

MANUAL



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RCTerra Class 1.0 Series 233kWh C&I Energy Storage System

Model: CESS233-100-02D



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PREFACE

Thank you for choosing the RCT Power C&I Energy Storage System!

You have purchased an innovative, high-quality product with unique features and consistently high efficiency. RCTerra Class 1.0 Series products are transformer-less, highly flexible, and robust. With this device, you will always achieve the highest possible yield from your PV system and our energy storage system.

 WARNING	The C&I energy storage system is electrical device. During installation, wiring, grid connection, operation, maintenance, and service they can cause various hazards. Please read the documents supplied with the product carefully and follow the instructions and device information to avoid material damage and personal injury.
---	--

	Keep this manual in a safe place for future reference.
---	---

1 About This Manual

1.1 Applicable Products

This document applies to the following types of energy storage systems.

- CESS233-100-02D

1.2 Validity, Purpose, Scope of this Document and Legal Regulations

This document applies to the RCTerra Class 1.0 Series products. It covers transportation and storage, mechanical installation, electrical connection, power-on and power-off operation, troubleshooting, and maintenance of the energy storage system.

Target Group

This manual is intended for operators of the power storage plant and qualified technical personnel. The RCTerra Class 1.0 cabinet must be installed only by professional technicians who meet the following requirements:

- Have received training.
- Have thoroughly read this manual and understand the safety instructions related to operations.
- Are familiar with local standards and relevant safety regulations of electrical systems.

The content of this manual is regularly updated and revised as a part of the continuous product development.

The current document version can be found at: www.rct-power.com.

We explicitly reserve the right to make technical changes which improve the device or increase its safety standard. These changes do not require a separate notification. RCT Power is not liable for damages resulting from the use of this document.

This manual does not supersede existing laws, regulations, rules, standards or conventions.

The warranty conditions are enclosed with the device. No further warranty claims can be derived from this document.

1.3 Explanation of Symbols and References

It is important to follow the references in this manual during the installation, operation, and maintenance of the storage cabinet. The table below shows the warning signs and symbols used in the manual.

Symbols and References	Description
 DANGER	This symbol indicates a direct imminent danger. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property.
 WARNING	This symbol indicates a direct imminent danger of medium risk. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property.
 CAUTION	This symbol indicates a direct imminent danger of low risk. If the safety regulations are not observed, it might result in minor or moderate material damage.
 NOTICE	This symbol indicates a potentially hazardous situation which, if not avoided, could result in material damage to equipment or property.



This symbol indicates important information and hints. They will help you to better understand the functionality of the cabinet.



This symbol indicates that the user manual must be read and understood before the device is put into operation.



HIGH VOLTAGE WARNING! Indicates hazardous high voltages are present, which, if not avoided, will result in death or serious injury. Thus, only authorized and trained personnel should install and/or maintain this product.



After disconnecting the electrical connections, wait a minimum of 10 minutes before opening the unit.



Hot surface!



Equipment grounding conductor (PE).



This product must not be disposed of as normal household waste.



TUV certified

1.4 **Abbreviations**

It is important to follow the references in the manual during the installation, operation, and maintenance of the storage cabinet. The table below shows the warning signs and symbols used in the manual.

Complete designation	Abbreviation
Commercial Energy Storage System	CESS
Power Conversion System	PCS
Battery Management System	BMS
Energy Management System	EMS
Uninterruptible Power Supply	UPS
Battery Monitoring Unit	BMU

2 Safety Instructions

2.1 Personnel and Qualifications



The cabinet and the battery must only be installed, wired, connected, commissioned, and serviced by qualified personnel to prevent material damage or personal injury.

The cabinet and the battery must only be installed, wired, connected, commissioned, and serviced by qualified personnel to prevent material damage or personal injury. Qualified personnel authorized to perform the tasks described in this manual must have the following skills and technical expertise:

- The hoisting, transportation, installation, wiring, operation, and maintenance of the energy storage system must be carried out by professional electrical technicians in accordance with local regulations.
- Technicians should have knowledge of electronic, electrical wiring, and mechanical expertise, and be familiar with electrical and mechanical schematics.
- They should be familiar with the composition and working principles of the energy storage system and its front and rear-access equipment.
- They must have received professional training related to the installation and commissioning of electrical equipment.
- They must be able to quickly respond to hazards and emergencies that occur during installation and commissioning.
- They should be familiar with the relevant standards and specifications of the country/region where the project is located.

2.2 Electrical Safety

The RCTerra Class 1.0 Series products were developed and tested in strict accordance with international safety regulations.

All safety instructions relating to electrical and electronic equipment must be complied with during installation, operation and maintenance.



Danger to life or serious injury due to electric shock!

- When the cabinet is connected to the power grid, the cables and components inside the cabinet generate high voltage.
- Before electrical connection, ensure that the device is not damaged; otherwise, electric shock or fire may occur.
- Qualified personnel must perform any work that involves wiring, connecting or opening the cabinet case.
- Important: Before performing any electrical work, it is necessary to ensure that the devices and systems in the energy storage integrated system are completely free of power.
- Touching the power grid or the contact points and terminals in the devices connected to the power grid may lead to electric shock.
- The battery side or the power grid side may generate voltage. Always use a multimeter to ensure that there is no voltage before touching.
- Lethal voltages are present inside the product!
 - Note and observe the warnings on the product.
 - Respect all safety precautions listed in these manual and other pertinent documents.
 - Respect the protection requirements and precautions of the lithium battery.
- When installing, maintaining, and repairing the device, ensure that:
 - To disconnect the battery voltage. To turn OFF the battery voltage, you must turn off the voltage source (AC / mains) and turn the isolation switch handles of the switch gears to "OFF" position to turn off the battery DC voltage.
 - Disconnect the MCCB to cut off the supply voltage (AC) and do not reconnect until the work is complete.

	■ Electricity may still exist in the battery when the power supply of the system is disconnected. Wait 10 minutes to ensure the equipment is completely voltage-free before any operation. ■ Ensure that other persons stay away from cables and internal components. ■ Do not open the door while the device is in operation. ■ Do not open the rear guard plate of the electrical room while the device is under operation.
--	--

 WARNING	Risk of injury due to electric shock! ■ Installation, service and maintenance work must only be carried out by a qualified electrician. ■ Only power on again after all electrical work has been completed. ■ All hoisting, transportation, installation, wiring, operation, and maintenance must be carried out complying with the relevant codes and regulations of the country where the project is located. ■ Hazardous Voltage Circuits. ■ To Reduce the Risk of injury, read all instructions. ■ Risk of Electric Shock or Serious Injury. Care shall be taken when entering enclosure- Authorized personnel only.
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 CAUTION	Risk of burns on hot parts of the device. ■ During standard operation of the device, some parts of the device can become hot. ■ Use care when touching the housing while the device is operating.
---	--

 NOTICE	■ All electrical installations must be carried out in accordance with local and national standards and guidelines. ■ Contact your local energy supplier or grid operator before connecting the energy storage system to the grid. ■ Ensure that electrically conductive surfaces of the entire energy storage system are grounded to prevent personal injury. ■ A malfunction can impair cabinet safety. Do not operate or start the energy system if it shows visible damage or if the displayed error message is unclear. ■ The cabinet does not contain any parts to be serviced by the owner. Please contact qualified personnel locally for servicing work on the energy storage system. ■ Only use devices and accessories approved by the manufacturer. Do not make any changes to the device. Do not remove the type plate. ■ Post prominent warning signs around the project location to prevent accidents caused by false switching. ■ Place necessary warning signs or barriers near the product.
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2.3 **Battery Safety**

For safe use of the product, the technician should carefully read and strictly observe the safety requirements. The company shall not be liable for product functional abnormality, component damage, personal safety accident, property loss, or other damage caused by the following reasons:

- The batteries are not charged as required, resulting in capacity loss or irreversible damage to the batteries.
- A battery is damaged, falls, or leaks due to improper operations or failure to operate the battery as required.
- The batteries are not powered on in time, which causes damage to the batteries due to over discharge.
- The damage is caused to batteries due to the use of improper equipment for charging and discharging.
- Batteries are frequently over discharged due to improper maintenance, capacity is incorrectly expanded, or the batteries have not been fully charged for a long time.
- Battery operation parameters are incorrectly set.
- Damage is caused to batteries because the battery operating environment does not meet the requirements.

- The customer uses the batteries beyond the scenarios specified in this manual, including but not limited to connect extra loads.
- Batteries are not maintained based on the system manual.
- The product is damaged due to the customer's continued use of batteries beyond the warranty period.
- The product is damaged due to the use of defective or deformed batteries.
- Use batteries provided by the company with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property loss are caused due to storing or installing batteries with flammable/explosive materials.
- Personal safety accidents and property loss are caused by battery-related operations performed by non-professional personnel, or by not wearing qualified protective equipment during operations.
- The battery is damaged due to eating, drinking, smoking and other behaviours near the battery.
- Batteries are stolen.

2.4 Electric Arc Protection



WARNING

To avoid unnecessary injury and device damage, strictly follow the instructions in this manual.

If not properly operated, it may cause arc hazards, and may even cause fire, explosion and other risks. RCT is not responsible for arcing, fire, explosion and other accidents caused by failure to operate according to the machine identification or product manual.

The following improper operation may cause arcing, fire, explosion and other hazards inside the device. And always remember that in the event of an accident, it must be handled by qualified professionals. Improper operations for existing accidents may cause a wider range of failures or accidents.

- Plug and unplug DC high-voltage fuses of each device on power.
- Touch the uninsulated end of a potentially live cable.
- Touch wiring bars, terminals, or other parts inside the device that may be live.
- The power cable is improperly connected.
- Parts such as screws fall into the power module.
- Incorrect operation by unqualified operators without training.

Before operating the equipment, assess whether there is an arc risk in the operating area. If there is a risk of arcing, you need to:

- Operators must receive safety training in advance.
- Try to assess the area where the shock is likely to occur.
- Before operating in a possible electric shock area, you must wear the required protective clothing.

2.5 Protective Tools

Special protective equipment must be used during operation, such as wearing protective clothing, insulating shoes, goggles, and insulating gloves.

Item	Name and Graphics			
Protective tools				
	Insulating gloves	Protective clothing	Goggles	Insulating shoes

2.6 Nameplate and Stickers

 C&I ENERGY STORAGE SYSTEM	
Model	CESS233-100-02D
Manufacturer	Suzhou RCT Power Energy Technology Co., Ltd.
Date of Manufacture	
Serial Number of Unit	
Battery Chemistry	LiFePO ₄
DC Voltage Range	715~928.2 Vd. c.
Max.Storage Capacity/Nominal Voltage	233kWh / 832Vd. c.
Output/input Voltage/Frequency	480Va. c. (3L/N/PE) / 60Hz
Output/input Current/Power	150Aa. c. Max / 125kVA Max
Aux.Power Voltage/Current/Frequency	277Va. c. / 16Aa. c. Max / 60Hz
Protection Class	I
IP Code	IP54(Battery Room IP55) / TYPE 3R
Dimensions(mm)/Weight	W1600xH2200xD1300 / 3.2T
Operating Temperature Range	-25~45°C










Rechargeable Lithium-Ion Battery Rack 
Product Name: C&I Energy Storage System Battery Rack Model: RACK-233L1D-UL Battery Designation: IFpP/73/175/208/[((13S)4S)5S]E/-10+50/90 Nominal Voltage: 832 Vd.c. Rated Capacity: 280 Ah Rated Energy: 232960 Wh Operating Voltage Range: 715~928.2Vd.c. Maximum Charging Power: 116480W Maximum Discharging Power: 116480W Ingress Protection: IP20 Protective Class: I Operating Temperature Range: -20~45°C Maximum Short Circuit Current And Duration Time: 15kA/2ms
   
Suzhou RCT Power Energy Technology Co., Ltd

 DANGER	
NOTES: - Disassembly or modification is prohibited without the maintenance personnel; - Do not drop, impact, cut, deform or spearing with a sharp object; - Do not place at a children or pet touchable area; - Keeping away from the source of fire to avoid fire or explosion; - Prohibit spraying, trampling, hitting and destroying, so as not to cause corrosive chemical leakage, fire or explosion; - Please read the maintenance manual or instructions carefully before maintenance; - Please wear protective equipment as required before maintenance or replacement	         

POWER CESS PACK 47L1D

Part Number: 20100060



20100060-XX-XX-XXXXXX

Rechargeable Lithium-Ion Battery



IFpP/73/175/208/[(13S)4S]E/-10+50/90

Product Name: C&I Energy Storage System Battery Pack

Model: POWER CESS PACK 47L1D

Nominal Voltage: 166.4 V

Rated Capacity: 280 Ah

Rated Energy: 46592 Wh

Maximum Charging Power: 23296W

Maximum Discharging Power: 23296W



Suzhou RCT Power Energy Technology Co., Ltd



CAUTION

**Keep Doors Close
Do Not Operate Under Load**

 DANGER			
	Arc Flash and Shock Hazard		
	Arc Flash Boundary	1.19 m	
	Incident Energy(cal/cm ²)	3.5	
	Working Distance	61.0 cm	
	Level 1		
	Shock Hazard Voltage	480 V	
	Limited Approach	1.07 m	
Restricted Approach	0.30 m		
Prohibited Approach	0.03 m		

WARNING		AVERTISSEMENT
DO NOT OPEN UNDER LOAD NE PAS MANOEUVRER EN CHARGE		

	Warning! High leakage currents. It is essential to establish an earthing connection before connecting to the power supply circuit (AC mains)!
---	--

	Warning fire.
---	----------------------

	Hight voltage inside! Risk of electric shock by touching it.
---	---

	TUV Rheinland certified.
---	---------------------------------

	Pay attention to corrosion.
---	------------------------------------



No fire.



No stepping on the surface.



This symbol indicates that the user manual must be read and understood before the device is put into operation.



Wear protective goggles before operating.



Wear protective gloves before operating.



Do not dispose of this product as household waste.



This product is recyclable.

3 Product Presentation

3.1 Product Introduction

RCTerra Class 1.0 Series product is a commercial & industrial sized energy storage system (CESS). It is an all-in-one solution rated for outdoor installations. It uses liquid-cooled, lithium iron phosphate (LFP) batteries, which are installed inside a compact cabinet together with the necessary safety instrumentation and other accessories. The all-in-one design of RCTerra Class 1.0 Series results in very short installation time. The modular and scalable design leads to unique flexibility for precise project sizing. During a grid outage, the RCTerra Class 1.0 Series product can be manually switched to backup mode to keep your production line or critical loads safely running (The AC bus must be disconnected to the grid before you turn back on manually).



Fig. 3-1 Product pictures

3.2 System Solution

The energy received from the connected solar generation is stored in the battery and is then converted into grid-compliant AC current to feed into the facility or back to the grid, dependent upon the interconnect agreement.

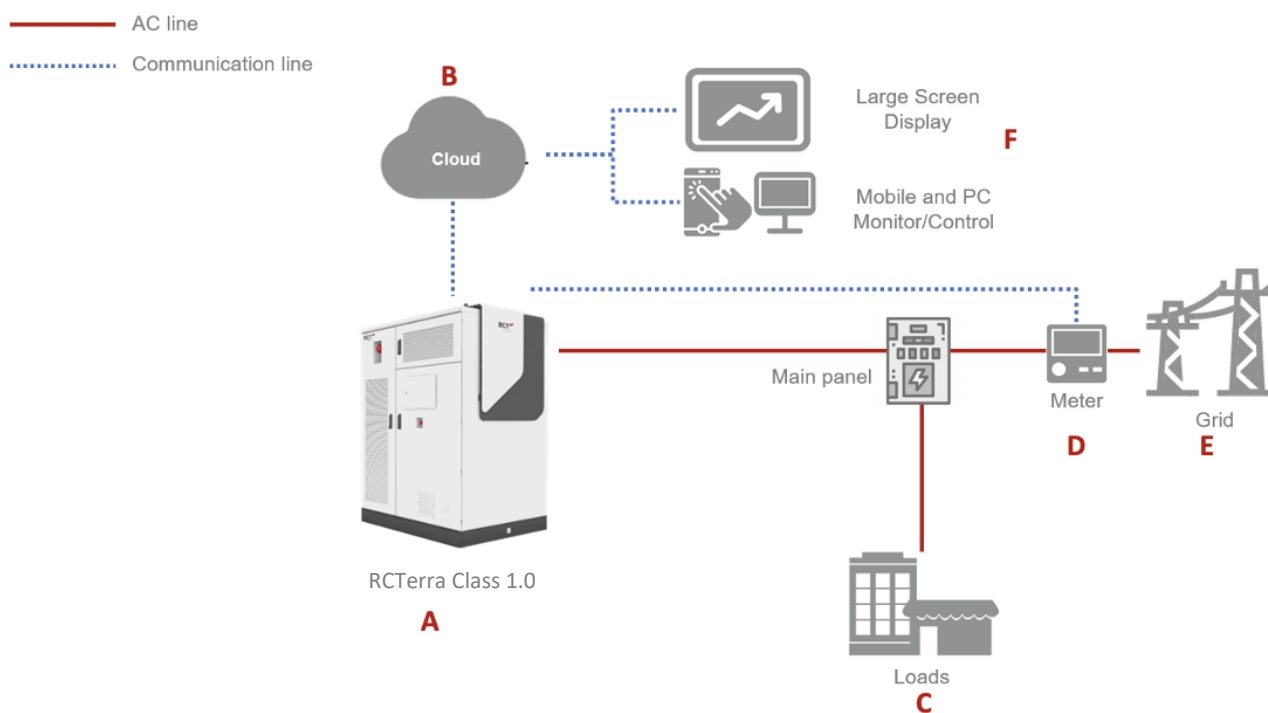


Fig. 3-2 Intended use of RCTerra Class 1.0 cabinet

Item	Description	Comment
A	C&I Energy Storage System	CESS233-100-02D
B	Cloud	Energy cloud data storage platform.
C	Loads	Loads which are not necessary to be fed with electrical energy during grid outage.
D	Power Meter	Collect AC power measurements.
E	C&I Public Grid	480V, 3-phase, L1/L2/L3/N.
F	HMI	Energy data display and function control.

3.3 Work Mode

There are three work modes of system, Backup-only, Self-Consumption and T.O.U.

3.3.1 Backup-only

In this mode, customer could set a minimum SOC 60% manually. Our System should ensure there is enough capacity in our product to face the next load shedding (grid outage) period.

3.3.2 Self-consumption

The PV inverter at the customer's site can be used to charge the cabinet.

In this mode, the PV energy is preferentially used by local load (main load and backup load) to improve the self-consumption rate and self-sufficiency rate. The battery is automatically charged and discharged to meet consumption needs and reduce the amount of electricity purchased from the grid.

1) Load priority: Load consumption -> charging the battery -> feeding to the grid

When the PV energy is sufficient, first supply power to the load, then charges the battery, finally feed to the grid.

2) Power priority: PV -> battery -> grid

The PV energy is as the main energy to supply the load, if the PV energy cannot satisfy the needs of local load, then the battery will discharge to the load, and finally use the power from GRID.

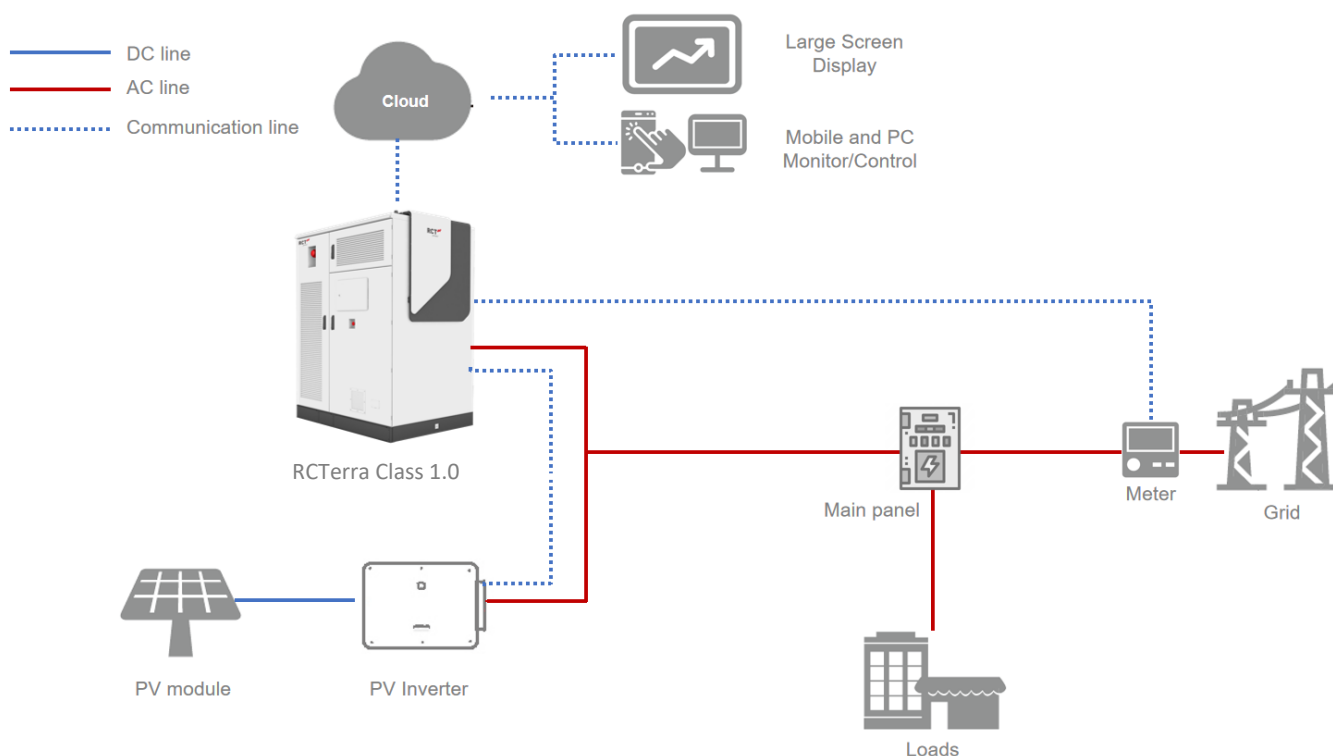


Fig. 3-3 Self-Consumption mode

3.3.3 T.O.U

In this mode, users can manage the energy according to their needs, and set a daily regular charging and discharging profile that is configurable on the app. The system operates according to a Time-of-use (T.O.U) arbitrage profile, in which the battery is charged from the grid when tariffs are low, and discharged when tariffs are high.

3.4 Product Specification

3.4.1 Scope of Supply

The condition of the product is inspected before shipment to ensure conformance with RCT Power quality standards.

Despite careful packaging, transport damage can occur. The transport company will typically need take responsibility for this damage, assuming Ex Works Incoterms govern the order.

Please inform the transport company immediately if upon inspection, there is any damage to the packaging or the product. The local RCT Power team will be happy to assist you if necessary.

Do not install, wire, or operate the product if any damage has been detected.

Check the contents of the shipment for completeness in accordance with below.



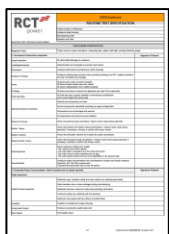
1 x RCTerra Class 1.0 cabinet



5 x MSD (Manual Service Disconnect) *



1 x User manual document



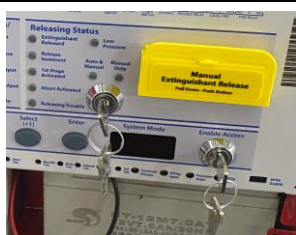
1 x Test report



1 x Point-touch Pen of EMS



1 x Door key



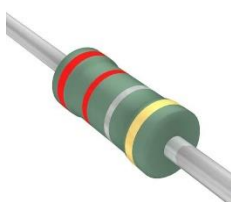
1 x Keys of FSS Sigma



4 x Lifting rings



5 x Fuse 6.3A



* For the protection and safety of technicians who repair a RCTerra Class 1.0 product in high voltage environments or to be able to respond to sudden or fault events, the connection of the battery DC high voltage circuit can be quickly isolated via the MSD device, so that the maintenance and other work is in a safe state.

3.4.2 External Description

Cabinet Appearance

The appearance of CESS 233-100-02D cabinet is shown as below:

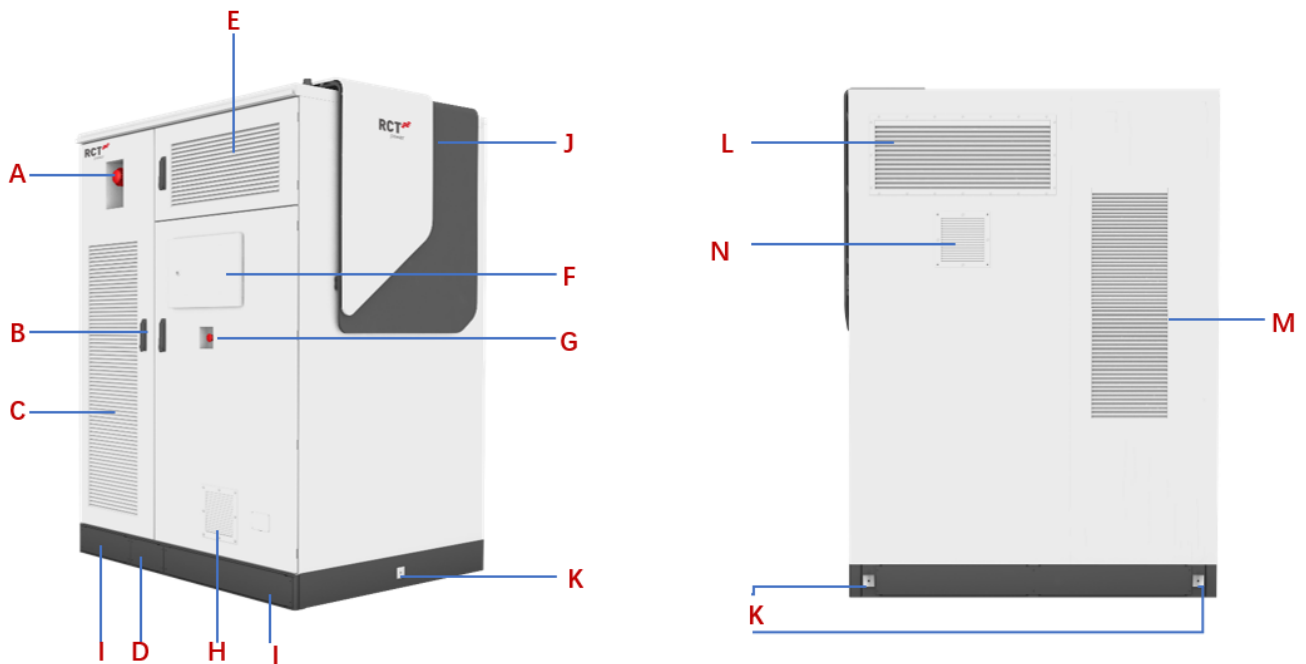


Fig. 3-4 Cabinet appearance

Item.	Description
A	Strobe and siren
B	Door lock
C	Air intake grill
D	Water inlet
E	Chiller air outlet grill
F	Touch panel cover
G	Emergency stop button
H	Exhaust fan intake
I	Forklift hole
J	Label plate
K	Grounding point
L	Chiller air intake grill
M	Air outlet grill
N	Exhaust fan outlet

3.4.3 Mechanical Parameters

Dimensions of cabinet are shown as below:

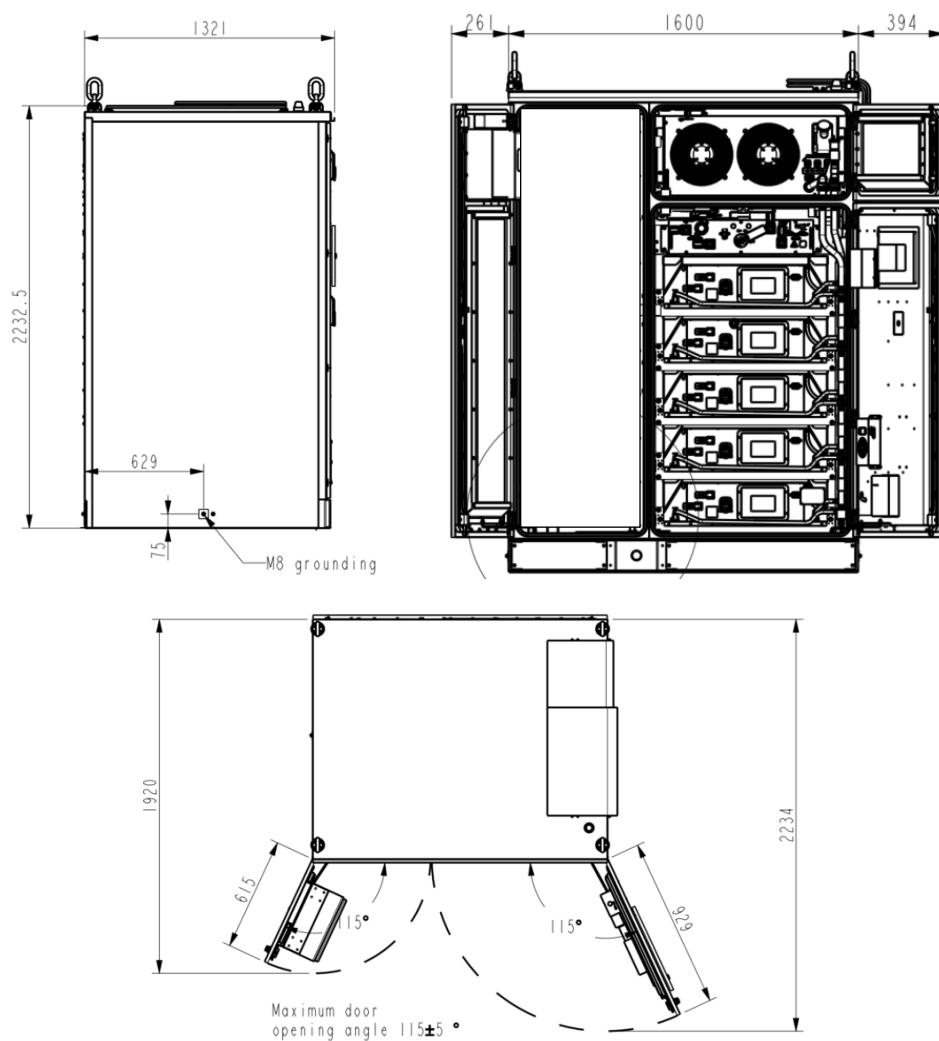


Fig. 3-5 Cabinet dimension

3.4.4 Ventilation Design

- The electrical enclosure intakes air from front and expels it from the back side.
- The chiller enclosure intakes air from the back side and expels it from the front side.

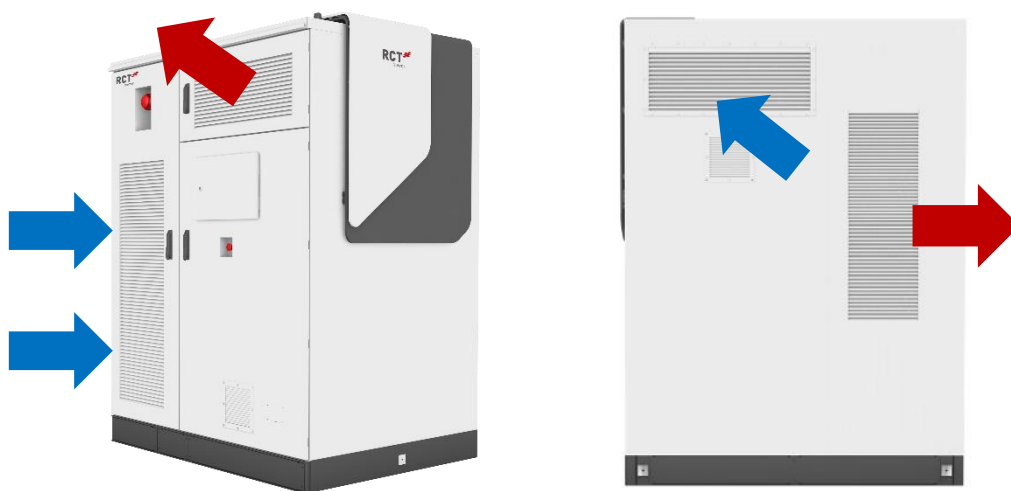


Fig. 3-6 Cabinet ventilation

3.4.5 Internal Design

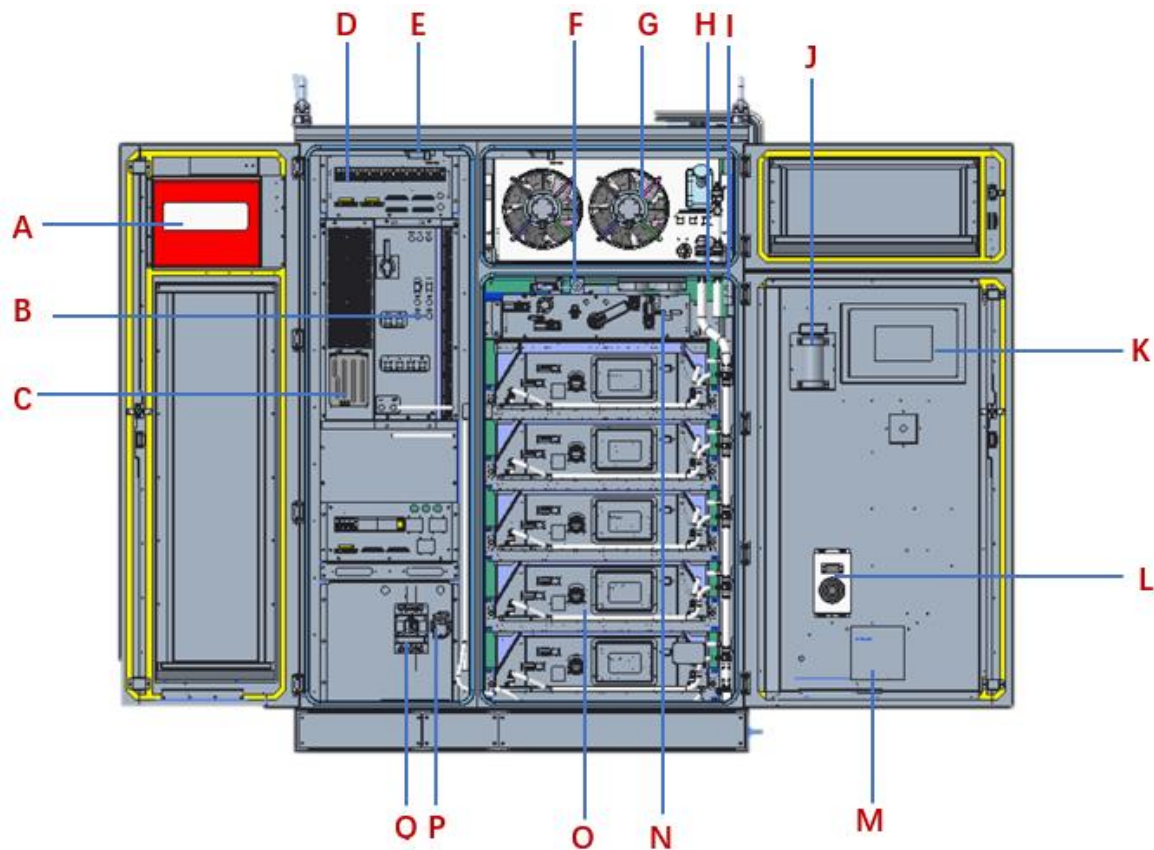


Fig. 3-7 Cabinet interior view

Item.	Component	Comments
A	Fire control panel	x 1
B	AC/DC inverter	x 1, AC/DC inverter module
C	UPS	x 1
D	Illumination	x 1
E	Door switch	x 2
F	H2 detector	x 1, Detect flammable and explosive gas
G	Chiller	x 1
H	Smoke detector	x 1
I	Temperature detector	x 1, Monitor the temperature inside the cabinet
J	Aerosol fire suppression	x 1
K	Touch panel	x 1, EMS platform
L	Dehumidifier	x 1
M	Exhaust fan	x 2, One is on the front and one is on the back side, Get rid of flammable and explosive gas.
N	Switch gear	x 1
O	Battery pack	x 5, 1P52S, 46.59kWh per pack
P	Grid neutral bus bar	x 1
Q	Grid connection MCCB	x 1, 3P, L1/L2/L3

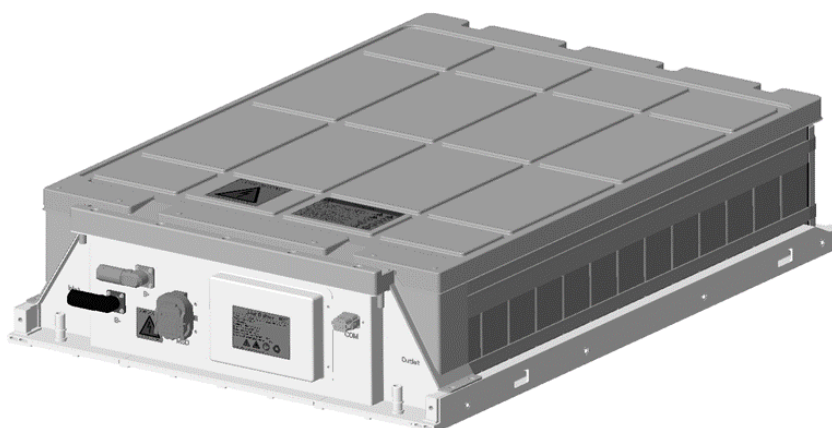
3.4.5.1 Cell Introduction



Parameter	Value
Size (T x H x W)	71.7 ± 0.8 mm * 207.2 ± 0.8 mm *173.9 ± 0.8 mm
Weight	Max. 5.70kg
Cell type	Prismatic aluminium shell LFP
Rated capacity	280Ah
Rated voltage	3.2Vdc
Rated capacity	280Ah
Rated energy	896Wh
Voltage range	2.5~3.65Vdc

3.4.5.2 Battery Pack introduction

The LFP battery module is mainly composed of cells in series. The dedicated cells are used for battery management. Control commands are received by means of daisy chain communication, and the collected data is reported.



Parameter	Value
Model	POWER CESS PACK 47L1D
Structure	1P52S
Cell type	Prismatic aluminium shell LFP
Voltage range	143 Vdc~166.4 Vdc~185.64 Vdc (Actual Operation Voltage Range Of Battery Cell: 2.75Vdc~3.57Vdc)
Rated voltage	166.4Vdc

Rated capacity	280Ah
Rated energy	46.592kWh
Cooling method	Liquid cooling
Delivery capacity	30% SOC
Standard charge/discharge rate	0.5P
Operating temperature range	-20~45°C
Dimension	W 810 x L 1106 x H 245 mm
Weight	322 ± 3 kg
Application altitude	2000m

3.4.5.3 AC/DC Inverter Module



Parameter	Value
Operating voltage range (DC connection)	700~1000 Vdc
Power Rating	125 kW
Rated AC current	150 A
AC line voltage	480 Vac (-15%~10%)
Rated Grid Frequency	60Hz
Rated AC line voltage	480 Vac, 3P/N/PE
Cooling Function	Liquid-cooling

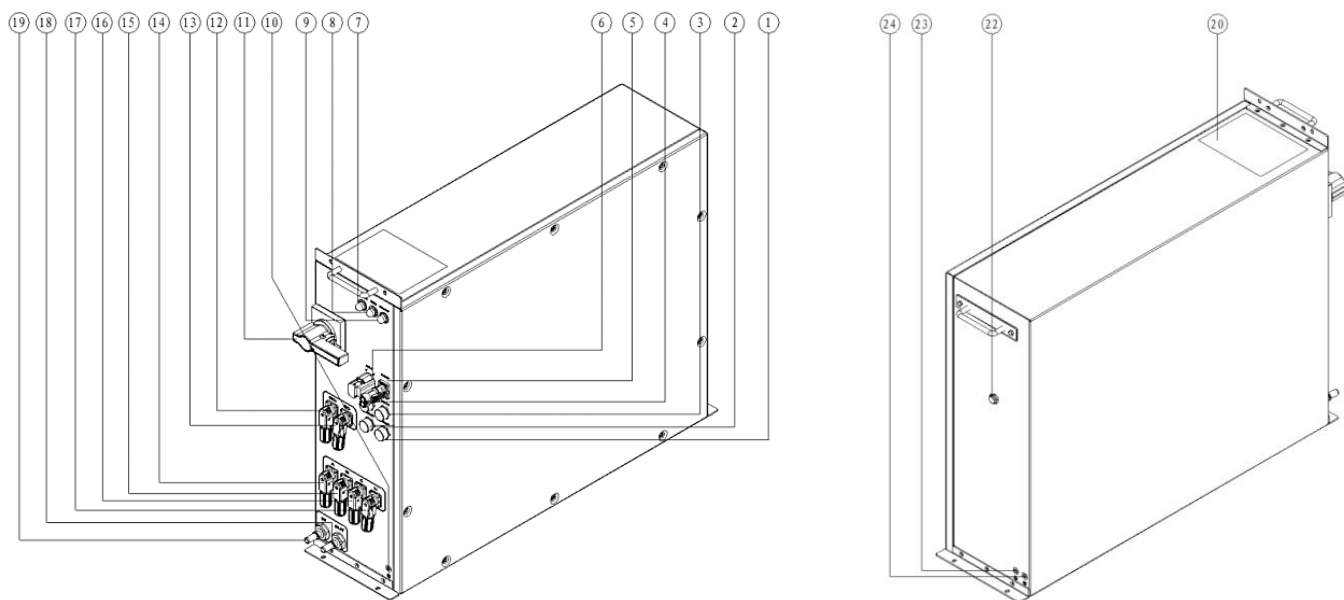
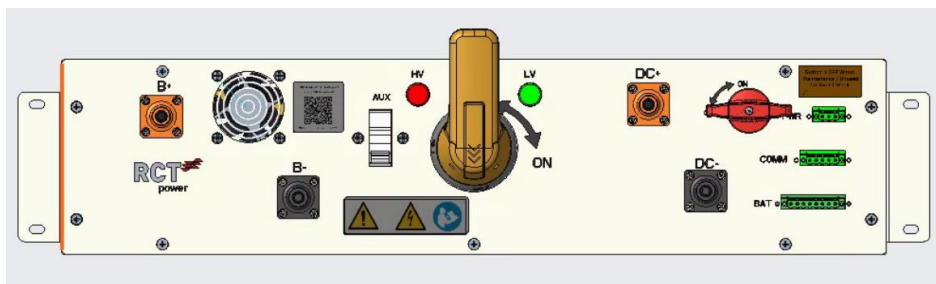


Fig.3-8 PCS Port Identification

No.	Name	Instructions
1	COM6	Ethernet (reserved)
2	COM5	EMS Ethernet interface
3	COM4	Port 2 on the parallel network
4	COM3	Port 1 on the parallel network
5	COM2	High voltage output port (optional)
6	COM1	Communication and DIO signal interface
7	Power indicator light	When the DC side is powered on, the DC indicator is steady on
8	Running light	The green indicator is steady on in running mode and blinking in standby mode at a frequency of 1s.
9	Fault light	When there is a fault, the red fault light is steady on. When there is no fault, the red fault light is not on.
10	Ground point of the front panel	The ground resistance is less than 0.1Ω and the wire diameter is 35mm^2 .
11	DC isolation switch handle	Isolate and break the battery voltage. Do not break the battery with power.
12	DC plug DC+	Connect the battery or the positive terminal of the high voltage switch box.
13	DC plug DC-	Connect the battery or the negative terminal of the high voltage switch box.
14	AC plug A	The AC side outputs phase A.
15	AC plug B	The AC side outputs phase B.
16	AC plug C	The AC side outputs phase C.
17	AC plug N	The AC side outputs phase N.
18	Coolant outlet	Coolant output port
19	Coolant inlet	Coolant input port
20	Equipment nameplate	Manufacturer product information
21	Locating pin	For mounting and fixing (vertical structure without dowel).
22	Breather valve	Adjust the air pressure in the module.

23	Ground point 1 on the rear panel	The ground resistance is less than 0.1Ω and the wire diameter is 35mm ² .
24	Ground point 2 on the rear panel	The ground resistance is less than 0.1Ω and the wire diameter is 35mm ² .

3.4.5.4 Switch Gear(Including BMS module)



Parameter	Value
Rated voltage (V)	1500V
Rated current (A)	140A
Protection level	IP67
Temperature range	-40~120℃
Humidity range	5~95%
Salt spray resistance	96H
Altitude (m)	2000
Size (mm)	D470 x W731 x H156
Weight (kg)	30

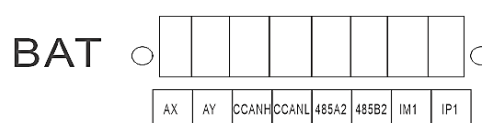
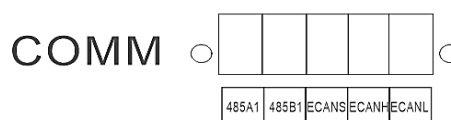
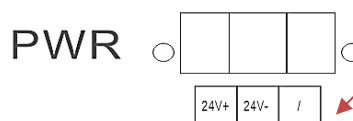
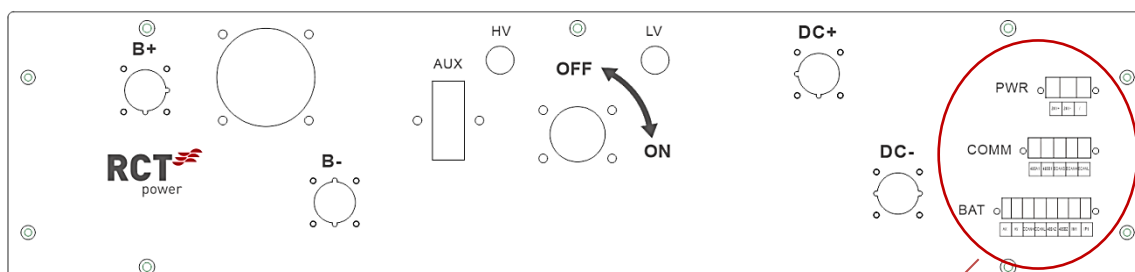


Fig.3-9 Switch Gear Port Identification

Name	Instructions
B+	High voltage input, connected to the positive terminal of the battery pack.
B-	High voltage input, connected to the negative terminal of the battery pack.
P+	High voltage output, connected to PCS bus positive.
P-	High voltage output, connected to PCS bus negative.
PWR	24V power input, connected to an uninterruptible power supply.
BAT	Battery communication, connected to battery COM.
COMM	External communication, connected to the main control EMS.
AUX	24V control power input.
HV	Bus high voltage status indicator light.
LV	Control power status indicator light.
ON/OFF	Isolation switch operation.

3.4.5.5 Fire Control Pannel

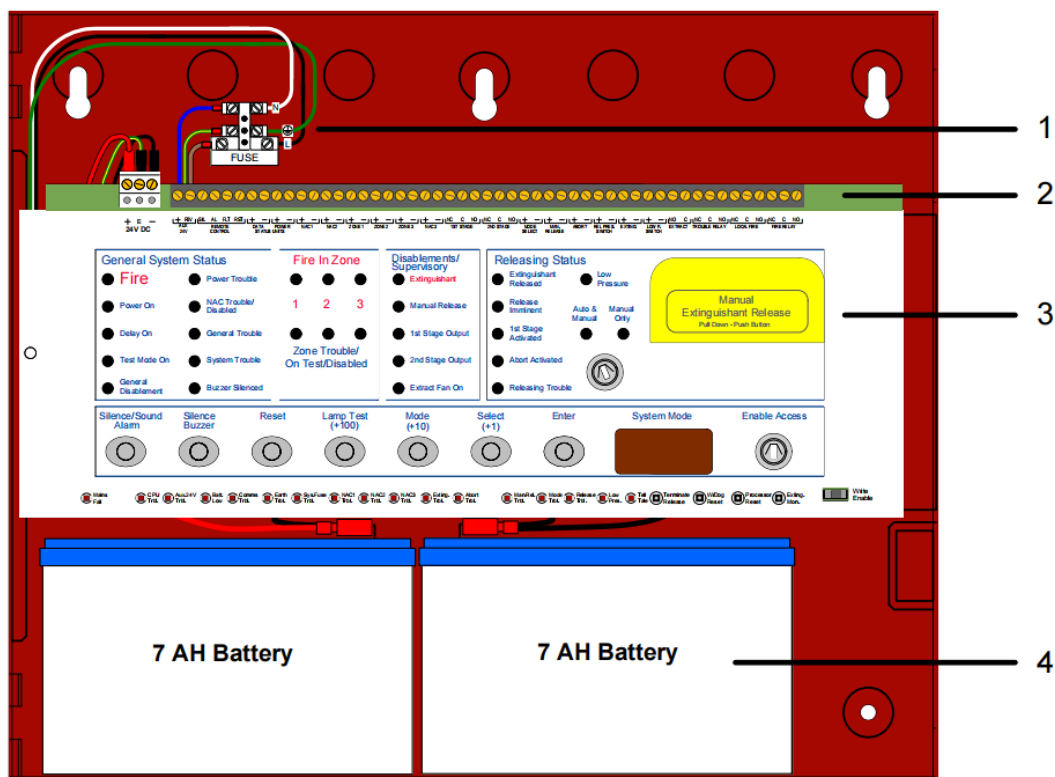


Fig.3-10 Fire Control Panel Introduction

No.	Name	Instructions
1	Mains Terminal Block	The Mains Terminal Block contains a 1.6 Amp fuse and accepts connections from the transformer primary and input power connections. Terminals of the Main Terminal Block are designated Line, Neutral and Ground.
2	Field Terminals	Field terminals provide connections for Zones, NACs, Releasing Devices, Relay Outputs, Status Units and AUX 24V.
3	Fascia	The front fascia of the Fire Control Panel is populated with controls and indicators for programming and operating the fire control panel.
4	Standby-Batteries	The Fire Control Panel contains two 12 VDC, 7 Ah batteries for operating the fire control panel during primary AC power failure.

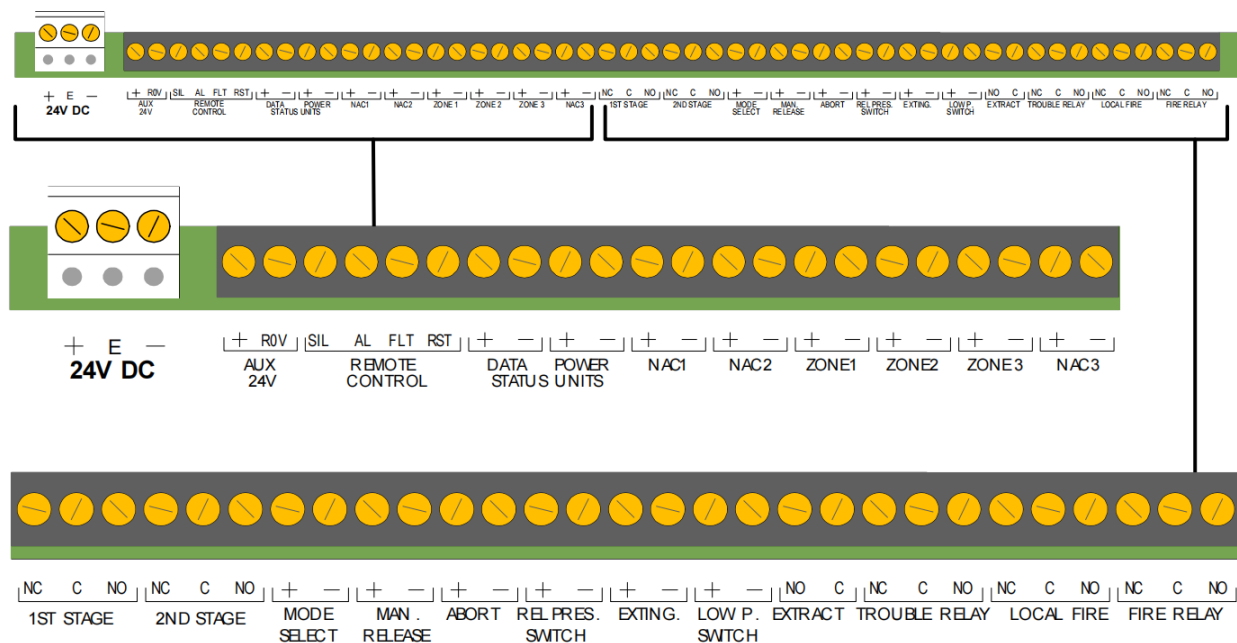


Fig.3-11 Field Terminals

Functions	Instructions
24V DC	Bridge-rectified 24 VDC from internal transformer
AUX 24V	Auxiliary 18 to 28 VDC terminals
REMOTE CONTROL	Connection for Manual Extinguishant Disablement Function
DATA - STATUS UNITS	RS485 serial data terminals for Status Units.
POWER - STATUS UNITS	18 to 28 VDC terminals for Status Units.
NAC1, NAC2	18 to 28 VDC terminals for authorized Notification Appliances.
ZONE1, ZONE2, ZONE3	Terminals accept only authorized conventional detectors that are two-wire smoke and closed contact-type.
NAC3	18 to 28 VDC terminals dedicated to releasing function only. Terminals operate only authorized Notification Appliances.
1ST STAGE	Relay contact is 1 Amp maximum with voltage free change-over.
2ND STAGE	Relay contact is 1 Amp maximum with voltage free change-over.
MODE SELECT	Supervised releasing input with 6.8K Ohm EOL.
MAN. RELEASE	Supervised releasing input with 6.8K Ohm EOL.
ABORT	Supervised releasing input with 6.8K Ohm EOL.
REL PRES. SWITCH	Supervised releasing input with 6.8K Ohm EOL.
EXTING.	Releasing output 18 to 28 VDC with 1.0 Amp maximum load for 5 minutes and voltage reversing DC.
LOW PRES. SWITCH	Supervised releasing input with 6.8K Ohm EOL.
EXTRACT	Relay contact with contacts for (NO) and (C) that are 1A Amp maximum with voltage free change-over.
TROUBLE RELAY	Relay contact is 1 Amp maximum with voltage free change-over.
LOCAL FIRE	Relay contact is 1 Amp maximum with voltage free change-over.
FIRE RELAY	Relay contact is 1 Amp maximum with voltage free change-over.

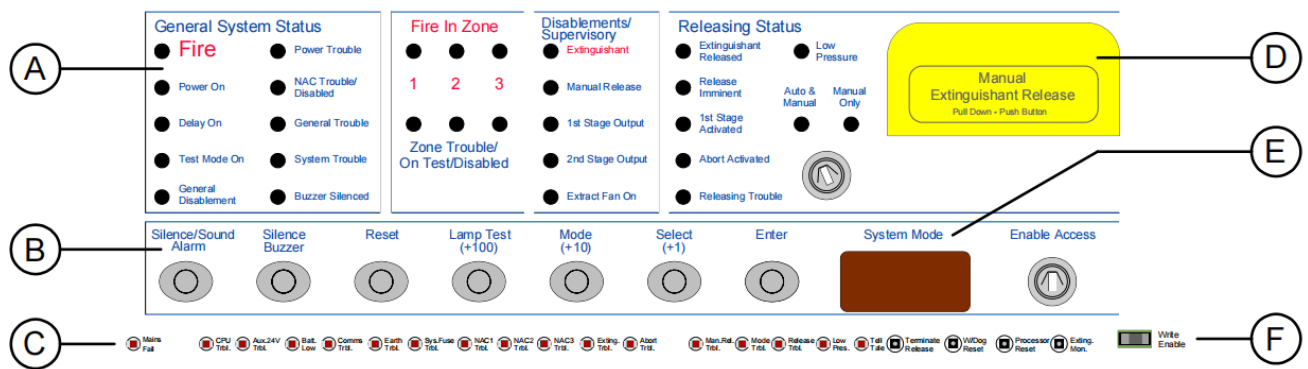


Fig.3-12 Controls and Indicators

Item.	Description	Instructions	
A	Upper Indicators	General System Status	LED Color
		Fire, NAC Output State	Red Flashing = NACs Activated ON Continuous = NACs silenced OFF = Panel and NACs Reset
		Power On	Green
		Delay On	Yellow
		Test Mode On	Yellow
		General Disabling	Yellow
		Power Trouble	Yellow
		NAC Trouble / Disabled	Yellow
		General Trouble	Yellow
		System Trouble	Yellow
		Buzzer Silenced	Yellow
		Fire In Zone	LED Color
		1	Red
		2	Red
		3	Red
		1-Zone Trouble/ On Test/ Disabled	Yellow
		2-Zone Trouble/ On Test/ Disabled	Yellow
		3-Zone Trouble/ On Test/ Disabled	Yellow
		Disables / Supervisory	LED Color
		Extinguishant	Yellow
		Manual Release	Yellow
		1st Stage Output	Yellow
		2nd Stage Output	Yellow
		Extract Fan On	Yellow
		Releasing Status	LED Color
		Extinguishant Released	Red
		Release Imminent	Red

Item.	Description	Instructions	
		1st Stage Activated	Red
		Abort Activated	Yellow
		Releasing Trouble	Yellow
		Low Pressure	Yellow
B	Central Controls	Silence/Sound Alarm `	Re-sounds the alarm when NACs are silenced using the Silence Buzzer button.
		Silence Buzzer	Silences NACs connected to the Fire Control Panel after receiving authorization through Access Level 2.
		Reset	Resets latching inputs such as fire and pre-alarm events after receiving authorization through Access Level 2. Trouble events are non-latching inputs and cannot be cleared by the Reset button. Non-latching inputs are cleared when faults are cleared.
		Lamp Test	Tests front-panel indicators and the internal buzzer by illuminating all LEDs while darkening the front-panel display and sounding the buzzer.
		Mode	Places the menu in a mode for operating or programming the Fire Control Panel.
		Select	Selects the menu option displayed on the System Mode LED of the front panel.
		Enter	Enables the menu selection to function on the Fire Control Panel.
		Enable Access	Places the menu of the Fire Control Panel in ACCESS LEVEL 2. Insert the key in the Enable Access lock and turn the key to the right to open ACCESS LEVEL 2.
C	Lower Indicators	Main Fail	Yellow
		CPU Trbl.	Yellow
		Aux. 24V Trbl.	Yellow
		Batt. Fail	Yellow
		Comms Trbl.	Yellow
		Earth Trbl.	Yellow
		Sys. Fuse Trbl.	Yellow
		NAC 1 Trbl.	Yellow
		NAC 2 Trbl.	Yellow
		NAC 3 Trbl.	Yellow
		Exting. Trbl.	Yellow
		Abort Trbl.	Yellow
		Man. Rel. Trbl.	Yellow
		Mode Trbl.	Yellow
		Release Trbl.	Yellow
		Low Pres.	Yellow
		Tell Tale	Yellow
D	Upper Controls	Releasing Key-Switch	Provides key-switch modes for automatic &

Item.	Description	Instructions	
			manual or manual-only release.
		Manual Extinguishant Release	Provides manual release as a push button
E	Central Indicator	System Mode	The System Mode display contains three seven segment LEDs. Use this indicator to identify status conditions and to program configurations on the fire control panel.
F	Lower Controls	Terminate Release	Terminates the flow of extinguishant caused by a releasing event and resets the operation of the fire control panel.
		W / Dog Reset	Clears the watchdog event caused when the fire control panel failed to carry out an operation.
		Processor Reset	Resets processors and restores operation of the fire control panel. This function is also used to re-initialize the processors following a firmware upgrade.
		Exting. Mon.	Potentiometer for calibrating the releasing circuit of the fire control panel.
		Write Enable	Slide-switch used in conjunction with the Enable Access switch to configure the fire control panel in Access Level 3.

4 Transport and Storage



NOTICE

Failure to transport and store the product in accordance with the requirements in this manual may void the warranty.

4.1 Shock-Resistant Label

To ensure the safety of the product during shipping, a shock-indicator label is affixed to the outer packaging. If you notice that this label has turned red upon receipt, please do not panic. A red label simply indicates that the device has been subjected to a certain degree of vibration. This does not mean the device is damaged or inoperable. To protect your rights, we recommend following these steps:

- Document the scene: Immediately take photos or videos of the discolored shock-indicator label, the outer packaging, and the overall condition of the product to preserve objective evidence.
- Inspect the product's exterior: Carefully check the product's casing, ports, and key components for any visible signs of impact, deformation, or damage.
- Contact After-Sales Service: Regardless of whether the visual inspection reveals any abnormalities, please contact our after-sales team immediately upon discovering the issue and provide the relevant visual evidence. Based on your feedback, we will conduct a professional assessment and handle the matter as soon as possible.

4.2 Transport Methods

The RCTerra Class 1.0 cabinet can be transported by sea or road but is not suitable for railway or air transport. The cabinet is highly integrated and designed for easy hoisting, which simplifies its transport.

4.3 Transportation Requirements

All components in the RCTerra Class 1.0 cabinet are installed and secured before leaving the factory, allowing for the entire unit to be hoisted and transported together.



NOTICE

During loading, unloading, and transport, adhere to all safety regulations applicable to the RCTerra Class 1.0 cabinet in the country or region where the project is located!

- Proper maintenance of all tools used for handling the RCTerra Class 1.0 cabinet is essential.
- Personnel involved in loading, unloading, and anchoring should have received relevant safety training.
- Maritime transport must comply with the IMDG Code and International Maritime Dangerous Goods Rules.
- Land transport should adhere to ADR or JTT617 transport requirements.
- Compliance with transport regulations of the originating country, route country, and destination country is required.
- Stacking is prohibited during transport at ports and on-board ships.
- Adhere to the regulatory requirements of the transportation regulatory authorities in the transport starting, route, and destination countries.

4.4 Storage Requirements

- To prevent condensation or water pooling, store the RCTerra Class 1.0 cabinet on dry, elevated ground.
- Elevate the container base according to site conditions, with the height determined based on geological and meteorological factors.
- Store the cabinet on dry, flat, stable ground with adequate load-bearing capacity, free of vegetation.
- Ensure all doors of the container and internal equipment are locked before storage.
- Storage temperature range: -22°F~ 122°F ; recommended storage temperature: 32°F~ 86°F.
- Long-term battery storage is not recommended as it may decrease battery capacity, even at the

recommended storage temperature. Capacity fade is irreversible and increases with storage duration. Refer to the technical protocol for specific capacity fade rates.

- Maintain relative humidity between 0% and 95% without condensation.
- Protect the air inlet and outlet of the cabinet from rain, sand, and dust.
- Conduct periodic inspections, checking the cabinet and internal equipment for damage at least every two weeks.
- For cabinets stored for over six months, open the door to check for condensation before installation, inspect for damage, and verify the product after power-on. Professional testing may be necessary before installation.

Starting from the delivery date, RCTerra Class 1.0 cabinets stored for over three months should be charged and discharged once to bring the system's State of Charge (SOC) to 20%-50%.

5 Mechanical Installation

5.1 Inspection before Installation

5.1.1 Deliverables Inspection

Verify that all deliverables are complete by comparing them against the included packing list. Check whether deliverables are complete against the attached packing list.

5.1.2 Product Inspection

Ensure that the received container matches the order. Inspect the RCTerra Class 1.0 cabinet and internal equipment for any damage. If any issues are found, or if there are any questions, contact the forwarding company or RCT Power immediately.



NOTICE

Only install the cabinet when it is complete and undamaged.

Before installation, ensure that:

- The cabinet is in good condition without any damage.
- All internal equipment is in good condition without any damage.

5.2 Installation Environment Requirements

5.2.1 Installation Site Requirements

- When selecting the installation site, consider the climate, geological conditions such as stress wave emissions, and the underground water level.
- Ensure that the environment is dry and well-ventilated.
- Avoid placing the installation near trees to prevent branches or leaves from obstructing the door or air inlet of the energy storage system.
- The site should be away from areas with high concentrations of toxic or harmful gases and free from flammable, explosive, and corrosive materials.
- The noise level of the cabinet is $\leq 70\text{dB @1m}$, which should be considered when choosing an appropriate installation location.

5.2.2 Outdoor Requirements

- There should be no vegetation or flammable plants within 3 meters of the installation site of the energy storage system or energy storage power station to prevent wildfires caused by high temperatures in summer.
- The top of the energy storage system cannot be covered, such as not installed under the shed, not laying photovoltaic panels on the top.
- The safe distance between the energy storage system and the production building should comply with local fire codes or standards.
 - Storage systems located outdoors should be at least 10 feet (3.048m) away from boundaries, public roads, buildings, flammable materials, hazardous materials, high piles, parking Spaces, and other hazards not related to the grid infrastructure.
 - When one of the following conditions is met, the distance between the energy storage system and the production building can be reduced to 0.914m, and the space requirements of equipment transportation, installation, and maintenance need to be considered.
 - The energy storage system has an independent fire-resistant firewall of 1h, and the length and height of the firewall should be 1.5m beyond the outer outline of the energy storage system.
 - The walls adjacent to the energy storage system are provided with non-combustible exterior walls with no openings or combustible finishes, and the exterior walls are fire resistant to ASTM E119 or UL 263 2h fire resistance rating.
- The distance between the exhaust device of the energy storage system and the heating, ventilation, air conditioning air intakes, windows, doors, discharge platforms, and fire sources of other buildings or facilities should be $> 15.09\text{ ft (4.6m)}$.
- Do not install an energy storage system in a salt-damaged or polluted area because it may be corroded.

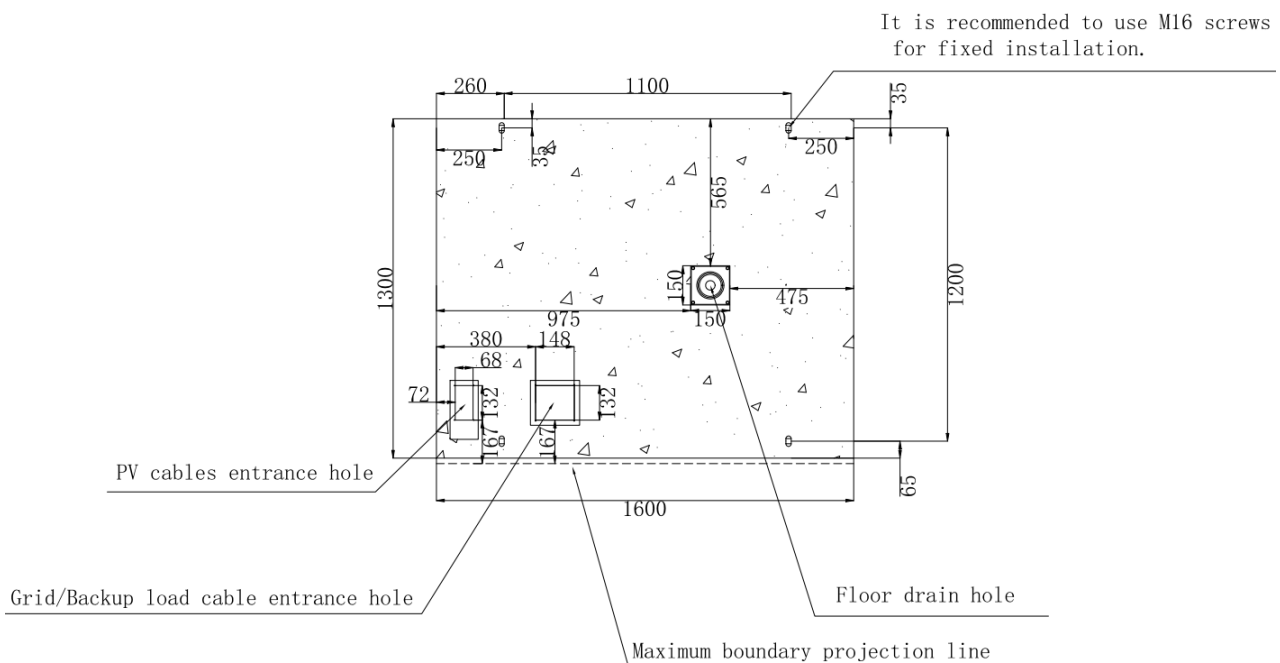
5.2.3 Foundation Requirements



The RCTerra Class 1.0 cabinet is heavy, so a detailed inspection of the installation site is necessary before constructing the foundation. This includes checking geological and environmental climatic conditions. Design and construct the foundation only after confirming that all requirements are met.

An improperly constructed foundation can cause significant issues, such as difficulty opening and closing the doors and affecting the normal operation of the cabinet. The foundation must be designed and constructed to meet standards for mechanical support, cable routing, and future maintenance and overhaul.

- Compact and fill the foundation pit to provide sufficient and effective support for the container.
- Raise the foundation to prevent the container base and interior from rain erosion.
- The foundation's cross-sectional area and height should meet the requirements.
- Construct appropriate drainage based on local geological conditions.
- Build a cement foundation with adequate cross-sectional area and height, determined by site geology.
- Consider cable routing when constructing the foundation.
- Build a maintenance platform around the foundation for easier future maintenance.
- During foundation construction, reserve enough space for the AC and DC cable trenches according to the size and position of the cable inlet and outlet holes, and pre-embed the cable conduit.
- A drainage system is essential to prevent water from soaking the bottom or internal equipment of the cabinet during the rainy season or heavy rainfall.
- Temporarily seal both ends of all embedded pipes to prevent impurities from entering and causing issues during wiring.
- After connecting all cables, seal the inlets, outlets, and connectors with fireproof mud or other suitable materials to prevent rodent access.



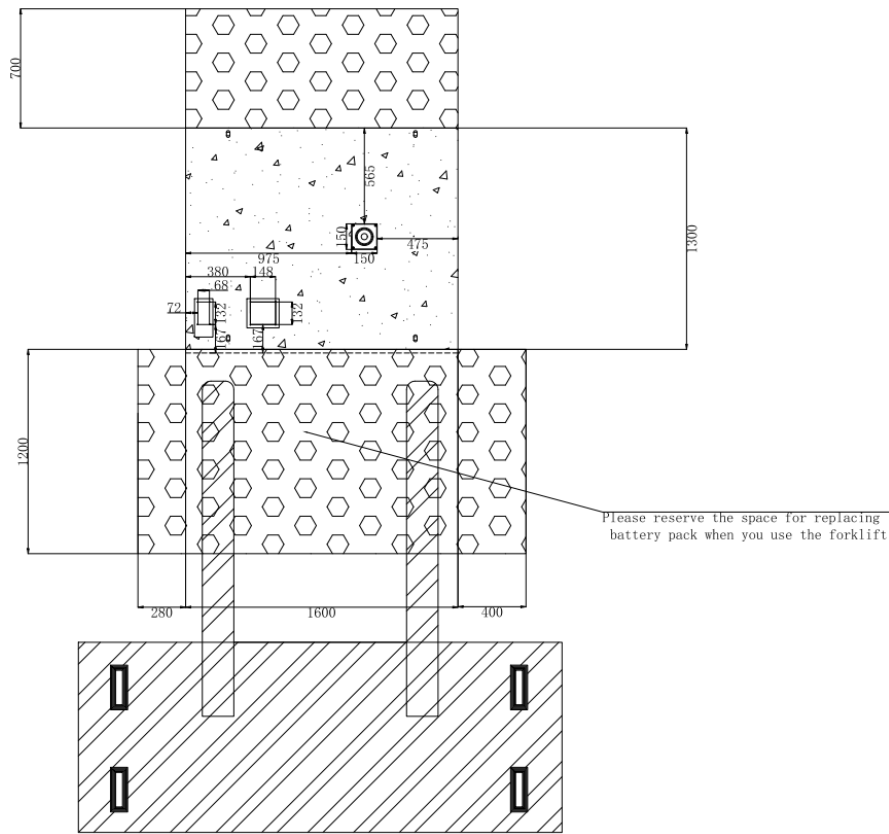


Fig. 5-1 Foundation instruction Top view Unit: mm

5.2.4 Installation Space Requirements

Equipment space requirements must also meet installation environment requirements. To ensure optimal heat dissipation and facilitate maintenance such as replacing battery modules, PCS components, please reserve sufficient space around the installation site. The diagram below illustrates the minimum clearance required for forklift access.

For a single cabinet installation, please maintain a clearance of at least **6.5ft** in front of and behind the equipment, and at least **3.3ft** to the left and right. The following diagram shows the minimum space requirements for single-cabinet installation and maintenance.

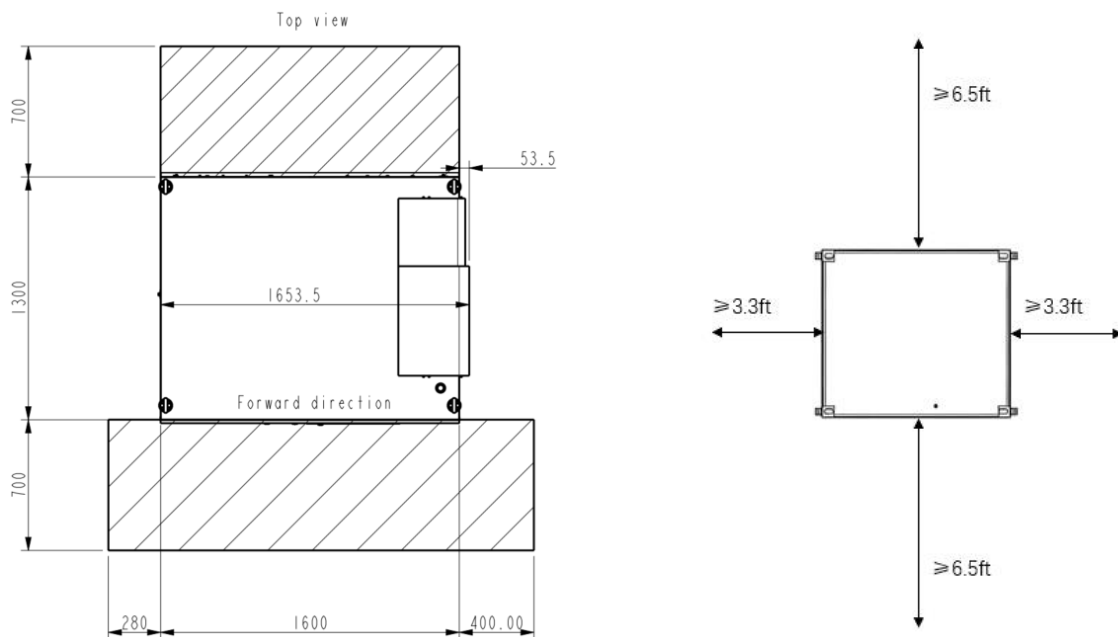


Fig. 5-2 Installation space top view Unit: mm

5.2.5 Parallel Space Requirements

Impacted Factors of Parallel Installation:

■ Fire Safety:

Preventing Thermal Runaway Propagation: Sufficient spacing acts as a physical fire barrier, preventing heat and flames from spreading too quickly to adjacent cabinets if a thermal runaway event occurs in one unit.

Providing Firefighting Operation Space: It offers essential working space for fire rescue efforts and equipment deployment (e.g., fire extinguishers, hydrants).

■ Heat Dissipation and Thermal Management:

Energy storage cabinets typically use a forced-air cooling mode, such as "front intake, rear exhaust". If the spacing is too small, hot exhaust air can be recirculated into the intake of adjacent cabinets. This leads to elevated intake air temperatures, creating a heat cycle that significantly reduces cooling efficiency. This can cause the system to report high-temperature faults and may even trigger safety risks.

■ Operations, Maintenance and Safety:

Working Space: Technicians require adequate space to open cabinet doors (the doors themselves have thickness and require swing clearance), perform wiring, and conduct inspections and maintenance tasks.

Emergency Evacuation: In the event of an incident, personnel must be able to evacuate quickly.

Recommended Distance:

- The recommended distance between parallel machines is **3ft**. If there is a great ventilation around the cabinets, the distance between parallel machines can be properly reduced. The figure below shows the minimum space requirements for installation and maintenance in a parallel configuration.

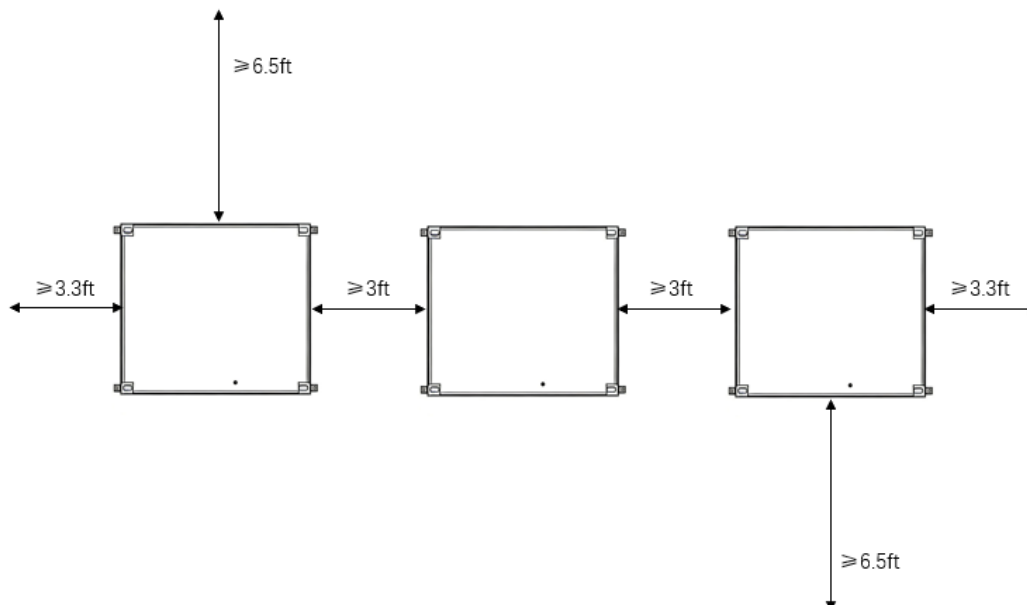


Fig. 5-3 Parallel space top view Unit: ft

- For easy operations and maintenance, the recommended clearance between the front and rear of the machines is **6.5ft**, and a minimum clearance of **3.3ft** must be maintained on both sides of the parallel system.
- Maximum number of parallel machines: Please refer to the technical data

5.3 Forklift Transport

If the installation site is flat, a forklift can be used to move the RCTerra Class 1.0 cabinet. The cabinet's bottom is equipped with fork holes specifically for forklift transportation. Move the cabinet using the side fork holes, ensuring the following requirements are met:

- The forklift should have sufficient load capacity.
- The length of the forklift feet should meet the device requirements, needing to be longer than 1800mm.

Insert the forklift feet into the fork pockets at the bottom of the cabinet (refer to the figure below for the pocket locations). Ensure the depth of insertion matches the pocket depth.

- Remove the front cover plate before moving the cabinet.
- The RCTerra Class 1.0 cabinet weighs about 3.4 tons, so select appropriate equipment.
- Transport and place the cabinet slowly and steadily. Only place the cabinet in a stable, well-drained location without obstructions or bulges. Secure the cabinet with four bottom mounting screws into the foundation.

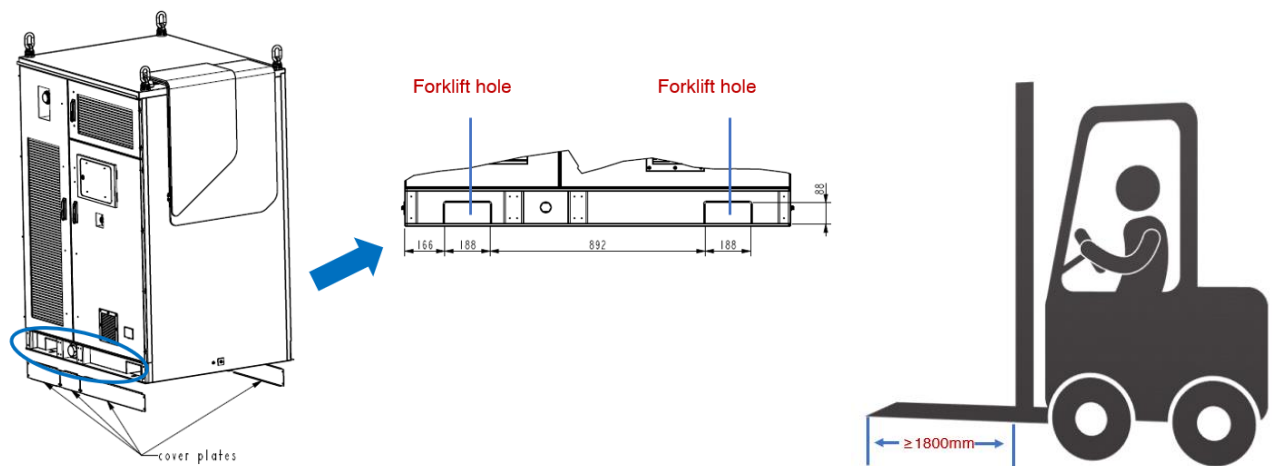


Fig. 5-3 Forklifting guide Unit: mm

5.4 Hoisting and Transport

5.4.1 Safety Precautions

When lifting the device, ensure that:

- All safety requirements are met.
- A professional instructor supervises the entire hoisting process.
- The sling strength can support the device's weight.
- All sling connections are secure and reliable, and the sling lengths connected to the corner fittings are equal.
- Sling length can be adjusted according to site requirements.
- The device remains stable and level during lifting.
- Lift the device from the top and take all necessary measures for a safe lift.



- Observe crane safety rules at all times.
- Standing within 5 to 10 meters of the hoisting area is strictly forbidden. Do not stand under the boom or station during the entire hoisting process.
- Stop hoisting work during violent weather conditions, such as strong winds, heavy rain, or thick fog.

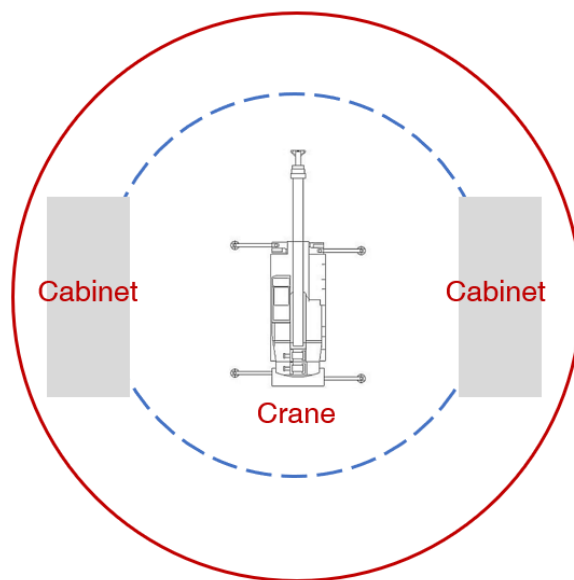


Fig. 5-4 Hoisting safety guide

5.4.2 Hoisting

During the lifting process, each operation should be executed according to the following requirements:

- **Vertical Lifting Only:** Devices must be lifted vertically. Do not drag them on the ground or over the top of the lower cabinet.
- **Initial Suspension Check:** After lifting the devices 300 mm from the supporting surface, suspend them and inspect the connection between the lifting tools and the devices. Only proceed if the connection is secure.
- **Gentle Placement:** When lowering the devices into place, do so gently and steadily. Never shake the lifting tools to adjust the devices vertically.
- **Placement Requirements:** Ensure that the placement site is solid, flat, well-drained, and free of obstacles or protrusions.
- **Recommended Hoisting Position:** Refer to the diagram below for the proper hoisting positions.

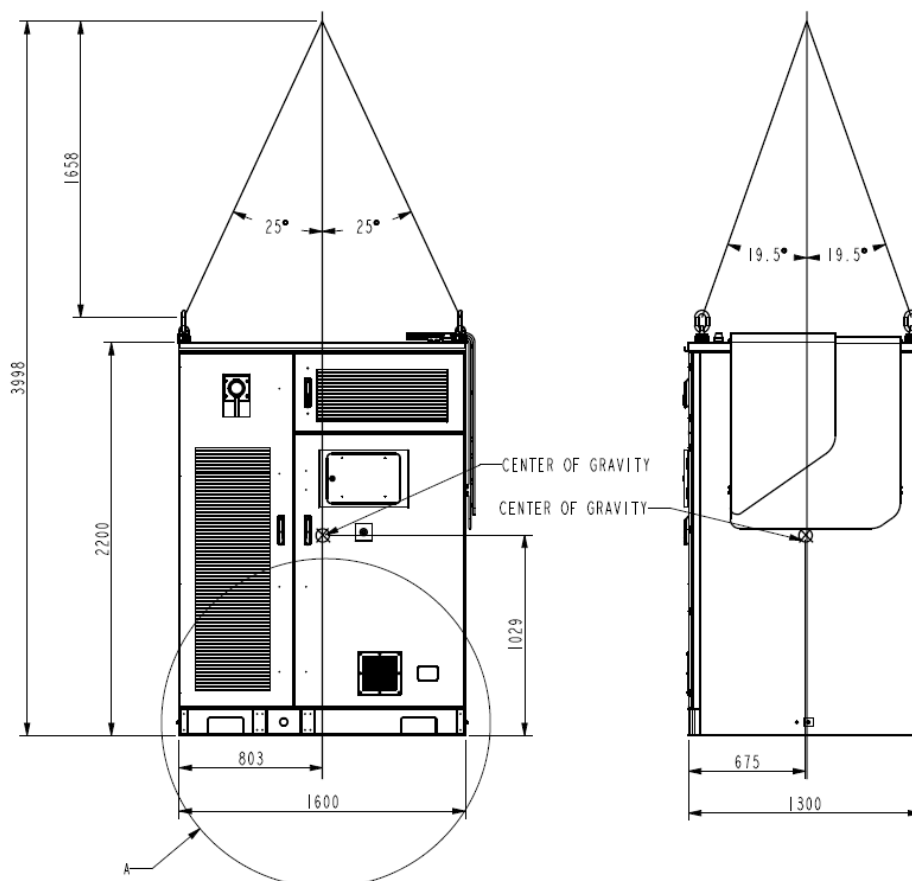


Fig. 5-4 Hoisting guide Unit: mm

5.5 Fixed Installation

For fixed installation, use an M16 rod. Once the customer places the cabinet on the threaded rods, secure it with gaskets and nuts. Refer to the bottom view line drawing for guidance.

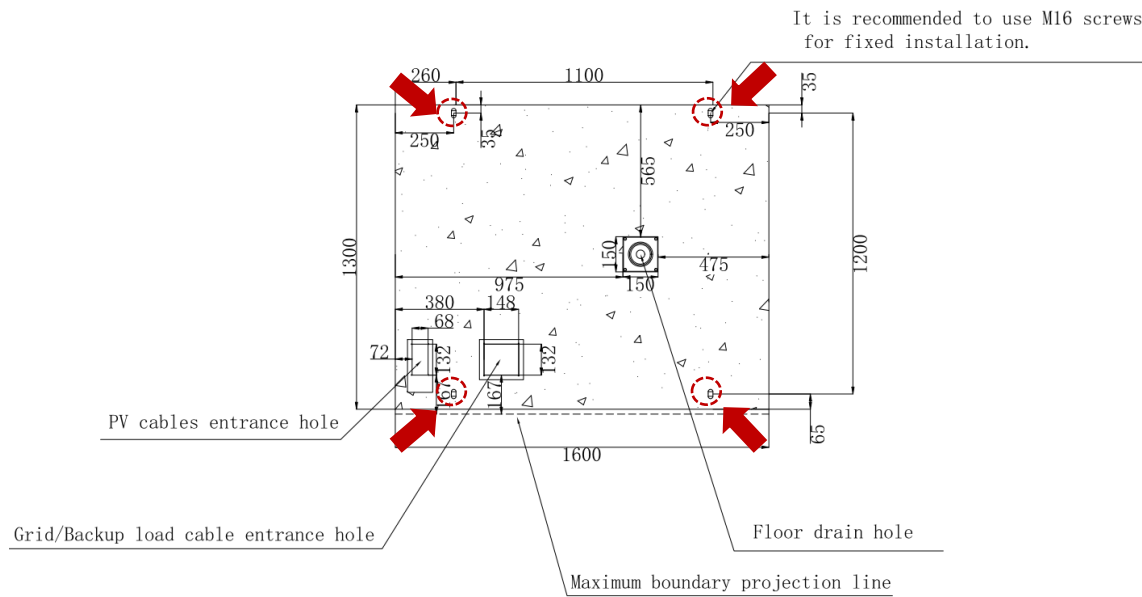


Fig. 5-5 Cabinet fixation guide bottom view Unit: mm

6 Electrical Connection

6.1 Precautions

 DANGER	High voltage! Risk of Electric shock! ■ Never touch live parts without proper protection! ■ Ensure all switches are off before starting installation.
 WARNING	Sand and moisture can damage the electrical equipment in the cabinet or impair their performance. ■ Avoid making electrical connections during sandstorms or when the relative humidity exceeds 95%. ■ Perform electrical connections only when the weather is fair and dry. ■ Before wiring, verify that the polarity of all input cables is correct. ■ During installation, do not forcibly pull any wires or cables, as this can damage the insulation. ■ Ensure that all cables and wires have adequate space for bends. ■ Use necessary auxiliary measures to minimize stress on cables and wires. ■ After completing each connection, thoroughly check to ensure it is correct and secure.

6.2 Electrical Connection Overview

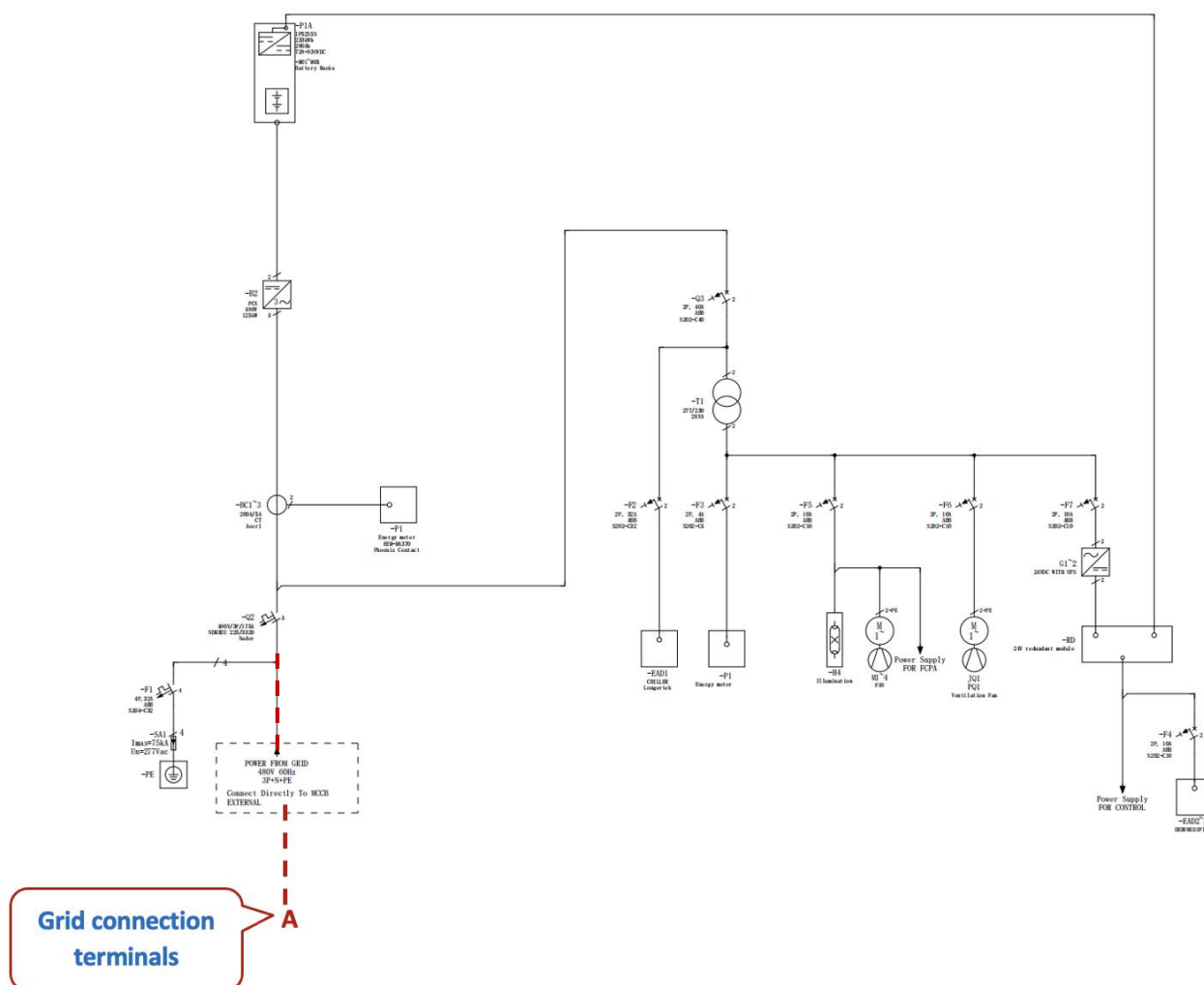


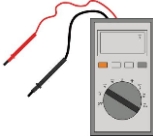
Fig. 6-1 Electrical SLD overview

6.2.1 Wiring instructions

Item	Recommended specification
Grid port connection terminals A	1/0 AWG or 2/0 AWG, $\Phi 20\sim 25\text{mm}$, 3 phases L1/L2/L3/N

6.3 Preparation Before Wiring

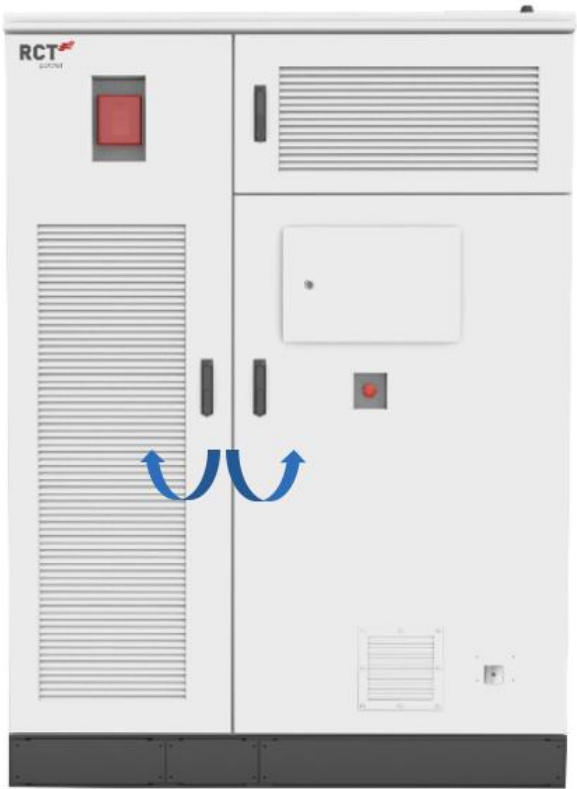
6.3.1 Tools Needed for Installation

Item	Name and Graphics
Installation tools	
	Torque screwdriver
	
	Heat gun
	
	Wire stripper
	
	Hydraulic pliers
	
	Torque wrench
	
	Screwdriver
	
	Multimeter

6.3.2 Open the Door

Before connecting the cables, follow these steps to open the door:

- Move the cover over the lock hole upward.
- Insert the door key and turn it clockwise.
- Rotate the handle clockwise for the right door and counterclockwise for the left door.



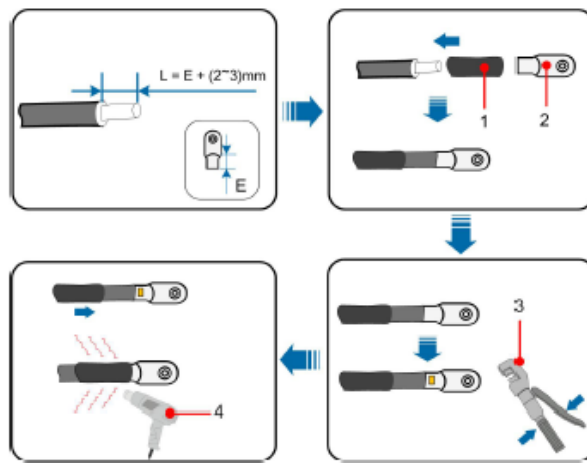
6.3.3 Preparing Cables

Ensure that the cables meet the following requirements:

- **Current Carrying Capacity:** The cable's current carrying capacity must be adequate. Factors affecting this include, but are not limited to:
 - Select cables with a proper diameter according to the maximum load, and the cables should be long enough.
 - Environmental conditions
 - Type of insulation material
 - Cabling method
 - Material and cross-sectional area of the cable.
- Select cables with the proper diameter to handle the maximum load, and ensure they are long enough.
- Use only flame-retardant cables.
- AC output cables for three-phase systems must be of the same specifications and materials.
- All DC input cables must be of the same specifications and materials

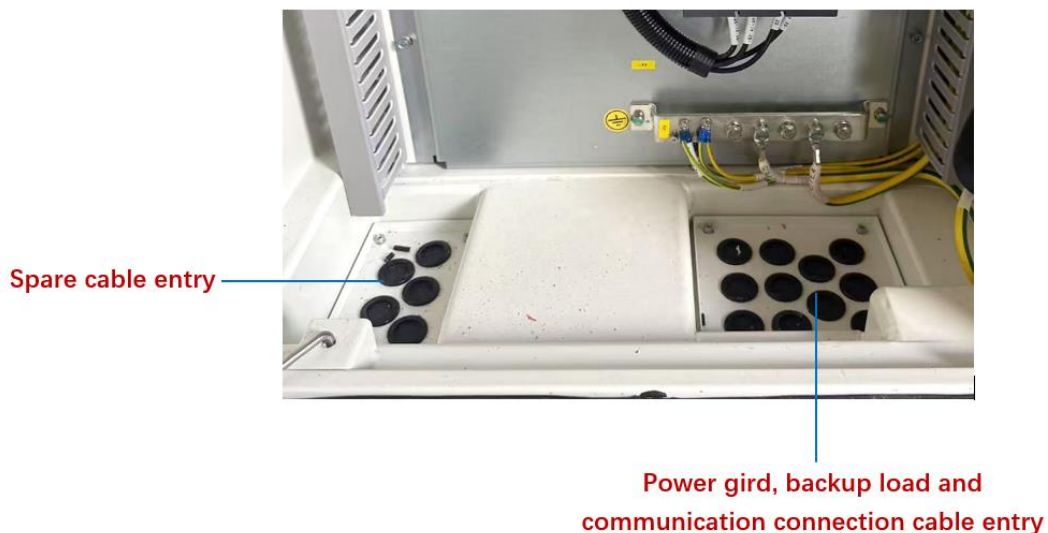
6.3.4 Crimp terminal

To crimp OT/DT terminals, follow these steps:



6.3.5 Cable Entry Instructions

Cables connecting the outdoor cabinet to external equipment can be routed through the bottom cable entry points of the outdoor cabinet. The cable entry points are illustrated below:



The primary cable entrance is at the bottom and is divided into sections for grid power cables, load power cables, and signal cables.

- **Grid Port Cables:** Connect these cables to the terminal MCCB (3 phases, L1/L2/L3) and Neutral bus bar. Use copper cables with a conductor cross-sectional area of 1/0 AWG or 2/0 AWG, with a diameter of $\Phi 20 \sim 25 \text{mm}$.
- **Communication / Signal Cables:** These cables enter and exit the cabinet with a copper cable conductor cross-sectional area of $\Phi 10 \text{mm}$.

6.4 Ground Connection

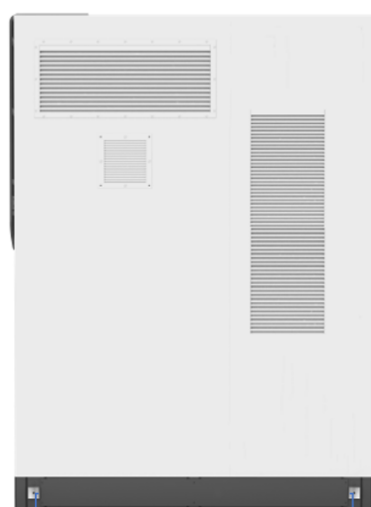


Grounding bus bar

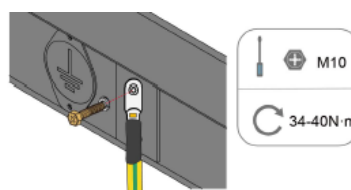
- **Grounding Cable:** Use a grounding cable of 1/0 AWG or 2/0 AWG with a diameter of $\Phi 20\sim 25\text{mm}$ to ensure a reliable connection between the grounding points and the grounding points of the RCTerra Class 1.0 cabinet. (The grounding point is covered with protective tape before delivery. Remove the tape before wiring.)
- **Grounding Points:** The grounding points are shown below.



External grounding bus bar

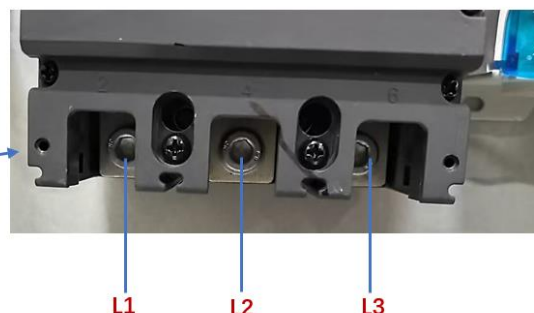
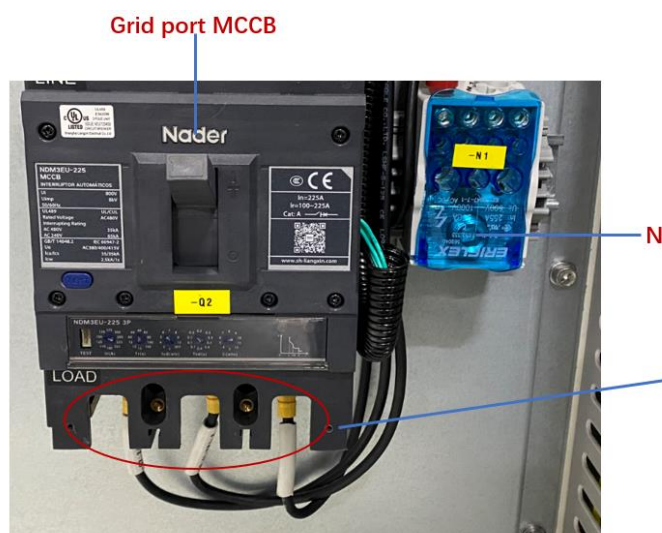
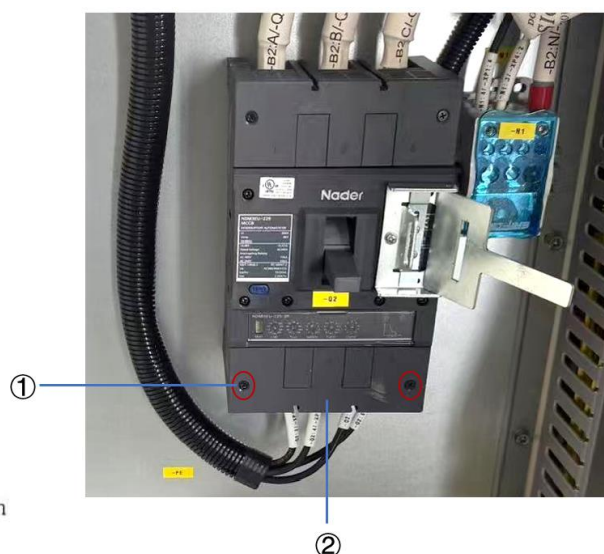
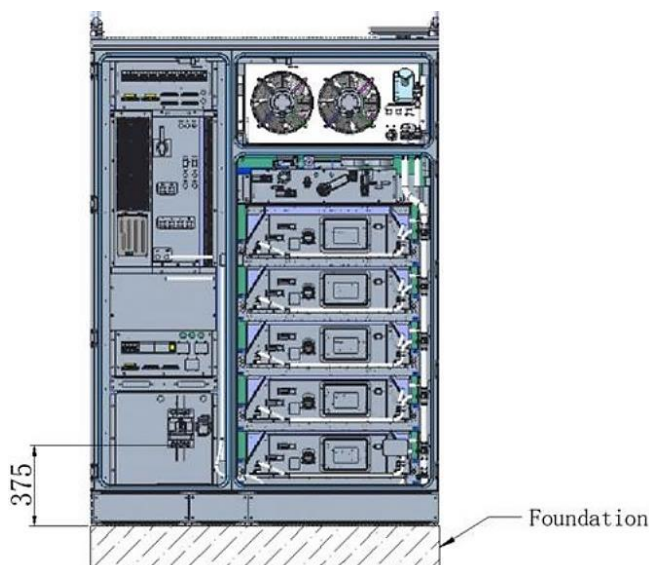


External
grounding points



6.5 AC Connection

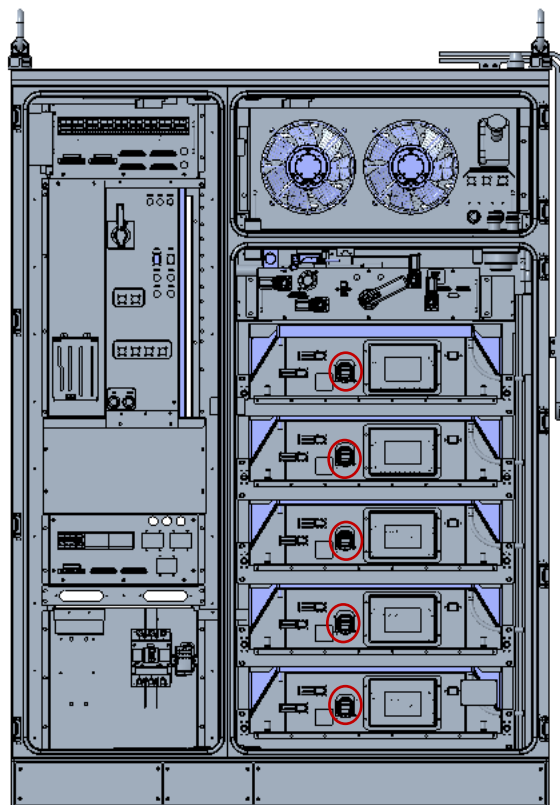
6.5.1 Grid port connection



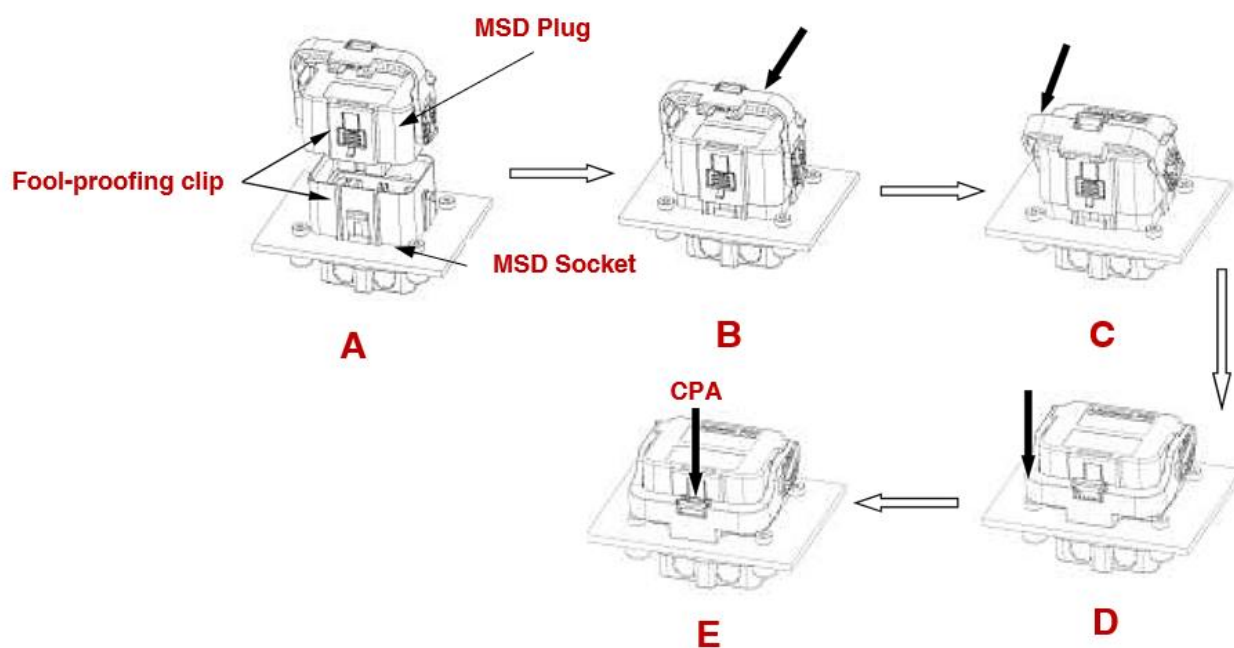
- **Grid Port Cables:** Connect these cables to the terminal MCCB (3 phases) and Neutral bus bar. The distance from the top of the foundation to the MCCB connection is 375mm.
Note: For AC connection, first remove the two screws (①) on the MCCB to remove the cover (②), then connect the cable to the position in the above picture, and install the cover back (②).
- **Copper Cable:** Use copper cables with a conductor cross-sectional area of 1/0 AWG or 2/0 AWG, with a diameter of $\Phi 20 \sim 25 \text{mm}$.
- **Rated input short-circuit current (SCCR):** 2kA.
- **Maximum overcurrent protective device rating:** 203A.
- **Output available fault current and time:** 2kA/200ms.

7 Battery MSD installation

Before powering up our system, please install all five MSD plugs into the battery pack MSD sockets.



■ Installation Procedure

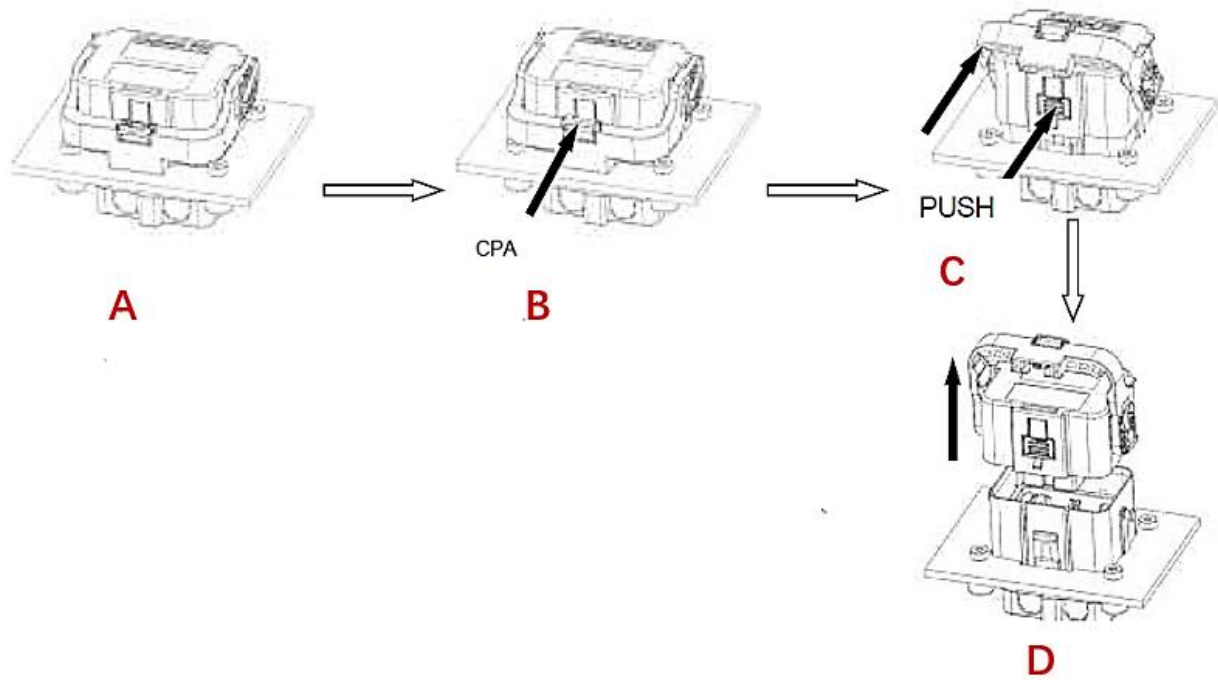


Step 1. Insert the plug and socket vertically according to the fool-proofing clip position (Figure A).

Step 2. Rotate the black handle to the vertical position and hear the “click” to ensure the plug is locked to socket tightly (Figure B to D).

Step 3. Press CPA button to complete locking (Figure E).

■ Remove Procedure



Step 1. Pull the CPA from the black handle upward (Figure B).

Step 2. Then rotate the black handle to about 60° to stop (Figure C).

Step 3. Press the PUSH button on the plug and rotate the black handle to 90° (Figure C to D).

Step 4. Unplug the socket.

8 Powering up and Shutdown



WARNING

- The RCTerra Class 1.0 cabinet can only be placed into operation after authorization by a professional and approval by the local AHJ
- For RCTerra Class 1.0 cabinet that has been shut down for an extended period of time, check the equipment thoroughly and carefully to ensure all components are in working order before powering it on.
- Before powering up the system, please ensure all technicians are wearing proper protective equipment to avoid any potential electric shock.

8.1 Pre-power Up Inspection

Before powering up the equipment, check the following items carefully.

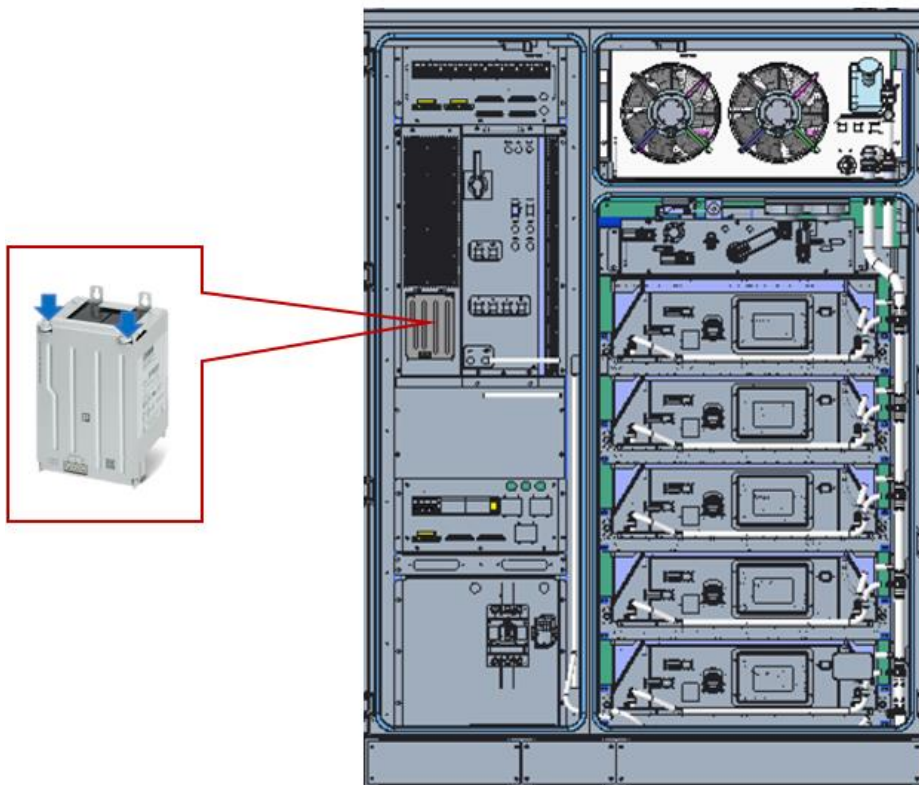
- Check whether the wiring is correct.
- Check whether the protective covers inside the equipment are installed firmly.
- Check whether the emergency stop button is released.
- Check and ensure that there is no grounding fault.
- Check whether the AC and DC voltages meet startup conditions and ensure that there is no over-voltage with a multimeter.
- Check and ensure that no tools or components are left inside the equipment.
- Check all air inlets and outlets for blockage.

If the RCTerra Class 1.0 cabinet has been stored for more than six months, the top radiator fan should be checked for proper rotation, noise or stalling before powering up.

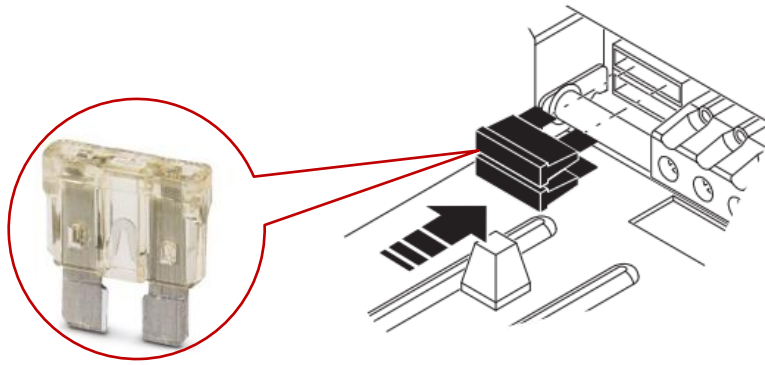
8.2 Powering-up Procedure

Step 1 Preparation:

- Open the front doors and open the EMS protective cover window by using the keys delivered with the cabinet.
- Install the MSD into the battery module pack. There is 1 MSD for each battery pack, resulting in 5 needing to be installed in total. (For installation instructions, please see "battery MSD installation" above)
- Install the 24V DC power supply fuse.
 - a) Press 2 locking lugs on the housing top and swivel the front cover down.



- b) Insert the fuses in the fuse holders.



- c) Swivel the front cover up until the locking lugs snap into the attachment on the housing top again.

Step 2 Power up the cabinet

- Close the grid facing AC breaker, Q2.



- Close the switch F1.



- Close the main auxiliary power switch Q3.



- Close the chiller switch F2, energy meter switch F3, dehumidifier switch F4, illumination switch F5, ventilation fan switch F6, and UPS switch F7.



- Close the fuse terminals X3.

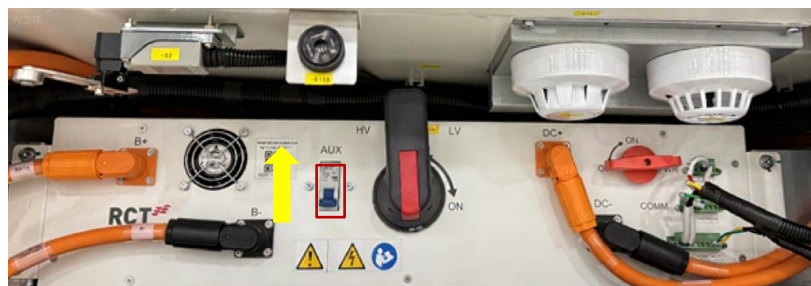


- Turn on the QS2 switch of the BMS.

Note: Minimize prolonged idling of the discharge end. The 24V power comes from the battery system. Long idling means constant 24V output. If the discharge end idles for over 3 days, with individual cell voltage under 2.5V for 30 minutes straight, the QS2 switch will cut off 24V output. Then, the equipment need to be repowered and recharged. After the system experiences an extended shutdown lasting over one week, the main switch of the switch gear and the QS2 must be turned to the OFF position to prevent the battery system from becoming over-discharged and unable to restart.



- Turn on the switchgear auxiliary 24V DC supply switch. This will give power to the BMS and start the self-inspection.



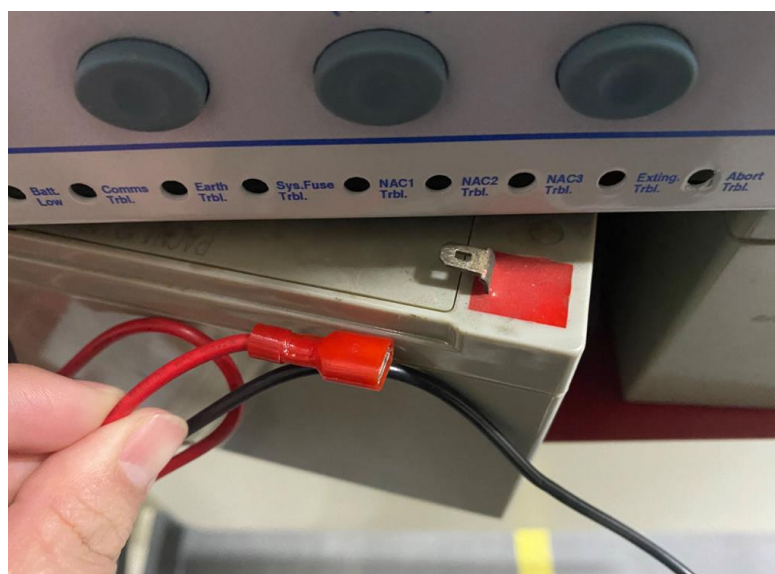
- Turn the main DC switch clockwise.



- Turn the isolation switch handle of all PCS clockwise to ON.



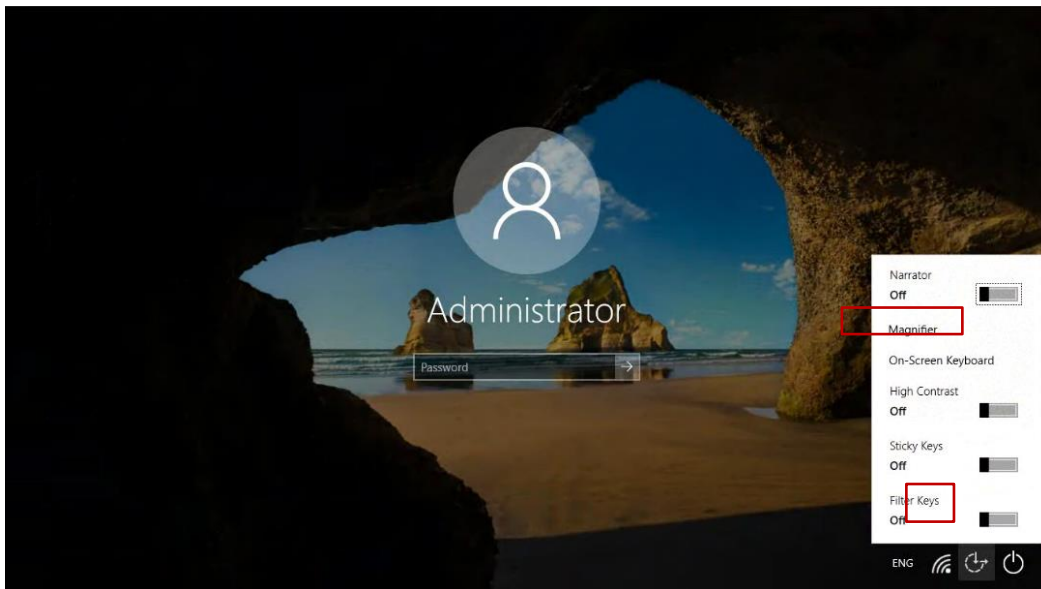
- Open the door of the fire control panel by key and connect the red cable to the 24V lead-acid battery (If the fire control panel still rings, you can turn the key clockwise to power and then turn it back, and then click the reset button).



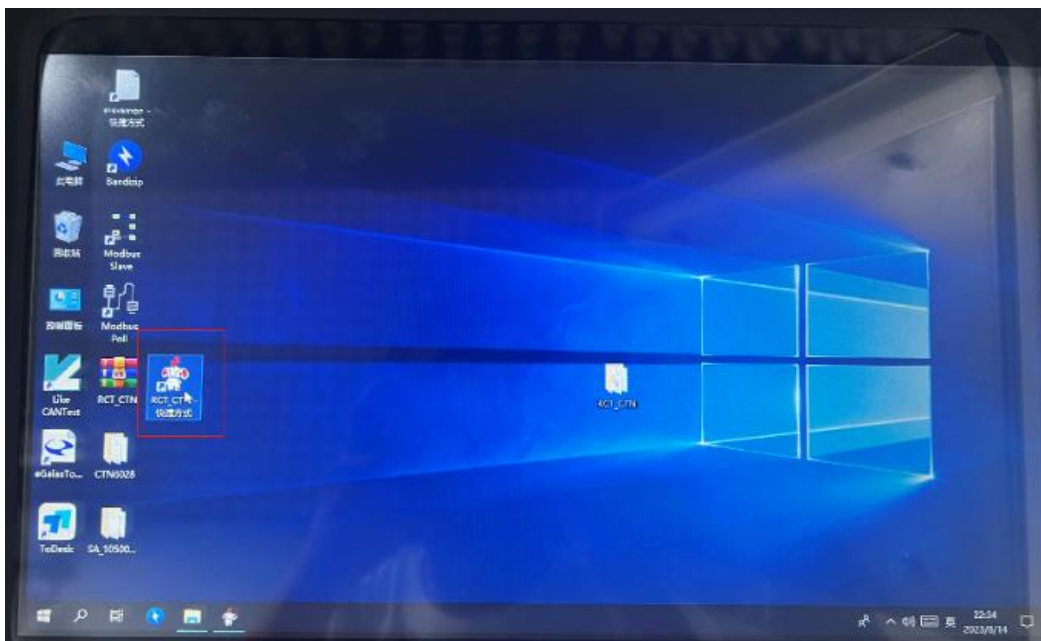
- Close and lock all the doors of the enclosure.

Step 3 Start the System via the EMS software.

- Open the touch panel protective window and wait for the startup screen.
- Touch the power button() to display the selection screen, click "on-screen keyboard" to enter the password. The default password is 0.



- Find the “RCT_CTN” application icon. And double click it to open the EMS control interface.



- To manage EMS settings, please read the EMS instructions.

8.3 Shutdown Steps

Step 1 Shutdown the EMS Software

- Shutdown PCS and BMS through EMS system (refer to [11.7.1](#) and [11.7.2](#) for details).
- Exit the EMS software.

Step 2 Shutdown the Cabinet

- Open the enclosure door.
- Disconnect the main auxiliary power switch Q3.
- Disconnect chiller, energy meter, dehumidifier, illumination, ventilation fan, and UPS switches F2-F7 respectively.

- Disconnect the fuse terminals X3.
- Disconnect the SPD1 switch F1.
- Turn off the switchgear 24V DC auxiliary power supply switch.
- Turn off the main DC switch by turning counter-clockwise.
- Turn the isolation switch handle of the PCS anticlockwise to OFF.
- Disconnect the grid facing AC breaker, Q2.
- Remove the 24V DC power supply fuse.
- Remove the 24V lead-acid battery of fire control panel.
- Remove the MSD of battery module pack.
- Close the enclosure door.

9 The Thermal Management System

The TMS system is liquid cooling, which main function is to maintain the temperature of the battery system to an allowable operating temperature range. Following is the coolant pipe layout.

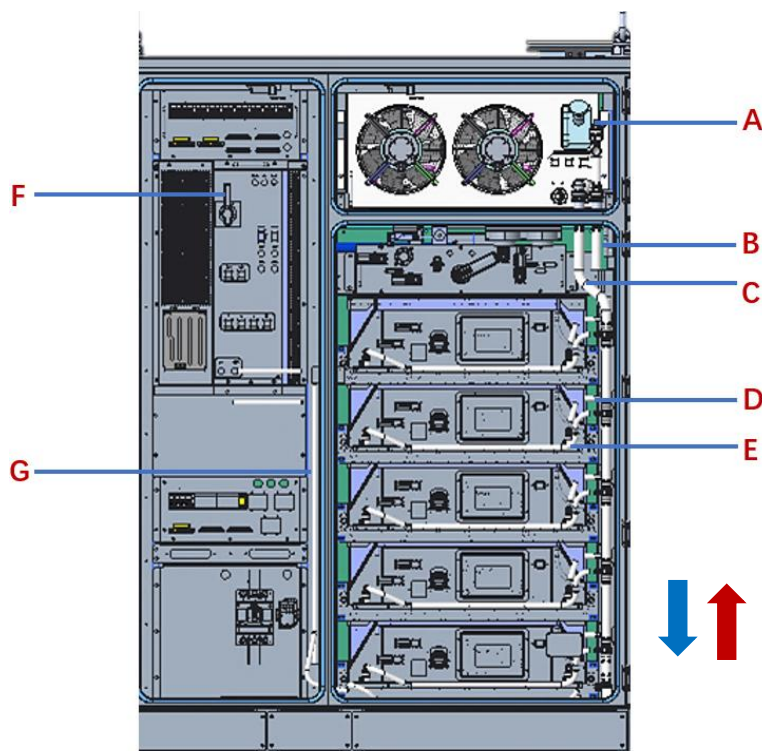


Fig. 10-1 Thermal management system

Item.	Description
A	Chiller
B	Main Coolant Outlet Pipe Line
C	Main Coolant Inlet Pipe Line
D	Sub Coolant Outlet Pipe Line
E	Sub Coolant Inlet Pipe Line
F	PCS
G	Liquid Cooled Pipe Line

Blue arrow: Low temperature; Red arrow: High temperature.

Cooling power is auto-adjustable according to ambient temperature and discharge/charge status. TMS system components'

working status is depend on the target battery cell temperature controlling by BMS.

Coolant: BASF Glysantin G30 50% concentration

Refrigerant pipe line pressure: 3.5Mpa

Coolant pipe line pressure: <3bar

10 Fire Suppression

10.1 General Rules

Please comply with all local laws, rules, and regulations regarding fire safety of the country/region where the project is located.

Check and maintain the fire suppression equipment regularly to ensure a normal operation and functionality.

10.2 Fire Suppression Equipment

The RCTerra Class 1.0 cabinet contains an aerosol fire suppression system that effectively extinguishes fires. It is equipped with combustible gas detectors, smoke detectors, and temperature sensors. If any abnormality is detected, the system sends a signal to the site-level alarm system through the early fire warning terminal of the control cabinet.



NOTICE

Combustible gas detectors need to be functionally tested and calibrated every year to ensure the detection accuracy.

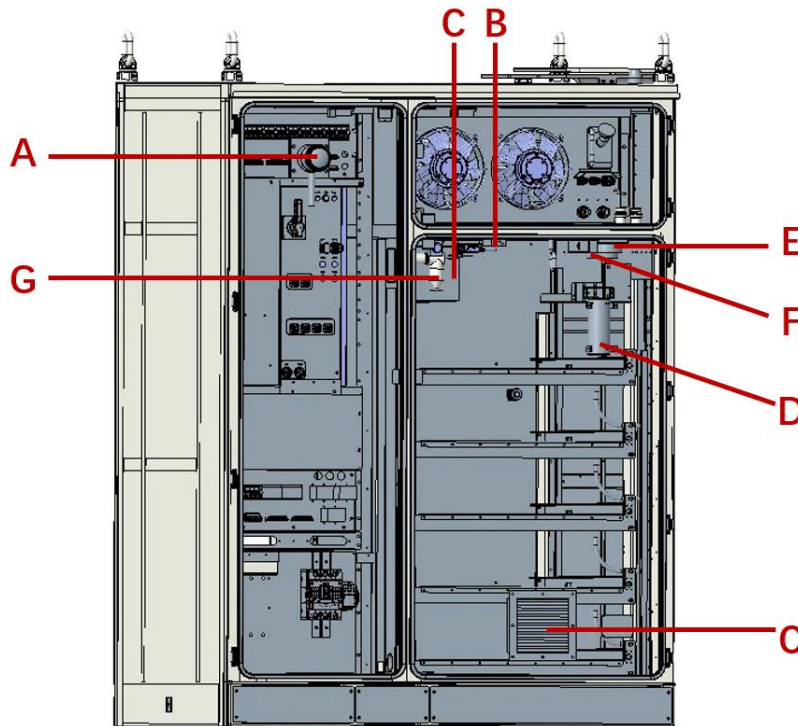


Fig. 10-1 Firefighting equipment

Item.	Description
A	Strobe and siren
B	Flammable and explosive gas detector
C	Exhaust fan
D	Aerosol fire suppression generator
E	Smoke detector
F	Temperature detector
G	Dry pipe and sprinkler

10.3 Exhaust System

When the concentration of combustible gas reaches the set threshold value, the combustible gas detector in the cabinet sends a signal to the EMS for fire warning to shut down the system and turn on the exhaust system (starts the air intake equipment and exhaust equipment).

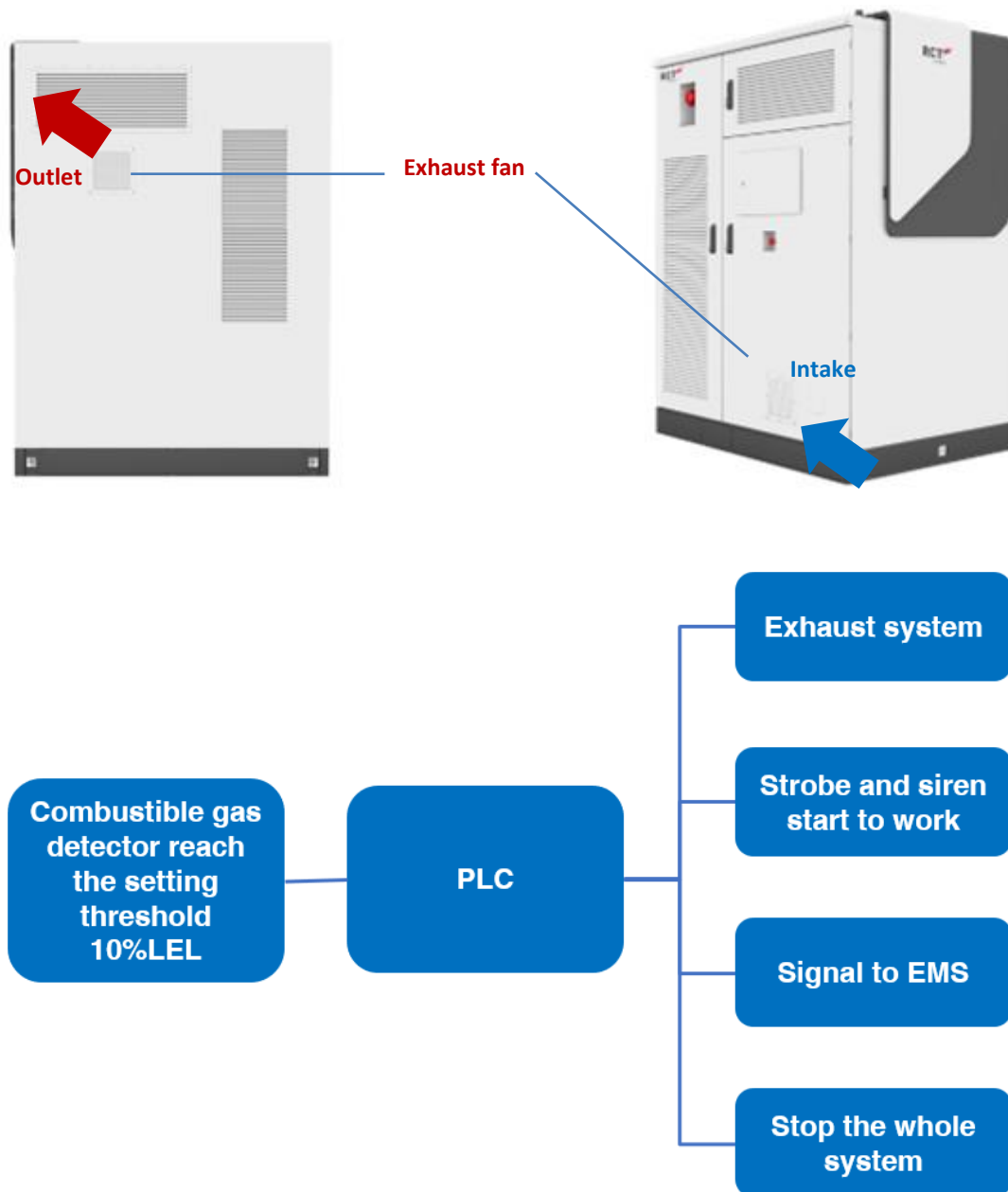


Fig. 10-2 Principle of exhaust system

10.4 Water-based Fire Protection System

The RCTerra Class 1.0 cabinet is equipped with water-based fire protection system. External firefighting water sources are introduced through the water inlet at the lower front of the cabinet. The water is conveyed via internal dry pipelines to the battery cabinet, where specialised sprinkler convert the water flow into water mist to implement firefighting. This process provides forced cooling to the battery clusters, isolates oxygen, and suppresses the spread of thermal runaway, thereby achieving rapid fire suppression and preventing reignition.

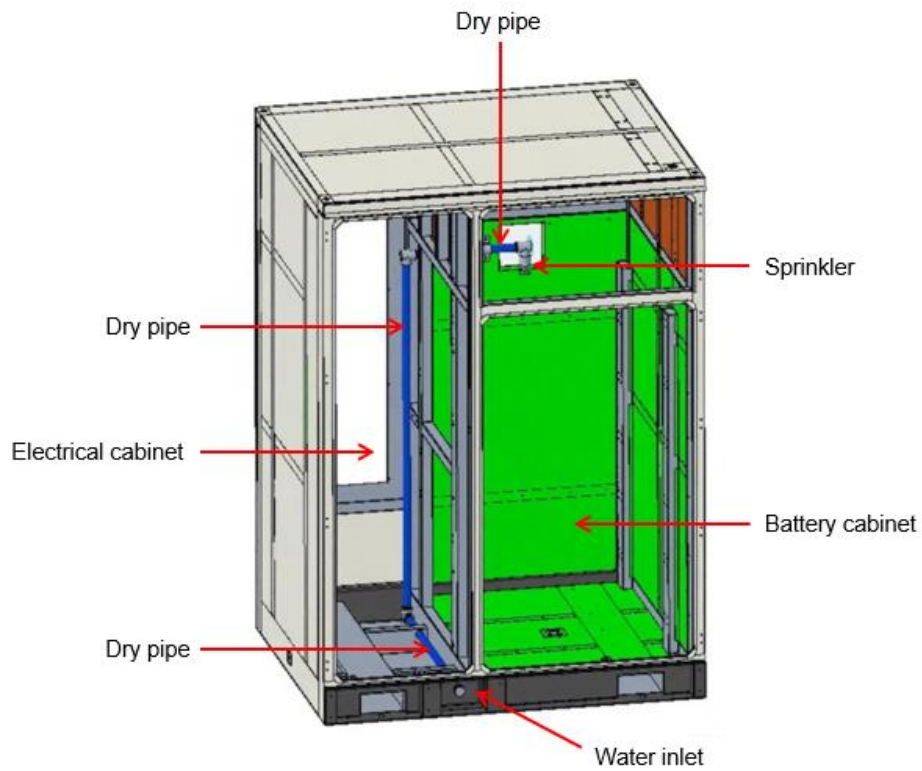
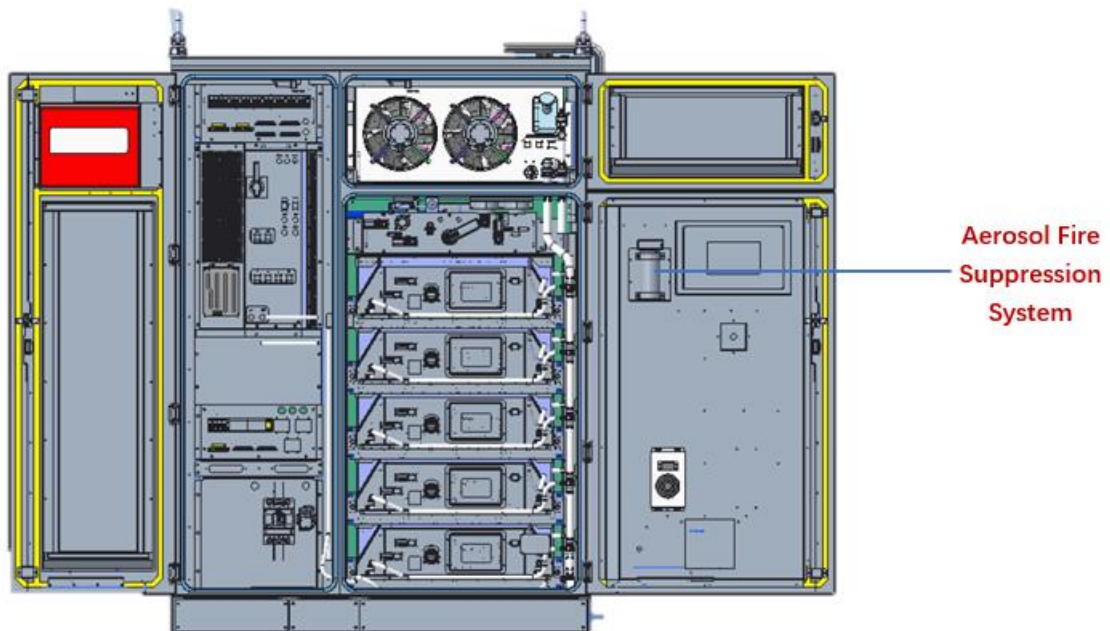


Fig. 10-3 Water-based fire protection system

10.5 Aerosol Fire Suppression System

The RCTerra Class 1.0 cabinet is equipped with an aerosol fire suppression system. Aerosol generators are automatically thermally activated. The aerosol fire suppression system is automatically activated when the smoke and temperature sensors reach their threshold value.



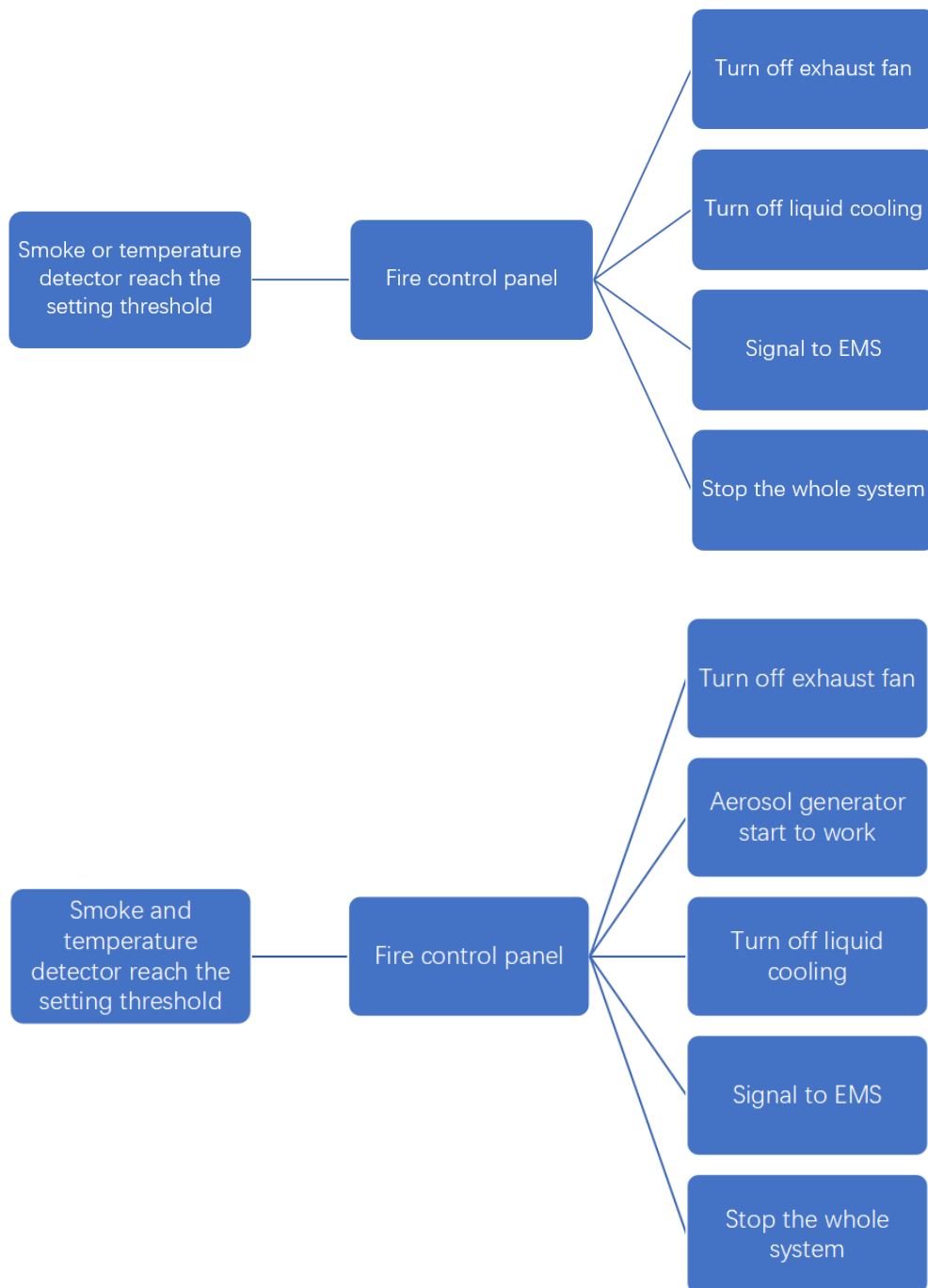
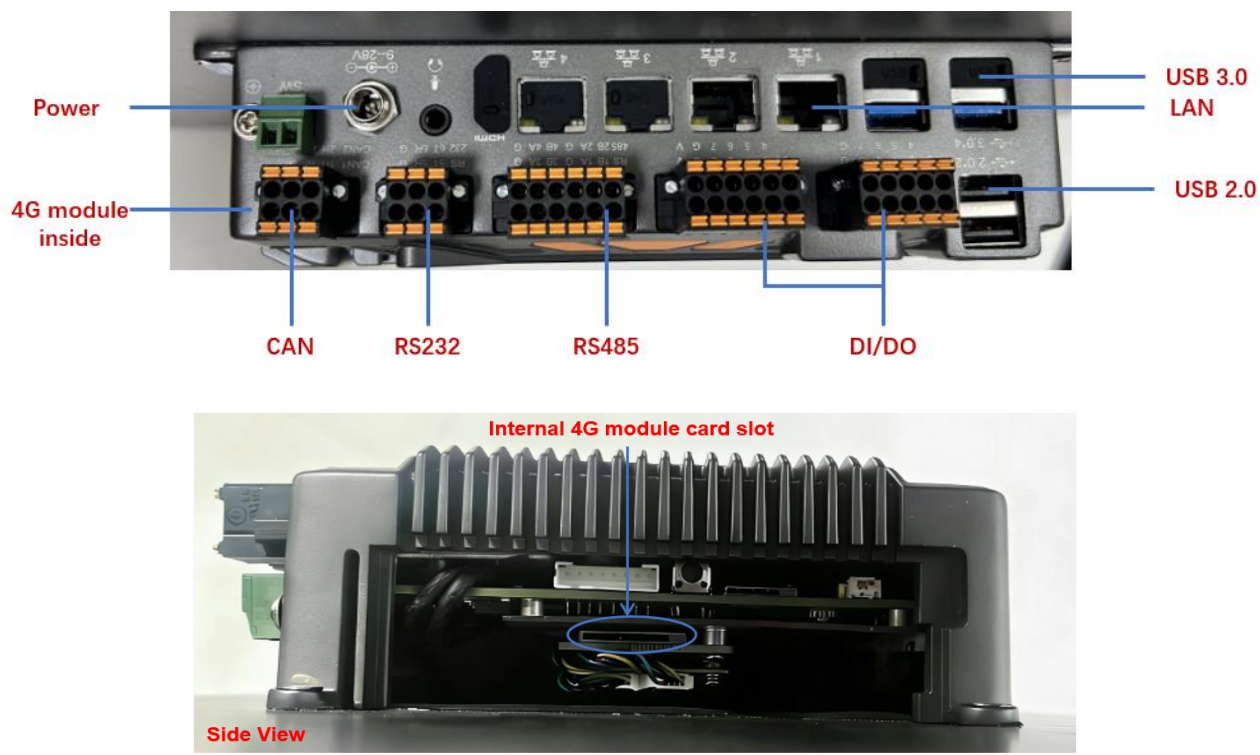


Fig. 10-4 Principle of aerosol fire suppression system

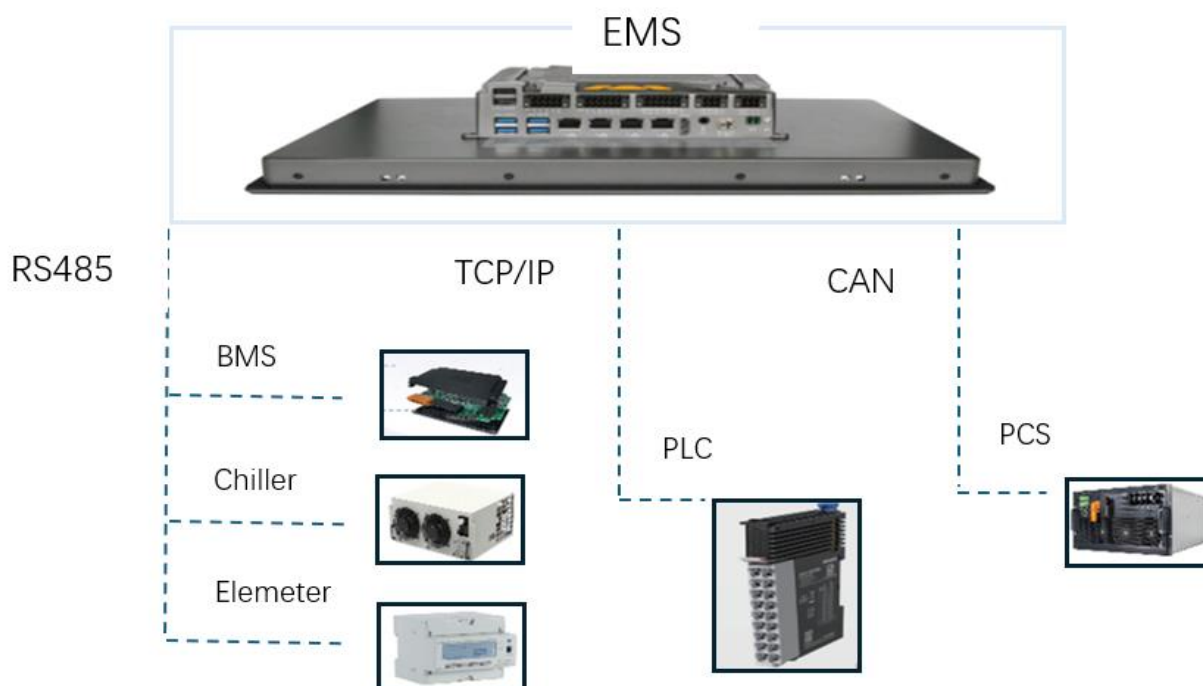
11 EMS Instruction

11.1 Touch Panel Interface



Note: The 4G module card slot is located within the touch panel and currently supports select carriers only.

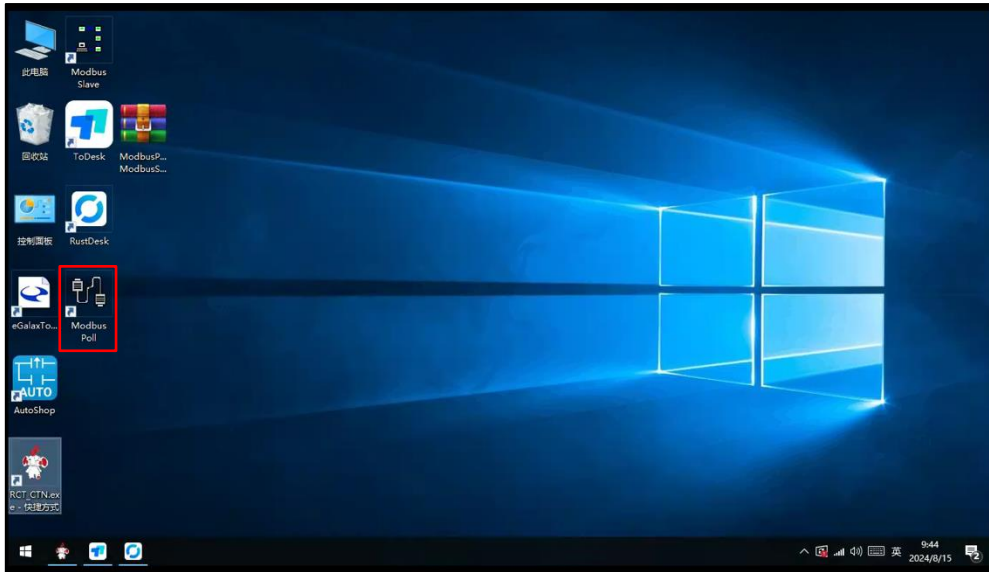
11.2 System Chart



11.3 Modbus Poll Communication

Note: During hardware debugging, ensure that cables are connected to all devices and auxiliary power supply is complete.

1. Remotely connect the industrial computer of the storage cabinet.
2. Open Modbus Poll on the industrial control computer of the energy storage cabinet to test the communication.
The connection method is shown below.



1) BMS

■ Connection Setup (As shown in figure 1)

Connection: Serial port;

Serial Settings: COM2;

9600 Baud, 8 Data bits, Node Parity, 1 Stop Bit;

■ Read/Write Definition (As shown in figure 2)

Slave ID: 2;

Function: Select according to PCS manual; register: 04 ;

Address: Select according to PCS manual; address: 8193;

Quality: Fill in as needed (Default 10); Read: 100.

2) Meter (EEM-MA370)

■ Connection Setup (As shown in figure 3)

Connection: Modbus TCP/IP;

IP Address or Node Name: 192.168.1.2 ;

■ Read/Write Definition (As shown in figure 2)

Slave ID: 1;

Function: Select according to meter manual; register: 03 ;

Address: Select according to PCS manual; address: 0;

Quality: Fill in as needed (Default 10); Read: 100.

3) Chiller

■ Connection Setup (As shown in figure 1)

Connection: Serial port;

Serial Settings: COM4;

9600 Baud, 8 Data bits, Node Parity, 1 Stop Bit;

- Read/Write Definition (As shown in figure 2)

Slave ID: 1;

Function: Select according to meter manual; register: 03 ;

Address: Select according to PCS manual; address: read 2001, write 3001;

Quality: Fill in as needed (Default 10); read: 18, write: 1.

4) PLC

- Connection Setup (As shown in figure 3)

Connection: Modbus TCP/IP;

IP Address or Node Name: 192.168.0.100;

- Read/Write Definition (As shown in figure 2)

Slave ID: 1;

Function: Select according to PLC manual; register: 03 ;

Address: Select according to PLC manual; address: 0;

Quality: Fill in as needed (Default 10); read: 100.

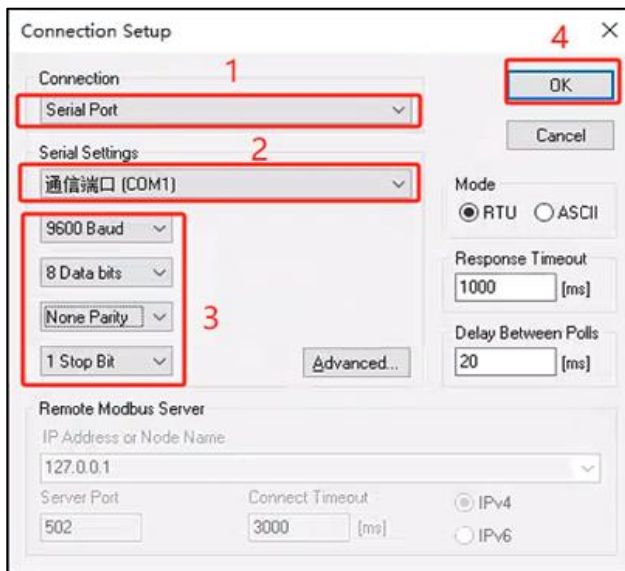


Figure 1

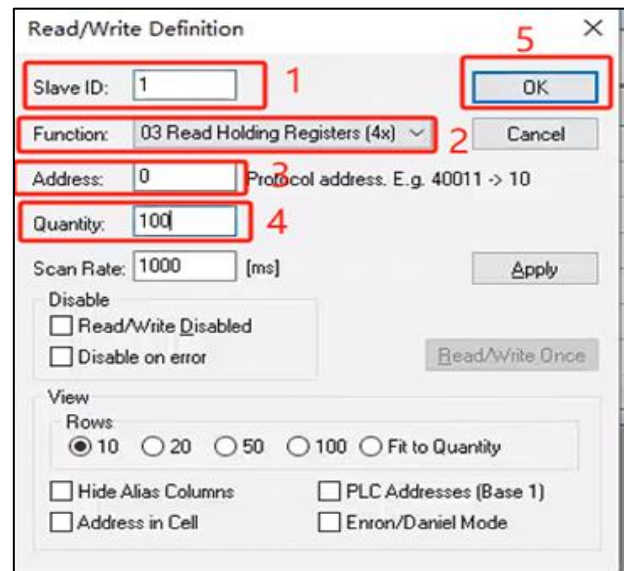


Figure 2

Connection Setup

Connection: **Modbus TCP/IP**

Serial Settings:

- COM7
- 9600 Baud
- 8 Data bits
- None Parity
- 1 Stop Bit

Mode: ☒ RTU ☐ ASCII

Response Timeout: 1000 [ms]

Delay Between Polls: 20 [ms]

Remote Modbus Server:

IP Address or Node Name: 192.168.0.100

Server Port: 502

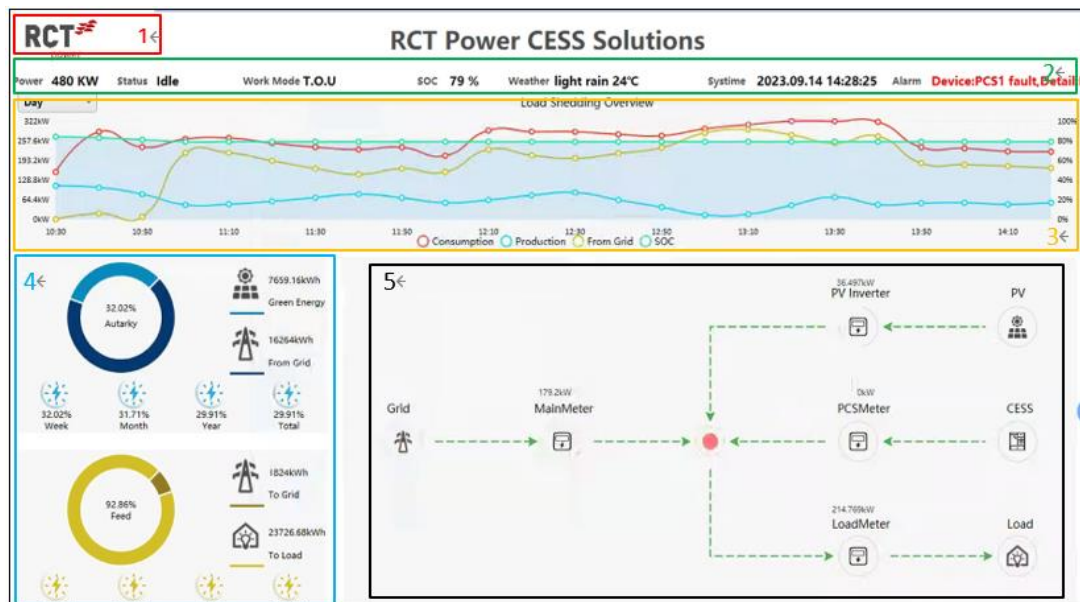
Connect Timeout: 3000 [ms]

☒ IPv4 ☐ IPv6

OK Cancel

Figure 3

11.4 Main UI Dashboard

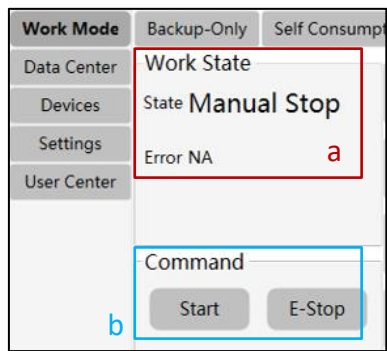


No. Description

- 1 Left click on the “RCT Power” logo to enter the main home page. If you right click on the logo you will open the menu bar.
- 2 ESS Information Displayed: Power Command, Charging or Discharging status, Application / Use Case, battery SOC, weather, system time, alarm equipment
- 3 Green Power (Daily)
- 4 Graph: Blue chart: The energy distribution generated by the storage cabinet this week (PV & Grid).
Yellow chart: The energy consumption distribution of the storage cabinet this week (Load & Grid).
- 5 Energy flow diagram

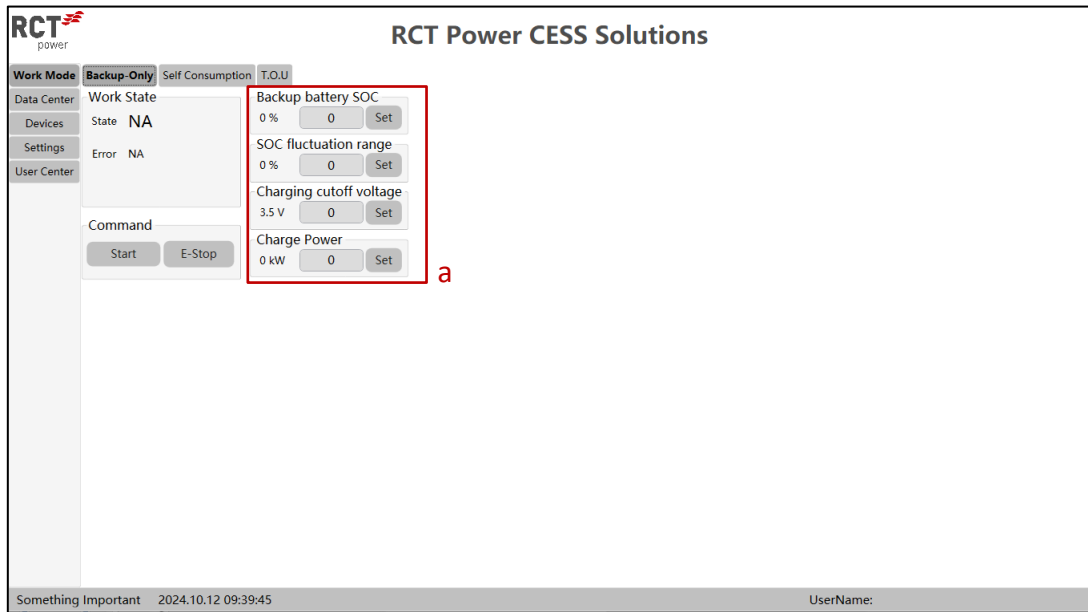
11.5 Work Mode

- Click on the left menu bar “Device” Button-> “Work Mode” Button
- Notice: Before the mode runs, BMS is in high voltage state.
 - Work mode Running status;
 - Command Area:



11.5.1 Backup-only

a. Parameter setting area:



Step1: Click on the left menu bar “Devices” button-> “Work Mode” button->Click “Backup-Only” button;

Step2: Enter parameters in the , click button.

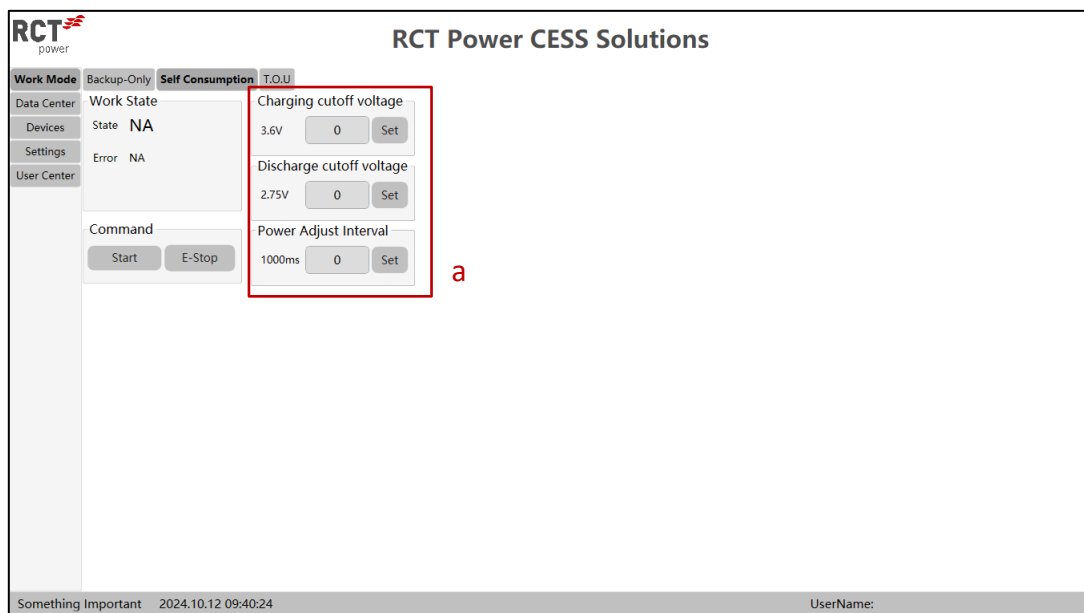
Backup battery SOC	0 ~ 100%
SOC fluctuation range	0 ~ 100%
Charging cutoff voltage	2.75 V~3.57 V
Charge power	Not exceeding rated power.

Step3: Click button, observe , “NA”->“Discharge” or “Charge”

Step4: Stop: Click button; E-Stop: Click button.

11.5.2 Self-consumption

a. Parameter setting area:



Step1: Click on the left menu bar “Devices” button-> “Work Mode” button->Click “Self-Consumption” button;

Step2: Enter parameters, in the , click button;

Charge power	Not exceeding rated power.
Discharging cutoff voltage	2.75 V~3.57 V
Power Adjust Interval	The default value is 5000 ms, not less than 1000 ms.

Step3: Click button, observe , “NA”->” Discharge” or ”Charge”;

Step4: Stop: Click button; E-Stop: Click button.

11.5.3 T.O.U

- Parameter setting area:
- Set the power curve

Start Time: Time to start charging and discharging

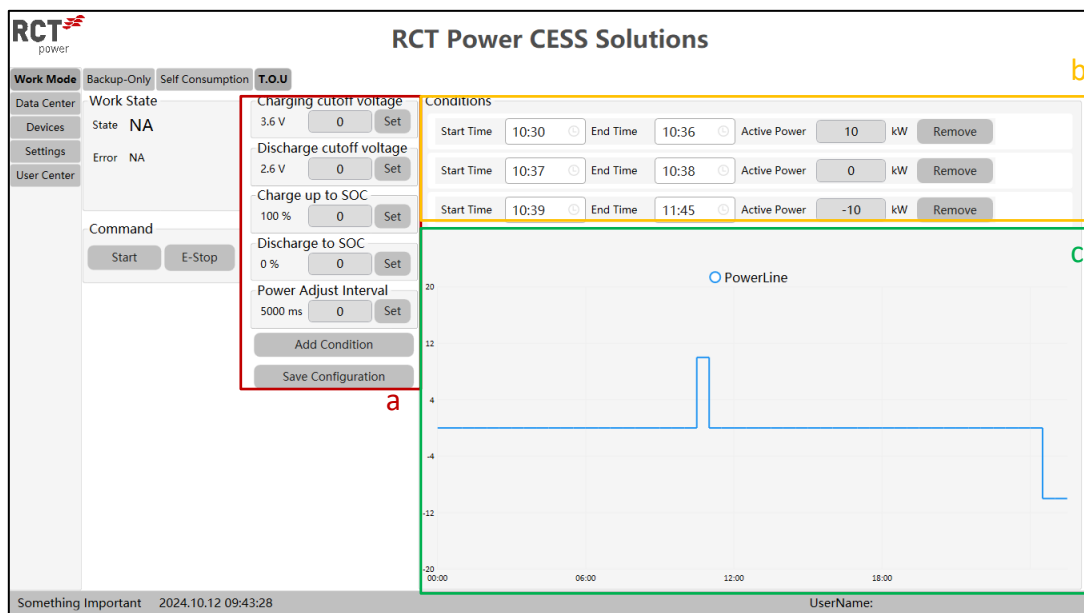
End Time: Time to end charging and discharging

Active Power: Not exceeding rated power.

Note: When the active power is positive, the device discharges.

When the active power is negative, the device charges.

- Power Line



Step1: Click on the left menu bar “Devices” button-> “Work Mode” button->Click “T.O.U” button.

Step2: Enter parameters in the , click button.

Charging cutoff voltage	2.75 ~3.57 V
Discharging cutoff voltage	2.75 ~3.57 V
Charge up to SOC	0-100%
Discharge to SOC	0-100%
Power Adjust Interval	The default value is 5000 ms, cannot set less than 1000 ms.

Step3: Each time click the button will add a row of .

Step4: Enter the start and stop time in the , enter active power in the . To cancel the line, click button.

Step5: After modification, click button, the power curve appears in zone C.

Step6: Click button, observe , “NA”-> “Discharge” or “Charge”.

Step7: To stop, click button; to E-Stop, click button.

11.6 Data Center

1. Report

a. Parameter setting area:

Start time: The start date of the report.

End time: The end date of the report.

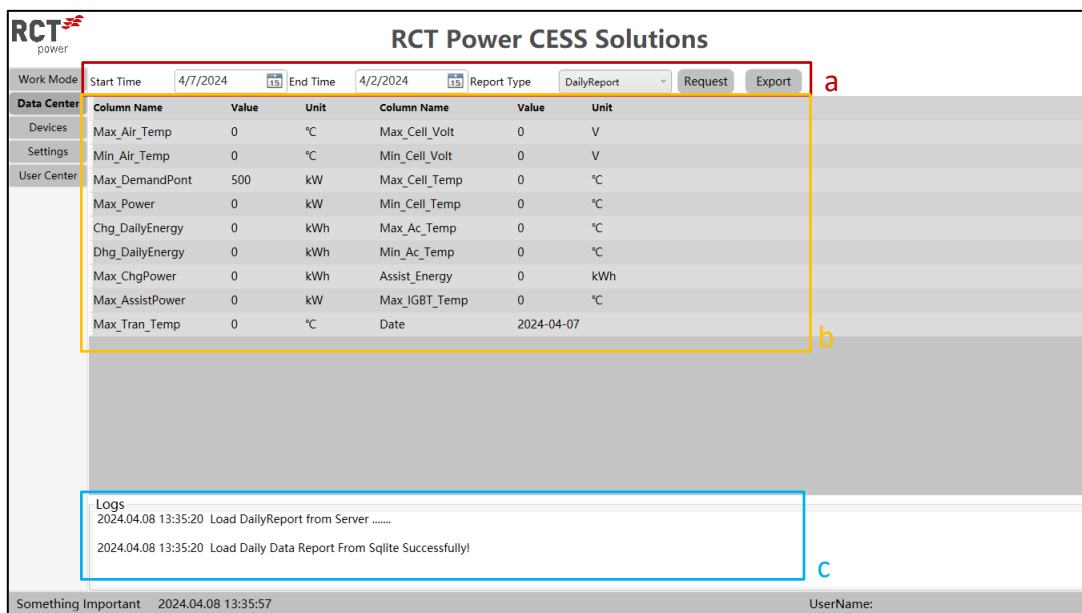
Report type: Select report type (Daily report, Summary report or Test report)

Report form button

Export data button

b. Report information display area

c. Log information.



Step1: Click on the left menu bar “Data Center” button->Click “Log Review” button.

Step2: Enter start and end time in the ,Click button to select the report type.

Step3: Click button, display reports in Zone b.

Step4: Click button to export Data.

11.7 Device

11.7.1 PCS

Step: Click on the left menu bar “Device” button-> “PCS” button.

a. Config: To configure the PCS parameters.

Note: Active Power: + Discharge, - Charge;

On or Off Grid Status: 0: On-Grid, 1: Off-Grid;

Grid frequency: 60 Hz.

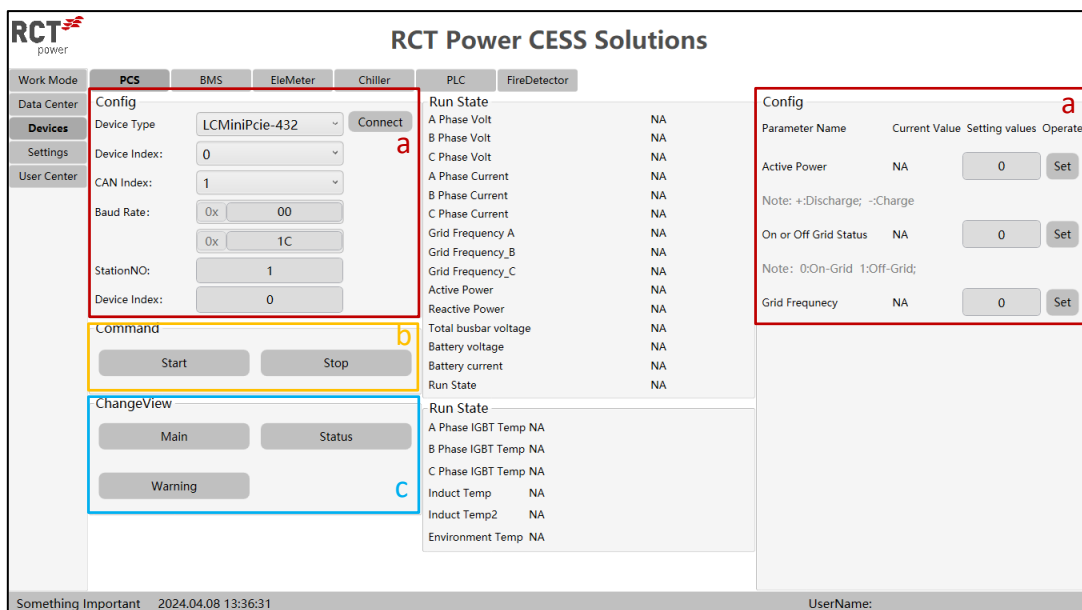
b. Command area: To start/stop PCS.

c. Change View area:

Main: To display PCS current, voltage, power, temperature, run state and related configuration parameters.

Status: To display PCS parameters.

Warning: All possible faults of PCS are listed in detail. If the fault entry is black, it means that there is no fault; if the fault entry is red, it means that the item is faulty and needs to be troubleshooting.



■ Device communication and connect

Step1: Enter the following parameters in the config area. Then click **Connect** button to turn it into **Disconnect**.

Device Type	Device Index	CAN Index	Baud Rate		Station NO.	Device Index
			0X	0X		
LCMiniPcie-432	0	2	00	14	1	1

Step2: Observe that the value displayed on the “Run State” interface on the right changes from "NA" to the specific value, indicating that the communication is successful.

The screenshot shows the RCT Power CESS Solutions interface. On the left, the 'Config' tab is active, and the 'Connect' button is highlighted with a red box and a red '1'. The configuration parameters are: Device Type: LCMINIpcie-432, Device Index: 0, CAN Index: 1, Baud Rate: 00 (0x) and 1C (0x), StationNO: 1, and Device Index: 0. On the right, the 'Run State' tab is active, and the 'Run State' section is highlighted with a red box and a red '2'. The 'Run State' section shows various parameters: A Phase Volt, B Phase Volt, C Phase Volt, A Phase Current, B Phase Current, C Phase Current, Grid Frequency_A, Grid Frequency_B, Grid Frequency_C, Active Power, Reactive Power, Total busbar voltage, Battery voltage, Battery current, and Run State. The 'Run State' parameter is highlighted with a red box and a red '2'.

■ Start PCS

Step1: Before PCS start, the BMS must be in the DC high voltage state (For details, please see [“11.8.2 BMS”](#)).

Step2: Click the **Start** button. If nothing goes wrong, the “Run State” in the State status interface will change from “Standby” to “Run”.

The screenshot shows the RCT Power CESS Solutions interface. On the left, the 'Config' tab is active, and the 'Start' button is highlighted with a red box. The configuration parameters are: Device Type: LCMINIpcie-432, Device Index: 0, CAN Index: 1, Baud Rate: 00 (0x) and 1C (0x), StationNO: 1, and Device Index: 0. On the right, the 'Run State' tab is active, and the 'Run State' section is highlighted with a red box. The 'Run State' section shows various parameters: A Phase Volt, B Phase Volt, C Phase Volt, A Phase Current, B Phase Current, C Phase Current, Grid Frequency_A, Grid Frequency_B, Grid Frequency_C, Active Power, Reactive Power, Total busbar voltage, Battery voltage, Battery current, and Run State. The 'Run State' parameter is highlighted with a red box.

■ Stop PCS

Step: Click the **Stop** button and the PCS will stop.

11.7.2BMS

Step: Click on the left menu bar “Device” button-> “BMS” button.

- Config: To configure the BMS parameters.
- Command area: To connect/disconnect the DC high volt.
- Change View area.
 - Status: To display the real-time data of BMS.
 - Config: To modify BMS parameters.
 - Warning: To display information about BMS faults.
 - Cell Data: To display real-time data of the battery unit
- To display the corresponding interface selected in area c.

RCT Power CESS Solutions

Work Mode: PCS, **BMS**, EleMeter, Chiller, PLC, FireDetector

Data Center: **Devices**, Settings, User Center

Connection: Modbus/RTU (a)

Port Name: COM1, Open

Baud Rate: 9600

Data Bits: 8

Stop Bits: One

Parity: None

StationNO: 1

Device Index: 0

Command (b): OFF

Changeview (c): Status, Config, Warning, Cell Date

State (d):

State	Value	State	Value
Equipment Running Status	Standby	Insulation Impedance	NA
Precharge stage	Standby	Positive Insulation Resistance	NA
Main pos-contact state	Closed	Negative Insulation Resistance	NA
Precharge contact state	Closed	Allowe Max Charge Current	NA
Main neg-contact state	Closed	Allowe Max Discharge Curren	NA
Isolation switch status	Closed	Cell Max Volt Index	NA
Precharge stage	NA	Cell Max Volt	NA
Battery voltage	NA	Cell Min Volt Index	NA
Battery current	NA	Cell Min Volt	NA
Charge or Discharge State	NA	Cell Max Temp Index	NA
SOC	NA	Cell Max Temp	NA
SOH	NA	Cell Min Temp Index	NA
		Cell Min Temp	NA
		Cell Avg Volt	NA
		Cell Avg Temp	NA
		Total Volt	NA
		Height Box Temp	NA
		Allow Charge Electric	NA
		Allow Discharge Electric	NA
		Last Charge Electric	NA
		Last Discharge Electric	NA
		Total charging capacity	NA
		Total discharge capacity	NA

Something Important 2024.04.08 13:37:06 UserName:

Device Communication

Step1: Enter the following parameters in the config area, click **Open** button to turn it into **Close**.

Connection	Port	Baud Rate	Data Bits	Stop Bits	Parity	Station NO.	Device Index
Modbus RTU	COM2	9600bps	8	One	None	2	1

Step2: Observe that the value displayed on the “State” interface on the right changes from "NA" to the specific value, check whether the data is consistent with the parameters in the following figure.

Step3: If the data shows no problem, you can click the **OFF** button to connect the DC high volt.

RCT Power CESS Solutions

Work Mode: PCS, **BMS**, EleMeter, Chiller, PLC, FireDetector

Data Center: **Devices**, Settings, User Center

Connection: Modbus/RTU (1)

Port: COM2, Close

Baud Rate: 9600

Data Bits: 8

Stop Bits: One

Parity: None

StationNO: 2

Device Index: 1

Command (3): OFF

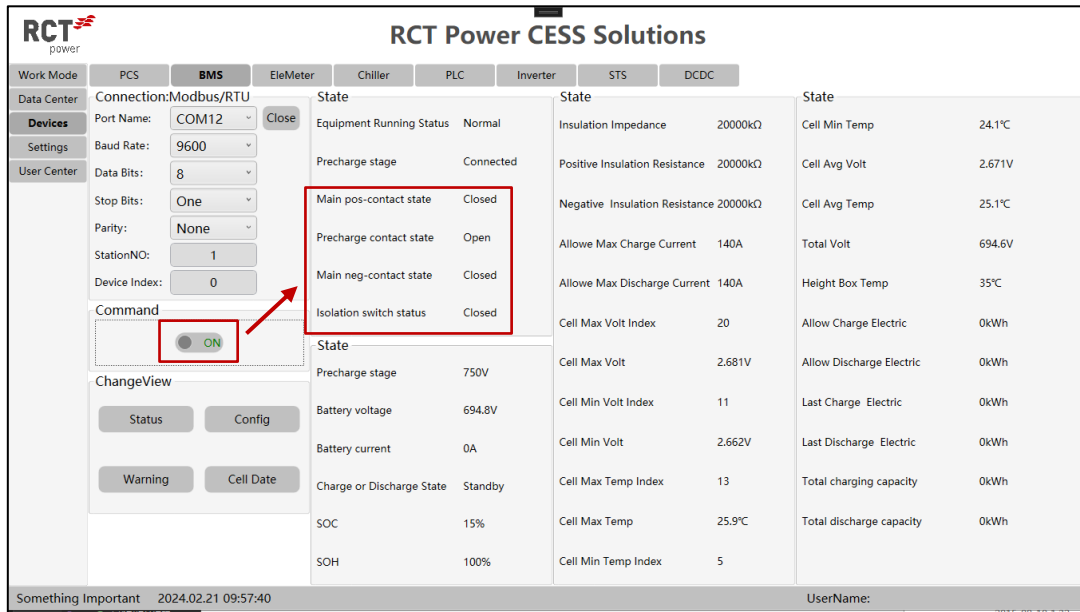
ChangeView: Status, Config, Warning, Cell Date

State (2):

State	Value	State	Value
Equipment Running Status	Standby	Insulation Impedance	20000kΩ
Precharge stage	Disconnected	Positive Insulation Resistance	20000kΩ
Main pos-contact state	Open	Negative Insulation Resistance	20000kΩ
Precharge contact state	Open	Allowe Max Charge Current	0A
Main neg-contact state	Open	Allowe Max Discharge Current	0A
Isolation switch status	Closed	Cell Max Volt Index	2
Precharge stage	0V	Cell Max Volt	3.297V
Battery voltage	857V	Cell Min Volt Index	221
Battery current	0A	Cell Min Volt	3.293V
Charge or Discharge State	Standby	Cell Max Temp Index	66
SOC	50%	Cell Max Temp	26.8°C
SOH	100%	Cell Min Temp Index	3
		Cell Min Temp	25.9°C
		Cell Avg Volt	3.296V
		Cell Avg Temp	26.2°C
		Total Volt	6553.5V
		Height Box Temp	26.9°C
		Allow Charge Electric	65535kWh
		Allow Discharge Electric	65535kWh
		Last Charge Electric	65535kWh
		Last Discharge Electric	65535kWh
		Total charging capacity	NaNkWh
		Total discharge capacity	NaNkWh
		BMU Communication State1	0
		BMU Communication State2	0

■ Connect the DC high volt

Click  button to turn it into . Then, observe the “State” interface, as shown in the figure:



RCT Power CESS Solutions

Work Mode: PCS BMS EleMeter Chiller PLC Inverter STS DCDC

Data Center: Connection: Modbus/RTU

Devices: Port Name: COM12 Close

Settings: Baud Rate: 9600

User Center: Data Bits: 8

Stop Bits: One

Parity: None

StationNO: 1

Device Index: 0

Command: 

ChangeView: Status Config Warning Cell Date

State:

Equipment Running Status	Normal
Precharge stage	Connected
Main pos-contact state	Closed
Precharge contact state	Open
Main neg-contact state	Closed
Isolation switch status	Closed

State:

Insulation Impedance	20000kΩ
Positive Insulation Resistance	20000kΩ
Negative Insulation Resistance	20000kΩ
Allowe Max Charge Current	140A
Allowe Max Discharge Current	140A
Cell Max Volt Index	20
Cell Max Volt	2.681V
Cell Min Volt Index	11
Cell Min Volt	2.662V
Cell Max Temp Index	13
Cell Max Temp	25.9°C
Cell Min Temp Index	5

State:

Cell Min Temp	24.1°C
Cell Avg Volt	2.671V
Cell Avg Temp	25.1°C
Total Volt	694.6V
Height Box Temp	35°C
Allow Charge Electric	0kWh
Allow Discharge Electric	0kWh
Last Charge Electric	0kWh
Last Discharge Electric	0kWh
Total charging capacity	0kWh
Total discharge capacity	0kWh

Something Important 2024.02.21 09:57:40 UserName:

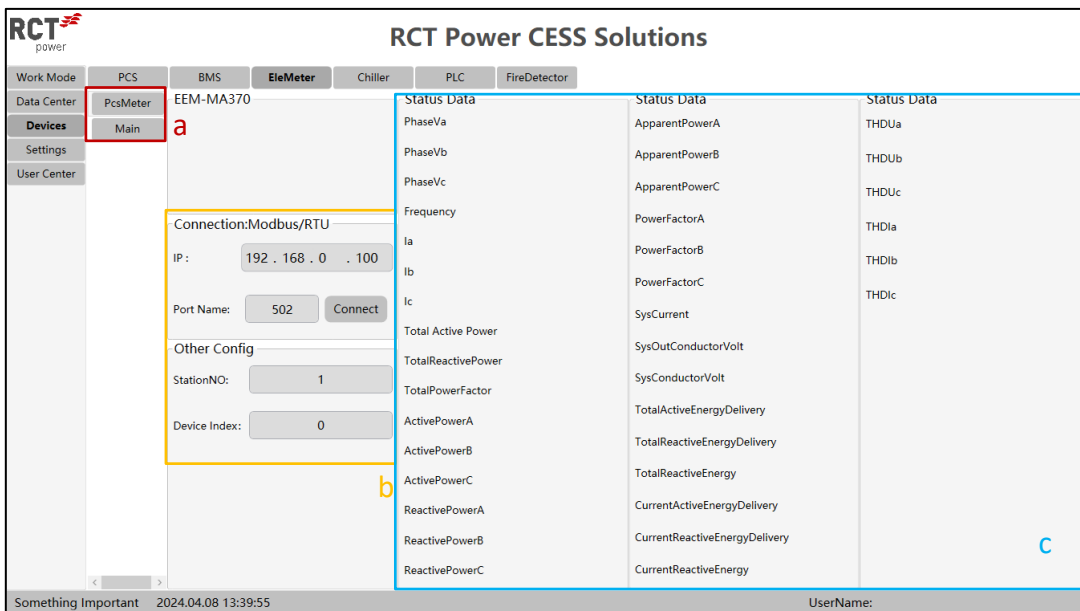
■ Disconnect the DC high volt:

Click  button to turn it into .

11.7.3 Ele Meter

Step: Click on the left menu bar “Device” button-> “Ele Meter” button.

- Meter switching panel;
- Config: To configure the Ele Meter parameters;
- To display the real-time data of Ele Meter.



RCT Power CESS Solutions

Work Mode: PCS BMS EleMeter Chiller PLC FireDetector

Data Center: PcsMeter EEM-MA370

Devices: Main

Settings: Main

User Center: Main

Connection: Modbus/RTU

IP: 192.168.0.100

Port Name: 502 Connect

Other Config:

StationNO: 1

Device Index: 0

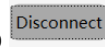
Status Data:

PhaseVa	ApparentPowerA	THDUa
PhaseVb	ApparentPowerB	THDUb
PhaseVc	ApparentPowerC	THDUc
Frequency	PowerFactorA	THDIa
Ia	PowerFactorB	THDIb
Ib	PowerFactorC	THDIc
Ic	SysCurrent	
Total Active Power	SysOutConductorVolt	
TotalReactivePower	SysConductorVolt	
TotalPowerFactor	TotalActiveEnergyDelivery	
ActivePowerA	TotalReactiveEnergyDelivery	
ActivePowerB	TotalReactiveEnergy	
ActivePowerC	CurrentActiveEnergyDelivery	
ReactivePowerA	CurrentReactiveEnergyDelivery	
ReactivePowerB	CurrentReactiveEnergy	
ReactivePowerC		

Something Important 2024.04.08 13:39:55 UserName:

■ Device Communication:

Step1: EEM-MA370 model is used for PCS meter. Enter the following parameters in the config area. Then click

 button to turn it into .

Modbus	IP	port	Station No	Device Index
Modbus TCP	192.168.1.2	502	1	1

Parallel, anti-counter meter configuration guide:

Connection	Serial Port	port	Station No	Device Index	Types
Modbus RTU	COM3	/	1	1	Grid-connection meter
Modbus TCP	192.168.1.2	502	2	2	Energy storage meter
Modbus RTU	COM3	/	3	3	Auxiliary meter
Modbus RTU	COM3	/	4	4	Anti-counter meter

Step2: Observe that the value displayed on the “Status Data” interface on the right changes from "NA" to the specific value, indicating that the communication is successful.

11.7.4 Chiller

Step: Click on the left menu bar “Device” button-> “Chiller” button.

- Device communication area;
- Chiller control area;
- To display the real-time data of chiller.
- Config: To configure the chiller parameters.

The screenshot shows the RCT Power CESS Solutions interface with the 'Chiller' tab selected. The interface is divided into three main sections: 'System Parameter', 'Run State', and 'Config'. The 'System Parameter' section on the left contains fields for Port Name (COM1), Baud Rate (9600), Data Bits (8), Stop Bits (One), Parity (None), Station NO (1), and Device Index (1). The 'Run State' section in the middle displays various status indicators like Internal Fan1 State, External Fan1 State, Compressor1 State, etc. The 'Config' section on the right contains a table for setting parameters like Refrigeration Target Temp, Heat Target Temp, Control Target, Remote Test, High water pressure protection, Low water pressure alarm, High Temp Alarm, Low Temp Alarm, and Remote Control. A 'Set ON/OFF' toggle is visible at the bottom left of the 'Run State' section.

■ Device Communication:

Step1: Enter the following parameters in the config area. Then, click **Open** button to turn it into **Close**.

Connection	Port	Baud Rate	Parity	Data Bits	Stop Bits	Station NO.	Device Index
Modbus RTU	COM4	9600bps	None	8	1	1	1

Step2: Click **OFF** button to turn it into **ON**, observe that the value displayed on the state interface on the right changes from "NA" to the specific value, indicating that the communication is successful.

Longtecool

System Parameter

Actual WorkModel: Refrigeration

ActualRefrigerationTargetTemp: 26 °C

ActualHeatTargetTemp: 15 °C

FaultCode: 0

Connection: Modbus RTU

Port Name: COM4

Baud Rate: 9600

Data Bits: 8

Stop Bits: One

Parity: None

StationNo: 1

DeviceIndex: 1

Set ON/OFF: ☒ ON

Run State

InFanState1: OFF

InFanState2: OFF

OutFanState1: ON

OutFanState2: ON

CompressorState1: ON

CompressorState2: OFF

ElecHeatRunState: OFF

HardWireShutDown: OFF

ControlTarget: OFF

Pump: ON

MakeUpPump: OFF

RemoteControl: ON

OutletWaterPressure: 1Bar

ReturnWaterPressure: 0.7Bar

Temperature

OuterWaterTemp: 26 °C

StorageTemp: 40 °C

ReturnWaterTemp: 27 °C

■ Setting Parameter:

To modify the parameters, enter values in “Setting values” and click button on the right. If the current value changes to the modified value, the modification succeeds. Otherwise, the modification fails.

11.7.5 PLC

Step: Click on the left menu bar “Device” button-> “PLC” button.

- Device communication area;
- To display the real-time data of PLC.
- Config: To configure the PLC parameters.

RCT power

RCT Power CESS Solutions

Work Mode: PCS BMS EieMeter Chiller **PLC** FireDetector

Data Center

Devices

Settings

User Center

Connection: Modbus/RTU

IP: 192.168.0.100

Port: 502

Config

StationNO: 0

Device Index: 0

Run State

PLC State

Dehumidifier1 Ambient Measuring Temperature

Dehumidifier1 Ambient Measuring Humidity

Dehumidifier1 Start Work Value

Dehumidifier1 Stop Work Value

Dehumidifier1 Communication Fault

Dehumidifier1 Working Status

PLC Module Fault code

K1 Switchgear power supply control relay status

Q3 Main MCB status/Q3 PCS3 MCB Feedback

Q1&Q2 Main MCB status

F1 feedback

F2 feedback

F3 Chiller power supply MCB status/F3 MCB feedback chiller2

F4 Dehumidifier power supply MCB status/F4 MCB feedback chiller3

F5 Cabinet illumination power supply MCB status/F5 MCB feedback chiller4

F6 H2 Ventilation system power supply MCB status/F6 MCB feedback illumination

F7 24VDC power supply MCB status/F7 MCB feedback dehumidifier

SE1 E-Stop button status

Door status

24DC UPS battery status

Fan failure

Ventilation air-inlet grille fault

Run State

O103 H2 detector status

F101 Aerosol discharge status/F101~F104 Aerosol discharge status

Fire system stage 1 status

Fire system stage 2 status

System status

K3 PCS E-stop relay status

Dehumidifier1 module

System remote reset

Config

Dehumidifier1 Start Work Value

Dehumidifier1 Stop Work Value

Dehumidifier1 module

1:Manual 0:Auto

System remote reset

K1 Delay Cut Off Time

K2 Delay Cut Off Time

Gate Shield Signal

Note: 1:Enable 0:Disable

Something Important 2024.04.08 13:41:36

UserName:

■ Device Communication:

Step1: Enter the following parameters in the config area. Then click button to turn it into .

Protocol	IP Address	Port	PC- Ethernet	Station No	Device Index
Modbus TCP/IP	192.168.0.100	502	192.168.0.99	1	1

Step2: Observe that the value displayed on the “Run State” interface on the right changes from “NA” to the specific value, indicating that the communication is successful.

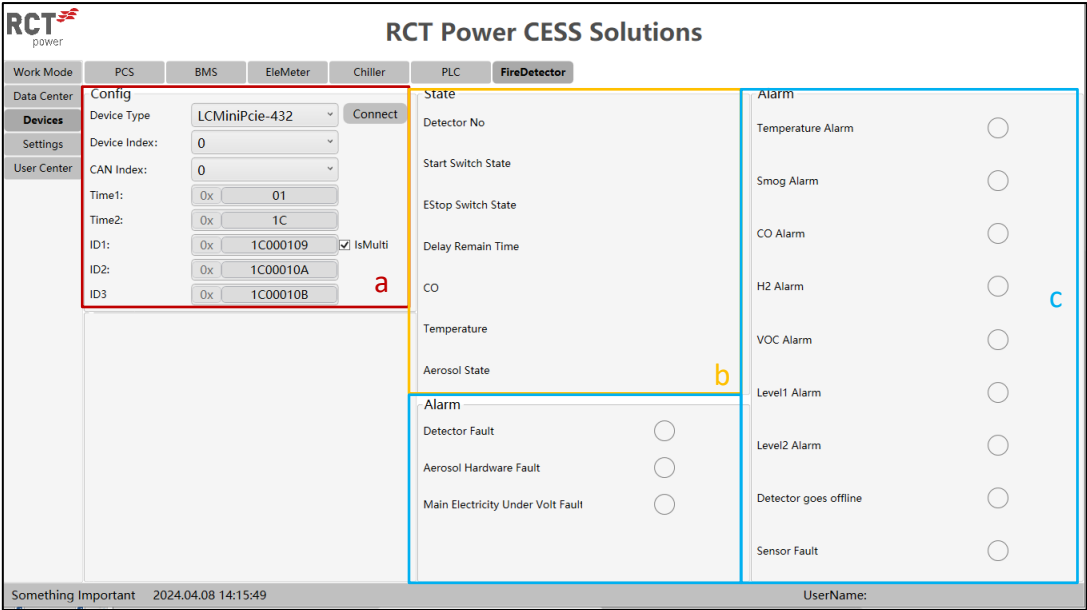
■ Setting Parameter:

To modify the parameters, enter values in “Setting values” and click button on the right.

11.7.6 Fire Detector

Step: Click on the left menu bar “Device” button-> “Fire Detector” button.

- a. Device communication area;
- b. To display the real-time data of fire detector.
- c. Fire Detector Alarm Information area.



■ **Device Communication:**

Step1: Enter the following parameters in the config area. Then click **Connect** button to turn it into **Disconnect**.

Device Type	Device Index	CAN Index	Time 1	Time 2	ID 1	ID 2	ID 3
LCMiniPcie-432	0	502	01	1C	1C000109	1C00010A	1C00010B

Step2: Observe that the value displayed on the “State” interface on the right changes from "NA" to the specific value, indicating that the communication is successful.

11.8 Settings

11.8.1Upload

Step: Click on the left menu bar “Settings” button-> “Upload” button.

- a. Option area
- b. Thingsboard Connection area
- c. Cloud Connection area
- d. Manua area
- e. Save and Setting button.

RCT Power CESS Solutions

Work Mode: **Upload** | SysSettings | Parallel | ModbusTcp | IO Setting

Data Center: **Option**

Devices: ☐ SSL Connection ☒ Enable Reconnect ☐ Test Mode ☐ Close ThingBoard ☐ Close Cloud

Settings: **Thingsaboard Connection**

Server Address: 192.168.2.122 Port: 1883 Qos: 0 **Connect**

Device ID: nQrXGxWqXlqjXyWxYLzv Device Secret: **Queue Status** 33 **Clear**

Cloud Connection

Server Address: 192.168.2.86 Port: 31883 Qos: 0 **Connect**

Station SN: sta20230001 **Queue Status** 33 **Clear**

Manual

Option: Thingsaboard

Subscribe Topic: **Subscribe**

Publish Topic: **Publish**

Publish Message: {'ts':1669192001000,'values':{'cell_voltage':3.123}}

Save **Setting**

Something Important 2024.09.19 16:01:39 UserName:

■ Option

SSL Connection: Secure connection with SSL certificate.

Enable Reconnection: Automatic reconnection for non-human disconnection.

Test Mode: Manual area is enabled.

RCT Power CESS Solutions

Work Mode: **Upload** | SysSettings | Parallel | ModbusTcp | IO Setting

Data Center: **Option**

Devices: ☐ SSL Connection ☐ Enable Reconnect ☒ Test Mode ☐ Close ThingBoard ☐ Close Cloud

Settings: **Thingsaboard Connection**

Server Address: 192.168.2.122 Port: 1883 Qos: 0 **Connect**

Device ID: nQrXGxWqXlqjXyWxYLzv Device Secret: **Queue Status** 2 **Clear**

Cloud Connection

Server Address: 192.168.2.86 Port: 31883 Qos: 0 **Connect**

Station SN: sta20230001 **Queue Status** 2 **Clear**

Manual

Option: Thingsaboard

Subscribe Topic: **Subscribe**

Publish Topic: **Publish**

Publish Message: {'ts':1669192001000,'values':{'cell_voltage':3.123}}

Save **Setting**

Something Important 2024.09.19 14:50:32 UserName:

Close ThingBoard: The Thingsboard Connection area cannot be edited.

RCT Power CESS Solutions

Work Mode: **Upload** | SysSettings | Parallel | ModbusTcp | IO Setting

Data Center: Option

Devices: ☐ SSL Connection ☐ Enable Reconnect ☐ Test Mode ☒ **Close ThingBoard** ☐ Close Cloud

Settings

User Center

Thingsaboard Connection

Server Address: 192 . 168 . 2 . 122 Port: 1883 Qos: 0 **Connect**

Device ID: nQrXGxWqXlqjXyWxYLzv Device Secret: **Connect**

Queue Status: 2 **Clear**

Cloud Connection

Server Address: 192.168.2.86 Port: 31883 Qos: 0 **Connect**

Station SN: sta20230001 **Connect**

Queue Status: 2 **Clear**

Manual

Option: Thingsaboard

Subscribe Topic: **Subscribe**

Publish Topic: **Publish**

Publish Message: {'ts':1669192001000,'values':{'cell_voltage':3.123}}

Save **Setting**

Something Important 2024.09.19 14:51:03 UserName:

Close Cloud: The Cloud Connection area cannot be edited.

RCT Power CESS Solutions

Work Mode: **Upload** | SysSettings | Parallel | ModbusTcp | IO Setting

Data Center: Option

Devices: ☐ SSL Connection ☐ Enable Reconnect ☐ Test Mode ☐ Close ThingBoard ☒ **Close Cloud**

Settings

User Center

Thingsaboard Connection

Server Address: 192 . 168 . 2 . 122 Port: 1883 Qos: 0 **Connect**

Device ID: nQrXGxWqXlqjXyWxYLzv Device Secret: **Connect**

Queue Status: 2 **Clear**

Cloud Connection

Server Address: 192.168.2.86 Port: 31883 Qos: 0 **Connect**

Station SN: sta20230001 **Connect**

Queue Status: 4 **Clear**

Manual

Option: Thingsaboard

Subscribe Topic: **Subscribe**

Publish Topic: **Publish**

Publish Message: {'ts':1669192001000,'values':{'cell_voltage':3.123}}

Save **Setting**

Something Important 2024.09.19 14:51:31 UserName:

■ Thingsaboard Connection

Step1: Enter the Server Address, Port, Device ID in the b area and click **Connect** button.

Step2: Click **Clear** button to clear the current unuploaded data.

■ Cloud Connection

Step1: Enter the Server Address, Port, Station SN in the c area and click **Connect** button.

Step2: Click **Clear** button to clear the current unuploaded data.

■ Manual

Step1: To close Thingsaboard Connection or Cloud Connection in option bar.

Step2: Enter sub topic and click **Subscribe** button.

Step3: Enter pub topic and click **Publish** button.

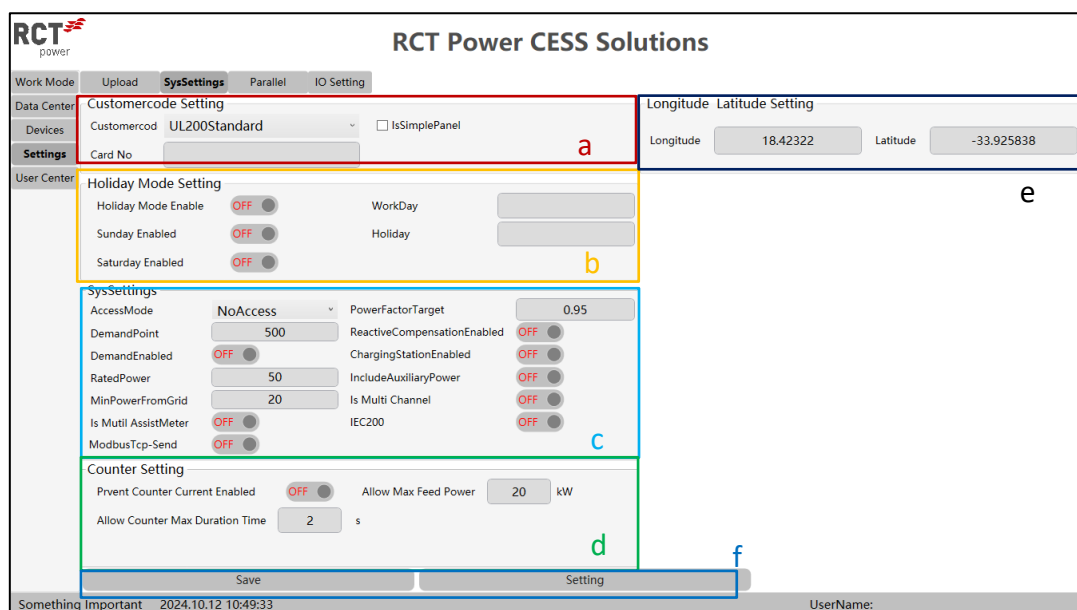
Manual	
Option	Thingsaboard
Sub Topic	
Pub Topic	
Pub Message	{'ts':1669192001000,'values':{'cell_voltage':3.123}}

Click the  button when all Settings are complete.

11.8.2 Sys Settings

Step: Click on the left menu bar “Settings” button-> “Sys Settings” button.

- Customer code setting area
- Holiday Mode Setting area
- Sys settings area
- Counter Setting area
- Longitude Latitude Setting area



■ Customer code Setting

Enter the customer code and card number of the industrial computer, and prevent the need to open the cover to view the card number when the traffic runs out.

■ Holiday Mode Setting

Storage cabinets can be set for working days and holidays.

■ Sys Settings

Access Mode	No Access Ac Access Dc Access Multi Access
Demand Point	Power demand control input, generally minus a maximum rated power of the device.
Rated Power	Rated power of energy storage system.
Min Power From Grid	Minimum load power of the grid.
Power Factor Target	Power factor.

Demand Enabled	
Is Mutil Assist Meter	
Modbus Tcp-Send	The default is off.
Reactive Compensation Enabled	OFF: 
Charging Station Enabled	ON: 
Include Auxiliary Power	
Is Mutil Channel	

■ Counter Setting

Prevent Counter Current Enabled	The default is off. OFF:  ON: 
Allow Counter Max Duration Time	The time allowed to feed power to the grid.
Allow Max Feed Power	The maximum power allowed to be fed to the grid. =0, indicates that countercurrent is not allowed at all; >0, indicates the value that allows countercurrent.

■ Longitude Latitude Setting

Enter latitude and longitude to display local weather conditions.



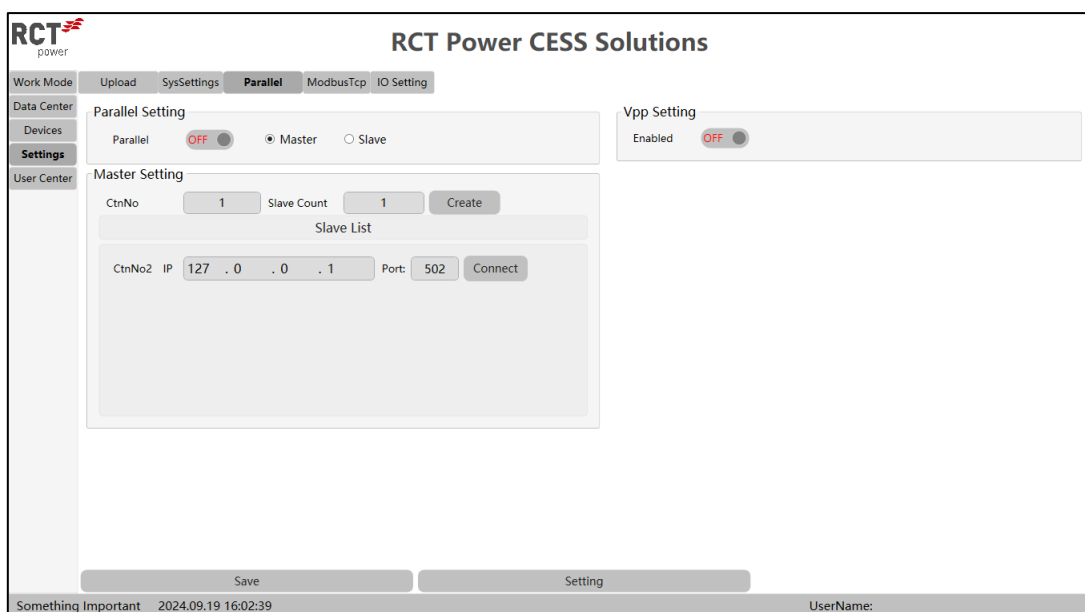
WARNING

The System Settings screen contains energy storage calculation parameters and conditions. All parameter modifications and settings must be completed by the specified agent (the administrator with the highest authority). For parameters whose meanings are not clear, please contact service. Do not modify them without authorization.

11.8.3 Parallel

If there are multiple devices, you need to achieve 1 master multi-slave or multi-master multi-slave, you need to perform parallel settings.

The default parallel mode is off. Click  button to turn the red button into  and select the current device as the master station or slave station.

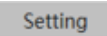


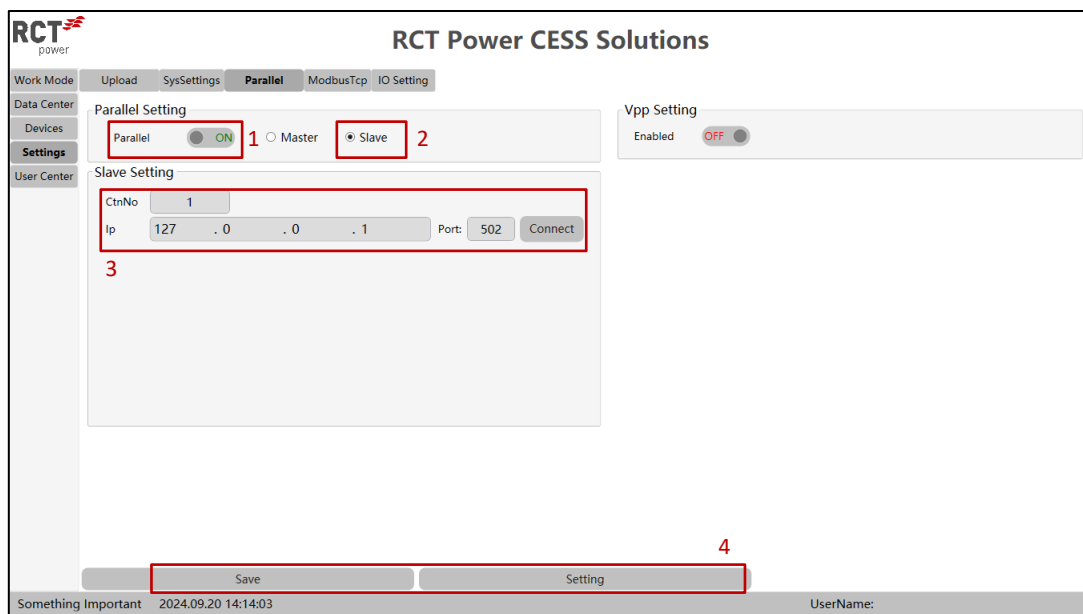
■ Slave Setting (Operation on slave device)

Step 1: Click  button to turn the red button into .

Step 2: Select .

Step 3: Enter the CtnNo, IP and port, click the  button and the settings are complete.

Step 4: Click the  button and then click  button.



■ Master Setting (Operation on master device)

Enter the CtnNo, starting with 1 by default, and then enter the number of slave count.

Take 1 master station and 2 slave stations as an example:

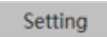
Step 1: Click  button to turn the red button into .

Step 2: Select .

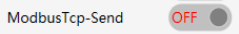
Step 3: Enter the CtnNo: 1, slave count: 2, click the  button; two lines appear in the "Slave Setting" panel.

Step 4: Enter the IP and port number of the slave station respectively, and then click the  button.

Note: Before performing this operation, you must set and connect the two slave devices. If the slave device is not connected, a communication fault is reported to the master device.

Step 5: Click the  button and then click  button.

11.8.4 Modbus Tcp

This interface is displayed only when the  button is enabled on the system setting interface. This function is enabled only when the customer uses the dispatch mode onsite.

11.8.5 IO Setting

This interface is designed to connect external loads to the cabinet when the factory generates reverse power flow to the grid, and to set the conditions for starting or shutting down these loads in order to consume the excess power.

- Command area: Enable or disable the counter-current reduction function.
- Add or remove load devices:
 - Counter-Flow Power: Set the reverse power flow threshold.
 - Duration: Set the duration of continuous reverse power flow.
 - Operation Time: Set the running time of the load after it is activated.
 - Power Consumption: Set the grid power consumed by the load.
 - Detection Interval: During the operation of the cabinet, the system checks whether the load meets the conditions for activation or shutdown every few minutes.
 - When both the Counter-Flow Power and the Duration meet the set conditions, the load is activated.
 - When the load has been running for longer than the set Operation Time, system checks whether the current power consumption from the grid is greater than the value set for Power Consumption:

- If the current power consumption is greater than the set Power Consumption value, the load is shut down.
- If the current power consumption is less than the set Power Consumption value, the load continues to run until the condition is met.

c. Perform IO tests manually.

The screenshot shows the RCT Power CESS Solutions web interface. The top navigation bar includes 'Work Mode', 'Upload', 'SysSettings', 'Parallel', and 'IO Setting'. The 'IO Setting' section is active, showing a table with columns: Index, Counter-flow Power(kW), Duration(min), Operation Time(min), Power consumption(kW), and Detection Interval(min). The table contains three rows of data. A red box labeled 'a' highlights the 'Enabled' toggle switch, which is currently 'OFF'. A blue box labeled 'b' highlights the 'Add' button. Below the table, the 'IO Test' section is visible, showing a table with columns: Type, Index, Value, Result, and Operation. The table contains two rows of data. A yellow box labeled 'c' highlights the 'IO Test' section.

■ IO Setting

Step 1: Connect the device to the DO port of the EMS (For interfaces, see [11.1 Touch panel interface](#)).

Step 2: Click the **Add** button and

1	20	5	10	10	1
---	----	---	----	----	---

 lines appear below.

Step 3: Enter Index, Counter-flow Power, Duration, Operation Time, Power consumption, Detection Interval.

Step 4: Click **OFF** button to turn the button into **ON** to enable this function.

Step 5: To remove this device, click **ON** button to turn the button into **OFF** and then click **Remove** button.

■ IO Test

Enter the DI/DO parameters of the device you want to test to manually test the counter-current protection of this device function.

11.9 User

Step: Click on the left menu bar “User” button.

RCT
power

Work Mode

Data Center

Devices

Settings

User

RCT Power CESS Solutions

User Information

UserName

Password

Role

User

Create

Delete

Step1: Enter the user name and password;

Step2: Choose the role,

Role

User

User

Administrator

 ;

Step3: Choose

Create

 button Create Account, click

Delete

 Delete Account.

Role	Permission
User	Only view data
Administrator	All

12 Error message and trouble shooting

Error message	Description	Cause and possible corrective action
ERR_Pcs_SPD	Pcs Device SPD Fault	Wait 10 minutes and the alarm will be cleared automatically. If the error still occurs, please contact service.
ERR_Pcs{i}_G_Frq	The power grid frequency is abnormal.	Check whether the AC connection is correct, if no problem, please contact service.
ERR_Pcs_G_O_Frq	Pcs Device Grid Over Frequency	
ERR_Pcs_G_U_Frq	Pcs Device Grid Under Frequency	
ERR_Pcs{i}_G_V_Unb	PCS Device Grid Volt Unbalance	Check whether the AC connection is correct, if no problem, please power off and restart; if the error still occurs, please contact service.
ERR_Pcs{i}_G_I_Unb	PCS Device Grid Current Unbalance	
ERR_Pcs_PreChgBus_O_V	Pcs Device Precharge Busbar Over Volt	Click the 'Reset' button on the EMS PCS command area and the alarm will be cleared automatically. If the error still occurs, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_PreChgBus_U_V	Pcs Device Precharge Busbar Under Volt	
ERR_Pcs_Cell_O_V	Pcs Device Cell Over Volt	Max. allowed DC-voltage was exceeded. Wait 3 hours and the alarm will be automatically cleared. If the error still occurs, please contact service.
ERR_Pcs_Cell_U_V	Pcs Device Cell Under Volt	
ERR_Pcs_Ex_EStop	Pcs Device E-Estop Detection Fault	Wait 10 minutes and the alarm will be cleared automatically. If the error still occurs, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_Lock_Pha	Pcs Device Hardware Phase Locking Fault	Check whether the AC connection is correct, if no problem, please contact service.
ERR_Pcs{i}_g_abnormal	Pcs Device Grid Abnormal	
ERR_Pcs{i}_Instant_V_High	Pcs Device Instantaneous grid High Voltage	
ERR_Pcs{i}_LineV_Eff	The RMS voltage of the power grid line is faulty	
ERR_Pcs_G_Frq	Pcs Device Grid Frequency Anomaly	
ERR_Pcs_DC_Bus_V_DeVM	Pcs Device Dc bus deviation is large.	Wait 10 minutes and the alarm will be cleared automatically. If the error still occurs, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_hawe	Pcs Device Hardware Fault	
ERR_Pcs_Inver_I_Samp_Offset	The sampling offset of ABC inverter current is faulty.	
ERR_Pcs_Inver_O_I	Pcs Device Inverter Over Current	
ERR_Pcs_AC_Main_KM	Pcs Device AC Contactor Fault	
ERR_Pcs_Start_Open	Pcs Device Start Fault	
ERR_Pcs_Induct1_O_T	Pcs Device Inductor 1 Over Temp	
ERR_Pcs_Induct2_O_T	Pcs Device Inductor 2 Over Temp	
ERR_Pcs_IGBT_Pha_O_T	Pcs Device IGBT Phase A Over Temp	
ERR_Pcs_IGBT_PhB_O_T	Pcs Device IGBT Phase B Over Temp	

Error message	Description	Cause and possible corrective action
ERR_Pcs_IGBT_PhC_OT	Pcs Device IGBT Phase C Over Temp	
ERR_Pcs_Cell_Volt	Pcs Device Cell Volt Fault	Check whether battery cables are correctly connected, if no problem, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_water_cool_OT	The water cooling plate is over temperature.	
ERR_Pcs_IMD	Pcs Device Insulation Detection Fault	Insulation detection BMS and EMS can only open one; contact service to close.
ERR_Pcs_g_ph_v_eff	The RMS voltage of the grid phase is faulty.	Check whether the AC connection is correct, if no problem, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_CPLD	Pcs Device CPLD Fault	
ERR_Pcs_PreSysncDetectionFault	Pcs Device Pre-synchronization detection Fault	Wait 10 minutes and the alarm will be cleared automatically. If the error still occurs, disconnect the main AC connection MCCB Q1 and wait for 10 minutes to connect Q1 again. If the error is still unresolved, please contact service.
ERR_Pcs_CPLDDetectHardwareFault	Pcs Device CPLD Hardware Fault	
ERR_Pcs_AReactorOverTempFault	Pcs Device A Phase Reactor Over Temp	
ERR_Pcs_CReactorOverTempFault	Pcs Device C Phase Reactor Over Temp	
ERR_Bms_BMU_Hardware	BMS Device BMU Hardware Fault	
ERR_Bms_BCU_Hardware	BMS Device BCU Hardware Fault	Please contact service to replace the BCU of the BMS device.
ERR_Bms_FusePro	BMS Device Fuse Fault	Check all battery MSD installation status, if the error still occurs after all MSDS are inserted, please contact service.
ERR_Bms_ConAdh	BMS Device Contactor Adhesion Fault	Click the  button on the EMS BMS command area to disconnect DC high voltage, wait 10 minutes to restart again, the alarm will be cleared automatically. If the error still occurs, please contact service.
ERR_Bms_BMU_Comm	BMS Device BMU Communication Fault	Please contact service.
ERR_Bms_BAU_Comm	BMS Device BAU Communication Fault	
ERR_Bms_CurSen	BMS Device Current Sensor Fault	
ERR_Bms_IMD	BMS Device Insulation Monitoring Device Fault	Check whether the positive or negative insulation resistance value is smaller than 20000kΩ, please contact service.
ERR_Bms_DisOpen	BMS Device Isolation switch Disconnect abnormally	Please contact service.
ERR_Bms_O_V	Level 1 alarm for overvoltage.	This fault can not affect device running.
ERR_Bms_U_V	Level 1 alarm for undervoltage.	
ERR_Bms_Cell_O_V	Level 1 alarm for cell overvoltage.	
ERR_Bms_Cell_U_V	Level 1 alarm for cell undervoltage.	

Error message	Description	Cause and possible corrective action
ERR_Bms_Dis_O_I_Le1	Level 1 alarm for discharging overcurrent.	This fault can not affect device running.
ERR_Bms_Cha_O_I_Le1	Level 1 alarm for charging overcurrent.	
ERR_Bms_DisBat_O_T	Level 1 alarm for battery discharging over temperature.	
ERR_Bms_DisBat_U_T	Level 1 alarm for battery discharging under temperature.	
ERR_Bms_ChaBat_O_T	Level 1 alarm for battery charging over temperature.	
ERR_Bms_ChaBat_U_T	Level 1 alarm for battery charging under temperature.	
ERR_Bms_IR_Low	Level 1 alarm for low insulation resistance.	
ERR_Bms_HVB_T_H	Level 1 alarm for switch gear connector high temperature.	
ERR_Bms_CellV_H	Level 1 alarm for high cell voltage difference.	
ERR_Bms_Cell_T_H	Level 1 alarm for high cell temperature difference.	
ERR_Bms_SOC_Low_Le1	Level 1 alarm for low SOC.	
ERR_Bms_O_V_Le2	Level 2 alarm for overvoltage.	
ERR_Bms_U_V_Le2	Level 2 alarm for undervoltage.	
ERR_Bms_Cell_O_V_Le2	Level 2 alarm for cell overvoltage.	
ERR_Bms_Cell_U_V_Le2	Level 2 alarm for cell undervoltage.	
ERR_Bms_Dis_O_I_Le2	Level 2 alarm for discharging overcurrent.	
ERR_Bms_Cha_O_I_Le2	Level 2 alarm for charging overcurrent.	
ERR_Bms_DisBat_O_T_Le2	Level 2 alarm for battery discharging over temperature.	
ERR_Bms_DisBat_U_T_Le2	Level 2 alarm for battery discharging under temperature.	
ERR_Bms_ChaBat_O_T_Le2	Level 2 alarm for battery charging over temperature.	
ERR_Bms_ChaBat_U_T_Le2	Level 2 alarm for battery charging under temperature.	
ERR_Bms_IR_Low_Le2	Level 2 alarm for low insulation resistance.	
ERR_Bms_HVB_T_H_Le2	Level 2 alarm for switch gear connector high temperature.	
ERR_Bms_CelVolDif_H_Le2	Level 2 alarm for high cell voltage difference.	
ERR_Bms_Cell_T_Dif_H_Le2	Level 2 alarm for high cell temperature difference.	
ERR_Bms_SOC_Low_Le2	Level 2 alarm for low SOC.	
ERR_Bms_O_V_Le3	Level 3 alarm for overvoltage.	Disconnect the DC high volt on the EMS BMS command area and turn off the switch gear 24V DC auxiliary power supply switch. Wait for 10 minutes to restart. If the error still occurs, please contact service.
ERR_Bms_U_V_Le3	Level 3 alarm for undervoltage.	
ERR_Bms_Cell_O_V_Le3	Level 3 alarm for cell overvoltage.	
ERR_Bms_Cell_U_V_Le3	Level 3 alarm for cell undervoltage.	

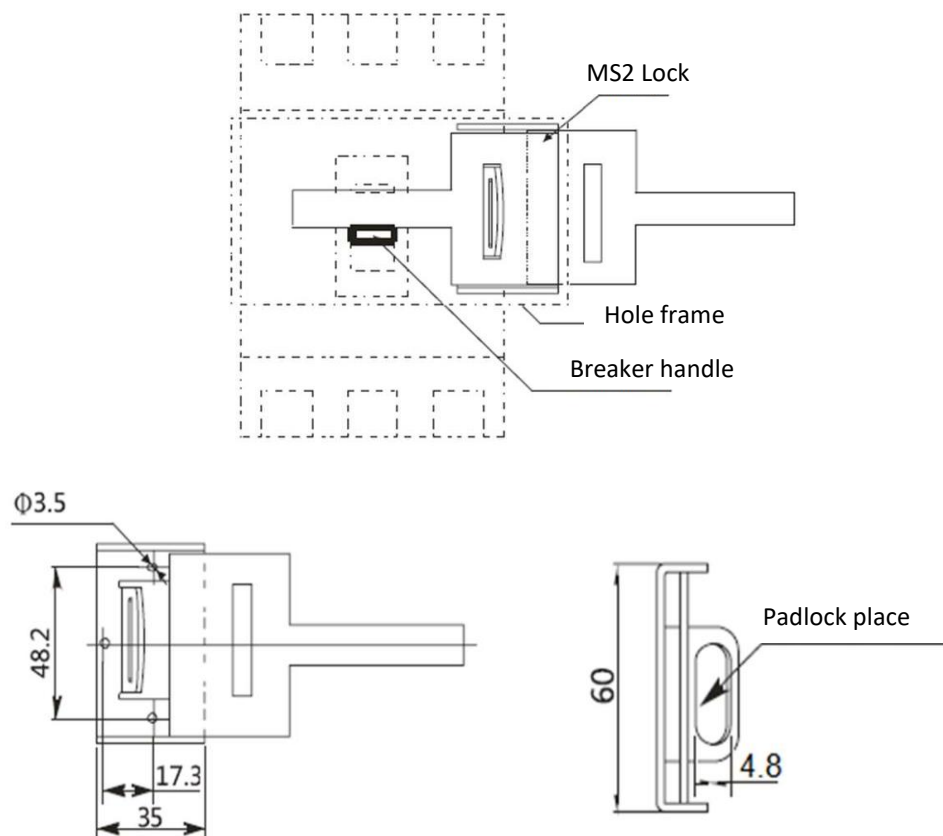
Error message	Description	Cause and possible corrective action
ERR_Bms_Dis_O_I_Le3	Level 3 alarm for discharging overcurrent.	Power up the cabinet, chiller will start cooling. Wait 10 minutes and the alarm will be cleared automatically.
ERR_Bms_Cha_O_I_Le3	Level 3 alarm for charging overcurrent.	
ERR_Bms_DisBat_O_T_Le3	Level 3 alarm for battery discharging over temperature.	
ERR_Bms_DisBat_U_T_Le3	Level 3 alarm for battery discharging under temperature.	
ERR_Bms_ChaBat_O_T_Le3	Level 3 alarm for battery charging over temperature.	
ERR_Bms_ChaBat_U_T_Le3	Level 3 alarm for battery charging under temperature.	
ERR_Bms_IR_Low_Le3	Level 3 alarm for low insulation resistance.	Check whether the positive or negative insulation resistance value is smaller than 20000kΩ, please contact service to check whether the fuse needs to be replaced.
ERR_Bms_HVB_T_H_Le3	Level 3 alarm for switch gear connector high temperature.	Wait 10 minutes and the alarm will be automatically cleared. If the error still occurs, please contact service.
ERR_Bms_Cell_V_Dif_H_Le3	Level 3 alarm for high cell voltage difference.	Wait 3 hours and the alarm will be automatically cleared. If the error still occurs, please contact service.
ERR_Bms_Cell_T_Dif_H_Le3	Level 3 alarm for high cell temperature difference.	
ERR_Bms_SOC_Low_Le3	Level 3 alarm for low SOC.	Battery discharge to the lowest SOC. Note: This fault can not affect device running.
ERR_Plc_EAD5DehComm	The dehumidifier communication failed.	■ Check whether the dehumidifier equipment is damaged, if so, please contact service. ■ Check the cables between the PLC and the dehumidifier, if damaged, wrap electrical tape around it. If there is no problem with the above two items, please contact service.
ERR_Plc_ModuleCode	PLC module Code Error	Please contact service.
ERR_Plc_K1Switch	K1 Switch Status	
ERR_Plc_Q3_PCS3_MCB	Q3 Auxiliary Power MCB Status	Check the status of the Q3 switch, whether it is open or closed. If it is open, close the Q3 switch.
ERR_Plc_FireSys_Sta1	Fire System Fault	Wait 10 minutes and the alarm will be automatically cleared. If the error still occurs, please contact service.
ERR_Plc_FireSys_Sta2	Fire System Alarm	Please contact service.
ERR_Plc_VenFan	Fan Fault Status	Check whether the fan is damaged.
ERR_Plc_VenAirGri	Ventilate air-inlet grille Status	Check whether the exhaust fan is damaged.
ERR_Plc_F1SA1MainPower_SpdPro_MCB	F1&SA1 Main Power SPD Protection MCB Status	Check the F1 switch status; ON or OFF, if it is OFF, close the F1 switch.
ERR_Plc_F2&SA2_MainPower_SPD_Protect_MCB_Status	F2&SA2 Main Power SPD Protection MCB Status	Check the F2 switch status; ON or OFF, if it is OFF, close the F2 switch.
ERR_Plc_F3ChiPower_MCB	F3 Chiller Power Supply MCB Status	Check the F3 switch status; ON or OFF, if it is OFF, close the F3 switch.
ERR_Plc_F4DehPower_MCB	F4 Dehumidifier Power Supply MCB Status	Check the F4 switch status; ON or OFF, if it is OFF, close the F4 switch.

Error message	Description	Cause and possible corrective action
ERR_Plc_F5CabIIIPower_MCB	F5 Cabient Illumination Power Supply MCB Status	Check the F5 switch status; ON or OFF, if it is OFF, close the F5 switch.
ERR_Plc_F6H2VenSysPower_MCB	F6 H2 Detection System Power Supply Status	Check the F6 switch status; ON or OFF, if it is OFF, close the F6 switch.
ERR_Plc_F724VDCPower_MCB	F7 24V DC Power Supply Satus	Check the F7 switch status; ON or OFF, if it is OFF, close the F7 switch.
ERR_Plc_SE1E_StopBut	SE1 E-Stop Button Status	Confirm the external emergency stop status. If the emergency stop is pressed, rotate it outward to reset it.
ERR_Plc_DC24UPS_Bat	24VDC UPS Status	Check the status of the 24V UPS, if it is fault, please contact service.
ERR_Plc_H2Det	H2 detector status. 0=Normal; 1=Fault; 2=Alarm.	■ Fault: Wait 10 minutes and the alarm will be automatically cleared. If the error still occurs, please contact service. ■ Alarm: Please contact service.
ERR_Plc__F101_Aerosol_Status	Aerosol status. 0=Normal; 1=Fault; 2=Discharged.	Please contact service.
ERR_Plc_K3PCS_Estop	K3 PCS E-Stop Switch Status	If it is fault, please contact service.

13 Routine Maintenance

13.1 Warnings Prior to Maintenance

- There is a fatal high voltage inside the cabinet equipment of the energy storage integrated system. If accidentally touched, there is a risk of fatal electric shock.
 - After shutdown, please wait at least 10 minutes before opening the cabinet door. Before performing maintenance work, please ensure that there is no electricity inside the equipment.
 - Only qualified and authorized personnel can perform maintenance and other operations on the energy storage integrated system.
 - When carrying out maintenance work, do not leave loose hardware inside the ESS. Otherwise, it may damage the equipment!
 - The entry of sand, moisture or other environmental material may damage the electrical equipment within the energy storage integrated system or affect the operational performance of the equipment!
 - Do not open the equipment cabinet doors of the CESS if installed outside during excessive rain, wind or sand, or when the relative humidity in the surrounding environment exceeds 95%.
 - To avoid the risk of electric shock, disconnect all AC/DC side switches and the front and rear circuit breakers of the energy storage integrated system and install MCCB lock before maintenance, repair, and other operations.
- MS2 is a split lock device (that is, the device is installed on the left or right side of the circuit breaker face cover, if there is no special requirement, it will be installed on the right side by default), which is used for NDM3E series products, designed to prevent human error closing or opening operation (dashed line part is the circuit breaker part).



- **Note:** After MS2 accessories are selected, no other internal or external accessories can be installed on the same side.

13.2 Maintenance Item and Period

13.2.1 Maintenance (Every 6-12 months)

Maintenance Tasks	Method
Software Maintenance	Check the EMS parameter configuration.
Safety function	- Check that the emergency stop button works normally. - Simulate shutdown. - Check the warning indicators and other device indicators and quickly replace them if illegible or damaged.
Internal component inspection	- Check the cleanness of the circuit board and other elements and components. - Check the temperature of the radiator and the amount of dust accumulated. - Clean fans and air filters with a vacuum cleaner if necessary. - Replace the air filter screen when necessary. Note: It is necessary to check ventilation of the air inlet. Otherwise, fault may occur due to overheating if the module cannot be cooled effectively.
Device maintenance	- Carry out regular inspection for corrosion of all metal components (Every 6 months). - Check the contactors (auxiliary switches and micro-switches) annually to ensure proper mechanical operation. - Check the main power conductors (especially voltage and insulation). - The radiator fan is showing signs of abnormal wear and tear, we recommended that it is replaced

13.2.2 Maintenance (Annually)

Maintenance Tasks	Method
Outside the container	Check the following items, and immediately correct any relevant issues: - Check for any flammable objects near or on top of the container. - Check the welding points between the container and the foundation steel plate are firm and for any corrosion. - Check for any damaged, flaking paint or sign of oxidization on the enclosure. - Check that the lock of the cabinet door can be smoothly operated. - Check that the gasket is properly fixed
Inside the container	Check for any foreign objects, dust, dirt, or condensed water inside the integrated energy storage system.
Air inlet and outlet	Check the temperature of the radiator and the amount of dust accumulated. Clean fan modules with a vacuum cleaner if necessary.
Wiring and cable layout	Completely power off the devices inside the system before checking. For any non-conformances found during inspection, correct them immediately. - Confirm the cable layout is normal and for any short circuit. For any non-conformities found during inspection, correct them immediately. - Confirm all cable entrances are well sealed and that there is no water seepage inside the device. - Check for any loose power cables, and fasten them again to the proper torque specification. - Check for any damaged power cables or insulation, especially if there are signs the insulation has been cut. - Check to ensure the insulation has not fallen or sagged off the power cables. If there is any exposed wire, either replace or cover with properly rated insulation tape.
Ground connection and equipotential connection	- Check for a solid ground connection and that the grounding resistance value meets the specifications. - Check whether the grounding connection inside the integrated system is correct.
Fan	- Check the running status of fans. - Check to see if the fans are blocked. - Check for abnormal or excessive noise during operation of the fans.
Screw	Confirm all internal hardware (screws, bolts, fasteners, etc) are properly fastened.

13.2.3 Maintenance (Every two years)

Maintenance Tasks	Method
System status and cleaning	Check the following items and correct them immediately if they do not meet the requirements: ■ Check for any visual damage or deformation on the enclosure and internal devices. ■ Check for any abnormal noise during operation of internal devices. ■ Ensure the temperature in the container is not excessively high. ■ Check whether the humidity and the amount of dust inside the container is within the normal range. Clean the equipment if necessary. ■ Check to make sure the air inlet and outlet are not clogged.
Warning marks	Ensure the warning labels and stickers are clearly visible and free of stains and damage. Replace them if necessary.
Ground of the shielded layer of cables	Check whether the cable shielding layer is in good contact with the insulation sleeve and whether the copper bus bar is firmly fixed.
Surge protection device and fuse	Check that the SPD and fuses are properly fastened.
Corrosion	■ Check for any oxidation or rust inside the cabinet. ■ Check for signs of animals or insects inside the cabinet.

13.3 Maintenance of Liquid Cooling System

Maintenance Tasks	Content	Method	Maintenance tools
Chiller system	Check that the HMI of the liquid cooling unit does not report a warning.	Check if the unit reports a "low water tank level" alarm and replenish the fluid when this alarm is received.	Slotted screwdriver, Phillips screwdriver, water pump, water pipe, clamp.
Chiller pump	■ Check whether the cooling air inlet hole of the chiller pump is blocked. If so, clear it with a brush. ■ Visually inspect the pump body (not the joint parts) and check for any obvious leaks (except condensate). If so, replace the sealing ring of the pump.	■ The pump runs smoothly without abnormal noise. ■ There is no obvious dripping on the pump body (except condensate).	Brush
Chiller fan	Check whether the fan blades cannot rotate or are damaged. If so, replace the fan.	■ The fan blade rotates smoothly without abnormal noise. ■ No damage to fan blade. Note: Check this item at least half a year. Blade damage inspection is not mandatory.	Screwdriver with long handle

13.4 Container Maintenance

13.4.1 Repairing Cosmetic Damage



It is necessary to check whether the protective paint sprayed on the shell has peeled off. If found, please repair it in a timely manner.

It is strictly prohibited to use touch up paint in adverse weather conditions such as rain, snow, strong winds, and sandstorms when there is no obstruction outdoors.

Case 1: Dirt on surface caused by water spots and dusts can be cleaned.

No.	Cleaning Tools	Component source
1	Cleaning cloth	Not included in the scope of supply
2	Water	
3	Alcohol or other non-corrosive detergent	

Procedure:

- 1、Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on surface.
- 2、If the dirt cannot be cleaned with water, scrub with 97% alcohol till the surface is acceptable. (Or try to use non-corrosive detergents that are generally used locally)

Case 2: Shallow scratches (without exposing the steel plate substrate) and indelible stains and rust.

No.	Cleaning Tools	Component source
1	Abrasive paper	Not included in the scope of supply
2	Cleaning cloth	
3	Water	
4	Alcohol	
5	Brush	
6	Color code RAL9010 paint	

Procedure:

- 1、Polish the paint surface where blistered or scratched with an abrasive paper for a smooth surface.
- 2、Wet the cleaning cloth with water or 97% alcohol and scrub the damaged parts to remove surface stains.
- 3、Perform paint repair for the scratched parts with a soft brush after the surface is dried; brush the paint as uniform as possible.

Case 3: Dirt on surface caused by water spots and dusts can be cleaned.

No.	Cleaning Tools	Component source
1	Abrasive paper	Not included in the scope of supply
2	Cleaning cloth	
3	Water	
4	Alcohol	
5	Zinc rich primer	
6	Brush	
7	Color code RAL9010 paint	

Procedure:

- 1、Polish the paint surface with blisters or scratches with an abrasive paper for a smooth surface.
- 2、Wet the cleaning cloth with water or 97% alcohol and scrub the damaged parts to remove surface stains.
- 3、After the surface is dry, spray zinc rich primer on the exposed parts of the substrate for protection. Spraying should completely cover the exposed substrate.
- 4、Perform paint repair for the scratched parts with a soft brush after the primer is dried; brush the paint as uniform as possible.

13.4.2 Checking Sealing Strip

If the sealing strip is in good condition, it can effectively prevent water seepage inside the container. Therefore, carefully check the sealing strip and replace it immediately if there is any damage.

13.5 Coolant Replacement



Normally coolant is not a health hazard, excessive exposure may cause irritation to the eyes, skin and breathing.

Object	Standard	Period	Tools
Coolant (Glysantin G30: Ethylene glycol concentration 50%)	1. There are obvious impurities in antifreeze. 2. Antifreeze is significantly darker in color.	1 year	Water pump, hose, hose clamp, slotted screwdriver

Personal protection

Wear personal protective equipment (PPE) when changing coolant. PPE should comply with relevant national standards, including but not limited to the following protective equipment.

No.	Protective parts	Protective equipment
1	Respiratory protection	Please use gas masks in high concentration areas.
2	Hands protection	Use oil-resistant, chemical-resistant protective gloves.
3	Eyes protection	Please use protective goggles.
4	Skin and body protection	Use non-permeable protective clothing and safety shoes.

Disposal considerations

No.	Protective parts	Protective equipment
1	Coolant	Discharges are made in accordance with local regulations and are not disposed of haphazardly.
2	Rubbish remnant	Separate and recycle, and if it meets the relevant regulations, it can be burned or reused.
3	Containers	Unpolluted containers can be recycled, while containers that cannot be cleaned clearly must be disposed of.

Accidental release measures

- When a coolant leak occurs, refer to the following measures to deal with it.
- Immediately contact a professional to have uninvolved persons evacuated quickly to safety.
- Cut off the source of the spill as far as possible and prevent it from entering spaces such as sewers, drains and bodies of water.
- When cleaning up spilled liquids, wear protective equipment to protect your body from contact with the spilled or released material.
- Use sand, mud or other materials that can be used as barriers to set up barriers to prevent diffusion. Recover liquid directly or store in absorbent. Clean the contaminated area with detergent, water and a hard broom. Put the collected liquid in a disposable container.

No.	Contact method	Measures
1	Inhalation	Move to fresh air. If breathing has stopped, give artificial respiration first aid. Seek medical attention.
2	Skin contact	Take off contaminated clothing. Rinse the skin thoroughly with soap and water. Seek medical attention if skin inflammation or rash occurs.
3	Eyes contact	Flush eyes with plenty of water for at least 15 minutes. Seek medical attention.
4	Ingestion	If ingested, but conscious, water or milk to drink and actively seek medical help, do not induce vomiting unless instructed by healthcare patients. If you cannot get help from a doctor, please send the patient and the container and label to the nearest medical emergency center or hospital. Do not give any food to unconscious patients.

14 Exclusion of liability

Although the information contained in this manual has been carefully checked for accuracy and completeness, no liability can be assumed for errors or omissions.

RCT Power reserves the right to change the hardware and software features described in this manual at any time without prior notice.

Warranty or liability claims of any kind are voided due to any one of the following:

- Incorrect use or installation of the product.
- Installation or operation of the product in an unsuitable environment.
- The relevant safety regulations during installation and commissioning at the operation site are ignored.
- The product relevant safety notices and instructions contained in the product documentation are ignored.
- By installing or operating the product under insufficient safety and security conditions.
- By modifying the product or by unauthorised software installation.
- A defect in the product caused by the operation of the product or adjacent equipment outside the permitted limits.
- Damage caused by force majeure.

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RCT Power does not accept any liability for damage caused by incorrect or lost data, due to incorrect operation or malfunction of the storage cabinet, the software, additional devices or personal computers.

15 Recycle



NOTICE

- The Company does not recycle batteries. Contact local recycling agencies to handle batteries.
- If there are no such agencies in your area, you can contact the nearest foreign recycling agencies.

Procure:

Step 1: Contact the nearest recycling agency.

- According to the requirements of the recycling agency, electrical and iron components of the energy storage system should be dismantled and classified after a power outage.

Step 2: Recycling agencies assess the costs.

- All costs/revenues arising from recycling shall be borne by the user themselves.

Step 3: Recycling agencies carry out recycling.

- Collect all recycled lithium batteries in one area and have the recycling agency come to the site for centralized processing.
- Electrical components such as refrigerators and inverters do not contain flammable or explosive dangerous goods and can be scrapped and recycled in accordance with relevant laws and regulations of overseas countries.

Step 4: Recycling companies handle recycling.

- The recycled lithium batteries are at the disposal of the recycling companies.

16 Technical Data

Technical Data	RCTerra Class 1.0 Series
Model Name	CESS 233-100-02D
GENERAL	
Nominal Capacity	233 kWh
Usable Capacity(95% DOD)	221.35kWh
Maximum Charge\Discharge Rate	0.5C
Self-Discharge Rate	≤3.5%(per month)
Relative Operating Humidity	0% ~ 95% RH, No-condensation
Operating Temperature Range	-13°F ~ 113°F
Storage Temperature Range	-22°F~ 122°F (Recommended 32°F ~ 86°F)
Operating Altitude	≤2000m
Dimensions (mm)	W1600 x H 2200 x D1300
Corrosion-proof Grade/Salt Spray Resistance	C4
Weight	Approximately 7055 lbs
Max. Number Of ESS used in parallel(On-grid)	16
Max. Number Of ESS used in parallel(Off-grid)	8
IP Rating	IP54 (Battery room IP55)
Noise Level	≤70dB
Communication Protocol	Modbus TCP/RTU, CAN
Black-start Function(Dark start)	Yes
AC Line Frequency	60 Hz
Auxiliary Power Supply	External powered
BMS	Integrated
EMS	Integrated
SAFETY FEATURE	

Technical Data	RCTerra Class 1.0 Series
Model Name	CESS 233-100-02D
Flammable/explosive Gas Detection	Yes
Flammable/explosive Gas Exhaust	Yes
Smoke Detection	Yes
Temperature Detection	Yes
Fire Suppression	Aerosol
Siren and Strobe Alarm	Yes
Dry Pipe and Sprinkle	Yes
Emergency Stop Button	Yes
BATTERY	
Battery Rack Quantity	1
Battery Pack Quantity Per Rack	5
Battery Pack Structure	1P52S
Battery Capacity Per Pack	46.592kWh
Battery Type	LiFePO4
DC-side Rated Voltage	832 Vdc
DC-side Operating Voltage Range	715 ~ 928 Vdc
Cooling Concept	Liquid-cooling
Cycle Lifetime	≥6000cls(70%SOH,25±2°C)
PCS	
DC Connection	
Operating Voltage Range	700~1000 Vdc
Max. DC Current	198A
AC Connection	
Rated AC Power	125 kW

Technical Data	RCTerra Class 1.0 Series
Model Name	CESS 233-100-02D
Rated AC Current	150 A
Rated AC Voltage	480 Vac, 3P+N+PE
AC Line Frequency	60Hz
Power Factor Adjustable Range	-1~+1
Peak Efficiency	>98.6%
Long-term Overload Capacity	110%
CEC Efficiency	>98%
Cooling Method	Liquid-cooling
STANDARDS	
UL1973, UL 9540A, UL 60730-1 Annex H, NFPA 69, UL 9540, UL 1741CRD, UN38.3	

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