



Power Quality Comprehensive Management Expert

Comprehensively improve your power quality, effectively filter harmonics, increase power factor, enhance anti-disturbance capability of power grid, and reduce loss and increase capacity.

Three-level Modular Active Power Filter

User Manual

CEAYEA ELECTRIC

Version V1.0

Safety Instructions



These safety instructions apply to all working active power filter devices. Ignoring these instructions can result in personal injury and death.



Hot-line work is forbidden!

Specific use

Active filter is applicable for dynamic compensation for harmonic control and reactive power in civil small capacity load and industrial large capacity load.

Be sure that there are no non-tuned compensation systems in the same network, which may conflict with the active filter otherwise.

Operator Qualification

Only personnel who are familiar with the relevant electrical rules and regulations and specialized in electrical work are allowed to operate the equipment.

Installation, operation monitoring and breakdown maintenance of APF can only be performed by qualified personnel, and the equipment operation personnel must be familiar with this manual.

Liability Exemption

The contents of the User Manual describe the characteristics of the product, but are usually not as the product guarantee.

If you have any questions and problems, please contact us in time to avoid irreparable accident!

Table of Contents

Safety Instructions-----	错误！未定义书签。
Specific Use-----	错误！未定义书签。
Operator Qualification-----	错误！未定义书签。
Liability Exemption-----	错误！未定义书签。
1.About This Manual-----	错误！未定义书签。
2.APF Introduction-----	错误！未定义书签。
2.1APF Working Principle-----	错误！未定义书签。
2.1.1 APF Functional Principle-----	错误！未定义书签。
2.1.2 APF Internal Control Principles---	错误！未定义书签。
2.2 APF Dynamic and Steady State Characteristics-----	3
2.3 APF Product Features-----	错误！未定义书签。
3.Installation Introduction-----	错误！未定义书签。
3.1Initial Inspection-----	错误！未定义书签。
3.2 Location Selection-----	错误！未定义书签。
3.2.1 APF Location Selection-----	错误！未定义书签。
3.2.2 Storage-----	错误！未定义书签。
3.3 Installation Environment-----	7
3.4 Device Handling-----	错误！未定义书签。
3.5 Operating Space-----	错误！未定义书签。
3.6 External Protection Device-----	错误！未定义书签。
3.7 Power Cable-----	8
4.Installation and Electrical Connection-----	错误！未定义书签。
4.1 Installation Conditions-----	10
4.2 APF Installation Diagram-----	错误！未定义书签。
4.2.1 Rack-mounted APF Module-----	错误！未定义书签。
4.2.3 Rack-mounted APF-----	12







4.3 Optional Component Installation-----	14
4.3.1 Molded Case Circuit Breaker and Surge Protective Device-----	14
4.3.2 External Sampling CT-----	14
1)Wiring of Current Transformer in Single APF Operation--	16
2)Wiring of Current Transformers in Parallel Operation of Multiple APF Modules-----	16
4.4 External Incoming Cable Specification-----	17
5.User Guide-----	18
5.1 Instructions-----	18
5.2 Common operations for HMI-----	18
5.2.1 Controlling Operation-----	22
5.2.2 State Query-----	24
5.2.3 Harmonic Query-----	27
5.2.4 Record Query-----	28
5.2.5 Parameter Settings: View and modify parameters-----	29
5.2.6 Parameter Query-----	32
5.2.7 Events Record-----	33
5.2.8. About the device-----	35
6. Technical Data-----	36
7. Common Fault List-----	37

1. About This Manual

This manual should be read carefully before installing and operating the Active Power Filter (hereinafter referred to as APF for short). The manual contains the necessary information conducive to the good performance of the equipment and avoid incorrect operation.

The following symbols, terms and names are used in this installation manual.

Table 1.2 The Use of Symbols, Terms and Names

	Annotation
Notice!	Follow the requirements of the manual to prevent equipment damage
 Caution	Follow the requirements of the manual to prevent equipment damage and personal injury
 Warning	Follow the requirements of the manual to prevent the occurrence of serious accidents
 Danger	Follow the requirements of the manual to prevent serious accidents and fatal injuries
 Danger	Follow the requirements of the manual to prevent serious accidents and fatal injuries due to hazardous voltages

【Note】	Please pay attention to the contents stated in 【Note】 【Example】 as explanatory notes
【Example】	

2. APF Introduction

Our company is dedicated to solving power quality problems for the users. With unprecedented filtering capability, APF can filter 2-50 times of harmonic. Its filtering rate can be as high as 97% or more. The complete compensation time for the harmonics with step change is less than 10ms. Multiple APFs can be run parallel at the same time, which is fully applicable to the industrial and civil fields in various situations, as the best solution for nonlinear load harmonic control.

2.1 APF Working Principle

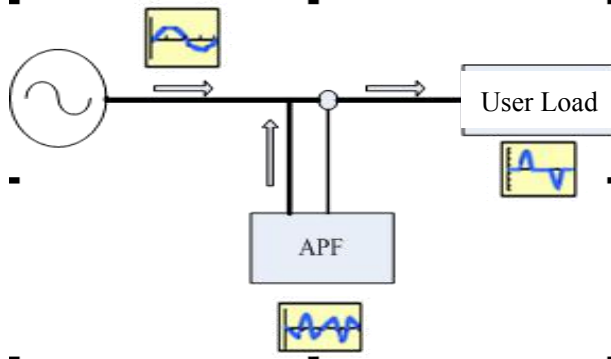


Figure 2-1 Working Diagram of APF

2.1.1 APF Functional Principle

◆ Filtering Principle

From the real-time current signals collected by the external current transformer, APF separates the harmonic part through the internal detection circuit and produces through the IGBT power converter the compensation current with same size and reversed phase to the harmonic in the system. Thus the harmonics are filtered.

The dynamic accurate change of APF output compensation current according to the system's harmonic content prevents the problem of over compensation. In addition, the overload protection function in the APF can help the device limit the output automatically at 100% of rated capacity when the system's harmonic content is greater than the filter's so as to avoid overload.

◆ Reactive Power Compensation Principle

Through the parameter setting, user can allow the APF to make dynamic reactive power compensation while filtering the harmonics.

APF generates capacitive or inductive fundamental currents through the IGBT power converter according to the reactive power of the system, so as to achieve dynamic reactive power compensation. The compensation target value can be set through the operation panel and overcompensation will not occur. The smooth compensation will not generate surge impact on the load and power grid.

2.1.2 APF Internal Control Principle

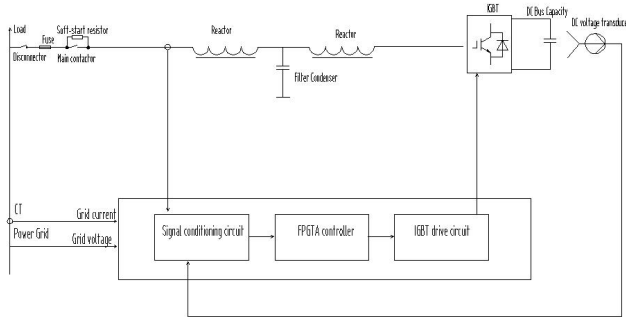
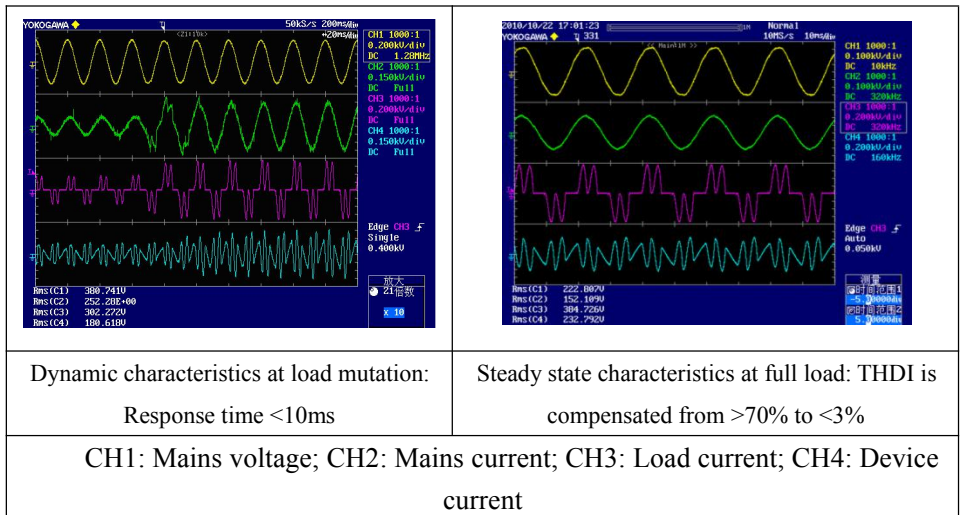


Figure 2-2 APF Internal Control Principle Diagram

As shown in Figure 2-2, after the disconnecter is closed, APF first charges the capacitor of the DC bus through the soft-start resistor to prevent the instantaneous impact of the power grid on the DC bus capacitor after power-on. This process lasts for dozens of seconds. When the bus voltage U_{dc} reaches the predetermined value, the main contactor is closed. DC capacitors, as the energy storage devices, output compensating current to provide energy through the IGBT inverter and internal reactor. APF acquires current signal real time through external CT and send to the signal conditioning circuit, and then send to the FPGA controller. The controller separates the fundamental components and extracts all the harmonics, before comparing the collected harmonic components with the compensation current sent by APF and outputting the difference as the real-time compensation signal to the driving circuit. The IGBT converter is then triggered to inject the compensation harmonic current into the power grid, so as to realize the function of filtering harmonics.

2.2 APF Dynamic and Steady State Characteristics

The superior dynamic and steady state characteristics of APF are particularly worth mentioning. The following diagram shows the dynamic characteristics of APF when the load changes, and the steady state characteristics when it is at full load.



2.3 APF Product Features

1. It can filter the harmonic current within 2 to 50 times at the same time, making the Total Harmonic Distortion of Current THDI <3% in full load or THDI <4% in half load;
2. Filtering only, or filtering while compensating reactive power are both optional, and the priority order of the functions can be set;
3. Sliding window iterative DFT detection algorithm is adopted, with fast calculation speed, and the instantaneous response time is

less than 0.1ms, the device compensation full response time is less than 10ms;

4. The original adaptive current average control algorithm is applied, so that the frequency range of the high-frequency harmonics generated by IGBT of the device itself in the working is narrow, and the output current distortion rate $<2.5\%$;

5. When the three-phase load current is unbalanced, APF can compensate and eliminate the imbalance;

6. Reliable current-limiting control link is adopted. APF can limit the output automatically at 100% of rated capacity when the system's harmonic content is greater than the filter's so as to maintain the normal work and avoid overload and burnout.

7. The main circuit switching devices adopt the internationally renowned brand IGBT, with very high reliability, combined with the unique active clamp technology, it can ensure that IGBT will not have over voltage pipe explosion failure in any extreme cases.

8. The main circuit adopts 3H bridge type three-level structure, the output waveform quality is high, and the switching loss is low.

9. High-definition 7-inch touch screen is adopted, which is easy to operate, the screen real-time displays the system and device operating parameters, with fault alarm and recall function;

10. Output filter adopts LCL structure, preventing the IGBT high-frequency switching harmonic generated in the APF compensation from being injected into the power grid, for a better compensation effect, applicable to any field power system

impedance without resonance to ensure the safety of the device.

11. Xilinx company's military-grade FPGA is adopted for centralized control. FPGA clock frequency is up to 200MHz, with 84 hardware DSP units internally, DSP parallel operation, and the operation rate is much higher than the single DSP control mode, the communication delay is small, response is faster, and after the sintering process, FPGA is equivalent to the hardware circuit, no need to call the program, hence the anti-interference ability is strong, and program fleet fault will not occur.

12. It can implement 12 units run in parallel and adopt only one FPGA controller for centralized control, to distribute the compensation current evenly to each device, so as to improve the efficiency of each device. As there is no communication between multiple controllers, it can effectively avoid the communication delay and external signal interference, enhance the compensation performance of APF, and thus improve the reliability of the system.


13. The reliable lightning surge protector equipped at the input end of APF can prevent the device from damage in case of the occurrence of lightning wave. Its own control device is also equipped with measures against surge, which has passed the anti interference test.

3. Installation Introduction

This chapter describes the selection and routing of APFs and their

associated equipment.

As each site has its special situation, this chapter does not describe the detailed installation steps, but only to provide guidance on the general installation steps and methods for the installation personnel, and the installation personnel shall handle according to the specific circumstances of the venue.

<ul style="list-style-type: none">● Notice!	<ul style="list-style-type: none">● Three-phase four-wire or three-phase three-wire input power supply is required● Standard APF systems can be connected to three-phase four-wire (grounded) TN, TT and IT AC power distribution systems (IEC60364-3) and three-phase three-wire AC power distribution systems. If it is applied for IT AC power distribution system, a 4-pole circuit breaker shall be set for the input, please refer to the relevant IT system standards.
 <ul style="list-style-type: none">● Warning	<ul style="list-style-type: none">● The APF can be powered up only with the consent of the commissioning engineer.● APF installation should be carried out by the qualified engineer according to the instructions in this manual. All other equipment not covered in this manual is shipped with the detailed mechanical and electrical installation information.

3.1 Initial Inspection

Before installing APF, first conduct the following inspection:

1. Visually inspect whether there is external and internal damage to the APF due to the transport. If there is damage, notify the carrier immediately.

2. Check the product label to confirm the correctness of the device. Equipment side wall is affixed with equipment label, which is marked with APF model, capacity and main parameters.

3.2 Location Selection

3.2.1 APF Location Selection

APF is designed for indoor installation, and should be installed in a clean environment, which should be well ventilated to ensure that the ambient temperature can meet product specifications.

Internal fan provides forced air cooling to the series APF. The cold air enters the interior of the APF through the wind grill on the front of the APF cabinet and exhausts the hot air through the wind grill at the back of the APF. Do not block the ventilation holes.

Notice!	<ul style="list-style-type: none">● If the installation mode is wall-mounted, set aside at least 150mm of the inlet and outlet air space at the APF chassis front and rear wind outlet port!● If the installation mode is standard cabinet, select a rack cabinet that can be ventilated at the front and rear doors. If necessary, install an indoor exhaust fan to avoid the increase in room temperature. In the dusty environment, air filter should be installed.
---------	---

Note: APF is only applicable for installation on concrete or other non-flammable mounting surfaces. APF installation methods can select rack mounting, plane mounting and wall-mounted installation.

3.2.2 Storage

If it is not required to install the APF immediately, the APF shall be stored indoors to avoid over-humid or over-high temperature conditions.

3.3 Installation Environment

APF chassis has modular design, which is easy for equipment locating and short-distance handling.

In order to extend the service life, APF position should be selected to ensure:

1. Convenient wiring
2. Enough room for operation
3. Good ventilated to meet the cooling requirements
4. No corrosive gas around
5. No over-wet and high temperature source
6. Non-dusty environment
7. Meet the fire requirements

The APF chassis has a power supply terminal and a CT input terminal.

The APF front panel is designed with an operator control panel that provides basic operating status and alarm information display.

APF rack-mounted installation provides air inlet in the front and air outlet in the rear; wall-mounted installation provides the air inlet at the bottom and air outlet at the top.

3.4 Device Handling

Notice!	<ul style="list-style-type: none">● As the weight of a single APF module is 30kg-35kg, in the short distance it is recommended to be handled by two people together, if long-distance handling is required, it needs to be completed by the application of certain transport equipment.
---------	---

3.5 Operating Space

In order to facilitate the daily operation, the power supply terminals within the APF shall be tightened, in addition to meet the local regulations, APF line should retain enough space to facilitate the maintenance personnel to access the cable. A minimum of 150 mm of space should be retained in place to keep the ventilation clear.




3.6 External Protection Device

The circuit breaker or other protective device must be installed at the external AC input of the wall-mounted APF system. This chapter provides general guidance for qualified installation engineers. Qualified installation engineers should understand the local wiring regulations for the equipment to be installed.

3.7 Power Cable

When selecting cables, the relevant electrical regulations (For details, please refer to section 4.4 External Incoming Cable Specification) shall be followed, and the ambient conditions shall be considered.

4. Installation and Electrical Connection

 <p>Danger</p>	<p>Short-circuit caused fatal danger, shock due to not grounded or exposed to liquid</p> <ul style="list-style-type: none"> ● Ensure that APF is grounded ● APF is not allowed to start up in the environment with liquid ● APF is not allowed to be placed in a high humidity environment ● Ensure that the cover/door is removed or opened when the APF is powered off
<p>Notice!</p>	<p>Poor ventilation</p> <ul style="list-style-type: none"> ● Poorly ventilated or heat dissipation can cause damage to the machine ● Do not cover the ventilation openings ● If it is installed in a switchgear, ensure that the heat source has been removed
 	<ul style="list-style-type: none"> ● The parts behind the protective cover which require tools to open are the components not allowed to be operated by the user ● Unauthorized anti tearing label tear-down is regarded as waiver of factory maintenance service ● It is strongly recommended that: User shall install an additional circuit breaker at the connection of the APF and mains for isolation

4.1 Installation Conditions

Please follow the installation conditions in Table 4.1, Table 4.2 and Table 4.3:

Table 4.1 Installation Conditions

Content	Conditions	Notice
Altitude	<1000 m From 1000m to 4000m, adopt 1% /100m derating internally	If the device is used at the altitudes above 2000m, the transient voltage (1.2μs/50μs) shall not exceed the following values: 3000m: maximum 3.51kV 4000m: maximum 3.10kV In accordance with over-voltage class III standard design
Temperature	-10~40℃	
Humidity	>90%	
Installation	Wall-mounted	Retain at least 150mm of the inlet and outlet air space at the APF chassis bottom air inlet and top air outlet

Table 4.2 Minimum Mounting Space for Wall-mounted APF

Position	Minimum Installation Space Required
Bottom (air inlet)	150mm
Top (air outlet)	150mm
Left / right side	Not required

Table 4.3 Minimum Installation Space for Rack-mounted APF

Position	Minimum Installation Space Required
Top (air outlet)	300mm
Front side (air inlet)	1100mm
Rear side (air inlet)	600mm

Left / right side	Not required
-------------------	--------------

4.2 APF Installation Instructions

4.2.1 Rack-mounted APF Module

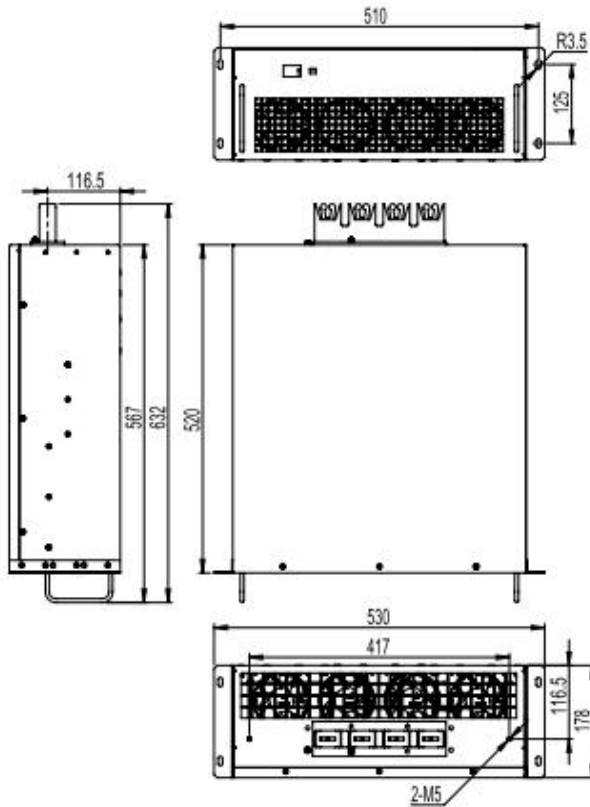


Figure 4-5 Module Dimensions

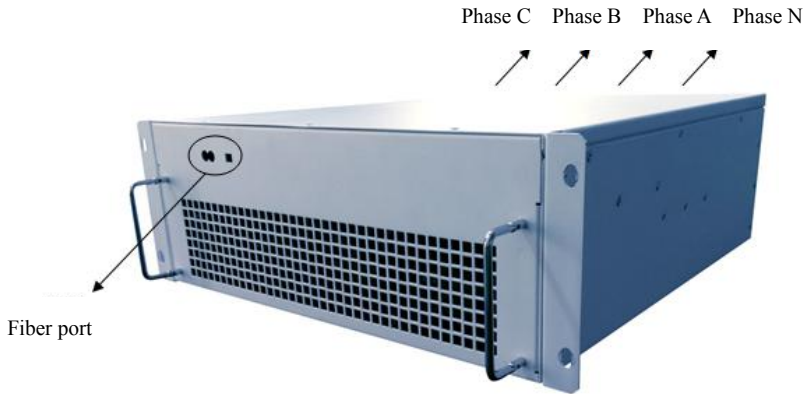


Figure 4-6 External Wiring Diagram

4.2.2 Rack-mounted APF

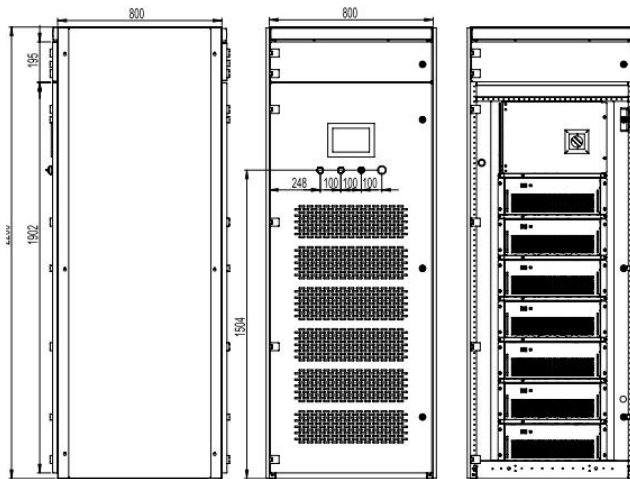


Figure 4-7 Rack-mounted APF Dimensions

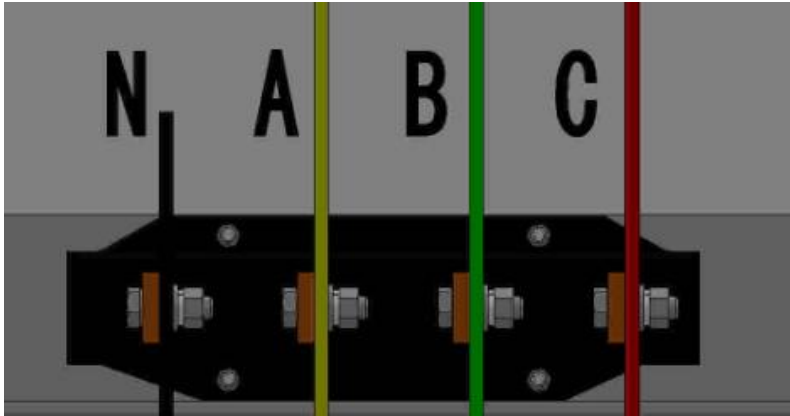


Figure 4-8 Three-phase Four-wire APF Main Circuit Wiring



Figure 4-9 Rack-mounted APF External CT Terminals

Table 4.4 External Current Transformer Terminal X Terminals

No.	Name	Remark
1	A Phase CT+	x-1 (In: AIS+)
2	B Phase CT+	x-2 (In: BIS+)
3	C Phase CT+	x-3 (In: CIS+)
4	A Phase CT-	x-4 (In: AIS-)
5	B Phase CT-	x-5 (In: BIS-)
6	C Phase CT-	x-6 (In: CIS-)

4.3 Optional Component Installation

4.3.1 Molded Case Circuit Breakers and Surge Protective Device

Wall-mounted APF requires users to configure additional molded case circuit breaker and surge protector.

4.3.2 External Sampling CT

APF is parallel installed in the system, and the current transformer CT is connected to the system side, if APF combines distribution cabinet with other distribution cabinets, it is required that the CT should be penetrated upon the penetration of the copper bar.

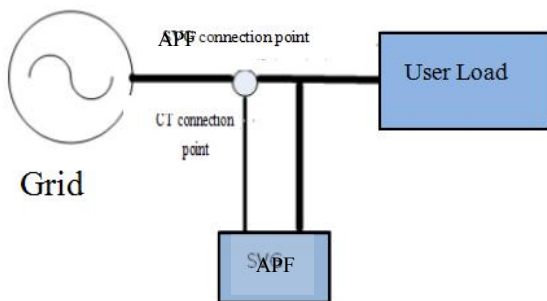


Figure 4-10 APF Installation Diagram

	<p>When capacitor compensation device is included in the system, APF must be installed near the load at the rear side of the capacitor</p>
Warning	

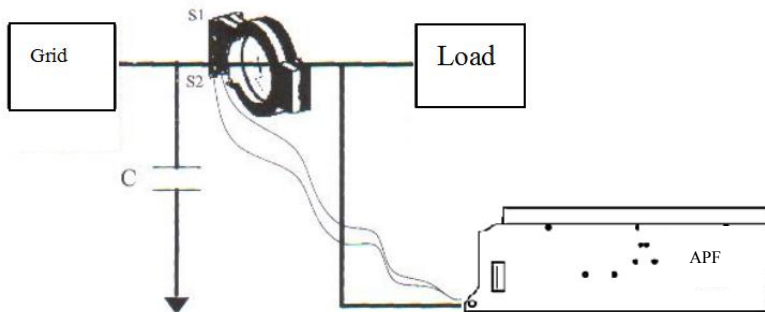


Figure 4-11 CT Connection 1

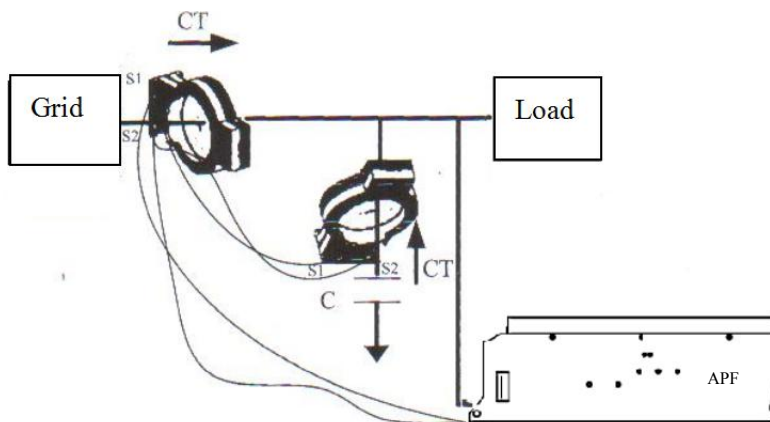


Figure 4-12 CT Connection 2

In connection 2, CT signal at the power supply is sent to the APF after deducting the CT signal at the capacitor, to prevent the current shock generated by the capacitor switching from effecting the APF operation.



Danger

If the current transformer is not connected properly, it may be fatal due to short circuit and electric shock

- Before the installation of the current transformer primary side, first adopt the short circuit separation jumper (not within the scope of supply) to short-circuit the secondary side
- Ensure that the current transformer is short-circuited until the CT connection terminals of the APF are properly connected.
- Before disconnecting the current transformer

	from the APF, short-circuit it with the detachable short-circuit terminal
--	---

The application of current transformers shall follow the following rules:

- Three external current transformers must be connected correctly to the APF.
- The current transformer is installed at the system side of the filter, and the system at the load side should be provided by the user

Table 4.5 External CT Specifications

Option	Model	Remark
External CT Components	Selected by the Customer	The electrification ratio can be arbitrarily selected from 75/5-5000/5, in view of the influence of AD sampling accuracy, excessive CT variation (such as 50A model CT> 4000/5) does not apply to stand-alone or CT secondary side parallel connection parallel system.

Table 4.6 Current Transformer Specifications

Parameter	Specification
Rated secondary	5A

current	
Rated primary current	The primary current must be selected based on the maximum effective current value (For example, starting current 800A → Adopt current transformer 1000A: 5A)
Accuracy class	Above 0.5
Rated load (VA)	Above 2.5

1) Wiring of Current Transformer in Single APF Operation

To ensure correct detection of current, pay attention to the current direction of the current transformer and the correct connection.

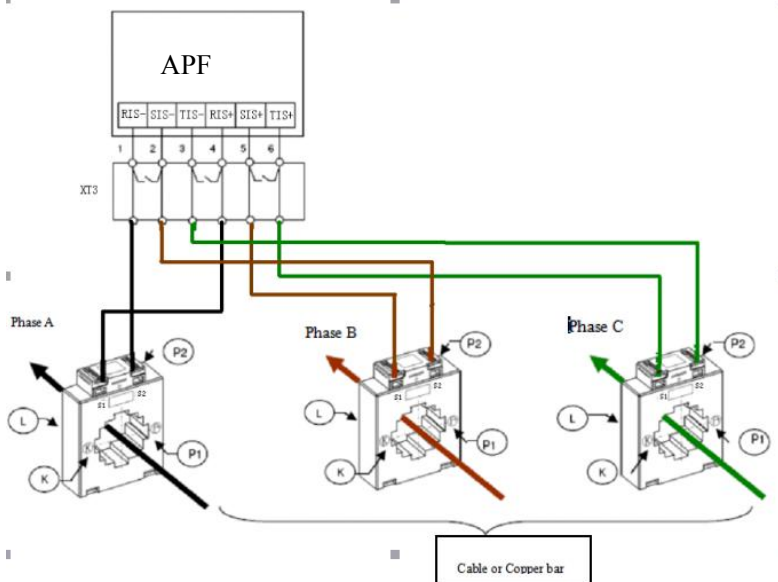


Figure 4-13 Transformer Wiring in Single APF Operation

2) Wiring of Current Transformers in Parallel Operation of Multiple APF Modules

The compensation current can be increased by the parallel operation of up to 12 APF modules. Multiple APFs share a set of current transformers.

【Note】: The installation of the electrical parts of the APF unit must be carried out by trained and qualified engineer according to the *Law of electrical engineering*. It is strictly forbidden for any other personnel to install. This manual only introduces the basic contents of the installation. Please refer to the electrical specification for installation details.

【Note】 :

1. CT cable adopts 2.5mm² shielded twisted pair RVSP2 × 2.5 (line length L<15m), CT cable adopts 4mm² shielded twisted pair RVSP2 × 4 (line length 15 <L <30m).
2. If the flow of CT current is from P1 → P2, then S1 is +, S2 is -; otherwise, S1 is -, S2 is +.

4.4 External Incoming Cable Specification

Three-phase four-wire APF to the load neutral line cable is required to be twice the incoming cable (otherwise the neutral line may be heated and causing danger).

The APF incoming cables for each current class are shown in the following table:

APF Current	50A	100A	150A	200A	250A	300A	350A
Cable (mm ²)	16	35	50	95	120	150	185

5. User Interface

5.1 User Interface Structure

This chapter mainly introduces the functional components of the APF user interface and the user operation information. APF user interface is located on the control panel of the cabinet. The user can make the related operation through touching the display panel.

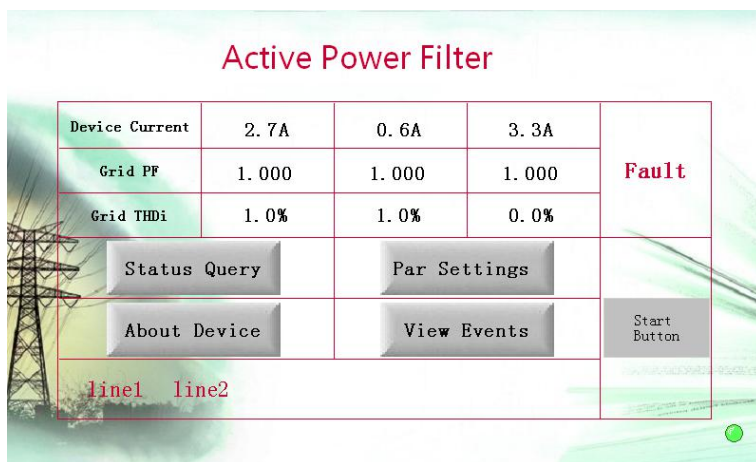


Figure 5-1 Front View of the User Interface

User interface rear common ports include DC power port, and the RS232/RS485 communication port, as shown in Figure 5-2.



Figure 5-2 Rear View of the User Interface
Common port on the back of the display

No.	Port Name
1	DC controller power supply
2	COM: RS232;RS485
3	USB1: main port, USB1.1 compatible
4	USB2: subsidiary port, for the download works

5.2 User Interface Functions

Through the user interface, user can perform related operations on APF.

The user interface mainly includes the following functions:

1. Device power-on/device power-off

Through the menu options on the user interface display, the APF power-on/power-off operation can be implemented

2. Characteristic parameters monitoring, analysis and recording

Display the system voltage, system current waveform and data, power factor, device temperature and other information.

3. Initial device settings

APF initialization includes many aspects, such as setting the APF compensation mode, the external system CT ratio and the number and size of compensated harmonics, etc.

4. Monitoring system power quality, module operation status and event records

APF device displays system power grid waveform data, and monitor the operation status of each module. The event log can reflect the system failure information.

5. Information on the device

It can display the product information of the device itself, such as device capacity, operating mode, product serial number and other information.

5.3 Main Menu Options

As shown in Figure 5-1, the user interface operation mainly includes the following four menu options:

Status query: Query the system running status, such as voltage, current and power module status, etc.

About the device: Display device and version information.

Parameter settings: Set the device operating parameters, such as the external system CT ratio, etc.

View events: Display information about events that occur during the operation of the device, such as voltage anomalies, etc.

The user can perform the corresponding operation through touching the menu option. And the operating instructions on the menu options are described as follows.

5.4 State Query

There are three submenu options under the "Status Query" menu in the main menu.

1. Voltage and current: Display the grid voltage, grid current, system power factor and device current, etc.
2. Module: Display the power unit module A, B, C bus voltage and compensation current, and show the power unit module A, B, C heat sink temperature.
3. Harmonics: Display the power unit module A, B, C version number and heat sink temperature.

5.4.1 Voltage and Current

Click the "Status Query" option in the main menu to enter the default "Voltage-Current" menu option, as shown in Figure 5-3.

Voltage-Current	Module	Harmonics	Main Menu	
Item	Phase A	Phase B	Phase C	Total
Grid Voltage	0.2V	0.1V	0.3V	47.6Hz
Grid Current	2.3A	4.4A	6.2A	
Device Current	2.6A	0.7A	3.2A	
Load Current	0.6A	4.0A	3.0A	
THDv	0.0%	0.0%	0.0%	
THDi	1.0%	1.0%	0.0%	
Item	Phase A	Phase B	Phase C	Total
System Active	0.0kW	0.0kW	0.0kW	0kW
System Reactive	0.0kvar	0.0kvar	0.0kvar	0kvar
Power Factor	1.000	1.000	1.000	1.000
Load Active	0.0kW	0.0kW	0.0kW	0kW
Load Reactive	0.0kvar	0.0kvar	0.0kvar	0kvar
Load Factor	1.000	1.000	1.000	1.000

Figure 5-3 Status Query - Voltage Current

APF parallel access to the distribution system, the controller internal PT performs voltage sampling on the main power supply access points, the external system CT performs system current sampling, the device CT performs device current sampling (APF compensation current), and the controller obtains the above sampling values and calculates to obtain the following parameters.

Grid voltage: APF access point line voltage, i.e. the grid line voltage.

Grid current: APF external system transformer sampled current, including device current and load current.

Device current: Device A, B, C three-phase compensation current.

Load current: Load A, B, C three-phase current.

System active: System A, B, C three-phase active power.

System reactive power: System A, B, C three-phase reactive power.

System power: System A, B, C three-phase power factor.

Load active: Load A, B, C three-phase active power.

Load Reactive: Load A, B, C three-phase reactive power.

Load power factor: Load A, B, C three-phase power factor.

5.4.2 Module

Click the “Module” option in the main menu to enter the interface as shown in Figure 5-4.

Voltage-Current		Module		Harmonics		Main Menu	
Item	Vbus_A	Vbus_B	Vbus_C	il_A	il_B	il_C	
Line1	0.0V	0.0V	0.0V	0.0A	0.0A	0.0A	
Line2	0.0V	0.0V	0.0V	0.0A	0.0A	0.0A	
Item	Temp_A	Temp_B	Temp_C	Status	Rest Times		
Line1	0℃	0℃	0℃	off	0		
Line2	0℃	0℃	0℃	off	0		

Figure 5-4 Status Query - Module

The controller can sample Vbus (bus capacitor DC voltage) and il (cell

module compensation current) for the 12-way parallel modules of the APF cabinet. The Vbus before the start-up of 400V APF is 310V or so, after start-up Vbus can be stabilized at 380V. The controller can conduct query on the version number and temperature of the 12-way parallel module of the APF cabinet. The version refers to the module program version number, temperature refers to the unit module A, B, C three-phase heat sink temperature, and the module sampling temperature in normal operation shall not exceed 60°C.

5.4.3 Harmonic

There are nine submenu options under the "Harmonics" menu in the main menu:

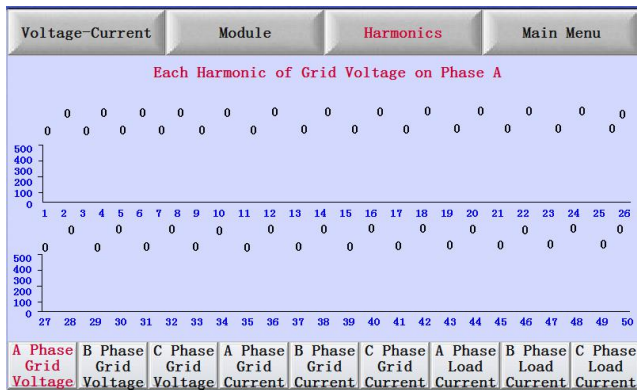


Figure 5-5 Status Query - Harmonics

Grid voltage harmonics: Display A, B, C three-phase grid voltage harmonic values

Grid current harmonics: Display A, B, C three-phase grid current harmonic values

Load current harmonics: Display A, B, C three-phase grid voltage harmonic values

Main menu: Return to the main menu

5.5 About the Device

User password can be managed at the interface.

About Device			Main Menu		
Product Model	00A		0x0	/L715	
Connection	0				Log In
PowerMdl Num	1				Change Password
Run Time	0hour				Log Out
Ext Switch	Off				User Management

Figure 5-6 About the Device

User Log in: Enter the password. The password is divided into: Two grades, advanced password and user password. The "Advanced Password" is for the engineering commissioning staff, and not opens to users. User password: 2015;

When engineering commissioning staff conducts the commissioning on the APF for the first time, they will set the corresponding parameters.

After the completion of the commissioning, user only needs to power on and off.

5.6 Parameter Settings

There are three submenu options under the "Parameter Setting" menu in the main menu.

Compensation parameter setting: User general parameter setting.

Other parameter setting: User general parameter settings.

Sub-harmonic limiter setting: APF 1-50 time fundamental reactive power compensation and harmonic filtering limit value setting.

Harmonic Limiter Setting		Click Save	Return
Compensation Parameter Setting		Other Parameter Setting	
System CT Ratio	300: 5	RS485 Number	0x0
Compensate Mode	Reactive 1st		
Target PF	0.90		
Warning: After setting the save button and press the relevant Power restart just effective!			

Figure 5-7 Parameter Setting

5.6.1 Compensation Parameter Setting

After entering the correct password, user can perform the related operations in the "User Parameter Setting".

System CT Ratio: Engineers set according to the actual current

transformer ratio. Click to enter the actual CT ratio, click Save, if it is not saved, the CT ratio after powered-off will be restored to the previous setting or the default value.

【Note】 Current transformer is connected to the system power side, measuring the total current of the APF and load, APF performs closed-loop compensation.

Compensation mode: APF compensation mode is divided into: reactive priority, harmonic priority. In the reactive power priority mode, based on the power factor as the compensation target, APF provides priority compensation reactive current, and the residual capacity for compensation harmonic current. In the harmonics priority mode, APF provides priority compensation harmonic current, and the residual capacity for compensation reactive current.

Note: APF compensation mode should be set by the professional commissioning engineer.

Target PF: Set the expected grid side target power factor.

5.6.3 Harmonic Limiter Setting

Harmonic limit setting 1: APF 1-50 time fundamental reactive power compensation and harmonic filtering limit value setting.

Total - 23 times setting		24 - 50 times setting		Click Here to Save		Return	
Times	Ratio	Times	Ratio	Times	Ratio	Times	Ratio
Total	100%	8	0%	16	0%		
1	20%	9	0%	17	0%		
2	0%	10	0%	18	0%		
3	50%	11	0%	19	0%		
4	0%	12	0%	20	0%		
5	30%	13	0%	21	0%		
6	0%	14	0%	22	0%		
7	20%	15	0%	23	0%		

Warning: After setting the save button and press the relevant Power restart just effective!

Figure 5-8 Parameter Setting - Sub-harmonic Limiter Setting

5.7 View Events

In the main menu, there are three submenu options, as shown in Figure 5-9.

The Current Event Table: Display failure or alarm under the current status of the APF device.

Event History Table: Display alarm that occurred previously on the APF unit.

Clear Event: Clear the history alarm.

Switch: Switch the current alarm with all the alarms occurred previously.

The Current Event Table		Event History Table		Clear Event		Switch		Main Menu	
Time	Alarm Type	Alarm Event	Value	Limit	Description				
03-22 15:30:54:000	Switch alarm	Alarm occur	On	On	Fault : A2 power module send several abnormal				
03-22 15:30:54:000	Switch alarm	Alarm occur	On	On	Fault : A2 power module send several abnormal				
03-22 15:30:54:000	Switch alarm	Alarm occur	On	On	Fault : A phase grid voltage is too low				
03-22 15:30:54:000	Switch alarm	Alarm occur	On	On	Fault : B phase grid voltage is too low				
03-22 15:30:54:000	Switch alarm	Alarm occur	On	On	Fault : C phase grid voltage is too low				

Figure 5-9 View Events

6. Technical Data

APF	3-wire	4-wire
Rated compensation current	50A – 350A	50A – 350A
Power input		
Working voltage (V)	400V (-20% ~ +15%) 690V (-20% ~ +15%)	400V (-20% ~ +15%)
Working frequency (Hz)	50/60	50/60
Performance index		
Filter capacity	THDi<3% (rated)	THDi<3% (rated)

Filtering range	2~50 harmonics, eliminating all the specified harmonics	2~50 harmonics, eliminating all the specified harmonics
Single harmonic compensation rate adjustment	The compensation current for each harmonic can be limited	The compensation current for each harmonic can be limited
Instantaneous response time	<100us	<100us
Full response time	<10ms	<10ms
Active power loss	<3% (rated)	<3% (rated)
Corrects three-phase unbalance	Yes	Yes
Reactive power compensation function	Yes, power factor can be set	Yes, power factor can be set
Overload protection	Automatic current limit at 100% rated output	Automatic current limit at 100% rated output
Switching frequency	21.6KHz	21.6KHz
Display and operation		
Display interface UI	7 inch touch display	7 inch touch display
Display status	Current, voltage and other grid parameters	Current, voltage and other grid parameters

Communication	Modbus,RS485,RS232	Modbus,RS485,RS232
Product configuration		
Installation method	Wall-mounted, cabinet	Wall-mounted, cabinet
Parallel unit operation	12 units parallel operation	12 units parallel operation
Environmental conditions		
Ambient temperature	-10℃~45℃	-10℃~45℃
Storage environment	-40℃~65℃	-40℃~65℃
Relative humidity	Maximum 95%, no condensation	Maximum 95%, no condensation
Altitude	Below 1,000m	Below 1,000m

7. Common Fault List

No.	Type of Fault Alarm	Suggestion
1	City power phase sequence abnormality	(1)Ensure that the controller sampling signal board cable is properly inserted (2)Exchange any two phase wires (note that the corresponding current sampling CT shall be adjusted simultaneously!)
2	Mains frequency abnormality	The power grid may have fluctuation, and the device can automatically resume operation after the fault is

		removed
3	Mains voltage too high	The power grid may have fluctuation, and the device can automatically resume operation after the fault is removed
4	Mains voltage too low	The power grid may have fluctuation, and the device can automatically resume operation after the fault is removed
5	DC voltage of the power module too high	Please turn off the machine and restart after 5 minutes
6	Communication error	Please check if the fiber is loose
7	System clock abnormality	Please reset the time in the "Parameter Setting" interface
8	Temperature too high	(1) The device can automatically resume work after the temperature becomes normal. (2) Please check whether the ventilation system is smooth
9	Parameter memory abnormality	Please reset the parameter and save it in the "Parameter Setting" interface
10	System startup timeout	Please check the soft-start resistor and contactor