Elecnova

Power Quality Products

User Manual

JIANGSU SFERE ELECTRIC CO., LTD.

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

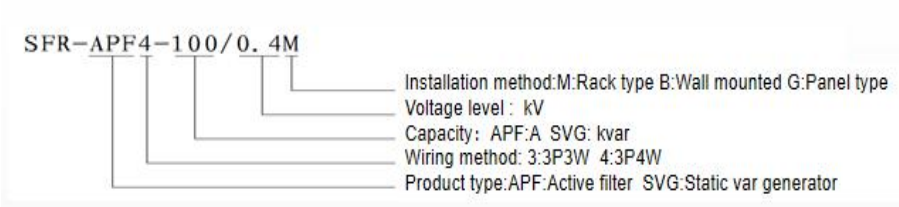
1. Introduction

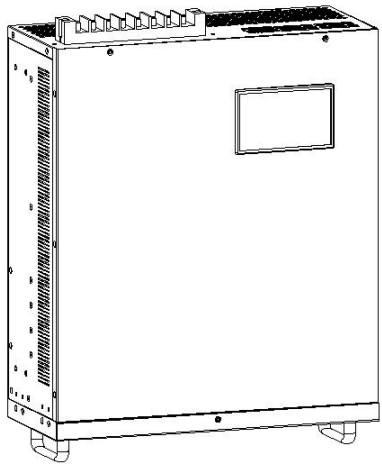
1.1 Overview

Power quality products include active harmonic filters (SVG) 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, subways, ships).

1.2 Model selection





2. Technical specification

2.1 Technical parameters

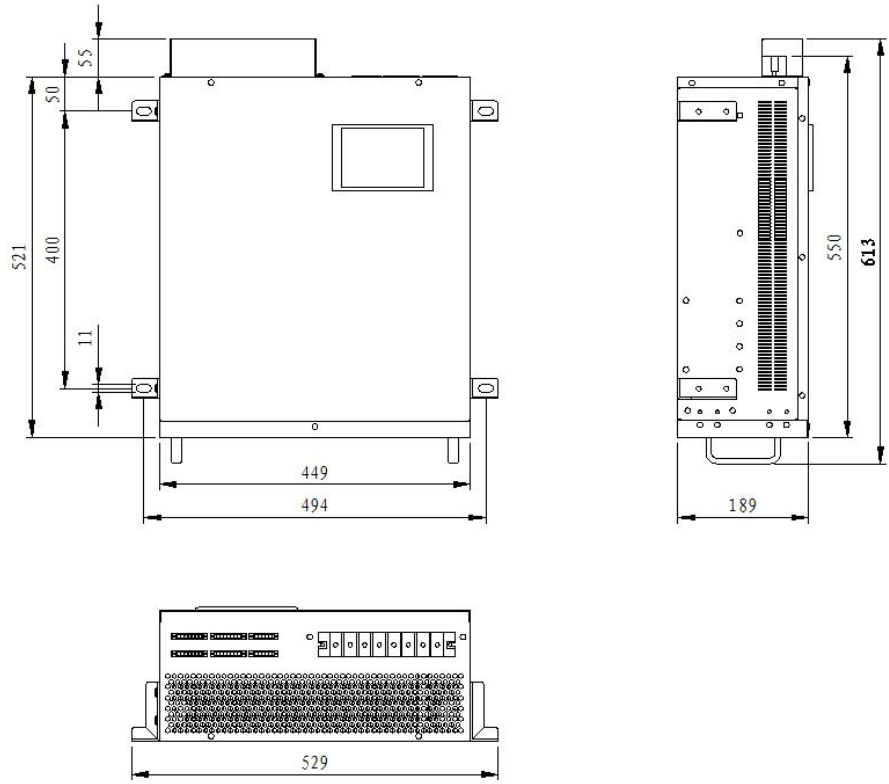
Input	
System voltage	Line voltage 400V
System voltage range	±15%
Frequency	50/60Hz ±5%
Output and installation	
Capacity specification	75A
Module type	Wall-mounted
Incoming way	Upper incoming
Performance	
Harmonics filtering rate	≥85% (Within the range of the ordered capacity, and the load harmonic 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）	Modbus-RTU, with remote monitoring interface and background database, it is convenient for users to run various parameters on the Internet terminal monitoring equipment
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)

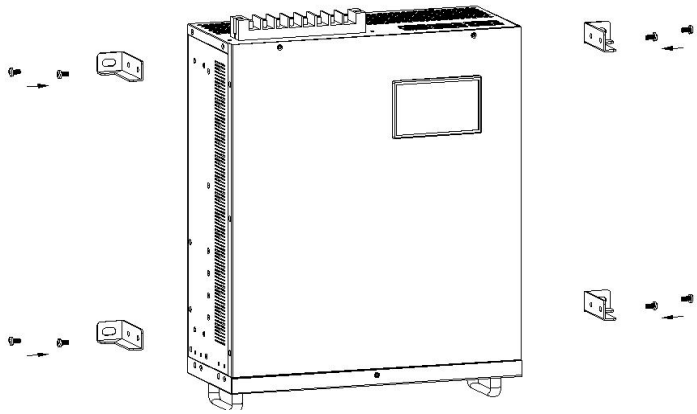
3. Installation

3.1 Installation instructions and dimensions

wall-mounted dimensions



Installation diagram



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

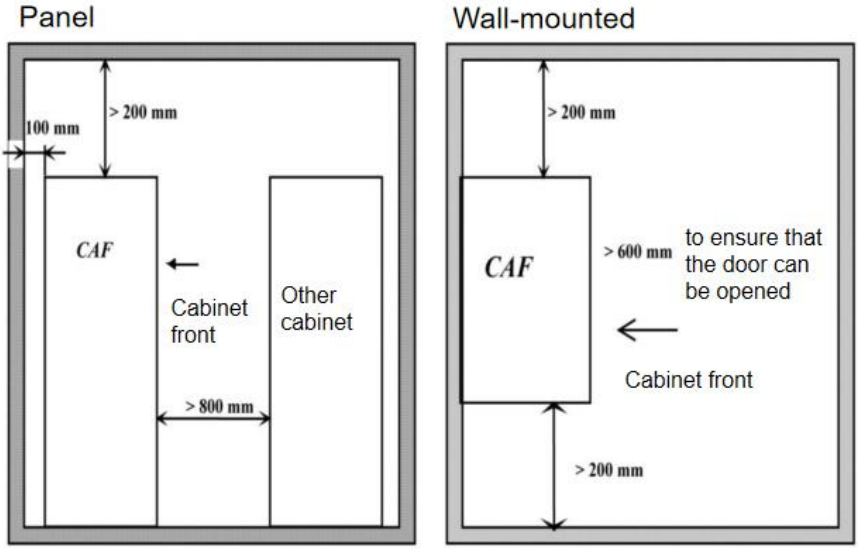


Figure 3-1 Device installation diagram

⚠ 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

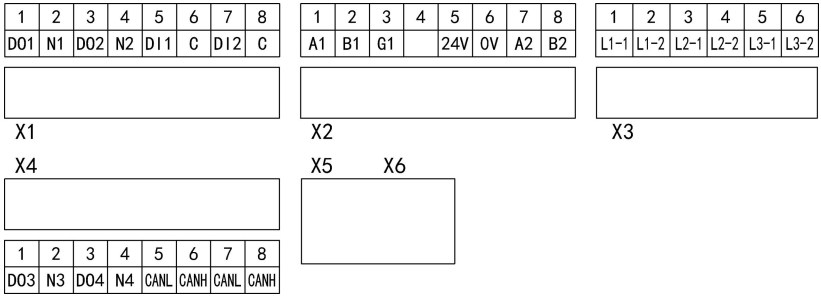
The device should be placed in a storage environment that meets the requirements, and the storage time should not exceed 3 months.

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



Port type	Port No.	Function/description
X1 control signal port	DO1	Device fault relay output
	N1	
	DO2	Relay output for device start-up operation
	N2	
	DI1	Device emergency stop input port (connected to external "normally closed" emergency stop button)
	C	
	DI2	Can be connected to the external start switch input port (connected to the external "normally open" start / stop button)
	C	

X2 communication signal port	A1	External communication interface A1
	B1	External communication interface B1
	G1	External communication interface G1
	Null	
	24V	Power output positive +24V (power supply for HMI touch screen)
	0V	Power output negative 0V (power supply for HMI touch screen)
	A2	Connect RS485 + to HMI touch screen DB9 serial cable (red indenter)
	B2	Connect RS485 - to HMI touch screen DB9 serial cable (black indenter)
X3 transformer signal port	L1-1	L1 phase current detection 1 input port (connected to phase A transformer S1)
	L1-2	L1 phase current detection 2 input port (connected to phase A transformer S2)
	L2-1	L2 phase current detection 1 input port (connected to phase B transformer S1)
	L2-2	L2 phase current detection 2 input port (connected to phase B transformer S2)
	L3-1	L3 phase current detection 1 input port (connected to phase C transformer S1)
	L3-2	L3 phase current detection 2 input port (connected to phase C transformer S2)
X4 port	DO3	Alarm Relay Output 1
	N3	
	DO4	Alarm Relay Output 2

	N4	
	CANL	CAN communication interface, default does not have this function
	CANH	
X5/X6		Online with other modules via network cable

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 mm2 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 SVG in the specification model has no N line; 4L SVG 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 mm2 insulated heat-resistant flexible cable		
120A-160A	Copper core is 70 mm2 insulated heat-resistant flexible cable		
160A-220A	Copper core is 90 mm2(or 2 pcs of 50mm2) insulated heat-resistant flexible cable		
220A-300A	Copper core is 120 mm2(or 2 pcs of 70mm2) insulated heat-resistant flexible cable		
300A-400A	Copper core is 2 pcs of 90mm2 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 SVG 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 SVGs.

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 mm2; 15m-30m: RVVSP 2 × 4 mm2.

3.4.3 Cable connections

Precautions

- To ensure safety, make sure that the power supply equipment (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 SVG and user equipment;

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 SVG 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).

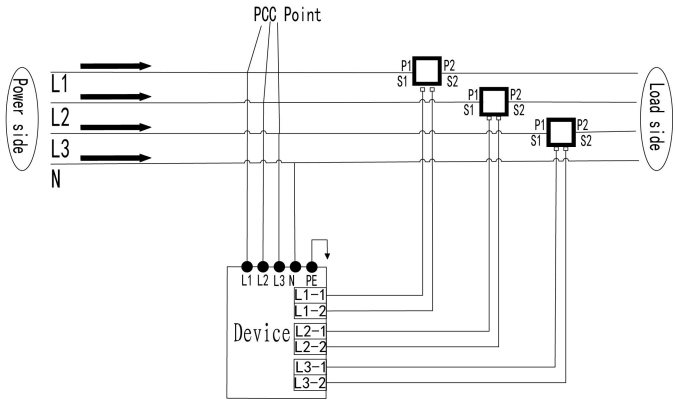


Figure 3-2A Correct power distribution method (transformer is located behind PCC point)

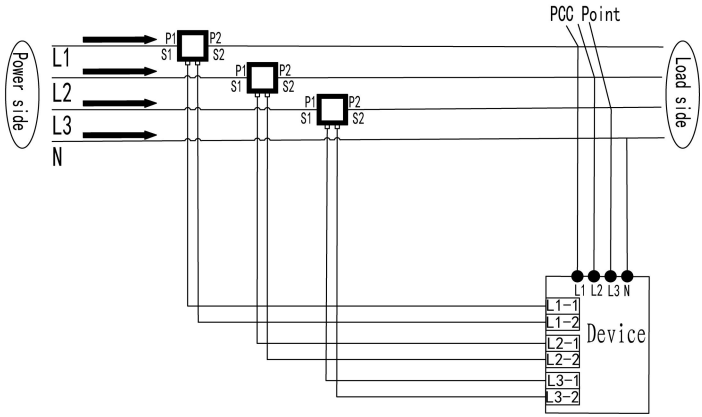


Figure 3-2B Correct power distribution method (transformer is located in front of PCC point)

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" and the password 123456 to enter the secondary menu selection shown in Figure 4-2. The factory setting interface requires permission to enter.

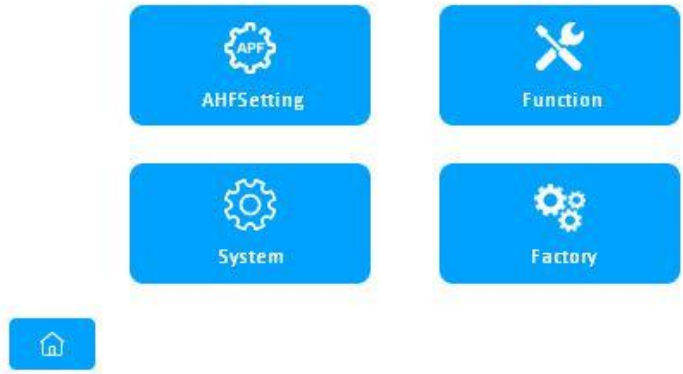


Figure 4-2 Setting selection interface

(2) Click "SVG 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.

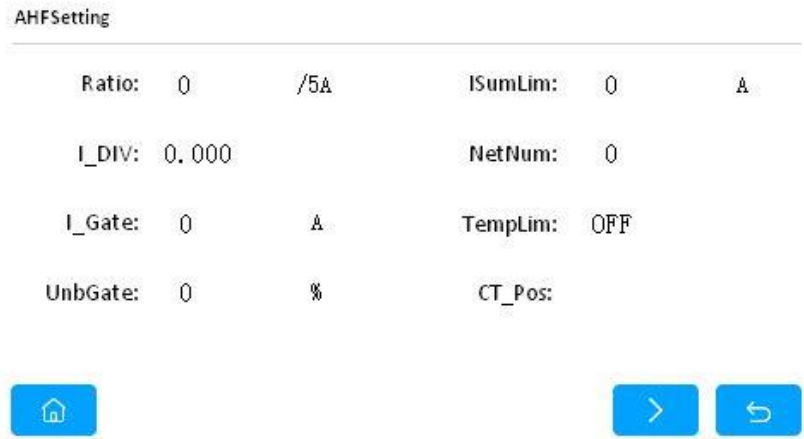


Figure 4-2 (1) Touch screen SVG setting interface

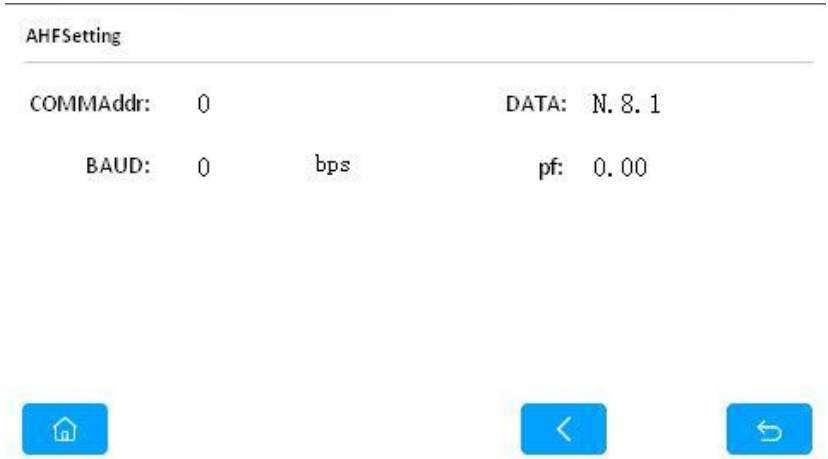


Figure 4-2 (2) Touch screen SVG setting interface

Table 4-1 User parameter settings

Name	Meaning	Range	Remarks
Ratio	Transformer ratio of current sampling transformer	0 ～ 20000	Set according to the situation
Shunt coefficient	Reciprocal number of parallel machines	0～1	
Threshold current	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
Unbalanced threshold	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

Total current limit	Maximum output current	0～50	Default 50
Number of parallel machines	Number of unit modules running in parallel	1～8	
Temperature limit	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 position	Select transformer location	Load or grid	1: grid side; 2: load side
Communicating address	External address	1～243	
Baud rate	Baud rate for external communications	2400 ～ 38400	Default 9600
Data Format	Data format of external communication	N.8.1	
Power factor	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%.

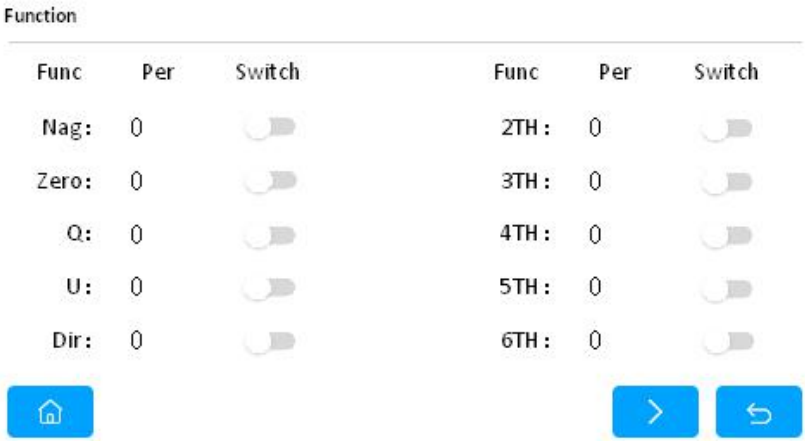


Figure 4-3 (1) Touch screen function setting interface

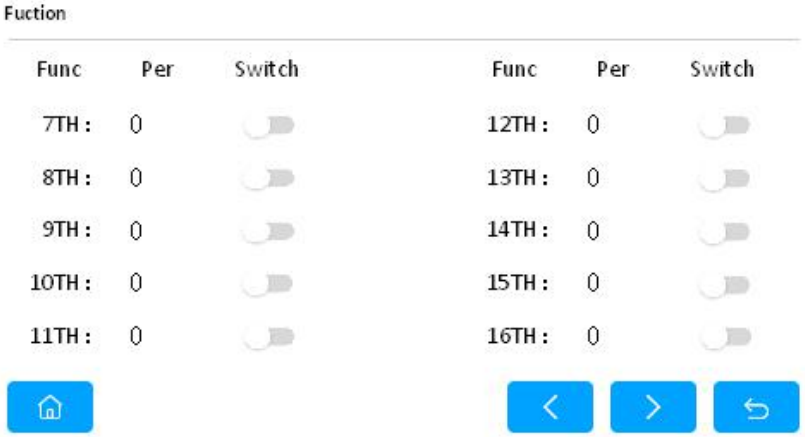


Figure 4-3 (2) Touch screen function setting interface

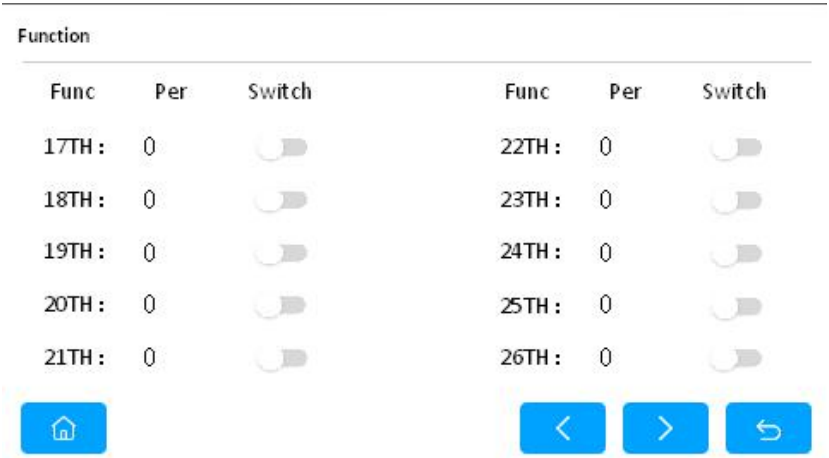


Figure 4-3 (3) Touch screen function setting interface

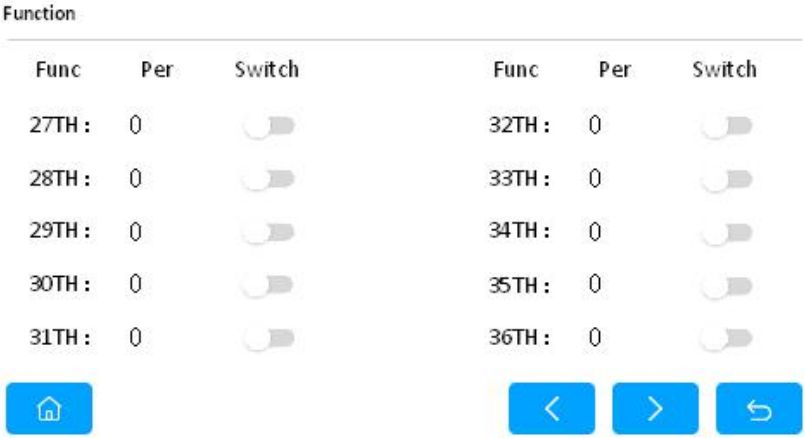


Figure 4-3 (4) Touch screen function setting interface

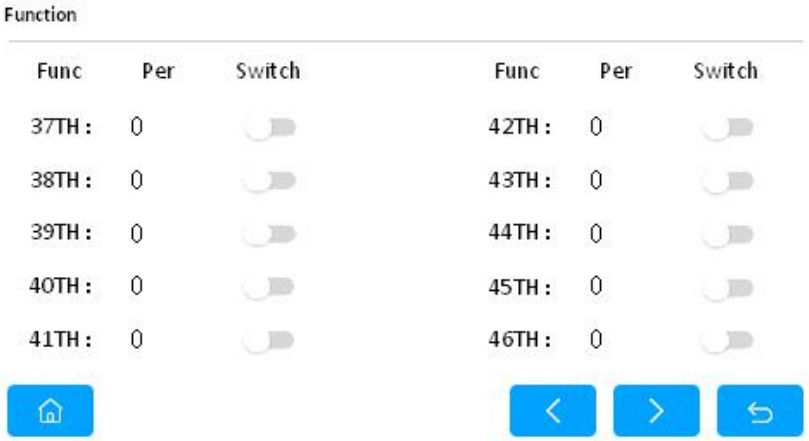


Figure 4-3 (5) Touch screen function setting interface

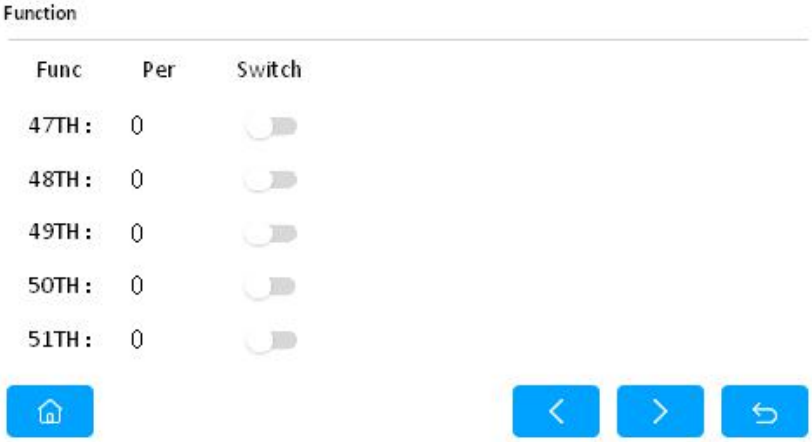


Figure 4-3 (6) Touch screen function setting interface

The user can also set the alarm settings for DO3 and DO4, 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.

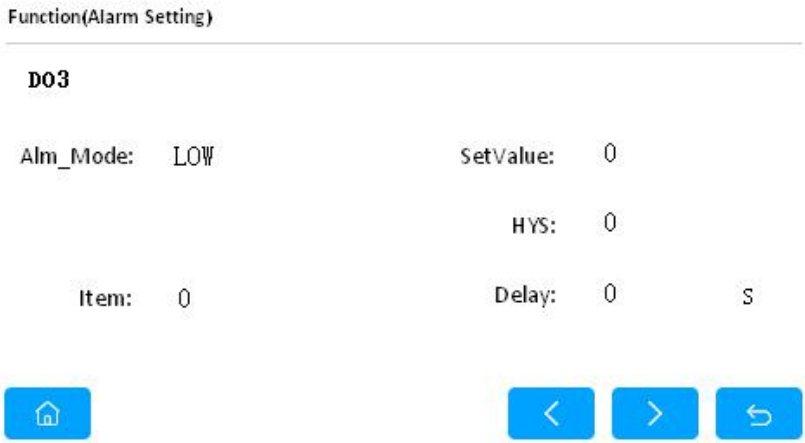


Figure 4-3 (7) Touch screen function setting DO3 alarm setting interface

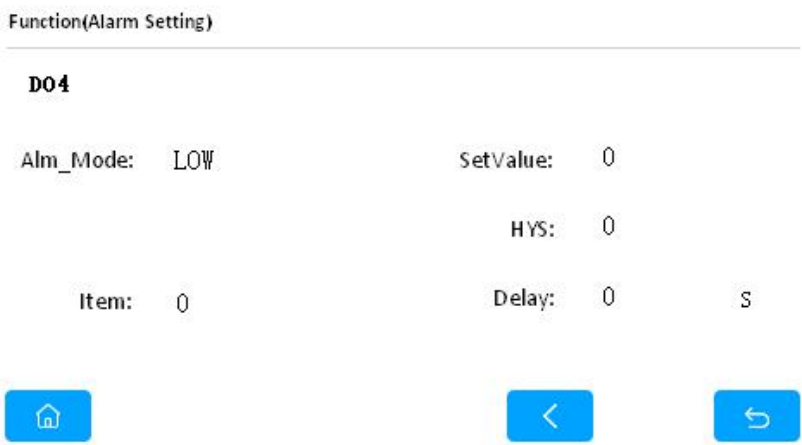


Figure 4-3 (8) Touch screen function setting DO4 alarm setting interface

Table 4-2 Comparison of alarm item serial numbers

Serial number	Parameter	Description	Serial number	Parameter	Description
1	COM	Communication control	25	S1	Grid apparent power, unit 1kw
2	ON_OFF	switch	26	S2	
3	DC_POS	Upper bus	27	S3	
4	DC_NEG	Lower bus	28	SZ	
5	DC_BUS	Busbar	29	PF1	Grid power factor, unit 0.001
6	I1_OUT	Output current, unit 1A	30	PF2	
7	I2_OUT		31	PF3	
8	I3_OUT		32	PFZ	
9	IN_OUT		33	THDI	Harmonic current
10	U1N	Grid phase voltage, unit 1V	34	I1_LOAD	Load current, unit 1A
11	U2N		35	I2_LOAD	
12	U3N		36	I3_LOAD	

13	I1_SYS	Grid current, unit 1A	37	IN_LOAD	
14	I2_SYS		38	I1_LCL,	Capacitance current, unit 1A
15	I3_SYS		39	I2_LCL	
16	IN_SYS		40	I3_LCL	
17	P1_SYS	Grid active power, unit 1kw	41	IN_LCL	
18	P2_SYS		42	TEMP_1	Temperature, unit 1 ℃
19	P3_SYS		43	TEMP_2	
20	PZ_SYS		44	TEMP_3	
21	Q1_SYS	Grid reactive power, unit 1kvar	45	TEMP_FAN	
22	Q2_SYS		46	TEMP_IN1	
23	Q3_SYS		47	TEMP_IN2	
24	QZ_SYS		48	Disconnect	

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

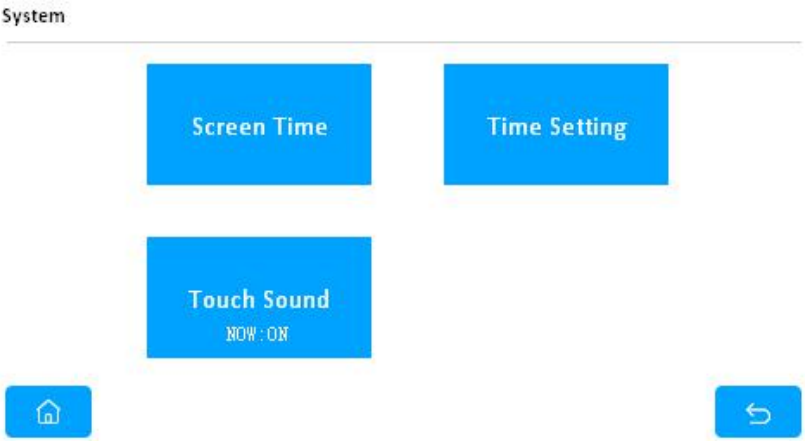


Figure 4-4 Touch screen system setting interface

[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 start button, the device starts to start, after about 15S the device

starts to finish.

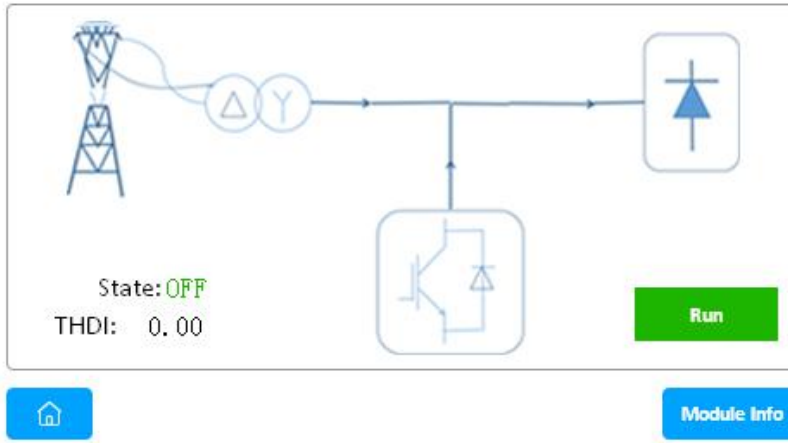


Figure 4-5 System information interface

[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).

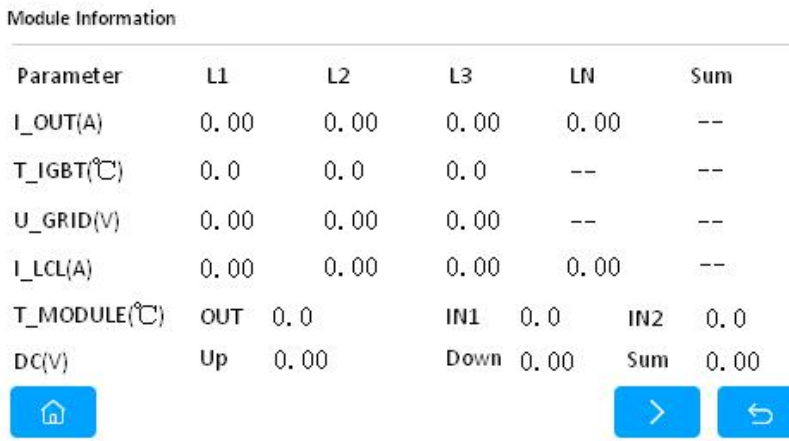


Figure 4-6 (1) Touch screen module information interface

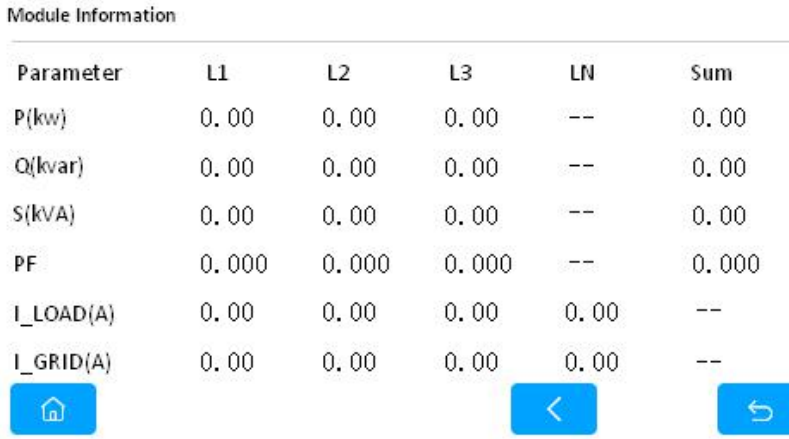


Figure 4-6 (2) Touch screen module information interface

4.2.2 Shut down

[Step 1] Click the 

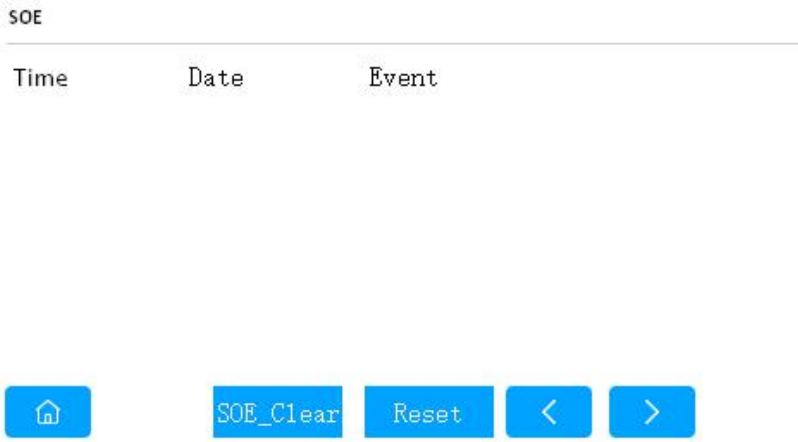
button on the system information interface, the device will stop.

[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 Fault 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.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;

2） Lightning protection inspection: The lightning protection indicator needs to be opened before the front door can be observed, so it is recommended to follow the

monthly inspection method. However, daily inspections are required in heavy and wet seasons, especially after lightning strikes occur near the equipment, in order to discover problems in real time and timely maintenance.

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 L1 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 L1 transformer is from P1 to P2? S1 is connected to terminal block L1-1, S2 is connected to terminal block L1-2? 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	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);

	started		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	529mm (width) × 613mm (height) × 189mm (deep)		
2. Weight	33kg		
3. Accessories			
Serial number	Name	Specification	Quantity
1	Terminals	KF2EDGKM-5.08-8P	4 (already installed on the product)
2	Terminals	KF2EDGKM-5.08-6P	2 (already installed on the product)
3	Incoming protective cover		1
4	Bridge piece	EBL2-5	1 (already installed on the product)
5	Wall mount bracket (left)		2
6	Wall mount bracket (right)		2
7	Cross recessed pan head screws	Spring washer and flat washer assembly M4 × 8	2
8	Cross recessed hexagon head bolts	Spring washer and flat washer assembly M6 × 12	8
9	test record		1
10	Instructions	Power Quality Product User Manual	1
11	Certificate of conformity		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	I1_Out	Device L1 output current value xxx.xxA
0x14	20	R	long	D*0.01	I2_Out	Device L2 output current value xxx.xxA
0x16	22	R	long	D*0.01	I3_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	U1n	Phase L1 grid side voltage xxx.xxV
0x1C	28	R	long	D*0.01	U2n	Phase L2 grid side voltage xxx.xxV
0x1E	30	R	long	D*0.01	U3n	Phase L3 grid side voltage xxx.xxV
0x20	32	R	long	D*0.01	I1	Phase L1 grid side current xxx.xxA
0x22	34	R	long	D*0.01	I2	Phase L2 grid side current xxx.xxA

0x24	36	R	long	D*0.01	I3	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	P1_Sys	Phase L1 grid side active power xxx.xxkw
0x2A	42	R	long	D*0.01	P2_Sys	Phase L2 grid side active power xxx.xxkw
0x2C	44	R	long	D*0.01	P3_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	Q1_Sys	Phase L1 grid side reactive power
0x32	50	R	long	D*0.01	Q2_Sys	Phase L2 grid side reactive power
0x34	52	R	long	D*0.01	Q3_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	S1_Sys	Phase L1 grid side apparent power
0x3A	58	R	long	D*0.01	S2_Sys	Phase L2 grid side apparent power
0x3C	60	R	long	D*0.01	S3_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	Pf1_Sys	Phase L1 grid side power factor
0x42	66	R	long	D*0.001	Pf2_Sys	Phase L2 grid side power factor
0x44	68	R	long	D*0.001	Pf3_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	I1_Load	Load side current L1
0x4E	78	R	long	D*0.01	I2_Load	Load side current L2
0x50	80	R	long	D*0.01	I3_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	I1_LCL	Phase L1 capacitor filter current xxx.xx
0x58	88	R	long	D*0.01	I2_LCL	Phase L2 capacitor filter current xxx.xx
0x5A	90	R	long	D*0.01	I3_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_1	IGBT L1 phase temperature *0.1
0x60	96	R	long	D*0.1	Tem_2	IGBT L2 phase temperature*0.1
0x62	98	R	long	D*0.1	Tem_3	IGBT L3 phase temperature*0.1
0x64	100	R	long	D*0.1	Tem_FAN	Module outlet temperature *0.1
0x66	102	R	long	D*0.1	Tem_L1	Module internal temperature 1 *0.1
0x68	104	R	long	D*0.1	Tem_L2	Module internal temperature 2 *0.1
0x6A	106	R	long	D*0.01	HRI02	2nd harmonic current calculation percentage XXX.XX%
0x6C	108	R	long	D*0.01	HRI03	3rd harmonic current calculation percentage
0x6E	110	R	long	D*0.01	HRI04	4th harmonic current calculation percentage
0x70	112	R	long	D*0.01	HRI05	5th harmonic current calculation percentage
0x72	114	R	long	D*0.01	HRI06	6th harmonic current calculation percentage
0x74	116	R	long	D*0.01	HRI07	7th harmonic current calculation percentage
0x76	118	R	long	D*0.01	HRI08	8th harmonic current calculation percentage
0x78	120	R	long	D*0.01	HRI09	9th harmonic current calculation

						percentage
0x7A	122	R	long	D*0.01	HRI10	10th harmonic current calculation percentage
0x7C	124	R	long	D*0.01	HRI11	11th harmonic current calculation percentage
0x7E	126	R	long	D*0.01	HRI12	12th harmonic current calculation percentage
0x80	128	R	long	D*0.01	HRI13	13th harmonic current calculation percentage
0x82	130	R	long	D*0.01	HRI14	14th harmonic current calculation percentage
0x84	132	R	long	D*0.01	HRI15	15th harmonic current calculation percentage
0x86	134	R	long	D*0.01	HRI16	16th harmonic current calculation percentage
0x88	136	R	long	D*0.01	HRI17	17th harmonic current calculation percentage
0x8A	138	R	long	D*0.01	HRI18	18th harmonic current calculation percentage
0x8C	140	R	long	D*0.01	HRI19	19th harmonic current calculation percentage
0x8E	142	R	long	D*0.01	HRI20	20th harmonic current calculation percentage
0x90	144	R	long	D*0.01	HRI21	21st harmonic current calculation percentage
0x92	146	R	long	D*0.01	HRI22	22nd harmonic current calculation percentage
0x94	148	R	long	D*0.01	HRI23	23rd harmonic current calculation percentage
0x96	150	R	long	D*0.01	HRI24	24th harmonic current calculation

						percentage
0x98	152	R	long	D*0.01	HRI25	25th harmonic current calculation percentage
0x9A	154	R	long	D*0.01	HRI26	26th harmonic current calculation percentage
0x9C	156	R	long	D*0.01	HRI27	27th harmonic current calculation percentage
0x9E	158	R	long	D*0.01	HRI28	28th harmonic current calculation percentage
0xA0	160	R	long	D*0.01	HRI29	29th harmonic current calculation percentage
0xA2	162	R	long	D*0.01	HRI30	30th harmonic current calculation percentage
0xA4	164	R	long	D*0.01	HRI31	31st harmonic current calculation percentage
0xA6	166	R	long	D*0.01	HRI32	32nd harmonic current calculation percentage
0xA8	168	R	long	D*0.01	HRI33	33rd harmonic current calculation percentage
0xAA	170	R	long	D*0.01	HRI34	34th harmonic current calculation percentage
0xAC	172	R	long	D*0.01	HRI35	35th harmonic current calculation percentage
0xAE	174	R	long	D*0.01	HRI36	36th harmonic current calculation percentage
0xB0	176	R	long	D*0.01	HRI37	37th harmonic current calculation percentage
0xB2	178	R	long	D*0.01	HRI38	38th harmonic current calculation percentage
0xB4	180	R	long	D*0.01	HRI39	39th harmonic current calculation

						percentage
0xB6	182	R	long	D*0.01	HRI40	40th harmonic current calculation percentage
0xB8	184	R	long	D*0.01	HRI41	41st harmonic current calculation percentage
0xBA	186	R	long	D*0.01	HRI42	42nd harmonic current calculation percentage
0xBC	188	R	long	D*0.01	HRI43	43rd harmonic current calculation percentage
0xBE	190	R	long	D*0.01	HRI44	44th harmonic current calculation percentage
0xC0	192	R	long	D*0.01	HRI45	45th harmonic current calculation percentage
0xC2	194	R	long	D*0.01	HRI46	46th harmonic current calculation percentage
0xC4	196	R	long	D*0.01	HRI47	47th harmonic current calculation percentage
0xC6	198	R	long	D*0.01	HRI48	48th harmonic current calculation percentage
0xC8	200	R	long	D*0.01	HRI49	49th harmonic current calculation percentage
0xCA	202	R	long	D*0.01	HRI50	50th harmonic current calculation percentage

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

The information in this document is subject to changes without any further notice.