

APF V6.0 Users Manual



Introduction

Thank you for purchasing our APF active power filter!

We are dedicated to solving power quality problems for our customers. Our active power filter offers comprehensive power quality management capabilities. The APF can simultaneously filter harmonics from the 2nd to the 51st order, achieving a filtering efficiency exceeding 97%. It fully compensates for step-change harmonics in less than 5ms. Multiple APFs can operate in parallel, achieving an overall efficiency exceeding 98%. They are ideal for a variety of industrial and residential applications, providing an optimal solution for harmonic control and reactive power compensation for nonlinear loads.

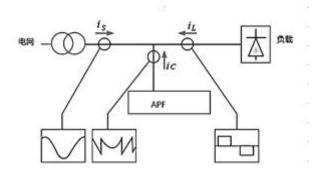


Product appearance

Overview

□ Product Principle

1) Functional Principle



APF Compensation Principle Diagram

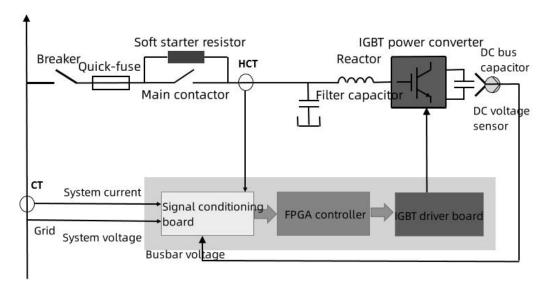
By setting parameters, users can enable the device to simultaneously have functions such as filtering harmonics, dynamically compensating reactive power, compensating for three-phase imbalance, and compensating for voltage drops.

APF Functional principle

Principle Name	Principle Description		
Harmonic Filtering Principle	The APF collects current signals in real-time through an external current transformer, separates the harmonic through its internal detection circuit, and generates a compensation current that is equal in magnitude but opposite in phase to the harmonics in the system through an IGBT power converter, thereby achieving the function of harmonic filtering. The compensation current output by the APF dynamically and accurately adjusts according to the harmonic content of the system, thus avoiding the problem of over-compensation. In addition, the APF is equipped with an internal overload protection function. When the harmonic content of the system exceeds the filter capacity, the device can automatically limit its output to 100% of the rated capacity, preventing overload.		
Reactive Power Compensation Principle	When the APF operates in ASVG mode, it generates capacitive or inductive fundamental current through the IGBT power converter based on the reactive power of the system, so as to achieve the purpose of dynamic reactive power compensation. The compensation target value can be set via the operation panel, with no over-compensation occurring, and the compensation is smooth, without inrush current impact on the load and the power grid.		

Three-Phase Imbalance Compensation Principle The APF extracts the unbalanced components based on the system current. The three phases generate currents that are equal in magnitude and opposite in phase to these unbalanced components, compensating the unbalanced part to zero, thereby correcting the three-phase unbalanced current into a three-phase balanced current.

2) Control principle



APF Internal Control Principle Diagram

After the circuit breaker is closed, to prevent the instantaneous impact of the power grid on the DC bus capacitor when power is applied, the APF first charges the DC bus capacitor through the soft-start resistor. When the bus voltage Udc reaches the preset value, the main contactor closes. The DC capacitors, acting as energy storage devices, output compensation currents through the IGBT inverter and internal reactors to provide energy.

The APF collects current signals in real time through an external CT, sends them to the signal conditioning circuit, and then to the controller. The controller decomposes the sampled current, extracts harmonic currents of all orders, reactive current, and three-phase unbalanced current. It compares the collected current components to be compensated with the compensation current already generated by the APF to obtain a difference, which is output as a real-time compensation signal to the drive circuit. This triggers the IGBT converter to inject the compensation current into the power grid, realizing closed-loop control and completing the compensation function.

☐ Product Features

- 1) Modular design: any module failure will not affect the normal operation of other modules, greatly improving the reliability of the entire equipment; it can achieve smooth expansion by directly connecting multiple units in parallel. Master-slave control is used for multiple unit expansion; when multiple modules are connected in parallel, all modules can share a set of current transformers
- 2) It can filter out harmonic currents of 2nd to 51st order at the same time, with a filtering rate of no less than 97%; reactive power compensation can make the power factor reach 1. It can correct the imbalance of three-phase current to complete balance
- 3) Adopting the seventh generation IGBT of internationally renowned brands, it can automatically adjust the output according to the harmonic current of the load and perform dynamic filtering.
- 4) Adopts imported DSP control chips from internationally renowned brands, featuring fast operating speed and high reliability.
- 5) The layered design prevents dust, dew and rain from adhering to the circuit board, making it suitable for use in harsh working conditions.
- 6) Filtering, reactive power compensation, and three-phase imbalance compensation can be selected individually or in multiple options, and the priority of the functions can be set
- 7) Adopting multi-coordinate rotation control algorithm based on instantaneous reactive power theory, reactive power and harmonic current are completely decoupled and controlled, with fast calculation speed, instantaneous response time less than 0.1ms, and full compensation response time of the device less than 5ms
- 8) The output filter adopts LC structure to connect to the power grid. Its own high-frequency carrier will not be fed back to the power grid, and there will be no interference to other equipment in the power distribution system
- 9) It has complete protection functions, including overvoltage, overcurrent, overheating, short circuit and other complete protection functions, and also has system self-diagnosis function
- 10) Equipped with a soft start control circuit to avoid excessive inrush current at the start moment and limit the current within the rated range
- 11) With a reliable current limiting control mechanism, when the current to be compensated in the system is greater than the rated capacity of the device, the device can automatically limit the current to 100% capacity output to maintain normal operation
- 12) The main circuit adopts a three-phase H-bridge two-interleaved topology,

with an equivalent switching frequency reaching 80K Hz, featuring high output waveform quality and low switching loss;

- 13) Adopts a high-definition 7-inch touch screen (10-inch touch screen customizable), which is easy to operate. The screen displays the operating parameters of the system and the device in real time, and is equipped with fault alarm and recall functions. Meanwhile, by utilizing the dual serial port function of the touch screen, data can be uploaded to the 4G cloud platform or a computer that supports RS485 for remote monitorin
- 14) Capable of compensating even-order harmonics and specified high-order harmonics
- 15) In ASVG mode, operating modes of reactive power priority and harmonic priority can be set, which can achieve the effect of free allocation between reactive power compensation and harmonic compensation

☐ First Use

Users who use this product for the first time should first read this manual carefully. If you still have questions about the function and installation of this product, please consult our technicians for assistance, which is beneficial for the correct use of this product.

Table of contents

Introduction	2
Overview	3
Product principle	3
Product Features	5
First Use	6
Table of contents	7
About the Manual	9
Safety instructions	10
Safety signs	10
Safety Notes	10
Specific purpose	13
Chapter 1 Product information	14
1.1 Product Appearance Description	15
1.2 Wiring Terminal Description	17
1.3 Indicator Light Status Description	18
1.4Product Dimension	19
Chapter 2 System Connection	21
2.1 System connection diagram	22
2.2 System Configuration and Components Se	election24
Chapter 3 Installation and Wiring	29
3.1 Installation Precautions	30
3.1.1 Installation Environment	30
3.1.2 Installation Space and Direction	31
3.2 Installation Instruction	33
3.2.1 Cabinet-type Installation	33
3.3 Wiring	
3.3.1 Primary wiring	39
3.3.2 Centralized Monitoring Touchscree	en Wiring41
3.3.3 CT Wiring	41
3.3.4 Emergency Stop Switch Wiring	46

Chapter 4	Start-up and Shutdown Operation Guide	48
4.1 Start	up steps	49
4.1.1	Wiring Inspection	49
4.1.2 (Communication Inspection	49
4.1.3 l	Parameter Check	50
4.2 Shuto	down steps	50
4.3 Autor	matic Startup	51
Chapter 5	7-inch HMI Operation Guide	52
5.1 Main	Interface	53
5.2 Grid	Parameter Interface	54
5.3 Load	Parameters Interface	57
5.4 Modu	ıle Parameters Interface	59
5.5 Parar	neter Setting Interface	60
5.6 Real-	time Recording Interface	62
5.7 Perso	onalized Interface	62
Chapter 6	Maintenance	64
6.1 Main	tenance	65
Appendix 1	APF Technical Specifications	67
Appendix 2	APF Detailed Menu Description	68
Appendix 3	APF Status and Fault Information	70
Appendix 4	APF communication data point	73
Appendix 5	APF status word and fault word	85

About the Manual

Thank you for purchasing our APF active power filter. This manual explains how to use this product correctly. Please read this manual carefully before use (installation, wiring, operation, maintenance, and inspection). Please also understand the safety precautions before using this product.



- This manual is delivered with the product
- This manual applies to APF200A,150A,100A
- This manual also applies to APF 690V 100A,75A
- This manual introduces the functional features and usage of APF, including product selection, parameter setting, operation and debugging, maintenance and inspection, etc. Please read this manual carefully before use. Equipment manufacturers should send this manual to the end user along with the equipment for subsequent reference.
- The illustrations in this manual are only for explaining how to install and use the product, and may be different from the product you ordered.
- Our company is committed to continuous improvement of products and upgrading of product functions. The information provided is subject to change without prior notice.
- If you have any questions during use, please contact our regional agents or directly contact our sales and technical personnel.

Safety instructions

■ Safety signs

In this manual, the safety levels are divided into the following three categories

Table 1-1 Usage of Symbols, Terms and Names

	Notes	
Notice Notice	Failure to follow the manual requirements may cause losses or equipment malfunction and damage!	
Warning	Failure to follow the manual requirements may result in equipment damage and minor injuries to personnel!	
Danger	Failure to follow the manual requirements may result in serious accidents and serious injuries or death!!!!	

These three symbols used throughout this manual indicates that the relevant content is important for safety. Failure to comply with these precautions may result in economic losses, minor or serious injuries, or even death, as well as damage to this product, relevant supporting components, and cabinets. Additionally, our company shall not be held liable for any injuries or equipment damage caused by your company or your customers' failure to comply with this manual.

■ Safety Notes

Before installation



- Danger
- If you find water in the box or the device, or if parts are missing or obviously damaged when unpacking, please do not install it!
- If the packing list does not match the name of the actual product and the name of the ordered equipment, please do not install it!



- When transporting the module, be sure to hold the housing tightly. If it falls during transport, there is a risk of injury and possible damage to the device.
- When transporting, lift and place with care, otherwise there is a risk of damaging the equipment!
- Do not use a damaged or missing module, as there is a risk of injury!
- This device has undergone a withstand voltage test before leaving the factory. Do not perform withstand voltage tests on any component of the device without confirmation with our technical staff. High voltage may damage the insulation and internal components of the device.

During installation



• Non-electrical construction professionals are prohibited from installing, maintaining, inspecting or replacing parts. Otherwise, there is a risk of electric shock!

- Danger
- It is strictly forbidden to tear off the anti-tear label of the equipment. Any damage caused is not within the scope of the company's responsibility and warranty.
- For renovation projects, when installing primary cables and current sampling secondary cables, ensure that the access system is powered off and that the surrounding area is safe for operation. Otherwise, there is a risk of electric shock, which could result in personal injury or death!
- Please handle the module gently during installation and be careful not to bump or knock it. Any damage caused thereby shall not fall within the company's liability scope or warranty scope



Notice

- When placing two or more modules in the same cabinet, pay attention to the installation position to ensure effective heat dissipation. It is recommended to add cooling measures such as fans.
- The module installation location should ensure ventilation. Do not cover the module's built-in cooling fan inlet and outlet.
- The module installation location should ensure safe debugging and maintenance by after-sales personnel.
- Wall-mounted modules should be installed in locations with less traffic as much as possible, and safety hazard signs should be placed in obvious locations.

During power-on operation



- Do not open the cover after power is turned on. Otherwise, there is a risk of electric shock, resulting in casualties!
- It is strictly forbidden to install or wire the equipment while it is energized!
- Do not touch any primary or secondary terminals of the module. Otherwise, there is a risk of electric shock, resulting in casualties!
- This equipment needs to be debugged by our company's designated after-sales engineers. Other personnel must operate it under the guidance of our after-sales engineers. Unauthorized operation is prohibited! Otherwise, it may cause equipment damage or even casualties!



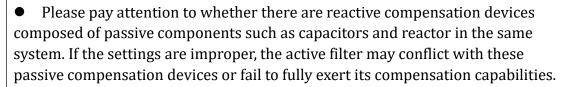
- When the device is running, please do not change the factory parameters of the device at will. Otherwise, it may cause damage to the device!
- When the device is running, avoid dropping objects into the device. Otherwise, the device may be damaged!
- After the device is powered on, avoid frequently starting and stopping the device or frequently turning on and off the upper switch of the device.
- During debugging, if the equipment makes abnormal noises or generates fault information, you should immediately turn off the power and contact our technical staff.

During maintenance



- Personnel without professional training are not allowed to repair or maintain the equipment. Otherwise, personal injury or equipment damage may occur!
- Do not repair or maintain the device while it is powered on. Otherwise, there is a risk of electric shock!
- Ensure that the input power supply of the equipment has been disconnected for no less than 10 minutes before carrying out maintenance and repair on the equipment. Otherwise, residual charges on the capacitors may cause personal injury!
- Before performing maintenance work on the device, ensure that the device is safely disconnected from all power sources.
- Parameters must be set and checked after replacing the device.
- Do not power on a device that has reported a fault or is damaged, otherwise it will cause further damage to the device.

☐ Specific purpose





Notice

- When using APF for harmonic compensation, ensure that there are no purely capacitive compensation devices or capacitive load devices in the system. If there are any, necessary measures (such as series reactors) must be taken to make the harmonics of the required compensation order inductive to avoid resonance. Otherwise, there is a risk of damage to the APF or to the purely capacitive compensation devices and capacitive load devices.
- When the APF is working, it may interfere with nearby communication equipment. The communication and control transmission signal lines must be kept as far away from the APF primary circuit as possible. If necessary, an anti-interference EMI filter can be installed to reduce the impact of interference.
- The altitude should not exceed 1000 meters. If it exceeds 1000 meters, the equipment rating will be derated by 1% for every 100 meters increase in altitude.

Chapter 1

Product information

.1 Product Appearance Description	15
2 Wiring Terminal Description	17
3 Indicator Light Status Description	18
.4 Product Dimension······	19

Chapter 1 Product information

1.1 Product appearance description

■Module Appearance: (200A, 150A, 100A)



Figure 1-1 Module Appearance

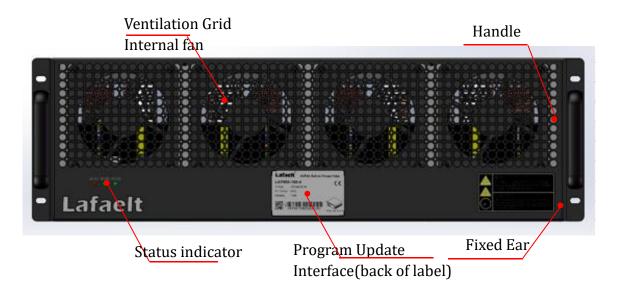


Figure 1-2 Front view of the module

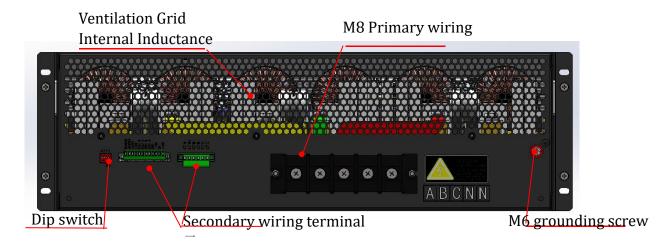


Figure 1-3 Module Back

■Module Appearance: Plug-in Type(150A, 100A)



Figure 1-4 Module Appearance (Plug-in Type)

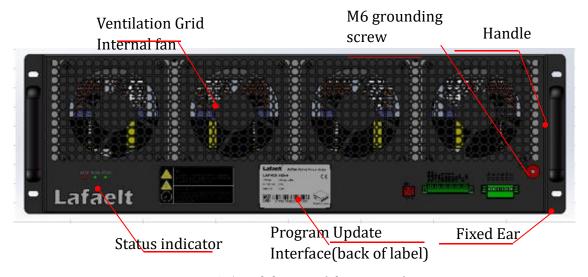


Figure 1-5 Module Front (Plug-in Type)

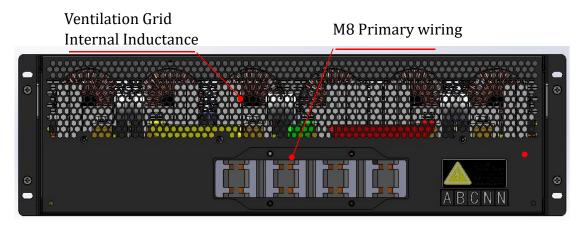


Figure 1-6 Module Back (Plug-in Type)

1.2 Wiring terminal description

■Module terminal blocks: (200A, 150A, 100A)

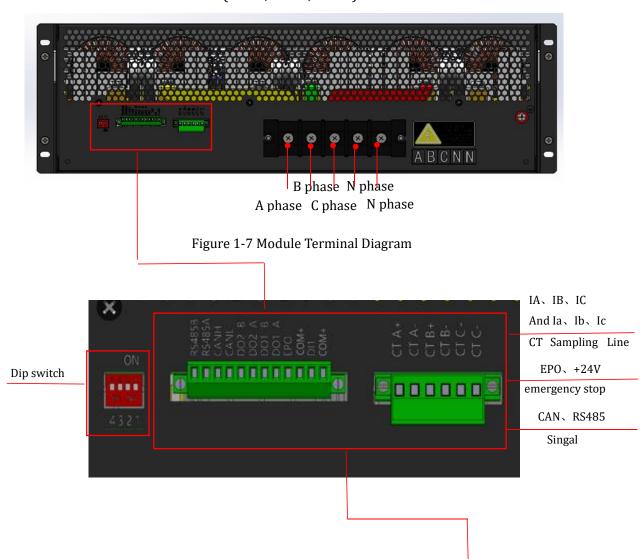




Figure 1-8 Module Terminal Diagram (Plug-in Type)

DIP Switch: Since the module itself is not equipped with a touch screen, the module address can be set via the DIP switch (converting binary to decimal). Only when the correct module address is set can the external centralized monitoring touch screen communicate normally with the module. For example, if there are 2 modules in the cabinet, the first module can have the DIP switch set to position 1, and the second module can be set to position 2, with position 1 needing to be reset (tconverting binary to decimal). The DIP switch has a total of 4 digits, allowing up to 15 modules to be connected in parallel.

1.3 Indicator Light Status Description



Figure 1-9 Indicator status diagram

Status indicator: There are three status indicators: ALM (alarm), RUN (operation), and POW (power supply); the POW indicator shows whether the module is powered on normally. If the mains power is connected once, the POW indicator (green) will be on; after the module is powered on, if the module is in normal operation, the RUN indicator (green) will be on; if the module alarms, the ALM indicator (red) will be on.

1.4 Product Dimension

■ Module Dimension: (200A、150A、100A)

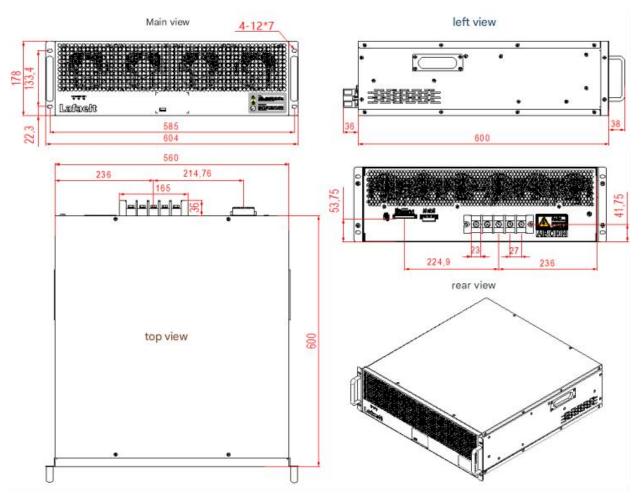


Figure 1-10 Module dimensions

■ Module dimensions: plug-in (150A, 100A)

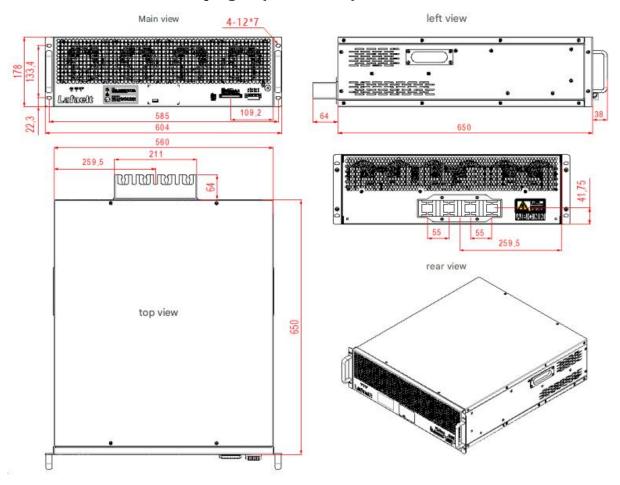


Figure 1-11 Module dimensions (plug-in type)

Chapter 2

System Connection

2.1 System connection diagram ·····	.22
2.2 System Configuration and Components Selection	.24

Chapter 2 System Connection

2.1 System Connection Diagram

■ Single Machine

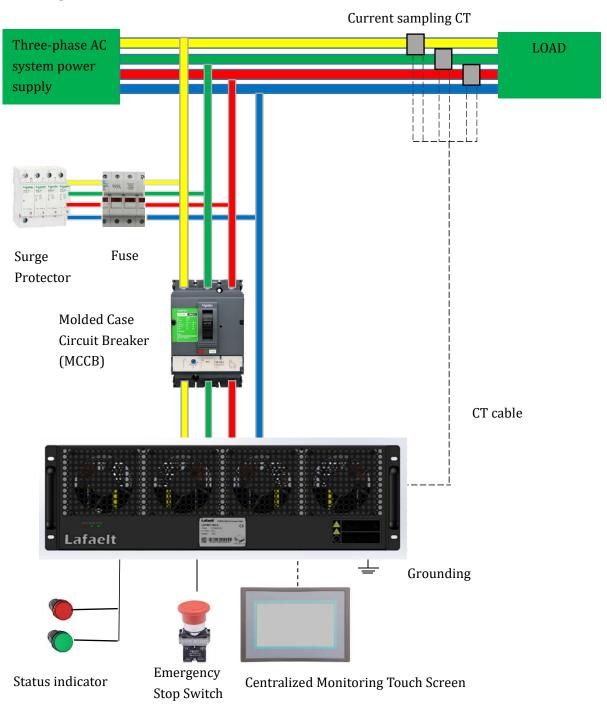


Figure 2-1 APF stand-alone system connection diagram

■ Multi-machine parallel connection

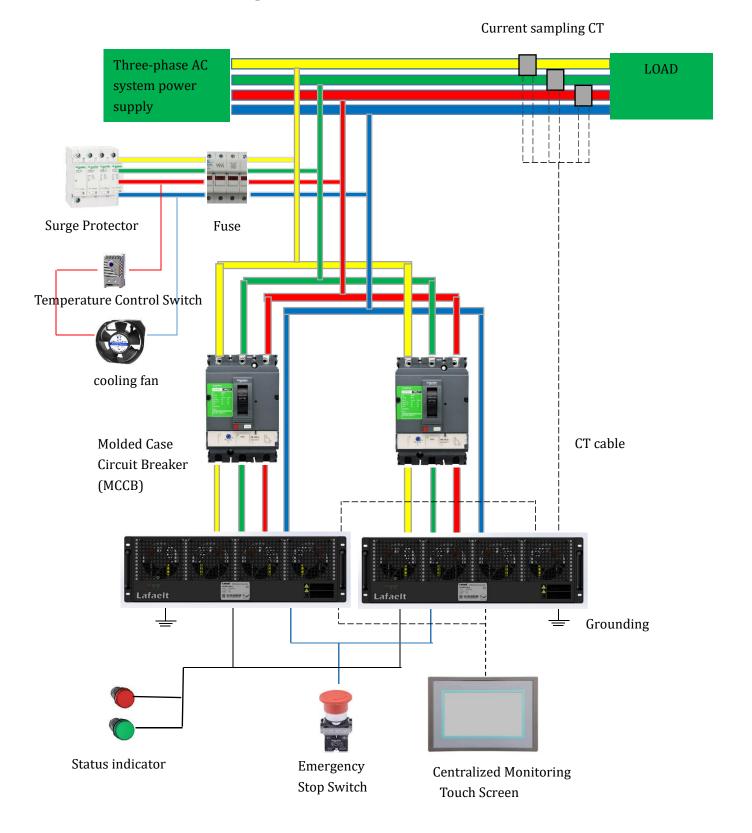


Figure 2-2 APF multi-machine parallel system connection diagram

- The system connection diagram is only used as a reference for the connection of main components under normal circumstances. Specific projects may vary slightly based on project requirements.
- The wiring of current transformer (CT) secondary circuits varies slightly depending on the installation location of the current sampling CT. For specific configurations, refer to the corresponding CT location section (not detailed here).
- The secondary wiring shown in the system connection diagrams is a schematic representation only; for detailed wiring, refer to the product's execution drawings provided by the manufacturer.

2.2 System Configuration and Components Selection

Component	Installation Location	Function Description	Selection Guidelines
Molded Case Circuit Breaker (MCCB) (must be installed)	 Power input terminal of the module For cabinet-mounted modules: Circuit breakers are installed inside the cabinet For wall-mounted modules: Circuit breakers are installed in the distribution box provided with the wall-mounted module 	 Switching control of the module Provides protection against overload, short-circuit, and undervoltage conditions, preventing damage to both wiring and the module. 	 Typically, one module can be equipped with one molded case circuit breaker (MCCB), or multiple modules may share a larger MCCB. The rated current of the MCCB is recommended to be 1.25~1.5 times the rated current of the module. Pole configuration: 3P/4PThermal-magnetic trip Breaking capacity: ≥35kA
Surge protector (Optional)	 At the power input terminal of the module, the line-side terminals of the molded case circuit breaker (MCCB) Be installed inside the cabinet or distribution box 	• Provides safety protection for cabinets and modules. When a peak current or voltage occurs in the electrical circuit, the surge protector can conduct and shunt in a very short time, thereby preventing overvoltage from damaging other devices in the electrical circuit.	 Pole configuration: 3P+N Maximum discharge current (Imax): ≥40kA

Fuse (Optional)	 Input terminal of Surge Protector Be installed inside the cabinet or distribution box. 	• The purpose of installing a fuse before a surge protector is mostly to avoid fire accidents such as combustion when a continuous short circuit fault occurs in the internal components of the surge protector	 Rated current: 32A and above Pole configuration: 4P
Centralized Monitoring Touch Screen (Optional)	 Cabinet-mounted type, can be installed on the cabinet door Wall-mounted installation, can be installed on the door of Communication is connected to the RS485 port of the module 	 Centralized monitoring, more convenient to view and set parameters. 	 Provided as part of our company's system package, or available for separate purchase.
Emergency Stop Switch (Optional)	 Installed on the cabinet door or the door of the distribution box. Connect to the module's EPO and +24V terminals. 	• When an abnormal situation occurs inside the cabinet or with the module (such as smoke, abnormal noise, or fire), the emergency stop switch can be pressed immediately to stop the module from operating, thereby effectively protecting the module.	 Button release type Operating part diameter: 40mm
Temperature Control Switch (Optional)	 Installed on the terminal block inside the cabinet Connected to the power input port of the fan 	Switch the fan on and off	 Withstand voltage 250V Overload current 10A Normally open, closes above 35°C

Fan (must be installed)	• Install on the rear door of the cabinet	 If the number of modules is ≤ 2, it is recommended to install two fans. If the number of modules is greater than 2, it is recommended to install four fans. 	 AC220V 50HZ 87W and above Air volume: 850CFM Operation direction: counterclockwise Recommended size: 254×254×89
Indicator light (Optional)	 Installed on the cabinet door Connected to the circuit of the relay's normally open and normally closed contacts. 	Display module running/stop, normal/fault status	 AC220V Red and Green Knob diameter: 22mm
Current transformer (must be installed)	 Installed on the main busbar of the power distribution system 	 Detect the load current of the power distribution system. 	 Transformation ratio must be /5, selectable between 100/5 and 10000/5 Accuracy 0.5 or higher Rated load 2.5VA or higher
	01	ther components	
Primary cable/copper busbar	 ■ Under different capacity and current levels, the selection of APF incoming cables shall comply with relevant electrical regulations, and environmental conditions shall be considered in the selection. The following table can be used as a reference: Note: APF is rated by current. For aluminum cables, they correspond to the corresponding current-carrying capacity specifications of copper cables. 		

Device rated	35A	50A、75A/50k	100A	150A	200A
current					
ABC					
three-phase	25mm ²	35mm ²	50mm^2	70mm ²	95mm ²
cable					
N wire	25mm ² *2	35mm ² *2	50mm ² *2	70mm ² *2	75mm ² *2
specification					

- Cables are typically BVR multi-strand copper-core PVC-insulated flexible wires.
- For high currents, two double-strand wires may be used.
- Since 3rd harmonics exist in some projects, harmonic currents will superimpose on the N wire, and the current can reach 3 times that of the phase wire. Therefore, the specification of the N wire must be one grade larger than that of the phase wire. For 100A, 150A, and 200A modules, there are 2 N wire terminals, and 2 N wires must be connected.

Copper busbar selection:

Device rated	Below 150A	150A~300	300A~600A	600A~900A
current		A		
Copper busbar specifications	20*4	30*4	50*5	60*8

	Reference Model selection:		
	Name	Specifications	
	Surge protector primary cable	6mm ² BVR multi-strand copper core flexible wire	
	Fan circuit cable		
	Emergency stop switch		
	circuit cable	1.5mm ² BVR multi-strand copper core flexible wire	
	Indicator light circuit cable		
Other cables	Grounding cable	Yellow-green BVR multi-strand copper core flexible cable. Suggestions for selecting protective grounding PE wire: When the cross-sectional area of AC phase wire $S \le 16 \text{mm}^2$, select the same cross-sectional area as the phase wire; when the phase wire cross-sectional area $16 \le S \le 35 \text{mm}^2$, select 16mm^2 for the protective grounding wire, when the phase	
		for the protective grounding wire; when the phase wire S > 35mm ² , select half of the phase wire's cross-sectional area as the cross-sectional area of the protective grounding wire.	
	CT current transformer sampling signal line	For CT cables, select 2.5mm ² shielded twisted pair RVSP2×2.5 (cable length L<15m), or 4mm ² shielded twisted pair RVSP2×4 (cable length 15m <l<30m).< td=""></l<30m).<>	
	Touch screen communication cable	Telephone line, provided as a complete set by our company	



• The table above lists the main components of the APF system for reference only. However, this does not guarantee that all components will be identical. If there are any special or discrepant features in your project, reasonable adjustments may be made based on the specific circumstances.

Chapter 3 Installation and Wiring

3.1	Installation Precautions	30
3.2	Installation Instruction	33
3.3	Wiring	39

Chapter 3 Installation and Wiring

3.1 Installation Precautions

3.1.1 Installation Environment

Installation environment requirements



- 1) Ambient temperature: The ambient temperature has a significant impact on the service life of the APF. The operating ambient temperature of the APF is not allowed to exceed the allowable range ($-10^{\circ}\text{C}\sim45^{\circ}\text{C}$). If the temperature is lower than -10°C , appropriate heating equipment should be added; if the temperature is higher than 45°C , cooling and heat dissipation equipment such as air conditioners should be added.
- 2) The APF should be installed on the surface of flame-retardant objects, and there must be sufficient heat dissipation space around the installation, as it will generate a large amount of heat during operation.
- 3) Please install it in a location not prone to vibration. Vibration should not exceed 0.6G. Special attention should be paid to keeping it away from stamping equipment such as punch presses.
- 4) Avoid installation in locations exposed to direct sunlight, damp environments, or places with water droplets.
- 5) Avoid installation in places where there are corrosive, flammable, or explosive gases in the air.
- 6) Avoid installation in locations with oil stains or dust.
- 7) When rack-mounted modules are installed in a cabinet, the cabinet must comply with relevant standards and regulations.

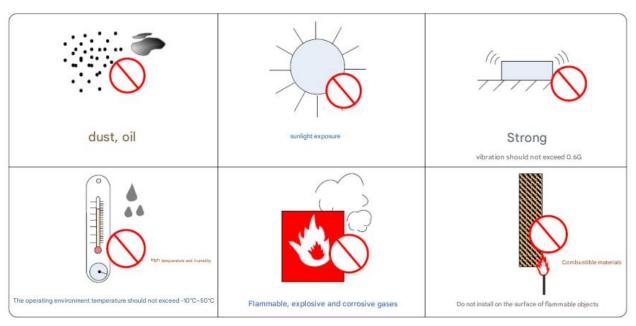


Figure 3-1 Installation environment requirements

3.1.2 Installation Space and Direction

1) Installation Space

When installing the APF, ensure adequate space for the air inlet and outlet.

Installation space requirements



- Strictly prohibit blocking the module's air outlets.
- For vertical cabinet installation, at least 600mm of space for air intake and exhaust, as well as rear maintenance space, must be reserved at the front and rear outlets of the cabinet. Additionally, ensure that the rear door of the cabinet can be opened and closed properly.

- Space Requirements for Cabinet-Type Installation
- (1) In cabinet-mounted installations, the module takes in air from the front and exhausts it to the rear, with heat dissipating from front to back.

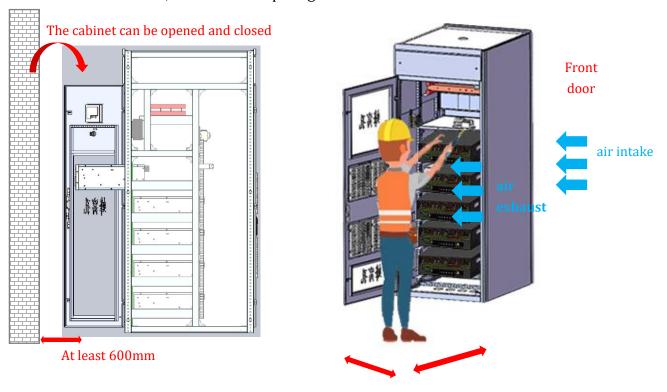


Figure 3-2 Schematic diagram of space requirements for vertical cabinet installation

(2) Installation direction

When installing the device, please place it horizontally or on its side. Try not to install it in an inverted or tilted position.

3.2 Installation Instruction

3.2.1 Cabinet-type Installation

(1) Cabinet Structure

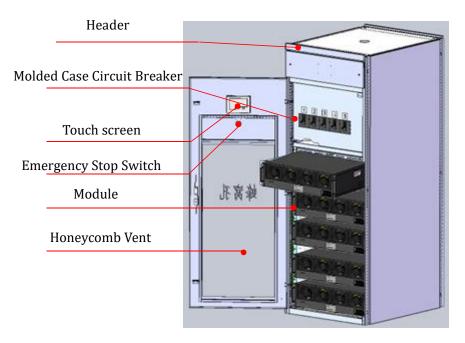


Figure 3-4 Schematic diagram of the entire cabinet (front)

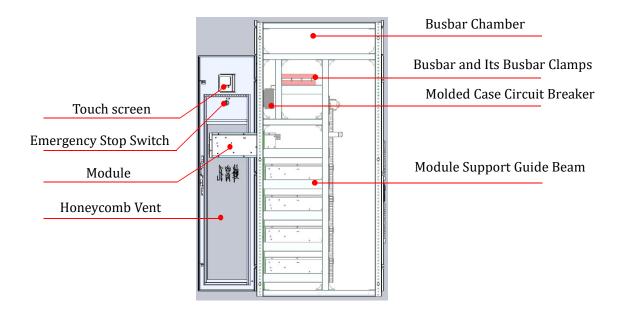


Figure 3-5 Schematic diagram of the entire cabinet (side view)

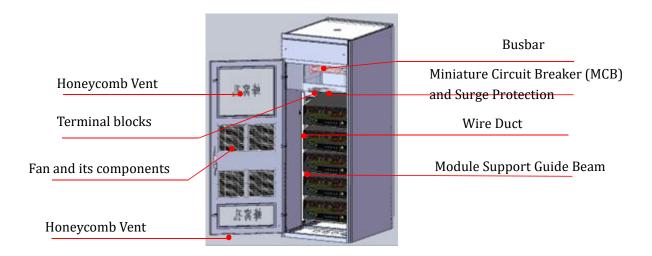


Figure 3-6 Schematic diagram of the entire cabinet (back)

The equipment is divided into three parts from top to bottom. The top is the busbar chamber, which passes through the system of the low-voltage complete equipment. The second part is the circuit breaker compartment, where each module is assigned a circuit breaker, multiple circuit breakers are connected via an internal busbar, which connects to the system busbars in the busbar compartment. The lower part is the module compartment, and a single cabinet can hold up to 5 modules.

A touch screen and an emergency stop button can be installed on the cabinet door. For better monitoring of module status and more convenient operation, a 7-inch external touch screen can be mounted on the cabinet door. The function of the emergency stop button is: when abnormal phenomena such as abnormal noise or smoke occur inside the cabinet, press the emergency stop button immediately to put the modules in standby mode, thus preventing the spread and aggravation of faults caused by module operation.

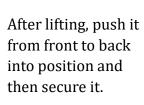
The front and rear doors of the module compartment should have honeycomb holes for ventilation and heat dissipation, with air flowing in from the front and out from the rear.

If there are ≤ 2 modules in the cabinet, it is recommended to install two fans on the rear door. If there are > 2 modules, it is recommended to install four fans.



• As specified in Chapter 2 System Connection, some components inside the cabinet are mandatory, while others are optional for installation. The selection can be made based on actual project conditions. The cabinet structure and accessory selection here are designed by our company's structural engineers and electrical engineers, which only take into account the circumstances of conventional projects. Some components are not shown as installed, such as status indicators mounted on the cabinet door, ammeters installed on the cabinet door, etc.

(2) Installation and fixing of modules



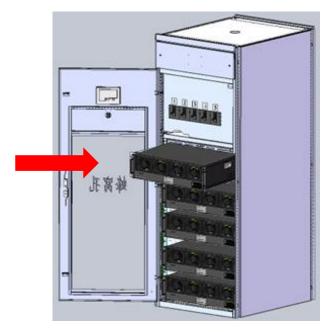


Figure 3-7 Module installation diagram



Notice

- The module weighs ≤ 38kg and requires transport equipment. Lift and installation requires at least two people.
- Please handle the module gently during installation and avoid bumping or knocking it, especially the touchscreen on the front panel. Any damage will be void our liability and warranty.

When installing the module in the cabinet, we provide two standard mounting brackets for each module to secure the front end to the cabinet. We also recommend installing two guide rail limit beams on the left and right sides of the module to stabilize the module. The rear side of the guide rail limit beams has fixing holes for bolting to the module. There are two fixing holes on each side of the rear of the module for securing with M6 screws.

(The mounting brackets are provided by our company. The guide rail limit beams are recommended for installation, but are not provided by our company. We recommend that they be included during cabinet sheet metal production.)



- The module mounting and installation method here was designed by our structural engineers. It is easy to install, meets mechanical strength requirements, and is convenient for transportation, disassembly, and maintenance.
- Other mounting methods are also acceptable, as long as they ensure mechanical strength and heat dissipation within the module's installation space.

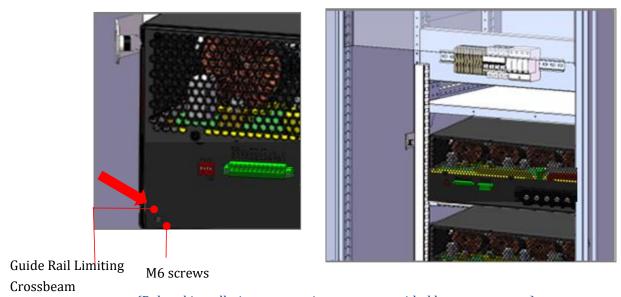
Ø7×12 hole
Compatible with M6 screws

Install the mounting bracket and fix them to the cabinet

Note: M6 screws should be provided by the user.

Figure 3-8 Installing the mounting bracket

Guide Rail Limiting Crossbeam(Recommended fixing method. Not provided by our company. It's recommended to integrate during cabinet sheet metal production.)

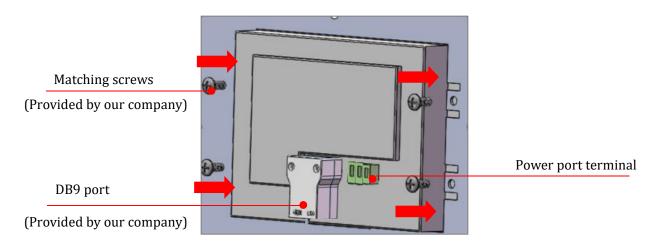


(Related installation accessories are not provided by our company)

Figure 3-9 Schematic diagram of module installation and fixation

(3) Installation of Centralized Monitoring Touchscreen

When installing the cabinet, a 7-inch external centralized touch screen can be installed on the cabinet door to centrally monitor all modules within the cabinet. The touch screen comes with mounting hardware for securement. The touch screen is equipped with a DB9 port and power port terminals.



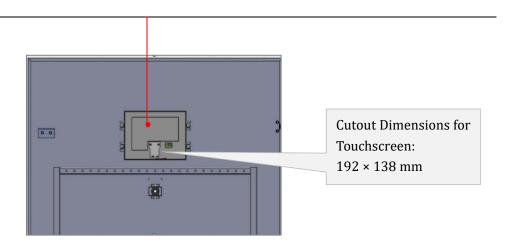


Figure 3-10 Touch screen installation diagram

3.3 Wiring

3.3.1 Primary wiring

(1) Wiring Diagram

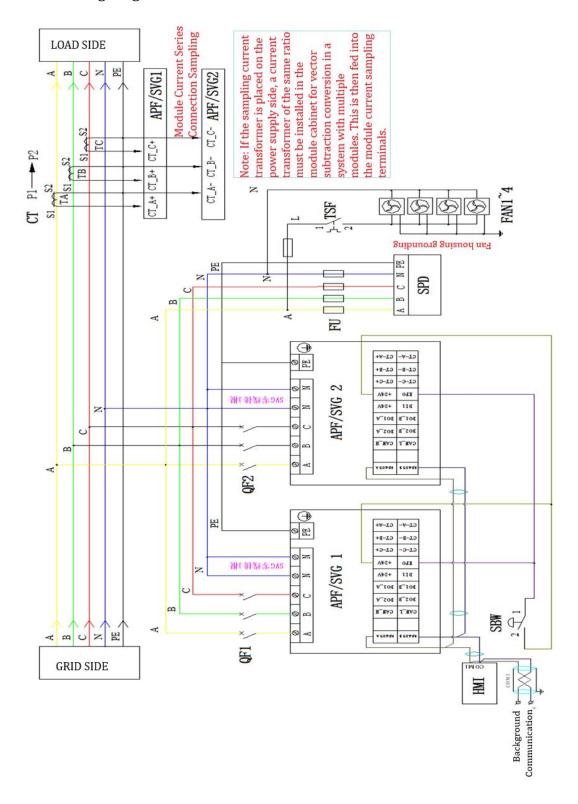


Figure 3-11 Wiring diagram

(2) Primary cable/copper busbar selection

Cable selection:

• The selection of APF incoming cables with different capacities and current levels should comply with relevant electrical regulations and take environmental conditions into consideration. The following table can be used as a reference:

Device rated current	35A	50A、75A/50k	100A	150A	200A
ABC three-phase cable	25mm ²	35mm ²	50 mm ²	70mm ²	95mm ²
N wire specifications	25mm ² *2	35mm ² *2	50mm ² *2	70mm ² *2	95mm ² *2

Note: APF is rated based on current. For aluminum cables, the corresponding copper wire specifications apply.

- Cables are usually BVR multi-strand copper-core PVC-insulated flexible wires.
- For high currents, two pairs of wires may be used.
- Neutral (N) Wire: Generally, it can be selected to be consistent with the phase wire. In situations with three-phase imbalance or significant third harmonics, it is recommended to use a larger gauge for the N wire, as the current at the N wire is relatively large at this time. If there is an accurate current value for the N wire in the actual project, the specification of the N wire can be selected according to the current.
- Grounding (PE) Wire:Yellow-green BVR multi-strand copper-core flexible wire. When the AC phase wire cross-sectional area S is $\leq 16 \text{ mm}^2$, the wire cross-sectional area is the same as that of the phase wire; when the phase wire cross-sectional area is $16 \leq S \leq 35 \text{ mm}^2$, use a 16 mm^2 protective ground wire. When the phase wire cross-sectional area is greater than 35 mm^2 , use half the phase wire cross-sectional area as the protective ground wire.
- Copper busbar selection reference:

Device rated current	below150A	150A~300A	300A~600A	600A~900A
Copper busbar	20*4	30*4	50*5	60*8
specifications				

3.3.2 Centralized Monitoring Touchscreen Wiring

The external centralized touchscreen connects to the RS485 port on the back of the module. The mounting bracket, port adapter module, and communication cable are standard accessories. Insert one end of the communication cable into the RS485 port on the module and the other end into the port module on the back of the touchscreen.

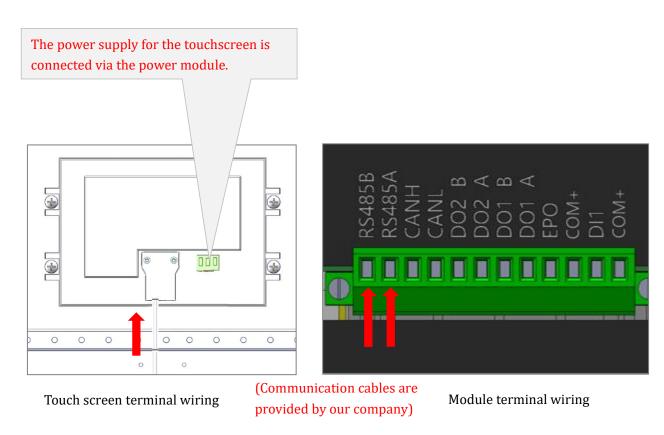
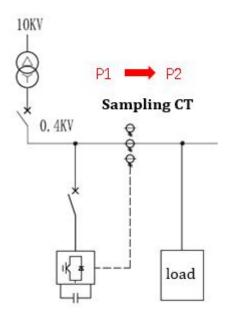


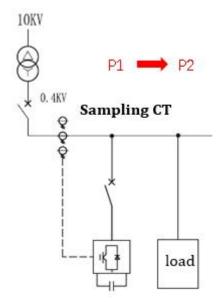
Figure 3-12 Wiring Diagram for Centralized Monitoring Touchscreen Communication Cable

3.3.3 CT Wiring

(1) CT Position and Direction

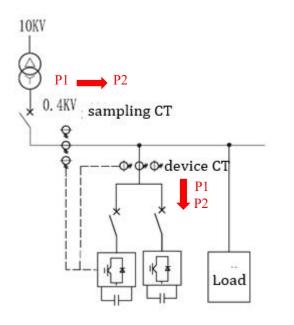
APFs are installed in parallel in the system. The current transformer (CT) can be installed on the grid side or the load side. The CT position (grid side or load side) can be set on the monitoring touchscreen according to the actual installation.

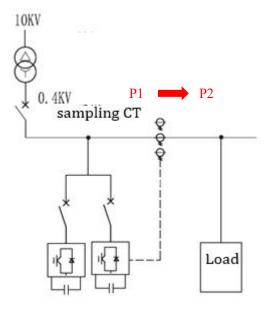




A: Single Module Load-Side Sampling

B: Single Module Grid-Side Sampling





C: Multi-module grid-side sampling

D: Multi-module load-side sampling

Figure 3-13 Schematic diagram of CT sampling scheme

■ Single Module

When a single APF module is connected to the system, the CT can be installed on either the grid side or the load side, as shown in Figures A and B.

■Multi-module

When multiple modules are connected to the system in parallel, the sampling grid side and the sampling load side are different, and the sampling load side wiring is more convenient.

Load-Side Sampling: When sampling the load side for multiple parallel-connected modules, only one set of CTs is required, as shown in Figure D.

Grid-Side Sampling: When sampling the grid side for multiple parallel-connected modules, it is necessary to add a CT device in the APF cabinet to sample the output current of the modules themselves. Then, the grid CT signal and the CT device signal are subtracted in anti-parallel to obtain the load-side current signal, which is input into the modules as the final sampling signal. The sampling signals between modules are connected in series, as shown in Figure C.

■Mixed Use of APF and Capacitor Compensation

When APF and capacitor-reactor compensation device are used together, the principle is that the main incoming line connection of APF should be closer to the load than the capacitor. This is because the APF compensates for harmonics. This way, the APF connection point faces the grid, and the current flowing through it is harmonically compensated, primarily consisting of the fundamental wave, which helps extend the life of the capacitors. The CT can be placed on either the grid or the load side.



• When APF is used for harmonic compensation, it cannot be used with pure capacitors. A reactor must be connected in series to ensure the compensation circuit exhibits inductive reactance at targeted harmonic frequencies, thereby preventing resonance.Otherwise, it may cause APF failure or damage to the pure capacitor compensation equipment.

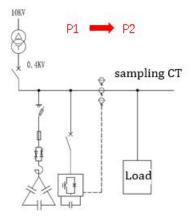


Figure 3-14 Schematic diagram of APF CT sampling position

CT installation direction: P1 towards the grid, P2 towards the load.

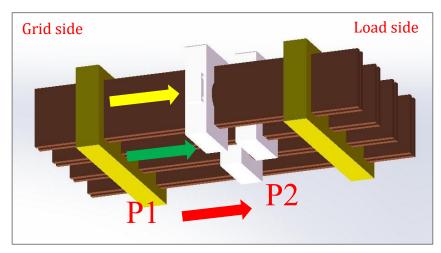


Figure 3-16 Schematic diagram of the P1 P2 direction of the current transformer

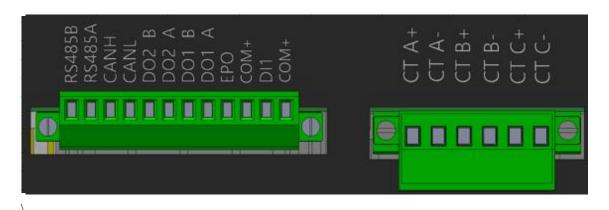
If the CT current flows from P1 to P2, then S1 is positive (+) and S2 is negative (-); otherwise, S1 is negative (-) and S2 is positive (+).

(2) Wiring

Improper current transformer connection can result in fatal electric shock due to an open circuit!



- Refer to the wiring diagram when installing and wiring the sampling CT. If you have any questions, please contact our technical support staff immediately.
- The installation and wiring of the APF CT must be performed by a trained and qualified engineer in accordance with the "Electrical Code." Unauthorized installation by other personnel is strictly prohibited. This manual only covers basic installation information. Please refer to the Electrical Code for specific installation details.
- Before installing the primary side of the current transformer, short-circuit the secondary side with a disconnect shorting terminal first. Otherwise, the current transformer in an open-circuit state will generate high voltage on the secondary side.
- Ensure that the current transformer is short-circuited until all APF CT terminals are connected.
- Before disconnecting the current transformer from the APF, short-circuit it with the disconnect shorting terminal.



	Description of Secondary Signal Wire Interface							
No.	Silk	Name &	Remarks	No.	Silk Screen	Name &	Remarks	
	Screen	Description				Description		
1	RS485B	485B Signal		11	DI1	Input 1		
2	RS485A	485A Signal		12	COM+	24V Power		
						Supply		
3	CAN_H	CAN_H Signal						
4	CAN_L	CAN_L Signal		No.	Silk Screen	Name &	Remarks	
						Description		
5	DO2_B	Output 2_B		1	CT_A+	Current		
						Transformer		
						Phase A+		
6	DO2_A	Output 2_A		2	CT_A-	Current		
						Transformer		
						Phase A-		
7	DO1_B	Output 1_B		3	CT_B+	Current		
						Transformer		
						Phase B+		
8	DO1_A	Output 1_A		4	CT_B-	Current		
						Transformer		
						Phase B-		
9	EPO	Emergency		5	CT_C+	Current		
		Stop				Transformer		
						Phase C+		
10	COM+	+24V Power		6	CT_C-	Current		
		Supply				Transformer		
						Phase C-		

Figure 3-17 Module secondary terminals and CT cable connection diagram $_{\rm 2}$

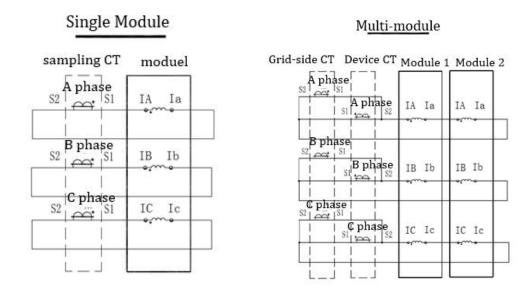


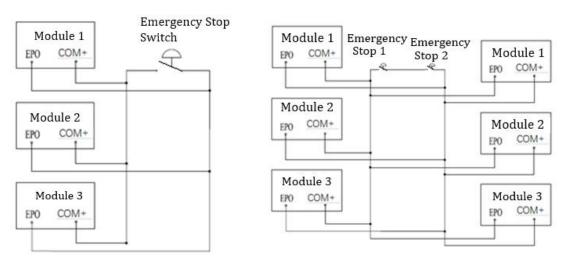
Figure 3-18 Typical CT wiring diagram

Grid-side sampling: When multiple modules are connected in parallel for grid-side sampling, a CT device must be added to the APF cabinet to sample the module's output current. Then, the grid CT signal and the device CT signal are connected in anti - parallel and subtracted to obtain the load - side current signal, which is then input into the module as the final sampling signal. The sampling signals between modules are connected in series. As shown in Figure 3 - 18.

The CT cable should be a 2.5mm^2 shielded twisted pair RVSP 2×2.5 (cable length L < 15m) or a 4mm^2 shielded twisted pair RVSP 2×4 (cable length 15 m < L < 30 m).

3.3.4 Emergency Stop Switch Wiring

When installing an APF cabinet, an emergency stop switch is typically installed on the cabinet door. If an abnormality (smoke, unusual noise, or fire) occurs inside the cabinet or within a module, pressing the emergency stop switch immediately stops the module, effectively protecting it.



Multiple modules in a Single Cabinet in parallel

Multiple modules in Primary & Auxiliary

Cabinets in parallel

Figure 3-19 Emergency stop switch wiring diagram

For parallel operation of multiple modules: Connect the EPO and COM+ pins of each module to an emergency stop switch, connected to a normally open signal.

For primary/auxiliary cabinet: Connect an emergency stop switch to each of the primary and auxiliary cabinet. The emergency stop of the primary cabinet and that of the auxiliary cabinet are connected in series, and then connected in parallel with each module. When the emergency stop switch in either primary or auxiliary cabinet is pressed, all modules will immediately shut down.



• The emergency stop switch is not mandatory for installation. If not installed, the EPO and COM+ ports should remain unconnected.

Chapter 4 Start-up and Shutdown Operation Guide

4.1 Startup steps·····	49
4.2 Shutdown steps····	50
4.3 Automatic Startup·····	51

Chapter 4 Start-up and Shutdown Operation Guide

4.1 Startup steps

4.1.1 Wiring Inspection

- (1) Check the wiring between the busbar and the circuit breaker, and between the circuit breaker and the equipment for obvious phase sequence errors. If any problems are found, correct them immediately.
- (2) Check whether the equipment's busbars are tightly connected and free from looseness; ensure all connections are secure.
- (3) Use a multimeter to check for short circuits between each pair of the equipment's A, B, C, N, and PE terminals.
- (4) Check whether the CT wiring is correct and whether the wiring at both ends of the terminal block corresponds. If not, make sure to correct them.

4.1.2 Communication Inspection

- (1) After confirming that the above procedures are correct, disconnect the emergency stop switch and close the circuit breaker.
- (2) Check whether the communication status indicator on the front of the module is lit and flashing normally. If it does not flash or is not lit, it indicates a communication problem. If the module on the main interface of the touch screen is displayed in red, check whether the address DIP switch of each module is set correctly. If all are set to 1, communication will definitely fail. The address DIP switches of the modules in the cabinet should be set as 1, 2, 3, 4 in sequence from top to bottom. If the communication problem persists, contact the manufacturer for resolution.
- (3) To enter the parameter setting interface, you need to enter a password to log in; no login is required for other interfaces.
- (4) Enter the setting interface to configure parameters. In this interface, users can set relevant parameters such as: startup mode, operating mode, CT transformation ratio, CT position, power factor, etc.

4.1.3 Parameter Check

Check whether the parameter display on the interface is consistent with the actual parameter display in the system. If the power factor, active power, or reactive power displays incorrectly (e.g., extremely low power factor, or negative values for active/reactive power in one or two phases), it may indicate a problem with the CT wiring. Please contact the manufacturer promptly for resolution.



- During APF start-up, APF output terminals become energized.
- If a load is connected to the APF output terminal, please confirm with the user whether it is safe to power the load. If the load is not ready to receive power, ensure the load is safely isolated from the APF output terminals.

4.2 Shutdown steps

Shutdown is performed by directly disconnecting the circuit breaker upstream of the APF, de-energizing the device. In this state, the APF blocks the IGBT trigger pulses, placing the device in non-compensation mode. Importantly, do not disassemble the module immediately after the APF is powered off. Wait until the internal capacitors are fully discharged, which takes approximately 10 minutes.



- Warning
- To prevent personal injury, if you attempt to perform maintenance or open the chassis after shutting down the unit, first use a multimeter to measure the voltage at the input terminals to ensure there is no mains power before proceeding.
- Module disassembly can only be performed 10 minutes after power-off (the energy storage capacitors inside the module require approximately 10 minutes to discharge).

4.3 Automatic Startup

If the system loses power or experiences voltage or frequency abnormalities, the APF will automatically shut down and stop outputting compensation current. If the following conditions are met, the APF will automatically restart and begin compensation without any further action.

- Mains power returns to normal
- The APF was in the power-on state before power failure
- After a 20-second delay for automatic startup

If the APF is not in the power-on state, the user can manually start the APF via the touch screen control panel.

Chapter 5 7-inch HMI Operation Guide

5.1 Main Interface·····	···53
5.2 Grid Parameter Interface·····	54
5.3 Load Parameters Interface·····	57
5.4 Module Parameters Interface·····	59
5.5 Parameter Setting Interface·······	60
5.6 Real-time Recording Interface······	62
5.7 Personalized Interface ···· ·······························	62

Chapter 5 7-inch HMI Operation Guide

When modules are installed in a cabinet, an external touch screen is usually mounted on the front door of the cabinet to facilitate parameter setting and viewing for users. The external touch screen is a 7-inch screen. The following describes how to operate the touch screen.

5.1 Main Interface

After the device is powered on, the screen will be in the startup state, and the startup process will last for several seconds. After the startup is successful, if the system is normal, the main interface will be displayed as shown in Figure 5.1.

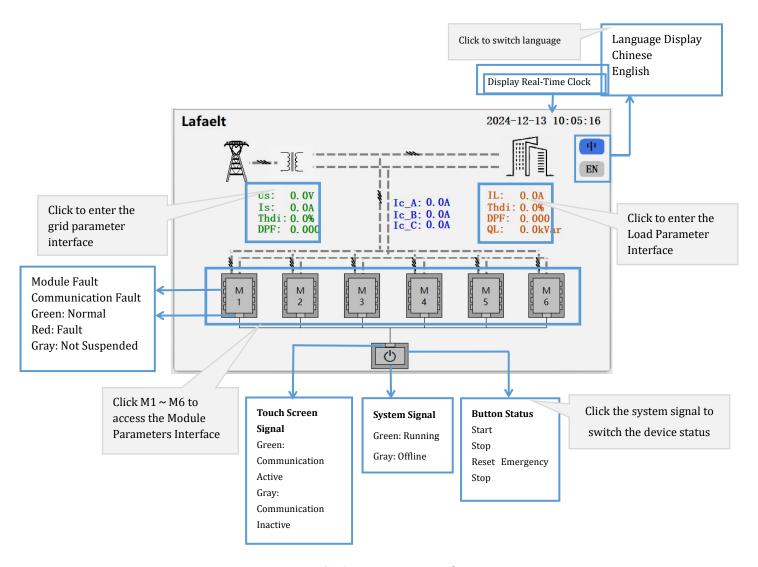


Figure 5.1 System Main Interface

Note: Button Status--During operation:

Hide Start & Reset buttons;

Display Stop & Emergency Stop buttons.

Stop: Blocks output.

Emergency Stop: Blocks output *and* trips the main circuit breaker.

5.2 Grid Parameters Interface

Click the "Grid" button in the navigation bar to enter the grid parameters interface:

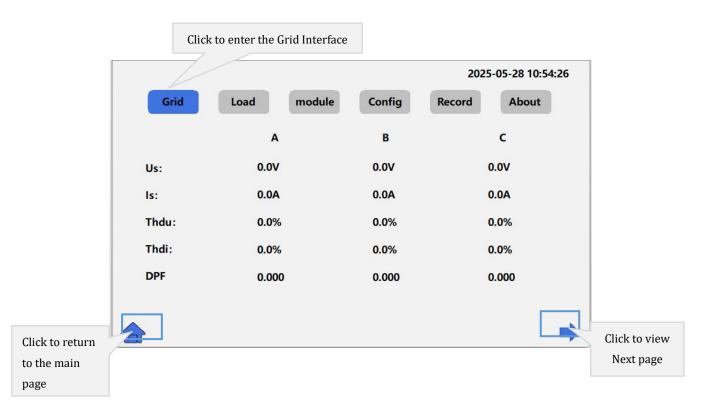


Figure 5.2 Grid Parameter 1 Interface

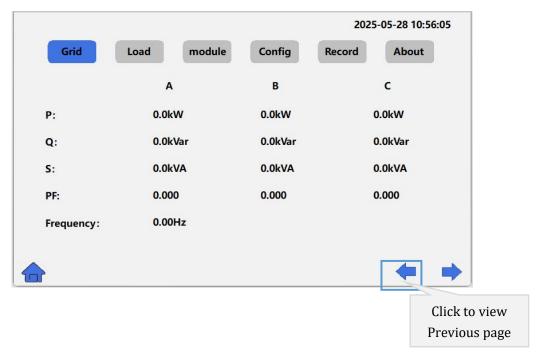


Figure 5.3 Grid Parameter 2 Interface

The 25th harmonic current of the power grid is shown in Figures 5.4 and 5.5:

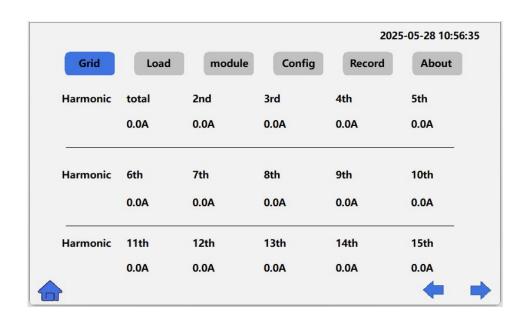


Figure 5.4 Power Grid Harmonic 1 Interface

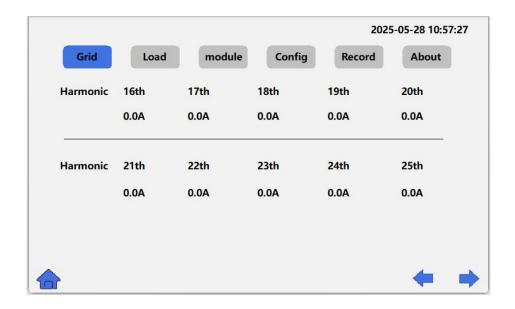


Figure 5.5 Grid Harmonics 2 Interface

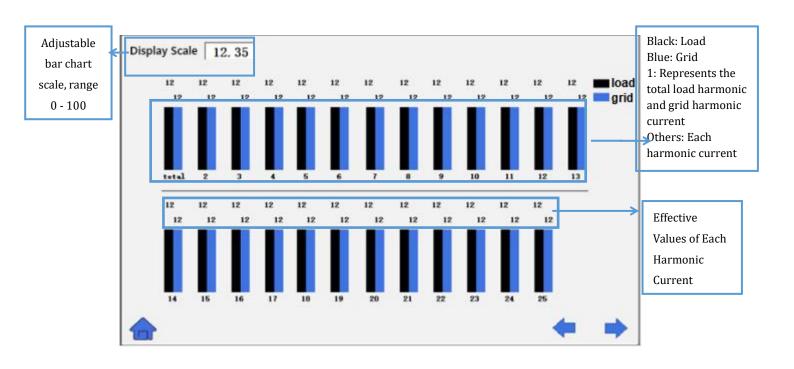


Figure 5.6 Bar Chart

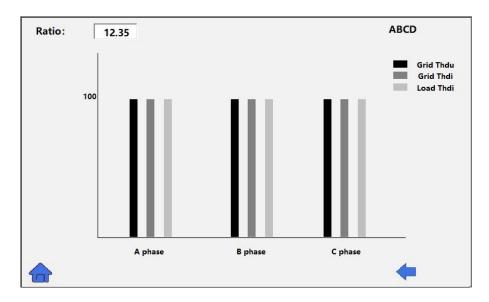


Figure 5.7 THD Bar Chart

5.3 Load Parameter Interface

Click the "Load" button in the navigation bar to enter the Load Parameter Interface:

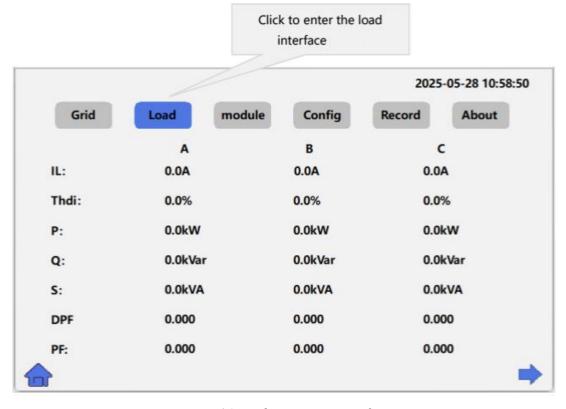


Figure 5.8 Load parameter interface

2025-05-28 10:59:25 Grid Load module Config Record About Harmonic total 2nd 3rd 4th 5th 0.0A 0.0A 0.0A 0.0A 0.0A Harmonic 6th 7th 8th 9th 10th 0.0A 0.0A 0.0A 0.0A 0.0A Harmonic 11th 12th 13th 14th 15th 0.0A 0.0A 0.0A 0.0A 0.0A

25th load harmonic current, as shown in Figures 5.9 and 5.10:

Figure 5.9 Load Harmonic 1 Interface

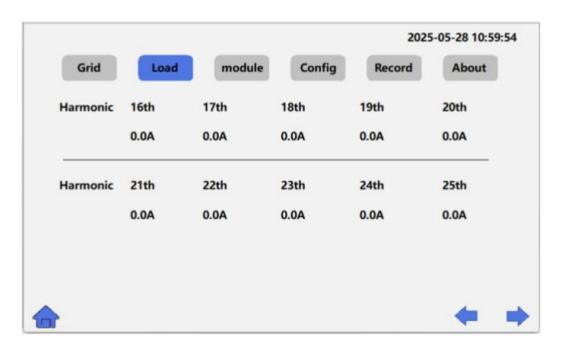


Figure 5.10 Load Harmonic 2 Interface

5.4 Module Parameter Interface

Click the "Module" button in the navigation bar to enter the Module Parameter Interface:

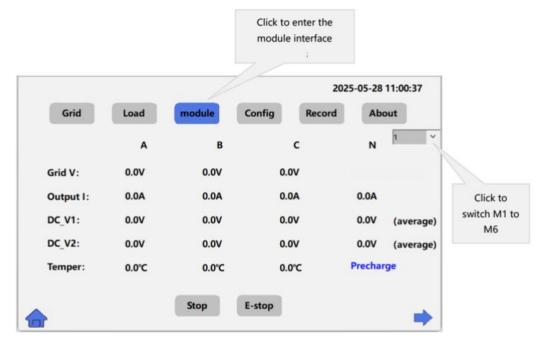


Figure 5.11 Module parameter 1 interface

Note: Device Status Indicators 5 states: Pre-charging, Standby, Start, Stop, Fault.

"Single Module Button" State — In the start state, the Start and Reset buttons are hidden, while the Stop and Emergency Stop buttons are displayed.

Stop: Blocks output.

mergency Stop: Blocks output and trips the main circuit breaker.

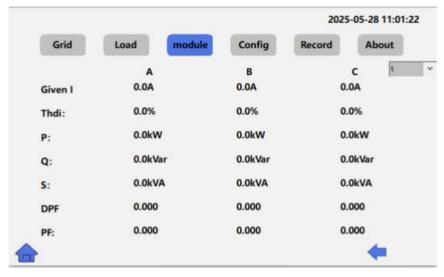
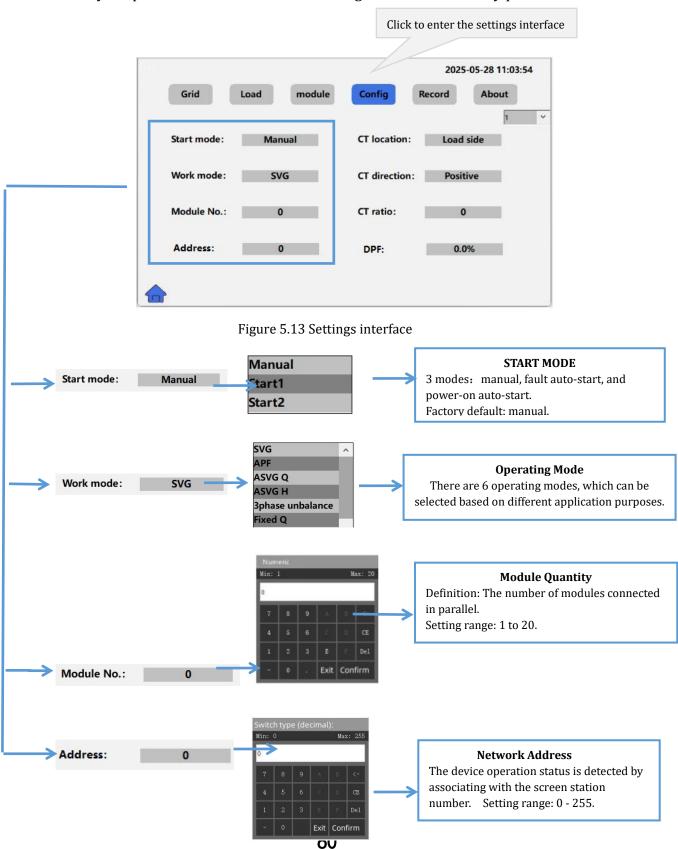
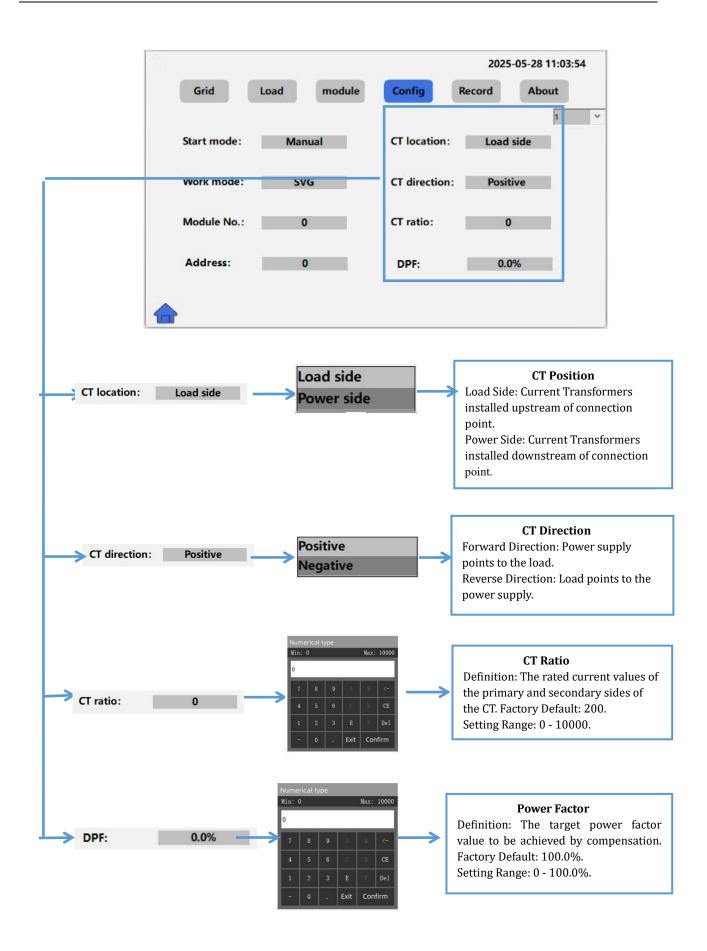


Figure 5.12 Module parameter 2 interface

5.5 Parameter Settings Interface

Click the "Settings" button in the navigation bar. A login page will pop up. Enter your password: 1234. Enter the settings interface to modify parameters:





5.6 Real-time recording interface

Click the "Record" button in the navigation bar to enter the real-time recording interface:



Figure 5.14 Real-time recording interface

5.7 Personalization Interface

Click the "about" button in the navigation bar to enter the Personalization interface:

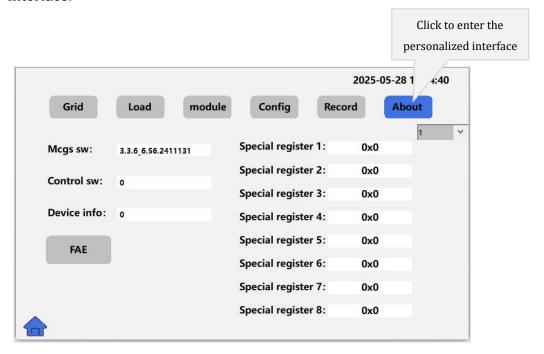


Figure 5.15 Personalized interface

This interface allows viewing of the software version number and device information. Fault codes can be viewed via Special Registers 1-8.



- If a fault occurs during operation and causes the device to automatically shut down, it will automatically restart after the fault clears.
- Upon power interruption immediately after startup, the current state is retained. Parameters will automatically restore to pre-outage settings when operation resumes.



- To ensure equipment safety and prevent unauthorized operation, ordinary users must enter the password "1234" to access parameter settings, while debug personnel may log in via the "Debug Parameters" button.
- Technician and administrator passwords are confidential and require authorization from our company for access. On-site debug personnel are strictly prohibited from disclosing technician or administrator passwords to ordinary users or non-professionals. Unauthorized operations may cause equipment malfunction or damage.

Chapter 6

Maintenance

	 ~ ~
6.1 Maintenance	 ריר

Chapter 6 Maintenance

6.1 Maintenance

To ensure the safe and reliable operation of the equipment, our company recommends regular maintenance: Clean dust annually (every 12 months), Replace heat dissipation fans every 4–5 years, Replace DC capacitors every 8 years. In special environments, maintenance intervals may be shortened based on operating conditions. The steps for comprehensive equipment maintenance are as follows:

Step 1: Check Ambient Temperature/Humidity

- Monitor temperature and humidity during APF operation to ensure values are within the equipment's specified range.
- If exceeded, the device MUST be derated.

Step 2: Power Off

- Stop equipment operation and disconnect all power cables.
- Wait AT LEAST 10 MINUTES to ensure complete discharge of DC-side capacitors.
- Open the equipment cabinet door.

Step 3: Clean the Device

- Visually inspect internal components and cables for abnormalities (eg.Deformation, discoloration, etc.)
- Clean all debris and dust from the device, paying particular attention to areas around the cooling fan and air inlets and outlets.
- Ensure no foreign objects are left inside the device.
- Use a soft brush to wipe off dust from the circuit boards.

Step 4: Inspect Circuit Breakers

• Check the circuit breakers for aging degradation and physical damage.

Step 5: Inspect Mechanical/Electrical Connections

- Check whether the electrical connections are secure and replace any oxidized pins or connectors.
- Check whether all mechanical connections are tight and re-tighten any loose parts.

Step 6: Other Abnormalities

• If any other abnormalities occur, perform appropriate repairs.

Step 7: Restart the Device

- Reconnect the primary power cable.
- Restore all connections.
- Restart the device.
- Verify the device status.

If the device experiences any abnormalities or is in an alarm state, contact us immediately!

Appendix 1 APF Technical Specifications

Category	Ite	em				Iı	ndex		
Name	Produc	t Name	APF						
	Voltage	e Level		400V				690V	
Chasifications	Module Spe	ecifications		50A	75A	100A	150A	200A	75A/100A
Specifications	Module	W560*H178							
	Dimensions	*D600		/	/				
	Operating	g Voltage		400V (-40%+20%) 、690V (-40%~+20%)					20%)
Input	Operating	Frequency			50/	′60Hz(-	10% ~ +1	10%)	
	Current Transformer					100:5	~ 10000:	5	
	Harmonic Co	ompensation				2nd-5	1st Order	•	
	Harmonic Fi	ltration Rate				(97%		
Function	Reactive	e Power	-:	1~+1 ad	justable	(within t	he equip	ment cap	acity range)
1 unction	Compe								
	Three-Phase				100%	6 unbalar	nce comp	ensation	
	Compensation								
	Communication Method				RS		odbus pro	otocol	
	Communication Interface		RS485						
Communication	Upper Computer Software		Yes, all parameters can be set via the upper computer						
Protocol	Fault A		Yes, unlimited alarm messages can be recorded.						
	Monit	coring	Supports independent monitoring of each module /						
	m . l D	m.	centralized monitoring of the entire unit						
	Total Response Time		≤5ms						
	Active Power Loss Cooling Method		≤2% Smart Air Cooling						
m- desired			Smart Air Cooling ≤60dB						
Technical Specifications	No Protection						w.oltogo		
Specifications	Protection	runction	Over 20 protection options, including overvoltage,				_		
			undervoltage, overheating, overcurrent, and short circuit.					iiu siioi t	
	CT Installati	on Location	Load-side/grid-side selectable						
Mechanical			≤37kg						
Characteristics	Module Weight Color		Matte Black						
	Operating T		-10°C~+40°C						
	Altit	_	<	< 5000 M	leters (A			. Capacity	Decreases
Environment					-			er Increas	
Requirements	Relative I	Humidity			_		Condens		-
_	Protection						ule IP20		
	Pollution Res	Pollution Resistance level Level 2 (Level 3 customizable)							

Appendix 2 APF Detailed Menu Description

Interface	Nam	e	Definition	
		Us	Grid-side voltage	
	Cuid	Is	Grid-side current	
	Grid	Thdi	Grid-side current distortion ratio	
		DPF	Grid-side fundamental power factor	
	_	Ic_A	Phase A compensation current	
Main Interface	Compensation Current	Ic_B	Phase B compensation current	
interface	Garrent	Ic_C	Phase C compensation current	
		IL	Load-side current	
	Inad	Thdi	Load-side current distortion ratio	
	Load	DPF	Load-side fundamental power factor	
		QL	Load-side reactive power	
	Volta	ge	Three-Phase Voltage	
	Curre		RMS value of three-phase current on the grid side	
	Thdu		Three-Phase Voltage Distortion Ratio	
	Thdi		Three-Phase Current Distortion Ratio on the grid side	
Grid	Displacement Power Factor(DPF)		Fundamental power factor on the grid side	
	Active Power		Active power of phases A, B, and C on the grid side	
	Reactive Power		Reactive power of phases A, B, and C on the grid side	
	Apparent Power		Apparent power of phases A, B, and C on the grid side	
	Power Factor(PF)		Power factor on the grid side	
	Freque	ncy	Voltage frequency	
	Curre	nt	RMS value of three-phase current on the load side	
	Thd	i	Three-Phase Current Distortion Ratio on the load side	
	Active P	ower	Active power of phases A, B, and C on the load side	
Load	Reactive l	Power	Reactive power of phases A, B, and C on the load side	
	Apparent	Power	Apparent power of phases A, B, and C on the load side	
	Displacement P (DPF		Fundamental power factor on the load side	
	Power Facto	or (PF)	Power factor on the load side	
	Grid Vol	tage	Three-Phase Voltage	
	Compensatio	n Current	Three-phase compensation current RMS value	

	Busbar Voltage 1	Three-phase busbar voltage 1 RMS value						
	Busbar Voltage 2	Three-phase busbar voltage 2 RMS value						
	Temperature	PCB_NTC temperature, heatsink_NTC temperature 1 heatsink_NTC temperature 2						
	Command current	RMS value of three-phase current on the module side						
	Thdi	Three-phase current distortion rate on the module side						
Module	Active power	Active power of phases A, B, and C on the module side						
	Reactive power	Reactive power of phases A, B, and C on the module side						
	Apparent power	Apparent power of phases A, B, and C on the module side						
	Displacement Power Factor (DPF)	Fundamental power factor on the module side						
	Power factor (PF)	Power factor on the module side						
	Start Mode	3 types: Manual, Auto-start after Fault, and Auto-start on Power-up. Factory Default: Manual.						
	Operating Mode	Six operating modes are available, selectable based on application purpose.						
	Module Quantity	Defines the number of modules connected in parallel. Setting range: 1 to 20.						
	Network Address	Device operation status can be monitored by associating with the screen station number. Setting Range: 0–255						
Settings	CT Position	Load-side: CT installed upstream of the connection point. Power Side: CT installed downstream of the connection point.						
	CT Direction	Forward: from power source to load.						
	CT Ratio	Reverse: from load to power source. Definition: The rated current of the primary and secondary sides of the CT. Factory default: 200. Setting range: 0–10000.						
	Power factor	Definition: The target power factor value to be achieved through compensation. Factory Default: 100.0%. Setting Range: 0 to 100.0%.						
Records	Real-Time Records	Current alarm time, date, and alarm information						
	Upper-Level Software	Touchscreen program version number						
Personaliz	Control Software	Software program version number.						
ation	Device Information	Model Type Version Number						
	Special Register	Displays the device fault word.						

Appendix 3 APF Status and Fault Information

Name		Definition
	Pre-charge	"Pre-charging" refers to the uncontrolled rectification charging status of the module after power-on.
	Standby	"Standby" indicates that pre-charging is completed, the current-limiting resistor is bypassed, the relay is engaged, and the module is in a standby state.
Status	Running	"Running Mode" indicates that the module is operating and can perform normal compensation.
	Normal Lockout	"Normal Lockout" indicates the module's IGBT is off and there are no faults.
	Fault Lockout	"Fault Blocking" indicates that the module's IGBT is turned off, and a secondary or tertiary fault exists in the system.
	DSP-EEPROM Communication Fault	When an error occurs in the communication between DSP and EEPROM, a "DSP-EEPROM Communication Fault" warning will be issued.
	Grid Voltage Low Alarm	When the grid voltage is too low (below the set protection value), a "Grid Voltage Low Alarm" warning will be issued.
System Level 1	Bus Voltage High	When the bus voltage is too high (exceeding the set protection value), a "Bus Voltage High" warning will be issued.
Fault	Ambient Overtemperature	When the internal ambient temperature of the module exceeds the set protection value, an "Ambient Overtemperature" warning will be issued.
	Heatsink Overtemperature	When the heatsink temperature exceeds the set protection value, a "Heatsink Overtemperature" warning is issued.
	Output Overcurrent Alarm	When the IGBT bridge arm current exceeds the set protection value, an "Output Overcurrent Alarm" warning will be issued.
	Emergency Stop	An "Emergency Stop" warning is triggered when: the IGBT is blocked due to excessive current; grid voltage exceeds the set range; or the emergency stop button on the cabinet door or touchscreen is pressed.(The Level 3 fault in the status word is set to 1, tripping the main circuit breaker.)
System	AD Reference Error	If the analog circuit sampling is not successfully debugged, an "AD Reference Error" warning is issued.
Level 2 Fault	Phase Loss	A "Phase Loss" warning is triggered when a phase is missing in the grid voltage.
	Hardware Overcurrent	A "Hardware Overcurrent" warning is issued when an overcurrent condition is detected by the hardware circuit.

	Hardware Drive Power supply	A "Hardware Drive Power Supply" warning is issued when the drive power supply is detected as abnormal by the hardware circuit.
	Voltage Phase Sequence Mismatch	A "Voltage Phase Sequence Mismatch" warning is triggered when the phase relationship of voltages in phases A, B, and C does not match.
	Load Current Phase Sequence Mismatch	A "Load Current Phase Sequence Mismatch" warning is triggered when the phase relationship of currents in phases A, B, and C does not match.
	Grid Overvoltage	A "Grid Overvoltage" warning is issued when the grid voltage is too high and exceeds the preset protection value.(The status word Level 3 fault is set to 1, tripping the main circuit breaker.)
	Grid Voltage Low Fault	A "Grid Voltage Low Fault" warning is issued when the grid voltage is too low and drops below the preset protection value.
	Grid Power Loss	A "Grid Voltage Low" warning is issued when there is no power in the grid.
	Grid-side Phase Lock Failure	A "Grid-Side Phase Lock Failure" warning is issued when an error occurs in the phase-locked loop regulator.
	Grid Frequency Error	A "Grid Frequency Error" warning is issued when an abnormal grid frequency is detected.
	Hardware Bus Voltage Overhigh	A "Hardware Bus Voltage Overhigh" warning is issued when the bus voltage is detected as too high by the hardware and exceeds the preset protection value.
7	Excessive Bus Voltage Difference	An "Excessive Bus Voltage difference" warning is issued when an excessive difference in bus voltage is detected by the software.
	Startup Bus Voltage Low	A "Startup Bus Voltage Low" warning is issued when the bus voltage during startup (from pre-charge completion to standby) is below the preset protection value.
	Output Peak Overcurrent	An "Output Peak Overcurrent" warning is issued when the maximum output current exceeds the preset protection value.
	Output Overcurrent Fault	An "Output Overcurrent Fault" warning is issued when the RMS output current exceeds the preset protection value.
	Neutral Overcurrent Fault	A "Neutral Overcurrent Fault" warning is issued when the zero-sequence current RMS exceeds the preset protection value.
	Fan Fault	A "Fan Fault" warning is issued when an input or output error is detected in the fan.
	PCB Overtemperature	A "PCB Overtemperature" warning is issued when the internal ambient temperature of the module exceeds the preset protection value.
	Heatsink Temperature Too High	A "Heatsink Overtemperature" warning is issued when the heat sink temperature exceeds the preset protection value.

	Pre-Charge Inverter Current Overhigh	An "Pre-Charge Inverter Current Overhigh" warning is issued when the inverter current exceeds the preset protection value before startup (Level 3 fault in the status word is set to 1, tripping the main circuit breaker.)
	IGBT Blocked, Inverter Current Overhigh	An "IGBT Blocked, Inverter Current Overhigh" warning is issued when the inverter current exceeds the preset protection value during operation.(Level 3 status word faults are set to 1, tripping the main circuit breaker.)
	Udc_A1 Overvoltage	A "Udc_A1 Overvoltage" warning is issued when the DC bus voltage of phase A1 is too high and exceeds the preset protection value.
	Udc_B1 Overvoltage	A "Udc_B1 Overvoltage" warning is issued when the DC bus voltage of phase B1 is too high and exceeds the preset protection value.
	Udc_C1 Overvoltage	A "Udc_C1 Overvoltage" warning is issued when the DC bus voltage of phase C1 is too high and exceeds the preset protection value.
	Udc_A2 Overvoltage	A "Udc_A2 Overvoltage" warning is issued when the DC bus voltage of phase A2 is too high and exceeds the preset protection value.
	Udc_B2 Overvoltage	A "Udc_B2 Overvoltage" warning is issued when the DC bus voltage of phase B2 is too high and exceeds the preset protection value.
	Udc_C2 Overvoltage	A "Udc_C2 Overvoltage" warning is issued when the DC bus voltage of phase C2 is too high and exceeds the preset protection value.
	NCAP_A1 Regulator	When the NCAP_A1 regulator algorithm is incorrect, the "NCAP_A1 Regulator" warning is issued.
Algorithm	NCAP_B1 Regulator	When the NCAP_B1 regulator algorithm is incorrect, the "NCAP_B1 Regulator" warning is issued.
Fault Word	ID Regulator	When the ID regulator algorithm is incorrect, the "ID Regulator" warning is issued.
	IQ Regulator	When the IQ regulator algorithm is incorrect, the "IQ Regulator" warning is issued.
	I0 Regulator	When the I0 regulator algorithm is incorrect, the "I0 Regulator" warning is issued.
	Udc Regulator	When the Udc regulator algorithm is incorrect, the "Udc Regulator" warning is issued.
	Harmonic Regulator	When the harmonic regulator algorithm is incorrect, the "Harmonic Regulator" warning is issued.
	CPU2 Harmonic Regulator	When the CPU2 harmonic regulator algorithm is incorrect, the "CPU2 Harmonic Regulator" warning is issued.

Appendix 4 APF communication data point

- 1. Communication Protocol: RS485_MODBUS_RTU_SLAVE; Communication Baud Rate: 9600bps; Data Bits: 8 bits; Parity Bit: None; Stop Bit: 1 bit; Protocol Function Code: 03.
- 2. Wiring Instructions: The RS485 signal positive (+) wire from the host device (e.g., industrial computer for remote monitoring) should be connected to the RS485+ terminal located on the upper-left corner of the back of dual serial port touchscreen. The RS485 signal negative (-) wire from the host device should be connected to the RS485- terminal on the upper-left corner of the back of the dual serial touchscreen.
- 3. The data table of the system data forwarding interface is as follows:

Item					Data	Address
No.	Description	Unit	Range	Remarks	Decimal (10-bit)	Hexadecimal (16-bit)
1	Grid-Side Thdv_A	%	-100~100	Actual Value = Communication Value	0	0
2	Grid-Side Thdv_B	%	-100~100	Actual Value = Communication Value	1	1
3	Grid-Side Thdv_C	%	-100~100	Actual Value = Communication Value	2	2
4	Grid-Side DPF_A	%	-100~100	Actual Value = Communication Value	3	3
5	Grid-Side DPF_B	%	-100~100	Actual Value = Communication Value	4	4
6	Grid-Side DPF_C	%	-100~100	Actual Value = Communication Value	5	5
7	Grid-side active power_A	kW	-32767~+327 67	Actual Value = Communication Value/10	6	6
8	Grid-side active power_B	kW	-32767~+327 67	Actual Value = Communication Value/10	7	7
9	Grid-side active power_C	kW	-32767~+327 67	Actual Value = Communication Value/10	8	8
10	Grid-side reactive power_A	kVar	-32767~+327 67	Actual Value = Communication Value/10	9	9
11	Grid-side reactive power_B	kVar	-32767~+327 67	Actual Value = Communication Value/10	10	A
12	Grid-side reactive power_C	kVar	-32767~+327 67	Actual Value = Communication Value/10	11	В
13	Grid-side apparent power_A	kVA	-32767~+327 67	Actual Value = Communication Value/10	12	С
14	Grid-side apparent power_B	kVA	-32767~+327 67	Actual Value = Communication Value/10	13	D

15	Grid-side apparent power_C	kVA	-32767~+327 67	Actual Value = Communication Value/10	14	E
16	Grid-side total harmonic current	A	0~65535	Actual Value = Communication Value/10	15	F
17	Grid frequency	Hz	0~65535	Actual Value = Communication Value	16	10
18	Load current_A	A	0~65535	Actual Value = Communication Value/10	17	11
19	Load current_B	A	0~65535	Actual Value = Communication Value/10	18	12
20	Load current_C	A	0~65535	Actual Value = Communication Value/10	19	13
21	Load Thdi_A	%	-100~+100	Actual Value = Communication Value	20	14
22	Load Thdi_B	%	-100~+100	Actual Value = Communication Value	21	15
23	Load Thdi_C	%	-100~+100	Actual Value = Communication Value	22	16
24	Load DPF_A	%	-100~+100	Actual Value = Communication Value	23	17
25	Load DPF_B	%	-100~+100	Actual Value = Communication Value	24	18
26	Load DPF_C	%	-100~+100	Actual Value = Communication Value	25	19
27	Load PF_A	%	-100~+100	Actual Value = Communication Value	26	1A
28	Load PF_B	%	-100~+100	Actual Value = Communication Value	27	1B
29	Load PF_C	%	-100~+100	Actual Value = Communication Value	28	1C
30	Load active power_A	kW	-32767~+327 67	Actual Value = Communication Value/10	29	1D
31	Load active power_B	kW	-32767~+327 67	Actual Value = Communication Value/10	30	1E
32	Load active power_C	kW	-32767~+327 67	Actual Value = Communication Value/10	31	1F
33	Load reactive power_A	kVar	-32767~+327 67	Actual Value = Communication Value/10	32	20
34	Load reactive power_B	kVar	-32767~+327 67	Actual Value = Communication Value/10	33	21
35	Load reactive power_C	kVar	-32767~+327 67	Actual Value = Communication Value/10	34	22

36	Load apparent	kVA	-32767~+327	Actual Value =	35	23
37	power_A Load apparent	kVA	67 -32767~+327	Communication Value/10 Actual Value =	36	24
	power_B	KVII	67	Communication Value/10	30	2.1
38	Load apparent power_C	kVA	-32767~+327 67	Actual Value = Communication Value/10	37	25
39	Total harmonic current on the load side	A	0~65535	Actual Value = Communication Value/10	38	26
40	Module 1_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	48	30
44	Module 1_Heatsink_NTC Temperature1	°C	-200~200	Actual Value = Communication Value	49	31
45	Module 1_Heatsink_NTC Temperature2	°C	-200~200	Actual Value = Communication Value	50	32
46	Module 1_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	51	33
47	Module 1_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	52	34
48	Module 1_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	53	35
49	Module 1_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	54	36
50	Module 1_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	55	37
51	Module 1_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	56	38
52	Module 1_Device Current_A	A	0~65535	Actual Value = Communication Value/10	57	39
53	Module 1_Device Current_B	A	0~65535	Actual Value = Communication Value/10	58	3A
54	Module 1_Device Current_C	A	0~65535	Actual Value = Communication Value/10	59	3B
55	Module 1_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	60	3C
56	Module 1_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	61	3D
57	Module 1_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	62	3E
58	Module 1_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	63	3F

59	Module 1_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	64	40
60	Module 1_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	65	41
61	Module 1_Unbalance _A	%	0~65535	Actual Value = Communication Value	66	42
62	Module 1_Unbalance_B	%	0~65535	Actual Value = Communication Value	67	43
63	Module 1_Unbalance_C	%	0~65535	Actual Value = Communication Value	68	44
64	Module 1_Total bus voltage	V	0~65535	Actual Value = Communication Value	69	45
65	Module 1_Average bus voltage1	V	0~65535	Actual Value = Communication Value	70	46
66	Module 1_Average bus voltage2	V	0~65535	Actual Value = Communication Value	71	47
67	Module 1_CT coefficient_A		0~30000	Actual Value = Communication Value	72	48
68	Module 1_CT coefficient_B		0~30000	Actual Value = Communication Value	73	49
69	Module 1_CT coefficient_C		0~30000	Actual Value = Communication Value	74	4A
70	Module 1_Number of Modules		0~65535	Actual Value = Communication Value	75	4B
71	Module 1_Reactive Power Setting	%	-100~100	Actual Value = Communication Value	76	4C
72	Module 1_System status word 1		0~65535	Actual Value = Communication Value	77	4D
73	Module 1_System Level 1 Fault Word		0~65535	Actual Value = Communication Value	78	4E
74	Module 1_System Level 2 Fault Word 1		0~65535	Actual Value = Communication Value	79	4F
75	Module 1_System Level 2 Fault Word 2		0~65535	Actual Value = Communication Value	80	50
76	Module 1_Load Distribution Ratio	%	0~100	Actual Value = Communication Value	81	51
77	Module 1_PCB_NTC temperature	°C	-200~200	Actual Value = Communication Value	82	52
78	Module 2_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	148	94
79	Module 2_Heatsink_NTC Temperature1	°C	-200~200	Actual Value = Communication Value	149	95

	Т		ı	T	<u> </u>	1
80	Module 2_Heatsink_NTC Temperature2	°C	-200~200	Actual Value = Communication Value	150	96
81	Module 2_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	151	97
82	Module 2_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	152	98
83	Module 2_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	153	99
84	Module 2_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	154	9A
85	Module 2_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	155	9B
86	Module 2_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	156	9C
87	Module 2_Device Current_A	A	0~65535	Actual Value = Communication Value/10	157	9D
88	Module 2_Device Current_B	A	0~65535	Actual Value = Communication Value/10	158	9E
89	Module 2_Device Current_C	A	0~65535	Actual Value = Communication Value/10	159	9F
90	Module 2_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	160	A0
91	Module 2_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	161	A1
92	Module 2_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	162	A2
93	Module 2_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	163	А3
94	Module 2_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	164	A4
95	Module 2_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	165	A5
96	Module 2_Unbalance_A	%	0~65535	Actual Value = Communication Value	166	A6
97	Module 2_Unbalance_B	%	0~65535	Actual Value = Communication Value	167	A7
98	Module 2_Unbalance_C	%	0~65535	Actual Value = Communication Value	168	A8
99	Module 2_Total bus voltage	V	0~65535	Actual Value = Communication Value	169	A9
100	Module 2_Average bus voltage 1	V	0~65535	Actual Value = Communication Value	170	AA

	Madula 2 Average			Actual Value -		
101	Module 2_Average bus voltage 2	V	0~65535	Actual Value = Communication Value	171	AB
102	Module 2_CT coefficient_A		0~30000	Actual Value = Communication Value	172	AC
103	Module 2_CT coefficient_B		0~30000	Actual Value = Communication Value	173	AD
104	Module 2_CT coefficient_C		0~30000	Actual Value = Communication Value	174	AE
105	Module 2_Number of modules		0~65535	Actual Value = Communication Value	175	AF
106	Module 2_Reactive Power Setting	%	-100~100	Actual Value = Communication Value	176	В0
107	Module 2_System Status Word 1		0~65535	Actual Value = Communication Value	177	B1
108	Module 2_System Level 1 Fault Word		0~65535	Actual Value = Communication Value	178	В2
109	Module 2_System Level 2 Fault Word 1		0~65535	Actual Value = Communication Value	179	В3
110	Module 2_System Level 2 Fault Word 2		0~65535	Actual Value = Communication Value	180	B4
111	Module 2_Load Distribution Ratio	%	0~100	Actual Value = Communication Value	181	B5
112	Module 2_PCB_NTC temperature	°C	-200~200	Actual Value = Communication Value	182	В6
113	Module 3_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	248	F8
114	Module 3_Heatsink_NTC Temperature 1	°C	-200~200	Actual Value = Communication Value	249	F9
115	Module 3_Heatsink_NTC Temperature2	°C	-200~200	Actual Value = Communication Value	250	FA
116	Module 3_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	251	FB
117	Module 3_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	252	FC
118	Module 3_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	253	FD
119	Module 3_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	254	FE
120	Module 3_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	255	FF

121	Module 3_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	256	100
122	Module 3_Device Current_A	A	0~65535	Actual Value = Communication Value/10	257	101
123	Module 3_Device Current_B	A	0~65535	Actual Value = Communication Value/10	258	102
124	Module 3_Device Current_C	A	0~65535	Actual Value = Communication Value/10	259	103
125	Module 3_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	260	104
126	Module 3_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	261	105
127	Module 3_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	262	106
128	Module 3_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	263	107
129	Module 3_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	264	108
130	Module 3_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	265	109
131	Module 3_Imbalance_A	%	0~65535	Actual Value = Communication Value	266	10A
132	Module 3_Imbalance_B	%	0~65535	Actual Value = Communication Value	267	10B
133	Module 3_Imbalance_C	%	0~65535	Actual Value = Communication Value	268	10C
134	Module 3_Total bus voltage	V	0~65535	Actual Value = Communication Value	269	10D
135	Module 3_Average bus voltage 1	V	0~65535	Actual Value = Communication Value	270	10E
136	Module 3_Average bus voltage 2	V	0~65535	Actual Value = Communication Value	271	10F
137	Module 3_CT coefficient_A		0~30000	Actual Value = Communication Value	272	110
138	Module 3_CT coefficient_B		0~30000	Actual Value = Communication Value	273	111
139	Module 3_CT coefficient_C		0~30000	Actual Value = Communication Value	274	112
140	Module 3_Number of Modules		0~65535	Actual Value = Communication Value	275	113
141	Module 3_Reactive Power Setting	%	-100~100	Actual Value = Communication Value	276	114

	Module 3_System			Actual Value =		.
142	status word 1		0~65535	Communication Value	277	115
143	Module 3_System Level 1 Fault Word		0~65535	Actual Value = Communication Value	278	116
144	Module 3_System Level 2 Fault Word 1		0~65535	Actual Value = Communication Value	279	117
145	Module 3_System Level 2 Fault Word 2		0~65535	Actual Value = Communication Value	280	118
146	Module 3_Load Distribution Ratio	%	0~100	Actual Value = Communication Value	281	119
147	Module 3_PCB_NTC temperature	°C	-200~200	Actual Value = Communication Value	282	11A
148	Module 4_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	348	15C
149	Module 4_Heatsink_NTC Temperature 1	°C	-200~200	Actual Value = Communication Value	349	15D
150	Module 4_Heatsink_NTC Temperature 2	°C	-200~200	Actual Value = Communication Value	350	15E
151	Module 4_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	351	15F
152	Module 4_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	352	160
153	Module 4_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	353	161
154	Module 4_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	354	162
155	Module 4_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	355	163
156	Module 4_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	356	164
157	Module 4_Device Current_A	A	0~65535	Actual Value = Communication Value/10	357	165
158	Module 4_Device Current_B	A	0~65535	Actual Value = Communication Value/10	358	166
159	Module 4_Device Current_C	A	0~65535	Actual Value = Communication Value/10	359	167
160	Module 4_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	360	168
161	Module 4_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	361	169

162	Module 4_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	362	16A
163	Module 4_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	363	16B
164	Module 4_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	364	16C
165	Module 4_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	365	16D
166	Module 4_Imbalance_A	%	0~65535	Actual Value = Communication Value	366	16E
167	Module 4_Imbalance_B	%	0~65535	Actual Value = Communication Value	367	16F
168	Module 4_Imbalance_C	%	0~65535	Actual Value = Communication Value	368	170
169	Module 4_Total bus voltage	V	0~65535	Actual Value = Communication Value	369	171
170	Module 4_Average bus voltage 1	V	0~65535	Actual Value = Communication Value	370	172
171	Module 4_Average bus voltage 2	V	0~65535	Actual Value = Communication Value	371	173
172	Module 4_CT coefficient_A		0~30000	Actual Value = Communication Value	372	174
173	Module 4_CT coefficient_B		0~30000	Actual Value = Communication Value	373	175
174	Module 4_CT coefficient_C		0~30000	Actual Value = Communication Value	374	176
175	Module 4_Number of Modules		0~65535	Actual Value = Communication Value	375	177
176	Module 4_Reactive Power Setting	%	-100~100	Actual Value = Communication Value	376	178
177	Module 4_System Status Word 1		0~65535	Actual Value = Communication Value	377	179
178	Module 4_System Level 1 Fault Word		0~65535	Actual Value = Communication Value	378	17A
179	Module 4_System Level 2 Fault Word 1		0~65535	Actual Value = Communication Value	379	17B
180	Module 4_System Level 2 Fault Word 2		0~65535	Actual Value = Communication Value	380	17C
181	Module 4_Load Distribution Ratio	%	0~100	Actual Value = Communication Value	381	17D
182	Module 4_PCB_NTC temperature	°C	-200~200	Actual Value = Communication Value	382	17E

183	Module 5_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	448	1C0
184	Module 5_Heatsink_NTC Temperature 1	°C	-200~200	Actual Value = Communication Value	449	1C1
185	Module 5_Heatsink_NTC Temperature 2	°C	-200~200	Actual Value = Communication Value	450	1C2
186	Module 5_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	451	1C3
187	Module 5_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	452	1C4
188	Module 5_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	453	1C5
189	Module 5_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	454	1C6
190	Module 5_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	455	1C7
191	Module 5_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	456	1C8
192	Module 5_Device Current_A	A	0~65535	Actual Value = Communication Value/10	457	1C9
193	Module 5_Device Current_B	A	0~65535	Actual Value = Communication Value/10	458	1CA
194	Module 5_Device Current_C	A	0~65535	Actual Value = Communication Value/10	459	1CB
195	Module 5_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	460	1CC
196	Module 5_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	461	1CD
197	Module 5_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	462	1CE
198	Module 5_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	463	1CF
199	Module 5_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	464	1D0
200	Module 5_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	465	1D1
201	Module 5_Imbalance_A	%	0~65535	Actual Value = Communication Value	466	1D2
202	Module 5_Imbalance_B	%	0~65535	Actual Value = Communication Value	467	1D3

	N 1 1			A . 177 1		
203	Module 5_Imbalance_C	%	0~65535	Actual Value = Communication Value	468	1D4
204	Module 5_Total bus voltage	V	0~65535	Actual Value = Communication Value	469	1D5
205	Module 5_Average bus voltage 1	V	0~65535	Actual Value = Communication Value	470	1D6
206	Module 5_Average bus voltage 2	V	0~65535	Actual Value = Communication Value	471	1D7
207	Module 5_CT coefficient_A		0~30000	Actual Value = Communication Value	472	1D8
208	Module 5_CT coefficient_B		0~30000	Actual Value = Communication Value	473	1D9
209	Module 5_CT coefficient_C		0~30000	Actual Value = Communication Value	474	1DA
210	Module 5_Number of Modules		0~65535	Actual Value = Communication Value	475	1DB
211	Module 5_Reactive Power Setting	%	-100~100	Actual Value = Communication Value	476	1DC
212	Module 5_System Status Word 1		0~65535	Actual Value = Communication Value	477	1DD
213	Module 5_System Level 1 Fault Word		0~65535	Actual Value = Communication Value	478	1DE
214	Module 5_System Level 2 Fault Word 1		0~65535	Actual Value = Communication Value	479	1DF
215	Module 5_System Level 2 Fault Word 2		0~65535	Actual Value = Communication Value	480	1E0
216	Module 5_Load Distribution Ratio	%	0~100	Actual Value = Communication Value	481	1E1
217	Module 5_PCB_NTC temperature	°C	-200~200	Actual Value = Communication Value	482	1E2
218	Module 6_System Status Word			0: Pre-charge 1: Standby 2: Run 3: Stop	548	224
219	Module 6_Heatsink_NTC Temperature 1	°C	-200~200	Actual Value = Communication Value	549	225
220	Module 6_Heatsink_NTC Temperature 2	°C	-200~200	Actual Value = Communication Value	550	226
221	Module 6_Grid-side voltage_A	V	0~65535	Actual Value = Communication Value/10	551	227
222	Module 6_Grid-side voltage_B	V	0~65535	Actual Value = Communication Value/10	552	228

Module 6_Grid-side voltage_C	V	0~65535	Actual Value = Communication Value/10	553	229
Module 6_Grid-side current_A	A	0~65535	Actual Value = Communication Value/10	554	22A
Module 6_Grid-side current_B	A	0~65535	Actual Value = Communication Value/10	555	22B
Module 6_Grid-side current_C	A	0~65535	Actual Value = Communication Value/10	556	22C
Module 6_Device Current_A	A	0~65535	Actual Value = Communication Value/10	557	22D
Module 6_Device Current_B	A	0~65535	Actual Value = Communication Value/10	558	22E
Module 6_Device Current_C	A	0~65535	Actual Value = Communication Value/10	559	22F
Module 6_Grid-side PF_A	%	-100~100	Actual Value = Communication Value	560	230
Module 6_Grid-side PF_B	%	-100~100	Actual Value = Communication Value	561	231
Module 6_Grid-side PF_C	%	-100~100	Actual Value = Communication Value	562	232
Module 6_Grid-side Thdi_A	%	-100~100	Actual Value = Communication Value	563	233
Module 6_Grid-side Thdi_B	%	-100~100	Actual Value = Communication Value	564	234
Module 6_Grid-side Thdi_C	%	-100~100	Actual Value = Communication Value	565	235
Module 6_Imbalance_A	%	0~65535	Actual Value = Communication Value	566	236
Module 6_Imbalance_B	%	0~65535	Actual Value = Communication Value	567	237
Module 6_Imbalance_C	%	0~65535	Actual Value = Communication Value	568	238
Module 6_Total bus voltage	V	0~65535	Actual Value = Communication Value	569	239
Module 6_Average bus voltage 1	V	0~65535	Actual Value = Communication Value	570	23A
Module 6_Average bus voltage 2	V	0~65535	Actual Value = Communication Value	571	23B
Module 6_CT coefficient_A		0~30000	Actual Value = Communication Value	572	23C
Module 6_CT coefficient_B		0~30000	Actual Value = Communication Value	573	23D
	voltage_C Module 6_Grid-side current_A Module 6_Grid-side current_C Module 6_Device Current_A Module 6_Device Current_B Module 6_Device Current_C Module 6_Grid-side PF_A Module 6_Grid-side PF_B Module 6_Grid-side PF_C Module 6_Grid-side PF_C Module 6_Grid-side Thdi_A Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_C Module 6_Imbalance_A Module 6_Imbalance_B Module 6_Imbalance_C Module 6_Total bus voltage Module 6_Average bus voltage 1 Module 6_CT coefficient_A Module 6_CT Coefficient_A Module 6_CT	Voltage_C Module 6_Grid-side current_A Module 6_Grid-side current_B Module 6_Grid-side current_C Module 6_Device Current_A Module 6_Device Current_B Module 6_Device Current_C Module 6_Device Current_C Module 6_Grid-side PF_A Module 6_Grid-side PF_B Module 6_Grid-side PF_C Module 6_Grid-side PF_C Module 6_Grid-side Thdi_A Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_C Module 6_Grid-side W Thdi_C Module 6_Imbalance_A Module 6_Imbalance_B Module 6_Imbalance_B Module 6_Average bus voltage 1 Module 6_Average bus voltage 2 Module 6_CT coefficient_A Module 6_CT	voltage_CVModule 6_Grid-side current_BA0~65535Module 6_Grid-side current_CA0~65535Module 6_Device Current_AA0~65535Module 6_Device Current_BA0~65535Module 6_Device Current_BA0~65535Module 6_Device Current_CA0~65535Module 6_Grid-side PF_A%-100~100Module 6_Grid-side PF_B%-100~100Module 6_Grid-side PF_C%-100~100Module 6_Grid-side Thdi_A%-100~100Module 6_Grid-side Thdi_B%-100~100Module 6_Imbalance_A%-100~100Module 6_Imbalance_B%0~65535Module 6_Imbalance_C%0~65535Module 6_Average bus voltageV0~65535Module 6_Average bus voltage 2V0~65535Module 6_Average bus voltage 2V0~65535Module 6_CT coefficient_AV0~65535Module 6_CT coefficient_AV0~65535	voltage_C Module 6_Grid-side current_A Module 6_Grid-side current_B Module 6_Grid-side current_B Module 6_Grid-side current_B Module 6_Grid-side current_C Module 6_Device Current_B Module 6_Device Current_B Module 6_Device Current_B Module 6_Device Current_B Module 6_Device Current_C Module 6_Device Current_C Module 6_Device Current_B Module 6_Device Current_C Module 6_Grid-side PF_A Module 6_Grid-side PF_B Module 6_Grid-side PF_C Module 6_Grid-side Thdi_A Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_B Module 6_Grid-side Thdi_C Module 6_Imbalance_A Module 6_Imbalance_B Module 6_Imbalance_B Module 6_Total bus voltage 1 Module 6_Average bus voltage 1 Module 6_Crr Coefficient_A Module Actual Value = Communication Value Communication Value Actual Value = Communication Value Actual Value = Communication Value Actual Value = Communication Value Communication Value Actual Value = Communication Value Communication Value = Communication Value Communication Value = Communication Value Actual Value = Communication Value Communication Value = Communication Value Actual Value = Communication Value Communication Value = Communication Value Actual Value = Communication Value Communication Value = Communication Value Actual Value = Communi	voltage_C V Communication Value/10 553 Module 6_Grid-side current_B A 0~65535 Actual Value = Communication Value/10 554 Module 6_Grid-side current_B A 0~65535 Actual Value = Communication Value/10 555 Module 6_Device Current_A A 0~65535 Actual Value = Communication Value/10 556 Current_B A 0~65535 Actual Value = Communication Value/10 557 Module 6_Device Current_C A 0~65535 Actual Value = Communication Value/10 558 Module 6_Device Current_C A 0~65535 Actual Value = Communication Value/10 559 Module 6_Grid-side PF_A ** -100~100 Actual Value = Communication Value 560 Module 6_Grid-side PF_B ** -100~100 Actual Value = Communication Value 561 Module 6_Grid-side Thdi_A ** -100~100 Actual Value = Communication Value 562 Module 6_Grid-side Thdi_B ** -100~100 Actual Value = Communication Value 563 Module 6_Grid-side Thdi_B ** -100~100 Actual

	Т					
244	Module 6_CT		0~30000	Actual Value =	574	23E
	coefficient_C		0 30000	Communication Value	5/1	
245	Module 6_Number of		0~65535	Actual Value =	575	23F
	Modules		0~05555	Communication Value	3/3	
246	Module 6_Reactive	0/	100 100	Actual Value =	F7.0	240
	Power Setting	% -100~100		Communication Value	576	240
247	Module 6_System		0 (5525	Actual Value =	577	241
	Status Word 1		0~65535	Communication Value		
248	Module 6_System		0 (5525	Actual Value =	578	242
	Level 1 Fault Word		0~65535	Communication Value		
240	Module 6_System		0 (5525	Actual Value =	F70	242
249	Level 2 Fault Word 1		0~65535	Communication Value	579	243
250	Module 6_System		0 (5525	Actual Value =	500	244
250	Level 2 Fault Word 2	0~65535		Communication Value	580	244
251	Module 6_Load	0/	0 100	Actual Value =	F01	245
	Distribution Ratio	%	0~100	Communication Value	581	
252	Module 6_PCB_NTC	0.0	200 200	Actual Value =	502	246
	temperature	°C -200~200		Communication Value	582	246

Appendix 5 APF status word and fault word

bit Name	System status word 1	System level 1 fault word	System level 2 fault word 1	System level 2 fault word 2
bit0	Pre-charge state	IIC communication failure	emergency stop	starting bus voltage too low
bit1	Pre-charge complete	low grid voltage alarm	AD reference error	Output Peak Overcurrent (Software)
bit2	Standby	high bus voltage alarm	phase loss	output overcurrent
bit3	Running	unning ambient temperature overtemperature alarm		neutral overcurrent fault
bit4	Stop	heatsink overtemperature alarm	hardware driver power supply	fan fault
bit5	IGBTlockout	IGBTlockout branch 1 overcurrent alarm		PCB overtemperature
bit6	IGBT fault lockout	regulator integral limiting	voltage phase sequence mismatch	Heatsink Over Temperature
bit7	Level 1 Fault	Regulator output limiting	load current phase sequence mismatch	inverter current too high during pre-charge.

bit8	Level 2 Fault	R regulator output limiting	grid voltage high	inverter current high during IGBT lockout.
bit9	Level 3 Fault	Branch 2 overcurrent alarm	grid voltage low	Udc_A1 overvoltage
bit10	Test run		Grid-side power loss	Udc_B1 overvoltage
bit11	self-startup completed		Grid-side phase lock failure	Udc_C1 overvoltage
bit12	System capacitive switching		grid frequency	Udc_A2 overvoltage
bit13	Heartbeat signal	Reserved	hardware bus voltage too high	Udc_B2 overvoltage
bit14	Relay status		kernel communication failure	Udc_C2 overvoltage
bit15	Udc reference complete		bus voltage difference too large	Reserved

Document Version V6.0