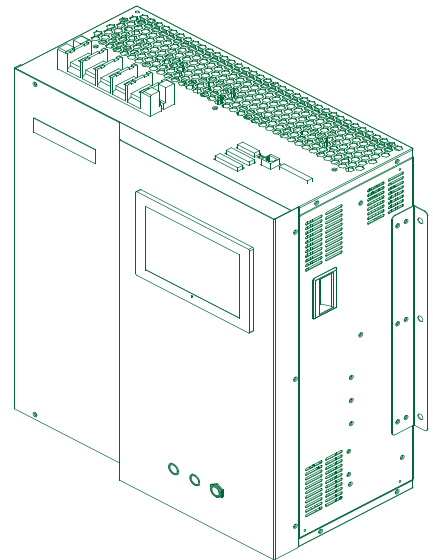
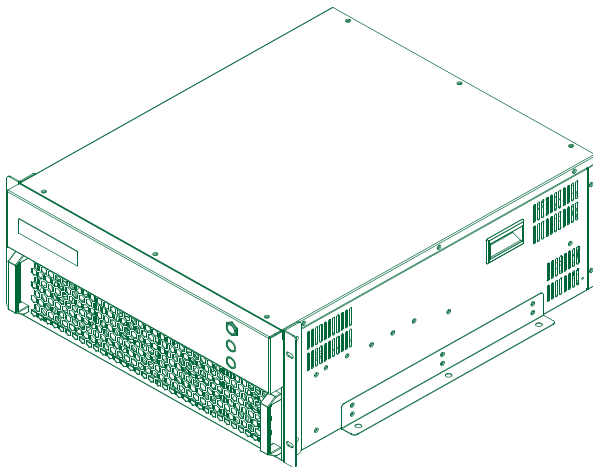


Active Power Filter

有源电力滤波器

操作手册

Operation manual



安全须知

Safety instructions



这些安全须知适用于所有工作的本公司的设备。忽视这些说明可能会导致人身伤害和死亡。
These safety instructions apply to all equipment of our company for work. Neglecting these instructions May cause personal injury and death.



禁止带电操作!
Prohibit live operation!

操作人员资格

Operator qualifications

只允许专业从事电气方面工作的人员操作本设备。本设备的安装、运行监测、故障维修只能由专业人员来操作，要求对设备操作的人员必须熟读此手册。

Only professionals engaged in electrical work are allowed to operate this equipment. The installation, operation monitoring, and troubleshooting of this equipment can only be operated by professional personnel. It is required that personnel operating the equipment must read this manual thoroughly.

安装和维护安全

Installation and maintenance of safety

绝不能对已接通电源的滤波器尝试任何操作。切断供应电源后，通常需要等中间回路电容放电5分钟，然后才能对变频器、电机或电机电缆操作。开始操作前，使用电压万用表检查谐波滤波器进出线端子处已经放电完毕。

Never attempt any operation on a filter that has been powered on. After cutting off the power supply, it is usually necessary to wait for 5 minutes for the intermediate circuit capacitor to discharge before operating the frequency converter, motor, or motor cable. Before starting the operation, use a voltage multimeter to check that the input and output terminals of the harmonic filter have been discharged.

责任免除

Exclusion

用户手册的内容描述了产品的特性，但是通常不是作为产品的保证书。如果遇到任何疑问和问题，请及时与我们取得联系，避免发生无可挽回的意外！

The content of the user manual describes the characteristics of the product, but it is usually not used as a warranty for the product. If you encounter any questions or problems, please contact us in a timely manner to avoid irreparable accidents!

尊敬的客户：

Dear customer

我司会对本说明进行周期性更新及补遗，恕不另行通知，如有疑问请垂询我司当地经销商！

Our company will periodically update and supplement this manual without prior notice. If you have any questions, please contact our local distributor!

关于本手册

About this Manual

在安装和操作设备前，应仔细地阅读本手册。
手册中包含了有利于设备完好发挥性能、避免错误操作的必备信息。
以下的符号、术语及名称用于本操作安装手册。

Before installing and operating the equipment, carefully read this manual.
The manual contains essential information that is beneficial for the equipment to perform well and avoid incorrect operations.
The following symbols, terms, and names are used in this operation and installation manual.

表1 符号、术语及名称的使用
Table 1 Use of Symbols, Terminology, and Names

	注释 explanatory note
注意! Attention!	遵循手册要求，防范设备损坏 Follow the manual requirements to prevent equipment damage
	遵循手册要求，防范设备损坏及人身伤害 Follow the manual requirements to prevent equipment damage and personal injury
 Warn	遵循手册要求，防止严重事故发生 Follow the manual requirements to prevent serious accidents from occurring
 Dangerous	遵循手册要求，防止严重事故及致命伤害情况的发生 Follow the manual requirements to prevent serious accidents
 Dangerous	遵循手册要求，防止因危险电压导致的严重事故及致命伤害发生 Follow the manual requirements to prevent serious accidents and fatal injuries caused by hazardous voltages
【注】 【Note】	请关注【注】表述的内容，用于解释说明 Please pay attention to the content expressed in 【Note】 for explanatory purposes

■ 接地

Grounding

这些安全指导适用于所有对滤波器进行接地操作的工程技术人员。
These safety guidelines apply to all engineering and technical personnel conducting grounding operations on filters.

警告！ 忽视以下指导会造成人身伤亡，并且会增加电磁干扰和设备损坏；在任何情况下都要将滤波器、传动及其连接设备接地，以保证人身安全，并减少电磁辐射和电磁干扰。

Warning! Neglecting the following guidance can cause personal injury and increase electromagnetic interference and equipment damage; In any case, the filter, transmission and its connecting equipment must be grounded to ensure personal safety and reduce electromagnetic radiation and interference.

必须保证接地导体的尺寸符合当地安全规范的要求。
It is necessary to ensure that the size of the grounding conductor meets the requirements of local safety regulations

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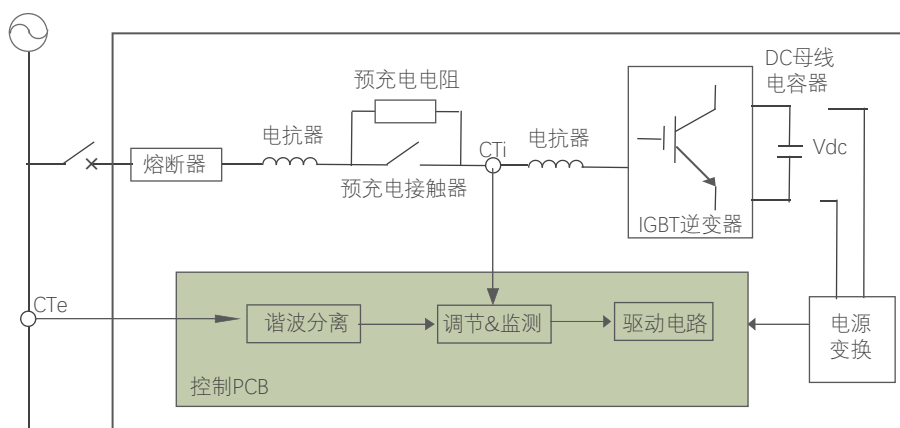
一. 产品介绍

Product introduction

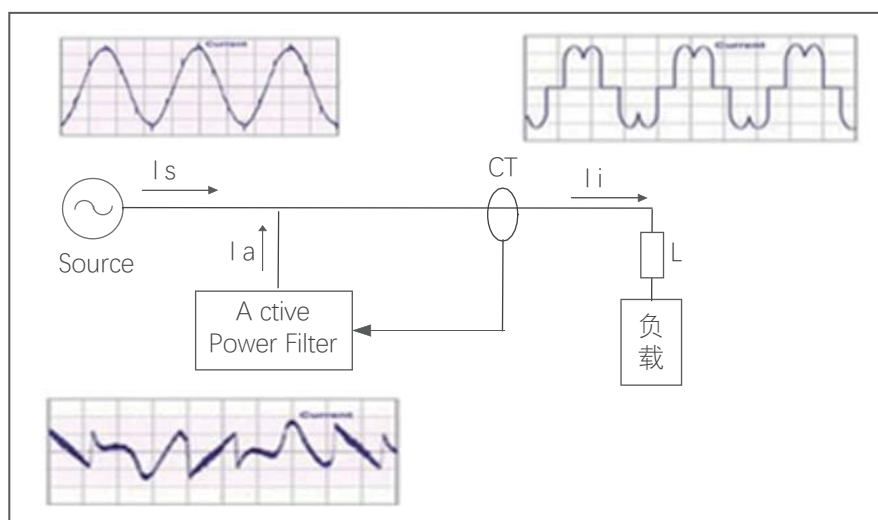
1.1 基本原理

Basic principles

有源电力滤波器是动态滤除谐波的新一代谐波治理解决方案，采用先进的动态实时跟踪补偿方式消除电网谐波，通过实时监测由非线性负载所产生的电流波形，分离出谐波部分，将大小相等方向相反的谐波电流注入到电网中，实现滤除谐波的功能。Active power filter is a new generation harmonic control solution that dynamically filters out harmonics, adopting advanced dynamic real-time technology. Tracking compensation method eliminates grid harmonics by real-time monitoring of current waveforms generated by nonlinear loads, separating them and injecting harmonic currents of equal magnitude and opposite directions into the power grid to achieve the function of filtering out harmonics.



内部原理图
Internal schematic diagram



使用原理图
Application schematic diagram

1.2 产品特点

Product features

- 可实时动态滤除 2 ~ 50 次谐波， 或者有选择的滤除电网相线和零线中存在的各次典型性特征谐波；
It can dynamically filter out 2-50 harmonics in real-time, or selectively filter out typical characteristic harmonics in the phase and zero lines of the power grid;
- 内置谐波补偿、无功补偿、不平衡补偿等多种补偿功能， 用户可自行设定选择补偿功能；
Equipped with various compensation functions such as harmonic compensation, reactive power compensation, and imbalance compensation, users can set and choose compensation functions themselves;
- 三相四线制APF在零线上的谐波滤除能力是相线滤波能力的三倍， 针对照明等单相负载多造成零线谐波过载（零线上的三次谐波电流因为相位相同而叠加将会达到相线上的三次谐波电流的三倍）和相不平衡的情况；
The harmonic filtering ability of three-phase four wire APF on the zero line is three times that of the phase line filtering ability, especially for single-phase loads such as lighting that cause more zero lines harmonic overload (the superposition of the third harmonic current on the zero line due to the same phase will reach three times the third harmonic current on the phase line) and the situation of phase imbalance;
- 友好的操作和显示人机界面， 操作简单方便， 可实时显示数据与曲线；
Friendly operation and display of human-machine interface, simple and convenient operation, and real-time display of data and curves;
- APF化柜体设计， 安装灵活（机架式和壁挂式）；
APF cabinet design, flexible installation (rack and wall mounted);
- 有效的各类保护措施， 确保正常工作和异常工况下都不会对供电系统及系统内其他设备造成任何影响。包括各类保护功能（过载、过/欠压， 内部故障等）， 可根据负荷变化， 自动合理限制补偿电流， 装置不会过流， 在滤波的同时， 能完全避免过补偿；
Effective protective measures are taken to ensure that normal operation and abnormal working conditions will not have any impact on the power supply and distribution system and other equipment within the system. Including various protection functions (overload, overvoltage/undervoltage, internal faults, etc.), it can automatically and reasonably limit the compensation current according to load changes, and the device will not overcurrent. While filtering, it can completely avoid overcompensation;
- APF自身高频载波不会回馈到电网， 对供电系统及系统内其他设备不造成干扰。
The high-frequency carrier of APF itself will not feedback back to the power grid, causing no interference to the power supply system and other equipment within the system.

1.3 应用场景

Application scenarios

办公大楼及商业大厦 Office and commercial buildings	不间断供电电源（UPS）系统 Uninterruptible Power Supply (UPS) System
计算机中心 Computer Centre	电梯、升降机、起重机、电缆索道 Elevators, Lifts, Cranes, Cable Ropeways
住宅大厦 Residential buildings	医院（医学机构） Hospitals (medical institutions)
电视台和广播的编辑制作室 Editing and production rooms for television and radio stations	空气调节系统 Air conditioning system
节能灯（例如在温室暖房里的） Energy saving lamps (such as those in greenhouses)	地铁 Metro
石化和天然气行业 Petrochemical and natural gas industries	电气化铁道及城市轨道交通行业 Electrified railway and urban rail transit industry
太阳能、风能、水能的电力应用 The application of solar energy, wind energy, and hydropower in electricity	水泥行业 Cement industry
水处理行业 Water treatment industry	汽车行业 The automotive industry
过程控制行业 Process Control Industry	精密制造业 Precision manufacturing industry
冶金行业 Metallurgical industry	逆变器驱动或者其他工业设计的机械 Inverter driven or other industrial designed machinery

1.4 技术参数

Technical parameter

输入电压 Input voltage	380VAC±20%
电网频率 Grid frequency	50Hz (-10%~+10%)
接线方式 Wiring method	三相四线+PE Three phase four wire+PE
额定电流 Rated current	30A / 50A / 75A / 100A / 150A
谐波电流补偿 Harmonic current compensation	2~51奇次谐波 2-51 odd harmonics
谐波滤除率 Harmonic filtering rate	≥95%
分次谐波补偿 Fractional harmonic compensation	补偿率可分次调整 The compensation rate can be adjusted in stages
无功电流补偿 Reactive current compensation	容性/感性 Tolerance/Sensibility
目标功率因数 Target power factor	±0.99
无功补偿率 Reactive power compensation rate	≥98%
不平衡电流补偿 Unbalanced current compensation	负序/零序(不平衡度≤3%) Negative sequence/zero sequence (imbalance ≤ 3%)
开关频率 Switching frequency	20kHz
全响应时间 Full response time	≤20ms
瞬时响应时间 Instantaneous response time	≤50us
设备损耗 Equipment loss	≥97%
防护等级 Protection level	IP20
设备噪声 Equipment noise	≤60dB
人机界面 Interface	液晶触摸屏 LCD touch screen
通讯接口 communication interface	RS485
通讯协议 Communication protocol	Modbus
运行温度 Operating temperature	-20°C~45°C
冷却方式 Cooling method	风冷 Air-cooled
安装方式 Installation method	机架式、壁挂式 Rack mounted, wall mounted
可并联合数 Number of parallel units	≤20PCS
互感器位置 Transformer position	单设备运行: 电网侧或负载侧; 多设备并机运行: 负载侧 Single device operation: grid side or load side; Multi device parallel operation: load side
存储温湿度 Storage temperature and humidity	-25~55°C, 5%~90%无凝露 -25~55 °C, 5%~90% without condensation
工作温湿度 Working temperature and humidity	-10~40°C, 5%~90%无凝露 -10~40 °C, 5%~90% without condensation
其他环境 Other environments	环境无腐蚀性气体及导电尘埃, 无剧烈振动及颠簸, 安装倾斜度<5% The environment is free of corrosive gases and conductive dust, and there is no severe vibration or turbulence. The installation inclination is less than 5%
海拔高度 Altitude	≤1500m, 1500m以上按照GBT3859.2降额使用
输出电流保护 Output current protection	支持输出电流限流, 过电流保护/功率器件暂态过电流保护 Support output current limiting, overcurrent protection/transient overcurrent protection for power devices
超温保护 Over temperature protection	支持功率器件超温降容/保护 Support power device over temperature reduction/protection
电压异常保护 Voltage anomaly protection	支持过电压、欠电压、过频率、欠频率保护 支持电压不平衡、电压谐波异常保护 Supports overvoltage, undervoltage, over frequency, and under frequency protection Support voltage imbalance and abnormal voltage harmonic protection

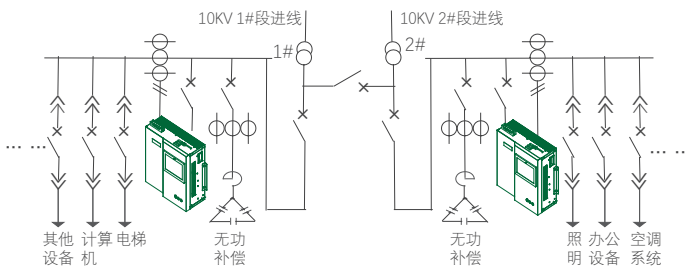
1.5 补偿方式

Compensation method

1.5.1 集中补偿:

Centralized compensation:

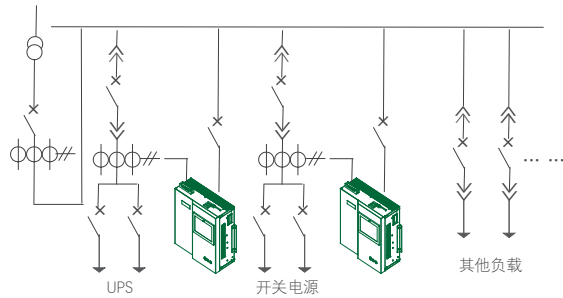
适用于混合型配电系统，非线性负载数量庞大、分散，并且单台非线性负载谐波含量小，可在电网的接入端安装APF有源滤波器，对配电系统的所有谐波综合治理。Suitable for hybrid distribution systems, with a large and dispersed number of nonlinear loads and low harmonic content in a single nonlinear load. APF active filters can be installed at the access end of the power grid to comprehensively manage all harmonics in the distribution system.



1.5.2 部分补偿:

Partial compensation:

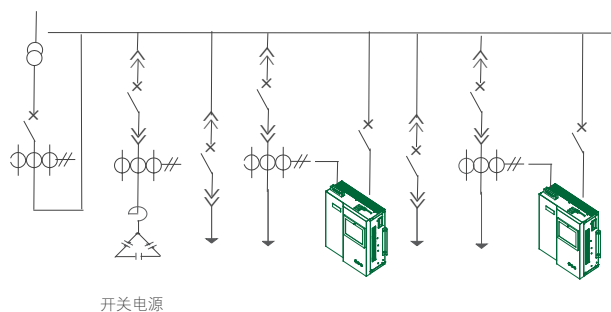
适用于非线性负载集中在某几条支路的配电系统，可在这几条支路的上端安装APF有源滤波器，确保谐波不流入电网污染其它负载。Suitable for distribution systems where nonlinear loads are concentrated in certain branches, APF active filters can be installed at the upper end of these branches to ensure that harmonics do not flow into the grid and pollute other loads.



1.5.3 就地补偿:

On site compensation:

适用于非线性负载集中且单台谐波含量较大的配电系统，在此负载的前端安装APF有源滤波器可达到理想治理效果。Suitable for distribution systems with concentrated nonlinear loads and high single harmonic content, installing APF active filters at the front end of this load can achieve ideal governance effects.



1.6 安全须知

Safety instructions

在安装和操作并联有源滤波器前，应仔细阅读用户手册。手册中包含了有利于设备完好性能发挥、避免错误操作的必备信息。只允许熟悉相关电气规章制度、专业从事电气方面工作的人员操作本设备。手册中，技术诠释的内容以及线路图，都可以按照通常的方式去理解，同时也可以按照需要的应用来参考。用户手册内容描述了产品的特性，要严格按照接线说明操作，错误的接线可能导致并联有源滤波器的损坏，也可能导致一些与之连接设备的损坏。必须由厂家或其代理商指定工程师进行调试和维护。否则可能危及人身安全和导致设备故障，由此引起的APF损坏，不属保修范围。

Before installing and operating a parallel active filter, carefully read the user manual. The manual contains essential information that is beneficial for the proper performance of the equipment and prevents incorrect operations. Only personnel familiar with relevant electrical regulations and professionals engaged in electrical work are allowed to operate this equipment. The content of technical explanations and circuit diagrams in the manual can be understood in the usual way, and can also be referenced according to the required application. The user manual describes the characteristics of the product and should be strictly operated according to the wiring instructions. Incorrect wiring may cause damage to the parallel active filter or some connected equipment. Debugging and maintenance must be carried out by engineers designated by the manufacturer or its agent. Otherwise, it may endanger personal safety and cause equipment failure, resulting in APF damage that is not covered by the warranty.

所有设备内部维护及保养工作都需使用工具，并且应该由接受过相关培训的人员执行。需使用工具才能打开的保护盖板后的器件为用户不可维护器件。该APF完全满足使用操作区设备安规要求。APF带有危险电压，但非维护人员接触不到。由于带有危险电压的元器件只有使用工具打开保护后盖后才能接触到，接触高压的可能性已降到最小。如果遵照一般规范并按照本书所建议的步骤进行设备的操作，将不会存在任何危险。

All internal maintenance and upkeep work of equipment requires the use of tools and should be carried out by personnel who have received relevant training. The device behind the protective cover that requires tools to open is a user non-maintainable device. This APF fully meets the safety requirements of the operating area equipment. APF carries dangerous voltage, but non-maintenance personnel cannot come into contact with it. Due to the fact that components with hazardous voltage can only be accessed by opening the protective cover with tools, the possibility of contact with high voltage has been minimized. If the equipment is operated according to general specifications and the steps recommended in this book, there will be no danger.

因本产品运行时涉及强电压、大电流，为避免使用不当造成人身危害，应用时需注意如下安全事项：

Due to the high voltage and current involved in the operation of this product, in order to avoid personal harm caused by improper use, the following safety precautions should be taken during application:

设备安装、运行前需可靠接地；
Reliable grounding is required before equipment installation and operation;

设备安装、运行时避免液体浸入；
Avoid liquid immersion during equipment installation and operation;

设备安装、维护操作时应注意切断电源；
Attention should be paid to cutting off the power supply during equipment installation and maintenance operations;

设备安装时，各线缆需按规范选型，接线端子务必拧紧；
When installing equipment, each cable should be selected according to specifications, and the wiring terminals must be tightened;

设备安装时，禁止将螺栓、螺母等金属异物掉入设备；
During equipment installation, it is prohibited to drop metal foreign objects such as bolts and nuts into the equipment;

设备安装时，电网相线、零线、地线避免混淆接线；
When installing equipment, avoid confusing the wiring of the phase line, neutral line, and ground line of the power grid;

设备维护时，断电后内部仍有残留高压，需静置5分钟才可以进行操作；

During equipment maintenance, there is still residual high voltage inside after power outage, and it needs to be left to stand for 5 minutes before operation can be carried out;

因本产品内涉及精密元器件，为保障产品的性能、寿命及后期可维护性，应用时需注意如下安全事项：

Due to the involvement of precision components in this product, in order to ensure the performance, lifespan, and later maintainability of the product, the following safety precautions should be taken during application:

安装设计时，需预留维护的操作空间，以便现场调试及维护；
When installing and designing, it is necessary to reserve maintenance operation space for on-site debugging and maintenance;

安装设计时，需选用分段测试型接线端子进行柜内CT二次接线，以便现场调试及维护；

When installing and designing, it is necessary to select segmented testing type wiring terminals for the secondary wiring of CT in the cabinet for on-site debugging and maintenance;

安装设计时，需保持散热风道通畅，否则易影响设备的性能及寿命；

When installing and designing, it is necessary to keep the heat dissipation duct unobstructed, otherwise it may affect the performance and lifespan of the equipment;

安装设计时，需保证CT二次接线正确，否则易影响设备的性能及寿命；

When installing and designing, it is necessary to ensure that the CT secondary wiring is correct, otherwise it may affect the performance and lifespan of the equipment;

若设备长期满负荷运行，需及时扩容，否则易影响设备的性能及寿命；

If the equipment operates at full load for a long time, it needs to be expanded in a timely manner, otherwise it may affect the performance and lifespan of the equipment;

避免在金属粉尘环境、高湿环境、腐蚀性环境下应用本产品，否则易影响设备的性能及寿命；

Avoid using this product in metal dust environments, high humidity environments, and corrosive environments, as it may affect the performance and lifespan of the equipment;

当系统中存在多种治理设备，如电容器、APF、SVG同时存在的场景，需注意系统设计，以避免各设备间电流耦合，互相影响。

When there are multiple governance devices in the system, such as capacitors, APFs, and SVGs, attention should be paid to system design to avoid current coupling and mutual influence among the devices.

二、设备详情

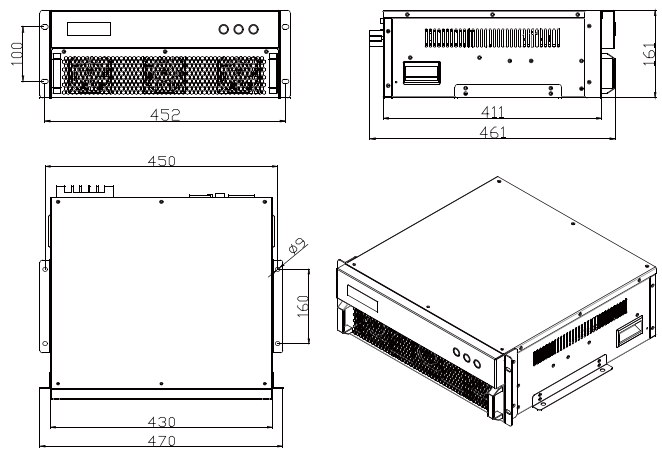
Equipment details

2.1 设备尺寸

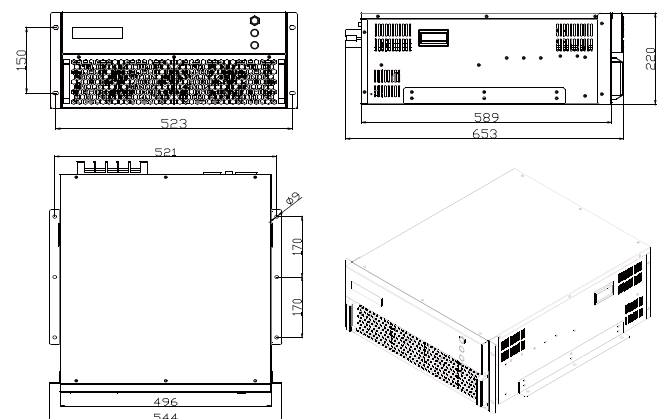
Equipment dimensions

为满足不同用户的客观需求，APF共设计有两种不同的外观，分别为机架式、壁挂式。

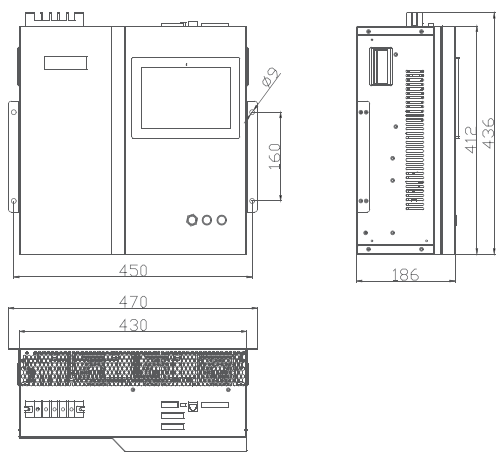
To meet the objective needs of different users, APF is designed with two different appearances, namely rack mounted and wall mounted.



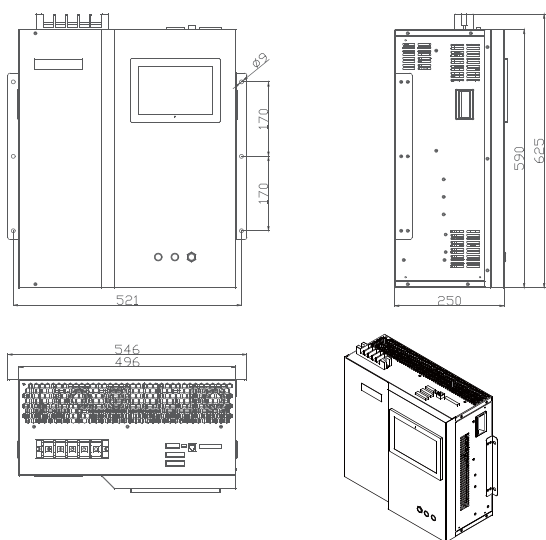
机架式APF-30A,50A,75A



机架式APF-100A,120A,150A

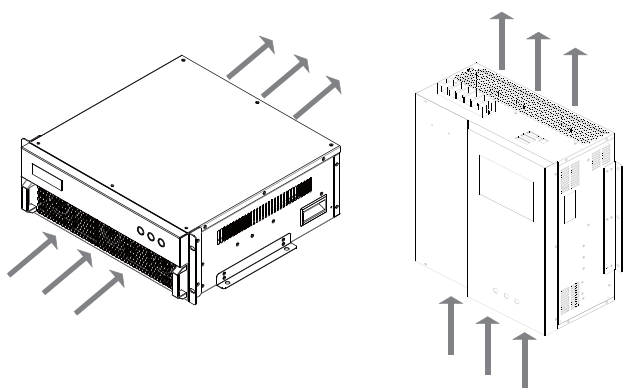


壁挂式APF-30A,50A,75A



壁挂式APF-100A,120A,150A

2.2 设备外形 Equipment appearance



机架式轴测图,
风向由前向后

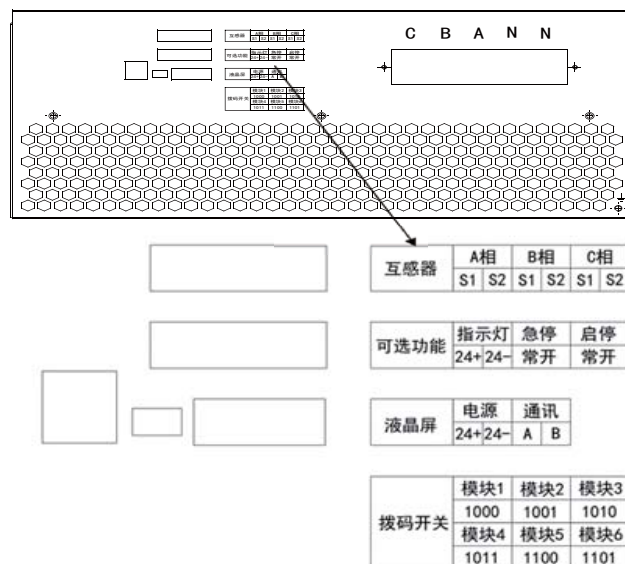
壁挂式轴测图,
风向由下向上

2.3 接线端口

Wiring port

APF与外部的接线主要有三块, 包含一次线, 互感器线, 辅助功能二次线, 详见下列丝印图。

There are mainly three pieces of wiring between APF and the outside, including primary wire, transformer wire, and auxiliary function secondary wire. Please refer to the silk screen diagram below for details.



各接线端口的具体功能及注意事项如下:

The specific functions and precautions of each wiring port are as follows:

2.3.1 一次线端口:

Primary line port:

采用M6/M8螺丝安装, 线缆端子建议采用SC型; Install with M6/M8 screws, and it is recommended to use SC type cable terminals;

2个N线端子在设备内部并联; 当N线工作电流不大于额定相线电流时, 仅需连接1根N线; 当N线工作电流大于额定相线电流时, 需连接2根N线;

Two N-wire terminals are connected in parallel inside the equipment; When the working current of the N-line is not greater than the rated phase line current, only one N-line needs to be connected; When the working current of the N-line is greater than the rated phase line current, two N-lines need to be connected;

设备启动前会自检相序, 若相序不对无法启动请更换相序; Before starting the device, it will self check the phase sequence. If the phase sequence is incorrect and cannot be started, please replace the phase sequence;

接地线需要可靠连接, 否则可能造成机器无法运行。The grounding wire needs to be reliably connected, otherwise it may cause the machine to malfunction.

A/B/C相线与N线严禁接反, 接反后会引引起相间短路, 造成设备严重损坏。

A/B/C phase lines and N lines are strictly prohibited from being connected in reverse, as reverse connection may cause a short circuit between phases and cause serious equipment damage.

2.3.2 互感器端口：

Transformer port:

CT1/CT2/CT3分别对应接入A/B/C相的电流互感器信号；
CT1/CT2/CT3 correspond to the current transformer signals connected to phase A/B/C respectively;

S1/S2分别为对应电流互感器二次信号的正负极；
S1/S2 are the positive and negative poles corresponding to the secondary signal of the current transformer;

电流互感器的接线若产生相间顺序或极性的错误，会导致设备无法正常补偿；
If there is an error in the phase sequence or polarity of the wiring of the current transformer, it will cause the equipment to be unable to compensate normally;

多台设备并运时，电流互感器二次信号需依次串联接入各设备，使各设备内流过的二次电流保持一致；
When multiple devices are operating in parallel, the secondary signal of the current transformer needs to be sequentially connected in series to each device, so that the secondary current flowing through each device remains consistent;

由于现场电流互感器接线极易出现问题，建议A/B/C三相上的CT的二次信号线使用三种不同颜色的线缆，便于安装及检查维护。

Due to the high risk of wiring problems with on-site current transformers, it is recommended to use three different colored cables for the secondary signal lines of CT on A/B/C three-phase for easy installation, inspection, and maintenance.

2.3.3 辅助端口：

Auxiliary Port:

指示灯：可接直流24V指示灯，显示APF运行状态；
Indicator light: Can be connected to a DC 24V indicator light to display the APF operating status;

急停开关：需本设备外部提供开/闭信号控制本设备的停止/运行，接常开开关；
Emergency stop switch: An external open/close signal is required to control the stop/operation of the equipment, and a normally open switch is connected;

一键启动：实体按键可一键启动运行APF，接常开开关。
One click start: The physical button can start and run APF with one click, connected to the normally open switch.

2.3.4 液晶屏端口：

LCD screen port:

该组端子为标准RS485通讯口，用于液晶屏查询本设备运行数据/配置数据或修改本设备配置数据；
This group of terminals is a standard RS485 communication port, used for LCD screen query of operating data/configuration data of this device or modification of configuration data of this device;

24V供电严禁接反，接反易引起电源内部短路，造成屏幕损坏。

Reverse connection of 24V power supply is strictly prohibited, as it can cause internal short circuits in the power supply and damage the screen.

2.4 显示与操作按钮：

Display and operation buttons:

2.4.1 后面板：

Rear panel:



后面板网口为APF程序升级接口；

The rear panel Ethernet port is an APF program upgrade interface;

1号拨码针对一键启动功能，上位生效，下位关闭；
The first dial is for the one click start function, which takes effect in the upper position and turns off in the lower position;

拨码开关在多台并机时需要设置地址，否则会报通讯异常，拨码方法如下：

The dial switch needs to set an address when multiple machines are connected, otherwise communication abnormalities will be reported. The dial method is as follows:



2.4.2 前面板：

Front panel:

设备前面板区域包含2个指示灯、1个实体按键；

The front panel area of the device includes 2 indicator lights and 1 physical button;



POWER: 供电指示灯，灯亮说明APF已通电，人员需注意操作安全；

The power indicator light is on, indicating that the APF has been powered on. Personnel need to pay attention to operational safety;

RUN : 显示APF运行状态，正常运行状态为常亮；
Display the operating status of APF, which is normally on;

START : 一键启动按钮，APF启动过程约1分钟。
One click start button, APF startup process takes about 1 minute.

三、安装接线

Installation wiring

3.1 安装前注意事项:

Precautions before installation:

本章介绍APF有源电力滤波器及其相关设备的选位和走线时所必须考虑的相关要求。

This chapter introduces the relevant requirements that must be considered when selecting the position and routing of APF active power filters and their related equipment.

要求由专业工程技术人员安装，应经调试工程师同意后，才可给APF上电；APF的安装应根据本手册说明由合格工程师进行。

It is required to be installed by professional engineering and technical personnel, and the APF can only be powered on with the consent of the commissioning engineer; The installation of APF should be carried out by qualified engineers according to the instructions in this manual.

3.1 初检

Initial inspection

目检APF外部和内部是否存在运输损坏。如有损坏，请立即通报承运商。

Visually inspect the APF for transportation damage both externally and internally. If there is any damage, please inform the carrier immediately.

核对产品标签，确认设备的正确性。设备侧壁贴有设备标签，标签上标明了APF型号、容量及主要参数。

Verify the product label and confirm the correctness of the equipment. There is a device label attached to the side wall of the device, which indicates the APF model, capacity, and main parameters.

3.3 选位

Selecting Positions

APF安装位置:

APF installation location:

APF设计为室内安装，应安装在清洁的环境中，并且应通风良好，以保证环境温度满足产品规格要求，在尘埃较多的环境中，应加装空气过滤网。

APF is designed for indoor installation and should be installed in a clean environment with good ventilation to ensure that the ambient temperature meets the product specifications. In dusty environments, air filters should be installed.

APF由内部风扇提供强制风冷，冷风通过APF机柜前面的风栅进入APF内部，并通过APF后部的风栅排出热风，请勿阻塞通风孔。如果安装方式为壁挂模式，在APF机箱的下进风口及上出风端口至少要预留10cm的进出风空间。Cold air enters the interior of the APF through the air grille in front of the APF cabinet, and hot air is discharged through the air grille at the rear of the APF. Do not block the ventilation holes. If the installation method is wall mounted, at least 10cm of air inlet and outlet space should be reserved at the lower air inlet and upper air outlet of the APF chassis.

如果安装方式为标准机柜模式，请选择前后门均可通风的机架机柜；如有必要，应安装室内排气扇，以避免室温升高。APF仅适用于安装在混凝土或其他非易燃安装表面。

If the installation method is standard cabinet mode, please choose a rack cabinet with both front and rear doors that can be ventilated; If necessary, indoor exhaust fans should be installed to avoid an increase in room temperature. APF is only suitable for installation on concrete or other non flammable installation surfaces.

3.4 存储

Storage

如果无需马上对APF进行安装，必须将APF存储于室内，避免过湿或温度过高的环境。

If it is not necessary to install the APF immediately, it must be stored indoors to avoid environments that are too humid or too hot.

3.5 安装

Install

有源滤波器两侧均有风栅，因此其侧面尽量留一定空间；There are wind barriers on both sides of the active filter, so try to leave some space on its side as much as possible;

为了方便日常运行时对APF内的电源端子进行紧固，除满足当地规定外，APF后面应保留足够空间，以方便维护人员进行线缆的接入。线缆接好后应留有至少200mm的空间以保持通风的顺畅。

In order to facilitate the tightening of the power terminals inside the APF during daily operation, in addition to meeting local regulations, sufficient space should be reserved behind the APF for maintenance personnel to access the cables. After the cable is connected, there should be at least 200mm of space left to maintain smooth ventilation.

APF 机箱前面板处有与标准机柜连接部位，在侧壁也有往墙壁上固定的结构件，所以在最终定位前要寻找好安装的位置和方式。

There is a connection point between the front panel of the APF chassis and the standard cabinet, and there are also structural components fixed to the wall on the side wall. Therefore, before final positioning, it is necessary to find a good installation position and method.

3.6 线缆

Cable

	丝印 端口	A/B/C/ N/N	PE	A/B/C- S1/S2	485±/ 24±/常开
模块 线缆 规格 推荐	模块 容量 (A)	一次 线 (mm ²)	接地 线 (mm ²)	互感 器线 (mm ²)	辅助 线 (mm ²)
	150	≥50	≥6	≥2.5	≥1
	120	≥45	≥6	≥2.5	≥1
	100	≥35	≥6	≥2.5	≥1
	75	≥16	≥6	≥2.5	≥1
	50	≥10	≥6	≥2.5	≥1
	30	≥6	≥6	≥2.5	≥1

3.7 断路器

Circuit breaker

必须在 APF 系统外部交流电源输入处安装断路器、空开或其它保护器件；断路器选型容量一般为APF装机容量的1.3~1.5倍。

Circuit breakers, air switches, or other protective devices must be installed at the external AC power input of the APF system; The selection capacity of circuit breakers is generally 1.3~1.5 times the installed capacity of APF.

3.8 互感器

Mutual inductor

本设备的电流互感器适配范围支持50:5~10000:5，互感器的精度及量程选型不当会影响设备的治理效果，互感器的精度通常建议选用0.5级，二次线缆建议选用不小于2.5mm²线缆。

The fitting range of the current transformer of this equipment supports 50.5 ~ 10000.5. The improper selection of the accuracy and measuring range of the transformer will affect the treatment effect of the equipment, secondary cable is recommended not less than 2.5 mm² cable.

选择CT变比时，最好能根据实际负载的电流大小来进行相应的选择，互感器容量的选择通常建议比变压器容量大一级，这样配置后 APF可以更高精度进行谐波的补偿，使客户端达到更理想的补偿效果。

When choosing the CT ratio, it is best to select it according to the current of the actual load. The selection of the transformer capacity is usually recommended to be one level larger than the transformer capacity, after this configuration, APF can compensate the harmonics with higher precision, so that the client can achieve a better compensation effect.

例：客户端负载电流最大为 1000A，则最好选择 1200:5 这一档位，没有必要进行 2000:5 档位的选择。APF 的外CT 推荐安装在负载侧，即 CT 是安装在 APF 与负载之间的。这样安装的话，只需要三个 CT 即可满足需求。

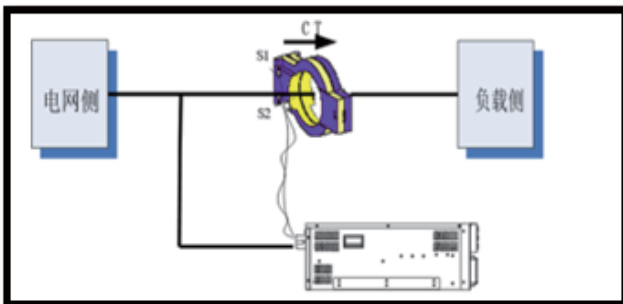
Example: client load current maximum of 1000A, it is best to choose 1200:5 this gear, there is no need to carry out 2000:5 gear selection. The external CT of APF is recommended to be installed on the load side, i. e. the CT is installed between APF and the load. With this setup, you only need three CTS to meet your needs.

3.8.1 互感器安装位置

Installation position of Mutual inductor

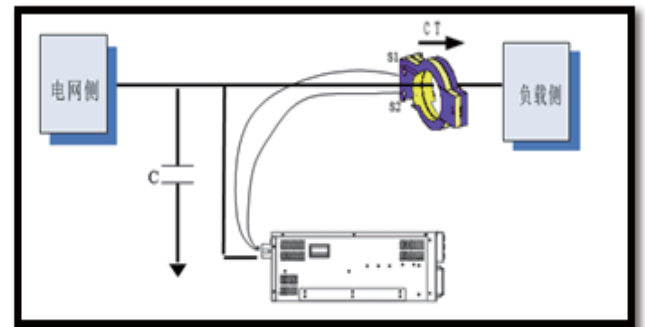
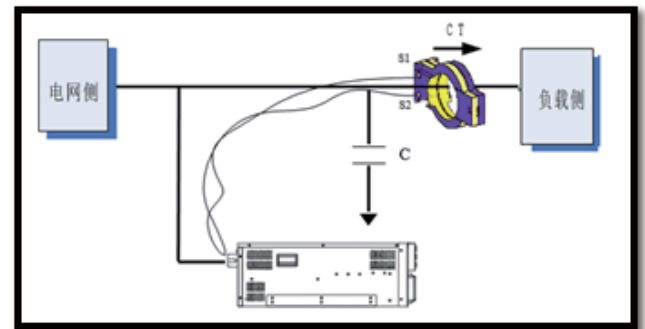
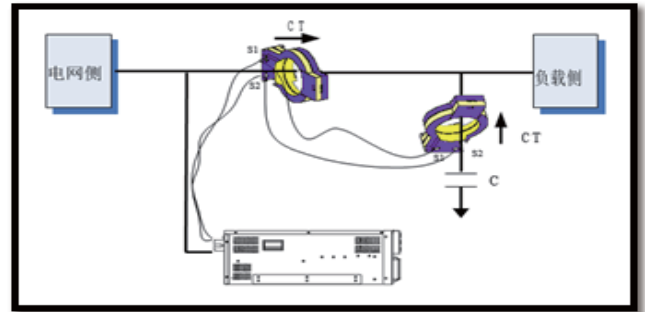
常见负载侧位置可参考下图示例：

Common load side positions can be seen in the following illustration:



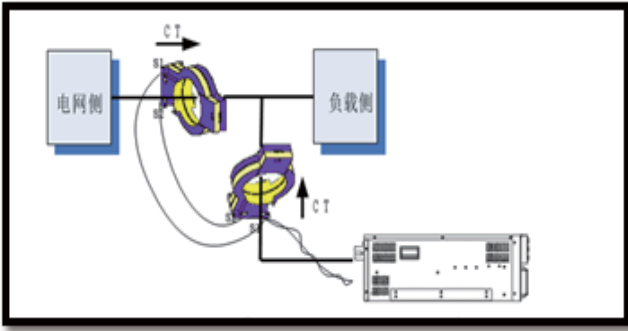
APF安装在负载侧但是负载侧有大电容的情况下，有下面三种安装方式可供选择：

If the APF is installed on the load side but the load side has a large capacitor, there are three installation options:

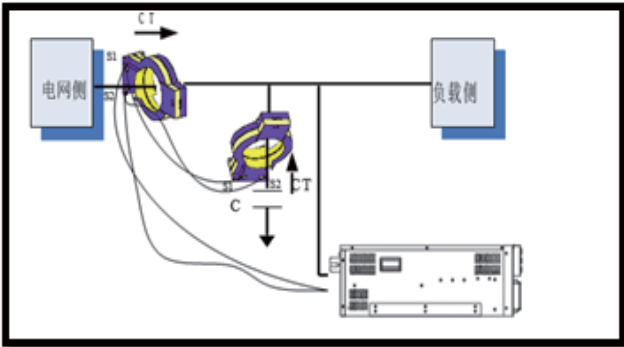


如果因为用户端在负载侧不方便接CT，而只能装在源端的话，则可以使用 6 个相同规格的CT，其中三个CT装在源端的 A/B/C 相上，另三个CT装在APF的输出端 A/B/C 三相上，如图所示。同一相的两个CT的输出端再并联在一起，图中箭头方向为CT的正方向，此箭头方向要与CT本身壳体外的箭头方向一致：

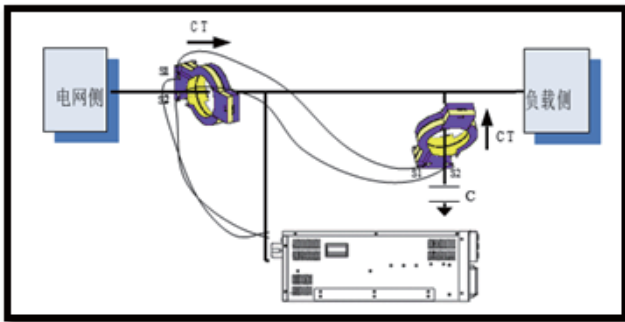
If the client can only be installed on the source side because it is not convenient to connect the CT on the load side, then six CT of the same specification can be used, three of which are installed on the A/b/c phase of the source side, the other three CTS are mounted on a/b/c three-phase APF output, as shown. The output ends of the two CTS in the same phase are connected in parallel. The direction of the arrow in the image is the positive direction of the CTS. The direction of the arrow should be the same as the direction of the arrow outside the CTS body:



互感器装于源侧且源侧有大电容的安装示意图：
Schematic diagram of the installation of a transformer on the source side with a large capacitor on the source side:



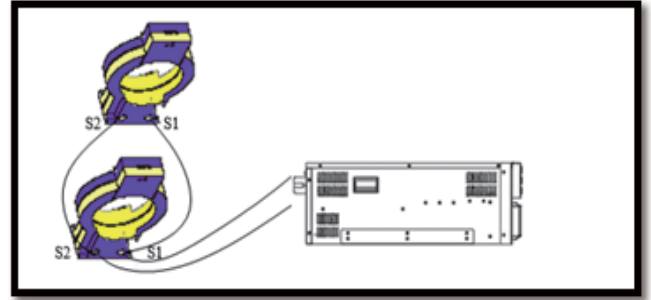
如果要将APF安装在源侧但是负载侧有大电容的情况下，CT 的安装方法如图所示：
If you want to install the APF on the source side but have a large capacitor on the load side, the installation of the CT is as shown:



3.8.2 互感器接法 Mutual inductor connection method

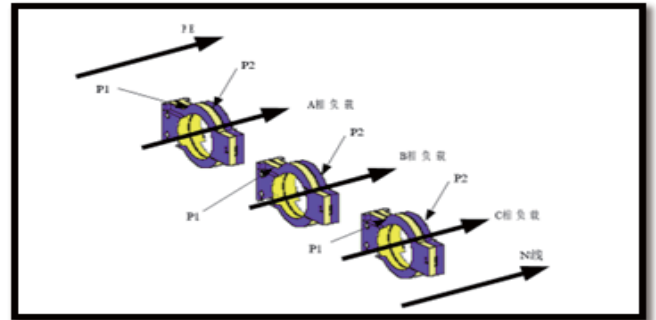
并机系统中，如果电流互感器无法安装在APF 和负载之间，则允许安装两套变比一致的电流互感器，其中一套电流互感器安装在电源侧，另一套电流互感器安装在并机系统的输出端。同一相的两个 CT 的输出端再并联在一起。If the current transformer can not be installed between the APF and the load in a parallel system, two sets of current transformers with the same ratio are allowed to be installed, one of which is installed on the power side, another set of current transformers is installed at the output end of the parallel system. The two outputs of the same phase CT are then connected in parallel.

两CT并联连接方式示意图：
Schematic diagram of parallel connection of two CT:



3.8.2 互感器安装方向： Installation direction of mutual inductor

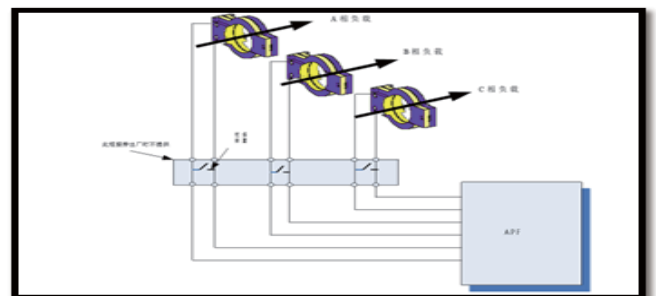
关于外接 CT 的安装方向，外接CT 的进线方向，详细图解如图所示。
About the installation direction of the external CT, the incoming line direction of the external CT, detailed diagram as shown.



3.8.2 互感器短接： Mutual inductor short:

一旦外接CT接入系统的配电中，则CT副边的端子必须进行短接，如图所示，只有在CT副边的电缆接入APF的相应端子后才可以断开。该短接装置出厂时不提供，请用户在接入CT时自行配置此短接装置。确保CT在接入系统前，保证三相CT的二次侧GND端全部短接并与APF的PE线相连接，以保护施工及操作人员的安全。副边线缆短接示意图如下：

Once the external CT access system in the distribution, the CT side of the terminal must be short-connected, as shown, only in the CT side of the cable connected to the corresponding APF can be disconnected. This short-circuit device is not provided when it leaves factory. Please configure this short-circuit device by yourself when accessing Ct.. Ensure that all secondary GND ends of the three-phase CT are short connected to the PE line of the APF before connecting to the system to protect the safety of the construction and operators. The schematic diagram of secondary side cable short connection is as follows:



四、上电调试

Power-on for debugging

4.1 开机前检查

Check before boot

本设备安装完成，通电运行前需进行如下检查：
After the installation of the equipment, the following inspection shall be carried out before power-on operation:

4.1.1 接线检查：

Wiring check:

通电前需确认A/B/C/N/N一次接线以及接地线是否正确，需用万用表测量进线电压，若相线与零线接错，会造成设备内部损坏；

Before power-on, make sure A/b/c/n/n primary connection and earthing line are correct, and use multimeter to measure the incoming line voltage

确认配件的选型安装是否正确，配件选型不合适可能会影响设备长期工作的稳定性；

Confirm the fitting selection and installation is correct, fitting selection is not appropriate may affect the long-term stability of the equipment;

4.1.2 通电检查：

Power Check:

通电后，通过组态屏查询数据，确认设备的电网电压显示是否正确；确认设备是否处于“待机”状态，并无任何告警信息；

After power-on, check the data through the configuration screen to confirm whether the voltage display of the equipment is correct, whether the equipment is in a "Standby" state, without any warning information;

4.1.3 通讯检查：

Communications check:

如需连接组态屏，则需先通过本设备的液晶屏进行通讯地址设定，确定并运的各设备地址（拨码开关）均不一致；If you need to connect the configuration screen, it is necessary to set the communication address through the LCD screen of the equipment, determine and transport the device address (dial switch) are not the same;

在组态屏上观察各设备的数据是否能够正常刷新；
On the configuration screen, observe whether the data of each device can be refreshed normally;

4.1.4 互感器检查：

Mutual inductor check:

通过组态屏将设备的CT位置、CT变比、并联系数等配置参数按实际情况进行配置；

The configuration parameters such as CT position, CT ratio and parallel coefficient are configured according to the actual situation through configuration screen

通过组态屏查询数据，确认设备的负载侧电流、功率因数、电流谐波是否与实际负荷一致，若不一致，则可能是CT接线存在错误；

By inquiring the data of configuration screen, it is confirmed that the current, power factor and current harmonics of the equipment are consistent with the actual load

4.2 开机关机

Turn it on and off

APF安装完毕，并由工程师调试正常，且外部电源开关已闭合，方可执行APF开机步骤。

APF installation, and by the Engineer Debugging Normal, and the external power switch has been closed, you can perform the APF boot steps.

4.2.1 开机步骤

Boot step

闭合市电与APF间的断路器。

Close circuit breakers between mains and APF.

此时，液晶屏点亮，前面板POWER灯常亮，RUN指示灯闪烁。LED指示灯呈闪烁。按下一键启动按钮或者在屏幕开机菜单点开机确认，运行指示灯在完成启动过程后呈常亮，表示APF开机正常；如果APF有故障的话，则运行灯会不断闪烁，APF不能正常开机。

At this point, the LCD screen is lit, the POWER light on the front panel is always on, and the RUN indicator is flashing. The LED indicator is flashing. Press the start button or click on the boot menu on the screen to confirm. The running light will remain bright after the start process, indicating that the APF is booting normally. If the APF is in trouble, the running light will continue to flicker, aPF does not work properly.

4.2.2 关机步骤

Shutdown step

关机方式有三种，一种是直接断开APF与市电间的断路器，这种方式是完全关机模式，即关机后，系统内是不带电的，可以进行系统的相关维修及设置工作。

There are three ways to shut down, one is to directly disconnect the circuit breaker between APF and power, this way is a complete shut-down mode, that is, after the shutdown, the system is not charged, can carry out system-related maintenance and setup work.

另两种方式是利用液晶屏面板的关机按钮或再次按一键启动按钮复位进行关机，此种关机模式只是关闭系统中功率器件的运行，但由于系统的母线及辅助电源仍然存在，所以相关的控制系统都处于待命状态，在这种关机模式下不允许进行机器的设置及维修工作。

The other two methods are to use the LCD panel's shutdown button or press a button to start again to reset the shutdown, this shutdown mode is just to shut off the power devices in the system, however, because the bus and auxiliary power still exist, so the relevant control system is on standby, in this shutdown mode does not allow the setting and maintenance of the machine.

4.3 自动运行

Run automatically

4.3.1 运行效果：

Results:

机器开启进入补偿状态；

The machine turns on and enters the compensation state;

通过液晶屏治理前后数据或第三方仪器确认实际电网侧电流已达到预期的治理效果；
Through the data before and after the LCD screen treatment or third-party instruments to confirm that the actual grid-side current has reached the desired treatment effect;

4.3.2 自动启动 Auto-start

确认补偿效果后，打开自动运行按钮；
After confirming the compensation effect, open the automatic running button;

市电停电或电压、频率异常，APF会自动关机，停止输出补偿电流。恢复正常后，APF将自动重新启动，恢复补偿。
Power outage or voltage, frequency abnormal, APF will automatically shut down, stop output compensation current. After returning to normal, APF will automatically restart, recovery compensation.

五、日常维护

Daily Maintenance

为保持APF的长期可靠运行，应进行日常或定期的检测与保养。

In order to maintain the long-term reliable operation of APF, daily or regular testing and maintenance should be carried out.

5.1 安全注意事项

Safety precautions

APF运行时带有强电，安全起见，设备运行时维护人员不可触碰设备的任何带电端子，并确保设备的接地端子可靠接地。由于APF设备母线有大量电容，检修保养工作必须在断电15分钟以后进行。

APF operation with strong electricity, for safety, equipment operation maintenance staff can not touch any live terminal of the equipment, and ensure that the equipment grounding terminal reliable grounding. Because of the large capacitance of the bus bar of APF equipment, the maintenance work must be carried out after 15 minutes of power failure.

5.2 日常检查

Daily check

运行中和通电状态下不要打开设备，从外部目视检查运行状态有无异常，通常进行下列项目的检查：

Do not open the device while it is running or energized. Check the status of the device visually from the outside. The following items are usually checked:

显示屏数据是否满足要求；
Whether the display screen data meets the requirements;

显示屏是否显示故障；
Whether the display screen shows the fault;

有无异常声音、异常振动、异常气味；
Whether there is abnormal sound, abnormal vibration, abnormal smell;

有无过热的迹象和变色等异常现象。
There are no signs of overheating and discoloration and other abnormal phenomenon.

5.3 定期检查

Check regularly

在遵循安全注意事项下，设备从电网断开后进行定期检查，定期检测项目如下表所示。

In accordance with the safety precautions, the equipment after disconnection from the power grid for regular inspection, regular inspection items as shown in the table below.

类别 Category	检查项目 Check items
环境 Environment	温度、湿度、是否有金属粉尘、腐蚀性气体 Temperature, humidity, metal dust, corrosive gas
电气连接 Electrical connection	线缆、端子是否有损坏 Whether the cable and terminal are damaged
设备散热 The equipment radiates heat	主回路接线、接地线、CT接线、通信接线等是否可靠连接风道处是否有堵塞 Main circuit wiring, grounding, CT wiring, communication wiring, such as whether the reliable connection of air duct is blocked

5.3 故障排查

Troubleshooting

5.4.1 常见故障

Common malfunctions

常见故障	处理方法
相序异常	调换任意两根相线即可（注意同时调整对应电流采样CT！）
频率异常	电网可能有波动，待故障消除后装置可自动恢复工作
电网过压	电网可能有波动，待故障消除后装置可自动恢复工作
通讯异常	请检查APF至触摸屏的接线是否松动，通讯接线、拨码是否正确
电源掉电	设备内部供电电源故障，请关机5分钟后重新开机
直流过压	设备内部直流母线过压，请关机5分钟后重新开机

5.4.2 其他异常

Other anomalies

上电机器没反应、其他异常请直接与我司产品工程师联系；
On the machine does not respond, other anomalies please contact our product engineers directly;

为了您的人身安全，无论是什么样的故障，未经我司允许不得私自拆机，易撕毁标毁坏的产品一律不在保修范围。
For your personal safety, no matter what kind of fault, without our permission can not disassemble, easy to tear mark damaged products are not in the scope of warranty.