EnerSalvis

Energy Storage System

User Manual

3, 4, 5 kW

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Foreword

Thank you for purchasing ESS Series 3300/4000/5000.

We are a specialized manufacturer of power equipment, with years of experience in development and production. We hope that this equipment will facilitate smooth and error-free operation of your solar system for years to come. However, a power system with PV inverter is a complicated system and failures may occur. If you encounter any errors or malfunctions in the PV inverter or system, please call us or the local distributor. We will provide prompt assistance to solve your problems.

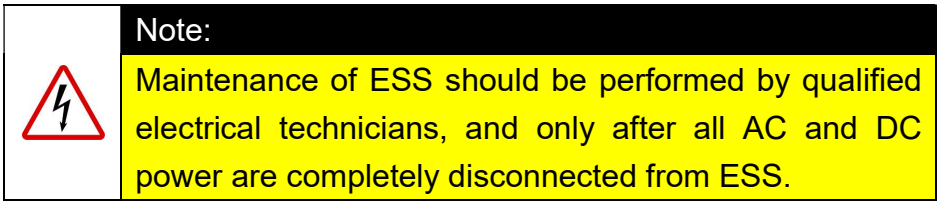
Please read this user manual carefully to ensure quick and correct installation of the equipment.

Safety Instructions

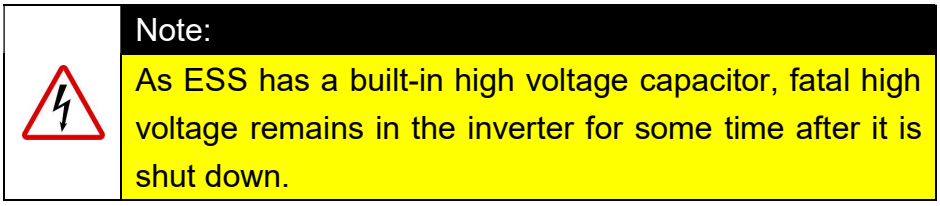
- Please read all the installation instructions in this ESS user manual before installing or maintaining your system.

- The ESS should be opened by qualified electrical technicians only.

- When the photovoltaic array is exposed to light, it supplies a d.c. voltage to the ESS.



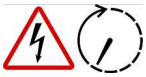
- ESS must be disconnected from the utility and make sure that there is no accidental connection with the utility. The PV array must also be disconnected with ESS.



- After the ESS is shut down and the utility and the PV array are disconnected from ESS, please wait for the internal capacitor to discharge before opening the unit for maintenance.

- Warning

  Warning label descriptions:

Symbol	Description
	Caution, Risk of electric shock!
	Caution, Danger!
	Caution, high temperature on surface! The temperature on the surface of the ESS case might exceed +70 °C.
 10min	Caution, Risk of electric shock! Residual energy release time!
	Please refer to the user manual!

- Repair and Maintenance

  ESS should be repaired by trained electrical technicians only.

- PV Array

  When installing and configuring the PV array, make sure that the PV array's rated voltage parameters which provided by the manufacturer could meet the applicable specifications. Make sure the open-circuit voltage of the PV array under intensive sun, with ambient temperature of -13°F (-25°C), does not exceed maximum withstanding voltage of EnerSolis (500Vdc). Voltage exceeding 500Vdc will cause permanent damage to ESS.

- Grid Connection

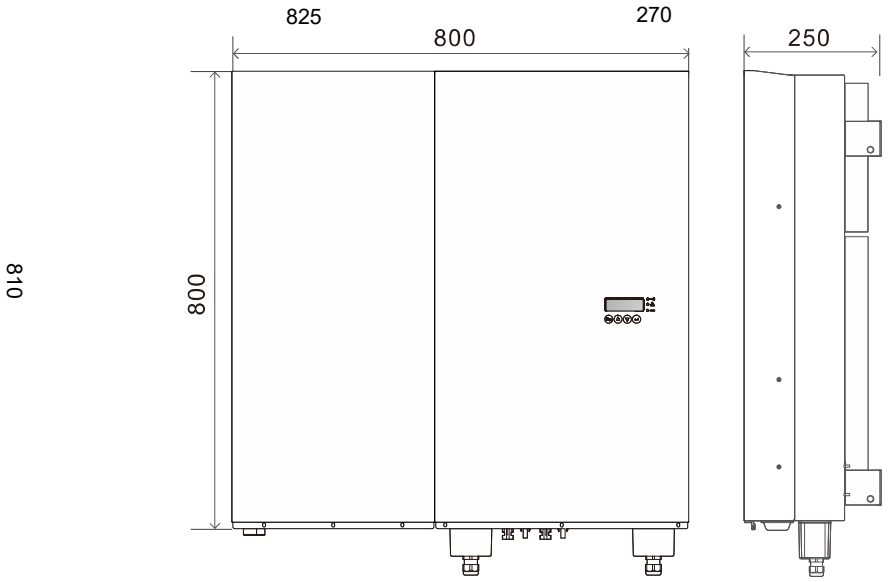
  Only the distributor whom has a licensed electrical engineer can install the PV inverter. To install and operate to the grid require the permission from the local power company. Please contact your local distributor for installation details.

1. Introduction

The Energy Storage System includes: Photovoltaic inverter(ESS-INV), battery cabinet (ESS-BAT) and smart meter (ESS-MET).

1-1.External Dimensions

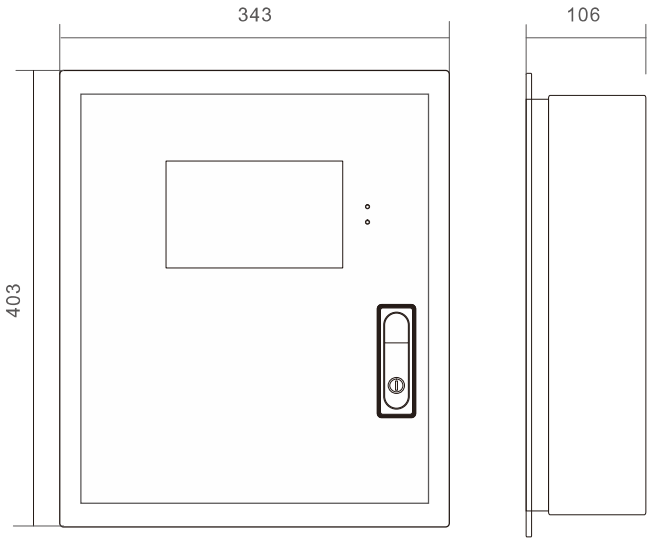
✓ Photovoltaic inverter(ESS-INV) equipped with a battery cabinet(ESS-BAT)



Unit:mm

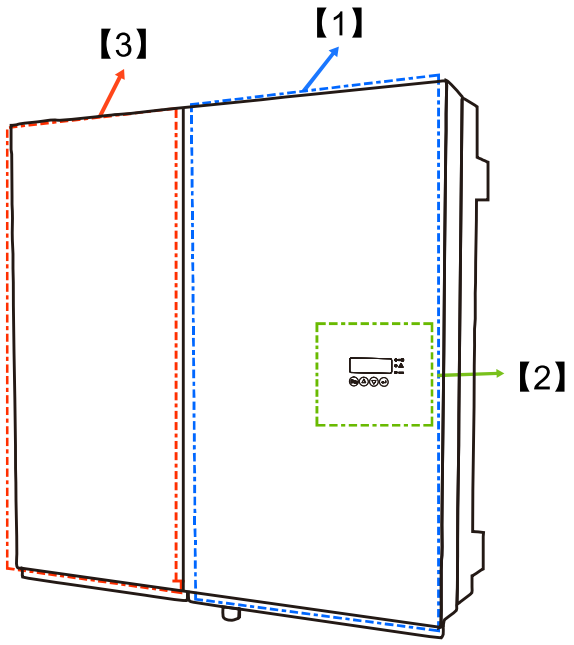
Model / Dimensions (mm)	ESS3300/ESS4000/ESS5000
Width(max.)	825
Height(max.)	810
Depth(max.)	270

✓ Smart meter (ESS-MET)



Model / Dimensions (mm)	ESS-MET
Width	343
Height	403
Depth	106

1-2.Equipment Description



【1】 Photovoltaic inverter (ESS-INV):

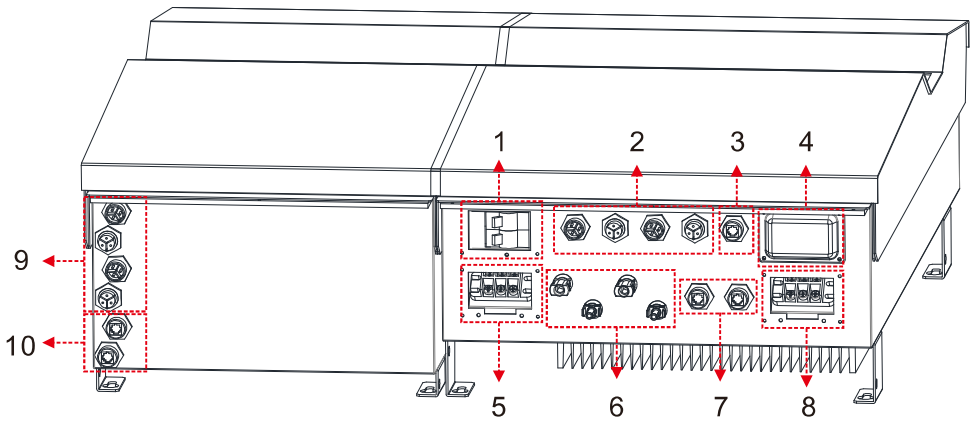
The photovoltaic inverter of the energy storage system not only can convert the power generated by the sun into utility grid, it can also control the charging/discharging functions of the battery to adjust the power flow of the solar system.

【2】 LCD display panel and LED indicators:

Displays operating information and status of the photovoltaic inverter.

【3】 Battery cabinet (ESS-BAT)

A standard battery **cabinet** is equipped with 6kWh battery, and allows a maximum of two battery cabinets to be connected using parallel connection, which is 12kWh of battery capacity.



【1】 **DC Breaker:**

If the breaker is ON

Battery is connected to the photovoltaic inverter.

If the breaker is OFF

Battery is disconnected from the photovoltaic inverter.

【2】 **Battery DC terminal (inverter):**

Connects to the positive and negative terminals of the battery in the battery cabinet.

【3】 **Battery communication terminal (inverter):**

Connects to the battery communication terminal of the battery cabinet.

【4】 **Optional Communication Interface expansion slot:**

Functions such as USB, Dry Contact and TCP/IP can be purchased optionally.

【5】 **AC terminal unit:**

Connects to the utility grid so that the power generated by the photovoltaic inverter can be feed into the utility grid, or use the utility grid to charge the battery.

【6】 **Photovoltaic array DC input terminal:**

Connects to the photovoltaic array input.

【7】 **Communication terminal:**

The communication terminal used to connect the photovoltaic inverter and ESS-MET.

【8】 AC Back-up power output terminal:

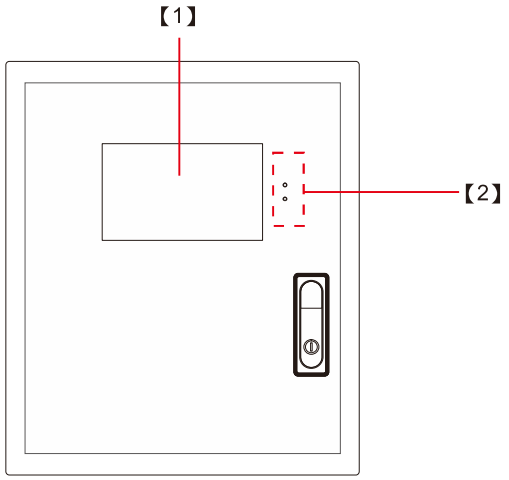
Outputs back-up power to the emergency load when power failure

【9】 Battery DC terminal (battery cabinet):

Connects with battery terminals of the photovoltaic inverter.

【10】 Battery communication terminal (battery cabinet):

Connects to the battery communication terminal of the photovoltaic inverter.



【1】 LCD touch screen:

Used to monitor the energy storage system, including the operation status of the photovoltaic inverter, solar power generation capacity, battery capacity and power usage status.It can also change the control setting of the energy storage system.

【2】 LED indicator:

Used to display the operation information and status of the photovoltaic inverter.

2. Installation

Please read the safety instructions before installing the ESS.

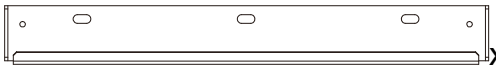
2-1. Unpacking

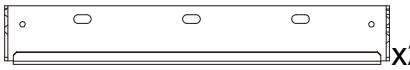
Although the manufacturer designed robust packaging for the product, but it may still get damaged during the transportation process. Please check the energy storage system upon receiving it and notify the dealer if the machine is damaged. (The external packaging can be recycled and used repeatedly.)

Remove the energy storage system from the cardboard box and check the contents of the package. Standard accessories include:

- ✓ One accessory pack.
- ✓ One data CD.
- ✓ One wall-mount kit set (backrest and backboard positioning paper).

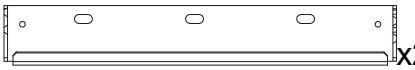
Standard accessory

 x2 for ESS-INV use

 x2 for ESS-BAT use

If the battery cabinet needs to be expanded, the expansion accessory required is as follows:

Expansion battery accessory

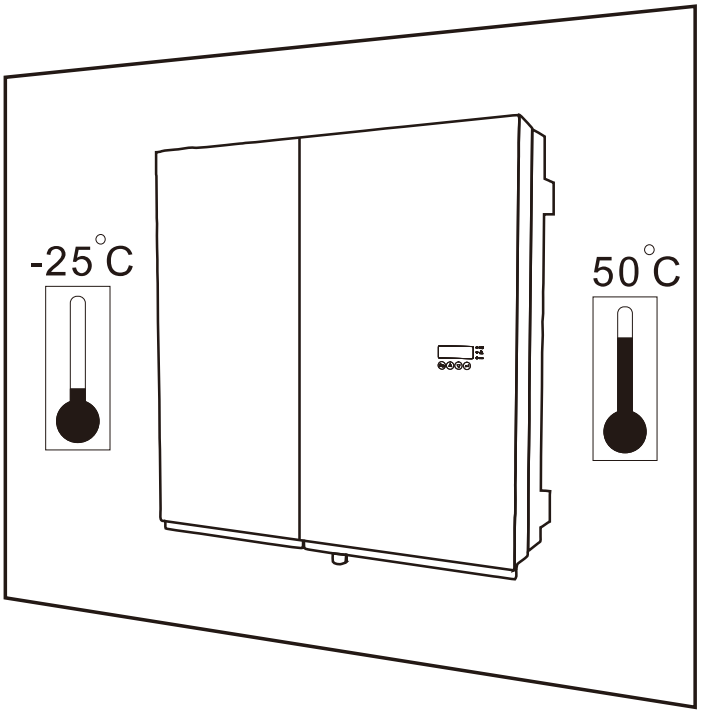
 x2 for expanded ESS-BAT use

2-2. Installation Site Requirements

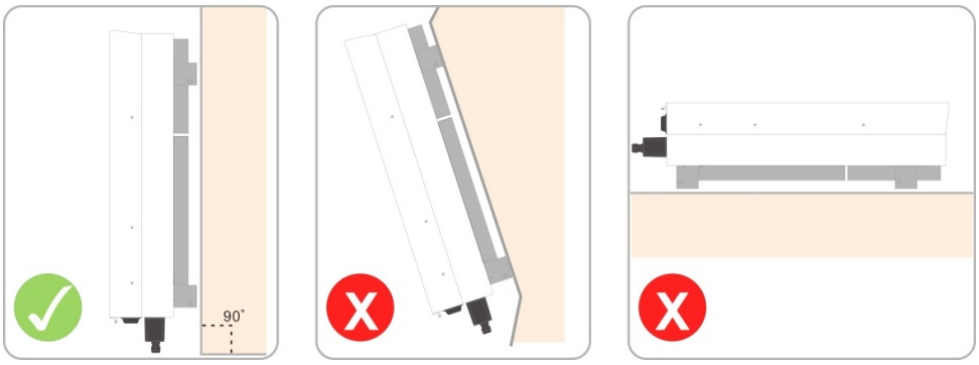
The weight of the photovoltaic inverter must be considered when selecting an installation site and method.

An appropriate installation site can effectively exert the functions of the photovoltaic inverter and reduce the chance of malfunctioning. It can also prolong the usage life of the photovoltaic inverter. Please refer to the following recommendations to select the most suitable location to install the photovoltaic inverter.

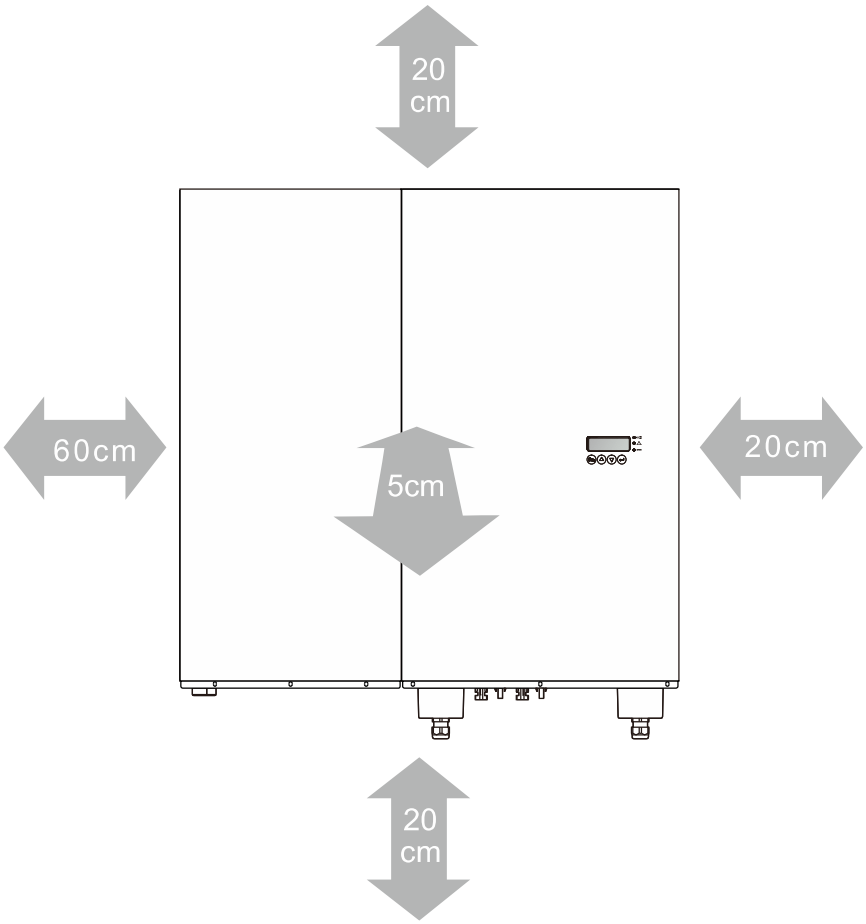
The photovoltaic inverter uses an outdoor design and complies with the IP65 protection level, allowing it to be installed outdoors and in humid environments. The power generating capacity of the photovoltaic inverter will be affected by the temperature and humidity of the environment, or if it was installed at an inappropriate location. It is recommended not to install it at a location exposed to direct sunlight and has an environmental temperature between the -25°C to +50°C range.



The design of the photovoltaic inverter allows it to be vertically mounted into the wall; therefore it must be confirmed whether the wall-mount location will allow the photovoltaic inverter to tilt forward/backwards.



When selecting an installation site, there must be sufficient space for the heat generated from photovoltaic inverter operations to be emitted.The recommended space to reserve for radiating is as shown in the figure below.



2-3. Wall Mount Installation

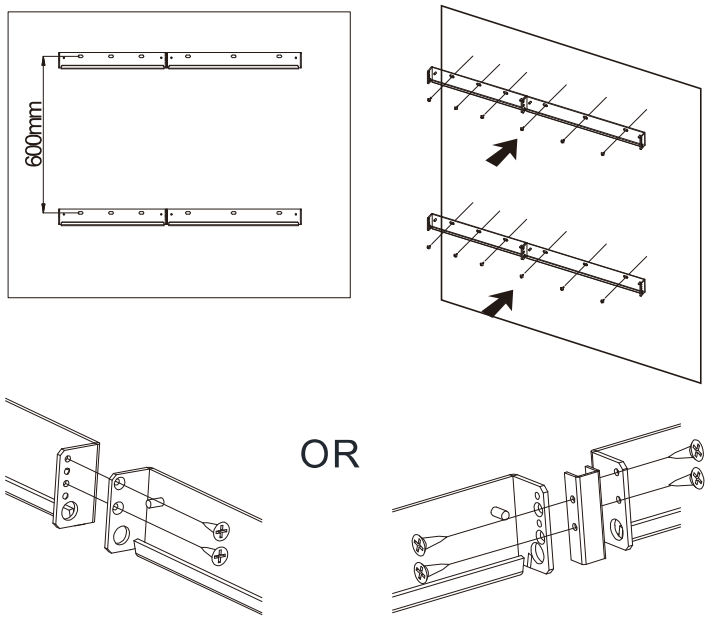
It is recommended to use the enclosed backplane to mount the PV inverter on the wall. When selecting an installation location, be sure to consider whether it can withstand the weight of PV inverter. It is recommended to install the unit vertically on a solid concrete or a brick wall.

Wall mount installation steps

Step 1:

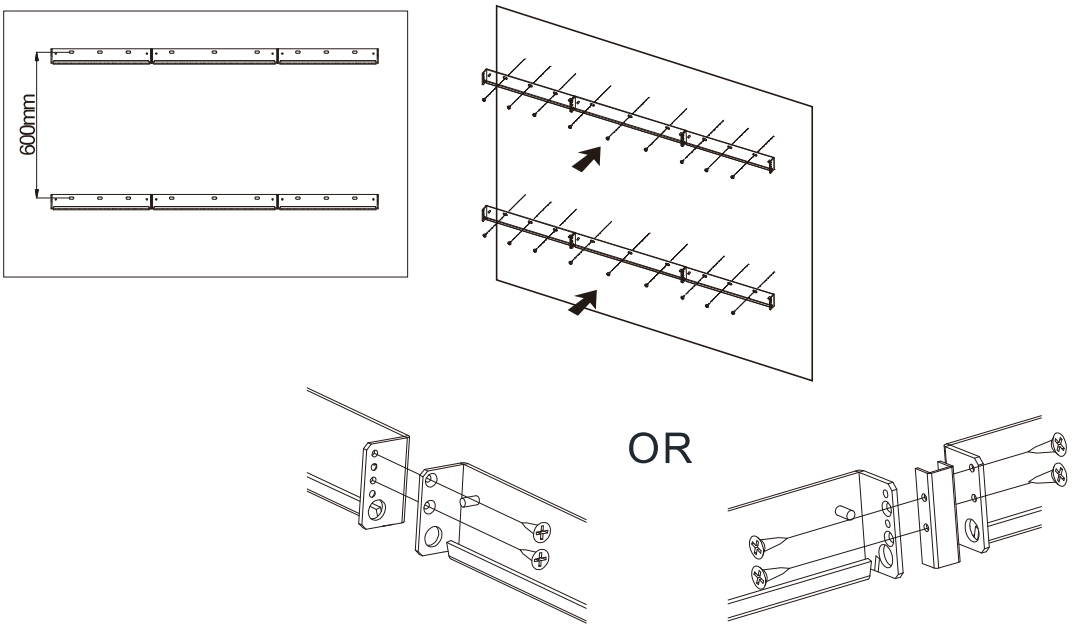
Place the backplane positioning paper on the wall to install, and drill holes according to the aperture of the backplane mounting holes.Finally fix the backplane onto the wall.

Backplane positioning paper



✓ **If there is the need for battery cabinet expansion, an additional battery cabinet backplane must be installed.**

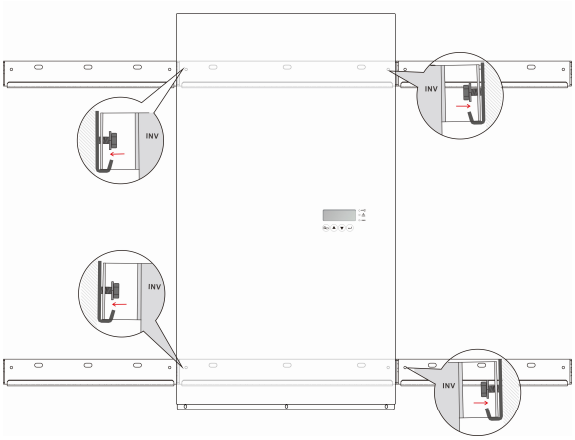
Backplane positioning paper



Step 2:

Hang the inverter on the wall mount, and confirm whether it is properly fixed in the mounts. Finally lock the nuts on the four corners tightly in place.

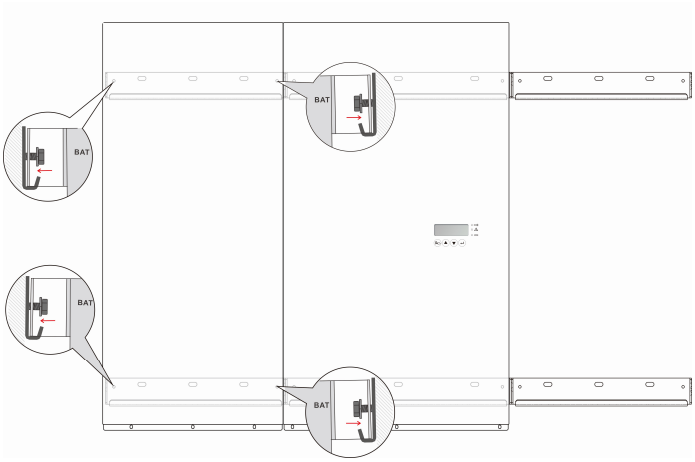
wall mount for ESS-INV



Step 3:

Hang the battery cabinet on the wall mount, and confirm whether it is properly seated in the mounts. Finally, lock the nuts on the four corners tightly in place.

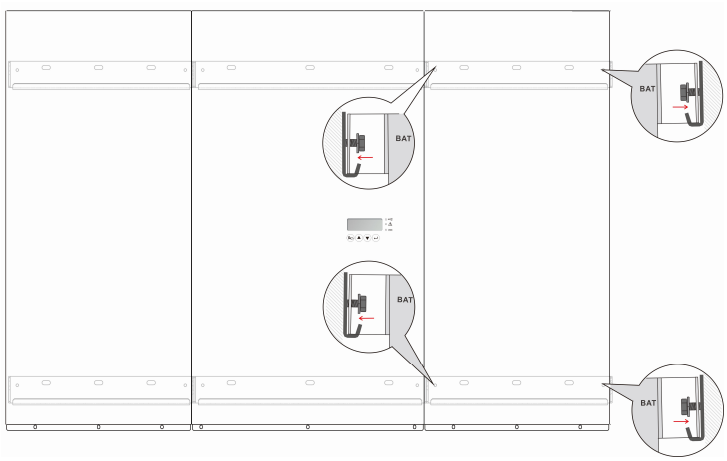
wall mount for ESS-BAT



Step 4 (please skip this step if there's no expansion battery cabinet):

Hang the second set of battery cabinet on the wall mount, and confirm whether it is properly fixed in the mounts. Finally, lock the nuts on the four corners tightly in place.

wall mount for expanded ESS-BAT



Step 5:

Check whether the inverter and battery cabinet is properly installed on the wall; It must not be tilted. This completes the wall mount installation.

2-4. Electrical Installation

Note:

Maintenance of ESS should be performed by qualified electrical technicians, and only after all AC and DC power are completely disconnected from ESS.

- Confirm that the AC breaker between the inverter and utility grid is installed.
  Note: AC breaker is recommended as below.

Model	Ue	Ie
ESS-INV-3	240Vac	20A
ESS-INV-4	240Vac	25A
ESS-INV-5	240Vac	30A

- Confirm that the breaker between the inverter and the photovoltaic array is installed.
  Note: The Ue: 600Vdc / Ie:20A specification breaker is recommended.

- Confirm that the breaker between the inverter and back-up power load is installed.
  Note: AC breaker is recommended as below.

Model	Ue	Ie
ESS-INV-3	240Vac	20A
ESS-INV-4	240Vac	25A
ESS-INV-5	240Vac	30A

- The AC and breakers must be disconnected when installing the inverter.
- It must be confirmed that the power of the AC and breakers are not connected during installation.

2-5. AC Input/Output Installation

	Note:
	Please install an AC breaker between the inverter and utility grid before wiring to utility grid.

Step 1:

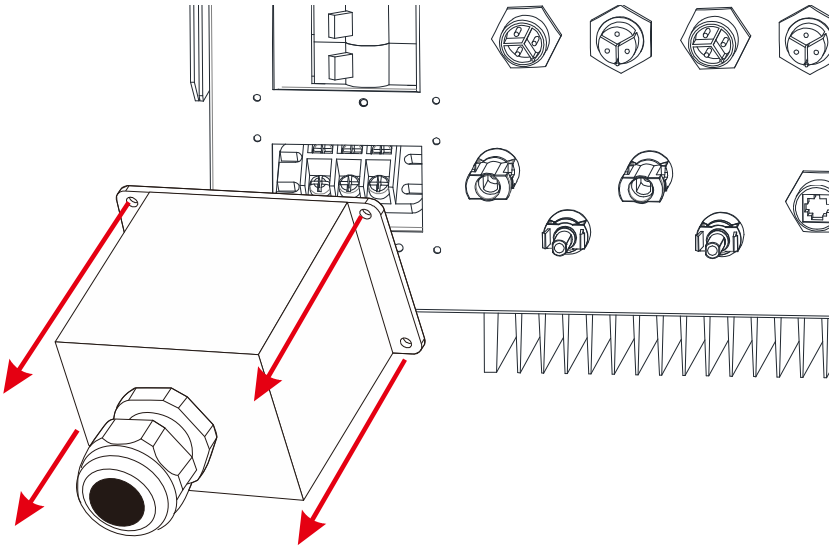
Confirm whether the utility grid voltage and frequency are within the inverter specifications.

Step 2:

Before installing the AC input/output of the inverter, please confirm whether the circuit breaker connected to the utility grid is open. The utility grid circuit breaker can only be closed when the electrical installation of the photovoltaic inverter is completed.

Step 3:

Remove the AC output cover.



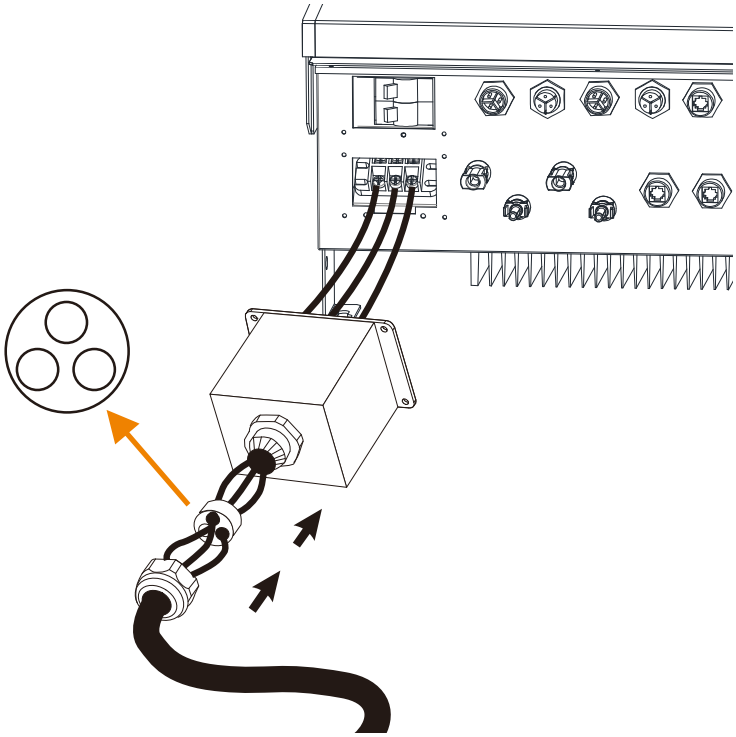
Step 4:

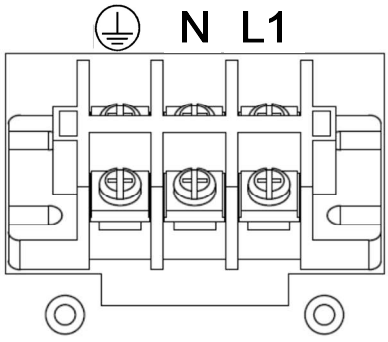
Wire the AC output according to the recommended wire diameter and the steps shown in the figure below.

■ Recommended AC output wiring wire diameter

Model	Diameter Φ(mm)	Area (mm^2)	AWG no.

ESS3300	>2.05	>3.5	>12
ESS4000 ESS5000	≥2.59	≥5.5	≥ 10

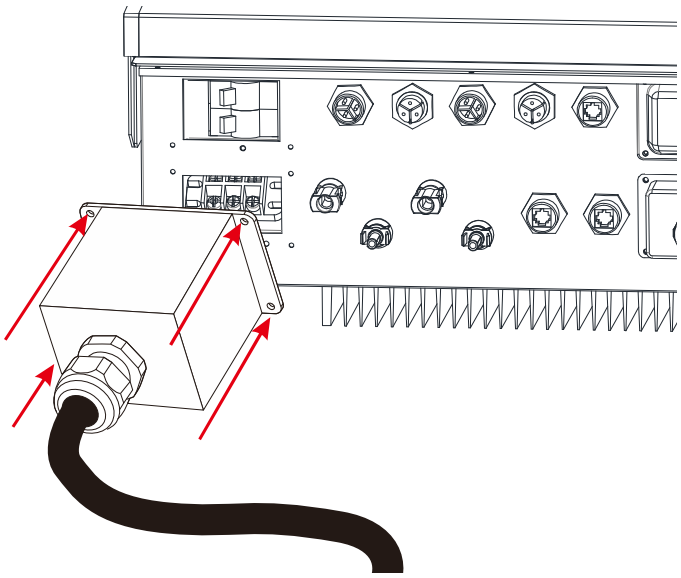




- To prevent the risk of electrical shock, please confirm the ground cable is properly grounded before operating the photovoltaic inverter.

Step 5:

Lock the AC waterproof cover properly.



2-6. AC Back-up Power Installation

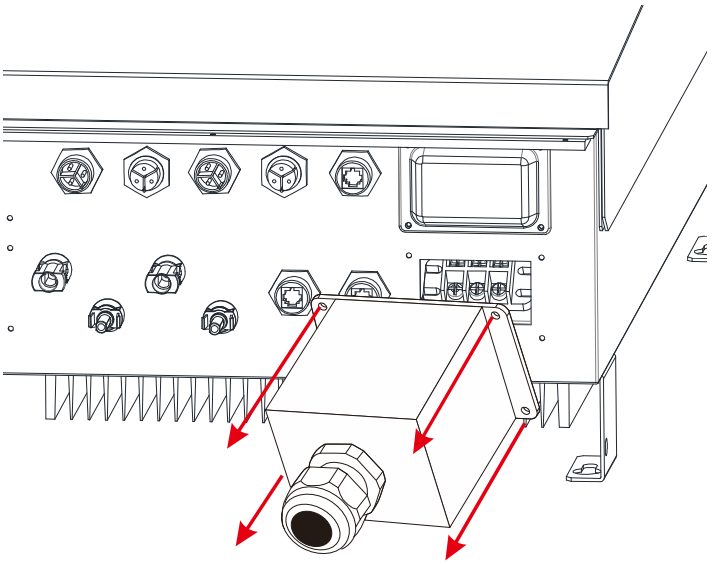
	Note:
	Please install an AC breaker between the inverter and back-up load before wiring to the back-up load.

Step 1:

Before installing the AC back-up power, please confirm whether the circuit breaker connected to the utility grid is open. The utility grid circuit breaker can only be closed when the electrical installation of the photovoltaic inverter is completed.

Step 2:

Remove the cover of the AC back-up power input.



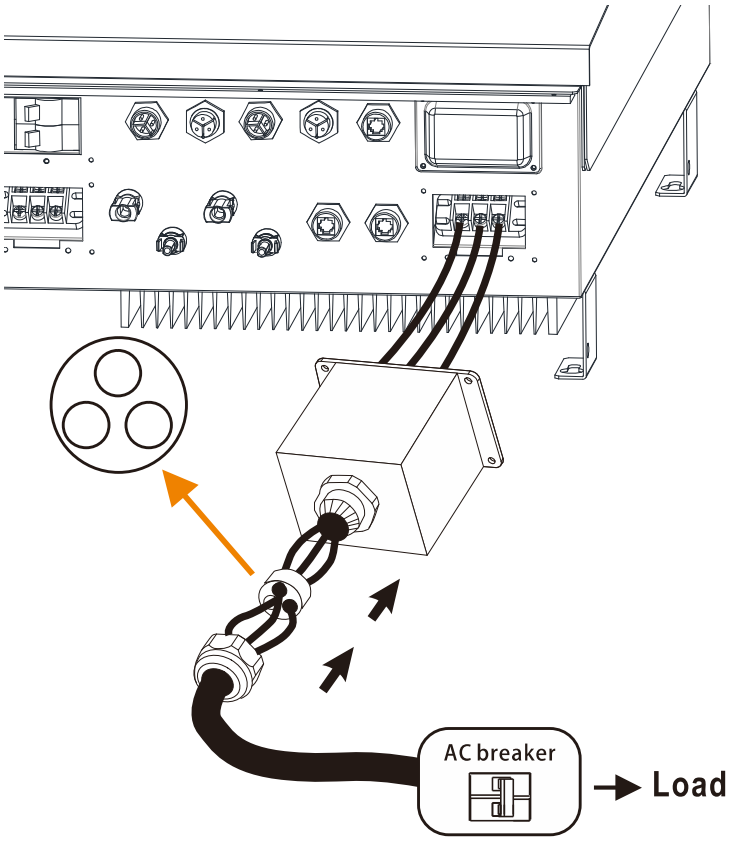
Step 3:

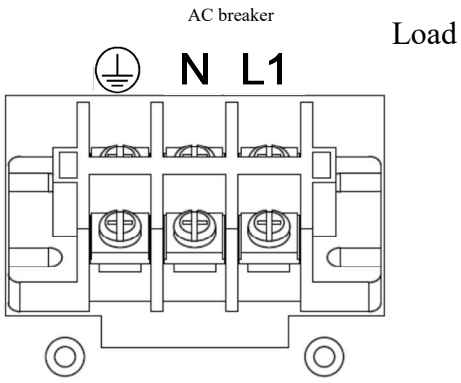
Wire the AC back-up power output according to the recommended wire diameter and the steps shown in the figure below.

■ Recommended AC back-up power output wiring wire diameter

Model	Diameter Φ(mm)	Area (mm^2)	AWG no.
ESS3300	>2.05	>3.5	>12
ESS4000 ESS5000	≥2.59	≥5.5	≥ 10

It is recommended to connect the AC back-up power output to the AC breaker, and then connect it to the load.

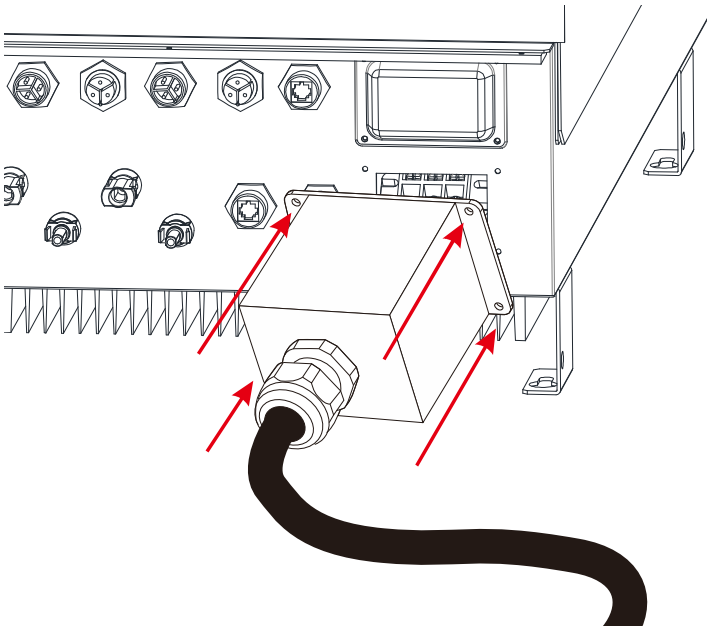




- To prevent the risk of electrical shock, please confirm the ground cable is properly grounded before operating the photovoltaic inverter.

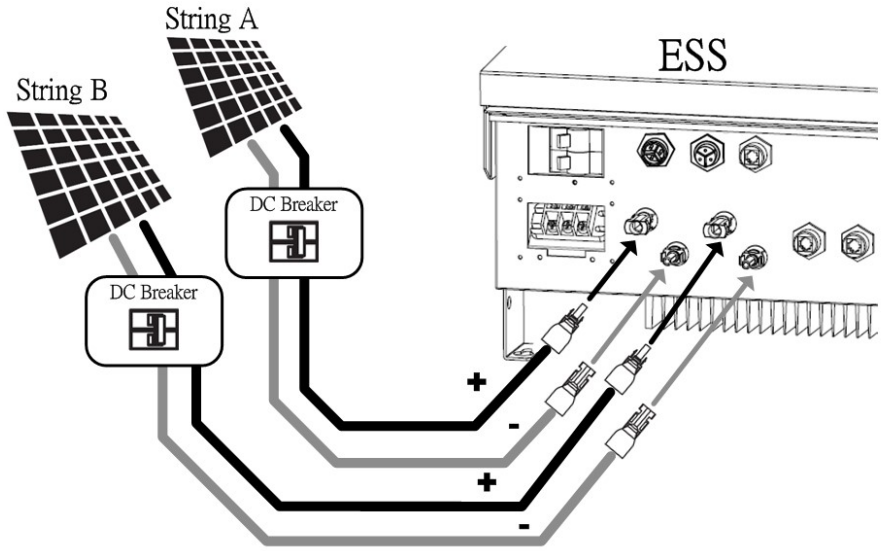
Step 4:

Lock the AC waterproof cover properly.

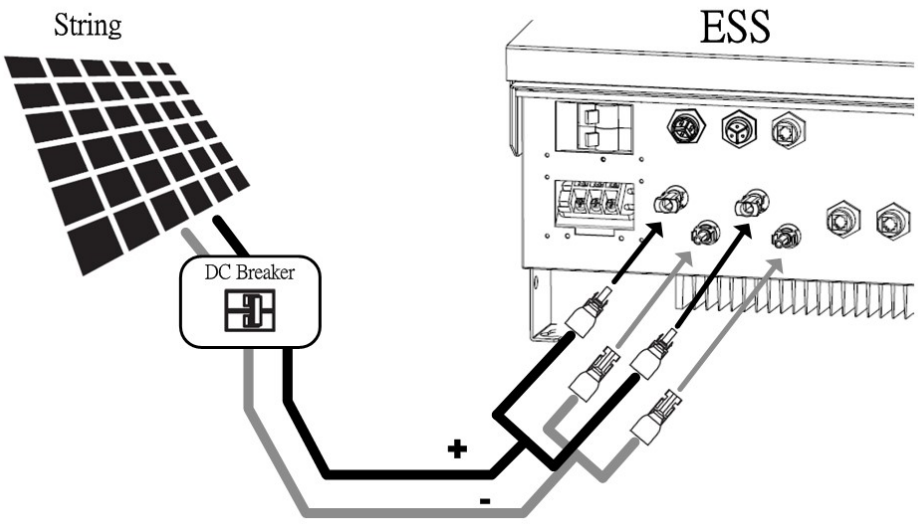


2-7. Solar Panel Input Wiring

1. **Standard mode:** Allows two independent strings configured with different numbers of photovoltaic arrays, as shown in the figure below.



2. **Parallel connection mode:** When a single string of photovoltaic array is connected to string A and String B, users must enter setting mode to make modifications as shown in the figure below. (The setting mode is explained in Chapter 3-1-3.)



■ Recommended PV panel input wiring wire diameter

Model	Diameter Φ(mm)	Area (mm^2)	AWG no.
ESS-INV-3	>2.05	>3.5	>12
ESS-INV-4 ESS-INV-5	≥2.59	≥5.5	≥ 10

2-8. Battery Cabinet Installation

Step 1:

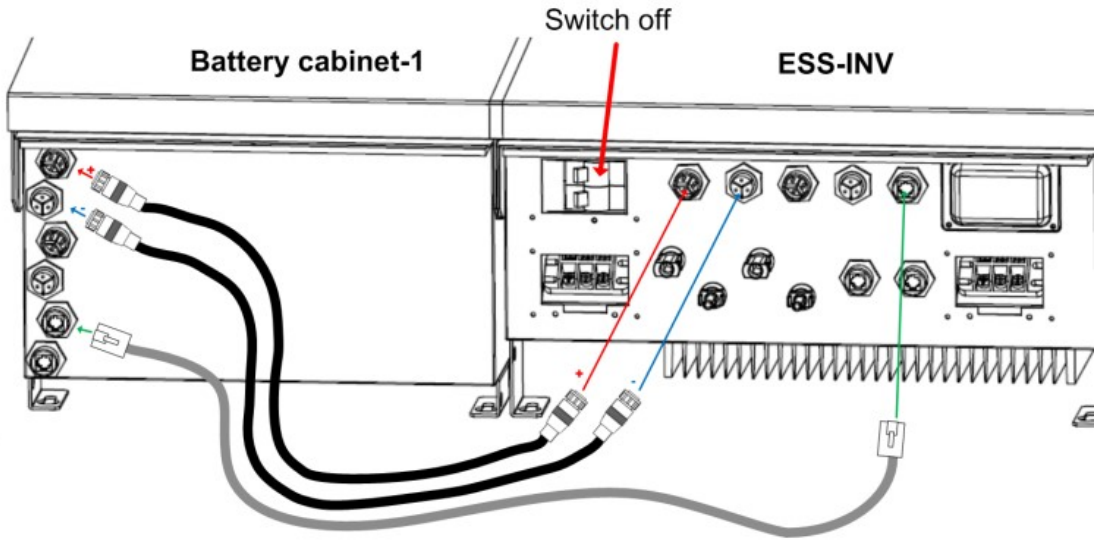
Please do not place the battery pack into the battery cabinet before installing the battery cabinet cables, and confirm that the DC breaker on the inverter is at the OFF status.

Step 2:

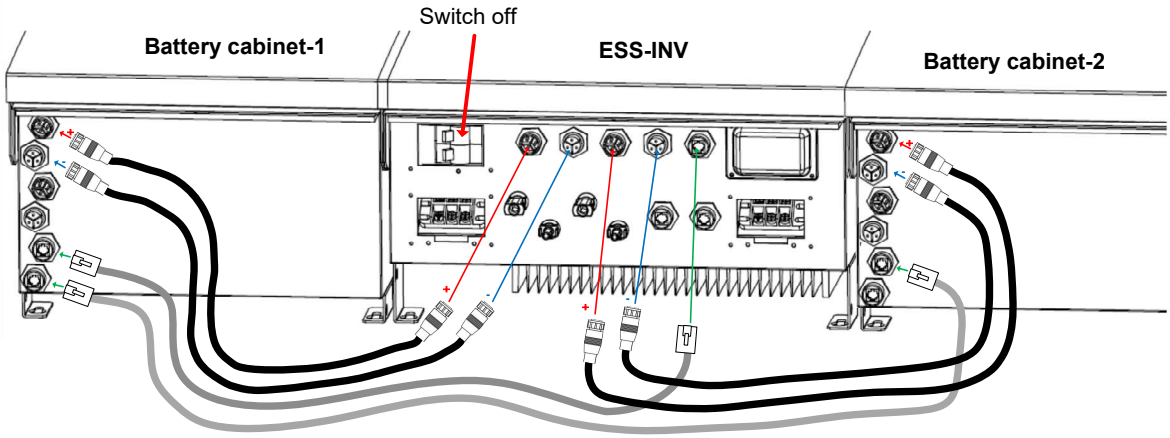
Install the wiring between the battery cabinet and the inverter. Each battery cabinet is equipped with two sets of positive/negative terminals and communication terminal.

Please refer to the explanations in the following figure below according to the number (1 or 2) of battery cabinets users selected.

✓ **Equipped with 1 battery cabinet (standard configuration)**

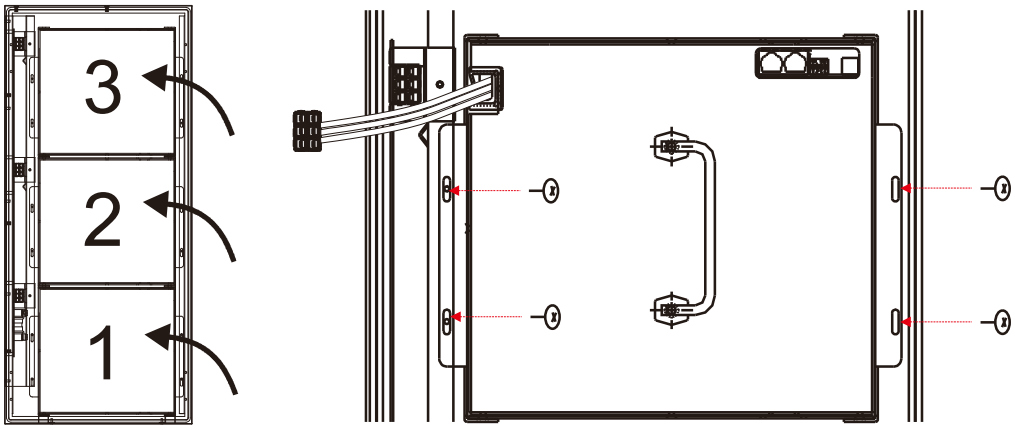


✓ **Equipped with 2 battery cabinets**



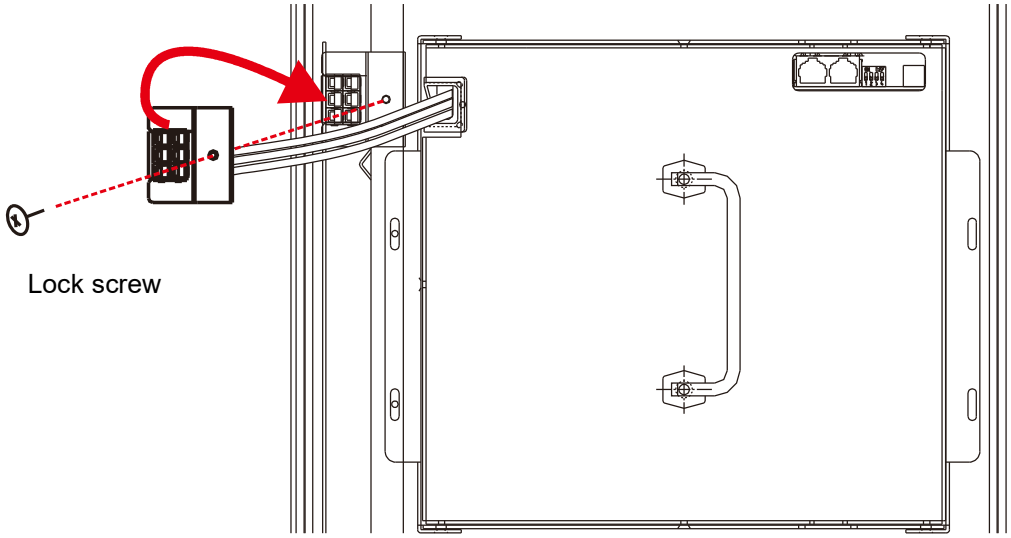
Step 3:

Open the front cover of the battery cabinet, then place the battery packs in place in the order from bottom to top(as the figure below 1~3) and lock in the screws on both sides to keep them in place.



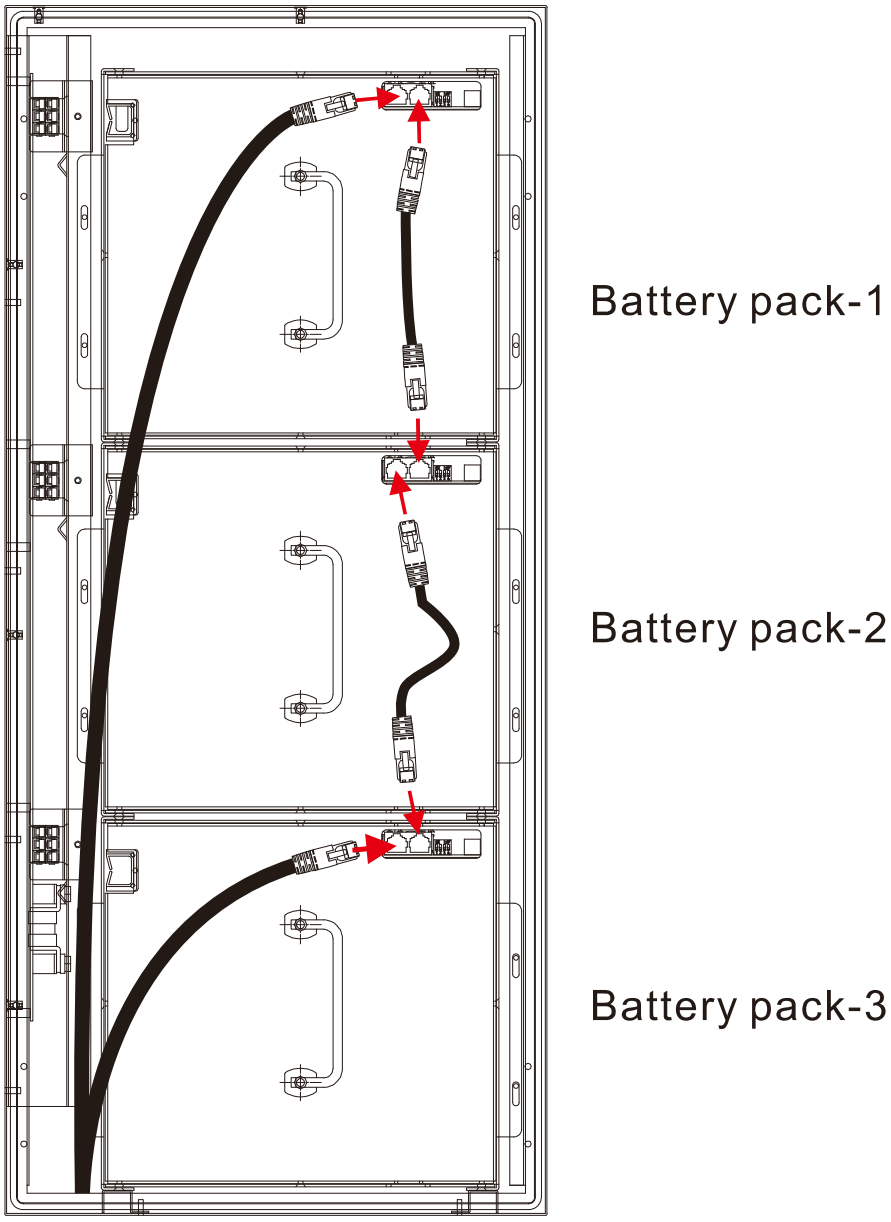
Step 4:

Insert the battery output terminal into the connector on the battery cabinet, and use the screw to lock the iron plate to keep the terminal in place.



Step 5:

Connect the communication cable.Please wire according to the connection method shown in the figure below.

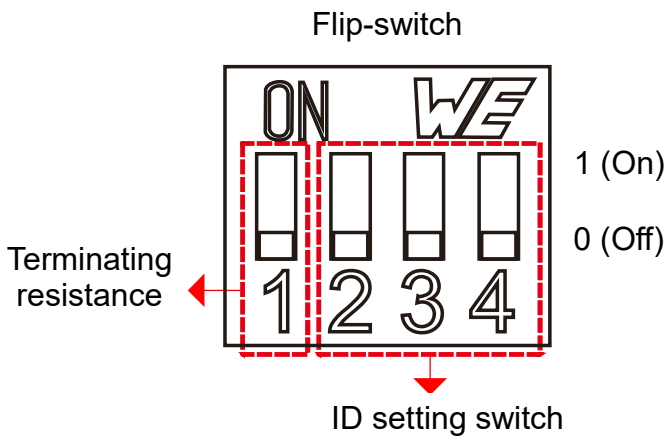


Step 6:

Use the flip-switch on the battery pack to set the following items:

1. **Communication ID:**
   Set the battery pack ID from bottom to top; the ID must be set starting from 1 and must be consecutive numbers. The maximum ID is 6.
   ※Please do not set the ID as nonconsecutive numbers, such as 1, 2, 4 or starting from numbers other than 1, such as 2, 3, 4.
2. **Terminating battery pack**
   The terminating battery pack only needs to be turned on for the battery pack with the last communication ID.Its goal is to increase the stability for communication.

Please refer to the explanations in the figure below for setting methods of the communication ID and terminal resistance. Switching the flip-switch to the bottom means Off and switching it to the top means On. Please refer to the ID setting table for ID settings.

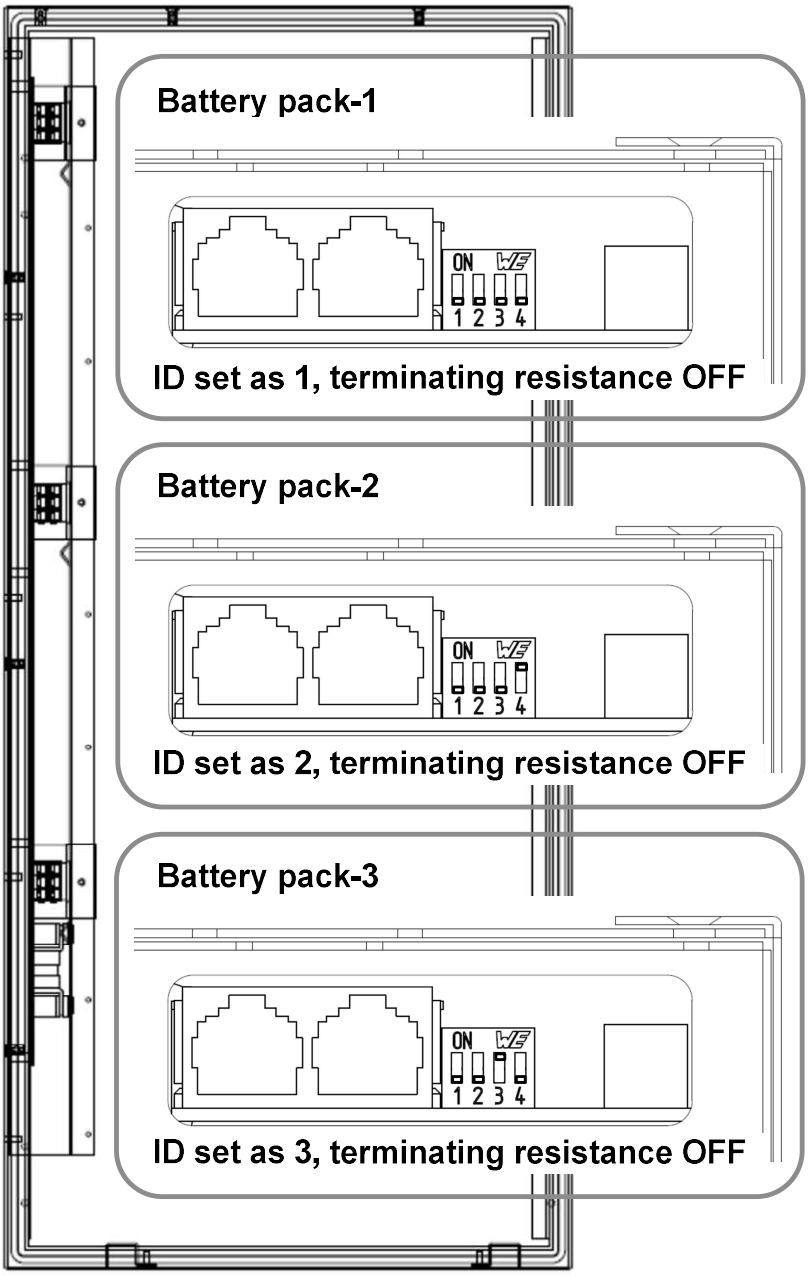


ID setting switch

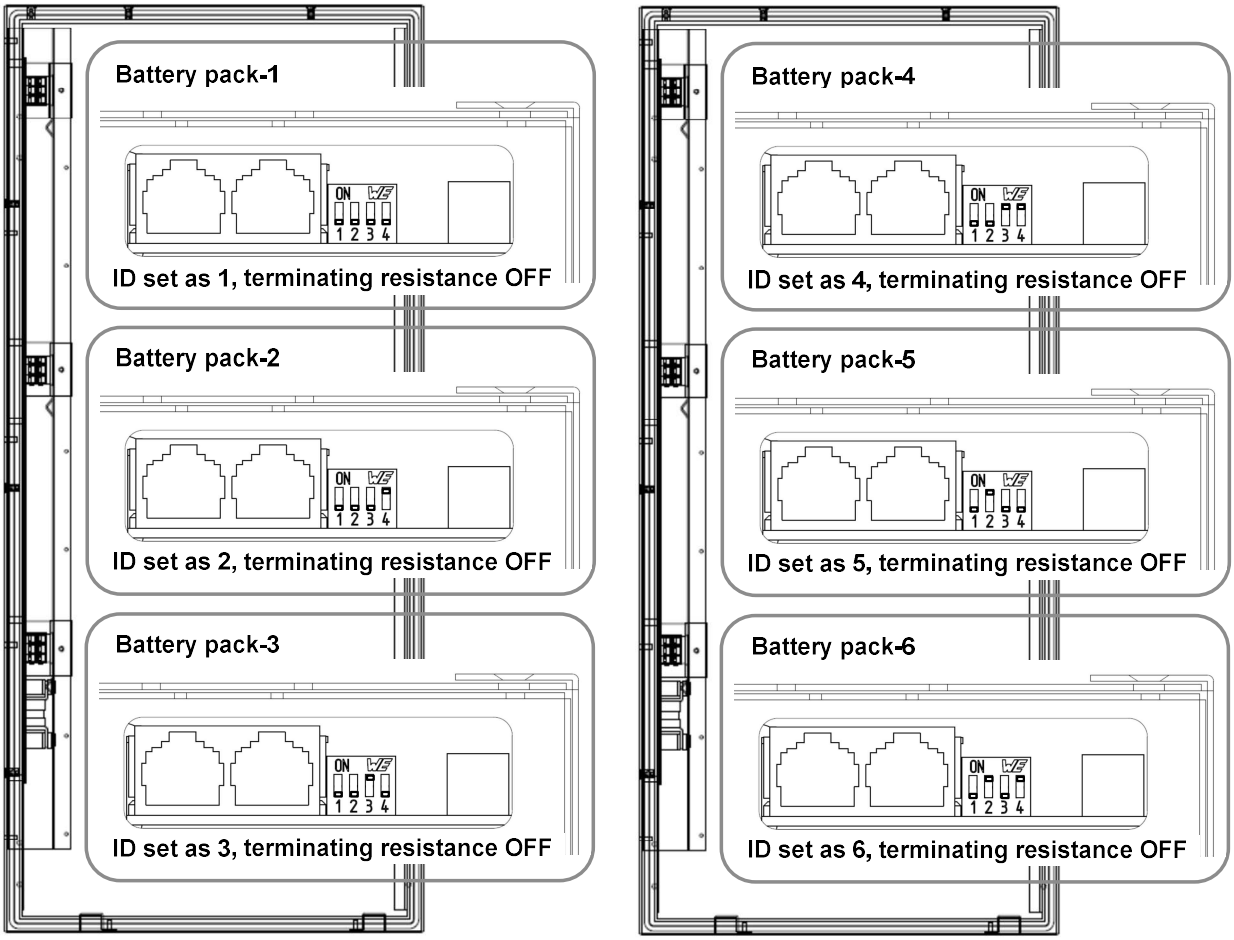
2	3	4	ID
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6

Communication ID and terminal resistance setting example

✓ **Equipped with one battery cabinet and 3 battery packs.**

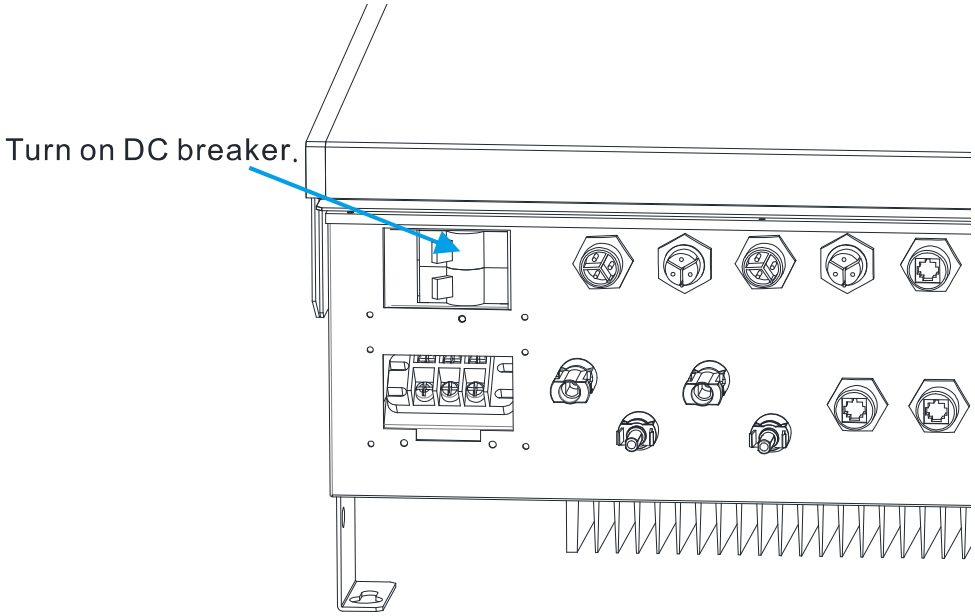


✓ **Equipped with two battery cabinets and 6 battery packs.**



Step 7:

Cover the top cover of the battery cabinet and turn on the DC breaker on the inverter to complete all battery cabinet installation.

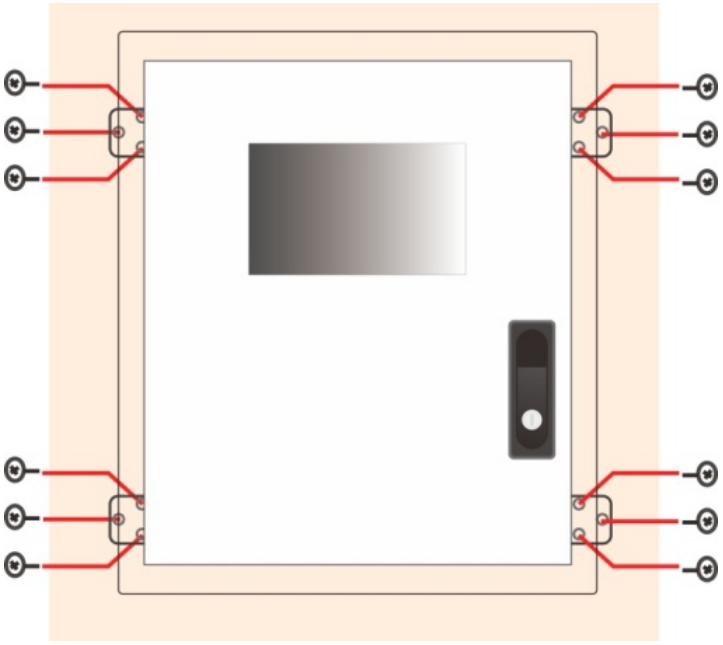


2-9. Smart Meter Installation

	Note:
	Please confirm the grid is disconnected before installation in order to prevent the installation personnel getting shocked.

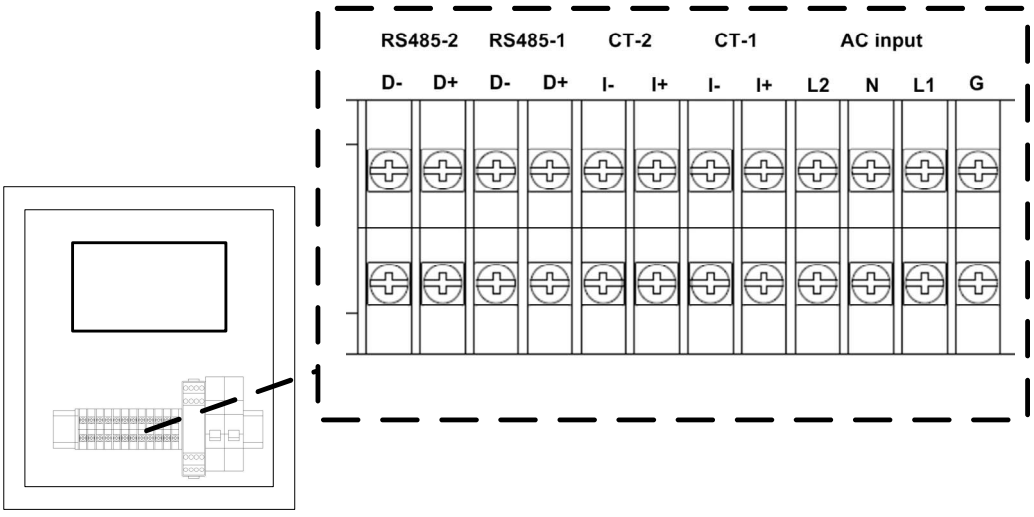
Step 1:

Install the smart meter on the wall and use screws to lock each corner.



Step 2:

Open the outer door of the smart meter, install CTs and wiring AC input cables to the terminals inside the **ESS-MET**.



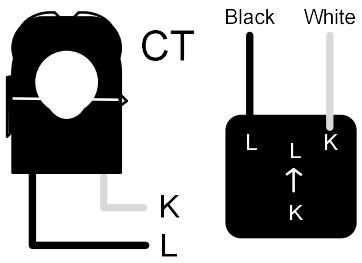
■ **CT definition**

There are 2 CT as standard accessories of **ESS-MET.**

1P2W system: Only one CT need to be installed.

1P3W system: Two CTs need to be installed.

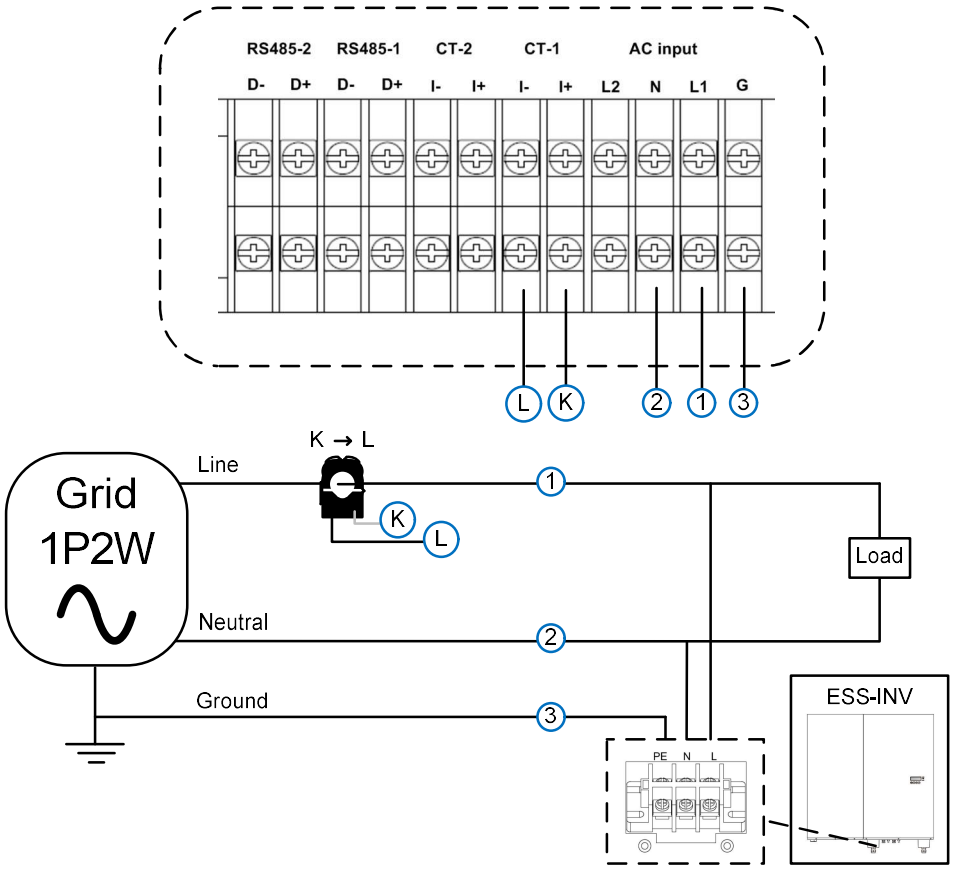
The CT must be installed at the point of common coupling(PCC).



According to the system connection(1P2W / 1P3W), please refer the figure below to install the CTs and wiring cables.

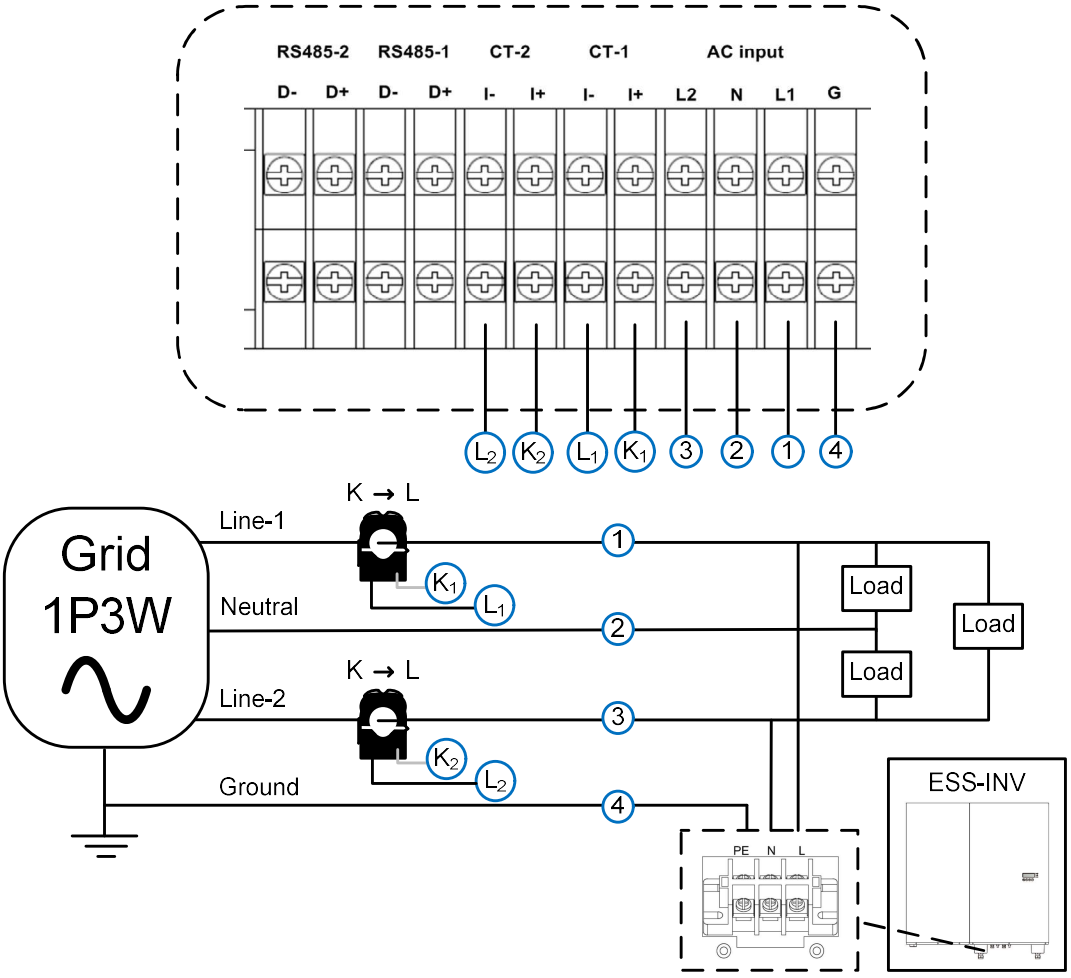
■ **1P2W system**

1. Wiring AC input cables to the terminals, Line, Neutral, Ground.
2. Placing the CT at the point of common coupling of hot wire(Line) so that the CT is able to measure the current which includes **ESS-INV** and load.
3. The direction of CT is from grid to load.



■ **1P3W system**

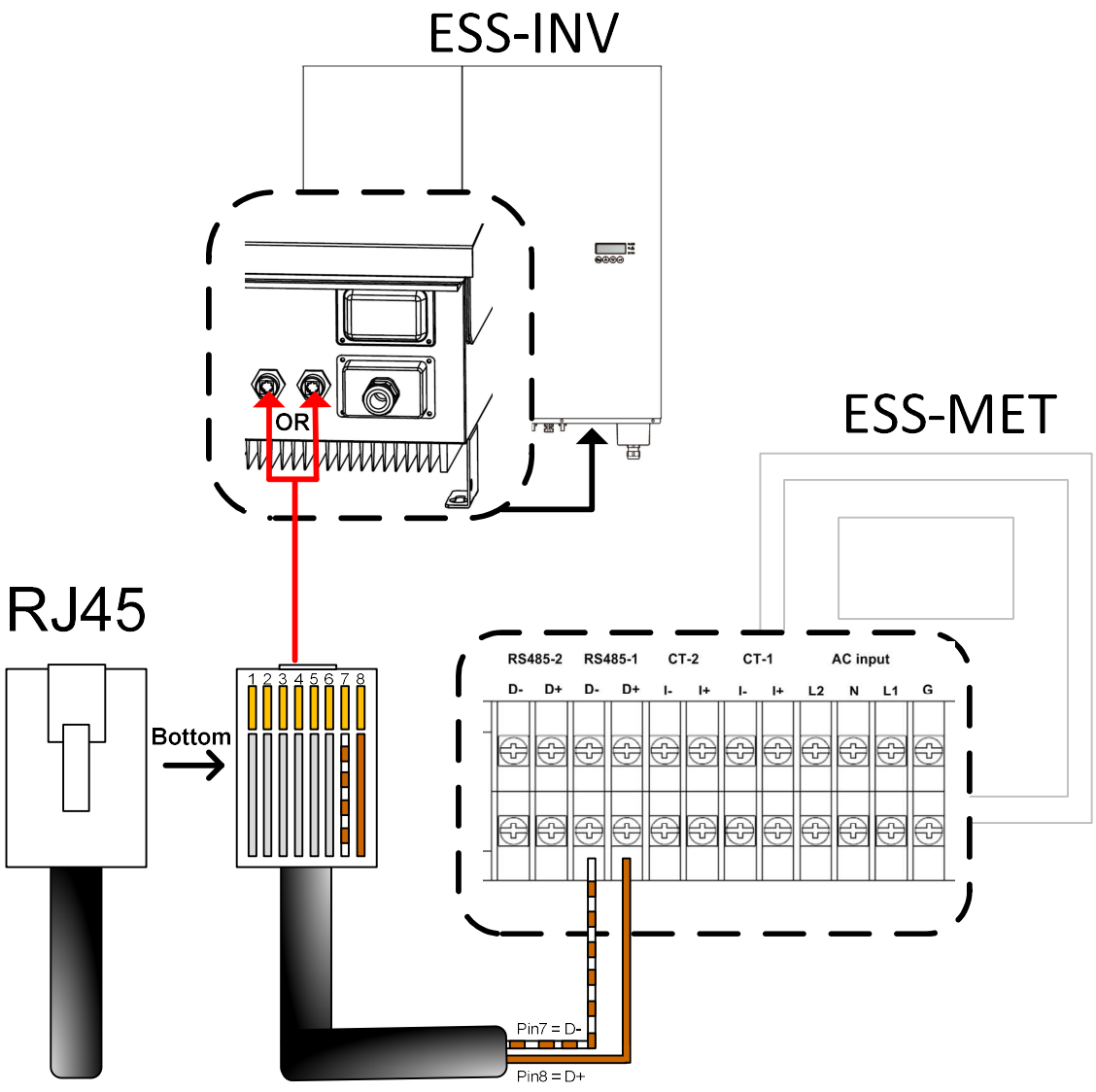
1. Placing the CT at the point of common coupling of each hot wire(Line-1, Line-2) so that CTs are able to measure the current which includes **ESS-INV** and load.
2. Wiring AC input cables to the terminals, Line, Neutral, Ground.
3. The direction of CT is from grid to load.



Step 3:

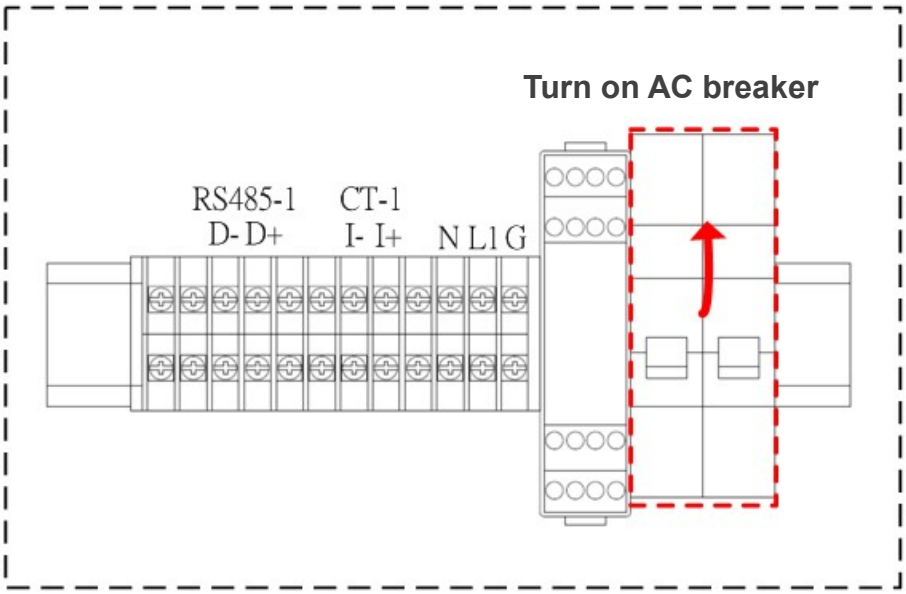
Wiring RJ45 cable from **ESS-INV** to **ESS-MET** for RS485 communication.

1. Make a RJ45 cable and wiring from ESS-INV to the terminals of RS485-1.
2. Pin8 as Data+/A, Pin7 as Data-/B.
3. There are two RJ45 port on the ESS-INV can be use, each port is connect in parallel inside so just select one port for communication with ESS-MET and the other one is use for ESS-INV parallel requirement.
4. The terminals of RS485-2 is reserved for slave mode which provide the function to monitor the system by external devices.



Step 4:

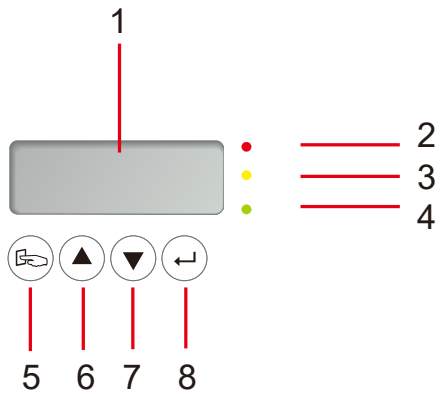
Turn on the AC breaker to complete the installation of the smart meter.

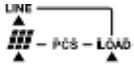


3. Operation and Function Description

This chapter will introduce all operations and descriptions of the ESS system.

3-1.ESS-INV 2.9 Inch Panel Function Description

4 Button LCD Panel


(1) LCD display	
Symbol	Description
	Photovoltaic inverter operating under special mode
	Ground malfunction or DC input insulation resistance too low.
LINE	Utility grid power
	Photovoltaic array
PCS	Photovoltaic inverter
LOAD	Photovoltaic inverter power generation indicator
	Operation flow display, which means the relationship between the photovoltaic inverter, photovoltaic array input and AC output power.
	Photovoltaic inverter measured value display

LED light		
(2)		When the red LED lights up it means that the photovoltaic inverter malfunctioned
(3)		When the yellow LED lights up it means that the electrical conditions exceeded the allowed operating range of the photovoltaic inverter
(4)		When the green LED lights up or flashes, it means that the energy generated by the solar panel is larger or less than the sleep power of the photovoltaic inverter
Buttons		
(5)		Set/Search
(6)		Previous page
(7)		Next page
(8)		Confirm setting changes

3-1-1. 2.9 Inch Panel Measurement Message Display Operations

When the photovoltaic inverter activates, all LED indicators light up and all LCD display symbols will light up, as shown in Figure A below.

A

Below are the descriptions of each power parameter displayed on the LCD display when the inverter operates; use the▲ and ▼ buttons to flip and view the pages; illustration of the display screen is as shown below.

String A input voltage is as shown in Figure B.

B

String B input voltage is as shown in Figure C.

C

String A input current is as shown in Figure D.

D

String B input current is as shown in Figure E.

E

String A input power is as shown in Figure F.

F

String B input power is as shown in Figure G.

G

Output voltage is as shown in Figure H.

H

Output frequency is as shown in Figure I.

I

Output current is as shown in Figure J.

J

Output power is as shown in Figure K.

K

Accumulated power generation capacity is as shown in Figure L.

L

When the accumulated power generation capacity exceeds 10000KWH, the power generation capacity information will be displayed with rotation; for example when the accumulated power generation capacity is 999999KWH, it will be as shown in Figure L1 and L2.

L1

L2

The chassis temperature can be displayed in Celsius or Fahrenheit, as shown in Figure M1 and M2.

M1

M2

The heatsink temperature can be displayed in Celsius or Fahrenheit, as shown in Figure N1 and N2.

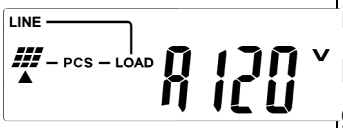
N1

N2

3-1-2. 2.9 Inch Panel Solar Inverter Status Description

When the voltage of the photovoltaic array exceeds 120Vdc, the photovoltaic inverter will start operating automatically.

The following table describes the various modes of photovoltaic inverter operations:

Mode	LCD display screen	Description
Power generation		When the voltage of the photovoltaic array is between 120Vdc ~ 500Vdc, the photovoltaic inverter will be in the power generating status.The green LED light will remain lit at this time.
Standby		When the voltage of the photovoltaic array is under 120Vdc, the photovoltaic inverter will enter standby mode.The green and yellow LED lights will flash individually during this time.
Malfunction		When the electric condition is abnormal, the code for the anomaly will be displayed on the LCD display; the yellow LED light will flash during this time.
		When the photovoltaic inverter malfunctions, the malfunction code will be displayed on the LCD display; the red LED light will flash during this time.
EPO		Emergency power off. When the user short-circuit the EPO terminal, the photovoltaic inverter will stop output immediately and remain in standby mode.The red LED light will flash during this time.
Power Off		When the photovoltaic array is unable to generate sufficient energy (such as at night or cloudy days), the photovoltaic inverter will automatically power off and stop output.

3-1-3. 2.9 Inch Panel Solar Inverter Setting Mode Description

Notes when setting the photovoltaic inverter:

a Confirm that the solar inverter and utility grid is disconnected.

b Only allow electrical technicians with professional training to operate on-site.

c Settings mode allows changing of country setting, set the photovoltaic arrayto standard or parallel connection mode, and machine number.

d Please make changes to the settings as needed.Do not change any other settings or else it might cause the photovoltaic inverter to operate abnormally.

Please use the following steps to complete setting mode changes:

Step 1: Press the “p buttonre (▲) and down button (▼) on the panel simultaneously for approximately five seconds to enter settings mode.

Step 2: After entering the setting mode, the first thing to set is the country. SET and the country will take turns to be displayed on the panel at this time, and display as shown in Figure O1 and O2 below. Use the “Up” button (▲) and “Down” button (▼) at this time to change the country setting.

	Note:
⚠	Do not randomly change the country setting as doing so might result in the photovoltaic inverter unable to operate normally.

Remark:					
The country codes are as follows					
de	/ Germany	es	/ Spain	it	/ Italy
fr	/ France	be	/ Belgium	tw	/ Taiwan
us a	/ U.S.A	pt	/ Portugal	au	/ Australia
gb	/ U.K.	cz	/ Czech	gr	/ Greece
nl	/ Holland	sl	/ Slovenia	at	/ Austria
jp	/Japan	ch	/ China	kr	/ Korea
ec	/ custom				

O1

O2

Step 3: Please press the “nterbuttons (↵) to enter the settings to set the photovoltaic array as standard or parallel connection mode. Use the “p buttonar(▲) and “Down” button(▼) to change between standard or parallel connection mode, which shows individually as Figures P1 and P2 below.

Remark:
STD: Standard mode; PAR: Parallel connection mode

P1

P2

Step 4: Please press the “nterbuttonse(↵) to enter settings for the photovoltaic inverter machine number.The SET and ID will take turns to display on the panel at this time, which shows individually as Figures O1 and Q below. Use the “p buttonow(▲) and “Down” button(▼) at this time to change the machine number setting.

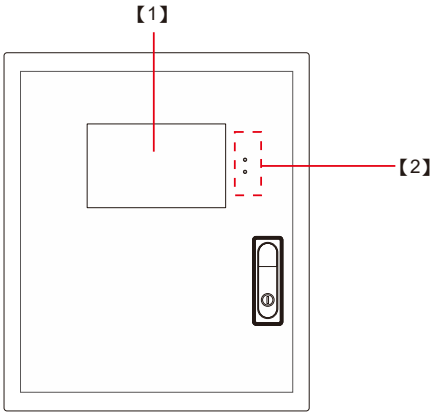
	Note:
⚠	Do not randomly change the machine number (ID) setting as doing so will cause abnormal surveillance software communication.

Q

Step 5: Please press the “nterbuttonse(↵) to end settings mode. “SAVE” will be displayed on the panel at this time as shown in Figure R.

Step 6: Wait until saving is complete and then please restart the photovoltaic inverter.

3-2.ESS-MET Function Description



【1】 LED status display:

Displays the current operating status of the ESS system.

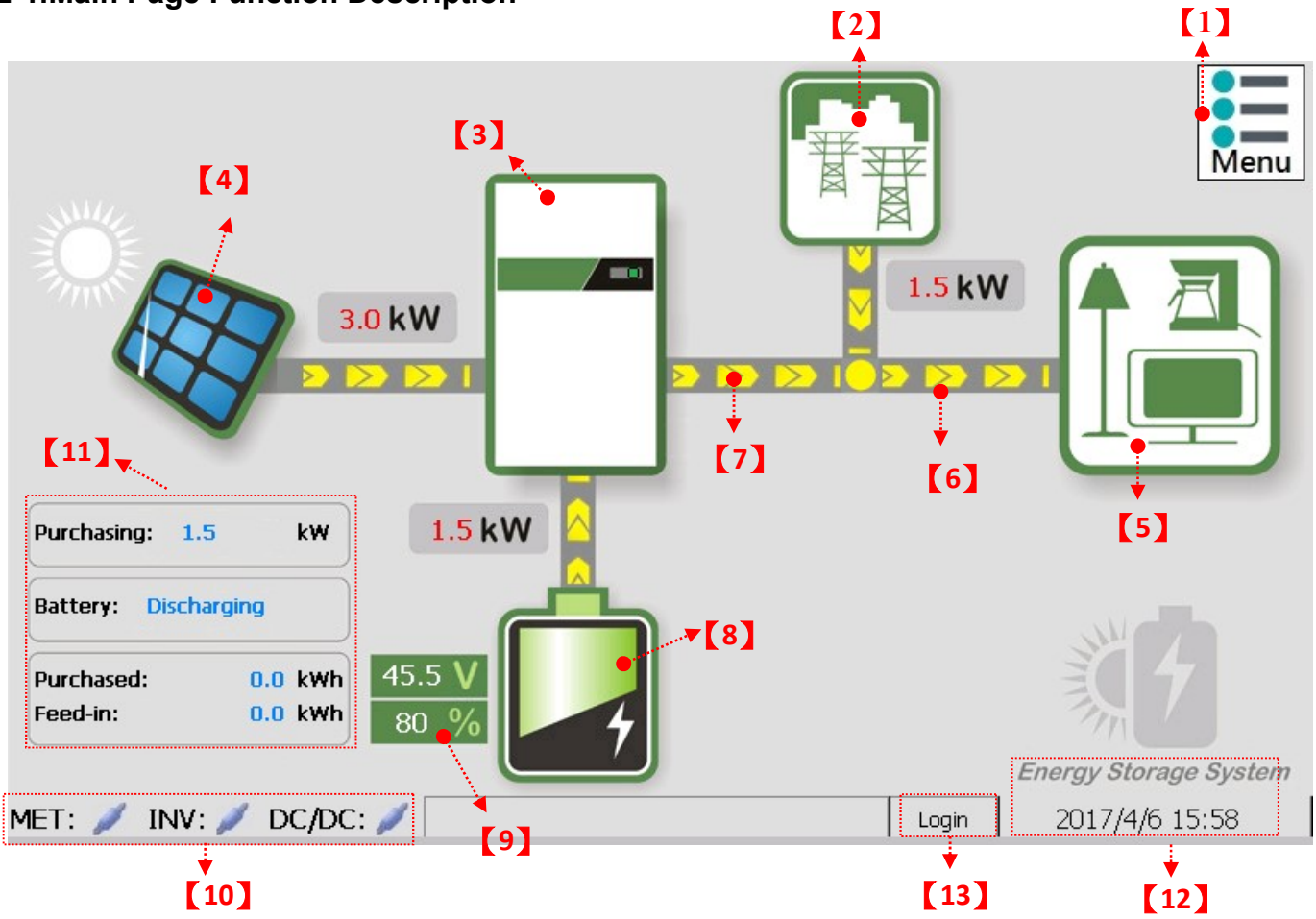
Indicator	Status	Description
Green light	**Constantly On**	**ESS operating normally**
Red light	**Constantly On**	**ESSError occurred**

【2】 LCD touch panel:

The panel is used to control and monitor the ESS system.Icon descriptions of frequently used functions are as follows:

Icon	Description
	Save function: Saves the changed setting/parameter into memory. Note: Changed parameters must be saved in order for them to take effect.
	Reload/reset: Reload the data or clear abnormal status.
	Return to the previous page.
	Execute function: Start activating the selected control mode.
	Stop function: Ends the currently executing control mode.
	Read status: Means currently reading data.
	Mute function: Turns off the buzzer.

3-2-1.Main Page Function Description



【1】**Function menu:** Click to open the function menu.

【2】**Power company icon.**

【3】**Energy storage system inverter icon.**

【4】**Solar panel icon.**

【5】**Load icon.**

【6】**Power display.**

【7】**Power flow display.**

【8】**Battery icon:** Color changes between red, yellow and green according to the state-of-charge (SOC).

【9】**Battery information display:** Voltage, state-of-charge (SOC).

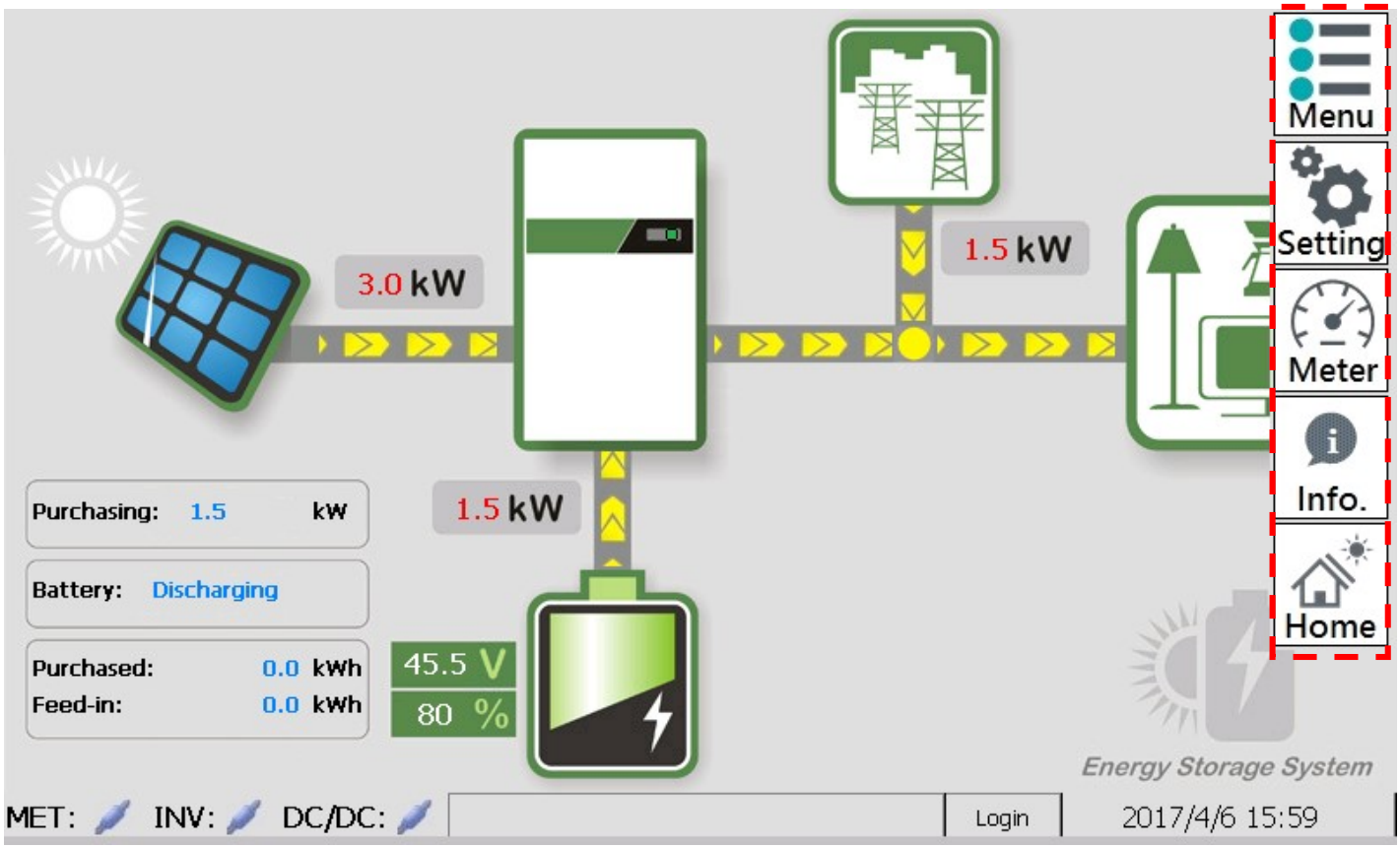
【10】**Communication connection status display:** connected; disconnected.

【11】**System status and purchase/feed-in of electricity record display.**

【12】**System date and time display:** Click to change the time and date settings.

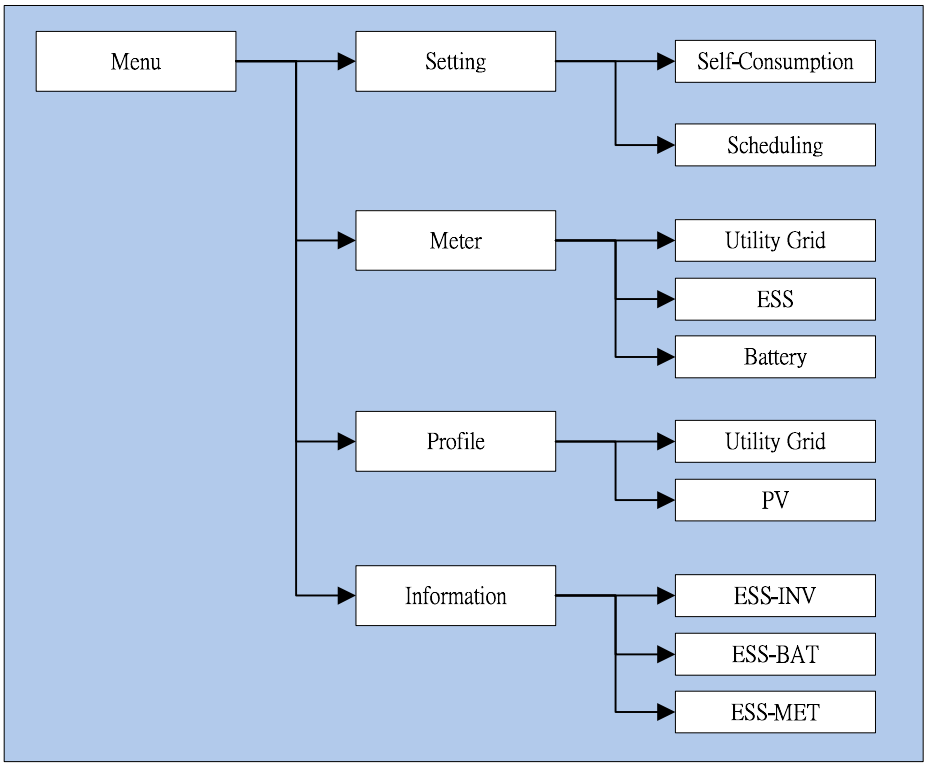
【13】**User login/logout:** Click to login/logout user account.

■ **Function menu**



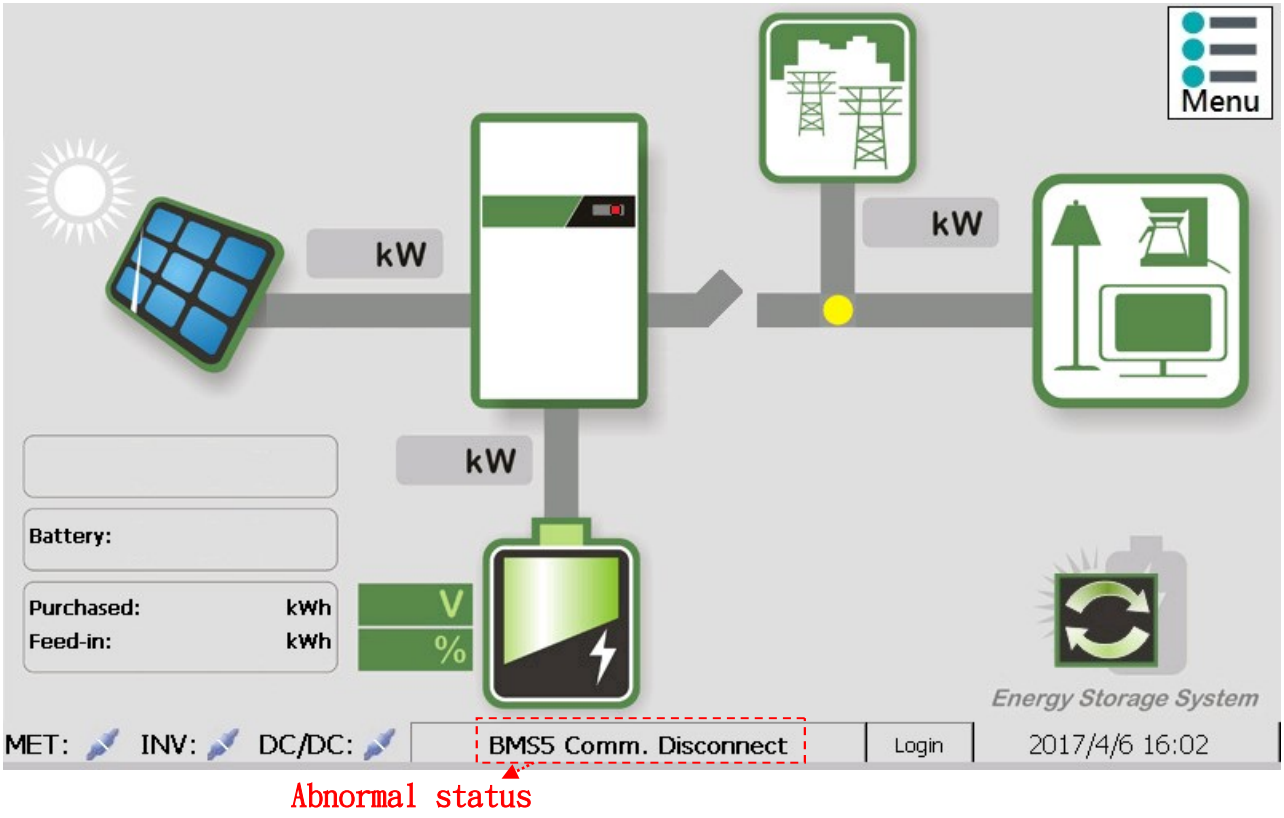
Function menu: Setting, Meter, Profile, Information.

■ **Function menu block figure:**

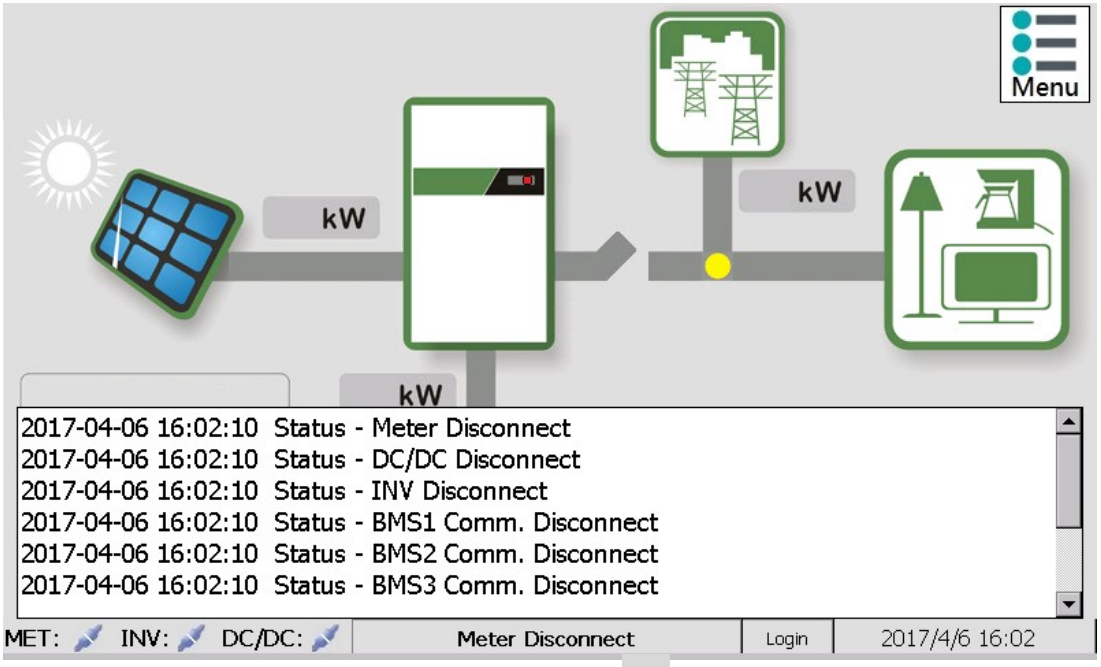


■ Abnormal status display

When the ESS or power system shows abnormal status, the field at the bottom of the main page will display a simple abnormal status reminder. If there are more than abnormal statuses, they will be displayed in turns.

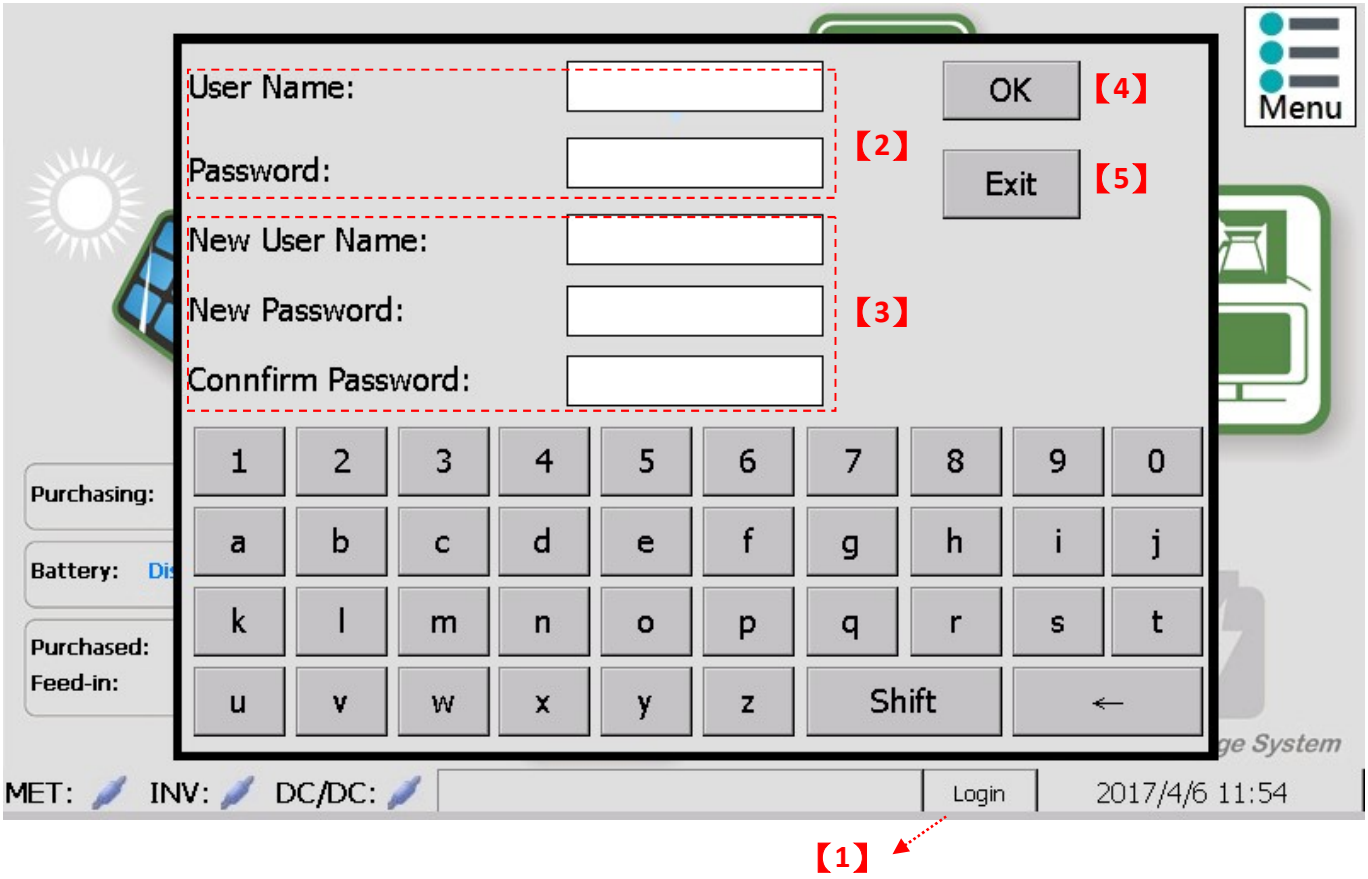


Users can also click the abnormal status directly to view details, including the error code (please refer to chapter four Troubleshooting and solutions for corresponding error codes).



■ User login

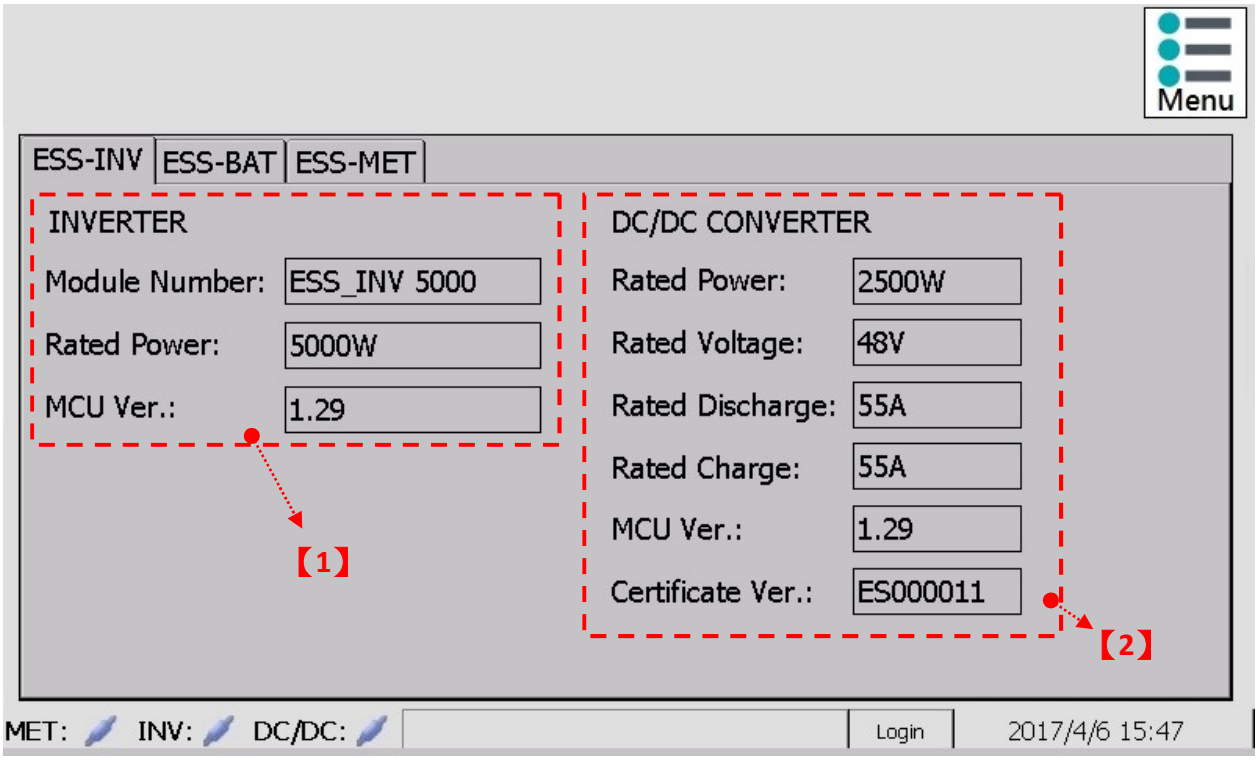
Users can login to their accounts by pressing the login button at the bottom of the main screen in order to gain different privileges. Once a user has logged in, the original login screen will change to a logout button.Click this button to logout.



【1】 Click to open the login screen.
【2】 Enter the account and password.
【3】 Create new account.
【4】 Ok
【5】 Exit the login screen.

3-2-2.Information Page Description

3-3-2-1.ESS-INV



【1】 Inverter information:

Model: Inverter model number.

Rated power: Displays the rated power of inverter

Firmware version: Displays the controller firmware version of the inverter.

【2】 DC/DC converter information:

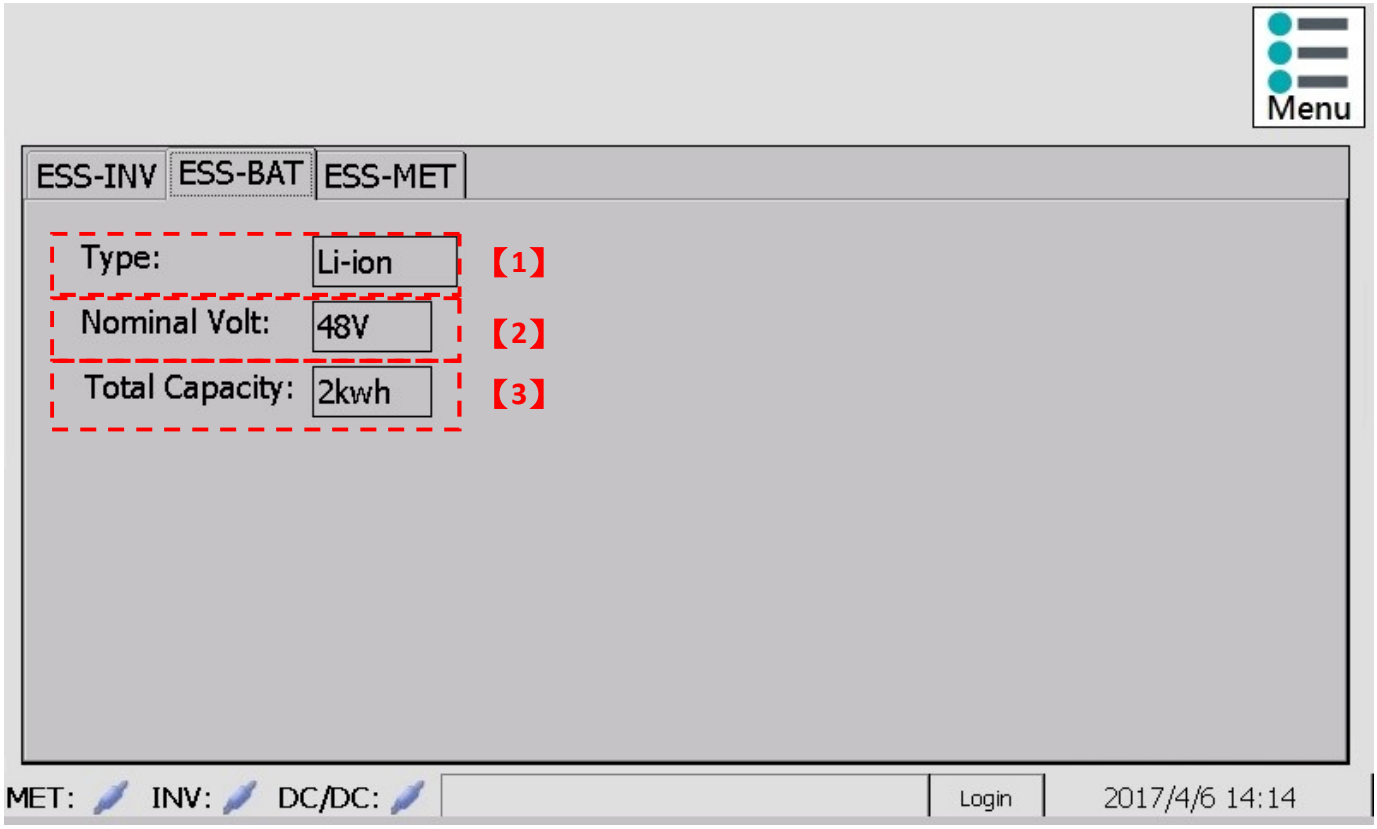
Rated power: Displays the rated power of DC/DC converter

Rated voltage: Rated voltage (battery terminal) of the DC/DC converter.

Firmware version: Displays the controller firmware version of DC/DC converter.

Certificate version: Displays the certificate version of the inverter.

3-3-2-2.ESS-BAT

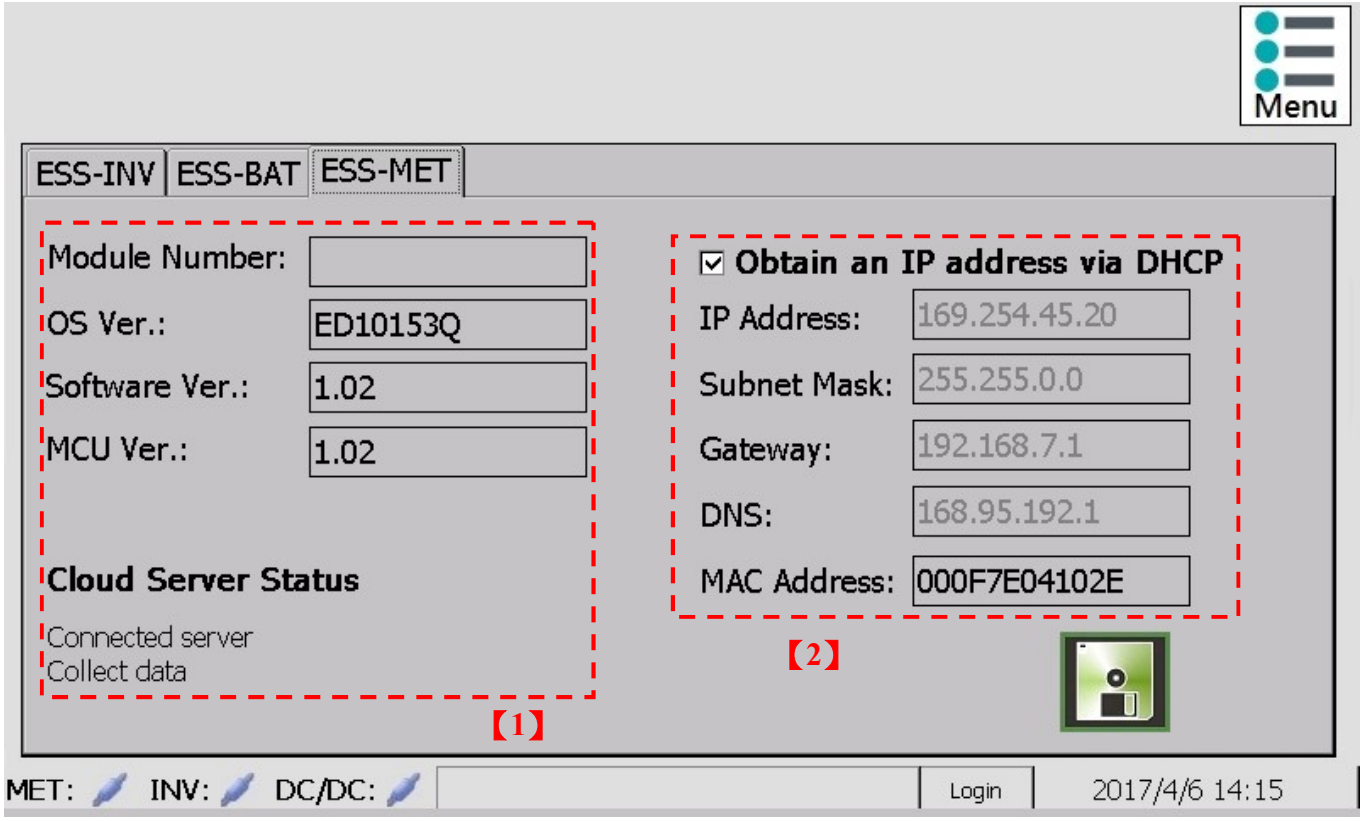


【1】 **Type:** Displays the type of battery packs.

【2】 **Nominal voltage:** Displays the nominal voltage of the equipped battery.

【3】 **Total Capacity:** Displays the total capacity of the equipped battery.

3-3-2-3.ESS-MET



【1】 ESS-MET information:

Model: ESS-MET model number.

OS version: OS (operating system) version of ESS-MET.

Software version: Software version of ESS-MET.

Firmware version: Firmware version of ESS-MET.

Cloud server status: Displays the connection status between ESS-MET and the cloud server.

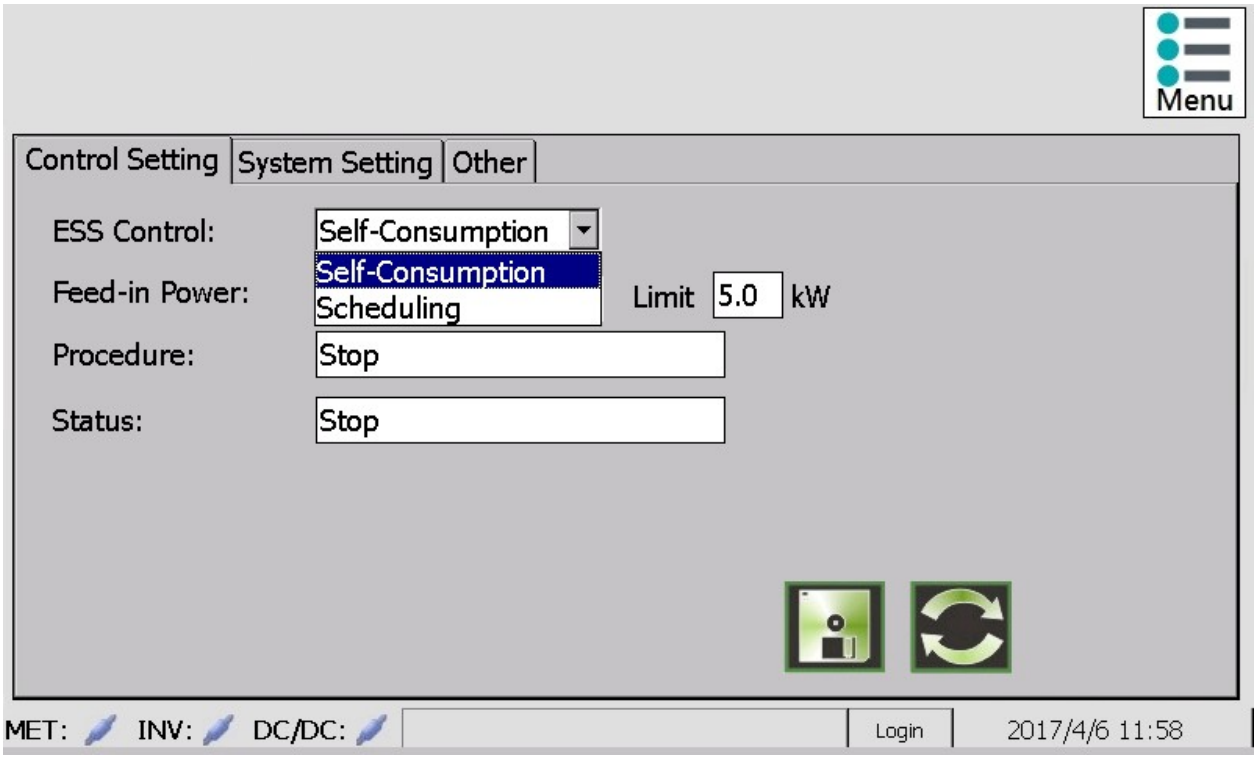
【2】 ESS-MET network setting information:

Displays the host IP, subnet mask, gateway, DNS and MAC Address (network card) information.

3-2-3.Setting Page Description

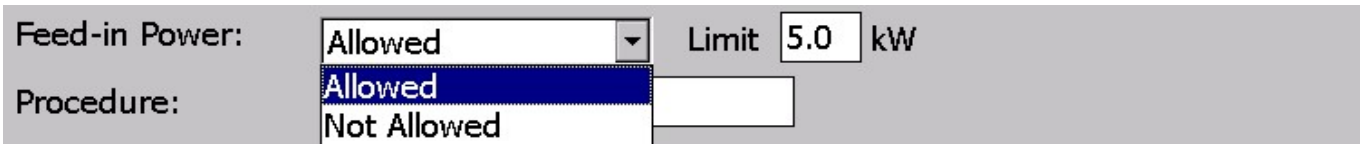
1. **Control setting:**

   Self-consumption or **Scheduling** control modes can be selected according to the contract between the power company. When the user selects a control mode, the save icon must be pressed to change the settings.

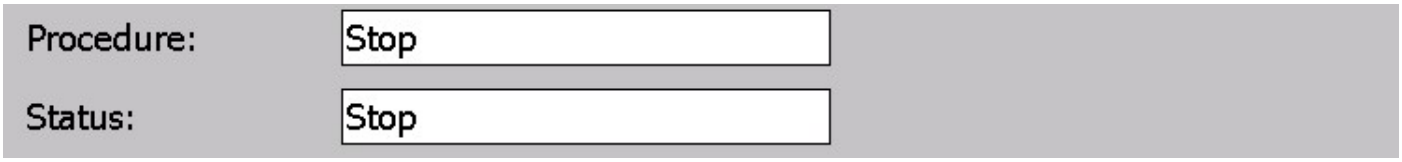


- **Self-consumption mode setting**

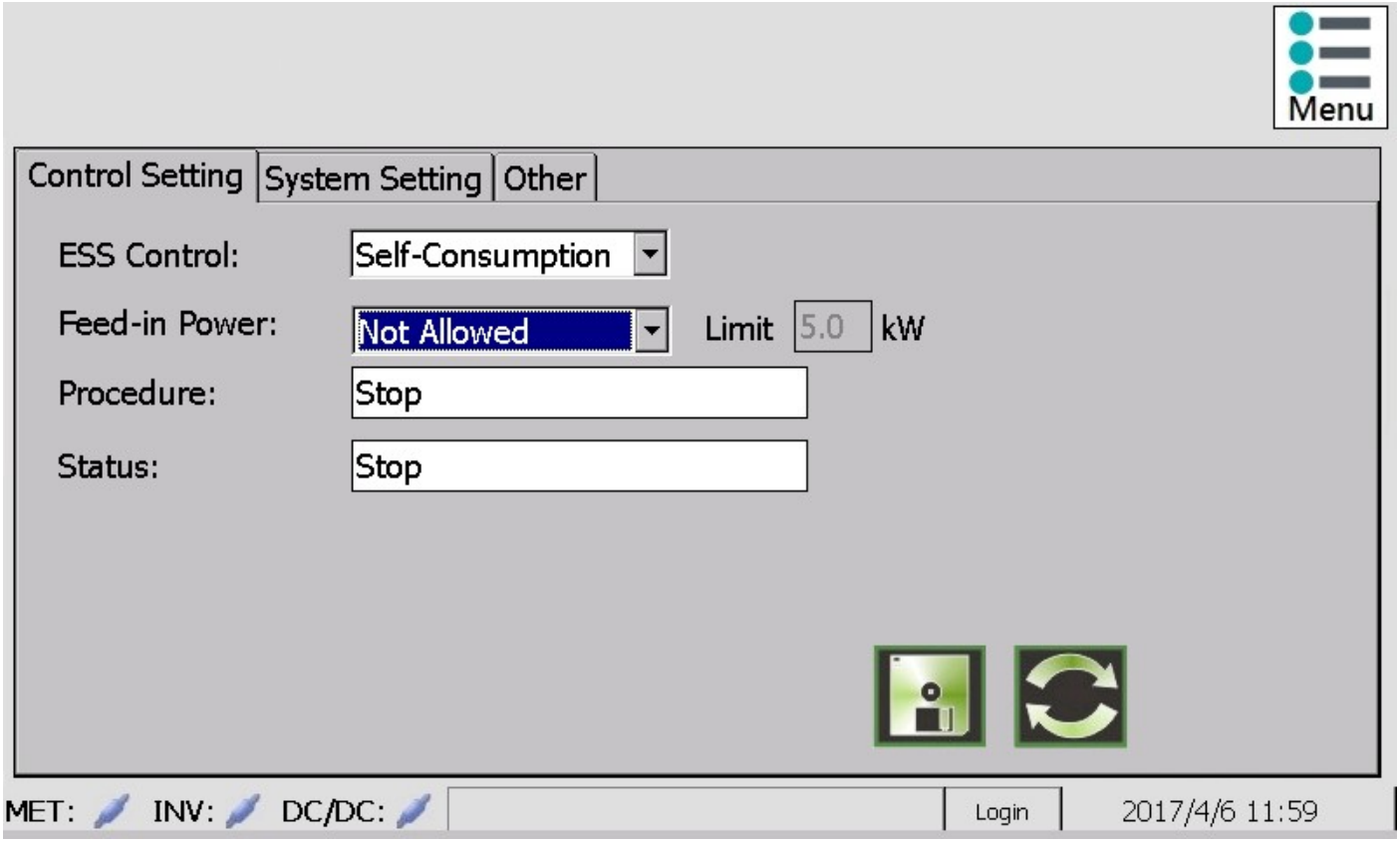
Users can select whether feed-in powertoutility grid under this mode.The default setting of feed-in power is Not Allowed, if users change the setting to Allowed, it is need to enter the limit value of feed-in power(1-5kW).



During self-consumption mode execution, the procedure and status of controller will be displayed below. Users can use this status bar to find out the current operation behavior of the energy storage system.



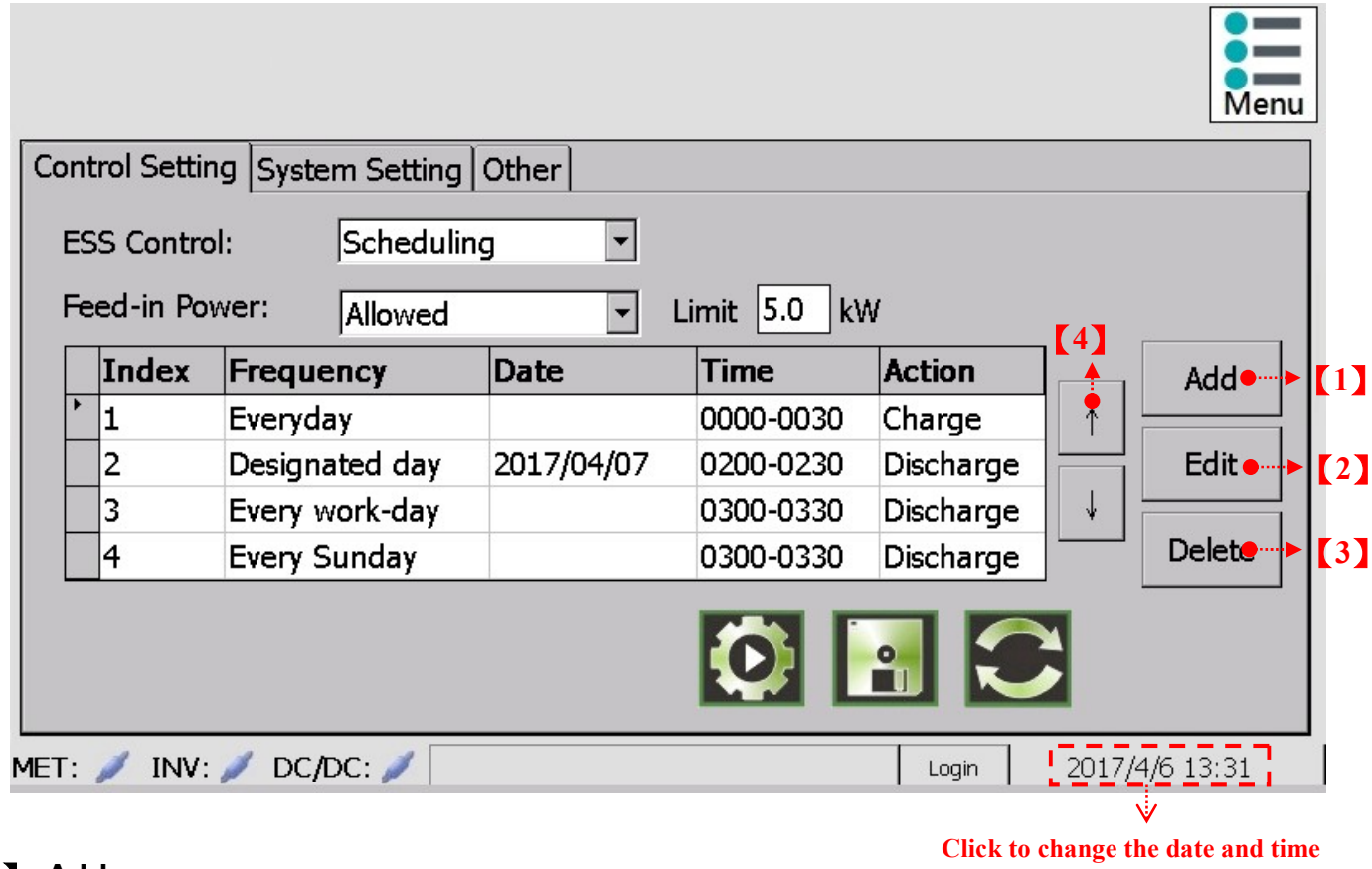
Once the feed-in power setting is decided, the save icon must be clicked.Then will the execute function icon appear. Once this icon is clicked, it will startactivating the self-consumption mode control. When execution starts, the original execute function icon will change to the stop function icon .Press this icon to stop the self-consumption function.



■ Scheduling mode setting

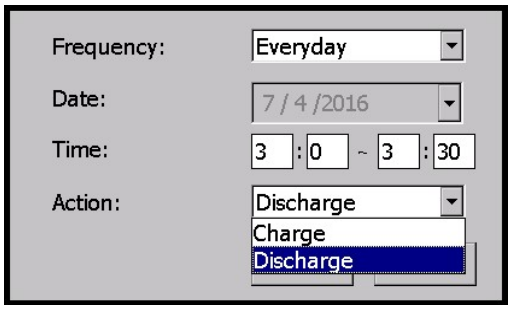
Scheduling is in accordance with the panel's current time and date setting, therefore users must first confirm whether the time settings of the panel is correct before executing this function.

Similar to self-consumption mode, users can select whether to feed-in power to utility grid. The system's default setting is not allow feed-in power; if feed-in power allowed is selected, users can also select the limit on how much power to feed (1~5kW).



【1】 Add:

Add a new schedule.



When a new schedule is added, users can change the setting as below:

Frequency: Daily, every work day, every Saturday, every Sunday, specify date.

Date: The date can only be set when the frequency is set as specify date.

Time: Enter the start and end time (24-hour) of schedule execution.

Action: Select the action to execute for this schedule, charge or discharge.

【2】 Edit:

Edit the schedule.

【3】 Delete:

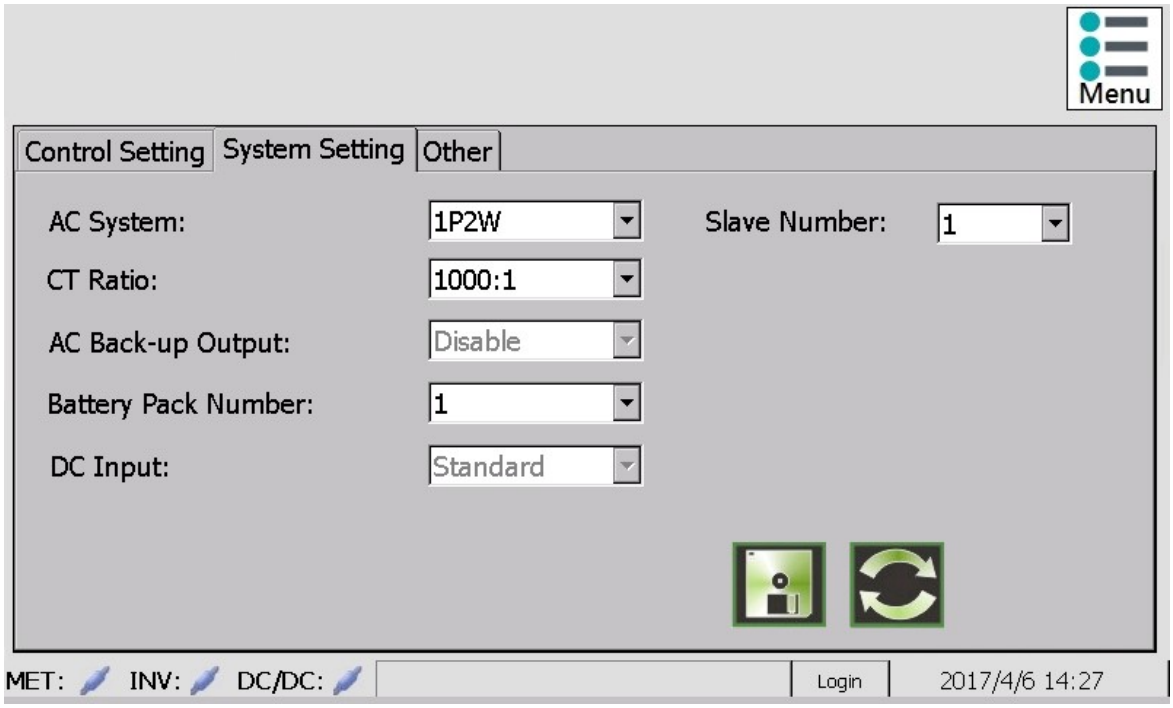
Delete the schedule.

【4】 Up and Down selection button:

Selects the schedule item.

Once scheduling setting is complete, the save icon must be clicked; then will the execute function icon appear. Once this icon is clicked, it will start activating the scheduling mode control. When execution starts, the original execute function icon will change to the stop function icon .Press this icon to stop the scheduling function.

2. System Setting



【1】 AC System:

There are two power system configuration can be selected.

1P2W: Single Phase Two-Wire

1P3W: Single Phase Three-Wire

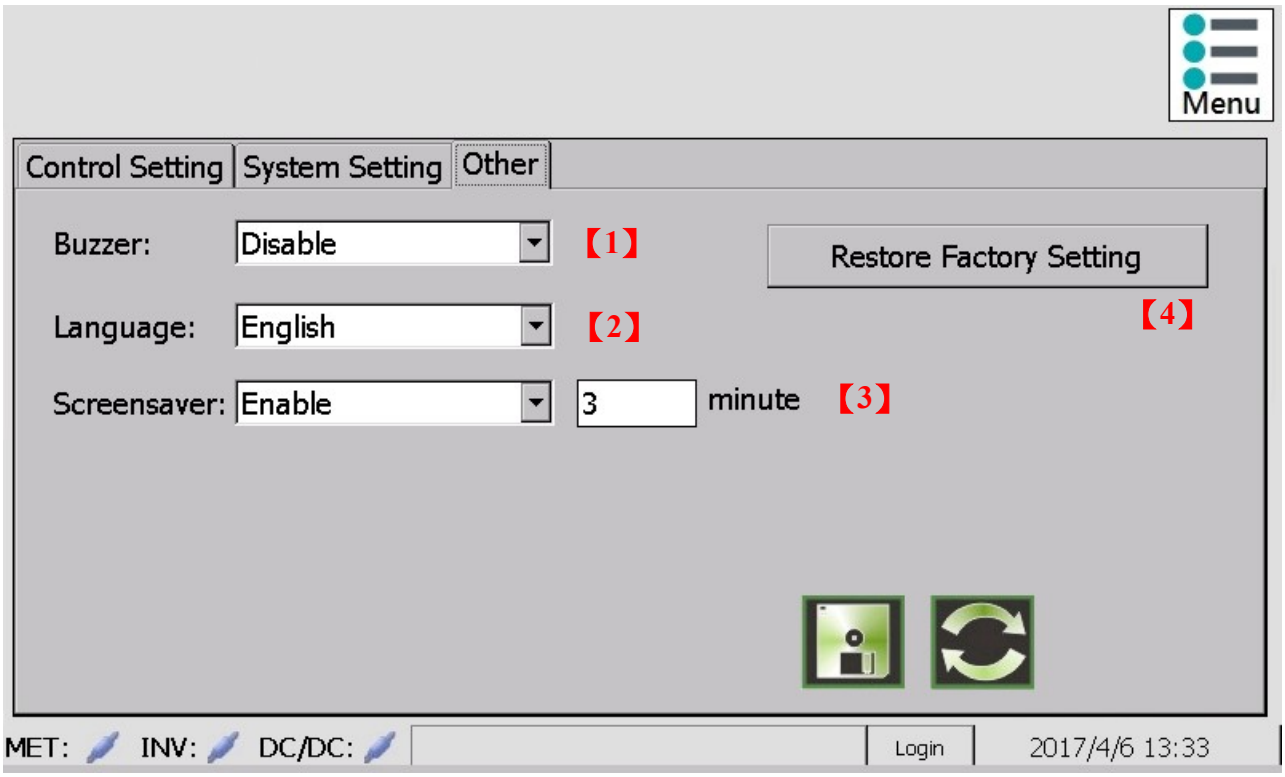
【2】 AC Back-up Output:

Users can select AC Back-up Output Enable/Disable。

【3】 Battery Pack Number:

Users must select the exactly equipped number of battery pack. If the number of battery pack is not correct, battery number setting error will show up.

3. Other:



【1】 Buzzer:

Enable/Disable Buzzer when Alarm/Error occurred。

【2】 Language:

Users can select various language as: Chinese, English, Japanese, Italian, French.

【3】 Screensaver:

Enable/Disable screensaver and set the idle time to start screensaver.

【4】 Restore factory setting:

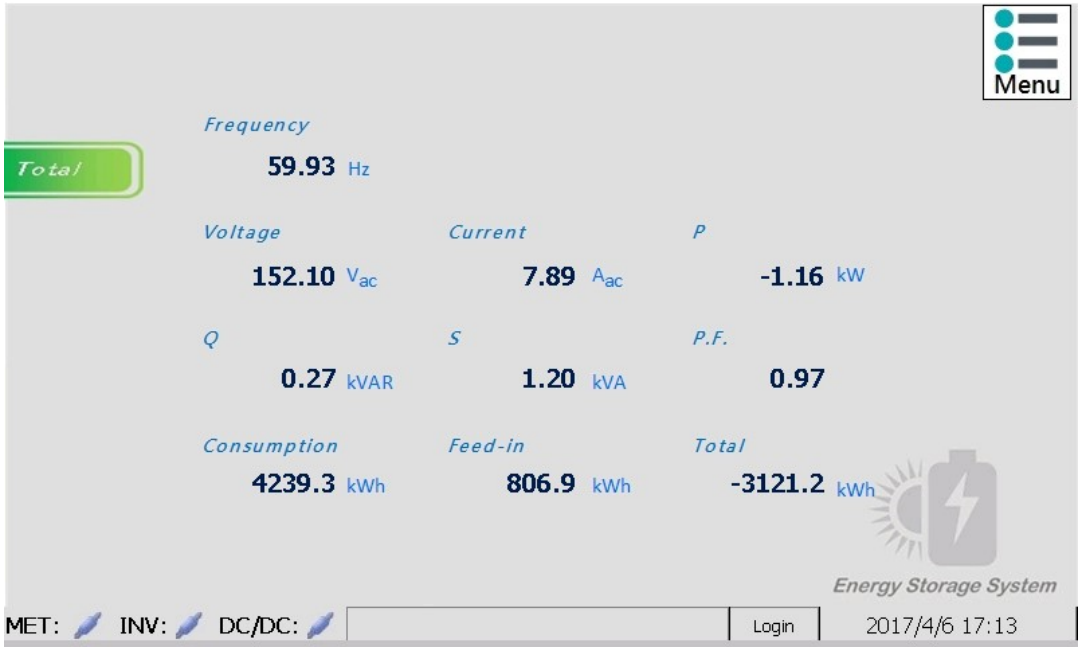
Restoring the settings to default.

3-2-4.Meter Function Description

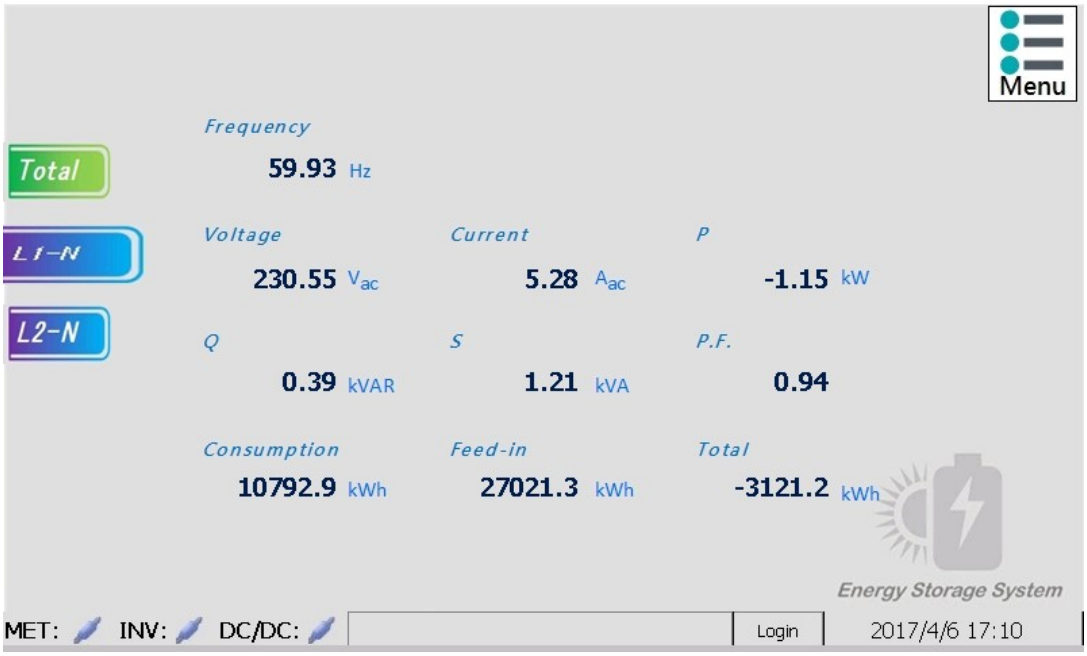
The function of the meter is to provide information on the entire system, including utility grid, energy storage system (ESS) and battery.

3-2-4-1. Meter - Utility Grid

- 1p2w page



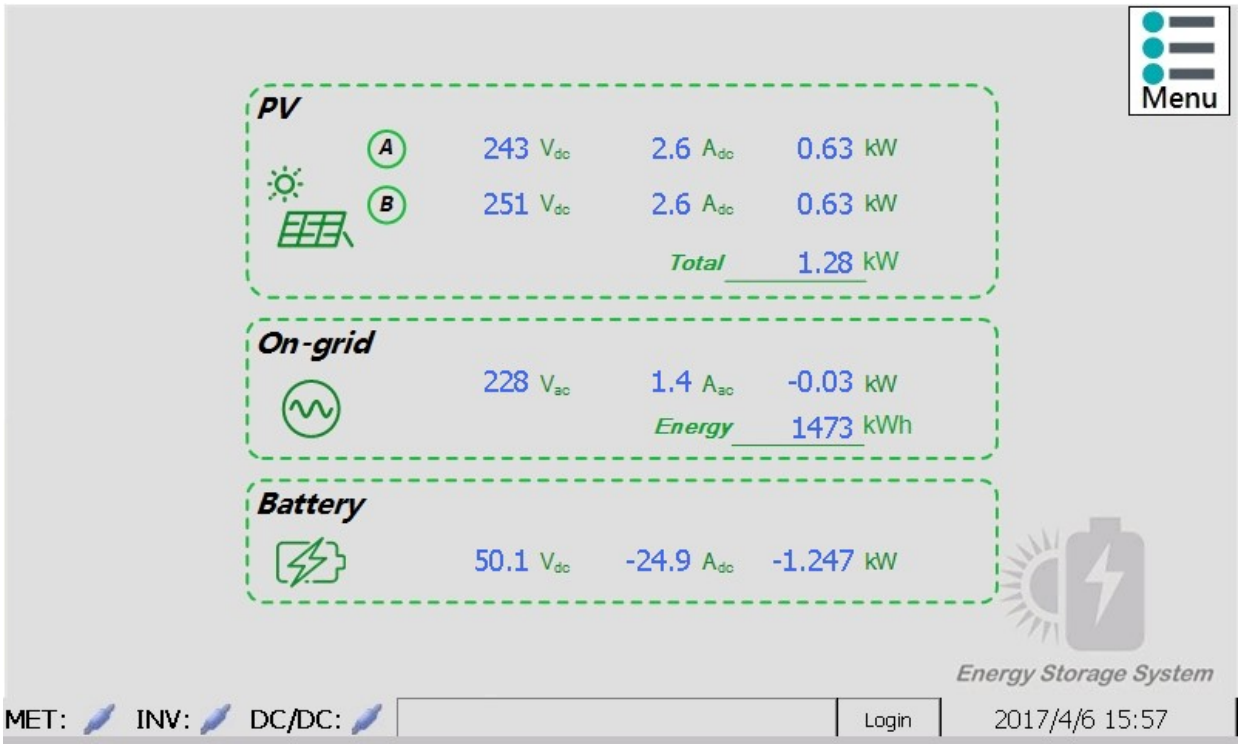
- 1p3w page



This page according to the system connection type(1p2w/1p3w) displays the power information of the utility grid, including:

1. System frequency(Hz)
2. Voltage(Vac)
3. Current(Aac)
4. Real power(kW)
5. Reactive power(kVAR)
6. Apparent power(kVA)
7. Power factor P.F.
8. Accumulated Energy of Power consumption (kWh)
9. Accumulated Energy of Feed-in electricity (kWh)
10. Accumulated Energy of Overall energy (kWh)

3-2-4-2. Meter – ESS

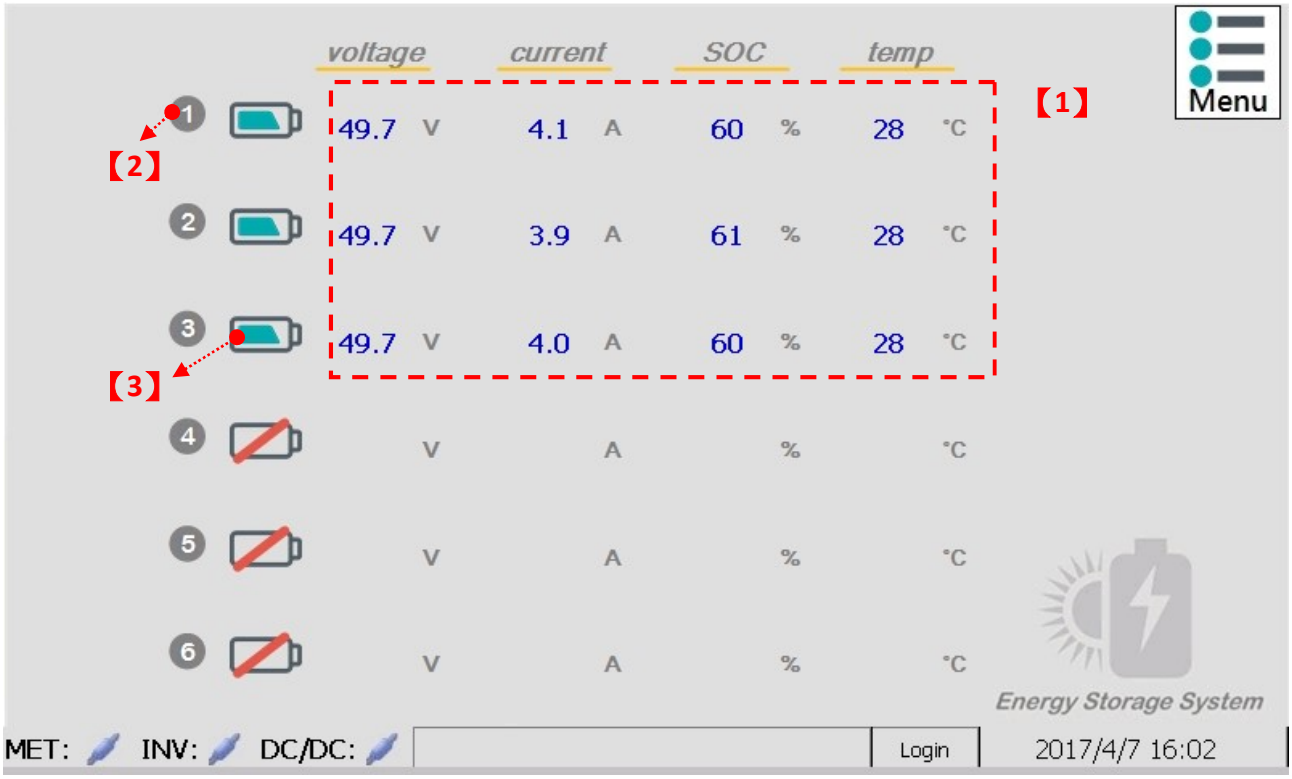


This page displays power information of the energy storage system, including:

- PV input String A & B
  1. DC input voltage(Vdc)
  2. DC input current(Adc)
  3. Power of each string(kW)
  4. Power summation of string A&B(kW)
- On-grid
  1. System voltage(Vac)
  2. Current(Aac)
  3. Inverter input/output power(kW)
  4. Accumulated energy of PV generated power
- Battery
  1. Battery voltage(Vdc)
  2. Battery current(Adc)
  3. Battery power(kW)

3-2-4-3. Meter - Battery

This page displays the connection status and information of each battery pack; since ESS allows parallel connection for a maximum of 6 battery packs, therefore it displays the information for a maximum of 6 packs.



【1】 Battery information:

1. Battery voltage Voltage(V)
2. Battery current Current(A)
3. State-of-charge of battery SOC(%)
4. Battery temperature Temp(℃)

※If the connection from ESS to the battery pack failed, the fields described above will display as gray empty spaces.

【2】 Battery ID:

This battery ID is set from the flip-switch on the battery pack.

【3】 Battery connection status icon:

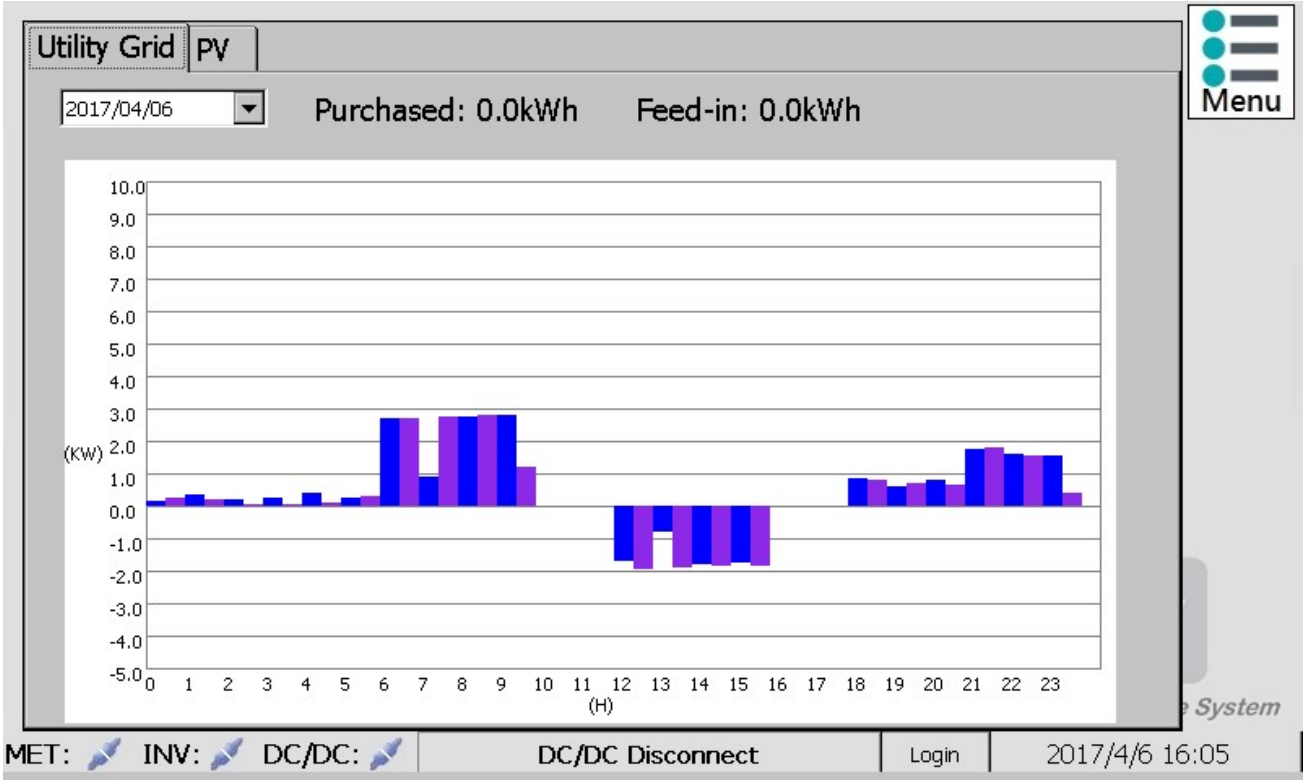
: Means that the communication between ESS and battery pack is successful and connecting.

: Means that the communication between ESS and battery pack failed and disconnected.

3-2-5.Curve Display Page Description

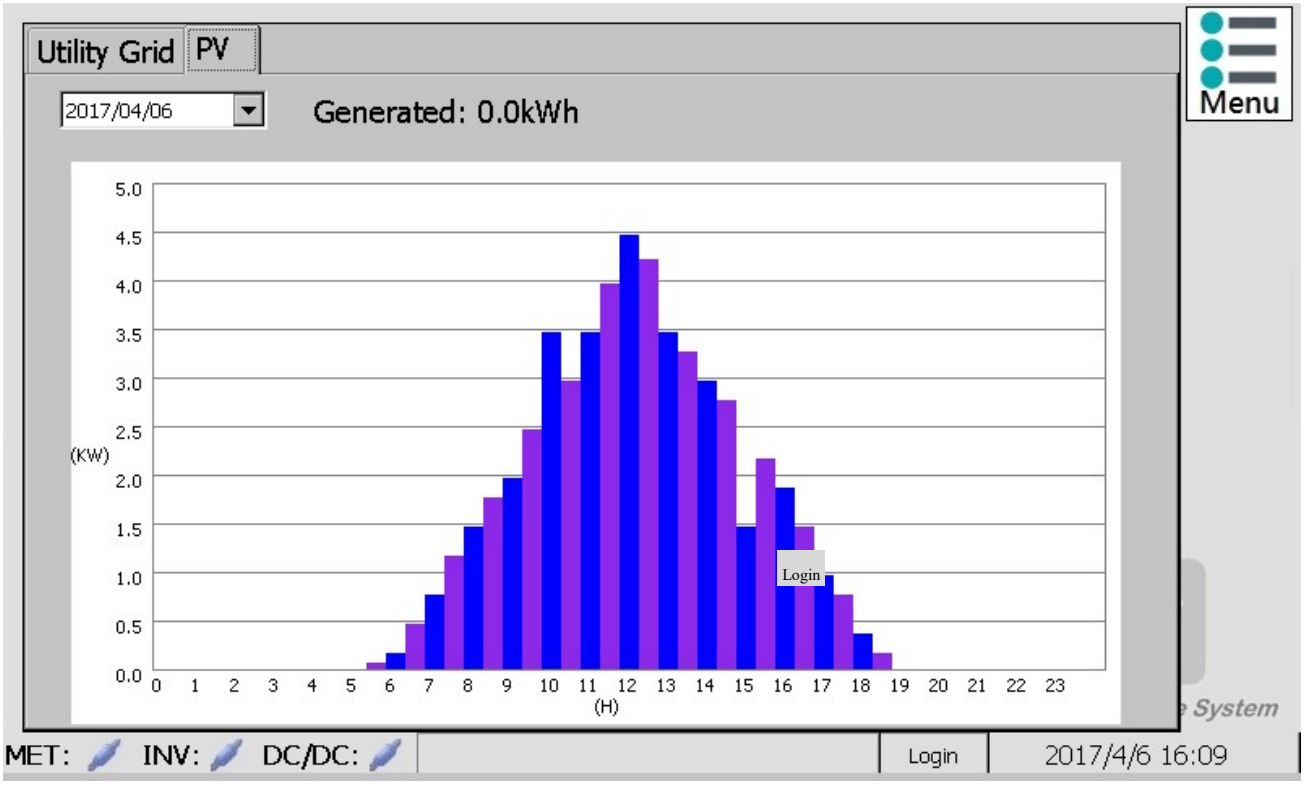
3-2-5-1.Utility grid power

This page displays the utility grid power curve recorded by the system.The positive power represents consumed power and the negative power represents power of fed-in Utility grid. The system will record an entry every hour.



3-2-5-2.Solar power generation amount

This page displays the solar power generation curve recorded by the system. The system will record an entry every hour.



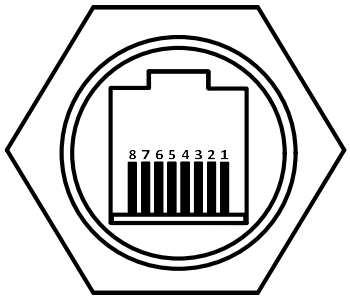
Utility grid power, solar power generation amount, login.

3-3. Communication Interface

RS-485Communication Interface settings are as follows:

Baud rate	9600 bps
Data length	8 bits
Stop bit	1
Parity	None

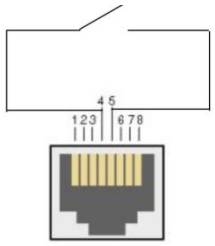
RS-485 pin definitions are as follows:



PIN 1 : Reserve
PIN 2 : Reserve
PIN 3 : RS485 GND
PIN 4 : EPO GND
PIN 5 : EPO
PIN 6 : Reserve
PIN 7 : RS485 A/Data+
PIN 8 : RS485 B/Data+

EPO (emergency power off) RJ45 connector

The inverter can be forced to power off by short-circuiting Pin4 and Pin5.

Note:	
Confirm that the cables of the RJ45 connector are connected properly. The EPO function is an emergency power switch and remains in standby mode; short-circuit the defined pins as shown in the figure to the right to force the photovoltaic inverter to stop operating immediately.	

3-4. Control Mode Description

3-4-1. Self-Consumption Control

The self-consumption control mode uses ***ESS-MET*** to measure the purchase/feed-in energy power of the **PCC(**Point of common coupling**)**, and feedback this power to the controller; when the power measured at the responsibility demarcation point is positive, it is purchasing energy, and if the measured power is negative, it is feeding-in energy. The main concept is that if the battery capacity is sufficient during energy purchase, then discharge for the load to use in order to lower the energy purchase ratio; if the battery was not fully charged during energy feed-in, then save the feed-in power into the battery.

Feed-in power behaviors of the ESS system that can be set by the user in the self-consumption mode are as follows:

1. Do not allow feed-in.
2. Allow feed-in.
3. Allow feed-in but limited the feed-in power (set by user).

The Figures 3-A, 3-B and 3-C below is the solar power generation curve and load curve for a day. Assume that the battery capacity was in the depleted status at first, from 0:00am to 6:00am, there is load consumption. therefore, ***ESS-MET*** measured that it was in the purchase electricity status within this period. However, since the battery was depleted, it therefore was unable to execute the discharge function.

When the time reached the 6:00am to 9:00am period, although the solar power gradually increased at first, it was still not enough to provide all load power.Therefore, the solar power and utility grid provided the load power together.

When the time reached the 9:00am to 16:00pm period, the solar power generation power is larger than the load requirement, so the excess solar power will be processed according to the feed-in power setting set by the user.

1. When the user set it as “**do not allow feed-in,** as shown in Figure 3-A, the excessive solar power will first charge the battery.The charging current will be adjusted according to the battery capacity. When the battery is fully charged or that the charging power was not enough to absorb all the solar power, the inverter will limit the output power until the feed-in power of the utility grid is zero.

2. When the user set it as “**allow feed-in”**, as shown in Figure 3-B, the excessive solar power will

first charge the battery. The charging current will be adjusted according to the battery capacity. When the battery is fully charged or that the charging power was not enough to absorb all the solar power, the remaining power will all be fed back to the utility grid.

3. When the user set it as "**allow feed-in but limit the feed-in power**, as shown in Figure 3-C, the excessive solar power will first charge the battery. The charging current will be adjusted according to the current feed-in power until the feed-in power of the utility grid is less than the "limit feed-in power" set by the user. When the battery is fully charged or the charging current has reached its top limit, the inverter will limit the output power.

After 17:00pm, the solar power generation power is less than the load requirement; therefore, ***ESS-MET*** measured that it is currently purchasing electricity and confirms that the battery capacity is sufficient. So it will discharge to supply load power until after 21:00pm when the battery power is depleted and the power required by the load afterwards are all provided by the utility grid.

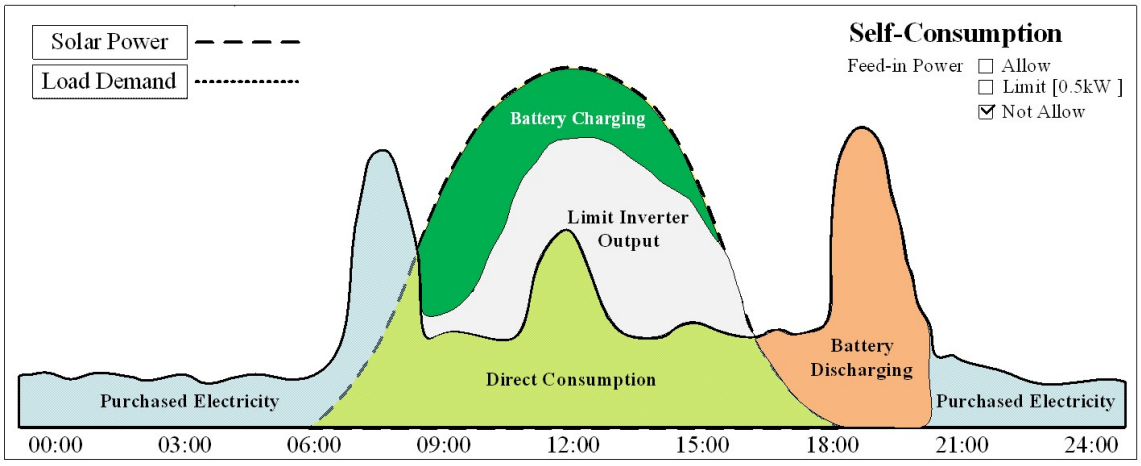


Figure 3-A

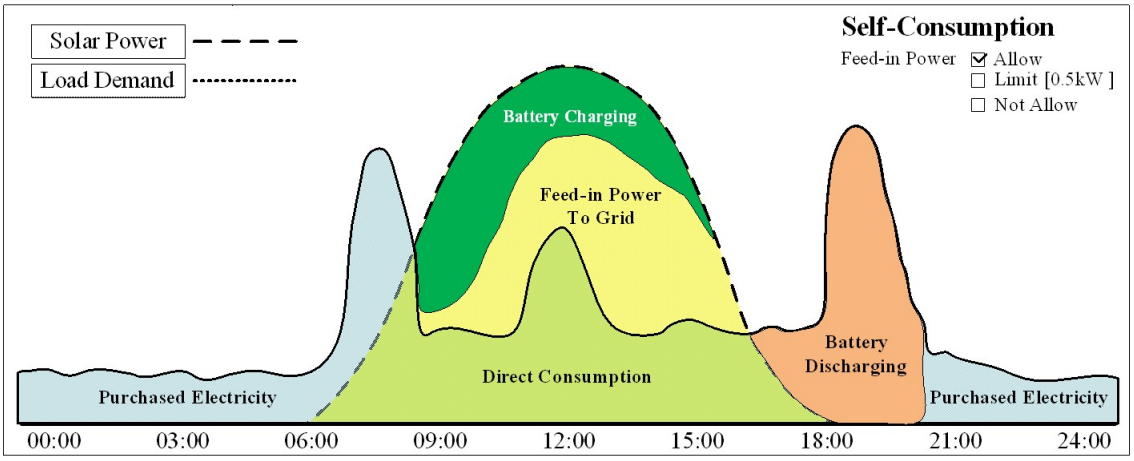


Figure 3-B

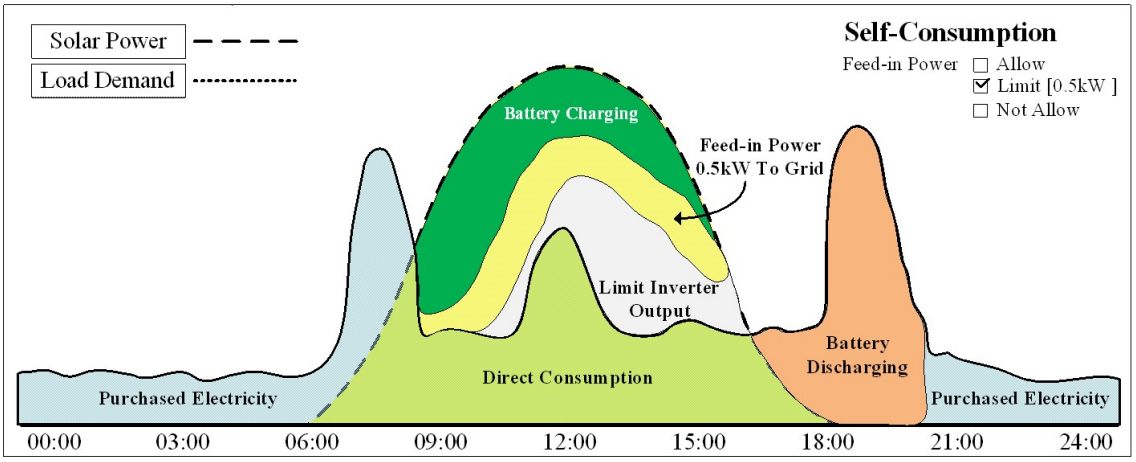


Figure 3-C

3-4-2. Scheduling Control

3-2-3-2. Scheduling–Scheduling control function descriptions

Scheduling control allows **time of use** users to customize the charging/discharging time of the ESS system to charge the battery usually at night or before dawn when the electricity price is lower. During the periods when the electricity price is higher, if the solar power generating power is lower than the required load power, discharge the battery for the load to use.

As shown in figures 3-D, 3-E, 3-F, between the hours of 12:00am and 6:00am, purchase electricity with lower price to charge the battery and also purchase electricity for the load to use.

After 6:00am, ESS confirms that the battery power is sufficient, therefore it discharges for the load to use. Between the hours of 9:00am~15:00pm, the solar power generation power is greater than the load need, so now the excessive solar power will be processed according to the feed-in power setting set by the user.

1. When the user set it as “**do not allow feed-in,** as shown in Figure 3-D, the excessive solar power will first charge the battery.The charging current will be adjusted according to the battery capacity. When the battery is fully charged or that the charging power was not enough to absorb all the solar power, the inverter will limit the output power until the feed-in power of the utility grid is zero.

2. When the user set it as “**allow feed-in** , as shown in Figure 3-E, the excessive solar power will all be fed to the utility grid.

3. When the user set it as “**allow feed-in but limit the feed-in power”**, as shown in Figure 3-F, the excessive solar power will first charge the battery. The charging current will be adjusted according to the current feed-in power until the feed-in power of the utility grid is less than the ntil the feed-in power of e 0.5kW is used for the explanation) set by the user. When the battery is fully charged or the charging current has reached its top limit, the inverter will limit the output power.

After 17:00pm, the solar power generation power is less than the load requirement; therefore ***ESS-MET*** measured that it is currently purchasing electricity and confirms that the battery capacity is sufficient. So it will discharge to supply load power until after 21:00pm when the battery power is depleted and the power required by the load afterwards are all provided by the utility grid.

When the time reaches 22:00pm, ESS will automatically activate to charge the battery.

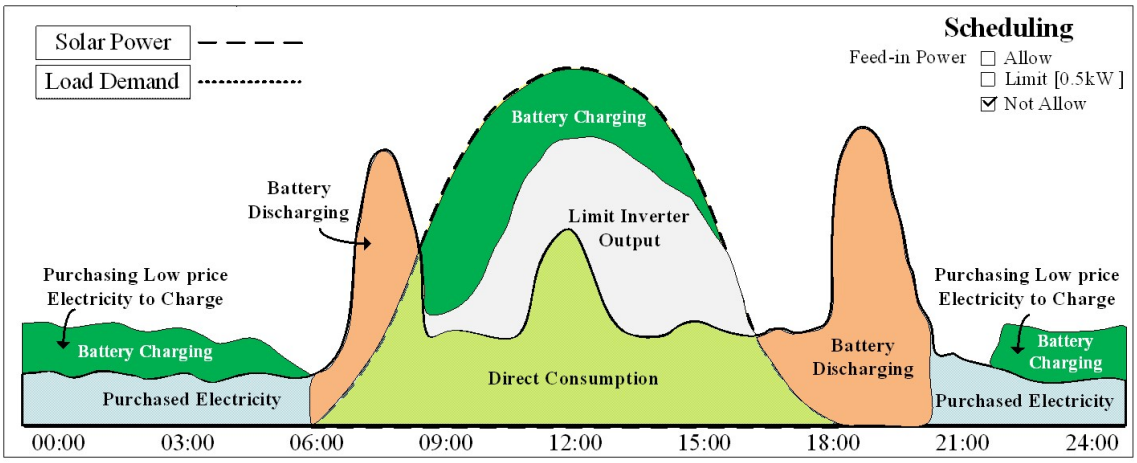


Figure 3-D

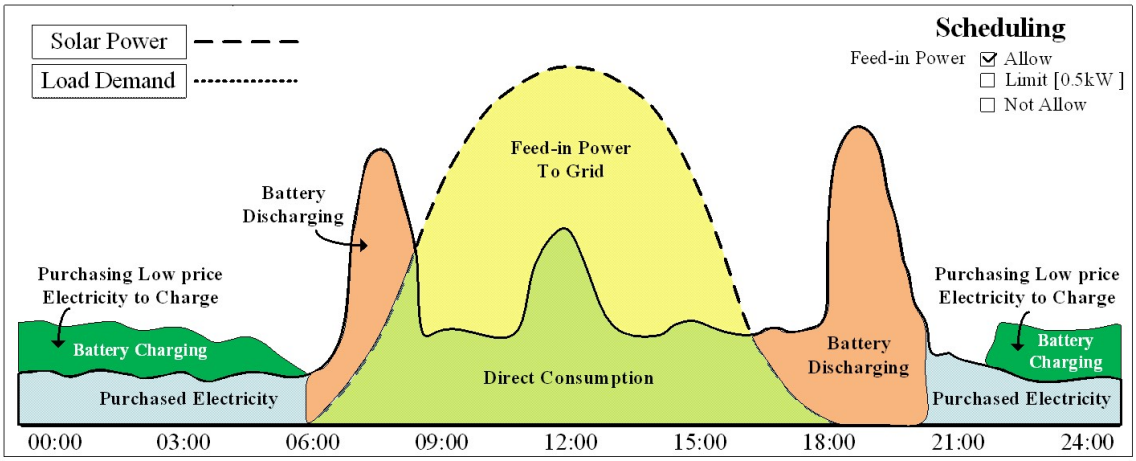


Figure 3-E

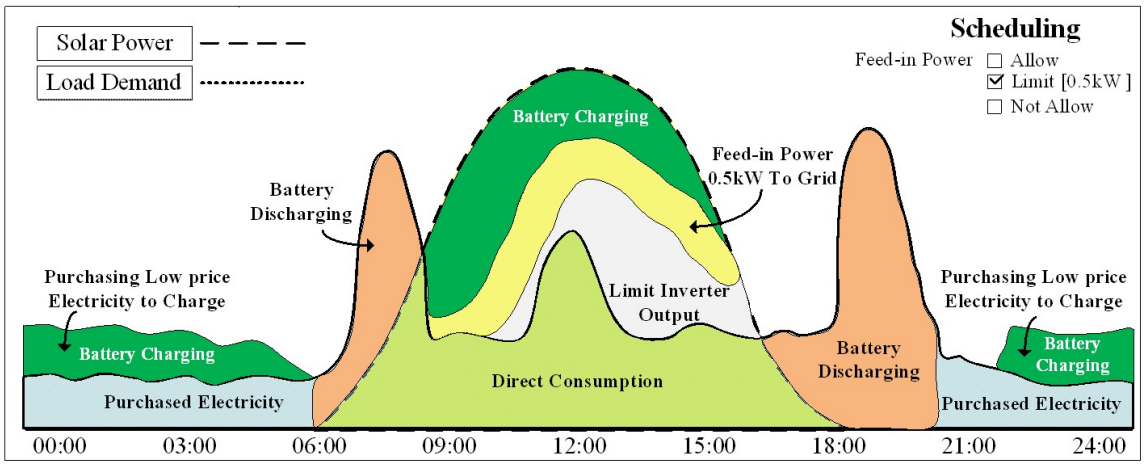

Solar Power
Load Demand
Scheduling
Feed-in Power
Allow
Limit [0.5kW]
Not Allow
Battery Charging
Feed-in Power
0.5kW To Grid
Battery
Discharging
Purchasing Low price
Electricity to Charge
Limit Inverter
Output
Purchasing Low price
Electricity to Charge
Battery Charging
Battery
Discharging
Battery
Charging
Direct Consumption
Purchased Electricity
Purchased Electricity
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
24:00

Figure 3-F

4. Troubleshooting and Solutions

Display of Error and Alarm Codes:

1. LCD display of the inverter: Automatically displays the Error/Alarm code.
2. LCD touch display of the smart meter: Automatically displays the Error/Alarm code.

■ Utility grid system abnormality code description:

<table>
<tr><th>LCD Display</th><th>Cause</th><th>Description</th><th>Troubleshooting</th></tr>
<tr><td>AL00</td><td>Utility grid voltage too high</td><td rowspan="2">Utility grid voltage does not comply with photovoltaic inverter specifications</td><td rowspan="4">1. Disconnect the photovoltaic inverter from the utility grid.
2. Confirm the wiring and architecture of the utility grid system
3. Confirm whether the utility grid voltage and frequency comply with photovoltaic inverter specifications
4. Restart the photovoltaic inverter. If the malfunction continues to occur, please contact the supplier.</td></tr>
<tr><td>AL01</td><td>Utility grid voltage too low</td></tr>
<tr><td>AL02</td><td>Utility grid voltage frequency too high</td><td rowspan="2">Utility grid voltage frequency does not comply with photovoltaic inverter specifications</td></tr>
<tr><td>AL03</td><td>Utility grid voltage frequency too low</td></tr>
<tr><td>AL04</td><td>String A input voltage too high</td><td rowspan="4">Input voltage does not comply with photovoltaic inverter specifications</td><td rowspan="4">1. Disconnect the photovoltaic array from the photovoltaic inverter
2. Confirm the open-circuit voltage of the photovoltaic array
3. If the open-circuit voltage of the photovoltaic array is within photovoltaic inverter specifications and the malfunction continues to occur, please contact the supplier.</td></tr>
<tr><td>AL05</td><td>String A input voltage too low</td></tr>
<tr><td>AL06</td><td>String B input voltage too high</td></tr>
<tr><td>AL07</td><td>String B input</td></tr>
</table>

	voltage too low		
AL08	Island effect	No utility grid or abnormal utility grid	1. Disconnect the photovoltaic array from the photovoltaic inverter and disconnected the utility grid. 2. Confirm whether there are any errors in the AC wiring. 3. Confirm whether the utility grid is abnormal 4. If the utility grid is normal and the wiring is correct but the malfunction continues to occur, please contact the supplier.
AL13	Abnormal utility grid voltage phase		
AL10	Leakage current is too high	Ground leakage current is too high	1. Disconnect the photovoltaic array from the photovoltaic inverter and disconnected the utility grid. 2. Confirm the wiring and architecture of the utility grid. 3. Restart the photovoltaic inverter. If the malfunction continues to occur, please contact the supplier.
AL11	Abnormal insulation resistance	The DC input insulation resistance of the photovoltaic inverter is too low and does not comply with specifications	1. Disconnect the photovoltaic array from the photovoltaic inverter and disconnected the utility grid. 2. Confirm whether the DC input terminal of the photovoltaic inverter and the photovoltaic array is abnormal (such as short-circuit or ruptured cable insulation cover) 3. Restart the photovoltaic inverter. If the malfunction continues to occur, please contact the supplier. 4.
AL21	RMS calculation error	The RMS calculation time is too long when the photovoltaic inverter is operating	If the malfunction continues to occur, please contact the supplier.

AL23	Photovoltaic inverter initialization	When the photovoltaic inverter starts executing DC power on sequence, the main controller is still in its initial status	If the malfunction continues to occur, please contact the supplier.

■ Energy storage system malfunction and system abnormality code description:

LCD Display	Cause	Description	Troubleshooting
ER00	Abnormal DC_BUS charging	The DC_BUS is unable to reach the value set when the machine is performing DC power on sequence.	1. Disconnect the photovoltaic array from the photovoltaic inverter. 2. Wait until the LCD display goes off completely and then reconnect the photovoltaic array with the photovoltaic inverter. 3. If the malfunction continues to occur, please contact the supplier.
ER02	Sub-control failure	Sub-controller unable to operate normally.	
ER07	DC_BUS voltage too high	DC_BUS voltage is higher or lower than the value set during the operation process	
ER08	DC_BUS voltage too low		
ER12	Abnormal DC_BUS charging	DC_BUS unable to reach the value set before connecting to the utility grid	
ER17	EEPROM error	Unable to access EEPROM	
ER22	Abnormal output relay	Abnormal AC output relay	
ER24	Abnormal output current detected	Abnormal output current when machine is executing DC power on sequence	
ER25	String A input over-current	Input current exceeded rated value	
ER26	String B input over-current		
ER27	String A&B short-circuit	Input short-circuit	

ER06	EPO	Emergency power off. Photovoltaic inverter will stop output and remain in standby mode	1. Remove the EPO terminal 2. If the malfunction continues to occur, please contact the supplier.
ER09	Photovoltaic inverter AC output over-current	Photovoltaic inverter AC output current exceeds rated value	1. Switch the utility grid breaker to the OFF position, then check the architecture of the utility grid system. 2. If the utility grid system is normal and the malfunction continues to occur, please contact the supplier.
ER11	Photovoltaic inverter over-load	Photovoltaic inverter AC output power exceeds rated value	
ER13	Photovoltaic inverter AC output short-circuit	Photovoltaic inverter AC output short-circuit or utility grid short-circuit	
ER14	Abnormal photovoltaic inverter phase-lock	Photovoltaic inverter unable to synchronize with utility grid phase during AC power on sequence	
ER29	DC component in photovoltaic inverter AC output too high	DC component in AC output exceeds rated value	
ER10	Chassis over-temperature	Temperature inside chassis too high	1. Try to lower the temperature around the photovoltaic inverter. 2. If the malfunction continues to occur, please contact the supplier.
ER18	Heat sink over-temperature	Heat sink temperature too high	
ER44	Battery over-voltage(HW)	Hardware circuit detects battery voltage too high	1. Wait until the voltage/current returns to the normal range and then just reset the abnormality. 2. If the malfunction continues to occur, please contact the supplier.
ER45	Battery under-voltage(HW)	Hardware circuit detects battery voltage too low	
ER46	DC bus over-voltage(HW)	Hardware circuit detects DC bus voltage too high	

ER47	DC bus under-voltage(HW)	Hardware circuit detects DC bus voltage too low	
ER50	DC/DC hardware over current (HW)	Battery terminal short-circuit or DC/DC hardware malfunction	
ER52	Abnormal DC/DC hardware (HW)	Hardware protection circuit activated	
ER60	Battery over-voltage(FW)	Firmware program detected battery voltage too high	
ER61	Battery under-voltage(FW)	Firmware program detected battery voltage too low	
ER62	DC bus over-voltage(FW)	Firmware program detected DC bus voltage too high	
ER63	DC bus under-voltage(FW)	Firmware program detected DC bus voltage too low	
ER64	DC bus 1 over-voltage (FW)	Firmware program detected DC bus 1 voltage too high	
ER65	DC bus 2 over-voltage (FW)	Firmware program detected DC bus 2 voltage too high	
ER66	Charging current too high (FW)	Firmware program detected charging current is too high	
ER67	Discharge current too high (FW)	Firmware program detected discharge current is too high	
ER68	Temperature point 1 over-temperature	Firmware program detected DC/DC temperature point 1 over-temperature	1. Try to lower the temperature around the photovoltaic inverter.

ER69	Temperature point 2 over-temperature	Firmware program detected DC/DC temperature point 2 over-temperature	2. If the malfunction continues to occur, please contact the supplier.
ER75	DC breaker open-circuit	DC breaker on the ESS-INV is open-circuit	Check if the DC breaker is off.
ER76	Write to memory failed	Abnormal FRAM memory write function	If the malfunction continues to occur, please contact the supplier.
ER77	Memory access failed	Abnormal FRAM memory read function	If the malfunction continues to occur, please contact the supplier.
ER91	Battery number setting error	Number of battery pack set different from actual number	Please check System Setting – Battery Pack Number is correct
ER92	BMS1 - over-voltage	BMS of battery pack 1 detects battery over-voltage	1. Wait until the abnormal parameters return to normal, then just reset the abnormality. 2. If the malfunction continues to occur, please contact the supplier.
ER93	BMS1 - under-voltage	BMS of battery pack 1 detects battery under-voltage	
ER94	BMS1 - over-current	BMS of battery pack 1 detects battery over-current	
ER95	BMS1 - short-circuit protection	BMS of battery pack 1 detects battery short-circuit	
ER96	BMS1 - temperature too high	BMS of battery pack 1 detects battery temperature too high	
ER97	BMS1 - temperature too low	BMS of battery pack 1 detects battery temperature too low	
ER 100	BMS2 - over-voltage	BMS of battery pack 2 detects battery over-voltage	
ER 101	BMS2 - under-voltage	BMS of battery pack 2 detects battery under-voltage	

ER 102	BMS2 - over-current	BMS of battery pack 2 detects battery over-current	
ER 103	BMS2 - short-circuit protection	BMS of battery pack 2 detects battery short-circuit	
ER 104	BMS2 - temperature too high	BMS of battery pack 2 detects battery temperature too high	
ER 105	BMS2 - temperature too low	BMS of battery pack 2 detects battery temperature too low	
ER 108	BMS3 - over-voltage	BMS of battery pack 3 detects battery over-voltage	
ER 109	BMS3 - under-voltage	BMS of battery pack 3 detects battery under-voltage	
ER 110	BMS3 - over-current	BMS of battery pack 3 detects battery over-current	
ER 111	BMS3 - short-circuit protection	BMS of battery pack 3 detects battery short-circuit	
ER 112	BMS3 - temperature too high	BMS of battery pack 3 detects battery temperature too high	
ER 113	BMS3 - temperature too low	BMS of battery pack 3 detects battery temperature too low	
ER 116	BMS4 - over-voltage	BMS of battery pack 4 detects battery over-voltage	
ER 117	BMS4 - under-voltage	BMS of battery pack 4 detects battery under-voltage	
ER 118	BMS4 - over-current	BMS of battery pack 4 detects battery over-current	
ER 119	BMS4 - short-circuit protection	BMS of battery pack 4 detects battery short-circuit	

ER 120	BMS4 - temperature too high	BMS of battery pack 4 detects battery temperature too high	
ER 121	BMS4 - temperature too low	BMS of battery pack 4 detects battery temperature too low	
ER 124	BMS5 - over-voltage	BMS of battery pack 5 detects battery over-voltage	
ER 125	BMS5 - under-voltage	BMS of battery pack 5 detects battery under-voltage	
ER 126	BMS5 - over-current	BMS of battery pack 5 detects battery over-current	
ER 127	BMS5 - short-circuit protection	BMS of battery pack 5 detects battery short-circuit	
ER 128	BMS5 - temperature too high	BMS of battery pack 5 detects battery temperature too high	1. Wait until the abnormal parameters return to normal, then just reset the abnormality. 2. If the malfunction continues to occur, please contact the supplier.
ER 129	BMS5 - temperature too low	BMS of battery pack 5 detects battery temperature too low	
ER 132	BMS6 - over-voltage	BMS of battery pack 6 detects battery over-voltage	
ER 133	BMS6 - under-voltage	BMS of battery pack 6 detects battery under-voltage	
ER 134	BMS6 - over-current	BMS of battery pack 6 detects battery over-current	
ER 135	BMS6 - short-circuit protection	BMS of battery pack 6 detects battery short-circuit	
ER 136	BMS6 - temperature too high	BMS of battery pack 6 detects battery temperature too high	

ER 137	BMS6 - temperature too low	BMS of battery pack 6 detects battery temperature too low	

5. Specifications Table

Model Name	ESS-INV-3	ESS-INV-4	ESS-INV-5
PV array input			
Recommended PV power	2700-3600Wp	3600 - 4800Wp	4500 - 6000Wp
Rated power	3300W	4000W	5000W
Rated voltage	360Vdc		
Max. input voltage(Voc)	500Vdc		
Start-up voltage	60Vdc		
Operating voltage range	120–500Vdc		
Max. input current	13A x Number of MPPT tracker		
Max. short circuit current(Isc)	15A x Number of MPPT tracker		
Max. inverter backfeed current to the array	0A		
MPP voltage range	150-450Vdc		
MPP voltage range (Nominal output)	230-450Vdc		
Number of MPPT tracker	1	2	2
Topology	Non-isolated type		
AC Input / Output			
Nominal AC power	3300W	4000W	5000W*
Peak power	3300Wp	4000Wp	5000Wp*
Max. apparent power	3300VA	4000VA	5000VA*
Nominal AC voltage	230Vac		
Connection	1-Phase / 2-Wire(L,N,PE)		
Operating AC voltage range	184-264Vac		
Nominal current	13A	17.4A	21.7A
Max. current (output fault current)	15A	20A	23A
Max. over current protection	15.6A	20.9A	24A
Inrush current (a.c.A Peak)	60A ≦1ms		
Frequency	50Hz/60Hz, Auto-selection		
Operating frequency range	50Hz: 47.5~50.2Hz		60Hz: 59.3~60.5Hz
Power factor	0.9 lagging to 0.9 leading		
Current distortion	Total harmonic distortion <3% Single order harmonic distortion<2%		

*De-rating to 4600W/Wp/VA for Germany.

Applicable Battery specs	
Nominal voltage	48Vdc
Applicable battery type	Li-ion / LiFePO4 / Lead-acid / Aqueous Hybrid Ion battery
D.C. input for battery discharge:	
Voltage(nominal or range)	40-60Vdc
Nominal battery voltage	48Vdc
Current(Max. continuous)	55A
Max. power	2500W
D.C. input for battery charge	
Voltage(nominal or range)	40-60Vdc
Nominal battery voltage	48Vdc
Current(Max. continuous)	55A
Max. power	2500W
Voltage(nominal or range)	CC,CV
Topology	Isolated type
Efficiency	
Max. conversion efficiency	>97.1%
Euro efficiency	>96.5%
System efficiency	>94%
Environmental	
Ambient Temperature	-25°C to +50°C / -13 °F ~ 122 °F -25°C to +40°C / -13 °F ~ 104 °F (For output AC full power)
Pollution degree	3
Overvoltage category level	DC circuit II, AC circuit III
Humidity	0~100%(Without condensation)
Altitude	0~2000M / 0~6600ft
Mechanical	
Dimension(HxWxD)	810 x 455 x 270mm
Weight	30kg
Degree of protection	IP65, outdoor
Cooling	Convection
AC connection	Screw Terminals
DC connection	MC4
Audible noise	<25dBA
Mounting	Wall Mount(mounting bracket included)
Communication / Front panel	
Interface	RS485, Dry contact

Display	Graphic LCD+LED panel(2.9”)	
Protection		
Utility grid	Over/under Voltage, Over/under Freq, Ground Fault, DC Isolation Fault	
Islanding protection	Passive: Voltage phase jump detection.	Active: Reactive power control.
Over temperature	De-rating output power	
EPO(Emergency power off)	Inverter powers off and stops its output and remains in standby mode	
DC(PV) reverse polarity protection	Internal diode clamp	
Internal DC & AC surge protection	Tested to 2kV	
Certification		
Grid standard	VDE-AR-N 4105, AS4777.2:2015	
Safety	IEC 62109-1, IEC62109-2, IEC 60529 Protection class: I	
EMC	EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12,	
Warranty	5 years	

Model name	**ESS-BAT**		
Battery spec			
Manufacturer	Panasonic / Samsung		
Battery type	Li-ion		
Nominal battery voltage	48V		
Max. battery voltage	53.3V		
Capacity	6kWh(3 packs) or 12kWh(6 packs)		
Cycle life	6000(80% DoD/0.5C)		
Warranty	10 years		
Discharge			
Equipped battery pack	1	2	>2
Max. discharge power	1000W	2000W	2500W
Max. discharge current	20A	40A	55A
Discharge end voltage	45.5V		
Charge			
Equipped battery pack	1	2	>2
Max. charge power	1000W	2000W	2500W
Max. charge current	20A	40A	55A
Charge voltage	53.3V		
Environmental data			
Operating ambient temperature	-25°C to +50°C / -13 °F ~ 122 °F		
Pollution degree	PD3		
Relative Humidity	0 – 100 % non-condensing		
Altitude	0~2000M / 0~6600ft		
Mechanical			
Dimension(HxWxD)	810 x 366 x 270mm		
Weight	60kg		
Protection Class	IP65, Outdoor		
Cooling	Natural		
Mounting	Wall Mount (mounting bracket included)		

Model name	**ESS-MET**
Measures	P, Q, A, V, F, PF, Energy
Accuracy and resolution	<1%, 1%
System connection type	1p2w / 1p3w
Nominal grid voltage/ voltage range	110-230Vac / 85-265Vac
Nominal grid frequency/ frequency range	50-60Hz / 45-65Hz
Power supply and consumption	<10W
Dimension(HxWxD)	403 x 343 x 106mm
Weight	7kg
Protection class	IP20, Indoor
Safety and EMC	IEC 61010-1, IEC 61326-1
Operating ambient temperature	0°C to +40°C
Storage ambient temperature	-20°C to +70°C
Relative Humidity	0 – 95 % non-condensing
Display size	7 inch
Display resolution	800x480
Display touch	Resistive Touch Screen
Display Backlight Module	LED
Display operating system	Windows CE 6.0
Power LED	Green x 1, Red x 1
RTC	Yes
Communication interface	RS485-1, RS485-2, Ethernet 10/100 (RJ45)
Storage	SD card (Up to 16G)