弧光保护装置

产品说明书

Arc protection device

Product instructions

前　　言

Preface

使用产品前，请仔细阅读此章节

Please read this chapter carefully before using this product.

本章节阐述使用产品前的安全防范知识及建议。在安装使用前，此章节必须阅读且充分的理解。如不仔细阅读，因不当操作造成的任何损害或本产品不能正常使用的，本公司不承担任何相应责任。

This chapter describes the safety precautions and recommendations before using this product. Before installation and use, this chapter must be read and fully understood. If not, our Company will not be responsible for any damage caused by improper operation or abnormal use of this product.

在对本产品做任何操作前，相关专业人员必须仔细阅读本说明书，熟悉相关操作内容。本章节将会定义以下指示标志和标准定义：

Before operating this product, relevant professionals must read this manual carefully and be familiar with the relevant operation. This chapter will define the following indicators and standard definitions:

危险！　意味着如果安全防范不得当，将会导致人员伤亡，或严重的设备损坏。

Danger! It means that if safety precautions are not taken, it may cause personal injury or serious damage to equipment.

警告！　意味着如果安全防范不得当，有可能会造成人身伤害，或设备的损坏。

Warning! It means that if safety precautions are not taken, it may cause personal injury or equipment damage.

警示！　意味着安装过程中该注意的注意事项，否则会造成轻微的人身伤害或严重的设备损坏，包括对可能要保护的的设备。

Caution! It means matters which need attention during installation, as this may result in minor personal injury or serious damage to equipment, including equipments that need to be protected.

警告！　在购买本产品前请确认是否与可能要被保护的设备应用相符，仔细阅读本产品说明书，了解本产品的开孔尺寸以及功能。本产品在正常运行时，某些部件会带电工作，不正确的操作会对本产品造成严重的损坏，以及影响被保护设备的正常运行。只有具备资质的相关人员才允许对本产品进行操作，

相关人员需仔细阅读本产品说明书。

⚠ **Warning!** Before purchasing this product, please confirm whether it is in line with the equipment that may be protected, and read this service manual carefully to understand the hole size and the function of this product. When this product is in normal operation, some parts may be energized. Improper operation may cause serious damage to this product and affect the normal use of protected equipment. Only qualified personnel are allowed to operate this product, and relevant personnel should read this product manual carefully.

⚠ 警示！

⚠ Caution!

1、本产品接地处必须可靠接地。

1. This product must be earthed reliably.

2、安装时请勿使本产品掉落以免对本产品造成损坏。

2. Do not drop this product during installation to avoid damage to this product.

3、接线端子处必须接牢，以免掉落造成严重后果。

3. The terminal blocks must be connected firmly to avoid serious consequences caused by dropping.

4、本产品正常运行过程中，请不要拔插电路板，否则会造成本产品数据的丢失，以及不能正常运行。

4. Please do not plug or unplug the circuit board during the normal operation of this product; otherwise, the data of this product will be lost and the product may not operate normally.

5、不得随意更改额定值，待相关专业人员进行更改。

5. The rated value is not changed randomly and it can be only changed by relevant professionals.

6、安装时，请根据端子定义进行安装，不得随意接线。

6. When installing, please install this product according to the terminal definition, and do not wire randomly.

⚡ 危险！ 安装完通电后，不要去触摸裸露在外的端子以及电源裸露部分，更不许将本产品放置在潮湿地方，以免端子处发生漏电短路现象。

⚡ Danger! After installation and energizing, do not touch the exposed terminals and the bare parts of the power supply and do not place this product in a damp area to avoid leakage and short circuit at the terminals.

目　　录

Contents

第一章 电弧光及保护系统简介

Chapter I Introduction of Arc and its protection system

1.1 概述

1.1 Overview

在我国，中、低压母线短路故障中，重点设备和人员伤害主要由电弧光引起，然而，我国的大多数中低压母线没有设置快速母线保护，而只是采用了简单的消弧装置和变压器后备保护。这些保护智能化较低，动作速度慢，往往会延长故障切除时间，从而进一步扩大设备损坏程度，甚至会引起"火烧连营"的恶性事故，冲击变压器一次运行，影响整个电网的安全运行。

In China, the damage to key equipments and personal damage are mainly caused by the Arc in the short circuit faults of low and medium voltage busbars. However, most of low and medium voltage busbars in China are only provided with the simple Arc-suppression device and the back-up protection system for transformer without the fast protection system for busbar. Due to less intelligence and slow motion of these protection systems, the fault clearing time is often extended so as to further expand the damage degree of equipment and even cause such serious accident as "fire and burn". When the impulse transformer runs once, the safety operation of the entire power grid will be affected.

弧光保护系统是我公司根据国内实际情况，吸收国外电弧光保护的特点，结合行业检测及保护配置相关规程，自主研发出具有独特创新技术、具有广泛实用性、高可靠性的新型电弧光保护系统。采用弧光检测和过电流检测双判据原理，具有保护动作速度快、可靠性高等特点。

The Arc protection system is a new Arc protection system with unique innovative technology, wide availability and high reliability, which is independently developed by our Company after absorbing the characteristics of foreign Arc protection system based on the domestic actual situation according to relevant specifications for industry testing and protection configuration. It is characterized by fast protection motion and high reliability because it adopts the double criterion principle of Arc detection and current detection.

1.2 电弧光产生的原因

1.2 Causes of Arc

引起开关柜弧光短路故障的原因很多，一般分为以下五类。

The Arc short circuit fault of the switchgear may be caused due to many reasons, which are generally divided into the following five categories。

1）绝缘故障：主要是柜中绝缘材料爬距不足，未满足加强绝缘要求，在脏污环境，天气潮湿下发生绝缘故障。另外，由于绝缘材料材质缺陷，运行年限较长的开关柜，在强电磁场作用下绝缘老化，也可能造成绝缘损坏而导致故障。

1）Insulation fault: it is mainly caused by insufficient creepage distance of insulation materials in the switchgear, and it does not meet the requirements of reinforced insulation. This fault occurs in the dirty environment and wet weather. In addition, due to material defects of insulation material, the switchgear with a long operating period is insulated and aged under the action of strong electromagnetic field, which may also cause insulation damage and malfunction.

2）载流回路不良：由于一些接头截面不够，紧固螺栓松动，手车柜触头接触不良，在大电流流过时引起发热，冒火进而引起相间，相对地击穿等等。

2）Poor current-carrying loop: Due to insufficient joint section, loose fastening bolts and loose contact of handcart switchgear, the heating and sparking may occur when the high current flows so as to cause the phase to phase and phase to earth breakdown.

3）外来物体的进入：如小动物（老鼠等）进入开关柜内部，或维修人员在工作完成后将工具遗留在开关柜内。

3）Entry of foreign bodies: for example, small animals (such as mouse) enter the switchgear or tools are left in the switchgear after the maintenance personnel finishes his work.

4）认为操作错误：如走错间隔，误操作，未对工作区域进行接地，未对工作区域进行验电等。

4）Misoperation: such as access to wrong interval, misoperation, no earthing in the workplace and no verification of live parts in the workplace.

5）系统方面的原因：如系统容量增大，接地方式改变，电缆应用增多，保护及自控装置配置不当，系统谐振过电压等。

5）System reasons: for example, increasing system capacity, change in earthing mode, increasing application of cables, improper protection and self-control devices

and resonant overvoltage of system.

1.3 电弧光的危害

1.3 Harms of Arc

开关柜内的发生短路弧光的功率可高达 100MW，电弧燃烧所产生的能量与电弧的燃烧时间及短路电流变化值呈指数倍增长（如下图所示），燃烧产生的高温、高压将会逐步摧毁元器件、铜排以及成列的开关柜，高明亮的弧光和有毒气体对人体也有巨大的伤害。

The power when the Arc short circuit happens in the switchgear is 100MW, and the energy generated by the Arc combustion increases exponentially with the burning time of the Arc and the variation of short circuit current (as shown in the figure below). The high temperature and the high pressure generated by the combustion will gradually destroy the components, copper bars and the switchgear in line, and highly bright Arc and toxic gas also have enormous harm to human body.
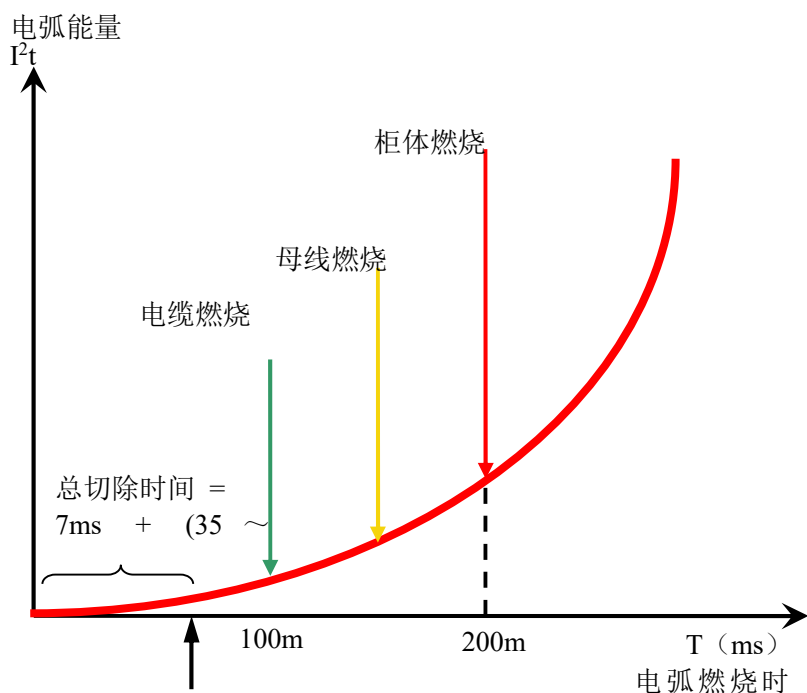
电弧光危害示意图

电弧能量	Arc energy
柜体燃烧	Switchgear combustion
母线燃烧	Busbar combustion

电缆燃烧	Cable combustion
总切除时间	Total clearing time
电弧燃烧时	Arc combustion time
电弧光危害示意图	Arc Harm Schematic Diagram

要保证设备不受结构性损伤，必须尽量缩短切除时间。

In order to ensure that the equipment is not structurally damaged, the clearing time must be minimized.

以下为国外资料介绍的各种燃弧时间长短和对设备造成的损坏程度的评估：

The estimate of the damage degree of the equipment depending various Arcing time introduced by foreign materials is as shown below:

燃弧时间 Arcing time	设备损坏程度 Damage degree of the equipment
35 ms	没有显著的损坏，一般可以在检验绝缘电阻后投入使用。 No significant damage; this product generally can be put into use after testing the insulation resistance.
100ms	损坏较小，在开关柜再次投入运行以前需要进行清洁或某些小的修理。 Minor damage; cleaning or some minor repairs are required before the switchgear is put into operation again.
500ms	设备损坏很严重，在现场的人员也受到严重的伤害，必须更换部分设备才可以再投入运行。 Since the equipment is damaged seriously and the personnel on site are also seriously injured, some equipments must be replaced before putting into

	operation.

1.4 电弧光保护系统作用及应用领域

1.4 Function and application area of the Arc protection system

电弧光保护系统，可以起到以下作用：

The Arc protection system functions as follows:

1) 减少或降低电弧光对于人体的伤害；

1) Reduce or decrease the harms of Arc to human body;

2) 减少或降低电弧光短路故障对于设备的损害；

2) Reduce or decrease the damage of Arc short circuit fault to the equipment;

3) 避免变压器因近距离母线故障造成动稳定破坏，延长变压器的使用寿命；

3) Avoid the dynamic stability damage caused by the close range busbar fault of transformer and extend the service life of the transformer;

4) 缩短电弧光故障切除时间，避免波及站内直流系统造成重大损失；

4) Shorten the Arc fault clearing time to avoid significant losses caused by the DC system in the station;

5) 减少因电弧光故障造成设备停运的时间，更快地恢复供电；

5) Reduce the equipment shutdown time caused by the Arc fault and restore the power more quickly;

应用场合：

Application occasion:

1) 电力变电站

1) Power substation

2) 常规电气段开关柜

2) Switch cabinet of conventional electrical section power plant

3）风电场升压站集电线路开关柜

3) Collector line switchgear of booster station of wind farm

4）箱式变电站

4) Box substation

第二章、电弧光保护系统的组成

Chapter II Composition of Arc Protection System

2.1技术优势

2.1 Technical advantages

1）. 动作迅速可靠：

1）. Rapid and reliable motion:

采用了可靠的快速算法，可以在短时间内判断弧光变化信号和电流变化信号并迅速出口，从发现故障到出口跳闸时间间隔优于10ms，确保开关柜内设备的弧光在75ms以内切除。

By adopting the reliable fast algorithm, the Arc and current change signals can be judged and rapidly sent to the outlet in a short time. The time interval from discovering the fault to tripping at the outlet is shorter than 10ms so as to ensure that the Arc in the switchgear can be removed within 75ms.

2）. 全数字化设计：

2）. Complete digital design:

本装置采用全数字化设计，配置灵活，动作精度高，而且排除了由于旋钮或其他机械设计导致的误差隐患。

The device adopts complete digital design which is characterized by flexible configuration and high motion precision and excludes the hidden trouble of errors caused by the knob or other mechanical design.

3）. 原理简单

3）.Simple principle

根据弧光产生时的特点，装置采用弧光和电流双重判据，判据简单且可以有效的保证动作的准确性。

The device adopts the double criterion of Arc and current according to the characteristics when the Arc is generated. The criteria are simple and can effectively ensure the accuracy of motion.

4）. 强大的电气性能：

4）. Strong electrical performance:

弧光探头设计、连接线等全部采用耐高温、阻燃的高分子材料，具有超强的电气隔离效果。装置完全满足EMC的标准，保证了弧光保护系统的整体稳定性和动作的可靠性。

The Arc probe and connecting wire are made from heat-resistant and flame-retardant polymer materials which have superior electrical isolation effect. The device completely meets the EMC standard and ensures the overall stability of the Arc protection system as well as motion reliability.

5）. 故障信息记录全面

5）. Comprehensive record of fault information

在故障弧光发生并引起装置跳闸后，主控单元或馈线保护单元可以准确的记录弧光探头检测到故障弧光的位置信息，且可以详细记录动作时刻的三相电流值。

After fault Arc occurs and causes tripping, the main control unit or feeder protection unit can record the location information of the fault Arc detected by the Arc probe accurately and record the three-phase current value at the moment of motion in details.

2.2 弧光保护系统组成

2.2 Arc protection system composition

弧光保护系统主要由主控单元、弧光采集单元和弧光传感器组成，为了适应现场的应用需求，分为了母线型弧光保护系统和馈线型弧光保护系统。

The Arc protection system is mainly composed of the main control unit, the Arc acquisition unit and the Arc sensor. In order to meet the field application requirements, it is divided into bus Arc protection system and feeder Arc protection system.

2.2.1 主控单元

2.2.1 Main control unit

主控单元是母线型弧光保护系统的核心。它检测分析故障信号、接收分析采集单元的弧光故障信号，并对两种信号进行综合分析判断。在满足跳闸条件时，发出跳闸指令以切除故障。主控单元一般安装在进线柜或紧邻进线柜的开关柜的二次控制门板上。

The main control unit is the core of the bus Arc protection system. It detects and analyzes the fault signal, receives and analyzes the Arc fault signal of the acquisition unit, and makes the comprehensive analysis and judgment of the two signals. When the tripping condition is satisfied, it issues the trip instruction to remove the fault. The main control unit is usually installed on the secondary control panel of the access cabinet or the switch cabinet near the access cabinet.

主控单元具备如下特点：

The main control unit has the following characteristics:

1）48 个弧光信号检测接口，用于接收来自弧光传感器的弧光故障信号；

1) There are 48 Arc signal detection interfaces that are used to receive Arc fault signals from Arc sensors.

2）2 个数据通讯接口，1 路 RS485，1 路以太网；

2) There are 2 data communication interfaces, 1-route RS485, 1-route Ethernet.

3）4 路快速跳闸输出接口，符合 IEC255-23 继电器标准。

3) There are 4-route fast tripping output interfaces that conform to the IEC255-23 relay standard.

4）2 路报警出口，其中一路为装置故障出口。

4) There are 2 alarm outlets, one of which is the device fault outlet

5）12 路电流输入，检测 4 组三相电流信号，用于判断故障电流。

5) There are 12-route current input that detects 4 groups of three-phase current signals and judges the fault current.

2.2.2 弧光传感器

2.2.2 Arc sensor

弧光传感器中的探头安装在柜内各间隔中，可实现由简单到复杂、有选择性的保护。弧光探头作为光感应元件，在发生弧光故障时检测突然增加的光强。

The probe in the Arc sensor is installed in each interval of the cabinet, which

can realize the selective protection from simple to complex. The Arc sensor is used as a light sensing element to detect sudden increase of light intensity when Arc failure occurs.

光纤式弧光传感器，前置探头采集弧光信号中的特有光谱信息，并通过专用光纤将光信号传送给弧光采集单元或主控单元，弧光单元或主控单元完成光信号的分析处理与采集。

The pre-probe of optical fiber type Arc sensor collects the special spectral information of Arc signal, and transmits the optical signal to the Arc acquisition unit or the main control unit through the special optical fiber, and the Arc unit or the main control unit completes the analysis, processing and acquisition of the optical signal.

2.3 技术特点

2.3 Technical characteristics

本系统具有以下技术特点：

The system has the following technical characteristics:

1）满足所有电磁兼容（EMC）标准；

1) It satisfies all electromagnetic compatibility (EMC) standards;

2）符合中国继电保护设计标准要求；

2) It conforms to the requirements of China's relay protection design standards;

3）采用过流及弧光双重判据，可靠性高；

3) It adopts the double criterion of over-current and Arc, with high reliability.

4）新型光纤连接传输，光电转换在装置内完成，抗电磁干扰能力强；

4) It is connected and transmits with new optical fiber, and photoelectric conversion is completed in the device, with strong electromagnetic interference resistance;

5）采用过滤干扰光的新型弧光传感器，具有过滤干扰光的功能，避免可见光传感器受环境光照影响引起误动；

5) It adopts a new type of Arc sensor to filter the interference light to filter the interference light, and avoid the visible light sensor mal-operation caused

by the influence of ambient light.

6） 出口跳闸时间小于 10ms，远快于传统的母线保护，对开关柜的内部弧光故障总切除时间可以控制在 75ms 以内；

6) Outlet tripping time is less than 10ms, which is much faster than traditional bus protection. The total removal time of internal Arc faults of switch cabinet can be controlled within 75ms.

7） 全汉字(英文)显示，操作习惯和传统数字式保护完全一致；

7) It is displayed with full Chinese（English）characters, and operation habits are identical with traditional digital protection.

8） 跳闸出口逻辑可编程；

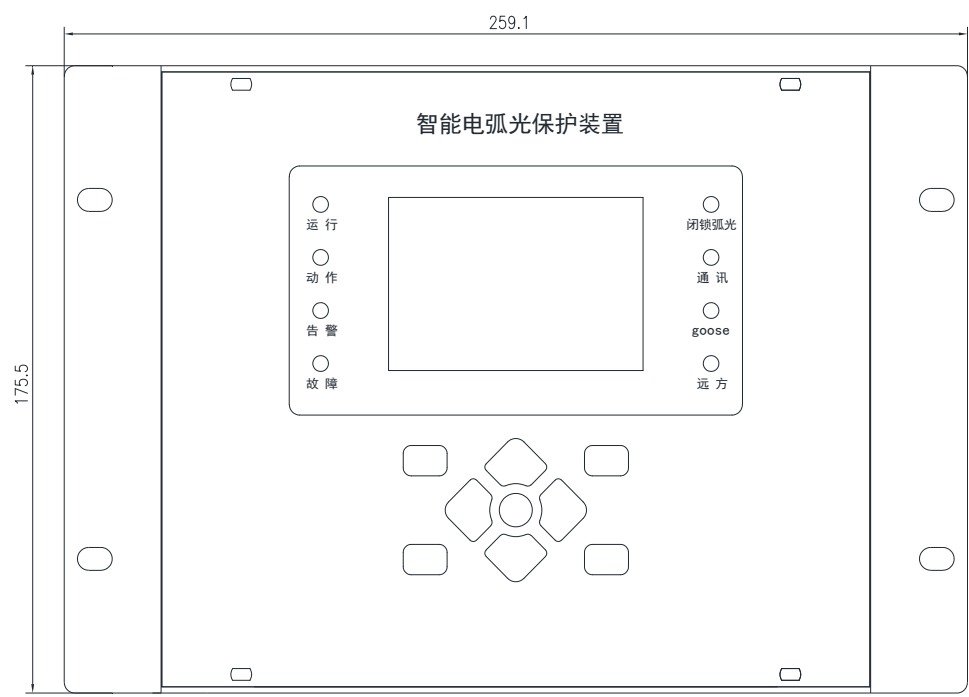8) The logic of trip exit is programmable.

第三章、电弧光保护系统产品外观与结构

Chapter III Appearance and Structure of Arc Protection System

3.1 弧光保护装置结构尺寸

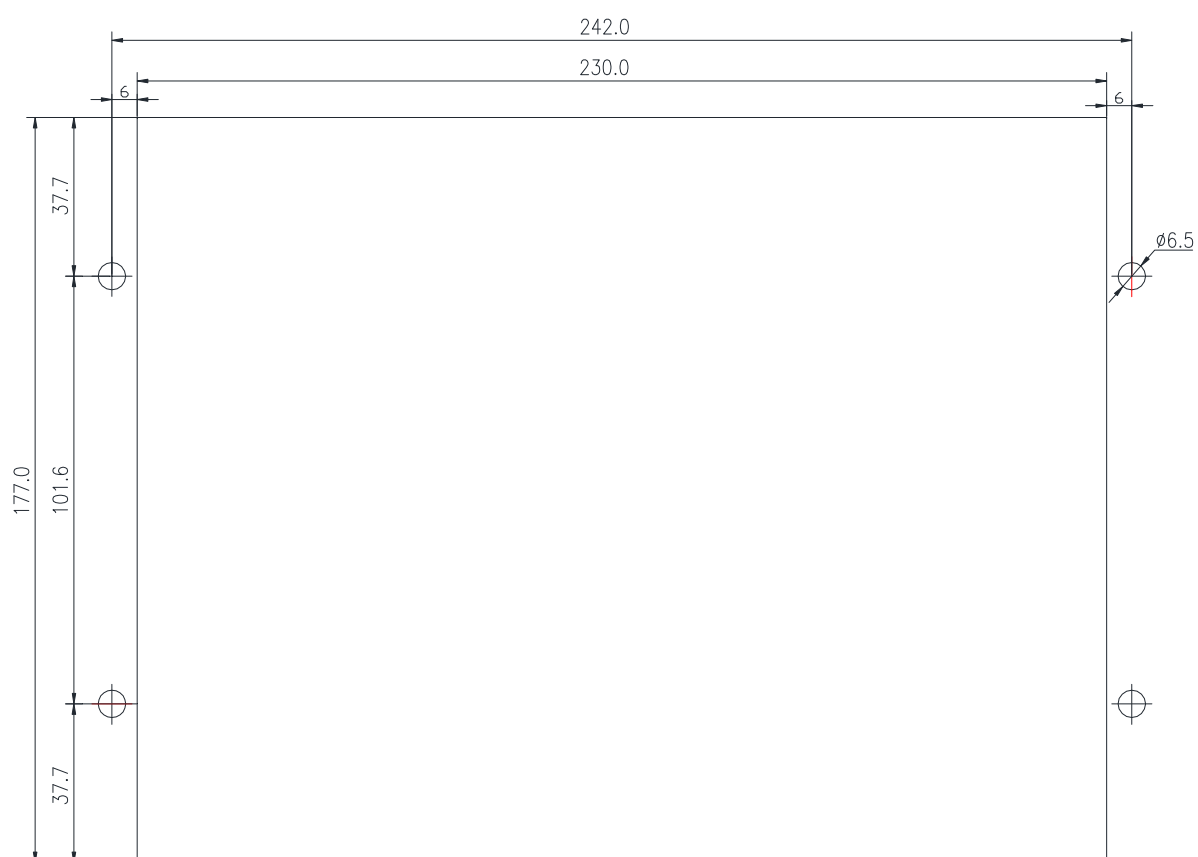## 3.1 Structural dimensions of arc protection device

主控单元采用全封闭 4U 1/2 标准机箱，嵌入式安装于屏(柜)上。插件为后插导轨式，插紧后上下有锁紧螺丝。机箱安装开孔尺寸图如下：

The main control unit adopts the fully enclosed 4U 1/2 standard case, and is mounted on the screen (cabinet). The plug-in is a rear-insert guide rail with tight screws up and down. The size of the mounting holes is as follows:

259.1

175.5

智能电弧光保护装置

运 行　　闭锁弧光
动 作　　通 讯
告 警　　goose
故 障　　远 方

3.1　面板尺寸图

3.1　Panel size

3.2 开孔尺寸图

3.2 Hole size drawing

A-电源板 / **B-继电器板** / **C-弧光板** / **D-弧光板** / **E-弧光板** / **F-弧光板** / **G-CPU板** / **H-交流板**

A-电源板:
A01	远方/就地
A02	1DL跳位
A03	1DL合位
A04	2DL跳位
A05	2DL合位
A06	3DL跳位
A07	3DL合位
A08	4DL跳位
A09	4DL合位
A10	弧光闭锁1
A11	弧光闭锁2
A12	灭弧元件分位
A13	灭弧元件合位
A14	开入14
A15	开入15
A16	开入16
A17	开入公共端
A18	失电告警信号
A19	
A20	L/+
A21	N/-
A22	PGND

B-继电器板:
B01 B02	跳闸出口1
B03 B04	跳闸出口2
B05 B06	跳闸出口3
B07 B08	跳闸出口4
B09 B10	跳闸出口5
B11 B12	跳闸出口6
B13 B14	跳闸出口7
B15 B16	跳闸出口8
B17 B18	跳闸出口9
B19 B20	保护动作
B21 B22	保护告警

C-弧光板: ARC01 ARC02 ARC03 ARC04 ARC05 ARC06 ARC07 ARC08 ARC09 ARC10 ARC11 ARC12

D-弧光板: ARC13 ARC14 ARC15 ARC16 ARC17 ARC18 ARC19 ARC20 ARC21 ARC22 ARC23 ARC24

E-弧光板: ARC25 ARC26 ARC27 ARC28 ARC29 ARC30 ARC31 ARC32 ARC33 ARC34 ARC35 ARC36

F-弧光板: ARC37 ARC38 ARC39 ARC40 ARC41 ARC42 ARC43 ARC44 ARC45 ARC46 ARC47 ARC48

G-CPU板:
G01	IRIG-B+
G02	IRIG-B-
G03	IRIG-G
G04	485A1
G05	485B1
G06	485A2
G07	485B2
G08	485GND

EXTRA / ETH1 / ETH2

H-交流板:
Ia1	H01	H02	Ia1'
Ib1	H03	H04	Ib1'
Ic1	H05	H06	Ic1'
Ia2	H07	H08	Ia2'
Ib2	H09	H10	Ib2'
Ic2	H11	H12	Ic2'
Ia3	H13	H14	Ia3'
Ib3	H15	H16	Ib3'
Ic3	H17	H18	Ic3'
Ia4	H19	H20	Ia4'
Ib4	H21	H22	Ib4'
Ic4	H23	H24	Ic4'
	H25	H26	

3.3 端子定义

3.3 Terminal definition

No.	定义功能 Definitional functions	备注 explanation
A01-A17	开入量：1-16 DI：1-16	数字信号输入 Digital input
A18-A19	失电告警 Power loss alarm output	装置失电 Device power loss
A20-A22	装置电源 Power	装置电源 Device power
B01-B02 B03-B04 . . . B17-B18	跳闸出口：1-9 Trip：1-9	可编程出口 Programmable outlet
B19-B20	保护动作信号	保护跳闸总输出

	Act signal	Trips total output
B21-B22	告警信号 Alarm signal	告警总输出 Alarm total output
ARC1 ARC2 . . . ARC48	弧光信号:1-48 Arc signal:1-48	弧光传感器接入接口 Arc sensor input
G01-G03	GPS 对时 GPS Timing	装置对时 Device timing
G04-G05 G06-G07	RS485-1 RS485-2	串口通讯 serial communication
EXTRA	以太网 Ethernet	系统组网通 System networking communication
H01-H06 H07-H012 H13-H18 H19-H24	四组三相电流输入 Four sets of three-phase current input	采样电流 Sampling current

3.2 指示灯

3.2 Indicator lights

a）"运行"指示灯为绿灯，装置正常运行时，每秒闪烁1次。

a) The "Run" indicator light is green. When the device is working, it flashes once a second.

b）"动作"指示灯为红灯，保护装置跳闸动作。

b）The "Trip" indicator light is red, and the protection device trips.

c）"告警"指示灯为红灯，装置保护告警动作。

c) The "Alarm" indicator light is the "red light" indicator of the protection device.

d) "故障"指示灯为红灯，装置自身产生故障。

d) The "Fault" indicator light is red, and the device system fails.

e) "闭锁弧光"指示灯为红灯，闭锁弧光保护功能。

e) The "Close arc" indicator light is red, and the close arc protection function.

f) "通讯"指示灯为绿灯，指示装置通讯状态。

f) "Comm" The indicator light is green, indicating the communication status of the device.

g) "扩展"指示灯为绿灯，指示装置与装置交互通讯。

g) "Extra" indicator light is green, and the indicator device communicates with the device interactively.

h) "远方"指示灯为绿灯，指示装置处于远方状态可以遥控。

h) "Dist" indicator light is green, and the indicator device is in remote state and can be remotely controlled.

3.3 按键说明

3.3 Instructions to keys

键盘上共有 9 个按键，包括"复归键"、"确认键"、"取消键"、"＋键"、"－键"、"上键"、"下键"、"左键"、"右键"。

There are nine keys on the keyboard, namely "RST", "ENT", "ECS", "+", "-", "↑", "↓", "→", "←".

a) 复归：用于对保护告警信号的复归；

a) "RST": Used to resetting protection warning signals;

b) 确认：用于对某项操作的确认或进入下级菜单；

b) "ENT": Used to confirming a specific operation or proceed to the following menu;

c) 取消：用于对所作操作的撤消或返回上级菜单；

c) "ESC": Used to cancelling the operation done or return to the previous menu;

d) "＋"、"－":用于修改数值的增加和减少；

d) "+", "-": Used to modify the increase and decrease of values;

e) "↑"，"↓"，"→"，"←"：光标移动及数值移位。

e) "↑", "↓", "→", "←": Cursor movement and numerical shift.

3.4.装置原理说明

3.4. Instructions of device principle

1）弧光保护功能

1）Arc protection function.

电弧光保护以电流单元为基础分组，弧光探头可以整定关联到任意一组电流信号上。

Arc protection is grouped on the basis of current units. Arc light probe can be tuned and correlated to any group of current signals.

当弧光单元把光信号从弧光传感器传输到主控单元时，并且同时电流启动元件动作，电弧光保护动作；装置可选择弧光信号动作单判据作为动作逻辑判断。

When the Arc unit transmits the light signal from the Arc sensor to the main control unit, the element acts with current, and the Arc protection acts; the device can choose the Arc signal action criterion as the action logic judgment.
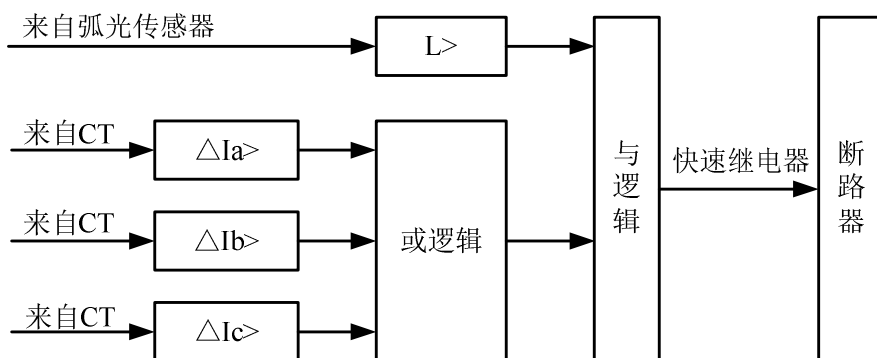
图3 电弧光保护逻辑图

Fig. 3 Arc protection logic diagram

来自弧光传感器	From Arc sensor
来自 CT	From CT
或逻辑	Or logic
与逻辑	And logic

快速继电器	Fast relay
断路器	Circuit breaker

2）装置自检

2）Device self-test

当装置检测到本身硬件故障时，发出告警信号，同时闭锁整套保护。硬件故障包括：采样回路故障、RAM 出错、定值出错等。

When the device detects its own hardware fault, it issues the alarm signal, and latches up protection as a whole. Hardware failures include: sampling circuit failure, RAM error and fixed value error.

第四章、装置操作说明书

Chapter III Device operation instructions

4.1.运行界面

4.1. Run interface

装置上电后，正常运行时液晶屏幕将显示保护装置类型、时间、日期、电流测量值。

After the device is powered on, the LCD screen will display the type, time, date and current measurement value of the protection device during normal operation.

4.1.1 运行界面

4.1.1 Run interface

当设备保护动作时，主屏幕显示最新动作报告，并显示动作报告的记录号、动作时间、动作名称、电弧通道和动作当前值。根据报告类型的不同，系统分为跳闸报告、自检报告、遥信报告、故障记录等。

When the device protection acts, the main screen displays the latest action report, and displays the record number, action time, action name, Arc channel and action current value of the action report. According to different report types, the system is divided into trip report, self inspection report, remote signaling report, fault recording, etc.

4.2.主菜单

4.2. Main menu

In the operation interface, press the "ENT" key to enter the main menu, and select the sub menu through the "↑", "↓", "←", "→" keys.

4.2 主菜单

4.2 Main menu

●模拟通道：Analog

●信息查询：Report

●压板投退：Function

●保护定值：Setpiont

●系统设置：System

●通讯设置：ETH Set

●装置测试：Test

●版本信息：Version

4.3. 模拟通道

4.3. "Analog"

"模拟通道"主要用于实时显示保护装置电流采样值及相角等。按"确认"键进入查看保护值、测量值画面图。其中"保护值"显示的是实时的二次侧保护互感器采样值。"测量值"显示的是乘以变比系数后的一次侧值。"测量校验"可以用于校验测量值。

"Analog" is mainly used to display the current sampling value and phase angle of the protection device in real time. Press the "ENT" key to enter the screen diagram of viewing protection value and measured value. The "Protect" shows the real-time sampling value of the secondary side protection transformer. The "Measure" shows the primary side value multiplied by the transformation ratio coefficient. "offset" can be used to verify the measured value.

4.3 模拟通道

4.3 Analog

● 保护值：Protect

● 测量值：Measure

● 测量校验：Offset

● 幅值：Value

● 名称：Name

● 相角：Angle

● 请选择相位基准： Reference phase

● 请输入密码：Password

4.4. 信息查询

4.4. "Report"

1）：跳闸报告

1）：Trip

"跳闸报告"显示保护跳闸报告记录，装置跳闸后请先检查这些记录。按"确认"键进入事故记录画

面图。首先显示最新的一条事故记录；按"↑"键显示前一个报告，按"↓"键显示后一个报告。

"Trip" can be used to verify the measured value. "Trip report" displays the protection trip report records. Please check these records after the device trips. Press the "ENT" key to enter the accident record screen. First, display the latest accident record; Press "↑" to display the previous report and "↓" to display the next report.

4.4.1 跳闸报告
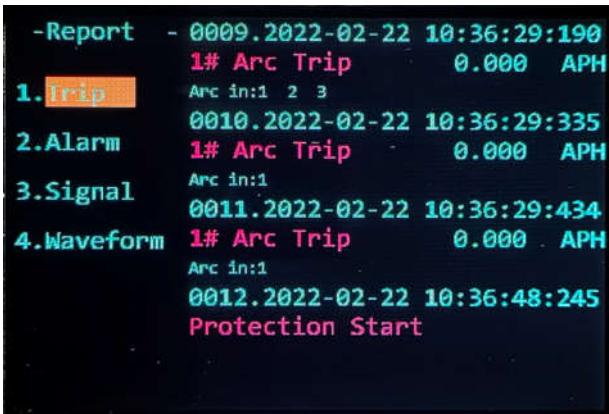
4.4.1 Trip

2）：自检报告

2）：Alarm

"自检报告"显示系统自检告警报告记录。按"确认"键进入自检报告画面。首先显示最新的告警记录；按"↑"键前翻一页报告，按"↓"键后翻一页报告。

"Alarm" displays the system self inspection alarm report record. Press the "ENT" key to enter the self inspection report screen. First, display the latest alarm record; Press "↑" to turn one page of report forward and "↓" to turn one page of report back.

4.4.2 自检报告
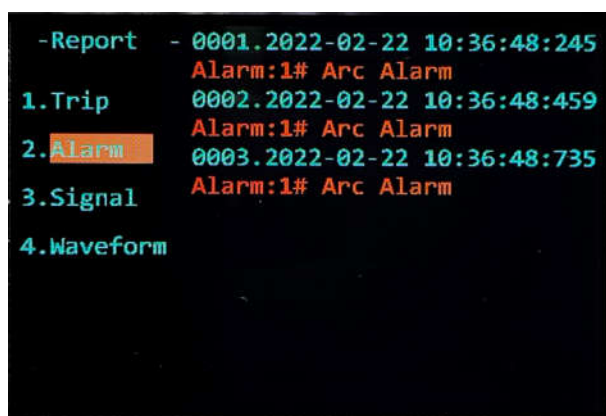
4.4.2 Alarm

3）：遥信报告

3）：Signal

　　"遥信报告"显示遥信报告记录。按"确认"键进入操作记录画面面。首先显示最新的一条操作记录，按"↑"键显示前一个报告，按"↓"键显示后一个报告。

　　"Signal" displays the remote signaling report record. Press the "ENT" key to enter the operation record screen. First, display the latest operation record, press "↑" to display the previous report, and press "↓" to display the next report.

4.4.3 遥信报告

4.4.3 Signal

4）：故障录波

4）：Waveform

　　"故障录波"本菜单显示变位报告记录。按"确认"键进入录波记录画面。首先显示最新的一条了录波记录；按"↑"键显示前一个报告，按"↓"键显示后一个报告。

　　"Waveform" this menu displays the displacement report record. Press the "ENT" key to enter the wave recording screen. First, the latest recording record is displayed; Press "↑" to display the previous report and "↓" to display the next report.
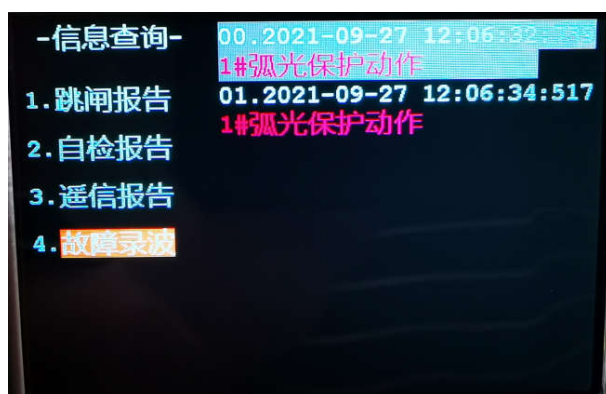
4.4.4.故障录波
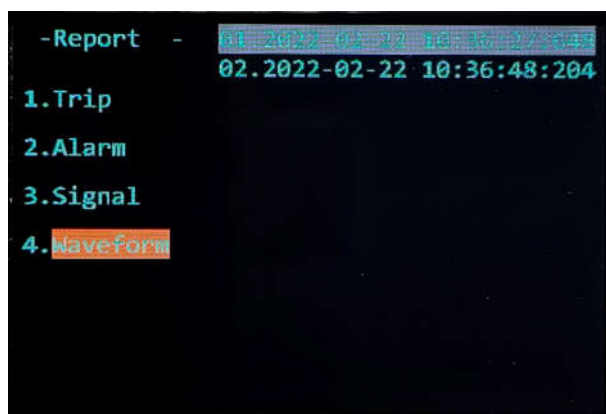
<div align="center">4.4.4 Waveform</div>

- 跳闸报告：Trip

- 自检报告：Alarm

- 遥信报告：Signal

- 故障录波：Waveform

- 装置整组启动：protection start

- 1#弧光保护动作：1# Arc Trip

- 1#弧光保护告警：1#Arc Alarm

4.5. 压板投退

4.5. Function

<div align="center">4.4 压板设置</div>

<div align="center">4.4 Function</div>

压板设置菜单内可对弧光保护功能进行投入和退出。不仅可以查看压板状态，同时可对压板进行修改。

The arc protection function can be switched on and off in the pressing plate setting menu. You can not only modify the status of the pressing plate, but also view it at the same time.

No.	压板名称 Name	默认值 Default	备注 explanation
1	1#弧光保护 1# Arc protect	On/off	Associated with I1 current
2	2#弧光保护 2# Arc protect	On/off	Associated with I2 current
3	3#弧光保护 3# Arc protect	On/off	Associated with I3 current
4	4#弧光保护 4# Arc protect	On/off	Associated with I4 current

4.6. 保护定值

4.6. Setpiont

本菜单主要用来整定或查看装置的定值。

This menu is mainly used to set or view the setting value of the device.

按"确认"键进入二级菜单，通过"↑"、"↓"切换序号，"→"、"←"键移位，"+"、"-"调整数值。设置好定值后，按取消键返回一级菜单时会弹出对话框。输入正确密码（默认出厂密码为：00）此时跳出"定值固话成功！"定值保存。如直接取消则定值不保存。如输入密码不正确，则装置会弹出"密码输入错误！"画面并返回到一级菜单界面。

This menu is mainly used to set or view the setting value of the device. Press the "ENT" key to enter the secondary menu. switch the serial number through "↑" and "↓", shift with "→" and "←", and adjust the value with "+" and "-". After setting the fixed value, press the "ESC" key to return to the primary menu, and a dialog box will pop up. Enter the correct password (the default factory password is: 00). At this time, the "save successful!". Fixed value saving. If it is cancelled directly, the fixed value will not be saved. If the input password is incorrect, the device will pop up "Password error! " Screen and return to the first level menu interface.

定值整定时首先可以选择整定的定值区。选择后进入设定的定值就是对应定值区的定值。设定好可以在"定值显示"中查看，同时当需要切换定值时，进入"定值区切换" 内对应切换即可。切换后，相应显

示和整定初始值变位切换后定值序号。

When setting the setting value, you can first select the setting value ZONE for setting. The set value entered after selection is the set value in the corresponding set value area. After setting, you can view it in the "Display". At the same time, when you need to switch the fixed value, enter the "Group". After switching, the serial number of the setting value after the displacement switching of the initial value will be displayed and set accordingly.
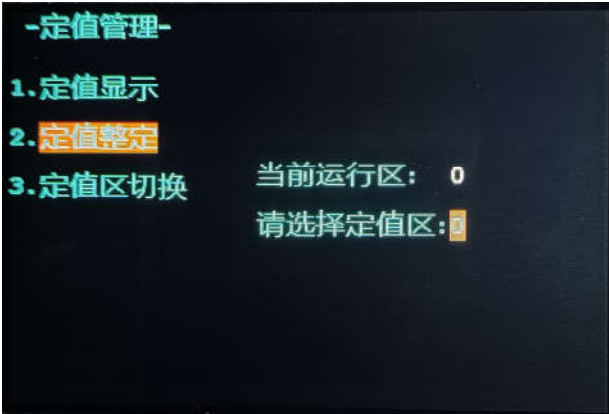
4.6.1 定值整定

4.6.1 Settings
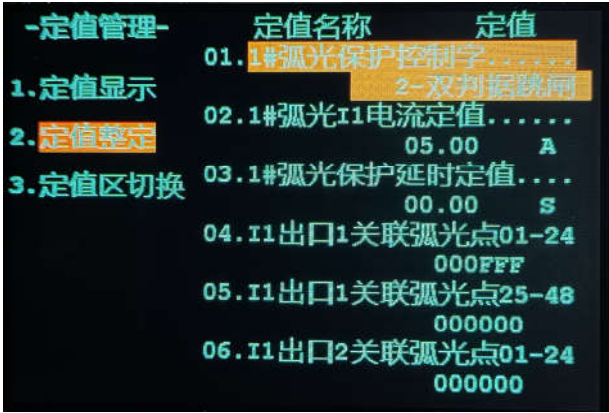
4.6.2 定值修改二级菜单

4.6.2 Modify secondary menu

●定值显示：Display

●定值整定：Settings

●定值区切换：Group

●请选择定值区：Active Group

●当前定值区 ：Setpiont Group

●1#弧光保护控制字：1# Arc Function

●纯弧光跳闸：Arc Act

●双判据跳闸：A & I Act

●纯弧光告警：Arc Alarm

●1#弧光保护电流：1# Arc I1 Value

●1#弧光保护延时：1# Arc delay

●I1 出口 1 关联弧光电 01-24：I1 Trip1-Arc 01-24

●I1 出口 1 关联弧光电 25-48：I1 Trip1-Arc 25-48

●弧光 1：Arc1

●压力异常报警控制字：Pressure Fail Function

●压力异常报警定值：Pressure value

●压力异常报警延时：Pressure Fail Delay

　　"定值整定"菜单中的"1#"、"2#"、"3#"、"4#"其含义是弧光保护 4 组采样电流。1#弧光保护的电

流判据为 Ia1,Ib1,Ic1 以此类推。由于弧光保护装置设定出口及传感器数量巨大，因此出口设定方式和弧

光点的对应方式设计为二进制转化为 16 进制的一种设定方法。下面我们以"1#弧光保护"设定举例：

"1 #," 2 #, "3 #," 4 # "in the" Settings"menu means 4 groups of sampling currents for arc

protection. The current criteria of 1# arc protection are IA1, IB1, IC1 and so on. Due to the protection device have large number of setting outlets and Arc sensors, the corresponding mode of outlet setting and arc channel is designed as a setting method from binary to hexadecimal. Let's take the setting of "1# arc Function" as an example:

当进入"定值管理"菜单选项后，屏幕右侧会出现定值，"1#弧光保护"共计有 21 项对应的设定值。有 9 个对应的出口可单独设定。这 9 个出口分别对应图纸上的跳闸 1-9。每一个出口可以分别选择弧光传感器。此项设定可以重复。1 个传感器可以对应多个出口。

After entering the menu option of " Settings ", the fixed value will appear on the right side of the screen. There are 21 corresponding set values in "1# arc Function ". There are 9 corresponding outlets that can be set separately. These nine outlets correspond to trips 1-9 on the drawing respectively. Arc sensors can be selected for each outlet. This setting can be repeated. One sensor can correspond to multiple outlets.

以"1#出口 1 关联弧光点 1-24"为例。 定值项下方显示"000000"。在这个菜单就可以对我们的传感器进行选择关联。"000000"即代表对应的弧光传感器 1-24（每一位代表 4 个弧光点）。自右向左的六位分别对应"1-4"，"5-8"，"9-12"，"13-16"，"17-20"，"21-24"。当光标在定值最右侧一位时，再按右键可进入单个弧光设定菜单。也可以投入和退出单独弧光通道。

Take "I1 Trip1-Arc 1-24 " as an example. "000000" is displayed below the fixed value item. In this menu, we can select and associate our sensors. "000000" represents the corresponding arc sensor 1-24 (each bit represents 4 arc points). The six bits from right to left correspond to "1-4", "5-8", "9-12", "13-16", "17-20" and "21-24" respectively. When the cursor is at the rightmost position of the fixed value, press the "→" button again to enter the single Arc setting menu. It is also possible to input and exit individual Arc channel.

需要投入的弧光传感器二进制位即转化为"1"，退出的即为"0"。根据实际投入的传感器首先需要确定二进制码后，再转化为对应的 16 进制数值输入即可。常规数组如下表（弧光点 25-48 同理）。

The binary bit of the arc sensor that needs to be input is converted to "1", and the exiting bit is "0". According to the actual input of the sensor, first determine the binary code, and then convert it into the corresponding hexadecimal value input. The general array is shown in the following table (arc points 25-48 are the same).

传感器序号 No.	二进制数值 Binary value	16 进制数值 hexadecimal value	备注 explanation
ARC:1	0000 0000 0000 0000 0000 0001	000001	Arc1:on
ARC:1-2	0000 0000 0000 0000 0000 0011	000003	Arc1-2:on
ARC:1-3	0000 0000 0000 0000 0000 0111	000007	Arc1-3:on
ARC:1-4	0000 0000 0000 0000 0000 1111	00000F	Arc1-4:on
ARC:1-5	0000 0000 0000 0000 0001 1111	00001F	Arc1-5:on
ARC:1-6	0000 0000 0000 0000 0011 1111	00003F	Arc1-6:on
ARC:1-7	0000 0000 0000 0000 0111 1111	00007F	Arc1-7:on
ARC:1-8	0000 0000 0000 0000 1111 1111	0000FF	Arc1-8:on
ARC:1-9	0000 0000 0000 0001 1111 1111	0001FF	Arc1-9:on
ARC:1-10	0000 0000 0000 0011 1111 1111	0003FF	Arc1-10:on
ARC:1-11	0000 0000 0000 0111 1111 1111	0007FF	Arc1-11:on
ARC:1-12	0000 0000 0000 1111 1111 1111	000FFF	Arc1-12:on
ARC:1-13	0000 0000 0001 1111 1111 1111	001FFF	Arc1-13:on
ARC:1-14	0000 0000 0011 1111 1111 1111	003FFF	Arc1-14:on

ARC:1-15	0000 0000 0111 1111 1111 1111	007FFF	Arc1-15:on
ARC:1-16	0000 0000 1111 1111 1111 1111	00FFFF	Arc1-16:on
ARC:1-17	0000 0001 1111 1111 1111 1111	01FFFF	Arc1-17:on
ARC:1-18	0000 0011 1111 1111 1111 1111	03FFFF	Arc1-18:on
ARC:1-19	0000 0111 1111 1111 1111 1111	07FFFF	Arc1-19:on
ARC:1-20	0000 1111 1111 1111 1111 1111	0FFFFF	Arc1-20:on
ARC:1-21	0001 1111 1111 1111 1111 1111	1FFFFF	Arc1-21:on
ARC:1-22	0011 1111 1111 1111 1111 1111	3FFFFF	Arc1-22:on
ARC:1-23	0111 1111 1111 1111 1111 1111	7FFFFF	Arc1-23:on
ARC:1-24	1111 1111 1111 1111 1111 1111	FFFFFF	Arc1-24:on

4.7. 系统设置

4.7. System

4.7 系统设置

4.5.1 System

●装置参数：basic Set

●时间调整：Time Set

●设备参数：Dev Set

●恢复出厂：Default

●报告清除：Clear

●清除跳闸报告：Clr Trip

●清除自检报告:Clr Alarm

●清除遥信报告:Clr Signal

●清除故障录波:Clr Wave

●清除所有:Clr All

●通讯地址：Slave address

●装置操作密码：Password

●串口 1 波特率设置：RS485 Baud rate1

●串口 2 波特率设置：RS485 Baud rate2

●弧光插件数量：Arc Block Number

●系统控制字：System

●CT 一次电流额定值：Phase CT Primary

●CT 二次电流额定值：Phase CT Secondary

●PT 一次电压额定值：PT Primary

●PT 接线方式：PT Voltage Connection

●CT 接线方式：Current Connection

●保护开入遥信确认时间： DI confirm time

●遥信开入遥信确认时间： DI signal confirm time

●遥跳保持时间：Remote NO continue time

●遥合保持时间：Remote Nc continue time

●电流压缩因子：Current factor

●压力压缩因子：Pressure factor

●就地开入电位选择：Local signal input

"装置参数"可以设置装置的串口通讯地址和波特率，操作密码，弧光接入插件数量，压力传感器接入数量进行设置。

"Basic Set" can set the serial communication address and baud rate of the device, operation password, the number of arc access plug-ins and the number of pressure sensors.

"时间调整"用于设置装置实时时钟。

"Time Set" is used to set the real-time clock of the device.

"设备参数"用于设置 CT 变比，电流额定值，接线方式及相关参数设置信息。（除 CT 变比，均不建议用户自行设置）。

"Dev Set" is used to set CT transformation ratio, current rating, wiring mode and relevant parameter setting information. (except for CT transformation ratio, users are not recommended to set it by themselves)

"恢复出厂"可将装置恢复至出厂模式。

"Default" returns the unit to factory mode.

"报告清除"清除目前产生的所有类型报告记录。也可以根据类型单独清除。

"Clear" clears all types of report records currently generated. It can also be cleared separately according to the type.

菜单设置结束后装置会自行重启，因此设置过程中建议一次性将所有信息设置完成后再返回保存。

After the menu is set, the device will restart automatically. Therefore, it is recommended to set all information at one time and then return to save.

4.8. 通讯设置

4.8. "ETH set"

本菜单主要用来设置装置的以太网接口对应的 IP 地址。设置结束后装置会自行重启。

This menu is mainly used to set the IP address corresponding to the Ethernet interface of the device. After setting, the device will restart automatically.

4.8 通讯设置

4.8 ETH Set

●参数名称：Name

●以太网1IP地址 ：Eth IP address1

●以太网2IP地址 ：ETH IP address2

●以太网子网掩码：Eth Subnet mask

4.9. 装置测试

4.9. Test

本菜单主要对装置的开出、开入、弧光、通讯进行测试

This menu is mainly used to test the output, input, arc and communication of the device.

"开出测试"用于测试所有信号出口及跳闸出口，通过"→"、"←"键可驱动开出动作。

"Output" is used to test all signal outlets and trip outlets. The outlets can be driven by "→" and "←" keys.

4.9.1 开出测试

4.9.1 Output

●开出测试：output

●跳闸出口：Output Relay

●动作信号：Trip Relay

●告警信号：Alarm Relay

开入显示可实时查看遥信开入量的状态。

"Input" can view the status of remote signaling input in real time.

4.9.1 开入显示

4.9.2 Input

●开入测试：Input

●远方：Remote sta

●跳位：OFF

●合位：ON

●弧光闭锁：Latch Arc1

●开入：DI

"弧光显示"实时显示弧光通道状态。

"Arc " displays the arc channel status in real time.

4.9.3 弧光显示

4.9.3 Arc

●弧光 1：Arc1

4.8. 版本信息

4.8. "Version"

本菜单可实时查看版本信息，序列号等相关软件信息。

This menu can view version information, serial number and other relevant software information in real time.

●版　本：Ver：
●序列号：crc：