



HIRDA - NM -B

Nonferrous metal electrolytic cell plate short circuit detection and positioning system

Technical Solution

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HIRDA-NM-B

Nonferrous Metal Electrolysis Plate Short Circuit Detection and Positioning System Technical Solution

1 Overview

Copper (99% copper) is made into a thick plate as the anode, and pure copper is made into a thin sheet as the cathode. A mixture of sulfuric acid and copper sulfate is used as the electrolyte. When the power is turned on, the copper dissolves from the anode into copper ions (Cu) and moves to the cathode. After reaching the cathode, it obtains electrons and precipitates pure copper (also called electrolytic copper) at the cathode. The copper plate produced in this way is called "electrolytic copper", of extremely high quality, and can be used to make electrical products.



During the deposition of cathode copper in the electrolytic cell, local short circuits may occur. The large amount of power loss and high temperature seriously affect the normal production of cathode copper. The detection method to find the short circuit phenomenon is low in efficiency, high labor intensity and harmful to the workers' health issues. Therefore, timely detection and accurate positioning of short-circuit faults in the electrolytic cell have become an important condition for electrolytic copper production. It is one of the most important factors affecting power efficiency and product quality. Traditional operation methods are inefficient and pose safety risks.

When a short circuit occurs in the electrolytic cell plate, the temperature rises sharply. Thermal imaging can monitor the entire electrolytic cell and accurately detect and locate short-circuited plates, greatly improving detection efficiency.



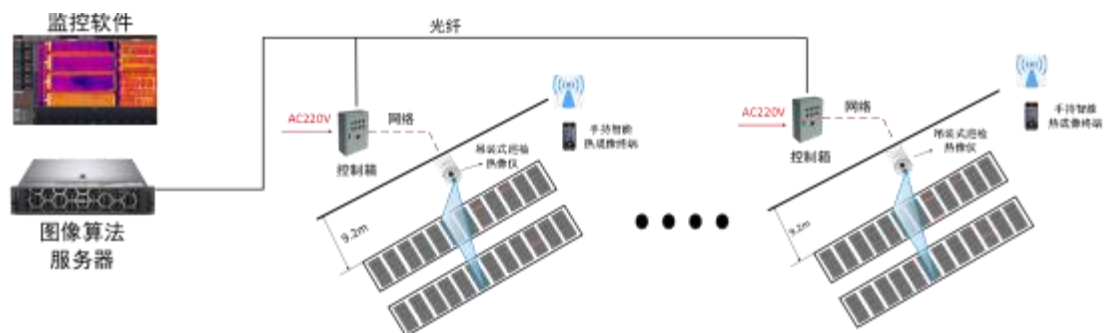
2 System Introduction

2.1 Product Description

HIRDA - NM -B The non-ferrous metal electrolytic plate short circuit detection and positioning system is a It is an intelligent detection system for electrolytic cell plate faults developed by the smelting industry. The system mainly consists of "front-end on-site monitoring unit Yuan "," Image algorithm server " and "Handheld Smart Terminal" It consists of three parts.

The system uses non-contact, industrial-grade anti-corrosion infrared thermal imager, high-precision two-axis servo turntable, manual Intelligent algorithm, real-time online temperature acquisition and plate fault detection and location during electrolysis process , 15 minute The whole workshop inspection can be completed within 10 minutes, and each faulty cathode plate can be accurately located; targeted anti-corrosion design, Ensure long-term reliable operation of the system.

The handheld smart terminal includes a high-performance PDA , uncooled infrared thermal imaging and visible light modules. It has daily team management functions (team, shift, personnel information, etc.); it has auxiliary positioning function; fault information It has the functions of information display and prompt; it has the functions of shooting, registering, and recording processing results, and can upload them to the platform system System.



Picture 1 HIRDA - NM -B System Block Diagram

2.2 System Features

- Large array, high resolution, industrial-grade infrared thermal imaging;
- Two-dimensional motion-type rapid inspection, covering the entire electrolysis workshop without blind spots;
- Use artificial intelligence algorithm to conduct efficient and accurate analysis of plate failures;



- High-precision positioning, capable of locating each faulty plate;
- Anti -corrosion design, adapting to the corrosive environment of the electrolysis workshop;
- Specialized electromagnetic compatibility design to resist the complex electromagnetic environment of the electrolysis workshop;
- Support 4G/5G Wireless data transmission;
- Open interface, providing SDK Development kit, available with DCS System docking.



2.3 System utility engineering requirements

2.3.1 power supply

Field probe power supply 220VAC 50/60HZ Power 200W/ set

Control room power supply: 220VAC 50/60HZ power 100W

3 Application Scenario

Detection of plate short circuit faults during the electrolysis of non-ferrous metals such as copper, zinc, lead, aluminum, and nickel .

4 System composition

The system mainly consists of "front-end field monitoring unit", "Image Algorithm Server" and "Handheld Smart Terminal" It consists of three parts.

4.1 Front-end field monitoring unit

The front-end on-site monitoring unit consists of an infrared thermal imaging thermometer, a high-definition visible light camera, and a high-precision two-axis servo. It consists of a turntable and a control box. It has a simple structure and is easy to install, which is conducive to the addition and expansion of on-site units. The layout of the electrolytic workshop is optimized, and several devices are reasonably installed to ensure full coverage monitoring of all electrolytic cells; Clear visible light and infrared images are integrated to improve the accuracy of faulty plate positioning. With infrared imaging and high-definition visible light, it can monitor the electrolytic cell over a large area in real time through a large range of rotation .



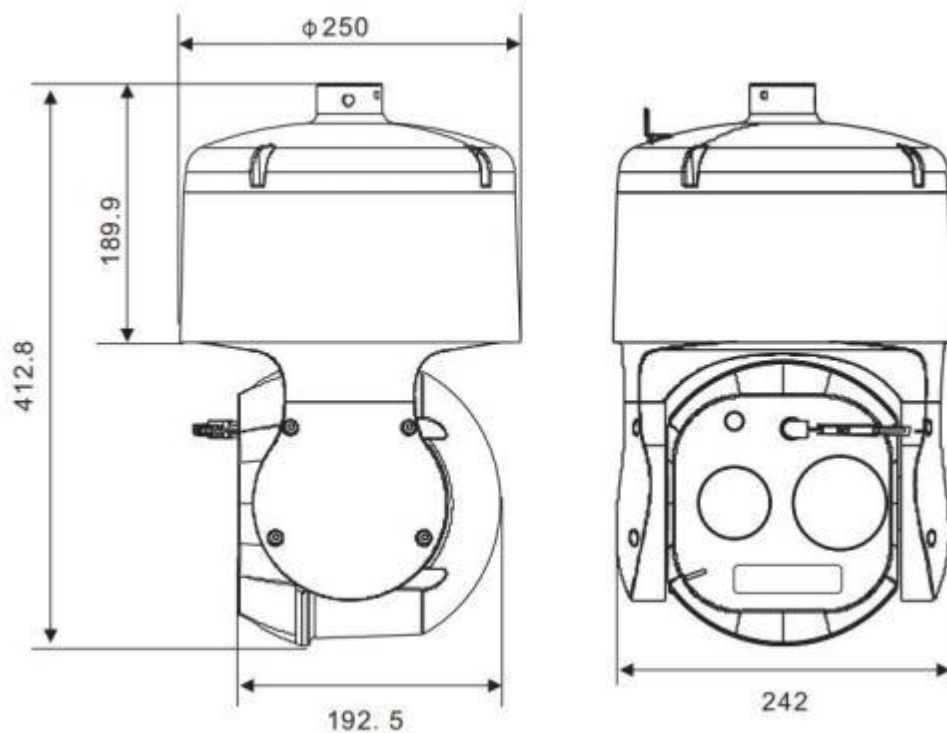
The main technical indicators are as follows:

Infrared detector type	Uncooled focal plane microbolometer
Infrared resolution	640×512
Lens focal length	25 mm
Frame rate	25 Hz
Temperature measurement accuracy	±2 °C or ±2%
Temperature measurement range	-20 °C~ 150 °C
Visible light sensor	High Definition Visible Light
Visible light resolution	200 10,000, 300 10,000, 500 10,000 Optional
Visible light magnification	18 times, 25 times, 30 times
Fault plate positioning accuracy	A plate
Faulty plate detection accuracy	> 95%
Inspection cycle	No more than 30 minute
powered by	AC 220V
Protection level	IP 66 , acid corrosion resistance
size	Φ 250 × 413 mm
Installation	Hoisting
weight	≤ 15 Kg
Operating temperature	-20 ~ 60 °C
Storage temperature	-40 °C~ 70 °C
humidity	≤ 95% (non-condensing)



4.2 Overall structural dimensions

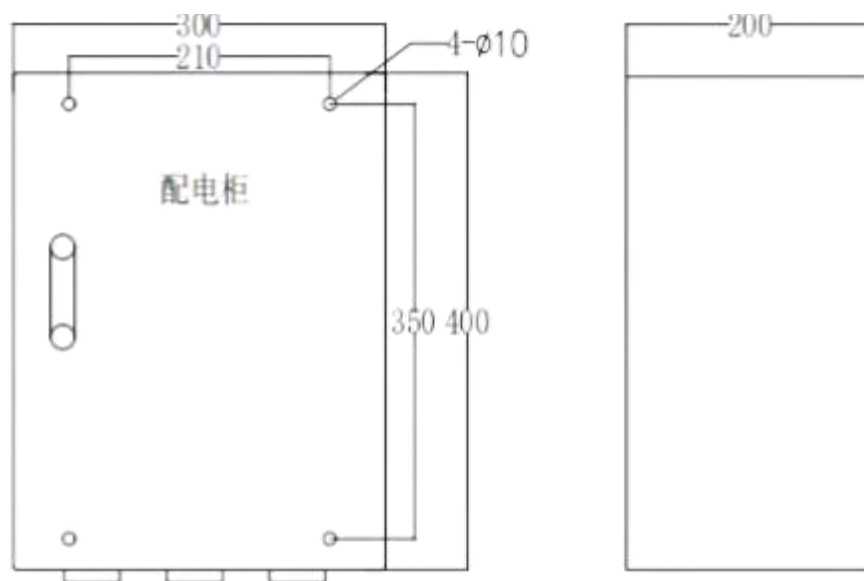
The overall structure dimensions are shown in the figure below.



4.3 On-site equipment box

The field equipment cabinet contains an industrial Ethernet switch (photoelectric conversion) and a power adapter. Its main function is to Provide stable power supply, network switching (photoelectric conversion), and data conversion for mobile inspection robots.

- Input interface: 100M/1000M Ethernet, RJ45interface
- Output interface: 1000M Optical port
- Transmission rate: Highest 1000M
- Standard : IEEE802.3, IEEE802.3u, IEEE802.3x
- Power supply: AC 220V \pm 10% 50W
- Ambient temperature: -20°C~65°C
- Ambient humidity: \leq 90%
- Dimensions : 400 (W) \times 300 (H) \times 200 (D) mm
- Dimensional drawings



picture2 Field equipment box dimensions

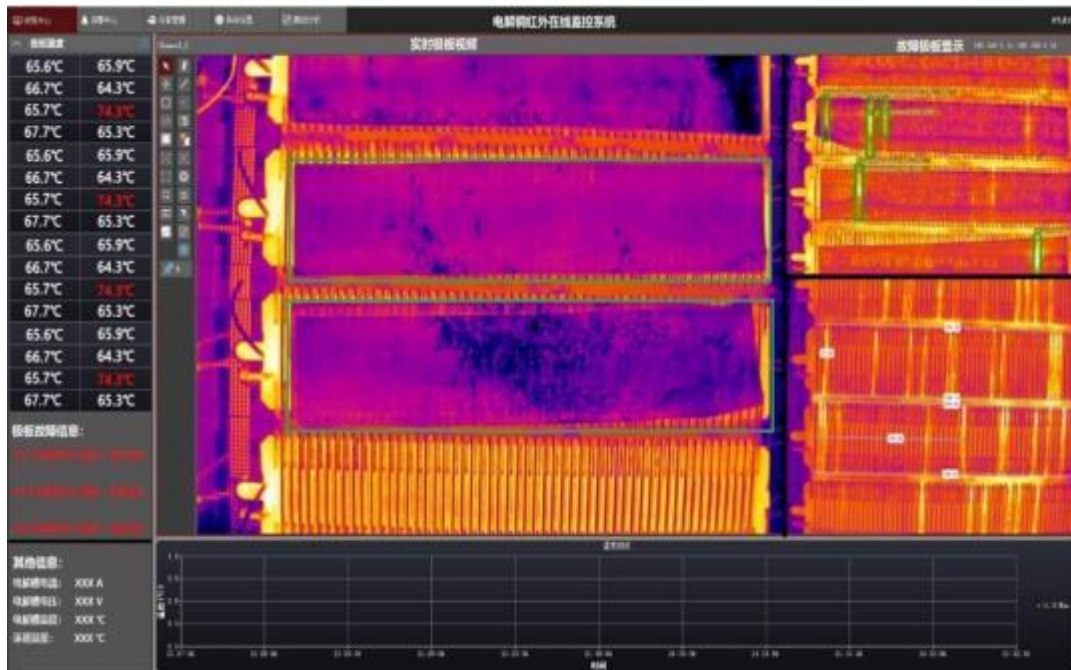
4.4 Image algorithm server

- Intel® Core™ i7-11700 processor (Quad Core, 8MB, 3.60GHz)
- Memory 16 GB 1600MHz DDR3 Non-ECC
- Hard disk 256G Solid state + 1TB 3.5inch SATA (7,200 Rpm) harddisk
- Monitor 23.8inch
- Windows 10 Professional, 64bit operating system

5 System Software

5.1 Software interface

The system client software interface is shown in the figure below.



picture2 System software interface

The system software interface is mainly divided into the following parts: title area, real-time video display area, fault plate Picture display area, fault plate information display area, plate temperature display area, other information and curve display area.

- Real-time video display area: mainly displays the electrolytic cell area that the track robot is currently inspecting. Real-time videos acquired by four robots are displayed simultaneously.
- Fault video display area: mainly displays the image of the faulty plate, and prominently marks the Inject the faulty plate.
- Faulty plate information display area: displays the faulty plate location information, temperature information, etc.
- Plate temperature display area: real-time display of the temperature of all plates in the electrolytic cell being inspected, cell by cell Scroll display.
- Other information: Display the tank temperature, tank pressure, tank current, workshop environment temperature and humidity, etc. Additional information.
- Curve display area: can display various temperature curves according to user settings, such as the highest point in real-time video Temperature curve, set temperature curve of special monitoring points, average temperature curve in real-time video, etc.



6 Configuration List

No.	name	model	unit	quantity	Remark
1	Ceiling-mounted thermal imaging camera	PSGMB 250	tower		
2	Field equipment box	SEB 432	indivual		
3	Image algorithm server	IDS	set		Including hardware and software Parts, Display
4	Handheld intelligent thermal imaging terminal end	M40	tower		
5	Cables and installation accessories	-	set	1	

7 Division of labor between the two parties

Supplier:

1) Provide HIRDA-NM-B Manufacturing, transportation, and positioning of non-ferrous metal electrolytic plate short circuit detection and positioning systems Provide guidance on installation and commissioning services to ensure the normal operation of the system, ensure the integrity of the system, and meet the requirements of on-site use. beg.

2) Responsible Choice HIRDA - NM -B Installation of equipment for short-circuit detection and positioning system for non-ferrous metal electrolytic plates Location: Provide equipment installation location map before construction.

3) Responsible for the purchaser's personnel HIRDA - NM -B Nonferrous metal electrolytic plate short circuit detection and positioning system The training on commissioning, use, maintenance and overhaul of the system is provided to enable the purchaser's personnel to master the operating skills independently.

4) Provide relevant technical information such as product certificates, inspection reports, operating and maintenance instructions , etc.

Buyer:

1) Provide HIRDA - NM -B The relevant on-site data and design drawings required for the installation and commissioning of the non-ferrous metal electrolytic plate short-circuit detection and positioning system equipment.



2) Ensure that the site meets the installation conditions required by the supplier, and notify the supplier's technical staff in advance to participate in the guidance Installation and debugging.

3) The purchaser shall assist in providing working conditions for the supplier's on-site service personnel.

8 Acceptance Criteria

1) Able to HIRDA - NM -B The software interface of the non-ferrous metal electrolytic plate short circuit detection and positioning system displays the infrared thermal image of the electrolytic cell plate and the detection and positioning of the short circuit fault plate. The equipment maintains good working performance;

2) It can display the currently detected electrolytic cell plate temperature and store the plate temperature data;

3) The supplier shall provide professional training to the personnel designated by the purchaser.

9 After-sales commitment

1) HIRDA - NM -B The warranty period of the non-ferrous metal electrolytic plate short circuit detection and positioning system is From the date 12 Months or after the equipment arrives 18 Months (Warranty period for purchased products, servers including internal hardware starts from the date of installation Calculation of arrival date 12 months).

2) If the product is damaged due to improper use, the purchaser shall order spare parts in a timely manner and the supplier shall provide maintenance services.

3) HIRDA-NM-B Nonferrous metal electrolytic plate short circuit detection and positioning system software is used for a long time, free of charge Provide software upgrade service.

4) Upon receiving a call from the buyer, the supplier is responsible for guiding the buyer to handle the fault; if the buyer is unable to resolve the problem, the supplier promises to 48 The company will rush to the scene to handle the problem within hours. The company's service phone number is: 400-080-4288