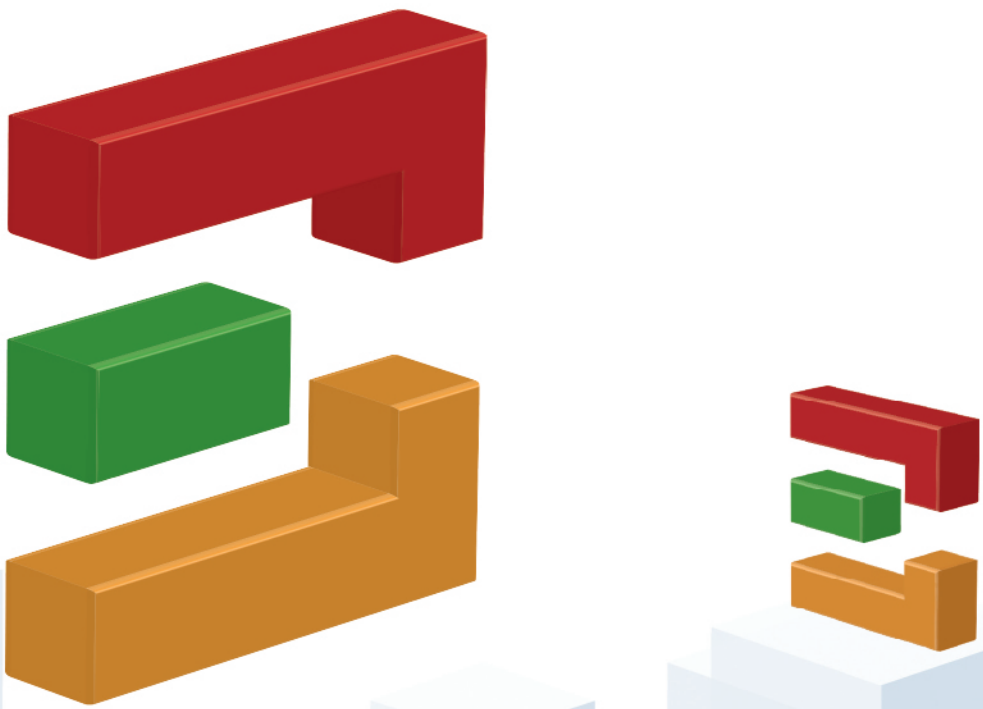
CENTRALTECH
中 联 太 信 科 技

TCIS-1000 Industrial Instrumentation Circuit Microcurrent Online Monitoring System



BEIJING CENTRALTECH COMPANY LIMITED

Document Identifier Definition	
	WARNING, RISK OF DANGER
	RISK OF ELECTRICAL SHOCK
	ESD HAZARD
	GROUND (EARTH) TERMINAL
	PROTECTIVE EARTH (GROUND) TERMINAL

Catalogue

1. Main Functions

As the core unit of industrial automation systems, the instrumentation circuit plays a pivotal role in real-time monitoring of process parameters and process control in the process industry, through the integration of sensors, transmitters, solenoid and control systems. The instrumentation circuit will establish a closed-loop mechanism. This system ensures that critical process parameters such as temperature, pressure, and flow remain under controlled conditions, exerting a decisive influence on the safe and stable operation of production equipment and enhancing product quality consistency.

Prolonged operation of load equipment under continuous electrical power can lead to gradual degradation of its condition, potentially resulting in sudden failures that disrupt production processes. In severe cases, such failures may cause interlock malfunctions, leading to secondary safety incidents. Common on-site hazards can be categorized into two main following types:

Contact Defects: These encompass issues such as oxidation of interlock relay contacts, loose terminals, and inter-turn short circuits within load coils.

Insulation Hazards: These primarily involve deterioration of on-site cable insulation, water ingress into solenoid valves, and degradation of load coil insulation.

The Industrial Instrumentation Circuit Microcurrent Online Monitoring System utilizes high-precision sensing technology to perform real-time monitoring of operational circuit impedance and comparing variations of the insulation resistance values. This system can preemptively detect equipment defects such as oxidation of relay contacts and identify safety hazards like cable insulation degradation. By monitoring operating current and circuit impedance, it assesses power supply stability and signal integrity; combined with current and insulation resistance monitoring, it anticipates trends in electrical insulation degradation. This dual-dimensional monitoring framework establishes a preventive maintenance mechanism, providing technical support on equipment health management, significantly reducing unplanned downtime and extending the life cycle of instrumentation, thereby delivering substantial engineering application value.

2. Performance Indicators

Table 1 Performance Parameters of Microcurrent Sensors

Microcurrent Sensors	Model		HSCS-001/100	HSCS-001/200	HSCS-001/300
	Operating Current	Range	20 μA~100mA	20 μA~200 mA	100~300 mA
		Deviation	±0.01%		
	Insulation Current	Range	5~1000 μA		
		Deviation	±1%		
	Power Supply		DC24V		
	Power		＜1W		
	Installation Method		CN National standard 3.5 DIN rail mounting		
	Size		53*82*26（W*D*H）		

Table 2 Communication Controller Performance Parameters

Communication Controller	Model	PWRS-485
	Function	Microcurrent Sensor Power Supply and Signal Acquisition
	Power Supply	DC24V
	Port	Input Port: DC 24V Power Supply + Carrier Signal
		Output： MODBUS RS485
	Maximum Access	≤128 circuits
	Distance	≤10km
	Installation Method	National standard 3.5 DIN rail mounting
	Size	70mm*30mm*120mm（W*D*H

Table 3 Data Terminal Performance Parameters

Data Terminal	Model	TCIS-1035C
	Function	Accuracy Calibration and Protocol Conversion
	Power Supply	AC220V
	Input Port	4 RS485 ports，1 Ethernet port
	Communication	IEC104、MODBUS、Internet of Things
	Installation Method	National standard 3.5 DIN rail mounting
	Size	105mm*33mm*145mm（W*D*H）

Table 4 Workstation Cabinet Performance Parameters

Workstation Cabinet	Model	TCIS-1000E
	Power Supply	AC220V，±7%
	Power	＜500W
	Maximum Access	16*128 Circuits
	Size	800*800*2000（W*D*H） Other sizes customizable

Table 5 Mobile Engineer Station Performance Parameters

Mobile Engineer Station	Model	TCIS-1000S
	Power Supply	AC220V，±7%
	Power	＜350W
	Maximum Access	2*128 circuits
	Size	800mm*800mm*2000mm（W*D*H） Other sizes customizable

3. Technical Advancements

3.1 Microcurrent sensors achieve DC current detection accuracy at the microampere (μA) level, in contrast, Hall effect sensors measure at the milliampere (mA) level. For a 24V DC system, measuring megohm (MΩ) level resistances necessitates current detection at the μA level.

3.2 Microcurrent sensors are capable of monitoring insulation currents within industrial instrumentation circuits, enabling real-time assessment of circuit insulation health.

3.3 Microcurrent sensors monitor the operating current of industrial instrumentation circuits, providing early warnings of potential circuit hazards based on data variations. In contrast, Hall-effect sensors have measurement precision at the milliampere (mA) level, with errors significantly influenced by their measurement principles, zero drift, and temperature variations, making them less effective in providing early warnings for various circuit defects.

4. User Instructions

4.1 Microcurrent Sensor Dimension

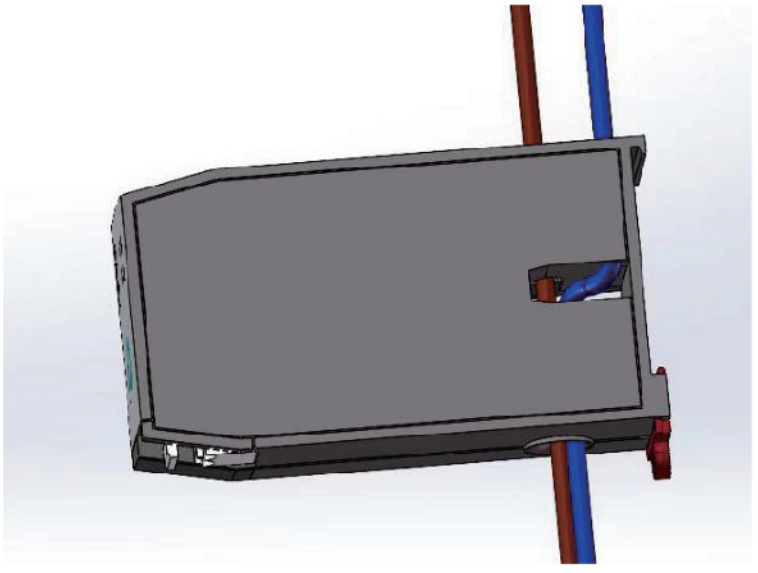


Image 1 Image of Microcurrent Sensor

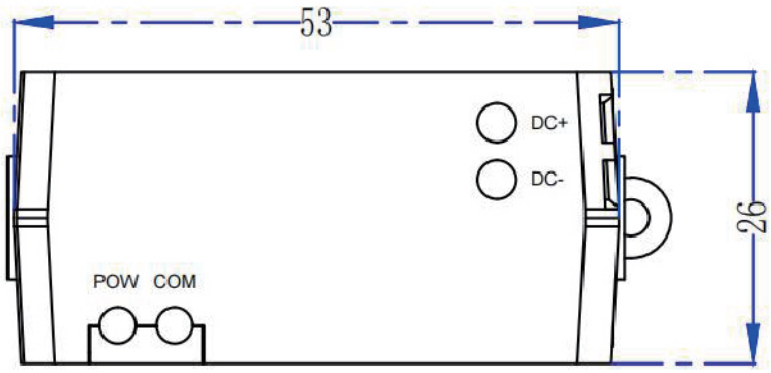


Image 2 Sensor Front View

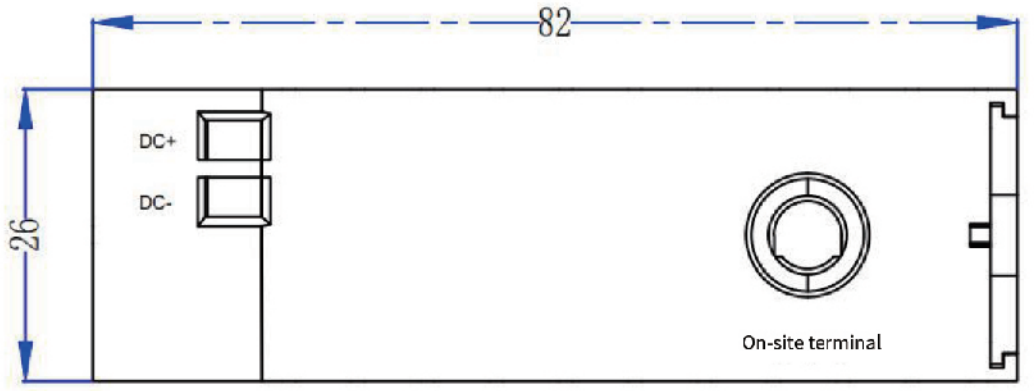


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Image 3 Sensor Right-side View

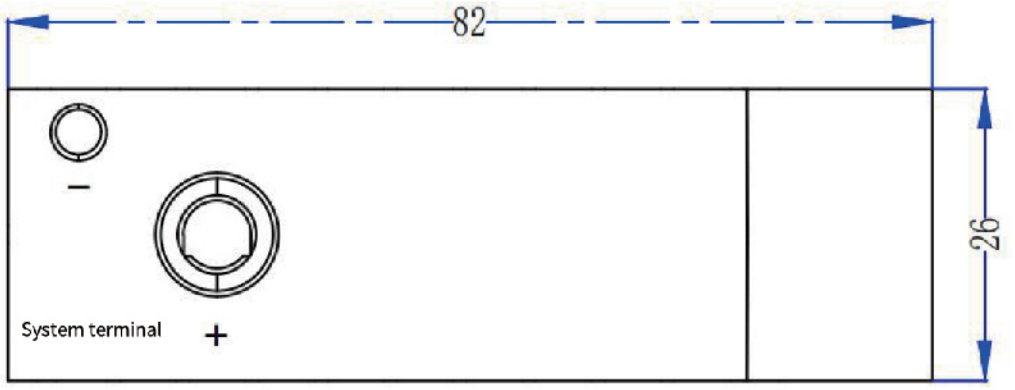

Image 4 Sensor Left-side View

4.2 Terminals and Indicator Descriptions

Power/Communication Terminal Blocks

POW: Power Indicator Light (Green): Illuminates During Normal Operation

COM: Communication Indicator Light (Green): Illuminates During Normal Operation

On-site Terminal: Dual Wire Threading Holes

System Terminal: '+': Positive Wire Threading Hole;

System Terminal: '+': Negative Wire Threading Hole;

5. Installation Instructions

5.1 Microcurrent Sensor Wiring

The microcurrent sensor is installed within the instrumentation circuit by threading the instrument circuit cable through it. Specifically, the two wires are threaded from the on-site terminal, with the positive wire emerging from the "+" terminal on the system terminal, and the negative wire exiting through the "-" terminal at the bottom.

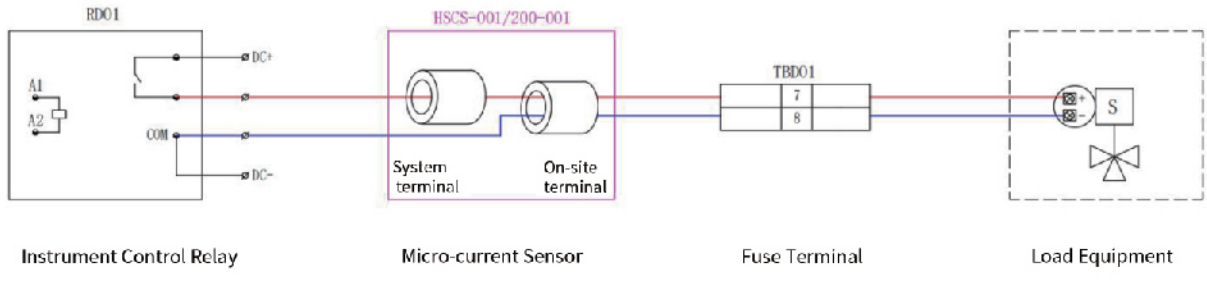

Image 5 Installation Wiring Diagram

5.2 Microcurrent Sensor Installation

Microcurrent Sensor is installed according to National standard 3.5 DIN rail mounting.

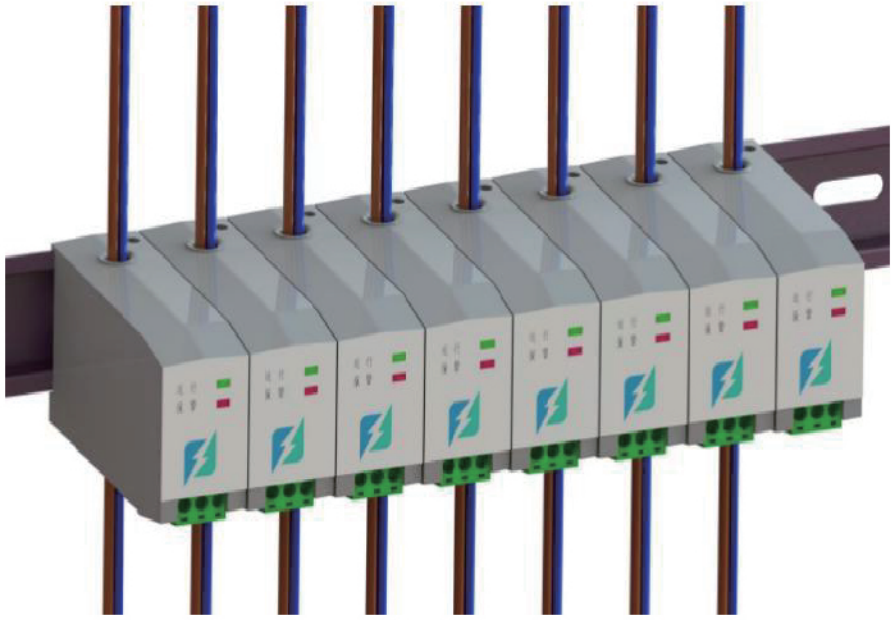

Image 6 Sensor Installation Diagram

5.3Microcurrent Sensor Connections

The sensor's power and communication terminals, labeled DC+ and DC-, connect to the workstation's terminal block and receive power from the communication controller within the workstation cabinet.

5.4 Workstation Installation

5.4.1 System Topology Diagram

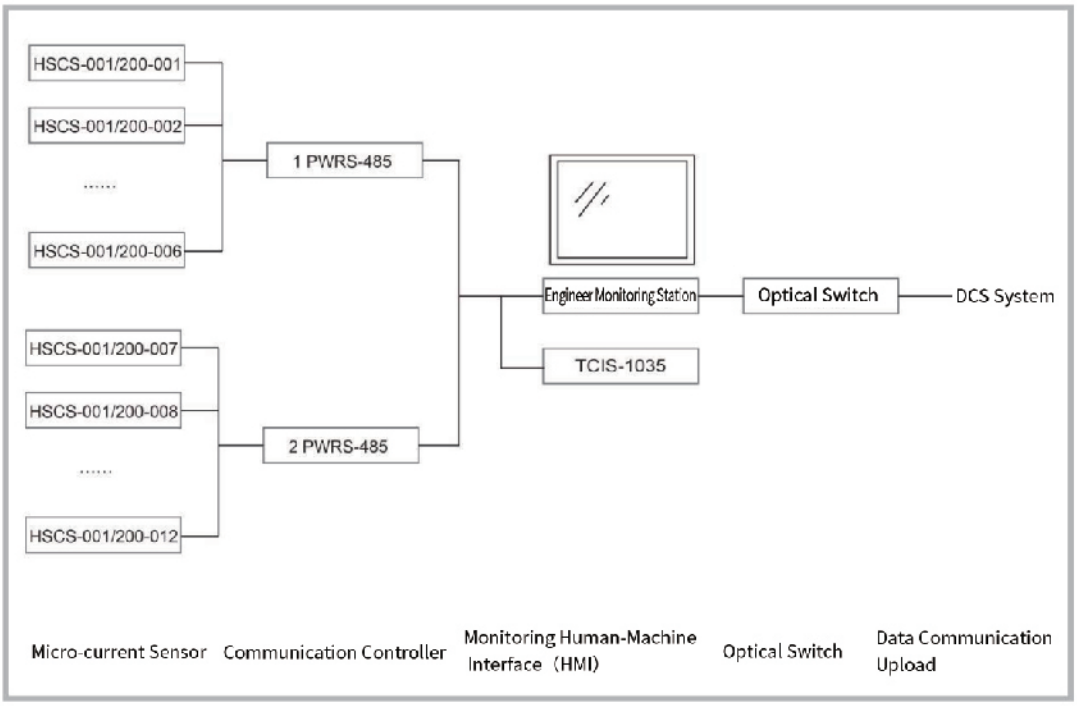

Image 7 System Topology Diagram（1）

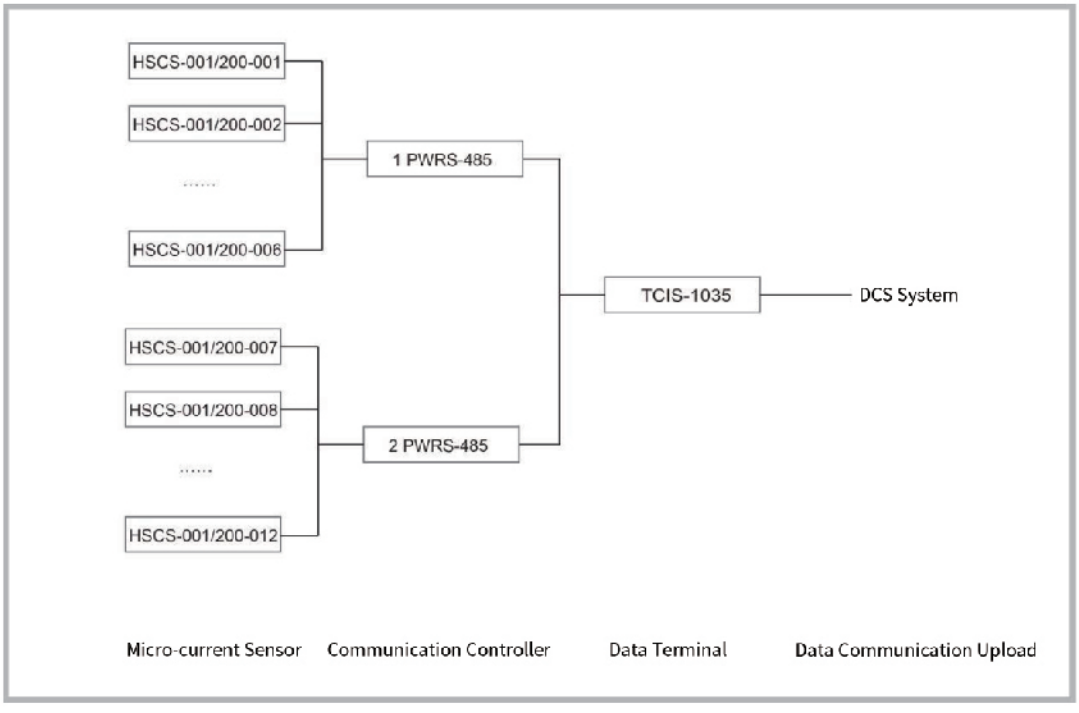

Image 8 System Topology Diagram（2）

6. Workstation Function Description

6.1 Human-Machine Interface Display

The backend human-machine interface (HMI) can display data such as operating current, circuit impedance, insulation current, and insulation resistance of the monitored circuit. Users can access bar analysis charts of current data, historical data curves, and alarm records.

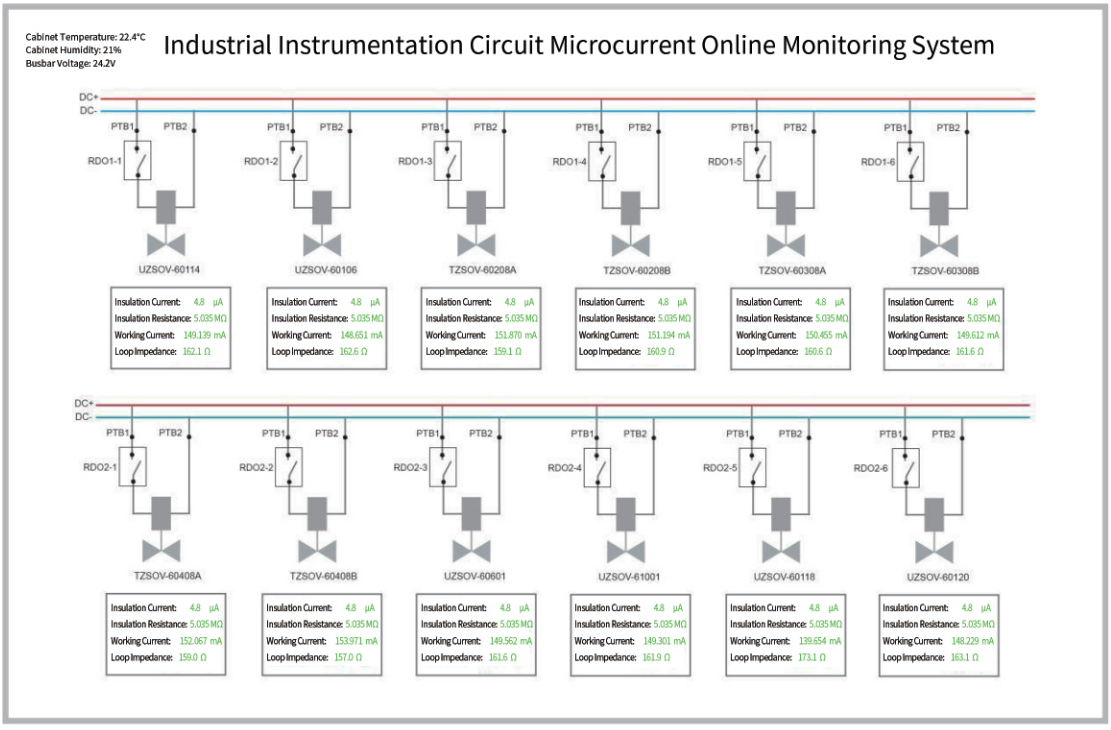

Image 9 System Monitoring Back-end

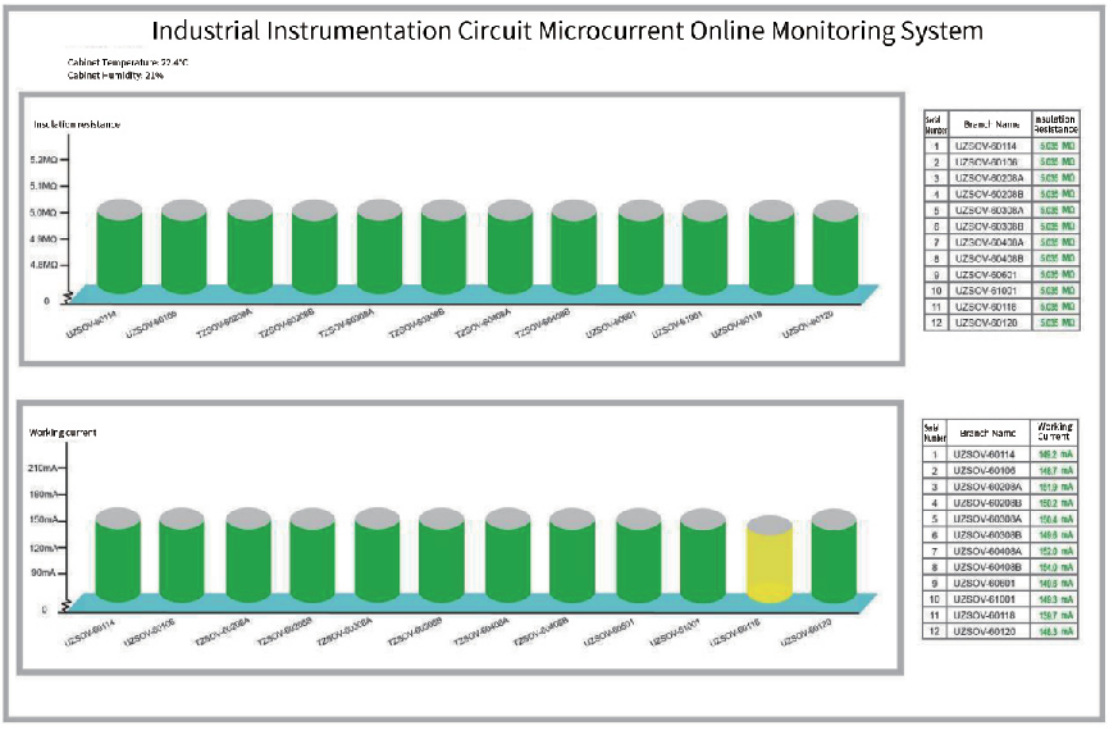

Image 10 Bar Analysis Chart

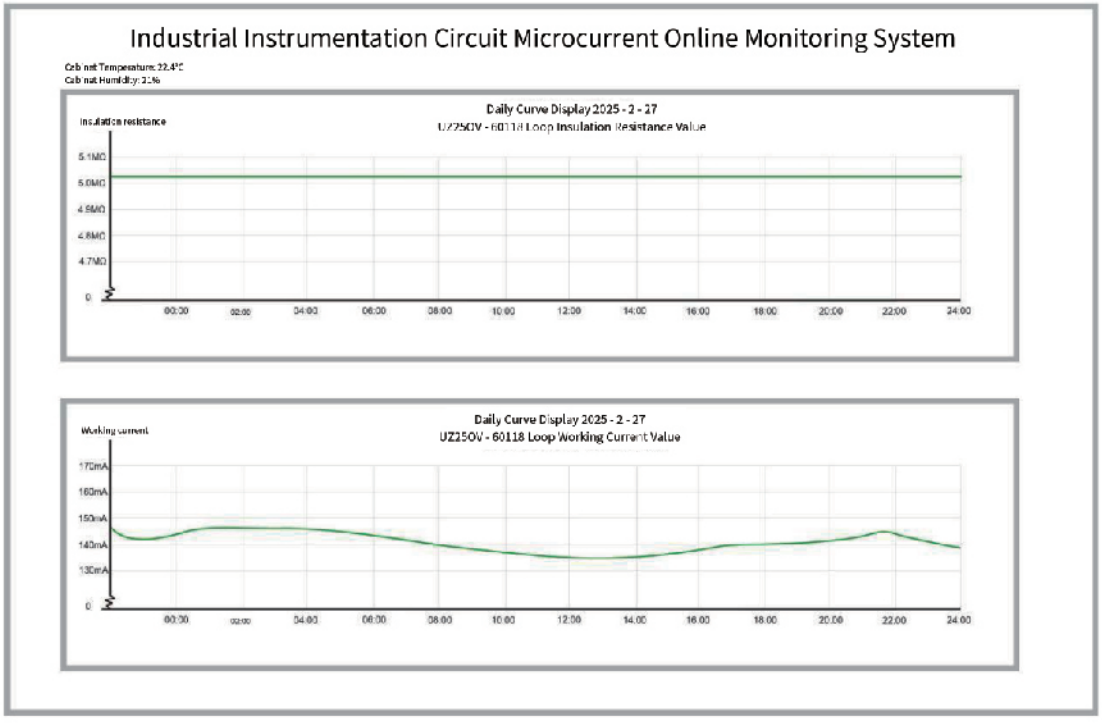

Image 11 Data Curve Graph

6.2 Alarm Settings

Alarm thresholds can be configured based on abnormal variations in monitored data, enabling early warnings through indicator lights and audible-visual alerts.

6.3 Cloud Services

The system supports configuration with cloud servers and mobile applications.

7. Engineering Application Instructions

7.1 Precautions

Before powering on the equipment, please verify that all wiring connections are correct and that the indicator lights display normal status. The cabinet operates on AC220V; ensure the power supply is disconnected prior to performing any operations to maintain personal safety.

7.2 Fault Analysis and Solution

If the microcurrent sensor's POW and COM indicators are off, please verify the wiring connections and ensure proper power supply. If both are correct, the sensor may be faulty and require replacement.

The successful application of microampere-level DC current sensing technology in industrial instrument control circuits enables health diagnostics of critical instrument loops, facilitates preventive maintenance of instrumentation equipment, and provides essential technical support for enhancing industrial digital management capabilities.

CENTRALTECH

Your Safty Guard

Add.:Jin Chang An, Building C, Room 2215, 82 East 4th Ring Middle Road,
Chaoyang District, Beijing, China, 100022
Tel : 010-5208 8723
Fax: 010-2175 0690
Email: techsun@centraltech.com
Web: www.centraltech.com