High Protection Series Power Quality Products APF/SVG/ASVG

User Manual

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Our company provides customers with a full range of technical support, users can contact the nearest company office or customer service center, or directly contact the company headquarters.

Special statement

- Personal Safety

  1. The installation of this product must be carried out by the professional engineer of the manufacturer or the manufacturer's authorized agent, and the debugging must be carried out by the engineer designated by the manufacturer, otherwise it may lead to product failure or endanger personal safety.

  2. Before installing and debugging this product, be sure to read this product manual and safety matters in detail, otherwise it may lead to product failure or endanger personal safety.

  3. This product should not be used as a power supply for any life support equipment.

- Equipment Safety

  1. If stored or left unused for a long time, this product must be placed in a dry, clean and specified temperature range.

  2. When the distortion rate of grid voltage is higher than 15%, the user needs to put forward special instructions in order to propose different solutions.

  3. This product should be used in an appropriate working environment (see the environmental requirements section of this product manual for details).

It is forbidden to use this product in the following work environments:

- High temperature, low temperature or humid places that exceed the technical specifications of this product'.
- Places where there is vibration and are susceptible to collision.
- Close to heat sources or places with strong electromagnetic field interference.
- Places with corrosive gases and dusts.

Statement of Responsibility

Our company is not responsible for defects or malfunctions caused by the following reasons:

- Exceed the scope of use and working environment specified in the product
- Unauthorized modification or maintenance, wrong installation, improper operation
- Force majeure
- Other matters that violate the provisions of this product manual

This manual covers the following products

	product	
APF High Protection Active Filter - rail mount type	APF 50A	208/400/480Vac Three-phase four-wire/three-phase three-wire 50A modular APF - High Protection -Rail mount
	APF 75A	208/400/480Vac Three-phase four-wire/three-phase three-wire 75A modular APF - High Protection -Rail mount
	APF 100A	208/400/480Vac Three-phase four-wire/three-phase three-wire 100A modular APF - High Protection -Rail mount
	APF 150A	208/400/480Vac Three-phase four-wire/three-phase three-wire 150A modular APF - High Protection -Rail mount
	APF 200A	208/400/480Vac Three-phase four-wire/three-phase three-wire 200A modular APF - High Protection -Rail mount
APF High Protection Active Filter - wall mount type	APF 50A	208/400/480Vac Three-phase four-wire/there-phase three-wire 50A modular APF - High Protection -Wall mount
	APF 75A	208/400/480Vac Three-phase four-wire/there-phase three-wire 75A modular APF - High Protection -Wall mount
	APF 100A	208/400/480Vac Three-phase four-wire/there-phase three-wire 100A modular APF - High Protection -Wall mount
	APF 150A	208/400/480Vac Three-phase four-wire/there-phase three-wire 150A modular APF - High Protection -Wall mount
	APF 200A	208/400/480Vac Three-phase four-wire/there-phase three-wire 200A modular APF - High Protection -Wall mount
SVG High Protection static var generator - rail mount type	SVG 35KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 35KVar(400Vac) modular SVG -High Protection - Rail mount
	SVG 50KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 50KVar(400Vac) modular SVG -High Protection - Rail mount
	SVG 75KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 75KVar(400Vac) modular SVG -High Protection - Rail mount
	SVG 100KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 100KVar(400Vac) modular SVG -High Protection - Rail mount
	SVG 150KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 150KVar(400Vac) modular SVG -High Protection - Rail mount

SVG High Protection static var generator - wall mount type	SVG 35KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 35KVar(400Vac) modular SVG -High Protection - Wall mount
	SVG 50KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 50KVar(400Vac) modular SVG -High Protection - Wall mount
	SVG 75KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 75KVar(400Vac) modular SVG -High Protection - Wall mount
	SVG 100KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 100KVar(400Vac) modular SVG -High Protection - Wall mount
	SVG 150KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 150KVar(400Vac) modular SVG -High Protection - Wall mount
ASVG High Protection static var generator - rail mount type	ASVG 35KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 35KVar(400Vac) modular ASVG -High Protection - Rail mount
	ASVG 50KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 50KVar(400Vac) modular ASVG -High Protection - Rail mount
	ASVG 75KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 75KVar(400Vac) modular ASVG -High Protection - Rail mount
	ASVG 100KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 100KVar(400Vac) modular ASVG -High Protection - Rail mount
	ASVG 150KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 150KVar(400Vac) modular ASVG -High Protection - Rail mount
ASVG High Protection static var generator - wall mount type	ASVG 35KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 35KVar(400Vac) modular ASVG -High Protection - Wall mount
	ASVG 50KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 50KVar(400Vac) modular ASVG -High Protection - Wall mount
	ASVG 75KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 75KVar(400Vac) modular ASVG -High Protection - Wall mount
	ASVG 100KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 100KVar(400Vac) modular ASVG -High Protection - Wall mount
	ASVG 150KVar	208/400/480Vac Three-phase four-wire/three-phase three-wire 150KVar(400Vac) modular ASVG -High Protection - Wall mount

Table of Contents

I Overview

1.1 Security

This manual uses the following safety signs, so be sure to follow them!

Improper use can cause dangerous situations and is highly likely to lead to personal injury or death!

 warning
1. It is strictly forbidden to place flammable materials near this product module, as it poses a fire hazard. 2. It is strictly forbidden to install this product module in an environment containing explosive gases, as it poses a risk of explosion. 3. This product must be wired by a qualified professional to avoid the risk of electric shock. 4. Ensure the input power is completely disconnected before wiring work is carried out, otherwise there is a risk of electric shock. After power is applied, do not touch parts of the product module other than the operation panel. 5. The grounding terminal of this product module must be reliably grounded, as poor grounding can lead to abnormal operation and poses an electric shock hazard. 6. Maintenance operations should be carried out 15 minutes after disconnecting the power to this product, to avoid the risk of electric shock. 7. The exposed parts of the cable lugs in the main circuit wiring must be wrapped with insulating tape to avoid safety hazards.
 warning
1. When handling, do not lift the module of this product by the front panel handle to avoid personal injury or damage to the item. 2. Do not let screws, washers, or metallic foreign objects fall into the module of this product, as this poses a risk of fire and damage to the components. 3. If the module of this product is damaged or components are missing, do not install or operate it, as this poses a risk of fire and personal injury. 4. The main circuit terminals and wire lugs must be securely connected.

1.2 Precautions for Use

Incorrect Installation

If the module of this product is incorrectly installed or applied (such as the current transformer being connected in reverse), it can increase the harmonic current and reactive current in the power system, potentially endangering the power system or other equipment.

Exceeding Input Voltage Value

Please use the module within its rated voltage range. For special circumstances, use a step-up or step-down device.

Lightning Surge Protection

The module of this product is equipped with an overcurrent protection device for lightning strikes. After wiring correctly according to the manual, it has a certain level of self-protection against induced lightning.

1.3 Disposal Precautions

When disposing of this product module, please note:

1.The electrolytic capacitors on the printed circuit board may explode when incinerated.

2.Burning plastic components will produce toxic gases.

3.Please treat it as industrial waste for disposal.

II Mechanical Installation

2.1 Precautions

Warning:Professional installation required
1.Power can be applied to this product module only after obtaining the approval of the commissioning engineer. 2.The installation of this product module must be carried out by qualified engineers according to this user manual.
Note: Three-phase five-wire input power is required (the three-phase three-wire system does not connect the N line to this product module).
This product module must be connected to a three-phase five-wire (A, B, C, N, PE) TN AC power distribution system (IEC60364-3). The three-phase three-wire system does not connect the N line to this product module.
Warning
1. In order to ensure personal safety, the installation tools operated with electricity must be insulated with insulating gloves.

2.2 Environmental Characteristics

The power quality product module is a power electronic module equipped with complex control devices. The installation environment may affect its operational reliability and service life. This product module is equipped with a cooling fan to dissipate heat generated during operation. Therefore, do not block the ventilation openings during installation. Do not install this product module in environments that are excessively dusty, hot, humid, corrosive, or subject to vibration.

Table 2-1 Environmental characteristics

		Rated Capacity						
characteristics	Current Rating	50A	75A	100A	108A*1	150A	200A*2	215A*3
	208Vac Power Rating	18KVar	27KVar	36KVar	38KVar	54KVar	72KVar	78KVar
	400Vac Power Rating	35KVar	50KVar	70KVar	75KVar	100KVar	133KVar	150KVar
	480Vac Power Rating	40KVar	60KVar	80KVar	90KVar	120KVar	160KVar	180KVar

Noise within 1m (front)	dB	＜60dB	65dB
altitude	m	≤1500,1% derating per 100m in the range of 1500m～3000m	
relative humidity	％RH	0～95,No condensation	
Operating temperature	℃	-10～55℃ When the ambient temperature is between -10 to 40°C, the system has no output power derating; when the ambient temperature is between 40 to 45°C, the system's output power is derated to 90%; when the ambient temperature is between 45 to 50°C, the system's output is derated to 80%; when the ambient temperature exceeds 55°C, a "High Ambient Temperature" fault occurs, and the functionality will be restored when the ambient temperature drops to 50℃.	
Storage and transport temperature	℃	－20～＋70	
Overvoltage rating		Overvoltage Level II.	

(* 1. This model is only suitable for SVG and ASVG; * 2. This model is only suitable for APF; * 3. This model is only suitable for SVG and ASVG)

2.3 Mechanical Characteristics

Table 2-2 Mechanical characteristics

characteristics			Rated Capacity						
	Current Rating		50A	75A	100A	108A*1	150A	200A*2	215A*3
	208Vac Power Rating		18KVar	27KVar	36KVar	38KVar	54KVar	72KVar	78KVar
	400Vac Power Rating		35KVar	50KVar	70KVar	75KVar	100KVar	133KVar	150KVar
	480Vac Power Rating		40KVar	60KVar	80KVar	90KVar	120KVar	160KVar	180KVar
Mechanical dimensions(W×D×H)	3U	mm	500*550*130（No packaging material）；617*617*204（With packaging materials）						
	4U		500*550*175（No packaging material）；617*617*249（With packaging materials）						
Weight (maximum)	kg		18	22	24	24	28	35	35
Color	N/A		Black fine grain (customizable)						
Degree of protection, IEC（60529）	N/A		IP20(Front door opens or closes, back door closes)						

(* 1. This model is only suitable for SVG and ASVG; * 2. This model is only suitable for APF; * 3. This model is only suitable for SVG and ASVG)

2.4 Electrical Characteristics

Table 2-3 Electrical Characteristics of APF Product Module

characteristics			Rated Capacity				
	Current Rating		50A	75A	100A	150A	200A
Rated AC voltage	Vac	208Vac	208, Three-phase four-wire/three-phase three-wire				
		400Vac	380/400/415, Three-phase four-wire/three-phase three-wire				
		480Vac	480, three-phase three-wire				
Current rating	A		50	75	100	150	200
Rated neutral current	A		3*50	3*75	3*100	3*150	3*200
frequency	Hz		50/60				
Voltage range	%Vac	208Vac	Lower limit:－25; Upper limit:＋15				
		400Vac	Lower limit:－25; Upper limit:＋15				
		480Vac	Lower limit:－20; Upper limit:＋8				
Frequency range	%		±10				
loss	%		<2				
CT ratio range			50:5～10000:5				

Table 2-4 Electrical Characteristics of SVG Product Module

characteristics			Rated Capacity				
	208Vac Power Rating		18KVar	27KVar	36KVar	54KVar	72KVar
	400Vac Power Rating		35KVar	50KVar	75KVar	100KVar	150KVar
	480Vac Power Rating		40KVar	60KVar	90KVar	120KVar	180KVar
Rated AC voltage	Vac	208Vac	208, Three-phase four-wire/three-phase three-wire				
		400Vac	380/400/415, Three-phase four-wire/three-phase three-wire				
		480Vac	480, three-phase three-wire				
Current rating	A		50	75	108	150	215
Rated neutral current	A		50	75	108	150	215
frequency	Hz		50/60				
Voltage range	%Vac	208Vac	Lower limit:－25; Upper limit:＋15				
		400Vac	Lower limit:－25; Upper limit:＋15				
		480Vac	Lower limit:－20; Upper limit:＋8				
Frequency range	%		±10				
loss	%		<2				
CT ratio range			50:5～10000:5				

Table 2-5 Electrical Characteristics of ASVG Product Module

characteristics			Rated Capacity				
	208Vac Power Rating		18KVar	27KVar	36KVar	54KVar	72KVar
	400Vac Power Rating		35KVar	50KVar	75KVar	100KVar	150KVar
	480Vac Power Rating		40KVar	60KVar	90KVar	120KVar	180KVar
Rated AC voltage	Vac	208Vac	208, Three-phase four-wire/three-phase three-wire				
		400Vac	380/400/415, Three-phase four-wire/three-phase three-wire				
		480Vac	480, three-phase three-wire				
Current rating	A		50	75	108	150	215
Rated neutral current	A		50	75	108	150	215
frequency	Hz		50/60				
Voltage range	%Vac	208Vac	Lower limit:－25; Upper limit:＋15				
		400Vac	Lower limit:－25; Upper limit:＋15				
		480Vac	Lower limit:－20; Upper limit:＋8				
Frequency range	%		±10				
loss	%		<2				
CT ratio range			50:5～10000:5				

2.5 Installation Drawing

2.5.1 Operating Space

To facilitate the tightening of the power terminals inside the cabinet during daily operation, in addition to meeting local regulations, sufficient space should be reserved at the front and back of the cabinet. This allows a person to pass freely when the front and rear doors of the cabinet are fully opened. Additionally, at least 500mm of space should be reserved at the back of this product, and the dust-proof film should be removed to ensure unobstructed ventilation for this product.

2.5.2 Structural Dimensions

Figures 2.1 to 2.4 illustrate the structural dimension diagrams of various types of high-protection-grade power quality product modules.

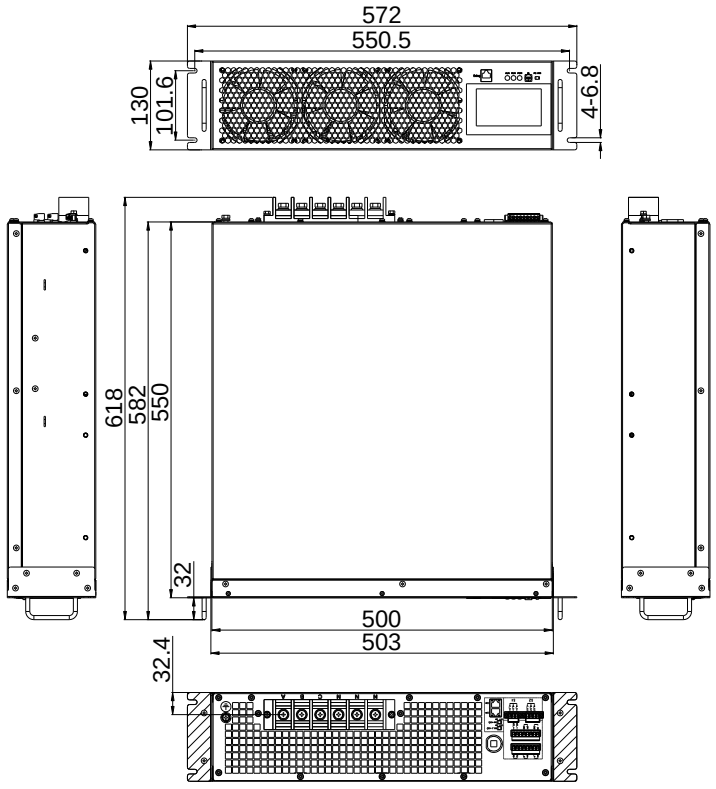


Figure 2.1 APF 50A~150A / SVG、ASVG 35KVar~100KVar -Rail Mounted

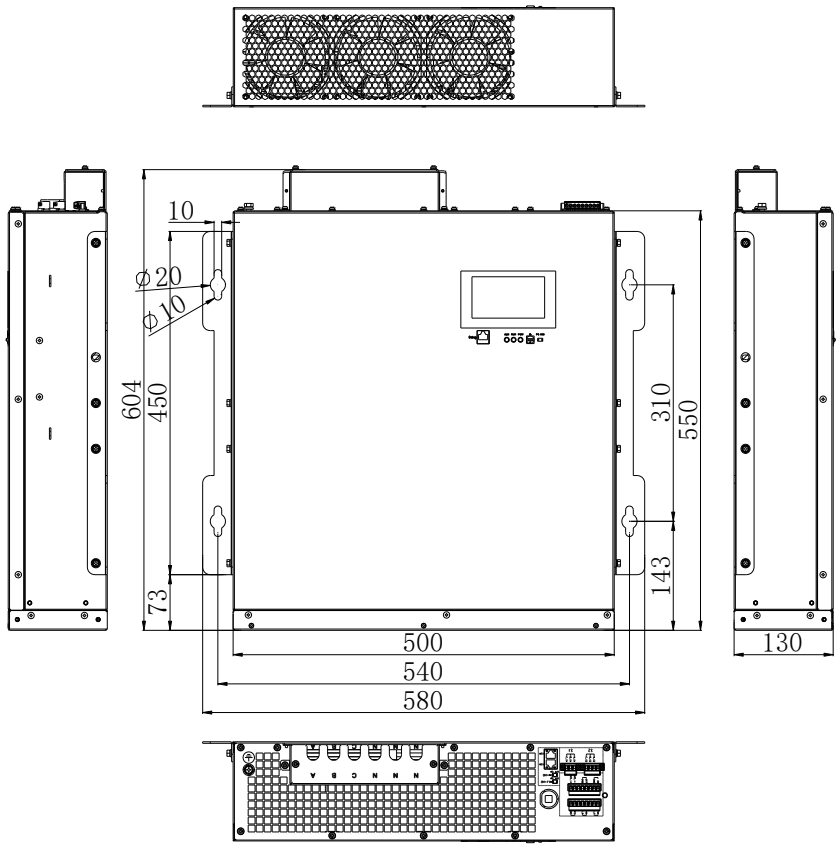


Figure 2.2 APF 50A~150A / SVG、ASVG 35KVar~100KVar －Wall Mounted

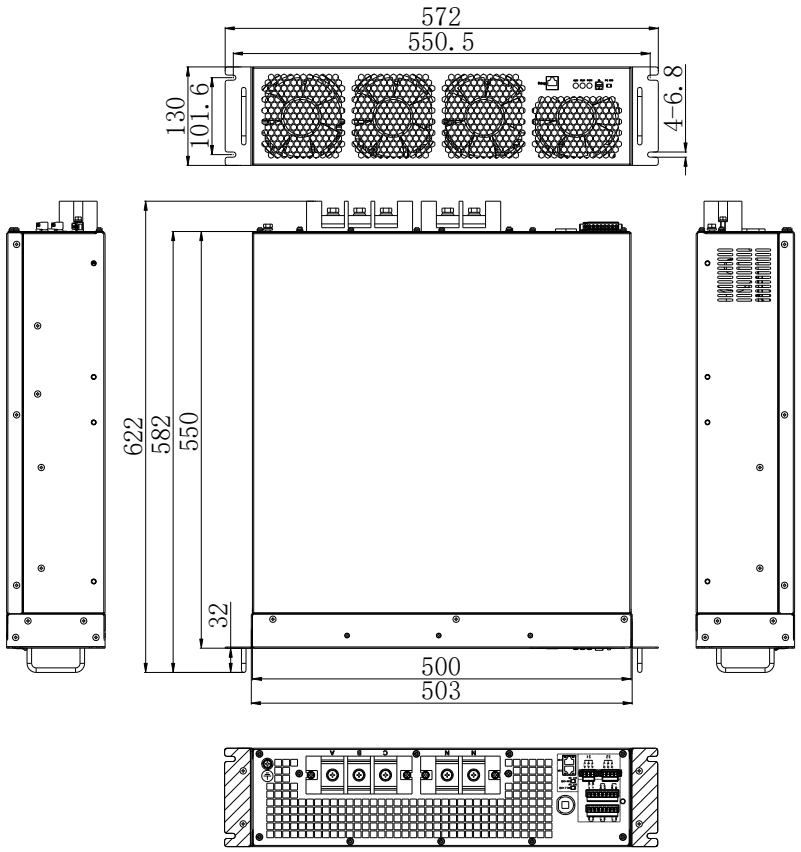


Figure 2.3 APF 200A / SVG、ASVG 150KVar - Rail Mounted -No Screen

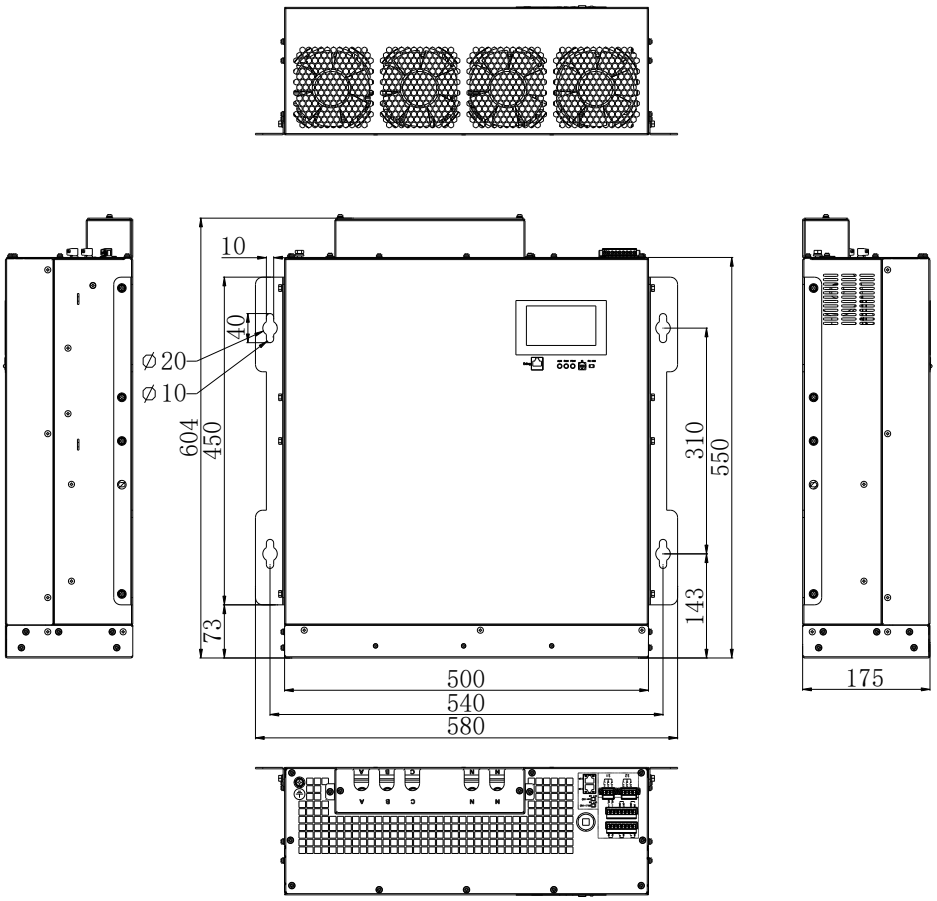


Figure 2.4 APF 200A / SVG、ASVG 150KVar - Wall Mounted -With Screen

2.5.3 Mechanical Installation

When installing the universal rail-mounted module, it is fixed to the installation pillars of the cabinet through the front two side ears, as shown in Figure 2.5. Wall-mounted models should be secured to a solid wall along the upper and lower edges or hung within the cabinet

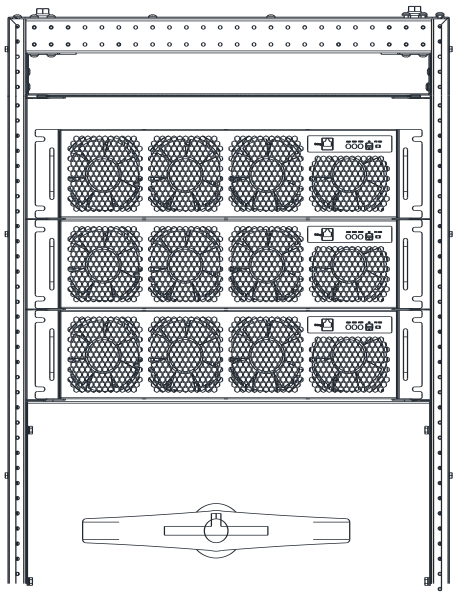


Figure 2.5 Schematic diagram of the rail-mounted model

III Electrical Installation

3.1 Power Cable Routing

3.1.1 Input Current and Cable Recommendation

The user installation power cables must comply with the reference values provided in Tables 3.1 to 3.3.

Table 3-1 Recommended rated capacity and cross-sectional area of copper core cables for APF products

Type	Rated Capacity				
	50A	75A	100A	150A	200A
Recommended phase cable(mm^2)	16	25	35	50	70
Recommended neutral cable(mm^2)*	2*16	2*25	3*35	3*50	2*70
Recommended PE wire and cable(mm^2)	16	16	16	25	35
Power terminal screw	M6	M6	M6	M8	M10
Suggested tightening torque(N•m)	6	6	6	15	20

(*'2*'means 2 cores, '3*' means 3 cores)

Table 3-2 Recommended rated capacity and cross-sectional area of copper core cables for SVG products

Type		Rated Capacity				
	208Vac Power Rating	18KVar	27 KVar	36 KVar	54 KVar	72 KVar
	400Vac Power Rating	35KVar	50 KVar	75 KVar	100 KVar	150 KVar
	480Vac Power Rating	40 KVar	60 KVar	90 KVar	120 KVar	180 KVar
Recommended phase cable(mm^2)		16	25	35	50	95
Recommended neutral cable(mm^2)		16	25	35	50	95
Recommended PE wire and cable(mm^2)		16	16	16	25	50
Power terminal screw		M6	M6	M6	M8	M10
Suggested tightening torque(N•m)		6	6	6	15	20

Table 3-3 Recommended rated capacity and cross-sectional area of copper core cables for ASVG products

Type		Rated Capacity				
	208Vac Power Rating	18KVar	27 KVar	36 KVar	54 KVar	72 KVar
	400Vac Power Rating	35KVar	50 KVar	75 KVar	100 KVar	150 KVar
	480Vac Power Rating	40 KVar	60KVar	90KVar	120KVar	180KVar
Recommended phase cable(mm^2)		16	25	35	50	95
Recommended neutral cable(mm^2)		16	25	35	50	95

Recommended PE wire and cable(mm^2)	16	16	16	25	50
Power terminal screw	M6	M6	M6	M8	M10
Suggested tightening torque(N•m)	6	6	6	15	20

NOTE

To ensure the safe operation of the equipment, the ground connection must use the shortest possible routing path.

3.1.2 Power Cable Connection

Three-phase three-wire and three-phase four-wire primary cable wiring A, B, C terminal wiring method is the same, four-wire system is connected to one more N terminal.

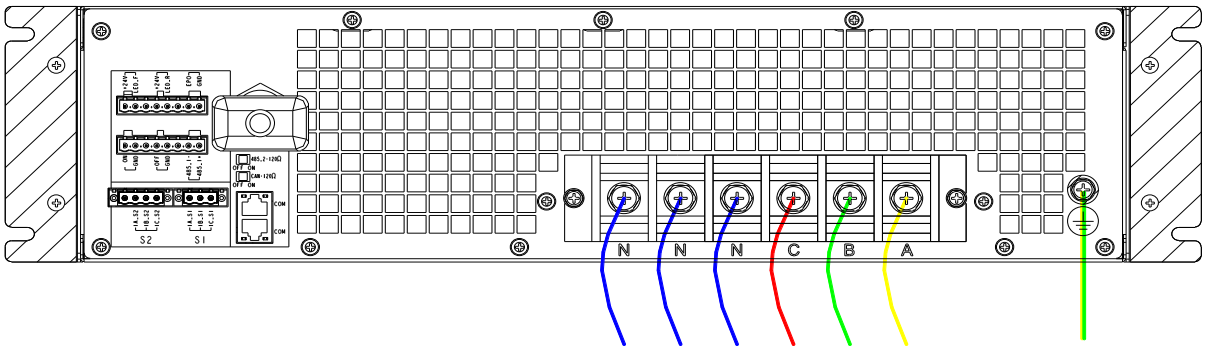


Figure 3-1 Terminal block (rear view)

1.Connect the input ground wire to the input grounding terminal. Note: The ground connection must comply with local and national regulations.

2.When routing the AC input cable, avoid passing it near the module's air outlet, ensuring that there are no obstructions within 20 cm of the module's air outlet.

3.When installing the power cables for a three-phase three-wire system, do not connect the N wire.

4.The ground connection must use the shortest possible routing path.

Table 3-2 APF power terminal definitions

Terminal symbol	Description of the terminal function
A	A-phase input and output terminal
B	B-phase input and output terminal
C	C-phase input and output terminal
N	Three-phase four-wire center line
PE	Safety Ground Terminal (Enclosure)

3.2 Port Information

3.2.1 Front Panel Ports

Figure 3.2 shows the signal ports on the front panel of the high-protection model. Users who need to perform parallel compensation with multiple modules must assign a unique ID number to each module by rotating the rotary switch marked "ID." **It is not allowed for multiple modules performing parallel compensation to use the same ID number, as this will prevent communication.**

Note: If the rotary switch displays "0" ,the corresponding ID number for that module is "1" ; If the rotary switch displays "1" ,the corresponding ID number for that module is "2" and so on.

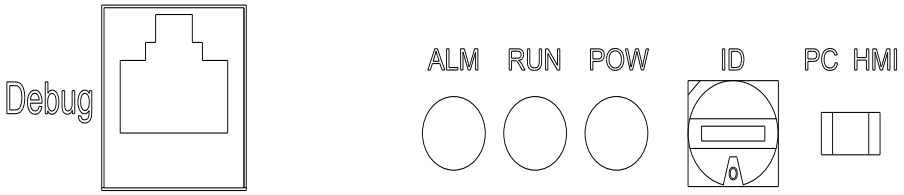


Figure 3.2 Front Panel Signal Ports

The status of the indicator lights and their meanings are shown in Table 3.5.

Table 3.5 Status of Indicator Lights and Their Meanings

Indicator Light	Color	Mode	Meaning
ALM	Red	On	Module fault exists
RUN	Green	Flashing	Powering on
		Steady	Running
POW	Yellow	On	Powered on

The network port marked with the "Debug" silkscreen is for debugging purposes by our staff and is not open to users.

3.2.2 Rear Panel Signal Ports

The definitions of the signal ports are shown in Figure 3.3, and the descriptions of each signal can be found in Table 3.3. It is strictly prohibited to apply external power when wiring the rear panel ports!

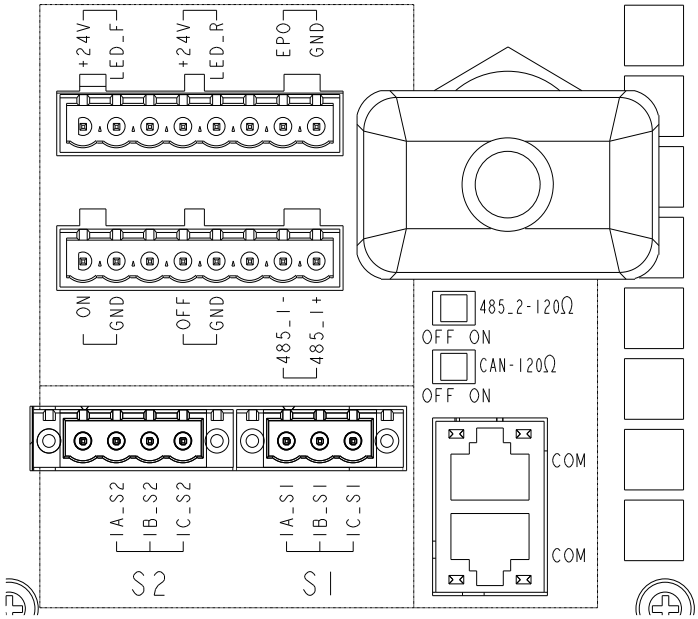


Figure 3.3 Rear Panel Signal Ports for High Protection Models

Table 3.3 Functions and Wiring Instructions for Rear Panel Signal Ports of High Protection Models

Property	Terminal Function	Port Name	Wiring Instructions
Output	Fault Indicator	+24V	Connect to the anode of the external LED
		LED_F	Connect to the cathode of the external LED
	Running Indicator	+24V	Connect to the anode of the external LED
		LED_R	Connect to the cathode of the external LED
Input	Emergency Stop	EPO	
		GND	
	Manual Start	ON	
		GND	
	Manual Stop	OFF	
		GND	
Output	Module Control Capacitor	485_1-	When compensating for multiple modules, only the module with ID 1 can control the capacitor, corresponding to a rotary dial setting of 0
		485_1+	

Input	Load CT Sampling S2 Output		Empty Interface, Anti-misconnection
		IA_S2	Connect to the S2 terminal of phase A CT
		IB_S2	Connect to the S2 terminal of phase B CT
		IC_S2	Connect to the S2 terminal of phase C CT
	Load CT Sampling S1 Output	IA_S1	Connect to the S1 terminal of phase A CT
		IB_S1	Connect to the S1 terminal of phase B CT
		IC_S1	Connect to the S1 terminal of phase C CT
	485_2 (Large Screen Communication) Matching Resistor	485_2-120Ω	Switch to "ON" to activate, see Section 3.3.1
	CAN (Module Grid Side Parallel) Matching Resistor	CAN-120Ω	Switch to "ON" to activate, see Section 3.3.1
Communication	Large Screen Communication and Module Source Side Wiring Port	COM	See Section 3.3.1
		COM	
		4G Module	Optional accessory, supports users to obtain module data via APP See Section 3.3.3 for download method

3.3 Signal Wiring Method

3.3.1 Wiring Method Between Module and Monitoring Screen

If the monitoring screen is only connected to one module, refer to Figure 3.4 and follow the suggested wiring method below.

Wiring Method for the Monitoring Screen: Insert one end of the pre-fabricated cable's DB9 connector into the DB9 interface of the monitoring screen and secure it with the locking screws. The other end, marked with "24V," should be connected to the 2PIN Phoenix terminal interface on the monitoring screen.

Wiring Method for the Module: Insert the crystal head of the pre-fabricated cable into one of the COM ports on the back panel of the module. The two COM ports marked with "COM" on the same module are identical, and there is no need to differentiate between them during wiring.

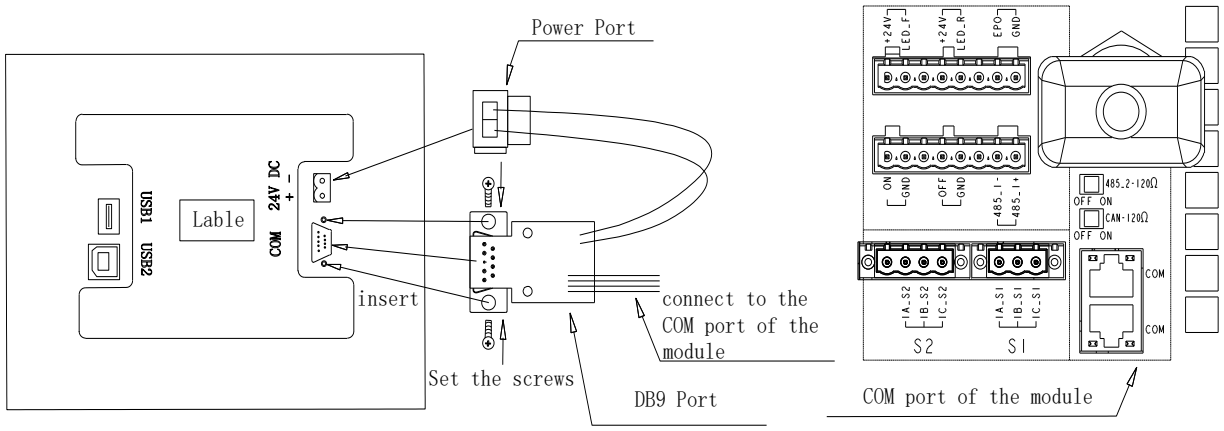


Figure 3.4 Communication Wiring Diagram Between the Monitoring Screen and Module

During parallel power distribution, regardless of whether the CT (Current Transformer) is connected to the load side or the grid side, it is necessary to connect the 485_2 signal line between each module and the monitoring screen to ensure the module has an ideal compensation effect. The 485_2 signal line is already prepared in the pre-fabricated cable; users simply need to plug the crystal head into the COM port of the module as shown in Figure 3.5. Additionally, users can set the 485_2 matching resistor located above the COM port on the first and last modules to "ON" to enhance the reliability of the 485_2 communication.

If the CT is connected to the grid side, the CAN signal line is already included in the same pre-fabricated cable, and no additional wiring is required. Users can also set the CAN matching resistor above the COM port on the first and last modules to "ON" to improve the reliability of CAN communication.

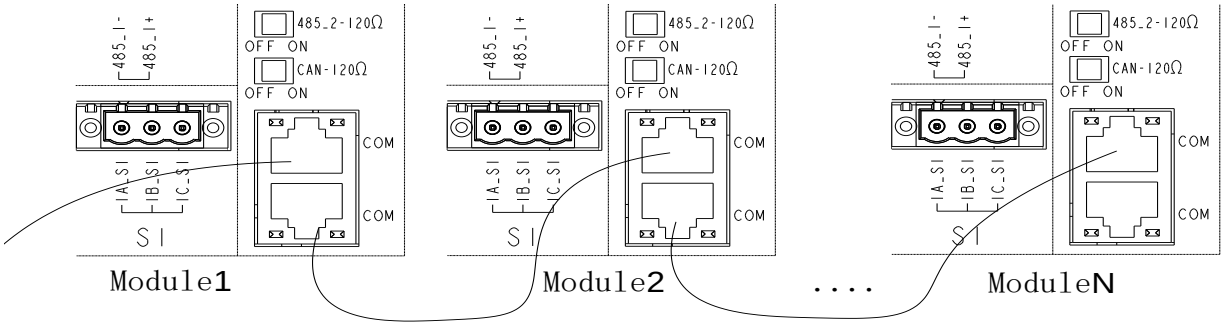


Figure 3.5 Schematic Diagram of 485_2 and CAN Communication Wiring

Before using different power quality product modules for parallel compensation, please refer to Table 3.4 to confirm whether the modules can operate in parallel. If incompatible product modules are used in parallel, they will not function properly.

Table 3.4 Compatibility of Power Quality Products for Parallel Operation

	APF	SVG	ASVG
APF	✓	✓	×
SVG	✓	✓	×
ASVG	×	×	✓

3.3.2 Wiring Methods for External Indicator Lights, Power On, Power Off, and Emergency Stop Buttons

Each module provides a set of wiring terminals for operation and fault indicator lights. **When using multiple modules in parallel, do not connect the indicator light output terminals of multiple modules in parallel.** If conditions allow, it is recommended to configure a separate set of operation and fault indicator lights for each module. The voltage level for the indicator lights should be 24VDC, and it is important to distinguish between the anode and cathode when wiring. The schematic diagrams for the wiring principles are shown in Figures 3.7 and 3.8. For detailed wiring terminals, refer to Table 3.3. If using 220VAC LED lights, it is necessary to confirm whether they are compatible with a 24VDC power supply, as some manufacturers produce 220VAC LED lights that are not compatible with 24VDC power supplies.

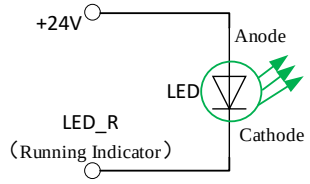


Figure 3.7: Wiring Diagram for Operation Indicator Lights

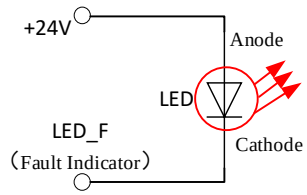


Figure 3.8: Wiring Diagram for Fault Indicator Lights

Each module provides a set of manual power-on wiring terminals. When using multiple modules in parallel, the dry contacts for all modules' power-on connections can be cascaded in parallel. The suggested wiring schematic diagram is shown in Figure 3.9. According to this diagram, when the manual power-on mechanical switch is activated, all modules cascaded at the button port will power on simultaneously.

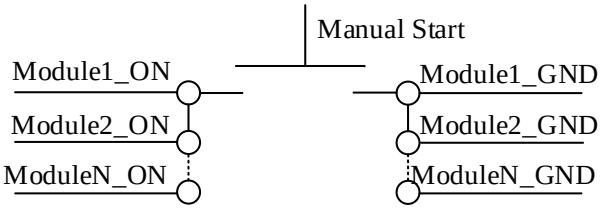


Figure 3.9: Wiring Diagram for Manual Power-On Mechanical Switch in Parallel Modules

Each module provides a set of manual power-off wiring terminals. When using multiple modules in parallel, the dry contacts for all modules' power-off connections can be cascaded in parallel. The suggested wiring schematic diagram is shown in Figure 3.10. According to this diagram, when the manual power-off mechanical switch is activated, all modules cascaded at the button port will power off simultaneously.

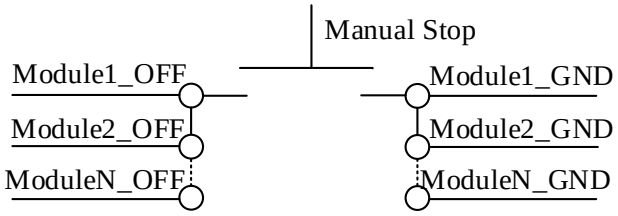


Figure 3.10: Wiring Diagram for Manual Power-Off Mechanical Switch in Parallel Modules

Each module provides a set of emergency stop wiring terminals. When using multiple modules in parallel, the emergency stop connections for all modules can be cascaded in parallel. The suggested wiring schematic diagram is shown in Figure 3.11. According to this diagram, when the emergency stop mechanical switch is activated, all modules cascaded at the button port will simultaneously perform an emergency stop.

Note: The emergency stop mechanical switch must be reset before the module can power on again. Otherwise, the module will not power on.

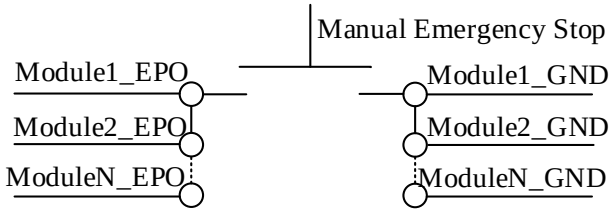


Figure 3.11: Wiring Diagram for Emergency Stop Mechanical Switch in Parallel Modules

3.3.3 4G Monitoring Screen (Optional Accessory)

If the user wants to view the data information of the module and set the parameters of the module remotely, the 4G monitoring screen is a optional accessories.

The large screen with 4G function can transmit the picture in the large screen to the mobile APP in real time, and the user can control the APP to realize remote viewing and setting of module information.

The wiring mode and operation mode are the same as that of the large monitoring screen. Details can be referenced in Section 3.3.1. and 4.3.

3.3.4 4G Module (Optional Accessory)

The appearance of 4G module is shown in Figure 3.11. When the 4G module is plugged into the USB port on the device and the mobile phone is connected to the network, the data information of the module can be easily viewed through the APP and the parameters of the module can be set.

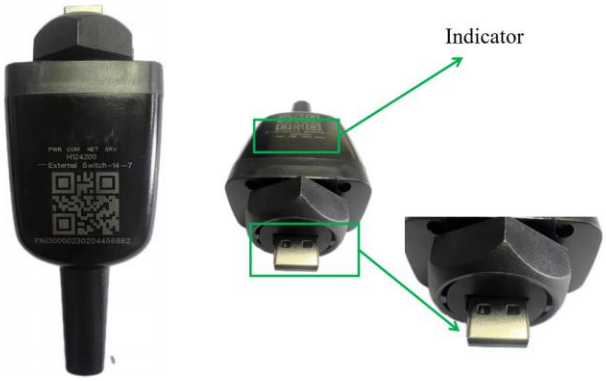


Figure 3.11: Appearance of the 4G Module

To ensure the reliable operation of the 4G module, the following checks must be performed during installation:

1. After the 4G module is plugged into the USB port on the device, push the hexagonal nut triangle mark on the 4G module upward and rotate to the side to ensure the reliable connection between the 4G module and the device interface;
2. Switch the 485_2-120Ω switch under the installation position of the 4G module to ON.
3. Set the rotary DIP switch of the front panel to 7, that is, set the device ID to 8.
4. After the device is powered on, the power indicator of the 4G module lights up, and data can be normally received in the mobile APP.

The QR code for downloading the app is shown in Figure 3.12. Open WeChat and scan the QR code below to get help with using the software.

Figure 3.12: Data Management App for the 4G Module

3.4 CT Wiring Methods

Figures 3.13 to 3.16 illustrate the CT wiring diagrams for our power quality product modules. When wiring CTs, users are advised to place the CTs on the load side, as shown in Figure 3.13, where the CTs are installed closer to the load. This wiring method is referred to as load-side wiring. In Figure 3.14, the CTs are installed closer to the grid, making it grid-side wiring, also known as source-side wiring.

When assembling the CT wiring, pay attention to the CT direction. Since CTs are directional electronic devices, incorrect orientation of the CT body or its wiring may lead to suboptimal compensation performance or even deterioration in the grid's power quality. The orientation of the CT body and its wiring can be referenced in Figures 3.13 to 3.16, where P1/P2 indicate the CT orientation, and S1/S2 indicate the CT output direction.

After connecting the CT wiring to the Phoenix terminal on the module, tighten the screws on the Phoenix terminal to ensure a secure connection.

The following diagrams use Phase A as an example for the power line and CT wiring. Solid lines represent power lines, wide dashed lines represent CT lines, and narrow dashed lines represent signal lines. For wiring methods of 485_2 and CAN communication lines, details can be referenced in Section 3.3.1.

3.4.1 Module Standalone Distribution (CT-Load Side)

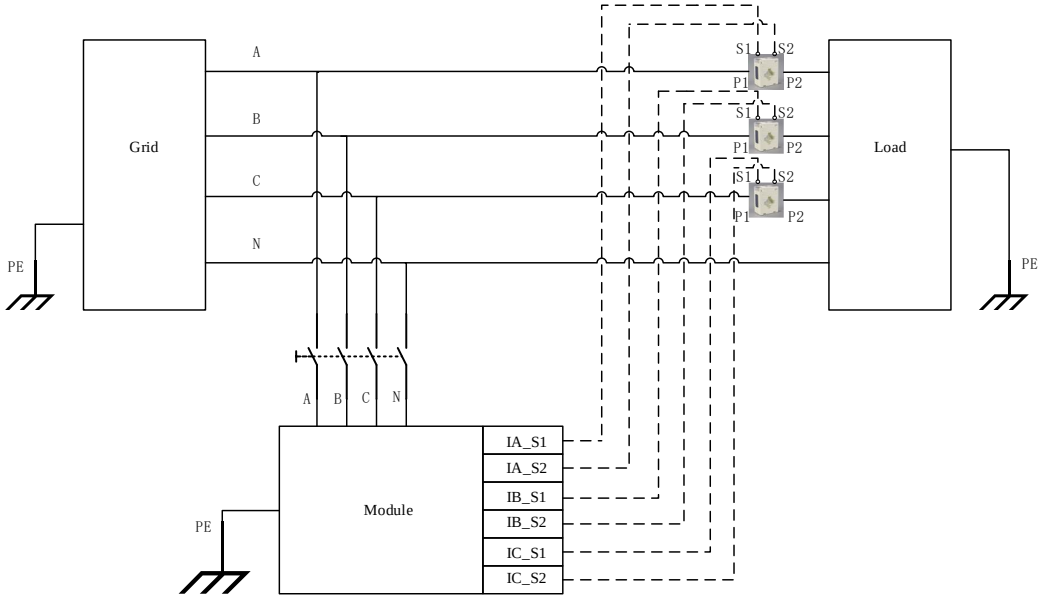


Figure 3.13: Module Standalone Power Distribution with CT on the Load Side

3.4.2 Module Standalone Distribution (CT-Grid Side)

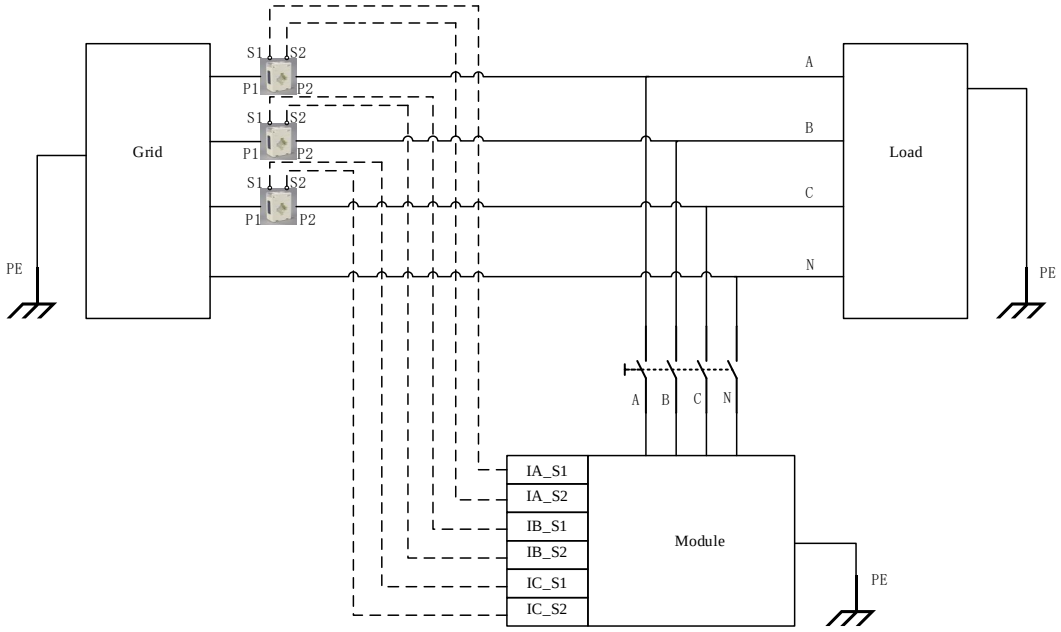


Figure 3.14: Wiring Diagram for Module Standalone Power Distribution with CT on the Grid Side

3.4.3 Multi-Module Parallel Distribution (CT-Load Side)

In parallel power distribution, to determine the compensation amount for each module, all modules must be connected to the large screen via the 485_2 communication line. Details can be referenced in Section 3.3.1.

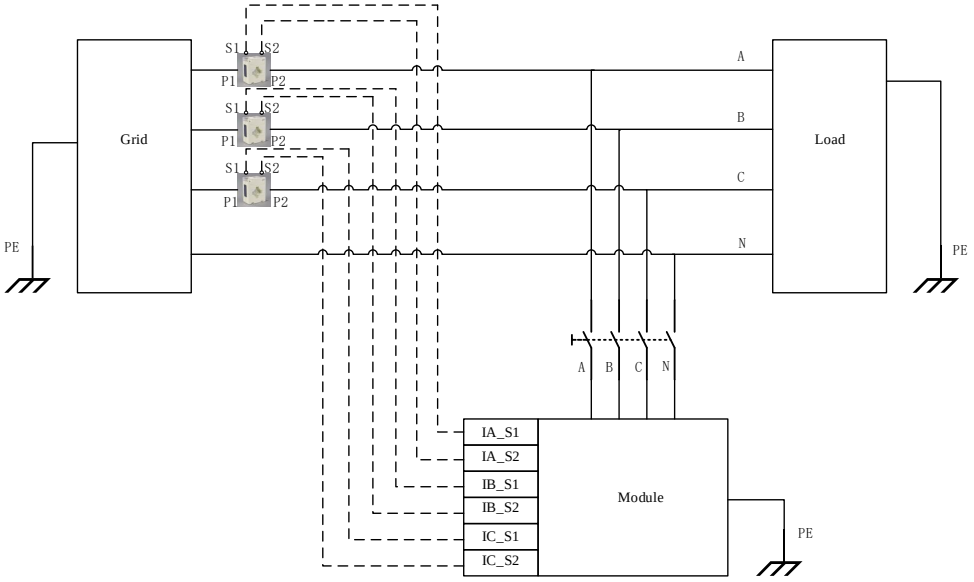


Figure 3.15: Wiring Diagram for Multi-Module Parallel Operation with CT on the Load Side

3.4.4 Multi-Module Parallel Distribution (CT-Grid Side)

In addition to the instructions in Section 3.4.3, when CTs are connected on the grid side in parallel power distribution, both 485_2 and CAN communication lines must be connected. This is shown in Figure 3.16 and details can be referenced in Section 3.3.1.

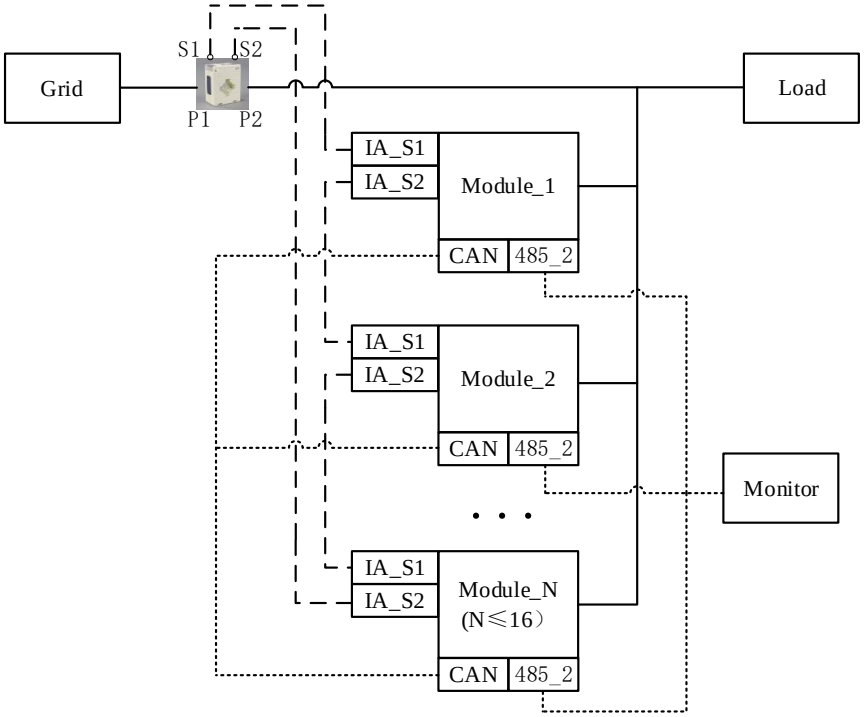


Figure 3.16: Wiring Diagram for Multi-Module Parallel Operation with CT on the Grid Side

3.4.5 Phase Sequence Adaptation and CT Direction

In some applications, users may be unable to confirm the correct phase sequence of the three-phase power lines. In such cases, the module's "Phase Sequence Adaptation" function can be enabled. The principle diagram is shown in Figure 3.17. To activate the "Phase Sequence Adaptation" function, users can access the monitoring screen parameter settings interface shown in Figure 4.2, select "Enable" for the "Phase Sequence Adaptation" option, and click "Confirm Settings" to activate it.

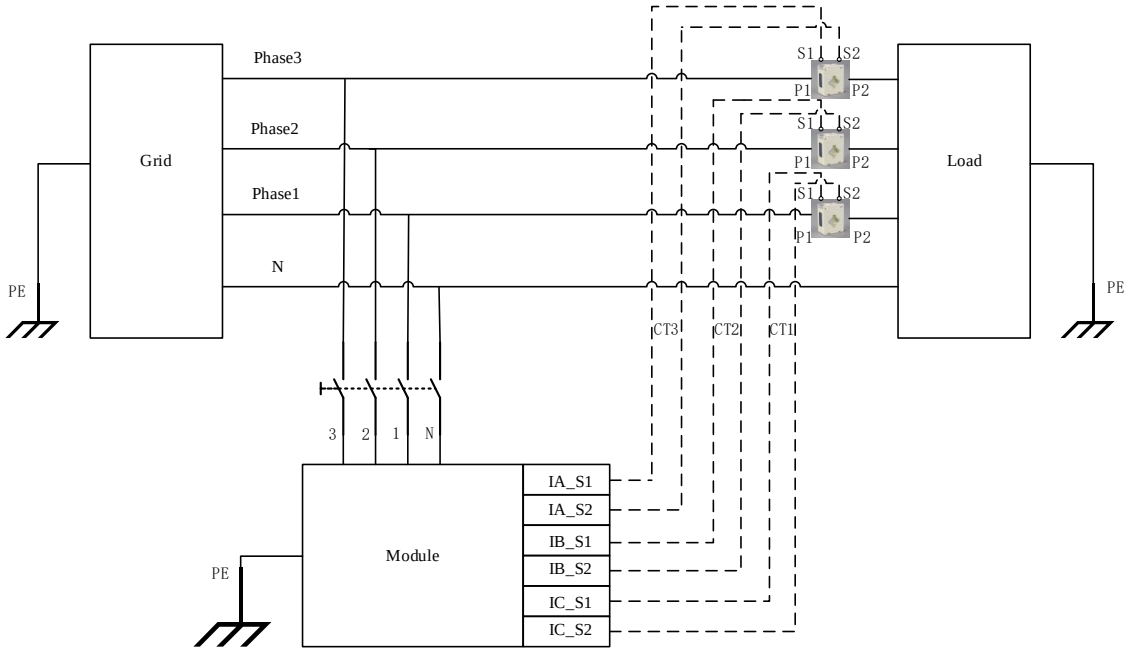


Figure 3.17: Schematic Diagram of CT Phase Sequence Adaptation Wiring

Once "Phase Sequence Adaptation" is enabled, the module can function correctly even if the exact phases are unknown, as long as the power lines and CT lines correspond to the same phase on the module.

Except for photovoltaic (PV) applications, the equipment will also check whether the S1/S2 direction of all three phases are reversed. By enabling the setting, "CT Direction" can realize all three phases CT are simultaneously reversed.

3.5 Module Control Capacitor Wiring

Figures 3.18 to 3.21 illustrate the wiring diagrams for CTs and capacitors when controlling capacitors with our power quality product modules.

For CT wiring methods and precautions, details can be referenced in Section 3.4.

Note the following:

It is important to note that regardless of which wiring method is used:

1. **Only the module with ID number "1" can control the capacitors.**

2. The number of capacitors connected to the grid must not exceed 16 for smart capacitors and 32 for conventional capacitors.

To control capacitors, use the "485_1+/485_1-" port on the module's rear panel to extend the control wires, as detailed in Table 3.3.

Since capacitor control port definitions differ between manufacturers, we do not provide pre-assembled power quality module-to-capacitor control cables. Users are advised to carefully verify port definitions and assemble the cables themselves.

The following diagrams use Phase A as an example for power line and CT wiring. Solid lines represent power lines, wide dashed lines represent CT lines, and narrow dashed lines represent signal lines. For the wiring of 485_2 and CAN communication lines, details can be referenced in Section 3.3.1.

3.5.1 Module Standalone Distribution Controlling Capacitors (CT-Load Side)

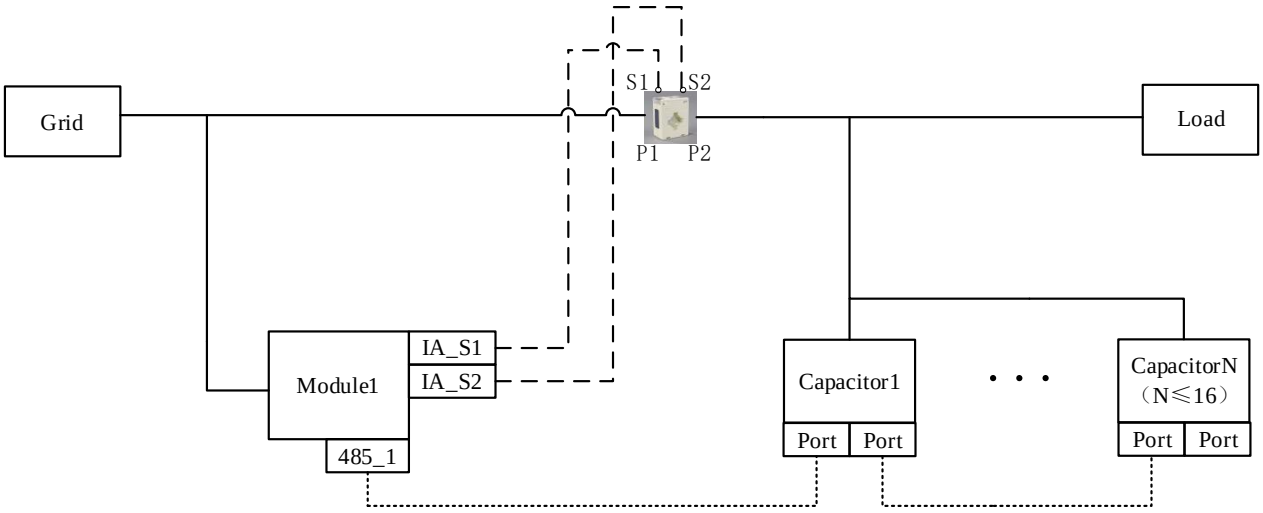


Figure 3.18: Wiring Diagram for Standalone Power Distribution with CT on the Load Side

In this wiring method, the CTs should be connected between the module and the capacitor, not between the capacitor and the load.

3.5.2 Module Standalone Distribution Controlling Capacitors (CT-Grid Side)

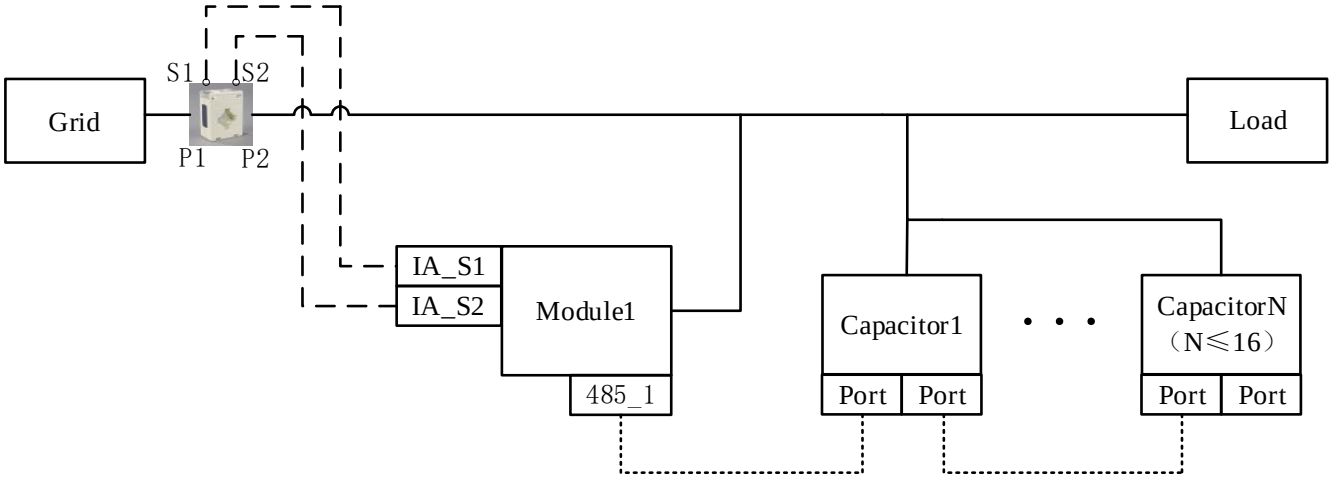


Figure 3.19: Wiring Diagram for Module Standalone Power Distribution Controlling Capacitors with CT on the Grid Side

3.5.3 Multi-Module Parallel Distribution Controlling Capacitors(CT-Load Side)

When controlling capacitors in a multi-module parallel distribution, only the module with ID number "1" can communicate with the capacitor. ID number "1" corresponds to a rotary DIP switch reading of "0"; details can be referenced in Section 3.2.2. Figure 3.20 shows the wiring diagram for this setup, with CTs are installed on the load side.

In this configuration, ensure the CTs are installed between the module and the capacitor, not between the capacitor and the load.

Additionally, for determining the compensation amount for each module, all modules must be connected to the large screen using the 485_2 communication line. Details can be referenced in Section 3.3.1.

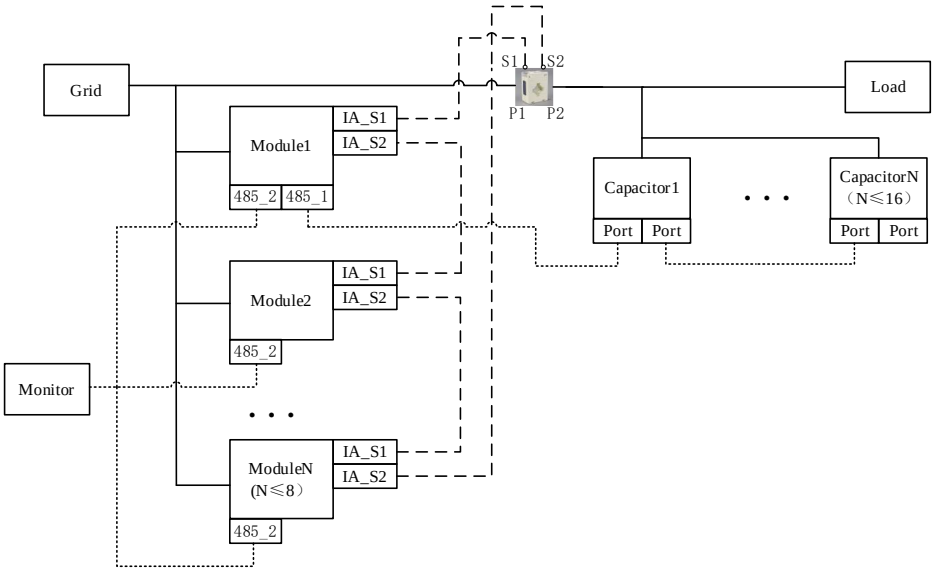


Figure 3.20: Wiring Diagram for Multi-Module Parallel Operation Controlling Capacitors with CT on the Load Side

3.5.4 Multi-Module Parallel Distribution Controlling Capacitors(CT-Grid Side)

Building upon the explanation in Section 3.5.3, when CTs are connected on the grid side in a multi-module parallel distribution, both the 485_2 communication line and the CAN communication line must be connected. Refer to Figure 3.21 for the wiring schematic.For communication line wiring instructions, details can be referenced in Section 3.3.1.

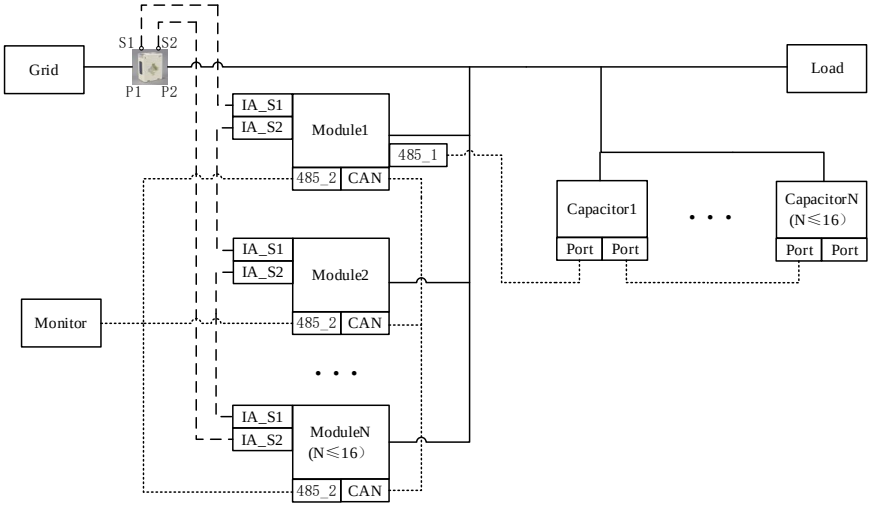


Figure 3.21: Wiring Diagram for Multi-Module Parallel Operation Controlling Capacitors with CT on the Grid Side

Ⅳ Power-On Operation Instructions

4.1 Module Power-On and Power-Off

4.1.1 Power-On Procedure

This power-on procedure applies to powering on the module when it is completely powered off. Follow the steps below:

1.Secure the module casing and connect power and signal cables.

Warning: During the power-on process, the module's output terminals may already be live. If there are loads connected to the module’s output terminals, ensure it is safe to supply power to the load. If the load is not ready to receive power, ensure the load is safely isolated from the module’s output terminals.

2.Close the isolation switch between the grid and the module.

At this point, the LCD display screen will start up. The front panel **indicator lights** will show as follows:

Fault (red)

Operation (green)

Power-On (yellow)

Indicator light behavior:

Power-on process: Green light blinks rapidly.

Normal operation: Green light remains steady on.

Fault state: Red light is illuminated, and the module cannot power on.

Yellow light on: Indicates the module is in a power-on state.

4.1.2 Power-Off Procedure

There are two methods to power off the module:

1. Completely Power Off by Disconnecting the Isolation Switch

This is a full power-off mode where the internal energy of the module is discharged slowly after the isolation switch is turned off.

Warning: The yellow light turning off does not indicate that the module is completely disconnect from the mains. Wait 15 minutes to ensure the module’s internal bus line is fully discharged before performing any maintenance. This operation should only be performed by qualified engineer.

2. Standby Power-Off via the LCD Control Panel or External Button

This method only shuts down the power components in the system, leaving the module in standby mode.

4.2 4.3-Inch LCD Display and Settings

When powered on, the LCD screen will light up and enter the "Parameter Settings" interface. Enter the password "123456", as shown in Figure 4.1.

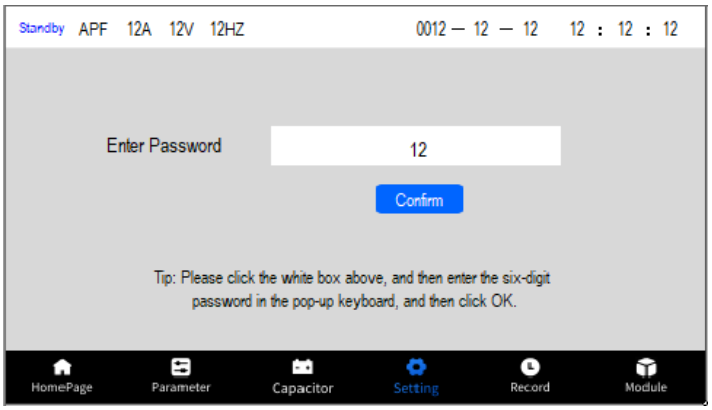


Figure 4.1: Parameter Settings - Password Input

The parameter settings interface consists of two pages. The first page of parameter settings is the same for APF, SVG, and ASVG modules. The settings mainly include—Starting Mode,Target COSΦ,CT Location,CT Ratio,CT Direction,Phase Order Adapt,PV Mode(Solar Power Mode) and Wire System Selection.After selecting the desired parameter, click the "Confirm" button on the right head side of the screen to apply the changes to take effect.

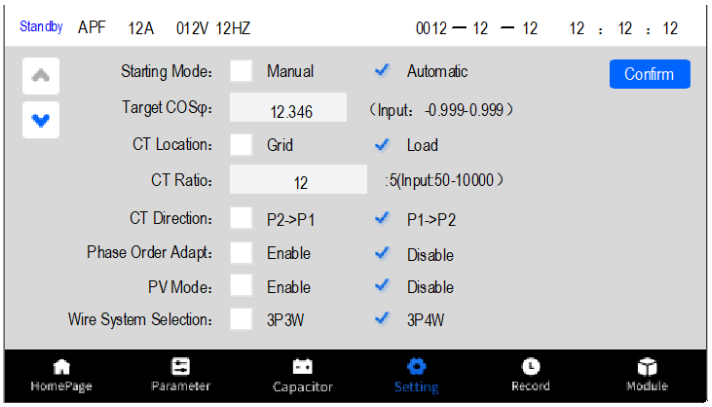


Figure 4.2 Parameter Setting First Page Common Interface

The second page of parameter settings mainly include—Function Selection,Compensating Harmony Number,Compensation Mode， Current Loop Ratio and Reactive Set.After selecting the desired parameter, click the "Confirm" button on the right head side of the screen to apply the changes to take effect.

The second page of parameter setting for APF, SVG and ASVG models is shown in Figure 4.3 to Figure 4.5.

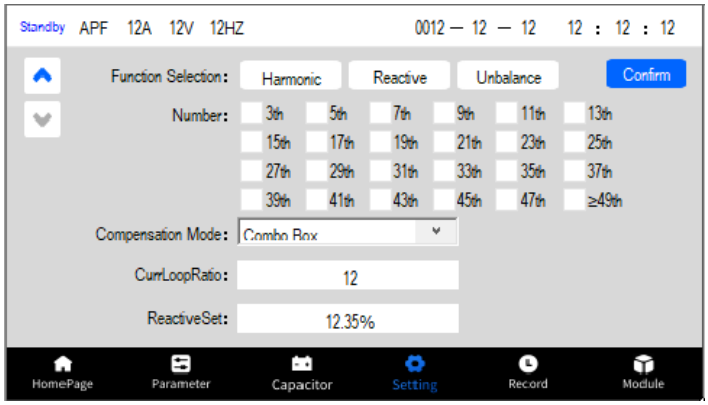


Figure 4.3 Parameter Settings for APF Interface

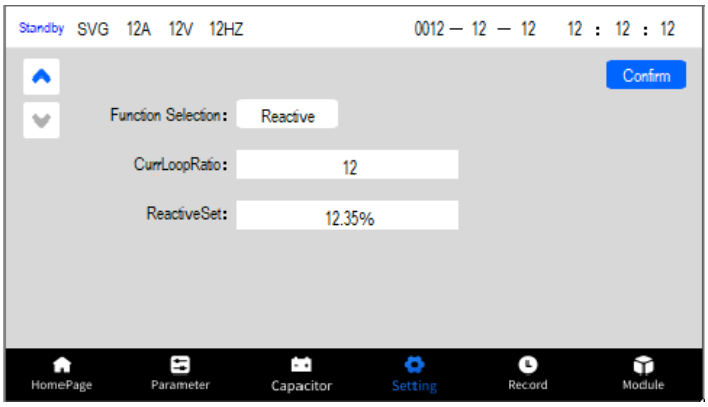


Figure 4.4 Parameter Settings for SVG Interface

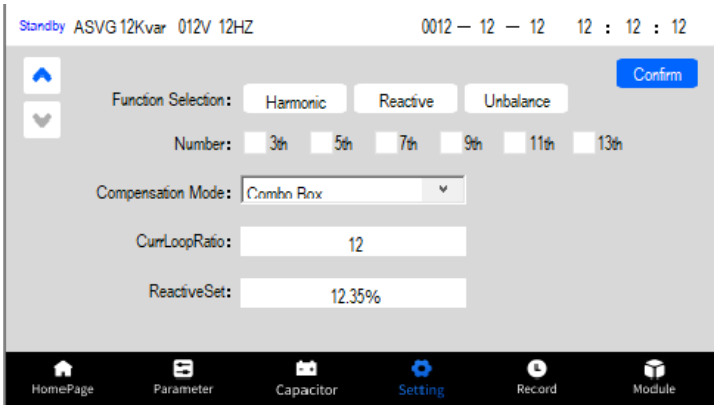


Figure 4.5 Parameter Settings for ASVG Interface

If the purchased module is intended for capacitor control, the screen will display capacitor information, as shown in Figure 4.6 ~ Figure 4.7. After setting the capacitor switching method, users need to click "Confirm" to activate the configuration. To protect the capacitor, any settings made during the capacitor switching delay time will not take effect.

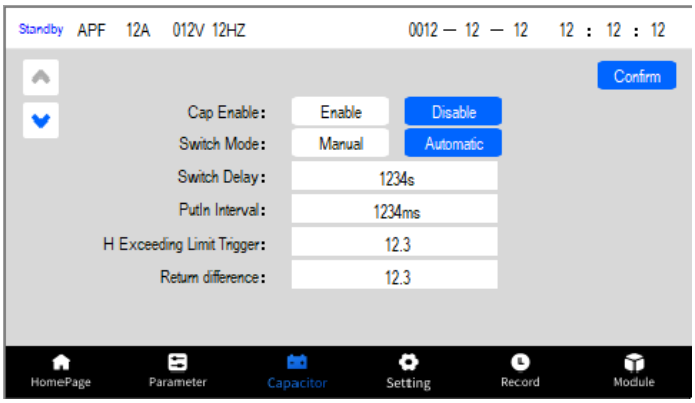


Figure 4.6 Capacitor Switching Interface First Page

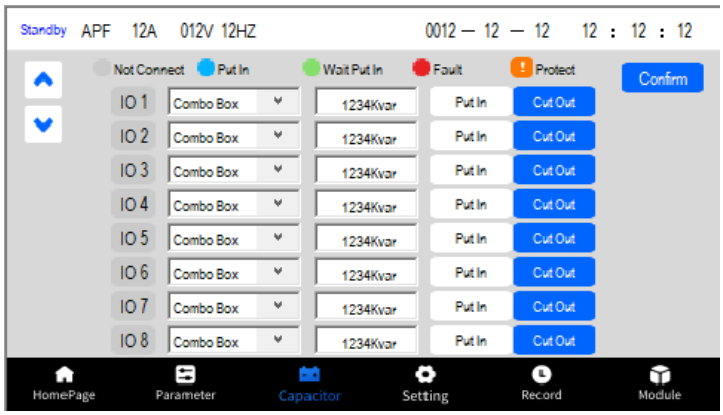


Figure 4.7 Capacitor Switching Interface Second Page

4.3 7-Inch LCD Display and Settings

When powered on, the 7-inch LCD screen will light up and enter the "Parameter Settings" interface. Enter the password "123456", as shown in Figure 4.8. For multiple modules connected in parallel distribution, parameters need to be set individually for each module, ensuring consistency across all modules.

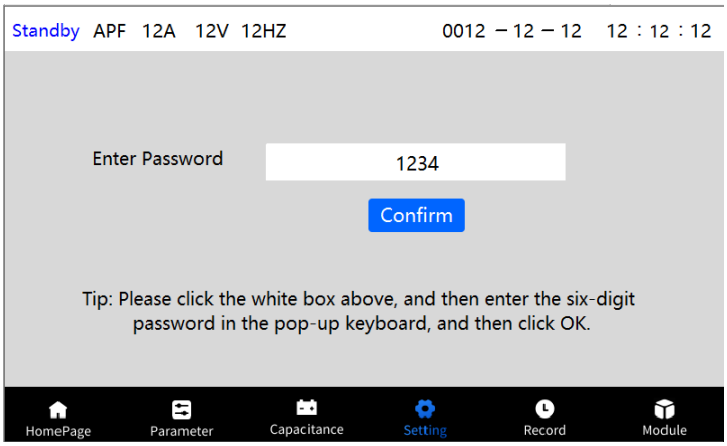


Figure 4.8: Parameter Settings - Password Input

The parameter settings interface consists of two pages. The first page of parameter settings is the same for APF, SVG, and ASVG modules. The settings mainly include—Starting Mode,Target COSΦ,CT Location,CT Ratio,CT Direction,Phase Order Adapt,PV Mode(Solar Power Mode) and Wire System Selection.After selecting the desired parameter, click the "Confirm" button on the right head side of the screen to apply the changes.

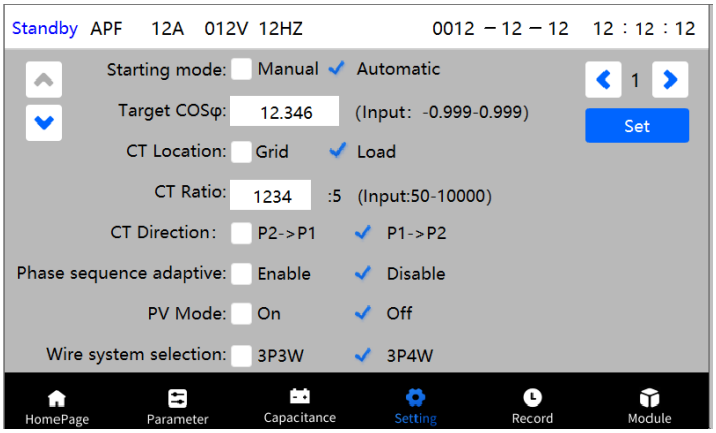


Figure 4.9: Common Parameter Settings Interface

The second page of parameter settings mainly include—Function Selection,Compensating Harmony Number,Compensation Mode， Current Loop Ratio and Reactive Set.After selecting the desired parameter, click the "Confirm" button on the right head side of the screen to apply the changes to take effect. (**Note: In most cases, settings on this page are not required.**)

The second page of parameter setting for APF, SVG and ASVG models is shown in Figure 4.10 to Figure 4.12.

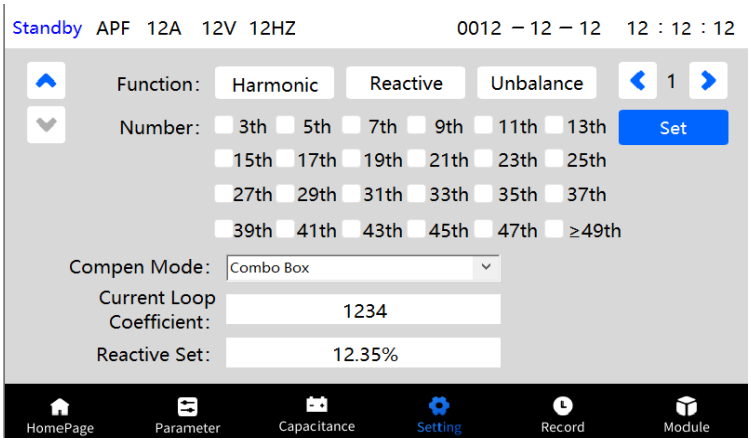


Figure 4.10: Parameter Settings for APF Interface

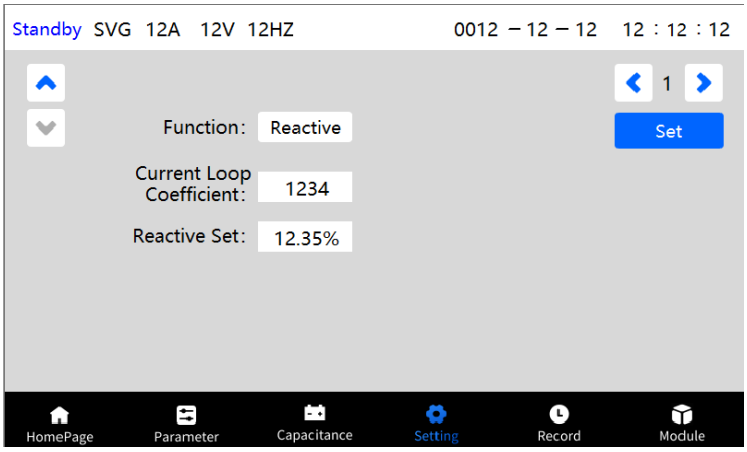


Figure 4.11: Parameter Settings for SVG Interface

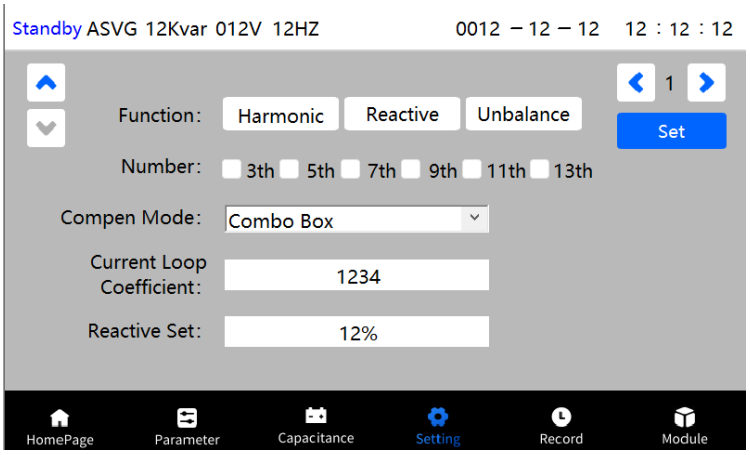


Figure 4.12: Parameter Settings for ASVG Interface

If the module is intended for capacitor control, the screen will display capacitor information, as shown in Figure 4.13 ~ Figure 4.14. After setting the capacitor switching method, users need to click "Confirm Settings" to activate the configuration. During the capacitor switching delay time, any changes will not take effect to ensure protection.

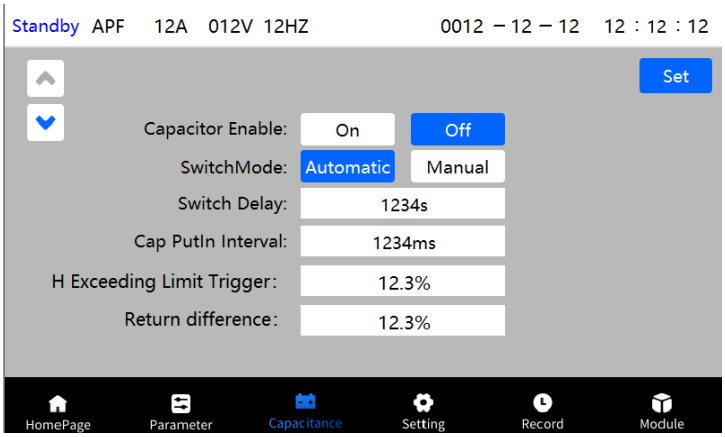


Figure 4.13 Capacitor Switching Interface First Page

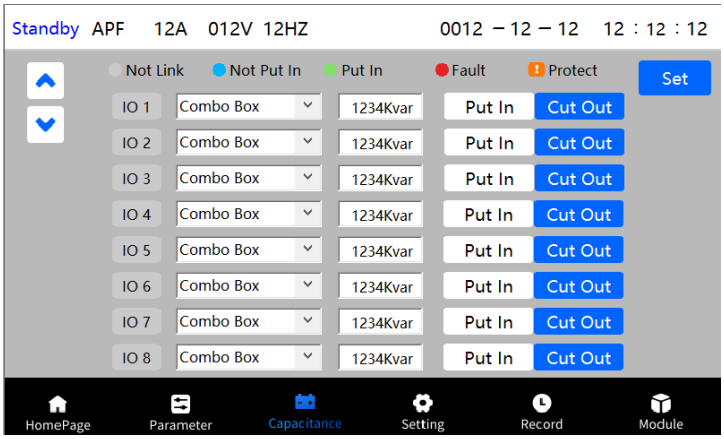


Figure 4.14 Capacitor Switching Interface Second Page

The 7-inch screen supports up to 16 modules in parallel distribution. The "Home" and "System Parameters" interfaces display system-level parameters, while the "Capacitor Information" interface shows details of the controlled capacitors. The "Module Information" interface provides specific information for each module, as shown in Figure 4.15.

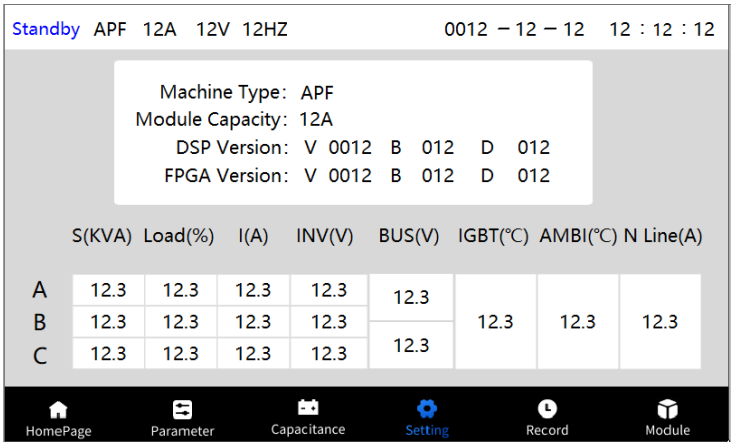


Figure 4.15: Module Parameter Information

4.4 Display and Setting of 4G Module APP and Website

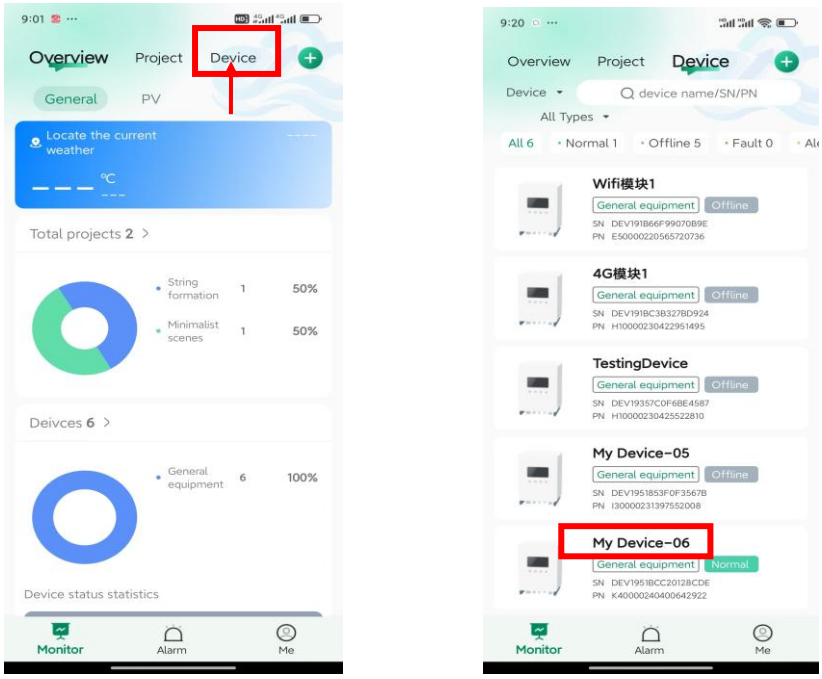
4G module APP: Download via QR code in Section 3.3.4.

4G module website: www.valueclouds.com

Both allow you to view electrical data, set device parameters, and perform simple remote debugging.

4.4.1 Logging Into and Selecting a Device

APP: Log into the APP and enter the overview interface, as shown in Figure 4.16 (1); Tap the "Device" option at the top to enter the device selection interface, as shown in Figure 4.16 (2); Tap the device name you want to view, for example, "My Device-06",then the device information screen is displayed.



(1) (2)

Figure 4.16 APP Overview interface

Website: Log into the website and enter the overview interface,as shown in Figure 4.17; Click "Device" - "Device List" on the left to enter the device selection interface, as shown in Figure 4.18; Click the device name you want to view, for example, " My Device-06",then the device information screen is displayed.

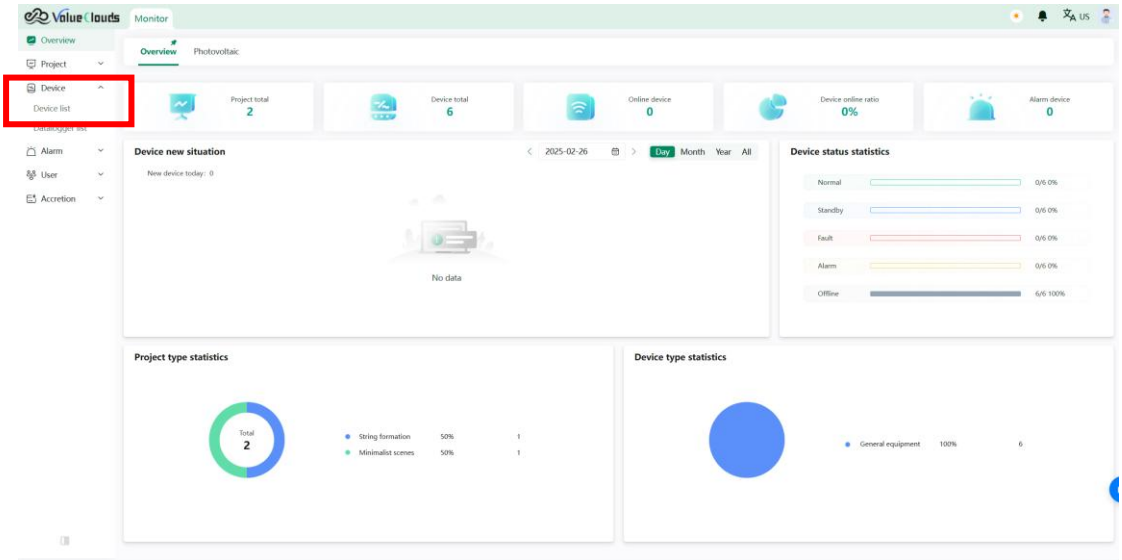


Figure 4.17 Web overview interface

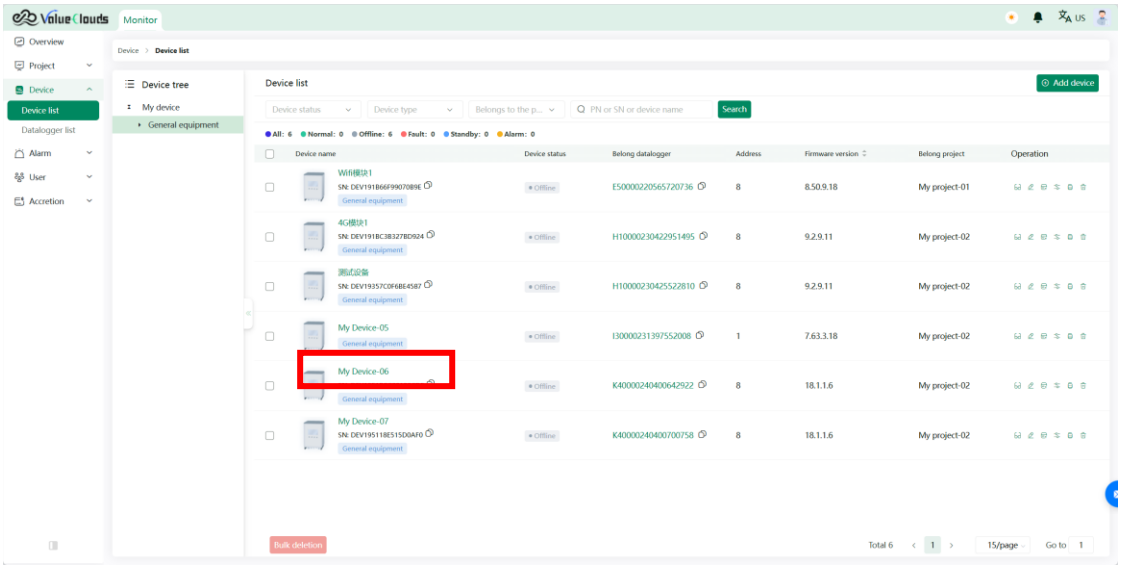
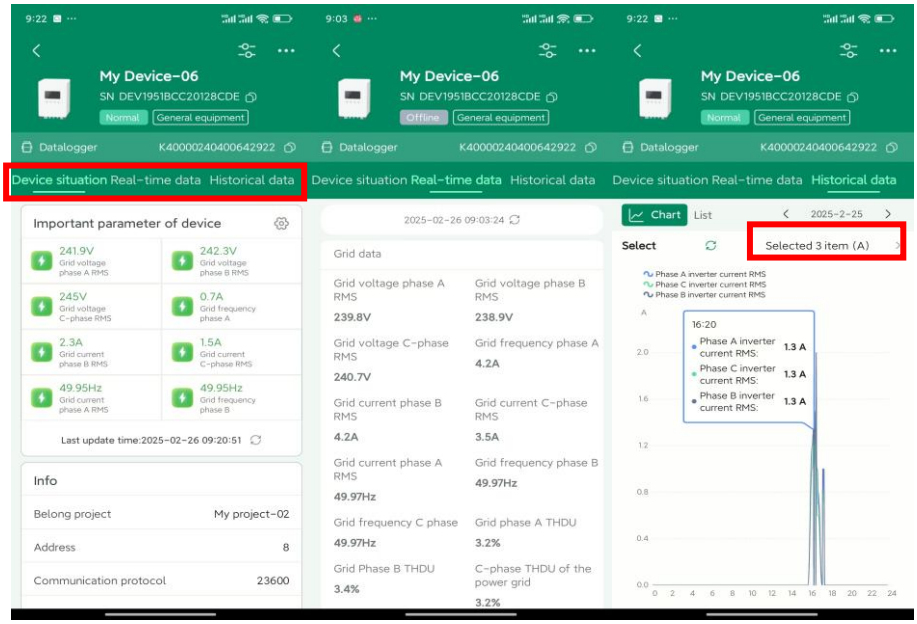


Figure 4.17 Web device selection interface

4.4.2 Viewing Device Data

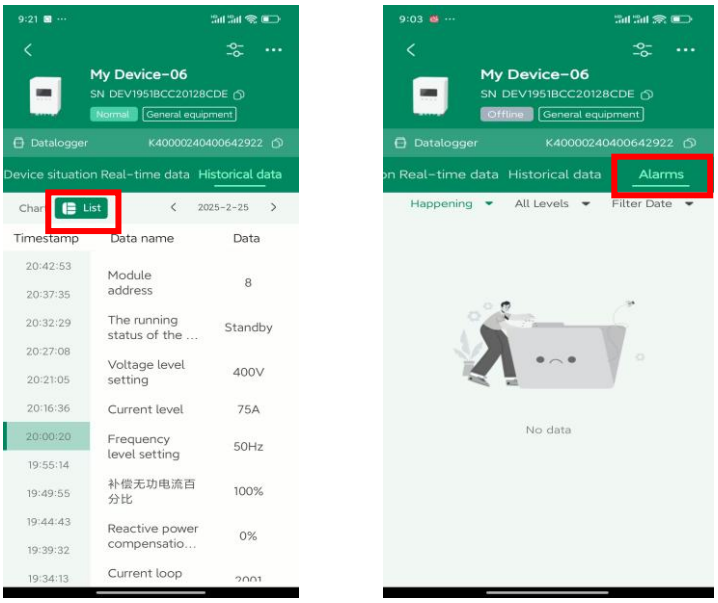
APP: Enter the device information interface, as shown in Figure 4.19 (1). You can slide the option bar in the box to select different options; Tap "Real-time Data", as shown in Figure 4.19 (2), to view the latest device information (refresh every 5 minutes); Tap "Historical Data", as shown in Figure 4.19 (3), to view the data chart of the selected parameters within 24 hours. Tap "Selected 3 items" to select and switch the data chart to be displayed.



(1) (2) (3)

Figure 4.19 APP device selection interface

Tap 4.20 (1) "List" to view all historical data, tap the time under "Timestamp" to view data at a specific moment; Slide the option bar in box 4.19 (2) and tap the "Alarms" option to enter the alarm display interface shown in the figure.



(1) (2)

Figure 4.20 Historical data and Alarms interface

Website: The device information page is displayed, as shown in Figure 4.21. Click 1- "Button" ,2- "Data dashboards – the gear icon" according to the sequence shown in the figure to collect device information and display key data.

Click "Historical Data" - "Table View" interface, as shown in Figure 4.22. 1-3 illustrates the buttons and slider bars for "Exporting data to excel", "Showing/hiding parameters", and "dragging to view all data in this period respectively".

Click the "Device alarm" interface, as shown in Figure 4.23. Device alarm interface default display "Occurring", you can view the current alarm; Click the drop-down box, select "Recovered", you can view the historical alarm. Users can choose to view the current alarm and historical alarm.

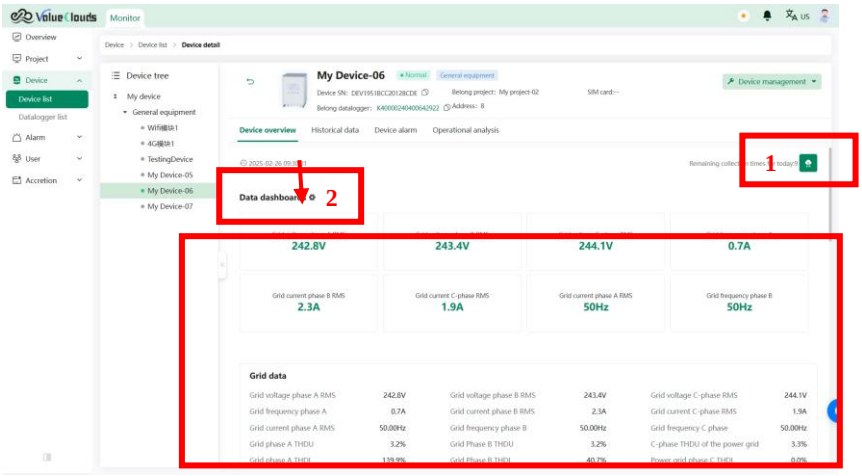


Figure 4.21 Equipment information overview interface

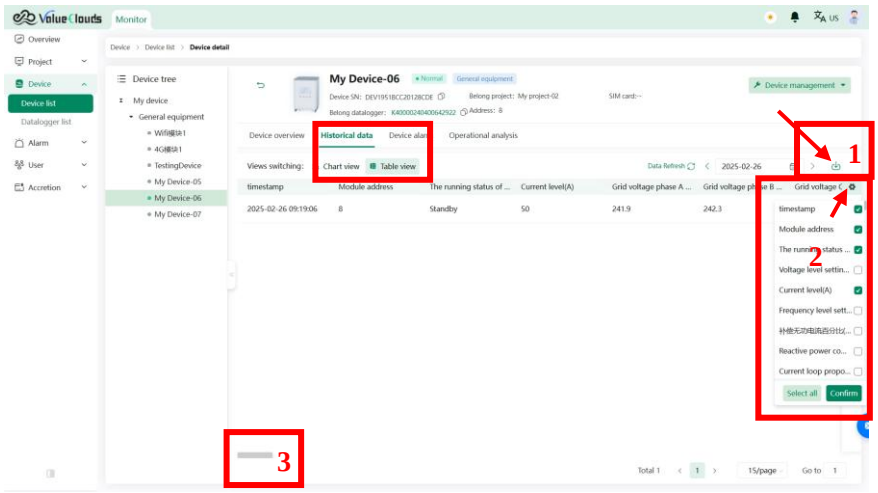
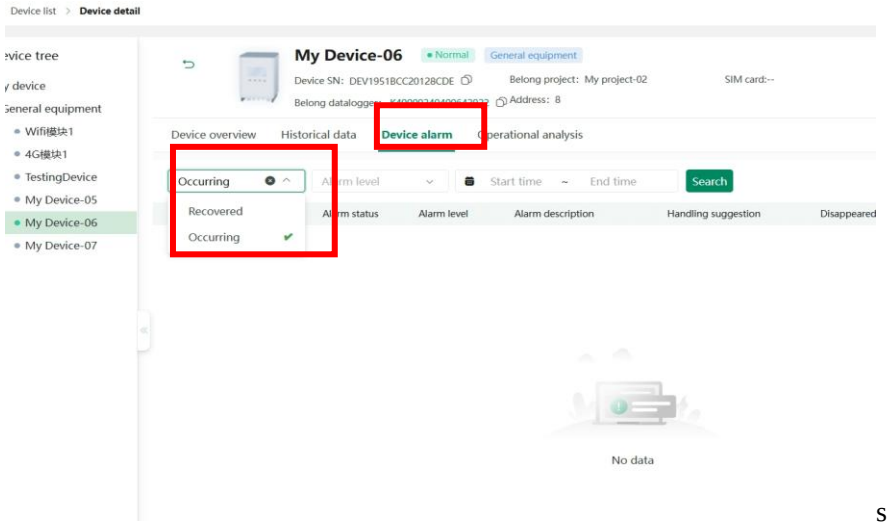


Figure 4.22 Historical data interface

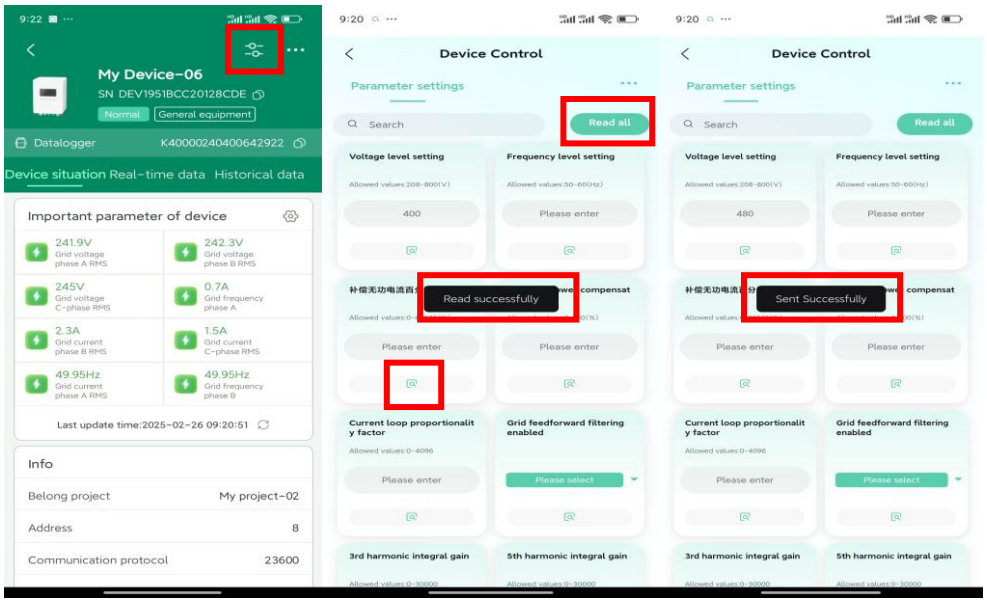


s

Figure 4.23 Device alarm interface

4.4.3 Setting Device Parameters

APP: In the device information interface, tap the icon in the upper right corner of Figure 4.24 (1) to enter the parameter setting interface. Tap "Read all" in Figure 4.24 (2) to read the current values of all configurable parameters; Tap the "magnifying glass" icon in the single parameter box to read the current value of a single parameter; Enter the setting value in the parameter setting input box - Tap"Confirm"- The pop-up window "Read/Sent successfully" appears, indicating that the parameter has been successfully read/modified. Users can tap the "Read all"/" Magnifying glass "icon again to read and confirm whether the parameter has been successfully modified.



(1) (2) (3)

Figure 4.24 Device Control interface 1

Website: Click "Device Management" - "Device Control" in the upper right corner of the device information page to enter the parameter setting screen. Click "One click reading" in the parameter setting interface to read the current values of all configurable parameters; Click "Read" in the single parameter box to read the current value of a single parameter; Enter the setting value in the parameter setting input box - click "Setting" - The pop-up window "Successful delivery" appears, indicating that the parameter has been successfully modified, as shown in Figure 4.25. Users can click the "One click reading"/"Read" again to read and confirm whether the parameter has been successfully modified.

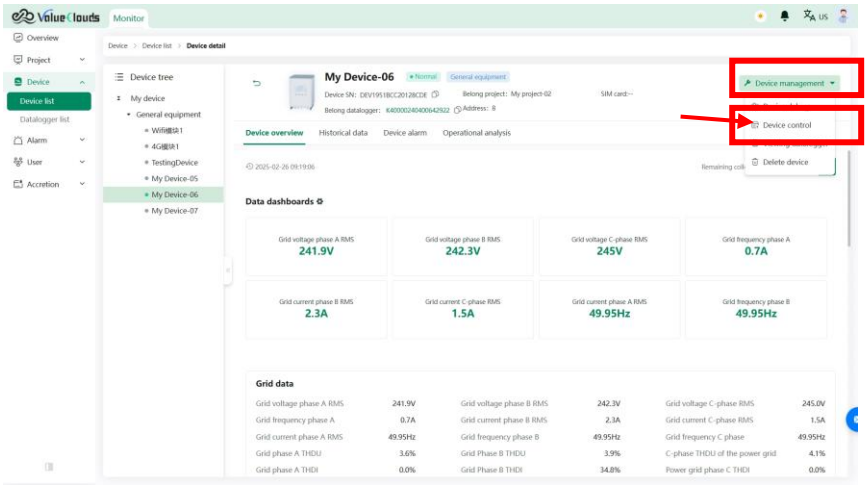


Figure 4.24 Device Control interface entry

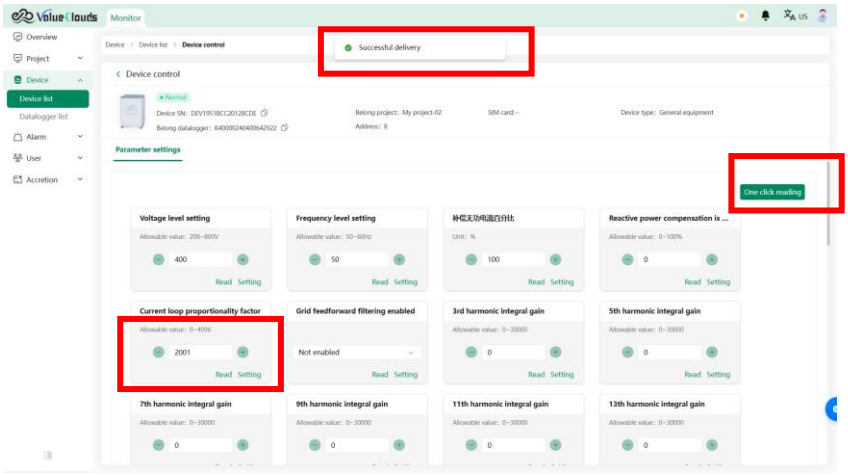


Figure 4.25 Device Control interface

Ⅴ Routine Maintenance and Care

5.1 Safety Precautions

Modules operate with high voltage. For safety, maintenance personnel must not touch any live terminals while the equipment is in operation. Ensure the grounding terminal of the equipment is reliably connected.

Due to the large number of capacitors in the module's bus, maintenance and inspection should only be performed 15 minutes after power is disconnected.

5.2 Routine Inspections

Do not open the module during operation or while it is powered. Perform a visual inspection from the outside to check for any abnormalities in the operation. The following items should typically be inspected:

1. Whether the display screen data meets requirements.
2. Whether the display screen shows any fault information.
3. Any abnormal sounds, vibrations, or odors.
4. Signs of overheating, discoloration, or other irregularities.
5. When following safety precautions, periodic inspections should be conducted after disconnecting the module from the grid.

The routine inspection items are listed in Table 5.1.

Table 5.1: Routine Inspection Items

category	Check the items	remark
circumstances	Temperature, humidity, presence of metal dust, corrosive gases	
Electrical connections	Whether the cables and terminals are damaged	
	Whether the main circuit wiring, grounding wire, CT wiring, communication wiring, etc. are reliably connected	
Heat dissipation of the device	Whether there is a blockage in the air duct	

5.3 Alarm List

This table outlines the comprehensive alarm information that can be accessed through the "Current Records" and "Historical Records" menus on the module's display interface. Each entry includes the alarm type, and description for troubleshooting.

Table 5.2 Alarm List

Alarm	interpretation
Soft Start Failure	Abnormalities in bus voltage or inverter output voltage during the soft-start process.
Abnormal Grid Voltage	Grid voltage exceeds 115% of the rated voltage or drops below 85% of the rated voltage.
Abnormal Grid Frequency	Grid frequency exceeds 3Hz above or drops 3Hz below the rated frequency.
Abnormal Grid Phase Sequence	Grid phase sequence is ACB, BAC, or CBA.
Input Neutral Missing	Main circuit input neutral line (N) not detected.
Bus Undervoltage	Bus voltage drops below 80% of the rated voltage.
Bus Overvoltage	Bus voltage exceeds 120% of the rated voltage.
Relay or Fuse Open Circuit	At least one output fuse or relay is in an open-circuit state.
Relay Short Circuit	At least one relay is closed without an enable signal.
Overload Timeout	Current overload during or after the soft-start process.
Auxiliary Power Abnormal	Auxiliary power failure or power loss.
Emergency Shutdown	Emergency stop (EPO) switch on the touch control panel is pressed, or external EPO command is received.
Fan Abnormality	At least one fan has failed.
Abnormal Output Current	Actual output current differs from the IGBT bridge arm output current by more than 20% of the rated current.
Overtemperature (Environment)	Ambient temperature exceeds 55°C.
Overtemperature (IGBT)	IGBT temperature exceeds 90°C.
CT Polarity Reversed	Secondary side of the current transformer (S1, S2) is reversed.
CT Current Overload	CT current exceeds 1.2 times the CT sampling range.
CAN Communication	CAN cable not connected or loose when CT is positioned on the grid side.

Alarm	interpretation
Failure	
Communication Failure	No 485 communication modules detected.
Model Mismatch	Alarm triggered if different models are used in a parallel configuration.
Voltage Level Mismatch	Alarm triggered if different modules have different voltage levels in a parallel configuration.
Frequency Level Mismatch	Alarm triggered if different modules have different frequency levels in a parallel configuration.
Start Method Mismatch	Alarm triggered if different modules use different start methods in a parallel configuration.
Target Cosine Value Mismatch	Alarm triggered if different modules have different target cosφ values in a parallel configuration.
CT Position Mismatch	Alarm triggered if different modules have different CT positions in a parallel configuration.
CT Ratio Mismatch	Alarm triggered if different modules have different CT ratios in a parallel configuration.
Compensation Function Mismatch	Alarm triggered if different modules have different compensation functions in a parallel configuration.

Appendix I Product Module Warranty Form

User Units:	
Address:	
Zip:	Fax:
Contact:	Phone:
Machine No.:	
Contract No.:	Date of purchase:
Service Units:	
Contact:	Phone:
Users' evaluation of service quality: □ Good □ Better □ ordinary □ Bad Other comments: User signatures: Date:	
Customer service center return visit record: □ Telephone return visits □ Letter return visit Other: Signature of Technical Support Engineer: Date:	

Note: This order will be invalid if the user cannot be returned.

Appendix II Notice to Users

1. The scope of warranty refers to the APF device itself.

2. During the warranty period, if the product fails or is damaged, our company will repair it free of charge.

3. The starting time of the warranty period is the date of manufacture of our company, and the machine code is the only basis for judging the warranty period.

4. Even during the warranty period, a certain repair fee will be charged if the following occurs:

- Machine failure caused by not operating according to the user manual;
- Machine damage caused by fire, flood, abnormal voltage, etc.;
- Damage caused when the device is used for non-normal functions.

5. The service fee is calculated according to the actual cost, if there is another contract, the principle of contract priority shall be used.

6. Please be sure to keep this card and present it to the repair unit during the warranty.