

SINEXCEL

Sinexcel 300K AVC-RTS User Manual



Safety Notices

The Manual introduces important operations and installation information for Sinexcel industrial-grade UPS products in details, and personnel operating AVC-RTS-P equipment should be familiar with the details of the UserManual.



The personnel in charge of operating and maintaining the equipment should accept and pass the relevant technology training and be familiar with the details of the equipment.



Ensure that all power supplies are isolated and safe prior to any non-instruction operation on the equipment.



Several parts of the equipment are equipped with lethal voltages, such as: printed board, connecting copper bar, etc., please avoid touching.



This equipment contains high-voltage energy storage devices, please do a good job of safety precautions to prevent electric shock. It's strictly forbidden to operate it by non-professional personnel.



Comprehensive safety protection measures shall be done to normal operating equipment, and ensure that the door is closed safely.



If you want to power on any unit of the equipment, make sure to wear safety goggles when working.



When installing or removing modules or parts from the equipment, ensure to wear appropriate insulating shoes.



After the power supply of the equipment is cut off, the voltage is still stored in any energy storage unit of the equipment, and the whole equipment is still charged.

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Chapter 1 Introduction

1.1 Equipment introduction

Thank you for choosing Sinexcel AVC-RTS series products, this product will provide your equipment with perfect voltage sag, voltage interruption, over-voltage protection and frequency anomaly solutions.

The normal operation of the equipment depends on the intact supply voltage. Unfortunately, the voltage disturbance in the voltage distribution network is universal.

With the progress of the times, electronic equipment constantly updates, and increasingly precision equipment has been widely applied in different fields. Shenzhen Sinexcel Electric Co., Ltd has been committed to providing users with complete power system solutions in order to ensure the normal operation of user equipment in complex power supply scenarios. In terms of low voltage, high voltage, abnormal frequency, power down, voltage swell, voltage sag and transient problems, Sinexcel has launched Sinexcel AVC-RTS series products for perfect treatment.

1.1.1 Voltage sag

When there are voltage sags in the network voltage, the current flows to the load through AVC-RTS-300KVA-P main circuit, and AVC-RTS-300KVA-P passes the rectification and inversion process to stabilize the output voltage. If the sags are not large, and AVC-RTS-300KVA-P can stabilize the output voltage by rectification and inversion, the battery does not work. If the sag value is too large, and the DC power rectified from the power grid to a rectifier is insufficient, the battery will also provide electricity. The power module will obtain energy from both mains supply and the battery at the same time, and then output the AC voltage converted by the inverter, thus stabilizing the output voltage together. (AVC-RTS-300KVA-P governance principle of voltage swell, voltage transient, frequency anomaly is the same)

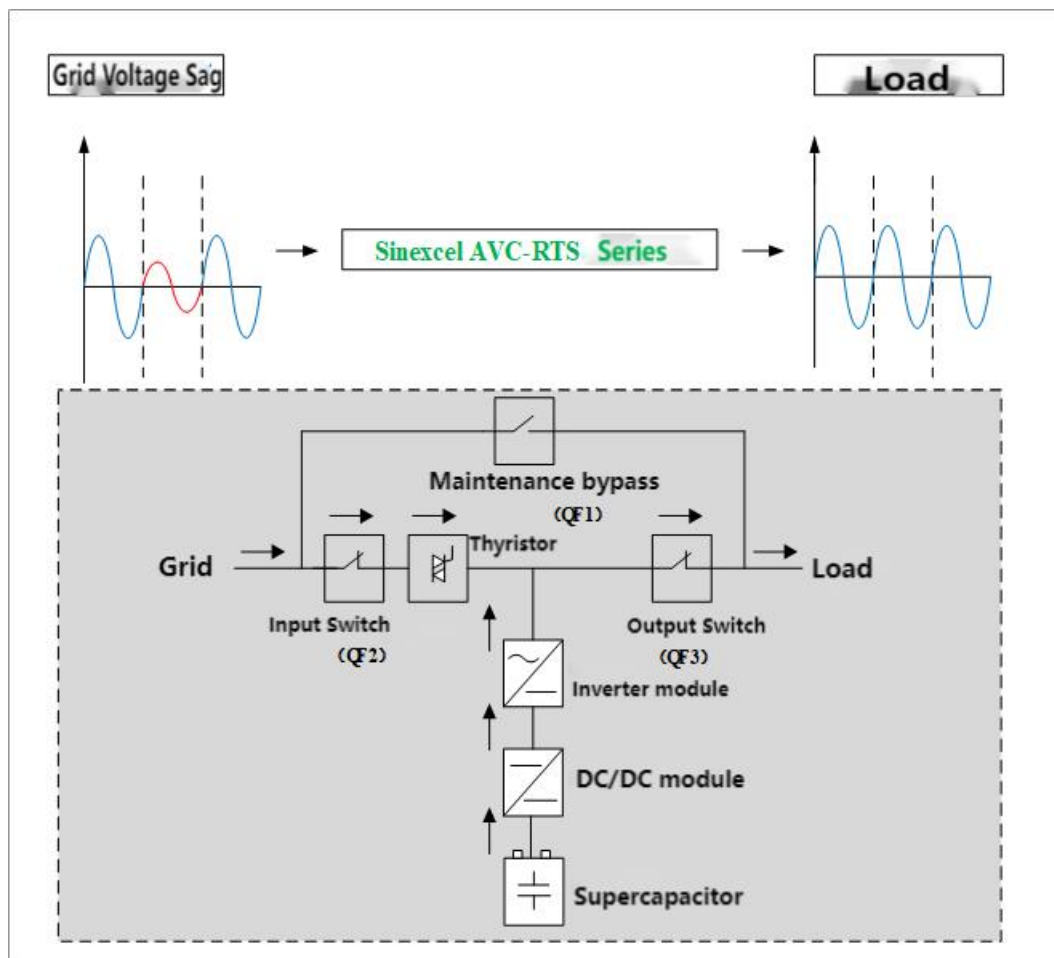


Figure 1-1 Voltage Transient Management Diagram

1.1.2 Voltage interruption

When the voltage of the power supply network is disconnected, the power from AVC-RTS-300KVA-P's energy storage battery will be inverted to AC power supply by inverter, thus stabilizing the output voltage.

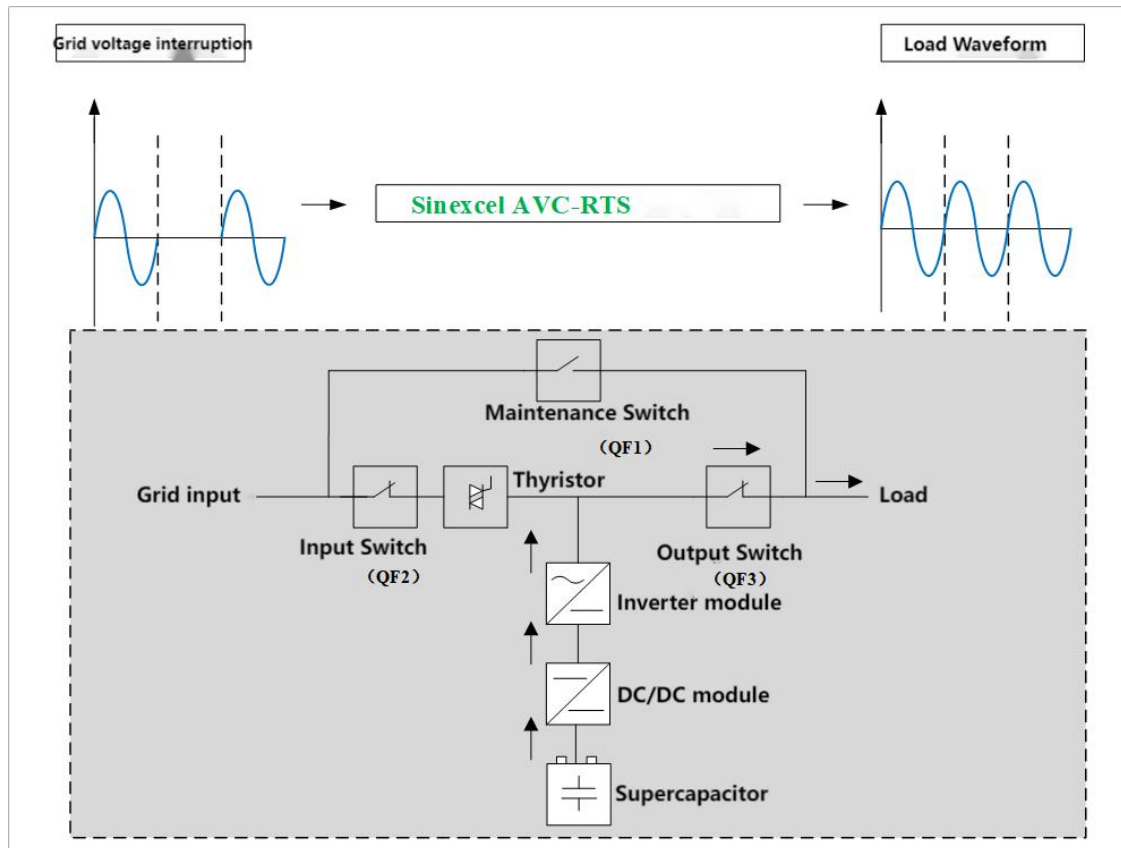


Figure 12 Voltage Interruption Governance Diagram

1.2 Working Principle

In normal operation, the AC mains input is supplied directly to the load from the bypass. In the event of a utility interruption, backup power is provided to the load by the supercapacitor through the inverter. When the unit is not switched on or in Super Bypass mode, the mains power is supplied directly to the load by static bypass.

In normal operation, the output of the inverter must be synchronized with the static bypass power supply, in which way that the continuous switching between the inverter and the static bypass power supply can be realized. The synchronization of inverter output and static bypass power supply can be realized by inverter control circuit. When the frequency of the static bypass power supply is in the synchronizing range, the inverter control circuit always makes the output frequency of the inverter to track the frequency of the static bypass power supply.

AVC-RTS-300KVA-P can also provide cabinet maintenance bypass via manual control. When it's time to shut down AVC-RTS-300KVA-P for maintenance and repair, AVC-RTS-300KVA-P can supply power to critical loads through a cabinet maintenance bypass.

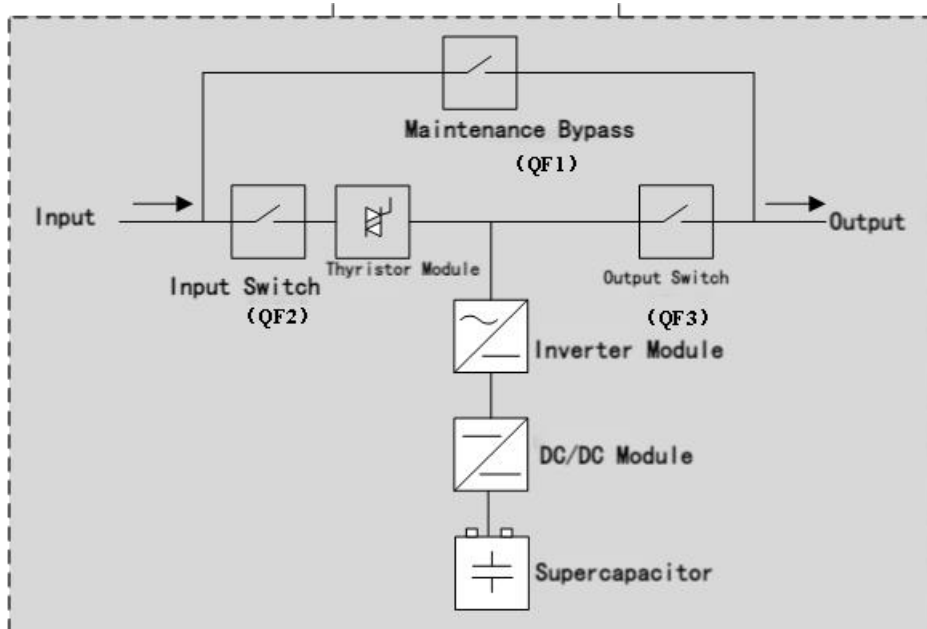


Figure 1-3 AVC-RTS-P Working Schematic Diagram

1.3 Working mode

1.3.1 Super bypass mode

Super bypass mode is an economic operation mode, which is commonly called bypass operation mode. Working efficiency is about 99% in super bypass mode. The mains supply can directly support the load through bypass, at which point the primary path rectifier works and supplies power to the battery. The inverter is in the standby status, maintains complete synchronized with static bypass power supply, and can monitor output voltage quality in real time. If the output voltage is power down, the bypass static switch disconnects and the inverter outputs immediately, thus ensuring the output voltage quality. When the grid voltage is abnormal, it takes about 5-20ms for general products to switch from bypass to primary path, but for our products, the typical switching time is 2ms, and the longest switching time is 5ms (communication mode and control logic are different). The functional block diagram is as shown in Figure 1-4.

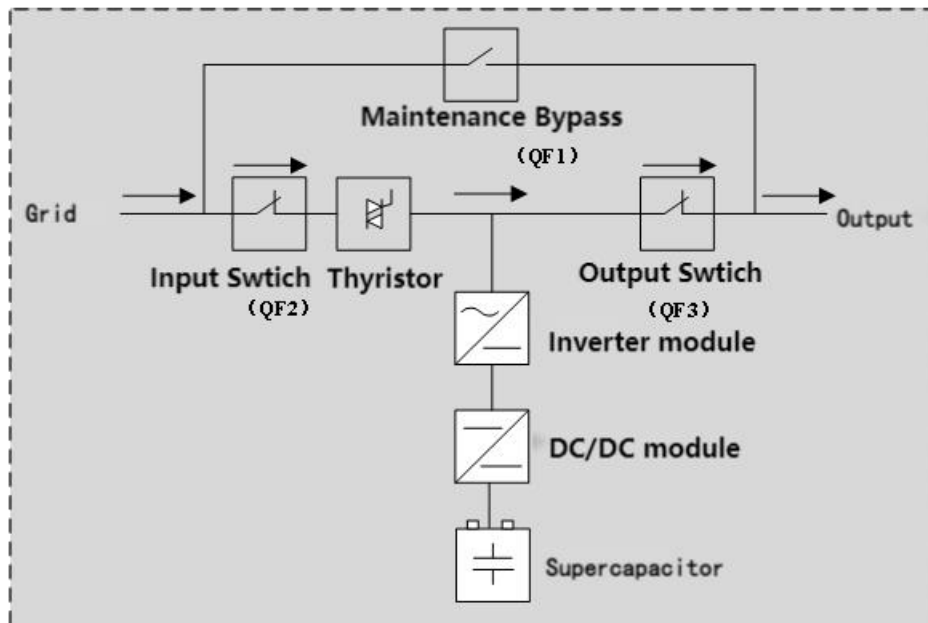


Figure 1-4 Super Bypass Mode Schematic Diagram

1.3.2 Bypass mode

Bypass mode refers to the moment that the equipment automatically changes to bypass work when the power module is encountered with over-temperature, overload or other failures that will shut down the inverter. At this moment, the mains supply will directly supply power to load through the bypass, and the primary-path rectifier functions, and supplies power to the battery, with the inverter being idle. The load supply quality in bypass mode is not protected by AVC-RTS-P, and is easily affected by power outages, AC voltage waveform or frequency anomalies.

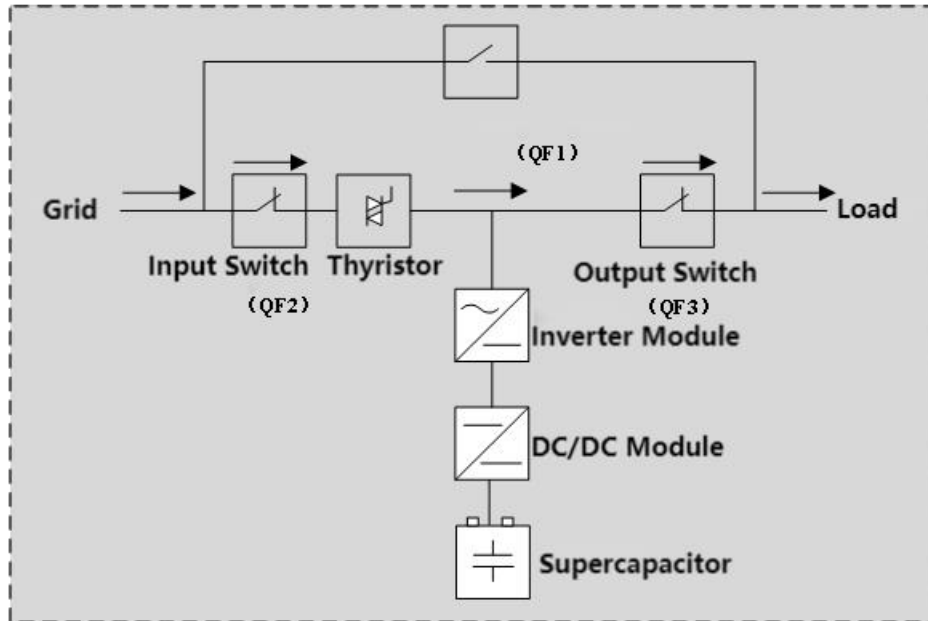


Figure 1-5 Bypass Mode Schematic Diagram

1.3.3 Compensation mode

Compensation mode is to provide power to the loads by reversing the power from the AVC-RTS's energy storage and power supply supercapacitor to AC power through the inverter when an abnormality occurs in the utility power supply.

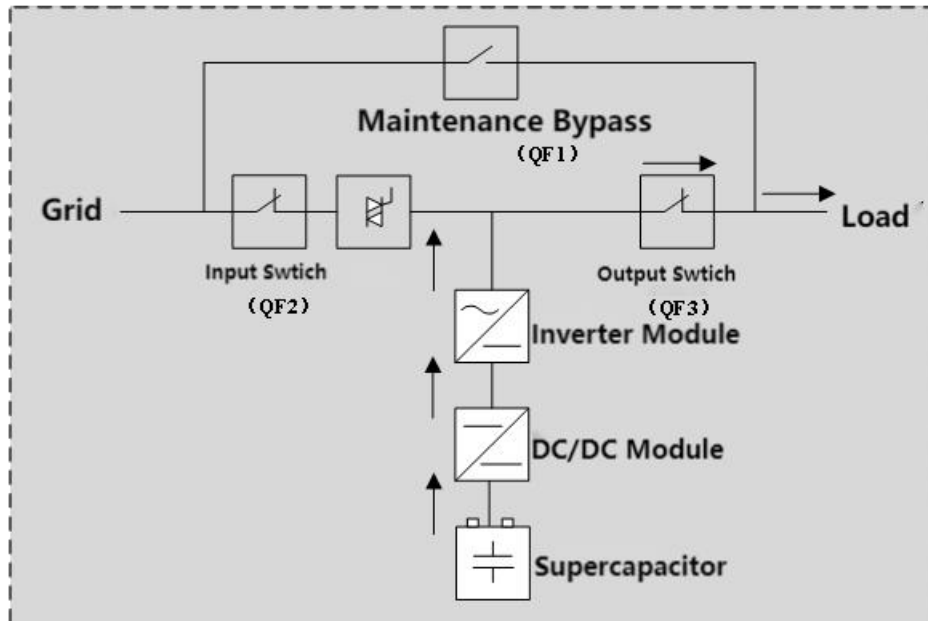


Figure 1-6 Compensation mode Schematic Diagram

1.3.4 Cabinet maintenance bypass mode

Cabinet maintenance bypass refers to that the current directly supplies power to load via maintenance bypass when there is a AVC-RTS failure, and the current no longer flow through the main power module, thus maintaining and protecting lines inside the cabinet.

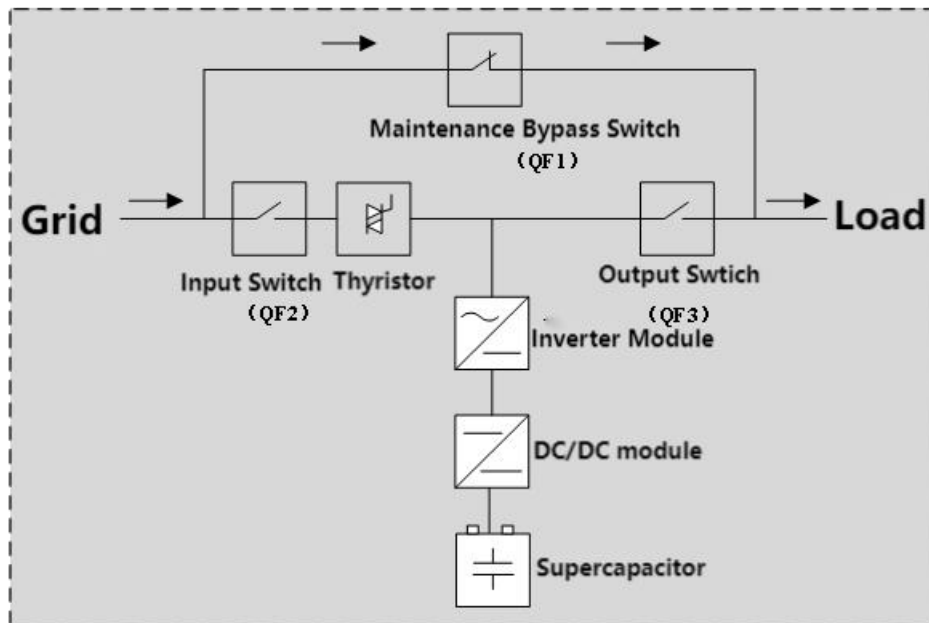


Figure 1-7 Maintenance Bypass Mode Schematic Diagram

Chapter 2 Product structure

2.1 Overall cabinet structure

AVC-RTS-P's overall cabinet structure can be divided into power module, bypass module, control module, and monitoring.

Table 2-1 AVC-RTS-P Structure Table

Overall cabinet structure	Main cabinet section	Master control module
		Bypass module
		Power module
	Energy storage cabinet section	Supercapacitor
		Monitoring Modules, Meters

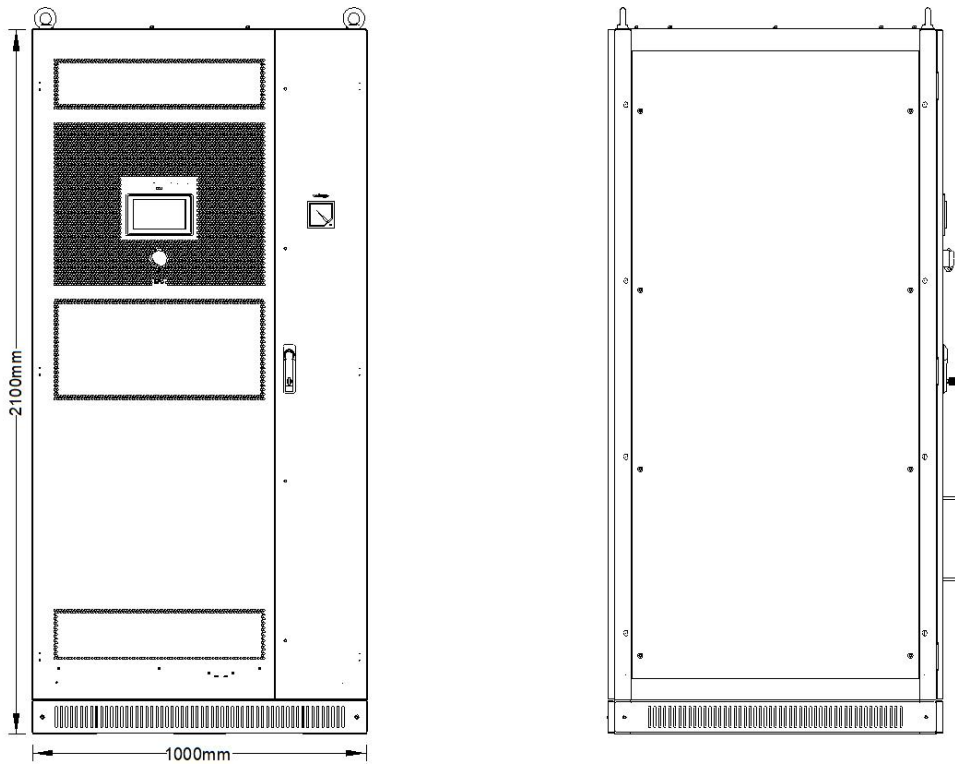


Figure 2-1 AVC-RTS-P Front View

2.2 Power module

2.2.1 Appearance and functional description



Figure 2-2 Power module outline

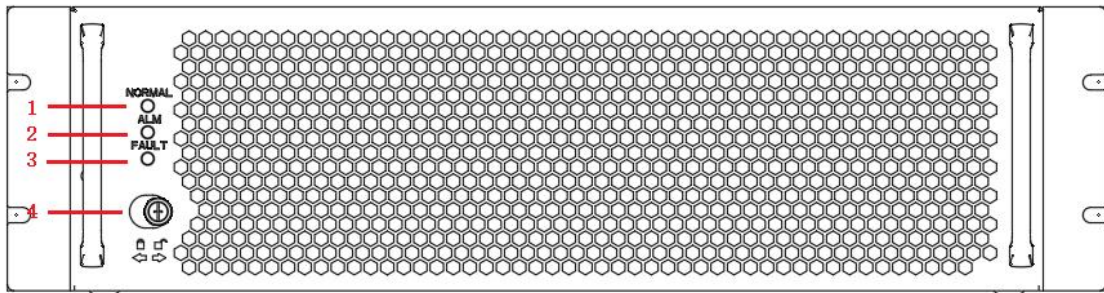


Figure 2-3 Power module front

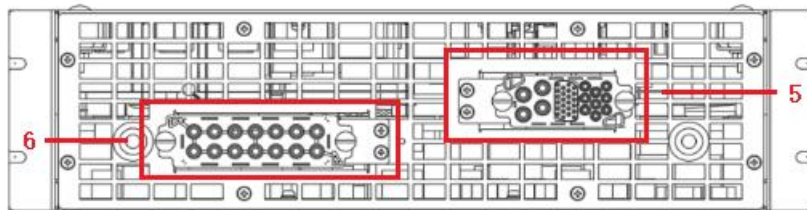


Figure 2-4 Power Module External View

Description:

Figure 2-2 Power Module Description Table

(1) Working indicator	(2) Alarm indicator	(3) Fault indicator
(4) Ready switch	(5) Inverter output signal port	(6) Rectification and battery input port

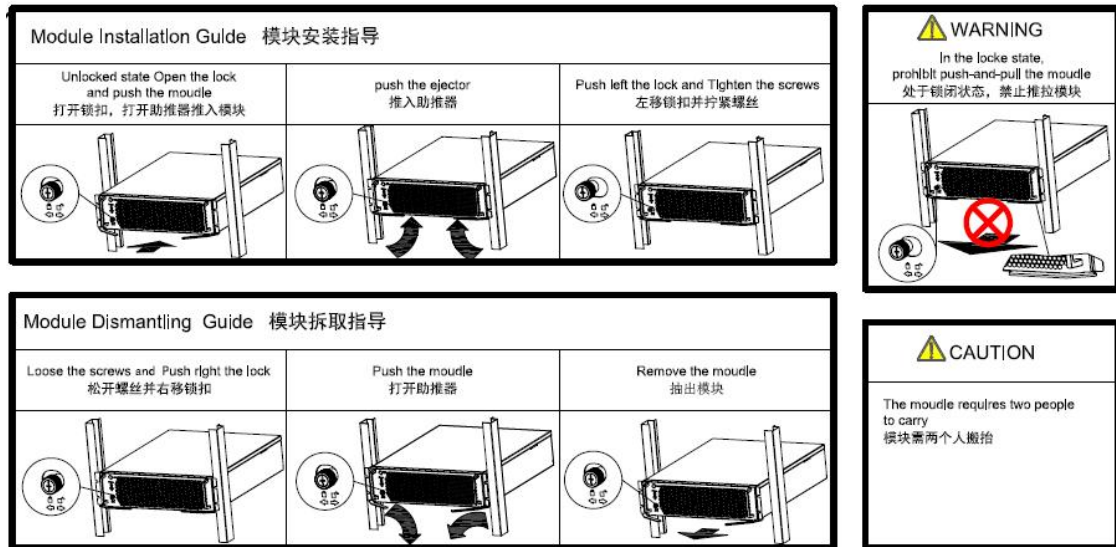


Figure 2-5 Power Module Operation Tabs

2.2.2 Indicator light description

Indicator	Color	Status	Description
NORMAL	Green	Always-on	Bypass module in operation
		0.5Hz flickering	Module is ready and in the standby state
ALM	Yellow	Always-on	Bypass module has minor alarm
		Always-off	Module is alarm-free
FAULT	Red	Always-on	Bypass module failure
		Always-off	Module is trouble-free

2.2.3 Ready Switch Description

After accessing to the module, before clicking to boot, switch the module ready switch leftwards to the ready state, then the module is started for work; Turing right to the not-ready state, the module exits from working, and if it's time for maintenance, it can be pulled out.

Power module function: standby when the power grid is normal, work in inverter mode to convert supercapacitor energy into AC power when the power grid is restored, charge the supercapacitor until it is full and return to standby.

2.2.4 Bypass module

2.2.5 Appearance and function description



Figure 2-6 Bypass module outline

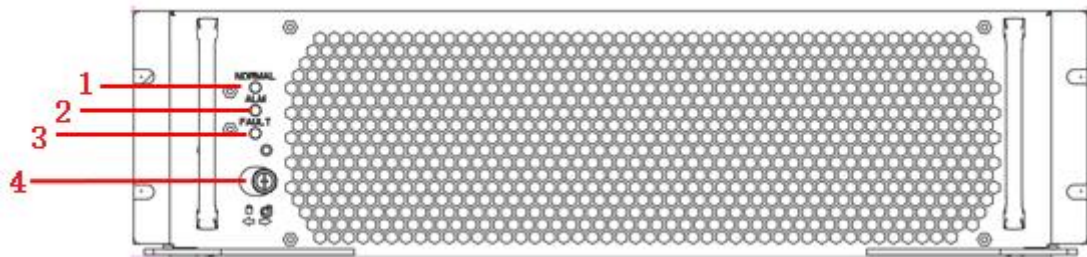


Figure 2-7 Bypass module front view

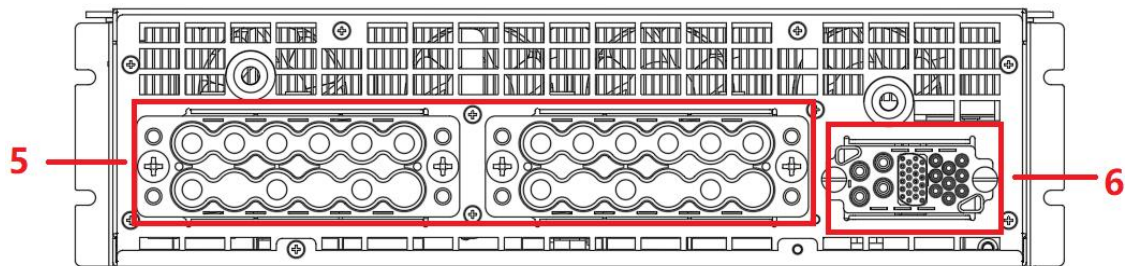


Figure 2-8 Bypass module back view

Table 2-4 Bypass Module Structure Description Table

(1) Working indicator	(2) Alarm indicator	(3) Fault indicator	(4) Ready switch
(5) Input and output ports	(6) Signal port+PE		

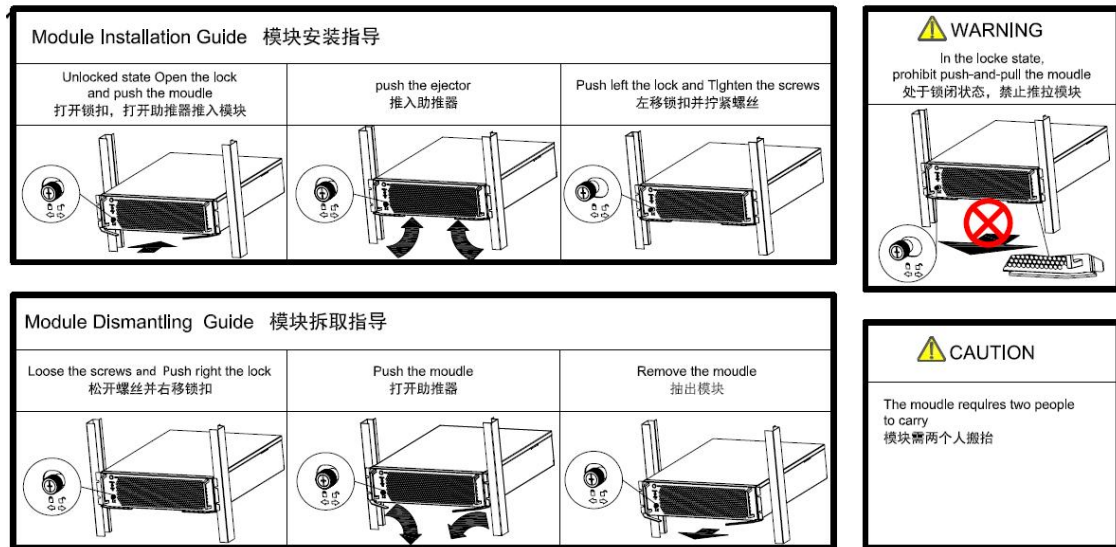


Figure 2-9 Bypass Module Operation Tab

2.2.6 Indicator Description

Figure 2-5 Bypass Module Indicator Functional Table

Indicator	Color	Status	Description
NORMAL	Green	Always-on	Bypass module in operation
		0.5Hz flickering	Module is ready and in the standby state
ALM	Yellow	Always-on	Bypass module has minor alarm
		Always-off	Module is alarm-free
FAULT	Red	Always-on	Bypass module failure
		Always-off	Module is trouble free

2.2.7 Ready switch Description

After accessing to the module, before clicking to boot, switch the module ready switch leftwards to the ready state, then the module is started for work; Turing right to the not-ready state, the module exits from working, and if it's time for maintenance, it can be pulled out.

Bypass module function: The bypass module is mainly composed of thyristors. In the normal cases, the bypass power is supplied to the load through the thyristor conduction.

2.3 Master control module

2.3.1 Appearance

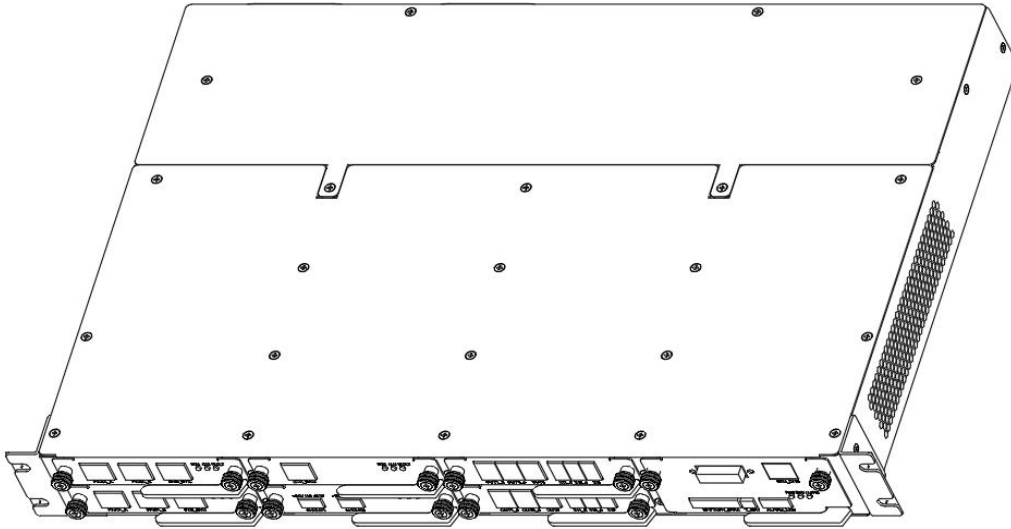


Figure 2-10 Main Control Module External View

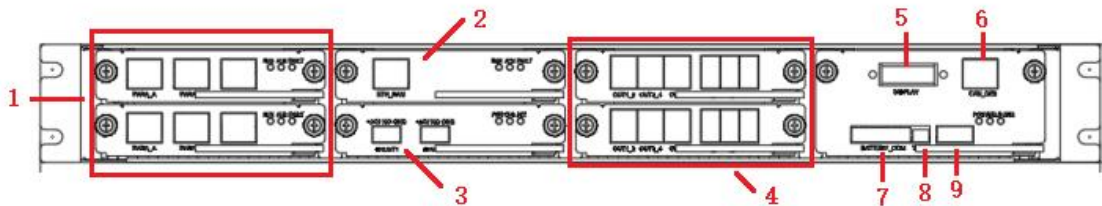


Figure 2-11 Main Control Module Front View

Table 2-6 Port Interpretation of Main Control Module

No.	silkscreen	port	application
1	PARA	SCM Ethernet port	Cabinet-to-cabinet combined cabinet signal interface A /B Dual-system synchronous signal interface
2	ETH_SAM	Data Acquisition Board, Ethernet port	Communication with monitoring, data acquisition, storage of waveform records
3	SHUNT	backflow preventer (reserve)	No energy backflow, use with external circuit breaker
4	OUT、IN	Dry contact board (reserve)	OUT1~5 output dry contact interface, maximum 5 channels IN1~5 input dry contact interface, max. 5 channels
5	DISPLAY	Monitor Auxiliary Source Board, 15Pin	Monitor Screen Communication Interface
6	CAN_DEB	Monitor Auxiliary Source Board, Ethernet port	Code Upgrade Ethernet port
7	BATTERY_COM	Monitor Auxiliary Source Board, 6pin	Reserve Test Interface
8	T_BAT	Monitor Auxiliary Source Board, 2pin	Reserved temperature sampling interface
9	ALARM_LED	Monitor Auxiliary Source Board, 4Pin	Alarm Lamp Power Interface

The main control module includes host and standby SCM(System Control Module)。

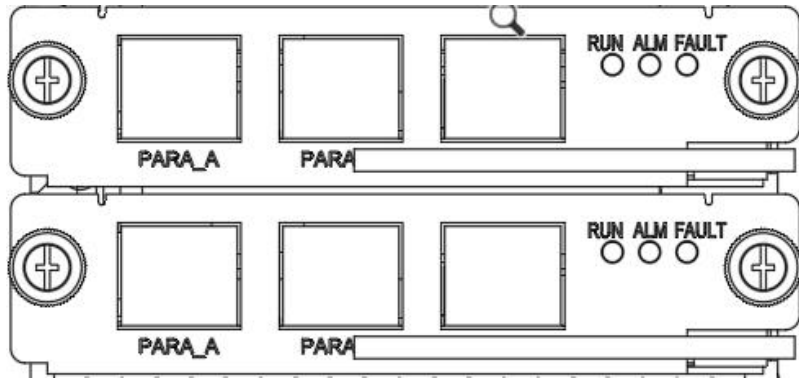


Figure 2-12 SCM Structure Diagram

Table 2-7 SCM Function Table

Panel screen print	Description
PARA_A	Cabinet-to-cabinet combined cabinet signal interface A
PARB_B	Cabinet-to-cabinet combined cabinet signal interface B
SYS_SYN	Dual-system synchronous signal interface

Table 2-8 SCM Indicator light menu

Indicator	Color	Status	Description
RUN	Green	Always-on	This SCM is running SCM
		0.5 Hz flickering	This SCM is a standby SCM and is currently in ready status
		Always-off	This SCM is not ready
ALM	Yellow	Always-on	SCM has minor alerts, but there is no need to replace SCM
		Always-off	SCM has no minor alarm
FAULT	Red	Always-on	SCM has an urgent alarm
		Always-off	SCM has no urgent alarm

2.3.2 Functional description

- (1) System's general control, which can achieve the control of the charging point of the battery and the management of the battery;
- (2) Monitoring and communication;
- (3) Combined cabinet processing, which can achieve the synchronization of system status in case of combined cabinet system. In double systems, it can achieve the synchronization of frequency and phase amplitude of the two systems.

2.3.3 Description of standard dry contacts

The system reserves 5 output dry contacts and 5 input dry contacts for the user, and the interfaces are located on the front panel of the main control module. The input dry contact ports are labeled as IN1_2, IN3_4, IN5, and the output dry contact ports are labeled as OUT1_2, OUT3_4, OUT5, and the output dry contact ports are labeled as NO, COM, and NC from left to right.

There are 5 input dry contacts in total, users can short the input dry contact to complete the signal input. Input dry contact function supports user-defined, when the user equipment installation needs special needs can contact the engineer to provide services for customers, for customers to provide personalized expansion of the subsequent product upgrades.

Output dry contact for relay control, a total of 5-way, from 1 to 5 functions were equipment power-up, system, inverter operation, fault, emergency shutdown information. Relay contact switching power for 277VAC 10A/28VDC 10A. dry contact relay normally open, normally closed, the common terminal are reserved, the user to choose their own connection. When the user equipment installation needs special needs can contact the engineer to provide services for customers, for customers to provide personalized expansion of the subsequent product upgrades.

Input dry contact port consists of three 4PIN terminals side-by-side, output dry contact port consists of three 6PIN terminals side-by-side, input dry contact and output dry contact side-by-side to form a dry contact port.

2.4 Monitor

2.4.1 Appearance

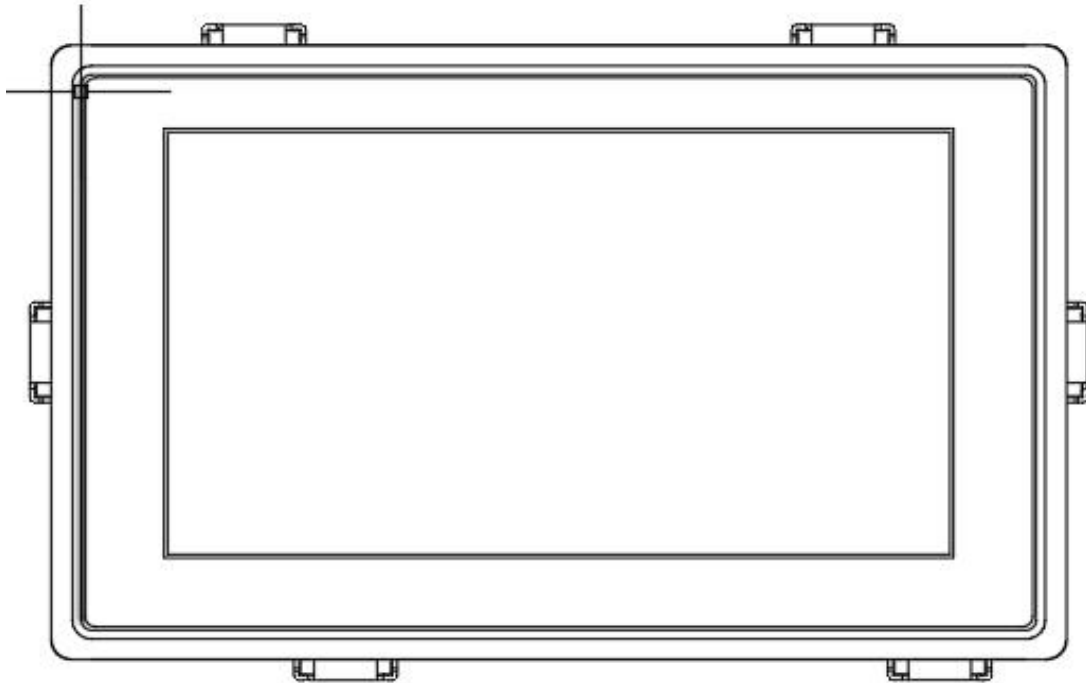


Figure 2-13 Monitoring External View

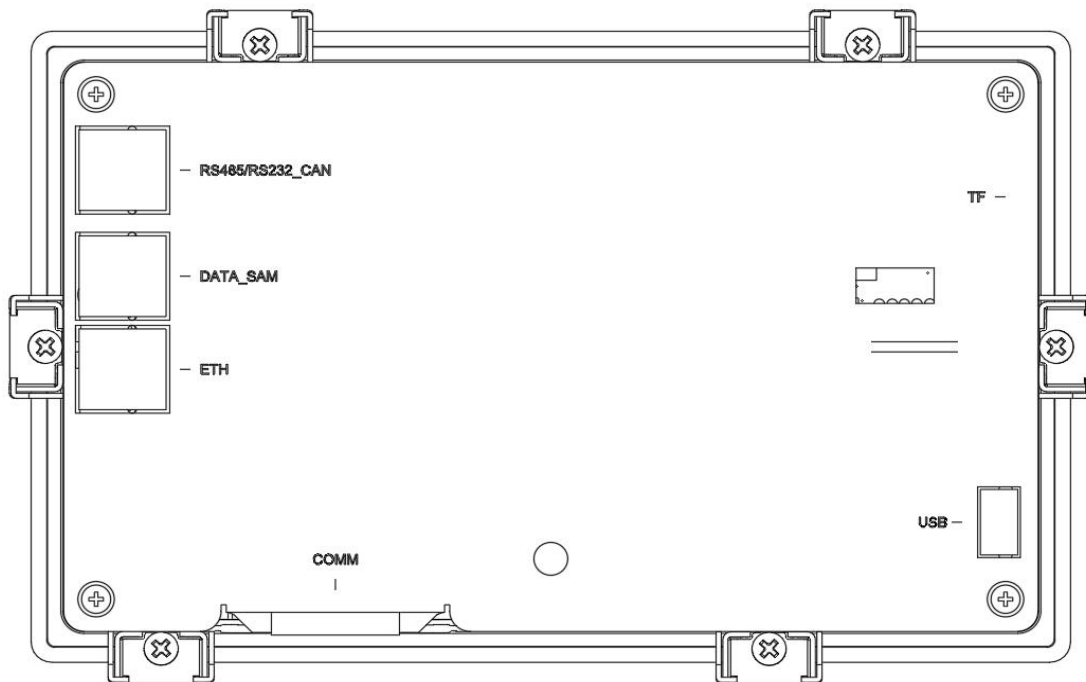


Figure 2-14 Monitor's Internal Port Diagram

2.4.2 Function Introduction

Table 2-9 Monitor Port Description Table

Silkscreen printing	Connector	Function
COMM	DB15 female connector (with reserved indicator signals, one way 485, one way CAN, 15V power supply)	Communication between SCM and monitoring module
DATA_SAM	Network port	Capture Board Communications
USB	USB	Software upgrades, data logging export
TF	IoT Card Slot	Used when the monitoring system is connected to the cloud platform
ETH	Network port	Back-end software communication port
RS232	Reserve	
RS485_CAN	RJ11 (built-in two 485, one CAN)	Reserve

Through the operation monitoring display module, you can achieve the operation control, operation status view, parameter setting, alarm view and other functions of AVC-RTS.

Chapter 3 Installation

3.1 Site planning

Ensure that the ground or mounting bracket can support the weight of the AVC-RTS, and that the weight of the super-capacitor and super-capacitor rack is calculated based on actual use.

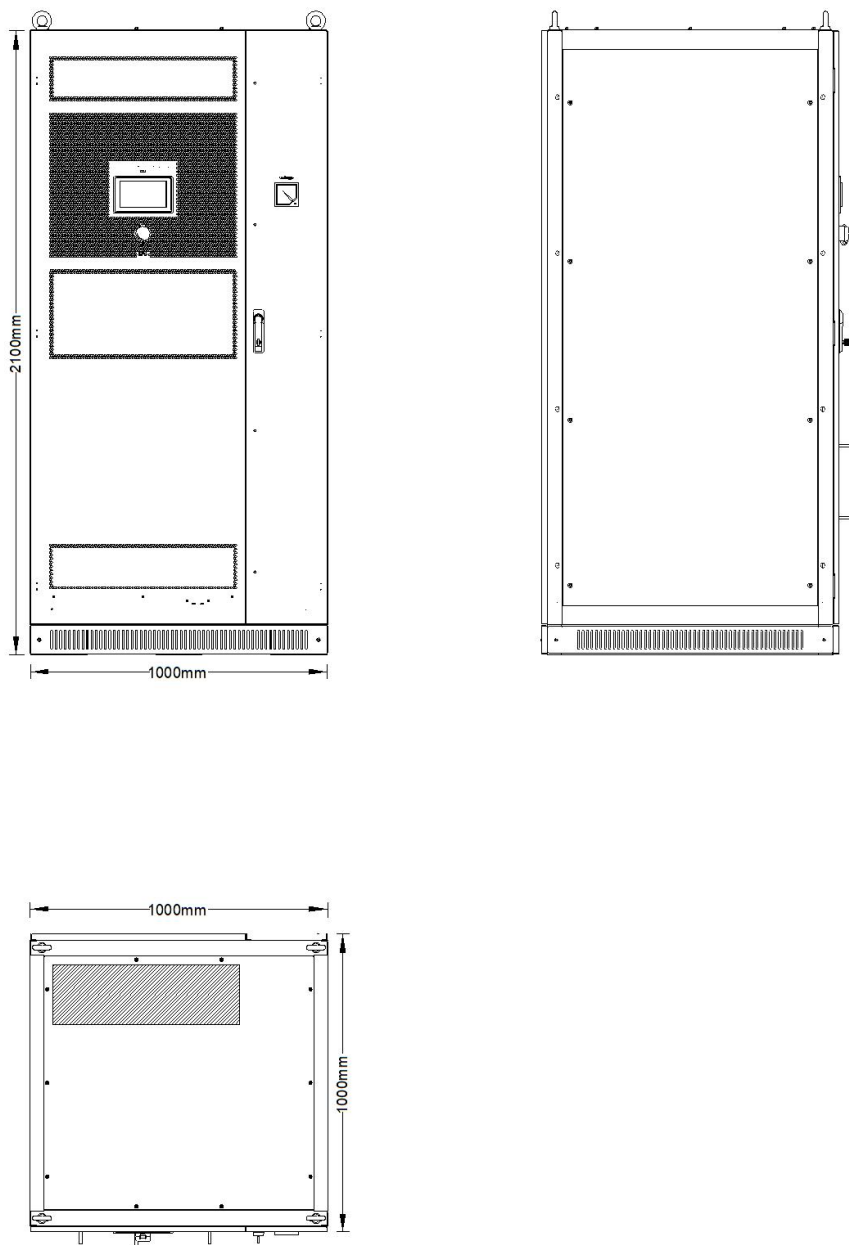


Figure 3-1 AVC-RTS Dimensional Drawing

3.2 Weight of the whole machine

Table 3-1 Weight of the whole machine

Weight of the whole machine	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Fallback time	3s、 5s、 7s、 9s	3s、 5s、 7s	3s、 5s	3s、 5s
The whole machine	< 650Kg	< 700Kg	< 750Kg	< 800Kg
The Whole machine with packaging	< 700Kg	< 750Kg	< 800Kg	< 850Kg
Incoming Wiring Method	Bottom in/out (standard, can add 400mm wide feeder cabinet top in/out)			
Instruction	This weight is the maximum backup time corresponding to the weight of the cabinet, does not include the feeder cabinet (up into the up and out), the actual weight to the weighing of the standard			

3.3 Installation environment

1, AVC-RTS-P should be installed in the surrounding technical indicators are within the requirements, avoid high temperature, high humidity or low temperature environment;

2, AVC-RTS-P is suitable for installation in a well-ventilated environment, do not install in the environment close to heat sources, stronger sources of radiation interference, too much dust, corrosive substances;

3, although the ambient temperature range of AVC-RTS-P is relatively wide, but in order to support the use of super-capacitor performance is optimal, to ensure that the service life of the super-capacitor, AVC-RTS-P should be installed in the ambient temperature of 20-30 °C .

3.4 Space reservation

AVC-RTS-P different capacity models are used in front and rear air inlet/outlet structure, the installation should be reasonably laid out to avoid heat flow back, resulting in abnormal temperatures in the working environment of the equipment, taking into account the maintenance and operation of the cabinet space as well as heat dissipation, the installation of the cabinet must be in a certain direction to reserve enough space distance, schematic diagram in Figure 3-2.

- 1, left and right need to reserve at least 500mm of operation and ventilation space;
- 2, before and after the need to reserve at least 1000mm of ventilation and operating space;
- 3, At least 400mm of operating space should be reserved at the top.

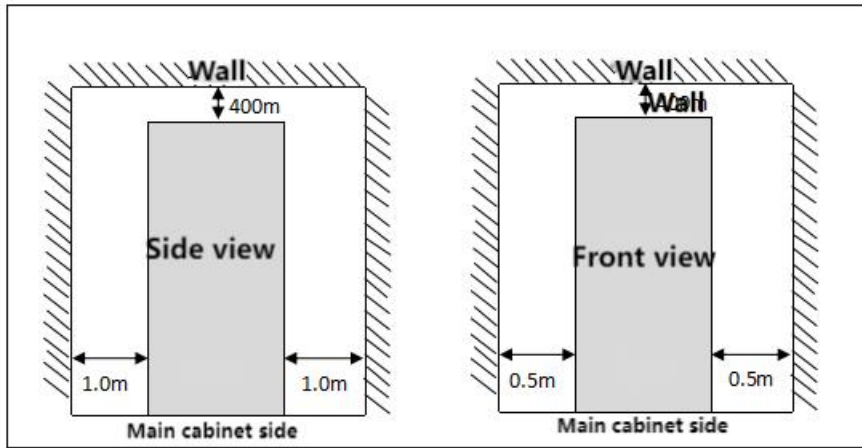


Figure 3-2 Schematic diagram of assembly reserved space

3.5 Installation Tools

Note: All tools used in the installation process should be insulated to avoid electric shock.

Table 3-2 Installation Tool List

Hand pallet truck	Step ladder	Rubber hammer	electric hand drill
Super hole cutter	heat air gun	Diagonal pliers	Crimping pliers
Wire strippers	Electro-hydraulic clamp flow meter	Multi-meter	Zip ties
Leveling instrument	Electrical tape	Cotton	Wrench torque
Electronic knife	Anti-electrostatic glove	Protective glove	Insulating glove
Insulated Protective Shoes	Torque screwdriver	Wire cutter	Paintbrush
One-piece screwdriver	Torque spanners (M3/M4/M5/M6/M8/M10)		

3.6 Power Cables

The system power access cable carries the system power capacity, as the AVC-RTS-P current size is different at different input voltages, the cable is selected to ensure that it can withstand the maximum current requirements. (The current value in the table is for the rated voltage of 380V).

Table 3-3 AVC-RTS-P Power Cable Options

Model		AVC-RTS-P				
		150KVA	200KVA	250KVA	300KVA	
Input	Input Current (A)	284	378	473	568	
	Recommended wire diameter (mm ²)	L1	4×(2×70)	4×(2×95)	4×(2×95)	4×(2×120)
		L2				
		L3				
		N				
PE	70	95	120	150		
Output	Output Current (A)	284	378	473	568	
	Recommended wire diameter (mm ²)	L1	4×(2×70)	4×(2×70)	4×(2×95)	4×(2×120)
		L2				
		L3				
		N				
PE	70	95	120	150		

- When the main load is non-linear, the N-wire cross section needs to be increased to 1.5 to 1.7 times;
- Input and output front and rear end circuit breakers are protected with 630A/3P moulded case circuit breakers.

3.7 Handling and unpacking inspection

1, AVC-RTS-P transported to the installation site should pay attention to tighten the equipment to prevent damage to the equipment in the transport process and transport device collision;

2, Check whether there is any damage to the packaging before opening the box, then remove the outer packaging to take out the accessories;

3, check whether there is damage to the appearance of the device, according to the list of accessories to verify whether complete and error-free model;

4, After confirming, you can move AVC-RTS-P down from the pallet: there are 4 M10 bolt holes on the top of the cabinet, which can be used to install 4 lifting rings, and then use the

crane to lift AVC-RTS-P to the ground; if there is no crane, you can use the side sliding plate to move AVC-RTS-P from the pallet to the ground.

3.8 single-unit installation

After the machine is completely fixed follow the steps below to connect the power cables:

1, make sure that the input power distribution switch is completely disconnected, the no-power-up sign is placed at the input air switch to prevent others from powering up the machine and causing electric shock, and the AVC-RTS-P internal switch is completely disconnected;

2. Open the front door of the AVC-RTS-P cabinet and the connecting copper rows are visible;

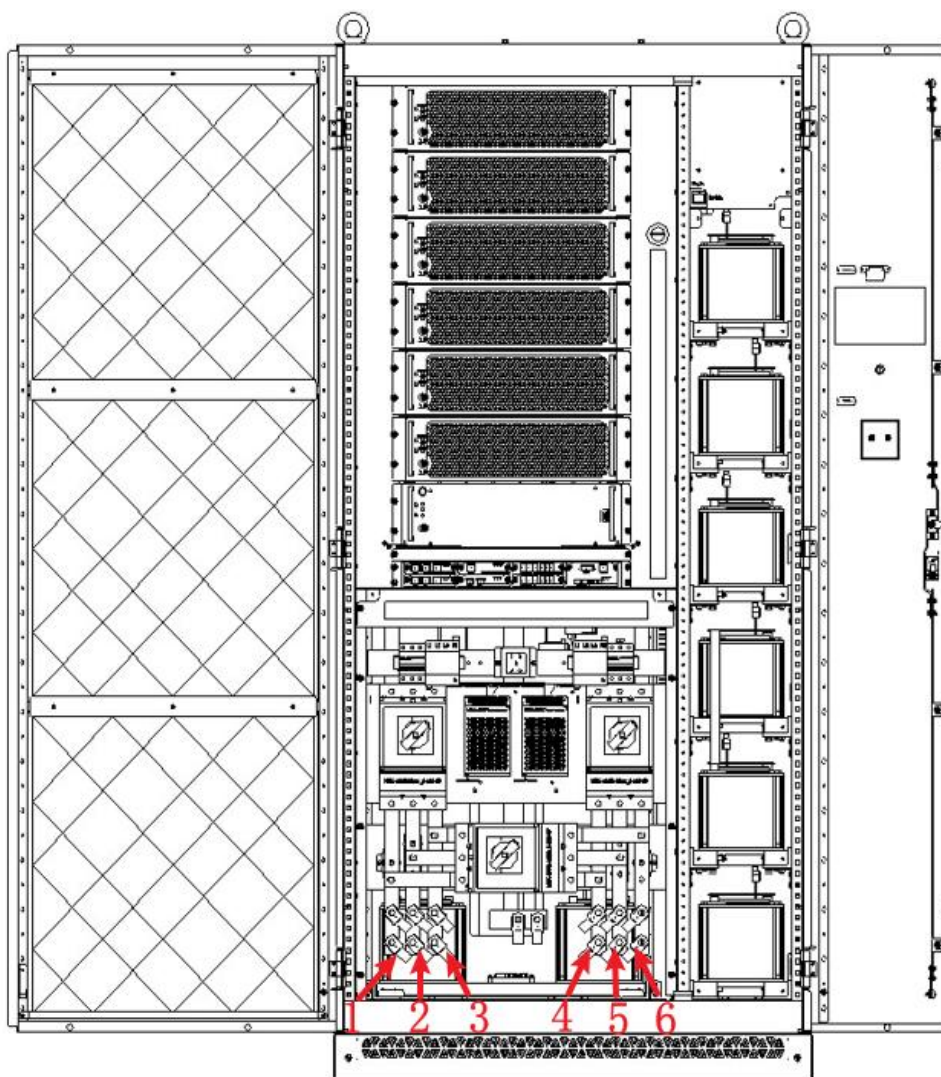


Figure 3-3 Cabinet Front Door Wiring Diagram

Table 3-4 Cabinet Wiring Description

1	Input A phase	4	Output A phase
2	Input B phase	5	Output B phase

3	Input C phase	6	Output C phase
---	---------------	---	----------------

3. After confirming the alignment, remove and wire the AVC-RTS-P bottom inlet and outlet covers.

3.9 Parallel installation

Place several machines to be installed at the location to be installed, it is recommended to install them two by two, if the site conditions do not allow, the distance between the machines to be installed should not exceed 5 metres. Connect the parallel interface of one machine to the parallel interface of another machine.

1. Refer to the single machine installation guide to connect each device, the power cable of each device is connected to use an equal length of cable;
2. Connect the corresponding parallel communication cable of the main control module:

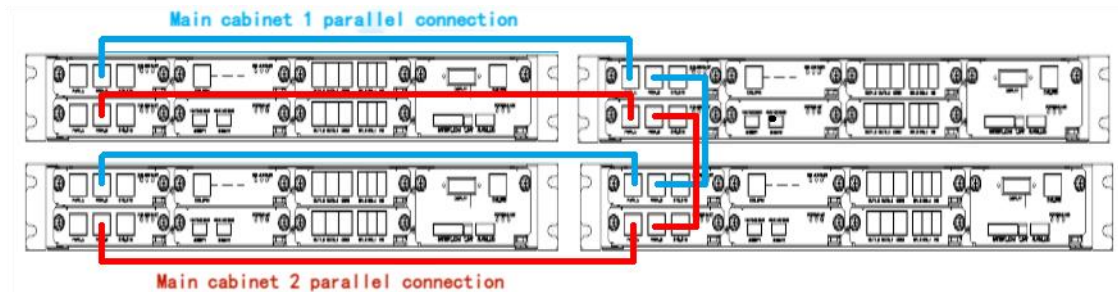


Figure 3-4 Parallel Cabinet Wiring Diagram

3. Using the supplied communication cable, connect the cabinet communication line as above to form a ring communication link;
4. In the case of sharing supercapacitors in parallel, the communication lines of the supercapacitor management system should be connected to the corresponding communication terminals of each AVC-RTS-P in parallel.

Chapter 4 User Interface

4.1 Outline

The user's primary means of display and operational configuration is through the monitoring module mounted on the door panel of the AVC-RTS-P system cabinet. The monitoring module allows users to locally record and access system status information, parameter information, historical event records and curve data. (Note: The following monitoring interface displays the default factory time, which can be calibrated in the personalisation settings, etc.)

The main interface page of monitoring module contains the following information:

- 1. Status information; (current system operation status, current working mode)
- 2. Operation information; (energy flow diagram)
- 3. Real-time data. (Grid, bus, load measurement data)

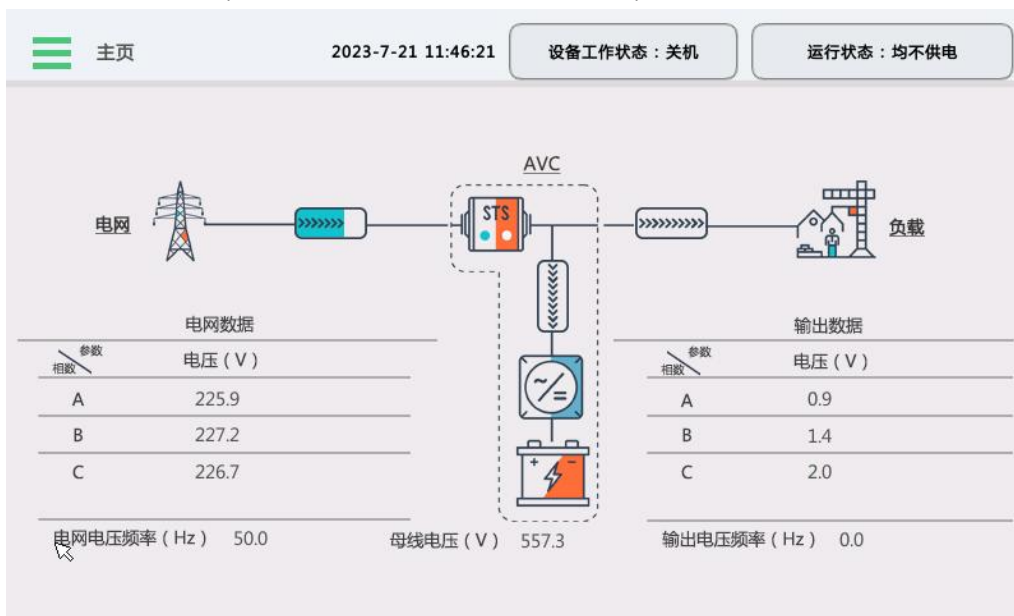


Figure 4-1 Monitoring main interface diagram

4.2 Monitor Operator Interface

Click the menu button on the top left corner of the monitor, there will be a series of operation options, including Home, Measurement, Alarm, Parameter Configuration, Record, Switch On/Off, and Screenshot options, and clicking on the corresponding operation options will lead you to different display and operation pages.

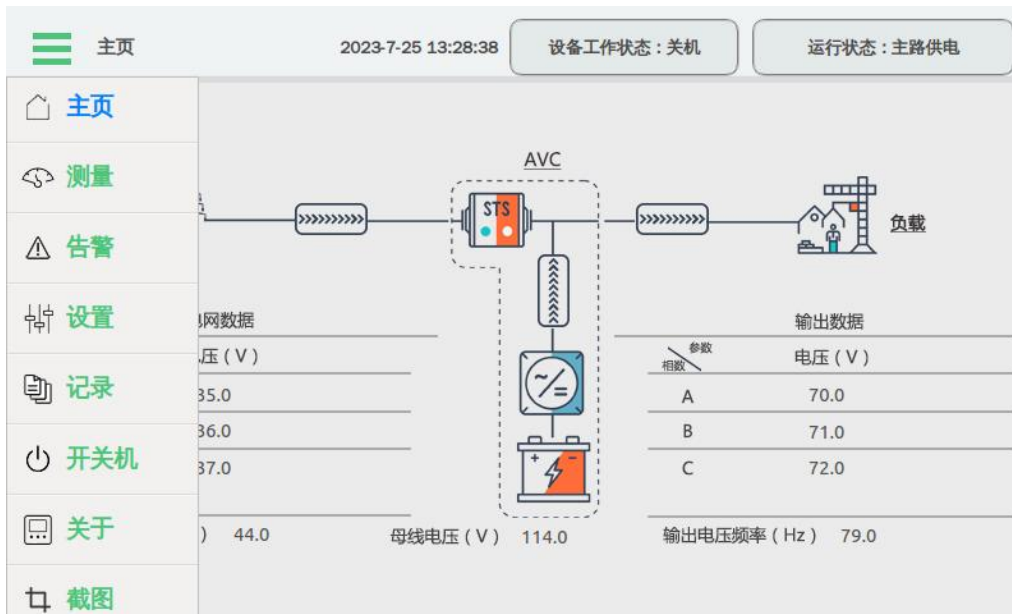


Figure 4-2 Monitor main interface options

Table 4-1 Operation Options Table

Measurement	Bypass Data	Parameter Configuration	System Setting
	Output Data		Input/Output
	Module Data		Bypass Setting
	Battery Data		Battery Setting
	Status		Communication Setting
	\		Personalisation
Alarm	Current Alarms	Record	Status Records
	Historical Alarms		Event Records
Switching mode	\		Curve Recording
Screenshot	\		Operation Record
			System status
			Record Download

4.2.1 Measurement

In the measurement, it contains bypass data, output data, module data, battery data, and status quantity. Clicking on different options will show the corresponding information.

4.2.1.1 Bypass data

Select Bypass Data in the Measurement screen.

相	电压(V)	电流(A)	电流峰值比	电压频率(Hz)
A	219.0	25.9	1.9	50.0
B	220.4	26.6	1.9	
C	220.4	26.0	2.0	
N		17.8		

相	视在功率(kVA)	有功功率(kW)	无功功率(kVar)	功率因数
A	5.7	-0.1	5.8	-0.01
B	5.9	-0.1	5.8	-0.01
C	5.7	-0.0	5.7	-0.01

Figure 4-3 Bypass Data

4.2.1.2

Output Data

Select Output Data in Measurement.

The screenshot displays a monitoring interface with the following elements:

- Header: 输出数据 (Output Data), 2024-3-4 10:23:59, 设备工作状态: 关机 (Device Status: Power Off), 运行状态: 均不供电 (Operation Status: No Power Supply).
- Navigation: 旁路数据 (Bypass Data), 输出数据 (Output Data), 模块数据 (Module Data), 电池数据 (Battery Data), 状态量 (Status).
- Table 1: Phase Voltage and Current Data.
- Table 2: Power and Load Data.

相	电压(V)	电流(A)	电流峰值比	电压频率(Hz)
A	0.4	0.0	2.4	0.0
B	1.2	0.0	2.5	
C	0.8	0.0	2.0	
N		6.4		

相	视在功率(kVA)	有功功率(kW)	无功功率(kVar)	功率因数	负载率(%)
A	0.0	-0.0	0.0	-0.11	0.0
B	0.0	0.0	0.0	0.20	0.0
C	0.0	0.0	0.0	0.84	0.0

Figure 4-4 Output Data

4.2.1.3 Module Data

Select the module data in the measurement.



Figure 4-5 Module Data

By clicking on 'module x' in the lower right corner, you can enter the module real-time status information display selection page, and the corresponding number indicates the power module number.



Figure 4-6 Module Selection Screen

When a module has successfully established a communication connection with the main

control, the green ' × ' under the corresponding module code on the module selection page will turn into a blue '√', indicating that the module has successfully communicated with the main control module, and if there is no other alarm information the module can be If there is no other alarm message, the module can be switched on and put into operation.

When there is a blue '√' under the module code, you can click the corresponding code to enter the real-time status information of the module, and you can see the inverter data information measured inside the power module.

4.2.1.4 Battery data

Battery data interface can view the current temperature, total voltage, current and status of each supercapacitor (or battery) in the cabinet. If there are more than one capacitor bank, you can click the green button on the right side of 'Capacitor Bank Selection' to enter the interface of 'Energy Storage Bank Selection' to select the capacitor bank you want to view. Blue colour indicates that the storage cabinet has been connected normally, green colour indicates that the storage cabinet is not connected, yellow colour indicates that the storage cabinet has alarms and faults, and up to 8 storage cabinets can be connected. The lower part shows the calculated temperature information of all storage modules in the energy storage cabinet, the minimum and maximum temperature is the result of comparing the instantaneous temperature values of all modules, and the average temperature is the result of averaging the instantaneous temperatures of all modules. Click the corresponding online energy storage cabinet number on the page to view the data information of all energy storage modules of the energy storage cabinet.

If users configure their own energy storage cabinets, the charging voltage and current settings must be strictly in accordance with the actual configuration of the energy storage module, in order to ensure the consistency of the communication protocol, the user must purchase our communication protocol board, and do a good job of all the safety monitoring and protection for the energy storage cabinet.



Figure 4-7 Battery Data



Figure 4-8 Storage cabinet options

Table 4-2 Battery Data Record Sheet

Item	Description
Battery status	Battery current status: not connected, equalised, floating, full, discharged, non-charged and non-discharged
Battery voltage (V)	Battery Voltage
Battery current (A)	Battery current, battery charging current '+', battery discharging current '-'

4.2.1.5 Status

In the status volume interface, users can check the system operation status, battery status, system breaker auxiliary contact status, main control status and other information. Click the 'Other' button at the bottom left corner of the interface to jump to the 'Other' interface to view the input dry contact status, bypass thyristor temperature and other information.



Figure 4-9 Status



Figure 4-10 Other

4.2.2 Alarm

In the Alarms option, you can see the current alarms and historical alarms. The current alarm record shows the number of alarms, alarm name, level and start time.

4.2.2.1 Current Alarm

The screenshot displays the 'Current Alarm' interface. At the top, there is a navigation bar with a menu icon, the text '当前告警' (Current Alarm), a user profile icon, the date and time '2024-2-22 14:42:25', and two status indicators: '设备工作状态: 开机' (Device Working Status: On) and '运行状态: 旁路供电 逆变器待机' (Running Status: Bypass Power Inverter Standby). Below the navigation bar are two tabs: '当前告警' (Current Alarm) and '历史告警' (Historical Alarm). The main area contains a table with the following columns: '序号' (Serial Number), '告警名称' (Alarm Name), '级别' (Level), and '开始时间' (Start Time). The table is currently empty. At the bottom left, it shows '记录总数: 0' (Total Records: 0) and a speaker icon. At the bottom right, there is a page number '1' in a box.

Figure 4-11 Current Alarm

4.2.2.2 History Alarm

The record shows the number of alarms, alarm name, level, start time and end time.



The screenshot displays a web interface for 'History Alarm'. At the top, there is a navigation bar with a menu icon, the title '历史告警', a user profile icon, the current time '2024-2-22 14:42:34', and two status indicators: '设备工作状态: 开机' and '运行状态: 旁路供电 逆变器待机'. Below the navigation bar are two tabs: '当前告警' (Current Alarm) and '历史告警' (History Alarm), with the latter being selected. The main content area features a table with the following columns: '序号' (Serial Number), '告警名称' (Alarm Name), '级别' (Level), '开始时间' (Start Time), and '结束时间' (End Time). The table contains seven rows of data, all with a '警告' (Warning) level. At the bottom left, it shows '记录总数: 2390' (Total Records: 2390). At the bottom right, there is a page number '1' and a '下一页' (Next Page) button.

序号	告警名称	级别	开始时间	结束时间
1	主控 旁路电压异常	警告	2020-01-01 01:09:05.230	2020-01-01 01:09:15.396
2	主控 输入电压异常	警告	2020-01-01 01:09:05.024	2020-01-01 01:09:13.644
3	主控 电网电压异常	警告	2020-01-01 01:09:05.008	2020-01-01 01:09:13.640
4	主控 旁路超跟踪	警告	2020-01-01 01:09:05.008	2020-01-01 01:09:15.396
5	#6 电网电压异常	警告	2020-01-01 01:09:05.012	2020-01-01 01:09:21.402
6	#5 电网电压异常	警告	2020-01-01 01:09:05.015	2020-01-01 01:09:21.040
7	#4 电网电压异常	警告	2020-01-01 01:09:05.026	2020-01-01 01:09:19.993

Figure 4-12 History Alarm

4.2.3 Setting

4.2.3.1 System Setting

In order to prevent misconfiguration of the system by uninvolved persons, the system parameters are configured with an access password. The primary password is '080808'. Enter the correct password to enter the system settings (all parameters of the AVC-RTS-P can not be changed arbitrarily, if you need to change in a timely manner to contact the customer service centre)

The screenshot shows the 'System Setting' interface. At the top, there is a navigation bar with a menu icon, the text '系统设置', a user icon, the date and time '2024-2-22 14:43:18', and two status indicators: '设备工作状态: 开机' and '运行状态: 旁路供电 逆变器待机'. Below the navigation bar is a tabbed interface with six tabs: '系统设置' (selected), '输入输出', '旁路设置', '电池设置', '通讯设置', and '个性化'. The main content area contains several configuration items:

单机/并机	单机	调试容量(KVA)	300
并柜编号	1	工作模式	ECO模式
模块台数	6	LBS模式	禁止
运行容量(KVA)	300	LBS设置	默认值
并柜数量	1	EOD关机后自动恢复输出	禁止

A green button labeled '下一页' is located at the bottom right of the configuration area.

The screenshot shows the second page of the 'System Setting' interface. It features the same navigation bar and tabs as the first page. The main content area contains several configuration items:

旁路电压上限(%)	10.00	均不供电时BCB脱扣	禁止
旁路电压下限(%)	-10.00	变压器接入状态	禁止
旁路电压异常检测系数1	0.80	备用设置项 4	100
旁路电压异常检测系数2	0.90	储能板工作模式	正常模式
Rep控制增益	0.00	逆变器自动开机模式	禁止

A green button labeled '上一页' is located at the bottom right of the configuration area.

Figure 4-13 System Setting

Table 4-3 System setup parameter table

Item	Default	Setting Range
Single/Parallel	\	0:Single; 1:Parallel
Parallel cabinet number	1	1~7
Number of modules	1	1~28
Operating Capacity	50 (KVA)	25~3000
Number of parallel cabinets	1	1~7
Commissioning capacity	300 (KVA)	200~3000
operating mode	1	0: Normal mode, 1: ECO mode, 2: Self-aging mode
LBS model	0	0: disable; 1: enable
LBS settings	0	0: none, 1: LBS slave, 2: LBS master
EOD automatically restores output after shutdown	0	0: prohibited; 1: permitted
Bypass Voltage Limit	+ 10%	+ 5%~ + 15%
Lower bypass voltage limit	- 10%	- 25%~ - 5%
Bypass voltage abnormality detection factor1	0.7	0.1~0.9
Bypass voltage abnormality detection factor2	0.8	0.1~0.9
Rep Control Gain	0	0~1
BCB disconnection when no power is supplied	0	0: prohibited; 1: permitted
Transformer access status	0	0: not connected; 1: connected
Alternate Setting 4	0	0~1000
Energy storage board working mode	0	0: Normal mode; 1: Maintenance mode
Inverter Auto Power On Mode	0	0: prohibited; 1: permitted

4.2.3.2 Input and output settings

The screenshot shows the 'Input and Output Settings' page. At the top, there is a navigation bar with '输入输出' (Input/Output) selected. The page displays various settings for the generator and output parameters. The settings are organized into two columns:

- Generator Settings:**
 - 发电机下限制输入功率(KVA): 300
 - 发电机下充电功率百分比(%): 100.00
 - 主路输入限流百分比(%): 200.00
 - 主路输入限流: 禁止
 - 智能发电机模式: 禁止
- Output Settings:**
 - 输出电压调整系数: 1.00
 - 输出频率跟踪率(Hz/s): 2.0
 - 输出频率等级(Hz): 50
 - 输出额定相电压(V): 220

Figure 4-14 Input and Output Settings

Table 4-4 Input/Output Setting Parameter Table

Item	Default	Setting Range
Limit input power under generator	300 (KVA)	25~8400
Percentage of charging power under generators	100%	0~1
Main circuit input current limit percentage	200%	0.5~2
Main input current limit	0	0: prohibited; 1: permitted
Smart Generator Mode	0	0: prohibited; 1: permitted
Output Voltage Adjustment Factor	1.0	0.95~1.05
Output frequency tracking rate	2Hz/s	0.1~10
Output Frequency Rating	50Hz	40~70
Output rated phase voltage	220V	100~690

4.2.3.3 Bypassed setting

Figure 4-15 Bypass Settings

Table 4-5 Bypass Setting Parameters

Item	Default	Setting Range
Upper limit of bypass voltage protection range (%)	+ 15%	+ 5%~ + 25%
Lower limit of bypass voltage protection range (%)	- 20%	- 60%~ - 5%
Bypass voltage frequency protection range (%)	4%	1%~12%

4.2.3.4 Battery Setting

☰ 电池设置 2024-2-22 14:43:50 设备工作状态：开机 运行状态：旁路供电 逆变器待机

系统设置 输入输出 旁路设置 电池设置 通讯设置 个性化

电池类型	超级电容	单节电池电压(V)	12
电池组数	1	电池充电限流系数	0.10
单组电池节数	40	单体浮充电压(V/cell)	2.25
单节电池单体数	6	单体均充电压(V/cell)	2.35
单节电池容量(A.h)	200	电池温度补偿	禁止

下一页

☰ 电池设置 2024-2-22 14:43:58 设备工作状态：开机 运行状态：旁路供电 逆变器待机

系统设置 输入输出 旁路设置 电池设置 通讯设置 个性化

放电电流0.1C EOD(V/cell)	1.80	均充温补系数(mV/cell*°C)	0.000
放电电流0.3C EOD(V/cell)	1.80	强制均充	禁止
放电电流0.5C EOD(V/cell)	1.80	电池检修	禁止
放电电流1.0C EOD(V/cell)	1.80	电池自检	0
浮充温补系数(mV/cell*°C)	0.000	电池自检结束	0

上一页 下一页

☰ **电池设置** 👤 2024-2-22 14:44:06 设备工作状态：开机 运行状态：旁路供电 逆变器待机

系统设置 输入输出 旁路设置 **电池设置** 通讯设置 个性化

电池自检容量百分比(%)	<input type="text" value="100.00"/>	充电延迟时间	<input type="text" value="0"/>
电池自检结束容量百分比(%)	<input type="text" value="80.00"/>	并机共用电池组	<input type="text" value="不共用"/>
转换参数1(A)	<input type="text" value="30.0"/>	超级电容充电电压(V)	<input type="text" value="544.0"/>
转换参数2(A)	<input type="text" value="20.0"/>	超级电容充电电流(A)	<input type="text" value="250.0"/>
电池充电	<input type="text" value="允许"/>	超级电容电压保护下限(V)	<input type="text" value="300.0"/>

⏪ ⏩

☰ **电池设置** 👤 2024-2-22 14:44:13 设备工作状态：开机 运行状态：旁路供电 逆变器待机

系统设置 输入输出 旁路设置 **电池设置** 通讯设置 个性化

超级电容电压保护上限(V)	<input type="text" value="564.0"/>
电池自检功能使能	<input type="text" value="禁止"/>
电池自检时间	<input type="text" value="30"/>

⏪ ⏩

Figure 4-16 Battery Settings

Table 4-6 Battery Setting Parameters

Item	Default	Setting Range
Battery Type	2	0: lead-acid battery, 1: lithium battery, 2: supercapacitor, 3: flywheel
Number of battery packs	1	1~100
Number of Cells per Battery	40	1~80
Number of cells in a single group	6	1~100
Single cell capacity	200 (Ah)	0~1000
Single Battery Voltage	12 (V)	0~100
Battery charging current limiting factor	0.1	0.05~0.2
Monoblock Float Voltage	2.25 (V/cell)	2.0~2.5
Monoblock charging voltage	2.35 (V/cell)	2.0~2.5
Battery temperature compensation	0	0: prohibited; 1: permitted
Discharge current 0.1C EOD	1.8 (V/cell)	1.5~2.5
Discharge current 0.3C EOD	1.8 (V/cell)	1.5~2.5
Discharge current 0.5C EOD	1.8 (V/cell)	1.5~2.5
Discharge current 1.0C EOD	1.8 (V/cell)	1.5~2.5
Floatation temperature compensation factor	0 (mV/cell*°C)	- 100~0
Equalisation temperature coefficient	0 (mV/cell*°C)	- 100~0
forced equalisation	0	0: prohibited; 1: permitted
Battery Overhaul	0	0: prohibited; 1: permitted
Battery self-test	0	1: Self-test enable, other characters are invalid
End of battery self-test	0	1: end of battery self-test, other characters are invalid
Battery self-test capacity percentage	100 (%)	10~100

Percentage of capacity at end of battery self-test	80 (%)	10~100
Conversion parameter 1 (A)	30	Greater than 0
Conversion parameter 2 (A)	20	Greater than 0
Battery charging	1	0: prohibited; 1: permitted
Charging delay time	0 (S)	0~300
Parallel Shared Battery Packs	0	0: not shared; 1: shared
Supercapacitor Charging Voltage	Specific settings (V)	0~850
Supercapacitor charging current	Specific settings (A)	0~2000
Lower limit of supercapacitor voltage protection	Specific settings (V)	0~700
Supercapacitor Voltage Protection Limit	Specific settings (V)	0~900
Battery self-test enable	0	0: prohibited; 1: permitted
Battery self-test time	30 (S)	1~300

4.2.3.5 Communication settings

The screenshot displays the 'Communication Settings' page. At the top, there is a navigation bar with a menu icon, the title '通讯设置', a user icon, the time '2024-2-22 14:44:25', and two status indicators: '设备工作状态: 开机' and '运行状态: 旁路供电 逆变器待机'. Below the navigation bar is a horizontal menu with six tabs: '系统设置', '输入输出', '旁路设置', '电池设置', '通讯设置' (which is highlighted in blue), and '个性化'. The main content area is divided into two columns of settings. The left column includes: 'IP地址' (172.16.106.191), '默认网关' (172.16.107.254), '子网掩码' (255.255.254.0), 'MAC地址' (00:65:97:C0:78:21), and '动态IP使能' (禁止). The right column includes: 'RS485 地址' (1), 'RS485 波特率' (19200), 'RS232 地址' (1), and 'RS232 波特率' (19200). At the bottom left, there is a green button labeled '云端信息' with a mouse cursor over it.

Figure 4-17 Communication Settings

The screenshot displays the 'Cloud Communication Settings' page. At the top, there is a navigation bar with a menu icon, the title '云端通讯', a user icon, the time '2024-2-22 14:44:39', and two status indicators: '设备工作状态: 开机' and '运行状态: 旁路供电 逆变器待机'. Below the navigation bar is a horizontal menu with six tabs: '系统设置', '输入输出', '旁路设置', '电池设置', '通讯设置', and '个性化'. The main content area is divided into two columns of settings. The left column includes: '云端通讯使能' (禁止), 'IP地址' (139.9.78.31), '端口号' (20000), and '密码' (102888). The right column includes: '设备编码' (0), 'SIM编码', '上传/下载速率' (0K/0K), and '网络状态' (网络不可用). At the bottom left, there is a green button labeled '返回' with a mouse cursor over it.

Figure 4-18 Cloud Communication Settings

Table 4-7 Communication Setting Parameters

IP address	Set the IP address of Ethernet (the same IP address setting in the same network segment will result in the background software not being able to access the monitoring, and not being able to obtain the monitoring local data)	172.16.4.201
Subnet mask	Setting the Ethernet subnet mask	255.255.254.0
gateway	Setting the gateway for Ethernet	172.16.5.254
MAC address	Defines the physical address of the network device, which can be changed	D4.A1.F2.B1.21.27
Dynamic IP Enable	Obtain a dynamic IP automatically, without using a fixed IP address as described above	Disable/Enable
RS485 address	Address of this site for external 485 communication	0~32
RS485 Baud Rate	Baud rate setting for external 485 communication	1200/2400/4800/9600/19200 bps
RS232 address	Address of this site for external 232 communication	0~32
RS232 Baud Rate	Baud rate setting for external 232 communication	1200/2400/4800/9600/19200 bps

Table 4-8 Cloud Communication Parameters

Item	Cloud communication enablement	Setting
IP address	Setting the Ethernet IP address	139.9.78.31
port number	Setting the port number	20000
Secret	Setting a password	102888

4.2.3.6 Personalisation



Figure 4-19 Personalisation

Table 4-9 Personalisation parameter setting table

Item	Default	Setting range
Time	Monitoring the current time	Setting the current time
Battery installation time	Monitoring the current time	Setting the battery installation time
Battery maintenance tips	Disable	Enable/Disable
Battery maintenance intervals	0	/
Battery Protocol	0	0/1/2
language	Chinese	Chinese/English (change language monitoring will restart)
Capture Board Communications	Enable	Enable/Disable

4.2.3.7 About

Users can view the protocol version, software version, monitoring version and other version information of the system master and module and machine type in the about interface, click the interface 'Master' or 'Module x' button to enter the module selection interface, you can choose to view the version information of the master and any module. You can choose to view the version information of master control and any module.



Figure 4-20 About

4.2.4 Record

4.2.4.1 Status Record

The screenshot shows the 'Status Record' (状态记录) interface. At the top, there is a navigation bar with a menu icon, the title '状态记录', a user profile icon, the date and time '2024-2-22 14:45:15', and two status indicators: '设备工作状态: 开机' (Equipment Working Status: On) and '运行状态: 旁路供电 逆变器待机' (Operating Status: Bypass Power Supply Inverter Standby). Below the navigation bar is a tabbed interface with six tabs: '状态记录' (Status Record), '事件记录' (Event Record), '曲线记录' (Curve Record), '操作记录' (Operation Record), '系统状态' (System Status), and '记录下载' (Record Download). The '状态记录' tab is active. The main content area contains a table with the following columns: '序号' (Serial Number), '开始时间' (Start Time), '旧状态' (Old State), '新状态' (New State), '条件1' (Condition 1), '条件2' (Condition 2), and '条件3' (Condition 3). The table lists seven records of state transitions. At the bottom right, there is a pagination control showing '1' and a '下一页' (Next Page) button.

序号	开始时间	旧状态	新状态	条件1	条件2	条件3
1	2020-01-01 01:09:12.325	PowerWalkin	旁路SCR闭合	0	0	4
2	2020-01-01 01:09:11.310	逆变	PowerWalkin	0	0	0
3	2020-01-01 01:09:04.995	快切	逆变	0	4640	1
4	2020-01-01 01:09:04.993	旁路SCR闭合	快切	0	4640	3
5	2020-01-01 01:07:31.179	PowerWalkin	旁路SCR闭合	0	0	4
6	2020-01-01 01:07:30.171	逆变	PowerWalkin	0	0	0
7	2020-01-01 01:07:24.838	快切	逆变	0	160	1

Figure 4-21 Status Record

4.2.4.2 Event Record

The screenshot shows the 'Event Record' (事件记录) interface. At the top, there is a navigation bar with a menu icon, the title '事件记录', a user profile icon, the date and time '2024-2-22 14:45:20', and two status indicators: '设备工作状态: 开机' (Equipment Working Status: On) and '运行状态: 旁路供电 逆变器待机' (Operating Status: Bypass Power Supply Inverter Standby). Below the navigation bar is a tabbed interface with six tabs: '状态记录' (Status Record), '事件记录' (Event Record), '曲线记录' (Curve Record), '操作记录' (Operation Record), '系统状态' (System Status), and '记录下载' (Record Download). The '事件记录' tab is active. The main content area contains a table with the following columns: '序号' (Serial Number), '类别' (Category), '开始时间' (Start Time), '持续时间(ms)' (Duration (ms)), and '电网电压特征幅值百分比' (Grid Voltage Characteristic Amplitude Percentage). The table lists seven records of voltage sags. Each record has a '曲线显示' (Curve Display) button. At the bottom left, there is a label '记录总数: 152' (Total Record Count: 152). At the bottom right, there is a pagination control showing '1' and a '下一页' (Next Page) button.

序号	类别	开始时间	持续时间(ms)	电网电压特征幅值百分比
1	电压暂降	2020-01-01 01:09:05:008	5384	0.2
2	电压暂降	2020-01-01 01:07:24:771	4595	56.9
3	电压暂降	2020-01-01 01:05:54:744	4598	62.4
4	电压暂降	2020-01-01 01:04:20:652	4603	79.1
5	电压暂降	2020-01-01 01:03:32:214	4630	79.6
6	电压暂降	2020-01-01 01:13:53:825	5777	0.5
7	电压暂降	2020-01-01 01:10:55:757	6061	0.2

Figure 4-22 Event Record

4.2.4.3 Curve Recording

This page can record the voltage and current curves of each phase when the corresponding abnormal event occurs, and it can record 240 curves at most.

Click curve display to enter the curve display page, as in Figure 4-22, click ‘red, green and blue’ to select the corresponding curve to display, each curve contains 100 weekly waves. The horizontal axis represents time and the vertical axis represents amplitude. Users can pan, zoom in and out of the recorded curve by operating the virtual buttons in the lower row.

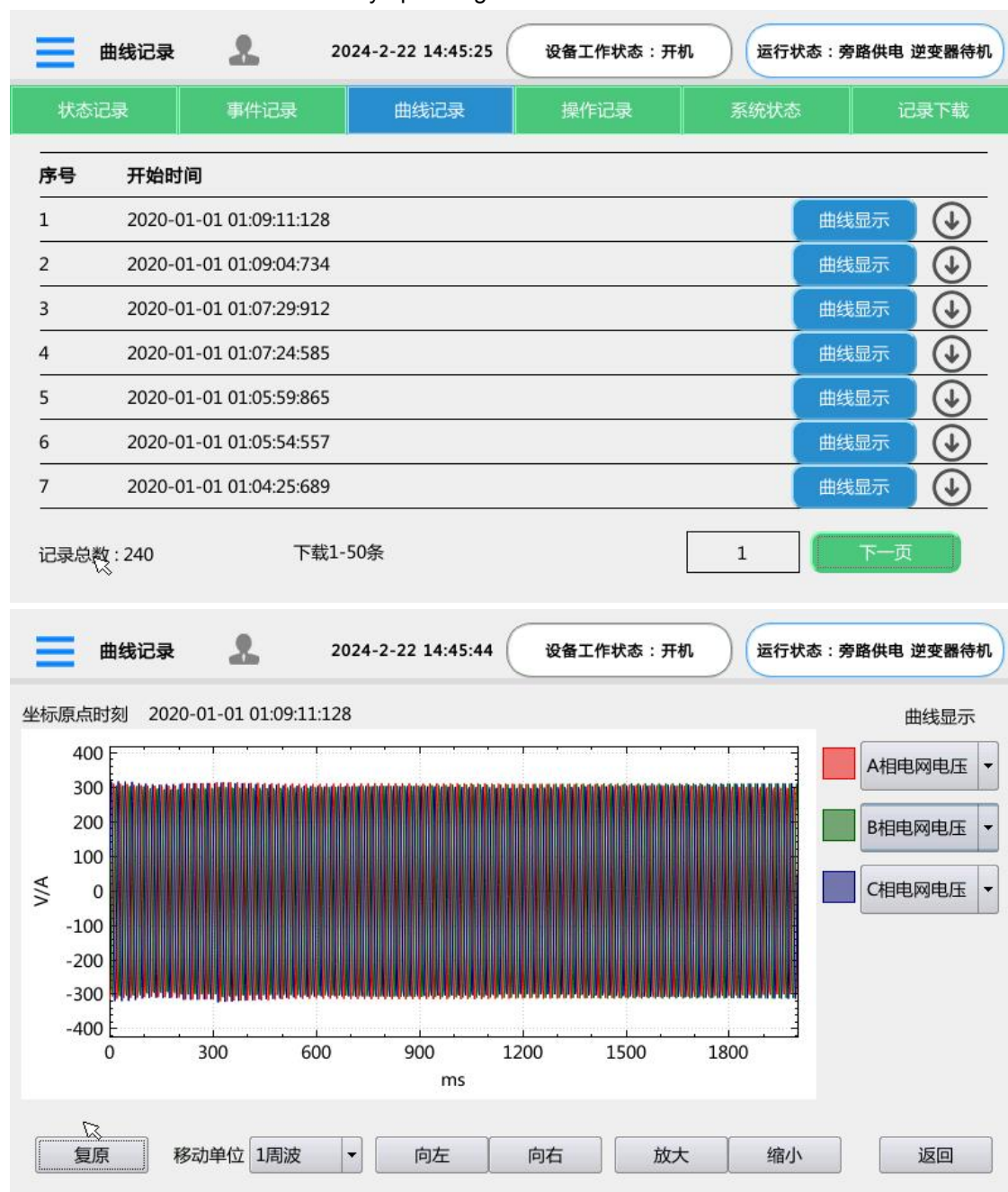


Figure 4-23 Curve Record

4.2.4.4 Record of operations

序号	操作时间	操作名称	原始值	设置值
1	2020-01-01 01:03:58.340	开机	1.000	1.000
2	2020-01-01 01:13:23.346	关机	1.000	1.000
3	2020-01-01 01:02:29.711	开机	1.000	1.000
4	2020-01-01 02:30:58.536	关机	1.000	1.000
5	2020-01-01 01:48:54.475	旁路电压异常检测系数2	0.800	0.899
6	2020-01-01 01:48:42.440	旁路电压异常检测系数1	0.699	0.800
7	2020-01-01 01:03:00.643	开机	1.000	1.000

Figure 4-24 Operation Log

4.2.4.5 System status

序号	状态名称	改变时间	原始值	更改值
1	电池状态	2020-01-01 01:09:42.227	均充	充满
2	电池状态	2020-01-01 01:09:15.496	非充非放	均充
3	电池状态	2020-01-01 01:09:13.964	放电	非充非放
4	系统运行状态	2020-01-01 01:09:13.809	电网电池联合供电	旁路供电 逆变器待机
5	系统运行状态	2020-01-01 01:09:11.216	电池供电	电网电池联合供电
6	系统运行状态	2020-01-01 01:09:05.387	电网电池联合供电	电池供电
7	电池状态	2020-01-01 01:09:05.181	均充	放电

Figure 4-25 System Status Log

4.2.4.6 Record downloads



Figure 4-26 Record Download

4.2.5 Switching on and off

Clicking the 'Power On' button or 'Power Off' button will pop up a confirmation box, users can confirm the corresponding operation or cancel the corresponding operation, the default password for switching on and off is '123456'.



Figure 4-27 Switching on and off

Newly installed cabinets should ensure that all cables are correctly connected and system parameters are set correctly, then click on the 'power on' operation to keep the system running online, in order to protect the user load in real time to cope with a variety of complex voltage events.

Chapter 5 Quick start guide

AVC-RTS-P series devices have a user-friendly interactive interface, which enters the power-on operation guide after the first power-on, and the power-on configuration can be completed by simple operation.

5.1 Stand-alone operation

- 1, in accordance with the 'stand-alone installation' requirements to install the equipment connected to normal;
- 2、Close the input power, the device boot self-test;
- 3、Check the 'current alarm' item of the device, if there is any abnormality, please confirm the feedback;
- 4, click the 'system settings' , enter the initial password: 080808, select the operating mode, the default is 'ECO mode' , you can choose the bypass mode or other modes (operating mode: normal mode, ECO mode, self-aging);
- 5, according to the configuration of the number of power modules to set the system operating capacity;
- 5、Setting super capacitor parameters according to the parameters of configured super capacitor;
- 6、Setting output voltage related parameters;
Configure remote access IP and other information for remote access settings;
- 8、Review the 'current alarm' item;
- 9, into the switching interface click on the boot (switching default password is '123456'), the system enters the corresponding working mode, to protect the load operation.

5.2 Parallel operation

Install and connect the equipment correctly according to the requirements of 'parallel installation' .
Close the input power, and the device will start self-test;

- 2、Refer to 'stand-alone operation' guide to carry out relevant alarm checking and parameter setting;
- 3、Monitoring interface set the parallel cabinet number of the host cabinet, and the rest of the number will be assigned automatically;
- 4、Set 'parallel operation' in 'system setting' interface, and set 'parallel capacity' parameter according to the number and capacity of parallel cabinets, currently only support parallel operation of cabinets with the same power capacity;
- 5、Review the item of 'Current Alarm' ;
- 6、Click the switching interface for power-on operation (the default password for switching is '123456'), the device will run in accordance with the set mode to protect the load.

Chapter 6 Maintenance

6.1 Maintenance AVC-RTS-P

Maintenance Instructions:

- The AVC-RTS-P system is designed to be easy to maintain. Maintenance personnel should have a certain degree of professionalism and a good understanding of the system, and the equipment must be disconnected from the power supply and effectively discharged before maintenance.
- Before operating or maintaining the AVC-RTS-P, wear anti-static work clothes, anti-static gloves and wrist straps, and remove easily conductive objects such as jewellery and watches to avoid electric shocks or burns.
- All internal maintenance and servicing work on the AVC-RTS-P requires the use of insulated tools, and devices behind protective covers that require tools to open are user non-maintainable devices.
- Only maintenance engineers should maintain the power and bypass modules.
- Regular maintenance of the AVC-RTS-P is required, otherwise the normal operation of the AVC-RTS-P will be affected and the normal service life of the AVC-RTS-P will be reduced.

6.1.1 Monthly maintenance

- Check the environment temperature: abnormal temperature and humidity need to check the air conditioning condition.
- Check the grid environment: abnormal input voltage needs to verify the grid condition and input wiring; abnormal output voltage needs to verify the AVC-RTS-P operation status, if there is any alarm.
- Check the monitoring panel: if there are alarms, troubleshoot the equipment status and parameters according to the content of the alarms.

6.1.2 Quarterly maintenance

- Module cleaning: Check all modules for excessive dust and dirt, clean them if necessary.
- Wiring detection terminal cleaning: use a flexible soft brush to clean each wiring detection terminal with dust, please do not move and touch the connection points and cables.
- Setting parameter checking: check the output voltage level, frequency, number of supercapacitor sections, supercapacitor capacity, abnormalities need to be reset.
- Shallow Discharge Test: Under the condition of making good measures for the backup of AVC-RTS-P system, make the supercapacitor do a shallow discharge test to ensure that the supercapacitor can be discharged normally.

6.1.3 Annual maintenance

- Grounding check: check whether the grounding cable is tight, if there is any abnormality you need to tighten the screws.
- Cable check: check whether the cable insulation layer is broken, whether the power connection has any blackening or ignition traces, if there is any abnormality, the cable needs to be replaced.
- Cable and air open flow: whether the cable meets the requirements of the load capacity, whether the actual flow of the cable is greater than the switch specifications, if any abnormality need to replace the cable.

6.2 Supercapacitor Maintenance

Maintenance instructions:

- When maintaining the supercapacitor, it is required that the tools used (spanners, etc.) be insulated and wrapped first; no debris should be placed on top of the supercapacitor.
- Do not use any organic solvent to clean the supercapacitor.
- Do not remove the safety valve of the supercapacitor or add any substances into the supercapacitor.
- Do not smoke or use open flame near the supercapacitor bank.
- After discharging the supercapacitor, the supercapacitor should be charged in time to avoid affecting the service life of the supercapacitor.
- All maintenance work must be carried out by professionals.

6.2.1 Monthly maintenance

- Alarm information query: check whether there is super capacitor management alarm information, and investigate the cause according to the alarm information.
- Supercapacitor Inspection: Check whether the supercapacitor shell is intact, whether there is acid leakage or acid seepage; whether there is any deformation or bulging of the shell, and whether there is any bruise, breakage or cracking around the shell. If there is any problem, contact the customer service centre in time.
- Supercapacitor appearance check: there is no acid leakage, acid seepage phenomenon; shell has no deformation, bulging phenomenon.
- Supercapacitor working temperature inspection: check the reason of abnormal working temperature of supercapacitor, if it can't be solved, contact the customer service centre in time.
- Super capacitor group charging voltage detection: check whether there is any error in the setting of equal charging voltage and floating charging voltage of AVC-RTS-P host. If the fault can not be solved, contact the customer service centre in time.

6.2.2 Quarterly maintenance

- Super Capacitor Temperature Sensor Detection Accuracy Check: If there is any abnormality, correct the installation position of the Super Capacitor Temperature Sensor or replace the Super Capacitor Temperature Sensor.
- Supercapacitor management parameter setting: check whether the supercapacitor management parameter setting meets the requirements of the product user manual, correct the parameter setting if there is any abnormality.
- Supercapacitor screw check: check whether the tightening scribe mark on the supercapacitor terminal screw has any displacement, if there is any abnormality multi-angle photo contact customer service centre.
- Super capacitor interconnecting line check: connecting line without aging, insulation layer without cracking phenomenon, if abnormal replacement of faulty connecting line.
- Single super capacitor voltage test: check whether the average charging voltage and floating charging voltage of single super capacitor are normal, if the super capacitor charging voltage is found to be over the standard, the group of super capacitors can be made a complete mandatory average charging, and then check whether the voltage of the super capacitor group is normal, and if the fault can't be eliminated, timely contact the customer service centre.
- Shallow Discharge Test: In the case of making good backup measures for AVC-RTS-P system, make the supercapacitor do a shallow discharge test to ensure that the supercapacitor can be discharged normally.

6.2.3 Annual maintenance

- Checking capacity test: Under the condition of good power backup measures of AVC-RTS-P system, make the supercapacitor discharge to the under-voltage warning point to make sure that the real-time capacity of the supercapacitor is refreshed.
- Supercapacitor Connection Reliability Check: Under the circumstance of power failure of the supercapacitor bank, check the reliability of each connection point of the supercapacitor bank one by one according to the fixed order from positive pole to negative pole. If the connection reliability is abnormal, it should be rectified in time, and if the fault can not be solved, contact the customer service centre in time.

Chapter 7 Performance Parameters

7.1 Environmental parameters

Environmental parameters	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Operating temperature	-10°C~40°C			
Storage temperature	-40°C~70°C			
Height above sea level	≤1000m (above 1000m, refer to IEC62040-3 standard derating, up to 4000m)			
Relative humidity	5%-95%			
Earthquake intensity	≤9 degrees			

7.2 Monitoring parameters

Monitoring parameters	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Sizes	7-inch touch monitor screen with multi-language support			
Function	Waveform Viewing, Recording, Downloading			
Back end	Network port connection, wireless 4G connection (optional), cloud platform (optional)			
Status Record	Up to 10,000 records, the oldest records will be overwritten when the data is full.			
System status	Up to 2000 records, the oldest records will be overwritten when the data is full.			
Event Records	Up to 1000 records, the oldest records will be overwritten when the data is full.			
Curve Recording	Up to 240 records, the oldest records will be overwritten when the data is full			
Record Download	Supports one-key download of 'Current Alarms', 'Historical Alarms', 'Operation Records', 'Status Records', 'System Status Records', 'Fault Messages', 'Parameter Records'. System Status Record, "Fault Information", "Parameter Record".			
Curve Download	Support '1~50 curves download', '1~200 curves download', 'All curves download'.			

7.3 Performance Parameters

Performance Parameters	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Efficiency	> 96.5%			
Bypass switching time	≤2ms			
Connect a wire	Incoming line below Outgoing line below			
Cabinet	IP20, wall mounting option			
Parallel cabinet	6 units			
Number of power modules	unlimited			
Noise level	66-75dB			
Connector	RS485, RS232, CAN, network port, optional backfill protection card, optional 4G module			

7.4 Bypass Input Parameters

Bypass input	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Voltage range	Rated: 380Vac/400Vac/415Vac			
Overload parameters	Rated 300kVA/300kW ≤ 135%, temperature ≤ 30°C, long term operation possible ≤ 125%, temperature ≤ 40°C, can be long-term operation 150% ~ 200%, maintenance time 5min 200% ~ 1000%, maintenance time 1min Maintenance time 100ms for >1000%			
linear	Three-phase four-wire + PE			
Frequency range	50Hz/60Hz			

7.5 Inverter output parameters

Inverter output parameters	150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Input voltage	Rated 380Vac/400Vac/415Vac			
Power	150kVA/150kW (3 modules)	200kVA/200kW (4modules)	250kVA/250kW (5 modules)	300kVA/300kW (6 modules)
Frequency	Mains mode (tracking mains), supercapacitor mode 50Hz/60Hz (0.05%)			
Degree of imbalance	≤ 0.1 per cent (balanced load); ≤ 1.0 per cent (100 per cent unbalanced load)			
Overload parameters	Bypass after 60min at 110% load, 10min at 125% load, 1min at 150% load			
THDu	THDu < 1%(100% resistive load); THDu < 3%(100% Non-resistive loads)			

7.6 DC parameters

DC parameters		150KVA AVC-RTS-P	200KVA AVC-RTS-P	250KVA AVC-RTS-P	300KVA AVC-RTS-P
Input voltage	Supercapacitor discharge power	300 ~ 700Vdc			
Power		153kW	204kW	255kW	306kW
Power	Super capacitor charging power	45kW(max) (with rated load)	60kW(max) (with rated load)	75kW(max) (with rated load)	90kW(max) (with rated load)

Chapter 8 Equipment alarms and maintenance

Alarm name	Alarm level	Causes	Restoration Recommendations
Abnormal bypass voltage	Minor	<ul style="list-style-type: none"> Unreasonable bypass voltage range setting Abnormal bypass input voltage 	<ol style="list-style-type: none"> Use a multimeter to check that the bypass input voltage or wiring is correct. Check that the voltage regime of the monitoring settings and the upper and lower limits of the bypass voltage are reasonable.
Bypass frequency abnormality	Minor	<ul style="list-style-type: none"> bypass frequency range not set properly Abnormal bypass input frequency 	<ol style="list-style-type: none"> Use a multimeter to check whether the bypass input voltage or wiring is correct. Check the bypass input frequency and whether the rated frequency and frequency range of the monitoring setting are reasonable.
Abnormal main circuit voltage	Minor	<ul style="list-style-type: none"> Wiring error Abnormal mains power supply Power module failure 	<ol style="list-style-type: none"> Check whether the utility wiring is disconnected, loose or connected incorrectly. After confirming the normal wiring, use a multimeter to measure the utility voltage: if the utility voltage is higher than 280V, then the utility input is abnormal; if the utility voltage is lower than 275V, then the power module sampling line is abnormal, and the faulty module needs to be replaced.
Main circuit frequency abnormality	Minor	<ul style="list-style-type: none"> Unreasonable main circuit frequency range setting Abnormal mains input frequency 	<ol style="list-style-type: none"> Use a multimeter to check whether the bypass input voltage or wiring is correct. Check the bypass input frequency and whether the rated frequency and frequency range of the monitoring setting are reasonable.
Bypass over-tracking	Minor	<ul style="list-style-type: none"> Bypass frequency changes too fast Output frequency tracking rate is not set properly 	<ol style="list-style-type: none"> Check whether the bypass output frequency changes too quickly. Check whether the 'output frequency tracking rate' is set reasonably.
Main circuit phase sequence reversal	Minor	<ul style="list-style-type: none"> Wiring error 	Check for correct wiring
Reverse bypass phase sequence	Minor	<ul style="list-style-type: none"> Wiring error 	Check for correct wiring
Bypass input out of phase	Minor	<ul style="list-style-type: none"> Wiring error 	Check for correct wiring
Main circuit input out of phase	Minor	<ul style="list-style-type: none"> Wiring error 	Check for correct wiring
Emergency switch-off	Emergency	<ul style="list-style-type: none"> The user presses the emergency shutdown button 	Restore emergency shutdown button status, clear the alarm and reboot the machine

Maintenance bypass closure	Emergency	<ul style="list-style-type: none"> Maintenance bypass closure 	Working condition presented, no fixes recommended
DC bus overvoltage	Emergency	<ul style="list-style-type: none"> DC bus over-voltage 	Check that individual DC bus voltages are above 450V
DC bus undervoltage	Minor	<ul style="list-style-type: none"> DC bus over-voltage 	<ol style="list-style-type: none"> Check that the individual DC bus voltages are not below 93v. Check that the individual DC bus voltages are not below 250v.
Inverter overload timeout	Emergency	<ul style="list-style-type: none"> Excessive load Derating resulting in reduced system power rating Damaged module Output ground fault 	<ol style="list-style-type: none"> Check if the load is too large. Check whether the module is derated due to wrong setting parameters. Check if there is a large asymmetrical load on the power grid. Check whether the output is grounded. <p>If there is no problem in the above 4 points, replace the power module.</p>
High ambient temperature	Emergency	<ul style="list-style-type: none"> High ambient temperature 	Check that the ambient temperature is not higher than 60°C
Radiator temperature too high	Emergency	<ul style="list-style-type: none"> Radiator temperature too high 	Check that the radiator temperature is not higher than 90°C
Auxiliary power supply 1 power down	Emergency	<ul style="list-style-type: none"> Abnormal 5v or 15v supply to the micro-controller 	Replacing a faulty module or board
Auxiliary power supply 2 power down	Emergency	<ul style="list-style-type: none"> Abnormal 24v supply to micro-controller 	Replacing a faulty module or board
In-cabinet maintenance bypass closure	Emergency	<ul style="list-style-type: none"> In-cabinet maintenance bypass closure 	Working condition presented, no fixes recommended
Fan abnormality	Emergency	<ul style="list-style-type: none"> Module Fan Abnormal Module Fan Detection Line Abnormal 	Replace the faulty module or replace the fan of the faulty module
Parameter setting abnormality	Emergency	<ul style="list-style-type: none"> Parameters of parameter settings appear to be contradictory 	Consult the relevant staff and reset the correct parameters
AC Fuse Failure	Emergency	<ul style="list-style-type: none"> Input or output fuse abnormality Detecting a problem with the wiring 	Replacement of faulty module
DC Fuse Failure	Emergency	<ul style="list-style-type: none"> Abnormalities in the fuse of the supercapacitor test Problems with the test wiring 	Replacement of faulty module

Charger failure	Emergency	<ul style="list-style-type: none"> The bridge arm current of the charger is not flowing evenly. Abnormal tubes in the charger 	<ol style="list-style-type: none"> Check the bridge arm current equalisation of the charger. Replace the faulty module.
Supercapacitor not connected	Minor	<ul style="list-style-type: none"> No supercapacitor pack Super capacitor bank not installed Power module supercapacitor fuse bad 	<ol style="list-style-type: none"> Check whether the super capacitor connection line is normal. Check whether the voltage of the supercapacitor port is normal. Check whether the super capacitor insurance in the module is normal.
Supercapacitor overvoltage	Emergency	<ul style="list-style-type: none"> Abnormal supercapacitor, high voltage The number of supercapacitor sections set by monitoring is smaller than the actual number of supercapacitor sections. The actual number of supercapacitor sections does not meet the specifications. 	<ol style="list-style-type: none"> Check the voltage of the supercapacitor unit. Check whether the number of supercapacitor sections in the monitoring setting matches the actual number of supercapacitor sections. Check whether the actual number of connected supercapacitor sections meets the specification requirements.
Reversed supercapacitor	Emergency	<ul style="list-style-type: none"> Supercapacitor installation error 	<ol style="list-style-type: none"> Use a multimeter to measure the supercapacitor installation polarity, if the installation is wrong need to reinstall the supercapacitor. If the measurement of the cabinet power distribution unit at the supercapacitor voltage is normal, then the power module is suspected of supercapacitor sampling line failure, need to replace the power module.
Supercapacitor discharge termination	Emergency	<ul style="list-style-type: none"> Continuous discharge of the supercapacitor causes the supercapacitor voltage to reach the EOD voltage point. 	<ol style="list-style-type: none"> Check if the voltage of super capacitor is normal. Check if the output is overloaded. Check whether the single supercapacitor is damaged, if there is damage then it needs to be replaced. alarm super capacitor low voltage in super capacitor mode can check whether the utility voltage is back to normal, if it is restored, charge it as soon as possible.
Supercapacitor Maintenance Reminder	Reminders	<ul style="list-style-type: none"> Supercapacitor installation time up to maintenance cycle 	Maintenance of supercapacitors
Communication	Emergency	<ul style="list-style-type: none"> Abnormalities in the 	<ol style="list-style-type: none"> Detect whether the segments of the

Failure A		main communication line between the inverter and the main control	communication line are loose, in the case of poor contact. 2. Replace the faulty module or the main control board.
Communication Failure B	Emergency	<ul style="list-style-type: none"> Abnormal communication line for backup use between the inverter and the main control 	<ol style="list-style-type: none"> 1. Detect whether the segments of the communication line are loose, in the case of poor contact. 2. Replace the faulty module or the main control board.
Communication Failure C	Emergency	<ul style="list-style-type: none"> Abnormalities in the main communication line between the module and the master control 	<ol style="list-style-type: none"> 1. Detect whether the segments of the communication line are loose, in the case of poor contact. 2. Replace the faulty module or the main control board.
Communication Failure D	Emergency	<ul style="list-style-type: none"> Abnormal spare communication line between the module and the main control 	<ol style="list-style-type: none"> 1. Detect whether the segments of the communication line are loose, in the case of poor contact. 2. Replace the faulty module or the main control board.
Communication Failure E	Emergency	<ul style="list-style-type: none"> Communication line abnormality in the same module. Abnormal communication line between master and bypass. 	<ol style="list-style-type: none"> 1. Detect whether the segments of the communication line are loose, in the case of poor contact. 2. Detect the fault is the module or the main control reported out. 3. If the module is reported out then replace the faulty module. 4. If it is the main control reported out to detect whether the bypass module is abnormal. If yes, then replace the bypass module; if not, replace the main control board.
Communication Failure F	Emergency	Abnormal communication between DSP and CPLD in module	Replacement of faulty module
Backup master abnormal	Emergency	<ul style="list-style-type: none"> The standby master is not accessed. Standby master abnormal 	<ol style="list-style-type: none"> 1. Insert the spare master board. 2. Replace the spare master board.
Soft start failure	Emergency	<ul style="list-style-type: none"> Busbar soft start abnormality 	<ol style="list-style-type: none"> 1. Detect whether the input voltage is too low, if the input voltage is too low, the soft start is abnormal. 2. Detect whether the soft start resistor is open circuit. 3. Replace the faulty module.

Charger soft start failure	Emergency	<ul style="list-style-type: none"> Abnormal soft start of charger busbar 	<ol style="list-style-type: none"> 1. Test whether the voltage of the supercapacitor is within the normal range. 2. Replace the faulty module.
Module not ready	Emergency	<ul style="list-style-type: none"> Ready switch not closed. 	Re-close the ready switch
Limit of bypass switching times	Minor	<ul style="list-style-type: none"> Frequent overload timeout or load shock to bypass 	Check the load
Super Bypass Voltage Abnormal	Minor	<ul style="list-style-type: none"> Bypass voltage or frequency is out of the set super bypass voltage range User-set super bypass voltage or frequency range is not reasonable Bypass input phase sequence is reversed, loss of centre line occurs 	<ol style="list-style-type: none"> 1. Check the bypass input voltage and frequency. 2. Check whether the rated voltage, rated frequency, super bypass bypass voltage range and frequency range are set reasonably. 3. Check whether the bypass wiring or openings are correctly connected.
Inverter soft start failure	Emergency	<ul style="list-style-type: none"> Abnormal output port voltage of inverter Abnormal power tube of the inverter 	<ol style="list-style-type: none"> 1. Detect whether the output port voltage of the inverter is abnormal. If abnormal, you need to wait for the voltage to be normal at the output port of the inverter (the output port of the bypass) before starting. 2. Replace the faulty module.
Failed to get module number	Emergency	<ul style="list-style-type: none"> There is a problem with the hardware of the machine number acquisition function of the module. 	Replacement of faulty module
Hall Failure	Emergency	<ul style="list-style-type: none"> The parameters of the Hall are set incorrectly. Abnormalities in Hall devices 	<ol style="list-style-type: none"> 1. Reset the correct Hall parameters. 2. Replace the faulty Hall device
Capture board not connected	Minor	<ul style="list-style-type: none"> The acquisition board is not connected The acquisition board detection circuit of the main control board is abnormal 	<ol style="list-style-type: none"> 1. Insert the capture board. 2. Replace the faulty capture board. If replacing the capture board with a new one still reports that the capture board is not plugged in, replace the main control board.
Supercapacitor Low Voltage	Minor	<ul style="list-style-type: none"> Low supercapacitor voltage due to supercapacitor discharge 	Super Capacitor Mode Alert Super Capacitor Low Voltage allows you to see if the mains voltage is back to normal, and if it is, charge it as soon as possible.
Supercapacitor undervoltage	Emergency	<ul style="list-style-type: none"> Prolonged operation in supercapacitor power mode Charger failure 	<ol style="list-style-type: none"> 1. Check if the voltage of super capacitor is normal. 2. Check if the output is overloaded. 3. Check if the single super capacitor is

			<p>damaged, if there is damage it needs to be replaced.</p> <p>4. Check whether there is charger alarm, if there is charger damage need to replace the corresponding fault module.</p>
Bypass fan abnormality	Emergency	<ul style="list-style-type: none"> • Bypass Module Fan Abnormal • Bypass Module Fan Detection Line Abnormal 	Replace the failed bypass module or replace the fan of the failed bypass module.
Bypass not ready	Emergency	<ul style="list-style-type: none"> • Ready switch not closed. • Bypass module powered down. • Bypass not connected or lost. 	<p>1. Reclose the bypass ready switch.</p> <p>2. If the bypass ready switch is still abnormal when re-closed, replace the faulty bypass module.</p> <p>3. If the cabinet bypass module is missing, reinsert the bypass module.</p>
Missing zero line	Minor	<ul style="list-style-type: none"> • wiring error 	<p>1. Check whether the cabinet wiring zero line is loose or not connected, if it is loose, tighten it.</p> <p>2. Check whether the zero line of the power distribution system is normal.</p>

Appendix 1 List of key system components

NO.	Name	Factory owners	quantities
1	Power module	Sinexcel	3、4、5、6
2	Master module	Sinexcel	1
3	Bypass module	Sinexcel	1
4	Monitoring Module	Sinexcel	1
5	AC Lightning Protector	普天中普/雅达电子	1 (2)
6	Miniature Circuit Breaker	良信/Schneider	1 (2)
7	Moulded Case Circuit Breakers	Schneider/ABB/Siemens/常熟 (可定制)	3
8	supercapacitor	今朝时代/江海/日立/重庆中科	8-14
8	Main cabinet and copper row	/	1
9	User Manual	Sinexcel	1

Appendix 2 Revised Record

The revision log accumulates a description of each document update. The latest version of a document contains updates from all previous versions of the document.

Version A00

First published