
RENA1000 Series



User Manual

RENA1000-E

RENAC

Content

1. About this Manual	3
1.1 Applicability	3
1.2 Target Group	3
1.3 Symbols Used	3
1.4 Designation in the Document	4
2. Safety	4
2.1 General Safety	4
2.2 Important Safety Instructions	5
2.3 Explanation of Symbols	7
2.4 Electrical Safety	8
2.4.1 Wiring Requirements	8
2.4.2 Grounding Requirements	8
2.4.3 Live Line Measurement	8
2.4.4 Maintenance Requirements	8
2.4.5 Mechanical Safety	9
2.4.6 Battery Safety	9
2.4.7 Maintenance and Replacement	10
2.4.8 Arc Protection	11
3. Product Introduction	11
3.1 Model Description	11
3.2 Product Overview	11
3.3 System Chart	12
3.4 Product Characteristic	12
3.4.1 Mechanical Parameters	12
3.4.2 Product Characteristic	12
3.5 Technical Data	13
3.6 Parts Introduction	14
3.6.1 Battery pack	14
3.6.2 Battery Management System	15
3.6.3 PCS	16
3.6.4 Environmental Control System	17
3.6.5 Isolation Transformer (Optional)	20
3.7 Package and Storage	21
3.7.1 Package	21
3.7.2 Storage Environment	22
4. System Installation	23
4.1 Installation Environment	23
4.2 Product Transport	24
4.3 Product Handling	24
4.4 Pre-installation Preparation	24
4.5 Mechanical Installation	25
4.6 Electrical Connection	30

4.6.1 Electrical Safety.....	30
4.6.2 Connecting Battery Communication Cable	31
4.6.3 Connecting Battery Power Cable.....	31
4.6.4 Connecting PCS Communication Cable	32
4.6.5 Connecting PCS Power Cable.....	33
4.6.6 Connecting PCS AC Cable	33
4.6.7 Connecting Mains.....	34
4.6.7 Meter Connection	35
4.7 Isolation Transformer Installation(Optional)	37
5. Start-up and Commissioning	38
5.1 Pre-opening Check	38
5.2 Boot Operation	39
5.3 Trial Operation.....	39
5.4 Switch Off	40
5.5 Emergency Shut Down	40
6. Operation and Handling	40
6.1 Introduction to Human-Machine Interface	40
6.2 Switchgear Operation	42
6.3 Communication Setting	42
6.4 Run Mode Setting	43
6.4.1 Introduction of the Modes	43
6.4.2 Manual Mode	43
6.4.3 Self Use Mode	44
6.4.4 Time Mode	45
6.4.5 Backup Mode	45
6.5 Parameter Setting	46
6.6 Data Viewing and Exporting	47
6.7 Software Upgrade	47
6.8 Environment Monitoring Interface Introduction	48
7. APP Download and Operation	49
7.1 Download Mobile App	49
7.2 Device Registration	49
7.3 Parameter View and Run Mode Configuration	50
7.3.1 Parameter View	50
7.3.2 Run Mode Configuration	51
8. Parallel System on Grid	53
9. Troubleshooting	55
10. Routine Maintenance and Warranty	57
10.1 Routine Maintenance	58
10.2 Warranty	59
10.2.1 Warranty period	59
10.2.2 Warranty Coverage	59
10.3 Firefighting Instructions.....	59
10.4 Disclaimer	59

1. About this Manual

1.1 Applicability

Please read the product manual carefully before installation, operation or maintenance. This manual mainly introduces the product information, installation and wiring, configuration and debugging, troubleshooting and maintenance of the outdoor C&I energy storage system (hereinafter referred to as the energy storage system). This manual is applicable to the following energy storage system models :

RENA1000-E




1.2 Target Group

This manual is suitable for those who transport, install, and operate the integrated PCS. Qualified persons 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 PCS; be familiar with the design and working principle of the integrated PCS 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:

	<p>DANGER!</p> <p>'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.</p>
	<p>WARNING!</p> <p>'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.</p>
	<p>CAUTION!</p> <p>'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.</p>
NOTICE	<p>NOTICE!</p> <p>'Notice' indicates a situation that, if not avoided, could result in equipment or property damage.</p>



NOTE!

'Note' provides tips that are valuable for the optimal operation of the product.

Table 1-1 Symbols used

1.4 Designation in the Document

Designation in this document	Designation in this document complete description
STS	Static Transfer Switch
EMS	Energy Management System
BMS	Battery Management System
BMU	Battery Management Unit
BCU	Battery Control Unit
PCS	Power Conversion System
SOC	State of Charge
PDU	Power Distribution Unit

Table 1-2 Designation in this document

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 PCS 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.

	<p>WARNING!</p> <ul style="list-style-type: none"> ◆ Battery pack Leakage <p>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:</p> <ul style="list-style-type: none"> · 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. <ul style="list-style-type: none"> ◆ The battery packs and their components should be protected from damage when transporting and handling. <ul style="list-style-type: none"> · 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.
	<p>CAUTION!</p> <ul style="list-style-type: none"> ◆ 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. <ul style="list-style-type: none"> · 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. <ul style="list-style-type: none"> ◆ 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.
<p>NOTICE</p>	<p>CAUTION!</p> <ul style="list-style-type: none"> ◆ Firefighting Measures <ul style="list-style-type: none"> · 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. <ul style="list-style-type: none"> ◆ Damage to the energy storage system due to under voltages <ul style="list-style-type: none"> · 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.



NOTE!

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

Table 2-2 Important safety instructions

2.3 Explanation of Symbols

Symbols on Label:

Symbol	Explanation
	TUV 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.

Table 2-3 Explanation of symbols

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 PCS, 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 PCS, 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.



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

	<p>WARNING!</p> <p>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.</p>
--	--

- 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

	<p>WARNING!</p> <p>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.</p>
---	--

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.

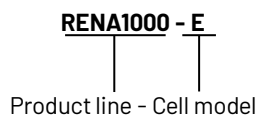
- Plug and unplug the DC side high-voltage cables of each device under power.
- Touch potentially live cable ends that are not insulated.
- Touch copper bars, terminals, or other parts inside the machine that may be live.
- Power cable connections are loose.
- Parts such as screws accidentally dropped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

3.1 Model Description



3.2 Product Overview

RENA1000 series outdoor energy storage cabinet integrates an energy storage battery, PCS, energy management monitoring system, power distribution system, environmental control system, and fire control system. PCS 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.

3.3 System Chart

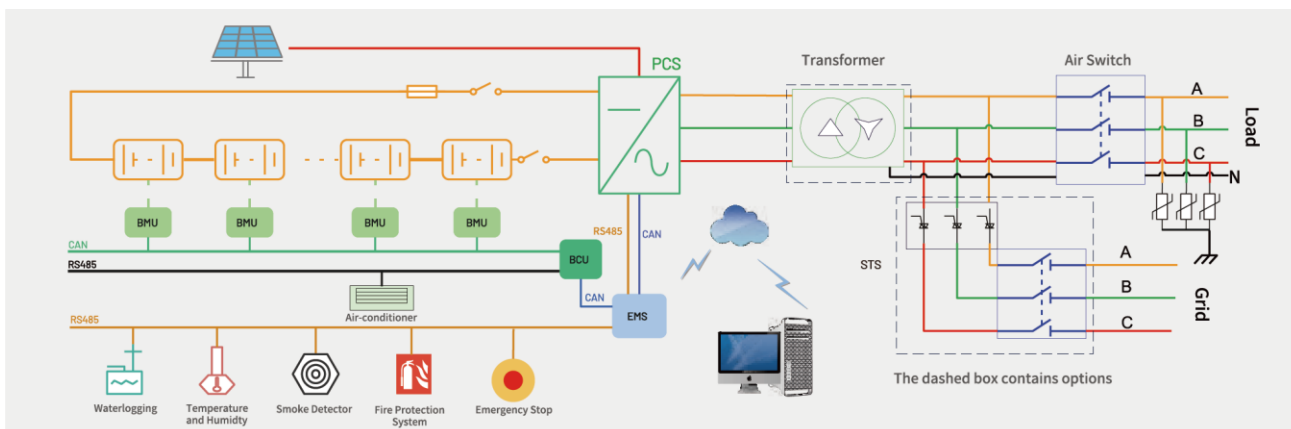


Figure 3-1 Energy storage cabinet system block diagram

3.4 Product Characteristic

3.4.1 Mechanical Parameters

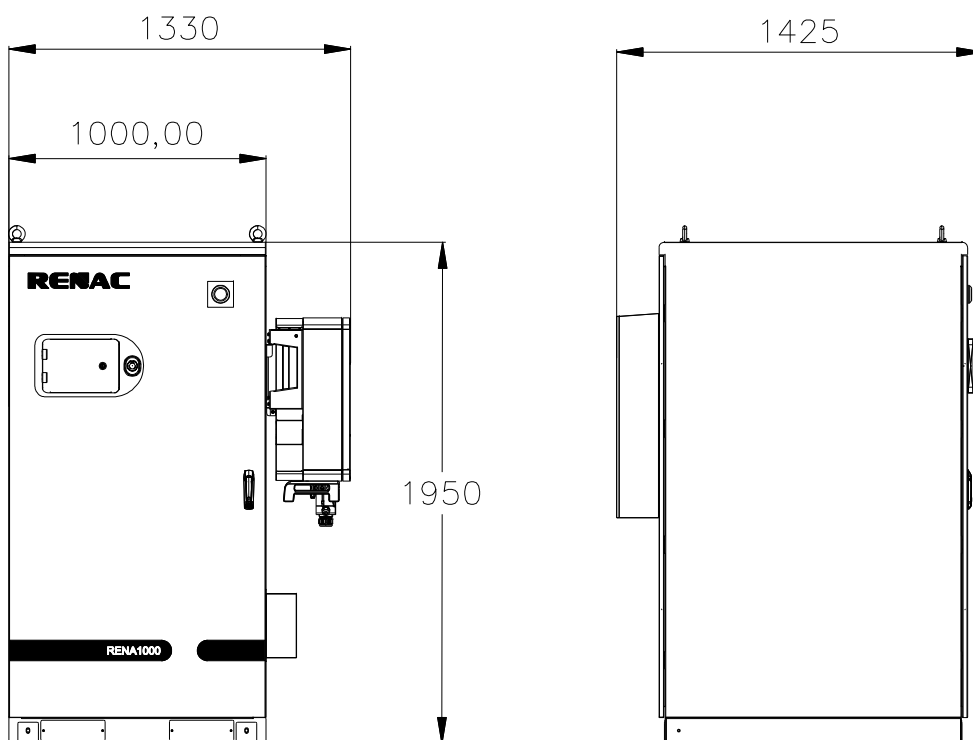


Figure 3-2 Battery cabinet diagram

3.4.2 Product Characteristic

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

Configure rack-type modular PCS, support multi-machine parallel, good scalability; according to the system capacity requirements of microgrid and other scenarios, the number of PCS modules and the total battery power can be selected, and the typical configuration is 83kWh/94kWh/104kWh.

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.

3.5 Technical Data

Model	RENA1000-E
PV Input Data	
Max. Input Voltage	1000V
MPPT Voltage Range	350V ~ 800V
Max. Current per MPPT	36A
Number of MPPT	3
Number of Inputs Per MPPT	2
Battery Data	
Max. Input Voltage	750V
Min. Input Voltage	350V
DC Voltage at Nominal Operation	500V ~ 750V
Max. DC Current	55A * 2
Max. DC Input Power	55kW
Number of DC Inputs	2
AC Side (On Grid)	
Nominal AC Output Power	50kW
Max. AC Output Power	55kVA
Max. AC Current	80A
Nominal AC Voltage	400V
AC Voltage Range	340V ~ 440V
Nominal Grid Frequency / Frequency Range	50 / 60Hz; ± 5 Hz
THDv	<3% (100%Load)
Adjustable PF Range	-1 (Lagging) ~ 1 (Leading)
AC Side (Off Grid)	
Nominal AC Voltage	230 / 400V; ± 3 %; 3L+N+PE
THDI	<3% (Linear Load)
Nominal Grid Frequency / Frequency Range	50 / 60Hz
Nominal AC Output Power	50kW
Max. AC Output Power	55kVA
Efficiency	

Max. Efficiency	97.5%
Protection	
Reverse Connection Protection	Yes
DC Switch	Yes
Over-Temperature Protection	Yes
Grid Monitoring / Earthing Fault Detection	Yes
Insulation Monitoring	Yes
DC / AC Surge Protection	DC Type II; AC Type III
General Data	
Dimensions (W * H * D)	1330*1950*1425mm
Weight	1400kg
Topology	Transformerless
IP Protection	IP55
Operation Temperature Range	-20~55°C (>45°C) Dweating
Operation Humidity Range	0~95%(No Condensing)
Cooling Method	Intelligent Air Cooling
Max. Operation Altitude	3000m
Communication Port	RS485 / CAN
Standards	UN38.3; IEC/EN 62619; IEC/EN61000; IEC62477; IEC62109; EN50549-1; VDE4105; VDE0126

Table 3-1 Technical data

3.6 Parts Introduction

3.6.1 Battery pack

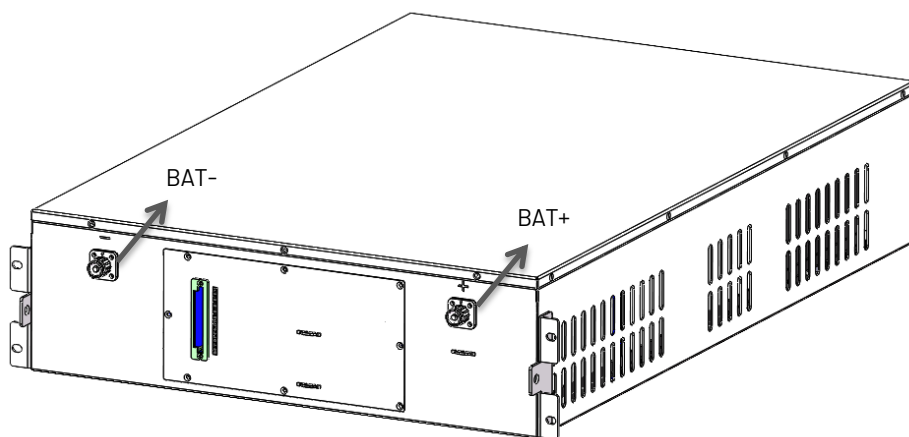


Figure 3-3 Dimensions of battery pack

Model	BS100-E
General parameters	
Dimensions(W * H * D)	1000*1950*1420mm

Weight	1325kg
Installation site	Outdoor
IP protection	IP55
Operation humidity	5%~95% (No condensing)
Operation temperature	-20°C ~+55°C
Max. operation altitude	≤ 2000m
Communication port	Ethernet; CAN
Communication protocol	CAN; MODBUS TCP / IP
Cooling method	Air conditioner
Standards	IEC62619; UN38.3; IEC61000; IEC62477
Technical parameters	
Battery type	LF100LA / 102Ah
Total battery capacity	104.4kWh
Number of modules	16S2P*10
Nominal voltage	512V
Operating voltage range	448 ~ 584V
Charge / Discharge rate	≤ 0.5C
Depth of discharge	95%

Table 3-2 Energy storage system data

3.6.2 Battery Management System

An energy storage management system consists of a battery management system (BMS) and an energy management system (EMS). The battery we choose comes with a BMS system, which is divided into two levels: BMU and BCU.

The BMU is located in the battery box, which completes the data acquisition of the single-cell information inside the battery box and uploads the data to the BCU. At the same time, the balance between the single cells in the battery box is completed according to the instructions issued by the BCU.

The BCU is in the main control box (PDU) and manages the battery cabinet. It accepts the detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, calculates and corrects the SOC, and is responsible for the pre-charging and charging and discharging management of the battery cabinet and uploads the relevant data to EMS. BCU is responsible for the operation and management of the entire battery cabinet, receives the data uploaded by BMU, analyzes and processes it, and transmits the battery cabinet data to EMS.

The system communication is based on EMS. EMS uploads battery information to regulate PCS according to BMS and feedback on PCS status to BMS.

3.6.3 PCS

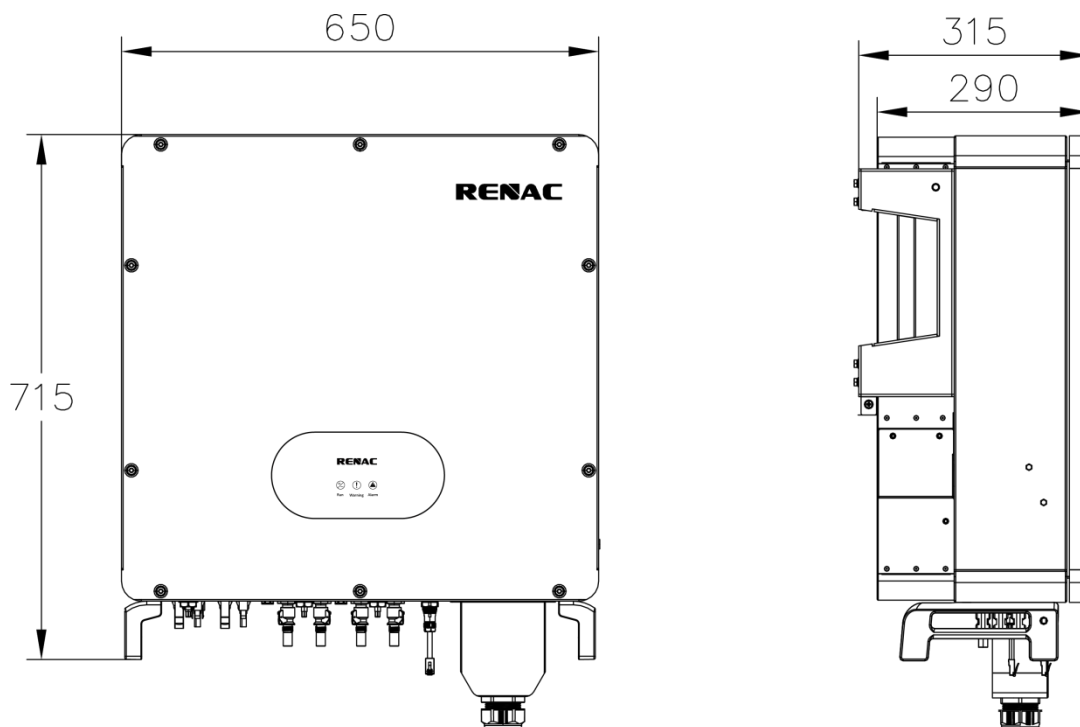


Figure 3-4 Dimensions of N3-HB-50.0 model

Model	N3-HB-50.0
PV Input Data	
Max. PV Input Voltage[V]	1000
MPPT Voltage Range[V]	350 ~ 800
No. of MPP Tracker	3
No. of Input Strings per Tracker	2 / 2 / 2
Max. PV Input Current[A]	36 / 36 / 36
Battery Data	
Battery Type	Lithium
No. of Battery Inputs	2
Battery Voltage Range[V]	350 ~ 750
DC Voltage at Nominal Operation[V]	500 ~ 750
Max. DC Input Power[W]	55000
Communication Port	CAN
AC Output/Input Data(On Grid)	
Max. input active power[W]	50000
Max. AC Power[VA]	55000
Max. AC Current[A]	80
Rated AC Voltage/Voltage Range[V]	3 / N / PE, 230 / 400; 340~ 440
Rated Grid Frequency/Frequency Range[Hz]	50 / 60; ±5
Power Factor	> 0.99 (Rated power)

Power Factor adjustment range	1 (leading) ~ 1(lagging)
THDv(@Rated Output)	< 3%
AC Outout Data(Off Grid)	
Max. input active power[W]	50000
Rated AC Current[A]	72
Rated AC Voltage/Voltage Range[V]	3 / N / PE, 230 / 400; ±3%
Rated Grid Frequency[Hz]	50 / 60
Power Factor	> 0.99 (Rated power)
Efficiency	
Max. Efficiency	97.5%
Protection	
Reverse Connection Protection	Integrated
DC Switch	Integrated
Over-Temperature Protection	Integrated
Grid Monitoring / Earthing Fault Detection	Integrated
Insulation Monitoring	Integrated
DC Surge Protection	Integrated (Type II)
AC Surge Protection	Integrated (Type II)
General Data	
Size(Width*Height*Depth)[mm]	650 * 715 * 315
Weight[kg]	75
Communication Port	RS485 / CAN
Operation Temperature Range[°C]	-25 ~ +60(45°C Derating)
Relative Humidity	0~100% (No Condensing)
Operation Altitude[m]	≤ 3000
Standby Self Consumption[W]	
Topology	Transformerless
Cooling	Intelligent Air Cooling
Enclosure	IP65
Warranty	10 years
Certifications & Standards	
IEC62477; IEC61000; IEC62109; EN50549-1; VDE4105; VDE0126	

Table 3-3 PCS parameters

3.6.4 Environmental Control System

The energy storage system is equipped with environmental control units such as smoke detectors, water immersion sensors, and fire fighting, which can fully control the operation status of the system. Environmental control system diagram:

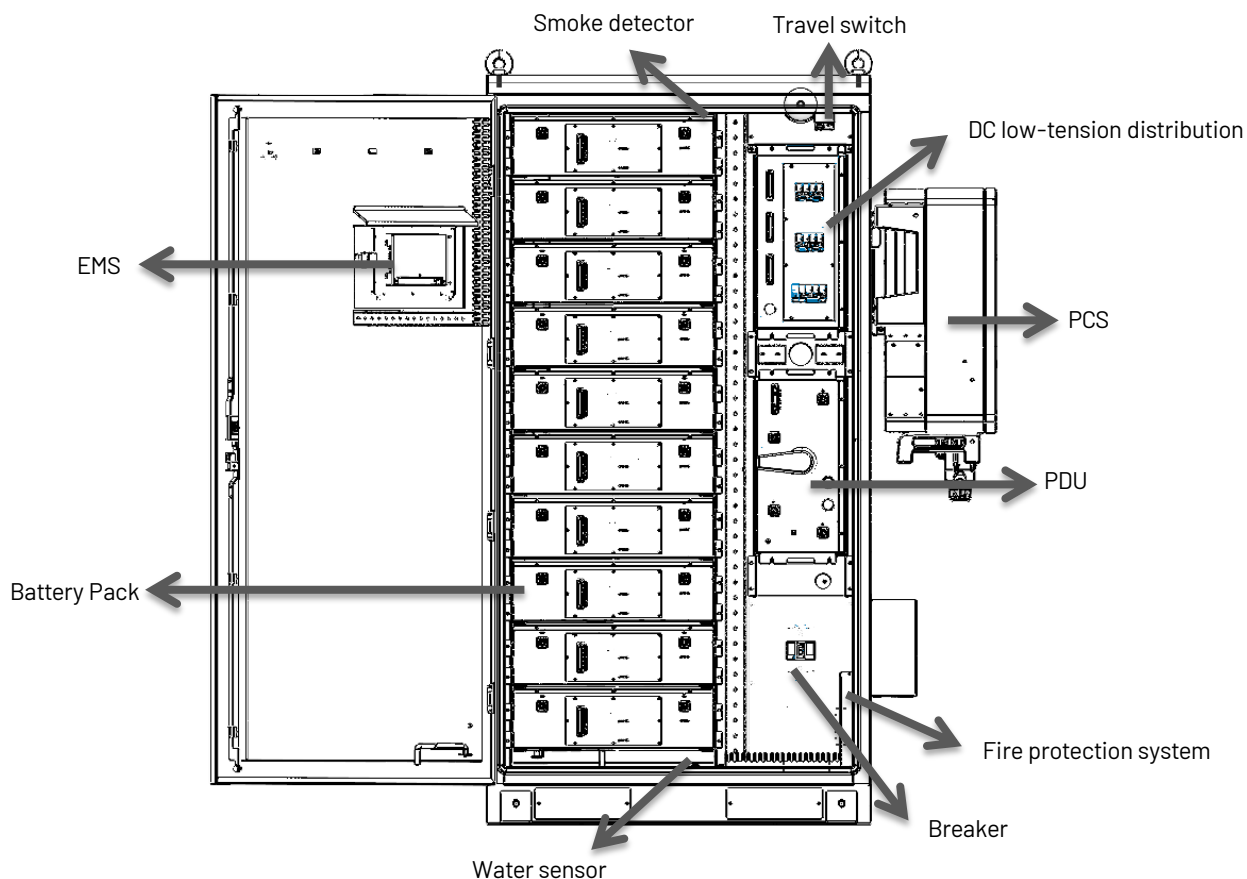


Figure 3-5

3.6.4.1 Smoke Detector

The detector is a non-coding type, which is directly connected to the DC power supply when working. When working normally, the working indicator light flashes. When the alarm is on, the alarm indicator light is on. The detector has a pair of output contacts, and the contacts are closed/disconnected after the alarm.

Model	Smoke detector
Operating voltage	DC9-35V, DC48V ; AC220V (Optional)
Static current	≥ 2mA (DC24V)
Alarm current	≥ 10mA (DC24V)
Warning indication	Red LED
Operating temperature range	-10 ~ +50℃
Environmental humidity	≤ 95%RH (Non-condensation)
Coverage area	When the space height is 6m ~ 12m, the protection area of a detector is 80 m ² for the general protection site, and the protection area is 60 m ² when the space height is below 6m.
Size (Diameter *Height)	104*53mm

Table 3-4 Smoke detector parameters

3.6.4.2 Water Sensor

The water sensor is a new type of water immersion transmitter installed on the split guide rail of the contact monitoring and protection probe, which is mainly used to determine whether there is a danger of water accumulation at the contact point of the examination.

Model	Water Sensor
Supply voltage	DC 24V (12V~36V)
Operating temperature range	0°C ~ 60°C
Environmental humidity	≤ 95%RH
False alarm rate	< 100ppm
Static power consumption	0.5W
Maximum alarm power consumption	1.8W
Sensitivity	Avoid using the neutral position, the factory setting defaults to 2 speeds. Gear level1: 0kΩ~4kΩ Gear level2: 0kΩ~10kΩ Gear level3: 0kΩ~22kΩ Gear level4: 0kΩ~300kΩ

Table 3-5 Water sensor parameters

3.6.4.3 Fire Protection System

Fire protection system is a new type of environmental protection fire product at the world's advanced level. Working principle: When the ambient temperature reaches the starting temperature of the heat-sensitive line or contacts the open fire, the heat-sensitive line spontaneously combusts and passes it to the aerosol series fire extinguishing device. After the Fire protection system receives the starting signal, the internal fire extinguishing agent is activated, and the nano-aerosol fire extinguishing agent is quickly generated and ejected to achieve rapid fire extinguishing.

Model	Fire protection system
Operating temperature range	-50°C ~ 90°C
Environmental humidity	≤ 95%RH
Blowing time	≤ 14s
Spraying lag time	≤ 5s
Nozzle thermal spacing	Thermal spacing for 400°C, 200°C and 75°C is 0.05m, 0.12m and 0.3m respectively
Shell surface temperature	≤ 150°C
Name and content of oxidant	Potassium nitrate, silver nitrate 50% ~ 58%
Size(Width* Height * Depth)	68.5*255*46mm
Weight	860g ± 30g

Table 3-6 Fire protection system parameters

3.6.4.4 Travel Switch

The travel switch is used here to detect whether the cabinet door is closed or not. If the cabinet door is left open, an alarm message is displayed on the EMS. It works on the principle of switching control of circuits by applying mechanical force to the contacts.

3.6.4.5 External Air Conditioner

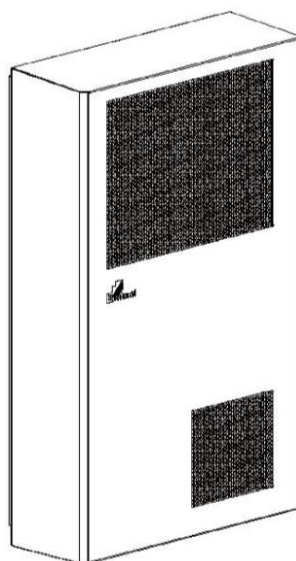


Figure 3-6

The external air conditioner is used to dissipate heat from the energy storage system. Configuring this air conditioner can provide a stable and suitable temperature and humidity environment for the energy storage system.

Model	External air conditioner
Operating temperature range	-40°C ~ 55°C
Noise	65dB
Enclosure	IP55
Refrigerant	R134a
Cooling capacity L35/L35	1500W
Calorisation	1000W
Dehumidification switch-on point	60%RH
Max. operating current L55/L55	5A
Internal circulation air volume	380 m ³ /h
Power supply range	220VAC ± 15%V, 50Hz
Size(Width* Height * Depth)	495*795*195mm
Weight	32kg

Table 3-7 External air conditioner parameters

3.6.5 Isolation Transformer (Optional)

The energy storage system requires a separate isolation transformer in off-grid mode (T50 recommended); in on-grid and off-grid mode an STS is required, which already contains the isolation transformer.

Model	T50
Rated voltage	Three-phase 400V
Rated power	50kVA
Wiring group	Dyn11
Winding parameters	Uk=3%

Insulation level	Class H
Efficiency	97.8%
Operation Temperature Range	-25℃ ~ 50℃
Operation Altitude	≤ 3000m
Enclosure	IP65
Size(Width* Height * Depth)	700*800*550mm
Weight	260kg

Table 3-8 Isolation transformer parameters

3.7 Package and Storage

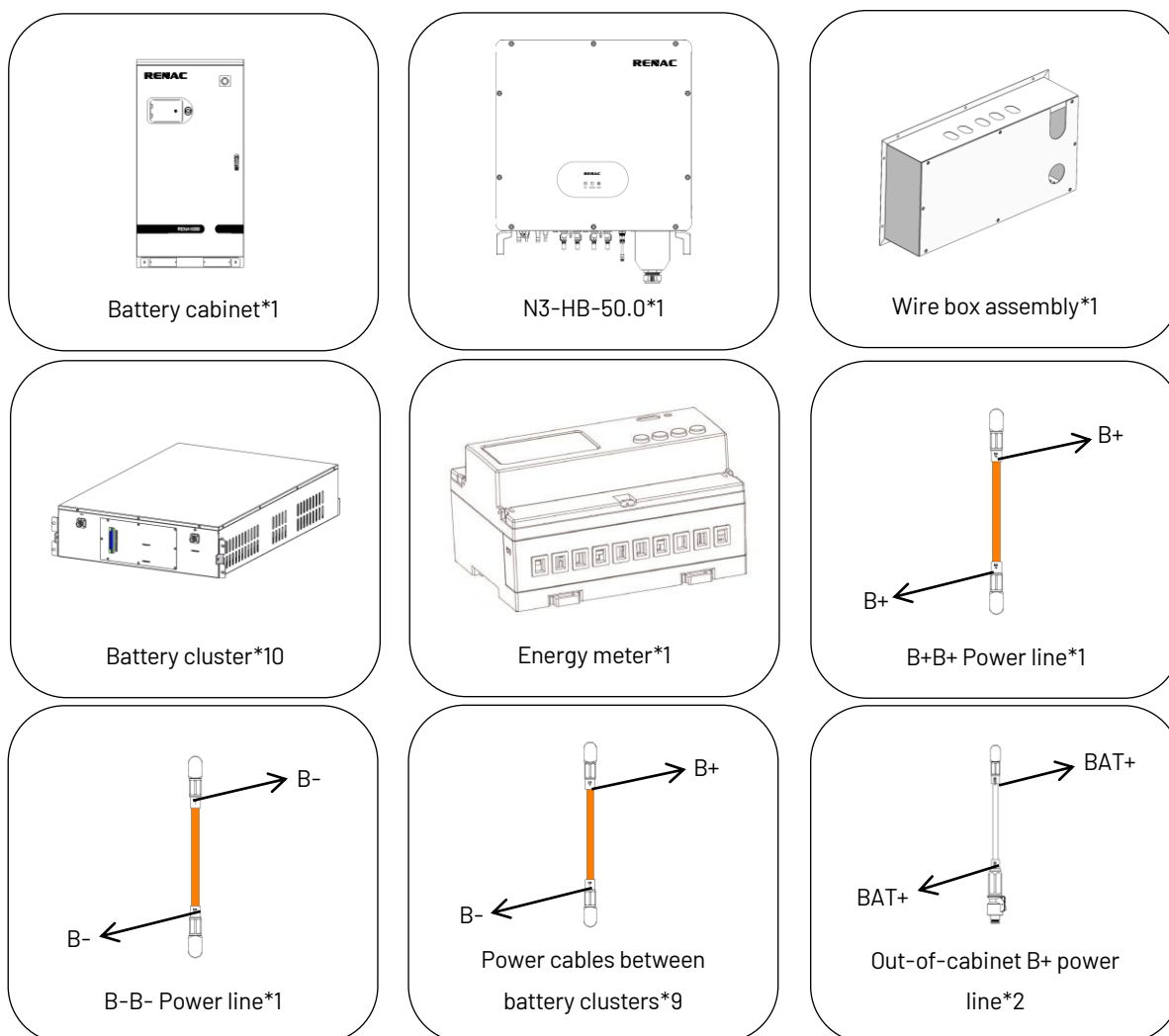
3.7.1 Package

The packing of the Outdoor C&I Energy storage system is mainly composed of the packages of the battery packs and the battery cabinet.

Check whether the packing is damaged and confirm the Battery pack before unpacking. Do not unpack the product if you find any damage or if the model is not what you requested. Contact after-sales service as soon as possible.

Check whether the deliverables are intact and complete first after unpacking. Contact the after-sales service as soon as possible for anything wrong.

Packaging is subject to actual availability.



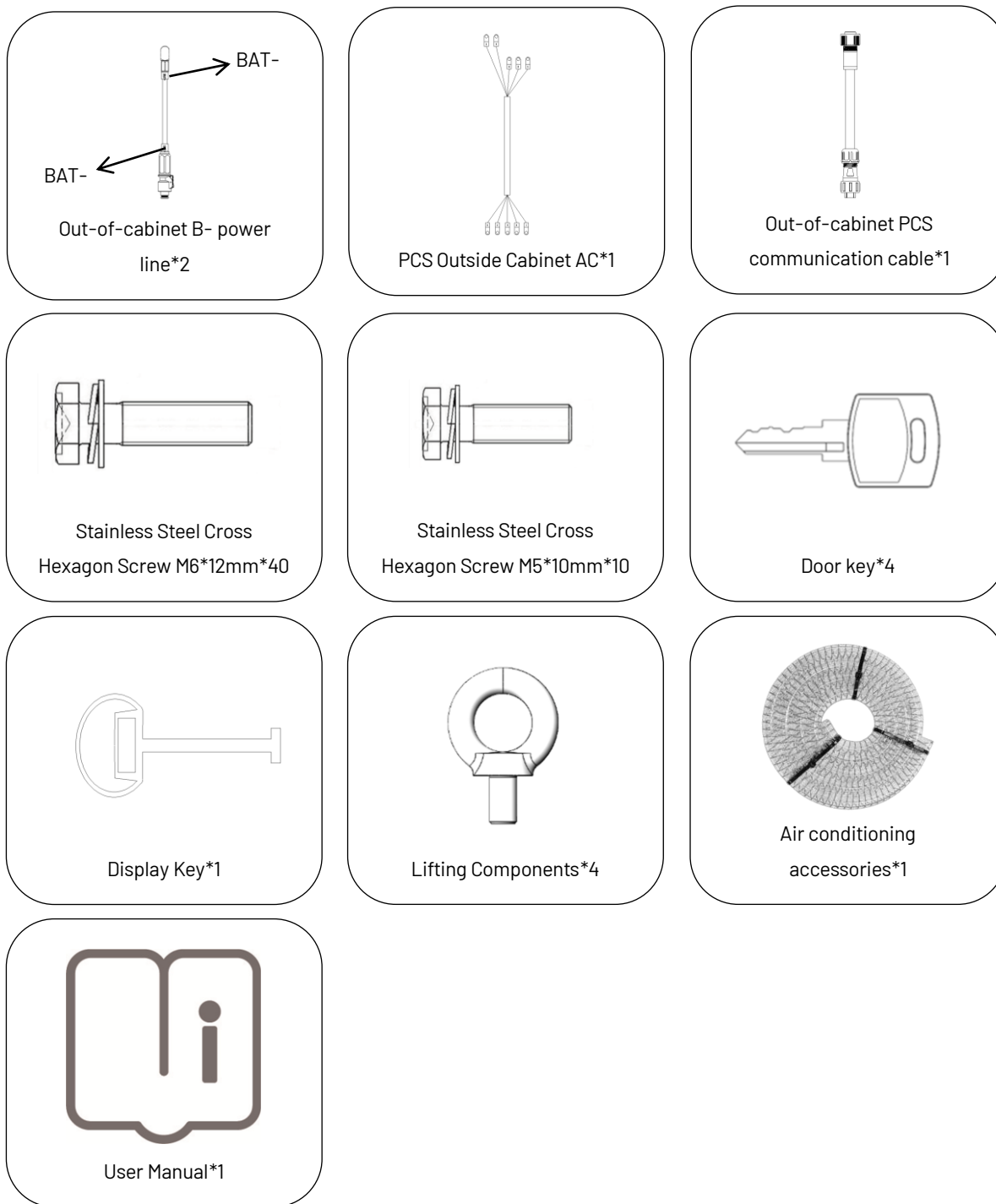


Figure 3-7 Package

3.7.2 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.

4. System Installation

4.1 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.

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 integrated PCS.
- Elevate the integrated PCS 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.



WARNING!

During the whole process of mechanical installation, the operators must follow the relevant standards and requirements of the project location.

4.2 Product Transport

- In order to keep the equipment in a better state of protection, it is recommended that the equipment be transported in packaging.
- Transport should be carried out in accordance with the marking requirements on the packaging to prevent personal injury and equipment damage.
- Energy storage batteries are not recommended for railway transport or air transport. Speed limit for land transport: 80km/h on flat roads, 60km/h on rough roads. If there is any conflict, please refer to local traffic regulations.

4.3 Product Handling

- When using a forklift to move, 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 $>3t$; without battery transfer, forklift truck loading capacity needs to be $>1.5t$.
- Recommended fork knife length $>1.5m$, width $500mm \pm 100mm$, 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 4-1

4.4 Pre-installation Preparation

1. Before installing the product, you need to check whether the product is intact and undamaged. If you find any traces of damage, please keep the evidence and contact RENAC Power Technology Co., Ltd.
2. If users are sure that there are no abnormalities in the product, please check that the accessories are complete according to the delivery list. Users can refer to the 3.7.1 Package.

3. Users need to prepare the relevant installation tools before installation. Refer to Table 4-1.
4. Before installation, the operator should be regulated to wear a helmet, insulated clothing, insulated gloves, and insulated boots.

No.	Tool	Function	Quantity
1	Screwdriver set	Wiring	1 set
2	Sleeve set	Wiring	1 set
3	Multimeter	Measuring current and voltage	1 pcs
4	Forklift	Move equipment	1 pcs
5	Screws, Nuts and Spacers	Fasteners	a certain number or amount
6	Installation jig	Move equipment	1 set
7	AC cable and neutral cable	Connect to municipal power supply	a certain number or amount
8	AC wiring terminals and heat shrinkable tube	Make cables	a certain number or amount
9	Wire stripper and Crimping plier	Make cables	1 set
10	Hot hair dryer	Shrink the heat shrink tubes	1 pcs

Table 4-1 Installation tool list

4.5 Mechanical Installation

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



NOTE!

If the energy storage system is transported by crane, the lifting assembly needs to be installed first. The lifting assembly can be found in the packaging.

- 1) According to the product size in advance, selecting the equipment installation location, positioning, and fixing, reference to the weight of the product, the choice of the installation location needs to have sufficient load-bearing strength and a reliable grounding point to ensure that the grounding resistance is less than 4 Ω .

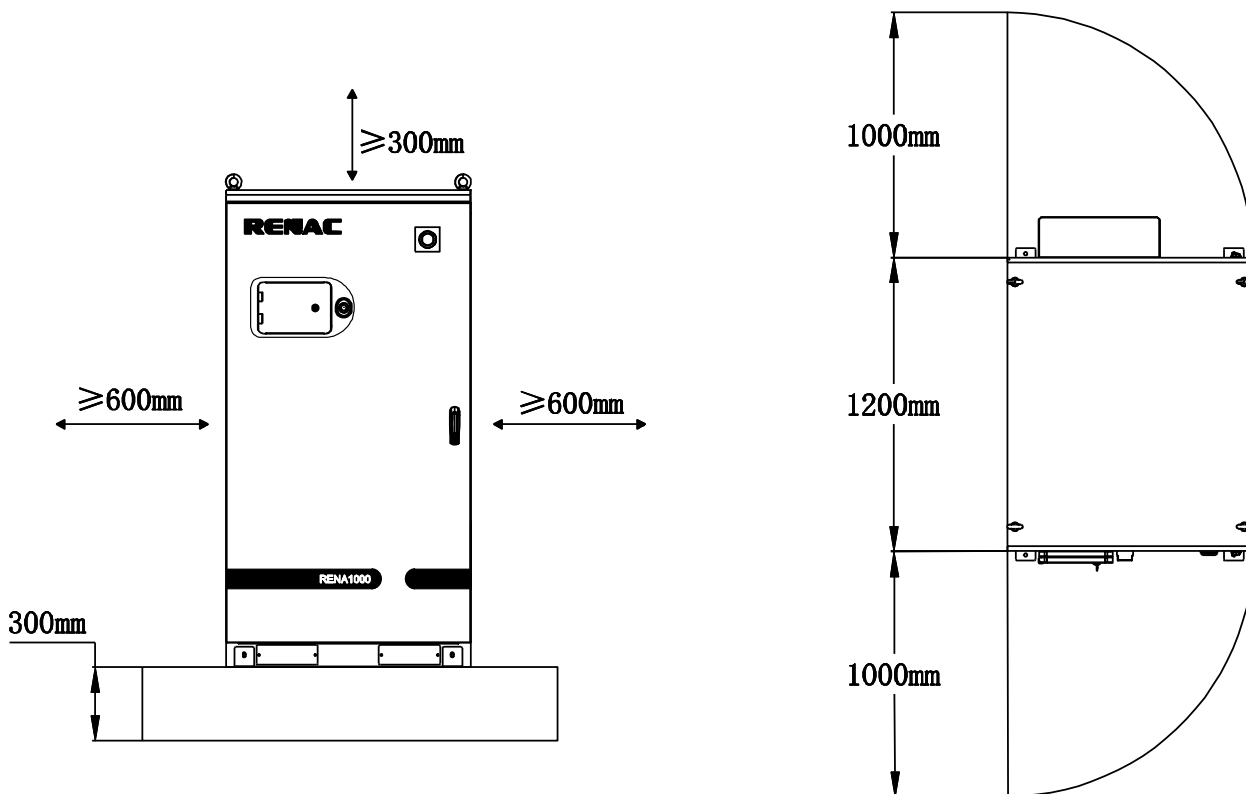


Figure 4-2 Basic reference

- 2) Position the equipment on the foundation with a forklift, align the equipment, fix holes with the pre-embedded nuts of the foundation, and tighten with M12 bolts.

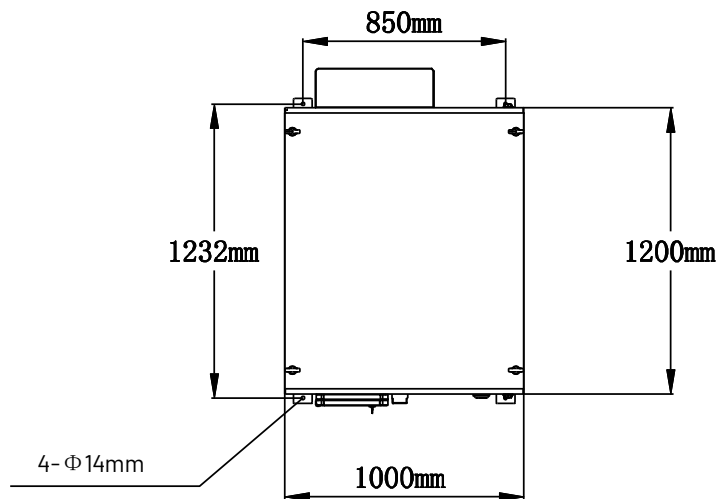


Figure 4-3 Bottom of the battery cabinet

- 3) Open the battery cabinet and take out the Battery packs.

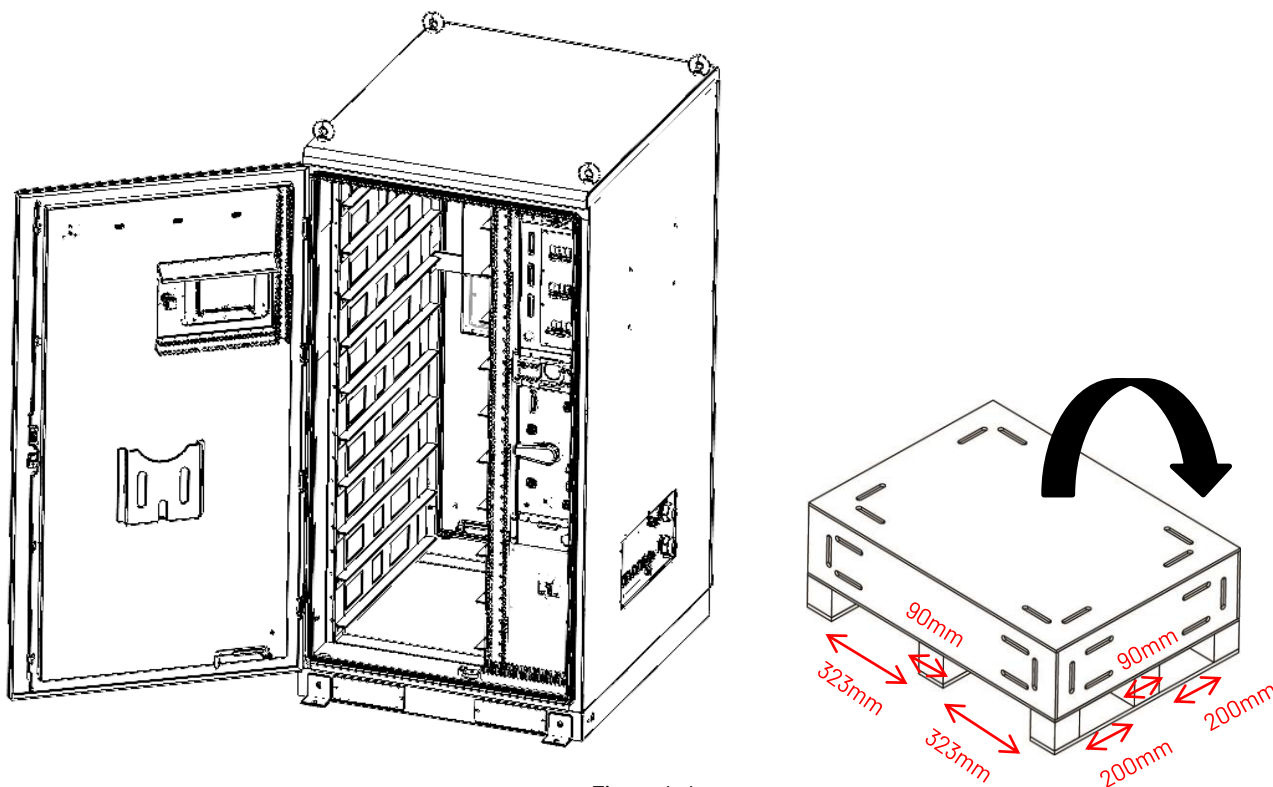


Figure 4-4

- 4) Move the battery pack onto a forklift or lifting device equipped with a installation jig. The manufacturer's after-sales service provides the installation jig.

The installation jig is subject to the availability of after-sales service.

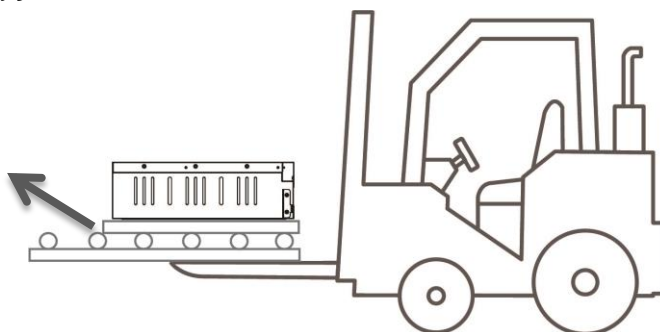


Figure 4-5

- 5) Use the forklift or the elevating devices to install each battery pack into the battery cabinet from bottom to top.

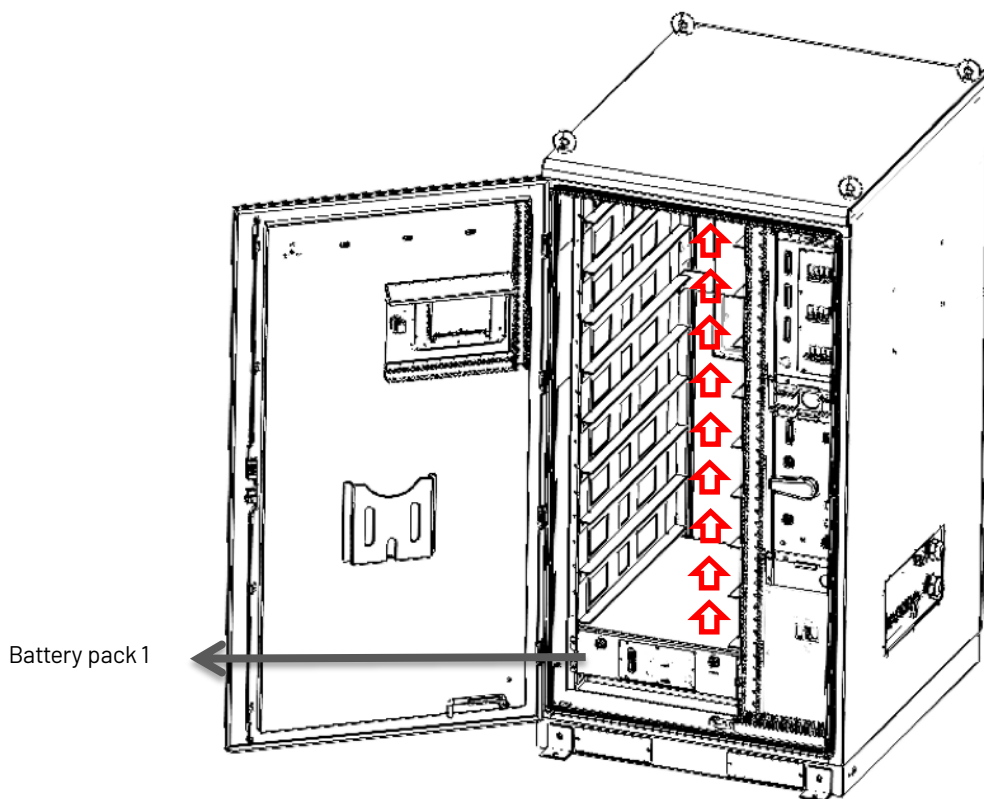


Figure 4-6

- 6) Use M6*12 screws to fix the battery packs.

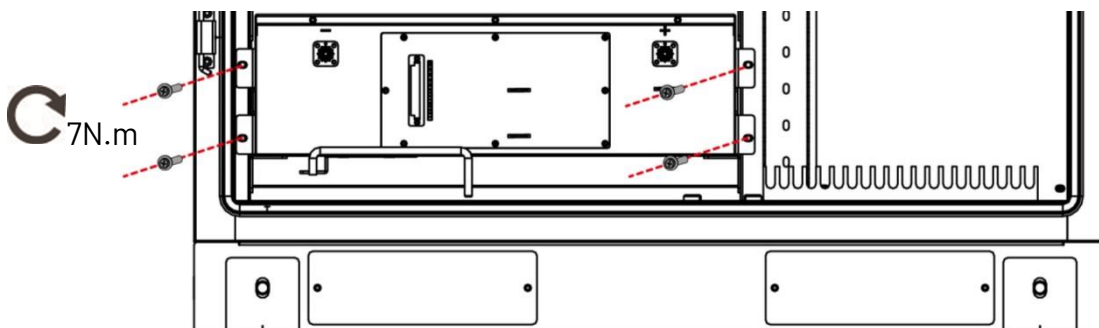


Figure 4-7

- 7) Open the PCS package and install the bracket in the upper right position of the battery cabinet. PCS installation instructions can also be detailed in the PCS User Manual.

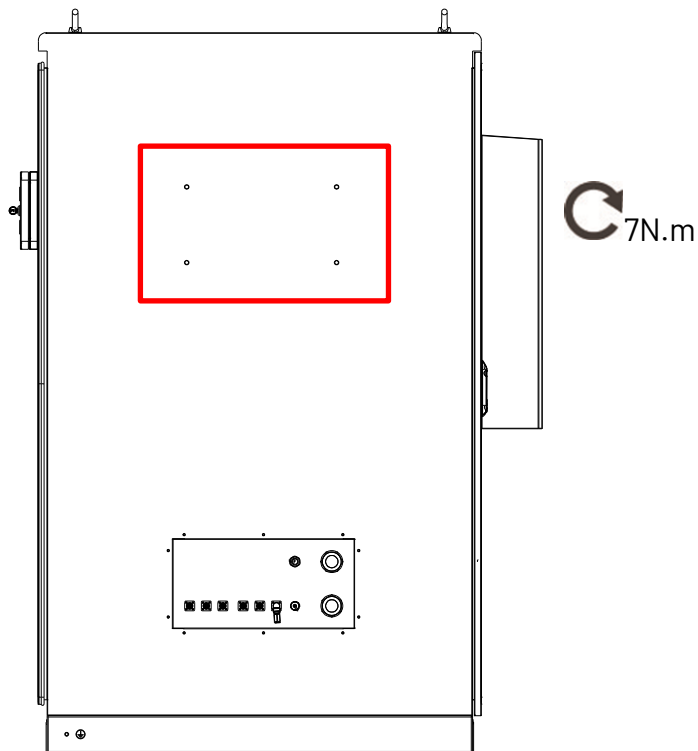


Figure 4-8

- 8) Hang the PCS on the bracket. There are fixing holes at the bottom of the power conversion system, which are used to fix the system on the bottom supporting channel steel or on the ground.
- 9) Install the junction box in the wiring location below the PCS. Leave the cover off for now.

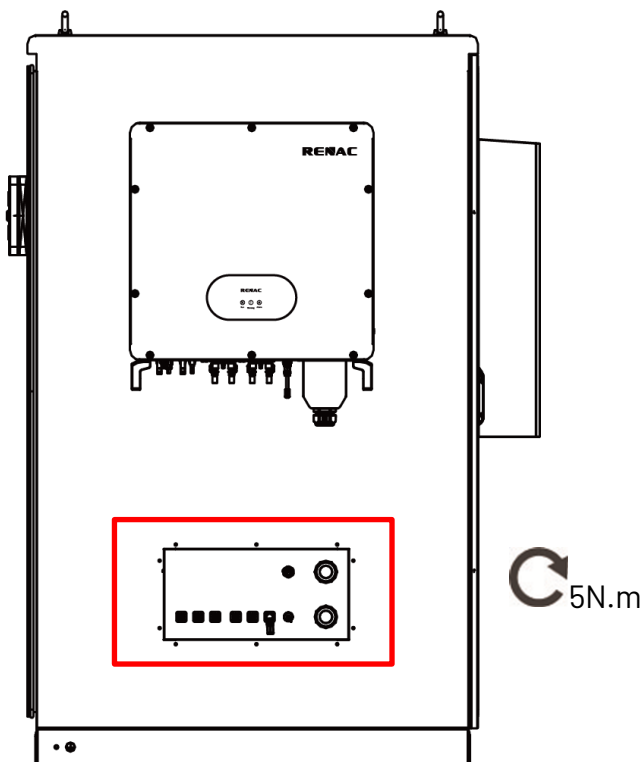


Figure 4-9




4.6 Electrical Connection

Electrical cabling is required in the field for the DC and AC sides as well as for external power and communications. Renac Power provides the wiring reference in Table 4-2 according to the product power and cable specification. Cable diameters should be selected in accordance with local cable standards. Factors affecting cable selection include current rating, cable type, laying method, ambient temperature, and maximum acceptable line loss.

Capacity	AC cable	Neutral cable	Earth
50kW	≥3*25mm ²	≥25mm ²	≥16mm ²

Table 4-2 Cable diameter comparison table

4.6.1 Electrical Safety

	<p>DANGER!</p> <p>Danger of high voltage! Danger of electric shock!</p> <ul style="list-style-type: none"> • 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.
	<p>WARNING!</p> <p>When performing an electrical installation, refer to the following recommendations for electrical installation:</p> <ul style="list-style-type: none"> • 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!
	<p>NOTE !</p> <p>During the whole process of electrical connection, as well as all other operations on equipment such as integrated PCS, the following five safety rules must be observed:</p> <p>Ensure that disconnection of the energy storage system does not accidentally energize it;</p> <p>Disconnect all external connections to the integrated PCS and the device's internal power supply.</p>

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.

4.6.2 Connecting Battery Communication Cable

One end of the communication cable for the Battery packs are already fitted in the cable slot; simply plug the end fitted with the 14Pin terminal into the corresponding battery box from bottom to top.

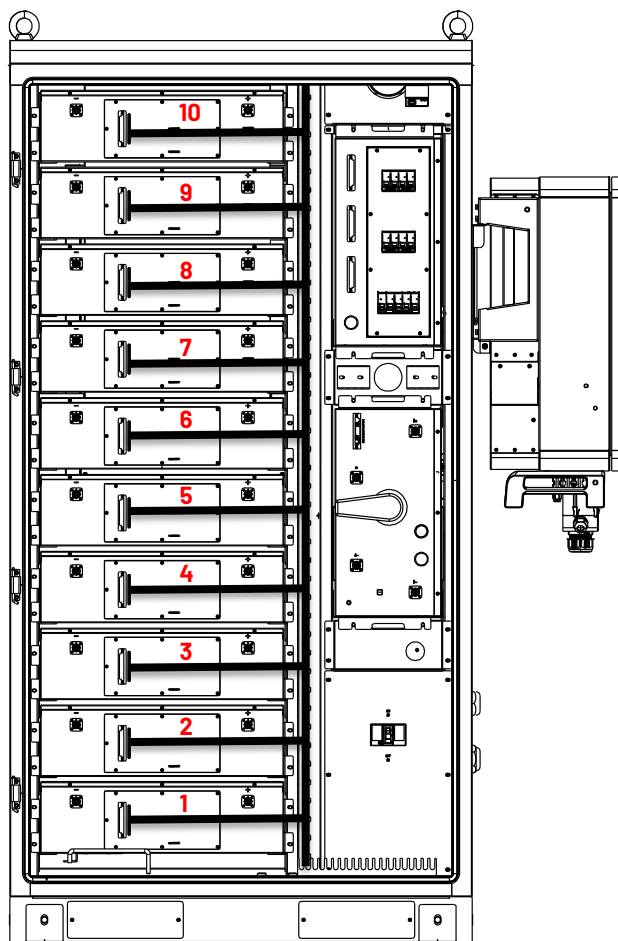


Figure 4-10

4.6.3 Connecting Battery Power Cable

Firstly, take out the power cable between the Battery packs from the accessory kit, then connect the positive pole of the first Battery pack to the negative bar of the second Battery pack, and so on from the bottom to the top, and finally connect the negative bar of the first Battery pack to the "B-" connector of the PDU, and connect the positive bar of the tenth Battery pack to the "B+" connector of the PDU.

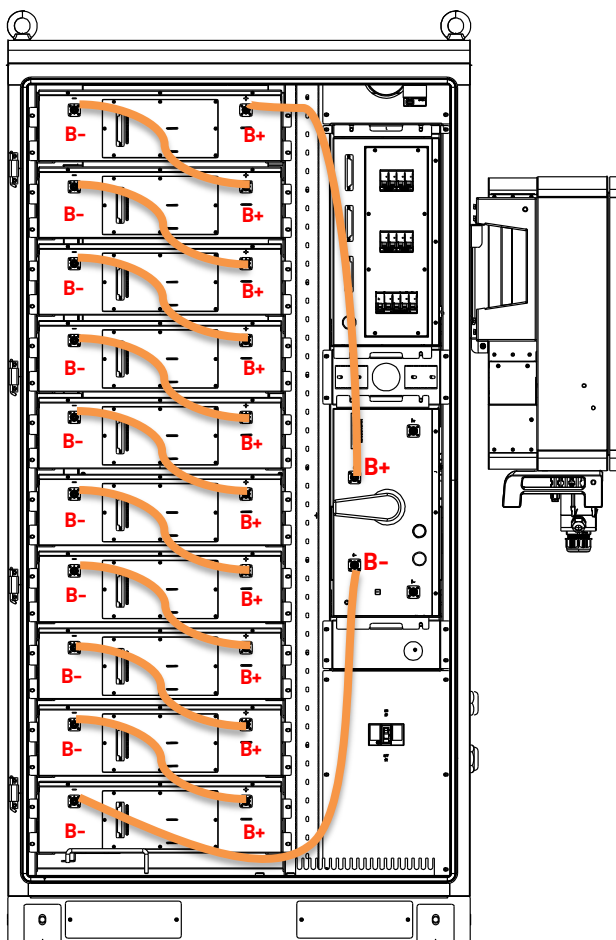


Figure 4-11

4.6.4 Connecting PCS Communication Cable

Connect the COM port on the PCS to the COM port inside the wire box. The communication cable can be found in the package.

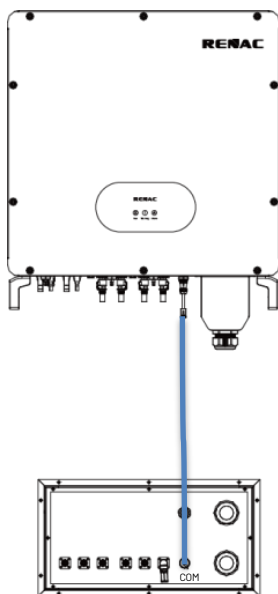


Figure 4-12

4.6.5 Connecting PCS Power Cable

Connect BAT+ on the PCS to BAT+ on the wire box and BAT- on the PCS to BAT- on the wire box. Take care to look at the positive and negative terminals of the wiring harness. Out-of-cabinet power harnesses can be found in the package.

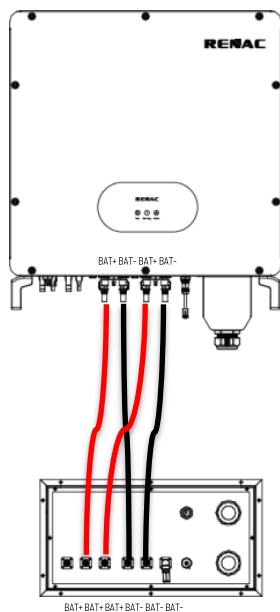


Figure 4-13

4.6.6 Connecting PCS AC Cable

Connect the AC wire to the AC INPUT of the PCS. In order to prevent the copper nose of the wiring from being loosened by force, causing poor contact, or increasing the contact resistance and causing heat or even fire, ensure that the screws that fasten the wiring terminals.

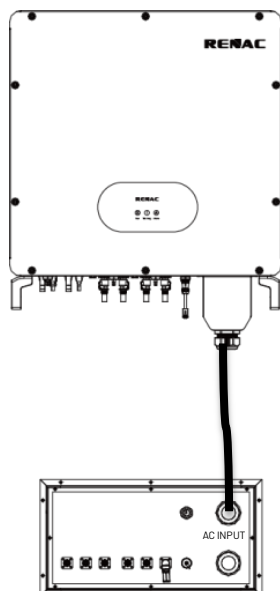


Figure 4-14

4.6.7 Connecting Mains

The inlet and outlet of the energy storage system are the bottom inlet and outlet, open the rear door of the cabinet, the wiring terminal is at the right bottom as shown in Figure 4-15. Connect L1/L2/L3/N/PE wires to the top lower row of the wiring terminal. The other end should be connected to the grid distribution box.

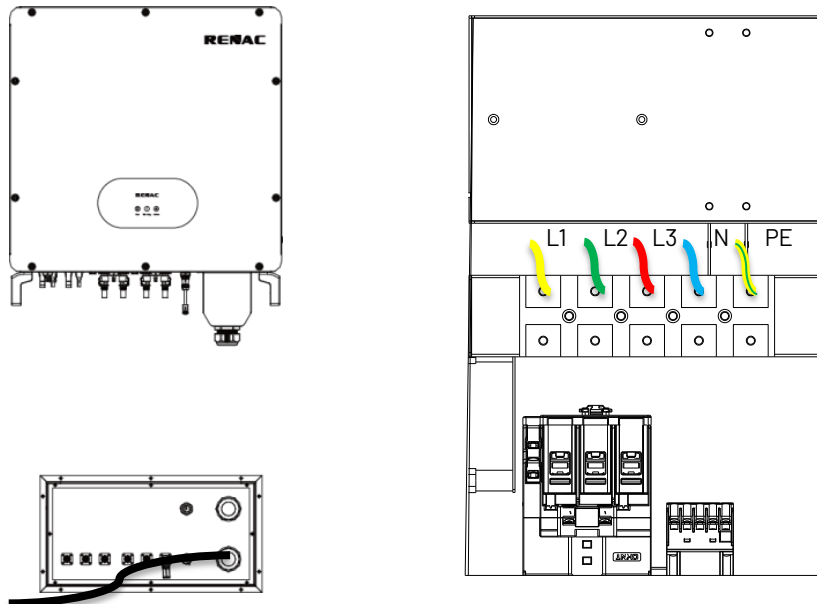


Figure 4-15



NOTE!

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

The cover of the wire box can only be fitted when the power and communication lines outside the cabinet and the main power are connected.

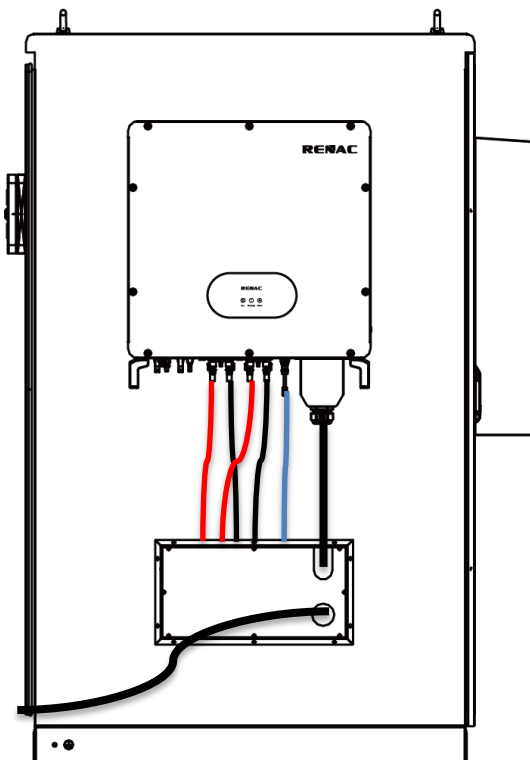


Figure 4-16 Outside cabinet wiring diagram

4.6.7 Meter Connection

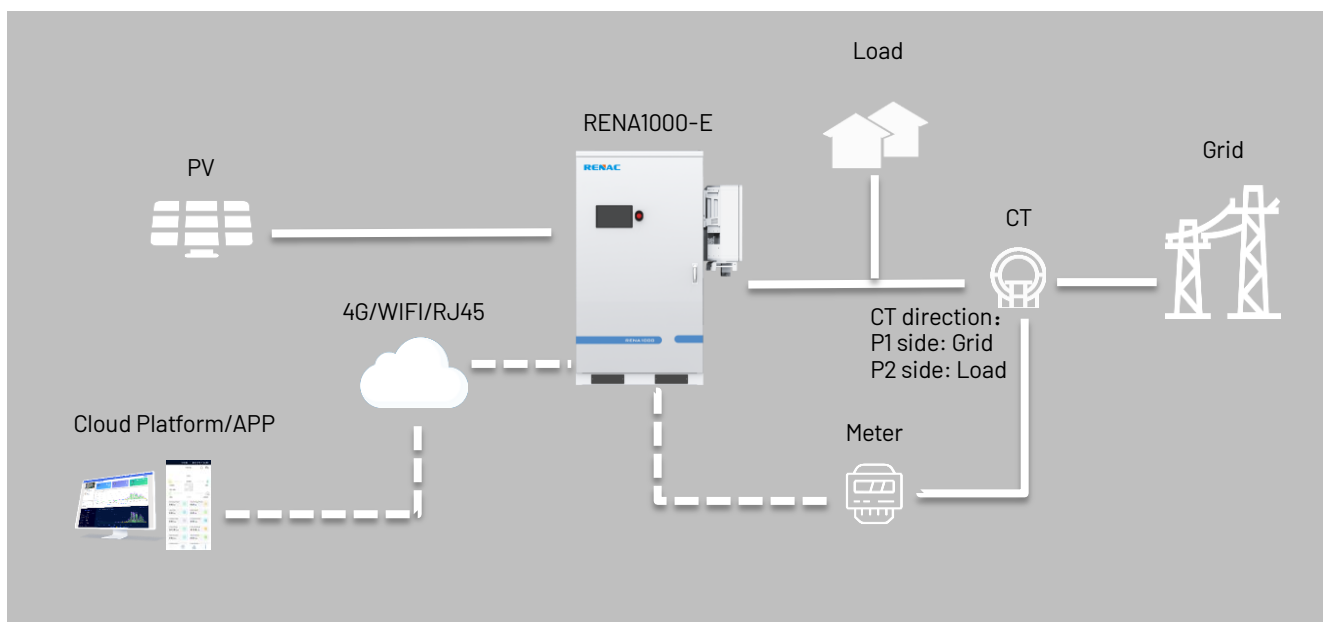


Figure 4-17 Electrical connection diagram

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 "2A, 2B" of the EMS screen.

1 channel communication

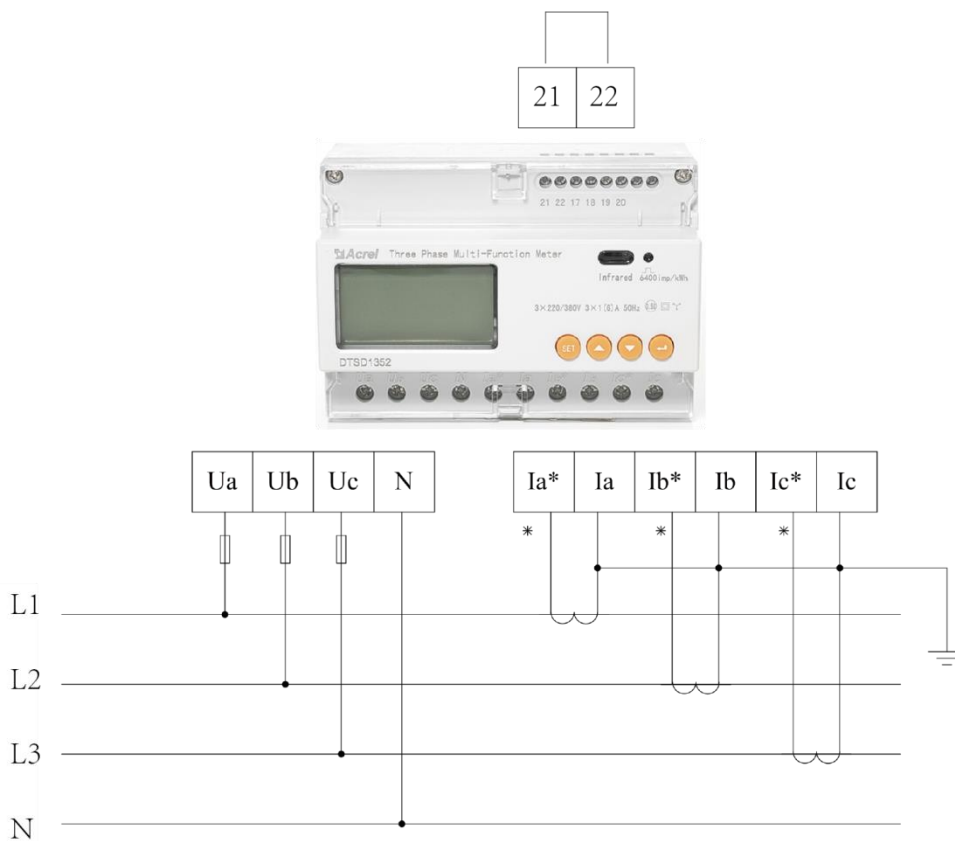


Figure 4-18 Meter wiring schematic



NOTE!

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

Rated current ratio	Accuracy class
200 / 5 (1)	0.5

The P1 side of the CT is connected to the grid and the P2 side is connected to the load.

4.7 Isolation Transformer Installation(Optional)

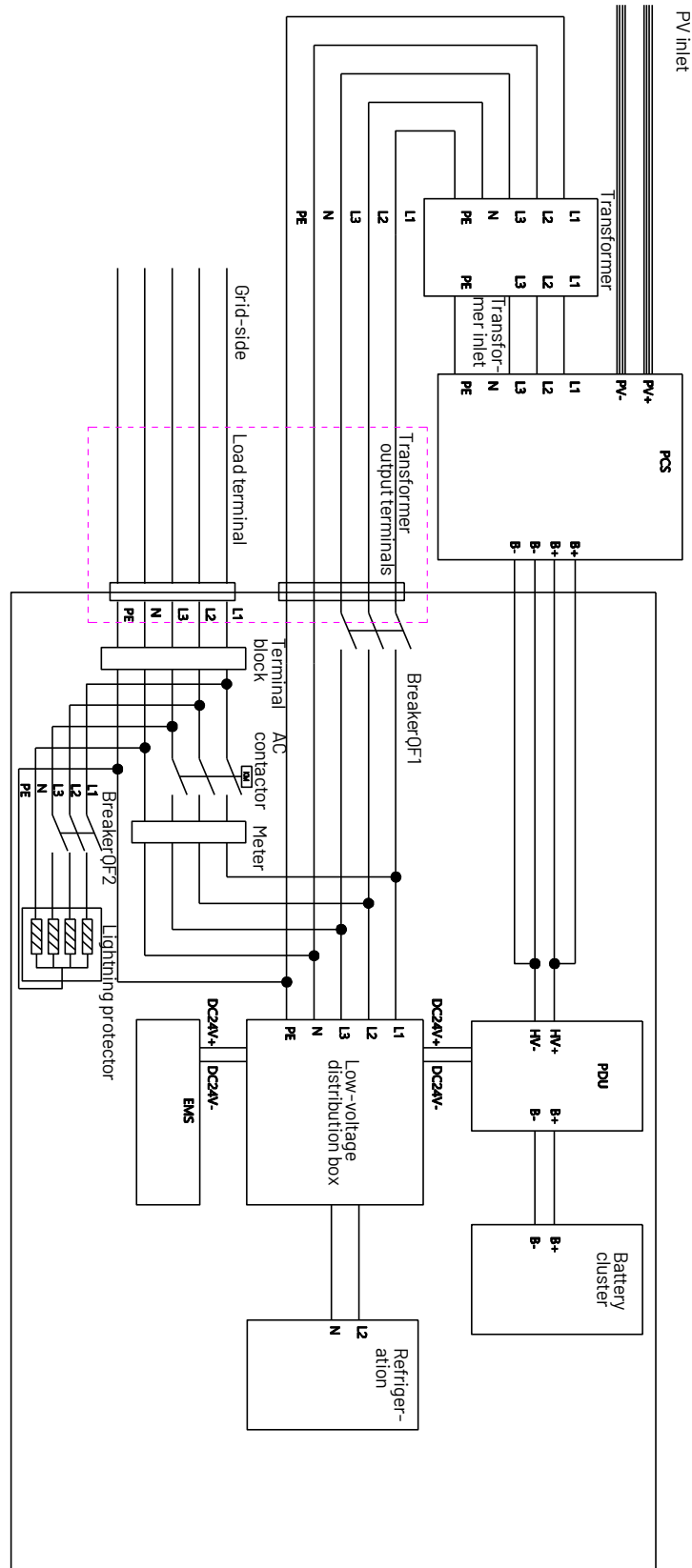


Figure 4-19 Off-grid electrical schematic

As shown in Figure 4-19, the off-grid function refers to the addition of an isolation transformer between the PCS and the grid side to ensure that the PCS can still ensure power supply to the loads if the grid side is unable to supply power for some reason. Referring to the off-grid electrical schematic diagram, the side of the transformer without the N wire is connected to the grid side of the PCS, and the other end of the transformer is connected to the molded case circuit breaker (main circuit breaker) so that the off-grid function can be realized automatically.

**NOTE!**

Once the off-grid function is enabled, the Run Mode can only be set to self-generation and self-consumption mode. Refer to Figure 5-1 for the setting interface.

5. Start-up and Commissioning

5.1 Pre-opening Check

Before running 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 machine to ensure that all indicators are in line with the requirements before switching on the machine.

(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 main breakers are all in the open position. Refer to Figure 5-1.

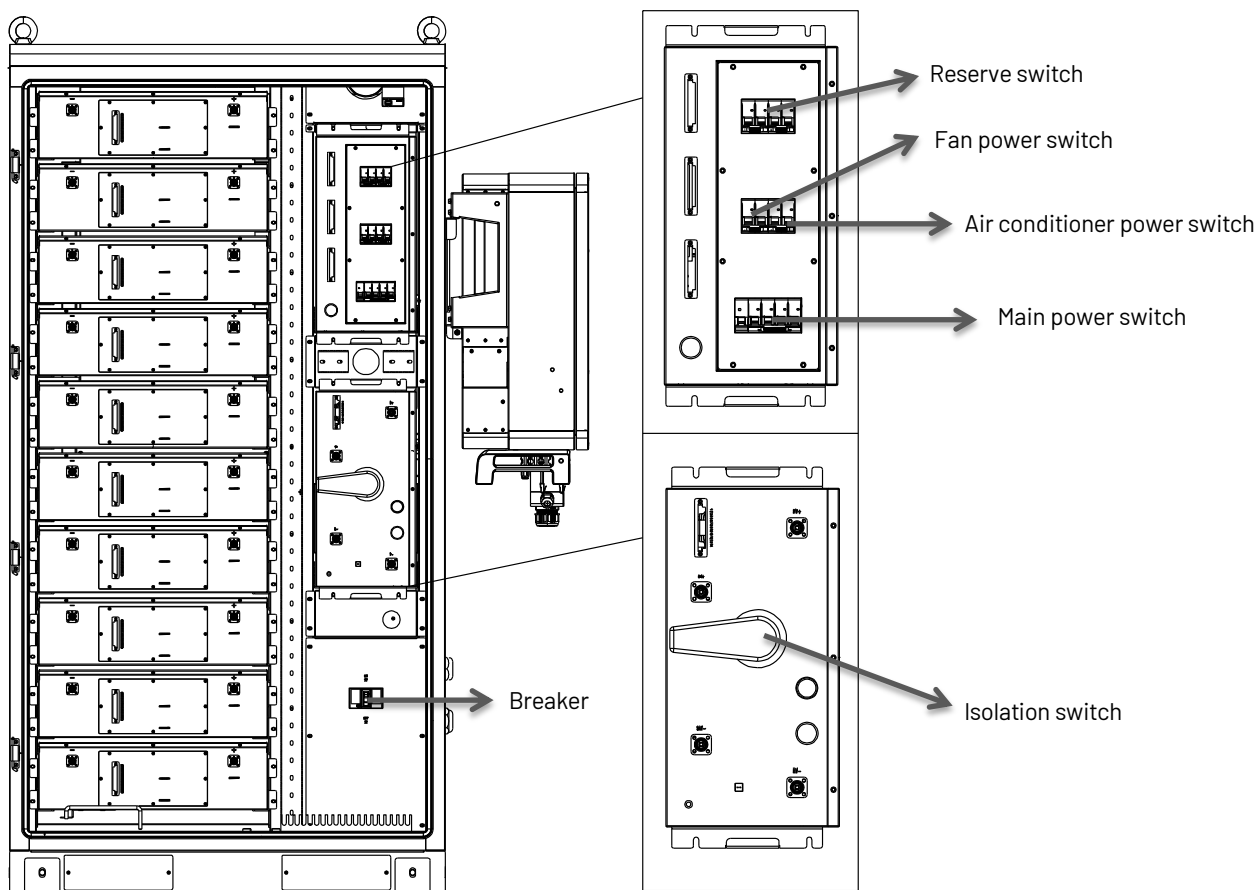


Figure 5-1 Distribution switch location diagram

5.2 Boot Operation

The product start-up operation process is as follows:

- 1) After confirming that the cables are connected correctly, switch on both PCS battery switches and the PV switch if using PV.
- 2) Turn breaker to ON to connect to the grid.
- 3) Use a multimeter to confirm that the grid voltage is within the intended range (400V+10%).
- 4) Referring to Figure 5-1, close the main power switch, then close the air conditioner power switch as well as the fan power switch.
- 5) The isolation switch hits ON, the system self-tests without error, the green light is always on, and the system is on high voltage.
- 6) PCS power-on self-test, no error can be operated on the EMS screen to run.

5.3 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 PCS, 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 PCS, 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, switch off the system in the "Operation" interface and manually switch 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 and then click "system start-up" in the system interface.

5.4 Switch Off

When the product needs daily maintenance, it needs to be shut down. The standard shutdown operation of the product is as follows:

- 1) Operate on the EMS screen to stop the system.
- 2) Operate on the EMS screen to bring the BMS down to high voltage and the PCS off.
- 3) Turn the isolation switch to OFF.
- 4) Turn off the air conditioner and fan power air switches, and turn off the main air switch.
- 5) Turn the breaker to OFF to disconnect the grid.
- 6) Switch off both PCS battery switches and also switch off the PV switch.

5.5 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 "EPO".
- 2) Referring to Figure 5-1, disconnect the breaker and power supply.
- 3) Reset the EPO button after determining that the fault or hazard is cleared and operation is required.

6. Operation and Handling

This chapter mainly introduces the LCD touchscreen display interface and the corresponding operation control through the human-machine interface. 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.

6.1 Introduction to Human-Machine Interface

After the system is powered on, the LCD touchscreen enters the start-up interface, and after 10 seconds, the start-up interface disappears, and the system enters the "Home" interface. As shown in Figure 6-1, the home page interface displays the system's comprehensive data, energy storage operation status (charging and discharging power chart), station-wide operation chart, work status, and other information.

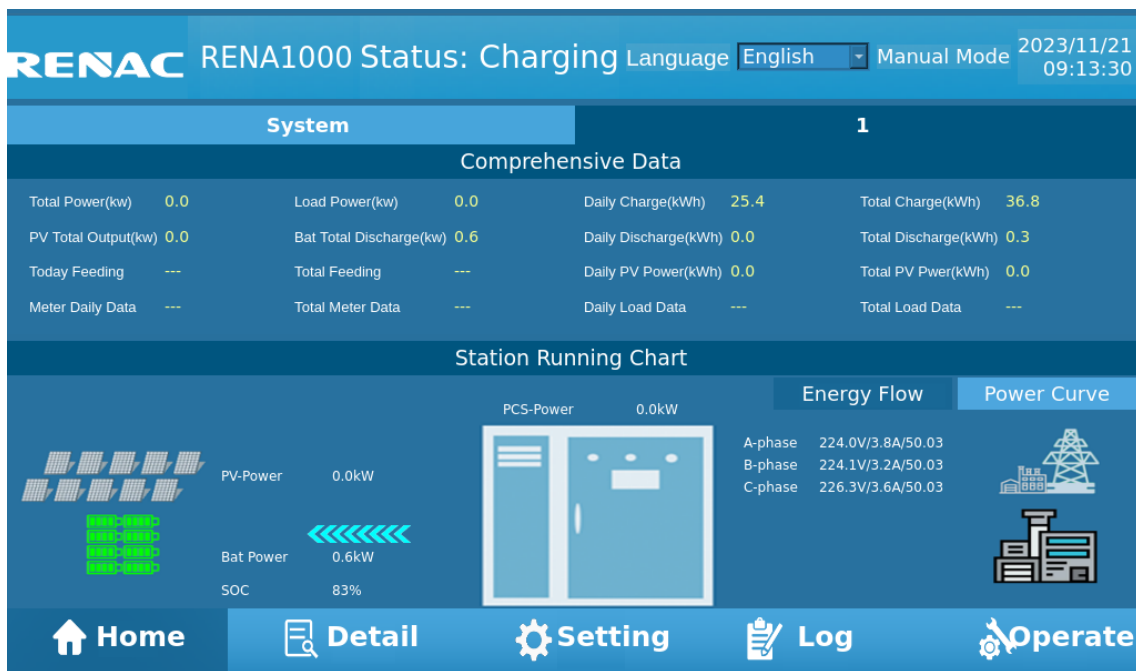


Figure 6-1 Home page

Items expanded by menu:

No.	Name of the menu	Menu items	Parametric function
1	Home	None	Displays the operating status of the system and the charging/discharging graph of the day.
2	Detail	PCS data	PCS related data
		Battery data	Battery related data
		System status	Display the current system status
		Environmental data	Displays the current environmental data
		Alarm information	Current system alarm messages
3	Setting	Run mode setting	System Run Mode setting
		Parameter setting	PCS and battery parameter setting
		Communication setting	Correspondence address setting
		Other setting	None
		Update	Perform software update operations
		System information	Displaying system information
4	Log	None	Displaying device operation log
5	Operate.	None	PCS on, PCS off, BMS on high voltage, BMS off high voltage, BMS de-energized, ATS on, ATS off, system shutdown, and EMS reboot

Table 6-1 Menu expansion table

6.2 Switchgear Operation

1. System open: first, check the whole machine on the power situation, refer to Figure 5-1, close the breaker, and then close the switch for air conditioning and fan power supply. At this time, the screen lights up, observe the touch screen without fault alarm (screen startup takes about 10 seconds), click on the screen in the "operation", click on the operation interface in the "BMS turn high vol" and then close the grid switch, the normal opening time is about 2 to 5 minutes, as shown in Figure 6-2.

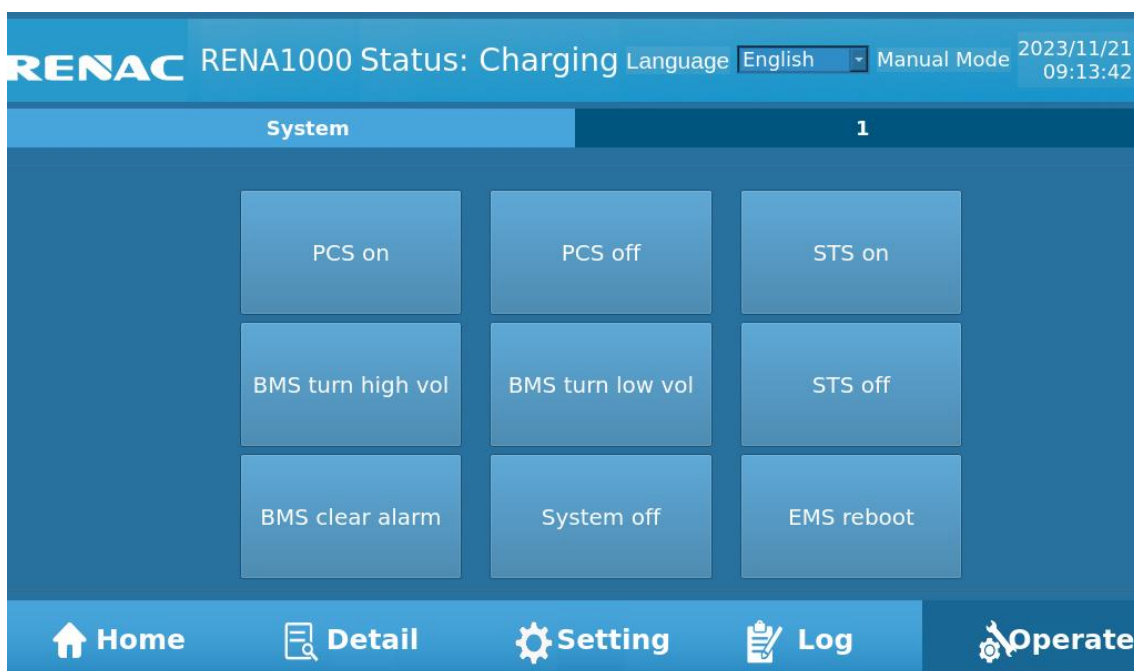


Figure 6-2 Operation page

2. System shutdown: When the system is running, click on the "System Off", and the battery running indicator red lights off, and the system shuts down. Then, the entire system will stop running if the system environment temperature and humidity are too high (too low). The air conditioning shutdown needs to wait for the temperature and humidity to return to the normal range (5 ~ 35 ° C) before the air conditioning stops working.
3. Disconnect the grid switch.
4. Disconnect power supply outlets as well as fan power.
5. Disconnect the breaker.

6.3 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.

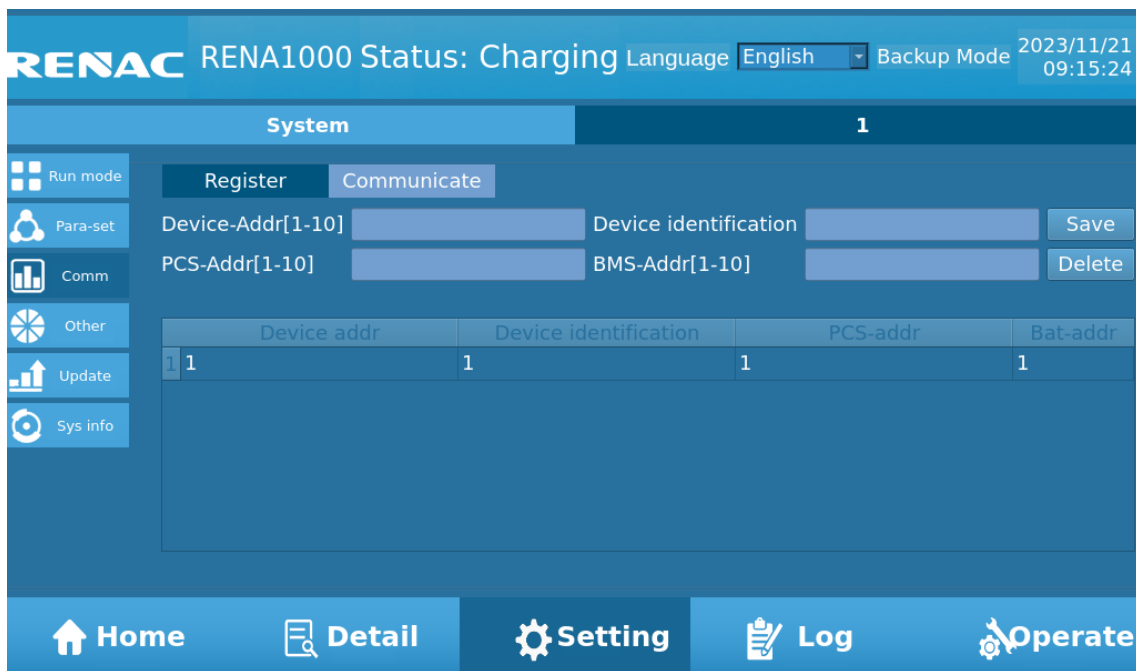


Figure 6-3 Communicate setting page

6.4 Run Mode Setting

6.4.1 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.

6.4.2 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.

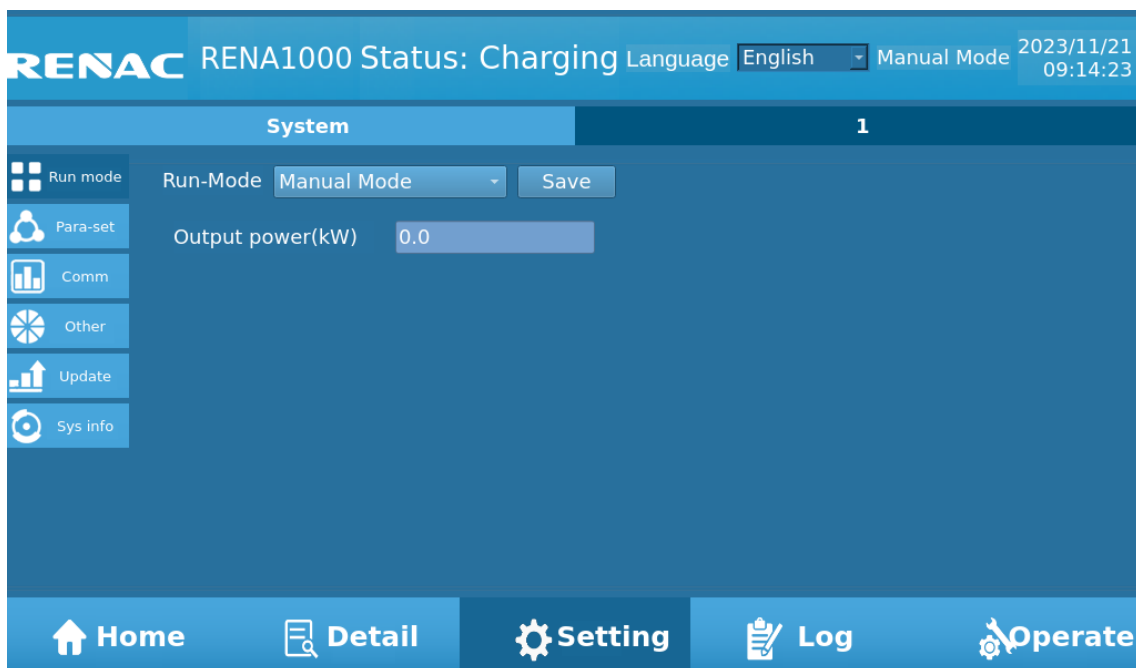


Figure 6-4 Manual Mode page

Users click "Save", and need to enter the password "888888" to save.



Figure 6-5

6.4.3 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

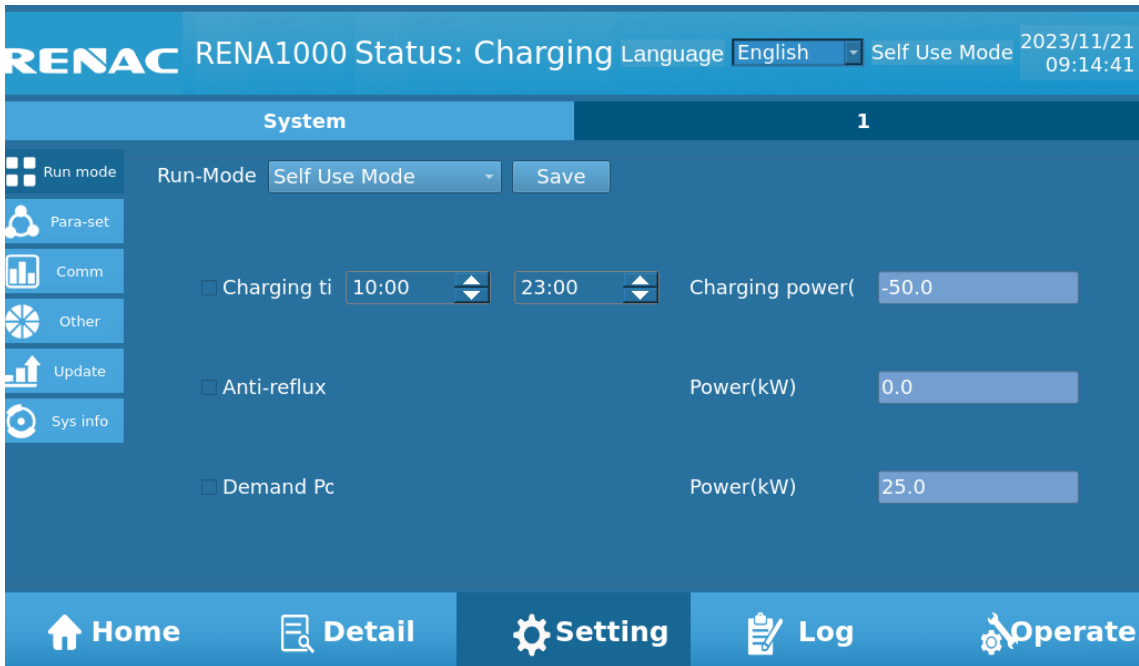


Figure 6-6 Self use page

6.4.4 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.

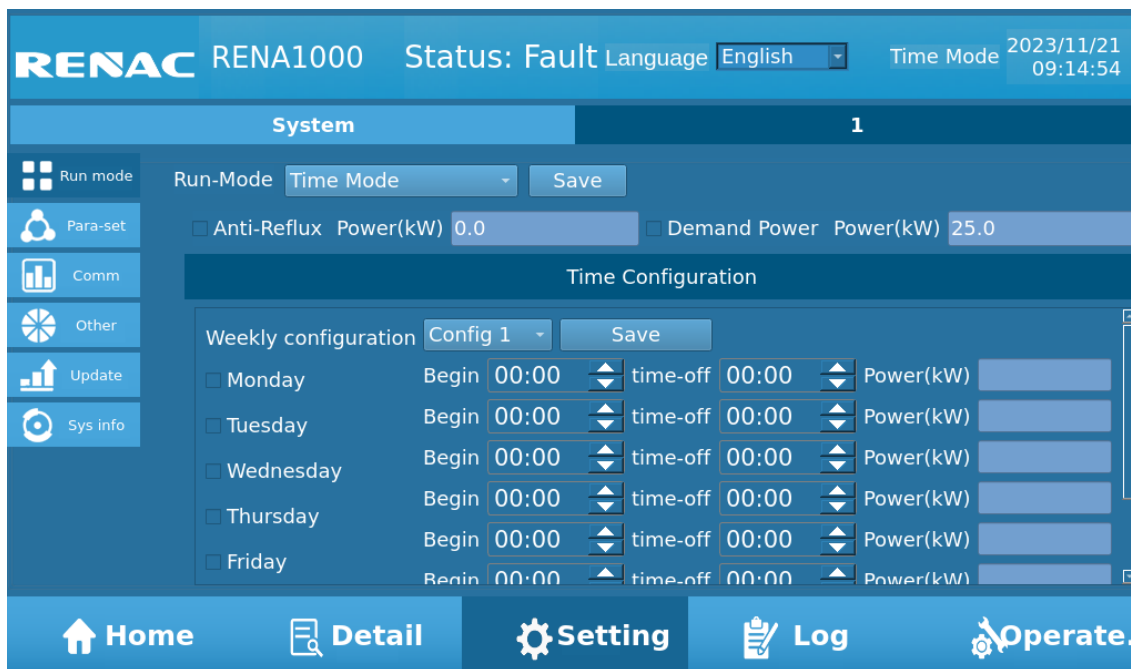


Figure 6-7 Time Mode page

6.4.5 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.

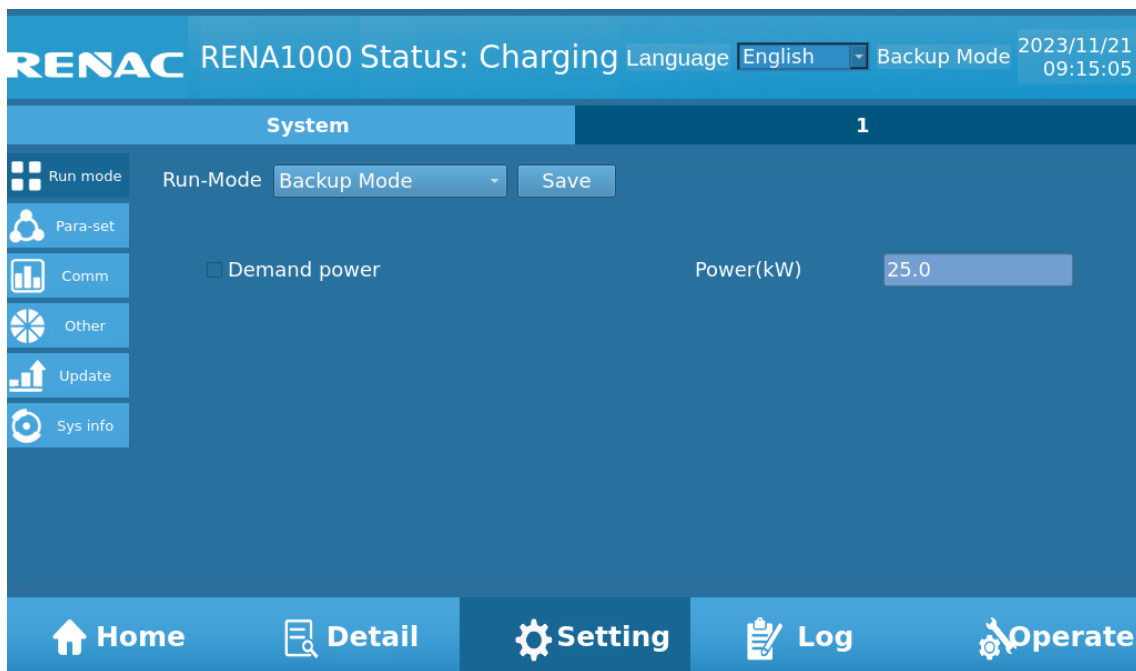


Figure 6-8 Backup Mode page

6.5 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.

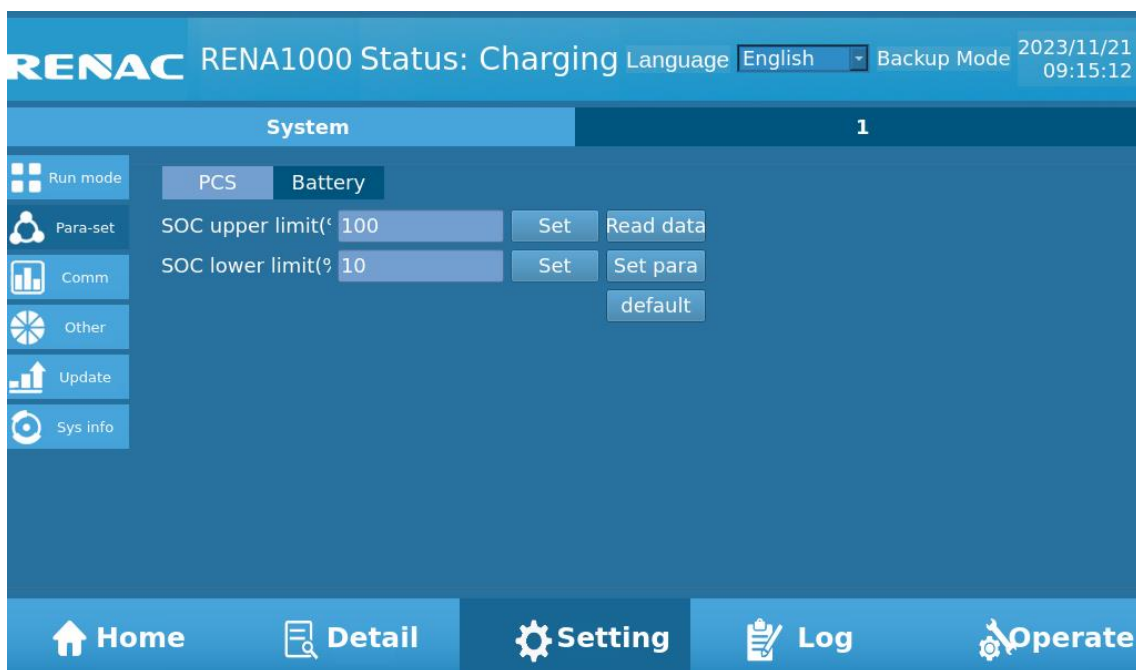


Figure 6-9 Parameter setting page



NOTE!

PCS and battery parameters are set before the energy storage system is shipped from the factory and are not recommended to be modified.

6.6 Data Viewing and Exporting

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

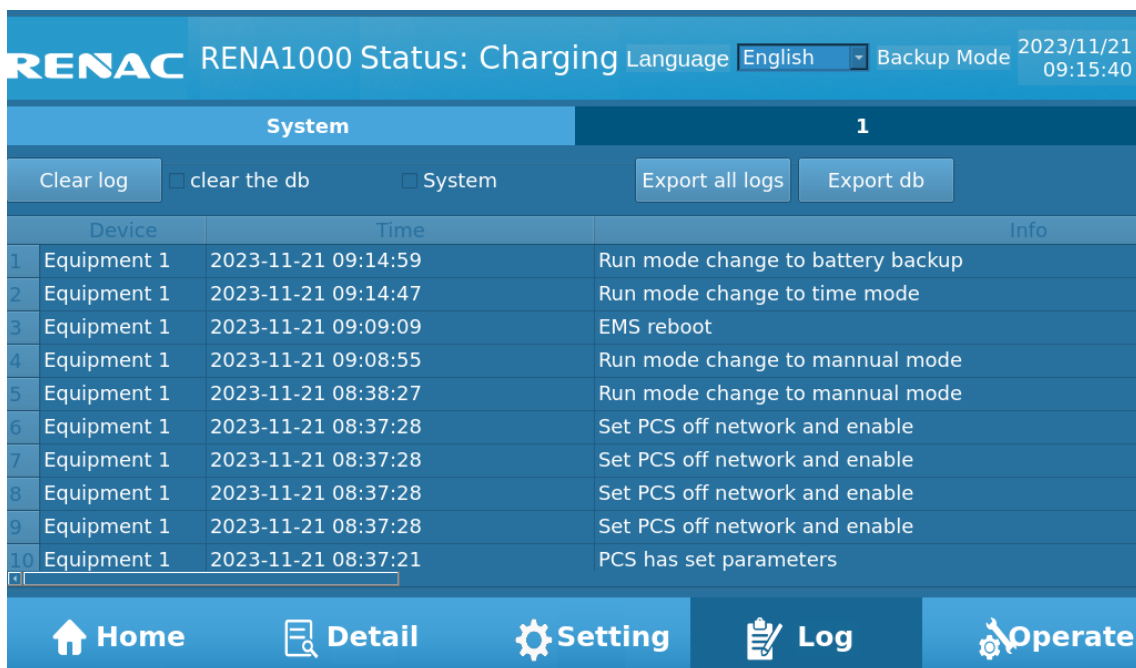


Figure 6-10 Log page

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.

6.7 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".
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.

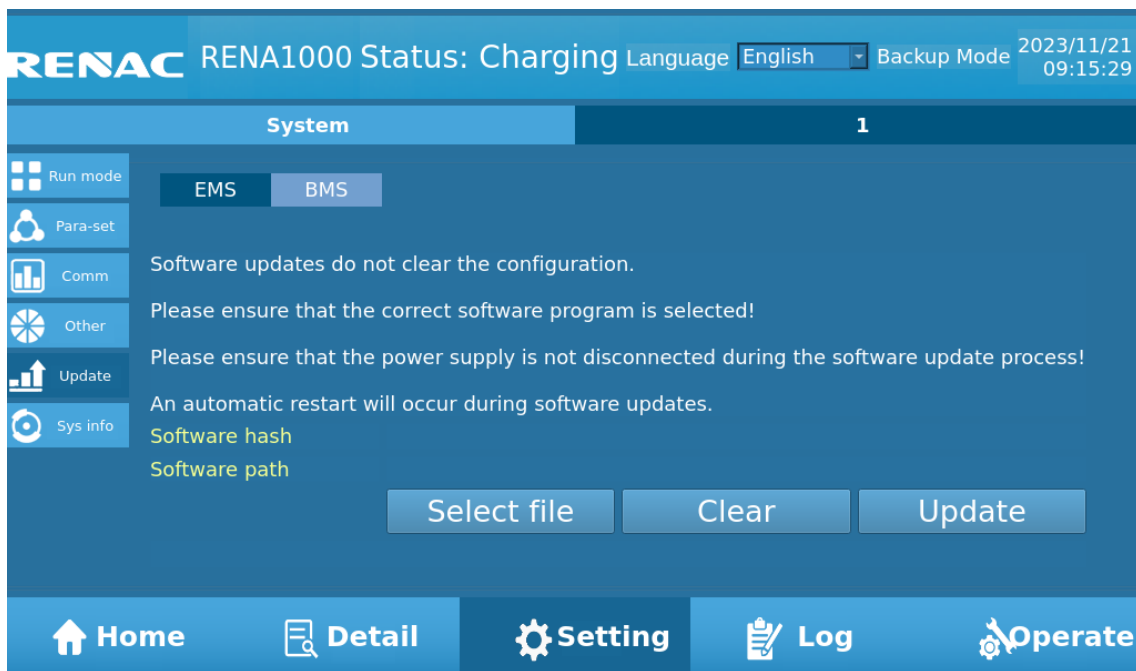


Figure 6-11 Update page

6.8 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°C (1 ~ 10°C 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 6-12 Environmental state page

7. APP Download and Operation

7.1 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 7-1

7.2 Device Registration

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

English

RENAC

Local [Forgot Password](#)

Log In

Register Demo

* Username
Enter your Username

* Email
Enter your Email address

* Password
Enter your Password

* Confirm Password
Enter confirm password

Submit

Log In

Figure 7-2

- 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.).

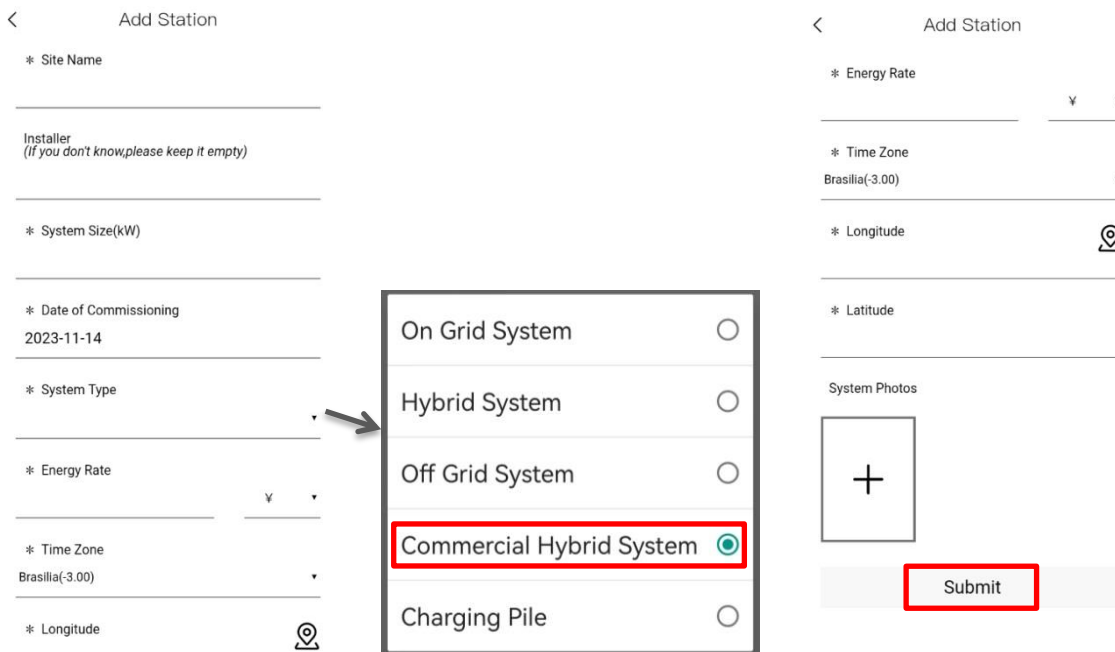


Figure 7-3

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

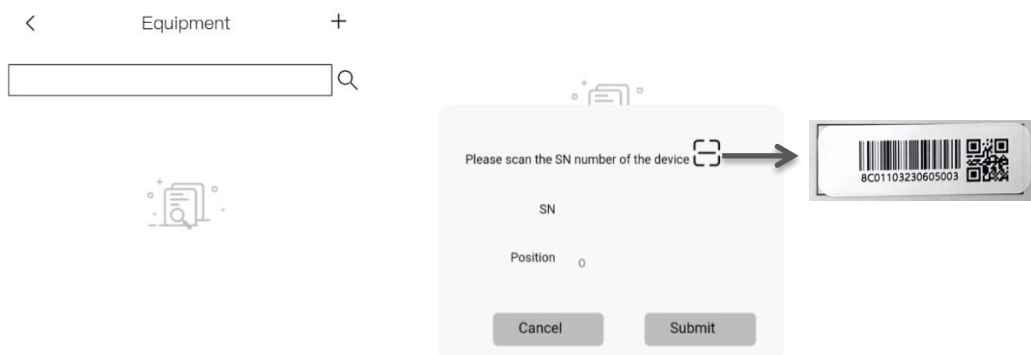



Figure 7-4

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

	<p>NOTE! The EMS needs to be restarted after the station has been successfully added.</p>
---	--

7.3 Parameter View and Run Mode Configuration

7.3.1 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 7-5

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



Figure 7-6

7.3.2 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.

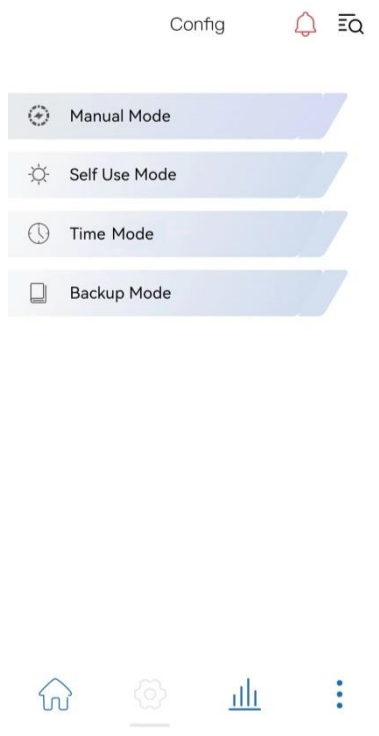


Figure 7-7 Setting page

Click "Manual Mode" to enter the settings interface.

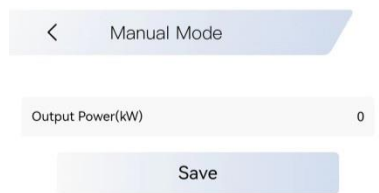


Figure 7-8 Manual mode

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

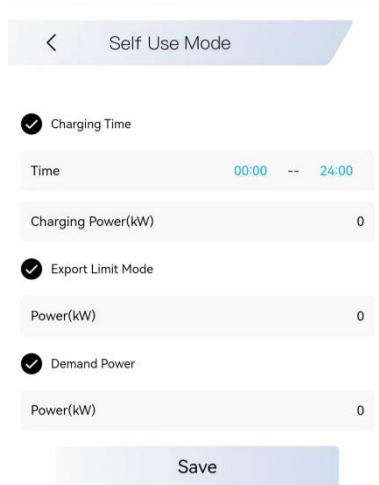


Figure 7-9 Self use mode

Click "Time Mode" to enter the setting interface.

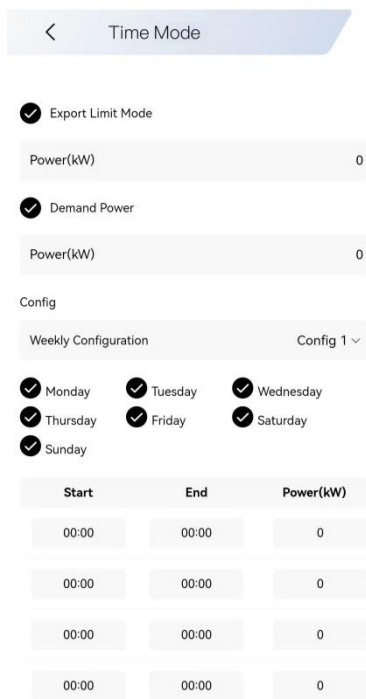


Figure 7-10 Time mode

Click "Backup Mode" to enter the setting interface.



Figure 7-11 Backup mode

8. Parallel System on Grid

When the users have larger PV panels, and 104.4kWh is not enough to meet the power supply requirements, connecting multiple energy storage systems in parallel on the AC side is recommended. The number of parallel machines is determined by the actual use, up to 5 units. The following two parallel machines are examples to illustrate. The rest of the multiple parallel machines can refer to this case and so on.

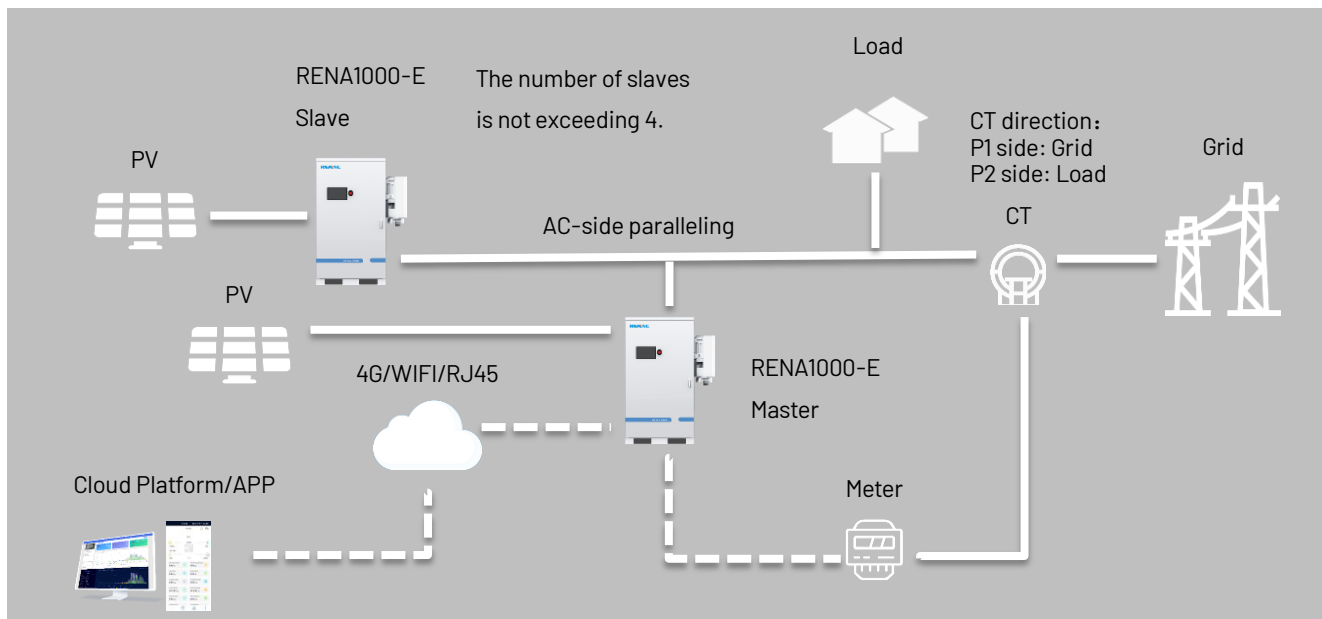


Figure 8-1 Paralleling of RENA1000

Installation steps:

- 1) Select a suitable environment and ground according to section 4.1, and the site area meets the installation distance. The installation distance is as shown in the Figure 8-2.

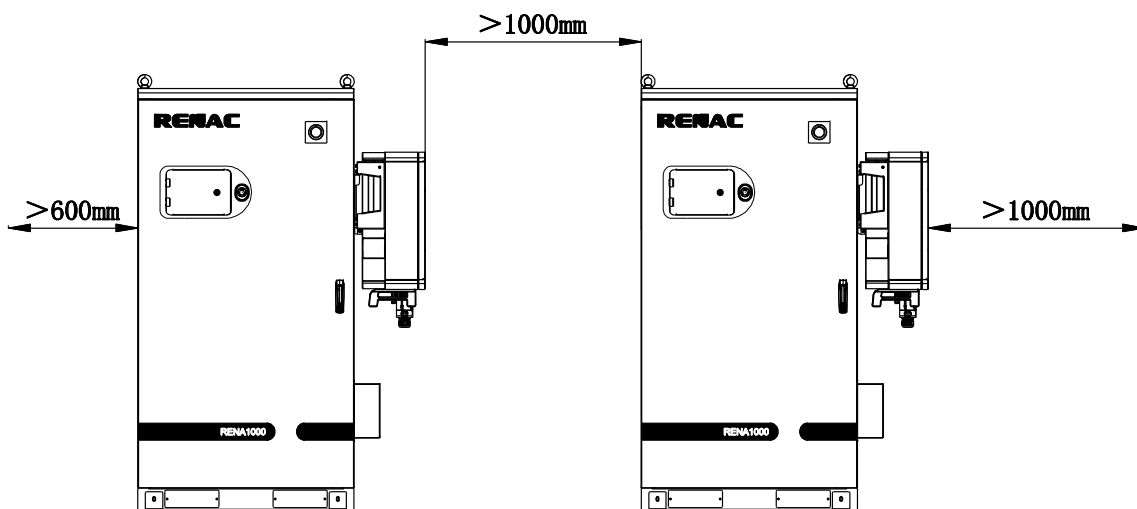


Figure 8-2 Recommended installation space for device

- 2) The installation procedure for each RENA1000-E follows the requirements described above.
- 3) Use a network cable to connect the EMS of the two energy storage systems via the LAN port.



NOTE!

The network cable should be at least 5M long if installed at the recommended distance. For the rest of the cases, please install the network cable according to the site conditions.



Figure 8-3

- 4) Set the master or slave in the communication setting screen of EMS. Refer to section 6.3.

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.
Grid overvoltage/ undervoltage fault	Grid / Tanker	Abnormal grid-connected side voltage	Check for abnormalities in the voltage on the grid-connected side.
Grid overfrequency/	Grid / Tanker	Frequency anomaly on the	Check for abnormalities in the frequency on the


underfrequency fault		grid-connected side	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	PCS	1. Load imbalance 2. Software anomalies	1. Check for loose or abnormal DC wiring; 2. Contact the manufacturer.
Busbar half-voltage unbalance fault	PCS	1. Load imbalance 2. Software anomalies	1. Check for load anomalies; 2. Contact the manufacturer.
Over-temperature derating Alarm	PCS	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	PCS	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	PCS	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	PCS	High internal temperature	1. Check for short circuits or broken wiring on the DC side; 2. Replace the PCS or contact the manufacturer.
Balanced bridge overcurrent fault	PCS	High internal temperature	1. Check for off-grid load overload; 2. Replace the PCS or contact the manufacturer.
Output overload/ overcurrent fault	PCS	AC side power / current excess	1. Check that the grid voltage is normal; 2. Check for short circuits or broken wiring on the DC side; 3. Check that off-grid loads are not exceeded; 4. Replace the PCS or contact the manufacturer.
Wave-by-wave current limiting fault	PCS	AC side current excess	1. Check that the grid voltage is normal; 2. Check that off-grid loads are not exceeded; 3. Replace the PCS or contact the manufacturer.
Communication	PCS local controller	Communications blackout	1. Check whether the communication network

Interruption malfunction			cable between modules is loose and abnormal; 2. Check whether the local controller communication network cable is loose and abnormal.
Parallel / synchronization fault	PCS	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	PCS	1. Internal relay abnormality 2. Software abnormality	1. Replace the PCS; 2. Contact the factory to replace the internal boards.
Fan 1/2/3 alarm	PCS	Internal fan abnormal	1. Replace the PCS; 2. Contact the manufacturer to replace the internal fan.
Leakage current fault	PCS	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	PCS / 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	PCS	Module-to-screen communication interruption	Check whether the communication network cable between modules is loose and abnormal.
Low DC voltage warning	PCS	Battery is not switched on	Check that the battery is switched on.

Table 8-1 Troubleshooting

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

	<p>WARNING!</p> <p>There is a deadly high voltage inside the cabinet equipment of the integrated PCS, and there is a risk of fatal electric shock if accidentally touched.</p> <p>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.</p> <p>Only qualified and authorized personnel can perform maintenance and other operations.</p>
---	--

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	<ol style="list-style-type: none"> 1. Check the appearance of the entire unit; 2. Check the vents; 3. Check the locking condition of the door. 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Check for noise and vibration; 2. Clean filters. 	<ol style="list-style-type: none"> 1. The fan and compressor rotate normally without jamming or rattling; 2. The surface of the filter is clean and not clogged.
PCS	<ol style="list-style-type: none"> 1. Check for noise and vibration; 2. Check for front panel vents; 3. Check for rear end copper row contact surfaces. 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Check the surge arresters; 2. Check the contact surface of the copper rows of the cables. 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Check for noise and vibration; 2. Check cable copper contact surfaces. 	<ol style="list-style-type: none"> 1. The battery pack fan rotates without stuttering or rattling; 2. The surface of the front panel vents is clean and free of blockages; 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.

Table 9-1 Routine maintenance work

10.2 Warranty

10.2.1 Warranty period

With proper use of the product, the warranty period agreed in the commercial contract shall prevail.

10.2.2 Warranty Coverage

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.



User Manual Download Center

www.renacpower.com

422-00223-00

SMART ENERGY FOR BETTER LIFE

RENAC

RENAC POWER TECHNOLOGY CO., LTD.

Block C-12, No. 20 Datong Road, Comprehensive Bonded Zone, Suzhou Hi-Tech District, Suzhou, China

Tel: +86-0512-66677278

info@renacpower.com

www.renacpower.com