User Manual

Intelligent modular UPS

(100–600kVA)

Preface

Usage

This manual introduces the main features, performance, working principle of the new generation modular intelligent UPS and provides users with information on installation, use, operation and maintenance.

Users

Technical support engineer
Maintenance engineer

Note

Our company is providing a full range of technical support and service for customers. Users can contact our local office or customer service center for help. This manual will be updated irregularly, due to the product upgrading or some other reasons. Unless otherwise agreed, this manual is only used as usage guideline. All the statements, information and suggestions contained in this manual make no warranty expressed or implied.

Content

1. Safety Precautions

Before handling, installation, operation, maintenance, please read the user manual carefully and follow all the safety precautions in the manual. If neglected, it may cause personal injury or equipment damage, or even death.

Our company will not be liable for any injuries or equipment damage caused by your company or your customers not following the safety precautions in the user manual.

1.1. Safety Message Definition

Danger: Serious human injury or even death may be caused, if this requirement is ignored.

Warning: Human injury or equipment damage may be caused, if this is requirement is ignored.

Attention: Moderate personal injury may be caused, if this requirement is ignored.

Commissioning engineer: The personnel who operating this equipment must undergo professional electrical training and safety knowledge training, and pass the exam, and familiar with the steps and requirements for installation, debugging, operation and maintenance of this equipment, and be able to avoid all kind of emergency situations.

1.2. Warning Label

The warning label indicates the possibility of human injury or equipment damage, and advise the proper step to avoid danger. In this manual, there are three types of warning label as follow:

Labels	Description
 Danger	Serious human injury or even death may be caused, if this requirement is ignored.
 Warning	Human injury or equipment damage may be caused, if this requirement is ignored.
 Attention	Moderate personal injury may be caused, if this requirement is ignored.

1.3. Safety Instruction

 Danger	✧ Performed only by commissioning engineers ✧ This UPS is designed for commercial and industrial applications only, and is not intended for any use in life-support devices or system.
 Warning	✧ Read all the warning labels carefully before operation, follow the instructions.
	✧ When UPS is running, don`t touch the surface with this label, to avoid scald.
	✧ The electronic components in UPS are static sensitive devices, and anti-static measures must be taken during relevant operations.

Move & Installation

 Danger	✧ This equipment cannot be installed near heat sources or similar equipment such as electric heaters. ✧ Use dry powder extinguisher only, liquid extinguisher can result in electric shock.
 Warning	✧ Do not install the UPS on flammable materials and avoid close contact or adhesion of flammable materials by the UPS. ✧ Please connect the brake options (brake resistance, brake unit or feedback unit) according to the wiring diagram. ✧ Do not start the system if any damage or abnormal parts founded. ✧ Do not contact UPS with wet material, hands to avoid electric shock.
 Attention	✧ Use proper facilities to handle and install the UPS. Shielding shoes, protective clothes and other protective facilities are necessary to avoid injury. ✧ During transportation and installation, keep the UPS way from shock or vibration. ✧ Install the UPS in proper environment, more details in section 3.3). ✧ Avoid screws, cables, and other conductive objects from falling into the UPS.

Debug & Operate

 Danger	✧ Make sure the grounding cable is well connected before connecting the power cables, the grounding cable and neutral cable must be in accordance with the local and national codes practice. ✧ Before moving or re-connecting the cables, make sure to cut off all the input power sources, and wait for at least 10 minutes for internal discharge. Use a multi-meter to measure the voltage on terminals and ensure the voltage is lower than 36V before operation
 Attention	✧ Do not disconnect and close the UPS input power frequently. ✧ The earth leakage current of load will be carried by RCCB or RCD. ✧ Initial check and inspection should be performed after long time storing of UPS.

Maintenance & Replacement

 Danger	✧ All the equipment maintenance and servicing procedures involving internal access need special tools and should be carried out only by trained personnel. The components that can only be accessed by opening the protective cover with tools cannot be maintained by user. ✧ This UPS full complies with "IEC62040-1-1-General and safety requirements for use in operator access area UPS". Dangerous voltages are present within the battery box. However, the risk of contact with these high voltages is minimized for non-service personnel. Since the component with dangerous voltage can only be touched by opening the protective cover with a tool, the possibility of touching high voltage component is minimized. No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures in this manual. ✧ Avoid screws, cables, and other conductive objects from falling into the UPS.

 Attention	✧ Please tighten the screws with appropriate torque. ✧ When maintaining and replacing components, UPS and components must be avoided from contacting or accompanying flammable materials. ✧ In the process of maintenance and component replacement, anti-static measures must be taken for UPS and internal devices.

Battery Safety

 Danger	✧ All the battery maintenance and servicing procedures involving internal access need special tools or keys and should be carried out only by trained personnel. ✧ When Connected Together, the battery terminal voltage will exceed 400Vdc and is potentially lethal. ✧ Battery manufacturers supply details of the necessary precautions to be observed when working on, or in the vicinity of, a large bank of battery cells. These precautions should be followed implicitly at all times. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-Figure ting facilities. ✧ The life of the battery shortens with the increase of ambient temperature. Replacing the battery regularly ensures that the UPS is working properly and guarantees sufficient backup time. ✧ Replace the batteries only with the same type and the same number, or it may cause explosion or poor performance. ✧ When connecting the battery, the voltage at the battery end will exceed the dangerous voltage of 400Vdc, in order to avoid electric shock and injury, please observe the following warnings when replacing the battery: ● Eye protection should be worn to prevent injury from electrical arcs; ● Remove the finger ring, watch, necklace, bracelet, any other metal jewelry; ● Use insulated tools; ● Wear protective overalls and rubber gloves; ● Do not place metal tools or similar metal parts on the battery; ● Disconnect the load before removing the battery connection terminal; ● Please do not expose the battery to fire, causing an explosion on one side, endangering personal safety; ● Please do not short-circuit the positive and negative poles of the battery, which will cause electric shock or fire; ● If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.

Disposal

 Warning	✧ The components in the UPS contain heavy metals, and the UPS must be treated as industrial waste after disposal.

Symbol Description

Symbol	Description
 NOTE	Indicates a supplement or emphasis on the main text.

2. Overview

2.1. Product Description

This modular UPS is an online double-conversion UPS that uses digital signal processing (DSP) technology. Provide a stable and uninterrupted power supply for the important load. It can eliminate "power pollution" such as power surge, instantaneous high voltage, low voltage, wire noise and frequency offset on the mains, and provide customers with high-efficiency, high-power density power supply guarantee.

2.2. System Composition

The modular UPS is configured with the following parts: main input, static bypass, maintenance bypass and external battery, the system structure is shown in Figure 2-1:

The system connects multiple power modules in parallel, mainly including AC-DC-AC structure composed of rectifier (REC) and inverter (INV). The bypass static switch consists of a thyristor connected in reverse parallel, and the utility power can be supplied directly to the load through the bypass static switch. The maintenance bypass switch is a circuit breaker, and the maintenance bypass switch can be used to ensure the uninterrupted power supply to the load when repairing the UPS. When the utility power is cut off, the external battery pack will supply power to the load through the inverter.

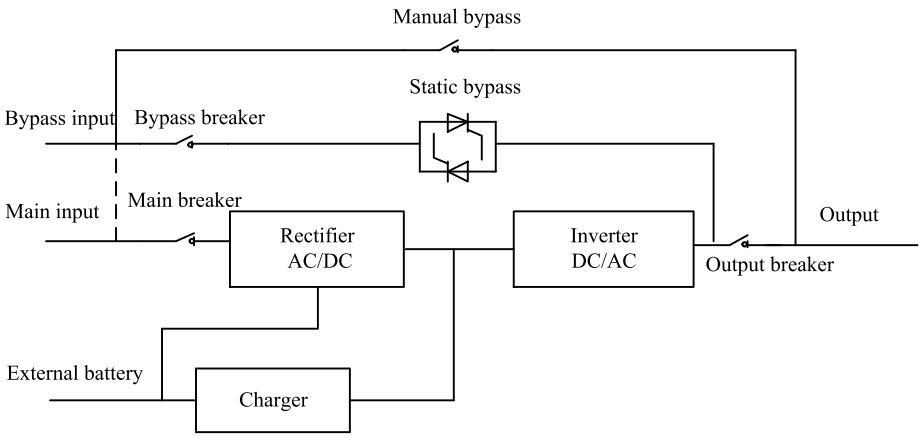


Figure 2-1 UPS system diagram

2.3. UPS Power Module

The power module conceptual diagram is shown as Figure 2-2. The UPS power module mainly consists of rectifier and inverter. Among them, the rectifier changes the AC input to DC, the inverter changes the DC to AC output, and the charger charges the external battery.

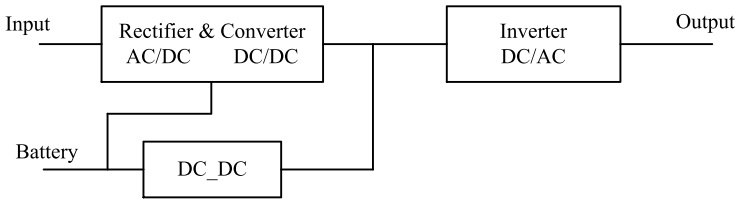


Figure 2-2 Power module diagram

2.4. Operating Mode

UPS system adopts online double-conversion design, according to different working conditions, can work in different working modes, including normal mode, battery mode, bypass mode, maintenance bypass mode, ECO mode, auto-restart mode and frequency converter mode.

2.4.1. Normal mode

In normal mode, UPS change AC input into DC voltage (AC/DC) through the rectifier, DC voltage boost to bus (BUS) voltage. When the system is connected to the external battery, part of the AC input is charging the battery through the charger, the other part is changed to AC output (DC/AC) through the inverter to provide high-quality AC power for the load. The normal mode working principle is shown in Figure 2-3:

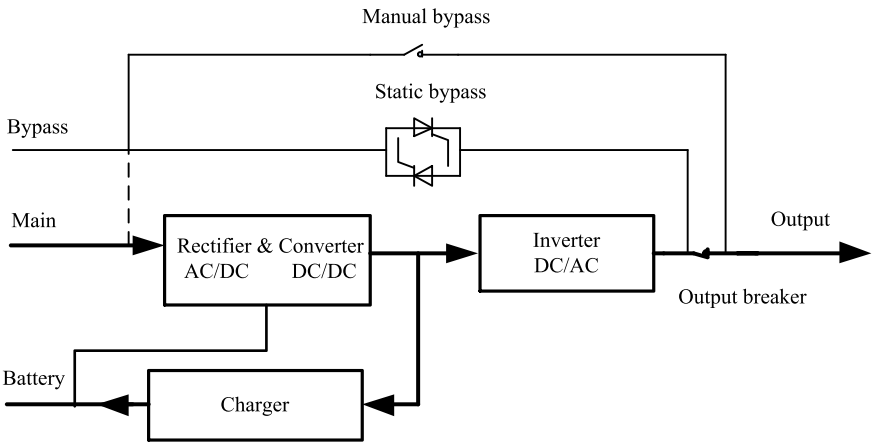


Figure 2-3 UPS conceptual diagram in normal mode

NOTE

The dark lines indicate the route involved in this mode of operation, and the arrows indicate the direction of energy flow, the same below.

2.4.2. Battery Mode

The operating mode in which the battery supplies AC power to the load through the inverter is called "battery mode". There is no interruption to the critical load upon AC main input power failure; UPS will automatically switch to "battery mode". After restoration of main input, UPS will switch to "Normal Mode", the diagram of "battery mode" is shown in Figure 2-4:

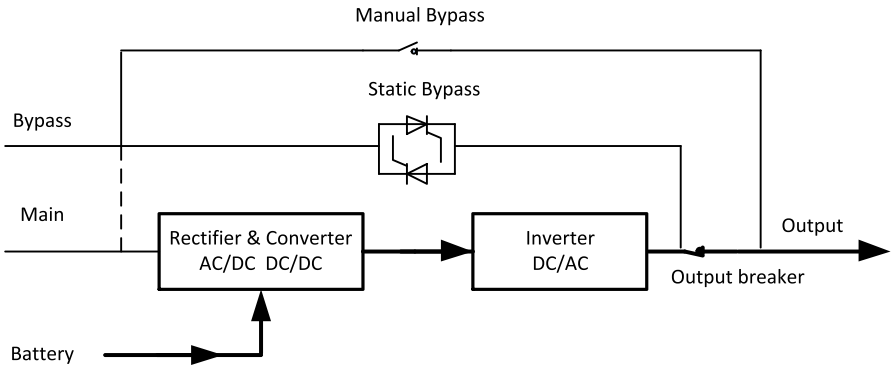


Figure 2-4 UPS conceptual diagram in Battery mode

NOTE

With the function of Battery cold start, the UPS may start without utility (The battery has been charged). Therefore, the battery power supply can be used independently to expand the usage range of the system, more details can be found in section 5.1.2.

2.4.3. Bypass mode

After the system is powered on, if the inverter is not started or manually turned off, the load will be supplied by bypass. In normal mode, if the UPS monitoring unit detects that the power module over temperature, overload, or other failures may cause the inverter to shut down, the UPS automatically switches to bypass mode and the mains supply power directly to the load through bypass static switch. In bypass mode, load power supply quality is not protected by the UPS and may be affected by power failure, abnormal voltage waveform or frequency. As Figure 2-5 shows:

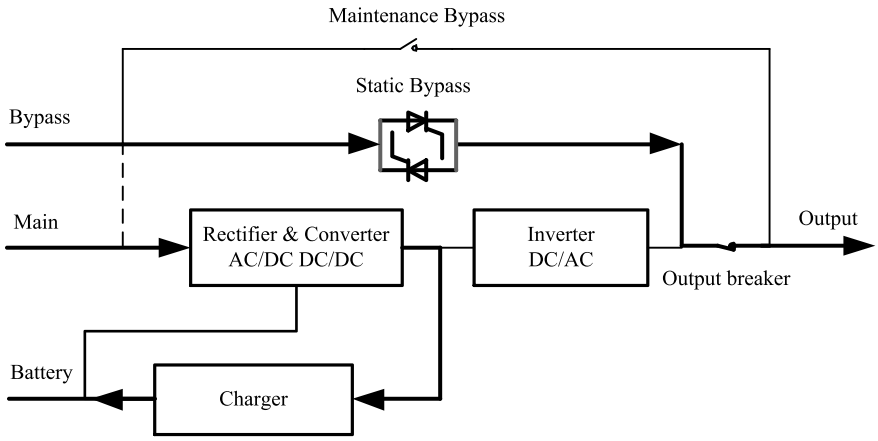


Figure 2-5 UPS conceptual diagram in Bypass mode

2.4.4. Maintenance Bypass Mode

When the UPS system and batteries are repaired, you should transfer to bypass first. Then manually close the maintenance bypass breaker, and then open the input, output breaker, open the bypass breaker, and turn off the external battery circuit breaker in the end. The load is directly supplied by the mains through the maintenance bypass, so as to realize the maintenance of the system without power failure to the load. As Figure 2-6 shows:

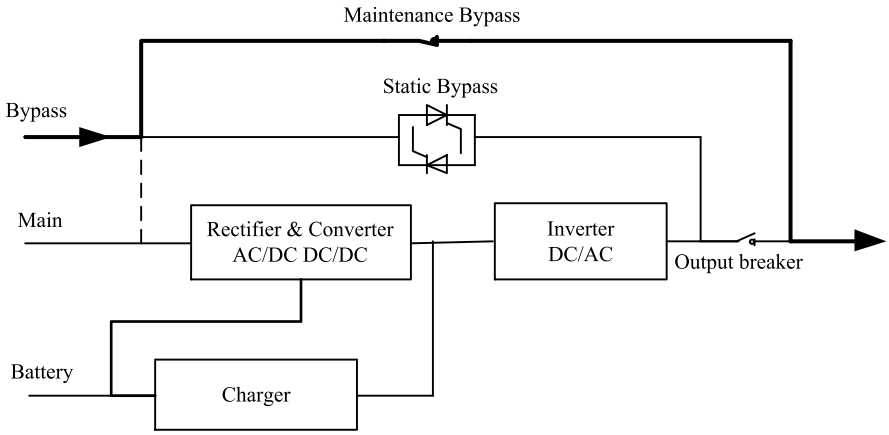


Figure 2-6 UPS conceptual diagram in Maintenance Mode

Danger

During Maintenance mode, hazardous voltages are present on the terminal of input, output and neutral, even with all the power, bypass module and LCD turned off.

2.4.5. ECO Mode

ECO mode is an UPS energy-saving mode which can be set through the LCD or background software. In ECO mode, when the bypass input voltage is within the ECO range, the load is powered by utility through bypass static switch, the rectifier and inverter are standby. When the bypass input voltage is beyond the ECO range, the UPS will transfer from to normal mode. In ECO mode, the system can achieve higher efficiency. As Figure 2-7 shows:

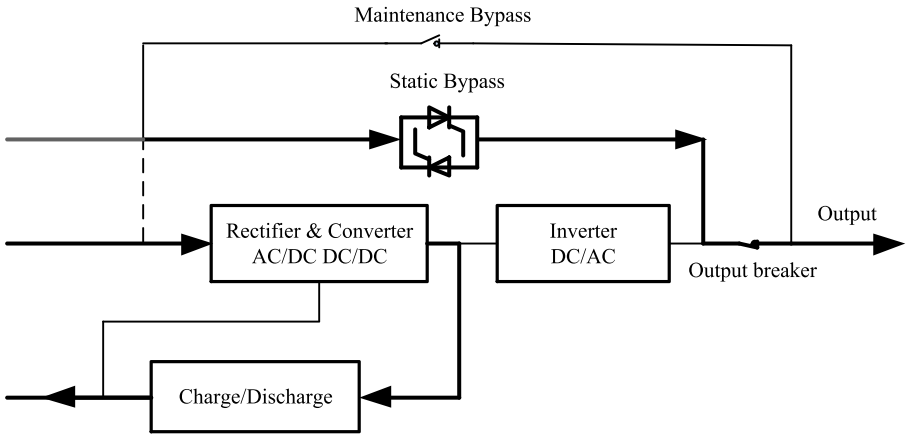


Figure 2-7 UPS conceptual diagram in ECO Mode

2.4.6. Auto-restart Mode

The UPS supports Auto-restart function, after a long time of AC mains failure, the inverter shuts down when the battery reaches the End of Discharge Voltage (EOD). The UPS will restart after

the mains recover. This function can be set by trained and qualified professionals.

2.4.7. Frequency Converter Mode

By setting the UPS to Frequency Converter mode, the UPS could provide a stable output frequency (50 or 60Hz). Input frequency range is 40Hz~70Hz. In this mode, bypass is not available; The battery is optional based on whether it is required to operate in battery mode.

2.5. UPS Structure

2.5.1. UPS Configuration

The UPS configuration is provided in Table 2-1.

Table 2-1 UPS Configuration

Item	Components	Quantity（pcs）	Remark
600kVA Cabinet	Switch	4	Main Input, Bypass, Output, Maintenance
	Monitoring & Bypass module	1	Standard configuration
100kVA Power module	Power module	1~6	/

2.5.2. UPS Structure

The UPS structure (front view) is shown in Figure 2-8.

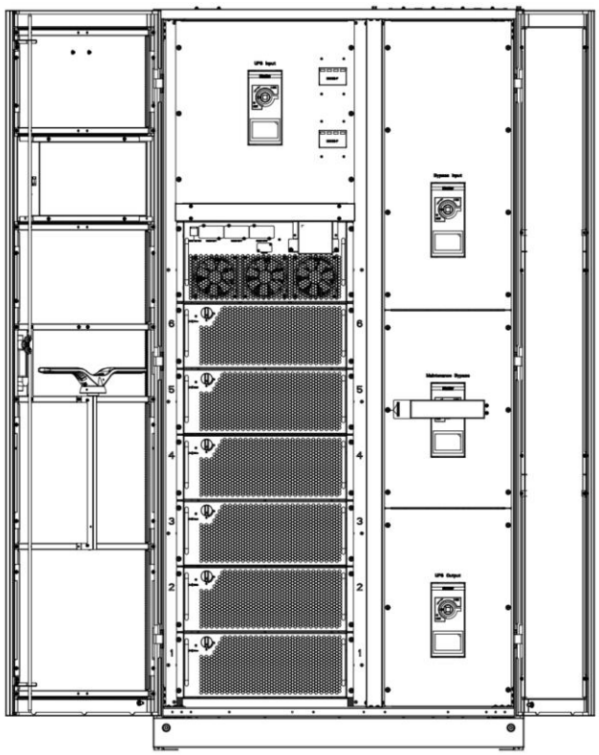


Figure 2-8 UPS Cabinet front view

The UPS structure (back view) is shown in Figure 9.

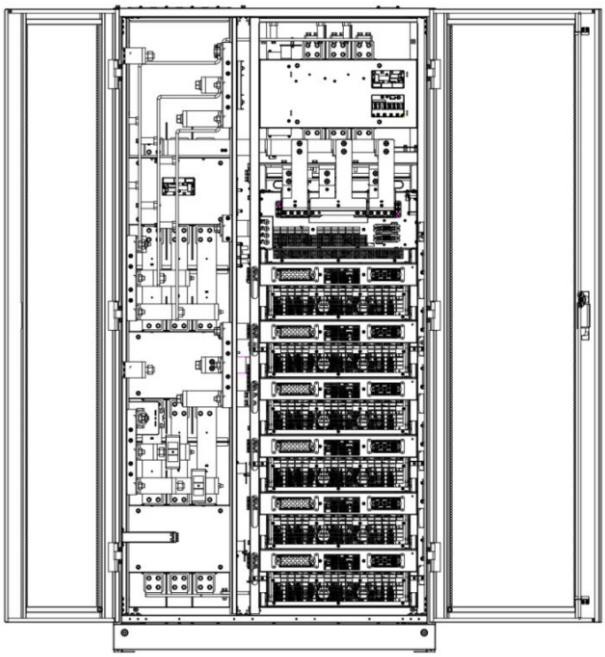


Figure 2-9 UPS Cabinet back view

3. Installation

3.1. Location

3.1.1. Installation Environment

- The UPS is intended for indoor installation and uses forced convection cooling by internal fans. Please make sure there is enough space for the UPS ventilation and cooling.
- Keep the UPS far away from water, heat and inflammable and explosive, corrosive material. Avoid installing the UPS in the environment with direct sunlight, dust, volatile gases, corrosive material and high salinity.
- Avoid installing the UPS in the environment with conductive dirt.
- The operating environment temperature for battery is 22±2℃. Operating above 30℃ will reduce the battery life, and operation below 20℃ will reduce the battery capacity.
- The battery will generate a little amount of hydrogen and oxygen at the end of charging; ensure the fresh air volume of the battery installation environment must meet EN50272-2001 requirements.
- If external batteries are to be used, the battery circuit breakers (or fuses) must be mounted as close as possible to the batteries, and the connecting cables should be as short as possible.

3.1.2. Site Selection

- Ensure the ground can bear the weight of the UPS cabinet, batteries and battery rack.
- No vibration and less than 5 degree inclination horizontally.
    - If don't have to install UPS right away, the equipment should be stored in a room so as to protect it against excessive humidity and heat sources. The battery needs to be stored in dry and cool place with good ventilation. The most suitable storage temperature is 20 ºC to 25 ºC. Battery storage time is generally not more than 3 months, more than this time need to recharge.

3.1.3. Weight and Dimension

Ensure that the power distribution room has sufficient space for the UPS system. The dimensions of the UPS cabinet are shown in Figure 3-1.

Attention

Ensure there is at least 0.8m before the front of the cabinet so as to easily maintain the power module with the front door fully open and at least 0.5m behind for ventilation and cooling, as Figure 3-2 shows.

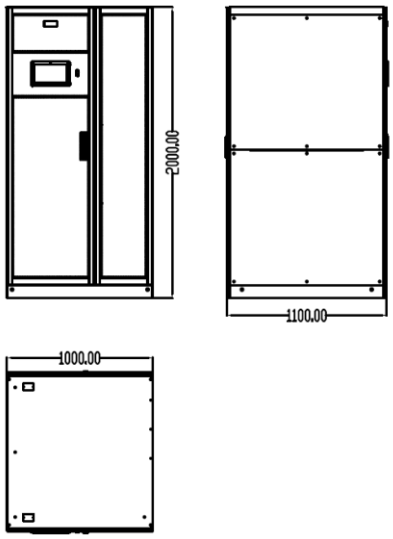


Figure 3-1 Dimensions of Cabinet (unit: mm)

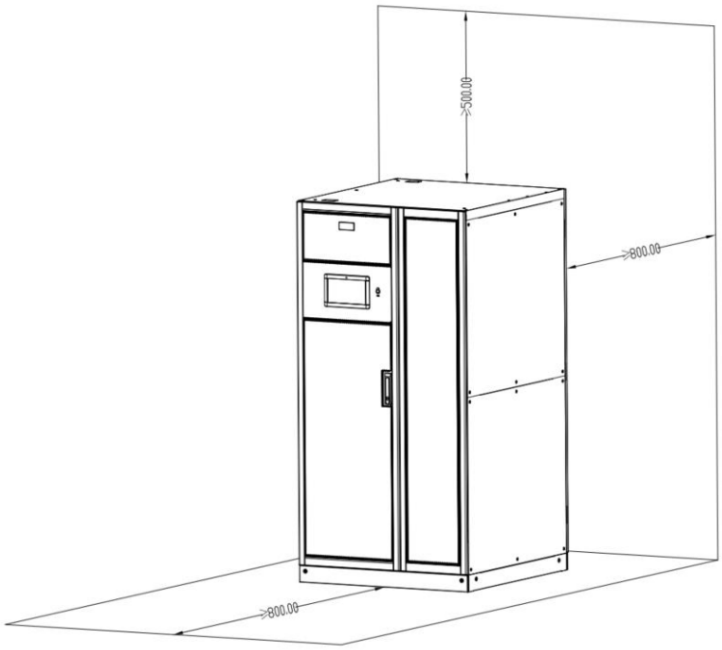


Figure 3-2 Reserved Cabinet Space (unit: mm)

Ensure that the floor or installation support can bear the weight of the UPS, batteries, and battery racks. The weight of batteries and battery racks depends on the site requirements. The weight for the UPS cabinet is shown in Table 3-1.

Table 3-1 Weight of the UPS

Item	Weight
600kVA Cabinet (Not include bypass and power module)	350 kg
600kVA Monitoring & Bypass module	50 kg
100kVA Power module	53.5 kg

3.2. Unloading and Unpacking

3.2.1. Moving and Unpacking of the Cabinet

The steps to move and unpack the cabinet are as follows:

Step 1: Check if any damages to the packing. (If any, contact to the carrier);

Step 2: Transport the equipment to the designated site by forklift, as shown in Figure 3-3;

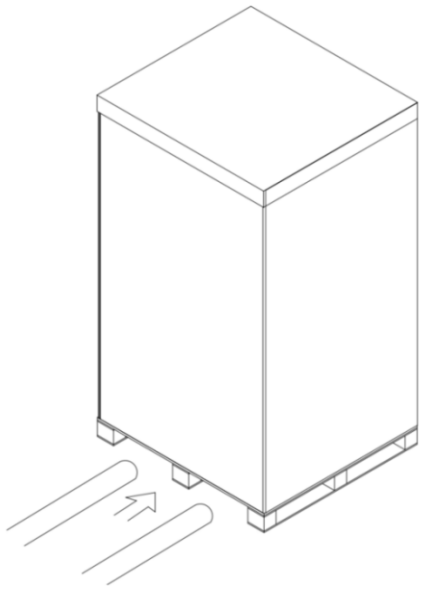


Figure 3-3 Transport to the designated site

Step 3: Remove the top cover, tear off the Velcro, and remove the carton fence as Figure 3-4:

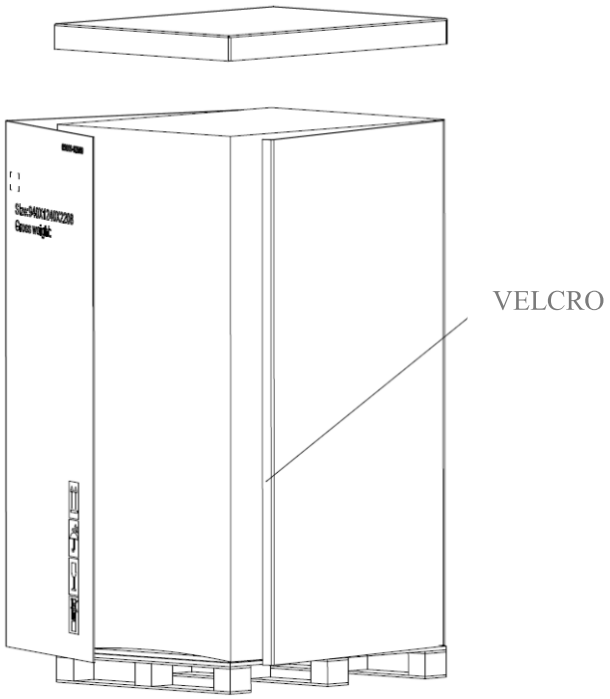


Figure 3-4 Disassemble the box

Step 4: Remove the protective foam around the cabinet as Figure 3-5;

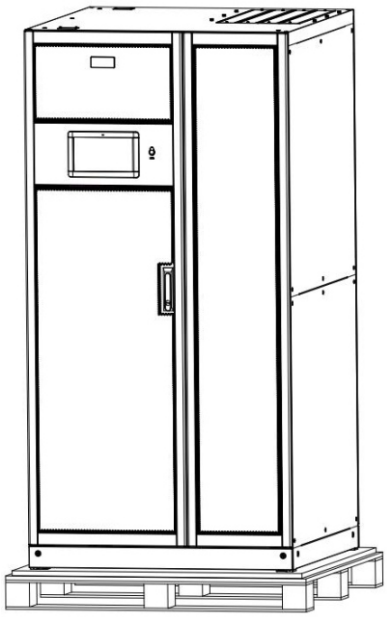


Figure 3-5 Remove the protective foam

Step 5: Check the UPS

1) Visually examine if there are damages to UPS during transportation. If any, contact to the carrier.

2) Check the UPS with the list of the goods. Check if the models of the accompanying accessories are complete and correct. If any items are not included in the list, should have recorded the scene in time, contact to our company or the local office.

Step 6: Dismantle the bolt that connects the cabinet and wooden pallet after disassembly;

Step 7: Move the cabinet to the installation position.

Attention

Be careful while removing to avoid scratching the equipment.

The waste materials of unpacking should be disposed as the demand for environment protection.

3.3. Positioning

3.3.1. Positioning Cabinet

The weight of the UPS cabinet is supported by its four wheels at the bottom. The support method is generally used to support the cabinet for a long time after it is fixed in position. As Figure 3-6 shows.

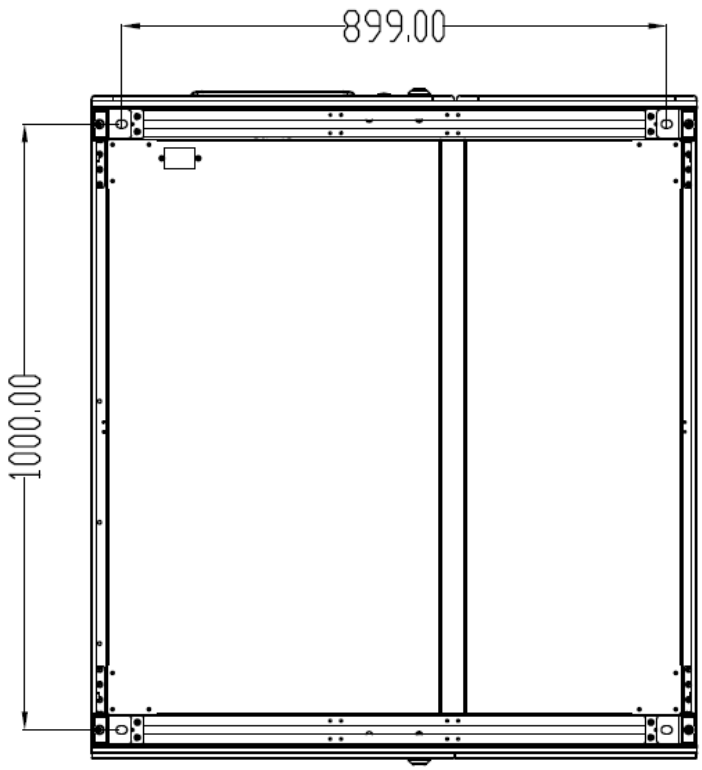


Figure 3-6 Supporting structure (Bottom view)

The steps to position the cabinet is as follows:

1) Ensure the supporting structure is in good condition and the mounting floor is smooth and strong;
2) Push the cabinet to the installation point by forklift, at this point, the cabinet is supported by the foundation;
3) Ensure the four anchor bolts are in the same height and the cabinet is fixed and immovable;
4) Positioning done.

Attention

Auxiliary equipment is needed when the mounting floor is not solid enough to support the cabinet, which helps distribute the weight over a larger area. For instance, cover the floor with iron plate or increase the supporting area of the anchor bolts.

3.3.2. Use Seismic fixed device to fix cabinet

The Seismic fixed device is optional part. After the factory installation is completed, the shipment is delivered. The installation method of the 600kVA cabinet is taken as an example by using the seismic fix device to fix the cabinet.

Figure 3-7 shows a cabinet with seismic fix device.

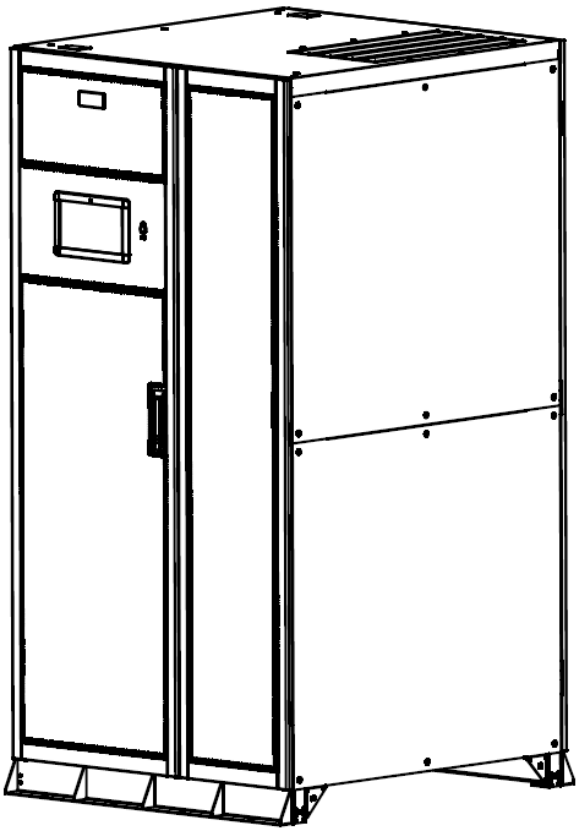


Figure 3-7 Cabinet with seismic fixed device

Ground Installation

1) Ensure that the installation ground is smooth.

2) Determine the installation position of the cabinet, and draw installation holes on the installation surface according to the seismic fixed device and equipment size diagram. The seismic fixed device and equipment dimension diagram is shown in Figure 3-8:

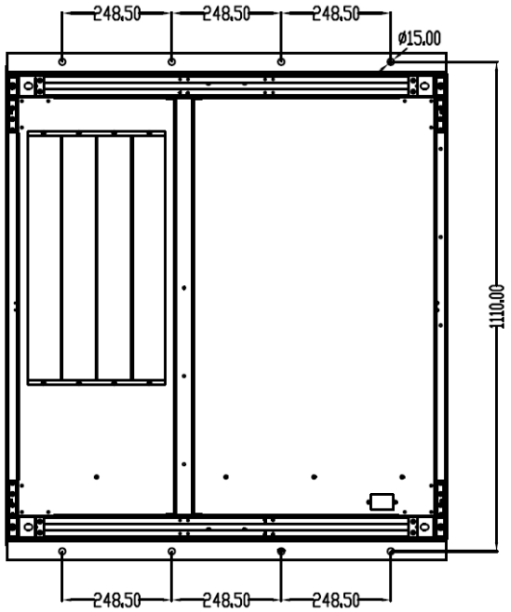


Figure 3-8 Dimensional drawings of seismic fixed device

3) Drill holes on the installation holes of the expansion bolts on the left and right sides of the cabinet using an impact drill, and then tap the expansion pipes of 12*M12 expansion bolts into the installation holes.

4) Push the cabinet to the installation ground and fix the cabinet to the installation ground using the screws of the M12 expansion bolts.

Attention

The expansion pipe of the expansion bolt should be tapped to be flush with the installation surface, and the expansion pipe should not be higher than the installation surface.

Channel steel installation

1) According to the seismic components and equipment dimension diagram, install the channel steel, it is recommended that the width of the channel steel should be more than 50mm, and the channel steel surface should be flush with the ground, and should not be tilted. Determine the bolt mounting holes on the channel steel.
2) Use an impact drill to drill holes on the installation hole of the channel steel, with a hole diameter of M14.
3) Use a top crane to transport the cabinet to the installation location.
4) Fix the cabinet to the installation hole of the channel steel with 12*M12x45 hexagonal bolts and tighten the bolts with nuts.

3.4. Battery

Three terminals (positive, neutral, negative) are drawn from the battery unit and connected to UPS system. The neutral line is drawn from the middle of the batteries in series, as shown in Figure 3-9.

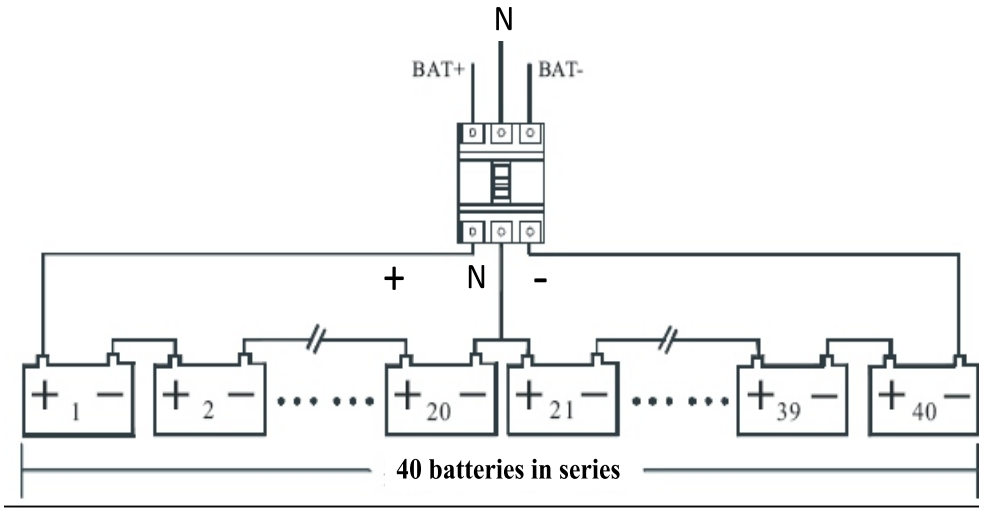


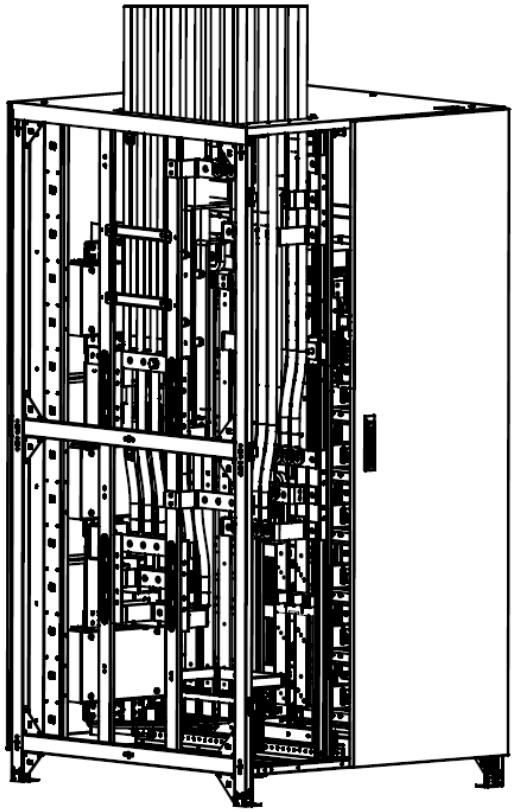
Figure 3-9 Battery string wiring diagram

Danger

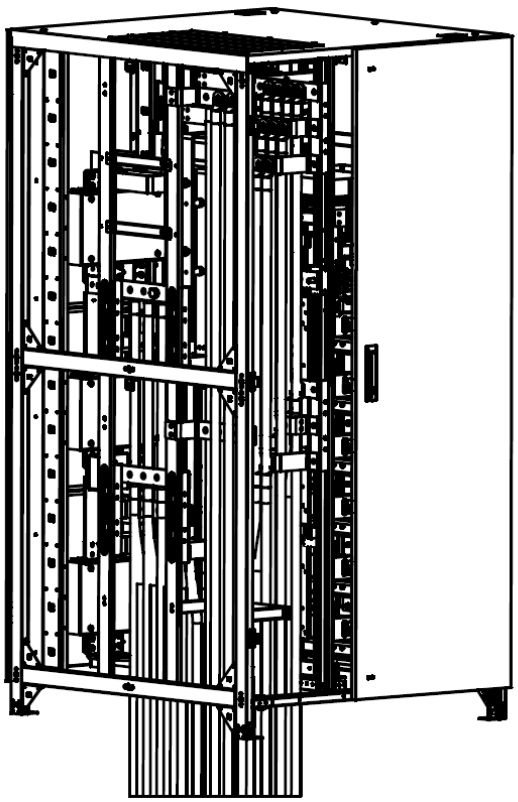
The battery terminal has hazardous voltage, please follow the safety instructions to avoid electric shock hazard. Ensure the positive, negative, neutral electrode is correctly connected from the battery unit terminals to the external switch of battery strings and from the external switch to the UPS system.

3.5. Cable Entry

The cabinet can support enters from both top and bottom sides. The cable entry is shown in Figure 3-10.



(a) Top entry



(b) Bottom entry

Figure 3-10 Cable Entry

3.6. Power Cables

3.6.1. Specifications

The selection of power cable should meet the Table 3B in IEC60950-1, and select suitable cable in combination with practical engineering applications, UPS working current shows in Table 3-2.

Table 3-2 UPS working current

Contents		600kVA Cabinet
Main Input	Main Input Current(A)	1200
Main Output	Main Output Current(A)	910
Bypass Input	Bypass Input Current(A)	910
Battery Input	Battery Input Current(A)	1300

NOTE

The recommended cable for power cables in Table 3-2 are only for situations described below:

- Ambient temperature: 30℃.
- AC loss less than 3%, DC loss less than 1%. The length of the AC power cable is no longer than 30 m and the length of the DC power cable is no longer than 40 m.
- When external conditions change, 90 ℃ copper conductor flexible cables need to be verified by referring to IEC60364-5-52 and local relevant specifications. The current values in the table are for data with a rated line voltage of 380V. For a rated voltage of 400V, the current value needs to be multiplied by 0.95; for rated voltage of 415V, the current value needs to be multiplied by 0.92.
- The size of neutral lines should be 1.5~1.7 times the value listed above when the predominant load is non-linear.

3.6.2. Specifications for Power Cables Terminal

Specifications for power cables connector are listed as Table 3-3.

Table 3-3 Requirements for power module terminal

Cabinet	Port	Connection	Bolt	Torque Moment
600kVA cabinet	Main Input	Cables crimped OT terminal	M16	96Nm
	Bypass Input	Cables crimped OT terminal	M16	96Nm
	Battery Input	Cables crimped OT terminal	M16	96Nm
	Output	Cables crimped OT terminal	M16	96Nm
	PE	Cables crimped OT terminal	M16	96Nm

3.6.3. External Circuit Breaker

The UPS system needs to be configured with external distribution circuit breakers, including main input circuit breakers, bypass input circuit breakers (configured for dual input), output circuit breakers, maintenance bypass circuit breakers, and battery output circuit breakers, the circuit breakers (CB) for the system are recommended in Table 3-4.

Table 3-4 Recommended CB

Installed Position	Recommended CB
Main Input front-end	1250A/3P
Bypass Input front-end	1250A/3P
Output back-end	1250A/3P
Maintenance Bypass	1250A/3P
Battery Output back-end	1600A/3P

Attention

The CB with RCD (Residual Current Device) is not suggested for the system.

3.6.4. Connecting Power Cables

The steps of connecting power cables are as follows:

Step 1: Verify that all the switches of the UPS are completely open, and the UPS power is all shut down. Attach necessary warning signs to these switches to prevent unauthorized operation;

Step 2: Open the back door of the cabinet, remove the plastic cover. The input and output terminal, battery terminal and protective earth terminal are shown in Figure 3-11;

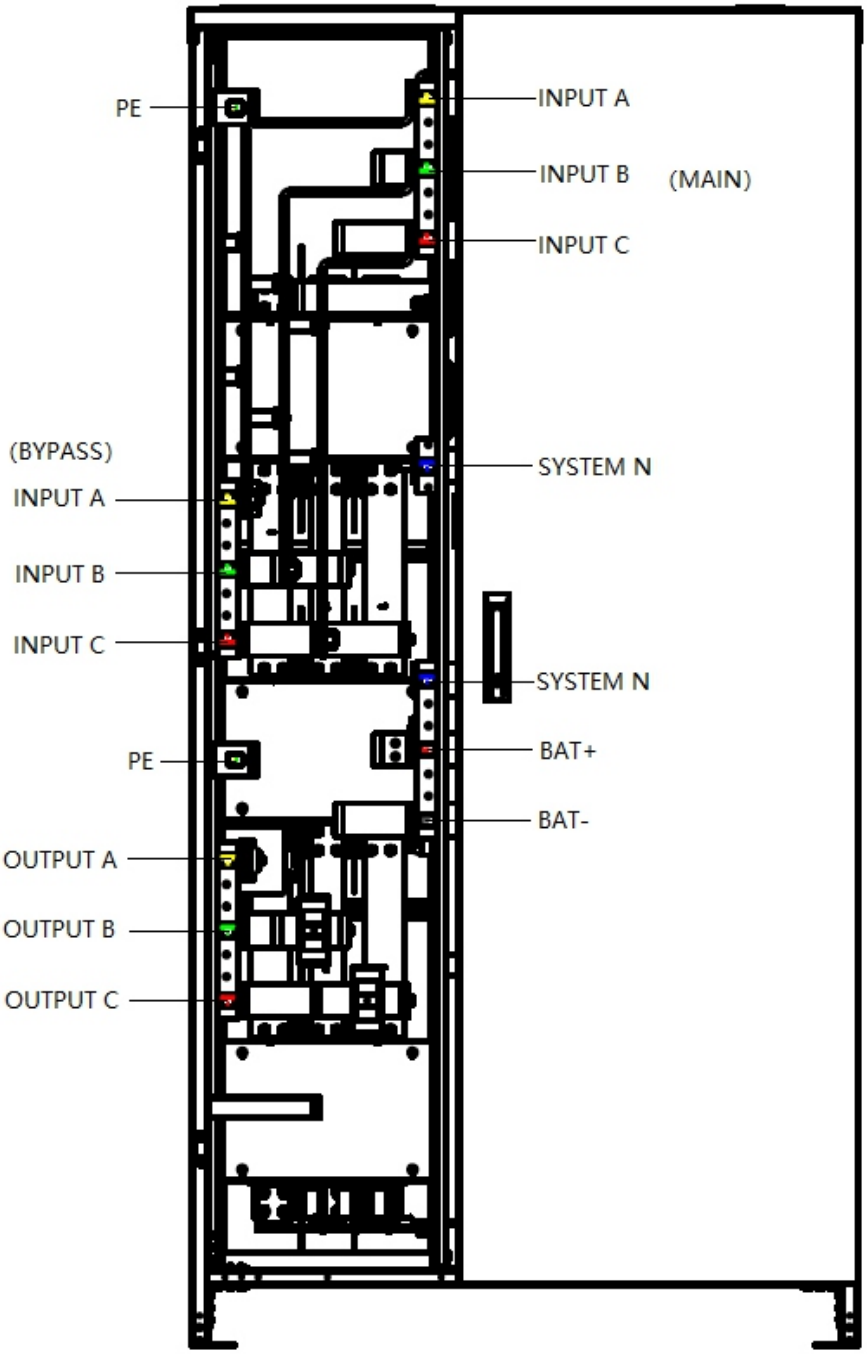


Figure 3-11 Connections terminals

Step 3: Connect the input ground wire to the input ground terminal. Note that the ground wire connection must comply with local and national regulations;

Step 4: Connect the main input wire to the input terminal (Main Input); Connect the output wire to the output terminal (Output) as figure 3-11;

Step 5: Connect the battery cables to the Battery terminal (Battery);

Step 6: Check to make sure there is no mistake and re-install all the protective covers.

Warning

- When connecting power cables, it is necessary to follow the torque given in Table 3-3 to ensure the tightness of the wiring terminals and avoid safety hazards.
- Before wiring the UPS, ensure that you know the position and status of the switch connecting the UPS input to the mains power distribution. Ensure that the switch is off and attaches warning labels to prevent others from operating the switch.

3.7. Control and Communication Cables

The front panel of the bypass module provides dry contact interface (EPO, NTC, IP, OP) and communication interface (CAN, RS485, Intelligent slot and USB Port), as shown in Figure 3-12.

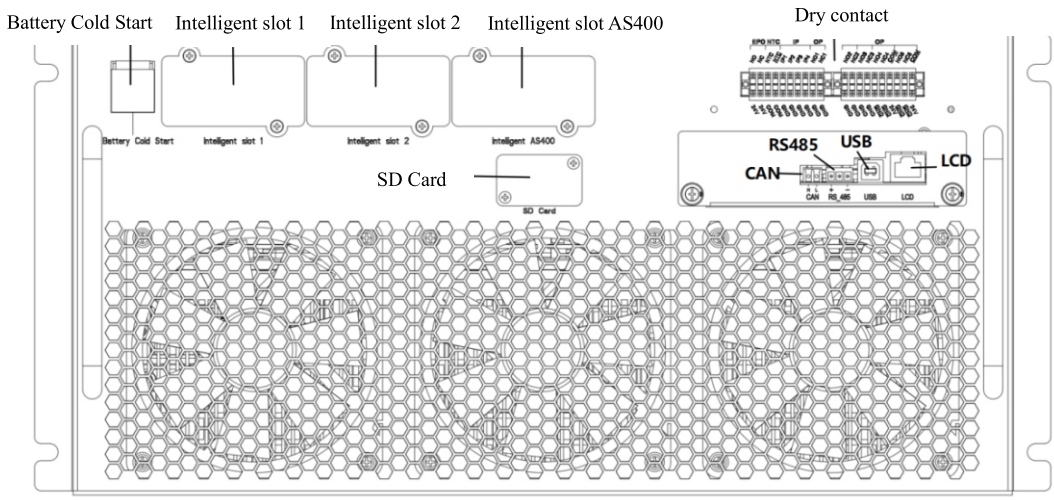


Figure 3-12 Communication interface

3.7.1. Dry Contact Interface

Dry contact interface includes EPO, NTC, IP, OP, as shown in Figure 3-13, the interface function can be set by software, the function of the dry contact are shown in Table 3-5:

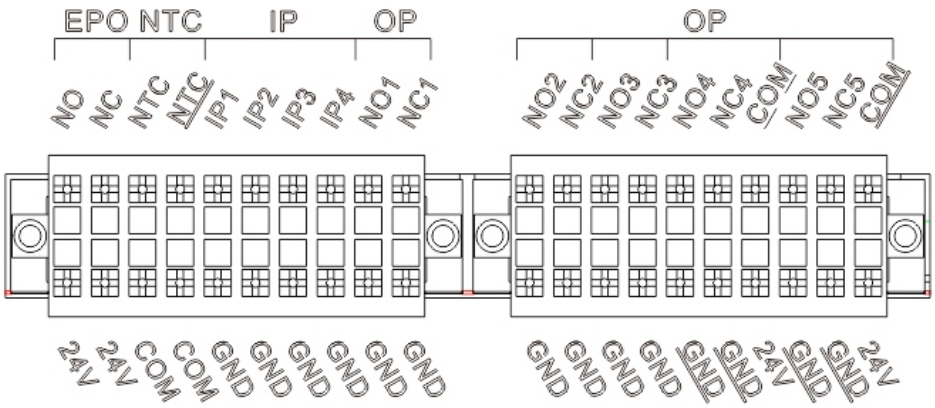


Figure 3-13 Dry Contact Interface
Table 3-5 Functions of the port

Port	Name	Function
NTC-NTC	TEMP_BAT	Detection of battery temperature
NTC-NTC	TEMP_ENV	Detection of environmental temperature

NTC-COM	TEMP_COM	Detection of Common terminal temperature
EPO-NC	REMOTE_EPO_NC	Trigger EPO when disconnect with EPO-24V
EPO-24V	+24V_DRY	+24V power
EPO-NO	REMOTE_EPO_NO	Trigger EPO when shorted with EPO-24V
IP-IP1	GEN_CONNECTED	Internal Input dry contact , function is settable Default: interface for generator
IP-IP2	BCB Status	Internal Input dry contact, function is settable Default: BCB Status (Alert no battery when BCB Status is invalid)
IP-IP3	BCB Online	Internal Input dry contact, function is settable Default: BCB Online (Alert no battery when BCB Status is invalid)
IP-IP4	Silence	Internal Input dry contact, function is settable Default: Mute the alarm
IP-GND	GND_DRY	Ground for +24V
OP-NO1	BCB Drive_NO	Internal Output dry contact, (Normally open) function is settable Default: Battery CB trip signal(Valid under EOD or EPO)
OP-NC1	BCB Drive_NC	Internal Output dry contact, (Normally close) function is settable Default: Battery CB trip signal (Valid under EOD or EPO)
OP-NO2	BAT_LOW_ALARM_NO	Internal Output dry contact, (Normally open) function is settable Default: Battery low alarming
OP-NC2	BAT_LOW_ALARM_NC	Internal Output dry contact (Normally closed), function is settable Default: Low battery alarming
OP-NO3	GENERAL_ALARM_NO	Internal Output dry contact, (Normally open) function is settable Default: General alarming
OP-NC3	GENERAL_ALARM_NC	Internal Output dry contact, (Normally closed) function is settable Default: General alarming
OP-NO4	UTILITY_FAIL_NO	Internal Output dry contact, (Normally open) function is settable Default: Utility abnormal alarming
OP-NC4	UTILITY_FAIL_NC	Internal Output dry contact, (Normally closed) function is settable Default: Utility abnormal alarming
OP-NO5	Overload_NO	Internal Output dry contact, (Normally open) function is settable Default: overload alarming
OP-NC5	Overload_NC	Internal Output dry contact, (Normally close) function is settable Default: overload alarming
OP-GND	GND	Internal Output dry contact GND

OP-24V	OP4_24V	+24V
OP-GND	GND	OP-5 Internal Output dry contact GND
OP-GND	GND	OP-4 Dry contact GND
OP-VCC	VCC	OP-5, optional connected to external power supply or internal 24V
OP-COM	COM	OP-5 COM port, optional external VCC and internal power supply 24V
OP-COM	COM	OP-4 COM port, optional external VCC and internal power supply 24V

NOTE

The function of each port can be set by the monitor software.

The default functions of each port are described as follows:

Battery Warning Output Dry Contact Interface

The input dry contact NTC can detect the temperature of batteries and environment respectively, which can be used in environment monitoring and battery temperature compensation. Interfaces diagram for NTC are shown in Figure 3-14, the description of interface is in Table 3-6.

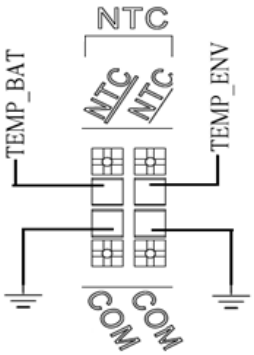


Figure 3-14 NTC for temperature detecting

Table 3-6 Description of input dry contact J2 and J3

Port	Name	Function
NTC-NTC	TEMP_BAT	Detection of battery temperature
NTC-NTC	TEMP_ENV	Detection of environment temperature
NTC-COM	ENV_TEMP	Temperature detection common port

NOTE

Specified temperature sensor is required for temperature detection (R25=5Kohm, B25/50=3275), please confirm with the manufacturer, or contact the local maintenance engineers when placing an order.

Remote EPO Input Port

For normal operation, the EPO_NC needs to be shorted to +24V, disconnect the EPO_NC from +24V when the EPO needs to be triggered. The port diagram is shown in Figure 3-15 and port

description is shown in Table 3-7.

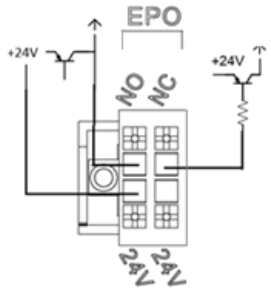


Figure 3-15 Diagram of input port for remote EPO

Table 3-7 Description of input port for remote EPO

Port	Name	Function
EPO-NC	REMOTE_EPO_NC	Trigger EPO when disconnect with +24V
EPO-24V	+24V_DRY	+24V
EPO-NO	REMOTE_EPO_NO	Trigger EPO when shorted with +24V

When UPS system in normal operation, port EPO-NC to EPO-24V should be shorted circuit, and EPO-NO to EPO-24V should be open. If port EPO-NC to EPO-24V is opening or EPO-NO to EPO-24V is shorted circuit, the ups will trigger an emergency shutdown.

Generator Input Dry Contact

The default function of IP-IP1 is the interface for generator connecting. If IP1 is connected with IP1-GND, it indicates that the generator has been connected with the system. The interface diagram is shown in Figure 3-16, and interface description is shown in Table 3-8.

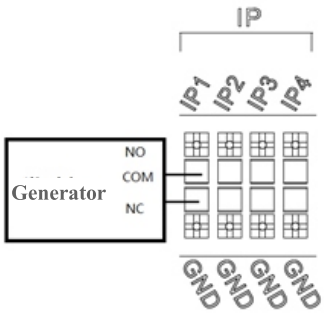


Figure 3-16 Diagram of status interface and connection of generator

Table 3-8 Description of status interface and connection of generator

Port	Name	Function
IP-IP1	GEN_CONNECTED	Connection status of generator
IP-GND	GND_DRY	Ground for +24V power

NOTE

IP-IP2, IP-IP3, IP-IP4 for the connection diagram of the input dry contact, see IP-IP1.

Battery Warning Output Dry Contact Interface

The default function of OP-1 is the output dry contact interface, default as the battery CB trip signal (under EOD or EPO). An auxiliary dry contact signal will be activated via the isolation of a relay to trip the CB. The interface diagram is shown in Figure 3-17, and description is shown in Table 3-9.

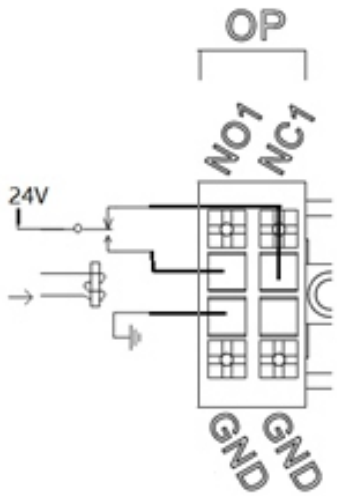


Figure 3-17 Battery warning dry contact interface diagram

Table 3-9 Battery warning dry contact interface description

Port	Name	Function
OP-NC1	BCB Drive_NC	Battery voltage warning relay (normally closed) will be open during warning
OP-NO1	BCB Drive_NO	Battery voltage warning relay (normally open) will be closed during warning
OP-GND	GND	Internal output dry contact GND

NOTE

OP-2, OP-3 for the connection diagram of the output dry contact, see OP-1.

Utility Fail Warning Output Dry Contact Interface

The default function of OP-4 is the output dry contact interface for utility failure warning, when the utility fails, the system will send a utility failure warning information, and provide an auxiliary dry contact signal via the isolated relay. The interface diagram is shown in Figure 3-18, and description is shown in Table 3-10.

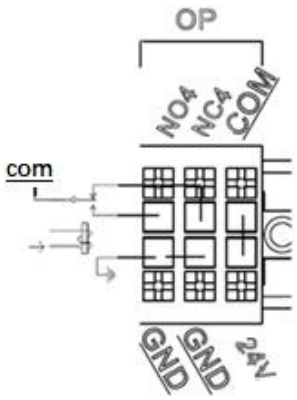


Figure 3-18 Utility failure warning dry contact interface diagram

Table 3-10 Utility failure warning dry contact interface description

Port	Name	Function
OP-NC4	UTILITY_FAIL_NC	Mains failure warning relay(normally closed) will be open during warning
OP-NO4	UTILITY_FAIL_NO	Mains failure warning relay (normally open) will be closed during warning
OP-GND	EXT_GND	Output common port, can be shorted with OP-COM
OP-COM	GND	The common terminal of OP-NC4 and OP-NO4 can be connected to an internal 24V power supply (OP-24V), an external 24V power supply, or an external common terminal (OP-GND)

Overload Alarm Input Dry Contact Interface

The default function of OP-5 is the output dry contact interface for overload alarm, when the ups is overload, the system will send an overload alarming information, and provide an auxiliary dry contact signal via the isolated relay. The interface diagram is shown in Figure 3-19 and description is shown in Table 3-11.

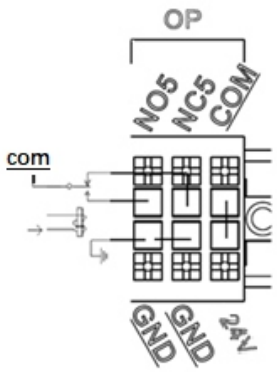


Figure 3-19 Overload Alarm Input Dry Contact Interface Diagram

Table 3-11 Overload Alarm Input Dry Contact Interface description

Port	Name	Function
OP-NC5	Overload_NC	Overload Alarm relay (normally closed) will be open during warning
OP-NO5	Overload_NO	Overload Alarm relay (normally open) will be close during warning
OP-GND	EXT_GND	External common terminal, can be short circuited with OP-COM
OP-COM	GND	The common terminal of OP-NC5 and OP-NO5, can be connected with internal 24V (OP-24V) or external 24V, also can be connected with external common terminal (OP-GND).

3.7.2. Communication Interface

CAN, RS485 and USB port: Provide serial data which can be used for commissioning and maintenance by authorized engineers or can be used for networking or integrated monitoring system in the service room.

SNMP Card: Used on site installation for communication (optional).

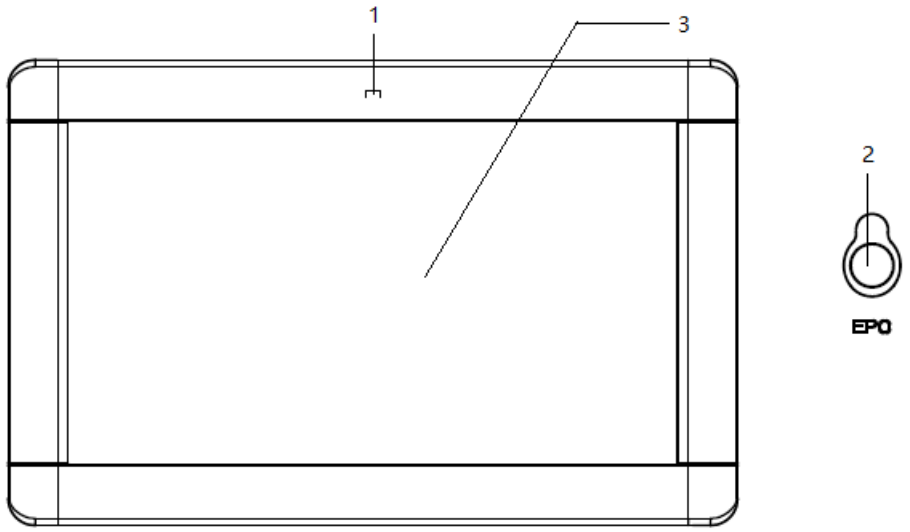
AS400 Card: Dry contact extension interface (optional).

Expand RS485 Card: For communication with BMS (optional).

4. Control and Display Panel

4.1. Cabinet Display panel

The panel is located on the front door. According to the function, it can be divided into two parts: control button and LCD display area; The structure is shown as Figure 4-1.



1: Screen power indicator light 2: EPO switch 3: LCD touch screen

Figure 4-1 Control and display panel

4.1.1. Audible Alarm Indication

There are two different types of audible alarm during UPS operation, as shown in Table 4-1.

Table 4-1 Description of audible alarm

Alarm	Description
Two short alarm with a long one	When system has general alarm (for example: AC fault)
Continuous alarm	When system has serious faults (for example: EOD or hardware failure)

4.1.2. Control operation key

Table 4-2 Functions of Control and operation keys

Function Key	Description
EPO	Long press, cut off the load power, shut down the rectifier, inverter, static bypass and battery

4.1.3. LCD touch Screen

After the monitoring system starts self-test, the system enters the home page, following the welcome window. Then 3s later, it will enter the home page. The home page is shown in Figure 4-2.

:

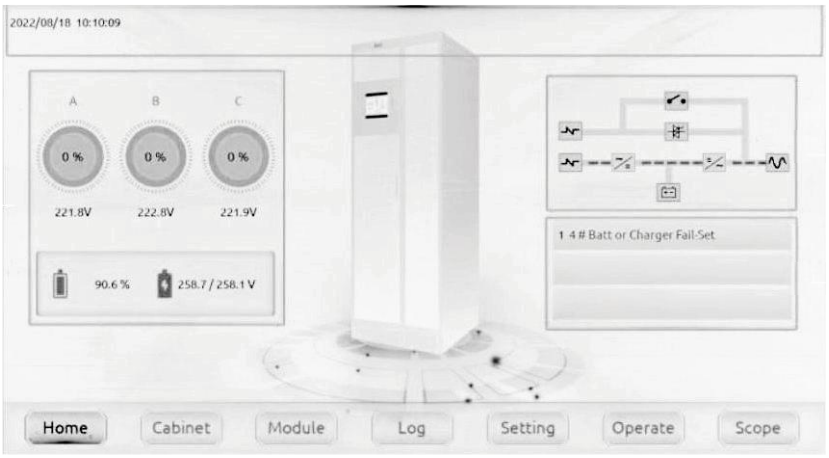


Figure 4-2 Home page

The homepage mainly includes status information, information display, operation status, alarm display, and main menu.

- **Status bar**

  The Status bar contains the model of the product; Parallel operational mode and the number of the power module, the time of the system and user account login.

- **Information display**

  Users can check the information of the cabinet in this area.

  The bypass voltage, main input voltage, battery voltage, and output voltages are presented in the form of gauge.

  The loads are displayed in the form of bar chart in percentage. The green area stands for a load of less than 60%, yellow area for a load of 60%-100% and red area for a load of more than 100%.

- **Running status**

  The visualized image displays the status of each part of the UPS system, green indicates that the power module is running normally, white indicates that it is not started, red indicates that the function of the part is missing (such as battery red, indicating that the battery is not connected to the system), green energy flow indicates that the module has energy output.

- **Warning Information**

  Display the warning information of the cabinet.

- **Main menu**

  The main menu displays UPS status information, fault alarm information, and related settings.

  It mainly includes six menus: Cabinet, Power module, Setting, Log, Operate and Scope. The structure of the main menu tree is shown in Figure 4-3.

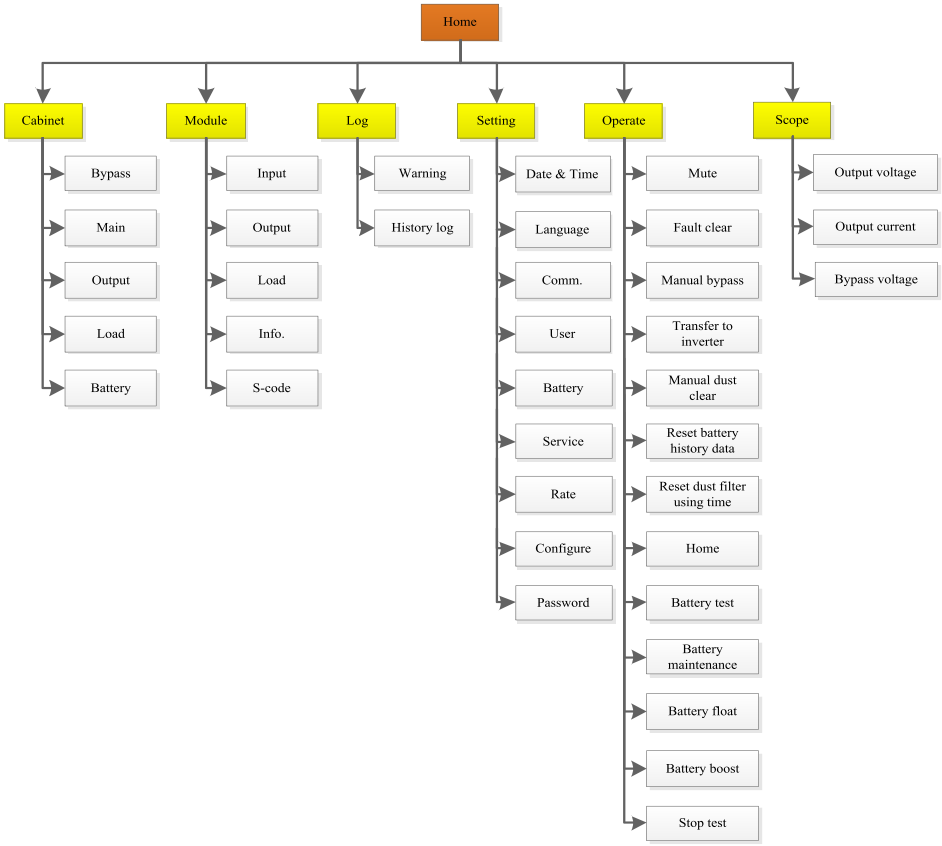


Figure 4-3 Structure of menu tree

4.2. Main Menu

The main menu mainly includes six menus: Cabinet, Power module, Setting, Log, Operate and Scope.

4.2.1. Cabinet Submenu

After entering the home page, touch the icon Cabinet (At the bottom left of the screen) and the system enters the page of the Cabinet, as shown in Figure 4-4:

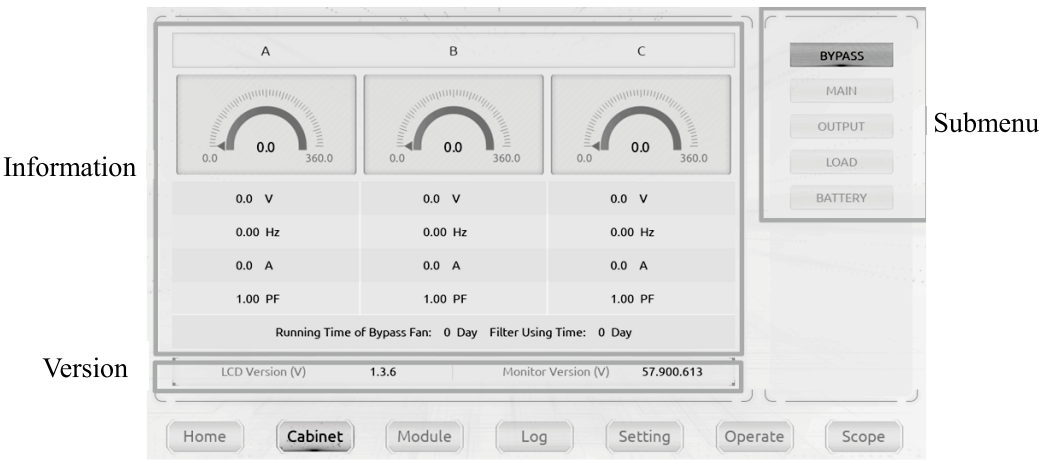


Figure 4-4 Cabinet Submenu

The Cabinet comprises sectors of title, information display, version running status, information of submenu. The sectors are described as follows.

- **Title**

  Indicate that the bypass of the cabinet is selected.

- **Version Information**

  The software version of LCD screen.

- **Information display**

  Visually display the voltage of each phase through a dynamic dial plate.

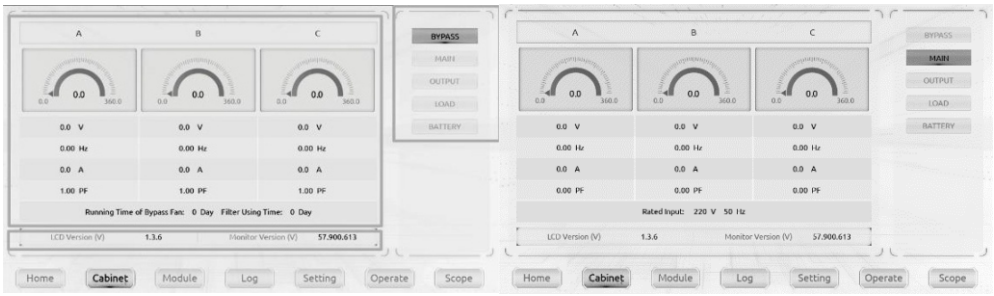
  It is mainly used to display the voltage (V), current (A), frequency (Hz), and power factor (PF) of the bypass three-phase.

  The running time displays the total running time of the bypass fan and the usage time of the dust screen.

- **Submenu**

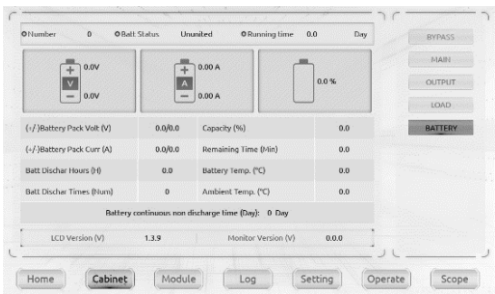
  It mainly includes submenu such as bypass, mains, output, load, battery, etc.

  Click on the submenu icon to enter the corresponding interface, as shown in Figure 4-5.



(a) Bypass (b) Main

(c) Output (d) Load



(e) Battery

Figure 4-5 Submenu interface of Cabinet

The submenu of Cabinet is described in details below in Table 4-3.

Table 4-3 Description of each submenu of Cabinet

Submenu	Items	Meaning
Bypass	V	Phase voltage
	Hz	Bypass frequency
	A	Phase current
	PF	Power factor
Main	V	Phase voltage
	Hz	Input frequency
	A	Phase current
	PF	Power factor
Output	V	Phase voltage
	Hz	Output frequency
	A	Phase current
	PF	Power factor
Load	%	Load (The percentage of the UPS load)
	kW	Pout: Active Power
	kVA	Sout: Apparent Power
	kVAR	Qout: Reactive power
Battery	Number	Battery number
	Battery status	Battery connection status
	Battery Running T (Day)	Battery running time (Day)
	V	Battery positive / negative Voltage
	A	Battery positive / negative Current
	Battery discharging time (H)	Battery discharging time (H)
	Num	Battery discharge number (Num)
	Capacity (%)	The percentage compared with new battery capacity
	Remain T (Min)	Remaining battery backup time
	Battery (℃)	Battery Temp
	Ambient (℃)	Environmental Temp
	Battery Continuous non discharge T (Day)	Continuous non discharge time of the battery (Day)

4.2.2. Power module

Touch the icon 

(At the bottom left of the screen), and the system enters the page of the Power unit, as is shown in Figure 4-6.

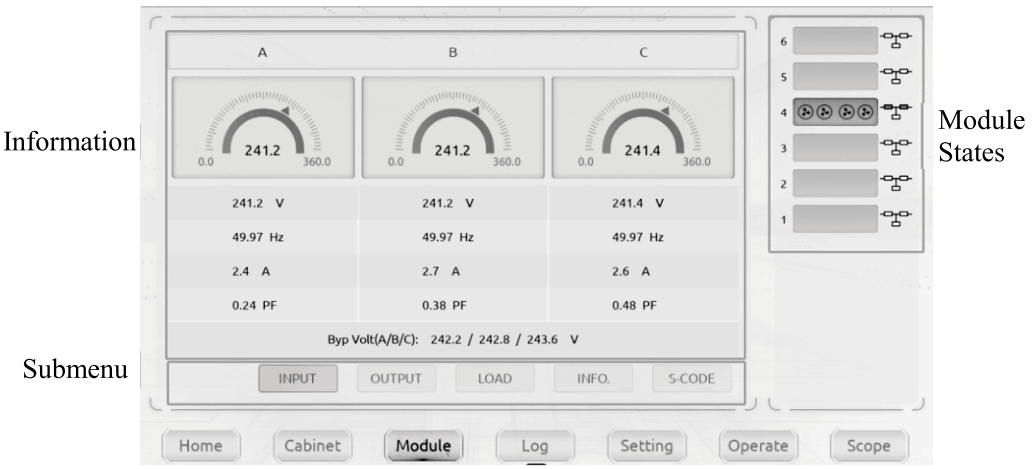


Figure 4-6 Power module

The module comprises sectors of information display, power module status.

- **Information display**

Display the corresponding information of the selected power module, mainly including voltage, frequency, current, and power factor.

- **Power module information**

(1) Power module numbers, numbered 1-6 from bottom to top;

(2) Whether the power module is inserted and selected;

After the module is inserted and the communication connection is normal, the module icon will be displayed on the corresponding ID number;

After the module is selected, the colour of the module changes dark;

(3) Power module operating status as follows:

(a) The green square indicating the power module working normally

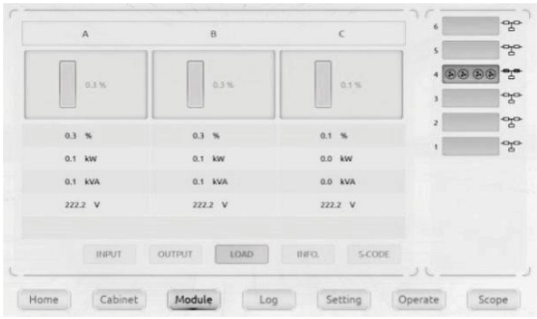
(b) The black indicating power module in invalid

(c) The red indicating the absence of the power module or in fault

- **Submenu**

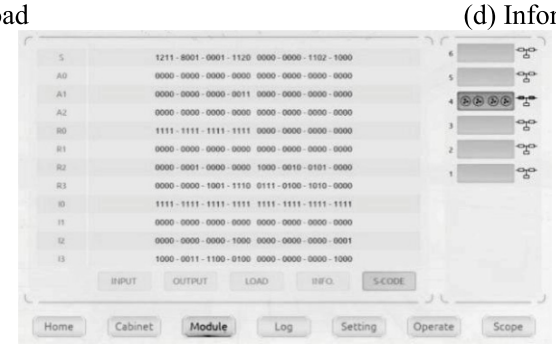
The submenu includes Input, Output, Load, INFO and S-CODE. Each interface of the submenu is shown in Figure 4-7:

(a) Input (b) Output



(c) Load

(d) Information



(e) S-code

Figure 4-7 Module menu

The submenus of Power module are described below in details in Table 4-4.

Table 4-4 Description of each submenu of Power module

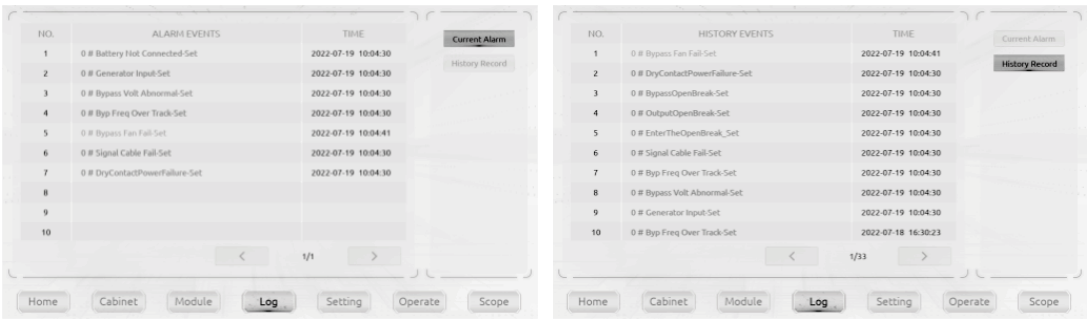
Submenu	Items	Meaning
Input	V	Phase voltage of selected module
	Hz	Frequency of selected module
	A	Phase current of selected module
	PF	Power factor of selected module
Output	V	Output phase voltage of selected module
	Hz	Output frequency of selected module
	A	Output phase current of selected module
	PF	Output power factor of selected module
Load	%	Load (The percentage of the power module selected)
	KW	Pout: Active Power
	KVA	Sout: Apparent Power
	V	Load voltage of selected module
Information	(+/-) BATT (V)	Battery Voltage (Positive & Negative)
	(+/-) BATT (A)	Battery Current (Positive & Negative)
	(+/-) BUS (V)	Bus Voltage (Positive & Negative)
	(+/-) Charger (V)	Charger Voltage(Positive & Negative)
	Fan Time	Total Fan's Running time of the selected power module
	Capacitance Time	Total Capacitance's Running time of the selected power module
	Inlet Temperature (℃)	Inlet Temperature of the selected power module
	Outlet Temperature (℃)	Outlet Temperature of the selected power module
	REC (V)	The module rectifier software version
	INV (V)	The module inverter software version

Submenu	Items	Meaning
S-code	Fault Code	For the maintenance personnel

4.2.3. Log

Touch the icon 

(At the bottom of the screen), and the system enters the interface of the Log, as shown in Figure 4-8. The log page mainly includes the display of current warning information and historical records. The submenu of log is described in details below in Table 4-8.



(a) Current alarm (b) Historical event

Figure 4-8 Log menu

The follow Table 4-5 gives the complete list of all the UPS events displayed by history record window and current record window.

Table 4-5 UPS Event List

UPS events	Description
Load On UPS	Inverter feeds load
Load On Bypass	Bypass feeds load
No Load	No load
Battery Boost	Charger is working in boost charging mode
Battery Float	Charger is working in float charging mode
Battery Discharge	Battery is discharging
Battery Connected	Battery is connected already
Battery Not Connected	Battery is not yet connected.
Maintenance CB Closed	Manual maintenance breaker is closed
Maintenance CB Open	Manual maintenance breaker is opened
EPO(Set)	Emergency Power Off
EPO(Disappear)	None Emergency Power Off
Module On Less (Set)	Inverter output module capacity is less than the load capacity.
Module On Less (Disappear)	Inverter output module capacity is more than the load capacity.
Generator Input (Set)	External generator is connected
Generator Input (Disappear)	Disconnect the external generator after it is connected
Utility Abnormal (Set)	Utility (Grid) is abnormal.
Utility Abnormal (Disappear)	Utility recover normal
Bypass Sequence Error (Set)	Bypass voltage Sequence is reverse
Bypass Sequence Error (Disappear)	Bypass voltage Sequence recover normally
Bypass Volt Abnormal (Set)	Bypass voltage is abnormal

UPS events	Description
Bypass Volt Abnormal (Disappear)	Bypass voltage is abnormal recover normally
Bypass Module Fail	Bypass module fails.
Bypass Module Fail	Bypass module recover normally
Bypass Module Over Load (Set)	Bypass current is over the limitation.
Bypass Module Over Load (Disappear)	Bypass current recover normally
Bypass Over Load Tout (Set)	The bypass overload status continues and the overload times out.
Bypass Over Load Tout (Disappear)	The bypass overload status continues and the overload times out off
Byp Freq Over Track (Set)	Bypass frequency is out of tracking range
Byp Freq Over Track (Disappear)	Bypass frequency recovery tracking range
Exceed Tx Times Lmt (Set)	The number of transfer between bypass and inverter exceeds five in the last hour
Exceed Tx Times Lmt (Disappear)	Clear transfer times
Output Short Circuit (Set)	Output shorted Circuit
Output Short Circuit (Disappear)	Output shorted Circuit disappear
Battery EOD (Set)	The battery voltage reaches the battery EOD
Battery EOD (Disappear)	The battery voltage is restored above the battery EOD
Battery Test	System transfer to battery mode
Load On UPS	Inverter feeds load
Load On Bypass	Bypass feeds load
No Load	No load
Battery Boost	Charger is working in boost charging mode
Battery Float	Charger is working in float charging mode
Battery Discharge	Battery is discharging
Battery Connected	Battery is connected already
Battery Not Connected	Battery is not yet connected
Maintenance CB Closed	Manual maintenance breaker is closed
Maintenance CB Open	Manual maintenance breaker is opened
EPO(Set)	Emergency Power Off
EPO(Disappear)	None Emergency Power Off
Module On Less (Set)	Inverter output module capacity is less than the load capacity
Module On Less (Disappear)	Inverter output module capacity is more than the load capacity
Generator Input (Set)	External generator is connected
Generator Input (Disappear)	Disconnect the external generator after it is connected
Utility Abnormal (Set)	Utility (Grid) is abnormal
Utility Abnormal (Disappear)	Utility recover normal
Bypass Sequence Error (Set)	Bypass voltage Sequence is reverse
Bypass Sequence Error (Disappear)	Bypass voltage Sequence recover normally
Bypass Volt Abnormal (Set)	Bypass voltage is abnormal
Bypass Volt Abnormal (Disappear)	Bypass voltage is abnormal recover normally
Bypass Module Fail	Bypass module fails

UPS events	Description
Bypass Module Fail	Bypass module recover normally
Bypass Module Over Load (Set)	Bypass current is over the limitation
Bypass Module Over Load (Disappear)	Bypass current recover normally
Bypass Over Load Tout (Set)	The bypass overload status continues and the overload times out
Bypass Over Load Tout (Disappear)	The bypass overload status continues and the overload times out off
Byp Freq Over Track (Set)	Bypass frequency is out of tracking range
Byp Freq Over Track (Disappear)	Bypass frequency recovery tracking range
Exceed Tx Times Lmt (Set)	The number of transfer between bypass and inverter exceeds five in the last hour
Exceed Tx Times Lmt (Disappear)	Clear transfer times
Output Short Circuit (Set)	Output shorted Circuit
Output Short Circuit (Disappear)	Output shorted Circuit disappear
Battery EOD (Set)	The battery voltage reaches the battery EOD
Battery EOD (Disappear)	The battery voltage is restored above the battery EOD
Battery Test	System transfer to battery mode
Battery Test OK	Battery Test OK
Manual battery Test Fail (Set)	The system detects that the battery is faulty
Battery Maintenance	The system is in battery maintenance status
Battery Maintenance OK	Battery maintenance succeed
Battery Maintenance Failed	Battery maintenance failed
Stop Test	Battery test or battery maintenance status terminate
Fault Clear	Clear the reported failure
History clear	Delete all history records
N#Module Inserted	The N# Power Module is inserted in system
N#Module Exit	The N# Power Module is pulled out from system
N#Rectifier Fail (Set)	The N# Power Module Rectifier Fail
N#Rectifier Fail (Disappear)	The N# Power Module Rectifier Fail removed
N#Inverter Fail (Set)	The N# Power Module Inverter Fail
N#Inverter Fail (Disappear)	The N# Power Module Inverter Fail removed
N#Rectifier Over Temp (Set)	The N# Power Module Rectifier Over Temperature
N#Rectifier Over Temp (Disappear)	The N# Power Module Rectifier Over Temperature Disappear
N#Fan Fail (Set)	The N# at least one fan fails, failed connection or blocked rotation
N#Fan Fail (Disappear)	The N# Fans recover normally
N#Output Over Load (Set)	The N# Power Module Output Over Load
N#Output Over Load (Disappear)	The N# Power Module Output Recover
N#Inverter Overload Tout (Set)	The N# Power Module Inverter Over Load Timeout
N#Inverter Overload Tout (Disappear)	The N# Power Module Inverter Over Load Timeout
N#Inverter Over Temp (Set)	The N# Power Module Inverter Over Temperature
N#Inverter Over Temp (Disappear)	The N#Power Module Inverter Over Temperature Disappear
On UPS Inhibited (Set)	Inhibit system transfer from bypass to inverter
On UPS Inhibited (Disappear)	Inhibit system transfer from bypass to inverter

UPS events	Description
	Disappear
Manual Transfer Byp	Transfer to bypass manually
Esc Manual Bypass	Escape from "transfer to bypass manually" command
Battery Volt Low (Set)	Battery Voltage is Low
Battery Volt Low (Disappear)	Battery Voltage recover normal
Battery Reverse (Set)	Battery cables are connected not correctly
Battery Reverse (Disappear)	Battery cables are connected correctly
N#Inverter Protect (Set)	The N#Power Module Inverter Protect
N#Inverter Protect (Disappear)	The N# Power Module Inverter Protect removed
Input Neutral Lost	The mains neutral wire is lost or not detected
Bypass Fan Fail (Set)	At least one of bypass module Fans Fails
Bypass Fan Fail (Disappear)	Bypass module Fans Fails removed
N#Manual Shutdown	The N# Power Module is manually shutdown
Manual Boost Charge	Manually force the Charger work in boost charge mode
Manual Float Charge	Manually force the charger work in float charge mode
UPS Locked	Forbidden to shutdown UPS power module manually
Parallel Cable Error (Set)	Parallel cables error
Parallel Cable Error(Disappear)	Parallel cables error disappear
Cumulative time of This Time	Cumulative time of this time
N#Battery Or Charger Malfunction (Set)	The N#Power module battery or charger malfunction
N#Battery Or Charger Malfunction (Disappear)	The N#Power module battery or charger malfunction removed
Lost N+X Redundant (Set)	Cabinet lost N+X Redundant
Lost N+X Redundant (Disappear)	Cabinet recover N+X Redundant
EOD Sys Inhibited (Set)	
EOD Sys Inhibited (Disappear)	
Signal Wire Connection Malfunction (Set)	Signal wire connection malfunction
Signal Wire Connection Malfunction (Disappear)	Signal wire connection malfunction removed
Ambient Over Temp (Set)	Battery ambient temperature is over the limit of UPS
Ambient Over Temp (Disappear)	Battery ambient temperature recover normal
REC CAN Fail (Set)	Rectifier CAN bus communication is abnormal
REC CAN Fail (Disappear)	Rectifier CAN bus communication recover normal
INV IO CAN Fail (Set)	IO signal communication of inverter CAN bus is abnormal
INV IO CAN Fail (Disappear)	IO signal communication of inverter CAN bus recover normal
INV DATA CAN Fail (Set)	DATA communication of inverter CAN bus is abnormal
INV DATA CAN Fail (Disappear)	DATA communication of inverter CAN bus recover normal

UPS events	Description
N#Power Share Fail (Set)	The difference of the N# power modules' output current in system is over limitation
N#Power Share Fail (Disappear)	The difference of the N# power modules' output current in system recover normal
N#Sync Pulse Fail (Set)	The N# Synchronization signal between modules is abnormal
N#Sync Pulse Fail (Disappear)	The N# Synchronization signal between modules recover normal
N#Input Volt Detect Fail (Set)	Input voltage of N# power module is abnormal
N#Input Volt Detect Fail (Disappear)	Input voltage of N# power module recover normal
N#Battery Volt Detect Fail (Set)	The N# Power module detect that battery voltage is abnormal
N#Battery Volt Detect Fail (Disappear)	The N#Power module detect that battery voltage recover normal
N#Output Volt Detect Fail (Set)	The N#Power module output voltage is abnormal
N#Output Volt Detect Fail (Disappear)	The N#Power module output voltage recover normal
N#Byp Volt Detect Fail (Set)	The N#Power module detect that bypass voltage is abnormal
N#Byp Volt Detect Fail (Disappear)	The N#Power module detect that bypass voltage recover normal
N#INV Bridge Fail (Set)	The N# Power module inverter is failure
N#INV Bridge Fail (Disappear)	The N#Power module inverter failure removed
N#Outlet Temp Error (Set)	Outlet temperature of N# power module is over the limitation
N#Outlet Temp Error (Disappear)	Outlet temperature of N# power module recover normal
N#Input Curr Unbalance (Set)	The three-phase input current of the N# power module is different
N#Input Curr Unbalance (Disappear)	The three-phase input current of the N# power module recover normal
N#DC Bus Over Volt (Set)	The N# Power module Voltage of DC bus capacitors is over limitation
N#DC Bus Over Volt (Disappear)	The N#Power module Voltage of DC bus capacitors recover normal
N#REC Soft Start Fail (Set)	The N#Power module rectifier can't start
N#REC Soft Start Fail (Disappear)	The N#Power module rectifier recover normal
N#Relay Connect Fail (Set)	The N# Power module inverter relay can't close
N#Relay Connect Fail (Disappear)	The N#Power module inverter relay is closed
N#Relay Short Circuit (Set)	The N#Power module Inverter relays are shorted
N#Relay Short Circuit (Disappear)	The N#Power module Inverter relays don't shorted
N#PWM Sync Fail (Set)	The N#Power module rectifier and inverter PWM synchronizing signal is abnormal
N#PWM Sync Fail (Disappear)	The N#Power module rectifier and inverter PWM synchronizing signal recover normal
N#Intelligent Sleep (Set)	The N#Power module works in intelligent sleep mode

UPS events	Description
N#Intelligent Sleep (Disappear)	The N#Power module exits intelligent sleep mode
Manual Transfer to INV	The N#Manually transfer UPS to inverter
N#Input Over Curr Tout (Set)	The N# Power module Input over current timeout
N#Input Over Curr Tout (Disappear)	The N# Power module Input over current timeout disappear
N#No Inlet Temp. Sensor (Set)	The N#Power module Inlet temperature sensor is not connected correctly or open
N#No Inlet Temp. Sensor (Disappear)	The N#Power module Inlet temperature sensor recover normal
N#No Outlet Temp. Sensor (Set)	The N#Power module outlet temperature sensor is not connected correctly or open
N#No Outlet Temp. Sensor (Disappear)	The N#Power module outlet temperature sensor recover normal
N#Inlet Over Temp (Set)	The N#Power module Inlet air is over temperature.
N#Inlet Over Temp (Disappear)	The N#Power module Inlet air temperature recover normal
N#Capacitor Time Reset	The N#Power module reset timing of DC bus capacitors
N#Fan Time Reset	The N#Power module reset timing of fans
Battery History Reset	Reset battery history data
Battery Over Temp (Set)	Battery is over temperature
Battery Over Temp (Disappear)	Battery temperature recover normal
Bypass Fan Expired (Set)	Working life of bypass fans is expired
Bypass Fan Expired (Disappear)	Working life of bypass fans isn’t expired
N#Capacitor Expired (Set)	The N#Power module Working life of capacitors is expired
N#Capacitor Expired (Disappear)	The N#Power module Working life of capacitors isn’t expired
N#Fan Expired (Set)	The N#Power module Working life of power modules’ fans is expired
N#Fan Expired (Disappear)	The N#Power module Working life of power modules’ fans isn’t expired
N#INV IGBT Driver Block (Set)	The N#Power module Inverter IGBTs are shutdown

NOTE

- Different colors of the words represent different level of events: Green, a normal event occur; Grey, the event occurs then clears; Yellow, warning occurs; Red, faults happen.
- Generally, "Set" refers to the occurrence of an event or corresponding operation. "Disappear" refer to the event is removed or the fault is cleared.

4.2.4. Setting

Touch the icon 

(At the bottom of the screen), and the system enters the page of the Setting, as shown in figure 4-9.

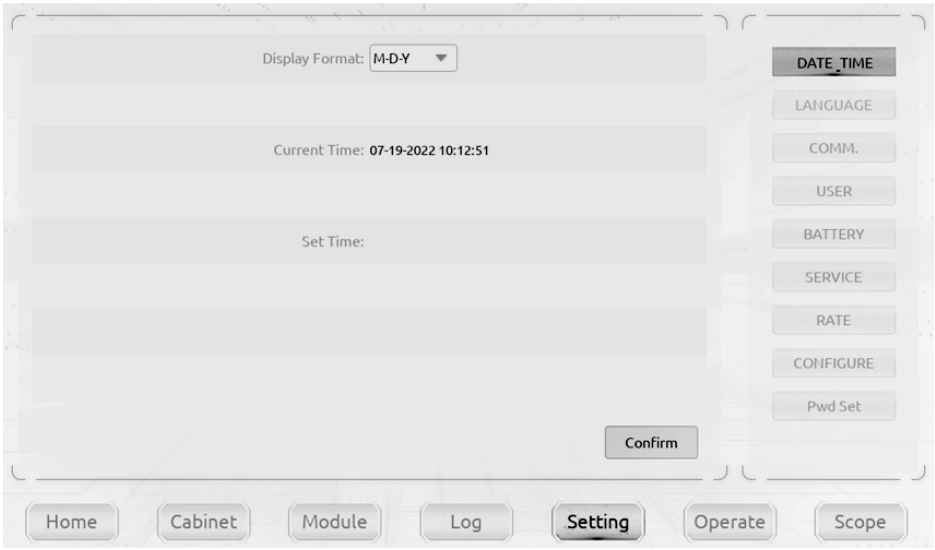


Figure 4-9 Setting menu

The submenus are described in details below in Table 4-6:

Table 4-6 Description of each submenu of Setting

Submenu	Items	Meaning
Date & Time	Date format setting	Three formats: year/month/day, month/day/year, day/month/year
	Time setting	Setting time
Language	Current language	Language in use
	Language selection	Simplified Chinese and English, etc. (selectable)
COMM.	Device address	Setting the communication address
	USB, RS485, SNMP protocol selection	SNT Protocol, Modbus Protocol
	Baud rate	Setting the baud rate of SNT, Modbus protocol
	Modbus mode	Setting mode for Modbus: ASCII and RTU selectable
	Modbus parity	Setting the parity for Modbus
USER	Output voltage adjustment	Setting the Output Voltage
	Bypass voltage up limited	Up limited working Voltage for Bypass, settable: +10%, +15%, +20%, +25%
	Bypass voltage down limited	Down limited working Voltage for Bypass, settable: -10%, -15%, -20%, -30%, -40%
	Bypass frequency limited	Permitted working Frequency for Bypass Settable: +-1Hz, +-3Hz, +-5Hz
	Title modification	Modify the software three-phase display title, such as A-B-C, R-S-T, U-V-W, L1-L2-L3
	LCD time	Set the time of LCD screen saver
	LOGO show time	Set logo page show time
BATTERY	Battery type	Display battery type, such as Lead-acid or lithium battery
	Battery number	Setting the number of the battery

Submenu	Items	Meaning
	Battery capacity	Setting of the AH of the battery
	Float charge voltage/cell	Setting the floating Voltage for battery cell
	Boost charge voltage/cell	Setting the boost Voltage for battery cell
	EOD (End of discharge) voltage/cell, @0.6C Current	EOD voltage for cell battery, @0.6C current
	EOD (End of charge) voltage/cell, @0.15C current	EOD voltage for cell battery, @0.15C current
	Charge current percent limit	Charge current (percentage of the rated current)
	Battery temperature compensate	Coefficient for battery temperature compensation
	Boost charge time limit	Setting boost charging time
	Auto boost period	Setting the auto boost period
	Auto maintenance discharge period	Setting the period for auto maintenance discharge
Service	System mode	System mode setting, such as single, parallel, single ECO, parallel ECO, LBS, parallel LBS. Self-aging can’t be set
	United number	Set the number of UPS in parallel system
	System ID	Set the ID of UPS in parallel system
	Frequency slew rate	Slew rate of track
	Dust filter maintenance period	Set the dust filter maintenance period
	Frequency slew limit	Set the frequency rate limitation
	Redundant module number	Set the redundant module number
	Battery transfer to main delay	Set the delay time from battery transfer to main
	System auto start mode after EOD	Setting System startup mode after EOD
Rated	Cabinet capacity	Set the UPS total capacity
	Power module capacity	Set the single power module capacity
	Rated input voltage	Set the rated input voltage
	Rated Input	Set the rated input frequency

Submenu	Items	Meaning
	Frequency	
	Rated output voltage	Set the rated output voltage
	Rated output frequency	Set the rated output frequency
CONFIGURE	System configuration	Configuring system parameters
Password	Change the password of the login account	Change the passwords of the current user and the user with lower privileges. The password recovery function sets the passwords of all login accounts to the initial values.

NOTE

- Set the time setting, language setting, and communication setting in the subordinate submenu, which can be set by the user; User settings require a first-level password, which needs to be set by professional personnel; Battery setting and service setting require a secondary password for after-sales service; Rated setting, system configuration factory setting, rated setting requires a three-level password.
- The C of the battery setting is the ampere hour of the battery, if it is a 100AH battery, then C=100A.

Warning

Ensure the number of the battery is completely equal to the real installed number. Otherwise it will cause serious damage to the batteries or the equipment.

4.2.5. Operate

Touch the icon Operate (At the bottom of the screen), and the system enters the page of the "Operate", as shown in Figure 4-10.

(a) Function Button Page (b) Test Command Page

Figure 4-10 Operate menu

The "Operate" menu includes Function button page and Test command page. The contents are described in details below.

Function Button

- **Clear/Restore Buzzing**

Touch the icon  or  to mute or restore buzzing of the system.

- **Fault Clear**

Touch the icon  to execute the fault clear.

- **Transfer to and ESC Bypass**

Touch the icon  or  to transfer to bypass mode or cancel.

- **Manual Transfer to Inverter**

Touch the icon  to transfer to inverter mode.

- **Manual Dust Clear**

Touch the icon  , the UPS start to dust clear.

- **Reset Battery History Data**

Touch the icon  , reset the battery history data, includes the times of discharge, days for running and hours of discharging.

- **Reset Dust filter Using Time**

Touch the icon  , reset the time of dust filter using.

Test Command

- **Battery Test**

Touch the icon  , the system transfer to the Battery mode to test the condition of the battery. Ensure the bypass working normally and capacity of the battery isn`t less than 25%.

- **Battery Maintenance**

By touching the icon  partially discharge the battery, charge and discharge the battery for maintenance. The bypass must be in normal condition and should maintain more than 25% of the battery capacity. After the system reaches EOD, the discharge ends and the system switches back to normal mode.

- **Battery Boost**

By touching the icon  the system starts boost charging.

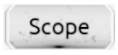
- **Battery Float**

By touching the icon  the system starts float charging.

- **Stop Test**

By touching the icon  the system stops battery test or battery maintenance.

4.2.6. Scope

Touch the icon 

(At the bottom right of the screen), and the system enters the page of the scope. It mainly provides waveform diagrams of output voltage, output current, bypass voltage, which is convenient for users to observe intuitively. As shown in Figure 4-11. Yellow, green, and red represent the corresponding ABC phase, and the numbers below represent their specific values in sequence.

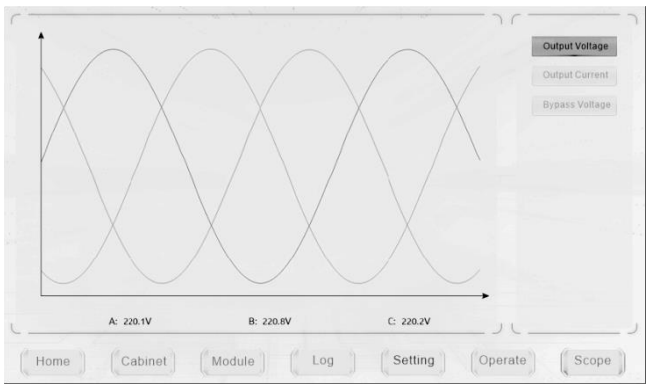


Figure 4-11 Scope Menu

5. Operation

5.1. UPS Start-up

5.1.1. Start in Normal Mode

The UPS must be started up by commissioning engineer after the completeness of installation. The steps below must be followed:

1. Ensure all the circuit breakers are open;
2. One by one to turn on the output breaker (Q4), input breaker (Q1), bypass input breaker (Q2), and then the system starts initializing;
3. After the LCD lit up, the system enters the home page, as shown in Figure 4-2;
4. Notice the energy bar in the home page, and pay attention to the LED indicators. The rectifier flashes indicating the rectifier is starting up. The LED indicators are listed below in Table 5-1;

Table 5-1 Rectifier starting up

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	off
Battery	red	Load	off
Bypass	off	Status	red

5. After 30S, the rectifier indicator goes steady green, presenting the finishing of rectification and bypass static switch closes then the inverter is starting up. The LED indicators are listed below in Table 5-2;

Table 5-2 Inverter starting up

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	green
Battery	red	Load	green
Bypass	green	Status	red

6. The UPS transfers from the bypass to inverter after the inverter goes normal bypass indicator off, inverter indicator and load indicator on. The LED indicators are listed below in Table 5-3;

Table 5-3 Supplying the load

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	green
Battery	red	Load	green
Bypass	off	Status	red

7. Close the battery circuit breakers, battery indicator status is green, then the UPS starts charging the battery, UPS is in Normal Mode. The LED indicators are listed below in Table 5-4.

Table 5-4 Normal mode

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	green
Battery	green	Load	green

Indicator	Status	Indicator	Status
Bypass	off	Status	green

NOTE

- When start-up for the first time, the language, time, date and system parameters can be set through the Setting submenus. When start-up again, the system defaults to the previous Settings. If these parameters have been set, the system defaults to the existing ones.
- Users can browse all events during the startup process of the starting up by checking the menu Log.
- Users can check the operating status during the startup process by the front button of the power module.

5.1.2. Start from Battery

The start from battery is referring to battery cold start. The steps for the start-up are as follows:

1. Confirm the battery is correctly connected, close the external battery circuit breakers;
2. Press the red battery cold start button for more than 5 seconds, the system is then powered by the battery, as shown in Figure 5-1;

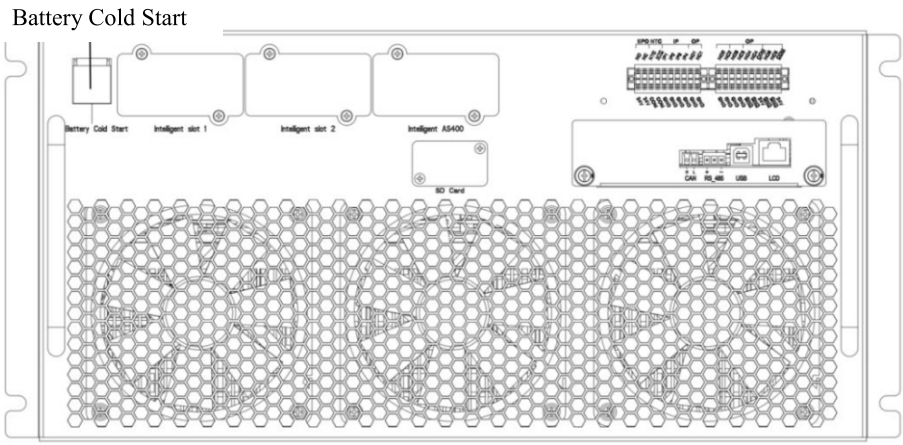


Figure 5-1 The position of the battery cold start button on cabinet

3. After that, start the system according to the steps after step 3 in normal mode. The system starts the rectifier and then the inverter to complete the inverter output. The entire process takes approximately 60 seconds and the system operates in battery mode;
4. Close the UPS output breaker or external output breaker to supply power to loads and finish UPS start-up in battery mode.

5.2. Operation Modes Switching

5.2.1. Switching to Battery Mode from Normal Mode

Disconnect the input switch to cut off the mains, and the UPS enters battery mode. If you need to switch the UPS back to normal mode, wait a few seconds before closing the input switch and resupplying mains power. After 10 seconds, the rectifier automatically restarts and power to the inverter is restored.

5.2.2. Switching to Bypass Mode from Normal Mode

Touch the icon 

to entry submenu page, then touch the icon  , then the system will transfer to bypass mode manually.

Warning

Ensure the bypass is working normally before transferring to bypass. Or it may cause failure.

Manually turning off power module, make sure the remaining power module don't overload.

5.2.3. Switching to Normal Mode from Bypass Mode

Enter the menu Operate, touch the icon 

, entry submenu page, and touch the  , system transfers to normal mode.

5.2.4. Switching to Maintenance Bypass Mode from Normal Mode

When UPS is operating in normal mode, this operation step can be used to switch the load from inverter output to maintenance bypass mode. It can achieve the maintenance of the cabinet.

1. Touch the  on LCD, transfer the UPS into Bypass mode following section 5.2.2;
2. The inverter indicator LED goes out, the buzzer alarm. The bypass supplies power to load, the inverter shutdown;
3. Turn off the external battery breaker and turn on the maintenance bypass breaker. And the load is powered through maintenance bypass and static bypass;
4. Now we can pull out the bypass module or power module for maintenance.

Warning

Before making this operation, check LCD display to be sure that bypass supply is regular and the inverter is synchronous with it, so as not to risk a short interruption in powering the load.

Danger

If you need to maintain the power module, wait for 10 minutes to let the DC bus capacitor fully discharge before removing the cover.

5.2.5. Switching to Normal Mode from Maintenance Bypass Mode

When UPS is running in maintenance bypass mode, this operation step can be used to switch the

system to normal main circuit mode.

1. Close bypass breaker and output breaker, power ON, after 30S, the static bypass turns on, the bypass indicator LED goes green, and the load is powered through maintenance bypass and static bypass;
2. Open the maintenance bypass breaker and the load is powered through static bypass;
3. Close the input breaker, battery breaker, and the rectifier starts, after 30S, the rectifier finish to start; the rectifier indicator LED goes green, and then inverter start. After 60S, the system transfers to Normal mode.

5.3. Battery Test

If the battery is not in use for a long time, it is necessary to test the condition of the battery. Two methods are provided:

1. Manual Discharging test. Enter the menu Operate, as is shown in Figure 5-2 and touch the icon "Battery maintenance"  , the system transfers into the Battery mode for discharging, then the battery will have 20% of capacity or in low voltage, users can stop the discharging by touching the "Stop Test" icon  .

(a) Function button page (b) Test command page

Figure 5-2 Battery Maintenance

2. Auto discharging. After the automatic discharge setting of the battery, the battery will automatically discharge to close to the battery low voltage and then recover. It is necessary to set automatic discharge period and enable battery maintenance. The steps are as follows:

(1) Enter the system configuration secondary menu under the Settings submenu, select "Automatic Battery Maintenance", and confirm;

(2) Enter the secondary menu of battery settings under the settings submenu, as shown in Figure 5-3 for automatic battery discharge period settings. Set the discharge period in the "Automatic Discharge Period" and confirm (the battery self-test period is 30-120 days, and if not set by default, the battery self-test is disabled).

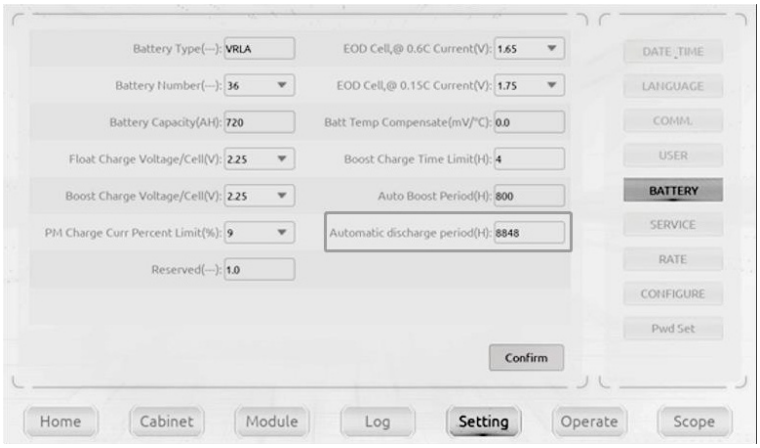


Figure 5-3 Setting period for battery auto discharge

Warning

The load for the auto maintenance discharge should be 20%-100%, if not, the system will not start the process automatically.

5.4. EPO

The EPO button is designed to switch off the UPS in emergency conditions (e. g., fire, flood, etc.). To achieve this, just press the EPO button, and the system will turn off the rectifier, inverter and stop powering the load immediately (including the inverter and bypass), and the battery stops charging or discharging.

As shown in Figure 5-4, open the cover of the EPO, and hold down the button for about 1 second to realize emergency stop.

If the input utility is present, the UPS control circuit will remain active; however, the output will be turned off. To completely isolate the UPS, users need to turn off the input breaker and external battery breaker supply to the UPS.

Warning

When the EPO is triggered, the load is not powered by the UPS. Be careful to use the EPO function.

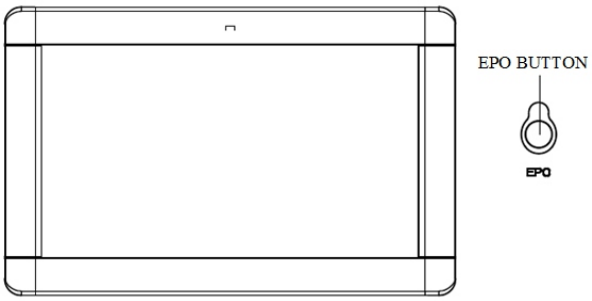


Figure 5-4 EPO Button

5.5. Installation of Parallel System

The UPS system can support maximum five cabinets in parallel. Two UPS cabinets are connected as is shown in Figure 5-5.

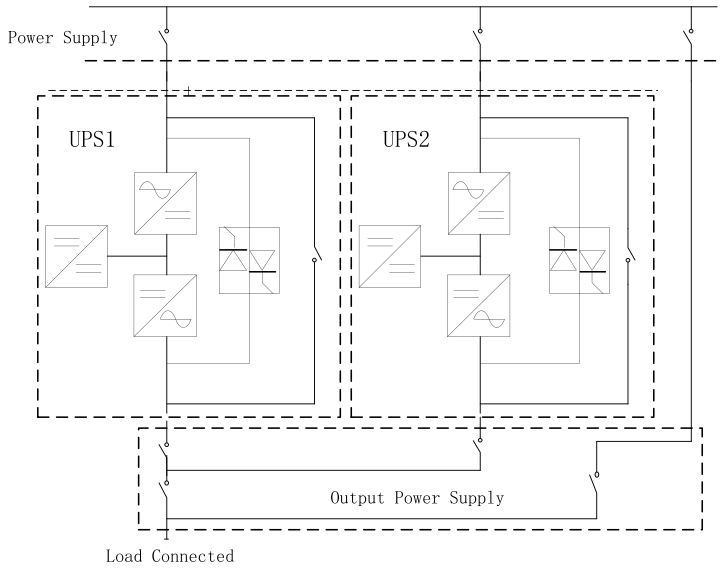


Figure 5-5 Parallel diagram

The parallel interfaces are located in the back panel of the cabinet, open the panel then you can see them. Its location is shown in Figure 5-6:

Figure 5-6 Location of the Parallel interface

The control cables for the parallel operation must be connected with all single devices to form a closed loop, as is shown in Figure 5-7.

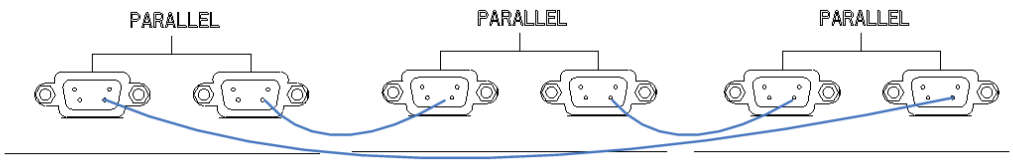


Figure 5-7 Parallel connection

For more details of parallel operation, please refer to the "Instruction for Parallel Operation".

6. Maintenance

6.1. Chapter Content

This chapter introduces the maintenance of UPS, including the operation and guidance for power module, monitoring bypass module, and battery pack maintenance.

6.2. System maintenance instruction

6.2.1. Precautions

Only maintaining engineers can maintain the power module, monitoring bypass module.

1. The power module should be disassembled from top to bottom to prevent the cabinet from tipping over due to its high center of gravity.
2. To ensure the safety before maintaining power module and monitoring bypass module, use a multi-meter to measure the voltage between operating parts and the earth to ensure the voltage is lower than hazardous voltage, DC voltage is lower than 36Vdc, and AC maximum voltage is lower than 30Vac.
3. Only when UPS is in Maintenance Bypass Mode or UPS is completely powered off, the monitoring bypass module can be disassembled.
4. Wait 10 minutes before opening the cover of the power module after pulling out from the Cabinet.

6.2.2. Instruction for Maintaining Power module

Confirm the UPS is operating in Normal Mode and the bypass is working normally before pulling out the power module needed to be repaired.

1. Shut down the power module. Turn the knob to the unlocked state and the power module exits the system;
2. Ensure the remaining power module will not be overloaded when one power module power off. If there is a risk of overload, please manually transfer the UPS system to bypass mode (refer to Chapter 5.2.2) before proceeding with the following operations;
3. Wait 10 minutes, remove the fixing screws on both sides of the front panel of the power module and pull it out of the cabinet;
4. After the repairing is done, push the power module into the cabinet (The push-in interval of each power module is more than 10s), turn the knob to the locked position, and tighten screws on both sides. The power module will automatically join the system;
5. If you manually switch the UPS system to bypass mode in Step 2, the power module will restore the UPS system to normal mode after starting the power module for 2 minutes. For details, see Section 5.2.3.

6.2.3. Monitoring bypass module for cabinet

Confirm the UPS is operating in Normal mode and the bypass is working normally:

1. Transfer the system to bypass mode through the LCD control panel;
2. Turn on the maintenance bypass breaker;
3. One by one to turn off the battery breaker, input breaker, bypass input breaker and output breaker. The load is powered through maintenance bypass;
4. Remove the fixing screws on both sides of the front panel of the monitoring module, unplug the LCD cable on the front panel of the monitoring module, and pull out the monitoring module to maintain it;
5. Remove the screws on both sides of the front panel of the bypass module and pull out the bypass module to maintain the bypass module;
6. After the completion of maintenance, insert power module and tighten the screws on both sides of the power module;
7. One by one to turn on the output breaker, bypass input breaker, input breaker and battery breaker;
8. After 2 minutes, the bypass indicator LED goes green, and the load is powered through maintenance bypass and static bypass;
9. Turn off the maintenance bypass breaker, the rectifier starts, After 60S, the system transfers to Normal mode.

 **Danger**

When the model without external distribution breaker is in the maintenance bypass mode, the wiring terminal and connected copper bar or cable, and the maintenance bypass breaker connected copper bar or cable will be charged. Do not touch it to avoid danger.

6.2.4. Battery maintenance

Generally, maintenance free batteries do not require manual maintenance when using. Operate according to certain requirements. The life of the battery can be prolonged. The factors that affect battery life are as follows: installation, temperature, charging and discharging current, charging voltage, discharge depth and long-term charging.

1. Installation. Batteries should be installed as clean as possible, in a cool, airy, dry place, avoiding exposure to direct sunlight or other radiant heat sources. When installing the battery, pay attention to the accuracy and quantity of the battery. The batteries with different specifications and batch numbers should not be mixed.
2. Temperature. Keep the temperature of the battery at about 25℃.
3. Charge discharge current. The optimum charging current of lead-acid battery is about 0.1C,

and the charging current must not be greater than 0.3C. Charging current is too large or too small, will affect the battery life. Discharge current is generally required at 0.05~3C.

4. Charging voltage. Because the UPS battery belongs to the standby mode, the battery will be discharged only when the power supply is abnormal or the battery will be charged. To prolong the life of battery charger, UPS generally uses the constant voltage/current limiting control, after the battery is turned into floating state, each section of the floating voltage set to about 13. 5V. if the charge voltage is too high, the battery will be overcharged; otherwise the battery will not be charged enough.
5. Discharge depth. The deeper the discharge depth is, the less cycle times to be, so the depth discharge should be avoided. UPS in the case of light load discharge or no-load discharge will cause deep discharge of the battery.
6. Regular maintenance. The battery should be checked regularly, such as observing its appearance and measuring the voltage of the battery. If the battery is not discharged for a long time, the activity will become worse, so the UPS also needs periodic discharge test to keep the battery active.
7. Check the battery regularly for leakage, deformation and so on.

7. Product Specification

7.1. Chapter Content

This chapter provides the specifications of the product, including environmental characteristics mechanical characteristics and electrical characteristics.

7.2. Applicable Standards

The UPS has been designed to conform to the following European and international standards shown in Table 7-1.

Table 7-1 Compliance with European and International Standards

Item	Normative reference
General safety requirements for UPS used in operator access areas	EN50091-1-1/IEC62040-1-1/AS 62040-1-1
Electromagnetic compatibility (EMC) requirements for UPS	EN50091-2/IEC62040-2/AS 62040-2 (C3)
Method of specifying the performance and test requirements of UPS	EN50091-3/IEC62040-3/AS 62040-3 (VFI SS 111)

NOTE

The above mentioned product standards incorporate relevant compliance clauses with generic IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN/AS61000 series) and construction (IEC/EN/AS60146 series and 60950).

7.3. Environment Characteristics

Table 7-2 Environmental Characteristics

Item	Unit	Requirements
Acoustic noise level at 1 meter	dB	75dB @ 100% load, 70dB @ 45% load
Altitude of operation	m	≤1000, derate by 1% every 100m within the range of 1000m to 2000m
Relative humidity	%RH	0~95, non-condensing
Operating temperature	℃	0~40, Battery life is halved for every 10°C increase above 20°C
UPS storage temperature	℃	-40~70
Recommended battery storage temperature	℃	20~30 (20℃ is optimal)

7.4. Mechanical Characteristic

The main physical parameters of the cabinet (Include bypass module) are shown in Table 7-3.

Table 7-3 Mechanical Characteristics for Cabinet

Model	Unit	Parameter
Cabinet type	N/A	600kVA Cabinet (Include bypass module)
Mechanical dimension (W*D*H)	mm	1000*1100*2000
Weight	kg	400
Color	N/A	Black
Protection level (IEC60529)	N/A	IP20

The main physical parameters of the cabinet are shown in Table 7-4.

Table 7-1 Mechanical Characteristics for power module

Model	Unit	Parameter
Mechanical dimension (W*D*H)	mm	440*795*174
Weight	kg	53.5

7.5. Electrical Characteristic

7.5.1. Electrical Characteristics (Input Rectifier)

The main electrical features of the rectifier are shown in Table 7-5.

Table 7-2 Rectifier AC input (Mains)

Item	Unit	Parameter
Grid system	\	3 Phases + Neutral + Ground
Rated AC input voltage	Vac	380/400/415 (three-phase and sharing neutral with the bypass input)
Rated frequency	Vac	50/60Hz
Input voltage range	Vac	323~478Vac (Line-Line), full load 323V~138Vac (Line-Line), load decrease linearly from 100% to 30%@30-40℃
Input frequency range	Hz	40~70
Input power factor	kW/kVA, full load	>0.99
THDi	THDi%	<3% (full Linear Load)

7.5.2. Electrical Characteristics (Intermediate DC Link)

Table 7-6 Battery

Items	Unit	Parameters
Battery bus voltage	Vdc	Rated: ±240V
Quantity of lead-acid cells	Nominal	40=[1 battery(12V)] , 240=[1 battery (2V)]
Float charge voltage	V/cell (VRLA)	2.25V/cell (selectable from 2.2V/cell~2.35V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/℃/cl	-3.0 (selectable: 0~-5.0)
Ripple voltage	%	≤1

Ripple current	%	≤5
Equalized charge voltage	VRLA	2.4V/cell (selectable from: 2.30V/cell~2.45V/cell) Constant current and constant voltage charge mode
Final discharging voltage	V/cell (VRLA)	1.65V/cell (selectable from: 1.60V/cell~1.750V/cell) @0.6C discharge current 1.75V/cell (selectable from: 1.65V/cell~1.8V/cell) @0.15C discharge current (EOD voltage changes linearly within the set range according to discharge current)
Battery charge	V/cell	2.4V/cell (selectable from: 2.3V/cell~2.45V/cell) Constant current and constant voltage charge mode
Battery charging power max current	kW	15%* UPS capacity (selectable from: 1~15%* UPS capacity)

Note: the default number of batteries is 40, please see the UPS battery voltage identification on the nameplate before installation, if the battery number is set to 32~50 pcs in the actual, please change the settings, and then connect the battery, otherwise the risk of damage. Please contact the manufacturer's customer service phone about the operation steps.

7.5.3. Electrical Characteristics (Inverter Output)

Table 7-7 Inverter Output (To critical load)

Items	Unit	Parameters
Rated capacity	kVA	100-600
Rated AC voltage	Vac	380/400/415 (three-phase four-wire, sharing neutral with the bypass)
Rated frequency	Hz	50/60
Frequency regulation	Hz	50/60Hz ±0.01%
Voltage precision	%	±1.0 (0-100% linear load)
Inverter overload	%	110%, 1hour 125%, 10min 150%, 1min >150%, 200ms
Synchronized range	Hz	Settable, ±0.5Hz ~ ±5Hz, default ±3Hz
Synchronized slew rate	Hz	Settable, 0.5Hz/s ~ 3Hz/s, default 0.5Hz/s
Output power factor		1
Transient response		<5% (20% - 80% - 20% step load)
Transient recovery		< 20ms (0% - 100% - 0% step load)
Output voltage (THDu)		<1%, 0-100%, linear load <5%, non-linear load

7.5.4. Electrical Characteristics (Bypass Mains Input)

Table 7-8 Bypass Mains Input

Item	Unit	Value
Rated capacity	kVA	600
Rated AC voltage	Vac	380/400/415 (three-phase four-wire and sharing neutral with the bypass, provide a neutral reference for the output)
Rated current	A	153~920 (see Table)

Overload	%	110%, Long term operation 110%~125%, 10min 125%~150%, 1min >150%, 200ms
Current rating of neutral cable	A	1.7×In
Rated frequency	Hz	50/60
Switch time (between bypass and inverter)	ms	Synchronous transfer: 0ms
Bypass voltage range	%	Settable: Up limited: +10, +15, +20, default is +15 Down limited: -10, -15, 30, -40, default is -20
Bypass frequency range	Hz	Settable, ±1, ±3, ±5

7.6. Efficiency

Table 7-9 Efficiency, Heat Dissipation and interchange of air

Item	Unit	Value
Overall efficiency		
Normal mode (dual conversion)	%	>97
ECO mode	%	>99
Battery discharging efficiency (DC/AC) (at nominal voltage 480Vdc and full-rated linear load)		
Battery mode	%	>96

7.7. Display and Interface

The system display and interface are shown in Table 7-10:

Table 7-10 System display and interface

Display	LED + LCD + Touch Screen
Interface	Standard: CAN, RS485, USB, Dry Contact Option: RS485 Expand Card, SNMP Card, AS400 Card

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