EN

All-in-one C&I Hybrid ESS

RENA1000 Series

User Manual

V01

- **RENA1000-E**

RENAC

Content

Notice

This manual contains important safety instructions, installation, electrical connections, commissioning, maintenance, and troubleshooting of the equipment.

Save the manual!

This manual must be stored carefully and be available at all times.

Copyright Declaration

1. About this Manual

1.1 Applicability

Please read the product manual carefully before installation, operation or maintenance. This manual contains important safety instructions and installation instructions that must be followed during installation and maintenance of the equipment.

1.2 Target Group

The instructions in this document can only be performed by qualified persons who must have the following skills:

- Have certain electronic, electrical wiring, and mechanical expertise, and be familiar with electrical and mechanical schematic diagrams.
- Be familiar with the composition and working principle of the integrated hybrid inverter; be familiar with the design and working principle of the integrated hybrid inverter and its front and back level equipment.
- Have received professional training related to electrical equipment installation and commissioning.
- Understand how the product works and how to operate the product.
- Have emergency response capabilities for dangerous or unexpected situations during installation or trial operation.
- Be familiar with the relevant standards and codes of the country where the project is located.
- Understand and follow this manual and all safety information.

1.3 Symbols Used

Symbols used have the following meaning:

 'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
 'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.
 'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
 'Notice' indicates a situation that, if not avoided, could result in equipment or property damage or provides tips that are valuable for the optimal operation of your product.

1.4 Designation in the Document

DG	Diesel generator
STS	Static Transfer Switch
EMS	Energy Management System
BMS	Battery Management System

BMU	Battery Management Unit
BCU	Battery Control Unit
SOC	State of Charge
PDU	Power Distribution Unit
Hybrid inverter	HYD INV
SPD	Surge Protective Device

2. Safety

2.1 General Safety

The energy storage system should be used in an environment that meets the requirements of the design specifications. Failure to follow proper usage guidelines may result in equipment malfunction, component damage, personal injury, property damage, and other issues. Please note that the energy storage system's quality assurance does not cover any such problems. Installation, operation, and maintenance of equipment should comply with local laws, regulations, and norms. The safety precautions in the manual are intended only as a supplement to local laws, regulations, and norms. The company shall not be liable in the event of any of the following circumstances.

- The installation and use environment exceeds the provisions of relevant international, national and regional standards.
- Does not operate under the conditions of use described in this manual.
- Disassemble, alter the product or modify the software code without authorization.
- Failure to follow the product's operating instructions and safety warnings, and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquakes, fires, storms, floods, mudslides, etc.).
- Damage caused by storage conditions not meeting the requirements of the product documentation.
- Damage to the hardware or data of the device due to customer negligence, incorrect operation, or intentional damage.
- System damage due to third-party or customer reasons, including relocation and installation systems that do not meet the requirements of this manual and damage caused by adjustments, alterations, or removal of identifying marks that do not meet the needs of this manual.
- Defects, malfunctions, or damages resulting from acts, events, omissions, or accidents beyond the seller's reasonable control, including power or electrical failures, theft, war, riot, civil commotion, terrorism, intentional or malicious damage, etc.
- The installation and various operations of the integrated hybrid inverter must comply with the relevant standards and regulations of the country/region where the project is located.
- The battery cabinet is equipped with an automatic fire extinguishing system and the fire switch should not be triggered unless it is an emergency.

2.2 Important Safety Instructions

DANGER

The equipment has a high voltage, and irregular operation may cause electric shock or fire, resulting in death, personal injury, or property damage. Please follow the operation sequence and safety precautions given in this manual and other related documents, and standardize the operation:

- Please check that the cable connection is fastened before the device. Inspect the machine for damage, such as holes, dents, or other signs of possible damage inside. Check that the internal parts of the equipment are kept the same, and it is forbidden to change the structure and installation order of the equipment without authorization.

- It is forbidden to clean the electrical parts inside the equipment with water. If you find liquid entering the device, press the emergency stop immediately off and notify the site management.
- It is forbidden to carry out installation, wiring, maintenance, and replacement operations with electricity. Contact should be measured before touching any conductor surface or terminal point voltage, and confirm that the protective ground wire of the equipment or parts to be serviced is reliably grounded to confirm that there is no risk of electric shock.
- Do not approach the equipment except those operating the equipment. The device has not been installed or confirmed by a professional Yes, do not power up the device. When powering up for the first time or operating the main circuit live, at least two personnel must be on site.

WARNING

◆ Battery pack Leakage

If the battery packs leak electrolytes, contact with the leaking liquid or gas should be avoided. The electrolyte is corrosive, and the contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

- Inhalation: Evacuate the contaminated area, and seek medical help immediately.
- Eye contact: Rinse eyes with flowing water for 15 minutes and seek medical help immediately.
- Skin contact: Wash the affected area thoroughly with soap and water and seek medical help immediately.
- Ingestion: Induce vomiting and seek medical help immediately.

◆ The battery packs and their components should be protected from damage when transporting and handling.

- Do not impact, pull, drag, or step on the battery packs.
- Do not insert unrelated objects into any part of the battery packs.
- Do not throw the battery pack into a fire.
- Do not soak the battery packs in water or seawater.
- Do not be exposed to strong oxidizers.
- Do not short-circuit the battery packs.
- The battery packs cannot be stored at high temperatures (more than 50°C).
- The battery packs cannot be stored directly under the sun.
- The battery packs cannot be stored in a high-humidity environment. Do not use the battery packs if it is defective, or cracked, broken or otherwise damaged, or fails to operate.
- Do not attempt to open, disassemble, repair, tamper with, or modify the battery packs. The battery packs are not user-serviceable.
- Do not use cleaning solvents to clean the battery packs.

CAUTION

◆ Risk of injury due to the weight of the battery pack injuries may result if the battery pack is lifted incorrectly or dropped while being transported or installed.

- Transport and lift the battery pack carefully. Take the weight of the battery pack into account.
- Wear suitable personal protective equipment for all work on the energy storage system.

◆ If the battery has not been installed within 6 months of shipment from the factory, the battery must be recharged until the State of Charge (SOC) is greater than 50% for maintenance.

NOTICE

◆ Firefighting Measures

The battery packs may catch fire when it is put into the fire. In case of a fire, please ensure an ABC or carbon dioxide extinguisher is nearby. Water cannot be used to extinguish the fire. Full protective clothing and self-contained breathing apparatus are for the firefighters to extinguish the fire.

◆ Damage to the energy storage system due to under voltages

If the energy storage system doesn't start at all, please contact Renac after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.

◆ Electrical installation and maintenance must be carried out by competent electricians according to local regulations.

2.3 Explanation of Symbols

Symbols on Label:

Symbol	Explanation
	TÜV mark
	Do not disconnect or disassemble by untrained personnel.
	Do not short circuit.
	Do not expose the battery to open flame, heat or sparks, as there is a risk of fire or explosion.
	Keep the battery packs away from children.
	Observe the documents Observe all documents supplied with the system.
	Warning! Metal parts of the batteries are always under voltage. Do not short-circuit the batteries! In case of a short-circuit may flow very high currents and cause burns. By Touching conductive parts can cause cardiac arrhythmia and shock.
	The battery contains corrosive electrolytes. Please avoid contact with the leaked substance.

	WEEE designation Do not dispose of the system together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.

2.4 Electrical Safety

2.4.1 Wiring Requirements

- Please select the cable that meets the requirements of local laws and regulations. The same type of cables should be tied together, different types of cables should be placed separately, and mutual winding or cross-laying should be prohibited.
- When the wiring is completed or left for a short time during the wiring process, it is necessary to immediately block the cable port and close the cabinet door to avoid the entry of small animals.
- The cables used in the energy storage system must be firmly connected and well insulated, and the specifications must meet the requirements. The position of the cable through the pipe or the wire hole must be protected to avoid the cable being damaged by sharp edges, burrs, etc.
- After the completion of the cable connection, it is necessary to use the cable bracket and the cable clamp to be reliably fixed. The cable in the backfill soil area ensures that it is closely fitted to the ground to prevent deformation or damage caused by the force of the cable when the backfill soil is loaded.
- The use of cables in high-temperature environments may cause aging and damage to the insulation layer and between the cable and the heating device or the periphery of the heat source area.
- In order to ensure the safety of construction, all cables should be installed above 0 ° C. When handling cables, especially in low-temperature environments, they should be taken lightly.

2.4.2 Grounding Requirements

- It is prohibited to destroy the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that the equipment is reliably grounded.
- The grounding impedance of the equipment meets the requirements of national standard IEC62477-1 and local electrical standards.
- It is prohibited to operate the equipment when the grounding conductor is not installed. When installing the equipment that needs to be grounded, the protective ground wire must be installed first; when the equipment is removed, the protective ground wire must be finally released.
- When a ground fault occurs in the integrated hybrid inverter, there may be fatal high voltage in the parts that are not charged originally. Dangerous if accidentally touched! Before operation, please ensure that there is no ground fault in the system, and also take relevant protective measures.

2.4.3 Live Line Measurement

There are high voltages in the equipment in the integrated hybrid inverter, and accidental touch may cause fatal electric shock hazards. Therefore, during live measurement, you should:

- Take appropriate protection (such as wearing insulating gloves, etc.).

There must be an accompanying person to ensure personal safety.

2.4.4 Maintenance Requirements

- Before connecting or removing the cable, the protective switch of the corresponding circuit must be disconnected.
- Use the multimeter of the corresponding voltage level to check whether it is charged to ensure that the device has been completely powered off.
- If there is a charged body nearby, please use an insulation board or insulation belt to block or wrap it.
- After the grounding wire is used to reliably connect the circuit to be repaired with the grounding circuit, the operation and maintenance is carried out.
- When maintaining or overhauling the hybrid inverter, at least two operators must be on site. The maintenance or overhaul operations can be performed only when the equipment has been safely disconnected and the power conversion system has discharged after 10 minutes.

WARNING

Before connecting the cable, it is necessary to confirm that the line label identification is correct before connecting.
If the device has multiple inputs, all inputs of the device should be disconnected, and the device can be operated after the device is fully powered down.
After the overhaul is completed, the grounding wire between the overhaul circuit and the grounding circuit is disassembled.

2.4.5 Mechanical Safety

- The bottom apron must be removed when forklifting without wooden boxes. Take-off and landing should be taken lightly to avoid impact or vibration.
- In the process of transportation, the center of gravity of the box should fall in the middle of the two forks on the forklift. Prohibit long-distance handling or inversion, tilt.
- When transporting equipment, it may cover the operator's line of sight due to the large volume of the equipment, and it is necessary to arrange auxiliary personnel to assist in the completion.
- In order to ensure the safety of drilling outside the equipment, the appropriate position should be selected before drilling to ensure that it will not cause short circuits and other effects.
- In the process of drilling, the equipment should be blocked to prevent the debris from falling into the equipment, and the debris should be cleaned in time after drilling.
- When handling equipment by hand, it is necessary to prepare for load-bearing, wear protective gloves, wear anti-shoes, and other safety protective equipment.
- Carefully move the device during the equipment handling process to avoid impact or drop. Avoid scratching the surface of the equipment and damaging parts or cables.

2.4.6 Battery Safety

The Company shall not be liable for any damage to the batteries provided by the Company due to the following reasons:

- Due to customer reasons, the battery is not charged and accepted in time, resulting in overdue storage, capacity loss, or irreversible damage.
- Due to improper operation or not in accordance with the requirements of the battery caused by the fall of mechanical damage, leakage, rupture, etc.
- The customer or third party did not inform the company to change the battery usage scenario. Including but not limited to self-connecting the battery to an additional load, mixing with other brands of batteries, mixing with batteries with different rated capacities, etc.

- The direct damage to the battery is caused by the operating environment of the field equipment or the external power parameters that cannot meet the requirements of the normal operating environment. Including the actual operating temperature of the battery is too high or too low, the power grid is bad, and the power outage is frequent.
- Customers do not correctly set the battery operation management parameters or improper maintenance, resulting in frequent over-discharge of the battery, customer on-site expansion, or long-term inability to fully charge.
- The customer did not carry out the correct maintenance of the battery according to the operating manual of the supporting equipment, including but not limited to not checking whether the battery terminal screw is tightened regularly.
- The battery was stolen and lost.
- Battery beyond the warranty period.

Battery exception handling measures:

- When electrolyte leakage or abnormal odor occurs, avoid contact with the leaked liquid or gas. Non-professionals, please do not approach; please contact the professionals immediately.
- The electrolyte is corrosive, and contact may cause skin irritation and chemical burns. If you come into contact with the battery electrolyte, you need to immediately clean the contact area with a lot of water and soap and immediately seek medical help.
- After the battery drops (whether with packaging material or not), it is prohibited to continue to use. If the appearance is not obviously deformed or damaged and there is no obvious smell, smoke, or fire, under the premise of ensuring safety, the battery is transferred to an open and safe place for one hour for post-treatment, and contact the company's technical service engineer.
- When the battery has obvious odor, damage, smoke, and fire after falling, the personnel should be evacuated immediately and alerted in time. Professionals use fire protection facilities to extinguish the fire under the condition of ensuring safety.

2.4.7 Maintenance and Replacement

When installing, maintaining and overhauling the equipment, make sure that:

- The energy storage battery has been completely disconnected.
- Clear warning signs at the point of disconnection to ensure no accidental reconnection.

- It is forbidden to open the cabinet door in the weather of rain, snow, lightning, dust, fog, and so on.
- Before the parts are taken out of the cabinet, please make sure that the other pieces on the cabinet are not loose.
- During the maintenance of the equipment, insulating materials should be used to cover the live parts nearby.
- Before the fan is powered off and stops rotating, any item is prohibited from contacting the running fan (such as fingers, components, screws, etc.). Please do not power on the device before troubleshooting.
- During the live inspection of the system, attention should be paid to the danger warning signs on the equipment to avoid standing at the cabinet door.
- Devices other than battery packs must wait for about 15 minutes after powering down to ensure that the device is powerless before operating the machine.
- After the power components of the energy storage system are replaced, or the wiring is changed, manual wiring detection is required to avoid the abnormal completion of the system operation.
- If any battery packs are damaged, they must be replaced with new ones. Please ensure that the voltage of the replacement battery pack is the same as that of the other battery packs.
- After the relevant operations of maintenance and replacement, the cabinet door should be locked in time, and the key should be properly kept.

2.4.8 Arc Protection

WARNING

In order to avoid unnecessary casualties and equipment damage, the product must be operated strictly according to the description in this manual. If the operation is improper, it may cause an arc hazard and may even cause fire, explosion, and other risks. The company will not be liable for accidents such as arcs, fires, explosions, and other accidents caused by failure to follow the signs or product manual.

Improper handling, as described below, may cause arcing, fire, explosion and other hazards inside the machine. In an accident, it must be handled by qualified professionals. If not handled properly, existing accidents may cause a broader range of malfunctions or accidents.

- Plug and unplug the DC side high-voltage cables of each device under power.
- Touch potentially live cable ends that are not insulated.
- Touch copper bars, terminals, or other parts inside the machine that may be live.
- Power cable connections are loose.
- Parts such as screws accidentally dropped into the power module.
- Improper operation by untrained and unqualified operators, etc.

Before working on the equipment, the area of operation must be pre-assessed for arc risk. If there is a risk of arcing:

- Operators must have received relevant safety training in advance.
- Try best to assess the area where shock may occur.
- Wear appropriate protective clothing before working in areas of potential electric shock.

3. Introduction

3.1 Block diagram

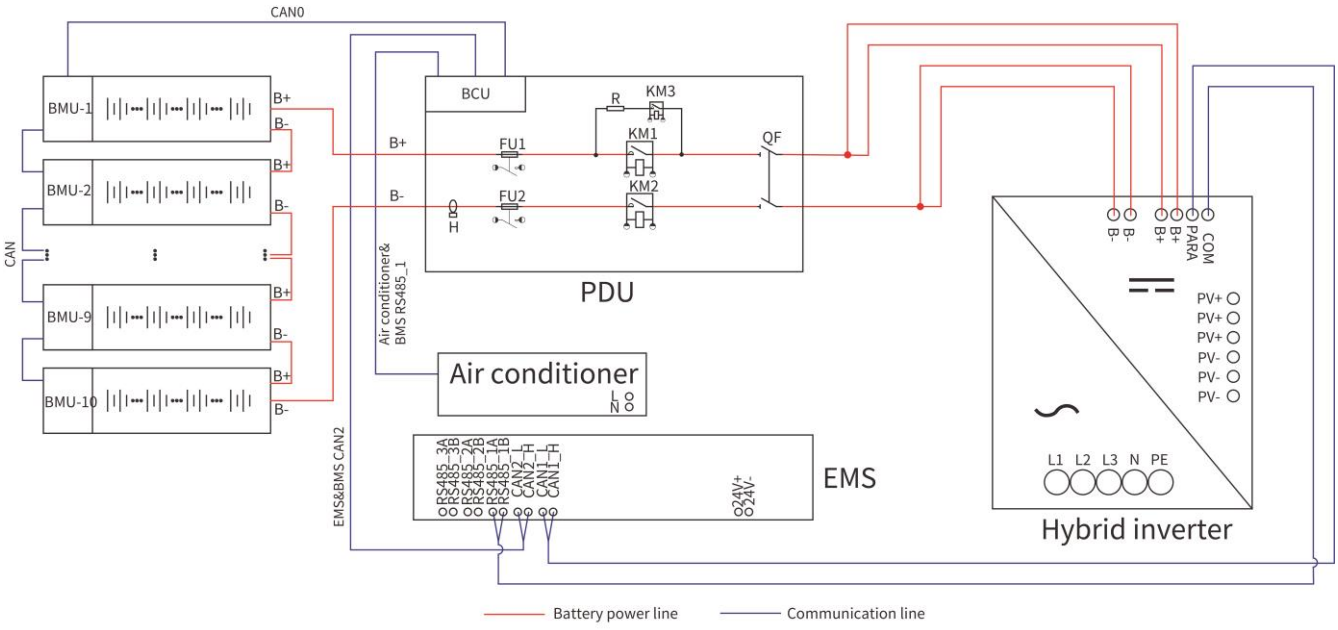


Figure 3-1 Block diagram of the RENA1000-E

3.2 Product Overview

RENA1000 series All-in-one C&I Hybrid ESS integrates battery cabinet, hybrid inverter, energy management monitoring system, power distribution system, environmental control system, and fire control system. The hybrid inverter is used to facilitate maintenance and expansion. Pre-maintenance of outdoor cabinets can reduce floor space and maintenance channels. It has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency, and intelligent management.

In typical application scenarios, the operation strategy of an energy storage system is as follows:

Optical storage combination: real-time access to local load power, photovoltaic power generation priority spontaneous self-use, residual power storage; if the photovoltaic power is insufficient to provide local load, the battery is preferred to store energy.

Model name: RENA1000 - E

- Cell model
- Product series

3.3 Appearance Introduction

3.3.1 Appearance and Dimensions

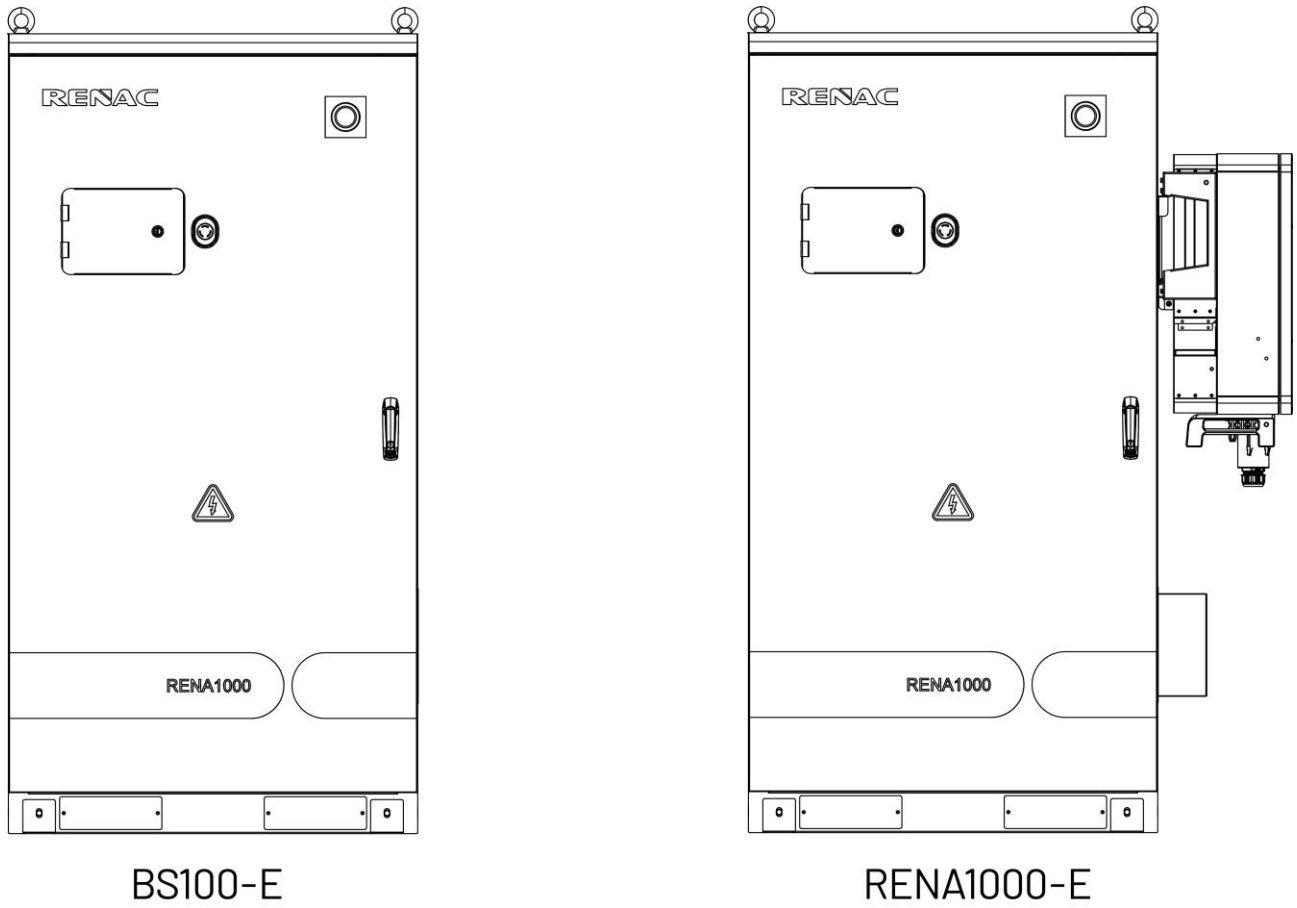


Figure 3-2 Appearance of the BS100-E and RENA1000-E

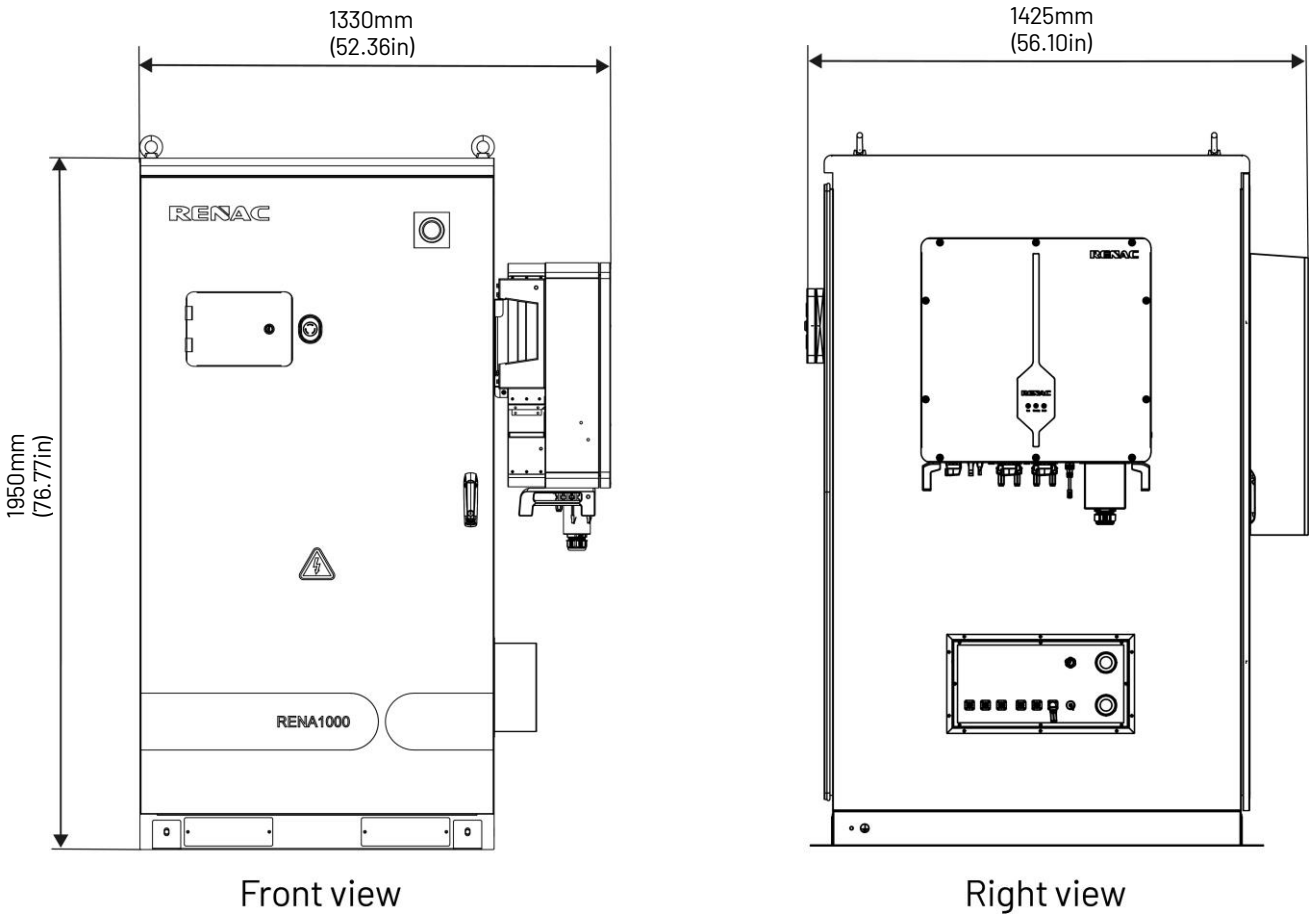


Figure 3-3 Dimensions of the RENA1000-E

3.3.2 Product Characteristic

System productization, integrated energy storage battery, hybrid inverter, energy management monitoring system, power distribution system, environmental control system, fire control, etc., to fully control the system operation status and risk.

According to the system capacity requirements of microgrid and other scenarios, the hybrid inverter and the battery packs power can be selected, and the typical configuration is 83.6kWh / 94kWh / 104.4kWh, corresponding to different battery systems for:

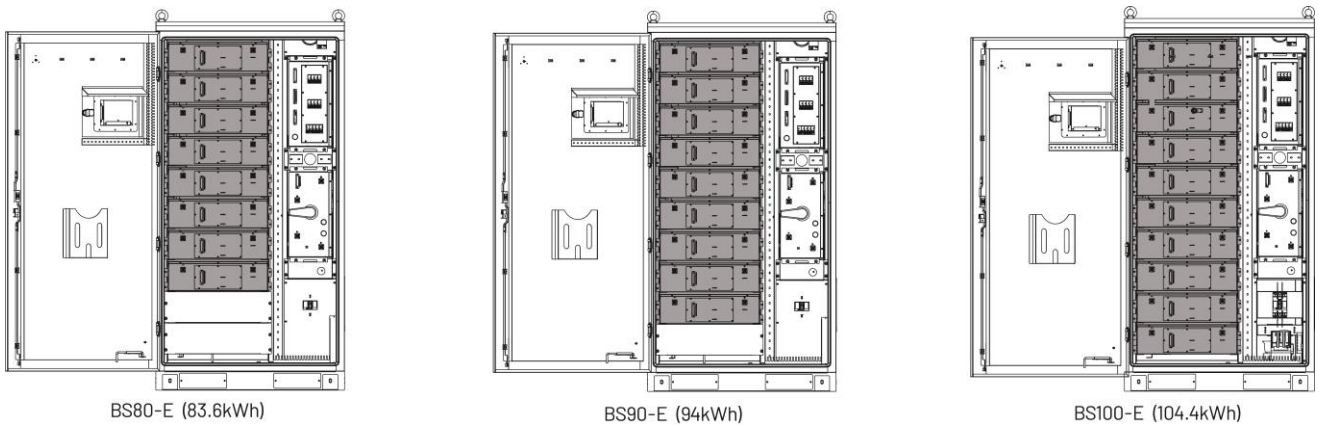


Figure 3-4 Appearance of different battery systems

IP55 protection level is the perfect response to all types of outdoor weather.

The door-mounted embedded integrated air conditioner does not occupy the cabinet space, improves the available space of the outdoor cabinet, and the top structure has a better waterproof effect.

The local control screen can realize diversified functions such as system operation monitoring, energy management strategy formulation, and remote equipment upgrade.

3.4 Application Scenarios

1. On-grid Solution

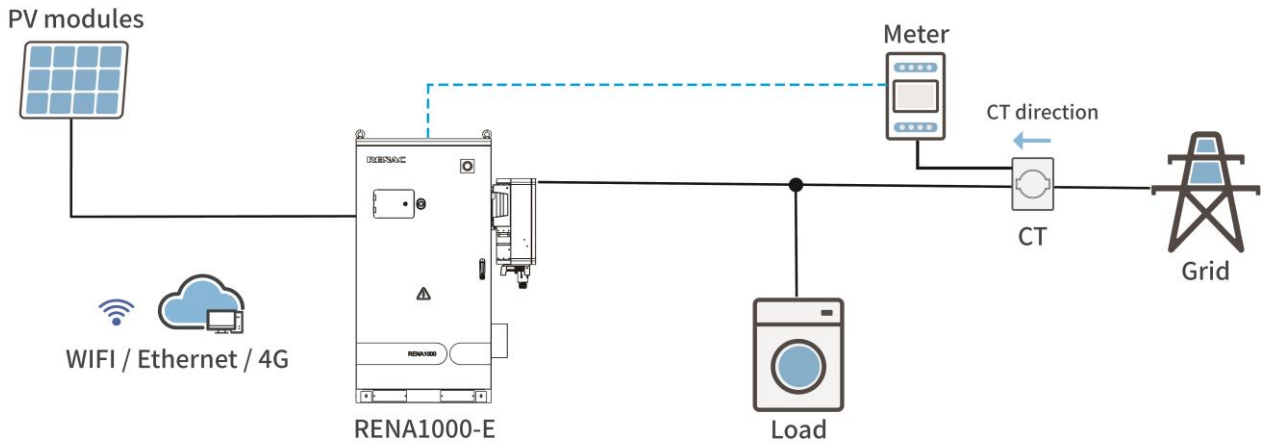


Figure 3-5 On-grid solution (One unit connection)

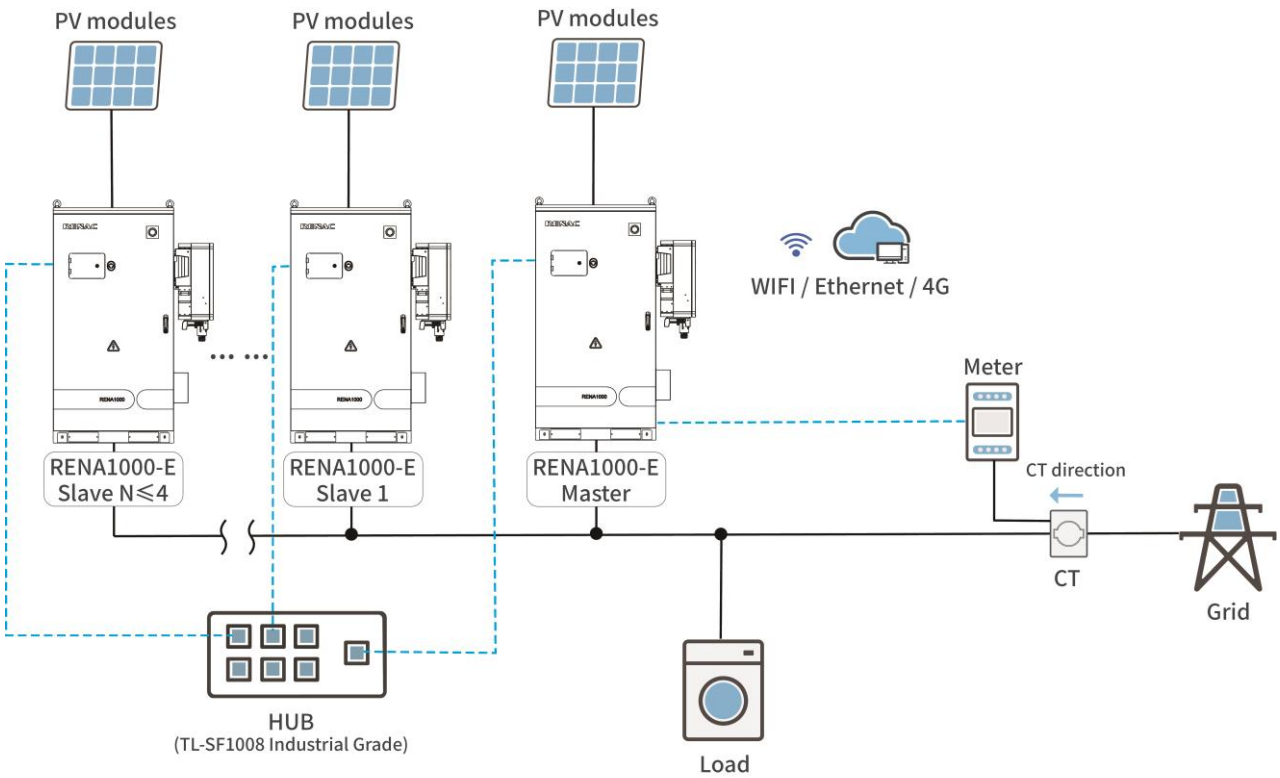


Figure 3-6 On-grid solution (Max. 5 units parallel connection)

Note: The HUB is required when the total number of parallel units reaches three RENA1000-E, and the user needs to prepare it.

2. Off-grid Solution

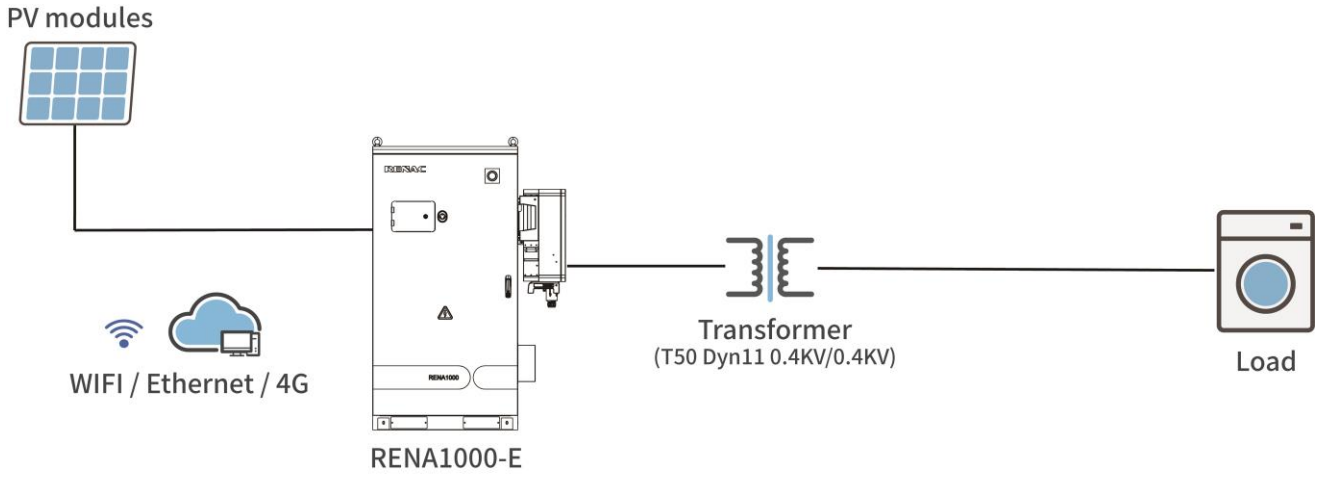


Figure 3-7 Off-grid solution

3. On / Off-grid Solution

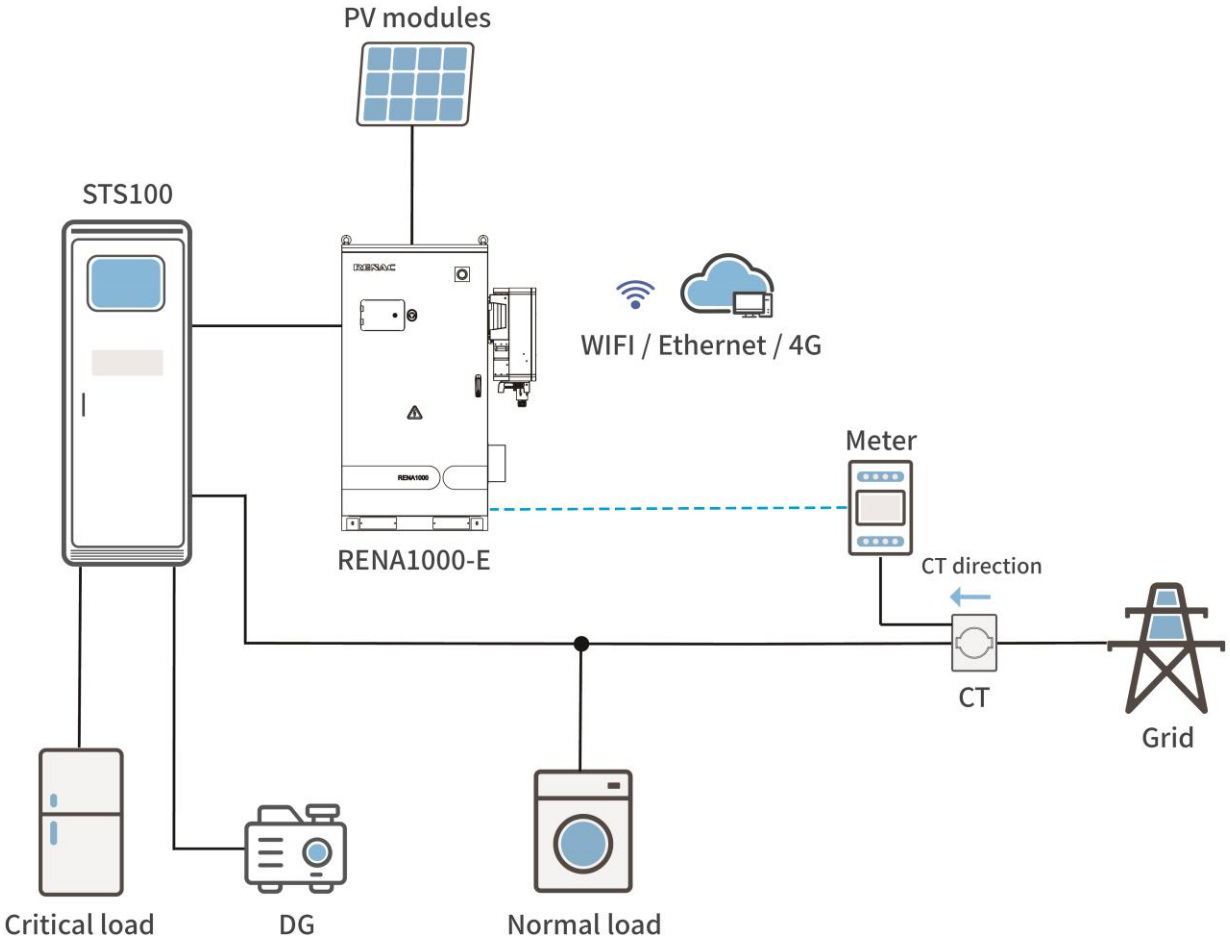


Figure 3-8 On / Off-grid solution (One unit)

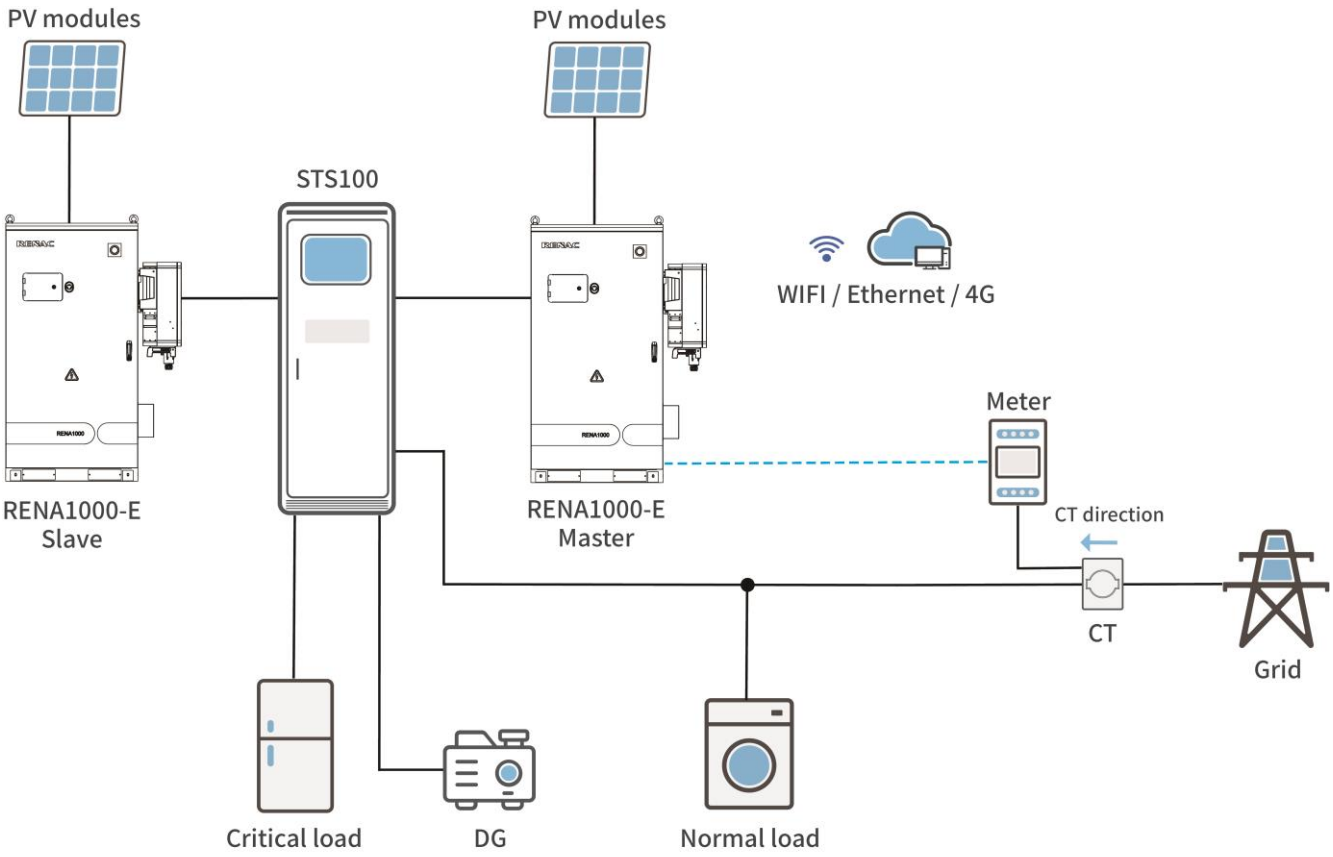


Figure 3-9 On / Off-grid solution (Two units)

3.5 Technical Data

System Model	RENA1000-E	
Inverter Model	**N3-49.9K**	**N3-50K**
PV Input		
Max. Recommended PV Power [Wp]	75000	
Max. PV Input Voltage [V]	1000	
MPPT Voltage Range [V]	350 ~ 800	
Rated PV Input Voltage [V]	667	
Start-up Voltage [V]	350	
Max. PV Input Current [A]	36 / 36 / 36	
No. of MPP Tracker	3	
No. of Input Strings per Tracker	2 / 2 / 2	
Max. PV Input Current [A]	36 / 36 / 36	
Max. Short-circuit Current [A]	40 / 40 /40	
AC Input		
Max. AC Input Apparent Power [VA]	54890	55000
Max. AC Input Active Power [W]	49900	50000
Max. AC Input Current [A]	79.6	80.0
Rated AC Input Voltage [V]	3 / N / PE, 230 / 400	
Grid Frequency [Hz]	50 / 60	

System Model	RENA1000-E		
AC Output			
Max. AC Output Apparent Power [VA]	54890	55000	
Max. AC Output Active Power [W]	49900	50000	
Max. AC Output Current [A]	79.6	80.0	
Rated AC Output Current [A]	72.4	72.5	
Rated AC Output Voltage [V]	3 / N / PE, 230 / 400		
Grid Frequency [Hz]	50 / 60		
Adjustable Power Factor [cosφ]	1 (0.9 leading ~ 0.9 lagging)		
Output THDi (@Rated Output)	< 3%		
Battery Model	**BS80-E**	**BS90-E**	**BS100-E**
Battery Technology	LiFePO4	LiFePO4	LiFePO4
Nominal Capacity [Ah]	204 (102 * 2)	204 (102 * 2)	204 (102 * 2)
Battery configuration	16S2P * 8	16S2P * 9	16S2P * 10
Nominal Energy [kWh]	83.6	94	104.4
Nominal Voltage [V]	409.6	460.8	512
Voltage Range [V]	358.4 ~ 467.2	403.2 ~ 525.6	448 ~ 584
Max. Continuous Charging / Discharging Current [A]	102 / 102	102 / 102	102 / 102
Depth of Discharge	95%	95%	95%
Nominal Power [kW]	41.8	47	52.2
System General Data			
Dimensions (with Inverter) (W * H * D) [mm]	1330 * 1950 * 1425		
Dimensions (without Inverter) (W * H * D) [mm]	1000 * 1950 * 1425		
Weight (with Inverter) [kg]	1227	1313.5	1400
Weight (without Inverter) [kg]	1152	1238.5	1325
Ambient Temperature Range [℃]	-20 ~ +55		
Relative Humidity	0 ~ 95%		
Operation Altitude [m]	≤ 2000		
Topology	Transformerless		
Cooling	Air-conditioner		
Fire Protection	Aerosol		
Communication	CAN, RS485, USB Upgrade, WiFi, 4G, Ethernet		
Ingress Protection	Cabinet: IP55; Inverter: IP65		
Cycle Life	6000 @90% DOD / 25℃ / 0.5C		
Certifications & Standards			
Grid Regulation	EN 50549-1, CEI 0-21, VDE4105, NRS 097-2-1		
Safety Regulation	IEC 62619, EN 62477-1, IEC 62109-1, IEC 62109-2, IEC62477-1, EN 62109-1, EN 62109-2		
EMC	EN / IEC 61000-6-2, EN / IEC 61000-6-4, EN IEC 61000-3-11, EN 61000-3-12		

3.6 Components Introduction

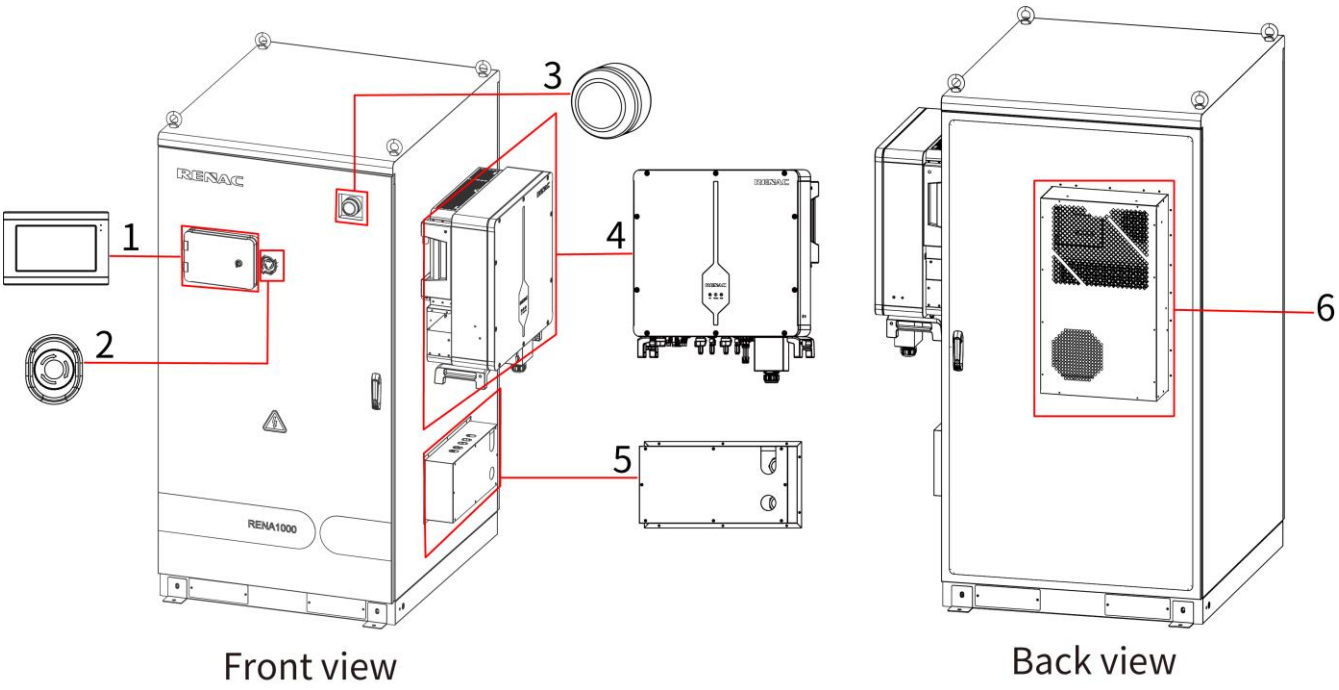


Figure 3-10 Components of the RENA1000-E (close the door)

No.	Model	Description	Quantity
1	EMS	An energy management system.	1
2	Audible-visual alarm	To alter you when the abnormal conditions occur, such as temperature, smoke.	1
3	Emergency stop	This button can be used to stop the system from running when an emergency occurs.	1
4	Hybrid inverter	50kW three phase Hybrid inverter.	1
5	Junction box	It is used to house the connections between electrical cables or conductors.	1
6	Air conditioner	Manage the temperature of the energy storage system. Power: 1.5kW; Refrigerant: 134A	1

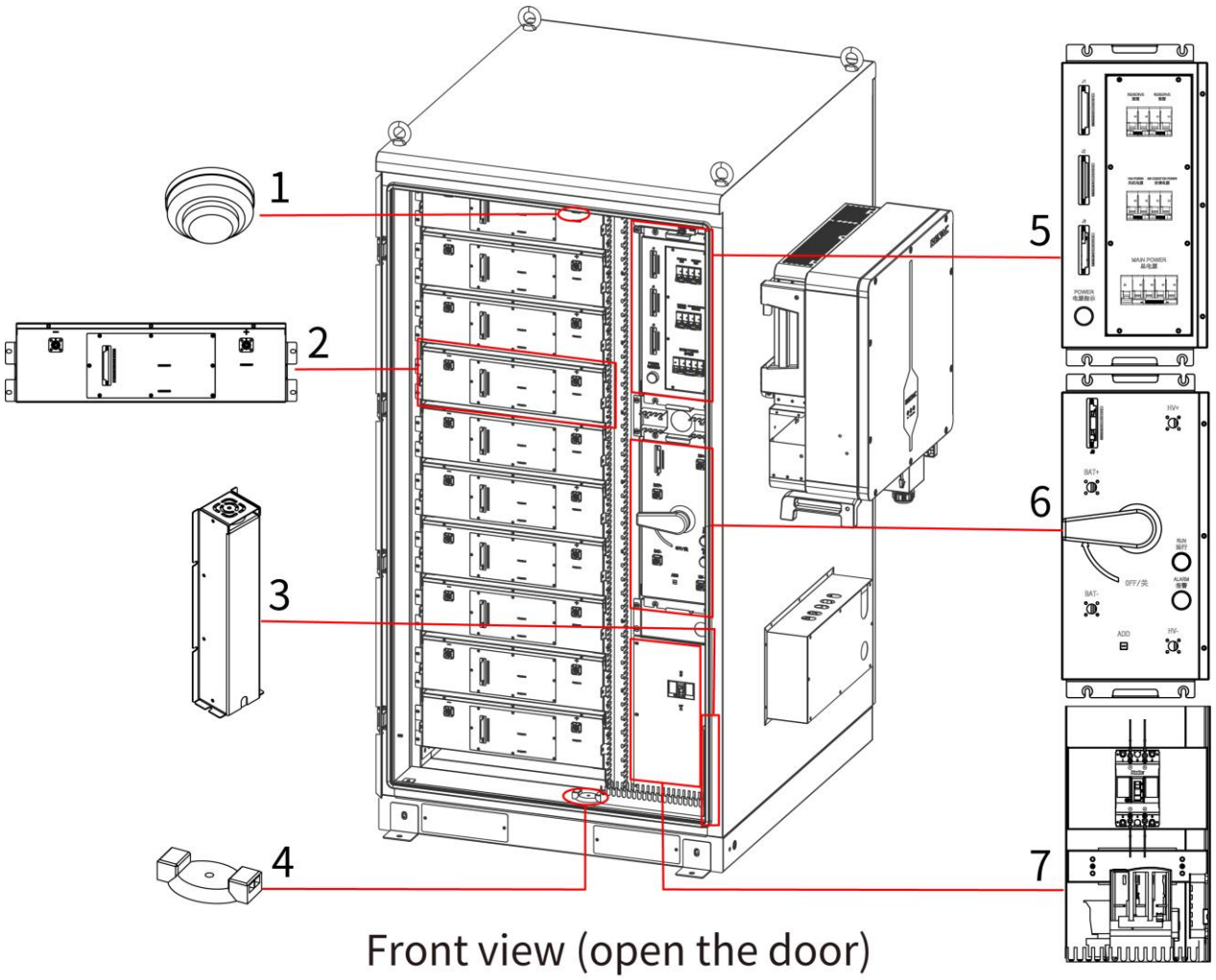


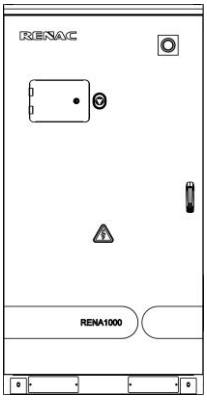
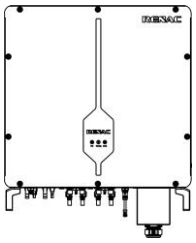
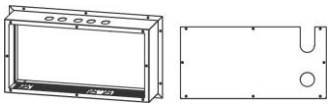
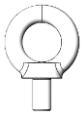
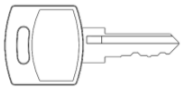
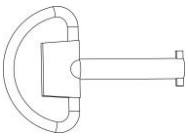
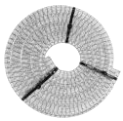
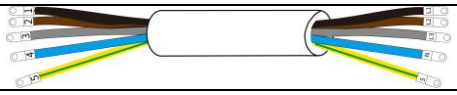
Figure 3-11 Components of the RENA1000-E (open the door)

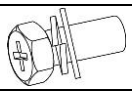
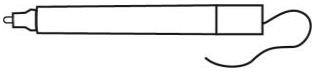
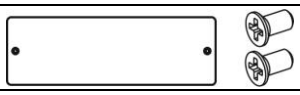
No.	Model	Description	Quantity
1	Smoke sensor	To detect smoke.	1
2	Battery pack	To store and release power.	1
3	Fire-fighting system	When a fire or other emergency occurs, it can suppress the fire, protect the system and personal safety. When the temperature inside the outdoor cabinet reaches 170℃, the fire detector tube will rupture automatically, and the Aerosol fire-fighting device can be released to the inside of the outdoor cabinet to extinguish the fire.	1
4	Water sensor	To detect water level based on the principle of potential difference between the two electrodes.	1
5	DC low voltage distribution	Distribution of AC power, as well as low voltage DC outputs	1
6	PDU	To collect current and voltage information on battery pack, and control the charge and discharge of battery pack. The DC switch above is referred to as QF.	1
7	Breaker	Main circuit breaker, also known as QF1.	1

4. Unpacking and Storage

4.1 Unpacking

Before opening the package, please check whether the packing box is complete and whether there is any damage, soaked in water; if the package is incomplete or obviously damaged, please contact the supplier. If the package is complete, please open the box to check whether the contents are complete against the material list or as shown in the figure below; if there is any omission or damage, please contact the supplier.

No.	Appearance	Model	Quantity
1		Battery cabinet	1
2		Hybrid inverter	1
3		Junction Box (for connecting cables)	1
4		Lifting components	4
5		Key (to open the door of RENA1000-E)	4
6		Key (to open EMS screen)	1
7		Air conditioning accessories	1
8		Hybrid inverter AC cables	1

No.	Appearance	Model	Quantity
9		Hybrid inverter communication cables	1
10		BAT+ power cable (for connecting the positive terminal of the hybrid inverter)	2
11		BAT- power cable (for connecting the negative terminal of the hybrid inverter)	2
12		Smart meter	1
13		Stainless steel cross socket head cap screws M5*10 (for fixing junction box)	10
14		Stylus pen (to operate EMS screen)	1
15		Anti-rodent panel assembly	4
16		User manual	1
17		Quality Certificate	1
18		Factory report	1

4.2 Storage Environment

If it isn't installed immediately after the delivery work is successfully completed, please properly store the RENA1000-E according to the description in this section.

- In order to prevent condensation inside the RENA1000-E, or if the bottom of the house is soaked by rainwater in the rainy season, the RENA1000-E should be stored in an indoor environment, such as a large warehouse or in the workshop.
- If the battery packs are going to be kept for more than 30 days, adjust SOC to 40%-60% and dis-/charge them once every six months.
- If it must be stored outdoors due to on-site conditions, the RENA1000-E must be raised. The specific elevation height should be reasonably determined according to the site's geological and meteorological conditions. If the ambient temperature is too low, heating should be provided for the internal equipment of the RENA1000-E.
- Storage environment temperature: -20°C~50°C (less than one month); recommended long-term storage temperature: 20°C~30°C; storage relative humidity: 0~95%, non-condensing. The storage ground must be flat, free of water, no bumps or undulations.

- Effective measures must be taken to prevent rainwater, sand, and dust from intruding into the RENA1000-E. At least the air inlet and outlet of the RENA1000-E must be effectively protected.
- It is strictly forbidden to put the batteries into fire. Otherwise it might be exploded. It also might cause a fire to the Battery pack when the ambient temperature exceeds 150°C.
- Inspect at least once every half month to check whether the cabinet and internal equipment are in good condition.

5. Installation

5.1 Installation Environment

- The level of the installation location should be above the highest historical water level in the area. The distance to airports, buried waste disposal sites, river banks, or dams should be greater than 2km.
- Select a well-ventilated area. Do not block the ventilation openings and heat dissipation system while the equipment is in operation to prevent fire from high temperatures.
- Installation space is sufficient to ensure that the surrounding equipment will not be affected by the heat generated by the product; the installation location ensures sufficient space for external wiring, easy access to transport, and reliable fire suppression system equipment.
- Keep the installation location away from sources of ignition, and do not place flammable or explosive materials around the equipment.
- If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground below the equipment needs to be hardened to prevent weeds from growing.
- Do not install the energy storage system outdoors in salt-affected areas to prevent equipment corrosion and fire. Salt-affected areas are defined as areas within 2km of the coast or affected by sea breezes.
- The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to avoid the entry of unauthorized personnel during the operation of the equipment, which may lead to personal injury or property damage.
- The equipment is installed in the area away from the liquid; should not be installed in the water pipe, air outlet, and other easy-to-produce condensation below the location; should not be installed in the air conditioning port, vents, machine room outlet windows, and other easy to leak below the area, to prevent the liquid from entering the internal caused by the short circuit of the equipment.

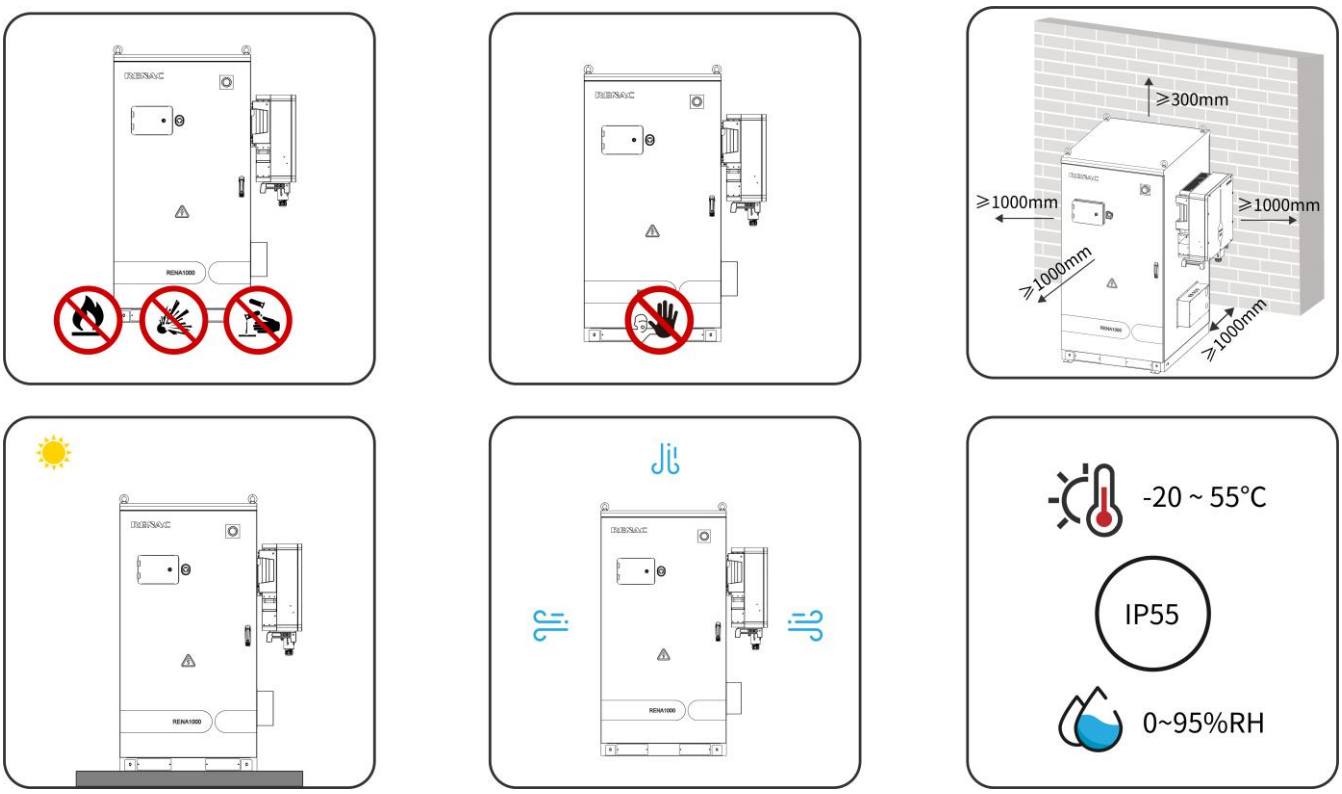


Figure 5-1

At least the following requirements should be met when constructing the foundation:

- The bottom of the foundation pit for building the foundation must be compacted and filled.
- The foundation should be sufficient to provide adequate load-bearing support for the energy storage system.
- Elevate the energy storage system to prevent rainwater from eroding the base and interior. It is suggested that the foundation should be about 300mm higher than the horizontal ground of the installation site.
- It is necessary to construct corresponding drainage measures in combination with local geological conditions.
- Construct concrete foundations of sufficient cross-sectional area and height. The construction party shall determine the foundation height according to the site geology.
- Cable routing should be considered when constructing the foundation.
- The maintenance platform should be built around the foundation to provide convenience for later maintenance.
- Both ends of all pre-buried pipes are temporarily sealed to prevent impurities from entering; otherwise, it will be inconvenient to route later.

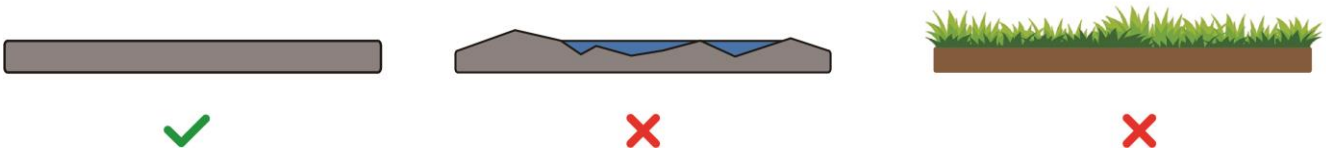


Figure 5-2

5.3 Product handling

Remove product packaging before handling.

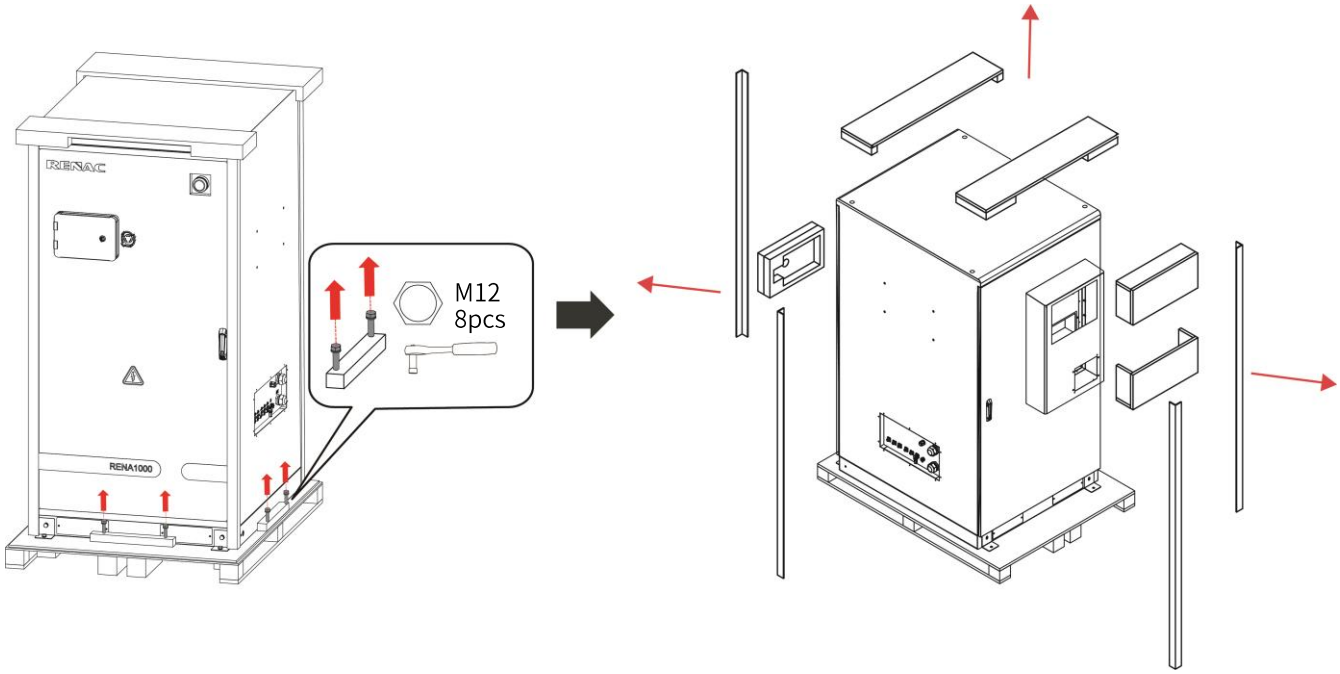


Figure 5-3

Forklift transport:

- When using a forklift to transport, ensure that the forklift has sufficient load capacity, and note that the center of gravity of the equipment should fall between the legs of the forklift to prevent personal injury and equipment damage.
- With battery transfer, forklift truck loading capacity needs to be ≥2t.
- Recommended fork knife length >1.5m, width 500mm±100mm, thickness < 70mm.
- Transportation, moving and setting down of the RENA1000-E should be slow and steady.
- When using a forklift truck to transport equipment, it is important that it is operated by a professional operator.

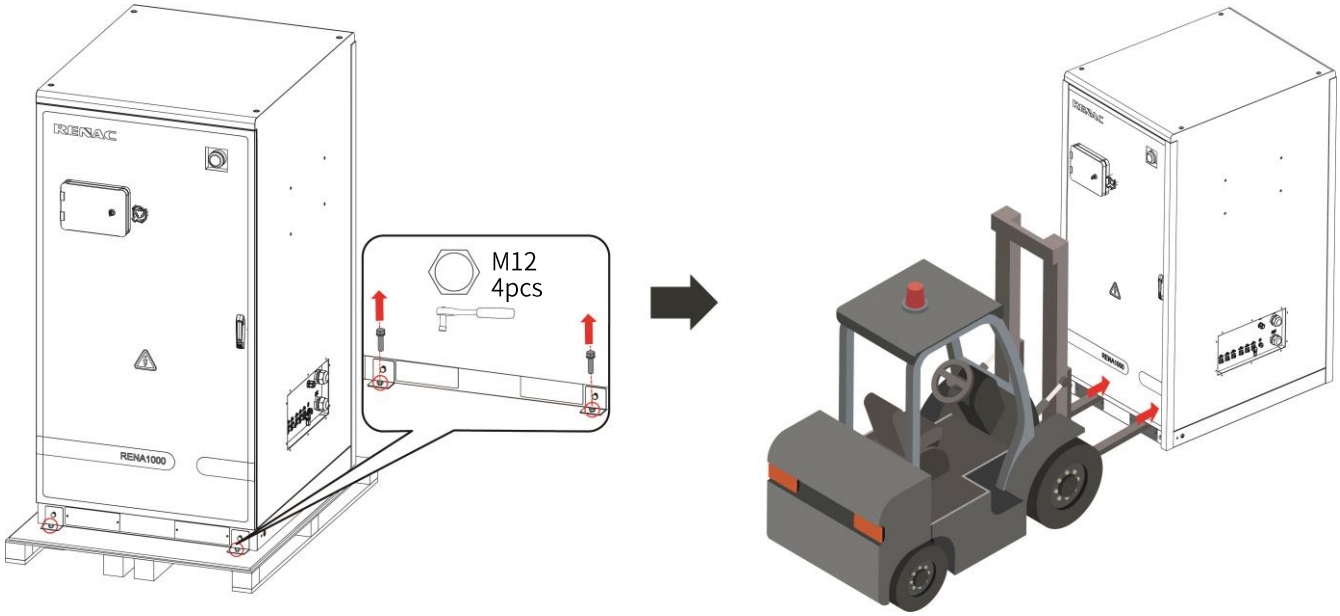


Figure 5-4

Lifting transport:

- When using a lifting equipment to transport, ensure that the energy storage system shall be lifted to the ceiling using a sling with a hook or U-hook.
- The load-bearing capacity of the lifting equipment shall be >2t.
- The entire lifting process should be carried out slowly; pay attention to observing the balance state of the box, and do not move too fast.
- During the entire lifting process, no one is allowed to stand underneath the energy storage system or the crane.

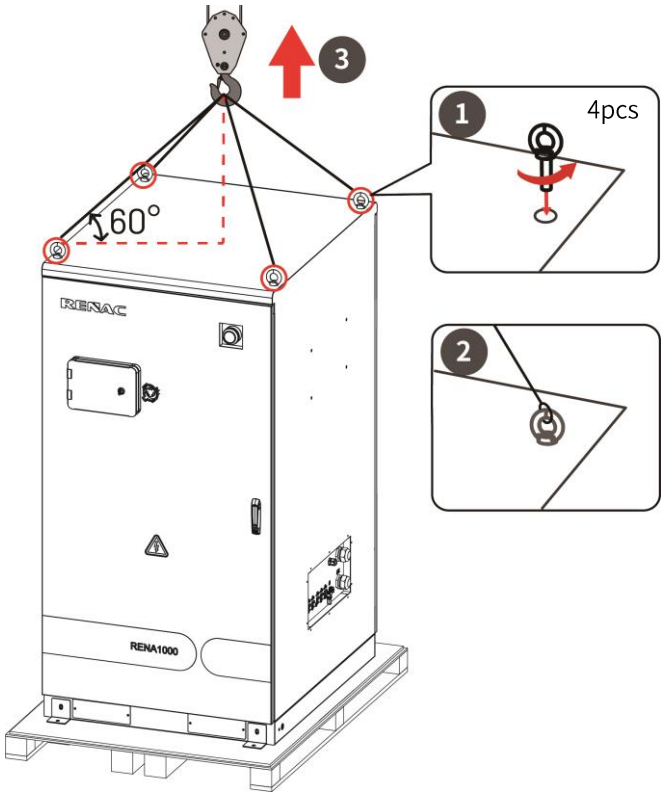
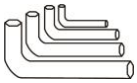
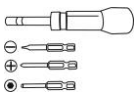
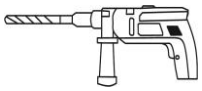
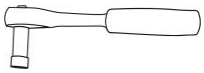
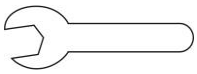


Figure 5-5

5.4 Preparation for Installation

(1) Installation tools:

No.	Tool	Model	No.	Tool	Model
1		Spirit level	7		Marker
2		Wire stripper	8		Rubber hammer
3		Crimping tool	9		Hex key
4		Heat gun	10		Torque screwdriver

No.	Tool	Model	No.	Tool	Model
5		Hammer drill	11		Multimeter
6		Socket spanner	12		Spanner

(2) Protective tools:

No.	Tool	Model	No.	Tool	Model
1		Dust mask	4		Insulated shoes
2		Goggles	5		Safety helmet
3		Insulated gloves			

(3) Cables and other tools:

No.	Type of cable	Description
1	5*25 mm^2	Grid input
2	2*4 mm^2	PV input
3	5*25 mm^2	Diesel generators input
4	5*95 mm^2	Loads input
5	RVSP 2*0.5 mm^2	Meter communication
6	OT25-8	Wiring connector

5.5 Mechanical Installation

After making sure that there is no abnormality in the product and all accessories are complete, you can refer to the following steps for installation.

1. Drill 4 holes with a diameter of 15 mm and a depth of 99 to 101 mm in the foundation and install expansion bolts.

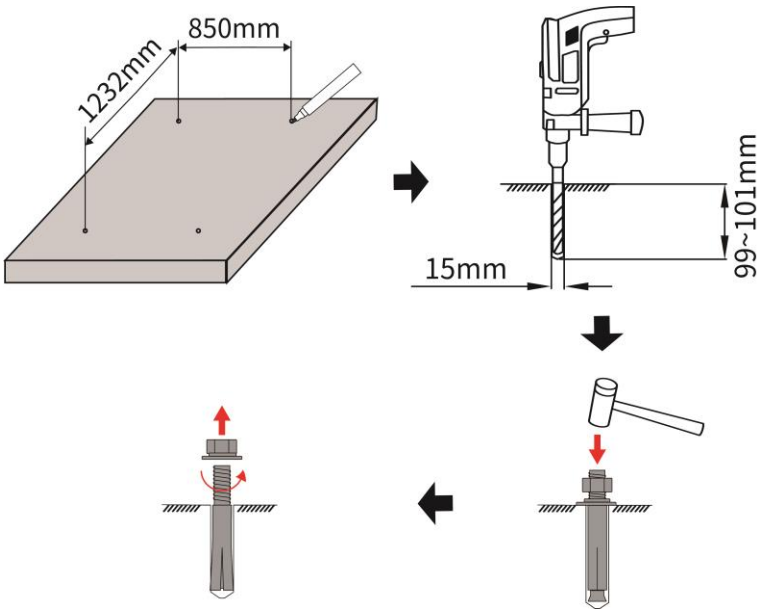


Figure 5-6

2. Carry the energy storage system to the location and tighten the expansion bolts using a socket spanner. Please don't forget that there are two anti-tipping plates at the back.

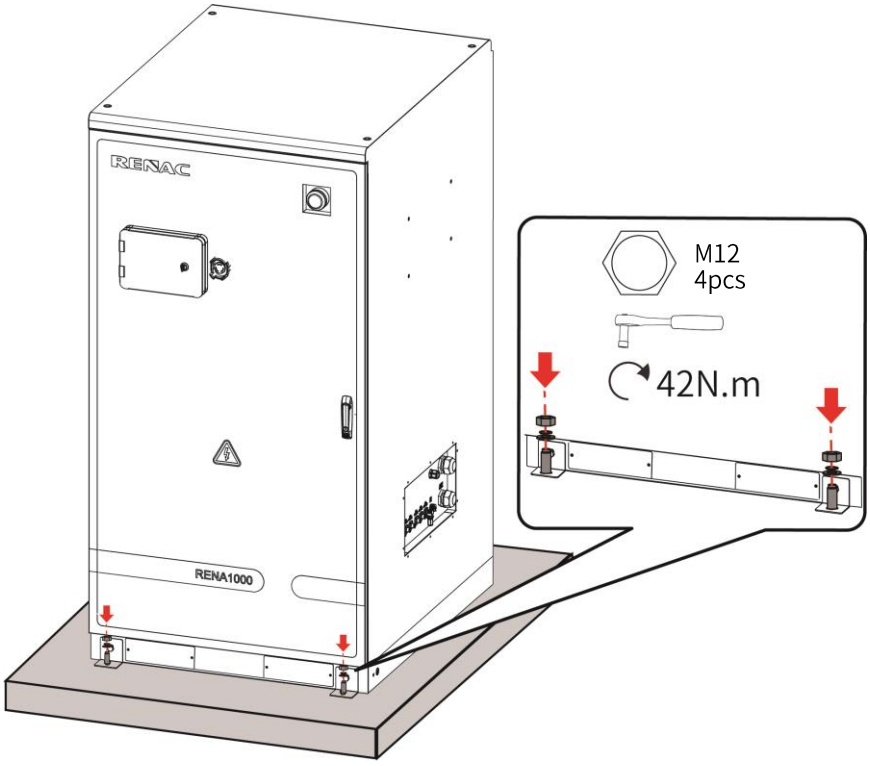


Figure 5-7

3. Install the four front and rear anti-rodent panels in place. Please don't forget that there are two anti-rodent panels at the back.

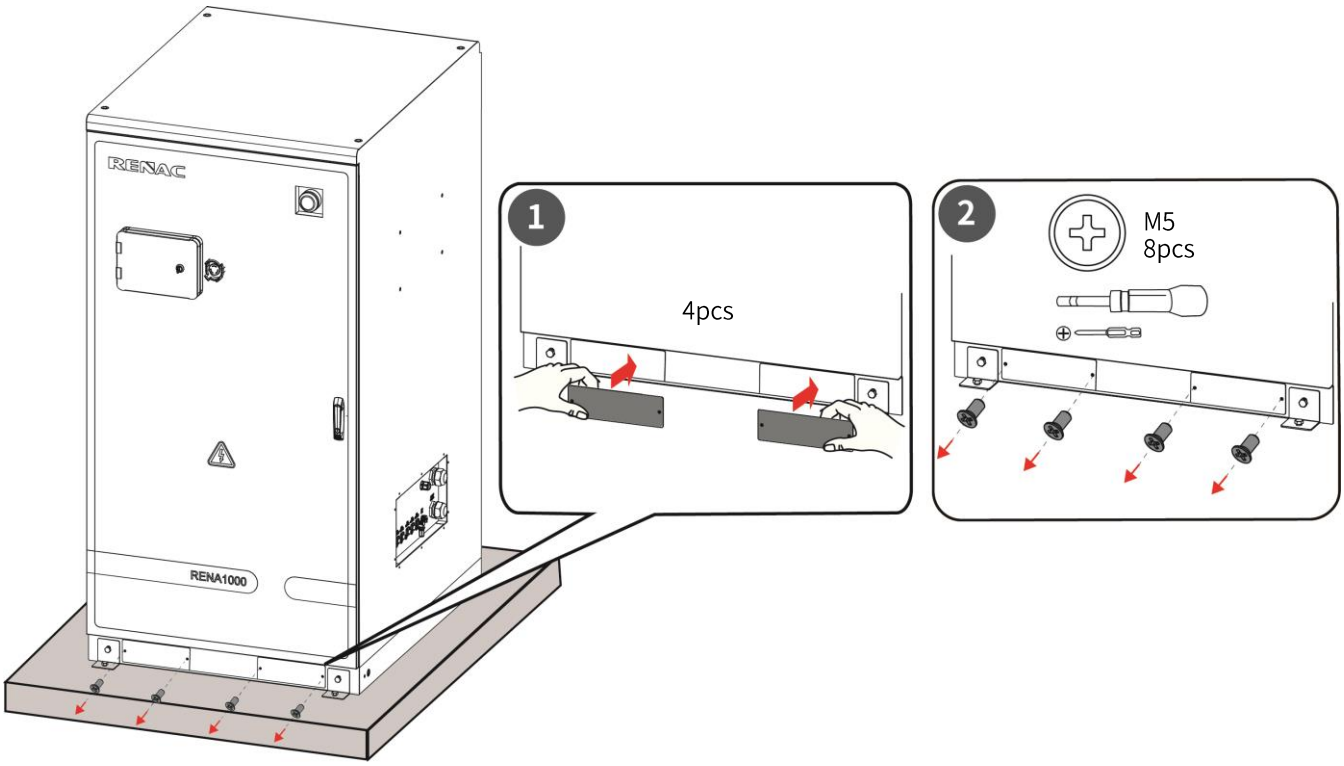


Figure 5-8

4. Install an external cabinet grounding wire.

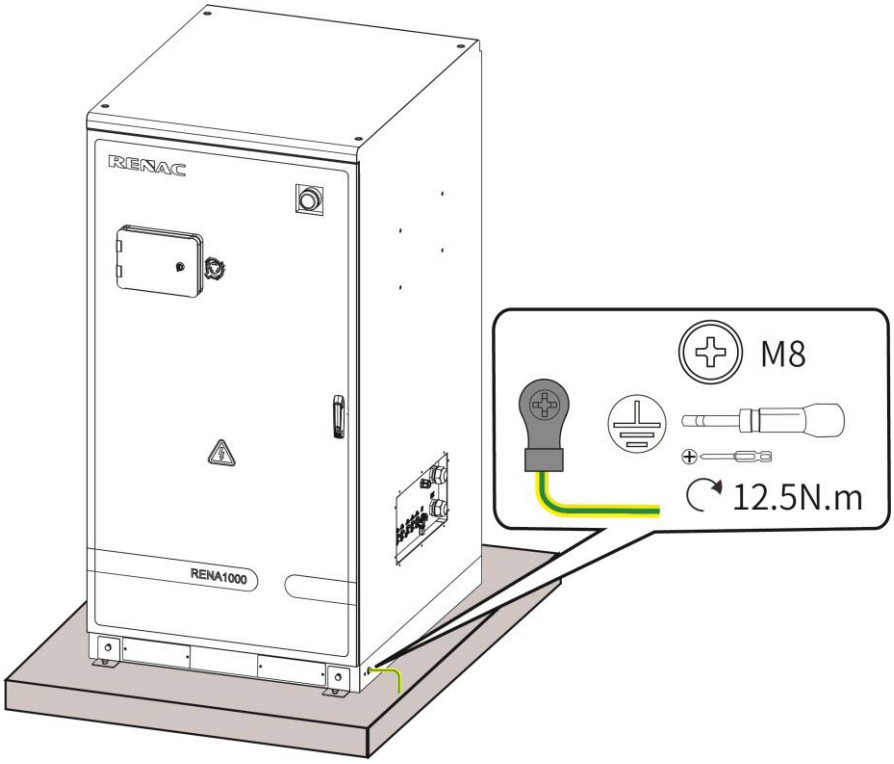


Figure 5-9

5. Install the bracket of the hybrid inverter on the right side of the energy storage system.

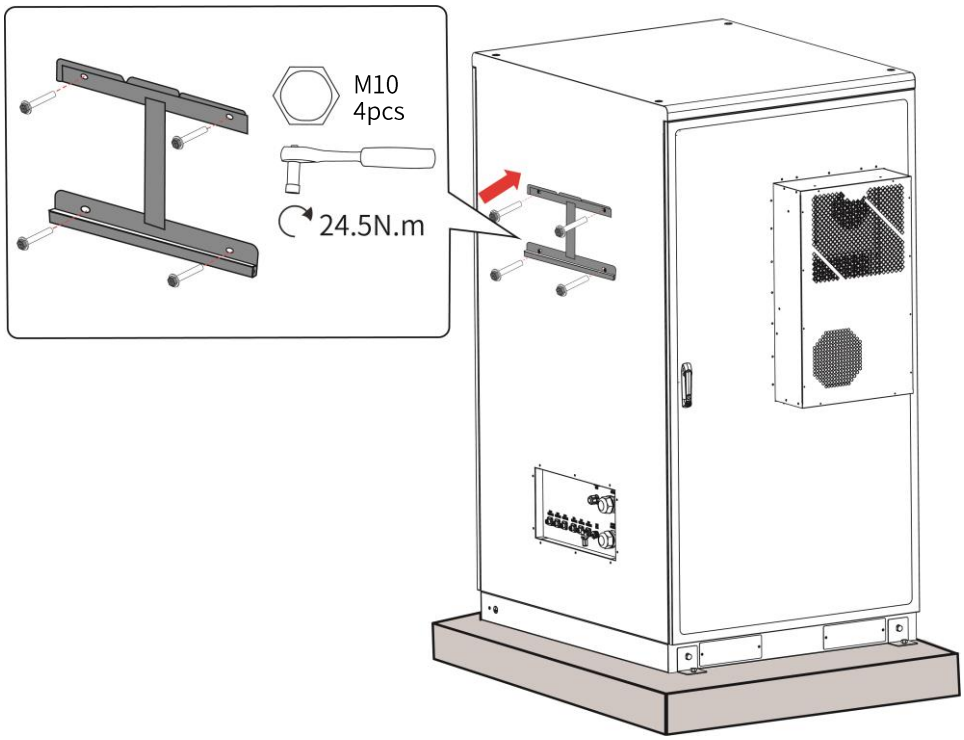


Figure 5-10

6. Install the hybrid inverter on the bracket.

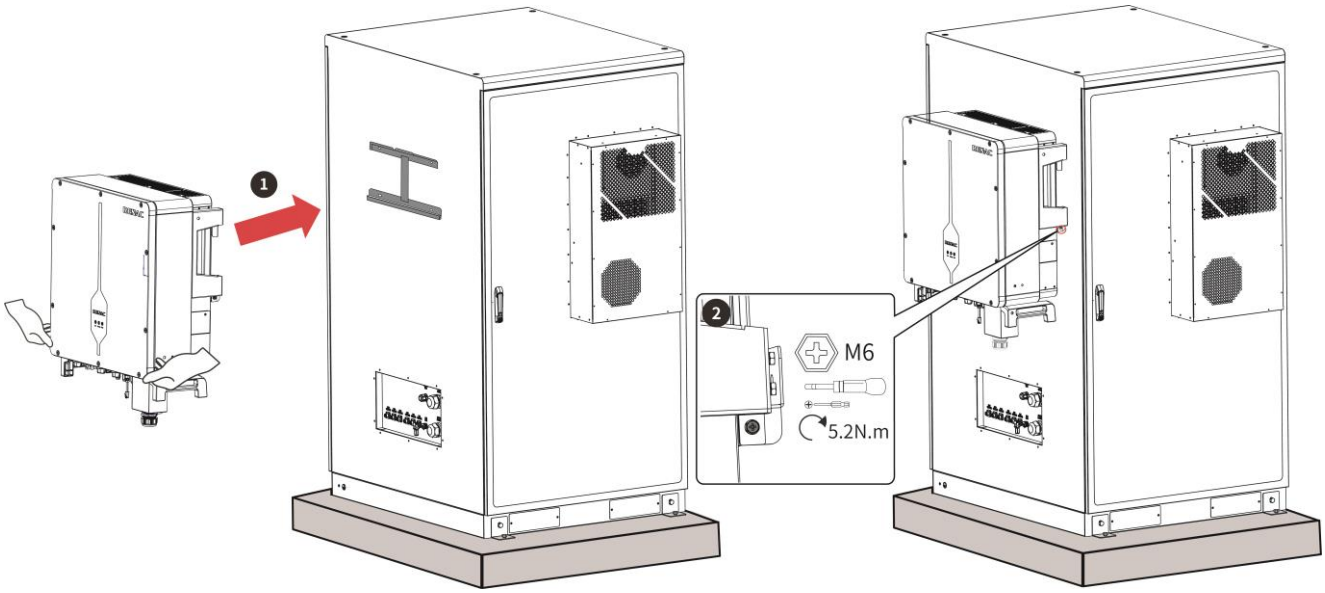


Figure 5-11

7. Install the junction box in the wiring location below the hybrid inverter. Leave the cover off for now.

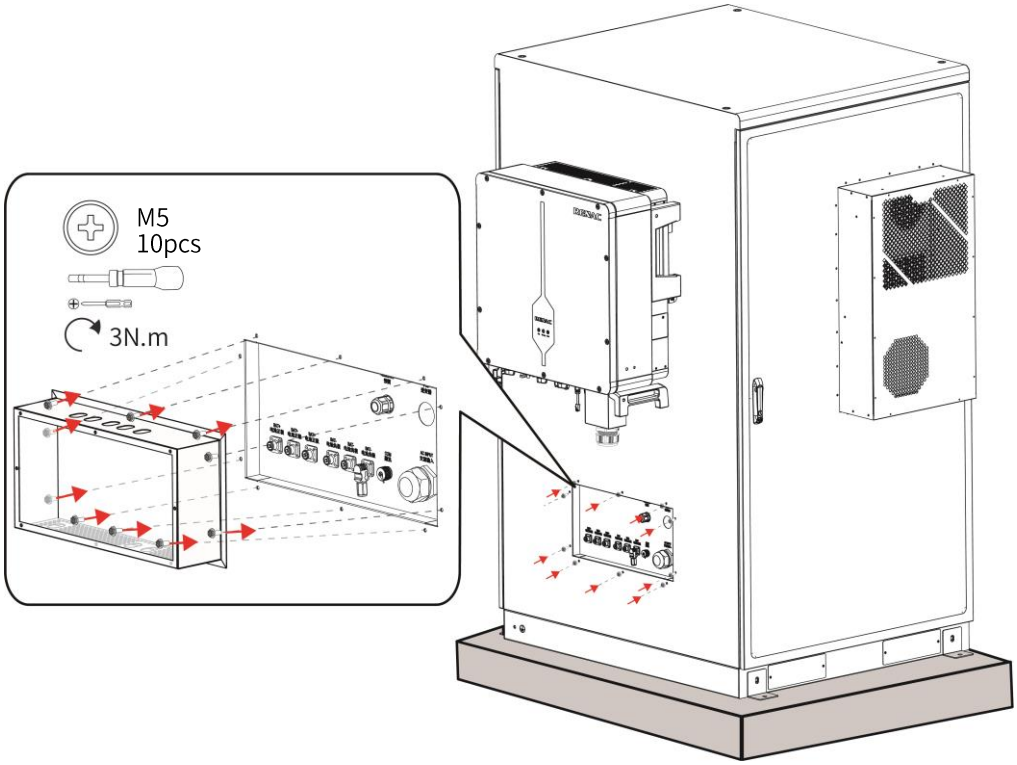


Figure 5-12

5.6 Electrical Connection

DANGER

Danger of high voltage! Danger of electric shock!

- Do not touch live parts!
- Please ensure that the AC and DC sides are not charged before installation.

Do not place the energy storage system on the surface of combustible materials.

WARNING

When performing an electrical installation, refer to the following recommendations for electrical installation:

- Check that all switches in the equipment are disconnected before wiring. Ensure that the equipment is not energized.
- Disconnect the grid switch before wiring and ensure the cable is not energized.
- To determine the correct phase sequence of the cable, you can add yellow, green, red, and black different colors of insulation sheath or marking to distinguish to prevent the phase sequence error.
- Cable terminals and copper row connections need to be compressed; screws should be selected to the right length so as not to affect the insulation and tightening.
- Lay communication and power cables as separately as possible, making sure that the cable insulation is not damaged during the laying process.
- The grounding cable must be reliably connected to the grounding copper row, and the cross-sectional area of the cable must meet the design requirements.
- All AC cables should be connected to the appropriate phase sequence after entering the device through the access holes on the bottom.

- After the wiring is completed, use fireproof mud to seal the leaks to prevent external insects and rodents from entering and damaging the equipment or cables.
- During electrical connection, bolts must be tightened strictly according to the torque described in this manual. Failure to observe the torque requirements may result in fire at the connection!

NOTICE

During the whole process of electrical connection, as well as all other operations on equipment such as integrated hybrid inverter, the following five safety rules must be observed:

Ensure that disconnection of the energy storage system does not accidentally energize it;

Disconnect all external connections to the integrated hybrid inverter and the device's internal power supply.

Ensure that the energy storage system is completely de-energized when using a multimeter.

Make the necessary grounding.

Insulate and cover potentially live parts adjacent to the operating part with insulating cloth.

Step 1: Open the door of battery cabinet and the door of EMS.

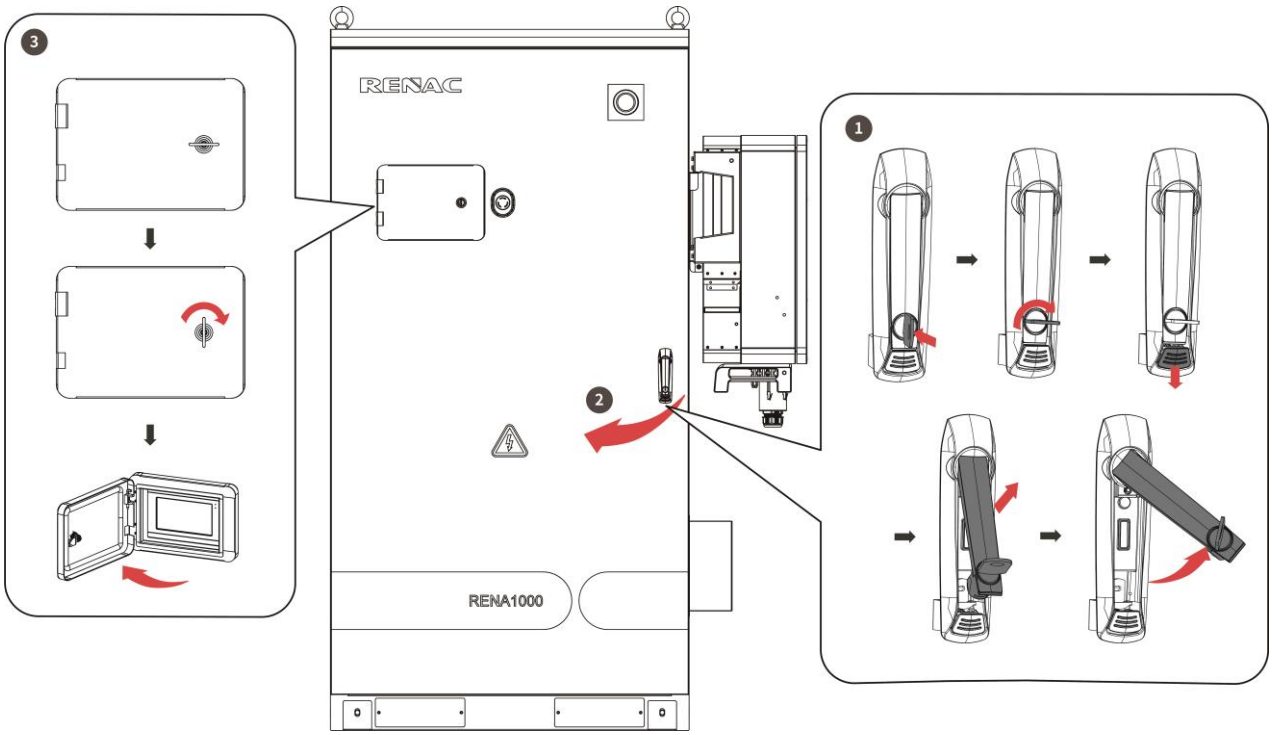


Figure 5-13

Step 2: Battery power cable connection.

Users need to connect the positive power cable between the battery packs.

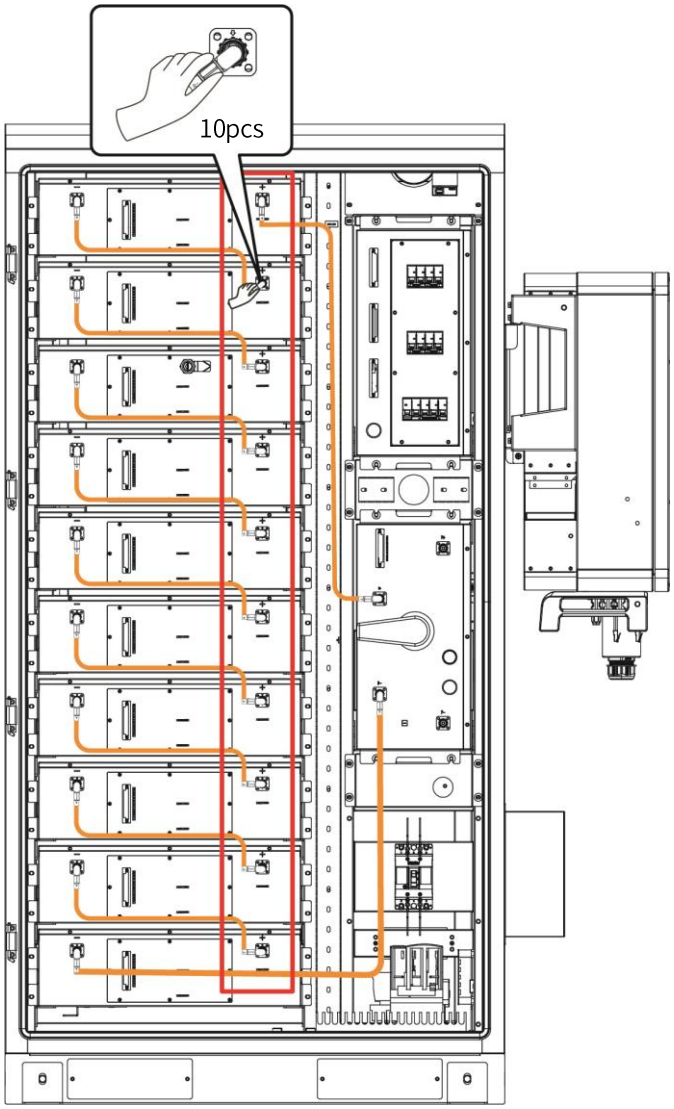


Figure 5-14

WARNING

Ensure that the QF turn on the PDU is in the "OFF" position before wiring.

5.6.1 On-grid solution wiring

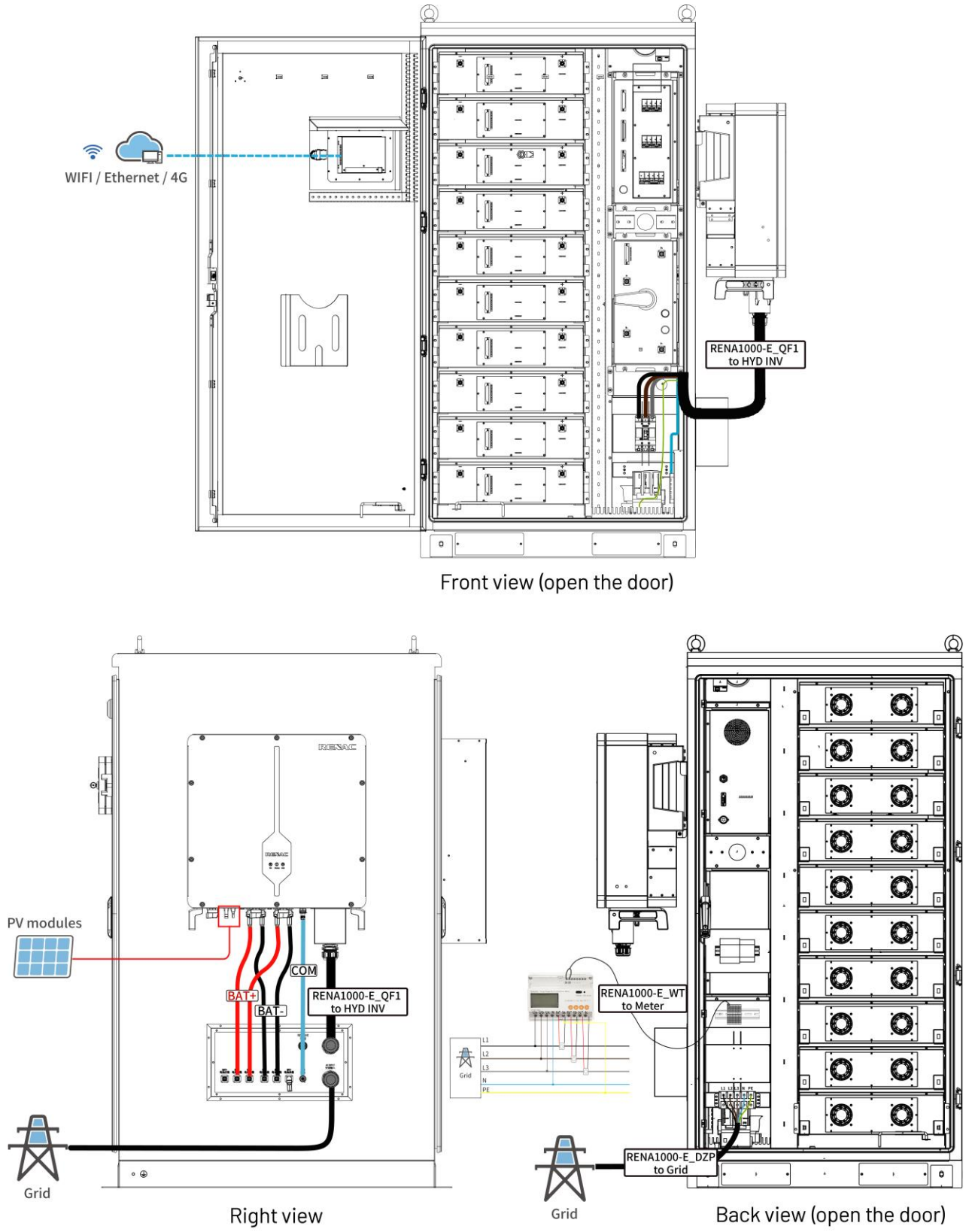


Figure 5-15 On-grid solution wiring (One unit)

(1) Hybrid inverter section wiring:

- Connect BAT+ of the hybrid inverter to BAT+ of the junction box and BAT- of the hybrid inverter to BAT- of the junction box. Take care to look at the positive and negative terminals of the junction harness.
- Connect the COM and PARA port of the hybrid inverter to the COM port of the junction box.
- Connect the AC cable of the hybrid inverter to QF1 of the RENA1000-E.
- Connect the PV ports of the hybrid inverter to PV modules.

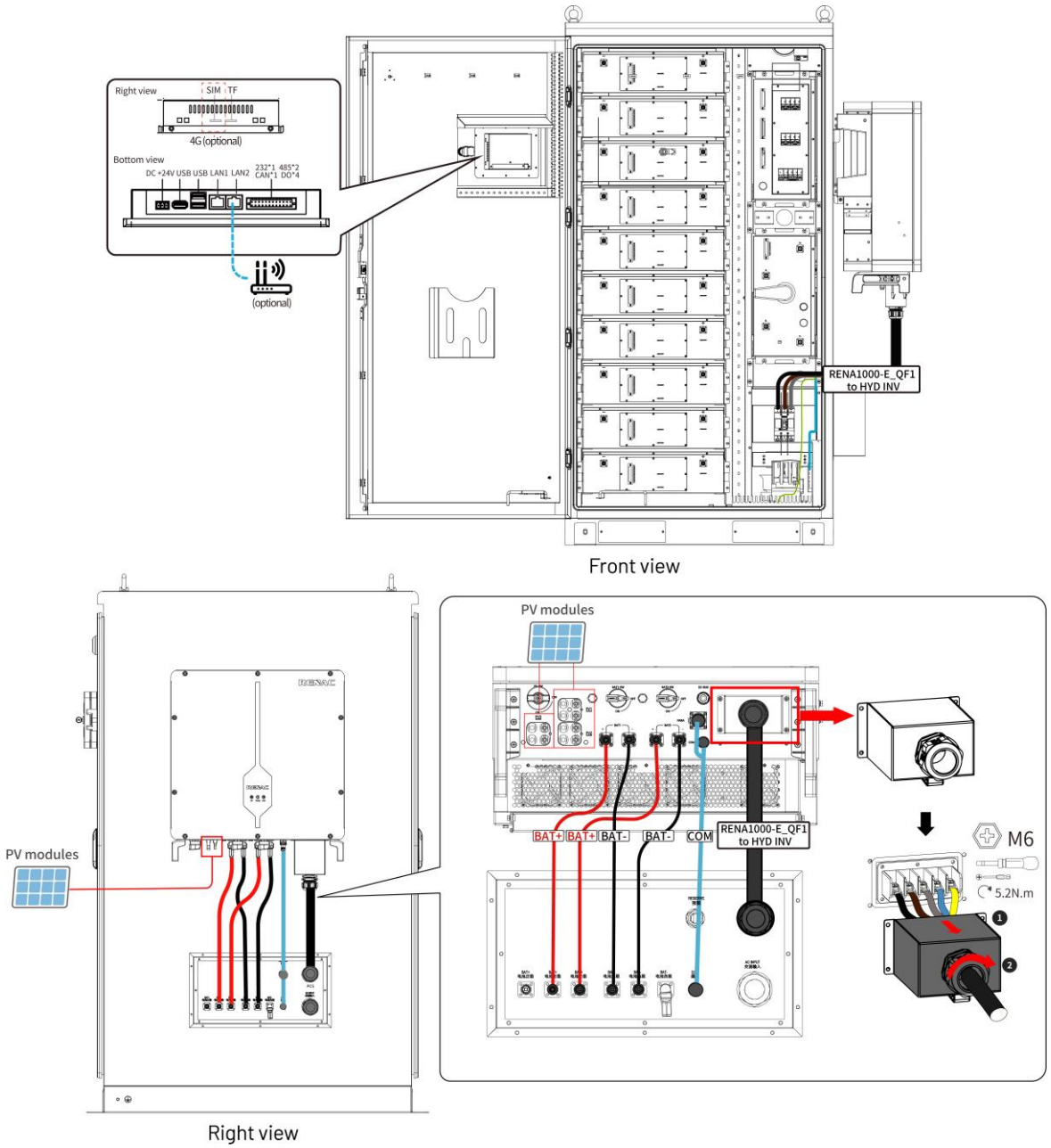


Figure 5-16

NOTICE

- Wiring details for the hybrid inverter section can be found in the N3 HB Series User Manual.
- The SIM card needs to be prepared by the user.

(2) Grid section wiring:

Connect the grid cable from the 5-pole terminal block (DZP) to the grid side, and the users prepare this cable.

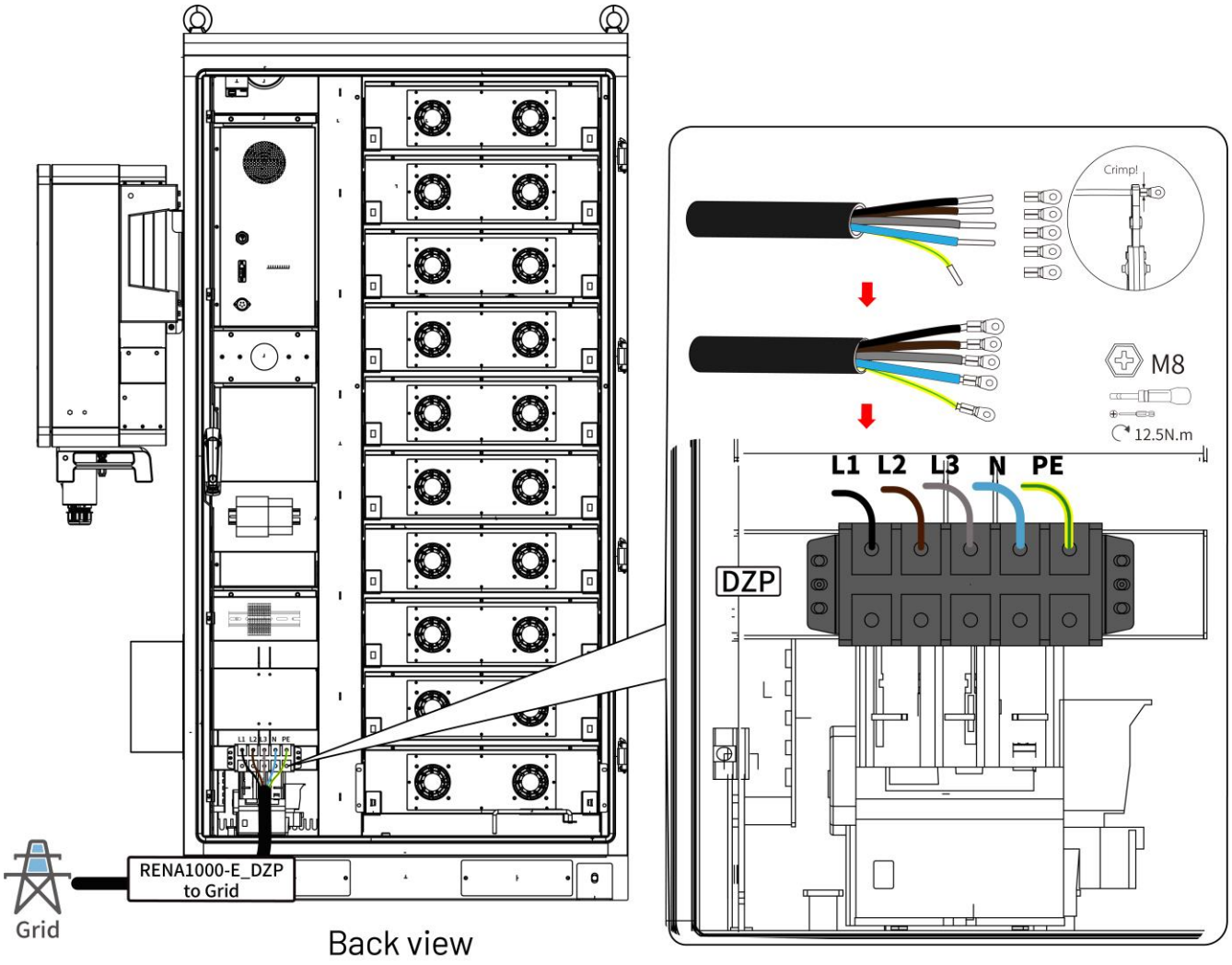


Figure 5-17

NOTICE

The cables colors shown in the picture are for illustration only. Users can decide according to the actual usage.

(3) Meter and CT connection

The energy storage system adopts DTSD1352-CT smart meter. The connect steps are as follows:

- Connect the meter output "Ua, Ub, Uc, N" to "L1, L2, L3, N" of the grid.
- Connect meter CT1 to Grid L1, CT2 to Grid L2, CT3 to Grid L3. Each CT needs to be connected to two wires: the inlet wire of the CT is connected to "Ia*, Ib*, Ic*" of the meter, and the outlet wire of the CT is connected to "Ia, Ib, Ic" of the meter.
- Connect the meter "21, 22" to "1, 2" of the WT.

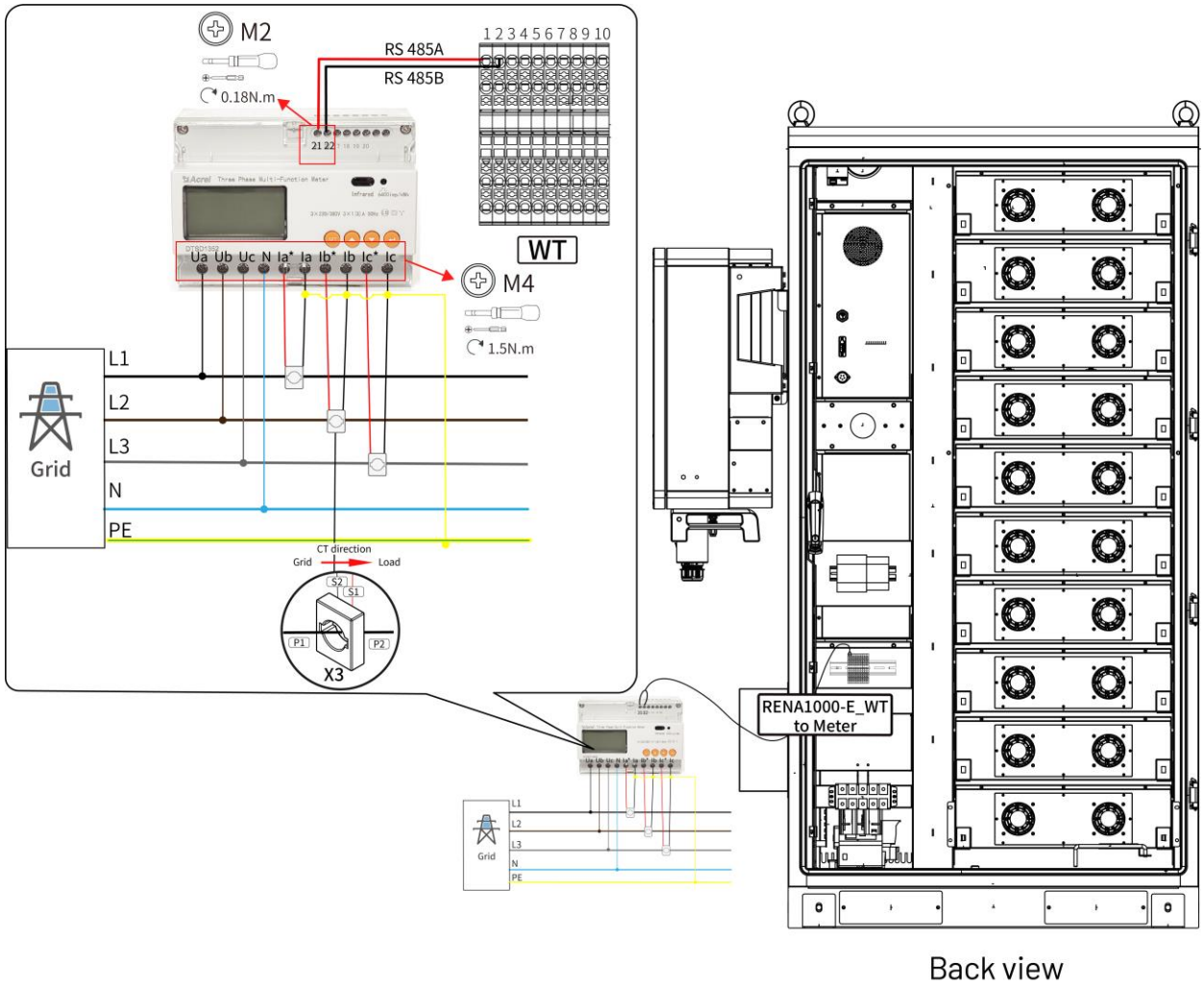


Figure 5-18

NOTICE

Each RENA1000-E can upload data via Ethernet, 4G, or WIFI.

CT is not standard and has to be purchased by the customer. Recommended models are shown in the table below:

Model	Ratio (A)	Overall Dimensions (W * H * D) (mm)	Perforation Dimensions (a * e) (mm)	Accuracy class
Acre AKH-0.66/K-30x20	250 / 5	90 * 114 * 40	22 * 32	0.5
Acre AKH-0.66/K-60x40	350 / 5	114 * 140 * 36	42 * 62	0.5
Acre AKH-0.66/K-60x40	500 / 5	114 * 140 * 36	42 * 62	0.5
Acre AKH-0.66/K-80x40	1000 / 5	122 * 161 * 40	42 * 82	0.5
Acre AKH-0.66/K-100x40	2500 / 5	144 * 194 * 52	42 * 102	0.5

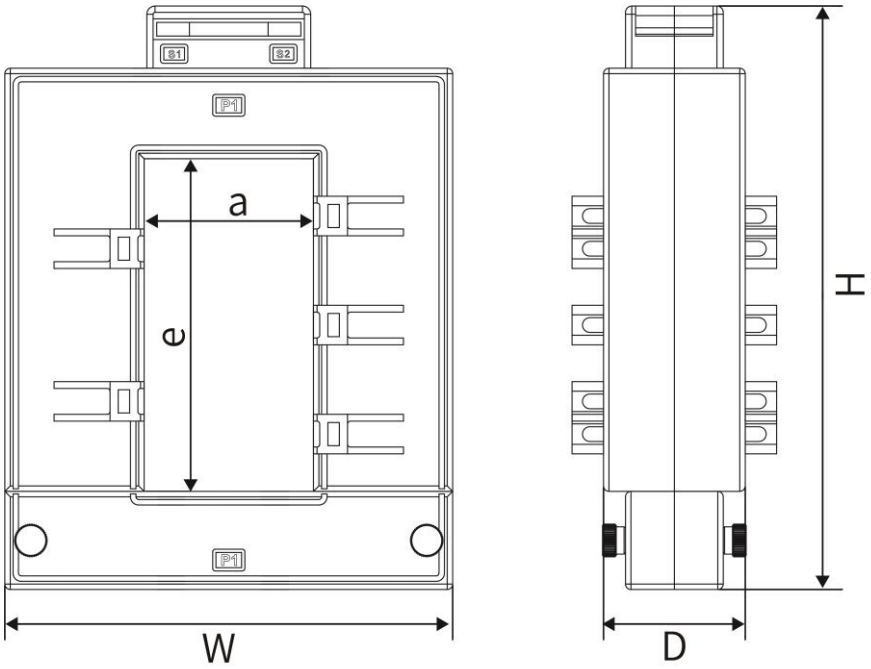


Figure 5-19

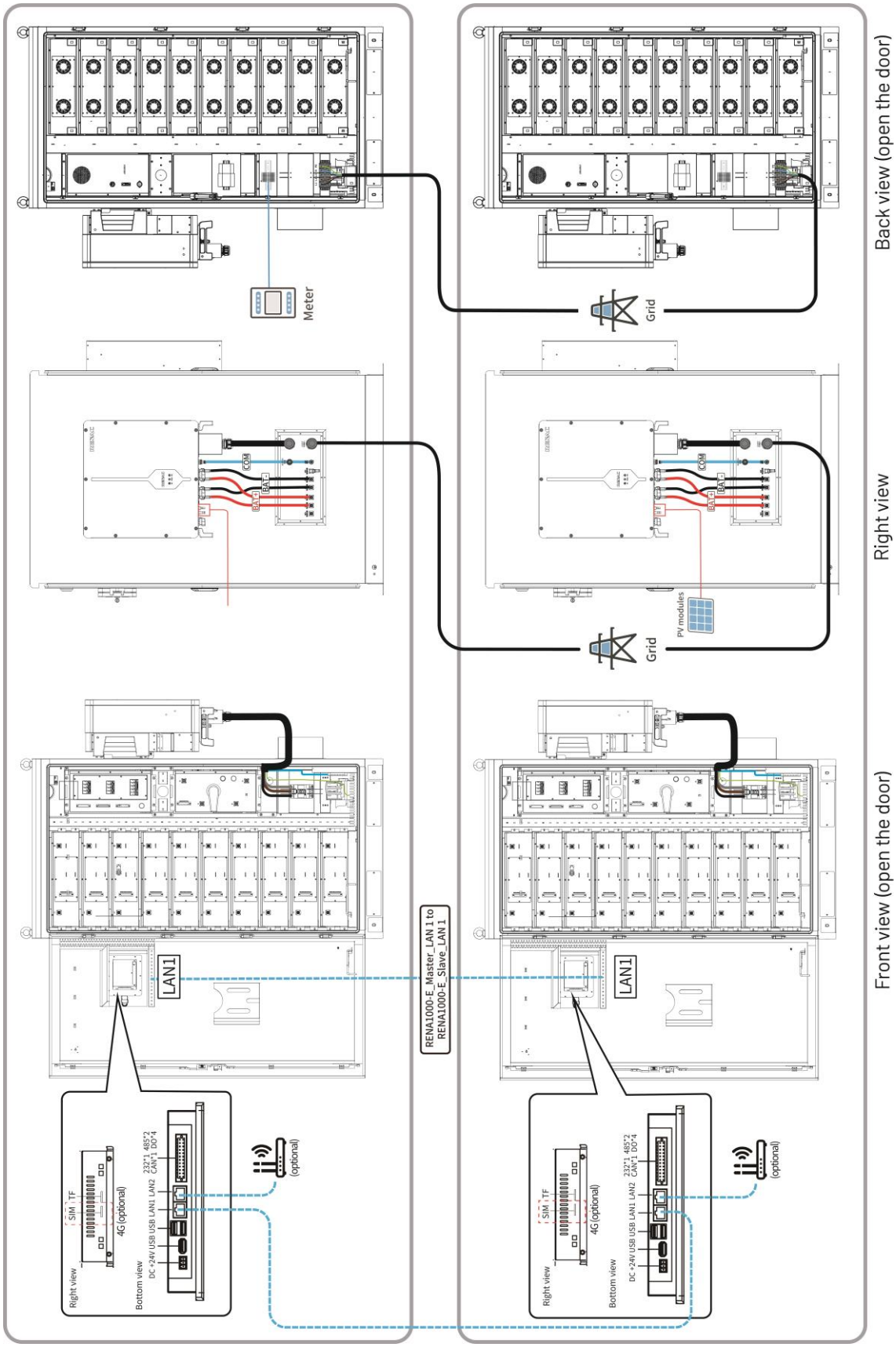


Figure 5-20 On-grid solution wiring (Two units)

If the user chooses to have three or more RENA1000-E in AC parallel, the units will need to communicate with each other via a HUB.

NOTICE

The HUB is used to exchange information among multiple TCP devices. We recommend the model TL-SF1008 Industrial Grade HUB.

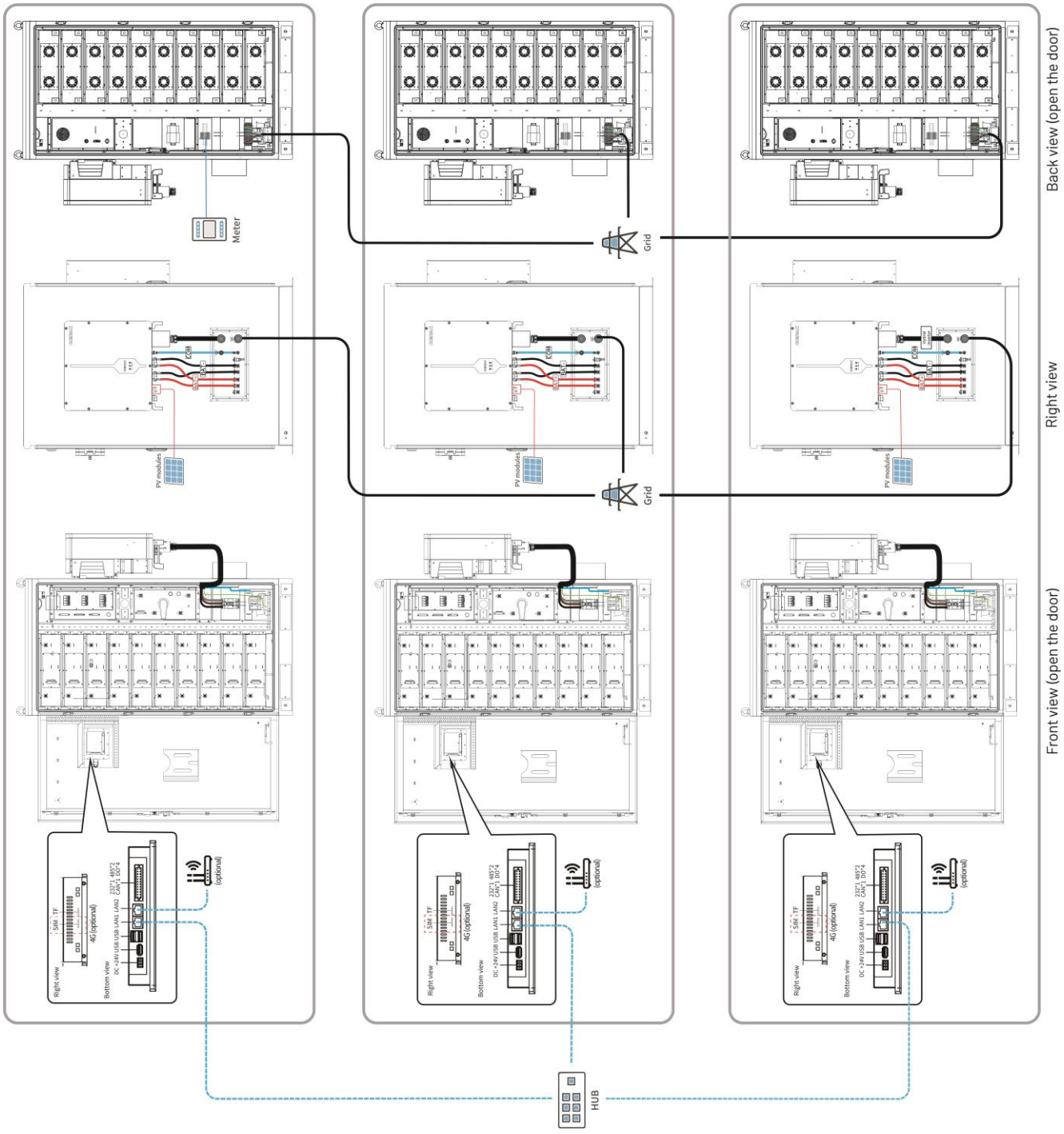


Figure 5-21 On-grid solution wiring (Three units)

5.6.2 Off-grid solution wiring

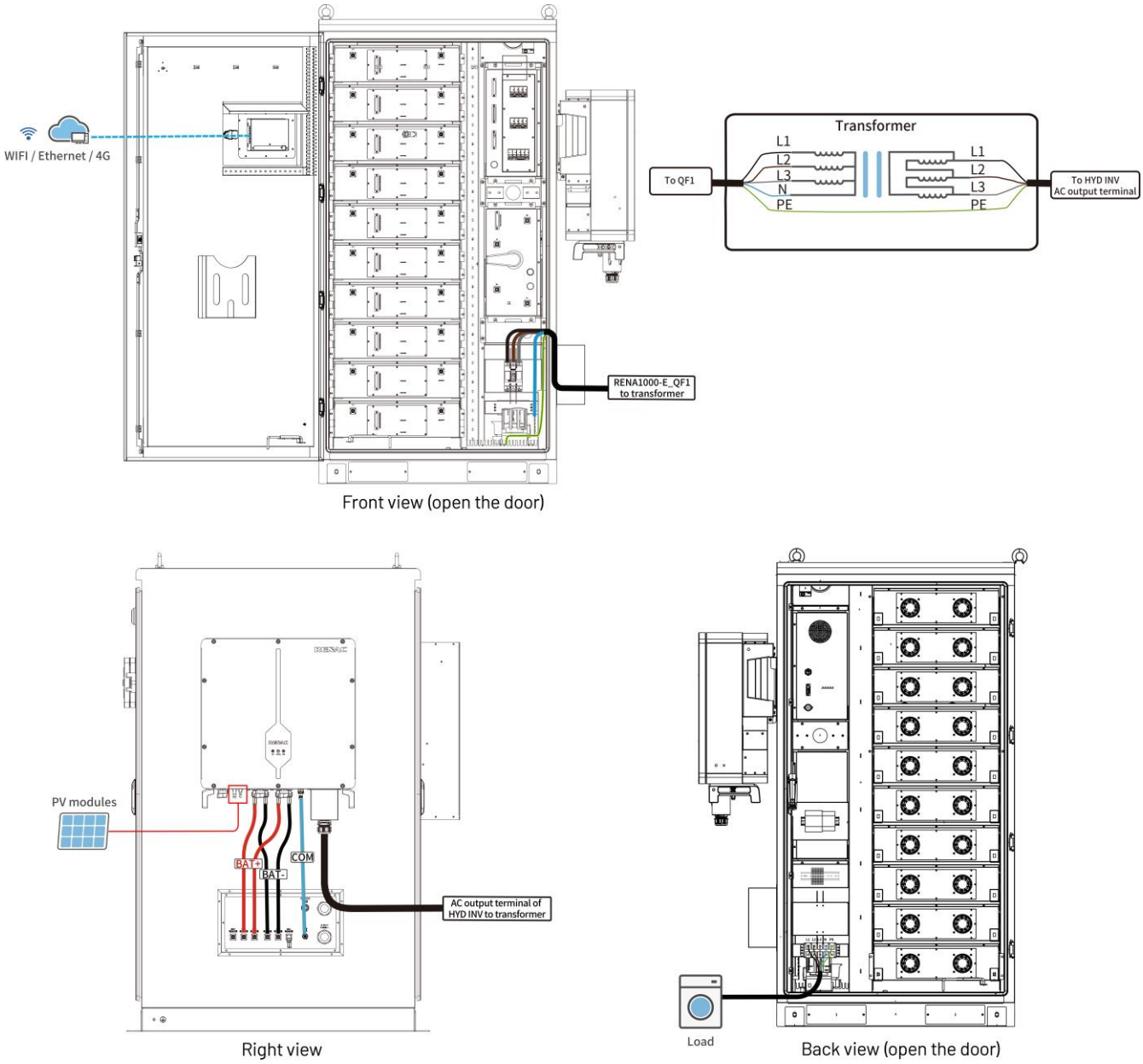


Figure 5-22 Off-grid solution wiring (General)

NOTICE

Transformers need to be prepared by the user. We recommend the model T50 Dyn11 0.4KV/0.4KV transformer. Contact sales for purchase details.

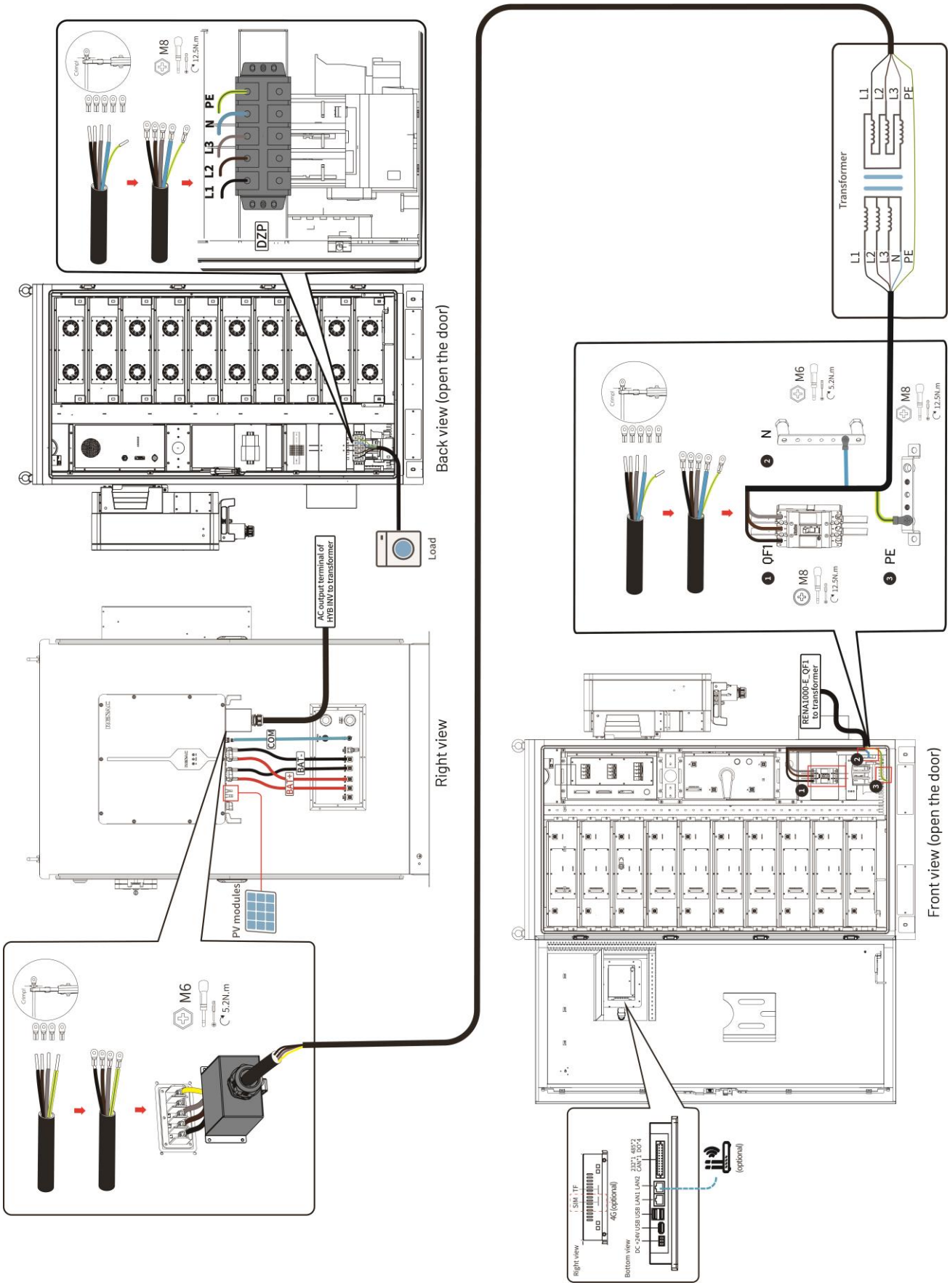


Figure 5-23 Off-grid solution wiring (Detail)

5.6.3 On / Off-grid solution wiring

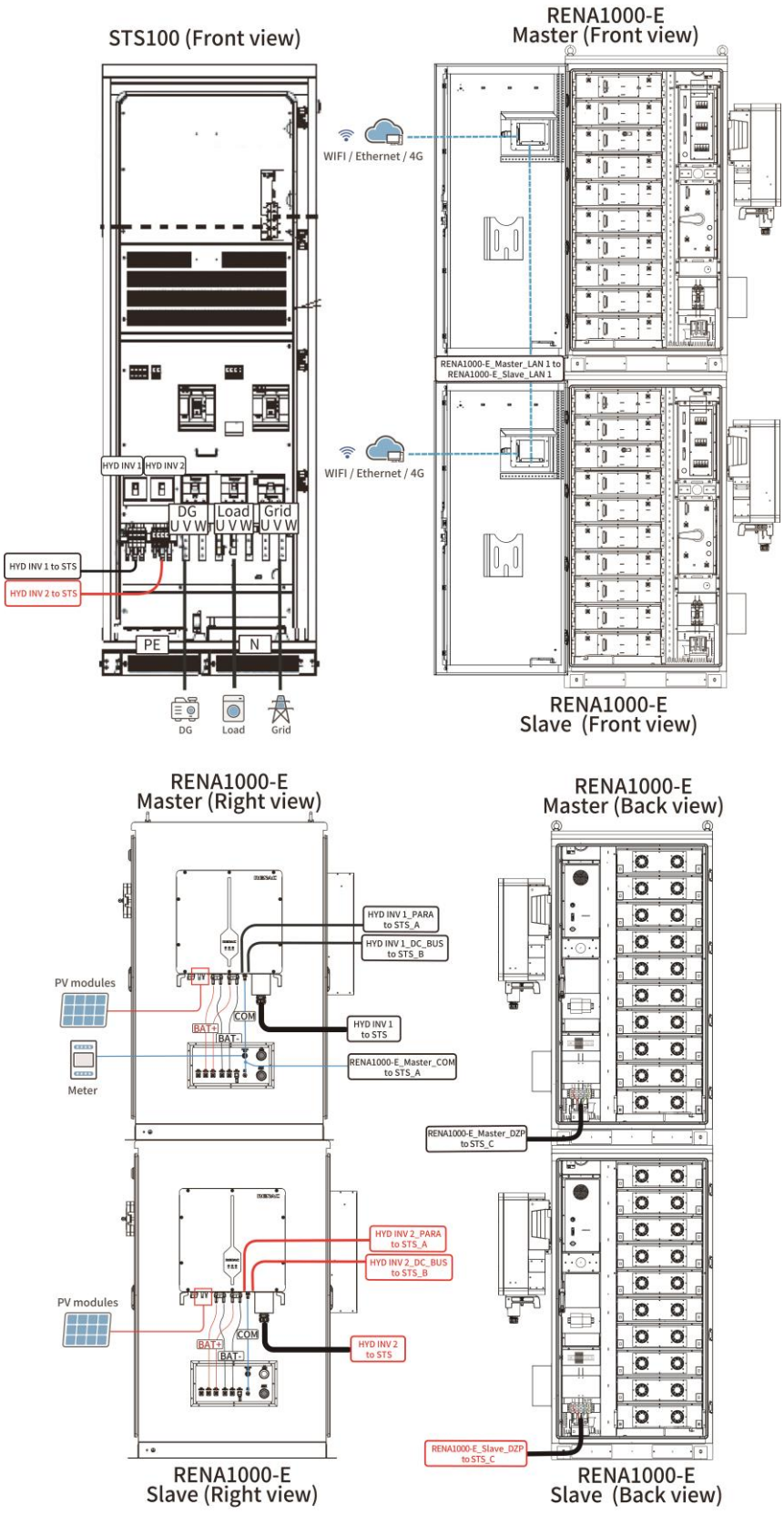


Figure 5-24 On / Off-grid solution wiring (General)

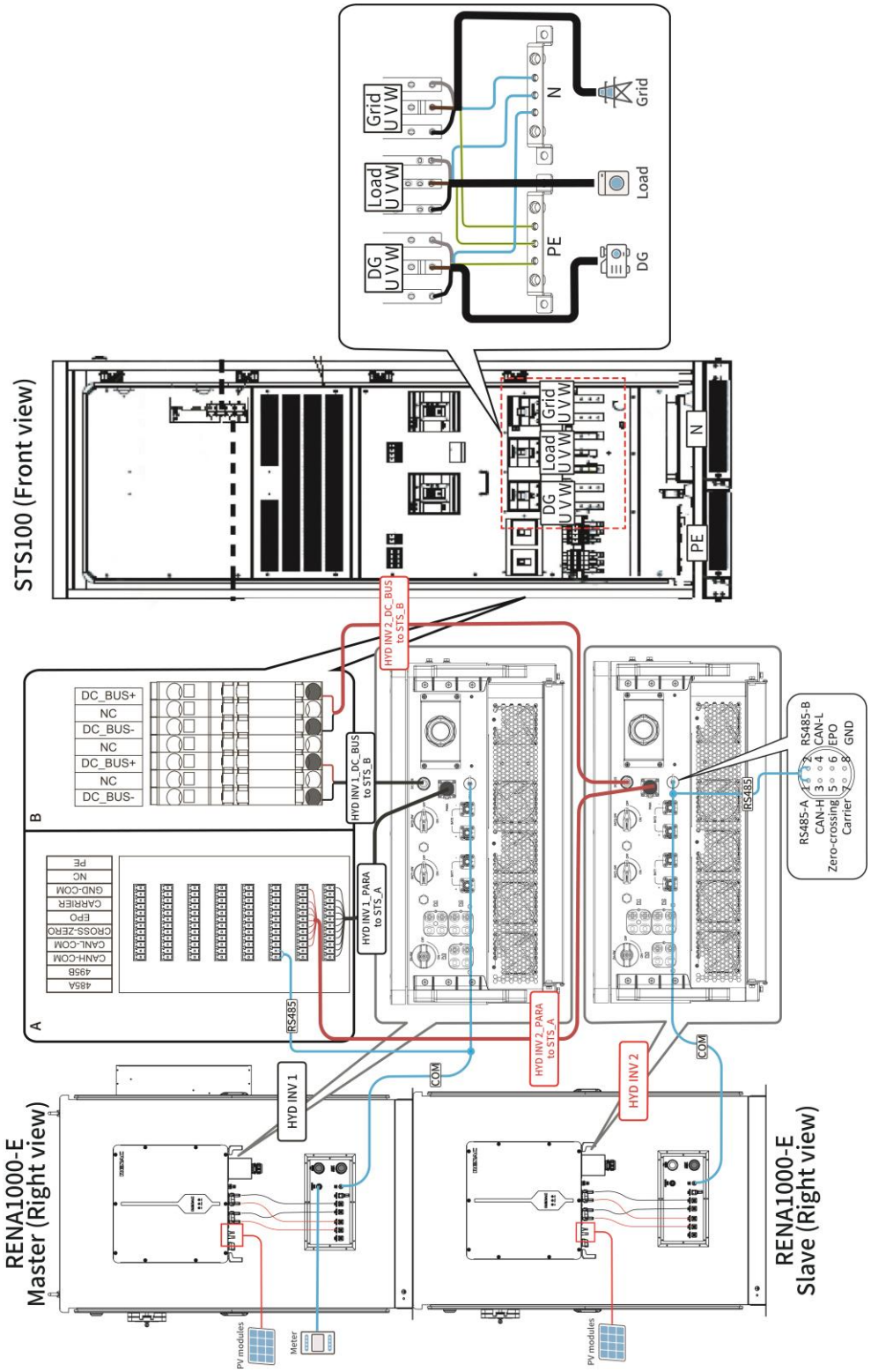


Figure 5-25 On / Off-grid solution wiring (Detail 1)

NOTICE

Wiring details for the STS100 section can be found in the STS100 Static Transfer Switch User Manual.

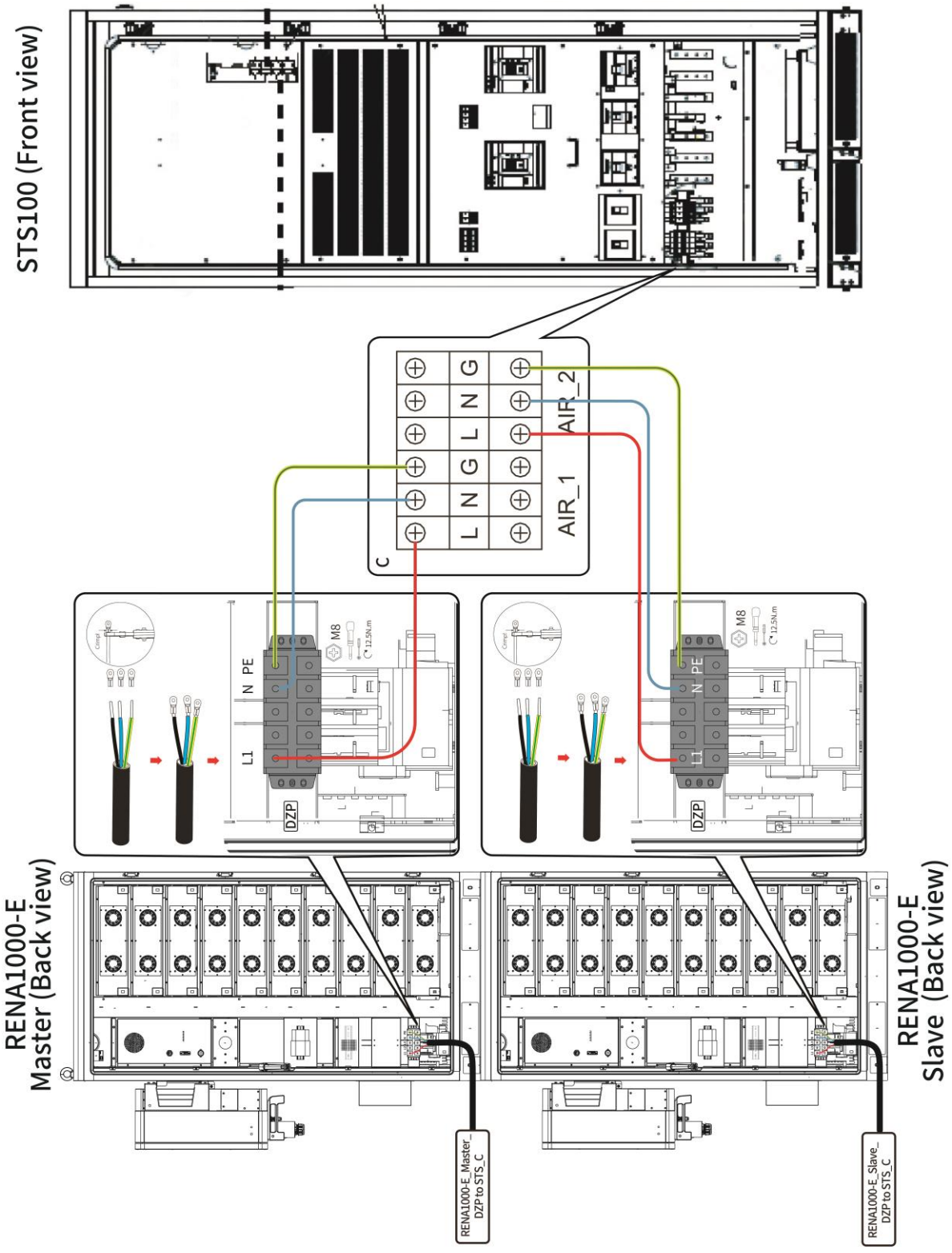


Figure 5-26 On / Off-grid solution wiring (Detail 2)

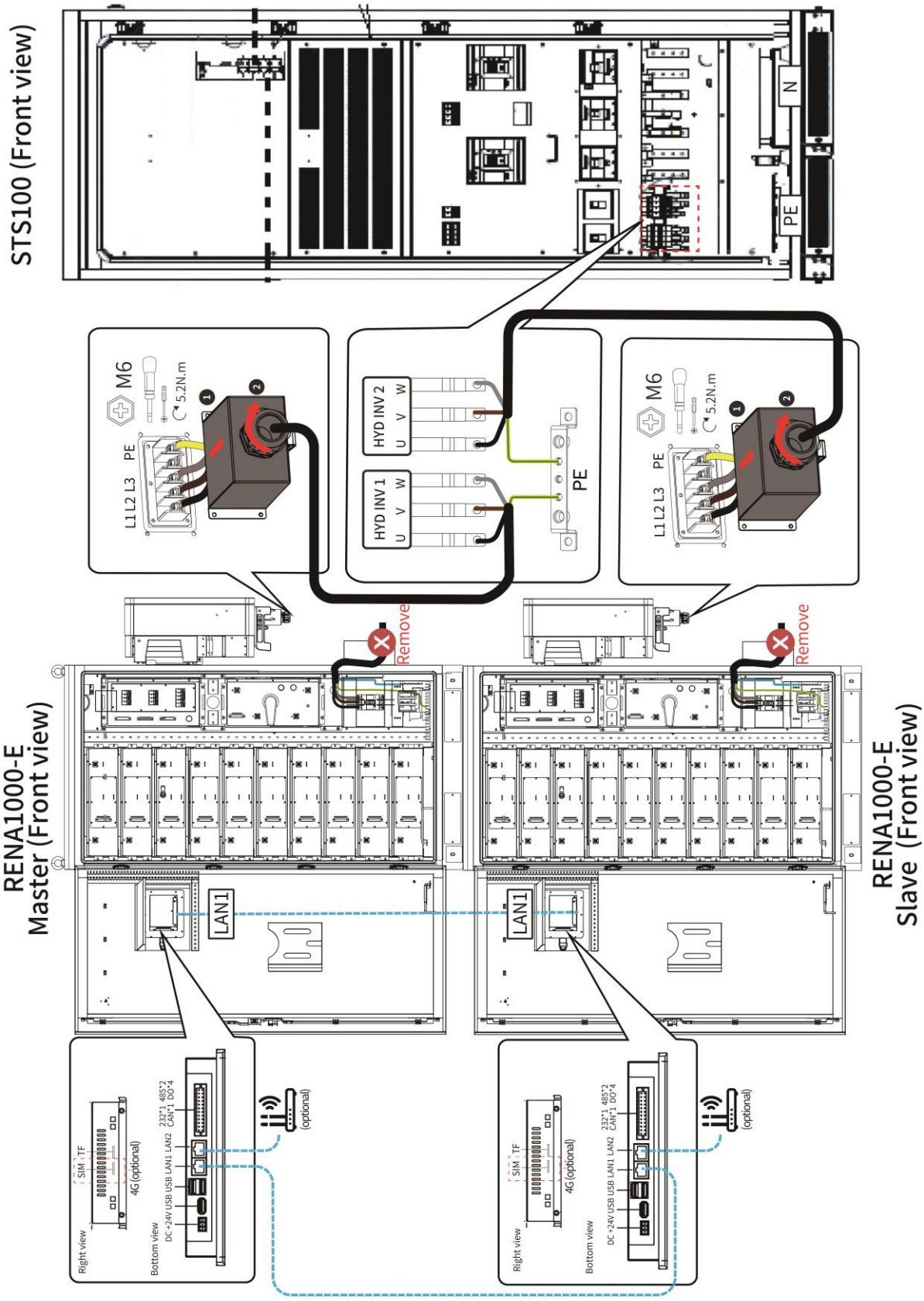


Figure 5-27 On / Off-grid solution wiring (Detail 3)

5.6.4 Close the cover of the junction box

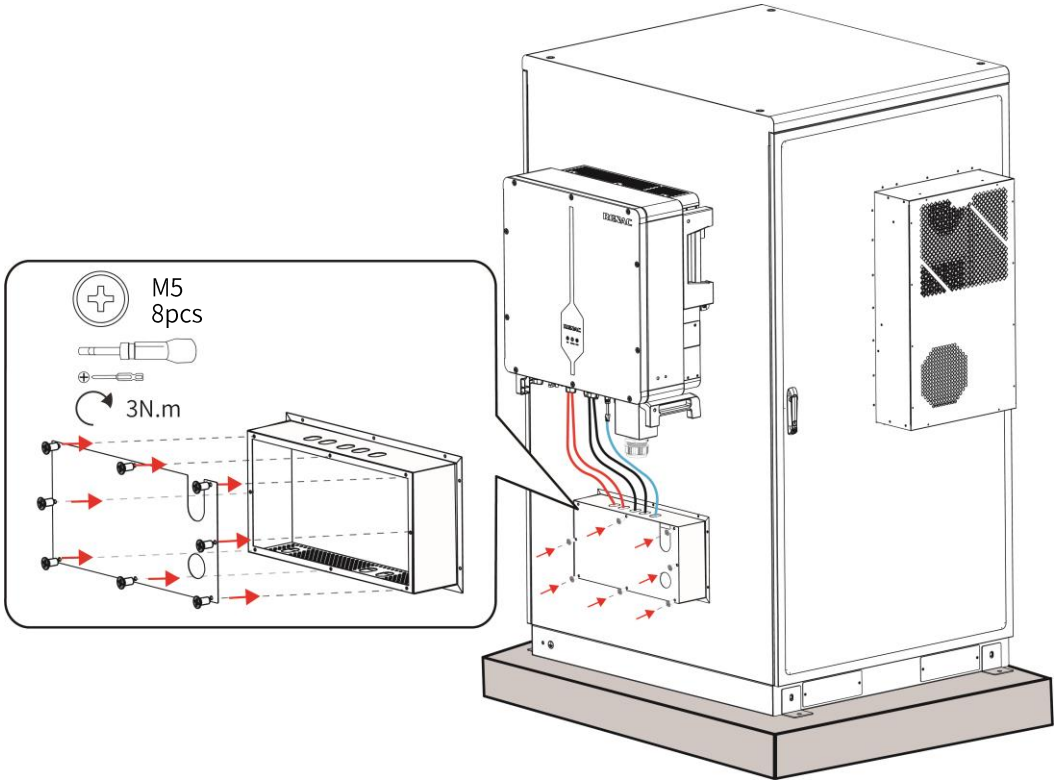


Figure 5-28

6. Commissioning

6.1 Check before Powering On

Before powering on the RENA1000-E, please make sure that the product has been installed following the specifications, and carry out a comprehensive and detailed inspection of the system to ensure that all indicators are in line with the requirements before powering on the system.

(1) Exterior Inspection:

- The RENA1000-E is in good condition, with no damage, no rust, and no paint loss. If there is any paint loss, please carry out a paint refinishing operation.
- The RENA1000-E labels are clearly visible, and damaged labels should be replaced promptly.

(2) Ground check:

- Box with a grounding point and grounded firmly, the box grounding conductor is reliably connected to the box grounding copper row.

(3) Cable check:

- The cable protection is well-wrapped with no visible damage.
- The terminals are made following specifications and are connected firmly and reliably.
- Each cable is clearly labeled at both ends. The alignment meets the principle of separation of strong and weak power, leaving a margin at the turn, and shall not be strained.
- Cable mounting bolts have been tightened, cable pulling without loosening, and cable crossing hole blocking has been completed.

(4) Copper row check:

- There is no obvious crack or deformation of the copper rows, the screws are tight at the lap joints, the scribe marking is not misplaced, and there is no debris on the copper rows.

(5) Component check

- The QF1 are all in the open position.

6.2 Power On

1. On-grid solution power on:

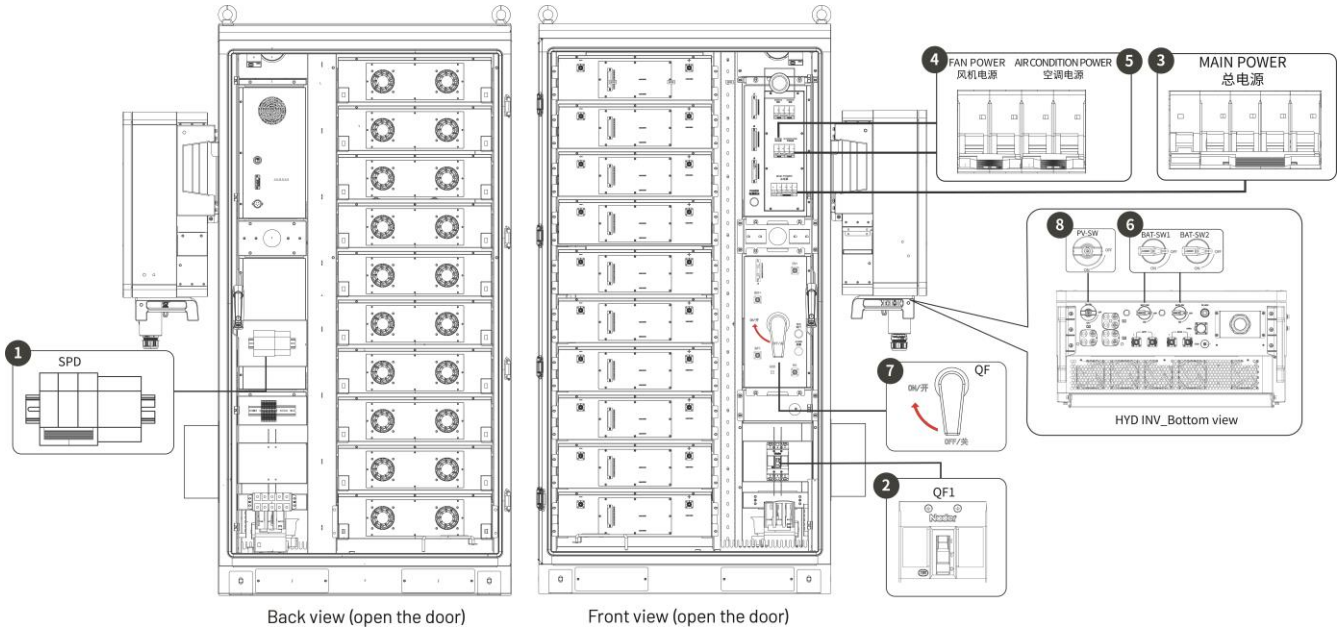


Figure 6-1

1) After checking, turn on the SPD switch.
2) Turn on the QF1 switch.
3) Turn on the main power switch.
4) Turn on the fan power switch, and you can see the power indicator light up on the DC low voltage distribution.

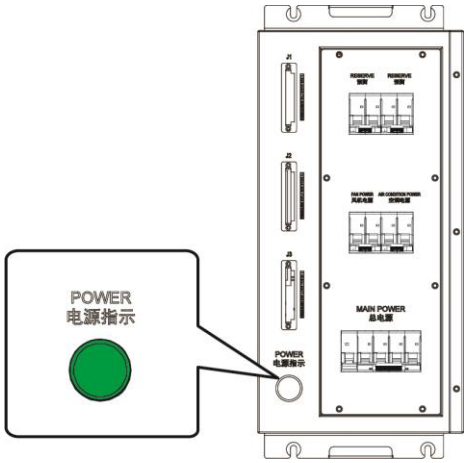


Figure 6-2

5) Turn on the air condition power switch.
6) Turn on the BAT-SW1 and BAT-SW2 switch of the hybrid inverter, and you can see the run indicator light up on the hybrid inverter. If there is a warning or fault indicator light up, please check that the switch is turned on correctly.

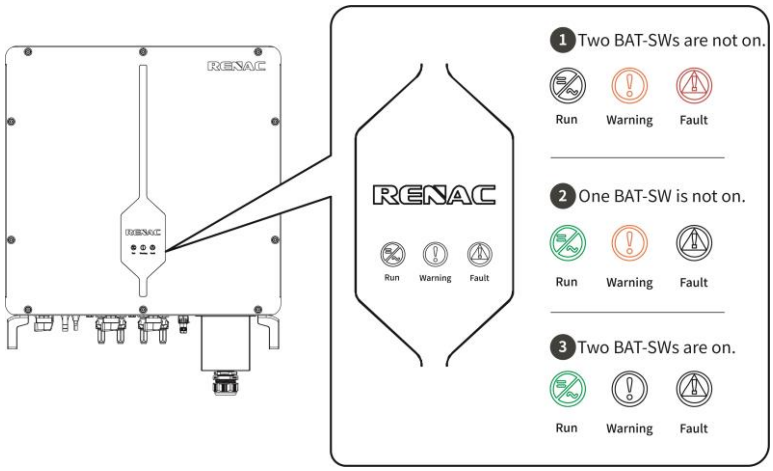


Figure 6-3

7) Turn on the QF switch, and you can see the run indicator light up on the PDU. If the fault indicator light up, you need to stop powering on and check faults immediately.

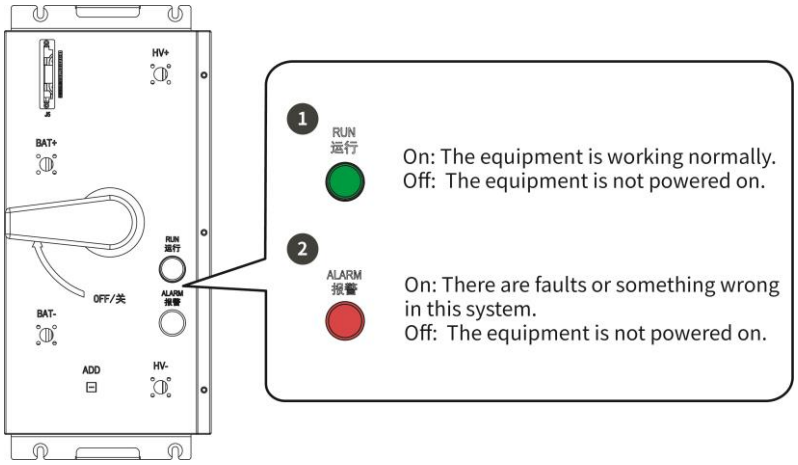


Figure 6-4

8) Turn on the PV-SW switch of the hybrid inverter. Next the user should operate on the EMS interface as described in Section 7.2.

WARNING

Users must turn on the PV-SW switch last, or the system will report a fault.

2. Off-grid solution power on:

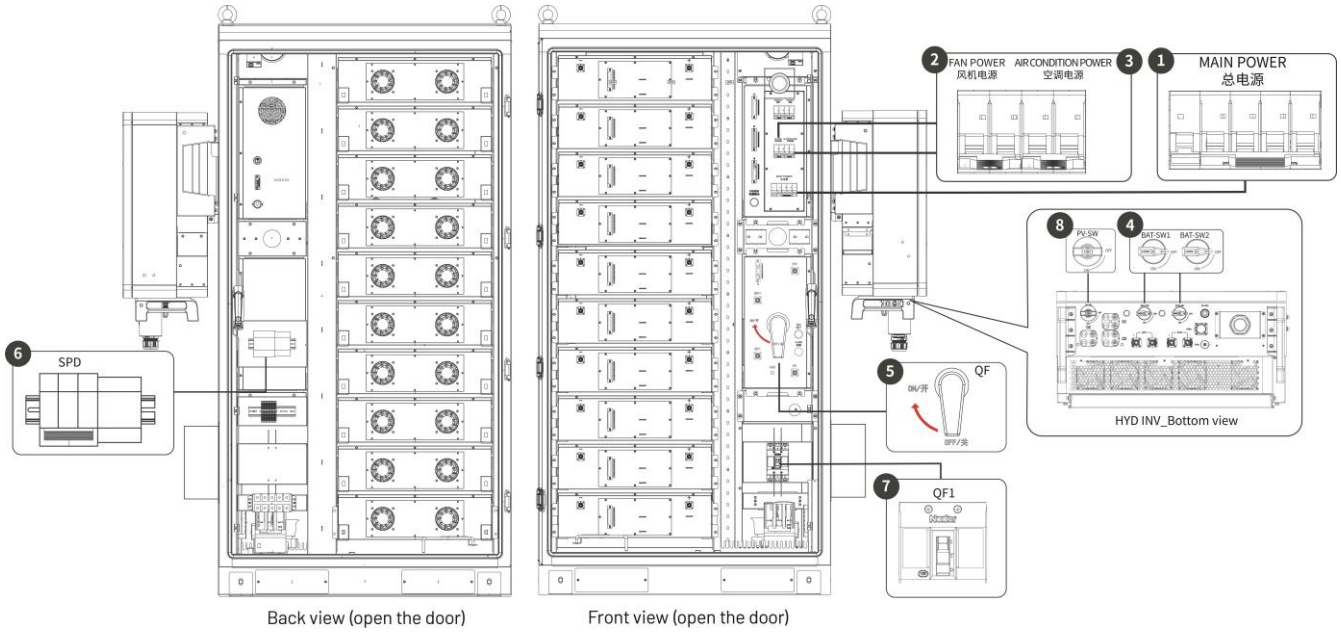


Figure 6-5

1) After checking, and turn on the main power switch.
2) Turn on the fan power switch.
3) Turn on the air condition power switch.
4) Turn on the BAT-SW1 and BAT-SW2 switch of the hybrid inverter.
5) Turn on the QF switch. You can see the power indicator light up on the DC low voltage distribution and the run indicator light up on the PDU. If the fault indicator light up, you need to stop powering on and check faults immediately.

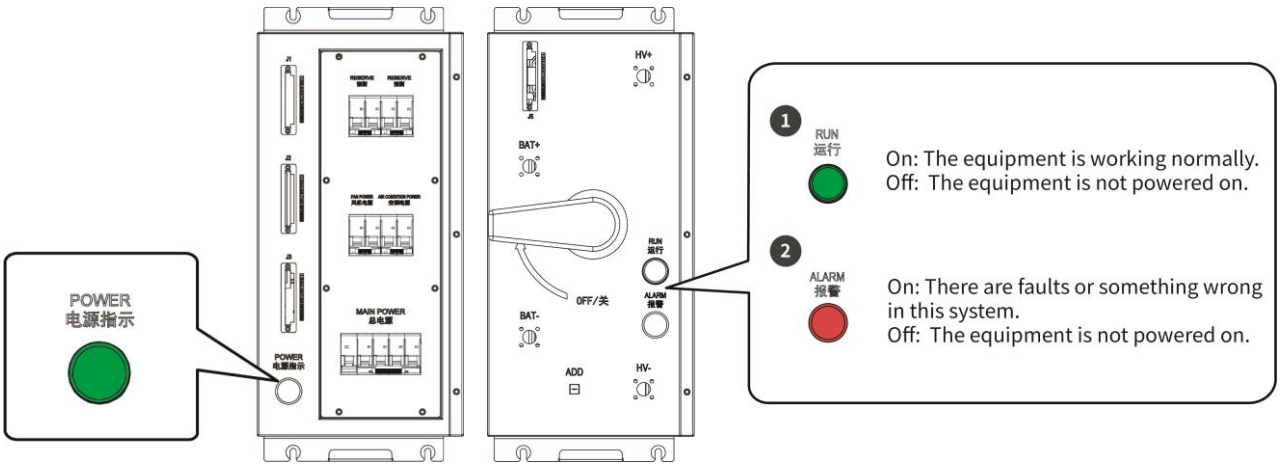


Figure 6-6

6) Turn on the SPD switch.
7) Turn on the QF1 switch.
8) Turn on the PV-SW switch. Next the user should operate on the EMS interface as described in Section 7.2.

3. On / Off-grid solution power on:

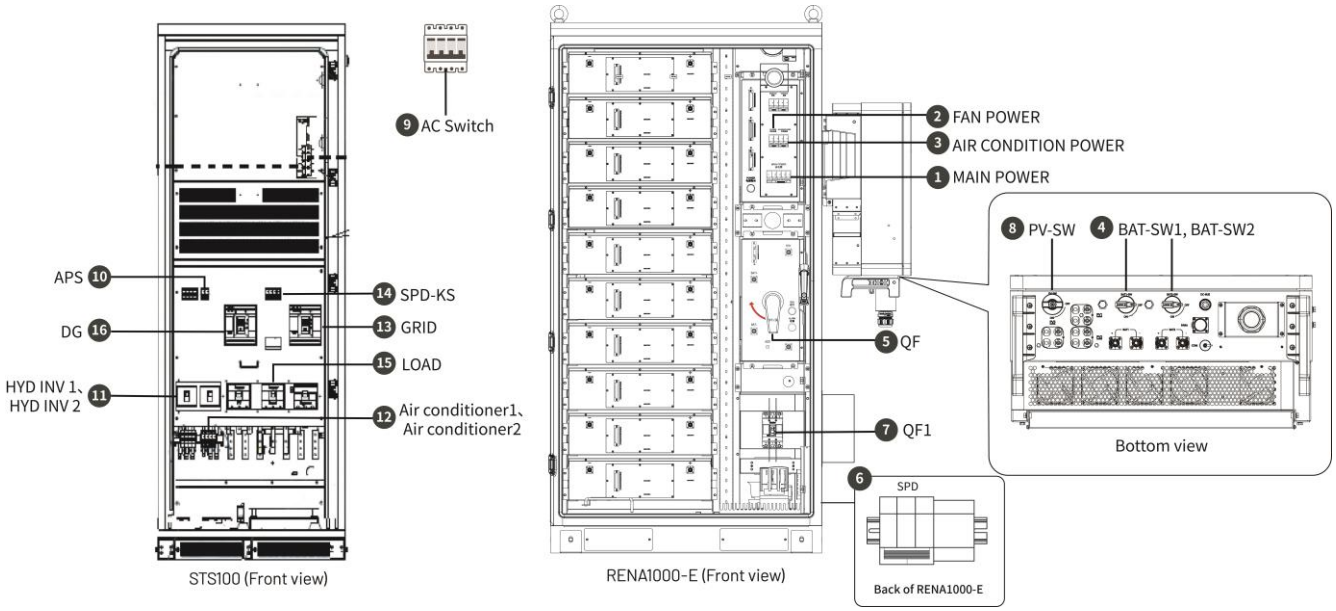


Figure 6-7

1) Turn on the main power switch of the RENA1000-E.
2) Turn on the fan power switch of the RENA1000-E.
3) Turn on the air condition power switch of the RENA1000-E.
4) Turn on the BAT-SW1 and BAT-SW2 switch of the hybrid inverter.
5) Turn on the QF switch of the RENA1000-E.
6) Turn on the SPD switch of the RENA1000-E.
7) Turn on the QF1 switch of the RENA1000-E.
8) Turn on the PV-SW switch of the RENA1000-E.
9) Turn on the AC switch between the STS100 and the power grid.
10) Turn on the APS switch of the STS100.
11) Turn on the HYD INV 1 and HYD INV 2 switch of the STS100.
12) Turn on the air conditioner 1 and air conditioner 2 switch of the STS100.
13) Turn on the grid switch of the STS100.
14) Turn on the SPD-KS switch of the STS100.
15) Turn on the load switch of the STS100.
16) Turn on the DG switch of the STS100. If you do not have a DG connected, you can ignore this step.
17) Users should operate on the EMS interface of the RENA1000-E. Please refer to Section 7.2 for details.

6.3 Trial Operation

After the equipment has completed the installation of all electrical structures to meet the start-up conditions, to ensure that the energy storage system runs reliably and stably, the initial operation must be powered up by professional electrical engineers and technicians and set up the Run Mode and related parameters according to the project requirements:

1) Set the device control mode to "Manual Mode" and the active power to 5.0.
2) Observe the screen hybrid inverter, battery, and air-conditioning parameters during operation, and stop the machine promptly for testing if there is any abnormality.
3) Allow the device to run for 0.5 hours.
4) The device control mode is set to "Battery Backup" and the active power is set to 5.0.

5) Observe the screen hybrid inverter, battery, and air-conditioning parameters during operation, and stop the machine promptly for testing if there is any abnormality.
6) Allow the device to run for 0.5 hours.
7) After completing a one-hour trial run without any abnormality, and turn off the system in the "Operation" interface and manually turn off the battery and air conditioner on the touch screen.
8) You can choose self-generation and self-consumption mode or other modes for formal commissioning according to the background and demand of the project.

6.4 Power Off

1. On-grid solution power off:

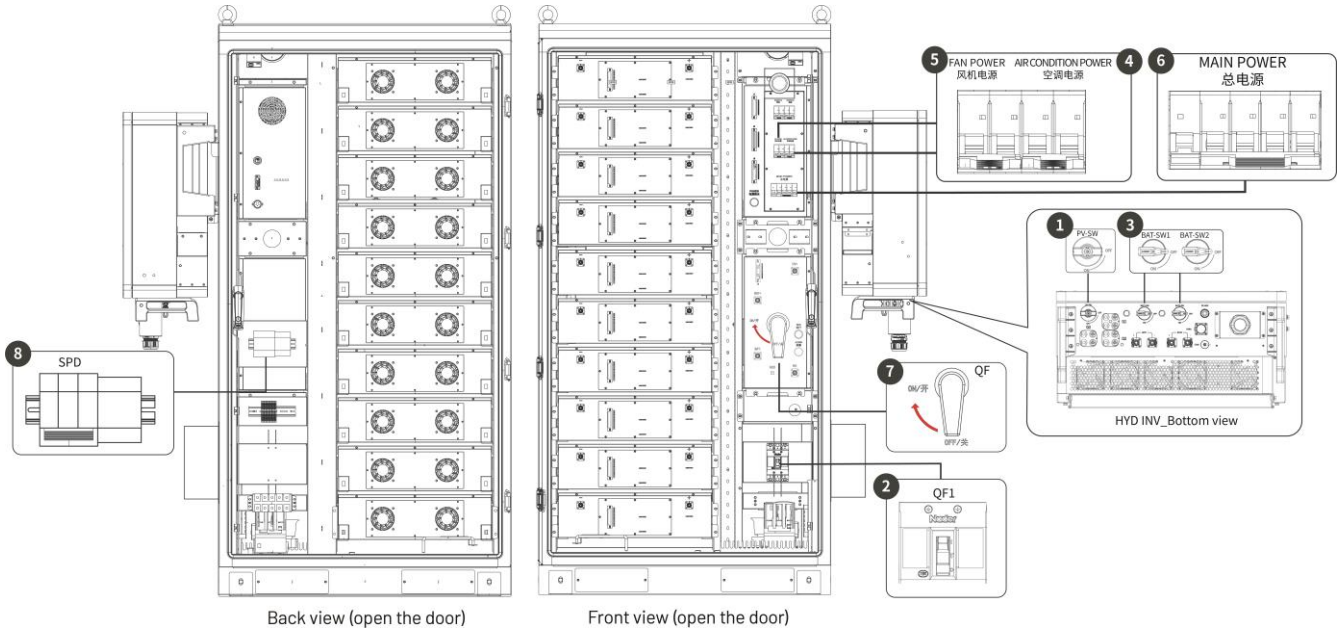


Figure 6-8

1) Users can refer to Section 7.2 to operate the EMS interface to shut down the system.
2) Turn off the PV-SW switch of the hybrid inverter.
3) Turn off the QF switch, and you can see the run indicator light off on the PDU.
4) Turn off the BAT-SW1 and BAT-SW2 switch of the hybrid inverter.
5) Turn off the air condition power switch.
6) Turn off the fan power switch, and you can see the power indicator light off on the DC low voltage distribution.
7) Turn off the main power switch.
8) Turn off the QF1 switch
9) Turn off the SPD switch.

2. Off-grid solution power off:

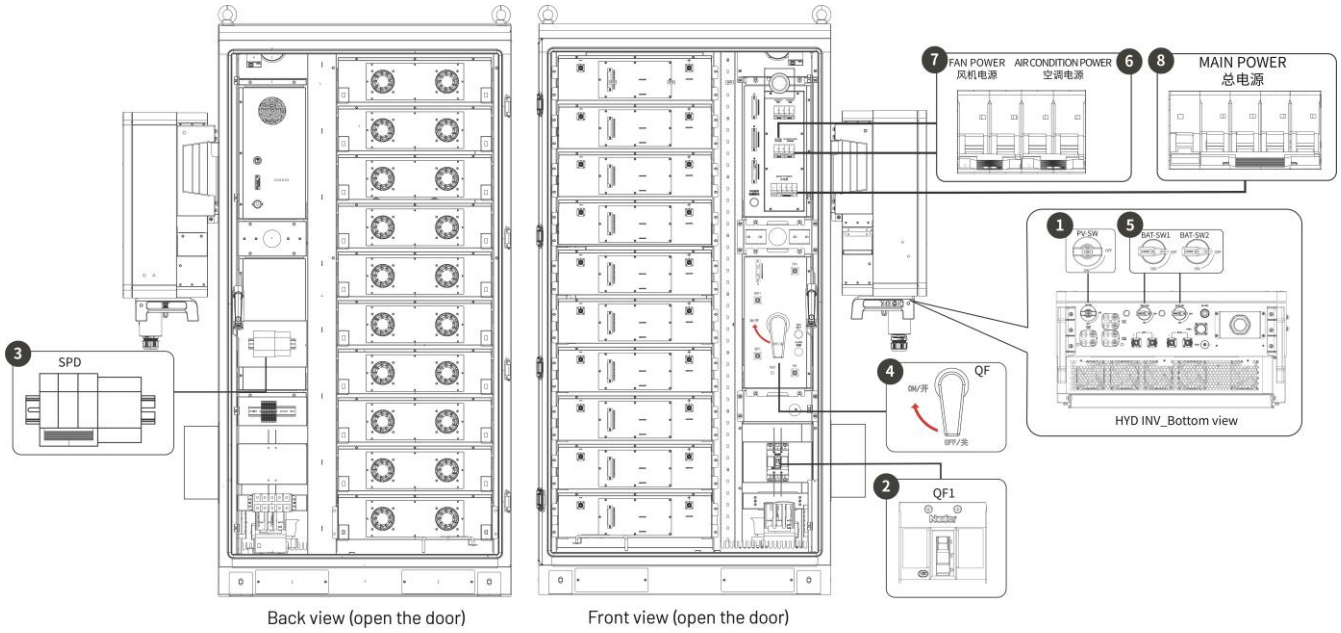


Figure 6-9

1) Users can refer to Section 7.2 to operate the EMS interface to shut down the system.
2) Turn off the PV-SW switch of the hybrid inverter.
3) Turn off the QF1 switch.
4) Turn off the SPD switch.
5) Turn off the QF switch, and you can see the run indicator light off on the PDU.
6) Turn off the BAT-SW1 and BAT-SW2 switch of the hybrid inverter.
7) Turn off the air condition power switch.
8) Turn off the fan power switch, and you can see the power indicator light off on the DC low voltage distribution.
9) Turn off main power switch.

3. On / Off-grid solution power off:

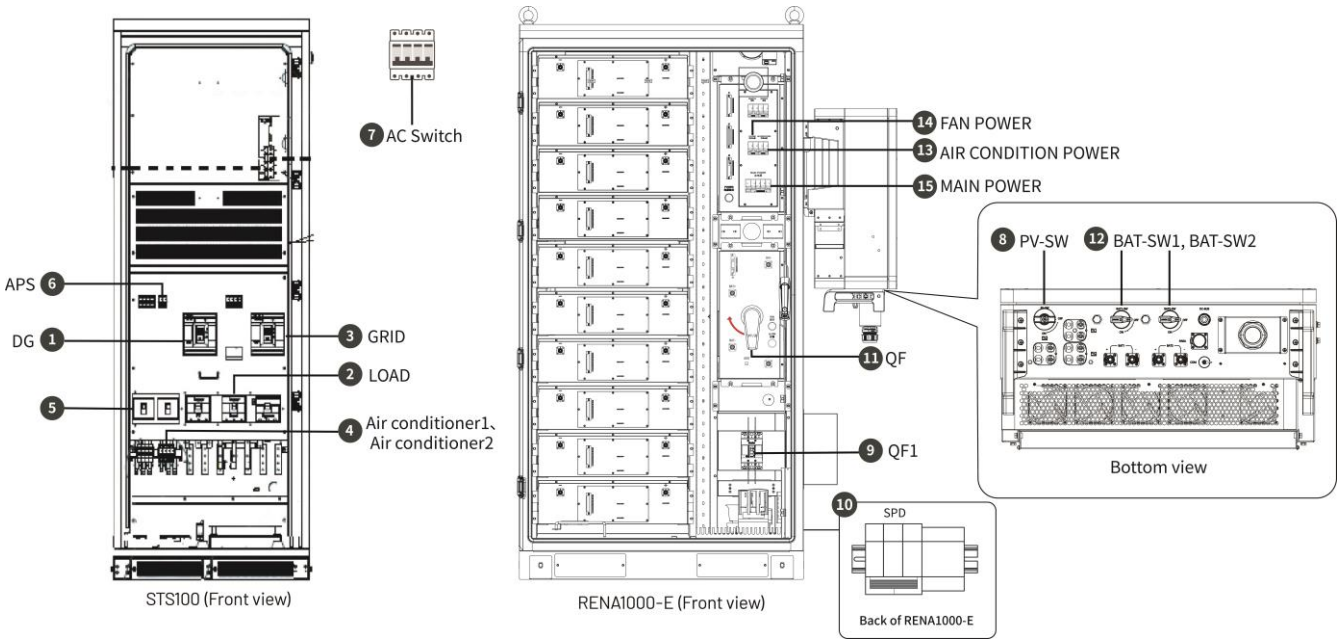


Figure 6-

1) Users can refer to Section 7.2 to operate the EMS interface to shut down the system.
2) Turn off the DG switch of the STS100. If you do not have a DG connected, you can ignore this step.
3) Turn off the load switch of the STS100.
4) Turn off the grid switch of the STS100.
5) Turn off the air conditioner 1 and air conditioner 2 switch of the STS100.
6) Turn off the HYD INV 1 and HYD INV 2 switch of the STS100.
7) Turn off the APS switch of the STS100.
8) Turn off the AC switch between the STS100 and the power grid.
9) Turn off the PV-SW switch of the RENA1000-E.
10) Turn off the QF1 switch of the RENA1000-E.
11) Turn off the SPD switch of the RENA1000-E.
12) Turn off the QF switch of the RENA1000-E.
13) Turn off the BAT-SW1 and BAT-SW2 switch of the hybrid inverter.
14) Turn on the air condition power switch of the RENA1000-E.
15) Turn on the fan power switch of the RENA1000-E.
16) Turn on the main power switch of the RENA1000-E.

6.5 Emergency Shut Down

When there is a malfunction of the product or a critical situation that requires emergency shutdown, you can perform the following emergency shutdown operations:

1) Press the emergency shutdown button "Emergency stop".
2) Referring to section 6.4, turn off all switches.
3) Reset the Emergency stop button after determining that the fault or hazard is cleared and operation is required.

7. Operation and Handling

This chapter mainly introduces the EMS operation. Users can execute various operation commands through the LCD display interface, conveniently browse the DC, AC, and system operation-related parameters and data, and obtain the current equipment status and real-time alarm information in a timely manner, which provides a reliable basis for troubleshooting. In addition, the LCD touchscreen can also display the system software version information and upgrade the software of each component through the U disk.

7.1 Introduction of Menu Interface

There are five submenus in the menu that can be selected for relevant setting operations.

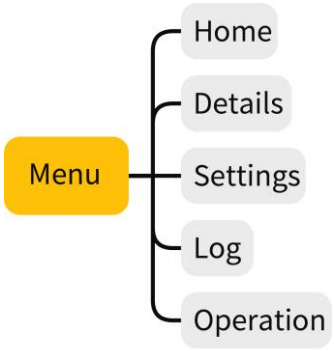


Figure 7-1

(1) Home page: Displays the operating status of the system and the charging/discharging graph of the day.

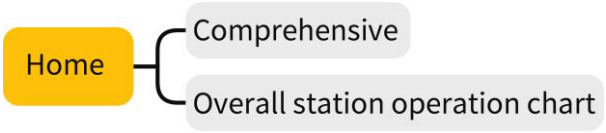


Figure 7-2

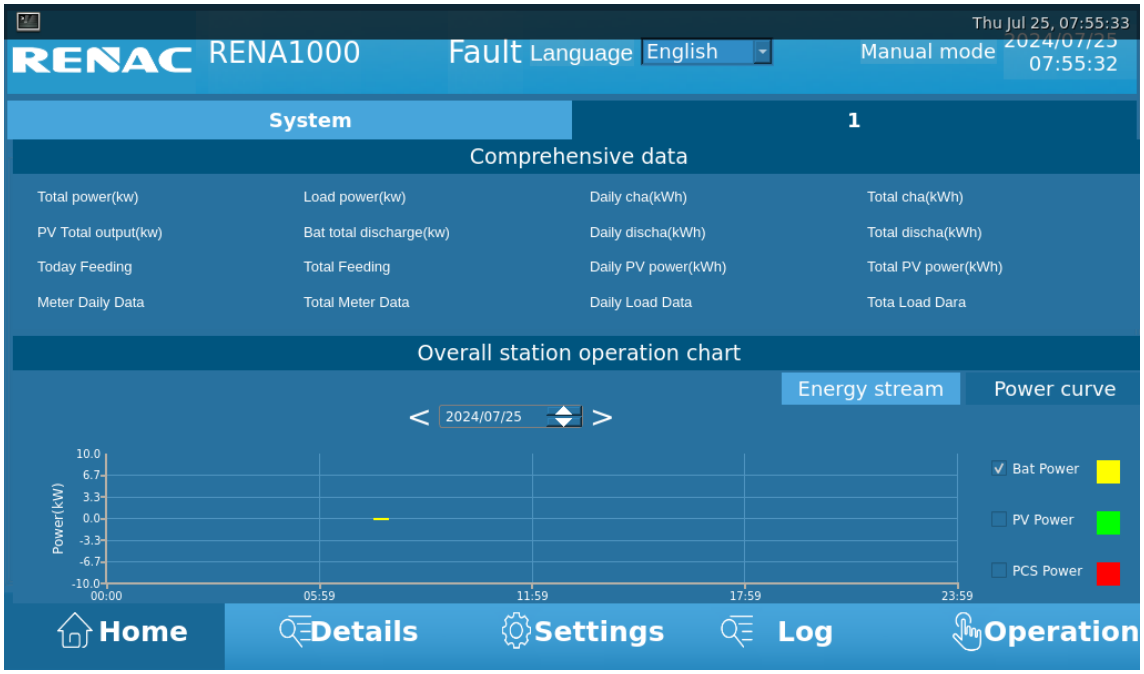


Figure 7-3 Home

- Comprehensive: This shows comprehensive data such as load power, charging or discharging power, the PV power.
- Overall station operation chart: This includes the energy flow or power curve of the station. Customers can see the whole energy conversion of the station.

(2) Details page: Displays hybrid inverter (PCS), battery, system, environmental and alarm information.

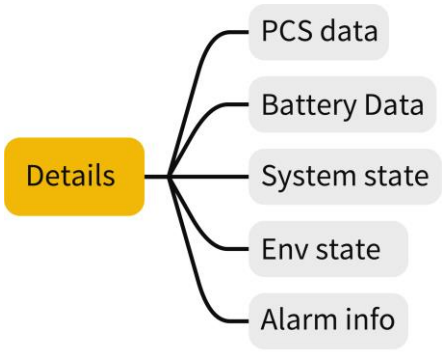


Figure 7-4

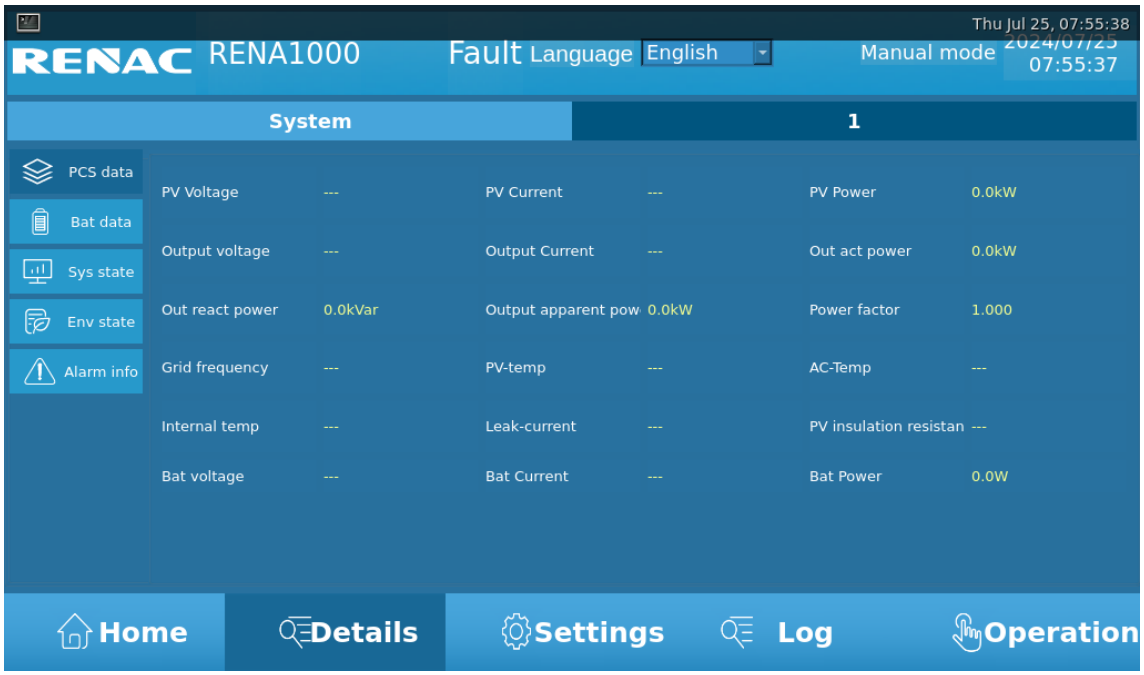


Figure 7-5 Details

PCS data: PCS related data such as voltage, current.

Battery data: Battery related data such as charging or discharging power.

System state: Display the current system status.

Environment data: Displays the current environmental data.

Alarm information: When the device is defective or something wrong, customer can see the alarm information and give the common solution.

(3) Settings page: There are four settings in this part that the user can set and operate, including work mode, battery data, system state, and environment state.

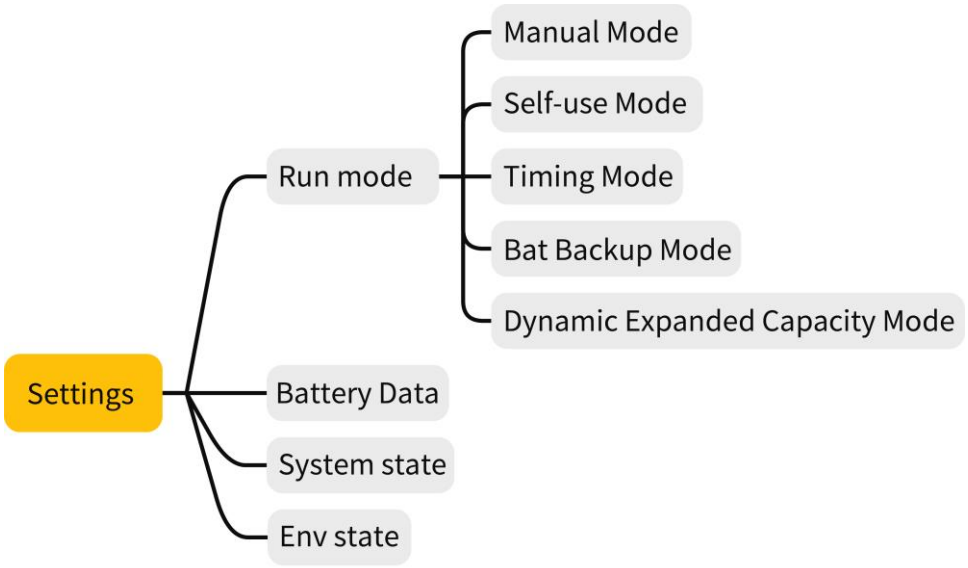


Figure 7-6

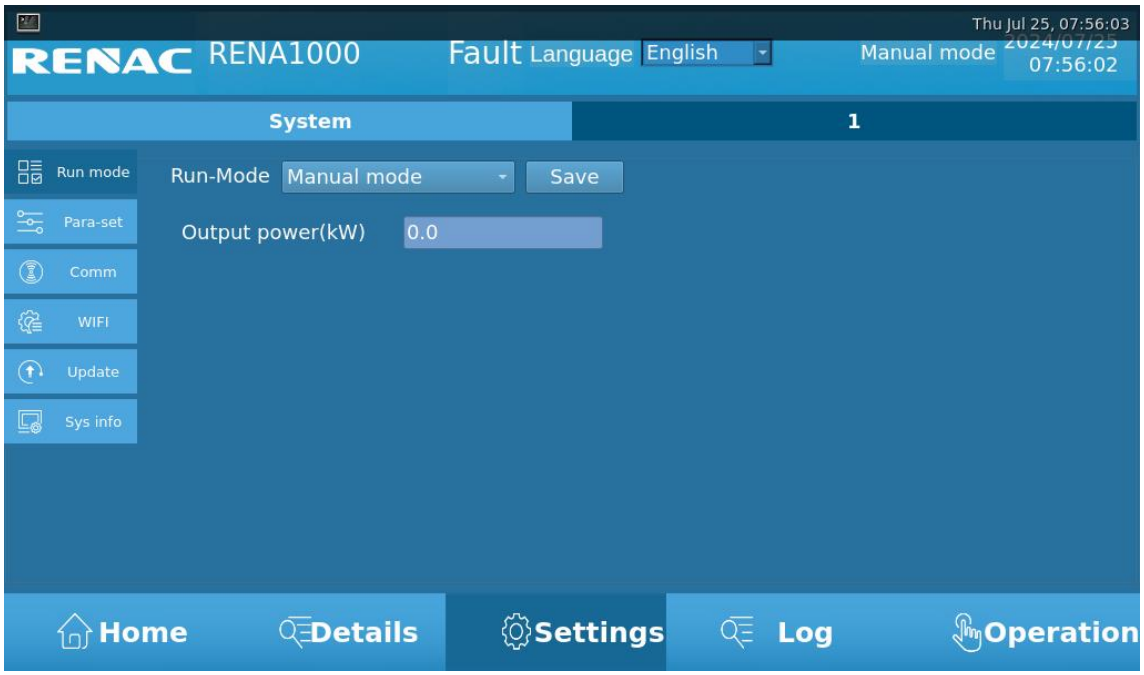


Figure 7-7 Settings

Run mode: There are 5 work modes in RENA1000-E that can satisfy various scenarios for users: Manual mode, Self-use Mode, Timing Mode, Battery Backup Mode, and Dynamic Expanded Capacity Mode.

Battery Data: It shows the battery data such as voltage, current data, charging or discharging power. Through this data, the customer will know the running state of the battery.

System state: It shows the system running information.

Environment state: It shows the environment of the system, such as temperature, the state of the smoke sensor, water sensor, and fire sensor information.

(4) Operation page: In this interface, the user can operate the hybrid inverter (PCS), battery and EMS.

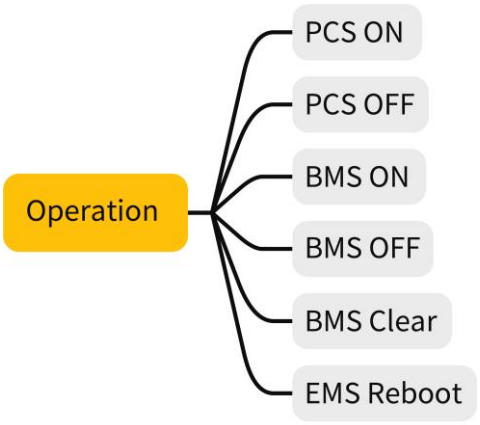


Figure 7-8

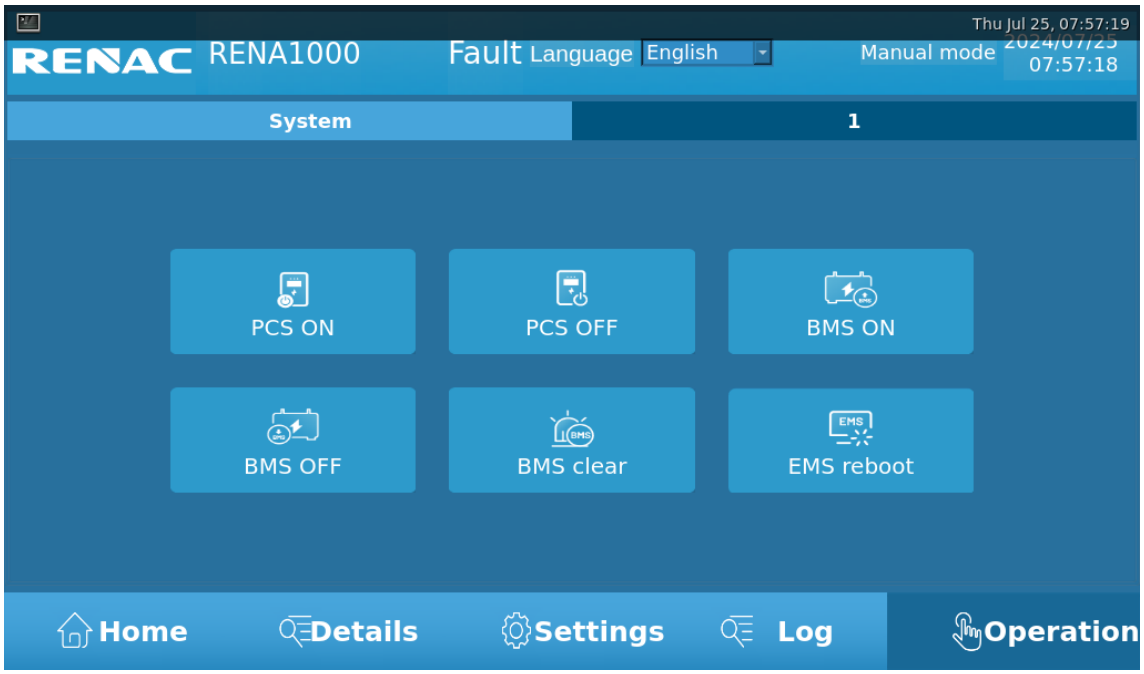


Figure 7-9 Operation

7.2 Switchgear Operation

1. System open:

Step 1: After referring to section 6.2, power on the energy storage system. Then, the screen lights up; screen startup takes about 10 seconds.

Step 2: Set the hybrid inverter (PCS) parameters. Users choose different modes of on-grid and off-grid according to the usage scenarios of the energy storage system.

Usage Scenarios	On-grid	Off-grid	On / Off-grid
PCS Usage Model	On-grid enable	Off-grid enable	Off-grid enable

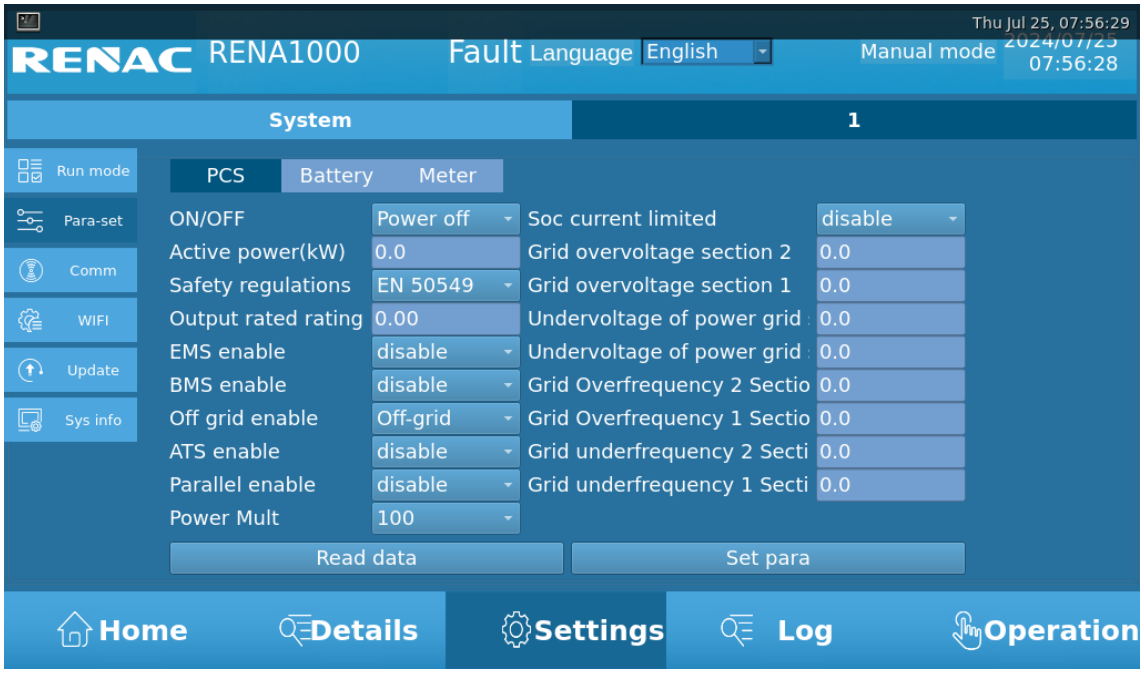


Figure 7-10 PCS setting

Step 3: Set the run mode according to the requirements.

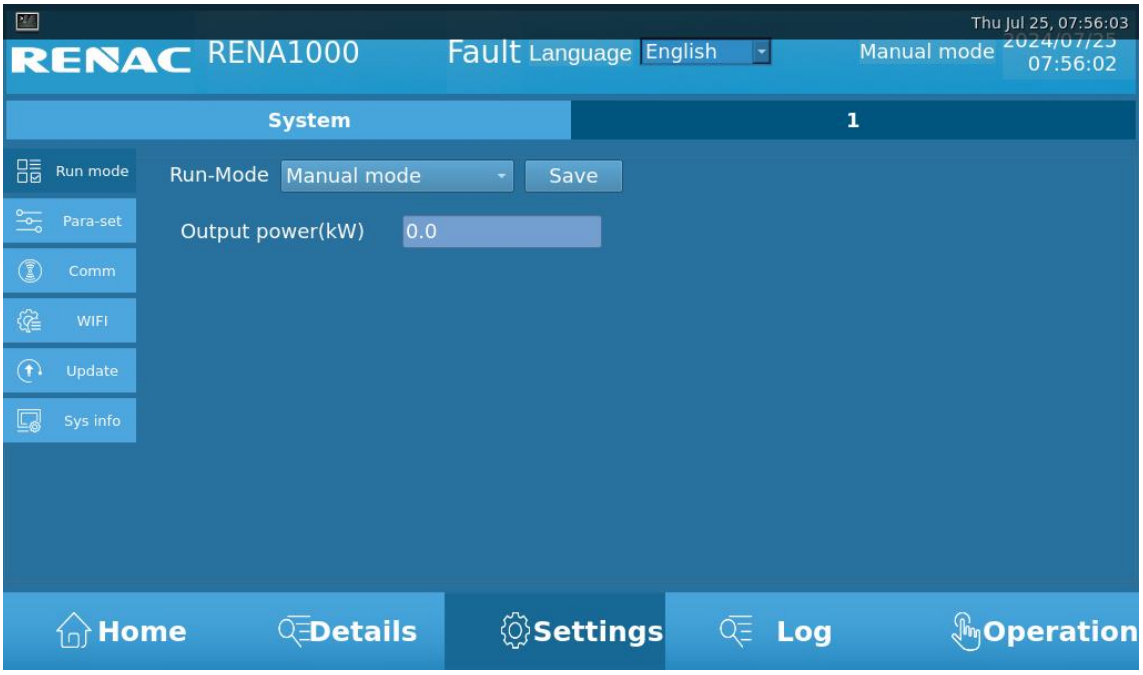


Figure 7-11 Run mode setting

2. System shutdown:

Click "Operation" to enter the operation interface, and click the corresponding shutdown operation according to the usage scenario.

Usage Scenarios	On-grid	Off-grid	On / Off-grid
Shutdown sequence	PCS OFF → BMS OFF	PCS OFF → BMS OFF	STS OFF → PCS OFF → BMS OFF

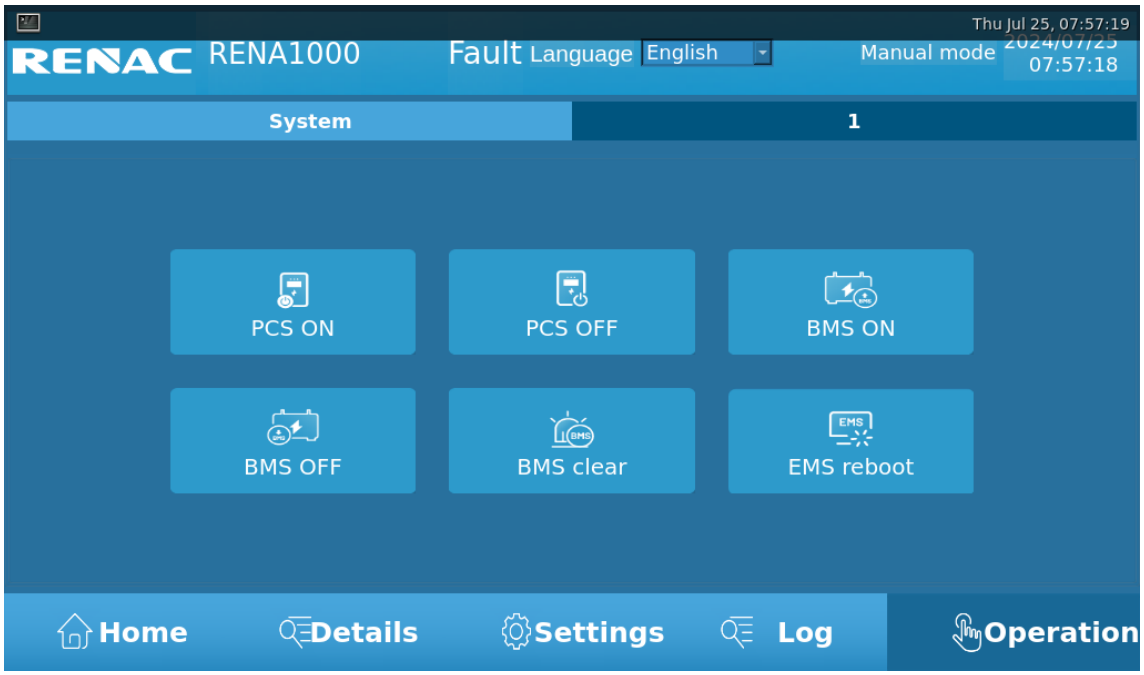


Figure 7-12 Operation setting

7.3 Communication Setting

Communication setting refers to the communication protocol between the LCD touch screen and battery BMS, LCD screen and EMS backend.

1) Check that the battery BMS communication cable is connected to the back terminal of the touch screen.
2) Check that the backstage EMS communication cable is connected to the back terminal of the touch panel or the network port position.
3) Click "Setting"->"Comm" to enter the communication setting interface.
4) First, register the network configuration and then save the configuration.
5) Click the LCD touch screen "Operation" and click "EMS reboot", the communication configuration is completed.

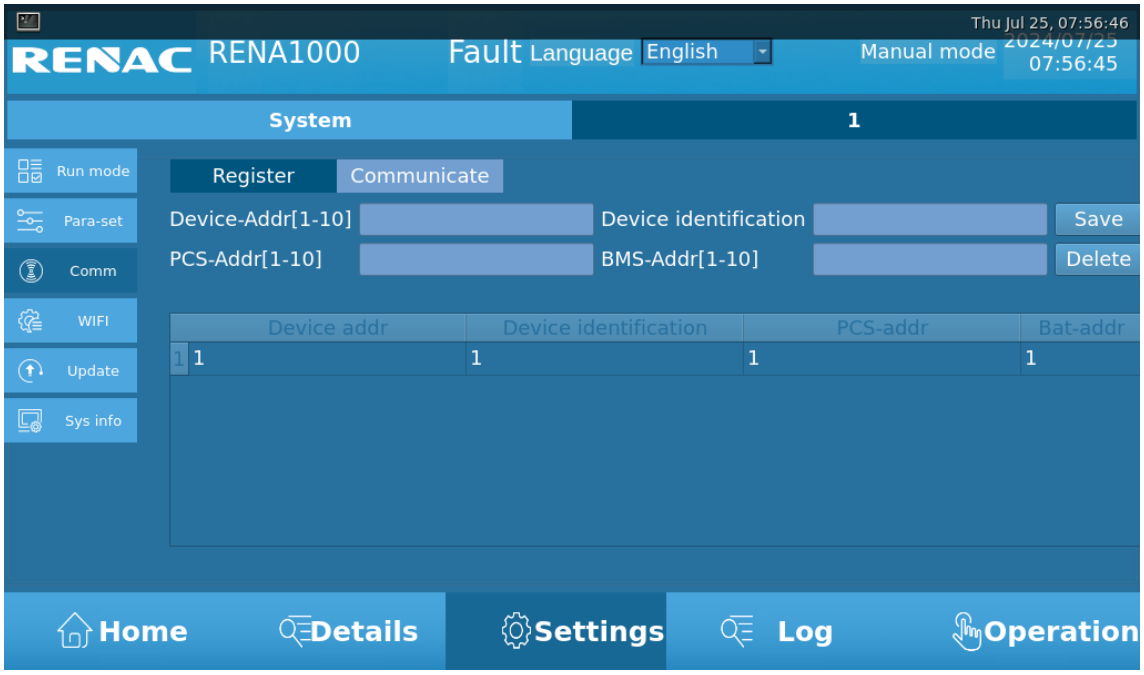


Figure 7-13 Communicate setting

7.4 Run Mode Setting

7.4.1 Introduction of the Modes

The run mode of the energy storage system can be divided into four: Manual Mode, Self use Mode, Time Mode, and Backup Mode.

7.4.2 Manual Mode

Click "Setting" -> "Run mode", and then click "Manual Mode" button to enter the settings page. Users can set the output power manually in this mode. This mode is only used for post-installation debugging.

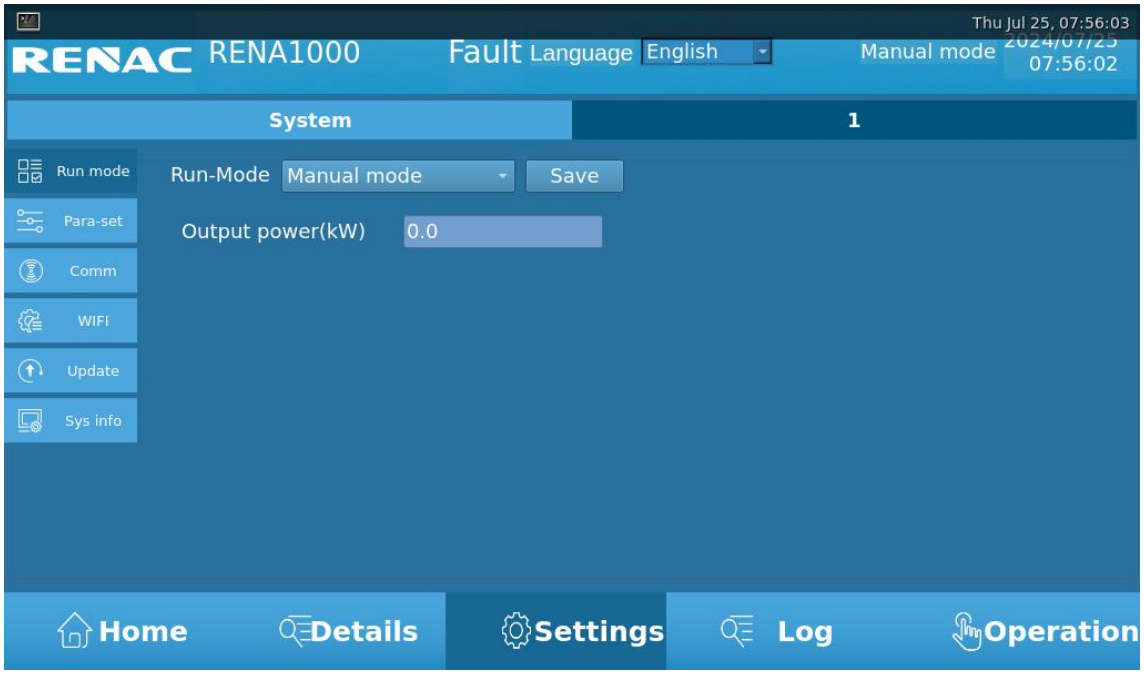


Figure 7-14 Manual Mode

7.4.3 Self Use Mode

Click "Setting" -> "Run Mode", and then click "Self Use Mode" button to enter the settings page.

This mode is applicable to the areas with low subsidies and high electricity prices.

- When the PV power is sufficient, PV power will supply the following sequence:
  Load -> Battery -> Grid
- When the PV power is insufficient, the battery will discharge to supply loads, and the grid will join in if the battery power is not enough:
  PV power -> Battery -> Grid

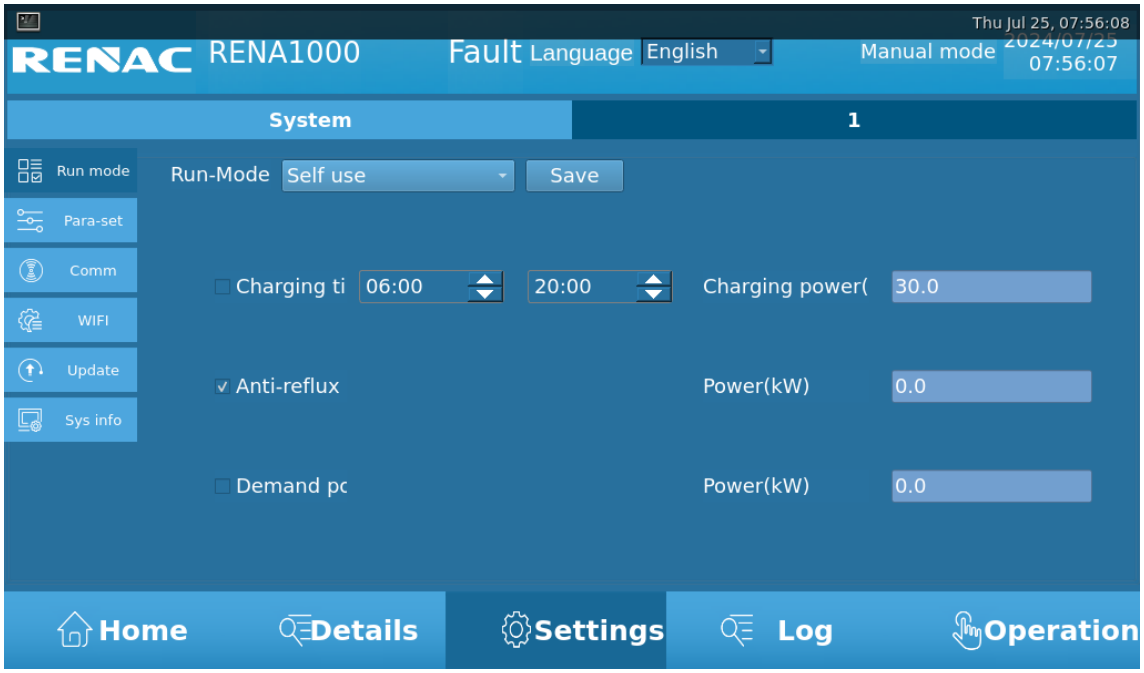


Figure 7-15 Self use

7.4.4 Time Mode

Click "Setting" -> "Run Mode", and then click "Time Mode" button to enter the settings page.

Applicable to the areas with large gaps between peak and valley electricity prices. Users can set a time-based schedule to charge or discharge the battery by App or display screen.

During the charging time period, the system will use the power from PV or grid to charge the battery.

During the discharging time period, the system will discharge the battery to supply loads.

Outside the charging and discharging time period, the system will work in Self Use Mode.

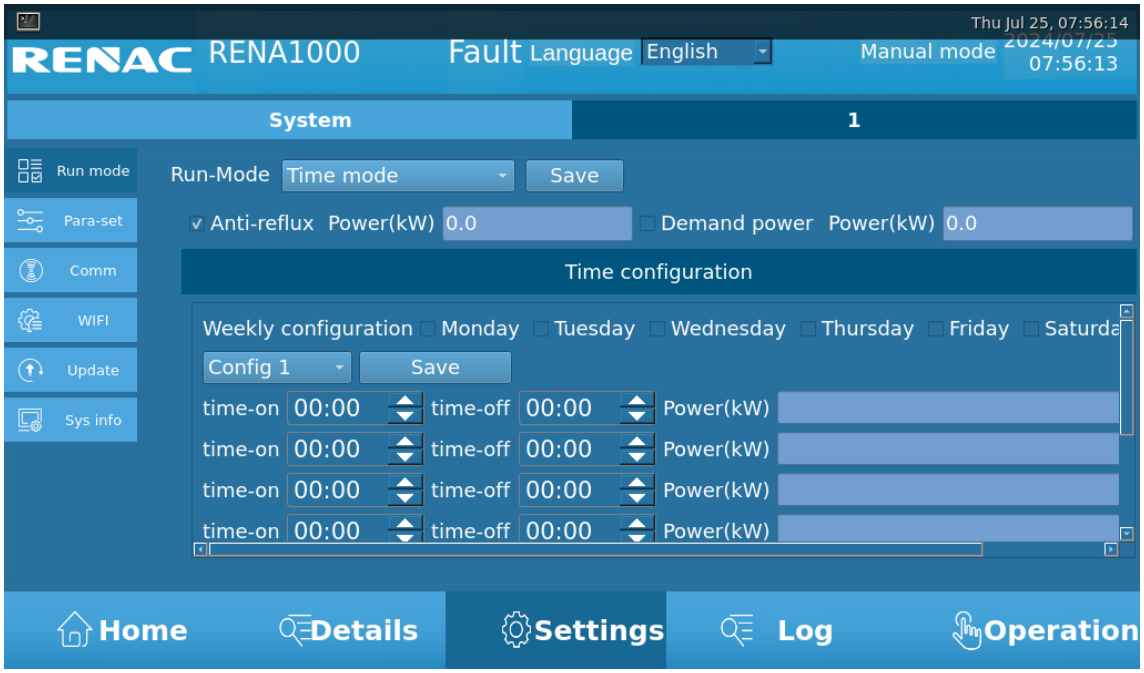


Figure 7-16 Time Mode

7.4.5 Backup Mode

Click "Setting" -> "Run Mode", and then click "Backup Mode" button to enter the settings page.

It is suitable for areas with frequent power outages. When the grid is off, the battery is used as backup power to supply load. Under this mode, when the grid is on, the battery will be in a charging state during charge time and will not be discharged. When the grid is off, the battery will be discharged to supply load. The energy storage system will connect to the grid automatically when the grid restores.

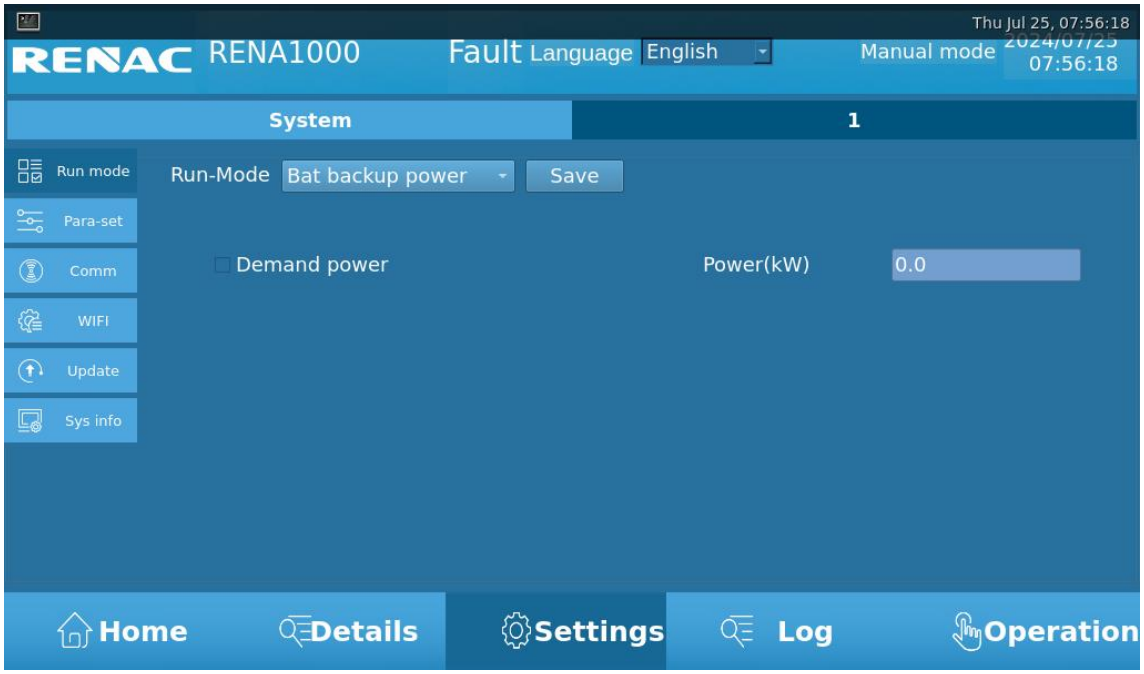


Figure 7-17 Backup Mode page

7.5 Parameter Setting

1. Click "Setting"->"Para-set" to enter the current page. This interface is usually set up in the factory, and users do not need to set it up.

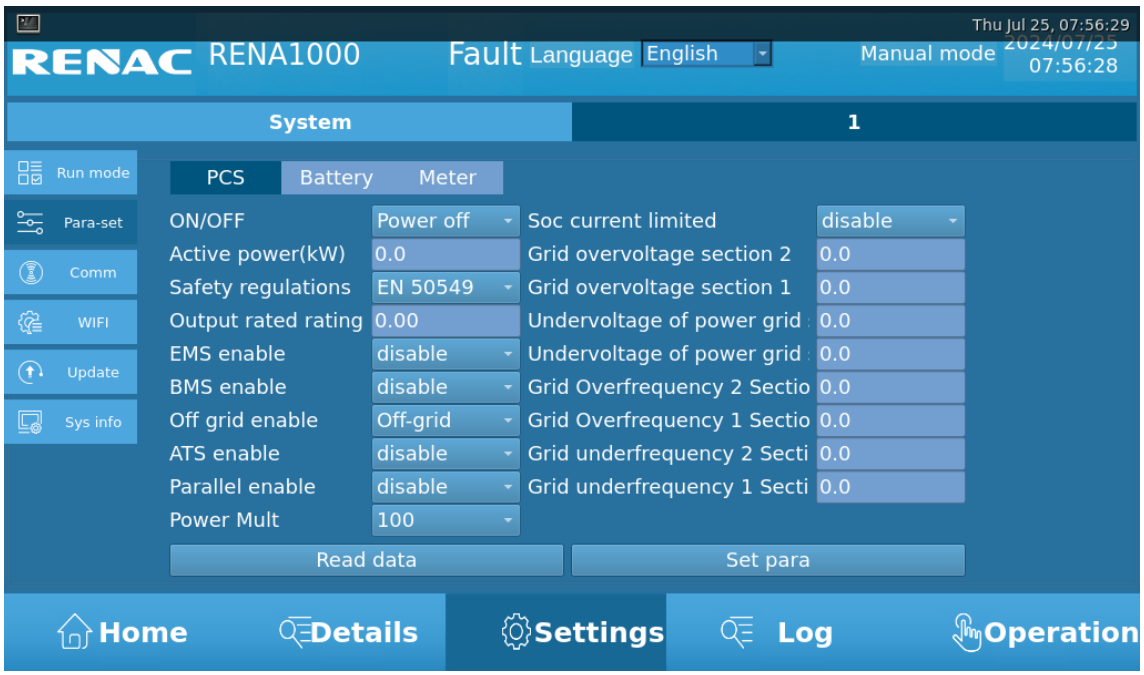


Figure 7-18 Parameter setting

- Users need to select the appropriate safety regulations according to local requirements.
- Users can set whether the hybrid inverter (PCS) is in On-Grid solution, Off-Grid solution, or On-Grid/Off-Grid mode according to the usage scenario.

7.6 Data Viewing and Exporting

1. Click "Log" to enter the current page.

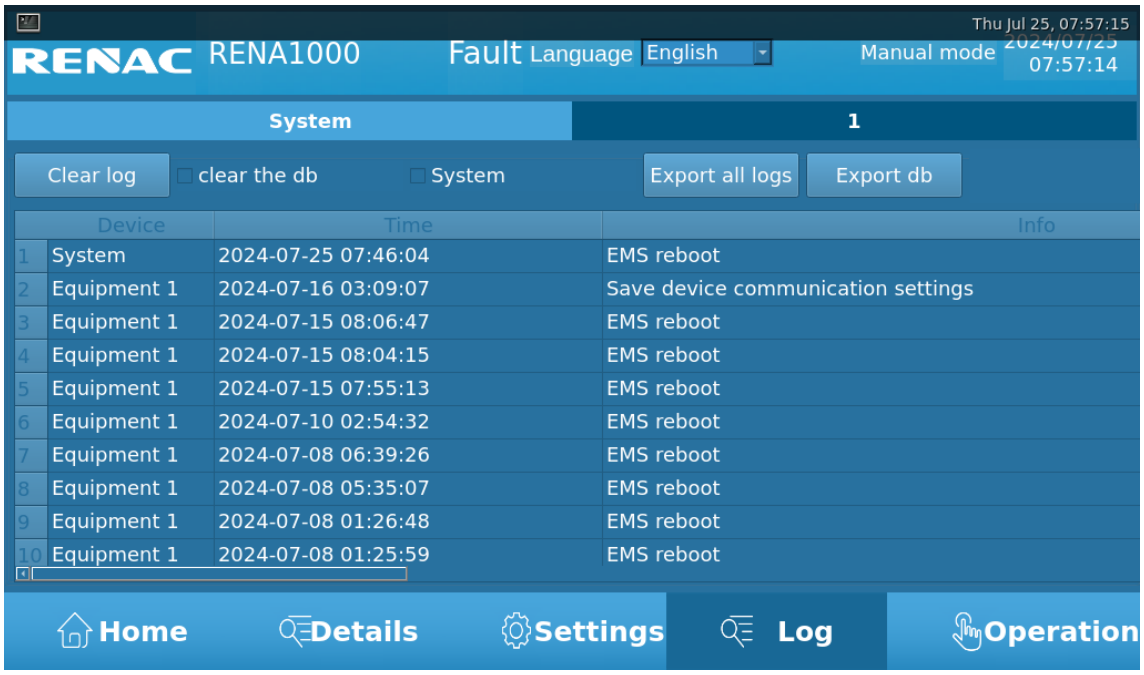


Figure 7-19 Log page

2. View the current day, month, year, and total charge/discharge.
3. Insert the USB stick, wait for the USB stick to be connected, click on "Export db", and wait for some time for the export to finish.

7.7 Software Upgrade

1. Prepare a computer and a USB stick, create a new folder in the USB stick and name it "Upgrade Folder". Users can also name it something else.
2. Copy the files to be burned into the "Upgrade Folder". Consult RENAC service personnel for upgrade documentation.
3. Plug the USB stick into the USB 2.0 socket of the storage screen.
4. Click "Setting" -> "Update" - "Select File", and select the burned file in the "Update Folder" on the USB stick.
5. Click "OK" to automatically enter the upgrade and wait for the upgrade to complete.

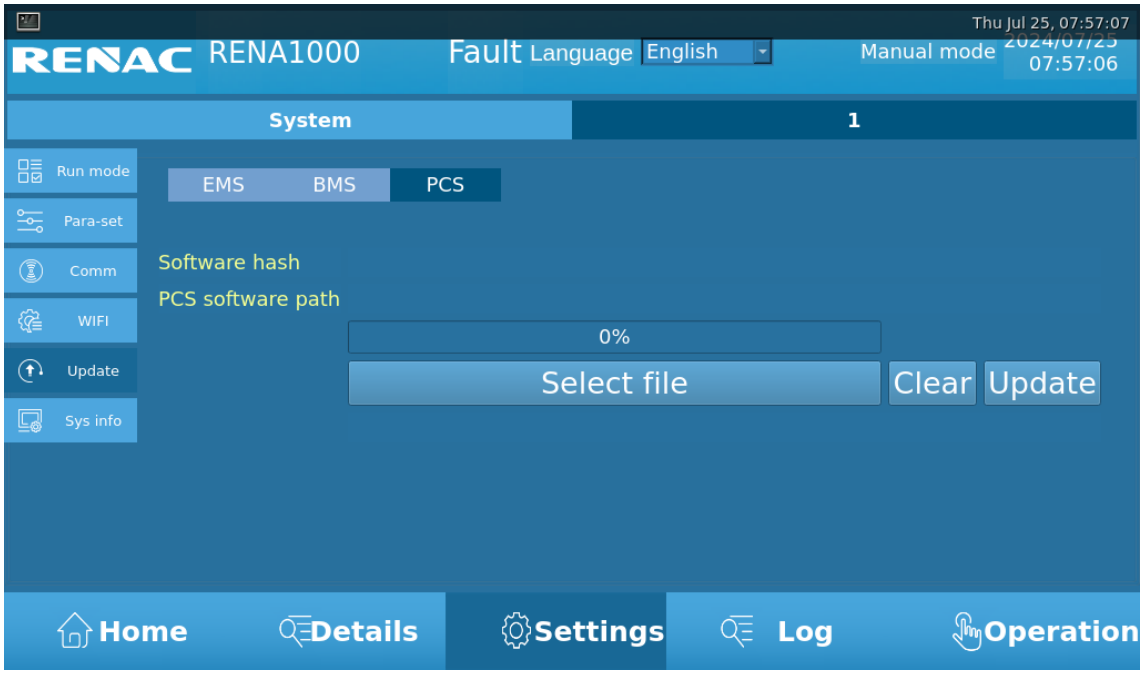


Figure 7-20 Update page

7.8 Environment Monitoring Interface Introduction

Click "Detail"->"Env state" to enter the following interface, where you can view the real-time environmental status of the system, air-conditioning parameter settings, and air-conditioning on and off.

Refrigeration mode: when the temperature is greater than or equal to the set refrigeration point, air-conditioning refrigeration on when the temperature is lower than the refrigeration point minus the difference between the air-conditioning refrigeration off, the difference between the default value of 5℃ (1 ~ 10℃ adjustable).

Heating mode: when the temperature is lower than the heating point, the air conditioning heating is on when the temperature reaches the heating point plus the return value, the heating is off, and the return value default 5°C (1~10°C adjustable).

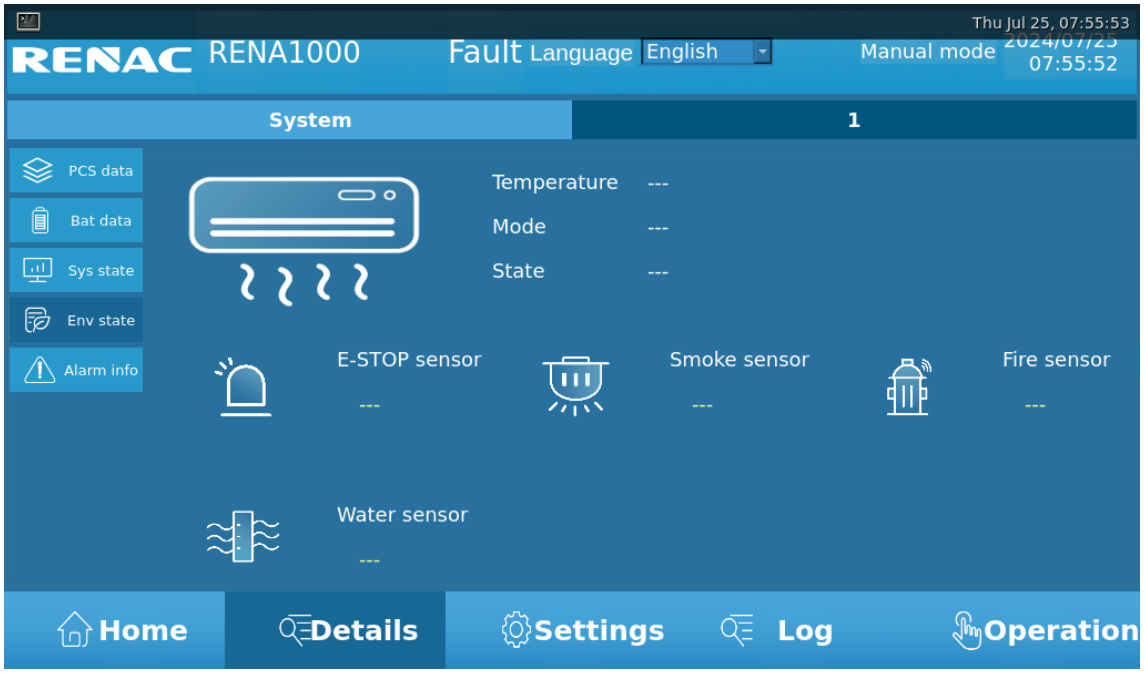


Figure 7-21 Environmental state page

8. APP Download and Operation

8.1 Download Mobile App

There are two ways to download Renac SEC:

1) Download and install <Renac SEC> mobile app by scanning the QR code below.

2) Download <Renac SEC> from Apple Store / Google Play.

Figure 8-1

8.2 Device Registration

1) Open the App, fill out the required information to create a new account, then click "Submit".

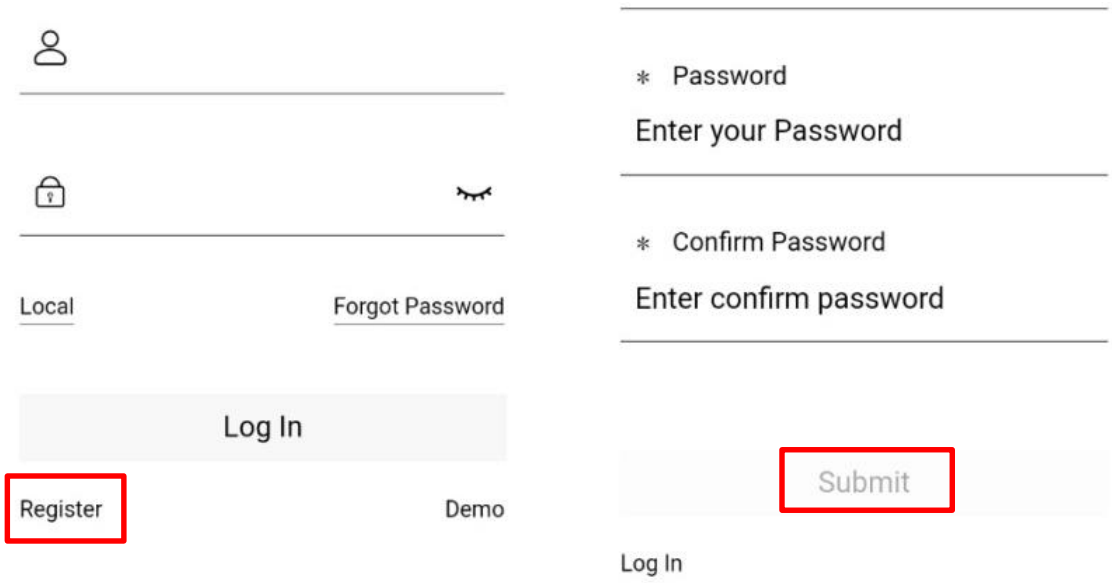


Figure 8-2

2) Add the power station page, fill in the corresponding information, and click [Add station] at the bottom to add a new power station (if you do not need to associate the installer account, you can ignore the "installer" item. Items marked with * are required.); then click “Submit”.

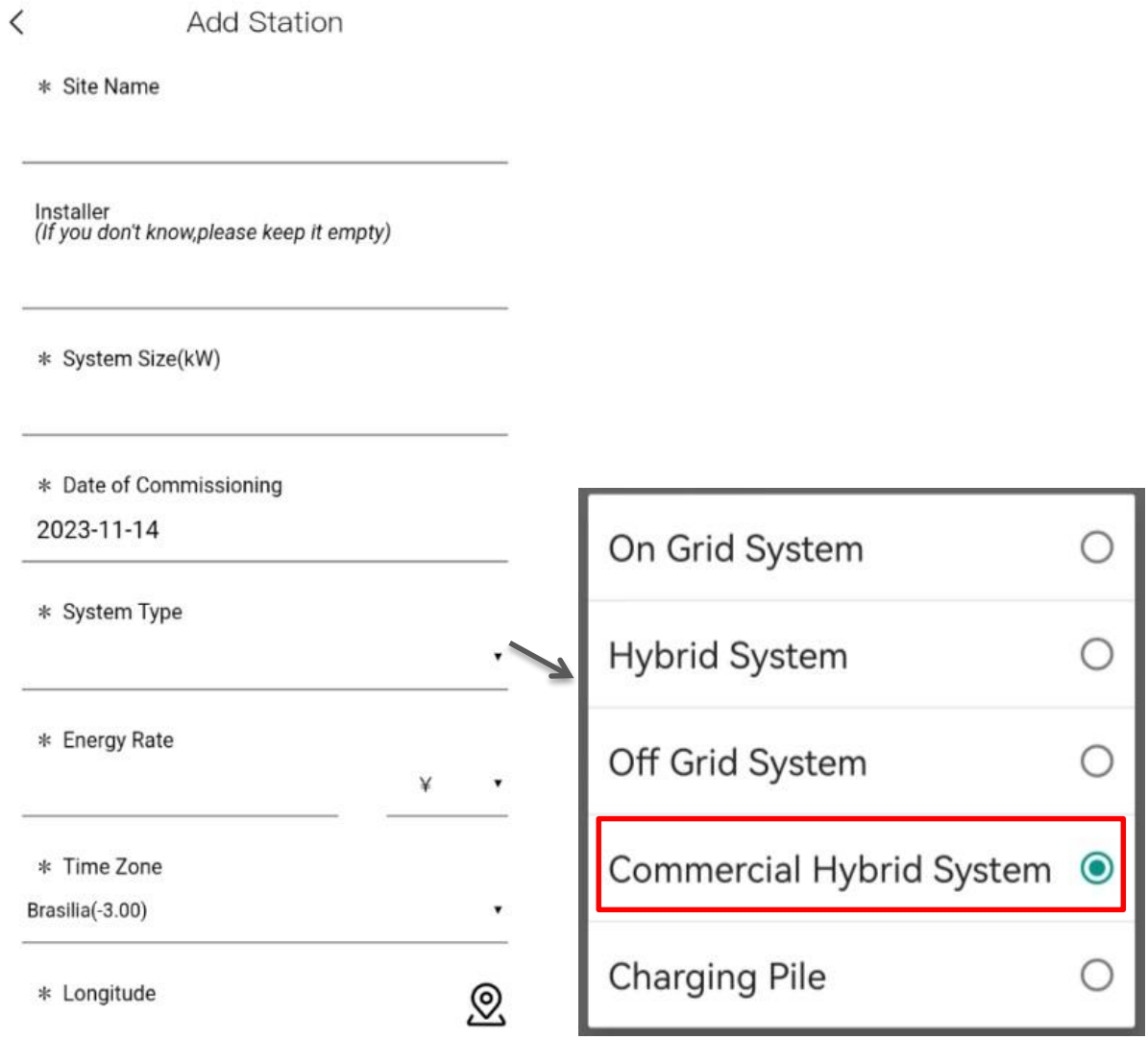


Figure 8-3

3) Click "+" and scan the QR code on the device label to add a device.

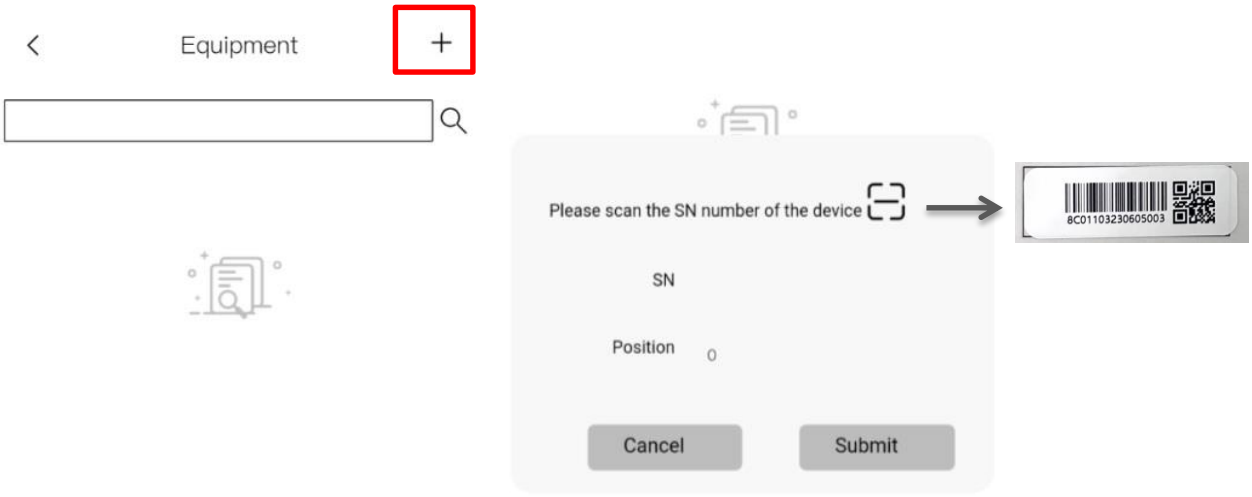


Figure 8-4

4) After adding the power station, back to the home page, and the newly added power station will be shown in the station list.

> **NOTICE**
>
> The EMS needs to be restarted after the station has been successfully added.

8.3 Parameter View and Run Mode Configuration

8.3.1 Parameter View

Click on the power station to enter the home page of the RENA1000-E device, and you can view the current operation of the device.

Figure 8-5

Click on the third item "Statistics" to view the detailed parameters of the current device.

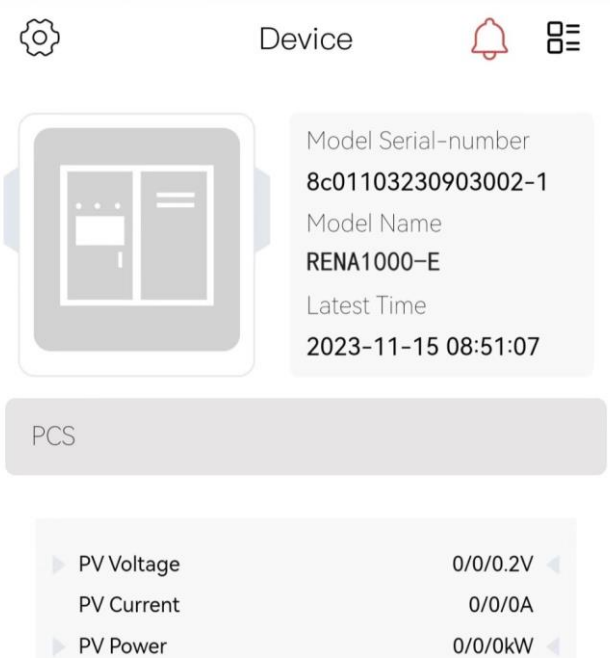


Figure 8-6

8.3.2 Run Mode Configuration

Click on the second item "Setting" to enter the setting interface. Users can configure the working mode of RENA1000-E. The settings on the App are the same as those on the EMS.

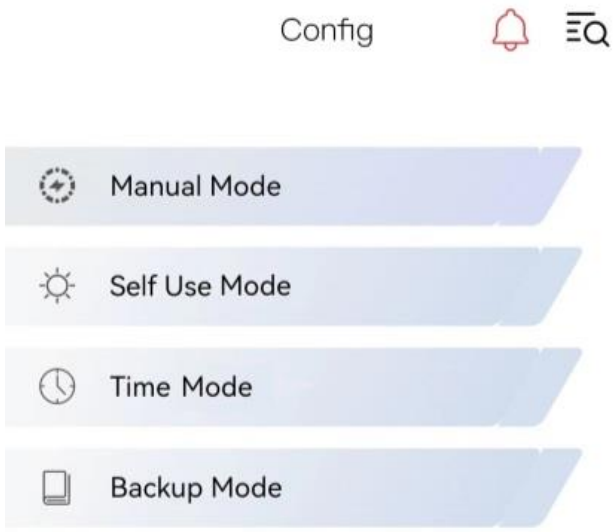


Figure 8-7 Setting page

Click "Manual Mode" to enter the settings interface.

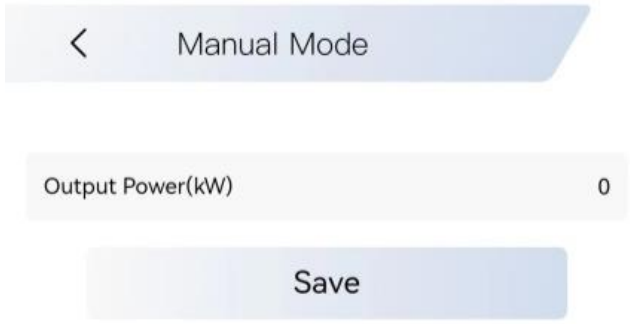


Figure 8-8 Manual mode

Click "Self use Mode" to enter the setting interface.

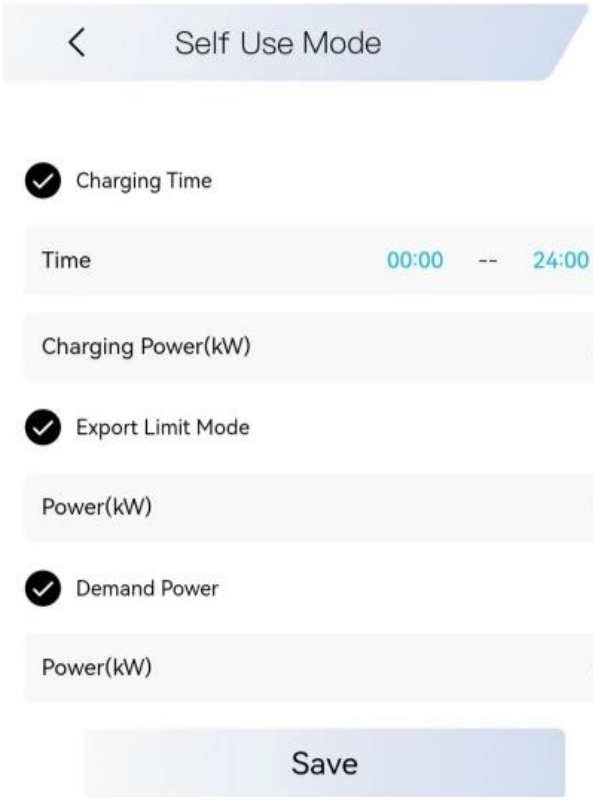


Figure 8-9 Self use mode

Click "Time Mode" to enter the setting interface.

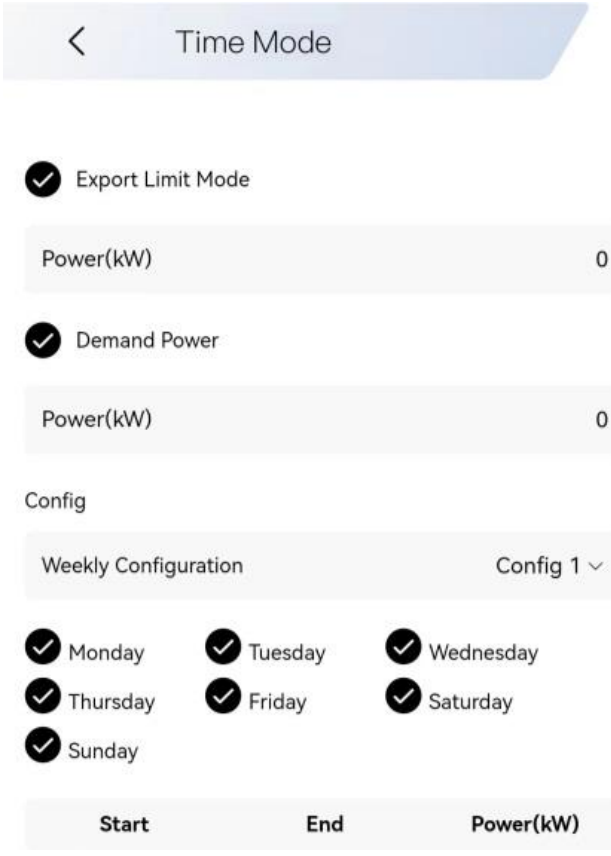


Figure 8-10 Time mode

Click "Backup Mode" to enter the setting interface.

Figure 8-11 Backup mode

9. Troubleshooting

Alarm levels are defined as follows:

Failure: The equipment fails, and the system stops running (charging /discharging);

Alarm: the output power of the device decreases, or part of its function fails due to external factors, but it does not affect the charging/discharging function of the system.

Fault	Components	Cause	Solution
Flooding fault	Battery	Flooding of energy storage cabinets	1. Check for water build-up inside the cabinet; 2.
Door Magnets alarm	Battery	Energy storage cabinet door open	1. Check that the cabinet door is fully closed; 2. Check that the cable on the door magnet sensor is not disconnected; 3. Check that the door magnetic sensor position is not offset.
Malfunction of fire protection	Battery	Battery overheating or fire	1. Immediately press the EPO button and move away from the energy storage cabinet; 2. Observe continuously for 30 minutes from a safe distance. Call the fire alarm if there is smoke or fire; if neither is abnormal, manually clear this activity alarm and contact the manufacturer.
Compressor alarm	Air conditioner	1. Loose wiring 2. Compressor damage	1. Disconnect the power distribution switch and open the air conditioner junction box to check for loose wiring; 2. Observe the appearance of the compressor for visible damage and a burning smell. If so, contact the manufacturer.
Outdoor fans alarm	Air conditioner	1. Loose wiring 2. Fan damage	1. Disconnect the power distribution switch and open the air conditioner junction box to check for loose wiring; 2. Observe the fan for visible damage and a burning smell. If so, contact the manufacturer.

Fault	Components	Cause	Solution
Grid over-voltage / Under-voltage fault	Grid / Tanker	Abnormal grid-connected side voltage	Check for abnormalities in the voltage on the grid-connected side.
Grid over-frequency / Under-frequency fault	Grid / Tanker	Frequency anomaly on the grid-connected side	Check for abnormalities in the frequency on the grid-connected side
Islanding protection fault	Grid / Tanker	Abnormal grid-connected side voltage	Check for abnormalities in the voltage on the grid-connected side.
High / low voltage ride through alarm	Grid / Tanker	Abnormal grid-connected side voltage	Check for abnormalities in the voltage on the grid-connected side.
Grid voltage imbalance fault	Grid / Tanker	Abnormal grid-connected side voltage	Check for abnormalities in the voltage on the grid-connected side.
Grid wrong phase fault	Grid / Diesel	Wrong phase sequence on the grid side	Adjusting the ABC cables.
DC voltage high/low fault	Battery	Abnormal battery voltage	Check for abnormal DC input voltage.
Busbar overvoltage fault	hybrid inverter	1. Load imbalance 2. Software anomalies	1. Check for loose or abnormal DC wiring; 2. Contact the manufacturer.
Busbar half-voltage unbalance fault	hybrid inverter	1. Load imbalance 2. Software anomalies	1. Check for load anomalies; 2. Contact the manufacturer.
Over-temperature derating Alarm	hybrid inverter	High internal temperature	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check whether the internal fan is functioning properly. 3. Contact the manufacturer.
Power tube over temperature fault	hybrid inverter	High internal temperature	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check whether the internal fan is functioning properly. 3. Contact the manufacturer.
Balance bridge over temperature fault	hybrid inverter	High internal temperature	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check whether the internal fan is functioning properly. 3. Contact the manufacturer.
DC overcurrent fault	hybrid inverter	High internal temperature	1. Check for short circuits or broken wiring on the DC side; 2. Replace the hybrid inverter or contact the manufacturer.
Balanced bridge overcurrent fault	hybrid inverter	High internal temperature	1. Check for off-grid load overload; 2. Replace the hybrid inverter or contact the manufacturer.
Output overload/ overcurrent fault	hybrid inverter	AC side power / current excess	1. Check that the grid voltage is normal; 2. Check for short circuits or broken wiring on the

Fault	Components	Cause	Solution
			DC side; 3. Check that off-grid loads are not exceeded; 4. Replace the hybrid inverter or contact the manufacturer.
Wave-by-wave current limiting fault	hybrid inverter	AC side current excess	1. Check that the grid voltage is normal; 2. Check that off-grid loads are not exceeded; 3. Replace the hybrid inverter or contact the manufacturer.
Communication Interruption malfunction	hybrid inverter local controller	Communications blackout	1. Check whether the communication network cable between modules is loose and abnormal; 2. Check whether the local controller communication network cable is loose and abnormal.
Parallel / synchronization fault	hybrid inverter	Parallel / synchronized signal interrupt	1. Check the parallel cable for looseness or abnormality; 2. Check that the parallel setting is not abnormal; 3. Hardware circuitry is damaged.
Relay open/short circuit fault	hybrid inverter	1. Internal relay abnormality 2. Software abnormality	1. Replace the hybrid inverter; 2. Contact the factory to replace the internal boards.
Fan 1/2/3 alarm	hybrid inverter	Internal fan abnormal	1. Replace the hybrid inverter; 2. Contact the manufacturer to replace the internal fan.
Leakage current fault	hybrid inverter	1. Leakage current excess 2. Software abnormality	1. Check the current hall for loose or abnormal wiring; 2. Check that the earth wire is not disconnected.
Abnormal insulation impedance fault	hybrid inverter / Battery	1. Low insulation to ground 2. Software abnormality	1. Check the AC and DC cables for breakage or short circuit in the ground; 2. check battery wiring for damage or short to ground.
Module loss alarm	hybrid inverter	Module-to-screen communication interruption	Check whether the communication network cable between modules is loose and abnormal.
Low DC voltage warning	hybrid inverter	Battery is not switched on	Check that the battery is switched on.

The above alarms and malfunctions are common alarms or malfunctions. If any malfunctions other than those in Table 8-1 occur, please contact the manufacturer directly.

10. Routine Maintenance and Warranty

WARNING

There is a deadly high voltage inside the cabinet equipment of the integrated hybrid inverter, and there is a risk of fatal electric shock if accidentally touched.

The energy storage system must be switched off before maintenance, wait 10 minutes, and then open the cabinet door. It is important to ensure that the unit is fully energized internally before carrying out maintenance.

Only qualified and authorized personnel can perform maintenance and other operations.

10.1 Routine Maintenance

There are a number of potential problems that can occur during system operation due to ambient temperature, humidity, dust, vibration, and aging of the inverter's internal components. In order to enable the energy storage system to operate in a long-term and stable manner, it is necessary to arrange for regular inspections by maintenance personnel, according to Table 9-1, so as to identify and deal with problems in a timely manner. Quarterly maintenance is recommended for systems installed in sandy, dusty, salt-fogged, or heavy industrial parks, and semi-annual maintenance is recommended for energy storage systems in areas with favorable climatic conditions.

Maintenance objects	Maintenance work	Reference standard
Cabinet	1. Check the appearance of the entire unit; 2. Check the vents; 3. Check the locking condition of the door.	1. No visible coating flaking, scratches, or rust; 2. No visible signs of water leakage; 3. No dust build-up in ventilation openings; 4. No damage to door locks.
Air conditioner	1. Check for noise and vibration; 2. Clean filters.	1. The fan and compressor rotate normally without jamming or rattling; 2. The surface of the filter is clean and not clogged.
hybrid inverter	1. Check for noise and vibration; 2. Check for front panel vents; 3. Check for rear end copper row contact surfaces.	1. The front panel fan normally rotates, with no jams or rattles; 2. The surface of the front panel vents is clean and free of blockages; 3. There is no corrosion or discoloration of the copper rows and contact surfaces and no accumulation of dust.
Electrical connection	1. Check the surge arresters; 2. Check the contact surface of the copper rows of the cables.	1. Lightning protectors are normal; 2. Screw socket connecting wires are not loose and off; 3. Copper rows and contact surfaces are not corroded and discolored, and there is no accumulation of dust.
Battery packs	1. Check for noise and vibration; 2. Check cable copper contact surfaces.	1. The battery pack fan rotates without stuttering or rattling; 2. The surface of the front panel vents is clean and free of blockages;

Maintenance objects	Maintenance work	Reference standard
		3. Screw socket connecting wires are not loose and off; 4. Copper rows and contact surfaces are not corroded and discolored, and there is no accumulation of dust.

10.2 Warranty

As long as the product is in the warranty period, where the quality of the product itself leads to failure, Renac Power Technology Co., Ltd. allows customers to carry out free repair or replacement products. Users shall reserve a reasonable response time for the Company's repairs, and the Company shall handle the replacement. Users must present proof of purchase of the product and ensure that the product logo is visible. Otherwise, the Division reserves the right not to warranty.

10.3 Firefighting Instructions

In the event of a fire in the energy storage system, the following measures are recommended for on-site personnel:

- In the event of a fire, evacuate the building or equipment area and press the fire alarm, call the fire alarm immediately, notify professional firefighters, and provide them with relevant product information (battery pack type, system capacity, etc.).
- In any case, re-entry into the area of the burning building or equipment, opening of the energy storage system door, and the approach of uninvolved persons are prohibited.
- After calling the fire alarm, on-site personnel remotely power down the system under conditions that will ensure their safety.
- Wait for professional firefighters to confirm that the fire is extinguished, and then let them handle the situation. It is forbidden to open the door of the energy storage system privately.

10.4 Disclaimer

In the following cases, we have the right not to carry out the warranty but can still provide paid repair services.
The product is out of warranty.
Users cannot provide proof of purchase of the product.
Damage caused during transport, loading, and unloading.
Damage caused by incorrect installation, modification, or dismantling by unauthorized personnel.
Damage caused by operation under abnormal conditions of use or environment.
Failure or damage to the machine caused by the use of non-Renac parts or software.
Failure or damage caused by fire, earthquake, flood, and other irresistible factors.

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