Power Quality Products

User Manual

Applied to：
SFR-AHF4-50/0.4B（50A Wall mounted）

Safety instructions

Before installing and using the device, please read this manual carefully to better install and use this product. The device must be debugged by the manufacturer and its authorized agents, otherwise it may endanger personal safety and cause device failure. The resulting device damage is not covered by the warranty.

The device is only used for commercial and industrial users, not as a power source for any life support device.

⚠ Attention
Unauthorized personnel are prohibited from debugging device.

Grounding

⚠⚡ Warning
When connecting the input cable, be sure to ground it reliably. The grounding of the device must comply with local electrical codes.

User maintainable devices

⚠⚡ Warning
Tools are required for all internal maintenance and repair work of the device, and should be performed by personnel who have received relevant training. Devices (including those behind the cover) that require tools to open are not user-maintainable. The device fully meets the safety requirements of device in the operating area. The device and internal capacitor modules have dangerous voltages, but are not accessible to non-maintenance personnel. Since it is only possible to touch a device with dangerous voltage after opening the cover with a tool, the possibility of contact with dangerous voltage has been minimized. There will be no danger if the device is operated in accordance with the general specifications and following the steps recommended in this manual.

Content

1. Introduction

1.1 Overview

Power quality products include active harmonic filters (AHF) and static var generators (SVG). The product uses an efficient power electronics topology and advanced all-digital control technology to dynamically eliminate harmonic currents and improve power factor.

The device can be widely used in the following industrial fields (steel industry, metallurgy industry, mining industry, new energy industry, automotive industry), municipal field (water treatment industry, telecommunications industry, research institutes), commercial field (hospital, bank, shopping mall , schools, computer rooms, computer centers), rail transportation (electrified railways).

2. Technical specification

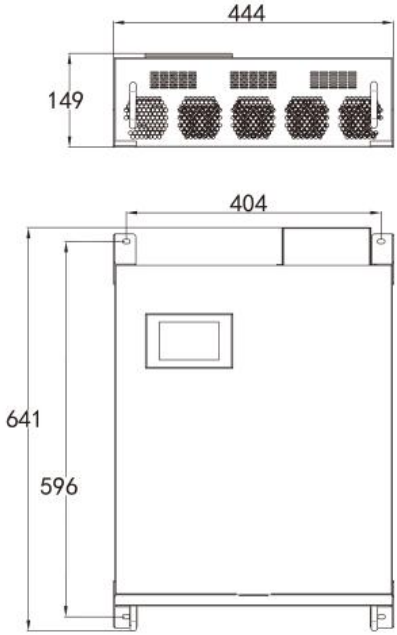
2.1 Technical parameters

Input	
System voltage	Line voltage 400V
System voltage range	±15%
Frequency	50/60Hz ±5%
Output and installation	
Capacity specification	50A
Module type	Wall-mounted
Incoming way	Upper incoming
Performance	
Harmonics filtering rate	≥90% (Within the range of the ordered capacity, and the load harmonic content is higher than 30% of the ordered capacity)
Harmonics filtering range	2^{nd} ~51^{st} harmonics（If you need to control the harmonic order of more than 25 times, you should write in the contract）
Full response time	≤5ms
Instantaneous response time	≤100us

Dynamic current	1.2 times the filter rated capacity output, 1min
PF setting	Settable
Protection	
Overload protection	Automatic current limit at 100% rated output
Other protection	Over-voltage protection, under-voltage protection, over-temperature protection, over-current protection
Operation mode	
Stand-alone operation	Support
Parallel operation	Conventionally support 8 sets, special requirements can be customized
Display and operation	
Display interface	The module is with 4.3 inch color touch screen
Display status	Current, voltage, power, harmonics distortion rate, etc.
Operation	Multiple operation mode options , remote or local
Communication（RS485 interface）	The module has 1 external communication interface supporting Modbus- RTU protocol
Environment condition	
IP level	IP20（customized）
Operating environment temperature	-20℃~45℃
Storage/ transport temperature	-25℃~55℃
Working humidity	Relative humidity 5~95%，no condensation
Altitude	1000m and below(above 1000m Every additional 100m / 1% derating)
Compliant with standard	JB/T 11067-2013 Low-voltage active power filter equipment

3. Installation

3.1 Size



Wall Mounted 30-75A

3.2 Installation requirements

3.2.1 Installation environment

- Good ventilation, keep away from water, heat and flammable and explosive materials.
- Avoid direct sunlight.
- Avoid installation in environments with **conductive dust, volatile gases, corrosive substances, and excessive salt.**
- If necessary, an indoor exhaust fan should be installed to avoid an increase in room temperature. In a dusty environment, dust protection should be done.

3.2.2 Installation spacing

The device is provided with forced air cooling by an internal fan, and hot air is

discharged through the ventilation holes on the top of the device. Please do not block the ventilation holes.

The device should be kept at least 200mm away from the wall or adjacent devices to avoid obstructing the ventilation and heat dissipation of the device, causing the internal temperature of the device to rise and affecting the service life of the device.

In order to achieve proper air circulation and device maintenance, the minimum space spacing is required as follows:

- The distance between the back of the cabinet and the wall is 100mm
- The top of the cabinet is at least 200mm away from the ceiling
- The front of the cabinet is at least 800mm away from the wall or other equipment

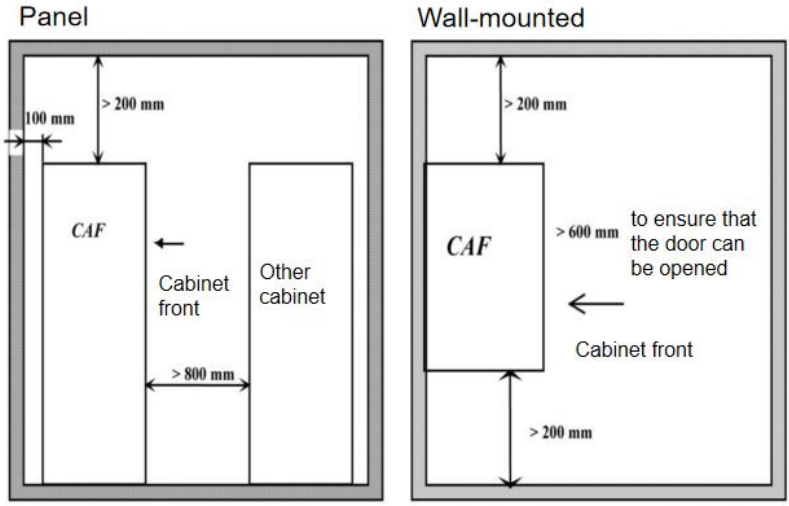


Figure 3-1 Device installation diagram

⚠ Attention
When installing the device, pay attention to personal safety to prevent the device from falling and hurting the human body.

3.2.3 Unpacking

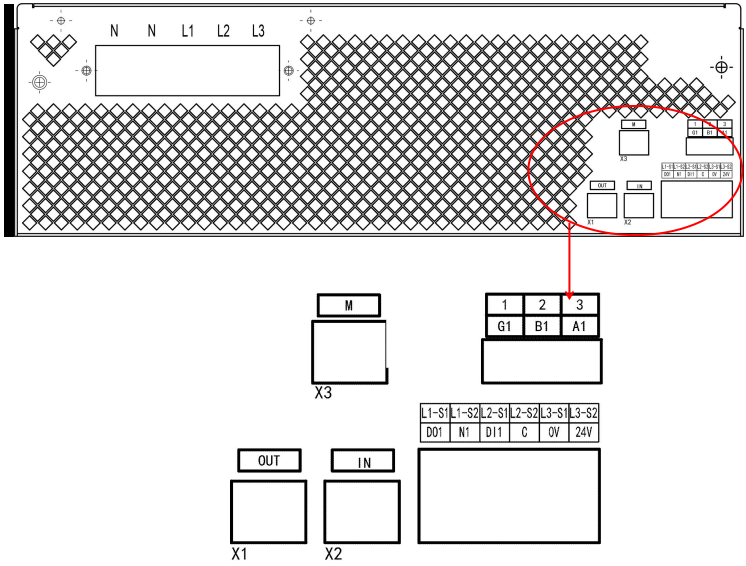
The device should be placed in a storage environment that meets the requirements, and the storage time should not exceed 3 months.

When installing the device, the device should be transported to the installation site before removing the outer packaging and checking the following items:

1) Unpack the device and visually inspect the appearance of the equipment. If there is any damage, please notify the carrier immediately.

2) Check whether the supplied accessory model is complete and correct against the delivery accessory list, and keep all kinds of spare parts accessories for future installation of device, connecting cables and future maintenance

3.3 Wiring



Function interface definition

Port type	Port No.	Function/description
X3	M	When the module is SVGM, it is connected with the intelligent capacitor

External communication signal port	A1	External communication port Note: this port is invalid when the module is SVGM
	B1	
	G1	
Transformer signal port	L1-S1	L1 phase current detection S1 input port (connected to phase L1 transformer S1)
	L1-S2	L1 phase current detection S2 input port (connected to phase L1 transformer S2)
	L2-S1	L2 phase current detection S1 input port (connected to phase L2 transformer S1)
	L2-S2	L2 phase current detection S2 input port (connected to phase L2 transformer S2)
	L3-S1	L3 phase current detection S1 input port (connected to phase L3 transformer S1)
	L3-S2	L3 phase current detection S2 input port (connected to phase L3 transformer S2)
control signal port	DO1	Programmable relay output, default configured to equipment fault relay output
	N1	
	DI1	Equipment emergency stop input port (can be connected with external "normally closed" emergency stop button)
	C	
	0V	Power output negative pole 0V (supply power to HMI)
	24V	Power output positive + 24V (supply power to HMI)

3.4 Electrical Installation

3.4.1 Power cable selection

Table 3-1 Recommended section of cable cross section

Current capacity	ABC three phase main circuit incoming line selection	N line selection	PE line selection

50A and below	Copper core is 25 mm^2 insulated heat-resistant flexible cable	The N-line cable is 1.5 times the copper core of the three-phase ABC main circuit cable. (Note: 3L AHF in the specification model has no N line; 4L AHF in the specification model has N line)	The PE cable is 0.67 times the copper core of the three-phase ABC main circuit cable
70A-120A	Copper core is 50 mm^2 insulated heat-resistant flexible cable		
120A-160A	Copper core is 70 mm^2 insulated heat-resistant flexible cable		
160A-220A	Copper core is 90 mm^2 (or 2 pcs of 50mm^2) insulated heat-resistant flexible cable		
220A-300A	Copper core is 120 mm^2 (or 2 pcs of 70mm^2) insulated heat-resistant flexible cable		
300A-400A	Copper core is 2 pcs of 90mm^2 insulated heat-resistant flexible cable		

The device power input and output power cables mainly include the main AC power input cable and the protective ground wire. It is recommended that the input and output cables of the device should be BVR or RV type flexible connecting cables with a rated dielectric strength of AC450V / 750V and an operating temperature of 70 ° C. The current and cable selection of this device are shown in Table 3-1.

3.4.2 CT and its cable selection

The use of current transformer is mainly used for AHF to collect load current and calculate the data of harmonic current, reactive current, negative sequence current and zero sequence current of load current. Table 3-2 is the selection guide for the key parameters of transformers used in this series of AHFs.

Table 3-2 Transformer key parameter selection

Parameter	Index requirements	Remarks

Primary rated current	XXX	0.3 times primary rated current ≤ actual max. working current≤ 0.6 times primary rated current
Secondary rated current	5A	
Rated voltage	≥0.66kV	
Rated capacity	≥2VA	
Accuracy level	0.5 or 0.2	
Dimension	——	The specific size needs to be selected according to the on-site installation environment

Transformer secondary side (rated current 5A) cable, a total of 3 groups (6 pcs) below 15m : RVVSP 2 × 2.5 mm^2 ; 15m-30m: RVVSP 2 × 4 mm^2 .

3.4.3 Cable connections

Precautions:

- To ensure safety, make sure that the power supply device (such as a transformer) is powered off before connecting all cables;
- To ensure safety, first connect the ground wire;
- Make sure the phase sequence of power cable connection is correct;
- Adopt the correct power distribution method (see Figure 3-2A and Figure 3-2B) to ensure the safety of AHF and user device; The main circuit wiring mode is shown in the figure. The wiring should ensure that the phase sequence of the power grid is consistent with the phase sequence of the device. Otherwise, the device may not start normally. The installation direction of the transformer must be close to the load as shown on the P2 surface. The S1 and S2 of each transformer must correspond to the AHF port with the corresponding label. It is strictly forbidden to open the secondary side.(If the circuit is open,

it may cause the transformer to burn).

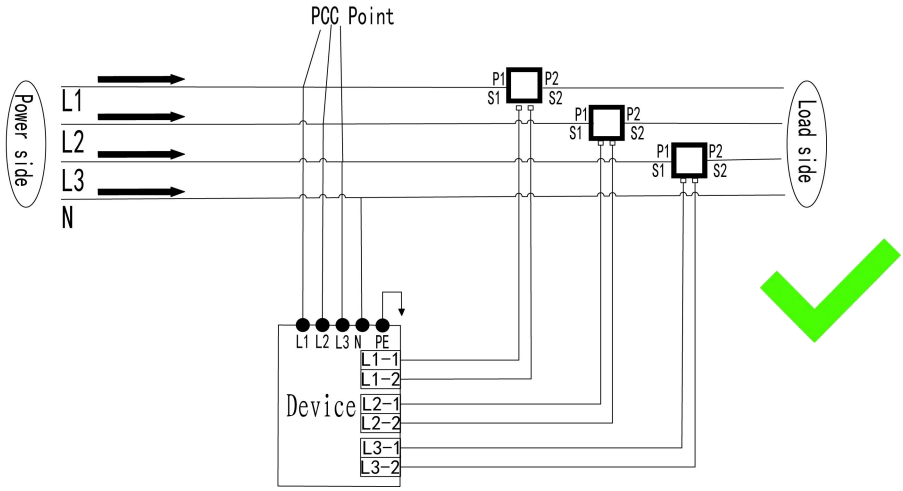


Figure 3-2A

Correct power distribution method (transformer is located behind PCC point)

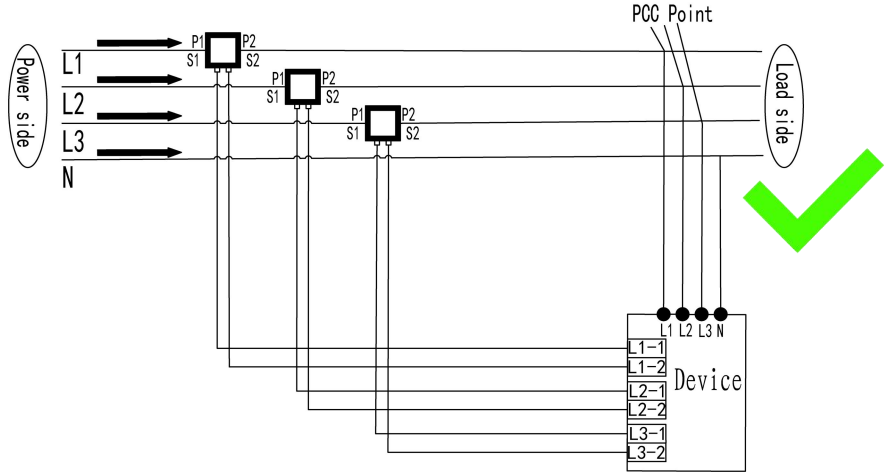


Figure 3-2B

Correct power distribution method (transformer is located in front of PCC point)

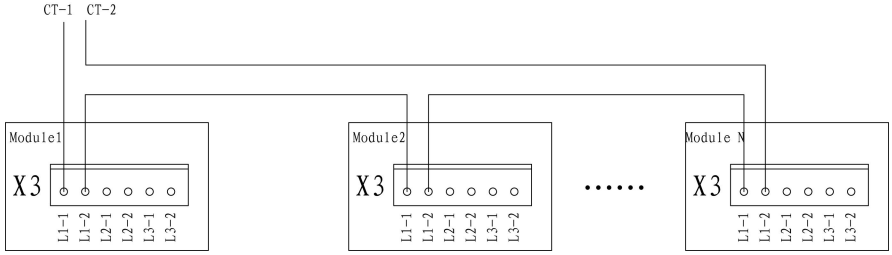


Figure 3-3

Schematic Diagram of CT Line Connection of Multiple Modules

When multiple modules are connected in parallel, the signal wiring method of CT_ L2/CT_ L3. refer to that of CT_ L1 (Fig. 3-3); When the current signals are connected in series, the communication interfaces X1 and X2 of the module are not connected.

4. Operation

4.1 Check before starting

After the equipment is installed, confirm that the electrical connection status of the system is correct and then power on.

1) Make sure that the equipment casing is reliably connected to the protective ground to prevent the casing from being charged with electricity.

2) Check and confirm that the power distribution method of the equipment, the connection of each power cable and signal cable are correct, and there is no short circuit.

3) Check and confirm that all input switches are disconnected, and attach warning signs to these switches to prevent others from operating the switches.

4.2 Device debugging

4.2.1 Debugging steps

【**Step 1**】Close the device input isolation switch.

The internal control of the device is powered on and enters the self-test state, about 10s; at the same time, the touch screen is turned on and lit.

【**Step 2**】Touch screen data check and parameter setting.

The main interface of booting is shown in Figure 4-1, which is divided into "System Information", "Event Record", "Setting", "Harmonic" and "Help" function modules.

Figure 4-1 Touch screen boot interface

Among them, "system information" can control the device power on / off and view the device operation data. Before starting the machine, the CT ratio, CT position and corresponding function switches of the equipment should be set. For details, please refer to the following instructions.

(1) Click the button "Setting" to enter the secondary menu selection shown in Figure 4-2. The factory setting interface requires permission to enter.

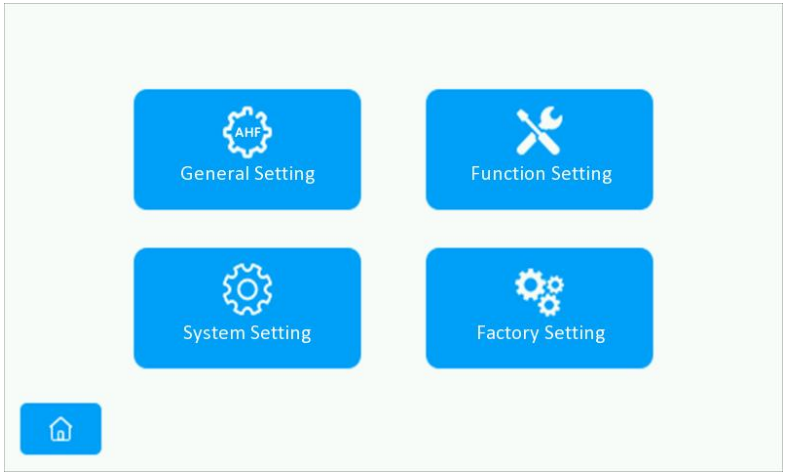


Figure 4-2 Setting selection interface

(2) Click "General Settings" in the secondary menu, as shown in Figure 4-2 (1) and 4-2 (2) The user can set the variable ratio and CT position according to the scene. The meaning of specific parameters is shown in Table 4-1.

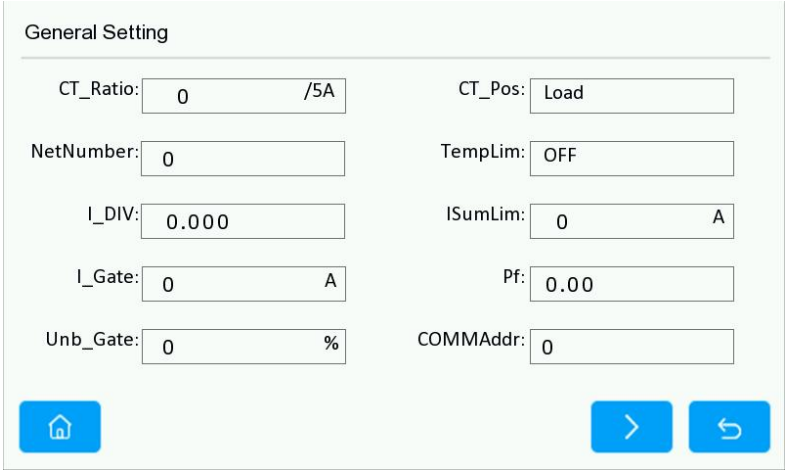


Figure 4-2 (1) Touch screen general setting interface

Figure 4-2 (2) Touch screen general setting interface

Table 4-1 User parameter settings

Name	Meaning	Range	Remarks
CT_Ratio	Transformer ratio of current sampling transformer	0 ～ 20000	Set according to the situation
I_DIV	Reciprocal number of parallel machines	0～1	
I_Gate	When the load current exceeds the threshold current setting value, the device runs at no load and does not output compensation current	0～100	Default 0
Unb_Gate	When the load current exceeds the threshold current setting value, the device runs at no load and does not output compensation current	0～100	Default 0
ISumLim	Maximum output current	50	**The total current limit**

			shall not exceed the rated current of the module
NetNumber	Number of unit modules running in parallel	1～8	
TempLim	Temperature limit protection switch	Enable / disable	After turning on, the total current limit will be set after the internal temperature exceeds the default value
CT_Pos	Select transformer location	Load or grid	1: grid side; 2: load side
COMMAddr	External address	1～243	
BAUD	Baud rate for external communications	2400 ～ 38400	Default 38400
DATA	Data format of external communication	N.8.1	
Pf	Set target power factor	0.9～1	Factory setting 0.98

Click "Function Settings" in the second level menu, and the user can turn on or off the function options as needed. It can set the 2nd to 51st harmonic filtering enable switch and each time can set the output percentage size, the general user can set the 3, 5, 7, 11, 13 times switch to open, the output percentage is 100%.

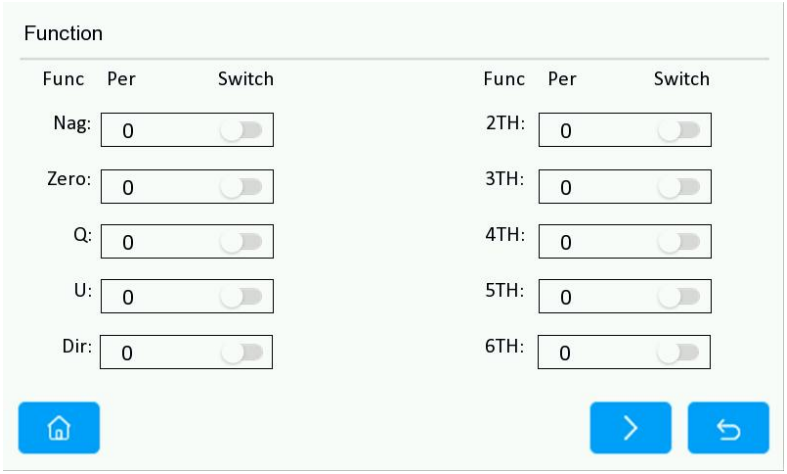


Figure 4-3 (1) Touch screen function setting interface

Figure 4-3 (2) Touch screen function setting interface

Figure 4-3 (3) Touch screen function setting interface

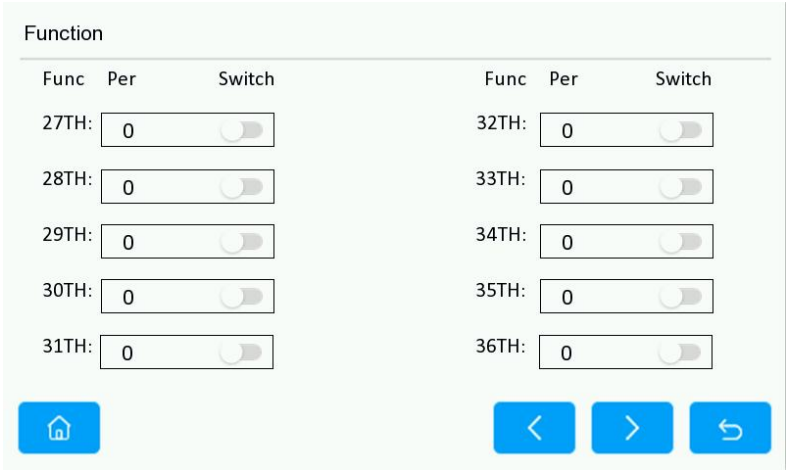


Figure 4-3 (4) Touch screen function setting interface

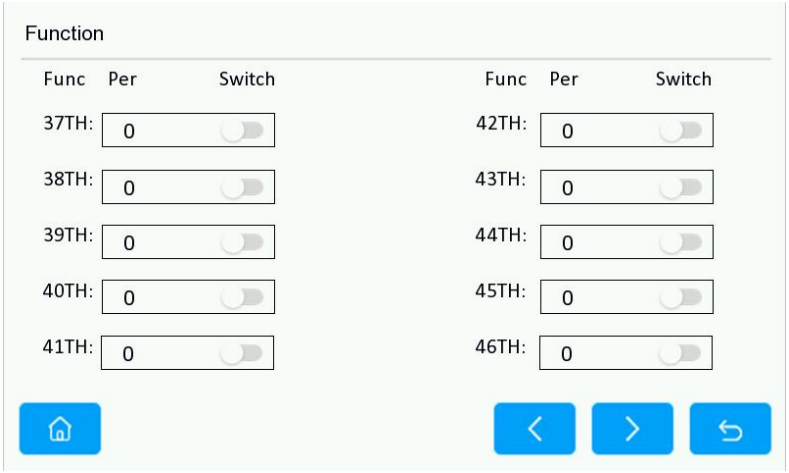


Figure 4-3 (5) Touch screen function setting interface

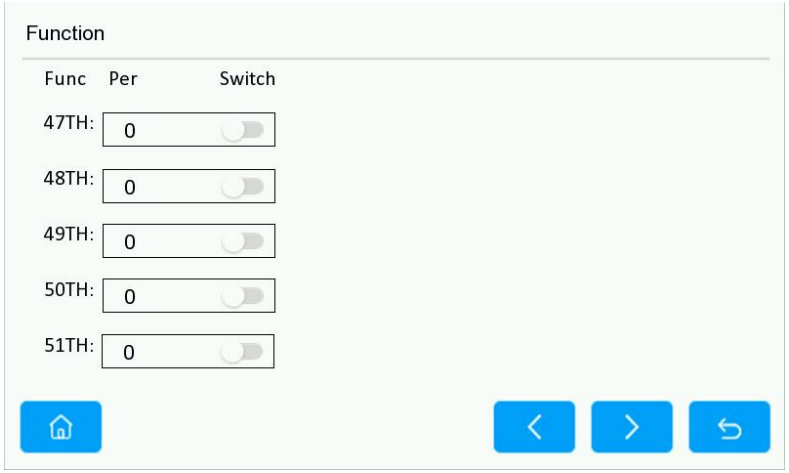


Figure 4-3 (6) Touch screen function setting interface

The user can also set the alarm settings for DO1, as shown in Figures 4-3 (7) and 4-3 (8). The corresponding serial numbers of the alarm items are shown in Table 4-2. Relay DO3, DO4 can be associated with some power parameters or status.

For example: if the output current on the IN line is greater than 50A, DO3 is closed, the alarm type should be set to high alarm, the alarm item is IN_OUT, the set value is 50, the hysteresis amount is 5, the action delay is 5.0, the alarm item index see Table 4-2.

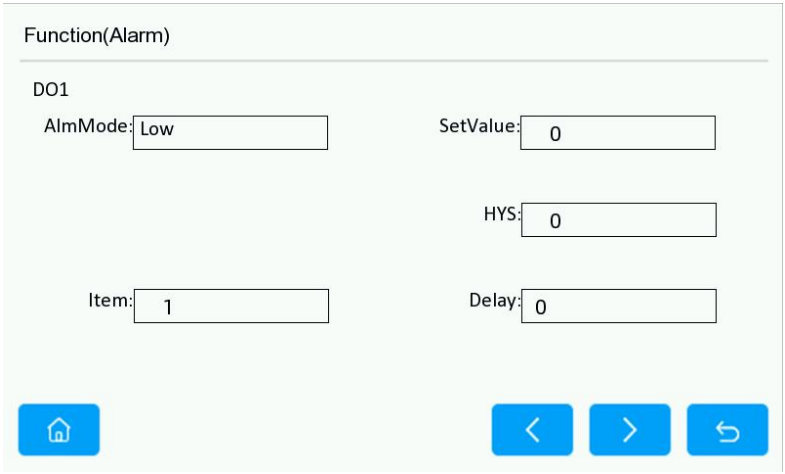


Figure 4-3 (7) Touch screen function setting DO1 alarm setting interface

Table 4-2 Comparison of alarm item serial numbers

Serial number	Parameter	Description	Serial number	Parameter	Description
1	COM	Communication control	25	SA	Grid apparent power, unit 1kw
2	ON_OFF	switch	26	SB	
3	Run_ST	Running status	27	SC	
3	DC_POS	Upper bus	28	SZ	
4	DC_NEG	Lower bus			
5	DC_BUS	Busbar	29	PFA	Grid power factor, unit

6	IA_OUT	Output current, unit 1A	30	PFB	0.001
7	IB_OUT		31	PFC	
8	IC_OUT		32	PFZ	
9	IN_OUT		33	THDI	Harmonic current
10	UAN	Grid phase voltage, unit 1V	34	IA_LOAD	Load current, unit 1A
11	UBN		35	IB_LOAD	
12	UCN		36	IC_LOAD	
13	IA_SYS	Grid current, unit 1A	37	IN_LOAD	
14	IB_SYS		38	IA_LCL,	Capacitance current, unit 1A
15	IC_SYS		39	IB_LCL	
16	IN_SYS		40	IC_LCL	
17	PA_SYS	Grid active power, unit 1kw	41	IN_LCL	
18	PB_SYS		43	TEMP_A1	Temperature, Unit 1℃
19	PC_SYS		44	TEMP_A2	
20	PZ_SYS		45	TEMP_B1	
21	QA_SYS	Grid reactive power, unit 1kvar	46	TEMP_B2	
22	QB_SYS		47	TEMP_C1	
23	QC_SYS		48	TEMP_C2	
24	QZ_SYS		49	TEMP_FAN	Off
			50	BREAK	Temperature, Unit 1℃

Click on the "System Settings" secondary menu, and the user can set the system time, touch sound and language as required. As shown in Figure 4-4.

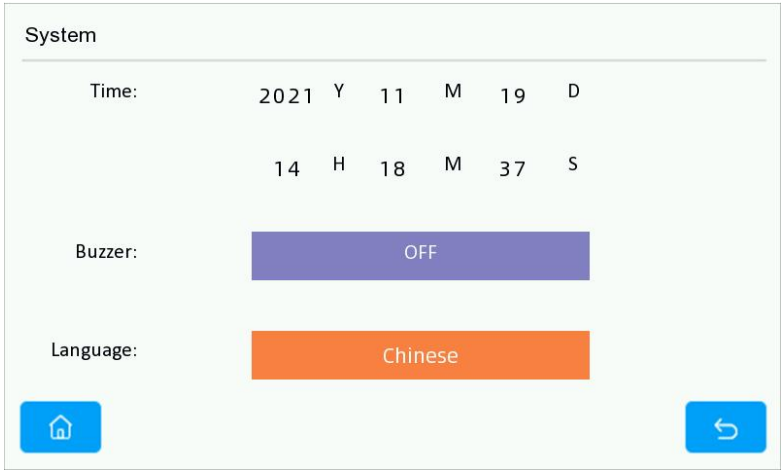


Figure 4-4 Touch screen system setting interface

【Step 3】 After setting the parameters, click the "System Information" button to enter the interface as shown in Figure 4-5. In this interface, you can control the power on and off of the device. Click the Run button, the device begins starting, about 15s later, the starting is completed.

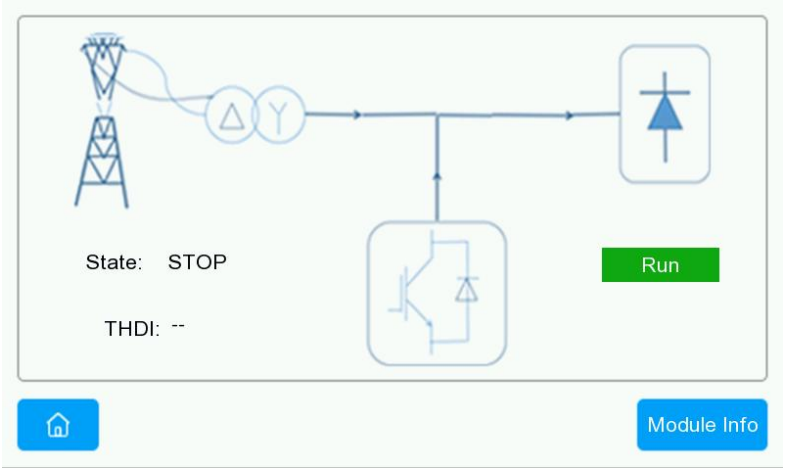


Figure 4-5 System information interface

【**Step 4**】After the start-up is completed, confirm whether the harmonic content of the grid current on the incoming cabinet has decreased. If it does not decrease but rises, it means that the current signal input is reversed. After shutting down and powering off, adjust the wiring and then start the observation. Click the module information button to check whether the module output current and other data and operating status are stable and normal, as shown in Figure 4-6 (1), 4-6 (2).

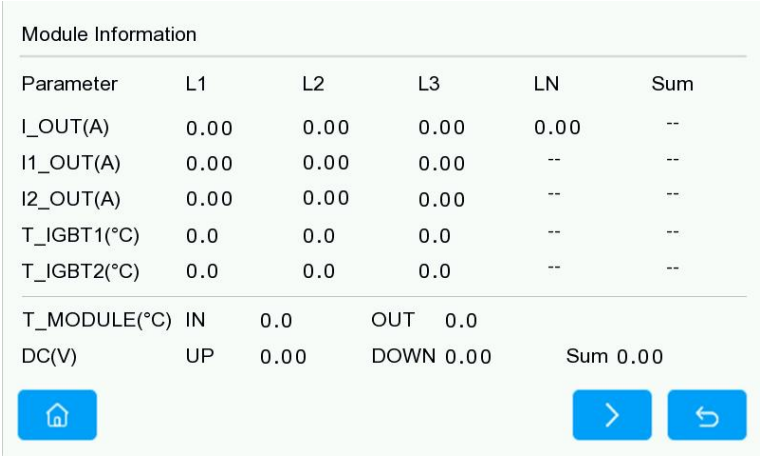


Figure 4-6 (1) Touch screen module information interface

Figure 4-6 (2) Touch screen module information interface

4.2.2 Shut down

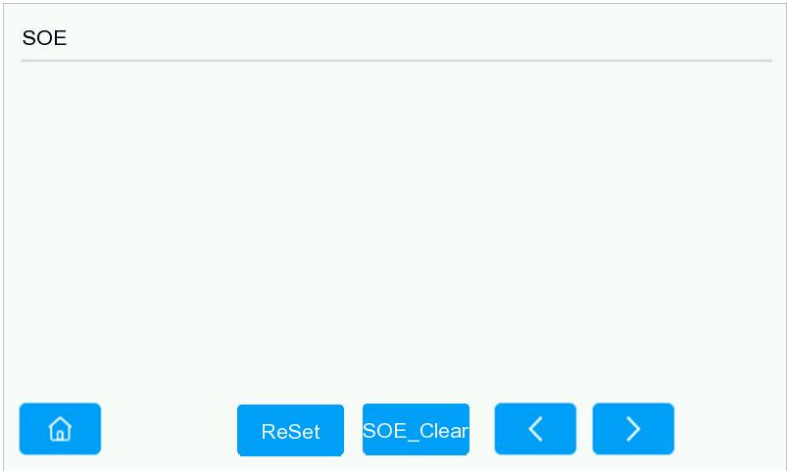
[Step 1] Click the STOP button on the system information interface, the device will stop.

[Step 2] Disconnect the input isolation switch.

Warning
About 15 minutes after the complete shutdown, the voltage of the electrolytic capacitor inside the equipment is completely released, and the equipment is shut down normally. Pay attention to personal safety to prevent accidental electric shock!

4.2.3 Protection reset

The device will automatically stop when it encounters event protection, extending the service life of the device. The protection status color of the device operation interface of the touch screen is yellow, and there will be a scroll bar at the top of the screen to remind. If you restart the device, you need to clear the current event protection status information.The operation steps are as follows: Click the ReSet button in the touch screen event recording interface.



5. Daily maintenance

The components inside the device are stationary except for the cooling fan rotating. Routine maintenance content is very small, because the normal operation of the equipment is greatly affected by the environment, so in daily maintenance, care must be taken to ensure that the environmental requirements for equipment operation are met. It is recommended that the user record the following inspection contents, so that the machine can maintain the best performance and prevent small problems from turning into major failures.

1. Daily inspection

1）Check whether the panel running indicator is on;

2）Check that there is no obvious high temperature at the output of each fan in the cabinet;

3）Whether there is abnormal noise and abnormal smell;

4）Confirm that the ventilation grid is not blocked;

5）Check whether all fans are operating normally and confirm that there is wind blowing out from the machine. The life of the fan will be shortened under high temperature environment;

6）Measure and record the three-phase input voltage of the equipment;

7）Measure and record the current of each phase of the equipment input. If the measured value is significantly different from the previous one, record the size, type and location of the newly added load, which is helpful to help analyze whether a failure will occur.

2.2 Monthly inspection

1）First check according to the content of daily inspection;

2）Shut down according to the shutdown procedure, wait 10 minutes, and then check when the DC side capacitor voltage drops to a safe voltage;

3）Check the aging, wear and over temperature traces of power cables and signal cables, and check whether the power cables and signal cables are firmly connected;

4）Use a vacuum cleaner to remove surface impurities, and use low-pressure air to remove the dust from the cooling air duct to keep the air duct clear.

3. Other checks

1）Input / output cable insulation jacket and connection end inspection: periodic inspection is recommended. At this time, the device needs to be completely powered off, and the inspection period is preferably not more than 1 year;

6. Handling of common abnormal problems

When the equipment stops during operation, the abnormal information will be saved in the event record, and the user can analyze and deal with it according to the saved fault information.

Table 6.1 Problems and treatment of field installation wiring debugging

Serial number	Problem Description	Cause Analysis	Approach
1	The active power of the touch screen view interface is negative	The current direction of the A transformer, or its secondary signal line is reversed, or the three-phase current and the three-phase voltage are not in one-to-one correspondence;	Check if the current direction of A transformer is from P1 to P2? S1 is connected to terminal block A-S1, S2 is connected to terminal block A-S2? Check the sequence of three-phase voltage and current in one-to-one correspondence?
2	Start-up emergency stop protection	The emergency stop button is pressed, or the module DI1 port and port C are not short-circuited;	If the emergency stop button is pressed, release the emergency stop button; if there is no emergency stop button, and port DI1 and port C are not short-circuited, short-circuit with a wire.
3	The fan does not rotate after the device is started	Fan failure：abnormal 24V power supply; missing fan control signal;	Check whether the fan cable is disconnected; check whether the fan is damaged (such as fan motor failure); check whether the 24V power supply is normal;
1) In the case of load current, the secondary side of the transformer cannot be opened, otherwise the transformer may be damaged, so the secondary side needs to be shorted with a shorting piece.			

7. Accessory List

1. Dimensions	444mm (width) × 149mm (height) × 609mm (depth)		
2. Weight	24.5kg		
3. Accessories			
N0.	Name	Specification	Quantity
1	Mounting bracket		4
2	Terminals	3P	1(already installed on the product)
3	Terminals	6P	2(already installed on the product)
4	Bridge piece	EBL2-5	1(already installed on the product)
5	Cross recessed pan head screws	M5×12	8
6	Test record		1
7	Instructions	Power Quality Product User Manual	1

Appendix: Communication Address Table

Address		R/W type	Data type	Data format	Name	Description
Hex.	Decimal					
0x0	0	R/W	long	D*1	Run_ST	Protection mark
0x2	2	R	long	D*1	FilterFlag	Harmonic enable flag (display 0 means off, display 1 means on)
0x4	4	R	long	D*1	PH_En_Flag	Imbalance enable flag (display 0 means off, display 1 means on)
0x6	6	R	long	D*1	Q_En_Flag	Reactive enable flag (display 0 means off, display 1 means on)
0x8	8	R	long	D*1	AutoResetFlag	Self-reset enable flag (display 0 means off, display 1 means on)
0xA	10	R	long	D*1	OnOffFlag	Start flag (display 0 means off, display 1 means on)
0xC	12	R	long	D*0.01	DC+	DC bus upper side voltage xxxx.xxV
0xE	14	R	long	D*0.01	DC-	DC bus lower voltage xxxx.xxV
0x10	16	R	long	D*0.01	DC	DC bus total voltage xxxx.xxV
0x12	18	R	long	D*0.01	Ia_Out	Device L1 output current value xxx.xxA
0x14	20	R	long	D*0.01	Ib_Out	Device L2 output current value xxx.xxA
0x16	22	R	long	D*0.01	Ic_Out	Device L3 output current value xxx.xxA
0x18	24	R	long	D*0.01	In_Out	Device LN output current value xxx.xxA
0x1A	26	R	long	D*0.01	Uan	Phase L1 grid side voltage xxx.xxV
0x1C	28	R	long	D*0.01	Ubn	Phase L2 grid side voltage xxx.xxV
0x1E	30	R	long	D*0.01	Ucn	Phase L3 grid side voltage xxx.xxV
0x20	32	R	long	D*0.01	Ia	Phase L1 grid side current xxx.xxA
0x22	34	R	long	D*0.01	Ib	Phase L2 grid side current xxx.xxA
0x24	36	R	long	D*0.01	Ic	Phase L3 grid side current xxx.xxA
0x26	38	R	long	D*0.01	In	Phase LN grid side current xxx.xxA

0x28	40	R	long	D*0.01	Pa_Sys	Phase L1 grid side active power xxx.xxkw
0x2A	42	R	long	D*0.01	Pb_Sys	Phase L2 grid side active power xxx.xxkw
0x2C	44	R	long	D*0.01	Pc_Sys	Phase L3 grid side active power xxx.xxkw
0x2E	46	R	long	D*0.01	P_Sys	Grid side active power xxx.xxkw
0x30	48	R	long	D*0.01	Qa_Sys	Phase L1 grid side reactive power
0x32	50	R	long	D*0.01	Qb_Sys	Phase L2 grid side reactive power
0x34	52	R	long	D*0.01	Qc_Sys	Phase L3 grid side reactive power
0x36	54	R	long	D*0.01	Q_Sys	Grid side reactive power
0x38	56	R	long	D*0.01	Sa_Sys	Phase L1 grid side apparent power
0x3A	58	R	long	D*0.01	Sb_Sys	Phase L2 grid side apparent power
0x3C	60	R	long	D*0.01	Sc_Sys	Phase L3 grid side apparent power
0x3E	62	R	long	D*0.01	S_Sys	Grid side apparent power
0x40	64	R	long	D*0.001	Pfa_Sys	Phase L1 grid side power factor
0x42	66	R	long	D*0.001	Pfb_Sys	Phase L2 grid side power factor
0x44	68	R	long	D*0.001	Pfc_Sys	Phase L3 grid side power factor
0x46	70	R	long	D*0.001	Pf	Grid side power factor xxx.x
0x48	72	R	long	D*0.01	Thd_Sys	Grid side current harmonics distortion rate xxx.xx%
0x4A	74	R	long	D*0.01	SysUnbalance	Grid side current imbalance rate
0x4C	76	R	long	D*0.01	Ia_Load	Load side current L1
0x4E	78	R	long	D*0.01	Ib_Load	Load side current L2
0x50	80	R	long	D*0.01	Ic_Load	Load side current L3
0x52	82	R	long	D*0.01	In_Load	Load side current LN
0x54	84	R	long	D*0.01	LoadUnbalance	Load side current imbalance rate
0x56	86	R	long	D*0.01	Ia_LCL	Phase L1 capacitor filter current xxx.xx
0x58	88	R	long	D*0.01	Ib_LCL	Phase L2 capacitor filter current xxx.xx
0x5A	90	R	long	D*0.01	Ic_LCL	Phase L3 capacitor filter current xxx.xx
0x5C	92	R	long	D*0.01	In_LCL	Phase LN capacitor filter current xxx.xx

0x5E	94	R	long	D*0.1	Tem_L1-1	IGBT L1 phase temperature *0.1
0x60	96	R	long	D*0.1	Tem_L2-1	IGBT L2 phase temperature*0.1
0x62	98	R	long	D*0.1	Tem_L3-1	IGBT L3 phase temperature*0.1
0x64	100	R	long	D*0.1	Tem_ L1-2	IGBT L1 phase temperature *0.1
0x66	102	R	long	D*0.1	Tem_ L2-2	IGBT L2 phase temperature*0.1
0x68	104	R	long	D*0.1	Tem_ L3-2	IGBT L3 phase temperature*0.1
0x6A	106	R	long	D*0.01	THI02	2nd harmonic current calculation percentage XXX.XX%
0x6C	108	R	long	D*0.01	THI03	3rd harmonic current calculation percentage
0x6E	110	R	long	D*0.01	THI04	4th harmonic current calculation percentage
0x70	112	R	long	D*0.01	THI05	5th harmonic current calculation percentage
0x72	114	R	long	D*0.01	THI06	6th harmonic current calculation percentage
0x74	116	R	long	D*0.01	THI07	7th harmonic current calculation percentage
0x76	118	R	long	D*0.01	THI08	8th harmonic current calculation percentage
0x78	120	R	long	D*0.01	THI09	9th harmonic current calculation percentage
0x7A	122	R	long	D*0.01	THI10	10th harmonic current calculation percentage
0x7C	124	R	long	D*0.01	THI11	11th harmonic current calculation percentage
0x7E	126	R	long	D*0.01	THI12	12th harmonic current calculation percentage
0x80	128	R	long	D*0.01	THI13	13th harmonic current calculation percentage
0x82	130	R	long	D*0.01	THI14	14th harmonic current calculation percentage
0x84	132	R	long	D*0.01	THI15	15th harmonic current calculation percentage
0x86	134	R	long	D*0.01	THI16	16th harmonic current calculation percentage

0x88	136	R	long	D*0.01	THI17	17th harmonic current calculation percentage
0x8A	138	R	long	D*0.01	THI18	18th harmonic current calculation percentage
0x8C	140	R	long	D*0.01	THI19	19th harmonic current calculation percentage
0x8E	142	R	long	D*0.01	THI20	20th harmonic current calculation percentage
0x90	144	R	long	D*0.01	THI21	21st harmonic current calculation percentage
0x92	146	R	long	D*0.01	THI22	22nd harmonic current calculation percentage
0x94	148	R	long	D*0.01	THI23	23rd harmonic current calculation percentage
0x96	150	R	long	D*0.01	THI24	24th harmonic current calculation percentage
0x98	152	R	long	D*0.01	THI25	25th harmonic current calculation percentage
0x9A	154	R	long	D*0.01	THI02_Load	2nd harmonic current calculation percentage XXX.XX%
0x9C	156	R	long	D*0.01	THI03_Load	3rd harmonic current calculation percentage
0x9E	158	R	long	D*0.01	THI04_Load	4th harmonic current calculation percentage
0xA0	160	R	long	D*0.01	THI05_Load	5th harmonic current calculation percentage
0xA2	162	R	long	D*0.01	THI06_Load	6th harmonic current calculation percentage
0xA4	164	R	long	D*0.01	THI07_Load	7th harmonic current calculation percentage
0xA6	166	R	long	D*0.01	THI08_Load	8th harmonic current calculation percentage
0xA8	168	R	long	D*0.01	THI09_Load	9th harmonic current calculation percentage
0xAA	170	R	long	D*0.01	THI10_Load	10th harmonic current calculation percentage
0xAC	172	R	long	D*0.01	THI11_Load	11th harmonic current calculation

						percentage
0xAE	174	R	long	D*0.01	THI12_Load	12th harmonic current calculation percentage
0xB0	176	R	long	D*0.01	THI13_Load	13th harmonic current calculation percentage
0xB2	178	R	long	D*0.01	THI14_Load	14th harmonic current calculation percentage
0xB4	180	R	long	D*0.01	THI15_Load	15th harmonic current calculation percentage
0xB6	182	R	long	D*0.01	THI16_Load	16th harmonic current calculation percentage
0xB8	184	R	long	D*0.01	THI17_Load	17th harmonic current calculation percentage
0xBA	186	R	long	D*0.01	THI18_Load	18th harmonic current calculation percentage
0xBC	188	R	long	D*0.01	THI19_Load	19th harmonic current calculation percentage
0xBE	190	R	long	D*0.01	THI20_Load	20th harmonic current calculation percentage
0xC0	192	R	long	D*0.01	THI21_Load	21st harmonic current calculation percentage
0xC2	194	R	long	D*0.01	THI22_Load	22nd harmonic current calculation percentage
0xC4	196	R	long	D*0.01	THI23_Load	23rd harmonic current calculation percentage
0xC6	198	R	long	D*0.01	THI24_Load	24th harmonic current calculation percentage
0xC8	200	R	long	D*0.01	THI25_Load	25th harmonic current calculation percentage
0xCA	202	R	long	D*0.01	IA1_OUT	L1-1 phase output current value xxx.xxxa
0xCC	204	R	long	D*0.01	IB1_OUT	L2-1 phase output current value xxx.xxxa

0xCE	206	R	long	D*0.01	IC1_OUT	L3-1 phase output current value xxx.xxxa
0xD0	208	R	long	D*0.01	IA2_OUT	L1-2 phase output current value xxx.xxxa
0xD2	210	R	long	D*0.01	IB2_OUT	L2-2 phase output current value xxx.xxxa
0xD4	212	R	long	D*0.01	IC2_OUT	L3-2phase output current value xxx.xxxa
0xD5	213	R	int	D*0.1	Temp_In	Internal temperature
0xD6	214	R	int	D*0.1	Temp_Fan	Outlet temperature

Protection mark

The 0th	DC bus over-voltage protection	The 7th	DC bus under-voltage protection
The 1st	AC grid over-voltage protection	The 8th	LCL topology C branch overload protection
The 2nd	AC grid under-voltage protection	The 9th	Grid voltage Ud off-limit protection
The 3rd	Contactor abnormal protection	The 10th	Grid voltage sum off-limit protection
The 4th	Module IGBT over-temperature protection	The 11th	Null
The 5th	Module output over-current protection	The 12th	AC grid voltage phase loss protection
The 6th	Module emergency stop protection	The 7th	DC bus under-voltage protection