

ANAPF  
有源电力滤波器  
Active Power Filter

安装使用说明书 V3.2  
Installation and Operation Instruction V3.2

安科瑞电气股份有限公司  
**Acrel Electric Co., Ltd.**

# 申 明

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# 更改履历

Change Record

次 NO.	更改日期 Change Date	更改后版次 Version after the Change	更改原因 Change Reason
01	2014.07.03 July 3 <sup>rd</sup> , 2014	V1.1	新增型号 Newly added model
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备注：

Remarks:

## 目录 Table of Contents

第一章 产品简介.....	1
<b>Chapter 1 Product Introduction.....</b>	<b>1</b>
1.1 概述.....	1
1.1 Introduction.....	1
1.2 ANAPF 的基本原理.....	1
1.2 Basic Principles of ANAPF.....	1
1.3 ANAPF 参照标准.....	2
1.3 Reference Standard of ANAPF.....	2
1.4 ANAPF 系统的构成.....	3
1.4 The composition of the ANAPF system.....	3
1.5 ANAPF 性能.....	4
1.5 Performance of ANAPF.....	4
1.5.1 技术参数.....	4
1.5.1 Technical Parameters.....	4
1.5.2 保护功能.....	6
1.5.2 Protection Functions.....	6
1.6. ANAPF 的电路结构.....	7
1.6. ANAPF Circuit Structure.....	7
1.6.1 主电路.....	7
1.6.1 Main Circuit.....	7
1.6.2 逻辑控制电路.....	9
1.6.2 Logic Control Circuits.....	9
1.6.3 驱动电路.....	9
1.6.3 Drive Circuit.....	9
1.6.4 电流采样电路.....	9
1.6.4 Current Sampling Circuit.....	9
1.7 人机界面.....	10
1.7 Human-Machine Interface.....	10
1.8 型号说明.....	11
1.8 Demonstration of the type.....	11
1.9 柜子外形尺寸.....	12
1.9 Cabinet dimensions.....	12
1.9.1 立柜式 ANAPF.....	12
1.9.1 Cabinet type ANAPF.....	12

1.9.2 模块化 ANAPF.....	12
1.9.2 Modularity ANAPF.....	12
1.10 治理方式.....	13
1.10 Control pattern.....	13
1.10.1 集中治理.....	13
1.10.1 Central control.....	13
1.10.2 局部治理.....	14
1.10.2 Local control.....	14
1.10.3 就地治理.....	15
1.10.3 In-situ control.....	15
第二章 安装说明.....	16
Chapter 2 Installation Instructions.....	16
2.1 安全指示.....	16
2.1 Safety instructions.....	16
2.2 注意事项.....	17
2.2 Precautions.....	17
2.2.1 接收和检查设备.....	17
2.2.1 Receiving and Checking the Equipment.....	17
2.2.2 运输.....	17
2.2.2 Transportation.....	17
2.2.3 标志.....	18
2.2.3 Labels.....	18
2.2.4 储存.....	18
2.2.4 Storage.....	18
2.3 配件选型.....	18
2.3 Accessories Selection.....	18
2.3.1 安装线缆.....	18
2.3.1 Installing Cables.....	18
2.3.2 采样互感器.....	19
2.3.2 Sampling transformer.....	19
2.3.3 断路器.....	20
2.3.3 Circuit breaker.....	20
2.4 单机安装.....	20
2.4 Stand-alone installation.....	20
2.4.1 模块接线端子说明.....	20
2.4.1 Description of Module Terminals.....	20

2.4.2 并网接线.....	22
2.4.2 Grid Connection.....	22
2.5 并机安装.....	25
2.5 Equipment parallel installation.....	25
2.5.2 壁挂式并机安装说明.....	32
2.5.2 Wall-mounted parallel installation instructions.....	32
2.5.3 柜体开孔说明.....	34
2.5.3 Cabinet hole opening description.....	34
第三章 操作说明.....	37
Chapter 3 Operation Instructions.....	37
3.1 操作时序.....	37
3.1 Operating sequence.....	37
3.2 启动前的准备工作.....	39
3.2 Preparation before starting.....	39
3.2.1 安装检查.....	39
3.2.1 Installation check.....	39
3.2.2 相序检查.....	39
3.2.2 Phase sequence check.....	39
3.2.3 互感器检查.....	40
3.2.3 Transformer inspection.....	40
3.3 操作步骤.....	40
3.3 Steps.....	40
3.3.1 登录.....	41
3.3.1 Log in.....	41
3.3.2 自检.....	43
3.3.2 Self test.....	43
3.3.3 启动.....	45
3.3.3 Start up.....	45
3.3.4 补偿.....	46
3.3.4 Compensation.....	46
3.3.5 待机.....	48
3.3.5 Standby.....	48
3.3.6 停机.....	49
3.3.6 Downtime.....	49
3.3.7 故障状态查询.....	51
3.3.7 Fault status query.....	51
第四章 维护及售后.....	54

Chapter 4 Maintenance and After-sales Service.....	54
4.1 维护.....	54
4.1 Maintenance.....	54
4.1.1 日常维护.....	54
4.1.1 Routine maintenance.....	54
4.1.2 定期维护.....	54
4.1.2 Regular maintenance.....	54
4.1.3 故障排查.....	55
4.1.3 Troubleshooting.....	55
4.2 售后服务.....	59
4.2 After-sale Service.....	59





## 第一章 产品简介

### Chapter 1 Product Introduction

#### 1.1 概述

##### 1.1 Introduction

电力系统中理想的电压、电流波形都是频率为 50Hz 的正弦波，但是非线性电力设备（如：大功率可控硅、变频器、UPS、开关电源、中频炉、节能灯等）的广泛应用产生了大量畸变的谐波电流，谐波电流耦合在线路上产生谐波电压。对非正弦的畸变电流作傅立叶级数分解，其中频率与工频相同的分量为基波，频率是基波频率整数倍的分量为谐波。这类谐波“污染”会对电网和用户产生很大危害，所以称谐波治理是一项“绿色工程”！

The ideal voltage and current waveforms in power systems are all sine waves with a frequency of 50Hz, but they are widely used in non-linear power equipment (such as high-power thyristors, frequency converters, UPS, switching power supplies, mid-frequency furnaces, and energy-saving lamps), in which a large number of distorted harmonic currents are generated and harmonic currents are coupled to produce harmonic voltages on the line. The Fourier series decomposition is performed on the non-sinusoidal distortion current, where the component of the same frequency with the power frequency is the fundamental wave, and the component of the integral multiple of the fundamental wave frequency is the harmonic wave. This kind of harmonic "pollution" will cause great harm to the power grid and the user, so the harmonic suppression is called a "green project"!

由于电力电子技术的发展，有源电力滤波器（APF）开始规模化应用，相对于传统的谐波抑制和无功补偿装置，APF 响应速度快、实时跟踪补偿各次谐波，具有补偿谐波、无功补偿和平衡三相电流的功能，同时，APF 还具有不受系统阻抗影响、无谐振隐患、补偿效率高等优势，在各行各业的供电系统中已经得到广泛应用。产品符合企业标准 Q31/0114000129C033-2017《ANAPF 有源电力滤波器》的规定。

Due to the development of power electronics technology, active power filters (APFs) have begun to be applied on a large scale. Compared to traditional harmonic suppression and reactive power compensation devices, APFs respond quickly and trace each harmonic in real time to compensate for harmonics, which have the functions of harmonic compensation, reactive power compensation and balance of three-phase current. At the same time, APF is free from system impedance, without hidden resonance problems, of high compensation efficiency, which has been widely used in all walks of life power supply system. The product meets the requirements of the enterprise standard Q31/0114000129C033-2017 *ANAPF Active Power Filter*.

#### 1.2 ANAPF 的基本原理

##### 1.2 Basic Principles of ANAPF

ANAPF 系列有源电力滤波器并联在含谐波负载的低压配电系统中，能够对动态变化的谐波电流进行快速实时的跟踪和补偿。其原理为：ANAPF 系列有源电力滤波器通过 CT 采集系统谐波电流，经控制器快速计算并提取各次谐波电流的含量，产生谐波电流指令，通过功率执行器件产生与谐波电流幅值相等方向相反的补偿电流，并

注入电力系统中，从而抵消非线性负载所产生的谐波电流。

ANAPF series active power filters are connected in parallel in a low-voltage power distribution system with harmonic loads, enabling fast and real-time tracking and compensation of dynamically changing harmonic currents. The principle is: ANAPF series active power filter collects harmonic current through CT, and quickly calculates and extracts the content of each harmonic current through the controller, generates harmonic current command, and then generates the compensation currents, which are of the same amplitude and the opposite direction with the harmonics current through power execution device. At last, the compensation currents are injected into the power system to cancel out the harmonic currents generated by the non-linear loads.

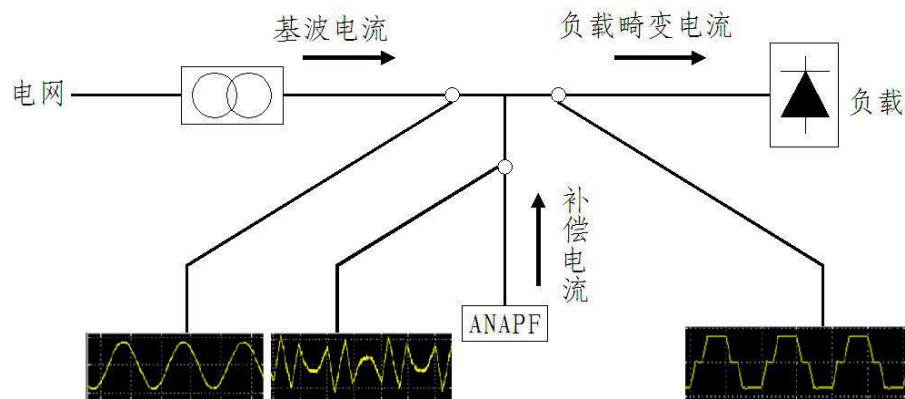


图 1-1 ANAPF 有源电力滤波器原理图

Figure 1-1 ANAPF Active Power Filter Schematic

电网 power grid

基波电流 fundamental current

负载畸变电流 Load distortion current.

负载 load

补偿电流 compensation current

### 1.3 ANAPF 参照标准

#### 1.3 Reference Standard of ANAPF

- GB/T14549-1993 《电能质量：公用电网谐波》
- GB/T15543-2008 《电能质量：三相电压不平衡》
- GB/T12325-2008 《电能质量：供电电压偏差》
- GB/T12326-2008 《电能质量：电压波动和闪变》
- GB/T18481-2001 《电能质量：暂时过电压和瞬态过电压》
- GB/T15945-2008 《电能质量：电力系统频率偏差》
- GB17625.1-2012 《电磁兼容 限值 谐波电流发射限值（设备每相输入电流≤16A）》
- GB/T15576-2008 《低压成套无功功率补偿装置》
- JB/T11067-2011 《低压有源电力滤波装置》

GB/T14549-1993 *Power Quality: Harmonics in the Utility Grid*

GB/T15543-2008 *Power Quality: Three-Phase Voltage Unbalance*

GB/T12325-2008 *Power Quality: Power Supply Voltage Deviation*

GB/T12326-2008 *Power Quality: Voltage Fluctuations and Flicker Changes*

GB/T18481-2001 *Power Quality: Temporary Overvoltage and Transient Overvoltage*

GB/T15945-2008 *Power Quality: Power System Frequency Deviation*

GB17625.1-2012 *Electromagnetic Compatibility, Limit, Harmonic Current Emission Limit (equipment input current per phase  $\leq 16A$ )*

GB/T15576-2008 *Low Voltage Complete Reactive Power Compensation Device*

JB/T11067-2011 *Low-voltage active power filter device*

#### 1.4 ANAPF 系统的构成

#### 1.4 The composition of the ANAPF system

图 1-2 为 ANAPF 的系统原理图。图中电流源是电力系统交流电压，非线性负载为谐波源，工作时产生谐波和无功电流。ANAPF 主要由负载电流检测、指令电流计算、桥臂电流输出控制、驱动电路以及主电路组成。通过检测负载电流中的谐波电流成分来得出实际补偿需要的指令电流。IGBT 驱动电路以及主电路为补偿电流发生电路，它的主要作用是根据指令运算电路得出的谐波电流补偿信号，产生实际的补偿电流。主电路主要由电压型 PWM 变流器，以及与其相连的电感和直流侧支撑电容（DC-Link）组成。

ANAPF 不仅可滤除谐波电流，还可适当补偿无功，平衡三相系统的电流。

Figure 1-2 shows the system schematic of the ANAPF. In the figure, the current source is the AC voltage of the power system, and the non-linear load is a harmonic source, where the harmonic and reactive currents are generated during operation. ANAPF is mainly composed of load current detection, command current calculation, bridge arm current output control, drive circuit and main circuit. By detecting the harmonic current component in the load current, the required command current for actual compensation is obtained. The IGBT drive circuit and the main circuit are the compensation current generation circuit, whose main function is to generate the actual compensation current based on the harmonic current compensation signal obtained by the instruction operation circuit. The main circuit is mainly composed of a voltage-type PWM converter, and an inductor and a DC-link capacitor (DC-Link) connected thereto.

ANAPF not only filters out harmonic currents, but also compensates reactive power appropriately and balances the current in three-phase systems.

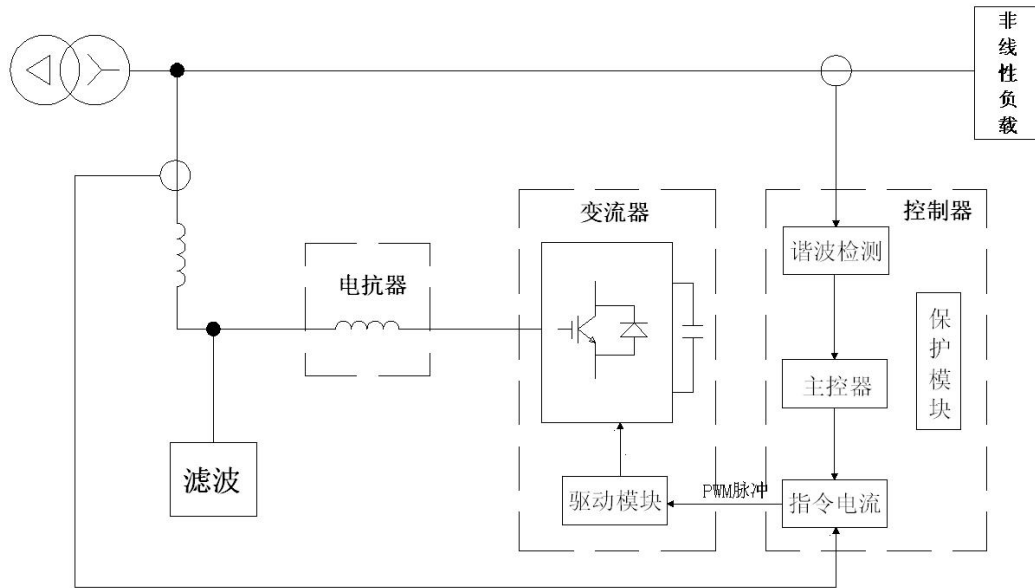


图 1-2 ANAPF 系统原理图

Figure 1-2 ANAPF system schematic

- 非线性负载 Nonlinear loads
- 谐波检测 Harmonic detection
- 控制器 Controller
- 主控器 Master controller
- 指令电流 Command current
- 保护模块 Protection module
- 交流器 Exchanger
- 驱动模块 Drive module
- 电抗器 Reactor
- 滤波 Filtering
- PMW 脉冲 PMW pulse

1.5 ANAPF 性能

1.5 Performance of ANAPF

1.5.1 技术参数

1.5.1 Technical Parameters

ANAPF 技术参数如表 1-1 所示。

The ANAPF technical parameters are shown in Table 1-1.

表 1-1 ANAPF 技术参数

Table 1-1 ANAPF technical parameters

接线方式 Connection mode	三相三线或三相四线 Three-phase three-wire or three-phase four-wire
接入电压 Access voltage	3×380V ±10%
接入频率 Access frequency	50Hz ±2%
响应时间 Response time	完全响应时间≤10ms，瞬时响应时间≤100μs Complete response time ≤ 10ms, transient response time ≤ 100μs
开关频率 Switching frequency	10-20kHz
功能设置 Function settings	只补偿谐波、只补偿无功、既补偿谐波又补偿无功 harmonics compensation only, reactive power compensation only, both harmonics compensation and reactive power compensation
谐波补偿次数 Harmonic compensation frequency	2-51 次 2-51 times
保护类型 Protection Type	直流过压保护、IGBT 过流保护、装置过温保护 DC Overvoltage Protection, IGBT Over Current Protection, Device Over Temperature Protection
冷却方式 Cooling method	强制风冷 Forced air cooling
噪音 Noise	< 65dB
工作环境温度 Working environment	-10℃ ~+45℃

temperature			
工作环境湿度 Working environment humidity	<85%RH 不凝结 Non-condensing		
安装场合 Installation occasion	室内安装 Indoor installation		
海拔高度 Altitude	≤1000m (更高海拔根据 GB/T3859.2 降容使用) ≤1000m (if higher altitude, derating capacity according to GB/T3859.2)		
进出线方 Incoming and outgoing ways	根据客户要求 According to customer requirements		
防护等级 Protection class	IP20		
智能通信接口 Smart Communication Interface	外加模块 Plus Module		
远程监控 Remote monitoring	可选 Optional		
安装方式 Installation Method	立柜式 Cabinet type	壁挂式 Wall-mounted	抽屉式 Drawer type

### 1.5.2 保护功能

#### 1.5.2 Protection Functions

##### a) 输出超限保护

##### a) Output over-limit protection

当谐波负载容量超出 ANAPF 补偿能力时，ANAPF 按最大能力输出（即限流输出），能有效避免由于负载容量过大而引起 ANAPF 线路烧毁的情况；

When the harmonic load capacity exceeds the ANAPF compensation capability, the ANAPF outputs the maximum capacity (that is, the current limit output), which can effectively prevent the ANAPF line from being burned due to the

excessive load capacity.

b) 过温度保护

b) Over temperature protection

ANAPF 内部功率半导体部分温度超过  $85\pm 2^{\circ}\text{C}$  时，ANAPF 会自动切断主回路，且显示屏 HMI 上产生相应的故障记录；

When ANAPF internal power semiconductor temperature exceeds  $85\pm 2^{\circ}\text{C}$ , ANAPF will automatically cut off the main circuit and generate corresponding fault records on the display HMI;

c) 直流母线过压保护

c) DC bus overvoltage protection

直流母线电压超过设定值时，ANAPF 会自动关闭，且显示屏 HMI 上产生相应的故障记录；

When the DC bus voltage exceeds the set value, ANAPF will automatically shut down and a corresponding fault record will be generated on the display HMI.

d) 输入电压欠压、过压保护

d) Input voltage under-voltage and overvoltage protection

当输入电压高于或低于额定电压的  $\pm 10\%$  时，ANAPF 会自动关闭，且显示屏 HMI 上产生相应的故障记录。

When the input voltage is higher or lower than  $\pm 10\%$  of the rated voltage, ANAPF automatically shuts off and a corresponding fault log is generated on the display HMI.

## 1.6. ANAPF 的电路结构

### 1.6. ANAPF Circuit Structure

ANAPF 电路结构主要由主电路、逻辑控制电路、驱动电路和电流采样电路等组成。

ANAPF circuit structure is mainly composed of the main circuit, logic control circuit, drive circuit, current sampling circuit and other components.

#### 1.6.1 主电路

#### 1.6.1 Main Circuit

ANAPF 主电路如图 1-3 所示。

The ANAPF main circuit is shown in Figure 1-3.

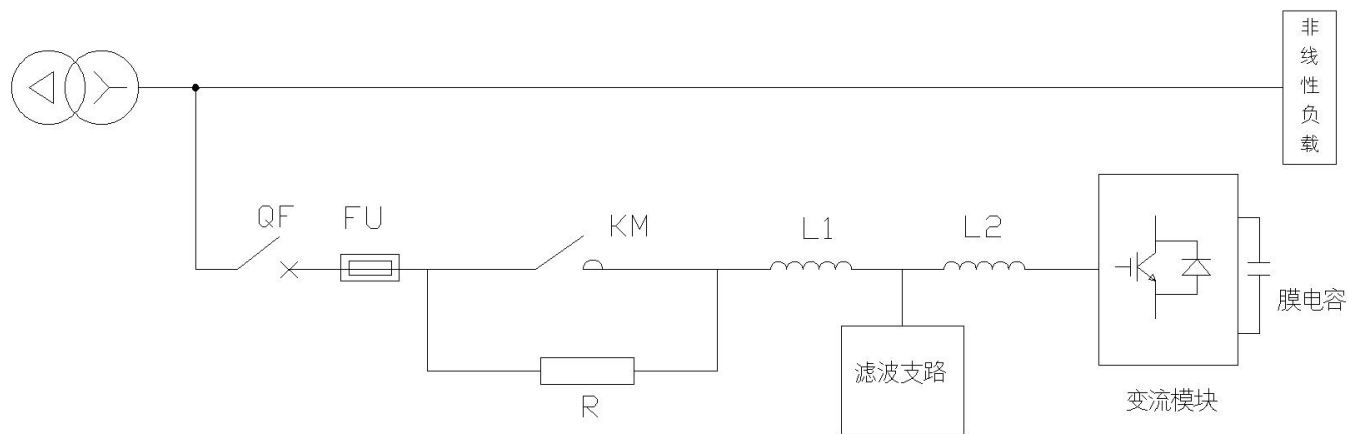


图 1-3 主电路图

Figure 1-3 Main circuit diagram

滤波支路 Filter Branch

交流模块 AC Module

膜电容 Film Capacitor

非线性负载 Nonlinear loads

主电路由断路器(QF)、交流接触器(KM)、限流电阻(R)、输出电抗(L1、L2)、RCL 滤波支路、IGBT 变流模块、膜电容组成。

The main circuit consists of circuit breaker (QF), AC contactor (KM), current limiting resistor (R), output reactance (L1, L2), RCL filter branch, IGBT converter module, and film capacitor.

主电路采用三相全桥电压型 PWM 变流器，变流器的作用主要是将电网的电压经 IGBT 功率模块整流后为储能电容充电，使母线电压维持在某个稳定值，在这个过程中变流器主要工作在整流状态；当主电路产生补偿电流时，变流器又工作在逆变状态。

The main circuit adopts a three-phase full-bridge voltage-type PWM converter. The function of the converter is mainly to rectify the voltage of the power grid and recharge the energy storage capacitor after being rectified by the IGBT power module so that the bus voltage is maintained at a certain stable value. During this process, the main converter works in the rectifier state, and when the main circuit generates the compensation current, the converter works in the inverter state.

电容用来储存直流侧能量；输出电抗的作用：补偿电流通过电抗向系统注入或吸收电流。

The capacitor is used to store the DC side energy; the role of the output reactance: the compensation current is injected into or absorbed by the system through the reactance.



## 1.6.2 逻辑控制电路

### 1.6.2 Logic Control Circuits

逻辑控制回路包括继电器控制、电源系统和 PWM 脉冲输出三部分：

- 继电器控制系统主要由断路器、接触器、中间继电器、控制按钮、指示灯等组成；
- 电源系统主要是给控制部分、辅助逻辑部分以及冷却系统供电，它由进线变压器、交流滤波器、开关电源等组成；
- PWM 脉冲输出部分是控制 IGBT 的通断，从而实现电流的跟踪控制。
- The logic control loop includes three parts: relay control, power system and PWM pulse output:
- The relay control system is mainly composed of circuit breakers, contactors, intermediate relays, control buttons, and indicator lights;
- The power system mainly supplies power to the control section, auxiliary logic section, and cooling system. It consists of line transformer, AC filter, and switching power supplies.
- The PWM pulse output section controls the on-off of the IGBT to achieve current tracking control.

## 1.6.3 驱动电路

### 1.6.3 Drive Circuit

驱动电路由电源部分、驱动部分和保护部分组成：

The drive circuit consists of a power section, a drive section, and a protection section:

- 电源部分为驱动模块的正常工作提供电源；
- 驱动部分包括驱动模块和相关的外围电路；
- 保护部分主要是检测 PWM 变流器的电流和温度信号，必要时停止 PWM 变流器。
- The power supply provides power for the normal operation of the drive module;
- The drive section includes the drive module and related peripheral circuits;
- The protection section mainly detects the current and temperature signals of the PWM converter and stops the PWM converter if necessary.

## 1.6.4 电流采样电路

### 1.6.4 Current Sampling Circuit

电流采样电路主要包括输出电流采样电路和负载电流采样电路（或电网电流采样电路）；通过采样到的负载电流（或电网电流）计算出其中的谐波电流，将这个谐波电流反相，就得到指令电流，通过指令电流和输出电流的差值控制 PWM 脉冲输出，驱动 IGBT 功率模块输出反相的谐波电流，与电网中的谐波电流相抵消，从而达到滤除谐波的目的。

The current sampling circuit mainly includes an output current sampling circuit and a load current sampling circuit (or a power grid current sampling circuit); the harmonic current is calculated from the sampled load current (or grid

current), and the harmonic current is inverted. Then the command current is obtained, and the PWM pulse output is controlled by the difference between the command current and the output current, which drives the IGBT power module to output the inverting harmonic current to cancel out the harmonic current in the power grid so as to achieve the purpose of filtering the harmonic wave.

## 1.7 人机界面

### 1.7 Human-Machine Interface

液晶显示屏的作用是检测、控制 ANAPF 的当前运行状态以及记录相关运行数据，便于用户实际操作。显示内容如表 1-2 所示：

The function of the liquid crystal display is to detect and control the current operating status of ANAPF and record the relevant operating data, which is convenient for the user to operate actually. The contents are as shown in Table 1-2:

表 1-2 液晶屏显示功能表

Table 1-2 LCD display function table

序号 No.	液晶显示 LCD display	功能说明 Function description
1	输出电流 Output Current	显示 ANAPF 输出电流 Displays ANAPF Output Current
2	电网电压 Grid voltage	显示电网侧电压 Displays grid side voltage
3	直流电压 DC voltage	显示 ANAPF 直流母线状态 Displays ANAPF DC bus status
4	系统当前状态 Current Status of the System	显示 ANAPF 当前运行状态 Displays the current operating status of ANAPF
5	启动 Start	ANAPF 启动控制按钮 ANAPF Start Control Button
6	停机 Stop	ANAPF 停机控制按钮 ANAPF Stop Control Button
7	补偿 Compensation	ANAPF 补偿控制按钮 ANAPF compensation control button
8	待机 Standby	ANAPF 待机控制按钮 ANAPF standby control button
9	自检 Self-Test	ANAPF 自检按钮 ANAPF Self-Test Button

10	历史曲线 History curve	输出电流波形显示 Output current waveform display
		负载电流波形显示 Load current waveform display
		电网电压波形显示 Grid voltage waveform display
		直流电压波形显示 DC voltage waveform display
11	故障查询 Fault Inquiry	故障记录查询 Fault Record Inquiry

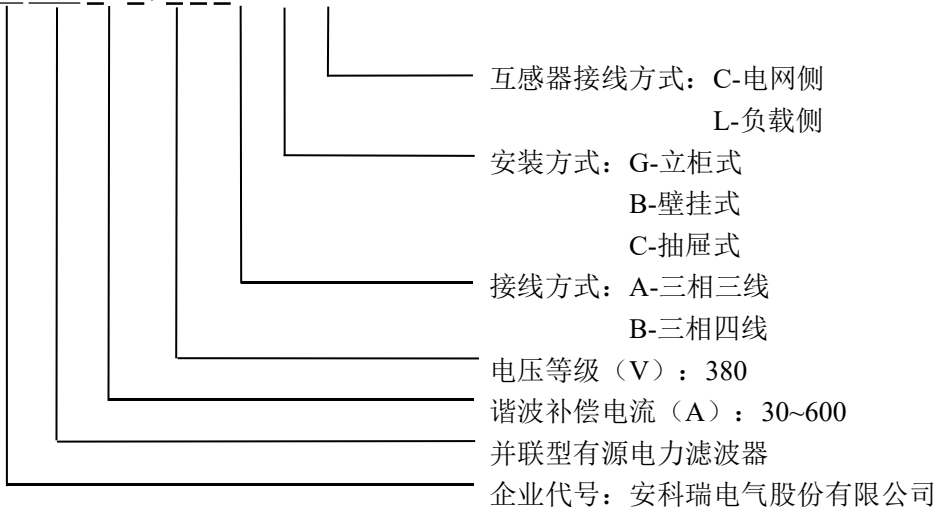
具体操作步骤及方法详见第三章节。

Refer to chapter 3 for detailed procedures and methods.

### 1.8 型号说明

#### 1.8 Demonstration of the type

AN APF □ - □ / □ □ □



互感器接线方式：C-电网侧 L-负载侧

Transformer wiring: C-grid side L-load side

安装方式：G-立柜式 B-壁挂式 C-抽屉式

Installation mode: G- Cabinet B-Wall C-Drawer

接线方式：A-三相三线 B-三相四线

Wiring mode: A-three-phase three-wire B-three-phase four-wire

电压等级

Voltage level

谐波补偿电流

Harmonic compensation current

并联型有源电力滤波器

parallel active power filter

企业代号: 安科瑞电气股份有限公司


Company Code: Acrel Electric Co., Ltd.

## 1.9 柜子外形尺寸

### 1.9 Cabinet dimensions


#### 1.9.1 立柜式 ANAPF


##### 1.9.1 Cabinet type ANAPF



	型号(立柜式) Type (cabinet)	补偿电流 Compensation current	柜体尺寸 Dimensions W×D×H (mm)	进出线方式 Wiring mode
	AN APF□ -380 /□ G □	50A~600 A	800×1000×2200 (其他尺寸可定制) Other sizes can be customized.	穿铜排 Copper bar 下进下出 Incoming line is down, outgoing line is down (其他方式可定制) Other modes can be customized.

#### 1.9.2 模块化 ANAPF

##### 1.9.2 Modularity ANAPF

壁挂式 APF Wall-type APF	型号 Type	补偿电流 Compensation current	柜体尺寸 Dimensions W×D×H (mm)	进出线方式 Wiring mode
	AN APF□ -380 /□ B □	50A	485*275*610	上进上出 Incoming line is up, outgoing line is up

		100A	485*240*615	
---	--	------	-------------	--

	型号(抽屉式) Type (drawer)	补偿电流 Compensation current	柜体尺寸 Dimensions W×D×H (mm)	进出线方式 Wiring mode
	AN APF □-380 / □ C	50A	485*610*275	后进后出 Incoming line is back, outgoing line is back
	□	100A	485*615*215	
		150A	500*533*280	

1.10 治理方式

1.10 Control pattern

1.10.1 集中治理

1.10.1 Central control

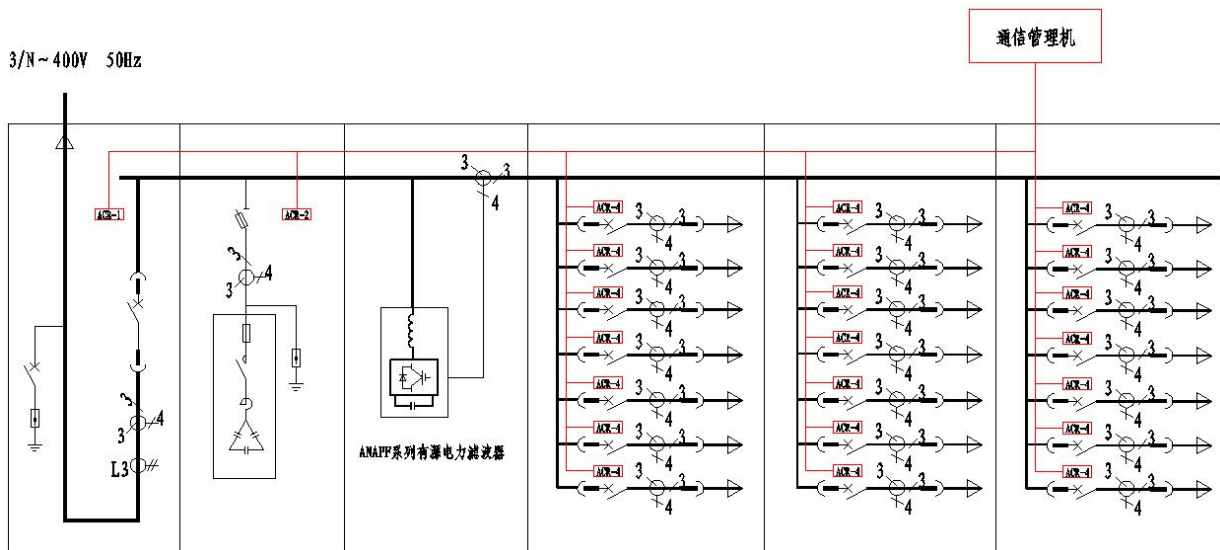


图 1-4 集中治理上图示例

Figure 1-4 Example of the central control

通信管理机

communication management unit

ANAPF 系列有源电力滤波器

ANAPF series active power filter

集中治理适用于单台设备谐波含量小，但数量庞大、布局分散的场合，比如办公大楼(个人电脑、节能灯、变频空调、电梯等)，虽然单台设备的电流小，谐波含量低，但整栋大楼的总电流大，总谐波电流也大。

Central control is applicable to occasions where the harmonic content of a single device is small but the number is large and the layout is decentralized, such as office buildings (personal computers, energy-saving lamps, inverter air conditioners, elevators, etc.). Although the current of a single device is small, and the harmonic content is low. However, the total current of the entire building is large, and the total harmonic current is also large.

1.10.2 局部治理

1.10.2 Local control

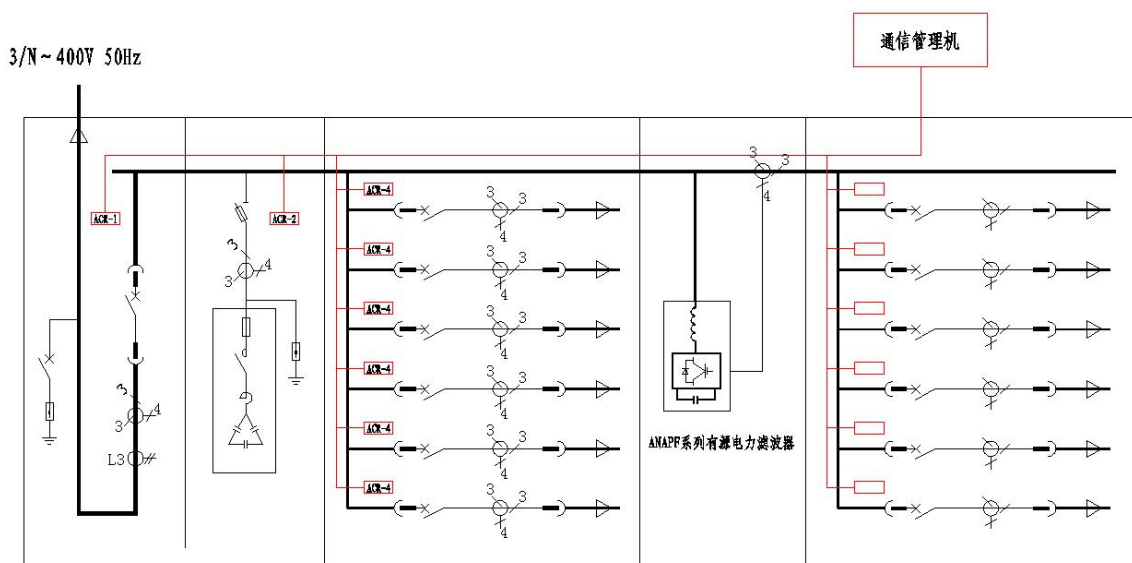


图 1-5 局部治理上图示例

Figure 1-5 Example of local control

通信管理机 communication management unit

ANAPF 系列有源电力滤波器 ANAPF series active power filter

局部治理适用于谐波源集中在某一条或几条馈出支路的配电系统，比如医院的精密仪器、UPS 电源等，虽然单台设备的电流小，谐波含量低，但为防止其他设备产生的谐波对其干扰，采用局部谐波治理。

Local control applies to power distribution systems where harmonic sources are concentrated in one or several feeder

branches, such as the precision instruments, UPS power supplies in the hospital. Although the current of a single device is small, the harmonic content is low, but to prevent the interference of the harmonics generated by other equipment, the local harmonics are used for treatment.

### 1.10.3 就地治理

#### 1.10.3 In-situ control

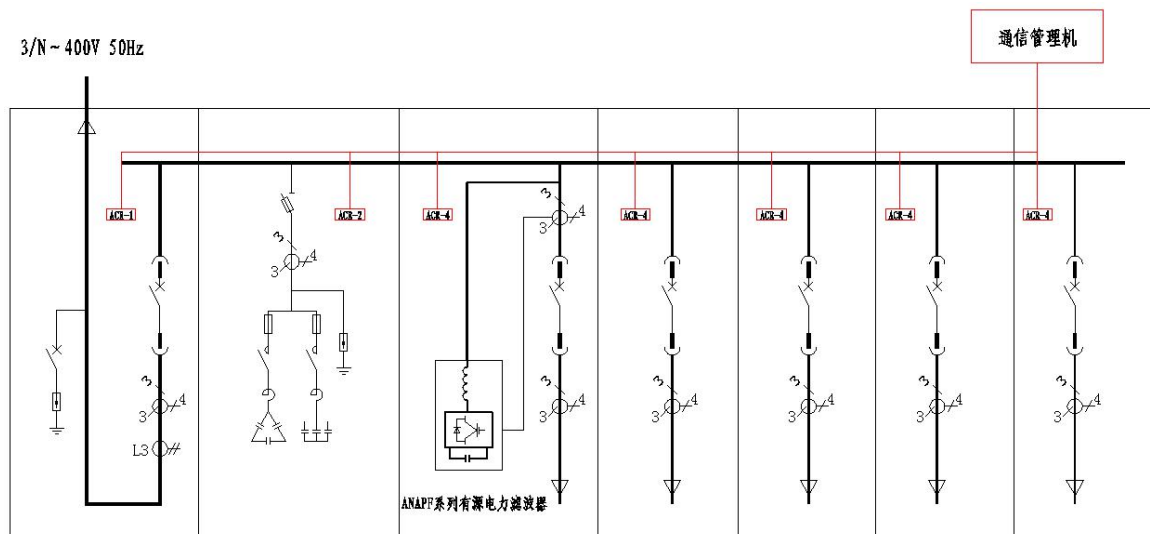


图 1-6 就地治理上图示例

Figure 1-6 Example of in-situ governance

就地治理适用于谐波源比较明确且单台设备谐波含量较大的配电系统，比如大型商业区的景观照明、影剧院的可控硅调光设备、工业区的变频器调速设备等，单台设备电流大、谐波含量高、谐波电流大，为防止谐波电流影响其他用电设备，采用就地治理。

In-situ control is applicable to power distribution systems with relatively clear harmonic sources and large harmonic content in single devices, such as landscape lighting in large commercial areas, thyristor dimming devices in theaters, and inverter speed control equipment in industrial areas, and so on. The current of single device is large, with high harmonic content and large harmonic current, in order to prevent harmonic currents to affect other electrical equipment, the in-situ control is used.

## 第二章 安装说明

### Chapter 2 Installation Instructions

#### 2.1 安全指示

#### 2.1 Safety instructions

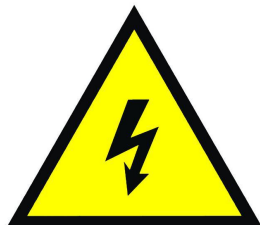


对 ANAPF 有源电力滤波器（下文简称 ANAPF）内部进行操作之前，要确保 ANAPF 处于断电状态，或是佩戴绝缘手套进行简单操作！

不要尝试在运行中的 ANAPF 上进行维护！

Before operating the ANAPF Active Power Filter (hereinafter referred to as ANAPF), make sure that the ANAPF is in a powered-off state, or wear insulating gloves for easy operation!

Do not try to perform maintenance on the running ANAPF!



切断 ANAPF 主回路后，等待至少 3 分钟，确保直流侧电压降至 36V 后再进行后续维护。

注意：直流侧电压可能超过 1000V。

After switching off the ANAPF main circuit, wait at least 3 minutes to ensure that the voltage on the DC side drops to 36V and perform subsequent maintenance.

Note: The voltage on the DC side may exceed 1000V.

操作电流互感器时，要确保电流互感器的次级短接，不允许任何电流互感器的次级开路。

When operating current transformers, make sure that the secondary of the current transformer is shorted and that no secondary open circuit of the current transformer is allowed.

在潮湿情况下，人体电阻会下降，此时可能有危险的大电流通过人体。不要在潮湿的地方检修 ANAPF。当在不可避免的潮湿环境下操作时，必须站在一块干燥的橡皮垫或干木板上，并佩戴绝缘手套，保持衣服干燥，且不要单独操作。

In wet conditions, the human body resistance decreases, and dangerous large currents may flow through the body. Do not overhaul ANAPF in wet locations. When operating in an unavoidable wet environment, you must stand on a dry



rubber mat or dry wood, wear insulated gloves and keep the clothes dry, and do not operate alone.

在安装操作和维护 ANAPF 前确保阅读、理解和遵守本说明书上所有说明。保留此说明书以备后用，让每个操作人员都可以阅读到说明书。

Be sure to read, understand, and follow all instructions in this manual before installing and maintaining ANAPF. Keep this manual for future use so that each operator can read the instruction.

## 2.2 注意事项

### 2.2 Precautions

#### 2.2.1 接收和检查设备

##### 2.2.1 Receiving and Checking the Equipment

ANAPF 在出厂前已经经过全面测试和检查，并根据安全运输的要求进行运输准备，但在长途运输过程中，ANAPF 上固定零件仍有可能由于振动颠簸等原因而松动，因此收到该设备后，请进行如下检查：

ANAPF has been thoroughly tested and inspected before leaving the factory, and it is prepared for transport in accordance with the requirements of safe transportation. However, during the long-distance transportation, the fixed parts on ANAPF may still be loosened due to vibration and other reasons. So after receiving the equipment, please check as follows:

- a) 检查运输的包装箱有无损坏，如果发现任何损坏，则要求运输代理检查运输情况并在运输接收单上记录损坏情况；  
a) Inspect the shipping container for damage, and if any damage is found, ask the shipping agent to check the shipment and record the damage on the shipping receipt;
- b) 如果包装箱没有明显损坏，拆卸包装箱时，应尽量小心，如果使用杠、锤等工具来拆除包装箱时，注意不要损坏设备；  
b) If there is no obvious damage to the packing box, take care when removing the packing box. When removing the packing box with tools such as bar and hammer, take care not to damage the equipment.
- c) 检查设备有无外部损坏，如面板擦伤、掉漆、凹陷等，检查有无元器件和连线松动。如运输有损伤应要求索赔，在索赔过程中需要协助，请联系本公司。  
c) Check the equipment for external damage, such as panel scratches, paint loss, dents, etc., and check for loose components and connections. If there is any damage due to the transportation, you should claim compensation and if you need assistance in the process of claim, please contact the company.

#### 2.2.2 运输

##### 2.2.2 Transportation

每套 ANAPF 均是通过木箱包装后运输的，这样能够保证 ANAPF 在运输过程中不易被损坏；ANAPF 运输过程中不能倒置。

Each ANAPF is transported by packing it in a wooden case, which ensures that ANAPF is not easily damaged during

transportation; ANAPF cannot be inverted during transportation.

### 2.2.3 标志

#### 2.2.3 Labels

每台 ANAPF 都装有一张铭牌或者标签，上面标有该 ANAPF 的型号、产品编号、额定电压、额定频率、最大输出电流、相数、运行环境温度、防护等级、质量、外形尺寸和出厂日期。

Each ANAPF is equipped with a nameplate or label bearing the ANAPF's model number, product number, rated voltage, rated frequency, maximum output current, number of phases, operating ambient temperature, degree of protection, weight, dimensions and date of shipment.

### 2.2.4 储存

#### 2.2.4 Storage

包装好的 ANAPF 可以在室内存放 6 个月（自出厂之日起），如果需要存放更长时间请向本公司特别指明。

The packaged ANAPF can be stored indoors for 6 months (from the date of shipment). If it needs to be stored for a longer time, please specify it to us.

如果 ANAPF 不是立即安装使用的话，应该放置于干燥、通风和无腐蚀性物质的仓库内，仓库内应无强烈的机械振动、冲击和磁场作用。

If ANAPF is not installed immediately, it should be placed in a dry, ventilated, and non-corrosive warehouse. There should be no strong mechanical vibration, impact, or magnetic fields in the warehouse.

存储极限温度最低  $-40^{\circ}\text{C}$ ，最高  $55^{\circ}\text{C}$ 。

Storage temperature limit is  $-40^{\circ}\text{C}$ , up to  $55^{\circ}\text{C}$ .

空气相对湿度最低 15%，最高 90%（ $20^{\circ}\text{C}$  以下时）。

The relative humidity is 15% minimum and 90% maximum (at or below  $20^{\circ}\text{C}$ ).

## 2.3 配件选型

### 2.3 Accessories Selection

#### 2.3.1 安装线缆

##### 2.3.1 Installing Cables

ANAPF 安装线缆需参照表 2-1 进行配置，避免由于线缆选择不当，造成过流，存在隐患！

The ANAPF cables must be configured according to Table 2-1 to prevent over-current caused by incorrect cable selection.

表 2-1 安装线缆规格表

Table 2-1 Installation cable specifications

ANAPF 型号 Type	安装电缆 Installation cable ( $\text{mm}^2$ )	CT 采样线 Sampling line ( $\text{mm}^2$ )	CT 接地线 Grounding wire ( $\text{mm}^2$ )	机柜接地线 Equipment cabinet grounding wire

				(mm <sup>2</sup> )
AN APF 50-380/□□□	≥16	2.5	2.5	16
AN APF 100-380/□□□	≥25	2.5	2.5	16
AN APF 150-380/□□□	≥50	2.5	2.5	25
AN APF 200-380/□□□	≥70	2.5	2.5	35
AN APF 250-380/□□□	≥95	2.5	2.5	50
AN APF 300-380/□□□	≥120	2.5	2.5	70
AN APF 350-380/□□□	≥150	2.5	2.5	70
AN APF 400-380/□□□	≥185	2.5	2.5	95
AN APF 450-380/□□□	≥240	2.5	2.5	120
AN APF 500-380/□□□	≥240	2.5	2.5	120
AN APF 550-380/□□□	≥300	2.5	2.5	150
AN APF 600-380/□□□	≥400	2.5	2.5	185

### 2.3.2 采样互感器

#### 2.3.2 Sampling transformer

互感器用来检测负载电流的大小，是 ANAPF 输出补偿信号的基础，所以互感器的选择和安装非常重要。

Transformer used to detect the size of the load current is the basis of the ANAPF output compensation signal, so the selection and installation of the transformer is very important.

选择互感器变比时，首先需要知道实际被测负载电流的最大值，在留有一定裕量的基础上，选择相应量程的互感器，这样配置后 ANAPF 可以更高精度进行谐波补偿，达到更佳补偿效果；另外，互感器外形尺寸、安装方式、测量精度、测量频带等参数都是选择互感器的参考依据。

When selecting the transformer ratio, you first need to know the maximum value of the actual load current to be measured, and select a corresponding range of transformers based on a certain margin. After this configuration, ANAPF can perform harmonic compensation with higher accuracy to achieve better compensation effect. In addition, transformer external dimensions, installation patterns, measurement accuracy, measurement frequency and other parameters are the reference for selecting the transformer.

互感器不作三相三线和三相四线的区分，统一安装在 A 相、B 相和 C 相上。

Transformer does not distinguish between three-phase three-wire and three-phase four-wire, and is installed on A-phase, B-phase and C-phase.

**注意：**ANAPF 的采样互感器推荐安装在负载侧，即 ANAPF 与负载之间，具体互感器安装示意图见 2.4.2 章节所述。

**Note:** The sampling transformer of ANAPF is recommended to be installed on the load side, which is between ANAPF and the load. Please refer to section 2.4.2 for specific transformer installation.

2.3.3 断路器

2.3.3 Circuit breaker

选择在每个 ANAPF 模块系统外部交流电源输入处安装微型断路器或并机总进线电源处安装框架断路器，起保护、分和作用，便于后期检修。

Choose to install a miniature circuit breaker at the external AC power input of each ANAPF module system, or install a frame circuit breaker at the parallel line power supply, so as to protect, divide and apply them, and facilitate later maintenance.

2.4 单机安装

2.4 Stand-alone installation

2.4.1 模块接线端子说明

2.4.1 Description of Module Terminals

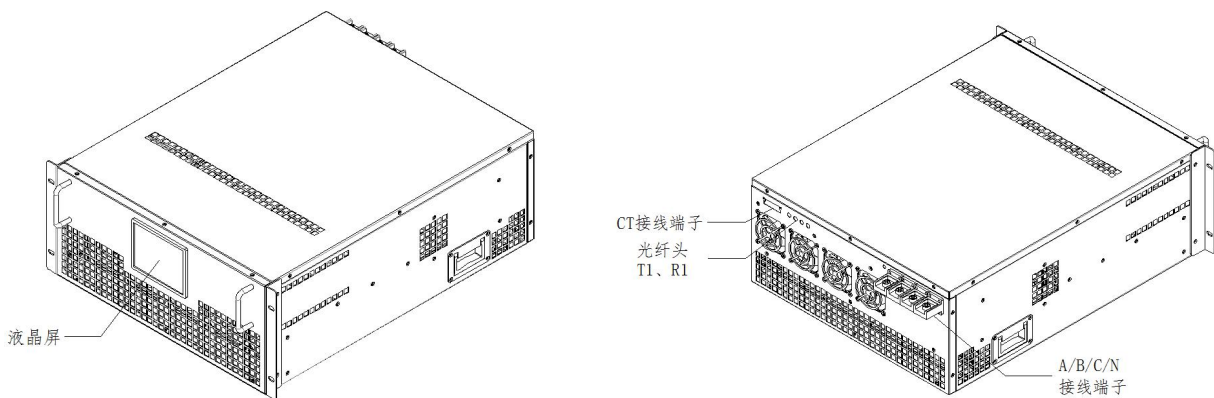


图 2-1 抽屉式接线端子示意图

Figure 2-1 Diagram of drawer-type terminal block

液晶屏 LCD

CT 接线端子 CT terminal block

光纤头 optical fiber terminal

接线端子 terminal block

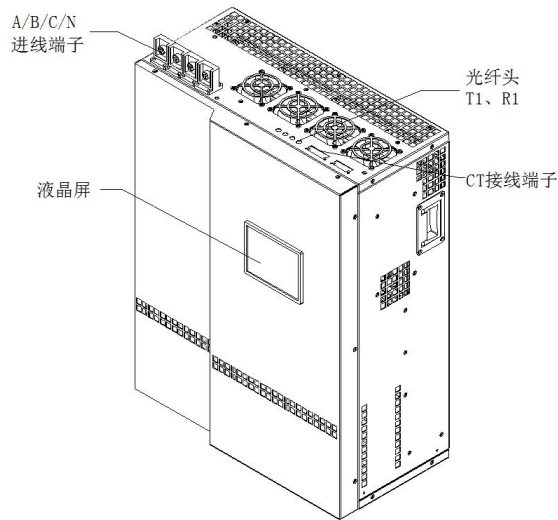


图 2-2 壁挂式接线端子示意图

Figure 2-2 Diagram of wall mount-type terminal block

液晶屏 LCD

CT 接线端子 CT terminal block

光纤头 optical fiber terminal

接线端子 terminal block

图 2-1、2-2 分别为 ANAPF 模块（抽屉式、壁挂式）接线端子示意图，ANAPF 与外部的接线端子主要有八个：  
 Figures 2-1 and 2-2 show the terminal block diagrams of ANAPF module (drawer type, wall mount type). There are eight main external terminals:

- A、B、C、N 主线，连接至接线端子（主线路输入端）
- PE 接地线，连接至接地端子或接地铜排
- CT 接线端子，连接至电流信号端子（电流互感器输入端）
- 光纤头 T1、R1，连接至对应并机模块光纤头
- A, B, C, N main lines, connected to the terminals (main line input)
- PE grounding wire, connected to ground terminal or ground copper bar
- CT terminal, connected to the current signal terminal (current transformer input)
- Head of optical fiber T1, R1, connected to the corresponding parallel module optical fiber heads

**注意:****Note:**

- ① 主回路布线与互感器次级布线要分别单独布线。
- ② 主回路接线应保证电网相序与 ANAPF 相序一致，否则 ANAPF 不能正常启动。
- ③ 互感器 P1 面必须指向电网，P2 面必须指向负载。

- ④ 每只互感器的 S1、S2 必须与相应标号的端子对应，严禁二次侧开路。
- ① The main circuit wiring and the transformer secondary wiring must be separately wired.
- ② The main circuit connection should ensure that the phase sequence of the power grid is consistent with the ANAPF phase sequence, otherwise ANAPF cannot start normally.
- ③ Transformer P1 must point to the grid, P2 must point to the load.
- ④ The S1 and S2 of each transformer must correspond to the terminals of the corresponding label, and the secondary side must not be open.

CT 端子共有六个接线位，对应的意义及接线如表 2-2 所示：

The CT terminal block has a total of six connection points. The corresponding meanings and connections are shown in Table 2-2.

表 2-2 外接 CT 接线端子对应表

Table 2-2 External CT Terminal Block Correspondence Table

对应端子位 Corresponding terminal position	描述 Description
Ia*	接 A 相 CT 的 S1 端 Connect to the CT S1 terminal of phase A
Ia	接 A 相 CT 的 S2 端 Connect to the CT S2 terminal of phase A
Ib*	接 B 相 CT 的 S1 端 Connect to the CT S1 terminal of phase B
Ib	接 B 相 CT 的 S2 端 Connect to the CT S2 terminal of phase B
Ic*	接 C 相 CT 的 S1 端 Connect to the CT S1 terminal of phase C
Ic	接 C 相 CT 的 S2 端 Connect to the CT S2 terminal of phase C

2.4.2 并网接线

2.4.2 Grid Connection

(1) 典型的推荐接线方式：无功柜在 ANAPF 并线点前侧

(1) Typical recommended wiring method: Reactive power cabinet at the front of the ANAPF connection point.

如图 2-3、图 2-4 所示，电流互感器（CT）可以置于负载侧或者网侧，一般情况下，推荐安装在负载侧，即 CT 安装在 ANAPF 主线与负载之间。

As shown in Figure 2-3 and Figure 2-4, current transformer (CT) can be placed on the load side or the grid side. Under normal circumstances, it is recommended to install on the load side, that is, the CT is installed between the

ANAPF main line and the load.

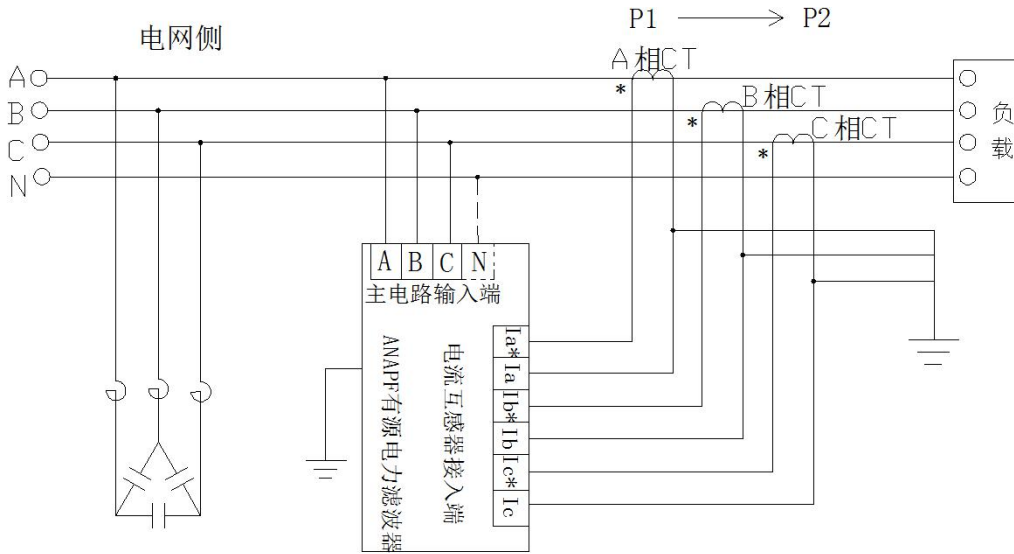


图 2-3 ANAPF 电流互感器负载侧接法的配线示意图

Figure 2-3 Wiring diagram of ANAPF Current Transformer Load Side Connection

电网侧 Grid side

负载 load

A 相 Phase A

主电路输入端 Main circuit input

电流互感器接入端 Current transformer access terminal

有源电力滤波器 Active power filter

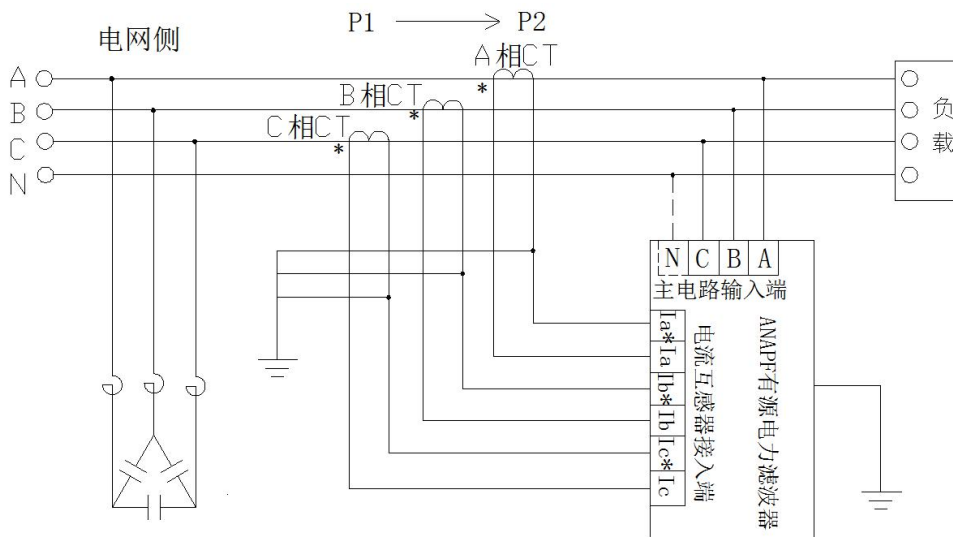


图 2-4 ANAPF 电流互感器电网侧接法的配线示意图

Figure 2-4 Wiring diagram of the ANAPF current transformer grid side connection

电网侧 Grid side

负载 load

A 相 Phase A

主电路输入端 Main circuit input

电流互感器接入端 Current transformer access terminal

有源电力滤波器 Active power filter

(2) 无功柜在 ANAPF 并线点后侧

(2) Reactive power cabinet at the rear side of the ANAPF connection point

在一些特殊应用场合，所安装的电容柜在负载中间或者末端，仅使用一组 CT 无法检测纯负载电流（不含电容柜电流），在此情况下，需要两组 CT，且它们的变比一致，穿线方向相反，从而确保用户 CT 检测的电流不含电容柜电流，接线如图 2-5 所示。

In some special applications, the installed capacitor cabinet is in the middle or at the end of the load. Using only one set of CT cannot detect the pure load current (without capacitor cabinet current). In this case, two sets of CTs are required, and their ratios of transformation are the same, with the reversed threading direction, to ensure that the current detected by the user's CT does not contain the current in the capacitor cabinet. The wiring is shown in Figure 2-5.

备注：由于配电系统复杂多样性，涉及到非常规系统可咨询我司技术人员指导接线。

Remarks: Due to the complexity of the distribution system, you can consult our technical staff for the unconventional system to guide the wiring.

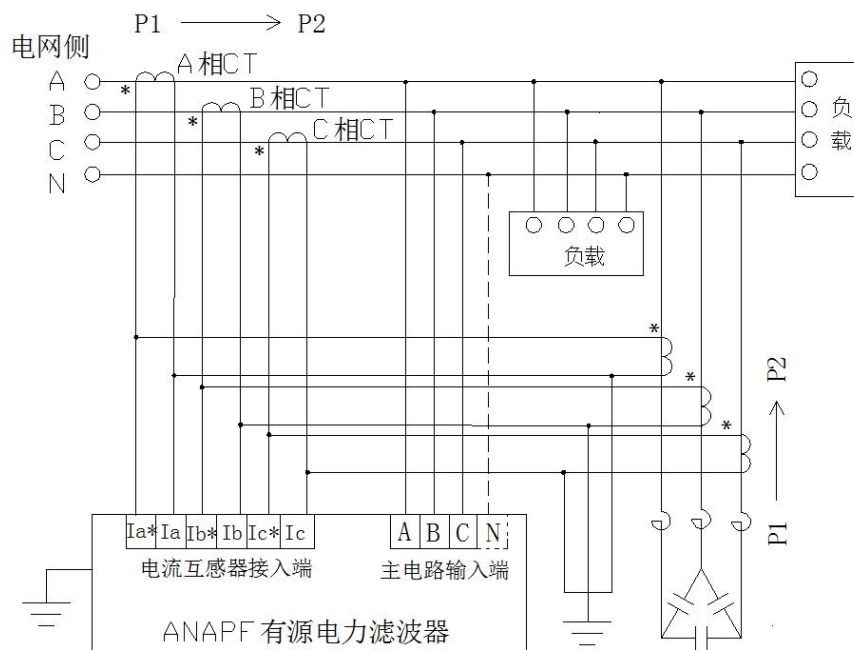


图 2-5 无功柜在负载之间（两组互感器示意）

Figure 2-5 Reactive power cabinet between loads (indicated by two groups of transformers)

电网侧 Grid side

负载 load

A 相 Phase A

主电路输入端 Main circuit input



电流互感器接入端 Current transformer access terminal

有源电力滤波器 Active power filter

## 2.5 并机安装

### 2.5 Equipment parallel installation

#### 2.5.1 抽屉式并机安装说明

#### 2.5.1 Drawer-type parallel installation instructions

(1) 抽屉模块和柜体尺寸示意

(1) Dimensions of modules and cabinets of the drawer-type

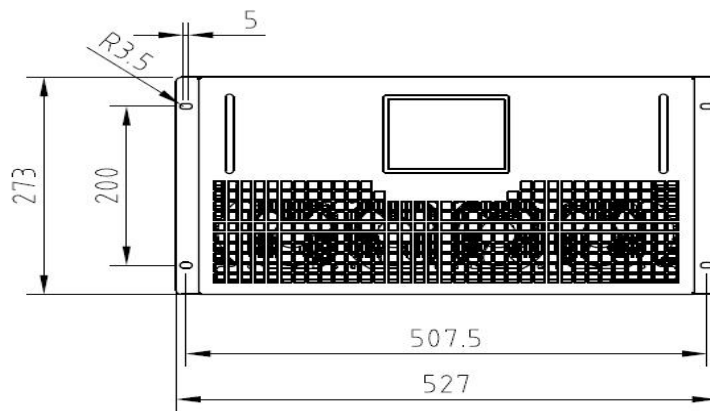


图 2-6 抽屉式 50A 模块尺寸图

Figure 2-6 Module dimension of drawer-type 50A

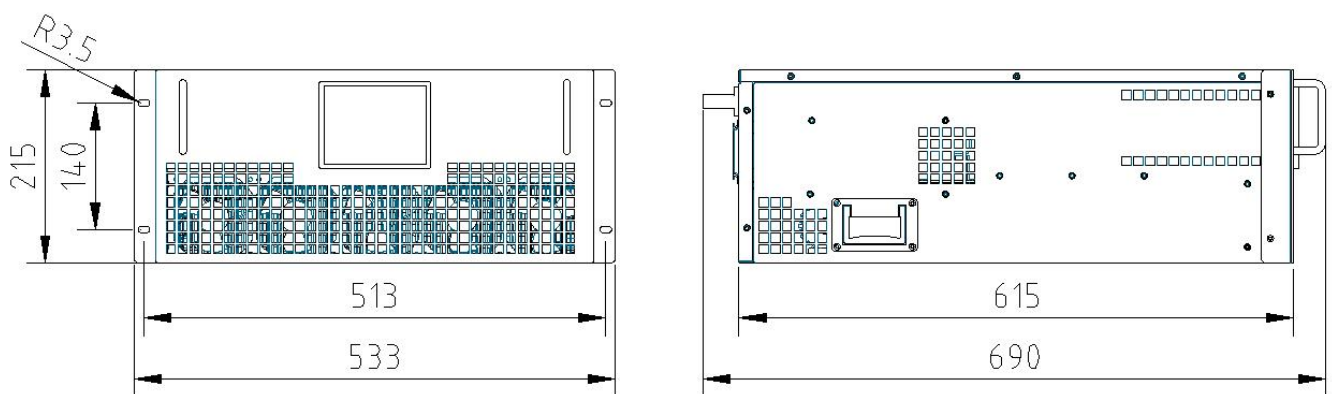


图 2-7 抽屉式 100A 模块尺寸图

Figure 2-7 Module dimension of drawer-type 100A

(2) 并机模块并机安装步骤说明

(2) Instructions for parallel installation of parallel modules

a) 成套柜体内部模块支撑支架由上往下左右两边支撑支架序号分别是 1、2、3、4、5，支架置于柜体内侧横梁上，每个支架有对应序号数量的小孔，仅仅作为支架区别用，不做安装使用。柜内 4 个模块及以下数量的模块固定位置从安装支架 3 开始安装，即 APF1 模块置于支架 3 上，APF2 模块置于支架 4 上，若 4 个模块时，依次类推，APF4 模块置于柜内底部支撑支架上；若 5 个模块时，APF1 模块置于支撑支架 2 上；若六个模块时置于支撑支架 1 上，如下图 2-8 所示。

a) The internal module support brackets of the cabinet body are numbered 1, 2, 3, 4 and 5 from top to bottom and left and right respectively. The brackets are placed on the internal beam of the cabinet, and each bracket has a corresponding number of small holes, which is only used as a stand, not for installation. The fixed positions of the 4 modules and below in the cabinet are installed from the mounting bracket 3, that is, the APF1 module is placed on the bracket 3, and the APF2 module is placed on the bracket 4. If 4 modules are used, the APF4 module is placed on the bottom supports bracket inner the cabinet. If there are 5 modules, the APF1 module is placed on the support bracket 2; if the six modules are placed on the support bracket 1, it is shown in Figure 2-8 below.

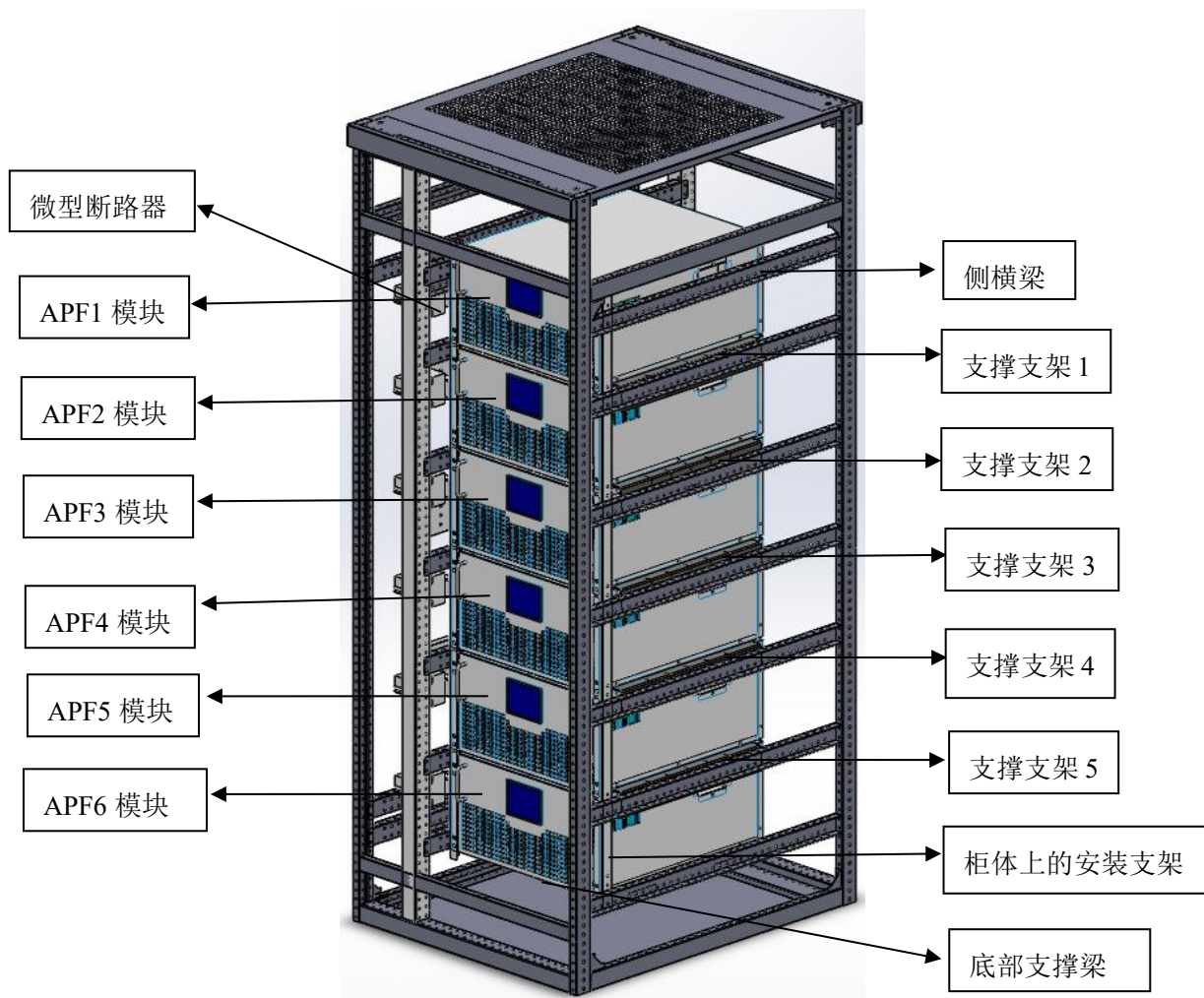


图 2-8 整机安装示意图

Figure 2-8 Schematic of overall installation

微型断路器 miniature circuit breaker

模块 module

侧横梁 side beam

## 支撑支架 Support bracket

柜体上的安装支架 Mounting bracket on cabinet.

## 底部支横梁 Bottom support beam

b) 每个 ANAPF 模块根据安装固定位置要求，放置于柜内相应位置，模块前面板上的安装孔刚好对应柜内安装支架上的安装孔，用 M6 的螺钉紧固，如下图 2-9 所示。

b) Each ANAPF module is placed in a corresponding position in the cabinet according to the installation and fixing position requirements. The mounting holes on the front panel of the module correspond to the mounting holes on the mounting bracket in the cabinet and are fastened with M6 screws, as shown in Figure 2-9 below.

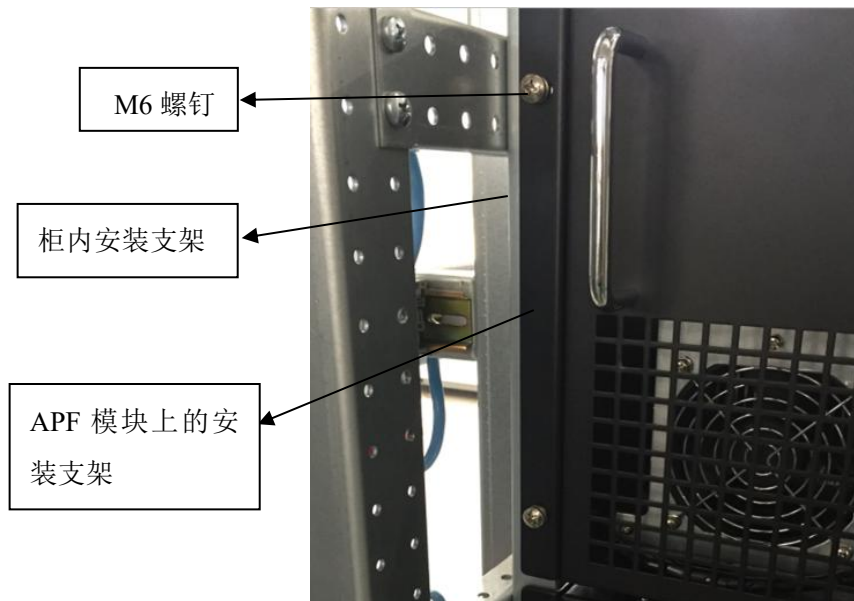


图 2-9 支架安装示意图

Figure 2-9 Schematic of the bracket installation

M6 螺钉 M6 screws

柜内安装支架 installation bracket in the cabinet

APF 模块上的安装支架 installation bracket on the APF module

c) 按照我司标准做法，每个 ANAPF 模块配一个微型断路器或塑壳断路器，其安装位置与 ANAPF 模块位置相对应，置于柜内左侧小门的 35mm 的导轨上。

c) According to our standard practice, each ANAPF module is equipped with a miniature circuit breaker or molded case circuit breaker. Its installation position corresponds to the position of the ANAPF module and is placed on the 35mm rail of the left small door in the cabinet.

## (3) 并机模块接线说明

## (3) Wiring instruction of the parallel module

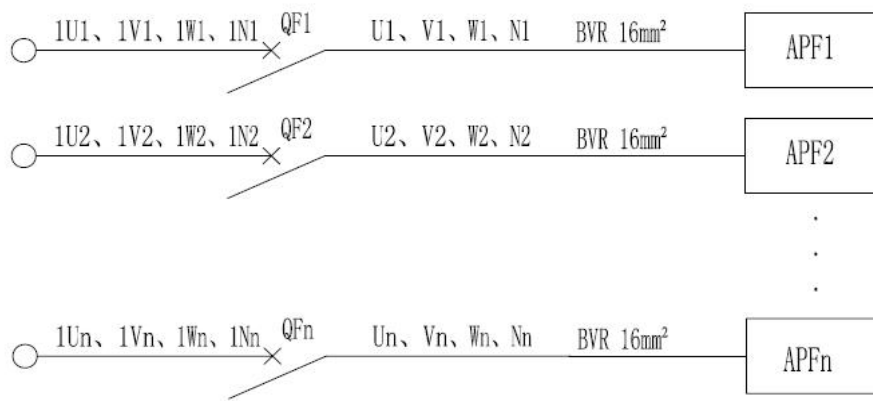


图 2-10 ANAPF 模块并机原理图

Figure 2-10 Schematic of ANAPF module parallel

d) 模块内进线的接线

d) Incoming wiring in the module

模块上 A、B、C、N 四相线分别接于微型断路器下桩头上，如图 2-12 所示，然后 A、B、C、N 四相线从微型断路器上桩头分别接在柜内 A、B、C、N 四根汇流排上，总进线分别接于这四根汇流排上，如图 2-13 所示；PE 线接在柜内对应侧横梁上，如图 2-11 左侧图所示。

The four phases A, B, C, and N on the module are connected to the lower end of the miniature circuit-breaker, as shown in Figure 2-12. Then the A, B, C, and N phases are connected to the four busbars A, B, C, and N in the cabinet through the miniature circuit breaker. The total incoming line is connected to the four busbars, as shown in Figure 2-13. The PE line is connected to the corresponding lateral beam in the cabinet as shown on the left of Figure 2-11.

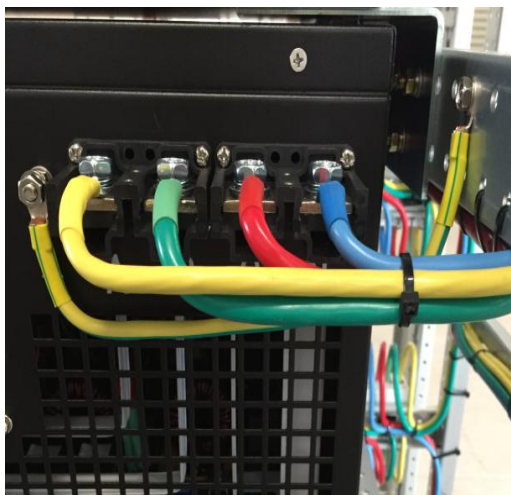


图 2-11 主进线端子接线示意



图 2-12 微型断路器接线示意

Figure 2-11 Schematic of the wiring of the main incoming terminal

Figure 2-12 Schematic of the wiring of the miniature circuit breaker



图 2-13 汇流排接线示意

Figure 2-13 Schematic diagram of bus connection

- e) 柜内模块光纤连线
- e) Optical fiber connection in the cabinet

为保证并机之间通讯和运行稳定性，各 ANAPF 模块间采用光纤连接，每个模块上均有两个光纤接头 T1、R1，如如 2-14 所示；各并机模块按照 APF1、APF2、APF3...依次类推排序，APF1 模块上 R1 不接、T1 接于 APF2 模块上的 R1 上，APF2 模块上的 T1 接于 APF3 模块上的 R1，以此类推，柜内最后一个模块上的 T1 不接，接线示意图如图 2-15 所示。

In order to ensure the stability of communication and operation between parallel machines, each ANAPF module uses fiber optic connections. Each module has two fiber connectors T1 and R1, as shown in Figure 2-14. Each parallel module is sorted by APF1, APF2, APF3 and so on. R1 on the APF1 module is not connected, T1 is connected to R1 on the APF2 module, T1 on the APF2 module is connected to R1 on the APF3 module, and so on. T1 on the last module in the cabinet is not connected, and the wiring diagram is shown in Figure 2-15.

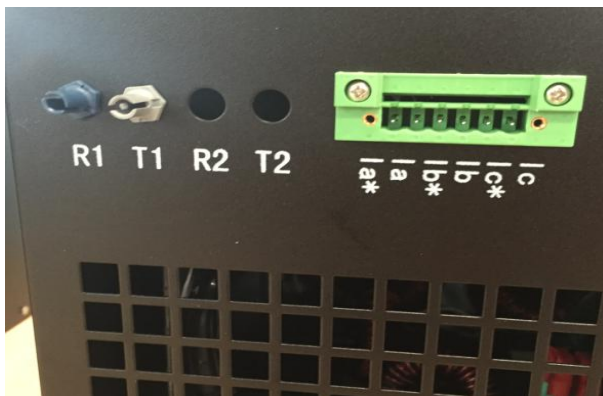


图 2-14 光纤接头示意

Figure 2-14 Schematic of fiber connectors

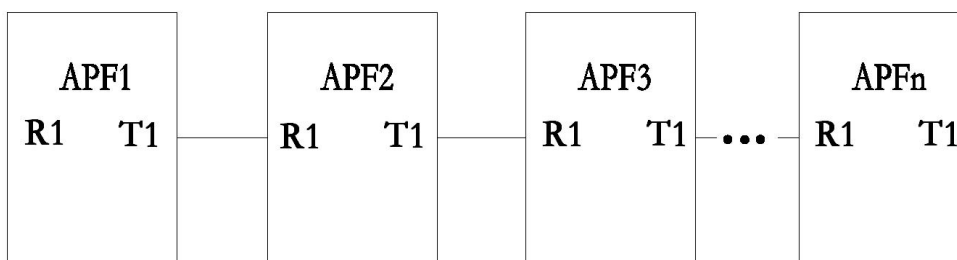


图 2-15 光纤接线原理图

Figure 2-15 Optical fiber connection schematic

- f) 互感器信号线缆接线
- f) Transformer signal cable wiring

如图 2-16 所示，CT1~CT3 为外接互感器，APF1 模块上 Ia\*、Ib\*、Ic\*引至柜内第 1、2、3 片 PCTK6 端子上如图 2-17，分别对应接外接互感器 A、B、C 相 S1,APF1 模块上 Ia、Ib、Ic 分别接 APF2 模块上 Ia\*、Ib\*、Ic\*，APF2 模块上 Ia、Ib、Ic 分别接 APF3 模块上 Ia\*、Ib\*、Ic\*，以此类推，柜内最下端一个模块上的 Ia、Ib、Ic 环绕一起分别接至第 4、5、6 片 PCTK6 端子上，分别对应外接互感器 A、B、C 相 S2 端。若出现使用两组互感器情况，则结合图 2-5 将互感器反向接好后，再结合图 2-16 进行模块间互感器接线。

As shown in Figure 2-16, CT1~CT3 are external transformers. The APF1 module leads Ia\*, Ib\*, and Ic\* to the PCK6 terminals on the 1, 2, and 3 PCs in the cabinet, as shown in Figure 2-17. Outer transformer A, B, C phase S1, Ap1 module Ia, Ib, Ic respectively connect the APF2 module Ia \*, Ib \*, Ic \*. APF2 module Ia, Ib, Ic respectively connect the APF3 module Ia \*, Ib \*, Ic\*, and so on. Ia, Ib, Ic on the bottom of a module in the cabinet are connected to the 4th, 5th and 6th PCTK6 terminals respectively, corresponding to the external transformers A, B, and C phase S2 respectively. If two sets of transformers are used, according to Figure 2-5, the transformers are connected reversely, and then we should connect the inter-module transformers together with Figure 2-16.

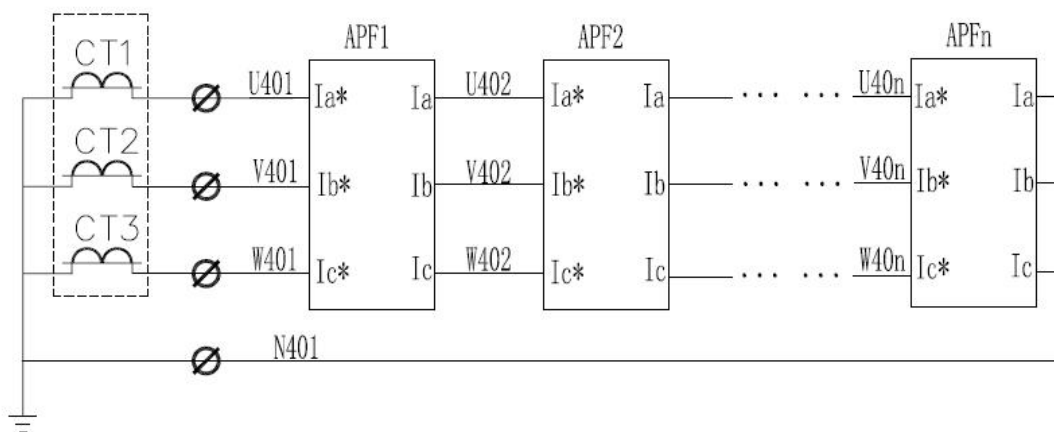


图 2-16 外接互感器接线原理图

Figure 2-16 External transformer wiring schematic



图 2-17 PCTK6 端子

Figure 2-17 PCTK 6 terminal

g) 整柜示意

g) The whole cabinet



图 2-18 整柜正视图

Figure 2-18 The entire front view



图 2-19 整柜后视图

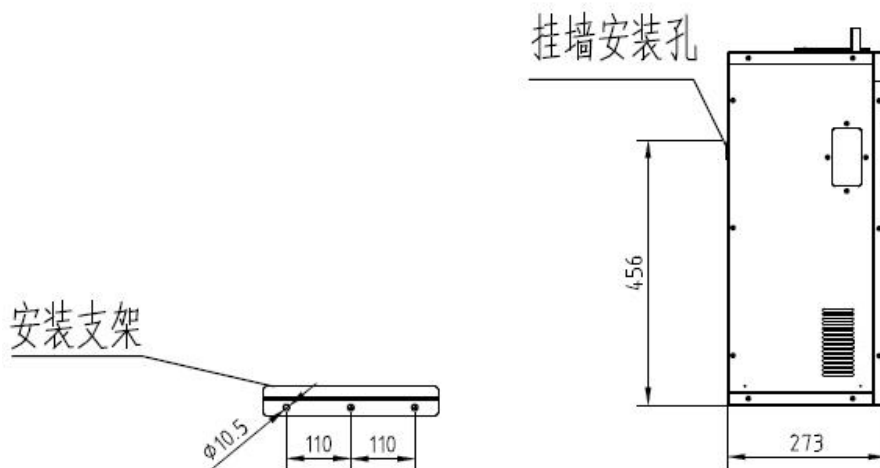
Figure 2-19 Rear view of the entire cabinet

2.5.2 壁挂式并机安装说明

2.5.2 Wall-mounted parallel installation instructions

(1) 壁挂模块安装尺寸示意

(1) Dimensions of Wall Mount Modules



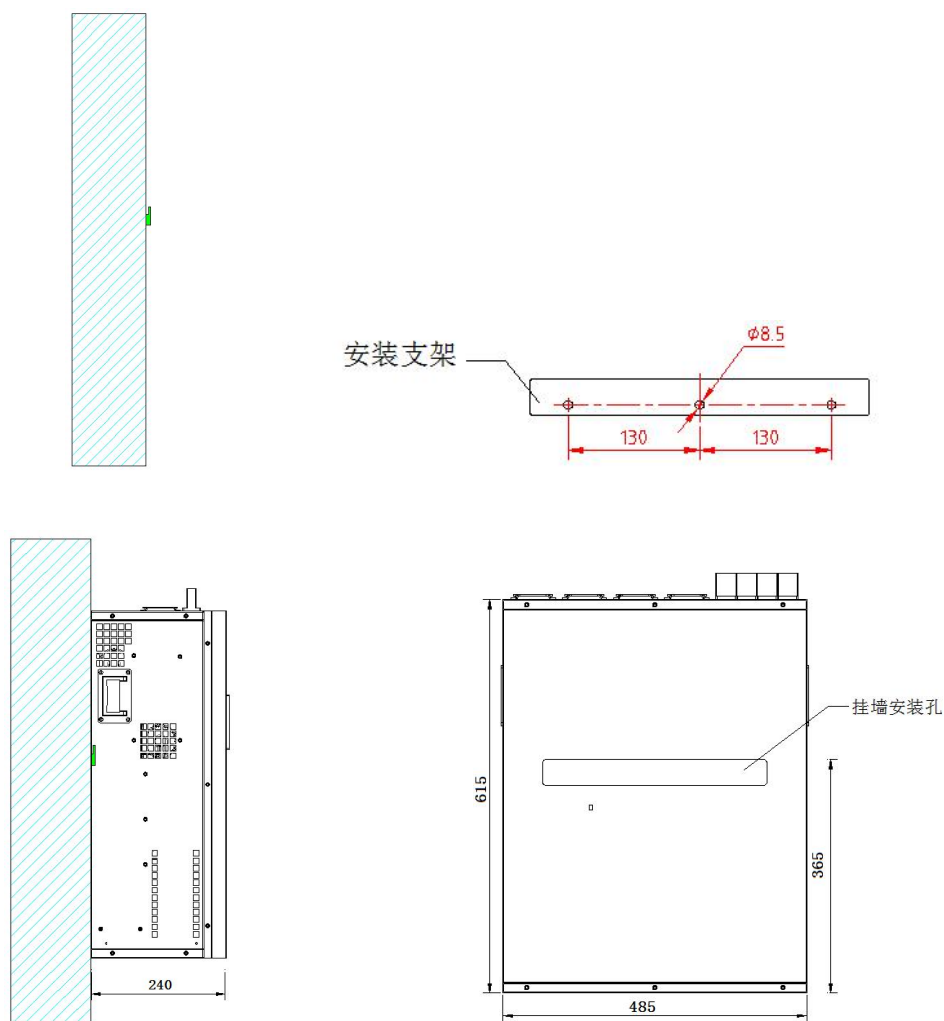


安装支架 Mounting brackets

挂墙安装孔 Wall mounting hole

图 2-20 壁挂式 50A 安装支架和模块安装尺寸

Figure 2-20 Wall-mounted 50A Mounting Bracket and Module Mounting Dimensions



安装支架 Mounting brackets

挂墙安装孔 Wall mounting hole

图 2-21 壁挂式 100A 安装支架和模块安装尺寸

Figure 2-21 Wall-mounted 100A Mounting Bracket and Module Mounting Dimensions

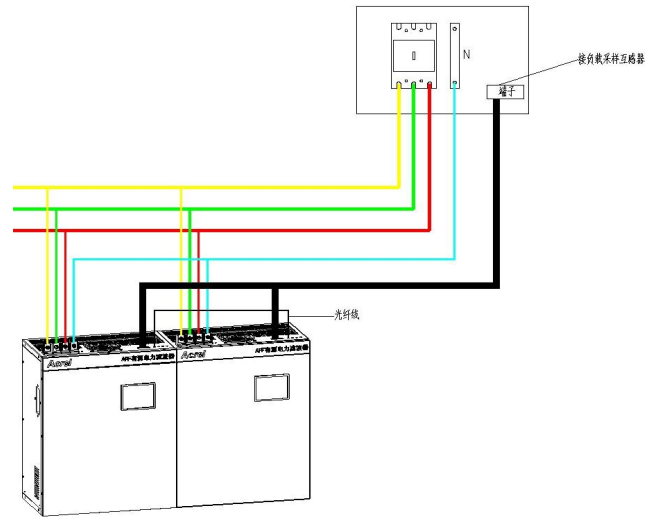


图 2-22 壁挂式模块并机安装示意（以 2 个模块为例）

Figure 2-22 Schematic diagram of parallel installation of wall-mounted modules (using two modules as an example)

(2) 壁挂模块安装说明

(2) Wall-mounted Module Installation Instructions

用 M10 的膨胀螺栓将对应安装支架固定在墙上，将模块后侧挂墙安装孔对应安装于安装支架上，便于接线及模块散热要求，建议模块并排安装，固定好后，模块 A、B、C、N 主进线引至 4 极塑壳断路器桩头上或 3 极加 N 排上，模块之间光纤接线和互感器信号线缆接线与抽屉式相同，可直接参照。

Fix the corresponding mounting bracket to the wall with M10 expansion bolts, and install the mounting holes on the rear wall of the module correspondingly to the mounting bracket to facilitate the wiring and cooling requirements of the module. It is recommended that the modules should be installed side by side. After fixing, the modules A, B, C, N main line leads to the 4-pole molded case circuit breaker pile head or 3-pole plus N-row, and the fiber-optic wiring between the module and the transformer signal cable wiring is the same as the drawer type, and can be directly referred to.

2.5.3 柜体开孔说明

2.5.3 Cabinet hole opening description

由于模块采用强制风冷，自带风扇，模块前后面板已经做开孔散热处理，为保证所产生的热量在柜体内能够散出，建议柜体前后门尽量多开孔，保证散热效果，所开孔可采用 10\*10mm 的方孔，上下孔间隔 3mm，具体开孔示意如下图 2-23，整柜前后门板开孔示意如图 2-24 所示，同时满足 IP20 的防护等级。

Because the module adopts forced air cooling and comes with a fan, the front and rear panels of the

module have been treated with holes for heat dissipation. To ensure that the generated heat can be dissipated in the cabinet, it is recommended that the front and rear doors of the cabinet be opened as much as possible to ensure the heat dissipation effect. The holes can be square holes of 10\*10mm, and the holes are separated by 3mm. The specific holes are shown in Figure 2-23. The openings of the front and rear doors of the cabinet are shown in Figure 2-24, and the IP20 protection level is also met.

注：① 如有条件允许，建议在柜体顶部安装风扇，提高散热效果；

**Note: ① If conditions permit, it is recommended to install a fan at the top of the cabinet to improve the cooling effect;**

② ANAPF 液晶屏可选择直接安装于模块本身前面板，常规采用 4.3 寸，液晶屏开孔尺寸为 119\*93mm，也可选择安装于柜体前面板上，常规采用 7 寸，液晶屏开孔尺寸为 192\*138mm。

**② ANAPF LCD screen which the conventional use is 4.3 inches can be directly installed on the front panel of the module itself. LCD screen opening size of 119 \* 93mm, can also be installed on the front panel of the cabinet, the conventional 7-inch, and LCD screen opening size is 192\*138mm.**

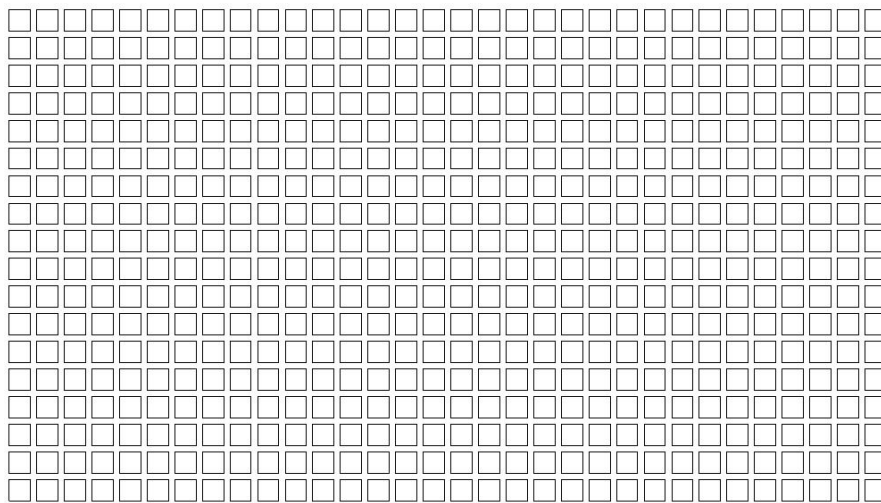


图 2-23 前后门板开孔示意

Figure 2-23 Front and rear door hole openings



图 2-24 前后门板开孔示意

Figure 2-24 Front and rear door hole openings

## 第三章 操作说明

## Chapter 3 Operation Instructions

ANAPF 的操作主要分为自检、启动、补偿、待机、停机等操作，以上功能的操作步骤必须严格按照本说明书中的相应步骤进行操作。

The operations of ANAPF are mainly divided into operations such as self-test, start-up, compensation, standby, and shutdown. The operation steps of the above functions must be performed in strict accordance with the corresponding steps in this manual.

## 3.1 操作时序

## 3.1 Operating sequence

表 3-1 ANAPF 操作时序表

Table 3-1 ANAPF Operation Timing Table

操作时序 Operating sequence	操作步骤 Procedure Steps	备注： 当 ANAPF 发生故障无法启动时，可在 HMI 显示屏的【故障查询】中查找相应故障原因 Remarks: When ANAPF fails to start, you can find the corresponding fault
自检 Self- test	1. 闭合 ANAPF 的断路器，整机上电；液晶显示屏点亮； 1. Close the ANAPF circuit breaker, the whole power; lighten the liquid crystal display; 2. 轻触显示屏上【自检】按钮，待“确定”对话框跳出后，点击【确定】； 2. Touch lightly the [Self-Test] button on the display, and after the “OK” dialog box pops up, click [OK]. 3. 当显示屏上的“系统当前状态”显示【停机（正常）】，说明自检操作完成。 3. When the "System Current Status" on the display shows [Stop (Normal)], the self-test operation is completed. 注意：如果“系统当前状态”显示【停机（故障）】，那么要将相应故障进行排查，重复以上步骤 2、3，直到“系统当前状态”显示【停机（正常）】后，便可以进行下一步操作。	

	<p>Note: If "System Current Status" displays [Stop (failure)], then the corresponding fault should be investigated. Repeat steps 2 and 3 above until "System Current Status" shows [Stop (Normal)]. Then proceed next step operation.</p>	<p>cause in the [Fault Inquiry] of the HMI display.</p>
<p>启动 Start up</p>	<p>1. 轻触显示屏上【启动】按钮，待“确定”对话框跳出后，点击【确定】；</p> <p>1. Tap slight the [Start] button on the display. After the “OK” dialog box appears, click [OK].</p> <p>2. 当“系统当前状态”显示“待机”，说明启动操作完成。</p> <p>2. When "System Current Status" shows "Standby", the startup operation is completed.</p> <p>注意：如果“系统当前状态”显示【停机（故障）】，那么要将相应故障进行排查，重复自检操作步骤 2、3，直到“系统当前状态”显示【停机（正常）】后，重新进行启动操作。</p> <p>Note: If the "System Current Status" displays [Stop (failure)], then the corresponding fault should be investigated. Repeat the self-test operation steps 2 and 3, until the "system current state" shows [stop (normal)], then restart the operation.</p>	
<p>补偿 / 待机 Compensation/stand by</p>	<p>1. 当需要补偿时，轻触显示屏上【补偿】按钮，待“确定”对话框跳出后，点击【确定】，此时“系统当前状态”显示“补偿”，说明 ANAPF 运行在补偿状态；</p> <p>1. When compensation is needed, touch slightly the [Compensation] button on the display screen. After the “OK” dialog box pops up, click [OK]. At this time, “System Current Status” displays “Compensation”, indicating that ANAPF is operating in the compensation state.</p> <p>2. 当需要待机时，轻触显示屏上【待机】按钮，待“确定”对话框跳出后，点击【确定】，此时“系统当前状态”显示“待机”，说明 ANAPF 运行在待机状态。</p> <p>2. When standby is needed, touch the [Standby] button on the display. After the “OK” dialog box pops up, then click [OK]. At this time, “System Current Status” displays “Standby”, indicating that ANAPF</p>	

	is operating in the standby state.	
<p>停机 Downtime</p>	<p>1. 当需要关机时，轻触显示屏上【停机】按钮，待“确定”对话框跳出后，点击【确定】，此时“系统当前状态”显示“停机（正常）”，说明 ANAPF 处于正常停机状态。</p> <p>1. When it is necessary to turn off the power, touch the [Stop] button on the display. After the “OK” dialog box pops up, click [OK]. At this time, “System Current Status” displays “Stop (Normal)”, indicating that ANAPF is normal. Shutdown state.</p> <p>2. 在紧急情况下，可直接按下【急停按钮】停机。</p> <p>2. In an emergency, you can directly press the [emergency stop button] to stop.</p> <p>注意：ANAPF 停机 3min 后，待直流电压 Udc 降到 10V 以下后，方可打开柜门。</p> <p>Note: After the ANAPF stops for 3 minutes, the cabinet door can not be opened until the DC voltage Udc drops below 10V.</p>	

### 3.2 启动前的准备工作

#### 3.2 Preparation before starting

##### 3.2.1 安装检查

##### 3.2.1 Installation check

- a. 检查 ANAPF 机柜是否安装平稳；
  - b. 检查 ANAPF 的安装电缆及电流互感器的电流采样线是否牢固；
  - c. 检查机柜及电流互感器的接地线是否正确、牢固；
- a. Check whether the ANAPF cabinet is installed smoothly.
  - b. Check the installation cable of ANAPF and current transformer's current sampling line for tightness;
  - c. Check whether the ground wire of the cabinet and current transformer is correct and firm;

##### 3.2.2 相序检查

##### 3.2.2 Phase sequence check

输入电压必须是正相序（A 相 → B 相 → C 相 → A 相）连接，错相会造成 ANAPF 不能正常

运行！ 检查相序办法：检查主电路接线，确保 ANAPF 的相序与电网相序一致。

The input voltage must be positive phase sequence (phase A → phase B → phase C → phase A) connection. The wrong phase will cause ANAPF to fail to operate normally! Check the phase sequence method: check the main circuit wiring to ensure that the phase sequence of the ANAPF is consistent with the phase sequence of the power grid.

### 3.2.3 互感器检查

#### 3.2.3 Transformer inspection

互感器的接线错误是导致 ANAPF 不能正常运行的主要原因之一！ 对照 2.4.2 节中正确的主电路接线图检查互感器接线，互感器接线的相序和主电路相序一致，互感器的 P1 面始终指向电网侧，P2 面始终指向负载侧。

One of the main reasons why ANAPF cannot operate properly is the wiring error of the transformer! Check the wiring of the transformer against the correct main circuit wiring diagram in Section 2.4.2 The phase sequence of the transformer wiring is the same as that of the main circuit. The P1 side of the transformer always points to the grid side, and the P2 side always points to the load side.

### 3.3 操作步骤

#### 3.3 Steps

启动 ANAPF 运行前要特别注意的几点：

- 确保 ANAPF 的塑壳断路器处于闭合状态；
- 确保主电路接线正确；
- 确保负载侧电流采样互感器接线正确；

Some points to note before starting ANAPF:

- Ensure that ANAPF's molded case circuit breakers are closed;
- Ensure that the main circuit wiring is correct;
- Ensure that the load side current sampling transformer wiring is correct;

注：以下为 APF1 模块液晶屏操作步骤演示，其余模块操作均一样。

Note: The following is a demonstration of the operation of the APF1 module LCD screen, and the rest of the module operations are the same.



## 3.3.1 登录

## 3.3.1 Log in

APF 模块上电后，液晶屏界面如下图 3-1 所示，点击【登录界面】可进入登录界面，如下图 3-2 所示，根据现场实际补偿模式，选择对应的用户登录信息。

After the APF module is powered on, the interface of the LCD screen is as shown in Figure 3-1. Click [Login Screen] to enter the login interface. As shown in Figure 3-2 below, select the corresponding user login information based on the actual compensation mode.

注：① 一屏多机谐波补偿运行模式时，用户为“1”，密码为“111111”；

一屏单机谐波补偿运行模式时，用户为“2”，密码为“222222”；

其余运行模式为调试人员须知，用户不宜操作。

② 未进行用户登录时，不能实现对液晶屏的操作。

Note: ① When in the multi-machine harmonic compensation mode, the user is "1" and the password is "111111";

In one screen single harmonic compensation operation mode, the user is "2" and the password is "222222";

The rest of the operating mode is for the commissioning personnel and the user should not operate.

② When the user is not logged in, the LCD screen cannot be operated.

	1#滤波器	2#滤波器	3#滤波器	4#滤波器	5#滤波器	6#滤波器
Eab (V)	392	0	0	0	0	0
Ebc (V)	389	0	0	0	0	0
IBa (A)	0	0	0	0	0	0
IBb (A)	0	0	0	0	0	0
IBc (A)	0	0	0	0	0	0
IBn (A)	0	0	0	0	0	0
运行状态	停机(故障)	未连接	未连接	未连接	未连接	未连接
登录界面	故障记录	故障记录	故障记录	故障记录	故障记录	故障记录
	运行操作	运行操作	运行操作	运行操作	运行操作	运行操作
设置预览	参数设置	参数设置	参数设置	参数设置	参数设置	参数设置

图 3-1 开机界面

Figure 3-1 Boot interface

滤波器 filter

运行状态 Operating status

停机（故障）Shutdown (failure)

未连接 unconnected

登录界面 login interface

故障记录 broken record

运行操作 operation

参数设置 parameter settings

设置预览 Set preview

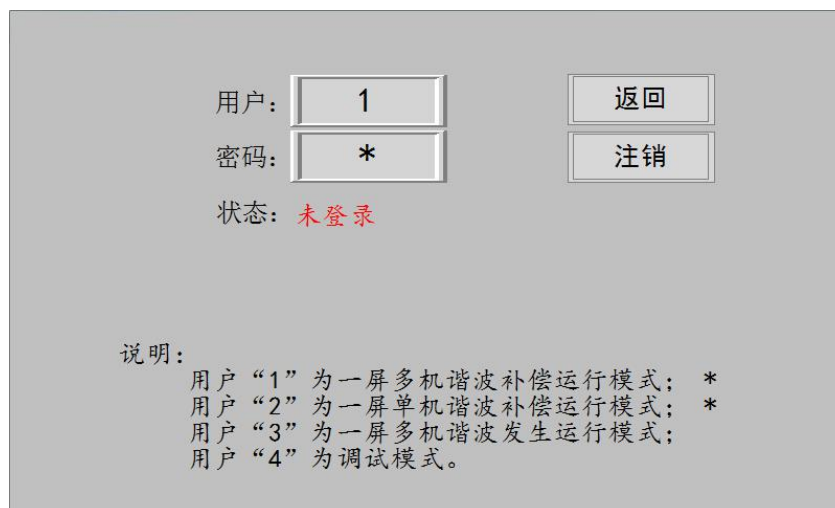


图 3-2 登录界面

Figure 3-2 Login page

用户 user

密码 password

状态: 未登录 Status: Not logged in

返回 Return

注销 Log out

说明:

用户“1”为一屏多机谐波补偿运行模式; \*

用户“2”为一屏单机谐波补偿运行模式；\*

用户“3”为一屏多机谐波补偿运行模式；

用户“4”为调试模式；

Explanation:

User "1" is a screen multi-machine harmonic compensation operation mode;\*

User "2" is a single-screen harmonic compensation operation mode;\*

User "3" is a screen multi-machine harmonic compensation operation mode;

User "4" is a debug mode;

### 3.3.2 自检

#### 3.3.2 Self test

输入正确用户登录信息后，点击登录界面的【返回】按钮，则返回到开机界面，如图 3-1 所示，观察液晶屏 1#滤波器一列，若运行状态显示“停机（故障）”，则点击【运行操作】按钮，进入 APF1#操作界面，如图 3-3 所示，然后点击【自检】按钮，待“APF1#装置确定自检”对话框弹出后，点击【确定】，ANAPF 进入自检状态，如图 3-4 所示。

After inputting the correct user login information, click the [Back] button on the login interface to return to the boot interface, as shown in Figure 3-1. Observe the 1# filter of the LCD screen. If the running status shows “Stop (Failure)”, Then click [Run Operation] button to enter the APF1# operation interface, as shown in Figure 3-3, and then click [Self-Test] button. After the “APF1# Device Confirm Self-Test” dialog box pops up, click [OK], ANAPF Enter the self-test state, as shown in Figure 3-4.

运行数据	APF1#	APF2#	APF3#	APF4#	APF5#	APF6#
IBa (A)	0	ILa (A)	93	Eab (V)	392	
IBb (A)	0	ILb (A)	107	Ebc (V)	389	
IBc (A)	0	ILc (A)	108	状态	停机 (故障)	
IBn (A)	0	ILn (A)	28	Udc (V)	510	

上一级    启动    停机    补偿    待机    自检

图 3-3 APF1#运行操作界面

Figure 3-3 APF1# operation interface

运行数据 Operating data

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Make up

待机 Standby

自检 Self test

状态： 停机（故障） Status: Shutdown (failure)

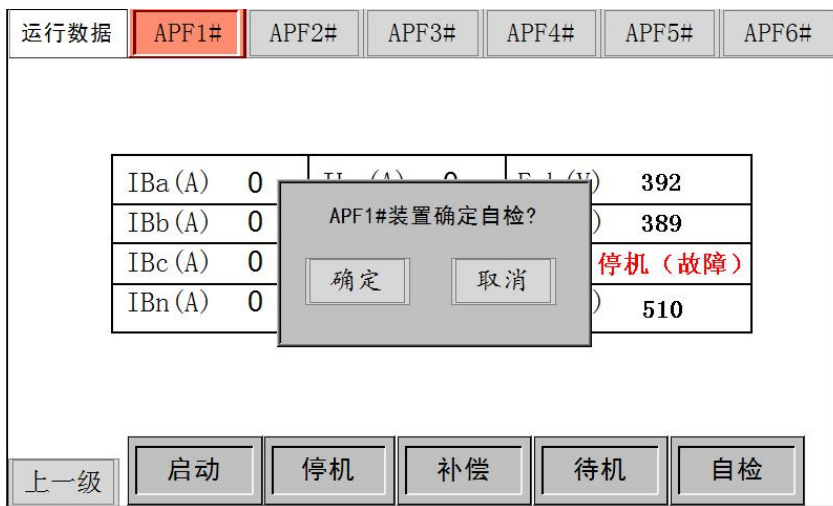


图 3-4 自检确定界面

Figure 3-4 Self-check Confirmation Screen

运行数据 Operating data

装置确定自检 The device confirms the self-test

确定 Confirm

取消 Cancel

自检完成后，系统当前状态显示：“停机（正常）”，如图 3-5 所示。

After the self-test is completed, the current status of the system displays: "Shutdown (Normal)", as shown in Figure 3-5.

运行数据	APF1#	APF2#	APF3#	APF4#	APF5#	APF6#
IBa (A)	0	ILa (A)	93	Eab (V)	392	
IBb (A)	0	ILb (A)	107	Ebc (V)	389	
IBc (A)	0	ILc (A)	108	状态	停机 (正常)	
IBn (A)	0	ILn (A)	28	Udc (V)	510	

上一级 启动 停机 补偿 待机 自检

图 3-5 停机（正常）界面

Figure 3-5 Shutdown (Normal) Interface

运行数据 Operating data

状态：停机（正常） Status: Shutdown (Normal)

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

## 3.3.3 启动

## 3.3.3 Start up

启动过程需要经历预充电、升压、待机三个过程，这三个过程是在点击启动按钮后由系统自动完成。点击显示屏上【启动】按钮，待“APF1#装置确定启动”对话框弹出后，点击【确定】，如图 3-6 所示。

The start-up process needs to undergo three processes of pre-charging, boosting, and standby. These three processes are automatically completed by the system after clicking the start button. Click the [Start] button on the display, wait until the “APF1# Device Confirm Startup” dialog box pops up, and then click OK, as shown in Figure 3-6.

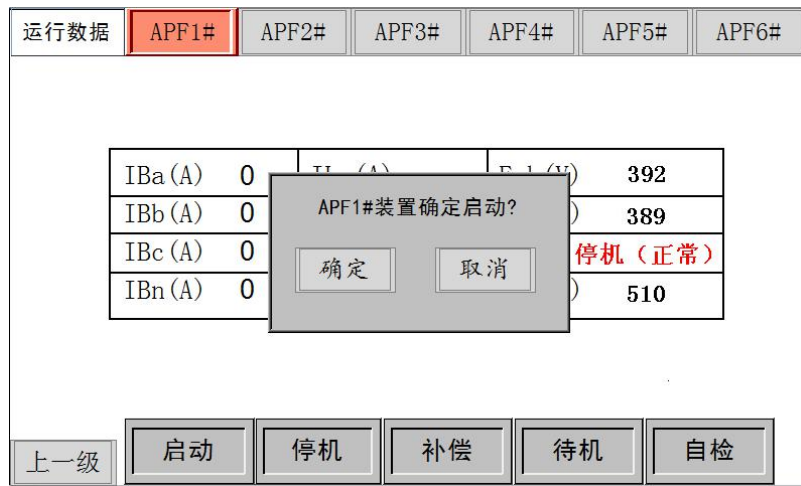


图 3-6 启动确定界面

Figure 3-6 Start Confirmation Screen

运行数据 operating data

装置确定启动? Device confirms start?

确定 Confirm

取消 Cancel

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

3.3.4 补偿

3.3.4 Compensation

启动正常后，系统状态为待机时，即可点击显示屏上【补偿】按钮，待“APF1#装置确定补偿”对话框弹出后，点击【确定】，如图 3-7 所示，ANAPF 就进入补偿状态，如图 3-8 所示。

After the system starting in normal state and in standby mode, click the [Compensation] button on the display. When the “APF1# Device Confirmation Compensation” dialog box pops up, click [OK]. As shown in Figure 3-7, ANAPF enters the compensation status as shown in Figure 3-8.

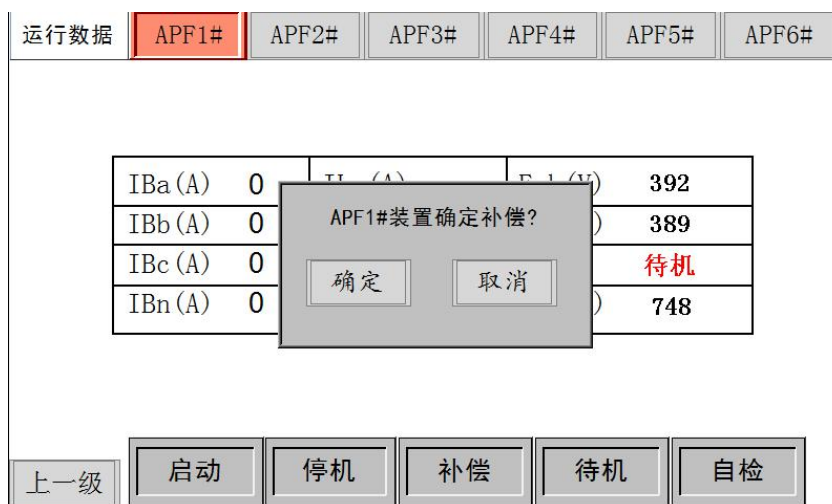


图 3-7 补偿确定界面

Figure 3-7 Compensation Confirmation Screen

运行数据 operating data

装置确定补偿? Device confirms compensation?

确定 Confirm

取消 Cancel

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

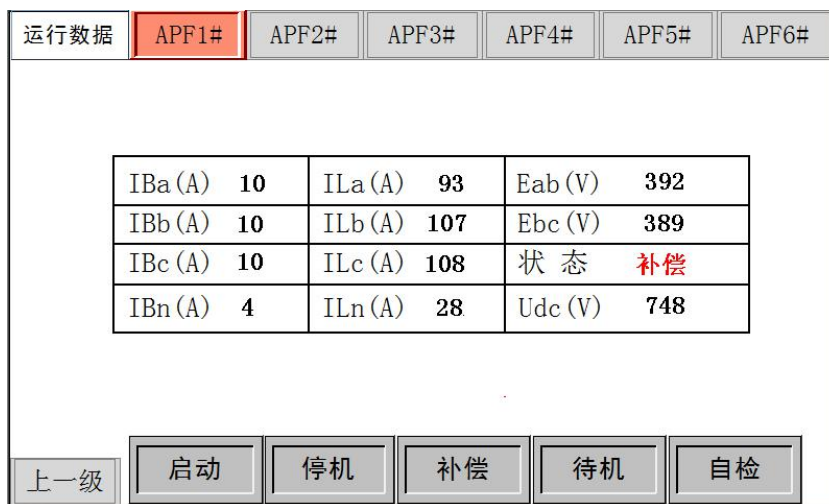


图 3-8 补偿界面

Figure 3-8 Compensation interface

运行数据 Operating data

状态：补偿 Status: Compensation

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

3.3.5 待机

3.3.5 Standby

点击显示屏上【待机】按钮，待“APF1#装置确定待机”对话框弹出后，点击【确定】，ANAPF 进入待机状态，如图 3-9 所示。

Click the [Standby] button on the display until the APF1#Device confirms standby, and then the dialog box appears. Click OK. ANAPF enters the standby state, as shown in Figure 3-9.



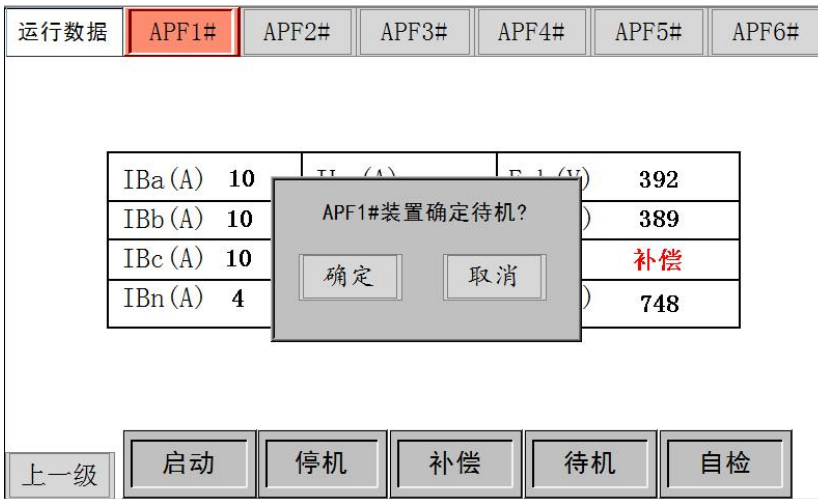


图 3-9 待机确定界面

Figure 3-9 Standby Confirmation Screen

运行数据 operating data

装置确定待机? Device determines standby?

确定 Confirm

取消 Cancel

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

### 3.3.6 停机

#### 3.3.6 Downtime

点击显示屏上【停机】按钮，待“APF1#装置确定停机”对话框弹出后，如图 3-10 所示，点击【确定】，ANAPF 退出“待机/补偿”状态，ANAPF 状态显示“停机（正常）”，则 ANAPF 进入停机状态，如图 3-11 所示。

Click the [Stop] button on the display. After the “APF1# Device Stops Determined” dialog box pops up, as shown in Figure 3-10, click [Confirm], then ANAPF exits the “Standby/Compensation” state, and the ANAPF status displays “Down (Normal)”. ANAPF enters the stop state, as shown in Figure 3-11.

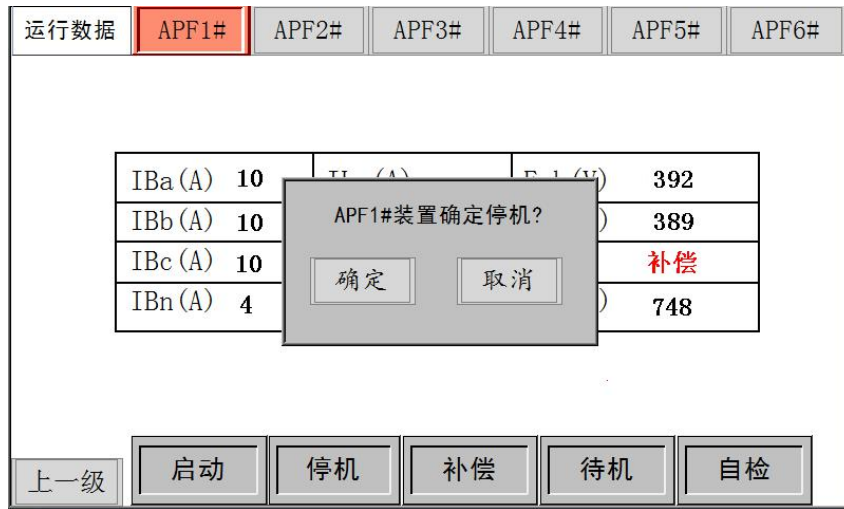


图 3-10 停机确定界面

Figure 3-10 Downtime Confirmation Interface

运行数据 Operating data

装置确定停机? Device confirms shutdown?

确定 Confirm

取消 Cancel

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

运行数据	APF1#	APF2#	APF3#	APF4#	APF5#	APF6#
IBa (A)	0	ILa (A)	93	Eab (V)	392	
IBb (A)	0	ILb (A)	107	Ebc (V)	389	
IBc (A)	0	ILc (A)	108	状态	停机 (正常)	
IBn (A)	0	ILn (A)	28	Udc (V)	510	

上一级	启动	停机	补偿	待机	自检
-----	----	----	----	----	----

图 3-11 停机正常界面

Figure 3-11 Shutdown interface

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

## 3.3.7 故障状态查询

## 3.3.7 Fault status query

无论 ANAPF 是在停机过程中还是在运行过程中，一旦发生故障，“状态”一栏都会显示：“停机（故障）”，如图 3-12 所示。

Whether ANAPF is in the process of shutdown or in operation, once the fault occurs, the “Status” column will show “Shutdown (Failure)”, as shown in Figure 3-12.

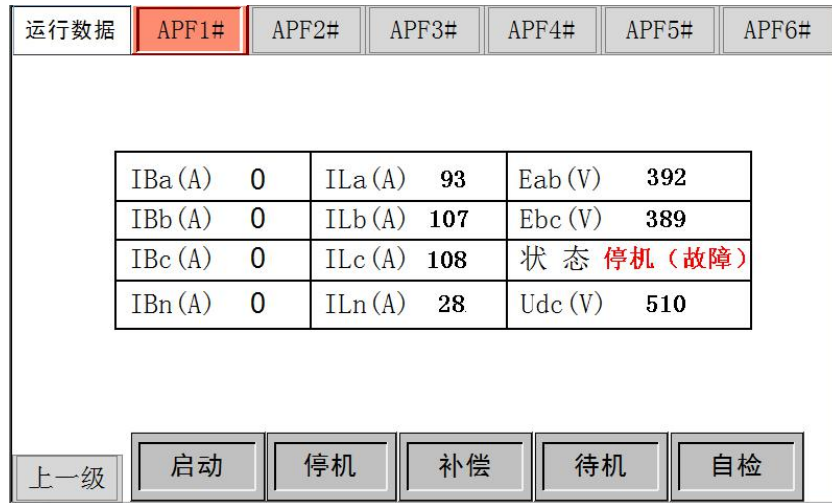


图 3-12 停机（故障）界面

Figure 3-12 Shutdown (Failure) Screen

运行数据 Operating data

上一级 Upper level

启动 Start up

停机 Downtime

补偿 Compensation

待机 Standby

自检 Self-test

当 ANAPF 发生故障时，在停机（故障）界面可点击【上一级】按钮进入开机界面，再点击【故障记录】按钮查看故障记录，并参考表 4-1 相应故障进行排查，如图 3-13 所示。

When ANAPF fails, click the [Up] button on the shutdown (failure) screen to enter the boot interface, then click the [Fault Log] button to view the fault log and refer to Table 4-1 for troubleshooting, as shown in Figure 3- 13 shows.

故障信息	APF1#	APF2#	APF3#	APF4#	APF5#	APF6#
1	14/10/31	22:18:50	COM1 Port Open failed			
2	14/10/31	22:18:51	通讯故障			

上一级      前一天 00      后一天

图 3-13 故障查询界面

Figure 3-13 Fault query interface

故障信息 Accident details

通讯故障 Communication fail

上一级 Upper level

前一天 The day before

后一天 The day after

故障查询界面 Fault Inquiry Interface

## 第四章 维护及售后

### Chapter 4 Maintenance and After-sales Service

#### 4.1 维护

##### 4.1 Maintenance

ANAPF 现场运行时免维护，现场维护只能由合格的服务人员进行，并只限于设备及其部件的清洁和检查，所有的服务和维修工作应由安科瑞电气股份有限公司的服务技术人员或合格电气技术人员来进行。

ANAPF is maintenance-free in on-site operation. On-site maintenance can only be performed by qualified service personnel, and is limited to the cleaning and inspection of equipment and components. All service and maintenance work should be performed by service technicians and qualified electrical technicians of Ankerui Electric Co., Ltd.

##### 4.1.1 日常维护

###### 4.1.1 Routine maintenance

- a) 检查断路器及熔丝；
  - b) 检查所有电力接驳点的松紧；
  - c) 检查周边温度；
  - d) 检查设备通风情况，清理风扇网罩上的积尘。
- a) Check circuit breakers and fuses;
  - b) Check the tightness of all power connections;
  - c) Check the ambient temperature;
  - d) Check the ventilation of the equipment and clean the dust on the fan grille.

##### 4.1.2 定期维护

###### 4.1.2 Regular maintenance

每半年或更频繁些，应按以下步骤清洁和检查 ANAPF 设备。

- a) 断开 ANAPF 的进线断路器，在配电处关掉电源，确保电源不会被意外送上；
- b) 电源断开 3 分钟后，检查功率模块部分直流母排上的直流电压  $U_{dc}$  降至安全电压 ( $\leq 36V$ ) 以下，相关技术人员才能在 ANAPF 内进行维护操作，如未满足上述条件，请不要在 ANAPF 内进行任

何维护操作；

- c) 检查主进线有无松动现象；
- d) 检查电气和机械连接牢固性；
- e) 检查所有导线有无各种原因引起的损伤现象；
- f) 检查印制电路板上器件有无异常；
- g) 检查风机工作是否正常；
- h) 检查完毕后，接通电源，启动 ANAPF。

Every six months or more often, the following steps should be taken to clean and inspect the ANAPF equipment.

- a) Disconnect the ANAPF inlet circuit breaker and turn off the power at the distribution station to ensure that the power supply will not be accidentally delivered;
- b) After the power supply is disconnected for 3 minutes, check that whether the DC voltage on the DC busbar of the power module has fallen below the safe voltage ( $\leq 36V$ ), and the relevant technicians can perform maintenance operations within ANAPF. If the above conditions are not met, please do not perform any maintenance operations within ANAPF;
- c) Check the main line for looseness;
- d) Check the electrical and mechanical connection firmness;
- e) Check all conductors for damage caused by various causes;
- f) Check for abnormalities in the components on the printed circuit board;
- g) Check if the fan is working properly;
- h) After checking, turn on the power and start ANAPF.

#### 4.1.3 故障排查

#### 4.1.3 Troubleshooting

ANAPF 在正常工作过程中可能会因为电网电压波动过大、主电路临时断电、安装过程中的一些误操作等而引起的一些常见故障及相应的排查方法，如表 4-1 所示。

In the normal working process of ANAPF, some common faults and corresponding troubleshooting methods that may be caused by excessive voltage fluctuations of the grid, temporary power interruption of the main circuit, and some misoperations in the installation process are listed in Table 4-1.

表 4-1 常见故障及排除方法

Table 4-1 Common Faults and Troubleshooting Methods

序号 No.	故障现象 Fault phenomenon	排除方法 Method of exclusion	备注 Note
1	<p>ANAPF 上电后，液晶屏上“AB 线电压”或“BC 线电压”显示电压不在 <math>380V \pm 10\%</math> 范围内，系统当前状态显示“停机（故障）”；</p> <p>After ANAPF is powered on, “AB line voltage” or “BC line voltage” display voltage on the LCD screen is not within <math>380V \pm 10\%</math>, and the current state of the system displays “stop (failure)”;</p>	<p>用万用表交流电压档测量断路器上桩头电压：</p> <p>1、如果三相电压显示异常，再检查三相主电路熔断器是否熔断；</p> <p>2、如果三相电压显示正常，再检查三相电压采样熔断器是否熔断；</p> <p>3、如果以上熔断器都是完好无损，那么用示波器测量线电压采样板的输出信号是否正确；</p> <p>Measure the voltage at the top of the circuit breaker with the multimeter's AC voltage range:</p> <p>1. If the three-phase voltage is abnormal, check whether the three-phase main circuit fuse is blown.</p> <p>2. If the three-phase voltage is normal, check whether the three-phase voltage sampling fuse is blown.</p> <p>3. If the fuses above are intact, then use an oscilloscope to measure the output signal of the line voltage sampling board whether is correct or not;</p>	<p>断相或缺相</p> <p>Phase failure or phase loss</p>
2	<p>ANAPF 上电后，自检结果为“停机（正常）”，但是点击启动按钮，直流电压显示没有变化，几秒钟后，系统当前状态显示“停机（故障）”；</p>	<p>1、检查断路器是否闭合；</p> <p>2、如果断路器确定闭合，那么检查延时继电器的延时时间是否设定为 3s 左右；</p> <p>1. Check the circuit breaker is closed or</p>	<p>操作错误</p> <p>Operation error</p>



	After the ANAPF is powered on, the self-test result is "stop (normal)". But clicking the start button, the DC voltage display does not change, after a few seconds, the current status of the system shows "stop (failure)";	not; 2. If the circuit breaker is determined to be closed, then check if the delay time of the delay relay is set up to about 3s;	
3	ANAPF 上电后, 自检结果为“停机(正常)”, 但是点击启动按钮, 直流电压在预充电过程中, 液晶屏显示“停机(故障)”, 故障类型为“驱动板故障”或者“输出过流故障”; After ANAPF is powered on, the self-test result is "stop (normal)". But clicking the start button, the DC voltage is in the pre-charging process, the LCD screen displays "stop (failure)", and the failure type is "drive board failure" or "overcurrent output fault";	1、如果柜子是第一次上电, 那么检查驱动板和控制器的光纤连接线是否正确; 2、检查主电路相序是否正确; 1. If the cabinet is powered on for the first time, check if the fiber optic cables of the driver board and controller are correct. 2. Checking the main circuit phase sequence is correct or not;	错相 Wrong phase
4	ANAPF 上电后, 启动运行正常, 但是当启动补偿选项时, ANAPF 输出电流不断增大, 同时电抗器声音也在逐渐变大; After the ANAPF is powered on, the start-up operation is normal, but when the compensation option is started, the output current of the ANAPF continuously increases and the reactor sounds gradually increase.	1、检查互感器的安装位置, ANAPF 的互感器安装位置有网侧安装和负载侧安装两种方式, 具体采用哪种安装方式, 根据实际订单为准; 2、互感器接线错误, 也会出现这种现象, 互感器的具体接线参考 2.4.2; 1. Check the installation position of the transformer. ANAPF has two installation methods for installation of the transformer and load side. The specific installation method is based on the actual order. 2. There will be this phenomenon-transformer wiring error, the specific wiring of the transformer reference 2.4.2;	互感器安装位置错误 Transformer installation position is wrong

5	<p>ANAPF 上电后，液晶屏显示负载电流和实际负载电流显示数值相差较大；</p> <p>After ANAPF is powered on, the LCD display shows a large difference between the load current and the actual load current.</p>	<p>1、检查互感器变比，是否和订单中要求的互感器变比一致；</p> <p>1. Check transformer ratio, if it is consistent with the transformer ratio required in the order;</p>	<p>互感器选型错误</p> <p>Transformer selection error</p>
6	<p>ANAPF 上电后，启动运行正常，当启动补偿选项时，负载电流变化比较稳定，但是柜子输出电流变化比较大，而且没有规律性；</p> <p>After the ANAPF is powered on, the start-up operation is normal. When the compensation option is started, the load current is relatively stable, but the output current of the cabinet is relatively large and there is no regularity.</p>	<p>1、检查互感器采样线是否和柜子主电路接线一起困扎或走线太近；</p> <p>1. Check whether the transformer sample line is trapped or routed too close to the main circuit wiring of the cabinet.</p>	<p>互感器布线错误</p> <p>Transformer wiring error</p>

## 4.2 售后服务

### 4.2 After-sale Service

本公司产品保修 1 年，保修期从产品出厂之日算起。若保修期内产品出现故障或零件损坏，经技术人员鉴定属于正常使用下所发生的，本公司将提供免费维修。

The company's products have a one-year warranty, and the warranty period starts from the date of shipment. If the product fails or the parts are damaged during the warranty period, the technicians will provide free maintenance if they are identified by the technicians as belonging to normal use.

如下情形，将收取材料成本及维修工时费用：

- (1) 未按使用说明书中的规定所导致的损坏状况；
- (2) 擅自拆焊零件或修改而导致的损坏状况；

In the following cases, material costs and maintenance work hours will be charged:

- (1) Damages not caused by the regulations in the instructions for use;
- (2) Damage caused by unauthorized demolition of parts or modifications;

本公司的技术人员将负责产品的安装、调试及优化等工作，提供全面的培训、维护、咨询等服务。产品出现故障,我方会在收到通知后 4 小时内响应，24 小时内派富有经验的技术人员并携带工具到现场作维修服务。

The company's technical staff will be responsible for product installation, commissioning and optimization, and provide comprehensive training, maintenance, consulting and other services. When the product fails, we will respond within 4 hours after receiving the notification. Within 24 hours, we will send experienced technicians carrying tools to the site for maintenance services.

本着优质的服务宗旨，未尽事宜，本公司将与用户协商解决，当双方无法协商解决时，则共同以《中华人民共和国消费者保护法》作为解决问题的依据。

In line with the principle of high quality service and unfinished business, the company will negotiate with users for settlement. When both parties cannot negotiate a settlement, they will jointly use the "Consumer Protection Law of the People's Republic of China" as the basis for solving the problem.

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The power of interpretation of this manual belongs to Acrel Electric Co., Ltd.

有关使用本公司产品的问题及保修服务，请拨打服务热线：

传真：(86)21-69158303 69158339

通信地址：上海市嘉定区育绿路 253 号

邮编： 201801

网址： <http://www.acrel.cn>

For more information regarding the use of our products and warranty service, please call the service hotline:

800-820-6632 (86)21-69158300 69158301 69158302

Fax: (86)21-69158303 69158339

Mailing address: No.253, Yulv Road, Jiading District, Shanghai

Zip code: 201801

Website: <http://www.acrel.cn>

## 装箱清单

## Packing List

序号 No.	名称 Name	单位 Unit	数量 Qty.	备注 Note
1	ANAPF 有源电力滤波器 ANAPF Active Power Filter	台 Set		
2	互感器 Transformer	个 Piece		
3	柜门钥匙 Cabinet key	把 Bunch		
4	检验合格证 Inspection certificate	张 Sheet		
5	ANAPF 有源电力滤波器安装使用说明书 ANAPF Active Power Filter Installation Instructions	本 Volume		
6				
7				
8				
9				
10				

总部：安科瑞电气股份有限公司

地址：上海市嘉定区育绿路 253 号

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PC: 201801

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地址：江阴市南闸镇东盟工业园区东盟路 5 号

Production Base: Jiangsu Acrel Appliance Manufacture Co., Ltd

Address: No.5 Dongmeng Road , Dongmeng Industrial Park, Nanzha Town, Jiangyin

Tel: (86)0510-86179966 86179967 86179968

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