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AM5-M-Q 电动机保护装置
AM5-M-Q Motor Protection Device

使用说明书 V1.1

Instruction Manual V1.1

安科瑞电气股份有限公司
Acrel Electric Co.,Ltd

申　明

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1 装置介绍

1 Device Introduction

1.1 概述

1.1 Overview

AM5-M-Q 微机保护测控装置（以下简称装置）集保护、控制、测量、通讯和监视功能于一体，资源丰富、配置完善、维护方便、稳定可靠，适用于 35kV 及以下电压等级电力系统的保护和测控。应用领域覆盖电力、水利、交通、石油、化工、煤炭、冶金等行业。

AM5-M-Q microcomputer protection measurement and control device (hereinafter referred to as the device) integrates the functions of protection, control, measurement, communication and monitoring, which has the characteristics of rich resources, perfect configuration, easy maintenance and stable reliability. The device can be used to protect and control the user substation which the input voltage is 35kV or below, and is be widely used to Power industry, Water conservancy industry, Traffic Industry, Oil industry, Chemical industry,Coal Industry,Metallurgical Industry and so on.

装置硬件设计采用可靠性配置，软件配以专门的保护算法，抗干扰性能强，可靠性高，保护实现方式灵活，能与 Acrel-2000Z 变电站综合自动化系统配套使用，为电力系统的安全可靠运行提供保障。

The hardware design of the device adopts a reliability configuration, and the software adopts a specialized protection algorithms, with the advantages of strong anti-interference performance, high reliability, and flexible protection implementation. The device can be used to communicate with Acrel-2000Z substation integrated automation system to ensure the safe and reliable operation of the power system.

1.2 特点

1.2 Features

高性能的硬件平台

- **High-performance hardware platform**

装置采用主频为 168MHz 的处理器，16 位同步采样 A/D，每周波 48 点高速采样、实时并行计算；配置 512K 字节 Flash、（192+4）K 字节 Sram、外置 4M 字节 NorFlash、外置 512K 字节 Sram，硬件资源充足，可靠性高。

The device has a 168MHz processor, 16-bit synchronous sampling A/D, 48 points high-speed sampling per cycle, and real-time parallel computing. The device has sufficient hardware resources and high reliability, with 512K bytes Flash, (192 + 4) K bytes Sram, external 4M bytes NorFlash, external 512K bytes Sram,

装置硬件包括电源模块、CPU 模块、开入开出模块、控制回路模块、模拟量采集、通讯模块等采用模块化设计，适用于高压电动机的保护和自动控制。

The hardware of the device includes modules of power supply, CPU, DI/DO , trip-and-close circuit, analog acquisition, communication, etc. The modularization design is suitable for the protection and automatic control of high-voltage motors.

丰富的接口资源

- **Rich interface resources**

12 路（可扩展到 14 路）交流电压/电流通道，测量三相电流、两路零序电流、三相电压、零序电压、有功功率、无功功率、功率因数、频率、有功电能、无功电能。保护电流的测量不仅反映基波，还可以通过逻辑可编程软件增加测量 2~10 次谐波，具有带谐波制动的保护功能。

12 AC voltage/current channels (expandable to 14) can measure three-phase current, two-way zero-sequence current, three-phase voltage, zero-sequence voltage, active power, reactive power, power factor, frequency, active power, and reactive power. The measurement of protection current not only reflects the first harmonic, but it can also increase the measurement of the second to tenth harmonics via logic programmable software, with the protection function of harmonic restraint.

具有 2 路 4～20mA 直流模拟量变送输出，可通过逻辑可编程软件自定义变送量。

The device has two-way 4-20mA DC analog output, which can be customized by logic programmable software.

自带操作回路，可自适应 0.25~5A 开关跳合闸电流。

Self-operating circuit, adaptive to 0.25~5A switch trip-and-close current.

20 路有源开关量输入通道、除操作回路外独立 10 路无源开关量输出通道。

20 active switch input channels and 10 independent passive switch output channels in addition to the trip-and-close circuit.

具有 2 路 RS485 串行通讯接口，支持 IEC60870-5-103、Modbus-RTU 规约；2 路以太网接口，支持 TCP IEC60870-5-103、TCP Modbus-RTU 规约。

2-way RS485 serial communication interface, supporting IEC60870-5-103 and Modbus-RTU protocol; 2-way Ethernet interface, supporting TCP IEC60870-5-103 and TCP Modbus-RTU protocol.

具有 GPS 对时功能，可采用硬接点分脉冲或秒脉冲方式，也支持 IRIG-B 对时方式（RS485 接口）。

GPS time synchronization function can be achieved by hard contact pulse per minute or pulse per second. The device also supports IRIG-B time synchronization (RS485 interface).

带一个 RS232 接口，可通过 USB 转 232 数据线升级装置程序，还可上传装置定值、动作事件信息和故障录波数据，方便现场事故分析。

With an RS232 interface, the device program can be upgraded via USB to 232 data cable, which can also upload setting value, action event information, and fault recorder to facilitate on-site accident analysis.

带一个 UBS 接口，可通过 U 盘升级装置程序，也可导出装置的定值、故障录波数据，方便故障分析。

With a UBS interface, the device program can be upgraded through a U disk, and the device's setting value and fault recording data can also be exported, which is convenient for fault analysis.

人性化

- **Humanization**

装置采用全汉化大屏幕液晶显示，人机界面清晰易懂。

The device adopts full Chinese large screen LCD display, the human-machine interface is clear and easy to understand.

灵活、舒适的按钮设计，菜单式操作简单、便捷。

Flexible and comfortable button design, simple and convenient menu operation

保护功能的出口可通过跳闸矩阵进行设置，方便用户选择要动作的继电器。

The outlet of the protection function can be set by tripping matrix, which is convenient for users to select the relay to be operated.

配备计算机界面的调试与分析软件，调试及维护简单方便。

The debugging and analysis software of the computer interface is simple and convenient for debugging and maintenance.

透明化

- **Transparency**

实时记录交流量、开入量、开出量和所有保护模块的状态。

Real-time recording of AC, DI, DO and the status of all protection modules.

装置记录内部各元件动作行为、动作时间和录波数据，共可记录 16 条故障录波，每条录波可触发 12 次录波，每次录波可录故障前 8 个周波、故障后 4 个周波波形，共计 46s。每个采样点录波至少包含 12 个模拟量、10 个开关量波形。

The device records the action behavior, action time, and wave recording data of every internal component. It can record total 16 fault waves, and every recording can trigger 12 other recordings, which can record 8 cycles before the fault and 4 cycles after the fault, for a total of 46s. Every sampling point recording contains at least 12 analog and 10 switching waves.

可靠性设计

- **Reliability design**

装置采用全图形编程技术设计每个保护功能，以提高程序的可靠性及正确性。

The device uses full graphic programming technology to design each protection function to improve the reliability and correctness of the program.

软硬件具有持续完善的自检功能，抗干扰性能好，装置通过多项电磁兼容检测认证，电快速瞬变脉冲群、静电放电、浪涌抗干扰性能均达到 IV 级标准。

The hardware and software have continuous and perfect self-test function and good anti-interference performance. The device has passed several EMC test certifications, and its electrical fast transient, electrostatic discharge and surge anti-interference performance have all reached the Class IV standard.

2 技术参数

2 Technical Parameters

2.1 额定参数

2.1 Rated Parameters

2.1.1 工作电源

2.1.1 Working Power Supply

额定电压：AC/DC 110V 或 AC/DC 220V

Rated voltage: AC/DC 110V or AC/DC 220V

范　　围：额定电压×（1±20%）

Range: Rated voltage × (1±20%)

功　　耗：≤15 VA

Power consumption: ≤15 VA

2.1.2 输入激励电压

2.1.2 Input Excitation Voltage

额 定 值：线电压 AC 100V 或相电压 100/V

Rated value: Line voltage AC 100V or phase voltage 100/V$\sqrt{3}$

测量范围：0.1V～120V

Measurement range: 0.1V～120V

准 确 度：±1%

Accuracy: ±1%

功率损耗：每相功率损耗不大于 0.5VA

Power consumption: ≤0.5VA (each phase)

过载能力：1.2 倍额定电压，连续工作；

2 倍热过载，允许 10s。

Overload capacity: 1.2 times rated voltage for continuous work;

2 times thermal for 10s.

2.1.3 输入激励电流（保护电流）

2.1.3 Input Excitation Current (Protection Current)

额 定 值：AC 5A 或 1A

Rated value: AC 5A or 1A

测量范围：0.04In～20In

Measurement range: 0.04In～20In

功率损耗：每相功率损耗不大于 0.5VA

Power consumption: ≤0.5VA (each phase)

过载能力：2 倍额定电流，连续工作；

40 倍额定电流，允许 1s。

Overload capacity: 2 times rated current for continuous work;

40 times rated current for 1s.

2.1.4 输入激励电流（测量电流）

2.1.4 Input Excitation Current (Measurement Current)

额 定 值：AC 5A 或 1A

Rated value: AC 5A or 1A

测量范围：0.04In～1.5In

Measurement range: 0.04In～1.5In

功率损耗：每相功率损耗不大于 0.5VA

Power consumption: ≤0.5VA (each phase)

过载能力：1.5 倍额定电流，连续工作；

4 倍额定电流，允许 1s。

Overload capacity: 1.5 times rated current for continuous work;

4 times rated current for 1s.

2.1.5 频率

2.1.5 Frequency

额定频率：50Hz 或 60Hz

Rated frequency: 50Hz or 60Hz

频率范围：47～63Hz

Frequency range: 47 ~ 63Hz

准 确 度：±0.1Hz

Accuracy: ±0.1Hz

2.1.6 开关量输入

2.1.6 Digital Input

额定电压：AC/DC 110V 或 AC/DC 220V

Rated voltage: AC/DC 110V or AC/DC 220V

电压范围：额定电压×（1±20%）

Voltage range: rated voltage × (1 ± 20%)

功率消耗：每通道功率消耗≤1W（DC220V）

Power consumption: ≤ 1W (each phase) (DC220V)

2.1.7 开关量输出

2.1.7 Digital Output

机械寿命：≥10000 次

Mechanical life: ≥ 10000 times

接通容量：≥1000W, L/R = 40ms

Turn-on capacity: ≥ 1000W, L / R = 40ms

导通电流：连续≥5A，短时（200ms）≥30A

On current: ≥ 5A continuous, short time (200ms) ≥ 30A

断开容量：≥30W, L/R = 40ms

Interrupting capacity: ≥ 30W, L/R = 40ms

2.2 主要技术性能

2.2 Main Technical Performance

电压元件：整定值容许误差应不大于±3%；过压返回系数 0.95，欠压返回系数 1.05；

Voltage element：The allowable error of setting value should not be greater than ±3%; the return coefficient of overpressure should be 0.95, and the return coefficient of underpressure should be 1.05；

电流元件：整定值容许误差应不大于±3%；过流返回系数 0.95，欠流返回系数 1.05；

Current element：The allowable error of setting value should not be greater than ±3%; the return coefficient of overcurrent should be 0.95, and the return coefficient of undercurrent should be 1.05；

频率元件：整定值容许误差应不大于±0.02 Hz；

Frequency element：The allowable error of setting value should not be greater than ±0.02 Hz；

比较元件：过量比较元件返回系数为 0.95，欠量比较元件返回系数 1.05；

Comparison element: The return coefficient of over-comparison element is 0.95, and the return coefficient of under-comparison element is 1.05;

反时限元件：反时限动作时间误差为±5%或±40ms；返回系数：0.95；

Inverse time element：The time error of the inverse time limit action is ±5% or ±40ms, and the return coefficient is 0. 95；

时间元件：延时时间 2s 内误差≤40ms；延时时间大于 2s，误差≤（2%）整定值±40ms。

Timing element：When delay time is within 2 seconds, error is ≤40ms; when delay time is more than 2 seconds, error is ≤ 2% and tuning value is ±40ms.

2.3 正常工作环境条件

2.3 Normal Working Conditions

环境温度： -10℃～＋55℃；

Ambient temperature: 10℃～＋55℃;

装置的贮存、运输允许的环境温度为-25℃～＋70℃；

The storage and transportation of the device allows the ambient temperature of 25℃～＋70℃;

相对湿度：5%～95%（产品内部不凝露，不结冰）；

Relative humidity: 5%～95% (no condensation and no ice is inside the product);

海拔高度：≤2000m；

Altitude: ≤ 2000m;

防护等级：IP20。

Protection grade: IP20.

2.4 绝缘性能

2.4 Insulation Performance

绝缘电阻：>100MΩ, 500Vdc

Insulation resistance: >100MΩ, 500Vdc

介质强度：回路和地之间，独立回路之间：工频耐压 2kV

Dielectric strength: between circuit and ground, between independent circuits: frequency withstand voltage 2kV

冲击电压：±5kV(1.2/50μs, 0.5J)

Impulse voltage: ±5kV (1.2/50μs, 0.5J)

2.5 电磁兼容性能

2.5 Electromagnetic Compatibility Performance

	试 验 项 目 Test items	要　　求 Requirement
1	辐射发射限值检验 Radiation emission limit test	满足 GB/T 14598.26-2015 规定 Meet the provisions of GB/T 14598.26-2015
2	传导发射限值检验 Conduction emission limit test	满足 GB/T 14598.26-2015 规定 Meet the provisions of GB/T 14598.26-2015
3	射频电磁场辐射抗扰度 RF electromagnetic field radiation immunity	满足 GB/T 14598.26-2015 规定，严酷等级 10V/m Meet the provisions of GB/T 14598.26-2015, severity is 10V / m
4	静电放电抗扰度 Electrostatic discharge immunity	满足 GB/T 14598.26-2015 规定，严酷等级为 IV 级 Meet the provisions of GB/T 14598.26-2015, severity is IV level
5	射频场感应传导骚扰抗扰度 RF field induction conducted disturbance immunity	满足 GB/T 14598.26-2015 规定，严酷等级骚扰电平 10V Meet the provisions of GB/T 14598.26-2015, severity is 10V
6	电快速瞬变脉冲群抗扰度 Electrical fast transient immunity	满足 GB/T 14598.26-2015 规定，严酷等级为 A 级 Meet the provisions of GB/T 14598.26-2015, severity is A level
7	慢速阻尼振荡波抗扰度	满足 GB/T 14598.26-2015 规定，共模 2.5kV，差模 1kV

	Slow damped oscillation wave immunity	Meet the provisions of GB/T 14598.26-2015, common mode is 2.5kV, differential mode is 1kV
8	浪涌抗扰度 Surge immunity	满足 GB/T 14598.26-2015 规定，严酷等级为 IV 级 Meet the provisions of GB/T 14598.26-2015, severity is IV level
9	交流和直流电压暂降中断影响试验 AC and DC voltage sag interruption impact test	满足 GB/T 14598.26-2015 规定 Meet the provisions of GB/T 14598.26-2015
10	工频磁场抗扰度 Power frequency magnetic field immunity	满足 GB/T 14598.26-2015 规定，严酷等级为 IV 级 Meet the provisions of GB/T 14598.26-2015, severity is IV level

3 装置操作说明

3 Device Operating Instructions

3.1 前面板说明

3.1 Surface Description

装置的人机交互主要在面板上进行，包括四个部分：液晶显示、LED 灯指示、按键和 RS232（DB9）维护口。

The human-machine interaction of the device is mainly carried out on the panel, including four parts: LCD display, LED indication, buttons and RS232 (DB9) maintenance port.

液晶显示屏采用 256*160 点阵，可以显示测量电流、电压、功率等电参量实时值，遥信量，事件记录，装置参数，定值参数，时间，装置版本号信息等。

The LCD display adopts 256*160 dot matrix, which can display the real-time values of electric parameters such as measured current, voltage, power, etc., telematics, event records, device parameters, setting value parameters, time, device version number information, etc.

LED 灯用来指示装置的运行状态、保护动作等信息，具体指示内容可根据用户需要进行任意配置，图 3.1 中为出厂默认配置。

LED lights are used to indicate the operation status of the device, protection action and other information. The specific instructions can be configured according to the user's needs. The factory default configuration is shown in Figure 3.1

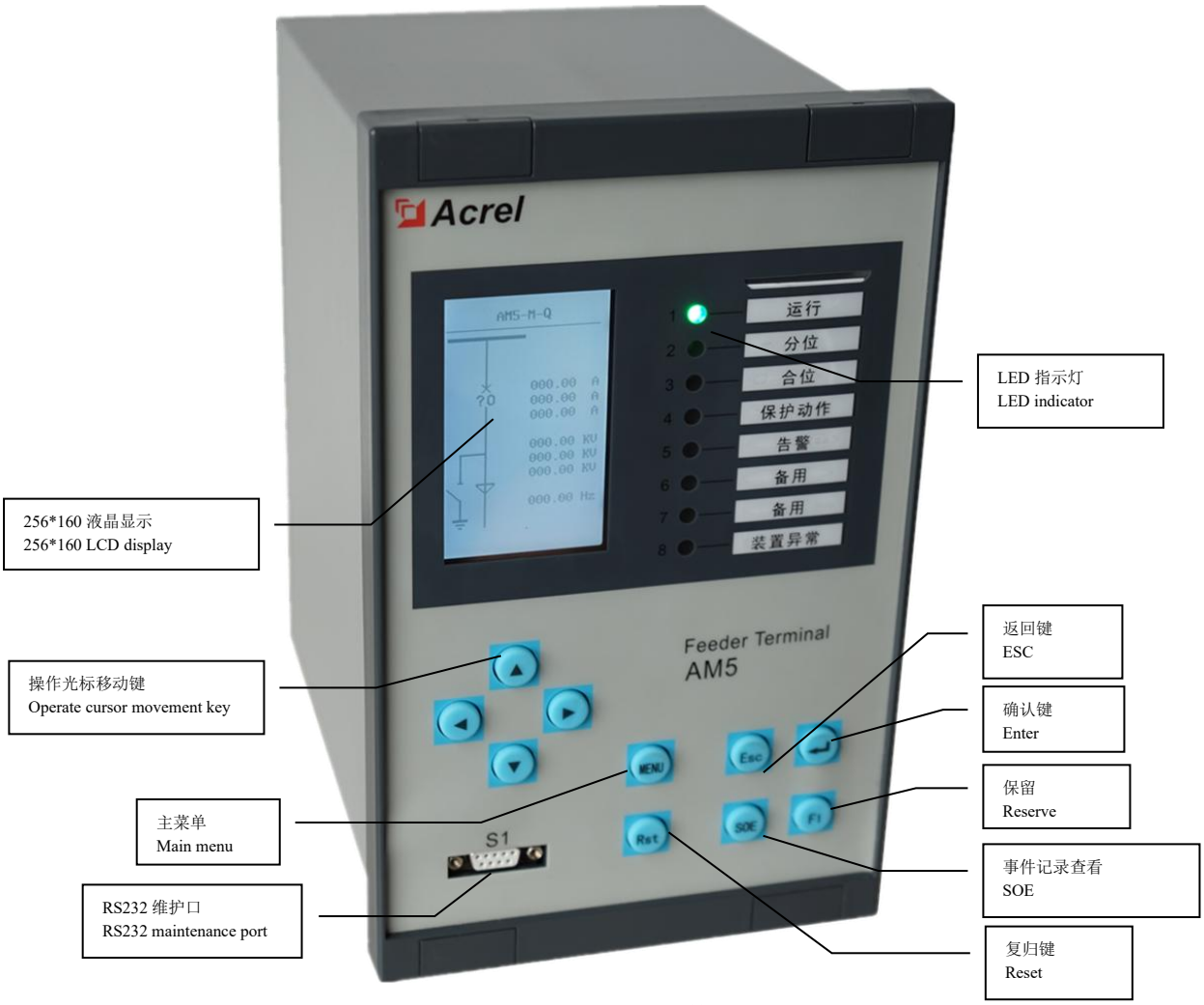


图 3.1　AM5-M-Q 前面板

Figure 3.1 AM5-M-Q surface

3.2 按键说明

3.2 Key Description

按键包括上、下、左、右、确认键、返回键及功能键，实现人机交互功能。

The keys include up, down, left, right, confirm, return and function keys to realize the human-machine interaction function.

表 3.1 AM5-M-Q 按键功能说明

Table 3.1 AM5-M-Q key function description

按键 Key	主要功能 Main Function	按键 Key	主要功能 Main Function
MENU	主菜单 Main Menu	▲	向上移动选项或数字增大 Up/Increase
Rst	复归 Reset	▼	向下移动选项或数字减小 Down/Decrease

Esc	返回 Back	◀	向左移动选项或页面前翻 Left/Page Forward
↵	确认 Enter	▶	向右移动选项或页面后翻 Right/Page Back
SOE	事件记录查看 SOE	F1	保留 Reserve

3.3 菜单说明

3.3 Menu Description

装置上电即进入主界面，主界面分四个界面显示：运行界面、遥测界面、遥信界面、DO 配置界面，如图 3.2～3.5 所示。各个界面之间可以通过左右键来切换显示。

The device is powered on and enters the main interface, which is divided into four interfaces: operation interface, telemetry interface, telematics interface, DO configuration interface, as shown in Figure 3.2~3.5. Each interface can be switched between the left and right keys to display.

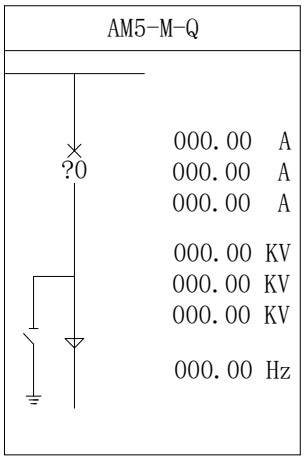


图 3.2 运行界面

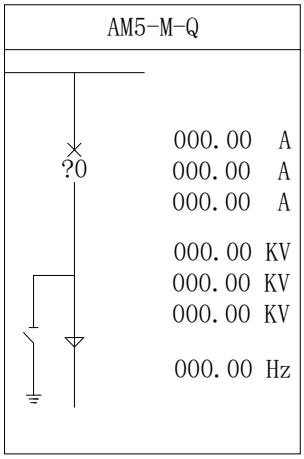


Figure 3.2 Operation interface

遥测		
Ia	0000.000	A
Ib	0000.000	A
Ic	0000.000	A
I1	0000.000	A
I2	0000.000	A
Iav	0000.000	A
I01	0000.000	A
I02	0000.000	A
3I0	0000.000	A
IA	0000.000	A
IB	0000.000	A
IC	0000.000	A

遥测		
UAB	0000.000	V
UBC	0000.000	V
UCA	0000.000	V
U4	0000.000	V
Fr	0000.000	Hz
dFr	0000.000	Hz/S
P	0000.000	KW
PF	0000.000	
U1	0000.000	V
U2	0000.000	V
3U0	0000.000	V
Uav	0000.000	V

遥测		
U20	0000.000	V
Q	0000.000	KVar
Ep	0000.000	kw*h
Eq	0000.000	kw*h
AO_1	0000.000	mA
AO_2	0000.000	mA
Ia_H2	0000.000	A
Ib_H2	0000.000	A
Ic_H2	0000.000	A
Uub	0000.000	%
Iub	0000.000	%
S	0000.000	KW

图 3.3 遥测界面

RemoteMeter		
Ia	0000.000	A
Ib	0000.000	A
Ic	0000.000	A
I1	0000.000	A
I2	0000.000	A
Iav	0000.000	A
I01	0000.000	A
I02	0000.000	A
3I0	0000.000	A
IA	0000.000	A
IB	0000.000	A
IC	0000.000	A

RemoteMeter		
UAB	0000.000	V
UBC	0000.000	V
UCA	0000.000	V
U4	0000.000	V
Fr	0000.000	Hz
dFr	0000.000	Hz/S
P	0000.000	KW
PF	0000.000	
U1	0000.000	V
U2	0000.000	V
3U0	0000.000	V
Uav	0000.000	V

RemoteMeter		
U20	0000.000	V
Q	0000.000	KVar
Ep	0000.000	kw*h
Eq	0000.000	kw*h
AO_1	0000.000	mA
AO_2	0000.000	mA
Ia_H2	0000.000	A
Ib_H2	0000.000	A
Ic_H2	0000.000	A
Uub	0000.000	%
Iub	0000.000	%
S	0000.000	KW

Figure 3.3 RemoteMeter interface

遥信	
合闸位置	分
分闸位置	分
运行位置	分
试验位置	分
接地刀闸	分
远方指示	分
弹簧未储能	分
备用6	分
非电量1	分
非电量2	分
热复归	分
转速低	分

遥信	
手动分闸	分
手动合闸	分
备用5	分
信号复归	分
负荷开关合位	分
负荷开关分位	分
备用2	分
备用1	分
断电检测	分
开出自检	分
合后位置	分
手分监视	分

遥信	
合位监视	分
分位监视	分
手合监视	分

图 3.4 遥信界面

RemoteSignal	
CB ON	OFF
CB OFF	OFF
Work Posi.	OFF
Test Posi.	OFF
GroundSwitch	OFF
Remote	OFF
Discharge	OFF
Spare6	OFF
Non-elec.1	OFF
Non-elec.2	OFF
Heat Recovery	OFF
Low Speed	OFF

RemoteSignal	
ManualTrip	OFF
ManualClose	OFF
Spare5	OFF
ResetSignal	OFF
LoadSW.On	OFF
LoadSW.Off	OFF
Spare2	OFF
Spare1	OFF
Power.L.Det	OFF
DO Test	OFF
Posi.Aft.CB.On	OFF
ManualTrip.M	OFF

RemoteSignal	
CB On.M	OFF
CB Off.M	OFF
ManualClose.M	OFF

Figure 3.4 RemoteSiganl interface

遥信界面中，遥信量“断路器合位/断路器分位”可选择由断路器辅助触点或操作回路的合位监视/分位监视关联；遥信量“远方/就地”，当装置处于远方状态时，开入量“远方/就地”显示“合”，当装置处于就地状态时，开入量“远方/就地”显示“分”。

In the remote interface, "CB ON/CB OFF" can be selected to be associated with the auxiliary contact of the circuit breaker or the TWJ/HWJ in trip-and-close circuit. When the device is in the remote state, the DI "Remote" in RemoteSignal interface shows "ON".And when the device is in the local state,the DI "Remote" in RemoteSignal interface shows "OFF".

出口映射
遥控跳闸
00000 00100 00100 0
遥控合闸
00000 00000 00010 0
启动时过流一段
00000 00100 10000 0
运行时过流一段
00000 00100 10000 0
过流保护
00000 00100 10000 0
零流保护
00000 00100 10000 0

出口映射
电压幅值保护
00000 00100 10000 0
电压相序保护
00000 00100 10000 0
非电量1跳闸
00000 00100 10000 0
过热保护
00000 00100 10000 0
启动超时
00000 00100 10000 0
合闸闭锁
00000 00000 00000 1

出口映射
跳负荷开关
00010 00000 00000 0
FC闭锁出口
00000 00010 00000 0
告警出口
00000 00100 00000 0
事故总信号
00000 00000 00001 0
开出测试
11111 11111 11111 0
相序保护信号
00000 00100 00000 0

图 3.5 DO 配置界面

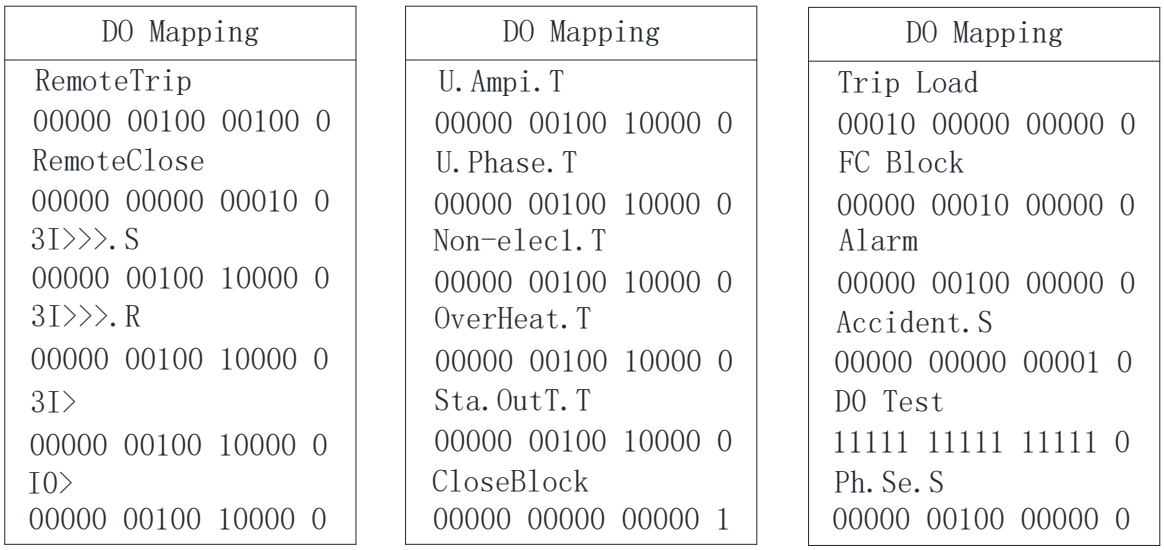


Figure 3.5 DO configuration interface

DO 类型界面中，保护功能与开出量的映射关系如下表中 1-16 位二进制数表示。

In the DO configuration interface, the mapping relationship between protection function and DO is shown in the following table with 1-15 binary digits.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

其中，1～10 分别表示无源开出 DO1～DO10；11～15 分别表示经操作回路的保护跳闸、保护合闸、遥控跳闸、遥控合闸、事故总信号；16 为内部合闸闭锁继电器。序号 1～16 其中一个若为 1 时，表示保护功能配置到该出口；若为 0 时，表示未配置到该出口。

1 – 10 represent passive DO1 – DO10 respectively; 11 – 15 represent protection tripping, protection closing, remote tripping, remote closing, and accident signal in trip-and-close circuit respectively; and 16 represents internal closing blocking relay. If one of the serial numbers 1 to 16 is 1, the protection function is configured to the outlet; if it is 0, the protection function is not configured to the outlet.

3.3.1 快速导航

3.3.1 Quick Navigation

装置菜单为多级菜单，在任一幅主界面里按“主菜单”键或者“确认”键即进入主菜单，主菜单分为 8 个子菜单，如图 3.6，由子菜单名称、图标构成。选定任一子菜单后按“确认”键进入菜单，按“返回”键返回上级菜单。图 3.7 为装置的快速导航示意图，可以依据该图迅速查找相关参数。

The device menu is a multi-level menu; to enter the main menu, press the "Main Menu" or "Enter" key in any of the main interfaces. The main menu is divided into 8 sub-menus, as shown in Figure 3.6, which consists of sub-menu names and icons. After selecting a sub-menu, click "Enter" to enter the menu, and then click "Back" to return to the main menu. Figure 3.7 is a quick navigation diagram, which can be used to quickly find the relevant parameters.

图 3.6 主菜单

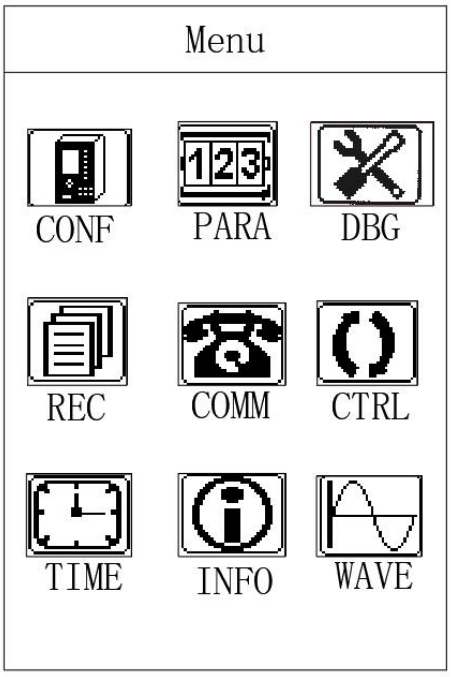


Figure 3.6 Main menu

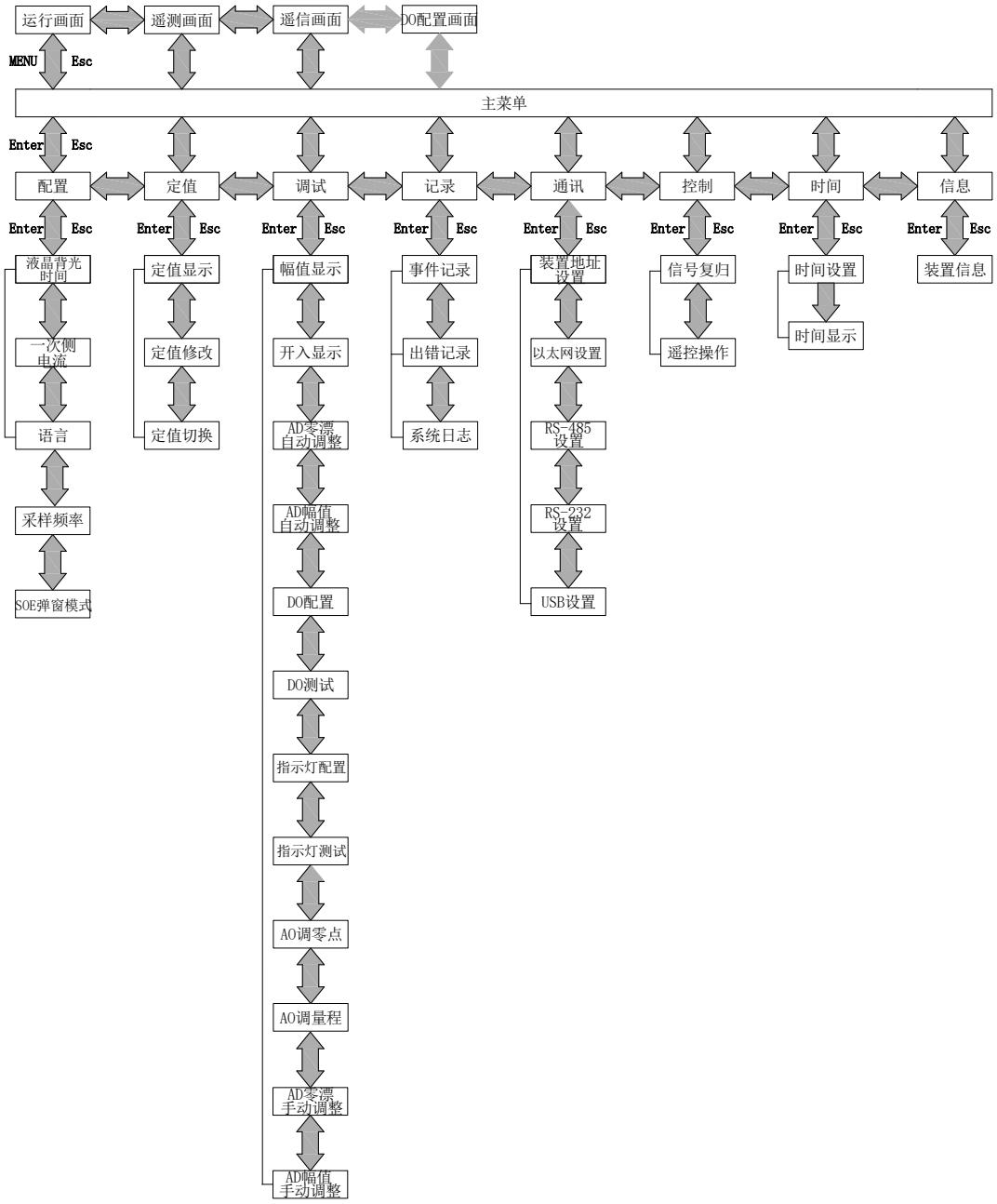

运行画面
遥测画面
遥信画面
DO配置画面
MENU
Esc
主菜单
Enter
Esc
配置
定值
调试
记录
通讯
控制
时间
信息
液晶背光时间
一次侧电流
语言
采样频率
SOE弹窗模式
定值显示
定值修改
定值切换
幅值显示
开入显示
AD零漂自动调整
AD幅值自动调整
DO配置
DO测试
指示灯配置
指示灯测试
AO调零点
AO调量程
AD零漂手动调整
AD幅值手动调整
事件记录
出错记录
系统日志
装置地址设置
以太网设置
RS-485设置
RS-232设置
USB设置
信号复归
遥控操作
时间设置
时间显示
装置信息

图 3.7 快速导航示意图

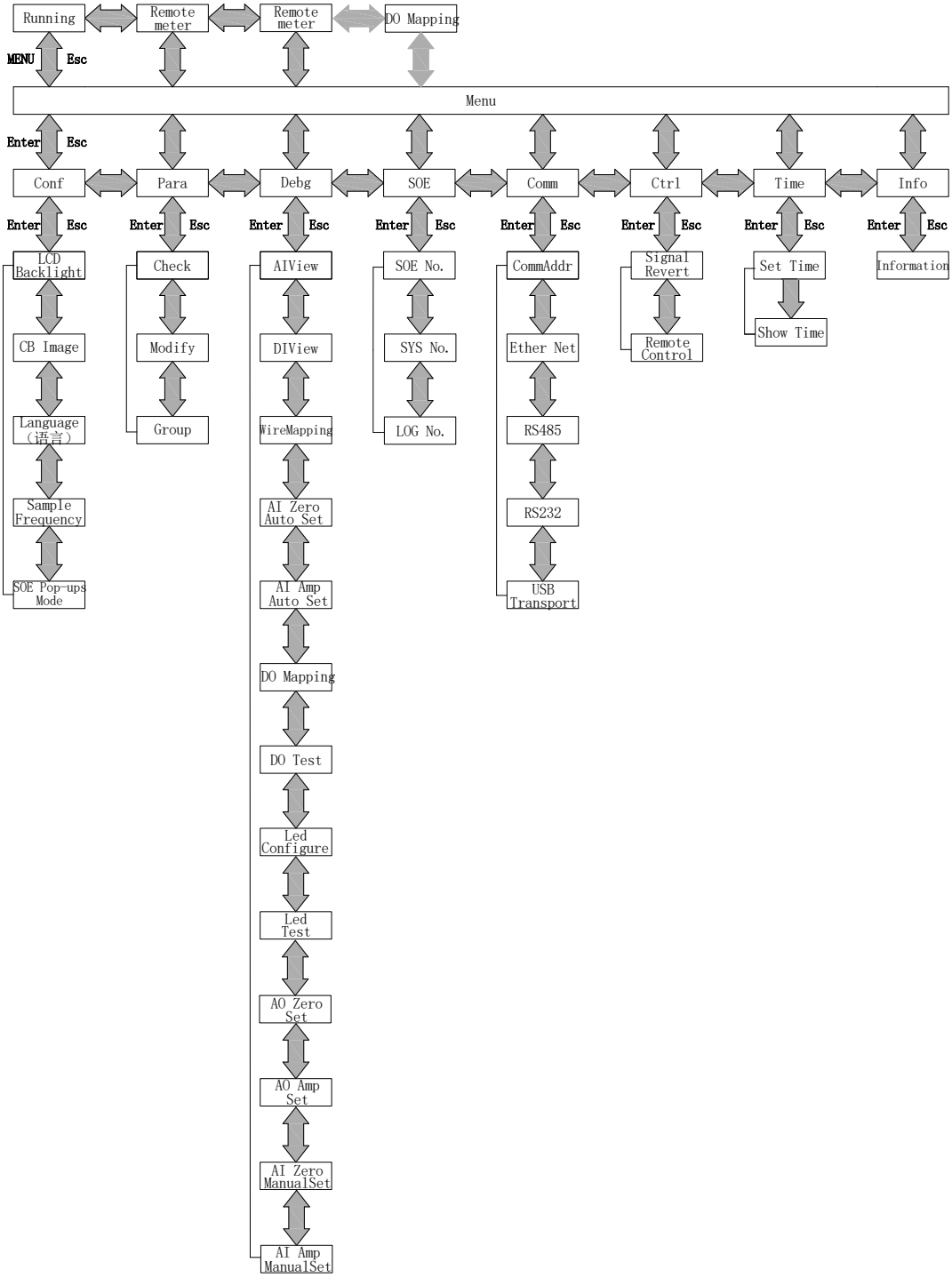


Figure 3.7 Quick navigation diagram

3.3.2 配置

3.3.2 Configuration

“配置”菜单可以设置液晶背光时间，如图 3.8，修改完成后，按“确认”键退出修改，再按“返回”键返回，装置会跳出数据保存界面，如图 3.9，按“确认”键保存修改并返回主菜单，按“返回”键不保存修改且返回主菜单。

The "Conf" menu can set the LCD backlight time, as shown in Figure 3.8; after modification, press the "Enter" button to exit the modification, and then click "Esc" button to return, the device will pop up data save interface as shown in Figure 3.9 ; press the "Enter" button to save the modification and return to the main menu; press the "Esc" button to not save the modification and return to the main menu.

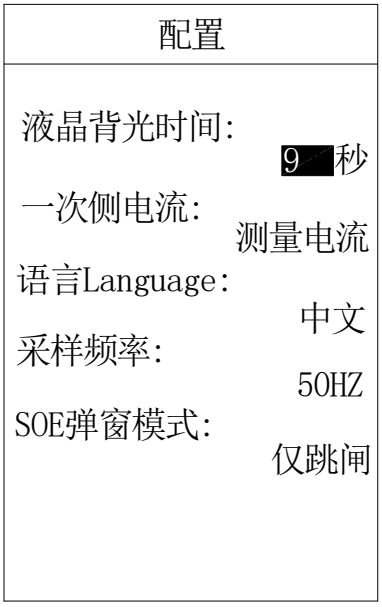


图 3.8 液晶背光时间设置

图 3.9 数据保存提示

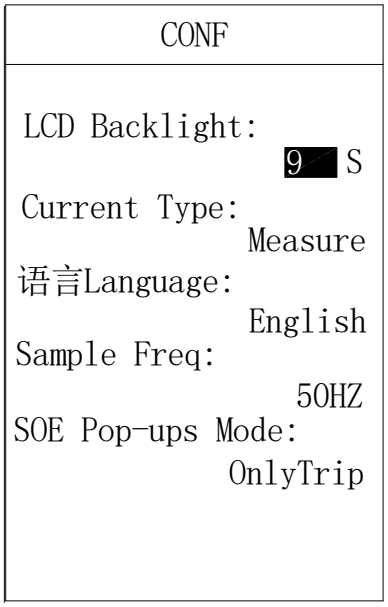
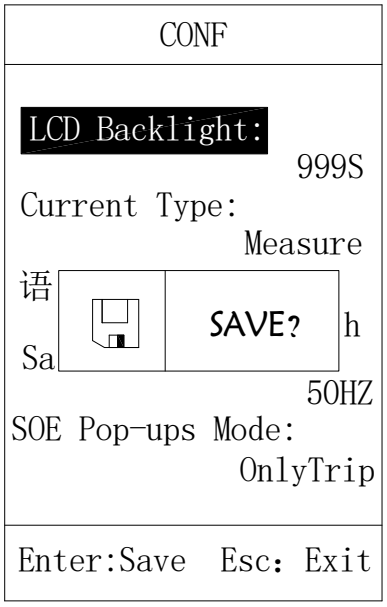


Figure 3.8 LCD backlight time setting



3.9 Data saving

3.3.3 定值

3.3.3 Parameter

“定值”菜单里有定值显示、定值修改、定值切换三个子菜单，如图 3.10。

The menu “Para.” has 3 sub-menus: Value View,Value Modify and Switch Group, as shown in Figure 3.10.

3.3.3.1 定值显示

3.3.3.1 Value View

“定值显示”菜单中有选择定值区、运行定值区两个子菜单。选择定值区里有四组有效定值，分别为 00、01、02、03 四个区号，选择相应区号，如图 3.11，按“确认”键进入定值显示。所有定值分页显示，按左右键可分页查看，如图 3.12。运行定值区里显示装置当前运行的定值区。

The "Value View" menu has two sub-menus: selected value section and running value section. The selected value section has 4 section: 00, 01, 02, and 03, as shown in Figure 3.11. Each section can be set different values, and press the "Enter" key to enter the "Value View". All values are displayed in pages; press left and right keys to navigate through them, as shown in Figure 3.12. The running value section shows the current running value section of the device.

图 3.10 定值菜单

图 3.11 设置选择定值区

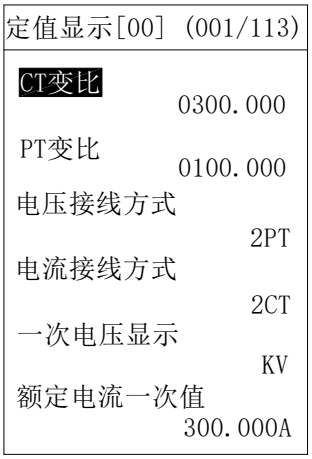


图 3.12 定值显示

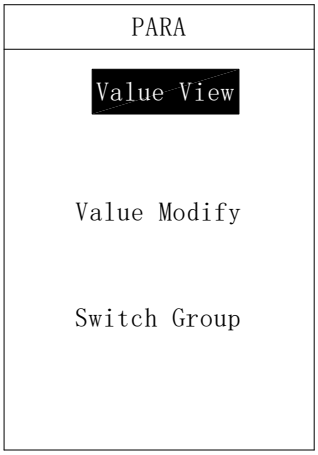


Fig. 3.10 Parameter

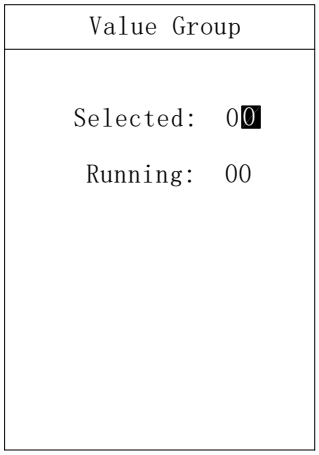


Fig. 3.11Selection area

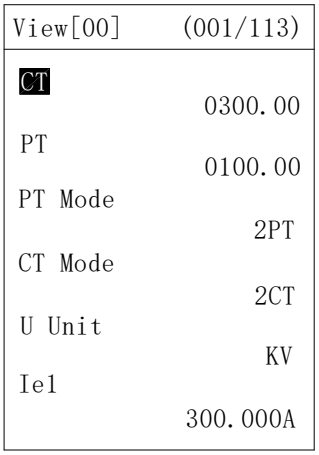


Fig. 3.12 Value View

3.3.3.2 定值修改

3.3.3.2 Value Modify

“定值修改”菜单有选择定值区、运行定值区两个子菜单，该菜单初始密码为“0008”。

The "Value Modify" menu has two sub-menus: selected value section and running value section, the initial password for this menu is "0008".

在选择定值区内设置需修改的定值区号，按“确认”键进入定值修改界面。这里分页显示所有定值信息，可通过上下左右键选择需修改的定值，先按“确认”键，再按上下键设置修改内容，如图 3.14。修改完成后，按“确认”键确定，再对下一个需修改的定值进行修改，待全部定值修改完成后，再按“返回”键退出，这时若数据有改动，则装置会弹出同图 3.9 所示的数据保存对话框，按“确认”键保存修改并返回定值管理菜单，按“返回”键不保存且返回定值管理菜单。

Set the value area code to be modified in the selected value section, and press“Enter”to enter the value modification interface. Here pagination displays all the value information. Use the up/down/left/right keys to select the value to be modified, and press the “Enter” button first, then press the up and down key to set the modified content, as shown in Figure 3.14. After the set is completed, press the“Enter”button, then set the next one as the same way. When all the setting is completed, press“Esc”button to exit. At this time if the data changes, the device will pop up with the data dialog box shown in Figure 3.9. Press “enter” button to save the changes and return to value management menu, and click“Esc”button to not saved and to return to value management menu.

运行定值区只显示装置当前运行的定值区号，这里不做修改。

The running value section only shows the current running value area of the device, so no modification is made here.

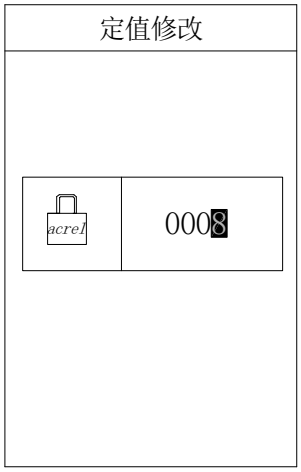


图 3.13 输入密码对话框

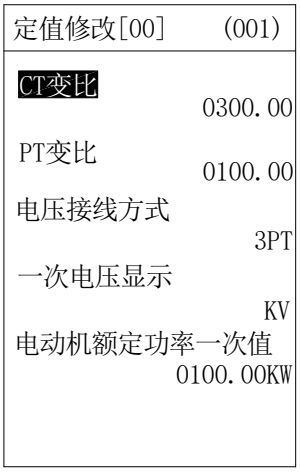


图 3.14 定值修改

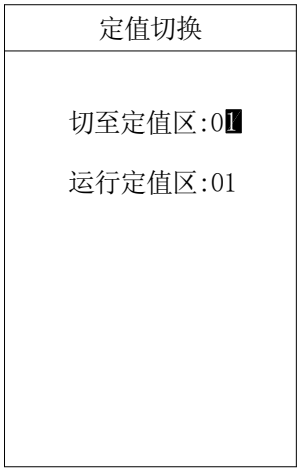


图 3.15 定值切换

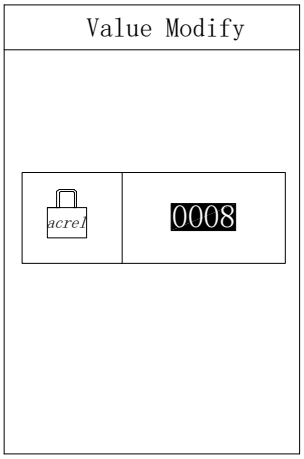


Fig. 3.13 entering password

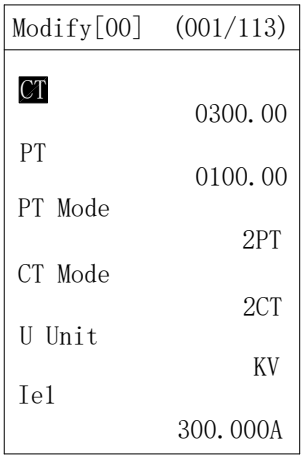


Fig. 3.14 Value Modify

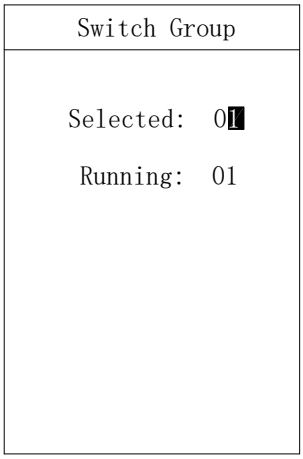


Fig. 3.15 Switch Group

3.3.3.3 定值切换

3.3.3.3 Switch Group

“定值切换”菜单有切至定值区、运行定值区两个子菜单，该菜单初始密码为“0008”。切至定值区内有 00-03 四个有效定值区可供切换，设置好后，按“确认”键确定，再按“返回”键返回主菜单。运行定值区将显示当前运行的定值区号，如图 3.15。

The “Switch Group” menu has two sub-menus: selected value section and running value section. The password of this menu is “0008”. The selected section shows the expected section users want to set, which can be set as 00-03. After making the selection, press the “Enter” button to determine, and then press the “esc” key to return to the main menu. The running value section will display the current running value area of the device, as shown in Figure 3.15.

3.3.4 调试

3.3.4 Debugging

“调试”菜单用于装置出厂前的测试，可对装置进行零漂调整、幅值调整、继电器输出测试、指示灯输出测试、指示灯颜色配置、继电器输出配置。

The "Debg" menu is used to test the device before it leaves the factory.The function includes zero adjustment, amplitude adjustment, relay output test, indicator output test, indicator color configuration, and relay output configuration.

该菜单功能使用时请与制造商联系。

Please contact the manufacturer when using this menu function.

3.3.5 记录

3.3.5 SOE

“记录”菜单中可以查看事件记录、系统记录、操作日志三类信息。

In the "SOE" menu, users can view three types of information: SOE Record、SYS Record and LOG Record.

3.3.5.1 事件记录

3.3.5.1 SOE Record

“事件记录”菜单可显示事件序号、事件总数、事件代码、事件发生时间、事件名称、动作类型（动作或告警）等信息。如果是保护动作引起的事件记录，还会记录事件发生时刻动作元件动作值和时间，如图 3.16 所示。装置可保存大于 200 条事件记录。

The "SOE Record" menu displays the event sequence, total number of events, event code, event time, event name, action type (action or alarm), and other information. If the event is caused by a protection action, the action value and time of the action element at the time of the event are also recorded, as shown in Figure 3.16. The device can save over 200 event records.

3.3.5.2 系统记录

3.3.5.2 SYS Record

“系统记录”菜单可显示出错序号、出错总数、出错时间、出错名称、出错码等信息，如图 3.17 所示。装置可保存大于 200 条记录。

The "SYS Record" menu displays the error sequence, total number of errors, error time, error name, error code and other information, as shown in Figure 3.17. The device can save more than 200 records.

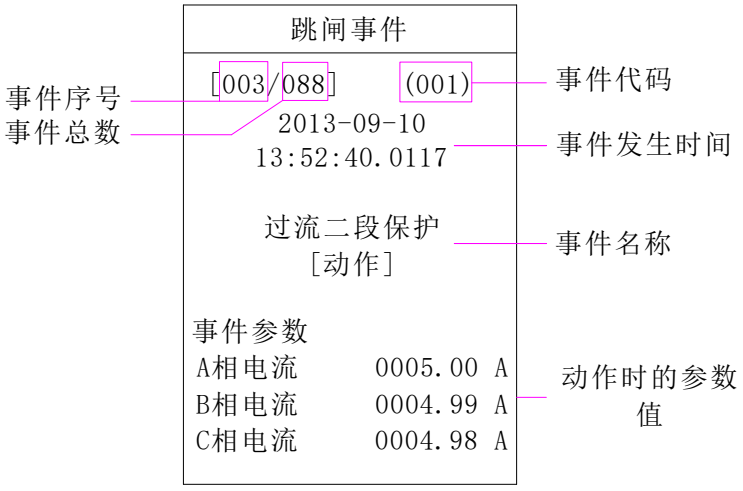


图 3.16 事件记录画面

图 3.17 出错记录画面

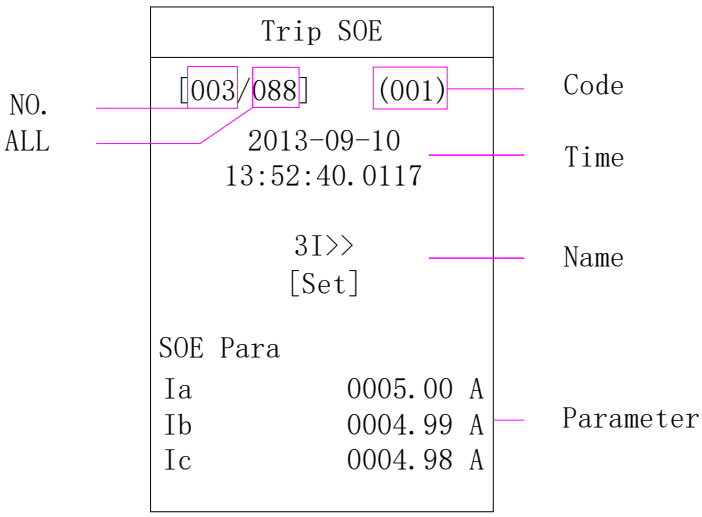


Figure 3.16 Event record screen

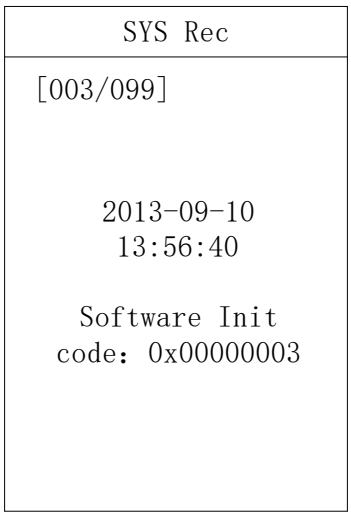


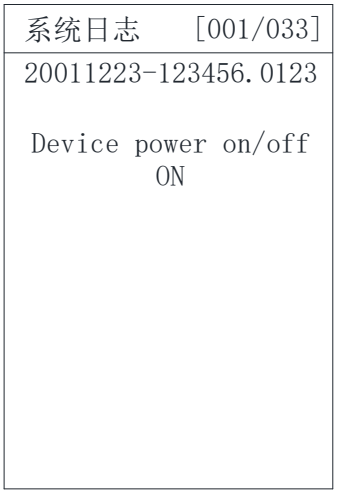
Figure 3.17 Error record screen

3.3.5.3 系统日志

3.3.5.3 System log

如图 3.18 所示，“系统日志”菜单记录装置所有的操作行为、设置变更行为等信息。

As shown in Figure 3.18, the "System Log" menu records all operation and setting changes of the device.



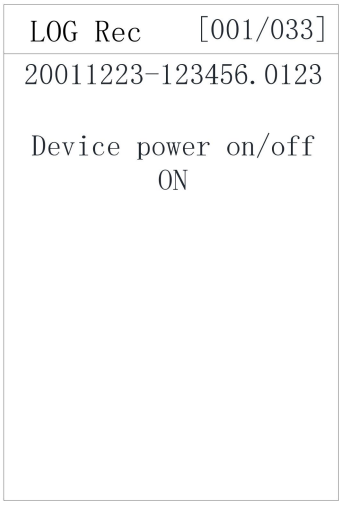


图 3.18 日志记录画面　　Figure 3.18 Log record screen

3.3.6 通讯

3.3.6 Communication

“通讯”菜单可设置装置通讯地址及通讯方式，如图 3.19。装置通讯地址设置如图 3.20 所示，通讯方式有以太网接口、RS485 接口、RS232 接口、USB 接口共 4 种接口的设置。

As shown in Figure 3.19, the "Comm" menu can set the device's communication address and mode. Figure 3.20 shows the device's communication address set, and the communication mode has four interface settings: Ethernet interface, RS485 interface, RS232 interface, and USB interface.

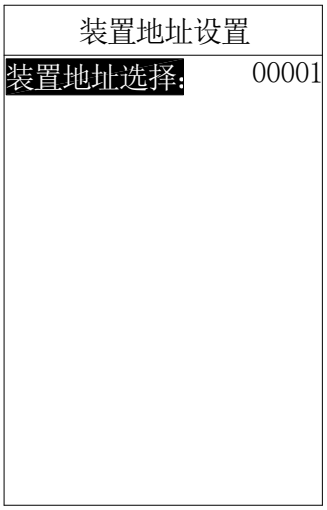
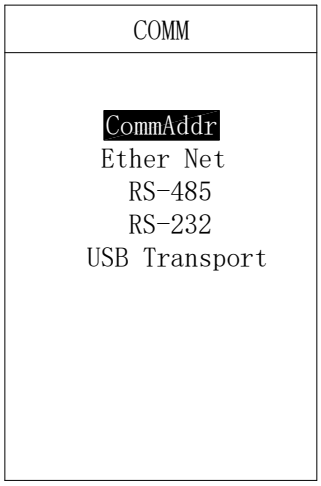


图 3.19 通讯菜单　　图 3.20 通讯地址设置



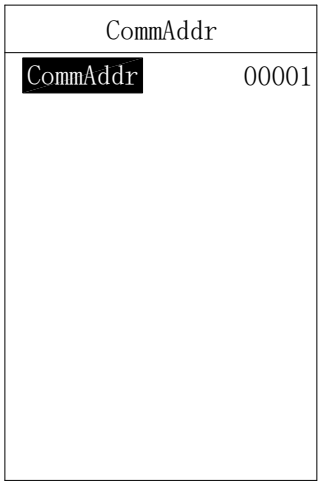
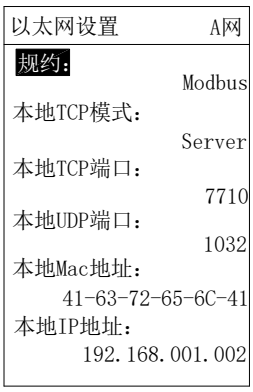


Fig. 3.19 Communication menu Fig. 3.20 Device address setting interface

如图 3.21、3.22 和表 3.2，可设置两路以太网口（A 网和 B 网）通讯参数。

As shown in Figure 3.21, 3.22 and Table 3.2, two Ethernet ports (A network and B network) communication parameters can be set.



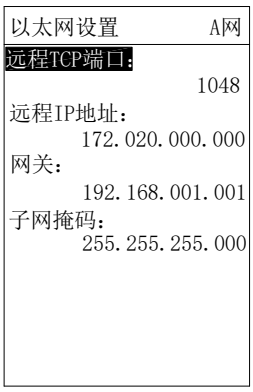
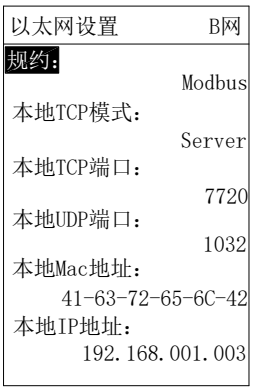


图 3.21 A 网通讯参数设置



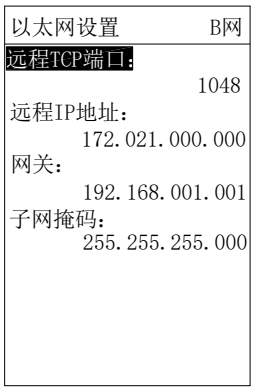
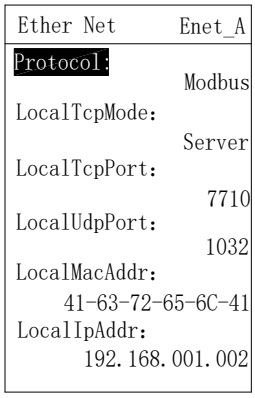


图 3.22 B 网通讯参数设置



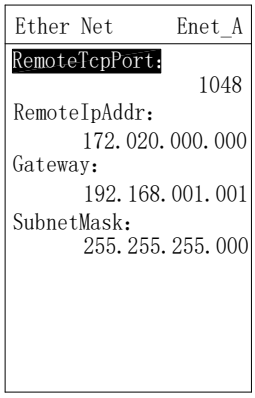
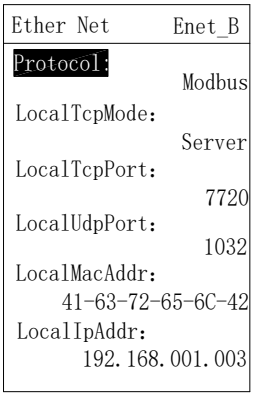


Fig. 3.21 A_net communication parameters



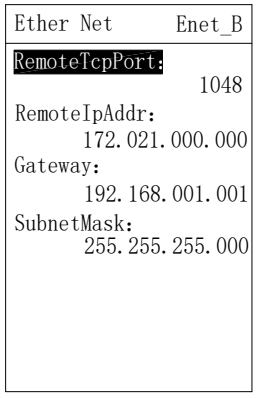


Fig. 3.22 B_net communication parameters

表 3.2 以太网口通讯参数设置

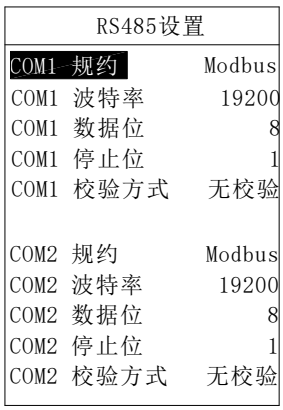
Table 3.2 Ethernet port communication parameters setting

本地 TCP 模式 Local TCP mode	按需设置，同一网内可设为相同 Set on demand, can be set to the same within

	the same network
本地 TCP 端口 Local TCP port	按需设置，同一网内可设为相同 Set on demand, can be set to the same within the same network
本地 UDP 端口 Local UDP port	按需设置，同一网内可设为相同 Set on demand, can be set to the same within the same network
本地 Mac 地址 Local Mac address	同一网内不可重复 Non-repeatable within the same network
本地 IP 地址 Local IP address	同一网内不可重复 Non-repeatable within the same network
远程 IP 地址 Remote IP address	即后台机的 IP 地址，同一网内可设为相同 The IP of the backend machine, which can be set to the same within the same network
远程 TCP 端口 Remote TCP port	即后台机的端口，同一网内可设为相同 The IP of the backend machine, which can be set to the same within the same network
网关 Gateway	按需设置，同一网内可设为相同 Set on demand, can be set to the same within the same network
子网掩码 Subnet Mask	按需设置，同一网内可设为相同 Set on demand, can be set to the same within the same network

如图 3.23，可设置两路 RS485 口（com1 和 com2）通讯参数。

As shown in Figure 3.23, the communication parameters of two RS485 ports (com1 and com2) can be set.



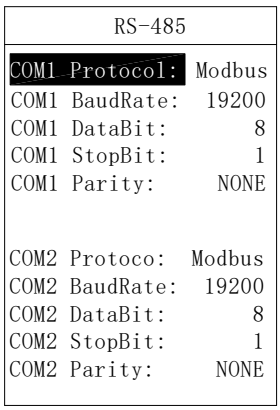


图 3.23 RS-485 通讯参数设置　　Fig. 3.23 RS-485 communication parameters

如图 3.24，可设置 RS232 口（com3）通讯参数，实现装置程序升级。

As shown in Figure 3.24, communication parameters of RS232 port (com3) can be set to realize device program upgrade.

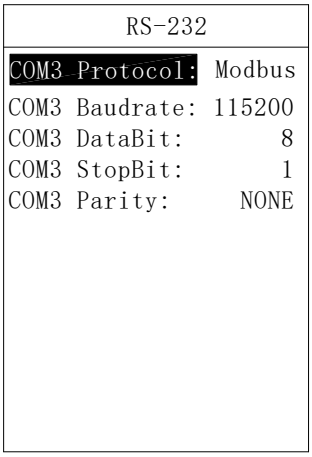
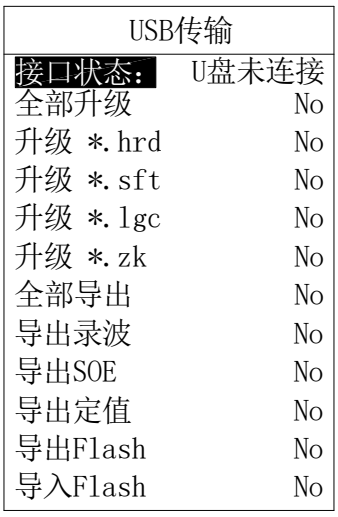


图 3.24 RS-232 通讯参数设置　　Fig. 3.24 RS-232 communication parameters

如图 3.25，可直接进入“USB 设置”菜单进行装置的程序升级。该菜单功能使用时请与制造商联系。

As shown in Figure 3.25, users can directly enter the "USB Transport" menu to upgrade the program of the device. **Please contact the manufacturer when using this menu function.**



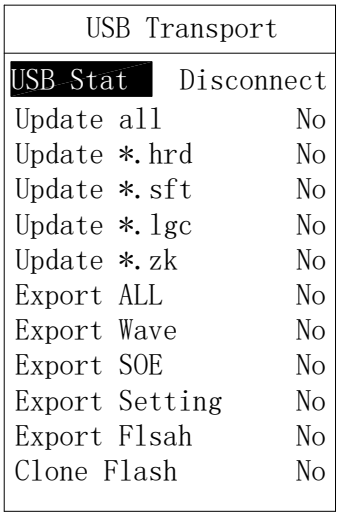


图 3.25 USB 程序升级界面　　Fig. 3.25 USB Transport

通讯参数可从表 3.3 选择参数进行设置。设置完成后先按“返回”键退出，然后按“确认”键保存后再按“返回”键返回主菜单。

Communication parameters can be set by selecting parameters from Table 3.3. After setting, press "Esc" to exit, then press "Enter" to save and then press "Esc" to return to the main menu.

表 3.3 通讯参数设置

Table 3.3 Communication parameter setting

设置量 Setting quantity	参数 Parameter
装置地址 Device address	0 to 255
波特率 Baud rate	110, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600, 115200, 128000, 256000
数据位 Data bits	8, 9
停止位 Stop bits	1, 1.5, 2
校验方式 Calibration mode	无校验、偶检验、奇校验 No calibration, Even calibration, Odd calibration
规约选择 Protocol selection	Modbus-RTU、IEC103、IEC101、LoopB
本地 TCP 模式 Local TCP mode	Server, Client

3.3.7 控制

3.3.7 Control

“控制”菜单用于装置出厂前的测试，可对装置进行遥控分闸、遥控合闸、及信号复归操作。

The "Control" menu is used to test the device before it leaves the factory, which allows remote control of the device for breaking, closing, and signal restoration operations.

该菜单功能使用时请与制造商联系。

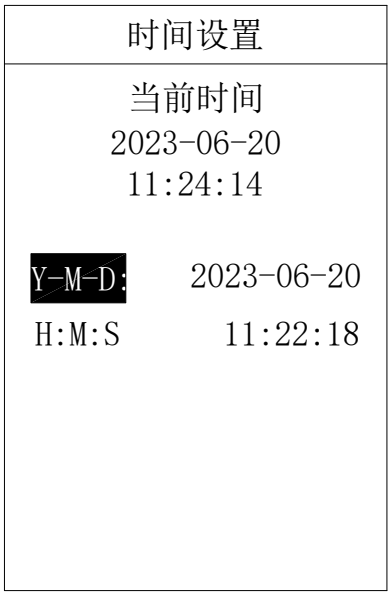
Please contact the manufacturer when using this menu function.

3.3.8 时间

3.3.8 Time

“时间”菜单用于修改时钟。如图 3.26，时间设置完成后按“确认”键即修改成功，再按“返回”键返回主菜单。

The "Time" menu is used to modify the clock. As shown in Figure 3.26, press the "Enter" button after the time setting is completed, then press the "Esc" button to return to the main menu.



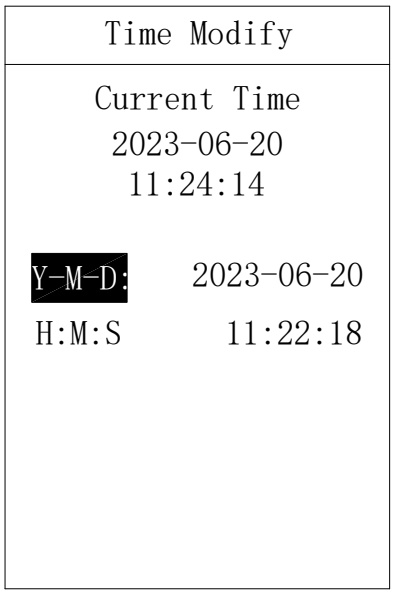


图 3.26 时间设置

Fig. 3.26 Time Setting

3.3.9 信息

3.3.9 Information

“信息”菜单可显示装置的基本信息包括装置名称、软件版本号、校验码、硬件配置生成时间、软件配置生成时间、保护逻辑图生成时间及逻辑图版本号等，如图 3.27 所示。

The "Information" menu can display the basic information of the device, including device name, software version number, check code, hardware configuration generation time, software configuration generation time, protection logic diagram generation time and logic diagram version number, etc., as shown in Figure 3.27.

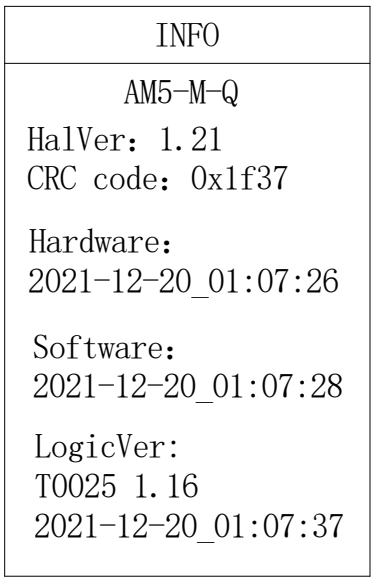


图 3.27 装置信息

图 3.27 Device information

4 装置外形尺寸及安装方法

4 Device Form Factor and Installation Method

4.1 外形及开孔尺寸

4.1 Outline and Opening Dimensions

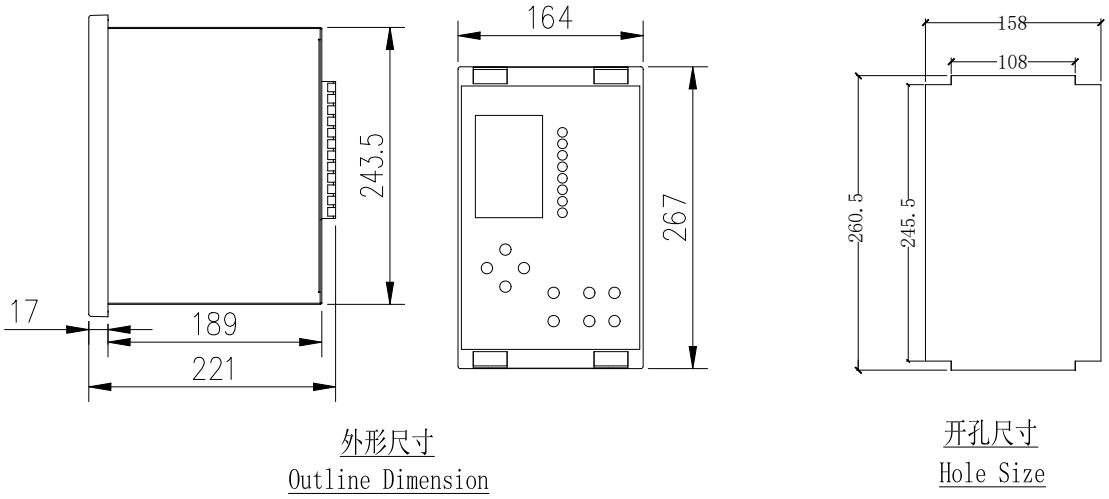


图 4.1 外形及开孔尺寸图

Figure 4.1 Outline dimension and hole size

注：1、方孔尺寸为 245.5*158；

Note: 1. The size of hole is 245.5*158;

2、开孔尺寸以毫米（mm）为单位。

2、The size of hole is in millimeter (mm).

4.2 安装方法

4.2 Installation Method

装置采用面板嵌入式安装，首先在屏体面上按开孔尺寸开孔，如图 4.2。再将装置按图 4.3 所示放入开孔中，直到装置面板靠住机柜的面板。将支架放置于机柜面板的内部（上下各有一个支架），如图 4.4，旋转 4 个固定螺丝，使装置牢固固定在机柜面板上，最后盖上 4 个翻盖即可。（翻盖上方有小缺口，拆卸时需用一字螺丝刀插入小缺口将翻盖取下。）

The protection device adopts embedded installation. First, open the hole on the screen surface according to the hole size, as shown in Figure 4.2. Then, as shown in Figure 4.3, insert the device into the open hole until the device panel rests against the cabinet panel. Place the bracket inside the cabinet panel (there is one on top and one on the bottom), then rotate the four fixing screws to secure the device in the cabinet panel as shown in Figure 4.4, and finally cover with four flip covers. (There is a small gap above the flip cover; when disassembling, insert a screwdriver into the small gap to remove the flip cover.)

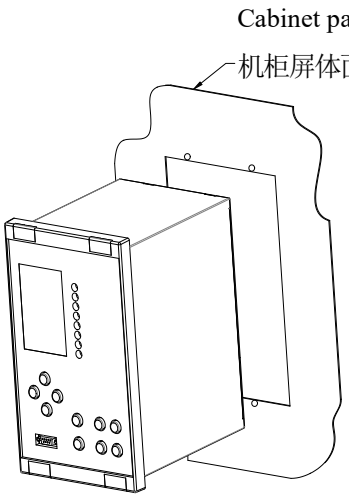


图4. 2

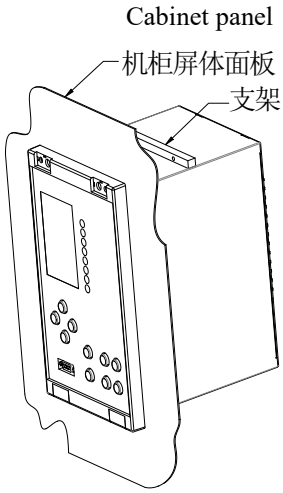


图4. 3

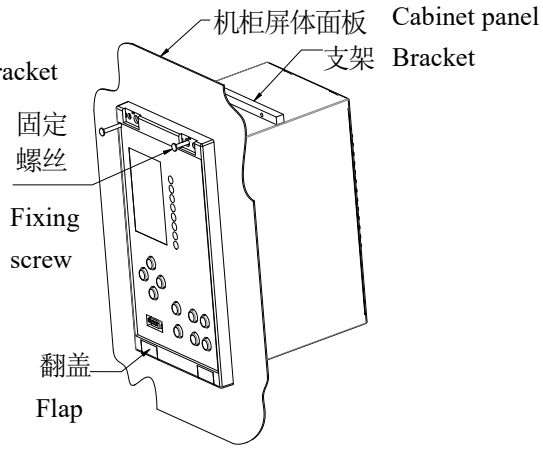


图4. 4

5 装置事件记录清单

5 Device Event Record List

表 5.1　AM5-M-Q 事件记录表

Table 5.1 AM5-M-Q Event Log List

AM 事件记录 AM event log				
事件代码 Event Code	事件名称 Event Name	参数名称 Parameter Name	参数值 Parameter Value	参数单位 Parameter Unit
0	过流一段保护 3I>>>	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
1	过流二段保护 3I>>	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
2	过流三段保护 3I>	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流	浮点数	A

		Ic	Float	
3	启动时过流一段保护 3I>>>.S	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
4	运行时过流一段保护 3I>>>.R	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
5	A 相反时限过流保护 Ia>InverseT.	时间 t	浮点数 Float	s
		A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
6	B 相反时限过流保护 Ib>InverseT.	时间 t	浮点数 Float	s
		A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
7	C 相反时限过流保护 Ic>InverseT.	时间 t	浮点数 Float	s
		A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
8	I01 过流一段 I01>>>	I01	浮点数 Float	A
9	I01 过流二段 I01>>	I01	浮点数 Float	A
10	I02 过流一段 I02>>>	I02	浮点数 Float	A

11	I02 过流二段 I02>>	I02	浮点数 Float	A
12	I01 反时限 I01>InverseT	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
13	I02 反时限 I02>InverseT.	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
14	后加速过流保护 I>P.T	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
15	重合闸 Reclosing	——	——	——
16	低频减载 UnderFr.	频率 Frequency	浮点数 Float	Hz
17	手动合闸 ManualClose	——	——	——
18	手动分闸 ManualTrip	——	——	——
19	过负荷跳闸 OverLoadTrip	最大相电流 Imax	浮点数 Float	A
20	负序过流一段保护 I2>>>	负序电流 I2	浮点数 Float	A
		最大相电流 Imax	浮点数 Float	A
21	负序反时限保护 I2>InverseT	时间 T	浮点数 Float	s
		负序电流 I2	浮点数 Float	A
22	热过载跳闸 OverHeat.T	跳闸百分比 Trip Percent	浮点数 Float	%
		最大相电流 Imax	浮点数 Float	A
		正序电流 I1	浮点数 Float	A
		负序电流 I2	浮点数 Float	A
23	堵转保护 StallTrip	最大相电流 Imax	浮点数 Float	A

24	启动时间过长保护 Sta.OutT.T	最大相电流 Imax	浮点数 Float	A
25	低电压保护 LVP.T	最大线电压 Umax	浮点数 Float	V
26	欠电压保护 LVP.T	UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
27	过电压保护 OVP.T	UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
28	零序过电压保护/自产零序过压保护 U0.OVP/3U0.OVP	零序电压 U0	浮点数 Float	V
29	不平衡电压保护 Unb.V.T	不平衡 U Unb.V	浮点数 Float	V
30	电流不平衡跳闸 Unb.I.T	定值 Value Percent	浮点数 Float	%
		延时 T	浮点数 Float	T
		动作值 Iub Percent	浮点数 Float	%
		I 平均 Iav	浮点数 Float	A
31	重瓦斯跳闸 SevereGas.T	——	——	——
32	压力释放跳闸 Pre.Re.T	——	——	——
33	超温跳闸 HighTemp.T	——	——	——
34	非电量 1 跳闸 Non-elec1.T	——	——	——
35	非电量 2 跳闸 Non-elec2.T	——	——	——
36	分段备投合母联 B.S.C.B.	——	——	——
37	分段备投跳进线 1 B.S.T.1	——	——	——
38	分段备投跳进线 2	——	——	——

	B.S.T.2			
39	2 备 1 跳进线 1 2S.1T.1-In.	——	——	——
40	2 备 1 合进线 2 2S.1C.2-In.	——	——	——
41	1 备 2 跳进线 2 1S.2T.2-In.	——	——	——
42	1 备 2 合进线 1 1S.2C.1-In.	——	——	——
43	分段复归合进线 1 B.R.C.1	——	——	——
44	分段复归合进线 2 B.R.C.2	——	——	——
45	分段复归跳母联 B.R.T.B.	——	——	——
46	2 备 1 复归合进线 1 2S.1R.C.1	——	——	——
47	2 备 1 复归跳进线 2 2S.1R.T.2	——	——	——
48	1 备 2 复归合进线 2 1S.2R.C.2	——	——	——
49	1 备 2 复归跳进线 1 1S.2R.T.1	——	——	——
50	FC 闭锁 FC Block	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
51	变压器门误开跳闸 DoorOpenT	——	——	——
52	遥控合闸 RemoteClose	——	——	——
53	遥控分闸 RemoteTrip	——	——	——
54	失压保护 LVP.T	最大线电压 Um	浮点数 Float	V
55	油位低跳闸 Low oil.T	——	——	——
56	油位高跳闸 High oil.T	——	——	——
57	反时限过流保护 I>InverseT.	时间 t	浮点数 Float	s

		A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
58	I01 过流三段 I01>	I01	浮点数 Float	A
59	I01 后加速过流 I01>P.T	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
60	高温保护跳闸 OverTemp.T	——	——	——
61	轻瓦斯保护跳闸 LightGasT	——	——	——
62	2 备 1 跳母联 2S.1T.B.	——	——	——
63	2 备 1 复归合母联 2S.1R.C.B.	——	——	——
64	柴发机备投跳进线 1 1 Die.S.T.1	——	——	——
65	柴发机备投跳进线 2 2 Die.S.T.2	——	——	——
66	柴发机备投合母联 Die.S.C.B.	——	——	——
67	柴发机备投合柴发机 Die.S.C.D.	——	——	——
68	非电量 3 跳闸 Non-el3.T	——	——	——
69	非电量 4 跳闸 Non-el4.T	——	——	——
70	备用 1 跳闸 Spare1.T	——	——	——
71	备用 2 跳闸 Spare2.T	——	——	——
73	备用 3 跳闸 Spare3.T	——	——	——
74	隔离柜连跳 Iso.Cab.T	——	——	——
75	系统谐振跳闸 Sys.Res.T	——	——	——

76	高频跳闸 OF.T	频率 Frequency	浮点数 Float	Hz
77	温控器故障跳闸 Th.Fa.T	——	——	——
78	自产 3I0 保护一段跳闸 3I0>>>	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
		3I0 3I0	浮点数 Float	A
79	自产 3I0 保护二段跳闸 3I0>>	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
		3I0 3I0	浮点数 Float	A
80	过负荷告警 OverLoadAla.	最大相电流 Imax	浮点数 Float	A
81	PT 断线告警 PT BreakAla.	UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		负序电压 U2	浮点数 Float	V
82	控故障告警 CtrErrorAla.	——	——	——
83	负序过流二段告警 I2>>.A	负序电流 I2	浮点数 Float	A
		最大相电流 Imax	浮点数 Float	A
84	热过载告警 OverHeat. A	告警百分比 Alarm percentage	浮点数 Float	%
		最大相电流 Imax	浮点数 Float	A
		正序电流 I1	浮点数 Float	A
		负序电流 I2	浮点数 Float	A

85	I母低电压告警（AM5\AM4-U1） I Bus LVP.A	最大线电压 Um	浮点数 Float	V
86	I母过电压告警（AM5\AM4-U1） I Bus OVP.A	最大线电压 Um	浮点数 Float	V
87	零序过压告警 U0.OVP.A	零序电压 U0	浮点数 Float	V
88	轻瓦斯告警 LightGasA	时间 t	浮点数 Float	s
89	高温告警 OverTemp. A	时间 t	浮点数 Float	s
90	非电量 2 告警 Non-elec2.A	——	——	——
91	非电量 3 告警 Non-el3.A	——	——	——
92	分段充电完成 BusCharge	——	——	——
93	进线 1 充电完成 I-In.Charge	——	——	——
94	进线 2 充电完成 2-In.Charge	——	——	——
95	I母自产零序过压告警 （AM5\AM4-U1） I Bus 3U0.OVP.A	零序电压 U0	浮点数 Float	V
96	II母低电压告警（AM5\AM4-U2） II Bus LVP.A	最大线电压 Um	浮点数 Float	V
97	II母零序过压告警（AM5\AM4-U2） II Bus U0.OVP.A	零序电压 U0	浮点数 Float	V
98	II母 PT 断线告警（AM5\AM4-U2） II Bus PT BreakAla.	UAB2	浮点数 Float	V
		UBC2	浮点数 Float	V
		UCA2	浮点数 Float	V
		负序电压 Negative sequence voltage	浮点数 Float	V
99	II母过电压告警（AM5\AM4-U2） II Bus OVP.A	最大线电压 Um	浮点数 Float	V
100	II母自产零序过压告警 （AM5\AM4-U2） II Bus 3U0.OVP.A	自产 3U0 3U0	浮点数 Float	V
101	电机备投跳进线 1,2 M.S.T.1,2	——	——	——
102	电机备投合电机	——	——	——

	M.S.C.M.			
103	过流三段告警 3I>.A	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
104	I01 过流一段告警 I01>>>.A	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
105	I01 过流二段告警 I01>>.A	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
106	I01 过流三段告警 I01>.A	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
107	I01 反时限过流告警 I01>InverseT.A	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
108	I01 后加速告警 I01>P.A	时间 t	浮点数 Float	s
		I01	浮点数 Float	A
109	I02 过流告警 I02>.A	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
110	I02 反时限过流告警 I02>InverseT.A	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
111	负序过流一段告警 I2>>>.A	负序电流 I2	浮点数 Float	A
		最大相电流 Im	浮点数 Float	A
112	超温保护告警 HighTemp. A	时间 t	浮点数 Float	s
113	重瓦斯保护告警 SevereGas. A	时间 t	浮点数 Float	s

114	失压告警 LVP.A	最大线电压 Um	浮点数 Float	V
115	I02 过流一段告警 I02>>>.A	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
116	I02 过流二段告警 I02>>.A	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
117	门开告警 DoorOpenA	时间 t	浮点数 Float	s
118	进线 PT 断线 I.PtBr.A	——	——	——
119	非电量 1 告警 Non-el1.A			s
120	非电量 4 告警 Non-el4.A			s
121	重合闸充电完成 chargeOK	——	——	——
122	备用 1 告警 Spare1.A	——	——	——
123	备用 2 告警 Spare2.A	——	——	——
124	备用 3 告警 Spare3.A	——	——	——
125	市电充电 Mark. Charge	——	——	——
126	市电备投跳发电机 Mark.S.T.D.	——	——	——
127	市电备投合进线 1 Mark.S.C.1	——	——	——
128	市电备投合进线 2 Mark.S.C.2	——	——	——
129	逆功率保护 RP.T	有功功率 Active power	浮点数 Float	kW kW
		功率因数 Power factor	浮点数 Float	无 None
130	压力释放告警 Pre.Re.A	——	——	——
131	发电机备 1 充电 Al.S.1.Charge	——	——	——
132	发电机备 2 充电 Al.S.2.Charge	——	——	——

133	柴发机备 1 跳 1QF Die.S.1T.1QF	——	——	——
134	柴发机备 1 合 4QF Die.S.1C.4QF	——	——	——
135	柴发机备 2 跳 2QF Die.S.2T.2QF	——	——	——
136	柴发机备 2 合 4QF Die.S.2C.4QF	——	——	——
137	温控器故障告警 Th.Fa.A	——	——	——
138	二次过压告警（非电量） Se.OVP.A	——	——	——
139	不平衡电流 3I0 保护告警 Unb.3I0.A	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
		3I0 3I0	浮点数 Float	A
150	DI1 变位 DI1	——	——	——
151	DI2 变位 DI2	——	——	——
152	DI3 变位 DI3	——	——	——
153	DI4 变位 DI4	——	——	——
154	DI5 变位 DI5	——	——	——
155	DI6 变位 DI6	——	——	——
156	DI7 变位 DI7	——	——	——
157	DI8 变位 DI8	——	——	——
158	DI9 变位 DI9	——	——	——
159	DI10 变位 DI10	——	——	——
160	DI11 变位 DI11	——	——	——

161	DI12 变位 DI12	——	——	——
162	DI13 变位 DI13	——	——	——
163	DI14 变位 DI14	——	——	——
164	DI15 变位 DI15	——	——	——
165	DI16 变位 DI16	——	——	——
166	DI17 变位 DI17	——	——	——
167	DI18 变位 DI18	——	——	——
168	DI19 变位 DI19	——	——	——
169	DI20 变位 DI20	——	——	——
170	合后位置变位 PoAF.CB.On	——	——	——
171	合位监视变位 CB On M.	——	——	——
172	分位监视变位 CCB Off M.	——	——	——
173	防跳监视变位 Anti- pumping set	——	——	——
174	装置上电 DeviceOn Power	——	——	——
179	PT 断线 PT Break	——	——	——
180	3 备 1 充电 3S.1 Charge	——	——	——
181	3 备 2 充电 3S.2 Charge	——	——	——
182	A 相差压跳闸 UdA.T	A 相差压 UdA	浮点数 Float	V
183	B 相差压跳闸 UdB.T	B 相差压 UdB	浮点数 Float	V
184	C 相差压跳闸 UdC.T	C 相差压 UdC	浮点数 Float	V
185	备投再恢复 1#合 3QF S.R.1#.C.3QF	——	——	——

186	均无压恢复充电 No-Vol.R.Charge	——	——	——
187	均无压复 2 跳 4 No-Vol.R.2.T.4	——	——	——
188	均无压复 2 合 2 No-Vol.R.2.C.2	——	——	——
189	均无压复 1 跳 4 No-Vol.R.1.T.4	——	——	——
190	均无压复 1 合 1 No-Vol.R.1.C.1	——	——	——
191	均无压复 1 合 3 No-Vol.R.1.C.3	——	——	——
192	远方按钮合闸 Remote button close	——	——	——
193	远方按钮分闸 Remote button trip	——	——	——
194	急停分闸 Emergency trip	——	——	——
195	2 备 1 合柴发 2S.1C.Die.	——	——	——
196	2 备 1 复归跳柴发 2S.1R.T.Die.	——	——	——
197	负控跳闸 Neg.Con.T	——	——	——
198	绝缘监测告警 Insul.Monit.A	——	——	——
199	绝缘监测跳闸 Insul.Monit.T	——	——	——
200	均无压充电 No-Vol.Charge	——	——	——
201	均无压跳 2 No-Vol.T.2	——	——	——
202	均无压合 1 No-Vol.C.1	——	——	——
203	备用进线备 1 充电 Sp.In.S1 Charge	——	——	——
204	备用进线备 2 充电 Sp.In.S2 Charge	——	——	——
205	备用进线备 1 跳进线 1 Sp.In.S1.T.1	——	——	——
206	备用进线备 1 合备用 Sp.In.S1.C.Sp.	——	——	——
207	备用进线备 2 跳进线 2 Sp.In.S2.T.2	——	——	——

208	备用进线备 2 合备用 Sp.In.S2.C.Sp	——	——	——
209	均无压跳进线 1,2 No-Vol.T.1,2	——	——	——
210	均无压合母联 No-Vol.C.B.	——	——	——
211	均无压合备用进线 No-Vol.C.Sp.In.	——	——	——
212	欠流告警 LIP.A	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
213	电压不平衡开入跳闸 Unb.V.DI.T	——	——	——
214	分段备投合进线 3 B.S.C.3	——	——	——
215	分段备投合进线 4 B.S.C.4	——	——	——
216	进线 1 逆功率 1-In.RP.T	——	——	——
217	2 备 1 退进线 1 手车 2S.1T.1-In.Hand.	——	——	——
218	2 备 1 复归合进线 1 手车 2S.1R.C.1-In.Hand.	——	——	——
219	低侧网门告警 Low S.D.A	——	——	——
220	低侧网门跳闸 Low S.D.T	——	——	——
221	事故总信号 Accident. S	——	——	——
222	电压不平衡跳闸 Unb.V.T	UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		不平衡度 Uub Percent	浮点数 Float	%
223	相序保护跳闸 Ph.Se.T	UAB	浮点数 Float	V
		UBC	浮点数 Float	V

		UCA	浮点数 Float	V
		U1	浮点数 Float	V
		U2	浮点数 Float	V
		Uav	浮点数 Float	V
224	电压断相跳闸 Ph.Br.T	UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
225	I段 PT 投入 I PT Invest.	——	——	——
226	II段 PT 投入 II PT Invest.	——	——	——
227	PT 并列 PT Juxtaposition	——	——	——
228	1 号 2 号主供断电警报 1,2 Main supply outage.A	——	——	——
229	遥控并列 Remote Juxtaposition	——	——	——
230	遥控解列 Remote Splitting	——	——	——
231	母线充电保护 B.Cha.T	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
232	CT 二次过压跳闸 CT Se.OVP.T	——	——	——
233	CT 二次过压告警 CT Se.OVP.A	——	——	——
234	隔离手车连跳动作 Iso.Handcart.T	——	——	——
235	备投允许 Standby allowed	——	——	——
236	允许合闸信号 Allowable C. signal	——	——	——
237	柴发机备投跳母联 Die.S.T.B.			

238	备投启动柴发信号 S.Sta.Die.Sig.			
239	油位高告警 High oil.A			
240	均无压跳母联 No-Vol.T.B.			
241	负序过流二段跳闸 I2>>	负序电流 I2	浮点数 Float	A
		最大相电流 Im	浮点数 Float	A
242	差动总启动标志 Differential total start flag	——	——	——
243	差动速断保护 Differential quick-break protection	动作时间 Action time	浮点数 Float	s
		A 相差流 IdA	浮点数 Float	A
		B 相差流 IdB	浮点数 Float	A
		C 相差流 IdC	浮点数 Float	A
		A 相制动 IrA	浮点数 Float	A
		B 相制动 IrB	浮点数 Float	A
		C 相制动 IrC	浮点数 Float	A
244	比率差动保护 Ratio differential protection	动作时间 Action time	浮点数 Float	s
		A 相差流 IdA	浮点数 Float	A
		B 相差流 IdB	浮点数 Float	A
		C 相差流 IdC	浮点数 Float	A
		A 相制动 IrA	浮点数 Float	A
		B 相制动 IrB	浮点数 Float	A
		C 相制动 IrC	浮点数 Float	A
245	差流越限 Differential current overshoot	A 相差流 IdA	浮点数 Float	A
		B 相差流 IdB	浮点数 Float	A

		C 相差流 IdC	浮点数 Float	A
246	正序过流一段保护 I1>>>	定值 Fixed value	浮点数 Float	A
		延时 Delayed	浮点数 Float	s
		正序电流 I1	浮点数 Float	A
247	正序过流二段保护 I1>>	定值 Fixed value	浮点数 Float	A
		延时 Delayed	浮点数 Float	s
		正序电流 I1	浮点数 Float	A
248	正序过流反时限保护 I1>InverseT.	曲线类型 Curve type	整数 Integer	一般/非常/极端 S1/S2/S3
		启动电流 Starting current	浮点数 Float	A
		时间系数 Time coefficient	浮点数 Float	s
		动作时间 Action time	浮点数 Float	s
		正序电流 I1	浮点数 Float	A
249	长启动保护告警 Long-start protection alarm	计时门槛 Timing threshold	浮点数 Float	A
		动作时间 Action time	浮点数 Float	s
250	电流不平衡告警 Unb.I.A	定值 Value Percent	浮点数 Float	%
		延时 T	浮点数 Float	s
		动作值 Iub	浮点数 Float	%
		平均电流 Iav	浮点数 Float	A
251	电压不平衡告警 Unb.V.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		动作值	浮点数	V

		Action value	Float value	
		平均线电压 Uavg	浮点数 Float	V
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
252	过电压保护告警 OVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		零序电压 U0	浮点数 Float	V
253	零序过压保护告警 U0.OVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		零序电压 U0	浮点数 Float	V
254	正序过压保护告警 U1.OVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V

		正序电压 U1	浮点数 Float	V
255	正序过压保护跳闸 U1.OVP.T	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		正序电压 U1	浮点数 Float	V
256	负序过压保护告警 U2.OVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		负序电压 U2	浮点数 Float	V
257	负序过压保护跳闸 U2.OVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		负序电压 U2	浮点数 Float	V
258	低电压保护告警 LVP.A	定值 Fixed value	浮点数 Float	V
		延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V

		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		零序电压 U0	浮点数 Float	V
259	相序保护告警 Ph.Se.A	延时 Delayed	浮点数 Float	s
		UAB	浮点数 Float	V
		UBC	浮点数 Float	V
		UCA	浮点数 Float	V
		零序电压 U0	浮点数 Float	V
		正序电压 U1	浮点数 Float	V
		负序电压 U2	浮点数 Float	V
		平均线电压 Uavg	浮点数 Float	V
260	首端 CT 断线告警 F.CT Break.A	——	——	——
261	尾端 CT 断线告警 T.CT Break.A	——	——	——
262	I02 后加速过流 I02>P.T	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
263	I02 后加速告警 I02>P.A	时间 t	浮点数 Float	s
		I02	浮点数 Float	A
264	差动保护长期启动 Long term start of differential protection	A 相差流 IdA	浮点数 Float	A
		B 相差流 IdB	浮点数 Float	A
		C 相差流 IdC	浮点数 Float	A
265				

266				
267	I侧 CT 断线告警 I CT Break.A	——	——	——
268	II侧 CT 断线告警 II CT Break.A	——	——	——
269	III侧 CT 断线告警 III CT Break.A	——	——	——
270	IV侧 CT 断线告警 IV CT Break.A	——	——	——
271	有压有流出口动作 Pressure and current outlet action	——	——	——
272	预留 Reserve （告警事件代码） (Alarm event code)			
289				
290	启动风冷 Starting air cooling	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
291	闭锁调压 Blocking voltage regulation	A 相电流 Ia	浮点数 Float	A
		B 相电流 Ib	浮点数 Float	A
		C 相电流 Ic	浮点数 Float	A
292	间隙零序过流一段跳闸 Clearance I0>>>	间隙零序电流 Clearance I0	浮点数 Float	A
293	间隙零序过流二段跳闸 Clearance I0>>	间隙零序电流 Clearance I0	浮点数 Float	A
294	I 母 PT 投入 I PT Invest.	——	——	——
295	II 母 PT 投入 II PT Invest.	——	——	——
296	PT 自动并列 PT Juxtaposition	——	——	——
297	遥控并列 Remote Juxtaposition	——	——	——
298	遥控解列 Remote Splitting	——	——	——

299	负控保护跳闸 Neg.Con.T	时间 t	浮点数 Float	s
300	负控保护告警 Neg.Con.A	时间 t	浮点数 Float	s
301	PT 自动解列 PT Splitting	——	——	——
302	二次谐波闭锁 SHB.	A 相二次谐波电流 Ia_H2	浮点数 Float	A
		B 相二次谐波电流 Ib_H2	浮点数 Float	A
		C 相二次谐波电流 Ic_H2	浮点数 Float	A
303	1 备 2 跳非重要负荷 1S.2T.Unimp.Lo.	——	——	——
304	2 备 1 跳非重要负荷 2S.1T.Unimp.Lo.	——	——	——
305	I02 过流三段 I02>	I02	浮点数 Float	A
306	I02 过流三段告警 I02>.A	I02	浮点数 Float	A
307	检修状态闭锁 Maint.Sta.B.	——	——	——
308	电机温度 1 跳闸 M.Tem1.T	——	——	——
309	电机温度 1 告警 M.Tem1.A	——	——	——
310	电机温度 2 跳闸 M.Tem2.T	——	——	——
311	电机温度 2 告警 M.Tem2.A	——	——	——
312	电源监视跳闸 Pow.Monit.T	——	——	——
313	电源监视告警 Pow.Monit.A	——	——	——
314	备投停止柴发信号 S.St.Die.Sig			
315	启动柜故障跳闸 St.Cab.Fa.T	——	——	——
316	启动柜故障告警 St.Cab.Fa.A	——	——	——
317	同期合闸	——	——	——

	Synchronous. C			
318	进线侧恢复充电 Synchronous. C	——	——	——
319	柴发充电 Die. Charge	——	——	——
320	市电恢复充电 Mark. R. Charge	——	——	——
321	柴发恢复充电 Die. R. Charge	——	——	——
322	柴发备投合柴发 Die.S.C.D	——	——	——
323	市电恢复跳柴发 Mark.R.T.D	——	——	——
324	市电恢复合市电 Mark.R.C.Mark.	——	——	——
325	柴发恢复合柴发 Mark.R.C.D.	——	——	——
326	弧光保护跳闸 Arc.Pro.T	——	——	——
327	弧光保护告警 Arc.Pro.A	——	——	——

第二章 技术说明

Chapter 2 Technical Description

1 AM5-M-Q 电动机保护测控装置

1 AM5-M-Q Motor Protection Measurement and Control Device

1.1 功能简介

1.1 Function Introduction

保护功能

Protection function

- 过流一段保护（启动中、已运行）
- Instantaneous overcurrent protection (Starting, Running)
- 过流二段保护
- Definite Overcurrent protection
- 反时限过流保护
- Inverse-time overcurrent protection
- 两段式负序过流保护
- Two-stages negative sequence overcurrent protection
- 负序反时限过流保护
- Negative sequence overcurrent IDMT protection
- 两段式零序过流保护
- Two-stages earth fault protection
- 热过载保护
- Overheat protection
- 过负荷告警
- Overload alarm
- 过负荷跳闸
- Overload trip
- 堵转保护
- Stall protection
- 启动时间过长
- Starting time-out
- 非电量保护
- Non-electric protection

- PT 断线告警
- PT supervision (alarm)
- 控故障告警
- Trip-and-close circuit supervision (alarm)
- 低电压保护
- Undervoltage protection
- 零序过压告警
- Zero sequence overvoltage alarm
- FC 回路配合的过流闭锁功能
- FC blocking
- 电压不平衡保护
- Voltage unbalance protection
- 相序保护
- Phase sequence protection
- 电压断相保护
- Voltage phase failure protection
- 过电压保护
- Overvoltage protection

监控功能

Monitoring function

- I, U, P, Q, PF, f, Ep, Eq 等电参量测量
- Measurement of electrical parameters such as I, U, P, Q, PF, f, Ep, Eq, etc.
- 2 路 4-20mA 变送输出
- 2-channel 4-20mA output
- 20 路有源开关量输入
- 20 active digital inputs
- 10 路无源继电器输出
- 10 passive relay outputs
- 自带操作回路，可适应 0.25A-5A 开关跳合闸电流
- Operating circuit which can adapt to 0.25A-5A switch trip-close current

通讯功能

Communication function

- 2 路 RS485 串行通讯接口，支持 Modbus-RTU、IEC60870-5-103 规约
- 2 RS485 communication interfaces, supporting Modbus-RTU and IEC60870-5-103 protocol
- 2 路以太网接口，支持 Modbus TCP 和 TCP IEC60870-5-103 规约

● 2 Ethernet communication interface, supporting Modbus TCP and TCP IEC60870-5-103 protocol

其他功能

Other functions

● 故障录波功能，保护动作时触发录波，可录故障前 8 周波、故障后 4 周波

● Fault recording function, triggered when the protection action happens. 8 waves before and 4 waves after the fault can be recorded.

● IRIG-B 格式对时

IRIGB time-mode

1.2 保护原理

1.2 Protection Principle

电动机状态识别

Motor state recognition

- 电机停用

  Motor is stopped

  保护动作当最大相电流小于无流定值时，即可判电动机状态为停用。

  When the maximum phase current is less than the whitout-current value “I.None”, the motor status can be identified as stop.

- 电机启动中
- Motor is starting

  电动机处于停用态；

  The motor is in stop state;

  最大相电流大于二次额定电流值的 1.2 倍。

  The maximum phase current is more than 1.2 times of the rated secondary current value.

- 电机已运行
- Motor is running

  不处于停用状态；

  The motor is not in stop state;

  电机由启动中退出。

  The motor exit from startup state.

1.2.1 过流一段保护

1.2.1 Instantaneous overcurrent protection

异步电动机在启动过程中电流很大，通常能达到 5～8 倍额定电流(Ie)，启动时间能长达几十秒。装置设两个过流一段定值，在启动过程中采用“启动时过流一段定值”，该值按躲过

电动机启动电流整定，等电动机启动过程结束后，自动采用“运行时过流一段定值”，该值按电动机自启动电流和区外出口短路时电动机最大反馈电流考虑，取两个电流中的大者。

The asynchronous motor has a high current during startup, usually 5 to 8 times the rated current (Ie), and the start-up time can be up to several tens of seconds. The device has two instantaneous overcurrent setting values, and adopts "3I>>>.S" during the startup process.The value is set according to the starting current of the motor. Once the motor startup process is completed, the device automatically adopts "3I>>>.R", which is set according to the self-starting current of the motor and the maximum feedback current of external fault short circuit. The higher value between these two currents will be selected as instantaneous overcurrent protection when the motor is running.

保护逻辑见图 1.1。

The protection logic is shown in Figure 1.1.

图 1.1 过流一段保护逻辑

Figure 1.1The instantaneous overcurrent protection logic

1.2.2 过流二段保护

1.2.2 Definite-time overcurrent protection

在电动机运行过程中，当三相电流 IA、IB、IC 有一相大于过流保护的整定值时，经延时出口跳闸，该功能在电动机启动完毕后有效。保护逻辑见图 1.2。

During the motor is running, when anyone of the three phases IA, IB and IC is larger than the setting value “3I>>” of overcurrent protection, the protection will have an output after a time

delay. This function is effective after the motor is started. The protection logic is shown in Figure 1.2.

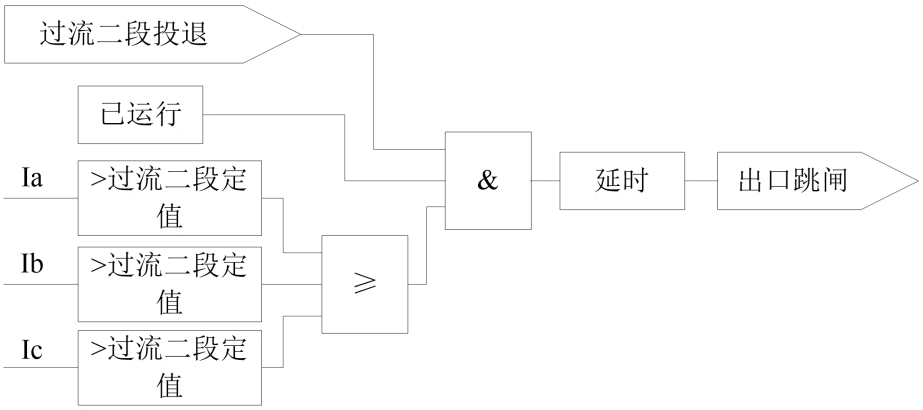


图 1.2 过流二段保护逻辑

Figure 1.2 Two-stages overcurrent protection logic

1.2.3 反时限过流保护

1.2.3 Inverse-time overcurrent protection

本装置共集成了三条特性曲线的反时限保护，用户可根据需要选择任何一种反时限特性曲线。根据国际电工委员会（IEC255-4），装置使用下列三个标准的反时限特性曲线：

The device integrates a total of three characteristic curves of IDMT overcurrent protection, and the user can select any of the inverse time characteristic curves . According to the International Electrotechnical Commission (IEC255-4), the device uses the following three standard inverse time characteristic curves:

一般反时限：

Normal inverse time: $$t = \frac{0.14K}{(I / I_{df})^{0.02} - 1}$$

非常反时限：

Very inverse time: $$t = \frac{13.5K}{(I / I_{df}) - 1}$$

极端反时限：

Extreme inverse time: $$t = \frac{80K}{(I / I_{df})^{2} - 1}$$

其中 t 为反时限动作时间，I 为反时限启动电流，I_{df} 为输入电流，K 为时间系数。本装置的反时限特性曲线可以通过定值菜单里的反时限曲线类型来选择（0：一般反时限，1：非常反时限，2：极端反时限）。

t is the inverse time action time, I is the inverse time start-up current, I_{df} is the input current, and K is the time factor. The inverse time characteristic curves of this device can be selected by the inverse time curve type in the parameter menu (S1: normal inverse time, S2: very inverse time,S3: extreme inverse time).

该功能在电动机启动完毕后有效，保护逻辑见图 1.3。

This function is valid after the motor has been started, and the protection logic is shown in Figure 1.3.

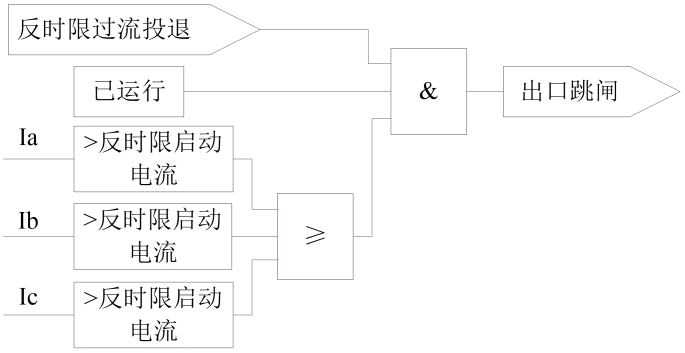


图 1.3 反时限过流保护逻辑

Figure 1.3 Inverse time overcurrent protection logic

1.2.4 两段式负序过流保护/负序反时限过流保护

1.2.4 Two-stages negative sequence overcurrent protection/negative sequence inverse-timet overcurrent protection

当电动机出现三相电压不平衡、断相、反相、匝间短路时，会产生负序电流。装置设有两段定时限负序过流保护，均由独立控制字选择功能投退，负序过流一段用于跳闸，负序二段用于告警。

When the motor has three-phase voltage unbalance, phase break, phase reverse and turn-to-turn short circuit, negative sequence current will be generated. The device is equipped with two-stages definite-time negative sequence overcurrent protection, both of which are selected by independent control word to enable and disable the function. One-stage negative sequence overcurrent is used for tripping, and the two-stages negative sequence is used for alarming.

保护逻辑见图 1.4。

Protection logic is shown in Figure 1.4.

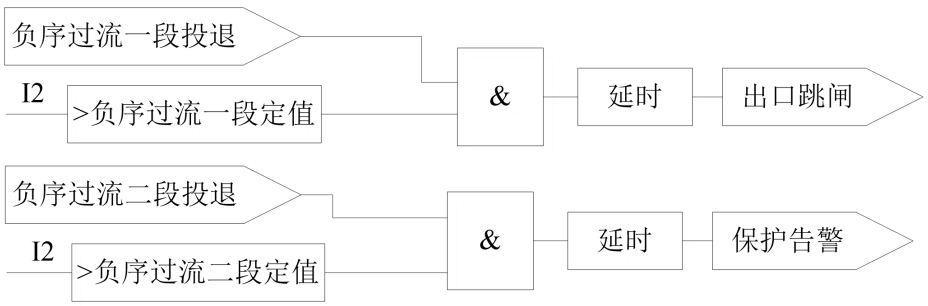


图 1.4 两段式负序过流保护逻辑

Figure 1.4 Two-stages negative sequence overcurrent protection logic

装置提供三条负序反时限过流保护特性曲线：

The device provides three negative sequence inverse-time overcurrent protection characteristic curves:

一般反时限：

Normal inverse time: $$t=\frac{0.14K}{(I_2/I_{df})^{0.02}-1}$$

非常反时限：

Very inverse time: $$t=\frac{13.5K}{(I_2/I_{df})-1}$$

极端反时限：

Extreme inverse time: $$t=\frac{80K}{(I_2/I_{df})^2-1}$$

其中 为反时限动作时间，为反时限启动电流，为输入负序电流，K 为时间常数。负序反时限特性曲线可以通过定值菜单里的负序反时限曲线类型来选择（0：一般反时限，1：非常反时限，2：极端反时限）。

t is the inverse time action time, I_2 is the inverse time start current, I_{df} is the negative sequence current, and K is the time factor. The negative sequence inverse time characteristic curves of this device can be selected by the negative sequence inverse time curve type in the parameter menu (S1: general inverse time, S2: very inverse time, S3: extreme inverse time).

保护逻辑见图 1.5。

The protection logic is shown in Figure 1.5.

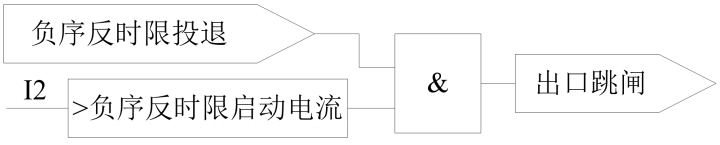


图 1.5 负序反时限过流保护逻辑

Figure 1.5 Negative sequence inverse-time overcurrent protection logic

1.2.5 两段式零序过流保护

1.2.5 Two-stages earth fault protection

当零序电流大于零序电流定值时，装置经延时保护动作。装置设有两段式零序过流保护，均由独立控制字实现投退，保护逻辑见图 1.6。

When the zero sequence current is higher than the zero sequence current setting value, the device is protected after a time delay. The device is equipped with two-stages earth fault protection, both of which are realized by independent control word, see Figure 1.6 for protection logic.

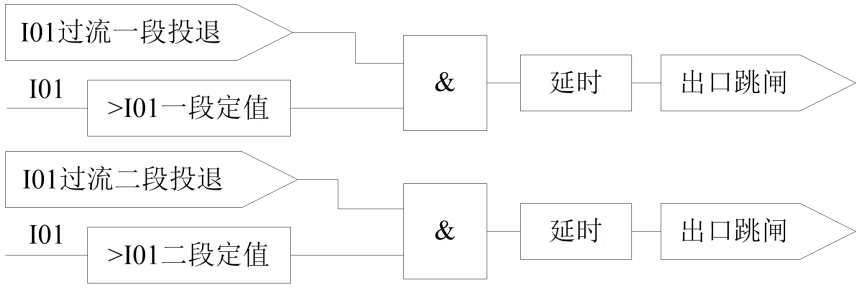


图 1.6 两段式零序过流保护逻辑

Figure 1.6 Two-stages earth fault protection logic

1.2.6 热过载保护

1.2.6 Overheat protection

电动机过负荷、启动时间过长、堵转等会产生较大的正序电流；而断相、不对称短路、输入电压不对称时会同时产生较大的正序和负序电流，根据电动机定子正序和负序电流引起的发热特征，可对上述故障提供热过载保护。

Motor overload, long starting time, blocking, etc. will generate large positive sequence current; while phase break, asymmetric short circuit, input voltage asymmetry will generate large positive sequence and negative sequence current at the same time. According to the heating characteristics caused by motor stator positive sequence and negative sequence current, Overheat protection can be provided for the above faults.

用正、负序综合测量值 Ieq 作为等效电流来模拟电动机的发热效应，即：

The combined positive and negative sequence measurement value Ieq is used as the equivalent current to simulate the heating effect of the motor, i.e:

$$Ieq^2 = K_1 \times I_1^2 + 6I_2^2$$

其中：Ieq ：等效电流

Where: Ieq : Equivalent current

I1：正序电流

I1: Positive sequence current

I2：负序电流

I2: Negative sequence current

K1：正序电流发热系数，在电机启动过程中 K1＝0.5，启动完毕 K1＝1

K1: positive sequence current heating coefficient, K1 = 0.5 during the motor starting process, K1 = 1 after starting

根据电动机的发热模型反时限特性，为有效保护电动机，保护的动作时间 t 和等效电流 Ieq 的关系有如下两条曲线可供选择：

According to the inverse time characteristics of the heat generation model of the motor, in order to effectively protect the motor, the relationship between the action time t of the protection and the equivalent current Ieq has two curves available as follows:

1) $$t = \frac{\tau}{Ieq^2 - I\infty^2}$$

其中：τ：过热时间常数

Where: τ: overheating time constant

I∞：允许电机长期运行的最大电流值，一般可设为 1.1

I∞: the maximum current value that allows the motor to run for a long time, generally can be set to 1.1

2) $$t = \tau \ln \frac{Ieq^2 - Ip^2}{Ieq^2 - I\infty^2}$$

其中：τ：过热时间常数

Where: τ: overheating time constant

I∞：允许电机长期运行的最大电流值，一般可设为 1.1

I∞: the maximum current value that allows the motor to run for a long time, generally can be set to 1.1

Ip：过负荷前的负载电流，若过负荷前处于冷态，则 Ip=0

Ip: load current before overload, if it is in cold state before overload, Ip=0

选择上述两曲线之一进行计算，当热积累值达到τ时，装置发出告警信号或保护跳闸。

Select one of the above two curves for calculation, when the heat accumulation value reaches τ, the device issues an alarm signal or protection tripping.

保护逻辑见图 1.7。

The protection logic is shown in Figure 1.7.

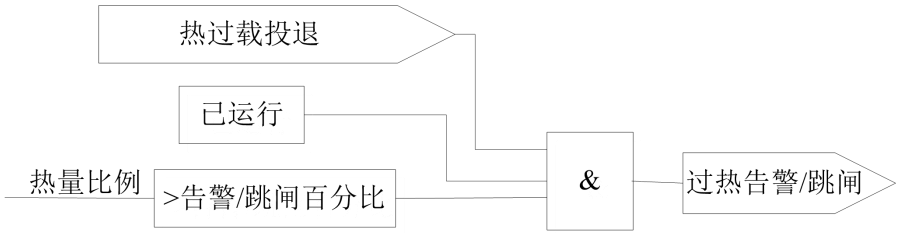


图 1.7 热过载保护逻辑

Figure 1.7 Overheat protection logic

1.2.7 过负荷保护

1.2.7 Overload protection

电动机运行过程中，出现超过电机正常运行最大电流时的保护。装置设有过负荷告警、过负荷跳闸保护，由独立控制字实现功能投退，保护功能在电机处于运行状态时有效，在启动过程中失效。

The motor is protected when the maximum current exceeds the normal operation of the motor during operation. The device is equipped with overload alarm and overload trip protection, which is realized by independent control word to enable and disable the function. The protection function is effective when the motor is in running state and ineffective during the starting process.

当电动机三相电流 IA、IB、IC 任一相大于过负荷告警定值时，经延时装置发出告警信号；当三相电流 IA、IB、IC 任一相大于过负荷跳闸定值时，经延时装置保护跳闸。

When any phase of the motor three-phase current IA, IB, IC is higher than the overload alarm value, the alarm signal will be issued by the time delay device; when any phase of the three-phase current IA, IB, IC is greater than the overload trip value, the protection will be tripped by the time delay device.

保护逻辑见图 1.8。

The protection logic is shown in Figure 1.8.

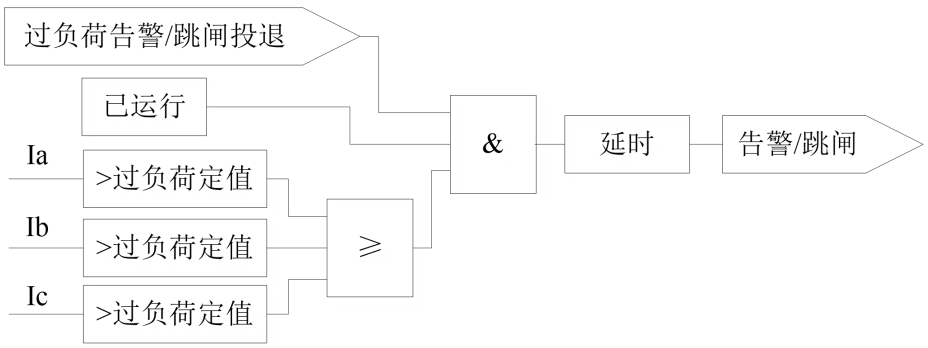


图 1.8 过负荷保护逻辑

Figure 1.8 Overload protection logic

1.2.8 堵转保护

1.2.8 Stall protection

电机由于负荷过大或自身机械原因造成电机轴被卡住等故障电流很大的保护。在电动机启动过程中堵转保护闭锁，电机进入运行状态后堵转保护才有效。

The motor is protected against high fault current due to excessive load or its own mechanical reasons such as the motor shaft being stuck. The stall protection is blocked during the motor starting process, and the stall protection is only effective after the motor enters the running state.

当电动机三相电流 IA、IB、IC 任一相超过堵转电流定值，并有转速低信号输入，达到整定延时时间后保护跳闸。

When any phase of the motor three-phase current IA, IB, IC exceeds the setting value of blocking current, and there is a low speed signal input, the protection trips after reaching the setting delay time.

保护逻辑见图 1.9。

The protection logic is shown in Figure 1.9.

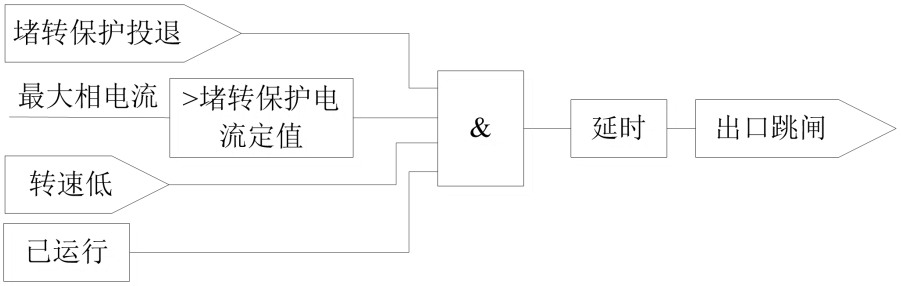


图 1.9 堵转保护逻辑

Figure 1.9 stall protection logic

1.2.9 启动时间过长保护

1.2.9 Start time-out protection

装置配置启动时间过长保护，根据电动机的发热模型，电动机的动作时间 t 与等效运行电流 Ieq 之间的特征曲线如下式所示：

Excessive starting time protection is enabled on the device. The characteristic curve between the motor action time t and the equivalent operating current Ieq is shown in the following equation according to the heat generation model of the motor:

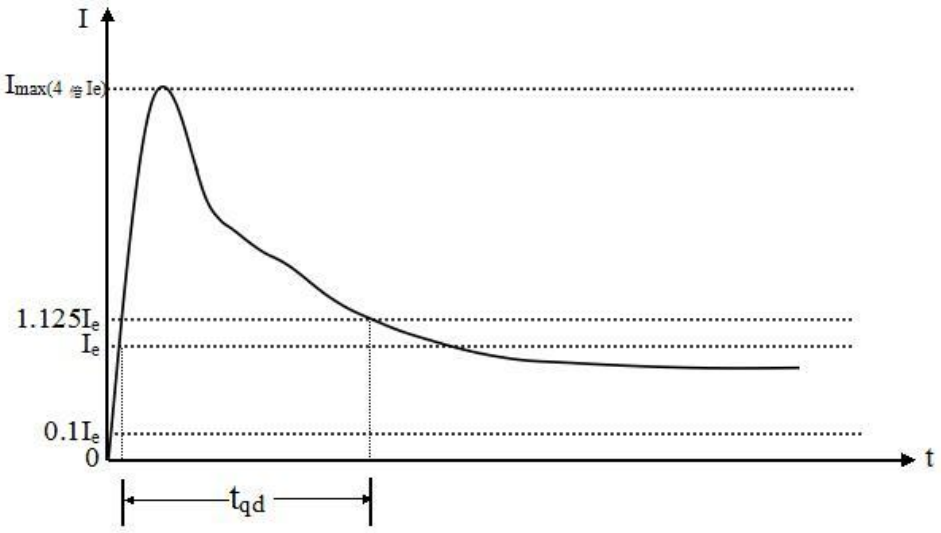


图 1.10 异步电动机启动电流特性图

Figure 1.10 Asynchronous motor starting current characteristic curve

其动作条件如下：

The action conditions are as follows:

- 启动时间过长保护控制字投入；
- The protection control word for a long starting time is put into operation;
- ，为电流定值，为额定二次电流的 1.125 倍，为最大相电流；
- $I_\phi > I_d$, is I_d the current setting value, 1.125 times of the rated secondary current, and is the maximum phase current; I_ϕ
- ，为电动机额定启动时间；
- $T > T_d$, is T_d the rated starting time of the motor;
- 电动机处于冷启动态。
- The motor is in cold start state.

延时时间到，液晶显示启动时间过长保护动作。

When the delay time is up, the LCD display shows the start time is too long protection action.

保护逻辑见图 1.11。

The protection logic is shown in Figure 1.11.

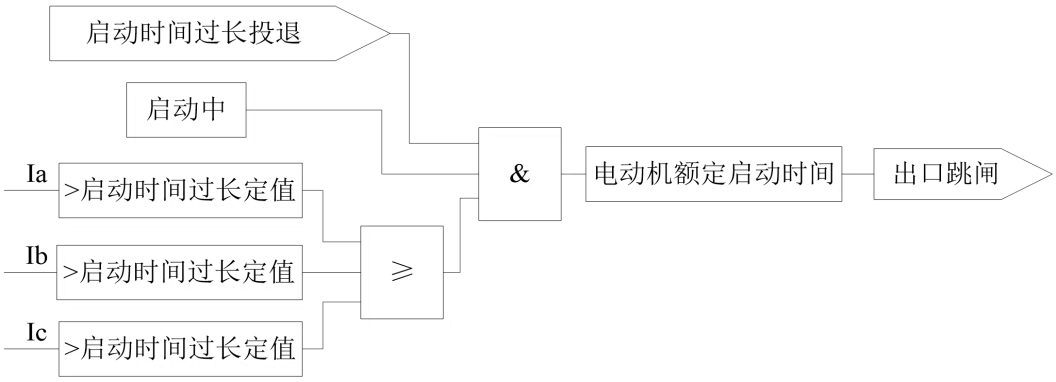


图 1.11 启动时间过长保护逻辑

Figure 1.11 Protection logic for excessive start time

1.2.10 低电压保护

1.2.10 Undervoltage protection

当三个线电压均小于低压定值时，经过延时，装置保护跳闸。为防止因 PT 断线使保护误动，设置有 PT 断线闭锁。当发生 PT 断线时，装置将发告警信号并闭锁低电压保护。为防止母线未送电时，低电压保护误动作，装置设有低电压开放条件。低电压保护开放条件：三个线电压有一个大于 1.05 倍低电压定值，且延时 500ms。该条件一旦成立，低电压保护有效。当低电压保护动作后，经过低电压开放条件无效，低电压保护自动返回。

After the delay time, the device protection trips if all three line voltages are less than the low-voltage setting value. PT break blocking is enabled to protect against false operations caused by PT break. When the PT breaks, the device sends an alarm and disables the low voltage protection. The device includes low-voltage open conditions to prevent the low-voltage protection from malfunctioning when the busbar is not powered. Low voltage protection open condition: one of the three line voltages exceeds 1.05 times the low voltage fixed value, with a 500ms delay. Once this condition is met, the low voltage protection kicks in. After the low voltage protection is activated, it will automatically return when the low voltage open condition is no longer met.

保护逻辑见图 1.12。

The protection logic is shown in Figure 1.12.

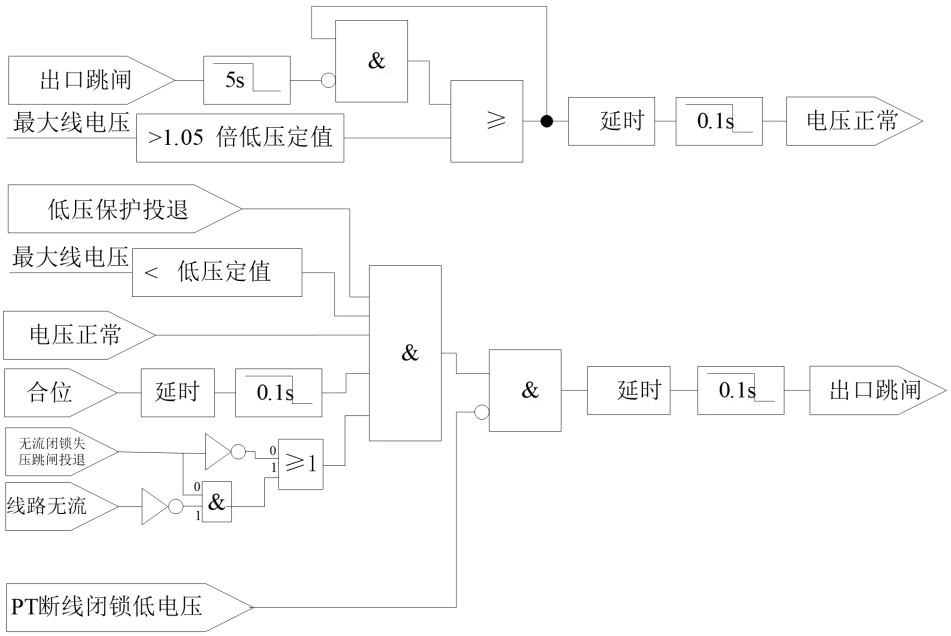


图 1.12 低电压保护逻辑

Figure 1.12 undervoltage protection logic

1.2.11 非电量保护

1.2.11 non-electric protection

装置设有 2 个非电量保护，每个非电量由独立控制字投退，可独立设时限，非电量 1 用于跳闸，非电量 2 用于告警。保护逻辑如图 1.13。

The device is equipped with 2 non-electric protections. Each non-electric is enabled and disabled by independent control word, and the time limit can be set independently. non-electric 1 is used for tripping, and non-electric 2 is used for alarm. The protection logic is shown in Figure 1.13.

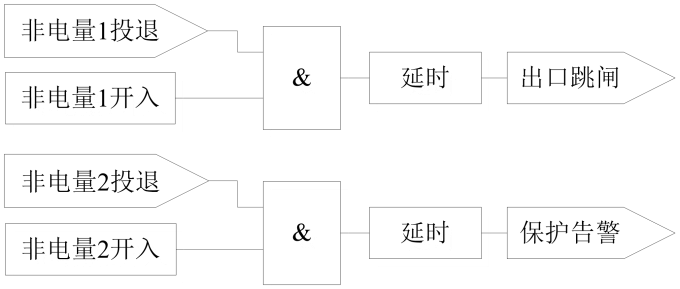


图 1.13 非电量保护逻辑

Figure 1.13 non-electric protection logic

1.2.12 PT 断线告警

1.2.12 PT supervision alarm

装置采用两种方法识别 PT 断线。

The device uses two methods to identify PT break.

方法一：当负序电压 3U2 大于 PT 断线负序电压时，经延时装置发出 PT 断线告警。

Method 1: When the negative sequence voltage 3U2 is higher than the PT break negative sequence voltage, the PT break alarm is issued by a time delay.

方法二：当三相线电压均小于无压定值，且至少有一相电流大于无流定值时，经延时装置发出 PT 断线告警。

Method 2: When all the three-phase line voltage is less than the no-voltage setting value, and at least one phase current is greater than the no-current setting value, the PT break alarm is issued by a time delay.

保护逻辑见图 1.14。

The protection logic is shown in Figure 1.14.

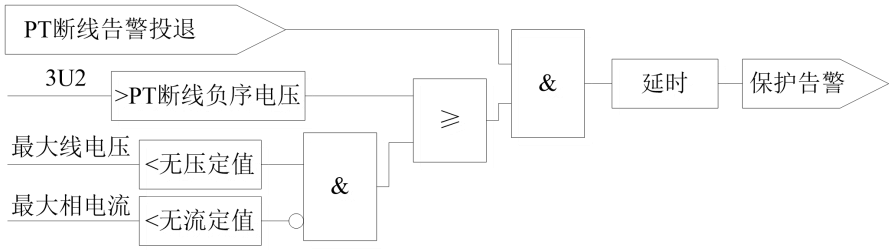


图 1.14 PT 断线告警逻辑

Figure 1.14 PT break alarm logic

1.2.13 控制回路故障告警

1.2.13 Trip-and-close circuit fault alarm

装置通过判断断路器操作回路的合位监视 HWJ、分位监视 TWJ 状态来识别控制回路是否异常，当合位监视与分位监视同时处于分状态时，判定为异常状态，装置将发出告警信号。

The device determines whether the trip-and-close circuit have fault by judging the state of HWJ and TWJ of the breaker. When both HWJ and TWJ are in the trip state at the same time, it is considered abnormal. The device will issue an alarm signal.

保护逻辑见图 1.15。

The protection logic is shown in Figure 1.15.

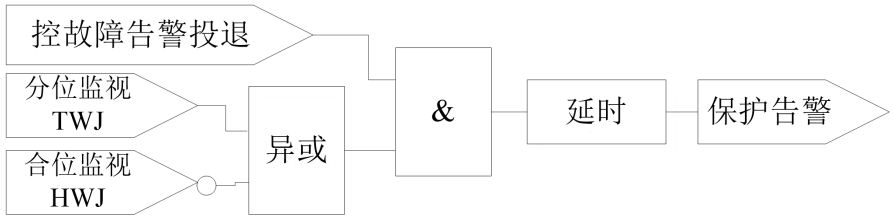


图 1.15　控制回路故障告警逻辑

Figure 1.15 Trip-and-close circuit fault alarm logic

1.2.14 零序过压告警

1.2.14 Zero sequence overvoltage alarm

当外接零序电压 U0 大于设定零序电压定值时，经延时，装置发出告警。

When the zero sequence voltage U0 is higher than the zero sequence voltage setting value, the device will issue an alarm after a delay.

保护逻辑见图 1.16。

The protection logic is shown in Figure 1.16.

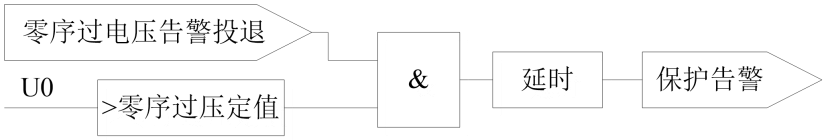


图 1.16　零序过压告警逻辑

Figure 1.16 Zero sequence overvoltage alarm logic

1.2.15 FC 回路配合的过流闭锁功能

1.2.15 FC blocking function

本装置设置了大电流闭锁保护动作的功能，用于断路器开断容量不足或现场为 FC 回路的情况。当故障电流大于电流闭锁保护定值时，闭锁装置保护出口，以保证熔断器首先熔断。当故障电流小于闭锁保护定值时，经延时开放所有保护出口。This device can blocking protection action when there is a high current.The function can be used in the event that the breaker opening capacity is insufficient or the site is FC circuit. When the fault current is higher than the FC blocking setting value, the device will block the trip outlet to ensure the fuse blows first. When the fault current is less than the FC blocking setting value, the trip outlet will not block all outlet of device.

保护逻辑见图 1.17。

The protection logic is shown in Figure 1.17.

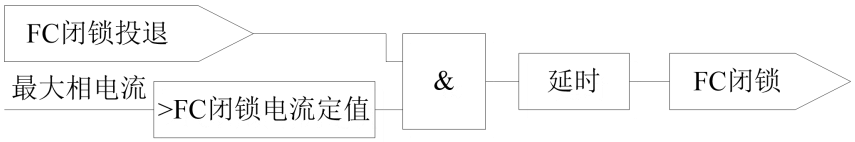


图 1.17　FC 回路配合的过流闭锁功能逻辑

Figure 1.17 FC blocking function logic

1.2.16 电压不平衡保护

1.2.16 Voltage unbalance protection

装置配置电压不平衡保护，当电压不平衡度超过电压不平衡度设定值，且当前最大线电压大于电压不平衡启动值，经延时，装置保护跳闸。

The device is equipped with voltage unbalance protection. When the voltage unbalance degree overtakes the voltage unbalance setting value and the current maximum line voltage is higher than the start value of voltage unbalance, the device protection will trip after a delay.

电压不平衡度的计算公式为：

The calculation formula of voltage unbalance degree is

$$\text{电压不平衡度} = \frac{\max（|\text{各相线电压} - \text{平均电压}|）}{\text{平均电压}} \times 100\%$$

$$\text{Voltage unbalance degree} = \frac{\text{Maximum voltage deviation from average voltage}}{\text{average voltage}} \times 100\%$$

保护逻辑见图 1.18。

The protection logic is shown in Figure 1.18.

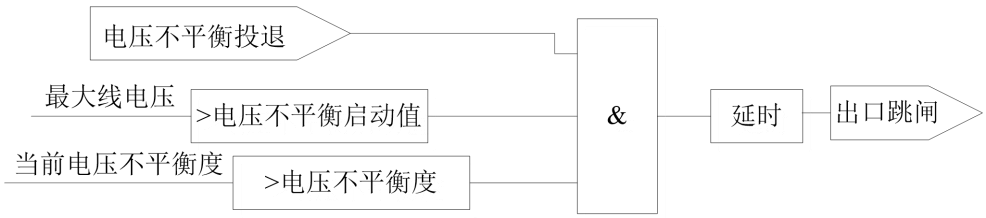


图 1.18　电压不平衡保护逻辑

Figure 1.18 Voltage unbalance protection logic

1.2.17 相序保护

1.2.17 Phase sequence protection

装置配置相序保护功能，装置错相判断依据如下：

The device is configured with phase sequence protection function, and the device misphase is judged based on the following:

最大相间电压小于线电压高定值（默认为 120V）；

Maximum phase-to-phase voltage is less than the line voltage high setting value (default is 120V)

最小相间电压大于线电压低定值（默认为 70V）；

Minimum phase-to-phase voltage is greater than the line voltage low setting value (default is 70V)

负序电压值超过平均电压值的一半；

Negative sequence voltage value is more than half of the average voltage value

正序电压值小于平均电压值的 30%；

Positive sequence voltage value is less than 30% of the average voltage value;

电动机处于启动中或已运行。

The motor is in start-up or already running.

经过设定的延时时间，装置相许保护跳闸。

After the set delay time, the device phase allows the protection trip.

保护逻辑见图 1.19。

The protection logic is shown in Figure 1.19.

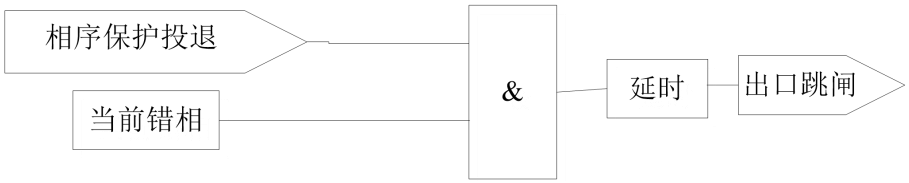


图 1.19　相序保护逻辑

Figure 1.19 Phase sequence protection logic

1.2.18 电压断相保护

1.2.18 Voltage phase failure protection

装置配置电压断相保护，采用两种方法识别电压断相。

The device is equipped with voltage phase failure protection. Two methods are used to identify voltage phase failure.

方法一：当最小线电压小于断相判据最小电压定值，且最大线电压大于断相判据最大电压定值时，经延时，装置保护跳闸。

Method 1: When the minimum line voltage is less than the minimum voltage setting value of the voltage phase failure and the maximum line voltage is more than the maximum voltage setting value of the phase failure, the device will trip after a delay.

方法二：当最大相间电压差值大于断相判据电压差定值，且最大线电压大于断相判据最大电压定值时，经延时，装置保护跳闸。

Method 2: When the maximum phase-to-phase voltage difference exceeds the voltage difference value of the phase failure and the maximum line voltage exceeds the maximum voltage value of the phase failure, the device will trip after a delay.

保护逻辑见图 1.20。

The protection logic is shown in Figure 1.20.

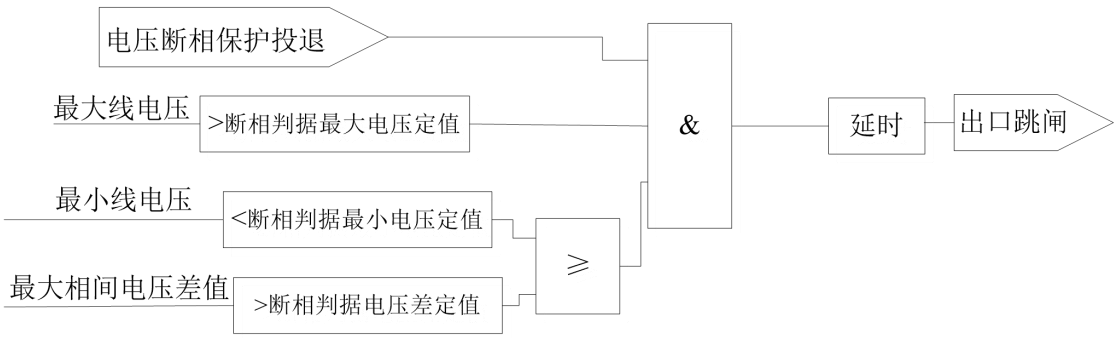


图 1.20　电压断相保护逻辑

Figure 1.20 Voltage phase failure protection logic

1.2.19 过电压保护

1.2.19 Overvoltage protection

当最大线电压大于过压定值时，经延时，装置保护跳闸。保护逻辑见图 1.21。

When the maximum line voltage is greater than the overvoltage setting value, the device protection trips after a time delay. See Figure 1.21 for the protection logic.

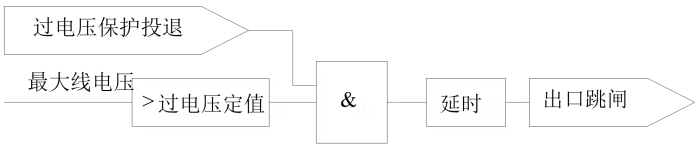


图 1.21 过电压保护逻辑

Figure 1.21 Overvoltage protection logic

1.3 定值表

1.3 Setting Value

表 1.1 AM5-M-Q 定值表

Table 1.1 AM5-M-Q Setting Table

AM5-M-Q 定 值 表 AM5-M-Q Setting Table				
保护名称 Protection name	定 值 名 称 Value Name	默认值 Default	范 围 Range	备 注 Remark
	CT 变比 CT	75	0.1～9999	比值 Ratio
	PT 变比 PT	100	0.1～9999	比值 Ratio
	电压接线方式 PT Mode	1	0～1	3PT；2PT 3PT; 2PT
	电流接线方式 CT Mode	1	0～1	3CT；2CT 3CT; 2CT
	一次电压显示 U Unit	0	0～1	kV；V kV；V
	额定电流一次值 Ie1	300	0.04～9999	Rate primary current
	启动门槛系数 K.Start	1.2	0.001～9999	
	运行门槛系数 K.Run	1.12	0.001～9999	
	电动机额定启动时间	14s	0～9999	电动机状态识别

	Te			Motor status recognition
	启动延时 Start Delay	0.04s	0～10	
	启动转运行延时 S-R.T	0.2s	0～10	Start to run delay time
启动时过流一段 Instantaneous overcurrent.starting	过流一段投退 E.3I>>>	1	0～1	退出；投入 No; Yes
	启动一段定值 3I>>>.S	30A	0.04～100	
	启动一段延时 3I>>>.Ts	0.3s	0～60	
运行时过流一段 Instantaneous overcurrent.running	运行一段定值 3I>>>.R	15A	0.04～100	
	运行一段延时 3I>>>.Tr	0s	0～60	
过流二段 Definite overcurrent	过流二段投退 E.3I>>	1	0～1	退出；投入 No; Yes
	过流二段定值 3I>>	2A	0.04～100	
	过流二段延时 3I>>.T	2s	0～60	
反时限过流 Inverse.Time overcurrent	反时限过流投退 E.I>.Inv	0	0～1	退出；投入 No; Yes
	反时限启动电流 I>.Inv	6A	0.04～100	
	反时限时间系数 I>.Inv.K	0.5	0～100	
	反时限曲线类型 I>.Inv.X	0	0～2	一般；非常；极端 S1;S2;S3
过负荷告警 Overload alarm	过负荷告警投退 E.I>Lo.A	0	0 to 1	退出；投入 No; Yes
	过负荷告警定值 I>Lo.A	6A	0.04～100	
	过负荷告警延时 I>Lo.A.T	5s	0～999	

过负荷跳闸 Overload trip	过负荷跳闸投退 E.I>Lo.T	1	0～1	退出；投入 No; Yes
	过负荷跳闸定值 I>Lo.A	7A	0.04～100	
	过负荷跳闸延时 I>Lo.A.T	12s	0～60	
启动时间过长 StartOutTime	启动超时投退 E. SoutT	1.	0～1	退出；投入 No; Yes
	启动超时定值 SoutT. I	1.125	0.04～100	
堵转保护 Stall Protection	堵转保护投退 E. Stall	1	0～1	退出；投入 No; Yes
	转速低闭锁堵转投退 E.LRS.B	0	0～1	转速低闭锁堵转 "Low speed" blocking stall 退出；投入 No; Yes
	堵转保护电流定值 Stall. I	6.5A	0.04～100	
	堵转保护延时 Stall. T	5s	0～60	
I01 过流一段 Zero sequence instantaneous overcurrent	I01 过流一段投退 E.I01>>>	1	0～1	退出；投入 No; Yes
	I01 一段定值 I01>>>	10A	0.04～100	
	I01 一段延时 I01>>>.T	1.5s	0～60	
I01 过流二段 earth fault	I01 过流二段投退 E.I01>>	0	0～1	退出；投入 No; Yes
	I01 二段定值 I01>>	9A	0.04～100	
	I01 二段延时 I01>>.T	10s	0～60	
负序过流一段 Negative sequence	负序过流一段投退 E.I2>>>	1	0～1	退出；投入 No; Yes

instantaneous overcurrent	负序过流一段定值 I2>>>	10A	0.04～100	
	负序过流一段延时 I2>>>.T	0.3s	0～60	
负序过流二段 Negative sequence overcurrent	负序过流二段投退 E.I2>>	0	0～1	退出；投入 No; Yes
	负序过流二段定值 I2>>	9A	0.04～100	
	负序过流二段延时 I2>>.T	10s	0～999	
负序反时限保护 Negative sequence inverse-time overcurrent	负序反时限投退 E.I2>Inv	0	0～1	退出；投入 No; Yes
	负序反时限启动电流 I2>Inv	6A	0.04～100	
	负序反时限时间系数 I2>Inv.K	0.5	0～100	
	负序反时限曲线类型 I2>Inv.X	0	0～2	一般；非常；极端 S1;S2;S3
热过载保护 OverHeat	热过载投退 E. OverHeat	0	0 to 1	退出；投入 No; Yes
	告警百分比 Heat. Al. P	70	0～100	
	跳闸百分比 Heat. Tr. P	100	0～200	
	发热时间常数 HeatPro. K	15min	0～100	
	散热时间常数 HeatEmi. K	30min	0～300	
	重启动过热闭锁值 HeatRe	50	0～100	
低电压保护 Under Voltage Protection	低电压保护投退 E. LVP.T	1	0～1	退出；投入 No; Yes
	低电压定值 LVP.T	90V	0～200	
	低电压延时	3s	0～60	

	LVP.T.T			
	PT 断线闭锁跳闸 E.T.PT.B	0	0～1	PT break blocking undervoltage protection 退出；投入 No; Yes
	合位允许低电压投退 E.CB OnT.B	0	0～1	Close position allows undervoltage protection 退出；投入 No; Yes
零序过压告警 Zero sequence overvoltage alarm	零序过压告警投退 E.U0.OVP	0	0～1	退出；投入 No; Yes
	零序过电告警定值 U0.OVP	110V	0～200	
	零序过电告警延时 U0,OVP.T	10s	0～999	
PT 断线告警 PT break alarm.	PT 断线告警投退 E.PtBr.A	1	0～1	退出；投入 No; Yes
	PT 断线告警延时 PtBr.T	10s	0～999	
	无压定值 U.None	15V	0～200	No Voltage Value
	无流定值 I.None	0.05A	0.04～100	No Current Value
	PT 断线负序电压 U2.Pt	35V	0～200	
控故障告警 Trip-and-close circuit fault Alarm	控故障告警投退 E.CB.A	1	0～1	退出；投入 No; Yes
	控故障告警延时 CB.A.T	10s	0～999	
非电量 1 保护 Non- electric 1 protection	非电量 1 投退 E.Non-el1	0	0～1	退出；投入 No; Yes
	非电量 1 延时 Non-el1.T	5s	0～60	
非电量 2 保护 Non- electric 2	非电量 2 投退 E.Non-el2	0	0～1	退出；投入 No; Yes

alarm	非电量 2 延时 Non-el2.T	5s	0～999	
FC 配合的过流闭锁功能 FC Block	FC 闭锁投退 E. FCBlock	0	0～1	退出；投入 No; Yes
	FC 闭锁电流定值 FCB. I	10A	0.04～120	
	FC 闭锁延时 FCB. T	5s	0～60	
	FC 闭锁返回延时 FCB.RT	0.5s	0～60	FC blocking return delay time
	无流闭锁低压 E.LVPT.I.B	1	0～1	No flow blocking low voltage protection throw back 退出；投入 No; Yes
电压不平衡保护 Unbalance Voltage Protection	电压不平衡投退 E. Unb. V	1	0～1	退出；投入 No; Yes
	电压不平衡度 Unb. V. R.	5	0～100	
	电压不平衡启动值 Unb. V	30V	0～200	
	电压不平衡延时 Unb. V. T	2s	0～100	
相序保护 Phase sequence protection	相序保护投退 E,Ph.Se.	1	0～1	退出；投入 No; Yes
	线电压高定值 LiV.HSet.	120V	0～200	Line voltage high setting
	线电压低定值 LiV.LSet.	70V	0～200	Line voltage low setting
	正序电压比例 U1 Ratio	30	0～100	Positive sequence voltage ratio
	负序电压比例 U2 Ratio	50	0～100	Negative sequence voltage ratio
	相序保护延时 Ph.Se.T	1	0～100	Phase sequence protection delay time

电压断相保护 Voltage phase failure protection	电压断相投退 E.Ph.Br	1	0～1	退出；投入 No; Yes
	电压断相延时 Ph.Br.T	1s	0～60	
	断相最大电压定值 PhBrUmax	30V	0～200	Maximum voltage setting for phase failure criterion
	断相最小电压定值 PhBrUmin	18V	0～200	Minimum voltage value for phase failure criterion
	断相判据电压差定值 Ph.BrU.Dif	18V	0～200	Voltage difference value of phase failure criterion
过电压保护 Over Voltage Protect	过电压保护投退 E.OVP	1	0～1	退出；投入 No; Yes
	过电压保护定值 U.OVP	110V	0～200	
	过电压保护延时 OVP.T	3s	0～60	
电流不平衡告警 Current unbalance alarm	电流不平衡告警 E.UnbI.A	1	0～1	退出；投入 No; Yes
	不平衡告警定值 UnbI.A	15	0 to 200	
	不平衡告警延时 UnbI.A.T	5s	0～999	
电流不平衡跳闸 Current unbalance trip	电流不平衡跳闸 E.UnbI.T	1	0～1	退出；投入 No; Yes
	不平衡跳闸定值 UnbI.T	30	0～200	
	不平衡跳闸延时 UnbI.T.T	1s	0～999	
	事故总信号延时 Acci.S.T	0.3s	0～60	Accident total signal delay time
	EMC 闭锁投退 E.EMC.B	0	0～1	EMC blocking 退出；投入

				No; Yes
	相序信号返回 T Ph.Se.SRT	2s	0～60	Phase sequence signal return delay
	分位开放负荷开关延时 Trip L.T	0.5s	0～60	CB Off open load switch delay
	断路器位置采集 CB Po.Ac	0	0～1	辅助触点;分合位监视 Auxiliary contact; split position monitoring
	断路器动作时间 Cir.Br,T	0.3s	0～999	Circuit breaker operation time
	电机启动方式 Start.Mode	0	0~1	Motor starting mode
	4-20mA 额定一次 4-20mA.1	125.00	0.001~9999.999	4-20mA rated primary current

1.4 接线方式

1.4 Wiring Method

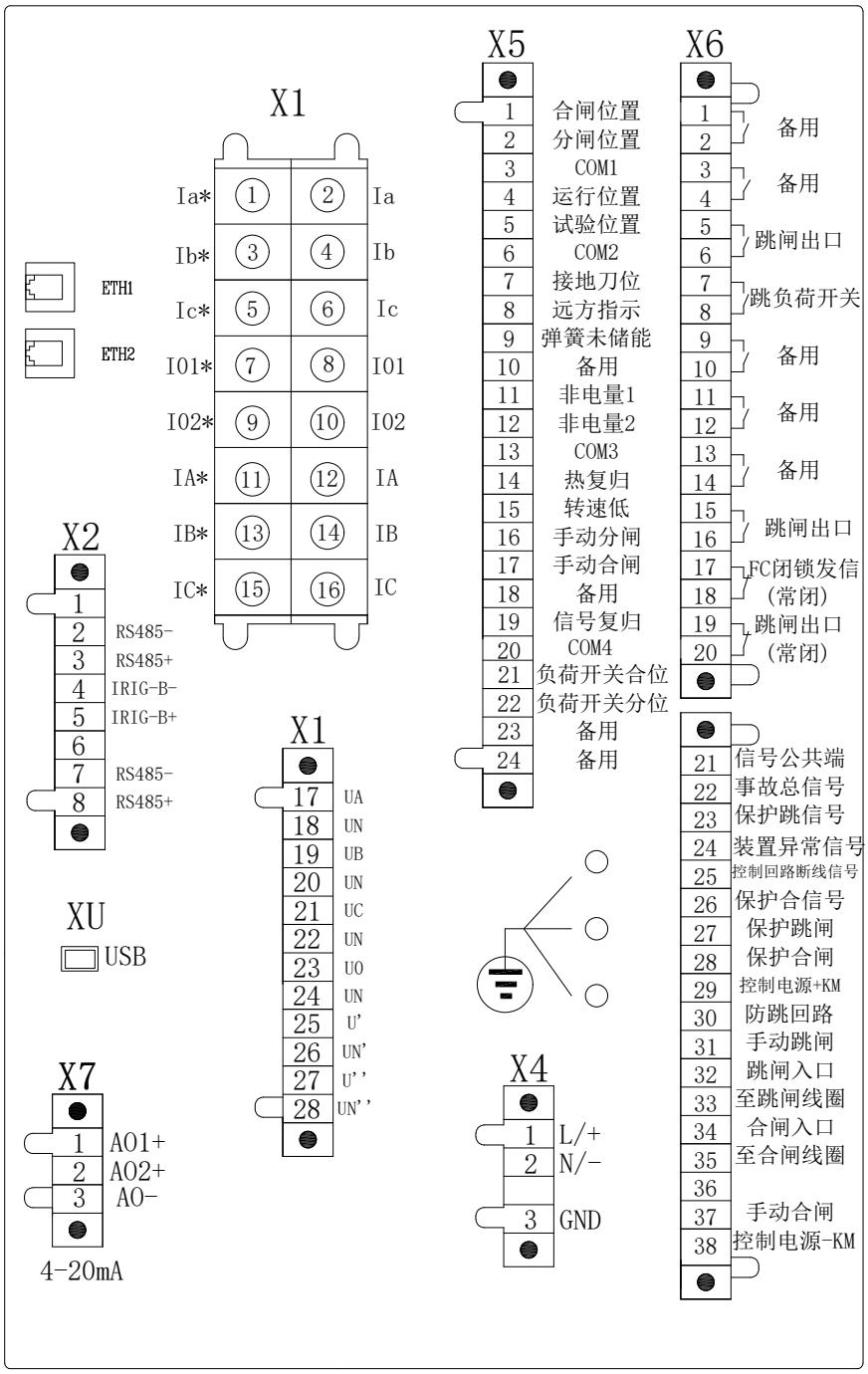


图 1.22　AM5-M-Q 电气接线图

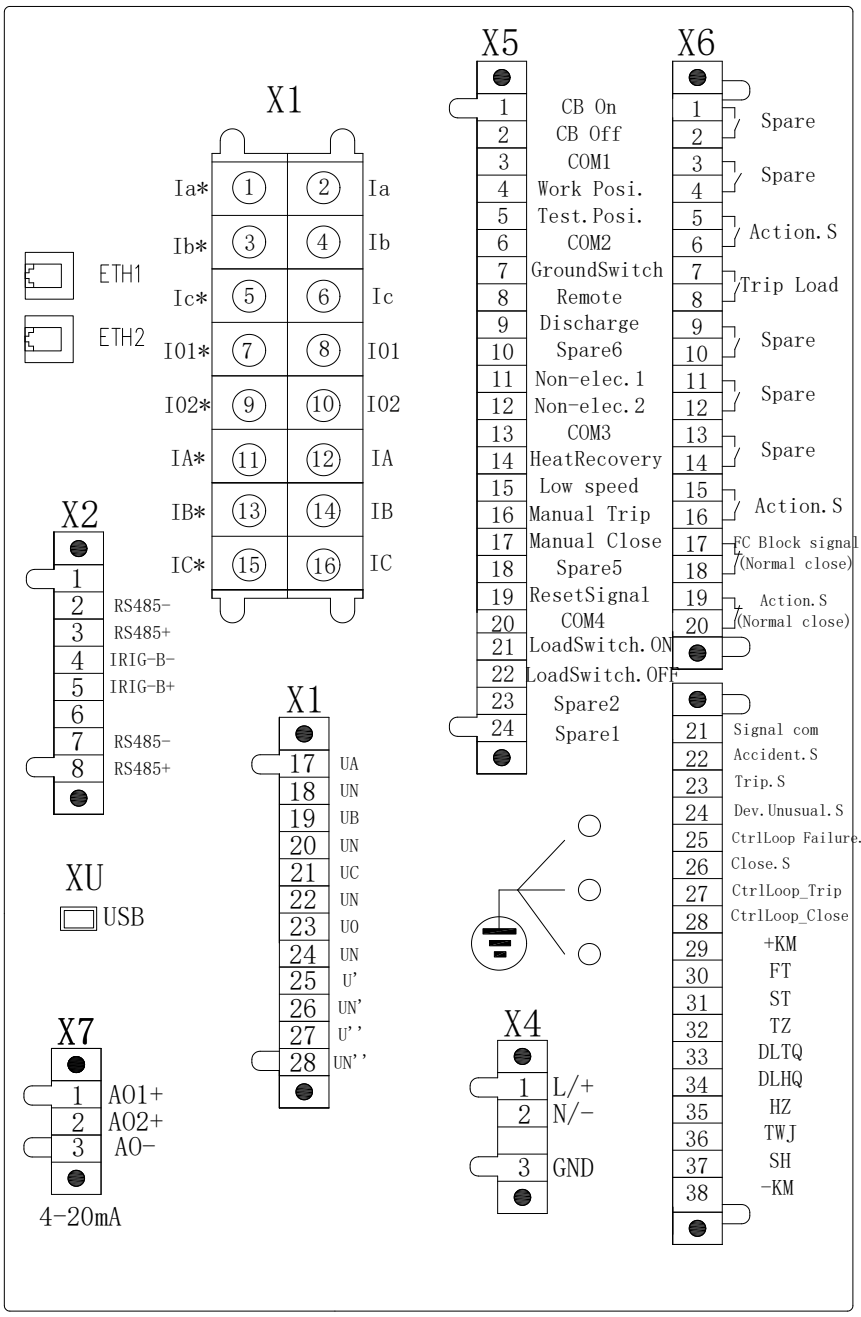


Figure 1.22 AM5-M-Q Electrical Wiring Diagram

AM5-M-Q 电气接线图如图 1.22 所示，包括交流输入量接线、开入开出接线、控制回路接线、通讯接线和辅助电源接线等。

The electrical wiring diagram of AM5-M-Q is shown in Figure 1.22, including AI, DO, DO, trip-and-close circuit wiring, communication wiring and auxiliary power wiring.

X1 端子为交流输入量端子，Ia、Ib、Ic 为保护相电流，IA、IB、IC 为测量相电流，I01、I02 为两路零序电流接入。UA、UB、UC 为三路电压接入，U0 为外接零序电压接入。U'、U"为备用输入。

Terminal X1 is AC current input terminal, Ia, Ib and Ic are protection phase current, IA, IB and IC are measurement phase current, I01 and I02 are zero sequence current input. UA, UB, UC are three voltage input, U0 is external zero sequence voltage input. U' and U" are backup input.

交流输入回路典型的 2PT、2CT 接线方式如图 1.23 所示。

Figure 1.23 depicts a typical 2PT and 2CT wiring method for an AI input circuit.

选择不同的接线方式，需修改装置“定值”菜单的“定值修改”子菜单里的“电压接线方式”设置：2PT——三相三线制；3PT——三相四线制。

To select a different wiring method, you need to modify the "PT Method" setting in the "Value Modify" sub-menu of the "Parameter" menu of the device: 2PT - three-phase three-wire; 3PT - three-phase four-wire.

X2 端子为通信端子，共有 2 路 RS485 通信端子和一路 IRIG-B 对时输入端子。 X2.1、X2.2、X2.3 为第一路通信端子，X2.6、X2.7、X2.8 为第二路通信端子，两路通讯均支持 IEC60870-5-103 和 Modbus-RTU 通讯规约。

X2 terminal is the communication terminal. There are two RS485 communication terminals and one IRIGB time synchronization terminal. X2.1, X2.2, X2.3 are the first communication terminals, and X2.6, X2.7, X2.8 are the second communication terminals. Both communication channels support IEC60870-5-103 and Modbus-RTU communication protocol.

X4 端子为辅助电源端子，AC/DC 110V，X4.3 为辅助电源保护地，必须可靠连接大地。

X4 terminal is the auxiliary power terminal, AC/DC 110V. X4.3 is the auxiliary power protection ground, which must be reliably connected to the earth.

X5 端子为开关量输入端子，共有 20 路，分为 4 组，每组有一公共端。第一组有 DI1 和 DI2，第二组有 DI3 和 DI4，第三组为 DI5-DI12，第四组为 DI13-DI20。所有开入允许接电压 AC/DC110V，同组的开入必须有相同的极性。

X5 terminal is the switch input terminal; there are 20 channels divided into four groups, each with a common terminal. DI1 and DI2 are in the first group, DI3 and DI4 are in the second, DI5-DI12 are in the third, and DI13-DI20 are in the fourth. All DI is permitted to connect voltage AC/DC110V and the same group DI must have the same polarity.

开入的电压接入 AC/DC110V，需要在订货前注明。

The DI voltage access AC/DC110V needs to be specified before ordering.

X6 端子为开关量输出和控制回路端子。端子号 X6.1-X6.20 开关量输出端子，共有 DO1-DO10 十路无源继电器输出接点，其中 DO9、DO10 出厂时为常闭接点，其他 8 路均为常开接点。端子号 X6.21-X6.38 为控制回路端子，具体定义如图 3.22。十组开关量输出的具体定义可以通过装置的“DO 类型　映射关系”界面查看。

X6 terminal is the switch output and trip-and-close circuit terminal. X6.1-X6.20 are switch output terminal, a total of ten passive relay output DO1-DO10. DO9 and DO10 are normally closed relay output, and the other eight are normally open relay output. According to Figure 3.22, the trip-and-close circuit terminal is X6.21-X6.38. The device's "DO Mapping" interface allows you to view the specific definitions of the ten switch outputs.

X7 端子为直流模拟量输出端子，共有 2 路 4-20mA 模拟量变送输出。X7.1、X7.3 为第一路 4-20mA 输出，默认定义为测量电流 A 相一次值，4mA 对应 0A，20mA 对应电机额定电流一次值的 1.25 倍；X7.2、X7.3 为第二路 4-20mA 输出，默认定义为测量电流 C 相一次值，4mA 对应 0A，20mA 对应电机额定电流一次值的 1.25 倍。

X7 is the DC output terminal,which has two 4-20mA analog outputs. X7.1 and X7.3 are the first 4-20mA output, and the default definition is the primary value of A phase measure current, 4mA corresponds to 0A, 20mA corresponds to 1.25 times the primary value of rated motor current; X7.2 and X7.3 are the second 4-20mA output, and the default definition is the primary value of C phase measure current, 4mA corresponds to 0A, 20mA corresponds to 1.25 times the primary value of rated motor current.

XB1、XB2 为以太网通讯端子，支持 TCP IEC60870-5-103、 Modbus-TCP 规约。该端子为选配，若需要需在订货前说明。

XB1, XB2 are Ethernet communication terminals, supporting TCP IEC60870-5-103, Modbus-TCPprotocol. This terminal is optional, if you need it, please specify before ordering.

XU 为 USB 维护口。

XU is the USB maintenance port.

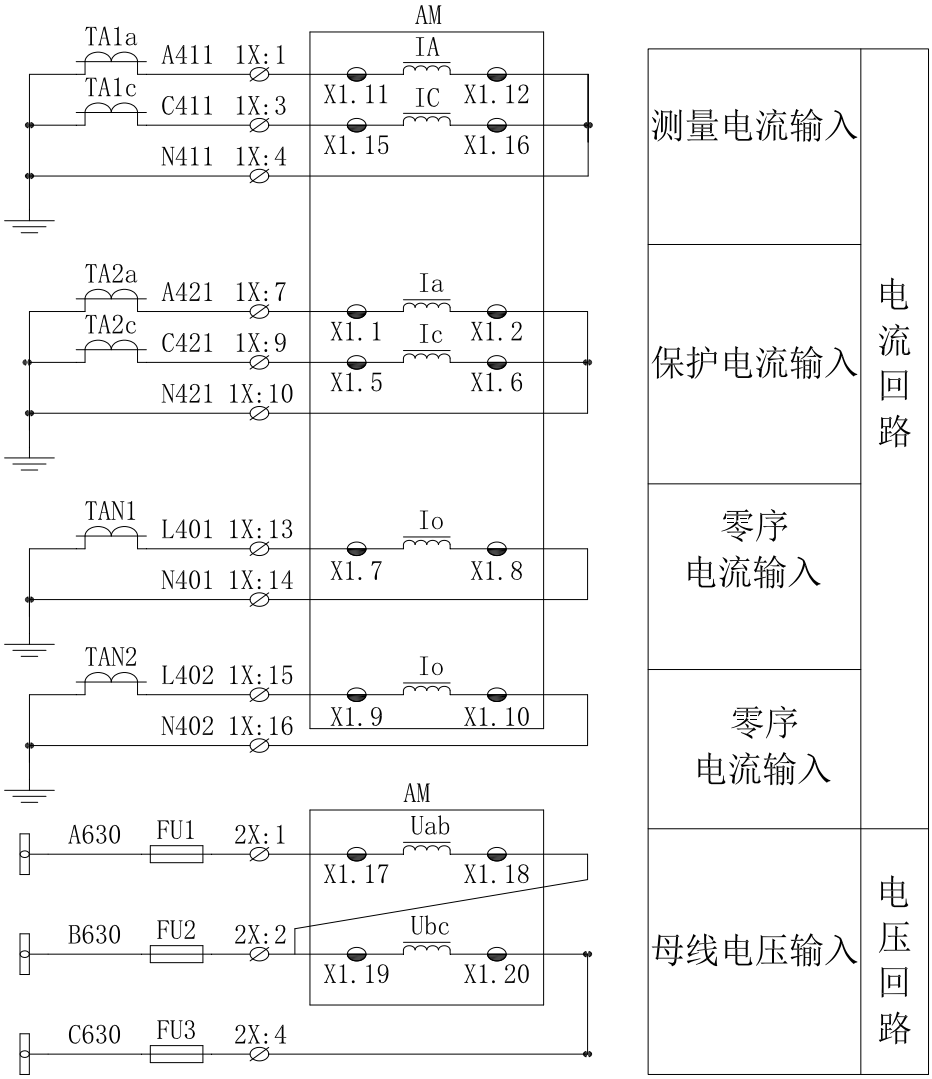


图 1.23　2PT 2CT 接线方法

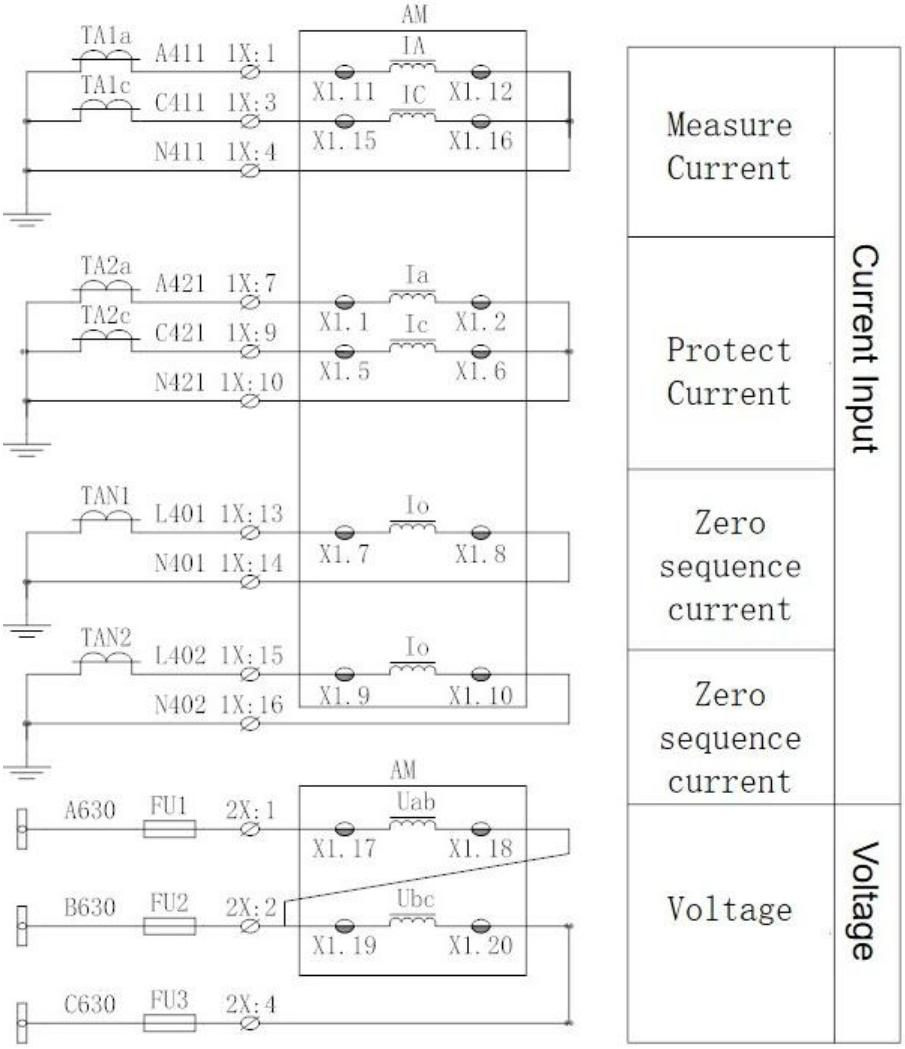


Figure 1.23 2PT 2CT wiring method

1.5 调试方法

1.5 Debugging Method

所有保护功能在调试过程中，当保护跳闸时，装置面板上“保护动作”指示灯点亮，对应继电器和跳闸信号继电器出口，液晶上显示相应事件记录信息；当保护告警时，装置面板上“告警”指示灯亮，告警信号继电器出口，液晶上显示相应事件记录信息。

When the device trips, the "Trip" indicator light on the device panel illuminates. It corresponds to the trip relay and tripping signal relay output, and the LCD display will show the corresponding event record information. When a protection alarm occurs, the "Alarm" indicator light on the device panel will illuminate. The alarm signal relay will be activated, and the LCD display will show the corresponding event record information.

本装置监视电动机运行状态进行保护，运行状态分为停用、启动中和已运行三种，识别方法如下：

The device monitors the motor status for protection. The status is divided into three kinds: stop, starting and running. The identification methods are as follows:

1）停用

1）Stop

当最大相电流小于无流定值时，即可判电动机状态为停用。

When the maximum phase current is less than the whitout-current value “I.None”, the motor status can be identified as stop.

2）启动中

2）Starting

电动机处于停用态；

The motor is in stop state;

最大相电流大于二次额定电流值的 1.2 倍。

The maximum phase current is more than 1.2 times of the rated secondary current value.

3）已运行

3）Running

不处于停用状态；电机由启动中退出。

The motor is not in stop state; the motor exits from the starting state.

当电机处于启动中是，面板上启动中指示灯亮；当电机处于已运行时，面板上已运行指示灯亮。

When the motor is starting, the starting indicator light on the panel illuminates; when the motor is running, the running indicator light illuminates.

1.5.1 过流一段保护

1.5.1 Instantaneous overcurrent protection

启动时过流一段

Instantaneous overcurrent in starting state

1）设置过流一段投退为“投入”，退出其他保护投退，设置启动时过流一段定值为 3A，启动时过流一段延时为 0s。

(1) Set the “E.3I>>>” as "yes", quit other protection, set the “3I>>>.S” as 3A, and the “3I>>>.Ts” as 0s.

2）当电动机处于启动中状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 均施加小于 0.97 倍定值的电流信号，装置可靠不动作；将电流加大至大于 1.03 倍定值，装置保护动作。

2）When the motor is in starting state, apply current signals less than 0.97 times the setting value to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, and the device will not operate reliably; increasing the current to more than 1.03 times the setting value, the device will operate.

运行时过流一段

Instantaneous overcurrent in running state

1）设置过流一段投退为“投入”，退出其他保护投退，设置运行时过流一段定值为 2A，运行时过流一段延时为 0s。

(1) Set the “E.3I>>>” as "yes", quit other protection, set the “3I>>>.R” as 2A, and the “3I>>>.Rs” as 0s.

2）当电动机处于运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 均施加小于 0.97 倍定值的电流信号，装置不动作；将电流加大至大于 1.03 倍定值，装置保护动作。

2）When the motor is running, apply current signals less than 0.97 times the setting value to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, and the device will not operate; increasing the current to more than 1.03 times the setting value, the device will operate.

1.5.2 过流二段保护

1.5.2 Definite-time overcurrent protection

1）设置过流二段投退为“投入”，退出其他保护投退，设置过流二段定值为 2A，过流二段延时为 5s。

(1) Set the “E.3I>>” as "yes", quit other protection, set set the “3I>>” as 2A, and the “3I>>.T” as 5s.

2）当电动机处于运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 均施加小于 0.97 倍定值的电流信号，经延时装置可靠不动作；将电路增大至大于 1.03 倍定值，装置经延时保护动作。

2）When the motor is in running state, apply current signals less than 0.97 times the setting value to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, and the device will not operate reliably; increasing the current to more than 1.03 times the setting value, the device will operate after a delay.

1.5.3 反时限过流保护

1.5.3 Inverse time overcurrent protection

1）设置反时限过流保护投退为“投入”，退出其他保护投退。将反时限启动电流设为 1A，反时限曲线类型、反时限时间系数按表 1.2 设置。

(1) Set the “E.I>inv” as "yes", quit other protection, set “I.Inv” to 1A. Set “I.Inv.K” and “I.Inv.X” according to table 1.2.

2）当电动机处于运行状态时，施加不同过流信号装置保护动作情况如表 1.2。

(2) When the motor is in running state, the protection action of different overcurrent signal devices is shown in Table 1.2.

表 1.2 反时限动作时间

Table 1.2 Inverse time action time

曲线类型 Curve type	时间系数 Time coefficient	施加信号 Applied signal	装置状态 Device state	动作时间误差 Action time error	理论值 Theoretical value
一般 S1	0.5	0.9 倍定值 0.9 times the setting value	不动作 No operation	------	------
		2 倍定值 2 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	5.015s
		5 倍定值 5 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	2.140s
非常 S2	0.1	0.9 倍定值 0.9 times the setting value	不动作 No operation	------	------
		2 倍定值 2 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	1.350s
		5 倍定值 5 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	0.338s
极端 S3	0.5	0.9 倍定值 0.9 times the setting value	不动作 No operation	------	------
		2 倍定值 2 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	13.333s
		5 倍定值 5 times the setting value	动作 Operation	±5%或±40ms ±5% or ±40ms	1.667s

1.5.4 两段式负序过流保护/负序反时限

1.5.4 Two-stages negative sequence overcurrent protection/negative sequence inverse time

负序过流一段

Negative sequence Instantaneous overcurrent

1）设置负序过流一段投退为“投入”，设定负序过流一段定值为 1A，负序过流一段延时为 3s。

(1) Set “E.I2>>>” as "yes", set “I2>>>” to 1A, and “I2>>>.T” to 3s.

2）在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加 4A/5A/5A 电流信号。当电流信号由 4A/5A/5A 变为 3.8A/5A/5A 时，装置可靠不动作；模拟故障，当电流变为 1A/5A/5A 时，装置经延时跳闸。

2）Apply 4A/5A/5A current signals at AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. When the current signal changes from 4A/5A/5A to 3.8A/5A/5A, the device does not operate reliably; Simulating a fault, when the current changes to 1A/5A/5A, the device trips after a delay.

负序过流二段

Negative sequence two-stages overcurrent

1）设置负序过流二段投退为“投入”，设定负序过流二段定值为 1A，负序过流二段延时为 1s。

(1) Set “E.I2>>” as "yes", set “I2>>” to 1A, and “I2>>.T” to 1s.

2）在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加 4A/5A/5A 电流信号。当电流信号由 4A/5A/5A 变为 3.8A/5A/5A 时，装置可靠不动作；当电流变为 1A/5A/5A 时，装置经延时发出告警信号。

2）Apply 4A/5A/5A current signals at AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. When the current signal changes from 4A/5A/5A to 3.8A/5A/5A, the device does not operate reliably ; when the current changes to 1A/5A/5A, the device issues an alarm signal after a delay.

负序反时限过流

Negative sequence inverse time overcurrent

1）设置负序过流反时限投退为“投入”，设定负序反时限启动电流为 1A。

(1) Set the “E.I2>Inv” as "yes", set the “I2>Inv” to 1A.

2）在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加 5A/5A/5A 电流信号，反时限曲线类型、反时限时间系数按表 1.3 设置，模拟故障，当三相电流施加不同信号时装置保护动作情况如表 1.3。

2）Apply 5A/5A/5A current signals to AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, set the “I2>Inv.K” and “I2>Inv.X” as shown in Table 1.3 to simulate the fault.The device protection action is shown in Table 1.3. when different signals are applied to the three-phase current.

表 1.3 负序反时限动作时间

Table 1.3 Negative sequence inverse time limit action time

曲线类型 Curve type	时间系数 Time factor	施加信号 Applied signal	装置状态 Device state	动作时间误差 Action time error	理论值 Theoretical value

一般 S1	0.5	1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	12.29s
		0.1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	7.19s
		0.1A/6A/6A	动作 Operation	±5%或±40ms ±5% or ±40ms	5.21s
非常 S2	0.1	1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	4.13s
		0.1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	2.20s
		0.1A/6A/6A	动作 Operation	±5%或±40ms ±5% or ±40ms	1.41s
极端 S3	0.5	1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	52.01s
		0.1A/5A/5A	动作 Operation	±5%或±40ms ±5% or ±40ms	24.18s
		0.1A/6A/6A	动作 Operation	±5%或±40ms ±5% or ±40ms	14.04s

1.5.5 两段式零序过流保护

1.5.5 Two-stages earth fault protection

I01 过流一段

I01 Instantaneous overcurrent

1）设置 I01 过流一段投退为“投入”，退出其他保护投退，设定 I01 一段定值为 5A，I01 一段延时为 0s。

(1) Set the “E.I01>>>” as "yes", quit other protection, set the “I01>>>” as 5A, and the “I01>>>.T” as 0s.

2）在交流输入端子 X1.7-X1.8 施加小于 0.97 倍定值的电流，装置可靠不动作；将电路增大至大于 1.03 倍定值，装置保护动作。

(2) Apply the current less than 0.97 times the setting value to the AC input terminal X1.7-X1.8, the device will not operate reliably; increasing the circuit to a value greater than 1.03 times the setting value, the device will operate.

I01 过流二段

I01 Two-stages overcurrent

1）设置 I01 过流二段投退为“投入”，退出其他保护投退，设定 I01 二段定值为 4A，I01 二段延时为 4s。

(1) Set the “E.I01>>” as "yes", quit other protection, set the “I01>>” as 4A and “I01>>>.T” as 4s.

2）在交流输入端子 X1.7-X1.8 施加小于 0.97 倍定值的电流，装置可靠不动作；将电路增大至大于 1.03 倍定值，经延时装置保护告警。

(2) Apply the current less than 0.97 times the setting value to AC input terminal X1.7-X1.8, the device will not operate reliably; increasing the circuit to a value greater than 1.03 times the setting value, the protection alarm will be activated after a delay.

1.5.6 热过载保护

1.5.6 Overheat protection

热过载告警

Overheat alarm

1）设置热过载投退为“投入”，退出其他投退，设置告警百分比值为 70%，发热时间常数为 15min，散热时间常数为 30min。

(1) Set the “E.OverHeat” as "yes", quit other protection, set the “Heat.Al.P” as 70%, the “HeatPro.K” as 15min, and the “HeatEmi.K” as 30min.

2）当电动机处于已运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加三相电流信号 5A/5A/5A，当电流由 5A/5A/5A 变为 5A/5A/1A 时，装置发出热过载告警。

2） When the motor is running, apply three-phase current signals 5A/5A/5A at AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. When the current changes from 5A/5A/5A to 5A/5A/1A, the device will issue overheat alarm.

热过载跳闸

Overheat trip

1）设置热过载投退为“投入”，退出其他投退，设置跳闸百分比值为 100%，发热时间常数为 15min，散热时间常数为 30min。

(1) Set the “E.OverHeat” as "yes", quit other protection, set the “Heat.Tr.P” as 100%, the “HeatPro.K” as 15min, and the “HeatEmi.K” as 30min

.2）当电动机处于已运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加三相电流信号 5A/5A/5A，当电流由 5A/5A/5A 变为 5A/5A/1A 时，装置保护跳闸。

(2) When the motor is running, apply three-phase current signals 5A/5A/5A at AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. When the current changes from 5A/5A/5A to 5A/5A/1A, the device protection will trip.

1.5.7 过负荷保护

1.5.7 Overload protection

过负荷告警

Overload alarm

1）设置过负荷告警投退为“投入”，退出其他保护投退，设定过负荷告警定值为 2A，过负荷告警延时为 2s。

(1) Set the “E.I>Lo.A” as "yes", quit other protection, set the “I>Lo.A” to 2A and the “I>Lo.A.T” to 2s.

2）当电动机处于已运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加小于 0.97 倍定值的电流，装置可靠不动作；将电流增大至大于 1.03 倍定值，经延时装置保护告警。

2）When the motor is running, apply the current less than 0.97 times the setting value to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, the device will not operate reliably; increasing the current to a value more than 1.03 times the setting value, the device will alarm after a delay.

过负荷跳闸

Overload trip

1）设置过负荷跳闸投退为“投入”，退出其他保护投退，设定过负荷跳闸定值为 3A，过负荷告警延时为 5s。

(1) Set the “E.I>Lo.T” as "yes", quit other protection, set the “I>Lo.A” to 3A and the “I>Lo.A.T” to 5s.

2）当电动机处于已运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加小于 0.97 倍定值的电流，装置可靠不动作；将电流增大至大于 1.03 倍定值，经延时装置保护跳闸。

(2) When the motor is in running state, apply the current less than 0.97 times the setting value to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, the device will not operate reliably; increasing the current to a value greater than 1.03 times the setting value, the protection will trip after a delay.

1.5.8 堵转保护

1.5.8 stall protection

1）设置堵转保护投退为“投入”，退出其他保护投退，设定堵转保护电流定值 2A，堵转保护延时 5s。

(1) Set the “E.Stall” as "yes", quit other protection, set the “Stall.I” to 2A and the “Stall.T” to 5s.

2）当电动机处于已运行状态时，给转速低对应的开入量施加信号（AC/DC220V 或 DC110V），在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 施加小于 0.97 倍定值的电流，装置可靠不动作；当电流增大至大于 1.03 倍定值，经延时装置保护跳闸。

2） When the motor is running, apply a signal (AC/DC220V or DC110V) to the DI corresponding to low speed, and apply the current less than 0.97 times the setting value to the AC

input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6, the device will not operate reliably; when the current exceeds 1.03 times the setting value, the protection will trip after a delay.

1.5.9 启动时间过长

1.5.9 Starting time-out

1）设置启动超时投退为“投入”，退出其他保护投退，设定启动时间过长电流定值为 5A，额定启动时间为 5s。

(1) Set the “E.SoutT” as "yes", quit other protection, set the ”SoutT.I” to 5A, the “Te” to 5s.

2）给合位对应的开入量施加信号（AC/DC 220V 或 AC/DC110V 或 DC48V）模拟电动机启动，再给装置施加大于 1.03 倍定值的电流信号直到电动机进入已运行状态，装置保护跳闸；装置复归后，再次施加大于 1.03 倍定值的电流信号，在电动机额定启动时间结束前将电流降至小于 0.97 倍定值，电动机进入已运行状态，装置可靠不动作。

2）Apply a signal (AC/DC 220V or AC/DC 110V or DC48V) to the DI corresponding to “CB On” to simulate the motor starting, and then apply a current signal greater than 1.03 times the setting value to the device until the motor enters the running state, and the device protects and trips; after the device has been restored, apply a current signal greater than 1.03 times the setting value again and reduce the current to less than 0.97 times the setting value before the end of the motor's rated starting time, the motor will enter the running state, and the device will not operate reliably.

1.5.10 低电压保护

1.5.10 Undervoltage protection

1）设置低电压跳闸投退为“投入”，退出其他保护投退，设定低电压跳闸定值为 70V，低电压跳闸延时 5s。

(1) Set the “E.LVP.T” as "yes", quit other protection, set the “LVP.T” to 70V and the “LVP.T.T” to 5s.

2）给合位对应的开入量施加信号（AC/DC 220V 或 AC/DC110V 或 DC48V），在端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上施加 57.74V 电压，当三相电压信号由 57.74V 降至小于 0.97 倍定值时，经延时，装置保护跳闸。

2）Apply a signal (AC/DC 220V or AC/DC110V or DC48V) to the DI corresponding to the "CB On". Apply 57.74V to the terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22, when the three-phase voltage signal drops from 57.74V to less than 0.97 times the setting value, the device will trip after a delay.

3）若投入“无流闭锁低压保护”控制字，则还须在端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 上施加三相电流信号 IA=IB=IC=1A。

(3) If the setting value "E.LVPT.I.B" is “yes”, the three-phase current signal IA=IB=IC=1A must be applied to terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6.

1.5.11 非电量保护

1.5.11 Non-electric protection

非电量 1

Non-electric 1

1）设置非电量 1 投退为“投入”，退出其他保护投退，设非电量 1 延时为 4s。

(1) Set the “E.Non-el1” as "yes", quit other protection, set the “E.Non-el1.T” to 4s.

2）给非电量 1 对应的开入量施加信号（AC/DC 220V 或 AC/DC110V 或 DC48V），经延时装置保护跳闸。

(2) Apply a signal (AC/DC 220V or AC/DC110V or DC48V) to the corresponding DI of “non-electric 1”, and the protection will trip after a delay.

非电量 2 的调试方法同非电量 1 类似，两路开入量可根据实际需要任意配置。

The debugging of non-electric 2 is similar to that of non-electric 1, and the two way DI can be arbitrarily configured according to actual needs.

1.5.12 PT 断线告警

1.5.12 PT break alarm

1) 设置 PT 断线告警投退为“投入”，退出其他保护投退，PT 断线告警延时为 5s。设 PT 断线负序电压为 35V，无压定值为 15V，无流定值为 0.2A。

1) Set the “E.Pt.Br.A” as "yes", quit other protection, and set the “PtBr.T” to 5s. Set the “U2.Pt” as 35V, “U.None” as 15V, “I.None” as 0.2A.

2) 在交流输入端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上施加三相电压信号 UA=UB=UC=57.74V，在端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 上施加三相电流信号 IA=IB=IC=1A。改变三相电压，使得负序电压 3U2 由 0V 升至大于 1.03 倍 PT 断线负序电压，经延时装置发出 PT 断线告警；

2) Apply three-phase voltage signal UA=UB=UC=57.74V at AC input terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22, and three-phase current signal IA=IB=IC=1A at terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. Change the three-phase voltage so that the negative sequence voltage 3U2 rises from 0V to greater than 1.03 times the “U2.Pt”, and the device issues the PT break alarm after a delay.

3) 复归装置，给装置施加三相电流 1A、三相电压 57.74V，改变电压值使得三相线电压降至小于 0.97 倍无压定值时，经延时装置发出 PT 断线告警。

3) Restore the device, apply 1A of three-phase current and 57.74V of three-phase voltage to the device, adjust the voltage so that the three-phase line voltage falls to less than 0.97 times “U.None”, and activate the PT break alarm by the delay device.

1.5.13 控制回路故障告警

1.5.13 Trip-and-close circuit fault alarm

1) 设置控故障告警投退为“投入”，退出其他保护投退，设控故障告警延时为 10s。

1) Set the “E.CB.A” as "yes", quit other protection, and set the “CB.A.T” as 10s.

2) 将合位监视(X6.33)和分位监视信号(X6.36)同时有电压时，经延时装置发出控故障告警；装置复归后，同时断开合位监视和分位监视信号，经延时装置发出控故障告警。

2) When voltage is present simultaneously in the “CB On.M”(X6.33) and “CB Offf.M”(X6.36), the device will issue the control fault alarm after a delay; after the device has been restored, disconnect two signals, and the device will issue the control fault alarm after a delay.

1.5.14 零序过压告警

1.5.14 Zero-sequence overvoltage alarm

1）设置零序过电压告警投退为“投入”，退出其他保护投退，设定零序过压告警定值为 30V，延时设为 5s。

(1) Set the “E.U0.OVP” as "yes", quit other protection, set the “U0.OVP” as 30V and “U0.OVP.T” as 5s.

2）在端子 X1.23-X1.24 上施加小于 0.97 倍定值的电压信号，将 U0 变为大于 1.03 倍定值，经延时装置发出零序过电压告警。

(2) Apply a voltage signal less than 0.97 times the setting value on terminal X1.23-X1.24. Change U0 to more than 1.03 times the setting value, and the device issues zero sequence overvoltage alarm after a delay.

1.5.15 FC 回路配合的过流闭锁功能

1.5.15 FC blocking function

1）设置过流二段投退与 FC 闭锁投退为“投入”，设置过流二段定值为 2A，延时为 2S，FC 闭锁定值为 4A，延时为 1S。

(1) Set “E.3I>>” and “E.FCBlock” as "yes", set “3I>>” to 2A, “3I>>.T” to 2S, “FCB.I” to 4A, “FCB.T” to 1S.

2）当电动机处于运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 均施加 5A 电流信号，经延时，装置 FC 闭锁，过流二段不动作，只产生“过流二段保护”事件记录。

2） When the motor is running, apply 5A current signals to AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. After a delay, the device FC blocking and two-stages overcurrent does not operate, only " 3I>>" event record is generated.

3）当电动机处于运行状态时，在交流输入端子 X1.1-X1.2、X1.3-X1.4、X1.5-X1.6 均施加 3A 电流信号，经延时，装置过流二段保护动作。

(3) When the motor is running, apply 3A current signals to the AC input terminals X1.1-X1.2, X1.3-X1.4, X1.5-X1.6. After a delay, the device two-stages overcurrent protection operates.

1.5.16 电压不平衡保护

1.5.16 Voltage unbalance protection

1）设置电压不平衡保护投退为“投入”，退出其他保护投退，设置电压不平衡度定值为 5%、电压不平衡保护定值为 30V、电压不平衡保护延时 0s。

(1) Set the “E.Unb.V” as "yes", quit other protection, set “Unb.V.R” to 5% , the “Unb.V” to 30V, the “Unb.V.T” to 0s.

2）在端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上施加电压 UA=UB=UC=57.74V，当电压变为 UA=10.74V, UB=57.74V,UC=57.74V，经延时装置保护动作。

(2) Apply the voltage UA=UB=UC=57.74V on terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22, when the voltage becomes UA=10.74V, UB=57.74V, UC=57.74V, the device will trip after a delay.

表 1.4 电压不平衡保护测试

Table 1.4 Voltage unbalance protection test

施加信号(3PT 接线) Applied signal (3PT wiring)	装置跳闸出口 Device tripping outlet	装置信号出口 Device signal outlet
UA=57.74∠0°, UB=57.74∠-120°, UC=57.74∠120°	无 None	无 None
UA=66.840∠0°, UB=57.74∠-120°, UC=57.74∠120°	DO-KT（X6.27-X6.29）	事故总动作 Total accidental operation
UA=57.74∠0°, UB=66.540∠-120°, UC=57.74∠120°	DO-KT（X6.27-X6.29）	事故总动作 Total accident operation
UA=57.74∠0°, UB=57.74∠-120°,	DO-KT（X6.27-X6.29）	事故总动作 Total accidental operation

UC=66.894∠120°		
UA=63.627∠0°, UB=55∠-120°, UC=55∠120°	DO-KT（X6.27-X6.29）	事故总动作 Total accident operation
UA=51.379∠0°, UB=60∠-120°, UC=60∠120°	DO-KT（X6.27-X6.29）	事故总动作 Total incident operation

1.5.17　相序保护

1.5.18　Phase sequence protection

1）设置相序保护投退为“投入”，退出其他保护投退，设置线电压高定值为 120V，线电压低定值为 70V，相序保护延时 5s。

(1) Set the “E.Ph.Se” as "yes" ,quit other protection, set“Liv.HSet”to 120V, “Liv.LSet” to 70V, and “Ph.Se.T” to 5s.

2）在端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上按下表施加电压信号，装置的动作情况如下：

(2) Apply voltage signals on terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22 according to the following table, the operation of the device is as follows:

表 1.5 相序保护测试

Table 1.5 Phase sequence protection test

施加信号 Applied signal	装置跳闸出口 Device tripping outlet	装置信号出口 Device signal outlet
UA=57.74∠0°,UB=57.74∠-120°　， UC=57.74∠120° UA=57.74∠0°,UB=57.74∠120°,UC=57.74∠120°	--	--
3PT 接线，ABC 顺序接线 3PT wiring, ABC sequence wiring	无 None	无 None
3PT 接线，ACB 顺序接线 3PT wiring, ACB sequential wiring	DO-KT（X6.27-X6.29）	跳闸出口 X6.27-X6.29 闭合，同时事故总信号出口 X6.21-X6.22 闭合，保护跳闸信号 X6.21-X6.23 闭合。 Trip outlet X6.27-X6.29 is closed, while accident total signal outlet X6.21-X6.22 is closed and protection trip signal X6.21-X6.23 is closed.
3PT 接线，BAC 顺序接线 3PT wiring, BAC sequential wiring	DO-KT（X6.27-X6.29）	
3PT 接线，CBA 顺序接线 3PT Wiring, CBA Sequential Wiring	DO-KT（X6.27-X6.29）	
3PT 接线，BCA 顺序接线 3PT Wiring, BCA Sequential Wiring	无 None	无 None
3PT 接线，CAB 顺序接线	无	

3PT Wiring, CAB Sequential Wiring	None	
2PT 接线，ABC 顺序接线 2PT wiring, ABC sequential wiring	无 None	
2PT 接线，ACB 顺序接线 2PT wiring, ACB sequential wiring	DO-KT（X6.27-X6.29）	跳闸出口 X6.27-X6.29 闭合，同时事故总信号出口 X6.21-X6.22 闭合，保护跳闸信号 X6.21-X6.23 闭合。 Trip outlet X6.27-X6.29 is closed, while general accident signal outlet X6.21-X6.22 is closed and protection trip signal X6.21-X6.23 is closed.
2PT 接线，BAC 顺序接线 2PT wiring, BAC sequential wiring	DO-KT（X6.27-X6.29）	
2PT 接线，CBA 顺序接线 2PT wiring, CBA sequential wiring	DO-KT（X6.27-X6.29）	
2PT 接线，BCA 顺序接线 2PT Wiring, BCA Sequential Wiring	无 None	无 None
2PT 接线，CAB 顺序接线 2PT Wiring, CAB Sequential Wiring	无 None	

1.5.19　电压断相保护

1.5.20　Voltage phase failure protection

1）设置电压断相保护投退为“投入”，退出其他保护投退，设置断相最大电压定值为 30V，断相最小电压定值为 18V，断相电压差定值为 18V，电压断相保护延时 5s。

(1) Set the “E.Ph.Br” as "yes", quit other protection, set the “PhBrUmax” as 30V, the “PhBrUmin” as 18V, the “Ph.BrU.Dif” as 18V, and the “Ph.Br.T” as 5s.

2）在端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上按表 1.6 施加电压，装置经过经过延时可保护动作。

(2) Apply voltage to terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22 according to Table 1.6, and the device protection operates after a delay.

表 1.6 电压断相测试

Table 1.6 Voltage phase failure test

3PT 接线，UA=57.74,UB=57.74，UC=57.74 3PT wiring, UA=57.74,UB=57.74, UC=57.74	无 None	无 None
3PT 接线，UA=57.74,UB=57.74，UC=10 3PT wiring, UA=57.74,UB=57.74, UC=10	DO-KT （X6.27-X6.29）	事故总出口 Total accident outlet
3PT 接线，UA=57.74,UB=10，UC=10 3PT wiring, UA=57.74,UB=10, UC=10	DO-KT （X6.27-X6.29）	事故总出口 Total accident outlet
2PT 接线，UA=57.74,UB=57.74，UC=57.74 2PT wiring, UA=57.74,UB=57.74, UC=57.74	无 None	无 None
2PT 接线，UA=57.74,UB=57.74，UC=10 2PT wiring, UA=57.74,UB=57.74, UC=10	DO-KT （X6.27-X6.29）	事故总出口 Total accident outlet

2PT 接线，UA=57.74,UB=10，UC=10 2PT wiring, UA=57.74,UB=10, UC=10	DO-KT （X6.27-X6.29）	事故总出口 Total accident outlet

1.5.19 过电压保护

1.5.19 Overvoltage protection

1）设置过电压保护投退为“投入”，退出其他保护投退，设置过电压保护定值为 120V，过电压保护延时 4s。

(1) Set the “E.OVP” to "yes", quit other protection throwback, set the “U.OVP” to 120V, the “OVP.T” to 4s.

2）在端子 X1.17-X1.18、X1.19-X1.20、X1.21-X1.22 上施加 57.74V 电压，改变电压使得三相线电压升至大于 1.03 倍定值时，经延时装置保护动作。

(2) Apply 57.74V to terminals X1.17-X1.18, X1.19-X1.20, X1.21-X1.22, and change the voltage so that the three-phase line voltage rises to more than 1.03 times the setting value. The device protection will operate after a delay.

1.6 二次原理图

1.6 Secondary Schematic Diagram

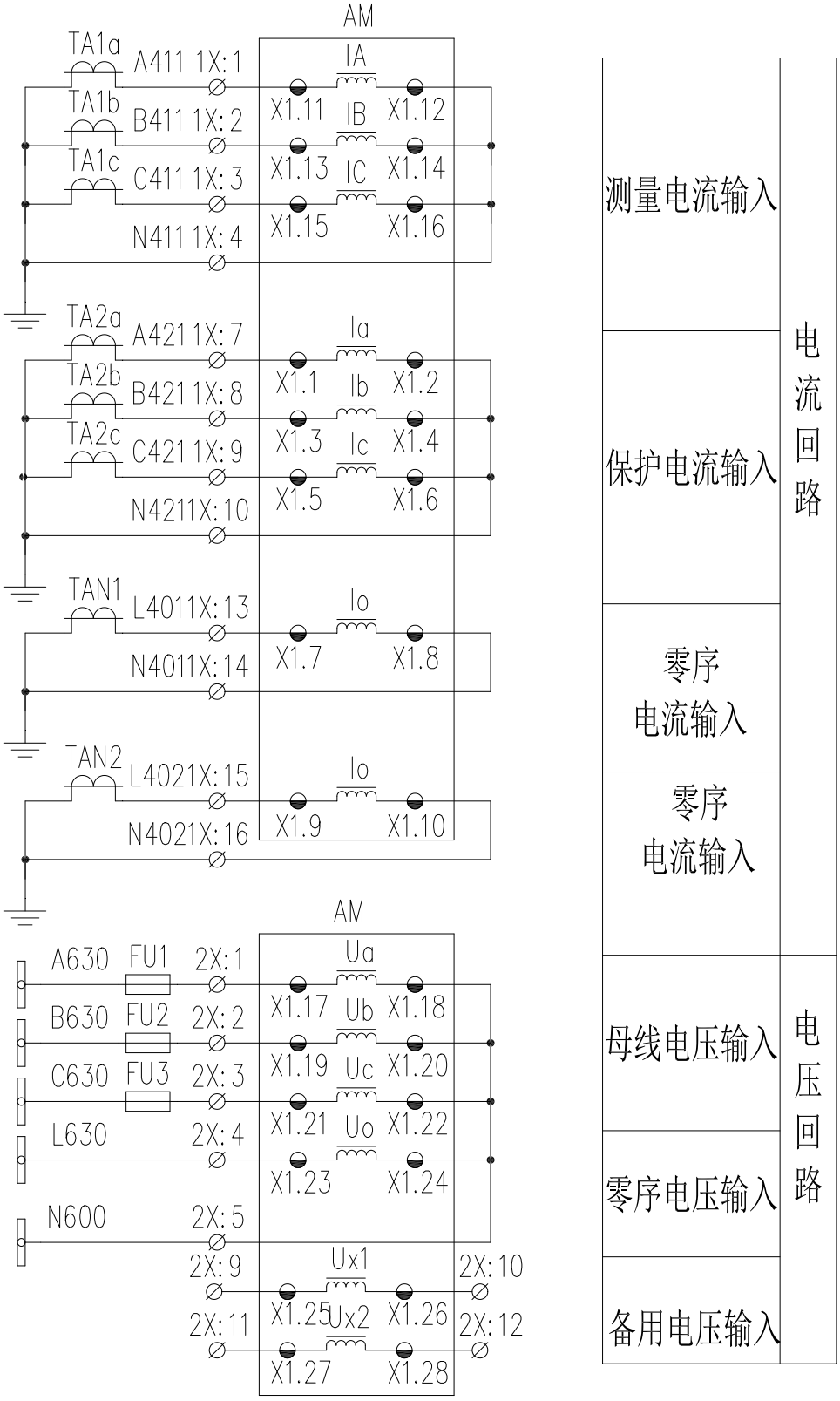


图 1.24 AM5-M-Q 二次原理图（一）

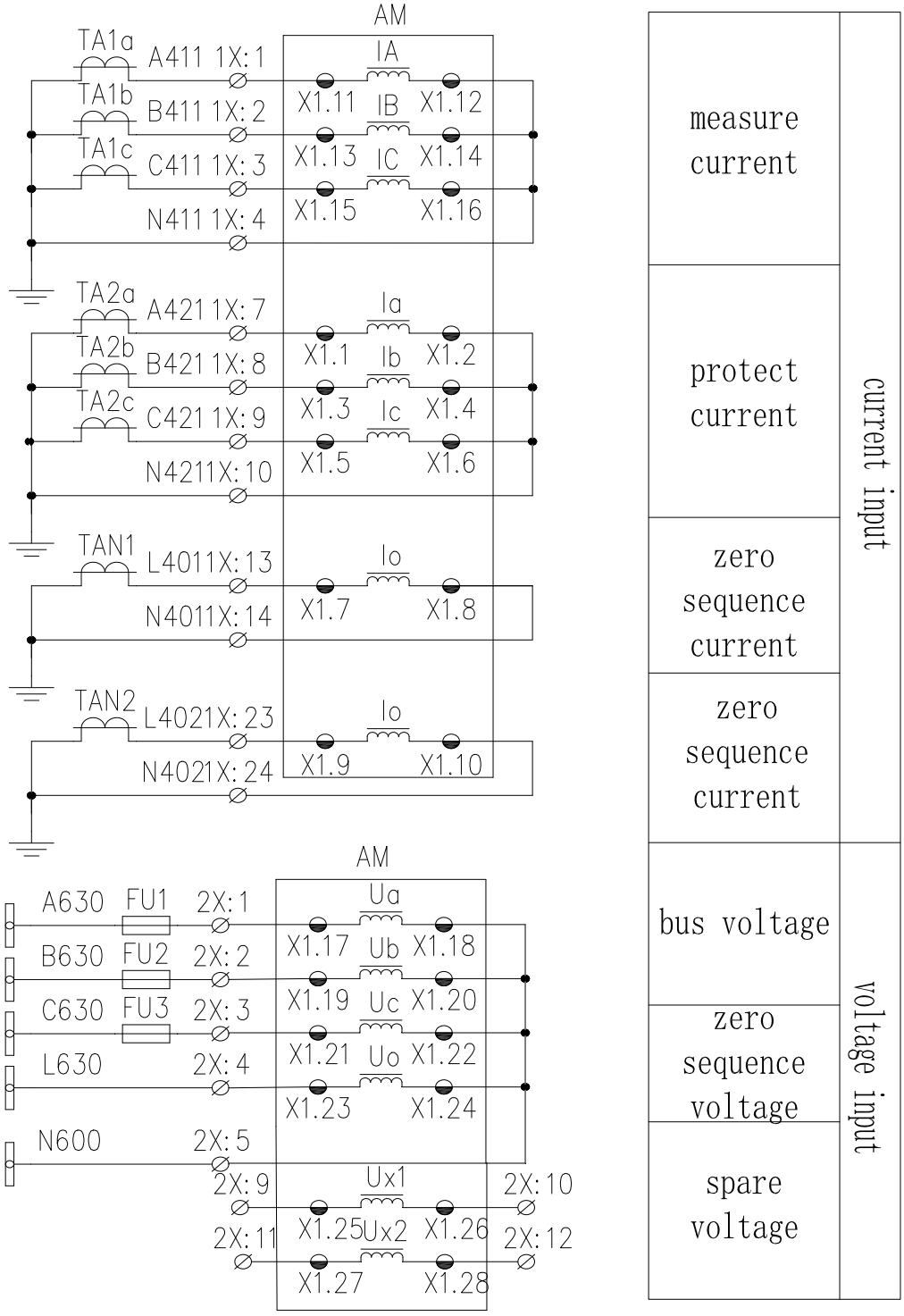
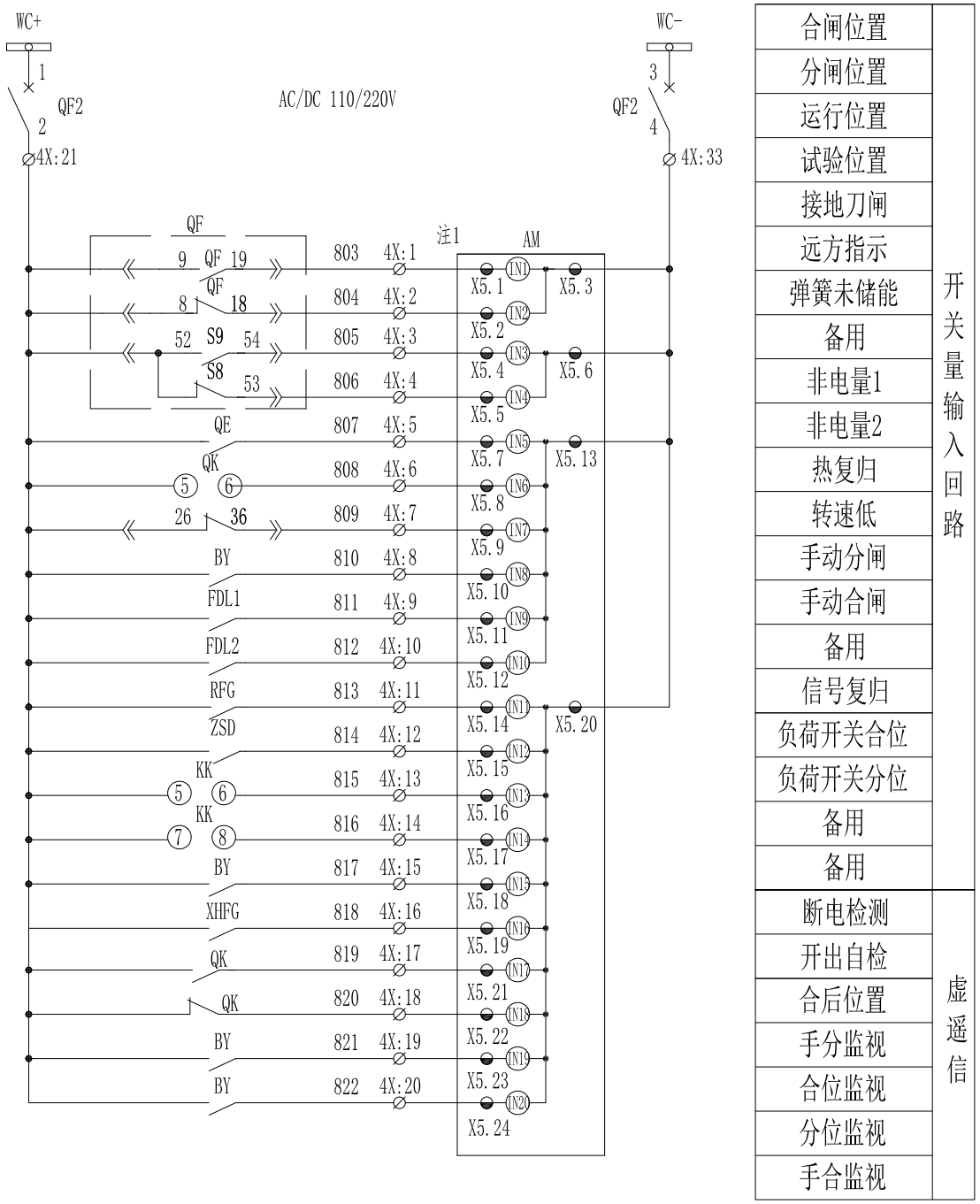


Figure 1.24 AM5-M-Q secondary schematic diagram (I)



合闸位置	开关量输入回路
分闸位置	
运行位置	
试验位置	
接地刀闸	
远方指示	
弹簧未储能	
备用	
非电量1	
非电量2	
热复归	
转速低	
手动分闸	
手动合闸	
备用	
信号复归	
负荷开关合位	
负荷开关分位	
备用	
备用	
断电检测	虚遥信
开出自检	
合后位置	
手分监视	
合位监视	
分位监视	
手合监视	

图 1.25 AM5-M-Q 二次原理图（二）

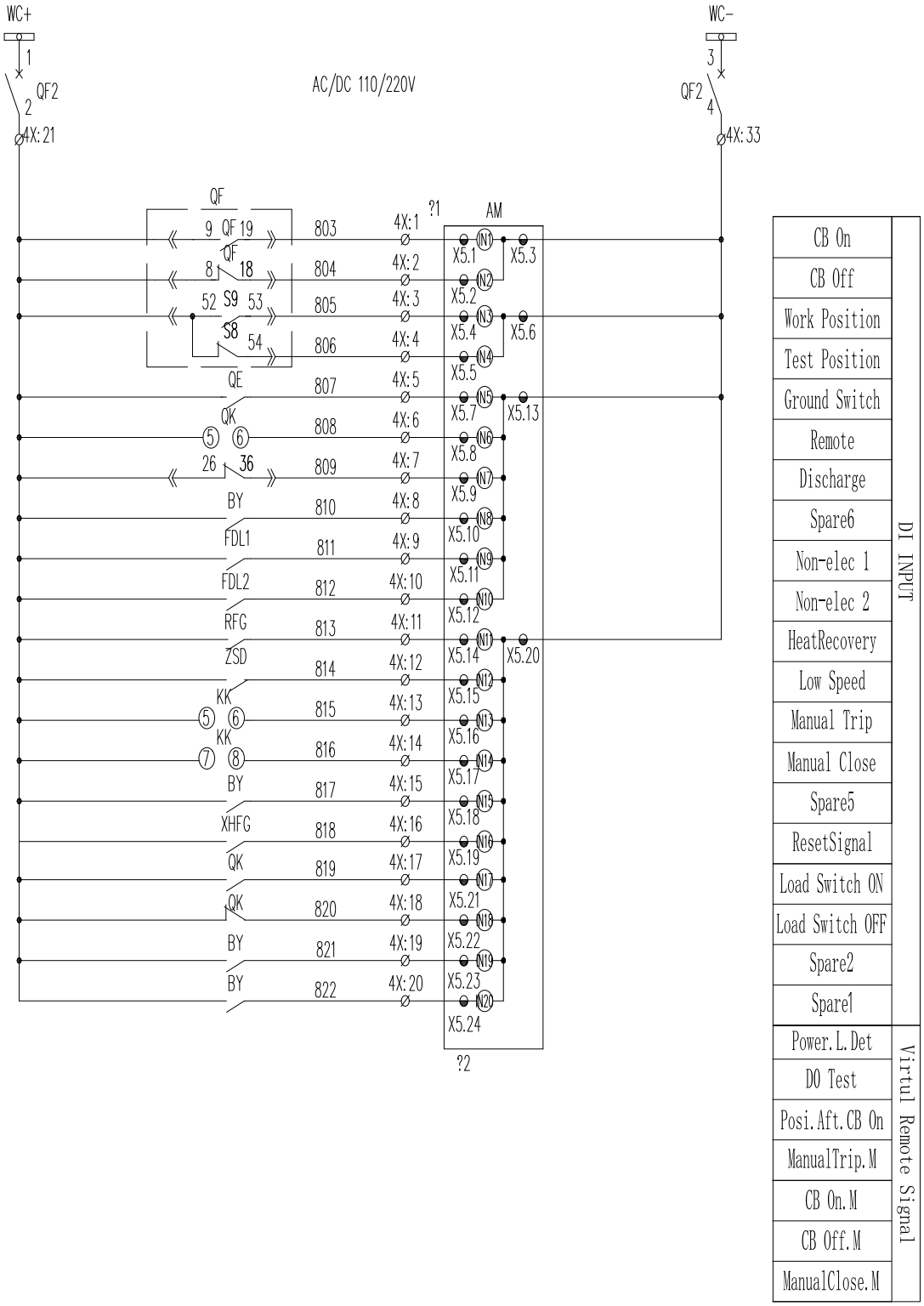


Figure 1.25 AM5-M-Q secondary schematic diagram (II)

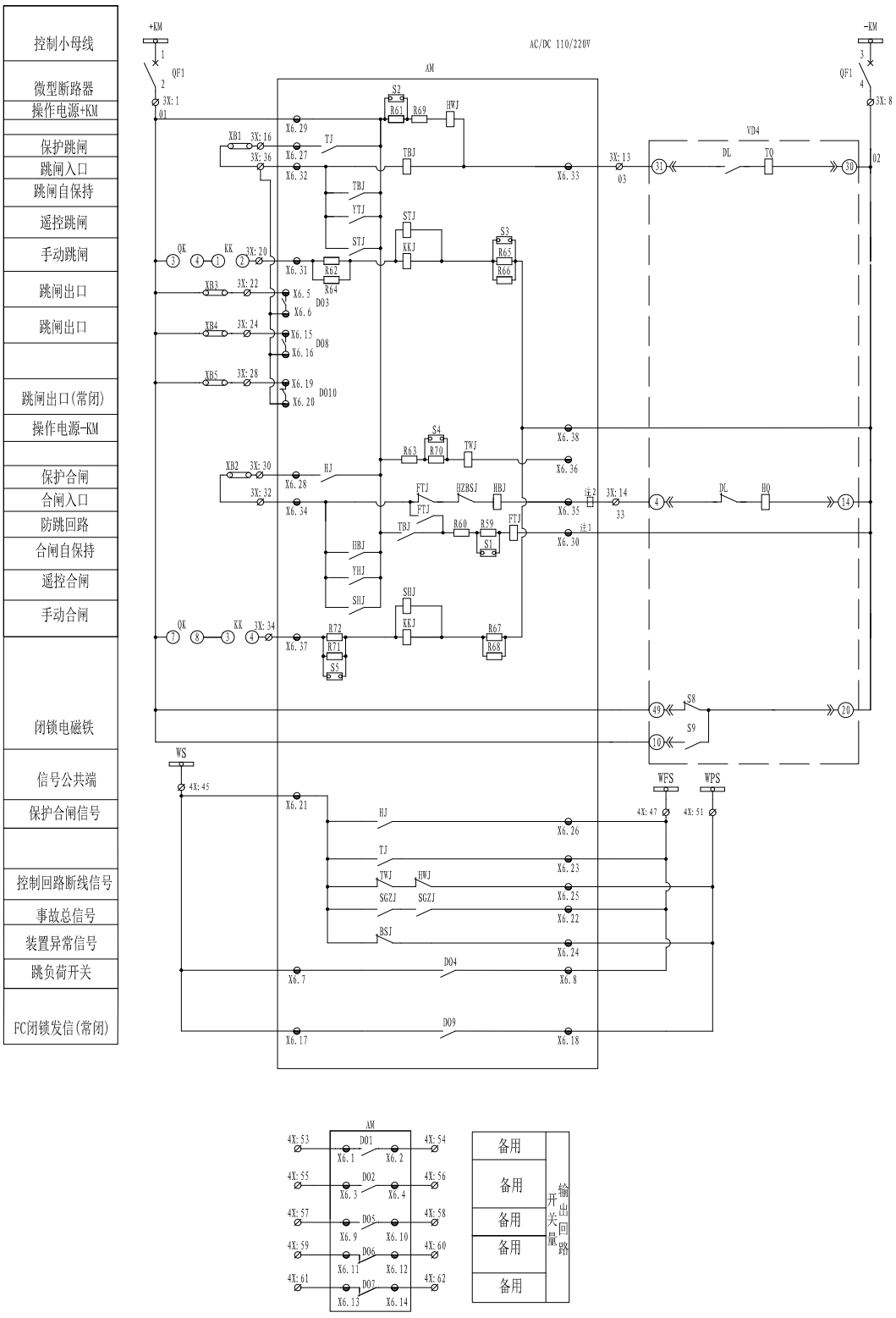


图 1.26 AM5-M-Q 二次原理图(断路器)（三）

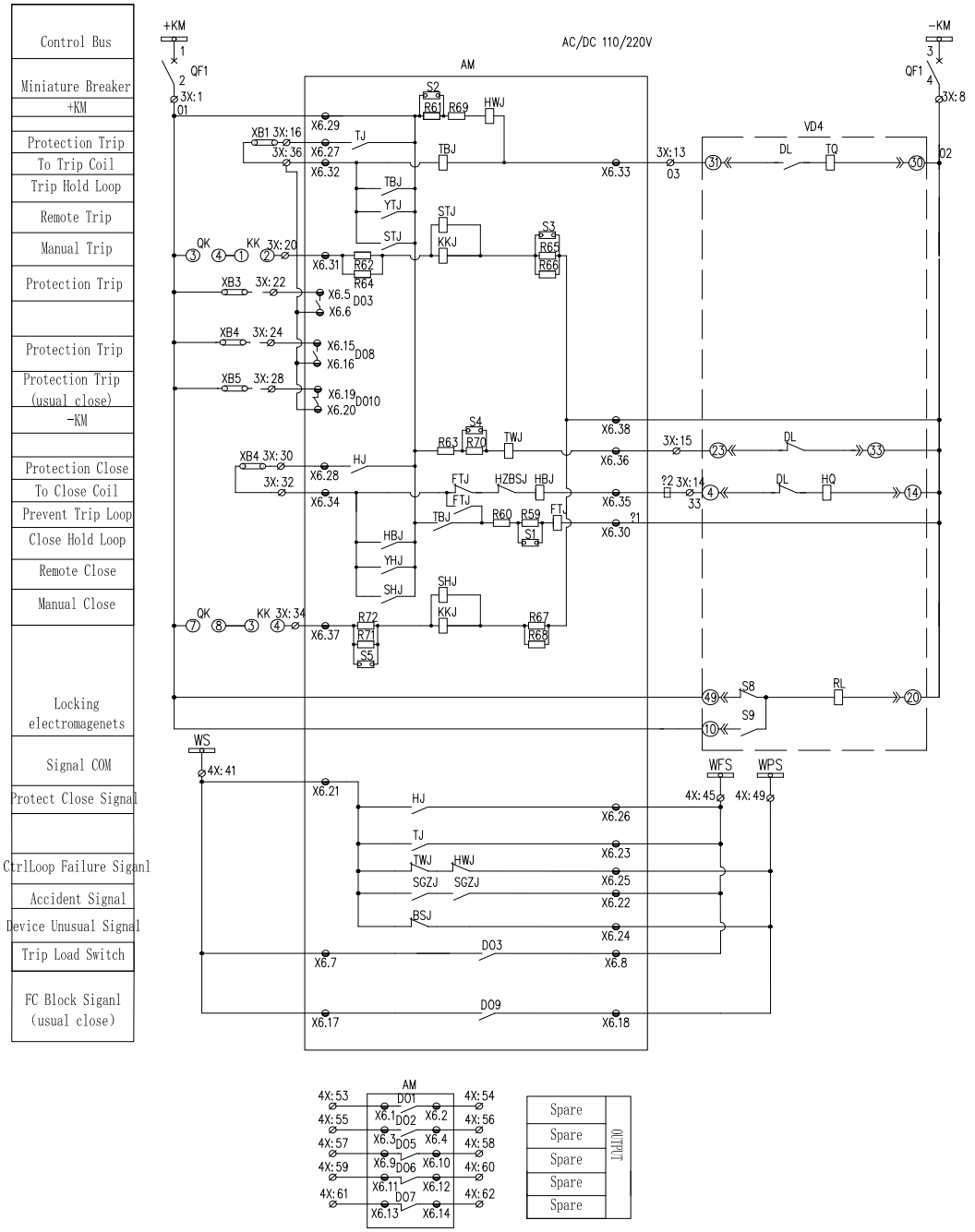


Figure 1.26 AM5-M-Q secondary schematic diagram (circuit breaker) (III)

2 维护及其他问题处理

2 Maintenance and Other Problems

装置为免维护产品，只要安装运行环境满足要求，正常运行期间不需要日常及定期保养

维护。但要留意因长期轻微震动引起的螺丝松动情况。

The device is a maintenance-free product. As long as the installation and operation environment meet the requirements, no daily and regular maintenance is required during normal operation period. However, attention should be paid to the loosening of screws caused by long-term slight vibration.

下表是在装置使用过程中可能会遇到的问题及相应处理建议。

The following table shows the problems that may be encountered during the use of the device and the corresponding treatment suggestions.

表 2.1 问题及相应处理建议

Table 2.1 Problems and corresponding treatment suggestions

问题 Questions	可能原因 Possible causes	处理建议 Suggestions for treatment
继电器不跳闸 Relay does not trip	1、该功能投退未投入 1、The function is not put into operation 2、条件闭锁 2、Condition blocking 3、出口映射表配置错误 3、Export mapping table configuration error	1、在定值表里投入相应保护投退 1、In the setting value table, put into operation the corresponding protection 2、检查是否有闭锁条件满足 2、Check whether the blocking conditions are met 3、请联系售后人员 3、Please contact after-sales staff
与装置背面的RS485口无通讯 No communication with the RS485 port on the back of the device	1、接线极性接反 1、Wiring polarity is reversed 2、通讯参数或规约不一致 2、Communication parameter or protocol is inconsistent 3、通讯电缆断线 3、Communication cable is disconnected 4、装置地址设置错误 4、The device address setting is wrong	1、调换极性接线 1、Switch polarity wiring 2、重新设置通讯参数或规约 2、Reset the communication parameters or protocol 3、维修或更换通讯电缆 3、Repair or replace the communication cable 4、在通讯菜单内设置装置地址 4、Set the device address in the communication menu
以太网接口无通讯 No communication with Ethernet interface	1、通讯参数或规约不一致 1、Communication parameters or protocol is inconsistent 2、通讯电缆断线 2、Communication cable is disconnected	1、重新设置通讯参数或规约 1、Reset the communication parameters or protocol 2、维修或更换通讯电缆 2、Repair or replace the communication cable
主界面一次电流显示不正确 The primary current display in	配置选项错误 Wrong configuration option	在配置菜单内选择正确的一次电流显示选项

the main interface is incorrect		Select the correct primary current display option in the configuration menu
指示灯显示异常或颜色与预期不符 Indicator display is abnormal or the color is not as expected	1、装置为初始化状态 1、The device is in initialized state 2、指示灯颜色配置错误 2、The color of the indicator is wrongly configured	1、请按一次“RST”按键 1、Please press "RST" button once 2、请联系售后人员 2、Please contact after-sales staff

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
电话：0086-021-69158161
网址：www.acrel.cn
邮箱：acrelsh@email.acrel.cn
邮编：201801
生产基地：江苏安科瑞电器制造有限公司
地址：江苏省江阴市南闸街道东盟工业园区东盟路 5 号
电话：0086-510-86179966
网址：www.jsacrel.cn
邮箱：jyacrel001@email.acrel.cn
邮编：214405

Headquarters: Acrel Co., Ltd.
Trade Company: Acrel E-Business(Shanghai)Co., Ltd.
Address: No.253 Yulv Road, Jiading District, Shanghai, China
TEL.: 0086-21-69156352
Web-site: www.acrel-electric.com
E-mail: sales@acrel-electric.com
Postcode: 201801
Manufacturer: Jiangsu Acrel Electrical Manufacturing Co., Ltd.
Address: No.5 Dongmeng Road, Dongmeng industrial Park, Nanzha Street, Jiangyin City, Jiangsu Province, China
TEL./Fax: 0086-510-86179970
Web-site: www.jsacrel.com
E-mail: sales@email.acrel.cn
Postcode: 214405