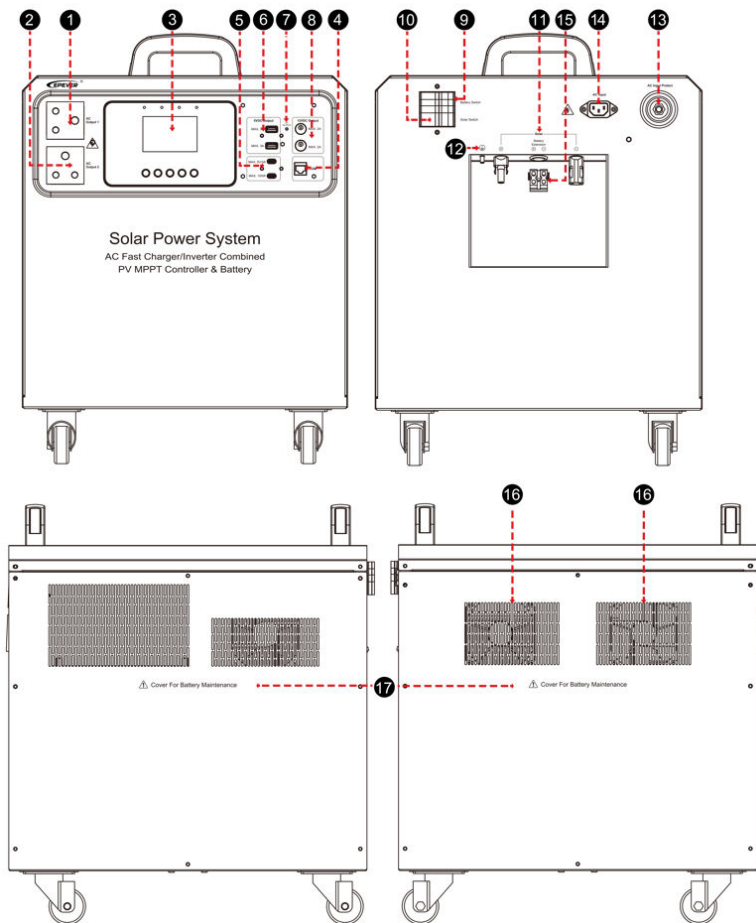
No.	Instruction	No.	Instruction
❶	AC outlet 1	❺	Type-C port *2 (5V/3A and 100W PD)
❷	AC outlet 2	❻	USB-A port *2 (5V/3A)
❸	LCD (see chapter 3)	❼	DC output indicator
❹	RS485 com. port [1]	❽	12V/2A output port *2

No.	Instruction	No.	Instruction
❾	Battery output circuit breaker (125A/60VDC)	⓭	AC input overload relay [2]
❿	PV input circuit breaker (32A/220VDC)	⓮	AC input port
⓫	PV input terminals	⓯	Extension battery terminal
⓬	Grounding terminal	⓰	Cooling fan
		⓱	Battery container [3]

⑴ Pin definition for the RS485 com. Port (RJ45):

Pin	Definition	Pin	Definition
1	+5VDC	5	RS485-A
2	+5VDC	6	RS485-A
3	RS485-B	7	GND
4	RS485-B	8	GND

⑵ Specifications for the AC input overload relay: 15A/250VAC (HPS2522-AL0315/HPS1522-AL0210), 7.5A/250VAC (HPS1022-AL0210)

⑶ Replace the battery as follows.

Step 1: Disconnect all the cable connections of the Utility, PV array, and loads. And then, open the cabinet after 10 minutes.

Step 2: Remove the battery cable and ensure a well insulation protection.

Step 3: Remove the screws of the battery fixing plate to take it out.

Note: Do not touch the battery terminals when taking out the battery fixing plate.

Step 4: Remove the battery temperature sensor.

Note: Do not damage the battery temperature sensor; otherwise, the energy storage system will not work.

Step 5: Take out the old battery and put in a new battery. Secure the battery fixing plate, and then connect the battery and the battery temperature sensor.

Note: The battery positive and negative poles cannot be reversed.

1.3 Naming rules

HPS 25 2 2 – A L 03 15

▸ PV maximum input withstand voltage: see "Specifications" for detail

▸ PV maximum charging current: value*10A, such as "03" means "30A"

▸ L means PV charges the battery directly

▸ A means Asynchronous Utility charging and bypass

▸ Inverter output voltage: 2 means 220VAC

▸ Battery Rated voltage: 2 means 24VDC

▸ Inverter rated power: value*100W, such as "25" means "2500W"

▸ HPS series home battery backup

1.4 Connection diagram
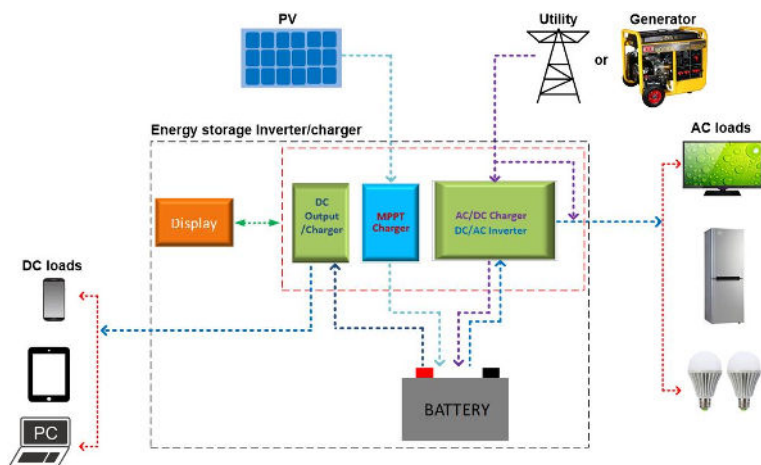
⚠️ **CAUTION**	There are many types of oil generators with complex output conditions, which must be tested before use.

2 Installation

2.1 Attention

- Please read the manual carefully to familiarize yourself with the installation steps.

- The energy storage system does not need to be fixed (placed on the ground directly). And the placed location is required to be no water, flat, strong, and clean.

- Ventilation is highly recommended if mounted in an enclosure. Never install the energy storage system in a sealed enclosure with flooded batteries! Battery fumes from vented batteries will corrode and destroy the energy storage system circuits.

- Ensure all switches and breakers are disconnected before wiring. Operate the energy storage system after checking that all wiring is correct.

- Loose connections and corroded wires may produce high heat that can melt wire insulation, burn surrounding materials, or even cause a fire. Ensure tight connections, use cable clamps to secure cables, and prevent them from swaying in motion.

- Select the system connection cables according to the current density no greater than 5A/mm^2.

- For outdoor installation, keep out of the direct sunshine and rain infiltration. Do not install the energy storage system in humid, salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments.

- After turning off the switch, high voltage still exists inside the energy storage system. Do not open or touch the internal devices; wait ten minutes before conducting related operations.

- There is no reverse polarity protection for the external battery. Please ensure the correct polarity before connecting the external battery.

- Utility input and AC output are high voltage. Please do not touch the wiring connection.

- When the fan is working, please do not touch it to avoid injury.

2.2 Wire size and circuit breaker

The wiring and installation methods must conform to all national and local electrical code requirements.

➢ **Recommended PV wire size**

Since the PV output current varies with the PV module's size, connection method, or sunlight angle, the minimum wire size can be calculated by the PV Isc (Max. short circuit current). Please refer to the Isc value in the PV module's specifications. When the PV modules are connected in series, the total Isc equals any PV module's Isc. When the PV modules are connected in parallel, the total Isc equals the sum of the PV module's Isc. The PV array's Isc must not exceed the maximum PV input current. For

Max. PV input current and Max. PV wire size, please refer to the table below:

Model	PV wire size
HPS1022-AL0210	4mm^2/11AWG
HPS1522-AL0210	4mm^2/11AWG
HPS2522-AL0315	4mm^2/11AWG

⚠️ CAUTION	When the PV modules are connected in series, the total voltage must not exceed the Max. PV open circuit voltage at the lowest environmental temperature (100V for HPS1022-AL0210 or HPS1522-AL0210, 150V for HPS2522-AL0315).

➢ **Recommended Utility wire size**

Model	Utility wire size
HPS1022-AL0210	2.5mm^2/13AWG
HPS1522-AL0210	2.5mm^2/13AWG
HPS2522-AL0315	4mm^2/11AWG

➢ **Recommended extension battery wire and breaker size**

Model	Extension battery wire size	Circuit-breaker size
HPS1022-AL0210	8AWG	2P- 60A/60VDC
HPS1522-AL0210	8AWG	2P- 80A/60VDC
HPS2522-AL0315	8AWG	2P-150A/60VDC

⚠️ CAUTION	The recommended extension battery breaker size is selected when the extension battery terminals are not connected to any additional inverter. **The external and internal batteries can be connected in parallel when their voltage are the same. When connecting the extension battery terminal, please operate under the guidance of a professional.**

➢ **Recommended AC output wire size**

Model	Recommended AC output wire size
HPS1022-AL0210	2.5mm^2/13AWG
HPS1522-AL0210	2.5mm^2/13AWG
HPS2522-AL0315	4mm^2/11AWG

⚠️ CAUTION	• The wire size is only for reference. Suppose a long distance exists between the PV array, the energy storage system, and the battery. In that case, larger wires shall be used to reduce the voltage drop and improve the system's performance. • The above wire and circuit breaker sizes are for reference only; please choose a

	suitable wire and circuit breaker according to the actual situation.

2.3 Wiring the energy storage system

Connect the energy storage system in the order of "grounding > load ⚡ > PV array ⊞ > Utility 🗼 or generator > optional accessories", and disconnect the energy storage system in the reverse order.

The following wiring sequence is illustrated in the appearance of "HPS2522-AL0315". For wiring positions of other models, please refer to the actual product appearance.

1. **Grounding**

The energy storage system has a dedicated grounding terminal, which must be grounded reliably. The grounding wire size must be consistent with the recommended AC output wire specification. The grounding connection point shall be as close as possible to the energy storage system, and the total grounding wire shall be as short as possible.
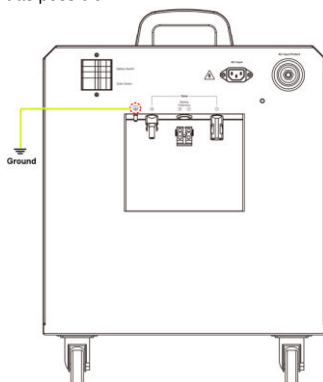
2. **Connect the AC load**

⚠️ **WARNING**	• Risk of electric shock! When wiring the AC load, please disconnect the circuit breaker and ensure that the poles' leads are connected correctly.
	• The AC loads shall be determined by the continuous output power of the energy storage system. The AC load's surge power must be lower than the instantaneous surge power of the energy storage system, or the energy storage system will be damaged.
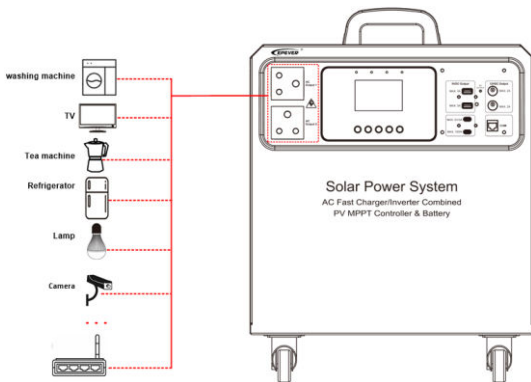
3. Connect the PV modules

⚡ **WARNING**	Risk of electric shock! The PV array can generate dangerous high-voltage! Disconnect the circuit breaker before wiring, and ensure that the leads of "+" and "-" poles are connected correctly.
⚠ **CAUTION**	Suppose the energy storage system is used in an area with frequent lightning strikes. In that case, it is recommended to install an external surge arrester.
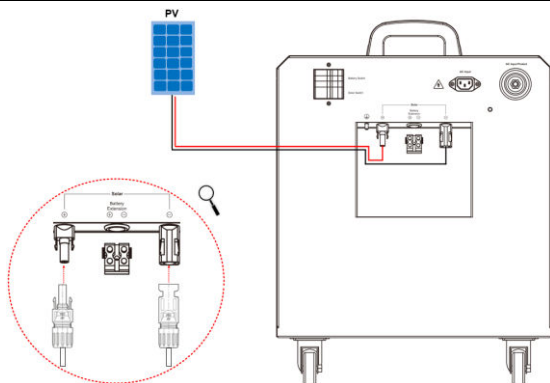
4. Connect the Utility or generator

⚡ **WARNING**	• Risk of electric shock! The Utility input can generate dangerous high-voltage! Disconnect the circuit breaker or fast-acting fuse before wiring, and ensure that the poles' leads are connected correctly. • After the Utility is connected, the PV and battery cannot be grounded. In contrast, the energy storage system cover must be grounded reliably (to shield the outside electromagnetic interference effectively and prevent the cover from causing electric shock to the human body).
⚠ **CAUTION**	There are many types of oil generators with complex output conditions, which must be tested before use.
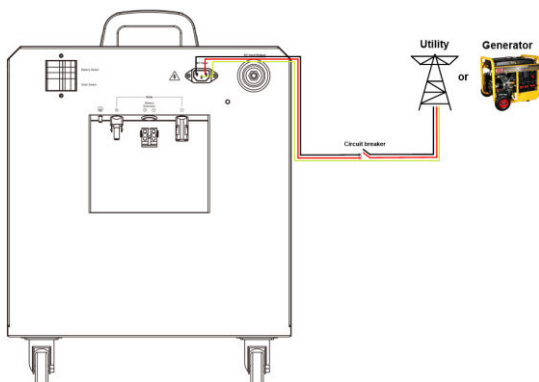
5. Connect optional accessories

A. Connect the communication module

Connect the WiFi module or 4G module to the RS485 com. port (when connecting the 4G module, an additional power supply is need). End-users can remote monitor the energy storage system or modify related parameters on the phone APP. For detailed settings, refer to the WiFi module or 4G module user manual.
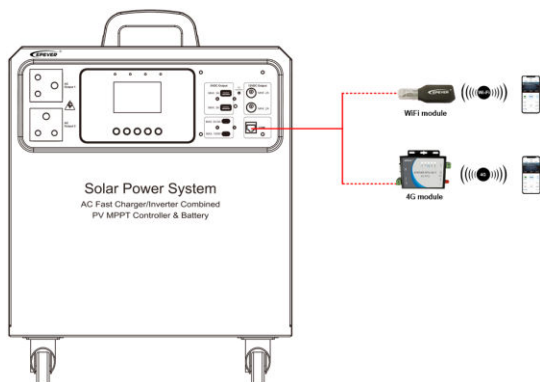
Note: The energy storage system is designed with a built-in Bluetooth module. After turning on the phone Bluetooth switch, the end-users can remotely monitor the energy storage system or set the parameters through the APP. For detailed settings, refer to the Solar Guardian APP user manual.

⚠️ **CAUTION**	After unplugging the communication module, you need to wait for more than 3 seconds, and then plug it into the energy storage system after the module is completely powered off.

B. Connect the mobile phone, or PC
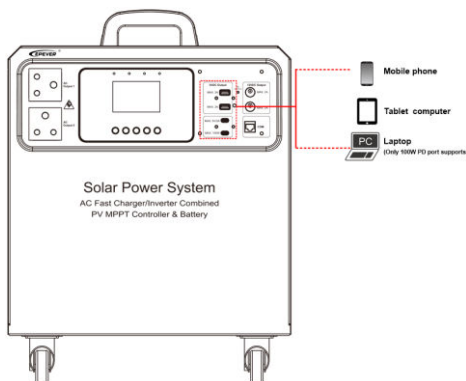
Charging the mobile phone, tablet computer, or laptop by the Type-C port (5V/3A and 100W PD).

Note: Only the Type-C port (100W PD) can charge the laptop.

C. Connect the extension battery

⚠️ **CAUTION**	• Please disconnect the circuit breaker before wiring the external battery and ensure that the leads of the "+" and "-" poles are polarity correctly. • A circuit breaker must be installed on the external battery side. For selection, please refer to chapter 2.2 Wire size and circuit breaker." The external and internal batteries can be connected in parallel when their voltage are the same.
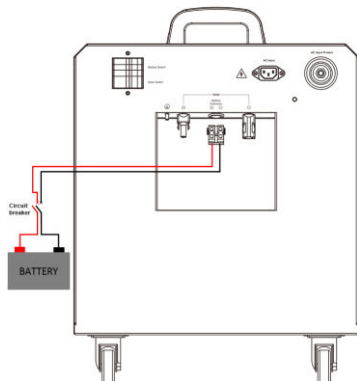
2.4 Operate the energy storage system

Step 1: Double-check whether the wire connection is correct.

Step 2: Connect the battery circuit breaker, and the LCD will be lit, which means the system is normal.

⚡ **WARNING**	• Connect the battery circuit breaker first. After the energy storage system normally works, connect the PV circuit breaker and the utility input plug. Otherwise, we won't assume any responsibility for not following the operation. • The AC output is ON by default after the energy storage system is powered. Before connect the battery circuit breaker, ensure the AC output is connected to loads correctly, and no safety hazard exists.

Step 3: Set parameters by the buttons.

Step 4： Use the energy storage system.

Connect the load circuit breaker, the PV circuit breaker, and the utility input plug in sequence. After the AC output is normal, turn on the AC loads one by one. Do not turn on all the loads simultaneously to avoid protection action due to a large transient impulse from the current. The energy storage system will perform normal work according to the set working mode. See chapter 3.3 Interface.

	• When supplying power for different AC loads, turning on the load with a larger impulse current is recommended first. After the load output is stable, turn on the load with a smaller impulse current later.
⚠️ **CAUTION**	• If the energy storage system cannot work properly or the LCD/indicator shows an abnormality, please refer to chapter 6.2 Troubleshooting or contact our after-sales personnel.

3 LCD
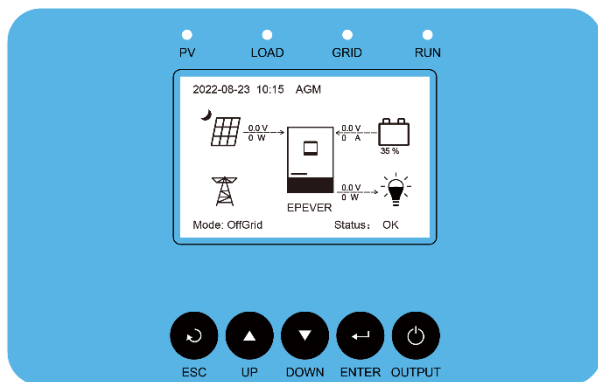
Note: The display screen can be viewed clearly when the angle between the end-user's horizontal sight and the display screen is within 90°. If the angle exceeds 90°, the information on the display screen cannot be viewed clearly.

3.1 Indicator

Indicator	Status	Instruction
PV	OFF	No PV input.
	Green ON	PV connection normal but no charging.
	Green flashing	PV charging normally.
	Red ON	PV charging fault.
LOAD	OFF	No inverter output.
	Green flashing	Inverter output is normal.
	Green ON	Utility supplying the load.
	Red ON	Inverter fault.
GRID	OFF	No utility input.
	Green ON	Utility connection normal but no working.
	Green flashing	Utility charging the battery or supplying the load.
	Yellow ON	The actual Utility voltage does not meet the Utility work voltage range for the first power-on.
	Red ON	Utility charging fault.
RUN	Green flashing	Normal communication.
	Red flashing	Communication fault.

3.2 Buttons

Buttons	Operation	Instruction
ESC	Click	• Exit the current interface. • Switch from the "home screen" to the "Main Table Data Information" screen.
UP / DOWN	Click	• Click on the parameter browse interface to scroll up or scroll down. • Click on the parameter setting interface to increase or decrease the parameter per step size.
	Press and hold	Press and hold on the parameter setting interface to increase or decrease the parameter per ten times the step size.
ENTER	Click	• Click on the parameter browse interface to enter the parameter setting interface. • Confirm the setting parameter.
	Press and hold	Press and hold on the home screen to enter the password interface. After verifying the password, enter the browse interface of setting parameters.
OUTPUT	Click	• Click on the home screen to turn on/off the DC output (5V/3A port, 100W PD port etc.). • Click on the time or password setting interface to move the cursor left.
	Press and hold	Press and hold on the home screen to turn on/off the inverter output, the utility charging, or the utility bypass.

3.3 Interface

3.3.1 Real-time data interface

After powering on the energy storage system, the home screen shows up. Click the "ENTER" button to enter the real-time data screen. Click the "ENTER" button to enter the next real-time interface, or click the "ESC" button to return the home screen.

1. Home Screen

2022-08-23 10:15   AGM

0.0 V
0 W

0.0 V
0 A

0.0 V
0 W

35 %

EPEVER

Mode: OffGrid   Status： OK

Press ESC

Press ENTER

2. "PV DATA" Screen

```
PV DATA
PV Voltage------  0.0V
PV Voltage------  0.0V
PV Power         0 W



          Page  1/ 2 Pages   NEXT
```

Press ENTER

3. "BAT DATA" Screen

Press ESC

```
BAT DATA
BAT Volt--------  26.8V
BAT Current------ -0.9 A
BAT SOC----------  98 %
BAT Type--------- AGM
MaxBatVolt-------  27.7V
MinBatVolt        26.9V
BatChgeStatus
          Page  1/ 2 Pages   NEXT
```

Press ENTER

4. "UTILITY DATA" Screen

Press ESC

```
UTILITY DATA
Utility Volt-----  0.0V
Current----------  0.0A
Frequency--------  0.0Hz
UtilityPower      0 W


          Page  1/ 2 Pages   NEXT
```

Press ENTER

5. "LOAD DATA" Screen

Press ESC

```
LOAD DATA
InverterCurrent--  0.0A
OutputFrequency--  50.0Hz
TransformerTemp-- 27.9 ℃
Active Power-----  8 W
Apparent Power--- 107 VA
LoadVoltage------  219.2V
          Page  1/ 3 Pages   NEXT
```

Press ENTER

6. "DEVICE DATA" Screen

Press ESC

```
DEVICE DATA
Product Type-----
      HPS2522-AL0315
SF_LCD Ver-------  1.06

SF_DCP Ver-------  1.10


          Page  1/ 3 Pages   NEXT
```

Press ENTER

3.3.2 User interface

After powering on the energy storage system, the home screen shows up. Click the "ESC" button to enter the "Main Table Data Information" screen. Click the "ENTER" button to enter the next interface, or click the "UP/DOWN" button to browse the current screen display.

1. Home Screen

2. "Main Table Data Information" Screen

3. "Sys Status" Screen

4. "Real DataList" Screen

5. "User DataSetup" Screen
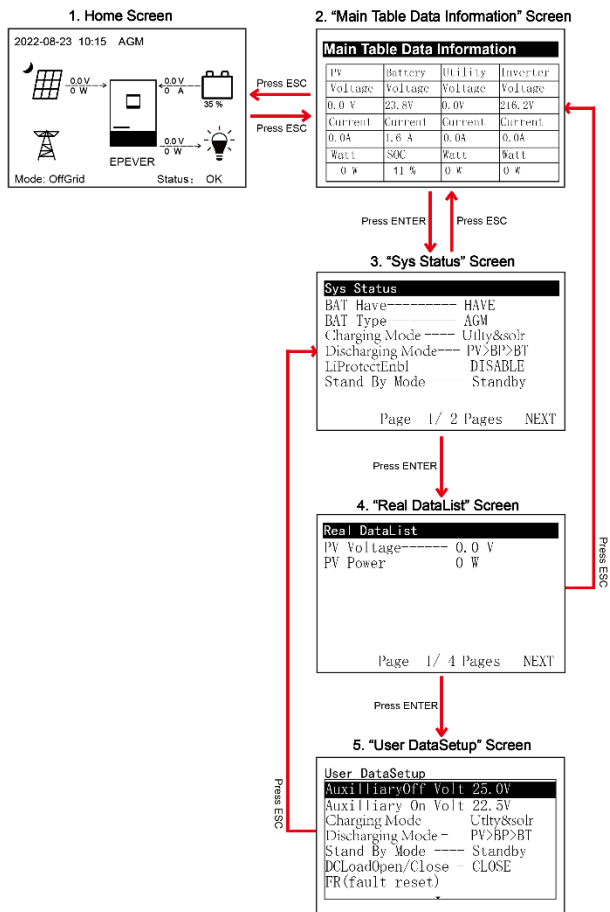
> **Home screen**
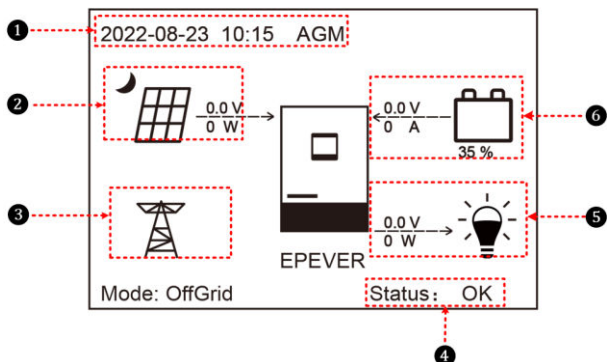
No.	Instruction
❶	Display the system time, current battery type, and charging stage★. When the BMS communication is normal, the BMS is shown on the far right.
❷	PV icon: ⛅⊞ PV connection is normal. 🌙⊞ No PV connection (or at night).
	Max. PV voltage / total PV power
❸	Utility icon: ~🗼 Utility connection is normal. 🗼 No utility connection.
	Utility input voltage / Utility input power
❹	System working mode: idle, start, ready, off-grid, on-grid, bypass.
❺	Status: When there are no faults, it displays "OK." When faults occur, it displays the minimum fault code. Note: On the home screen, click the "UP/DOWN" button to select the "Status" bar, and click the "ENTER" button to check the detailed fault.
❻	Load icon: 💡 AC output is normal. 🔦 No AC output.
	AC output voltage / AC output power
❼	Battery status: ◄------- The battery is discharging. -------► The battery is being charged.
	Battery voltage / battery current / lithium battery real-time SOC (It displays the current battery SOC when there is no lithium battery)

★ When the PV array charges the battery, the equalizing charging is performed on the 28th of each month by default (the date can be modified).

> **"User Data Setup" interface**

The end-users can modify common parameters on the "User Data Setup" interface without inputting the password. The default parameters and setting range refer to chapter 3.4.3 Parameters list.

3.3.3 Administrator interface

After powering on the energy storage system, the home screen shows up. Press and hold the "ENTER" button to enter the password interface. Input the password correctly to check all parameters or modify them.
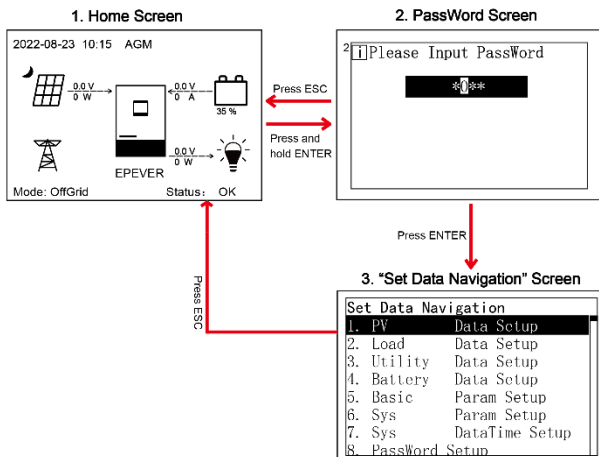
3.4 Parameters setting

3.4.1 Time setting
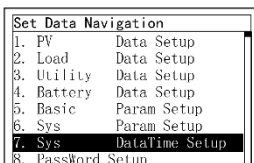
Enter the "Set Data Navigation" interface according to chapter 3.3.3 Administrator interface. Then click the "UP/DOWN" button to select "7 Sys Data Time Setup", and click the "ENTER" button to enter the system time setting interface. On the system time setting interface, click the "ENTER" button to move right, click the "OUT PUT" button to move left, and click the "UP/DOWN" button to adjust the value. After the time setting is completed, move the cursor back to the first digit and click the "ENTER" to confirm. The system time will be updated if the setting value complies with the range.

3.4.2 Password modifying
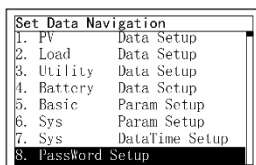
```
Set Data Navigation
1. PV       Data Setup
2. Load     Data Setup
3. Utility  Data Setup
4. Battery  Data Setup
5. Basic    Param Setup
6. Sys      Param Setup
7. Sys      DataTime Setup
8. PassWord Setup
```

Enter the "Set Data Navigation" interface according to chapter 3.3.3 Administrator interface. Then click the "UP/DOWN" button to select "8 Pass Word Setup", and click the "ENTER" button to enter the password modifying interface. Click the "ENTER" button to move right, click the "OUT PUT" button to move left, and click the "UP/DOWN" button to adjust the value. After the password is modified, move the cursor back to the first digit and click the "ENTER" button to confirm.

Note: The default password is "0000", which is set to prevent non-professional operations. Please memorize the new password after modifying it. If forgetting the password, press and hold the "OUT PUT" button on the password inputting page; the password will be automatically reset to "0000."

3.4.3 Parameters list
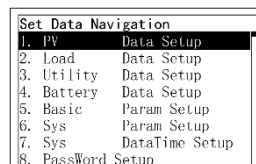
```
Set Data Navigation
1. PV       Data Setup
2. Load     Data Setup
3. Utility  Data Setup
4. Battery  Data Setup
5. Basic    Param Setup
6. Sys      Param Setup
7. Sys      DataTime Setup
8. PassWord Setup
```

Enter the "Set Data Navigation" interface according to chapter 3.3.3 Administrator interface. Then click the "UP/DOWN" button to select navigation 1~9 for detail settings. Default parameters and setting ranges are shown in the following table.

Note: On the parameter setting interface, click the "UP/DOWN" button to increase/decrease the parameter value by one step size (step size is the minimum unit to modify the parameter). Press and hold the "UP/DOWN" button to increase/decrease the parameter value by ten times the step size. Press the "ENTER" button to confirm.

Parameters	Default	User define
1. PV Data Setup		
UnderVolProtect (PV Under Voltage Protect Voltage)	30.0V	Read-only
UnderVoltRecover (PV Under Voltage Recover Voltage)	35.0V	Read-only
2. Load Data Setup		
OutputVoltLevel (Output voltage level)	220.0V	User define: 220.0~230.0V, step size: 0.1V
Output Frequency	50Hz	User define: 50Hz / 60Hz
3. Utility Data Setup		
OverVoltDisconect (Utility over voltage disconnect voltage)	285.0V	User define: (Utility over voltage reconnect voltage +10V)~295.0V, step size: 0.1V

Parameters	Default	User define
OverVoltReconnect (Utility over voltage reconnect voltage)	275.0V	User define: 235.0V～(Utility over voltage disconnect voltage-10V), step size: 0.1V
Low Volt Disconct (Utility low voltage disconnect voltage)	176.0V	User define: 176.0V～(Utility low voltage reconnect voltage-10V), step size: 0.1V
LowVolt Reconnect (Utility low voltage reconnect voltage)	186.0V	User define: (Utility low voltage disconnect voltage+10V)～200.0V, step size: 0.1V
OverFreqDisconnect (Utility over frequency disconnect)	65.0Hz	User define: (Utility under frequency disconnect+0.5Hz)～65.0Hz, step size: 0.1Hz
UnderFreqDisconct (Utility under frequency disconnect)	45.0Hz	User define: 45.0Hz～(Utility over frequency disconnect-0.5Hz), step size: 0.1Hz
MaxUtiltyInCurent (Max. Utility input current)	14.9A	User define: 0～16.0A, step size: 0.1A (HPS2522-AL0315)
	9.6A	User define: 0～11.0A, step size: 0.1A (HPS1522-AL0210)
	6.7A	User define: 0～8.0A, step size: 0.1A (HPS1022-AL0210)
4. Battery Data Setup		
BAT Set Mode (Battery set mode)	Expert	Smart, Expert
BAT Capacity (Battery capacity)	120.0AH	User define: 0～600AH, step size: 0.1AH (HPS2522-AL0315)
	70.0AH	User define: 0～600AH, step size: 0.1AH (HPS1522-AL0210)
	55.0AH	User define: 0～600AH, step size: 0.1AH (HPS1022-AL0210)
EqualizeTime (Battery equalize charging time)	120 Min	User define: 10～180Mins, step size: 1Min
Boost Time (Battery boost charging time)	120 Min	User define: 10～180Mins, step size: 1Min
T/C mV/℃/2V (Battery temperature compensate coefficient)	3	User define: 0～9, step size: 1
AuxiliaryOff Volt (Auxiliary module Off voltage)	25.0V	User define: 21.4～30.0V, step size: 0.1V **Note: (Auxiliary module ON voltage+0.2*N) ≤ Auxiliary module Off voltage ≤ Charging limit voltage (N=Rated battery voltage/12)**

Parameters	Default	User define
Auxiliary On Volt (Auxiliary module ON voltage)	22.5V	User define: 21.0～29.6V, step size: 0.1V **Note: Low voltage disconnect voltage ≤ Auxiliary module ON voltage ≤ (Auxiliary module Off voltage-0.2*N) (N=Rated battery voltage/12)**
MaxCharginCurrent (Battery Max. charging current)	30.0A	User define: 0～30.0A, step size: 0.1A (HPS2522-AL0315)
	21.0A	User define: 0～21.0A, step size: 0.1A (HPS1522-AL0210)
	16.5A	User define: 0～16.5A, step size: 0.1A (HPS1022-AL0210)
LimitDisChgCurrt (Battery limit discharging current)	200.0A	User define: 10.0～1000.0A, step size: 0.1A
SOC BAT Capacity (SOC Battery Capacity)	0%	User define: 0～100%, step size: 1%
Charge low temperature limit	0℃	User define: -30～10℃, step size: 0.1℃
Discharge low temperature limit	-20.0℃	User define: -30～10℃, step size: 0.1℃
BATOverTemp (Battery over temperature protect)	55.0℃	User define: (Battery over temperature protect recover +5℃)～60℃, step size: 0.1 ℃
BATOverTempRecovr (Battery over temperature protect recover)	50.0℃	User define: 20℃～(Battery over temperature protect -5℃), step size: 0.1 ℃
Equalize Date	28	User define: 1～ 28, step size: 1
Manual Equalize	OFF	OFF, ON
Reset Soc Calculate	--	RESET
Reset Self Study AH	--	RESET
5. Basic Param Setup		
BAT Have (Battery have or not)	HAVE	Read-only
Charging Mode	Utly & solr	Solar, Solar prior, Utly & solr(Utility & solar), Utltyprior (Utility priority). **Note: After setting, restart the energy storage system.**
Discharging Mode	PV>BP>BT	PV>BP>BT PV>BT>BP BP>PV>BT **Note: After setting, restart the energy storage system.**
LiProtectEnbl (Lithium battery protection enable)	DISABLE	DISABLE, ENABLE

Parameters	Default	User define
PV Mode	ALL SINGLE	Auto, ALL SINGLE, ALL MULTIPLE, 12M3S, 13M2S, 23M1S **Note: Only the "ALL SINGLE" mode is valid.**
Stand By Mode	Normal	Standby, Normal
Equalize Enable	DISABLE	DISABLE, ENABLE
DC Load Open/Close	OPEN	CLOSE, OPEN
Calibration Mode	OFF	OFF, ON
Return Factory Set (Return to the factory settings)	--	Factory Set (After setting the "Stand By Mode" as "Standby," all settings except the history faults can be restored to the factory state.)
FR (fault reset)	--	CLEAR
Load Open/Close	OPEN	CLOSE, OPEN
Invert Open/Close (Inverter Open/Close)	OPEN	CLOSE, OPEN
PV Charge Open/Close	OPEN	CLOSE, OPEN
AC Charge Open/Close	OPEN	CLOSE, OPEN
Charge Enable	OPEN	CLOSE, OPEN
Discharge Enable	OPEN	CLOSE, OPEN
ClearAccum Energy (Clear accumulated energy)	--	CLEAR POWER
6. Sys Param Setup		
Back Light Time	Always	6S, 30S, 60S, Always
Buzzer Alert	ON	OFF, ON
BckLightOnOff (Back Light On/Off)	ON	OFF, ON
Baud Rate	115200	115200, 4800, 9600, 19200, 38400, 57600
Address	1	User define: 1～254, step size: 1
Remote Com Method	4G	BLUE, 4G, WIFI, BLUE&4G, 4G&WIF, WIFI&BLUE **Note: Only the "4G", "WIFI", and "4G&WIFI" are valid.**
Language	ENGLISH	ENGLISH, CHINESE
Blue Valid	INVALID	INVALID, VALID
Temperature Unit	℃	℃, ℉
BMS Valid/Invalid	INVALID	INVALID, VALID
BMS Protocol	0	User define: 0～240, step size: 1
BMS Com Method	RS485	RS485, CAN
Led Switch	OPEN	OPEN, CLOSE

Parameters	Default	User define
BMS Param Valid	INVALID	INVALID, VALID
Note: The Bluetooth and BMS function are not supported currently. Thus, parameters of Bluetooth and BMS are invalid.		
7. Sys DataTime Setup (See chapter 3.4.1)		
8. Password Setup (See chapter 3.4.2)		
9. Bat Control Data Setup (Set the "BAT Set Mode" as "Smart" first)		
BAT Set Mode (Battery set mode)	Smart	Read-only
System voltage level	24V	Read-only
Battery Type	AGM	**24V battery type**: AGM, GEL, FLD, LFP8S, LNCM6S, LNCM7S
BoostCharginVolt (Boost charging voltage)	28.8V	Read-only **Note: They are determined by the battery type and cannot be modified.**
FloatChagingVolt (Float charging voltage)	27.6V	
LowVoltReconect (Low voltage reconnect voltage)	25.2V	
LowVoltDisconect (Low voltage disconnect voltage)	21.0V	
9. Bat Control Data Setup (Set the "BAT Set Mode" as "Expert" first)		
BAT Set Mode (Battery set mode)	Expert	Read-only
System voltage level	24V	Read-only
Battery type	AGM	**24V battery type**: AGM, GEL, FLD, LFP8S, LNCM6S, LNCM7S
OverVoltDiscnect (Over voltage disconnect voltage)	32.0V	User define: (Charging limit voltage) ~ 17*N, step size: 0.1V **Note: N=Rated battery voltage/12.**
Charging Limit Volt (Charging limit voltage)	30.0V	User define: (Equalize charging voltage) ~ (Over voltage disconnect voltage), step size: 0.1V
OverVoltReconect (Over voltage reconnect voltage)	30.0V	User define: 9* N~ (Over voltage disconnect voltage - 0.1*N), step size: 0.1V **Note: N=Rated battery voltage/12.**
EqualizeChagVolt (Equalize charging voltage)	29.2V	User define: (Boost charging voltage) ~ (Charging limit voltage), step size: 0.1V
BoostCharginVolt (Boost charging voltage)	28.8V	User define: (Float charging voltage) ~ (Equalize charging voltage), step size: 0.1V
FloatChagingVolt (Float charging voltage)	27.6V	User define: (Boost voltage reconnect voltage) ~ (Boost charging voltage), step size: 0.1V

Parameters	Default	User define
BoostRecnectVolt (Boost voltage reconnect voltage)	26.4V	User define: (Low voltage reconnect voltage) ~ (Float charging voltage), step size: 0.1V
LowVoltReconect (Low voltage reconnect voltage)	25.2V	User define: (Low voltage disconnect voltage) ~ (Boost voltage reconnect voltage), step size: 0.1V
UndrVltWarnRecvr (Under voltage warning recover voltage)	24.4V	User define: (Under voltage warning voltage + 0.1*N) ~ (Low voltage reconnect voltage), step size: 0.1V **Note: N=Rated battery voltage/12.**
UnderVolt Warn (Under voltage warning voltage)	24.0V	User define: (Discharging limit voltage) ~ (Under voltage warning recover voltage - 0.1* N), step size: 0.1V **Note: N=Rated battery voltage/12.**
LowVoltDisconect (Low voltage disconnect voltage)	21.0V	User define: (Discharging limit voltage) ~ (Low voltage reconnect voltage), step size: 0.1V
DischrgeLimitVolt (Discharging limit voltage)	20.0V	User define: "N*9 ≤ Discharging limit voltage < Under voltage warning voltage" and "Discharging limit voltage < Low voltage disconnect voltage", step size: 0.1V **Note: N=Rated battery voltage/12.**

3.4.4 Battery voltage control parameters (Smart)

After setting the "BAT Set Mode" as "Smart," the battery voltage control parameters are determined by the battery type and cannot be modified. To modify them, set the "BAT Set Mode" as "Expert" first.

3.4.5 Battery voltage control parameters (Expert)

After setting the "BAT Set Mode" as "Expert," all battery voltage control parameters can be modified.

Lead-acid battery voltage control parameters

The parameters are measured in the condition of 24V/25 ºC.

Battery Type Voltage control parameters	AGM	GEL	FLD	User define
Over Voltage Disconnect Voltage	32.0V	32.0V	32.0V	21.2~32.0V
Charging limit voltage	30.0V	30.0V	30.0V	21.2~32.0V
Over Voltage Reconnect Voltage	30.0V	30.0V	30.0V	21.2~32.0V
Equalize Charging Voltage	29.2V	--	29.6V	21.2~32.0V
Boost Charging Voltage	28.8V	28.4V	29.2V	21.2~32.0V
Float Charging Voltage	27.6V	27.6V	27.6V	21.2~32.0V

Boost Voltage Reconnect Voltage	26.4V	26.4V	26.4V	21.2~32.0V
Low Voltage Reconnect Voltage	25.2V	25.2V	25.2V	21.2~32.0V
Under Voltage Warning Recover Voltage	24.4V	24.4V	24.4V	21.2~32.0V
Under Voltage Warning Voltage	24.0V	24.0V	24.0V	21.2~32.0V
Low Voltage Disconnect Voltage	22.2V	22.2V	22.2V	21.2~32.0V
Discharging Limit Voltage	21.2V	21.2V	21.2V	21.2~32.0V

The following rules must be obeyed when setting the Lead-acid battery voltage control parameters.

A. Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Voltage Reconnect Voltage

B. Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage

C. Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage

D. Under Voltage Warning Recover Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage

E. Boost Voltage Reconnect Voltage > Low Voltage Reconnect Voltage
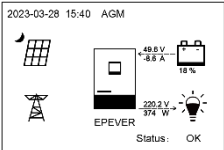
4 Working modes

4.1 Abbreviation

Abbreviation	Instruction
P_{PV}	PV power
P_{LOAD}	Load power
V_{BAT}	Battery voltage
LVD	Low Voltage Disconnect Voltage
LVR	Low Voltage Reconnect Voltage
LED	Low Energy Disconnect SOC
LER	Low Energy Disconnect Recover SOC
AOF	Auxiliary module OFF voltage (namely, Utility charging OFF voltage)
AON	Auxiliary module ON voltage (namely, Utility charging ON voltage)
UCF	Utility Charging OFF SOC
UCO	Utility Charging ON SOC
MCC	Battery Max. Charging Current
SOC	The battery charging state, which indicates the ratio of the current storage capacity dividing the maximum storage capacity. This value is automatically read from the BMS and displayed on the "BAT DATA" screen.
PV>BP>BT	Discharging Mode: PV>Bypass>Battery
PV>BT>BP	Discharging Mode: PV>Battery>Bypass
BP>PV>BT	Discharging Mode: Bypass>PV>Battery

4.2 Working modes

4.2.1 Scenario A: Both PV and Utility are not available.

	Regardless of the input and output sources, the working mode is as follows.
（A） PV ❌ Utility ❌	 $V_{BAT} \geq LVR$ / SOC ≥ LER $V_{BAT} \leq LVD$ / SOC ≤ LED	❶Any of the following is satisfied, the battery supplies the load. • The battery voltage is greater than or equal to the **LVR** value. • The battery SOC is greater than or equal to the **LER** value.

	❷Any of the following is satisfied, the battery stops supplying the load. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.

CAUTION	• Set the "Charge Control Mode" as "VOLT"; the working mode is determined by the battery voltage. • Set the "Charge Control Mode" as "SOC," the working mode is determined by the battery SOC. The battery SOC value will be more accurate after several full charge-discharge cycles when the "Charge Control Mode" is set to "VOLT." • For setting the "Charge Control Mode", refer to chapter 3.4.3 Parameters list.

4.2.2 Scenario B: PV is available, but the Utility is not available.

	Regardless of the input and output sources, the working mode is as follows.
	❶ When the PV power is greater than the load power, the PV charges the battery and supplies extra power to the load.
	$P_{PV} > P_{LOAD}$　$P_{PV} \leq P_{LOAD}$
（B） **PV** ☑ **Utility** ☒	
	❷ When the PV power is lower than or equal to the load power, the PV will not charge the battery, the battery will cut in to supply power to the load together with the PV.
	$V_{BAT} \geq LVR$ / $SOC \geq LER$　$V_{BAT} \leq LVD$ / $SOC \leq LED$
	❸Any of the following is satisfied, the PV and the battery stop supplying power to the load. The PV charges the battery only. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.

4.2.3 Scenario C: Both PV and Utility are available.

	Charging Mode: "Solar"	**Discharging Mode: "PV>BP>BT" or "PV>BT>BP"**
	$P_{PV} > P_{LOAD}$ | $P_{PV} \le P_{LOAD}$	❶ When the PV power is greater than load power, the PV charges the battery and supplies extra power to the load.
（C-1） PV ☑ Utility ☑	$V_{BAT} \ge$ LVR / SOC≥ LER | $V_{BAT} \le$ LVD / SOC ≤ LED	❷ When the PV power is lower than or equal to the load power, the PV will not charge the battery, the battery will cut in to supply power to the load together with the PV.
		❸ Any of the following is satisfied, the Utility supplies power to the load and the PV charges the battery. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.
	Note: When the battery voltage is greater than or equal to the LVR value, or the battery SOC is greater than or equal to the LER value, the working mode returns to state❷ .	

	Charging Mode: "Solar"	Discharging Mode: "BP>PV>BT"
（C-2） PV ☑ Utility ☑		The Utility supplies power to the load, and the PV charges the battery.

	Charging Mode: "Solar prior"	Discharging Mode: "PV>BP>BT" or "PV>BT>BP"
（C-3） PV ☑ Utility ☑	 $P_{PV} > P_{LOAD}$ ⇕ $P_{PV} \leq P_{LOAD}$ $V_{BAT} \geq AOF$ / SOC≥ UCF ⇕ $V_{BAT} \leq AON$ / SOC ≤ UCO 	❶ When the PV power is greater than the load power, the PV charges the battery and supplies extra power to the load. ❷ When the PV power is lower than or equal to the load power, the PV will not charge the battery, the battery will cut in to supply power to the load together with the PV. ❸ Any of the following is satisfied, the Utility supplies power to the load and charges the battery together with the PV. • The battery voltage is lower than or equal to the **AON** value. • The battery SOC is lower than or equal to the **UCO** value.
	Note: When the battery voltage is greater than or equal to the **AOF** value, or the battery SOC is greater than or equal to the **UCF** value, the working mode returns to state❷.	

	Charging Mode: "<u>Solar prior</u>"	Discharging Mode: "<u>BP>PV>BT</u>"
（**C-4**） **PV** ☑ **Utility** ☑	 $P_{PV} > MCC*V_{BAT}$ ⤒ $P_{PV} \le MCC*V_{BAT}$ $V_{BAT} \ge AOF$ ⤒ $V_{BAT} \le AON$ / SOC ≥ UCF / SOC ≤ UCO 	❶ When the PV power is greater than the (**MCC***V_{BAT}), the Utility and PV supply power to the load, and the PV charges the battery at the same time. ❷ When the PV power is lower than or equal to the (**MCC***V_{BAT}), the Utility supplies power to the load and the PV charges the battery. ❸ Any of the following is satisfied, the Utility supplies power to the load and charges the battery together with the PV. • The battery voltage is lower than or equal to the **AON** value. • The battery SOC is lower than or equal to the **UCO** value.

Note: When the battery voltage is greater than or equal to the **AOF** value, or the battery SOC is greater than or equal to the **UCF** value, the working mode returns to state❷ **.**

（**C-5**） **PV** ☑ **Utility** ☑	Charging Mode: "Utly & solr"	Discharging Mode: Un-programmable
	  $P_{PV} > MCC*V_{BAT}$ ⤒ $P_{PV} \le MCC*V_{BAT}$	❶ When the PV power is greater than the (**MCC***V_{BAT}), the Utility and PV supply power to the load, and the PV charges the battery simultaneously.

	2023-03-28 17:08 AGM Boost 150.6 V / 464 W 56.6 V / 11.9 A 0 % 218.2 V / 1337 W 219.5 V / 1010 W ByPass Status： OK	❷ When the PV power is lower than or equal to the (**MCC***V_{BAT}), the Utility and PV charge the battery, and the Utility supplies power to the load.

	Charging Mode: "Utltyprior"	Discharging Mode: Un-programmable
（C-6） PV ☑ Utility ☑	2023-03-28 17:12 AGM Boost 47.9 V / 5.1 A 4 % 218.2 V / 1337 W 219.5 V / 1010 W ByPass Status： Err 50	The Utility supplies power to the load and charges the battery simultaneously.

4.2.4 Scenario D: The PV is not available, but the Utility is available.

	Charging Mode: "Solar"	Discharging Mode: "PV>BT>BP"
（D-1） PV ☒ Utility ☑	2023-03-28 17:40 AGM 48.1 V / -22.4 A 1 % 220.0 V / 1012 W EPEVER Status： OK $V_{BAT} \ge$ LVR / SOC $\ge$ LER $V_{BAT} \le$ LVD / SOC $\le$ LED 2023-03-28 17:41 AGM 43.6 V / 0.3 A 0 % 219.1 V / 1009 W 219.6 V / 1010 W ByPass Status： Err 05	❶Any of the following is satisfied, the battery supplies the load. • The battery voltage is greater than or equal to the **LVR** value. • The battery SOC is greater than or equal to the **LER** value. ❷ Any of the following is satisfied, the Utility supplies power to the load. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.

	Charging Mode: "Solar"	Discharging Mode: "PV>BP>BT" or "BP>PV>BT"
（D-2） PV ☒ Utility ☑	2023-03-28 17:43 AGM 50.9 V / -0.4 A 0 % 219.3 V / 1009 W 219.6 V / 1010 W ByPass Status： OK	The Utility supplies power to the load.

	Charging Mode: "Solar prior"	Discharging Mode: "PV>BT>BP"
（D-3） PV ❌ Utility ☑	 $V_{BAT} \geq$ AOF / SOC $\geq$ UCF ↑ ↑ $V_{BAT} \leq$ AON / SOC $\leq$ UCO 	❶Any of the following is satisfied, the battery supplies the load. • The battery voltage is higher than or equal to the **AOF** value. • The battery SOC is greater than or equal to the **UCF** value. ❷Any of the following is satisfied, the Utility supplies power to the load and charges the battery simultaneously. • The battery voltage is lower than or equal to the **AON** value. • The battery SOC is lower than or equal to the **UCO** value.

	Charging Mode: "Solar prior"	Discharging Mode: "PV>BP>BT" or "BP>PV>BT"
（D-4） PV ❌ Utility ☑	 $V_{BAT} \geq$ AOF / SOC $\geq$ UCF ↑ ↑ $V_{BAT} \leq$ AON / SOC $\leq$ UCO 	❶Any of the following is satisfied, the Utility supplies power to the load. • The battery voltage is greater than or equal to the **AOF** value. • The battery SOC is greater than or equal to the **UCF** value. ❷Any of the following is satisfied, the Utility supplies power to the load and charges the battery simultaneously. • The battery voltage is lower than or equal to the **AON** value. • The battery SOC is lower than or equal to the **UCO** value.

	Charging Mode: "Utly & solr" or "Utltyprior"	Discharging Mode: Un-programmable
（D-5） PV ☒ Utility ☑	2023-03-28 17:15 AGM Boost 48.9 V 4.7 A 3 % 219.2 V 1337 W 219.5 V 1008 W ByPass Status: OK	The Utility supplies power to the load and charges the battery simultaneously.

5 Protections

No.	Protections	Instruction
1	PV limit Current/Power	When the PV array's actual charging current/power exceeds its rated current/power, it will charge the battery as per the rated current/power.
2	PV short circuit	When the PV is not charging and short circuit, the energy storage system is not damaged.
3	PV reverse polarity	Fully protect against PV reverse polarity, correct the wire connection to resume normal operation. ⚠️CAUTION: If the PV open-circuit voltage + battery voltage ≥ the Max. PV open-circuit voltage, the energy storage system will be damaged.
4	Night reverse charging	Prevent the battery from discharging through the PV module at night.
5	Utility input overvoltage	When the utility voltage exceeds 285V, the utility stops charging the battery.
6	Utility input under-voltage	When the utility voltage is lower than 176V, the utility stops charging the battery and supplying the load.
7	Utility over current	① When the actual Utility current triggers the protection strategy of the "AC input overload relay", the "AC input overload relay" is disconnected. The Utility input is recovered after the user reset the "AC input overload relay" manually. ② When the actual Utility current exceeds 2.4 times the rated Utility input current, the switch between the Utility and the load is disconnected immediately without the "AC input overload relay" protection. And then, the output is recovered automatically after a delay time of 5s, 10s, and 15s separately (less than three times recovery within 5 minutes, it will be recounted). The energy storage system stops working after the 4th protection and resumes working after restarting. When the Utility supplies the load and charges the battery, and the actual Utility current exceeds the "Max. Utility Input Current", the Utility charging current is decreased after the actual Utility input current reaches the setting value. The Utility will charge the battery at a current not exceeding the set value until the Utility charging current is decreased to 0A.

No.	Protections	Instruction
8	Battery polarity reverse	Fully protected against the battery polarity reverse; no damage will occur to the battery. Correct the miswire to resume operation. ⚠️**CAUTION: Limited to the characteristic of lithium battery, when the PV connection is correct and the battery connection reversed, the energy storage system will be damaged.**
9	Battery overvoltage	When the battery voltage goes higher than the [Over Voltage Disconnect Voltage], the energy storage system will stop charging the battery to protect the battery from being over-charged.
10	Battery over-discharge	When the battery voltage goes lower than the [Low Voltage Disconnect Voltage], the energy storage system will stop discharging the battery to protect the battery from being over-discharged.
11	Battery low/high temperature	The energy storage system reserves a battery temperature sensor port. The battery will stop discharging when its temperature is higher than 55℃ or lower than -20℃, and it will resume discharging when its temperature is normal for 20 minutes. The battery will stop charging when its temperature is higher than 40℃ or lower than 0℃, and it will resume charging when its temperature is normal for 20 minutes. This function ensures battery safety and extends the battery life.
12	Load output short circuit	The output is turned off immediately in the occurrence of short-circuiting. And then, the output is recovered automatically after a delay time of 5s, 10s, and 15s separately (less than three times recovery within 5 minutes, it will be recounted). The energy storage system stops working after the 4th protection and can resume working after resetting or restarting. Clear the fault in time because it may damage the energy storage system.

No.	Protections	Instruction		
		Load power	**Working time**	**Note**
13	Load output overload(HPS1 022-AL0210)	810W<P_{Load}≤900W	2 hours[1]	The energy storage system performs the protection action after reaching the working time. And then, it will recover the load output after a delay time. The energy storage system stops working after the 4th protection and can resume working after resetting or restarting. [1] Recover the load output after a delay time of 10 minutes. [2] Recover the load output after a delay time of 5 minutes. [3] Recover the load output after a delay time of 5S, 10S, and 15S.
		900W<P_{Load}≤1080W	30 minutes[1]	
		1080W<P_{Load}≤1200W	10 minutes[2]	
		1200W<P_{Load}≤1350W	2 minutes[2]	
		1350W<P_{Load}≤1725W	5 seconds[2]	
		P_{Load}>1725W	Immediately[3]	
	Load output overload(HPS1 522-AL0210)	**Load power**	**Working time**	
		1050W<P_{Load}≤1350W	2 hours[1]	
		1350W<P_{Load}≤1550W	30 minutes[1]	
		1550W<P_{Load}≤1750W	10 minutes[2]	
		1750W<P_{Load}≤1850W	2 minutes[2]	
		1850W<P_{Load}≤2300W	5 seconds[2]	
		P_{Load}>2300W	Immediately[3]	
	Load output overload(HPS2 522-AL0315)	**Load power**	**Working time**	
		2100W<P_{Load}≤2300W	2 hours[1]	
		2300W<P_{Load}≤2600W	30 minutes[1]	
		2600W<P_{Load}≤3100W	10 minutes[2]	
		3100W<P_{Load}≤3600W	2 minutes[2]	
		3600W<P_{Load}≤4600W	5 seconds[2]	
		P_{Load}>4600W	Immediately[3]	
14	Device overheating	When the internal temperature overheats, the energy storage system will stop charging/discharging. The energy storage system will resume charging/discharging when the internal temperature is normal for more than 20 minutes.		

6 Troubleshooting

6.1 Battery faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	Bat Error (Battery error)	Err 05	No indicator (The inverter error accompanies the battery error.)	--	This fault will not appear alone, it appears together with one or more faults in the "Battery faults" table, please refer to the solution of other faults.
2	BatOC (Battery over current)	Err 36		--	Check that the battery actual charging and discharging current does not exceed the setting values of "Battery Max. charging current " and "Battery limit discharging current."
3	BatOT (Battery over temperature protect)	Err 52		Intermittent beeps for 20S	Ensure the energy storage system is installed in a cool and well-ventilated place. It resumes normal work when the battery cools down to below the "Battery over temperature protect recover."
4	BatOV (Battery over-voltage)	Err 55		--	Disconnect the utility and PV sides, and check whether the extension battery voltage is too high. Or check if the "over voltage disconnect voltage" setting value is too low.
5	BatOverDischarge (Battery over dischage)	Err 56		Intermittent beeps for 20S	After connecting the PV or Utility, charging the battery above the "low voltage reconnect voltage" can solve the problem. **Note: If the battery is deeply over-discharged (below 20V) without PV access, the Utility will not be able to charge the battery. Please contact the agency or our technical support.**

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the

"Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

6.2 PV faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	PV Error	Err 00	PV indicator red on	--	This fault will not appear alone, it appears together with one or more faults in the "PV faults" table, please refer to the solution of other faults.
2	PV OC (PV1 over current)	Err 21		--	Please check whether the PV actual input power exceeds the PV maximum input power.
3	PVConnectReverse (PV connect reverse)	Err 64		Intermittent beeps for 20S	Please check the PV input polarity and connect the PV terminal according to the identification.
4	PVOV (PV input over-voltage)	Err 65		Intermittent beeps for 20S	Please check whether the PV actual input voltage exceeds the PV maximum input voltage.
5	PVOCS (PV soft over current)	Err 66		--	Please check whether the PV actual input power exceeds the PV maximum input power.

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

6.3 Inverter faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	Inv Error (Inverter error)	Err 04	LOAD indicator red on	--	This fault will not appear alone, it appears together with one or more faults in the "Inverter faults" table, please refer to the solution of other faults.
2	InvLVSft_OC (Inverter low voltage soft over current)	Err 33		--	Check if the load actual power exceeds the rated power (namely, the energy storage system's "Inverter Rated Power"), disconnect the load completely and turn off the energy storage system. Wait 5 minutes and then turn on the energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support.
3	Inv_LV OC (Inverter low voltage over current)	Err 19		Intermittent beeps for 20S	
4	InvSft_OC (Inverter output soft over current)	Err 35		Intermittent beeps for 20S	
5	InvOutOV (Inverter output over-voltage)	Err 45		Intermittent beeps for 20S	Disconnect the load completely and turn off the energy storage system. Wait 5 minutes and then turn on the energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support.
6	InvAcOverLoad (Inverter AC output overload)	Err 49		Intermittent beeps for 20S	Check if the load actual power exceeds the rated power (namely, the energy storage system's "Inverter Rated Power"), disconnect the load completely and turn off the energy storage system. Wait 5 minutes and then turn on the

| 7 | InvOutUV (Inverter output under voltage) | Err 76 | | Intermittent beeps for 20S | energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support. |

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

6.4 Utility faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	Utility Error	Err 06	GRID indicator red on	--	This fault will not appear alone, it appears together with one or more faults in the "Utility faults" table, please refer to the solution of other faults.
2	UtilitySft_OC (Utility soft over current)	Err 32	LOAD indicator red on	Intermittent beeps for 20S	Check if the load actual power exceeds the rated power (namely, the energy storage system's "Inverter Rated Power"), disconnect the load completely and turn off the energy storage system. Wait 5 minutes and then turn on the energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support.
3	UtilityOverLoad (Utility overload)	Err 38	GRID indicator red on	Intermittent beeps for 20S	
4	UtilityOverVolt (Utility over-voltage)	Err 40		--	Check whether the Utility actual input voltage is normal (i.e. within the Utility working voltage range).

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
5	UtilityUnderVolt (Utility under voltage)	Err 41		--	
6	UtilityOverFreq (Utility over frequency)	Err 42		--	Check whether the Utility actual input frequency is normal (i.e. within the Utility working frequency range).
7	UtilityUnderFreq (Utility under frequency)	Err 43		--	

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

6.5 Load faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	Load Error	Err 07		--	This fault will not appear alone, it appears together with one or more faults in the "Load faults" table, please refer to the solution of other faults.
2	Load_ OV (Load over-voltage)	Err 16	LOAD indicator red on	Intermittent beeps for 20S	Disconnect the load completely and turn off the energy storage system. Wait 5 minutes and then turn on the energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support.
3	LoadOV (Load over-voltage)	Err 46		Intermittent beeps for 20S	

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

6.6 Others

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	TZError	Err 25	LOAD indicator red on	--	Check whether the load is short-circuited, or if the actual output power exceeds the allowable output power, or whether the battery actual input voltage exceeds the allowable input range.
2	Heat Sink OT (Heat sink over temperature protect)	Err 48		Intermittent beeps for 20S	Ensure the energy storage system is installed in a cool and well-ventilated place.
3	Environment OT (Environment over temperature protect)	Err50		Intermittent beeps for 20S	Please operate the energy storage system in the allowed temperature range.
4	UdcOV (Udc over-voltage)	Err 37		--	Disconnect the utility and PV sides, and check whether the extension battery voltage is too high. Or check if the "over voltage disconnect voltage" setting value is too low.
5	TransfromerOT (Transformer over temperature)	Err 60		--	Ensure the energy storage system is installed in a cool and well-ventilated place.

| 6 | ParamSetError (Parameter set error) | Err 57 | -- | -- | After resetting the device to its factory settings, reset the operating parameters as required before running. |
| 7 | DspComError (DSP communication error) | Err 58 | RUN indicator red flashing | -- | Restart the energy storage system to check if it resumes normal. If it is still abnormal, please contact the agency or our technical support. |

① The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

② Set the "Buzzer Alert" parameter as "ON", the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "Buzzer Alert" parameter is set as "OFF," the buzzer will not beep even if there is an error. **Note: The "Buzzer Alert" parameter is "ON" default.**

7 Maintenance

The following inspections and maintenance tasks are recommended at least twice yearly for best performance.

- Make sure no block on airflow around the energy storage system. Clear up dirt and fragments on the radiator.

- Check all the wired cables to ensure insulation is not damaged for serious solarization, frictional wear, dryness, insects or rats, etc. Repair or replace some wires if necessary.

- Check and confirm that LED or LCD is consistent with the required. Pay attention to any troubleshooting or error indication. Take necessary corrective action.

- Confirm that all the terminals have no corrosion, insulation damage, high temperature, or burnt/discolored sign. Tighten terminal screws to the suggested torque.

- Check for dirt, nesting insects, and corrosion. If so, clear up in time.

- Check and confirm that the lightning arrester is in good condition. Replace a new one in time to avoid damaging the energy storage system and other equipment.

- If the energy storage system is not used for a long time; please full charge the battery, and then, disconnect the battery circuit breaker. Charge and discharge the battery every 3-6 months.

- If you need to replace the built-in battery, please operate under the guidance of professional personnel.

⚡ **WARNING**	Risk of electric shock! Turn off all the power before the above operations and follow the corresponding inspections and operations.

8 Specifications

Model		HPS1022-AL0210	HPS1522-AL0210	HPS2522-AL0315
Utility input	Utility Rated Voltage	220VAC		
	Utility Voltage	176VAC~285VAC		
	Uitility Frequency	45Hz-65Hz		
	Utility Maximum Work Current (Charging + Bypass)	2.2A for charging+4.5A for bypass@220VAC	2.8A for charging+6.8A for bypass@220VAC	3.5A for charging+11.4A for bypass@220VAC
	Switch Response Time	Switch Response Time – Utility to Inverter: <15ms Switch Response Time – Inverter to Utility: 0ms		
	AC Input Overload Relay	HAVE		
Inverter output	Inverter Rated Power (@25℃)	1000W	1500W	2500W
	5-second Transient Surge Output Power	1500W	2000W	4000W
	Inverter Output Voltage	220VAC±3%		
	Inverter Frequency	50Hz/60Hz±0.2%		
	Output Voltage Waveform	Pure sine wave		
	Output Voltage Harmonic Distortion Rate	≤3% (Resistive load)		
	Output Gradual Start	HAVE		
Solar controller	PV Maximum Input Withstand Voltage	95V	95V	145V
	PV Maximum Input Power	500W	600W	850W
	Solar Controller Type	MPPT		

	MPPT Maximum efficiency	＞99.5%		
	MPPT Voltage Range	30V~80V	30V~80V	30V~120V
	MPPT Input Channels	One way	One way	One way
	PV Maximum Charging Current	16.5A	21A	30A
Battery	Battery Type	GEL		
	Battery Rated Voltage	24VDC		
	Battery Work Voltage Range	21VDC -30VDC		
	Battery Work Temperature Range	Discharging Mode: -20℃ ~ 55℃; Charging Mode: 0℃ ~ 40℃		
	Battery Capacity	55Ah*2	70Ah*2	120Ah*2
DC output	DC 12V Port	12V/2A*2		
	USB-A Port	5V/3A*2		
	Type-C Port	100W PD3.0*1 5V/3A*1		
	DC Output Switch	HAVE		
Others	Work Temperature Range	-20℃~55℃ (when the environment temperature exceeds 25℃, the charging power and load power will be reduced appropriately; working of full load is not supported.)		
	Enclosure	IP20		
	Communication Method	RS485 (GRPS/ Bluetooth/ WiFi optional)		
	LCD	Monochrome LCD, English interface		
	Warranty	Two years		
	Dimension (Length x Width x Height)	255x406x541mm (with floor mats and handles)	288x449x586mm (with wheels and handles)	435x504x574.5mm (with wheels and handles)
	Net Weight	55kg	65kg	107kg

★Instruction for energy storage system actual output power reducing

1. The actual output power is reduced with the temperature: 25℃ to 45℃; the load will be reduced by 50W for each 1℃ increase. 45℃ to 55℃, the load will be reduced by 100W for each 1℃ increase.

2. The actual output power is reduced with the altitude: When the altitude height is over 2000m, the actual output power will be reduced by 300W for each 1000m increase.

Any changes without prior notice! Version number: V1.0

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